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"TRADER" SERVICE SHEET

951

BUSH AC11, DAC11

A.C. and A.C./D.C. Superhets

QUICK-RELEASE facilities are a feature of the Bush AC11 receiver, whose chassis is held only by two push-in pegs and two fixing screws. The receiver is a 4-valve (plus rectifier), 3-band superhet, designed to operate from A.C. mains of 100-250 V, 40-100 c/s. Wavebands are 16-50 m, 182-560 m, 830-2,068 m.

Another feature of the design is that the A.C. model can be converted to the A.C./D.C. model DAC11. The differences are very small, and the same valves are used in the same heater sequence. The differences between the two are explained in "Circuit Description," which is written basically on the A.C. model.

Release date and original price, both models: June 1949; *£*17 13*s.* 7*d. Purchase tax extra.*

CIRCUIT DESCRIPTION

Input from external aerial is passed via socket **A1** and coupling coils **L1** (S.W.), **L2** (M.W.) or **L3** (L.W.) to single-tuned circuits **L4, C34** (S.W.), **L5, C34** (M.W.) or **L6, C34** (L.W.), which precede first valve **(V1, Mullard UCH42)** operating as frequency changer with internal coupling.

A second aerial socket **A2** is intended for use when interference is experienced from the local station, or when a very long aerial is used. It inserts the series capacitor **C1** in the aerial lead. A frame aerial winding **L7**, connected via sockets **5, 6** permits the receiver to be operated without an aerial. In the A.C./D.C. model, isolating capacitors **C39** and **C40** are inserted in the aerial and earth leads.

V1 triode oscillator grid coils **L8** (S.W.), **L9** (M.W.) and **L10** (L.W.) are tuned by **C35.** Parallel trimming by **C36** (S.W.), **C37** (M.W.) and **C14, C38** (L.W); series tracking by **C12** (M.W.) and **C13** (L.W.), but tracking adjustments are made by manipulating the iron-dust cores of the tuning coils. Reaction coupling from anode is provided by coils **L11** (S.W.), **L12** (M.W.) and **L13** (L.W.).

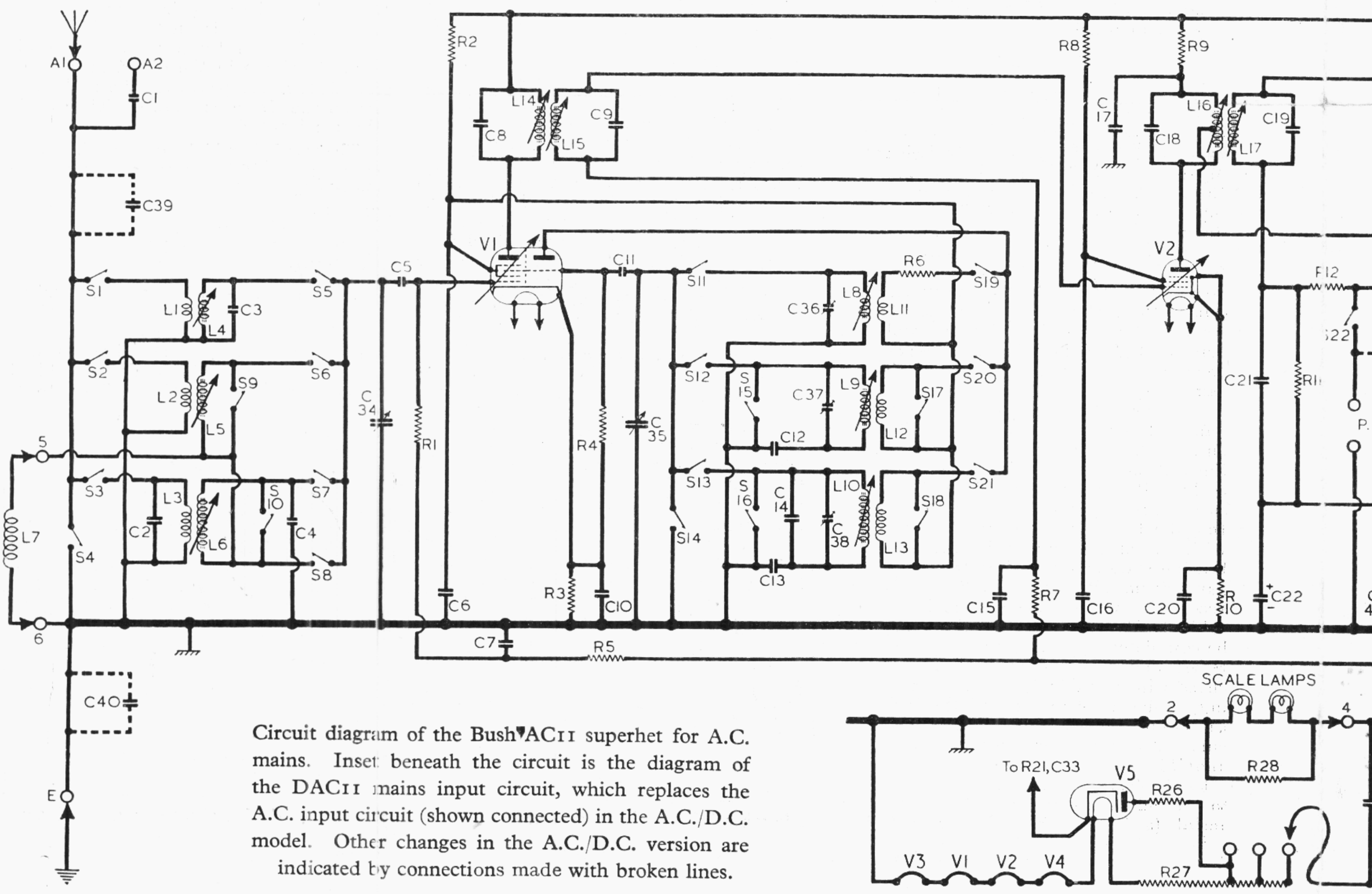
Second valve **(V2, Mullard UF41)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C8, L14, L15, C9** and **C18, L16, L17, C19.**

Intermediate frequency 465 kc/s.

Diode second detector is part of double diode triode valve **(V3, Mullard UBC41).** Audio frequency component in rectified output is developed across load resistor **R11** and passed via I.F. stopper **R12,** coupling capacitor **C24** and manual volume control **R13** to control grid of triode section, which operates as an A.F. amplifier.

I.F. filtering by **C21, R12** in diode circuit, and **C28** in triode anode circuit. Provision for connection of a gramophone pick-up across **R13,** via **C24** and **C25.** In A.C./D.C. models two isolating capacitors **C41, C42** are inserted in the leads, and **R25** is added.

Second diode of **V3,** fed from a tapping on **L16** via **C23,** provides D.C. potential which is developed across load resistor **R17** and fed back via decoupling circuits as G.B., to F.C. and I.F. valves, giving automatic gain control.



Circuit diagram of the Bush AC11 superhet for A.C. mains. Inset beneath the circuit is the diagram of the DAC11 mains input circuit, which replaces the A.C. input circuit (shown connected) in the A.C./D.C. model. Other changes in the A.C./D.C. version are indicated by connections made with broken lines.

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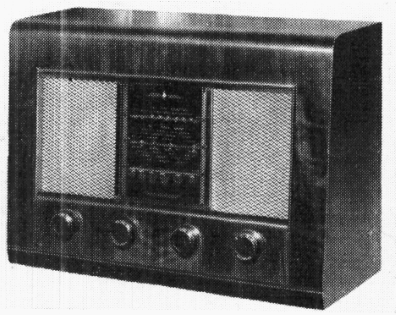
Resistance-capacitance coupling by **R15**, **C29** and **R18**, via grid stopper **R19**, between **V3** anode and pentode output valve **(V4, Mullard UL41)**. Fixed tone correction by **C31**, **R24** and **C32** in anode circuit. Variable tone control by **R22**, **C30**, also in anode circuit.

In addition, voltages developed across **R23** in **V4** cathode circuit are fed back via a frequency-selective network **R20**, **C26**, **C25**, **R14** to **V3** triode control grid circuit. Provision is made for the connection of a low impedance external speaker across the secondary of the output transformer **T1**, while switch **S23** permits the internal speaker to be muted.

In the A.C. model, H.T. current is supplied by half-wave rectifying valve **(V5, Mullard UY41)**, which is fed from the complete secondary winding of the double-wound mains transformer **T2.** Smoothing is effected by resistor **R21** and electrolytic capacitors **C27**, **C33.** Valve heaters are connected in series between tappings **7** and **12** (116.6 V) on **T2** secondary, and the scale lamps are connected in series between tappings **7** and **10** (9 V).

In the A.C./D.C. model, the A.C. mains input circuit which we show connected in our circuit diagram is replaced by the mains input circuit we show inset beneath the circuit diagram, to the left of the A.C. mains circuit. Here the transformer is replaced by the tapped ballast resistor **R27**, but the valve types and their heater sequence remain unaltered. The scale lamps, however, are connected in series with the mains input lead to the chassis and are shunted by **R28.** They carry the heater and H.T. current. **L19, L20** and **C43** filter out mains-borne interference.



COMPONENTS AND VALUES

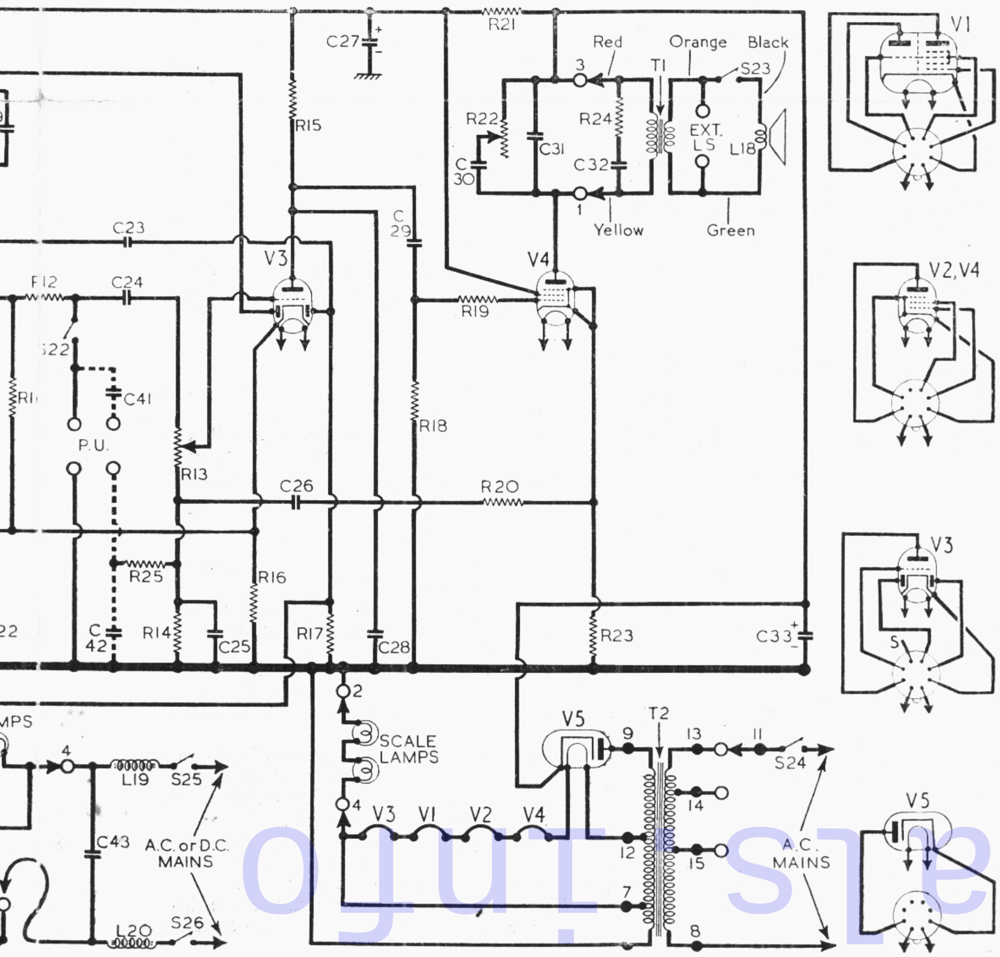
RESISTORS		Values	Locations
R1	V1 hex. C.G. ...	470kΩ	F4
R2	H.T. feed	15kΩ	F4
R3	V1 fixed G.B. ...	220Ω	F3
R4	V1 osc. C.G. ...	47kΩ	F3
R5	A.G.C. decoupling	1MΩ	E4
R6	S.W. osc. stabilizer	47Ω	G4
R7	A.G.C. decoupling	2·2MΩ	E4
R8	V2 S.G./H.T. feed ...	47kΩ	E4
R9	V2 anode decoup. ...	10kΩ	E4
R10	V2 fixed G.B. ...	330Ω	E4
R11	Sig. diode load ...	330kΩ	E4
R12	I.F. stopper ...	100kΩ	E3
R13	Volume control ...	2MΩ	E3
R14	F-B resistor ...	4·7kΩ	E3
R15	V3 anode load ...	150kΩ	D4
R16	V3 G.B.	5·6kΩ	D4
R17	A.G.C. diode load ...	1MΩ	E4
R18	V4 C.G.	470kΩ	D4
R19	Grid stopper ...	47kΩ	E4
R20	F.-B. resistor ...	330Ω	D4
R21	H.T. smoothing ...	10kΩ	C4
R22	Tone control ...	50kΩ	C3
R23	V4 G.B.	220Ω	D4
R24	Fixed tone correct	10kΩ	—
R25	P.U. coupling ...	47kΩ	E3
R26	Surge limiter ...	150Ω	B2
R27	Heater ballast ...	1·25kΩ†	B2
R28	Scale lamp shunt ...	250Ω	—

† tapped at 950Ω + 150Ω + 150Ω from V5 heater.

CAPACITORS		Values	Locations
C1	Aerial series ...	50pF	G4
C2	L.W. aerial shunt ...	800pF	G4
C3	S.W. aerial trim. ...	20pF	H4
C4	L.W. aerial trim. ...	60pF	G4
C5	V1 hex. C.G. ...	50pF	G4
C6	V1 H.T. decoup. ...	0·05μF	F4
C7	A.G.C. decoupling	0·1μF	F4
C8	1st I.F. trans. tuning	110pF	A2
C9	1st I.F. trans. tuning	110pF	A2
C10	V1 cath. by-pass ...	0·05μF	F3
C11	V1 osc. C.G. ...	50pF	G3
C12	Osc. M.W. tracker	556pF	G3
C13	Osc. L.W. tracker ...	390pF	G3
C14	Osc. L.W. trim. ...	180pF	G3
C15	A.G.C. decoupling	0·05μF	F4
C16	V2 S.G. decoup. ...	0·05μF	F4
C17	V2 anode decoup. ...	0·05μF	E4
C18	2nd I.F. trans. tuning	110pF	B2
C19	2nd I.F. trans. tuning	110pF	B2
C20	V2 cath. by-pass ...	0·05μF	E4
C21	I.F. by-pass ...	100pF	E4
C22*	V3 cath. by-pass ...	50μF	D3
C23	A.G.C. coupling ...	50pF	E4
C24	A.F. coupling ...	0·01μF	E3
C25	F-B capacitors ...	0·1μF	E3
C26	F-B capacitors ...	0·05μF	D4
C27*	H.T. smoothing ...	16μF	B1
C28	I.F. by-pass ...	0·002μF	D4
C29	A.F. coupling ...	0·01μF	D4
C30	Part tone control ...	0·05μF	C3
C31	Part tone correct. ...	0·001μF	C3
C32	Part tone correct. ...	0·01μF	—
C33*	H.T. smoothing ...	32μF	B1
C34†	Aerial tuning ...	528pF	A1
C35†	Oscillator tuning ...	528pF	A1
C36‡	Osc. S.W. trim ...	40pF	G3
C37‡	Osc. M.W. trim. ...	40pF	G3
C38‡	Osc. L.W. trim. ...	40pF	G3
C39	Aerial isolator ...	0·005μF	G4
C40	Earth isolator ...	0·01μF	G4
C41	P.U. isolators ...	0·005μF	H4
C42	P.U. isolators ...	0·1μF	D3
C43	Mains R.F. by-pass	0·01μF	B2

* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS		Approx. Value (ohms)	Locations
L1	Aerial coupling coils	—	H4
L2	Aerial coupling coils	0·6	G4
L3	Aerial coupling coils	32·0	G4
L4	Aerial tuning coils	—	H4
L5	Aerial tuning coils	4·0	G4
L6	Aerial tuning coils	16·0	G4
L7	Frame aerial ...	0·3	—
L8	Oscillator tuning coils	—	G3
L9	Oscillator tuning coils	3·2	G3
L10	Oscillator tuning coils	4·0	F3
L11	Oscillator reaction coils	—	G3
L12	Oscillator reaction coils	0·6	G3
L13	Oscillator reaction coils	1·5	F3
L14	1st I.F. trans. Pri.	12·5	A2
L15	1st I.F. trans. Sec.	12·5	A2
L16	2nd I.F. trans. Pri.	12·5	B2
L17	2nd I.F. trans. Sec.	12·5	B2
L18	Speech coil ...	2·5	—
L19	Mains R.F. filter chokes	3·0	B2
L20	Mains R.F. filter chokes	3·0	B2
T1	Output trans. Pri.	500·0	—
	Output trans. Sec.	0·5	
T2	Mains trans. Pri. (total)	42·0	D3
	Mains trans. Sec. 9–12	177·5	
	Mains trans. Sec. 12–7	40·0	
	Mains trans. Sec. 7–10	3·2	
S1-S22	W/band switches ...	—	G4
S23	Sp'kr. muting switch	—	—
S24-S26	Mains sw. g'd R13 ...	—	E3



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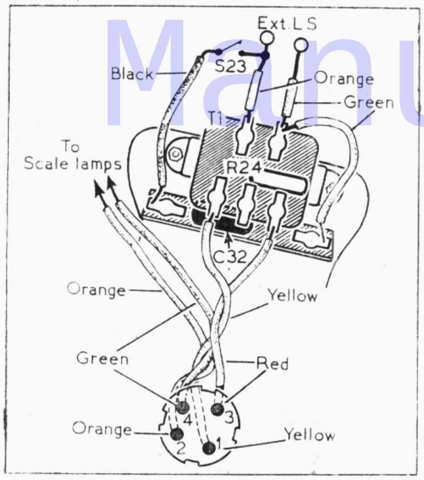


Sketch of the speaker connections as seen from the rear. The plug is viewed from the free ends of its pins.

GENERAL NOTES

Switches.—**S1-S21** are the waveband and radio muting switches, and **S22** is the pick-up switch, ganged in two rotary units beneath the chassis. These units are indicated in our under-chassis view, where they are identified by the numbers **1** and **2** in diamonds, and shown in detail in the diagrams in col. 3, where they are drawn as seen when viewed from the rear of an inverted chassis.

The table (col. 3) gives the switch positions for the four control settings, starting from the fully anti-clockwise position of the control spindle. A dash indicates open, and **C**, closed.

S23 is a screw-type switch mounted with the external speaker sockets at the top right-hand corner of the cabinet. It opens when screwed a few turns anti-clockwise to mute the internal speaker.

S24 is the Q.M.B. mains switch in the A.C. model, ganged with the volume control **R13.** In the A.C./D.C. model it is replaced by **S25, S26.**

Scale Lamps.—In the A.C. model these are two M.E.S. types, with large clear spherical bulbs, rated at 6.2 V, 0.3 A. In the A.C./D.C. model they have smaller diameter bulbs and are rated at 3.5 V, 0.15 A. In both cases they are connected via pins 2 and 4 of the speaker connecting plug. In the A.C./D.C. model the lamps are mounted on a panel which can be withdrawn after removing two nuts. **R28** is mounted with them.

External Speaker.—Two sockets are provided on a panel mounted at the top right-hand corner of the cabinet for the connection of a low-impedance (about 2.5 Ω) speaker. The screw-type switch **S23** mounted with them permits the internal speaker to be muted.

Connecting Plugs.—A 4-pin plug and socket device is used to connect the speaker and scale lamps to the chassis. The socket is located at one end of the chassis, where it is indicated on the left in our under-chassis view.

The plug and its connecting leads are shown, together with the leads associated with the speaker, in the sketch in col. 1, where the speaker transformer **T1** is drawn as seen from the rear of the cabinet and the plug is viewed from the free ends of its pins, which are numbered **1-4.**

The frame aerial winding **L7** is connected via a 2-pin plug and socket whose pins are numbered **5** and **6.** The socket is indicated on the left of our plan view of the chassis. The larger pin **(6)** goes to chassis.

Chassis Divergency. — **R16,** which was 5.6 kΩ in our chassis, was 3.3 kΩ in earlier models.

VALVE ANALYSIS

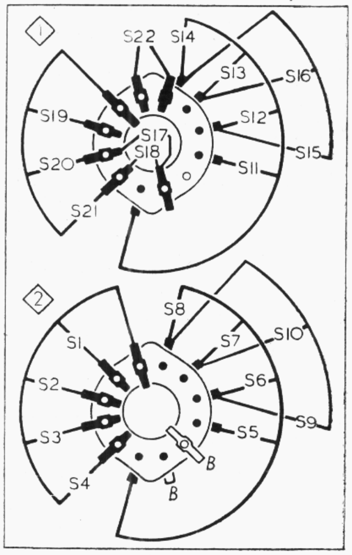
Valve voltages and currents given below are those quoted by the manufacturers for the A.C. model only, which was operating from A.C. mains of 230 V using the 210-230 V tapping on **T2.** A similar set of readings taken on a model DAC11 were found to be approximately 25 per cent lower than those in the A.C. model. The receiver was tuned to M.W. and there was no signal input. Anode and screen currents were not quoted.

Valve	Anode Voltage (V)	Screen Voltage (V)	Cathode (V)	Cathode (mA)
V1 UCH42	120 / Oscillator 60	60	1.2	6.0
V2 UF41	84	62	1.5	5.0
V3 UBC41	60	—	0.8	0.2
V4 UL41	260	120	8.0	35.0
V5 UY41	263†	—	282.0	46.0

† A.C.

Except for cathode readings, all voltages were measured on the 1,000 V range of a model 7 Avometer, chassis being the negative connection.

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



Diagrams of the waveband switch units, viewed from the rear of an inverted chassis. The associated table is above them.

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (pull off);

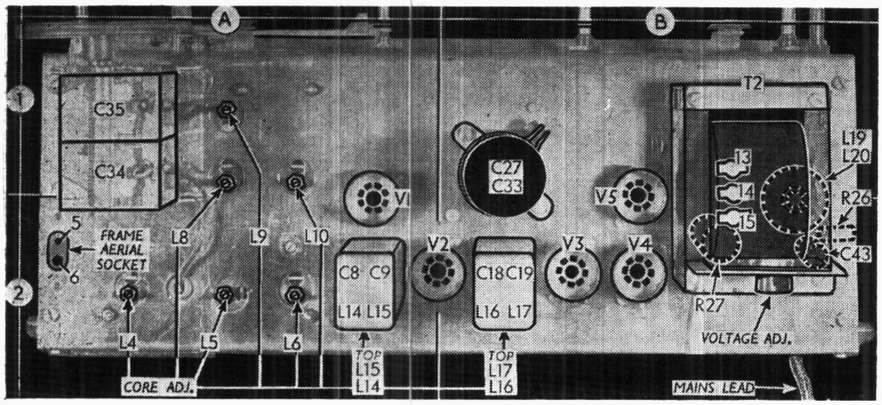
withdraw the frame aerial and speaker plugs located at opposite ends of the chassis;

remove the two chassis retaining bolts (with one large washer and spacing collar each) from the rear lower corners of the chassis;

withdraw chassis about one inch and ensure that the cursor carriage clip disengages with the cursor carriage and remains on the drive cord;

completely withdraw chassis. To operate the receiver in this position, insert frame aerial and speaker plugs.

When replacing, ensure that the rubber grommets in the front locating brackets



Plan view of the chassis, in which all the core adjustments are indicated.

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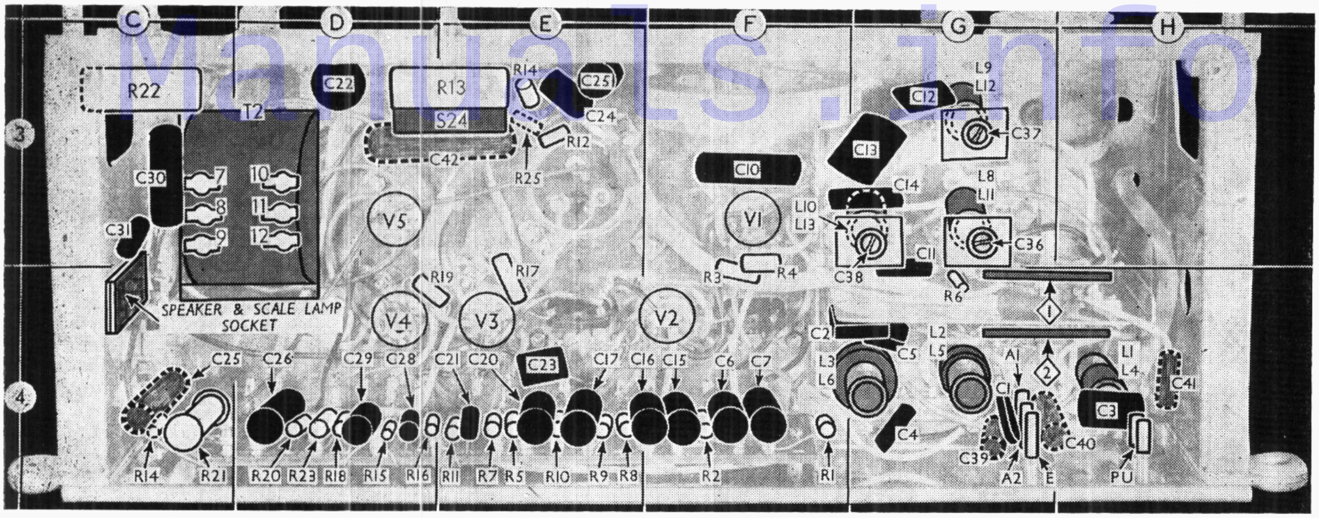


Under-chassis view. Six tags of the mains transformer are numbered here to agree with the circuit diagram overleaf. The other three tags are numbered in our plan view. Detailed diagrams of the waveband switch units 1 and 2 appear in col. 3.

are in position. Do not omit to re-engage the cursor carriage with its driving clip on the drive cord.

Removing Speaker.—Unsolder four connecting wires and remove three 4 BA nuts (with one washer each).

When replacing, the connections should be resoldered as illustrated in our diagram in col. 1.

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator leads via a 0.1 μF capacitor (use two in the A.C./D.C. receiver) to control grid (pin 6) of **V2** and chassis. Switch set to M.W., tune to 300 m on scale, and turn the volume control to maximum. Keep input low to avoid A.G.C. action, reducing input as circuits come into line.

Unscrew all four I.F. cores fully, then feed in a 465 kc/s (645.16 m) signal, and adjust **L17,** then **L16,** for maximum output to the first peak encountered. Transfer signal generator lead to control grid (pin 6) of **V1** and adjust the cores of **L15,** then **L14,** for maximum output in the same way. Do not readjust the cores.

R.F. and Oscillator Stages.—With the gang at maximum, the centre of the cursor should coincide with the datum lines at the long wavelength ends of the scales. It may be adjusted by sliding the cursor drive wedge along the drive cord. In order that alignment may be performed with the chassis out of its cabinet, calibration marks are scaled on the rear of the gang drum, although all adjustments are accessible while the chassis is in the cabinet. The procedure should in any case be completed, however, by readjusting the M.W. and L.W. aerial circuits with the chassis in its cabinet, as the frame winding, which is wound round the inside of the cabinet, forms part of the aerial circuit. The location references are A1, A2 and G3.

L.W.—Transfer signal generator leads to **A1** and **E** sockets via a suitable dummy aerial (a 0.0002 μF capacitor will do). Switch set to L.W., tune to 2,000 m on scale, feed in a 2,000 m (150 kc/s) signal, and adjust the cores of **L10,** then **L6,** for maximum output. Tune to 1,000 m on scale, feed in a 1,000 m (300 kc/s) signal, and adjust **C38** for maximum output. Check calibration at 2,000 m.

M.W.—Switch set to M.W., tune to 500 m on scale, feed in a 500 m (600 kc/s) signal, and adjust the cores of **L9,** then **L5,** for maximum output. Tune to 200 m on scale, feed in a 200 m (1,500 kc/s) signal, and adjust **C37** for maximum output. Check calibration at 500 m.

S.W.—Switch set to S.W., and change dummy aerial to a 400 Ω non-inductive resistor. Tune to 50 m on scale, feed in a 50 m (60 Mc/s) signal, and adjust the cores of **L8,** then **L4,** for maximum output. Tune to 25 m on scale, feed in a 25 m (12 Mc/s) signal, and adjust **C36** for maximum output. Check again at 50 m.

Finally, fit chassis into cabinet, connect up frame aerial winding **(L7),** and re-adjust **L5** and **L6** cores for maximum output at 500 m and 2,000 m respectively.

DRIVE CORD REPLACEMENT

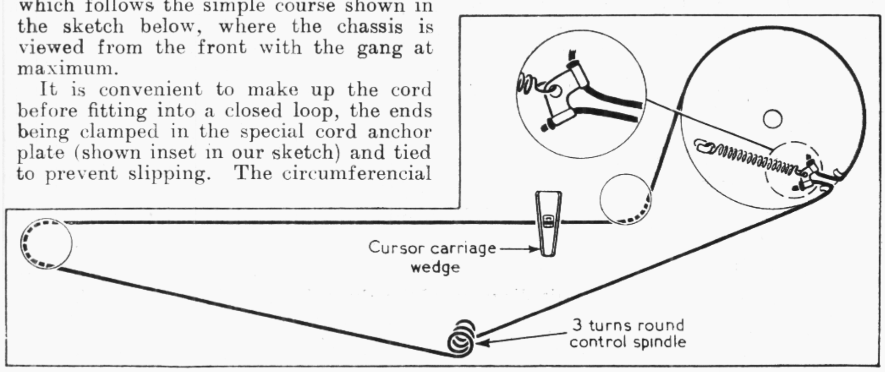
About three feet of Nylon braided glass yarn is required for a new drive cord, which follows the simple course shown in the sketch below, where the chassis is viewed from the front with the gang at maximum.

It is convenient to make up the cord before fitting into a closed loop, the ends being clamped in the special cord anchor plate (shown inset in our sketch) and tied to prevent slipping. The circumferencial length of the cord when so made up is $32\frac{1}{4}$-ins. overall; or it measures $16\frac{1}{8}$-ins. when the loop is stretched between two pins stuck in the bench.

Having made the loop, pull it out straight as for the second measurement quoted, and pass the folded end through the hole in the gang drum groove so that the anchor plate is on the inside. Wind the cord three turns round the tuning control spindle in the direction shown in the sketch, and pass over the pulleys and round the drum as shown. Then anchor the tension-spring.

The wedge which drives the cursor carriage should be fitted loosely until the chassis is fitted in the cabinet, when its grip tag can be tightened after correct positioning of the cursor carriage. This should be done as explained under "Circuit Alignment in col. 4.

It is not permissible to make adjustments of the drum on the gang spindle, as this carries on its rear face a calibrated alignment scale. The line marked "Datum" on this scale should be opposite the brass pointer fixed to the top of the gang frame when the gang is at maximum capacitance.



Sketch of the tuning drive cord, with the anchor plate device shown enlarged inset.

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