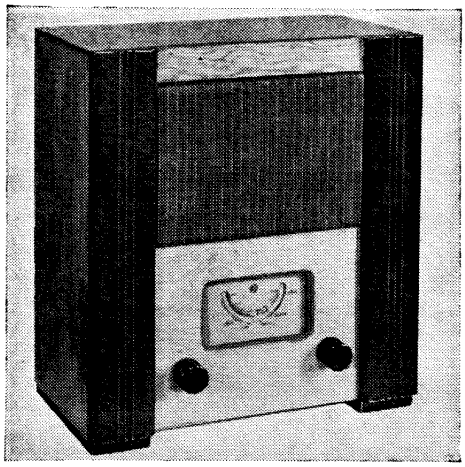
"TRADER" SERVICE SHEET

688

The WARTIME CIVILIAN RECEIVER

AC Model—MW only



DESIGNED with the object of producing a mains-operated receiver of satisfactory performance with the minimum of raw materials and labour, the Wartime Civilian AC receiver is a single-waveband superhet employing three thermionic receiving valves, a Westector detector and a thermionic full-wave power rectifier, operating from AC mains of 195-250 V, 50 c/s.

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 our sample receiver, and divergencies that will be found in other manufacturers' chassis are described under "Modifications" overleaf.

Release date: June, 1944.

Retail selling price: £12 3s. 4d., including purchase tax.

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 **A1.**

Input from **A1** is via series capacitor **C1,** coupling coil **L1** and capacitor **C2** to single-tuned circuit **L2, C19.** 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.

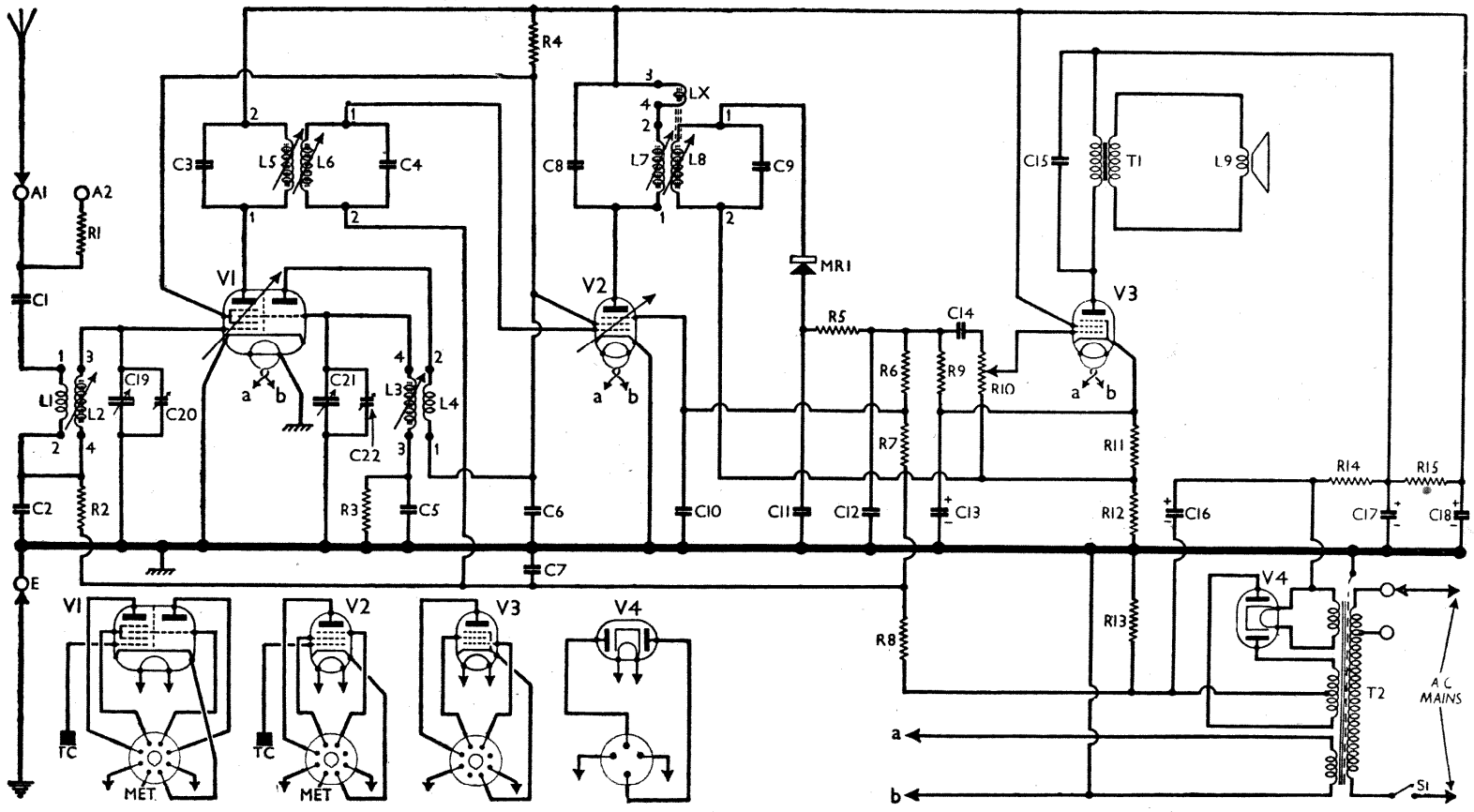
First valve **(V1, BVA 274, 275** or **276)** is a triode-hexode operating as frequency changer with internal coupling. Triode oscillator grid coil **L3** is tuned by **C21.** Parallel trimming by **C22,** and fixed tracking by series capacitor **C5,** while tracking adjustment is effected by varying the inductance of **L3** which, like the aerial tuning coil **L2,** has an adjustable dust-iron core. The oscillator grid resistor **R3** is series connected, across **C5.** Reaction coupling is applied via coil **L4.**

Second valve **(V2, BVA 243, 246** or **247)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C3, L5, L6, C4** and **C8, L7, Lx, L8, C9.** The tuning capacitances are of fixed values, and trimming is effected by adjusting the positions of the dust-iron cores of the coils.

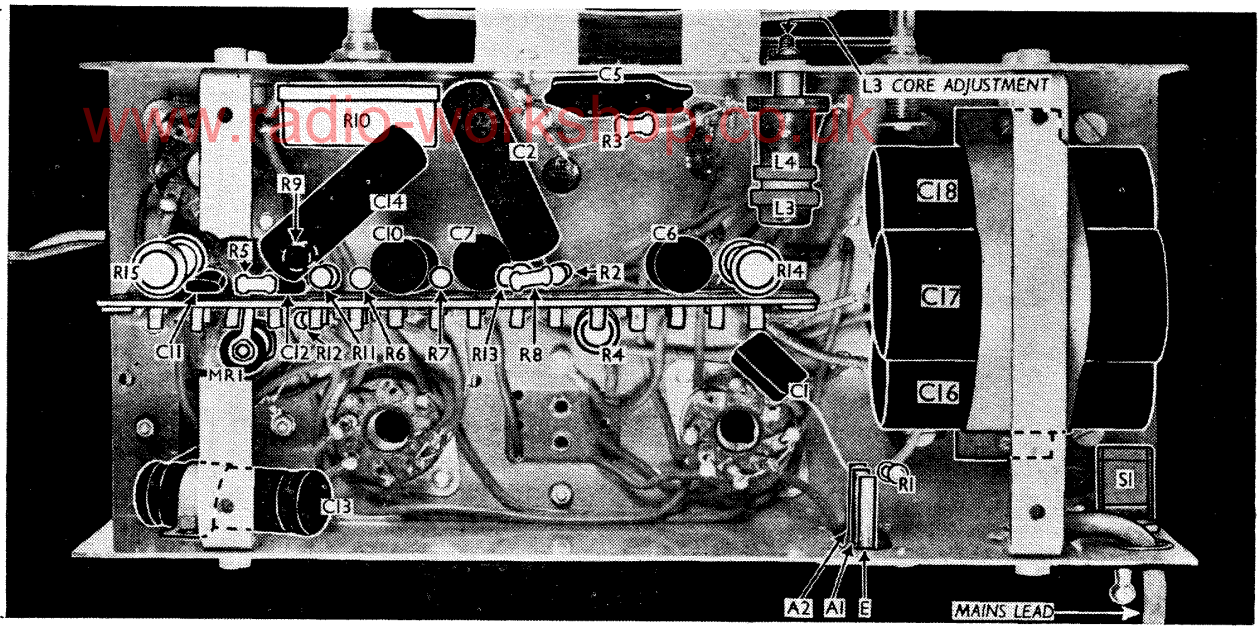
Intermediate frequency 460 kc/s.

Diode second detector is an RF metal rectifier **(MR1, Westinghouse WX6).** Audio-frequency component in rectified output is developed across load resistor **R9** and passed via AF coupling capacitor **C14** and manual volume control **R10** to CG of pentode output valve **(V3, BVA 264, 265, 266** or **267).** If filtering by **C11, R5, C12.**

MR1 is connected via **R9, R5** and **L8** across **R11,** deriving therefrom a small biasing potential which maintains it in a conducting condition in the absence of a signal, so that it is never required to operate on the threshold of conduction. The small coupling coil **Lx,** which consists of three turns attached to the primary and is wound close to the secondary, is introduced in order to in-



Circuit diagram of the Wartime Civilian AC Receiver. **MR1** is a Westector. The numbers at the coil ends indicate connecting tags shown in the sketches overleaf. In most chassis an anti-modulation hum resistor is connected between the **A1** and **E** sockets.



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

crease the coupling between primary and secondary windings. **R11** also provides the GB potential for **V3.** Fixed tone correction by **C15** in **V3** anode circuit.

HT current is supplied by full-wave rectifying valve **(V4, BVA 211, 214, 215 or 216).** Resistance-capacity smoothing by **C16, R14, C17, R15** and **C18** to the main HT posible line, **V3** anode being fed from the intermediate position at the junction of **R14** and **R15. R13,** in the negative HT lead to chassis, provides a potential which is required in connection with the AVC system and its delay.

R8, R7 and **R6** are connected in series between the negative end of **R13** and the diode circuit, which is returned to the positive ends of **R11** and **R12;** the junction of **R6** and **R7** is connected to **V2** suppressor grid.

With a weak signal, the junction of **R6, R7** is positive with respect to chassis and, therefore, to **V2** cathode; and the cathode/suppressor path is conductive, acting like a diode and having a DC resistance which is very low compared with **R6** or **R7.** The suppressor is thus held almost at chassis potential, so that the drop along **R13** appears across **R7** and **R8,** and the potential at the junction of these two resistors provides the fixed minimum GB for **V1** and **V2,** via the AVC line.

As the signal strength increases, the DC potential developed across the signal diode load resistor **R9** increases, and the polarity of the detector **MR1** is such that this potential opposes that applied to **V2** suppressor from **R12.**

When the signal reaches a predetermined strength, **V2** suppressor is driven negative; cathode/suppressor conduction ceases, and the suppressor has no further effect on the bias circuit. The junction of **R6** and **R7,** therefore, is free to become more negative, as is also the junction of **R7** and **R8,** according to the strength of the signal and the resulting potential across **R9.**

Beyond the point at which **V2** suppressor path ceases to be conductive, the AVC line potential will increase with increased signal strength, but until that point is reached no variation will occur, and this constitutes the AVC delay.

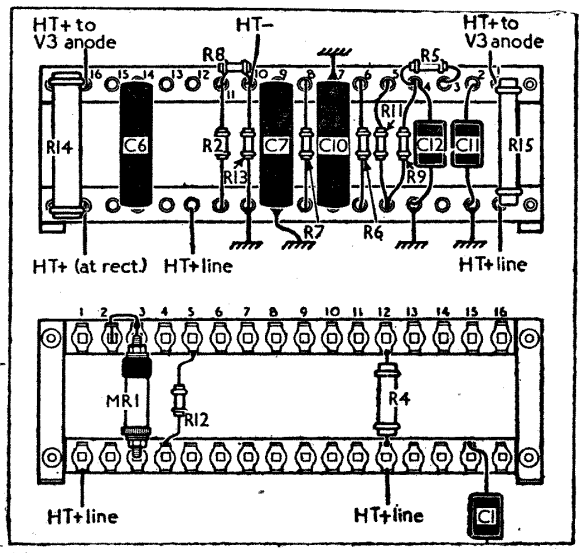
COMPONENTS AND VALUES

	CAPACITORS	Values (μF)
C1	Aerial series capacitor ...	0·0005
C2	V1 hex. CG decoupling...	0·005
C3, C4	1st IF transformer tuning capacitors ...	0·0001, 0·0001
C5	Oscillator circuit tracker	0·0005
C6	V1, V2 SG's decoupling...	0·1
C7	V2 CG decoupling ...	0·1
C8, C9	2nd IF transformer tuning capacitors ...	0·0001, 0·00022
C10	V2 suppressor decoupling	0·1
C11, C12	IF by-pass capacitors ...	0·0001, 0·0001
C13*	V3 cathode by-pass ...	25·0
C14	AF coupling to V3 ...	0·005
C15	Fixed tone corrector ...	0·005
C16*, C17*, C18*	HT smoothing capacitors	8·0, 8·0, 8·0
C19†	Aerial circuit tuning ...	0·000532
C20‡	Aerial circuit trimmer ...	0·00005
C21†	Oscillator circuit tuning	0·000532
C22‡	Oscillator circuit trimmer	0·00005

* Electrolytic. † Variable. ‡ Pre-set.

	RESISTORS	Values (ohms)
R1	A2 series resistor ...	47,000
R2	V1 hex. CG decoupling...	680
R3	V1 osc. CG resistor ...	47,000
R4	V1, V2 SG's HT feed ...	6,800
R5	IF stopper	47,000
R6, R7, R8	AVC feed potential divider resistors ...	1,000,000, 1,500,000, 4,700,000
R9	Westector load resistor...	330,000
R10	Manual volume control...	1,000,000
R11, R12, R13	V1, V2, MR1 and V3 GB, and AVC delay resistors	180, 390, 220
R14, R15	HT smoothing resistors	1,000, 2,200

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial coupling coil ...	0·4
L2	Aerial tuning coil ...	2·6
L3	Oscillator tuning coil ...	1·6
L4	Oscillator reaction coil ...	0·6
L5, L6, L7	1st IF trans. Pri. ...	7·0
	Sec. ...	7·0
LX, L8	2nd IF trans. Pri. ...	7·0
	coupling	Very low
	Sec. ...	5·5
L9	Speaker speech coil ...	2·5
T1	Speaker input trans. Pri. ...	400·0
	Sec. ...	0·8
T2	Mains trans. Pri., total ...	30·0
	Heater sec. ...	0·3
	Rect. heat. sec.	0·1
	HT sec., total	550·0
S1	Mains switch	—
MR1	Westector WX6	—



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.

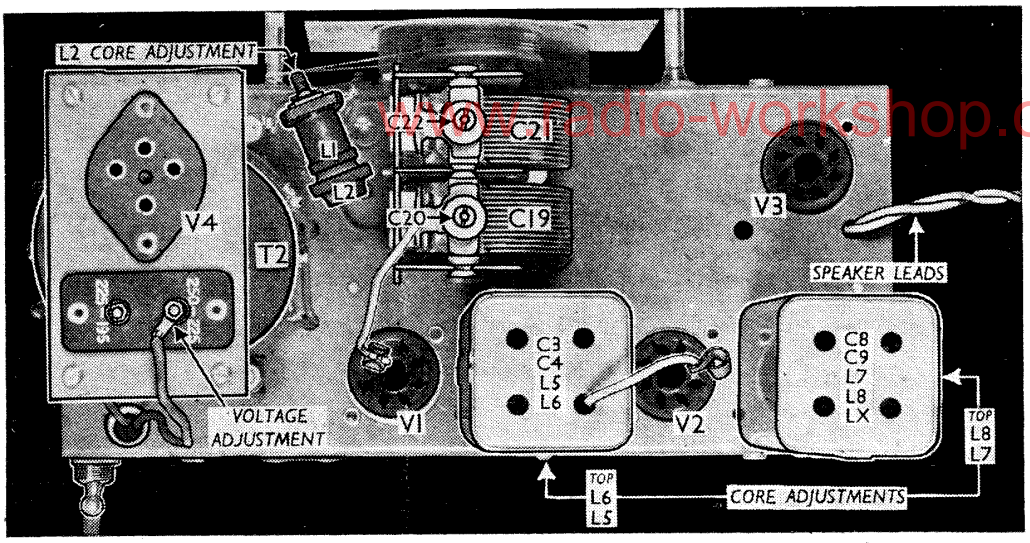
VALVE ANALYSIS

Valve voltages and currents given in the tables below are those quoted as average values by the designers. Readings were taken on a receiver working from AC mains of 240 V, using the 250 V tapping on the mains transformer, the gang being at maximum, but with no signal input.

Under these conditions, the HT voltage at **V4** filament is 270 V; at **R14, R15** it is 220 V; at **V3** cathode, 13 V; at HT negative 10 V

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1	175	2·9	107	3·9
	Oscillator	
	107	4·1		
V2	175	7·2	107	2·2
V3	210	22·0	175	2·6
V4	250†	—	—	—

† Each anode, AC.



Plan view of the chassis. **V4** is mounted above the mains transformer. Sketches below show the connections to the mains transformer and tuning coils.

(with reversed polarity across **R13**); the total HT current is 45 mA; and **V1** oscillator triode grid current is 220 μA.

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

DISMANTLING THE SET

Removing Chassis.—Remove the cover (four ½in. round head wood screws) from the back of the cabinet, and the two control knobs (recessed grub screws) from the front of the cabinet; remove the four round head set screws (with washers) holding the chassis to the bottom of the cabinet.

The chassis may now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free the chassis entirely, unsolder from the speaker transformer the two leads connecting it to chassis.

Removing Speaker.—Remove the four 4BA nuts (with lock-washers) from the bolts holding speaker to sub-baffle.

When replacing, the transformer should go at the top. If the two connecting leads have been unsoldered, it is immaterial which way round they are reconnected.

GENERAL NOTES

Switch S1.—As there is no waveband or pick-up switching, **S1,** the mains circuit switch, is the only switch used in the receiver. It is a QMB switch of the toggle type, fitted on the rear chassis member near the mains lead entry.

Coils.—The aerial coils **L1, L2** are on a plastic former mounted unscreened on the front of the chassis deck between the gang assembly and the mains transformer. 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, Lx** 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, are indicated approximately in our plan view.

The connecting tags on all the coil units are numbered, and the numbering is shown in the sketches in col. 3 below.

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 7,000 Ω) could be connected to the primary tags of the internal speaker input transformer **T1.**

Capacitor C15.—This is mounted directly to the primary tags of **T1,** and does not appear in our chassis illustrations.

Capacitors C16, C17, C18.—These are three tubular electrolytics in separate cardboard containers. They are all of the same type, rated at 8 μF, 500 V working, 600 V surge. They are strapped beneath the chassis by a metal band.

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 in col. 5 overleaf, where the tags to which they the attached are numbered.

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.

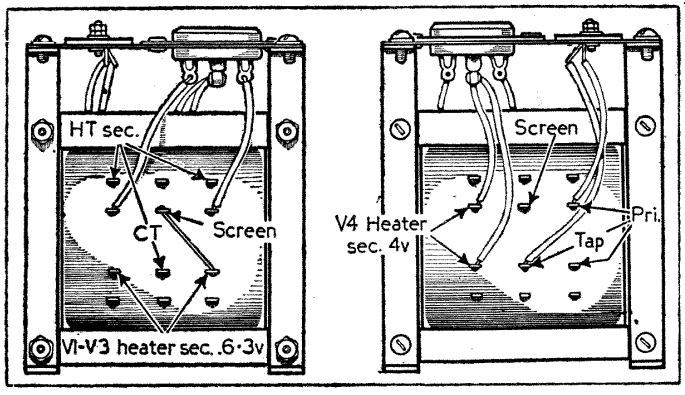
Mains Transformer T2.—In the sketches in col. 1 are shown the two sides of **T2,** the connecting tags being identified.

CIRCUIT ALIGNMENT

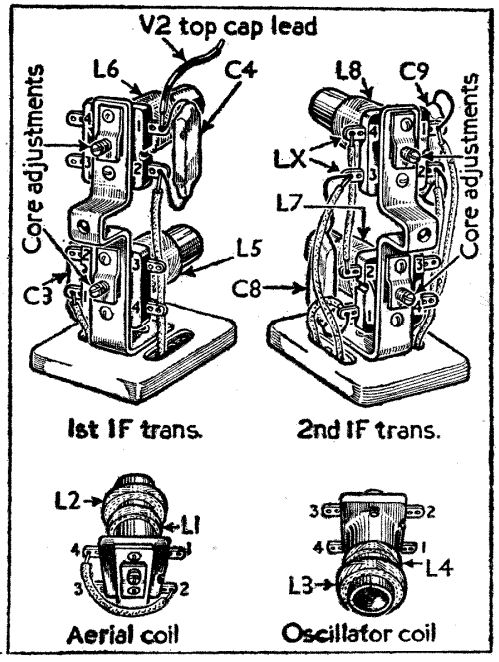
IF Stages.—Connect signal generator via a 0.01 μF capacitor to control grid (top cap) of **V1** and chassis, turn the gang to minimum, and the volume control to maximum. Feed in a 460 kc/s (652.1 m) signal, and adjust the cores of **L8, L7, L6** and **L5** for maximum output, keeping the signal generator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

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 **C22,** then **C20,** for maximum output. Feed in a 500 m (600 kc/s) signal, tune it in, and adjust the cores of **L3** and **L2** for maximum output, rocking the gang a little if necessary after each adjustment for optimum results.



Sketches showing two sides of the mains transformer (*left*) and the RF, oscillator and IF units (*right*). The connecting tags are numbered to correspond with the circuit diagram overleaf.



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 their code numbers.

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

U1

An additional resistor of 100,000 Ω is connected between the **A1** and **E** socket.

On component assembly there are several divergencies as compared with our sketches overleaf. Using same tag numbering, with "T" representing tag remote from, and "B" tag adjacent to, chassis, the arrangement is:

UPPER SKETCH		LOWER SKETCH	
Component	Tags	Component	Tags
R14	T16/B16	Westector	T3/B3
R4	T14/B14	R12	T4/B4
C6	T13/B13	R11	T4/B5
C7	T11/B11	R9	T5/B5
R8	T12/T10	R6	T7/B7
C10	T8/B8	R13	T10/B10
C14	T6/B6	R2	T12/B12
R5	T5/T3		
C12	T5/B4		
C11	T2/B2		
R15	T1/B1		

U2

An addtional resistor of 47,000 Ω is connected between the **A1** and **E** sockets.

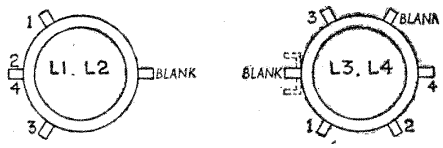
The coupling coil **LX** shown on the second IF transformer is omitted.

The mains transformer does not conform to the type shown in our sketches, the connections being taken to two terminal strips.

U3

Aerial and oscillator coils **L1, L2, L3, L4** are not fitted with dust-iron cores. Should **C5** be renewed, tracking of the Oscillator section may sometimes be improved by softening wax securing Oscillator coil **L3** and altering its position.

The connecting tags of coil units **L1, L2** and **L3, L4** are not numbered, but in the diagrams below they are given numbers to agree with those shown in our circuit diagram overleaf, as seen viewing the free ends of the units.



IF transformer coupling coil **Lx** is omitted. **The IF transformers are adjusted to a frequency of 462.5 kc/s.** Their core adjustments are all accessible without removing chassis.

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 perperly completed BVA replacement form. This information is confidential to the Trade.

Tag numbers are not applicable, but the connections are as follows:

1st IF transformer (centre can, No. MC11572):
Blue lead to junction of **C7, R2, R8, R7.**
Black lead to grid cap of **V2.**
Brown lead to **V1** anode.
Orange lead to HT+ line.

2nd IF transformer (end can, No. MC11573).
Orange lead to HT+ line.
Brown lead to **V2** anode.
Black lead to **MR1+.**
Blue lead to junction of **R10, R11, R12.**

A 47,000 ohms anti-modulation hum resistor is fitted across **A1** and **E** terminals.

Resistor **R14** is composed of two 2,200 Ω resistors in parallel.

Capacitor **C1** is mounted on the component assembly. **R1, C2, R3, C5** are in slightly different positions from those shown by us.

Mains transformer unit differs from our sketch.

U4, U4A

The second IF transformer coupling coil **Lx** is omitted.

The low potential ends of capacitors **C11** and **C12** will in most cases be returned not to chassis as shown in our circuit diagram, but to the earthy side (tag 2 in our diagam) of **L8.**

U7

R8 may be mounted on the back of the component assembly, and **R4** on the front, but they will be connected to the same pairs of tags as shown in our sketches.

An additional resistor of 27,000Ω is connected directly between the **A1** and **E** sockets.

U8, U31, U33, U34, U37, U39

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

The IF coils are of the usual Philips type. The secondary adjusting core is the upper one in each case. The extra coupling coil **Lx** is not used but the detector **MR1** is connected to a tap on **L8** to reduce damping.

Deviation in coil resistances should be noted as follows: **L1,** 3Ω; **L3,** 6.5Ω; **L4,** 2Ω; **T1** primary, 470Ω; **T2** primary, 55Ω (total).

The speaker is mounted with the input transformer **T1** on the right, viewed from rear.

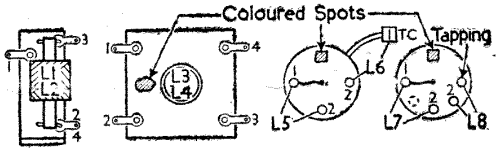
The mains transformer is of a different construction from that in our chassis, with vertical connecting strips either side of the core at one end. Viewed from this end, and reading from top to bottom, the connections are as follow:. Left-hand strip: 1, HT secondary (end); 2, HT secondary (CT); 3, HT secondary (end); 4 and 5, **V4** heater secondary (4 V). Right-hand strip: 1, primary (250 V end); 2, primary (220 V tap); 3, primary (common end); 4 and 5, **V1-V3** heater secondary (6.3 V).

Capacitors **C16, C17, C18** may be three wet electrolytics, three dry or a combination of the two types. When dry tubular capacitors are used they are strapped beneath the chassis as in the under-chassis view. When wet types are used, **C17** and **C18** may be any value between 8 mfd and 32 mfd 350 V. **C18** is mounted on the chassis between **V3** and the gang. **C16** and **C17** are carried on a metal bracket on **T2.**

C3, C8 and **C9** are each 103 pf (0.000103 μF); **C4** is 97 pf (0.000097 μF); **C15** is mounted under the chassis below **V3.**

R8 is a longer resistor than that shown in our sketch, and is therefore connected between tags 10 and 13, with tag 13 joined to tag 11. **R14** is made up of two 2,200Ω 1 watt resistors in parallel; **R15** is made up of two 4,700Ω 1 watt resistors in parallel.

The revised coil connections are shown below.



U14

The aerial coupling coil **L1** shown in the circuit diagram is omitted, but a spare tag connected to the earthy end of the tuning coil **L2** is provided for the aerial connection.

The IF transformers are variable-capacitance tuned, instead of variable-inductance as shown.

In ganging, there is no necessity to adjust the core of **L2.**

U21

An additional resistor of 100,000Ω is connected between the **A1** and **E** sockets.

The connections to **L3** may be transposed, tag 4 becoming tag 3 and tag 3 becoming tag 4. **L4** will also be reversed.

In the same way, the connections to **Lx,** tags 3 and 4, may be reversed.

REPLACEMENT VALVES FOR THE BVA NUMBERED TYPES

VALVE	BVA NUMBER	COSSOR	MAZDA	EVER READY	FERRANTI	MARCONI OSRAM	MULLARD	PHILIPS	BRIMAR
V1*	274 275 276	OM10	—	ECH35	6K8G	X61M	ECH35	—	6K8G
V2	243 246 247	6K7G OM6	—	EF39	6K7G VPT62	—	EF39	—	6K7G
V3	264 265 266 267	—	—	EL33	—	—	EL33	—	6AG6G
V4	211 214 215 216	43IU	UU5	A11D S11D	R4	U14 MU14	DW4/350 IW4/350	1561 1867	R2 R3

* Although two additional BVA numbers for V1—273 and 277—may appear in the instructions issued with the receiver, no valves of these types have been produced.

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