"TRADER" SERVICE SHEET

931

PYE 48A

Three-band A.C./D.C. Superhet

A FIVE-POSITION "Tonemaster" tone control and on/off switch unit is incorporated in the Pye 48A, together with the now familiar Pye quick-release device for securing the chassis.

The receiver is a 3-valve (plus rectifier) 3-band superhet designed to operate from A.C. or D.C. mains of 110 V or 200-250 V, 25-100 c/s in the case of A.C.

Release date and original price: November 1947; £17 17*s. plus P.T.*

CIRCUIT DESCRIPTION

For operation without an aerial on M.W. and L.W., frame aerial input is provided by **L1** in conjunction with loading coils **L5** (M.W.) and **L6** (L.W.). On S.W., input from the plate aerial is inductively coupled by **L2** to single tuned circuit **L4, C33.**

Provision is made for the connection of an external aerial which is operative on all wavebands, insertion of the aerial plug automatically opening **S1** to disconnect the shunt capacitor **C1** connected across the coupling coil **L3.**

First valve **(V1, Mullard metallized CCH35)** is a triode-hexode operating as frequency changer with internal coupling. Triode anode oscillator coils **L10** (S.W.), **L11** (M.W.), **L12** (L.W.) are tuned by **C37.** Parallel trimming by **C34** (S.W.), **C35** (M.W.) and **C10, C36** (L.W.); series tracking by **C11** (S.W.), and **C12** (M.W. and L.W.).

Inductive reaction coupling to grid by coils **L7** (S.W.), **L8** (M.W.), and **L9** (L.W.), with additional capacitative coupling provided by the trackers, which are common to grid and anode circuits.

Second valve **(V2, Mullard metallized EF39)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C6, L13, L14, C7** and **C15, L15, L16, C16,** in which alignment adjustments are effected by varying the positions of the iron-dust coil cores.

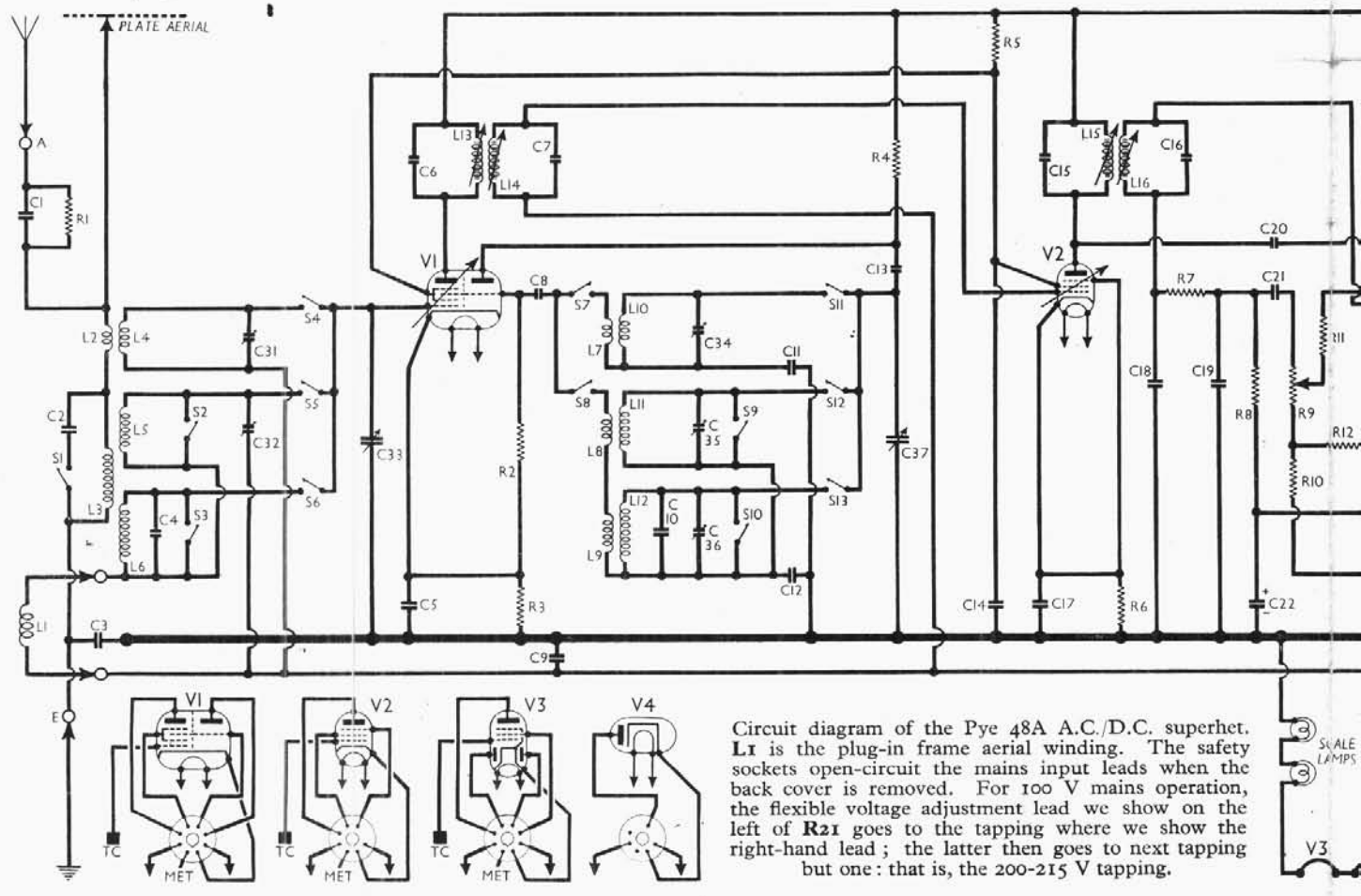
Intermediate frequency 465 kc/s.

Diode second detector is part of double diode pentode output valve **(V3, Mullard metallized CBL31).** Audio frequency component in rectified output is developed across diode load resistor **R8,** and passed via A.F. coupling capacitor **C21,** manual volume control **R9,** and grid stopper **R11** to control grid of pentode section. I.F. filtering by **C18, R7, C19** in diode circuit and by **R11** in pentode grid circuit.

Second diode of **V3,** fed from **V2** anode via **C20,** provides D.C. potential which is developed across load resistor **R16** and fed back through a decoupling circuit as G.B. to F.C. and I.F. valves, giving automatic gain control.

Delay voltage, together with G.B. for pentode section, is obtained from the voltage drop across **R13, R14** in **V3** cathode lead to chassis. Fixed tone correction in pentode anode circuit of **V3** by **C23,** and provision for the connection of a low-impedance external speaker across the output transformer **T1** secondary winding, via **S22,** while **S23** permits the internal speaker to be muted.

Voltage negative feedback is obtained from the series network **C25, R17, R18, R19,** which forms a potential divider in **V3** pentode anode circuit, and is fed via **R12,** to control grid circuit. Switches **S14-S21** permit the frequency response to be modified by manipulation of the circuit



Circuit diagram of the Pye 48A A.C./D.C. superhet. **L1** is the plug-in frame aerial winding. The safety sockets open-circuit the mains input leads when the back cover is removed. For 100 V mains operation, the flexible voltage adjustment lead we show on the left of **R21** goes to the tapping where we show the right-hand lead; the latter then goes to next tapping but one: that is, the 200-215 V tapping.

arrangement, giving a four-position tone control with the following positions: Fidelity, Brilliant, Mellow 1 and Mellow 2.

In the "Fidelity" position, **S15** and **S19** close, so that **C25, R17, R18** and **C26** form the potential divider, with **R19** in parallel with **C26,** the voltage developed across the latter two being fed back via **C24** and **R12.**

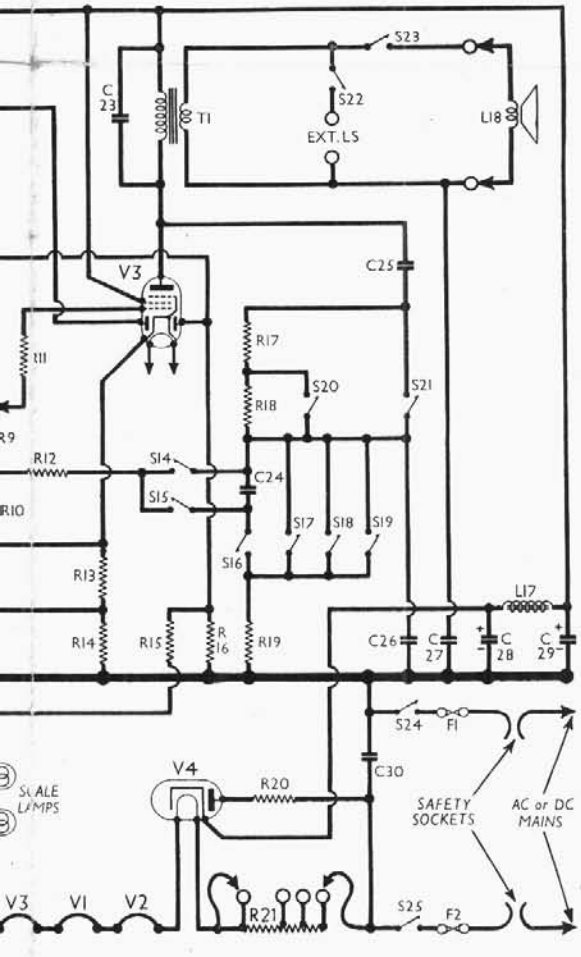
In the "Brilliant" position, **S14** and **S16** are closed; **R12** is now connected directly to the potential divider, and **R19** and **C24** are connected in series across **C26.**

In the "Mellow 1" position, **S15, S17** and **S20** close, so that **R18** is short-circuited; and in the "Mellow 2" position **S15, S18** and **S21** close, short-circuiting both **R17** and **R18.**

S17, S18, S19 are electrically a single switch, but physically it consists of three separate switches on the unit, connected in parallel. They are shown separately in the circuit diagram because it would be difficult to show them as a single switch in the switch unit.

When the receiver is operated from A.C. mains, H.T. current is supplied by half-wave rectifying valve **(V4, Mullard CY31)** which, with D.C. mains, behaves as a low resistance. Smoothing by iron-cored choke **L17** and electrolytic capacitors **C28, C29.**

Valve heaters, together with scale lamps and ballast resistor **R21,** are connected in series across mains input. Safety sockets in the mains input leads ensure that the chassis cannot remain "live" to the mains if the back cover is removed.



COMPONENTS AND VALUES

	CAPACITORS	Values (μF)	Locations
C1	Aerial series	0·0005	F3
C2	Aerial shunt	0·00022	A1
C3	Earth isolator	0·01	E4
C4	Aerial L.W. trim.	0·000056	A1
C5	V1 cath. by pass	0·1	F3
C6, C7	1st I.F. trans. tun.	0·00007	A2
		0·00007	A2
C8	V1 osc. C.G.	0·00005	E3
C9	A.G.C. decoupling	0·1	A1
C10	Osc. L.W. trim.	0·00033	E3
C11	Osc. S.W. track	0·005	E3
C12	Osc. L.W., M.W. track	0·00057	E3
C13	Osc. anode coup.	0·00005	E3
C14	V2 S.G. decoupling	0·1	E4
C15, C16	2nd I.F. trans. tun.	0·00007	B2
		0·00007	B2
C17	V2 cath. by pass	0·1	E4
C18, C19	I.F. by passes	0·0001	D4
		0·0001	D4
C20	A.G.C. coupling	0·00001	E4
C21	A.F. coupling	0·01	D4
C22*	V3 cath. by pass	25·0	D4
C23	Tone corrector	0·001	D4
C24		0·02	D3
C25	Tone control cap.	0·02	D3
C26		0·01	D3
C27	Speaker isolator	0·01	D4
C28*, C29*	H.T. Smoothing capacitors	16·0	E4
		24·0	E4
C30	Mains by pass	0·1	D3
C31‡	Aerial S.W. trim	0·00005	A1
C32‡	Aerial M.W. trim.	0·00005	A1
C33†	Aerial tuning	0·000532§	A1
C34‡	Osc. S.W. trim.	0·00005	E3
C35‡	Osc. M.W. trim.	0·00005	E3
C36‡	Osc. L.W. trim.	0·00005	E3
C37†	Osc. tuning	0·000532§	A1

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

	RESISTORS	Values (ohms)	Locations
R1	Aerial series	500,000	F3
R2	V1 osc. C. G.	47,000	F3
R3	V1 fixed G. B.	220	F3
R4	Osc. H.T. feed	39,000	F4
R5	S.G.'s H.T. feed	33,000	E4
R6	V2 fixed G.B.	330	E4
R7	I.F. stopper	47,000	E4
R8	Sig. diode load	470,000	D4
R9	Volume Control	1,000,000	C3
R10	F.-B. coupling	4,700	D4
R11	V3 grid stopper	47,000	B2
R12	F.-B. coupling	15,000	C3
R13, R14	V3 pent. G.B. and A.G.C. delay	220	D4
		220	D4
R15	A.G.C. decoupling	1,000,000	D4
R16	A.G.C. diode load	1,000,000	D4
R17	Tone control resistors	27,000	D3
R18		22,000	D3
R19		47,000	D3
R20	V4 surge limiter	82	C3
R21	Heater ballast	*800	B2

* Tapped at 620Ω + 90Ω × 90Ω from V4 heater.

	OTHER COMPONENTS	Approx. Values (ohms)	Locations
L1	Frame aerial	0·5	A2
L2	Aerial coupling coils	very low	A1
L3		57·0	
L4	Aerial tuning coils	very low	A1
L5		1·1	
L6		14·5	
L7	Osc. S.W. reaction	21·5	E3
L8	Osc. M.W. and L.W. reaction, total	2·4	E3
L9			
L10	Oscillator tuning coils	very low	E3
L11		4·0	E3
L12		4·5	E3
L13	1st I.F. transformer Pri.	9·4	A2
L14	Sec.	9·4	A2
L15	2nd I.F. transformer Pri.	9·4	B2
L16	Sec.	9·4	B2
L17	Smoothing choke	490·0	B1
L18	Speech coil	2·5	—
T1	O/put trans. Pri.	500·0	C4
	Sec.	0·5	
S1	Aerial switch	—	F4
S2-S13	W/band switches	—	E3
S14-S21	Tone control switches	—	D3
S22, S23	Speaker switches	—	D4
S24, S25	Mains switches	—	D3

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 230 V.

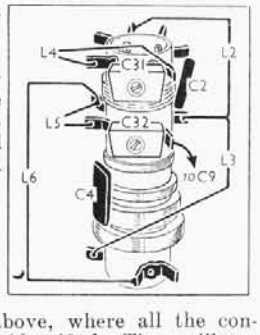
The receiver was tuned to the lowest wavelength on the M.W. band, the volume control was at maximum, and the tone control was at "Fid," but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Avometer, chassis being the negative connection.

VALVE	Anode V	Anode m/A	Screen V	Screen m/A	Cath. V
V1 CCH35	220	2·9	80	3·6	1·7
	Oscillator				
	84	2·5			
V2 EF39	220	5·1	80	1·6	2·1
V3 CBL31	200	37·0	220	4·1	18·5
V4 CY31	—	—	—	—	250·0

GENERAL NOTES

Coils.—**L1** is the frame aerial winding mounted in a bakelized support which plugs into two sockets at one end of the chassis deck. **L2-L6** are the aerial circuit tuning coils, wound on a single unscreened tubular former mounted on the chassis deck. The unit is indicated in our plan view of the chassis, but it is shown in detail in the sketch above, where all the connecting tags are identified. The oscillator coils **L7, L10** and **L8, L9, L11, L12** are in two unscreened tubular units beneath the chassis.



Sketch identifying the aerial coil unit tags.

Switches.—S2-S13 are the waveband switches, ganged in two rotary units be-

neath the chassis. These are indicated in our under-chassis view, where they are identified by the numbers **1** and **2** in diamonds, with arrows to indicate the direction in which they are viewed in the two upper diagrams in col. 2, where the units are shown in detail.

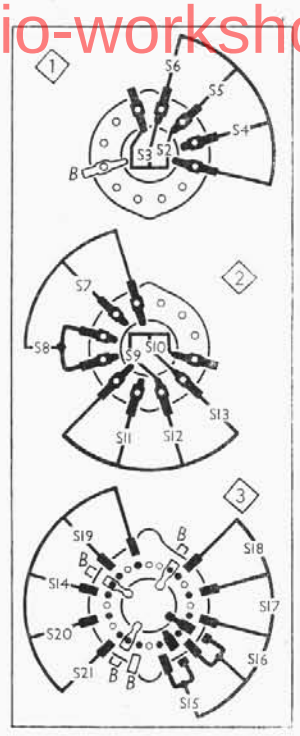
The table below gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

S14-S21 are the "Tonemaster" tone control switches, ganged in a single rotary unit beneath the chassis. This is indicated in our under-chassis view, where it is identified by the number **3** in a diamond surround with an arrow to show the direction in which it is viewed in the bottom diagram in col 2, where it is shown in detail.

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

Waveband Switch Table

Switch	S.W.	M.W.	L.W.
S2	C	—	—
S3	—	C	—
S4	C	—	—
S5	—	C	—
S6	—	—	C
S7	C	—	—
S8	—	C	C
S9	C	—	—
S10	—	C	—
S11	C	—	—
S12	—	C	—
S13	—	—	C



Diagrams of the waveband (upper pair, **1** and **2**) and tone control (bottom unit, **3**) switch units, all drawn as seen from the rear of an inverted chassis. On the left (col. 1) is the waveband switch table, and on the right (col. 3) is the tone control switch table.

Tone Control Switch Table

Switch	FID	BRI	MI	M2
S14	—	C	—	—
S15	C	—	C	C
S16	—	C	—	—
S17	—	—	C	—
S18	—	—	—	C
S19	C	—	—	—
S20	—	—	C	—
S21	—	—	—	C

S1 is a jack-type switch associated with the aerial socket. When the frame aerial is being used **S1** is closed, but when the external aerial plug is inserted in its socket **S1** opens automatically.

S22, S23 are the internal and external speaker switches. They are of the push-pull type and are mounted together on a panel at the rear of the chassis above their respective speaker sockets. The switches close when their knob is depressed.

S24, S25 are the Q.M.B. mains switches, operated by the "Tonemaster" control spindle in the fully anti-clockwise position of its knob.

Scale Lamps.—These are two M.E.S. types, with small clear spherical bulbs, rated at 4 V, 0.3 A. Their clips slip directly on to earthed metal brackets, but their holders are insulated from their clips.

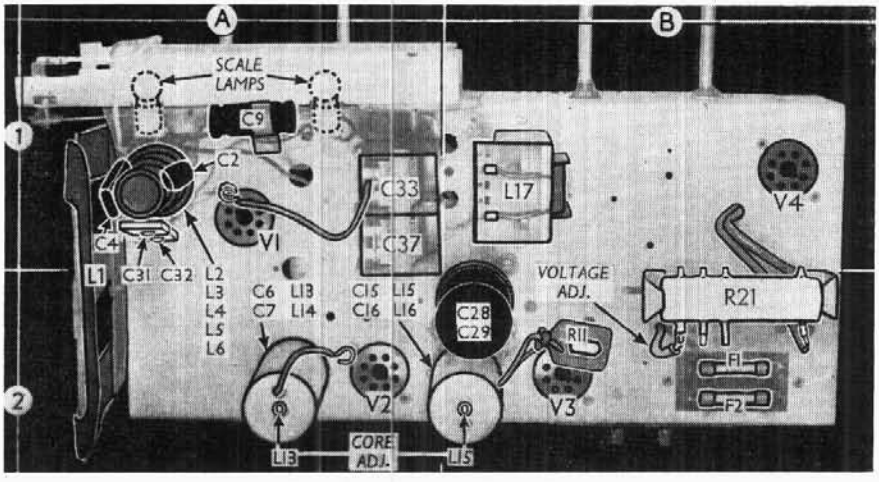
External Speaker.—Two pairs of sockets, effectively in parallel, are provided at the rear of the chassis for the connection of the internal and low impedance (about 2-4 Ω) external speaker. The speakers are connected when their switch knobs are pushed in.

Fuses.—**F1, F2** are the mains circuit fuses, rated at 1 A each. They are of the standard $1\frac{1}{4} \times \frac{1}{4}$in pattern.

Safety Sockets.—Two split sockets, mounted on a panel at the rear of the chassis, are inserted in series with the mains leads. When the back cover is off the receiver, the two halves of each socket are separated, breaking the mains input circuit. When the back cover is fitted again, a pair of insulated plugs mounted on the cover enter the sockets and connect the two halves of each together. To operate the receiver with the back off it is necessary to remove the plug panel from the cover and insert it into the safety sockets. The plugs are held inside a block of wood which permits them to slide up and down when the back is being fitted. They may be released upon removal of two wood screws.

Mains Voltage Adjustment.—One end of the heater ballast resistor **R21** is connected directly to **V4** heater, while the other end has the usual three tappings for mains voltage adjustments from 200-250 V.

At these voltages a second lead from **V4** heater is slipped on to the terminal at that end of the resistor, just to keep it in a safe place, but if the receiver is to be operated from mains of about 100 V, this lead should be taken from its normal terminal and slipped on to the highest tapping at the free end of **R21**, removing the ballast resistor from the circuit. The normal voltage adjustment lead is then slipped on to the 200-215 V tapping.

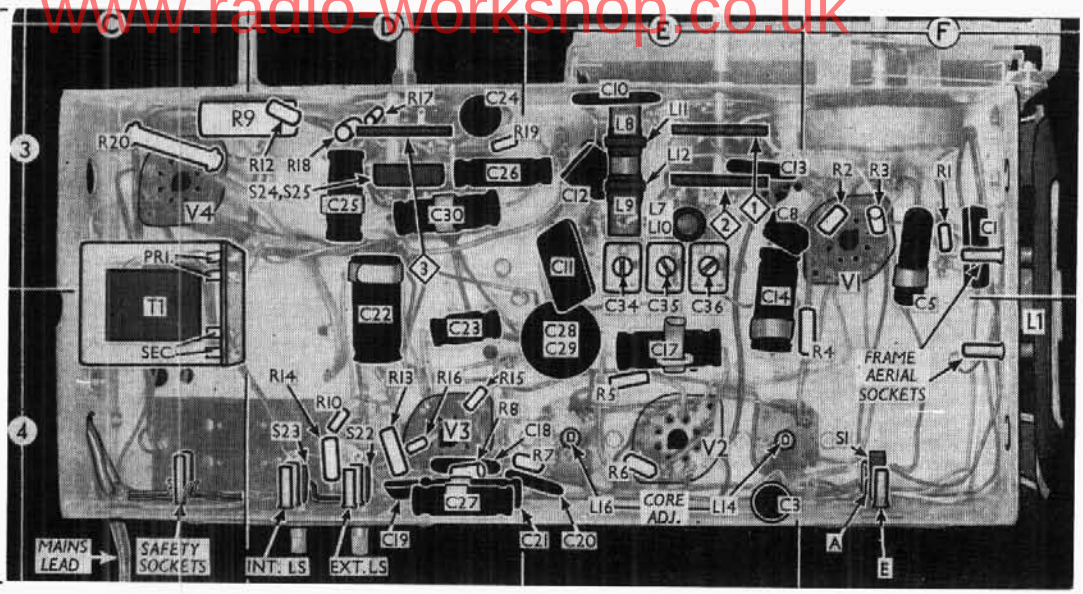


Plan view of the chassis. The tags of the **L2-L6** coil unit are identified in a sketch overleaf (col. 6). The voltage adjustment on **R21** is set to 236-250 V.

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (recessed grub screws);
detach the plate aerial lead from the spring clip inside the top of the cabinet and withdraw the two speaker lead plugs from their sockets at the rear of the chassis;
remove the two 2BA fixing screws from the lower rear corners of the chassis, draw the chassis backwards for about two inches and lift slightly at the rear, when it may be withdrawn completely from the cabinet.
When replacing, ensure that the projections on the chassis retaining bars in the cabinet engage with the holes provided in the front chassis member.

Removing Speaker.—Remove chassis, unclip the leads, remove the four 4BA fixing nuts (with one plain and one spring washer each), and lift out speaker.



Under - chassis view, showing the positions of the waveband and tone control switch units, which are shown in detail in the diagrams in col. 2. The tags of the output transformer **T1** are identified.

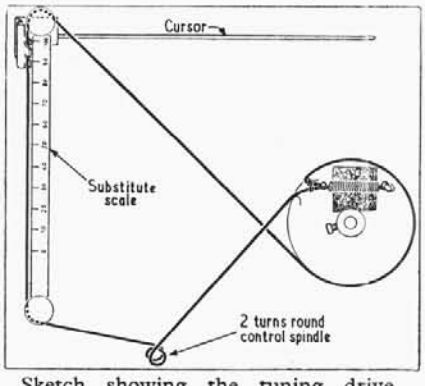
When replacing, the connecting tags should be on the right, when viewed from the rear.

DRIVE CORD REPLACEMENT

About a yard of Nylon braided glass yarn is required for the drive cord, this length leaving ample for tying off.

The complete drive system is shown in the sketch below, where it is drawn as seen from the rear of the chassis, neglecting obstructions, when the gang is at maximum capacitance. The actual overall length of our sample cord was 29½ inches, after making the loops.

When fitting the cursor carriage, which has a tongued cord grip, the receiver should be slipped into its cabinet and the cursor adjusted by the tuning knob until it registers with the black spots at the



Sketch showing the tuning drive system, as seen from the rear with the gang at maximum.

tops of the scales. A pencil mark should then be made on the cursor carriage, level with the 100 degree mark on the substitute scale. Then remove the chassis from the cabinet, turn the gang to maximum, and readjust the cursor carriage until the pencil mark is again level with 100 degrees.

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator leads, via a 0.1 μF capacitor, to control grid (top cap) of **V1** and chassis, removing the original top cap connector, but connecting a 500,000 Ω resistor between the valve cap and the A.G.C. line. A convenient point to make the latter connection is the bare wire between the trimmers **C31** and **C32** (location A1).

Switch set to M.W., turn the volume control to maximum, the tone control to "Fid" and the cursor to 570 m on the scale. Feed in a 465 kc/s (645.16 m) signal, and adjust the cores of the two I.F. transformers. The primary adjustments are at the lower ends of the transformers, while the secondary adjustments are at the upper ends. After adjusting these in turn for maximum output, remove the 500,000 Ω resistor and replace the top cap connector.

R.F. and Oscillator Stages.—Since the calibrated glass scale is mounted in the cabinet and alignment adjustments must be carried out with the chassis on the bench, a substitute scale is printed on the rear of the scale backing plate. This scale has 100 divisions and readings on it are taken against a pencil mark on the cord clamp on the cursor carriage.

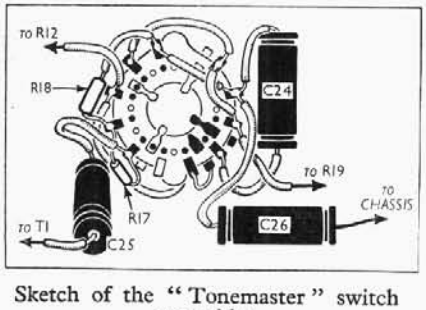
With the gang at maximum capacitance, the reading on the substitute scale should be 100 degrees, and if any adjustment is required the cursor carriage may be slid up or down the drive cord as necessary. Transfer the "live" signal generator lead to **A** socket via a suitable dummy aerial.

M.W.—With set still switched to M.W., tune to 8 deg on scale, feed in a 200 m (1,500 kc/s) signal, and adjust **C35** (E3) and **C32** (A1) for maximum output. Tune to 78 deg on scale, feed in a 500 m (600 kc/s) signal, and check calibration.

L.W.—Switch set to L.W., tune to 31 deg. on scale, feed in a 1,200 m (250 kc/s) signal, and adjust **C36** for maximum output. Tune to 75 deg on scale, feed in an 1,800 m (166.7 kc/s) signal, and check calibration.

S.W.—Switch set to S.W., using a 400 Ω dummy aerial, tune to 6 degrees on scale, feed in a 17.5 m (17.14 Mc/s) signal, and adjust **C34** (E3) and **C31** (A1) for maximum output. Tune to 75.5 deg on scale, feed in a 43 m (6.98 Mc/s) signal, and check calibration. If any error exists, the turns spacing of **L10** (E3) should be altered to correct it. Then adjust the turns spacing of **L4** (A1) for maximum output. Repeat these adjustments until no improvement results.

Sensitivity Figures.—The following sensitivity measurements were made by the makers on a standard 48A receiver, and a reasonable tolerance would be



Sketch of the "Tonemaster" switch assembly.

about 20 per cent. Using a Pye workshop rack, type No. 940020, the input signal was applied as specified in the foregoing alignment instructions, with the aerial jack (S1) open. The output in each case was 10 mW with the speaker connected. The mains voltage was 200 V, A.C.

I.F. stages: (input to V1 hex. C.G. with receiver tuned to 570 m on scale) 95 μV.

R.F. and I.F. stages: (input to aerial circuit) as follows :

S.W.	17.5 m.	17.14 Mc/s.	75 μV
	43.0 m.	6.98 Mc/s	95 μV
M.W.	200 m.	1,500 kc/s.	60 μV
	500 m.	600 kc/s.	150 μV
L.W.	1,200 m.	250 kc/s.	75 μV
	1,800 m.	(No reading : noise level too high.)	

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