Instructions 23334-1

for

Full Range Test Oscillator

Type TMV-97-C

INTRODUCTION

The Type TMV-97-C Test Oscillator is a compact, self-contained portable instrument designed especially for service and test purposes. It is essentially an r-f oscillator modulated with 400 cycles and covers a frequency range from 90 kc. to 25,000 kc. in eight steps. Power for its two RCA-30 Radiotrons is obtained from two batteries housed in the instrument. The coils are contained in a drawn copper can, thus effectively shielding them separately from the remainder of the oscillatory circuit. The whole is entirely shielded in an aluminum case.

In conjunction with other apparatus it is adaptable for the following test and service functions:

1. R.F. and I.F. tests and alignments on receivers either with the Cathode Ray Oscillograph (TMV-122-B) and Frequency Modulator (TMV-128-A), sweeping the oscillator output frequency over a definite range, or with an output indicating meter such as the TMV-121-A.

2. Overall response characteristics of receivers (r-f input to a-f output) with oscillograph or output meter and a Beat Frequency Oscillator such as the TMV-52-E, or similar, furnishing a variable frequency modulation.

3. Heterodyne detection of an external frequency with headphones, the test oscillator functioning as a frequency or wave meter.

4. Calibration with headphones and a source of known frequencies, by heterodyne detection.

All controls, regulation and connections are made from the front panel, on which are mounted the following devices:

1. "On-Off" or Power Switch (S-2).

2. "Mod-Off" or Modulation Switch for Modulator tube (S-3).

3. "Hi-Lo" or Attenuation Range Switch (S-4).

4. Vernier Tuning Dial—calibrated directly in kilocycles.

5. Range Switch with eight-position plate.

6. Output Control with graduated plate, 0–100.

7. Sweep Capacitor Jack for Frequency Modulator (J-1).

8. Jack for External Modulator or Heterodyne Detector (J-2).

9. Antenna and Ground Binding Posts for connection to the circuit under test.

The overall dimensions of the instrument are approximately 9¾" wide, 4½" deep and 8½" high (including handle). Its weight is 5¾ pounds, including batteries.

A calibration correction card is provided, installed in a frame on the back of the instrument.

The following frequency ranges are covered by the eight-position range switch:

Position	*Approximate Frequency Range (K.C.)*
1	90– 200
2	200– 400
3	400– 800
4	800– 1500
5	1500– 3100
6	3100– 6800
7	6800–14000
8	14000–25000

The oscillator is shipped complete with Radiotrons, but less batteries. Figure 2 shows the schematic circuit and Figure 5 the wiring diagram.

CONNECTIONS

Installation of Batteries

Two batteries are required, one 4½-volt filament battery (Burgess No. 2370, or equivalent) and one 22½-volt "B" battery (Burgess No. 4156, or equivalent).

Remove the four screws at the top and side edges of the front panel and withdraw the panel and chassis from the cabinet. Make certain that the Radiotrons are firmly in their sockets and the "On-Off" switch is off. Then turn the chassis upside down. Sufficient space is allowed beneath the chassis for insertion of the batteries, which should be located and connected as shown in Figure 3. Turn the case upside down and replace the chassis, bottom uppermost. This assures proper location of the chassis and batteries within the case. Turn the oscillator over and replace the front panel mounting screws. The unit is then ready for operation.

R.F. and I.F. Test Connections

Connect the output of the oscillator to the receiver under test from the two binding posts "Ant" and "Gnd" on the front panel. Reference to the service instructions for the receiver will disclose

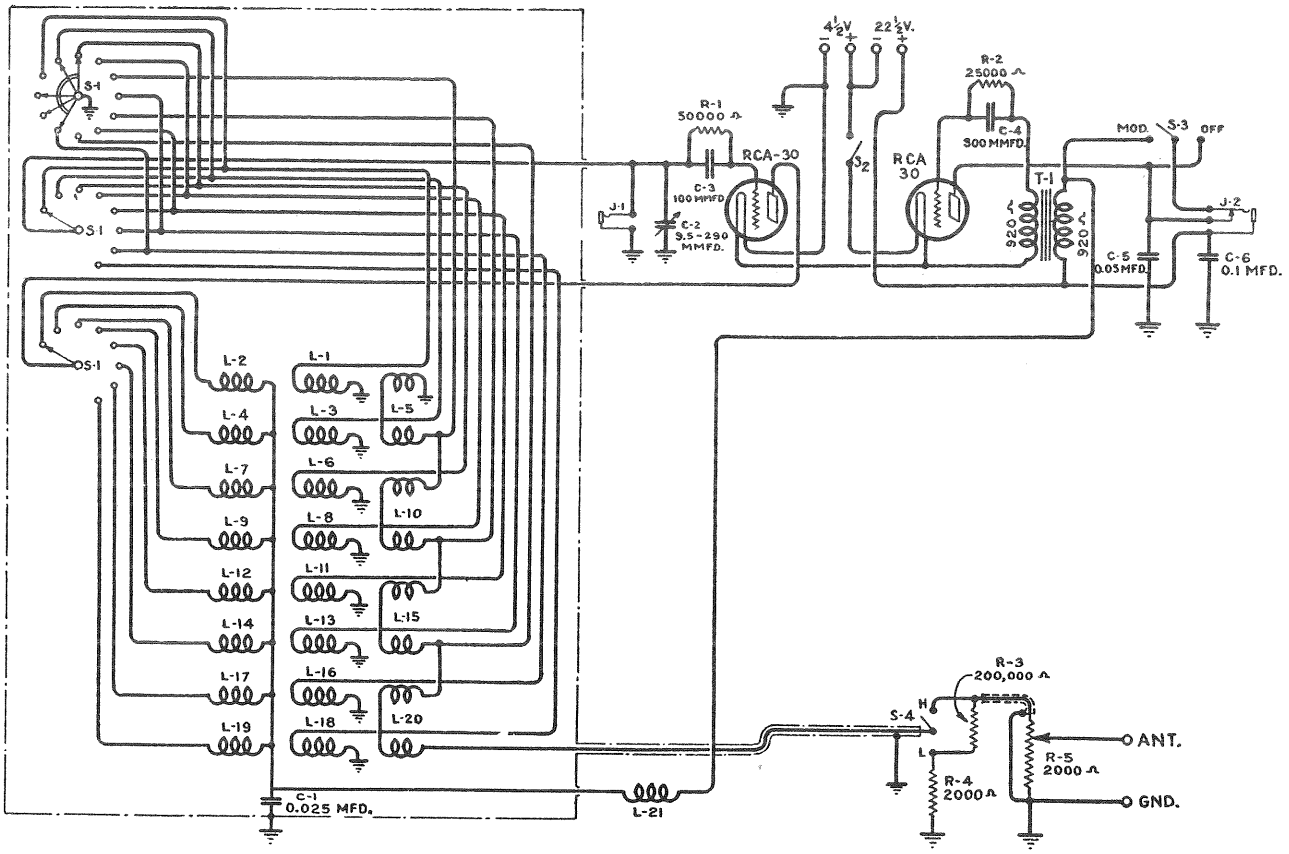


Figure 2—Schematic Circuit

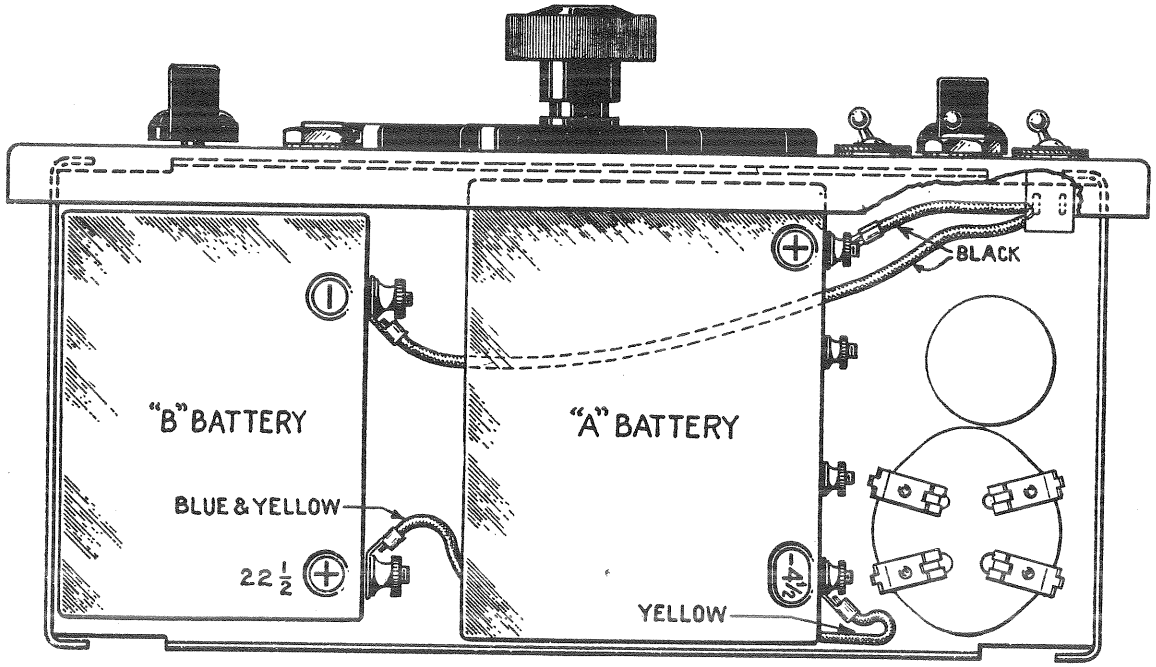


Figure 3—Location of Batteries

the proper points for making the connections on the set. Connect the output of the receiver either to an indicating meter or to a cathode ray oscillograph. In the latter case when it is desired to observe the selectivity curve of the receiver, connections will be made in accordance with Figure 1, the frequency modulator being plugged in at the sweep capacitor jack (No. 7) and connected to the oscillograph.

Overall Response Test Connections

Connect the test oscillator output to the receiver under test and the receiver output to meter or oscillograph, all as for r-f connections. Plug in a beat frequency oscillator at the external modulator jack (No. 8). The output from the instrument should be delivered through a low resistance transformer and both output leads must be insulated from both ground and instrument case. The beat oscillator should be capable of providing approximately 9 volts (r.m.s.) when connected to a 2,000-ohm load, and give a constant audio output voltage.

Heterodyne Connections

Connect the signal source to the "Ant" and "Gnd" binding posts, and plug headphones in detector jack (No. 8).

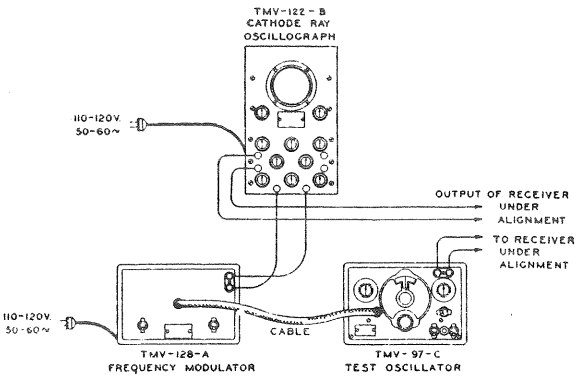


Figure 1—Connections for Oscillograph Test

OPERATION

Check connections for the particular test being made and turn the power switch (On-Off) to "On." Turn modulation switch to "Mod" for all tests except those using the frequency modulator and for heterodyne detection. Adjust the eight-point range switch and tuning dial for desired frequency signal. The tuning dial is calibrated directly in kilocycles with eight scales, one corresponding to each position of the range switch. The vernier tuning ratio may be varied from 6:1 to 20:1 by adjustment of the position of the small arm at the tuning knob. The extreme clockwise position of the arm gives a 20:1 ratio which is particularly advantageous for critical tuning.

Adjust the output of the oscillator to the particular test requirements by means of the output control knob and scale and the attenuation (Hi-Lo) switch. This switch provides a stage of attenuation of 100:1 in addition to the variable output control attenuation. The minimum signal with the switch on "Lo" and the control knob on zero will be less than 20 microvolts at any frequency setting within the range of the instrument. By recording the position of the output dial setting throughout the receiver range (for same signal output) a good indication of the relative receiver sensitivity may be obtained.

R.F. and I.F. Alignment with Indicating Meter

With modulation switch on "Mod" adjust the attenuation switch and output control to give the desired reading on the output meter and then adjust the receiver trimmers, in accordance with the instructions in the Service Notes for the set, to give maximum output. It will be found advisable to make tests with the attenuation switch on "Lo" except when extremely high signal intensities are necessary.

R.F. and I.F. Alignment with Cathode Ray Oscillograph

R.F. and I.F. alignment with cathode ray oscillograph is effected in a manner similar to the above, the frequency modulator being plugged in at the sweep capacitor jack and the modulator switch turned to "Off." Readings are taken on the cathode ray oscillograph which replaces the indicating meter and provides more extensive and detailed performance data. Information with regard to the operation of the oscillograph and frequency modulator is contained in their respective instruction books.

Overall Response Tests

Set the receiver at a definite point, as, for example, 1,000 kc. Plug in the beat frequency oscillator. Turn the power switch to "On," the modulation switch to "Mod" and adjust the instrument controls as required. Take output readings, on an indicating meter or cathode ray oscillograph, corresponding to the various modulation frequencies of the beat frequency oscillator. A check may be made at any other setting of the receiver.

Any discrepancies in the audio frequency characteristics of the receiver may thus be definitely detected.

Note—The beat frequency oscillator output voltage should be set at the required value to give the desired percentage modulation. A voltage of approximately 9 volts (r.m.s.) will modulate the TMV-97-C oscillator 50 per cent.

Heterodyne Detection

Plug headphones in the detector jack, turn modulation switch to "Off" and adjust frequency

controls to give beat note. The frequency being checked may now be read on the dial or the dial readings may be checked against known frequencies for rough calibration of the instrument. The output control should always be used at the lowest possible value at which it will provide an audible beat note.

CALIBRATION

The individual oscillators will be found to be within plus or minus 3% of the dial scale reading. However, if it is desirable to have a more accurate calibration than this, a separate correction card is included for each owner to calibrate his own instrument. This is done by tuning in stations in the various ranges on a receiving set and then beating them with the test oscillator for zero beat. The frequency of the test oscillator will then be identical with that of the station. By noting the oscillator dial reading and the station frequency, a very accurate correction curve may be plotted on this card.

For the lower frequencies, 90 kc. to 550 kc., a calibration is readily made by using harmonics of the oscillator for checking against frequencies in the broadcasting band. For example, 175 kc. can be checked by beating its fourth harmonic with Station WLW, the frequency of which is 700 kc.

The instrument will be factory calibrated and a curve plotted on the card at customer's expense, on request, before shipment is made.

MAINTENANCE

The battery voltages should be checked if at any time the output of the oscillator becomes weak.

The drain on the batteries is small, so that their expected life is approximately 15 hours' operation. However, the batteries should be replaced when the filament battery voltage is less than 3 volts and the "B" battery voltage is less than 17 volts.

The combined series battery voltage may easily be metered between the external modulator jack (No. 8) and ground. If this reading is less than 25 volts each battery should be checked separately.

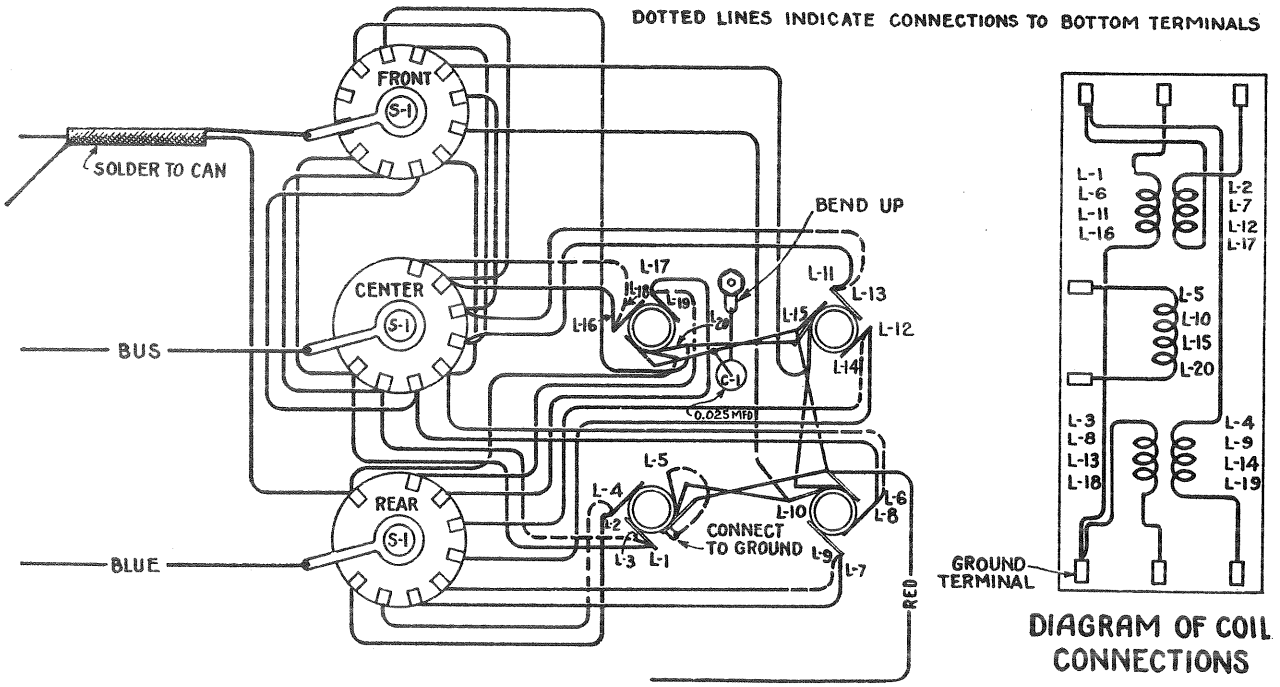


Figure 4—Coil Assembly

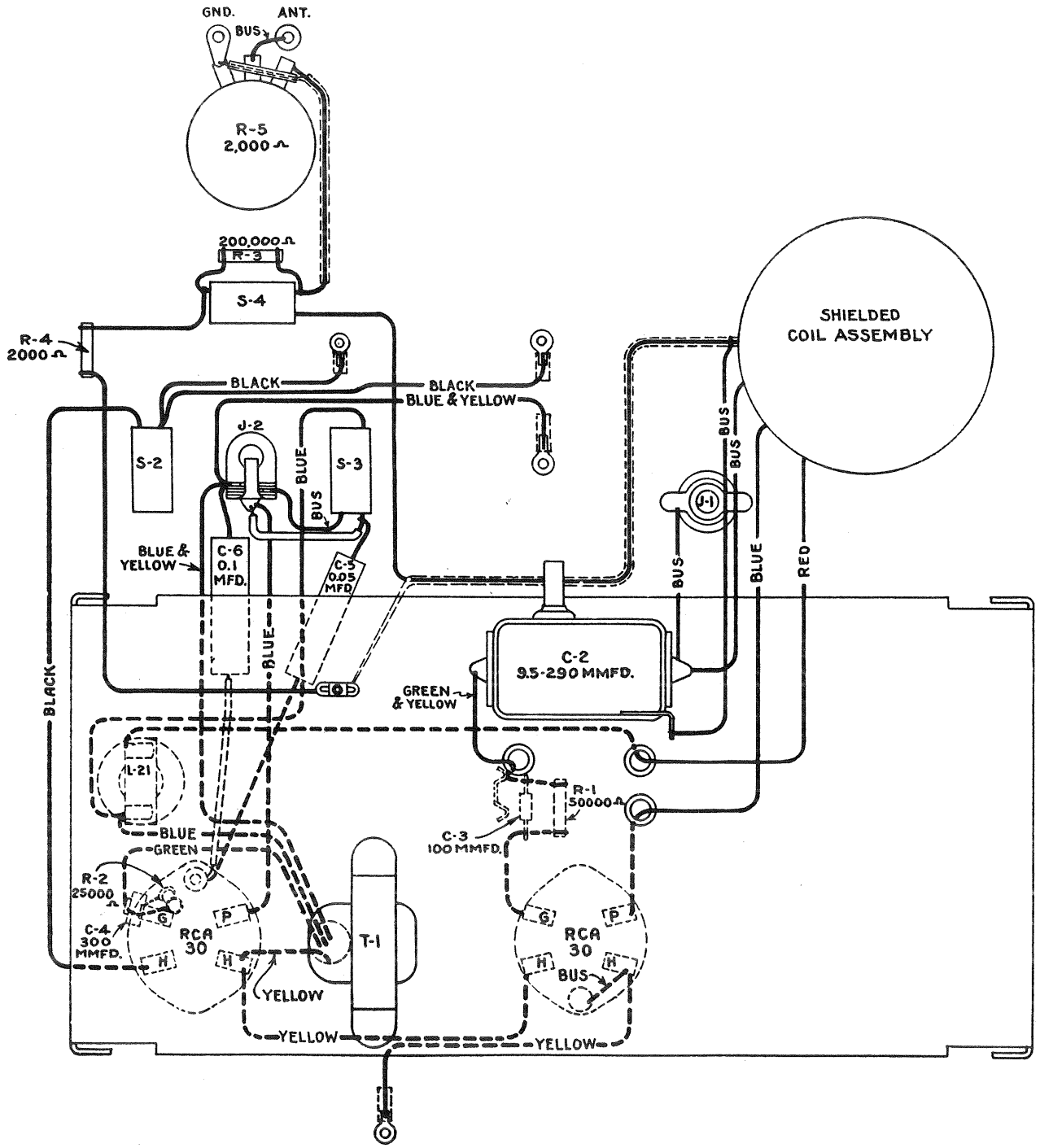


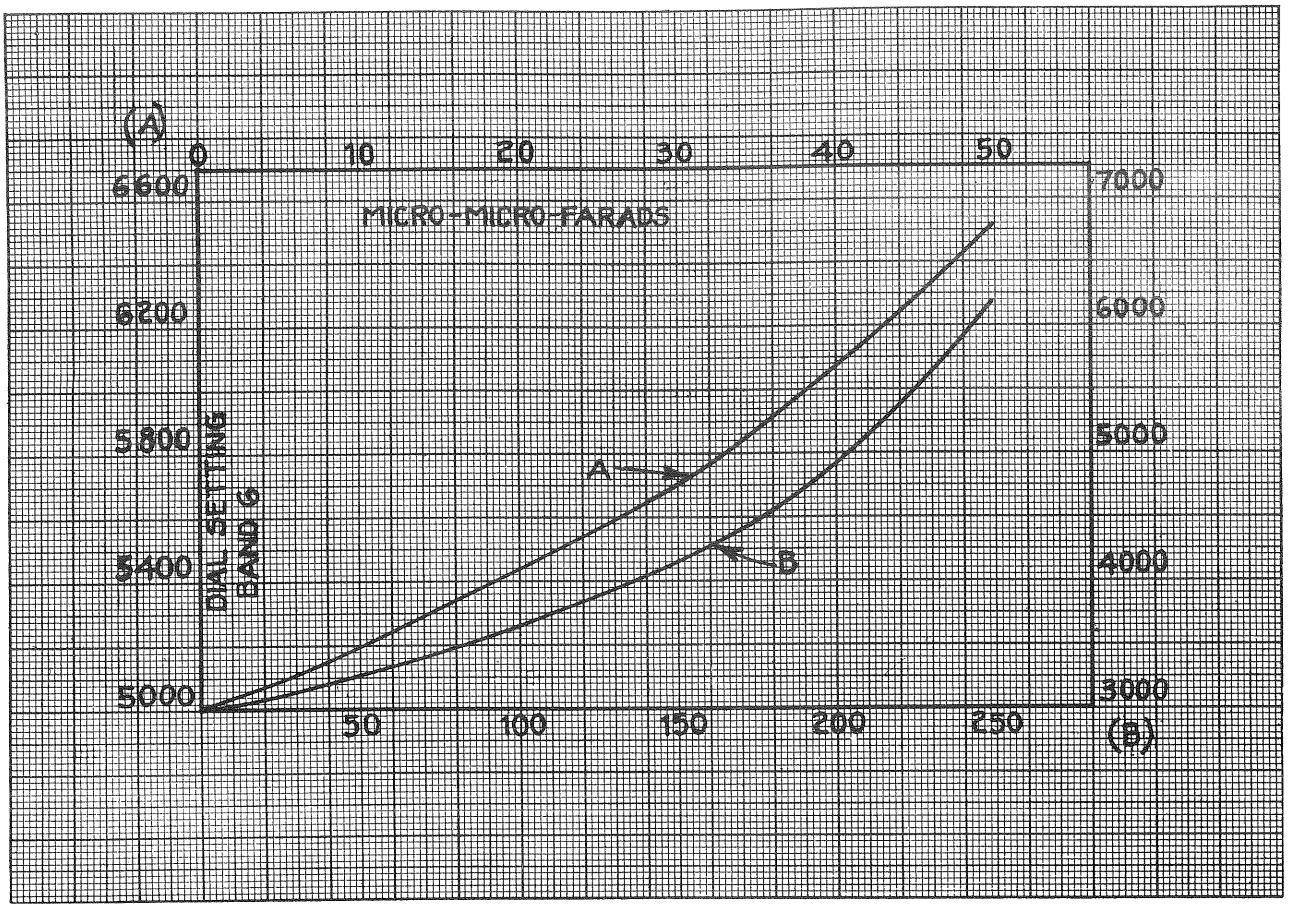
Figure 5—Wiring Diagram

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
7918	Base—Coil mounting base complete with bushings and terminal	$0.22
7914	Coil—Oscillator coil—Range 90–200 and 200–400 kc. (L1, L2, L3, L4, L5)	1.06
7915	Coil—Oscillator coil—Range 400–800 and 800–1500 kc. (L6, L7, L8, L9, L10)	.80
7916	Coil—Oscillator coil—Range 1500–3100 and 3100–6800 kc. (L11, L12, L13, L14, L15)	.65
7917	Coil—Oscillator coil—Range 6800–14,000 and 14,000–25,000 kc. (L16, L17, L18, L19, L20)	.65
7268	Coil—R.F. plate choke coil (L21)	.40
3794	Capacitor—100 mmfd. (C3)	.30
3981	Capacitor—300 mmfd. (C4)	.30
4870	Capacitor—0.025 mfd. (C1)	.20
4836	Capacitor—0.05 mfd. (C5)	.30
4841	Capacitor—0.1 mfd. (C6)	.22
3980	Capacitor—Tuning capacitor (C2)	1.40
7958	Dial—Tuning condenser dial—Complete	4.00
7923	Escutcheon—Modulation switch escutcheon—Engraved "MOD" and "OFF"	.16
7922	Escutcheon—Output control switch escutcheon—Engraved "HI" "LO"	.16
7901	Escutcheon — Power switch escutcheon — Engraved "ON" "OFF"	.28
3982	Handle—Carrying handle	.60
7961	Jack—Modulation input jack (J2)	.72
7903	Jack—R.F. jack—For use with frequency modulator (J1)	$0.45
7960	Knob—Range switch or output potentiometer knob	.20
7959	Potentiometer—Output control potentiometer (R5)	1.00
5195	Resistor—2,000 ohms—Carbon type—¼ watt (R4)—Package of 5	1.00
3110	Resistor—25,000 ohms—Carbon type—¼ watt (R2)—Package of 5	1.00
5194	Resistor—50,000 ohms—Carbon type—¼ watt (R1)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt (R3)—Package of 5	1.00
3986	Scale—Output potentiometer dial plate scale	.66
7921	Scale—Range switch dial plate scale	.20
7924	Scale—Tuning condenser dial scale	.16
7912	Shield—Coil assembly shield (top)	.20
7913	Shield—Coil assembly shield (bottom)	.30
4794	Socket—4-contact Radiotron socket	.15
7925	Switch—Modulation control or output control switch (S3, S4)	.52
7900	Switch—Power switch (S2)	.75
7919	Switch—Range switch—Less coil mounting base (S1)	1.85
3979	Transformer—Audio oscillator transformer (T1)	1.94

USE OF TMV-97-C, CONVERTED TMV-97-A OR CONVERTED TMV-97-B TEST OSCILLATOR FOR CHECKING SMALL CAPACITORS OF VALUES FROM 2 TO 250-MMFD



Proceed as follows:

Connect a two wire cable to a standard telephone plug. If two separate wires are used, lace them together so that their capacity remains constant. Leave three inches free at the end. Insert the plug in the sweep jack and place the oscillator in operation with the range switch in the 800 to 1500 kc. position.

CAPACITORS 2—50-MMFD

Set oscillator dial to 5000 kc. on scale for band 6. Tune in signal on broadcast range of a receiver. Place unknown capacitor across free ends of wires from test cable. Reset oscillator dial until signal is again tuned in at receiver. Compare reading of new oscillator dial setting from scale for band 6 with the capacity chart and follow across to curve A. At intersection, follow line up to Scale A and read the corresponding value of capacity. EXAMPLE: Oscillator dial at 5000. Connect capacitor. Retune oscillator for signal in receiver. New reading 5800. Consult chart. Read value of capacitor as 33-MMFD.

CAPACITORS UP TO 250-MMFD

Set oscillator dial to 3000 kc. on scale for band 6. Tune in signal as before and connect the unknown capacitor. Retune the oscillator as above until the signal is tuned in at the receiver. Compare the new setting of the oscillator dial for scale 6 with the capacity chart and follow across to curve B. At intersection follow the line down to scale B and read the corresponding value of capacity. EXAMPLE: Oscillator dial at 3000. Connect the unknown capacitor. Retune the oscillator for signal in receiver. New reading 5000. Consult chart. Read value of capacitor as 204-MMFD.

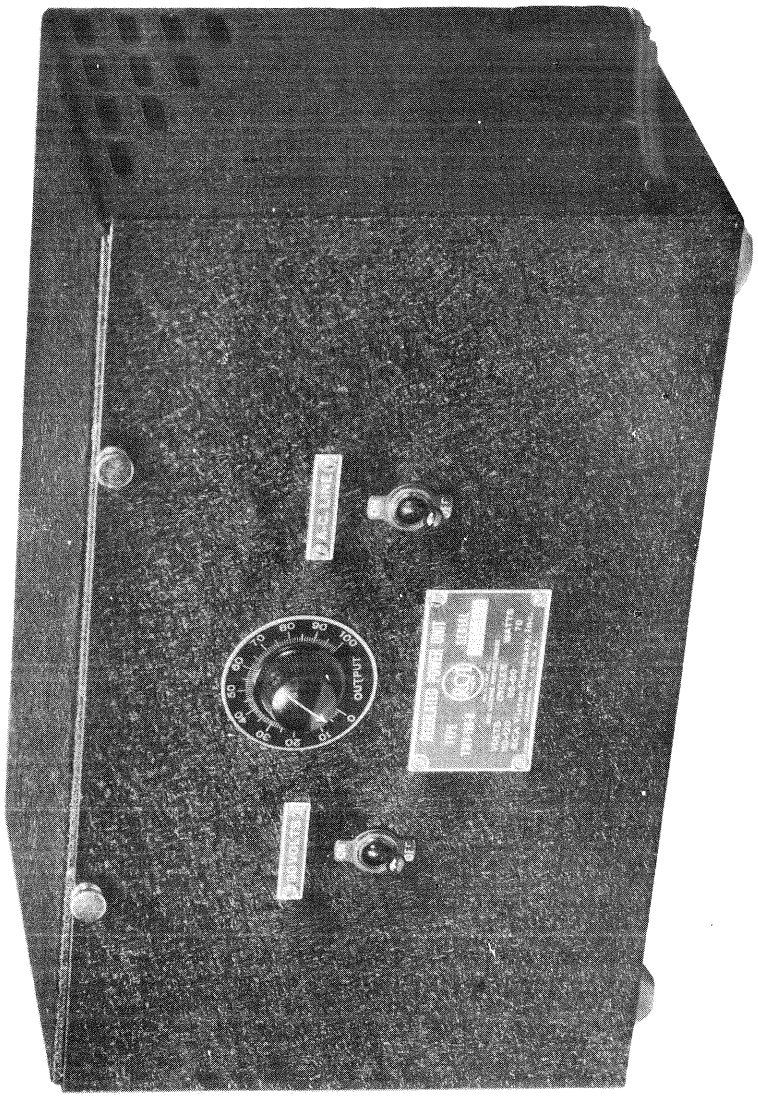


Figure 1—External view of Type TMV-118-B Regulated Power Unit

RCA REGULATED POWER UNIT

TYPE TMV-118-B

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

A. C. Input Voltage Rating	90–130 Volts
Frequency Rating	50–60 Cycles
Power Consumption	70 Watts
Maximum Output Voltage	See Curves
Maximum Output Current	See Curves
Type and Number of Radiotrons	1 RCA-80, 1 RCA-2A3, 2 RCA-874, 1 RCA-57—Total, 5

PHYSICAL SPECIFICATIONS

Height	7¼ Inches
Width	12 Inches
Depth	7 Inches
Weight	25 Pounds
Weight Packed for Shipment	28 Pounds

The RCA Regulated Power Unit, Type TMV-118-B, is a device for converting the usual alternating current line power into direct current suitable for use with devices normally requiring "B" batteries. The voltage regulation is better than that obtained from a set of heavy-duty batteries while the hum is negligible. A special regulating circuit maintains constant output voltages independently of line or load variations over a wide range. A general view of the external appearance of the TMV-118-B Power Unit is shown in Figure 1.

DESCRIPTION OF ELECTRICAL CIRCUIT

Figure 2 shows the schematic circuit diagram of the complete unit, while Figure 3 shows a sketch of the current-carrying section of the circuit. All by-pass capacitors and filter circuits are omitted.

Before examining the circuit, it is well to understand the action of the voltage regulating tube, RCA-874. The RCA-874 is a gaseous tube of two elements The tube functions to maintain a fairly constant voltage (90 volts) across a circuit, independently of load due to the fact that its resistance varies with the voltage across its terminals. The tube requires 125 volts for starting and maintains an approximately constant D. C. voltage across its terminal for any current from 10 to 50 milliamperes. A link circuit is provided by having two of the tube prongs tied together so that the power circuit may be wired through this link. This prevents power from being applied to the unit without the RCA-874 in place. Excessive voltage might otherwise occur if such a condition existed due to absence of the load of the regulator tube.

The rectifier and filter circuit of the TMV-118-B functions in the usual manner, a full-wave rectifier and a tapped choke being used. The voltage regulating feature consists of four tubes which function as follows:

Referring to Figure 3, the general purpose of each tube is as follows:

RCA-874 is a voltage regulator, maintaining a fairly constant voltage across resistors R-5 and R-6. This voltage is known as the reference voltage and a portion of it comprises the grid voltage of the RCA-57.

RCA-57 is a control tube for changing the grid voltage of Radiotron RCA-2A3 in accordance with voltage variations.