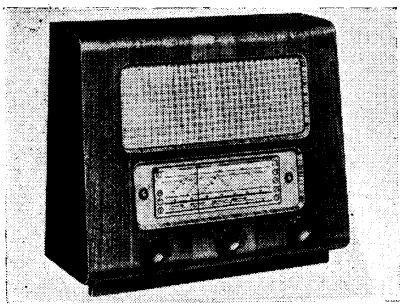
"TRADER" SERVICE SHEET

1093

INVICTA 33

Covering also Models 34, 58 & 75



The appearance of the Invicta 33.

DESIGNED to operate from A.C. mains only of 200-250 V, 50-100 c/s with a double-wound mains transformer, the Invicta model 33 is a 4-valve (plus rectifier) 4-band superhet covering the ranges 15-43 m (S.W.), 75-200 m (trawler, or T.W.), 190-550 m and 1,000-2,000 m. The differences in models 34 and 75 are explained overleaf under "Associated Models." Both can be operated from mains of 110 V-250 V. The 34 is a 3-band export model with two S.W. bands and M.W., operating from A.C. mains only. The 75 is an A.C./D.C. version of the model 33. Model 58 is an autoradiogram employing a 33-type chassis.

Release dates and original prices: 33, *October* 1951, £19 2s 5d; 75, £19 19s 9d; 58, *September* 1952, £36 0s 8d. *Purchase tax extra.*

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (S.W.), **L2** (T.W.), **L3** (M.W.), **L4** (L.W.) to single tuned circuits **L5, C33** (S.W.), **L6, C33** (T.W.), **L7, C33** (M.W.), **L8, C33** (L.W.), which precede triode hexode valve **(V1, Mullard ECH42** (A.C. model) or **UCH42** (A.C/D.C., model)**)** operating as frequency changer with internal coupling. In the A.C./D.C. model **C38** and **C50** isolate the **A** and **E** sockets from chassis, which is "live" to the mains.

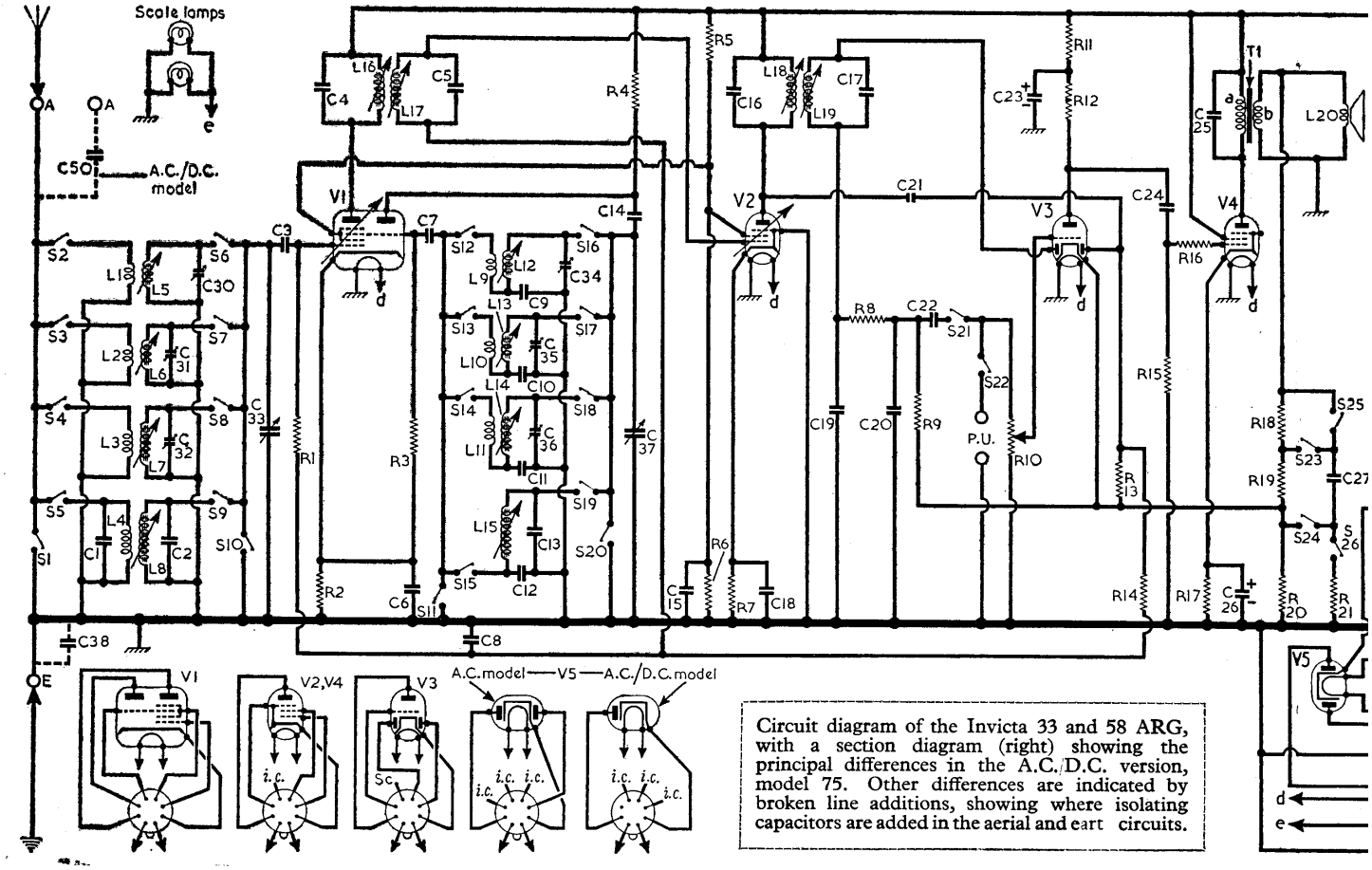
Oscillator anode coils **L12** (S.W.), **L13** (T.W.), **L14** (M.W.) and **L15** (L.W.) are tuned by **C37.** Parallel trimming by **C34** (S.W.), **C35** (T.W.), **C36** (M.W.) and **C13** (L.W.); series tracking by **C9** (S.W.), **C10** (T.W.), **C11** (M.W.) and **C12** (L.W.). Reaction coupling from grid by coils **L9** (S.W.), **L10** (T.W.) and **L11** (M.W.), and across the tracker **C12** (L.W.).

Second valve **(V2, Mullard EF41** (A.C. model) or **UF41** (A.C./D.C. model)**)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C4, L16, L17, C5** and **C16, L18 L19, C17.**

Intermediate frequency 420 kc/s.

Diode signal detector is part of double diode triode valve **(V3, Mullard EBC41** (A.C. model) or **UBC41** (A.C./D.C. model)**).** Audio frequency component in rectified output is developed across diode load resistor **R9** and passed via **C22** and manual volume control **R10** to grid of triode section, which operates as A.F. amplifier.

Provision is made for the connection of a gramophone pick-up across **R10** via **S22,** which closes in the gram position of the waveband switch control. In this position **S1, S10, S11** and **S20** close and **S21** opens to prevent radio break-through. In



Circuit diagram of the Invicta 33 and 58 ARG, with a section diagram (right) showing the principal differences in the A.C./D.C. version, model 75. Other differences are indicated by broken line additions, showing where isolating capacitors are added in the aerial and eart circuits.

the A.C./D.C. model, the pick-up sockets are isolated from the chassis by **C38** and **C39,** the former also providing isolation for the **A** and **E** sockets.

Second diode of **V3** is fed from **V2** anode via **C21** and the resulting D.C. potential developed across **R13** is fed back as bias to **V1** and **V2** giving automatic gain control.

Resistance-capacitance coupling by **R12, C24** and **R15** between **V3** triode and pentode output valve **(V4, Mullard EL41** (A.C. model) or **UL41** (A.C./D.C.)**).** Fixed tone correction by **C25** in anode circuit. Three-position tone control by **S23-S26** and **C27, R21** which vary the frequency characteristic of the negative feed-back network **R18, R19, R20** between **T1** secondary winding and **V3** cathode circuit. In the A.C./D.C. model the feed-back path is via **C44** and **R30,** between **V4** anode and grid circuits, and its frequency characteristic is modified by **S28, S29** and **C43.**

In the A.C. model, H.T. current is supplied by full-wave I.H.C. rectifying valve **(V5, Mullard EZ40).** Smoothing by **R22** and electrolytic capacitors **C28, C29.** In the A.C./D.C. model, H.T. current is supplied by half-wave I.H.C. rectifying valve **(V5, Mullard UY41).** Smoothing by choke **L21** and electrolytic capacitors **C48, C49.** Valve heaters, together with ballast resistor **R32,** scale lamps and shunt **R34,** are connected in series across the mains input.

COMPONENTS AND VALUES

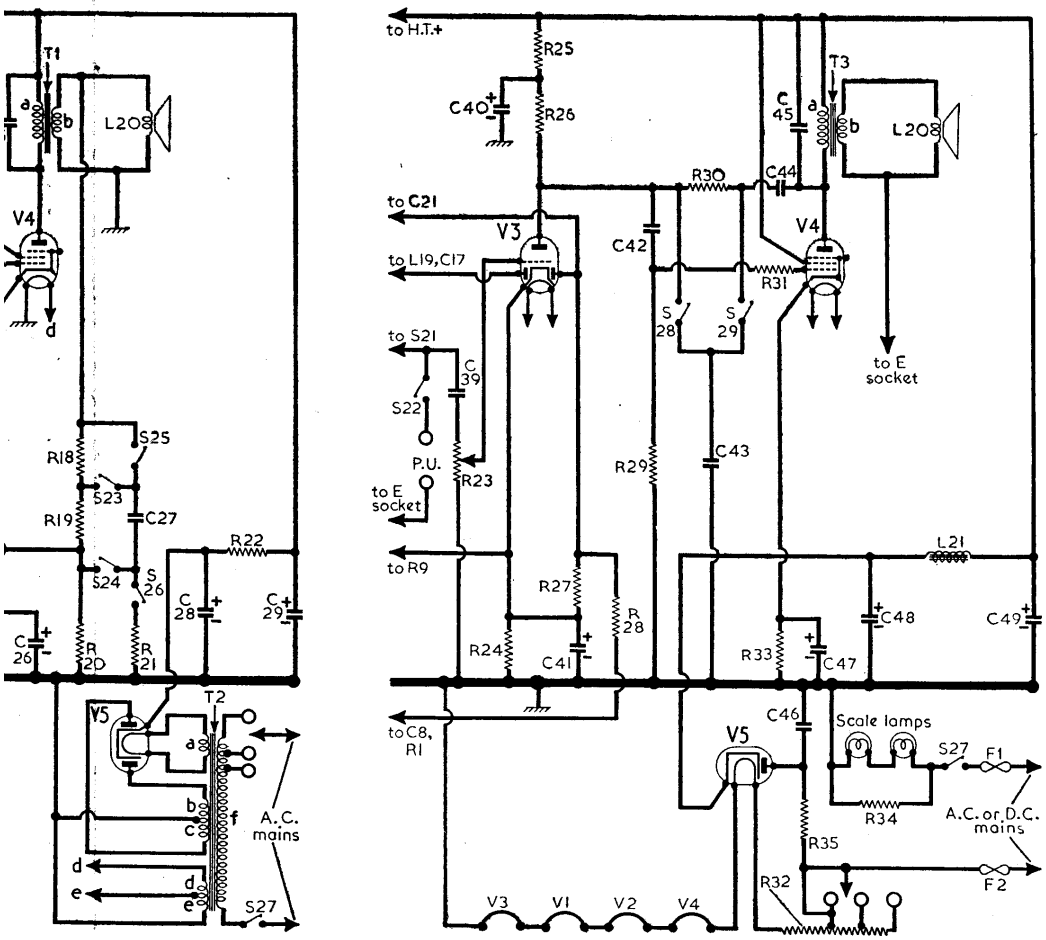
	RESISTORS	Values	Locations
R1	V1 C.G.	680kΩ	G3
R2	V1 G.B.	220Ω	G3
R3	V1 osc. C.G. ...	47kΩ	G3
R4	Osc. anode feed ...	22kΩ	G3
R5	S.G. H.T. pot.	33kΩ	F3
R6	divider ...	33kΩ	F3
R7	V2 G.B.	†330Ω	F3
R8	I.F. stopper ...	47kΩ	F3
R9	Signal diode load ...	680kΩ	E3
R10	Volume control ...	1MΩ	D2
R11	H.T. decoupling ...	47kΩ	E2
R12	V3 anode load ...	100kΩ	E3
R13	A.G.C. diode load ...	1MΩ	E3
R14	A.G.C. decoupling	1MΩ	E3
R15	V4 C.G.	680kΩ	E3
R16	V4 C.G. stopper ...	100kΩ	E3
R17	V4 G.B.	180Ω	E2
R18	Part tone control	2·2kΩ	D3
R19	Part tone control	2·2kΩ	D3
R20	Part tone control	1kΩ	E3
R21	Part tone control	2·2kΩ	D3
R22	H.T. smoothing ...	1·5kΩ	D2
R23	Volume control ...	1MΩ	—
R24	V3 G.B.	1kΩ	—
R25	H.T. decoupling ...	47kΩ	—
R26	V3 anode load ...	100kΩ	—
R27	A.G.C. diode load ...	1MΩ	—
R28	A.G.C. decoupling	1MΩ	—
R29	V4 C.G.	680kΩ	—
R30	Part tone control ...	1MΩ	—
R31	V4 C.G. stopper ...	100kΩ	—
R32	Ballast resistor ...	*1,100Ω	—
R33	V4 G.B.	180Ω	—
R34	Scale lamp shunt ...	68Ω	—
R35	V5 surge limiter ...	150Ω	—

* Tapped at 850Ω+125Ω+125Ω from V5 heater.
† 220Ω in A.C./D.C. model.

	CAPACITORS	Value	Locations
C1	L.W. aerial shunt ...	100pF	F2
C2	L.W. aerial trim. ...	110pF	F2
C3	V1 C.G.	100pF	G2
C4	1st I.F. trans.	125pF	A1
C5	tuning	125pF	A1
C6	V1 cath. by-pass ...	0·05μF	G3
C7	V1 osc. C.G. ...	100pF	G2
C8	A.G.C. decoupling	0·02μF	G3
C9	S.W. osc. tracker ...	0·005μF	F2
C10	T.W. osc. tracker ...	0·0017μF	G2
C11	M.W. osc. tracker ...	500pF	F2
C12	L.W. osc. tracker	220pF	F2
C13	L.W. osc. trimmer	150pF	F2
C14	Osc. anode coup. ...	100pF	G3
C15	S.G. decoupling ...	0·03μF	F3
C16	2nd I.F. trans.	125pF	B1
C17	tuning	125pF	B1
C18	V2 cath. by-pass ...	0·05μF	F3
C19	I.F. by-passes ...	100pF	F3
C20		100pF	F3
C21	A.G.C. coupling ...	22pF	E3
C22	A.F. coupling ...	0·01μF	F3
C23*	H.T. smoothing ...	2μF	E3
C24	A.F. coupling ...	0·02μF	E3
C25	Tone corrector ...	0·01μF	E2
C26*	V4 cath. by-pass ...	25μF	C1
C27	Part tone control ...	0·1μF	D3
C28*	H.T. smoothing ...	32μF	C1
C29*		32μF	C1
C30‡	S.W. aerial trim. ...	30pF	F2
C31‡	T.W aerial trim....	30pF	G2
C32‡	M.W. aerial trim....	30pF	F2
C33†	Aerial tuning ...	—	A1
C34‡	S.W. osc. trim. ...	30pF	F2
C35‡	T.W. osc. trim. ...	30pF	G2
C36‡	M.W. osc. trim. ...	30pF	F2
C37†	Oscillator tuning ...	—	A1
C38	Earth isolator ...	0·1μF	—
C39	A.F. coupling ...	0·01μF	—
C40*	H.T. smoothing ...	2μF	—
C41*	V3 cath. by-pass ...	50μF	—
C42	A.F. coupling ...	0·02μF	—
C43	Part tone control ...	0·02μF	—
C44		0·001μF	—
C45	Tone corrector ...	0·005μF	—
C46	Mains R.F. by-pass	0·02μF	—
C47*	V4 G.B.	25μF	—
C48*	H.T. smoothing ...	32μF	—
C49*		32μF	—
C50	Aerial isolator ...	0·001μF	—

* Electrolytic. † Variable. ‡ Pre set.

	OTHER COMPONENTS	Approx. Values (ohms)	Locations
L1	Aerial coup. coils ...	—	F2
L2		5·0	G2
L3		35·0	F2
L4		200·0	F2
L5	Aerial tuning coils	—	F2
L6		0·5	G2
L7		2·5	F2
L8		15·0	F2
L9	Oscillator reaction coils	—	F2
L10		—	G2
L11		—	F2
L12	Oscillator tuning coils	—	F2
L13		—	G2
L14		2·0	F2
L15		4·5	F2
L16	1st I.F. trans (Pri.	9·0	A1
L17	(Sec.	9·0	A1
L18	2nd I.F. trans. (Pri.	9·0	B1
L19	(Sec.	9·0	B1
L20	Speech coil ...	2·5	—
L21	H.T. smoothing choke	500·0	—
T1	O.P. trans. (A.C. model) a ...	320·0	E2
	b ...	—	
T2	Mains trans a ...	—	
	b ...	310·0	
	c ...	310·0	C1
	d ...	—	
	e ...	—	
	f, total ...	20·0	
T3	O.P. trans (A.C./D.C. model) a	320·0	
	b	—	—
F1, F2	1A fuses	—	—
S1-S22	Waveband switches	—	G2
S23-S26	Tone switches ...	—	D3
S27	Mains s.w., g'd. R10	—	D2
S28, S29	Tone switches ...	—	—



VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating from 235 V A.C. mains with the voltage adjustment set to the V tapping. The receiver was switched to M.W. and the gang turned to maximum, but there was no signal input.

Voltages were measured with an Avo Electronic Test Meter, and as this instrument has a high internal resistance allowance should be made for the current drawn by other types of meter. Chassis was the negative connection in every case. The manufacturers quote the H.T. line voltage in the A.C./D.C. model as 140 V.

Valves	Anode		Screen		Cath.
	V	mA	V	mA	V
V1 ECH42	250 (Oscillator 115)	1·0 (6·0)	68	2·0	2·6
V2 EF41	250	4·4	68	3·4	1·8
V3 EBC41	110	1·0	—	—	0·8
V4 EL41	245	31·0	250	4·6	6·5
V5 EZ40	280*	—	—	—	330·0

* A.C. reading, each anode.

GENERAL NOTES

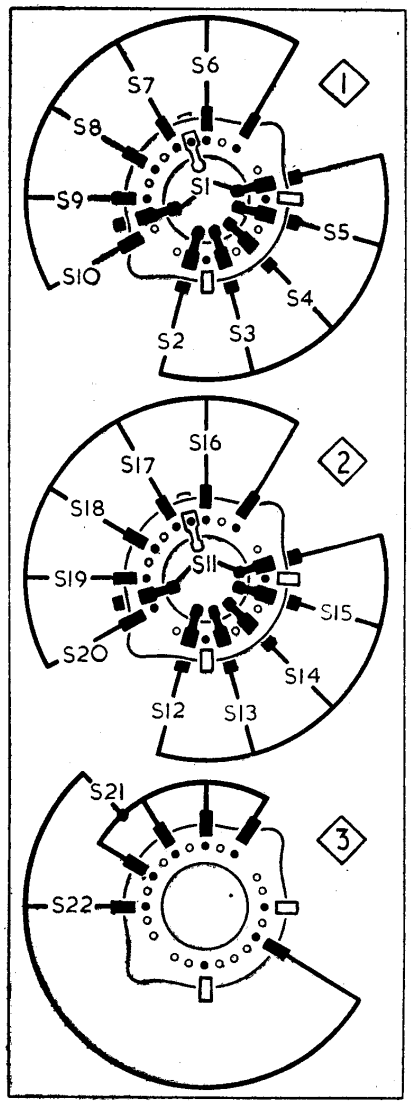
Switches.—S1-S20 are the waveband switches, and **S21, S22** are the radio/gram change-over switches, ganged in three rotary units beneath the chassis. These are indicated in our underside view of the chassis, and are shown in detail in the diagrams in col. 2, where they are drawn as seen when viewed from the rear of an inverted chassis.

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

S23-S26 are the tone control switches, in a 3-position unit mounted at the rear of the chassis. This is indicated in our underside chassis illustration, and shown in detail in the diagram in col. 4, where it is drawn as seen from the front of an inverted chassis.

In the brilliant tone position (control knob in fully anti-clockwise position, when viewed from the rear) **S23** and **S26** close. In the next position all four switches are open. In the fully clockwise position **S24** and **S25** close for deepest tone. In the A.C./D.C. version, **C28** closes for deepest tone, and **C29** for brilliant.

S27 is the Q.M.B. mains switch, ganged with the volume control **R10.**



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

Diagrams of the waveband and radio/gram change-over switches, as seen from the rear of an inverted chassis. On the right is the associated table.

Scale Lamps.—In the A.C. model, these are two M.E.S.-type lamps, with small, clear, spherical bulbs, rated at 6.5 V, 0.3A. In the A.C./D.C. version the lamps are of similar design, but they are rated at 3.5 V, 0.15A, and they are shunted by a 68 Ω resistor. As these lamps are connected directly in series with the mains lead to the receiver they will be energized by the total current taken by the receiver, including the H.T. current.

Low-voltage Mains.—The A.C./D.C. receiver can be operated from mains of 100-130 V if the heater ballast resistor is suitably modified. This is done by connecting together the lowest two tags on the ballast resistor **R32,** short-circuiting the 850 Ω section. This leaves the three voltage adjustment tappings still in circuit, and the readings on the voltage adjustment plug panel are then halved.

Fuses.—The A.C./D.C. version is provided with a fuse in the mains lead. These fuses are of the standard 1¼in glass type, rated at 1A (dark blue spot).

Chassis Divergencies.—R12 and **R16** were quoted in the makers' manual as being 91 kΩ, but owing to conditions of availability they were both 100 kΩ in our chassis. Similarly, **R7** might be 220 kΩ.

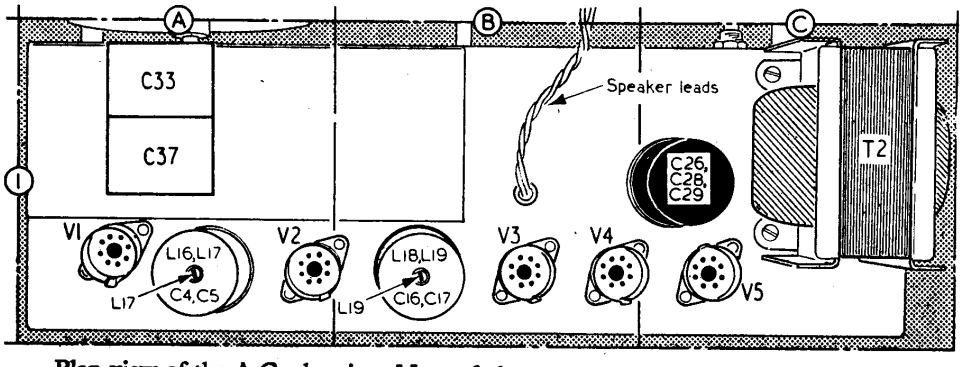
In early versions the negative feed-back circuit in model 33 was different from that shown in our diagram. A 4.7 kΩ resistor was inserted in the lead from **R10** to chassis, and the junction of **R19** and **S24** went to the junction of **R10** and the 4.7 kΩ, instead of to **V3** cathode. **R20** was still **V3** cathode resistor, but it was by-passed by a 50 μF electrolytic capacitor.

ASSOCIATED MODELS

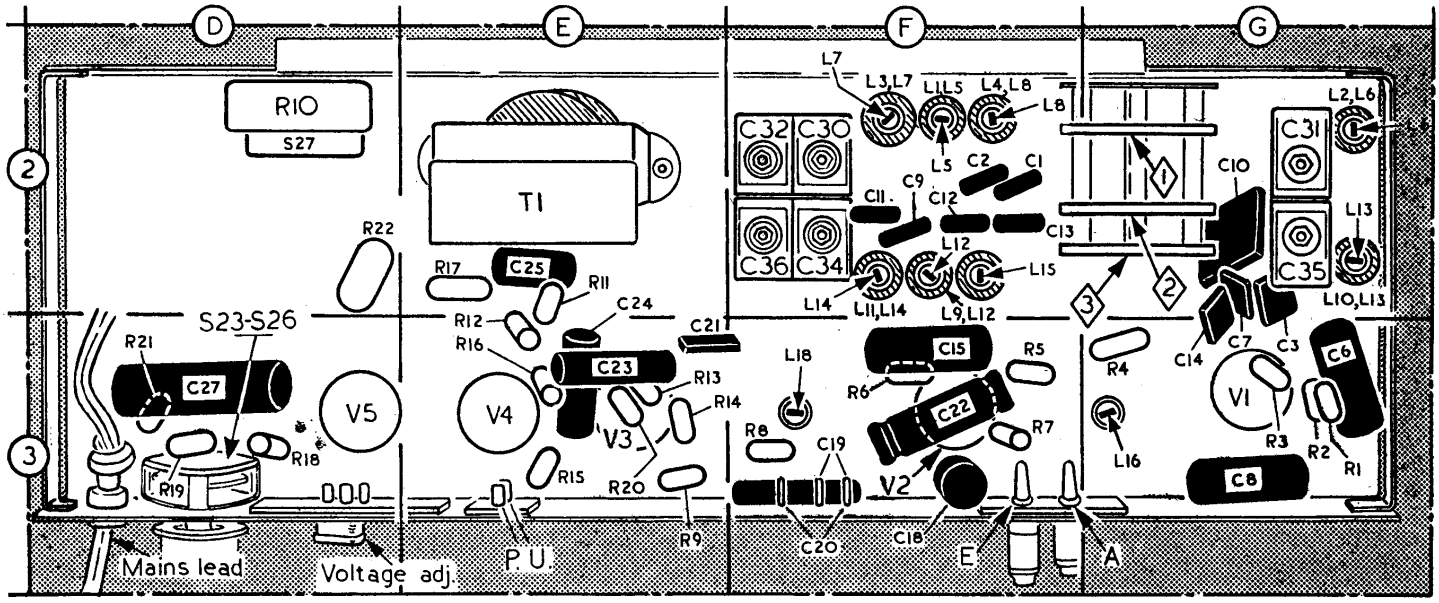
Our sample receiver was a model 33, which operates from A.C. mains only. The differences in the A.C./D.C. version, **model 75,** are explained as they arise throughout the *Service Sheet,* but in general they concern only the aerial input circuits (which are isolated from the mains) and the A.F., output and power circuits. These differences are shown quite clearly in a section diagram on the left and right of our main circuit diagram overleaf. They were drawn from information supplied by the makers.

Model 34 is an export model using a model 33 chassis with a 3-band tuning unit in place of the 4-band one in the 33, and with a mains voltage range of 110-250 V. The wavebands are designated S.W.1 (25-60 m), S.W.2 (12-27 m) and M.W. The M.W. band is like that in the 33, except that **C11** is 570 pF instead of 500 pF and the trimmers are 50 pF instead of 30 pF.

The circuitry of the two S.W. bands is the same as in our diagram except for a 570 pF tracker in series with **L5** (S.W.1) and a 22 pF fixed trimmer across **C31** (S.W.2), but all trimmers are 50 pF.



Plan view of the A.C. chassis. Most of the components are on the underside.



Underside view of the A.C. chassis. Diagrams of the waveband switch units numbered **1, 2, 3** in diamonds appear in col. 2.

S.W.1 tracker is 570 pF, and S.W.2 tracker is 0.004 μF. Instructions for the alignment of the two S.W. bands is given after the full alignment for model 33. M.W. alignment is the same as for model 33.

Model 58 is an autoradiogram employing a chassis like that in the model 33,

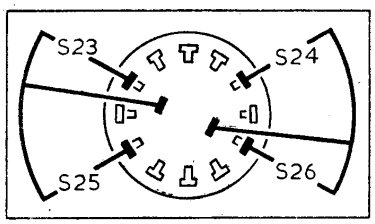


Diagram of the tone control switch unit.

but in some cases the tone control circuit is like that in the model 75. Like the 33, its tone control circuit has been modified recently, so that it is like that in our sample chassis. Previously it was the same as in early 33 chassis, and before that it was like that in the 75 chassis. The 3-speed motor is a B.S.R. "Monarch."

CIRCUIT ALIGNMENT

All the core and trimmer adjustments are easily accessible upon removing the base cover (two wood screws) and back cover (two clips).

I.F. Stages.—Switch receiver to L.W. and turn gang to maximum. Connect signal generator output, via an 0.1 μF capacitor in each lead, to control grid (pin 6) of **V1** and chassis. Feed in a 420 kc/s (714.3 m) signal and adjust the cores of **L19** (location reference B1), **L18** (F3), **L17** (A1) and **L16** (G3) for maximum output. Repeat these adjustments.

R.F. and Oscillator Stages.—As the tuning scale is fixed to the cabinet, the following alignment should be carried out with the chassis in the cabinet. Check that with the gang at maximum capacitance, the cursor coincides with the short vertical mark at the right-hand end of the M.W. tuning scale. Transfer signal generator leads to **A** and **E** sockets.

L.W.—Switch receiver to L.W., tune to 1,428.5 m, feed in a 1,428.5 m (210 kc/s) signal and adjust the cores of **L15** (F2) and **L8** (F2) for maximum output. Repeat these adjustments.

M.W.—Switch receiver to M.W., tune to 200 m, feed in a 200 m (1,500 kc/s) signal and adjust **C36** (F2) and **C32** (F2) for maximum output. Tune receiver to 500 m, feed in a 500 m (600 kc/s) signal and adjust the cores of **L14** (F2) and **L7** (F2) for maximum output. Repeat these adjustments.

T.W.—Switch receiver to trawler band, tune to 90 m, feed in a 90 m (3.3 Mc/s) signal and adjust **C35** (G2) and **C31** (G2) for maximum output. Tune receiver to 200 m, feed in a 200 m (1,500 kc/s) signal and adjust the cores of **L13** (G2) and **L6** (G2) for maximum output. Repeat these adjustments.

S.W.—Switch receiver to S.W., tune to 15 m, feed in a 15 m (20 Mc/s) signal and adjust **C34** (F2) and **C30** (F2) for maximum output. Tune receiver to 37.5 m, feed in a 37.5 m (8 Mc/s) signal and adjust the cores of **L12** (F2) and **L5** (F2) for maximum output. Repeat these adjustments.

MODEL 34 (Export)

S.W.1.—The range of this band is 25-60 m. Adjust aerial and oscillator trimmers at 25 m (12 Mc/s) for maximum output, and adjust the cores of **L5** and **L12** at 60 m (5 Mc/s). Repeat these adjustments until no improvement can be obtained, and check calibration.

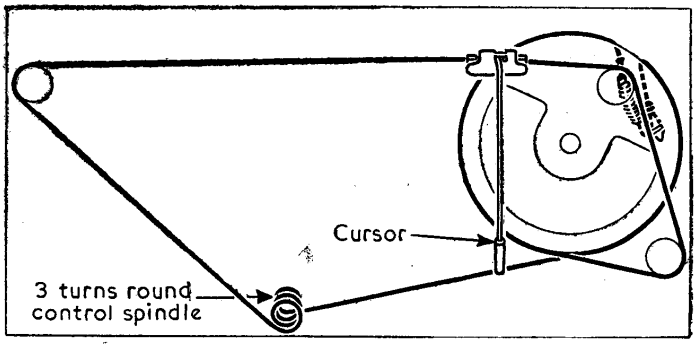
S.W.2.—The range of this band is 11-27 m. Adjust aerial and oscillator trimmers at 12 m (25 Mc/s) for maximum output, and adjust the cores of **L6** and **L13** at 25 m (12 Mc/s). Repeat these adjustments until no improvement can be obtained, and check calibration.

DRIVE CORD REPLACEMENT

About four feet of fine gauge nylon braided glass yarn is required for a new drive cord, which should be run as shown in the accompanying sketch, where the tuning drive system is drawn as seen from the front of the chassis when the gang is at maximum capacitance.

If the cord is fitted with the gang in this position, and the fixed end of the cord is attached to its anchor, the cord can be run while pulling against the gang stop, holding the cord in position. Tie off the finishing end to the tension spring so that the spring is extended to about twice its relaxed length when hooked on to the anchor tag.

The cursor can be fitted afterwards, and it should be finally adjusted as explained under "Circuit Alignment."



Sketch of the tuning drive system, drawn as seen from the front when the gang is at maximum capacitance.

Printed in England by Cornwall Press Ltd., Paris Garden, London, S.E.1.