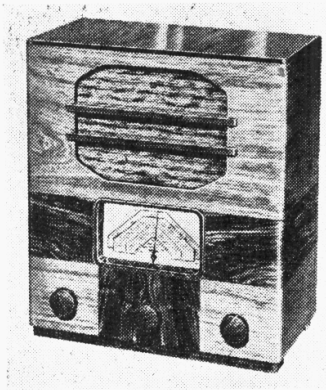
'TRADER' SERVICE SHEET 319

ULTRA 105

3-BAND BATTERY SUPERHET



A SHORT-WAVE range of 16.8-51 m is covered by the Ultra 105 4-valve battery 3-band superhet, which employs a triode-pentode frequency changer, a variable-mu pentode IF amplifier, a double diode and a pentode output valve. Provision is made for an extension speaker and there is a plug and socket device for cutting out the internal speaker.

CIRCUIT DESCRIPTION

Aerial input via IF rejector circuit **L1, C1** and coupling coils **L3** (SW), **L4** (MW) and **L5** (LW), assisted by small coupling condensers **C3** (MW) and **C4** (LW), to single tuned circuits **L6, C24** (SW), **L7, C24** (MW) and **L8, C24** (LW). On LW, aerial input to coupling coil is also via MW rejector circuit **L2, C2.**

First valve (**V1, Mazda metallised TP23**) is a triode pentode operating as frequency changer with internal coupling. Triode oscillator anode coils **L12** (SW), **L13** (MW) and **L14** (LW) are tuned by **C30**; parallel trimming by **C25** (SW), **C26** (MW) and **C9, C27** (LW); series tracking by **C10** (SW), **C28** (MW) and **C29** (LW). Reaction by grid coils **L9** (SW), **L10** (MW) and **L11** (LW).

Second valve (**V2, Mazda metallised VP210**) is a variable-mu RF pentode operating as intermediate frequency amplifier with iron cored tuned-primary tuned-secondary transformer input coupling **C6, L15, L16, C7** and iron cored tuned-primary transformer output coupling **C14, L17, L18.**

Intermediate frequency 470 KC/S.

Diode second detector is part of separate double diode valve (**V3, Mazda metallised DD207**). Audio frequency component in rectified output is developed across load resistance **R8** and passed via AF coupling condenser **C16** and manual volume control **R10** to CG of pentode output valve (**V4, Mazda Pen231**). Fixed tone correction in anode circuit by **C18.** Provision for connection of low impedance external speaker across secondary of output transformer **T1,** while internal speaker may be muted by separating the plug and socket connected in its speech coil circuit.

Second diode of **V3** fed from **L18** via **C17,** provides DC potential which is developed across load resistance **R9** and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control. Delay voltage, together with GB potential for **V4,** is automatically obtained from drop along resistances **R11, R12** in HT negative lead to chassis, that for delay being tapped off at their junction.

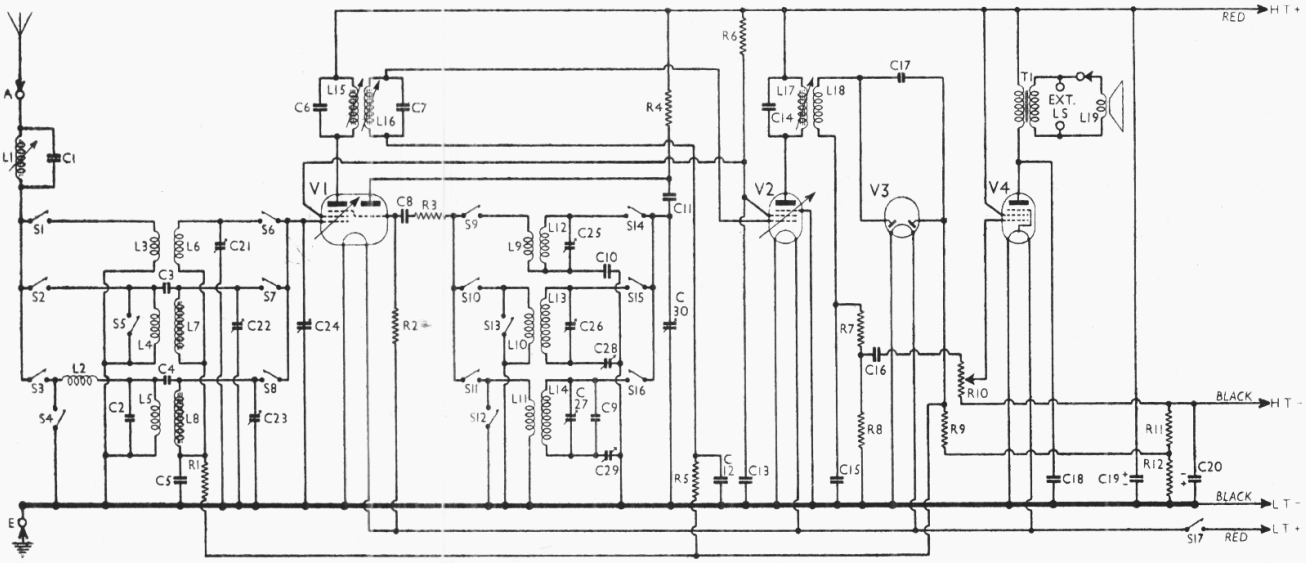
COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 pentode GC decoupling ..	1,000,000
R2	V1 osc. CG resistance ..	25,000
R3	V1 osc. CG stabiliser ..	20
R4	V1 osc. anode HT feed ..	25,000
R5	V2 CG decoupling	1,000,000
R6	V1, V2 SG's HT feed ..	70,000
R7	IF stopper	25,000
R8	V3 signal diode load	1,000,000
R9	V3 AVC diode load	1,000,000*
R10	Manual volume control ..	1,000,000
R11	V4 GB and AVC delay voltage	200
R12	potential divider ..	130

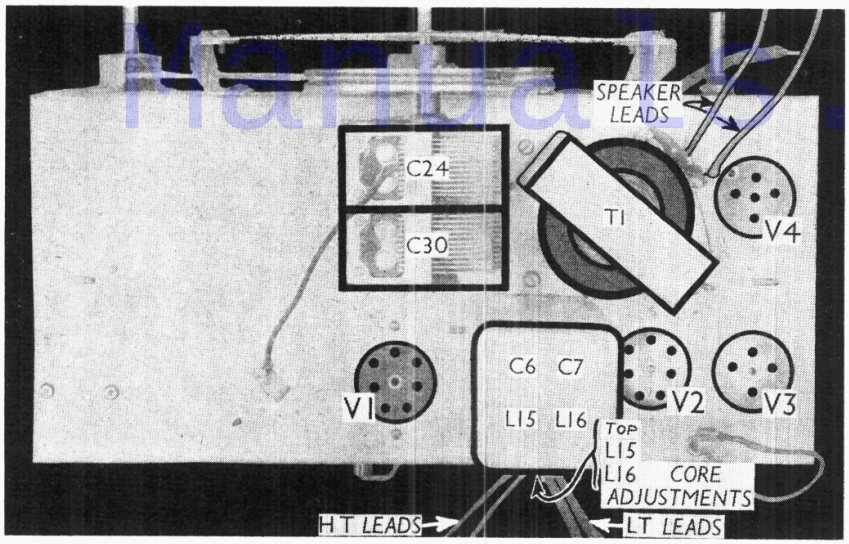
* One 250,000 Ω + one 750,000 Ω in series.

	CONDENSERS	Values (μF)
C1	Aerial IF filter tuning ..	0·001
C2	MW rejector tuning	0·000005
C3	Aerial MW coupling condenser	0·000005
C4	Aerial LW coupling condenser	0·00001
C5	V1 pentode CG decoupling ..	0·05
C6	1st IF trans. pri. fixed trimmer	0·0002
C7	1st IF trans. sec. fixed trimmer	0·0002
C8	V1 osc. CG condenser ..	0·0003
C9	Osc. circuit LW fixed trimmer	0·00007
C10	Osc. circuit SW tracker ..	0·004§
C11	V1 osc. anode coupling ..	0·0002
C12	V2 CG decoupling	0·05
C13	V1, V2 SG's decoupling ..	0·1
C14	2nd IF trans. pri. fixed trimmer	0·0002
C15	IF by-pass	0·0002
C16	AF coupling to V4	0·01
C17	Coupling to V3 AVC diode ..	0·00001
C18	Fixed tone corrector	0·002
C19*	HT circuit reservoir	2·0
C20*	GB and AVC delay by-pass ..	100·0
C21‡	Aerial circuit SW trimmer ..	—
C22‡	Aerial circuit MW trimmer	—
C23‡	Aerial circuit LW trimmer ..	—
C24†	Aerial circuit tuning	—
C25‡	Osc. circuit SW trimmer ..	—
C26‡	Osc. circuit MW trimmer ..	—
C27‡	Osc. circuit LW trimmer ..	—
C28‡	Osc. circuit MW tracker ..	—
C29‡	Osc. circuit LW tracker ..	—
C30†	Oscillator circuit tuning ..	—

§ Two condensers in parallel. * Electrolytic.
† Variable. ‡ Pre-set.



Circuit diagram of the Ultra 105 battery superhet. The secondary of the second IF transformer is untuned.



Plan view of the chassis. The cores of **L15** and **L16** are adjusted through holes in the rear of the can.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial IF filter coil	1·0
L2	LW aerial MW rejector coil	46·0
L3	Aerial SW coupling coil	0·1
L4	Aerial MW coupling coil	15·0
L5	Aerial LW coupling coil	74·0
L6	Aerial SW tuning coil	0·1
L7	Aerial MW tuning coil	1·2
L8	Aerial LW tuning coil	24·0
L9	Osc. SW grid reaction coil	0·1
L10	Osc. MW grid reaction coil	1·5
L11	Osc. LW grid reaction coil	2·1
L12	Osc. circuit SW tuning coil	0·1
L13	Osc. circuit MW tuning coil	6·0
L14	Osc. circuit LW tuning coil	10·0
L15	1st IF trans. Pri.	3·7
L16	1st IF trans. Sec.	3·7
L17	2nd IF trans. Pri.	3·7
L18	2nd IF trans. Sec.	36·0
L19	Speaker speech coil	2·1
T1	Output trans. Pri.	490·0
	Output trans. Sec.	0·2
S1-S16	Waveband switches	—
S17	LT circuit switch, ganged R10	—

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, remove the three control knobs (recessed grub screws) and the three bolts (with spring and claw washers) holding the chassis to the bottom of the cabinet, when the chassis can be withdrawn to the extent of the speaker leads, which is adequate for normal purposes. *When replacing*, note that the knob with the three coloured dots goes on the spindle of the wave-change switch.

To free the chassis entirely, unsolder the speaker leads and *when replacing*, make sure that the leads do not foul the gang condenser or the drive.

Removing Speaker.—If it is desired to remove the speaker from the cabinet, remove one of the clamps holding it to the sub-baffle (nut and spring washer) and slacken the other two. *When replacing*, see that the terminal panel is on the left.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating with a new HT battery reading 120 V, on load. 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 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 TP23	117	0·4	45	0·6
	Oscillator 58	2·0		
V2 VP210	117	1·0	45	0·3
V3 DD207	—	—	—	—
V4 Pen231	115	1·3	117	0·5

GENERAL NOTES

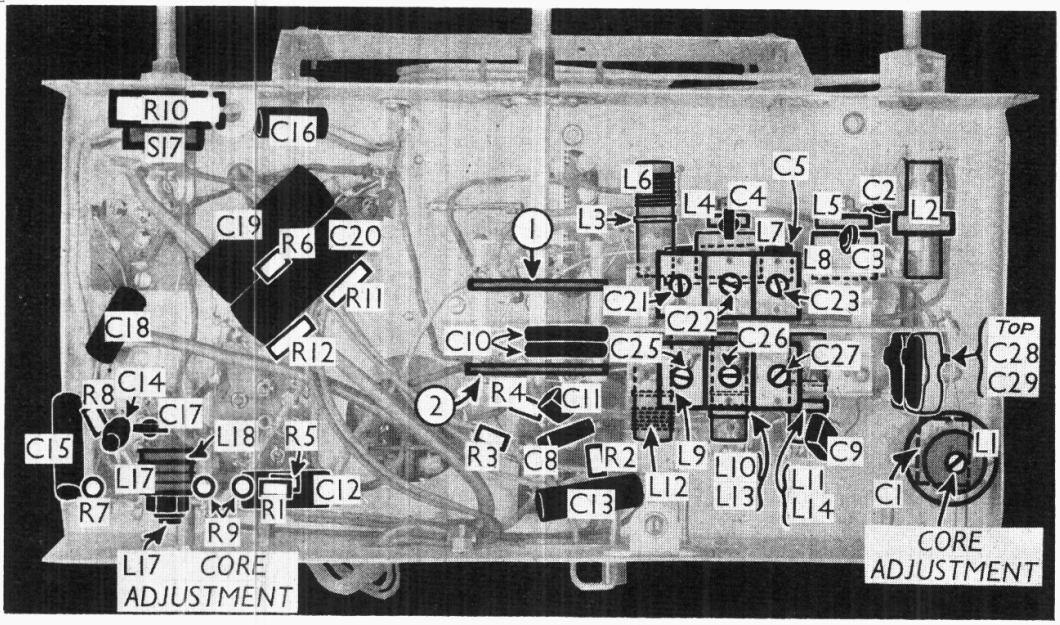
Switches.—**S1-S16** are the waveband switches, in two rotary units beneath the chassis. These are indicated in our under-chassis view, and shown in detail in the diagrams on page IV. The table (page IV) gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates *open*, and **C**, *closed*.

S17 is the QMB filament switch, ganged with the volume control **R10.**

Coils.—All the coils, with the exception of **L15, L16,** are in unscreened units beneath the chassis, and are all indicated in our under-chassis view. Some of these coils are iron-cored, the cores of both **L1** and **L17** being adjustable. **L7** and **L8** are completely enclosed in their "pill-box" cores. **L15, L16** are in a screened unit on the chassis deck, and also have adjustable cores reached through holes in the back of the can.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (2 to 4 O) external speaker. A plug and socket device serves to dis-

Continued overleaf



Under-chassis view. Note the core adjustments of **L1** and **L17**. **R9** consists of two resistors in series, and **C10**, two condensers in parallel. Many of the coils are on small tubular formers singly or in pairs.

ULTRA 105—*Continued*

connect the internal speaker speech coil when desired.

Resistance R9.—In our chassis this consists of two resistors in series.

Condenser C10.—In our chassis this consists of two condensers in parallel.

Resistance R3.—This is not shown in the makers' diagram, and therefore may not occur in some chassis.

Batteries.—LT 2 V accumulator cell. HT, 120 V dry HT battery. GB is automatic.

Battery Leads and Voltages.—Black rubber lead, spade tag, LT negative; red rubber lead, spade tag, LT positive 2 V; black lead and plug, HT negative; red lead and plug, HT positive, + 120 V.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator between control grid (top cap) of **V1** and chassis. Feed in a 470 KC/S signal, and adjust cores of **L17** (beneath chassis) and **L15, L16** (through holes in back of can on chassis deck), in that order, for maximum output.

IF Rejector.—Connect signal generator to **A** and **E** sockets, switch set to LW, tune to 950 m on scale, and feed in a 470 KC/S signal. Adjust core of **L1** (beneath chassis) for *minimum* output.

RF and Oscillator Stages.—When gang is at maximum, pointer should coincide with the lowest horizontal line at the right of the scale. Connect signal generator to **A** and **E** sockets.

Switch set to MW, tune to 200 m on scale, feed in a 200 m (1,500 KC/S) signal and adjust **C26**, then **C22,** for maximum output.

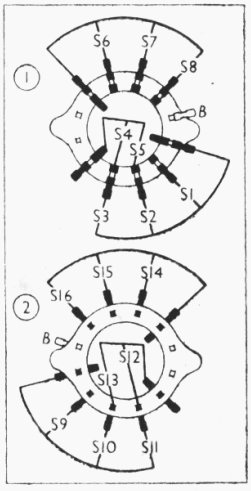
Feed in a 500 m (600 KC/S) signal, tune it in, and adjust **C28** for maximum output, while rocking the gang for optimum results. Repeat the 200 and 500 m adjustments until there is no further improvement.

Switch set to LW, tune to 1,000 m on scale, feed in a 1,000 m (300 KC/S) signal, and adjust **C27,** then **C23,** for maximum output. Feed in a 1,700 m (176.5 KC/S) signal, tune it in, and adjust **C29** for maximum output, while rocking the gang for optimum results. Repeat the 1,000 and 1,700 m adjustments until there is no further improvement.

Switch set to SW, tune to 17 m on scale, feed in a 17 m (17·65 MC/S) signal, and adjust **C25,** then **C21,** for maximum output. If two peaks are found when adjusting **C25,** that produced with **C25** nearest minimum capacity is correct. Check at 30 and 51 m.

SWITCH TABLE AND DIAGRAM

Switch	SW	MW	LW
S1	C	—	—
S2	—	C	—
S3	—	—	C
S4	—	C	—
S5	C	—	—
S6	C	—	—
S7	—	C	—
S8	—	—	C
S9	C	—	—
S10	—	C	—
S11	—	—	C
S12	—	C	—
S13	C	—	—
S14	C	—	—
S15	—	C	—
S16	—	—	C



Diagrams of the switch units, as seen looking at the underside of the chassis in the directions of the arrows in the under-chassis view.

AUTOMATIC TUNING—3c

(*Continued from page 1*).

When this is the case, I stops rotating, and the whole assembly is rigid. On releasing the plunger pressure, the fork travels back to its original position (due to the coil spring Y in Fig. 1), and rotates C and E back again. G and H, and, what is more important, I, remain where they are.

If, when depressing the plunger, F came up against H first of all, then I, and the condenser spindle, would have been rotated anti-clockwise until it came up against G and D. The final result would have been exactly the same, and the spindle's final position does not depend on its initial position in any way. Only by altering the position of I relative to the spindle can the final position of the spindle be affected.

This provides the method of adjusting the unit for various stations. First of all, the screw X (Fig. 1) is slackened off, thus freeing all the flanged discs (of which there are six, one for each press-button). Next, the station required is tuned in by the manual knob, and, holding the knob firmly to prevent rotation, the button which is to select this station is depressed to its full extent and then released. Any button can be used for any station.

The effect of this is to rotate not only D, G, F and H, but also I, relative to the spindle. On tightening X again, I is clamped up with the spindle, and whatever the position of the spindle at any future time, pressure on the particular button will always rotate it to the position just selected.

When X is loosened, all the buttons can be adjusted, if desired, and tightening X clamps them all up in their new positions.

MAINTENANCE PROBLEMS

Weston Midget Hints

LAST year's Weston TRF midget can be considerably improved as regards long wave performance if the volume control is arranged to vary the bias on the RF valve, as well as the aerial input.

This can be done by taking the green wire off the aerial coil, and re-connecting it to the end of the original fixed bias resistor (of RF valve) which was connected to chassis. The other two wires on the volume control, namely, an earth (chassis) wire and a brown wire, are changed over, earth to centre tag, brown to end tag.

The tag on the aerial coil, from which the green wire was removed, is connected to the same point on aerial isolating condenser as the brown wire. This completes the operation, and the set will then be found to be stable, and capable of giving a useful performance on the LW band.

* * *

ANOTHER frequent fault with this model is the 9266 ballast tube, arcing taking place between the pins numbered 5 and 6. This is really due to a fine film of moisture between the pins. However, when the ballast tube has commenced arcing, but has been switched off before serious damage has resulted, it may still be used if the mains lead, which goes to the on/off switch, is removed from its anchor point on number 6 tag on the ballast tube holder, and suitably insulated. When this has been done the set will work OK without any recurrence of the trouble.

* * *

WHENEVER the DTL condenser bank requires replacing on this model, it is advisable to fit it in the spare hole between speaker and gang condenser, as the original position was too close to the hot ballast tube, and the heat seriously reduced the life of the condenser.

* * *

THE dial light holder is sometimes a source of trouble due to internal short-circuiting. An examination, on dismantling it, reveals that the centre contact has moved, due to the insulating washers not having a properly formed shoulders on them, and is touching either the bracket, or screw cap.

The hole in each of these should be increased to about ¼ of an inch in diameter, and the screw cap holder should be soldered to the bracket. Then re-assemble, using a nut and bolt, instead of the rivet, taking care that the bolt is located centrally, and firmly tighten up. When fitting it to the gang condenser take care that the moving vanes when right out do not foul the lamp-holder.—H. T. COPELAND, KENTON.