'TRADER' SERVICE SHEET 256

PHILCO A537BG, A537CG AND A537RG

THE Philco A537BG receiver is a 4-valve (plus rectifier) A.C. 3-band superhet suitable for mains of 200-260 V, 50-100 C/S. It has provision for both an extension speaker and a gramophone pick up, and also for the Philco all-wave aerial.

A similar chassis is fitted in the A537CG console and A537RG radiogram, but this *Service Sheet* was prepared on an A537BG, while modifications in the last two models are detailed under "General Notes."

CIRCUIT DESCRIPTION

Aerial input on all bands via condenser **C1** and coil **L6**. On M.W. and L.W. input is then via split coupling coils **L4, L5,** matching transformer **L2, L3** and coupling coil **L8** to single-tuned circuits **L9, C35** (M.W.) and **L10, C35** (L.W.). Coupling is also assisted by condensers **C3, C4**. On S.W. **L6** feeds single-tuned circuit **L7, C35**. Normally the link is left in socket **B**, connecting centre-tap of **L2** to chassis. Provision is made for connecting the Philco all-wave anti-static aerial, in which case the link is transferred to socket **C** and the transmission line is connected to sockets **Red** and **Black**. Choke **L1** across aerial input circuit prevents modulation hum and morse break-through on L.W.

First valve (**V1, Philco 6A7E**) is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L11** (S.W.), **L13** (M.W.) and **L14** (L.W.) are tuned by **C36**; parallel trimming by **C37** (S.W.), **C38** (M.W.) an **C39** (L.W.); series tracking by **C6** (S.W.), **C40** (M.W.) and **C41** (L.W.). Anode reaction by coil **L12** and condenser **C7** on S.W. and condenser **C8** on M.W. and L.W.

Second valve (**V2, Philco 78E**) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C42, L15, L16, C43** and **C44, L17, L18, C45**.

Intermediate frequency 451 KC/S.

Diode second detector is part of double-diode triode valve (**V3, Philco 75**). Audio frequency component in rectified output is developed across load resistance **R8** and passed via coupling condenser **C13,** manual volume control **R12** and coupling condenser **C18** to C.G. of triode section. I.F. filtering by **C11, C12, R7**. Bass-boosting by **R11, C16**. Provision for connection of gramophone pick-up across **R12** via switch **S11,** with special input tone filter **C14, R10, C15**.

Second diode of **V3,** fed by **C20** from **L15,** provides D.C. potential which is developed across load resistance **R17** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control.

Resistance-capacity coupling by **R16, C23** and **R18** between **V3** triode and pentode output valve (**V4, Philco 42E**). Variable tone control in grid circuit by **R19, C25**. Fixed tone correction in anode circuit by condenser **C26**. Provision for connection of low impedance external speaker across secondary of internal speaker input transformer **T1**.

H.T. current is supplied by full-wave rectifying valve (**V5, Philco 80**). Smoothing by speaker field **L21** and dry electrolytic condensers **C28, C29**. R.F. filtering of H.T. supply to **V2** and **V4** by **C27**; mains R.F. filtering by **C30, C31**.

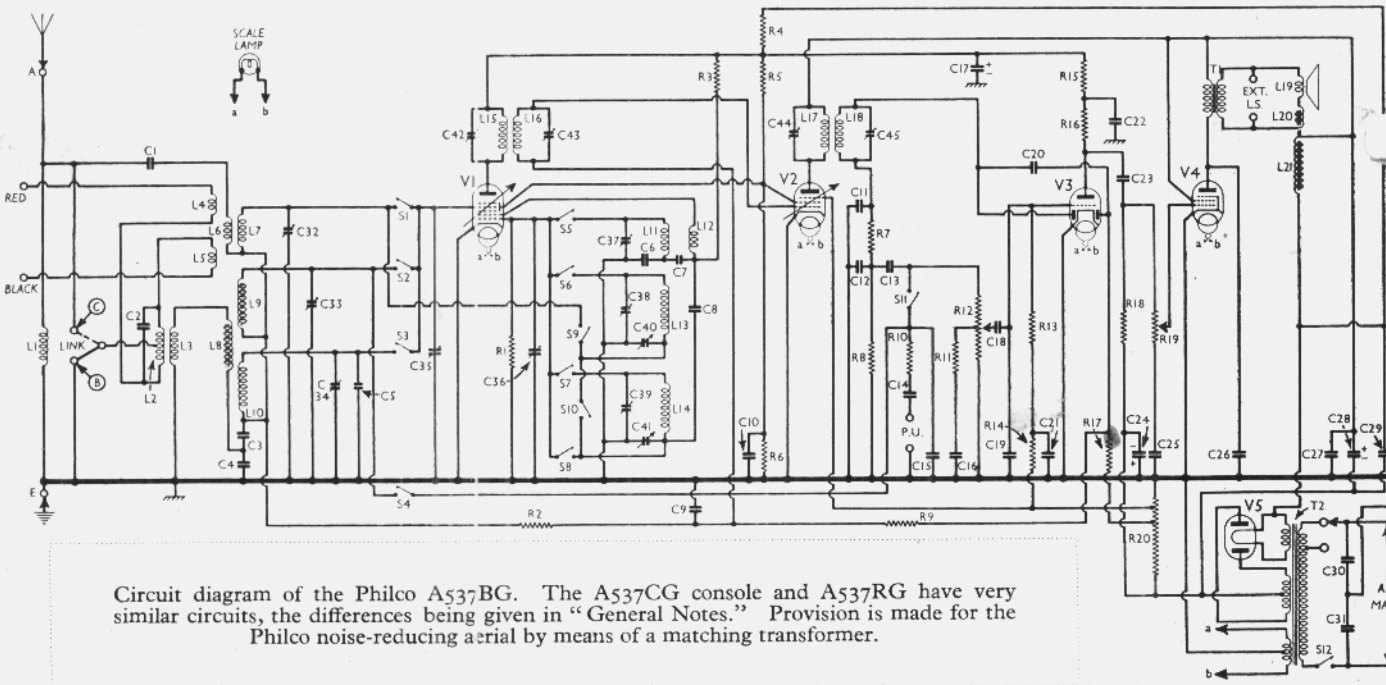
COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 osc. C.G. resistance	99,000
R2	V1 C.G. decoupling	10,000
R3	V1 osc. anode H.T. feed	10,000
R4	V1, V2 S.G., V1, V3 anode H.T. feed	10,000
R5	V1, V2 S.G. H.T. potential divider	10,000
R6		25,000
R7	I.F. stopper	51,000
R8	V3 signal diode load	330,000
R9	A.V.C. line decoupling	1,000,000
R10	Part P.U. input circuit tone filter	51,000
R11	Part of bass boosting circuit	99,000
R12*	Manual volume control	2,000,000
R13	V3 triode C.G. resistance	1,000,000
R14	V3 triode C.G. decoupling	490,000
R15	V3 triode anode decoupling	99,000
R16	V3 triode anode load	240,000
R17	V3 A.V.C. diode load	1,000,000
R18	V4 C.G. resistance	1,000,000
R19	Variable tone control	500,000
R20†	Automatic G.B. potential divider	236

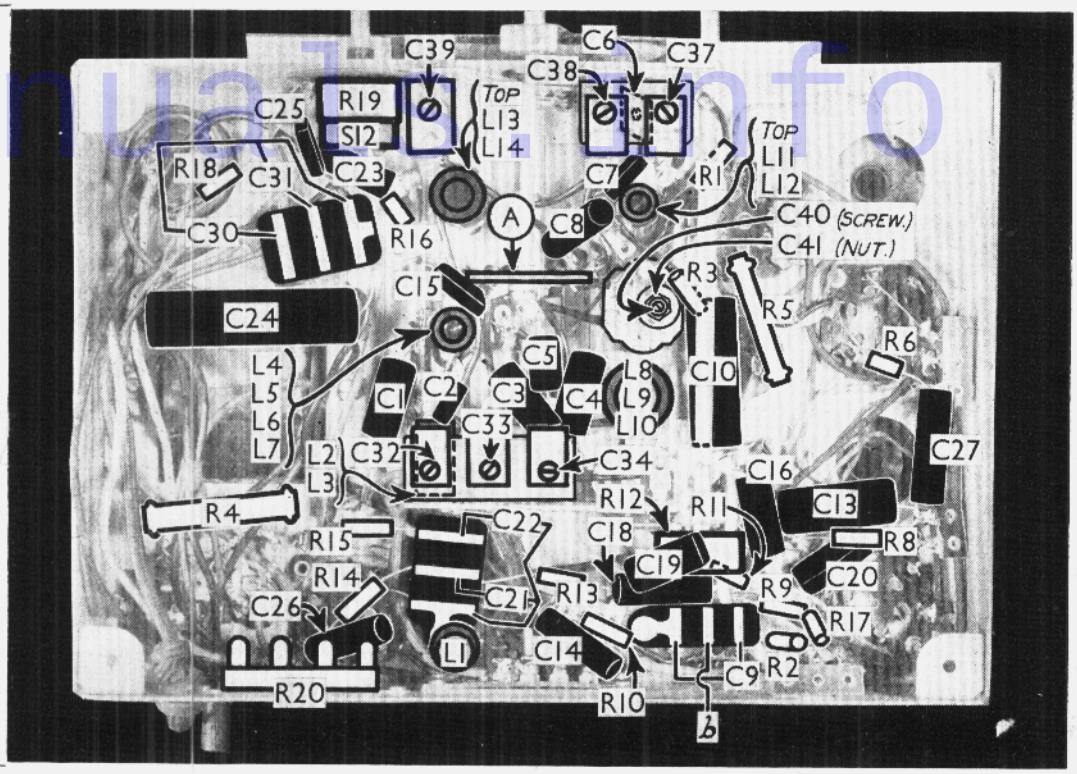
* Tapped at 1,000,000 O.

† Tapped (from chassis) at 23 O, 23 O and 196 O.

	CONDENSERS	Values (μF)
C1	Aerial series condenser	0·01
C2	Matching transformer pri. tuning	0·00025
C3	Parts of aerial coupling and impedance matching circuit on M.W. and L.W.	0·01
C4		0·01
C5	Aerial circuit L.W. fixed trimmer	0·00003
C6	Osc. circuit S.W. tracker	0·00165
C7	Additional osc. anode S.W. coupling	0·00005
C8	Osc. anode coupling on M.W. and L.W.	0·001
C9	A.V.C. line decoupling	0·05
C10	V1, V2 S.G. decoupling	0·25
C11	I.F. by-pass condensers	0·00011
C12		0·00011
C13	A.F. coupling to R12	0·05
C14	Parts of P.U. input circuit tone filter	0·01
C15		0·00025
C16	Part of bass boosting circuit	0·01
C17*	V1, V3 H.T. circuit decoupling	16·0
C18	A.F. coupling to V3 triode	0·01



Circuit diagram of the Philco A537BG. The A537CG console and A537RG have very similar circuits, the differences being given in "General Notes." Provision is made for the Philco noise-reducing aerial by means of a matching transformer.



Under-chassis view. **R20** is a tapped Candohm resistance. Note that the centre tag of the **C9** unit is a bearer only. The trackers **C40** and **C41** are in a dual unit, and are adjusted by a screw and nut. **C6** is beneath **C37** and **C38**.

	CONDENSERS (*Continued*)	Values (μF)
C19	Fixed tone corrector	0·00011
C20	V3 A.V.C. diode feed condenser	0·00011
C21	V3 C.G. decoupling	0·15
C22	V3 triode anode decoupling	0·15
C23	V3 triode to V4 A.F. coupling	0·01
C24*	V4 C.G. decoupling	10·0
C25	Part of T.C. circuit	0·00041
C26	V4 anode fixed tone corrector	0·002
C27	H.T. circuit R.F. by-pass	0·05
C28*	H.T. smoothing	8·0
C29*	H.T. smoothing	8·0
C30	Mains R.F. by-passes	0·015
C31	Mains R.F. by-passes	0·015
C32‡	Aerial circuit S.W. trimmer	0·000035
C33‡	Aerial circuit M.W. trimmer	0·000035
C34‡	Aerial circuit L.W. trimmer	0·000035
C35†	Aerial circuit tuning	—
C36†	Oscillator circuit tuning	—
C37‡	Osc. circuit S.W. trimmer	0·000035
C38‡	Osc. circuit M.W. trimmer	0·000035
C39‡	Osc. circuit L.W. trimmer	0·00011
C40‡	Osc. circuit M.W. tracker	0·000125
C41‡	Osc. circuit L.W. tracker	0·000375
C42‡	1st I.F. trans. pri. tuning	—
C43‡	1st I.F. trans. sec. tuning	—
C44‡	2nd I.F. trans. pri. tuning	—
C45‡	2nd I.F. trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Mod. hum rejector and anti-break through choke	17·0
L2	M.W. and L.W. coupling transformer	6·0
L3	M.W. and L.W. coupling transformer	17·0
L4	Transmission line input coils	0·2
L5	Transmission line input coils	0·2
L6	Aerial coupling coil	0·8
L7	Aerial S.W. tuning coil	0·1

	OTHER COMPONENTS (*Continued*)	Approx. Values (ohms)
L8	M.W. and L.W. coupling coil	0·5
L9	Aerial M.W. tuning coil	3·2
L10	Aerial L.W. tuning coil	36·0
L11	Oscillator S.W. tuning coil	0·1
L12	Oscillator S.W. reaction coil	0·45
L13	Oscillator M.W. tuning coil	2·5
L14	Oscillator L.W. tuning coil	17·5
L15	1st I.F. trans. Pri.	10·0
L16	1st I.F. trans. Sec.	12·0
L17	2nd I.F. trans. Pri.	12·0
L18	2nd I.F. trans. Sec.	10·0
L19	Speaker speech coil	2·2
L20	Hum neutralising coil	0·2
L21	Speaker field coil	1,140·0
T1	Speaker input trans. Pri.	215·0
T1	Speaker input trans. Sec.	0·3
T2	Mains trans. Pri., total	20·0
T2	Mains trans. Heater sec.	0·2
T2	Mains trans. Rect. heat. sec.	0·2
T2	Mains trans. H.T. sec., total	380·0
S1-S10	Waveband switches	—
S11	Radiogram change switch	—
S12	Mains switch, ganged R19	—

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, remove the five control knobs (pull off) and the four self-tapping bolts (with washers) holding the chassis to the bottom of the cabinet. The chassis can now be withdrawn to the extent of the speaker leads, which should be sufficient for normal purposes.

To free the chassis entirely, unsolder the speaker leads and *when replacing*, connect them as follows, numbering the tags from bottom to top:—1, white; 2, green; 3, green/white.

Removing Speaker.—To remove the speaker from the cabinet, remove the nuts and spring washers from the four screws holding it to the front of the cabinet *When replacing*, see that the transformer is pointing to the bottom right-hand corner of the cabinet.

VALVE ANALYSIS

Valve voltages and currents given in the table (col. 3) are those measured in our receiver when it was operating on mains of 230 V, using the 200-230 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium 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 6A7E*	165	3·4	85	2·6
V2 78E	265	4·9	85	1·2
V3 75	65	0·2	—	—
V4 42E	255	38·0	265	8·3
V5 80	335†	—	—	—

* Oscillator anode 110 V, 4·2 mA.
† Each anode, A.C.

GENERAL NOTES

Switches.—**S1-S10** are the wavechange switches, and **S11** the radiogram switch, ganged in a single 4-position rotary unit beneath the chassis, which is indicated in our under-chassis view by the letter A in a circle and an arrow. The arrow shows the direction in which the unit is viewed in the diagram on page VIII.

The table (p. VIII) gives the switch positions for the four control settings, starting from fully anti-clockwise. A dash indicates open, and **C** closed.

S12 is the Q.M.B. mains switch, ganged with the variable tone control, **R19.**

Coils.—All the R.F. and oscillator coils are beneath the chassis, in unscreened units. **L1** is on its own near the rear member. **L2, L3**; **L4-L7**; **L8-L10**; **L11, L12** and **L13, L14** are in five tubular units, their associated trimmers being close to them in each case.

The I.F. transformers **L15, L16** and **L17, L18** are in two screened units on the chassis deck, with their trimmers. Note that the **L17, L18** unit also contains **R7, C11** and **C12.**

Scale Lamp.—This is a Tung Sol miniature bayonet cap type, rated at 6·3 V, 0·35 A (Philco part No. 34-2064 or 34-2141).

External Speaker.—Two sockets are provided on the internal speaker terminal panel for a low impedance (2-3 Ω) external speaker.

Condensers C28, C29.—These are two 8 μF dry electrolytics in a single tubular metal case mounted on the chassis deck. Note that the casing, which forms the common negative connection, is insulated from chassis. The connection tags are beneath the chassis, that on the rim of the casing being the common negative. The tag connected to **V4** holder (yellow wire) is the positive of **C28,** while the tag connected to

Continued overleaf

PHILCO A537—*Continued*

V5 (white-black wire) and **T2** (slate wire) is the positive of **C29**.

Resistance R20.—This is a tapped Candohm type, with a total resistance of 236 O. It is attached to the rear member of the chassis, and the tag at the end nearest the centre of the chassis is on the casing, and so is connected to chassis. Between this tag and the next there is a resistance of 23 O, between the second and third tags, 23 O, and between the third and fourth tags (nearest end of chassis), 190 O.

Condensers C21, C22, C30, C31.—These are in pairs in Philco black moulded units. The large end tag is common in each case, and is connected to chassis by the holding down screw.

Trimmers.—One side of each of these goes to chassis, and advantage is taken of this to build up the units on metal plates (common to each condenser in the unit) which are screwed to chassis, or to a bracket riveted to chassis.

Trackers C40, C41.—These are two pre-set condensers in a single unit beneath the chassis, adjusted by a nut and screw. The screw adjusts **C40** and the nut, **C41.**

Condenser C6.—This is a S.W. tracker, situated beneath **C37** and **C38.** It is normally not intended to be adjusted, and hence we do not include it in our list of pre-set condensers.

Condensers C12, C13.—These are inside the **L17, L18** I.F. unit, but on removing the can they will not at first be seen. The reason is that they are contained in the ceramic moulding at the top of the coil unit, which carries the two trimmers. The common connection of **C11, C12** goes to the long tag terminating in the washer which is clamped under the coil can by the fixing nut.

Condenser C9.—This is in a black moulded unit, and is connected to the two outer tags. The central tag is merely a bearer for certain wires.

Condenser C24.—If this electrolytic should have to be replaced, note that its *positive* connection goes to chassis.

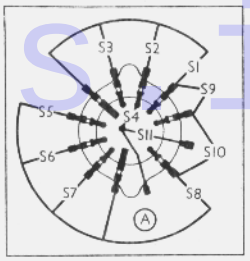
Aerial Connections.—Ordinary aerial and earth leads are connected to the **A** and **E** sockets, with the link at the rear of the chassis bridging from the centre socket to socket **B.**

When using a Philco noise-reducing aerial, the red and black leads should be plugged into the sockets marked "**Red**" and "**Blk.**" and the link should bridge from the centre socket to that marked **C.**

A537CG and RG Modifications.— In these models **R19** and **C25** are removed from the positions shown in our diagram, and are connected in series across **R16,** the lower end of **R19** going to **V3** anode, and the free end of **C25** going to the top of **R16.** The connection from **C23** is removed from the anode of **V3** and taken to the slider of **R19,** while the junction of **C23, R18** goes direct to C.G. of **V4. C25** is changed in capacity from 0·00041 μF to 0·002 μF.

DIAGRAM AND TABLE OF SWITCH UNIT

Switch diagram, looking from the front of the underside of the chassis.



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

In these models **C16** and **R11** are also removed, the centre tap of **R12** not being used.

CIRCUIT ALIGNMENT

With gang at minimum, pointer should cover index line, beyond 1,700 KC/S, just above the words "Medium Wave." Switch set to M.W., turn volume-control to maximum, and tone control fully anti-clockwise (without operating mains switch, of course). The link at rear of chassis should be in socket **B.**

I.F. Stages.—Feed a 451 KC/S signal to top cap of **V1** and chassis, leaving existing connection in place. Adjust **C45, C44, C43** and **C42** in turn for maximum output.

R.F. and Oscillator Stages.—Connect signal generator to **A** (via dummy aerial) and **E** sockets. Align in following order.

L.W.—Switch set to L.W., feed in a 290 KC/S signal, tune to 290 KC/S on scale, and adjust **C39,** then **C34,** for maximum output. Feed in a 160 KC/S signal, tune it in, and adjust **C41** (nut) for maximum output, whilst rocking the gang for optimum results. Re-adjust **C39** at 290 KC/S and **C41** at 160 KC/S until no further improvement results.

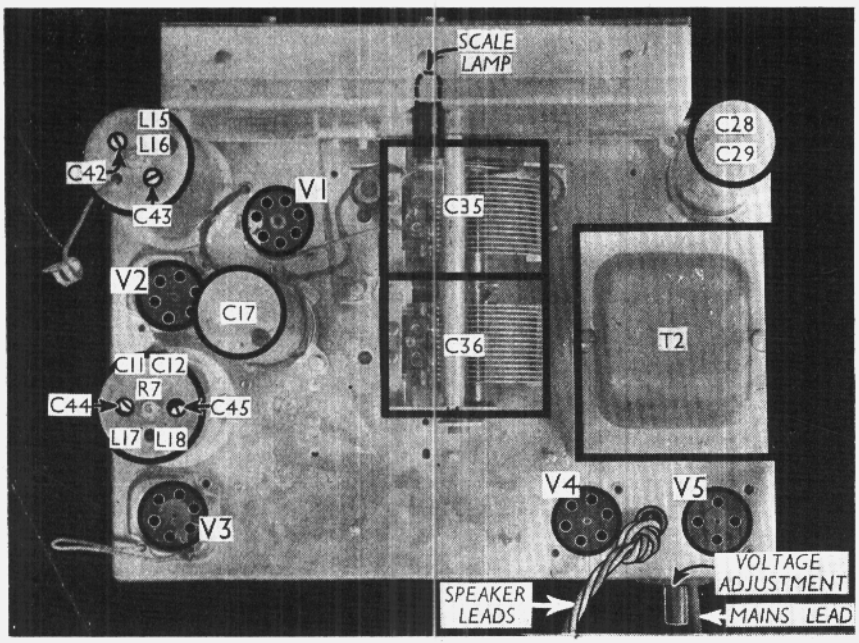
M.W.—Switch set to M.W., feed in a 1,400 KC/S signal, tune to 1,400 KC/S on scale, and adjust **C38,** then **C33,** for maximum output. Feed in a 600 KC/S signal, tune it in, and adjust **C40** (screw) for maximum output, whilst rocking the gang. Re-adjust **C38** at 1,400 KC/S and **C40** at 600 KC/S, until no further improvement results.

S.W.—Switch set to S.W., use a 400 O resistance as dummy aerial, and feed in an 18 MC/S signal. Tune to 18 MC/S on scale, and adjust **C37** for maximum output. The correct peak is the second obtained when unscrewing **C37** from the maximum position

The adjustment of **C32** may have a tendency to "pull" the frequency of the oscillator section of the receiver. This may be minimised by shunting a 0·00035 μF variable condenser across **C36,** and tuning it so that the second harmonic instead of the fundamental beats with the incoming signal. Connect the shunt condenser between the tag of **C37** and chassis, and tune it (about half open) for the signal from 18 MC/S input. Then adjust **C32** for maximum output. Disconnect shunt condenser and re-adjust **C37** for maximum output.

Check that the 18 MC/S image is obtained at about 17·1 MC/S.

Feed in a 6 MC/S signal, tune it in, and check for correct reading on scale. It should not be necessary to adjust **C6** (which we show as a fixed condenser), but if sensitivity is low at 6 MC/S, re-adjust **C6** very slightly only, whilst rocking the gang. Then re-adjust **C37** at 18 MC/S.



Plan view of the chassis. The second I.F. unit contains **C11, C12** and **R7** in addition to the trimmers.

MAINTENANCE PROBLEMS

Low Gain and Distortion

AN A.C. superhet was in for repair recently, and was giving low gain and distorted signals. The output pentode on an independent test was seen to have low emission. A new valve was tried and gave practically no improvement in results.

While testing it was found that no signals were received with the tone control turned to maximum. Current and voltage tests with the control in this position were made, and the output valve was found to be taking 41 mA, the normal being about 30 mA. The anode voltage was about 25 V lower than normal.

On turning the control to minimum the anode current dropped to 38 mA. This tone control was a variable condenser, with paper dielectric, connected between grid and cathode of the output valve. A resistance test revealed a dead short across these electrodes with the condenser at maximum. The tone control condenser was then disconnected while further tests were made.

The detector was coupled to the output valve by a parallel-fed transformer, and disconnecting the coupling condenser was found to have no effect on the output valve consumption. A 2 μF condenser decoupling the anode feed to the detector valve had its earthy end connected to the bottom end of the transformer. A further condenser tied this point to earth, the D.C. circuit being continued via a 0·25 MO resistance and the L.S. field. On disconnecting the decoupling condenser the output valve anode current dropped to normal.

This condenser had developed a leak and gave a positive potential to the grid of the output valve via the transformer and grid resistance, so causing the rise in current.

The tone control and decoupling condensers were replaced, a new output valve fitted, and results were quite good. Completely realigning the set completed the job, and the receiver was O.K.—W. G. GOUGH, WORCESTER.

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