NUMBER ONE HUNDRED **'TRADER' SERVICE SHEETS**

BURNDEPT 218

TRANSPORTABLE BATTERY SUPERHET

BURNDEPT fit a 4-valve superhet chassis in their 218 battery operated transportable receiver. The valves include a variable-mu pentode H.F. amplifier, a heptode frequency changer, a pentode second detector and a pentode output valve. A Westector provides A.V.C.

Provision is made for using an external aerial and earth, a separate winding on the frame aerial being used for coupling.

CIRCUIT DESCRIPTION

Tuned frame aerial input (**L2, L3, C14** with provision for external aerial-earth coupling by small winding **L1**) to variable-mu pentode signal frequency amplifier (**V1, Mullard metallised VP2**).

Tuned secondary transformer coupling by **L4, L5, L6, L7** and **C15** to heptode frequency changer (**V2, Marconi metallised X21**) operating with electron coupling. Oscillator grid coils **L8, L9,** tuned by **C17**; tracking by pre-set condensers **C19** (L.W.) and **C20** (M.W.); anode reaction coils **L10, L11.**

No valve amplification other than that afforded by the frequency changer is used in the intermediate frequency stage. A single tuned-primary tuned-secondary transformer, **L12, L13,** couples **V2** to the second detector, an H.F. pentode (**V3, Mullard metallised SP2**) operating on grid leak system with **C6** and **R4.**

Intermediate frequency 130 KC/S.

A half-wave metal rectifier (**MR1, Westinghouse W6 Westector**) is fed from the detector anode by condenser **C10** and provides D.C. potential, developed across load resistance **R8,** which is fed back through decoupling circuits as G.B. to H.F. and F.C. valves, giving automatic volume control.

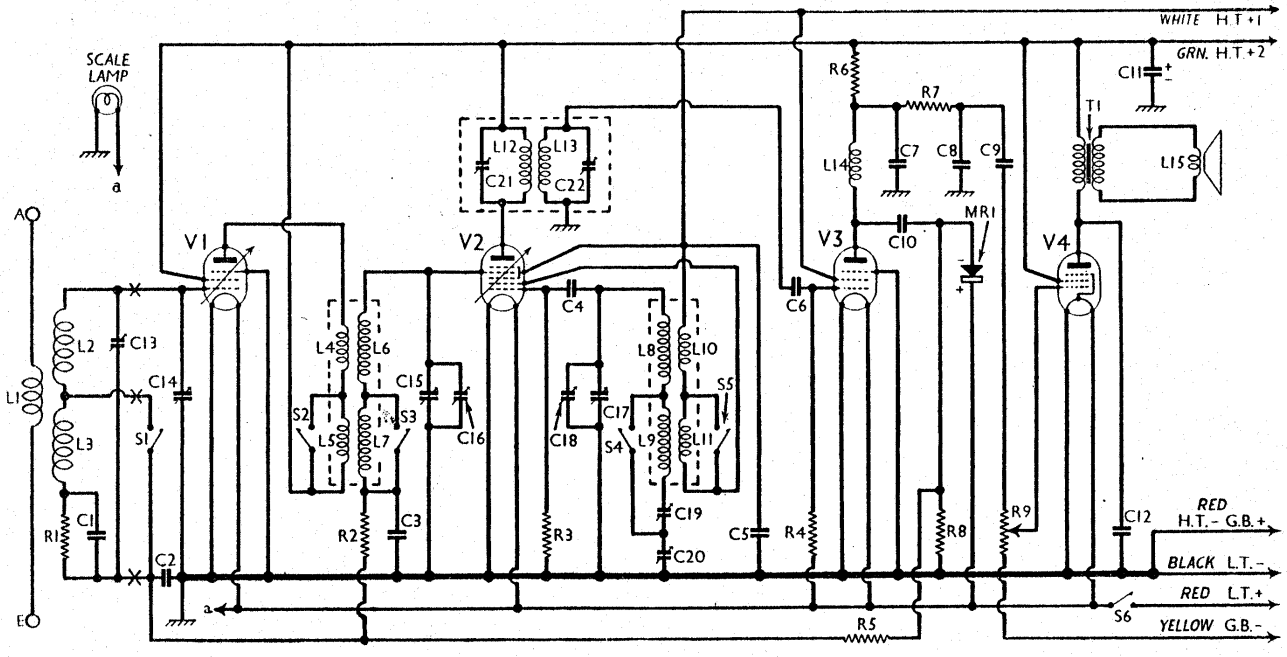
I.F. filtering in **V3** anode circuit by choke **L14,** stopper resistance **R7,** and by-pass condensers **C7, C8.** Resistance-capacity coupling by **R6, C9,** and manual volume control **R9,** to output pentode (**V4, Mullard PM22A**). Tone correction in anode circuit by fixed condenser **C12.**

No provision for connection of gramophone pick-up or external speaker.

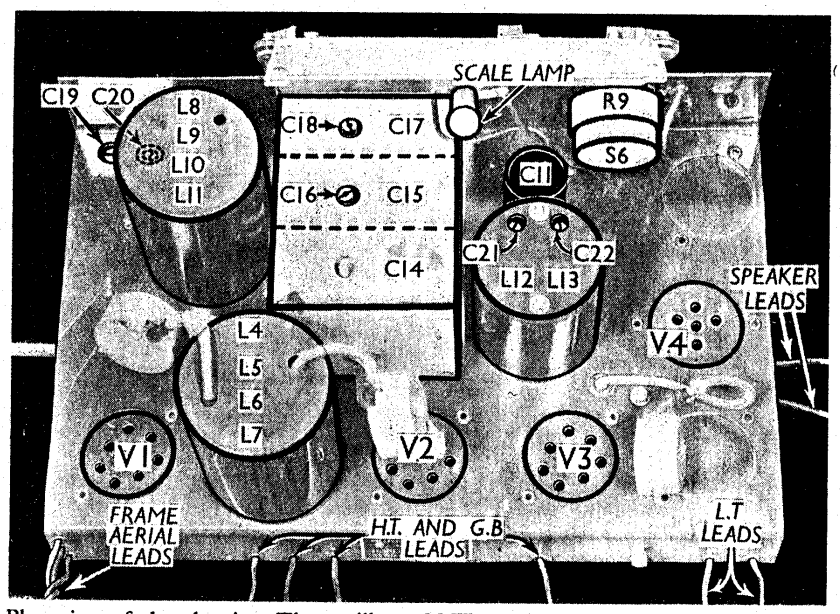
COMPONENTS AND VALUES

	Resistances	Values (ohms)
R1	V1 C.G. decoupling	1,000
R2	V2 tetrode C.G. decoupling	250,000
R3	V2 oscillator C.G. resistance	100,000
R4	V3 grid leak	1,000,000
R5	A.V.C. line decoupling	1,000,000
R6	V3 anode load	100,000
R7	I.F. stopper	15,000
R8	Westector load resistance	1,000,000
R9	Manual volume control	500,000

	Condensers	Values (μF)
C1	V1 C.G. decoupling	0·01
C2	A.V.C. line decoupling	0·1
C3	V2 tetrode C.G. decoupling	0·1
C4	V2 oscillator C.G. condenser	0·001
C5	V2 S.G.'s and oscillator anode decoupling	0·1
C6	V3 C.G. condenser	0·0001
C7	I.F. by-passes	0·0002
C8	I.F. by-passes	0·0001
C9	L.F. coupling to V4	0·01
C10	Coupling to Westector (MR1)	0·0005
C11*	H.T. reservoir	8·0
C12	Tone corrector	0·002
C13‡	Frame aerial trimmer	—
C14†	Frame aerial tuning	—
C15†	H.F. transformer tuning	—
C16‡	H.F. transformer trimmer	—



Circuit diagram of the Burndept 218 transportable battery superhet. The crosses on the diagram towards the left indicate the points where the frame aerial circuit connects to the chassis wiring.



Plan view of the chassis. The oscillator M.W. tracker, C20, is hidden behind the L8-L11 coil unit. The trimmer of C14 is in the frame aerial. C11 is the H.T. reservoir condenser.

Condensers (contd.)		Values (μF)
C17†	Oscillator tuning	—
C18‡	Oscillator trimmer	—
C19‡	Oscillator L.W. tracker ..	0·0015
C20‡	Oscillator M.W. tracker ..	0·002
C21‡	I.F. trans. pri. tuning.. ..	—
C22‡	I.F. trans. sec. tuning ..	—

* Electrolytic † Variable ‡ Pre-set.

Other Components		Approx. Values (ohms)
L1	External aerial-earth coupling	0·4
L2 L3	Frame aerial	0·9 / 5·5
L4 L5	H.F. transformer primary	4·2 / 4·0
L6 L7	H.F. transformer secondary	5·0 / 9·0
L8 L9	Oscillator tuning coils..	4·5 / 6·5
L10 L11	Oscillator anode coils ..	1·0 / 4·0
L12 L13	I.F. transformer Pri. .. / Sec. ..	27·0 / 27·0
L14	V3 anode I.F. choke	170·0
L15	Speaker speech coil	2·5
T1	Speaker input trans. Pri... / Sec...	700·0 / 0·4
MR1	A.V.C. Westector	—
S1-S5	Waveband switches	—
S6	L.T. switch, ganged R9 ..	—

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, remove the two control knobs on the front of the set (recessed grub screws) and the switch knob (recessed grub screw) and escutcheon (three countersunk-head wood screws) on the right-hand side of the cabinet. Disconnect the frame aerial and the speaker and remove the two round-head screws (with washers) holding the chassis to the shelf, the heads of which are under the shelf. Take out the VP2 and PM22A, thus making it possible to remove the nuts and washers from the two screws holding the front of the chassis to the cabinet. The chassis can now be withdrawn.

When replacing, note that the leads to the frame go straight across to the nearest tag and that the speaker leads should go to the tags marked 1 and 3.

Removing Speaker.—The speaker can be removed from the cabinet by removing the nuts and washers from the four bolts holding it to the sub-baffle.

Removing Frame Aerial.—If it is necessary to remove the frame aerial, this can be done by removing the four countersunk-head wood screws holding it in the cabinet lid, two being at the top and two at the bottom. The screws concerned are the smaller ones, that is those nearer the centre.

VALVE ANALYSIS

Voltages and currents for the various valves in the receiver given in the table below are those measured in our set when it was operating from a new H.T. battery reading 126 V. The volume control was at maximum, and the set was tuned to the lowest wavelength on the medium band. There was no signal input, the frame connections being shorted together.

Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

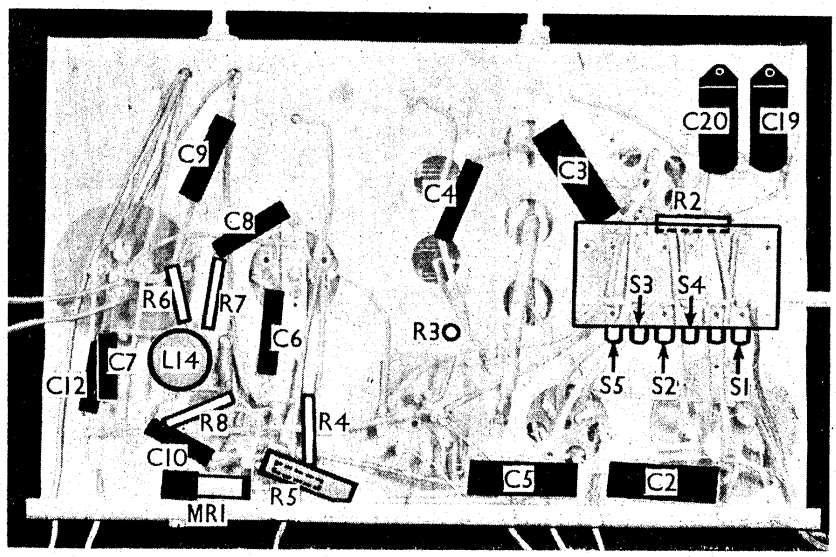
Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 VP2 ..	120	2·3	120	0·6
V2 X21* ..	120	0·5	60	1·4
V3 SP2 ..	38	0·7	60	0·2
V4 PM22A	118	3·5	120	0·8

* Osc. anode (G2) 60 V, 1.5 mA.

GENERAL NOTES

Switches.—The spindle of the wave-change switch unit projects from the right of the chassis. It contains **S1** to **S5**, and all the switches are *closed* on

(*Continued overleaf*)



Under-chassis view. R5 is inside a length of sleeving. L14 is an I F. choke. Note that one set of contacts in the switch unit is not used.

BURNDEPT 218 *(Continued)*

the M.W. band and *open* on the L.W. band. Note that one set of contacts, between **S1** and **S4**, is not used, the switch being shorted out by the wire from **C20** to the **V1** holder, and earthed.

S6 is the Q.M.B. L.T. switch, ganged with the volume control **R9.**

Coils.—Apart from the frame aerial and external aerial coupling coils (**L1-L3**), all the coils are in three screened units on the chassis deck. The units are **L4-L7**, the H.F. transformer; **L8-L11**, the oscillator unit; and **L12, L13**, the I.F. transformer, with its trimmers **C21, C22. L14** is an I.F. choke, mounted beneath the chassis.

Scale Lamp.—This is a 2 V Competa M.E.S. pattern, of the low consumption type.

External Speaker.—There is no provision for an external speaker, though a high resistance type could be connected across the primary of the internal speaker transformer **T1.**

Trimmer C13.—This is inside the frame aerial, and is adjustable through a hole in the back of cabinet door. The main condenser, **C14,** is not fitted with a trimmer.

Condenser C1, Resistance R1.—These two components are in parallel, and are mounted inside the frame aerial just above the panel carrying the connecting tags.

Batteries.—The batteries supplied are: L.T., Exide celluloid 2 V 25 AH cell, RSZ4; H.T. and G.B., Burndept 120 V battery, tapped in 1.5 V steps from negative to +9 V.

Battery Plugs and Voltages.—Yellow plug, G.B. negative, insert in H.T.— socket. Red plug, G.B. positive, insert in +4.5 V socket. White plug, H.T.+1, insert in +60 V socket. Green plug, H.T.+2, insert in +120 V socket.

Resistance R5.—This is covered by a piece of black sleeving.

Metal Rectifier MR1.—This is a Westinghouse type W6. Should a new one be necessary, note the polarity when replacing.

CIRCUIT ALIGNMENT

Remove chassis from cabinet, connect up batteries and speaker, and connect output meter across the primary of **T1.** Leave frame aerial disconnected, but connect a 0.25 MO resistance across the two outer frame aerial leads on the chassis.

Connect a 0.25 MO resistance from the grid (top cap) of **V2** to chassis, leaving normal cap disconnected. Connect the signal generator across this latter resistance and see that the set is switched to L.W. and tuned to bottom of L.W. scale. Switch the set on, turn volume control to maximum, and switch on signal generator, adjusting this to 130 KC/S, and keeping the input to the set low.

Adjust **C21** and **C22** for maximum output.

Remove the 0.25 MO resistance from the top cap of **V2,** and replace the normal connection. Turn gang condenser to absolute minimum, and adjust pointer to coincide with the black spot at the lower end of the M.W. scale. Set receiver to 200 m. and switch to M.W. Apply a 200 m. signal across the resistance connected across the frame aerial leads, again keeping the input low to avoid A.V.C. action.

Now adjust **C18** and then **C16** for maximum output. As the set comes more in line the input must be reduced. Inject a 500 m. signal, and tune receiver to 500 m. on scale. Adjust **C20** for maximum output. Swing the gang condenser slightly for optimum reading whilst making this adjustment. If after this the circuit is out of alignment at 200 m., re-trim **C16** and **C18** at 200 m. and re-adjust **C20** at 500 m. Continue until the set is in gang at both ends of the scale.

Switch receiver to L.W., tune to 2,000 m. and tune generator also to 2,000 m. Adjust **C19** for maximum, swinging gang condenser for maximum output, irrespective of scale reading. The optimum point should, however, be close to 2,000 m. on the scale.

Now remove the 0.25 MO resistance, put chassis back in cabinet, and reconnect all leads. Leave output meter connected, but close back of cabinet as much as possible. Connect signal generator to a coil of 20-60 turns, and place close to back of frame aerial. Switch to M.W. and tune receiver to 200 m., setting signal generator to 200 m. Switch on, and adjust **C13** through hole in back of cabinet door to give maximum output. The set should then be correctly aligned.

HINTS AND PROBLEMS

(Continued from p. IV)

Intermittent Valve Heater

I was called upon recently to attend to a Marconi superhet which was behaving in the following manner. The volume would slowly fade off to a whisper, and at the same time the scale lamp would increase in brilliancy. A few seconds later the lamp would return to its correct brilliancy, and signals would slowly build up to normal strength. This state of affairs occurred over and over again with almost clock-like regularity.

The customer asked me to tighten up the bulb and cure the fading, but I informed him that in my opinion the two faults were interconnected and in all probability the lamp was O.K.

I got busy with an Avodapter plug and a meter and found that the plate current of one of the VMS4B valves went down to zero in sympathy with the slow drop in volume and increase of light in the dial bulb.

A meter was then put in series with the heater of this particular valve, and the real fault was localised. Evidently the heater had an intermittent break which, when O/C, caused a rise in heater voltage, evidenced in the brilliantly lit pilot bulb. The fading signal, of course, was due to the heater in the valve slowly cooling off. The break must have been extremely minute or the heater could not have remade circuit again.

I think I shall have to use this valve for a flashing sign!—R. A. C.

Simple Holder for Screws

For inserting screws in awkward places in chassis and other parts of a receiver I have found the following simple gadget particularly useful. Obtain about two inches of rubber tubing which is a tight fit over the screwdriver blade, and slip it over the blade for such a distance that about ¼ in. projects from the end of the blade.

The screw can now be pushed into the overlapping portion of the tubing, and the blade engaged in the slot of the screw. The rubber will now hold the screw, which can be inserted at any angle without falling out, and much time and temper will be saved.—F. L. T.

Converting Receiver for 110 V D.C. Mains

Recently a customer came into our shop and asked for a receiver to work from 110 V D.C. plant. As we do not stock American midgets or anything in this line, the customer was told to return later, when we would see if we could fix him up.

A standard Ekco A.C./D.C. receiver was chosen for trial, and, after calculation, a portion of the heater resistance was shorted out. The set was then tried on 110 V, but was found to be rather weaker than was expected.

The loud-speaker field was next disconnected and put on a separate circuit across the mains with a suitable resistor in series, as it was found that owing to the reduced voltage, the field coil in series with them was insufficiently magnetized. The set contained a separate smoothing choke, so that removing the L.S. field made little difference to the smoothing. Hum was found to be barely audible, and the volume was now quite surprising. The customer came in two hours later and purchased the set.

Similar alterations might be made to any universal set to suit the above voltage, provided that the valve heater voltages together do not exceed this, and the heater resistor is of the wire-wound type. The rectifier valve should, of course, be kept in circuit if polarized electrolytic condensers are used, in case the mains plug is inserted the wrong way round.—W. J.