"TRADER" SERVICE SHEET

A.C./D.C. Midget Superhet

COMPONENTS AND VALUES



▼ ANGED permeability variable tuning is a feature of the Dulci MLU5 receiver a model of "midget" construction designed to operate from A.C. or D.C. mains of 200-250 V. The waveband ranges are 187-540 m and 1,200-2,000 m. It is not fitted with a frame aerial, but is intended to be used with a "throw out" flexible aerial. In conformity with midget practice, no provision is made for an earth connection.

Release date and original price: September 1952 £7 15s plus purchase tax.

CIRCUIT DESCRIPTION

Aerial input via C1 and "bottom" capacitance coupling C2 (M.W.) to inductively tuned aerial coil L1 which has a manually operated irondust core, giving permeability tuning with the fixed tuning capacitor C5 (M.W.) shunted by C4 for L.W. operation. On L.W., also, C2 is shunted by C3.

First valve (V1, Brimar 12BE6) is a heptode operating as frequency changer with electron coupling. The oscillator grid circuit is again permeability-tuned by a manually operated sliding core, which is ganged with the core of L1. On M.W., the oscillator tuned circuit comprises L4, shunted by L2 and the trimmers C11, C23, while L3 is short-circuited; on L.W., (Continued in col. 3)

	CAPACITORS	Values	Leca-
C1 C2	} Aerial couplers {	700pF 470pF	E3 E3
C3	L.W. aerial shunt	$0.004 \mu F$	E3
C4	L.W. aerial tune	$0.002 \mu F$	F3
C5	M.W. aerial tune	35pF	A1
C6	V1 C.G	$75 \mathrm{pF}$	F4
C7	1st I.F. trans.	$100 \mathrm{pF}$	A2
C8	f tuning \	$100 \mathrm{pF}$	A2
C9	A.G.C. decoupling	$0.1 \mu F$	D4
C10	V1 osc. C.G	75pF	F4
C11	M.W. osc. tuning	75pF	A1
C12 C13	L.W. osc. tuning S.G. H.T. decoup.	$120 \mathrm{pF} \\ 0.1 \mu \mathrm{F}$	F3 D4
C14	I.F. coil tuning	$470 \mathrm{pF}$	B2
C15	I.F. by-pass	180pF	E3
C16	Signal diode feed	75pF	B2
C17	1	$0.01 \mu F$	E3
C18	A.F. couplers {	$0.01 \mu F$	$\overline{D3}$
C19*	TI TI amouthing	$32\mu F$	A1
C20*	H.T. smoothing {	$32\mu F$	A1
C21	Mains R.F. by-pass	$0.01 \mu F$	D4
$C22\dagger$	M.W. aerial trim.	-	A1
C23†	L.W. osc. trim	-	A1

* Electrolytic.	† Pre-set
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	RESISTORS	Values	Loca- tions
R1	Aerial shunt	$4.7k\Omega$	E3
R2	V1 C.G	$1M\Omega$	F4
R3	V1 osc, C.G	$22k\Omega$	F4
R4	V1 osc. stabilizer	120Ω	F4
R5	S.G. H.T. feed	$10 \mathrm{k}\Omega$	$\mathbf{F4}$
R6	V2 G.B	68Ω	E4
R7	A.G.C. decoupling	$2 \cdot 2 \mathbf{M} \Omega$	E3
R8	I.F. stopper	$100 \mathrm{k}\Omega$	E3
R9	Volume control	$500 \mathrm{k}\Omega$	E3
R10	V3 C.G	$10M\Omega$	E3
R11	V3 C.G. stopper	$220 \mathrm{k}\Omega$	E3
R12	V3 anode load	$220 \text{k}\Omega$	$\overline{D3}$
R13	V4 C.G	$470 \mathrm{k}\Omega$	D3
R14	V4 G.B	330Ω	$\overline{\mathrm{D4}}$
R15) Neg. feed-back	330Ω	E3
R16	pot. divider	120Ω	E3
R17	H.T. smoothing	2·2kΩ	F4
R18	V5 surge limiter	120Ω	$\overline{D4}$
R19	Ballast resistor	$1.150\Omega^*$	C2
1010			

^{*} Tapped $150\Omega + 865\Omega + 135\Omega$ from V5 heater.

OT	OTHER COMPONENTS		Loca- tions
L1 L2 L3 L4 L5 L6 L7 L8	Aerial tuning M.W. osc. shunt L.W. osc. coil Osc. tuning, total J.F. trans. { Pri. Speech coil O.P. trans. { Pri. Spec	(ohms) 30·0 15·0 8·5 5·6 7·0 7·0 9·5 2·5 280·0	B1 B1 F4 B1 A2 A2 B2 C1
S1-S4 S5	Waveband switches Mains s.w., g'd S1-S4	0.5	F3 F3

Circuit Description-continued

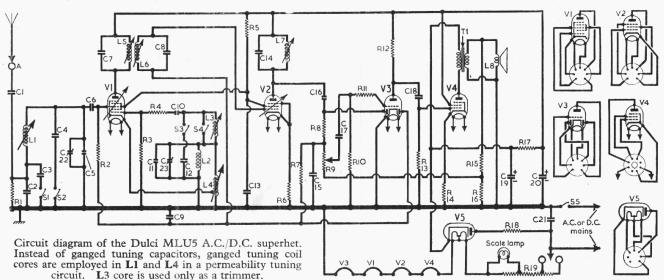
S4 opens and L3 is inserted in series with L2, L4, while the fixed trimmer C12 is added. Reaction coupling is effected by cathode injection via the tapping on L4. Oscillator stabilization by R4. Second valve (V2, Brimar 12BAG) is a variable mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer input and tuned anode output couplings C7, L5, L6, C8 and L7, C14.

Intermediate frequency 422 kc/s.

Diode signal detector is part of double diode triode valve (V3, Brimar 12AT6) and is parallelfed via C16 from V2 anode. Audio frequency component in its rectified output is developed across volume control R9, which acts as diode load, and is passed via C17 and grid stopper R11 to grid of triode section, which operates as A.F. amplifier. I.F. filtering by R8, C15.

D.C. potential developed across R9 is fed back as bias via decoupling circuit R7, C9 to V1 and V2, giving automatic gain control.

Amplified A.F. signals at V3 anode are developed across R12 and resistance-capacitance coupled by C18 and R13 to control grid of beam tetrode output valve (V4, Brimar 12AG). A proportion of the speech coil voltage, that dropped across R16 in potential divider R15, R16, is fed back to the volume control circuit, giving tone correction. Further tone correction is provided by the negative feed-back voltage developed across R14 in V4 cathode circuit. H.T. current is supplied by I.H.C. half-wave rectifying valve (V5, Brimar 35W4). Smoothing by R17 and electrolytic capacitors C19, C20. Valve heaters, together with ballast resistor R19, are connected in series across the mains input. R18 protects V5 from current surges. Mains R.F. filtering by C21.



VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating from 230 V A.C. mains, the voltage adjustment plug being set to the 220-230 V tapping. The receiver was tuned to the

Valve	Aı	ode	Scr	een	Cath.
varve	V	mA	V	mA	V
V1 12BE6	194	2.2	93	1.5	-
V2 12BA6	194	8.0	93	3.0	0.9
V3 12AT6	78	0.55			
V4 12A6	250	20.0	194	3.5	7.4
V5 35W4	205†				250.0

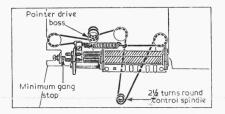
† A.C. reading.

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, which has a very high internal resistance, and allowance should be made for the current drawn by other types of meter. Chassis was the negative connection in avery easy. every case.

GENERAL NOTES

Switches.—S1-S4 are the waveband switches, and S5 is the mains switch, all ganged in a single 3-position rotary unit beneath the chassis. The unit is indicated in our underside view of



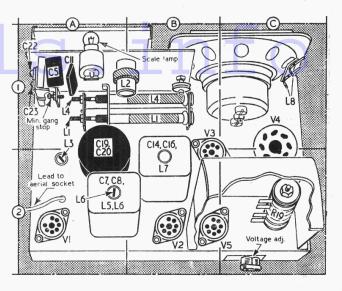
The drive cord system can be seen from this sketch, which is drawn as seen from the rear.

the chassis, but it is shown in detail in the

diagram in col. 3.

All the switches open in the "off" position (control knob turned fully anti-clockwise); in the M.W. position (knob central), \$4 and \$5

Three-quarter plan view of the chassis. The permeability tuning assembly L1, L4 is seen at the front, behind the tuning scale. The minimum gang stop is adjustable. The heat deflecting cowl over V5 and R19 has been cut away to show the inside.



close; in the L.W. position (knob fully clockwise) \$4 opens and all the other switches close.

Tuning Coils.—The main tuning coils are L1 and L4, and variable tuning is effected by varying their inductance by sliding iron-dust cores in or out of them, otherwise known as permeability tuning. The cores are linked at one end so that they move together. The coils are fundamentally M.W. coils, and L.W. coverage is achieved by shunting C4 across L1 and inserting L3 in series with L4. The core in L3 is pre-set. There is no capacitative tuning ang.

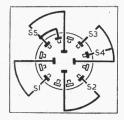
L3 is pre-set. There is no capacitative tuning gang.

Scale Lamp.—This is an Osram lamp, with a small clear spherical bulb and an M.E.S. base, rated at 6.3 V, 0.115 A. It is mounted in a rubber holder which slips on to a bracket projecting from the rear of the scale assembly and provides adequate insulation, but it is 80-90 V above chassis potential, and care should be exercised to prevent the metal neck of the bulb from touching the scale backing plate, through which it projects.

Mains Voltage Adjustment.—The mains voltage panel on our sample was provided with three adjustment positions for the setting strap, but there were only two tappings on the ballast resistor R19. One of these (the end one) went to the 240-250 V socket, and the other went to the 202-210 V and the 220-230 V sockets.

Chassis Divergencies.—C4 in our sample receiver was 0.002 μF, but the value originally

Diagram of the waveband/on/ off switch, drawn as seen when viewed from the rear of an inverted chassis.



CIRCUIT ALIGNMENT

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The chassis should be withdrawn from the cabinet for the following alignment adjustments.

1.F. Stages.—Connect output of signal generator, via an 0.1 µF capacitor in each lead, to control grid (pin 7) of V1 and chassis. Switch receiver to M.W. and tune to highest wavelength end of scale. Feed in a 422 kc/s (711 m) signal and adjust the cores of L7 (location reference E4), L6 (A2) and L5 (F4) for maximum output, reducing the gain as the circuits come into line to avoid A.G.C. action.

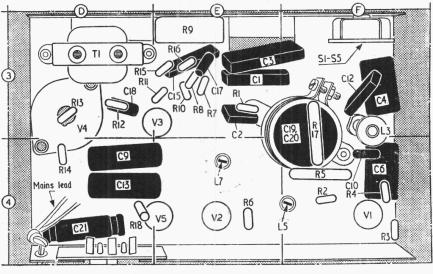
R.F. and Oscillator Stages.—With the tuning cores of L1 and L4 fully in the coils, the cursor should coincide with the high wavelength end of the clear section of the M.W. tuning scale. If any error exists, the cursor can be moved relative to its spindle. With the tuning slugs in the fully out position, against the minimum gang stop, the cursor should coincide with the low wavelength end of the clear portion of the scale. Corrections at this end of the scale can be made by adjusting the end-stop screw (location reference A1) which controls the amount the tuning cores, and thus the pointer, can travel in this direction. The adjustments to trimmers and cores should be made in the following order, any further M.W. adjustments always being followed by L.W. re-alignment.

M.W.—Switch receiver to M.W., and tune to 200 m. Transfer "live" signal generator lead to A socket. Feed in a 200 m (1,500 kc/s) signal and adjust C23 (A1) and C22 (A1) for maximum output. Tune to 500 m, fed in a 500 m (600 kc/s) signal, slacken the locking-nuts, and adjust the cores of L4 (A1) and L1 (A1) for maximum output. Repeat these adjustments until no further improvement results and then tighten up the locking nuts.

L.W.—Switch receiver to L.W., tune to 500 m, feed in a 1500 m feed kc/s) signal and

up the locking nuts.

L.W.—Switch receiver to L.W., tune to 1,500 m, feed in a 1,500 m (200 kc/s) signal and adjust the core of L3 (A2) for maximum output.



Underside view of the chassis. A diagram of the waveband switch unit \$1-\$5 appears in col. 3. The L.W. loading coil L3 is seen on the right.