'TRADER' SERVICE SHEET

214

BUSH DAC43, DUG43, RG43

A SHORT-WAVE range of 17-53 metres is covered by the Bush DAC43 4-valve A.C./D.C. 3-band superhet. Suitable for mains of 180-260 V (40-80 C/S in the case of A.C.), it employs a Westinghouse unit for rectification on A.C. supplies and has provision for both a gramophone pick-up and an extension speaker, a plug and socket arrangement allowing the internal speaker to be cut out, if desired.

A very similar chassis is fitted in the DUG43 console receiver and a slightly modified one in the RG43 radio-gramophone and automatic radio-gramophone, but this *Service Sheet* was prepared on a DAC43 table receiver.

CIRCUIT DESCRIPTION

Aerial input via blocking condenser **C1** and on M.W. and L.W. via coupling coils **L1** (M.W.) and **L3** (L.W.) to capacity coupled band-pass filters. Primaries **L2** (M.W.), **L4** (L.W.) are tuned by **C33**; secondaries **L7** (M.W.), **L8** (L.W.) are tuned by **C37**; top coupling by small condensers **C4** (M.W.), **C5** (L.W.) and bottom coupling by **C3.** On S.W. band aerial input is via coupling coil **L5** to single tuned circuit comprising **L6** and tuning condenser **C37**.

First valve (**V1, Mullard metallised TH21C**) is a triode-hexode operating as a frequency changer with internal coupling. Oscillator grid coils **L9** (S.W.), **L11** (M.W.) and **L13** (L.W.) are tuned by **C38**; parallel trimming by **C39** (S.W.), **C40** (M.W.) and **C12, C42** (L.W.); series tracking by **C10** (S.W.), **C11, C41** (M.W.) and **C43** (L.W.); oscillator anode reaction coils **L10** (S.W.), **L12** (M.W.) and **L14** (L.W.).

Second valve is a variable-mu R.F. pentode (**V2, Mullard metallised VP13C**), operating as intermediate frequency amplifier with special triple-tuned transformer couplings **C44, L15, L16, C45, L17, C46** and **C47, L18, L19, C48, L20, C49.**

Intermediate frequency 465 KC/S.

Diode second detector is part of double diode triode valve (**V3, Mullard metallised TDD13C**). Audio-frequency component in rectified output is developed across load resistance **R14** and passed via coupling condenser **C21** and manual volume control **R12** to C.G. of triode section of **V3** operating as A.F. amplifier. Provision for connection of gramophone pick-up across **R12** via mains isolating condensers **C19** and **C20.**

Second diode of **V3,** fed from **V2** anode via **C24,** provides D.C. potential which is developed across **R19** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along **V3** cathode resistance **R17.**

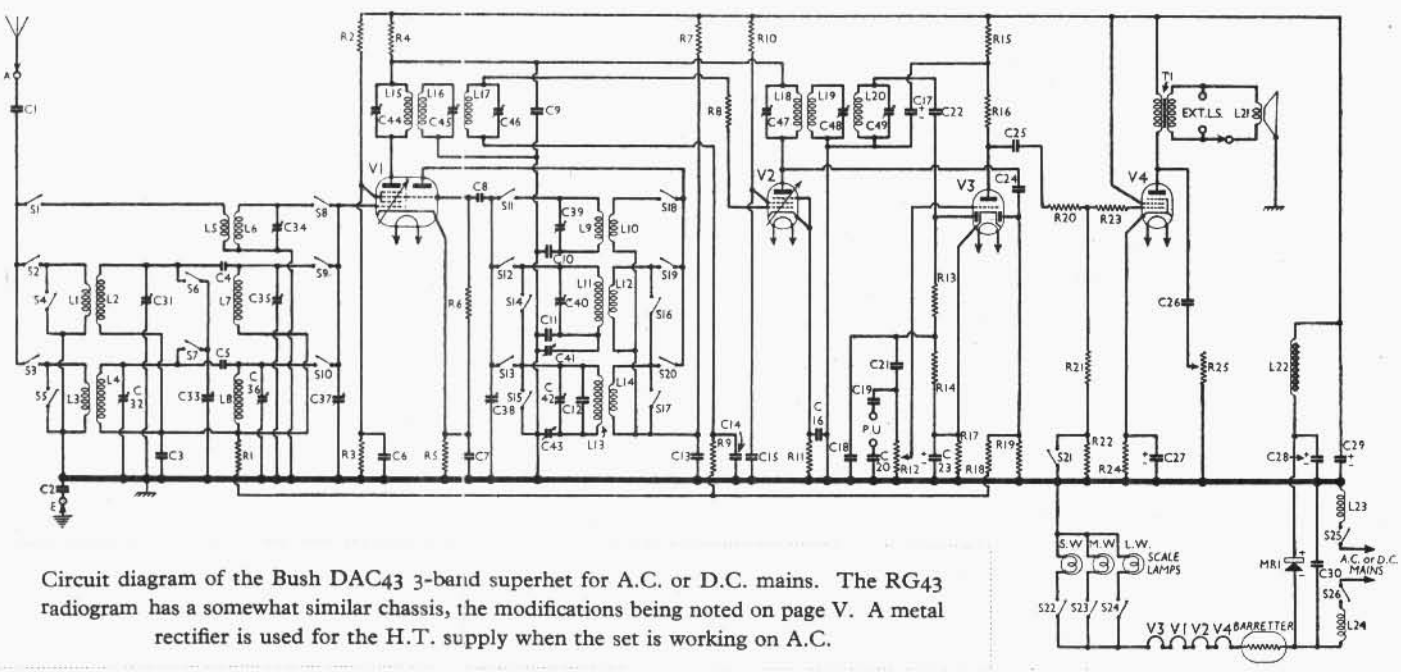
Resistance capacity coupling by **R16, C25, R21, R22** between **V3** triode and pentode output valve (**V4, Mullard Pen36C**). **S21** opens on S.W. and provides tone adjustment. Variable tone control by R.C. filter **C26, R25** in anode circuit. Provision for connection of low impedance external speaker across secondary of internal speaker transformer **T1.** Plug and socket arrangement enables internal speaker speech coil circuit to be broken.

When the receiver is used with A.C. mains, H.T. current is supplied by a half-wave metal rectifier (**MR1, Westinghouse B27**) which, with D.C. supplies, behaves as a low resistance. Smoothing is effected by iron-cored choke **L22** and dry electrolytic condensers **C28, C29.**

Valve heaters are connected in series together with scale lamps and current regulating barretter lamp (**Philips C1**), across mains input circuit. Filter comprising chokes **L23, L24** and condenser **C30** suppresses mains-borne interference.

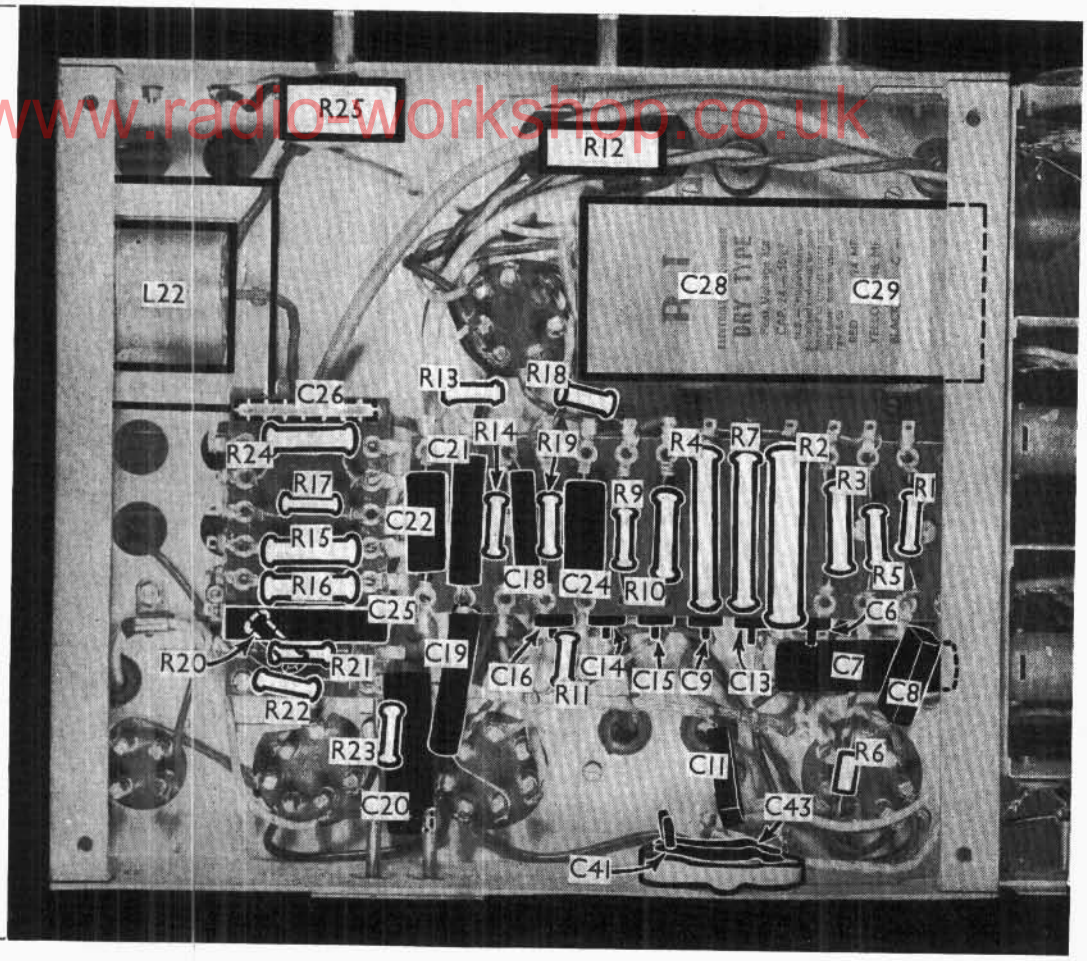
COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 hexode C.G. decoupling ..	1,000,000
R2	V1 hexode S.G's H.T. potential divider	20,000
R3		20,000
R4	V1 hexode anode and V2 anode decoupling	5,000
R5	V1 fixed G.B.	100
R6	V1 osc. C.G. resistance ..	30,000
R7	V1 osc. anode decoupling ..	15,000
R8	V2 C.G. stabilising resistance	250
R9	V2 C.G. decoupling resistance	1,000,000
R10	V2 S.G. decoupling	50,000
R11	V2 fixed G.B. resistance ..	100
R12	Manual vol. control	500,000
R13	I.F. stopper	200,000
R14	V3 signal diode load	1,000,000
R15	V3 triode anode decoupling ..	10,000
R16	V3 triode anode load	50,000
R17	V3 G.B. resistance	1,000
R18	A.V.C. line decoupling ..	1,000,000
R19	V3 A.V.C. diode load ..	1,000,000
R20	V4 C.G. I.F. stopper	100,000
R21	V4 C.G. resistances ..	100,000
R22		550,000
R23	V4 C.G. I.F. stopper	100,000
R24	V4 G.B. resistance	350
R25	Variable tone control ..	50,000



Circuit diagram of the Bush DAC43 3-band superhet for A.C. or D.C. mains. The RG43 radiogram has a somewhat similar chassis, the modifications being noted on page V. A metal rectifier is used for the H.T. supply when the set is working on A.C.

Under-chassis view. The whole of the coil unit on the right is not shown, as all the components in it are identified in the side - chassis view on page VIII. Note the six condensers beneath the horizontal component panel, which are in a single metal case, which forms one common connection to each condenser. The tags forming the other connections are indicated.



	CONDENSERS	Values (μF)
C1	Aerial blocking condenser	0·005
C2	Earth blocking condenser	0·005
C3	Band-pass bottom coupling	0·03
C4	Band-pass M.W. top coupling	Very low
C5	Band-pass L.W. top coupling	Very low
C6	V1 hexode S.G.'s by-pass	0·1
C7	V1 cathode by-pass	0·1
C8	V1 osc. C.G. condenser	0·00005
C9	V1, V2 anodes decoupling	0·1
C10	Osc. S.W. tracker	0·0043
C11	Osc. M.W. fixed tracker	0·0004
C12	Osc. L.W. fixed trimmer	0·0001
C13	V1 osc. anode decoupling	0·1
C14	V2 C.G. decoupling	0·1
C15	V2 S.G. decouping	0·1
C16	V2 cathode by-pass	0·1
C17*	V3 triode anode decoupling	2·0
C18	I.F. by-pass	0·0001
C19	Pick-up isolating condensers	0·03
C20		0·1
C21	A.F. coupling to V3 triode	0·005
C22	V3 signal diode coupling	0·0001
C23*	V3 cathode by-pass	50·0
C24	V3 A.V.C. diode coupling	0·0001
C25	V3 to V4 A.F. coupling	0·03
C26	Part of T.C. filter	0·03
C27*	V4 cathode by-pass	50·0
C28*	H.T. smoothing	16·0
C29*		24·0
C30	Mains R.F. by-pass	0·01
C31‡	Band-pass M.W. pri. trimmer	0·000035
C32‡	Band-pass L.W. pri. trimmer	0·000035
C33†	Band-pass pri. tuning	—
C34‡	Aerial S.W. trimmer	0·000035
C35‡	Band-pass M.W. sec. trimmer	0·000035
C36‡	Band-pass L.W. sec. trimmer	0·000035
C37†	Band-pass sec. tuning	—
C38†	Osc. circuit tuning	—
C39‡	Osc. S.W. trimmer	0·000035
C40‡	Osc. M.W. trimmer	0·00008
C41‡	Osc. M.W. tracker	0·0003
C42‡	Osc. L.W. trimmer	0·00008
C43‡	Osc. L.W. tracker	0·0003

	CONDENSERS (*Continued*)	Values (μF)
C44‡	1st I.F. trans. pri. tuning	0·00015
C45‡	1st I.F. trans. tert. tuning	0·00015
C46‡	1st I.F. trans. sec. tuning	0·00015
C47‡	2nd I.F. trans. pri. tuning	0·00015
C48‡	2nd I.F. trans. tert. tuning	0·00015
C49‡	2nd I.F. trans. sec. tuning	0·00015

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial M.W. coupling coil		0·7
L2	Band-pass M.W. primary coil		2·4
L3	Aerial L.W. coupling coil		15·5
L4	Band-pass L.W. primary coil		7·4
L5	Aerial S.W. coupling coil		0·2
L6	Aerial S.W. tuning coil		0·05
L7	Band-pass M.W. secondary coil		2·4
L8	Band-pass L.W. secondary coil		7·4
L9	Osc. S.W. tuning coil		0·05
L10	Osc. S.W. reaction coil		0·2
L11	Osc. M.W. tuning coil		1·5
L12	Osc. M.W. reaction coil		1·25
L13	Osc. L.W. tuning coil		2·45
L14	Osc. L.W. reaction coil		2·0
L15	1st I.F. trans.	Primary	7·0
L16		Tertiary	7·0
L17		Secondary	7·0
L18	2nd I.F. trans.	Primary	7·0
L19		Tertiary	7·0
L20		Secondary	7·0
L21	Speaker speech coil		1·7
L22	H.T. smoothing choke		160·0
L23	Mains filter chokes		6·0
L24			6·0
T1	Speaker input trans.	Pri.	600·0
		Sec.	0·2
S1-S21	Wavechange switches		—
S22-24	Scale lamp switches		—
S25,26	Mains switches		—

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, first remove the five control knobs (recessed grub screws) and then remove the insulating covering for the heads of the four chassis fixing bolts (eight round-head wood screws) and remove the bolts (with washers).

Now free the speaker and mains switch leads from the cleats holding them to the side of the cabinet, when the chassis can be withdrawn to the extent of the leads.

To free the chassis entirely, remove the mains switch unit from the side of the cabinet (four round-head wood screws) and unsolder the speaker leads. *When replacing*, connect the leads as follows, numbering the tags from bottom to top :— 1, red ; 5, yellow.

Removing Speaker.—The speaker may be removed from the cabinet by unsoldering the leads and removing the nuts (and washers) from the four bolts holding it to the sub-baffle. *When replacing*, see that the terminal panel is on the right and connect the leads from the chassis and mains switch unit as above, and the leads from the extension speaker panel as follows :— 2, green ; 3, brown ; 4, black. The black lead from the mains switch unit goes to the earthing tag on the speaker.

Continued overleaf

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on A.C. mains of 225 V. 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 1,200 V scale of an Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TH21C*	185	2·5	65	5·8
V2 VP13C	185	6·0	100	2·2
V3 TDD13C	90	2·2	—	—
V4 Pen 36C	215	33·0	235	4·7

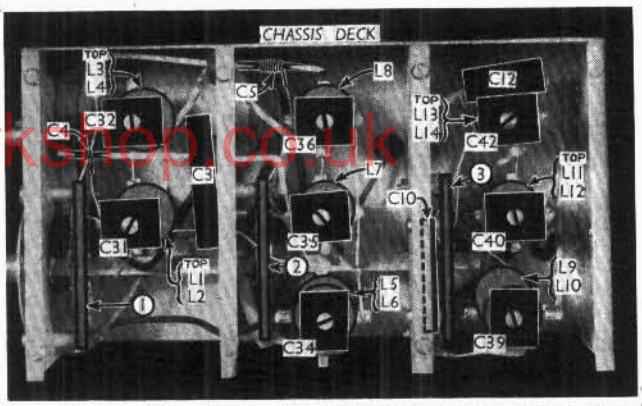
* Oscillator anode 140 V, 7·4 mA.

GENERAL NOTES

Switches.—**S1-S21** and **S22-S24** are the waveband and scale lamp switches, ganged in three rotary units beneath the chassis. The units are indicated in our side-chassis view, and are shown in detail in the diagrams on page V, as seen looking at the underside of the chassis from the rear. The table (p. V) gives the switch positions for the three control settings, starting from fully anti-clockwise. O indicates open, and **C**, closed.

S25 and **S26** are the Q.M.B. mains switches, in a single unit, mounted on the separate mains input panel, with **L23, L24** and **C30.**

Coils.—The signal frequency and oscillator coils, **L1-L14,** are in a partitioned screened unit, with the wavechange switches and several other components.



Side-chassis view, showing the coil and switch assembly with its metal side-plate removed. Note the two small condensers **C4, C5.** Each of the eight coil formers carries one or two coils, and a trimmer mounted at its front end.

This unit projects above and below the chassis deck. The coils are indicated in detail in our side-chassis view, the metal side plate of the unit having been removed. In all there are eight coil formers, each carrying one or two coils, and each having a trimmer mounted at its end.

The I.F. transformers, **L15-L17** and **L18-L20,** are in two screened units on the chassis deck. Note that each contains three coils and three trimmers. The trimmers are adjustable through holes in the backs of the cans, and in our plan chassis view, they are numbered from top to bottom in each case.

Scale Lamps.—These are three Ever Ready M.E.S. types, rated at 6·2 V, 0·3 A. They are switched by **S22-S24.**

External Speaker.—Provision is made, by a panel at the top of the back of the cabinet, for the use of a low impedance (about 2 O) external speaker. The internal speaker speech coil may be disconnected by a plug and socket device, also on the panel.

Condensers C17, C23, C27.—These are three dry electrolytics in a single container, mounted on the chassis deck, and having a common negative (black) lead. The red lead is the positive of **C17** (2 μF), the yellow lead to **V3** cathode the positive of **C23** (50 μF), and the yellow lead to **V4** cathode the positive of **C27** (50 μF).

Condensers C28, C29.—These are two dry electrolytics in a single carton with a common negative (black) lead. The yellow lead is the positive of **C28** (16 μF) and the red the positive of **C29** (24 μF).

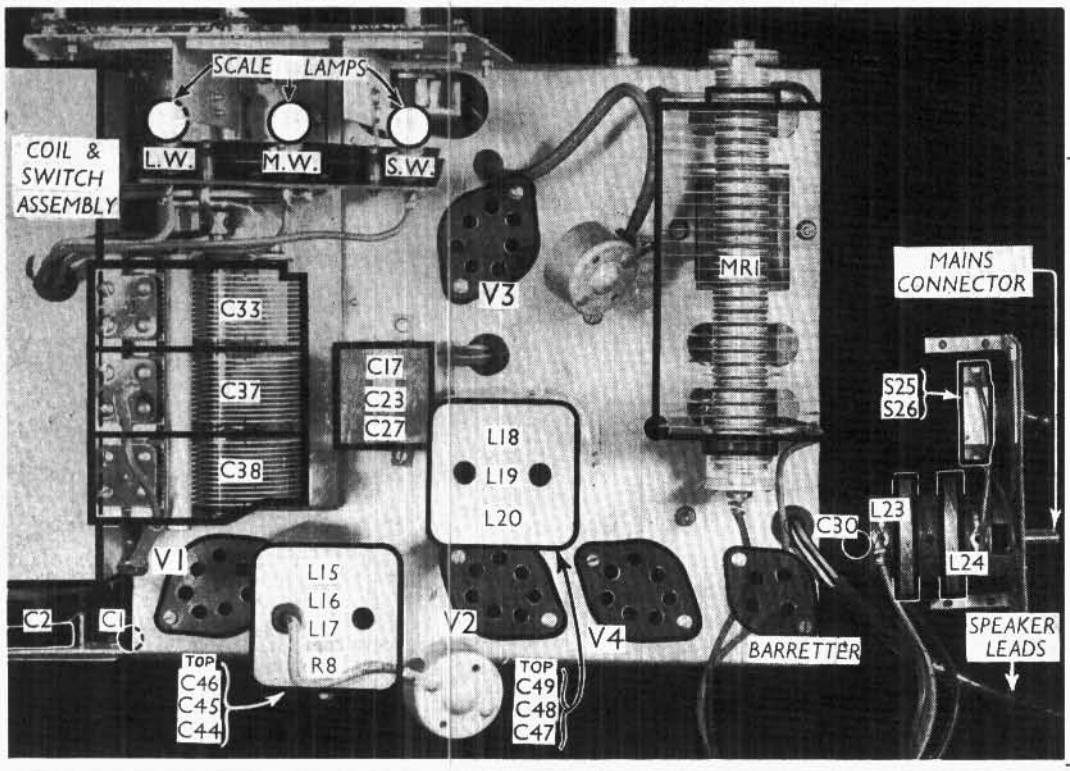
Condensers C6, C9, C13, C14, C15, C16.—These are six 0·1 μF paper types in a metal case, mounted beneath one of the component strips. The case forms one common connection, and the tags indicated in the under-chassis view belong one to each condenser.

Condensers C41, C43.—These two preset condensers are mounted in a single unit, adjustable by two screws at the rear of the chassis.

Condensers C4, C5.—These are two very small fixed condensers, formed of spirals of wire wound round straight insulated wires. They are indicated in the side-chassis view.

Speaker.—This is a Rola 8ZA, 9·5 PMP.

Continued on page V



Plan view of the chassis, with a side view of the mains input panel on the right. The I.F. trimmers are at the backs of the I.F. units, as indicated by the arrows, and they are numbered from top to bottom.

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BUSH DAC43—*Continued*

Radiogram Modifications.—In the radiogram model, RG43, the chassis is basically the same, but there are certain additions and modifications.

In the first place, there are four switch positions instead of three, Gram. being fully clockwise. An additional switch unit, outside the coil assembly, is included, while switch units 1 and 2 are modified. The effect of the modifications is to switch all scale lamps "off" on Gram.; to short **C37** on Gram. (thus muting radio); to close **S21** on Gram. as well as on M.W. and L.W.; and to disconnect **C21** and connect **C19** to the top of **R12** on Gram., and vice-versa on S.W., M.W. and L.W.

The switch **S21** is transferred to one side of the additional switch unit, while the other side of this unit is used for the pick-up switching. There are also other minor modifications.

The isolating condenser **C20** is omitted (**C19** being retained) and the bottom pick-up tag goes direct to chassis. The pick-up arm and screening goes to true earth, not chassis. The motor frame also goes to true earth. **R10** becomes 100,000 O (not 50,000 O).

The speaker is a Rola F10 13/P.M. **T1** has a primary resistance of 750 O and a secondary of 0·5 O. **L21** has a resistance of 1·6 O. In early models the speaker may be a Rola G12 P.M.

CIRCUIT ALIGNMENT

I.F. Stages.—Switch set to L.W., turn gang condenser to maximum, and connect signal generator to control grid (top cap) of **V1**, and chassis. Feed in a **465** KC/S signal, and adjust **C49, C48 C47** and **C46, C45, C44** for maximum output in each case, keeping the input low. **C48** is very critical.

H.F. and Oscillator Stages.—Connect signal generator to **A** and **E** sockets, via a suitable dummy aerial which may consist of an inductance of 20 μH, a capacity of 200 $\mu\mu$F and a resistance of 15 O in series on M.W. and L.W., and a 400 O resistance only on S.W. See that with gang at maximum, pointer reads 550 and 2,000 m. on scale.

S.W.—Switch set to S.W. feed in an 18 m. signal. Set pointer to 18 m. on scale and adjust **C39** for maximum output. Two peaks will be obtained, that which requires the lesser trimmer capacity being correct. Next adjust **C34** for maximum output.

M.W.—Switch set to M.W., feed in a 200 m. signal, tune to 200 m. on scale, and adjust **C40** for maximum output on the peak requiring the lesser trimmer capacity. Feed in a 300 m. signal, tune to 300 m. on scale, and adjust **C31** and **C35** for maximum output. Feed in a 500 m. signal, tune to 500 m. on scale, and adjust **C41** for maximum output. Check again on 300 m.

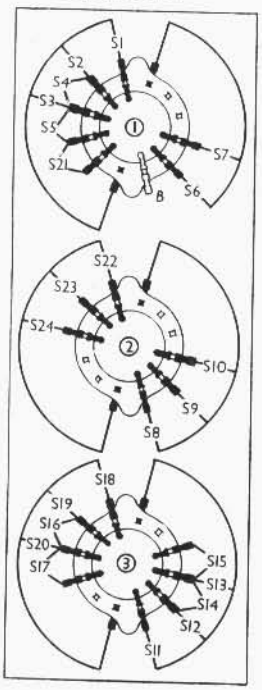
L.W.—Adopt procedure as for M.W., but adjust **C42** on 1,000 m., **C32** and **C36** on 1,500 m. and **C43** on 1,800 m. Check again on 1,500 m.

SWITCH TABLE

Switch	S.W.	M.W.	L.W.
S1	**C**	O	O
S2	O	**C**	O
S3	O	O	**C**
S4	**C**	O	O
S5	**C**	**C**	O
S6	O	**C**	O
S7	O	O	**C**
S8	**C**	O	O
S9	O	**C**	O
S10	O	O	**C**
S11	**C**	O	O
S12	O	**C**	O
S13	O	O	**C**
S14	**C**	O	O
S15	O	**C**	O
S16	**C**	O	O
S17	O	**C**	O
S18	**C**	O	O
S19	O	**C**	O
S20	O	O	**C**
S21	O	**C**	**C**
S22	**C**	O	O
S23	O	**C**	O
S24	O	O	**C**

SWITCH DIAGRAMS

Switch disgrams, looking from the rear of the underside of the chassis. The units are numbered as in the side-chassis view.



MAINTENANCE PROBLEMS—*continued*

Hum in Philips 838U

I NOTICE that a number of engineers have written with regard to the high pitched hum which develops on Philips 838U receivers. This trouble caused me a number of hours' work, and I have found it is useless just re-soldering the top of the Pen26 as this only makes a temporary repair.

The real cure is to run the solder from the top of the valve, thoroughly clean the wire connection and then re-solder. When the solder is being run out, it will be noticed that the lead is absolutely black.

I have also found it advisable to do the rest of the valves at the same time, as I have had the same trouble with all of them.—A. LINTER, REDHILL.

I.F. Transformer Short

HAVING made the usual tests for a leakage to earth of the H.T. current in a Ferranti 1934-5 Lancastria receiver, I finally traced a dead short between the secondary and primary windings of the second I.F. transformer.

Opening out the can, expecting to find the leads from the windings to the tags twisted together, which is the usual cause of this fault, I was surprised to find a piece of wire (the same material as the secondary windings) was between the layers of the secondary, continuing for one turn round the former and then entering the layers of the primary. On cutting this wire the short disappeared and after refitting the transformer and re-ganging the set, it again worked perfectly.

The only reason I can give for the break down was that the end of the short piece of wire must have pierced the insulation of the primary when the coil was made, and due to the constant vibration the other end of the wire finally punctured the insulation of the secondary.—G. JAMES, WALSALL.

Modifying a K-B 333A

A KOLSTER-BRANDES 33A receiver had never really given satisfactory results since it was purchased. This was put down to the band-pass circuit which this receiver incorporates, so an attempt was made to find out if the circuit would lend itself to modification.

The first half of the band-pass circuit was cut out and the aerial transferred *via* a small capacity fixed condenser to the grid end of the coil, this resulting in a considerable increase of signal strength, but it was still felt that a bigger reserve was desirable.

The plate circuit of the S.G. valve consisted of an H.F. transformer with a tuned secondary and reaction winding, and as it was not possible to alter the transformer, it was decided to alter the circuit to a parallel fed arrangement. This was carried out, using an H.F. choke in the S.G. plate circuit and coupling *via* a fixed condenser to the tuned secondary, which, of course, was retained.

The set was now extremely lively and while the selectivity was not exactly razor sharp, the improved performance of the receiver more than justified anything lacking in that respect, and our customer was very satisfied with the alteration.—R. A. COATES, WHITBY.

About the Philco 56

I NOTED with interest a paragraph about a Philco 56 model, in which the writer suggested changing the two 36E valves round when signals disappeared below 260 metres. The best way of curing the trouble permanently is to lessen the bias on the oscillator valve so that it oscillates more freely, as the trouble can nearly always be traced to this valve ceasing to oscillate.

In other cases the cathode winding in the oscillator coil gets too close to the main coil, when the unit should be removed and the windings separated with paxolin or rubber.—R. YOUNG, SLOUGH.