OPERATING INSTRUCTIONS

TYPE 1218-A

UNIT OSCILLATOR

GENERAL RADIO COMPANY

F

OPERATING INSTRUCTIONS

TYPE 1218-A

UNIT OSCILLATOR

Form 1218-0100-F
August, 1964

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

Figure 1. Panel View, Type 1218-A Unit Oscillator

SPECIFICATIONS

Frequency Range: 900-2000 Mc.

Circuit: Grid separation triode oscillator. Line sections with sliding contacts used to tune plate and cathode.

Frequency Control: 6-in. dial with direct-reading frequency calibration over 200 degrees. Slow-motion drive, 8 turns.

Frequency Calibration Accuracy: ±1%.

Frequency Drift: Approximately 0.1% during warm-up.

Output Power: At least 150 milliwatts into a 50-ohm load with Type 1269-A Power Supply. Maximum power can be delivered to load impedances normally encountered in coaxial systems.

Output Connector: Type 874 Coaxial Connector; adaptors to other types of coaxial connectors are available.

Modulation: Many kinds of external modulation can be applied. Sinusoidal amplitude modulation in the plate circuit; automatic output control with with amplitude-regulating power supply; square-wave modulation in the grid circuit; pulse modulation in the plate circuit; frequency variation in the grid circuit. For general use, square-wave modulation is recommended.

Power Supply Required: 340 v, 30 ma, dc; 6.3 v, 0.3 a ac or 6 v, 0.15 a dc. (Heater supply must be ungrounded.) Multipoint connector on attached power cable fits Gereral Radio Unit Power Supplies.

Tube: Type 5675 UHF medium-mu triode pencil type.

Mounting: The oscillator is housed in an aluminum casting and is shielded with two spun-aluminum covers. The assembly is mounted on an L-shaped panel and chassis finished in black-crackle lacquer. Relay-Rack Panel Type 480-P7U1 is available for use with the Type 1218-A Unit Oscillator.

Accessories Supplied: Type 874-R22LA Patch Cord, and phone plug.

Dimensions: Width: 12-1/2 in.; height: 10-1/2 in.; depth: 9-1/2 in. (320 by 270 by 240 mm), over-all.

Net Weight: 14-3/4 lb (6.7 kg)

U. S. Patent No.: 2,548,457

TYPE 1218-A
UNIT OSCILLATOR

Section 1
INTRODUCTION

1.1 PURPOSE.

1.1.1 The Type 1218-A Unit Oscillator (Figure 1) is a general-purpose power source for the radio-frequency laboratory. Covering the frequency range from 900-2000 Mc, it can be used to drive bridges, slotted lines, impedance comparators, admittance meters, and other measuring instruments. In combination with Type 874 Coaxial Elements and other basic instruments of the General Radio Unit Line, Unit Oscillators can, in many applications, replace more expensive equipment that is not always available.

1.1.2 With a Type 874 Voltmeter and Attenuator, known output voltages can be provided for receiver testing. Connected to a Type 874 Mixer, the Unit Oscillator can provide the local signal in a heterodyne receiver system to convert the Type 1216-A Unit I-F Amplifier or any low-frequency communications receiver into a detector for uhf signals.

1.1.3 Provisions have been made to apply external modulating voltages for various modes of operation, including square-wave, sine-wave, and pulse modulation, and automatic output control.

1.1.4 With the Type 1000-P7 Balanced Modulator, linear 100-percent amplitude modulation is possible over a modulating frequency range of 0 to 20 Mc. The same modulator can be used for pulsing where it provides high carrier suppression and fast rise-time characteristics, unaffected by the relatively long build-up time of the oscillator.

1.1.5 Automatic output control is of great advantage when frequency characteristics are obtained by manual methods, and is almost indispensable for a swept oscillator. The output of the Type 1218-A Unit Oscillator can be monitored by a voltmeter and can be kept constant by the Type 1263-B Amplitude-Regulating Power Supply.

1.1.6 For occasional sweeping and for automatic data presentation on a cathode-ray oscilloscope with a long-persistence screen, the Type 1750-A Sweep Drive can be used. This mechanical drive can be coupled to the tuning control of the Unit Oscillator and will turn it in reciprocating motion over any selected part of its range. To prevent excessive wear of sliding contacts and of other moving parts, the mechanical drive should be used sparingly and only at slow speeds.

1.2 DESCRIPTION. The complete Type 1218-A Unit Oscillator consists of a main casting with large, round shields at either side mounted on an L-shaped bracket, which supports the frequency dial and the modulation circuits. The output connector and a knob for fine tuning are located on top of the casting. Connections to an external power supply are made by a multipoint connector on a short cable. The shield at the right covers the oscillator assembly. The output control is mounted on the left-hand shield.

1.3 OSCILLATOR TUBE. The Type 1218-A Unit Oscillator uses a Type 5675 Pencil Triode in a grid-separation oscillator. This tube has small internal electrodes of conventional cylindrical design, but grid connections are brought out to a large circumferential terminal, which requires disk-seal construction. The cylindrical plate, grid, and cathode electrodes are all on the plate side of the grid disk, and tuning between plate and grid is possible with a quarter-wave line section at frequencies as high as 2000 Mc. A 3/4-wave-length section is required for tuning between grid and cathode at the same frequency.

1.4 ACCESSORIES. The following table lists accessories that are available for use with the Type 1218-A Unit Oscillator:

ACCESSORIES AVAILABLE

Function	Instrument	Remarks
Power Supplies		
For operation from 115 v, 50-60 cps	Type 1203 Unit Power Supply. Type 1201 Unit Power Supply. Type 1264-A Modulating Power Supply.	Regulated plate supply Requires Type 1264-P2 Adaptor Cable.
For operation from 115 or 230 v, 50-60 cps to hold output constant when frequency is swept	Type 1263-B Amplitude-Regulating Power Supply	Requires also Type 874-VR Voltmeter Rectifier and Type 874-R22A Patch Cord.

TYPE 1218-A UNIT OSCILLATOR

Function	Instrument	Remarks
Modulation Sources For square waves	Type 1210 Unit R-C Oscillator with power supply or Type 1217 Unit Pulser with power supply Type 1264-A Modulating Power Supply	
For pulses	Type 1217 Unit Pulser with power supply	
Modulator For 100% amplitude modulation with negligible FM and for pulsing with short rise time	Type 1000-P7 Balanced Modulator	Requires additional modulation source
Sweep Drive For automatic tuning	Type 1750-A Sweep Drive	Type 1263 Amplitude-Regulating Power Supply recommended to keep oscillator output constant
Adaptors Are available for Types N, BNC, C, UHF, and HN, and for v-h-f 1-5/8-in. and u-h-f 3-1/8-in. Rigid Lines.		
Adaptor Panel For relay rack mounting	Type 480-P7U1	For Type 1218-A Unit Oscillator
Frequency Converter Unit Oscillator used as local oscillator to convert low-frequency receiver into receiver for uhf	Type 1216-A Unit I-F Amplifier and Type 874-MRL Mixer Rectifier	
Signal Source For checking receiver performance	Type 874-GAL Adjustable Attenuator, Types 874-D20L Stub, 874-VR Voltmeter Rectifier, 874-VI Voltmeter Indicator, and 874-LAL Adjustable Line	

Section 2

THEORY OF OPERATION

2.1 TUNED CIRCUITS. Performance and stability of the oscillator are determined by the short high-Q coaxial grid-plate line. The longer grid-cathode line is coiled in a circle to save space. The mechanical design of the oscillator is determined by this construction, which requires a linear motion for plate tuning and a rotational motion for the cathode tuning in a plane perpendicular to the plate line. The 1/4-in.-wide beryllium copper band and the rack and pinion visible in Figure 9 provide the linkage between the main frequency dial, which is rotated through 200° by eight turns of the vernier dial; the short-circuit plunger of the plate-grid line, which moves linearly by 1-3/4 in.; and the contact arm on the grid-cathode line, which rotates 200°.

Reliable sliding contacts are used in the two tuned circuits. Fm noise due to vibration and microphonics is lower in contact-type circuits than in circuits that have closely spaced parts to produce wide frequency ranges.

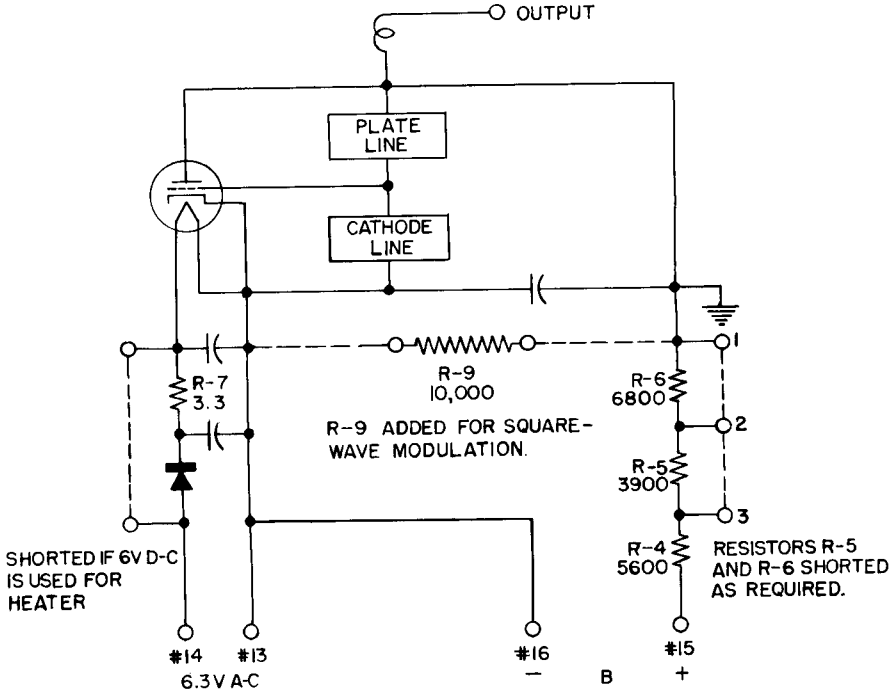


Figure 2. Simplified Heater and Plate Supply Wiring Diagram.

2.2 OUTPUT CIRCUIT. Coupling to the load is accomplished in the movable short circuit of the grid-plate quarter-wave line, since this is the only point with a current maximum at all frequencies. The coupling is varied by rotation of a loop.

2.3 POWER SUPPLY. A wiring diagram of the oscillator is shown in Figure 10. A simplified wiring diagram for heater and plate supply is shown in Figure 2. Like other Unit Oscillators, the Type 1218-A works best from a 300-volt power supply with about one half this voltage on the plate of the oscillator tube. The large plate series resistor required for this operation helps stabilize the oscillator and protects the tube from overloads. To avoid complications in the rf output circuit, the B supply is grounded at the plate potential of the oscillator tube. To reduce undesirable fm, if 6.3-volt ac heater power is used, a rectifier and filter for the cathode heater voltage have been included. One of the small GR Unit Power Supplies will be satisfactory for most uses. These power supplies all have 300-350 volts plate voltage under load and 6.3 volts ac for the heater. For stable operation, good regulation and low hum voltages are essential. A one-percent change in plate voltage changes the oscillator frequency approximately 20 parts per million; a one-percent change in heater voltage approximately 50 parts per million. If the heater of the oscillator is operated from 6.3-volt, 60-cycle ac power and rectified and filtered by the built-in circuit, noise modulation of the oscillator frequency has a peak deviation of the order of 4000 cps or 2 parts per million. This deviation can be reduced by an order of magnitude if a battery is substituted for the rectified supply. Small hum voltages in the plate supply are attenuated considerably by the large plate circuit series resistor mentioned previously and by a bypass condenser in the oscillator. These voltages do not contribute noticeably to fm noise modulation unless a battery is used for the heater. Fm noise due to vibration and microphonics can readily be kept below these values.

2.4 MODULATION. A three-position switch on the front panel selects the desired operation, and allows the application of external control or modulating voltages at a telephone jack. Schematic diagrams corresponding to the switch positions are shown in Figure 3.

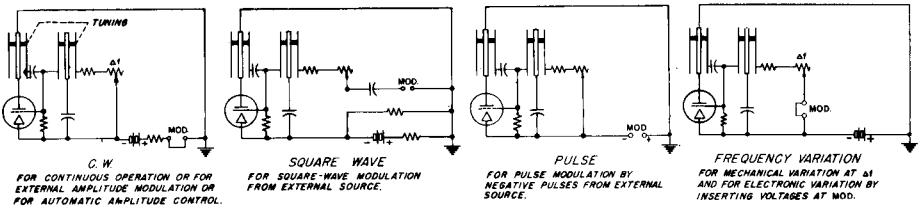


Figure 3. Elementary Wiring Diagram for Various Modulation Conditions.

Normal operation is obtained in the first switch position, labeled CW. The plate circuit can be opened at the ground point by a plug-in at the panel jack, and a control voltage can be inserted in series with the plate voltage. As with all other Unit Oscillators, audio voltage can be applied here to obtain sinusoidal amplitude modulation.

2.5 AUTOMATIC OUTPUT CONTROL. No control voltage is required for CW operation, unless it is desired to change the amplitude or to hold the oscillator output constant as the frequency is varied. To accomplish this, a controlled resistance or a voltage derived from an output monitor can be inserted at the panel jack. While a feedback system of this sort can be set up with a voltmeter and an amplifier, automatic output control is readily obtained with the Type 1263 Amplitude-Regulating Power Supply.

2.6 SQUARE-WAVE MODULATION. Amplitude modulation, obtained by ac voltages superimposed on the dc plate voltage of the oscillator tube, introduces undesirable frequency modulation, which increases rapidly with carrier frequency. Square-wave modulation that turns the oscillator on and off eliminates this difficulty. Ordinarily considerable square-wave power is required to turn the oscillator off completely or to give large output if the dc plate voltage is eliminated. To obtain satisfactory operation with low power, the circuit is changed with the selector switch in the SQUARE WAVE position, as shown in Figure 3. The large resistor, R6, in the grid circuit is no longer bypassed by R2 and R3 and makes the oscillator unstable so that it can be modulated with relatively low power. Good square-wave modulation from about 100 to 5000 cps can be obtained, with square-wave input as shown in Figure 4. Figure 5 shows the output produced if sine waves are applied with the selector switch in the SQUARE WAVE position. In square-wave modulation, plate current flows only half the time, and the voltage drop in the large plate circuit series resistor is reduced. To prevent a rise of voltage at the oscillator tube, a shunt resistor (R9) is added when the selector switch is in the SQUARE WAVE position.

> The Type 1263-B Amplitude-Regulating Power Supply, a compatible unit instrument, is recommended for use as a square-wave modulator for the oscillator, in addition to its primary function as a power supply.

2.7 PULSE MODULATION. For pulse modulation, the d-c plate supply is removed when the selector switch is in the PULSE position, and negative pulses are applied to the cathode. For full output, 150 volts are required. The leading edge of the pulse is delayed from about 3 to 10

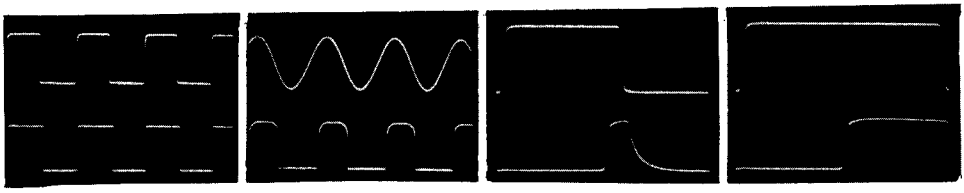


Figure 4. Square-wave modulation. The rise-and-fall time is faster in r-f output than in input.

Figure 5. Sine-wave input, square-wave output.

Figure 6. 6-μsec input, 1-μsec output pulses.

Figure 7. 10-μsec input pulse, 5-μsec output pulse.

Oscillograms of Modulation Waveforms. Repetition rate is 100 cps. Upper traces are input waveforms; lower traces output waveforms.

microseconds, depending on carrier frequency and load. The decay time is of the order of 0.5 microsecond. While this performance is not adequate for faithful reproduction of short pulses, it is possible to obtain reasonably good output pulses as short as 1 microsecond. If a monitoring scope is available, the input pulse can be adjusted to equal the observed rise time and the desired pulse length. Characteristic 1- and 5-microsecond output pulses, obtained with input pulses of 6 and 10 microseconds, at 1500 Mc, are shown in Figures 6 and 7.

2.8 FREQUENCY INCREMENTS. Small frequency variations, of the order of 20 kc to 100 kc, can be obtained as the resistance in the grid circuit is varied mechanically. The 1000-ohm resistor (Δf) at the top of the main casting is provided for this purpose. In series with this variable resistor is a fixed resistor of 2000 ohms and a telephone jack that is normally closed. (See Figure 3.) An increase in the grid circuit resistance beyond 3000 ohms tends to make the oscillator unstable, but bias voltages with low internal impedance can be introduced at the telephone jack to change the frequency by about 0.1 percent. Since the entire grid circuit is below ground potential, the grounded modulator jack on the front panel cannot be used for this purpose, and a second jack has been provided. (See J3, Figure 8.) The circuit can be used for electronic frequency control in a closed-loop system as well as for frequency modulation and for sweeping. Sweeping with the saw-tooth output of an oscilloscope can be used for panoramic presentation.

Section 3

INSTALLATION

3.1 GENERAL RADIO UNIT POWER SUPPLIES. The Type 1218-A Unit Oscillator is shipped with the oscillator tube in place and ready for use with the General Radio Type 1203-B Unit Power Supply. The power cable of the oscillator plugs directly into the multipoint connector of the power supply. A series resistor in the oscillator plate circuit prevents overloading of the oscillator tube under various conditions of load and line voltage. This resistor has been adjusted for the Type 1203-B Power Supply by short-circuiting terminals 1 and 2 at the lower right-hand side of the unit.

The General Radio Type 1201-B Unit Regulated Power Supply and the Type 1263-B Amplitude-Regulating Power Supply have lower plate voltages. To obtain increased output when these power supplies are used, a 3900-ohm shunting resistor should be connected across terminals 2 and 3, thereby halving the effective value of the existing internal 3900-ohm resistor, R5. Terminals 1 and 2 should still be shorted. A suitable 2-watt resistor has been supplied for this purpose. It is stored in parallel with the short circuit of terminals 1 and 2.

3.2 OTHER POWER SUPPLIES. Satisfactory operation can be obtained with other power supplies having a plate supply of 350 volts at 30 milliamperes and an ungrounded 6.3-volt, 60-cycle heater supply at 0.27 ampere. For higher or lower plate supply voltages, the plate circuit series resistors may have to be changed to prevent overloading or for full output. Plate and grid current can be measured conveniently with the modulation switch in the CW position. Plate current, measured at the modulation jack on the front panel, should not exceed 25 ma. Grid current, measured at the phone jack under the right-hand oscillator shield, should not exceed 8 ma. (Full plate voltage appears between the phone jack and ground.) Ordinarily, the first indication of overload is excessive grid current at low frequencies. To correct this condition, increase the plate circuit series resistor at terminal 1, 2, or 3, or reduce the plate supply voltage. If a 6-volt battery is used for the heater, the built-in rectifier and filter resistor should be shorted. The heater current is 0.135 ampere dc.

3.3 FREQUENCY AND OUTPUT. Frequency and output are adjusted readily by means of the frequency dial in front and the output control at the left-hand side of the oscillator. Small frequency increments of the order of 20-100 kc, depending on carrier frequency, can be obtained by means of the Δf knob on the top of the instrument.

A three-foot, 50-ohm coaxial cable serves to make connections to the oscillator. Adaptors for most commonly used connector systems are available.

Section 4

OPERATING PROCEDURE

4.1 PLATE CIRCUIT MODULATION. For unmodulated output, automatic output control, or amplitude modulation, place the MOD. switch in the CW position. As shown in Figure 3, the plate circuit can be opened by means of a phone plug at the MOD. jack on the front panel. This permits the insertion of control voltage or a variable control resistance. One side of the jack is ground. A voltage that is positive with respect to ground reduces the output.

For amplitude modulation, audio power can be inserted at the panel jack. An oscillator plate current of 30 ma must pass through the audio oscillator output system. About 30 volts are required for 30-percent amplitude modulation. Since incidental frequency modulation will be about 0.1 percent, this type of modulation is undesirable for many applications.

For automatic output control, the Type 1263-B Amplitude-Regulating Power Supply is recommended to hold the output constant as frequency or load is changed. To monitor the output, a Type 874-VR Voltmeter Rectifier with a Type 874-R22A Patch Cord should be used.

4.2 SQUARE-WAVE MODULATION. If modulation is required to allow the use of high-gain audio amplifiers after an rf detector, the MOD. switch is usually set to the SQUARE WAVE position. For best results, and to avoid incidental fm, square waves should be inserted at the MOD. jack. Thirty volts peak to peak with a 2500-ohm internal impedance is adequate. The Type 1264 Modulating Power Supply with the Type 1264-P2 Adaptor Cable is recommended. If sine waves are used instead of square waves, with the switch in the SQUARE WAVE position, some incidental frequency modulation will exist. At frequencies under 100 and over 5000 cps, and with long or short pulses instead of square waves, the output waveform may be erratic.

The peak output under square-wave modulation is approximately the same as that in the CW position of the MOD. switch, since the plate voltage of the oscillator tube is held to approximately the same value in both conditions by the addition of the 10,000-ohm resistor R9.

The Type 1210-C Unit R-C Oscillator or the Type 1217 Unit Pulser (set to square waves) is recommended for square-wave modulation. Each instrument requires a Type 1203 Unit Power Supply.

4.3 PULSE MODULATION. For pulse modulation when low-power square-wave modulation is not possible, the MOD. switch is set to the PULSE position.

For full output, negative 150-volt pulses are required at the MOD. jack. The input resistance of the oscillator is about 5000 ohms. Since the build-up time of the oscillator may vary from 3 to 10 microseconds, an oscilloscope should be used to observe the output pulses. The build-up time varies with frequency and load and is determined largely by the tracking of the two ganged tuned circuits. The decay time is about 0.5 microsecond.

The Type 1217 Unit Pulser, the Type 1203 Unit Power Supply, and the Type 1264-A Modulating Power Supply are recommended for pulse modulation.

4.4 FREQUENCY MODULATION. As mentioned in paragraph 2.8, a modulating voltage can be introduced in the grid circuit to produce frequency modulation. Because the frequency swing produced by a given modulating voltage varies widely over the frequency range and may not be the same for all instruments, operating conditions for this type of modulation must be determined by experiment.

4.5 MECHANICAL SWEEP. The General Radio Type 1750-A Sweep Drive has been developed for automatic tuning of Unit Oscillators and other instruments. The reciprocating output shaft of this Sweep Drive is connected to the tuning control of the oscillator by means of a short flexible shaft and a universal clutch. Three controls on the Sweep Drive allow independent adjustment of sweep speed, sweep arc, and center position of the sweep while the drive is in motion.

Unlike electronic sweep oscillators, which can be operated indefinitely without causing wear, the mechanically driven Type 1218-A Unit Oscillator should be used sparingly and only at slow speeds. The Sweep Drive can be coupled to the vernier knob (2 in. dia) to sweep over small ranges, or directly to the calibrated dial to sweep over the full range from 900 to 2000 Mc. To couple to the large dial, remove the two small screws from the black cover, under the vernier dial. To prevent excessive wear of the sliding contacts and other moving parts, do not operate the Type 1218-A Unit Oscillator at sweep speeds over one cycle per second. Sweep only during actual observation. Do not set up for continuous operation.

The Type 1263-B Amplitude-Regulating Power Supply is recommended to keep the output of the Unit Oscillator constant as frequency is varied by the Sweep Drive.

Section 5

SERVICE AND MAINTENANCE

5.1 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.

5.2 MAINTENANCE.

5.2.1 GENERAL. To obtain access to the drive mechanism under the left-hand shield, remove the output control knob. Always replace the spring washer and collar under the knob to reduce leakage.

CAUTION

Since the 300-volt B supply is grounded at the potential of the oscillator plate, all grid and cathode circuits are high against ground. This includes the cast oscillator housing under the right-hand shield, and the cathode line drive, the aluminum pulley, the beryllium band, and the rectifier and filter under the left-hand shield.

To obtain access to the resistors and capacitors mounted on the main casting, and to the modulation switch, the vernier drive and the calibrated dial must be removed. When replacing the dial, use the reference mark below 900 Mc. This mark corresponds to a definite mechanical stop in the plate line.

5.2.2 FINGER CONTACTS. When smooth frequency adjustment is no longer possible, clean the surfaces on which the finger contacts operate, using carbon tetrachloride. Lubricate these surfaces with a thin film of Lubrico (MD-T-419, Master Lubricant Co., Philadelphia) and clock oil. To obtain access to the grid cathode line, remove the large round shield on the right-hand side of the oscillator and remove the flat cover of the oscillator housing. To obtain access to the grid plate line, remove the oscillator tube, in accordance with paragraph 5.2.3.

5.2.3 REMOVAL OF OSCILLATOR TUBE. (See Figure 8.) The Type 5675 Oscillator Tube used in the Type 1218-A Unit Oscillator has no socket. The two heater leads are connected to the heater terminals (A_1, A_2) by small, bare wires, which are soldered to the heater terminals and wound around the heater leads. To remove the tube, unsolder the leads from the terminals and unwind them from the heater leads. Lift out the short extension of the cathode line at the tube end after removing two small screws (B_1, B_2). Loosen screws (C_1, C_2, and C_3) and remove the pressure ring that holds the two tube clamp rings. When installing a tube, insert the first tube clamp ring with the fingers bent up, plug the tube into the end of the plate line and insert the second tube clamp ring with the fingers bent down. After installing the pressure ring and the end section of the cathode line, solder new wires to terminals (A_1, A_2) and wrap carefully around the cathode leads of the tube. (No. 30 bare copper wires are supplied for this purpose.)

5.2.4 REPLACEMENT OF THE OSCILLATOR TUBE. The oscillator tube is a Type 5675 UHF Medium-Mu Triode of pencil-type construction. These tubes are available from several manufacturers. Experience has shown that, while most tubes can be used in the Type 1218-A Unit Oscillator, tubes of the same make agree more closely in frequency calibration. Tubes of different manufacture may differ by several percent at the high-frequency end of the range. Small discrepancies can be minimized by realignment of the calibrated dial, but best results are assured by a tube of the same make.

Failure of the oscillator to give full output does not always indicate that the tube should be replaced. Tracking of the tuned plate and cathode lines is very important, and should always be checked before a tube is replaced for low output, and after a new tube has been installed.

At least 200-milliwatt output into a 50-ohm load should be obtained at all frequencies. Output is best measured with a power meter, but good indications can be obtained with a voltmeter and a termination.

The Type 874-VR Voltmeter Rectifier with Type 874-VI Voltmeter Indicator and Type 874-W50 Termination is suitable for this measurement. Type 874-G10 (10 db) or Type 874-G20 (20 db) Fixed Attenuators are also needed.

5.2.5 TRACKING ADJUSTMENT. In normal operation, plate current does not change much over the entire frequency range, and should be 15 to 25 ma. Grid current usually varies from 6 ma at low frequencies to 1 ma at 2000 Mc. Plate and grid current should be measured in accordance with paragraph 3.2. If both plate and grid current are low in an oscillator that has been operating satisfactorily, a faulty tube is indicated. If plate current is normal or high, and grid current low or zero at some frequencies, adjust tracking.

After a new tube has been installed, the plate series resistor may have to be changed by changing the interconnections of terminal 1, 2, or 3. Increased plate voltage may also improve operation of an old tube.

Tracking between plate and cathode circuits depends on the relative position of two tuning elements, which are ganged by a 1/4-in. beryllium band. (See Figure 9.) This band is coiled on two pulleys, and tension is maintained by a cord that runs over a small third pulley. The diameters of the two larger pulleys determine the relative motion of the tuning elements. These diameters are fixed, but a small adjustment at high frequencies is provided by an arm, which interferes with the beryllium band and causes the cathode tuning to move faster. This arm is mounted on a metal ring, which rides on the large insulating pulley on the main drive shaft. (The arm is not visible in Figure 9.) To adjust the arm, rotate the metal ring on the large pulley.

To check tracking, loosen the two setscrews of the large insulating pulley with a 3/32 Allen wrench to see if higher output can be obtained by readjustment. (For convenience, use the Allen wrench as a lever to turn the pulley on its shaft.) Turning the pulley changes the tuning of the cathode line. At low frequencies, only one position of the cathode tuning will give output and grid current. At high frequencies, three positions will be found, but obviously only one of these can be used. For best results, set tracking at about 1800 Mc for maximum output. Output at lower frequencies will then be correct, even though not at maximum.

The adjusting arm mentioned above contacts the beryllium copper band soon after 1800 Mc. Output at 2000 Mc and beyond is sometimes critically affected by the position of the arm. Adjustment may be necessary after a tube change.

To increase output near 900 Mc, adjust the No. 6 brass screw through the side of the cast oscillator housing. This screw is situated

between two pairs of nylon screws, and is secured by a locknut. Do not use this adjustment beyond the point where grid current exceeds 8 ma.

The pulley adjustment described above may be required if the beryllium band has stretched. It may also be required due to the slipping of a setscrew on the drive pinion, on the two large pulleys, or on the arm that sweeps over the cathode line. After any adjustment, be sure to tighten all setscrews.

5.2.6 LUBRICATION. In addition to the care of the finger contacts described in paragraph 5.2.2, some lubrication of moving parts is required, particularly when the Sweep Drive is used for automatic tuning. The main drive shaft and the shaft of the cathode line tuner have ball bearings and do not require frequent attention, but the rack and pinion drive of the plate tuner, and particularly the gears of the precision drive on the front panel, should be inspected and lubricated from time to time. The two small rolls that press the rack against the pinion, and the small idler pulley should always move freely when frequency is changed.

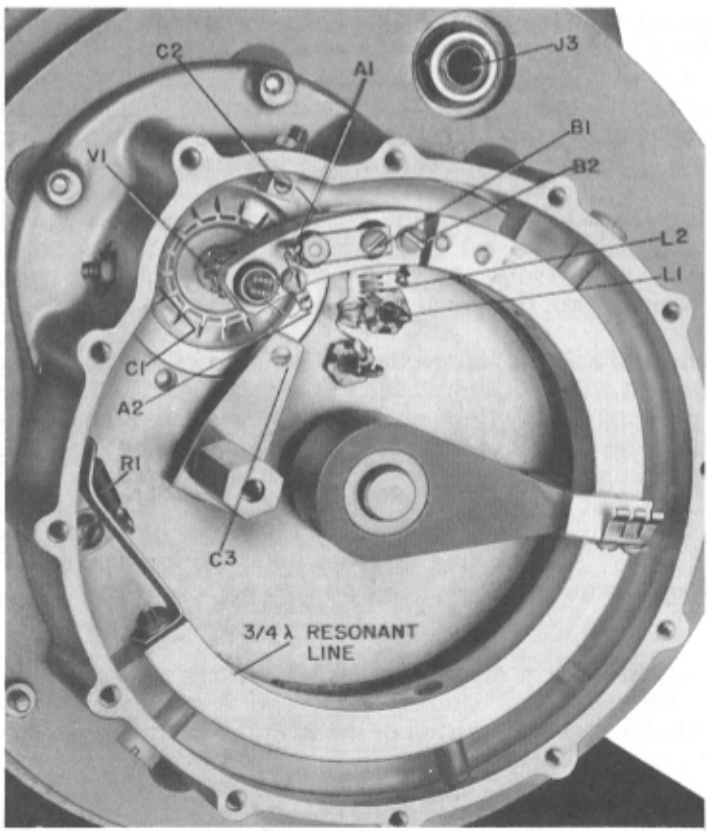


Figure 8. Right-Hand End of Oscillator, Cover Removed.
(NOTE: A1, A2, B1, B2, C1, C2, and C3 refer to paragraph 5.2.3.)

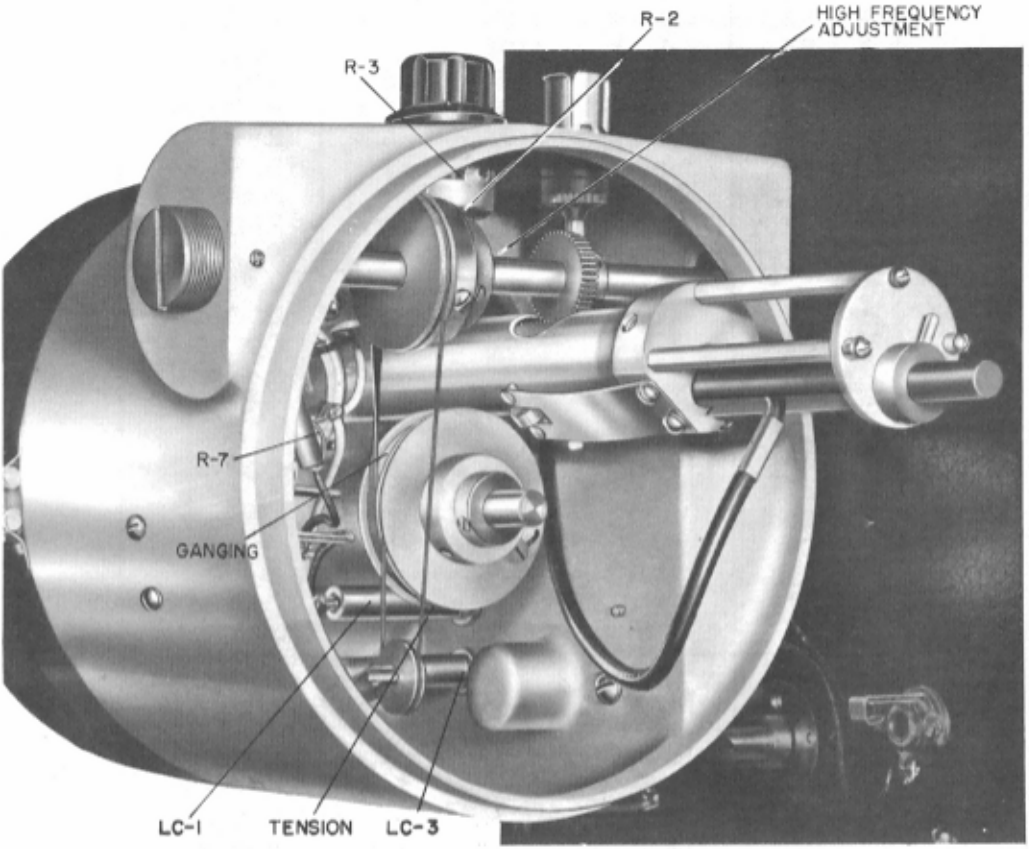


Figure 9. Left-Hand End of Oscillator, Cover Removed.

Section 6

					GR NO. (Note A)
RESISTORS (Note B)	R1	75	± 5%	1/2 w	REC-20BF
	R2	2 k	± 5%	1 w	REPO-45
	R3	1 k	±10%		POSC-7
	R4	5.6 k	±10%	5 w	REPO-22
	R5	3.9 k	±10%	5 w	REPO-22
	R6	6.8 k	±10%	5 w	REPO-22
	R7	3.3	±10%	1 w	REW-3C
	R8	25 k	±10%		POSC-11
	R9	10 k	±10%	5 w	REPO-43
CAPACITORS (Note C)	C1	27μμf	±10%		COC-3
	C2	27μμf	±10%		COC-3
	C3	Built in			
	C4				
	C5				
	C6	10	450 dcwv		COE-5
	C7	10			
	C8	1500			
	C9	750	10 dcwv		COE-9
	C10	750			
	C11	4	450 dcwv		COE-32
MISCELLANEOUS		Jack			874-370
	J2	Jack			CDSJ-10
	J3	Jack			CDSJ-10
	L1	Inductor			1218-803
	L2	Inductor			1218-803
	L3	Inductor			1218-94
	LC1	Low-Pass Filter			1218-203
	LC2	Low-Pass Filter			1218-203
	LC3	Low-Pass Filter			1218-203
	PL1	Plug			1218-20
	RX1	Rectifier			2RE-18
	S1	Switch			SWRW-120

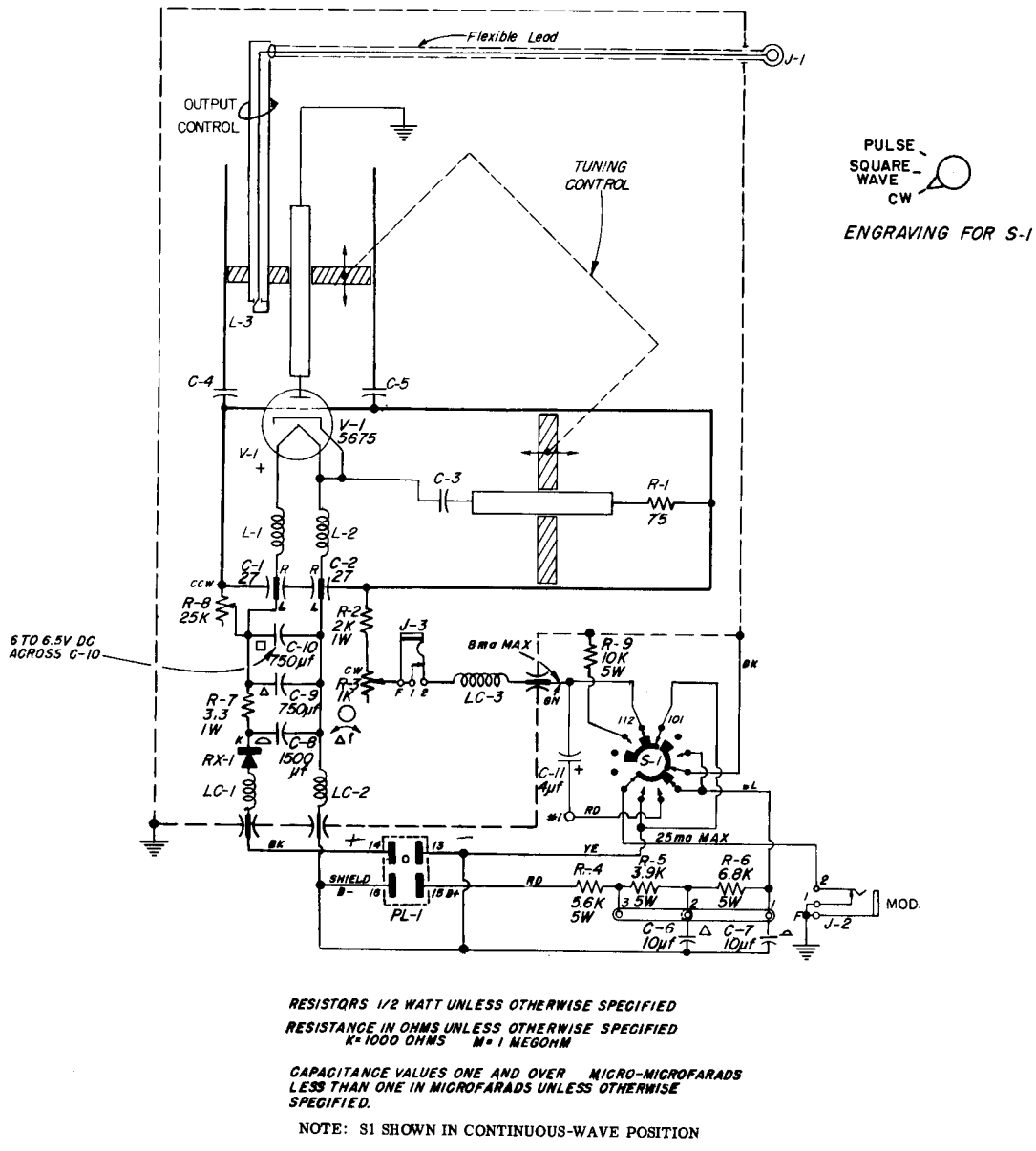
NOTES

(A) Type designations for resistors and capacitors:

COC - Capacitor, ceramic
COE - Capacitor, electrolytic
POSC - Resistor, variable, composition
REC - Resistor, fixed, composition
REPO - Resistor, fixed, power
REW - Resistor, fixed, wirewound

(B) All resistances are in ohms, except otherwise indicated by k (100 Ω).

(C) All capacitances are in microfarads, except as otherwise indicated by μμf (micromicrofarads).



RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED

RESISTANCE IN OHMS UNLESS OTHERWISE SPECIFIED
K=1000 OHMS M=1 MEGOHM

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

NOTE: S1 SHOWN IN CONTINUOUS-WAVE POSITION

Figure 10. Wiring Diagram, Type 1218-A Unit Oscillator.

GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS

EMerson 9-4400 Mission 6-7400

DISTRICT OFFICES

NEW YORK

Broad Ave. at Linden, Ridgefield, N. J.
Telephone N.Y. WOrth 4-2722
N.J. WHitney 3-3140

PHILADELPHIA

1150 York Rd., Abington, Penna.
Telephone TUrner 7-8486
Philo., HAncock 4-7419

WASHINGTON

8055 13th St., Silver Spring, Md.
Telephone JUniper 5-1088

CHICAGO

6605 West North Ave., Oak Park, Ill.
Telephone VIllage 8-9400

LOS ANGELES

1000 N. Seward St., Los Angeles 38, Calif.
Telephone HOllywood 9-6201

SAN FRANCISCO

1186 Los Altos Ave., Los Altos, Calif.
Telephone WHitecliff 8-8233

CANADA

99 Floral Pkwy., Toronto 15, Ont.
Telephone CHerry 6-2171

REPAIR SERVICES

EAST COAST

General Radio Company
Service Department
22 Baker Ave., W. Concord, Mass.
Telephone EMerson 9-4400

NEW YORK

General Radio Company
Service Department
Broad Ave. at Linden, Ridgefield, N. J.
Telephone N.Y. WOrth 4-2722
N.J. WHitney 3-3140

MIDWEST

General Radio Company
Service Department
6605 West North Ave., Oak Park, Ill.
Telephone VIllage 8-9400

WEST COAST

General Radio Company
Service Department
1000 N. Seward St., Los Angeles 38, Calif.
Telephone HOllywood 9-6201

CANADA

Bayly Engineering, Ltd.
First Street, Ajax, Ontario
Telephone Toronto EMpire 2-3741

Printed in USA

(Representatives in Principal Overseas Countries)