NUMBER SEVENTY-EIGHT

'TRADER' SERVICE SHEETS

HALCYON 4701

(AND 4701G RADIOGRAM)

FOUR valves, a "Westector" and a Westinghouse rectifier for H.T. supply are used in the Halcyon 4701 superhet. It is an A.C./D.C. type for mains of 200-260 V (25-100 c.p.s. in the case of A.C.). Features of the chassis are a visual tuning indicator, an indicator showing the switch positions and a three-position tone control.

A similar chassis is fitted in the 4701G radio-gramophone.

CIRCUIT DESCRIPTION

Aerial input via pre-set condenser **C28** and switches **S1** (L.W.) **S2** (M.W.) to tappings on primary of inductively coupled band-pass filter. Primary **L2, L3** tuned by **C29**; secondary **L6, L7** tuned by **C31**; coupling by coils **L4, L5.** Choke coil **L1** in aerial circuit prevents break-through on L.W.

First valve (**V1, Mullard metallised FC13**) is an octode operating as frequency changer with electron coupling. Oscillator grid coils **L8, L9** tuned by **C33** which has shaped vanes for tracking; anode reaction coils **L10, L11**; L.W. tracking by pre-set condenser **C35.**

Second valve, a variable-mu H.F. pentode (**V2, Mullard metallised VP13A**) operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **L12, L13** and **L14, L15.**

Intermediate frequency 110 KC/S.

Moving-iron visual tuning indicator in anode H.T. feed circuit.

Metal rectifier second detector forms part of full-wave "Westector" (**MR1, Westinghouse type WM26**). Second part, fed from **V2** anode by **C11,** provides D.C potential which is developed across **R12** and fed back through decoupling circuit **R4, C3** as G.B. to F.C. valve, giving automatic volume control. Delay voltage is obtained from potential divider **R7, R8** across H.T. supply lines. A.V.C. potential for I.F. valve is provided by signal rectifier and fed through decoupling circuit **R6, C7.**

Audio frequency component present in rectified potential developed across **R11** is passed via I.F. stopper **R13,** coupling condenser **C14,** switch **S7,** and manual volume control **R15** to grid of triode L.F. amplifier (**V3, Mullard metallised HL13**). Switch **S8** connects gramophone pick-up which is isolated from chassis by condenser **C16.**

Resistance-capacity coupling by **R16, C19** and **R18,** to output pentode (**V4, Mullard Pen 26**). Fixed tone compensation in anode circuit by condenser **C22**; three-point tone control by condensers **C23, C24** and switch unit **S12.** Provision for connection of low impedance external speaker across secondary of output transformer **T1.** Plug and socket device cuts out internal speaker.

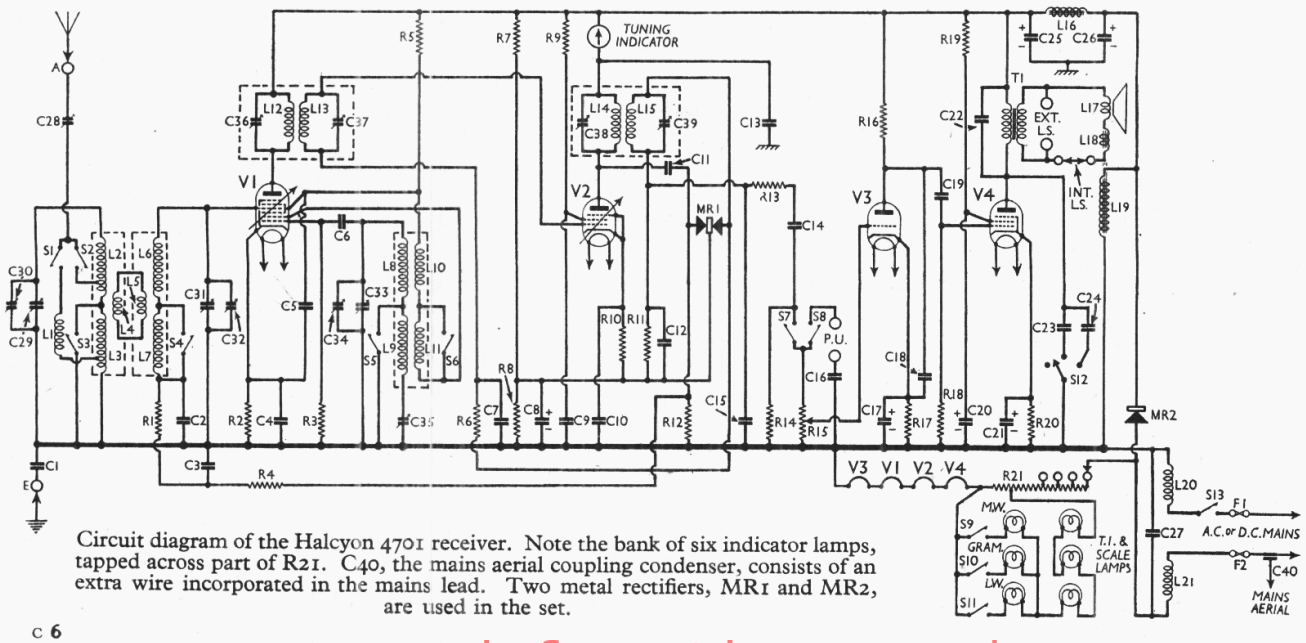
When the receiver is used with A.C. mains, H.T. current is supplied by a half-wave metal rectifier (**MR2, Westinghouse type B27**), which behaves as a low resistance with D.C. supplies. Smoothing by choke **L16** and large-capacity dry electrolytic condensers **C25, C26.** Speaker field winding **L19** is connected across the unsmoothed supply.

Valve-heaters are connected in series together with tapped ballast resistance **R21** across mains input circuit. Tuning indicator, scale, and switch indicator lamps obtain their current from a tapping on **R21.** Chokes **L20** and **L21,** and condenser **C27** form a filter for the suppression of mains-borne interference. Mains-aerial coupling condenser, **C40,** is formed by an extra wire in mains lead.

COMPONENTS AND VALUES

	Resistances	Values (ohms)
R1	V1 pent. cont. grid decoupling	250,000
R2	V1 fixed G.B. resistance	300
R3	V1 osc. grid resistance	33,000
R4	V1 A.V.C. line decoupling	250,000
R5	V1 S.G.'s and osc. anode decoupling	19,000
R6	V2 cont. grid decoupling	600,000*
R7	A.V.C. delay voltage potential divider	60,000
R8		2,200
R9	V2 S.G. H.T. feed	50,000
R10	V2 fixed G.B. resistance	300
R11	Signal rectifier load	500,000
R12	A.V.C. rectifier load	600,000
R13	I.F. stopper	30,000
R14	Volume control shunt (radio)	250,000
R15	Manual volume control	250,000
R16	V3 anode load	80,000
R17	V3 G.B. resistance	1,000
R18	V4 grid resistance	250,000
R19	V4 aux. grid H.T. feed	22,000
R20	V4 G.B. resistance	450
R21	Heater circuit ballast, total	945

* May be 500,000 Ω.



Circuit diagram of the Halcyon 4701 receiver. Note the bank of six indicator lamps, tapped across part of R21. C40, the mains aerial coupling condenser, consists of an extra wire incorporated in the mains lead. Two metal rectifiers, MR1 and MR2, are used in the set.

	Condensers	Values (μF)
C1	Earth blocking condenser	0·02
C2	V1 pent. cont. grid decoupling	0·1
C3	V1 A.V.C. line decoupling	0·1
C4	V1 cathode by-pass	0·25
C5	V1 S.G.'s and osc. anode decoupling	0·1
C6	V1 osc. grid condenser	0·001
C7	V2 cont. grid decoupling	0·02
C8*	A.V.C. delay pot. div. by-pass	25·0
C9	V2 S.G. by-pass	0·1
C10	V2 cathode by-pass	0·1
C11	Coupling to A.V.C. rectifier	0·0002
C12	I.F. by-pass	0·0001
C13	V2 anode decoupling	0·1
C14	L.F. coupling to V3	0·02
C15	I.F. by-pass	0·0003
C16	Pick-up isolating condenser	1·0
C17*	V3 cathode by-pass	25·0
C18	V3 anode I.F. by-pass	0·0003
C19	L.F. coupling to V4	0·05
C20*	V4 aux. grid by-pass	1·0
C21*	V4 cathode by-pass	50·0
C22	Fixed tone compensator	0·005
C23	Tone control condensers	0·01
C24	Tone control condensers	0·02
C25*	H.T. smoothing	24·0
C26*	H.T. smoothing	24·0
C27	Mains H.F. by-pass	0·01
C28‡	Aerial series condenser	—
C29†	Band-pass primary tuning	—
C30‡	Band-pass primary trimmer	—
C31†	Band-pass secondary tuning	—
C32‡	Band-pass secondary trimmer	—
C33†	Oscillator tuning	—
C34‡	Oscillator trimmer	—
C35‡	Oscillator L.W. tracker	—
C36‡	1st I.F. trans. pri. tuning	—
C37‡	1st I.F. trans. sec. tuning	—
C38‡	2nd I.F. trans. pri. tuning	—
C39‡	2nd I.F. trans. sec. tuning	—
C40§	Mains aerial condenser	—

* Electrolytic.
‡ Pre-set.
§ Formed by extra wire in mains lead.
† Variable.

	Other Components		Values (ohms)
L1	Aerial circuit choke coil (L.W.)		8·25
L2	Band-pass primary coils		2·75
L3	Band-pass primary coils		32·0
L4	Band-pass coupling coils		0·25
L5	Band-pass coupling coils		0·25
L6	Band-pass secondary coils		2·75
L7	Band-pass secondary coils		32·0
L8	Oscillator tuning coils		2·25
L9	Oscillator tuning coils		22·5
L10	Oscillator anode coils		3·5
L11	Oscillator anode coils		6·5
L12	1st I.F. trans.	Pri.	85·0
L13	1st I.F. trans.	Sec.	90·0
L14	2nd I.F. trans.	Pri.	90·0
L15	2nd I.F. trans.	Sec.	85·0
L16	H.T. smoothing choke		280·0
L17	Speaker speech coil		2·5
L18	Hum neutralising coil		0·1
L19	Speaker field winding		6750·0
L20	Mains filter chokes		4·25
L21	Mains filter chokes		4·25
T1	Output transformer	Pri.	345·0
T1	Output transformer	Sec.	0·65
S1-S6	Waveband switches		—
S7, S8	Radio-gram. switches		—
S9	M.W. ind. lamp switch		—
S10	Gram. ind. lamp switch		—
S11	L.W. ind. lamp switch		—
S12	Tone control switch unit		—
S13	Mains switch, ganged R15		—
F1 F2	Mains circuit fuses, 1A		—

DISMANTLING THE SET

Access to most of the under-chassis components can be gained by removing the false bottom which is fitted to the cabinet. This can be done by taking out six countersunk-head wood screws.

Removing Chassis.—If it is necessary to remove the chassis, remove the false bottom, thus exposing the four chassis fixing bolts (each with a washer), which should be removed. Remove the four control knobs and the two cleats (one round-head wood screw each) holding the speaker leads. The chassis can now be withdrawn from the cabinet and there is sufficient slack on the speaker leads to allow normal repairs to be carried out.

When replacing chassis, note that the two large control knobs should be fitted to the tuning condenser and the volume control.

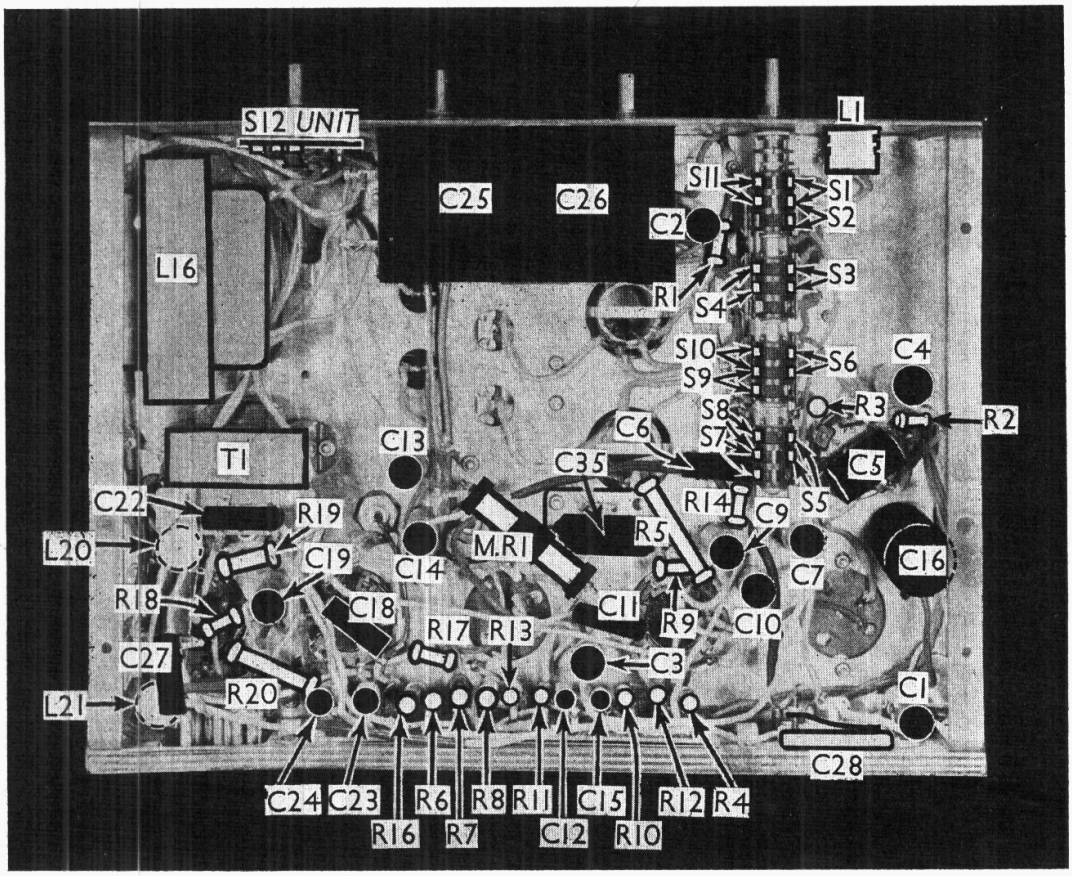
To remove the chassis entirely from the cabinet, unsolder the leads on the speaker terminal panel, and, *when replacing*, connect the leads as follow, numbering the tags from top to bottom with the transformer on the right:—1, blue; 2, yellow; 3, yellow; 4, blank; 5, white.

Removing Speaker.—The speaker can be removed by running off the nuts from the four bolts holding it to the sub-baffle.

VALVE ANALYSIS

Valve voltages and currents given in the table overleaf were measured with the receiver operating on A.C. mains of 225 V and with the transformer adjusted to the 220 V tap. There was no signal input, the volume control was at maximum and the receiver was tuned to the lowest wavelength on the M.W. band. Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

(*Continued overleaf*)



Under-chassis view. The S12 unit is a rotary 3-position switch, for tone control, explained in "General Notes." L20 and L21, beneath a paxolin strip, are the mains filter chokes. The contacts of the S1-S11 switch unit are all indicated. L1 is the aerial L.W. choke coil, and MR1 is the Westector for second detection and A.V.C.

HALCYON 4701 (continued)

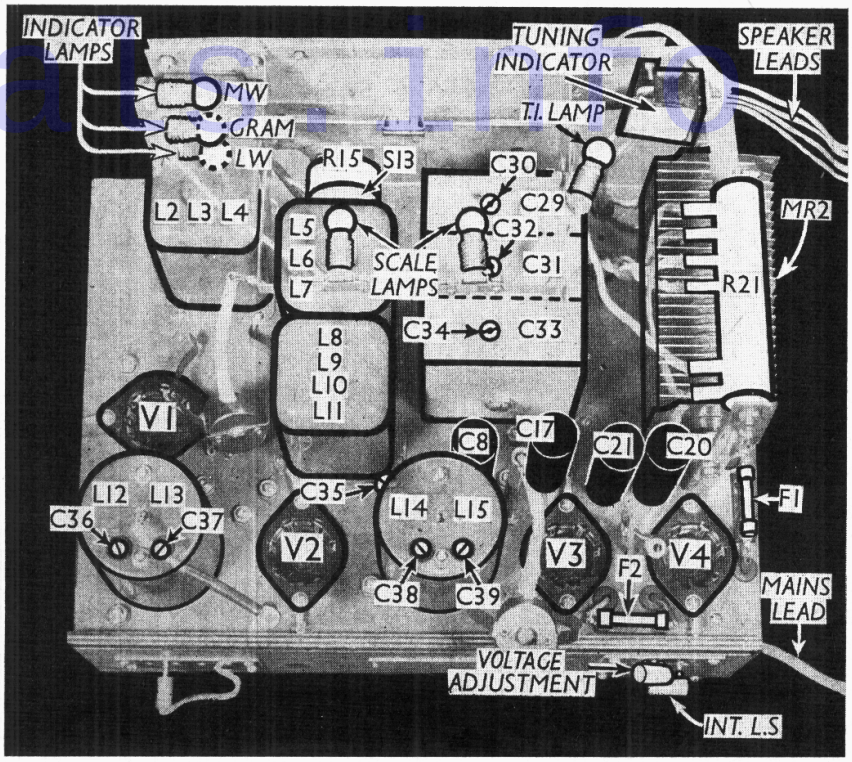
Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 FC13*..	210	1·5	80	4·0
V2 VP13A	200	4·3	100	1·4
V3 HL13 ..	75	1·6	—	—
V4 Pen 26	200	33·0	105	4·3

* Osc. anode (G2) 80 V, 2·5 mA.

GENERAL NOTES

Switches.—**S1-S11,** the waveband, radio—gramophone and scale lamp switches are in a single unit, seen in the under-chassis view. Note that in some cases one contact is common to two switches. The table below gives the switch positions for the various settings of the control knob. O indicates open, and C closed.

Switch	M.W.	L.W.	Gram.
S1	O	C	O
S2	C	O	O
S3	C	O	C
S4	C	O	C
S5	C	O	O
S6	C	O	O
S7	C	C	O
S8	O	O	C
S9	C	O	O
S10	O	O	C
S11	O	C	O



Plan view of the Halcyon 4701 chassis. C8, C17, C20 and C21 are electrolytic condensers. S13 is ganged with R15. Note the disposition of the indicator, scale and T.I. lamps.

S12 is the rotary tone control switch, which has three positions. With this switch fully anti-clockwise, the slider rests on a blank stud. The first clockwise position switches in **C23** and the second **C24.**

S13 is the mains Q.M.B. switch, ganged with the volume control **R15.**

Coils.—All the tuning coils, with the exception of **L1,** are in screened units on the chassis deck. **L1** is unscreened, and is beneath the chassis near the spindle end of the switch assembly.

Scale, Indicator and T.I. Lamps.—There are two scale lamps, three switch indicator lamps, and one tuning indicator lamp. All are of the Osram M.E.S. type, rated at 3.5 V, 0.15 A.

L20, L21.—These are two mains filter chokes, situated beneath the chassis. They are shown dotted in our under-chassis view.

L16.—This is the H.T. smoothing choke, mounted beneath the chassis.

Fuses.—Two standard 1A 1¼ in. tubular fuses are mounted in clips on the chassis. The voltage adjusting plug also incorporates a piece of fuse wire.

Tuning Indicator.—This is of the moving-iron type, and the resistance of the winding is 1,500 O.

Metal Rectifiers.—Two Westinghouse rectifiers are employed, one for the H.T. supply and one, a Westector, for second detection and A.V.C. They are designated respectively **MR2** and **MR1** in our illustrations.

Mains Aerial.—The mains aerial condenser, **C40,** is formed of an extra wire incorporated in the mains lead. It is indicated in the circuit diagram, but not in the chassis views.

Condensers C25, C26.—These are two 24 μF dry electrolytic condensers in one unit. There is a single tag projecting from one end of the unit, which is the common negative. The two positive tags project from the other end of the unit. That marked "1," connected to one tag of **L16** and **C22,** is the positive of **C25,** while that marked "2," connected to the other end of **L16** and one end of **L19,** is the positive of **C26.**

Condenser C8, C17, C20, C21.—These are all metal-cased tubular electrolytics, the cases being negative, and connected to chassis.

Resistance R6.—This may be 500,000 or 600,000 O.

Condenser C14.—The upper end of this may go to the junction of **R13, C14,** instead of where shown in our circuit.

Condenser C22.—In our chassis this is across the primary of **T1,** but in others it may connect from the blank stud of **S12** to the anode of **V4.**

External Speaker.—This should be of the low resistance type (about 2O), and plugs into the sockets provided. The internal speaker may be cut out by removing the 2-pin plug at the rear of the chassis from the sockets marked "on" to those marked "off."

WORKSHOP HINTS

When drilling or tapping aluminium, the best cutting lubricant to use is turpentine; the drill cuts through smoothly and cleanly and does not leave a large burr on the outgoing side, as is the case if the drill is used dry. For copper, drilling or tapping, tallow is the best. Drills for brass or cast iron should be used dry. For steel, ordinary domestic soda dissolved in water is the next best to the proper cutting compounds as used in production shops.

* * *

For making steel scribers, special screwdrivers, punches and numerous other tools "silver steel" rod is an excellent material, since it can be easily filed to shape and ground on an emery wheel, hardened and tempered, and is cheap in price. It is obtainable in 13 in. lengths, from about 1/16 in. up to ¾ in. in diameter.

* * *

To harden silver steel, the part to be hardened should be heated to a bright red colour (about 750° Cent.) and then plunged into water. To temper, clean the part that has been hardened, with emery cloth, till it is bright (it will have turned black after heating), hold over small flame and revolve slowly so that it is uniformly heated. When colour changes to light straw, withdraw from flame, wait till it turns to dark straw, then quickly plunge into water. The tempering process has to be done carefully, the part treated not being allowed to get too hot or it will again become softened.—M.F.