INSTRUCTION MANUAL

Type 1363 | VHF OSCILLATOR
56-500 MEGAHERTZ

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GENERAL RADIO COMPANY

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56-500 MEGAHERTZ

Form 1363-0100-A
ID-B100
April, 1968

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

TABLE OF CONTENTS

Section 1 INTRODUCTION

1.1 Purpose 1
1.2 Description 1
1.3 Amplitude Modulation. 2
1.4 Sweep Operation 3
1.5 Auxiliary Equipment 3

Section 2 INSTALLATION

2.1 Connection to Power Supply 7
2.2 Bench Mounting 7
2.3 Rack Mounting. 8
2.4 Relocation of Output Jack 9
2.5 Modulation Connection 9
2.5 RF Output Connections 10

Section 3 OPERATING PROCEDURE

3.1 Equipment Turn-On 11
3.2 Frequency Adjustment 11
3.3 Output Adjustment 11
3.4 Modulation 11

Section 4 APPLICATIONS

4.1 General. 13
4.2 Signal Generator for Receiver Testing . . 13
4.3 Local Oscillator in a Frequency Converter 13
4.4 Admittance Measurements (One Port). . . 14
4.5 Observation of Modulation. 15

Section 5 PRINCIPLES OF OPERATION

5.1 General. 17
5.2 Circuitry 17

Section 6 SERVICE AND MAINTENANCE

6.1 Warranty 19
6.2 Service 19
6.3 Minimum Performance Standards 19
6.4 Trouble Analysis. 21
6.5 Removal of Covers. 21
6.6 Replacement. 21
6.7 Frequency Calibration 23
6.8 Lubrication 24
6.9 Adjustment for Maximum Tube Life . . . 24

TYPE 1363 VHF OSCILLATOR
56-500 MEGAHERTZ

SPECIFICATIONS

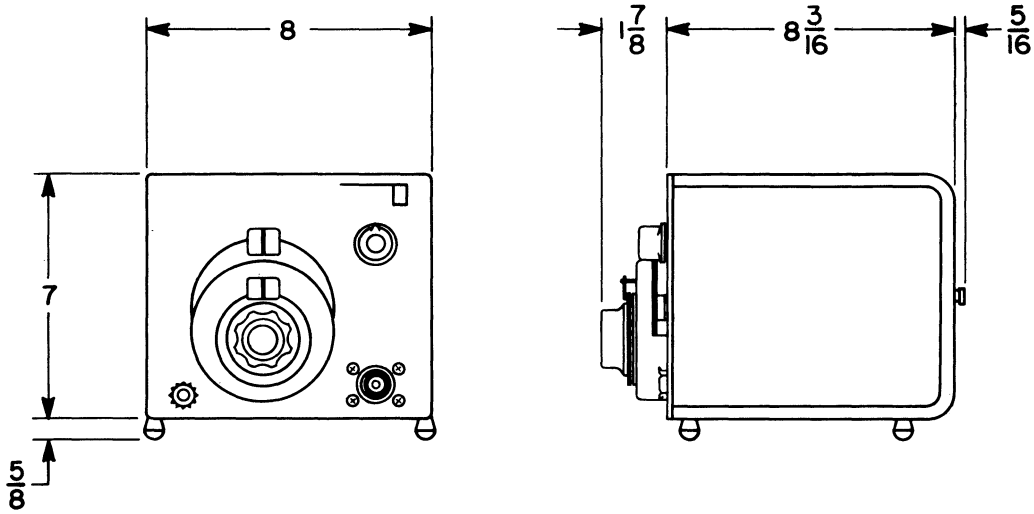
Frequency Range: 56 to 500 MHz.
Tuned Circuit: Variable L and C
Frequency Accuracy: ±2%.
Warmup Frequency Drift: 0.8% typical total; 0.2% after 30-min. warmup.
Frequency Control: A four-inch dial with calibration over 250°, with a slow-motion drive of about 7 turns.
Output Power (into 50 ohms): At least 90 mW over entire frequency range, 150 mW from 90 to 350 MHz, 250 mW from 150 to 250 MHz.
Output System: A potentiometer provides a continuous output adjustment range of at least 15 dB. At the minimum output setting, power output is less than 7 mW. Output adjustment and locking GR874 output connector are at the front of the instrument. Provision is made for alternative rear mounting of output connector.
Modulation: An external audio-frequency plate modulator may be connected to the front panel MOD jack. The modulation impedance is approximately 6 kΩ. A sine wave of 100 V rms amplitude will produce approximately 30% amplitude modulation. For 400 Hz, 1000 Hz and other audio-frequency modulation, the Type 1311 Audio Oscillator is recommended. The Type 1264 Modulating Power Supply can be used for square-wave or pulse modulation.

Power Supply: Three types of power supplies are recommended; the choice depends on the intended application. Refer to Table of Accessories, paragraph 1.5.
Tube: One 2C43.
Mounting: Rack-bench cabinet.
Accessories Supplied: GR 874-R22LA Patch Cord and a telephone plug (P/N 4220-2000).
Accessories Available: Refer to paragraph 1.5 and table below.

Catalog Number		Description
Bench	Rack	Oscillator/Power Supply Combinations
1363-9414	1363-9504	1363 with 1264 Modulating Power Supply
1363-9417	1363-9507	1363 with 1267 Regulated Power Supply
1363-9419	1363-9509	1363 with 1269 Power Supply

Dimensions: Width 8, height 7-5/8, depth 9-1/2 inches (205 by 195 by 240 mm). See outline below.
Net Weight: 7-1/2 pounds (3.4 kg).

GR 874 Patent No. 2,548,457.



1363 VHF Oscillator dimensions (inches).

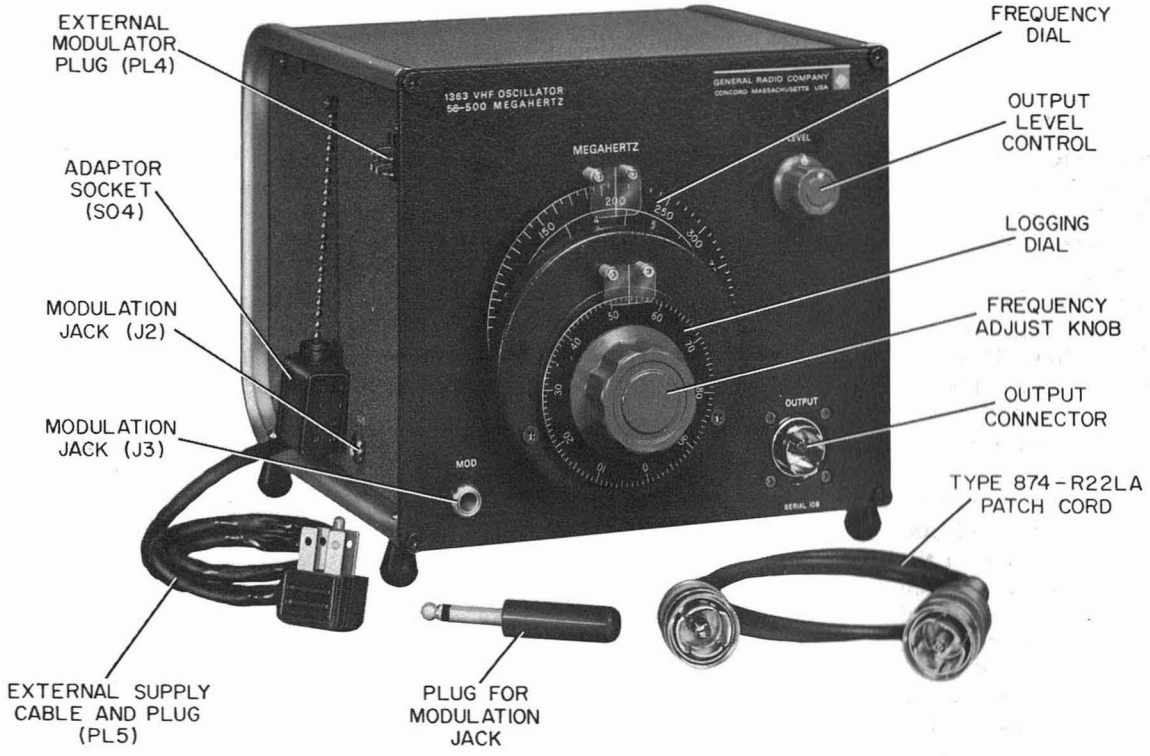


Figure 1-1. Panel view of 1363 VHF Oscillator with accessories.

CONDENSED OPERATING INSTRUCTIONS

CONNECTION TO A POWER SUPPLY.

Connect the 1363 VHF Oscillator to a power supply suitable for the application (refer to paragraphs 1.2.4 and 1.5 for details).

APPLYING POWER.

The 1363 Oscillator line power is completely controlled by the adjacent power supply. Turn the power supply "ON" and let the oscillator warm up (refer to paragraph 3.1 for details).

FREQUENCY ADJUSTMENT.

Set the desired frequency with the knob on the front of the instrument (refer to paragraph 3.2 for details).

LOAD CONNECTION.

Connect the desired load to the GR874 locking output connector either directly or through a GR874 adaptor (refer to the table at the rear of this manual).

OUTPUT ADJUSTMENT.

Set the output to the desired level by adjusting the LEVEL control on the front of the 1363 Oscillator (refer to paragraph 3.3 for details).

SECTION 1

INTRODUCTION

1.1 PURPOSE.

The 1363 VHF Oscillator (Figure 1-1) is a general-purpose oscillator for the radio frequency laboratory. Covering the calibrated range from 56 to 500 MHz, this oscillator provides adequate power to drive bridges, slotted lines, impedance comparators, and other measuring equipment. The output is brought through an output level control with a range of at least 15 dB. Direct sine-wave, square-wave, or pulse amplitude modulation is possible. Amplitude modulation free from incidental fm can be obtained with an external diode modulator. Connected to a mixer, the oscillator can be used as the local oscillator in a heterodyne receiver to convert the GR 1236 I-F Amplifier, or a low-frequency communications receiver, into a detector for uhf signals. Square-wave and pulse amplitude modulations can be obtained with the GR Type 1264 Modulating Power Supply (Figure 1-2).

1.2 DESCRIPTION.

1.2.1 GENERAL.

The 1363 VHF Oscillator uses a planar triode tube in a contact type tuned circuit that combines a variable air capacitor and a variable inductor in a single unit. For details, refer to paragraph 5.2.

The tuning shaft is directly driven through 250 degrees by the main dial that is in turn driven by a vernier drive whose 7 turns are each resolved into 100 arbitrary logging divisions. Resolution of 0.1% or better with the logging scale is described in paragraph 3.2. Jacks are provided for modulation, connection of special-purpose power supplies, and the measurement of plate current.

1.2.2 OUTPUT SYSTEM.

The output system consists of a coupling loop feeding a special potentiometer used as an output level control and a locking GR874 coaxial output connector.

The range of control provided by the potentiometer is at least 15 dB at the highest carrier frequencies, and is substantially more at the low end of the tuning range. With the control set fully counterclockwise the output power can always be reduced to less than 7 mW into 50Ω. Power available into a 50-Ω load is plotted against frequency in Figure 1-3 for a typical 1363 VHF Oscillator.

1.2.3 FREQUENCY STABILITY.

For most applications a well-regulated and filtered power supply should be used to avoid amplitude and frequency variations caused by line-voltage fluctuation and to produce a clear audible tone when the output beats with a stable reference. With an unregulated power supply, a line voltage variation of 10% causes an immediate (1 second) frequency change

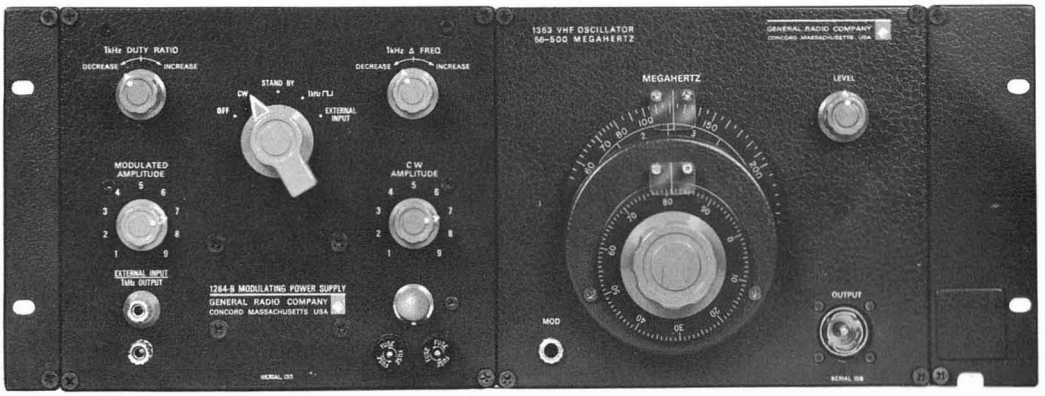


Figure 1-2. The VHF Oscillator and the 1264 Modulating Power Supply assembled with the Type 0481-P416 Adaptor Plate Set for rack mounting.

of about 0.005% at frequencies up to 200 MHz, and a change of about 0.04% at 500 MHz.

If the line voltage is held stady for 5 minutes after the shift of 10%, the frequency change is about 0.02% up to 200 MHz and 0.12% at 500 MHz. Of the power supplies listed in paragraph 1.5, only the Type 1269 is unregulated. The Type 1267, for example, reduces the effect of line voltage change by a factor of 100 or more.

When the oscillator is turned on for use, a warmup frequency drift (0.8% typical total) will occur until the circuit stabilizes at the set frequency. Figure 1-4 shows typical warmup frequency drift curves.

Individual instruments may drift considerably more or less, or even in the opposite sense from the typical.

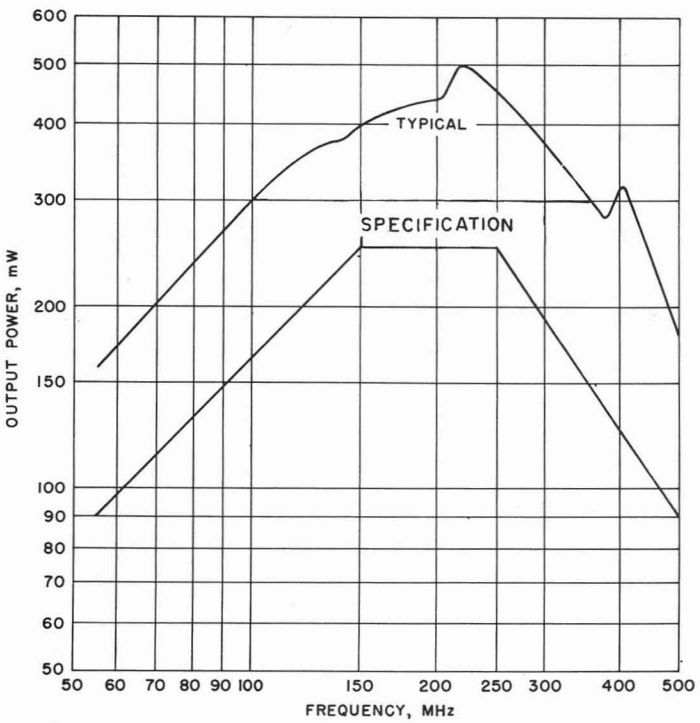


Figure 1-3. Output power into a 50-Ω-load for a typical 1363 Oscillator.

1.2.4 POWER REQUIREMENTS.

The 1363 VHF Oscillator requires an external power supply. The choice among the three General Radio power supplies recommended in paragraph 1.5 should be based on the intended application of the oscillator. If a power supply other than one of those recommended is used, it should be capable of delivering 300V dc at 50 mA for the plate, and 6.5V at 0.9 A for the heater. The negative side of the power supply must be floating, since the positive side is grounded inside the oscillator.

1.2.5 ACCESSORIES SUPPLIED.

Supplied with the oscillator are a three-foot coaxial double-shielded Type 874-R22LA Patch Cord, and a phone plug (GR P/N 4220-2000, Switchcraft No. 440, Figure 1-1).

1.3 AMPLITUDE MODULATION.

1.3.1 GENERAL.

Amplitude modulation of the signal source (in a test setup having a demodulator followed by a tuned amplifier) permits increased sensitivity of measurement compared to cw operation. Recommended auxiliary equipment is described in paragraph 1.5.

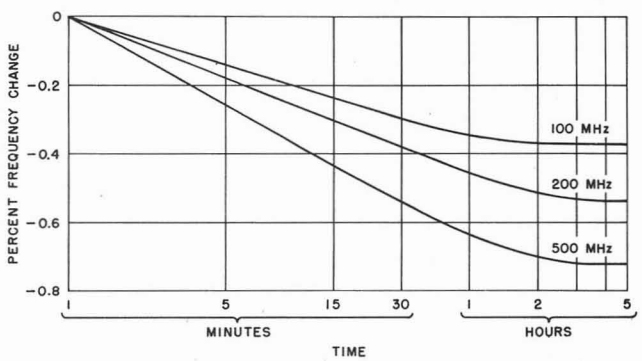


Figure 1-4. Typical warmup frequency-drift characteristics for the 1363 VHF Oscillator with a Type 1267 Regulated Power Supply.

1.3.2 SINUSOIDAL AMPLIFIER MODULATION.

A jack on the front panel of the oscillator permits plate modulation by connection of an audio oscillator, such as the Type 1311. This function is also supplied at another jack on the left-hand side plate. The modulator must supply a dc path and must be able to carry 50 mA dc. A sine wave of 100 V rms amplitude, will produce approximately 30% amplitude modulation.

Incidental frequency modulation is about 50 kHz (peak deviation) with 30% a-m at a carrier frequency of 200 MHz, and increases with frequency.

1.3.3 SQUARE-WAVE AMPLITUDE MODULATION.

High level plate modulation is obtained with the Type 1264 Modulating Power Supply.

1.3.4 PULSE AMPLITUDE MODULATION.

The rise time, starting delay, and jitter of the 1363 VHF Oscillator depend on the frequency and load conditions. Typical values obtained with a Type 1217 Unit Pulse Generator used to drive the Type 1264 Modulating Power Supply are shown in Figure 1-5.

1.4 SWEEP OPERATION.

The 1363 VHF Oscillator is not recommended for sweep operation due to the use of sliding contacts in the tuning mechanism.

1.5 AUXILIARY EQUIPMENT.

The 1363 VHF Oscillator can be used in conjunction with a variety of auxiliary General Radio equipment to build a signal-source system that is suited to specific requirements. Typical systems are shown in Figure 1-6.

Table 1-1 lists the accessories recommended for use with the 1363 VHF Oscillator. The choice of a recommended power supply or modulator should be based on the intended application of the oscillator.

The Type 1264, 1267, and 1269 Power Supplies can be readily attached to the oscillator to form a single unit for bench use or for relay-rack mounting with the listed adaptor plates.

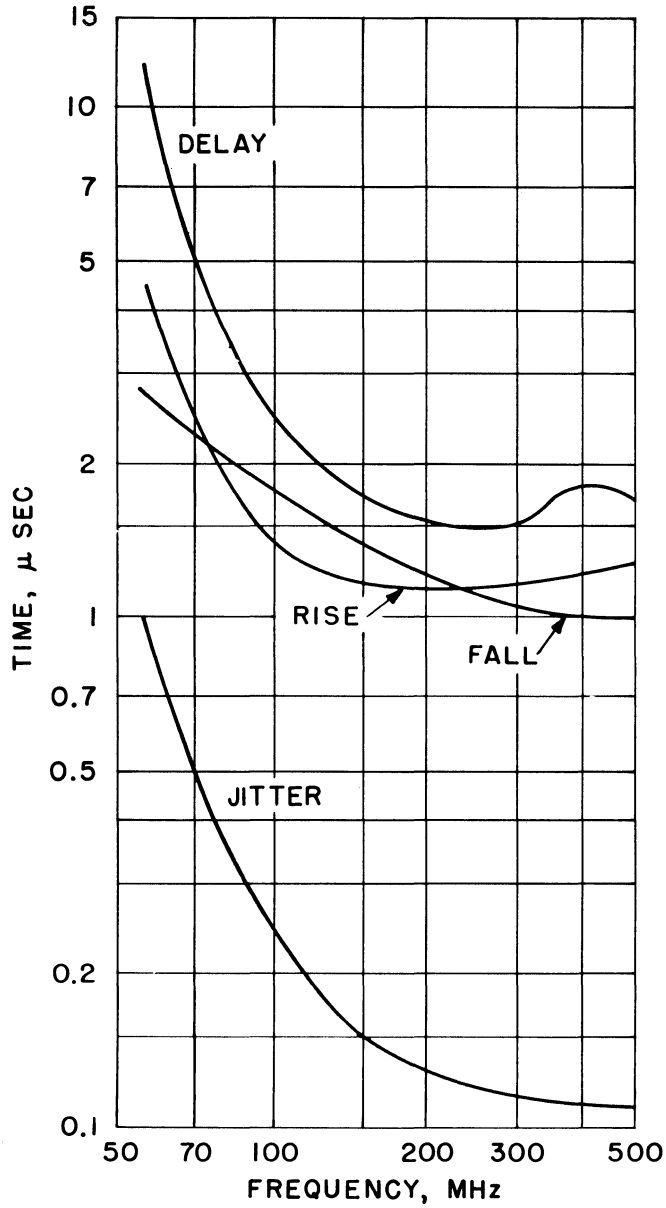


Figure 1-5. Typical rise time, starting delay, and jitter when the oscillator is pulsed by the 1264 Modulating Power Supply, driven by the Type 1217 Unit Pulse Generator.

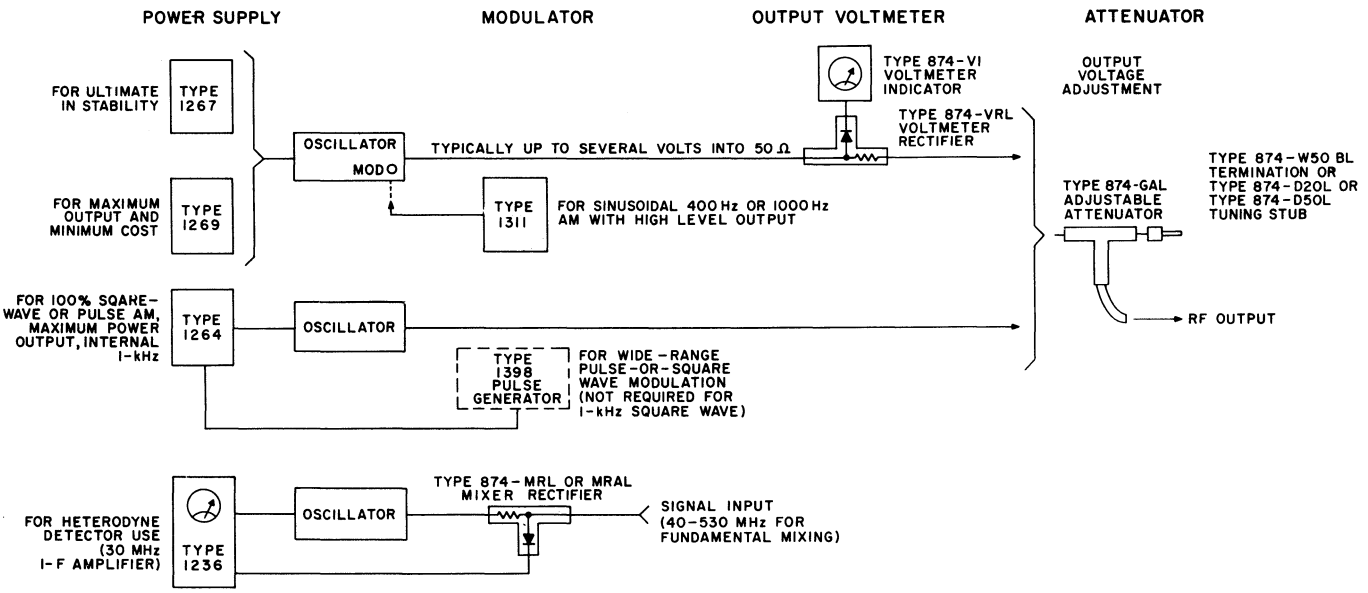


Figure 1-6. Typical signal-source systems built with a 1363 VHF Oscillator and associated equipment.

Table 1-1
ACCESSORIES

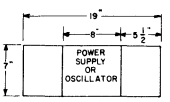
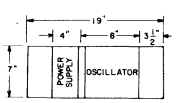
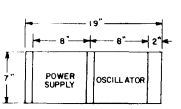
Function	*GR Instrument**	*Remarks*
POWER SUPPLIES		
For best stability, freedom from line-voltage variations, and minimum residual fm.	Type 1267 Power Supply	Regulated dc plate and heater supplies.
For full-power square-wave, pulsed a-m, or cw operation.	Type 1264 Modulating Power Supply	Internal 1-kHz square-wave generator or external pulser (20 Hz to 50 kHz).
For use as local oscillator in heterodyne detector system.	Type 1236 I-F Amplifier	Regulated, adjustable oscillator supply.
For maximum output at minimum cost.	Type 1269 Power Supply	Filtered dc plate supply and ac heater supply, both unregulated.
MODULATORS		
For pulse and square-wave modulation with little incidental fm.	Type 1264 Power Supply	See listing above.
For sinusoidal plate modulation at 400 Hz, 1000 Hz and other audio frequencies.	Type 1311 Audio Oscillator	Provides 30% modulation.
ADAPTOR PLATE SETS		
To rack-mount the oscillator alone.	Type 480-P408 Adaptor Plate Set.	
To rack-mount the oscillator with a Type 1267 or 1269 Power Supply.	Type 481-P412 Adaptor Plate Set	
To rack-mount the oscillator with a Type 1264 Power Supply.	Type 481-P416 Adaptor Plate Set	

Table 1-1 (cont)

Function	*GR Instrument* *	*Remarks*
COAXIAL ELEMENTS		
	See table at the rear of this manual.	
To convert from Type 874 to other coaxial systems.	Type 874-Q Adaptors	Plug and jack adaptors available for 15 series.
To reduce standing-wave ratio on transmission lines.	Type 874-G Attenuators	Available in 3, 6, 10, and 20 db ratings.
To reduce harmonic content of output from oscillator.	Type 874-F Filters	Type 874-F500L recommended.
For use in a heterodyne detector system.	Type 874-MRAL Mixer Rectifier	Particularly useful with Type 1236 I-F Amplifier.
To provide monitored output level.	Type 874-VRL Voltmeter Rectifier	Use with Type 874-VI Voltmeter Indicator.
To provide modulation detector.	Type 874-VQL Voltmeter	Demodulator used with Type 1232 Detector.
DETECTOR		
Provides a sensitive detector and amplifier for testing systems.	Type 1232 Tuned Amplifier and Null Detector	Sensitive tuned or broad-band amplifier with indicating meter.
Amplifier with a 30-MHz i-f frequency.	Type 1236 I-F Amplifier	30-MHz center-frequency amplifier has calibrated attenuator and output meter. Use with Type 874-MRAL Mixer Rectifier.

*Or equivalent.

SECTION **2**

INSTALLATION

2.1 CONNECTION TO POWER SUPPLY.

The 1363 VHF Oscillator is shipped complete with tube installed and is ready for use when connected to a suitable power supply. A cord and connector are supplied with the instrument for direct connection to a General Radio Power supply. Refer to paragraph 1.5 for recommendations.

To connect the oscillator to the power supply, plug the oscillator power cable into the receptacle on the side of the power supply.

NOTE

The dummy socket chained to the left-hand side of the cabinet must be connected to the associated plug, except for use with the Type 1264 Modulating power supply, when the socket on the power supply cable replaces the dummy.

2.2 BENCH MOUNTING.

To bench mount the 1363 VHF Oscillator with a Type 1264, 1267, or 1269 Power Supply, proceed as follows:

a. Remove the exterior cover from both the oscillator and power supply by turning the captive thumbscrews at the rear counterclockwise and sliding the cover toward the rear.

b. Release the two end-frame attaching screws (D) at the left-hand edge (as seen from the front of the oscillator and the power supply (Figure 2-1).

c. Withdraw the screws and remove the spacers (E) between the panels and the end frame.

d. Slide end frame Y toward the rear and off the oscillator.

e. Slide end frame Z toward the rear and off the power supply.

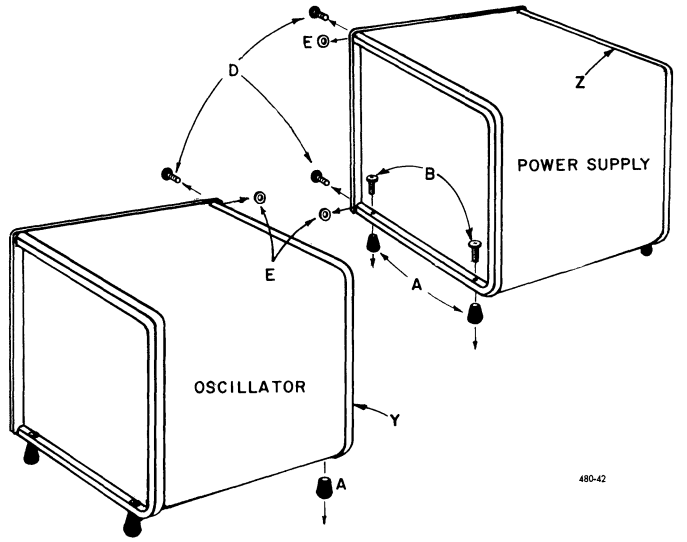


Figure 2-1. Preparation for bench mounting hardware.

f. Slide end frame Y into place where end frame Z was removed.

g. Slide end frame Z into place where end frame Y was removed.

h. Replace and tighten screws (D) and spacers (E) at the left-hand edge of the power supply.

i. Replace the exterior power supply cover.

j. Remove both rubber feet (A) at the right-hand side of the power supply and the left-hand side of the oscillator so that the feet will not interfere with one another (see Figure 2-1). Retain screws (B).

k. Release the two end-frame attaching screws (D) at the right-hand edge of the power supply.

l. Withdraw the screws and remove the spacers (E) between the panel and the end frame.

m. Install one clip (F) in place of each spacer on the power supply, with the plain surface of the clip against the inner surface of the end frame. Align one hole in each clip with the appropriate panel hole (Figure 2-2).

n. Reinstall the panel screws (D) through the clips, into the end frames.

o. Place the power supply on its left-hand side close to the oscillator.

p. Attach the 5-pin plug from the oscillator to the POWER jack on the supply. Figures 2-3 and 2-4 show the oscillator/power supply combination as finally assembled.

NOTE

With the Type 1264 Power Supply, remove the dummy socket from the plug on the left-hand side of the oscillator. Plug the eight-terminal connector of the attached modulation patch cord on the power supply to the connector on the oscillator (Figure 2-4).

q. Hold the oscillator immediately above the supply, oriented as it will be in final assembly. Form the patch cords into flat coils between the side walls of the instruments.

r. Lower the oscillator, so that the instruments slide together, with the exposed ends of the clips (F) on the supply entering the spacer slots behind the oscillator front panel.

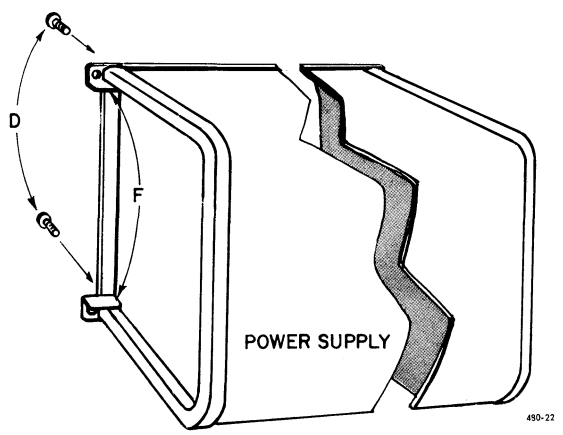


Figure 2-2. Installation of clip in place of washers.

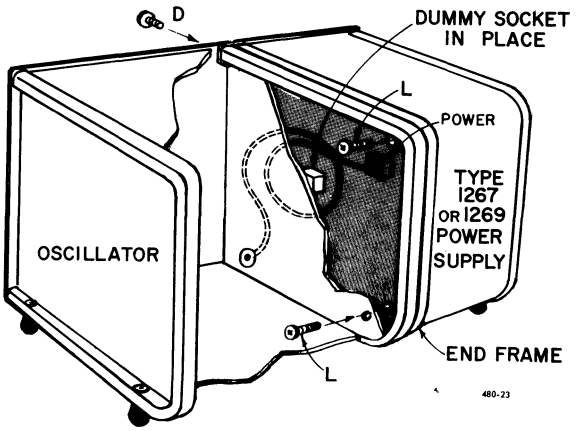


Figure 2-3. Installation of oscillator with Type 1267 or 1269 Power Supply.

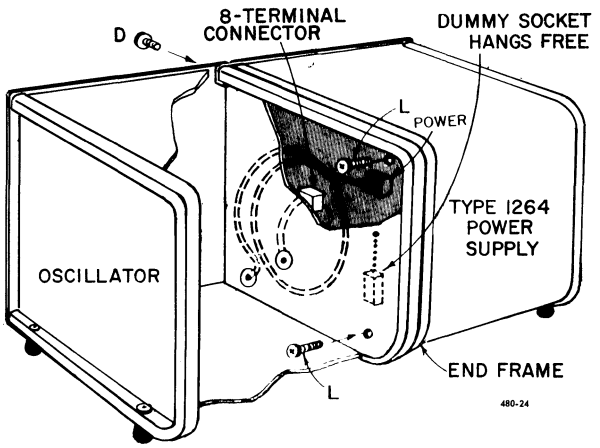


Figure 2-4. Installation of oscillator with Type 1264 Power Supply.

s. Reinstall the front-panel screws (D) in the oscillator, through the slips, into the end frame.

t. Pass the 10-32 screws (L) (supplied) through the rear clearance holes (top and bottom) on the oscillator left-side panel (Figures 2-3 and 2-4).

u. Thread the screws into the matching tapped holes in the joining wall of the supply.

NOTE

If the power supply in the combination does not have tapped holes in the joining wall, a No. 10-32 nut and lockwasher will be necessary for each screw.

v. Tighten all six screws and remount the oscillator cover. Retain the surplus rubber feet and attaching hardware, in case it may be desired to restore the instruments to their original form in the future.

2.3 RACK MOUNTING.

To mount the assembly in a standard 19-inch relay rack, attach the rack-adaptor set as follows:

NOTE

The coaxial patch cord assembly supplied in the set need not be used with the 1363 VHF Oscillator. Refer to paragraph 2.4.

a. Release the two end-frame attaching screws (D) at the left-hand edge of the oscillator.

b. Attach oscillator to power supply as described in paragraph 2.2 starting at step j.

c. Remove the remaining rubber feet from both instruments.

d. Install clips (F) on panels (U) and (V), using screws (G), lockwashers (H), and nuts (I) supplied (Figure 2-5).

e. Assemble the cover plate (R) and mount it over the hole (Figure 2-6). To do this, push the spring into the mounting hole from the front.

f. Remove the outside pairs of front panel screws (D) and spacers (E) from both instruments.

g. Attach panels (U) and (V) as shown in Figure 2-7. Install the clips in place of the spacers (E) and fasten them with the screws (D).

h. Use the 5/8-inch No. 10-32 screws (W) and nylon washers (X) (supplied) to attach the assembly to the relay rack. Patch cords connecting front and rear points (if any) can easily pass through the small notch at the bottom of panel (V).

2.4 RELOCATION OF OUTPUT JACK.

The OUTPUT jack is normally mounted on the front panel but can be moved to the rear as follows:

a. Remove the instrument cover assembly.

b. Push out the snap cover plate from the rear mounting bracket.

c. Remove the four screws that secure the connector to the front panel.

d. Move the connector to the rear, reinsert the screws, and secure in place.

e. Push the snap cover plate into the panel hole.

f. Reinstall the instrument cover assembly.

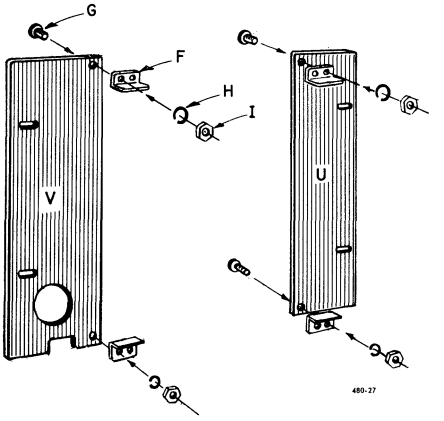


Figure 2-5. Subassembly of rack adaptor plates.

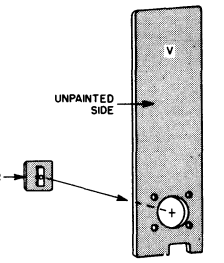


Figure 2-6. Installation of the cover plate.

The operating characteristics of the instrument remain the same regardless of the location of the OUTPUT connector. Relocation may be necessary in a rack system to avoid a long connecting cable from the front of the oscillator to a piece of equipment in the rack with a rear input jack.

2.5 MODULATOR CONNECTION.

WARNING

An open circuited plug in either of the phone jacks will stop the oscillator and cause full power supply voltage to appear at the terminals.

For sinusoidal amplitude modulation the audio modulation voltage should be inserted at the MOD jack on the front panel or at the phone jack on the left side. Full plate current (about 50 mA) must flow through the modulating source. A modulation voltage of about 100 V is required for 30-percent modulation. The input impedance is about 6000 ohms. The Type 1311 Audio Oscillator is an economic audio-frequency modulator for the uhf oscillator.

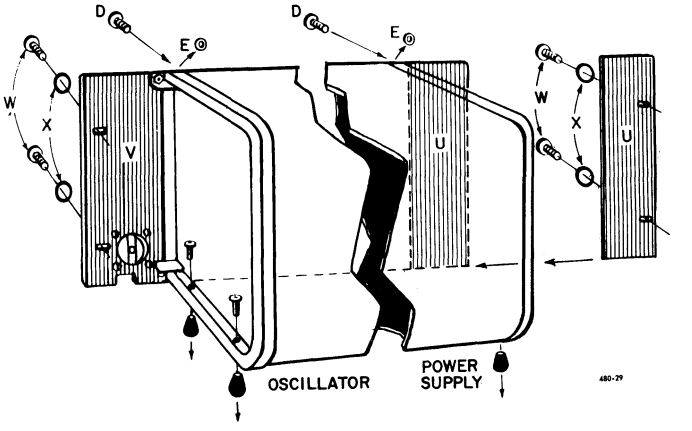


Figure 2-7. Rack installation of oscillator with power supply.

2.6 RF OUTPUT CONNECTIONS.

With the Type 1264, 1267, or 1269 Power Supply, the oscillator rf output can be connected directly to the equipment under test by means of the three-foot coaxial cable supplied.

Attenuator pads can help to reduce standing waves on the cable where the equipment under test does not provide a good termination. Without padding, cable resonance effects can be quite pronounced since the output coupling of the oscillator is not a matched source. A low-pass filter can be beneficial in cases where oscillator harmonics must be kept to very low values.

If cables equipped with other connectors are to be used, a suitable adaptor can be semipermanently attached to the locking GR874 output receptacle of the oscillator. See the table at the rear of this book for a listing of available adaptors.

SECTION 3

OPERATING PROCEDURE

3.1 EQUIPMENT TURN-ON.

The power switch on any of the recommended power supplies controls the application of heater power to the oscillator. On all supplies except the Type 1269 Power Supply, plate voltage is applied by appropriate setting of a standby or function switch. Rf output is obtainable from the oscillator about 30 seconds after power is turned on, an interval required for the heater to come up to temperature.

NOTE

Do not attempt to operate the oscillator with the eight-pin plug on the left-side panel disconnected. For good oscillator frequency stability, allow a one-half-hour warmup period. Refer to paragraph 1.2.3.

3.2 FREQUENCY ADJUSTMENT.

The calibration accuracy of the frequency dial is ±2% but the frequency can be reset by use of the logging scales to a precision of 0.5 MHz at midscale. This precision increases to 0.1 MHz at the low end and falls off to 1.7 MHz at the high end. By interpolation within the 1/8-inch interval between the vernier scale marks, the precision of the setting can be increased by a factor of at least two, to ±0.1% at midscale.

The inner scale on the main frequency-control dial serves as the first digit in a three-digit logging scale, the last two-digits being indicated by the vernier dial. The 0 mark on the vernier corresponds to any one of the lines separating the numbered segments, 0 through 7. Combined, the dials furnish 700 dial settings throughout the range of the oscillator to permit rapid and precisely repeatable frequency settings.

The mesh of the main- and vernier-dial drive gears is maintained by a spring return, which disengages the drive if the vernier knob is lifted. To restore proper mesh, rotate the main dial to an inter-segment mark, lift up gently on the knob, and reset the vernier 0 mark.

3.3 OUTPUT ADJUSTMENT.

Maximum output is obtained with the LEVEL control set fully clockwise. To reduce output, turn the LEVEL control counterclockwise.

Load reaction on the oscillator frequency will be negligible for adjustments of load or attenuator below midscale settings of the output LEVEL control. Adjustment of the output LEVEL control over the full range, with a 50-ohm load connected to the oscillator output, may cause frequency changes up to 0.3%. Padding (refer to paragraph 2.6) may be desirable to reduce standing waves in the rf output cable.

3.4 MODULATION.

The 1363 VHF Oscillator can be modulated by using the 1264 Modulating Power Supply as a power source. Section 2 details the installation of the supply (Figure 2-4) and paragraph 4.5 explains how to observe the output waveform.

SECTION **4**

APPLICATIONS

4.1 GENERAL.

The versatility of the 1363 VHF Oscillator is greatly increased by the large selection of GR874 coaxial elements available from General Radio Company. These elements are part of a broad, integrated line of equipment for measurements of voltage, power, and standing-wave ratio at very-high and ultra-high frequencies. Use of the coaxial elements can adapt the oscillator to various applications in the radio-frequency laboratory in place of more expensive equipment.

Five applications are described in detail in the following paragraphs. Others will be suggested by a study of the complete list of GR874 coaxial elements included in the General Radio catalog. Coaxial elements with locking connectors are preferred over nonlocking ones because of better impedance matching, shielding, mechanical stability, and repeatability. A condensed list of GR874 elements appears in the rear of this manual.

4.2 SIGNAL GENERATOR FOR RECEIVER TESTING.

The 1363 VHF Oscillator, as a well-shielded power source, can be used as a signal generator to test receivers if means are available to measure and attenuate the output. The Type 874-VRL Voltmeter Rectifier, Type 874-VI Voltmeter Indicator, and Type 874-GAL Adjustable Attenuator are suitable for this purpose, and should be connected to the oscillator as shown in Figure 4-1. Also, a Type 874-D50L Adjustable Stub is required at the higher frequencies (from 300 MHz up) to produce a current maximum at that point of the attenuator where the adjustable output loop is coupled. At lower frequencies, a Type 874-WN Short-Circuit Termination can be used for this purpose. A tuning element between the oscillator and the attenuator is required to increase the output to a value that can be read on the voltmeter. At higher frequencies coverage is obtained by a Type 874-LAL Adjustable Line. At lower frequencies additional lengths of line must be used.

Current from the oscillator is fed through the attenuator into the short circuit or the stub. The attenuator is calibrated in decibels. At minimum attenuation the attenuator output is measured by a crystal diode in the voltmeter rectifier and read on the meter of the voltmeter indicator. Means are provided to standardize the crystal indicator. A 50-Ω resistor after the crystal determines the output impedance.

With the above-described arrangement, the maximum available output is several tenths of a volt. The attenuator calibration covers 120 dB but shielding of the oscillator and of other components is not sufficient for accurate measurements in the microvolt region.

4.3 LOCAL OSCILLATOR IN A FREQUENCY CONVERTER.

Connected to a Type 874-MRAL Mixer Rectifier, the 1363 VHF Oscillator can provide the local oscillator signal in a heterodyne converter to adapt the 1236

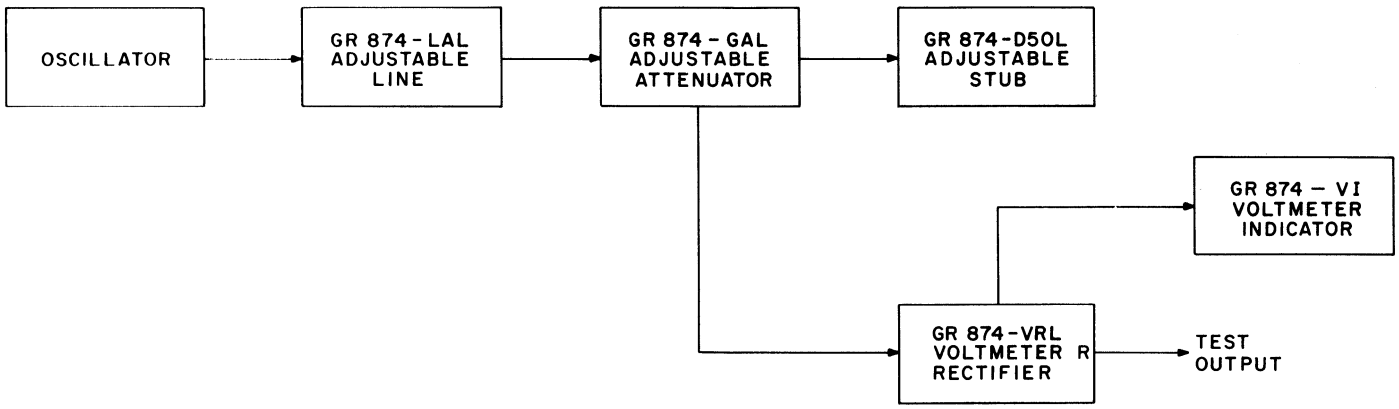


Figure 4-1. 1363 VHF Oscillator set up as a standard-signal generator.

I-F amplifier for use as a sensitive detector for vhf signals (Figure 4-2). Without additional tuning, the conversion loss is about 6 dB at an intermediate frequency of 30 MHz. The Type 1236 I-F amplifier has a built-in precision attenuator, a panel meter, which normally indicates signal level, and a separate built-in power supply for operating the oscillator. The panel meter, besides indicating signal level, can also be used to measure the mixer current (and hence, local-oscillator level).

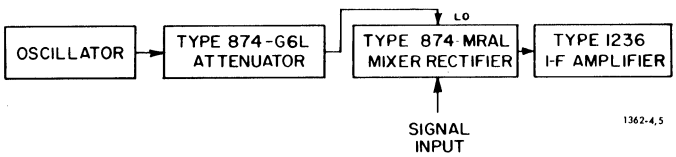


Figure 4-2. Setup of a superheterodyne receiver using the 1363 VHF Oscillator as the local oscillator.

4.4 ADMITTANCE MEASUREMENTS (ONE PORT).

For the measurement of the admittance or impedance of one-port networks, one 1363 VHF Oscillator can be used as the primary source of cw rf power, and another as the local oscillator in the associated heterodyne detector. The Type 1602 UHF Admittance Meter is the central instrument in the setup depicted in Figure 4-3. This is a null instrument in the GR874 coaxial line size, useful for rapid, direct-reading measurements of complex X or Y on one-port rf devices at frequencies up to 1500 MHz. The type 1609 Precision UHF Bridge is a similar instrument in the GR900 connector series.

The GR 1241-9701 Heterodyne Detector system contains much of the equipment associated with Figure 4-3. Besides the oscillator and the 1241-9701 Detector, a GR Type 1267 Power Supply, GR 874-G10L Attenuator, and a GR 874-G6L Attenuator (or equivalents) are needed to complete the testing system.

For impedance and VSWR measurements with slotted lines (such as the GR Type 874-LBB Slotted Line or the GR Type 900-LB Precision Slotted Line), the 1363 VHF Oscillator with the GR Type 1264 Modulating Power Supply is an excellent rf source. Figure 4-4 shows the setup; square-wave, 1-kHz modulation is used. Detection of the rf signal takes place in the probe carriage and can be indicated by the GR 1234 Standing-Wave Meter.

4.5 OBSERVATION OF MODULATION.

The envelope of the amplitude-modulated rf signal can be displayed on the oscilloscope with the setup shown in Figure 4-5. Since the detector provides a negative signal, the use of an oscilloscope with polarity inversion is recommended, so that the display will show increasing voltage upward.

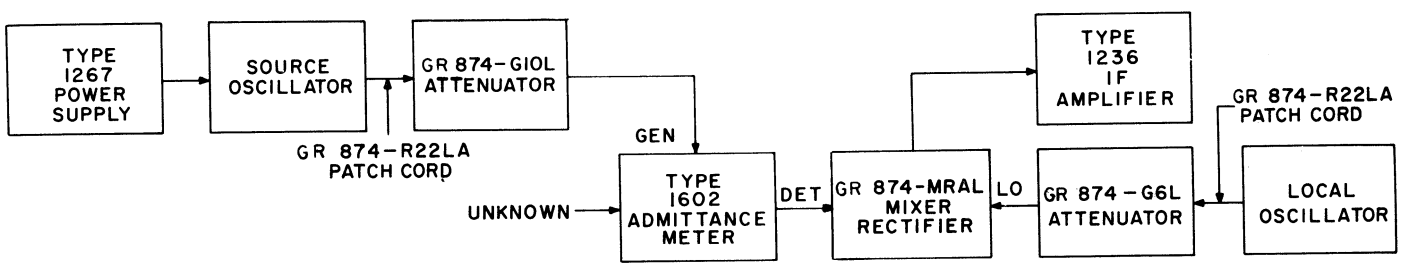


Figure 4-3. Admittance measurement setup utilizing the 1363 VHF Oscillator with the Type 1602 UHF Admittance Meter.

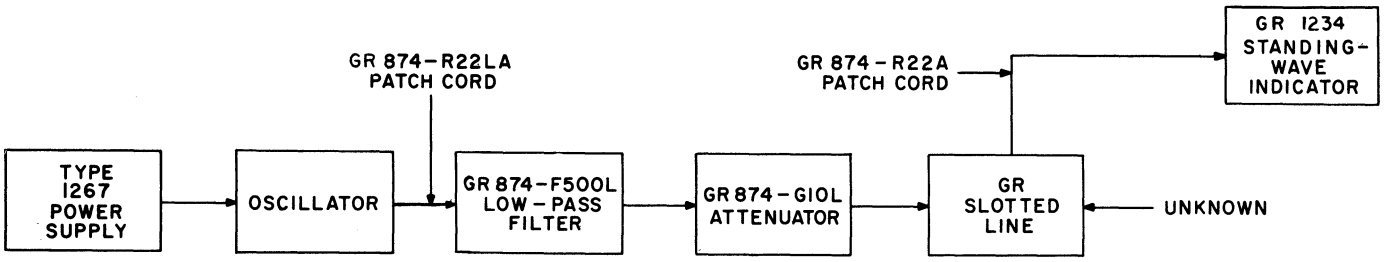


Figure 4-4. VSWR measurements with the 1363 VHF oscillator and a GR slotted line.

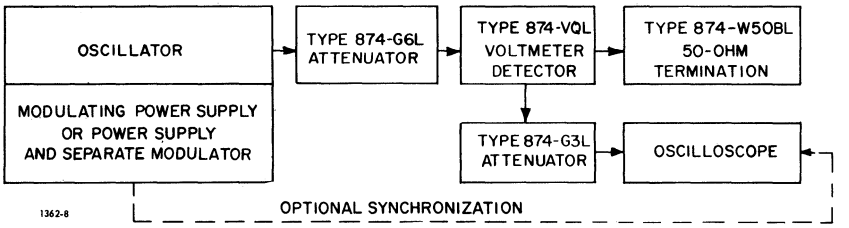


Figure 4-5. Setup for observation of modulation envelope.

SECTION 5

PRINCIPLES OF OPERATION

5.1 GENERAL.

The 1363 VHF Oscillator is a vacuum-tube oscillator intended for use as a general-purpose laboratory rf source. Its frequency range, which extends from 56 to 500 MHz, is tuned with a single control, without band switching. Frequency setting is indicated on a large, easy-to-read, engraved dial, individually calibrated to give ±2% accuracy.

The oscillator is capable of delivering rf power in excess of 90 mW into 50Ω over its frequency range. Power-supply, modulation, and output-calibration circuitry have been omitted from the instrument, in order to leave the user the greatest possible latitude of choice to arrange the oscillator in a system that meets his particular needs. The complete schematic diagram is shown in Figure 6-6.

5.2 CIRCUITRY.

5.2.1 TUBE CIRCUIT.

The oscillator uses the General Electric Type 2C43 metal-and-ceramic, planar, triode tube. The tube is designed to operate with 6.3 V and 0.9 A on the heater and a maximum plate voltage of 500 V.

The tube is used in a Colpitts circuit (Figure 5-1) with the plate and grid connected to the tuned circuit LC101. The cathode is grounded for rf. The feedback is determined by the inter-electrode capacitance of the tube, and capacitance associated with the tuning element structure.

The biasing used is a combination of cathode and grid leak, resulting in a high output and good leveling of the output versus frequency.

At low oscillation levels, the grid-leak resistance is essentially that of the Zener diode CR2. This low resistance does not allow the coupling capacitor to retain a dc voltage and thus no grid leak bias. The 4.7-V Zener, and the cathode bias developed across R_1, places the grid slightly positive, resulting in maximum rf grid current and thus maximum power output.

At higher oscillator levels, the resistance in the grid-leak circuit is that of R_3. Grid current flowing through R_3 drops the voltage on CR1 and the Zener diode, which are in turn cut off. The greater

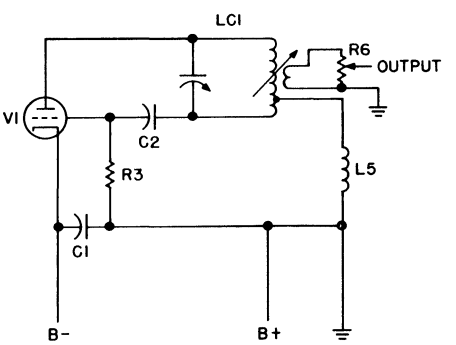


Figure 5-1. Elementary schematic diagram of the 1363 VHF Oscillator.

grid leak bias now developed keeps the grid current, and thus the output power, within safe limits. For pulse modulation, the pulses are applied to the dc cathode connection through rf filter C_9, L_4, and C_6, and through cathode bias resistor R_1.

5.2.2 TUNING.

The 1363 VHF Oscillator uses a "contact-type" circuit, which combines a variable air capacitor and a variable inductor in a single unit. Inductance varies from 0.06 μH at the low-frequency end to 0.01 μH at the high-frequency end, and capacitance varies from 130 pF to 9 pF. Rotor and stator plates are shaped so that frequency varies logarithmically with dial rotation. Special damping elements are used to overcome undesired resonances in the inactive portion of the tank circuit (C_3, R_4, and R_5).

5.2.3 OUTPUT COUPLING.

Radio-frequency power is coupled from the oscillator tank circuit by means of a loop located near the oscillator tube. The loop is connected by means of a 50-Ω coaxial cable to a special potentiometer level control located on the instrument panel, and from that point to the output connector by means of a second 50-Ω coaxial cable.

SECTION **6**

SERVICE AND MAINTENANCE

6.1 WARRANTY.

We warrant that each new instrument manufactured and sold by us is free from defects in material and workmanship, and that, properly used, it will perform in full accordance with applicable specifications for a period of two years after original shipment. Any instrument or component that is found within the two-year period not to meet these standards after examination by our factory, District Office, or authorized repair agency personnel will be repaired or, at our option, replaced without charge, except for tubes or batteries that have given normal service.

6.2 SERVICE.

The two-year warranty stated above attests the quality of materials and workmanship in our products. When difficulties do occur, our service engineers will assist in any work possible. If the difficulty cannot be eliminated by use of the following service instructions, please write or phone our Service Department (see rear cover), giving full information of the trouble and of steps taken to remedy it. Be sure to mention the type and serial numbers of the instrument.

Before returning an instrument to General Radio for service, please write to our Service Department or nearest District Office, requesting a "Returned Material Tag." Use of this tag will ensure proper handling and identification. For instruments not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay.

6.3 MINIMUM PERFORMANCE STANDARDS.

6.3.1 GENERAL.

The following paragraphs contain necessary information on means to determine rapidly that the oscillator is performing within specifications. The procedures given will be useful to instrument-standards laboratories and equivalently equipped service facilities, to perform routine calibration checks on properly functioning instruments, and to determine that a repaired instrument has been restored to proper operation. The procedures that follow immediately apply to bench checks that use only front-panel controls and externally available test points (i.e., instrument disassembly is neither required nor recommended).

A list of recommended test equipment appears in Table 6-1.

6.3.2 OPERATING CHECK.

To check the dc operating conditions, plug a dc milliameter into either MOD jack (J101 or J102) and measure the plate current of V101. Oscillation is indicated by a gradual variation of the plate current as the oscillator is tuned over its frequency range. Maximum current normally occurs near 200 MHz and should be 45 to 50 mA for CW operation with a 300-V power supply.

Table 6-1

TEST EQUIPMENT

Name	*Function*	*Recommended Equipment**
Modulating Power Supply	Power and modulate oscillator for frequency, output, and modulation measurements.	GR 1264
Frequency Measuring Assembly, dc to 500 MHz	Furnish digital indication of signal-source output frequency.	GR 1191-Z (500 MHz)
Voltohmeter, 20 kΩ/V, minimum	Measure voltage and resistance values.	Simpson Model 260
Microwave power meter, ±3% accuracy	Measure rf power output of oscillator.	HP Model 431C
Patch Cord	To interconnect system components.	GR 874-R22LA
Patch Cord	To connect GR 874-VI into a system.	GR 874-R34
Termination, 50-ohm	Terminate rf system for noise and modulated-output measurements.	GR 874-W50BL
Power Divider	Means of balanced coaxial interconnection.	GR 874-TPDL
Voltmeter Indicator	Measures output voltage of oscillator.	GR 874-VI
Coaxial Crystal Detector	Used to generate harmonics of reference signal and mix these with oscillator output. Also used to detect the rf envelope in modulation.	GR 874-VQL
Coaxial Attenuator Pads, 10 dB and 20 dB	Reduce oscillator output to protect sensitive measuring instruments.	GR 874-G10L or -G20L

*Or equivalent.

6.3.3 FREQUENCY CHECK.

The frequency can be checked readily by means of a Type 1191-Z 500-MHz counter. Refer to Figure 6-1 for the test setup and proceed as follows:

a. Connect the 1363 Oscillator to the power supply, apply power and allow for a one-half hour warmup in the CW mode.

b. Apply power to the counter and allow for a one-half hour warmup.

c. Tune the 1363 Oscillator to the desired calibration point and observe the frequency indication on the 1191-Z Counter assembly.

d. If the oscillator frequency calibration is outside specification, refer to paragraph 6.7 for corrective action.

6.3.4 POWER OUTPUT CHECK.

To check the available rf power output from the oscillator, use any suitable rf power meter. A GR 874-G20L, 20-dB pad, should be used between the oscillator and the bolometer element of the power meter as otherwise the high output of the 1363 oscillator can damage the sensitive bolometer element. Alternatively, a GR Type 874-VI Voltmeter Indicator can be used with a GR Type 874-VQL Voltmeter Detector. The detector will produce a dc current to drive the indicator, which can be calibrated in volts. The 874-VQL Detector introduces no appreciable discontinuity when inserted in a 50-Ω coaxial line and should be terminated with a 50-Ω load, such as the Type 874-W50BL 50-Ω Termination.

To make a measurement, set up the equipment as in Figure 6-2. The use of a GR Type 874-G10L Attenuator limits the power level to prevent damage to the diode in the detector. The oscillator output voltage is measured by suitable adjustments of sensitivity and calibration controls on the voltmeter indicator. That value in volts must be squared, multiplied by ten for each 10-dB attenuator pad inserted in the system, and divided by the termination resistance in ohms, to obtain the output power in watts. (Example: Given a measurement of 1.4 V, a 10-dB pad in the system, and a 50-Ω load. Solution: $1.4^2 \times 10/50 = 0.4$ W = 400 mW.) Refer to

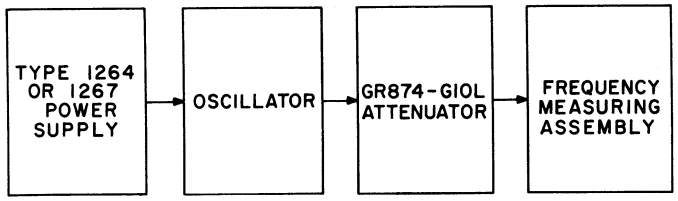


Figure 6-1. Setup to check frequency calibration of 1363 VHF Oscillator.

Figure 1-3 for guaranteed and typical performance with various General Radio power supplies.

If the output power is very low, refer to the trouble analysis, paragraph 6.4. On the other hand if the output power is slightly below specification, it may be corrected by adjustment of R10. Refer to paragraph 6.6, step e.

6.4 TROUBLE ANALYSIS.

6.4.1 GENERAL.

If the 1363 Oscillator performs outside of specification, as determined by use of paragraph 6.3, the procedures below can be used to isolate the trouble to a defective assembly or part. Suggestions for trouble analysis are given in Tables 6-2 and 6-3. The former is based on operating parameters, the latter on cold resistances. (Refer to Figures 6-3 and 6-4 and to the schematic diagram, Figure 6-6, at the end of the book.) Instructions for adjustment and repair are given in subsequent paragraphs of Section 6.

WARNING

When the cover(s) of the 1363 are removed, some connections have as much as 300 V dc on them.

6.4.2 DETAILS OF TROUBLE ANALYSIS.

If the oscillator is weak, and the analysis suggested in Tables 6-2 and 6-3 show no defects except low plate current, the tube has a defective (worn-out) cathode. Proceed to paragraph 6.6.

If oscillation ceases and restarts very abruptly as the tuning dial is rotated, inspect the tuning capacity visually for possible short circuits. If there is a short-circuit caused by a loose piece of material between rotor and stator, its behavior may be erratic and difficult to analyze. If a short-circuit is the result of bent plates, the malfunction will be repeatable and the instrument should be serviced as described in paragraph 6.2.

NOTE

If measurements are attempted on this oscillator with power on the rf shield removed, one may except the instrument in good repair to oscillate over most of its tuning range but to deviate appreciably from specified frequency calibration and output power level.

When the oscillator is being serviced and repaired, a visual inspection is appropriate. All soldered joints should be secure, mechanical fasteners tight and dial-drive mechanism operating smoothly without backlash. For lubrication, refer to paragraph 6.8.

6.5 REMOVAL OF COVERS.

6.5.1 GENERAL.

The 1363 Oscillator has two covers. The exterior cover can be removed at any time without difficulty; however, the rf shield cover shouldn't be removed unless it is absolutely necessary for a trouble-analysis procedure.

6.5.2 REMOVAL OF EXTERIOR COVER.

To remove the exterior cover, loosen the captive thumb screws that hold the exterior cover on by rotating them ccw (as seen from the rear). Slide the cover off the rear of the instrument.

6.5.3 REMOVAL OF RF SHIELD COVER.

To remove the rf shield cover proceed as follows:

a. Unscrew the two captive No. 10-32 Phillips-head screws on opposite sides of the shield cover. Unscrew several turns at a time, alternating between screws.

b. Slide the rf shield cover off. Figure 6-4 identifies the major interior components.

CAUTION

The positions of parts in the rf section are critical. Do not move any part unless it is defective. When a part must be replaced, install the new one in the same position and orientation, with the same lengths of leads and lead dress.

6.6 TUBE REPLACEMENT.

When it is necessary to replace the Type 2C43 tube, proceed as follows:

CAUTION

Turn all power off.

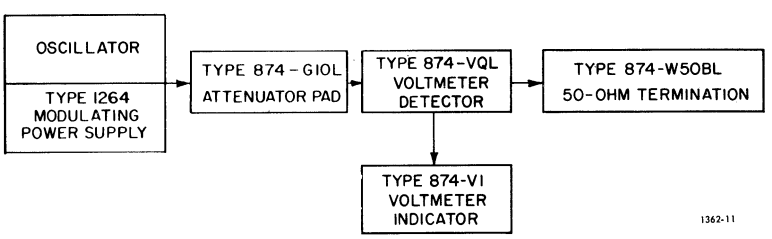


Figure 6-2. Setup to check output level of 1363 VHF Oscillator.

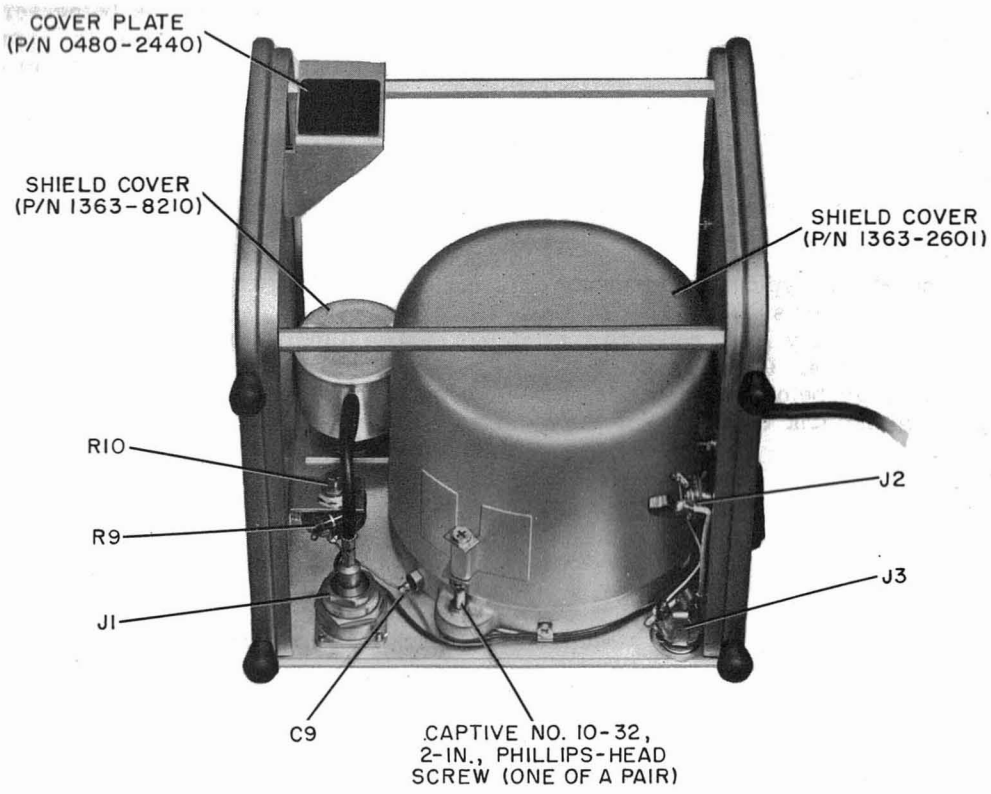


Figure 6-3. Interior bottom view with shield covers installed.

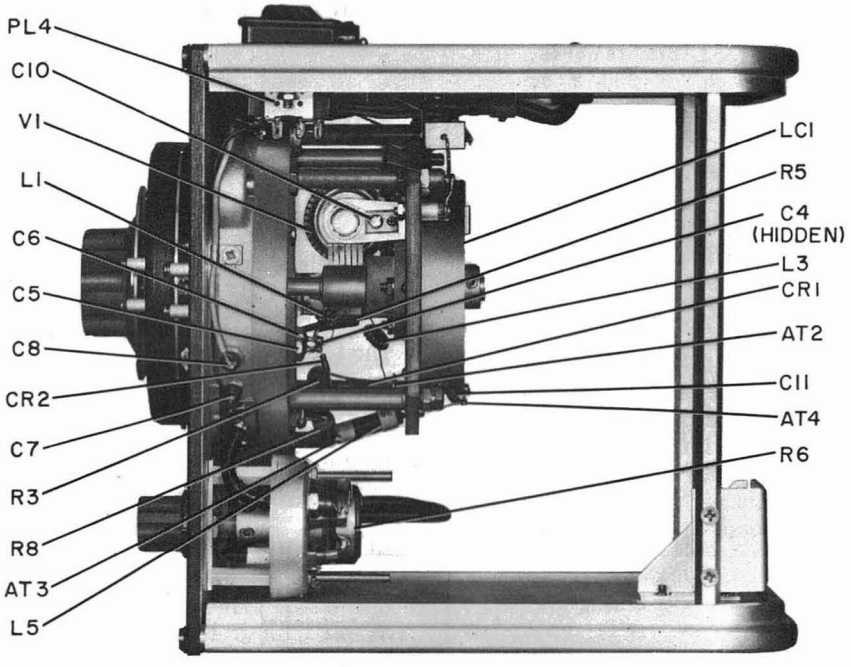


Figure 6-4. Interior top view with shield covers removed.

Table 6-2

CURRENT AND VOLTAGE ANALYSIS*

Step	Measurement (by use of)	Test Points	Indication	Comments
a	Plate current (100-mA dc meter and phone plug)	MODulation jack on panel (J3, Figure 6-3)	0 mA	Check power supply and connections. Check voltages.
			35 to 50 mA, varies with tuning	Normal.
			12 mA steady	Defective tube V1.
			37 mA fixed when tuning dial is rotated	No oscillation. (Suspect LC1 shorted.)
			>55 mA	Short circuit from plate to cathode. (Check resistances.)
b	Cathode voltage (300-V dc meter)	Ground or sub-panel (+); blue wire at C9 or arm of R10 (-) (Figure 6-3)	0 V	Lack of voltage from power supply or grounded cathode circuit.
			<75 V	Suspect V1. (Set up both steps a and b, disconnect PL4.)
			250 to 300 V dc, varies with tuning	Normal.
c	Heater voltage (10-V dc or ac meter depending on power supply)	C7; C8 (Figure 6-4) NOTE For dc, + to C7, - to C8.	0 V	Lack of voltage from power supply. (Check connections, resistances.)
			6.5 V	Normal. (If 300 V in step b go to Table 6-3, step 2.)

*Power supply: Type 1267, or 1264 set to CW with amplitude control clockwise.
RF shield cover in place.

a. Remove the covers as described in paragraph 6.5.

b. Remove the tube socket assembly and withdraw the tube from the socket. (Grasp the pin end of the tube and pull.)

c. Plug replacement tube into socket and plug into oscillator, using care not to snag the grid fingers on the smaller (plate) flange of the tube. Be sure that the tube is fully seated, and that the grid fingers are making contact.

d. Replace the rf shield cover; tighten the two clamping screws alternately to insure that the cover is seated squarely.

e. Connect a 0-100 mA VOM at the MOD jack, and apply power using a 1264 or 1267 Power Supply. (If using a 1264, set the function selector to CW.) With a 50-Ω load connector and the output-LEVEL control fully cw, tune to the frequency at which plate current is maximum, usually near 200 MHz, and adjust R10 with a screwdriver (refer to Figure 6-3) for a 50-mA plate current. The current can be set lower for improved tube life at the expense of power output (paragraph 6.9).

f. Restore frequency calibration if necessary, in accordance with paragraph 6.7.

6.7 FREQUENCY CALIBRATION.

Replacement of the oscillator tube can affect frequency calibration. This can be checked by the method described in paragraph 6.3.3, during which process the shield cover must be in place with both screws tight, and the output LEVEL control set fully cw. If necessary, remove the shield cover and set the trimmer capacitor C10 by rotation to make the output signal frequency agree with the dial calibration at 500 MHz. To free C10, temporarily loosen the screw slightly.

Table 6-3

RESISTANCE ANALYSIS*

CAUTION - Turn all power off and remove PL5 from power supply.

Step	*Measurement (ohmmeter)*	*Test Points*	*Indication*	*Comments*
a	Heater	Pins 13 and 14 of PL5 (Figure 6-6)	1.3Ω	Normal
			∞Ω	Open circuit (go to step b)
b		S01; S02 (Figure 6-6)	∞Ω	Open heater in tube (See paragraph 6.6)
c	Cathode string	PL5, pin 16; blue wire at R10 arm, C9, or C6 (Figures 6-3, 6-6)	0-700Ω	Normal
d	Modulation circuit	PL5, pin 15; ground (Figure 6-6)	0Ω	Normal
			∞Ω	Fault in J2, J3, or S04
e	Cathode to grid	AT2; C6 (Figure 6-4)	0Ω	Suspect tube (V1)
			∞Ω	Normal
f	Grid to plate	AT2; AT4 (Figure 6-4)	0Ω	Tube V1 shorted
			25 kΩ	Normal
g	Cathode to plate	C6; AT4 (Figure 6-4)	0Ω	Short in V1 or C6
			∞Ω	Normal
h	L5	AT3; AT4 (Figure 6-4)	0Ω	Normal
i	Heater to cathode	C7; C9 (Figures 6-3, 6-4)	1 mΩ	Normal
			∞Ω	Check S04
			Low resistance	Tube V1 shorted

*Conditions: PL5 (5-pin plug) floating, S04-PL4 (8-pin plug and socket) connected, no phone plugs.

6.8 LUBRICATION.

Proper lubrication consists of occasional application of a light coat of silver-bearing grease to the contact surface on the inductance ring of LCI.

6.9 ADJUSTMENT FOR MAXIMUM TUBE LIFE.

Longest tube life will be obtained by the use of regulated plate and heater voltages as supplied by the 1264 or 1267 power supply. When the 1269 (unregulated) power supply is used, tube life can be prolonged at the expense of maximum power output by read-adjusting R10 to reduce plate current as far as possible, normally to about 40 mA. (Refer to paragraph 6.6, step e.)

FEDERAL MANUFACTURERS CODE

From Federal Supply Code for Manufacturers Cataloging Handbooks H4-1 (Name to Code) and H4-2 (Code to Name) as supplemented through June, 1967.

Code	Manufacturers Name and Address
00192	Jones Mfg. Co., Chicago, Illinois
00194	Walsco Electronics Corp., Los Angeles, Calif.
00656	Aerovox Corp., New Bedford, Mass.
01009	Alden Products Co., Brockton, Mass.
01121	Allen-Bradley, Co., Milwaukee, Wisc.
01295	Texas Instruments, Inc., Dallas, Texas
02114	Ferroxcube Corp. of America, Saugerties, N. Y. 12477
02606	Fenwal Lab. Inc., Morton Grove, Ill.
02660	Amphenol Electronics Corp., Broadview, Ill.
02768	Fastex Division of Ill. Tool Works, Des Plaines, Ill. 60016
03508	G. E. Semiconductor Products Dept., Syracuse, N. Y. 13201
03636	Grayburne, Yonkers, N. Y. 10701
03888	Pyrofilm Resistor Co., Cedar Knolls, N. J.
03911	Clairex Corp., New York, N. Y. 10001
04009	Arrow, Hart and Hegeman Electric Co., Hartford, Conn. 06106
04713	Motorola Semi-Conduct Product, Phoenix, Ariz. 85008
05170	Engineered Electronics Co., Inc., Santa Ana, Calif. 92702
05624	Barber-Colman Co., Rockford, Ill. 61101
05820	Wakefield Eng., Inc., Wakefield, Mass. 01880
07127	Eagle Signal Div. of E. W. Bliss Co., Baraboo, Wisc.
07261	Avnet Corp., Culver City, Calif. 90230
07263	Fairchild Camera and Instrument Corp., Mountain View, Calif.
07387	Birtcher Corp., No. Los Angeles, Calif.
07595	American Semiconductor Corp., Arlington Heights, Ill. 60004
07828	Bodine Corp., Bridgeport, Conn. 06605
07829	Bodine Electric Co., Chicago, Ill. 60618
07910	Continental Device Corp., Hawthorne, Calif.
07983	State Labs Inc., N. Y., N. Y. 10003
07999	Amphenol Corp., Borg Inst. Div., Delavan, Wisc. 53115
08730	Vemaline Prod. Co., Franklin Lakes, N. J.
09213	General Electric Semiconductor, Buffalo, N. Y.
09823	Burgess Battery Co., Freeport, Ill.
09922	Burndy Corp., Norwalk, Conn. 06852
11599	Chandler Evans Corp., W. Hartford, Conn.
12498	Teledyn Inc., Crystalonics Div., Cambridge, Mass. 02140
12672	RCA Commercial Receiving Tube and Semi-conductor Div., Woodridge, N.J.
12697	Clarostat Mfg. Co. Inc., Dover, N. H. 03820
12954	Dickson Electronics Corp., Scottsdale, Ariz.
13327	Solitrone Devices, Tappan, N. Y. 10983
14433	ITT Semiconductors, W. Palm Beach, Florida
14655	Cornell Dubilier Electric Co., Newark N. J.
14674	Corning Glass Works, Corning, N. Y.
14936	General Instrument Corp., Hicksville, N. Y.
15238	ITT, Semiconductor Div. of Int. T. and T, Lawrence, Mass.
15605	Cutler-Hammer Inc., Milwaukee, Wisc. 53233
16037	Spruce Pine Mica Co., Spruce Pine, N. C.
19701	Electra Mfg. Co., Independence, Kansas 67301
21335	Fafnir Bearing Co., New Briton, Conn.
24446	G. E. Schenectady, N. Y. 12305
24454	G. E., Electronic Comp., Syracuse, N. Y.
24455	G. E. (Lamp Div), Nela Park, Cleveland, Ohio
24655	General Radio Co., W. Concord, Mass 01781
26806	American Zettler Inc., Costa Mesa, Calif.
28520	Hayman Mfg. Co., Kenilworth, N. J.
28959	Hoffman Electronics Corp., El Monte, Calif.
30874	International Business Machines, Armonk, N.Y.
32001	Jensen Mfg. Co., Chicago, Ill. 60638
35929	Constanta Co. of Canada Limited, Montreal 19, Quebec
37942	P. R. Mallory and Co. Inc., Indianapolis, Ind.
38443	Marlin-Rockwell Corp., Jamestown, N. Y.
40931	Honeywell Inc., Minneapolis, Minn. 55408
42190	Muter Co., Chicago, Ill. 60638
42498	National Co. Inc., Melrose, Mass. 02176
43991	Norma-Hoffman Bearings Corp., Stanford, Conn. 06904
49671	RCA, New York, N. Y.
49956	Raytheon Mfg. Co., Waltham, Mass. 02154
53021	Sangamo Electric Co., Springfield, Ill. 62705
54294	Shallcross Mfg. Co., Selma, N. C.
54715	Shure Brothers, Inc., Evanston, Ill.
56289	Sprague Electric Co., N. Adams, Mass.
59730	Thomas and Betts Co., Elizabeth, N. J. 07207
59875	TRW Inc. (Accessories Div), Cleveland, Ohio
60399	Torrington Mfg. Co., Torrington, Conn.
61637	Union Carbide Corp., New York, N. Y. 10017
61864	United-Carr Fastener Corp., Boston, Mass.
63060	Victoreen Instrument Co., Inc., Cleveland, Ohio
63743	Ward Leonard Electric Co., Mt. Vernon, N. Y.
65083	Westinghouse (Lamp Div), Bloomfield, N. J.
65092	Weston Instruments, Weston-Newark, Newark, N. J.
70485	Atlantic-India Rubber Works, Inc., Chicago, Ill. 60607
70563	Amperite Co., Union City, N. J. 07087
70903	Belden Mfg. Co., Chicago, Ill. 60644
71126	Bronson, Homer D., Co., Beacon Falls, Conn.
71294	Canfield, H. O. Co., Clifton Forge, Va. 24422
71400	Bussman Mfg. Div. of McGraw Edison Co., St. Louis, Mo.
71590	Centralab, Inc., Milwaukee, Wisc. 53212
71666	Continental Carbon Co., Inc., New York, N. Y.
71707	Coto Coil Co. Inc., Providence, R. I.
71744	Chicago Miniature Lamp Works, Chicago, Ill.
71785	Cinch Mfg. Co. and Howard B. Jones Div., Chicago, Ill. 60624
71823	Darnell Corp., Ltd., Downey, Calif. 90241
72136	Electro Motive Mfg. Co., Willmington, Conn.
72259	Nytronics Inc., Berkeley Heights, N. J. 07922
72619	Dialight Co., Brooklyn, N. Y. 11237
72699	General Instrument Corp., Capacitor Div., Newark, N. J. 07104
72765	Drake Mfg. Co., Chicago, Ill. 60656
72825	Hugh H. Eby, Inc., Philadelphia, Penn. 19144
72962	Elastic Stop Nut Corp., Union, N. J. 07083
72982	Erie Technological Products Inc., Erie, Penn.
73445	Amperex Electronics Co., Hicksville, N. Y.
73559	Carling Electric Co., W. Hartford, Conn.
73690	Elco Resistor Co., New York, N. Y.
73899	J. F. D. Electronics Corp., Brooklyn, N. Y.
74193	Heinemann Electric Co., Trenton, N. J.
74861	Industrial Condenser Corp., Chicago, Ill.
74970	E. F. Johnson Co., Waseca, Minn. 56093
75042	IRC Inc., Philadelphia, Penn. 19108
75382	Kulka Electric Corp., Mt. Vernon, N. Y.
75608	Linden and Co., Providence, R. I.
75915	Littelfuse, Inc., Des Plaines, Ill. 60016
76005	Lord Mfg. Co., Erie, Penn. 16512
76487	James Millen Mfg. Co., Malden, Mass. 02148
76545	Mueller Electric Co., Cleveland, Ohio 44114
76684	National Tube Co., Pittsburg, Penn.
76854	Oak Mfg. Co., Crystal Lake, Ill.
77147	Patton MacGuyer Co., Providence, R. I.
77166	Pass-Seymour, Syracuse, N. Y.
77263	Pierce Roberts Rubber Co., Trenton, N. J.
77339	Positive Lockwasher Co., Newark , N. J.
77542	Ray-O-Vac Co., Madison, Wisc.
77630	TRW, Electronic Component Div., Camden, N. J. 08103
77638	General Instruments Corp., Brooklyn, N. Y.
78189	Shakeproof Div. of Ill. Tool Works, Elgin, Ill. 60120
78277	Sigma Instruments Inc., S. Braintree, Mass.
78488	Stackpole Carbon Co., St. Marys, Penn.
78553	Tinnerman Products, Inc., Cleveland, Ohio
79089	RCA, Commercial Receiving Tube and Semi-conductor Div., Harrison, N. J.
79725	Wiremold Co., Hartford, Conn. 06110
79963	Zierick Mfg. Co., New Rochelle, N. Y.
80030	Prestole Fastener Div. Bishop and Babcock Corp., Toledo, Ohio
80048	Vickers Inc. Electric Prod. Div., St. Louis, Mo.
80131	Electronic Industries Assoc., Washington, D.C.
80211	Motorola Inc., Franklin Park, Ill. 60131
80258	Standard Oil Co., Lafeyette, Ind.
80294	Bourns Inc., Riverside, Calif. 92506
80431	Air Filter Corp., Milwaukee, Wisc. 53218
80583	Hammarlund Co. Inc., New York, N. Y.
80740	Beckman Instruments, Inc., Fullerton, Calif.
81073	Grayhill Inc., LaGrange, Ill. 60525
81143	Isolantite Mfg. Corp., Stirling, N. J. 07980
81349	Military Specifications
81350	Joint Army-Navy Specifications
81751	Columbus Electronics Corp., Yonkers, N. Y.
81831	Filton Co., Flushing, L. I., N. Y
81860	Barry Controls Div. of Barry Wright Corp., Watertown, Mass.
82219	Sylvania Electric Products, Inc., (Electronic Tube Div.), Emporium, Penn.
82273	Indiana Pattern and Model Works, LaPort, Ind.
82389	Switchcraft Inc., Chicago, Ill. 60630
82647	Metals and Controls Inc., Attleboro, Mass.
82807	Milwaukee Resistor Co., Milwaukee, Wisc.
83058	Carr Fastener Co., Cambridge, Mass.
83186	Victory Engineering Corp (IVECO), Springfield, N. J. 07081
83361	Bearing Specialty Co., San Francisco, Calif.
83587	Solar Electric Corp., Warren, Penn.
83740	Union Carbide Corp., New York, N. Y. 10017
84411	TRW Capacitor Div., Ogallala, Nebr.
84835	Lehigh Metal Products Corp., Cambridge, Mass. 02140
84971	TA Mfg. Corp., Los Angeles, Calif.
86577	Precision Metal Products of Malden Inc., Stoneham, Mass. 02180
86684	RCA (Electrical Component and Devices) Harrison, N. J.
88140	Cutler-Hammer Inc., Lincoln, Ill.
88219	Gould Nat. Batteries Inc., Trenton, N. J.
88419	Cornell Dubilier Electric Corp., Fuquay-Varina, N. C.
88627	K and G Mfg. Co., New York, N. Y.
89482	Holtzer Cabot Corp., Boston, Mass.
89665	United Transformer Co., Chicago, Ill.
90201	Mallory Capacitor Co., Indianapolis, Ind.
90750	Westinghouse Electric Corp., Boston, Mass.
90952	Hardware Products Co., Reading, Penn. 19602
91032	Continental Wire Corp., York, Penn. 17405
91146	ITT Cannon Electric Inc., Salem, Mass.
91293	Johanson Mfg. Co., Boonton, N. J. 07005
91598	Chandler Co., Wethersfield, Conn. 06109
91637	Dale Electronics Inc., Columbus, Nebr.
91662	Elco Corp., Willow Grove, Penn.
91719	General Instruments, Inc., Dallas, Texas
91929	Honeywell Inc., Freeport, Ill.
92519	Electra Insulation Corp., Woodside, Long Island, N. Y.
92678	Edgerton, Germeshausen and Grier, Boston, Mass.
93332	Sylvania Electric Products, Inc., Woburn, Mass.
93916	Cramer Products Co., New York, N. Y. 10013
94144	Raytheon Co. Components Div., Quincy, Mass.
94154	Tung Sol Electric Inc., Newark, N. J.
95076	Garde Mfg. Co., Cumberland, R. I.
95146	Alco Electronics Mfg. Co., Lawrence, Mass.
95238	Continental Connector Corp., Woodside, N. Y.
95275	Vitramon, Inc., Bridgeport, Conn.
95354	Methode Mfg. Co., Chicago, Ill.
95412	General Electric Co., Schenectady, N. Y.
95794	Ansconda American Brass Co., Torrington, Conn.
96095	Hi-Q Div. of Aerovox Corp., Orlean, N. Y.
96214	Texas Instruments Inc., Dallas, Texas 75209
96256	Thordarson-Meissner Div. of McGuire, Mt. Carmel, Ill.
96341	Microwave Associates Inc., Burlington, Mass.
96906	Military Standards
97966	CBS Electronics Div. of Columbia Broadcasting Systems, Danvers, Mass.
98291	Sealectro Corp., Mamaroneck. N. Y. 10544
98821	North Hills Electronics Inc., Glen Cove, N. Y.
99180	Transitron Electronics Corp., Melrose, Mass.
99378	Atlee Corp., Winchester, Mass. 01890
99800	Delevan Electronics Corp., E. Aurora, N. Y.

8/67

PARTS LIST — MECHANICAL

Ref. Figure	*Description*	*Part Number*	*Fed. Mfg. Code*	*Mfg. Part No.*	*Fed. Stock No.*
1	Slider to raise front of instrument	5250-1800	24655	5250-1800	
2	Rubber foot (4 required)	5260-0700	24655	5260-0700	5340-738-6329
3	Screw, binder head, No. 10-32, 3/8 in. (2 required)	7080-1000	24655	7080-1000	5305-974-0373
4	Dress nut	5800-0805	24655	5800-0805	
	Tooth lock washer, 3/8 in.	8050-0400	78189	1920-02	5310-209-3989
	Hex nut, 3/8 in.	5810-1000	24655	5810-1000	5310-282-4653
5	Frequency dial housing	0907-1062	24655	0907-1062	
6,7	Screw, binder head, No. 6-32, 3/8 in.	7070-1700	24655	7070-1700	
	Split lock washer, No. 6	8040-1800	96906	MS35338-79	5310-011-1041
	Hex nut, No. 6-32	5810-2400	24655	5810-2400	5310-964-5861
8	Screw, binder head, No. 6-32, 1/4 in.	7070-0600	24655	7070-0600	5305-929-9387
	Split lock washer, No. 6	8040-1800	96906	MS35338-79	5310-011-1041
	Metal flat washer	8100-0200	24655	8100-0200	
9	Screw, binder head with lock washer, No. 10-32, 3/8 in.	7090-0700	24655	7090-0700	
10	Left end frame	5310-4087	24655	5310-4087	
11	Metal flat washer	8100-1517	24655	8100-1517	5310-849-7166
12	Screw, binder head with washer, No. 10-32 1/2 in.	7098-0161	24655	7098-0161	
13	Dust cover assembly	1363-1580	24655	1363-1580	
14	Right end frame	5310-4086	24655	5310-4086	
15	Screw, binder head, No. 4-40, 5/8 in. (2 required)	7060-2200	24655	7060-2200	5305-997-3054
	Spacer, metal, No. 4, 11/32 in. (2 required)	7640-0900	24655	7640-0900	
	Plastic indicator	5470-0651	24655	5470-0651	
16	Knob for LEVEL control	5530-0400	24655	5530-0400	5355-985-6850
17	Frequency dial (black)	1363-2591	24655	1363-2591	
18	Screw, binder head, No. 4-40, 7/16 in. (2 required)	7060-1700	24655	7060-1700	5305-995-6716
	Spacer, metal, No. 4, 9/32 in. (2 required)	7640-0750	24655	7640-0750	
	Plastic indicator	5470-0650	24655	5470-0650	6625-738-6353
19	Logging dial	5120-2336	24655	5120-2336	
20	Frequency control knob	5520-2500	24655	5520-2500	
21, 22	Screw, binder head, No. 6-32, 1 in.	7070-4100	24655	7070-4100	
23	Dress nut	5800-0805	24655	5800-0805	
	Tooth lock washer, 3/8 in.	8050-0400	24655	8050-0400	
	Metal washer, 3/8 in., 1/16 in. thick	8100-1104	24655	8100-1104	

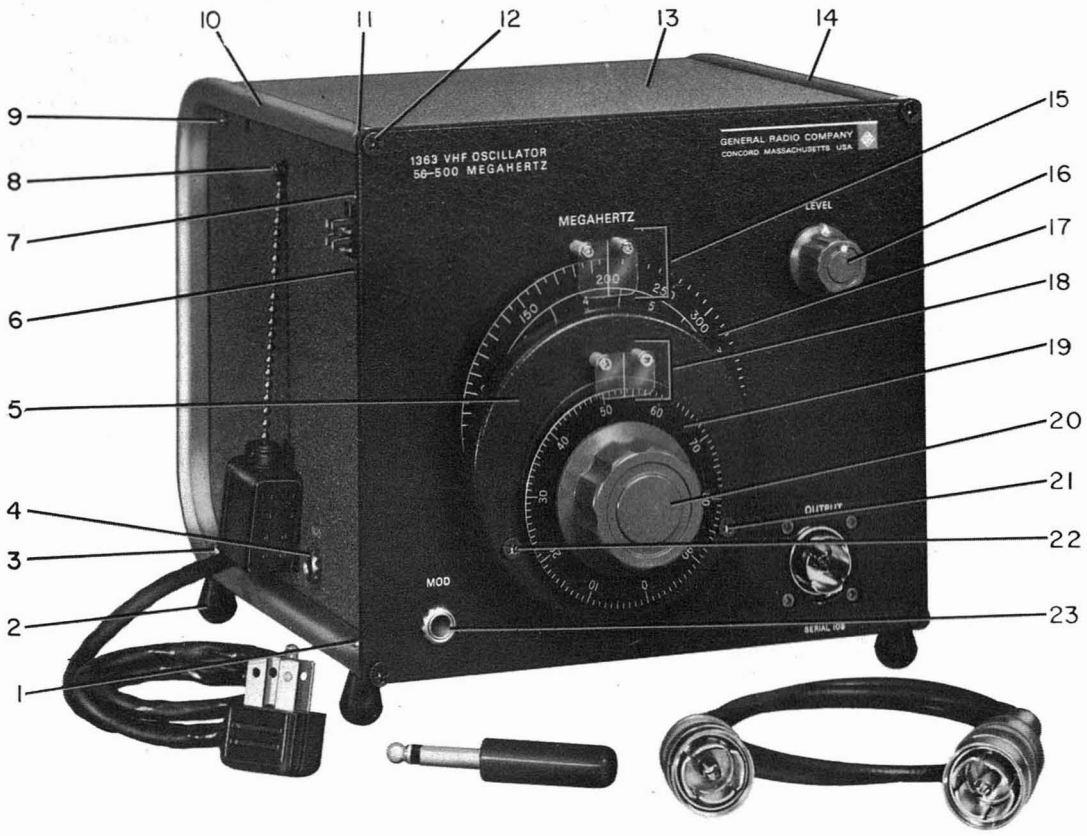


Figure 6-5. Exterior replaceable parts identification.

PARTS LIST — ELECTRICAL

Ref. No.	*Description*	*GR Part Number*	*Fed. Mfg. Code*	*Mfg. Part No.*	*Fed. Stock No.*
CAPACITORS					
C1	100pF, Part of V1				
C2	28pF, Part of LC1				
C3	Ceramic, 6.8pF ±10% 500 V	4400-0800	78488	GA, 6.8pF±10%	
C4	Ceramic, 220pF ±20% 500 V	4400-1950	01121	FB2B, 220pF ±20%	
C5	Ceramic, 220pF ±20% 500 V	4400-1950	01121	FB2B, 220pF ±20%	
C6	Ceramic, 100pF ±20% 500 V	4400-1700	01121	FB2B, 100pF ±20%	
C7	Ceramic, 220pF ±20% 500 V	4400-1950	01121	FB2B, 220pF ±20%	

Ref. No.	*Description*	*GR Part Number*	*Fed. Mfg. Code*	*Mfg. Part No.*	*Fed. Stock No.*
C8	Ceramic, 220pF ±20% 500 V	4400-1950	01121	FB2B, 220pF ±20%	
C9	Ceramic, 100pF ±20% 500 V	4400-1700	01121	FB2B, 100pF ±20%	
C10	Special	1363-1530	24655	1363-1530	
C11	Ceramic, 3.3pF ±5% 500 V	4400-0330	78488	GA, 3.3pF ±5%	
RESISTORS					
R1	Composition, 220Ω ±5% 1/2 W	6100-1225	01121	RC20GF221J	5905-279-3513
R3	Power, 25KΩ ±5% 10 W	6670-3255	80183	247E, 25KΩ ±5%	
R4	Composition, 56Ω ±5% 1/2 W	6100-0565	01121	RC20GF560J	5905-279-1897
R5	Composition, 10KΩ ±5% 1/2 W	6100-3105	01121	RC20GF103J	5905-185-8510
R6	Composition, 100Ω ±10%	6000-3000	24655	6000-3000	
R7	Composition, 1MΩ ±5% 1/2 W				
R8	Composition, 820Ω ±10% 2 W	6120-1829	01121	RC42GF821J	5905-279-2286
R9	Composition, 2.7KΩ ±10% 1 W	6110-2279	01121	GB, 2.7KΩ ±10%	
R10	Pot. Comp., 1KΩ ±10%	6010-0400	24655	6010-0400	5905-448-5726
TUBE					
V1	Vacuum, 2C43	8320-0200	12672	2C43	5960-114-4654
DIODES					
CR1	Semiconductor, Type 1N625	6082-1012	24446	1N4009	
CR2	Semiconductor, Type 1N750	6083-1003	07910	1N750	
INDUCTORS					
L1	Toroid core coil assembly	1363-2560	24655	1363-2560	
L2	Toroid core coil assembly	1363-2561	24655	1363-2561	
L3	Toroid core coil assembly	1363-2570	24655	1363-2570	
L4	Toroid core coil assembly	1363-2570	24655	1363-2570	
L5	Choke	4290-1300	24655	4290-1300	5950-815-9795
SOCKET					
S01	Connector, jack CDSJ-14	4260-0900	98291	SKT-1	
S02	Connector, jack CDSJ-14	4260-0900	98291	SKT-1	
S03	Connector, jack CDSJ-14	4260-0900	98291	SKT-1	
S04	8-pin special socket 1361-41	1361-0410	24655	1361-0410	
JACKS					
J1	Special	1363-0390	24655	1363-0390	
J2	Connector, jack	4260-1040	82389	112A	
J3	Connector, jack	4260-1060	82389	113B	
PLUGS					
PL1	Pin	1363-6970	24655	1363-6970	
PL2	Pin	1363-6970	24655	1363-6970	
PL3	Pin	1363-6970	24655	1363-6970	
PL4	Connector, multiple plug;	4220-4600	71785	P308-AB	5395-351-3739
PL5	Connector, multiple plug	1363-0391	24655	1363-0391	

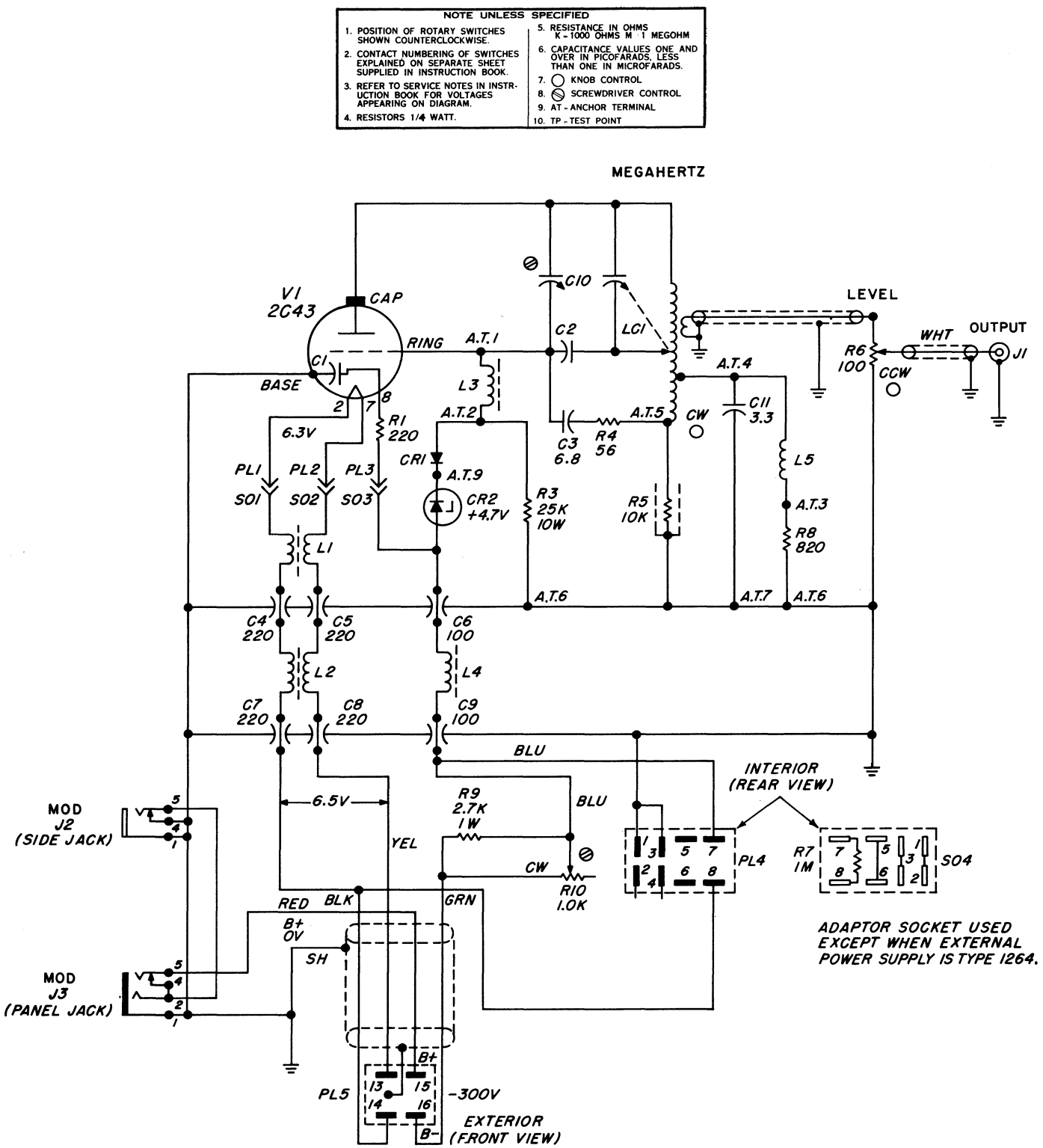


Figure 6-6. 1363 VHF Oscillator schematic diagram.

APPENDIX

Type 1267 Regulated Power Supply

The 1267 Power Supply has both regulated heater and plate supplies, 6.3 and 300 volts respectively. The regulation provides complete freedom from line-voltage variations, minimum residual modulation and frequency drift, and long oscillator-tube life.

TYPE 1267-A

Type 1269 Power Supply

The 1269 Power Supply is a general-purpose, unregulated supply producing 300 to 380 Vdc and 6.3 Vac. This supply, like the others in this appendix, can be bench or relay-rack mounted in combination with several GR oscillators.

TYPE 1269-A

Type 1311-A Audio Oscillator

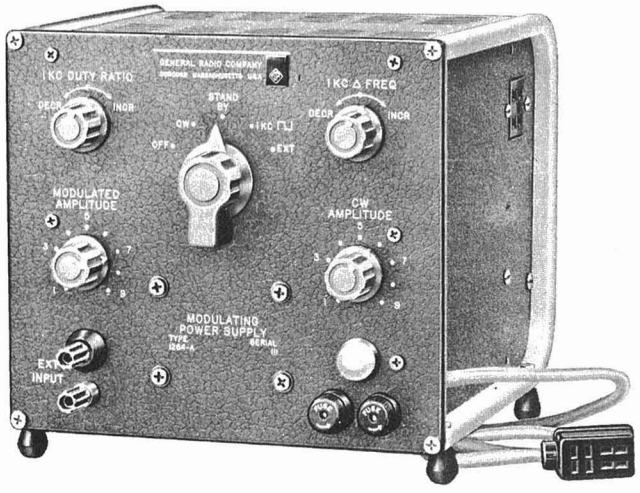
The many features and superior performance of this instrument make it well suited for almost any application requiring a high-quality audio oscillator. For bridge measurements, the shielded output-transformer secondary minimizes circulating ground currents and matches loads over a wide impedance range. The frequency can be synchronized with that of an external standard for precise measurement of frequency-sensitive parameters.

Its short-term amplitude stability and frequency stability are advantageous for the calibration of high-speed level recorders and analog-to-digital convertors. Its ability to drive any load impedance with low waveform distortion makes it an outstanding general-purpose oscillator.

The frequency is determined by a Wien-bridge network. A multi-stage, Class-B, six-transistor circuit delivers an output of one watt. A tapped output transformer makes available a wide range of voltages and short-circuit currents. Feedback around the whole amplifier makes the distortion practically independent of load impedance, even under short-circuit conditions.

The convertible bench-type cabinet can be easily mounted in a relay rack by means of adpator panels.

Type 1264 Modulating Power Supply



The 1264 produces pulse and square-wave modulation of vhf and uhf oscillators, 1361, 1362, 1363, 1215, and 1218. In addition, it can be used as an adjustable regulated power supply for the oscillator plate and as a source of regulated heater power.

It is available in combination with the above oscillators.

The 1264 comprises an electronically regulated, adjustable-output, high-voltage, dc supply; a dc-coupled, series-type power modulator driven by a Schmitt trigger circuit; and a 1-kHz multivibrator. A switch permits selection of cw, standby (only heaters energized), 1-kHz square-wave modulated (internally generated), or externally modulated operation. Independent panel controls vary the regulated supply voltage for cw operation and the modulator amplitude for square-wave and polse operation. Controls are also provided to adjust the frequency of the internal 1-kHz multivibrator and the duty ratio to produce a true square wave.

The input trigger circuit accepts single or multiple positive pulses, which are reproduced at the modulator output. It also accepts square waves at rates up to 100 kHz, or sine waves up to 50 kHz, from any 20-volt source such as the 1217 Unit Pulse Generator or the 1310 oscillator and produces square waves at the modulator output. No adjustment of triggering is necessary. The stable 1-kHz multivibrator provides ideal square-wave modulation for use with sharply selective amplifiers following the signal detector.

Type 1236 I-F Amplifier

The 1236 will meet the many critical demands placed upon a precision laboratory receiver. More than an amplifier, it is a complete 30-MHz measuring receiver with preamplifier, wide-range calibrated attenuator, and a large meter with normal, expanded, and compressed scales. In most applications the high sensitivity, or low noise figure, with narrow bandwidth will provide good small-signal performance and noise rejection for improved measurement accuracy. The availability of a wider bandwidth also greatly simplifies use at high frequencies where sources are generally less stable.

Gain stability during a measurement is ensured by a fully regulated power supply; 10% line voltage variation changes gain less than 0.05 dB. Frequency stability of the local oscillator can be achieved by using the 30-MHz i-f output of the amplifier to drive an afc loop.

Precision Attenuation Measurement

Large values of attenuation can be measured with particular ease with the 1236 owing to the wide, 155-dB, dynamic range of its preamplifier and attenuator. A 1-dB full-scale, expanded meter scale is provided that facilitates measurement of small values of, or changes in, attenuation. A continuous gain control permits setting initial reading for easy subtraction in substitution measurements.

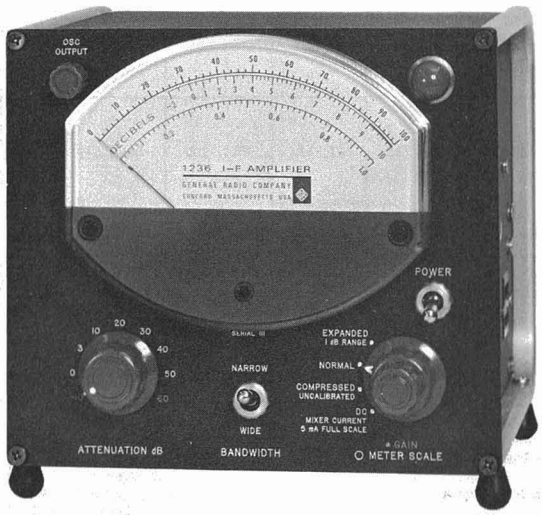
VSWR Measurement

The 1236 is recommended for the most precise VSWR measurements, of both high and low values. The expanded VSWR scale is 1.12:1 full scale. The high sensitivity of the 1236 permits the VSWR of solid-state devices to be measured at tolerably low signal levels.

As a null detector, the 1236 offers the advantages of its compressed (agc) meter scale for convenience in rapid null balancing and its added sensitivity for sharp nulls and more precise data. It should also find application in some noise-figure measurements.

Precision Heterodyne Receivers

The 1236 I-F Amplifier can be used in combination with an appropriate local oscillator, mixer, and low-pass filter to make up complete wide-band precision test receivers. A power supply for the local oscillator is built into the 1236.



Type 1232 Tuned Amplifier And Null Detector

The Type 1232 Amplifier is a sensitive, general-purpose, metered audio amplifier. Intrinsically broadband (±3 dB from 20 Hz to 20 kHz), it has optional filtering, which can be tuned continuously over the audio-frequency range or at spots up to 100 kHz.

Its utility as a null detector is enhanced by high gain, long-life battery power, and the optional logarithmic response characteristic. The output is adequate to drive head phones.

Its frequency range can be extended up to 10 MHz by use of the Type 1232-P1 RF Mixer and appropriate local oscillator; at 20 or 100 kHz. It makes an excellent i-f amplifier.

GR874 COAXIAL COMPONENTS

GR874 CABLE CONNECTORS

APPLICABLE CABLE TYPES		CONNECTOR TYPE	CABLE	CABLE LOCKING	PANEL FLANGED	PANEL LOCKING	PANEL LOCKING RECESSED	PANEL LOCKING (KEYED)
		874-A2	-CA	-CLA	-PBA	-PLA	-PRLA	-PBRLA
	50-OHM	RG-8A/U RG-9B/U RG-10A/U RG-87A/U RG-116/U RG-156/U RG-165/U RG-166/U RG-213/U RG-214/U RG-215/U RG-225/U RG-227/U	-C8A	-CL8A	-PB8A	-PL8A	-PRL8A	-PBRL8A
	NON-50-OHM	RG-11A/U RG-12A/U RG-13A/U RG-63B/U RG-79B/U RG-89/U RG-144/U RG-146/U RG-149/U RG-216/U						
	50-OHM	874-A3 RG-29/U RG-55/U (Series) RG-58/U (Series) RG-141A/U RG-142A/U RG-159/U RG-223/U	-C58A	-CL58A	-PB58A	-PL58A	-PRL58A	-PBRL58A
	NON-50-OHM	RG-59/U RG-62/U (Series) RG-71B/U RG-140/U RG-210/U	-C62A	-CL62A	-PB62A	-PL62A	-PRL62A	-PBRL62A
	50-OHM	RG-174/U RG-188/U RG-316/U	-C174A	-CL174A	-PB174A	-PL174A	-PRL174A	-PBRL174A
	NON 50-OHM	RG-161/U RG-187/U RG-179/U						

Example: For a locking cable connector for RG-8A/U, order Type 874-CL8A.

GR874 ADAPTORS

TO TYPE		TYPE 874-
APC-7		QAP7L*
BNC	plug	QBJA QBJL*
	jack	QBPA
C	plug	QCJA QCJL*
	jack	QCP
GR900		Q900L*
HN	plug	QHJA
	jack	QHPA
LC	plug	QLJA QLPA
LT	plug	QLPT
	jack	QLTJ
Microdot	plug	QMDJ QMDJL*
	jack	QMDP
N	plug	QNJA QNJL*
	jack	QNP QNPL*
OSM/BRM**	plug	QMMJ QMMJL*
	jack	QMMP QMMPL*
SC (Sandia)	plug	QSCJ QSCJL*
	jack	QSCP
TNC	plug	QTNJ QTNJL*
	jack	QTNP
UHF	plug	QUJ QUJL*
	jack	QUP
UHF 50-Ω Air Line	7/8-in.	QU1A
	1-5/8-in.	QU2
	3-1/8-in.	QU3A

*Locking GR874 Connector

Example: To connect Type 874 to a type-N jack, order Type 874-QNP

**Reg. T.M. Omni Spectra, Inc.

OTHER COAXIAL ELEMENTS

TYPE 874-	DESCRIPTION	TYPE 874-	DESCRIPTION
A2	50-Ω cable (low loss)	MB	coupling mount
A3	50-Ω cable	MR, MRL, MRAL	mixer-rectifier
D20L, D50L	20-, 50-cm adjustable stubs	R20A, R20LA	patch cord, double shield
EL, EL-L	90° ell	R22A, R22LA	patch cord, double shield
F185L	185-MHz low-pass filter	R33, R34	patch cord, single shield
F500L	500-MHz low-pass filter	T, TL	tee
F1000L	1000-MHz low-pass filter	TPD, TPDL	power divider
F2000L	2000-MHz low-pass filter	U	U-line section
F4000L	4000-MHz low-pass filter	UBL	balun
FBL	bias insertion unit	VCL	variable capacitor
G3, G3L, G6, G6L G10, G10L, G14, G14L G20, G20L	3-, 6-, 10-, 14-, and 20-dB attenuators	VI	voltmeter indicator
		VQ, VQL	voltmeter detector
		VR, VRL	voltmeter rectifier
GAL	adjustable attenuator	W100	100-Ω termination
JR	rotary joint	W200	200-Ω termination
K, KL	coupling capacitor	W50B, W50BL	50-Ω termination
L10, L10L L20, L20L L30, L30L	10-, 20-, and 30-cm rigid air lines	WN, WN3, WNL	short-circuit terminations
		WO, WO3, WOL	open-circuit terminations
		X	insertion unit
LAL	35-58 cm adjustable line	XL	series inductor
LK10L, LK20L	constant-Z adjustable lines	Y	cliplock
LR	radiating line	Z	stand
LTL	trombone constant-Z line	-9508	air line inner conductor
ML	component mount	-9509	air line outer conductor

CONNECTOR ASSEMBLY TOOLS

TYPE 874-	FUNCTION
TOK	Tool Kit
TO58	Crimping Tool
TO8	Crimping Tool

MISCELLANEOUS COAXIAL CONNECTORS

CONNECTOR TYPE	TYPE NO.	USED WITH
Basic	874-B	50-ohm air line
Basic Locking	874-BBL	50-ohm air line
Panel Locking	874-PLT	Wire lead
Panel Locking Recessed	874-PRLT	Wire lead
Panel Locking Feedthrough	874-PFL	Type 874 patch cords

L suffix indicates locking Type 874 Connector.

FOR COMPLETE DETAILS, REFER TO THE GENERAL RADIO CATALOG.

11/67

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Printed in USA