OPERATING INSTRUCTIONS

TYPE 1025-A
STANDARD SWEEP-FREQUENCY GENERATOR

1025-A

GENERAL RADIO COMPANY

B

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STANDARD SWEEP-FREQUENCY GENERATOR

Form 1025-0110-B
January, 1965

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

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SPECIFICATIONS

FREQUENCY

Range: 0.7 to 230 Mc in 10 ranges (0.7 to 1.4, 1.3 to 2.6, 2.4 to 4.8, 4 to 8, 7 to 14, 13 to 26, 24 to 48, 40 to 80, 65 to 140, and 100 to 230 Mc) and bandspread ranges of 400 to 500 kc and 10.7 ± 0.3 Mc.

Alternate range sectors can be substituted in the range-selector turret. Those presently available are: 0.4 to 0.8 Mc, 2 ± 0.1 Mc, 2.8 ± 0.1 Mc, 4 to 5 Mc, 16 ± 0.3 Mc, and 40 to 50 Mc. Special bandspread ranges can be provided according to the following schedule:

Specified Center Frequency	*Bandwidth*
Between 0.4 and 0.5 Mc	±0.01 Mc
0.45 and 1.6 Mc	±0.03 Mc
1.4 and 5 Mc	±0.1 Mc
4.5 and 16 Mc	±0.3 Mc

Control: 11-inch semicircular dial; scales are logarithmic for octave ranges up to 80 Mc, quasi-logarithmic between 65 and 230 Mc, essentially linear for all bandspread ranges. Slow-motion vernier drive dial is provided. One division on the vernier dial represents approximately 0.1% frequency difference on the octave frequency ranges.

Calibration Accuracy: At output voltages less than 0.3 volt, frequency is indicated to within ±0.5% when scale corrector is set to bring dial to index line. At output voltages above 0.3 volt, an external load on the output can produce frequency changes as large as ±0.5%. With an external frequency meter, scale corrector can be used to bring dial into agreement, for frequency resolution within ±0.1%.

Drift: Not greater than 0.3% for five hours after one-hour warmup.

Sweeping Rate: Frequency is swept from low-frequency end to high-frequency end of range in 22.2 milliseconds 20 times per second. Output is blanked off for return sweep.

Sawtooth Sweep Voltage: Adjustable in amplitude up to 100 volts, peak-to-peak. Also adjustable in starting point in the frequency range.

Marker: Internally generated marker of half-sinusoidal waveform is adjustable in amplitude from 3 millivolts to 1 volt and in frequency over the full sweep range; response amplitude multiplier effectively extends range up to 100 volts. Amplitude is indicated to an accuracy of ±10%.

RF OUTPUT

Voltage: Adjustable from 0.3 microvolt to 1 volt behind 50 ohms (−123 to 7 dbm power into 50 ohms).

Over-all Voltage Accuracy: ±14% up to 100 Mc, due to maximum voltmeter and attenuator errors listed below. Above 100 Mc, harmonics may add additional error of ±3%.

Voltmeter Error: ±2% (+2% of full scale reading).

Attenuator Error: 1% per step to maximum of 6%.

Stability: Output is held at preset level to within ±1% (0.1 db) up to 100 Mc and within ±3% (0.25 db) up to 230 Mc. Changes due to line-voltage variations and range switching will not exceed ±3% (0.25 db). A TYPE 874-R22A Patch Cord will reduce output 5% (0.4 db) at 230 Mc.

Effective Generator Impedance: 50 Ω resistive, VSWR less than 1.01 at panel jack; less than 1.1 at output of TYPE 874-R22LA Patch Cord, over the frequency range of the active generator.

Leakage: External rf field produces negligible interference with measurements down to the lowest levels.

RESPONSE AMPLIFIER

Maximum Input Voltage: 1, 10, or 100 volts as selected by the response-amplifier multiplier switch. Noise level is less than 1 millivolt, peak-to-peak, referred to the input at the ×1 (1 v) position of the multiplier switch, 10 millivolts at the × 10(10 v) position, and 100 millivolts at the ×100 (100 v) position.

Input Impedance: 1 megohm in parallel with 30 to 45 pf.

Gain: Approximate dc amplification between external response input connector and vertical display output connector is ×8 (18 db) at the ×1 position of the multiplier, ×0.8 at the ×10 multiplier position, and ×0.08 at the ×100 multiplier position.

Bandwidth: Greater than 10 kc. Sufficient for passing all details of any response that can be resolved at the maximum sweep rate of the generator.

Polarity: A polarity-reversing switch is provided to give a positive display vertical output voltage with either positive or negative inputs from the external response detector.

DISPLAY OUTPUT VOLTAGES

Vertical: Up to +8 volts into 100-kilohm load, consisting of marker plus response to be displayed.

Horizontal: Up to +100 volts dc or sawtooth peak into 100-kilohm load.

GENERAL

Frequency Output Voltage: 0.1 to 0.3 volt behind 50 ohms for operating external frequency meter or external marker generator.

External Marker Input Voltage: 1 volt, peak-to-peak, into 50 kilohms. Birdie-type markers can be applied which are controlled in amplitude and added to the response displayed.

Power Requirements: 105 to 125 (or 210 to 250) volts, 60 (or 50) cps, as specified below. Maximum input power is 145 watts.

Terminals: Recessed TYPE 874 Locking Connectors, except for EXTERNAL MARKER input connector, which is a standard telephone jack. For connection to type N, BNC, TNC, SC, C, or UHF connector, use a locking adaptor, which locks securely in place, yet is easily removed. Panel connector is recessed, and adaptor projects only about an inch from panel.

Accessories Supplied: TYPE 1025-P1 Detector Probe, three TYPE 874-R22A Patch Cords, three TYPE 874-R33 Patch Cords, three TYPE 874-C58A Cable Connectors, six TYPE 838-B Alligator Clips, TYPE CAP-22 Power Cord, spare fuses.

Accessories Available: TYPE 874-VQ Voltmeter Detector, TYPE 874-WM 50-ohm Termination, TYPES 908-P2 and -P3 Synchronous Dial Drives.

Cabinet: Rack-bench.

Dimensions: Bench model — width 19, height 16, depth 13¾ (485 by 410 by 350 mm), over-all; rack model — panel 19 by 15¾ inches (485 by 400 mm), depth behind panel 11⅛ inches (290 mm).

Net Weight: 73 pounds (34 kg).

Shipping Weight: 108 pounds (50 kg), approximately.

Type 1025-P1 Detector Probe (supplied with instrument)

Input Impedance: 1.5 pf, in parallel with 25 kilohms up to 10 Mc decreasing to 6 kilohms at 250 Mc.

Maximum RF Voltage: 3 volts, rms.

Frequency Characteristic: Flat within 5% (0.4 db) from 0.4 to 250 Mc.

Output Polarity: Positive.

Transfer Characteristic: DC output voltage equals the rms rf voltage above 0.5-volt input; essentially square-law characteristic below 50 millivolts, rms, rf input.

Fall Time: Less than 150 μsec, sufficiently short to follow all details of any response that can be resolved at the maximum sweep rate of the TYPE 1025-A.

For a more complete description of this instrument refer to the *General Radio Experimenter*, 37, 1, January, 1963.

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

Your need for this instrument indicates an interest in sweep measurement techniques. Reprints of an article entitled "Sweep Measurement Techniques" are available from us. To receive a copy, just fill out the card enclosed with this manual.

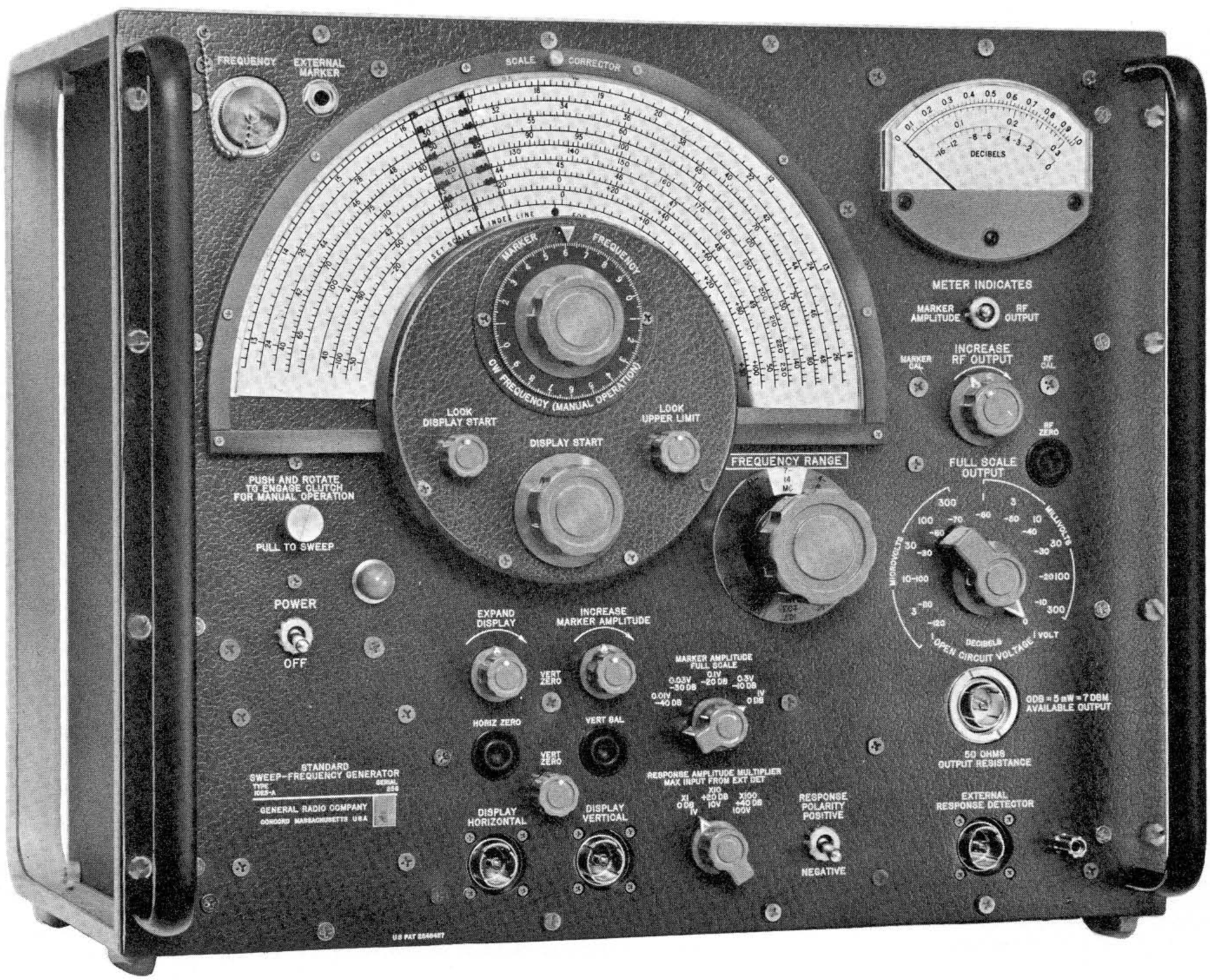


Figure 1-1. Panel view of the Type 1025-A Standard Sweep-Frequency Generator.

SECTION 1

INTRODUCTION

1.1 PURPOSE.

The Type 1025-A Standard Sweep-Frequency Generator (Figure 1-1) provides a signal which is repetitively varied in frequency, along with a synchronously varying sweep voltage, for automatic display of frequency response on an oscilloscope. An adjustable marker signal is also provided for calibration of the frequency scale of the display. The marker projects up from a true zero-level base line. Its amplitude is adjustable and is indicated by a meter and step attenuator to provide amplitude calibration for the display. The marker frequency is indicated by the large dial on the instrument. The adjustable rf output voltage is indicated by a meter and step attenuator, and is maintained at the preset level, independent of line voltage, generator frequency, and load impedance, as a true voltage in series with an accurate 50-ohm resistance.

In addition to automatic repetitive sweep operation, the instrument can be operated manually to provide an unmodulated rf signal, whose cw frequency is indicated by the large dial. In this mode, slow-speed sweep displays can be obtained when the frequency-control knob is rotated manually or with an accessory dial drive. A synchronously varying voltage is provided for driving the frequency axis of the display device. This permits the use of both long-persistence oscilloscopic displays and X-Y plotters for permanent recording.

1.2 DESCRIPTION.

1.2.1 GENERAL. The Type 1025-A Standard Sweep-Frequency Generator meets the performance requirements of a standard-signal generator. A motor-driven variable air capacitor provides the swept-frequency output which is high in amplitude, free from harmonic distortion and spurious responses, and extremely stable. As shown in the block diagram, Figure 1-2, the Type 1025-A consists of an oscillator with voltmeter and attenuator, an amplitude-regulating power supply (automatic-amplitude-control circuit), an induction motor, the sweep and marker-generating circuits, and the response display circuits.

To tune the oscillator to a given range, the tank-circuit inductance is changed. The oscillator output is metered by a peak-reading vacuum-tube voltmeter and

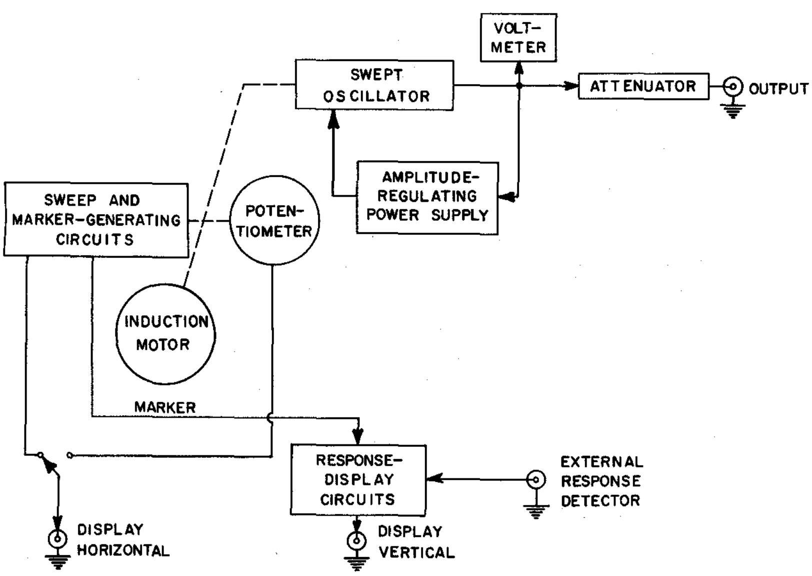


Figure 1-2. Block diagram of the Standard Sweep-Frequency Generator.

fed to the output connector through a step attenuator. The output level is regulated by an amplitude-regulating power supply, which compares the detected rf output with an adjustable reference voltage and uses the difference to correct the oscillator output by changing its plate voltage.

The frequency sweep is generated by an induction motor operating at 1675 rpm on a 60-cycle line (1410 rpm on a 50-cycle line). A drum drive arrangement reduces the speed to 1200 rpm, or 20 rps. The drive drum connected to the tuning-capacitor shaft carries three magnetic vanes, which also rotate at 20 rps. As the three magnetic vanes pass under the pole pieces of three sets of coils outside the periphery of the drive-drum, pulses are generated to (1) turn the sweep generator off during the return trace, (2) provide the frequency marker, and (3) generate the sweep voltage applied to the horizontal axis of the display oscilloscope.

The oscillator is turned on as the tuning capacitor starts rotation through its active 180° arc and is turned off for the remaining, inactive 180° rotation. Two of the coil sets can be moved independently through a 180° arc around the periphery of the drive drum so that the frequency-marker position and the starting point of the sweep voltage are adjustable.

1.2.2 CONTROLS. The following controls are on the Type 1025-A Standard Sweep-Frequency Generator:

TABLE 1 - CONTROLS

Name	Description	Function
Power	2-position toggle switch with pilot light	Turns power on or off
RESPONSE POLARITY	2-position toggle switch	Selects polarity required at external-response-detector connector for "response up" display.
METER INDICATES	2-position toggle switch	Selects meter function.
-----	2-position push-pull plus rotary motion	Selects manual or sweep operation.
HORIZ ZERO	Recessed thumb set control	Sets display horizontal-output voltage to zero at display-start point (left-hand side).
VERT BAL	Recessed thumb set control	Eliminates display base-line shifts with selection of response polarity.
RF ZERO	Recessed thumb set control	Sets rf output-meter zero indication.
EXPAND DISPLAY	Continuous rotary control	Sets horizontal size of display.
INCREASE MARKER AMPLITUDE	Continuous rotary control	Provides continuous variation of marker amplitude on display.
VERT ZERO	Continuous rotary control	Sets display vertical output to zero at base line.
INCREASE RF OUTPUT	Continuous rotary control	Provides continuous variation of rf output voltage.
MARKER AMPLITUDE FULL SCALE	5-position selector switch	Provides step attenuation of marker amplitude for accurate marker-amplitude indication by panel meter.
FULL SCALE OUTPUT	13-position selector switch	Provides step attenuation of rf open-circuit voltage for accurate rf output-voltage indication by panel meter.
RESPONSE AMPLITUDE MULTIPLIER MAX INPUT FROM EXT DET	3-position selector switch	Provides step attenuation of input from external response detector to accommodate a wide range of voltage.

TABLE 1 - CONTROLS (Continued)

MARKER FREQUENCY CW FREQUENCY	Multiturn vernier knob with increment dial	Provides continuous variation of marker frequency or cw frequency. Drives main dial.
DISPLAY START	Multiturn knob	Sets point in frequency range where display-voltage zero level occurs.
LOCK DISPLAY START	Rotary knob	Locks position of display-start knob.
LOCK UPPER LIMIT	Rotary knob	Locks position of an upper-limit stop which is positioned by the dial indicator with this lock released.
FREQUENCY RANGE	12-position selector	Selects frequency range covered.
SCALE CORRECTOR	Small knob at top of dial	Permits frequency scale to be shifted from normal position to make indication match external calibrator.

1.2.3 CONNECTORS. The following connectors are on the Type 1025-A Standard Sweep-Frequency Generator:

TABLE 2 - CONNECTORS

Name	Description	Function
Power	3-terminal plug at back of cabinet	Connection for ac power through detachable line cord.
FREQUENCY	Recessed Type 874 Coaxial Connector	Provides signal for monitoring frequency by external frequency meter or marker generator.
EXTERNAL MARKER	Phone jack	Permits externally generated marker to be substituted for internal marker.
DISPLAY HORIZONTAL	Recessed Type 874 Coaxial Connector	Provides display horizontal voltage synchronized with frequency sweep in both sweep and manual modes of operation.
DISPLAY VERTICAL	Recessed Type 874 Coaxial Connector	Provides display vertical voltage proportional to the voltage at the external-response-detector connector plus the frequency marker.
0DB-5MW-7DBM AVAILABLE OUTPUT	Recessed Type 874 Coaxial Connector below full-scale output selector	Provides selected rf output voltage behind 50 ohms resistance.
EXTERNAL RESPONSE DETECTOR	Recessed Type 874 Coaxial Connector	Connection from external response detector.

1.2.4 METER. The panel meter has three scales: 0 to 1.0 volt, 0 to 0.3 volt, and -16 to 0 (full-scale) db. The meter indicates the magnitude of either the MARKER AMPLITUDE or the RF OUTPUT, as selected by the

METER INDICATES switch. Step attenuators provide a wide range of effective full-scale meter sensitivity.

1.2.5 FREQUENCY INDICATION. The large frequency dial has nine scales. Four of these have a nearly logarithmic frequency distribution and each is used twice for frequency ranges separated by a decade. The two highest frequency ranges deviate somewhat from the others and have quasilogarithmic scales. Three additional scales with nearly linear frequency distribution are provided for all bandspread ranges, both the ranges normally supplied and all optional ranges (refer to specifications). Two of the linear scales have a zero-center calibration: one is calibrated ±30, the other is calibrated ±100. The third linear scale covers 40 to 50 and is used for the 0.4-to-0.5 Mc bandspread range (and can also be used for 4-to-5 and 40-to-50 Mc optional ranges).

As an aid in finding the proper scale for the selected frequency range, the nominal range limits are engraved in red on the transparent dial indicator near the scale arc to be used. The decimal-point position is indicated in the frequency-range limits shown by the FREQUENCY RANGE selector.

On the octave-frequency ranges up to 80 Mc, frequency increments of 0.1% are equal to approximately one small division on the vernier dial; one major division equals 1%.

1.2.6 FUSES. Line fuses are accessible from the rear of the instrument, near the plug for the line cord. Slow-blow 1.6-ampere fuses are used for 115-volt operation and slow-blow 0.8-ampere fuses are used for 230-volt operation.

1.3 ACCESSORY EQUIPMENT.

1.3.1 DISPLAY OSCILLOSCOPE. Any direct-coupled, cathode-ray oscilloscope with at least a 100-kc bandwidth will serve as a display device for sweep presentations with the Type 1025-A Standard Sweep-Frequency Generator. There are no internal sweep requirements for the oscilloscope since the sweep voltage is provided by the generator. Dc coupling in both vertical and horizontal channels is a practical necessity even with the generator operated in the normal sweep mode. A vertical sensitivity of 8 volts full-scale is sufficient for displaying the nose of a response producing one-volt peak at the external response-detector terminal; however, a full-scale sensitivity of 0.2 to 0.3 volt can be used without serious degradation due to noise or drift in the Type 1025-A. For greatest flexibility, the vertical full-scale sensitivity of the oscilloscope should be continuously adjustable between 0.2 and 8 volts. A horizontal sensitivity of 10 volts full-scale is adequate and no sensitivity adjustment is required. With this sensitivity, the oscilloscope should be capable of accepting up to 100-volt peak drive without damage or excessive recovery-time difficulties. The input impedance of both horizontal and vertical channels should be at least 100 kΩ. A relatively high accelerating potential on the cathode-ray tube is desirable for good display brightness and sharpness with expanded displays (down to 5% duty ratios). For best all-around use, a P-2 phosphor is recommended for good display under average lighting conditions and has sufficient decay time to permit slow-sweep "manual" exploration of critical parts of a response. For slow-speed sweeping with longest persistence, a P-7 phosphor can be used if ambient lighting is greatly reduced.

1.3.2 X-Y PLOTTER (OPTIONAL). An X-Y plotter may be substituted directly for the display oscilloscope when the Type 1025-A Standard Sweep-Frequency Generator is operated manually with an accessory dial drive on the manual mode. The input resistance of both channels should be at least 100 kΩ, or padded up to this value, to prevent overloading the amplifiers in the generator. The vertical sensitivity should be adjustable between 0.1 and 8 volts full-scale. A horizontal sensitivity of 10 volts will permit a 10-to-1 expansion of any part of a frequency range of the generator but higher sensitivity is of little use due to the limited resolution of the drive voltage supplied. The response speed of the X-Y plotter must be high enough to follow the excursions of the response at the rate at which the frequency dial is driven. The rate required can be estimated from accessory dial-drive motor data, frequency range of the generator, and steepness of response sides. If the dial is manually driven, the ability of the recorder to follow can be experimentally checked as the tuning rate is varied.

1.3.3 EXTERNAL RESPONSE DETECTOR. The rf output of a device under test must be rectified and applied as a varying dc voltage to the EXTERNAL RESPONSE DETECTOR connection on the Type 1025-A. Many devices to be tested include a built-in detector or rectifier at the rf output which can be connected directly to the generator. A Type 1025-P1 Detector Probe (see characteristics in Figures 5-1 and 5-2 of Section 5.3) is supplied for use where a convenient, relatively high-impedance detector is required. A Type 874-VQ Voltmeter Detector is recommended for use as a bridging detector with minimum disturbance to a 50-ohm line. A Type 874-VQ with a Type 874-WM 50-ohm Termination is recommended to terminate a device under test in 50 ohms and monitor the voltage developed across this resistance.

1.3.4 DIAL DRIVES (OPTIONAL). The Type 908-P2 Synchronous Dial Drive or the Type 908-P3 Reversible Dial Drive may be substituted for the frequency-control knob assembly to provide slow automatic sweeping with the Type 1025-A Standard Sweep-Frequency Generator operated in the "manual" mode. The Type 908-P2 Synchronous Dial Drive is recommended for repetitive slow sweeping with a long-persistence oscilloscopic display. With this drive the frequency is swept approximately 7 percent per second on octave ranges and approximately 0.1 x total bandwidth per second on bandspread ranges, with a 60-cycle power line. With a 50-cycle line, the sweep rates are 5/6 the values given. The Type 908-P2 Dial Drive automatically reverses when it encounters resistance so it provides alternatingdirection sweeps between any display-start and upper-limit points set on the Type 1025-A.

The Type 908-P3 Reversible Dial Drive is recommended for single, slower-rate sweeps for plotting response curves on an X-Y recorder. With this drive, the frequency is swept approximately 0.9 percent per second on the octave ranges and approximately 0.013 x total bandwidth per second of bandspread ranges, with a 60-cycle power line. With a 50-cycle line, the rates are 5/6 the values given. The Type 908-P3 Reversible Dial Drive can be directed to drive in either direction and a slip clutch limits drive torque when the dial indicator reaches a limit stop, where it remains until the direction of the drive is manually reversed.

1.3.5 EXTERNAL FREQUENCY METER (OPTIONAL). A minimum of 0.1 volt behind 50 ohms is available for operating an external frequency meter for increased accuracy of frequency indication. With manual operation, the greatest accuracy for single cw frequencies is obtained with a digital frequency meter, such as the General Radio Type 1130-A Digital Time and Frequency Meter in combination with a Type 1133-A Frequency Converter and Video Amplifier.

For checking the frequency-dial calibration of the generator at 10-, 1-, or 0.01-Mc intervals, the General Radio Type 1213-D Unit Time/Frequency Calibrator is recommended. This calibrator is also useful for producing birdie-type markers at low sweep rates in manual operation. When used with an external detector, such as the General Radio Type 874-VQ Voltmeter Detector, calibrating markers can also be obtained with the generator operated in its normal sweep mode.

SECTION **2**

THEORY OF OPERATION

2.1 GENERAL.

The Type 1025-A Standard Sweep-Frequency Generator is, like any standard-signal generator, a source of ac energy of accurately known characteristics. The oscillator meets the requirements of stability, constant output level, good waveform, and negligible hum and noise modulation. An oscilloscope display of response vs frequency of a device under test can be calibrated in both frequency and amplitude without external equipment.

The output frequency is swept by a motor-driven tuning capacitor of a split-stator design with the rotor plates divided equally about the axis of rotation. This provides both mechanical and electrical balance so that no balancing weights or sliding contacts are required. The generator is normally supplied with 10 octave ranges from 0.7 to 230 Mc, with generous overlaps. The frequency range swept is selected by a 12-sector turret, which is designed to permit the sectors to be readily replaced for special ranges. The entire frequency range selected is swept in 1/45 of a second and there are 20 sweeps per second. The oscillator always sweeps from low to high frequencies, and is blanked off between sweeps to permit the capacitor to return to the low-frequency end of the range. A sawtooth voltage is generated in synchronism with the frequency sweeping for horizontal deflection on a cathode-ray oscilloscope. With the EXPAND DISPLAY and DISPLAY START controls, as little as one-tenth of any octave range can be set to occupy the full width of the display oscilloscope.

For additional resolution, bandspread ranges can be used to cover as little as 5% in frequency for the full-range sweep and this, too, can be reduced by expansion of the display to one-tenth of the full range. The two range positions beyond the 10 required for 0.7 to 230 Mc are normally supplied with bandspread sectors of 0.4 to 0.5 Mc and 10.7 ± 0.3 Mc. (Other frequency ranges are supplied on special order; see specifications.) The bandspread ranges have an essentially linear frequency distribution on the display, while the octave ranges have a logarithmic distribution. For general-coverage octave ranges there are four logarithmic scales plus two quasilogarithmic scales (for the 65-to-140 Mc and 100-to-230 Mc ranges). For the bandspread ranges there are three scales (40 to 50, 0±100, and 0±30).

In addition to the normal sweep mode of operation, the sweep motor can be stopped and a clutch engaged to connect the marker control and frequency indicator directly to the tuning capacitor for manual control of the frequency. In this mode, the frequency indicated on the dial is the cw frequency generated. The generator still functions as a sweep generator since a dial potentiometer provides a display-sweep voltage proportional to frequency-indicator travel. This potentiometer duplicates operation in the normal sweep mode so that the DISPLAY START and DISPLAY EXPANSION controls are still operative. An X-Y plotter can be connected in place of the oscilloscope used at the high-speed sweep, and the response can be plotted on paper as the frequency knob is turned slowly. This manual mode also permits slow exploration speed to check that the normal sweep speed is not too great for the device under test and that the true response is being plotted.

If desired, the frequency knob of the Type 1025-A can be removed and a Type 908-P2 Synchronous Dial Drive attached for slow-speed sweeping with an oscilloscope display, or a Type 908-P3 Reversible Dial Drive attached for use with an X-Y plotter.

2.2 ELECTRICAL AND MECHANICAL DETAILS.

A unique feature of the Type 1025-A Standard Sweep-Frequency Generator is the system used to provide frequency markers. An LC resonant circuit is used as the frequency-determining circuit (see elementary schematic diagram, Figure 2-1). The inductance is switched by the turret to select the various frequency ranges and a variable capacitor provides a smooth variation of frequency over the range selected. The angular position of the variable C can be calibrated in terms of frequency generated for any particular L. The capacitor drive drum carries a thin iron vane which generates a pulse as it passes a magnetic-pickup device. The pickup's angular position is indicated on a dial and can be adjusted to coincide with the instantaneous position of the capacitor vane at any point over a 180° arc. For each setting of the marker-pickup dial, the pulse generated occurs at a particular position of the tuning capacitor and consequently at a particular frequency. The dial therefore can be calibrated in frequency existing at the instant the pulse occurs. This pulse is displayed as a vertical deflection on an oscilloscope whose horizontal deflection is a time-varying voltage in synchronism with the frequency variation of the oscillator. The position of the pulse is not affected by any nonlinearities that may be present in the display horizontal deflection.

The tuning capacitor is useful for only 180° of its range. During the inactive 180° the oscillator is blanked off. The rotating capacitor with its drive drum serves as a very good flywheel to make the angular speed of the second 180° very nearly that of the first 180° and the time relationships in the two half-revolutions are nearly identical. The timing diagram of Figure 2-2 shows the relationship of events in the sweep cycle. The marker vane is positioned 180° from the position to be identified so that the marker is generated while the oscillator is blanked off. The blanking is controlled by pulses from a fixed magnetic pickup. Two vanes, 180° apart on a separate track from the marker vane, produce pulses at the beginning and end of the active tun-

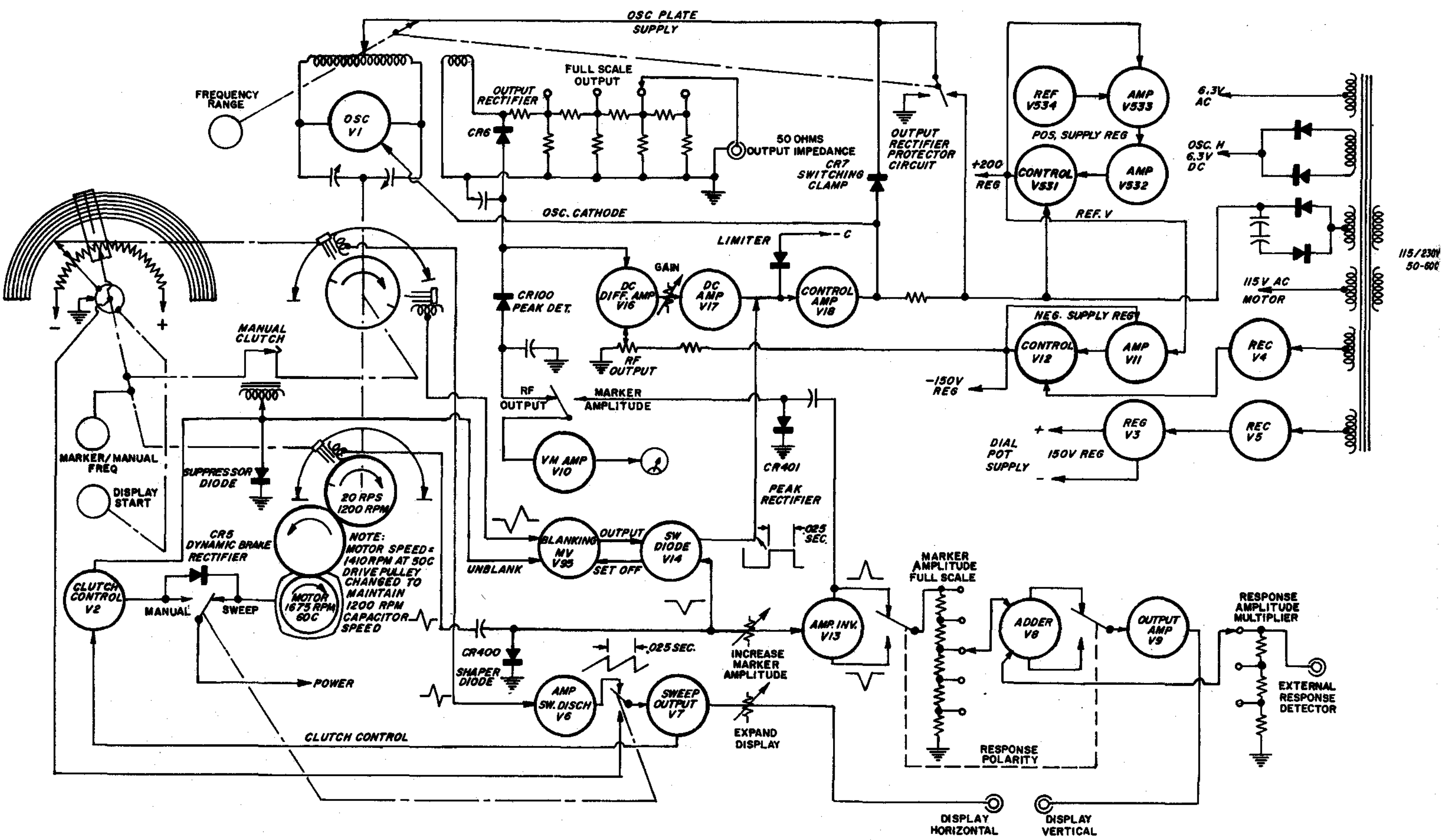


Figure 2-1. Elementary schematic diagram of the Type 1025-A Standard Sweep-Frequency Generator.

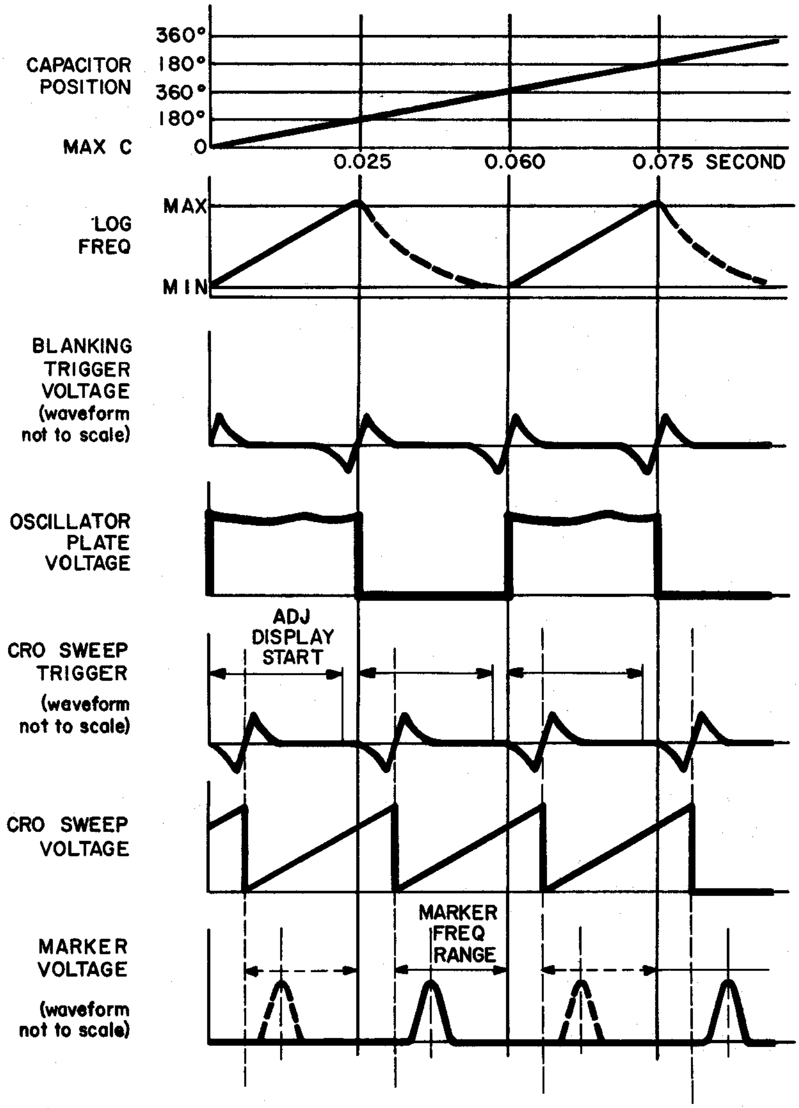


Figure 2-2. Timing diagram for one complete cycle of the Type 1025-A.

ing range of the capacitor. These are used to complement a bistable blanking multivibrator. The proper blanking phase is obtained by use of the marker pulse to set the multivibrator to the "blanked" state.

A sawtooth waveform voltage is generated for the display horizontal deflection, at two cycles per revolution of the tuning capacitor. The response and the marker are displayed on alternate sweeps of the display so that they do not interfere with each other. The dotted marker voltage pulse on the timing diagram, Figure 2-2, shows the position to be identified, but the pulse is actually generated exactly 180° later while the oscillator is blanked off. The display horizontal sawtooth voltage is generated by an electronic sweep circuit triggered by pulses from the DISPLAY START magnetic pickup. This pickup operates with the same rotating vanes used for the blanking and thus two equally spaced pulses are produced per revolution of the tuning capacitor. The angular position of the pickup is varied by the DISPLAY START control to set the point at which the display sawtooth starts. This control, in conjunction with the EXPAND DISPLAY control, permits any part of a frequency range to be expanded on the display, so that 1/10 of any tuning range can be made to occupy full scale of this display. (This expansion requires a 10-volt full-scale display horizontal sensitivity since the maximum peak-to-peak amplitude of the sawtooth is 100 volts.) The start of the sawtooth is clamped to zero so that, with a direct-coupled oscilloscope, the start of the display remains fixed and the excess voltage deflects the trace off scale to the right. The base width of the marker is less than 1% of the unexpanded display and, since it occurs when the oscillator is blanked off, its base line is the zero-reference level of the response. The response appears as a separate line on the display, except when it is zero, due to presentation of the marker and response on alternate display sweeps. The triangular marker waveform permits the indication to be read to about 1/10 of the base width for a resolution of about 0.1% of the unexpanded display, or 1% with a 10-to-1 expansion.

The output of an external response detector is brought back to the signal generator so that the marker can be added to the vertical-display voltage. About 18 db of direct-coupled amplification is provided. A polarity-reversing switch permits a right-side-up display with a response detector of either output polarity. Step attenuators and the metering of the adjustable marker amplitude provide means of calibrating the vertical scale of the display.

The rf output voltage is provided as a true zero-impedance generator voltage in series with an accurate 50-ohm resistance. The maximum value of the voltage is 1 volt and is adjustable down to a fraction of 1 microvolt by means of an attenuator and continuously adjustable output control. A complete circuit schematic diagram appears in Section 6.

SECTION 3

INSTALLATION

3.1 MOUNTING.

The instrument is available equipped for either bench or relay-rack mounting. For bench mounting (Type 1025-AM), aluminum end frames are supplied to fit the ends of the cabinet. Each end frame is attached to the instrument with four panel screws and four 10-32 round-head screws with notched washers.

For rack mounting (Type 1025-AR), special rack-mounting brackets are supplied to attach the cabinet and instrument to the relay rack (see Figure 3-1). These brackets permit either cabinet or instrument to be withdrawn independently of the other.

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.

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

c. Insert the four panel 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. Toward the rear of each bracket, put a thumb screw (D) through the slot in the bracket and into the hole in the side of the cabinet.

To remove the instrument from the rack, remove the four panel screws with washers (C) and the 16 bright screws around panel (screws at sides inside handles) and draw the instrument forward out of the rack. To remove the cabinet and leave the instrument mounted in the rack, remove only the two thumb screws (D) at the rear of the brackets and the 16 bright screws around panel (screws at sides inside handles) and pull the cabinet back off the instrument from the rear of the rack.

3.2 CONNECTION TO POWER SUPPLY.

Connect the Type 1025-A to a source of power as indicated near the input socket at the rear of the instrument, using the power cord provided. If a three-wire grounded receptacle is not available at the power source, the plug may be modified or adapted to fit existing receptacles, but a safety ground should be provided either to the adaptor or the ground post on the panel of the instrument.

A small plate attached to the cabinet near the rear power connection gives the limits of line voltage and nominal frequency that can be applied to the instrument. If the line voltage and/or frequency must be changed, refer to paragraph 6.10.

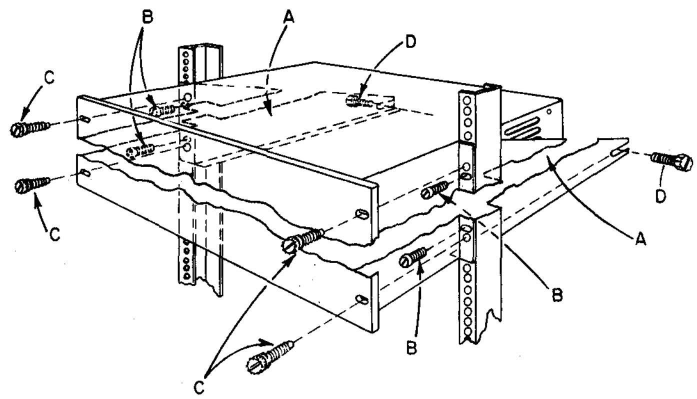


Figure 3-1. Installation of relay-rack model, Type 1025-AR.

3.3 CONNECTION TO DISPLAY DEVICE.

Connect the DISPLAY HORIZONTAL connector of the Type 1025-A to the horizontal-input terminals of the display oscilloscope or X-Y recorder with a shielded patch cord. Connect the DISPLAY VERTICAL connector of the generator to the vertical-input terminals of the oscilloscope or X-Y recorder with a shielded patch cord. The Type 874-R22A or Type 874-R33 Patch Cords supplied with the generator are recommended for these connections. (Type 874 Adaptors to other standard connectors are available; see table at the rear of this manual.)

3.4 GENERATOR RF OUTPUT.

Connect the GENERATOR OUTPUT connector to the input of the device under test with a shielded 50-ohm patch cord (Type 874-R22A is recommended). At the high-frequency end of the range it is particularly important to preserve the uniform characteristics of a 50-ohm coaxial connection right up to the actual input point of the device under test. If the device under test is not equipped with a suitable input connector, attach one of the Type 874-C58 Cable Connectors to the device. (Type 874 Adaptors to other standard connectors are available; see table at rear of this manual.)

3.5 EXTERNAL RESPONSE DETECTOR.

Connect the EXTERNAL RESPONSE DETECTOR connector to the response detector at the output of the device under test with a shielded patch cord. The Type 1025-P1 Detector Probe has its own attached cable. To maintain a flat frequency-response characteristic and to minimize stray pickup, keep the rf connections to the probe as short as possible. If practical, connect the hook on the probe tip directly to the high output terminal of the device under test. (A small hook of solid copper buss wire can be soldered to the terminal of the device to mate with the probe hook.) The ground connection should also be short. Rest the solid ground clip of the probe against a chassis ground in the device under test. The notch in the end of the ground clip will accept a 6-32 screw for a more permanent connection. To plug the probe and ground clip directly into a Type 874 Connector, squeeze the clip against the insulator and insert it at a slight angle. For frequencies below 50 Mc, the solid ground clip can be removed (snap fit) and the flexible lead terminated with an alligator clip for more convenient ground connection.

CAUTION

> The maximum sine-wave voltage that should be applied to the Type 1025-P1 is 3 volts rms. For higher levels, use a suitable voltage divider at the output of the device under test. The built-in capacitor will withstand 300 volts dc, but sudden application of more than +20 volts dc may damage the diode in the probe.

With the Type 874-VQ Voltmeter Detector use one of the Type 874-R22A Patch Cords. For devices with built-in detectors, use a Type 874-R33 Patch Cord fitted with alligator clips, or attach a Type 874-C58 Cable Connector to the detector and use a Type 874-R22A Patch Cord.

3.6 FREQUENCY.

To monitor the generator frequency with an external frequency meter, connect the frequency meter to the FREQUENCY connector of the generator with a shielded 50-ohm coaxial cable. (Caution: The shielding of an external device may be insufficient to prevent its rf leakage from interfering with measurements at the lowest output from the generator.) The screw-on shield cap eliminates leakage from the FREQUENCY connector when it is not in use.

3.7 EXTERNAL MARKER.

The output of an external frequency calibrator, such as the General Radio Type 1213-D Unit Time/Frequency Calibrator, can be inserted at the EXTERNAL MARKER phone jack of the generator to provide birdy-type markers. The Type 1213-D, however, is suitable only at low sweep rates in manual-mode operation.

SECTION **4**

OPERATING PROCEDURE

NOTE

> Operations described in the following paragraphs are to be done in the sequence indicated.

4.1 NORMAL SWEEP OPERATION.

4.1.1 INITIAL ADJUSTMENT. After installation (Section 3), turn the power on and allow at least a two-minute warmup. Set the controls as follows:

1. Mode control, PULL TO SWEEP (position further out from panel).
2. EXPAND DISPLAY control, counterclockwise.
3. INCREASE MARKER AMPLITUDE control, counterclockwise.
4. METER INDICATES switch, RF OUTPUT position.
5. INCREASE RF OUTPUT control, counterclockwise.

6. RF ZERO control, adjust for zero meter indication.

7. LOCK DISPLAY START control, off (knob dot down).

8. LOCK UPPER LIMIT control, off (knob dot down).

9. Temporarily remove the connection between the DISPLAY VERTICAL connector and the oscilloscope. Set the oscilloscope for maximum sensitivity, and with the vertical and horizontal position controls of the oscilloscope, position the spot at the desired lower left-hand corner of the display. Replace the connection to the DISPLAY VERTICAL connector.

10. Temporarily remove the connection to the EXTERNAL RESPONSE DETECTOR connector. If necessary, reduce the vertical sensitivity of the oscilloscope until the spot appears at the left-hand edge of the display and remains on the screen when the position of the RESPONSE POLARITY switch is changed. Adjust the VERT BAL control so that the spot does not change position when the RESPONSE POLARITY switch is changed. With the VERT ZERO control return the spot to the lower left-hand corner of the display.

When adjustments 9 and 10 are properly made, the sensitivity of the oscilloscope can be changed without shifting the position of the spot.

11. Reconnect the EXTERNAL RESPONSE DETECTOR connection.

A shift in the spot position indicates residual output from the external response detector. (This will not occur with semiconductor rectifiers such as those used in the Types 1025-P1 and 874-VQ unless there is residual rf present.) If a thermionic rectifier is used, residual dc potential will be present. For measurements at very low levels, this potential should be bucked out by an auxiliary power supply. (The VERT BAL control may be used if it has sufficient range.)

12. Turn the EXPAND DISPLAY control fully clockwise and observe the shift in the left-hand end of the display. Adjust the HORIZ ZERO control until there is negligible shift as the EXPAND DISPLAY control is operated.

13. Set the EXPAND DISPLAY control until the horizontal line just fills the screen.

14. Set the SCALE CORRECTOR until the small hole at the bottom center of the dial matches the index line.

15. Set the DISPLAY START control until the small indicator is at the left-hand end of the frequency scale arcs.

16. Set the METER INDICATES switch to MARKER AMPLITUDE.

17. Set the MARKER AMPLITUDE FULL SCALE switch to 1 v (0 db).

18. With the INCREASE MARKER AMPLITUDE control, adjust for a meter indication of 1.0 v.

19. Adjust the vertical sensitivity of the oscilloscope until the marker displayed produces a full-scale deflection. Note that the marker position varies as the MARKER FREQUENCY control is turned and appears at the left-hand end of the horizontal base line on the oscilloscope when the dial indicator on the instrument is at the left-hand end of the frequency-scale arcs.

20. Turn the MARKER FREQUENCY control counterclockwise so that the marker moves toward the right-hand end of the display.

21. Set the frequency indicator to the right-hand end of the frequency-scale arcs.

22. The point indicated by the marker on the display is now at the right-hand limit of the useful display. To bring this point to the right-hand edge of the horizontal display scale, increase the setting of the EXPAND DISPLAY control.

23. Set the RESPONSE AMPLITUDE MULTIPLIER switch so that the indicated maximum input from the external detector will not be exceeded.

a. Select the frequency range that covers the pass band of the device under test.

b. Set the FULL SCALE OUTPUT selector to the lowest setting that will permit the desired input level to the device under test.

c. With the INCREASE RF OUTPUT control, gradually increase the output to the desired level, observing the response displayed.

d. If the response goes in a negative direction, change the position of the RESPONSE POLARITY switch. (Positive for Type 1025-P1; negative for Type 874-VQ.)

If the displayed response exceeds full scale of the display, that is, exceeds the marker amplitude before the desired input level is reached, the input level from the external response detector is above the acceptable limit and the setting of the RESPONSE AMPLITUDE MULTIPLIER control must be increased.

If the displayed response does not approach full scale on the display, the vertical sensitivity of the oscilloscope may be increased. If it is less than one-tenth of full scale when the desired input level is applied and the setting of the RESPONSE AMPLITUDE MULTIPLIER switch is above the X1 position, the setting of this switch should be reduced.

4.1.2 EXPANDING THE DISPLAY. In general, the response displayed will occupy only a portion of the full width of a selected frequency range. To expand the picture presented, proceed as follows:

1. Set the DISPLAY START control until the left-hand edge of the response appears near the left-hand edge of the display.

2. Turn the EXPAND DISPLAY control clockwise to produce the desired expansion (size) of the display.

3. Reset the DISPLAY START control to center the display, if desired.

4. Set the LOCK DISPLAY START control to the locking position (knob dot upward) to prevent accidental shift in the horizontal position of the display.

5. If desired, set a stop for the marker frequency

indicator at the right-hand limit of the display:

a. Turn the MARKER FREQUENCY control to position the displayed marker at the right-hand end of the oscilloscopic display.

b. Set the LOCK UPPER LIMIT control to the locking position (knob dot upward).

The travel of the frequency indicator is now restricted between the limits set by the DISPLAY START control and the LOCK UPPER LIMIT control. To reset the upper-limit stop, release the LOCK UPPER LIMIT control (knob dot downward), turn the frequency indicator to the new position, then relock the control (knob dot upward).

4.1.3 FREQUENCY CALIBRATION OF THE DISPLAY. The horizontal position of the marker represents the frequency shown by the hairline indicator on the main-dial scale. To determine the frequency of any point on the response displayed, position the marker with the MARKER FREQUENCY control and read the frequency indicated on the main dial. The small dial on the control knob can be used to determine incremental changes in frequency. One small division represents approximately a 0.1% frequency change in octave ranges of the instrument. For increased accuracy of frequency determination, match the peak of the marker to the response curve (refer to paragraph 4.1.4).

4.1.4 AMPLITUDE CALIBRATION OF THE DISPLAY. The absolute amplitude of the voltage produced by the external response detector across the EXTERNAL RESPONSE DETECTOR connector can be determined for any point on the response displayed as follows:

1. Set the MARKER INDICATES switch to the MARKER AMPLITUDE position.

2. Set the MARKER AMPLITUDE FULL SCALE switch to the lowest setting that will permit the marker peak to be matched to the desired point on the response with the INCREASE MARKER AMPLITUDE control, keeping the meter indication on scale.

The voltage indicated by the meter (with full-scale sensitivity indicated by the MARKER AMPLITUDE FULL SCALE switch multiplied by the setting of the RESPONSE AMPLITUDE MULTIPLIER switch) is the response voltage at the marker tip.

When only relative response amplitudes are of interest, the decibel scales are convenient since relative amplitude expressed in decibels is merely the difference in the db indications. For the greatest simplicity, set the desired 0-db reference level on the response to a 0-db marker indication with the RF OUTPUT control.

The calibration of the response amplitude on the display, as described above, does not include the voltage-transfer characteristics of the external response detector. To determine the true relative rf response levels in the display, reduce the rf output level from the generator in steps of, say, 1 db, and mark or note the corresponding levels of the response peak on the display screen.

The marker amplitude calibration is referred to the voltage across the EXTERNAL RESPONSE DETECTOR connector and the voltage delivered to the DISPLAY VERTICAL connector can be higher or lower than this, depending on the setting of the RESPONSE AMPLITUDE MULTIPLIER switch. Therefore, an existing absolute calibration of the display-device vertical scale should be ignored.

4.2 MANUAL OPERATION.

4.2.1 TEST FOR ACCURACY OF SWEEP PRESENTATION. In the manual mode of operation, first check that the normal sweep presentation is not distorted by excessive sweep speed. Engage the manual clutch --- PUSH AND ROTATE slowly, the knob, as indicated, until increased resistance is felt. A slight click can usually be heard as the manual clutch engages. When the clutch is properly engaged, the clutch-control knob will rotate slowly when the frequency knob is turned. Turn the frequency knob to trace out the response with a moving spot on the display oscilloscope. With the phosphors recommended (refer to paragraph 1.3.1), there is sufficient trace persistence to see the shape of the response. If there is no distortion due to sweep speed, this response will closely agree with the response picture obtained in the normal sweep mode.

If this test indicates that the sweep speed is excessive and causes distorted presentation, use a Type 908-P2 Synchronous Dial Drive or a Type 908-P3 Reversible Synchronous Dial Drive for automatic sweeping. The Type 908-P2 is recommended for repetitive sweeps with a cathode-ray oscilloscopic display; the Type 908-P3 for single sweeps with an X-Y Recorder. However, for occasional use, hand operation produces perfectly usable slow sweep presentations or recordings.

4.2.2 SLOW-SPEED SWEEPING. To mount the Type 908-P2 Synchronous Dial Drive on the Type 1025-A for repetitive slow-speed sweeping, first remove the vernier-dial assembly on the generator by loosening the two binder-head screws on the sides of the assembly. Mount the Dial Drive in place of the vernier-dial assembly with the two long screws provided with the Dial Drive. Set the outer-face pinion on the Type 908-P2 approximately 1/2 inch above the back plate of the drive assembly to properly engage the gear in the generator dial assembly. Use the metal knob projecting at the top of the drive-slide mechanism to help engage the gears.

Turn the power on. The Type 908-P2 will sweep the dial indicator back and forth between the limits previously set. The upper limit may be reset at any time by merely releasing the LOCK UPPER LIMIT control and then relocking it as the dial indicator passes the desired upper limit. The lower limit is the point where the LOCK DISPLAY START control is set.

4.2.3 USE WITH AN X-Y RECORDER. For permanent recording of response curves, an X-Y recorder of suitable characteristics can be directly substituted for the display oscilloscope (refer to paragraph 1.3.2). The sweep speed provided by the Type 908-P3 Reversible Synchronous Dial Drive is suitable for most applications.

To mount the Type 908-P3 on the Type 1025-A, first remove the vernier-dial assembly on the generator by loosening the two binder-head screws on the sides of the assembly. Mount the dial drive in place of the vernier-dial assembly with the two long screws provided with the Dial Drive. Use the metal knob projecting at the top of the drive-slide mechanism to help engage the gears.

Turn the power on. The Type 908-P3 will drive the dial indicator in the direction in which it starts until the indicator encounters a limit stop where it remains until manually reversed by a small lever near the top slide knob. The dial indicator then travels in the opposite direction until it encounters the other limit stop. This process can be repeated, producing single, alternate-direction sweeps. Leave the power on to prevent interrupting the sequence. The limit stops can be readjusted as described in paragraphs 4.1.2 and 4.2.2.

4.3 EXTERNAL FREQUENCY MONITORING.

4.3.1 GENERAL. With cw operation an external frequency meter, such as the General Radio Type 1130-A Digital Time and Frequency Meter with the Type 1133-A Frequency Converter and Video Amplifier, can be used to monitor the generator frequency. Remove the screw-on cap from the FREQUENCY connector, and in its place connect the external device with one of the Type 874-R22A or 874-R33 Patch Cords supplied with the Type 1025-A. At the lowest output levels from the generator, rf leakage from the frequency meter may seriously interfere with measurements. To check this, disconnect the frequency meter and replace the shield cap on the FREQUENCY connector.

An external frequency calibrator, such as the General Radio Type 1213-D Unit Time/Frequency Calibrator, can be used in the same manner to provide check points at finite frequency intervals. For increased accuracy of dial indication at intermediate points, use the scale corrector on the frequency dial of the Type 1025-A to bring the dial to agreement at adjacent test points.

4.3.2 SLOW-SWEEP EXTERNAL-MARKER GENERATOR. The Type 1213-D Calibrator can also be used to provide "birdie" type markers on an oscilloscopic display when the generator is operated in the manual mode with slow sweep rates (refer to paragraph 4.2.2). For this use, connect the output of the Type 1213-D to a standard two-terminal phone plug (high terminal of the calibrator output to the tip of the phone plug), set the Type 1213-D for AUDIO BEAT SIGNAL output and insert the phone plug into the EXTERNAL MARKER jack of the generator. Set the AUDIO GAIN control of the Type 1213-D fully clockwise and adjust the amplitude of the marker "birdie" with the INCREASE MARKER AMPLITUDE control of the generator. Set the frequency spacing between markers with the FUNDAMENTAL FREQUENCY switch on the Type 1213-D.

4.3.3 NORMAL-SWEEP EXTERNAL-MARKER GENERATOR. The system described in paragraph 4.3.2 is not satisfactory when the generator is operated in the normal sweep mode due to the limited bandwidth of the audio output from the Type 1213-D and the lack of dc coupling. However, a very satisfactory calibrating system is obtained when an external heterodyne detector, such as a General Radio Type 874-VQ Voltmeter Detector, is used to compare the generator sweeping frequency with the harmonic series of frequencies provided by the Type 1213-D.

For this calibrating system, proceed as follows:

1. Plug one end of the through coaxial line of the Type 874-VQ into the OUTPUT connector of the Type 1213-D.

2. Connect the other end of the Type 874-VQ to the FREQUENCY connector on the Type 1025-A with a Type 874-R22A Patch Cord.

3. Connect the output (side connector) of the Type 874-VQ to the EXTERNAL RESPONSE DETECTOR connector of the Type 1025-A (in place of the connection from the response detector) with a Type 874-R22A Patch Cord.

4. Set the RESPONSE POLARITY switch to NEGATIVE with a normal-polarity diode in the Type 874-VQ.

5. Select an oscilloscope sensitivity so that the beat-type markers appear on an elevated, approximately horizontal line. (Above 50 Mc the line will dip down and some ripples will appear due to the input-impedance variation of the Type 1213-D, but the markers will remain in the proper positions.)

6. With the FUNDAMENTAL FREQUENCY selector on the Type 1213-D, select a suitable marker-frequency interval for the generator frequency range being used. A fundamental frequency as low as 100 kc can be used on the lower frequency ranges of the generator (satisfactory below about 3 Mc). Some secondary beats will appear on the display, principally at one-half the selected frequency interval; use the basic calibration of the FREQUENCY dial of the generator to identify these. To identify the actual frequency that each beat marker represents, first select the highest FUNDAMENTAL FREQUENCY on the Type 1213-D that will give a series of markers across the frequency range in use. Then, for higher resolution, select a lower FUNDAMENTAL FREQUENCY on the Type 1213-D.

7. Match the generator marker to the center of the beat pattern of the marker nearest the frequency of interest. Above 100 Mc, the beat markers will be somewhat smaller and slightly distorted but are still reliable if the tip of the internal marker is matched to the leading edge of the beat markers displayed.

8. Adjust the SCALE CORRECTOR, if necessary, to make the FREQUENCY dial indication agree with the beat-marker frequency (an integral multiple of the FUNDAMENTAL FREQUENCY selected).

9. Check the agreement between the frequency indicated by the generator dial and the beat markers over the frequency bandwidth of interest, and make any necessary corrections.

10. Remove the connection to the Type 874-VQ and replace the connection from the external response detector and proceed with response measurements.

NOTE

On a dual-trace oscilloscope, apply the output from the Type 874-VQ directly to the second channel so that the beat markers and response pattern can be simultaneously displayed. For ease of centering, set the channel fed by the Type 874-VQ to reverse the polarity of the signal.

4.4 SWEPT-FREQUENCY IMPEDANCE MEASUREMENTS.

4.4.1 GENERAL. A completely automatic presentation of impedance or admittance in the complex impedance plane is possible with a sweep-frequency generator and some special auxiliary equipment. Useful swept-frequency measurements of impedance in the vicinity of the 50-ohm output impedance of the Type 1025-A Standard Sweep-Frequency Generator can be made with relatively simple auxiliary equipment as described in the following paragraphs.

4.4.2 VSWR REFERRED TO 50-OHM LINE. Figure 4-1 is a recommended set-up for measuring VSWR or matching impedances over a relatively wide frequency range. In addition to the sweep generator and display oscilloscope, the following auxiliary equipment is required:

1. A Type 874-VQ Voltmeter Detector. The crystal diode of this detector should have a back resistance of 10 kΩ or more at 5 volts, and a forward resistance of 100 ohms or less at 1 volt.

2. A suitable length of 50-ohm coaxial cable fitted with Type 874 Connectors. A 32-foot, 3-1/4-inch length of General Radio Type 874-A2 Cable, fitted with a Type 874-C Connector at each end, provides a recommended electrical length of 15 meters.

Proceed with the measurement as follows:

1. Plug one end of the through coaxial line of the Type 874-VQ directly into the OUTPUT connector of the generator.

2. Connect the 15-meter auxiliary coaxial cable to the other end of the Type 874-VQ. Leave one end of the cable unterminated.

3. Connect the output (side connector) of the Type 874-VQ to the EXTERNAL RESPONSE DETECTOR connector of the generator with a Type 874-R22A Patch Cord.

4. On the generator, set the FREQUENCY RANGE switch to 24-48 Mc, set the INCREASE RF OUTPUT and FULL SCALE OUTPUT controls for maximum output voltage, and set the EXPAND DISPLAY control for an unexpanded display. Set the vertical sensitivity of the oscilloscope for an on-scale presentation. A characteristic standing-wave pattern of the unterminated cable will be displayed (three minima on this frequency range).

5. Change the FREQUENCY RANGE of the generator and note the pattern changes: the number of minima increases on higher frequency ranges and decreases on lower frequency ranges. The lowest frequency at which a minimum occurs is approximately 5 Mc and minima occur at 10-Mc (half-wavelength) intervals above 5 Mc with the recommended cable length.

6. If the cable is terminated with a Type 874-WM 50-Ohm Termination, the standing-wave pattern is a horizontal line at half the peak amplitude of the unterminated-cable pattern. This represents a matched line. Some slight ripples in the line at the higher frequencies are due to irregularities in the impedance of the long cable. These ripples should not exceed ±5% (the possible inaccuracy in the characteristic impedance of the cable).

7. For a reference-level marker, set the MARKER AMPLITUDE control so that the marker amplitude equals the amplitude displayed for the matched cable.

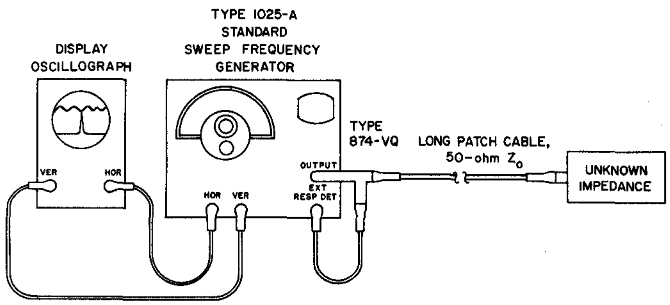


Figure 4-1. Measurement set-up for display of VSWR.

8. To demonstrate the ability of the system to indicate an impedance match, substitute a variable carbon resistor of about 200 ohms maximum resistance for the Type 874-WM termination. Note that, below 4-to-8 Mc range, an indication of impedance is still present but, to determine the VSWR, at least one maximum and one minimum are necessary (10-Mc bandwidth or greater for the recommended cable length).

9. To check an unknown impedance, connect it to the end of the long cable and select the desired FREQUENCY RANGE on the generator. With a bandwidth of 10 Mc or greater, at least one maximum and one minimum will be displayed with the recommended cable length. At nearly maximum generator-output voltages, the amplitude response of the detector diode in the Type 874-VQ is essentially linear so that the relative amplitude of maxima and minima on the displayed waveform is nearly the actual VSWR.

At lower voltage levels, the SWR (in decibels) can be more accurately determined as follows:

a. Set the minima of the pattern to a suitable reference line on the display graticule with the vertical-sensitivity and/or the centering adjustments of the display oscilloscope, and note the rf-output indication on the decibel scale of the meter. (For greatest simplicity, set the reference level to 0 db with the RF OUTPUT control.)

b. Reduce the rf output until the maxima matches the reference line and note the new rf-output indication in decibels.

c. The SWR (in decibels) is the difference in the two indications.

4.4.3 OTHER IMPEDANCE MEASUREMENTS. In the measurement set-up described in paragraph 4.2.2, some sort of impedance indication is obtained with the long cable removed. Unless the impedance is entirely resistive, this is not a unique indication of the impedance. However, with a sweep covering a wide range of frequencies, a flat presentation, with an amplitude equal to that obtained with a known 50-ohm termination, will usually represent a truly matched condition. In many filter tests, input-impedance variations over the pass band are a more sensitive indication of performance than the over-all response. For tests of this nature, the 50-ohm impedance of the generator if unsuitable can be increased to match that of higher impedance filter by addition of an external series resistor. Use the Type 1025-P1 Probe to monitor the voltage variations at the input terminals of the filter to give a qualitative indication of impedance.

4.5 USE OF A WIDE-BAND DISPLAY OSCILLOSCOPE

With a display oscilloscope whose vertical response is flat over the radio-frequency range of interest, the output of a device under test can be applied directly to the oscilloscope without interposing an external response detector. The principal advantage of this type of display is that the dynamic range is not reduced by the transfer characteristics of a response detector at the low levels. Above about 10 Mc, the frequency-response characteristics of even the wider bandwidth oscilloscopes are likely to roll off, so this characteristic should be checked before attempting to use this method.

When a wide-band oscilloscope is used, there is no connection to the EXTERNAL RESPONSE DETECTOR connector on the generator. The response pattern presented will be a solid figure, extending both sides of the horizontal zero-level base line. The outline of the figure, relative to the center base line, represents the rf peak voltage and consequently, the relative response vs frequency. The marker supplied by the generator at the DISPLAY VERTICAL connector can be superimposed on this response pattern through either a dual channel or a differential-input connection to the oscilloscope. Calibration provided by the display oscilloscope, but not the marker-amplitude calibration on the generator, may be used to indicate peak rf levels in the response.

SECTION 5
ACCURACY OF RESPONSE PRESENTATION

5.1 SWEEP RATE.

The true response of a device is considered to be the steady-state output with an applied sine-wave signal of a particular amplitude and frequency. A frequency-response curve of the device is drawn through a series of output levels with an applied signal of different frequencies. The steady-state response is measured, and any transient disturbance as a result of changing frequency is not considered.

The term "steady-state" is used in a relative sense since determination of absolute steady state would require waiting an infinite time after applying any signal. The output level in point-by-point response tests is measured when the output indicator ceases to move a significant amount compared with the accuracy desired and the level indicated.

There are some basic limitations on response determination by any swept-frequency method. When the frequency of the applied signal is automatically changed in a smooth, continuous manner, significant errors can be introduced due to the transient part of the output signal. To determine whether or not the transient components affect the measurement, reduce substantially the rate of frequency change, and, if there is no significant change in the response curve, it is reasonable to assume that these components are negligible and the true response is presented. To make this test on the Type 1025-A Standard Sweep-Frequency Generator, switch to the manual mode of operation and slowly sweep through the response by turning the FREQUENCY knob.

To predict whether or not an accurate swept response measurement can be made on a device whose approximate response is known, use the following general rule to determine the maximum permissible sweep rate. First, determine the change in frequency for a 6-db change in response (Δf_{6db}) at the steepest part of the expected response curve. The maximum sweep rate (SR_{max}) should not exceed 2π times the square of this frequency:

$$SR_{max} = 2\pi \ (\Delta f_{6db})^2$$

where SR is in cycles per second per second and f is in cycles per second

The SWEEP rates of the Type 1025-A are approximately:
on any octave range, $SR_{oct} = 31.2f$
on any bandspread range, $SR_{bs} = 45$ (total bandwidth)

Example 1: A 5-Mc, i-f strip has a maximum side slope of 6 db in 10 kc:

$\Delta f_{6db} = 10$ kc $= 10 \times 10^3$ cps
$SR_{max} = 2\pi \ (10^2)\ (10^6)$ cps/sec $= 628 \times 10^6$ cps/sec $= 628$ Mc/sec

The sweep rate of the Type 1025-A at 5 Mc on an octave range is:

$$SR_{oct} = 31.2 \ (5)\ (10^6) \text{ cps/sec} = 156 \text{ Mc/sec}$$

Automatic SWEEP on the generator should present a reasonable picture of the response.

Example 2: A 450-kc filter has a maximum side slope of 6 db in 150 cps:

$\Delta f_{6db} = 150$ cps
$SR_{max} = 2\pi \ (150)^2$ cps/sec $= 141 \times 10^3$ cps/sec $= 141$ kc/sec

The sweep rate of the Type 1025-A on the 0.4-to-0.5 Mc range is:

$$SR_{bs} = 45\ (100) \times 10^3 \text{ cps/sec} = 4500 \text{ kc/sec}$$

Automatic SWEEP on the generator is much too fast for accurate response presentation.

NOTE

For this measurement the generator can be operated in the MANUAL mode, swept by the Type 908-P2 Synchronous Dial Drive at $0.1\ (100) \times 10^3$ cps/sec = 10 kc/sec.

Measurement errors can also be introduced at the output of the device under test by the response detector or output rectifier, which may be unable to follow rapidly changing responses. However, if the time constant of the rectifier is not too high for the operating frequency, the limitation of the rectifier will usually not restrict the sweep rate below the limit set by the steepness of the response characteristic. To avoid this difficulty with a built-in detector, use a minimum capacitance to bypass the output.

5.2 FREQUENCY RESOLUTION.

In addition to the sweep-speed limitation (paragraph 5.1) and the possible absolute frequency inaccuracy of ±0.5% of the generator, there is a limitation on the resolution of frequency differences on the response presented. The reasons for this include random frequency modulation, finite width of the frequency marker, and sweep-voltage irregularities. The incremental resolution of the Type 1025-A Standard Sweep-Frequency Generator, including all limitations, is better than ±0.1% of any frequency produced, or ±0.1% of the total width of any bandspread range. The same figure applies to both the normal-sweep and manual modes of operation. This resolution is significant only with maximum display expansion where it may become ±1% of the display width.

In the examples given in paragraph 5.1, the resolution of frequency in the display is as follows:

Example 1: For a frequency of 5 Mc on an octave range, resolution is better than $\pm 0.001\ (5 \times 10^6)$ cps $= \pm 5 \times 10^3$ cps = ±5 kc.

Example 2: For a frequency of 450 kc on the 0.4-to-0.5 Mc bandspread range, resolution is better than $\pm 0.001\ (100 \times 10^3)$ cps = ±100 cps.

5.3 AMPLITUDE RESOLUTION.

To present an accurate picture of amplitude response, a display of output amplitude vs input amplitude must be produced with no additional amplitude variation introduced by the generator or output detector. In the Type 1025-A Standard Sweep-Frequency Generator, an automatic amplitude-regulating circuit keeps the voltage supplied behind 50-ohm resistance at a constant preset level, independent of frequency, line-voltage and load variations, to within ±1% up to 100 Mc and to within ±3% up to 230 Mc. The amplitude resolution in any response displayed is, therefore, within these limits over the width of the display if the response detector has a flat characteristic. The frequency characteristic of the Type 1025-P1 is flat over most of the range of the generator. At the highest and lowest frequencies the probe may introduce a maximum error of 5%.

Additional errors can be produced by any harmonic distortion introduced by the device under test. To avoid this difficulty, be careful not to overdrive the device.

The transfer characteristics of all diode detectors, including the Type 1025-P1, become nonlinear at low levels. The Type 1025-P1 characteristic is essentially square law below 50 millivolts rf input, but very

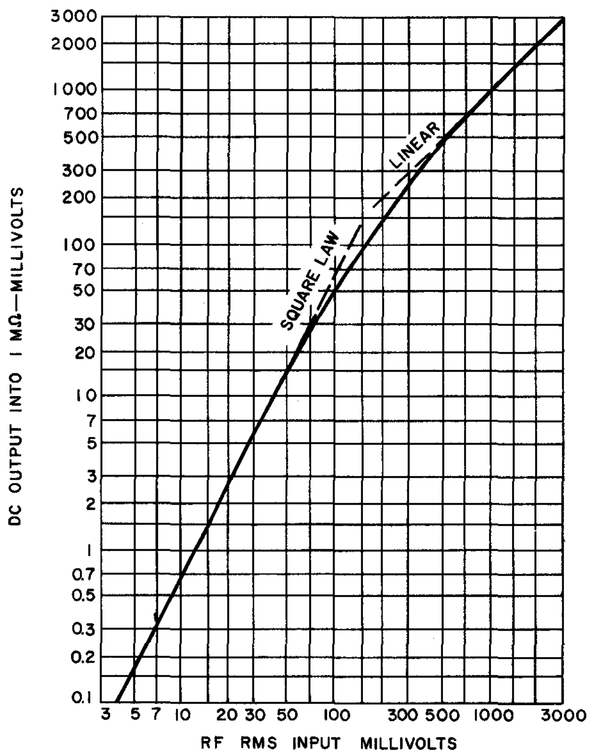


Figure 5-1. Typical voltage-transfer characteristic of the Type 1025-P1 Detector Probe.

nearly linear above 0.5-volt input. Figure 5-1 is a curve showing the typical voltage-transfer characteristics of the Type 1025-P1 Detector Probe. Figure 5-2 shows the input impedance as a function of frequency. The calibrated output system of the Type 1025-A Standard Sweep-Frequency Generator permits determination of the actual characteristics of any response detector so that the over-all response curve can be properly interpreted in relative amplitude.

With a voltage supplied to the response detector in the order of 1 volt at the peak of a response, the observable relative range of amplitude in the response presentation is only a little over 20 db because of detector nonlinearity. At a 10-volt response-peak level, a range of about 40 db can be presented; this is about the maximum range that can be resolved on a linear cathode-ray oscilloscope.

If overloading difficulties in the device under test can be avoided, the display can be expanded vertically with the output of the generator increased so that only the skirts of the response are on scale. This provides a composite picture of a response covering a wider amplitude range than possible in a single presentation. Logarithmic amplifiers are available for part of the frequency range covered by the Type 1025-A Standard Sweep-Frequency Generator. Some of these can produce ranges of over 80 db in response amplitude displayed, but particular care must be taken to see that the response speed of the logarithmic amplifier is high enough to produce an accurate display at the sweep rate provided by the generator.

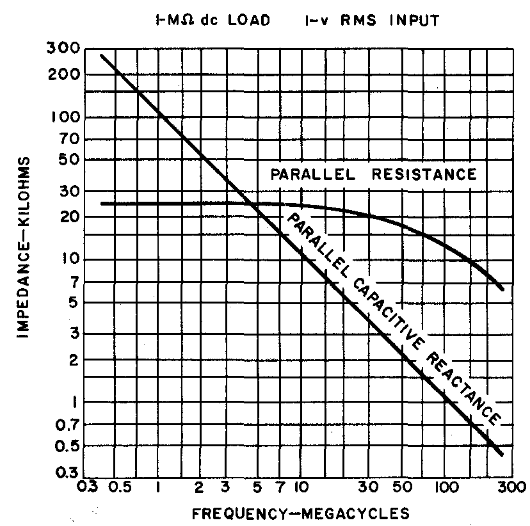


Figure 5-2. Typical input impedance vs frequency for the Type 1025-P1 Detector Probe.

In Section 4.5, the use of a wide-band oscilloscope for direct display of the rf output of the device under test is described. This eliminates the nonlinearities associated with a response detector, and, while the presentation has the limitations of a linear voltage display, this technique offers a worthwhile improvement for many measurements.

SECTION **6**

SERVICE AND MAINTENANCE

6.1 WARRANTY.

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

6.2 SERVICE.

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

6.3 OVER-ALL OPERATIONAL CHECK.

To check the general performance of the Type 1025-A Standard Sweep-Frequency Generator, proceed as follows:

1. Use the Type 1025-P1 Detector Probe as the external response detector.

2. Plug the INPUT of the detector probe directly into the output connector of the generator.

3. Make the initial adjustments outlined in Section 4.1.1, except set the RESPONSE AMPLITUDE MULTIPLIER switch to X1.

4. Set the FREQUENCY RANGE switch to 7-14 Mc.

5. Set the METER INDICATES switch to RF OUTPUT, the FULL SCALE OUTPUT control to 1 VOLT, and the INCREASE RF OUTPUT control for a full-scale meter indication.

6. Two horizontal lines should be displayed on the oscilloscope screen. The lower line represents the zero rf reference level and the internally generated marker projects upward from this line. The upper line represents the 1-volt output level from the generator and should be perfectly flat across the nominal screen width of the display. At the right-hand edge of the display, the on-off blanking transitions of the oscillator will appear. The region of these transitions, and to the right of them, is not useful in the normal use of the generator, so set the controls to keep the transitions off-scale to the right.

7. Unlock and move the DISPLAY START position toward higher frequencies and note that the blanking-transition region moves to the left on the display. Set the DISPLAY START position to about the middle of the frequency scale as indicated by the small black pointer and LOCK DISPLAY START (knob dot upward). Note that the blanking transitions now occur near mid-scale on the display. Without resetting the EXPAND DISPLAY control, explore the range that can be covered by the marker. Toward lower frequencies, the travel of the marker is limited at the DISPLAY START position and is at the extreme left-hand edge of the display when the MARKER FREQUENCY and DISPLAY START indicators coincide. Move the MARKER FREQUENCY indicator to the extreme right-hand end of the frequency scale and note the position of the displayed marker. It will be just to the left of the blanking transition; the region to the right of this point is not accessible by the marker and therefore is not a useful part of the display.

8. Turn the EXPAND DISPLAY control clockwise while observing the display. The blanking transitions move to the right and go off the display screen before the maximum setting of the EXPAND DISPLAY control is reached. With a maximum setting of this control, note the range of MARKER FREQUENCY that is covered while the display marker is on the screen. With the recommended horizontal sensitivity in the display oscilloscope (10 v full scale), the frequency coverage is approximately 7 percent.

9. Change the position of the DISPLAY START indicator to other points on the frequency scale and note that the coverage of the display remains close to 7%. This is true for all octave ranges of the generator.

10. Reduce the setting of the EXPAND DISPLAY control and note that the on-scale frequency coverage of the display marker increases. If the blanking transitions reappear on the display, reset the EXPAND DISPLAY and/or the DISPLAY START controls to move the blanking transitions off-scale to the right.

11. Reset the DISPLAY START control to the left-hand end of the frequency scale and reset the EXPAND DISPLAY control until the blanking transitions occur just off-scale to the right on the display. The marker can now be moved over the full 7-to-14 Mc range while remaining on-scale of the display screen.

12. Switch through all the frequency ranges and observe the displayed rf output (upper horizontal line). Except for the highest frequency range, the display height should not vary by more than ±2% between ranges and should be flat over any one range by better than ±1%.

NOTE

The characteristics of the Type 1025-P1 Detector Probe can produce apparent deviations from flatness up to 5% on the highest frequency range while the actual deviation should be less than ±2%. For best accuracy over the entire range of the generator, use a Type 874-VQ Voltmeter Detector with a Type 874-WM 50-Ohm Termination. Because of the 50-ohm termination, the height of this display will be about one-half of that with the Type 1025-P1.

13. The marker-amplitude indication can be checked against the rf output of the generator as follows: With a Type 1025-P1 Detector Probe connected as described in step 2, reduce the rf output voltage to 0.8 volt. Change the setting of the METER INDICATES switch to MARKER AMPLITUDE. Match the marker peak to the display rf output voltage (upper horizontal line) with the INCREASE MARKER AMPLITUDE control. The marker amplitude indicated by the meter should be 0.8 volt ±10%. Note that the marker amplitude will vary somewhat with the setting of the MARKER FREQUENCY control, but should remain within ±10% of the average level. The actual level is always indicated by the meter. Decrease the setting of the MARKER AMPLITUDE FULL SCALE switch and notice that the marker amplitude on the display decreases. Increase the setting of the RESPONSE AMPLITUDE MULTIPLIER switch and notice that the displayed rf output decreases. Decrease the setting of the FULL SCALE OUTPUT selector and notice that the displayed rf output decreases. The absolute accuracy of these selectors and the calibrations of the metering function can be checked as described in detail in Section 6.12.

14. PUSH AND ROTATE TO ENGAGE CLUTCH FOR MANUAL OPERATION control as so labeled. Notice that the horizontal lines disappear and a single spot is displayed at exactly the same vertical height as the former upper line and at the same horizontal position as the former marker. The MARKER FREQUENCY control is now the cw frequency control. Turn the EXPAND DISPLAY control fully clockwise and note that the on-scale range of spot movement is reduced to approximately 7% in frequency. Change the setting of the DISPLAY START control and notice that any other 7% portions of the frequency range can be displayed.

6.4 MOTOR LUBRICATION.

The internal-drive motor bearings should be lubricated regularly: once every six months with continuous operation of the generator, once a year with normal service. A can of suitable lubricant is supplied with the instrument. Stanoil #35 (Standard Oil of Indiana) and Gulfcrest C (Gulf Oil Company) are also satisfactory. Four drops of lubricant in each oil hole (painted red) is sufficient. Access to the motor is obtained when the outer cabinet of the generator is removed (refer to paragraph 6.6). The motor is at the center left-hand side (looking at the panel) of the instrument. The other bearings in the instrument have sealed-in lubricant and do not require relubrication.

6.5 PRELIMINARY TROUBLE-SHOOTING.

After an over-all operation check (refer to paragraph 6.3), a partial malfunction can usually be isolated in a particular section of the generator. If the generator is completely inoperative, the pilot light is not on, and the sweep-drive motor does not operate, check the connection to the power line and test for power with an ac voltmeter at the line fuses at the rear of the instrument. The fuse posts have test points at their centers where test prods can be inserted to determine that the supply voltage is present beyond the fuses. Replace any blown fuses. If this restores operation, an incipient trouble is usually indicated and the power input should be monitored as described below.

Check the input with a wattmeter or ammeter. Values for a normal instrument are listed in Table 3. Your measurements should agree with these figures within ±5%. Set the INCREASE RF OUTPUT control fully counterclockwise for this test.

TABLE 3 - POWER INPUT

Mode of Operation	Line Voltage	Line Watts	Line Amperes
Manual	115	105	0.95
	230	105	0.475
Sweep	115	101	0.91
	230	101	0.455

NOTE

A maximum power input of 145 watts will occur with a 125-volt or 250-volt (1.35- or 0.675-ampere) line, with the INCREASE RF OUTPUT control fully clockwise and manual operation at 100 Mc on the 100-to-230 Mc range of the generator.

6.6 REMOVAL OF THE GENERATOR FROM THE CABINET.

The following instructions apply to either the bench- or the relay-rack model of the Type 1025-A Standard Sweep-Frequency Generator. For the relay-rack model, leave the cabinet mounted in the relay rack with the mounting brackets supplied.

First detatch the external power connection. Remove the eight double-hex-head panel screws along the outside edges of the panel. Remove the sixteen bright-nickel-plated recessed-head screws along the edges of the panel (inside the handles at the sides). The generator can now be withdrawn from the cabinet with the handles at the sides. An extendible coiled-line cable will remain attached to the cabinet. To detach this cable, tip the generator forward (the handles will protect the controls) and remove the cord from the power plug under the body of the instrument. While testing the generator, supply power through the normal plug at the rear of the cabinet to retain fuse protection. A standard two- or three-wire power cable can be used to extend the connection between the generator and the coiled cord attached to the cabinet.

CAUTION

WHEN THE GENERATOR IS OUT OF ITS CABINET, POTENTIALLY HAZARDOUS VOLTAGES ARE EXPOSED AT SEVERAL PLACES. BE CAREFUL TO AVOID PERSONAL CONTACT. ALWAYS REMOVE THE EXTERNAL POWER CONNECTION WHEN REMOVING OR REPLACING THE GENERATOR IN THE CABINET.

The cabinet provides a portion of the electrical shielding necessary to prevent interference from extraneous radio-frequency leakage at the lowest rf output levels from the generator. To achieve specified performance, the cabinet must be in place and the sixteen recessed-head screws tightened (15 inch-pounds of torque recommended).

6.7 SECTIONALIZED CONSTRUCTION.

6.7.1 GENERAL. The complete electrical circuit of the generator is shown schematically in Figure 6-17. Figures 6-12 through 6-16 show the details of the various frequency-selector-turret sections. For ease of construction and serviceability, the circuit has been divided into eight sections, with each section in a separate subassembly in the instrument.

6.7.2 PANEL-AND-OSCILLATOR ASSEMBLY. This is the basic section of the instrument and includes the rf oscillator and all the panel controls except the FULL SCALE OUTPUT selector (rf attenuator).

The oscillator tube, V1, is accessible when the large circular shield cover is removed from the rear of the main casting in the center of the panel. Two 1/4-inch hex-head screws at the top and bottom of this cover force the cover free of a tight taper on the casting when the screws are turned counterclockwise. Use a small hex-head socket wrench to loosen these fastenings. The top and bottom screws should be loosened alternately to force the cover off evenly. Figure 6-1 shows most of the components associated with the oscillator tube, V1. Note the orientation of the cover (TOP) when replacing.

The multisector FREQUENCY RANGE selector turret is also exposed when the large circular shield cover is removed. The tuning-inductance/trimmer-capacitance assembly for each frequency range is mounted on an easily removable sector of the range-selector turret. Each sector is held in place by a single 6-32 recessed-head screw, and is identified with a stamped marking of its frequency range.

There are four other tubes in the panel-and-oscillator (A-0) assembly on the small shelf to the right (looking from the rear of the instrument) of the main casting. These tubes are:

V2, manual-clutch-control thyratron
V3, dial-potentiometer voltage regulator
V4, negative-power-supply rectifier
V5, dial-potentiometer-supply rectifier.

Most of the components associated with V2 are under the shelf. The components associated with the other tubes are in the power-supply assemblies (refer to paragraphs 6.7.9 and 6.7.10). The location of the components which are panel controls can be determined from the panel photograph, Figure 1-1. Figures 6-2, 6-3, and 6-4 show the location of other components in this assembly. The resistors associated with the MARKER AMPLITUDE FULL SCALE and RESPONSE AMPLITUDE MULTIPLIER switches are mounted directly between switch terminals and R46 and R58 are wired directly to their associated panel potentiometers.

6.7.3 METERING-CIRCUIT ASSEMBLY. The small etched-circuit board mounted behind the panel at the top-center portion is the metering-circuit (A-1) assembly. This assembly includes biasing resistors, a peak envelope detector circuit, and filter networks for the rf-output metering circuit. The location of this assembly is shown in Figure 6-1. Figure 6-5 shows the component assembly on the etched-circuit board.

6.7.4 DISPLAY-OUTPUT ASSEMBLY. This shelf (A-2) assembly, mounted from the bottom of the instrument under the main casting (see Figure 6-1), carries most of the circuits associated with the DISPLAY HORIZONTAL and DISPLAY VERTICAL outputs. The four tubes in this assembly are:

V6, display-sweep trigger amplifier and sweep discharge
V7, display-sweep output cathode follower and manual clutch hold-off
V8, response/marker adder/inverter
V9, display-vertical output amplifier.

The principal components in this hand-wired assembly can be identified from Figure 6-4 which shows the assembly demounted, folded out on its flexible connecting leads, and the inter-circuit shield partition removed. Terminal 8 of V7 is a test point for checking the operation of the manual clutch-control circuit and is provided with a bus-wire extension to facilitate connection of a test meter as described in paragraph 6.12.

6.7.5 -150-VOLT REGULATOR/METER-CIRCUIT ASSEMBLY. The etched-circuit board at the top right-hand side (looking at the panel) is the -150-volt regulator and meter circuit (A-3) assembly. The location of this assembly is shown in Figure 6-3. This assembly includes the dc amplifier for the panel meter, the marker-metering diode circuit, and the voltage-regulator circuit of the negative 150-volt supply. The voltage reference source for the -150-volt regulator is the regulated +200-volt supply (refer to paragraph 6.7.7). The board terminals 1 through 16 and the exposed terminals of the tube sockets can be used as test points. The three vacuum tubes in this assembly are:

V10, meter dc amplifier
V11, -150-volt control amplifier
V12, -150-volt series tube.

A single screw-driver adjustment (ZERO) on this assembly sets the balance of V10 for zero meter indication. Figure 6-6 shows the component assembly on the etched-circuit board. For best access to the component side of this board and the tubes, swing this assembly out with the automatic-amplitude-control amplifier assembly as described at the end of paragraph 6.7.6.

6.7.6 AUTOMATIC-AMPLITUDE-CONTROL-AMPLIFIER CIRCUIT ASSEMBLY. The etched-circuit board at the right-hand side (as viewed from the panel) near the bottom is the automatic-amplitude-control amplifier circuit (A-4) assembly. This assembly contains the automatic-amplitude-control amplifier circuit, the marker inverter and metering cathode follower, and the rf-oscillator blanking flip-flop. The board terminals 19 through 35 and the exposed tube-socket terminals can be used as test points. The six vacuum tubes in this assembly are:

V13, marker inverter and cathode follower
V14, keying and steering diode
V15, blanking flip-flop
V16, automatic-amplitude-control first difference-amplifier
V17, automatic-amplitude-control second difference-amplifier
V18, automatic-amplitude-control output amplifier.

The MARK CAL screw-driver adjustment sets the amplitude of the marker to agree with the meter indication at the POSITIVE position of the RESPONSE POLARITY switch. The GAIN screw-driver adjustment sets the gain of the automatic-amplitude-control amplifier for optimum operation over the frequency range of the generator. The location of these adjustments and the assembly are shown in Figure 6-3. Figure 6-7 shows the component assembly on the etched-circuit board. Access to the component side of this board, the -150-volt regulator and meter-circuit board, and the vacuum tubes of both boards can be obtained as follows: Remove the recessed-head screw that holds the V18 heat sink to the lower shelf bracket. This is near the rear of the instrument. To loosen the screw, grasp the heat-sink cylinder and rotate the top toward the panel until the mounting screw is loose enough to be removed by hand. Loosen the two dark recessed-head screws at the top and bottom of the vertical hex bar that supports the front edges of the two boards and remove the dark recessed-head screws that hold the vertical hex bar at the rear of the assemblies to the top and bottom supporting shelves.

The two assemblies can now be pivoted outward, around the front support screws. The heat-sink cylinder will be carried along with V18 but can be slipped off for better accessibility. Be sure to replace the heat-sink cylinder before swinging the assemblies back into position.

6.7.7 200-VOLT REGULATOR ASSEMBLY. The etched-circuit board mounted under the top left-hand (as viewed from the panel) support shelf is the 200-volt regulator (A-5) assembly. The three vacuum tubes and the gas-filled voltage-reference tube in this assembly are:

V531, series regulator tube
V532, cathode driven amplifier/cathode follower driver
V533, difference amplifier
V534, voltage reference.

The board terminals, B+ UNR, B- REG, and H, and the tube-socket terminals can be used as test points. There is one screw-driver adjustment in this assembly which sets the regulating level (200 volts). Figure 6-2 shows the location of the assembly in the instrument and Figure 6-8 shows the component location on the etched-circuit board. Access to the circuit side of the board can be obtained when the four dark screws which hold the mounting spacers to the top shelf are removed.

6.7.8 RF STEP ATTENUATOR. The FULL SCALE OUTPUT selector on the panel controls the rf attenuator (A-6) assembly. The location of this assembly is shown in Figure 6-3. The attenuator is held in place by a special hollow-slotted nut, which surrounds the rf output connector. A semirigid coaxial line provides rf connection to the main casting. The hollow hex-head nuts at the ends of this line form a compression-type connection to the outer conductor. The inner-conductor connections are made by spring chucks. To separate a connection, unscrew the outer fitting and pull apart. Use extreme caution in replacing the connection to be sure that the inner conductor enters the miniature spring chuck properly.

The resistors in this assembly (see Figure 6-9) are nonspiraled carbon-film resistors and any replacements must be made with identical units to retain the high-frequency performance of the attenuator. To obtain access to these resistors, first remove the attenuator from the panel and then the thin metal plate from the front side of the attenuator. Note the orientation of the locating pin. The resistor leads are press fitted and soldered into the contact terminals. Access to the contact side of the attenuator is obtained when the back half of the attenuator casting is removed.

6.7.9 POWER-SUPPLY-CIRCUIT ASSEMBLY, A7. The etched-circuit board at the left-hand side (as viewed from the panel) near the bottom rear is one (A7) of the power-supply circuit assemblies. This assembly contains the silicon power-supply rectifiers and some of the associated electrolytic-filter capacitors. The two rectifier units nearest the rear edge of the board are in the center-tapped circuit which supplies dc power for the heater of the rf oscillator. The next two rectifier units, toward the front edge of the board, are in the voltage-doubler circuit of the main high-voltage supply. The rectifier nearest the front edge of the board is the half-wave rectifier for dynamic braking the sweep-drive motor. Terminals 1 through 18 (except No. 3) appear on the board and can be used as test points on this assembly. Figure 6-2 shows the location of the assembly in the instrument. Figure 6-10 shows the component locations on the etched-circuit board.

To obtain access to the circuit side of this assembly, the component side of the second power-supply (A8) assembly, and the components in the panel-and-oscillator assembly (which is concealed by the power-supply assemblies), proceed as follows:

Remove the two dark bottom screws and the single dark top mounting screw from the second power-supply assembly (A8) at the rear of the instrument. This will give limited access as the A8 assembly can be pivoted outward. For complete accessibility, continue as follows: Remove the diagonal brace from the left-hand side (two dark screws). Remove the vertical bar at the left-hand rear corner between the top and bottom shelves (two dark screws). Remove the dark screw between the power receptacle and electrolytic capacitor on the vertical portion of the bottom shelf. Remove the two dark screws in the horizontal shelf behind the drive motor, the dark screw in the vertical edge of the motor panel, and the two dark screws at the bottom of the first power-supply assembly (A7). (All these screws are near the left-hand edge of the instrument as viewed from the panel.) The two power-supply assemblies can now be hinged outward to the left-hand side of the instrument (as viewed from the panel) to give access to all concealed components and connections.

6.7.10 POWER-SUPPLY-CIRCUIT-ASSEMBLY, A8. The etched-circuit board at the lower rear near the left-hand side (as viewed from the panel) is the second power-supply-circuit assembly, A8. This assembly includes some of the resistors associated with the power supplies, two of which are screw-driver adjustments. The OSC HEATER V adjustment sets the dc voltage at the heater of the oscillator tube. The DIAL POT V adjustment sets the voltage supplied to the dial potentiometer for agreement between the display presented with manual operation and the display obtained in the normal sweep mode. The markings for the terminals 10 through 23 (except No. 11) on this board are on the circuit side of the board, and can be seen when the assembly is demounted as described at the end of this paragraph. Figure 6-1 shows the location of this assembly in the instrument. Figure 6-11 shows the location of the components on the etched-circuit board. To obtain access to the circuit side of this assembly, remove the two dark mounting screws at the bottom, and the single dark mounting screw at the top, and hinge the board outward to the left-hand side (as viewed from the panel) of the instrument. For increased accessibility, continue with the procedure described at the end of paragraph 6.7.9.

6.8 VOLTAGE AND RESISTANCE MEASUREMENTS.

Tables 4 and 5, which give the nominal voltages and resistances in a normal Type 1025-A Standard Sweep-Frequency Generator, helps to locate the source of trouble in a defective instrument. Voltages are measured with a vacuum-tube voltmeter, resistances with a 20,000 ohms/volt ohmmeter. Line voltage is set to 115 (or 230) volts. With cw operation of the Type 1025-A, the POWER switch is on, the DISPLAY START and CW FREQUENCY controls at their left-hand end stops, and all other knob controls set counterclockwise. In a normal functioning instrument, measurements should agree with the listed values within ±20%.

TABLE 4 - VOLTAGES AND RESISTANCES

Tube (Type)	Pin	Dc Volts	Ohms to Gnd	Tube (Type)	Pin	Dc Volts	Ohms to Gnd
V1	P	370	30 k		6	55	60 k
(5675)	G	370	30 k		7	0.38	51 k
	K	370	30 k		8	0	0
	H*	360	1 M				
	H*	366.3	1 M	V7	1	197	30 k
				(5965)	2	-0.3	200
V2	1	6.9	500 k		3	4.1	108 k
(5727)	2	0	0		6	128	60 k
	3	0	0		7	33	10 M
	5	0	0		8	69	30 k
	6	-112	4.5 k				
	7	0	0	V8	1	140	130 k
				(5751)	2	0	50 k
V3	1	143	100 k		3	1.7	220 k
(OA2)	2	-5.7	4 k		6	140	130 k
	5	143	100 k		7	0	1.2 M
					8	1.7	220 k
V4	1	-150	65 k				
(6X4)	6	-150	65 k	V9	1	89	30 k
	7	215	50 k	(5965)	2	-4.5	570 k
					3	-2.8	100 k
V5	1	-7.4	4.3 k		6	-2.8	100 k
(6X4)	6	-7.4	4.3 k		7	-98	570 k
	7	365	120 k		8	-97	90 k
V6	1	16	5 M	V10	1	150	31 k
(5965)	2	0.8	10 M	(5751)	2	0.5	3.3 M
	3	0	0		3	2	65 k

* 6.3-volt dc filament supply on.

(Continued on next page)

TABLE 4 - VOLTAGES AND RESISTANCES (Continued)

Tube (Type)	Pin	Dc Volts	Ohms to Gnd	Tube (Type)	Pin	Dc Volts	Ohms to Gnd
	6	150	31 k		6	110	230 k
	7	0.5	3 M		7	0.15	210 k
	8	2	65 k		8	1.6	343 k
V11	1	200	30 k	V17	1	200	30 k
(5751)	2	-50	780 k	(5751)	2	1.8	350 k
	3	-47	120 k		3	3.9	234 k
	6	-8	2.03 M		6	65	230 k
	7	-48	350 k		7	3.3	350 k
	8	-47	120 k		8	3.9	234 k
V12	1	215		V18	1	0	0
(5814A)	2	-8	2.03 M	(6197)	2	-15	590 k
	3	0	0		3	200	36 k
	6	215			6	370	
	7	-8	2.03 M		7	0	0
	8	0	0				
				V531	1	170	490 k
V13	1	200	30 k	(6AV5GA)	3**	200	30 k
(5965)	2	0	1 M		5	370	
	3	4.6	4.7 k		8	370	
	6	127	60 k				
	7	71	1.03 M	V532	1	370	
	8	73	30 k	(6AN8)	2	155	2.7 M
					3	170	490 k
V14	1	40	928 k		6	155	2.7 M
(6887)	2	65	230 k		7	200	30 k
	5	190	100 k		8	122	85 k
	7	39	270 k		9	125	77 k
V15	1	61	90 k	V533	1	125	77 k
(5814A)	2	39	270 k	(5965)	2	37	≈500 k
	3	39	18 k		3	38	5.6 k
	6	190	100 k		6	200	30 k
	7	-19	270 k		7	35.5	75 k
	8	39	18 k		8	38	5.6 k
V16	1	95	230 k	V534	1	82	≈55 k
(5751)	2	0.42	105 k	(5651)	2	0	0
	3	1.6	343 k		5	82	≈55 k

** 200-volt dc regulated supply.

TABLE 5 - TRANSFORMER VOLTAGES

Between Terminals	Ac Volts
1 and 4	115 or 230 (ac line)
5 and 6	140
7 and 8	6.4
9 and 10	9
10 and 11	9
12 and 14	6.4
15 and 16	290
16 and 17	290
18 and 20	6.4
21 and 22	290
22 and 23	290
24 and 25	115
26 and 27	135

6.9 TUBE REPLACEMENT.

None of the tube positions should require particular selection to obtain rated performance of the instrument if the specified types are used as replacements. In most positions, industrial types have been used to secure the maximum life and performance. In many of these positions, it is possible to replace with an equivalent entertainment-grade tube if the specified type is not immediately available.

Access to the oscillator tube, V1, is obtained when the shield cover is removed from the main casting, as described in paragraph 6.7.2. After this tube is replaced, the frequency dial may require recalibration as described in Section 6.12 to obtain rated accuracy. For access to tubes V10 through V18, hinge out the assemblies which hold these tubes as described at the end of paragraph 6.7.6.

Excessive microphonics or differential cathode drift in V8, V10, V11, V16, and V533 may cause inferior performance. The balance or calibration adjustments associated with any tube that is replaced should be checked as described in Section 6.12 to ensure rated performance.

6.10 CHANGING OPERATING-LINE FREQUENCY AND/OR VOLTAGE.

The generator will operate satisfactorily only with a line frequency (±2%) and line voltage within the range specified on the rear of the cabinet near the power receptacle. However, it is possible to change supply ratings to one of three options. To indicate properly a change in supply rating, obtain an engraved plate from General Radio. If the line frequency is to be changed, a new motor-drive drum must also be obtained. The options available are given in Table 6.

TABLE 6 - SUPPLY RATINGS

Nominal Line Voltage	Line Frequency	Input Plate	Drive Drum
115 volts	60 cps	LAP-166G 105-125 V 60 C	1025-192
115 volts	50 cps	LAP-166G2 105-125 V 50 C	1025-192-2
230 volts	50 cps	LAP-166G3 210-250 V 50 C	1025-192
230 volts	60 cps	LAP-166G4 210-250 V 60 C	1025-192-2

To change the supply frequency, the motor-drive drum must be changed as follows: Disconnect the power. PULL TO SWEEP the control so indicated. Note or mark the position of the control shaft. Loosen the set screws in the circular-cam assembly, which operates the Microswitches, on this shaft. Remove the rubber tip from the shaft: grasp the tip with one hand and with the other hand rotate and pull the control knob. To facilitate reassembly, do not withdraw the shaft, but retract it only until it is flush with the rear bearing. Loosen the set screws on the motor-drive drum and slip the drum off the motor shaft. If the drum sticks, apply symmetrical pressure to the drum to avoid bending the motor shaft. Lift the rubber-tired idler and slide the new drive drum onto the motor shaft, centering the face of the drum under the rubber track on the idler. Tighten the drive-drum set screws and replace the rubber tip on the control shaft. Check that the rubber tip engages the surface of the drive drum squarely. Position the control shaft at the position noted before disassembly and retighten the set screws in the cam assembly. Push in the control shaft to see that the Microswitch rollers rest squarely in the center of the high flat surface of the circular cam and that the drive can be rotated by the panel knob.

To change the line-voltage range from 105-to-125 volts to 210-to-250 volts, or vice versa, merely reconnect the terminals of the split-primary power transformer and change the line fuses as indicated in Table 7.

TABLE 7 - TRANSFORMER CONNECTIONS

Line Voltage	Transformer Connections	Fuses
105-125 V	Connect 1 to 3 Connect 2 to 4	1.6-amp Slow-Blow
210-250 V	Connect 2 to 3 only	0.8-amp Slow-Blow

The transformer terminals are accessible from the left-hand side of the instrument (as viewed from the panel).

6.11 CHANGING FREQUENCY-RANGE SECTORS.

A number of alternate bandspread ranges are available (refer to specifications). The optional bandspread-range sectors are shown schematically in Figures 6-4 and 6-5. Additional ranges can be obtained on special order; these will be similar schematically to Figure 6-5, but with different component values. Any range sector, or sectors, supplied with the generator can be quickly replaced, but the frequency dial must be recalibrated for the new ranges (refer to paragraph 6.12). Merely remove the single mounting screw to remove any sector and substitute a new one. In most cases, there is negligible reaction on the frequency of the adjacent sector so that only the new range needs recalibration.

6.12 DETAILED TESTING AND CALIBRATING INSTRUCTIONS.

6.12.1 EQUIPMENT REQUIRED. These calibrating instructions are given for those repair and service personnel in laboratories equipped to handle such calibration. The following equipment or equivalent is required:

Type W5MT3A Metered Variac® Autotransformer
Type 874-G10 Attenuator
Type 874-R22A Patch Cord
Type 874-VQ Voltmeter Detector
Type 874-WM 50-ohm Termination
Type 1203-B Unit Power Supply or Type 1201-B Unit Regulated Power Supply
Type 1213-D Unit Time/Frequency Calibrator
Type 1806-A Electronic Voltmeter
differential dc vacuum-tube voltmeter
20,000 ohms/volt ohmmeter
oscillating grid dipper with tuning range of 2 to 250 Mc
cathode-ray oscilloscope with 50 mv/cm input sensitivity and provision for external horizontal input
10-to-1 oscilloscope probe
100-kΩ adjustable carbon resistor
single-turn pickup loop
accurately calibrated square-wave voltage-calibrating source with a range of 0.01 to 100 volts and better than 1% accuracy
Type 1N23BR reversed diode (to use in some tests in place of the diode supplied in the Type 874-VQ)

6.12.2 GENERAL TESTS.

1. Check the mechanical operation of the sweep control. See that all microswitches operate and that the rubber clutch turns the motor in the manual mode of operation.

2. Remove the oscillator shield cover. Lift the idler drive pulley and block free of the capacitor drum. Turn the capacitor so that it is fully meshed and turn the DISPLAY START control until the pickup magnet attracts the capacitor vane. The bearings should now be free enough so that you can position the capacitor with the DISPLAY START control. The display-start indicator should be at the left-hand end of the ±30 scale arc with the capacitor fully meshed. (The dial must be set with the scale corrector to the index line for this check.) Remove the block from the idler wheel.

3. Set the INCREASE RF OUTPUT control fully counterclockwise and the sweep control for manual operation.

4. Apply power with a Type W5MT3A Metered Variac® Autotransformer and set the voltage to 115 volts. The current should be approximately 1 ampere and all tubes should light (oscillator heater is not visible). All of the following tests are made at 115-volt line unless otherwise indicated.

5. Connect a dc voltmeter to terminal 16 of the A3 board and adjust the VOLT OUT control (R551) for 200 volts. Vary the voltage at the Variac autotransformer from 100 to 130 volts and see that the voltage at terminal 9 does not change more than ±0.5 volts.

6. Connect the voltmeter to terminal 8 of tube V7 on the tube shelf at the bottom of the instrument (A2 assembly). This voltage should be approximately 68 volts.

7. Rest the instrument on its right-hand side so that gravity will not reduce the pressure on the idler drive pulley. Pull out the sweep control. The motor

should start and the voltage on terminal 8 of V7 should drop to zero.

8. Push in the sweep control. The motor should stop within one second and the voltage at the test point should take approximately 2 seconds to reach 68 volts. (This 2-second delay prevents the clutch from engaging before the capacitor stops.) Remove the voltmeter from V7 and restore the instrument to its normal position.

9. Set the Variac autotransformer for 105 volts. Rotate the sweep knob slowly until resistance is felt and a click is heard, indicating that the manual clutch is engaged. Reset the input to 115 volts.

10. Turn the MARKER FREQUENCY control and note that the tuning capacitor also turns. Set the frequency indicator to the left-hand end of the frequency scale and note that the capacitor is fully meshed.

11. On the A7 board, check that the voltage from terminal 5 to ground is 360 volts ±10%.

12. On the top right-hand shelf, check that the voltage across C21A is 350 volts ±10%.

13. On the A3 board, check that the voltage from terminal 11 to ground is -150 volts ±5%. There should be less than 1% variation with line-voltage variation from 100 to 130 volts.

14. On the A7 board, check that the voltage from terminal 15 (-) to terminal 16 (+) is 360 volts ±10%.

15. Connect a dc voltmeter across the oscillator dc heater supply inside the oscillator compartment (- to left-hand side of the instrument, + to right-hand top feed-through filter). Set this voltage to 6.3 volts with the OSC HEATER V control at the back of the instrument on the A8 board.

CAUTION

THE HEATER IS AT 330 VOLTS ABOVE GROUND.

16. On the A3 board, check that the ac voltage between terminals 13 and 14 is 6.3 volts ±5%.

17. On the A4 board, check that the ac voltage between terminals 31 and 33 is 6.3 volts ±5%.

18. Check that the dc voltage from R65 on the motor shelf (-) to ground (+) is 25 volts ±10% with the sweep off and 160 volts ±10% with the sweep on.

19. With the RF OUTPUT control fully counterclockwise, check that the oscillator dc plate-supply voltage inside the oscillator compartment (at the lower feed-through filter at the left-hand side of the instrument) is 370 volts ±10% to ground.

6.12.3 TESTS ON MARKER SYSTEM AND DISPLAY CIRCUITS.

20. Connect the vertical input of an oscilloscope to the DISPLAY HORIZONTAL connector of the generator. Set the oscilloscope vertical sensitivity for 20 volts/cm and 5 milliseconds/cm sweep.

21. Pull out the sweep control. With the EXPAND DISPLAY control fully clockwise, two sawtooth signals of 100 volts ±10% peak-to-peak should appear in exactly 10 cm (25-millisecond period) with good linearity. The retrace should be essentially vertical (approximately 50 μsec).

22. Increase the oscilloscope sensitivity to 2 volts/cm. Check the range of the HORIZ ZERO control by observing that the shift in the negative tip of the sawtooth (with the EXPAND DISPLAY control fully clockwise) is at least 2 cm.

23. Set the HORIZ ZERO control so that there is no shift in the negative tip of the sawtooth when the position of the EXPAND DISPLAY control is varied.

24. With the EXPAND DISPLAY control, bring the entire sawtooth onto the display and vary the setting of the DISPLAY START control to see that it has no effect on the sawtooth presentation. (Disregard small sawtooth deviations while the DISPLAY START control is turned.)

25. Connect the DISPLAY HORIZONTAL output of the generator to the horizontal input of the oscilloscope and change the settings of the oscilloscope controls to accept this input. (The deflection factor of the oscilloscope should be 1.4 volts/cm or better.)

26. Connect the DISPLAY VERTICAL output of the generator to the vertical input of the oscilloscope.

27. Adjust the EXPAND DISPLAY control until the base line of the display just fills the screen (10 cm).

28. Set the vertical sensitivity of the oscilloscope to 2 volts/cm. With the MARKER AMPLITUDE control at 1 VOLT FULL SCALE and the INCREASE MARKER AMPLITUDE control fully clockwise, the marker amplitude should exceed 4 cm (8 volts peak-to-peak) throughout the nominal range of the MARKER FREQUENCY dial.

29. Set the DISPLAY START control and the MARKER FREQUENCY indicator to the left-hand end of the frequency scales. Adjust the marker amplitude to a suitable size.

30. The tip of the marker should coincide with the start of the sweep. If it does not, shift the dial pointer as follows:

a. Remove the DISPLAY START knob.
b. Remove the dial cover.
c. Loosen slightly the three clamping screws in the small disk in the center of the dial-shaft assembly.
d. Form a pin spanner of stiff wire to fit the two small holes in this clamp disk (to rotate the shaft with respect to the pointer). Without pressing the shaft in (hold out on pointer disk), tighten the three clamping screws when the proper position is found.

31. Push in the sweep control for manual operation with the CW FREQUENCY indicator coincident with the DISPLAY START indicator, and short the front arm of the dial potentiometer to ground. There should be less then 1/10-cm shift in the horizontal position of the displayed spot. If the shift is greater than 1/10 cm, move the contact on the display-start pointer by bending its support.

32. Pull out the sweep control and adjust the EXPAND DISPLAY control until the nominal low and high ends of the frequency scale (as indicated by the marker on the display) are at the 0- and 10-cm positions, respectively.

33. On the A8 board, adjust the DIAL POT V control at the left rear of the instrument to make the oscilloscope spot correspond to the 10-cm position of the marker when the sweep control is operated.

34. Check the agreement between the position of the spot for MANUAL operation, and the position of the marker for SWEEP operation at various points across the display. (Start and stop the sweep at various dial positions.) The positions of the spot and the marker should not differ more than 1% of the display width (1/10 cm for 10-cm total width). If necessary, readjust the DIAL POT V control slightly to obtain this agreement.

35. Turn the EXPAND DISPLAY control fully clockwise and repeat the test in step 34 for agreement within 5% of display width (1/2 cm with 10-cm total width). If necessary, offset the wiper of the DISPLAY START potentiometer slightly to improve agreement. If the wiper is reset, repeat steps 32 through 35. When the test results are satisfactory, replace the dial cover.

36. With maximum setting of the EXPAND DISPLAY control and automatic sweeping, adjust the MARKER AMPLITUDE control for an amplitude of 4 cm on the display. Set the RESPONSE AMPLITUDE MULTIPLIER control to X10. The marker should appear as a half sine wave with less than 1% negative overshoot at the leading and trailing edges, should be symmetrical about the tip, and the width of the base should be less than 10 vernier dial divisions. (Change the position of the marker with the MARKER FREQUENCY control to observe the width against a fixed line on the display.)

37. Set the RESPONSE AMPLITUDE MULTIPLIER control to X1 and adjust trimmer C208 on the bottom of tube V8 on shelf A2 at the bottom of the instrument for the same marker waveform as in step 36 (with RESPONSE AMPLITUDE MULTIPLIER control set to X10). This neutralizes the grid-to-plate capacitance of tube V8.

38. Connect a square-wave voltage-calibrating source (such as an oscilloscope calibrating source) to the EXTERNAL RESPONSE DETECTOR connector. The accuracy of this source should be checked, or known, to better than 1%.

39. Set the MARKER AMPLITUDE FULL SCALE control to 1 V. Set the RESPONSE AMPLITUDE MULTIPLIER control to X1. Set the RESPONSE POLARITY switch to NEGATIVE. Set the EXPAND DISPLAY control to its maximum setting. Set the oscilloscope sensitivity to 2 volts/cm. Set the square-wave calibrator to 1 volt peak-to-peak.

40. The square-wave signal will not, in general, be synchronous with the display sweep, but the peak-to-peak amplitude can easily be seen. This amplitude should be approximately 4 cm (8 volts) on the display.

41. Check that the corners of the square wave are not more than slightly rounded. If necessary to obtain a good response, dress lead A2-44. (The oscilloscope may be temporarily changed to internal sweep if desired to stop pattern.)

42. Return to external horizontal drive of the oscilloscope from the generator. The marker will be superimposed on the square wave.

43. Switch the METER INDICATES control to MARKER AMPLITUDE and, on the A3 board, temporarily short terminals 8 and 9. On the A3 board, set the ZERO adjustment for zero meter indication. Remove the short circuit from terminals 8 and 9. Turn the MARKER AMPLITUDE control fully counterclockwise. The meter will indicate approximately 1/3 of the distance between zero and 0.1 volt.

44. Set the INCREASE MARKER AMPLITUDE control to match the marker amplitude exactly to the peak-to-peak swing of the square-wave calibrating source (1 volt).

45. Set the MARKER CAL adjustment on the front panel for a 1-volt indication on the meter.

46. Set the square-wave calibrating source successively to 0.5 and 0.2 volt, and match the marker as in step 44 at each level. Meter tracking should be better than 2% of full scale. The full-scale adjustment in step 45 may be offset slightly if necessary to average the error. For best presentation, the oscilloscope sensitivity should be changed to match the calibrating levels used.

47. Match the marker to a 0.5-volt calibrating source and note the meter indication, which should be very close to 0.5 volt.

48. Set the RESPONSE POLARITY switch to POSITIVE and set the + MARK CAL adjustment of the A4 board for a match between the marker and the 0.5 volt square wave.

49. Check all positions of the MARKER AMPLITUDE FULL SCALE switch and the RESPONSE AMPLITUDE MULTIPLIER switch against the appropriate square-wave voltages as in step 44. Accuracy should be 2% or better.

50. With no input at the EXTERNAL RESPONSE DETECTOR connector, PULL TO SWEEP the sweep control. Connect a 10-volt peak-to-peak signal from the oscilloscope calibrator to the EXTERNAL MARKER connector. Set the INCREASE MARKER AMPLITUDE control fully clockwise. On the display oscilloscope, the normal marker should be replaced with a square wave of approximately 7 volts peak-to-peak.

51. Remove the calibrating source. Set the RESPONSE AMPLITUDE MULTIPLIER control to X10. Place the generator on a grounded shield or in the cabinet.

52. With a vertical sensitivity of 1 volt/cm on the oscilloscope, adjust the vertical balance control of the oscilloscope until there is no shift in the base line with

the RESPONSE POLARITY switch at either PLUS or MINUS. Excess range of at least ±1/2 cm should exist.

53. Temporarily disconnect the oscilloscope vertical input and center the trace vertically. Reconnect the oscilloscope to the generator, and with the VERT ZERO knob at the center of its range, adjust the screw-driver VERT.ZERO control behind the panel for center-screen position of the line. The range of the control knob should then be ±1-1/2 cm.

54. Increase the sensitivity of the oscilloscope to 0.2 volt/cm. Vary the line voltage from 100 to 130 volts. The vertical drift of the base line should remain within 2 cm.

55. Increase the oscilloscope sensitivity to 0.1 volt/cm. The noise should be less than 0.05 cm, peak-to-peak.

56. Switch the RESPONSE AMPLITUDE MULTIPLIER control to X1 (generator must be grounded to bench shield or cabinet). Hum should be less than 0.1 cm peak-to-peak.

6.12.4 TESTS ON AMPLITUDE CONTROL AND BLANKING CIRCUITS.

57. Connect a Type 874-VQ Voltmeter Detector terminated with a Type 874-WM 50-ohm Termination to the RF OUTPUT connector of the generator. Connect the output of the Type 874-VQ to the EXTERNAL RESPONSE DETECTOR connector with a short patch cord. With an ohmmeter, check that the diode in the Type 874-VQ has a back resistance greater than 20 kΩ. Temporarily place the oscillator shield cover on the generator (does not have to be fastened with screws).

58. Set the FULL SCALE OUTPUT switch (attenuator) to 1 VOLT. For a normal diode in the Type 874-VQ, set the RESPONSE POLARITY switch to NEGATIVE. Set the RESPONSE AMPLITUDE MULTIPLIER control to X1. Set the oscilloscope vertical sensitivity to 1 volt/cm. Set the INCREASE RF OUTPUT control fully clockwise. Set the FREQUENCY RANGE to 7-to-14 Mc. Set the EXPAND DISPLAY control fully clockwise. Adjust the DISPLAY START control to show the rising edge of the waveform (against the stop at the left-hand end of the frequency scales).

59. Adjust the GAIN control on the A4 board until ringing at the leading edge of the waveform is seen and then reduce the setting until the second overshoot just disappears. A small first overshoot and undershoot will still be visible.

60. Change the FREQUENCY RANGE to 0.7-to-1.4 Mc. The first overshoot should be 5% or less and the second overshoot just visible.

61. Reduce the EXPAND DISPLAY control setting until the waveform rectangle just fills the oscilloscope screen and switch through all the frequency ranges. Look for possible oscillation on the amplitude of the displayed trace (upper line). The 65-to-140 Mc range is most likely to have this trouble. If instability is noted, slightly reduce the setting of the GAIN control on the A4 board. If more than a slight readjustment is required, check for component failure in the automatic-amplitude-control amplifier.

62. Change the setting of the DISPLAY START control so that the blanking on-off transition occurs at the right-hand end of the unexpanded display. The display-start indicator is at the left-hand end of the frequency-scale arcs.

63. Connect a 100-kΩ adjustable carbon resistor across terminals 17 and 18, and, with the MARKER FREQUENCY control setting that gives minimum marker amplitude, adjust the resistor for approximately 1/4 marker amplitude.

64. Momentarily short terminals 19 and 20 to get the reduced marker to jump to the upper line of the display.

65. Increase the resistance of the variable resistor until the marker returns to the base line and note the marker amplitude.

66. Disconnect the variable resistor and note the increase in marker amplitude. This amplitude increase should be at least 50% to ensure adequate blanking synchronism.

67. Connect the 100-kΩ adjustable resistor across terminals 19 and 20 and set it to its minimum resistance. The upper line on the display should disappear.

68. Increase the resistance until the upper line reappears. Connect the vertical input of the oscilloscope across the resistor with a 10-to-1 probe. Note the peak-to-peak amplitude of the trigger pulse.

69. Leaving the oscilloscope connected, open the resistor and observe the increase in trigger amplitude. This increase should be at least 50% to ensure adequate trigger for blanking the multivibrator.

6.12.5 FREQUENCY CALIBRATION.

NOTE

Before the following adjustments are made, the generator should be warmed up for at least two hours and the cover of the oscillator should be screwed in place. (The adjustments are accessible through holes in the back of the cover.)

70. Connect a Type 874-VQ Voltmeter Detector with a reversed diode to the output of the generator. With an ohmmeter, check that the diode back resistance is greater than 20 kΩ. Terminate the Type 874-VQ with a Type 874-WM 50-ohm Termination. Feed the output of the Type 874-VQ to the EXTERNAL RESPONSE DETECTOR connector and display the envelope of the swept output on the oscilloscope as in previous tests. Set the RF OUTPUT control to 1 volt. Adjust the oscilloscope sensitivity for 5-division vertical displacement of the displayed output from the base line on the 7-to-14 Mc frequency range.

71. All ranges should remain within 4% of the 7-to-14 Mc range up to frequencies above 150 Mc, where a deviation of up to 10% may occur.

72. All ranges (up to 150 Mc) should be flat over the range to better than ±2% (0.2 db). Above 150 Mc, deviation should be less than ±5% (0.4 db) due to harmonics in the output.

73. Any excessive deviation from flat output may be due to incorrect polarity of the output coil or incorrect coupling.

74. Connect the vertical input of the oscilloscope to the generator and set the vertical sensitivity to 0.1 volt/cm. Reduce the setting of the FULL SCALE OUTPUT control to 100 millivolts, and set the INCREASE RF OUTPUT control to maximum.

75. Remove the Type 874-WM from the Type 874-VQ and replace it with a Type 874-G10 Attenuator. Connect a Type 1213-D Unit Time/Frequency Calibrator to the other end of the Type 874-G10 with a Type 874-R22 Patch Cord. Set the FULL SCALE OUTPUT control to 100 millivolts. Set the MARKER AMPLITUDE FULL SCALE control to 0.1 v. Set the FREQUENCY RANGE to 7-to-14 Mc. Set the fundamental frequency on the Type 1213-D to 1 Mc.

76. With an oscilloscope sensitivity of 0.1 volt/cm, a series of markers will appear on the display. The largest markers are at 1-Mc intervals, and markers half-way between the largest ones are at 1/2-Mc points. To identify the 10-Mc marker, switch the fundamental frequency of the Type 1213-D to 10 Mc and reduce the oscilloscope gain. Set the internal marker to 10 Mc, reset the output of the Type 1213-D to 1 Mc, and reset the gain to its original position.

77. Adjust the coil and capacitor trimmers of the oscillator so that the low and high ends (7 and 14 Mc) of the dial agree exactly with the birdie markers. Match the internal markers successively to the various birdie markers. This match should be better than 0.5% or 5 vernier divisions.

NOTE

Linearity over the range may be improved by offsetting the end points slightly to improve the mid-range linearity.

78. Adjust the coil and capacitor trimmers on the 4-to-8 Mc range for the condition of step 76. Use the 10-Mc output of the Type 1213-D to identify the 5-Mc markers to calibrate the 4- and 8-Mc points.

79. Adjust the coil and capacitor trimmers on the 2.4-to-4.8 Mc range. Remove the Type 874-G10 and reduce the setting of the FULL SCALE OUTPUT control to 30 millivolts. Use the 1-Mc output of the Type 1213-D to identify the 3- and 4-Mc points and use the 100-kc markers to calibrate the 1.4- and 4.8-Mc points.

80. Adjust the coil and capacitor trimmers on the 1.3-to-2.6 Mc range. Use the 1-Mc output from the Type 1213-D to identify the 2-Mc point and use the 100-kc markers to calibrate the 1.3- and 2.6-Mc points.

81. Adjust the coil and capacitor trimmers on the 0.7-to-1.4 Mc range. Use the 1-Mc output from the Type 1213-D to identify the 1-Mc point and use the 100-kc markers to calibrate the 0.7- and 1.4-Mc points.

82. Adjust the coil and capacitor trimmers on the 0.4-to-0.5 Mc (or 0.4-to-0.8 Mc alternate) range. Use the 1-Mc output from the Type 1213-D to identify the 0.5-Mc point and use the 100-kc markers to calibrate the 0.4- and 0.5-Mc (or 0.4- and 0.8-Mc) points.

83. Change the FREQUENCY RANGE to 10.7 ±0.3 Mc and temporarily substitute a single-turn pickup loop for the Type 1213-D. Loosely couple an oscillating grid dipper tuned to 11 Mc, and adjust the oscillator coil of the Type 1025-A until a marker appears near the right-hand end of the display. Substitute the Type 1213-D set to 1-Mc output, and adjust for a match between the internal marker at +30 on the dial and the birdie. This is 11 Mc. Change the fundamental frequency of the Type 1213-D for 100-kc output and readjust the coil and capacitor trimmers so that 10.4 Mc and 11 Mc occur at -30 and +30, respectively, on the dial. To make sure that the 11-Mc point is at +30 on the dial, repeat the identification procedure. Match on the bandspread ranges should be within ±0.5% of the frequency read.

84. Adjust the coil and capacitor trimmers on the 13-to-26 Mc range. Replace the Type 874-G10 between the Type 874-VQ and the Type 1213-D. Increase the setting of the FULL SCALE OUTPUT control to 100 millivolts. Use the 10-Mc output of the Type 1213-D to identify the 20-Mc point and use the 1-Mc markers to calibrate the 13- and 26-Mc points.

85. Adjust the coil and capacitor trimmers on the 24-to-48 Mc range. Temporarily substitute the coupling loop for the Type 874-G10 and use the grid dipper as an absorption wavemeter set to 40 Mc. Note the absorption point on the display and substitute the 10-Mc output from the Type 1213-D. This identifies the 40-Mc point. Use 1-Mc markers to calibrate the 24- and 48-Mc points. If necessary, recheck the 40-Mc point so that the proper 1-Mc points are used for calibration.

86. Adjust the coil and capacitor trimmers on the 40-to-80 Mc range. Identify the 50-Mc point by the grid-dipper absorption method used in step 83. The 5-Mc points are apparent. Change the oscilloscope sensitivity to 0.5 volt/cm. Use the 10-Mc output of the Type 1213-D to calibrate the 40- and 80-Mc points.

87. Adjust the coil and capacitor trimmers on the 65-to-140 Mc range. Identify the 100-Mc point by the grid-dipper absorption method. Use the 10-Mc output of the Type 1213-D to calibrate the 65- and 140-Mc points.

88. Set the FREQUENCY RANGE to 100-to-230 Mc. Identify the 100- and 200-Mc points by the grid-dipper absorption method. Use the 10-Mc output of the Type 1213-D to calibrate the 230-Mc point exactly with the trimmer capacitor. Check that the 100-Mc point is within ±0.5% on the dial. Check the linearity at several points over the range. Errors greater than 0.5% may be corrected at the upper end of the range by slightly offsetting the 230-Mc point to improve linearity over the range.

NOTE

This range is hand-calibrated. If the error at the 100-Mc point is greater than 0.5%, or if the linearity cannot be corrected by offsetting the 230-Mc point, the range must be recalibrated at our laboratory.

89. If the 4-to-5 Mc optional range is used, check the 4- and 5-Mc points against the 1-Mc output from the Type 1213-D and calibrate with 100-kc markers.

90. If the 40-to-50 Mc optional range is used, check the 40- and 50-Mc points against the 10-Mc output from the Type 1213-D and calibrate with 1-Mc markers.

91. The above tests should ensure that all dial calibrations will agree with crystal-reference markers to within 5 small vernier divisions or 0.5% for any frequency range.

92. To adjust the manual clutch, return to the 7-to-14 Mc frequency range. Set the fundamental frequency of the Type 1213-D to 1 Mc. Match the internal marker to 10 Mc as indicated by the birdie. Note the exact dial indication. PUSH AND ROTATE TO ENGAGE CLUTCH FOR MANUAL OPERATION as marked on the sweep control. Set the CW FREQUENCY to exact zero beat with the Type 1213-D. (Use headphones for greatest accuracy.) Note the dial deviation from the previous sweep marker position. The dial indication can be brought into agreement, within 1 small vernier division, by adjustment of the clutch setscrews on the marker pickup arm. Loosen the setscrew accessible at the low-frequency end of the dial and tighten the setscrew accessible at the high-frequency end to increase the scale indication at zero beat. To decrease the scale indication at zero beat, tighten the setscrew accessible at the high-frequency end of the dial and loosen the setscrew accessible at the low-frequency end. Repeat checks between the manual and sweep frequencies at every megacycle on this range to average any possible errors and obtain exact agreement. Start and stop the sweep several times to see that the calibration repeats. The setscrews must be securely locked to oppose any backlash in the clutch assembly.

6.12.6 RF METER CALIBRATION.

93. With the RF OUTPUT control fully counterclockwise, the range of the RF ZERO adjustment should be near the center of its range, or well within the range required for zeroing the meter.

94. To the RF OUTPUT connector of the generator, connect an accurately calibrated, rf, vacuum-tube voltmeter (0.5% accuracy, very high impedance compared with 50 ohms, and a Type 874 connector to plug directly into the generator). Set the FULL SCALE OUTPUT control to 1 volt. Set the CW FREQUENCY control to 10 Mc. Set the INCREASE RF OUTPUT control for 0.7 volt on the external meter. Set the RF CAL adjustment (under the panel screw) for 0.7-volt indication on the panel meter. The RF ZERO adjustment must be set with the INCREASE RF OUTPUT control fully counterclockwise.

95. Check the tracking of the panel meter with the external meter at 0.1, 0.3, 0.4, 0.5, 0.6, 0.8, 0.9, and 1 volt by adjusting the RF OUTPUT control successively to these values. Tracking should be better than 1% of the indicated reading plus 2% of full scale.

96. Set the RF OUTPUT control to full scale on the meter with manual operation and then start the sweep. The change in panel-meter indication should be less than 2% downward.

97. Connect an external rf voltmeter to the FREQUENCY connector of the generator. Set the CW FREQUENCY control to 10 Mc. Set the RF OUTPUT control to 1 volt. The voltage should be greater than 0.35 volt.

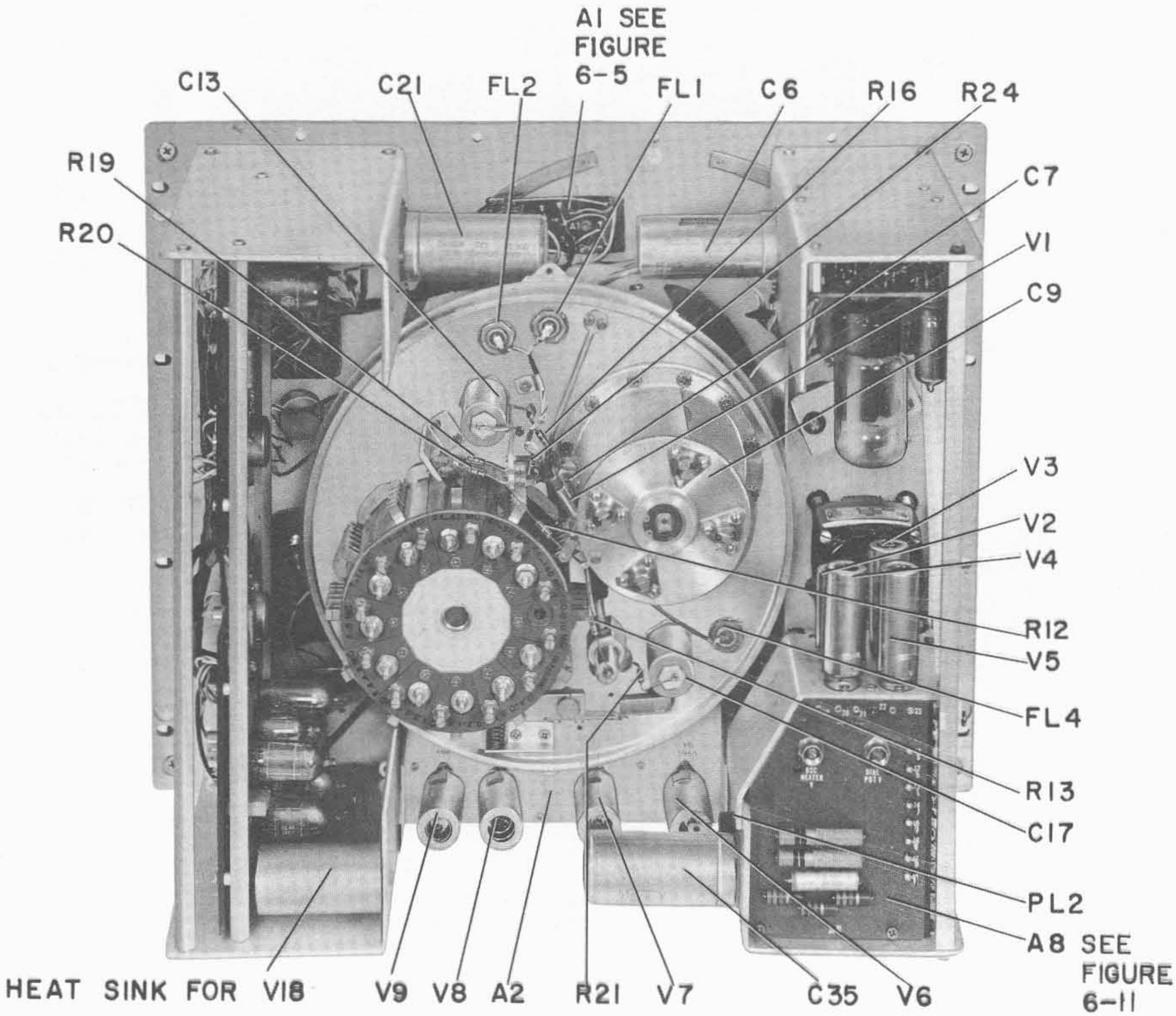


Figure 6-1. Rear interior view of the Type 1025-A.

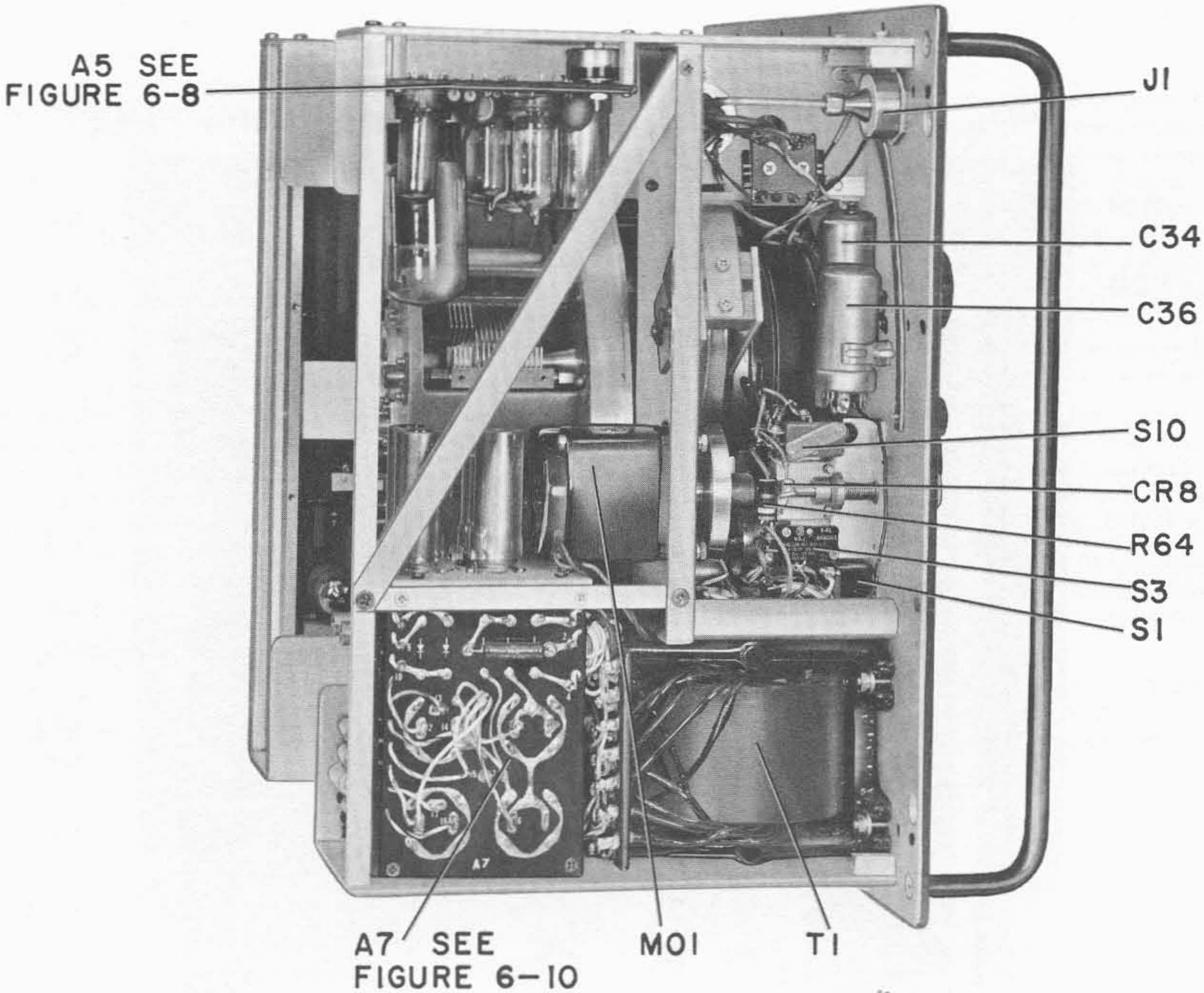


Figure 6-2. Interior view of left-hand side of the Type 1025-A.

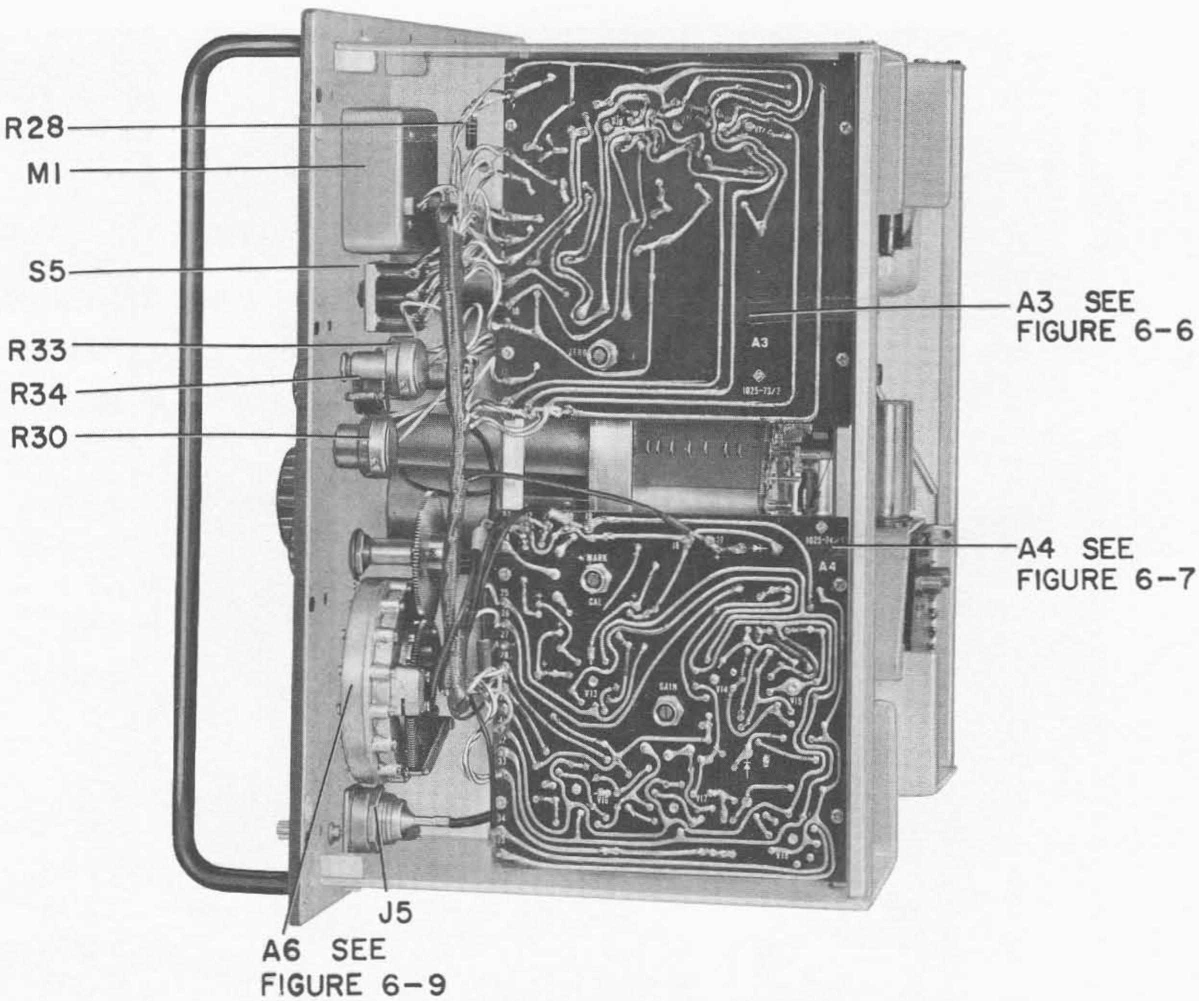


Figure 6-3. Interior view of right-hand side of the Type 1025-A.

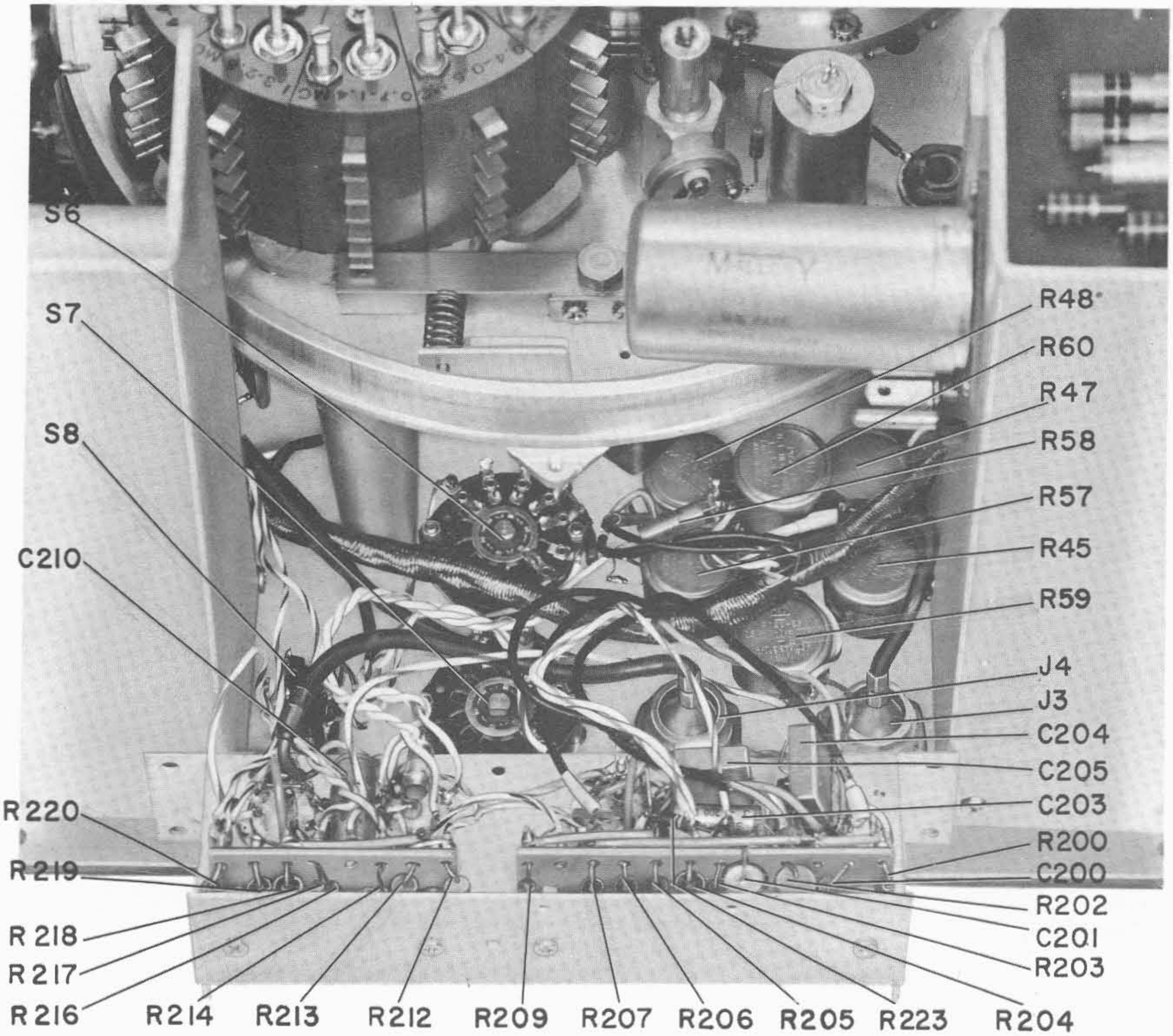


Figure 6-4. Display-output assembly (A2) of the Type 1025 demounted and folded out on its flexible connecting leads. Inter-circuit shield has been removed.

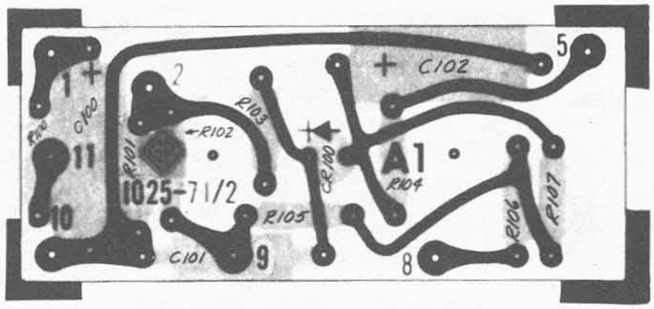


Figure 6-5. Etched-board layout for metering circuit (A1) of the Type 1025-A.

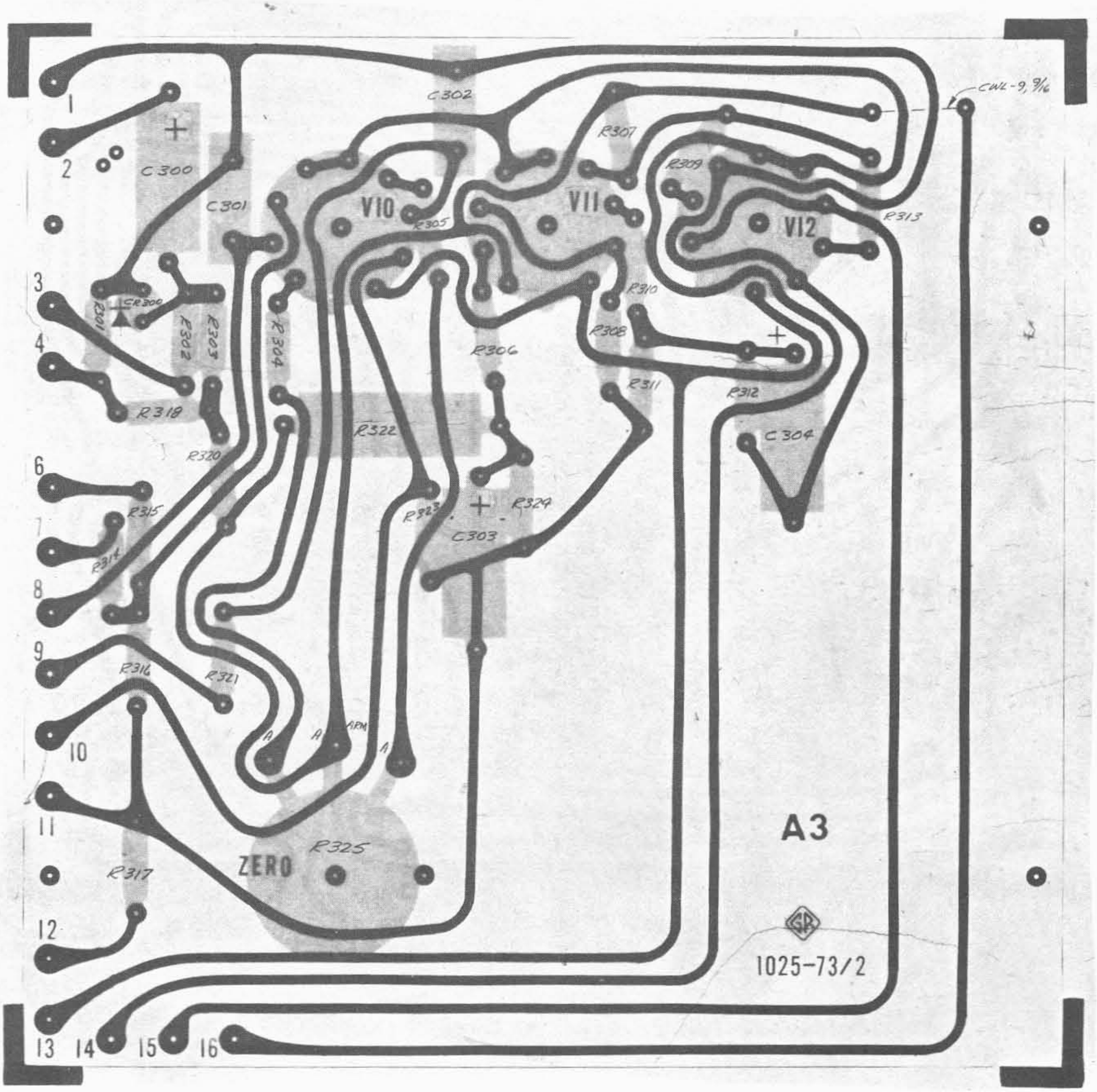


Figure 6-6. Etched-board layout for −150-volt regulator and meter circuit (A3) of the Type 1025-A

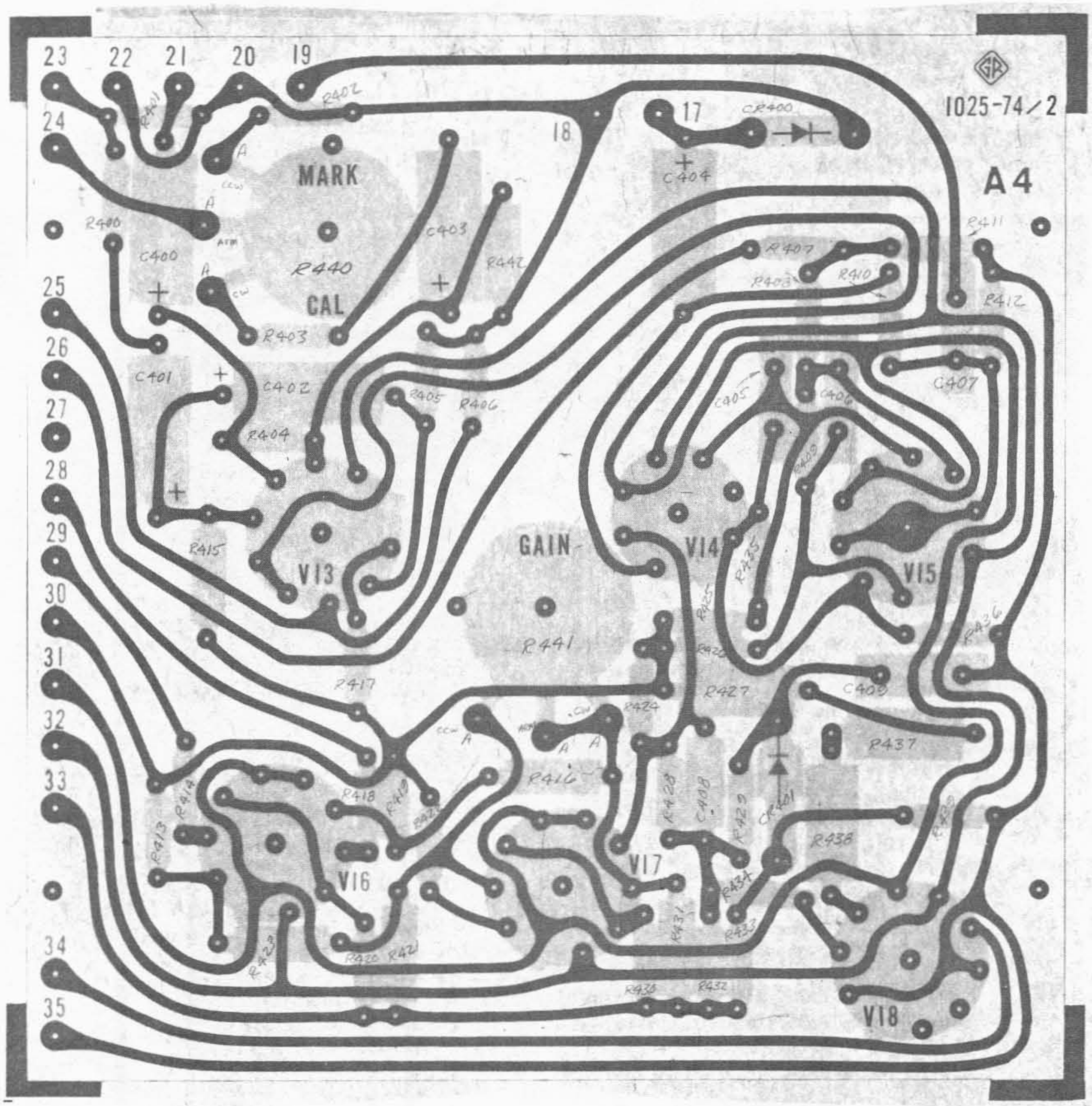


Figure 6-7. Etched-board layout for automatic-amplitude-control amplifier (A4) of the Type 1025-A.

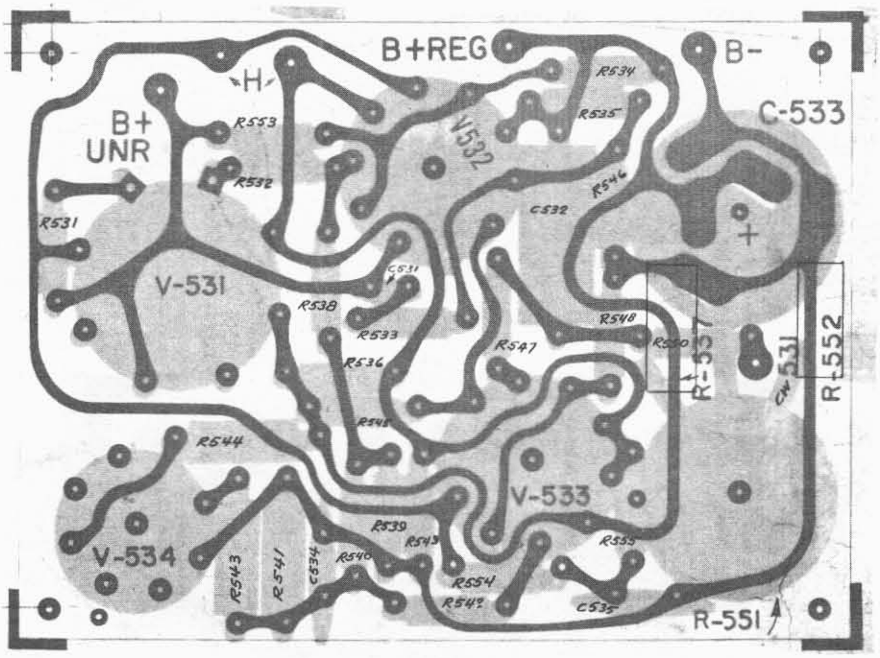


Figure 6-8. Etched-board layout for 200-volt regulator (A5) of the Type 1025-A.

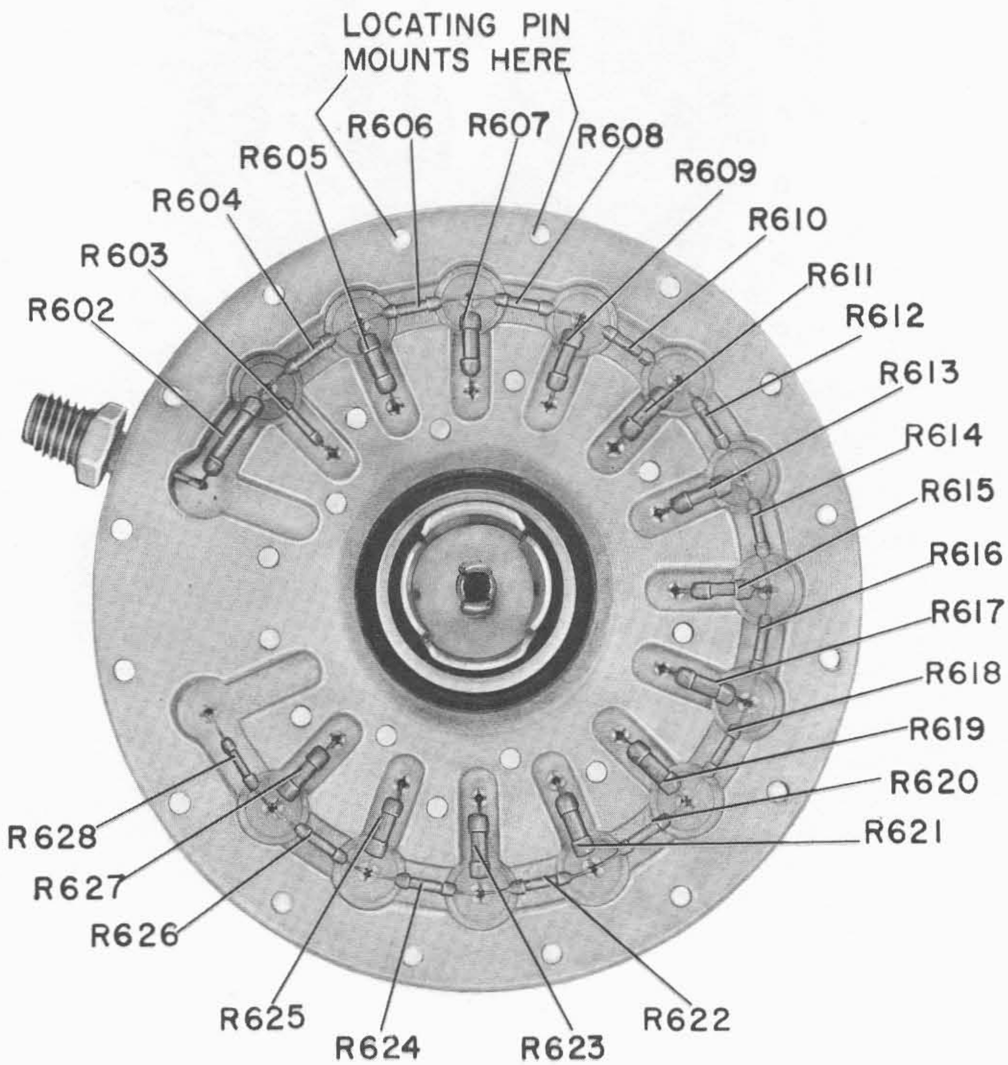


Figure 6-9. Interior view of the rf step attenuator (A6) of the Type 1025-A.

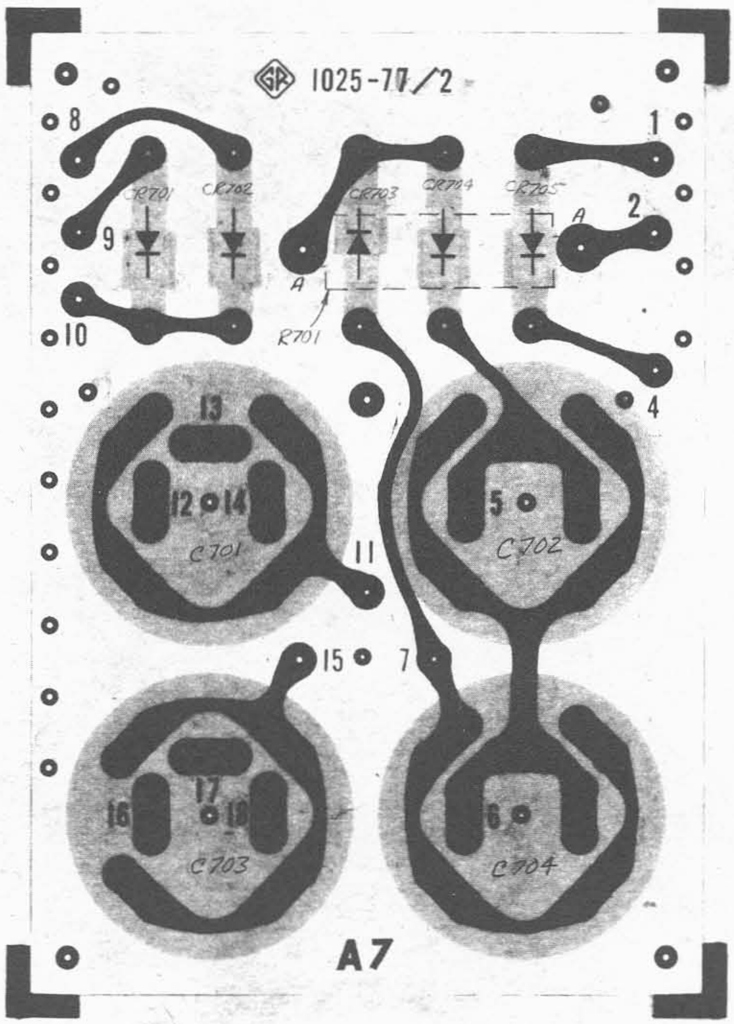


Figure 6-10. Etched-board layout for power supply (A7) in the Type 1025-A.

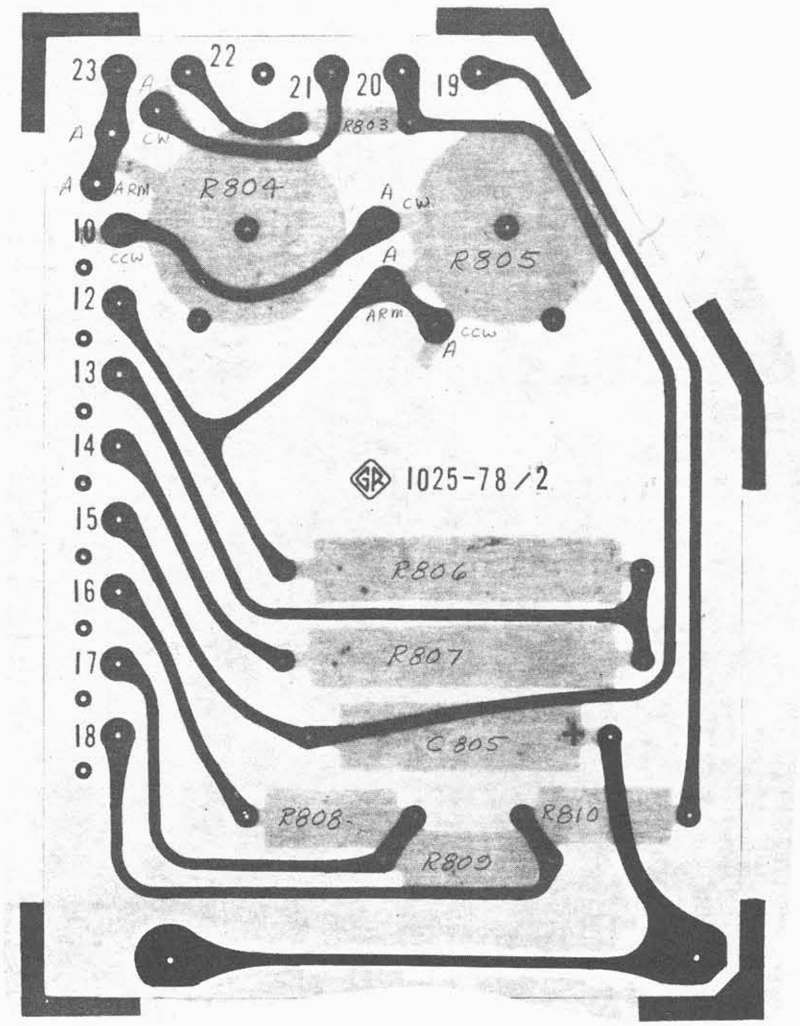


Figure 6-11. Etched-board layout for power supply (A8) in the Type 1025-A.

STANDARD TURRET SECTORS

Freq	Coil	Composition Resistors ±5%, 1/2 w				Mica Capacitors ±5%		Ceramic Capacitors ±5%		Trimmer Capacitors	Choke
	TA	RA	RB	RC	RL	CA	CB	CC	CD	CT	
0.4-0.5 Mc (Fig. 6-15)	1350 μh 1025-3250	2 kΩ 6100-2205	100 kΩ 6100-4105	---	---	---	150 pf 4640-0600	47 pf 4411-0475	120 pf 4411-1205	0.4-12 pf 4910-1108	---
0.7-1.4 Mc (Fig. 6-12)	560 μh 1025-3521	3 kΩ 6100-2305	270 kΩ 6100-4275	---	---	---	---	---	---	0.4-12 pf 4910-1108	---
1.3-2.6 Mc (Fig. 6-12)	160 μh 1025-3522	1.5 kΩ 6100-2155	150 kΩ 6100-4155	---	---	---	---	---	---	0.4-12 pf 4910-1108	---
2.4-4.8 Mc (Fig. 6-12)	47 μh 1025-3523	820 Ω 6100-1825	75 kΩ 6100-3755	---	---	---	---	---	---	0.4-12 pf 4910-1108	---
4-8 Mc (Fig. 6-12)	17 μh 1025-3524	510 Ω 6100-1515	47 kΩ 6100-3475	---	---	---	---	---	---	0.4-12 pf 4910-1108	---
10.7±0.3 Mc (Fig. 6-16)	1 μh 1025-3525	200 Ω 6100-1205	20 kΩ 6100-3205	10Ω 6100-0105	---	100 pf 4640-0500	150 pf 4640-0600	36 pf 4411-0365	180 pf 4411-1805	0.4-12 pf 4910-1108	---
7-14 Mc (Fig. 6-12)	5.6 μh 1025-3526	300Ω 6100-1305	27 kΩ 6100-3275	---	---	---	---	---	---	0.4-12 pf 4910-1108	---
13-26 Mc (Fig. 6-12)	1.6 μh 1025-3527	150 Ω 6100-1155	15 kΩ 6100-3155	---	---	---	---	---	---	0.4-12 pf 4910-1108	---
24-48 Mc (Fig.	0.47 μh 1025-3528	82 Ω 6100-0825	7.5 kΩ 6100-2755	---	---	---	---	---	---	0.4-12 pf 4910-1108	---
40-80 Mc (Fig. 6-12)	0.17 μh 1025-3529	51 Ω 6100-0515	4.7 kΩ 6100-2475	---	---	---	---	---	---	0.4-12 pf 4910-1108	---
65-140 Mc (Fig.	0.05 μh 1025-8590	---	2 kΩ 6100-2205	---	2 kΩ 6100-2205	---	---	---	---	0.4-12 pf 4910-1108	1025-2580
100-230 Mc (Fig. 6-14)	1/2-turn wire loop	51 Ω 6100-0515	2 kΩ 6100-2205	100 Ω 6100-1105	---	220 pf 4640-0700	0.001 μf[1] 4406-2108	3.3 pf[2] 4400-0400	---	0.4-12 pf 4910-1108	2 μh 4290-1400

[1]Ceramic, ±10%
[2]±10%

OPTIONAL TURRET SECTORS

Freq	Coil	Composition Resistors ±5%, 1/2 w				Mica Capacitors ±5%		Ceramic Capacitors ±5%		Trimmer Capacitors	Choke
	TA	RA	RB	RC	RL	CA	CB	CC	CD	CT	
0.4-0.8 Mc (Fig. 6-12)	1700 μh 1025-3570	5.1 kΩ 6100-2515	470 kΩ 6100-4475	---	---	---	---	---	---	0.4-12 pf 4910-1108	---
2 ± 0.1 Mc (Fig.	41 μh 1025-3571	200 Ω 6100-1205	75 kΩ 6100-3755	---	---	100 pf 4640-0500	150 pf 4640-0600	47 pf 4411-0475	68 pf 4411-0685 47 pf 4411-0475	0.4-12 pf 4910-1108	---
2.8±0.1 Mc (Fig. 6-16)	17 μh 1025-3524	200 Ω 6100-1205	75 kΩ 6100-3755	---	---	100 pf 4640-0500	150 pf 4640-0600	43 pf 4411-0435	75 pf 4411-0755 82 pf 4411-0825	0.4-12 pf 4910-1108	---
4-5 Mc (Fig. 6-15)	13.5 μh 1025-3573	200 Ω 6100-1205	10 kΩ 6100-3105	---	---	---	150 pf 4640-0600	47 pf 4411-0475	75 pf 4411-0755	0.4-12 pf 4910-1108	---
16±0.3 Mc (Fig. 6-16)	0.32 μh 1025-3574	200 Ω 6100-1205	15 kΩ 6100-3155	10 Ω 6100-0105	---	100 pf 4640-0500	150 pf 4640-0600	33 pf 4411-0335	82 pf 4411-0825	0.4-12 pf 4910-1108	---
40-50 Mc (Fig. 6-15)	0.135 μh 1025-3529	20 Ω 6100-0205	2 kΩ 6100-2205	---	---	---	150 pf 4640-0600	56 pf 4411-0565	91 pf 4411-0915	0.4-12 pf 4910-1108	---

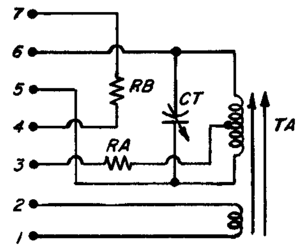


Figure 6-12. Schematic diagram of frequency-turret sectors for the following ranges:

0.4 to 0.8 Mc	7 to 14 Mc
0.7 to 1.4 Mc	13 to 26 Mc
1.3 to 2.6 Mc	24 to 48 Mc
2.4 to 4.8 Mc	40 to 80 Mc
4 to 8 Mc	

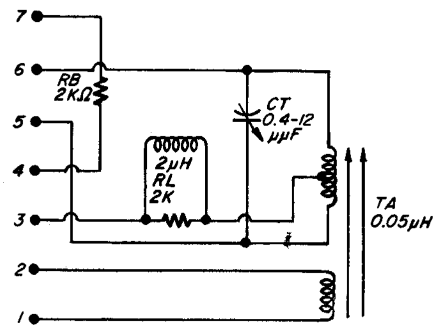


Figure 6-13. Schematic diagram of the frequency-turret sector for the 65-to-140 Mc range.

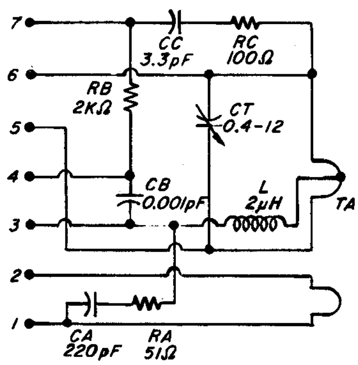


Figure 6-14. Schematic diagram of the frequency-turret sector for the 100-to-230 Mc range.

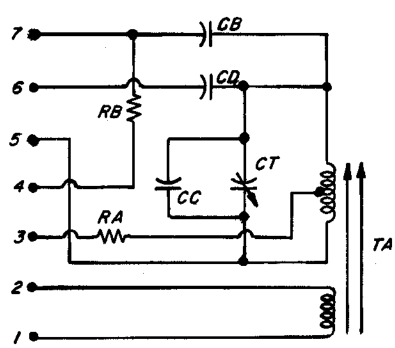


Figure 6-15. Schematic diagram of the frequency-turret sectors for the following ranges:

0.4 to 0.5 Mc
4 to 5 Mc
40 to 50 Mc

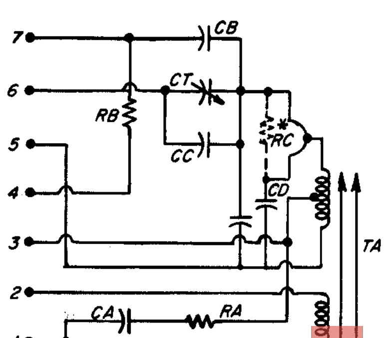


Figure 6-16. Schematic diagram of the frequency-turret sectors for the following ranges:

10.7 ±0.3 Mc
2.0 ±0.1 Mc
2.8 ±0.1 Mc
16.0 ±0.3 Mc

PARTS LIST

REF NO.	DESCRIPTION - RESISTORS				PART NO.
R11	Composition	1MΩ	±5%	1/2w	6100-5105
R12	Composition	150Ω	±5%	1/2w	6100-1155
R13	Composition	150Ω	±5%	1/2w	6100-1155
R14	Film	62.5Ω	±1/2%	1/4w	6609-0062
R15	Film	250Ω	±1/2%	1/4w	6609-0250
R17	Composition	1kΩ	±5%	2w	6120-2105
R18	Film	50Ω	±1/2%	1/4w	6613-0050
R19	Composition	100Ω	±5%	1/2w	6100-1105
R20	Composition	100Ω	±5%	1/2w	6100-1105
R21	Composition	51Ω	±5%	1/2w	6100-0515
R22	Composition	51Ω	±5%	1/2w	6100-0515
R23	Composition	39kΩ	±5%	2w	6120-3395
R24	Composition	150Ω	±5%	1/2w	6100-1155
R25	Composition	1kΩ	±5%	1w	6110-2105
R26	Composition	1kΩ	±5%	2w	6120-2105
R27	Composition	51Ω	±5%	1/2w	6100-0515
R28	Composition	470Ω	±5%	1w	6110-1475
R30	Potentiometer, Composition	500Ω	±10%		6010-0300
R31	Composition	200Ω	±5%	1/2w	6100-1205
R32	Potentiometer, Composition	10kΩ	±10%		6010-0900
R33	Potentiometer, Composition	5kΩ	±10%		6010-0800
R34	Potentiometer, Composition	50kΩ	±10%		6000-0800
R35	Composition	13MΩ	±5%	1w	6110-6130
R36		98kΩ	±5%		1025-2220
R37	Composition	300Ω	±5%	2w	6120-1305
R38	Composition	300Ω	±5%	2w	6120-1305
R39	Wire-wound	6.8Ω	±10%	2w	6760-9689
R40	Composition	1kΩ	±5%	1/2w	6100-2105
R41	Composition	1MΩ	±5%	1/2w	6100-5105
R42	Composition	510kΩ	±5%	1/2w	6100-4515
R43	Power	330Ω	±5%	10w	6640-1339
R44	Composition	51kΩ	±5%	1/2w	6100-3515
R45	Potentiometer, Composition	5kΩ	±10%		6010-0800
R46	Composition	150kΩ	±5%	1/2w	6100-4155
R47	Potentiometer, Composition	100kΩ	±10%		6020-0700
R48	Potentiometer, Composition	50kΩ	±10%		6000-0800
R49	Film	1kΩ	±1%	1/8w	6250-1100
R50	Film	2.16kΩ	±1%	1/8w	6250-1216
R51	Film	6.84kΩ	±1%	1/8w	6250-1684
R52	Film	21.6kΩ	±1%	1/8w	6250-2216
R53	Film	68.4kΩ	±1%	1/8w	6250-2684
R54	Film	10kΩ	±1%	1/8w	6250-2100
R55	Film	90kΩ	±1%	1/8w	6250-2900
R56	Film	900kΩ	±1%	1/8w	6250-3900
R57	Potentiometer, Composition	500kΩ	±10%		6010-0300
R58	Film	150kΩ	±1%	1/2w	6450-3150
R59	Potentiometer, Composition	25kΩ	±10%		6040-1755
R60	Potentiometer, Composition	100kΩ	±10%		6010-1700
R61	Composition	1kΩ	±5%	2w	6120-2105
R62	Composition	1kΩ	±5%	2w	6120-2105
R63	Composition	1kΩ	±5%	2w	6120-2105
R64	Composition	3.9kΩ	±5%	2w	6120-2395
R65	Power	1kΩ	±5%	10w	6640-2105
R100	Composition	100kΩ	±5%	1/2w	6100-4105
R101	Composition	100kΩ	±5%	1/2w	6100-4105
R102	Composition	10MΩ	±5%	1/2w	6100-6105
R103	Composition	3.9kΩ	±5%	1/2w	6100-2395
R104	Composition	3MΩ	±5%	1/2w	6100-5305
R105	Composition	200kΩ	±5%	1/2w	6100-4205

REF NO.	DESCRIPTION - RESISTORS				PART NO.
R106	Composition	510Ω	±5%	1/2w	6100-1515
R107	Composition	10MΩ	±5%	1/2w	6100-6105
R200	Composition	51kΩ	±5%	1/2w	6100-3515
R201	Composition	51kΩ	±5%	1/2w	6100-3515
R202	Film	4.99MΩ	±1%	1w	6550-4499
R203	Composition	1MΩ	±5%	1/2w	6100-5105
R204	Composition	30kΩ	±5%	2w	6120-3305
R205	Composition	30kΩ	±5%	1w	6110-3305
R206	Composition	3kΩ	±5%	1w	6110-2305
R207	Composition	30kΩ	±5%	1w	6110-3305
R209	Composition	100Ω	±5%	1/2w	6100-1105
R212	Film	100kΩ	±1%	1/2w	6450-3100
R213	Film	100kΩ	±1%	1/2w	6450-3100
R214	Film	1MΩ	±1%	1/8w	6250-4100
R215	Film	1MΩ	±1%	1/8w	6250-4100
R216	Film	1MΩ	±1%	1/8w	6250-4100
R217	Film	1MΩ	±1%	1/8w	6250-4100
R218	Composition	30kΩ	±5%	2w	6120-3305
R219	Composition	62kΩ	±5%	1w	6110-3625
R220	Composition	20kΩ	±5%	1w	6110-3205
R221	Composition	10MΩ	±5%	1/2w	6100-6105
R223	Composition	510kΩ	±5%	1/2w	6100-4515
R224	Composition	10MΩ	±5%	1/2w	6100-6105
R225	Composition	750Ω	±5%	1/2w	6100-1755
R226	Composition	100kΩ	±5%	1/2w	6100-4105
R227	Composition	1kΩ	±5%	1/2w	6100-2105
R301	Composition	5.6kΩ	±5%	1/2w	6100-2565
R301	Composition	3MΩ	±5%	1/2w	6100-5305
R303	Composition	10MΩ	±5%	1/2w	6100-6105
R304	Composition	1kΩ	±5%	1/2w	6100-2105
R305	Composition	1kΩ	±5%	1/2w	6100-2105
R306	Composition	1kΩ	±5%	1/2w	6100-2105
R307	Composition	2MΩ	±5%	1/2w	6100-5205
R308	Film	51.1kΩ	±1%	1/8w	6250-2511
R309	Composition	1kΩ	±5%	1/2w	6100-2105
R310	Composition	1kΩ	±5%	1/2w	6100-2105
R311	Film	1MΩ	±1%	1/8w	6250-4100
R312	Film	480kΩ	±1%	1/8w	6250-3480
R313	Composition	1kΩ	±5%	1/2w	6100-2105
R314	Composition	6.8kΩ	±5%	1/2w	6100-2685
R315	Composition	30kΩ	±5%	1/2w	6100-3305
R316	Composition	150kΩ	±5%	1/2w	6100-4155
R317	Composition	2MΩ	±5%	1/2w	6100-5205
R318	Composition	4.3kΩ	±5%	1/2w	6100-2435
R320	Composition	2MΩ	±5%	1/2w	6100-5205
R321	Composition	3MΩ	±5%	1/2w	6100-5305
R322	Film	2.49MΩ	±5%	1w	6550-4249
R323	Composition	150kΩ	±5%	1/2w	6100-4155
R324	Film	1MΩ	±5%	1/8w	6250-4100
R325	Potentiometer, Composition	100kΩ	±10%		6010-1700
R400	Composition	430kΩ	±5%	1/2w	6100-4435
R401	Composition	100kΩ	±5%	1/2w	6100-4105
R402	Composition	75kΩ	±5%	1/2w	6100-3755
R403	Composition	390kΩ	±5%	1/2w	6100-4395
R404	Composition	1MΩ	±5%	1/2w	6100-5105
R405	Composition	1MΩ	±5%	1/2w	6100-5105
R406	Composition	4.7kΩ	±5%	1/2w	6100-2475
R407	Composition	62kΩ	±5%	1/2w	6100-3625
R408	Composition	300kΩ	±5%	1/2w	6100-4305
R409	Composition	910kΩ	±5%	1/2w	6100-4915
R410	Composition	910kΩ	±5%	1/2w	6100-4915
R411	Composition	62kΩ	±5%	1/2w	6100-3625
R412	Composition	18kΩ	±5%	1/2w	6100-3185
R413	Composition	200kΩ	±5%	1/2w	6100-4205
R414	Composition	1kΩ	±5%	1/2w	6100-2105
R415	Composition	30kΩ	±5%	1w	6110-3305
R416	Film	800kΩ	±1%	1/4w	6350-3800
R417	Composition	100Ω	±5%	1/2w	6100-1105
R418	Composition	1kΩ	±5%	1/2w	6100-2105

PARTS LIST Continued

REF NO.	DESCRIPTION - RESISTORS				PART NO.
R419	Composition	200kΩ	±5%	1/2w	6100-4205
R420	Composition	200kΩ	±5%	1/2w	6100-4205
R421	Film	1.2MΩ	±1%	1/4w	6350-4120
R422	Composition	100Ω	±5%	1/2w	6100-1105
R423	Film	800kΩ	±1%	1/4w	6350-3800
R424	Composition	200kΩ	±5%	1/2w	6100-4205
R425	Composition	75kΩ	±5%	1/2w	6100-3755
R426	Composition	62kΩ	±5%	1/2w	6100-3625
R427	Composition	1.6kΩ	±5%	2w	6120-2165
R428	Composition	910kΩ	±5%	1/2w	6100-4915
R429	Composition	6.8kΩ	±5%	1/2w	6100-2685
R430	Composition	91kΩ	±5%	1/2w	6100-3915
R431	Film	1.2MΩ	±1%	1/4w	6350-4120
R432	Composition	1.1MΩ	±5%	1/2w	6100-5115
R433	Composition	130kΩ	±5%	1/2w	6100-4135
R434	Composition	1kΩ	±5%	1/2w	6100-2105
R435	Composition	910kΩ	±5%	1/2w	6100-4915
R436	Composition	330kΩ	±5%	1/2w	6100-4335
R437	Composition	1.6kΩ	±5%	2w	6120-2165
R438	Composition	1.6kΩ	±5%	2w	6120-2165
R439	Composition	13kΩ	±5%	1/2w	6100-3135
R440	Potentiometer, Composition	50kΩ	±10%		6010-1400
R441	Potentiometer, Composition	5MΩ	±10%		6030-0450
R442	Composition	30kΩ	±5%	1w	6110-3305
R531	Composition	1kΩ	±5%	1/2w	6100-2105
R532	Composition	1kΩ	±5%	1/2w	6100-2105
R533	Composition	9.1MΩ	±5%	1/2w	6100-5915
R534	Composition	2.7MΩ	±5%	1/2w	6100-5275
R535	Composition	120kΩ	±5%	1/2w	6100-4125
R536	Composition	2.2MΩ	±5%	1/2w	6100-5225
R537	Film	162kΩ	±1%	1/2w	6450-3162
R538	Composition	390kΩ	±5%	1/2w	6100-4395
R539	Composition	100kΩ	±5%	1/2w	6100-4105
R540	Composition	6.2MΩ	±5%	1/2w	6100-5625
R541	Film	75kΩ	±1%	1/4w	6350-2750
R542	Composition	1kΩ	±5%	1/2w	6100-2105
R543	Film	100kΩ	±1%	1/4w	6350-3100
R544	Composition	43kΩ	±5%	1w	6110-3435
R545	Composition	47kΩ	±5%	1/2w	6100-3475
R546	Composition	180kΩ	±5%	1/2w	6100-4185
R547	Composition	1kΩ	±5%	1/2w	6100-2105
R548	Composition	5.6kΩ	±5%	1/2w	6100-2565
R549	Composition	1.5MΩ	±5%	1/2w	6100-5155
R550	Composition	470kΩ	±5%	1/2w	6100-4475
R551	Potentiometer, Wire-wound	10kΩ	±10%		6050-1800
R552	Film	33kΩ	±1%	1/4w	6350-2330
R553	Composition	10MΩ	±5%	1/2w	6100-6105
R554	Composition	100Ω	±5%	1/2w	6100-1105
R555	Composition	100Ω	±5%	1/2w	6100-1105
R602	Film	50Ω	±1/2%	1/4w	6609-0050
R603	Film	192.5Ω	±1/2%	1/8w	6610-1700
R604	Film	142.3Ω	±1/2%	1/8w	6610-1600
R605	Film	96.25Ω	±1/2%	1/8w	6610-1900
R606	Film	142.3Ω	±1/2%	1/8w	6610-1600
R607	Film	96.25Ω	±1/2%	1/8w	6610-1900
R608	Film	142.3Ω	±1/2%	1/8w	6610-1600
R609	Film	96.25Ω	±1/2%	1/8w	6610-1900
R610	Film	142.3Ω	±1/2%	1/8w	6610-1600
R611	Film	96.25Ω	±1/2%	1/8w	6610-1900
R612	Film	142.3Ω	±1/2%	1/8w	6610-1600
R613	Film	96.25Ω	±1/2%	1/8w	6610-1900
R614	Film	142.3Ω	±1/2%	1/8w	6610-1600
R615	Film	96.25Ω	±1/2%	1/8w	6610-1900
R616	Film	142.3Ω	±1/2%	1/8w	6610-1600
R617	Film	96.25Ω	±1/2%	1/8w	6610-1900
R618	Film	142.3Ω	±1/2%	1/8w	6610-1600
R619	Film	96.25Ω	±1/2%	1/8w	6610-1900
R620	Film	142.3Ω	±1/2%	1/8w	6610-1600
R621	Film	96.25Ω	±1/2%	1/8w	6610-1900
R622	Film	142.3Ω	±1/2%	1/8w	6610-1600
R623	Film	96.25Ω	±1/2%	1/8w	6610-1900
R624	Film	142.3Ω	±1/2%	1/8w	6610-1600
R625	Film	96.25Ω	±1/2%	1/8w	6610-1900
R626	Film	142.3Ω	±1/2%	1/8w	6610-1600
R627	Film	96.25Ω	±1/2%	1/8w	6610-1900
R628	Film	208.1Ω	±1/2%	1/8w	6610-1800
R701	Power	10Ω	±5%	5w	6660-0105
R803	Composition	100Ω	±5%	1/2w	6100-1105
R804	Potentiometer, Composition	50kΩ	±10%		6010-1400
R805	Potentiometer, Wire-wound	10Ω	±10%		6050-0600
R806	Wire-wound	10Ω	±10%	2w	6760-0109
R807	Wire-wound	10Ω	±10%	2w	6760-0109
R808	Composition	6.8kΩ	±5%	2w	6120-2685
R809	Composition	6.8kΩ	±5%	2w	6120-2685
R810	Composition	6.8kΩ	±5%	2w	6120-2685

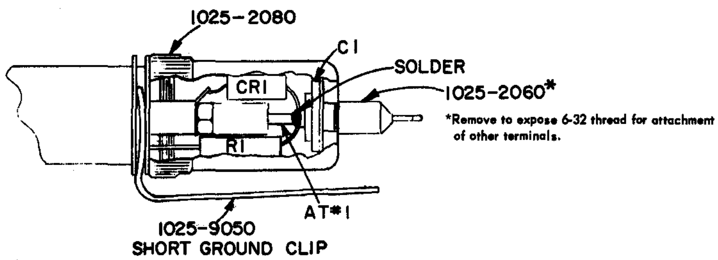
REF NO.	DESCRIPTION - CAPACITORS				PART NO.
C6A	Electrolytic	50μf		450dcwv	4450-0800
C6B	Electrolytic	25μf		450dcwv	4450-0800
C6C	Electrolytic	25μf		450dcwv	4450-0800
C7	Unclassified	500pf	±10%	500dcwv	4920-0600
C8		15pf			Built-in
C9		10-82pf			1025-3400
C10	Ceramic	0.001μf	±5%	500dcwv	4680-3200
C11	Composition	10pf	±0.5%	500dcwv	4400-3000
C12	Built-in	400pf			1025-8830
C13	Unclassified	500pf	±10%	500dcwv	4920-0600
C14	Unclassified	500pf	±10%	500dcwv	4920-0600
C15	Unclassified	500pf	±10%	500dcwv	4920-0600
C16	Unclassified	500pf	±10%	500dcwv	4920-0600
C17	Unclassified	1000pf	±10%	500dcwv	4920-0699
C18	Unclassified	500pf	±10%	500dcwv	4920-0600
C19	Unclassified	500pf	±10%	500dcwv	4920-0600
C20	Unclassified	500pf	±10%	500dcwv	4920-0600
C21A	Electrolytic	50μf		450dcwv	4450-0800
C21B	Electrolytic	25μf		450dcwv	4450-0800
C21C	Electrolytic	25μf		450dcwv	4450-0800
C22	Ceramic	0.001μf	+20-0%	500dcwv	4400-2049
C23	Ceramic	0.001μf	+20-0%	500dcwv	4400-2049
C24	Oil	0.01μf		600dcwv	4516-3109
C25	Oil	0.01μf		600dcwv	4516-3109
C26	Mica	470pf	±10%	300dcwv	1025-0455
C27	Ceramic	0.001μf	+100 -0%	500dcwv	4400-1800
C28	Ceramic	0.001μf	+100 -0%	500dcwv	4400-1800
C29	Ceramic	0.001μf	+100 -0%	500dcwv	4400-1800
C30A	Electrolytic	30μf	+20-0%	150dcwv	4450-1700
C30B	Electrolytic	30μf	+20-0%	150dcwv	4450-1700
C31	Wax	0.1μf	±10%	200dcwv	5010-0700
C32	Unclassified	0.002μf		400dcwv	4920-2500
C33	Ceramic	0.001μf	+20-0%	500dcwv	4400-1800
C34	Electroytic	1.2μf			5760-1932
C35A	Electrolytic	90μf		300dcwv	4450-3400
C35B	Electrolytic	30μf		300dcwv	4450-3400
C35C	Electrolytic	30μf		300dcwv	4450-3400
C36A	Electrolytic	30μf		1000dcwv	4450-1700
C36B	Electrolytic	30μf		1000dcwv	4450-1700
C37	Mica	0.001μf	±5%	500dcwv	4680-3200
C100	Wax	0.1μf	±10%	200dcwv	5010-0700
C101	Mica	0.001μf	±10%	500dcwv	4660-6400
C102	Wax	0.1μf	±10%	500dcwv	5010-0700
C200	Mica	0.001μf	±10%	500dcwv	4660-6400
C201	Wax	0.22μf	±10%	200dcwv	5010-0800

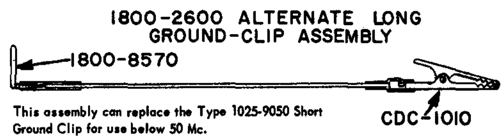
REF NO.	DESCRIPTION - CAPACITORS				PART NO.
C202	Wax	0.1μf	±10%	200dcwv	5010-0700
C203	Wax	0.01μf	±10%	200dcwv	5010-0400
C204	Mica	0.00475μf	±1%	500dcwv	4560-0147
C205	Wax	0.1μf	±10%	200dcwv	5010-0700
C206	Mica	0.01μf	±10%	500dcwv	4760-0100
C208	Trimmer	0.8-8.5pf			4910-1100
C209	Ceramic	1.5pf	±10%	500dcwv	4400-0159
C210	Wax	0.22μf	±10%	200dcwv	5010-0800
C211	Ceramic	24pf	±5%	500dcwv	4410-0245
C212	Ceramic	24pf	±5%	500dcwv	4410-0245
C300	Wax	0.1μf	±10%	200dcwv	5010-0700
C301	Mica	0.001μf	±10%	500dcwv	4530-0300
C302	Mica	0.001μf	±10%	500dcwv	4530-0300
C303	Wax	0.1μf	±10%	200dcwv	5010-0700
C304	Wax	0.1μf	±10%	200dcwv	5010-0700
C400	Wax	0.1μf	±10%	200dcwv	5010-0700
C401	Wax	0.1μf	±10%	200dcwv	5010-0700
C402	Wax	0.1μf	±10%	200dcwv	5010-0700
C403	Wax	0.1μf	±10%	200dcwv	5010-0700
C404	Wax	0.1μf	±10%	200dcwv	5010-0700
C405	Mica	0.001μf	±10%	500dcwv	4570-1200
C406	Mica	0.0022μf	±10%	300dcwv	4570-1300
C407	Mica	0.0027μf	±10%	300dcwv	4570-1327
C408	Ceramic	10pf	±10%	500dcwv	4400-2999
C409	Mica	6800pf	±10%	500dcwv	4530-0100
C531	Ceramic	0.001μf	±20%	500dcwv	4404-2109
C532	Wax	0.047μf	±10%	400dcwv	5020-1000
C533	Electrolytic	20μf		450dcwv	4450-0300
C534	Ceramic	0.01μf	±20%	500dcwv	4406-3109
C535	Ceramic	0.01μf	±20%	500dcwv	4406-3109
C701A	Electrolytic	1500μf		10dcwv	4450-0700
C701B	Electrolytic	750μf		10dcwv	4450-0700
C701C	Electrolytic	750μf		10dcwv	4450-0700
C702A	Electrolytic	90μf		300dcwv	4450-3400
C702B	Electrolytic	30μf		300dcwv	4450-3400
C702C	Electrolytic	30μf		300dcwv	4450-3400
C703A	Electrolytic	50μf		450dcwv	4450-0800
C703B	Electrolytic	25μf		450dcwv	4450-0800
C703C	Electrolytic	25μf		450dcwv	4450-0800
C704A	Electrolytic	90μf		300dcwv	4450-3400
C704B	Electrolytic	30μf		300dcwv	4450-3400
C704C	Electrolytic	30μf		300dcwv	4450-3400
C805	Electrolytic	4μf		150dcwv	4450-3200

REF NO.	DESCRIPTION	PART NO.
CR6	DIODE, Type 1N994	6082-1017
CR7	DIODE, Type 1N3254	6081-1002

REF NO.	DESCRIPTION	PART NO.
CR8	DIODE, Type 1N3254	6081-1002
CR100	DIODE, Type 1N300	6082-1009
CR300	DIODE, Type 1N300	6082-1009
CR400	DIODE, Type 1N118A	6082-1006
CR401	DIODE, Type 1N459A	6082-1011
CR701	DIODE, Type 1N3253	6081-1001
CR702	DIODE, Type 1N3253	6081-1001
CR703	DIODE, Type 1N3254	6081-1002
CR704	DIODE, Type 1N3254	6081-1002
CR705	DIODE, Type 1N3254	6081-1002
F1	FUSE, 115-v, 1.6a	5330-1700
	230-v, 0.8a	5330-1200
F2	FUSE, 115-v, 1.6a	5330-1700
	230-v, 0.8a	5330-1200
J1	CONNECTOR, Frequency	0874-2530
J2	JACK, External Marker	4260-0400
J3	CONNECTOR, Display Horizontal	0874-4552
J4	CONNECTOR, Display Vertical	0874-4552
J5	CONNECTOR, External Response Detector	0874-4552
J6	CONNECTOR, ODB = 5mW = 7DBM Available Output	0874-6197
J7		1025-3800
L1	CHOKE, Air	4290-3650
L2	CHOKE, Air	4290-3650
L3	CHOKE, Air	4290-3650
L4	CHOKE, Air	4290-3650
L5	CHOKE, Air	4290-3650
L6	CHOKE, Air	4290-3650
M1	METER, 200μa, 600 Ω	5730-0960
MO1	MOTOR	5760-1930
P1	PILOT LIGHT, No. 44	5600-0700
PL1	PLUG	4240-0700
PL2	PLUG	4240-0700
S1	SWITCH, Toggle	7910-1300
S2	MICROSWITCH	3030-4360
S3	MICROSWITCH	3030-4240
S5	SWITCH, Toggle	7910-0750
S6	SWITCH ASSEMBLY	1025-3120
S7	SWITCH ASSEMBLY	1025-3130
S8	SWITCH, Toggle	7910-1500
S9	SWITCH	1025-0420
S10	MICROSWITCH	3030-4360
SO1	SOCKET	4200-1921
T1	TRANSFORMER ASSEMBLY	0685-4080

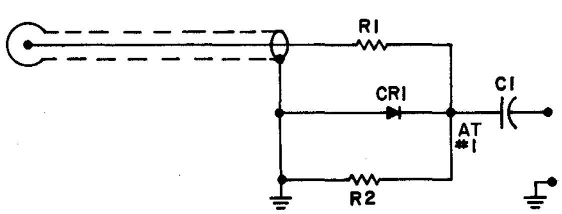
TYPE 1025-P1 PROBE





TYPE 1025-P1 PROBE

R1	RESISTOR, Film	100kΩ	±1%	1/8w	6250-3100
R2	RESISTOR, Film	100kΩ	±1%	1/8w	6250-3100
C1	CAPACITOR, Composition	470pf	±20%	300 dcwv	4400-5550
CR1	DIODE, Type 1N994				8201-6994



TYPE 874 COAXIAL COMPONENTS

TYPE 874 CABLE CONNECTORS

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

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

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

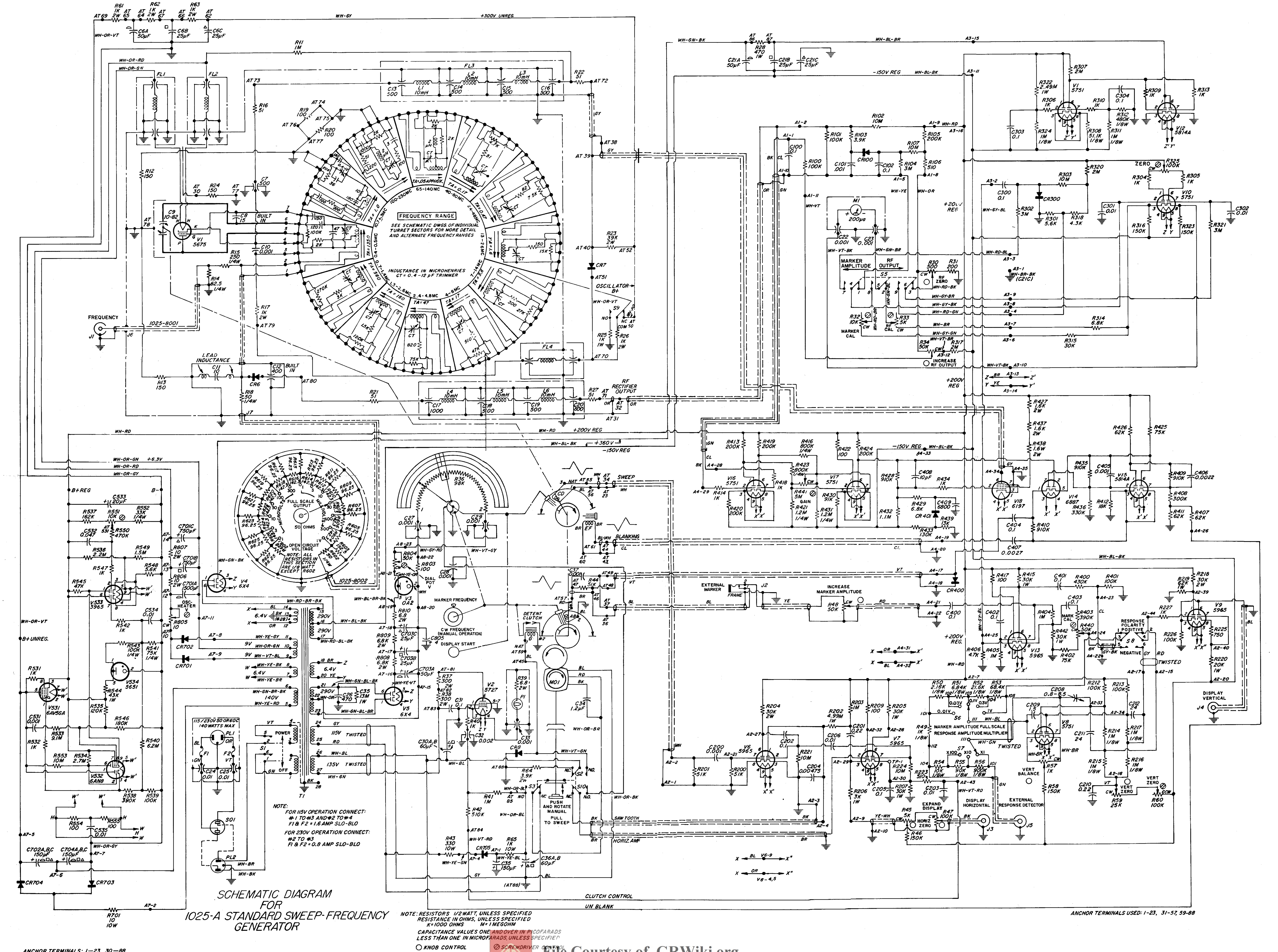
OTHER COAXIAL ELEMENTS

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.



SCHEMATIC DIAGRAM FOR 1025-A STANDARD SWEEP-FREQUENCY GENERATOR

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

ANCHOR TERMINALS: 1–23, 30–88

ANCHOR TERMINALS USED: 1–23, 31–57, 59–88

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