

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 TH210) 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 VP130C), 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 TDD130C). 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.

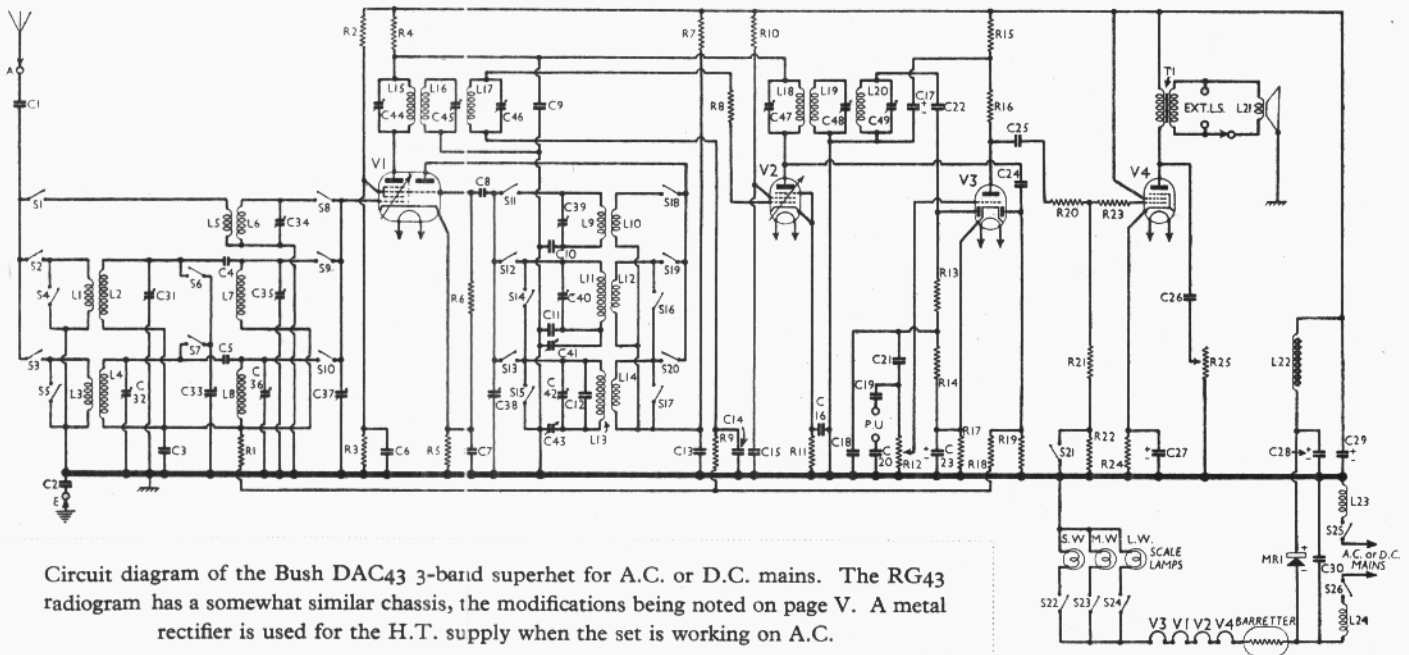
Resistance capacity coupling by R16, C25, R21, R22 between V3 triode and pentode output valve (V4, Mullard Pen360C). S21 opens on S.W. and provides tone adjustment. Variable tone control by R.C. filter C26, R25 in anode circuit. Provision for connection of low impedance external speaker across secondary 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.

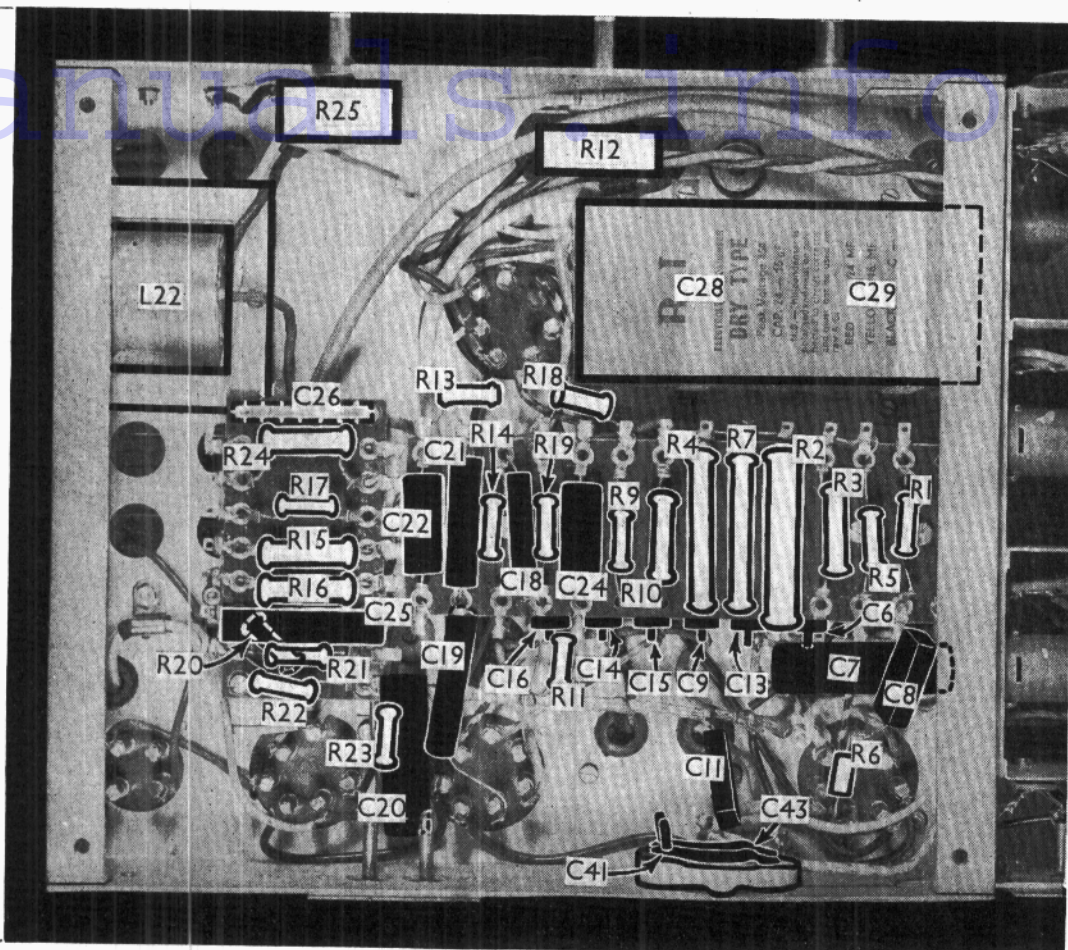
COMPONENTS AND VALUES

| 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. decoupling .. | 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

BUSH DAC43—Continued

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 TH2rC* | 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.

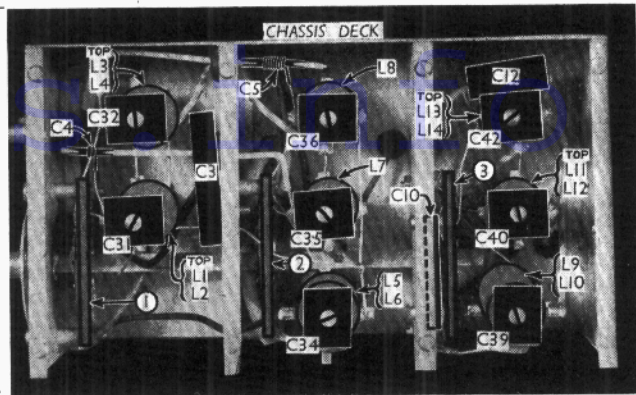
GENERAL NOTES

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).

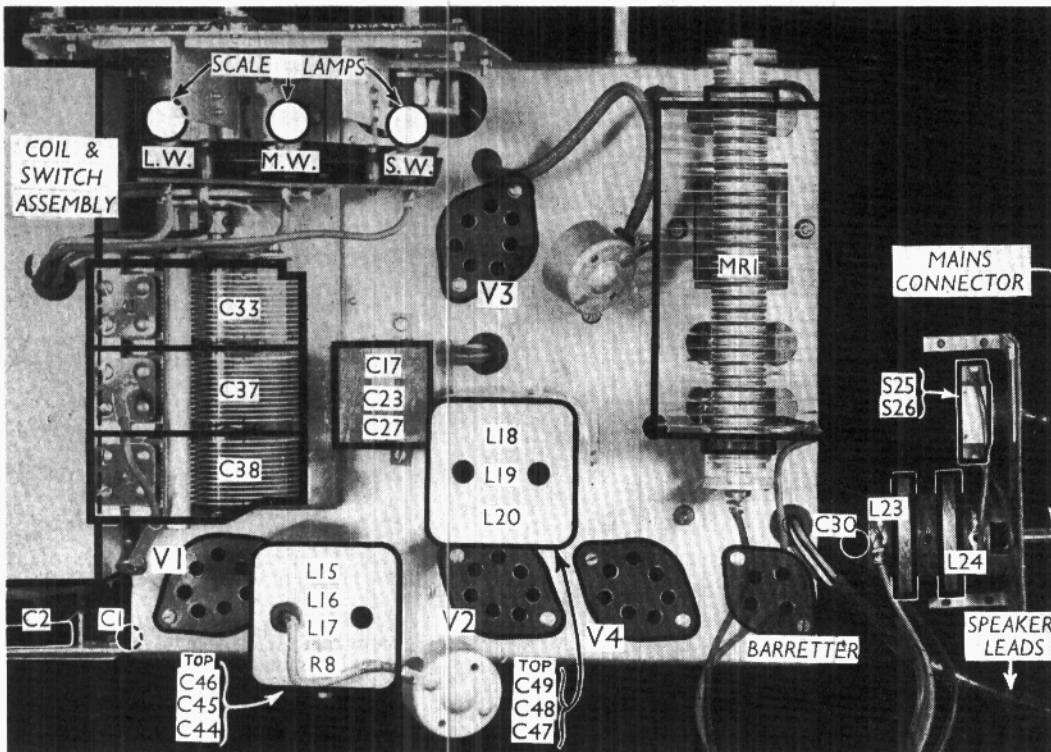
Condensers C6, C9, C13, C14, C15, C16.—These are six 0.1 μF paper types in a metal case, mounted beneath one of the component strips. The case forms one common connection, and the tags indicated in the under-chassis view belong one to each condenser.

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.

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 μ H, a capacity of 200 μ 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.

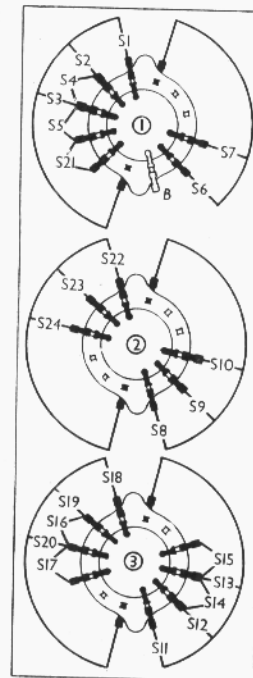
M.W.—Switch set to M.W., feed in a 200 m. signal, tune to 200 m. on scale, and adjust C40 for maximum output on the peak requiring the lesser trimmer

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 DIAGRAMS

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



SWITCH TABLE

| Switch | S.W. | M.W. | L.W. |
|--------|------|------|------|
| S1 | C | O | O |
| S2 | O | O | O |
| S3 | O | O | C |
| S4 | C | O | O |
| S5 | C | O | 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 | O | C |
| S13 | O | O | O |
| S14 | C | O | O |
| S15 | O | O | O |
| S16 | C | O | O |
| S17 | O | C | O |
| S18 | C | O | O |
| S19 | O | C | O |
| S20 | O | O | C |
| S21 | O | C | O |
| S22 | C | O | O |
| S23 | O | C | O |
| S24 | O | O | C |

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.