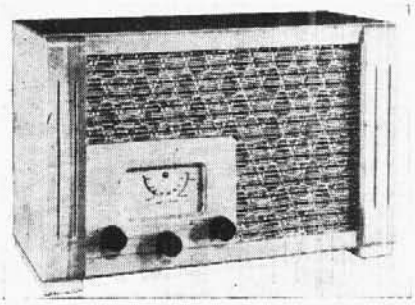
"TRADER" SERVICE SHEET

# 690

# The WARTIME CIVILIAN RECEIVER

## Battery Model—MW only



The appearance of the battery operated version of the Wartime Civilian Receiver.

DESIGNED with the object of producing a battery operated receiver of satisfactory performance with the minimum of raw materials and labour, the Wartime Civilian battery receiver is a single-waveband (MW only) superhet employing four Mazda valves.

The receiver is of a standard design, but will be made by a number of manufacturers. The information in this *Service Sheet* is based upon a sample receiver, and divergencies that will be found in other manufacturers' chassis are described under "Modifications" overleaf.

*Release date: June*, 1944.

*Retail selling price:* £10 19s., *without batteries.*

### CIRCUIT DESCRIPTION

Two alternative aerial input sockets are provided: **A1** for general use, and **A2** for the reception of the local transmission when it is strong enough to overload **V1** from socket **A1.**

Input from **A1** is via series capacitor **C1,** coupling coil **L1** and capacitor **C2** to single-tuned circuit **L2, C18.** From **A2,** input is taken via series resistor **R1** to **A1,** the potential divider so formed by **R1** and the aerial coupling circuit providing a step-down coupling.

First valve **(V1, BVA metallised 172)** is a triode-pentode operating as frequency changer with internal coupling. Triode oscillator anode coil **L4** is tuned by **C20.** Parallel trimming by **C21,** and fixed tracking by **C6** in the high potential side of the circuit, while tracking adjustment is effected by varying the inductance of **L4,** which, like the aerial tuning coil **L2,** has an adjustable dust-iron core. Reaction coupling is applied from the grid circuit via coil **L3.**

Second valve **(V2, BVA metallised 142)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C3, L5, L6, C4** and **C10, L7, L8, C11.** The tuning capacitances are of fixed values, and trimming is effected by adjusting the positions of the dust-iron cores of the coils.

**Intermediate frequency 460 kc/s.**

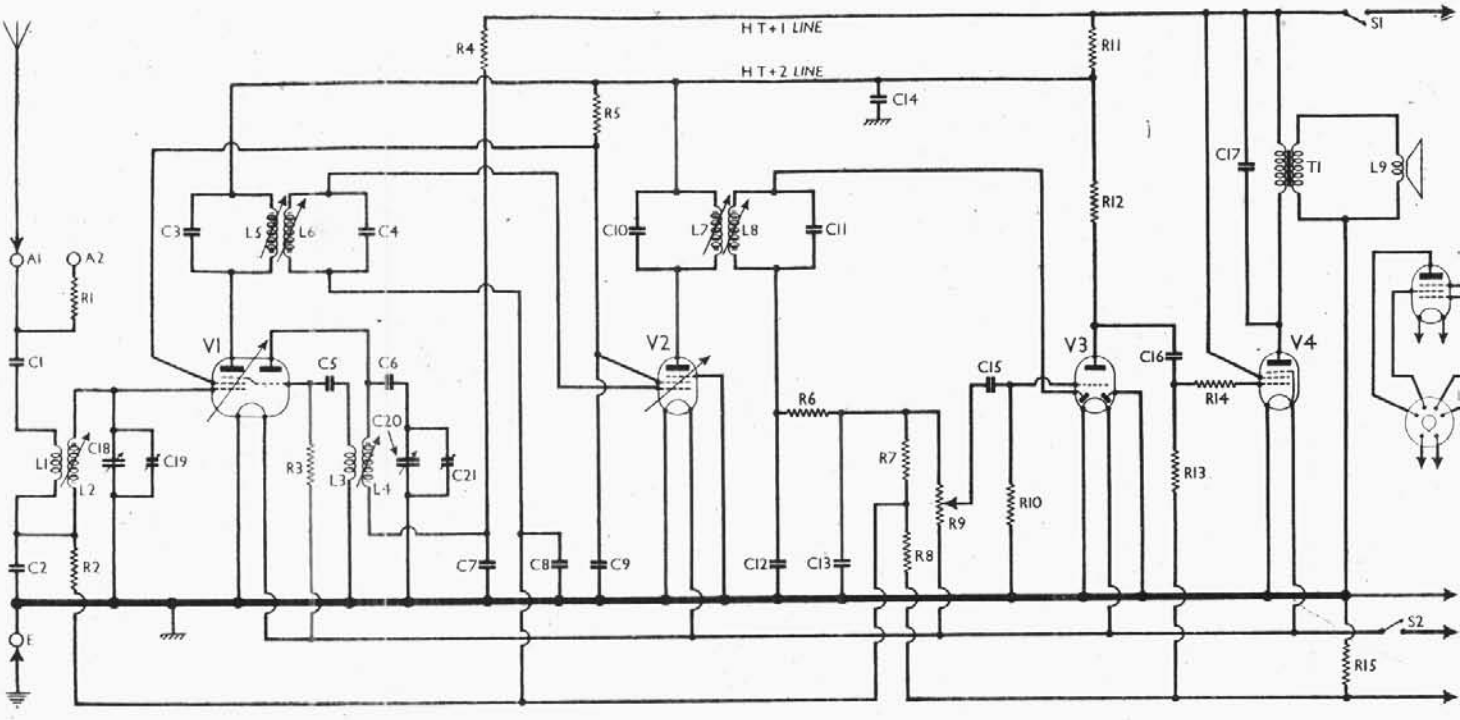
Diode second detector is part of double diode triode valve **(V3, BVA metallised 132).** Audio frequency component in rectified output is developed across the manual volume control **R9,** which also operates as load resistor, and passed via AF coupling condenser **C15** to control grid of triode section, which operates as AF amplifier. IF filtering by **C12, R6** and **C13.**

DC potential developed across **R9** appears also across the potential divider comprising resistors **R7, R8,** and that at their junction is tapped off and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control. The second diode of **V3** is unused, and is connected directly to chassis.

No delay is imposed on the AVC action, but for the purposes of signal rectification the signal diode is returned to the positive end of the filament, so that the diode is conducting before the arrival of a signal.

Resistance-capacity coupling by **R12, C16, R13,** via grid stopper **R14,** between **V3** triode and pentode output valve **(V4, BVA 162).** Fixed tone correction by **C17** in anode circuit.

Negative GB potential for **V4** is obtained automatically from the drop along **R15** in the negative HT lead to chassis. The same potential (about 3 V), plus the LT voltage (2 V), appears across the potential divider formed by **R9, R7** and **R8,** and from the junction of **R7** and **R8** it is tapped off and applied via the AVC line as fixed GB to **V1** and **V2.** A small fraction is tapped off at the junction of



**R7** and **R9** also, and applied via **R6** to the signal diode, but this is positive with respect to chassis.

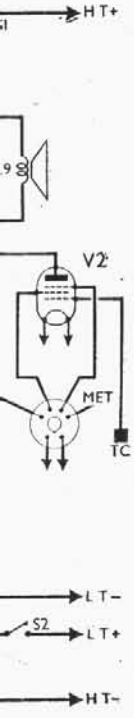


## COMPONENTS AND VALUES

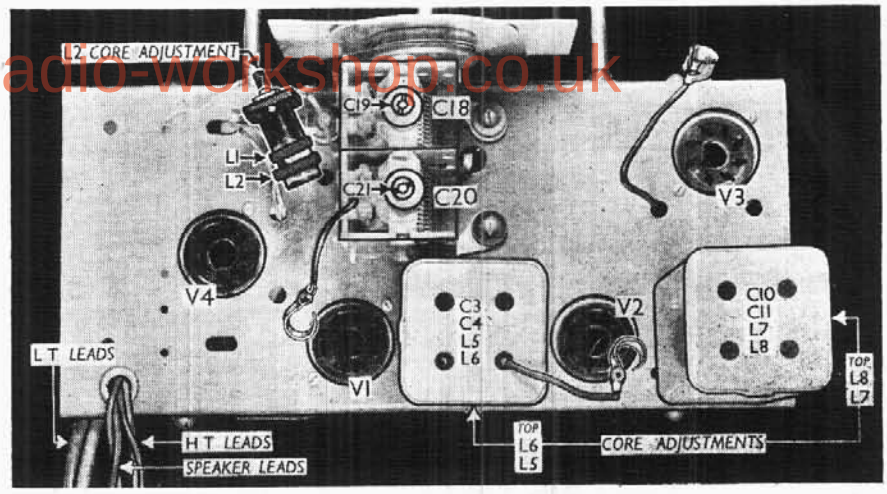
| | CAPACITORS | Values (μF) |
|---|---|---|
| C1 | Aerial series capacitor ... | 0·0005 |
| C2 | V1 hex. CG decoupling ... | 0·005 |
| C3 | 1st IF transformer tuning capacitors ... ... | 0·0001 |
| C4 | | 0·0001 |
| C5 | V1 osc. CG capacitor ... | 0·0002 |
| C6 | Oscillator circuit tracker | 0·0005 |
| C7 | V1 osc. anode decoupling | 0·1 |
| C8 | V2 CG decoupling ... | 0·1 |
| C9 | V1, V2 SG's decoupling ... | 0·1 |
| C10 | 2nd IF transformer tuning capacitors ... | 0·0001 |
| C11 | | 0·0001 |
| C12 | IF by-pass capacitors ... | 0·0001 |
| C13 | | 0·0001 |
| C14 | HT circuit by-pass ... | 0·5 |
| C15 | AF coupling to V3 triode | 0·005 |
| C16 | V3 triode to V4 AF coupling ... ... | 0·005 |
| C17 | Fixed tone corrector ... | 0·005 |
| C18† | Aerial circuit tuning ... | 0·000532 |
| C19‡ | Aerial circuit trimmer ... | 0·00005 |
| C20† | Oscillator circuit tuning | 0·000532 |
| C21‡ | Oscillator circuit trimmer | 0·00005 |

† Variable. ‡ Pre-set.

| | RESISTORS | Values (ohms) |
|---|---|---|
| R1 | A2 series resistor ... | 47,000 |
| R2 | V1 pent. CG decoupling | 680 |
| R3 | V1 osc. CG resistor ... | 22,000 |
| R4 | V1 osc. anode HT feed ... | 39,000 |
| R5 | V1, V2 SG's HT feed ... | 47,000 |
| R6 | IF stopper ... ... | 100,000 |
| R7 | V1, V2 fixed GB and AVC feed resistors ... ... | 2,200,000 |
| R8 | | 3,900,000 |
| R9 | Manual volume control; V3 signal diode load ... | 1,000,000 |
| R10 | V3 triode CG resistor ... | 3,300,000 |
| R11 | V1, V2, V3 HT feed ... | 10,000 |
| R12 | V3 triode anode load ... | 68,000 |
| R13 | V4 CG resistor ... ... | 330,000 |
| R14 | V4 grid stopper ... | 100,000 |
| R15 | V1, V2, V4 fixed GB, resistor ... ... | 390 |




Circuit diagram of the Wartime Civilian Battery Receiver. All the tuning coils have adjustable dust-iron cores. HT + 1 and HT + 2 lines are identified here to agree with references marked in the component assembly sketch overleaf.




Plan view of the chassis. The aerial and IF coil assemblies are seen here, and their core adjustments are indicated. All four coil units are shown in detail in the sketches overleaf.

| | OTHER COMPONENTS | Approx. values (ohms) |
|---|---|---|
| L1 | Aerial coupling coil ... | 0·8 |
| L2 | Aerial tuning coil ... | 3·0 |
| L3 | Oscillator reaction coil ... | 0·8 |
| L4 | Oscillator tuning coil ... | 1·7 |
| L5 | 1st IF trans. Pri. ... | 7·0 |
| L6 | 1st IF trans. Sec. ... | 7·0 |
| L7 | 2nd IF trans. Pri. ... | 7·0 |
| L8 | 2nd IF trans. Sec. ... | 7·0 |
| L9 | Speaker speech coil ... | 3·0 |
| T1 | Speaker input trans. Pri. ... | 600·0 |
| | Speaker input trans. Sec. ... | 0·2 |
| S1 | HT circuit switch ... | — |
| S2 | LT circuit switch ... | — |

## VALVE ANALYSIS

Valve voltages and currents given in the table below are those quoted as average values by the designers. They are based on readings taken on a receiver operating from an HT battery measuring 115 V on load, with the gang turned to maximum, but with no signal input.

Voltages were measured on the 400 V scale of a model 7 Avometer, chassis being negative.

In addition to the table, the following information is given: GB voltage (across **R15**) is −3 V; total HT current is 8·9 mA; total LT current is 0.45 A; **V1** oscillator grid current (with gang at maximum) is 220 μA.

The valves are fitted with Mazda octal bases, whose pin connections are given in the diagrams beside the circuit diagram on this page.

| Valve | Anode voltage (V) | Anode Current (mA) | Screen Voltage (V) | Screen Current (mA) |
|---|---|---|---|---|
| V1 172 | 85 | 0·36 | 46 | 0·71 |
| | Oscillator | | | |
| | 58 | 1·3 | | |
| V2 142 | 85 | 0·61 | 46 | 0·17 |
| V3 132 | 52 | 0·5 | — | — |
| V4 162 | 109 | 4·2 | 112 | 0·98 |

## DISMANTLING THE SET

**Removing Chassis.**—Remove the three control knobs (recessed grub screws); unsolder from the connecting tags on the speaker transformer the two leads connecting it to chassis; remove the four $\frac{3}{16}$ in. hexagon bolts (with flat washers and lock washers) holding the chassis to the base of the cabinet.

*When replacing*, pass the speaker leads through the gap between the dividing partition and the front of the cabinet before connecting them to the speaker. It is immaterial which way round they are connected.

Note that the switch control (centre) is the one engraved with appropriate markings.

**Removing Speaker.**—Unsolder from the tags on the speaker transformer the two leads connecting it to chassis, and remove the four 4BA hexagon nuts (with washers) holding the speaker to the sub-baffle.

*When replacing*, the transformer should be at the top.

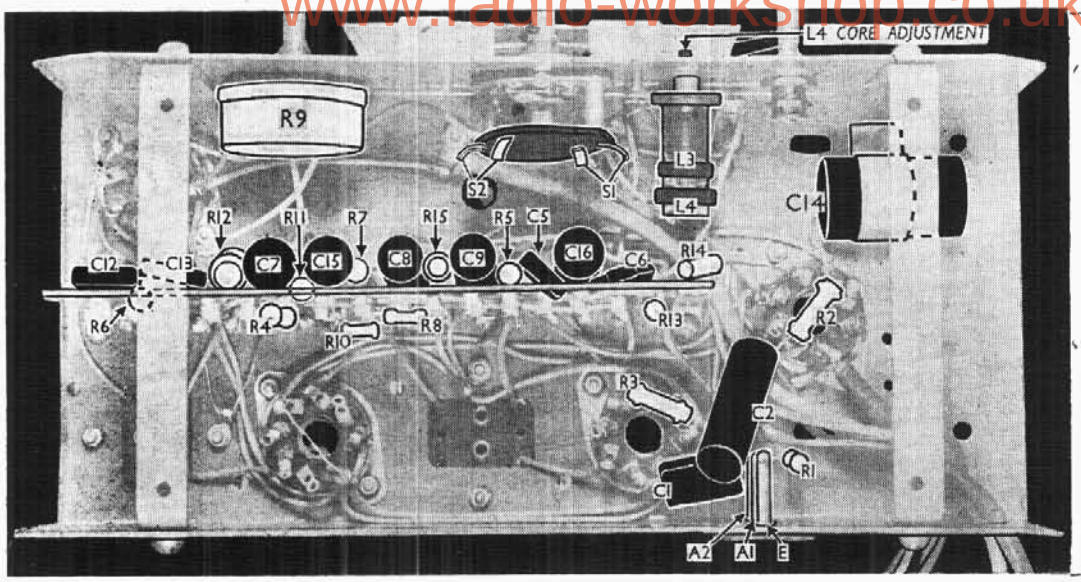
## GENERAL NOTES

**Switches S1, S2.**—As there is no wave-band or pick-up switching, the HT and LT circuit switches **S1, S2** are the only switches used in the receiver. They are ganged in a small rotary unit behind the central control spindle on the front chassis member. Their connecting tags are clearly identified in our under-chassis view, where the unit has been given an artificial tilt to show them.

**Coils.**—The aerial coils **L1, L2** are on a plastic former mounted unscreened on the front of the chassis deck beside the gang assembly, just above the tuning control spindle. The unit has an adjustable iron-dust core, the adjusting screw of which projects over the front of the chassis.

The oscillator unit **L3, L4** is of similar construction, but is mounted on the front member beneath the chassis deck, its core adjusting screw also projecting from the front of the chassis.

The IF transformers **L5, L6** and **L7, L8** are in two screened units on the chassis deck with their fixed tuning capacitors. These again are of the same construction as the aerial unit, and the positions of their core adjustments, which are reached through holes in the sides of their cans,




Under - chassis view. Both sides of the component assembly, running along the horizontal centre-line, are shown in detail in the sketches below, where the tags are nunbered. In this photograph, No. 1 tag is on the extreme left.

are indicated approximately in our plan view. The coil assemblies are shown in detail in the sketches below.

The connecting tags on all the coil units are numbered, and the numbering is shown in the sketches.

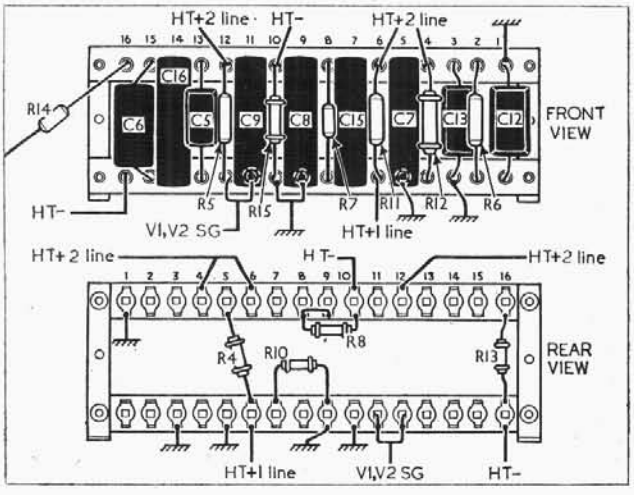
**External Speaker.** — No provision is made for this, but a low impedance speaker (about 4-6 Ω) could be connected to the speech coil connections of the internal speaker. Alternatively, a high impedance speaker (about 14,000 Ω) could be connected to the primary tags of the internal speaker input transformer **T1.**

**Capacitor C17.**—This is mounted directly to the primary tags of **T1,** and does not, therefore, appear in our chassis illustrations.

**Component Assembly.** — Most of the small components are mounted on a connecting strip, containing sixteen pairs of tags, suspended vertically from beneath the chassis deck. The components are indicated in our under-chassis view, but they are shown again in the sketches on the right, where the tags to which they are actually attached are identified by numbers.

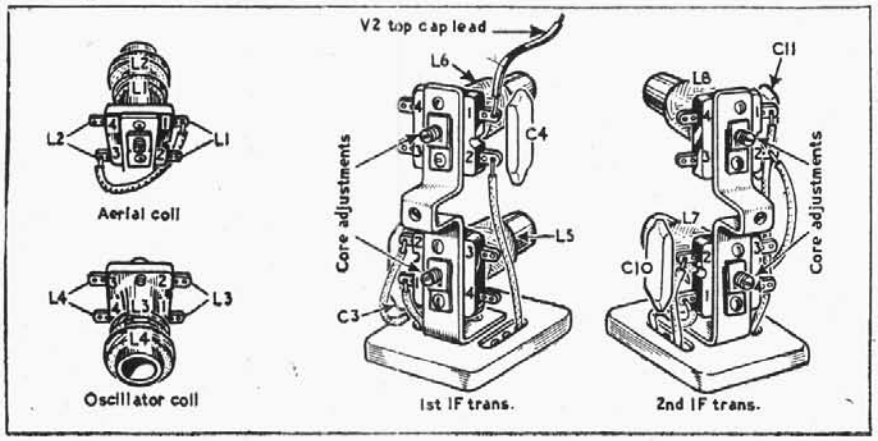
This will be found useful in making point-to-point tests, and to this end certain tags, such as those connected to HT positive points, chassis, etc., are appropriately marked also.

Sketches showing both sides of the component assembly, the upper one as seen from the front, and the lower one as seen from the rear, when the chassis is inverted. Certain key-points are indicated.




**Battery Leads and Voltages.**—No batteries are supplied with the receiver, but it is designed for use with an HT battery of 120 V and a 2 V LT accumulator. Any normal HT battery may be used, however, up to a maximum voltage of 150, as grid bias is obtained automatically. The performance specification requires that the receiver shall continue to operate when fed from a 60 V HT battery via a series resistance of 2,200 Ω.

There are only two HT battery leads, marked HT+ and HT−, and they are coloured red and black respectively. The two LT leads, with spade tags, are similarly coloured.




Sketches showing in detail the RF, oscillator and IF coil units, with their connections, as they were in our sample chassis.

## CIRCUIT ALIGNMENT

**IF Stages.**—Connect signal generator via a 0.01 μF capacitor to control grid (top cap) of **V1** and chassis, turn the gang to minimum, and the volume control to maximum, and short-circuit **R8** to avoid AVC action. Feed in a 460 kc/s (652.1 m) signal, and adjust the cores of **L8, L7, L6** and **L5** for maximum output.

**RF and Oscillator Stages.**—With the gang at maximum, the cursor line on the tuning disc should coincide with the calibration mark on the outside of the semi-circular slot in the scale plate, nearly opposite the 550 m mark on the scale. If it does not, it may be adjusted after slackening the screw at the centre of the scale.

Transfer signal generator leads, via a 0.0002 μF condenser, to **A1** and **E** sockets, tune to 220 m (calibration mark on outside edge of semi-circular slot, nearly opposite the 200 m mark), feed in a 220 m (1,364 kc/s) signal, and adjust **C21,** then **C19,** for maximum output. Feed in a 500 m (600 kc/s) signal, tune it in, and adjust the cores of **L4** and **L2** for maximum output, rocking the gang a little if necessary after each adjustment for optimum results.

# MANUFACTURERS' CODE NUMBERS and RECEIVER MODIFICATIONS

The following is a list of manufacturers concerned with the production of the Wartime Civilian Receivers, together with their code numbers, which precede the serial number. From the code number, dealers can ascertain to whom they should apply for spares. This information must be regarded as confidential to the Trade.

Below the list are details of modifications to be found in some manufacturers' versions grouped under the code numbers to which they apply. Replacement valve types suitable for the Wartime Receiver are given in the table below against the BVA numbers which will be found on the original valves.

| | | |
|---|---|---|
| **U1** | ... ... | **Bush Radio, Ltd.** |
| **U2** | ... ... | **E. K. Cole, Ltd.** |
| **U3** | ... ... | **A. C. Cossor, Ltd.** |
| **U4** | ... ... | **Gramophone Co., Ltd.** |
| **U4A** | ... ... | **Marconiphone Co., Ltd.** |
| **U5** | ... ... | **Ferguson Radio Corporation, Ltd.** |
| **U6** | ... ... | **General Electric Co., Ltd.** |
| **U7** | ... ... | **Murphy Radio, Ltd.** |
| **U8** | ... ... | **Philips Lamps, Ltd.** |
| **U9** | ... ... | **Pye, Ltd.** |
| **U10** | ... ... | **Ultra Electric, Ltd.** |
| **U11** | ... ... | **A. J. Balcombe, Ltd.** |
| **U12** | ... ... | **Burndept, Ltd.** |
| **U12A** | ... ... | **Vidor, Ltd.** |
| **U13** | ... ... | **Central Equipment, Ltd.** |
| **U14** | ... ... | **Ferranti, Ltd.** |
| **U15** | ... ... | **Felgate Radio, Ltd.** |
| **U16** | ... ... | **Hale Electrical Co., Ltd.** |
| **U17** | ... ... | **Halcyon Radio, Ltd.** |
| **U18** | ... ... | **Invicta Radio, Ltd.** |
| **U19** | ... ... | **Lissen, Ltd. (Ever Ready).** |
| **U20** | ... ... | **McMichael Radio, Ltd.** |
| **U21** | ... ... | **Philco Radio & Tel. Corp. Ltd.** |
| **U22** | ... ... | **Pilot Radio, Ltd.** |
| **U23** | ... ... | **Plessey Co., Ltd.** |
| **U24** | ... ... | **Regentone Products, Ltd.** |
| **U25** | ... ... | **R.M. Electric, Ltd.** |
| **U26** | ... ... | **Decca Record Co., Ltd.** |
| **U27** | ... ... | **Dulci Company.** |
| **U28** | ... ... | **R. N. Fitton, Ltd.** |
| **U29** | ... ... | **Portadyne Radio, Ltd.** |
| **U30** | ... ... | **Pamphonic Radio, Ltd.** |
| **U31** | ... ... | **Mains Radio Gramophones, Ltd.** |
| **U32** | ... ... | **Kolster-Brandes, Ltd.** |
| **U33** | ... ... | **Roberts Radio Co., Ltd.** |
| **U34** | ... ... | **Radio Gramophone Dev. Co., Ltd.** |
| **U35** | ... ... | **R.S.C. Radio, Ltd.** |
| **U36** | ... ... | **Beethoven Electric Equip. Co., Ltd.** |
| **U37** | ... ... | **J. G. Graves, Ltd.** |
| **U38** | ... ... | **Aren Radio & Television, Ltd.** |
| **U39** | ... ... | **N.H. Radio Products, Ltd.** |
| **U40** | ... ... | **Ace Radio, Ltd.** |
| **U41** | ... ... | **Solectric, Ltd.** |
| **U42** | ... ... | **Whiteley Electrical Co., Ltd.** |

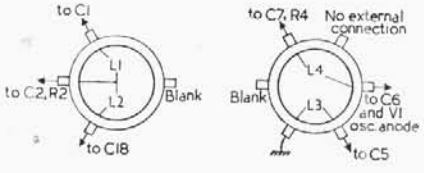
## U2

Capacitor **C1** is mounted on the component assembly, while **C6** is suspended in the wiring.

## U3

The aerial and oscillator coils **L1, L2** and **L3, L4,** are not fitted with dust-iron cores. Should **C6** be renewed, tracking of the oscillator circuit may sometimes be improved by softening the wax securing **L3** and **L4** and altering their positions.

These coil units are of a different construction from that shown in our sketches, but they have connecting tags which are identified in the diagrams below, where the internal and external connections are indicated.




The IF transformers are also of a different construction from that shown in our sketches, and are so arranged that trimmers are accessible without removing the chassis from the cabinet. Their flexible connecting leads are colour coded, and they are connected to the following points in the circuit:—

1st IF transformer (centre can, No. MC11572/2):
Orange lead to HT+2 line.
Brown lead to **V1** pentode anode.
Blue lead to AVC line.
Black lead to **V2** top cap lead.

2nd IF transformer (end can, No. MC11574):
Orange lead to HT+2 line.
Brown lead to **V2** anode.
Blue lead to **R6, C12.**
Black lead to **V3** signal diode anode.
**The IF transformers are adjusted to a frequency of 462.5 kc/s.**

### BVA VALVE CODE

Claims for free replacement under guarantee of any valve in the Wartime Civilian Receiver must be made on the valve manufacturer whose name can be identified by reference to the final figure of code marking on the valve, as follows:—

| | |
|---|---|
| 1 | **Cossor** |
| 2 | **Ediswan (Mazda)** |
| 3 | **Ferranti** |
| 4 | **GEC** |
| 5 | **Marconiphone** |
| 6 | **Mullard** |
| 7 | **Standard Telephones** |

All applications for such replacements must be made in conjunction with a properly completed BVA replacement form.

This information is confidential to the Trade.

## U4, U4A

The coil units are of a different construction from those shown in our sketches, and the IF transformer core adjustments are vertical screws reached from beneath the chassis in the case of the primaries and the tops of the cans in the case of the secondaries. No tags are fitted on the aerial and oscillator units, lead-out wires being continuations of the windings.

Some of the components beneath the chassis occupy positions different from those shown in our under-chassis view, and roughly an approximately equal number of components are distributed on either side of the component assembly. **S1** and **S2** are transposed as compared with those in our illustration.

## U5, U13, U32, U40

The aerial coupling coil **L1** is of the high-impedance type as against the low impedance one in our basic chassis, and it is returned directly to chassis instead of to the bottom of **L2.** Its DC resistance is 23.5Ω.

The IF transformer coils are air cored, and have mica pre-set trimmers whose adjustments are reached through holes in the tops of the cans. The DC resistance of all the IF coils is 7.5Ω each.

## U7

The shorting link shown connected between tags 1 and 3 in our sketch of the **L1, L2** coil unit is now connected instead between tags 2 and 4.

## U8, U14, U31, U33, U34, U37, U39

Adjustment of the aerial and oscillator inductances at the low frequency end of the band is not necessary. The coils are closely adjusted in the factory, then sealed, and they should not be altered.

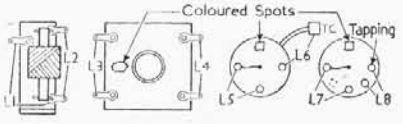
The IF coils are of the usual Philips type. The secondary adjusting core is the upper one in each case. The signal diode of **V3** is connected to a tapping on **L8** to reduce damping.

The following deviations occur in the DC resistance of the coils, as compared with the values in our table: **L1,** 3Ω; **L3,** 2Ω; **L4,** 6.5Ω.

Capacitors **C3, C10** and **C11** are 103 pf (0.000103μF) each, and **C4** is 97 pf (0.000097μF). **C17** is mounted beneath the chassis, underneath **V4** holder.

Resistor **R8** is a longer type than that shown in our sketch, and is therefore connected between tags 8 and 10 on the component assembly, and tag 8 is joined to tag 9.

At present the HT negative lead is yellow instead of black, and the speaker leads are green, but the maintenance of consistent lead colours is in any case subject to supply limitations. The connecting tags of the coil units are indicated in the diagrams below.




## U10, U17, U35, U41

The principal difference in these chassis lies in the DC resistance values of coil windings. Those that differ from our "Other Components" are as follows: **L1,** 0.6Ω; **L2,** 2.6Ω; **L3,** 0.5Ω; **L4,** 2.7Ω; **L5, L6, L7** and **L8,** 5.8Ω each; **L8,** 2.0Ω; **L9,** 2Ω; **T1** pri., 550Ω; sec., 0.3Ω.

## U21

The coil units in these chassis have numbered tags. Each coil has two tags, and in the following list the numbers of the two tags concerned follow the number of the coil, the first tag quoted being the one at the upper end of the coil as drawn in our circuit diagram, and the second the one at the lower end, as in the following example: **L1,** tag 1 (to **C1**), tag 2 (to **C2, R2**); **L2,** tag 3 (to **V1** top cap lead), tag 4 (to **C2, R2** and to tag 2).

Quoting in the same order, the rest are as follows: **L3,** tags 3 and 4; **L4,** tags 1 and 2; **L5,** tags 2 (to HT+2 line) and 1; **L6,** tags 1 and 2; **L7,** tags 2 (to HT+2 line) and 1; **L8,** tags 1 and 2.

Also in these chassis, the HT negative lead, which is given as black under "Battery Leads and Voltages," is slate or grey to distinguish it from the LT negative lead, which is black.

## U28

The aerial and oscillator coils are air cored.

## VALVE REPLACEMENT TABLE

| VALVE | BVA NUMBER | REPLACEMENT (MAZDA) |
|---|---|---|
| **V1** | **172** | **TP25** |
| **V2** | **142** | **VP23** |
| **V3** | **132** | **HL23DD** |
| **V4** | **162** | **Pen25** |

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