*Supplement to The Wireless & Electrical Trader, April 19, 1947*

"TRADER" SERVICE SHEET

# 808

# AERODYNE 302

+ ALBA 462 + 472

## A.C./D.C. 3-BAND SUPERHET

DESIGNED to operate from 100 V or 200 V A.C. or D.C. mains, the Aerodyne 302 is a 4-valve (plus rectifier) 3-band superhet. The prescribed mains voltage ranges are 100-120 V and 200-240 V, 40-100 c/s in the case of A.C. It may be used on 250 V mains if the adjustment screw is removed altogether.

A tuning assembly which contains all the components (except the tuning gang and waveband switch unit) intimately associated with the R.F. and oscillator tuning circuits, forms a screened unit which may easily be removed for inspection or replacement.

*Release date and original price: December,* 1945*;* £13, *plus* £2 15s 11d *purchase tax; increased November,* 1946, *to* £13 13s, *plus* £2 18s 9d *purchase tax.*

### CIRCUIT DESCRIPTION

Aerial input via mains isolating capacitor **C1** and coupling coils **L1** (S.W.), **L2** (M.W.) and **L3** (L.W.) to single tuned circuits **L4, C32** (S.W.), **L5, C32** (M.W.) and **L6, C32** (L.W.); "bottom" coupling on M.W. is provided by **C2, R1,** which are common to aerial coupling and tuning circuits.

First valve **(V1, Mullard metallized CCH35)** is a triode hexode operating as frequency changer with internal coupling. Triode oscillator grid coils **L7** (S.W.), **L8** (M.W.) and **L9** (L.W.) are tuned by **C33.** Parallel trimming by **C34** (S.W.), **C35** (M.W.) and **C10, C36** (L.W.); series tracking by **C11** (S.W.), **C12** (M.W.) and **C13** (L.W.). Reaction coupling by coils **L10** (S.W.), **L11** (M.W.) and **L12** (L.W.).

Second valve **(V2, Mullard metallized EF39)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C5, L13, L14, C6** and **C16, L15, L16, C17.**

**Intermediate frequency 460 kc/s.**

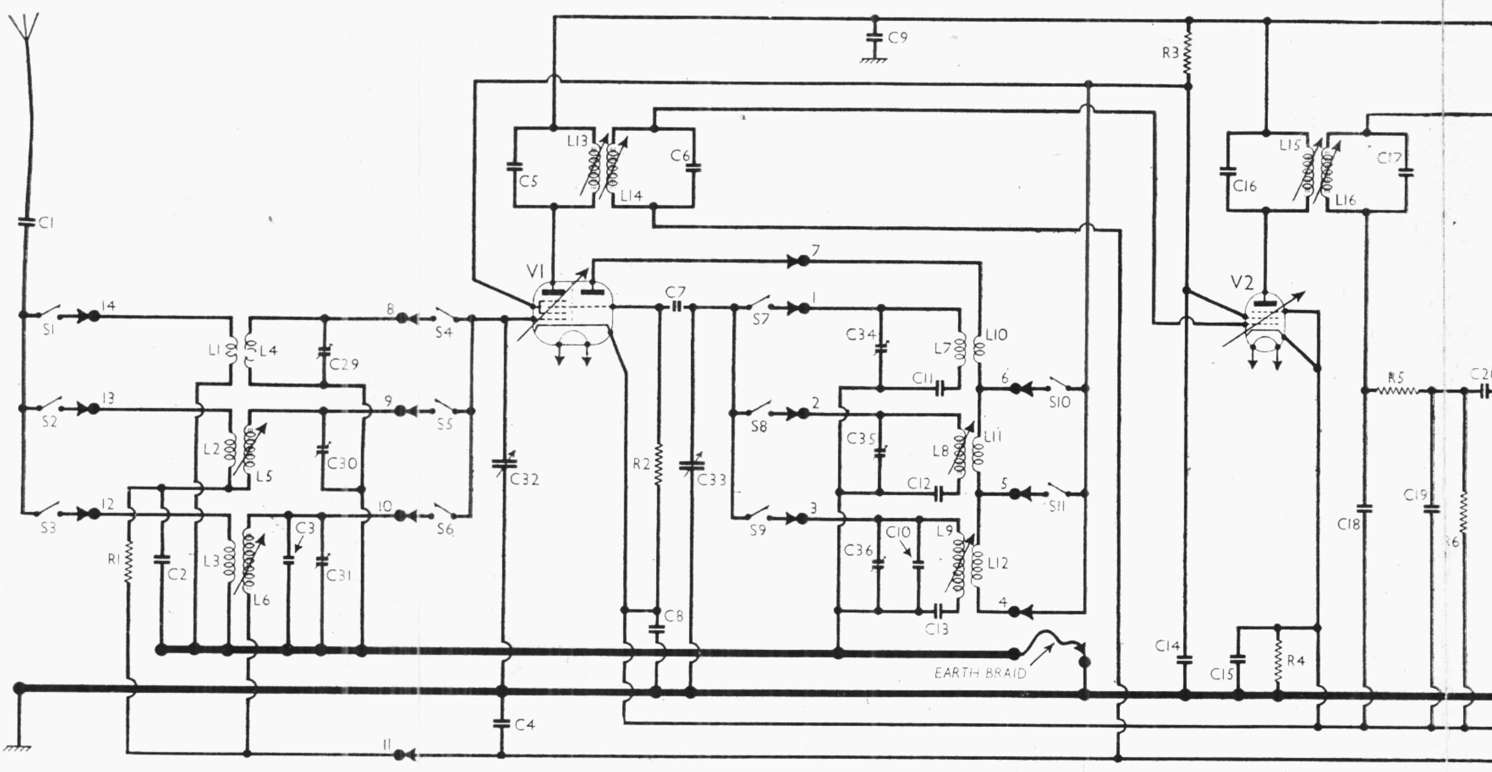
Diode second detector is part of double diode triode valve **(V3, Mullard metallized EBC33).** Audio frequency component in rectified output is developed across load resistor **R6** and passed via coupling capacitor **C20** and manual volume control **R7** to C.G. of triode section, which operates as A.F. amplifier. I.F. filtering in diode circuit by **C18, R5** and **C19.**

Second diode of **V3,** fed from **L16** via **C21,** provides D.C. potentials which are developed across load resistor **R10** and fed back through decoupling circuits as G.B. to F.C. (except on S.W.) and I.F. valves, giving automatic volume control. Delay voltage, together with fixed G.B. for **V1, V2** and **V3** triode is obtained from the drop along **R4,** which is common to the cathode circuits of the three valves.

Resistance-capacitance coupling by **R8, C23** and **R11,** via grid stopper **R12,** between **V3** triode and pentode output valve **(V4, Mullard CL33).** Fixed tone correction in anode circuit by **C24.**

When the receiver is operated from A.C. mains, H.T. current is supplied by half-wave rectifying valve **(V5, Brimar 1D5)** which, with D.C. mains, behaves as a low resistance. Smoothing by resistors **R14, R15** and electrolytic capacitors **C25, C26** and **C27.** H.T. circuit R.F. filtering by **C9.**

Valve heaters, together with scale lamp and tapped ballast resistor **R17** are connected in series across mains input. Mains R.F. filtering by **C28.**




Circuit diagram of the Aerodyne 302 A.C./D.C. 3-band superhet. The mains voltage adjustment consists of a screw and two sockets for normal low v[oltage and] high voltage mains. For mains of 250 V the screw is removed entirely. The heavy line, above the chassis line under V1, represents the frame of th[e] assembly, the fourteen connecting tags and the earthing braid being marked to agree with the chassis and assembly illustrations overle[af]

## VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on A.C. mains of 223 V, using the 200-240 V tapping on the heater ballast resistor. The receiver was tuned to the lowest wavelength on the M.W. 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 CCH35 | 170 Oscillator 92 | 2·7 4·0 | 92 | 2·4 |
| V2 EF39 | 170 | 5·6 | 92 | 1·7 |
| V3 EBC33 | 85 | 1·7 | — | — |
| V4 CL33 | 192 | 37·0 | 170 | 3·9 |
| V5 1D5† | — | — | — | — |

† Cathode to chassis, 231 V, D.C.

## DISMANTLING THE SET

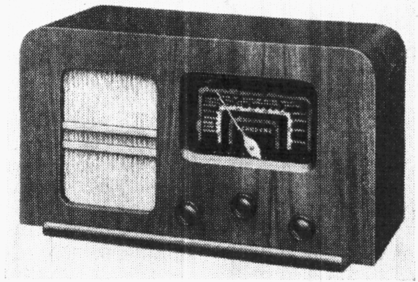
**Removing Chassis.**—Remove the three control knobs (recessed grub screws); remove the two plywood strips (two countersunk-head wood-screws each) from the underside of the cabinet; if the four chassis fixing screws (with metal washers) are removed the chassis and speaker may be withdrawn as a single unit.

**Removing Tuning Assembly.**—Unsolder from the two tag strips on the assembly the fourteen leads connecting it to the chassis, also the braided lead which is joined to an earthing tag adjacent to the assembly.

Remove the two cheese-head screws (with nuts and locking washers) securing the tuning assembly to the side of the chassis, and lift it out.

*When replacing*, the connections may be identified by reference to the numbered tags in the under-chassis illustration and the numbered connections on the circuit diagram. Most of these connections come from the switch unit, whose diagram appears in col. 3 overleaf.

Although all the interconnecting leads are coloured, the available colours are subject to supply conditions and cannot be relied upon for coding.



The appearance of the Aerodyne 302 A.C./D.C. receiver.

## COMPONENTS AND VALUES

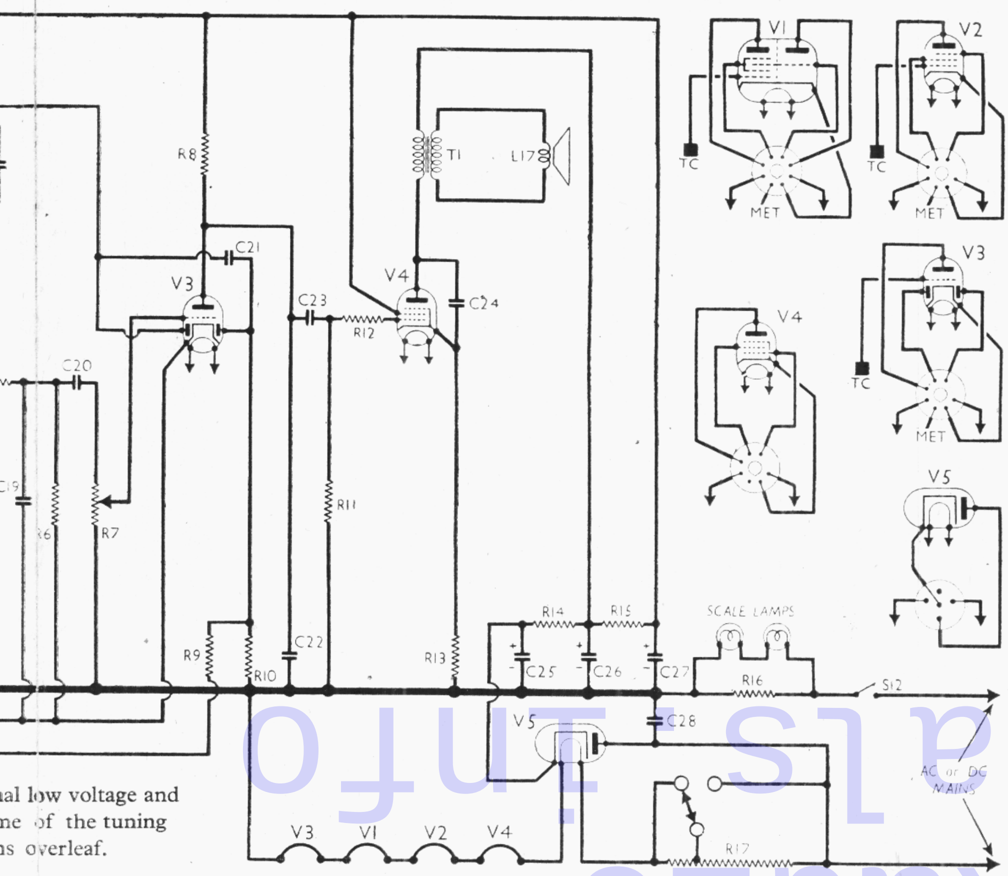
*Dealers are reminded when ordering replacements to mention the fact that component numbers were taken from this Service Sheet as these numbers do not agree with those on the maker's diagram.*

| | RESISTORS | Values (ohms) |
|---|---|---|
| R1 | Part aerial M.W. coupling | 680 |
| R2 | V1 osc. C.G. resistor ... | 47,000 |
| R3 | H.T. feed resistor... | 10,000 |
| R4 | V1, V2, V3 G.B. resistor... | 100 |
| R5 | I.F. stopper ... ... | 47,000 |
| R6 | V3 signal diode load ... | 470,000 |
| R7 | Manual volume control ... | 1,000,000 |
| R8 | V3 triode anode load ... | 47,000 |
| R9 | A.V.C. line decoupling ... | 2,200,000 |
| R10 | V3 A.V.C. diode load ... | 1,000,000 |
| R11 | V4 C.G. resistor ... ... | 470,000 |
| R12 | V4 grid stopper ... ... | 47 000 |
| R13 | V4 G.B. resistor ... ... | 150 |
| R14 | H.T. smoothing resistors | 560 |
| R15 | H.T. smoothing resistors | 1,500 |
| R16 | Scale lamp shunt... ... | 40 |
| R17 | Heater circuit ballast, total ... ... ... | 700† |

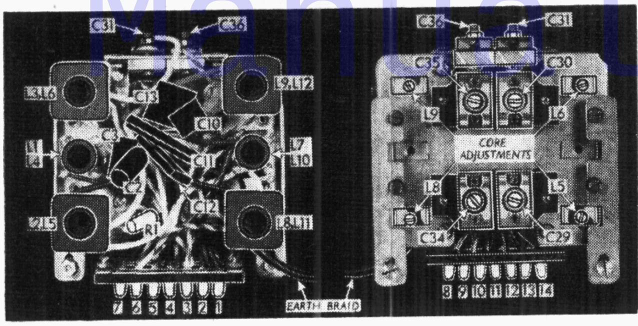
† Line cord, tapped at 100 Ω + 600 Ω from V5 heater.

| | CAPACITORS | Values (μF) |
|---|---|---|
| C1 | Aerial isolator ... ... | 0·0002 |
| C2 | Aerial M.W. coupling capacitor ... ... | 0·005 |
| C3 | Aerial L.W. fixed trimmer | 0·000056 |
| C4 | A.V.C. line decoupling ... | 0·05 |
| C5 | 1st I.F. transformer tuning capacitors | 0·0001 |
| C6 | 1st I.F. transformer tuning capacitors ... ... | 0·0001 |
| C7 | V1 osc. C.G. capacitor ... | 0·000047 |
| C8 | V1 cathode by-pass ... | 0·1 |
| C9 | H.T. circuit R.F. by-pass | 0·1 |
| C10 | Osc. L.W. fixed trimmer... | 0·000056 |
| C11 | Osc. circ. S.W. tracker ... | 0·0056 |
| C12 | Osc. circ. M.W. tracker ... | 0·000575 |
| C13 | Osc. circ. L.W. tracker ... | 0·0002 |
| C14 | H.T. feed decoupling ... | 0·1 |
| C15 | V2, V3 cathode by-pass ... | 0·25 |
| C16 | 2nd I.F. transformer tuning capacitors | 0·0001 |
| C17 | 2nd I.F. transformer tuning capacitors ... | 0·0001 |
| C18 | I.F. by-pass capacitors ... | 0·0001 |
| C19 | I.F. by-pass capacitors ... | 0·0001 |
| C20 | A.F. coupling to V3 triode | 0·005 |
| C21 | V3 A.V.C. diode coupling | 0·0001 |
| C22 | V3 anode I.F. by-pass ... | 0·0002 |
| C23 | A.F. coupling to V4 C.G.... | 0·005 |
| C24 | Fixed tone corrector ... | 0·005 |
| C25* | H.T. smoothing capacitors | 8·0 |
| C26* | H.T. smoothing capacitors | 16·0 |
| C27* | H.T. smoothing capacitors | 16·0 |
| C28 | Mains R.F. by-pass ... | 0·05 |
| C29‡ | Aerial circ. S.W. trimmer | 0·00005 |
| C30‡ | Aerial circ. M.W. trimmer | 0·00005 |
| C31‡ | Aerial circ. L.W. trimmer | 0·00005 |
| C32† | Aerial circuit tuning ... | 0·0005 |
| C33† | Oscillator circuit tuning... | 0·0005 |
| C34‡ | Osc. circ. S.W. trimmer ... | 0·00005 |
| C35‡ | Osc. circ. M.W. trimmer... | 0·00005 |
| C36‡ | Osc. circ. L.W. trimmer... | 0·00005 |

* Electrolytic. † Variable. ‡ Pre-set.




...al low voltage and ...ne of the tuning ...s overleaf.




Two views of the tuning assembly after dismounting it from the chassis and removing the cover. On the outer side (right) are seen all the R.F. and oscillator alignment adjustments.

| OTHER COMPONENTS | | Approx. Values (ohms) |
|---|---|---|
| L1 | Aerial S.W. coupling coil... | 0·1 |
| L2 | Aerial M.W. coupling coil... | 0·4 |
| L3 | Aerial L.W. coupling coil... | 80·0 |
| L4 | Aerial S.W. tuning coil ... | Very low |
| L5 | Aerial M.W. tuning coil ... | 2·5 |
| L6 | Aerial L.W. tuning coil ... | 20·0 |
| L7 | Osc. S.W. tuning coil ... | Very low |
| L8 | Osc. M.W. tuning coil ... | 1·5 |
| L9 | Osc. L.W. tuning coil ... | 4·5 |
| L10 | Osc. S.W. reaction coil ... | 0·1 |
| L11 | Osc. M.W. reaction coil ... | 0·6 |
| L12 | Osc. L.W. reaction coil ... | 1·1 |
| L13 | 1st I.F. trans. { Pri. ... | 5·2 |
| L14 | 1st I.F. trans. { Sec. ... | 5·2 |
| L15 | 2nd I.F. trans. { Pri. ... | 6·8 |
| L16 | 2nd I.F. trans. { Sec. ... | 6·8 |
| L17 | Speaker speech coil ... | 2·5 |
| T1 | Output trans. { Pri. ... | 320·0 |
| | Output trans. { Sec. ... | 0·2 |
| S1-S11 | Waveband switches ... | — |
| S12 | Mains switch, ganged R7... | — |

## GENERAL NOTES

**Switches.**—**S1-S11** are the waveband switches, ganged in a single rotary unit under the chassis deck, beneath the tuning assembly. The unit is indicated in our under-chassis view, and shown in detail in the diagram in col. 3, where it is drawn as seen when viewed from the rear of an inverted chassis.

The table below gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

**S12** is the Q.M.B. mains switch, ganged with the manual volume control **R7**.

### Switch Table

| Switch | S.W. | M.W. | L.W. |
|---|---|---|---|
| S1 | C | — | — |
| S2 | — | C | — |
| S3 | — | — | C |
| S4 | C | — | — |
| S5 | — | C | — |
| S6 | — | — | C |
| S7 | C | — | — |
| S8 | — | C | — |
| S9 | — | — | C |
| S10 | C | — | — |
| S11 | — | C | — |

**Tuning Assembly.**—All the R.F. and oscillator coils **L1-L6** and **L7-L12,** together with their trimmers and other associated components, are housed in an assembly mounted at one end of the chassis deck, over the waveband switch unit.

This assembly is indicated in our plan view of the chassis, where the components it contains are listed. It is also shown in the photograph in cols. 1 and 2 above, where the two side views are seen with the cover removed. One side shows all the R.F. and oscillator adjustments, while the other shows the inside of the assembly.

At the bottoms of these two views and in the under-chassis illustration the two rows of connecting tags are shown, numbered **1** to **14,** while in the circuit diagram the points at which these connections occur are indicated by arrows and solid circles bearing the same numbers. If it is necessary to remove the assembly for inspection or replacement, reference must be made to these indications when reconnecting it again unless the leads have been coded with labels as they were disconnected.

**Scale Lamps.**—These are two Osram lamps, with small clear spherical bulbs and M.E.S. bases, rated at 4 V, 0.3 A. They are shunted by a 40 Ω wire-wound resistor **R16.**

**Capacitors C25, C26, C27.**—These are three electrolytics in a single tubular metal container mounted on the chassis deck. The red tag is the positive of **C25** (8 μF), and the two plain tags are the positives of **C26** and **C27.** The case forms the common negative connection. The unit is rated at 400 V D.C. working.

**Line Cord.**—This is a multiple cable carrying **R17** as the resistance lead and four flexible conductors. At the receiver end four leads emerge: a maroon braided lead from the near end of **R17,** which goes to **V5** heater; a red rubber lead from the mains end of **R17,** which goes to the 120 V tag on the voltage adjustment panel and to **V5** anode; and two green leads, one from the tapping on **R17,** which goes to the common voltage adjustment bus-bar, and the other from the "negative" side of the mains, which goes to **S12.**

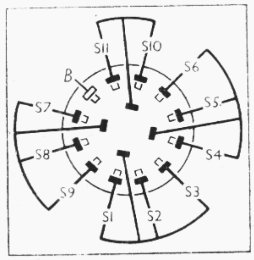
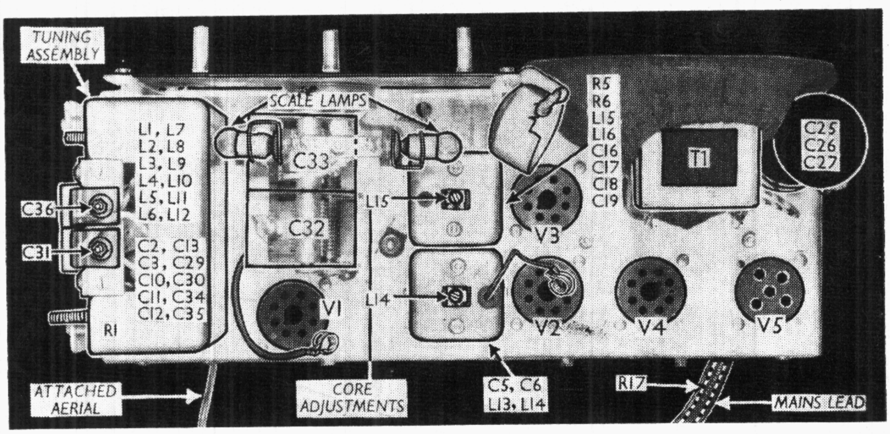



Diagram of the waveband switch unit, drawn as seen when viewed from the rear of an inverted chassis. ***B*** indicates a blank tag.

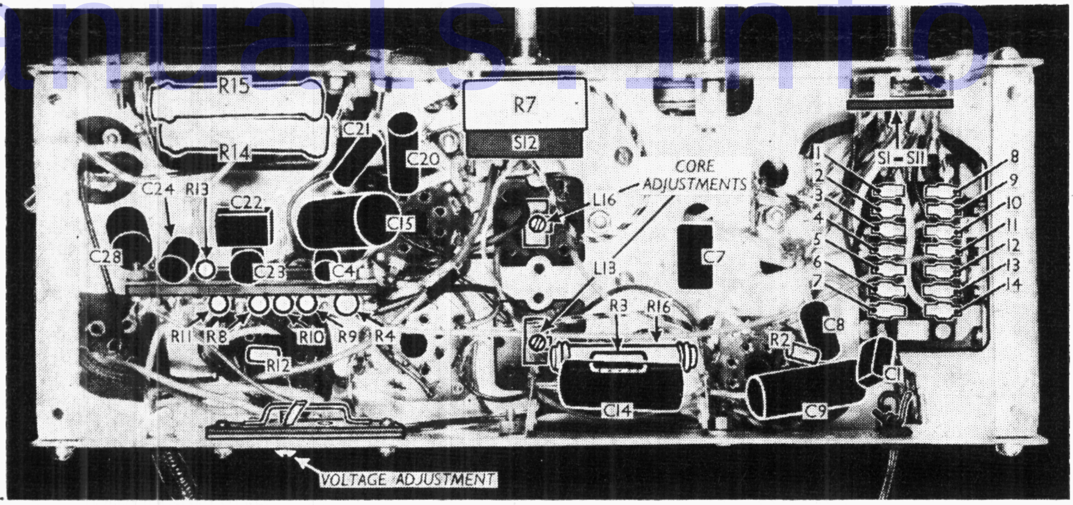
**Drive Cord Replacement.**—This is very straightforward and requires no description beyond that given in the sketch (col. 4), which shows the position of cord and drum when the gang is at maximum. The sketch is drawn as seen when viewed from the front of the set.

To obtain access to the drum, the scale must be removed (four set-screws) from its supports, after first removing the pointer (pull-off). When replacing the scale, washers go under the heads of the two upper fixing screws, on the face of the scale.




Plan view of the chassis. All the components inside the screened units are indicated here, but those in the tuning assembly are also shown in detail in the illustration above at the head of cols. 1 and 2.

Under-chassis view. The waveband switch unit **S1-S11** is indicated here and shown in detail in the diagram in col. 3. Below the switch are seen the fourteen tags of the tuning assembly, numbered to agree with the circuit diagram overleaf. The numbers are also repeated in the two views of the tuning assembly at the head of cols. 1 and 2 opposite.




### CIRCUIT ALIGNMENT

**I.F. Stages.**—Connect signal generator leads via a 0.1 μF capacitor to control grid (top cap) of **V1,** leaving original connector in position, and chassis. Tune the receiver to 550 m and turn the volume control to maximum.

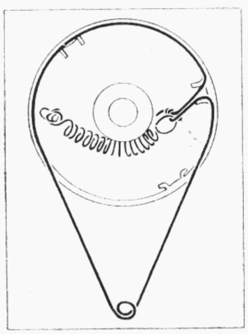
Feed in a 460 kc/s (652.1 m) signal, and adjust the cores of **L16, L15, L14** and **L13,** in that order, for maximum output.

**R.F. and Oscillator Stages.**—Transfer signal generator leads to one end of attached aerial and chassis, via a suitable dummy aerial. Turn gang to maximum, when the pointer should cover the high wavelength ends of the three scale lines. All the trimmers involved in the following adjustments are grouped together in the tuning assembly. The adjustments are identified on the right in the illustration in cols. 1 and 2, which shows the tuning assembly as it appears when viewed from the end of the chassis after removal from the cabinet.

**S.W.**—Switch set to S.W., tune to 20 m on scale, feed in a 20 m (15 Mc/s) signal, and adjust **C34,** then **C29,** for maximum output.

**M.W.**—Switch set to M.W., tune to 550 m on scale, feed in a 550 m (545 kc/s) signal, and adjust the cores of **L8** and **L5** for maximum output. Tune to 250 m on scale, feed in a 250 m (1,200 kc/s) signal and adjust **C35,** then **C30** for maximum output. Repeat the 550 m and 250 m adjustments until no improvement can be obtained.

**L.W.**—Switch set to L.W., tune to 2,000 m on scale, feed in a 2,000 m (150 kc/s) signal and adjust the cores of **L9** and **L6** for maximum output. Tune to 1,000 m on scale, feed in a 1,000 m (300 kc/s) signal, and adjust **C36,** then **C31** for maximum output. Repeat the 2,000 m and 1,000 m adjustments until no improvement can be obtained.



Sketch showing the drive cord system as seen from the front. The cord makes 1½ turns round the control spindle.

# CAPACITOR VALUE CONVERSIONS

## Microfarads, Micro-microfarads and Picofarads

THE range of values associated with the L. C and R components in modern domestic radio receivers is very wide, so wide indeed that standard units are divided up into sub-units of one-millionth part of a unit, or bunched together in multiples of a million units, like megohms.

In the case of capacitors, this commonly happens twice: the unit of capacitance is the Farad, the practical sub-multiple or "working unit" is the microfarad (one-millionth of a Farad) and the sub-sub-multiple of that, which is now used frequently, is the picofarad or micro-micro-farad. This is one millionth of a micro-farad, or one million-millionth of a Farad.

### Microfarads to Picofarads

Radio dealers are quite familiar with these terms, but some of them find difficulty in converting them from one degree of magnitude to another when, for instance, a 0.00001 μF capacitor is required and they have 10 pF and 100 pF types in stock. We are frequently asked to publish a conversion table, but there are several reasons why a table is not the best solution of the difficulty. One of them is that it would have to include all possible values from, say, 0.000001 μF (1μμF or 1 pF) to 0.1 μF; another is that it is quite a simple matter and quite as quick to work it out.

The method is to write down the value given, always inserting the decimal point even if the value is a whole number, like 50.0, which might have been given as 50 μμF or 50 pF. Then, if it is desired to convert this to microfarads, divide by one million by shifting the decimal point six places to the left, thus: 0.0000500, or 0.00005 μF. If instead the value given is 0.001 μF, convert it to picofarads by shifting the decimal point six places to the right, giving 0001000.0 or 1,000 pF.

### Worked Examples

To make this perfectly clear, three different examples are shown below, where the values in picofarads are written exactly under the same values in micro-farads, only the decimal point being altered to make the conversion, thus:

| | | | |
|---|---|---|---|
| μF : | 0.000300 | 0.000005 | 0.025000 |
| pF : | 000300.0 | 000005.0 | 025000.0 |

Upon removal of the surplus noughts, and in the cases of whole numbers the decimal points, these values read thus:

| | | |
|---|---|---|
| 0.0003 μF | 0.000005 μF | 0.025 μF |
| 300 pF | 5 pF | 25,000 pF |

If the conversion is practised by this method every time a small capacitor is encountered, the process rapidly becomes automatic and either value can be quoted off-hand. Where the conversion is only needed occasionally, the method described is the quickest way to perform it.

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