'TRADER' SERVICE SHEET 246

BURGOYNE AWS

AWSG AND AWSG/RG

A SHORT-WAVE range of 19-56 metres is covered by the Burgoyne AWS 4-valve (plus rectifier) A.C. 3-band superhet. It is suitable for mains of 200-250 V, 40-60 C/S, and is provided with a sensitivity switch and sockets for a gramophone pick-up and an extension speaker.

An identical chassis is fitted in the AWSG radio-gramophone and the AWSG/RG automatic radio-gramophone, but this Service Sheet was prepared on an AWS.

CIRCUIT DESCRIPTION

Aerial input from **A1** via series condenser **C1**, L.W. second channel rejector **L1, C3, S2** and coupling coils **L4** (S.W.), **L5** (M.W.), and via **L3, L6** (L.W.) to single tuned circuits **L7, C33** (S.W.), **L8, C33** (M.W.) and **L9, C33** (L.W.). An I.F. filter circuit **L2, C30** is connected across aerial circuit. Second aerial input socket **A2** feeds the signal to **A1** via small condenser **C2**.

First valve (**V1, Tungsram metallised V04**) is an octode operating as frequency changer with electron coupling. Oscillator grid coils **L11** (S.W.), **L12** (M.W.) and **L13** (L.W.) are tuned by **C34**; parallel trimming by **C35** (S.W.); **C10, C36** (M.W.) and **C11, C37** (L.W.); series tracking by **C8, C38** (M.W.) and **C9, C39** (L.W.). An additional adjustment on S.W. is by a series connected coil **L10**. Anode reaction is by coils **L14** (S.W.), **L15** (M.W.) and **L16** (L.W.). The alternative resistances **R4** and **R5** connected in the cathode circuit via switches **S18** or **S19** provide the appropriate fixed G.B. voltages for the three positions of the sensitivity switch control.

Second valve (**V2, Tungsram metallised VP4B**) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C40, L17, L18, C41** and **C42, L19, L20, C43.** Two more resistances here form a second part of the sensitivity control. **R3,** connected across **L17** by switch **S20** and **R7** across **L18** via **S21** reduce the gain in this stage and broaden tuning when the switches close, on the "Local" position of the control.

Intermediate frequency 473KC/S.

Diode second detector is part of double diode triode valve (**V3, Tungsram metallised DDT4**). Audio frequency component in rectified output is developed across load resistance **R14** and passed via I.F. stopper **R15,** coupling condenser **C18** and manual volume control **R16** to C.G. of triode section which operates as A.F. amplifier. I.F. filtering by **R15, C20** and **C21.** Provision for connection of gramophone pick-up across **R16** via switch **S17.** The final section of the sensitivity control is provided here by means of the G.B. resistances **R17, R18** in the cathode circuit which bias the signal diode via switches **S22** (distant) which returns direct to cathode, **S23** (medium) which connects to junction of **R17, R18** and **S24** (local) which is connected to chassis.

Second diode of **V3,** fed from **L20** via **C19,** provides D.C. potential which is developed across load resistance **R21** and fed back via decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from **R17, R18.**

Resistance-capacity coupling by **R20, C24** and **R24** between **V3** triode and pentode output valve (**V4, Tungsram APP4C**). Provision for connection of high impedance external speaker across the leads to the primary of the internal speaker input transformer **T1,** which can be disconnected by turning the special external speaker plug slightly anti-clockwise in its socket, opening **S25** and thus muting the internal speaker. Variable R.C. tone control in anode circuit by **C26** and **R26.**

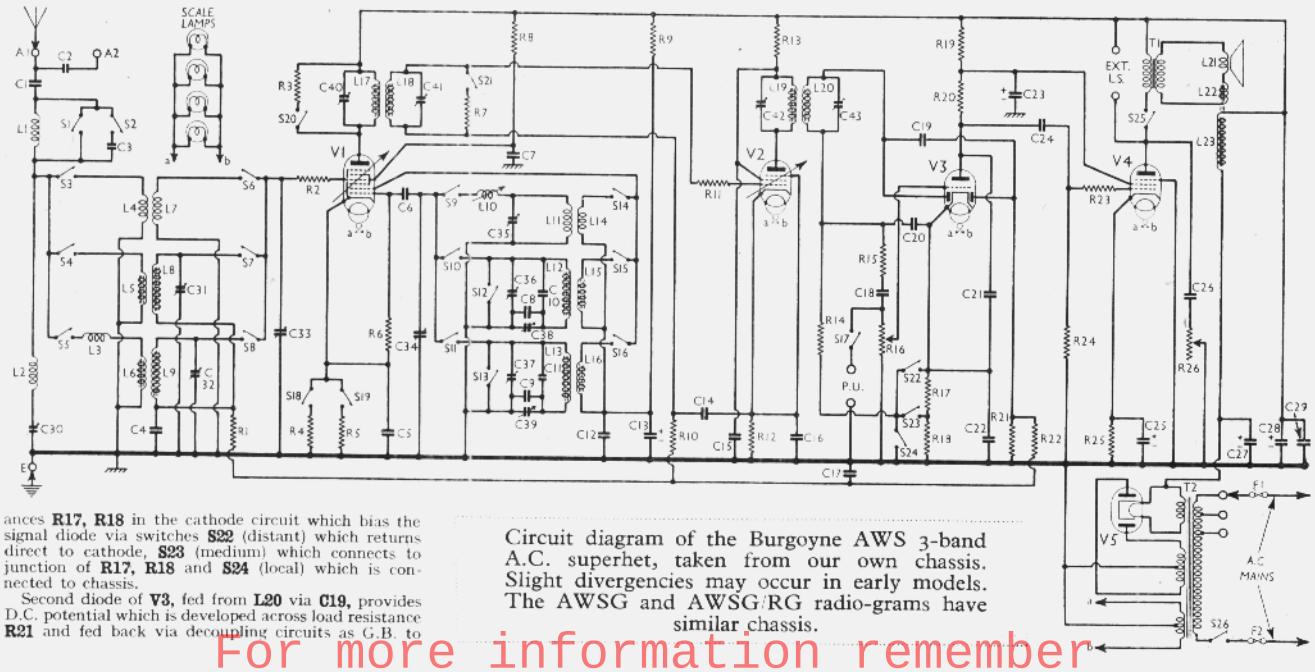
H.T. current is supplied by an I.H.C. full-wave rectifying valve (**V5, Tungsram APV4**). Smoothing by speaker field **L23** and dry electrolytic condensers **C27, C28.** Fuses **F1** and **F2,** located in the mains connector plug, protect the mains input circuit. H.T. circuit R.F. filtering by **C29.**

COMPONENTS AND VALUES

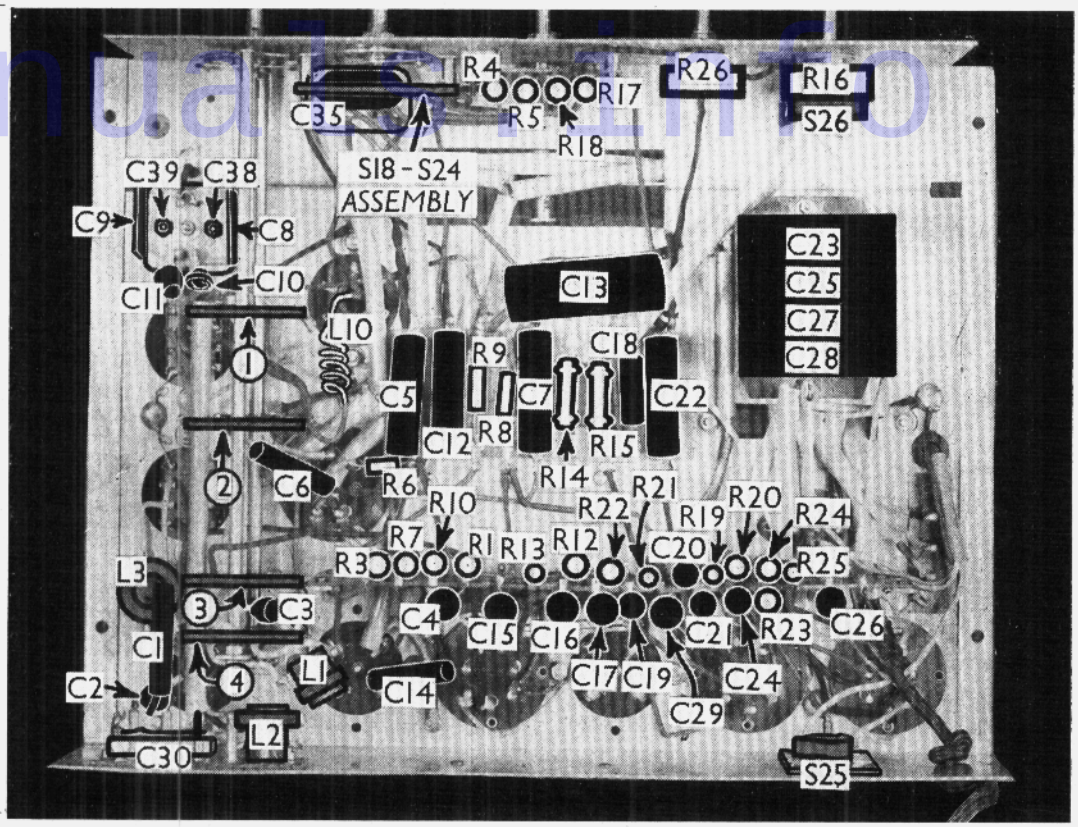
	RESISTANCES	Values (ohms)
R1	V1 pentode C.G. decoupling	100,000
R2	V1 pentode C.G. stabiliser	100
R3	L17 sensitivity shunt resistance	50,000
R4, R5	V1 fixed G.B. and sensitivity control resistances	200, 500
R6	V1 osc. C.G. resistance	50,000
R7	L18 sensitivity shunt resistance	50,000
R8	V1 S.G. H.T. feed	40,000
R9	V1 osc. anode H.T. feed	40,000
R10	V2 C.G. decoupling	250,000
R11	V2 C.G. stabiliser	500
R12	V2 fixed G.B. resistance	100
R13	V2 S.G. and anode H.T. feed	5,000
R14	V3 signal diode load resistance	250,000
R15	I.F. stopper	250,000
R16	Manual volume control	500,000
R17, R18	V3 G.B. and sensitivity control resistances	500, 500
R19	V3 triode anode and V4 S.G. H.T. feed	5,000
R20	V3 triode anode load	30,000
R21	V3 A.V.C. diode load	500,000
R22	A.V.C. line decoupling	250,000
R23	V4 C.G. I.F. stopper	50,000
R24	V4 C.G. resistance	250,000
R25	V4 G.B. resistance	140
R26	Variable tone control	10,000

	CONDENSERS	Values (μF)
C1	Aerial series condenser	0·0001
C2	A2 socket aerial series condenser	0·000035
C3	L.W. second channel rejector tuning	0·00005
C4	V1 pentode C.G. decoupling	0·1
C5	V1 cathode by-pass	0·1
C6	V1 osc. C.G. condenser	0·0001
C7	V1 S.G. decoupling	0·1
C8	Osc. circuit M.W. fixed tracker	0·00048
C9	Osc. circuit L.W. fixed tracker	0·00013
C10	Osc. circuit M.W. fixed trimmer	0·00002
C11	Osc. circuit L.W. fixed trimmer	0·00005
C12	Osc. anode R.F. by-pass	0·1
C13*	Oscillator anode decoupling	2·0
C14	V2 C.G. decoupling	0·001
C15	V2 S.G. and anode decoupling	0·1
C16	V2 cathode by-pass	0·1
C17	A.V.C. line decoupling	0·1
C18	A.F. coupling to V3 triode	0·005
C19	V3 A.V.C. diode coupling	0·0001
C20	I.F. by-pass	0·0004
C21	V3 triode anode I.F. by-pass	0·0001
C22	V3 cathode by-pass	0·1
C23*	V3 triode anode and V4 S.G. decoupling	4·0
C24	V3 to V4 A.F. coupling	0·01
C25*§	V4 cathode by-pass	50·0
C26	Part variable tone control	0·05
C27*, C28*	H.T. smoothing	8·0, 12·0
C29	H.T. circuit R.F. filter	0·1
C30‡	Aerial I.F. filter tuning	—
C31‡	Aerial circuit M.W. trimmer	—
C32‡	Aerial circuit L.W. trimmer	—
C33†	Aerial circuit tuning	0·0005
C34†	Oscillator circuit tuning	0·0005
C35‡	Oscillator circuit S.W. trimmer	—
C36‡	Oscillator circuit M.W. trimmer	—
C37‡	Oscillator circuit L.W. trimmer	—
C38‡	Oscillator circuit M.W. tracker	—
C39‡	Oscillator circuit L.W. tracker	—
C40‡	1st I.F. trans. pri. tuning	—
C41‡	1st I.F. trans. sec. tuning	—
C42‡	2nd I.F. trans. pri. tuning	—
C43‡	2nd I.F. trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.
§ Two 25 μF in parallel.



Circuit diagram of the Burgoyne AWS 3-band A.C. superhet, taken from our own chassis. Slight divergencies may occur in early models. The AWSG and AWSG/RG radio-grams have similar chassis.



Under-chassis view. **L10** is a S.W. inductive trimmer. **C35, C38** and **C39** are adjusted through holes in the chassis deck. The numbers in circles refer to the four wave-change switch units, while **S18-S24** is the sensivity switch unit. Diagrams of these are on page VIII. **C25** in the condenser block is made up of two units in parallel, so there are actually five units in the block.

	OTHER COMPONENTS		Approx. Values (ohms)
L1	Second channel L.W. rejector		8·5
L2	Aerial I.F. filter coil		22·0
L3	Aerial L.W. choke		58·0
L4	Aerial S.W. coupling coil		0·15
L5	Aerial M.W. coupling coil		0·4
L6	Aerial L.W. coupling coil		3·0
L7	Aerial S.W. tuning coil		0·1
L8	Aerial M.W. tuning coil		2·6
L9	Aerial L.W. tuning coil		12·5
L10	Osc. S.W. trimming coil		Very low
L11	Oscillator S.W. tuning coil		Very low
L12	Oscillator M.W. tuning coil		1·25
L13	Oscillator L.W. tuning coil		3·9
L14	Oscillator S.W. reaction		0·1
L15	Oscillator M.W. reaction		0·9
L16	Oscillator L.W. reaction		1·3
L17, L18	1st I.F. trans.	Pri.	5·4
		Sec.	9·5
L19, L20	2nd I.F. trans.	Pri.	5·6
		Sec.	5·0
L21	Speaker speech coil		1·7
L22	Hum neutralising coil.		0·1
L23	Speaker field coil		2,000·0
T1	Speaker input trans.	Pri.	700·0
		Sec.	0·3
T2	Mains trans.	Pri. total	27·0
		Heat. sec. total	0·075
		Rec. heat. sec.	0·1
		H.T. sec. total	560·0
S1-S16	Waveband switches		—
S17	Radio-gram. change switch		—
S18-S24	Sensitivity switches		—
S25	Internal speaker switch		—
S26	Mains switch, ganged R16		—
F1, F2	Mains circuit fuses, 1 amp.		—

DISMANTLING THE SET

A detachable bottom is fitted to the cabinet, and upon removal (eight countersunk-head wood screws) gives access to most of the components beneath the chassis.

Removing Chassis.—If it is necessary to remove the chassis from the cabinet, remove the five control knobs (recessed grub screws) and the four bolts (with nuts and washers) holding the chassis to the bottom of the cabinet. Now free the speaker leads from the cleat holding them to the sub-baffle, when the chassis can be withdrawn to the extent of the leads, which should be just sufficient for normal purposes.

When replacing the chassis, note that the medium-sized knob with a white dot goes on the spindle of the wave-change switch, while the small knob with a white dot goes on the spindle of the sensitivity switch.

To free the chassi sentirely, unsolder the speaker leads, and *when replacing*, connect them as follows, numbering the tags from bottom to top :—1 and 2 joined together, red ; 3, white ; 4, yellow. The black lead goes to the tag on the bottom left-hand speaker fixing screw.

Removing Speaker.—To remove the speaker from the cabinet, remove the nuts from the four screws holding it to the sub-baffle, and *when replacing* see that the transformer is on the left, and do not forget to replace the tag for the earthing lead on the bottom left-hand screw.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 230 V, using the 220-230 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band and both the volume and sensitivity controls were at maximum (the latter fully anti-clockwise). There was no signal input.

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

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VO4*	255	5·3	85	1·2
V2 VP4B	180	10·7	180	3·1
V3 DDT4	110	3·3	—	—
V4 APP4C	230	35·0	220	3·6
V5 APV4	350†	—	—	—

* Oscillator anode (G2) 100 V, 3·4 mA.

† Each anode, A.C.

GENERAL NOTES

Switches.—**S1-S17** are the wavechange and gramophone switches, ganged in four rotary units beneath the chassis. These are indicated by numbers in circles in our under-chassis view, and shown in detail in the diagrams on page VIII.

S18-S24 are the sensitivity switches, in a single rotary unit beneath the chassis, also indicated in our under-chassis view, and shown in the diagrams on page VIII.

The tables (p. VIII) give the switch positions for the various control settings, starting from fully anti-clockwise in each case. A dash indicates open, and **C**, closed.

S25 is the internal speaker switch, combined with the external speaker sockets. When the special external speaker plug is inserted, and rotated anti-clockwise, **S25** opens and mutes the internal speaker.

S26 is the Q.M.B. mains switch, ganged with the volume control, **R16**.

Coils.—**L1-L3** are on separate small tubular formers beneath the chassis, while **L10** is a small self-supporting inductance, also beneath the chassis. The remaining coils are in six screened units on the chassis deck. Some of these, including the I.F. transformers, contain also two associated trimmers.

Scale Lamps.—These are four M.E.S. types, each rated at 6·2 V, 0·3 A.

Fuses.—These are two 1 A types fitted in the special mains plug. They are ¾ in. long, with $\frac{3}{16}$ in. diameter metal end caps.

External Speaker.—A special combined external speaker socket and internal speaker switch (**S25**) is provided at the rear of the chassis. The speaker should be of the high impedance (7,000-8,000 Ω) type.

Resistances R2, R11.—These are fitted inside the screened top cap connectors of **V1** and **V2** respectively.

Condensers C23, C25, C27, C28.—These are all included in a dry electrolytic block beneath the chassis, with a common negative (black) lead. The blue lead is the positive of **C23** (4 μF) ; **C25** (50 μF) consists of two 25 μF types in parallel (two green leads form the positive connection) ; the yellow lead is the positive of **C27** (8 μF), and the red lead is the positive of **C28** through (12 μF).

Trimmers C35, C38, C39.—These are adjustable holes in the chassis deck.

V5 Holder.—The centre socket of this is used as a bearer in our chassis. **V5**, of course, only has four pins.

Chassis Divergencies.—**C13** is not included in the makers' diagram. **V4** suppressor grid is shown con-

Continued overleaf

BURGOYNE AWS (*Continued*)

nected to cathode by the makers, while there is another switch connecting the junction of **L1, L2** to chassis on gram. **C29** is not shown by the makers.

Several of the components may have values different from those shown by us. Thus **C20** may be 0·0005 μF, **R15** may be 100,000 Ω and **R25** may be 150 Ω.

CIRCUIT ALIGNMENT

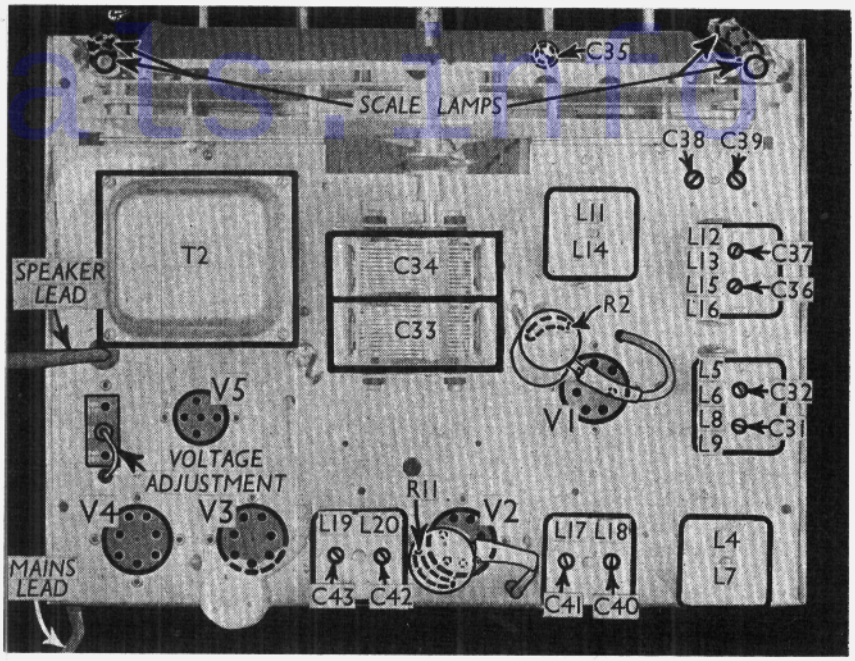
I.F. Stages.—Disconnect **V1** top cap connector, and connect signal generator to top cap (via a 0·0002 μF condenser) and chassis. Connect a 250,000 Ω resistance from top cap to chassis. Feed in a 473 KC/S signal, and adjust **C43, C42, C41** and **C40** for maximum output, the sensitivity switch being at "distant." Remove shunting resistance and replace top cap connector.

R.F. and Oscillator Stages.—Connect signal generator to **A1** and **E** sockets. Switch set to L.W., tune to bottom of scale, turn volume control to maximum and sensitivity switch to "distant," and feed in a 473 KC/S signal. Adjust **C30** for *minimum* output.

M.W.—Switch set to M.W., tune to 200 m. on scale, feed in a 200 m. signal, and adjust **C36** and **C31** for maximum output. Tune to 500 m. on scale, feed in a 500 m. signal, and adjust **C38** for maximum output. Re-adjust **C36** at 200 m. and **C38** at 500 m. until no further improvement can be made. If necessary slightly re-adjust **C31** in order to balance sensitivity at 200 and 500 m.

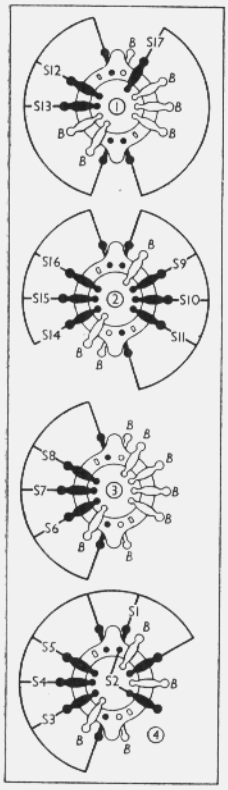
L.W.—Switch set to L.W., and set pointer to 1,700 m. on scale. Feed in a 1,700 m. signal, and adjust **C32** and **C39** for maximum output. Set pointer to 1,200 m., feed in a 1,200 m. signal, and adjust **C37** only for maximum output. Continue adjusting **C39** on 1,700 m. and **C37** on 1,200 m. until no further improvement can be made.

S.W.—Switch set to S.W., tune to 21 m. on scale, feed in a 21 m. signal, and adjust **C35** for maximum output. Set pointer to 48 m. on scale, feed in a 48 m. signal, and adjust **L10** by closing up or opening out turns until maximum output is indicated. Continue adjusting **C35** at 21 m. and **L10** at 48 m. until no further improvement results.



Plan view of the chassis. Note the resistances **R2** and **R11** inside the top cap connectors of **V1** and **V2**. **C35, C38** and **C39** are adjusted through holes in the chassis deck.

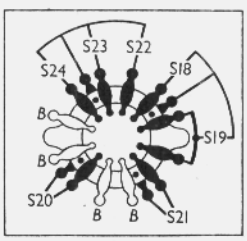
SWITCH DIAGRAMS AND TABLES



On the left are the four wavechange and gramophone switch diagrams, as seen looking from the rear of the underside of the chassis. At the bottom of the centre column is the sensitivity switch unit, viewed from the same position.

Switch	L.W.	M.W.	S.W.	Gram.
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

Switch	Dist.	Med.	Local
S18	—	—	C
S19	C	C	—
S20	—	—	C
S21	—	—	C
S22	C	—	—
S23	—	C	—
S24	—	—	C



MAINTENANCE PROBLEMS

Leaking Condenser Alters Bias

I RECENTLY encountered a rather unusual fault in a Marconi 262 receiver. The complaint was that after the set had been on for about two minutes, reproduction would become terribly distorted.

Upon inspecting the set, I found it was just as the customer had stated. I immediately carried out all the routine tests for distortion, checking bias voltages, continuity of grid circuits, etc., but found everything in order, except that the anode and screen current of the output pentode was abnormally high; this rather puzzled me, as I had checked the bias voltage on this valve and found it correct.

After having checked everything (as I thought) that could possibly cause the trouble and having drawn a blank, I decided to study the circuit diagram of the receiver very carefully, to see if I had missed anything. After going over this several times I suddenly noticed a bass compensation condenser, which is connected between the anode circuit of the detector valve and the grid end of the output valve decoupling resistance, and as it was the only thing left to suspect, I decided to test it, and there sure enough was the trouble.

This condenser was leaking, and was applying a positive bias of about nine volts to the grid of the output pentode. This, of course, was not indicated on measuring the bias from the speaker field tapping. Upon replacing this condenser with a new one, all trace of distortion vanished and the anode and screen currents returned to normal.

As a matter of interest, I have just serviced two more receivers of this type for the same trouble.—K. G. PILGRIM, HOVE.

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