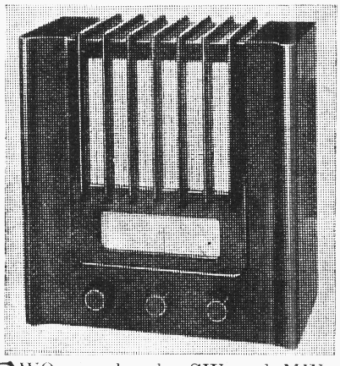
Supplement to The Wireless & Electrical Trader, August 2, 1941

"TRADER" SERVICE SHEET

530

MURPHY AD94



TWO wavebands, SW and MW, are provided in the Murphy AD94, a 4-valve (plus rectifier) AC/DC receiver, designed to operate from mains of 200-250 V, 25-100 C/S in the case of AC. The SW range is 16.7-50 m.

Release date: September, 1940.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (SW) and **L2** (MW) to single-tuned circuits **L3, C23** (SW) and **L4, C23** (MW). Aerial and earth circuit isolated from mains by double wound coils and **C1.**

First valve **(V1, Mazda metallised TH233)** is a triode heptode operating as frequency changer with internal coupling. Oscillator anode coils **L7** (SW) and **L8** (MW) are tuned by **C26.** Parallel trimming by **C27** (SW) and **C25** (MW); series tracking by **C9** (MW). Reaction by grid coils **L5** (SW) and **L6** (MW).

Second valve **(V2, Mazda metallised VP133)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C4, L9, L10, C5** and **C12, L11, L12, C13.**

Intermediate frequency 465 KC/S.

Diode second detector is part of double diode triode valve **(V3, Mazda metallised HL133DD).** Audio frequency component in rectified output is developed across load resistance **R9** and passed via **C15,** manual volume control **R10** and stopper **R12** to CG of triode section.

DC potential across **R9** is fed back through decoupling circuit as GB to FC and IF valves, giving AVC.

Resistance-capacity coupling by **R13, C17** and **R14** between **V3** triode and beam tetrode output valve **(V4, Mazda Pen 383).** Fixed tone correction by **C18.**

With AC mains, HT current is supplied by half-wave rectifying valve **(V5, Mazda metallised U403)** which, with DC mains, behaves as a low resistance. Smoothing by speaker field **L15** and **C19, C20.**

Valve heaters, together with pilot lamp and ballast resistance **R20,** are connected across mains input.

GB potential for **V3** triode, and GB for **V4** in addition to that dropped across **R16,** are obtained from drop along **R17** in HT negative lead to chassis.

VALVE ANALYSIS

Valve voltages and currents given in the table (col. 3) are those measured in our receiver when it was operating on mains of 234 V, using the 220-230 V tapping on the mains resistance. The receiver was tuned to the lowest wavelength on the MW band and the volume control was at maximum; there was no signal input.

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

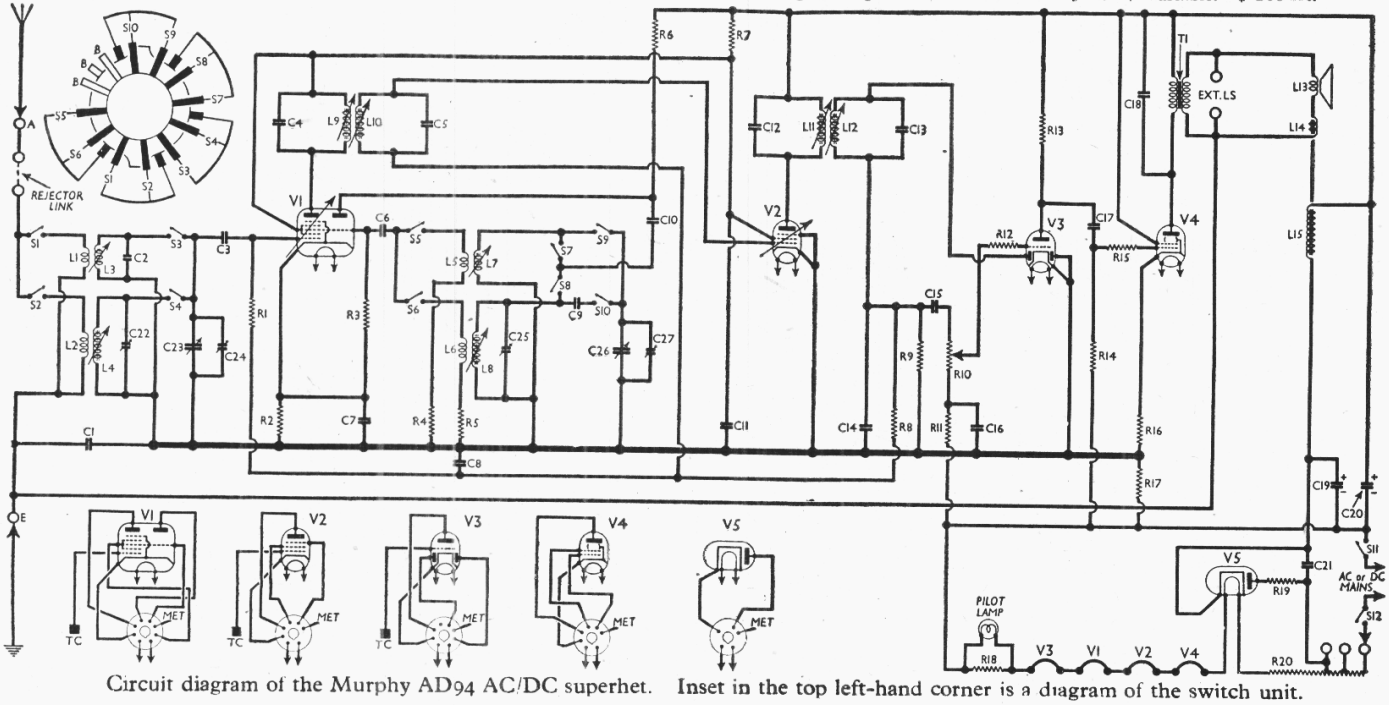
Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TH233	107 Oscillator 66	1·4 — 4·2	107	4·3
V2 VP133	143	2·9	107	0·5
V3 HL133DD	64	0·6	—	—
V4 Pen 383	130	45·0	143	8·9
V5 U403	215†	—	—	—

† Cathode to chassis, DC.

COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Mains isolating condenser	0·007
C2	Aerial SW fixed trimmer...	0·000015
C3	V1 Heptode CG condenser	0.0005
C4	1st IF transformer tuning condensers	0·000139
C5		0·00015
C6	V1 osc. CG condenser ...	0·0002
C7	V1 cathode by-pass ...	0·05
C8	AVC line decoupling ...	0.05
C9	Osc. circuit MW tracker...	0·0007
C10	V1 osc. anode coupling ...	0·0001
C11	V1, V2 SG's decoupling ...	0·05
C12	2nd IF transformer tuning condensers	0·000139
C13		0·00015
C14	IF by-pass	0·0002
C15	AF coupling to V3 triode	0·025
C16	V3 triode CG decoupling...	0·1
C17	V3 triode to V4 coupling...	0·025
C18	Fixed tone corrector ...	0·02
C19*	HT smoothing condensers	32·0
C20*		32·0
C21	Mains RF by-pass ...	0·04
C22‡	Aerial circ. MW trimmer...	0·000035
C23†	Aerial circuit tuning ...	—
C24‡	Aerial circ. SW trimmer...	—
C25‡	Osc. circuit MW trimmer	0·000035
C26†	Oscillator circuit tuning ...	—
C27‡	Osc. circuit SW trimmer...	—

* Electrolytic. † Variable. ‡ Pre-set.



Circuit diagram of the Murphy AD94 AC/DC superhet. Inset in the top left-hand corner is a diagram of the switch unit.

	RESISTANCES	Values (ohms)
R1	V1 Heptode CG resistance	1,000,000
R2	V1 fixed GB resistance ...	300
R3	V1 osc. CG resistance ...	22,000
R4	SW reaction damping ...	47
R5	MW reaction damping ...	470
R6	V1 osc. anode HT feed ...	15,000
R7	V1, V2 HT feed resistance	5,100*
R8	AVC line decoupling ...	2,200,000
R9	V3 signal diode load ...	470,000
R10	Manual volume control ...	1,000,000
R11	V3 triode CG decoupling...	1,500,000
R12	V3 triode grid stopper ...	270,000
R13	V3 triode anode load ...	47,000
R14	V4 CG resistance... ...	470,000
R15	V4 grid stopper	47,000
R16	Part V4 GB resistance ...	140
R17	V3 triode and V4 GB ...	20†
R18	Pilot lamp shunt ...	15
R19	V5 anode surge limiter ...	47
R20	Heater circuit ballast ...	574‡

* Approx : 12,000 O + 9,000 O in parallel.
† Two 40 O resistances in parallel.
‡ Tapped at 405 O + 84·5 O + 84·5 O from V5 heater.

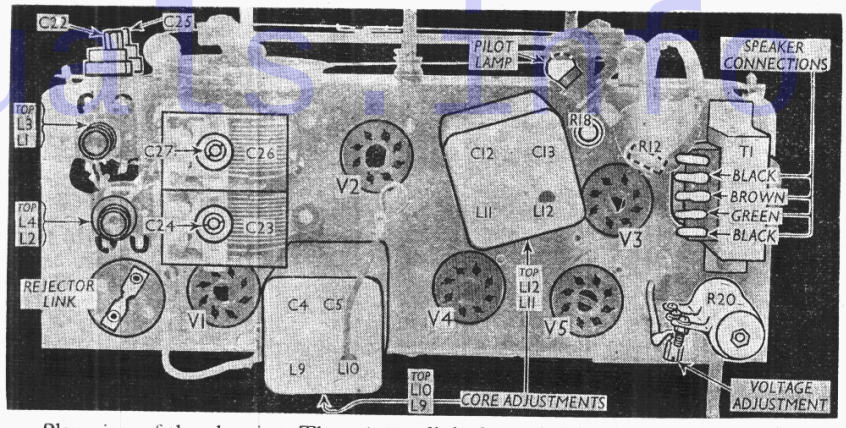
	OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial SW coupling coil		0·15
L2	Aerial MW coupling coil		0·6
L3	Aerial SW tuning coil...		Very low
L4	Aerial MW tuning coil		2·3
L5	Oscillator SW reaction		0·05
L6	Oscillator MW reaction		0·8
L7	Osc. circ. SW tuning coil		Very low
L8	Osc. circ. MW tuning coil		1·3
L9	1st IF trans.	Pri. ...	6·0
L10		Sec. ...	6·0
L11	2nd IF trans.	Pri. ...	6·0
L12		Sec. ...	6·0
L13	Speaker speech coil ...		4·0
L14	Hum neutralising coil ...		0·1
L15	Speaker field coil ...		900·0
T1	Output trans.	Pri. ...	270·0
		Sec. ...	1·2
S1-S10	Waveband switches ...		—
S11, S12	Mains switches, ganged R10		—

GENERAL NOTES

Switches.—**S1-S10** are the waveband switches, in a single rotary unit beneath the chassis. It is indicated in our under-chassis view, and shown in detail in the top left-hand corner of the circuit diagram. **S1, S3, S5, S7** and **S9** are closed on SW and open on MW; **S2, S4, S6, S8, S10** are closed on MW and open on SW.

S11, S12 are the QMB mains switches, ganged with the volume control **R10.**

Coils.—**L1-L4** are the aerial coils in two unscreened units on the chassis deck, and **L5-L8** two oscillator units beneath the chassis. All have adjustable cores, and the adjustments are indicated in our under-chassis view.



Plan view of the chassis. The rejector link short-circuits the rejector sockets.

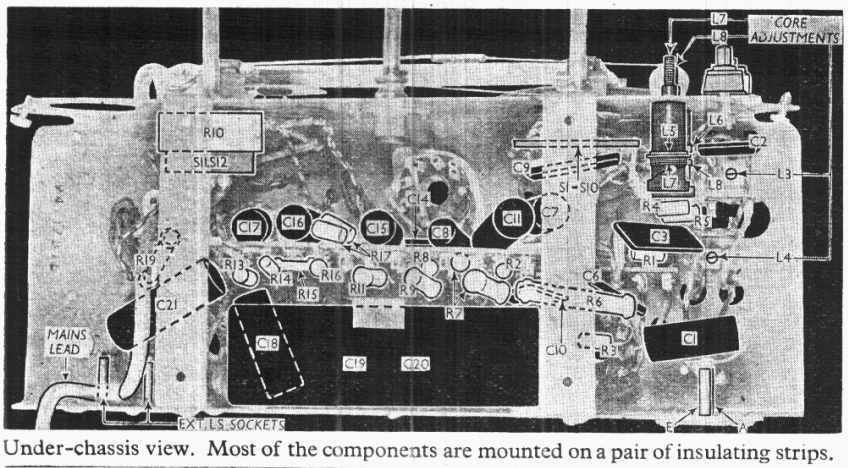
The IF transformers **L9, L10; L11, L12** are in two screened units on the chassis deck with their fixed tuning condensers. Their iron-dust core adjustments are approximately indicated in our plan view.

Pilot Lamp.—This is an Osram MES type, rated at 3.5 V, 0.15 A, with a clear spherical bulb. It is mounted with its shunt **R18** on a removable paxolin holder.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (4-8 O) external speaker. The sockets are in metallic contact with the earth socket, and are isolated from the mains.

Condensers C19, C20.—In our chassis, these two electrolytics were both 32 μF condensers in a single rectangular carton. Their positive leads were red, and the common negative black. Originally, two 16 μF condensers were employed, and they were in a tubular cardboard container which lay horizontally beneath the chassis at right-angles to the block in our under-chassis view, so that one end projected through the front chassis member, upon which it was mounted below **T1.**

Chassis Divergencies.—Several changes from the original design were incorporated in our chassis, and others have been introduced since our chassis was made. Originally, **C18** was 0.025 μF, **C1** was 0.01 μF, and **C2** was 0.00001 μF. The pilot lamp and **R18** were omitted



Under-chassis view. Most of the components are mounted on a pair of insulating strips.

In chassis later than ours, **R2** and **C7** may be deleted, and fixed GB for **V1** and **V2** is obtained via the AVC line by "splitting" the chassis line between **V1, V2** and **V3, V4** and inserting an 80 O resistance in the gap. **C1** may go to the chassis end of the mains instead of directly to chassis. **C11** may be 0.005 μF, as may also **C15** and **C17.** **R14** may be 1,000,000 O.

CIRCUIT ALIGNMENT

IF Stages.—Unless an oscilloscope is used, it is essential to damp the transformer primary while trimming the secondary, and vice versa. The damping shunt could consist of a 50,000 O resistance and a 0.05 μF condenser in series. Connect signal generator to control grid (top cap) of **V2** and chassis via a 0.1 μF condenser, and turn volume control to maximum.

Connect damping shunt between **V2** anode and chassis, feed in a 465 KC/S (645.16 m) signal, and adjust the core of **L12** for maximum output. Transfer top of shunt to pin 7 of **V3,** and adjust **L11** for maximum. Transfer signal generator lead to **V1** top cap, and top of shunt to **V1** heptode anode; adjust core of **L10** for maximum output. Transfer top of shunt to control grid of **V2,** and adjust **L9** for maximum output.

RF and Oscillator Stages.—With the gang at maximum, the pointer should cover the vertical lines at the right-hand ends of the tuning scales. Connect signal generator to **A** and **E** sockets via a suitable dummy aerial, which should be 400 O for the SW band.

SW.—Switch set to SW, tune to 49 m on scale, feed in a 49 m (6.2 MC/S) signal and adjust **L7** core to correct calibration errors, then **L3** for maximum output. Tune to 17 m on scale, feed in a 17 m (17.6 MC/S) signal, and adjust **C27,** then **C24,** for maximum output. Repeat the 49 m and 17 m adjustments for optimum results.

MW.—Switch set to MW, tune to 500 m on scale, feed in a 500 m (600 KC/S) signal, and adjust **L8** core to correct calibration, then **L4** for maximum output. Tune to 200 m on scale, feed in a 200 m (1,500 KC/S) signal, and adjust **C25,** then **C22,** for maximum output. Repeat the 500 m and 200 m adjustments for optimum results.

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