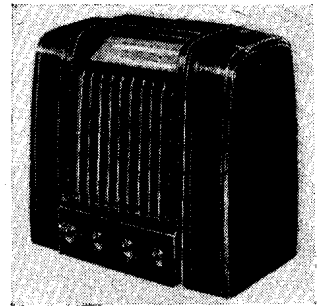


# 866

# BEETHOVEN U2038



**M**ETAL loops, shaped to follow the contour of the cabinet, permit the chassis to stand inverted on the bench for service work in the Beethoven U2038. The receiver is a 3-valve (plus rectifier) 2-band superhet designed for A.C. or D.C. mains of 190-250 V.

Release date and original price: October, 1947; £15 15s, plus purchase tax.

### CIRCUIT DESCRIPTION

Aerial input, via isolating capacitor C1, is inductively coupled by L2 (M.W.) and L3 (L.W.) to single-tuned circuits L4, C32 (M.W.) and L5, C32 (L.W.). Coil L1 is a M.W. harmonic rejector.

First valve (V1, Mullard metallized CCH35) is a triode-hexode operating as frequency changer with internal coupling. Triode oscillator grid coils L6 (M.W.) and L7 (L.W.) are tuned by C33, with parallel trimming by C34 (M.W.) and C35 (L.W.) and series tracking by C9 (M.W.) and C10 (L.W.). Reaction coupling is obtained from the common impedance of the trackers.

Second valve (V2, Mullard metallized EF39) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings C4, L8, L9, C5 and C13, L10, L11, C14.

#### Intermediate frequency 465 kc/s.

Diode second detector is part of double diode pentode output valve (V3, Mullard metallized CBL31). Audio frequency component in rectified output is developed across load resistor R11 and passed via A.F. coupling capacitor C20, manual volume control R12 and C.G. stopper R13, to control grid of pentode section. I.F. filtering by C16, R9, C17 in diode circuit and R13 in pentode C.G. circuit. Provision for the connection of a crystal gramophone pick-up across R12, via isolating capacitors C21, C22.

Second diode of V3, fed from V2 anode via C19, provides D.C. potentials which are developed across load resistor R17 and fed back through a decoupling circuit as G.B. to F.C. and I.F. valves, giving A.V.C. Delay voltage, together with G.B. for pentode section, is obtained from the drop across R15, R16.

When the receiver is operated from A.C. mains, H.T. current is supplied by I.H.C. half-wave rectifier (V4, Mullard CV31) which, with D.C. mains, behaves as a low resistance. Smoothing by iron-cored choke L13 and electrolytic capacitors C27, C28.

### DISMANTLING THE SET

**Removing Chassis.**—Stand the cabinet upside down on a felt pad, and remove the four control knobs (recessed grub screws); remove the bottom cover (four 4BA screws) and unsolder the plate aerial connecting lead from the springy contact strip; withdraw the four 4 BA cheese-head screws at the corners of the chassis underside, and lift out chassis and speaker as a single unit.

When replacing, do not omit to resolder the (Continued Col. 1, overleaf)

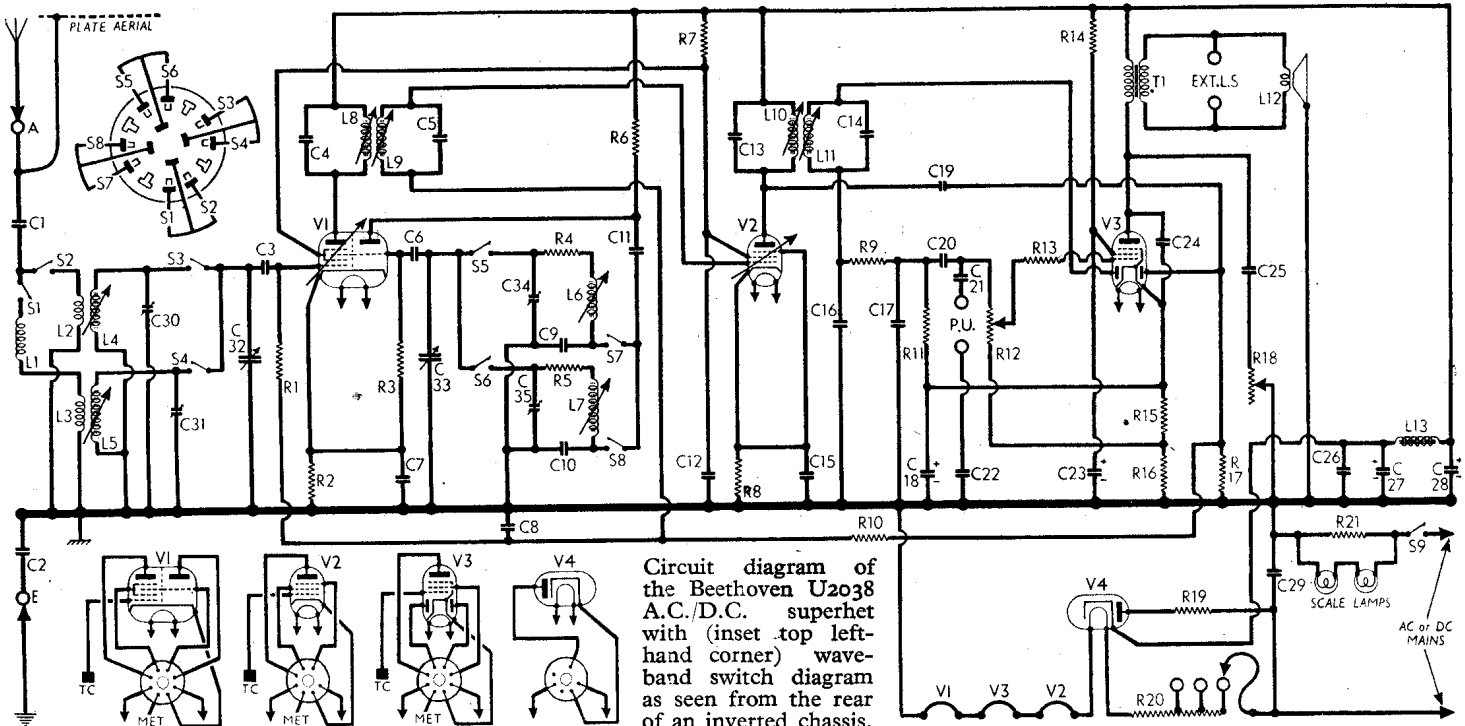
### COMPONENTS AND VALUES

RESISTORS		Values (ohms)	Locations
R1	V1 hex C.G.	1,000,000	A3
R2	V1 fixed G.B.	220	N8
R3	V1 osc. C.G.	47,000	M8
R4	Osc. M.W. and L.W. stabilizers	50	K6
R5		180	K6
R6	Osc. anode load	33,000	M8
R7	S.G.'s H.T. feed	33,000	K8
R8	V2 fixed G.B.	270	L8
R9	I.F. stopper	47,000	J8
R10	A.V.C. decoup.	1,000,000	J8
R11	Sig. diode load	470,000	I8
R12	Volume control	1,000,000	J5
R13	V3 C.G. stopper	47,000	E3
R14	V3 S.G. H.T. feed	6,800	H8
R15	V3 G.B., and A.V.C. delay resistors	180	I6
R16		180	I5
R17	A.V.C. diode load	1,000,000	I8
R18	Tone control	50,000	I5
R19	V4 surge limiter	100	G8
R20	Heater ballast	725*	F3
R21	Scale lamps shunt	100	F2

CAPACITORS		Values (μF)	Locations
C1	Aerial isolator	0.01	L6
C2	Earth isolator	0.1	L7
C3	V1 hex. C.G.	0.0001	B2
C4	1st I.F. transformer tuning	0.0001	B3
C5		0.0001	B3
C6	V1 osc. C.G.	0.0001	M7
C7	V1 cath. by-pass	0.1	N7
C8	A.V.C. decoup.	0.1	A4
C9	M.W. tracker	0.000555	K6
C10	L.W. tracker	0.00018	K6
C11	Osc. anode coup.	0.01	M7
C12	S.G.'s decoupling	0.1	N8
C13	2nd I.F. transformer tuning	0.0001	D3
C14		0.0002	D3
C15	V2 cath. by-pass	0.1	L7
C16	I.F. by-passes	0.0001	J8
C17		0.0001	J8
C18*	V3 cath. by-pass	25.0	I6
C19	A.V.C. coupling	0.00001	D3
C20	A.F. coupling	0.01	J6
C21	P.U. isolating capacitors	0.01	J6
C22		0.01	J8
C23*	V3 S.G. decoup.	4.0	K7
C24	Tone corrector	0.002	I7
C25	Tone control	0.05	H7
C26	H.T. R.F. by-pass	0.01	H7
C27*	H.T. smoothing capacitors	16.0	C3
C28*		16.0	C3
C29	Mains R.F. by-pass	0.01	G7
C30†	Aerial M.W. trim.	0.00003	M5
C31†	Aerial L.W. trim.	0.0001	M5
C32†	Aerial tuning	0.000442§	B3
C33†	Oscillator tuning	0.000442§	B2
C34†	Osc. M.W. trim.	0.00003	L5
C35†	Osc. L.W. trim.	0.0001	L5

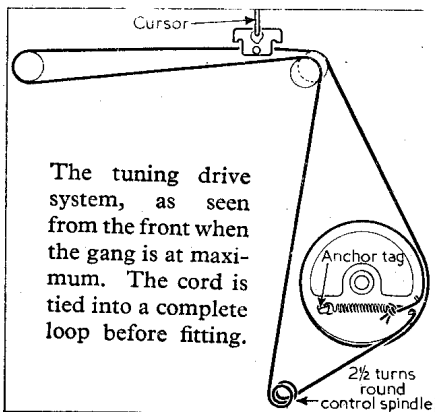
\* Tapped at 625Ω + 50Ω + 50Ω from V4 heater.

† Electrolytic. ‡ Variable. § Pre-set. § "Swing" value, n.in. to max.



Circuit diagram of the Beethoven U2038 A.C./D.C. superhet with (inset top left-hand corner) wave-band switch diagram as seen from the rear of an inverted chassis.

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Aerial coupling coils	24.0	C3
L2		1.0	N6
L3		2.0	N6
L4	Aerial tuning coils	2.6	N6
L5		17.0	N6
L6	Oscillator tuning coils	2.5	K6
L7		6.6	K6
L8	1st I.F. trans.	8.0	B3
L9		8.0	B3
L10	2nd I.F. trans.	8.0	D3
L11		6.0	D3
L12	Speech coil	2.7	—
L13	Smoothing Choke	215.0	D3
T1	Speaker trans.	500.0	D1
S1-S8		Waveband switches	0.4
S9	Mains s.w. g'd R12		—



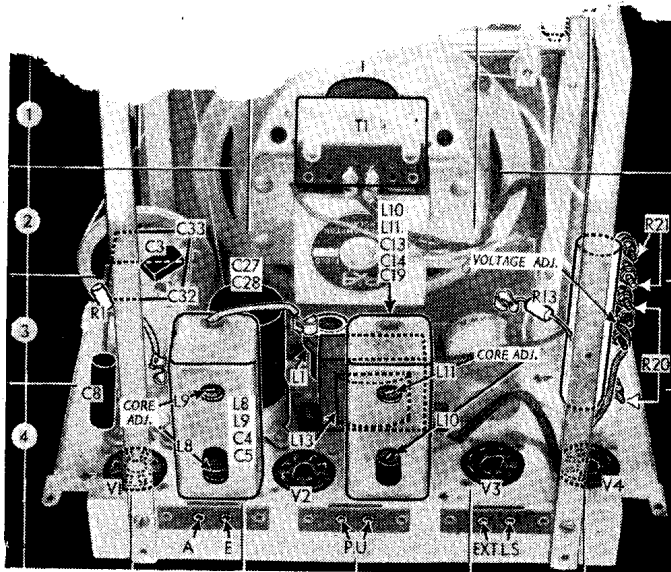
### Dismantling the Set—continued

plate aerial lead to the springy contact strip on the chassis side of the bottom cover.

**Removing Speaker.**—Unsolder the systoflex covered earthing lead from a tag beneath the upper right-hand speaker fixing bolt; remove the four self-tapping screws securing the sub-baffle to the vertical chassis end-frame supports, and lift out the speaker and sub-baffle to the extent of the speaker leads. To free the speaker entirely, unsolder the four coloured leads from tags on the speaker input transformer, and remove the four cheese-head bolts (with spring washers) securing it to the sub-baffle.

**When replacing**, the speaker should be replaced with its input transformer nearest to the bevelled edge of the sub-baffle, and the assembly must be fitted to the chassis end-frame supports so that the transformer is directly beneath the scale backing plate, a

Three-quarter rear view of the chassis deck, with the speaker and sub-baffle in position. **R13** is in the top cap lead to **V3**.



fibre washer going between the sub-baffle and the end frame support in the case of each of the upper fixing screws.

The four coloured speaker leads should be resoldered as follows, numbering the tags on the input transformer from left to right when viewed from the rear: 1, green; 2, red; 3, black; 4, yellow.

### GENERAL NOTES

**Switches.**—**S1-S8** are the waveband switches, ganged in a two-position rotary unit on the front chassis member. The unit is indicated in our under-chassis view, and shown in detail in the diagram inset in the top left-hand corner of the circuit diagram overleaf, where it is drawn as seen from the rear of an inverted chassis. **S2, S3, S5** and **S7** close on M.W. (knob clockwise); **S1, S4, S6** and **S8** close on L.W. (knob anti-clockwise).

**Scale Lamps.**—These are two Osram M.E.S. types rated at 6.5 V, 0.3 A.

**Gramophone Pick-up.**—Two sockets are provided for a crystal pick-up, which should be shunted by a 2.4 megohm resistor, or a magnetic pick-up via a step-up transformer. Any screen braiding must be connected to the "earthy" (left-hand) socket—not to chassis.

**External Speaker.**—Two sockets are provided for the connection of a low impedance (2.5 Ω) external speaker.

**Drive Cord Replacement.**—The sketch (cok 1) shows the course taken by the tuning drive cord as seen from the front with the gang at maximum. Tie the cord into a loop having an all-round length of 40½ in., so that it can be stretched taut over two pins stuck in the bench 20½ in. apart. 4ft. of cord is ample. Slip the knotted end of the loop on to the tension spring, and hook the spring to its anchor. Pass the rest of the loop through the slot in the drum groove, and follow the course shown.

### VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on A.C. mains of 227 V, using the 210-229 V tapping on the heater ballast resistor. The receiver was tuned to the lowest wavelength on the M.W. band and the volume and tone controls were turned fully clockwise, but there was no signal input.

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

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 CCH35	216	5.1	98	1.8
V2 EF39	95	4.0	98	2.1
V3 CBL31	196	38.0	183	4.6
V4 CY31†	—	—	—	—

† Cathode to chassis, 230V D.C.

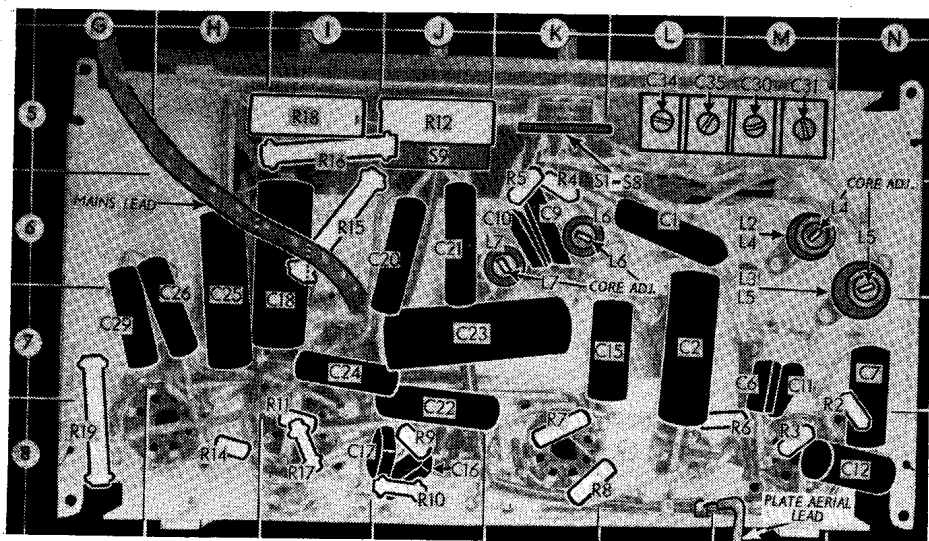
### CIRCUIT ALIGNMENT

**I.F. Stages.**—For this operation the chassis must be removed from the cabinet. Switch set to M.W., turn volume control to maximum and gang to minimum capacitance, and connect signal generator, via an 0.1 μF capacitor in each lead, to control grid (top cap) of **V1** and chassis. Feed in a 465 kc/s (645.16 m) signal, and adjust the cores of **L8, L9, L10** and **L11** (location references **B4, D4**) for maximum output.

**R.F. and Oscillator Stages.**—These operations must be carried out with the chassis in position in the cabinet, after removal of the bottom cover. With the gang at minimum capacitance the cursor should coincide with the left-hand vertical line on each scale. It may be adjusted in position by slackening the screw clamping the cursor carriage to the drive cord. Transfer signal generator leads to **A** and **E** sockets, via a suitable dummy aerial.

**L.W.**—Switch set to L.W., tune to 2,000 m on scale, feed in a 2,000 m (150 kc/s) signal, and adjust the cores of **L7** (**K6**) and **L5** (**N6**) for maximum output. Tune to 1,000 m on scale, feed in a 1,000 m (300 kc/s) signal, and adjust **C35** (**L5**) and **C31** (**M5**) for maximum output. Check calibration at 2,000 m and repeat these adjustments if necessary.

**M.W.**—Switch set to M.W., tune to 500 m on scale, feed in a 500 m (600 kc/s) signal, and adjust the cores of **L6** (**K6**) and **L4** (**N6**) for maximum output. Tune to 214 m on scale, feed in a 214 m (1,400 kc/s) signal, and adjust **C34** (**L5**) and **C30** (**M5**) for maximum output. Check calibration at 500 m and repeat these adjustments if necessary. Finally, replace the bottom cover and readjust **C30**, through the hole provided, for maximum output on a weak signal at the low wavelength end of the band, using the plate aerial only.



Under-chassis view. The **S1-S8** switch unit is indicated beside the row of trimmers.