OPERATING INSTRUCTIONS

TYPE 1025-A

STANDARD SWEEP-FREQUENCY GENERATOR

1025-A

GENERAL RADIO COMPANY

B

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.

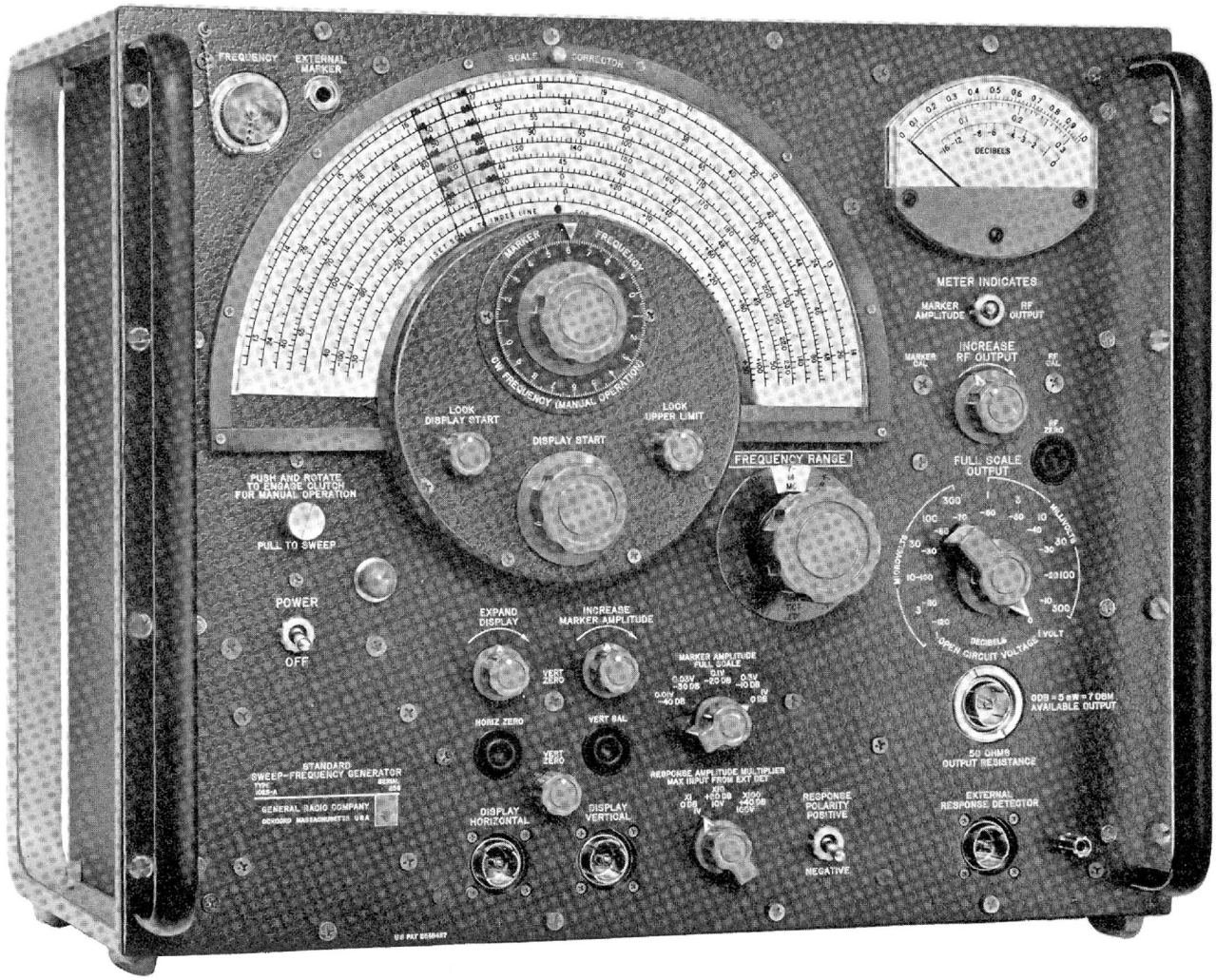


Figure 1-1. Panel view of the Type 1025-A Standard Sweep-Frequency Generator.

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

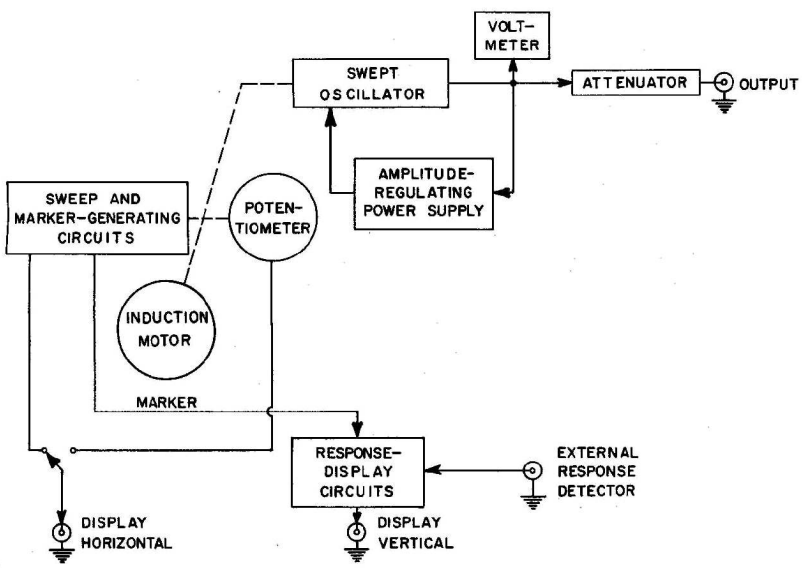


Figure 1-2. Block diagram of the Standard Sweep-Frequency Generator.

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 alternating-

direction 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 pick-up'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-

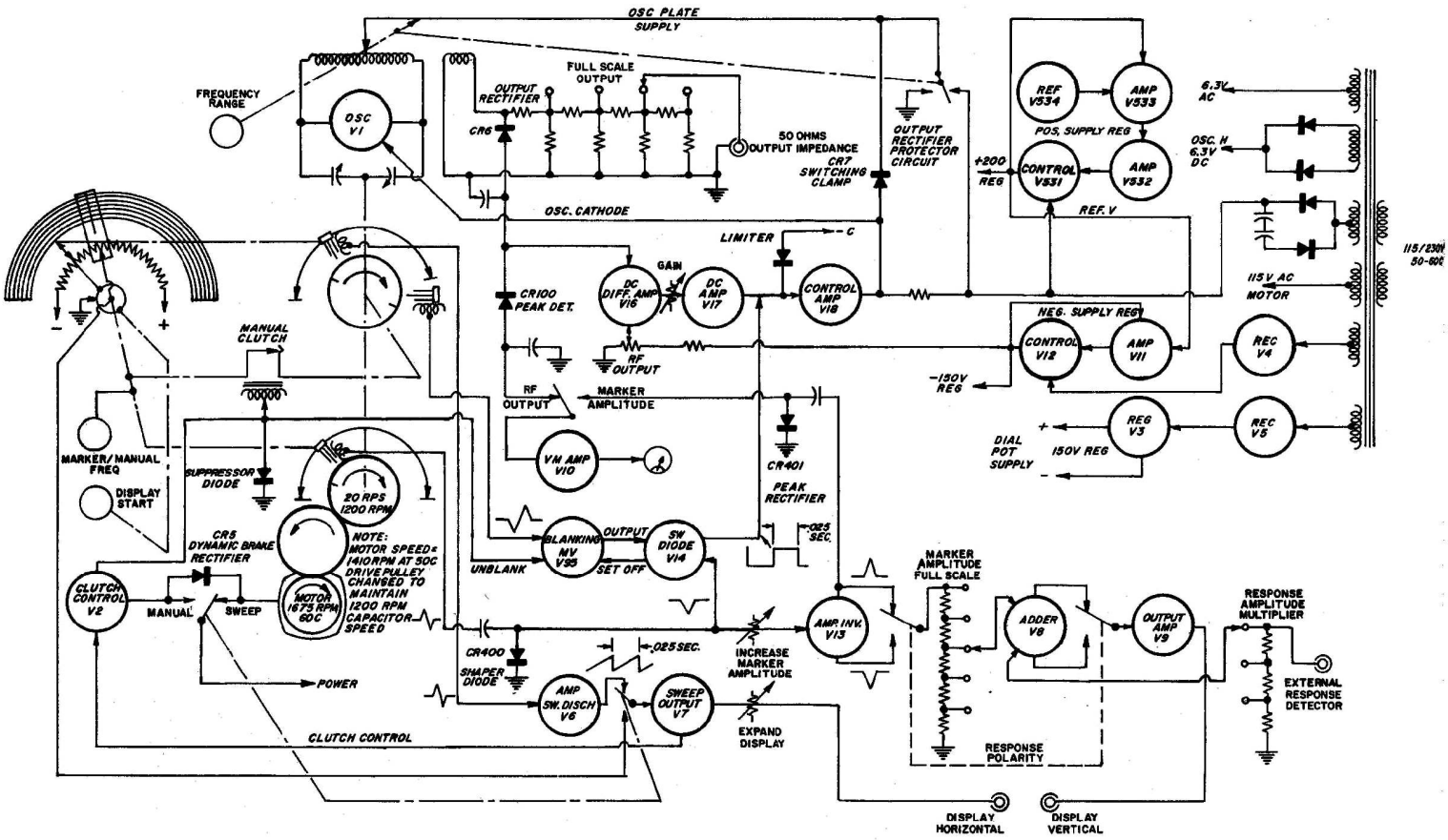


Figure 2-1. Elementary schematic diagram of the Type 1025-A Standard Sweep-Frequency Generator.

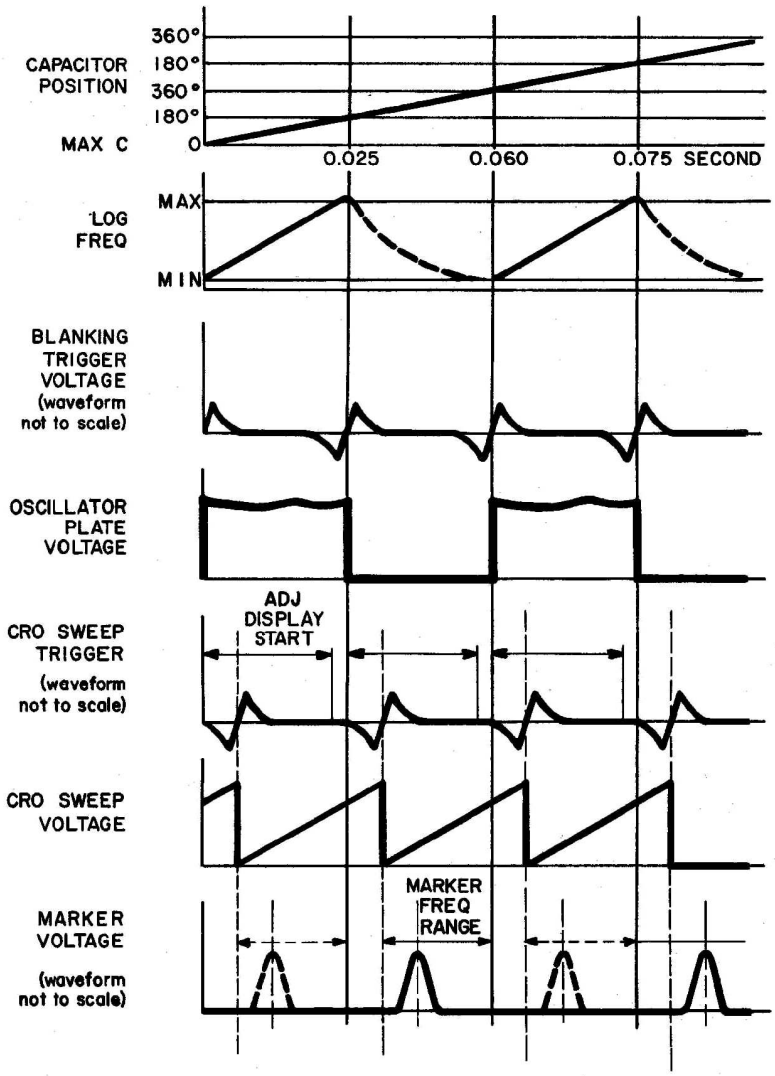


Figure 2-2. Timing diagram for one complete cycle of the Type 1025-A.

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.

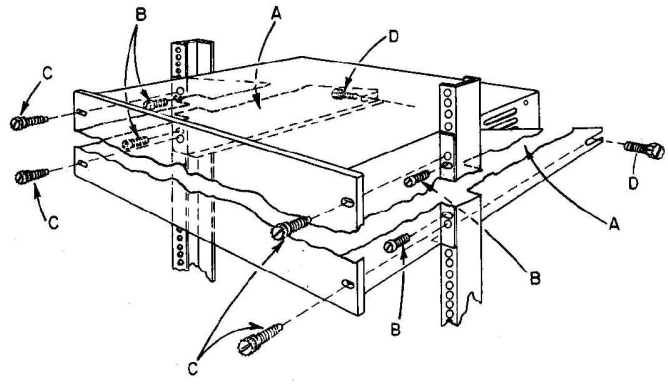


Figure 3-1. Installation of relay-rack model, Type 1025-AR.

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.

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.)

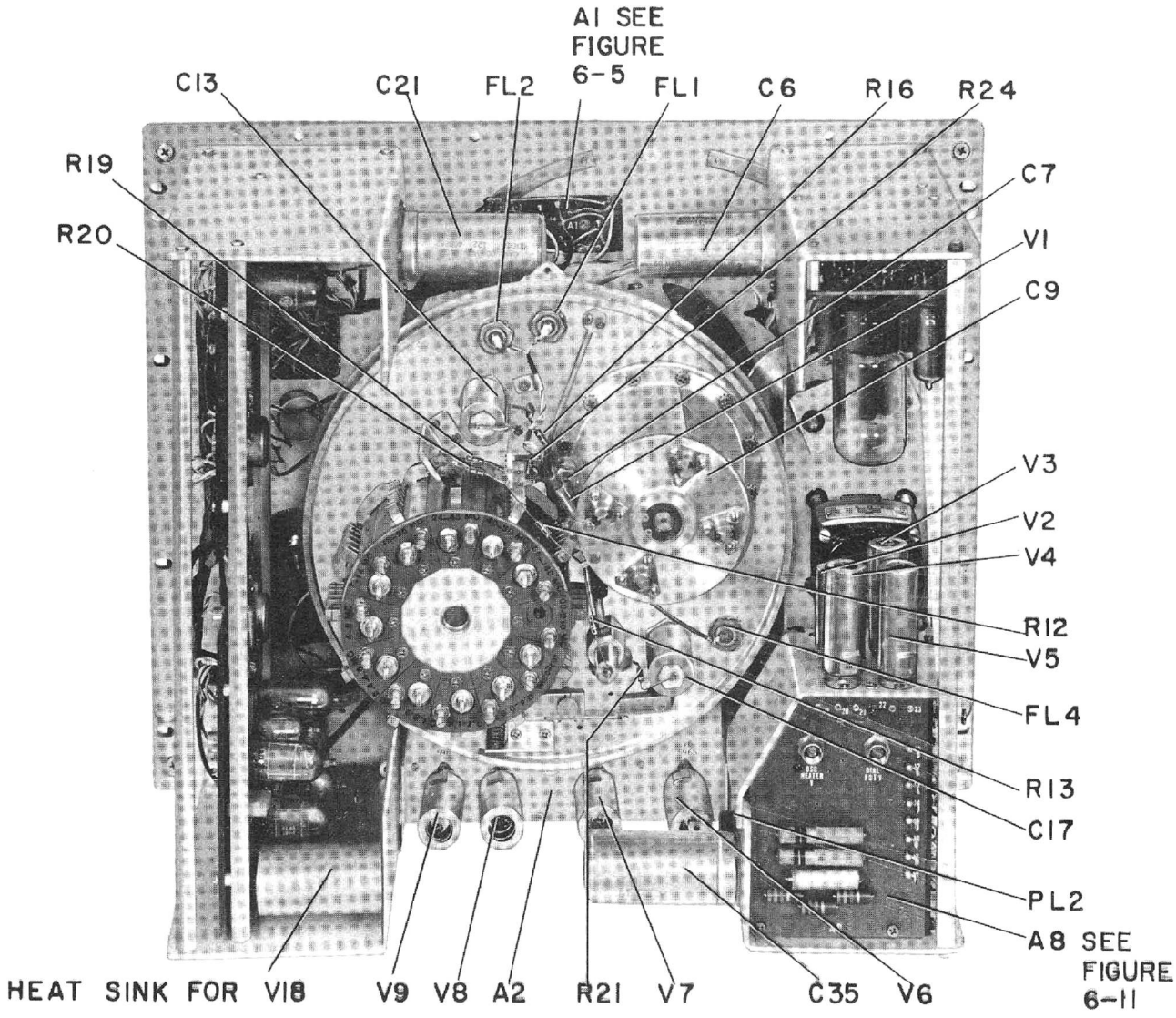


Figure 6-1. Rear interior view of the Type 1025-A.

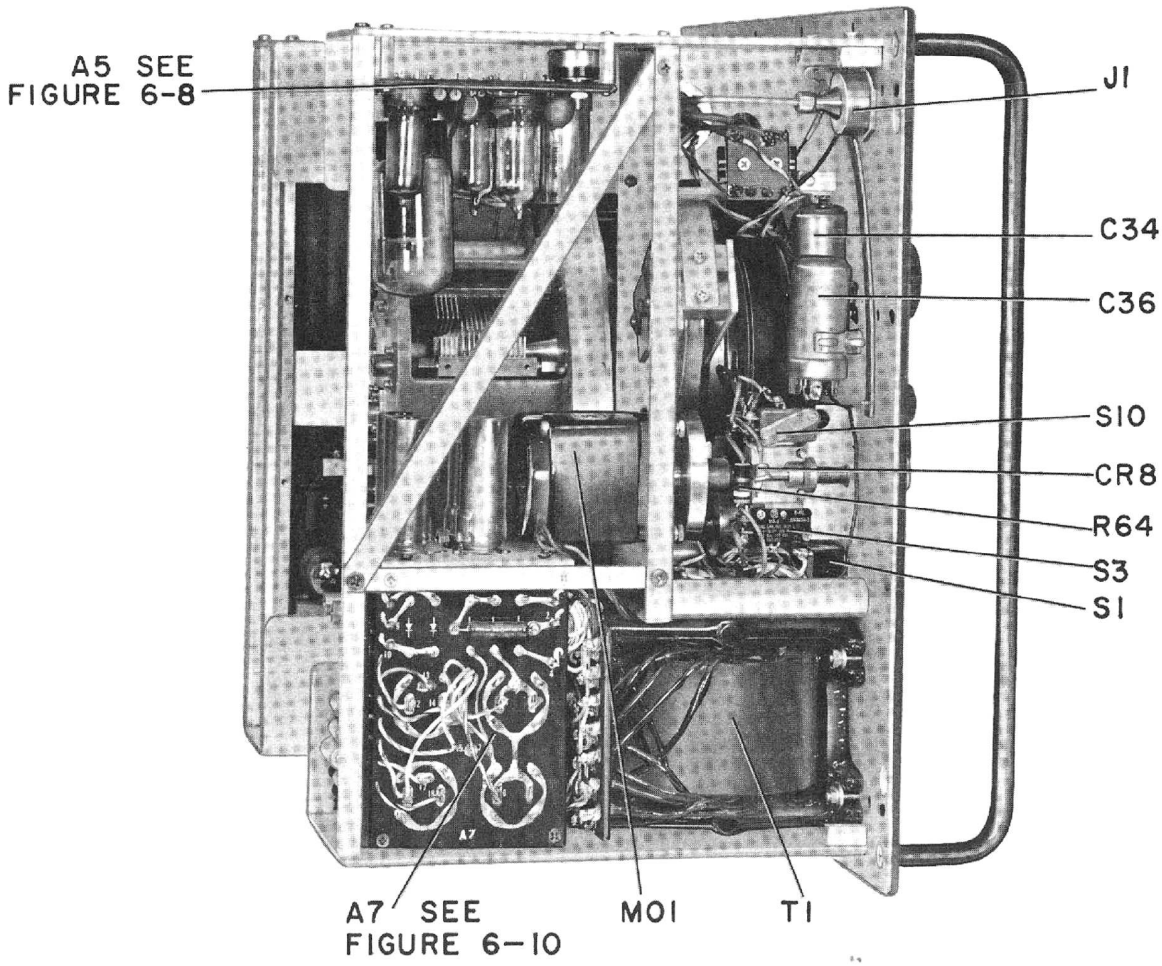


Figure 6-2. Interior view of left-hand side of the Type 1025-A.

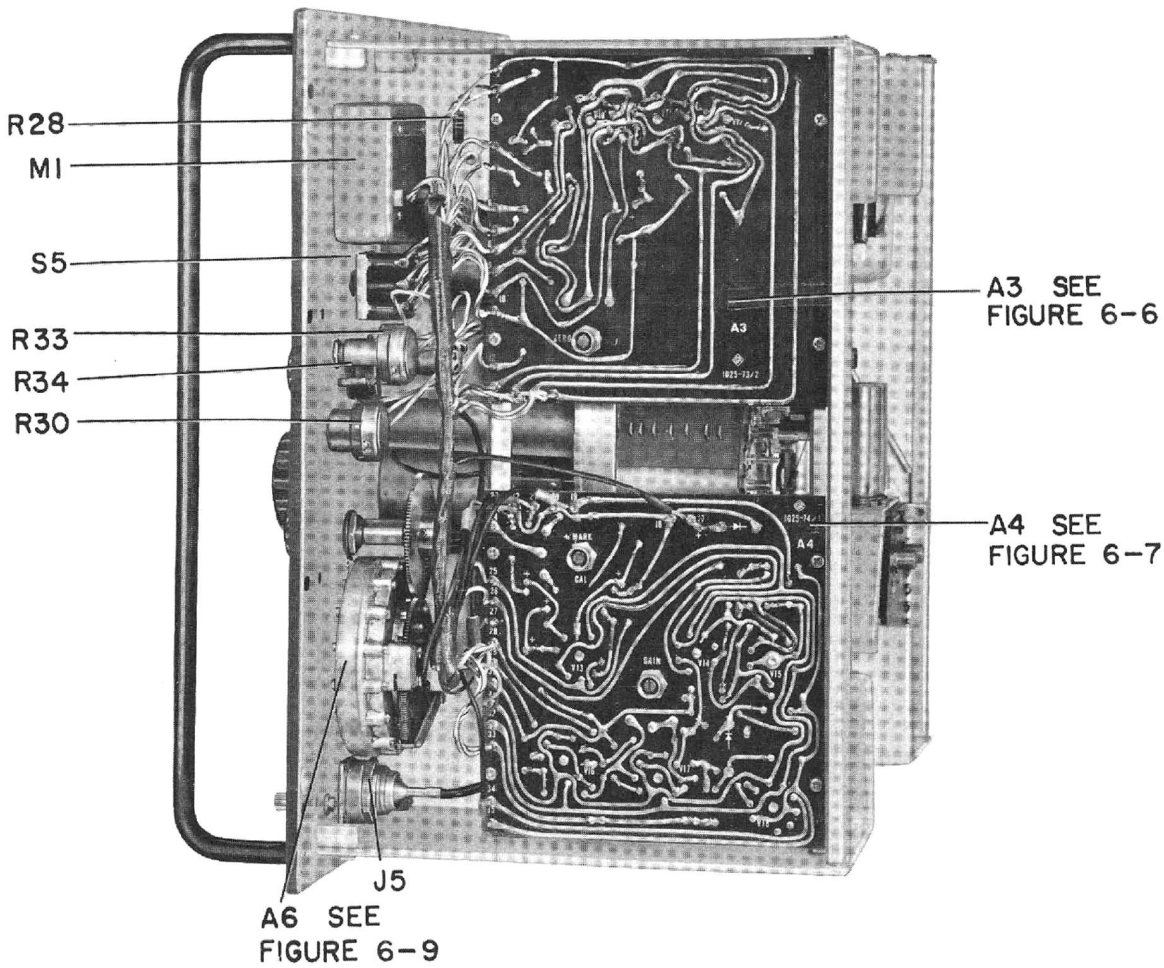


Figure 6-3. Interior view of right-hand side of the Type 1025-A.

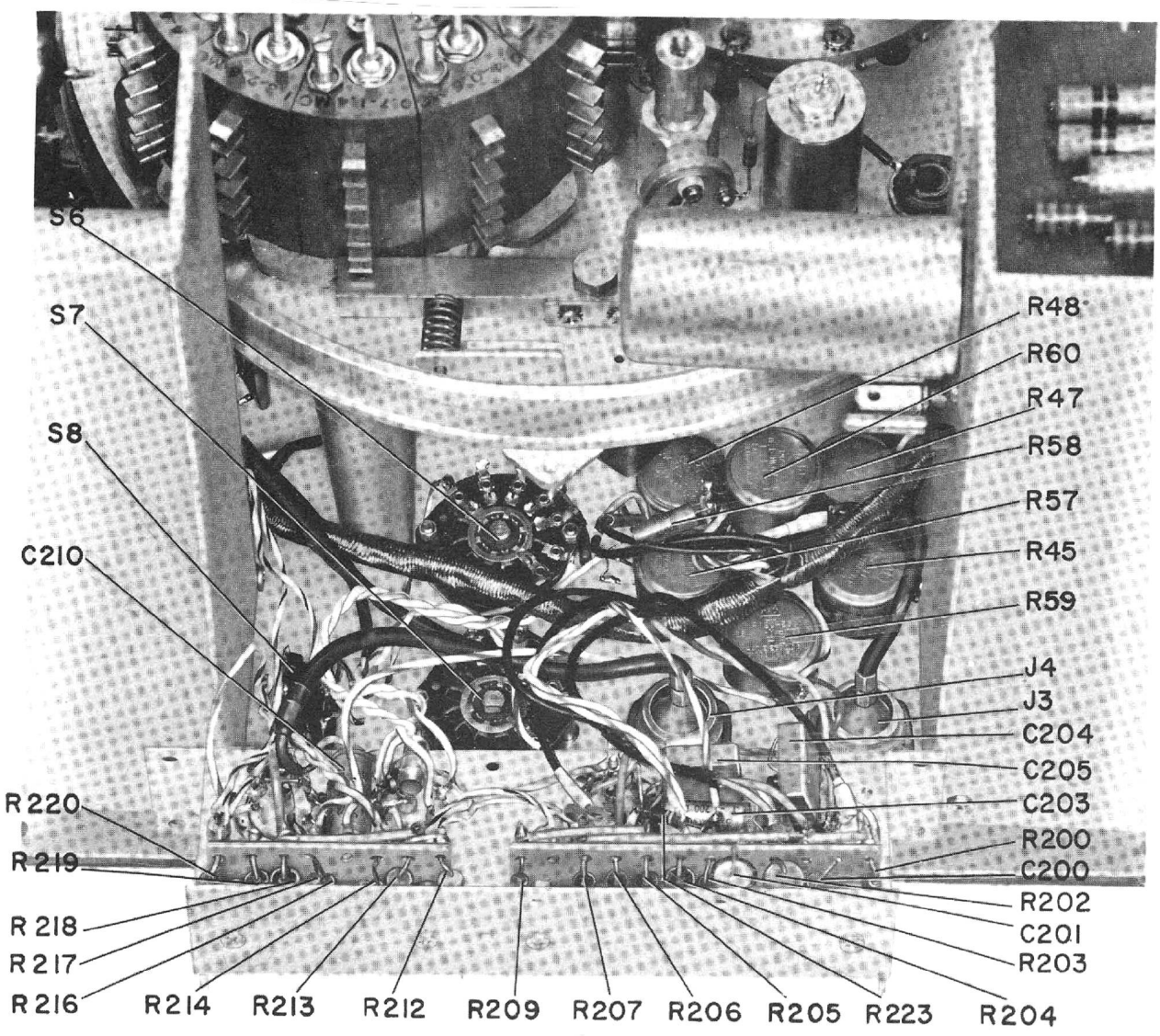


Figure 6-4. Display-output assembly (A2) of the Type 1025 demounted and folded out on its flexible connecting leads. Inter-circuit shield has been removed.

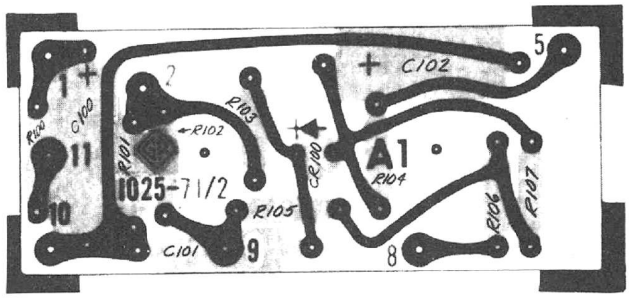


Figure 6-5. Etched-board layout for metering circuit (A1) of the Type 1025-A.

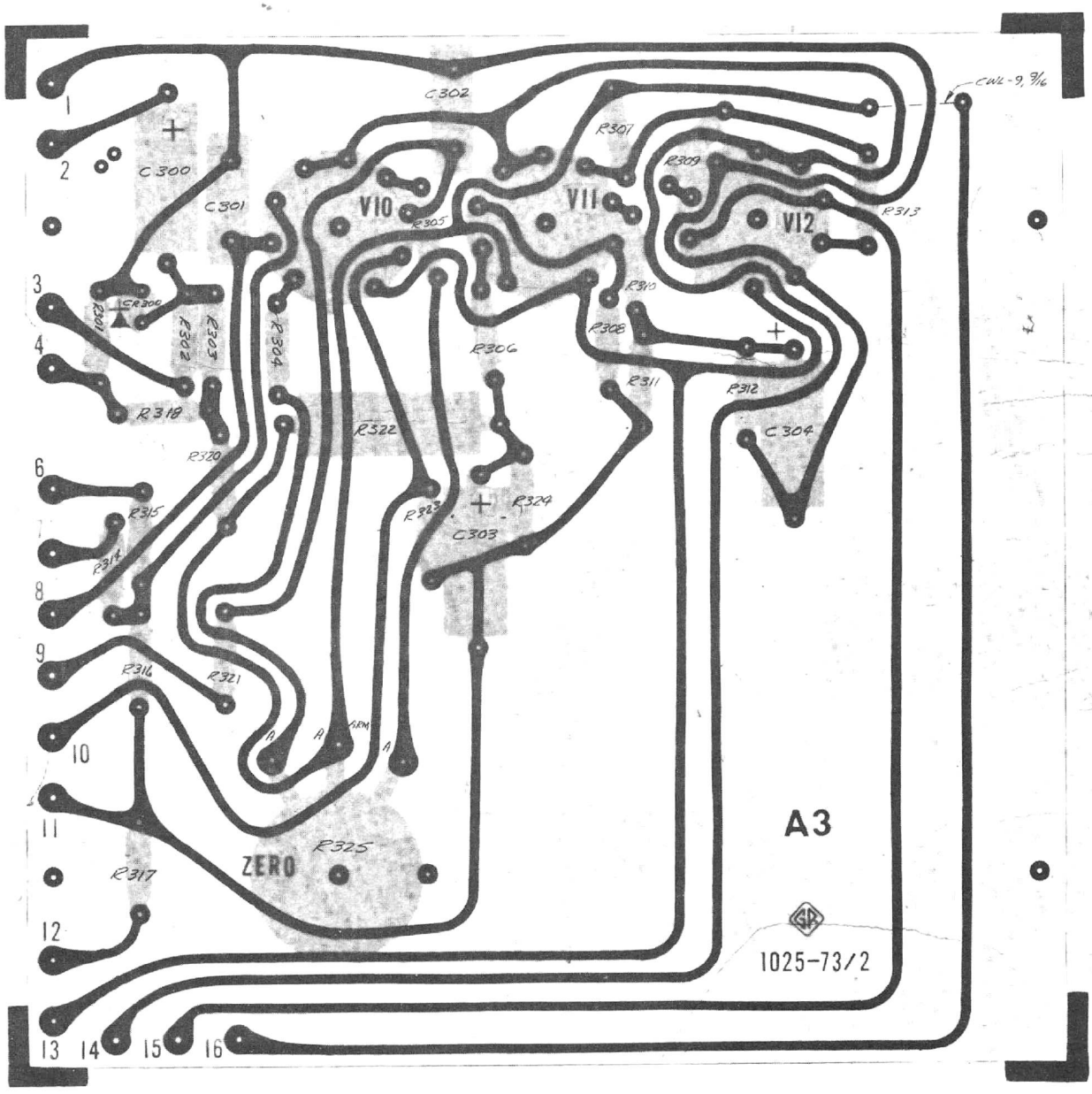


Figure 6-6. Etched-board layout for −150-volt regulator and meter circuit (A3) of the Type 1025-A

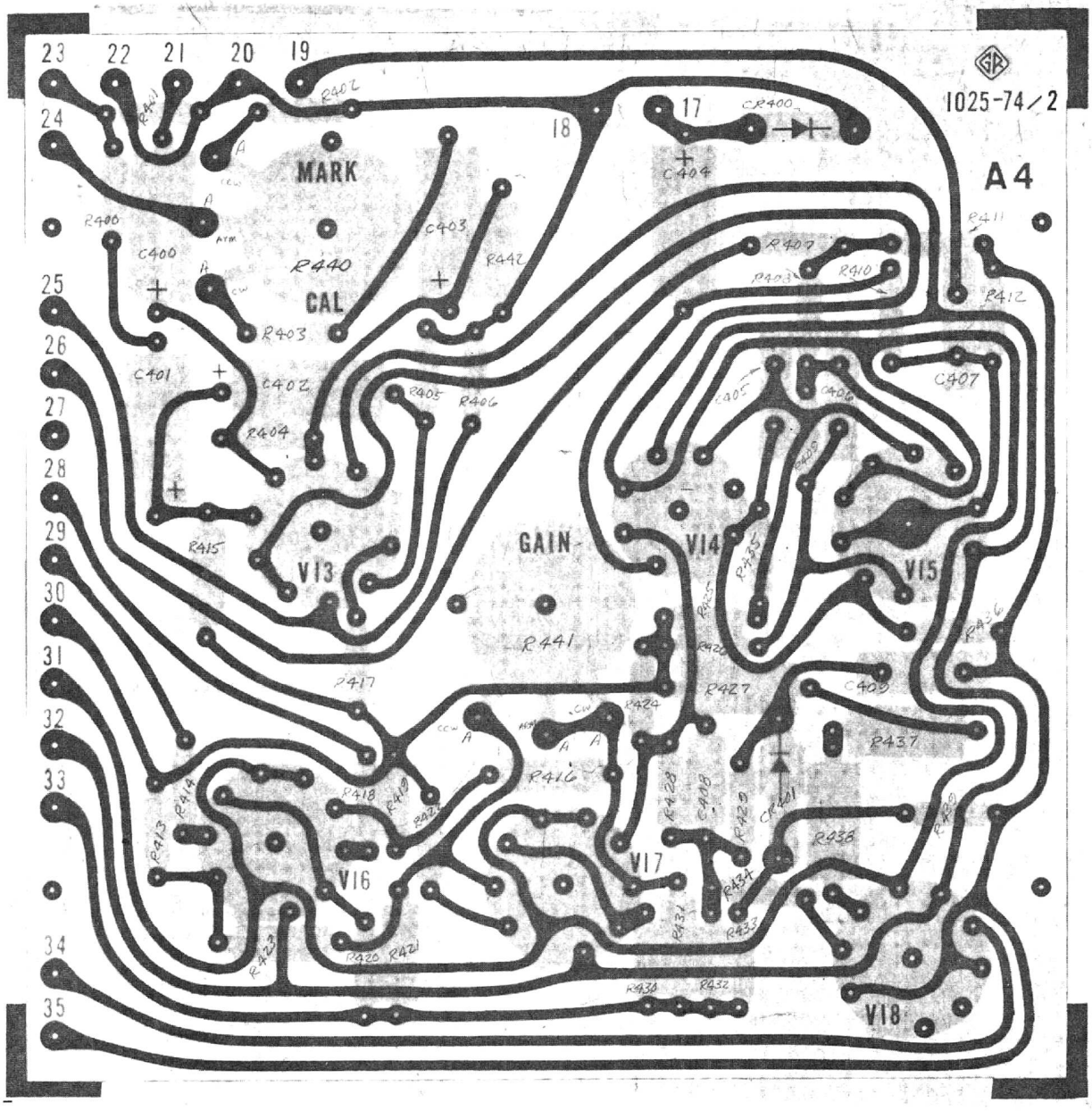


Figure 6-7. Etched-board layout for automatic-amplitude-control amplifier (A4) of the Type 1025-A.

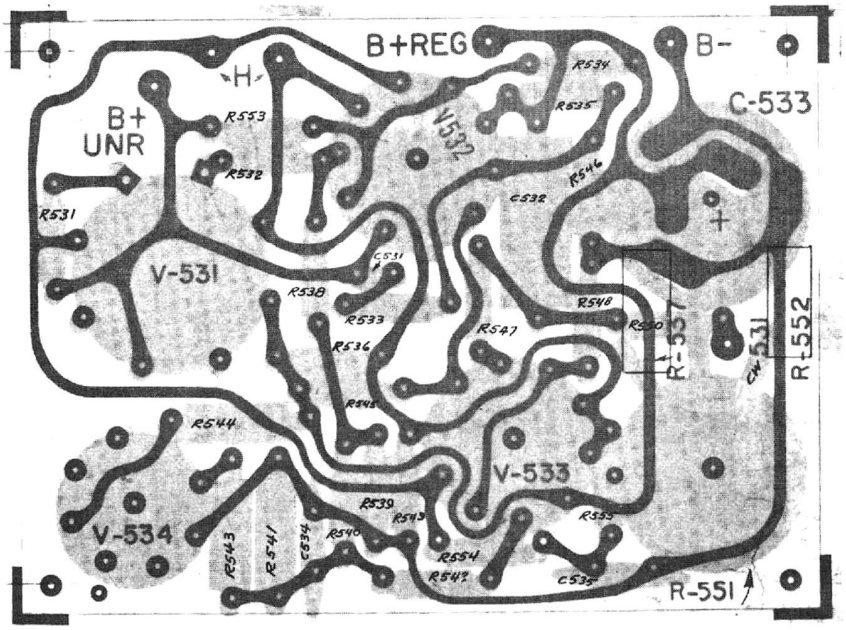


Figure 6-8. Etched-board layout for 200-volt regulator (A5) of the Type 1025-A.

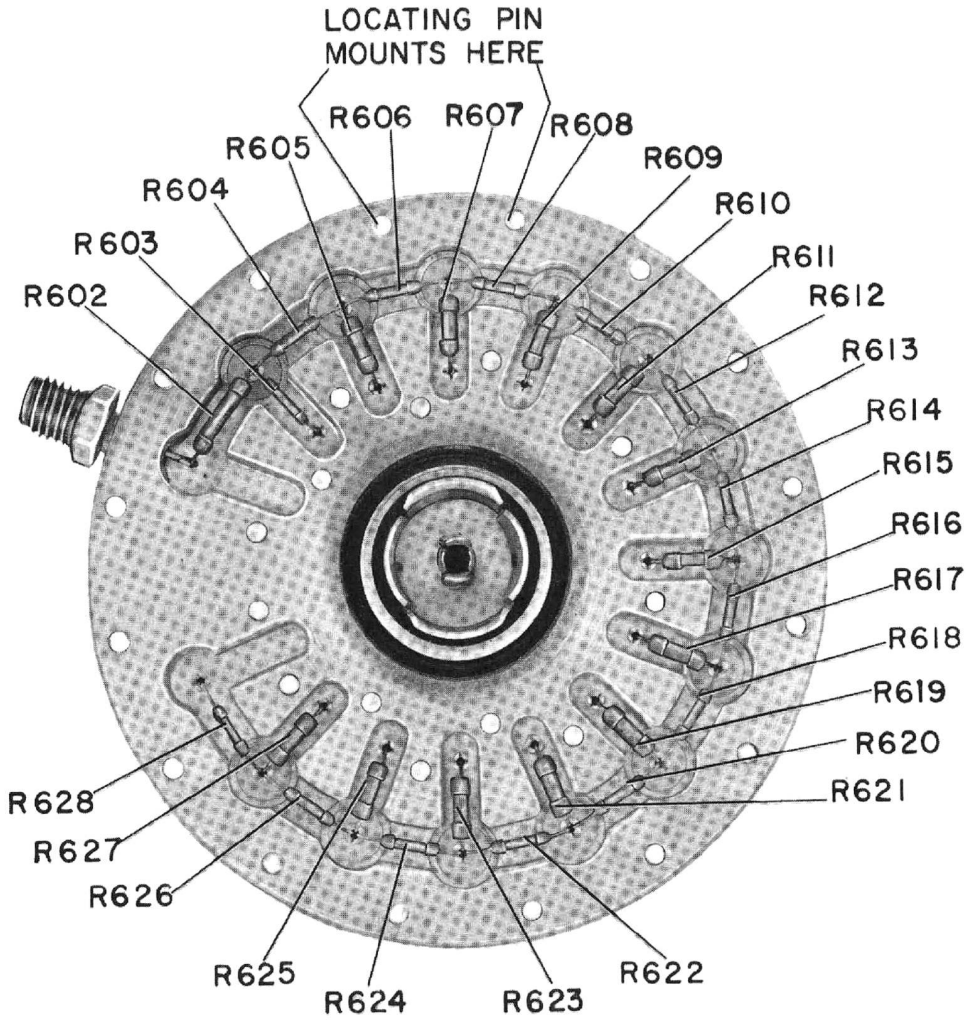


Figure 6-9. Interior view of the rf step attenuator (A6) of the Type 1025-A.

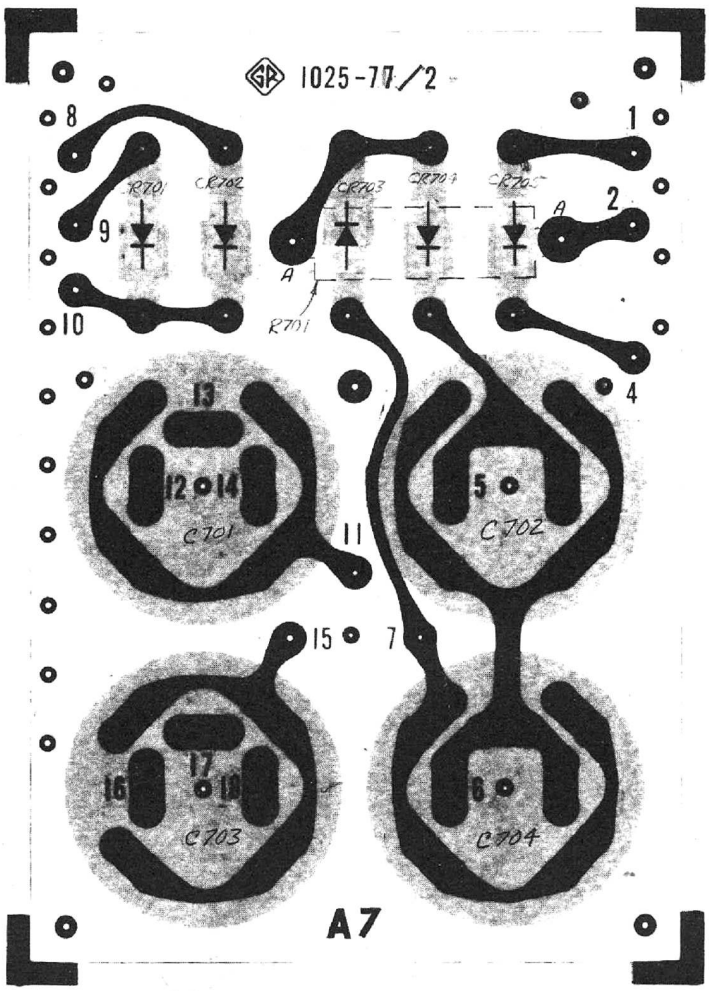


Figure 6-10. Etched-board layout for power supply (A7) in the Type 1025-A.

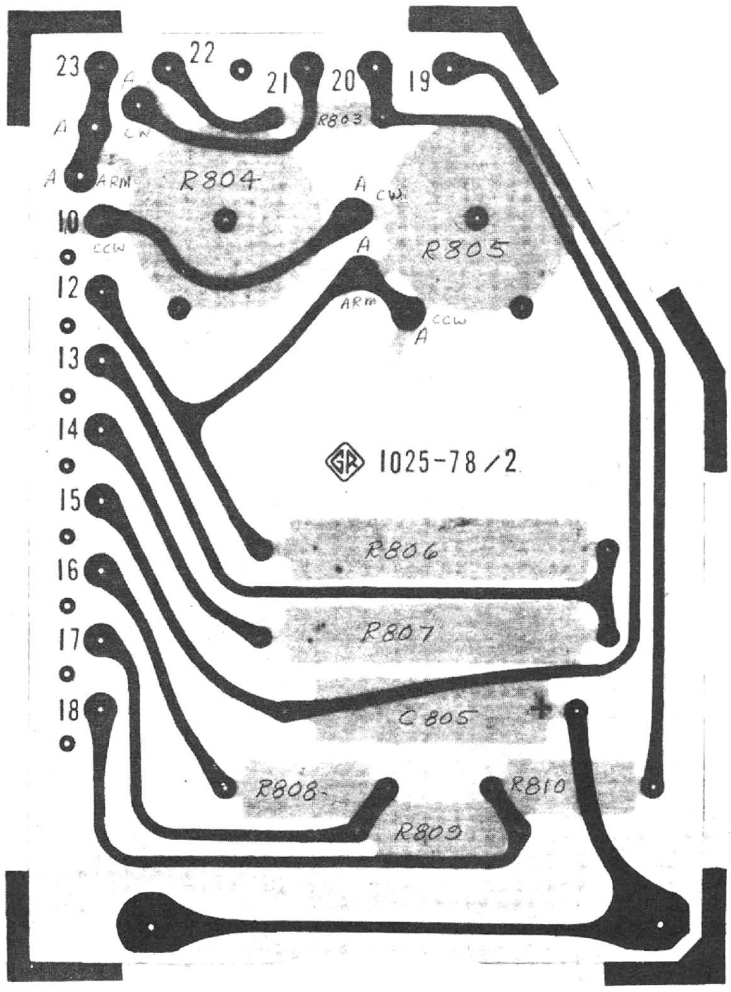


Figure 6-11. Etched-board layout for power supply (A8) in the Type 1025-A.

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	---

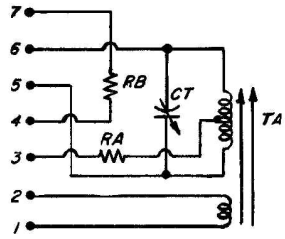


Figure 6-12. Schematic diagram of frequency-turret sectors for the following ranges:

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	

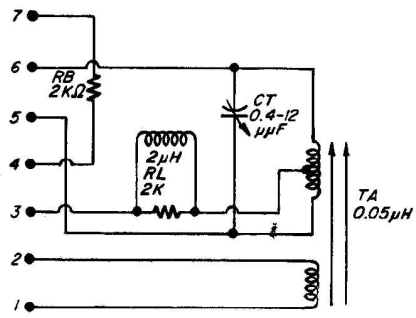


Figure 6-13. Schematic diagram of the frequency-turret sector for the 65-to-140 Mc range.

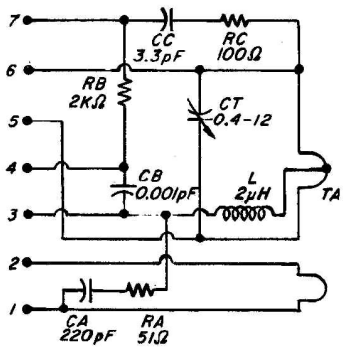


Figure 6-14. Schematic diagram of the frequency-turret sector for the 100-to-230 Mc range.

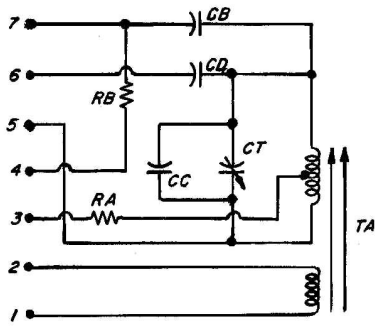


Figure 6-15. Schematic diagram of the frequency-turret sectors for the following ranges:

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

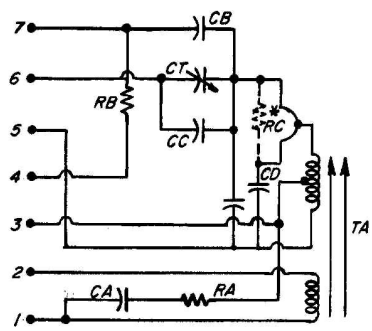


Figure 6-16. Schematic diagram of the frequency-turret sectors for the following ranges:

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

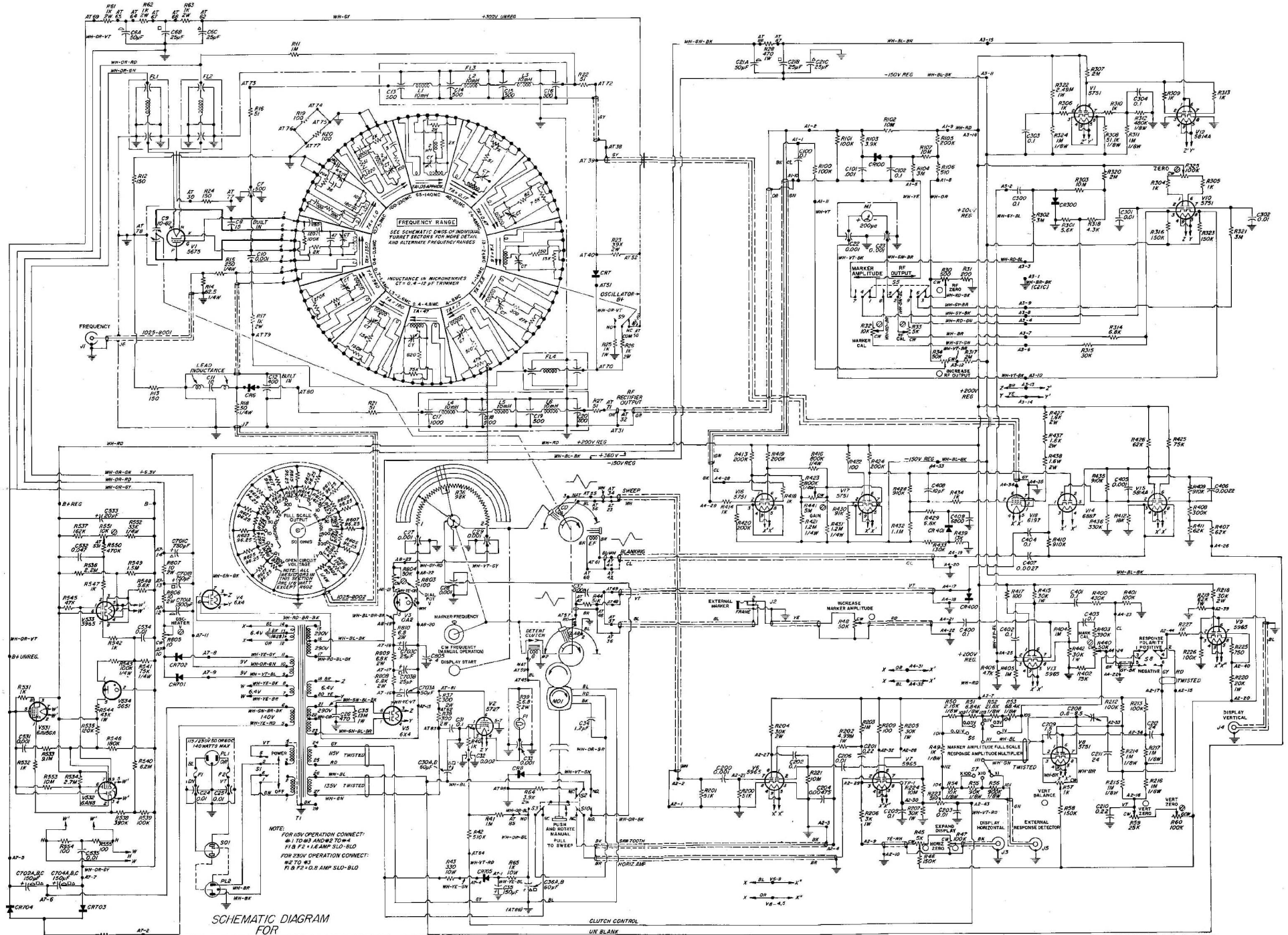
REF NO.	DESCRIPTION - RESISTORS				PART NO.
R620	Film	142.3Ω	±1/2%	1/8w	6610-1600
R621	Film	96.25Ω	±1/2%	1/8w	6610-1900
R622	Film	142.3Ω	±1/2%	1/8w	6610-1600
R623	Film	96.25Ω	±1/2%	1/8w	6610-1900
R624	Film	142.3Ω	±1/2%	1/8w	6610-1600
R625	Film	96.25Ω	±1/2%	1/8w	6610-1900
R626	Film	142.3Ω	±1/2%	1/8w	6610-1600
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

PARTS LIST Continued

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
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



SCHEMATIC DIAGRAM FOR 1025-A STANDARD SWEEP-FREQUENCY GENERATOR