"TRADER" SERVICE SHEET

1013

PYE P33TQ

3-band Superhet with R.F. Amplifier

A SIGNAL-FREQUENCY amplifier precedes the frequency changer in the Pye P33TQ, a 5-valve (plus rectifier) 3-band superhet designed to operate from A.C. mains of 200-250 V, 40-100 c/s. Other features include the "Tonemaster" 4-position tone control, using negative feed-back, and a 3-valve amplifier on gram sufficiently sensitive to handle long-playing records.

Release date and original price: April 1951, £23 9s 3d plus purchase tax.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L3** (S.W.), **L4** (M.W.) and **L5** (L.W.) to single tuned circuits **L6, C48** (S.W.), **L1, L7, C48** (M.W.) and **L2, L8, C48** (L.W.), which precede variable-mu pentode valve **(V1, Mullard EF41)** operating as R.F. amplifier. In areas of good signal strength, use can be made of frame aerial coils **L1** (M.W.) and **L2** (L.W.), which are connected in series with their respective tuning coils **L7, L8.**

Amplified R.F. signals appearing across **V1** anode load **R2,** are coupled via **C7** direct to single tuned circuit **L12, C51** (S.W.), and via coils **L10** (M.W.) and **L11** (L.W.) to single tuned circuits **L13, C51** (M.W.) and **L14, C51** (L.W.), which precede triode-hexode valve **(V2, Mullard ECH42)** operating as frequency changer. Additional "top" coupling by **C11** on M.W. I.F. filtering by **C8, L9.**

Oscillator anode coils **L17** (S.W.), **L18** (M.W.) and **L19** (L.W.) are tuned by **C53.** Parallel trimming by **C52** (M.W.) and **C21** (L.W.); series tracking by **C18** (S.W.), **C19** (M.W.) and **C20** (L.W.) Reaction coupling from grid across the common impedance of the trackers, with additional coupling by **L15** (S.W.) and **L16** (M.W.).

Third valve **(V3, Mullard EBF80)** is a double diode R.F. pentode whose pentode section operates as intermediate frequency amplifier with tuned transformer couplings **C14, L20, L21, C15** and **C25, L22, L23, C26.**

Intermediate Frequency 420 kc/s.

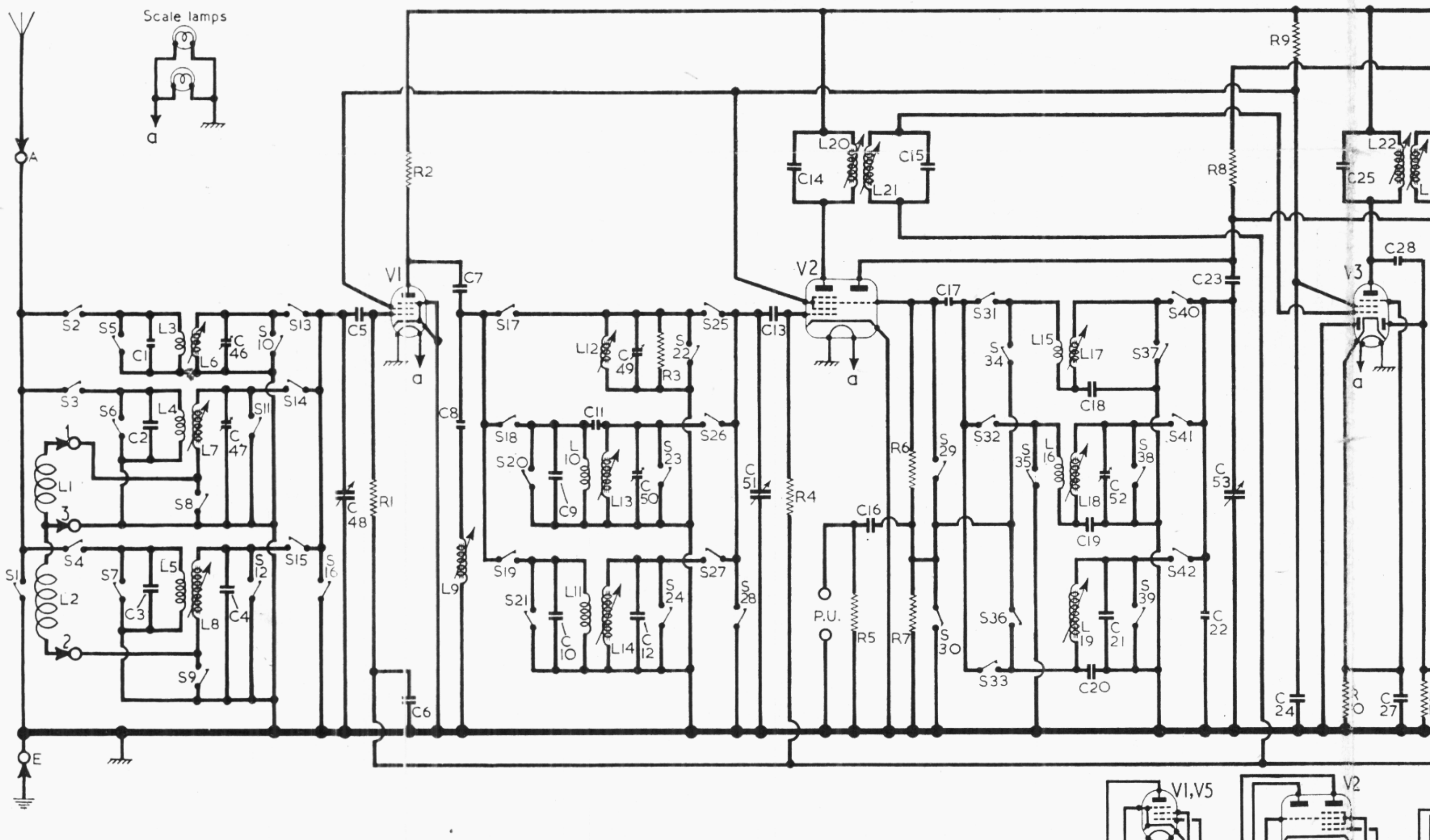
Diode signal detector is part of double diode triode valve **(V4, Mullard EBC41).** A.F. component in rectified output is developed across diode load resistor **R14 (S43** is closed on radio) and passed via tone control circuit, volume control **R22,** and **C39** to grid of triode section, which operates as A.F. amplifier. I.F. filtering by **C29, R13** and the capacitance of the screened leads.

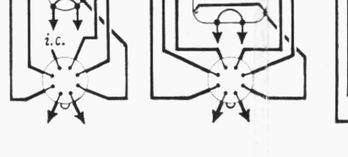
One diode of **V3** is fed from the pentode anode via **C28,** and the resulting potential developed across **R11** is fed back, via decoupling circuit **R12, C6,** as bias for R.F., F.C. and I.F. stages giving automatic gain control. A.G.C. delay is obtained by connecting the A.G.C. line to the second diode of **V4,** and arranging for this diode to conduct while the signal is weak. The delay diode then clamps the A.G.C. line to chassis.

This is achieved by including **R11** and **R12** in an H.T. potential divider with **R26,** which has a very high resistance, so that the delay diode anode has a small positive bias and conducts When the potential across **R11** rises upon the arrival of a signal, however, its negative polarity tends to offset the positive bias.

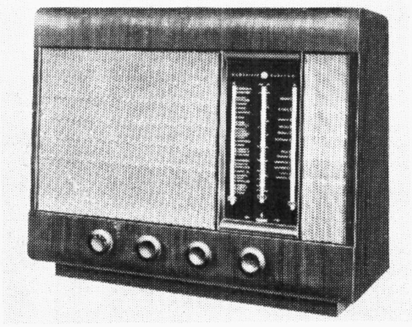
When it becomes large enough, on receipt of a strong enough signal, it neutralizes the bias altogether, and the diode ceases to conduct. The A.G.C. line is then released from chassis and is able to become more and more negative in sympathy with increased signal strength.

Resistance-capacitance coupling by **R25, C41** and **R27** is employed between **V4** triode and pentode output valve **(V5, Mullard EL41).** Provision is made for the connection of a low impedance external speaker.





Circuit diagram of the Pye P33TQ. **L1** and **L2** are frame aerial windings, which can be used in many areas where local interference permits, because of the increased gain given by the R.F. amplifier **V1. C8, L9** form an I.F. filter. The triode section of the frequency changer **V2** is used on gram as a pre-amplifier, and when switched to gram, **S43** opens. **SX** is part of the tone control assembly, on which it consists of two contacts which are always closed. It forms a "through" connection and is not shunted by a wire.



The appearance of the Pye P33TQ. The two outer knobs are switch controls: left, tone; right, waveband.

Provision is also made for the connection of a gramophone pick-up, using the triode section of the frequency changer **V2** as a pre-amplifier. When the waveband switch control is turned to gram, **S30** opens and **S29** closes, connecting the pick-up to the triode grid. The triode output is developed across **R8** and passed via tone correcting circuits **R16**, **C31**, **R15**, **C30** and **R14**, **C32**, **C33** to the volume control, **S43** being open.

Speech voltages in the secondary of the output transformer **T1** are tapped off and returned to **V4** input circuit, giving negative feed-back affecting the middle and treble frequencies. The overall voltage at **c** is returned via **C38**, **C39** directly to the grid of **V4**, and via switch **Sx** and **R18** to the tone control circuit associated with the 5-position switch unit **S44-S47**, which modifies its effect according to its setting. **Sx** does not act as a switch, in that it always remains closed, but it forms the connection between **S46** and **S47**.

The path **C35**, **R17**, **C36**, **R19** forms a treble filter feed to the tapping on **R22**, modified by the closing of **S46**; **C34** passing the signal directly to the top of **R22**. The path **C37**, **R20**, **R21** provides a bass boost to the tapping, modified by **S47**. Further tone control is effected by **C32** and **S45**, but not in association with the feed-back circuit.

From the tapping **b** on **T1** negative feed-back is applied to the bottom of **R22**, but this has a fixed frequency characteristic and does not form part of the tone control circuit.

H.T. current is supplied by I.H.C. full-wave rectifying valve (**V6**, **Mullard EZ40**). Smoothing by **R29** and electrolytic capacitors **C42**, **C43**, residual hum being neutralized by passing the current through part of the primary winding of the output transformer **T1**. A single winding on the mains transformer **T2** feeds the heaters of all valves, including the rectifier.

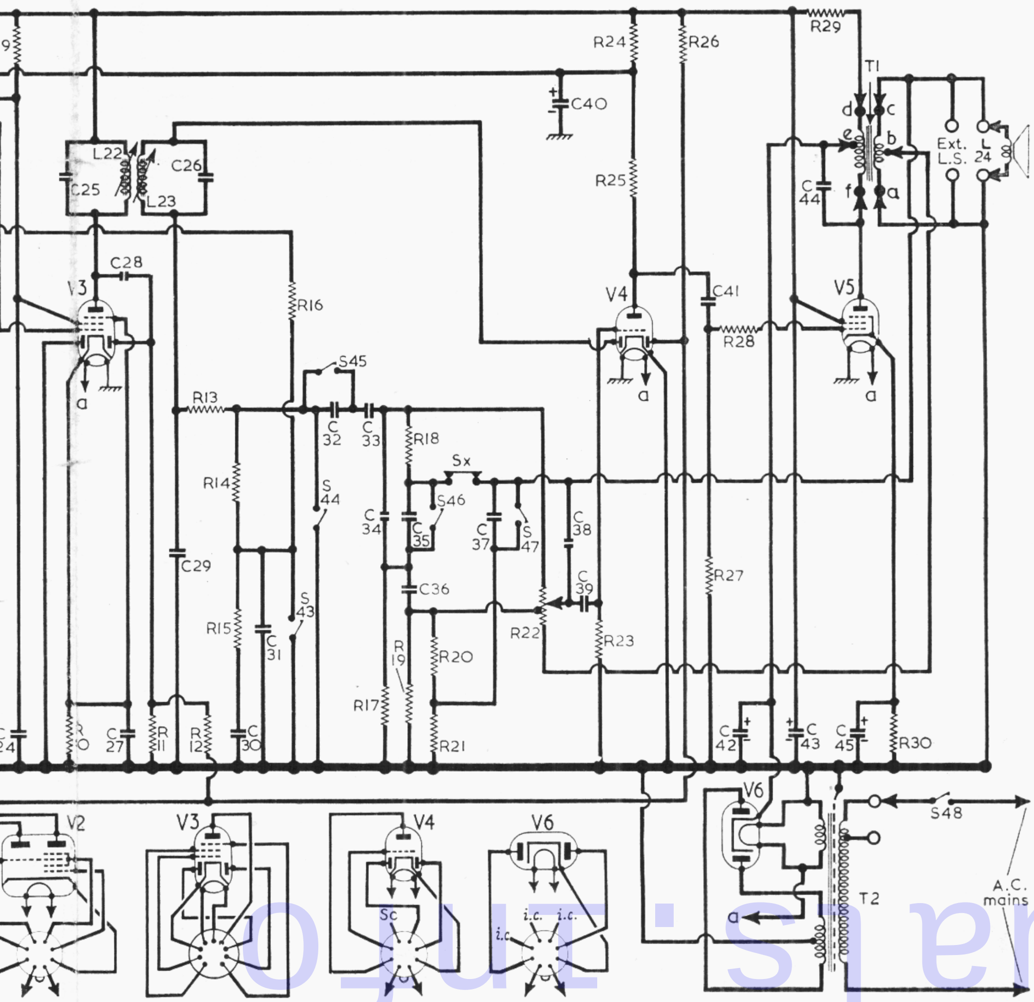
Dealers are reminded that the component numbers used in the accompanying tables may be different from those in the makers' circuit diagram. If our component numbers are used, therefore, when ordering spares, it is advisable to mention the fact.

COMPONENTS AND VALUES

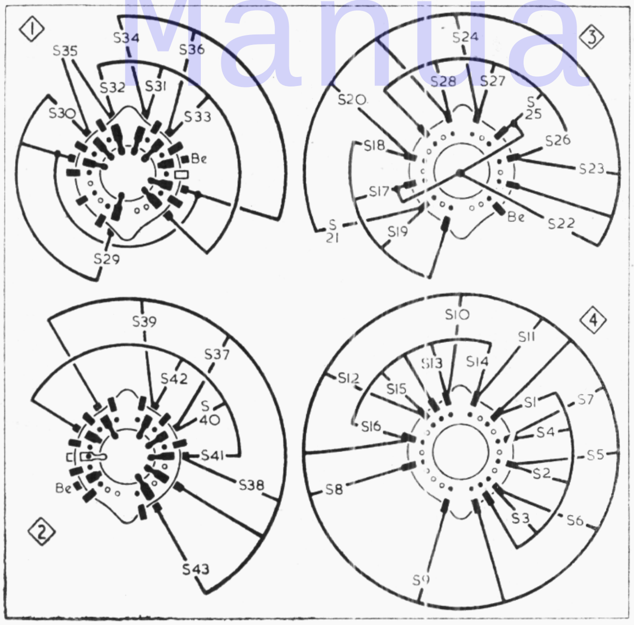
RESISTORS		Values	Locations
R1	V1 C.G.	1MΩ	G4
R2	V1 anode load ...	4·7kΩ	G4
R3	S.W. R.F. shunt ...	1kΩ	G4
R4	V2 hex. C.G. ...	1MΩ	G4
R5	P.U. shunt ...	22kΩ	G4
R6	V2 osc. C.G. ...	47kΩ	H3
R7	V2 P.U. C.G. ...	10MΩ	H3
R8	V2 osc. anode feed	10kΩ	G3
R9	S.G. H.T. feed ...	22kΩ	G4
R10	V3 G.B.	100Ω	F4
R11	A.G.C. diode load ...	1MΩ	F4
R12	A.G.C. decoupling	2·2MΩ	F4
R13	Signal diode load ...	470kΩ	F4
R14		100kΩ	E4
R15	Tone correctors ...	10kΩ	E4
R16		100kΩ	G3
R17	Part of tone control network ...	2·7kΩ	D3
R18		2·2MΩ	D3
R19		10kΩ	D3
R20		100kΩ	D3
R21		100kΩ	D3
R22	Volume control ...	1MΩ	E3
R23	V4 C.G.	22MΩ	E4
R24	H.T. decoupling ...	4·7kΩ	F4
R25	V4 anode load ...	220kΩ	E4
R26	A.G.C. delay ...	47MΩ	E4
R27	V5 C.G.	470kΩ	E3
R28	V5 C.G. stopper ...	470kΩ	E4
R29	H.T. smoothing ...	1kΩ	E4
R30	V5 G.B.	180Ω	E4

CAPACITORS		Values	Locations
C1	S.W. aerial shunt ...	22pF	H4
C2	M.W. aerial shunt ...	100pF	H4
C3	L.W. aerial shunt ...	220pF	H4
C4	L.W. aerial trim. ...	120pF	H4
C5	V1 C.G.	100pF	G4
C6	A.G.C. decoupling	0·05μF	G4
C7	R.F. coupling .	100pF	G4
C8	Part I.F. filter ...	56pF	H4
C9	M.W. R.F. shunt ...	470pF	H4
C10	L.W. R.F. shunt ...	470pF	H4
C11	M.W. R.F. coupling	15pF	H4
C12	L.W. R.F. trimmer	110pF	H4
C13	V2 hex. C.G. ...	100pF	G4
C14	1st I.F. trans. tuning	100pF	B1
C15		100pF	B1
C16	P.U. coupling ...	0·01μF	F4
C17	V2 osc. C.G. ...	47pF	H3
C18	S.W. osc. tracker ...	0·0047μF	G3
C19	M.W. osc. tracker ...	620pF	G3
C20	L.W. osc. tracker ...	240pF	H3
C21	L.W. osc. trimmer	150pF	H3
C22	Fixed trimmer ...	15pF	G3
C23	Osc. anode coup. ...	100pF	G3
C24	S.G. decoupling ...	0·1μF	F4
C25	2nd I.F. trans. tuning	100pF	B2
C26		100pF	B2
C27	V3 cath. by-pass ...	0·1μF	F4
C28	A.G.C. diode coup.	47pF	F4
C29	I.F. by-pass ...	100pF	F4
C30	P.U. tone correctors	0·05μF	E4
C31		0·005μF	E4
C32	A.F. coupling ...	0·002μF	E3
C33		0·02μF	D3
C34	Part tone control ...	47pF	D3
C35		0·001μF	D3
C36		0·002μF	D3
C37		0·01μF	E3
C38		4·7pF	E3
C39	A.F. coupling ...	0·05μF	E3
C40*	H.T. decoup. ...	32μF	B1
C41	A.F. coupling ...	0·01μF	E4
C42*	H.T. smoothing ...	60μF	C1
C43*		60μF	C1
C44	Tone corrector ...	0·01μF	D4
C45*	V5 cath. by-pass ...	50μF	E4
C46‡	S.W. aerial trim. ...	50pF	G4
C47‡	M.W. aerial trim. ...	50pF	H4
C48†	Aerial tuning ...	§532pF	A1
C49‡	S.W. R.F. trimmer	50pF	G3
C50‡	M.W. R.F. trimmer	50pF	H3
C51†	R.F. tuning ...	§532pF	A1
C52‡	M.W. osc. trimmer	50pF	H3
C53†	Oscillator tuning ...	§532pF	A1

* Electrolytic. † Variable. ‡ Pre-set.
§ " Swing " value, min. to max.



Waveband Switch Unit Diagrams and Table



Four diagrams of the three waveband switch units, drawn as seen when viewed in the directions of the arrows in our underside drawing of the chassis opposite. Diagrams 1 and 2 are the two sides of the front unit. The associated switch table is on the right of this caption, in col. 3.

Switch	M.W.	S.W.	L.W.	Gram.
S1	—	—	—	C
S2	—	C	—	—
S3	C	—	—	—
S4	—	—	C	—
S5	C	—	C	—
S6	—	C	C	—
S7	C	C	—	—
S8	—	C	C	—
S9	C	C	—	—
S10	C	—	C	—
S11	—	C	C	—
S12	C	C	—	—
S13	—	C	—	—
S14	C	—	—	—
S15	—	—	C	—
S16	—	—	—	C
S17	—	C	—	—
S18	C	—	—	—
S19	—	—	C	—
S20	—	C	C	—
S21	C	C	—	—
S22	C	—	C	C
S23	—	C	C	C
S24	C	C	—	C
S25	—	C	—	—
S26	C	—	—	—
S27	—	—	C	—
S28	—	—	—	C
S29	—	—	—	C
S30	C	C	C	—
S31	—	C	—	—
S32	C	—	—	—
S33	—	—	C	—
S34	C	—	C	—
S35	—	C	C	C
S36	C	C	—	—
S37	C	—	C	C
S38	—	C	C	C
S39	C	C	—	C
S40	—	C	—	—
S41	C	—	—	—
S42	—	—	C	—
S43	C	C	C	—

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	M.W. frame aerial...	1·0	—
L2	L.W. frame aerial...	15·0	—
L3	Aerial coupling coils	3·0	H4
L4		80·0	H4
L5		260·0	G4
L6	Aerial tuning coils	Very low	H4
L7		2·0	H4
L8		10·0	G4
L9	I.F. filter coil ...	32·0	H4
L10	R.F. coupling coils	40·0	G4
L11		270·0	H4
L12	R.F. tuning coils...	Very low	H4
L13		3·0	G4
L14		24·0	H4
L15	Oscillator reaction coils	Very low	G3
L16		0·5	G3
L17	Oscillator tuning coils	Very low	G3
L18		1·9	G3
L19		4·2	H3
L20	1st I.F. trans Pri.	13·9	B1
L21	1st I.F. trans Sec.	13·9	B1
L22	2nd I.F. trans Pri.	13·9	B2
L23	2nd I.F. trans Sec.	13·9	B2
L24	Speech coil ...	2·4	—
T1	d—e	9·0	B1
	e—f	500·0	
	a—b ...	0·2	
	b—c	0·2	
T2	H.T. sec. (total) ...	600·0	C2
	Heater sec. ...	Very low	
	Primary (total) ...	38·0	
S1-S43	Waveband switches	—	H3
S44–S47	Tone switches ...	—	D3
S48	Mains switch ...	—	D3

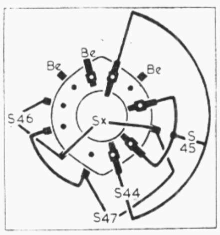
GENERAL NOTES

Switches.—**S1-S43** are the waveband and radio/gram change-over switches, ganged in three rotary units beneath the chassis. These are indicated in our under-chassis view by the numbers **1-4** in diamond surrounds, **1** and **2** being the two sides of the front unit.

These units are shown in detail in the diagrams above, where they are drawn as seen in the directions of the arrows in the under-chassis drawing. The table in column 3 gives the switch positions for the four control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

Switches	Off	F	B	M	S
S44	C	—	—	—	—
S45	—	C	—	C	—
S46	—	—	—	C	C
S47	C	—	C	—	C

Diagram of the tone control switch unit, as seen from the rear of an inverted chassis.



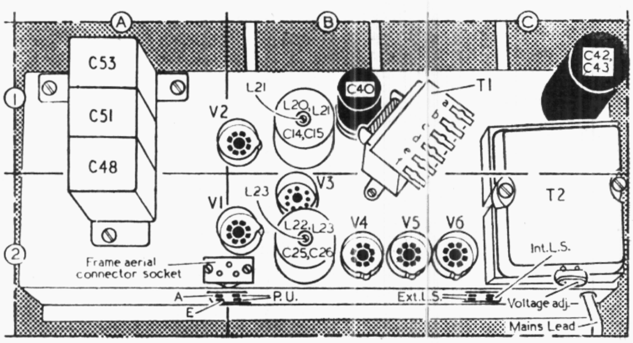
S44-S47 are the tone control switches, ganged in a single rotary unit beneath the chassis. This unit forms part of an assembly on which is mounted the mains switch **S48**, and although the tone control has only four positions, a fifth is required for the off position.

The unit is shown in detail in the diagram in col. 2, where it is viewed from the rear of an inverted chassis. The table above it gives the switch positions for the five settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed. One of the switches, **S44**, plays no part in the action of the tone control. It closes only in the "off" position.

Switch **Sx** forms part of this group, but it does not function as a switch. It merely provides continuity between the wiring associated with **S46** and that associated with **S47**, and could be replaced by a piece of wire, as it never opens. We show it because our diagram is intended for service work, and if the switch contacts were not shown some confusion might arise from the absence of the connecting wire.

Scale lamps.—In our chassis these were two Mazda M.E.S. types, with large spherical bulbs sprayed white. They were rated at 6.5 V, 0.3 A.

External Speaker.—Two vertical pairs of sockets are provided on the right-hand panel at the rear of the chassis for the connection of the internal speaker and an external speaker if desired. Either can be muted by withdrawing a plug. The impedance is about 2-4 Ω.



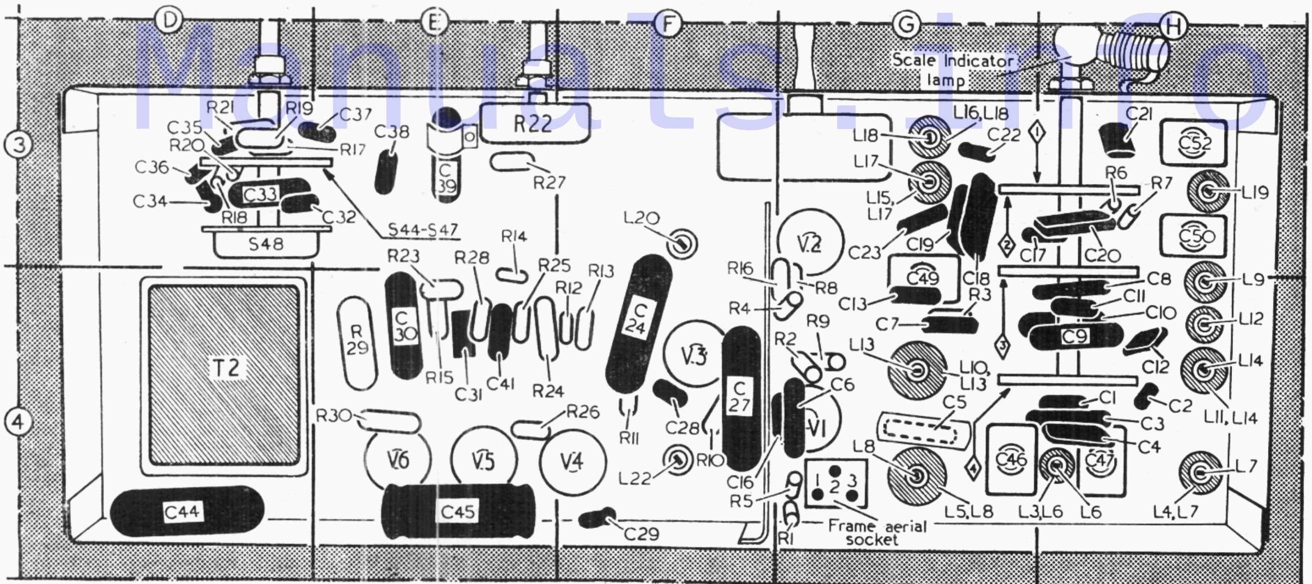
Plan view of the chassis. The connecting tags of the output transformer **T1** are coded to agree with the circuit diagram overleaf.

CIRCUIT ALIGNMENT

Remove chassis from cabinet and stand it, on its mains transformer end, on the bench. Place cabinet near chassis and re-connect frame aerial plug.

I.F. Stages.—Connect signal generator output, via a 0.1 μF capacitor in the "live" lead, to control grid (pin 6) of **V2** and chassis. Switch set to M.W. and turn gang to maximum. Feed in a 420 kc/s (714.3 m) signal and adjust the cores of **L23** (location reference B2), **L22** (F4), **L21** (B1) and **L20** (F3) for maximum output.

I.F. Filter.—Transfer signal generator leads via a dummy aerial to **A** and **E** sockets.



Underside view of the chassis, in which the waveband switch units are indicated by the numbers **1-4** in diamond surrounds. The front unit is viewed from both sides, arrows showing the direction of view in the diagrams in col. 1 opposite. A diagram of the tone control switch unit appears in col. 2.

With set switched to M.W., feed in a 420 kc/s signal and adjust the core of **L9** (H4) for minimum output.

R.F. and Oscillator Stages.—As the tuning scale remains fixed in the cabinet when the chassis is withdrawn, reference must be made to the substitute tuning scale printed on the rear of the scale backing plate. This scale is numbered 0 to 50, and readings on it are taken against the top edge of the cursor carriage.

Check that with the gang at maximum capacitance the substitute scale reading is 50. When the chassis is in the cabinet the cursor should also coincide with the upper ends of the M.W. and L.W. scales at maximum gang setting.

M.W.—With the set switched to M.W., tune to 41 on substitute scale, feed in a 500 m (600 kc/s) signal and adjust the cores of **L18** (G3), **L13** (G4) and **L7** (H4) for maximum output. Tune set to 4.2 on scale, feed in a 200 m (1,500 kc/s) signal and adjust **C52, C50** (H3) and **C47** (H4) for maximum output. Repeat these adjustments until calibration holds at both ends of the scale.

S.W.—Switch set to S.W., tune to 47 on scale, feed in a 49.3 m (6.1 Mc/s) signal and adjust the cores of **L17** (G3), **L12** (H4) and **L6** (H4) for maximum output. Repeat these adjustments until no further improvement results. Feed in a 19.6 m (15.3 Mc/s) signal, tune it in, and adjust **C49** (G3) and **C46** (G4) for maximum output. Repeat these adjustments until no further improvement results.

L.W.—Switch set to L.W., tune to 24 on scale, feed in a 1,400 m (214 kc/s) signal and adjust the cores of **L19** (H3), **L14** (H4) and **L8** (G4) for maximum output.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those derived from the manufacturers' service information and were taken on a receiver while it was operating from A.C. mains of 210 V, the voltage adjustment being set to the 200-220 V tapping. The set was tuned to the high wavelength end of M.W., but there was no signal input.

Voltage readings were measured with a Model 7 Avometer, chassis being the negative connection.

Valves	Anode V	Anode mA	Screen V	Screen mA	Cath. V
V1 EF41	190	4.9	66	1·7	—
V2 ECH42	215 Oscillator 115	1·9 6.3*	66	3·1	—
V3 EBF80	215	6·0	66	2·5	0·9
V4 EBC41	65	0·5	—	—	—
V5 EL41	230	29·0	215	4·5	5·8
V6 EZ40	480†	—	—	—	250·0

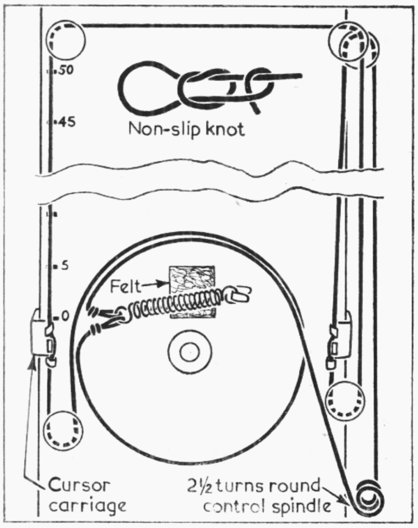
* Including 1·3mA passing through R16.
† A.C. volts, each anode.

DRIVE CORD REPLACEMENT

About six feet of nylon braided glass yarn is required for a new drive cord, and it should be run as shown in the sketch below, where the system is drawn as seen from the rear, with the gang at minimum capacitance. It is helpful to make up the cord before fitting, by tying a non-slip loop at each end, the overall length then being 70 inches, as recommended by the makers.

Actually, in our sample the length was one inch shorter than this, so there is some latitude in that direction, although our tension spring was stretched to its utmost, and it was difficult to hook to its anchor. A suggested method of tying a non-slip knot is shown inset in the sketch.

Fitting is simplified if the cord is run with the gang at minimum, pulling against the gang stop to hold the cord in position. The cursor can be slipped on afterwards, and should be adjusted so that with the gang at maximum the upper edge of the cursor carriage is level with the top calibration mark (No. 50). At minimum it is roughly level with the zero mark.



Sketch showing the cord-driven tuning drive system. It is drawn as seen from the rear of the chassis, neglecting obstructions. The gang is at minimum.

DISMANTLING THE SET

Removing Chassis.—Remove four control knobs (pull off);
unplug frame aerial leads from top, and speaker leads from rear of chassis;
remove two 2BA cheese-head bolts securing rear chassis flange to cabinet, and withdraw chassis.

Service Sheet Correction

An unfortunate error crept into our circuit diagram of the Bush TV22 receiver in Service Sheet 1003/T15, owing to a slip in the drawing office which was not noticed in subsequent checking.

The upper end of the deflector coil secondary **d** on the line output transformer T2 is shown connected to C31 and V10a anode, whereas in fact it should go to C31 and HT positive, where it completes the circuit to the deflector coils via socket **B** and C34.

Thanks are due to one of our subscribers for pointing out the error, and dealers are requested to transpose the connection in their diagrams to avoid the possibility of confusion at some later date.

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