

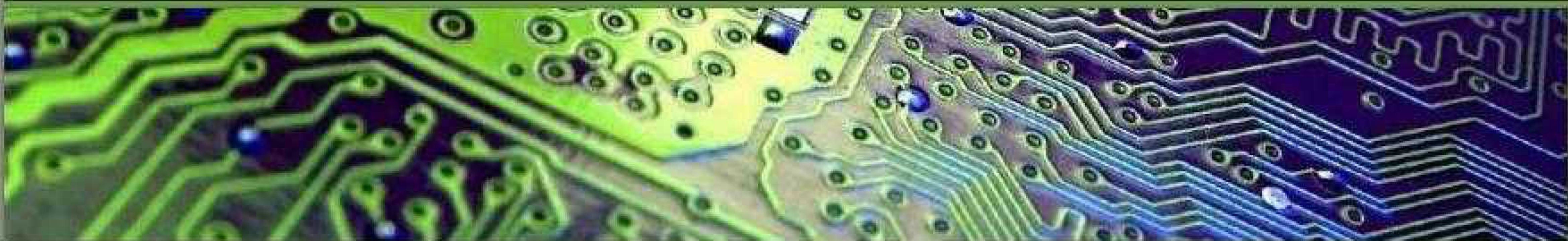
OPERATING INSTRUCTIONS



TYPE 1361-A

OSCILLATOR

GENERAL RADIO COMPANY



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Figure 1. Type 1361-A Oscillator.

SPECIFICATIONS

Frequency Range: 450 to 1050 Mc. Frequency scale is logarithmic, with vernier scale calibration in 0.1% increments.

Frequency Accuracy: $\pm 1\%$.

Output Power (into 50 ohms): At least 125 mw with Type 1203-B Unit Power Supply, 100 mw with Type 1201-B Unit Regulated Power Supply or Type 1264-A Modulating Power Supply, 20 mw with Type 1263-B Amplitude-Regulated Power Supply used with Type 874-VR Voltmeter Rectifier (adequate level for heterodyning with Type 1216-A Unit I-F Amplifier).

Modulation Possibilities: Sine-wave modulation depth is approximately 30% with 40 volts into 6000 ohms. Type 1214-A Unit Oscillator is recommended. Type 1263-B Amplitude-Regulated Power Supply can be used for 1-kc square-wave modulation, Type 1264-A Modulating Power Supply for sine-wave, square-wave, and pulse modulation.

Stability: Warm-up frequency drift is 0.2% maximum.

Attenuator: Range, 80 db with 5-db scale divisions, relative attenuation. Additional uncalibrated range is provided.

Power Supply: Five types of power supplies are available. Refer to Table of Accessories, page 3.

Tube: One 5675, supplied.

Accessories Supplied: Type 874-R22 Patch Cord, Type 874-C58 Cable Connector, phone plug.

Other Accessories Available: Type 480-P408 Panel Extensions, for rack-mounting the Type 1361-A; Type 480-P416 Panel Extensions, for rack-mounting combination of Type 1361-A and Type 1264-A Modulating Power Supply or Type 1263-B Amplitude-Regulated Power Supply; Type 874 Coaxial Connectors, Adaptors and Elements as listed in rear of this manual.

Dimensions: Width 8, height 7-5/8, depth 9-1/2 inches (205 by 195 by 240 mm), over-all.

Weight: 7 pounds (3.2 kg).

U.S. Patent No. 2,548,457 and 2,367,681.

General Radio Experimenter Reference: Vol 35 No. 3, March, 1961.

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TYPE 1361-A OSCILLATOR

Section 1

INTRODUCTION

1.1 PURPOSE.

The Type 1361-A Oscillator (Figure 1) is a general-purpose oscillator for the radio-frequency laboratory. Covering the range from 450 to 1050 Mc, this oscillator can be used to drive bridges, slotted lines, impedance comparators, and other measuring equipment. Used with a voltmeter, it provides an accurately known output voltage for the testing of receivers. Direct sine-wave, square-wave, or pulse amplitude modulation is possible. Amplitude modulation free from incidental fm can be obtained with a single crystal-diode modulator over the frequency range from 0 to 5 Mc. Connected to a mixer, the oscillator can be used as the local oscillator in a heterodyne receiver to convert the Type 1216-A Unit I-F Amplifier or a low-frequency communications receiver into a detector for vhf and uhf signals. Pulsing and linear 100-percent amplitude modulation can be obtained with an external balanced modulator.

1.2 DESCRIPTION.

The tuning system of the Type 1361-A Oscillator is a butterfly circuit, which combines a variable air capacitor and a variable inductor in a single unit with no sliding contacts. The vernier dial requires about 8-1/2 turns to rotate the main dial over its full 315 degrees. The rotor of the tuning unit is geared down for 70-degree rotation. The frequency calibration is accurate within 1 percent. The dial calibration is logarithmic over the range from 500 to 1000 Mc with a tuning rate of approximately 0.1% per vernier dial division. A turn-counting scale provided for use with the vernier dial permits accurate, unambiguous resettability. This feature is particularly valuable for the measurement of selectivity characteristics of receivers and other filter circuits.

Plate and grid of the oscillator tube are connected to the tuned circuit, and the cathode is left floating. The oscillator circuit is of the Colpitts type, with feedback determined essentially by the electrode capacitances of the tube. A small amount of cathode-plate capacitance has been added.

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The output system is an adjustable coaxial line, with a coupling loop on one end and a Type 874 Coaxial Connector on the other. Coupling between the loop and the oscillator can be adjusted over a wide range, and the loop can be clamped in the desired position. Maximum power can be delivered to load impedances normally encountered in coaxial systems. The output line forms a waveguide-below-cutoff attenuator, calibrated over a range of 80 db. This range is approximately 15 to 95 db below the maximum power-output setting. Power available into a 50-ohm load is plotted against frequency in Figure 2 for a typical Type 1361-A Oscillator.

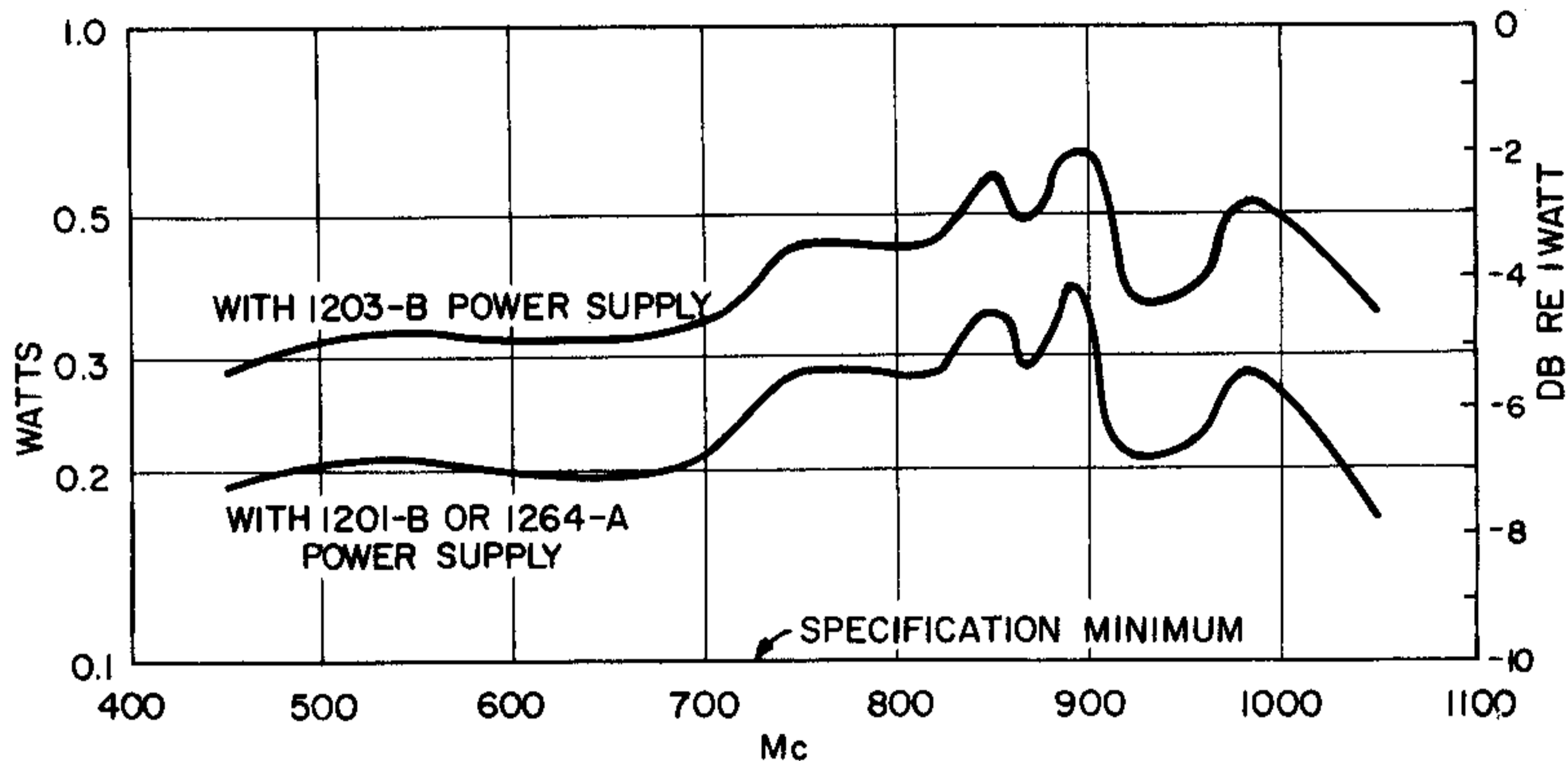


Figure 2. Typical Power Output vs Frequency.

1.3 AUXILIARY EQUIPMENT.

1.3.1 AMPLITUDE MODULATION. A simple audio oscillator can be connected in the plate circuit of the oscillator to give amplitude modulation over the audio-frequency range. The audio oscillator circuit must supply a dc path and must be able to carry 30 milliamperes dc. The Type 1214-A Unit Oscillator is suitable when 400- or 1000-cps modulation is required.

Plate modulation of the oscillator introduces some incidental frequency modulation. Incidental fm is considerably reduced if square-wave or pulse modulation is used instead of sinusoidal amplitude modulation. The Type 1264-A Modulating Power Supply is designed for this purpose.

Amplitude modulation free from incidental fm can be obtained by means of a Type 1000-P6 Crystal Diode Modulator or Type 1000-P7 Balanced Modulator connected between oscillator and load.

1.3.2 SWEEP AND DIAL DRIVES. The frequency dial of the Type 1361-A Oscillator can be mechanically swept back and forth by the Type 1750-A Sweep Drive or the Type 907-R144 Dial Drive.

The Type 1750-A Sweep Drive can be coupled either to the slow-motion dial or to the main frequency dial of the oscillator. When the main frequency dial is coupled to the Sweep Drive, the sweep rate should be restricted to one excursion per second or less. The slow-motion dial can

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TABLE OF ACCESSORIES

Accessory and Function	Instrument	Remarks
POWER SUPPLIES		
Standard	Type 1203-B Unit Power Supply	115-v, 50-60-cps line.
Stabilized Plate Voltage	Type 1201-B Unit Regulated Power Supply	105-125-v, 50-60-cps line.
Adjustable Plate Voltage	Type 1205-B Adjustable Regulated Power Supply	115-v, 60-cps line.
Constant Output Level vs Frequency	Type 1263-B Amplitude Regulating Power Supply with Type 874-VR Voltmeter Rectifier, Type 874-Q6 Adaptor, and Type 274-NF Patch Cord	115- or 230-v, 50-60-cps line.
MODULATORS		
Plate Modulation	Type 1214-A Unit Oscillator	400 and 1000 cps output, 115-v, 40-60-cps line.
Square-Wave or Pulse Modulation (also cw operation)	Type 1264-A Modulating Power Supply	Internal 1-kc square waves or pulses from external source (Type 1217-A Pulser).
Absorption Modulation with no Incidental FM	Type 1000-P6 Crystal-Diode Modulator	Requires modulation source. Modulation freq range 0-5 Mc. Maximum output 10 mv.
Balanced Modulation for linear 100-percent amplitude modulation and for pulses with high degree of carrier suppression.	Type 1000-P7 Balanced Modulator	Requires modulation source. Modulation frequency range 0-20 Mc.
SWEEP DRIVE		
Automatic Frequency Sweep	Type 1750-A Sweep Drive Type 908-P Synchronous Dial Drive Type 907-R144 Dial Drive	Type 1263-B Amplitude-Regulating Power Supply recommended to keep oscillator output level constant.
RELAY-RACK PANEL		
	Type 480-P416	For Types 1264-A and 1361-A or for Types 1263-B and 1361-A.
	Type 480-P408	For Type 1361-A alone.
ADAPTORS - available for connecting Type 874 coaxial output terminals to Types N, BNC, C, UHF, and HN coaxial systems.		

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be driven at rates up to 5 cycles per second. The magnitude and center position of the sweep arc, as well as the sweep rate, can be set by controls on the Sweep Drive panel. The Sweep Drive also provides horizontal deflection voltage, proportional to shaft rotation, for an oscilloscope. The combination of a Type 1361-A Oscillator, Sweep or Dial Drive, and Type 1263-B Amplitude-Regulating Power Supply is a versatile sweep generator for recording or oscilloscopic display of frequency characteristics.

When the Type 1361-A Oscillator is driven by a sweep or dial drive, all moving parts in the oscillator must be lubricated in accordance with paragraph 4.5.

1.3.3 ACCESSORIES SUPPLIED. Supplied with the oscillator are a Type 874-R22 three-foot coaxial double-shielded patch cord, a Type 874-C58 Cable Connector, and a phone plug.

Section 2

OPERATING PROCEDURE

2.1 INSTALLATION.

The Type 1361-A 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 Unit Power Supply. The dummy socket chained to the left-hand side of the cabinet should be inserted into the associated plug except for use with the Type 1264-A Modulating Power Supply, when the cable from the power supply is inserted. Connect the oscillator to the equipment under test by means of the three-foot coaxial cable supplied. If cables equipped with military connectors are to be used, a suitable adaptor may be semi-permanently attached to the locking Type 874 output receptacle of the oscillator.

If a power supply other than a Unit Power Supply is used, it should be capable of supplying 300 volts dc at 30 milliamperes and 6.3 volts ac

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at 0.135 ampere. When the Type 1361-A Oscillator is used with a Type 1263-B Amplitude-Regulating Power Supply or a Type 1264-A Modulating Power Supply, the power supply can be attached directly to the left-hand side of the oscillator with the power cables coiled between the cabinets and end frames. This method of attachment, particularly advantageous for rack-mounted installations, is described in the operating instructions for the power supply.

For rack mounting, appropriate panel extensions should be installed. Remove the two screws in the upper and lower corners on one side of the panel. These screws fasten the panel to the aluminum end frames. Place one of the panel extensions in front of the panel so that the corner holes on the extension line up with those on the instrument and replace the two screws. Attach the second panel extension on the other side of the instrument panel in the same manner. The oscillator can then be mounted in a standard 19-inch relay rack.

2.2 FREQUENCY STABILITY.

For some applications a well regulated and filtered power supply should be used to avoid frequency variations caused by line-voltage fluctuation and to produce a clearer beat note at the highest frequencies. With an unregulated power supply, a line-voltage variation of 20 percent causes an instantaneous frequency change of about .007 percent at frequencies up to 750 Mc, and a frequency change of about .03 percent at the top end of the frequency range (1050 Mc). If a line-voltage shift of 20 percent is maintained for long enough to establish new conditions of thermal equilibrium, drifts as great as 0.1% may occur. Stability will be achieved within 5 minutes.

2.3 CW OPERATION.

After turning on the power supply, adjust the frequency by means of the frequency dial, and adjust the output by pushing or pulling the output coupling loop. The output lock is activated by clockwise rotation.

2.4 SINE-WAVE MODULATION.

For sine-wave plate modulation the audio modulating voltage should be inserted at either the jack on the front panel or the jack on the left-hand side of the oscillator. Full plate current must flow through the modulating source. A modulating voltage of about 40 volts is required for 30-percent modulation. The input impedance is about 6000 ohms.

Incidental fm, inherent in this system, is about .01 percent for 50-percent amplitude modulation at a carrier frequency of 450 Mc and increases almost linearly with frequency to a value of .05% at 1050 Mc.

2.5 SQUARE-WAVE AND PULSE MODULATION.

The rise time, starting delay, and jitter of the Type 1361-A Oscillator depend on the frequency and load conditions. Typical values obtained with a Type 1217-A Unit Pulser used to drive the Type 1264-A Modulating Power Supply are shown in Figure 3.

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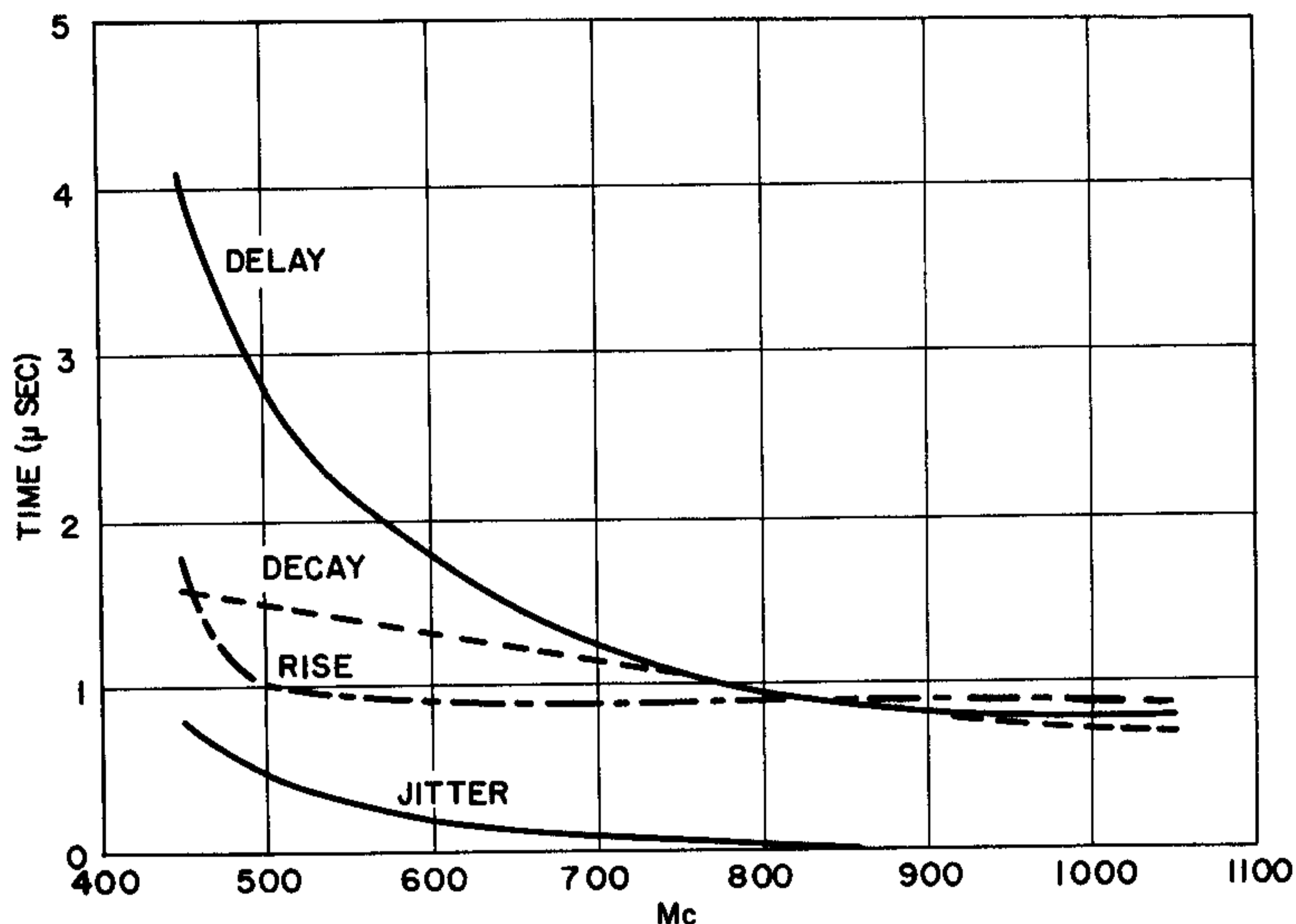


Figure 3. Typical Rise Time, Starting Delay and Jitter when the Type 1217-A Pulser is used to drive the Type 1264 Modulating Power Supply.

Section 3

APPLICATIONS

3.1 GENERAL.

The versatility of the Type 1361-A Oscillator is greatly increased by the large selection of Type 874 coaxial elements, available from General Radio Company. These elements are part of a complete, 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 that is not always available.

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Four applications are described in detail in the following paragraphs. Others will be suggested by a study of the complete list of Type 874 coaxial elements, included in the General Radio catalog.

3.2 OSCILLATOR AS SIGNAL GENERATOR FOR RECEIVER TESTING.

The Type 1361-A Oscillator, as a well shielded power source, can be used as a signal generator to test receivers if means are available to measure the output. The Type 874-VR Voltmeter Rectifier and the Type 874-VI Voltmeter Indicator are suitable for this purpose, and should be connected to the oscillator as shown in Figure 4.

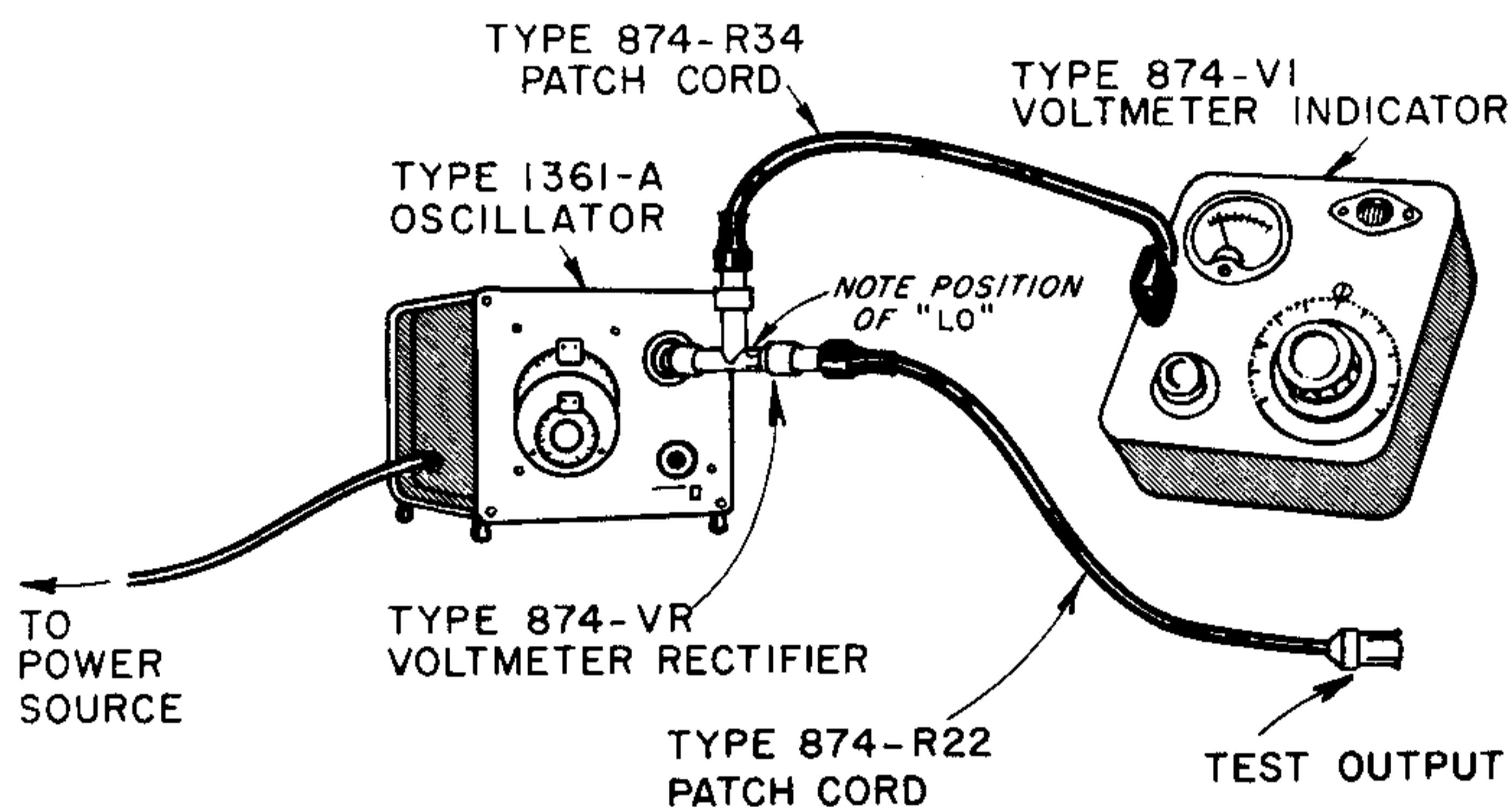


Figure 4. Setup of the Oscillator and Accessories for Use as a Standard-Signal Generator.

The output coupling system of the Type 1361-A Oscillator is calibrated in decibels. At 0-db output setting, the output is measured by a crystal diode in the voltmeter rectifier and indicated on the meter of the voltmeter indicator. Means are provided to standardize the crystal indication. A 50-ohm 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 80 db. Shielding of the oscillator and of other components is adequate for accurate measurements over this range.

3.3 OSCILLATOR AS A TELEVISION SIGNAL GENERATOR.

Used in combination with a Type 1000-P6 Crystal Diode Modulator and a Type 874-G20 20-db Fixed Attenuator, the oscillator is a convenient source of television signals over its entire carrier-frequency range if video modulating voltage is available (see Figure 5). The modulating voltage required can be obtained from a standard television receiver tuned to the local channel.

Since the modulator and oscillator are separated from each other by an attenuator pad, amplitude modulation is free from incidental fm. Output is about 10 millivolts.

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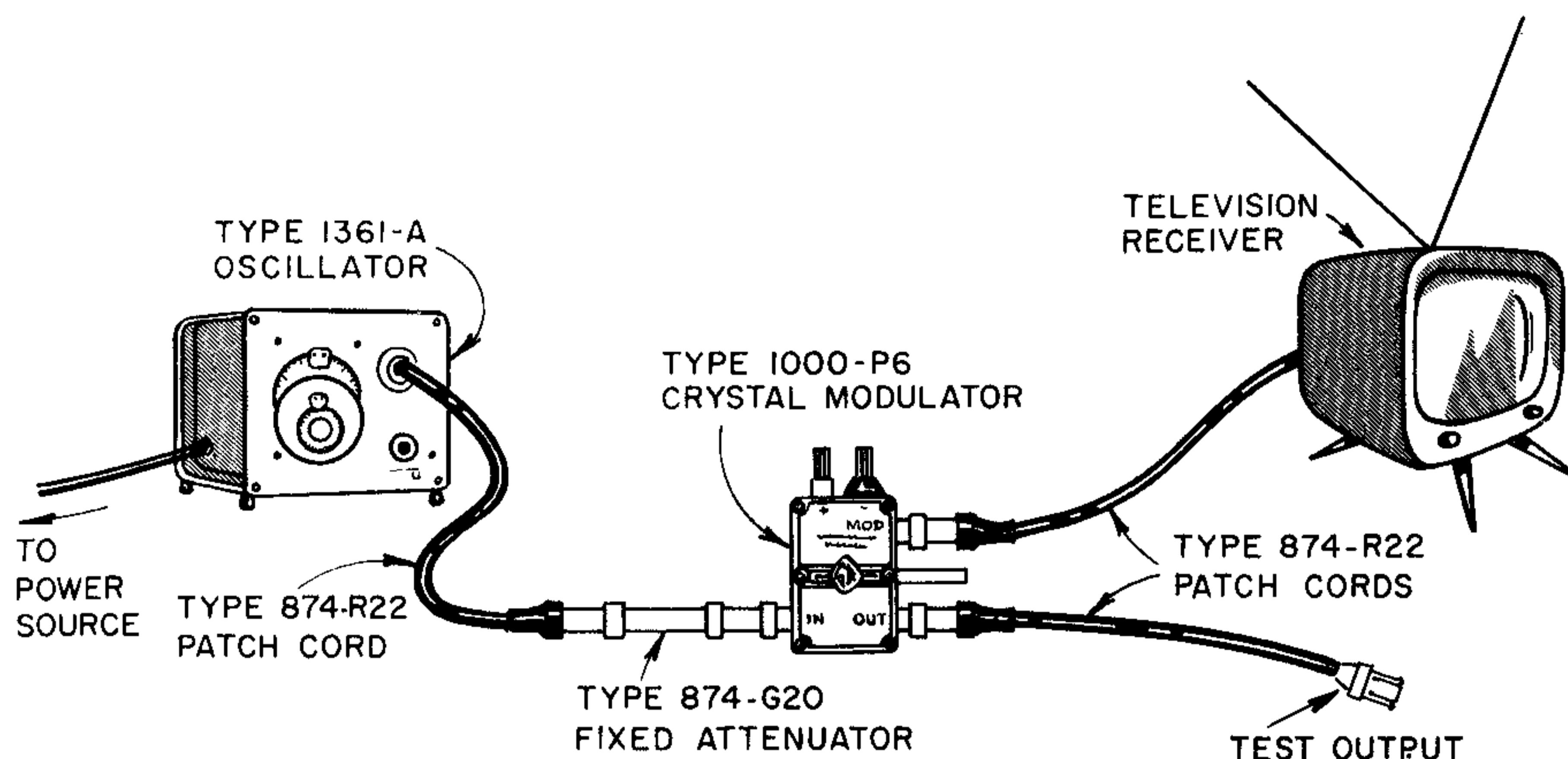


Figure 5. Setup of the Oscillator with a Video Modulator for Use as a Television Signal Generator.

3.4 OSCILLATOR AS A FREQUENCY CONVERTER.

Connected to a Type 874-MR Mixer Rectifier, the Oscillator can provide the local signal in a heterodyne converter to adapt the Type 1216-A Unit I-F Amplifier for use as a sensitive detector for uhf signals (see Figure 6). Without additional tuning, the conversion loss is about 6 db at an intermediate frequency of 30 Mc. The Type 1216-A I-F Amplifier has a built-in precision attenuator and a panel meter. Its bandwidth is 0.7 Mc and it has excellent sensitivity. Provision is made for the measurement of the rectified mixer current in the i-f amplifier, and a separate built-in power supply is available for operating the oscillator.

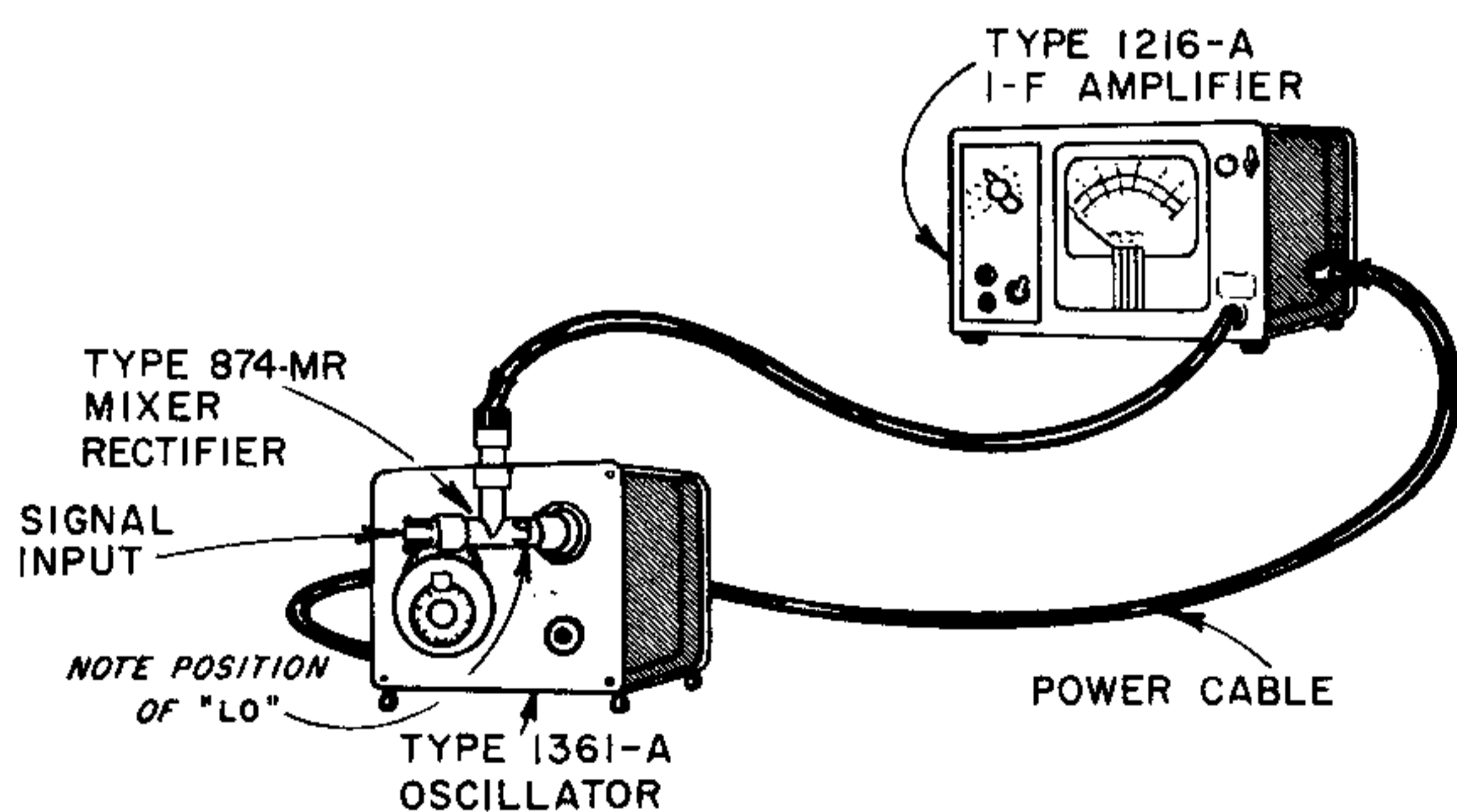


Figure 6. Setup of the Oscillator and a Mixer Rectifier for Use as a Frequency Converter.

Similar oscillators for other tuning ranges in the vhf-uhf region are as follows:

50-250 Mc - Type 1215	180-600 Mc - Type 1209-BL
65-500 Mc - Type 1208	250-920 Mc - Type 1209-B
900-2000 Mc - Type 1218	

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3.5 OSCILLATOR AS TRANSFER OSCILLATOR.

The oscillator can be used as a transfer oscillator to measure the frequency of a microwave source. The tuning range slightly greater than an octave is particularly well suited to this application.

Auxiliary equipment required, in addition to a power supply, includes a Type 1232-A Amplifier, a Type 874-VR Voltmeter Rectifier, a Type 874-G10 pad, a Type 874-R34 patch cord, and two patch cords such as Type 874-R22 for connection to the signal source and frequency-measuring equipment. The necessary connections are shown in Figure 7.

The oscillator is tuned to beat with the source at two or more points on the dial. The harmonic order of the unknown is thus determined while the exact frequency of the Type 1361-A Oscillator may be measured with a frequency counter or heterodyne frequency meter. The unknown frequency is the product of the measured frequency and the harmonic order.

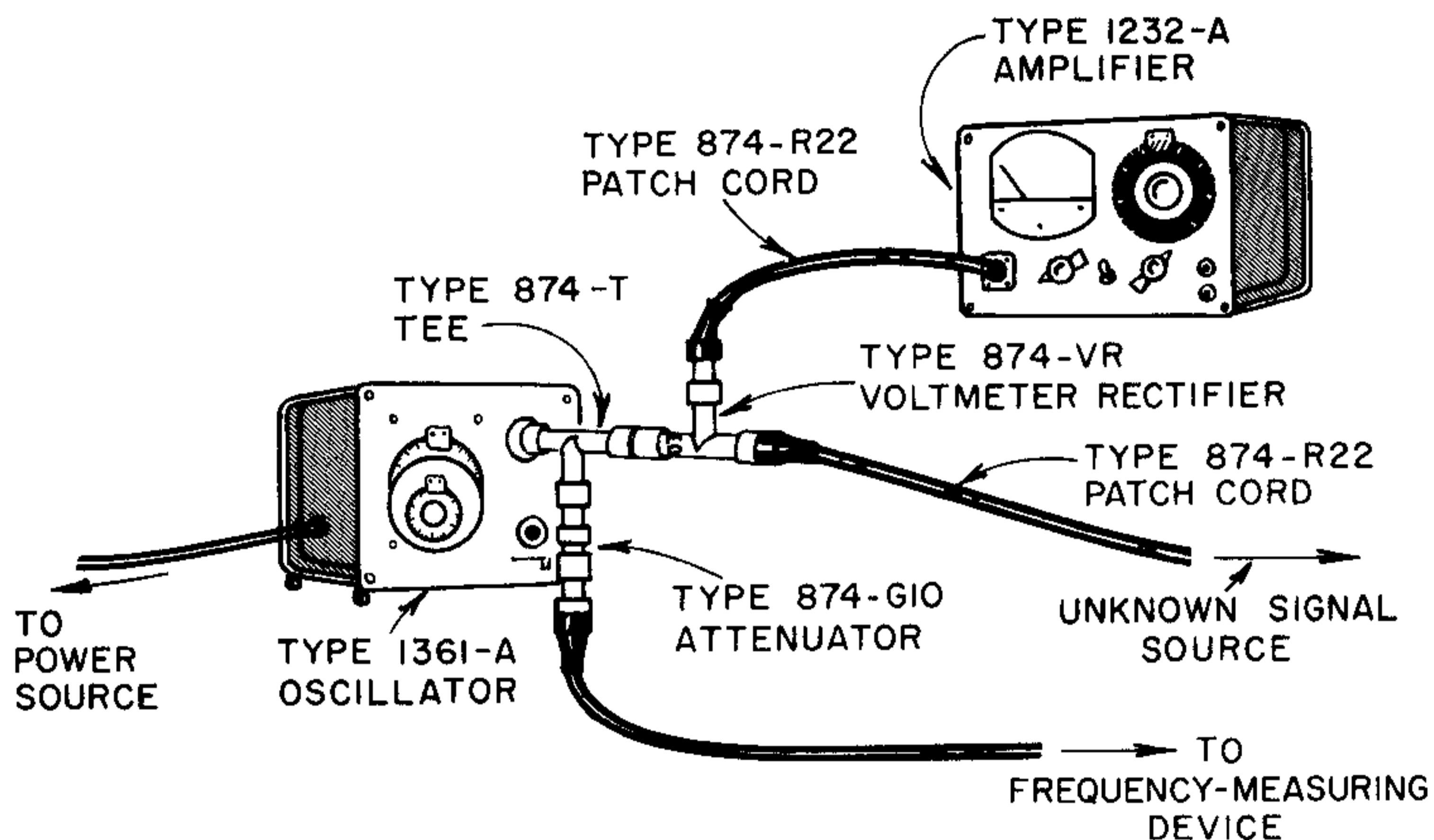


Figure 7. Setup for Use as Transfer Oscillator.

Section 4

SERVICE AND MAINTENANCE

4.1 GENERAL.

The two-year warranty given with every General Radio instrument attests the quality of materials and workmanship in our products. When difficulties do occur, our service engineers will assist in any way possible.

In case of difficulties that cannot be eliminated by the use of these service instructions, please write or phone our Service Department, giving full information of the trouble and of steps taken to remedy it. Be sure to mention the serial and type numbers of the instrument.

Before returning an instrument to General Radio for service, please write to our Service Department or nearest district office (see back cover), 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.

4.2 INSTALLATION OF OSCILLATOR TUBE.

When it is necessary to replace the Type 5675 oscillator tube, install the new tube as follows (see Figure 8):

- a. Loosen the two thumb screws at the center of the rear surface of the cabinet and pull the cover free.
- b. Remove the small screw at the top of the shield can, loosen the screw that holds the clamping band, and then remove the shield can carefully.
- c. Disengage the cathode connection by pushing the clip supporting the two teflon-insulated wires that form the feedback capacitance C1 toward the butterfly.
- d. Pull the tube socket free, being careful not to disturb the heater and cathode chokes.

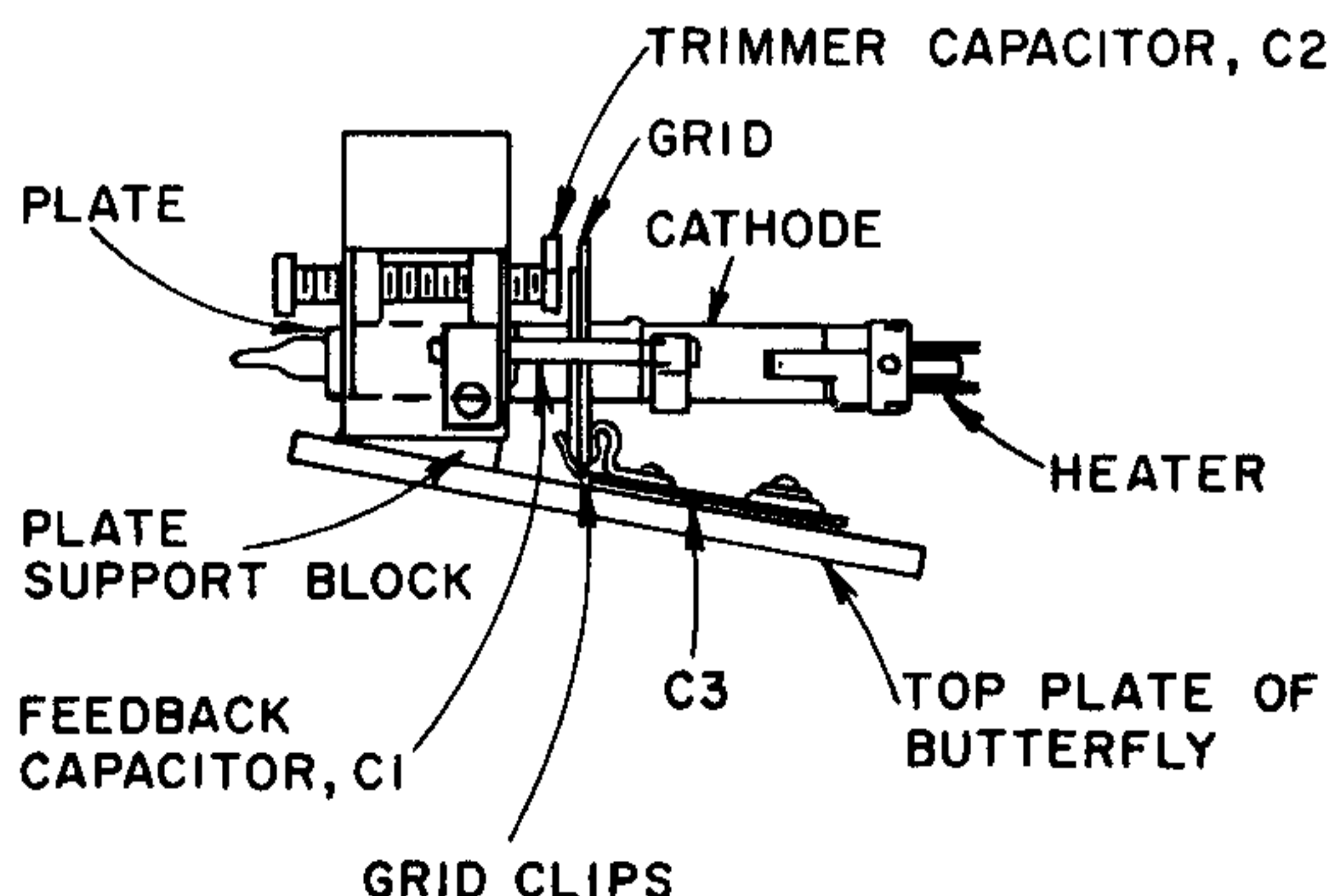


Figure 8. Installation Detail of the Oscillator Tube.

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e. Remove the tube by swinging the cathode end upward.

f. To install the new tube, follow steps a through e in reverse order. Be sure that the plate of the tube is squarely seated in the plate support block. Failure to seat the tube properly may seriously reduce the maximum frequency to which the oscillator can be tuned. Lift grid clips upward to ensure full seating of grid. This may be accomplished by means of a small screw-driver slipped between the plate that supports the grid clips and the butterfly rotor. Make sure that no shorts exist between heater or heater and cathode leads; do not disturb the orientation of the associated chokes. When installing the shield can, be sure to replace the small screw that secures it to the internal angle-bracket to prevent holes in the output at certain frequencies.

4.3 FREQUENCY CALIBRATION.

Replacement of the oscillator tube may affect the frequency calibration. To restore calibration, rotate trimmer capacitor C2 to make the output frequency agree with the dial indication at 1050 Mc. Before adjusting the trimmer capacitor, allow the instrument to warm up, since warm-up drift may be as much as 0.2 percent. The oscillator shield should be in place during this adjustment. The trimmer is accessible through the shield can when the large screw on the side of the can is removed. There is no dc on the trimmer shaft.

4.4 OPERATING CHECK.

To check dc operating conditions, plug a dc milliammeter into either MODULATION jack (J1 or J2) and measure the plate current of V1. Oscillation of V1 is indicated by a variation of the plate current as the oscillator is tuned over its frequency range. Maximum plate current normally occurs near the high end of the range and should be 25 to 30 ma for CW operation with a 300-volt power supply.

The resistances to ground from each terminal of V1, measured with the power off, PL1 plugged into SO1, and the PL2 terminals shorted together, are as follows:

- Plate: 0 ohm
- Grid: 7600 ohms
- Cathode: 5600 ohms
- Heaters: Less than 1 ohm.

Test voltages are given on the schematic diagram, Figure 10.

4.5 LUBRICATION.

When the Type 1361-A Oscillator is driven by a sweep or dial drive, all moving parts must be properly lubricated. Proper lubrication includes an occasional drop of light oil at the ball bearings, and occasional re-lubrication of the pinion gear in the dial assembly.

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PARTS LIST

RESISTORS				MISCELLANEOUS			
R1	2k	±5%	1/2 w	REF-256-C5	J1	JACK	CDSJ-10
R2	470	±5%	1/4 w	REF-833-C1	J2	JACK	CDSJ-10
R3	470	±5%	1/4 w	REF-833-C1	L1	INDUCTOR, 4.3 μh	ZCHA-62
R4	33	±5%	1/2 w	REC-20BF (330B)	L2	INDUCTOR, 4.3 μh	ZCHA-62
R5	5.6k	±10%	10w	REPO-20P (562C)	L3	INDUCTOR, 0.16 μh	ZCHA-58
R6	1 M	±20%		Part of SO1	LC1	Butterfly Capacitor	
CAPACITORS				PL1	PLUG		CDMP-1264-8
C1A				PL2	PLUG		1361-40
C1B				SO1	SOCKET		1361-41
C2				V1	TUBE		5675
C3				Z1	FILTER, 2500 pf GMV		FIE-1
C4	100 pf		500 dcwv	Z2	FILTER, 2500 pf GMV		FIE-1
C5	100 pf		500 dcwv	Z3	FILTER, 200 pf ±10%		FIE-2
C6	100 pf		500 dcwv				
C7A	10 μf	}	450 dcwv				
C7B	10 μf						

NOTES:

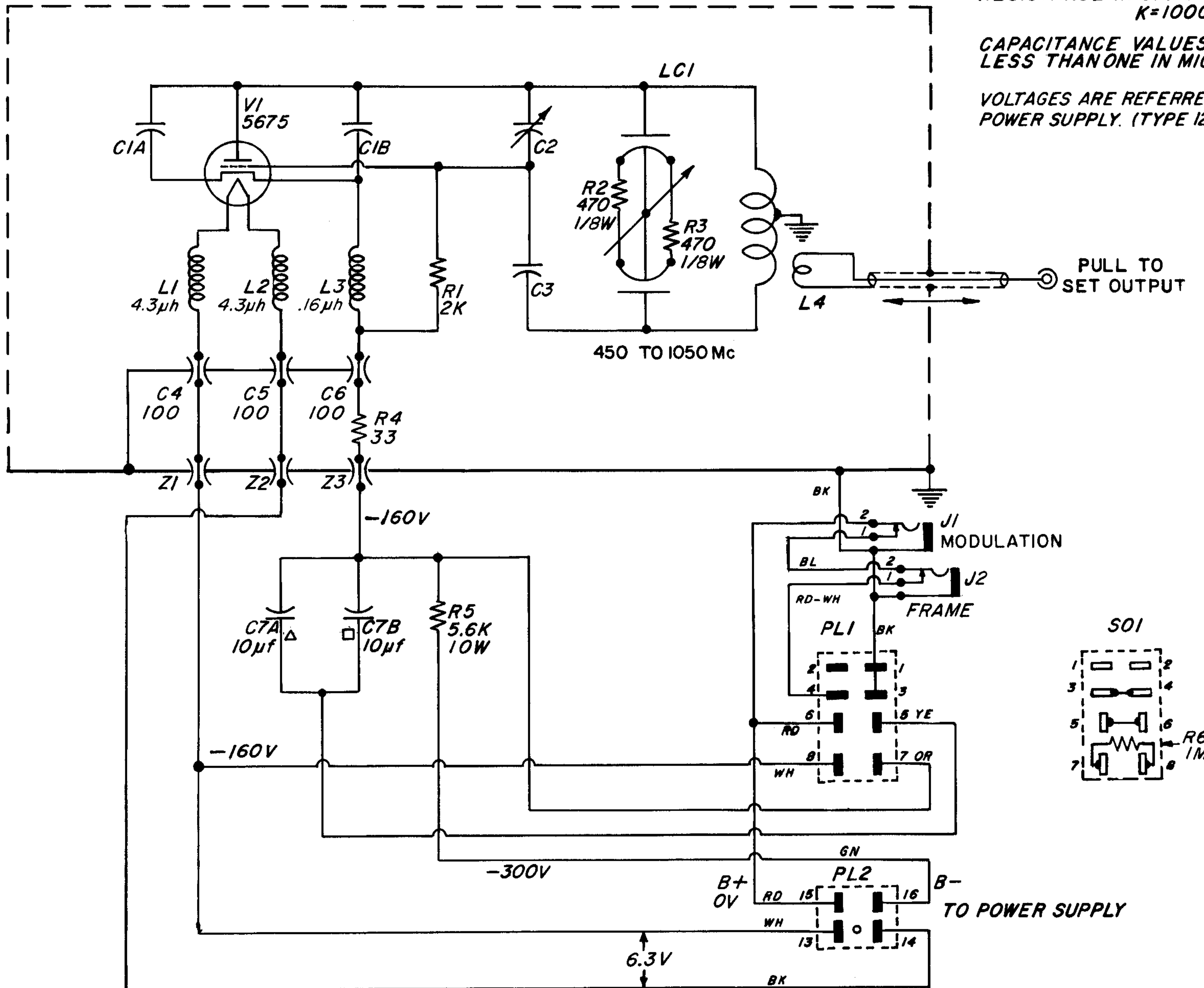
1. All resistances are in ohms except as other-indicated by k (kilohms) or M (megohms).
2. Type designations for resistors and capacitors are as follows:

COC - Capacitor, ceramic
 COE - Capacitor, electrolytic
 REC - Resistor, composition
 REF - Resistor, film
 REPO - Resistor, power

RESISTANCE 1/2 WATT UNLESS OTHERWISE SPECIFIED.
 RESISTANCE IN OHMS UNLESS OTHERWISE SPECIFIED.
 K=1000 OHMS M=1 MEGOHM

CAPACITANCE VALUES ONE AND OVER IN MICRO-MICROFARADS,
 LESS THAN ONE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

VOLTAGES ARE REFERRED TO GROUND, USING A 300 VOLT DC
 POWER SUPPLY. (TYPE 1201 OR 1264)



ADAPTER SOCKET USED
 WHEN EXTERNAL POWER
 SUPPLY IS TYPE 1201,
 1203, 1216 OR 1263.

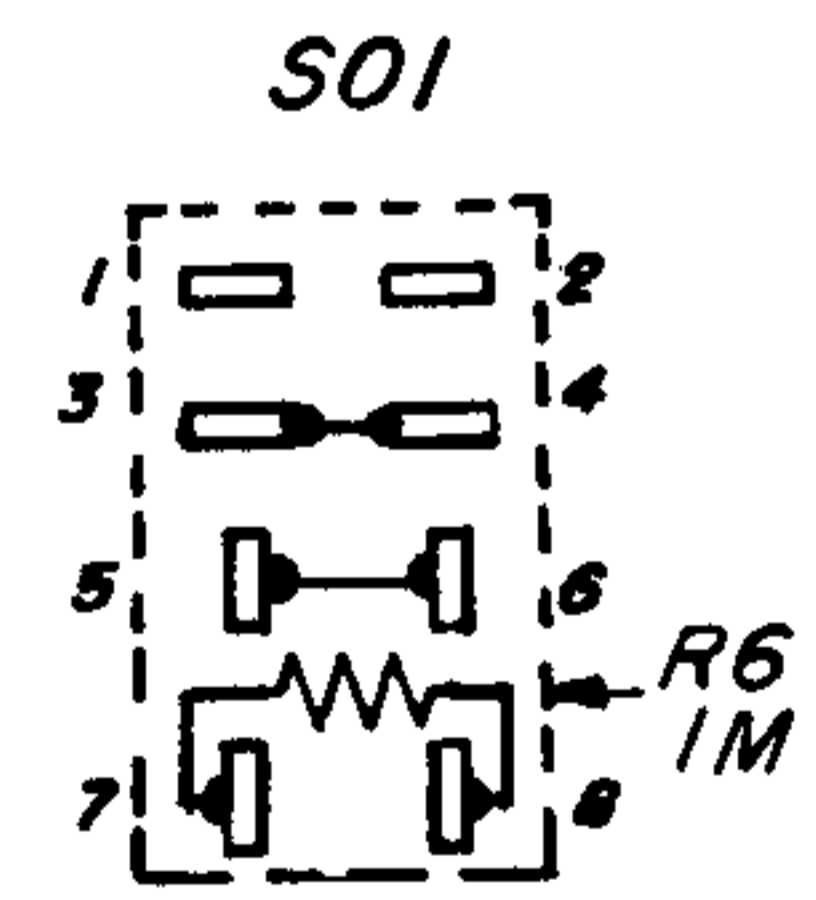


Figure 9. Schematic Diagram of the Type 1361-A Oscillator.

TYPE 874 COAXIAL COMPONENTS

TYPE 874- CONNECTORS						OTHER COAXIAL ELEMENTS	
CONNECTOR TYPE	CABLE TYPE					Type 874-	
	874-A2	874-A3 RG-29/U RG-55/U RG-58/U RG-58A/U	RG-8/U	RG-9/U RG-116/U	RG-59/U RG-116/U		
CABLE	-C	-C58	-C8	-C9	-C62	A2	50 Ω cable (low loss)
CABLE LOCKING	-CL	-CL58	-CL8	-CL9	-CL62	A3	50 Ω cable
PANEL	-P	-P58	-P8	-P8	-P62	D20, D50	20-, 50-cm adjustable stubs
PANEL, FLANGED	-PB	-PB58	-PB8	-PB8	-PB62	EL	90° ell
PANEL, LOCKING	-PL	-PL58	-PL8	-PL8	-PL62	F185	185-Mc low-pass filter
PANEL, LOCKING RECESSED	-PRL	-PRL58	-PRL8	-PRL8	-PRL62	F500	500-Mc low-pass filter
Example: For a locking cable connector for RG-8/U, order Type 874-CL8.						F1000	1000-Mc low-pass filter
TYPE 874- ADAPTORS						F2000	2000-Mc low-pass filter
TO TYPE	874-	TO TYPE	874-				
BNC plug	QBJA	TNC plug	QTNJ				
jack	QBJL* QBPA	jack	QTNJL* QTNP				
C plug	QCJA	UHF plug	QUJ				
jack	QCJL* QCP	jack	QUJL* QUP				
HN plug	QHJA	double plug or jack	Q2				
jack	QHPA	binding post pair	Q9				
LC plug	QLJA	UHF 7/8-in.	QU1A				
	QLPA	Air 1-5/8-in.	QU2				
LT plug	QLTJ	Line 3-1/8-in.	QU3A				
jack	QLTP	*Locking Type 874 Connector, Example: To connect Type 874 to a Type N jack, order Type 874-QNP.					
N plug	QNJA						
jack	QNJL* QNP						
SC plug	QSCJ						
jack	QSCJL* QSCP						
						L10, L20, L30	{ 10-, 20-, & 30-cm rigid air lines
						LA	33-58 cm adjustable line
						LK10, LK20	constant-Z adjustable lines
						LR	radiating line
						LT	trombone constant-Z line
						M	component mount
						MB	coupling probe
						MR	mixer-rectifier
						T	tee
						UB	balun
						VC	variable capacitor
						VI	voltmeter detector
						VR	voltmeter rectifier
						W100	100 Ω termination
						W200	200 Ω termination
						WM	50 Ω termination
						WN, WN3	short-circuit terminations
						WO, WO3	open-circuit terminations
						X	insertion unit
						Y	cliplock
						Z	stand
						The above is a partial listing. For complete details, refer to the General Radio catalog.	

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