

RECEIVER, RADIO, No. 12

Description, Operation and Maintenance

1. Introduction.—The “Receiver, Radio, No. 12” is a light, portable, interference-locating set covering the frequency-range 30 to 100 Mc/s. This Instruction describes the receiver, its operation and maintenance.

CIRCUIT DESCRIPTION

2. General.—The receiver, which is illustrated in Figs. 1 and 2, is of conventional design. It has facilities for indicating the relative field-strengths of interfering signals, but absolute measurements cannot be made.

3. Circuit.—The superheterodyne circuit (see Fig. 3) consists of a frequency changer with separate oscillator, four I.F. stages, two detectors (one for metering, the other for aural monitoring), audio and D.C. amplifiers, beat-frequency oscillator for C.W. reception, and an audio output stage feeding 2,000-ohm headphones. Miniature valves with B7G bases and 1.4-volt filaments are used throughout. An intermediate frequency of 3 Mc/s. is used, the oscillator frequency being on the high side of the signal frequency. The circuit has been designed to cover the frequency range in three bands with single-control tuning.

4. The positions of the controls of the receiver are shown in Fig. 1.

★**5. Aerials.**—The following three aerials are provided:—

- (a) *Aerial No. 12*—a short vertical rod, 9½ in. in length, for use with signals of high field strength
- (b) *Aerial No. 13*—a vertical rod, 4 ft. in length, for signals of normal field strength
- (c) *Aerial No. 14*—a screened loop for direction finding.

Two ‘aerial pads’ are provided for connecting the rod aerials to the receiver input. One of these aerial pads (“Attenuator No. 24”) marked AERIAL PAD ATTENUATOR provides approximately 26 db. attenuation to prevent overloading the receiver on very strong signals. The other pad (“Adaptor No. 13”) marked AERIAL PAD PLAIN provides no attenuation.

A coaxial socket near the tuning dial provides the receiver input connexion. A second coaxial socket, fitted near the top left corner of the meter, is earthed and provides the other termination for the loop aerial. The receiver input impedance is approximately 75 ohms.

6. Output.—The receiver is designed for headphone reception, and two telephone jacks, connected in parallel, are provided.

7. Power supplies.—The L.T. supply of 1.5 volts is obtained from a “Battery, Dry, No. 16” and the

H.T. supply of 90 volts is obtained from a “Battery, Dry, No. 17”. These batteries are accommodated in a compartment at the back of the case. The approximate current consumption of the receiver is 20 mA. at 90 volts and 0.55 amp. at 1.5 volts.

8. Meter.—The L.T. and H.T. battery voltages may be measured, when the receiver is switched on, by turning the METER switch to H.T. or L.T. If the voltages are correct, the needle should rest within the corresponding sector on the meter scale.

★**9. Unit, Auxiliary Apparatus, No. 90.**—Reception of weak signals is often impaired by ignition interference. A limiter unit (“Unit, Auxiliary Apparatus, No. 90”) has been produced for fitting to “Receiver, Radio, No. 12” to reduce the amplitude of impulsive interference and thus enable the wanted signal to be heard. The unit is available from the Supplies Dept. and should be requisitioned and fitted to all sets already in use. New receivers will be modified before issue. In Fig. 3 is shown, in dotted outline, the circuit of the unit which is connected between the anode of V7 (CV 784 pin 5) and the receiver chassis. By means of switch S5 the limiter may be disconnected when not required.

MECHANICAL DESCRIPTION

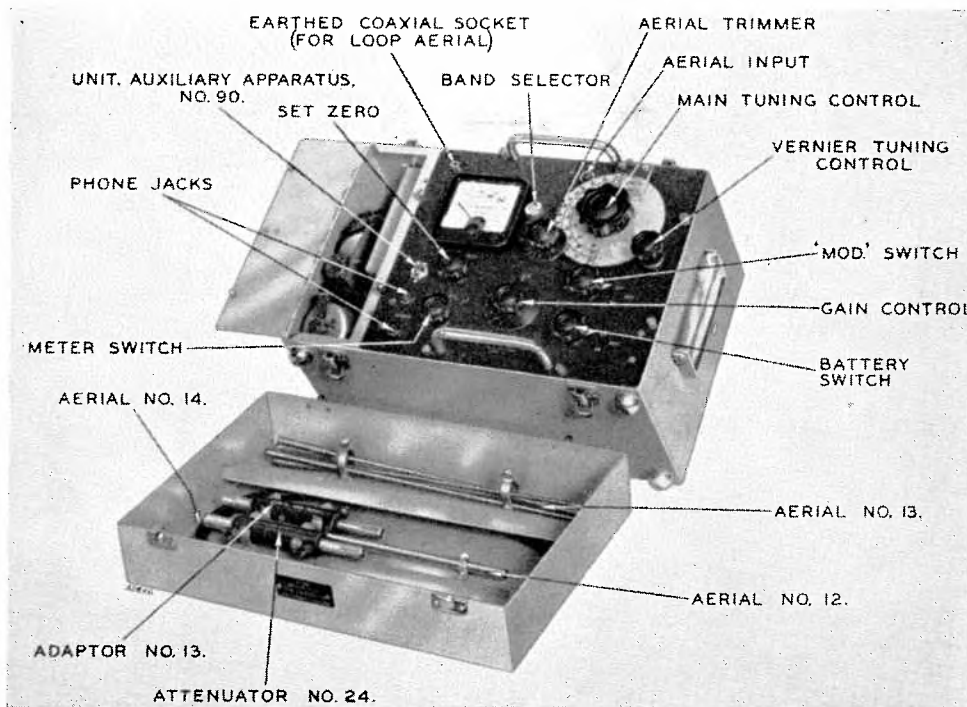
10. The main assemblies of the instrument are: case, cover, battery cover, front panel, R.F. unit, I.F. unit, and phone compartment. The cover may be released by four snap fasteners, and the various aerial accessories can then be unclipped from the inside of the cover. By releasing the six “Oddie” fasteners (with coin slots) on the battery cover the batteries can be withdrawn and unplugged from their connexions. Access to the phone compartment is obtained by undoing the two “Oddie” fasteners (with wing heads). *NOTE:*—“Oddie” fasteners are released by turning them through 90° only.

11. Size and weight.—The overall dimensions of the receiver are 15 in. by 10 in. by 9¼ in. and its weight complete with batteries is 22 lb.

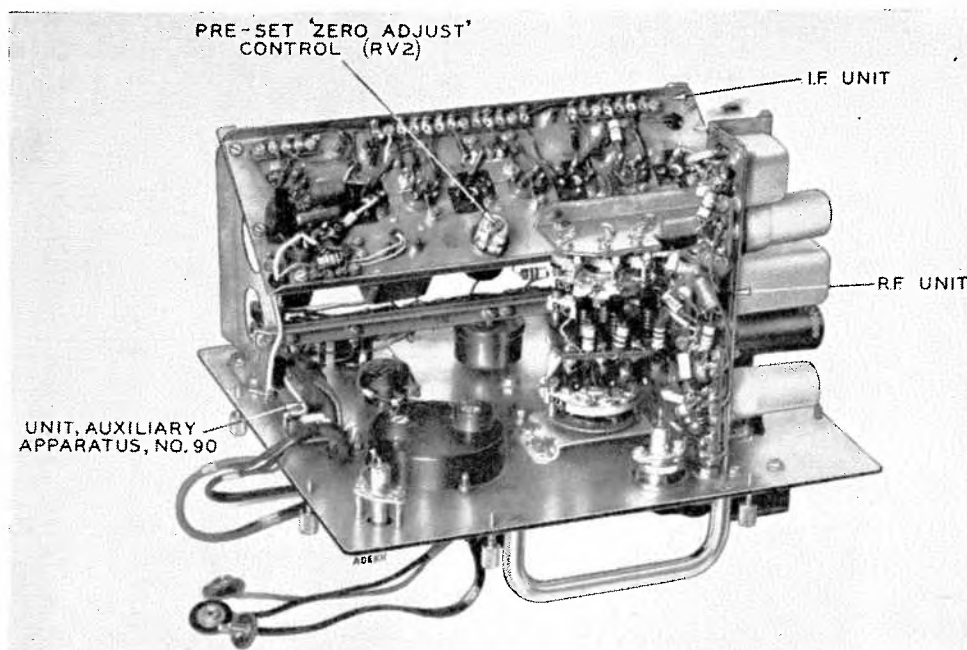
OPERATION

12. Preparation for use.—The following operations should be carried out in the order shown. The positions of the controls can be seen in Fig. 1.

- (a) Set the METER switch to L.T.
- (b) Switch the batteries on.
- (c) Check the L.T. and H.T. batteries by means of the meter and switch provided (see par. 8).
- (d) Set the GAIN control to minimum (i.e. set 10 on the dial opposite the white reference line).
- (e) With the meter switch set to OPERATE, adjust the meter to zero by means of the SET ZERO control.



★FIG. 1. VIEW OF RECEIVER, RADIO, NO. 12, WITH LID REMOVED



★FIG. 2. VIEW OF RECEIVER, RADIO, NO. 12, WITH CASE REMOVED

If this is not possible, the zero adjustment described in par. 17 should be made.

(f) Insert the appropriate aerial.

(g) Increase the gain, tune to the required signal, and adjust the AERIAL TRIMMER for maximum meter deflexion.

(h) If necessary, re-adjust the gain and insert the aerial attenuator to give a suitable meter reading.

(j) If C.W. signals are to be received, the beat-frequency oscillator should be switched on by operating the switch marked MOD.

13. Spurious responses.—Care should be taken when using the receiver in high field-strengths (e.g. close to R.F. heating equipment), because spurious responses due to the image-frequency or to harmonics make it difficult to identify the actual frequency radiated.

14. Care in transit.—When the receiver is conveyed in a Radio-Interference Car (M) the instrument should be put in the sorbo-rubber-lined locker provided for the purpose. When the receiver is dispatched by rail, it should be well packed and sent by passenger train.

MAINTENANCE

15. The receiver should always be maintained in good working condition, local arrangements being made for the prompt repair of minor faults and the replacement of faulty valves.

16. Repairs.—Whenever possible, simple faults not entailing replacements of main components should be rectified by the investigation officer. No attempt should be made to re-align the receiver or to alter the adjustment of any iron-dust-cored transformers or coils in the receiver.

17. Adjustment of meter zero.—This adjustment should be carried out whenever V7 or V8 is replaced, or whenever it is impossible to adjust the meter to zero by means of the SET ZERO control. The adjustment should be made as follows:—

(a) Remove the chassis from the case (see par. 21).

(b) Connect a 0–100 V. voltmeter between the chassis (negative) and pin 4 of V8.

(c) Set the GAIN control to 10.

(d) Adjust the SET ZERO control on the front panel until the voltmeter reads 75 volts.

(e) Set the METER switch to OPERATE.

(f) Unlock the pre-set ZERO ADJUST control on the I.F. unit (RV2 in Figs. 2 and 3), and adjust it until the meter reading is zero.

(g) Re-lock the control.

18. Valves.—The types of valves used in the set are shown in Table 1, together with the H.T. current values which should be obtained when the valves are tested in the following manner:—

(a) Connect an ammeter in the common H.T. negative lead.

(b) Insert each valve in turn in its appropriate valve holder, all the other valves being removed.

It should be noted that there may be some variation from the values quoted.

19. Voltage readings.—Table 2 shows the voltage readings that should be obtained between various test points and chassis when the receiver is operating correctly. These measurements should be made with a Universal Avometer, Model 7 (500 ohms per volt), or a "Meter, Multi-range, No. 3".

TABLE 1. VALVE CURRENTS

Valve	Rate Book title	Maker's code	Approx. total current in mA.	Remarks
Standing current without valves in circuit	—	—	5.3	Before commencing tests disconnect input signal and set controls as follows:—
V1 Frequency changer	CV 782	1R5	7.4	(a) Set meter to zero (see par. 17)
V2 Oscillator	CV 807	3A4	10.2	(b) GAIN AT 0
V3 1st I.F. amplifier	CV 785	1T4	6.4	(c) METER switch at H.T.
V4 2nd	CV 785	1T4	8.0	(d) MOD switch at OFF
V5 3rd	CV 785	1T4	6.4	
V6 4th	CV 785	1T4	6.6	
V7 Audio metering	CV 784	1S5	7.1	
V8 Output	CV 784	1S5	8.0	
All in circuit	—	—	20.5	

(Table 2 follows)

TABLE 2. VOLTAGE READINGS

Test point	Meter range (voltage)	Voltage reading	Remarks
V8 pin 4	100	75	Set voltage to this value (see par. 17)
V1 pin 3	100	22-25	Depending on frequency
V1 pin 2	100	68	
V1 pin 7	10	1.3-1.5	L.T. voltage
Junction R6-L4	100	48	Band A
Junction R7-L5	100	58	Band B
Junction R8-L6	100	58	Band C
V3 pin 2	100	70	
V3 pin 3	100	16	Gain at "0"
V3 pin 3	100	6	Gain at "10"
V4 pin 2	100	60	
V4 pin 3	100	30	
V5 pin 2	100	66	
V5 pin 3	100	16	Gain at "0"
V5 pin 3	100	6	Gain at "10"
V6 pin 2	100	66	
V6 pin 3	100	20	Gain at "0"
V6 pin 3	100	7	Gain at "10"
Junction VR1-R29 (blue lead to VR1)	100	25	Gain at "0"
	100	14	Gain at "5"
	100	9	Gain at "10"
V7 pin 4	100	47	Gain at "10"
V7 pin 5	100	19	Gain at "10"
V8 pin 5	100	71	

20. Resistance readings.—Table 3 gives the D.C. resistance values of the iron-cored components.

TABLE 3. RESISTANCE READINGS

Cct. ref.	Description	Resistance (ohms)
TR1	Modulation transformer { Screen winding	105
	{ Grid winding	145
TR2	Output transformer { Primary	1,000
	{ Secondary	55
L19	A.F. choke	1,800

21. Removal of units from case.—The set may be dismantled as follows:—

- (a) Remove cover
- (b) Unfasten battery cover and remove batteries
- (c) Remove headphones from their compartment
- (d) Release the eight front panel retaining screws and withdraw the panel by means of the handles.

22. Removal of I.F. unit.—The I.F. unit may be withdrawn as follows:—

- (a) Remove the knobs of the gain control, meter switch, set-zero control, modulation switch, and battery switch, and remove the bush nuts from these controls
- (b) Undo the screws holding the I.F. chassis brackets to the front panel.

23. Removal of R.F. unit.—The R.F. unit may be withdrawn as follows:—

- (a) Remove cursor
- (b) Undo grub screws securing tuning dial to its shaft, and remove the dial and its drive knobs simultaneously

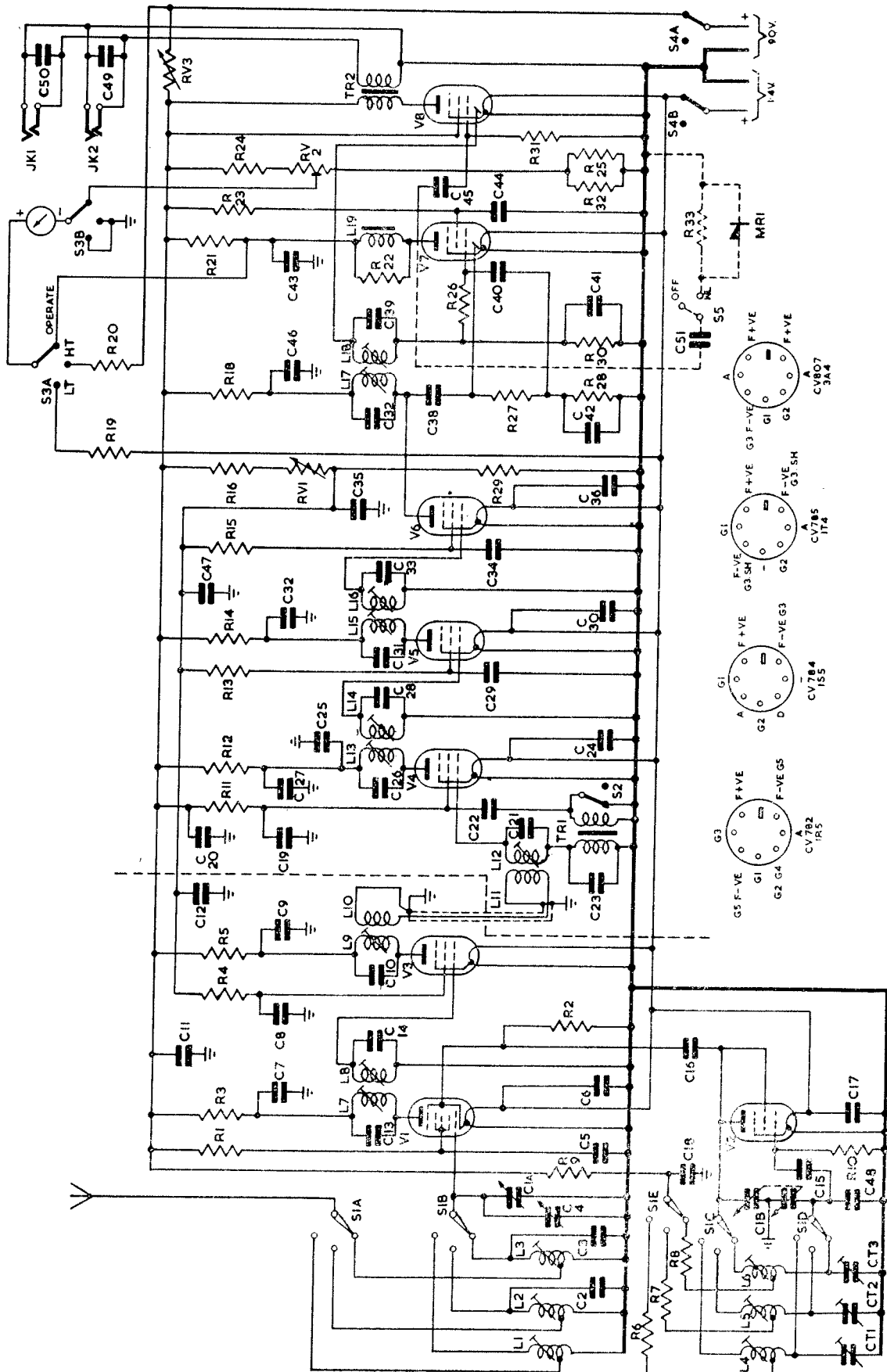
(c) Remove the aerial trimmer knob and its bush nut

(d) Remove the band selector index-finger from its shaft

(e) Undo the three screws holding the Z-shaped deck, and the four screws holding the dished bracket to the range switch.

24. Alignment.—Alignment is carried out during overhaul and should not be attempted by radio investigation staff.

25. Maintenance exchange.—If a serious fault develops in the receiver, or a main component requires replacing, or an overhaul is necessary, the receiver should be returned under maintenance exchange procedure (see STORES, Workmen's Procedure, I 0011). Only the batteries and headphones should be removed from the receiver, and the set complete with valves should then be dispatched to the Supplies Department, Birmingham, by passenger train.



★ FIG. 3

★TABLE 4. LIST OF COMPONENTS (See Fig. 3)

Cct. ref.	Description	Cct. ref.	Description
C1A	Capacitor variable 34 pF., Wingrove & Rogers	V1	Mixer valve, Type CV 782 (1R5)
C1B	variable 52+52 pF., Wingrove & Rogers	V2	Local oscillator valve, Type CV 807 (3A4)
C2	4.7 pF. ±5%, Erie Type CER	V3	1st I. F. valve, Type CV 785 (1T4)
C3	8.2 pF. ±5%, " "	V4	2nd " "
C4	2.3-5 pF., Trimmer, Wingrove & Rogers	V5	3rd " "
C5	0.01 μF., T. C. C. Type CP 32 N	V6	4th " "
C6	0.01 μF., " "	V7	Audio metering valve, Type CV 784 (1S5)
C7	0.1 μF., Dubilier Type 410	V8	Output valve, Type CV 784 (1S5)
C8	0.1 μF., " "	S1	Switch, 4-bank, 3-way, Oak Type Ceramic
C9	500 pF. ±20%, Erie Type CER	S2	" 2-pole, 2-way, Minibank
C10	36 pF. ±5%, " "	S3	" 4-pole, 3-way, "
C11	0.01 μF., T. C. C. Type CP 32 N	S4	" 2-pole, 2-way, "
C12	0.01 μF., " "	S5	" 1-pole, 2-way, Bulgin Type 259
C13	30 pF. ±5%, Erie Type CER	TR1	Mod. transformer
C14	39 pF. ±5%, " "	TR2	Output transformer
C15	47 pF. ±10%, " "	JK1	Telephone jack, Igranic Type P 71
C16	10 pF. ±10%, " "	JK2	" "
C17	0.1 μF., Dubilier Type 410	RV1	Resistor, variable, 50K Ω, Colvern Type CLR 3001
C18	0.01 μF., T. C. C. Type CP 32 N	RV2	" variable, 5K Ω, Colvern Type CLR 1106
C19	750 pF. ±20%, Erie Type CER	RV3	" variable, 2.5K Ω, Colvern Type CLR 1106
C20	2 μF., Micropack, 150-V. working	R1	Resistor, 33K Ω ±20%, Type T 16
C21	39 pF. ±5%, Erie Type CER	R2	" 120K Ω ±20%, "
C22	0.01 μF., Dubilier Type 410	R3	" 3.3K Ω ±20%, "
C23	0.05 μF., " "	R4	" 27K Ω ±20%, "
C24	0.01 μF., T. C. C. Type CP 32 N	R5	" 3.3K Ω ±20%, "
C25	0.01 μF., " "	R6	" 3.9K Ω ±10%, Type Y 9
C26	36 pF. ±5%, Erie Type CER	R7	" 1.5K Ω ±10%, "
C27	2 μF., Micropack, 150-V. working	R8	" 1.5K Ω ±10%, "
C28	39 pF. ±5%, Erie Type CER	R9	" 220 Ω ±20%, Type T 16
C29	0.01 μF., T. C. C. Type CP 32 N	R10	" 100K Ω ±20%, "
C30	0.01 μF., " "	R11	" 47K Ω ±20%, "
C31	36 pF. ±5%, Erie Type CER	R12	" 4.7K Ω ±20%, "
C32	0.01 μF., T. C. C. Type CP 32 N	R13	" 27K Ω ±20%, "
C33	39 pF. ±5%, Erie Type CER	R14	" 4.7K Ω ±20%, "
C34	0.01 μF., T. C. C. Type CP 32 N	R15	" 15K Ω ±20%, "
C35	0.1 μF., Dubilier Type 410	R16	" 15K Ω ±10%, Type Y 9
C36	0.01 μF., T. C. C. Type CP 32 N	R18	" 4.7K Ω ±20%, Type T 16
C37	30 pF. ±5%, Erie Type CER	R19	" 10K Ω ±2% (½W.), Welwyn Electric
C38	27 pF. ±20%, Erie Type CER	R20	" 430K Ω ±2% (½W.), Type A 3623
C39	39 pF. ±5%, " "	R21	" 47K Ω ±20%, Type T 16
C40	0.002 μF., T. C. C. Type CP 30S	R22	" 68K Ω ±10%, "
C41	0.1 μF., Dubilier Type 410	R23	" 27K Ω ±20%, Type T 16
C42	750 pF. ±20%, Erie Type CER	R24	" 27K Ω ±10%, Type Y 8
C43	0.01 μF., Dubilier Type 410	R25	" 10K Ω ±5%, Type Y 9
C44	0.01 μF., T. C. C. Type CP 32 N	R26	" 2.2M Ω ±20%, Type T 16
C45	0.005 μF., Hunts Type L2/2	R27	" 82K Ω ±20%, "
C46	0.11 μF., T. C. C. Type CP 32 N	R28	" 1.2M Ω ±20%, Type T 16
C47	0.01 μF., " "	R29	" 10K Ω ±10%, Type Y 9
C48	4.7 pF. ±5%, Erie Type CER	R30	" 2.2M Ω ±20%, Type T 16
C49	100 pF. ±10%, Erie Type CER	R31	" 3.3M Ω ±20%, "
C50	100 pF. ±10%, " "	R32	" 27K Ω ±10%, Type Y 8
C51	0.02 μF., T. C. C. Type 743	R33	" 1M Ω ±20%, Type Y 9
CT1	Capacitor trimmer, 1-11 pF., Welwyn Electric Type A 611	MR1	Rectifier (BTH. CGI - C)
CT2			
CT3			

References:—STORES, Workmen's Procedure, I 0011
(WP 2/3)

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