"TRADER" SERVICE SHEET

942

FERGUSON 259 SERIES

Covering Models 259A (A.C.), 259L (100V mains) 259U (A.C./D.C.) & 269RG Autoradiogram

THE Ferguson 259A is a 4-valve (plus rectifier) 3-band superhet designed to operate from A.C. mains of 200-250 V, 50-100 c/s. Provision is made for the connection of a gramophone pick-up and an external speaker, with switching in each case. The waveband ranges are 15.5-55 m, 184-576 m and 730-2050 m.

The 259L is a special version of the 259A, with tappings for mains of 110-130 V, the differences being explained overleaf. The 269RG is an autoradiogram employing a slightly modified 259A chassis. Its mains frequency is restricted to 50 c/s.

The 259U is an A.C./D.C. version of the 259A. The differences between it and the A.C. model are shown in the circuit diagram by dotted lines, the A.C. circuit, from which this *Service Sheet* was prepared, being shown in solid line.

Release dates and original prices: 259A, October 1949, £17 5*s* 8*d*; 269*RG, November* 1949, £34 10*s* 2*d*. *Purchase tax extra.* 259*L*, 259*U to be announced.*

CIRCUIT DESCRIPTION

Aerial input via series capacitor **C1** is inductively coupled by **L1** (S.W.), **L2** (M.W.) and **L3** (L.W.) to single-tuned circuits **L4, C30** (S.W.), **L5, C30** (M.W.) and **L6, C30** (L.W.) which precede a triode heptode valve **(V1, Mullard ECH35** (A.C. model) or **CCH35** (A.C./D.C. model)**)** operating as frequency changer with internal coupling.

Triode oscillator anode coils **L9** (S.W.), **L10** (M.W.) and **L11** (L.W.) are tuned by **C36.** Parallel trimming by **C33** (S.W.), **C34** (M.W.) and **C35** (L.W.); series tracking by **C8** (S.W.), **C9, C31** (M.W.) and **C32** (L.W.). Inductive reaction coupling to control grid by coils **L7** (S.W.) and **L8** (M.W. and L.W.), with additional coupling on S.W. due to the common impedance of the tracker **C8.**

Second valve **(V2, Mullard EF39)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C37, L12, L13, C38** and **C39, L14, L15, C40.**

Intermediate frequency 470 kc/s.

Diode second detector is part of double diode triode valve **(V3, Mullard EBC33).** Audio-frequency component in rectified output is developed across manual volume control **R14,** which is also the diode load resistor, and passed via **C18** and **R15** to control grid of triode section, which operates as A.F. amplifier.

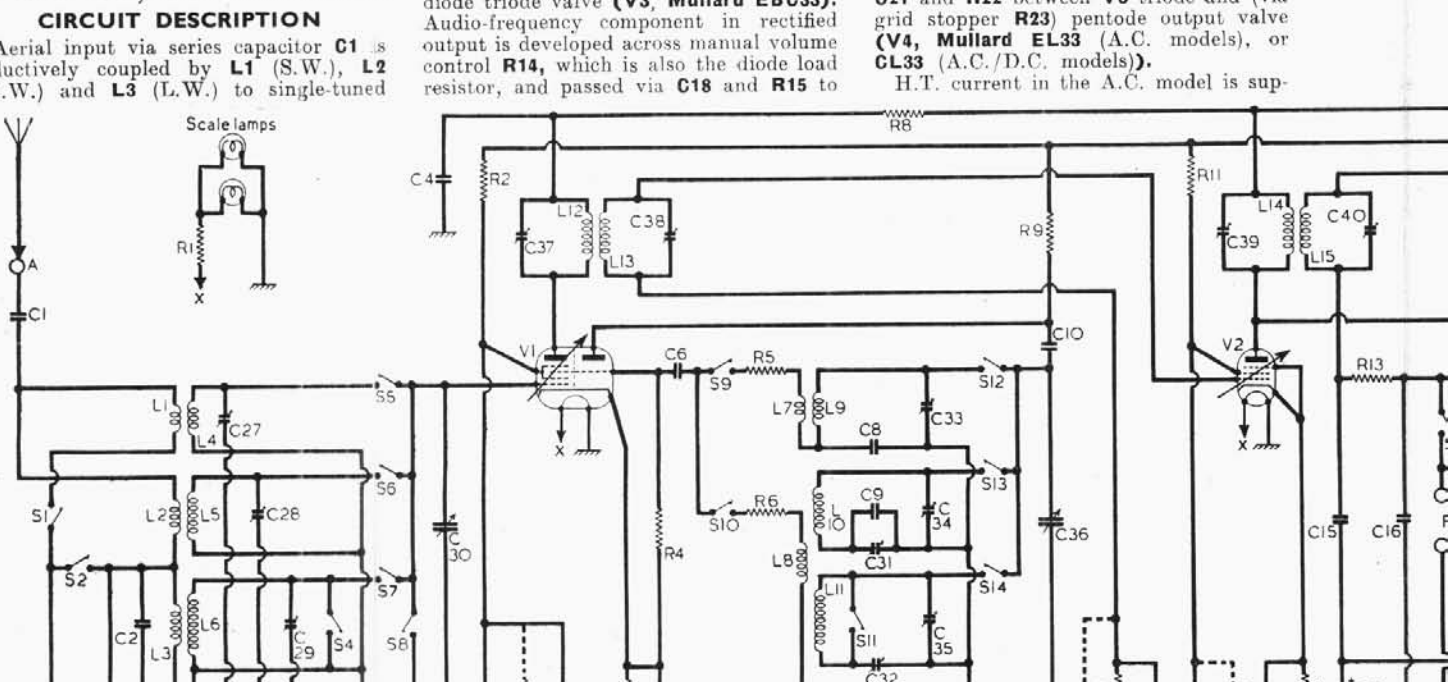
I.F. filtering by **C15, R13** and **C16** in diode circuit and by **C20** (A.C. models only) in triode anode circuit. Provision is made for the connection of a gramophone pick-up across **R14,** via **S15** and **C14.** In the A.C./D.C. version these is also an isolating capacitor **C42,** as indicated by dotted line.

Second diode of **V3,** fed from **V2** anode, provides D.C. potential which is tapped off from load resistors **R19, R20** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic gain control. Delay voltage, together with G.B. for triode section, is obtained from the drop across **R18.**

In the A.C./D.C. model **R19** is omitted, as is also **R10,** so that the bottom of **L13** is connected directly to the A.G.C. diode anode. This is indicated by the dotted lines.

Resistance-capacitance coupling by **R17, C21** and **R22** between **V3** triode and (via grid stopper **R23**) pentode output valve **(V4, Mullard EL33** (A.C. models), or **CL33** (A.C./D.C. models)**).**

H.T. current in the A.C. model is sup-



Circuit diagram of the Ferguson 259A and 259U. The circuit is based on the 259A, which is drawn in solid line, but the differences inv A.C./D.C. model are shown in dotted line. On the extreme right is the A.C./D.C. power input circuit; **R26** is added in the A.C screen is fed from a potential divider, the value of **R2** being suitably modified; on gram, **V2** screen is earthed to mute radio, instead of positive line to **R2, R9, R11** becomes part of the main H.T. positive line, and two of the A.G.C. line resistors **R10, R19** are omitted and **L18** is replaced by the choke **L19.** The three rectifier valve base diagrams shown for **V5** are respectively those for the 259A,

COMPONENTS AND VALUES

Resistors	A.C. Values	A.C. Locations	A.C./D.C. Values	A.C./D.C. Locations
R1	2Ω	C4	—	C4
R2	100kΩ	E4	25kΩ	E4
R3	220Ω	F4	220Ω	F4
R4	47kΩ	F4	47kΩ	F4
R5	47Ω	E3	47Ω	E3
R6	2kΩ	E4	2kΩ	E4
R7	1MΩ	D4	1MΩ	D4
R8	4·7kΩ	E4	4·7kΩ	E4
R9	22kΩ	F4	22kΩ	F4
R10	1MΩ	D4	—	—
R11	100kΩ	E4	100kΩ	E4
R12	220Ω	E4	220Ω	E4
R13	100kΩ	D4	100kΩ	D4
R14	500kΩ	C3	500kΩ	C3
R15	2·2MΩ	D4	2·2MΩ	D4
R16	3kΩ	E4	10kΩ	E4
R17	47kΩ	D4	100kΩ	D4
R18	1kΩ	E3	1kΩ	E3
R19	680kΩ	D4	—	—
R20	680kΩ	D4	1MΩ	D4
R21	100kΩ	C4	100kΩ	C4
R22	680kΩ	D4	470kΩ	D4
R23	4·7kΩ	D4	4·7kΩ	D4
R24	100Ω	C3	150Ω	C3
R25	500Ω†	Spkr.	—	—
R26	—	—	33kΩ	F4
R27	—	—	100Ω	C4
R28	—	—	860Ω‡	B1

† Value depends on resistance of L18.
‡ Tapped at 680Ω + 90Ω + 90Ω.

Capacitors	A.C. Values	A.C. Locations	A.C./D.C. Values	A.C./D.C. Locations
C1	100pF	F3	100pF	F3
C2	150pF	F3	150pF	F3
C3	0·05μF	F3	0·05μF	F3
C4	0·1μF	E4	0·1μF	F4
C5	0·1μF	F3	0·1μF	F3
C6	100pF	F4	100pF	F4
C7	0·1μF	F3	0·1μF	F3
C8	3,550pF	E3	3,550pF	E3
C9	250pF	E3	250pF	E3
C10	100pF	F4	100pF	F4
C11	0·05μF	D3	0·05μF	D3
C12	0·1μF	E3	0·1μF	E3
C13	0·1μF	E4	0·1μF	E4
C14*	25μF	D3	25μF	D3
C15	100pF	D4	100pF	D4
C16	100pF	D4	100pF	D4
C17	100pF	D4	100pF	D4
C18	0·02μF	D4	0·02μF	D4
C19*	8μF	B2	8μF	B2
C20	100pF	D4	—	—
C21	0·02μF	D4	0·02μF	D4
C22	0·01μF	C4	0·01μF	C4
C23*	25μF	C3	25μF	C3
C24	0·005μF	C4	0·005μF	C4
C25*	16μF	B2	16μF	B2
C26*	24μF	B2	24μF	B2
C27‡	40pF	F3	40pF	F3
C28‡	40pF	F3	40pF	F3
C29‡	80pF	F3	80pF	F3
C30†	528pF	A2	528pF	A2
C31‡	300pF	E3	300pF	E3
C32‡	300pF	E3	300pF	E3
C33‡	40pF	E3	40pF	E3
C34‡	40pF	E3	40pF	E3
C35‡	80pF	E3	80pF	E3
C36†	528pF	A2	528pF	A2
C37‡	180pF	A2	180pF	A2
C38‡	180pF	A2	180pF	A2
C39‡	180pF	A2	180pF	A2
C40‡	180pF	A2	180pF	A2
C41	—	—	0·005μF	F4
C42	—	—	0·1μF	D4
C43	—	—	0·1μF	D3
C44	—	—	0·01μF	C4

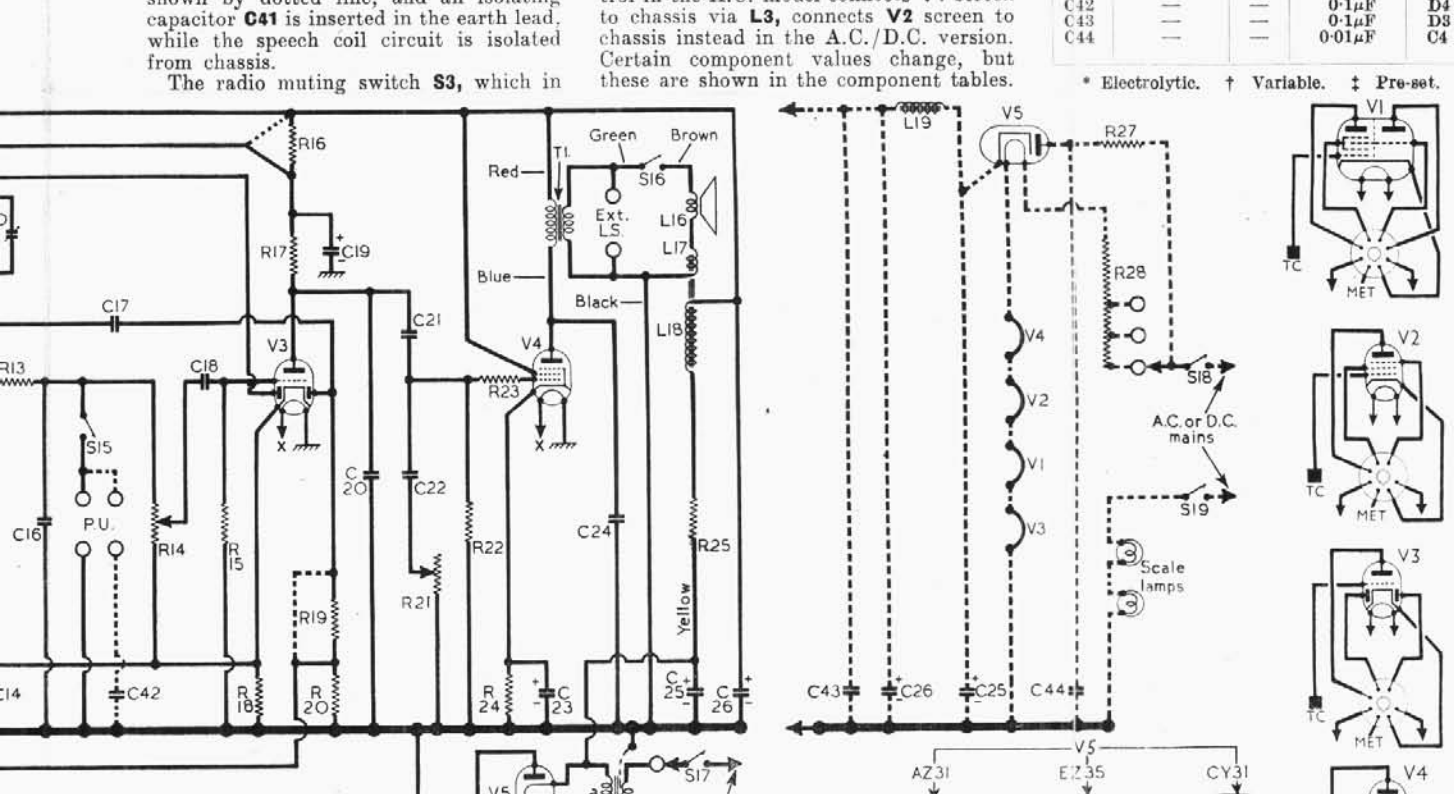
* Electrolytic. † Variable. ‡ Pre-set.

plied by full-wave rectifying valve **(V5, Mullard AZ31).** Smoothing by speaker field **L18** and capacitors **C25, C26.**

In the A.C./D.C. version, H.T. current is supplied by I.H.C. half-wave rectifying valve **(V5, Mullard CY31),** which, with D.C., behaves as a low resistance, and the valve heaters, together with scale lamps, and heater ballast resistor **R28** are connected in series across the mains input.

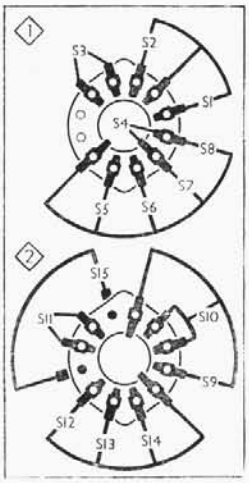
Apart from the differences already mentioned, the circuit is modified very little in the conversion from A.C. to A.C./D.C. operation. The secondary H.T. positive line feeding **V1** and **V2** screens via **R2** and **R11,** and the oscillator anode via **R9,** is transferred from the bottom of **R16,** as shown by the solid lines, to the top, as shown by dotted line, and an isolating capacitor **C41** is inserted in the earth lead, while the speech coil circuit is isolated from chassis.

The radio muting switch **S3,** which in the gram position of the waveband control in the A.C. model connects **V1** screen to chassis via **L3,** connects **V2** screen to chassis instead in the A.C./D.C. version. Certain component values change, but these are shown in the component tables.



ences involved in changing it to an
the A.C./D.C. model, so that V1
nstead of V1 screen; the sub-H.T.
omitted; a P.M. speaker is used,
ne 259A, the 259L and the 259U.

Waveband Switch Units and Diagrams



Diagrams of the two waveband switch units (left) as seen in the direction of the arrows in the underchassis view. On the right is the associated table.

Switch	S.W.	M.W.	L.W.	Gram.
S1	C	—	—	—
S2	—	C	—	—
S3	—	—	—	C
S4	—	C	—	C
S5	C	—	—	—
S6	—	C	—	—
S7	—	—	C	—
S8	—	—	—	C
S9	C	—	—	—
S10	—	C	C	—
S11	—	C	—	—
S12	C	—	—	—
S13	—	C	—	—
S14	—	—	C	—
S15	—	—	—	C

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Aerial coupling coils	4·0	F3
L2		4·0	F3
L3		7·0	F3
L4	Aerial tuning coils	Very low	F3
L5		3·5	F3
L6		32·0	F3
L7	Oscillator reaction coils	Very low	B3
L8		4·5	B3
L9	Oscillator tuning coils	Very low	B3
L10		3·0	B3
L11		7·0	B3
L12	1st I.F. trans. Pri.	8·5	A2
L13	1st I.F. trans. Sec.	8·5	A2
L14	2nd I.F. trans. Pri.	8·5	A2
L15	2nd I.F. trans. Sec.	8·5	A2
L16	Speech coil	1·5	—
L17	Hum neut. coil	0·3	—
L18	Field coil	1,100·0†	—
L19	Smoothing choke	130·0	D3
T1	Output trans. Pri.	360·0	Spk'r
	Output trans. Sec.	0·3	Spk'r
T2	Mains trans. Pri. (total)	29·0	B2
	Mains trans. Sec. (a)	0·2	
	Mains trans. Sec. (b+c)	615·0	
	Mains trans. Sec. (d)	0·2	
S1-S14	W/band switches	—	F4
S15	P.U. switch	—	F4
S16	Speaker muting	—	C4
S17	Mains sw.; g'd R21	—	C4
S18-S19	Mains sw's., g'd R21	—	C4

† See "Chassis Divergencies"

GENERAL NOTES

Switches.—**S1-S15** are the waveband, pick-up and radio muting switches, ganged in two rotary units beneath the chassis. The units are indicated in our underchassis view, and shown in detail in the diagrams in col. 1, where they are drawn as seen in the direction of the arrows in the chassis illustration.

The table above 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.

S16 is the internal speaker muting switch, operated by a rotary movement of the special plug provided with the receiver. When the plug is vertical, both speakers operate; when it is turned anti-clockwise, the internal speaker is muted.

S17 is the Q.M.B. mains switch, ganged with the tone control **R21.** In the A.C./D.C. model it is replaced by **S18, S19.**

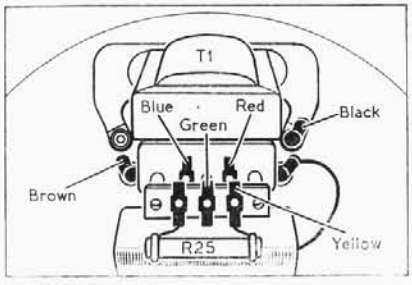
P.U. Connection.—The pick-up leads should be screened by metal braiding, which in the A.C. model should be connected to chassis. In the A.C./D.C. model the braiding should be connected to the earth socket, which should be earthed.

Chassis Divergencies.—The speaker field **L19** varies in D.C. resistance between 1,000 Ω and 1,500 Ω, the balance in the cases of lower values being made up by a series resistor **R25.** The value of **R25** should be 500 Ω for a 1,000 Ω or 1,100 Ω field, and 200 Ω for a 1,200 Ω or 1,300 Ω field. In the 269 RG the field is always 1,500 Ω, and **R25** is omitted.

Model 259L has tappings on the mains transformer primary for 110-130 V and 200-250 V. In order to accommodate the heavier primary winding, the separate rectifier heater winding is omitted in the 259L transformer and an indirectly heated rectifier, an EZ35, is used in place of the AZ31, its heater being connected to the common heater winding for the other valves in the receiver. The total D.C. resistance of the primary winding becomes 30 Ω.

Scale Lamps.—These are two Osram lamps, with small clear spherical bulbs and M.E.S. bases, rated at 6.2 V or 6.5 V, 0.3 A. The same types are used in the A.C. and A.C./D.C. versions.

External Speaker.—Two sockets in association with a special plug are provided for the connection of a low impedance (2-3 Ω) external speaker. A rotary movement of the plug mutes the internal speaker.



Rear view of the speaker assembly, showing the lead connections.

CIRCUIT ALIGNMENT

If the bottom cover is removed, the complete alignment can be performed without removing the chassis from the cabinet.

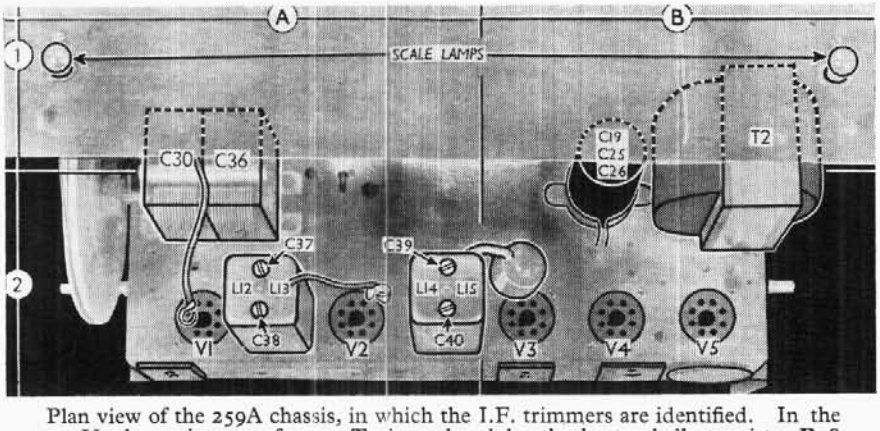
I.F. Stages.—Switch set to M.W. and turn gang and volume control to maximum. Connect signal generator leads, via a 0.01 μF capacitor in each lead, to control grid (top cap) of **V1** and chassis, removing the existing top cap connector and connecting instead a 500 kΩ resistor between the valve cap and chassis.

Feed in a 470 kc/s (638.3 m) signal, and adjust **C40, C39, C38** and **C37** (location reference A2) for maximum output, keeping the input low to avoid A.G.C. action.

R.F. and Oscillator Stages.—With the gang at maximum capacitance the cursor should be vertical and coincident with the high wavelength ends of the tuning scales. It may be adjusted in position by rotating the drive drum on its spindle, after slackening the two fixing screws. Transfer "live" signal generator lead to **"A"** socket, via a suitable dummy aerial. Replace **V1** top cap and remove the 500 kΩ resistor.

S.W.—Switch set to S.W., tune to 20 m on scale, feed in a 20 m (15 Mc/s) signal, and adjust **C33** (E3) and **C27** (F3) for maximum output. Tune to 50 m on scale, feed in a 50 m (6 Mc/s) signal, and check calibration. Adjustments to the tracking may be made by moving the top turn of **L9.** This should, however, not normally be necessary.

M.W.—Switch set to M.W., tune to 210 m on scale, feed in a 210 m (1,429 kc/s) signal, and adjust **C34** (E3) and then **C28** (F3) for maximum output. Tune to 500 m on scale, feed in a 500 m (600 kc/s) signal,

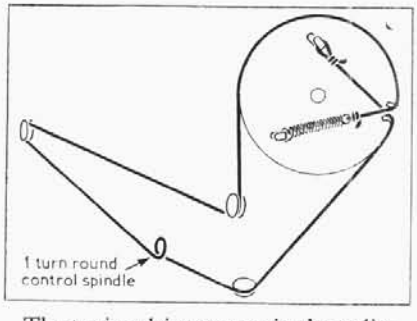


Plan view of the 259A chassis, in which the I.F. trimmers are identified. In the 259U, the mains transformer **T2** is replaced by the heater ballast resistor **R28.**

Under-chassis view of the 259A and 259U, the added components, such as **L19, R27** and **C44** having dotted outlines. The three switch numbers shown attached to the tone control **R21** refer to the A.C. mains switch (**S17**) and the double-pole A.C./D.C. mains switches (**S18, S19**). The waveband switch units (1 and 2 in diamonds) are shown in detail in the diagrams in col. 1

and adjust **C31** (E3) for maximum output. Repeat these adjustments until no improvement results.

L.W.—Switch set to L.W., tune to 850 m on scale, feed in an 850 m (352.9 kc/s) signal, and adjust **C35** (E3) and **C29** (F3)



The tuning drive system in the radiogram, seen from front right when the gang is at maximum.

for maximum output. Tune to 1,875 m on scale, feed in a 1,875 m (160 kc/s) signal, and adjust **C32** (E3) for maximum output. Repeat these adjustments until no improvement results.

DISMANTLING THE SET

Removing Chassis.—Remove the back cover, free the four short control knob spindles inside the cabinet at either end of the chassis and withdraw the knobs;
remove four woodscrews from the ends of the tuning scale assembly;
remove four chassis fixing bolts (with two washers and one tie bar per pair).
The chassis may now be withdrawn to the extent of the speaker leads.
To free chassis entirely, unsolder speaker leads.
When replacing, the chassis fixing bolts should be replaced first. If the speaker leads have been unsoldered, they should be connected as shown in the diagram in col. 3.

Removing Speaker.—Remove the chassis, slacken the four clamping bolts, swivel the clamps and lift out the speaker.
When replacing, the transformer should be at the top, and the leads should be connected as shown in the diagram in col. 3.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted by the manufacturers, whose receiver was tuned to the highest wavelength on the M.W. band. The volume control was at maximum, but there was no signal input.

Except for the cathode readings, voltages were measured on the 400 V scale of a model 7 Avometer, chassis being the negative connection. The A.C. model was operating from mains of 225 V, using the 220-230 V tapping on **T2**; the A.C./D.C. receiver was operating under similar conditions with a corresponding tapping on **R28**.

Valve	Anode V	Anode mA	Screen V	Screen mA	Cath. V
A.C. Model					
V1 ECH35	242	2·4	90	2·5	2·2
	Oscillator				
	108	3·9			
V2 EF39	258	7·3	105	2·2	2·5
V3 EBC33	105	2·2	—	—	2·0
V4 EL33	245	38·0	258	4·0	4·2
V5 AZ31	330†	—	—	—	340·0
A.C./D.C. Model					
V1 CCH35	182	1·8	75	2·3	1·8
	Oscillator				
	105	3·9			
V2 EF39	205	4·2	75	1·2	1·9
V3 EBC33	70	0·9	—	—	1·7
V4 CL33	195	44·0	205	5·0	7·2
V5 CY31	207†	—	—	—	223·0

† A.C.

DRIVE CORD REPLACEMENT

Two separate drive cords are used in the table receivers; the gang drive cord and the cursor drive cord. A single cord is used in the radiogram for both functions. The cords are made of good quality plaited flax waxed fishing twine.

Table Model.—Where both cords are to be replaced it is advisable to fit the cursor drive first. In any case, it is important to see that *both* sides of the gang drive cord are in front of, or behind, the cursor drive cord, as otherwise the two will bind.

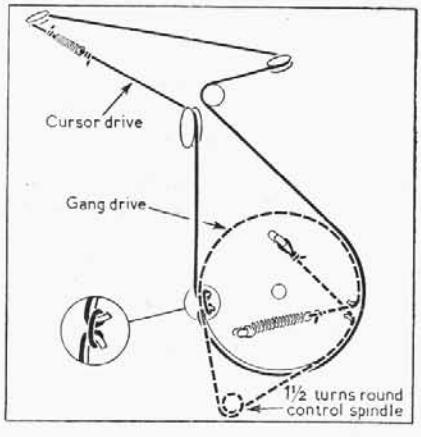
Cursor Drive.—About five feet of cord is required, both ends of which are tied to opposite ends of the tension spring to form a complete loop. The overall length of the cord when thus tied was 50½ inches in our sample, and the overall length of the spring was ⅝in when relaxed.

Having made the large loop, measure off 16in from one end of the spring and fold the cord into a small loop, turn the gang to maximum, and pass the small loop through the hole in the drum groove as shown in the sketch below, hooking it over the two little claws just inside the rim of the drum as shown inset.

It is then a simple matter to run the cord round the pulleys as shown, commencing by passing the short cord over the large pulley on the front of the scale assembly, so that the spring is beneath the scale backing plate.

Gang Drive.—Take about 30 inches of cord, pass one end into the drum through the second hole in the groove, tie a small loop in it, and hook it over one of the anchor tags as shown in our sketch. Run the cord as shown, taking care not to cross the cursor cord, pass the end into the drum again and tie to the spring, which should expand to something approaching twice its length when hooked to its anchor.

Radiogram Drive.—A single length of cord, 50 inches long between its terminating knots, is run as shown in the sketch in col. 4.



The tuning drive system in the table models, seen from front right when the gang is at maximum. The cursor drive is shown solid, and the gang drive dotted.

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