'TRADER' SERVICE SHEET

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HALCYON B691

6-VALVE BATTERY SUPERHET

THE Halcyon B691 is a 6-valve battery-operated all-wave superhet with a two-valve frequency changer stage and two separate pentodes operating in a Q.P.P. output stage. The set has as short-wave range of 16.5-51 metres, while a special feature is the large tuning scale with a flywheel drive.

CIRCUIT DESCRIPTION

Aerial input via series condenser **C1** to tappings on inductively coupled M.W. and L.W. band-pass filter. Primary coils **L1, L2** are tuned by **C15**; secondaries **L6, L7** are tuned by **C17**, coupling by small coils **L3** and **L4**. On S.W. **C1** is connected to centre tap of coil **L5** which, tuned by **C17**, forms a single tuned circuit.

First valve (**V1, Mullard metallised VP2B**) is a variable-mu hexode operating as frequency changer with suppressor grid injection in conjuction with a separate triode oscillator valve (**V2, Mullard metallised PM2HL**). Oscillator grid coils **L8** (S.W.), **L9** (M.W.) and **L10** (L.W.) are tuned by **C19**; parallel trimming by **C20** (M.W.); series tracking by **C4, C22** (M.W.) and **C21** (L.W.). Anode reaction by coils **L11** (S.W.), **L12** (M.W.), and **L13** (L.W.).

Third valve (**V3, Tungsram metallised VP2B**), a variable-mu pentode, operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C23, L14, L15, C24** and **C25, L16, L17, C26**.

Intermediate frequency 130·5 KC/S.

Diode second detector is part of double diode triode valve (**V4, Tungsram metallised DDT2**). Audio frequency component in rectified output is developed across load resistance **R7** and passed via I.F. stopper **R8**, coupling condenser **C10** and manual volume control **R9** to C.G. of triode section, which operates as A.F. amplifier.

Second diode of **V4**, fed via **C8** from anode of **V3**, provides D.C. potential which is developed across load resistance **R12** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from tapping **G.B.1** on G.B. battery.

Parallel-fed transformer coupling by **R11, C11** and **T1** between triode section of **V4** and quiescent push-pull output stage comprising two matched pentodes (**V5, V6, Tungsram PP222's**), with a common screen feed. Variable tone control by R.C. filter **R14, C14** across the two anodes.

DISMANTLING THE SET

A detachable bottom is fitted to the cabinet and upon removal (six counter-sunk-head wood screws) gives access to most of the components beneath the chassis.

Removing Chassis.—If it is necessary to remove the chassis from the cabinet, remove the four control knobs (recessed grub screws) and remove the volume control from the front of the cabinet (nut and lock washer). Now pull out the battery platform, bringing the battery leads through the hole in it.

Next remove the two round-head wood screws (with distance pieces) holding the scale assembly to the front of the cabinet and the two round-head wood screws (with rubber distance pieces) holding the top of the assembly to the top of the cabinet. Remove the four bolts (with washers) holding the chassis to the bottom of the cabinet.

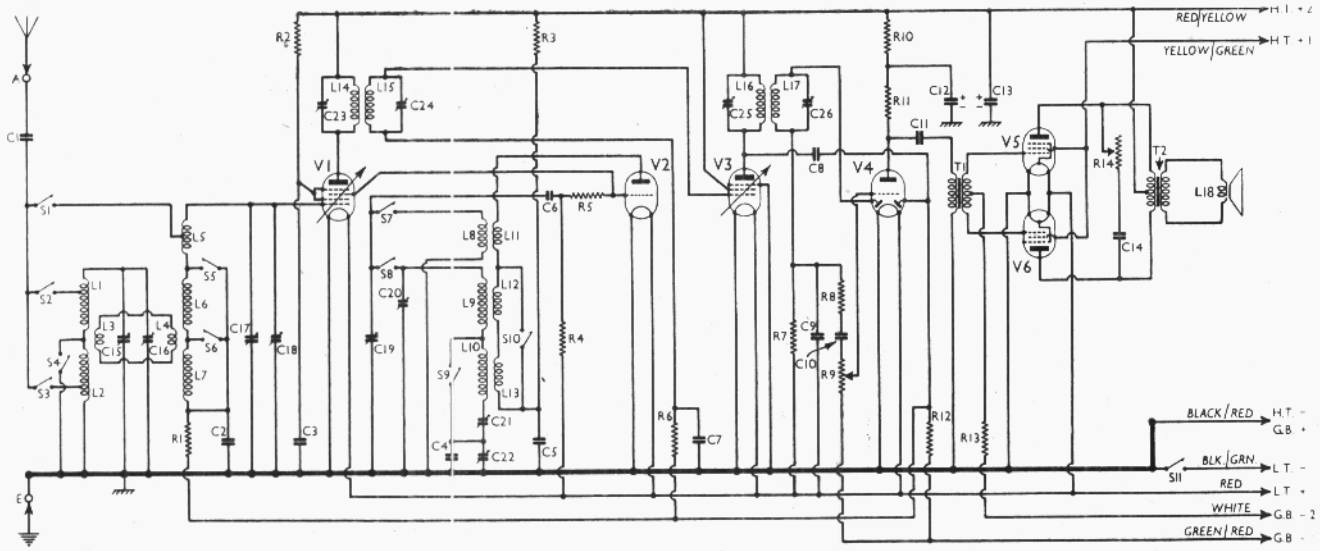
Remove the Speaker by taking off the nuts and lock washers from the three screws holding it to the sub-baffle. It will be seen that there are three pairs of screws; those with which we are concerned are the more clock-wise of each pair.

The chassis and speaker can now be withdrawn together and *when replacing*, secure the volume control to the front of the cabinet before replacing the speaker as the former is inaccessible when the speaker is in place. When fixing the speaker see that the transformer is on the right and do not forget to place the tag for the earthing lead on the top right-hand screw. Note that the large knobs go on the top spindles and the small knob with the white dot goes on the left-hand bottom spindle.

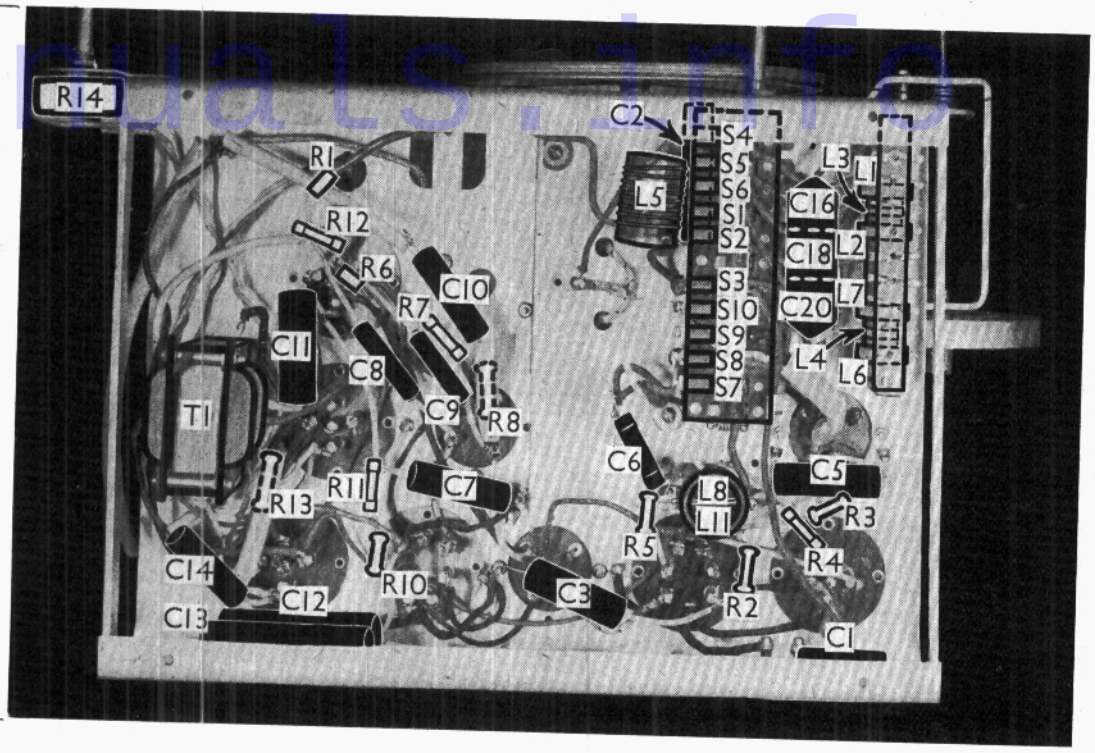
If the speaker has been unsoldered re-connect it as follows, numbering the tags from bottom to top:— 1, yellow; 2, green/red; 3, yellow.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 C.G. decoupling	500,000
R2	V1 S.G. H.T. feed	100,000
R3	V2 anode H.T. feed	10,000
R4	V2 C.G. resistance	50,000
R5	V2 C.G. circuit stabiliser	50
R6	V3 C.G. decoupling	500,000
R7	V4 signal diode load	1,000,000
R8	I.F. stopper	100,000
R9	Manual volume control	1,000,000
R10	V4 triode anode decoupling	10,000
R11	V4 triode anode load	50,000
R12	V4 A.V.C. diode load	1,000,000
R13	V5, V6 C.G. circuit stabiliser	100,000
R14	Variable tone control	50,000



Circuit diagram of the Halcyon B691 6-valve battery superhet. A separate hexode mixer and triode oscillator is used, while the output stage has two pentodes in Q.P.P.



Under-chassis view. **C16, C18** and **C20** are adjustable through holes in the chassis deck. Note the S.W. coils **L5** and **L8, L11.**

	CONDENSERS	Values (μF)
C1	Aerial series condenser	0·0005
C2	V1 C.G. decoupling	0·1
C3	V1 S.G. decoupling	0·1
C4	Osc. circuit M.W. fixed tracker	0·0015
C5	V2 anode decoupling	0·1
C6	V2 C.G. condenser	0·00005
C7	V3 C.G. decoupling	0·1
C8	Coupling to V4 A.V.C. diode	0·0001
C9	I.F. by-pass	0·0001
C10	A.F. coupling to V4 triode	0·01
C11	A.F. coupling to T1	0·05
C12*	V4 triode anode decoupling	4·0
C13*	H.T. circuit reservoir	8·0
C14	Part of T.C. circuit	0·01
C15†	Band-pass primary tuning	—
C16‡	Band-pass pri. M.W. trimmer	0·000035
C17†	Band-pass sec. and S.W. aerial tuning	—
C18‡	Band-pass sec. and S.W. aerial trimmer	0·000035
C19†	Oscillator circuit tuning	—
C20‡	Oscillator circuit M.W. trimmer	0·000035
C21‡	Oscillator circuit L.W. tracker	0·0009
C22‡	Oscillator circuit M.W. tracker	0·0009
C23‡	1st I.F. trans. pri. tuning	0·00015
C24‡	1st I.F. trans. sec. tuning	0·00015
C25‡	2nd I.F. trans. pri. tuning	0·00015
C26‡	2nd I.F. trans. sec. tuning	0·00015

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Band-pass primary coils	2·6
L2		30·5
L3	Band-pass coupling coils	Very low
L4		Very low
L5	Aerial S.W. tuning coil	Very low
L6	Band-pass secondary coils	2·4
L7		30·0
L8	Oscillator S.W. tuning coil	Very low
L9	Oscillator M.W. and L.W. tuning coils	2·25
L10		23·0
L11	Oscillator S.W. reaction	0·1
L12	Oscillator M.W. and L.W. reaction, total	3·0
L13		
L14	1st I.F. trans. Pri.	73·0
L15	Sec.	73·0
L16	2nd I.F. trans. Pri.	73·0
L17	Sec.	73·0

	OTHER COMPONENTS (*Continued*)	Approx. Values (ohms)
L18	Speaker speech coil	1·5
T1	Intervalve trans. Pri.	450·0
	Sec. total	6,000·0
T2	Speaker input trans. Pri. total	500·0
	Sec.	0·3
S1-S10	Waveband switches	—
S11	L.T. circuit switch, ganged R9	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating with an H.T. battery reading 145 V on the H.T. section, on load. The voltage applied to the screens of the output valves was 140·5 V.

The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 1,200 V scale of an Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VP2B	145	2·0	60	1·0
V2 PM2HL	110	2·6	—	—
V3 VP2B	145	1·4	145	0·5
V4 DDT2	90	0·7	—	—
V5 PP222	143	0·9	140·5	0·2
V6 PP222	143	0·9	140·5	0·2

GENERAL NOTES

Switches.—S1-S10 are the waveband switches, ganged in a single unit beneath the chassis. All the switches are indicated in our under-chassis view. The table (col. 3) gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and **C,** closed.

Switch	S.W.	M.W.	L.W.
S1	C	—	—
S2	—	C	—
S3	—	—	C
S4	C	C	—
S5	C	—	—
S6	C	C	—
S7	C	—	—
S8	—	C	C
S9	C	C	—
S10	C	—	—

S11 is the L.T. circuit switch, ganged with the volume control **R9.**

Coils.—L1-L4 and **L6, L7** are all wound on a single tubular former beneath the chassis to the right of the switch unit in our diagram, while **L5** is on a separate former to the left of the unit. **L8** and **L11** are on another former, also beneath the chassis. **L11** is the fine wire winding.

L9, L10, L12, L13 and the I.F. transformers **L14, L15** and **L16, L17** are in three screened units on the chassis deck. The first unit also contains the pre-set trackers **C21, C22** and the fixed tracker **C4.** The I.F. units contain their associated trimmers.

External Speaker.—No provision is made for this, but a low resistance (about 2 Ω) type could be connected across the secondary tags of **T2.**

Trimmers C16, C18, C20.—These are adjustable through holes in the chassis deck.

Batteries.—L.T., 2 V accumulator cell. H.T. and G.B., combined 145 V H.T. plus 9 V G.B. battery.

Battery Leads and Voltages.—Black/green lead, spade tag, L.T. negative; red lead, spade tag, L.T. positive 2 V; black/red lead, black plug, H.T. negative, G.B. positive; yellow/green lead, yellow plug, H.T. positive 1, depending on marking of **V5, V6** (Y, 143·5 V; X, 140·5 V; W, 137·5 V; V, 134·5 V; U, 131·5 V); red/yellow lead, red plug, H.T. positive 2,

Continued overleaf

WE INVITE readers to submit paragraphs based on their own experiences.

Payment will be made for all ideas and articles used, about the 10th of the month following publication. They should be addressed to the Technical Editor, THE WIRELESS & ELECTRICAL TRADER, *Dorset House, Stamford Street, S.E.1.*

HALCYON B691—*Continued*

+ 145 V; green/red lead, green plug, G.B. negative 1, — 1·5 V; white lead, blue plug, G.B. negative 2, —9 V.

CIRCUIT ALIGNMENT

I.F. Stages.—Feed a 130·5 KC/S signal to control grid (top cap) of **V1** and chassis, and adjust **C26, C25, C24** and **C23** for maximum output, in that order.

R.F. and Oscillator Stages.—Switch set to S.W., feed a 20 m. (15 MC/S) signal into **A** and **E** sockets, tune to 20 m. on scale, and adjust **C18** for maximum output.

Switch set to M.W., feed in a 250 m. signal, tune to 250 m. on scale, and adjust **C20** for maximum output, then **C16.** If there are two peaks when adjusting **C20**, that with the trimmer nearest its minimum position is correct. Feed in a 500 m. signal, tune it in, and adjust **C22** for maximum output, while rocking the gang for optimum results.

Switch set to L.W., feed in a 1,900 m. signal, tune it in, and adjust **C21** for maximum output, while rocking the gang for optimum results.

MAINTENANCE PROBLEMS

Low Value Condenser

A PYE T6 came in for service, the owner complaining of no signals on the long waveband, but normal ones on M.W. The L.W. and oscillator coils were O.K. on test, as was also the switching assembly. The F.C. valve was O.K., and signals were still absent when it was replaced.

It was found after numerous tests that a freshly charged accumulator always worked the set perfectly, but after a day or two's use the L.W. band always went off, the medium waveband still working O.K.

All the components around the F.C. circuit were given tests, and replacements tried.

C16, the V1 A.V.C. line decoupling condenser was found to be of slightly low capacity and consequently it was changed.

The changing of this condenser seems to have been a cure, as the set has worked well for months now, but it seems rather difficult to understand how a lower capacity in an A.V.C. decoupling condenser should affect the L.W. performance of the set.—W. B. WHITE, LONDON, N.W.4.

Repairing a "Repair"

AN Ekco AC/85 superhet was in the workshop for repair this week, and it was complained that it was almost impossible to obtain results on medium waves and only National on the long waves. There was also severe intermittent noise. The customer also stated that he had recently paid a dealer in the city two pounds for repairs, including a new valve. Since then, results had never been really good.

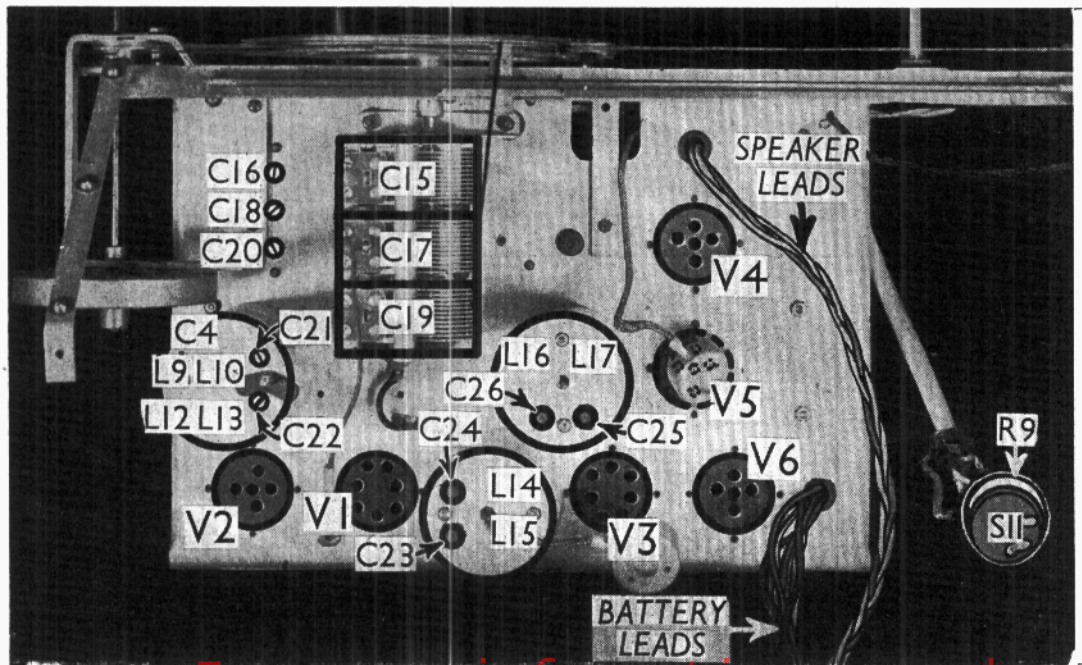
On test it was found that the wave-change switch was in very poor condition and it was removed from the chassis for attention. While refitting this switch a number of dry joints were found and re-made. By the number of points at which disconnections had obviously been made it was surmised that "hit and miss" methods had been tried instead of logical reasoning and testing. Therefore it was thought advisable to scrutinise the whole of the winding. More dry joints were discovered in this way and a sound connection was made in each case.

The valves were tested and were found to be working normally. The I.F. trimming was being attended to when a burst of noise appeared, which was of a bubbling nature. This trouble was found to be due to instability caused by an intermittent O/C in the cathode decoupling condenser of the frequency changer valve. A new condenser was fitted and the trimming proceeded with.

Once more instability was experienced, but of a different nature this time.

It was noticed that the trouble appeared at a number of tuning points on the long-wave scale even without the applied I.F. signal. Further tests and an examination of the winding and components revealed that the 0·1 μF decoupling condenser to the screen of the frequency changer valve had been replaced with an 0·01 μF, thus giving insufficient decoupling at this point.

A condenser of correct value was fitted and the trimming completed. On test some loud-speaker rattle was noticed. Centering the cone cured this trouble. A soak test and final broadcast test then completed the job.—W. G. GOUGH, WORCESTER.



Plan view of the chassis. The **R9** and **S11** unit are normally mounted on the front of the cabinet. Note the trimmers **C16, C18** and **C20.**

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