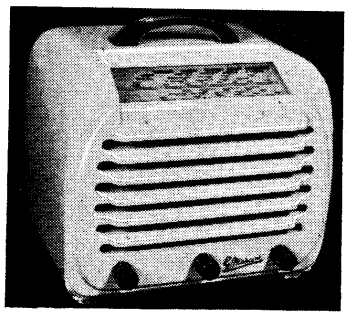
Supplement to The Wireless & Electrical Trader, June 12, 1948

"TRADER" SERVICE SHEET

865

MARCONIPHONE T15DA

TWO-BAND "COMPANION" RECEIVER



The appearance of the Marconiphone T15DA "Companion" superhet. The colour scheme is red and cream.

RECENTLY introduced valves of the Marconiphone 145 series which are fitted with B.V.A. B8A bases are used in the Marconiphone T15DA, another of the "Companion" receivers, of compact proportions and designed for A.C. or D.C. mains of 195-255 V, 25-100 c/s in the case of A.C. The waveband ranges are 195-567 m and 900-2,000 m.

A frame aerial is fitted, but provision is made for the connection of an external aerial. No provision is made for connecting a gramophone pick-up or an external speaker.

Full technical data on the new valve range have not been published as this goes to press, but the base connections are shown on the right of the circuit diagram below, and the essential technical details are given under "General Notes" overleaf.

Release date and original price: December, 1947; £15 4s. 6d. plus purchase tax.

CIRCUIT DESCRIPTION

Tuned frame aerial input by **L1, L2, C30** (M.W.) and **L1, L2, L3, C30** (L.W.) precedes a triode-hexode valve **(V1, Marconi X145)** operating as frequency changer with internal coupling. **L2** (M.W.) and **L3** (L.W.) are loading coils, and provision is made for the connection of an external aerial via the "bottom" coupled potential divider **C1, R1, C2, R2.**

Triode oscillator grid coils **L4** (M.W.) and **L5** (L.W.) are tuned by **C31,** with parallel trimming by **C32** (M.W.) and **C9, C33** (L.W.); series tracking by **C10** (M.W.) and **C11** (L.W.). Reaction coupling from anode by coil **L6** on M.W., and the common impedance of the tracker **C11** on L.W.

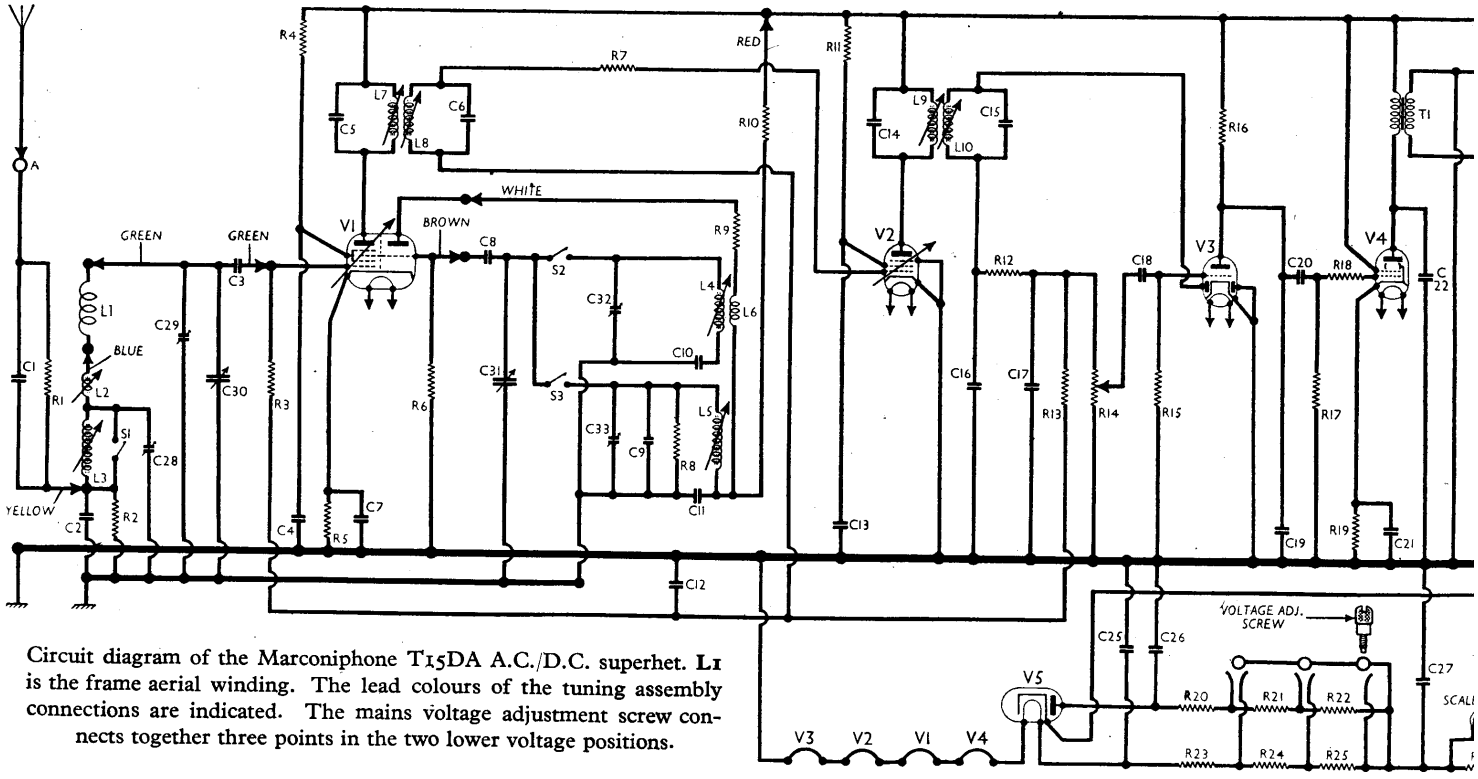
Second valve **(V2, Marconi W145)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned primary, tuned secondary transformer couplings **C5, L7, L8, C6** and **C14, L9, L10, C15,** in which the tuning capacitors are fixed and alignment adjustments are effected by varying the positions of the iron-dust cores.

Intermediate Frequency 465 kc/s.

Diode second detector is part of double diode triode valve **(V3, Marconi DL145)** in which one diode anode is not used and is strapped to cathode. Audio frequency component in rectified output is developed across manual volume control **R14,** which is also the diode load resistor, and passed via A.F. coupling capacitor **C18** and C.G. resistor **R15** to grid of triode section, which operates as A.F. amplifier. I.F. filtering by **C16, R12, C17** in the diode circuit, and **C19** in the triode anode circuit.

D.C. potential developed across **R14** is tapped off and fed back, via a decoupling circuit **R13, C12,** as G.B. to F.C. and I.F. valves, giving automatic volume control on both bands.

Resistance-capacitance coupling by **R16, C20, R17,** via grid stopper **R18,** between



Circuit diagram of the Marconiphone T15DA A.C./D.C. superhet. **L1** is the frame aerial winding. The lead colours of the tuning assembly connections are indicated. The mains voltage adjustment screw connects together three points in the two lower voltage positions.

V3 triode and beam tetrode output valve **(V4, Marconi N145).** Fixed tone correction by **C22.**

When the receiver is operated from A.C. mains, H.T. current is supplied by I.H.C. half-wave rectifying valve **(V5, Marconi U145),** which, with D.C. mains, behaves as a low resistance. Smoothing by speaker field **L13** and electrolytic capacitors **C23, C24.**

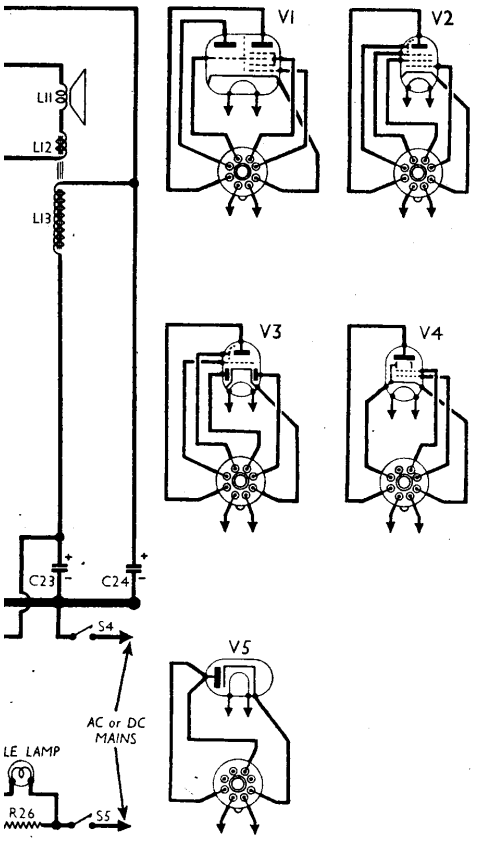
Valve heaters, together with scale lamps (shunted by **R26**) and ballast resistors **R23, R24, R25,** are connected in series across mains input, and the anode of **V5** is fed from the mains via **R20, R21** and **R22** in series. The voltage adjustment screw serves to short-circuit appropriate sections of the two resistor networks simultaneously when inserted in the two lower mains voltage settings. R.F. filtering in heater and mains input circuits by **C25, C26** and **C27.**

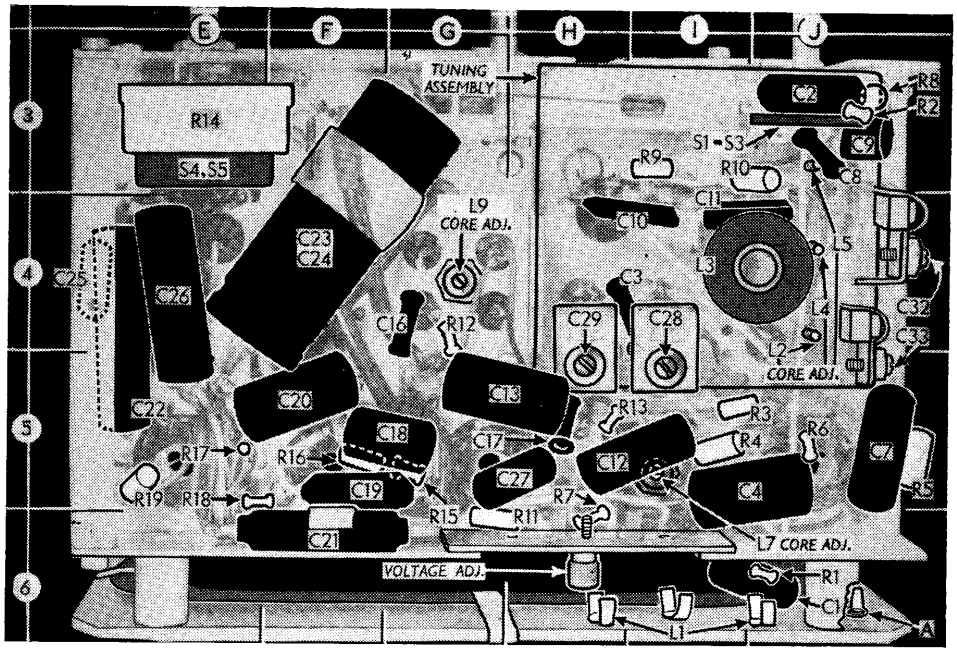
VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the manufacturers. Their receiver was operating on A.C. mains of 220 V, and they give the total H.T. current as 56 mA. Voltages were measured with a meter having a resistance of 500 ohms-per-volt.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 X145	160 / Oscillator / 60	3.0 / 2·1	85	4.6
V2 W145	160	8·5	80	3·0
V3 DL145	60	2·1	—	—
V4 N145	150	25·0	160	6·0
V5 U145†	—	—	—	—

† Cathode to chassis, 192 V,D.C.





Under chassis view. Part of the frame aerial winding and its support, on which the aerial socket is mounted, can be seen. The boundary of the tuning assembly is outlined in the top right-hand sector of the illustration. Instructions for removing and replacing this unit are given overleaf.

COMPONENTS AND VALUES

	CAPACITORS	Values (μF)	Locations
C1	Aerial coupling capacitors	0·001	J6
C2		0·0033	J3
C3	V1 hex. C.G.	0·0001	H4
C4	V1 S.G. decoup	0·1	I5
C5	1st I.F. transformer tuning	0·0001	B2
C6		0·0001	B2
C7	V1 cath. by-pass	0·047	J5
C8	V1 osc. C.G.	0·0001	J3
C9	L.W. fixed trim.	0·000082	J3
C10	M.W. tracker	0·00039	I4
C11	L.W. tracker	0·00018	I4
C12	A.V.C. decoupling	0·047	I5
C13	V2 S.G. decoup.	0·1	H5
C14	2nd. I.F. trans. tuning	0·0001	C1
C15		0·0001	C1
C16	I.F. by-passes	0·0001	G4
C17		0·0001	H5
C18	A.F. coupling	0·01	F5
C19	I.F. by-pass	0·00022	F6
C20	A.F. coupling	0·1	F5
C21*	V4 cath. by-pass	20·0	F6
C22	Tone corrector	0·02	E4
C23*	H.T. smoothing capacitors	32·0	F4
C24*		32·0	F4
C25	Mains R.F. by-pass capacitors	0.0022	E4
C26		0·05	E4
C27		0·0022	H5
C28‡	Aerial L.W. trim.	0·00003	I4
C29‡	Aerial M.W. trim.	0·00003	H4
C30†	Aerial tuning	—	B1
C31†	Oscillator tuning	—	B1
C32‡	Osc. M.W. trim.	0.00003	J4
C33‡	Osc. L.W. trim.	0.00003	J4

*Electrolytic. † Variable. ‡ Pre-set.

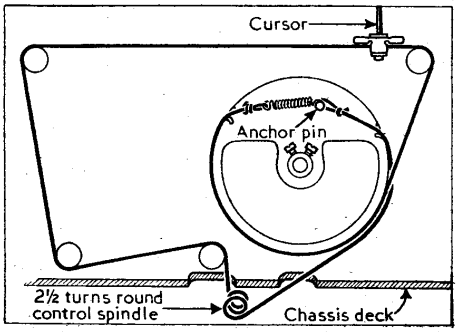
	RESISTORS	Values (ohms)	Locations
R1	Aerial coupling resistors	1,000,000	I6
R2		22,000	J3
R3	V1 hex. C.G.	470,000	I5
R4	V1 S.G. feed	15,000	I5
R5	V1 fixed G.B.	150	J5
R6	V1 osc. C.G.	47,000	J5
R7	V2 C.G. stopper	10,000	H6
R8	Osc. L.W. shunt	47,000	J3
R9	Osc. stabilizer	3,900	I3
R10	Osc. H.T. feed	22,000	I3
R11	V2 S.G. feed	33,000	G6
R12	I.F. stopper	47,000	G4
R13	A.V.C. decoupling	1,500,000	H5
R14	Volume control	500,000	E3
R15	V3 C.G. resistor	3,300,000	G5
R16	V3 triode load	47,000	F5
R17	V4 C.G. resistor	220,000	E5
R18	V4 C.G. stopper	10,000	E5
R19	V4 G.B. resistor	270	E5
R20	V5 surge limiting resistors	175	C2
R21		120	C2
R22		120	C2
R23	Heater ballast resistors	650	C2
R24		200	C2
R25		200	C2
R26	Scale lamp shunt	50	C2

	OTHER COMPONENTS	Approx. Values (ohms)	Locations
L1	Frame aerial	1·4	I6
L2	M.W. loading coil	1·7	A2
L3	L.W. tuning coil	14·5	I4
L4	Oscillator tuning coils	4·0	A1
L5		6·7	A1
L6	M.W. reaction coil	3·5	A1
L7	1st I.F. trans. Pri.	10·0	B2
L8	1st I.F. trans. Sec.	10·0	B2
L9	2nd I.F. trans Pri.	10·0	C1
L10	2nd I.F. trans Sec.	10·0	C1
L11	Speech coil	3·5	C1
L12	Hum neut. coil	0·1	C1
L13	Field coil	570·0	C1
T1	Output trans. Pri.	340·0	C1
	Output trans. Sec.	0·1	C1
S1-S3	W/band switches	—	J3
S4, S5	Mains sw. g'd R14	—	E3

If the component numbers given in the adjacent tables are used when ordering replacements, dealers should mention the fact, as these numbers may differ from those in the makers' diagram.

DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (pull off);
from the underside of the cabinet, remove the four 6BA cheese-head screws (with lock-washers) securing the plastic covers protecting the fixing screw heads;
remove the four 4BA cheese-head screws (with metal and lock-washers), thus ex-



Sketch showing the tuning drive system, drawn as seen when viewed from the front of the chassis when the gang is at maximum, neglecting the obstructions caused by the speaker and front chassis member.

posed, and slide out the chassis and speaker as a single unit by pulling on the two frame aerial mounting pillars.

Removing Tuning Assembly.—Untie and detach the drive cord (with tension spring);
remove the two machine screws securing the lower edge of the speaker frame to the front chassis member;
slacken the two drive drum grub screws, and slide the drum off the gang spindle, taking care not to distort the speaker frame when easing the drum from behind it;
from the rear underside of the chassis remove the cross-brace above the assembly (two cheese-head screws and lock-washers);
unsolder the three connecting leads from tags on the frame aerial; unsolder the white lead at pin 3, the brown lead at pin 4, and the green lead at pin 6 on **V1** holder; and unsolder the red lead from the assembly at the H.T.+ tag on **L7**;
finally, remove the five cheese-head screws (with lock-washers) securing the assembly to the chassis and lift it out. The screws are located directly behind the tuning control spindle, close to **V2** holder; along the right-hand edge of the chassis; and on the front chassis member close to the waveband switch spindle.

When replacing, viewing the chassis from the rear underside, reconnect the blue, yellow and long green leads from the assembly to the left-hand, centre and right-hand tags respectively on **L1.** The white, brown and short green leads should be resoldered to pins 3, 4 and 6 respectively, on **V1** holder, and the red lead must join the H.T.+ tag on **L7.** These lead colours are indicated in the circuit diagram overleaf.

To fit the tuning drive cord see the instructions given under "Drive Cord Replacement" in col. 4.

GENERAL NOTES

Switches.—The waveband switches **S1-S3** are contained in a small rotary two-position unit beneath the chassis, where it forms part of the tuning assembly. **S1** and **S2** close on M.W. (anti-clockwise position of the control knob), and **S3** only closes on L.W.

S4, S5 are the double-pole mains switches, ganged with the manual volume control **R14.**

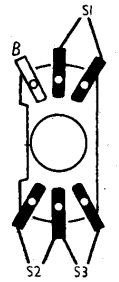
Tuning Assembly.—All the R.F. and oscillator tuning coils, trimmers, trackers, switches and the gang unit form an assembly mounted in an opening in the chassis deck. This assembly can be removed as a single unit, and instructions for doing this and replacing the unit are given under "Dismantling the Set" on this page.

The I.F. transformers are in two screened units on the chassis deck with their associated tuning capacitors. All the R.F., oscillator and I.F. coils have adjustable iron-dust cores.

Scale Lamp.—This has a clear spherical bulb and an M.E.S. base and is rated at 5 V, 0.15 A. Our sample was a Vitality 5/5.2 V, 0.15 A.

Resistors R20-R26.—These seven resistors are in fact seven sections of the wire-wound mains voltage adjustment ballast resistor. **R23, R24, R25** are the heater circuit ballast sections, and **R20, R21, R22** are surge-limiting resistors in the rectifier anode lead. **R26** is the scale lamp shunt.

Diagram of the waveband switch unit, drawn as seen from the rear of an inverted chassis.



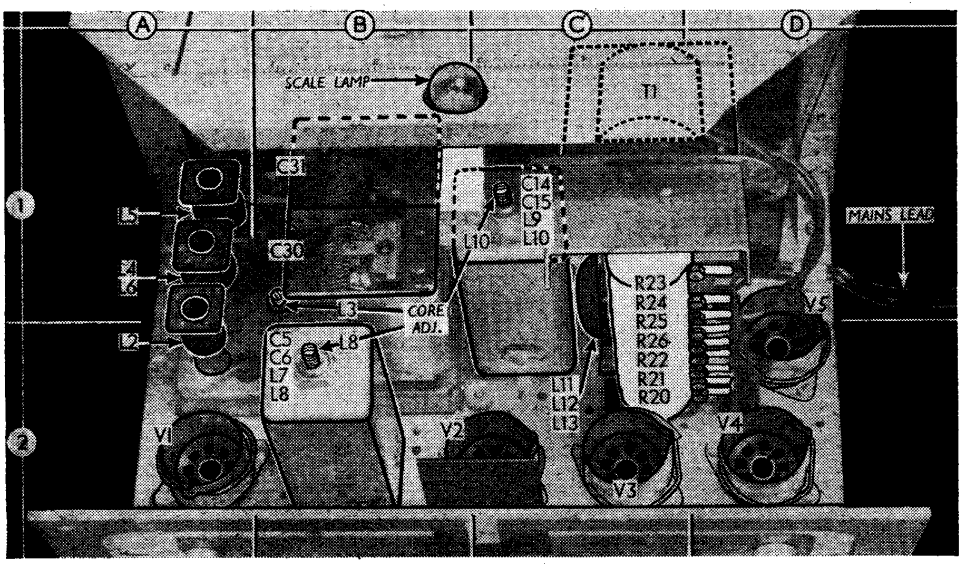
Junctions between these resistors are taken to the mains voltage adjustment panel which is so arranged that the adjustment screw short-circuits **R21, R22** and **R24, R25** in the 195-215 V position; or **R22** and **R25** in the 216-235 V position; in the 236-255 V position no sections are short-circuited.

In the sketches in col. 5 are shown the resistance unit, as seen from the rear of the chassis, and the inside face of the voltage adjustment panel as seen from the front of an inverted chassis. The lead colours associated with the tags on the resistance unit are indicated, together with the points to which they are connected. The letters **a, b, c, d, e** in both sketches show the interconnections between resistance unit and adjustment panel.

Valve Series.—The valves used in this receiver belong to the 145 series which is new and whose figures have not yet been generally published. These valves are fitted with the B.V.A. B8A base, full details of which were given in our *Service Sheet* 790.

Valves of the 145 series have 0.1 A heaters for economical series operation. Their voltage ratings are: X145, 28 V; W145, 13 V; DL145, 15 V; N145, 40 V; U145, 40 V. The valve holders are enclosed in metal sleeves which also cover the base of the valve. A slot is provided in the locating key channel to permit the retaining spring which surrounds the sleeve to lock the valve in by covering the locating pip. The spring must be removed before withdrawing a valve.

V2 is provided with a flat metal plate screen, screwed to the rear chassis member. **V4** is enclosed on three sides by a perforated metal screen, screwed to the chassis deck. This latter screen must be



Three-quarter rear view of the chassis. The speaker and its input transformer **T1** are obscured by the scale backing plate, on which the scale lamp is mounted. The seven-section ballast resistor **R20-R26** is seen beneath its heat deflector. The small metal screen behind **V2** is just visible. The perforated shield that screens **V4** has been removed.

removed (after slackening the two fixing screws) before the valve can be withdrawn.

DRIVE CORD REPLACEMENT

The course followed by the tuning drive cord is shown in the sketch (col. 1), where it is drawn as it would be seen when viewed from the front, when the gang is at maximum, if such obstructions as the speaker and chassis members were removed.

The makers emphasize that only the correct high grade of fishing line should be used for replacements, supplies of which can be obtained from E.M.I. Sales and Service, Ltd., Sheraton Works, Wadsworth Road, Greenford, Middlesex. A 36-in length is sufficient, leaving ample to spare for tying off.

Tie a small loop (about $\frac{1}{8}$ in diameter) at one end of the cord, turn the gang to maximum, pass the loop into the drum through the appropriate slot in the drum groove, and slip it over the anchor pin as indicated in the sketch. A touch of shellac will render the knot non-slipping.

Pass the free end of the cord down through the first slot in the chassis deck as indicated, under and round the control spindle $2\frac{1}{2}$ times in a clockwise direction, then up through the second hole and behind the speaker, passing over one pulley wheel and under the next. Run it up and over the two upper pulleys, between which is the cursor track, then down and round the drum again, half a turn clockwise. A stiff piece of wire shaped into a small hook at one end is a very useful aid to the foregoing operation.

Finally, pass the free end of the cord into the drum through the second slot and tie it to one end of the tension spring, whose coils should then open visibly when it is hooked to the anchor pin, and cut off surplus cord. The cursor carriage is held to the cord by a clamp plate, and should be adjusted as described under "Circuit Alignment."

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator, via an 0.1 μF isolating capacitor in each lead, to control grid (pin 6) of **V1** and chassis, leaving the existing control grid connection in position. Switch set to M.W., and turn gang to maximum capacitance and volume control fully clockwise. Feed in a 465 kc/s (645.16 m) signal, and adjust the cores of **L10, L9, L8** and **L7** (location references C1, G4, B2, I5) for maximum output, progressively reducing the input signal as the circuits are aligned to avoid automatic volume control action. Repeat these operations until no improvement results.

R.F. and Oscillator Stages.—Since the calibrated glass scale is mounted in the cabinet and the alignment adjustments have to be carried out with the chassis on the bench, a substitute scale is fixed to the front of the scale backing plate. This is divided into inches and sixteenths of an inch, and linear measurements on this scale correspond to frequencies given in the alignment instructions, being read against the right-hand edge of the cursor.

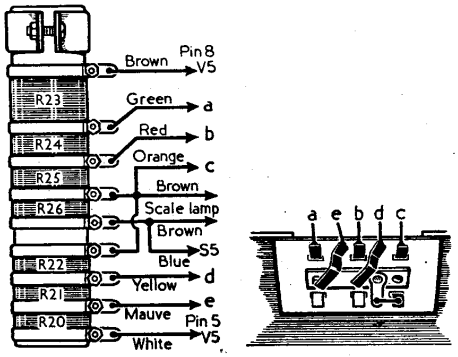
With the gang at maximum capacitance the right-hand edge of the cursor should coincide with the "0" on the scale. If any adjustment is required, slacken the cheese-head screw clamping the cursor carriage to the drive cord, correct the error, and tighten the clamping screw.

Transfer "live" signal generator lead to **A** socket, via a suitable dummy aerial and 0.1 μF isolating capacitor.

M.W.—Switch set to M.W., turn gang to minimum capacitance, feed in a 192 m (1,563 kc/s) signal and adjust **C32** (J4) for maximum output. Set cursor to $\frac{1}{16}$in, feed in a 567. m (529 kc/s) signal, and adjust the core of **L4** (J4) for maximum output. Set cursor to $4\frac{17}{32}$ in, feed in a 210 m (1,427 kc/s) signal, and adjust **C29** (H5) for maximum output. Set cursor to $1\frac{3}{8}$ in, feed in a 510 m (583 kc/s) signal, and adjust the core of **L2** (J4) for maximum output. Repeat these adjustments.

L.W.—Switch set to L.W., turn gang to minimum capacitance, feed in a 900 m (333.3 kc/s) signal, and adjust **C33** (J5) for maximum output. Set cursor to $\frac{3}{16}$ in, feed in a 2,000 m (150 kc/s) signal, and adjust the core of **L5** (J3) for maximum output. Set cursor to $4\frac{1}{16}$ in, feed in a 1,000 m (300 kc/s) signal, and adjust **C28** (I5) for maximum output. Set cursor to $\frac{3}{4}$ in, feed in a 1,850 m (162 kc/s) signal, and adjust the core of **L3** (B1) for maximum output. Repeat these adjustments.

Finally, replace the chassis in the cabinet and check calibration, at about the middle of the tuning scale, on a station of known wavelength. Adjust the cursor position to give the best compromise on both wavebands, if necessary.



Sketch of the **R20-R26** unit, with the destinations of all the leads from its nine tags indicated. Letters **a-e** indicate the five tags on the voltage adjustment panel, shown here on the right as seen from the front of an inverted chassis.

Service Short-cuts

PHILIPS 634A

When testing one of these receivers for low H.T. line volts, first disconnect the potential divider circuit (R13, R11, R10 "Trader" Service Sheet 613) and make an insulation test across the H.T. circuit, when the insulation resistance should be something approaching infinity.

If this test is satisfactory, and the H.T. volts are still low, it is worth while to check over R3, R8 and R9 in the control grid circuit of the output valve, looking for an open circuit, which would result in a heavy flow of H.T. current through the valve.

I have found this method quicker than testing anode current and then checking the bias voltage.—**R. C. B.**, Ambleside.

BUSH AC81

Perhaps other subscribers to the "Trader" may be interested in a rather unusual fault encountered in a new Bush AC81. The fault was intermittent, and the main symptom was a sudden fall in volume, accompanied by a slight click. The volume control was then practically inoperative.

The fault was extremely elusive, as it lasted for only a few seconds at a time, and the period of recurrence was irregular. However, during one of the more prolonged periods, it was established that if the grid cap of the D.D.T. was shorted to the cap-shield, the volume actually increased.

This clue was followed up by an examination of the circuit diagram, bearing in mind that the signal was reaching the D.D.T. not by the normal path, since short-circuiting the triode grid did not stop the receiver from working, but by some other path.

The I.F. valve and the D.D.T. use a common bias resistor, and it was thought that the interruption of the normal path may have been due to (a) a short-circuited secondary trimmer on the 2nd I.F.T., or (b) the signal diode end of that winding being shorted to chassis, and that an alternative input path was being provided via the cathode resistor. This is by-passed by a 0.05 μF capacitor, which is ineffective at A.F.

Both of these faults were simulated in turn, with identical symptoms, and upon opening up the can the fault was seen to be due to (b). After clearing the fault, it was simulated again by shorting the diode pin to chassis, when an oscillographic examination showed that an A.F. signal appeared across the bias resistor. —**S. G. P.**, Wellingborough.

H.M.V. 146

Intermittent crackle in the H.M.V. 146 and equivalent models, when not due to a fault in the output transformer, can sometimes be traced to leakage across the small vertical tag strip at the "output" end of the chassis.

This strip has three tags, the outside ones carrying the D.D.T. grid stopper (R7 in "Trader" Service Sheet 650). The centre tag forms an anchor for the D.D.T. anode feed resistors R8 and R9. A cure can be effected either by fitting a new tag strip or disconnecting R8, R9 from the tag.—**R. C. B.**, Ambleside.

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