OPERATING INSTRUCTIONS

TYPE 1360-B

MICROWAVE OSCILLATOR

GENERAL RADIO COMPANY

B

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TYPE 1360-B
MICROWAVE OSCILLATOR

Form 1360-0100-B
May, 1964

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

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SPECIFICATIONS

FREQUENCY

Range: 1.7 to 4.1 Gc in two ranges. The 1.7 to 2.8 Gc range is covered in approximately 5 1/2 turns of the tuning control, and the 2.6 to 4.1 Gc range in approximately 9 turns. The tuning control carries a 100-division interpolation scale.

Fine Frequency Control (ΔF): Order of 1 Mc, but not functioning for square-wave modulation.

Accuracy: ±1%.

Stability: Warm-up drift under laboratory conditions is approximately 0.15% during the first hour; total drift, approximately 0.25%. After warm-up, average frequency observed in a one-second measurement interval is stable within approximately 5 ppm over a 10-minute period.

Residual FM: Approximately 0.5 ppm in the lower-frequency range and 0.2 ppm in the higher. Dominant frequencies are 60 and 120 cps (with 60-cycle line frequency).

OUTPUT

Power: At least 20 mw from 1.7 to 2.1 Gc; at least 50 mw from 2.1 to 4.1 Gc.

Attenuator: Relative calibration; 1 db per division over 70-db range.

INTERNAL MODULATION

Narrow-Band Sweep: Maximum sweep ranges from 1 to 3 Mc, depending on carrier frequency (minimum sweep is approximately 15% of maximum sweep); 1-kc and power-line frequency sweeps are provided internally. Negative trigger pulse supplied.

Square-Wave: 1 kc, adjustable approximately ±5%.

EXTERNAL MODULATION

FM: Sensitivity approximately 0.1 to 0.2 Mc per volt; input impedance, 400 kilohms and 70 pf (ac only).

Square-Wave: 50 cps to 200 kc, 12-v (rms) sine wave or 20-v (peak-to-peak) square wave; 20% minimum duty cycle from external source. Input impedance greater than 100 kilohms.

Pulse: Rise and fall times approximately 0.2 μsec, minimum length approximately 0.5 μsec, jitter may be 0.2 μsec. Input impedance 100 kilohms; driving-pulse amplitude, 20 v peak, positive-going polarity; maximum duty cycle 20%.

GENERAL

Terminals: RF output—Type 874 Locking Coaxial Connector. Modulation input and trigger output binding posts.

Mounting: Bench or relay rack.

Power Input: 105 to 125 (or 210 to 250) volts, 50 or 60 cps, 85 watts. Instrument will operate satisfactorily (except for line-frequency sweep) at power-line frequencies up to 400 cps.

Accessories Supplied: Type 874-R22LA Patch Cord, Type CAP-22 Power Cord, and spare fuses.

Dimensions: Width 19, height 7 1/2, depth 15 1/2 inches (485 by 195 by 395 mm), over-all; panel, 19 by 7 inches (485 by 180 mm).

Net Weight: 38 pounds (17.5 kg).

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

General Radio *Experimenter* reference: Vol 36, Nos 1 and 2, January-February 1962.

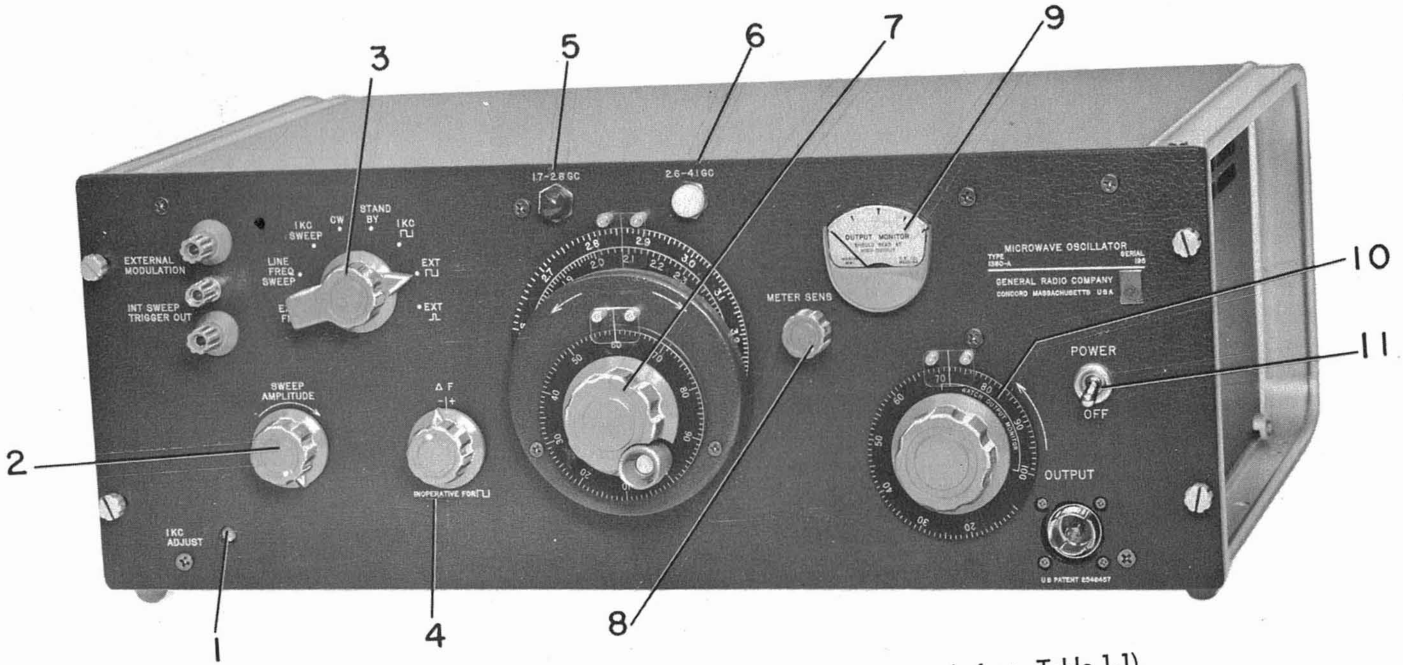


Figure 1-1. Panel view of the Type 1360-B Microwave Oscillator (refer to Table 1-1).

SECTION 1

INTRODUCTION

1.1 PURPOSE.

The Type 1360-B Microwave Oscillator (Figure 1-1) is a general-purpose test oscillator with a frequency range of 1.7 to 4.1 Gc. In addition to its general usefulness as a microwave signal source, its relatively high output power makes this oscillator particularly useful for attenuation and antenna measurements where detector sensitivity is sometimes a problem.

1.2 DESCRIPTION.

1.2.1 GENERAL.

The oscillator in the Type 1360-B is a type 5836 reflex klystron in a coaxial cavity with a noncontacting tuning plunger. The frequency range of 1.7 to 4.1 Gc is covered in two modes with internal mode switches which operate from the main tuning knob. An internal 1-kc RC phase-shift oscillator provides square-wave amplitude modulation and linear frequency sweep over a narrow band. The same sweep can also be obtained at the power-line frequency (50 to 60 cps). For square-wave modulation at other frequencies or for pulse modulation, an external modulator must be used. The Type 1217-B Unit Pulse Generator is recommended for pulse and square-wave modulation and the Type 1210-C Unit RC Oscillator is recommended for square-wave modulation. The EXT FM position of the modulator switch permits ac coupling to the repeller for frequency modulation or sweep.

1.2.2 CONTROLS AND INDICATORS

Controls and indicators on the Type 1360-B Microwave Oscillator are listed and described in Table 1-1.

TABLE 1-1
CONTROLS AND INDICATORS

Ref. Fig. 1-1	Name	Type	Function
11	POWER	Toggle switch	Turns power on or off.
10	OUTPUT	Continuous rotary control with dial	Output attenuator. Reads relative db directly, below 70 on dial. Watch meter for overcoupling at high output.
8	METER SENS	Continuous rotary control	Changes sensitivity of output-monitor meter.
4	ΔF	Continuous rotary control	Fine-frequency adjustment. Not operative for square-wave modulation.
2	SWEEP AMPLITUDE	Continuous rotary control	Changes bandwidth of internal sweep.
1	1 KC ADJUST	Screw-driver control	Frequency adjustment of internal 1-kc oscillator.
3		Eight-position rotary switch	Modulation selector.
7		Continuous rotary control with main dial and vernier	Main frequency control. Colored arrows indicate direction to turn for range switching.
5	1.7 - 2.8 GC	Red pilot light	Glows when the instrument is operating in the 1.7-to-2.8 Gc range and the red frequency scale should be read.
6	2.6 - 4.1 GC	White pilot light	Glows when the instrument is operating in the 2.6-to-4.1 Gc range and the white frequency scale should be read.
9	OUTPUT MONITOR	Meter	Indicates relative rf power.

TABLE 1-2

CONNECTORS

Name	Type	Function
EXTERNAL MODULATION	Binding post	Input connection for external fm, square-wave, and pulse modulation.
INT SWEEP TRIGGER OUT	Binding post	Negative trigger output for line-frequency and 1-kc sweep.
OUTPUT	Type 874 Coaxial Connector	Rf output connector.
	Three-terminal male connector	Connection for power line.

1.2.3 CONNECTORS.

Connectors on the Type 1360-B Microwave Oscillator are listed and described in Table 1-2.

1.3 ACCESSORIES SUPPLIED.

Supplied with the Type 1360-B Microwave Oscillator are a Type 874-R22LA Patch Cord, a Type CAP-22 Three-Wire Power Cord, and spare fuses.

1.4 COAXIAL ADAPTORS

As with similar General Radio equipment, the Type 1360-B Microwave Oscillator uses the low-VSWR, quick-connect, Type 874 coaxial connector. However, for the user wishing to mate the oscillator to components fitted with coaxial connectors of some other series, it is a simple matter to adapt the instrument to that series (see Figure 1-2).

Type 874 adaptors to leading commercial and military coaxial series are available to convert the OUTPUT connector to the desired type. The preferred adaptors are listed in Table 1-3.

Because the OUTPUT connector is recessed, the adaptor will protrude less than one inch beyond the panel. Over-all VSWR of the converted Type 874 connector is typically no greater than that of the other-series connector by itself, and leakage at the 874 joint is typically better than 120 db down.

A comprehensive assortment of special coaxial devices and instruments based on the Type 874 50-ohm design are available to complement the oscillator; a complete listing is given at the back of this manual.

TABLE 1-3

TYPE 874 LOCKING COAXIAL ADAPTORS TO OTHER SERIES

Adapts	Type	Contains 874 and...	Connects Type 874 to...	Part Number
TO TYPE BNC	874-QBJL	BNC Jack	BNC Plug	0874-9701
TO TYPE C	874-QCJL	C Jack	C Plug	0874-9703
TO TYPE MICRODOT	874-QMDJL	Microdot Jack	Microdot Plug	0874-9721
TO TYPE N	874-QNJL	N Jack	N Plug	0874-9711
TO TYPE SC	874-QSCJL	SC Jack	SC Plug (Sandia)	0874-9713
TO TYPE TNC	874-QTNJL	TNC Jack	TNC Plug (Sandia)	0874-9717

NOTES

Types preferred for use with the Type 1360-B. These are locking types terminating in jacks; they adapt to connector series appropriate for the 1.7 to 4.2 Gc frequency range.

Refer to the table at the rear of the manual for the complete listing of Type 874 adaptors.

1.5 OTHER COAXIAL ACCESSORIES.

1.5.1 GENERAL.

An important consideration in the operation of a microwave oscillator is the possibility of interaction with mismatched loads and consequent effects on amplitude and frequency stability. Impedance changes and reflections occuring in instruments being driven by the oscillator, or in terminal elements, can cause frequency pulling. To avoid this possibility, routine insertion of an appropriate buffer element, such as an attenuator or isolator, is suggested.

1.5.2 ATTENUATOR PADS.

In the usual installation in which no question of output-power adequacy exists, Type 874-G Fixed Attenuators are recommended. These attenuator pads are available in 3-, 6-, 10-, and 20-db values. They are fitted with Type 874 connectors at both ends and can be purchased with either locking or nonlocking versions, depending upon leakage considerations.

1.5.3 FERRITE ISOLATORS.

For applications that require maximum power transfer, the Type 874-H2000L Isolator will meet the need. It is a compact, broadband, one-way transmission device with a 1.0-db (maximum) insertion loss in the forward direction and a minimum 20-db attenuation in the reverse direction. Connectors are locking Type 874 at both ends.

1.6 SWEEP-DRIVE ACCESSORIES.

1.6.1 GENERAL.

To extend the built-in narrow-band sweep capability of the Type 1360-B, General Radio has available a comprehensive array of automatic attachments suitable for sweeping the oscillator frequency over a considerable portion of its range. Such accessories are used principally in plotting output amplitude as a function of frequency for a variety of rf networks. These sweeping devices are useful in many laboratory applications and in production testing to furnish accurate, graphic performance records.

For narrow-band sweeping the variation of oscillator output with frequency may be small enough to be neglected, and the response of the network under test may be monitored by means of a diode detector, such as the Type 874-VQ, driving an oscilloscope or recorder. For wider-band sweeping, input to and output from the network under test must be both monitored and applied to a ratiometer in order to compensate for the variation in oscillator output with frequency.

All General Radio sweep drive accessories have in common a 60-cps motor capable of driving the main frequency control of the oscillator. Drive is accomplished through a set of reduction gears attached to the motor shaft.

The drives vary chiefly in the amount of adjustment versatility offered, in the type of display device with which they are to be used, and in the ease with which they can be attached. They are listed in Table 1-4. Complete installation and operating instructions are supplied with each.

TABLE 1-4

SWEEP ATTACHMENTS

Type	Name	Recommended Display	Part Number
1750-A	Sweep Drive	Oscilloscope	1750-9701
907-R144	Dial Drive	X-Y Recorder	0907-9885
908-P1	Synchronous Dial Drive	Graphic Recorder	0908-9601
908-P2	Synchronous Dial Drive	Oscilloscope	0908-9602

1.6.2 AUTOMATIC WIDE-RANGE DATA DISPLAY.

The Type 1750-A Sweep Drive is the easiest sweep device to use and offers the widest adjustment latitude. It can be adjusted (in 30-degree steps) to sweep, in reciprocating motion, any arc up to 300 degrees, at speeds ranging from 0.5 to 5.0 cps. For narrow-band sweeping, it attaches directly to the knob of the main frequency control of the Type 1360-B and requires no physical alteration of the oscillator. An adjustable clutch mechanism slips over the control knob and locks easily in place to complete the attachment. Sweep widths up to at least 90 Mc are attainable at the low-frequency end of each band, and increase to at least 200 Mc at the high-frequency end of each band.

For wider-band sweeping, the dial cover of the Type 1360-B may be removed to permit attachment of the sweep drive directly to the dial. Sweep widths up to the whole 1.7 to 2.8 Gc range are attainable, and up to 1.4 Gc in the 2.6 to 4.1 Gc range. When the main frequency control is coupled to the sweep drive, the sweep rate should be restricted to one excursion per second or less. The slow-motion dial can be driven at rates up to 5 cycles per second.

This accessory is useful primarily for the automatic presentation on an oscilloscope of the frequency-response curve of a device under test. The sweep shaft is driven through an adjustable rack-and-differential

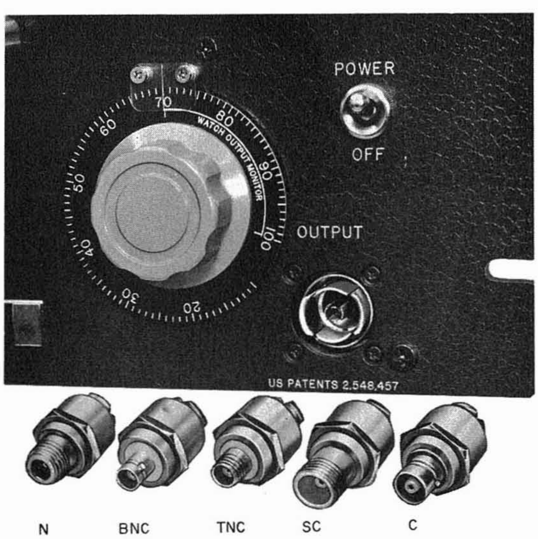


Figure 1-2. Type 874 Adaptors quickly and easily convert the output connector of the Type 1360-B to other popular coaxial series.

mechanism. Sweep frequency, arc, and center position are all adjustable, even while the drive is in motion. An adjustable limit switch can be set to stop the drive when predetermined limits of motion of the drive shaft are reached.

With an appropriate dc bias, an internal potentiometer circuit provides a horizontal deflection voltage proportional to shaft angle; a blanking circuit is also included to eliminate the return trace and produce a base line.

1.6.3 X-Y RECORDER SWEEP.

The Type 907-R144 Dial Drive will sweep the oscillator at a single, fixed rate and will also supply a sweep voltage proportional to the angle of rotation. The sweep width can be adjusted by means of dial stops provided with the drive, up to the full range of either band of the oscillator. Dial resolution is 0.4 degree. The dial drive is intended primarily to be used for automatic plotting with an X-Y recorder. It can also be used with a dc oscilloscope with a long-persistence display. The self-reversing, synchronous motor in the drive rotates the frequency control at a rate of 144 degrees per minute and also rotates a 50-kilohm potentiometer which, with an external dc bias across it, produces an output voltage proportional to the dial position. The motor can be switched off and/or disengaged from the frequency control to permit manual operation of the instrument. The potentiometer remains engaged with the dial regardless of the method of operation, to facilitate adjustment before recording. Adjustable sweep stops, to reverse the motor automatically, are included.

Drive is accomplished by means of a pinion gear connected to the motor shaft through a set of reduction gears mounted in a sealed assembly with the motor. The pinion engages the drive shaft of the main frequency control of the oscillator. The drive replaces the knob, cover plate, and pinion assembly of the control, which are removable as a unit for convenient installation.

1.6.4 UNREFERENCED SWEEPS.

The Type 908-P1 and 908-P2 Synchronous Dial Drives are available for applications in which sweep-position information is not critical. However, because the drive motors are synchronous, they can still be used in recording systems with satisfactory results, particularly if the drive of the recorder is synchronous. The sweep width can be adjusted, by means of dial stops, up to the full range of either band of the oscillator.

The Type 908-P1 is a slow-speed drive (114 degrees per minute), best suited for graphic-recorder display. The Type 908-P2 will sweep at a rate of 1080 degrees per minute and is compatible with an oscilloscope display.

Stops, which are included with both dial drives, can be attached to limit the travel of the sweeping drive to the desired part of the range. In addition, the stops automatically reverse the drive.

These drives also replace the knob, cover plate, and pinion assembly of the oscillator main-frequency control.

SECTION 2

INSTALLATION

2.1 MOUNTING.

The Type 1360-B Microwave Oscillator is supplied equipped either for bench or for relay-rack mounting.

For bench mounting (Type 1360-BM), aluminum end frames are supplied to fit the ends of the cabinet (see Figure 1-1). Each end frame is attached to the instrument with two panel screws and four 10-32 Phillips-head screws with notched washers.

For rack mounting (Type 1360-BR), special brackets (Type ZSU-3-4) and hardware are furnished to attach the cabinet and instrument to the relay rack (see Figure 2-1). These brackets permit either cabinet or instrument to be withdrawn independently.

To install the instrument in a relay rack:

a. Attach each mounting bracket (A) to the rack with two 12-24 round-head screws (B). Use the inside holes on the brackets. The shelf lip must face in.

b. Slide the instrument into the brackets as far as it will go.

c. Insert the four knurled screws with attached washers (C) through the panel and the bracket and thread them into the rack. The washers are provided to protect the face of the instrument.

d. At the rear of the instrument, remove the two knurled screws that attach the cabinet to the chassis.

e. Install these knurled screws (D) plus 2 supplied with the brackets in each side of the cabinet, with clearance for the slot at the rear of the bracket.

To remove the instrument from the rack, remove only the four panel screws (C) and slide the instrument forward out of the rack. To remove the cabinet and leave the instrument mounted in the rack, loosen only the two thumb screws (D) at the rear of the brackets and pull the cabinet back off the instruments from the rear of the rack.

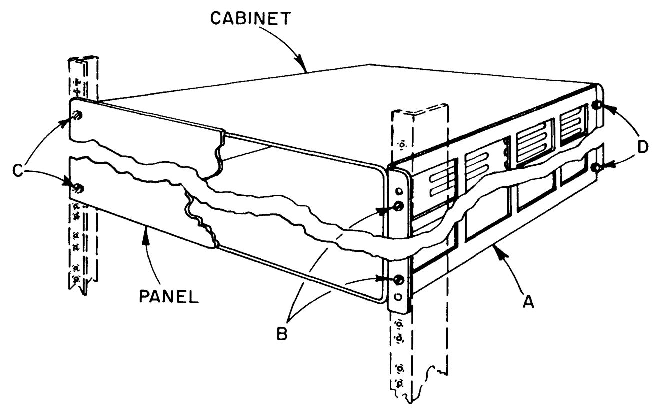


Figure 2-1. Installation of relay-rack model, Type 1360-B.

2.2 CONNECTION POWER.

Connect the Type 1360-B to a source of power as indicated on the chassis over the input socket at the rear of the instrument, using the power cord provided. The long cylindrical pin (ground) is connected directly to the metal case of the instrument.

While instruments are normally supplied for 115-volt operation, the power transformer can be reconnected for 230-volt service (refer to the schematic diagram, Figure 5-11). When changing connections, be sure to indicate on the chassis the correct input voltage and replace the 2-ampere line fuses with fuses rated at 1-ampere.

WARNING

Lethal voltages are present inside the cabinet when power is applied.

SECTION 3

OPERATING PROCEDURE

3.1 EQUIPMENT TURN-ON.

Throw the power switch to POWER and allow approximately one minute for the instrument to warm up; the klystron will not deliver power until its heater is up to normal temperature. Where high stability of output frequency is required, a warm-up period of one to two hours is recommended. Figure 3-1 shows typical warm-up frequency drift as a function of time.

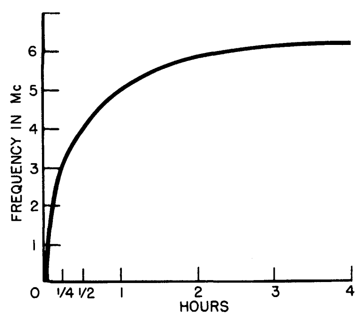


Figure 3-1. Typical warm-up frequency drift of the Type 1360-B Microwave Oscillator.

3.2 FREQUENCY SELECTION.

Select the desired operation frequency by means of the main tuning control; repeller tracking and range change do not require separate adjustment. The range in use is indicated by illumination of the appropriate pilot lamp. Range changing is accomplished automatically; to go from the 2.6 to 4.1 Gc range (white light on) to the 1.7 to 2.8 Gc range, tune in the direction of the red arrow to slightly above 4.1 Gc. Conversely, to change from the 1.7 to 2.8 Gc range (red light on) to the 2.6 to 4.1 Gc range, tune in the direction of the white arrow to slightly below 4.1 Gc.

3.3 POWER OUTPUT ADJUSTMENT.

Set the modulation switch to CW or to any of the internal-modulation positions, and increase the setting of the OUTPUT control by counterclockwise rotation until the OUTPUT MONITOR meter indicates. This indication should occur with the control in the region marked "WATCH OUTPUT MONITOR".

NOTE

To obtain maximum power output, always approach the final setting from the low output side; increase the setting only as long as the reading is increasing.

The setting for optimum output is a function of frequency. At high output settings the oscillator may react severely to changes in the load impedance; this can be minimized by use of an isolator, such as the Type 874-H2000L, between the oscillator output and the load. At most frequencies, setting the OUTPUT control to maximum will over-couple, resulting in either low and unstable output or no output at all. Figure 3-2 shows curves for optimum CW output power over the frequency range of the oscillator.

The output control is calibrated in decibels over the entire 70-db range below the "WATCH OUTPUT MONITOR" region. This calibration is useful in the measurement of receiver selectivity, filter insertion loss, and other similar characteristics.

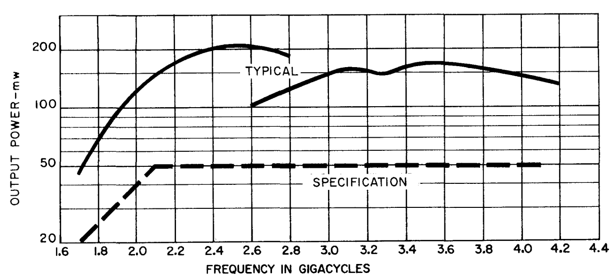


Figure 3-2. Output power frequency for the Type 1360-B. Variations of up to 2:1 are normal.

3.4 STANDBY OPERATION.

In the STAND BY position of the function selector, the output is turned off but the oscillator is ready for immediate operation in any desired mode, since its heater is kept on. This position is very useful in checking the zero of associated external equipment without disconnecting cables or resetting the output control.

3.5 MODULATION.

Select the desired type of modulation, using the eight-position rotary switch (3, Figure 1-1).

3.5.1 EXTERNAL FM.

In the EXT FM position of the selector switch, an external signal is connected through a blocking capacitor to the repeller of the klystron to permit frequency modulation. The peak-to-peak deviation attainable is a function of the oscillator frequency and of the allowable variation in oscillator output level with deviation. Maximum peak deviations range from about 1 to 2 Mc (lower at the lower carrier frequencies). The input required is 5 to 10 volts peak, per megacycle of peak deviation. The maximum voltage that should be applied is 50 volts peak or 35 volts rms; this voltage is sufficient to drive the repeller beyond its normal operating range. The Type 1217-B Unit Pulse Generator is suitable for pulse and square-wave fm, and the Type 1210-C Unit Oscillator is suitable for sine-wave and square-wave fm.

3.5.2 LINE SWEEP.

In the LINE FREQ SWEEP position of the selector switch, the oscillator is frequency-modulated with a sawtooth sweep at the power-line frequency. The swept bandwidth may be varied from a small value up to a maximum ranging from 1 to 3 Mc, depending on carrier frequency. A negative trigger pulse, of at least 65 volts amplitude for oscilloscope synchronization, is available at the INT SWEEP TRIGGER OUT terminal.

3.5.3 1-KC SWEEP.

In the 1 KC SWEEP position of the selector switch, the oscillator is frequency-modulated with a sawtooth sweep at a rate of 1 kc, adjustable over a range of ±5% by means of the 1 KC ADJUST screw-driver adjustment. The swept bandwidth may be varied from a small value up to a maximum ranging from 1 to 3 Mc, depending on carrier frequency. A negative trigger pulse, of at least 30 volts amplitude for oscilloscope synchronization, is available at the INT SWEEP TRIGGER OUT terminal.

3.5.4 INTERNAL SQUARE WAVE.

In the 1 KC ⊓⊔ position of the selector switch, the oscillator is 100-percent amplitude modulated with a square wave at a rate of 1 kc, adjustable over a range of ±5% by means of the 1 KC ADJUST screwdriver adjustment. This adjustment is useful in setting the modulation frequency to the center of the passband of a selective amplifier such as the Type 1232-A Tuned Amplifier and Null Detector. The rf fine-frequency adjustment, ΔF, does not operate in this position of the selector switch.

3.5.5 EXTERNAL SQUARE WAVE.

In the EXT ⊓⊔ position of the selector switch, the oscillator can be 100-percent amplitude modulated by means of an external square wave (or pulse of greater than 20% duty cycle) at rates between 50 cps and 200 kc. The external generator should deliver at least 12 volts rms (sine wave), or 20 volts peak-to-peak (square wave). The Type 1217-B Unit Pulse Generator or the Type 1210-C Unit Oscillator is suitable for this purpose. The rf fine-frequency adjustment, ΔF, does not operate in this position of the selector switch.

3.5.6 EXTERNAL PULSE.

In the EXT ⊓⊔ position of the selector switch, the oscillator can be 100-percent amplitude-modulated by means of an external pulse with a duty cycle up to 20% and a maximum repetition rate of 200 kc. The rf pulse rise and fall times are approximately 0.2 μsec; the rf pulse width may be as narrow as approximately 0.5 μsec. For optimum shape of the rf output pulse, the driving pulse should be of the smallest amplitude that will result in reliable triggering of the modulator.

3.6 APPLICATIONS.

The Type 1360-B is particularly useful as a power source in the measurement of attenuator and filter insertion-loss characteristics, as a driver for slotted lines, and as a local oscillator in a heterodyne detector.

The decibel calibration of the output control, over a 70-db range, makes the oscillator especially valuable for insertion-loss measurements. In this application, the internal 1-kc square-wave modulation capability permits the use of a simple, high-sensitivity detector. Such a detector could consist of a Type 874-VQ diode detector and associated Type 874-W50 50-ohm Termination, followed by a Type 1232-A Tuned Amplifier and Null Detector, as shown in Figure 3-3.

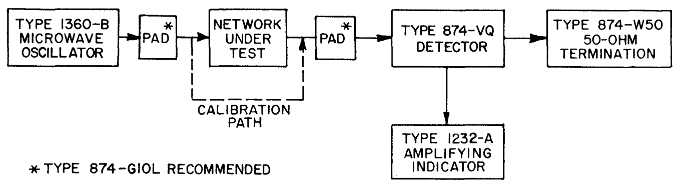


Figure 3-3. Sensitive insertion-loss test set-up incorporating the Type 1360-B Microwave Oscillator.

Operated in its 1-kc square-wave mode, the oscillator is a highly stable signal source for the General Radio Type 874-LBA (general-purpose) and Type 900-LB (precision) slotted lines. The amplitude stability of the Type 1360-B makes it particularly well-suited for use with the Type 1640-A Slotted Line Recorder System, which is capable of automatically plotting precision VSWR measurements ranging from 1.001 to 1.20, within 0.1% accuracy.

The Type 1360-B is a reliable local oscillator in heterodyne-detector hookups which combine it with the Type 874-MRL Mixer Rectifier and the Type 1216-A Unit I-F Amplifier. Such an instrument combination constitutes a well-shielded, sensitive, broadband detector. In use, the incoming signal is heterodyned in the mixer with the output of the Type 1360-B to obtain a 30-Mc difference frequency which is amplified and indicated on the meter of the Type 1216-A. As an indicator of relative signal levels, the detector can be used to measure insertion loss and attenuation of filters, pads, and cables, and as a field-strength indicator for antenna gain and radiation-pattern measurements.

SECTION **4**

PRINCIPLES OF OPERATION

4.1 GENERAL.

The Type 1360-B Microwave Oscillator is a complete, self-contained signal source consisting of a type 5836 reflex-klystron oscillator tube in a coaxial cavity, together with an adjustable-piston attenuator-output system and associated indicator circuit, a multi-purpose modulator, and associated power supplies.

4.2 REFLEX-KLYSTRON OSCILLATOR (See Figure 4-1).

There are two frequency-determining elements in a reflex klystron oscillator: the size of the resonant cavity, and the repeller voltage of the klystron. In the Type 1360-B, these two elements are ganged by driving the tuning plunger and the repeller potentiometer with a common shaft. The cavity-tuning plunger is a noncontacting Z-type, while the resistance card of the potentiometer is shaped to give the correct tuning characteristic.

Two modes of oscillation (1.1 and 2.2) cover the range, and the switching is performed with a set of three snap-action switches, which are roller-actuated by the plunger drive rack as the frequency dial is turned. The 1/4-wavelength cavity mode is used in conjunction with the 1 3/4-cycle repeller mode (1.1 mode) to cover 1.7 to 2.8 Gc, while the 3/4-wavelength cavity mode is used in conjunction with the 2 3/4-cycle repeller mode (2.2 mode) to cover 2.6 to 4.1 Gc. The use of the $\lambda/4$-cavity mode for the 1.7 to 2.8 Gc (low-frequency) range requires a shorter cavity than does the use of the 3 $\lambda/4$-cavity mode for the 2.6 to 4.1 Gc (high-frequency) range. Thus, the 1.7 Gc point on the dial is just beyond the 4.1 Gc point.

Colored lights on the front panel indicate the active mode, and the arrows over the tuning knob indicate the direction in which to turn the knob to change modes. To adjust the tracking for differences between tubes, a set of trimming potentiometers, R100 through R104 and R108 through R111, is provided (refer to paragraph 5.6).

A ganged pair of small rheostats for fine-frequency adjustment (R106, R107), with a range of approximately 1 Mc, is connected in series with the repeller potentiometer. Since adjustment of this ΔF control may seriously alter the tracking of repeller voltage and cavity tuning when the oscillator is square-wave modulated, the control is disabled under that condition.

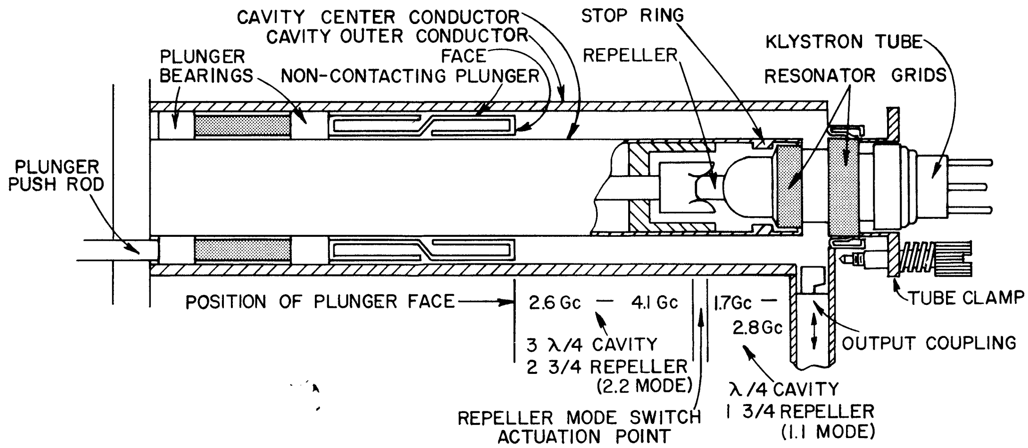


Figure 4-1. Functional cut-away view of klystron cavity.

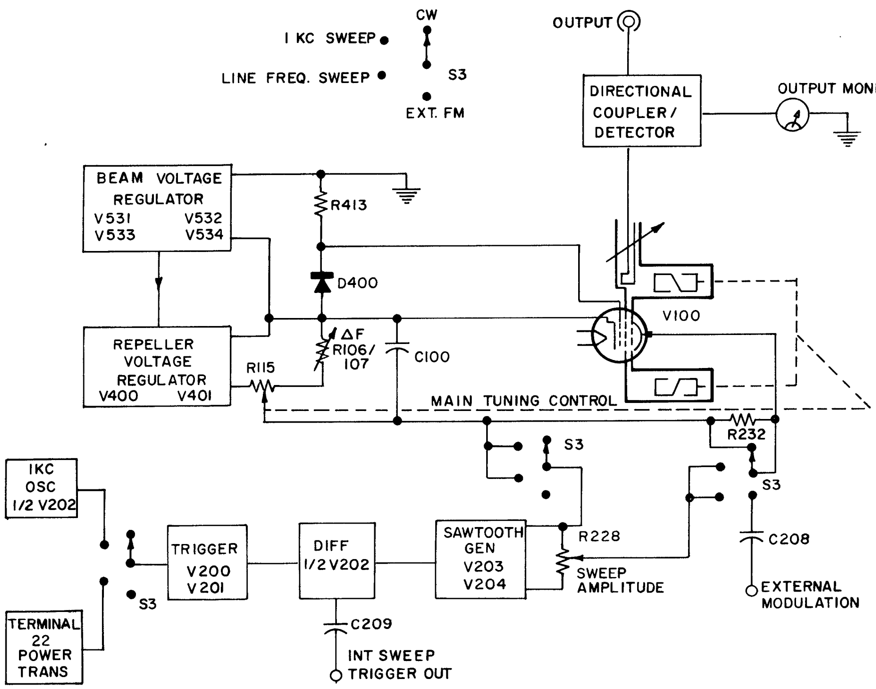


Figure 4-2. Block diagram for operation of the Microwave Oscillator with external frequency modulation, line-frequency sweep, internal 1-kc sweep, or cw.

4.3 ELECTRONIC CIRCUITS.

4.3.1 GENERAL.

As seen in the schematic diagrams (Figures 5-10 and 5-11), the beam voltage and repeller voltage for the klystron are fed from regulated supplies with a common reference tube, V534. The other tubes used in the regulator are V531, V532, and V533 in the beam-voltage regulator, and V400 and V401 in the repeller-voltage regulator. The klystron heater, fed from a dc supply, is unregulated but adequately filtered. The 10-volt bias voltage for the klystron grid is taken from a Zener diode, D400, in order to make the voltage constant and independent of the grid current, which varies considerably from tube to tube.

The modulator consists of a 1-kc RC phase-shift oscillator (one half of V202), a Schmitt-trigger circuit (V200 and V201), and a sawtooth generator (V203 and V204), which is preceded by a differentiating stage (half of V202). Paragraphs that follow show how the modulating circuits are employed for various positions of the selector switch, S3.

4.3.2 EXTERNAL FM MODULATION.

With the modulation switch in the EXT FM position, the modulation circuit is not used (see Figure 4-2). The external modulation input is connected to the repeller through a 0.047-μf capacitor (C208) feeding a 470-kilohm resistor (R232). The shunt capacitance of the repeller circuit is approximately 70 pf. The modulation sensitivity varies over the frequency range and is of the order of 0.2 Mc per volt. Voltages greater than 50 volts peak (or 35 volts rms) will drive the repeller positive at the low end of both tuning ranges.

4.3.3 LINE-FREQUENCY SWEEP.

With the modulation switch set at LINE FREQ. SWEEP, a sine-wave signal from the power transformer (terminal 22) is clipped in the Schmitt trigger, differentiated and fed into the sawtooth generator (see Figure 4-2). The sawtooth is approximately 20 volts, maximum, and the swept bandwidth varies between 1 and 3 Mc. The output is controlled by the SWEEP AMPLITUDE control, R228, and is ac-coupled to the repeller. To prevent distortion caused by ripple in the oscillator, a resistor (R415) mounted on switch S3 keeps the sawtooth from dropping to zero value. Over the narrow range the sweep is quite linear in frequency. A negative trigger pulse for oscilloscope synchronization is available from the differentiator at the INT SWEEP TRIGGER OUT terminal.

4.3.4 INTERNAL 1-KC SWEEP.

With the modulation switch in the 1 KC SWEEP position (see Figure 4-2), the operation is similar to line-frequency sweep (refer to paragraph 4.3.3) except that the repetition frequency is taken from the internal 1-kc oscillator.

4.3.5 CW OPERATION.

With the modulation switch set to CW, the modulator circuit is not used, as shown in Figure 4-2. To prevent hum pickup, resistor R232 is short-circuited.

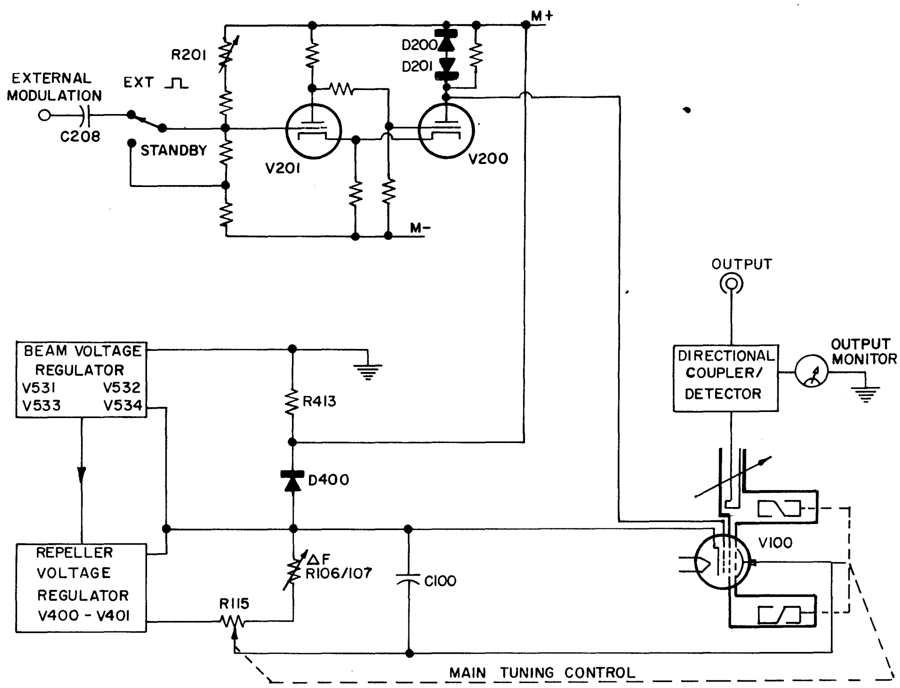


Figure 4-3. Block diagram for operation of the Microwave Oscillator on standby operation or with external pulse modulation.

4.3.6 STANDBY OPERATION.

With the modulation switch set at STAND BY, the control grid of the klystron is connected to the output of the Schmitt-trigger circuit and the B+ bus of the modulator is connected to the bias reference diode (see Figure 4-3). When the first tube in the trigger circuit is biased off, a negative voltage developed in the output of the second tube cuts off the beam current of the klystron. Since the klystron heater is on, standby operation does not affect the operational lifetime of the klystron. The main purpose of the STAND BY switch position is to provide a simple means for turning the rf power on and off quickly to calibrate external measuring devices.

4.3.7 1-KC SQUARE-WAVE MODULATION.

In many types of klystrons, including the type 5836, an appreciable amount of fm occurs across long pulses

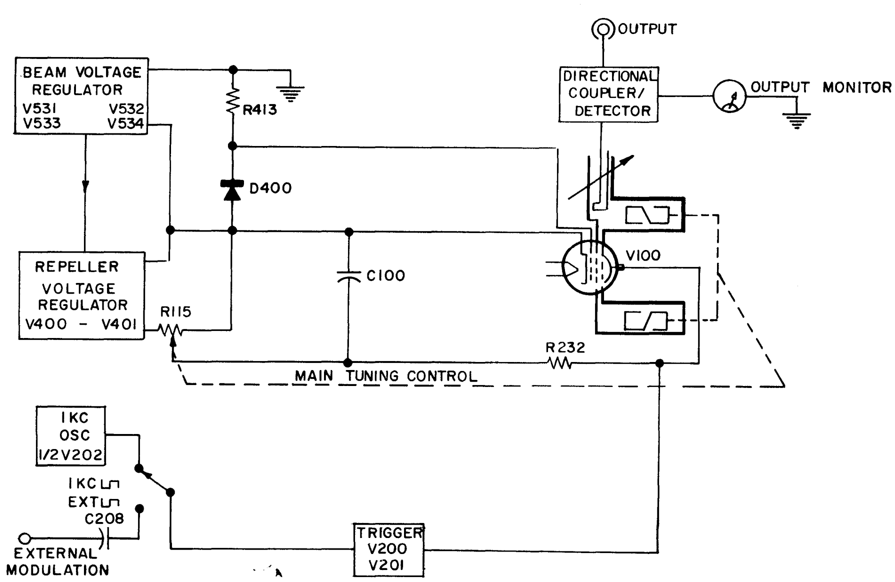


Figure 4-4. Block diagram for operation of the Microwave Oscillator with internal 1-kc square-wave modulation or external square-wave modulation.

when the tube is grid-modulated. Therefore, in the Type 1360-B Microwave Oscillator, the repeller is used for square-wave modulation. When modulated in and out of a repeller mode, fm will naturally occur on the leading and trailing edges of the pulse, but its duration is a function of the switching speed. The 1-kc output from the RC oscillator is fed into the Schmitt-trigger circuit, where square-wave output is applied across R232 in series with the repeller lead (see Figure 4-4). The square-wave amplitude is clamped by diodes D200 and D201 so that circuit operation is independent of line-voltage fluctuations. The frequency of the 1-kc square wave can be changed with 1 KC ADJUST screw-driver control (R217) to match the frequency of filters in external detector-amplifier systems. Figure 4-5 shows the typical warm-up drift for the 1-kc oscillator. The frequency change

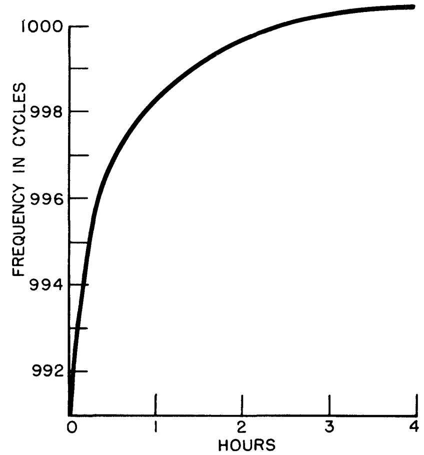


Figure 4-5. Typical warm-up drift for the 1-kc oscillator of the Type 1360-B.

with power-line voltage fluctuations is negligible in the Type 1360-B because the oscillator plate voltage is regulated by diode D202.

4.3.8 EXTERNAL SQUARE-WAVE MODULATION.

For external square-wave modulation, operation is similar to 1-kc square-wave modulation (see Figure 4-4) except that the modulating voltage is fed from an external source through the EXTERNAL MODULATION connector. The voltage applied must be at least 12-volts rms sine wave, or 20-volts peak-to-peak square wave. Frequencies between 50 cps and 200 kc do not cause appreciable dissymmetry in the output. The symmetry can be adjusted with potentiometer R201 inside the instrument.

4.3.9 EXTERNAL PULSE MODULATION.

For external pulse modulation, the control grid of the klystron is connected to the output of the Schmitt trigger and the B+ bus of the modulator circuit is connected to the bias-reference diode, D400 (see Figure 4-3). A positive pulse of approximately 20 volts peak will cause the second tube in the Schmitt-trigger circuit to stop conducting, turning on the beam of the klystron. For optimum shape of the rf output pulse, a driving pulse of the smallest possible amplitude should be used. If the output pulse is too long (duty cycle greater than 20%), an appreciable frequency change may occur along the pulse. If this is objectionable, use the EXT ⊓⊔ position of the modulation switch, and adjust the symmetry control, R201, as required.

4.4 OUTPUT SYSTEM.

The rf energy is picked up in the klystron cavity by a movable coupling loop controlled by the OUTPUT knob through a rack-and-pinion drive. The dial is calibrated to read db when the output is below 70, i.e., outside the nonlinear region of the attenuator. Since too-close coupling to the cavity will overload the oscillator at some frequencies, an output monitor is provided. It consists of a directional coupler with a detector, and a meter that indicates the amount of power into the load. The meter is uncalibrated and indicates the point of highest output at each frequency. It shows overcoupling by a reduction in output. (The range in which overloading may occur is indicated on the OUTPUT dial by the legend "WATCH OUTPUT MONITOR.")

SECTION 5

SERVICE AND MAINTENANCE

5.1 WARRANTY.

General Radio warrants that each new instrument 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 part 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, semiconductors, or batteries that have given normal service. Normal life of the klystron tube is considered to be 400 hours or 6 months; replacements for defective klystrons will be made on a prorated basis within this period.

5.2 SERVICE

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

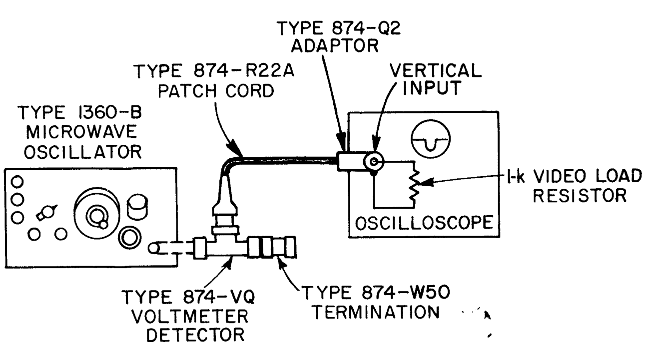


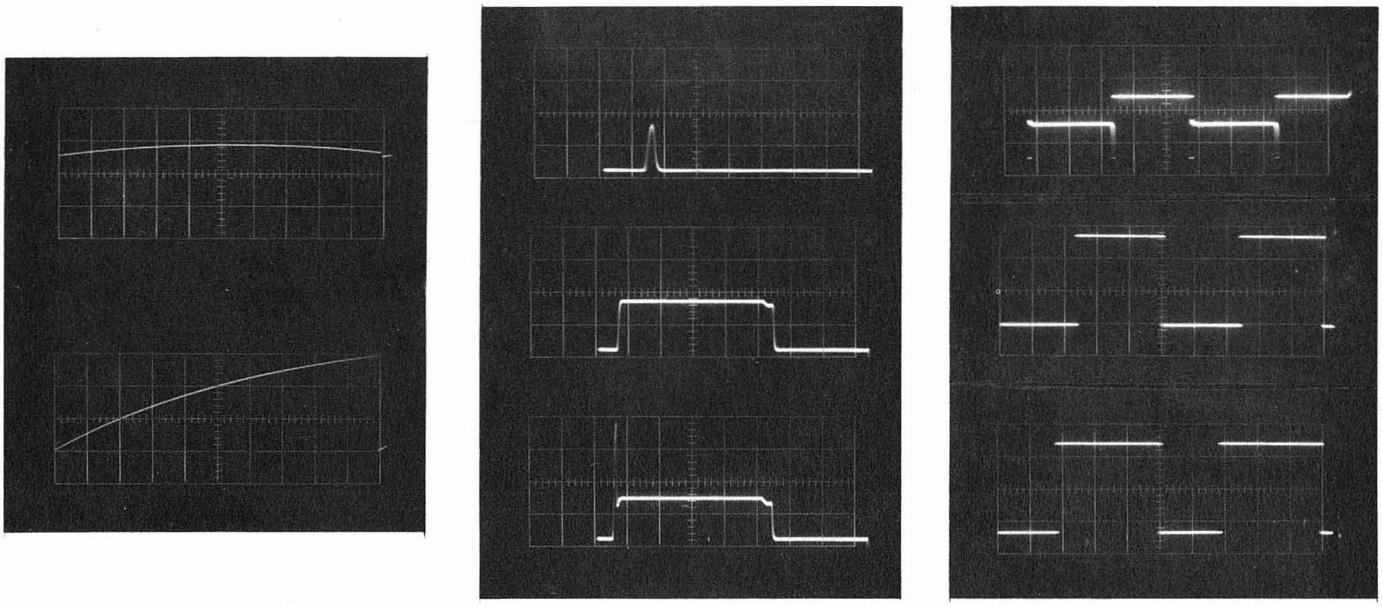
Figure 5-1. Arrangement of test equipment for observation of oscillator performance.

5.3 MINIMUM PERFORMANCE STANDARDS.

The most common source of trouble is that the OUTPUT control has been set too high, resulting in overcoupling and cessation of oscillation. Before undertaking any service procedures, be certain that satisfactory output cannot be obtained when the adjustment procedure of paragraph 3.3 is followed. OUTPUT MONITOR sensitivity depends both on frequency setting and on the impedance of the load connected to the OUTPUT. Thus, low readings do not necessarily indicate trouble, unless they have changed significantly from values previously observed under identical conditions.

5.3.1 OVER-ALL PERFORMANCE.

To check the over-all performance of the Type 1360-B Microwave Oscillator, observe the output pattern on an oscilloscope when the oscillator is operated in the 1 KC SWEEP mode. In this mode, all circuits are active, so that most defects will show up. Test equipment required is a low-frequency oscilloscope and a coaxial detector, such as the Type 874-VQ Voltmeter Detector with a Type 874-W50 50-ohm Termination, as shown in Figure 5-1. With the output control set as described in paragraph 3.3 a smooth, dome-shaped curve should be observed on the oscilloscope (see Figure 5-2).



Repeller Tracking Adjustment

Top: Correct
Bottom: Incorrect
Scope settings
Vertical: 0.1 v/cm
Horizontal: 0.1 ms/cm

Pulse Performance

Top: 1/2 μs pulse, typical
Middle: 10 μs pulse, typical
Bottom: 10 μs pulse, incorrect repeller adjustment
Time Base: 2 μs/cm

Square-Wave Performance

Top: Incorrect repeller adjustment
Middle: Correct adjustment
Bottom: Incorrect symmetry adjustment
Time Base: 0.2 ms/cm

Figure 5-2. Oscilloscope patterns for repeller-tracking adjustment.

5.3.2 POWER

The power-output level may be checked by means of a bolometer-bridge power meter. Since most such meters have a maximum full-scale range of 10 milliwatts, it is desirable to connect an attenuator pad between the oscillator and the power meter. A 10-db pad, Type 874-G10, is suitable for checks near 1.7 Gc, where the oscillator power is lowest. An additional 6-db pad, Type 874-G6, should be used over the middle and upper part of the range. The oscillator output should be optimized at each frequency according to the procedure of paragraph 3.3.

5.3.3 FREQUENCY.

The frequency accuracy may be checked by means of a heterodyne frequency meter; the OUTPUT control should be set at 70 or lower, in order to avoid pulling the oscillator frequency.

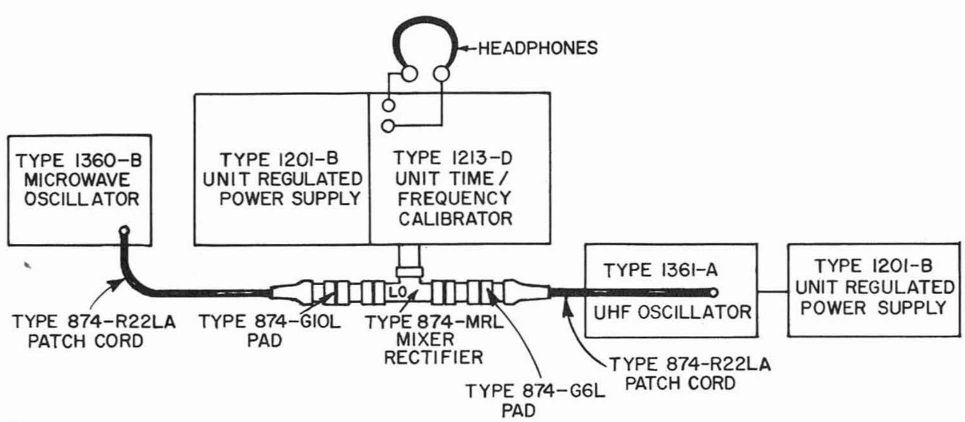


Figure 5-3. Frequency test set-up.

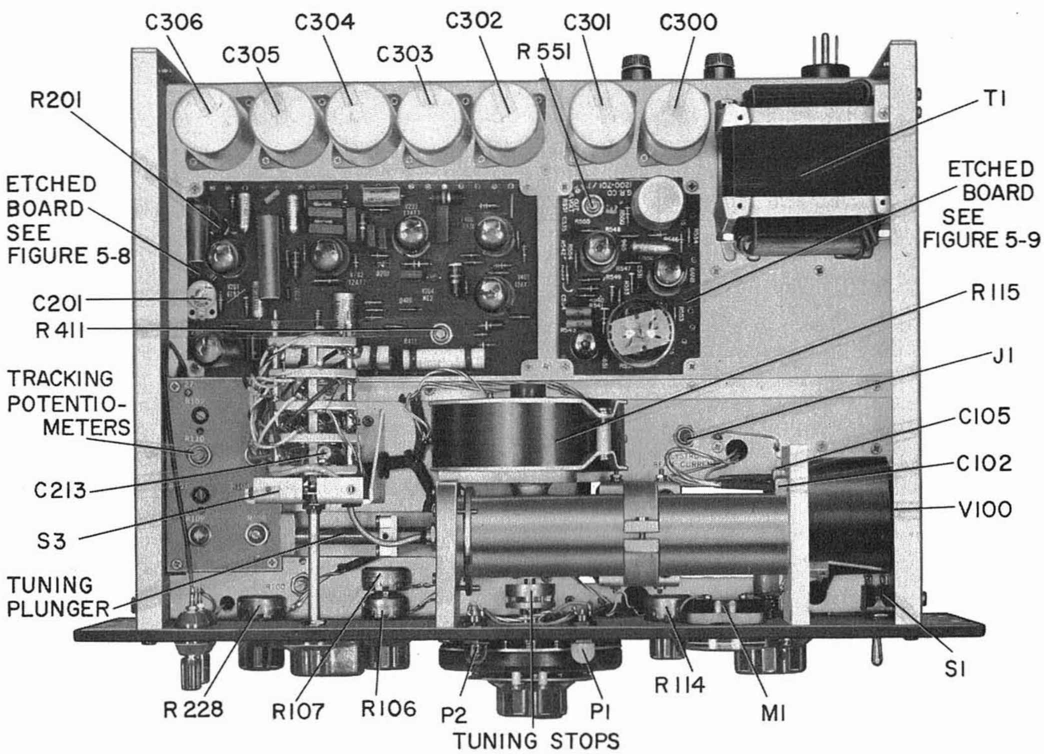


Figure 5-4. Top interior view.

If a heterodyne frequency meter is not available, accurate frequency checks can be made by means of a Type 1361-A UHF Oscillator as the heterodyne oscillator with a Type 1213-D Unit Time/Frequency Calibrator and associated accessories (shown in Figure 5-3) as the detector.

The procedure is as follows:

a. Set the Type 1213-D FUNDAMENTAL FREQUENCY switch to STAND BY, and tune the Type 1361-A to approximately 500 Mc and the Type 1360-B to that multiple of 500 Mc, such as 2.0 Gc, that it is desired to check.

b. Set the dial of the Type 1360-B to read exactly the desired multiple, the ΔF control to the midposition, and the selector switch to CW.

c. Set the output control of the Type 1361-A to the 0-db mark and that of the Type 1360-B to 70.

d. Tune the Type 1361-A until a beat note is detected on the Type 1213-D and observe the frequency-vernier-dial reading.

e. Next, turn the selector switch on the Type 1360-B to STAND BY and the FUNDAMENTAL FREQUENCY switch on the Type 1213-D to 10 Mc.

f. Tune the Type 1361-A to obtain a second beat note, with the dial reading closest to 500 Mc. Again note the vernier-dial reading.

g. Observe the frequency error of the Type 1360-B calibration, expressed in tenths of a percent, as the difference between the two vernier-dial readings of the Type 1361-A.

If the frequency calibration error of the Type 1360-B is greater than 1%, it may be possible to restore the calibration be resetting the dial position as described in paragraph 5.7.5). If such readjustment is incapable of bringing the dial accuracy within specifications, the instrument should be returned to General Radio Company for calibration.

5.3.4 ABNORMAL PERFORMANCE.

If the oscillator otherwise fails to perform within specifications, refer to the procedure of paragraph 5.4 to gain access to interior test points and follow the procedures given in paragraph 5.5 to isolate the trouble.

5.4 REMOVAL OF INSTRUMENT FROM CABINET.

WARNING

Dangerously high voltages are present when operated with the cabinet removed. Use insulated screwdrivers for all adjustments.

Remove the power cable, the four large screws on the front panel, and the two similar screws in the rear of the instrument. The instrument can then be pulled forward out of the cabinet.

5.5 TROUBLE ANALYSIS.

5.5.1 GENERAL.

Detailed procedures and supporting illustrations required to isolate troubles indicated in paragraph 5.3 are given in this paragraph. All test points and detail electrical parts are called out with respect to reference designators appearing in Figure 5-11, the complete schematic wiring diagram for the instrument. As an aid in locating test points and detail parts, Figures 5-4 and 5-5 and 5-8 and 5-9 are referenced where appropriate. Figure 5-10, an elementary schematic wiring diagram, will facilitate circuit tracing through various modulation-selector switch positions. Table 5-3 is a comprehensive listing of vacuum-tube voltage and resistance measurements. Complete descriptions for all electrical parts, listed in reference-designator order, are given in the Parts List for use in procuring replacements from local sources. The General Radio part numbers appearing in this table, along with the electrical descriptions, should be used to order replacements.

5.5.2 KLYSTRON AND POWER SUPPLIES.

Inability to obtain any OUTPUT MONITOR reading at all with a 50-ohm load connected to the OUTPUT jack, or to obtain satisfactory performance as indicated in paragraph 5.3, is due to one of the following:

(1) defective klystron tube;
(2) incorrect power-supply voltages;
(3) repeller-tracking failure;
(4) defective klystron-contact springs; or
(5) defective output-monitor diode, D100. (If power output is satisfactory but the monitor does not indicate; refer to paragraph 5.9).

It is important to distinguish between failure to obtain output at any frequency and failure over only part of the range. Failure throughout the range is usually due to (1) or (2) above, while failure in certain parts of the range only is almost certainly due to (3) or (4).

The klystron beam current can be checked with a 50-ma meter at test jack J1 (see Figure 5-4). This current should be between 16 and 22 ma with the selector switch in the CW position. If the klystron beam current is less than 16 ma, the tube may be defective or the beam-supply, grid-supply, or heater voltage may be low. Refer to the note accompanying Table 5-1 for equipment to be used in measuring voltages.

The beam voltage, measured at the klystron-cathode filter, C101, with respect to the chassis, should be between -320 and -330 volts.

The grid voltage measured at the klystron-grid filter, C105, with respect to the klystron cathode, measured at C101, should be between 9.5 and 10.5 volts with the selector set at CW. Absence of voltage is usually due to a short-circuited diode D400.

The heater voltage with the klystron tube plugged in should be between +6.1 and +6.4 volts dc, as measured at C102 with respect to C101 and with normal line voltage of 115 v (or 230 v). This voltage will rise to between 10 and 13 volts if the klystron heater is open, and in this event, the tube must be replaced.

If beam, grid-bias, and heater voltages are all correct, but klystron beam current is low, the klystron itself is defective and should be replaced. Normal klystron life is at least 400 hours, unless the instrument has been operated at consistently high line voltage.

If the beam current appears to be very high, it is probably not actually beam current but leakage current through a defective capacitor C101 or C102. This type of failure may be accompanied by low beam voltage.

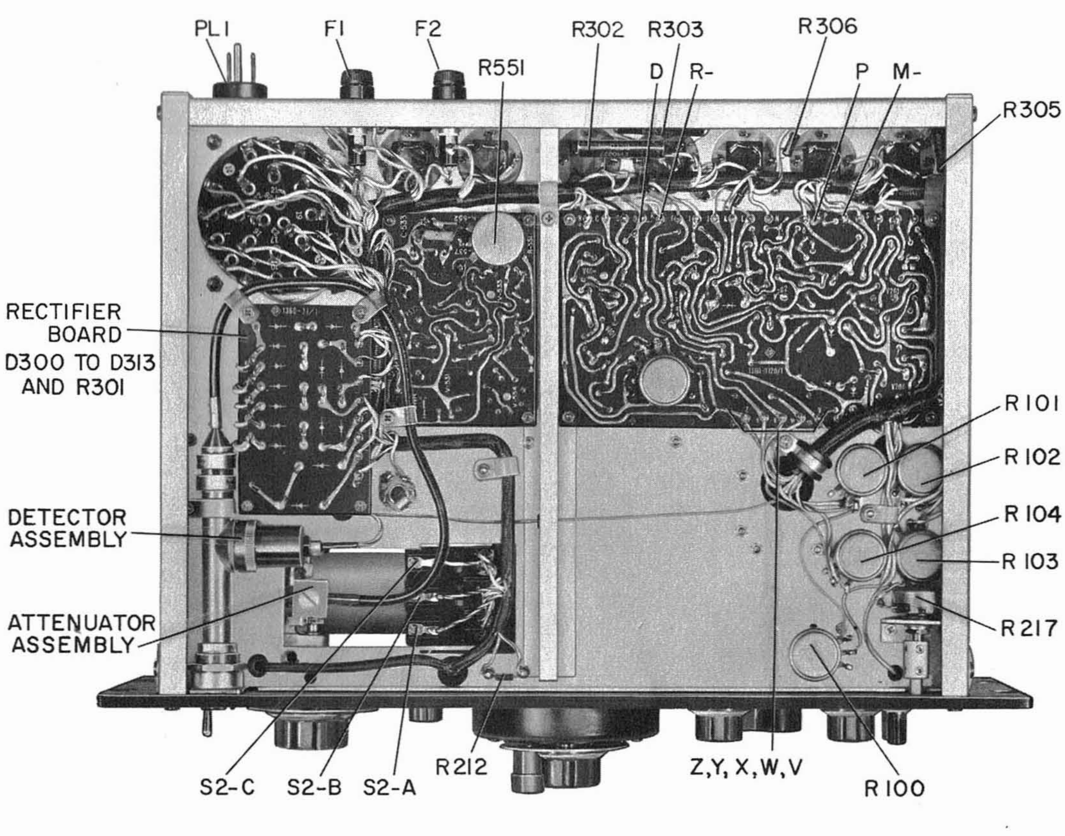


Figure 5-5. Bottom interior view.

CAUTION

If this difficulty is suspected, turn the power off and remove the klystron tube socket before proceeding with further tests, as prolonged operation may result in klystron-heater burnout.

Continued presence of current at J1 after removal of the socket from the klystron is conclusive evidence of defects in C101 or C102. Such defects show up only with high voltage applied and may not be detectable with an ordinary ohmmeter. If either capacitor is suspect, replacement of both is recommended.

If the beam current at J1 is between 16 and 22 ma, the klystron is probably satisfactory, and the difficulty is almost certainly due to a failure in the repeller-tracking circuits or in the repeller supply.

If the repeller-supply voltage, measured between terminals Z and R- on the large etched-board, is 425 volts (R- being the negative terminal), and repeller-voltage failure is still suspected, R115 may be defective. The voltage between the arm of R115, as measured at terminal V with respect to terminal Z, should vary smoothly with frequency setting, from about -65 volts at 1.7 Gc to -420 volts at 2.8 Gc, and from about -135 volts at 2.6 Gc to -250 volts at 4.1 Gc.

If the repeller voltage varies in the proper fashion, but the swept-mode pattern as observed on the oscilloscope is grossly tilted, the repeller tracking is incorrect and should be readjusted as described in paragraph 5.6. Before readjustment, inspect the mechanical tuning drive to find the cause of the tracking error. For correct mechanical adjustments refer to paragraph 5.7.

Table 5-1 describes trouble-analysis procedures for the klystron power supplies. Refer to Figure 5-5 for test-point location and to Table 5-3 for complete voltage and resistance measurements.

It is possible for the contact between the inner conductor of the coaxial cavity and the resonator grid adjacent to the repeller cap to be marginal, especially following klystron replacement. This difficulty is manifested by holes in the output-versus-frequency characteristic, especially in the 2.6 to 4.1 Gc range.

CAUTION

The operation to reform the contacts inside the cavity is a delicate operation requiring special tools. Since it should not be attempted in the field, the instrument should be returned to General Radio Company for such repair.

5.5.3 MODULATOR.

Table 5-2 furnishes detailed trouble-analysis procedures for the modulator circuits. To make these measurements, a voltmeter with a "floating" cabinet and at least 20,000 ohms-per-volt sensitivity, an oscilloscope, and a pulse generator are needed (see Figure 5-6).

CAUTION

When these measurements are made, all voltages are far removed from ground potential and are not only hazardous to personnel, but also could damage test equipment.

To simplify measurements, turn the main frequency dial to 1.7 Gc. At this point, the highest voltage in the instrument at M- is approximately 600 volts from ground; thus, most oscilloscope probes can be used without an external capacitor. A 1000-volt capacitor will give adequate protection regardless of frequency-dial setting.

TABLE 5-1
TROUBLE ANALYSIS – KLYSTRON POWER SUPPLIES
(Figure 5-5 and Table 5-3)

Measurement	Voltage	Tubes and Diodes Involved	Adjustment
Klystron Beam Supply	325 volts between chassis or terminal D (positive) and terminals Z or B-.	V531, V532, V533, V534, D300, D301, D302, D303	R551
Klystron Grid Supply	9.5 to 10.5 volts between terminals Y (positive) and Z.	D400	None
Klystron Heater Supply	6.1 to 6.4 volts between terminals 24 (positive) and Z or B- at 115 (or 230) -volt power line.	D304, D305	None
Repeller Supply	425 volts between Z or B- (positive) and R-.	V400, V401, D310, D311, D312, D313	R411

NOTE

Most power-supply failures will cause voltages to differ very substantially from correct values, and can therefore be detected with a standard VOM. Only an accurate meter, such as a digital voltmeter, a differential voltmeter, or a ±1% moving-coil meter, should be used to reset any voltage in the instrument, since the error of a typical VOM may far exceed the allowable tolerance.

TABLE 5-2

TROUBLE ANALYSIS – MODULATOR

(See Figures 5-4 through 5-6)

Measurement	Voltage	Tubes and Diodes Involved	Adjustments	Type 1360-B Selector
Power Supply	240 to 260 volts between M+ (positive) and M- with 115 (or 230) -volt power line.	D306, D307, D308, D309	None	Any
1-kc Oscillator	Sine wave (slightly distorted) of at least 10 volts rms at terminal P.	Pins 1, 2, and 3 of V202	None	1 KC ⊓⊔
Schmitt Trigger	30 volts peak-to-peak at terminal A. Pulse rise time should be less than 0.3 μsec; jitter, less than 0.1 μsec.	V201, V202	R201, symmetry C201, overshoot	EXT ⎍
Sawtooth Generator	Negative trigger pulse should be greater than 30 volts peak-to-peak for internal 1-kc sweep and 65 volts peak for line-frequency sweep at the INT SWEEP TRIGGER OUT binding post on the panel. Amplitude of sawtooth should be greater than 15 volts peak-to-peak at terminal X.	V203, V204; pins 6, 7, and 8 of V202; D303	None	1 KC SWEEP LINE FREQ SWEEP

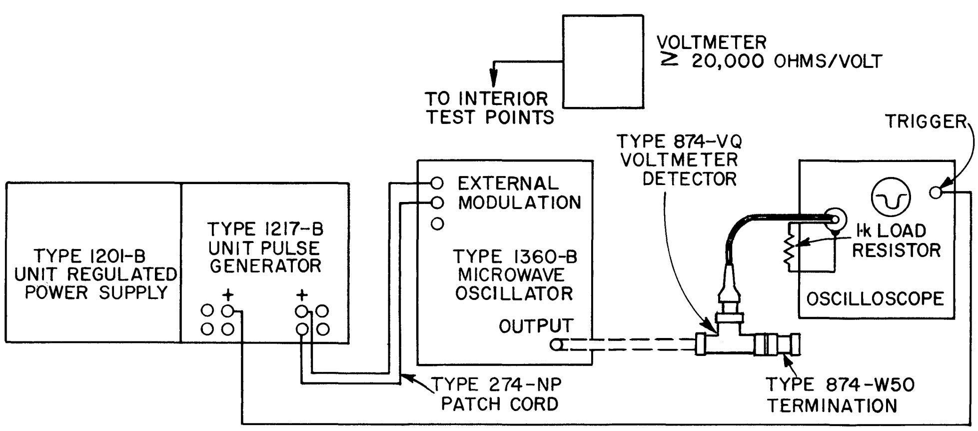


Figure 5-6. Test set-up for testing modulation circuitry of Type 1360-B.

When performance of the Schmitt trigger is checked, the Type 1217-B Pulse Generator should be set to a prf of 1 kc, pulse width of 2 μsec, and its output adjusted to the lowest value that will give satisfactory triggering. This should be less than 20 volts peak, using positive-going pulses.

5.6 TRACKING ADJUSTMENT.

5.6.1 GENERAL.

The two frequency-determining elements of the oscillator, the tuned cavity and the repeller voltage, must maintain a fixed relation to each other over the entire frequency range. The procedure for establishing this relation is referred to as "tracking". As given here, it assumes that the mechanical alignment is correct (refer to paragraph 5.7) and gives the rules for adjustment of the repeller-electrode voltage by means of the tracking potentiometers (see Figure 5-5). Tracking adjustment may be required when the klystron tube is replaced.

WARNING

Use an insulated screwdriver for the following adjustments.

5.6.2 CW, SWEEP, AND EXT FM OPERATION.

For this adjustment, use the setup of Figure 5-1 and operate the oscillator with 1-kc internal sweep and with the ΔF control set to its midposition. Watch the OUTPUT MONITOR meter and avoid overloading the klystron (refer to paragraph 4.4). Set the following adjustments to obtain a smooth, dome-shaped swept-mode pattern on an oscilloscope (see Figure 5-2) over the entire frequency range:

R111--high end of the 1.7 to 2.8 Gc range;
R101--low end of the 1.7 to 2.8 Gc range;
R108--high end of the 2.6 to 4.1 Gc range;
R104--low end of the 2.6 to 4.1 Gc range;

Successive adjustments may be required.

5.6.3 PULSE-MODULATED OPERATION.

For this adjustment, modulate the oscillator with an external pulse. The test equipment should be set up as shown in Figure 5-6. Watch the OUTPUT dial and be careful not to overload the klystron. If using the output monitor to check the OUTPUT control setting, set the function switch to CW while making the adjustment. Alternatively, the output may be increased while the oscillator is being pulsed until the observed video-pulse shape deteriorates or decreases in amplitude with further increase. Set the following adjustments for an output pulse of high output and good quality:

R111--high end of the 1.7 to 2.8 Gc range;
R100--low end of the 1.7 to 2.8 Gc range;
R108--high end of the 2.6 to 4.1 Gc range;
R104--low end of the 2.6 to 4.1 Gc range;

If the setting of R111, R108, or R104 is changed, recheck the CW operation (refer to paragraph 5.6.2).

5.6.4 SQUARE-WAVE OPERATION.

To make this adjustment, operate the oscillator with internal 1-kc square-wave modulation or external square-wave modulation. External modulation (see Figure 5-6) is recommended to facilitate oscilloscope triggering. To keep track of polarity during the adjustment, offset the symmetry of the applied square wave. The modulator reverses the square wave so that an applied pulse length, t, will appear as a pulse length $\left(\frac{1}{prf - t}\right)$ of the rf output pulse.

Starting at the high end of each frequency range, adjust the following controls to obtain an output with a reasonable compromise between maximum output level and modulation quality over the entire frequency range:

R110--high end of the 1.7 to 2.8 Gc range;
R102--low end of the 1.7 to 2.8 Gc range;
R109--high end of the 2.6 to 4.1 Gc range;
R103--low end of the 2.6 to 4.1 Gc range;

Successive adjustments may be required.

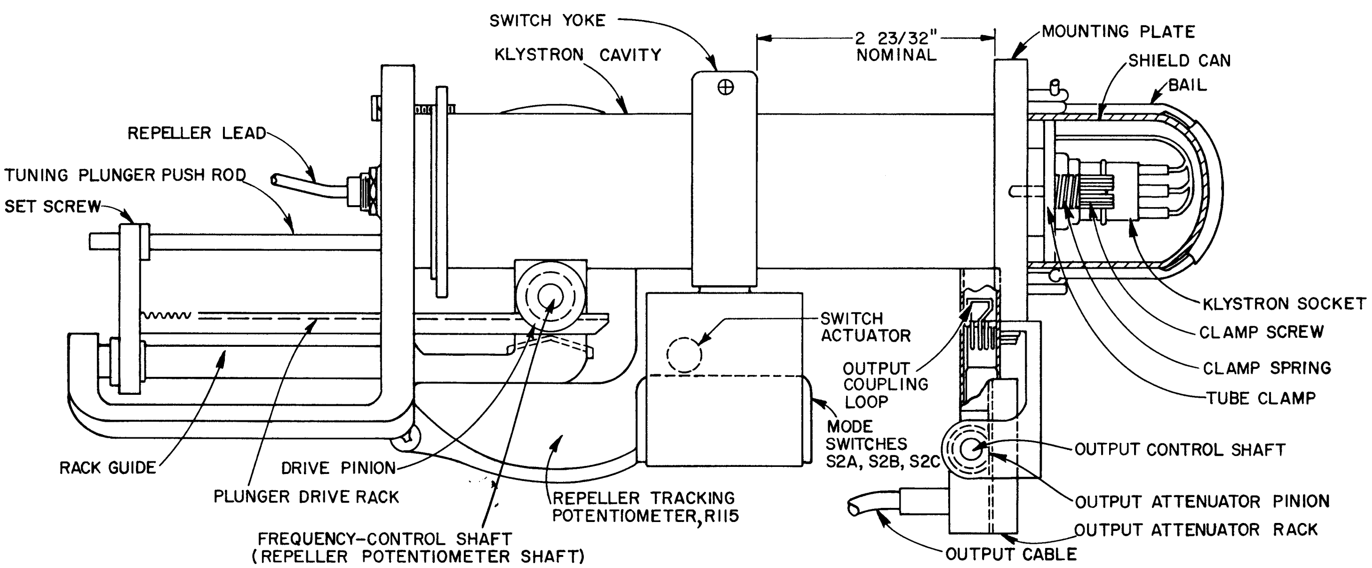


Figure 5-7. Mechanical features of klystron cavity (side view).

5.7 MECHANICAL ALIGNMENT OF OSCILLATOR (See Figure 5-7).

Some of the dimensions of the klystron cavity are critical, and care must be taken when the cavity is reassembled after repair or cleaning. The cavity-tuning plunger, repeller-voltage tracking potentiometer, mode switches, tuning-shaft stop washers, and frequency dial must be adjusted for coincidence to obtain correct performance.

CAUTION

Disassembly is not recommended for field maintenance; if the instrument must be disassembled, it should be returned to General Radio Company for repair.

If field adjustments must be attempted, they should be made in the sequence which follows:

5.7.1 MODE SWITCHES.

The position of the mode switches (S2A-C) is used as the reference. Thus, their factory-set position should be maintained, if possible. However, if the switches are moved, they should be reset so that the switch yoke is 2 23/32 inches from the klystron-end mounting plate.

5.7.2 REPELLER POTENTIOMETER.

The repeller potentiometer, R115, is mounted on the support bracket for the cavity with three Phillips-head captive screws that are accessible through the covered holes in the back of the potentiometer. (Make certain that the wiper arm of the potentiometer is not in the way of the screw-driver.) The arm is continuously adjustable and should be set so that the electrically open position is in the middle of the switching range of the mode switches. The switching range can easily be determined from the vernier dial readings at both ends of the switching sequence. The electrically open position can be checked with an ohmmeter.

5.7.3 TUNING PLUNGER.

To adjust the position of the tuning plunger, loosen the setscrew that clamps the fiberglass push rod. Set the plunger so that the top frequency calibrated on the dial for the 2.6 to 4.1 Gc range can just be obtained before the mode switches are actuated as the tuning knob is turned counterclockwise. For this adjustment, the selector switch should be set to 1 KC SWEEP and the SWEEP AMPLITUDE control set fully clockwise. The center frequency of the swept oscillator can be checked against a frequency marker from a reference oscillator such as the Type 1213-D unit oscillator or another Type 1360-B, or against a cavity wavemeter.

5.7.4 TUNING-SHAFT STOP WASHER.

The stops on the tuning shaft should be set to prevent any moving part in the drive system from being pushed up against its mechanical limit (see Figure 5-4).

NOTE

Tracking of the repeller voltage as described in paragraph 5.6 will be required upon completion of mechanical alignment.

5.7.5 MAIN FREQUENCY DIAL.

To remove the gear drive, remove the two Phillips-head screws adjacent to the frequency vernier dial and pull the control assembly straight away from the panel. Loosen the frequency-dial setscrews, and set the dial to indicate the correct frequency, with a reference signal or wavemeter (refer to paragraph 5.3.3). Retighten the dial setscrews and remount the vernier control. With the plunger fully withdrawn, the dial reading should be slightly less than 2.6 Gc (see Figure 4-1).

5.8 KLYSTRON REPLACEMENT.

NOTE

Replacement of the klystron may lead to minor frequency calibration errors in the oscillator.

To replace the klystron, first turn the power off, then release the wire bail, remove the shield can, unplug the socket, and remove the tube clamp with its two captive spring-loaded screws. Withdraw the tube, with a slight twisting motion. To replace the tube, insert it until fully seated, before replacing the tube clamp and socket. Repeller tracking adjustment, as described in paragraph 5.6, will usually be required.

Slight readjustment of the dial position at 2.8 Gc on the 1.7 to 2.8 Gc band may be desirable to improve average calibration accuracy; refer to paragraph 5.7.5. If recalibration is desired, contact our Service Department.

5.9 DETECTOR SERVICING.

The directional-coupler unit within the detector assembly is mounted underneath the chassis behind the output connector (see Figure 5-5). To replace diode D100 unscrew the shield cap. To peak the directional coupler, loosen the setscrews on either side of the diode and position the loop in the plane of the main-line center conductor, with the termination resistor facing the output connector.

5.10 TABLE OF VOLTAGES AND RESISTANCES.

Table 5-3 lists test voltages and resistances for trouble-shooting. For these measurements, use a 115-volt line, set the frequency dial to 1.7 Gc and set the modulation-selector switch to 1 KC SWEEP. Measure voltages and resistances with an electronic voltmeter such as the Type 1806-A. Deviations of up to ±10% from the listed values should not be considered abnormal.

TABLE 5-3 - VOLTAGE AND RESISTANCE MEASUREMENTS

Tube (Type)	Pin	Dc Volts to terminal M-	Resistance to Ground with terminal M+ shorted to M-
V200 (6197)	1	94	2k
	2	71	61k
	3	252	0
	4	6.3 ac	-
	5	between pins	-
	6	235	1.5k
	7	87	1M
	8	252	0
	9	71	61k
V201 (6197)	1	94	2k
	2	72	316k
	3	252	0
	4	6.3 ac	-
	5	between pins	-
	6	210	2k
	7	87	1M
	8	252	0
	9	72	316k
V202 (12AT7)	1		69k
	2	-0.4	700k
	3	1.4	470
	4	6.3 ac	-
	5	to pin 9	-
	6	250	8.2k
	7	0.2	100k
	8	6.2	10k
	9	-	-
V203 (12AT7)	1	237	8k
	2	19.4	4.4M
	3	22.3	10k
	4	6.3 ac	-
	5	to pin 9	-
	6	19.4	4.4M
	7	-8.4	1M
	8	0	0
	9	-	-

Tube (Type)	Pin	Dc Volts to terminal Z	Resistance to Ground with terminal D shorted to Z, terminal R+ shorted to R-, and anchor terminal 1 shorted to 12
V100 (5836)	1	10 ±0.5	68k
	2	6.2	0
	3	0	0
	4	0	0
	CAP	DO NOT MEASURE	560k
V400 (12BH7A)	1	157	3.7M
	2	-4.7	2.4M
	3	0	0
	4	6.3 ac	-
	5	to pin 9	-
	6	172	910k
	7	82	250k
	8	88	430k
	9	-	-
V401 (12AX7)	1	290	47k
	2	0	2M
	3	0.6	4M
	4	6.3 ac	-
	5	to pin 9	-
	6	88	430k
	7	0	0
	8	0.6	4M
	9	-	-
V531 (6AV5GA)	1	308	500k
	2	6.3 ac to pin 7	-
	3	325	0
	4	-	-
	5	442	0
	6	-	-
	7	147	-
	8	441	1k
	9	-	-
V532 (6AN8)	1	442	0
	2	299	2.5M
	3	308	490k

Tube (Type)	Pin	Dc Volts to terminal Z	Resistance to Ground with terminal D shorted to Z, terminal R+ shorted to R-, and anchor terminal 1 shorted to 12
V532 (6AN8) (cont)	4	6.3 ac	-
	5	between pins	-
	6	299	2.5M
	7	325	0
	8	196	72k
	9	201	47k
V533 (5965)	1	201	47k
	2	39	540k
	3	42	5.6k
	4	6.3 ac	-
	5	to pin 9	-
	6	325	0
	7	36.4	58k
	8	42	5.6k
	9	-	-
V534 (5651)	1	84	66k
	2	0	0
	3	-	66k
	4	-	0
	5	84	66k
	6	-	-
	7	-	0
	8		
	9		

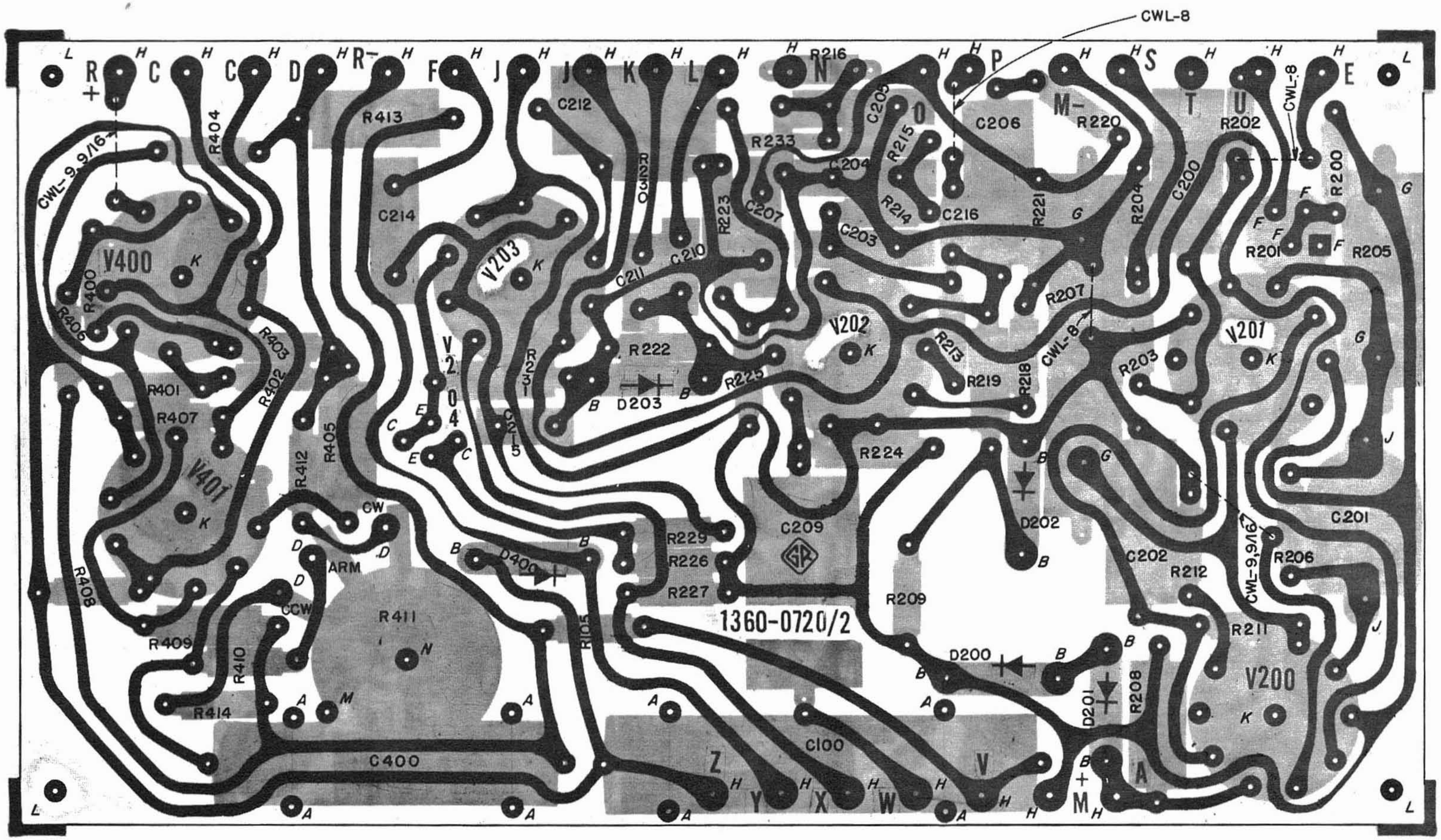


Figure 5-8. Modulator and repeller-voltage regulator etched board.

PARTS LIST

REF. NO.	CAPACITORS	PART NO.
C100	Plastic 1 ±10% 400 v	4860-9850
C101	Filter 2500 pf ±10% GMV	5280-0100
C102	Filter 2500 pf ±10% GMV	5280-0100
C103	Filter 2500 pf ±10% GMV	5280-0100
C104	Special 0.0003	1360-6240
C105	Filter 50 ±10%	5280-0200
C200	Wax 0.047 ±10% 400 v	5020-1000
C201	Trimmer 7 to 45 pf	4910-0100
C202	Wax 0.1 ±10% 200 v	5010-0700
C203	Mica 0.0051 ±1% 100 v	4600-1511
C204	Mica 0.0051 ±1% 100 v	4600-1511
C205	Mica 0.0051 ±1% 100 v	4600-1511
C206	Wax 0.047 ±10% 400 v	5020-1000
C207	Mica 0.0051 ±1% 100 v	4600-1511
C208	Special 0.047 1000 v	1360-0490
C209	Special 0.047 1000 v	1360-0490
C210	Mica 0.0001 ±5% 500 v	4700-0660
C211	Mica 0.0015 ±5% 100 v	4700-0690
C212	Wax 0.22 ±10% 100 v	5010-3300
C213	Wax 0.047 ±10% 400 v	5020-1000
C214	Mica 0.0091 ±5% 500 v	4540-0091
C215	Mica 0.000562 ±5% 300 v	4700-0700
C216	Ceramic 0.0047 ±20%	4406-2470
C300A	Electrolytic 90 300 v	
C300B	Electrolytic 30 300 v	4450-3400
C300C	Electrolytic 30 300 v	
C301A	Electrolytic 90 300 v	
C301B	Electrolytic 30 300 v	4450-3400
C301C	Electrolytic 30 300 v	
C302A	Electrolytic 1500 15 v	
C302B	Electrolytic 750 15 v	4450-0700
C302C	Electrolytic 750 15 v	
C303A	Electrolytic 1500 15 v	
C303B	Electrolytic 750 15 v	4450-0700
C303C	Electrolytic 750 15 v	
C304A	Electrolytic 50 450 v	
C304B	Electrolytic 25 450 v	4450-0800
C304C	Electrolytic 25 450 v	
C305A	Electrolytic 50 450 v	
C305B	Electrolytic 25 450 v	4450-0800
C305C	Electrolytic 25 450 v	
C306A	Electrolytic 50 450 v	
C306B	Electrolytic 25 450 v	4450-0800
C306C	Electrolytic 25 450 v	
C400	Plastic 22 ±10% 600 v	4860-9500
C531	Ceramic 0.001 ±20% 500 v	4405-2108
C532	Wax 0.047 ±10% 400 v	5020-1000
C533	Electrolytic 20 450 v	4450-0300
C534	Ceramic 0.01 ±20% 500 v	4407-3109
C535	Ceramic 0.01 ±20% 500 v	4407-3109

REF. NO.	RESISTORS	PART NO.
R100	Potentiometer, Composition 50k ±10%	6000-0800
R101	Potentiometer, Composition 50k ±10%	6000-0800
R102	Potentiometer, Composition 50k ±10%	6000-0800
R103	Potentiometer, Composition 100k ±10%	6000-0900
R104	Potentiometer, Composition 100k ±10%	6000-0900
R105	Composition 10M ±5% 1/2 w	6100-6105
R106	Potentiometer Assembly 25k ±10%	1360-4100
R107	Potentiometer Assembly 50k ±10%	
R108	Potentiometer, Composition 500k ±10%	6010-2200
R109	Potentiometer, Composition 500k ±10%	6010-2200
R110	Potentiometer, Composition 250k ±10%	6010-2000
R111	Potentiometer, Composition 100k ±10%	6010-1700
R112	Composition 15 ±5% 1/2 w	6100-0155
R113	Part of Output Attenuator 100 1/10 w	1360-4130
R114	Potentiometer, Composition 25k ±10%	6040-1755
R115	Potentiometer, Precision	0977-4030
R200	Composition 510k ±5% 1/2 w	6100-4515
R201	Potentiometer, Composition 500k ±20%	6040-1200
R202	Composition 220k ±5% 1/2 w	6100-4225
R203	Composition 68k ±5% 1/2 w	6100-3685
R204	Composition 390k ±5% 1/2 w	6100-4395
R205	Power 2k ±5% 5w	6650-2205
R206	Composition 180k ±5% 1/2 w	6100-4185
R207	Power 2k ±5% 10 w	6650-2201
R208	Composition 1.5k ±5% 2 w	6120-2155
R209	Composition 33k ±10% 1w	6110-3335
R211	Composition 1M ±5% 1/2 w	6100-5105
R212	Composition 91k ±5% 1/2 w	6100-3915
R213	Composition 100 ±5% 1/2 w	6100-1105
R214	Film 38.3k ±1% 1/8 w	6250-2383
R215	Film 38.3k ±1% 1/8 w	6250-2383
R216	Film 34.8k ±1% 1/8 w	6250-2348
R217	Potentiometer, Composition 25k ±10%	6000-0700
R218	Composition 470 ±5% 1/2 w	6100-1475
R219	Composition 36k ±5% 1 w	6110-3365
R220	Film 21.5k ±1% 1/8 w	6250-2215
R221	Composition 3.3M ±5% 1/2 w	6100-5335
R222	Composition 100k ±5% 1/2 w	6100-4105
R223	Composition 10k ±10% 1 w	6100-3109
R224	Composition 8.2k ±5% 1 w	6110-2825
R225	Composition 750k ±5% 1/2 w	6100-4755
R226	Composition 1.1M ±5% 1/2 w	6100-5115
R227	Composition 20k ±5% 1/2 w	6100-3205
R228	Potentiometer, Composition 10k ±10%	6000-0600
R229	Composition 3.3M ±5% 1/2 w	6100-5335
R230	Composition 1M ±5% 1/2 w	6100-5105
R231	Composition 10k ±10% 1 w	6110-3109
R232	Composition 470k ±5% 1/2 w	6110-4475
R233	Thyrite	6740-0300
R300	Power 33 ±5% 5 w	6660-0335
R301	Power 1 ±5% 10 w	6670-9105
R302	Power 1.8 ±5% 10 w	6670-9185
R303	Power 1.8 ±5% 10 w	6670-9185
R304	Power 620 ±5% 5 w	6660-1625
R305	Power 620 ±5% 5 w	6660-1625
R306	Power 270 ±5% 3 w	6680-1275
R400	Composition 2M ±5% 1/2 w	6100-5205
R401	Composition 330k ±5% 1/2 w	6100-4335
R402	Composition 1M ±5% 1/2 w	6100-5105
R403	Composition 1M ±5% 1/2 w	6100-5105
R404	Composition 430k ±5% 1/2 w	6100-4435
R405	Composition 47k ±5% 2 w	6120-3475
R406	Composition 4.3M ±5% 1/2 w	6100-5435
R407	Composition 120 ±5% 1/2 w	6100-1125
R408	Composition 120 ±5% 1/2 w	6100-1125
R409	Composition 270k ±5% 1 w	6110-4275
R410	Composition 1k ±5% 1/2 w	6100-2105
R411	Potentiometer, Composition 1M ±10%	6010-2300
R412	Composition 2.7M ±5% 1/2 w	6100-5275
R413	Composition 68k ±5% 2 w	6120-3685
R414	Composition 3.9M ±5% 1/2 w	6100-5395
R415	Composition 1.8k ±5% 1/2 w	6100-2185
R531	Composition 1k ±5% 1/2 w	6100-2105
R532	Composition 1k ±5% 1/2 w	6100-2105
R533	Composition 9.1M ±5% 1/2 w	6100-2915
R534	Composition 2.7M ±5% 1/2 w	6100-2275
R535	Composition 120k ±5% 1/2 w	6100-4125
R536	Composition 2.2M ±5% 1/2 w	6100-5225
R537	Film 287k ±1% 1/2 w	6450-3287
R538	Composition 390k ±5% 1/2 w	6100-4395
R539	Composition 100k ±5% 1/2 w	6100-4105
R540	Composition 6.2M ±5% 1/2 w	6100-5625
R541	Film 75k ±1% 1/4 w	6350-2750
R542	Composition 1k ±5% 1/2 w	6100-2105
R543	Film 100k ±1% 1/4 w	6350-3100
R544	Composition 91k ±5% 1 w	6110-3915
R545	Composition 47k ±5% 1/2 w	6100-3475
R546	Composition 180k ±5% 1/2 w	6100-4185
R547	Composition 1k ±5% 1/2 w	6100-2105
R548	Composition 5.6k ±5% 1/2 w	6100-2565
R549	Composition 1.5M ±5% 1/2 w	6100-5155
R550	Composition 470k ±5% 1/2 w	6100-4475
R551	Potentiometer, Wire-Wound 10k ±10%	6050-1800
R552	Film 33k ±1% 1/4 w	6350-2330
R553	Composition 10M ±5% 1/2 w	6100-6105
R554	Composition 100 ±5% 1/2 w	6100-1105
R555	Composition 100 ±5% 1/2 w	6100-1105

PARTS LIST (Continued)

REF. NO.	MISCELLANEOUS	PART NO.	REF. NO.	MISCELLANEOUS	PART NO.
D100	DIODE, Type 1N23B	6084-1002	J2	BINDING POST, Insulated	4060-0410
D200	DIODE, Type 1N3690B	6083-1033	J3	BINDING POST, Insulated	4060-0410
D201	DIODE, Type 1N3253	6082-1001	J4	BINDING POST	4060-1800
D202	DIODE, Type 1N989B	6083-1035	M1	METER	5730-0940
D203	DIODE, Type 1N34A	6082-1003	P1	LAMP, No. 328	5600-0300
D300	DIODE, Type 1N3254	6081-1002	P2	LAMP, No. 328	5600-0300
D301	DIODE, Type 1N3254	6081-1002	PL1	POWER PLUG, Three-wire	4240-0600
D302	DIODE, Type 1N3254	6081-1002	S1	SWITCH, Toggle	7910-1300
D303	DIODE, Type 1N3254	6081-1002	S2A	SWITCH, Snap-action	1360-4120
D304	DIODE, Type 1N3253	6081-1001	S2B	SWITCH, Snap-action	1360-0470
D305	DIODE, Type 1N3253	6081-1001	S2C	SWITCH, Snap-action	1360-4120
D306	DIODE, Type 1N3254	6081-1002	S3	SWITCH, Rotary	7890-1980
D307	DIODE, Type 1N3254	6081-1002	T1	TRANSFORMER	0685-4040
D308	DIODE, Type 1N3254	6081-1002	V100	TUBE, Type 5836	8380-5836
D309	DIODE, Type 1N3254	6081-1002	V200	TUBE, Type 6197	8380-6197
D310	DIODE, Type 1N3254	6081-1002	V201	TUBE, Type 6197	8380-6197
D311	DIODE, Type 1N3254	6081-1002	V202	TUBE, Type 12AT7	8370-0200
D312	DIODE, Type 1N3254	6081-1002	V203	TUBE, Type 12AT7	8370-0200
D313	DIODE, Type 1N3254	6081-1002	V204	TUBE, Type NE-2	8390-0200
D400	DIODE, Type 1N758A	6083-1012	V400	TUBE, Type 12BH7A	8370-1001
F1	FUSE, 115-v, 2a	5330-2000	V401	TUBE, Type 12AX7	8370-0900
	FUSE, 230-v, 1a	5330-1400	V531	TUBE, Type 6AV5GA	8360-2390
F2	FUSE, 115-v, 2a	5330-2000	V532	TUBE, Type 6AN8	8360-1300
	FUSE, 230-v, 1a	5330-1400	V533	TUBE, Type 5965	8380-5965
J1	JACK, Telephone (NC)	4260-0400	V534	TUBE, Type 5651	8380-5651

NOTES

All resistances are in ohms, unless otherwise indicated by k (kilohms) or M (megohms).

All capacitances are in microfarads, unless otherwise indicated by pf (picofarads).

Rotary switch sections are shown as viewed from the panel end of the shaft. The first digit of the contact number refers to the section. The section nearest the panel is 1, the next section back is 2, etc. The next two digits refer to the contact. Contact 01 is the first position clockwise from a strut screw (usually the screw above the locating key), and the other contacts are numbered sequentially (02, 03, 04, etc), proceeding clockwise around the section. A suffix F or R indicates that the contact is on the front or rear of the section, respectively.

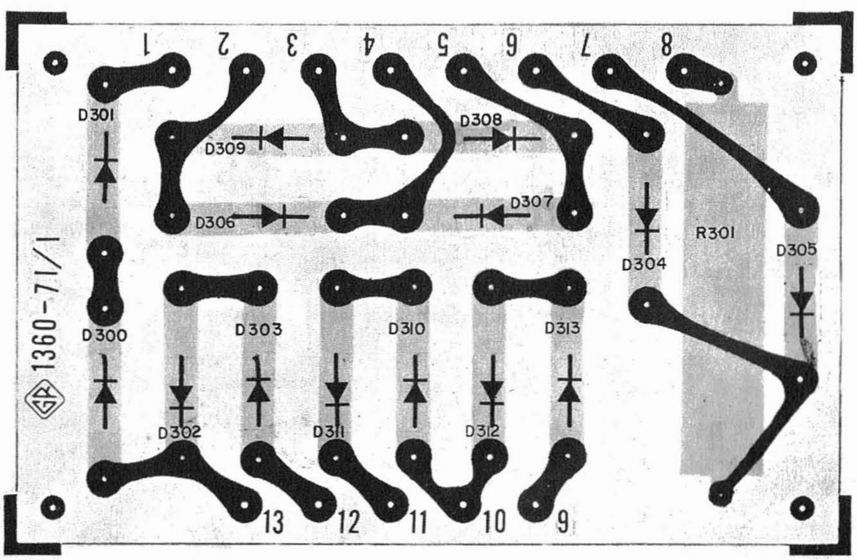


Figure 5-9. Beam-voltage regulator etched board.

NOTES:
RESISTORS 1/2 WATT UNLESS OTHERWISE SPECIFIED
RESISTANCE IN OHMS UNLESS OTHERWISE SPECIFIED
K=1000 OHMS M=1 MEGOHM
CAPACITANCE VALUES ONE AND OVER IN PICOFARADS,
LESS THAN ONE IN MICROFARADS, UNLESS OTHERWISE SPECIFIED
○ KNOB CONTROL
⊘ SCREWDRIVER CONTROL

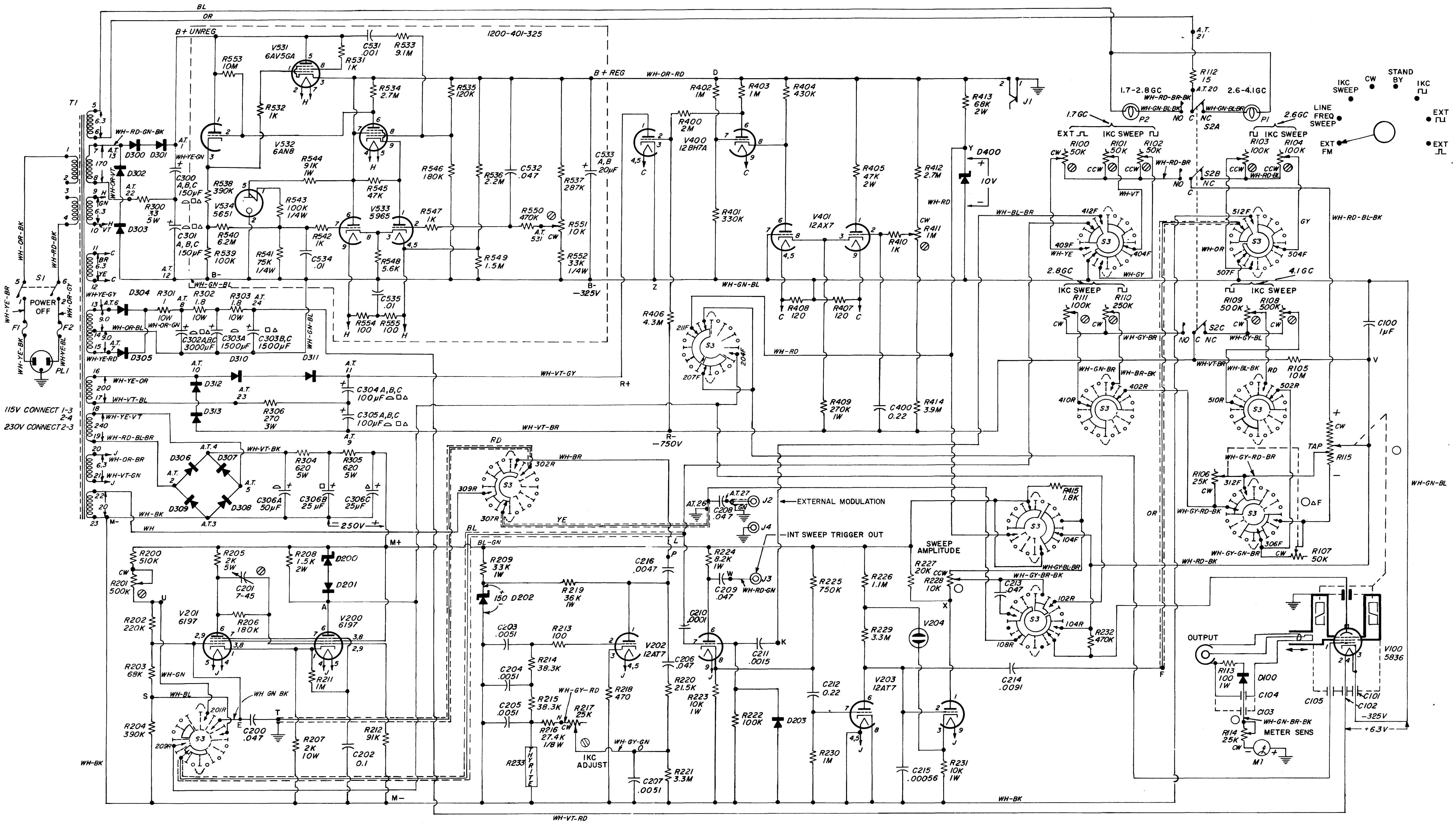


Figure 5-11. Schematic diagram for the Type 1360-B Microwave Oscillator.

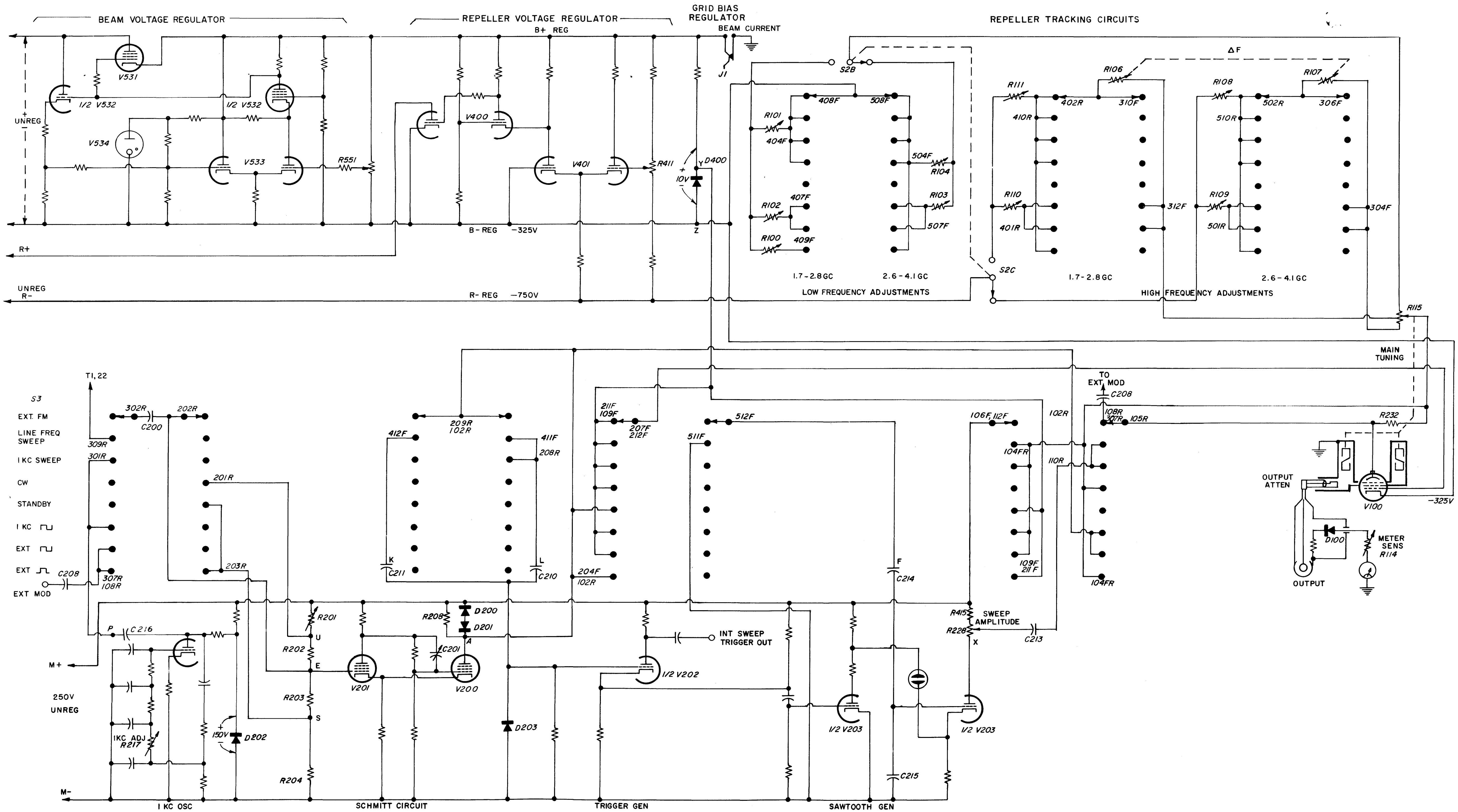


Figure 5-10. Elementary Schematic diagram for Type 1360-B Microwave Oscillator.

TYPE 874 COAXIAL COMPONENTS

TYPE 874 CABLE CONNECTORS

<table>
<tr><th colspan="2">APPLICABLE CABLE TYPES</th><th>CONNECTOR TYPE</th><th>CABLE</th><th>CABLE LOCKING</th><th>PANEL FLANGED</th><th>PANEL LOCKING</th><th>PANEL LOCKING RECESSED</th></tr>
<tr><td rowspan="2"></td><td>50-OHM</td><td>874-A2</td><td>-CA</td><td>-CLA</td><td>-PBA</td><td>-PLA</td><td>-PRLA</td></tr>
<tr><td>50-OHM</td><td>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</td><td rowspan="2">-C8A</td><td rowspan="2">-CL8A</td><td rowspan="2">-PB8A</td><td rowspan="2">-PL8A</td><td rowspan="2">-PRL8A</td></tr>
<tr><td></td><td>NON-50-OHM</td><td>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</td></tr>
<tr><td></td><td>50-OHM</td><td>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</td><td>-C58A</td><td>-CL58A</td><td>-PB58A</td><td>-PL58A</td><td>-PRL58A</td></tr>
<tr><td></td><td>NON-50-OHM</td><td>RG-59/U
RG-62/U
(Series)
RG-71B/U
RG-140/U
RG-210/U</td><td>-C62A</td><td>-CL62A</td><td>-PB62A</td><td>-PL62A</td><td>-PRL62A</td></tr>
<tr><td></td><td>50-OHM</td><td>RG-174/U
RG-188/U
RG-316/U</td><td rowspan="2">-C174A</td><td rowspan="2">-CL174A</td><td rowspan="2">-PB174A</td><td rowspan="2">-PL174A</td><td rowspan="2">-PRL174A</td></tr>
<tr><td></td><td>NON 50-OHM</td><td>RG-161/U
RG-187/U
RG-179/U</td></tr>
</table>

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

TYPE 874 ADAPTORS

TO TYPE		874–
BNC	plug	QBJA QBJL*
	jack	QBPA
C	plug	QCJA QCJL*
	jack	QCP
HN	plug	QHJA
	jack	QHPA
LC	plug	QLJA QLPA
LT	plug	QLTJ
	jack	QLTP
Microdot	plug	QMDJ QMDJL*
	jack	QMDP
N	plug	QNJA QNJL*
	jack	QNP
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 Type 874 Connector.

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

CONNECTOR ASSEMBLY TOOLS

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

OTHER COAXIAL ELEMENTS

TYPE 874–		TYPE 874–	
A2	50 Ω cable (low loss)	LR	radiating line
A3	50 Ω cable	LTL	trombone constant-Z line
D20L, D50L	20-, 50-cm adjustable stubs	ML	component mount
EL, EL - L	90° ell	MB	coupling probe
F185L	185-Mc low-pass filter	MR, MRL	mixer-rectifier
F500L	500-Mc low-pass filter	R20A, R20LA	patch cord, double coax
F1000L	1000-Mc low-pass filter	R22A, R22LA	patch cord, double coax
F2000L	2000-Mc low-pass filter	R33	patch cord, single coax
F4000L	4000-Mc low-pass filter	R34	patch cord, single coax
G3, G3L	3-, 6-, 10-, & 20-db attenuators	T, TL	tee
G6, G6L		UBL	balun
G10, G10L		VCL	variable capacitor
G20, G20L		VI	voltmeter indicator
GAL	adjustable attenuator	VQ, VQL	voltmeter detector
H500L	isolator	VR, VRL	voltmeter rectifier
H1000L	isolator	W100	100-Ω termination
H2000L	isolator	W200	200-Ω termination
JR	rotary joint	W50, W50L	50-Ω termination
K, KL	coupling capacitor	WN, WN3	short-circuit terminations
L10, L10L	10-, 20-, & 30-cm rigid air lines	WO, WO3	open-circuit terminations
L20, L20L		X	insertion unit
L30, L30L		XL	series inductor
LAL	33-58 cm adjustable line	Y	cliplock
LK10L, LK20L	constant-Z adjustable lines	Z	stand

MISCELLANEOUS COAXIAL CONNECTORS

CONNECTOR TYPE	TYPE NO.	USED WITH
Basic	874-B	50-ohm Air Line
Basic Locking	874-BL	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.

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