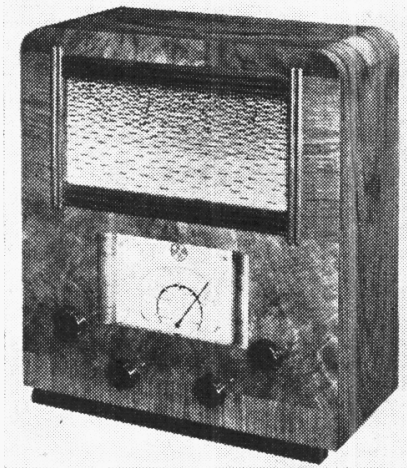


"TRADER" SERVICE SHEET

# 413

# BURNDEPT 313

## 2-BAND AC SUPERHET



**T**HE Burndept 313 is a 2-band AC superhet incorporating a cathode-ray tuning indicator, and fitted with Mullard "E" type valves.

The receiver is for 200-250 V, 50-100 C/S AC mains. There is provision for an external speaker (with a switch for muting the internal speaker), and also for a gramophone pick-up, a gram. position being provided on the wavechange switch.

Release date : March, 1939.

### CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (MW) and **L2** (LW) to single tuned circuits **L3**, **C31** (MW) and **L4**, **C31** (LW) which precede a triode pentode valve (**V1**, Mullard **ECH2**) operating as frequency changer with internal coupling.

Triode oscillator anode coils **L7** (MW) and **L8** (LW) are tuned by **C36**; parallel trimming by **C34** (MW) and **C10**, **C35** (LW); series tracking by **C8**, **C32** (MW) and **C9**, **C33** (LW). Reaction by grid coils **L5** (MW) and **L6** (LW).

Second valve (**V2**, Mullard **EF9**) is a variable- $\mu$  RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary iron-cored transformer couplings **C37**, **C4**, **L9**, **L10**, **C5**, **C38** and **C39**, **C15**, **L11**, **L12**, **C16**, **C40**.

Intermediate frequency 473 KC/S.

Diode second detector is part of separate double diode valve (**V3**, Mullard **EB4**) in which each diode has an independent cathode and the two halves of the valve are separated from each other by a screen. Audio frequency component in rectified output is developed across load resistance **R8** and passed via **R10**, AF coupling condenser **C22**, switch **S21**, manual volume control **R15** and grid stopper **R16** to CG of pentode output valve (**V4**, Mullard **EL3**).

A DC potential is developed across **R9**, in series with **R8**, and applied between CG and cathode of cathode-ray tuning indicator (**T.I.**, Mullard **EM1**) as control voltage. **C18** by-passes AF across **R9** and decouples the leads to the T.I. grid circuit. IF filtering by **C17**, **R10** and **C20**. Provision for connection of gramophone pick-up across **R15** via **S22**. When the switch control is turned to the gramophone position, **S21** opens to mute radio, and **S22** closes.

Fixed tone correction by **C23** and variable tone control by **C25**, **R18**, both in **V4** anode circuit. Provision for connection of low impedance external speaker across secondary of internal speaker

input transformer **T1** by means of sockets which are so arranged that a small anti-clockwise movement of the connecting plug causes **S25** to open and so mute the internal speaker.

Second diode of **V3**, fed from **V2** anode via **C19** provides DC potential which is developed across load resistance **R14** and fed back through decoupling circuit as GB to FC and IF valves, giving automatic volume control. Delay voltage is obtained from potential divider consisting of resistances **R11** and **R12**, which are connected across the HT supply.

HT current is supplied by IHC full-wave rectifying valve (**V5**, Mullard **AZ3**) in which the cathode is terminated at an independent pin on the valve base. Smoothing by iron-cored choke **L14** and dry electrolytic condensers **C26**, **C27**. Mains RF filtering by **C28**.

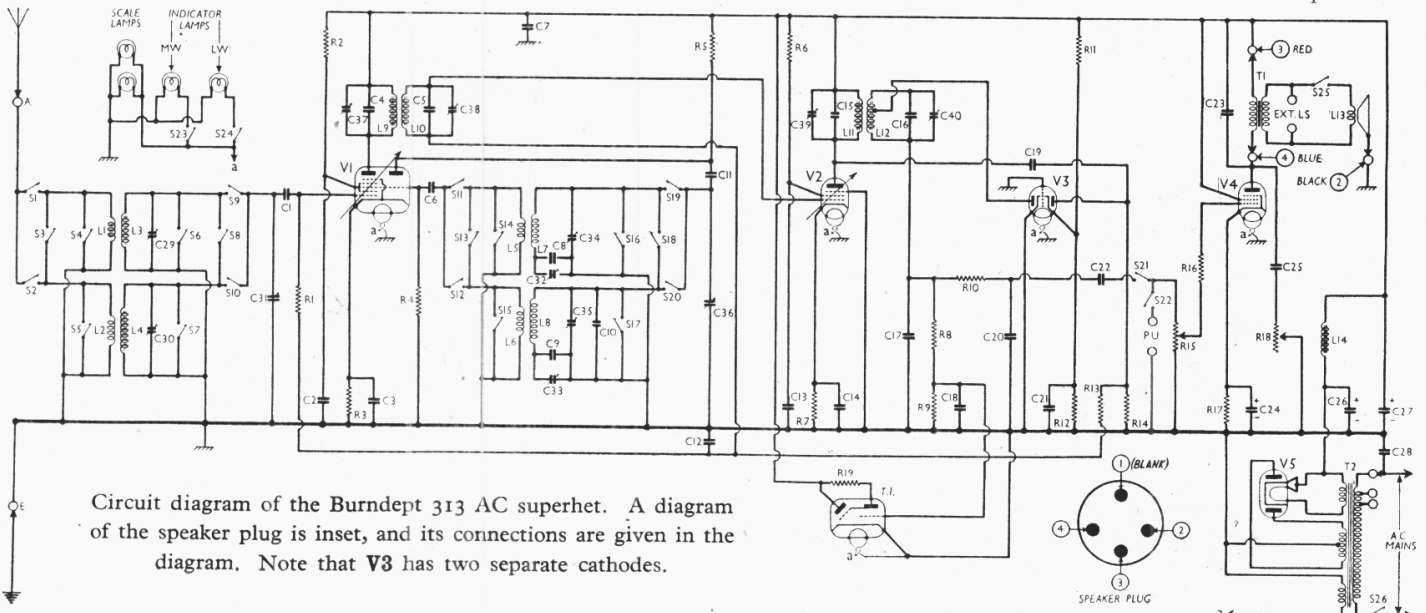
### DISMANTLING THE SET

The cabinet has a detachable bottom (four wood screws) enabling access to be gained to most of the components beneath the chassis.

**Removing Chassis.**—To remove the chassis entirely, remove the four control knobs (recessed grub screws) from the front of the cabinet and the four round-head bolts (with claw washers and lock washers) holding the chassis to the bottom of the cabinet. After removing the 4-pin plug carrying the speaker connections from the chassis, the latter can be withdrawn completely.

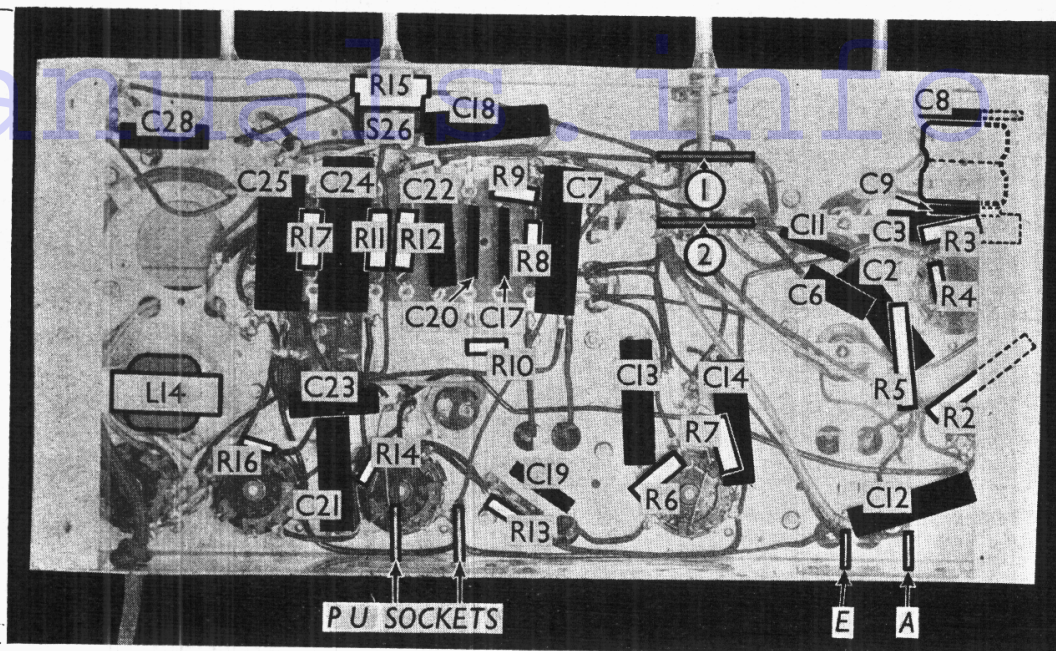
**When replacing,** note that a felt washer goes between each of the control knobs and the front of the cabinet.

**Removing Speaker.**—To remove the speaker, unscrew the external speaker



Circuit diagram of the Burndept 313 AC superhet. A diagram of the speaker plug is inset, and its connections are given in the diagram. Note that **V3** has two separate cathodes.

Under-chassis view. Diagrams of the two switch units are in col. 3 overleaf. Between C8 and C9 are the trackers C32, C33, in a dual unit. These are adjusted through holes in the chassis deck, the screws being indicated in our plan chassis view.



panel (two round head wood screws) from the top right-hand side of the rear of the cabinet, and withdraw the 4-pin speaker connecting plug from its socket on the chassis if this has not already been done. Unscrew the four nuts (with lock washers) holding the speaker to the sub-baffle, after which the speaker can be removed from the cabinet. When replacing note that the transformer should be on the right.

### COMPONENTS AND VALUES

CONDENSERS		Values (μF)
C1	V1 CG condenser	0.0001
C2	V1 SG decoupling	0.1
C3	V1 cathode by-pass	0.1
C4	1st IF transformer fixed	0.0001
C5	trimmers	0.0001
C6	V1 osc. CG condenser	0.0002
C7	HT circuit RF by-pass	0.25
C8	Osc. circuit MW fixed tracker	0.0005
C9	Osc. circuit LW fixed tracker	0.00015
C10	Osc. circuit LW fixed trimmer	0.00004
C11	V1 osc. anode coupling	0.0002
C12	AVC line decoupling	0.1
C13	V2 SG decoupling	0.1
C14	V2 cathode by-pass	0.1
C15	2nd IF transformer fixed	0.00008
C16	trimmers	0.0001
C17	IF by-pass	0.0002
C18	AF by-pass	0.1
C19	Coupling to V3 AVC diode	0.0001
C20	IF by-pass	0.0002
C21	V3 AVC cathode by-pass	0.1
C22	AF coupling to V4	0.05
C23	Fixed tone corrector	0.01
C24*	V4 cathode by-pass	100.0
C25	Part of variable tone control	0.05
C26*	HT smoothing condensers	16.0
C27*		24.0
C28	Mains RF by-pass	0.01
C29†	Aerial circuit MW trimmer	0.00003
C30†	Aerial circuit LW trimmer	0.00003
C31†	Aerial circuit tuning	—
C32‡	Osc. circuit MW tracker	0.0001
C33‡	Osc. circuit LW tracker	0.0001
C34‡	Osc. circuit MW trimmer	0.00003
C35‡	Osc. circuit LW trimmer	0.00003
C36†	Oscillator circuit tuning	—
C37‡	1st IF trans. pri. tuning	0.00007
C38‡	1st IF trans. sec. tuning	0.00007
C39‡	2nd IF trans. pri. tuning	0.00007
C40‡	2nd IF trans. sec. tuning	0.00007

\*Electrolytic † Variable. ‡ Pre-set.

RESISTANCES		Values (ohms)
R1	V1 pentode CG resistance	500,000
R2	V1 SG HT feed	30,000
R3	V1 fixed GB resistance	200
R4	V1 osc. CG resistance	50,000
R5	V1 osc. anode HT feed	30,000
R6	V2 SG HT feed	100,000
R7	V2 fixed GB resistance	300
R8	V3 signal diode load	500,000
R9	T.I. CG control resistance	100,000
R10	IF stopper	10,000
R11	IF stopper	100,000
R12	AVC delay potential divider	100,000
R13	resistances	5,000
R14	AVC line decoupling	500,000
R15	V3 AVC diode load	1,000,000
R16	Manual volume control	500,000
R17	V4 grid stopper	100,000
R18	V4 GB resistance	150
R19	Variable tone control	50,000
R19	T.I. anode HT feed	5,000,000

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial MW coupling coil	1.25
L2	Aerial LW coupling coil	100.0
L3	Aerial MW tuning coil	2.25
L4	Aerial LW tuning coil	0.25
L5	Oscillator MW reaction coil	70.0
L6	Oscillator LW reaction coil	1.5
L7	Osc. circuit MW tuning coil	6.0
L8	Osc. circuit LW tuning coil	4.5
L9	1st IF trans. { Pri. . . . .	5.0
L10	{ Sec. . . . .	5.0
L11	2nd IF trans. { Pri. . . . .	5.0
L12	{ Sec. . . . .	5.0
L13	Speaker speech coil	2.5
L14	HT smoothing choke	380.0
T1	Speaker input trans. { Pri. . . . .	470.0
	{ Sec. . . . .	0.3
T2	Mains { Pri., total . . . . .	30.0
	{ Heater sec. . . . .	0.1
	{ Rect. heat. sec. . . . .	0.1
	{ HT sec., total . . . . .	330.0
S1-S20	Waveband switches	—
S21,22	Radio/gram. change switches	—
S23,24	Indicator lamps switches	—
S25	Internal speaker switch	—
S26	Mains switch, ganged R15	—

### VALVE ANALYSIS

Valve voltages and currents in the table (next col.) are those measured in our receiver when it was operating on mains of 230 V, using the 230 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the MW band and

the volume control was at maximum, but there was no signal input.

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

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 ECH2	{ 288 105 288	{ 2.0 4.7 5.5	95	6.4
V2 EF0	—	—		
V3 EB4	—	—	180	1.6
V4 EL3	265	42.0	288	5.2
V5 AZ3	277†	—	—	—
TI EMI	{ 5.0 288	{ 0.1 0.4	—	—

† Each anode, AC.

### GENERAL NOTES

**Switches.**—S1-S20 are the waveband switches, S21, S22 the radio/gram switches and S23, S24 the indicator lamps switches, ganged 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 rear 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.

It will be noted that there are a number of shorting switches (not shown in the makers' diagram) formed by tags behind the No. 2 switch unit, and they are closed by contact with a common rotating plate. This plate is earthed on MW and LW, but not on gram. On gram., switches S3, S8, S13 and S18 are closed, and are all connected together by the common plate. For the sake of clarity these interconnections are not shown in the circuit diagram.

S25 is the internal speaker switch, associated with the external speaker sockets on the panel at the back of the cabinet. By inserting the external speaker

TABLE AND DIAGRAMS OF SWITCH UNITS

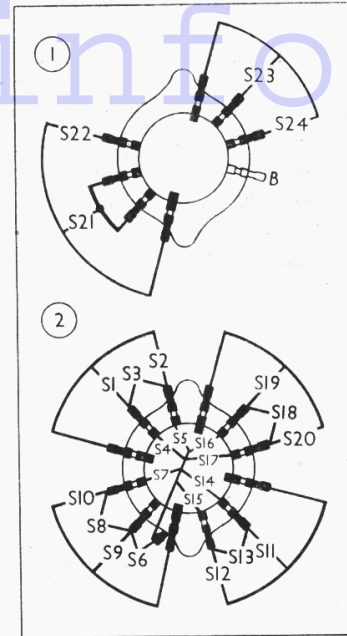
Switch	Gram.	LW	MW
S1	—	—	C
S2	—	C	—
S3	C	—	—
S4	—	C	—
S5	—	—	C
S6	—	C	—
S7	—	—	C
S8	C	—	—
S9	—	—	C
S10	—	C	—
S11	—	—	C
S12	—	C	—
S13	C	—	—
S14	—	C	—
S15	—	—	C
S16	—	C	—
S17	—	—	C
S18	C	—	—
S19	—	—	C
S20	—	C	—
S21	—	C	—
S22	C	—	—
S23	—	—	C
S24	—	C	—

CIRCUIT ALIGNMENT

**IF Stages.**—Remove top cap connector of V1, and connect signal generator to top cap of valve and chassis. Also, between top cap and chassis connect a 0.25 MO resistor. Short-circuit C36. Feed in a 473 KC/S signal, and adjust C40, C39, C38 and C37 for maximum output. Repeat until no further improvement can be obtained. Remove 0.25 MO resistor, replace top cap connector on V1 and remove short from C36.

**RF and Oscillator Circuits.**—When gang is at maximum, pointer should cover horizontal black lines at 2,000 m mark on scale. Volume control should be at maximum. Connect signal generator via a suitable dummy aerial to A and E sockets.

**LW.**—Switch set to LW, tune to 1,000 m on scale, feed in a 1,000 m (300 KC/S) signal, and adjust C35, then C30, for



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

maximum output. Feed in a 2,000 m (150 KC/S) signal, tune it in, and adjust C33 for maximum output, while rocking the gang slightly for optimum results.

**MW.**—Switch set to MW, tune to 200 m on scale, feed in a 200 m (1,500 KC/S) signal, and adjust C34, then C29, for maximum output. Feed in a 500 m (600 KC/S) signal, tune it in, and adjust C32 for maximum output, while rocking the gang slightly for optimum results.

plug and rotating anti-clockwise, S25 opens, and mutes the internal speaker. This switch is not shown in the chassis pictures.

S26 is the mains switch, ganged with the volume control R15.

**Coils.**—L1-L4; L5-L8; and the IF transformers L9, L10 and L11, L12 are in four screened units on the chassis deck, with their associated trimmers. The first unit also contains C10. L14 is the HT smoothing choke, mounted beneath the chassis.

**Scale and Indicator Lamps.**—These are four Tre-Vita MES types, rated at 6.5 V, 0.5 A. The two indicator lamps are controlled by S23, S24.

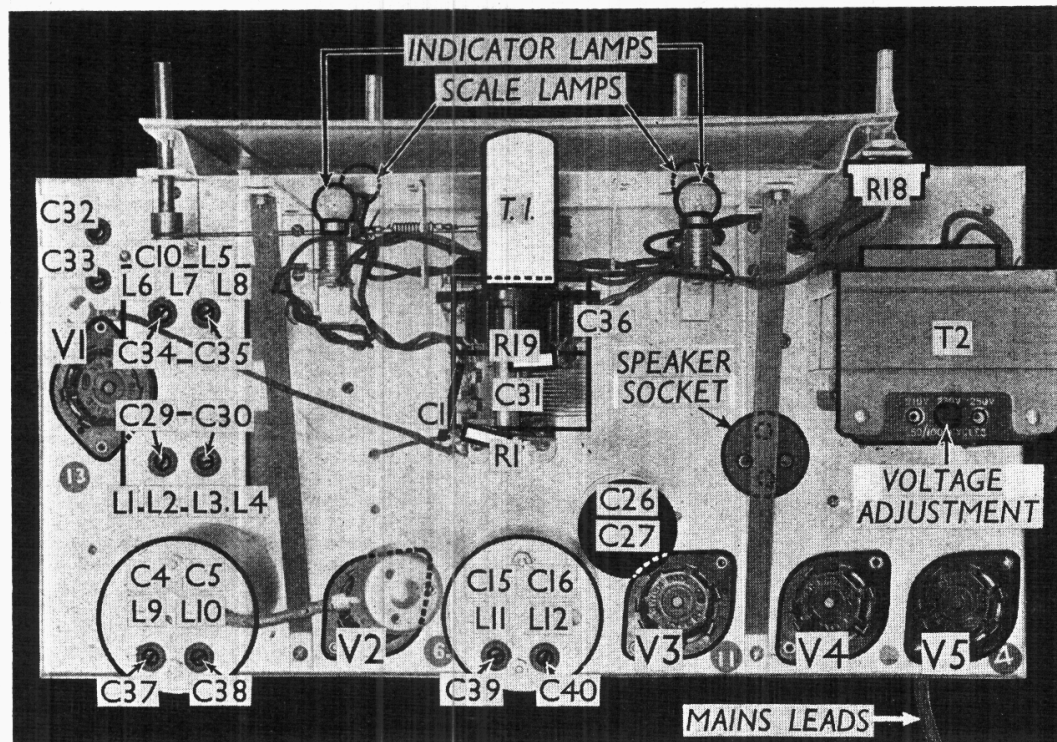
**External Speaker.**—Two sockets are provided on a panel at the rear of the cabinet for a low resistance (about 3 O) external speaker. Associated with these sockets is the internal speaker switch S25.

**Condensers C26, C27.**—These are two dry electrolytics in a single metal-cased tubular unit on the chassis deck, the can being negative. The yellow coded tag beneath the chassis is the positive of C26 (16 μF), while the red coded tag is the positive of C27 (24 μF).

**Speaker Plug.**—The speaker is connected to the chassis by a 4-pin plug and socket, of which only three pins are connected. A diagram showing the plug looking from the free ends of the pins is inset at the bottom of the circuit diagram, and the connection points are numbered accordingly in the circuit.

The colour coding of the leads to the plug is: Pin 1, blank; 2, black; 3, red; 4, blue.

**Trackers C32, C33.**—These are adjusted through two holes in the chassis deck, shown at the top left-hand corner of the plan chassis view.



Plan view of the chassis. All the pre-set trimmer condenser adjustments are shown. C10 is included in the L5-L8 coil unit, while the IF units contain the fixed condensers C4, C5 and C15, C16.