

OPERATING INSTRUCTIONS
for
TYPE 1215-B UNIT OSCILLATOR



GENERAL RADIO COMPANY
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U. S. A.

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for
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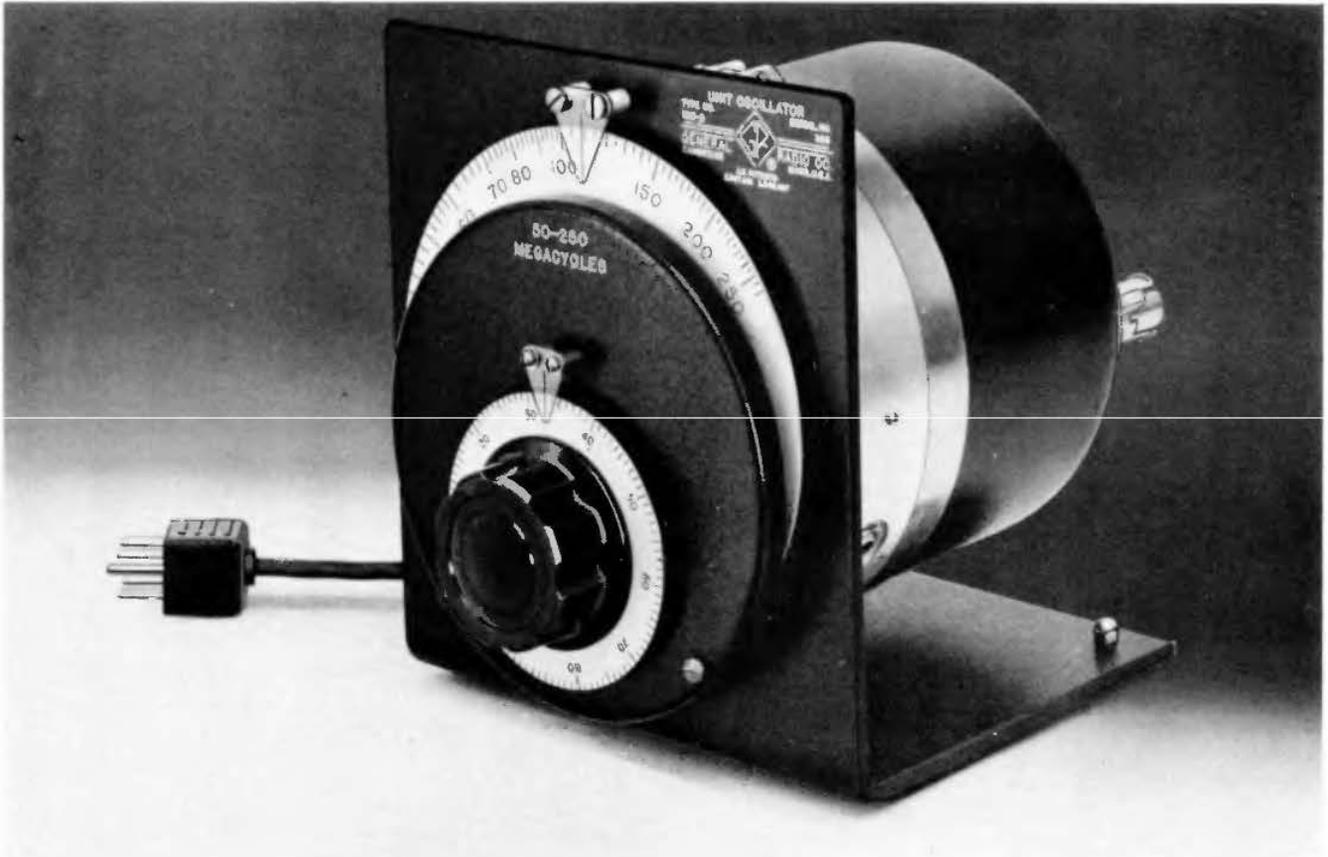
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View of Type 1215-B Unit Oscillator

Operating Instructions for Type 1215-B Unit Oscillator

The Type 1215-B Unit Oscillator is a general-purpose power source for the radio-frequency laboratory. It covers the range of 50 to 250 Mc with no moving contacts in the tuned circuit and can be used to drive bridges, admittance meters, impedance meters, impedance comparators and other measuring equipment. In combination with a voltmeter and attenuator it provides an accurately known output voltage for receiver testing. Direct amplitude modulation over the audio-frequency range is possible, and amplitude modulation free from incidental frequency modulation, over the frequency range from zero to 5 Mc can be obtained with a simple crystal diode modulator such as the Type 1000-P6. Connected to a mixer, such as the Type 874-MR, the unit oscillator can be used as the local oscillator in a heterodyne receiver to convert a low-frequency communications receiver into a detector for v-h-f signals.

SECTION 1.0 OPERATION

- 1.1 The instrument is shipped with the oscillator tube in place, and, when connected to an adequate power supply, it is ready for use.
- 1.2 The instrument was designed for operation with a Type 1203-A Unit Power Supply. The power cable supplied with the oscillator plugs directly into the multi-point connector in the side of the Type 1203-A Supply. The oscillator can, however, be powered by any other adequate supply. See paragraphs 1.6 and 1.7 below.
- 1.3 The frequency control is a direct-reading panel dial calibrated to an accuracy of $\pm 1\%$ at no load.
- 1.4 The output is taken from a 2-turn coupling loop mounted with a coaxial connector in the back of the instrument. Typical output characteristics are shown in Figure 1. By rotating the loop-connector assembly or by partially withdrawing it, the output level can be set to the desired value. The assembly can be clamped in position by tightening the large wing nut.

The output connector is a Type 874 Coaxial element which was designed especially for v-h-f and u-h-f applications. The accessories include a Type 874-R20 3-foot coaxial double shielded Patch Cord, a Type 874-PB Panel Connector and a Type 874-C Cable Connector to facilitate complete coaxial connections to the equipment under test.

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1.5 Direct amplitude modulation over the audio-frequency range can be obtained by connecting an audio oscillator in the cathode circuit at the MOD jack provided on the right side of the instrument. The Type CDMA-22 telephone plug is supplied for this purpose. The audio oscillator circuit must supply a d-c path and must be capable of carrying 25 ma d-c.

A convenient modulating source is the Type 1214-A Unit Oscillator which delivers about 55 volts at either 400 or 1000 cycles and yields about 25% amplitude modulation.

Direct cathode modulation of the oscillator introduces some incidental frequency modulation. Amplitude modulation essentially free of frequency modulation can be obtained by using a Type 1000-P6 Crystal Diode Modulator.¹ This instrument is described in the latest General Radio Catalog. See also Section 5.0.

OPERATION WITH POWER SUPPLY OTHER THAN TYPE 1203-A

1.6 The Type 1215-B Unit Oscillator can be operated equally well from a Type 1204-B Unit Variable Power Supply, but it is then necessary to adjust the control of the power supply so that the total d-c current taken by the oscillator does not exceed 25 ma. The current is indicated on the panel meter of the power supply.

1.7 A matching multi-point connector (CDMS-18-4) is supplied to permit easy connection of the Unit Oscillator to another adequate power supply,

¹W. F. Byers, "An Amplitude Modulator for Video Frequencies", General Radio Experimenter, March, 1950.

Figure 1.
Typical Output Characteristic

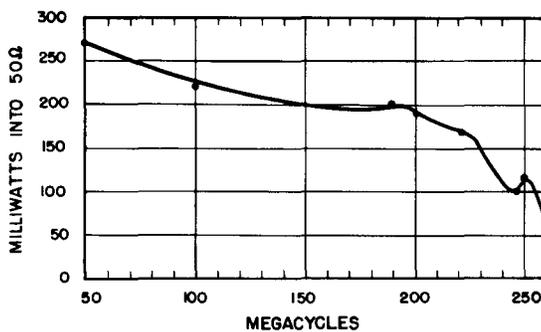
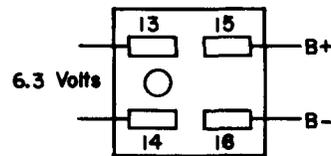


FIGURE 1. TYPICAL OUTPUT CHARACTERISTIC.

Figure 2.
Terminals of
CDMS-18-4
Multipoint Connector



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including batteries. The power requirements are 6.3 volts, 0.3 ampere a-c or d-c and about 370 volts d-c at 25 ma. The correct terminal connections are indicated in Figure 2.

To reduce the power supply voltage requirements, the resistors R-5 and R-6 in the base of the oscillator can be removed. The leakage will then be greater, and care has to be taken not to exceed the maximum allowable plate dissipation of the oscillator tube which is rated at 5 watts.

1.8 For some applications, a well regulated power supply with low hum level will be found desirable to avoid frequency variations caused by line voltage fluctuations and to produce a clearer beat note. For a 20% line voltage variation, the frequency change is of the order of 0.01% for frequencies below 200 Mc. It increases to about 0.03% at 250 Mc.

2.0 CIRCUIT

2.1 The schematic and complete wiring diagrams are shown in Figures 3 and 4.

2.2 The tuning system is a modified "butterfly" arrangement wherein the plates are shaped to permit operation over essentially 150 degrees rotation. There are no sliding contacts in the tuned circuit.

The oscillator tube is the miniature twin-triode Type 12AT7; the triode sections are connected in push-pull across the high-impedance portions of the tuned circuit.

2.3 The oscillator unit is mounted on a cylindrical casting which encloses the filter components. All leads are carefully filtered to keep the external field to a low value. A cylindrical cover is held in place by a metallic strap for complete shielding. The output mechanism (loop and coaxial connector) is mounted on this cover.

3.0 ACCESSORIES AVAILABLE

A large selection of Type 874 Coaxial Elements is available to increase the utility of the unit oscillator. These accessories are part of a complete integrated line of measuring equipment for the determination of voltage, power and standing-wave ratio at v-h and u-h frequencies.

While the unit oscillator is primarily intended as a source of power for this measuring equipment, for the Type 1601-A V-H-F Bridge and for the Type 1602-A Admittance Meter, many of the coaxial elements serve as accessories to the unit oscillator to adapt it to various applications in the radio-frequency laboratory as a substitute for more expensive equipment that is not always available.

Three of these applications are described in detail below, and others will suggest themselves after a study of the list of Type 874 Coaxial Elements which was published in the January 1950 issue of the General Radio Experimenter and is shown in the latest General Radio Catalog.

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Particularly useful are some of the small parts connectors, cables, adaptors, terminations, attenuators and coupling units which can be plugged together in various combinations for many different setups.

4.0 UNIT OSCILLATOR AS SIGNAL GENERATOR

Since the unit oscillator is a fairly well shielded source of power, it can be used as a signal generator for receiver testing if means are provided to measure and to attenuate the output.

A recommended arrangement of accessory components is shown in Figure 5.

To cover completely the 50-250 Mc frequency range, four sections of the Type 874-L20 (50 Ω , 20 cm) Air Line and a 20 $\mu\mu\text{f}$ fixed capacitor ("C" in Figure 5 below) series-mounted in a Type 874-X coaxial container are required. These units permit tuning the oscillator output to obtain a maximum current in the center conductor of the attenuator to which the output loop is coupled.

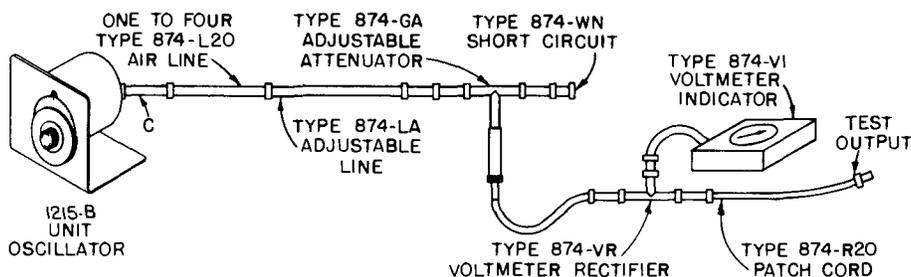
The attenuator is calibrated in db. At minimum attenuation the attenuator output is measured by a crystal diode in the Type 874-VR Voltmeter Rectifier and read on the meter of the Type 874-VI Voltmeter Indicator. Means are provided to standardize the crystal indication. The crystal is followed by a 50-ohm resistor which determines the output impedance.

The arrangement just described is similar to the one used in the General Radio Type 1021-A Standard-Signal Generator. The calibration of the attenuator covers 150 db, but the shielding of the unit oscillator and the various other components is not sufficient to make accurate measurements in the microvolt region.

5.0 UNIT OSCILLATOR AS TELEVISION SIGNAL GENERATOR

In combination with a Type 1000-P6 Crystal-Diode Modulator and a Type 874-GF 20-db Fixed Attenuator the unit oscillator is a convenient source of

Figure 5. Functional Diagram of the Unit Oscillator and Accessories Arranged to Work as a Standard-Signal Generator.



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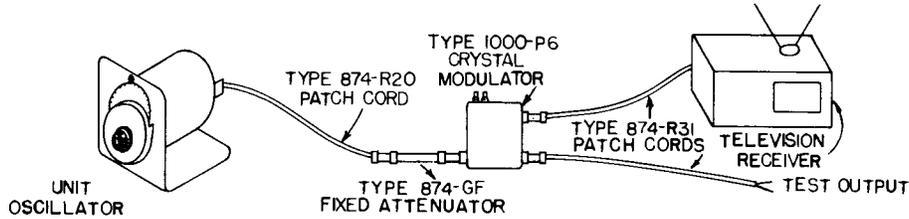


Figure 6. Functional Diagram of the Unit Oscillator with Video Modulator to Form a Television Signal Generator

television signals over its entire carrier-frequency range if video modulating voltage is available. The circuit arrangement is shown in Figure 6. The modulating voltage required can be obtained from a standard television receiver tuned to a local station.

Since the modulator is separated from the oscillator by an attenuator pad, amplitude modulation free from incidental frequency modulation is obtained.

6.0 UNIT OSCILLATOR AS FREQUENCY CONVERTER

Connected to a Type 874-MR Mixer Rectifier, the unit oscillator can provide the local signal in a heterodyne converter, to adapt the Type 1216-A I-F Amplifier or a low-frequency communications receiver for use as a sensitive detector for v-h-f signals. This circuit is shown in Figure 7. The Type 1216-A has a built-in precision attenuator and a panel meter. It has a bandwidth of 0.7% megacycle and excellent sensitivity. Provision is made for measuring the rectified mixer current in the I-F Amplifier, and a separate built-in power supply is available for operating the Unit Oscillator.

For the u-h-f range from 250 to 920 megacycles, the Type 1209-A Unit Oscillator is available as a companion instrument to the Type 1215-B. The Type 1209-A is similar in appearance and construction.

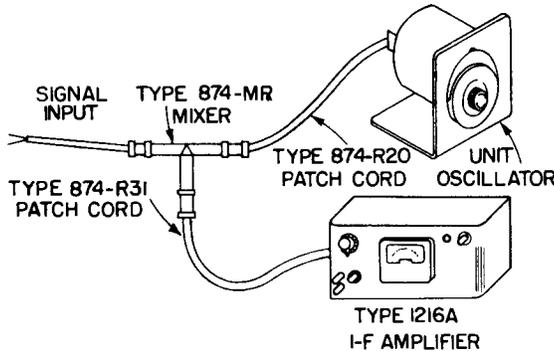


Figure 7. Functional Diagram of the Unit Oscillator and Mixer Rectifier Used as a Frequency Converter to Feed the Type 1216-A I-F Amplifier

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7.0 PULSE MODULATION

At carrier frequencies above 60 Mc the Type 1000-P7 Balanced Modulator is very useful for modulating the Unit Oscillator. It has the fast rise-time characteristic and high carrier suppression necessary for pulse modulating with a pulse source such as the Type 1217-A Unit Pulser. Linear amplitude modulation up to 100% is also possible over a modulating frequency range of 0 to 20 Mc. The incidental frequency modulation introduced is low.

8.0 MAINTENANCE

With the shield cover off, the tube and many of the components are accessible.

Tube replacement, in general, will cause less than 0.5% change in frequency. If a source of standardized frequencies is available, the trimmer capacitor (a small slotted rectangular plate) built onto the main tuning unit can be readjusted for correct calibration at the 250 Mc end of the range. The shield cover must be in place when the frequency is measured.

OTHER GENERAL RADIO UNIT INSTRUMENTS

Type 1203-A Unit Power Supply
Type 1204-B Unit Variable Power Supply
Type 1206-B Unit Amplifier
Type 1208-A Unit Oscillator (65 - 500 Mc)
Type 1209-A Unit Oscillator (250 - 920 Mc)
Type 1211-A Unit Oscillator (0.5 - 50 Mc)
Type 1212-A Unit Null Detector
Type 1213-A Unit Crystal Oscillator (1 Mc, 100 kc, and 10 kc)
Type 1214-A Unit Oscillator (400 and 1000 cycles)
Type 1216-A Unit I-F Amplifier
Type 1217-A Unit Pulser

TYPE 1215-B UNIT OSCILLATOR

SPECIFICATIONS

Frequency Range: 50-250 Mc.

Tuned Circuit: A semi-butterfly with no sliding contacts.

Frequency Control: A 6-inch dial with direct calibration over 140 degrees.
Slow motion drive: 4 turns of a 3-inch dial with arbitrary scale of 100 divisions.

Frequency Calibration Accuracy: 1% at no load.

Warm-up Frequency Drift: 0.4%.

Output System: Short Coaxial line with a coupling loop at one end and a Type 874 Coaxial Connector on the other end. Maximum power can be delivered to load impedances normally encountered in coaxial systems.

Output Power: At least 80 milliwatts into a 50-ohm load.

Power Supply Requirements: 370 volts d-c at 25 ma and 6.3 volts a-c or d-c at 0.3 ampere. The Type 1203-A Unit Power Supply is recommended.

Modulation: Direct amplitude modulation over the audio-frequency range can be obtained with an external audio oscillator. The impedance at the modulation terminals is about 15,000 ohms. A convenient audio source is the Type 1214-A Unit Oscillator which will deliver about 55 volts at 400 or 1000 cycles and will yield about 25% modulation. The Type 1000-P6 Crystal Diode Modulator can be used for modulation at video frequencies essentially free of fm.

Tube: Type 12AT7 miniature twin-triode which is supplied with the instrument.

Mounting: The oscillator is mounted in an aluminum casting and is shielded with a spun-aluminum cover. The assembly is mounted on an L-shaped panel and chassis.

Accessories Supplied: Type CDMA-22 Plug, Type 874-R20 Patch Cord, Type 874-C Cable Connector, Type 874-P Panel Connector and Type CDMS-18-4 Multi-point Connector.

Accessories Available: Type 1000-P6 Modulator, Type 1203-A Power Supply, Type 1204-B Power Supply, Type 1214-A Oscillator and the Type 874 Coaxial Elements such as adaptors, attenuators, voltmeters, mixer, etc.

Dimensions: 7 x 8 x 9-1/2 inches, over-all.

Net Weight: 7 1/2 pounds.

U.S. Patent Nos. 2,125,816, 2,548,457 and 2,367,681

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PARTS LIST

RESISTORS

				TYPE
R-1 =	5.1 k ohms	±5%	(AB) Type EB	REC-20BF
R-2 =	10 ohms	±5%	(AB) Type EB	REC-20BF
R-3 =	10 ohms	±5%	(AB) Type EB	REC-20BF
R-4 =	5.1 k ohms	±5%	(AB) Type EB	REC-20BF
R-5 =	2.4 k ohms	±5%		REC-41BF
R-6 =	2.4 k ohms	±5%		REC-41BF
R-7 =	1 k ohms	±10%		REC-30BF
R-8 =	1 k ohms	±10%		REC-30BF

CONDENSERS

			TYPE
C-1 =	Built in	(Air) Trimmer	
C-2 =	5.0 μ f	±0.5 μ f, NPO	CC20CG050D <input type="checkbox"/>
C-3 =	5.0 μ f	±0.5 μ f, NPO	CC20CG050D <input type="checkbox"/>
C-4 =	1000 μ f	±20% Max, Neg.	GP, CN-1 <input type="checkbox"/>
C-5 =	500 μ f		COU-8-2
C-6 =	500 μ f		COU-24
C-7 =	2000 μ f		COU-10-2
C-8 =	1000 μ f		COU-24
C-9 =	500 μ f		COU-8-2
C-10 =	500 μ f		COU-24

Electrical Reactance Corp.

CHOKES

		TYPE
L-1 =	20 μ h	ZCHA-29
L-2 =	R.F. Pickup Loop	874-402-2

MISCELLANEOUS

LC-1 =	Butterfly	50-250 Mc	Built in
PL-1 =	Plug		1215-33
J-1 =	Signal Jack		CDSJ-10

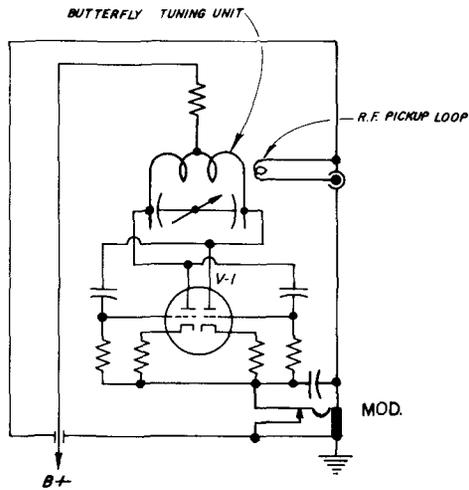
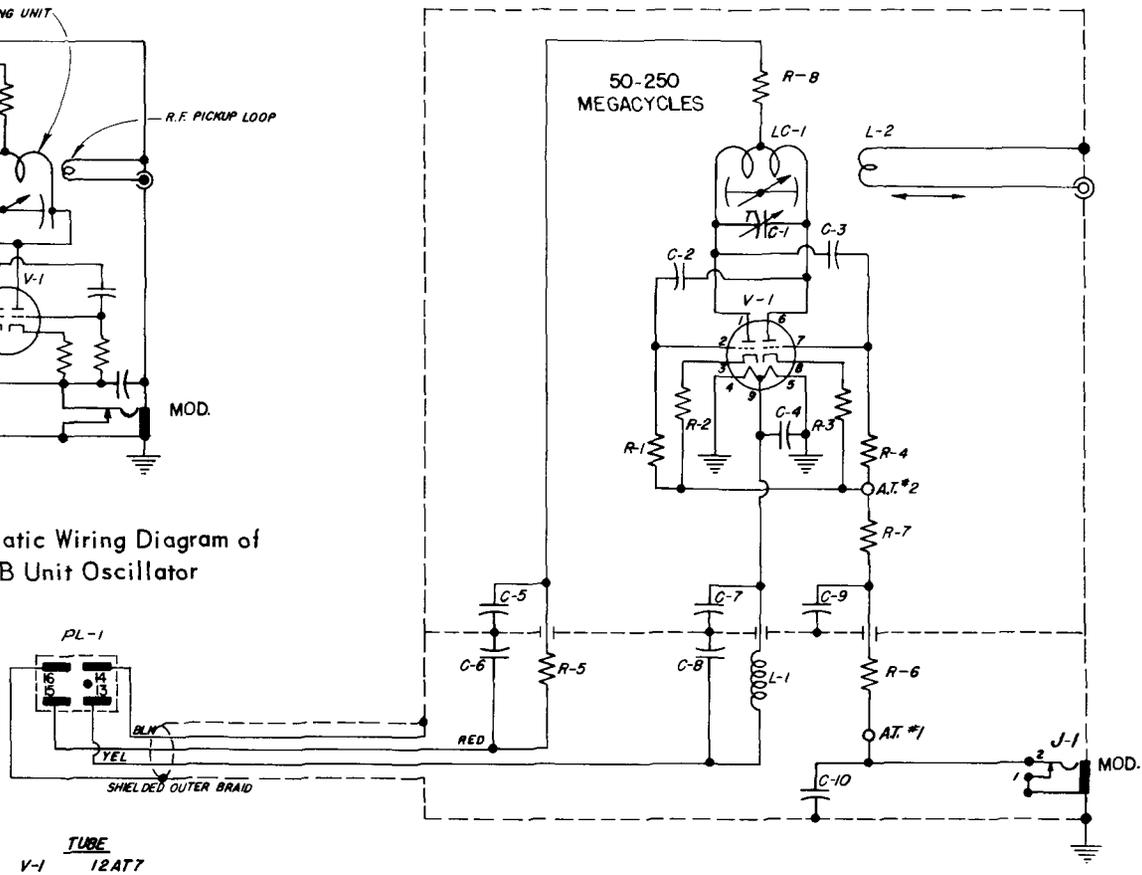


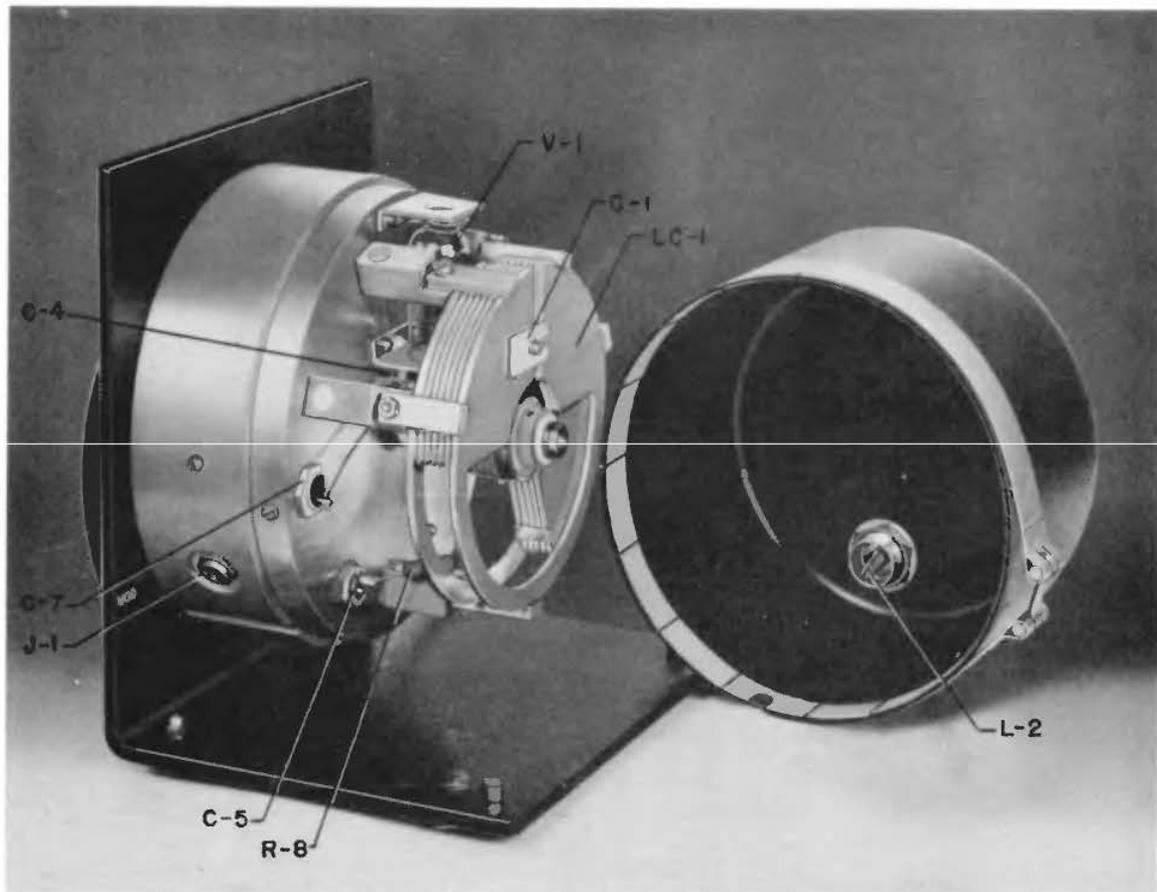
Figure 3. Schematic Wiring Diagram of Type 1215-B Unit Oscillator



TUBE
V-1 12AT7

Figure 4. Wiring Diagram of Type 1215-B Unit Oscillator

TYPE 1215-B UNIT OSCILLATOR



Interior View of Type 1215-B Unit Oscillator