INSTRUCTION MANUAL

MODELS
1001A to 1005
SWEEP/SIGNAL GENERATOR

WAVETEK® INDIANA INC.

66 N. 1st AVENUE, P.O. BOX 190
BEECH GROVE, INDIANA 46107
317—783-3221

Serial No.______________

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WARRANTY

All Wavetek instruments are warranteed against defects in material and workmanship for a period of one year after date of manufacture. Wavetek agrees to repair or replace any assembly or component (except batteries) found to be defective, under normal use during this period. Transfermatic Switch assemblies, manufactured by Wavetek, are unconditionally warranteed for the life of the instrument. Wavetek's obligation under this warranty is limited solely to repairing any such instrument which in Wavetek's sole opinion proves to be defective within the scope of the warranty when returned to the factory or to an authorized service center. Transportation to the factory or service center is to be prepaid by purchaser. Shipment should not be made without prior authorization by Wavetek.

This warranty does not apply to any products repaired or altered by persons not authorized by Wavetek, or not in accordance with instructions furnished by Wavetek. If the instrument is defective as a result of misuse, improper repair, or abnormal conditions or operations, repairs will be billed at cost.

Wavetek assumes no responsibility for its product being used in a hazardous or dangerous manner either alone or in conjunction with other equipment. High voltage used in some instruments may be dangerous if misused. Special disclaimers apply to these instruments. Wavetek assumes no liability for secondary charges or consequential damages and in any event, Wavetek's liability for breach of warranty under any contract or otherwise, shall not exceed the purchase price of the specific instrument shipped and against which a claim is made.

Any recommendations made by Wavetek for use of its products are based upon tests believed to be reliable, but Wavetek makes no warranty of the results to be obtained. This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to represent or assume for Wavetek any liability in connection with the sale of our products other than set forth herein.

Revised 4/77

Contents

CHANGE INFORMATION, IF ANY, IS LOCATED AT THE REAR OF THIS MANUAL

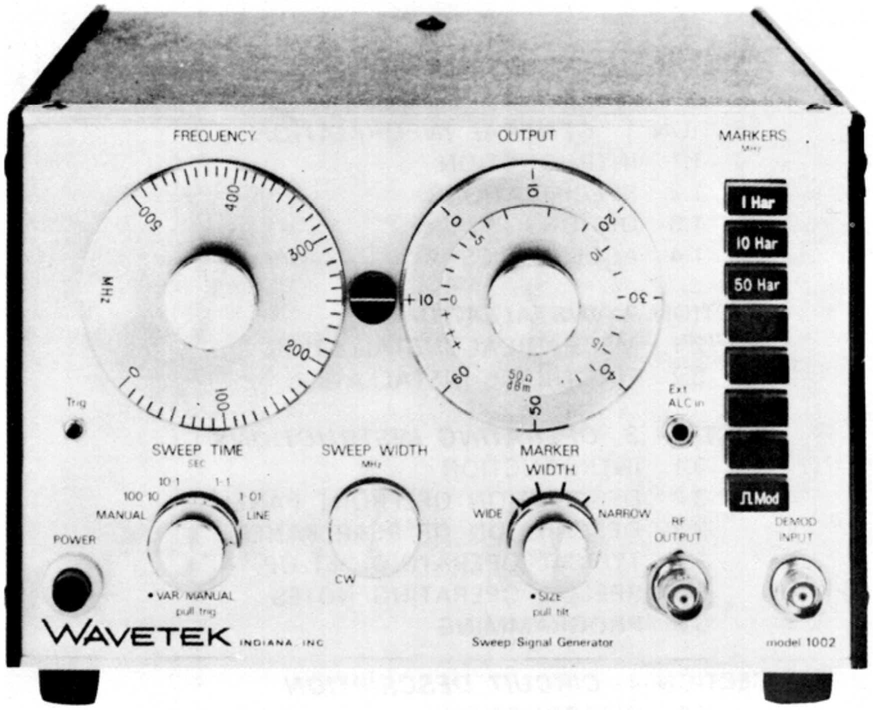


FIGURE i—MODEL 1002 SWEEP/SIGNAL GENERATOR

SCOPE OF THIS MANUAL

This manual provides descriptive material and instructions for the installation, operation, maintenance, and repair of the WAVETEK Model 1001A to 1005 Sweep/Signal Generator.

SECTION 1
GENERAL INFORMATION

1.1 INTRODUCTION

The Wavetek 1000 Series Sweep/Signal generators are single band instruments covering the frequency range from 500 KHz to 1.4 GHz. All units utilize the same, Front Panel, Harness and Power Supply with the balance of the circuits contained in Plug-In Modules. However, it is not intended that one model be converted to another. The plug-in concept simplifies maintenance problems and provides marker circuits which can be customized to specific applications. A Rear Panel Connector permits remote programming of Center Frequency, Sweep Width and Output Level, plus, External Amplitude and Frequency Modulation.

1.2 SPECIFICATIONS

TABLE 1-1. SPECIFICATIONS

RF SPECIFICATIONS

MODEL		1001A	1002	1003	1004-1	1004	1005	
Frequency Range		0.5 to 300	1.0 to 500	350 to 650	450 to 950	500 to 1000	700 to 1400	MHz
Sweep Width	MAX	300	500	300	500	500	700	MHz
	MIN	200	200	300	400	400	500	KHz
Maximum Output		+13	+13	+13	+10	+10	+10	dBm
Flatness (Note 1)		±0.25	±0.25	±0.25	±0.25	±0.25	±0.5	dB
Frequency Dial Calibration Intervals		10	10	10	10	10	20	MHz
Freq. Dial Accuracy		±3 MHz	±5 MHz	1% (Note 2)	1% (Note 2)	1% (Note 2)	1% (Note 2)	———
Display Linearity		2	2	2 (Note 2)	2 (Note 2)	2 (Note 2)	2 (Note 2)	%
Frequency Drift	5 MIN.	100	100	50	100	100	200	KHz (Note 3)
	8 HR.	2	2	2	2	2	4	MHz (Note 3)
Residual FM		15	15	10	10	10	20	KHz
Spurious	Harmonics	30 (10 to 300 MHz)	26 (10 to 500 MHz)	26 (380 to 650 MHz)	26 (500 to 950 MHz)	26 (550 to 1000 MHz)	26 (800 to 1400 MHz)	dB below output
	Non-Harmonics	40	40 to 300 MHz 30 to 500 MHz	—	—	—	—	

NOTE 1 Flatness is read with a Negative Half-wave Detector. If flatness is read with a power meter, flatness will be approximately 2 times negative detector specifications.

NOTE 2 Linearity and Dial accuracy are measured at full output, as additional errors can occur due to frequency pulling from the 0-20db vernier attenuator. This pulling effect is typically less than 1% of frequency.

NOTE 3 Drift is measured after 1 hour warm-up and constant ambient temperature and allowing a 5 minute stabilizing period after a frequency change.

NOTE 4 An output impedance of 75 ohm is available on instruments up to 1000 MHz and provides the same performance. The output system is calibrated in dBmV (0dB REF is 1MV). Maximum output of units providing +13dBm into 50 ohm would be +60dBmV into 75 ohm. Units having a maximum output of +10dBm into 50 ohm, would provide +57dBmV into 75 ohm.

TABLE 1-1. Specifications (Con't.)

Blanking	Retrace blanking of the RF output is provided for sweep operation and removed for CW operation.
Output Impedance	50 ohm standard, 75 ohm optional (see Note 4)
Attenuation	0 to 70dB in 10dB steps 0 to 20dB vernier, calibrated in 1dB intervals.

ACCURACY OF STEP ATTENUATOR	ACCURACY OF VERNIER ATTENUATOR
±0.5dB to 500 MHz	±0.5 dB to 500 MHz
±1.0dB to 1000 MHz	±1.0dB to 1000 MHz
±2.0dB to 1400 MHz	±2.0dB to 1400 MHz

Vernior Frequency Control	±1% of frequency range.

REMOTE PROGRAMMING

A Rear Panel REMOTE Jack provides necessary connections for Remote Control of Frequency, Sweep width and the 0 to 20 dB Vernier output control. This jack also provides connections for EXTERNAL Amplitude and Frequency Modulation

Frequency	May be remotely programmed by a ±16 volt signal (−16 volts corresponds to LOW frequency band end and +16 volts to HIGH frequency band end).
Sweep Width	May be controlled by a remote potentiometer, (Input and output connections provided in Rear Panel REMOTE jack).
Vernier 0-20dB Output	May be remotely programmed over a 20dB range with a 0 to −18 volt signal (−18 volts corresponds to maximum output).
External FM	The full frequency range can be swept at rates up to 4 kHz With reduced Deviation and Linearity, modulation rates to 100 kHz are possible.
External AM	External AM signals are applied to the same connections as for vernier 0-20dB control. Therefore, vernier range must be restricted so the 0 to −18 volt range is not exceeded or distortion will occur. With average voltage set to mid-range, 100% modulation is obtainable up to 1 kHz, 40% modulation is obtainable up to a 40kHz rate.

SWEEP SPECIFICATIONS

Sweep Modes	Repetitive sweep Single sweep Externally triggered sweep Manual sweep Line-lock sweep
Sweep Time	Continuously variable from less than 10ms to over 100 seconds, in 4-decade steps, plus vernier.
Horizontal Output	16 volts peak-to-peak (symmetrical about ground)

TABLE 1-1. Specifications (Con't.)

EXTERNAL LEVELING

External Monitor (ALC)	An external negative signal, between 0.2 and 2 volts, may be used to level the RF output. The ALC front panel input jack mates with Switchcraft type 750 plug.

MARKER SPECIFICATIONS

Type	Birdy by-pass markers with provisions for 8 plug-in marker modules, plus, rear panel external marker input. Markers may be either single frequency or harmonic (comb) type. (See Options A-1 and A-2)
Accuracy	0.005%
External Marker Input	Rear Panel BNC connector accepts external CW signal for conversion to a Birdy marker. Input level: 100mV into 50 ohms.
Marker Width	Adjustable from (approx.) 15 to 400 kHz in four steps.
Marker Size	Adjustable from (approx.) 1V to 1mV peak-to-peak.
Rectified Birdy	Internal switch removes the negative portion of the birdy marker for use with X-Y recorders. Size varies with detector's impedance. Adjustable from (approx.) 6 volt to 1mV with detector impedance of 1 meg ohm, or from 0.5V to 1 mV with detector impedance of 0 ohms.
Marker Tilt	Provides horizontal markers with a size equal to approximately 10% of horizontal display. Adjustment of marker size vectorily adds the normal vertical marker to the horizontal marker, causing the resulting marker to vary from a horizontal position toward a vertical position.

POWER REQUIREMENTS

Line Supply	115 or 230 VAC ± 10%, 50 to 60 Hz, (approx. 20 watts)

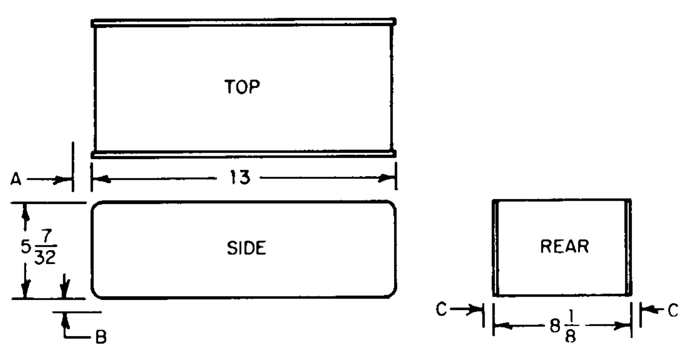
MECHANICAL SPECIFICATIONS (See Figure 1-1.)

A For total length, including knobs, add 11/16 inch

B For total height, including feet, add 5/8 inch

C For total width, including screw heads, add 3/16 inch

Weight
Net— 19 lbs.
Shipping—25 lbs.



1.3 OPTIONS

1.3.1 Marker A-1. Any single frequency between 1 to 1400 MHz.

1.3.2 Marker A-2. Harmonic type at 1, 10 or 50 MHz. (Other frequencies available on special order.)

1.3.3 Modulator A-4. Provides 100% amplitude modulation at a 1 kHz rate.

1.3.4 Penlift A-5. Provides contact closure during sweep time.

1.4 ACCESSORIES

1.4.1 Accessories furnished: Instruction Manual and Plug to mate with Rear Panel REMOTE jack.

1.4.2 Accessories Available:

a. Wide-band RF Detector	Model D-151 for 50 ohm applications up to 1000 MHz. Model D-152 for 50 ohm applications up to 1400 MHz. Model D-171 for 75 ohm applications up to 1000 MHz.
b. Service Kit	K102. Contains a module extender and extension cables.
c. Rack Mount Kit	K103. Mounts single instruments in a 5½ inch space. See figure 2-1
d. Rack Mount Kit	K104. Mounts one or two instruments in a 7 inch space. See figure 2-

SECTION 2
INSTALLATION

2.1 MECHANICAL INSTALLATION

2.1.1 Initial Inspection

After unpacking the instrument, visually inspect the external parts for damage to knobs, connectors, surface areas, etc. The shipping container and packing material should be saved in case it is necessary to reship the unit.

2.1.2 Damage Claims

If the instrument is received mechanically damaged in transit, notify the carrier and either the nearest Wavetek area representative or the factory in Indiana. Retain the shipping carton and packing material for the carrier's inspection.

The local representative, or the factory, will immediately arrange for either the replacement or repair of your instrument, without waiting for damage claim settlements.

2.1.3 Rack Mounting

The instrument is 1/2 rack size and two rack mounting kits are available. The K-103 kit provides the necessary hardware to mount the unit to either the right or left of a standard 5¼" x 19" opening. The K-104 kit provides the necessary hardware to rack mount two instruments. These may be two 1000 or 2000 series Wavetek, Indiana Instruments, or two 130 or 140 series Wavetek, San Diego Instruments, or a combination of either. This provides a 7" x 19" package. Facilities are provided for Front Panel mounting of instrument Rear Panel connectors.

2.1.4 K-103, Rack Mounting Kit (Refer to Figure 2-1)

CONTENTS

Item	Qty.	Part No.
A (Side)	1 ea.	B000-608
B (Side)	1 ea.	C000-691
C (Screw)	8 ea.	HS101-806

Procedure:

Remove the screws from one side panel at a time. Mount item A or B against the side panel of the instrument and secure with screws provided (item C). Repeat operation for other side. NOTE: Items A & B may be interchanged to position the unit to the side of the rack desired.

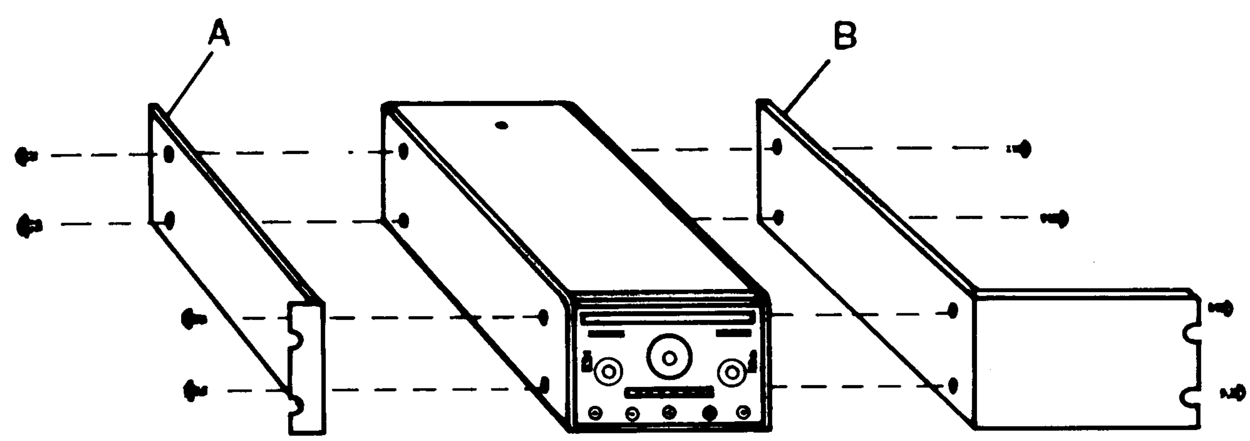


Figure 2-1. K-103 Rack Mounting

2.1.5 K-104 Rack Mounting Kit (Refer to Figure 2-2)

CONTENTS

Item	Qty.	Part No.
A (Tray)	2 ea.	C000-729
B (Side)	2 ea.	A500-230
C (Screw)	12 ea.	HS101-903

Procedure:

Install both sides (item B) to one tray (item A) using 10-32 x 3/16" screws (item C). Position the instrument on the tray so that the feet extend into the provided holes. Holes are provided for all Wavetek, Indiana 1000 and 2000 series and for most Wavetek, San Diego 130, 140, and 700 series instruments. Other instruments not exceeding 5¼" x 8" may also be mounted by drilling additional holes for their feet.

When one or both instruments are properly seated, install the other item "A" and secure with the remaining screws (item C).

NOTE: If the Wavetek instrument has been supplied with a bail, it must be removed before installing in the K-104 rack mounting kit.

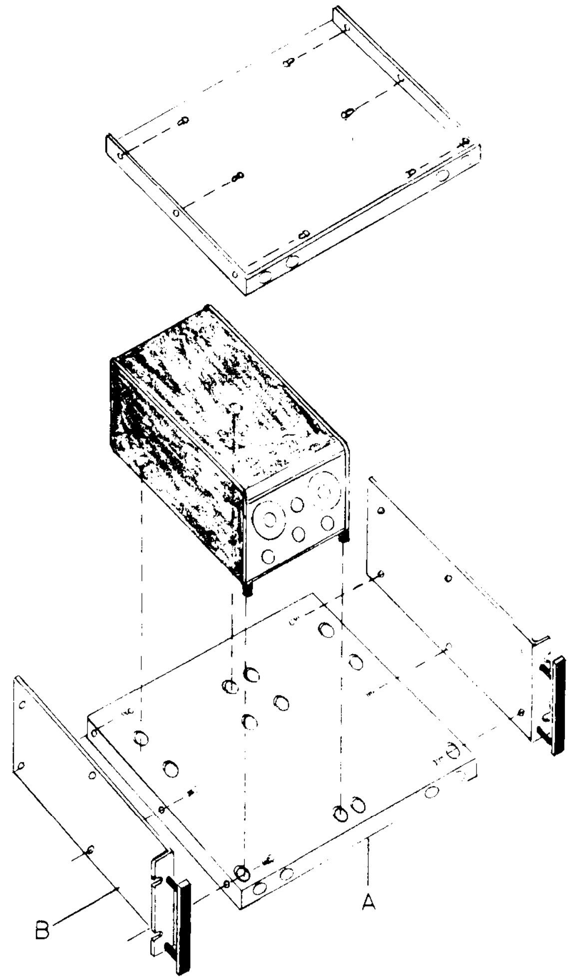


Figure 2-2. K-104 Rack Mounting

2.2 ELECTRICAL INSTALLATION

2.2.1 Primary Power Requirements

These instruments operate from either 115 volt AC or 230 volt AC supply mains as selected by a Slide Switch located on the Rear Panel. Before operating the instrument, check that the fuse mounted in the Rear Panel Fuse Holder corresponds to the correct value for the selected voltage; i.e., 0.5 amp for a 115 volt AC, and 0.25 amp for 230 volt AC.

The power supply has been designed to operate from either 50 or 60 Hz supply mains, however, the line operated sweep rate function must be adjusted to the line frequency.

Instruments are shipped from the factory for operation at 115 volt AC, 60 Hz unless specified for 230 volt AC or 50 Hz operation.

2.2.2 Performance Checks

The electrical performance of this instrument should be verified. Performance checks for incoming inspection are given in Section 5, Maintenance.

SECTION 3
OPERATING INSTRUCTIONS

3.1 INTRODUCTION

This section provides complete functional control description, operating instructions, and programming instructions for the 1000 Series Sweep/Signal Generators.

In addition, special operating notes cover sweep rate errors, overloading, low level measurements and operation with networks analyzers and X-Y plotters.

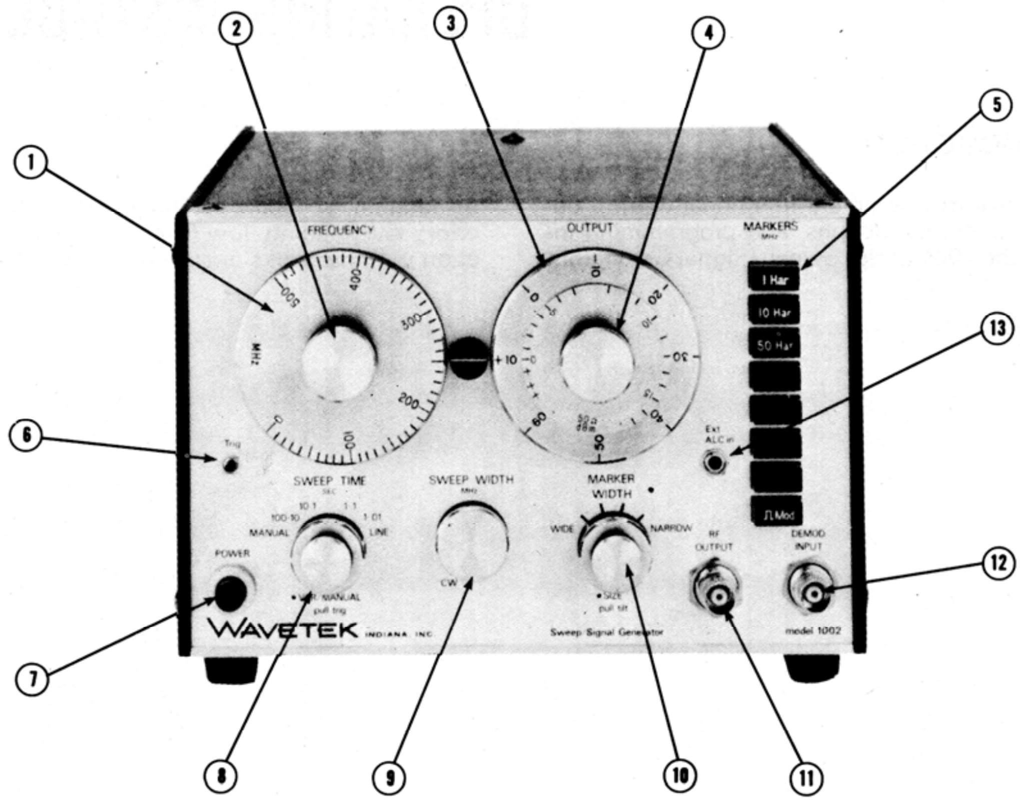


Figure 3-1. Front Panel

3.2 DESCRIPTION OF FRONT PANEL

① FREQUENCY (Coarse)	A center frequency tuning control.
② FREQUENCY (Vernier)	Provides approximately a ±1% adjustment of the tuning range. NOTE: The coarse control will be calibrated when the calibration line of the vernier knob is aligned with the frequency indicator.
③ OUTPUT (Step)	Provides calibrated adjustment of the RF output in 10dB increments, from +10dBm to −60dBm.
④ OUTPUT (Vernier)	Provides a 20dB vernier adjustment of the RF output. Calibrated in 1dB increments.
⑤ MARKERS—(MHz)	Eight, push button switches control A-1 and A-2 Marker Options (Marker frequency is engraved on push button). The eighth button also controls Modulation Option A-4.
⑥ TRIG	Momentary contact switch, triggers the sweep in the triggered mode for single sweep operation.
⑦ POWER	Push Button, applies A.C. power to the power supply. The light indicates that the instrument is operating.

(8) SWEEP TIME Sec. VAR/MANUAL Control PULL TRIG	This is a six position Switch/Control. The Outer knob provides selection of MANUAL, LINE, or Four Decade Ranges of Variable sweep time. The Inner knob provides manual frequency sweeping when SWEEP TIME Sec. switch is set to MANUAL, and variable adjustment of sweep time in each of the four decade ranges. The sweep may be changed from recurring to triggered by pulling the knob out. (The sweep may be triggered in the four decade ranges only).
(9) SWEEP WIDTH	Control logarithmically adjusts the displayed sweep width. Full counterclockwise rotation will switch the instrument to a Continuous Wave mode of operation.
(10) MARKER WIDTH SIZE PULL TILT	Dual Concentric Control; Outer knob adjusts marker width from 15 to 400 KHz, in four steps; Inner knob controls marker size, and when pulled out activates the marker TILT feature. When the marker TILT is activated, full counter-clockwise rotation of the control will provide horizontal markers with an amplitude of approximately 10% of the total horizontal display. Clockwise rotation will produce a varying amount of tilt toward the vertical axis.
(11) RF OUTPUT	BNC connector provides a connection for the RF output signal.
(12) DEMOD INPUT	BNC connector accepts the demodulated swept signal from the device under test, so that RF markers may be added. (The combined signal is available at the SCOPE VERT connector on the rear panel).
(13) EXT. ALC in	Phone jack connector accepts an automatic leveling control signal from a remote monitor, and disconnects the internal ALC loop. (mates with Switchcraft type 750 plug)

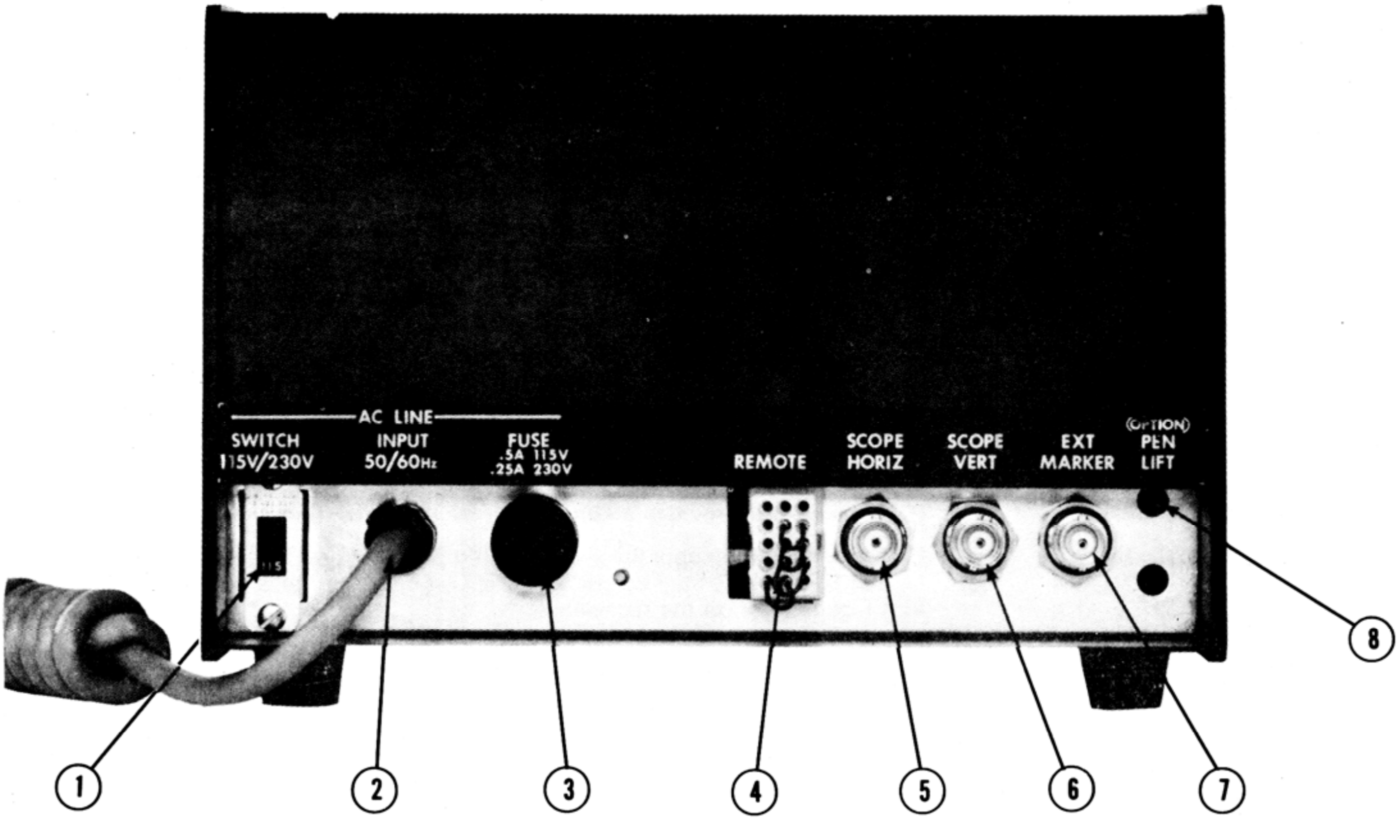


Figure 3-2. Rear Panel

3.3 DESCRIPTION OF REAR PANEL

① SWITCH 115/230 volt	Selects 115 or 230 volt line voltage.
② INPUT 50/60Hz	3 prong AC plug provides connection to AC mains.
③ AC LINE FUSE	0.5A for 115 volt AC or 0.25A for 230 volt AC.
④ REMOTE Jack	Provides connection for programming of frequency, sweep width and RF output level. (See paragraph 3-6 for detailed instructions). This jack is supplied with a mating "jumpered plug" which provides Front Panel control.
⑤ SCOPE HORIZ. Jack	BNC jack provides connection to (X) axis of oscilloscope or plotter.
⑥ SCOPE VERT. Jack	BNC connector provides the combined markers and demodulated RF (when Front Panel DEMOD INPUT is connected) for connection to the oscilloscope Vertical (Y) axis input.
⑦ EXT. MARKER Jack	BNC connector accepts an externally generated Continuous Wave signal to produce a frequency marker on the display.
⑧ (OPTION) PEN LIFT	When Pen Lift Option is installed, these 2 terminals provide *contact closure* during sweep "ON" time. This option operates only when the Front Panel SWEEP TIME Selector is set to the 100-10 SEC. position.

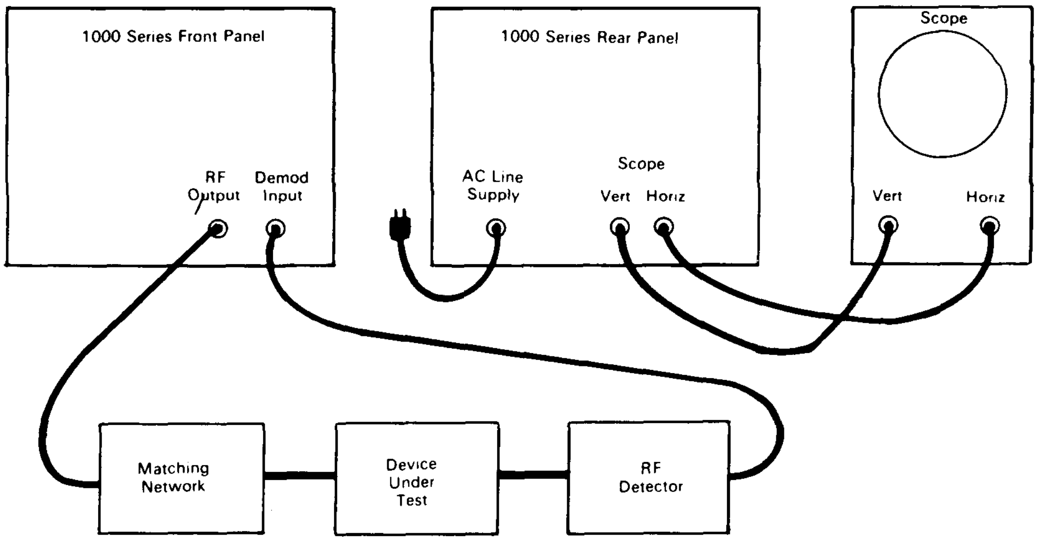


Figure 3-3. Typical Operating Set-up

3.4 TYPICAL OPERATING SET-UP

When initially setting up instrument, first check Rear Panel AC LINE VOLTAGE Selector Switch and Fuse to insure the instrument is set for operation with the available AC mains.

Make connections between the Sweep Generator, the device under test, and the oscilloscope as shown in Figure 3-3. Since Hum, RF leakage, and Spurious signal pick-up must be kept to a minimum, it is essential that good connections and grounds be maintained throughout the entire set-up. Use coaxial cables with BNC connectors wherever possible. The RF OUTPUT cable is especially critical. It should match the output impedance of the sweep generator and should be kept as short as practical (under 3 feet). If the input impedance of the device under test is not the same as the sweep generator output impedance, a matching network, as shown in Figure 3-3, should be used to insure a constant amplitude input signal to the device under test.

After the RF signal passes through the RF circuit, of the device under test, it must be demodulated before being connected to the DEMOD IN of the Sweep Generator. If a demodulator is not a part of the device under test, one must be added externally. (See Figure 3-3). The input impedance of the demodulator must present the proper load to the RF circuit being tested. The Wavetek Model D151 or D152 RF Detector is recommended for 50-ohm applications and the Model D171 for 75 ohm applications.

Depress the POWER push-button. The light in the switch button should light, indicating an operating condition.

(NOTE: This instrument does not require a warmup period unless it is to be used at the extreme limits of its specifications.)

After completing the set-up, adjust the Sweep Generator controls for the required Center Frequency, Sweep Width, Output Amplitude, and Sweep Rate. Turn the desired markers On, and adjust their Size and Width.

3.5 SPECIAL OPERATING NOTES

3.5.1 Errors From Sweep Rate Effects

When sweeping RF circuits having rapid amplitude changes, errors may occur, due mainly to detector delays. Decreasing the detector output time constant will minimize this effect. Figure 3-4 illustrates sweep rate effect.

To check for sweep rate effect, first set the sweep width to its lowest practical amount, then reduce sweep time while closely observing the swept output response. Any change in the response indicates the sweep rate is too fast for a true response. When a further reduction of sweep time does not change the response, a true response has been obtained.

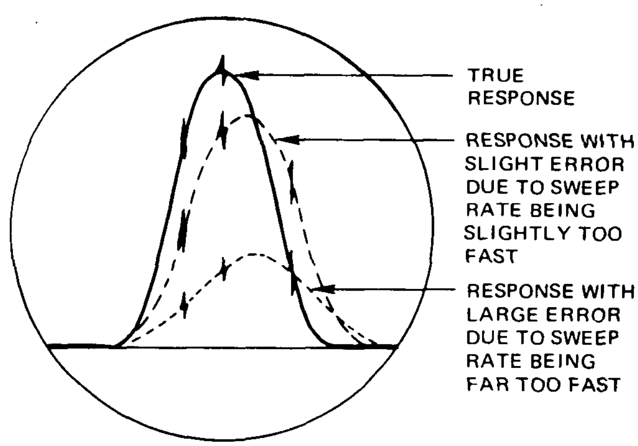


Figure 3-4. Sweep Rate Effects

3.5.2 Effects From Overloading

The use of excessive input signals to the device under test can cause overloading. To assure that this condition is not present, and that the response is a true representation of the device under test, turn the OUTPUT dbm controls to minimum output amplitude. Gradually increase the output amplitude until a response is obtained. Further increase of the output amplitude should not change the configuration of the response envelope except in amplitude. If the response envelope does change, such as flattening at the top, decrease the output just far enough to restore the proper configuration.

3.5.3 Making Measurements At Low Levels

When making measurements at low levels, radiation and ground loops become problems. Using double shielded cables for cables carrying RF signals helps minimize the radiation problem. Ground loops causing hum pick-up can sometimes be eliminated by completing only one ground connection between each instrument. This applies particularly to the scope horizontal input. If the ground connection is made at the vertical input terminal, an additional ground at the horizontal input terminal will often result in hum pick-up.

3.5.4 Operation With X-Y Plotters

Two features are incorporated into the 1000 Series Sweep Generators to facilitate operation with X-Y plotters. First, a Marker Clamp Switch converts the hi-frequency marker signals to a lower frequency which is compatible with the operating speed of the plotter pen. This is an internally operated switch located directly behind the front panel DEMOD input jack, and is accessible by removing the instrument bottom cover.

Second, is an optional feature (A-5). This feature provides a Contact Closure during the sweep time, to operate the plotter's Pen Lift. The A-5 feature operates only when the Sweep Time selector switch is set to its slowest position, 10 to 100 sec.

3.5.5 Operation With Network Analyzers

To operate properly with certain network analyzers several modifications might be required. Some analyzers require the removal of the blanking signal during the sweep return trace. This can be accomplished by disconnecting the single wire connected to pin 10 of the M1H Module. Another modification sometimes required is to provide a horizontal output ramp that varies from zero to some positive voltage instead of the standard −8 to +8 volt ramp. This can be accomplished by connecting a 56 K ohm resistor between pins 2 and 11 of the M1H Module. This connection provides a horizontal output signal from approximately 0 to 11 volts.

3.5.6 Operation With An External Monitor

Operation with an External Monitor can produce a flatter (less amplitude variation) input signal, to the device under test, than is obtainable with the internal monitor. The external monitor point is located at the point where greatest flatness is desired, and is not affected by cable VSWR or input impedance of the device under test. Another application, is to level at the output point of a Wide Band Power Amplifier, in order to increase the output power capability of the sweep generator.

To operate with an external monitor; First, set the OUTPUT controls for maximum. Next, connect the output from the External Monitor to the Front Panel phone jack labeled ALC IN. The signal from the external monitor must be of a negative polarity between 0.2 and 2 volts. If the signal is larger than 2 volts, use a resistive divider to obtain less than 2 volts, While observing the output from the monitor on an oscilloscope, adjust the Vernier OUTPUT Control until the monitor signal becomes leveled. (Refer to Figure 3-5).

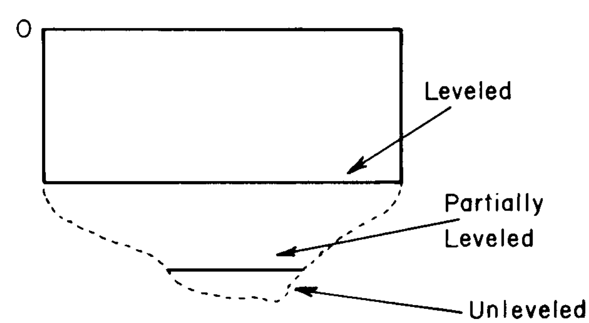
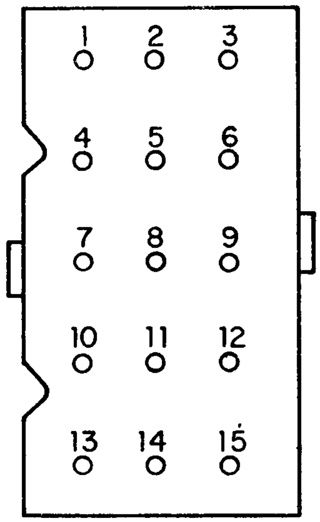


Figure 3-5.

3.6 PROGRAMMING

Connections for remote operation of OUTPUT AMPLITUDE, FREQUENCY and SWEEP WIDTH plus EXTERNAL AM and FM MODULATION and triggering of the sweep circuit is provided by a Rear Panel REMOTE programming connector. The programming jack and its pin functions are shown below.



Rear Panel
Remote Jack J 101

VOLTAGE AND SIGNAL SOURCES

Pin 1—Ground
Pin 2—+16 volts
Pin 3—−16 volts
Pin 4—−18 volts
Pin 10—Ramp for Driving Sweep Width Control

CONTROL INPUTS

Pin 6—Output Level Control (AM Modulation)
Pin 7—Sweep Time, Trigger Input
Pin 9—Frequency Control
Pin 12—Sweep Width Control (FM Modulation)
Pin 14—Sweep Width Control Ground

INTERNAL CONTROL

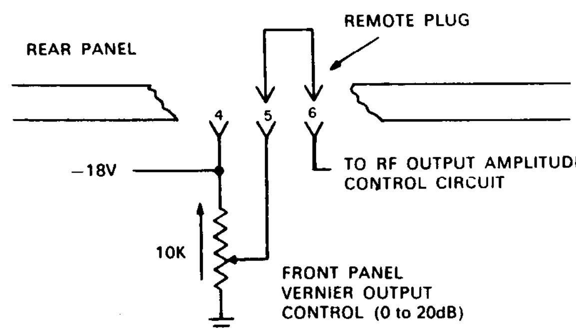
Pins 5, 8, 11 and 13 are used to program internal operation of Output, Frequency and Sweep Width.

UNUSED

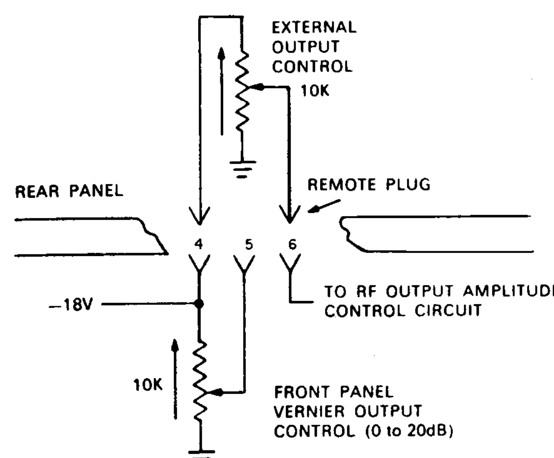
Pin 15 is unused.

3.6.1 OUTPUT AMPLITUDE CONTROL (AM MODULATION)

Normal internal control is provided by a jumper wire connected between pins 5 and 6 of the REMOTE plug as shown below.



To provide external control, remove jumper wire and connect an external OUTPUT Control as shown below. The RF OUTPUT is a linear function of the programming voltage as shown in Figure 3-6.



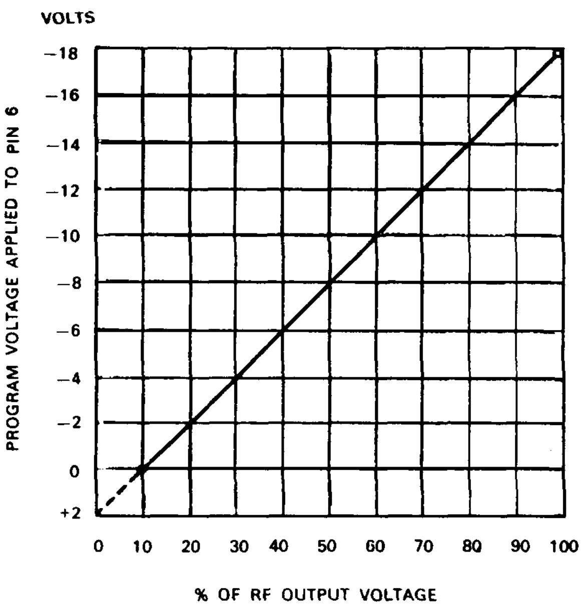
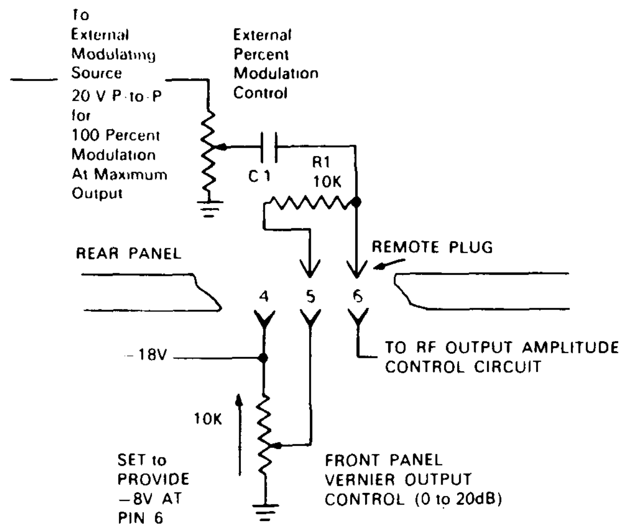


Figure 3-6. Program Voltage/RF Output

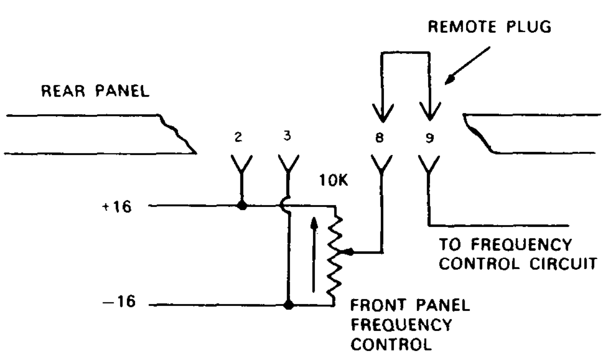
To provide AM MODULATION, connect as shown at right. The low frequency modulation will be limited by the reactance of capacitor C1. Lower frequency modulation, down to DC, can be provided with a modulating source having a DC offset. In this case, resistor R1 is omitted. In all cases, the peak modulating voltage plus the DC offset must be within the limits of −18 to +2 volts, as shown in Figure 3-6, or distortion will occur. The modulation frequency limits the maximum usable percentage of modulation as shown in Figure 3-7. This graph was obtained with the DC level set to −8 volts.

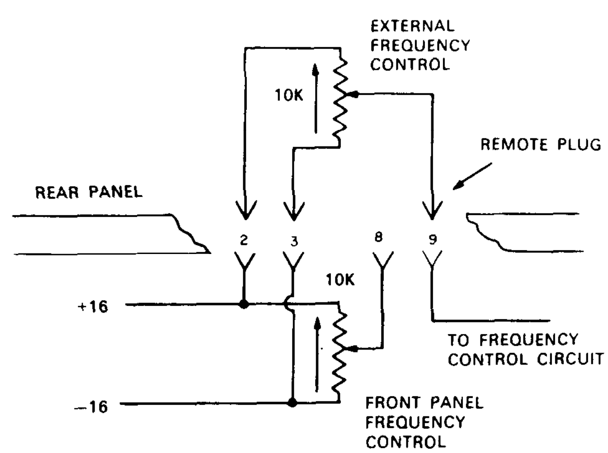


3.6.2 FREQUENCY CONTROL

Normal internal control of frequency is provided by a jumper wire connected between pins 9 and 8 of the REMOTE plug as shown below.

To provide external control, remove the jumper and connect pin 9 to an external Frequency control as shown below. Tuning sensitivity, is shown graphically in Figure 3-8.





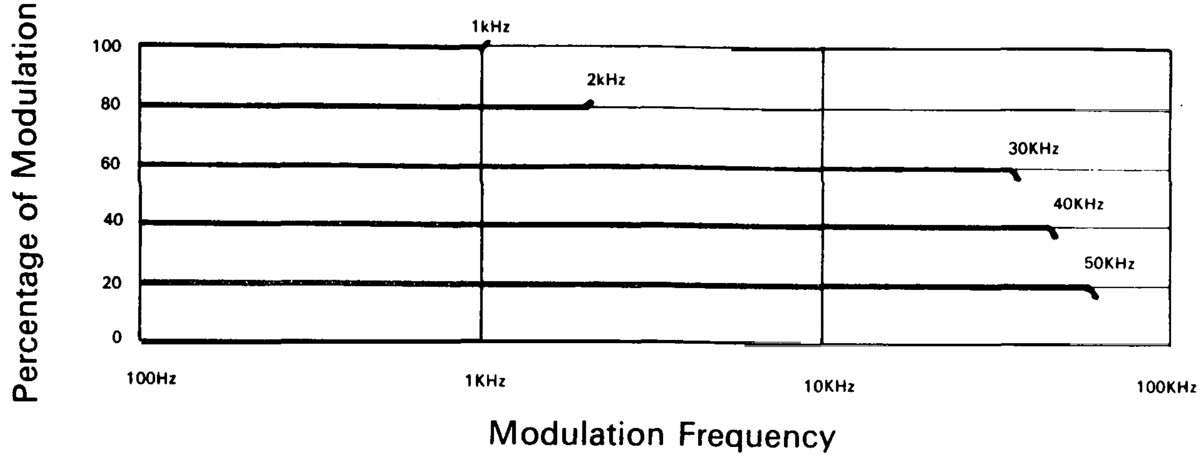
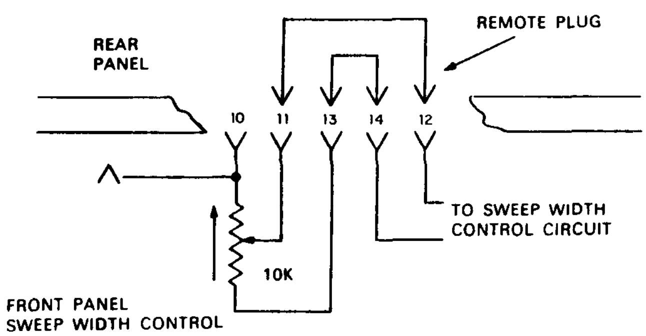


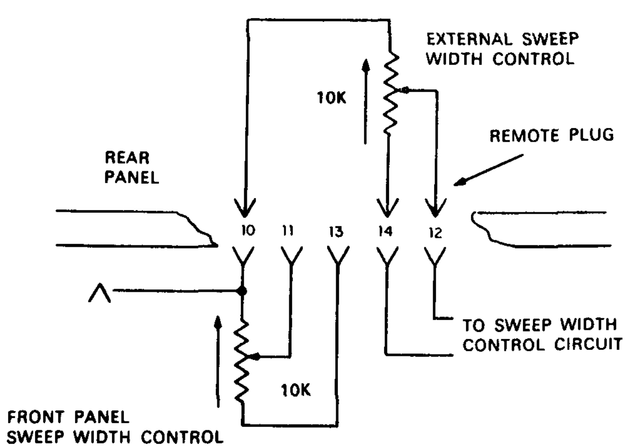
Figure 3-7. Percentage Modulation/Modulating Frequency

3.6.3 SWEEP WIDTH CONTROL (FM Modulation)

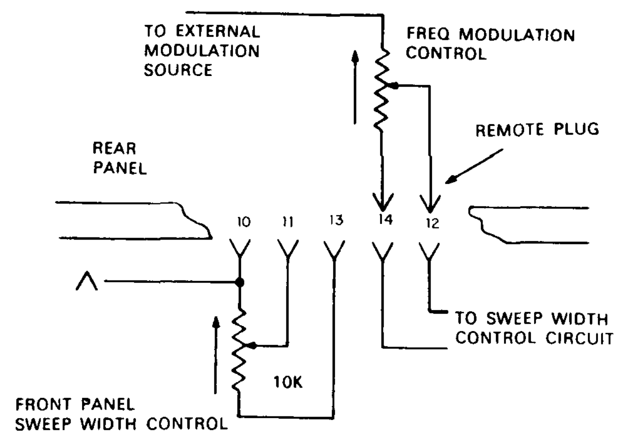
Normal internal control of Sweep Width is provided by a jumper wire from pins 11 to 12 and pins 13 to 14 of the REMOTE plug as shown below.



To provide external control, remove the jumpers and connect pin 12 and 14 to an external Sweep Width control as shown below.



To provide FM modulation, connect as shown below and set the Sweep Width Control for CW operation.



The modulating wave form should have an average potential of zero volts. Frequency sensitivity, is shown graphically in Figure 3-8. The maximum modulating frequency, while still maintaining this sensitivity, varies from approximately 4 kHz at maximum deviation to 20 kHz for 1 MHz deviation. (See Figure 3-9). With decreased frequency sensitivity, frequency up to 200 kHz can be used, as shown in the shaded area of Figure 3-9.

The peak amplitude of the modulating signal plus the DC voltage supplied to the Frequency Control (pin 9 of REMOTE plug) should not exceed + or −16 volts. This amplitude would program the unit to sweep beyond the band limits.

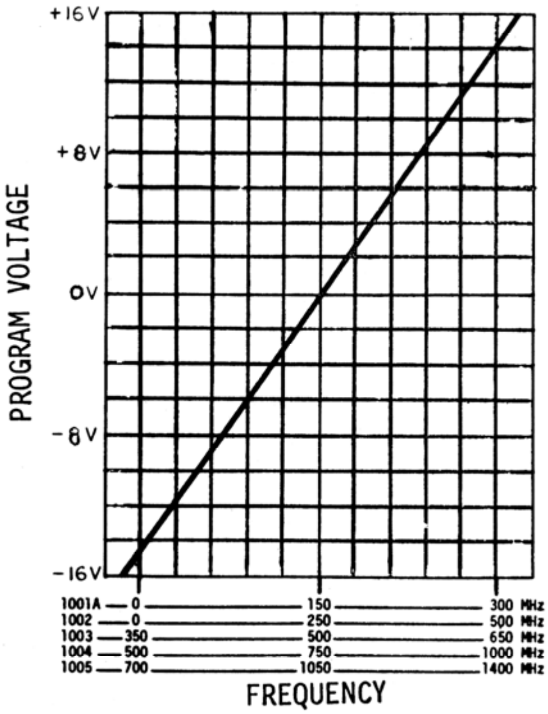


Figure 3-8. Program Voltage (pin 9 or 12)/Frequency

3.6.4 REMOTE TRIGGERING OF SWEEP TIME CIRCUIT

The Sweep Time Circuit can be remotely triggered by applying a 10 volt positive pulse to pin 7 of the REMOTE plug. For proper operation, the Front Panel SWEEP TIME Selector must be set for one of the four variable sweep time positions, and the PULL/TRIG Switch set to its OUT position. The repetition rate of the external trigger should be slower than the free running rate set by the Front Panel SWEEP TIME Selector and VAR/ MANUAL Control.

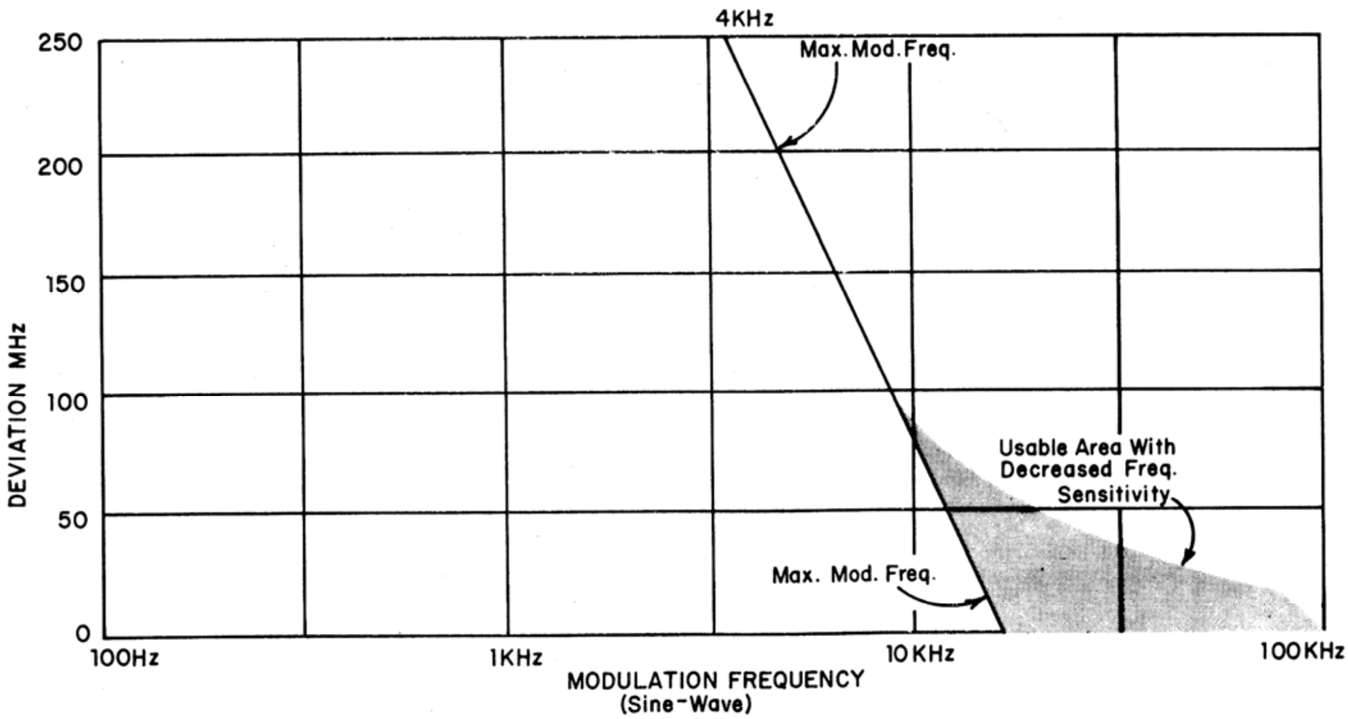


Figure 3-9. FM Modulation Frequency Limits

SECTION 4
CIRCUIT DESCRIPTION

4.1 INTRODUCTION

The 1000 Series Instruments are single band RF SWEEP and Marker Generators. This section first presents an overall block diagram analysis followed by a more detailed description of each module.

Before beginning the actual circuit description, it would be well to consider the mechanical arrangement of the instrument. This will enable the following block diagram and circuit description to be associated with its physical position, thereby, providing a better understanding of the overall instrument. The mechanical arrangement can be seen by referring to Figure 5-14 in the Maintenance section. This TOP VIEW shows the Front Panel, plug-in module and the rear chassis Power Supply sections.

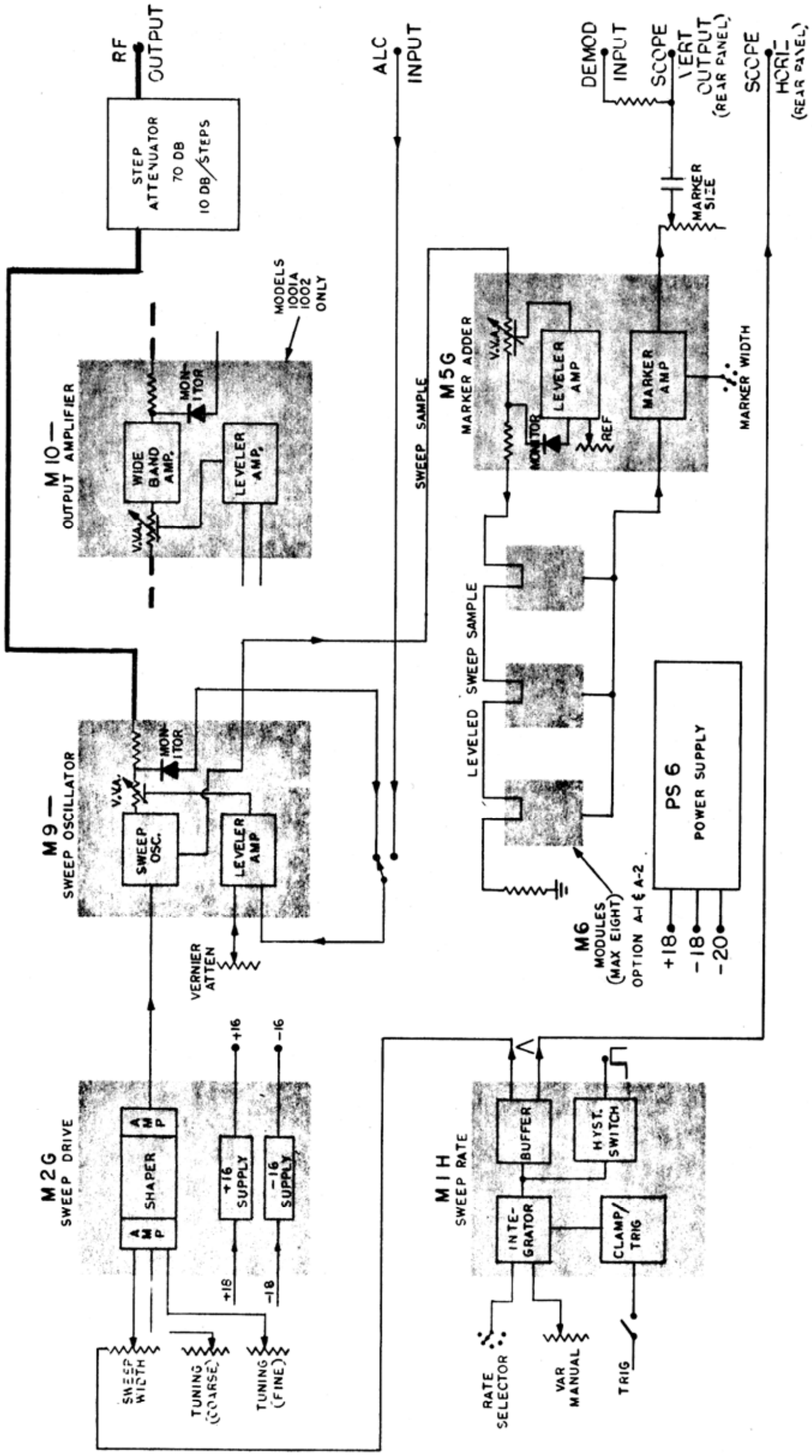


Figure 4-1. Simplified Block Diagram

4.2 SIMPLIFIED BLOCK DIAGRAM

The block diagram in Figure 4-1 contains both block and module information. The blocks contained within each module are indicated by the shaded area.

The Power Supply provides three regulated voltage sources of +18, −18, and −20 volts for connection to the plug-in modules.

The M1H Module generates the sweep ramp, blanking and scope horizontal voltages.

The M2G Module contains three distinct circuits; a −16 volt reference supply, a +16 volt reference supply, and the sweep drive circuits.

The two reference supplies provide the voltage to the Coarse Frequency control, while the sweep ramp from the M1H module supplies the signal to the Sweep Width control. The output signal from the Frequency and Sweep Width controls are then fed to the sweep drive circuit in the M2G module where they are combined into a single signal, which drives the Frequency Determining Varactor Diodes in the sweep oscillator module. Necessary level shifting, shaping and amplitude control is provided by the sweep drive circuit.

The RF sweep generator circuits for the models 1001A and 1002 are contained in two modules, an M9- Sweep Oscillator module and an M10- Wide Band Amplifier module.

The sweep signal is generated by hetrodyning two UHF sweep oscillators in a diode mixer. The resultant difference signal is then amplified in a wide band amplifier and connected to the M10- module. The M10- module contains a Voltage Variable Attenuator, the final output Wide Band Amplifier, the Monitor Diode, and the Leveling Amplifier. The input signal from the M9- module is connected through the Voltage Variable Attenuator to the Wide Band Amplifier and then to the monitor point.

Leveling of the RF output is accomplished by the monitor diode which measures the RF voltage and compares it to a reference voltage supplied by the vernier output control. Any error between the two voltages is amplified in the leveler amplifier located in the M10- module. The error voltage is then connected to the Voltage Variable Attenuator at the input of the final wide band amplifier. This closed-loop system maintains a constant amplitude RF signal at the monitor point, which compensates for amplitude variations in the sweep oscillator, mixer, and amplifier circuit and also creates a zero impedance at the monitor point. In order to create a 50 ohm source impedance, a 50 ohm resistor is connected between the zero impedance point and the RF output system.

The output from the M10- module is then connected through the turret step attenuator to the front panel RF output connector.

The RF sweep generator circuit for the models 1003, 1004, and 1005 is contained in a single M9- sweep oscillator module. These modules contain a high level Sweep Oscillator, a Voltage Variable Attenuator, Monitor, and Leveling Amplifier. The output from the sweep oscillator is fed through the voltage variable attenuator to the monitor point. Leveling of the RF output is accomplished in the same manner as previously described. The output from the module is then fed directly to the turret step attenuator without amplification.

The marker circuit is comprised of the Marker Adder Module M5G and the individual marker generators (M6's). In addition to the marker adding function of the M5G module, it also provides for leveling of the sweep sample signal in the same manner as the main RF output signal was leveled. This provides a constant amplitude sweep sample signal to the individual marker modules which is extremely important in obtaining a "flat comb" output from the harmonic generating marker modules. It also standardizes the sweep sample amplitude in all instruments, which insures proper operation of field installed markers.

This constant amplitude sweep sample signal is then fed to the individual M6 marker modules where it is combined in a mixer with a crystal controlled CW signal. The resultant difference signal, which is the birdy marker, is then fed back to the marker adder module where they are combined, amplified, and shaped into a single composite signal. This signal is then fed through the marker size control and to the Rear Panel vertical output connector.

The following circuit descriptions are referenced to the schematics appearing in Section 6.

4.3 POWER SUPPLY (PS6)

The PS6 power supply provides three regulated voltages and an optional "pen-lift" circuit.

AC POWER & RECTIFIER CIRCUITS

A dual-primary transformer allows operation at a line voltage of 115 or 230 volts. AC power is supplied through a 4 wire receptacle from the Front Panel ON/OFF switch. The transformer is located away from the sweep drive module to reduce magnetically coupled line ripple. Unregulated plus and minus voltages are supplied by two full wave rectifier circuits and filtered by C1 and C7. A 12 pin plug, mounted to the printed circuit board, provides access to three unregulated voltages as well as the regulated +18, −18, and −20V. This plug also accepts a scope horizontal signal for connection to a Rear Panel connector. The penlift switching circuit is also enabled through this plug.

PEN LIFT OPTION

Installation of K50 and Rear Panel jacks provides a contact closure which occurs during the sweep on-time. Q11 is normally conducting from current supplied through pin 9 of the 12 pin plug. When the base drive to Q11 is removed, the relay is energized by the turn-on of Q12. To prevent early failure of the relay contacts, the relay is only energized during slow sweep speeds and in the manual position of the front panel sweep rate selector.

+18 VOLT SERIES REGULATOR

Regulation is provided by IC1 which contains its own internal reference supply. R9 provides an adjustment to +18.00 volts. An external pass transistor, Q2, boosts the current capability, and Q1 improves the current limiting characteristics of IC1 by providing amplification before limiting. The +18 volt supply is protected against reverse voltage by CR7.

−18 VOLT SERIES-SHUNT REGULATOR

The voltage reference for this supply is obtained from the +18 volt supply through R20, and R19 provides the feedback which is applied to IC2 which provides high gain forcing Q5 to maintain a shunt regulated voltage across R13. Q3 and Q4 provides the series pass element and are connected as a compound emitter follower so that the voltage across R13 is not loaded heavily. Short circuit protection of Q5 is provided by CR8. Current limiting is provided by Q5, when Q6 conducts sufficiently to forward bias CR9 and CR10. Reverse voltage protection is provided by CR12.

−20 VOLT SERIES REGULATOR

The reference voltage for the −20V supply is applied to a differential amplifier, Q9 and Q10, which in conjunction with Q8 provides a compound emitter following action similar to the pass element of the −18V supply.

CR 17 provides reverse voltage protection. Current limiting is provided by shutting down of the −18 volt supply by Q7 through CR14 to the base of Q5, reducing the reference voltage to the base of Q9. This action is helped along by the conduction of CR13 if the −20 volt supply drops below −18 volts.

4.4 SWEEP RATE (MODULE M1H)

M1H SWEEP RATE GENERATOR

This module generates a variable rate square and triangular waveform. Front Panel switching provides recurring, triggered, or manual modes. The triangular waveform is a 32 volt peak-to-peak signal with a sweep time variable from 10ms to 100 seconds in four steps. Retrace time is held constant at the fastest sweep time of each range. The triangular waveform is used to provide the sweep drive and the scope horizontal signals.

The square wave output is a −1 to +15 volt signal whose −1 volt level corresponds to the sweep time and whose 15 volt level corresponds to the retrace time. The square wave is used to provide blanking of the RF output during retrace time.

Triangular waveforms are generated in an integrator, Q1, Q2, Q3, and Q4, by applying positive and negative voltage levels to the integrator input. When the integrator positive ramp output exceeds a threshold voltage, a bi-stable hysteresis switch is switched, reversing the polarity of the integrator dc input, causing the triangular waveform to start down toward another threshold. If the module is programmed in a recurring mode, the negative ramp will trip the hysteresis switch producing continuous oscillations. The hysteresis switch output is clipped on the negative polarity and is used for blanking (pin 10).

The symmetrical square wave output from the hysteresis switch (pin 9) is connected, through the Front Panel SWEEP TIME vernier and one of the range determining resistors of the SWEEP TIME selector switch, to the integrator input (pin 7). Since the integrator output voltage change is proportional to the input voltage level, the SWEEP TIME vernier provides a sweep time increase by reducing the hysteresis switch output if the polarity is negative. If the polarity is positive, full output is retained (a diode opens the vernier ground connection) producing a nearly constant retrace time.

For triggered modes, the negative threshold of the hysteresis switch is shifted out of the way by a diode and resistor connected through Q14 or through S102D, when in "line" position. The integrator will now continue its negative ramp until it is stopped by a clamp circuit turned on by a comparator. The integrator output is now held at this level unless a trigger is applied to the hysteresis switch. A trigger cannot flip the hysteresis switch until this clamp level is reached because the triggers must pass through an amplifier which is gated off until the clamp comparator (Q9) conducts.

Triggers are prevented from reaching the hysteresis switch (pin 6) by a voltage at pin 1, which causes comparator Q8 to open FET switch Q14. The primary function of the voltage at pin 1 is to shift the clamp comparator input out of the way to allow free-running oscillations.

Since the integrator is an inverting amplifier, and both input (pin 7) and output (pin 8) are available, a feedback resistor network allows the SWEEP TIME vernier, R102, to be used as a dc level shifter in the manual mode. A non-inverting amplifier consisting of Q6, Q7 and Q19, with a gain of 2, provides a 32 volt peak-to-peak wave output which is used for sweep drive. This output is divided by R18 and R53 to provide a horizontal drive of about 16 volts peak-to-peak at an impedance of about 23K ohms.

A centering adjustment (R41) provides a dc level adjustment of the integrator and horizontal outputs (pin 8, pin 12, and pin 11) by shifting both positive and negative thresholds of the hysteresis switch. A size adjustment (R45) provides an amplitude adjustment by effectively varying the size of the hysteresis window. Symmetry of trace and retrace time (for equal positive and negative input voltages to the integrator) is established by adjusting the integrator balance control R7. This adjustment also affects the manual mode centering and the sweep period for fully counterclockwise rotation of the SWEEP TIME vernier.

The four sections of the SWEEP TIME selector switch program the M1A module. The functions of each section are listed below:

Section A	Integrator input selector
Section B	Clamp level shift and routing switch disconnect
Section C	Trigger source selector
Section D	Line trigger routing, and hysteresis switch hold.

Circuit operation as modified by the switch positions may be understood by considering the MANUAL, VARIABLE RATE, and LINE positions one at a time.

MANUAL POSITION

Section A. A feedback resistor R113 is connected from output (pin 8) to input (pin 7) of the integrating amplifier, converting it to an inverting dc amplifier. Resistor R114 shifts the amplifier output dc level to −8 volts for zero input voltage to R104. When the SWEEP TIME vernier control R102 is fully clockwise, the negative input voltage to R104 is sufficient to shift the output voltage to +8 volts dc.

Section B. The clamp is disabled in this position by applying +18V to pin 1, causing the hysteresis switch input to be disconnected from any internal source of triggers by opening the routing switch Q14 (since Q8 is turned off). The shift bias is disconnected when Q14 is open.

Section C. The trigger input point pin 4 is grounded.

Section D. The hysteresis switch is held in one state by applying −18 volts to its input through a 33K ohm resistor. This causes the output to be negative (this bistable circuit is a positive feedback amplifier) providing the proper polarity to R102 and preventing blanking of the RF output.

VARIABLE RATE POSITIONS

Section A. Proper integrator input resistors are selected in decade increments in these positions, R105-R108.

Section B. The clamp is disabled and triggers are held off unless the "pull trigger" switch is opened, removing +18 volts.

Section C. Two trigger sources are connected to pin 4; an external trigger from REMOTE jack J101-7 and triggers from the Front Panel momentary TRIG switch S103.

Section D. No connection is made to pin 6 in any of the four variable rate positions.

LINE POSITION

Section A. The proper value integrating resistor is selected, by-passing the SWEEP TIME vernier, to produce equal sweep and retrace periods.

Section B. Clamping, works in this position independently of the "pull trig" switch.

Section C. The line rate sine wave from the power supply is connected to the trigger input.

Section D. Amplified triggers are routed into the hysteresis switch independently of the internal routing transistor, providing additional (redundant) line rate reliability.

4.5 SWEEP DRIVE (MODULE M2G)

The M2G Module provides the drive voltage to the varactor diode in the sweep oscillator module as determined by the programming voltage applied to PIN 5, 7 and 8 by the freq (coarse), freq (fine) and sweep width controls.

The programs are summed to a standard voltage level in the input amplifier consisting of Q1, 2 and 3 and then fed to the shaping circuit.

The shaping diodes (CR2 to CR6) conduct at levels determined by a resistor network driven by a constant current source Q4. As each diode conducts, an additional current is fed into the summing junction of the output amplifier consisting of Q5, Q6 and Q7. The output amplitude is set by R35, the sweep width limit control.

This module also provides two regulator voltages for use primarily as programming voltages.

4.6 SWEEP OSCILLATOR, Model 1001A and 1002 (MODULE M9G and H)

The RF sweep signal is developed by the hetrodyne method which utilizes two UHF sweep oscillators, a diode mixer, and a wide-band RF amplifier.

Sweep oscillator, Q2, sweeps from approximately 1.4 to 1.65 GHz. The average frequency is adjusted by R2 which controls the average bias on the varactor diodes, CR1; CR2 and CR3. The sweep drive voltage from pin 9 of the module is connected to the opposite side of these diodes causing the frequency to vary above and below this average frequency in a low-to-high frequency direction.

Sweep oscillator, Q5, is similar to the Q2 circuit, however, the varactor diodes have been reversed, and the polarity of the bias voltage supplied by R12, course adjustment, and R13, CENT FINE adjustment, has been changed. These changes cause the oscillator frequency to vary from a high to low frequency. The approximate output frequency is 1.4 and 1.15 GHz. This out of phase sweep technique has several advantages. First, larger sweep widths are obtainable and second, the nonlinearity (FREQ versus TIME) of one oscillator is cancelled by the nonlinearity of the second oscillator. R9, which is a linearity adjustment, optimizes this cancelling process by controlling the sweep drive ratio between the oscillators.

The two sweep signals are combined in a single balance diode mixer comprised of L4, L5, CR8 and CR9. The resultant, difference frequency, of 0 to 500 MHz, is then amplified in the wide band amplifier consisting of transistor stages Q11, Q12 and Q13.

Transistor stages Q6 and Q7 supply the blanking voltage to the wide band amplifier and causes it to be shut off during the sweep retrace time. The output from the wide band amplifier is connected to J1, which in turn is connected to the output wide band amplifier located in module M10-. A second output is also obtained from this amplifier and is coupled, via R45, to a similar wide band amplifier consisting of transistor stages Q14, Q15 and Q16. The output from this amplifier is connected to J2 which in turn is connected to the marker generating circuits.

Transistors Q8, Q9 and Q10 provide a −15 volt supply to operate the sweep oscillators. This improves stability and provides isolation between the oscillators and the −18 volt supply.

4.7 OUTPUT AMPLIFIER Model 1001A and 1002 (MODULE M10F and G)

This module contains a Voltage Variable Attenuator (VVA), a Wide Band Amplifier, an output Monitor circuit and the Leveling Amplifier.

The input signal from the M9- sweep oscillator is fed through the VVA consisting of diodes CR1, 2 and 3 to a two stage RF amplifier. Each amplifier Q1 and Q4 is followed by two emitter followers Q2, Q3 and Q5, Q6. The approximate gain of the amplifier is 40db from .5 to 500 MHz.

The output of the amplifier is connected to the monitor diode CR8.

This diode provides a negative DC voltage related to the RF output level present in the output system. This negative voltage is connected to one input of the leveler amplifier consisting of Q8, 9 and 10.

The second input to the amplifier is provided by the output vernier control. Any error between the two inputs is amplified and used to control the VVA. This closed loop system maintains a zero impedance, constant amplitude signal at the monitor point and allows an adjustment of the signal over a 20dB range.

The output impedance is provided by the resistor connected between the monitor and the RF out connector.

RF blanking is provided by a positive input to pin 4 to switching transistor Q7, which causes the output of the leveling amplifier to go negative during the sweep retrace time, providing maximum attenuation of the VVA.

4.8 SWEEP OSCILLATOR, Model 1003, 4 and 5 MODULE M9R, S, and T)

Each of these modules contains an Oscillator, a Voltage Variable Attenuator, a Leveler Amplifier, and a Monitor. The differences in Modules M9R, in the 1003, M9S, in the 1004, and M9T, in the 1005 are in the circuitry associated with Q1.

Q1 is a common base varactor tuned oscillator. Biasing of the varactor diodes is provided by Q4 and Q5. The B− voltage for the oscillator is modulated by the blanking signal from pin 10 in transistor stages Q2 and Q3. This modulation causes the oscillator to be cut off during the sweep retrace period, thereby providing a zero RF output level during the retrace time. The RF signal is coupled from the oscillator to a Voltage Variable Attenuator consisting of CR1, CR2, and CR3. This attenuator is part of the closed loop leveling system consisting of the monitor diode CR4, the leveler amplifier, Q9, Q10 and Q11 and the voltage variable attenuator. The operation of this circuit is identical to that described in paragraph 4.7 (M10F & G), and maintains a constant amplitude RF signal at the monitor point, while allowing adjustment of this signal over a 20db range.

The output impedance is provided by the resistor connected between the monitor and the RF output connector.

4.9 MARKER ADDER (MODULE M5G)

The main function of this module is adding together and amplifying the individual marker signals from the M6 marker modules. It also contains the external marker mixer circuit and the sweep sample leveling circuits.

A low level sweep sample signal supplied from the sweep oscillator module M9- is connected to jack J2. This signal is then leveled in the same manner as the main RF output signal. The voltage from the monitor, CR7, and the reference voltage from R46 is fed to the leveling amplifier consisting of transistor stages Q12 and Q13. Q11 provides blanking of the leveling amplifier. Any error between the two input signals is amplified and fed to the voltage variable attenuator CR6. The operation of this circuit produces a constant amplitude signal at the monitor point.

The leveled sweep sample signal is connected to the external marker mixer, CR1 and CR2, and to the sweep sample output connector, J4. A 47 ohm resistor, which is connected between J4 and the monitor point, establishes the source impedance at approximately 50 ohm. The signal is then routed to each M6 marker module.

The marker output signals from the individual M6 marker modules are connected to the input pins 1, 2, 3 and 4 of the M5G module. One or two M6 outputs are connected to each input. The signals are then amplified in the input stages (Q2, Q3, Q4, and Q5) and combined in the common collector load. The collector load is an external 10mH choke when the Front Panel MARKER WIDTH Selector is set to "WIDE", or a 3.3k ohm resistor, R21, when the Width Selector is set to "NARROW." The combined marker signals are then amplified in transistor stages Q6, Q7 and Q8. The Front Panel Marker WIDTH Selector also varies the high frequency gain of the amplifier by connecting capacitance across R27, the feedback resistor. The amplified signal is then fed to the complimentary output stage, Q9 and Q10, which is biased so that input signals less than 0.5 volts are not amplified. This eliminates most spurious markers and noise from the output. The output is then connected to the Front Panel MARKER SIZE Control and finally to the Rear Panel SCOPE VERT. connector.

4.10 MARKERS (MODULE M6's)

Each marker module contains a crystal oscillator, a tuned or untuned mixer and a marker amplifier. Harmonic generator marker modules also include one or more harmonic generating stages.

Several types of marker modules are required to cover the wide frequency range and to produce both single frequency and harmonic type markers. A single frequency marker generator produces a marker at a single frequency while the harmonic marker generator produces markers at harmonically related frequencies of the crystal oscillator.

The model number for single frequency markers is M6S followed by the marker frequency. The model number for harmonic markers is M6H followed by the harmonic marker frequency.

The Crystal Oscillator operates between the frequencies of 100 kHz and 55MHz. Several different types of oscillators are required to cover this range of frequencies. The 100 kHz oscillators use a tuned oscillator with the crystal operating at its fundamental frequency in a series resonant mode. The 1 to 17 MHz crystal oscillators are either tuned series resonant mode oscillators or untuned pierce type oscillators. The 17 to 55 MHz oscillators use a tuned Colpits oscillator with the crystal operating at its third overtone frequency in a series resonant mode. The tuning supresses the crystal fundamental and higher order resonant frequencies. The crystal and marker frequency are the same for frequencies between 100 kHz and 55 MHz. The markers above 55 MHz use harmonic generating techniques.

The output from the crystal oscillator (or harmonic generator) is combined with the sweep sample in the mixer stage. In the case of single frequency markers, the mixer includes a tuned circuit which selects the desired crystal or crystal-harmonic frequency and the sweep sample frequency. In the case of a harmonic marker, the mixer is untuned. The mixer circuit is generally a diode mixer, although transistor mixers are sometimes used. The fundamental and product signals are filtered from the mixer output, leaving the "difference signal" which is applied to the marker amplifier stage.

The marker amplifier is a single stage amplifier having a frequency response of several kHz to approximately 500 kHz. The output of the marker amplifier is connected through the SIZE Control to the output pin of the module.

SECTION 5
MAINTENANCE

5.1 INTRODUCTION

This section provides information for testing, calibrating, and trouble shooting the sweep generator. The performance test is designed for incoming inspection and periodic evaluation. If performance is not to specifications, refer to the calibration and trouble shooting sections.

5.2 SERVICE INFORMATION

5.2.1 DISASSEMBLY INFORMATION

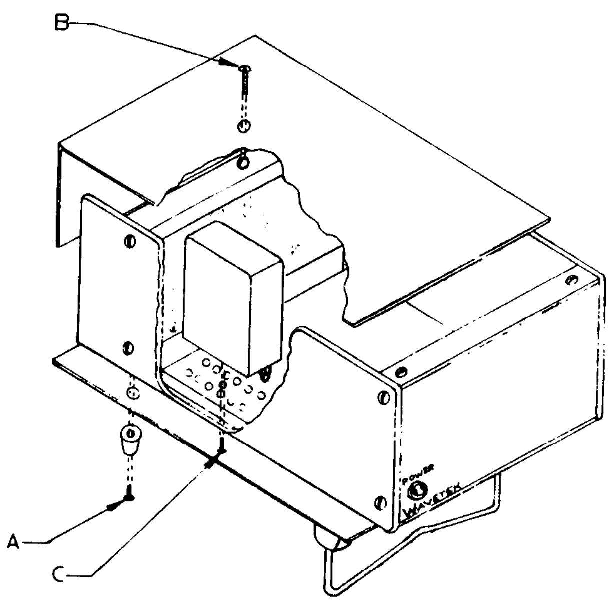


Figure 5-1. Disassembly

REMOVAL OF BOTTOM COVER—Remove the two rear feet (A) and lift cover off with a slight rear movement.

REMOVAL OF TOP COVER—Remove the single screw (B) from the top and lift off cover with a slight rear movement.

REMOVAL OF SIDE PANEL—Either side panel can be removed to provide better access by removing the four screws holding the side panel to the instrument. The Front Panel/Module Section can be removed from the power supply section by removing two screws holding the sections together and by disconnecting the electrical connectors between the two sections. NOTE: The separation of the two sections performs no useful purpose during normal service procedures.

5.2.2. MODULE SERVICING

SERVICE KIT K102—This service kit contains a module extender and RF extension cables which enables the module to be electrically operated while physically located above the rest of the modules, thereby making all parts easily accessible.

REMOVAL OF MODULE—Modules may be removed by removing any cables attached to the top of the module and removing the hold-down screw (C) from the bottom. Pushing up on the module ball studs will help free the ball studs from the chassis mounted spring clips.

REMOVAL OF MODULE COVER—Remove all nuts and screws from the top of the module and slide the cover off.

REINSTALLING MODULE—Before reinstalling the module, check the module pins for proper alignment, then carefully seat the module pins into the chassis socket and replace the hold-down screw (C) to insure a good ground connection between module and chassis.

MODULE PIN NUMBERING SYSTEM—The module pins are numbered as shown in Figure 5-2. The ball studs for the circuit modules are located off center to prevent the module's being plugged in backwards. This off-center ball stud location also provides a method for locating pin No. 1.

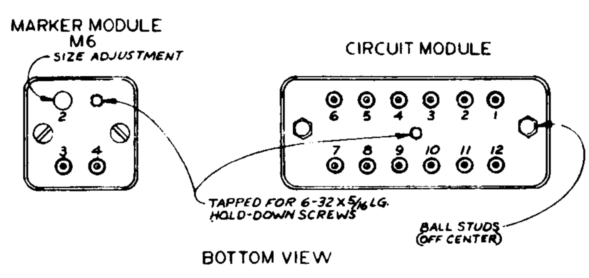


Figure 5-2. Module Pin Numbering System

5.2.3. TRANSISTOR LEAD CONFIGURATION—Transistor lead configurations are shown in Figure 5-3.

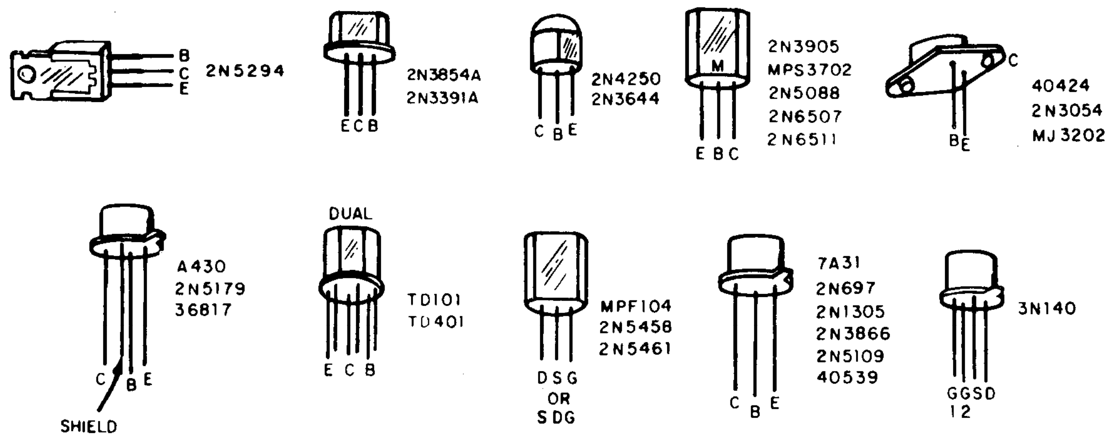


Figure 5-3. Transistor Lead Configuration

5.2.4 RECOMMENDED TEST EQUIPMENT—The following test equipment, recommended for servicing, trouble shooting, and calibrating the Wavetek 1000 Series Instruments is shown in Table 5-1.

TABLE 5-1 RECOMMENDED TEST EQUIPMENT

INSTRUMENT	CRITICAL REQUIREMENT	RECOMMENDED
Oscilloscope	DC Coupled 1mV/cm sensitivity	HP-130
Digital Voltmeter	0.1% Accuracy	Weston 1240
Power Meter	Frequency Range 10 to 1500 MHz	HP 432A/478A
Spectrum Analyzer	Frequency Range 10 MHz to 3 GHz	HP 8555A/8552A
Precision Attenuator Pads	10db 20db 40db	Weinchel 50-10 Weinchel 50-20 Weinchel 50-40
RF Detector	Halfwave Negative output-flat	Wavetek D-152 50 ohm Wavetek D-171 75 ohm
Matching Pad (75 ohm units only)	Minimum Loss 50 to 75 ohms	Wavetek M157
Harmonic Marker Generators	1 MHz 10 MHz 30 MHz (for Model 1001A) 70 MHz (for Model 1005) 50 MHz (for Model 1002, 3, & 4)	Wavetek M6H-1 Wavetek M6H-10 Wavetek M6H-30 Wavetek M6H-70 Wavetek M6H-50
CW Signal Generator	Tunable to any Frequency within the frequency range of the sweep generator. Accuracy ±5 MHz Output 0.1V	

5.3 PERFORMANCE CHECKS

The following procedure is intended to ensure that the instrument meets its published specifications. The checks specified, assume that the instrument is equipped with A-2 options at 1 MHz, 10 MHz and a higher frequency harmonic marker as specified in table 5-1, Recommended Test Equipment. While it is possible to check the instrument's performance without the use of harmonic markers, by using suitable external CW sources, a complete check by this method is impractical. The required performance is shown in paragraph 1.2, Specifications. This paragraph is intended to be used in conjunction with the following performance check.

5.3.1 TYPICAL SET-UP

Connect the sweep generator, RF detector and scope as shown in figure 5-4. Adjust the sweep generator controls as follows.

FREQUENCY to exact center frequency (example 150 MHz for model 1001A), OUTPUT to maximum (+10 or +13dBm depending on model), SWEEP TIME to line, PULL/TRIG to its "in" position and SWEEP WIDTH to maximum (fully clockwise).

Adjust the scope to operate in an X-Y mode. Set the vertical sensitivity to 0.2 volt/cm. Adjust the vertical position, horizontal position and horizontal sensitivity to obtain a scope pattern as shown in figure 5-5.

Adjust the sweep generator marker controls as follows.

Highest frequency harmonic generator marker as shown in table 5-1. to "on". Adjust marker width to wide and and marker size to produce a marker amplitude similar to that shown in figure 5-5.

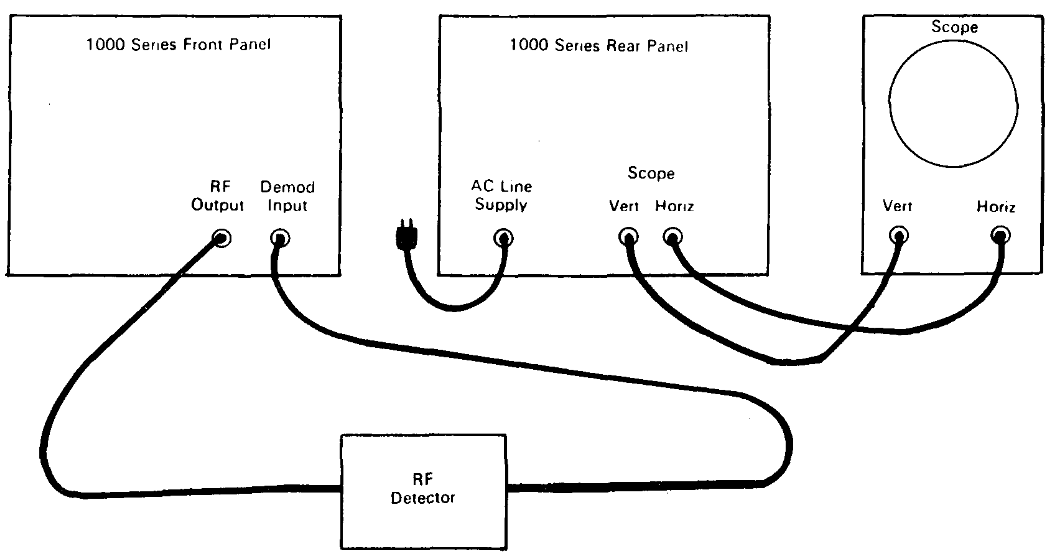


Figure 5-4. Typical Set Up

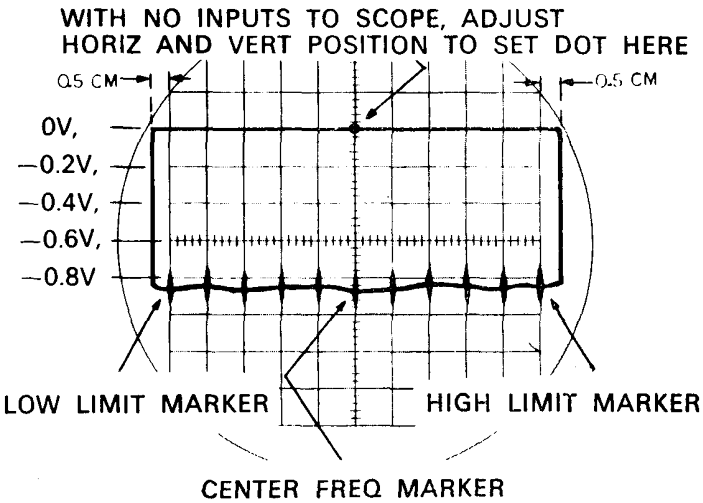


Figure 5-5. RF Detector Display

5.3.2 DISPLAY LINEARITY, MAXIMUM SWEEP WIDTH AND FREQUENCY RANGE CHECK

(See note at end of this paragraph for Model 1003)

Display linearity is read directly from the display shown in figure 5-5. Each marker must fall within ±0.2cm from each centimeter line on the graticule, this is equivalent to a display linearity of 2%.

Maximum sweep width is also read directly from the display of figure 5-5 and equals [N minus 1 times the Harmonic Marker Frequency] where "N" equals the number of markers present on the display.

To identify the frequencies shown on the display of figure 5-5, one frequency or marker must be positively identified. All remaining frequencies can be identified by referencing to this frequency. For models 1001A and 1002, the low limit marker is not a marker but the zero lock-in produced by the heterodyne sweep generator technique. The frequency of each marker shown on the display can be identified by referencing to the zero lock-in point. For model 1003, 1004 and 1005, one frequency can be identified by using an external CW generator and the EXT marker generator circuits of the instrument. By referencing to the marker produced by the known EXT CW signal, the exact frequency of each marker on the display is obtained.

Since the frequency indicated at the exact center of the display of figure 5-5 is the same as the output frequency when the instrument is operated at minimum sweep width, the center frequency range of the instrument can be checked by simply turning the FREQUENCY (coarse) control to its extremes and noting the range of frequencies indicated at the exact center of the display. The low and high limit markers should move past the display center line by approximately 1/2CM. This represents approximately a 5% overrange capacity.

LOW FREQUENCY LIMIT CHECK FOR MODEL 1001A & 1002

Turn on the 10 MHz harmonic marker and adjust the FREQUENCY (coarse) and SWEEP WIDTH controls to position the zero lock-in point centered on the extreme left scope graticule line and the first 10 MHz harmonic marker centered on the extreme right scope graticule line. Turn on the 1 MHz harmonic markers and counting down from the 10 MHz marker, locate the marker which corresponds to 1 MHz.

The output must be flat (constant amplitude) down to the 1 MHz marker. This verifies the low frequency limit of the MODEL 1002. For the model 1001A continue as follows. Locate the harmonic markers which correspond to 1 MHz and 2 MHz respectively. Adjust the FREQUENCY (coarse) control FREQUENCY (fine) control, and SWEEP WIDTH control to set the 1 MHz harmonic marker on the extreme left scope graticule line and the 2 MHz harmonic marker on the extreme right scope graticule line. Adjust the FREQUENCY (fine) control to set the 1 MHz harmonic marker on the extreme right scope graticule line. The zero lock-in point should now be on the extreme left scope graticule line and by interpolation, performance to 500 KHz, the low frequency limit for the model 1001A, can be verified (500 KHz is the scope center graticule line).

NOTE: Model 1003

Due to the frequency range of the model 1003, the RF detector display will be slightly different than that of figure 5-5. Only seven 50 MHz harmonic markers will be present on the display instead of the eleven markers shown in figure 5-5.

Maximum sweep width and frequency range is checked exactly as described above. However, the display linearity check varies as indicated below.

Verify the display linearity of ±.2CM of the marker at 350, 500 and 650 MHz. Turn on the 10 MHz harmonic markers and check the display linearity at the remaining CM lines using each third marker.

5.3.3 DIAL ACCURACY CHECK

Dial accuracy is checked in a manner similar to the frequency range check just completed.

Set the FREQUENCY (coarse) control to position the zero lock-in or the low limit harmonic marker to the center of the display. Reduce the sweep width to approximately 10 MHz to provide the necessary resolution. Turn the high frequency harmonic marker off and turn the 10 MHz harmonic marker on. Center the marker on the display with the FREQUENCY (coarse) control (make sure the indicator line on the FREQUENCY (fine) control is aligned to the frequency indicator and remains in this position during the entire check) and read the frequency error on the FREQUENCY (coarse) dial. Allowable error is shown in paragraph 1.2. Next advance the FREQUENCY (coarse) control until the next

10 MHz harmonic marker is centered on the display and again read the error on the FREQUENCY (coarse) dial. Continue this process until the entire frequency range has been verified.

Since the model 1005 is calibrated in 20 MHz intervals, check every other 10 MHz point on this instrument.

5.3.4 MINIMUM SWEEP WIDTH CHECK

The minimum sweep width for each model is shown in paragraph 1.2 and is verified as follows.

Turn the 1 MHz harmonic marker to on. Adjust the FREQUENCY (coarse), FREQUENCY (fine) and the SWEEP WIDTH controls to exactly position a 1 MHz harmonic on the extreme left scope graticule line and the next higher 1 MHz harmonic marker on the extreme right scope graticule line. The scope horizontal is now calibrated for 1 MHz full scale or 100 KHz per centimeter. Adjust the FREQUENCY (fine) control to center a 1 MHz harmonic on the scope display. Adjust the MARKER WIDTH control to produce a marker width approximately equal to the minimum sweep width specification. Since the marker presentation has sloping sides it should be possible somewhere along its amplitude to locate a point where its width exactly equals the minimum sweep width specification. For example, if the marker is 300 KHz wide at its base and 100 KHz wide at its peak amplitude point, it would be 200 KHz wide (2 centimeters) at approximately its 75% amplitude point. This is equal to the minimum sweep width specification for models 1001A or 1002. Now decrease the sweep width to minimum and ensure that the marker at the amplitude point corresponds to the minimum sweep width specification covers the entire scope display.

5.3.5 MAXIMUM OUTPUT CHECK

Frequency for Output Check (These frequencies have been selected to provide a minimum error over the maximum frequency range)

Model	Frequency
Model 1001A	100 MHz
1002	300 MHz
1003	500 MHz
1004	700 MHz
1005	1000 MHz

Set the frequency dial to indicate frequency. Set sweep width control for CW operation.

MODELS 1001A, 1002 & 1003

Turn step Output control to 0dBm. Turn vernier Output control to +3dBm. Set power meter to +5dBm range and connect the power meter's thermistor mount to the RF output connector. The power meter should read +3dBm, ±.5dB (the calibration procedure calls for an exact reading of +3dBm, however some error must be allowed due to thermal effects and variations between power meters).

MODELS 1004 & 1005

Turn step Output control to +10dBm. Turn vernier Output control to 0dB. Set power meter to +10dBm range and connect the power meter's thermistor mount to the RF output connector. The power meter should read +10dBm, ±.5dB.

5.3.6 FLATNESS CHECK

Assuming the sweep generator has been set-up as outlined in paragraph 5.3.1 proceed as follows.

Decrease the scope's horizontal sensitivity to produce a display width of approximately 4 cm. Increase the scope's vertical sensitivity and adjust the vertical position control until the display occupies exactly 10 cm between the zero level retrace line and the maximum amplitude point.

The minimum amplitude point must be 9.45 cm or more for units with a ±.25dB flatness specification or 8.9 cm or more for units with a flatness specification of ±.5dB.

5.3.7 CW MODE CHECK

Adjust the sweep width control fully counterclockwise until an audible "click" is apparent. This position removes the return trace blanking and sweep drive from the oscillator. The output frequency is controlled by the FREQ (coarse) and (vernier) controls and the accuracy is identical to the FREQ dial accuracy check performance in paragraph 5.3.3. The output amplitude is the same as in the sweep mode of operation with the absence of the zero level return reference.

5.3.8 FREQUENCY DRIFT CHECK

Return to typical set-up of paragraph 5.3.1 and again calibrate the display's sweep width to 1 MHz. Position the marker to the exact center of the oscilloscope display and read frequency drift directly from the scope display by noting the change in the markers position with time. Each centimeter represents 100 KHz. When reading drift over long periods of time, calibrate the display sweep width to 5 MHz, using the 1 MHz harmonic marker. Next turn off the 1 MHz marker and turn on the 50 or 10 MHz harmonic markers. Center a marker on the scope display and read drift as before, except each centimeter now represents 500 KHz.

Maximum allowable drift is indicated in paragraph 1.2 (see note 3).

5.3.9 RESIDUAL FM CHECK

Readjust SWEEP WIDTH to produce a calibrated frequency display of exactly 1 MHz for a 10 cm display. Adjust the FREQUENCY (fine) control to center one of the 1 MHz harmonic markers on the scope display. Increase the horizontal sensitivity by a factor of ten. Use the horizontal step V/cm control only and do not turn the horizontal vernier control as this would change the calibration. The display is now calibrated to indicate 10 KHz/cm.

Residual FM can be read directly on the scope display by noting the amount of jitter of the marker.

Change the SWEEP TIME from LINE to the 0.1-0.01 position and again read the marker jitter. Any additional jitter in this position represents the line related residual. Maximum allowable jitter is indicated in paragraph 1.2.

5.3.10 SPURIOUS SIGNAL CHECK

Checking for spurious signal content is not normally required for periodic calibration, only for incoming inspection. The only practical way to measure spurious signal content is with a high quality spectrum analyzer covering from 10 MHz to at least two times the upper frequency range of the unit to be checked. The spurious check is made in accordance with the instructions furnished with the particular spectrum analyzer being used.

The specifications for spurious signal content is listed in paragraph 1.2.

The hetrodyning method of generating the output signal in the model 1001A and 1002 will give non-harmonically related spurious signals in addition to the harmonically related signals. These signals are typically 40 to 50 dB below the output signal and should increase to no more than the specifications listed in paragraph 1.2 near the high end of the frequency range.

5.3.11 ATTENUATOR CHECKS

20dB Vernier: The accuracy of the 20dB vernier can be checked using the power meter while operating the instrument in the CW mode. The initial set-up is the same as in paragraph 5.3.5, Maximum Output Check. Once the maximum output has been checked, continue by reducing the vernier Output control in 1dB increments until the minimum vernier Output has been reached. The power meter reading at each 1dB increment should be within ±.5dB of the indicated Output plus the error at maximum output. If desired, the 20dB vernier can be checked at other frequencies. Overall accuracy is ±.5dB to 500 MHz, ±1dB to 1000 MHz, and ±2dB to 1400 MHz. This error is contributed by the vernier and does not include the basic flatness error at maximum Output.

70dB Attenuator: The accuracy of the step attenuator can be measured by using a suitable Attenuation Test Set or by directly substituting precision RF attenuator pads for each 10dB step of the attenuator. The difference between the two outputs represents the attenuator error. An RF detector can be used to recover the signal at levels down to approximately −40dBm. Below this level an RF amplifier or sensitive receiver (spectrum analyzer) must be used. Allowability error is ±0.5dB to 500 MHz, ±1dB to 1000 MHz, and ±2dB to 1400 MHz. This error is that produced by the step attenuator alone and does not include the basic flatness or the vernier attenuator error.

5.3.12 SWEEP TIME CHECK (Horizontal Output Check)

Connect the horizontal output of the sweep generator to the oscilloscope vertical input. Adjust the oscilloscope controls for an internally generated, automatic, line triggered sweep of 2 ms/cm and a vertical sensitivity of 2V/cm. Adjust the sweep generator SWEEP TIME selector to LINE lock and ensure that the PULL/TRIG switch is pushed in. Adjust the oscilloscope vertical position, horizontal position, and trigger level to obtain the waveform shown in figure 5-6.

Adjust the sweep generator SWEEP TIME selector to .1-.01 position. Ensure that the VARIABLE MANUAL control is fully clockwise. The wait time should disappear and the sweep time should be less than 10ms with approximately equal sweep time and retrace time periods. Adjust the oscilloscope time base to 50ms/cm. Adjust the sweep generator VARIABLE/MANUAL control fully counterclockwise. The sweep time should be more than 100ms with approximately a 10:1 ratio between the sweep and retrace time periods.

NOTE: The retrace time period remains constant within any one SWEEP TIME range setting and the VARIABLE/MANUAL control varies the sweep time period. With the VARIABLE/MANUAL control fully clockwise the sweep and retrace times are both approximately 0.01 seconds. With the control fully counterclockwise the sweep time becomes approximately 0.1 seconds and the retrace time remains 0.01 seconds. On the next lower range (1-.1) the retrace time would remain 0.1 sec. and the sweep time would vary from 0.1 to 1 seconds.

Repeat these checks for the 1-.1, 10-1, and 100-10 sec positions of SWEEP TIME selector switch. Adjust oscilloscope time base as necessary to ensure that the VARIABLE/MANUAL control will adjust the sweep time from faster than the maximum to slower than the minimum specifications for each range.

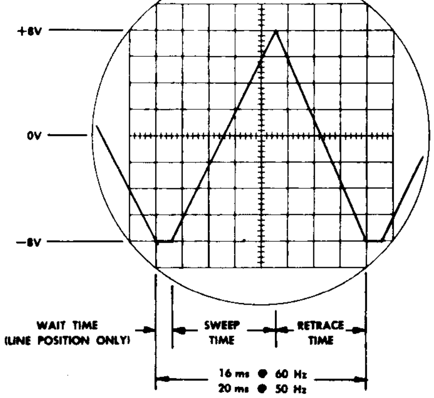


Figure 5-6. Scope Horizontal Output

Adjust the SWEEP TIME selector to MANUAL and adjust the VARIABLE/MANUAL throughout its range. A DC voltage should be present that is variable from −8V, ±0.5V with the control fully counterclockwise to +8V, ±0.5V with the control fully clockwise.

Adjust the SWEEP TIME selector to the .1-.01 position and pull the PULL/TRIG switch. The sweep should now be disabled. Each depression of the front panel TRIG switch should produce one complete sweep cycle.

NOTE: The triggered mode of operation is only possible in the variable rate positions and will not operate in the LINE lock position of the SWEEP TIME selector.

5.3.13 MARKER SYSTEM CHECK

Connect the equipment as outlined in par 5.3.1. The following check is for a harmonic marker. Specifications, with the exception of spurious markers are the same for either single frequency or harmonic type markers and the procedure for verification of performance does not differ.

Single frequency markers should have no spurious markers throughout the swept range. Harmonic type markers may or may not have small spurious markers at one half or one third the specified marker interval.

MARKER SIZE

Observe the markers and ensure they are of equal amplitude throughout the range.

Set the oscilloscope vertical gain to 2V/cm and adjust the MARKER SIZE control fully clockwise. The markers should be approximately 1V peak to peak in amplitude. Adjust the MARKERS SIZE control fully counterclockwise and set the oscilloscope vertical gain to 5mV/cm. The markers should be less than 1mV peak to peak in amplitude. Remove the sweep generator's bottom cover and position the marker CLAMP switch to its clamp position. (This slide switch is located directly behind the front panel DEMOD IN connector. Normal position is with slide lever toward center of instrument, the clamp position is with slide lever toward the right side panel.) Positive rectified markers should be present for use with X-Y recording instruments. The amplitude will be dependent on the output impedance of the RF detector being used. The amplitude should be adjustable from approximately 6V maximum to 1mV minimum with a detector impedance of 1 meg ohm, or from 0.5V to 1mV with a detector impedance of 0 ohms. NOTE: The sweep width must be decreased or the sweep time increased to observe the rectified marker. Return the marker clamp switch to its normal position and replace the instrument's bottom cover.

MARKER TILT

Pull the PULL TILT switch out. Adjust the MARKER SIZE control throughout its range and note that the birdy marker is adjustable from a 12V peak to peak vertical marker to a horizontal marker having a size approximately equal to 10% of the horizontal deflection (1cm on a 10cm deflection).

MARKER WIDTH

Return the PULL TILT switch to its "in" position. Turn on the 1MHz markers and adjust the MARKER SIZE control to approximately a 4 cm peak to peak marker. Set the marker width selector to its widest position. Adjust the CENTER FREQUENCY and SWEEP WIDTH controls to calibrate the oscilloscope for a 1 MHz sweep width.

Adjust the CENTER FREQUENCY to center the birdy zero beat on the oscilloscope center graticule line and note that the marker width is approximately 400 kHz wide (each cm equals 100 kHz). Decrease the MARKER WIDTH switch one position and note that the marker is approximately 200 kHz wide. Decrease the MARKER WIDTH switch one position and note that the marker is approximately 100 kHz wide. Decrease the MARKER WIDTH switch to the most narrow position. The marker is now approximately 15 kHz wide.

MARKER ACCURACY

Marker accuracy may be verified by one of several methods. The first method requires a signal generator and a frequency counter covering the desired marker frequency. First adjust the sweep generator's center frequency to the markers frequency and the sweep width to approximately 2 MHz. Connect the output from the signal generator to the EXTERNAL MARKER IN jack, located on the rear panel, and carefully adjust the signal generator for a zero beat with the internally generated birdy marker. Next, connect the signal generator's output to the counter and read the signal generator frequency which is now identical to the internal markers frequency. Allowable error is 0.005% of the marker frequency. The second method uses the counter only but requires the removal of the instrument and marker module covers. Probe the marker box with the input lead from the counter until sufficient signal is picked up to provide a counter reading.

The highest crystal frequency used is approximately 50 MHz. Markers above this frequency use harmonics of the crystal frequency. Again the allowable error is 0.005% of the crystal frequency.

Test equipment for the marker accuracy check is not listed in the recommended test equipment chart since the requirements vary with the method and the specific markers installed in the unit. Also, the inherent stability of the quartz crystal makes a marker accuracy check unnecessary in all but the most critical applications.

5.3.14 EXTERNAL PROGRAMMING

External programming inputs are not normally checked during incoming inspection unless these special functions are to be used in a particular application. The external programming circuits are covered in section 3 under Operating Instructions. If it is necessary to check these functions at incoming inspection, reference can be made to that section of the manual for complete setup instructions.

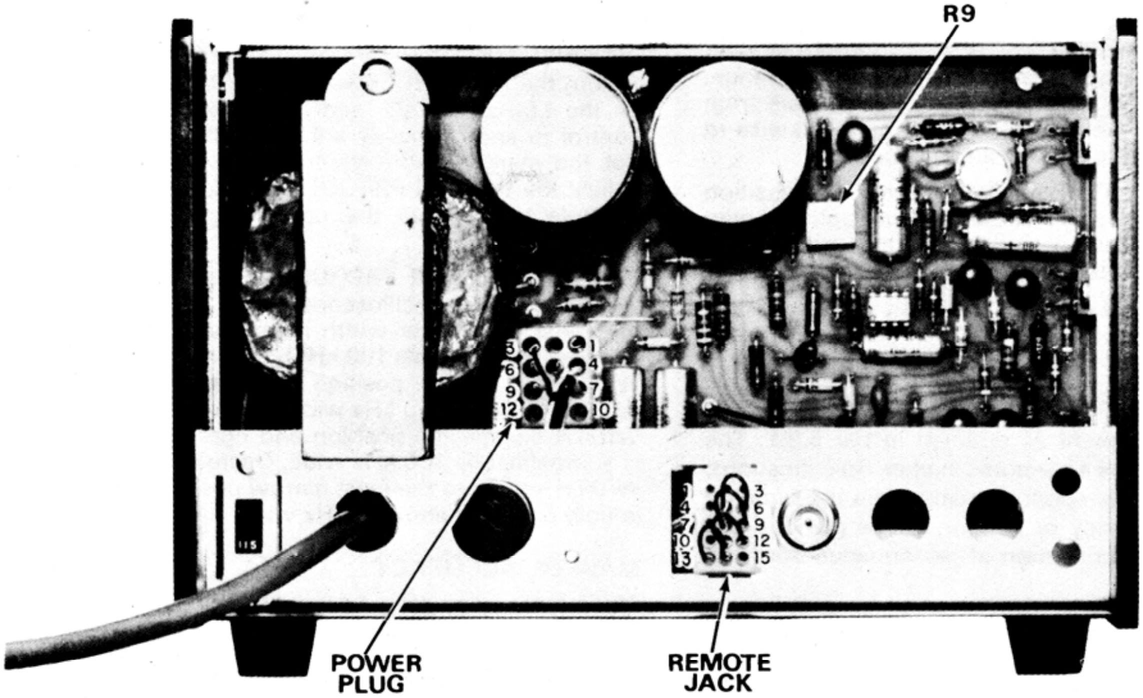


Figure 5-7. Power Supply

5.4. CALIBRATION PROCEDURE

Remove top cover, bottom cover, and the M2G module. Install the module extender into the M2G socket. Remove the cover from the M2G module and then install the module into the module extender (this provides access to the adjustment potentiometers in the module).

In general, calibration must be performed in the sequence given. Refer to figure 5-7, 5-8, 5-9 and 5-14 for adjustment and test points.

5.4.1. +18 VOLT ADJUSTMENT

Connect the digital voltmeter to the +18 volt supply, pin 6 on the power plug and adjust R9 to produce +18V, ±10mV. (See figure 5-7).

5.4.2 −18 VOLT CHECK

Connect the digital voltmeter to the −18 volt supply, pin 4 on power plug. The reading must be −18 volts, ±50mV.

5.4.3 −20 VOLT CHECK

Connect the digital voltmeter to the 20 volt supply, pin 5 on the power plug. The reading must be −20 volts, ±0.3V.

5.4.4 −16 VOLT CHECK, **CAUTION:** The + and −16 Volt supplies are not short circuit protected.

Connect the digital voltmeter to the −16 volt supply, pin 3 of the remote jack. It must read −16 volts, ±0.1 volt. (Record reading).

5.4.5 +16 VOLT ADJUSTMENT

Connect the digital voltmeter to the +16 volt supply, pin 2 of the remote jack. Adjust R42 (see figure 5-8) to obtain exactly the same voltage, but of opposite polarity, as recorded for the −16 volt supply in paragraph 5.4.4.

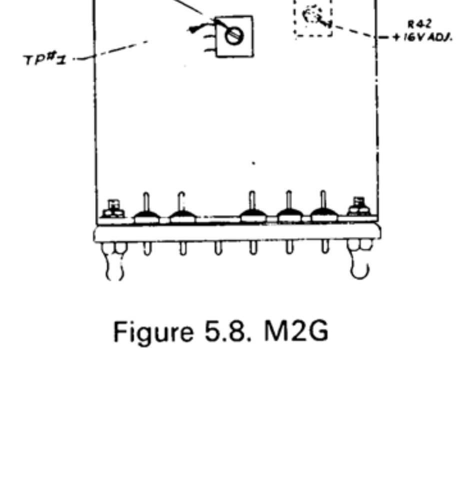


Figure 5.8. M2G

5.4.6 SWEEP RATE ADJUSTMENTS—MODULE M1H
Set Front Panel controls as shown in Figure 5-9. Connect the scope vertical input to the output of the rate generator, pin 10 of the REMOTE jack, and adjust the scope vertical and horizontal time base controls to produce a stable pattern similar to Figure 5-10. Adjust M1H CENT control to obtain an output symetrical about zero volts and the M1H SIZE control to obtain the 32 volt, peak-to-peak, amplitude.

See figure 5-9 for control locations.

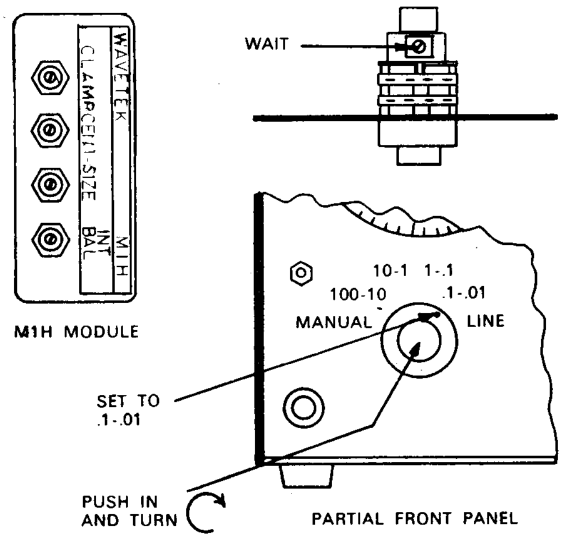


Figure 5-9. M1H Adjustments

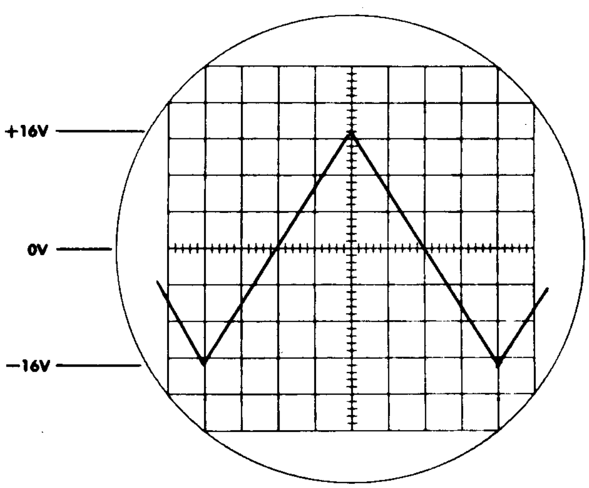


Figure 5-10. M1H Center and Size Adjustment

These adjustments should be made as precisely as possible. The + and −16 volt references available at pin 2 & 3 of the remote jack can be used to check the accuracy of the vertical calibration of the oscilloscope.

Next, set the Front Panel VAR/MANUAL control fully CCW and adjust the M1H INT/BAL to produce a sweep time of 0.12 seconds. See Figure 5-11.

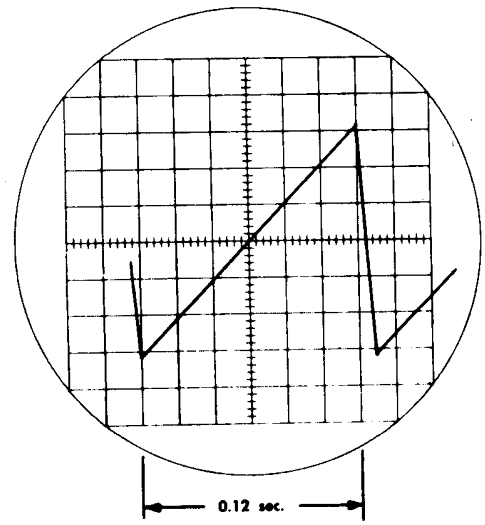


Figure 5-11. M1H Internal Balance Adjustment

Then set the Front Panel SWEEP TIME to LINE and adjust the M1H CLAMP control to clamp the negative going peak of the M1H output to −16 volts. See Figure 5-12.

Finally, adjust the WAIT control, mount on rear of the SWEEP TIME switch assembly, (see Figure 5-9) until the wait time as shown in Figure 5-12 is approximately 1 millisecond.

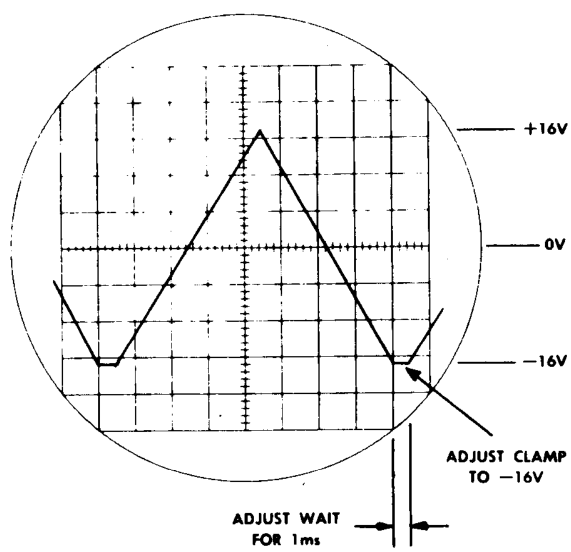


Figure 5-12. M1H Clamp and Wait Adjustment

5.4.7 SWEEP DRIVE ADJUSTMENTS—Module M2G

Connect the scope vertical input to test point #1 in the M2G module (see figure 5-8). Set the front panel frequency control (coarse) to produce 0V at pin 5 of the module. The center frequency dial must read the exact center frequency of the instrument, for example 150 MHz for model 1001A. If not, loosen the set screw holding the frequency dial to its shaft and reposition. Next, see the frequency (vernier) control to produce −8V at pin 8 of the module. The indicator line on the frequency (vernier) must be pointing toward the frequency indicator. If not, loosen screw and reposition. Next, set the front panel sweep width control completely counter-clockwise (CW position) and adjust R4 to produce 0V at test point #1. Then adjust R25 to produce 0V at pin 9 of the module. Next set the front panel sweep width control to maximum (completely clockwise) and adjust R13 to produce a 28V peak to peak signal at test point #1.

Without disturbing the Front Panel CENT FREQ or SWEEP WIDTH adjustments return the scope to an X-Y operating mode with the HORIZ OUTPUT of the sweep generator driving the scope X input. Set the SWEEP TIME to .1-01 sec and adjust the SCOPE display width to 11cm (0.5cm overlap on each end). See figure 5-13a.

Connect the scope "Y" input to M2G test point #2. (Linearity correcting resistors may or may not be connected to the diode depending on the inherent linearity of the sweep oscillator). Adjust M2G, R15, to position the "knee" approximately 2/3cm to the left of the 10cm mark, as shown in Figure 5-13b. Turn off the AC power and remove the module extender, replace the M2G cover and reinstall the M2G module into the instrument. Make sure the hold-down screw is replaced and tightened.

5.4.8 LEVEL MIN AND MAX ADJUSTMENT—Modules M9— and M10—

The level MIN and MAX controls are located on top of the M10 module for models 1001A and 1002 and on top of the M9 module for models 1003, 1004 and 1005. The adjustment procedure is the same regardless of location. Preset the front panel controls as follows:

Frequency (coarse) to

100 MHz for model 1001A
300 MHz for model 1002
500 MHz for model 1003
700 MHz for model 1004
1000 MHz for model 1005

Set the sweep width control to its CW position (completely counterclockwise).

MODELS 1001A, 1002 and 1003

These models have a maximum output of +13dBm while the recommended power meter HP432A has a maximum input of only +10dBm. Therefore, a 10dB pad is inserted into the RF output system by setting the outer OUTPUT knob to read zero dB. The inner OUTPUT vernier knob is adjusted to its maximum output position and indicates an output of +3dBm. Set the power meter range selector to the +5dBm scale, connect the thermistor mount to the sweep generator RF output connector and adjust the LEVEL MAX control to produce a +3dBm reading on the power meter.

Next turn the output vernier to its minimum output position which indicates a vernier dial reading of −17dBm. Change the power meter range selector to the −15dBm scale and then adjust the LEVEL MIN control to produce a power meter reading of −17dBm. Some interaction exists between the LEVEL MIN and LEVEL MAX controls so repeat the adjustments until both the MAX and MIN readings are obtained.

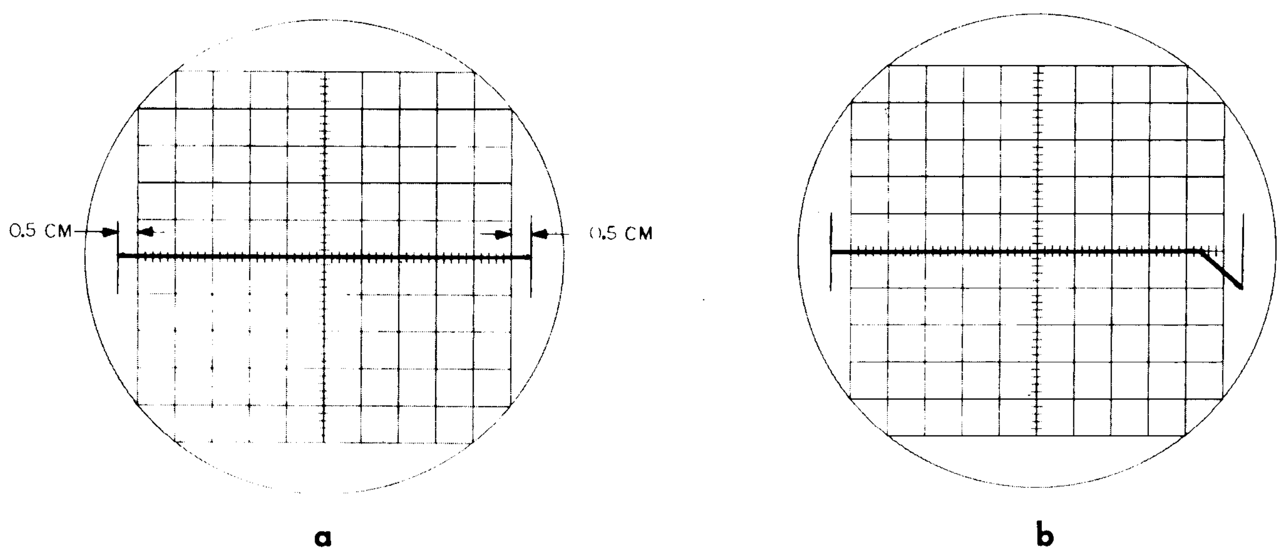


Figure 5-13. Linearity **Ref** Adjustment

MODELS 1004 and 1005

These models have a maximum output of +10dBm which is within the range of the power meter. Therefore, the OUTPUT control outer knob can be set for the maximum output of +10dBm. The inner OUTPUT vernier is set for maximum output (zero dial reading). Set the power meter range selector to the +10dBm scale, connect the thermistor mount to the sweep generators RF output connector and adjust the LEVEL MAX control to produce a +10dBm reading on the power meter.

Next turn the output vernier to its minimum output position which indicates a vernier dial reading of −20dBm. Change the power meter range selector to the −10dBm scale and adjust the LEVEL MIN control to produce a power meter reading of −10dBm. Some interaction exists between the LEVEL MIN and LEVEL MAX controls so repeat the adjustments until both the MAX and MIN readings are obtained.

75 OHM INSTRUMENTS

To adjust the level MIN and MAX controls on instruments with output impedance of 75 ohms, insert a minimum loss matching pad between the 75 ohm output of the instrument and the 50 ohm input of the power meter. Adjust as before except adjust to the power meter reading shown below.

MODELS 1001A, 1002 & 1003	Output	Power Meter Reading
Level Max	+60dBmV	+5.5dBm
Level Min	+40dBmV	−14.5dBm
MODEL 1004		
Level Max	+57dBmV	+2.5dBm
Level Min	+37dBmV	−17.5dBm

5.4.9 CENTER FREQUENCY ADJUSTMENT—M9—

Connect the Sweep Generator, Scope and RF Detector as shown in the typical set-up, figure 5-4. Preset the front panel controls as follows:

Frequency (*coarse*) adjust to exact center frequency of the instrument.
Frequency (*fine*) adjust line on control knob to point toward frequency indicator. Set the sweep width control to its maximum clockwise position.
Set the RF Output controls for maximum output and the sweep time control to line position. Turn on the highest frequency harmonic marker and adjust marker width to wide and marker size for a display similar to that of figure 5-5. Locate the harmonic marker corresponding to the exact center frequency of the instrument (count up from ther zero lock-in point on models 1001A and 1002. Use an external CW signal generator and the external marker generating circuit to identify the proper harmonic marker on models 1003, 1004 and 1005). Adjust the M9- centering control to position this marker to the exact center of the display. Gradually reduce the front panel Sweep Width control to minimum while readjusting the M9 centering control to maintain the marker centered on the display.

5.4.10 SWEEP WIDTH ADJUSTMENT—M2G

With the unit operating as set-up in paragraph 5.4.9, Reposition the *Frequency* (*coarse*) control to indicate the lowest frequency, make sure the *Frequency* (*fine*) control is not disturbed. Return the front panel Sweep Width control to its maximum clockwise position and locate the harmonic marker corresponding to the low frequency limit of the instrument (for models 1001A and 1002 the low frequency limit is indicated by the zero frequency lock-in point and not the harmonic marker). Adjust the sweep width limit pot on top of the M2G module to position the marker, or zero frequency lock-in point, to the exact center of the display. Gradually reduce the front panel Sweep Width control to minimum while readjusting the M2G sweep width limit control to maintain the marker centered on the display.

5.4.11 SWEEP SAMPLE ADJUSTMENT—Module M5G

Connect the RF detector to the SWEEP SAMPLE OUT Jack of the module, using the adapter cable supplied in the service kit, and adjust the SWEEP SAMPLE ADJ. to produce a detected output of approximately 35 millivolts.

5.4.12 MARKER SIZE ADJUSTMENT—Module M6

Each marker module has a SIZE adjustment potentiometer which is accessible from the under side of the sweep generator, when the bottom cover is removed. (See Figure 5-2). The control is adjusted until a staurated marker is obtained on the scope display when operating the unit as shown in the typical set-up, Figure 5-4. A saturated marker is obtained when a further increase in the marker modules SIZE adjustment does not increase the marker amplitude on the scope display. Increasing the size adjustment beyond this point will result in spurious markers on the display.

5.5 TROUBLESHOOTING

Trouble shooting is generally a systematic procedure of "divide and conquer." A thorough understanding of the block diagram and circuit description located in Section 4 of this manual will enable the trouble symptom to be associated with a particular module. Once this has been accomplished the module can be replaced or trouble shot with the aid of the module schematic. A problem in a power supply often causes many symptoms pointing to other areas and should be checked when the symptom does not clearly indicate a specific problem. The +18, −18, and −20V supplies are located on the rear chassis printed circuit board and the +16 and −16 reference voltage supplies are located in the M2G module. Performance of these supplies are indicated in the calibration procedure.

5.5.1 TROUBLE SHOOTING HINTS

The following is a list of several typical symptoms followed by the probable cause or a trouble shooting procedure.

INTERMITTENT OPERATION OF ANY TYPE—Defective module pin sockets or loose RF cables.

NO RF OUTPUT—Defective attenuator or RF cables connecting to the input or output of the attenuator.

RF OUTPUT NOT FLAT—Most common cause is the external RF detector being defective. Another is the monitor diode located in the M9R, S and T modules. This is a point contact diode and can be damaged if the RF output is momentarily connected to a B+ voltage. A good monitor diode will produce a negative detected voltage approximately twice the amplitude of the external detector. For example, at an RF output of +10dBm an external RF detector will read approximately 0.8V. The internal monitor, will read approximately −1.6V.

FREQUENCY UNSTABLE (JITTER)—Check all modules for loose hold-down screws, especially module M2G. Check the + and −16V reference supplies. Operating the unit in a strong magnetic field, such as setting on top of or adjacent to another instrument containing a large power transformer, can produce 60Hz HUM modulation.

SWEEP RATE PROBLEM—Probable cause is a defective M1H module or wiring to the Front Panel SWEEP TIME selector switch. See the calibration procedure for verifying proper operation.

NO RF SWEEP—First check pin 12 of the M1H module for the presence of a 32V ramp. This ramp indicates proper operation of the M1H. Next check for the ramp at the input of M2G, pin 7. Finally check the output of M2G, at pin 9. It should be similar to the input except it will be lower in amplitude, approximately 12V peak-to-peak, and will have an average value of 0V when the Front Panel center frequency control is set to mid-band. If the M2G output is correct the trouble would probably be in the M9- sweep oscillator module.

MARKER PROBLEMS

To isolate the cause of a marker problem when the symptom does not clearly indicate a specific circuit or component, first check the sweep sample output at the M5G Sweep Sample Out connector. It should be a detected signal between 30 to 50 mV. If the proper sweep sample signal is not present it indicates that the trouble is in the sweep oscillator module or connecting sweep sample cables. Next connect the detector in place of the terminating plug P102.

A signal at this point indicates all jumper cables and RF jacks on the M6 modules are intact. Then check for the birdy output at pin 3 of the marker module. A 10 to 15mV peak-to-peak birdy is sufficient to drive the M5G module and indicates the M6 module is operating properly. With the 15mV peak-to-peak birdy present at the input of the M5G, pins 1, 2, 3 or 4, a 32V peak-to-peak signal will be produced at the output pin 7. This indicates proper operation of the M5G. This output signal at pin 7 is controllable in width by the FRONT PANEL MARKER WIDTH control. The signal is now routed through the Front Panel Marker Size control and to the Rear Panel SCOPE VERTICAL connector. A 12V peak-to-peak signal is normally at this point when the Front Panel SIZE control is set to maximum. A common marker problem is that caused by one of the interconnecting cables between the M6 modules being loose. This causes a notch in the sweep sample input to the module causing uneven harmonic or weak output.

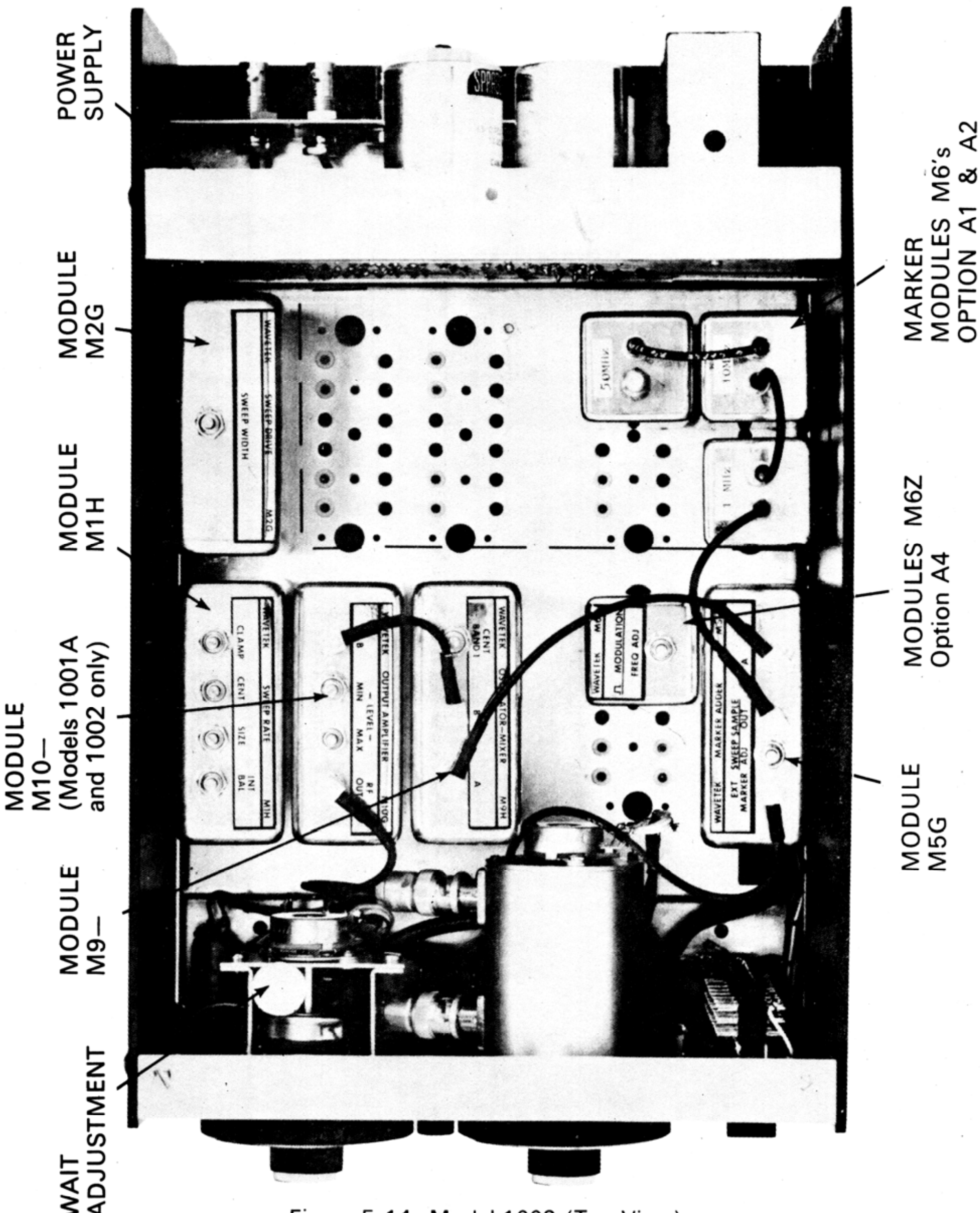


Figure 5-14. Model 1002 (Top View)

SECTION 6
SCHEMATICS AND PARTS LISTS

6.1 INTRODUCTION - This section contains all schematics and a list of replaceable parts for the instrument. In an assembly containing one or more subassemblies, the assembly parts list is divided to separate the subassemblies. The subassembly three-digit circuit reference on the schematic is represented in the REFERENCE SYMBOL column by the last one or two digits. The first digit represents the subassembly on which the part is located. The subassembly (100, 200 . . .) is indicated next to the reference symbol heading. Also included are the Wavetek code for component manufacturer, an explanation of schematic symbols, and a list of abbreviations used in the text.

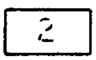
6.2 MANUFACTURER'S CODE - The following code is used on the parts list to identify the manufacturer.

A-B	Allen-Bradley	Milwaukee, Wisconsin
ACI	Advance Components, Inc.	Centerbrook, Connecticut
A-D	Analog Devices	Norwood, Massachusetts
AER	AVX	Myrtle Beach, South Carolina
A-I	Alan Industries	Columbus, Indiana
AIN	Alpha Industries, Inc.	Woburn, Massachusetts
ALC	Alco Electronics Products, Inc.	Lawrence, Massachusetts
AMP	AMP, Inc.	Harrisburg, Pennsylvania
APL	Amphenol	Danbury, Connecticut
A-P	American Plasticraft (APCO)	Chicago, Illinois
APX	Amperex	Slatersville, Rhode Island
ARC	ARCO Electronics	Great Neck, New York
ASE	Airco Speer Electronics	Nogales, Arizona
AVT	Avantek	Santa Clara, California
BEK	Beckman Instruments, Inc.	Fullerton, California
BEL	Belden	Chicago, Illinois
BER	Berg Electronics	New Cumberland, Pennsylvania
BOU	Bourns	Riverside, California
BUS	Bussman	St. Louis, Missouri
CAM	Cambion	Cambridge, Massachusetts
CAR	Carling Electric, Inc.	West Hartford, Connecticut
C-D	Cornell Dubilier	Newark, New Jersey
C-E	Clinton Electronics	Rockford, Illinois
CGW	Corning Glass Works	Corning, New York
CHE	Cherry Electrical Products, Prod.	Waukegan, Illinois
C-H	Cutler-Hammer	Milwaukee, Wisconsin
C-I	Components Incorporated	Biddeford, Maine
C-J	Cinch Jones	Elk Grove Village, Illinois
C-K	C & K Components	Watertown, Massachusetts
CKI	CTS Knight, Inc.	Sandwich, Illinois
C-L	Centralab	Milwaukee, Wisconsin
CLA	Clairex Electronics	Mount Vernon, New York
CTS	Chicago Telephone Systems	Elkhart, Indiana
C-W	C-W Industries	Philadelphia, Pennsylvania
DAL	Dale Technology Corp.	Hartsdale, New York
DEL	Delevan	East Aurora, New York
DIO	Diodes, Inc.	Chatsworth, California
DRA	Drake Mfg. Company	Harwood Heights, Illinois
ETP	Erie Technological Prod., Inc.	Erie, Pennsylvania
FCD	Fairchild	Mountain View, California

G-E	General Electric	Syracuse, New York
G-H	Grayhill	La Grange, Illinois
G-I	General Instrument Semi., Comp,	Hicksville, New York
HEL	Helipot	Anaheim, California
HEY	Heyman Mfg. Company	Kenilworth, New Jersey
HHS	Herman H. Smith, Inc.	Brooklyn, New York
HIT	Hitachi America Ltd.	Chicago, Illinois
H-P	Hewlett-Packard	Palo Alto, California
INT	Intersil, Inc.	St. Palos Heights, Illinois
IRC	International Resistance Co.	Philadelphia, Pennsylvania
ITT	International Telephone and Telegraph	West Palm Beach, Florida
JEF	Jeffers	Dubois, Pennsylvania
JEW	Jewell Electrical Instruments	Manchester, New Hampshire
JON	E.F. Johnson Company	Waseca, Minnesota
KEM	Kemtron Electron Products, Inc.	Newburyport, Massachusetts
KID	Kidco, Inc.	Medford, New Jersey
KIN	Kings	Tuckahoe, New York
KSW	KSW Electronics	Burlington, Massachusetts
LIT	Littelfuse	Des Plaines, Illinois
M-A	Microwave Associates	Burlington, Massachusetts
MAL	Mallory	Indianapolis, Indiana
MDC	Maida Development Co.	Hampton, Virginia
M-E	Mepco/Electra	Mineral Wells, Texas
M-O	Marko-Oak	Anaheim, California
MOL	Molex	Downers Grove, Illinois
MOT	Motorola	Phoenix, Arizona
NAT	National Semiconductor Corp.	Santa Clara, California
NEC	Nippon Electric Company, Limited	Burlingame, California
N-T	National Teltronics	Laredo, Texas
OHM	Ohmite Mfg. Company	Skokie, Illinois
O-S	Omni Spectra, Inc.	Farmington, Michigan
P-B	Potter and Brumfield	Princeton, Indiana
POM	Pomona Electronics Co., Inc.	Pomona, California
Q-C	Quality Components	St. Marys, Pennsylvania
RAY	Raytheon	Burlington, Massachusetts
RCA	RCA	Harrison, New Jersey
RMC	Radio Material Company	Chicago, Illinois
S-C	Specialty Connector	Indianapolis, Indiana
SCC	Stackpole Carbon Co.	St. Marys, Pennsylvania
SEL	Sealectro	Mamaroneck, New York
SEM	Semtech	Newbury Park, California
S-G	Standard Grigsby	Aurora, Illinois
SGM	Sigma	Braintree, Massachusetts
S-I	Switchcraft, Inc.	Chicago, Illinois
SIG	Signetics Corporation	Sunnyvale, California
SPE	Spetrol	City of Industry, California
SPR	Sprague	North Adams, Massachusetts
SSS	Solid State Scientific	Montgomeryville, Pennsylvania
S-T	Sarkes Tarzian	Bloomington, Indiana
STR	Stettner Trush	Cazenovia, New York
SYL	Sylvania	Woburn, Massachusetts
SYS	Syscon International	South Bend, Indiana
THR	Thermalloy, Co.	Dallas, Texas
T-I	Texas Instruments	Dallas, Texas
TRW	TRW Capacitor Division	Ogallala, Nebraska
VAC	VACTEC	Maryland Heights, Missouri
VAR	Varadyne Capacitor Div.	Santa Monica, California
W-E	Wells Electronics	South Bend, Indiana
W-I	Wavetek Indiana, Inc.	Beech Grove, Indiana
WSD	Wavetek, San Diego	San Diego, California
WSR	Wavetek, Santa Rosa	Santa Rosa, California

6.3 SCHEMATIC NOTES - The following notes and abbreviations pertain to all schematics. Additional notes pertaining to specific schematics are included on each schematic if required.

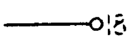
All resistor values are shown in ohms unless otherwise specified.
All capacitor values are shown in picofarads (pF) unless otherwise specified.
All inductor values are shown in microhenries (μH) unless otherwise specified.

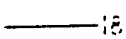


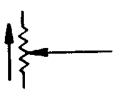
Denotes DC voltage reading in volts unless otherwise specified.

Denotes high impedance crystal detector reading in volts unless otherwise specified.

Denotes 50 ohm crystal detector reading in volts unless otherwise specified.


Signal or voltage source.


Connects to indicated signal or voltage source.

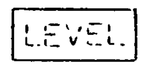

Arrow indicates clockwise rotation of wiper.


Coaxial jack


Coaxial plug


Coaxial cable

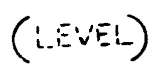

Factory adjusted part.



Denotes a front-panel device.

Denotes a rear-panel device.

Denotes a PC board adjustment or accessible module adjustment.



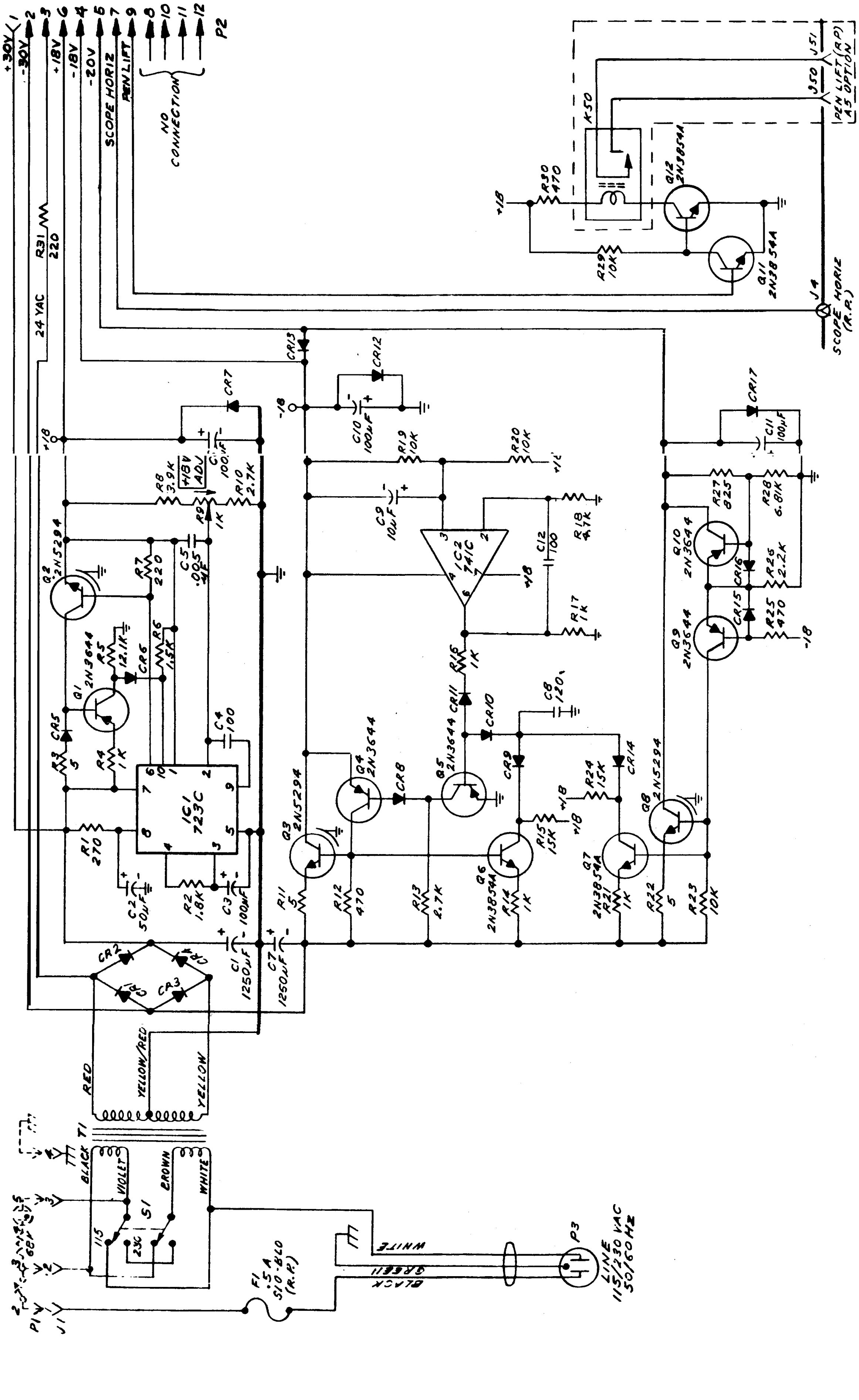
Denotes an internal module adjustment not accessible without removing module cover.

6.4 ABBREVIATION CODE

A	ampere	K	relay	Ω	ohm
AC	alternating current	kHz	kilohertz	P	plug
C	capacitor	kΩ	kilohm	pp	peak-to-peak
CR	diode	kV	kilovolt	pF	picofarad
dB	decibel	kW	kilowatt	Q	transistor
dBm	decibel referred to 1 mW	L	inductor	R	resistor
dBmV	decibel referred to 1 mV	MHz	megahertz	RF	radio frequency
DC	direct current	MΩ	megohm	RMS	root-mean-square
DS	indicating device, lamp	μF	microfarad	R.P.	rear panel
F	farad	μA	microampere	S	switch
F.P.	front panel	μH	microhenry	T	transformer
H	henry	M	meter	TP	test point
Har	harmonic	mA	milliampere	V	volt
Hz	hertz	mH	millihenry	VA	voltampere
IC	integrated circuit	mV	millivolt	W	watt
IF	intermediate frequency	mW	milliwatt	X	crystal
J	jack				

SCHEMATIC, PS6 POWER SUPPLY

REV. D



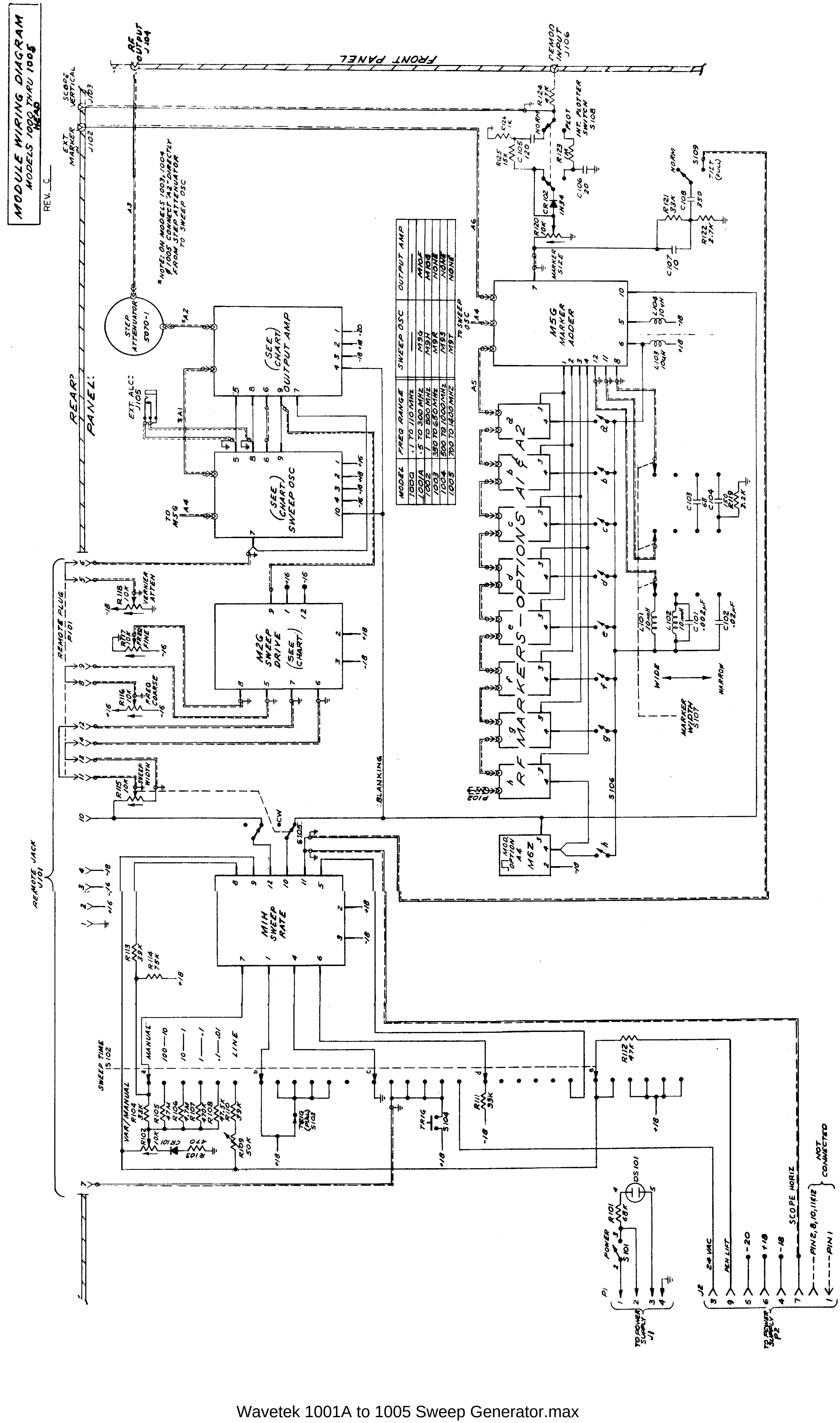
PARTS LIST PS6 POWER SUPPLY REV. D

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"Q "	TRANSISTORS				
1,4,5,9,10	PNP, Silicon	QA036-440	FCD	2N3644	5
2,3,8	NPN, Silicon	QA052-940	RCA	2N5294	3
6,7,11,12	NPN, Silicon	QA038-541	G-E	2N3854A	4
	---- PARTS MOUNTED ON CHASSIS, AND MISCELLANEOUS PARTS----				
"J "	CONNECTORS (JACKS)				
1	4-pin receptacle	MC000-034	MOL	1625-4R-1	1
----	Contact, female, for above	MC000-018	MOL	1855	4
4	BNC, receptacle	JB109-111	APL	UG911A/I	1
"P "	CONNECTORS (PLUG)				
3	AC Plug/cord assembly (USA-Canada)	WL002-088	BEL	17237	1
	AC Plug/cord assembly (Western Europe)	WL007-088	BEL		
"F "	FUSES				
1	.5 Amp., slo-blo (used with 115Vac line)	MF000-007	BUS	MDV½	1
	.25Amp., slo-blo (used with 230Vac line)	MF000-006	BUS	MDV¼	--
	Fuse holder, for above	MF000-001	BUS	HMM	1
"S "	SWITCHES				
1	DPDT, slide, power change	SS000-003	S-I	46256LFE	1
	MISCELLANEOUS				
	Bushing, strain relief	HB104-000	HEY	SR5P1	1
	10 lead, TO-5 pad	HQ103-000	THR	7717-21DAP	1
	Insulated sholder washer	HW110-400	RCA	DF137A	3
	Transistor mtg. insulator, mica	HQ101-003	W-I	HQ101-003	3
	---- PARTS FOR PEN LIFT OPTION A5 ----				
"J "	CONNECTORS (JACKS)				
50,51	Binding post, miniature, .104ID (mates with wire, or banana plug)	MC000-038	POM	2439	2
"K "	RELAYS				
50	SPST, N.O. 12V	MR000-001	P-B	JRM1006	1

PARTS LIST PS6 POWER SUPPLY

REV. D

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
------------	----PARTS MOUNTED ON PRINTED CIRCUIT BOARD	----------	-----	--------------	--
"C "	CAPACITORS				
1,7	Electrolytic, 1250uF, 50V	CE114-212	SPR	PCL-1339	2
2	Electrolytic, 50uF, 50V	CE107-050	SPR	TE1307	1
3,6,10,11	Electrolytic, 100uF, 25V	CE105-110	SPR	TE1211	4
4,12	Ceramic disc., 100pF ±20% 1kV	CD102-110	SPR	5GA-T10	2
5	Ceramic disc., .005uF ±20%	CD103-250	SPR	TG-D50	1
8	Ceramic disc., 120pF ±20% 1kV	CD102-112	SPR	5GA-T12	1
9	Electrolytic, 10uF, 25V	CE105-010	SPR	TE1204	1
"P "	CONNECTORS (PLUGS)				
2	12-pin printed circuit	MC000-031	MOL	03-04-4121	1
"CR "	DIODES				
1 to 17	Silicon, junction, 100piV, 3/4A	DR000-001	ITT	1N4002	17
"IC "	INTEGRATED CIRCUITS				
1	Voltage Regulator, 10 pin TO-5	IC000-001	FCD	U5R7723393	1
2	Operational amplifier, 8 pin in line	IC000-002	SIG	N5741V	1
"R "	RESISTORS				
1	Fixed, comp., 270ohm ±10% ¼W	RC104-127	A-B	CB2711	1
2	Fixed, comp., 1.8k ±10% ¼W	RC104-218	A-B	CB1821	1
3,11,22	Fixed, deposited carb., 5ohm ±1% ¼W	RD0R-050	K1D	K-C¼	3
4,14,21	Fixed, deposited carb. 1k ±1% ¼W	RD011-100	COR	RN60D	3
5	Fixed, deposited carb., 12.1k ±1% ¼W	RD012-121	COR	RN60D	1
6	Fixed, comp., 1.5k ±10% ¼W	RC104-215	A-B	CB1521	1
7	Fixed, comp., 220ohm ±10% ¼W	RC104-122	A-B	CB2211	1
8	Fixed, comp., 3.9k ±5% ¼W	RC103-239	A-B	CB3925	1
9	Variable, cermet, 1k ±20%	RP131-210	CTS	360T102B	1
10	Fixed, comp., 2.7k ±5% ¼W	RC103-227	A-B	CB2725	1
12,25	Fixed, comp., 470ohm ±10% ¼W	RC104-147	A-B	CB4711	2
13	Fixed, comp., 2.7k ±10% ½W	RC106-227	A-B	EB2721	1
15,24	Fixed, deposited carb., 15k ±1% ¼W	RD012-150	COR	RN60D	2
16,17	Fixed, comp., 1k ±10% ¼W	RC104-210	A-B	CB1021	2
18	Fixed, comp., 4.7k ±10% ¼W	RC104-247	A-B	CB4721	1
19,20	Dep. carb., 10k, matched set, ±.1%	RX000-003	W-I	RX000-003	1
23,29	Fixed, comp., 10k ±10% ¼W	RC104-310	A-B	CB1031	2
26	Fixed, comp., 2.2k ±10% ½W	RC106-222	A-B	EB2221	1
27	Fixed, deposited carb., 825ohm ±1% ¼W	RD010-825	COR	RN60D	1
28	Fixed, deposited carb., 6.81k ±1% ¼W	RD011-681	COR	RN60D	1
30	Fixed, comp., 470ohm ±10% ½W	RC106-147	A-B	EB4711	1
31	Fixed, comp., 220ohm ±10% ½W	RC106-122	A-B	EB2211	1
"T "	TRANSFORMERS				
1	115/230 X 48 Vac, center tapped	TT000-022	W-I	TT000-022	1



MODULE WIRING DIAGRAM
MODELS 1000 THRU 1005
REV. C
FRONT PANEL
REAR PANEL
RF OUTPUT J104
DEMOD INPUT J106
SCOPE VERTICAL J103
EXT MARKER J102
EXT. ALC J105
STEP ATTENUATOR 5070-1
*NOTE: ON MODELS 1003, 1004 & 1005 CONNECT 'A2' DIRECTLY FROM STEP ATTENUATOR TO SWEEP OSC
(SEE CHART) OUTPUT AMP
(SEE CHART) SWEEP OSC
M5G MARKER ADDER
M2G SWEEP DRIVE (SEE CHART)
M1H SWEEP RATE
M6Z MOD OPTION A4
RF MARKERS-OPTIONS A1 & A2
MARKER SIZE
INT. PLOTTER SWITCH S108
MARKER WIDTH S107
WIDE
NARROW
REMOTE PLUG P101
REMOTE JACK J101
SWEEP TIME S102
VAR/MANUAL
MANUAL
LINE
BLANKING
TILT (PULL)
NORM
PLOT
POWER S101
DS101
TO POWER SUPPLY J1
TO POWER SUPPLY P2
24 VAC
PEN LIFT
SCOPE HORIZ
NOT CONNECTED
MODEL | FREQ RANGE | SWEEP OSC | OUTPUT AMP
1000 | .1 TO 110 MHz | — | —
1001A | .5 TO 300 MHz | M3G | M10F
1002 | 1 TO 500 MHz | M9H | M10B
1003 | 350 TO 650 MHz | M9R | NONE
1004 | 500 TO 1000 MHz | M9S | NONE
1005 | 700 TO 1400 MHz | M9T | [illegible]

PARTS LIST

MODELS 1000 thru 1005 HEAD REV. C

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
	STANDARD MODULES				
M1H	Sweep Rate Module	M1H	W-I	M1H	1
M2G	Sweep Drive Module	M2G	W-I	M2G	1
M5G	Marker Adder Module	M5G	W-I	M5G	1
M9___	Oscillator/Mixer Module (See Diagram)	M9___	W-I	M9___	1
M10___	Output Amplifier Module (See Diagram)	M10___	W-I	M10___	1
	OPTIONS				
A1	Single frequency marker, 1 to 1400 MHz (specify frequency)	M6S___	W-I	M6S___	
A2	Harmonic markers 1, 10 & 50 MHz (specify frequency)	M6H___	W-I	M6H___	
A4	1 KHz Square Wave Modulation	M6Z	W-I	M6Z	
A5	(See Power Supply Parts List)	---	---	---	
"A "	ASSEMBLIES				
1	RF Cable, 50 ohm	WX1000-A1	W-I	WX1000-A1	1
2	RF Cable, 50 ohm	WX1000-A2	W-I	WX1000-A2	1
3	RF Cable, 50 ohm	WX1000-A3	W-I	WX1000-A3	1
4	RF Cable, 50 ohm	WX1000-A4	W-I	WX1000-A4	1
5	RF Cable, 50 ohm	WX1000-A5	W-I	WX1000-A5	1
6	RF Cable, 50 ohm	WX1000-A6	W-I	WX1000-A6	1
-----	S102 Assembly with Associated Parts	B500-227	W-I	B500-227	1
-----	S107 Assembly with Associated Parts	B500-181	W-I	B500-181	1
5070-1	RF Attenuator	5070-1	W-I	5070-1	1
"C "	CAPACITORS				
101	Ceramic disc., .002uF $\pm$10% 1kV	CD102-220	SPR	5GAD20	1
102	Ceramic disc., .02uF $\pm$10% 100V	CD103-320	SPR	TGS20	1
103	Ceramic disc., 68pF $\pm$5% 1kV	CD104-068	SPR	10TCUQ68	1
104	Ceramic disc., 150pF $\pm$20% 1kV	CD102-115	SPR	5GAT15	1
105	Ceramic disc., 120pF $\pm$20% 1kV	CD102-112	SPR	5GAT12	1
106	Ceramic disc., 20pF $\pm$5% 1kV	CD101-020	SPR	10TCCQ20	1
107	Ceramic disc., 10pF $\pm$5% 1kV	CD101-010	SPR	10TCCQ10	1
108	Ceramic disc., 350pf $\pm$20% 1kV	CD102-135	SPR	5GAT35	1
"J "	CONNECTORS (JACKS)				
2	12-pin receptacle	MC000-030	MOL	1360-R1	1
	Contact, female, for above	MC000-032	MOL	1433	6
	Contact, male, for above	MC000-033	MOL	1434	1
101	15-pin receptacle	MC000-016	MOL	1625-15R	1
	Contact, female, for above	MC000-018	MOL	1855	14
102,103,104	BNC, Cable	JB000-003	W-I	JB000-003	3
105	Phone, receptacle, submin. (mates with Switchcraft "750" plug)	MC000-036	S-I	142A	1
106	BNC, receptacle	JB109-111	APL	UG911A/U	1
-----	Pin Socket, Teflon	MC000-002	W-I	MC000-002	--

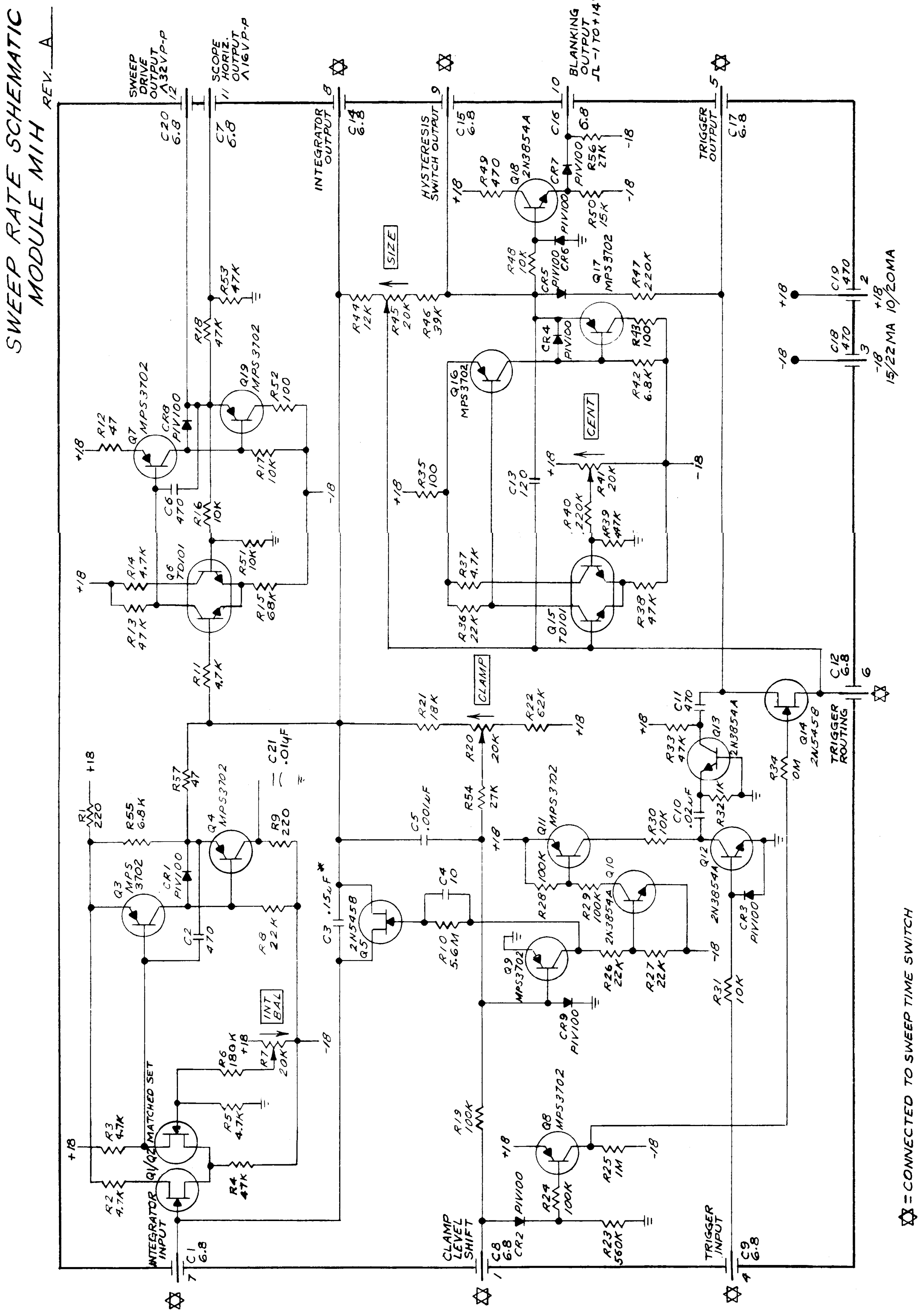
PARTS LIST Models 1000 thru 1005

REV C

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"P "	CONNECTORS (PLUGS)				
1	4-pin	MC000-035	MOL	1625-4P1	1
	Contact, male, for above	MC000-019	MOL	1854	4
101	15-pin	MC000-017	MOL	1625-15P	1
	Contact, male, for above	MC000-019	MOL	1854	8
102	Termination	JF000-009	SEL	60-0010501	1
"CR "	DIODES				
101	Silicon, junction, 100piV, 75omA	DR000-001	ITT	1N4002	1
102	Germanium, point contact	DG100-341	SYL	1N34AS	1
"DS "	LAMPS				
101	Indicator, Neon, Parts of S101	MB000-002	M-0	A1H	1
"L "	INDUCTORS				
101,102	Fixed, 10mH	LA104-310	JEF	15S	2
103,104	Fixed, 10uH	LA101-010	JEF	15	2
"R "	RESISTORS				
101	Fixed, comp., 68kohm±10% ¼W	RC104-368	A-B	CB6831	1
102	Variable, 10kohm, part of S103 assembly	----------	---	------	--
103	Fixed, comp., 470ohm±5% ¼W	RC103-147	A-B	CB4715	1
104,111	Fixed, comp., 33kohm±5% ¼W	RC103-333	A-B	CB3335	2
105	Fixed, comp., 47Mohm±5% ¼W	RC103-647	A-B	CB4765	1
106	Fixed, comp., 4.7Mohm±5% ¼W	RC103-547	A-B	CB4755	1
107	Fixed, comp., 470kohm±5% ¼W	RC103-447	A-B	CB4745	1
108	Fixed, metal film 47.5kohm±1% ¼W	RF012-475	COR	RN60D	1
109	Variable, cermet, 50kohm±20% 1W	RP129-350	CTS	360S503B	1
110,113	Fixed, comp., 39kohm±5% ¼W	RC103-339	A-B	CB3935	2
112	Fixed, comp., 47kohm±5% ¼W	RC103-347	A-B	CB4735	1
114	Fixed, comp., 75kohm±5% ¼W	RC103-375	A-B	CB7535	1
115	Variable, carbon 10kohm	RP132-310	W-I	RP132-310	1
116	Variable, carbon 10kohm	RP900-004	W-I	RP900-004	1
117	Variable, carbon 10kohm	RP123-310	W-I	RP123-310	1
118	Variable, carbon 10kohm	RP128-310	W-I	RP128-310	1
119	Fixed, comp., 2.2kohm±10% ¼W	RC104-222	A-B	CB2221	1
120	Variable, carbon 10kohm,part of S107	---------	---	------	--
121	Fixed, comp., 33kohm±10% ¼W	RC104-333	A-B	CB3331	1
122	Fixed, comp., 2.7Kohm±10% ¼W	RC104-227	A-B	CB2721	1
123	Fixed, comp., 1Mohm±10% ¼W	RC104-510	A-B	CB1051	1
124	Fixed, comp., 47kohm±10% ¼W	RC104-347	A-B	CB4731	1
125	Fixed, comp., 15kohm±10% ¼W	RC104-315	A-B	CB1531	1
126	Fixed, comp., 1kohm±10% ¼W	RC104-210	A-B	CB1021	1
"S "	SWITCHES				
101	SPDT, Push/Push illuminated	SZ000-003	M-0	54-6169126	1
102	Rotary, 6-pole,6-position, assembly	SR000-019	W-I	SR000-019	1
103	SPST, Push on, (part of S102 assembly)	---------	---	----------	--
104	Momentary contact N.O. submin	SM000-004	G-H	39-1	1
105	DPST, Rotary, (part of R115)	---------	MAL	U27	1
106	Push-button switch assembly	SZ000-004	W-I	SZ000-004	1
107	Rotary, 6-pole, 4-position assembly	SR000-018	W-I	SR000-018	1
108	DPDT, Slide, subminiature	SS000-001	C-W	G126	1
109	SPST, Push-off (part of S107 assembly	---------	---	----------	--

SWEEP RATE SCHEMATIC MODULE M1H

REV. A



PARTS LIST　MODULE M1H　REV A

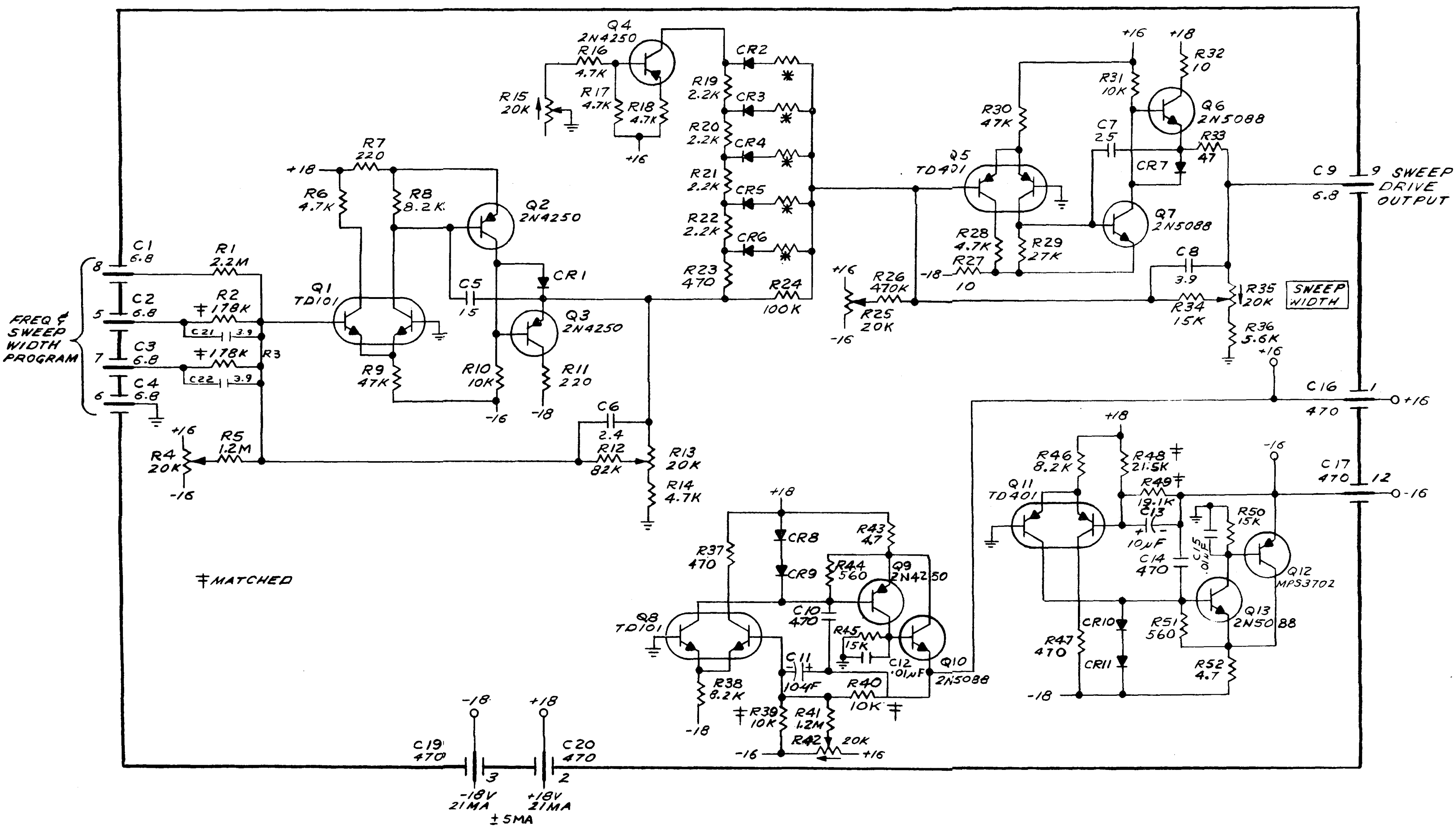
REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"C"	CAPACITORS				
1,7,8,9 12,14,15 16,17,20	Ceramic feedthru, 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	10
2,6,11	Ceramic disc, 470pF, ±20% 1KV	CD102-147	SPR	5GAT47	3
3	Mylar paper, 15uF ±10% 100V	CP103-415	C-D	WMF1P15	1
4	Ceramic disc, 10pF ±5% 1KV	CD101-010	SPR	10TCCV10	1
5	Ceramic disc, .001uF ±20% 1KV	CD102-210	SPR	5GA010	1
10	Ceramic disc, .02uF ±20% 100V	CD103-320	SPR	TGS20	1
13	Ceramic disc, 120pF ±20% 1KV	CD102-112	SPR	5GAT12	1
18,19	Ceramic feedthru, 470pF ±20% 500V	CF101-147	A-B	FA5C	2
21	Ceramic disc, .01uF ±20% 100V	CD103-310	SPR	TGS10	1
"CR"	DIODES				
1,2,3,4,5 6,7,8,9	Silicon, junction, 100PIV, 750mA	DR000-001	ITT	1N4002	9
"R"	RESISTORS				
1,9	Fixed, comp., 220ohm ±10% ¼W	RC104-122	A-B	CB2211	2
2,3,5,11 14,37	Fixed, comp., 4.7k ±10% ¼W	RC104-247	A-B	CB4721	6
4,13,18,33 38,39,53	Fixed, comp., 47k ±10% ¼W	RC104-347	A-B	CB4731	7
6	Fixed, comp., 180k ±10% ¼W	RC104-418	A-B	CB1841	1
7,20,41,45	Variable, carbon, 20k ±20%	RP124-320	A-B	WA2G032	4
8,26,27,36	Fixed, comp., 22k ±10% ¼W	RC104-322	A-B	CB2231	4
10	Fixed, comp., 5.6M ±10% ¼W	RC104-556	A-B	CB5651	1
12,57	Fixed, comp., 47ohm ±10% ¼W	RC104-047	A-B	CB4701	2
15	Fixed, comp., 68k ±10% ¼W	RC104-368	A-B	CB6831	1
16,51	Fixed, comp., 10k ±5% ¼W	RC103-310	A-B	CB1035	2
17,30,31,48	Fixed, comp., 10k ±10% ¼W	RC104-310	A-B	CB1031	4
19,24,28,29	Fixed, comp., 100k ±10% ¼W	RC104-410	A-B	CB1041	4
21	Fixed, comp., 18k ±10% ¼W	RC104-318	A-B	CB1831	1
22	Fixed, comp., 62k ±5% ¼W	RC103-362	A-B	CB6235	1
23	Fixed, comp., 560k ±10% ¼W	RC104-456	A-B	CB5641	1
25	Fixed, comp., 1M ±10% ¼W	RC104-510	A-B	CB1051	1
32	Fixed, comp., 1k ±10% ¼W	RC104-210	A-B	CB1021	1
34	Fixed, comp., 10M ±10% ¼W	RC104-610	A-B	CB1061	1
35,43,52	Fixed, comp., 100ohm ±10% ¼W	RC104-110	A-B	CB1011	3
40,47	Fixed, comp., 220k ±10% ¼W	RC104-422	A-B	CB2241	2
42,55	Fixed, comp., 6.8k ±10% ¼W	RC104-268	A-B	CB6821	2
44	Fixed, comp., 12k ±10% ¼W	RC104-312	A-B	CB1231	1
46	Fixed, comp., 39k ±10% ¼W	RC104-339	A-B	CB3931	1
49	Fixed, comp., 470ohm ±10% ¼W	RC104-147	A-B	CB4711	1
50	Fixed, comp., 15k ±10% ¼W	RC104-315	A-B	CB1531	1
54,56	Fixed, comp., 27k ±10% ¼W	RC104-327	A-B	CB227	2

PARTS LIST

MODULE M1H REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"Q "	TRANSISTORS				
1,2	N-channel JFET'S, matched pair	QB000-014	W-I	QB000-014	1
3,4,7,8,9 11,16,17,19	PNP, Silicon	QB000-009	MOT	MPS3702	9
5,14	N-channel, Silicon, JFET	QA054-580	MOT	2N5458	2
6,15	Dual, NPN, Silicon	QB000-010	SPR	TD101	2
10,12,13,18	NPN, Silicon	QA038-541	G-E	2N3854A	4

SWEEP DRIVE SCHEMATIC
MODULE M2G REV E

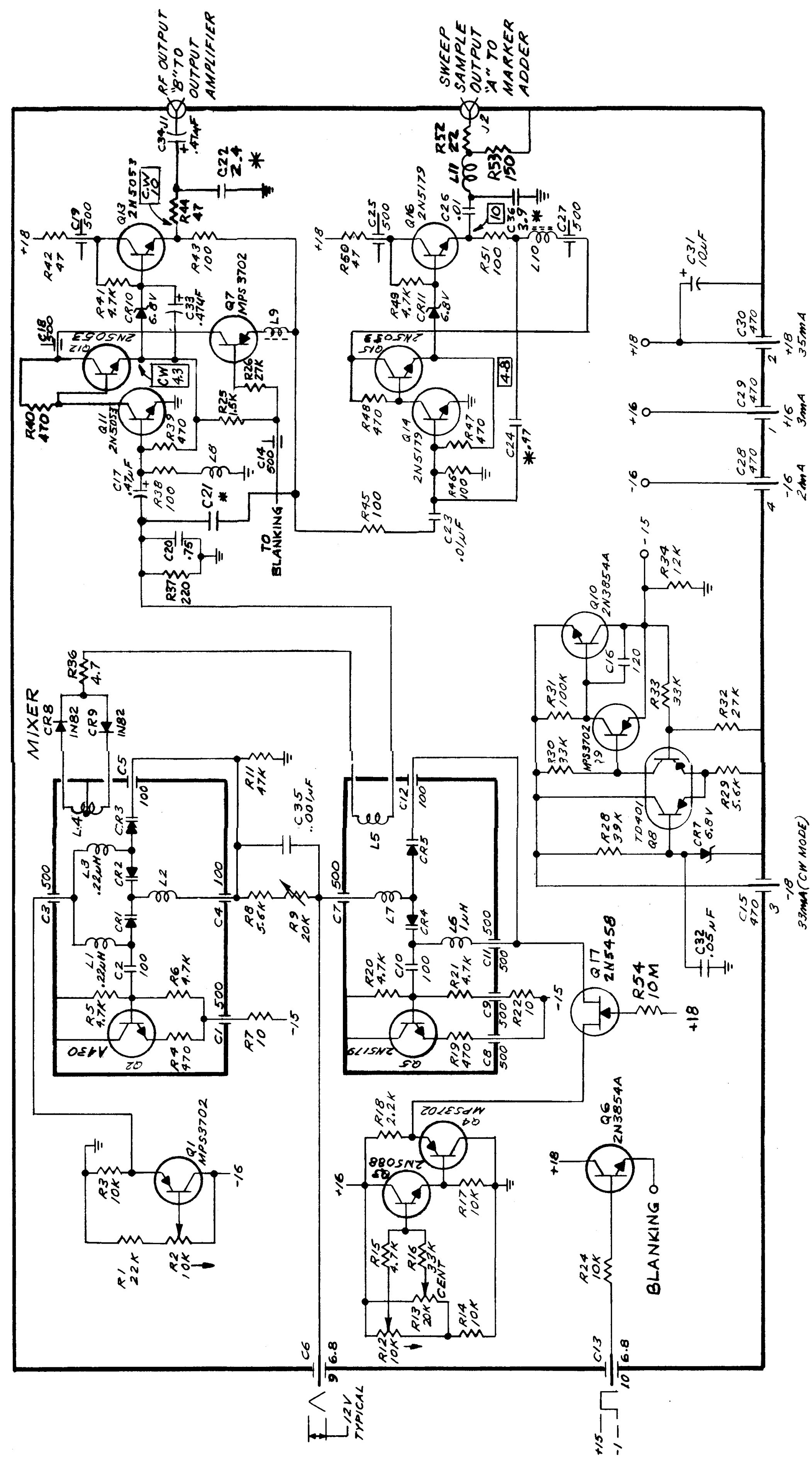


PARTS LIST MODULE M2G REV E

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"C "	CAPACITORS				
1,2,3,4,9	Ceramic feedthru, 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	5
5	Ceramic disc., 15pF ±5% 1kV	CD101-015	SPR	10TCC-Q15	1
6	Composition 2.4pF ±10% 500V	CG101-224	Q-C	QC 2.4	1
7	Ceramic disc., 25pF ±5% 1kV	CD101-025	SPR	10TCC-Q25	1
8,21,22	Composition, 3.9pF ±10% 500V	CG101-239	Q-C	QC 3.9	3
10,14	Ceramic disc., 470pF ±20% 1kV	CD102-147	SPR	5GA-T47	2
11,13	Electrolytic, 10uF ±20% 100V	CE105-010	SPR	TE1204	2
12,15	Ceramic disc., .01uF ±20% 100V	CD103-310	SPR	TG-S10	2
16,17,19,20	Ceramic feedthru, 470pF ±20% 500V	CF101-147	A-B	FA5C	4
"CR "	DIODES				
1 to 11	Silicon, junction, 100piV, 750mA	DR000-001	ITT	1N4002	11
"R "	RESISTORS				
1	Fixed, comp., 2.2M ohm ±5% ¼W	RC103-522	A-B	CB2255	1
2,3	Metal film, 178k ohm, matched set .1%	RX000-005	W-I	RX000-005	1
4,13,15,25 42	Variable, cermet, 20k ohm ±20%	RP129-320	CTS	360S203B	5
5,41	Fixed, comp., 1.2M ohm ±10% ¼W	RC104-512	A-B	CB1251	2
6,14,16,17 18,28	Fixed, comp., 4.7k ohm ±10% ¼W	RC104-247	A-B	CB4721	6
7,11	Fixed, comp., 220 ohm ±10% ¼W	RC104-122	A-B	CB2211	2
8,38,46	Fixed, comp., 8.2k ohm ±10% ¼W	RC104-282	A-B	CB8221	3
9,30	Fixed, comp., 47k ohm ±10% ¼W	RC104-347	A-B	CB4731	2
10,31	Fixed, comp., 10k ohm ±10% ¼W	RC104-310	A-B	CB1031	2
12	Fixed, comp., 82k ohm ±10% ¼W	RC104-382	A-B	CB8231	1
19,20,21,22	Fixed, comp., 2.2k ohm ±10% ¼W	RC104-222	A-B	CB2221	4
23,37,47	Fixed, comp., 470 ohm ±10% ¼W	RC104-147	A-B	CB4711	3
24	Fixed, comp., 100k ohm ±10% ¼W	RC104-410	A-B	CB1041	1
26	Fixed, comp., 470k ohm ±10% ¼W	RC104-447	A-B	CB4741	1
27,32	Fixed, comp., 10 ohm ±10% ¼W	RC104-010	A-B	CB1001	2
29	Fixed, comp., 27k ohm ±10% ¼W	RC104-327	A-B	CB2731	1
33	Fixed, comp., 47 ohm ±10% ¼W	RC104-047	A-B	CB4701	1
34,45,50	Fixed, comp., 15k ohm ±10% ¼W	RC104-315	A-B	CB1531	3
35	Variable, carbon, 20k ohm ±20%	RP124-320	A-B	WA2G032	1
36	Fixed, comp., 5.6k ohm ±10% ¼W	RC104-256	A-B	CB5621	1
39,40	Metal film, 10k ohm matched set, .1%	RX000-003	W-I	RX000-003	1
43,52	Fixed, comp., 4.7 ohm ±10% ¼W	RC104-R47	A-B	CB47G1	2
44,51	Fixed, comp., 560 ohm ±10% ¼W	RC104-156	A-B	CB5611	2
48	Metal film, 21.5k ohm matched set				
49	Metal film, 19.1k ohm 9:8 within 1%	RX000-004	W-I	RX000-004	1
"Q "	TRANSISTORS				
1,8	NPN, Silicon, dual	QB000-010	SPR	TD101	2
2,3,4,9	PNP, Silicon	QA042-500	FCD	2N4250	4
5,11	PNP, Silicon, dual	QB000-011	SPR	TD401	2
6,7,10,13	NPN, Silicon	QA050-880	MOT	2N5088	4
12	PNP, Silicon	QB000-009	MOT	MPS3702	1

OSCILLATOR-MIXER SCHEMATIC MODULE M9G & M9H

REV H



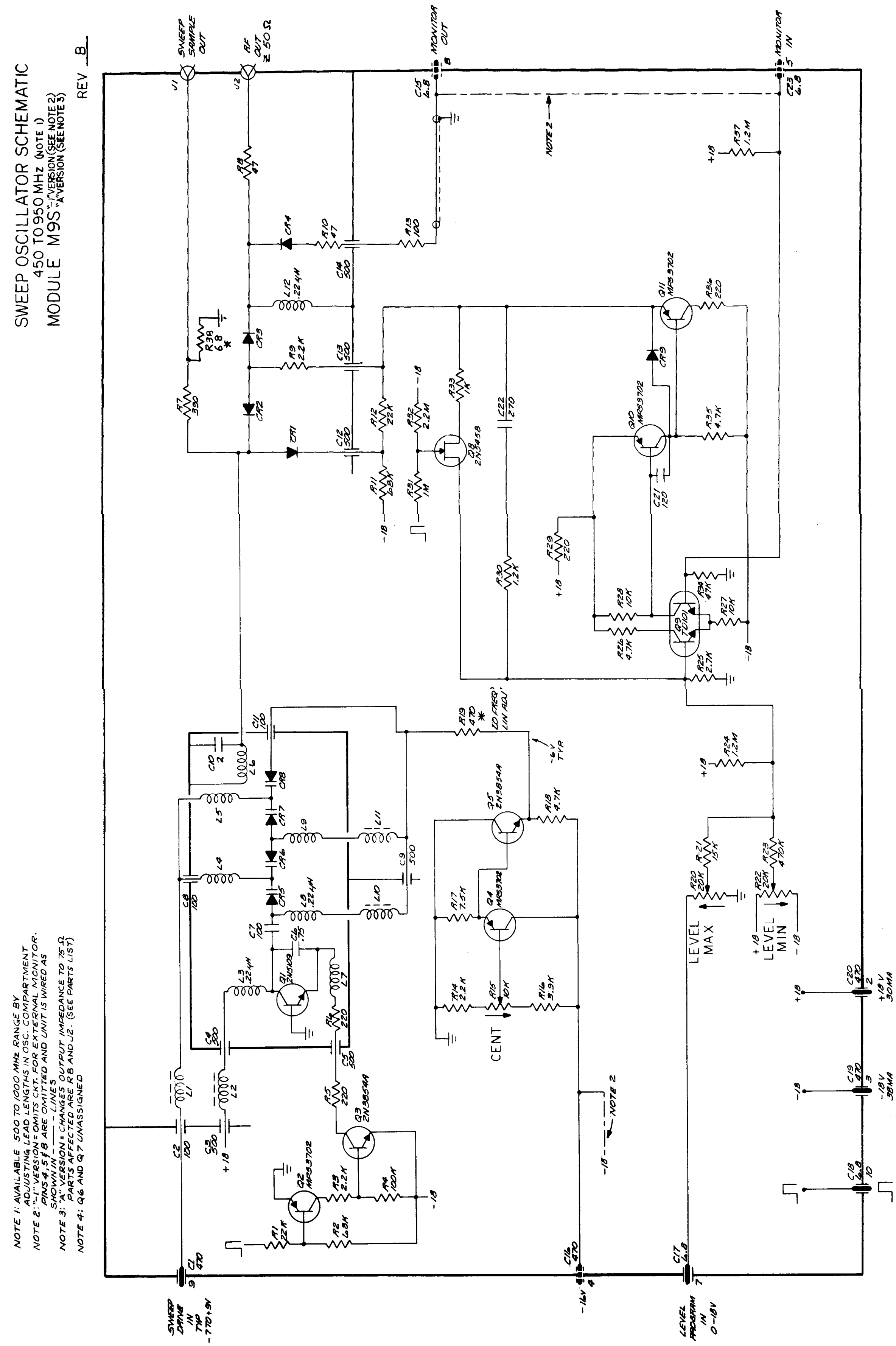
PARTS LIST

MODULE M9G M9H REV H

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"C "	CAPACITORS				
1,3,7,8,9, 11,14,18,19, 25,27	Ceramic Feedthru 500 pF ±20% 250 V	CF104-150	AER	EF4	11
2,10	Ceramic Disc, 100 pF ±10% 1 kV	CD108-110	RMC	C,N1500	2
5,12,4	Ceramic Feedthru, 100 pF ±20% 250 V	CF104-110	AER	EF4	3
6,13	Ceramic Feedthru, 6.8 pF ±10% 500 V	CF102-R68	A-B	FA5C	2
15,28,29,30	Ceramic Feedthru, 470 pF ±20% 500 V	CF101-147	A-B	FA5C	4
16	Ceramic Disc, 120 pF ±20% 1 kV	CD102-112	SPR	5GAT12	1
17,33,34	Electrolytic, .47 uF ±10% 50 V	CE113-447	TRW	935	3
20	Composition, .75 pF ±10% 500 V	CG101-175	Q-C	QC.75	1
21	Factory adjusted	Not Assign	---	------	--
22	Composition, 2.4 pF ±10%, factory adj.	CG101-224	Q-C	QC2.4	1
23,26	Ceramic Disc, .01 uF ±20% 100 V	CD103-310	SPR	TGS10	2
24	Factory adjusted, nominal value shown	Not Assign	---	-------	--
31	Electrolytic, 10 uF 25 V	CE105-010	SPR	TE1204	1
32	Ceramic Disc, .05 uF ±20% 100 V	CD103-350	SPR	TGS50	1
35	Ceramic Disc, .001 uF ±20% 1 kV	CD102-210	SPR	5GAD10	1
36	Composition, 3.9 pF ±10%, factory adj.	CG101-239	Q-C	QC3.9	1
"J "	CONNECTORS				
1,2	Jack, receptacle, 50 ohm subminiature	JF000-005	APL	27-9	2
"CR "	DIODES				
1,2,3,4,5	Voltage variable capacitance	DC000-005	W-I	DC000-005	5
6	Not assigned	------	---	------	--
7,10,11	Zener, 6.8 V	DB000-001	C-L	ZD6.8A	3
8,9	Silicon, point contact (S-T only)	DG100-823	W-I	DG100-823	2
"L "	INDUCTORS				
1,3	Fixed, .22 uH	LA005-R02	ASE	08NR47K	2
2,7	Fixed -------	Not Assign	W-I	------	--
4	Fixed -------	Not Assign	W-I	------	--
5	Fixed -------	Not Assign	W-I	------	--
6	Fixed, 1 uH	LA005-R10	ASE	08N1R0K	1
8	Fixed -------	Not Assign	W-I	------	--
9,10	4 Turn Toroid	LA006-004	W-I	LA006-004	2
11	Fixed -------	Not Assign	W-I	------	1
"Q "	TRANSISTORS				
1,4,7,9	PNP, Silicon	QB000-009	MOT	MPS3702	4
2	NPN, Silicon, Wideband Amp.	QB000-013	APX	A430	1
3	NPN, Silicon, Low Noise	QA050-880	MOT	2N5088	1
5,14,16	NPN, Silicon	QA051-790	RCA	2N5179	3
6,10	NPN, Silicon,	QA038-541	G-E	2N3854A	2
8	PNP, Silicon, dual	QB000-011	SPR	TD401	1
11,12,13,15	NPN, Silicon	QA050-530	AMP	2N5053	4
17	N-Channel JFET	QA054-580	MOT	2N5458	1
"R "	RESISTORS				
1	Fixed Comp., 22 Kilohm ±10% ¼ W	RC104-322	A-B	CB2231	1
2,12	Variable Cermet, 10 Kilohm ±20%	RP129-310	CTS	360S103B	2
3,14,17,24	Fixed Comp., 10 Kilohm ±10% ¼ W	RC104-310	A-B	CB1031	4

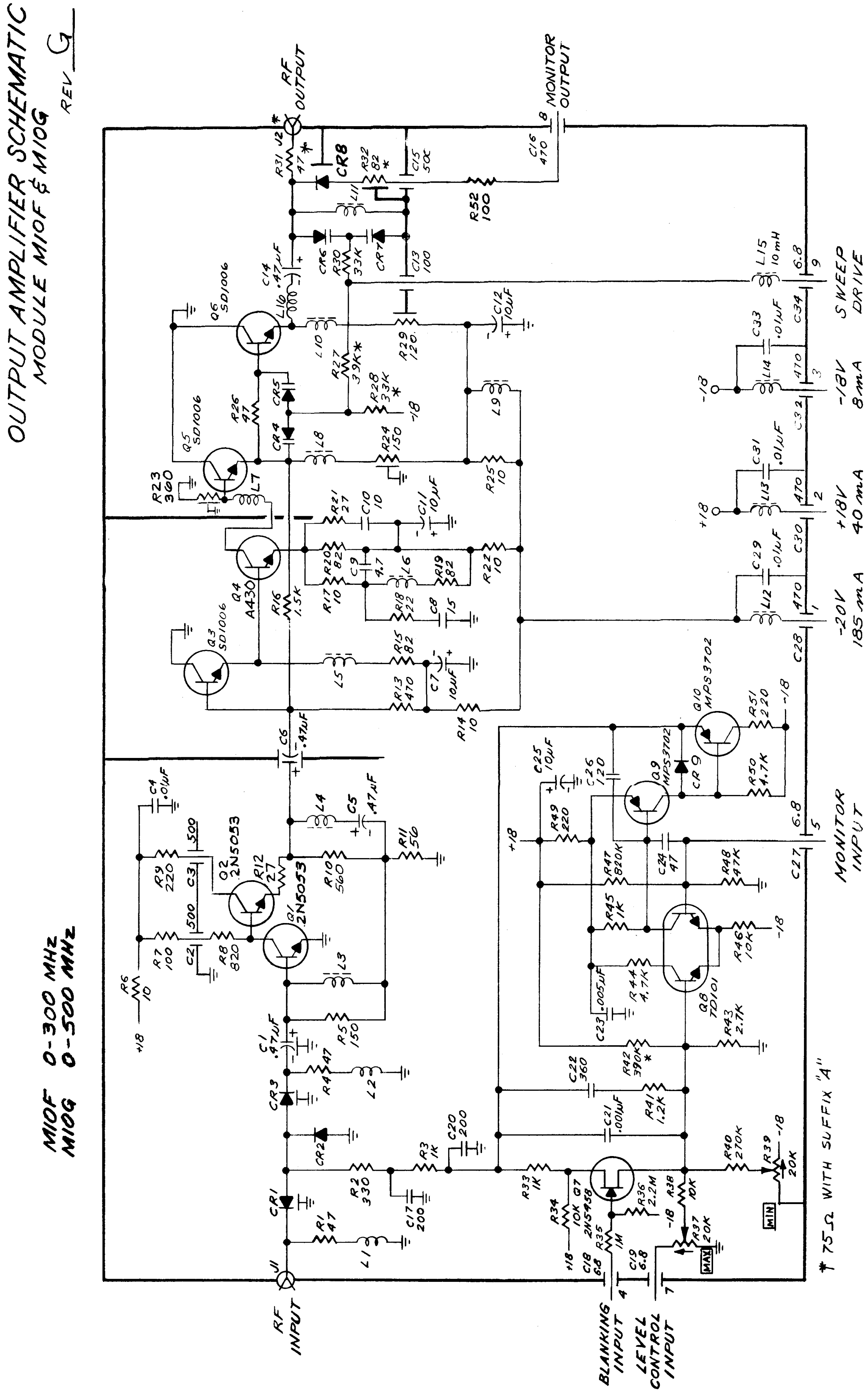
PARTS LIST MODULE M9G M9H REV H

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"R "	RESISTORS (Cont'd)				
4,19,39,40, 47,48	Fixed Comp., 470 ohm ±10% ¼ W	RC104-147	A-B	CB4711	6
5,6,15,20,21 41,49	Fixed Comp., 4.7 Kilohm ±10% ¼ W	RC104-247	A-B	CB4721	7
7,22	Fixed Comp., 10 ohm ±10% ¼ W	RC104-010	A-B	CB1001	2
8,29	Fixed Comp., 5.6 Kilohm ±10% ¼ W	RC104-256	A-B	CB5621	2
9	Variable Cermet, 20 Kilohm ±10%	RP129-320	CTS	360S203B	1
10,23,27,35	Not Assigned	---------	---	--------	--
11	Fixed Comp., 47 Kilohm ±10% ¼ W	RC104-347	A-B	CB4731	1
13	Variable Carbon, 20 Kilohm ±20%	RP124-320	A-B	WA2G032	1
16,30	Fixed Comp., 33 Kilohm ±10% ¼ W	RC104-333	A-B	CB3331	2
18	Fixed Comp., 2.2 Kilohm ±10% ¼ W	RC104-222	A-B	CB2221	1
25	Fixed Comp., 1.5 Kilohm ±10% ¼ W	RC104-215	A-B	CB1521	1
26	Fixed Comp., 27 Kilohm ±10% ¼ W	RC104-327	A-B	CB2731	1
28	Fixed Comp., 39 Kilohm ±10% ¼ W	RC104-339	A-B	CB3931	1
31	Fixed Comp., 100 Kilohm ±10% ¼ W	RC104-410	A-B	CB1041	1
32	Fixed Comp., 27 Kilohm ±5% ¼ W	RC103-327	A-B	CB2735	1
33	Fixed Comp., 33 Kilohm ±5% ¼ W	RC103-333	A-B	CB3335	1
34	Fixed Comp., 12 Kilohm ±10% ¼ W	RC104-312	A-B	CB1231	1
36	Fixed Comp., 4.7 ohm ±10% ¼ W	RC104-R47	A-B	CB47G1	1
37	Fixed Comp., 390 ohm ±10% ¼ W	RC104-139	A-B	CB3911	1
38,43,45,46, 51	Fixed Comp., 100 ohm ±10% ¼ W	RC104-110	A-B	CB1011	5
42,44,50	Fixed Comp., 47 ohm ±10% ¼ W	RC104-047	A-B	CB4701	3
52	Fixed Comp, 22 ohm ±10% ¼ W	RC104-022	A-B	CB2201	1
53	Fixed Comp., 150 ohm ±10% ¼ W	RC104-115	A-B	CB1511	1
54	Fixed Comp., 10 Megohm ±10% ¼ W	RC104-610	A-B	CB1061	1


SWEEP OSCILLATOR SCHEMATIC
450 TO 950 MHz (NOTE 1)
MODULE M9S "-1" VERSION (SEE NOTE 2)
"A" VERSION (SEE NOTE 3)
REV B
NOTE 1: AVAILABLE 500 TO 1000 MHz RANGE BY ADJUSTING LEAD LENGTHS IN OSC. COMPARTMENT
NOTE 2: "-1" VERSION = OMITS CKT. FOR EXTERNAL MONITOR. PINS 4,5 & 8 ARE OMITTED AND UNIT IS WIRED AS SHOWN IN ---- LINES
NOTE 3: "A" VERSION = CHANGES OUTPUT IMPEDANCE TO 75 Ω. PARTS AFFECTED ARE R8 AND J2. (SEE PARTS LIST)
NOTE 4: Q6 AND Q7 UNASSIGNED
SWEEP SAMPLE OUT
RF OUT
MONITOR OUT
MONITOR IN
SWEEP DRIVE IN TYP -7 TO +9V
LEVEL PROGRAM IN 0-18V
LEVEL MAX
LEVEL MIN
CENT
NOTE 2

PARTS LIST MODULE M9S-1 REV B

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"R"	RESISTORS				
32	Fixed, comp. 2.2Mohm ±10% ¼W	RC104-522	A-B	CB2251	1
33	Fixed, comp. 1Kohm ±10% ¼W	RC104-210	A-B	CB1021	1
34	Fixed, comp. 47Kohm ±10% ¼W	RC104-347	A-B	CB4731	1
38*	Fixed, comp. 68 ohm ±10% ¼W	RC104-068	A-B	CB6801	1
"Q"	TRANSISTORS				
1	NPN, Silicon	QA051-090	SSS	2N5109	1
2,4,10,11	PNP, Silicon	QB000-009	MOT	MPS3702	4
3,5	NPN, Silicon	QA038-541	G-E	2N3854A	2
8	N-channel JFET	QA054-580	MOT	2N5458	1
9	Dual NPN Silicon	QB000-010	SPR	TD101	1
	"A" VERSION				
"J"	CONNECTORS				
2	Jack, receptacle 75ohm	JF000-004	APL	27-21	1
"R"	RESISTORS				
8	Fixed, metal film 75ohm ±1%	RF407-500	E-M	MF5C1%TO	1


OUTPUT AMPLIFIER SCHEMATIC
MODULE M10F & M10G
REV G
M10F 0-300 MHz
M10G 0-500 MHz
RF INPUT
RF OUTPUT
MONITOR OUTPUT
MONITOR INPUT
SWEEP DRIVE
BLANKING INPUT
LEVEL CONTROL INPUT
-20V 185 mA
+18V 40 mA
-18V 8 mA
* 75Ω WITH SUFFIX "A"
MIN
MAX

PARTS LIST

MODULE M10F M10G REV G

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"C "	CAPACITORS				
1,5,6,14	Electrolytic, .47uF 50V	CE113-447	TRW	935	4
2,3,15	Ceramic Feedthru, 500pF ±20% 250V	CF104-150	AER	EF4	3
4,29,31,33	Ceramic Disc, .01uF ±20% 100V	CD103-310	SPR	TG-S10	4
7,11,12,25	Electrolytic, 10uF 25V	CE105-010	SPR	TE1204	4
8	Ceramic Disc, 15pF ±5% 1kV	CD101-015	SPR	10TCC-Q15	1
9	Ceramic Disc, 4.7pF ±5% 1kV	CD101-R47	SPR	10TCC-V47	1
10	Ceramic Disc, 10pF ±5% 1kV	CD101-010	SPR	10TCC-Q10	1
13	Ceramic Feedthru, 100pF ±20% 250V	CF104-110	SPR	EF4	1
16,28,30,32	Ceramic Feedthru, 470pF ±20% 500V	CF101-147	A-B	FA5C	4
17,20	Ceramic Disc, 200pF ±20% 1kV	CD102-120	SPR	5GA-T20	2
18,19,27,34	Ceramic Feedthru, 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	4
21	Ceramic Disc, .001uF ±20% 1kV	CD102-210	SPR	5GA-D10	1
22	Ceramic Disc, 360pF ±20% 1kV	CD102-136	SPR	5GA-T36	1
23	Ceramic Disc, .005uF ±20% 100V	CD103-250	SPR	TG-D50	1
24	Ceramic Disc,. 47pF ±5% 1kV	CD104-047	SPR	10TCU-Q47	1
26	Ceramic Disc, 120pF ±20% 1kV	CD102-112	SPR	5GA-T12	1
"J "	CONNECTORS				
1,2	Jack, receptacle 50 ohm submin.	JF000-005	APL	27-9	2
"CR "	DIODES				
1,2,3	Silicon, P.I.N.	DP000-050	W-I	DP000-050	3
4,5	Voltage variable capacitance	DC000-008	W-I	DC000-008	2
6,7	Voltage variable capacitance	DC000-005	W-I	DC000-005	2
8	Silicon, hot carrier	DG000-007	H-P	5082-2800	1
9	Silicon, junction, 100PIV 750mA	DR000-001	ITT	1N4002	1
"L "	INDUCTORS				
1,2,7,16	Fixed -----	Not Assign	W-I	---------	4
3,4,9,12,13, 14	Fixed -----	LA006-010	W-I	LA006-010	6
5,6,8,10	Fixed -----	LA006-005	W-I	LA006-005	4
11	Fixed -----	LA006-004	W-I	LA006-004	1
15	Fixed, 10mH	LA004-310	JEF	15S103K	1
"R "	RESISTORS				
1,4,26	Fixed Comp., 47 ohm ±10% ¼W	RC104-047	A-B	CB4701	3
2	Fixed Comp., 330 ohm ±10% ¼W	RC104-133	A-B	CB3311	1
3,33,45	Fixed Comp., 1k ohm ±10% ¼W	RC104-210	A-B	CB1021	3
5	Fixed Comp., 150 ohm ±10% ¼W	RC104-115	A-B	CB1511	1
6,14,17,22, 25	Fixed Comp., 10 ohm ±5% ¼W	RC103-010	A-B	CB1005	5
7,52	Fixed Comp., 100 ohm ±10% ¼W	RC104-110	A-B	CB1011	2
8	Fixed Comp., 820 ohm ±10% ¼W	RC104-182	A-B	CB8211	1
9,49,51	Fixed Comp., 220 ohm ±10% ¼W	RC104-122	A-B	CB2211	3
10	Fixed Comp., 560 ohm ±10% ¼W	RC104-156	A-B	CB5611	1
11	Fixed Comp., 56 ohm ±10% ¼W	RC104-056	A-B	CB5601	1
12,21	Fixed Comp., 27 ohm ±10% ¼W	RC104-027	A-B	CB2701	2
13	Fixed Comp., 470 ohm ±5% ¼W	RC103-147	A-B	CB4715	1
15,19,20	Fixed Comp., 82 ohm ±5% ¼W	RC103-082	A-B	CB8205	3
16	Fixed Comp., 1.5k ohm ±5% ¼W	RC103-215	A-B	CB1525	1

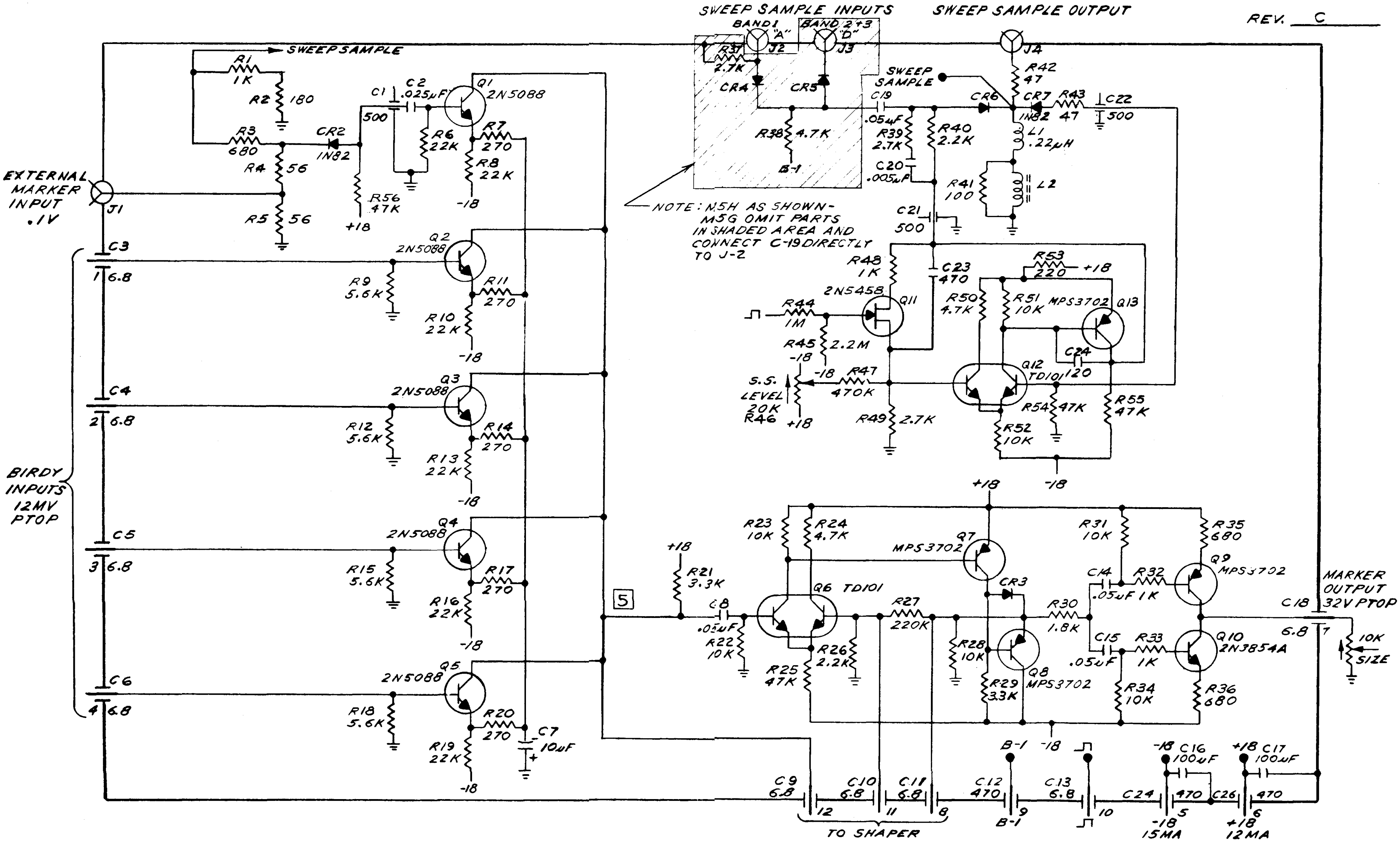
PARTS LIST

MODULE M10F M10G REV G

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"R "	RESISTORS				
18	Fixed Comp., 22 ohm ±10% ¼W	RC104-022	A-B	CB2201	1
23	Fixed Comp., 360 ohm ±5% ½W A-B only	RC105-136	A-B	EB3615	1
24	Fixed Comp., 150 ohm ±5% 1W	RC107-115	A-B	GB1515	1
27	Fixed Comp., 39k ohm ±10% ¼W	RC104-339	A-B	CB3931	1
28,30	Fixed Comp., 33k ohm ±10% ¼W	RC104-333	A-B	CB3331	2
29	Fixed Comp., 120 ohm ±5% 1W	RC107-112	A-B	GB1215	1
31	Fixed Comp., 47 ohm ±5% ¼W	RC103-047	A-B	CB4705	1
32	Fixed Comp., 82 ohm ±10% ¼W A-B only	RC104-082	A-B	CB8201	1
34,38,46	Fixed Comp., 10k ohm ±10% ¼W	RC104-310	A-B	CB1031	3
35	Fixed Comp., 1M ohm ±10% ¼W	RC104-510	A-B	CB1051	1
36	Fixed Comp., 2.2M ohm ±10% ¼W	RC104-522	A-B	CB2251	1
37,39	Variable Carbon, 20k ohm ±20% ¼W	RP124-320	A-B	WA2G032	2
40	Fixed Comp., 270k ohm ±10% ¼W	RC104-427	A-B	CB2741	1
41	Fixed Comp., 1.2k ohm ±10% ¼W	RC104-212	A-B	CB1221	1
42	Fixed Comp., 390k ohm ±10% ¼W	RC104-439	A-B	CB3941	1
43	Fixed Comp., 2.7k ohm ±10% ¼W	RC104-227	A-B	CB2721	1
44,50	Fixed Comp., 4.7k ohm ±10% ¼W	RC104-247	A-B	CB4721	2
47	Fixed Comp., 820k ohm ±10% ¼W	RC104-482	A-B	CB8241	1
48	Fixed Comp., 47k ohm ±10% ¼W	RC104-347	A-B	CB4731	1
"Q "	TRANSISTORS				
1,2	NPN, Silicon	QA050-530	APX	2N5053	2
3,5,6	NPN, Silicon	QB000-018	SSS	SD 1006	3
4	NPN, Silicon	QB000-013	AER	A430	1
7	N-channel, JFET, Silicon	QA054-580	MOT	2N5458	1
8	NPN, Silicon, dual	QB000-010	SPR	TD101	1
9,10	PNP, Silicon	QB000-009	MOT	MPS3702	2
	"A" VERSION				
"J "	CONNECTORS				
2	Jack, receptacle, 75 ohm	JF000-004	APL	27-21	1
"R "	RESISTORS				
31	FIxed Comp., 75 ohm ±5% ¼W	RC103-075	A-B	CB5705	1

MARKER ADDER SCHEMATIC
MODULE M5G AND M5H

REV. C



PARTS LIST MODULE M5H REV. C

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	TQ
"C "	CAPACITORS				
1,21,22	Ceramic feedthru, 500pF ±20% 250V	CF104-150	AER	EF4	3
2	Ceramic disc., .025uF ±20% 100V	CD103-325	SPR	TG-S25	1
3,4,5,6,9 10,11,13,18	Ceramic feedthru, 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	9
7	Electrolytic 10uF 25V	CE105-010	SPR	TE-1204	1
8,14,15,19	Ceramic disc., .05uF ±20% 100V	CD103-350	SPR	TG-S50	4
12,24,26	Ceramic feedthru, 470pF ±20% 500V	CF101-147	A-B	FA5C	3
16,17	Electrolytic 100uF 25V	CE105-110	SPR	TE-1211	2
20	Ceramic disc., .005uF ±20% 100V	CD103-250	SPR	TG-D50	1
23	Ceramic disc., 470uF ±20% 1kV	CD102-147	SPR	5GAT47	1
24	Ceramic disc., 120uF ±20% 1kV	CD102-112	SPR	5GAT12	1
"J "	CONNECTORS				
1,2,3,4	Jack, receptacle, 50ohm, submin.	JF000-005	APL	27-9	4
"CR "	DIODES				
2,7	Silicon, point contact	DG100-821	SYL	1N82AS	2
3	Silicon, junction, 100piV 750mA	DR000-001	ITT	1N4002	1
4,5,6	Silicon, P.I.N.	DP000-040	W-I	DP000-040	3
"L "	INDUCTORS				
1	Fixed, .22uH	LA005-R02	W-E	506	1
2	Fixed	LA006-010	W-I	LA006-010	1
"R "	RESISTORS				
1,32,33,48	Fixed, comp., 1k ±10% ¼W	RC104-210	A-B	CB1021	4
2	Fixed, comp., 180ohm ±10% ¼W	RC104-118	A-B	CB1811	1
3,35,36	Fixed, comp., 680ohm ±10% ¼W	RC104-168	A-B	CB6811	3
4,5	Fixed, comp., 56ohm ±10% ¼W	RC104-056	A-B	CB5601	2
6,8,10 13,16,19	Fixed, comp., 22k ±10% ¼W	RC104-322	A-B	CB2231	6
7,11,14 17,20	Fixed, comp., 270ohm ±10% ¼W	RC104-127	A-B	CB2711	5
9,12,15 18	Fixed, comp., 5.6k ±10% ¼W	RC104-256	A-B	CB5621	4
21,29	Fixed, comp., 3.3k ±10% ¼W	RC104-233	A-B	CB3321	2
22,23,28 31,34,51 52	Fixed, comp., 10k ±10% ¼W	RC104-310	A-B	CB1031	7
24,38,50	Fixed, comp., 4.7k ±10% ¼W	RC104-247	A-B	CB4721	3
25,54,55,56	Fixed, comp., 47k ±10% ¼W	RC104-347	A-B	CB4731	4
26,40	Fixed, comp., 2.2k ±10% ¼W	RC104-222	A-B	CB2221	2
27	Fixed, comp., 220k ±10% ¼W	RC104-422	A-B	CB2241	1
30	Fixed, comp., 1.8k ±10% ¼W	RC104-218	A-B	CB1821	1
37,39,49	Fixed, comp., 2.7k ±10% ¼W	RC104-227	A-B	CB2721	3
41	Fixed, comp., 100ohm ±10% ¼W	RC104-110	A-B	CB1011	1
42	Fixed, comp., 47ohm ±5% ½W	RC105-047	A-B	EB4705	1
43	Fixed, comp., 47ohm ±5% ¼W	RC103-047	A-B	CB4705	1
44	Fixed, comp., 1M ±10% ¼W	RC104-510	A-B	CB1051	1
45	Fixed, comp., 2.2M ±10% ¼W	RC104-522	A-B	CB2251	1

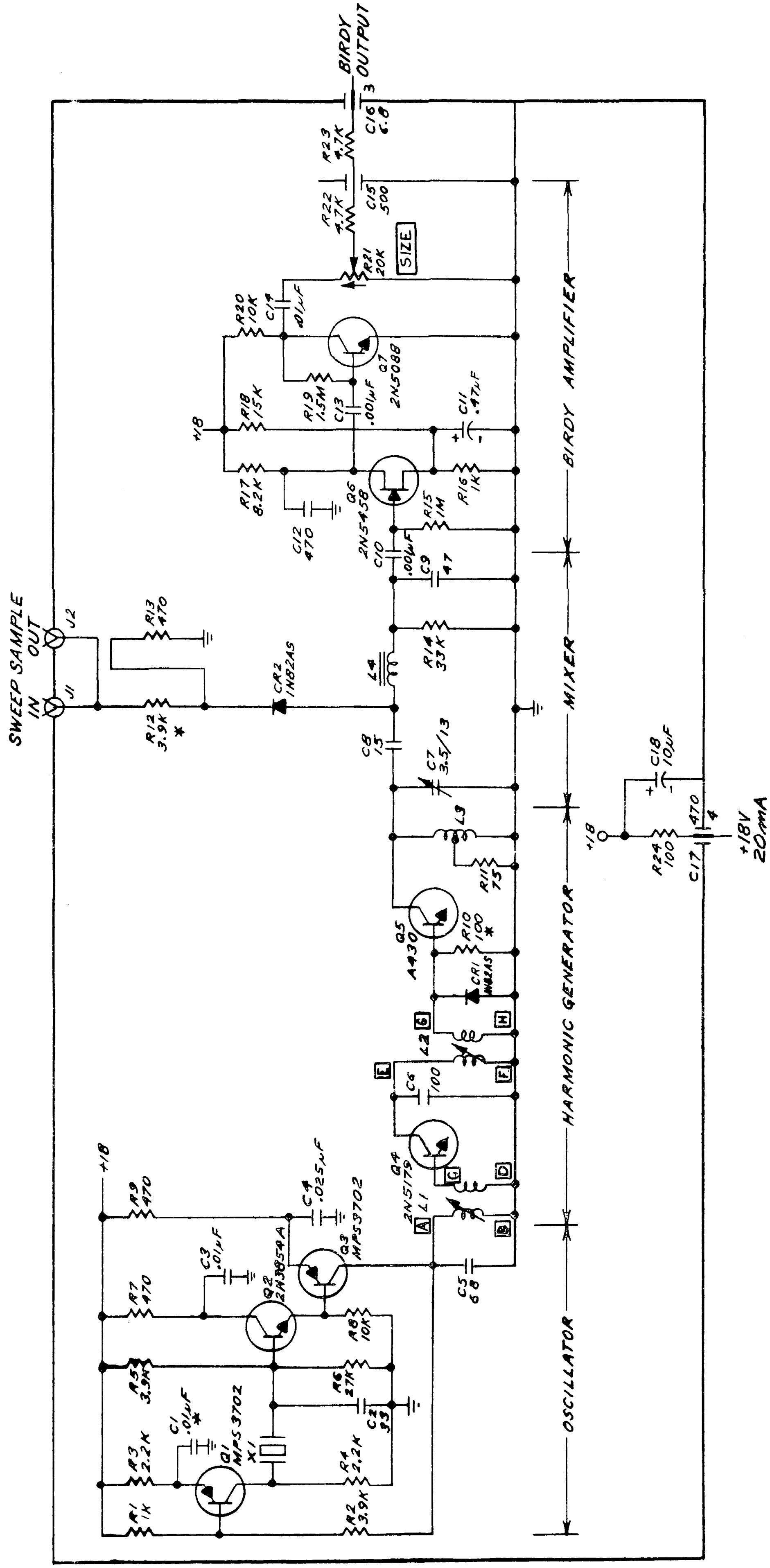
PARTS LIST

MODULE M5H REV. C

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"R "	RESISTORS (Continued)				
46	Variable, carbon 20k ±20% ¼W	RP124-320	A-B	WA2G032	1
47	Fixed, comp., 470k ±10% ¼W	RC104-447	A-B	CB4741	1
53	Fixed, comp., 220ohm ±10% ¼W	RC104-122	A-B	CB2211	1
"Q "	TRANSISTORS				
1,2,3,4	NPN, Silicon	QA050-880	MOT	2N5088	5
5					
6,12	Dual NPN, Silicon	QB000-010	SPR	TD101	2
7,8,9,13	PNP, Silicon	QB000-009	MOT	MPS3702	4
10	NPN, Silicon	QA038-541	GE	2N3854A	1
11	N-channel JFET	QA054-580	MOT	2N5458	1

HARMONIC MARKER SCHEMATIC
(OPTION A2) INTERVAL: 1 MHz
MODULE M6H1

REV E



PARTS LIST

MODULE M6H 1 REV E

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"C"	CAPACITORS				
1,3,14	Ceramic disc, .01uF +20% 100V	CD-103-310	SPR	TG-S10	2
2	Ceramic disc, 33pF +5% 1kV	CD-104-033	SPR	10TCU-Q33	1
4	Ceramic disc, .025uF +20% 100V	CD-103-325	SPR	TG-S25	1
5	Ceramic disc, 68pF +5% 1kV	CD-104-068	SPR	10TCU-Q68	1
6	Ceramic disc, 100pF +5% 1kV	CD-104-110	SPR	10TCU-T10	1
7	Variable, ceramic, 3.5/13pF	CV-101-013	STR	7S-TRIKO-02	1
8	Ceramic disc, 15pF +5% 1kV	CD-101-015	SPR	10TCC-Q15	1
9	Ceramic disc, 47pF +5% 1kV	CD-104-047	SPR	10TCU-Q47	1
10,13	Ceramic disc, .001uF +20% 1kV	CD-102-210	SPR	5GA-D10	2
11	Electrolytic, .47uF +10% 50V	CE-113-447	TRW	935	1
12	Ceramic disc, 470pF +20% 1kV	CD-102-147	SPR	5GA-T47	1
15	Ceramic feedthru, 500pF +20% 250V	CF-104-150	AER	EF4	1
16	Ceramic feedthru, 6.8pF +10% 500V	CF-102-R68	A-B	FASC	1
17	Ceramic feedthru, 470pF +10% 500V	CF-101-147	A-B	FASC	1
18	Electrolytic, 10uF 25V	CE-105-010	SPR	TE1204	1
"J"	CONNECTORS				
1,2	Jack, receptacle, 50ohm, submin.	JF-000-005	APL	TE1204	2
"X"	CRYSTALS				
1	X25W at 1MHz	XX-000-251	W-I	XX-000-251	1
"CR"	DIODES				
1,2	Silicon, point contact	DG-100-821	SYL	IN82AS	2
"L"	INDUCTORS				
1	Coil form LB-002-000 with 160 turns, 20 turns 32 ga. wire	Not Assign.	---	----------	1
2	Coil form LB-003-000 with 35 turns, 10 turns 32 ga. wire	Not Assign.	---	----------	1
3	-------24 ga. wire	Not Assign.	---	----------	-
4	Fixed -----	LA-006-004	W-I	LA-006-004	1
"R"	RESISTORS				
1,16	Fixed comp., 1k ohm +10% ¼W	RC-104-210	A-B	CB1021	2
2,5,12	Fixed comp., 3.9 ohm +10% ¼W	RC-104-239	A-B	CB3921	3
3,4	Fixed comp., 2.2k ohm +10% ¼W	RC-104-222	A-B	CB2221	2
6	Fixed comp., 27k ohm +10% ¼W	RC-104-327	A-B	CB2731	1
7,9,13	Fixed comp., 470 ohm	RC-104-147	A-B	CB4711	3
8,20	Fixed comp., 10k ohm +10% ¼W	RC-104-310	A-B	CB1031	2
10,24	Fixed comp., 100 ohm +10% ¼W	RC-104-110	A-B	CB1011	2
11	Fixed comp., 75 ohm +5% ¼W	RC-103-075	A-B	CB7515	1
14	Fixed comp., 33k ohm +10% ¼W	RC-104-333	A-B	CB3331	1
15	Fixed comp., 1M ohm +10% ¼W	RC-104-510	A-B	CB1051	1
17	Fixed comp., 8.2k ohm +10% ¼W	RC-104-282	A-B	CB8221	1
18	Fixed comp., 15k ohm +10% ¼W	RC-104-315	A-B	CB1531	1
19	Fixed comp., 1.5M ohm +10% ¼W	RC-104-515	A-B	CB1551	1
21	Variable, carbon 20k ohm +20% ¼W	RP-124-320	A-B	WA2032	1
22,23	Fixed comp., 4.7k ohm +10% ¼W	RC-104-247	A-B	CB4721	2

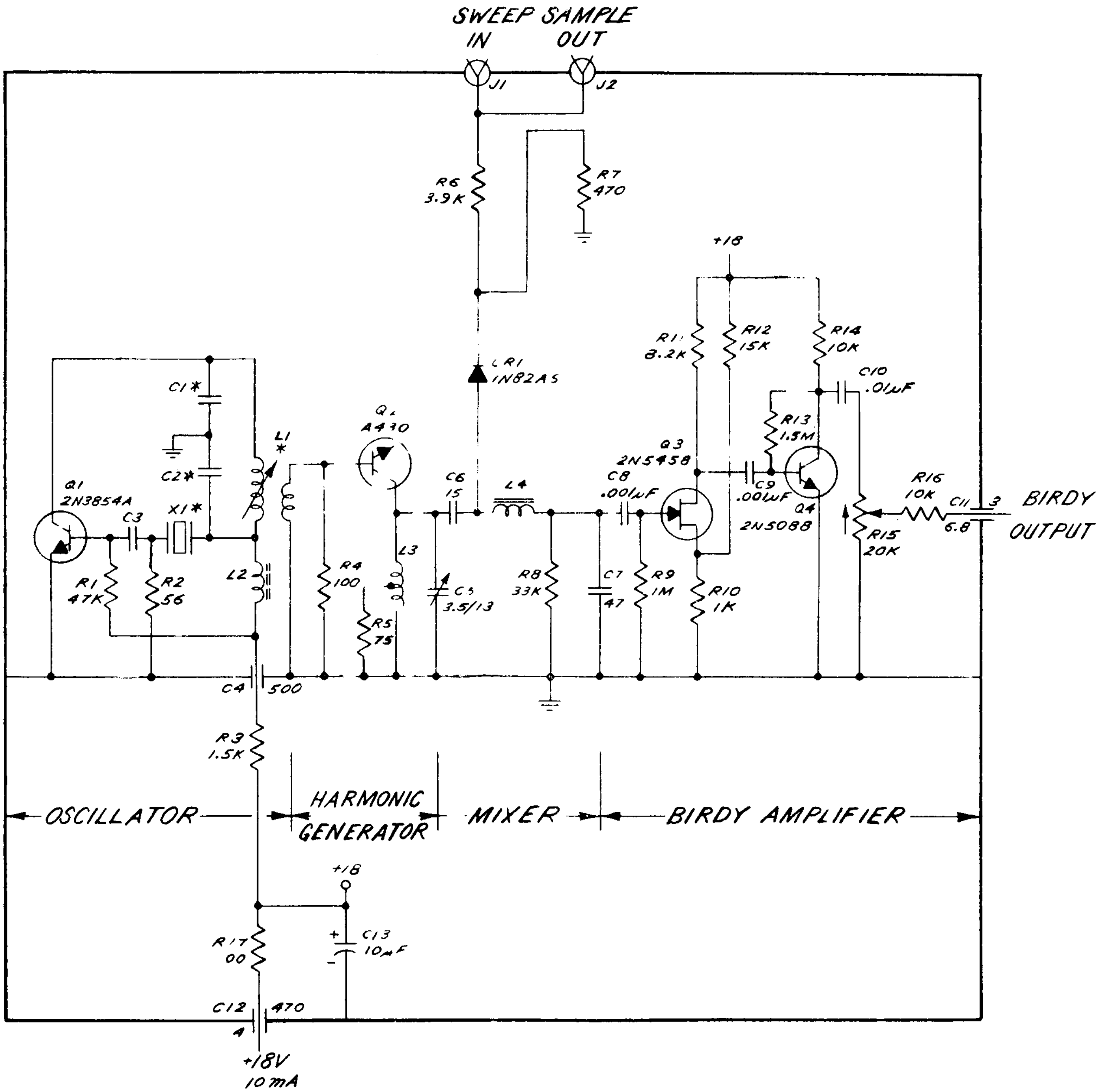
PARTS LIST

MODULE M6H 1 REV E

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"Q "	TRANSISTORS				
1,3	PNP, Silicon	QB-000-009	MOT	MPS3702	2
2	NPN, Silicon	QA-038-541	G-E	2N3854A	1
4	NPN, Silicon	QA-051-790	RCA	2N5179	1
5	NPN, Silicon	QB-000-013	APX	A430	1
6	N-channel JFET	QA-054-580	MOT	2N5458	1
7	NPN, Silicon	QA-050-880	MOT	2N5088	1

HARMONIC MARKER SCHEMATIC
(OPTION A2) INTERVAL: 5 TO 50 MHz
MODULE M6H 5-50

REV C



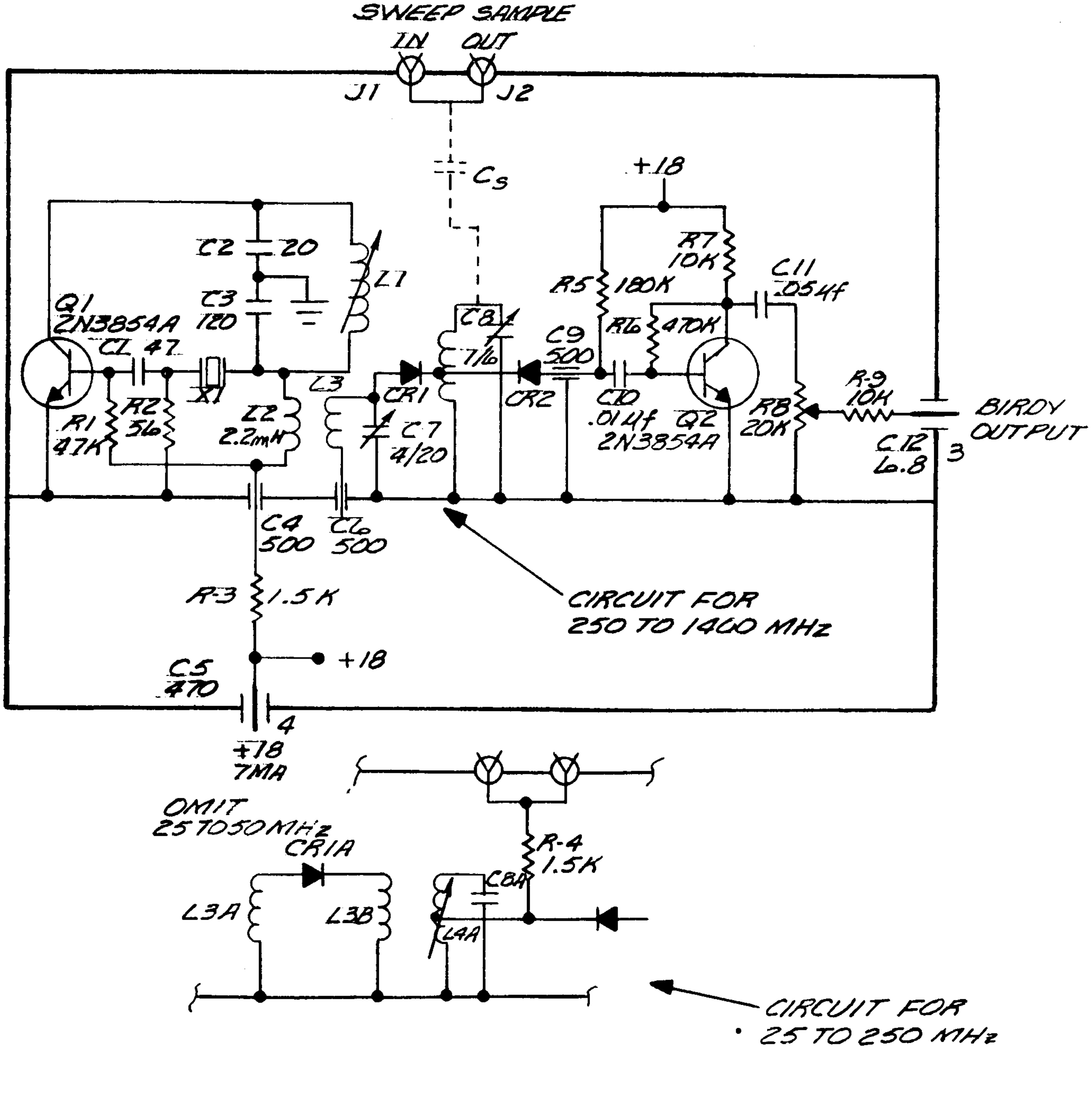
PARTS LIST

MODULE M6H5-50 REV C

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"C "	CAPACITORS				
1,2,3	Ceramic disc, vary with crystal freq.	----------	---	----------	--
7	Ceramic disc, 47pF ±5% 1kV	CD104-047	SPR	10TCC-Q47	2
4	Ceramic feedthru, 500pF ±20% 250V	CF104-150	AER	EF4	1
5	Variable, ceramic, 3.5/13pF	CV101-013	STR	7STRIK0-02	1
6	Ceramic disc, 15pF ±5% 1kV	CD101-015	SPR	10TCC-Q15	1
8,9	Ceramic disc, .001uF ±20% 1kV	CD102-210	SPR	5GA-D10	2
10	Ceramic disc, .01uF ±20% 100V	CD103-310	SPR	TG-S10	1
11	Ceramic feedthru, 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	1
12	Ceramic feedthru, 470pF ±20% 500V	CF101-141	A-B	FA5C	1
13	Electrolytic, 10uF 25V	CE105-010	SPR	TE1204	1
"J "	CONNECTORS				
1,2	Jack, receptacle, 50ohm submin	JF000-005	APL	27-9	2
"X "	CRYSTALS				
1	Type to vary with Harmonic interval	----------	---	----------	--
"CR "	DIODES				
1	Silicon, point contact	DG100-821	SYL	IN82AS	1
"L "	INDUCTORS				
1	Coilform with 32 ga. magnet wire, number of turns varies with crystal freq.	Not Assign.	---	----------	--
2	10 turn Torroid	LA006-010	W-I	LA006-010	1
3	Formed from 24 ga. buss wire	Not Assign.	---	----------	--
4	4 turn Torroid	LA006-004	W-I	LA006-004	1
"R "	RESISTORS				
1	Fixed, comp., 47kohm ±10% ¼W	RC104-347	A-B	CB4731	1
2	Fixed, comp., 56ohm ±10% ¼W	RC104-056	A-B	CB5601	1
3	Fixed, comp., 1.5kohm ±10% ¼W	RC104-215	A-B	CB1521	1
4,17	Fixed, comp., 100ohm ±10% ¼W	RC104-110	A-B	CB1021	2
5	Fixed, comp., 75ohm ±5% ¼W	RC103-075	A-B	CB7505	1
6	Fixed, comp., 3.9kohm ±10% ¼W	RC104-239	A-B	CB3921	1
7	Fixed, comp., 470ohm ±10% ¼W	RC104-147	A-B	CB4711	1
8	Fixed, comp., 33kohm ±10% ¼W	RC104-333	A-B	CB3331	1
9	Fixed, comp., 1Mohm ±10% ¼W	RC104-510	A-B	CB1051	1
10	Fixed, comp., 1kohm ±10% ¼W	RC104-210	A-B	CB1021	1
11	Fixed, comp., 8.2kohm ±10% ¼W	RC104-282	A-B	CB8221	1
12	Fixed, comp., 15kohm ±10% ¼W	RC104-315	A-B	CB1531	1
13	Fixed, comp., 1.5Mohm ±10% ¼W	RC104-515	A-B	CB1551	1
14,16	Fixed, comp., 10kohm ±10% ¼W	RC104-310	A-B	CB1031	2
15	Variable, carbon, 20kohm ±20% ¼W	RP124-320	A-B	WA2G032	1
"Q "	TRANSISTORS				
1	NPN, Silicon	QA038-541	G-E	2N3854A	1
2	NPN, Silicon	QB000-013	APX	A430	1
3	N-channel JFET	QA054-580	MOT	2N5458	1
4	NPN, Silicon	QA050-880	MOT	2N5088	1

SINGLE FREQ MARKER SCHEMATIC
OPTION A1
FREQ RANGE 25 TO 1400 MHz
MODULE M6S- ____

REV A

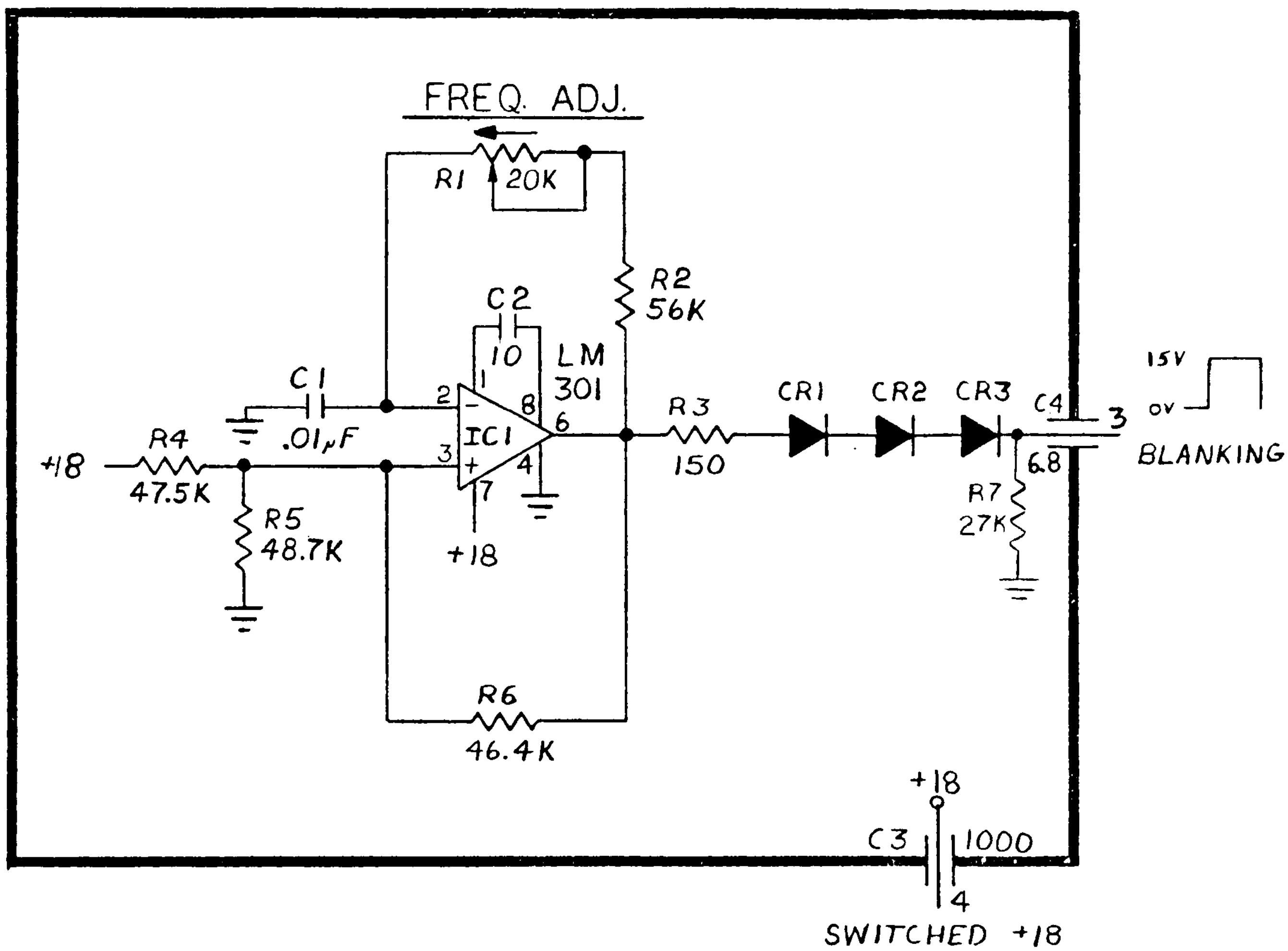


PARTS LIST

MODULE M6S 25-1400 REV A

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
" C "	CAPACITORS				
1	Ceramic disc, 47pF ±5% 1kV	CD-104-047	SPR	10TCU-Q47	
2	Ceramic disc, 20pF ±5% 1kV	CD-101-020	SPR	10TCC-Q20	
3	Ceramic disc, 120pF ±5% 1kV	CD-104-112	SPR	10TCU-T12	
4,6,9	Ceramic feedthru, 500pF ±20% 250V	CF-104-150	AER	EF4	
5	Ceramic feedthru, 470pF ±20% 500V	CF-101-147	A-B	FA5C	
7	Variable, ceramic, 4/20pF	CV-105-020	STR	S-TRIKO	
8	Variable, ceramic, 1/6pF	CV-106-R60	APX	2222-802	
8A	Ceramic disc, from 4.7 to 20pF varies with marker freq.	CD-101 ---	SPR	10TCL	
10	Ceramic disc, .01uF ±20% 100V	CD-103-310	SPR	TG-S10	
11	Ceramic disc, .05uF ±20% 100V	CD-103-350	SPR	TG-S50	
12	Ceramic feedthru, 6.8pF ±10% 500V	CF-102-R68	A-B	FA5C	
" J "	CONNECTORS				
1,2	Jack, receptacle, 50ohm submin.	JF-000-005	APL	27-9	
" X "	CRYSTALS				
1	Quartz crystal, frequency varies with marker frequency	XX-000-331	W-I	XX-000-331	
" CR "	DIODES				
1,2	Silicon, point contact	DG-100-821	SYL	IN82AS	
1A	Silicon, Hot carrier	DG-000-007	H-P	5082-2800	
" L "	INDUCTORS				
1	Coil form No. LB-003-000 wound with 32 gauge magnet wire. Number of turns varies with crystal frequency	Not Assign.	W-I	Not Assign.	
2	Fixed, 2.2uH	LA001-R22	JEF	15	
4A	Coil Form LB-006-000, with magnet wire, gauge and number of turns to vary with marker frequency	Not Assign.	W-I	Not Assign.	
" R "	RESISTORS				
1	Fixed, comp., 47kohm ±10% ¼W	RC-104-347	A-B	CB4731	
2	Fixed, comp., 56ohm ±10% ¼W	RC-104-056	A-B	CB5601	
3,4	Fixed, comp., 1.5kohm ±10% ¼W	RC-104-215	A-B	CB1521	
5	Fixed, comp., 180kohm ±10% ¼W	RC-104-418	A-B	CB1841	
6	Fixed, comp., 470kohm ±10% ¼W	RC-104-447	A-B	CB4741	
7,9	Fixed, comp., 10kohm ±10% ¼W	RC-104-310	A-B	CB1031	
8	Variable, carbon, 20kohm	RP-124-320	A-B	WA2G032	
" Q "	TRANSISTORS				
1,2	NPN, Silicon	QA-038-541	G-E	2N3854A	

M6Z-1
1KHZ MODULATOR



REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
C1	CAP,FILM,10KPF,160V CP105-310	SXM110	MAL	1510-60-5103	1
C2	CAP,CER,10PF,1KV CD101-010	10TCC-Q10	SPR	1510-10-0100	1
C3	CAP,CER,F.T. 1000PF CF112-210	54-794-010-102P	SPEC	1510-30-8102	1
C4	CAP,F.T.,6.8PF CF102-R68	FASC-6892	A-H	1510-30-1689	1
CR1 CR2 CR3	DIODE DG109-140	1N4148	FCD	4807-01-0914	3
IC1	IC,8 PIN,IC000-008	LM301-AN	NAT	7000-03-0100	1
R1	POT,20K RP124-320	WA2G032S-203MA	A-B	4610-10-7203	1
R2	RES,C,1/4W,5%,56K RC103-356	CF1/4-56K	ASE	4700-15-5602	1
R3	RES,C,1/4W,5%,150 RC103-115	CF1/4-150	ASE	4700-15-1500	1
R4	RES,MF,1/8W,1%,47.5K RF213-475	MF55K-47.5K	ASE	4701-03-4752	1
R5	RES,MF,1/8W,1%,48.7K RF213-487	MF55K-48.7K	ASE	4701-03-4872	1
R6	RES,MF,1/8W,1%,46.4K RF213-464	MF55K-46.4K	ASE	4701-03-4642	1

WAVETEK PARTS LIST	TITLE 1 KHZ SQR WAVE MODULATOR, M6Z-1	ASSEMBLY NO. 1114-00-0150 PAGE: 1	REV A

MODEL 1001A TO 1005 MANUAL CHANGES

WAVETEK'S product improvement program incorporates the latest electronic developments into these instruments as rapidly as development and testing permit. Due to the time required to document and print these instruction manuals, it is not always possible to include the change information in the current printing. The following changes should be made to this manual:

1. The use of ball studs on certain modules has been discontinued. In place of ball studs, a single index stud and a #6 screw is used. The index stud is located on the module end nearest pin #1.

Modules without ball studs but with index studs may be used in any chassis with no mismatch of pins, and they cannot be plugged in backwards.

2. Delete L11 on M9G/H parts list, connect C26 directly to R52 on the Schematic.

3. Models 1000 thru 1005 Head Parts List should read:

L101, 102	...Fixed, 10 mH...	LA004-310	JEF	15S	2
L103, 104	...Fixed, 10 uH...	LA001-010	JEF	15	2

4. Module M6Z (Option A-4) has been replaced by module M6Z-1. Specifications and adjustment are unchanged.

5. Module M1H is now constructed on a PC board rather than a metal chassis. To access the adjustments (see Figure 5-9), the module cover must be removed.

6. Module M6H-5-50 - C3 is now a * part. R16 is 10 kohm instead of 100 kohm on Schematic.

PARTS LIST MODULE M9S-1 REV B

REFERENCE SYMBOL	DESCRIPTION	WAVETEK PART NO.	MANUFACTURER CODE	MANUFACTURER NUMBER	T Q
"C"	CAPACITORS				
1,16,19,20	Ceramic feedthru 470pF ±20% 500V	CF101-147	A-B	FA5C	3
2,7,8,11	Ceramic feedthru 100pF ±20% 250V	CF104-110	AER	EF4	4
3,4,5,9,12 13,14	Ceramic feedthru 500pF ±20% 250V	CF104-150	AER	EF4	7
6	Composition, .75pF ±10% 500V	CG101-175	Q-C	QC.75	1
10	Composition 2 pF ±10% 500V	CG101-220	Q-C	QC2.0	1
15,17,18,23	Ceramic feedthru 6.8pF ±10% 500V	CF102-R68	A-B	FA5C	2
21	Ceramic disc 120pF ±20% 1kV	CD102-112	SPR	5GA-T12	1
22	Ceramic disc 270pF ±20% 1kV	CD102-127	SPR	5GA-T27	1
"J"	CONNECTORS				
1,2	Jack, receptacle, 50 ohm	JF000-005	APL	27-9	2
"CR"	DIODES				
1,2,3	Silicon, P.I.N.	DP000-040	W-I	DP000-040	3
4	Silicon, Point contact	DG100-821	SYL	1N82AS	1
5,6,7,8	Voltage variable capacitance	DC000-008	W-I	DC000-008	4
9	Silicon, junction 100 P.I.V. 750 mA	DR000-001	ITR	1N4002	1
"L"	INDUCTORS				
1,2,10,11	Fixed ———	LA006-004	W-I	LA006-004	4
3,8,12	Fixed, .22uH	LA005-R02	W-E	506	3
4	Fixed ———	Not Assign	W-I	Not Assign	-
5,7,9	Fixed ———	Not Assign	W-I	Not Assign	-
6	Fixed ———	Not Assign	W-I	Not Assign	-
"R"	RESISTORS				
1,12	Fixed, comp. 22Kohm ±10% ¼W	RC104-322	A-B	CB2231	2
2,11	Fixed, comp. 68Kohm ±10% ¼W	RC104-368	A-B	CB6831	2
3,9,14	Fixed, comp. 2.2Kohm ±10% ¼W	RC104-222	A-B	CB2221	3
4	Fixed, comp. 100Kohm ±10% ¼W	RC104-410	A-B	CB1041	1
5,6	Fixed, comp. 220ohm ±10% ½W	RC106-122	A-B	EB2211	2
7	Fixed, comp. 390ohm ±10% ¼W	RC104-139	A-B	CB3911	1
8	Fixed, comp. 47ohm ±5% ½W	RC105-047	A-B	EB4705	1
10	Fixed, comp. 47ohm ±10% ¼W	RC104-047	A-B	CB4701	1
13	Fixed, comp. 100ohm ±10% ¼W	RC104-110	A-B	CB1011	1
15	Variable, wirewound 10Kohm	RV102-310	BOU	3067P	1
16	Fixed, comp. 3.9Kohm ±10% ¼W	RC104-239	A-B	CB3921	1
17	Fixed, comp. 7.5Kohm ±5% ¼W	RC103-275	A-B	CB7525	1
18,26,35	Fixed, comp. 4.7Kohm ±10% ¼W	RC104-247	A-B	CB4721	3
19	Fixed, comp. 470ohm ±10% ¼W	RC104-147	A-B	CB4711	1
20,22	Variable, carbon 20Kohm ±20%	RP124-320	A-B	WA2G032	2
21	Fixed, comp. 15Kohm ±10% ¼W	RC104-315	A-B	CB1531	1
23	Fixed, comp. 470Kohm ±10% ¼W	RC104-447	A-B	CB4741	1
24,37	Fixed, comp. 1.2Mohm ±10% ¼W	RC104-512	A-B	CB1251	2
25	Fixed, comp. 2.7Kohm ±10% ¼W	RC104-227	A-B	CB2721	1
27,28	Fixed, comp. 10Kohm ±10% ¼W	RC104-310	A-B	CB1031	2
29,36	Fixed, comp. 220 ohm ±10% ¼W	RC104-122	A-B	CB2211	2
30	Fixed, comp. 1.2Kohm ±10% ¼W	RC104-212	A-B	CB1221	1
31	Fixed, comp. 1Mohm ±10% ¼W	RC104-510	A-B	CB1051	1