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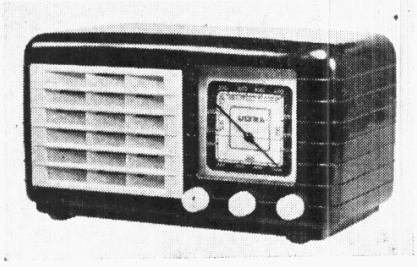
"TRADER" SERVICE SHEET

# 754

# ULTRA U405

## MIDGET AC/DC SUPERHET



ONE of the Ultra post-war range, the model U405 is a 4-valve (plus rectifier) 2-band superhet designed for use with AC or DC mains of 200-260 V, 40-100 c/s in the case of AC.

*Release date and original price: November, 1945; £12 17s. 6d. plus £2 15s. 6d. purchase tax.*

### CIRCUIT DESCRIPTION

Input from permanently attached aerial, which is isolated by capacitor **C1,** is via **C3** and **L2** (MW) or **L3** (LW) to single-tuned circuits **L4, C31** (MW) and **L5, C31** (LW). IF filtering by tuned acceptor **L1, C2, C28** across the aerial circuit.

First valve **(V1, Osram metallised X71M)** is a triode-hexode operating as frequency changer with internal coupling. Triode oscillator anode coils **L8** (MW) and **L9** (LW) are tuned by **C36.** Parallel trimming by **C34** (MW) and **C35** (LW); series tracking by **C10, C32** (MW) and **C11, C33** (LW). Reaction coupling by **L6** (MW) and **L7** (LW) in control grid circuit.

Second valve **(V2, Osram metallised KTW74M)** is a variable-mu RF tetrode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary dust-iron cored transformer couplings **C6, L10, L11, C7** and **C16, L12, L13, C17.**

**Intermediate frequency 470 kc/s.**

Diode second detector is part of double diode triode valve **(V3, Osram metallised DL74M).** Audio frequency component in rectified output is developed across manual volume control **R7,** which operates as load resistor, and passed via **C20** to CG of triode section. The second diode is strapped to cathode.

Resistance-capacitance coupling by **R10, C22** and **R12** between **V3** and beam tetrode output valve **(V4, Osram KT74).** Negative feed-back due to omission of usual by-pass capacitor from **V3** cathode.

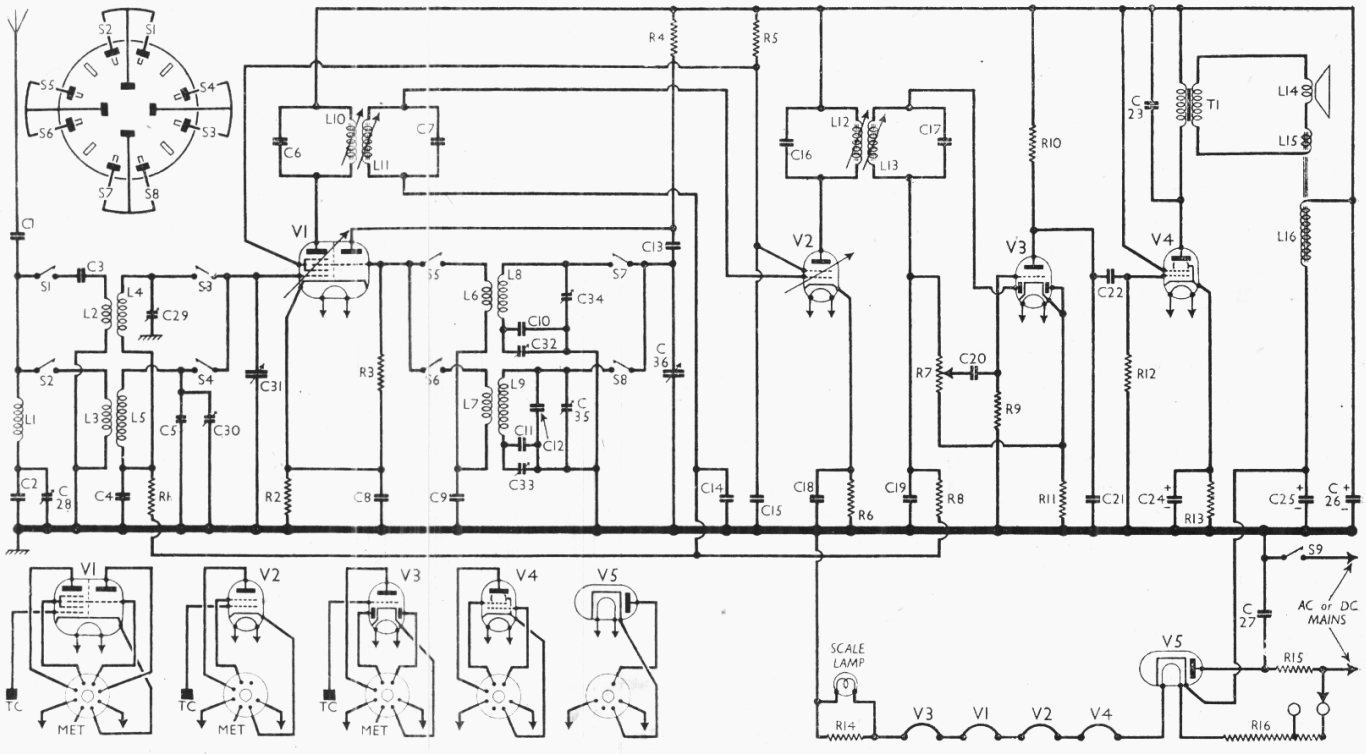
When used with AC mains, HT current is supplied by half-wave rectifying valve **(V5, Osram U74),** which with DC mains behaves as a low resistance. Smoothing by **C25, C26** and speaker field **L16.**

Valve heaters, together with scale lamp and ballast resistor **R16,** are connected in series across mains input circuit.

### COMPONENTS AND VALUES

| | CAPACITORS | Values (μF) |
|---|---|---|
| C1 | Aerial isolator ... ... | 0·005 |
| C2 | Aerial IF filter tuning ... | 0·00018 |
| C3 | Aerial MW series ... | 0·00047 |
| C4 | V1 hex. CG decoupling... | 0·05 |
| C5 | Aerial LW fixed trimmer | 0·000047 |
| C6 | 1st IF transformer tuning capacitors ... ... | 0·00012 |
| C7 | | 0·00012 |
| C8 | V1 cathode by-pass ... | 0·05 |
| C9 | V1 osc. CG capacitor ... | 0·00047 |
| C10 | Osc. MW fixed tracker ... | 0·0005 |
| C11 | Osc. LW fixed tracker ... | 0·00018 |
| C12 | Osc. LW fixed trimmer... | 0·0001 |
| C13 | V1 osc. anode coupling ... | 0·0001 |
| C14 | V2 CG decoupling ... | 0·05 |
| C15 | V1, V2 SG's decoupling... | 0·05 |
| C16 | 2nd IF transformer tuning capacitors ... | 0·00012 |
| C17 | | 0·00012 |
| C18 | V2 cathode by-pass ... | 0·05 |
| C19 | IF by-pass ... ... | 0·0001 |
| C20 | AF coupling to V3 ... | 0·005 |
| C21 | IF by-pass ... ... | 0·00047 |
| C22 | AF coupling to V4 ... | 0·01 |
| C23 | Fixed tone corrector ... | 0·005 |
| C24* | V4 cathode by-pass ... | 50·0 |
| C25* | HT smoothing capacitors | 16·0 |
| C26* | | 24·0 |
| C27 | Mains RF by-pass ... | 0·05 |
| C28‡ | Aerial IF filter tuning ... | 0·00007 |
| C29‡ | Aerial MW trimmer ... | 0·00007 |
| C30‡ | Aerial LW trimmer ... | 0·00007 |
| C31† | Aerial circuit tuning ... | 0·000494 |
| C32‡ | Osc. circ. MW tracker ... | 0·00007 |
| C33‡ | Osc. circ. LW tracker ... | 0·00007 |
| C34‡ | Osc. circ. M.W trimmer | 0·00007 |
| C35‡ | Osc. circ. LW trimmer | 0·00007 |
| C36† | Oscillator circuit tuning | 0·000494 |

* Electrolytic. † Variable. ‡ Pre-set.




Circuit diagram of the Ultra U405. In the conventional manner of midgets, the aerial wire is permanently attached, and no earth must be connected. Inset at top left corner is a diagram of the waveband switch unit, as seen from the rear.

| | RESISTORS | Values (ohms) |
|---|---|---|
| R1 | V1 hex. CG decoupling ... | 470,000 |
| R2 | V1 fixed GB resistor ... | 270 |
| R3 | V1 osc. CG resistor ... | 47,000 |
| R4 | V1 osc. anode HT feed ... | 33,000 |
| R5 | V1, V2 SG's HT feed ... | 22,000 |
| R6 | V2 fixed GB resistor ... | 270 |
| R7 | Manual volume control V3 signal diode load ... | 1,000,000 |
| R8 | AVC line decoupling ... | 2,200,000 |
| R9 | V3 triode CG resistor | 1,000,000 |
| R10 | V3 triode anode load ... | 220,000 |
| R11 | V3 triode GB resistor ... | 2,700 |
| R12 | V4 CG resistor ... ... | 470,000 |
| R13 | V4 GB resistor ... ... | 330 |
| R14 | Scale lamp shunt ... | 60 |
| R15 | V5 anode stopper ... | 100 |
| R16 | Heater ballast resistor ... | 987† |

† Tapped at 797 Ω from V5 heater.

| | OTHER COMPONENTS | | Approx. Values (ohms) |
|---|---|---|---|
| L1 | Aerial IF filter coil ... | | 7·5 |
| L2 | Aerial MW coupling coil | | 2·6 |
| L3 | Aerial LW coupling coil | | 12·5 |
| L4 | Aerial MW tuning coil ... | | 2·6 |
| L5 | Aerial LW tuning coil ... | | 12·0 |
| L6 | Osc. MW reaction coil ... | | 1·5 |
| L7 | Osc. LW reaction coil ... | | 5·3 |
| L8 | Osc. MW tuning coil ... | | 2·9 |
| L9 | Osc. LW tuning coil ... | | 6·9 |
| L10 | 1st IF trans. | Pri. ... | 8·0 |
| L11 | | Sec. ... | 8·0 |
| L12 | 2nd IF trans. | Pri. ... | 8·0 |
| L13 | | Sec. ... | 8·0 |
| L14 | Speaker speech coil ... | | 2·8 |
| L15 | Hum neutralising coil ... | | 0·1 |
| L16 | Speaker field coil ... | | 1,000.0 |
| T1 | Speaker input trans. | Pri. | 450·0 |
| | | Sec. | 0·5 |
| S1-S8 | Waveband switches ... | | — |
| S9 | Mains switch, ganged R7 | | — |

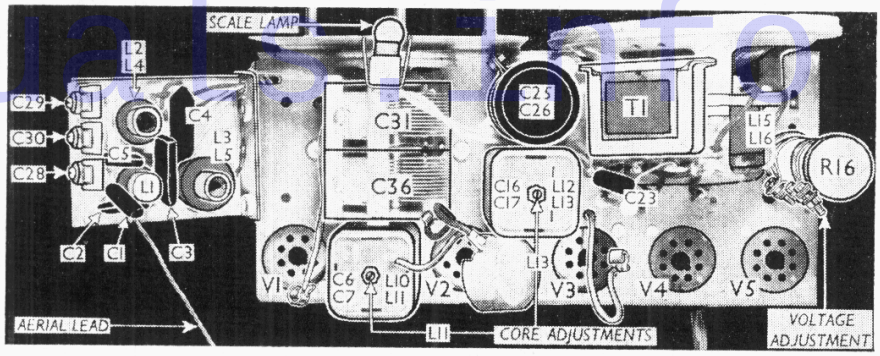
## VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on AC mains of 235 V, using the 260 V tapping on the ballast resistor. The receiver was tuned to the lowest wave-length in the MW 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 Avometer, chassis being the negative connection.

| Valve | Anode Voltage (V) | Anode Current (mA) | Screen Voltage (V) | Screen Current (mA) |
|---|---|---|---|---|
| V1 X71M | 170 | 1·9 | 80 | 2·6 |
| | Oscillator | | | |
| | 69 | 3·1 | | |
| V2 KTW74 | 170 | 7·2 | 80 | 1·5 |
| V3 DL74 | 52 | 0·5 | — | — |
| V4 KT74 | 157 | 26·0 | 170 | 5·7 |
| V5 U74 | † | — | — | — |

† Cathode to chassis 212V, DC.




Plan view of the chassis. The aerial coil assembly panel on the left has been freed from its fixing and swung back on its leads to show its interior.

## DISMANTLING THE SET

**Removing Chassis.**—Remove the three control knobs (two recessed grub screws each); remove back cover (five self-tapping screws) on which is wound the aerial lead; remove the four self-tapping screws holding chassis to base of cabinet, when chassis and speaker may be withdrawn as a single unit.

*When replacing*, fit a felt washer behind each control knob, and do not omit to rewax all control knob and chassis fixing screws, as these are "live" to the mains.

The metal heat deflector fitted over **V4** and **V5** may be lifted off upon removal of one nut and bolt holding it to the chassis deck and two nuts holding it at the top. A second deflector, round **R16**, is then held only by a nut to the chassis deck.

## GENERAL NOTES

**Switches.**—**S1-S8** are the waveband switches, in a two-position rotary unit beneath the chassis. This is indicated in our under-chassis view and shown in detail in the diagram inset at top right-hand corner of the circuit diagram overleaf, where it is drawn as seen from the rear of an inverted chassis.

In the MW (anti-clockwise) position of the control knob, all the odd-numbered switches close, and in the LW position the even ones close. Otherwise they are open.

**S9** is the QMB mains switch, ganged with the volume control **R7.**

**Coils.**—All the aerial circuit coils **L1; L2, L4;** and **L3, L5** are mounted on a vertical metal panel at one end of the chassis with several associated capacitors and the trimmers **C28, C29, C30.**

Access can be gained to the coils if two screws holding the panel to the chassis deck are removed, when the whole unit may be swung clear of the chassis on its seven connecting leads, for which a slot is cut in the chassis deck. The unit is shown in this position in our plan view of the chassis.

The oscillator coils **L6, L8** and **L7, L9** are mounted with their associated fixed and pre-set capacitors in another unit, beneath the chassis. This is also fixed by two screws, but its extraction is not so simple as in the case of the aerial unit. It is, however, in a much more accessible position.

The IF transformers **L10, L11** and **L12, L13** are in two screened units on the chassis deck. Their core adjustments, which project from either end of each unit, are indicated in our chassis illustrations.

**Scale Lamp.**—This is an Osram lamp with a small clear spherical bulb and an MES base. It is rated at 2.5 V, 0.2 A.

**Capacitors C25, C26.**—These are two dry electrolytics in a tubular cardboard container mounted in a clip on the chassis deck. The unit is rated at 350 V DC working. The red spotted tag is the positive of **C25** (16 μF); the plain tag that of **C26** (24 μF); and the black is the common negative connection.

## CIRCUIT ALIGNMENT

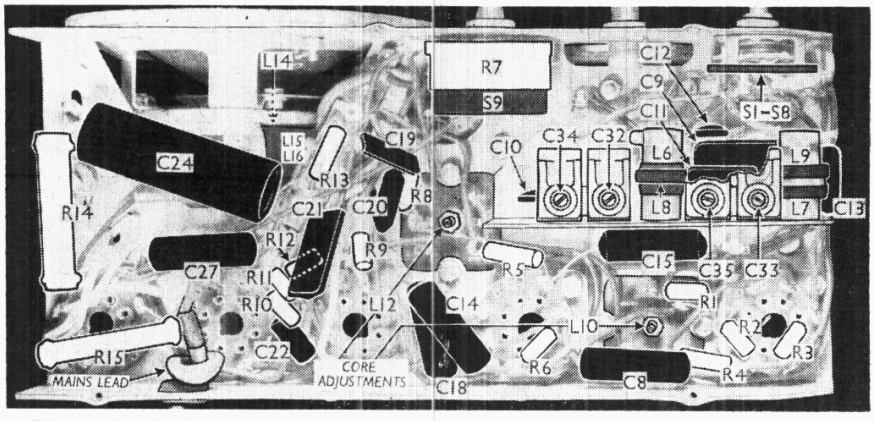
**IF Stages.**—Connect signal generator lead and one end of a 1,000,000Ω resistor to control grid (top cap) of **V1,** after removing the existing top cap connector, and connect the other signal generator lead (via a 0.05 μF capacitor) and the other end of the resistor to chassis.

Switch set to MW, feed in a 470 kc/s (638.3 m) signal, and adjust the cores of **L13, L12, L11** and **L10** in turn for maximum output.

**RF and Oscillator Stages.**—Transfer signal generator lead from **V1** to aerial lead at **C1,** replace top cap connector on **V1,** tune to 550 m on scale, feed in a 470 kc/s signal and adjust **C28** for minimum output.

**MW.**—Tune to 200 m on scale, feed in a 200 m (1,500 kc/s signal, and adjust **C34,** then **C29,** for maximum output. Feed in a 500 m (600 kc/s) signal, tune it in, and adjust **C32** for maximum output while rocking the gang.

**LW.**—Switch set to LW, tune to 1,000 m on scale, feed in a 1,000 m (300 kc/s) signal, and adjust **C35,** then **C30,** for maximum output. Feed in a 2,000 m (150 kc/s) signal, tune it in, and adjust **C33** for maximum output while rocking the gang for optimum results.




Under-chassis view. A diagram of the **S1-S8** switch unit is inset with the circuit overleaf. Parts of the trimmers **C33, C35** have been broken away to show capacitors hidden by them.

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