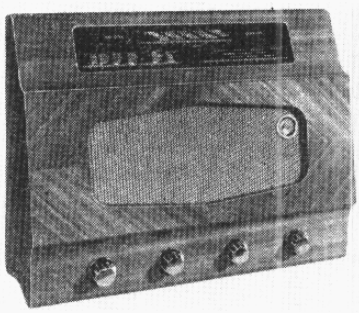
"TRADER" SERVICE SHEET
1154

MURPHY A186

Covering Welwyn and Dublin versions and the A186R Radiogram



The appearance of the Welwyn and Dublin versions of the Murphy A186.

EMPLOYING Bandpass tuning on the medium and long wavebands the Murphy A186 is a 4-valve (plus rectifier and tuning indicator) 3-band superhet, designed to operate from A.C. mains of 200-250 V, 50-100 c/s. The waveband ranges are 15.4-53 m, 184-577 m and 967-2,053 m.

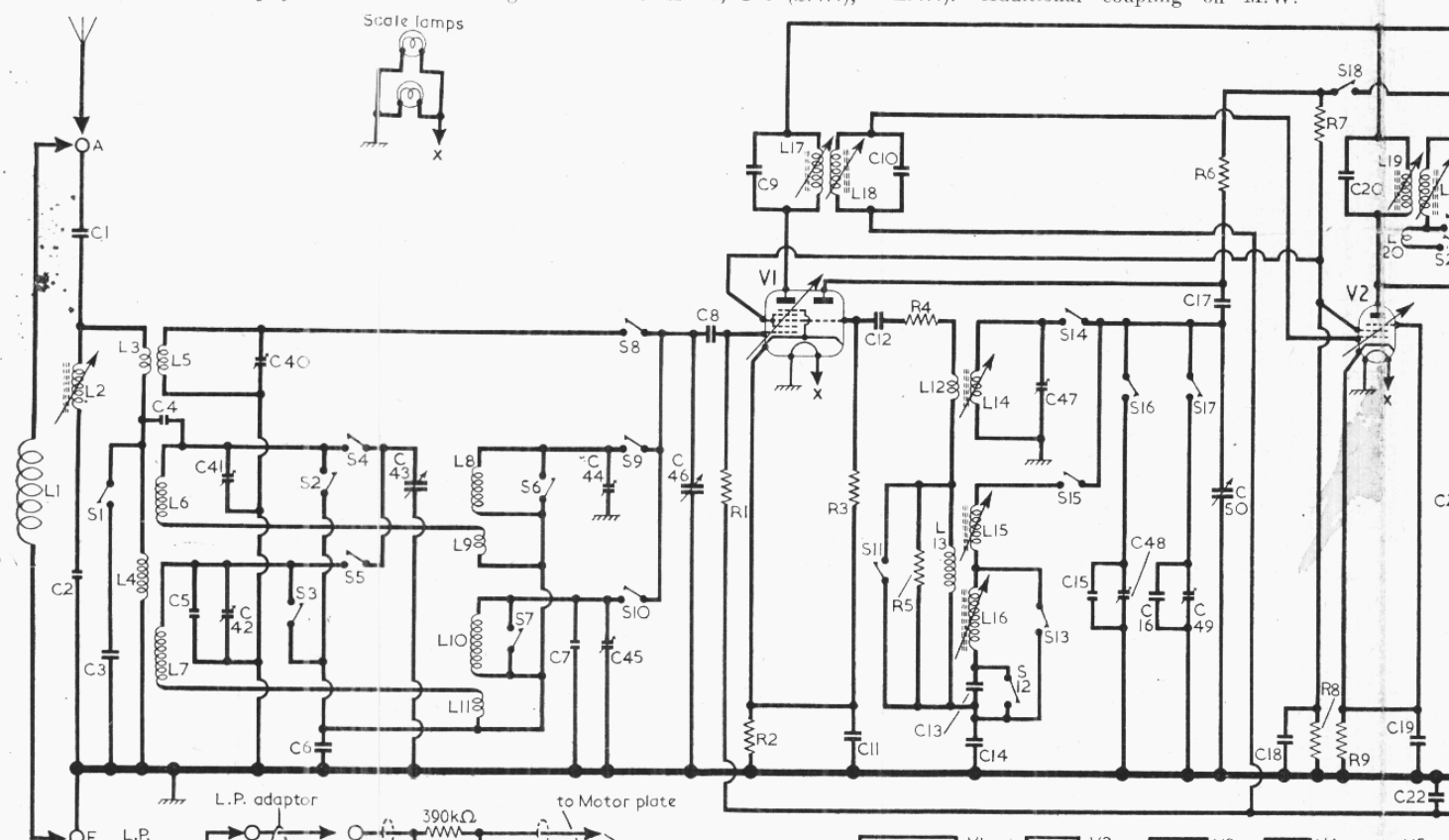
One version of the A186 was made at Welwyn, and the other, containing small differences, was made in Dublin. A radiogram version, model A186R, was produced in Dublin only.

Release dates and original prices. Welwyn model: May 1951, £27 10s 5d, plus purchase tax. Dublin models: A186, November 1951, £28 15s; A186R, November 1951, £66 18s.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L3, L4** to single tuned circuits **L5, C46** (S.W.), **L6, C43** (M.W.) and **L7, C43** (L.W.). For M.W. and L.W. operation an extra bandpass tuning stage is employed, the tuned aerial circuits being coupled via **L9, L11,** and the common impedance of **C6,** to the bandpass tuning circuits **L8, C46** (M.W.) and **L10, C46** (L.W.) Provision is made for the connection of a frame aerial **L1** to the **A** and **E** sockets. I.F. rejection in the aerial circuit by **L2, C2.**

First valve **(V1, Mazda 6C9)** is a triode heptode valve operating as frequency changer with internal coupling. Oscillator anode coils **L14** (S.W.), **L15** (M.W.) and **L16** (L.W.) are tuned by **C50.** Parallel trimming by **C47** (S.W.), **C15, C48** (M.W.) and **C16, C49** (L.W.); series tracking by **C14** (M.W.) and **C13, C14** (L.W.). Reaction coupling from grid circuit by **L12** (S.W.) and **L13** (M.W. and L.W.). Additional coupling on M.W.



Circuit diagram of the Murphy A186 receiver, as produced at Welwyn. Another version, produced at Dublin, contains some small differences which ar
circuit melts if the transformer overheats, and open-circuits the mains supply. The H.T. feed resistor **R16** is a special type, design

and L.W. across the common impedance of **C14.**

Second valve **(V2, Mazda 6F15)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C9, L17, L18, C10** and **C20, L19, L21, C21.**

Intermediate frequency 470 kc/s (Dublin model, 465 kc/s).

Diode signal detector is part of double diode triode valve **(V3, Mazda 6LD20).** Audio frequency component in rectified output is developed across **R12, R13** and passed via **C26** and volume control **R15** to grid of triode section. I.F. filtering by **R10** and **C24, C25.** D.C. component developed across **R12, R13** is passed via decoupling circuit **R11, C28** to tuning indicator **(T.I., Mazda 6M1).**

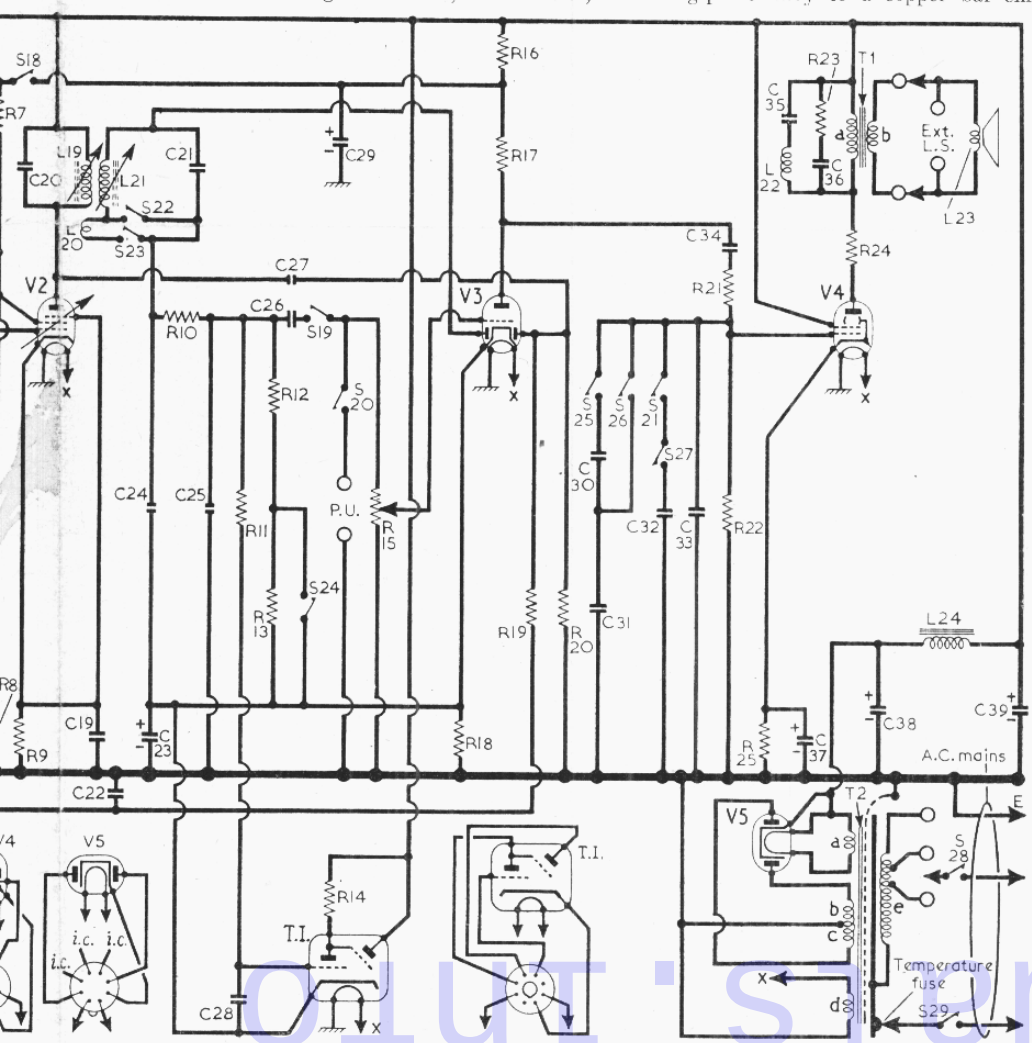
Second diode of **V3** is fed from **V2** anode via **C27,** and the resulting potential, developed across load resistor **R20** is fed back as bias to **V1** and **V2** giving automatic gain control.

Provision is made for the connection of a gramophone pick-up across **R15** via **S20** which closes in the gram position of the waveband control. **S18** and **S19** open in this position to mute the radio section.

In the radiogram version, an RC filter, shown in the lower left-hand corner of the circuit diagram, is connected in series with the pick-up. A separate adaptor is also used in series with each of the heads to equalize their output responses.

Resistance-capacitance coupling by **R17, C34, R21** and **R22** between **V3** and pentode output valve **(V4, Mazda 6P25).** Four-position tone control by switches **S22-S27** which shunt capacitors **C30, C31** and **C32** across **V4** control grid circuit and broaden the I.F. bandwidth by increasing the coupling between **L19** and **L21** via **L20.** To offset the rise in gain which occurs when **L20** is switched into circuit, diode load resistor **R13** is short-circuited. Fixed tone correction in **V4** anode circuit by **R23, C36.** The primary of the output transformer **T1** is also shunted by a 9 kc/s whistle filter **C35, L22.** Provision is made for the connection of a low impedance external speaker across **T1** secondary by sockets in the internal speaker plugs.

H.T. current is supplied by I.H.C. full-wave rectifying valve **(V5, Mazda UU9).** Smoothing by choke **L24** and electrolytic capacitors **C38, C39.** The temperature fuse in the mains input circuit consists of a spring contact, which is held by a low-melting-point alloy to a copper bar embedded in the mains transformer **T2** near the primary winding. One side of the mains is connected to the transformer primary through the temperature fuse, and if the transformer becomes overheated owing to a component breakdown the copper bar conducts the heat to the fusible alloy and melts it, releasing the spring contact and breaking the input circuit.



nces which are explained overleaf under "General Notes". The temperature fuse in the mains transformer type, designed to open-circuit if a fault in its subsidiary circuits causes it to overheat.

COMPONENTS AND VALUES

	CAPACITORS	Values	Locations
C1	Aerial coupling ...	470pF	A2
C2	I.F. filter tune ...	33pF	A1
C3	S.W. aerial coup.	470pF	H3
C4	M.W. aerial coup.	5·6pF	G3
C5	L.W. aerial trim...	92pF	G3
C6	Bandpass coupling	0·02μF	G4
C7	L.W. bandpass trim.	82pF	G3
C8	V1 C.G.	470pF	G4
C9	1st I.F. trans. tuning	150pF	B2
C10		150pF	B2
C11	V1 cath. by-pass ...	0·04μF	G4
C12	V1 osc. C.G. ...	100pF	G4
C13	L.W. osc. tracker...	390pF	H4
C14	M.W. osc. tracker...	510pF	H4
C15	M.W. osc. trim. ...	22pF	H4
C16	L.W. osc. trim. ...	150pF	H4
C17	V1 osc. anode coup.	100pF	G4
C18	S.G. decoupling ...	0·1μF	G4
C19	V2 cath. by-pass ...	0·04μF	G3
C20	2nd I.F. trans. tuning	150pF	C2
C21		150pF	C2
C22	A.G.C. decoupling	0·04μF	G3
C23*	V3 cath. by-pass ...	50μF	F3
C24	I.F. by-pass ...	47pF	F4
C25		82pF	F4
C26	A.F. coupling ...	0·005μF	F4
C27	A.G.C. coupling ...	47pF	F4
C28	Tuning ind. C.G. ...	0·04μF	C1
C29*	H.T. decoupling ...	16μF	F3
C30	Parts tone control	0·0015μF	F3
C31		0·003μF	F3
C32		500pF	F3
C33		100pF	F4
C34	A.F. coupling ...	0·01μF	F4
C35	Part whistle filter...	820pF	C1
C36	Tone corrector ...	0·02μF	F4
C37*	V4 cath. by-pass ...	50μF	F3
C38*	H.T. smoothing ...	16μF	E4
C39*		32μF	E4
C40‡	S.W. aerial trim. ...	35pF	H3
C41‡	M.W. aerial trim....	35pF	H3
C42‡	L.W. aerial trim.	35pF	H3
C43†	Aerial tuning ...	580pF§	A2
C44‡	M.W. bandpass trim.	35pF	H3
C45‡	L.W. bandpass trim.	35pF	G3
C46†	Bandpass tuning...	580pF§	A1
C47‡	S.W. osc. trim. ...	35pF	G4
C48‡	M.W. osc. trim. ...	35pF	H4
C49‡	L.W. osc. trim. ...	35pF	H4
C50†	Oscillator tuning...	580pF§	A2

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

	RESISTORS	Values	Locations
R1	V1 C.G.	470kΩ	G4
R2	V1 G.B.	330Ω	G4
R3	V1 osc. C.G. ...	22kΩ	G4
R4	Osc. stabilizers ...	82Ω	G4
R5		330Ω	H4
R6	Osc. anode load ...	27kΩ	G4
R7	S.G. H.T. potential divider ...	12kΩ	G4
R8		27kΩ	G4
R9	V2 G.B.	330Ω	G4
R10	I.F. stopper ...	100kΩ	F4
R11	T.I. decoupling ...	2·2MΩ	F4
R12	Signal diode loads	100kΩ	F3
R13		220kΩ	F3
R14	T.I. anode load ...	1MΩ	C1
R15	Volume control ...	1MΩ	E3
R16*	H.T. decoupling ...	2·2kΩ	E4
R17	V3 anode load ...	47kΩ	F4
R18	V3 G.B.	1·5kΩ	F4
R19	A.G.C. decoupling	1MΩ	F4
R20	A.G.C. diode load	1MΩ	F4
R21	Tone corrector ...	100kΩ	F4
R22	V4 C.G.	470kΩ	F4
R23	Tone corrector ...	6·8kΩ	F4
R24	V4 anode stopper...	47Ω	F4
R25	V4 G.B.	180Ω	F4

* Special type: See "Safety Device" under "General Notes" overleaf.

OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Frame aerial ...	10·0	—
L2	I.F. rejector ...	17·0	A1
L3	Aerial coupling coils	—	B1
L4		25·0	B1
L5	Aerial tuning coils	—	B1
L6		4·0	B1
L7		18·0	B1
L8	M.W. and L.W. bandpass secondary coils	4·0	B2
L9		—	B2
L10		18·0	B2
L11		—	B2
L12	Oscillator coupling coils	—	G4
L13		—	H4
L14	Oscillator tuning coils	—	G4
L15		5·0	H4
L16		16·0	H4
L17	1st I.F. trans. Pri.	6·2	B2
L18	1st I.F. trans. Sec.	6·2	B2
L19	2nd I.F. trans. Pri.	6·2	C2
L20	2nd I.F. trans. Sec.	6·2	C2
L21	2nd I.F. trans. Sec.	—	C2
L22	9 kc/s whistle filter	305·0	C2
L23	Speech coil ...	2·5	—
L24	Smoothing choke...	267·0	E4
T1	O.P. trans. a	310·0	C1
	O.P. trans. b	—	
T2	Mains trans. a	—	D2
	Mains trans. b	157·0	
	Mains trans. c	167·0	
	Mains trans. d	—	
	Mains trans. e, total	36·0	
S1-S21	Waveband switches	—	H3
S22-S27	Tone switches ...	—	F3
S28, S29	Mains switches ...	—	F3

CIRCUIT ALIGNMENT

The chassis should be removed from its cabinet for the following alignment adjustments. Turn the volume control to maximum and set the tone control to position 3.

I.F. Stages.—When adjusting the I.F. transformers, a damping unit consisting of a 10 kΩ resistor in series with an 0.01 μF capacitor should be connected, via the shortest possible leads, across one winding while the core of the other is adjusted. Connect output of signal generator, via an 0.01μF capacitor in the "live" lead, to control grid (pin 6) of **V1** and chassis.

Tune receiver to highest wavelength end of M.W., feed in a 470 kc/s (638.3 m) signal and adjust the cores of **L21** (location reference F4), **L19** (C2), **L18** (G4) and **L17** (B2) for maximum output. Repeat these adjustments until no further improvement results.

R.F. and Oscillator Stages.—As the tuning scale remains fixed in the cabinet when the chassis is withdrawn, reference is made during alignment to the substitute tuning scale embossed on the front of the metal drive drum. Readings on this scale are taken against the "V" notch in the metal cursor mounted below the drum. The substitute scale readings are given in brackets after each calibration frequency in the following instructions. Check that with the gang at maximum capacitance, the notch in the metal cursor coincides with 260 on the substitute scale. It should be noted that the gang can turn beyond its maximum capacitance setting, and it should therefore be set to maximum capacitance by inspection, or by holding a straight edge against the gang plates.

On the long and medium wavebands the aerial circuit must be damped while the grid circuit is being trimmed, and vice versa. One end of the damping unit, which consists of a 1 kΩ resistor, should be connected to the junction of **C6, L11,** and the other end to the aerial and grid trimmers in turn as indicated above. Transfer signal generator leads, via a dummy aerial, to **A** and **E** sockets.

M.W.—Switch receiver to M.W., tune to 500 m (300 on scale), feed in a 500 m (600 kc/s) signal and adjust the core of **L15** (A2) for maximum output. Tune receiver to 200 m (66.5 on scale), feed in a 200 m (1,500 kc/s) signal and adjust **C48** (H4), **C44** (H3) and **C41** (H3) for maximum output. Repeat these adjustments until no further improvement results.

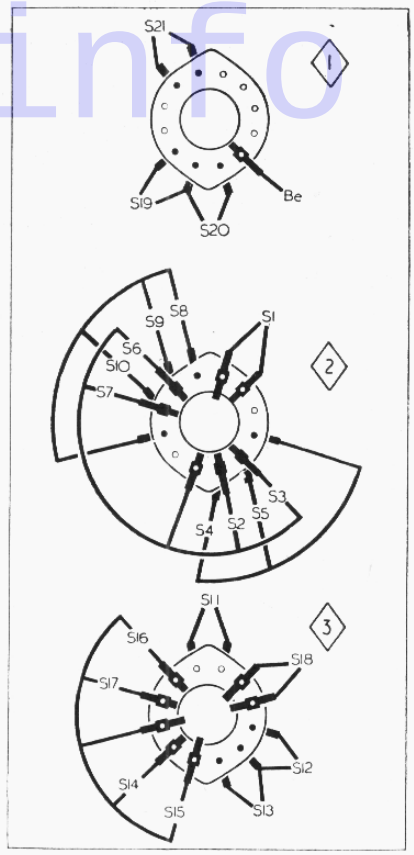
L.W.—Switch receiver to L.W., tune to 1,900 m (287 on scale), feed in a 1,900 m (157.8 kc/s) signal and adjust **L16** (H4) for maximum output. Tune receiver to 1,000 m (66.5 on scale), feed in a 1,000 m (300 kc/s) signal and adjust **C49** (H4), **C45** (G3) and **C42** (H3) for maximum output. Repeat these adjustments until no further improvement results.

S.W.—Switch receiver to S.W., tune to 41.4 m (312 on scale), feed in a 41.4 m (7.25 Mc/s) signal and adjust the core of **L14** (G4) for maximum output. Tune receiver to 16.86 m (65 on scale), feed in a 16.86 m (17.79 Mc/s) signal and adjust **C47** (G4) and **C40** (H3) for maximum output, rocking the gang while adjusting **C40** for optimum results.

I.F. Filter.—The core of **L2** (A1) has been accurately set at the factory and should not need readjustment. If necessary, however, the core can be moved with a non-metallic tool, and should be adjusted for maximum voltage at **V1** or **V2** cathode, feeding a 470 kc/s signal into the **A** and **E** sockets.

Waveband Switch-Table

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

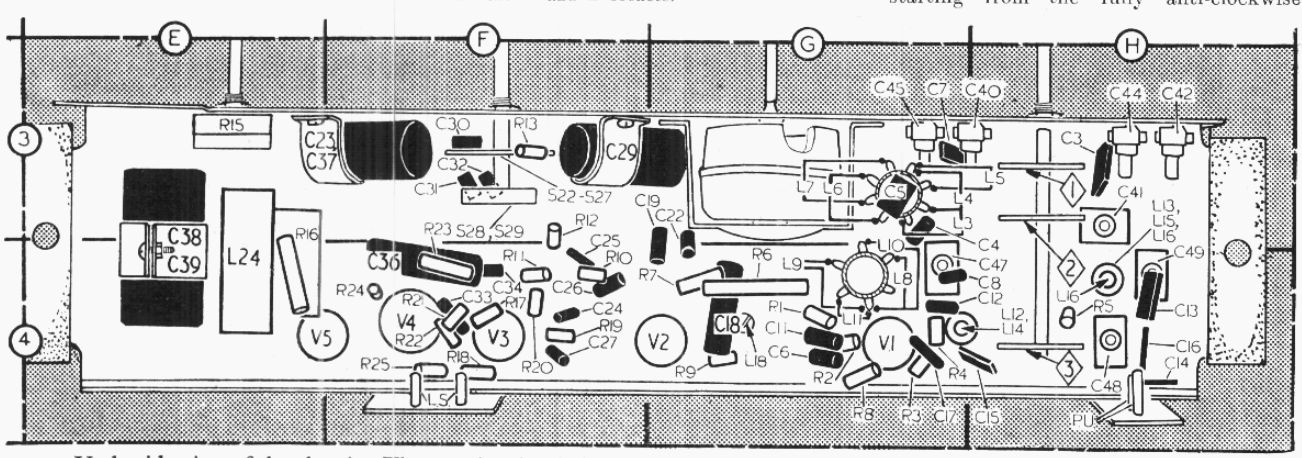


Diagrams of the waveband switch units. On the left is the associated switch table.

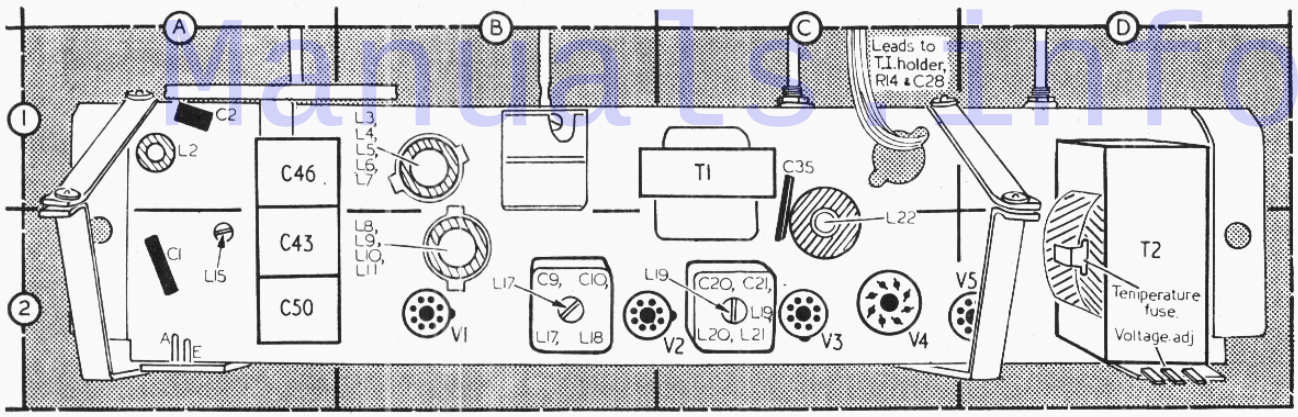
GENERAL NOTES

Switches.—**S1-S21** are the waveband and radio/gram change-over switches, ganged in three rotary units beneath the chassis. These units are indicated in our underside drawing of the chassis, where they are identified by the numbers **1, 2, 3** in diamond surrounds. They are shown in detail in the diagrams above where they are drawn as viewed from the rear of an inverted chassis.

The table beside them gives the switch operations for the four control settings, starting from the fully anti-clockwise



Underside view of the chassis. The waveband switch units are identified by the numbers **1, 2, 3** in diamond surrounds.



Plan view of the chassis. The temperature fuse is shown on the left-hand face of the mains transformer **T2** in location reference D2.

position of the control knob. A dash indicates open, and **C**, closed.

S22-S27 are the tone control switches, ganged in a single 5-position rotary unit beneath the chassis. The unit, which is shown in detail in the diagram below is ganged with the double pole mains switch unit **S28, S29.**

Scale Lamps.—These have small clear spherical bulbs and M.E.S. bases, and are rated at 6.5 V, 0.3 A.

Temperature Fuse.—The operation of the temperature fuse is described in "Circuit Description" overleaf. To reset the spring contact, which is normally held in tension to the heat conducting bar by a low fusing point alloy, it is important to use the correct soldering metal (fusible alloy 0075/1, which can be obtained from the manufacturers) and to apply it with a clean soldering iron that has been filed free of solder. No flux should be used.

Sufficient of the alloy has been deposited during production to permit its re-use several times without a new supply, but the original deposit should not be entirely removed, as the process of applying a new deposit on a cleaned surface is rather specialized.

Safety Device.—The H.T. feed resistor **R16** is so designed that if a fault in the subsidiary H.T. circuits feeding from it causes overheating, it cuts off the H.T. supply. Replacements should be made of the same type (Manufacturers' part No. 25086) and should be fitted in the same position.

Drive Cord Replacement.—Two separate drive cords are used in this receiver, the gang drive cord and the cursor drive cord, and the makers quote the lengths required for replacement as 34in and 63in respectively. To fit a new cord, it is necessary to remove the chassis from its cabinet. Supplies of cord (part No. 2033/5) and springs (part No. 19448) can be obtained from the makers, and the cords should be stretched by hanging a weight of several pounds on them for a few hours before fitting.

It is unimportant which cord is fitted first, but the (shorter) gang drive is the inner one : that is to say, nearer to the chassis. The tension should be such that the springs are extended to about 1in.

Dublin Models.—These chassis were constructed in Dublin and differ from the Welwyn-produced chassis in the following respects. The frame aerial **L1** is not fitted. A twin core mains lead is used, the earth wire being omitted. The intermediate frequency is 465 kc/s.

Radiogram Model, A186R.—The radiogram version employs an A186 Dublin chassis, there being no Welwyn version. It is fitted with a Garrard RC72A record changer, and an RC filter, shown inset in the lower left-hand corner of the circuit diagram, is fitted in series with the pick-up leads.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured on our receiver when it was operating from A.C. mains of 230 V. The receiver was tuned to the highest wavelength end of M.W., with the volume control turned to maximum, but there was no signal input.

Voltage readings were measured with an Avo Electronic TestMeter, and as this instrument has a high internal resistance, allowance should be made for the current drawn by other types. Chassis was the negative connection.

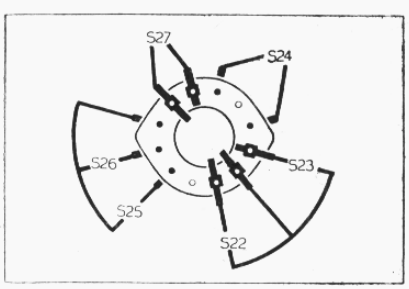
Valves		Anode		Screen		Cath.
		V	mA	V	mA	V
V1	6C9	250 Oscillator 82	2·2 5·0	95	4·0	3·7
V2	6F15	250	6·0	95	1·8	2·2
V3	6LD20	136	1·5	—	—	4·0
V4	6P25	234	38·0	250	7·7	8·6
V5	UU9	253†	—	—	—	268·0

† A.C. reading, each anode.

MODIFICATIONS

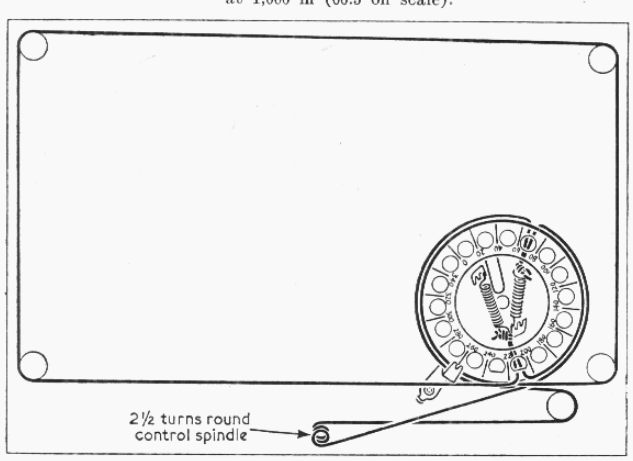
Welwyn Models.—To prevent "squegging" in the oscillator circuit, **R4** has been changed to 100 Ω in later models. Some receivers have been fitted with a Mullard **EM34** tuning indicator in place of the Mazda **6M1.** The I.F. amplifier **V2** may be a Mazda **6F16.** **V6** may be a Mullard **EZ40.** In earlier receivers, the I.F. was 465 kc/s. Alignment on these receivers may be carried out at 465 kc/s or 470 kc/s, whichever involves the fewer whistles.

Dublin Models.—To increase the sensitivity in later models the following changes are made. **C3** is changed to 68 pF. **R17** is changed to 100 kΩ. **V4** is changed to a Mullard **EBC41.** During alignment **L16** and **C45** are adjusted at 1,700 m (315 on scale), **C49** and **C42** are adjusted at 1,000 m (66.5 on scale).



Switches	Off	1	2	3	4
S22	—	C	C	C	—
S23	—	—	—	—	C
S24	—	—	—	—	C
S25	—	—	C	—	—
S26	—	C	—	—	—
S27	—	—	—	C	—

Left : Diagram of the tone control switch unit with, below it, the associated switch table. *Right :* Sketch of the tuning drive system as seen from the front with gang at maximum.



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