Serial No._____

INSTRUCTION MANUAL

MODEL 2001
SWEEP/SIGNAL GENERATOR

WAVETEK® INDIANA INC.

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SECTION 1
GENERAL INFORMATION

1.1 INTRODUCTION

The compact WAVETEK MODEL 2001 Sweep/Signal Generator offers programming, versatility and an exceptionally wide frequency range (1 to 1400 MHz) in a ruggedized inexpensive instrument. Its unique adaptability promotes sophisticated laboratory applications, as well as automatic production testing.

Each of its three frequency ranges (1-500 MHz, 450-950 MHz, and 900-1400 MHz) may be used in 3 modes of operation; start-stop, Δf or CW. It can be swept from end-to-end, up-or-down, at any rate from 50 sweeps per second to 1 sweep every 100 seconds. Manual, triggered, or recurring sweeps are provided and the sweep frequency, sweep width, and output attenuation all may be controlled by external voltages.

Up to six crystal controlled birdy marker modules (single frequency or harmonic type) may be plugged into the 2001. Each module has its own Front Panel On/Off switch. Front Panel amplitude and width controls enable optimum adjustment of the marker display. In application, the markers may be tilted 90° for easy viewing when displayed with steep transition signals or rectified for X-Y plotter applications by a Front Panel switch. A 1kHz square wave modulator, providing 100% amplitude modulation of the RF output for low level recovery applications, is available as an optional feature.

Most optional features, as well as the functional circuits for the basic sweep generator, have modular plug-in construction. This allows optional features to be factory installed at the time of purchase, or customer installed at a later date. This concept offers protection against obsolesence since updated and additional features can be simply and economically added as new test procedures dictate.

Maintenance problems can be greatly simplified by stocking several modules instead of hundreds of discrete components. Servicing time of a defective instrument can be cut to a fraction of the time previously required and can be performed by relatively inexperienced technicians. Modules for the 2001 are stocked in Wavetek service centers around the world.

1.2 SPECIFICATIONS

Table 1-1. lists the specifications for MODEL 2001 Sweep/Signal Generator.

TABLE 1-1.
SPECIFICATIONS

RF SPECIFICATIONS	
Frequency Range –	1 to 1400 MHz in three overlapping bands Band 1 1 to 500 MHz Band 2 450 to 950 MHz Band 3 900 to 1400 MHz
Operating Modes –	Start/Stop, Δf, and CW

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

Frequency Dial Calibration –	10 MHz intervals
Accuracy –	Band 1 10 MHz Band 2 2% of selected frequency Band 3 2% of selected frequency
Sweep Width –	200 kHz to 500 MHz-calibrated in 10 MHz intervals
Accuracy –	Band 1 ±10 MHz Band 2 ±20 MHz Band 3 ±20 MHz
Display Linearity –	2%
Spurious Signals –	Band 1 10 to 500 MHz 26dB below output Band 2 500 to 950 MHz, 26dB below output Band 3 900 to 1400 MHz, 26dB below output
Residual FM –	Less than 15kHz
Drift –	100 kHz/5 minutes – 2 MHz/8 hours (after 1/2 hour warm-up at a constant ambient, and allowing a 5 minute stabilizing period after a frequency change)
Blanking –	Retrace blanking of the RF output provided for sweep operation. Removed for CW operation.
RF Output Amplitude –	Continuously adjustable from +10 to -80 dBm; 70 dB in 10 dB steps, plus a 20 dB vernier, calibrated in 1 dB increments. Step attenuator and vernier attenuator accuracy: ±0.5 dB to 500 MHz ±1 dB to 1000 MHz ±2 dB to 1400 MHz
Flatness at +10 dBm –	±0.5 dB over 1 to 1400 MHz (when read with negative detector) ±0.75 dB over 1 to 1400 MHz (when read with a power meter)
Impedance –	50 ohms

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 within the selected band by a ±16 V signal. (-16 volts corresponds to LOW frequency

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

	band end and +16 volts to HIGH frequency band end) Tuning sensitivity: 16 MHz/volt (approx.)
Sweep Width —	May be controlled by a remote potentiometer. (Input and output connections provided in Rear Panel REMOTE jack)
Vernier 0-20 dB Output —	May be remotely programmed over a 20 dB range with a 0 to -18 volt signal. (-18 volts corresponds to a maximum output)
External FM —	Full deviation of ±250 MHz possible at rates up to 4kHz. With reduced deviation and linearity, modulation rates to 100kHz are possible. Sensitivity: 16 MHz/volt (approx.)
External AM —	External AM signals are applied to same connections as for vernier 0-20 dB 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 possible to 1kHz, 40% modulation possible to a 40kHz rate.
SWEEP SPECIFICATIONS	
Sweep Modes —	Repetative sweep Single sweep Externally triggered sweep Manual sweep Line lock sweep
Sweep time —	Continuously variable from less than 10 ms to over 100 seconds, in 4-decade steps, plus vernier
Horizontal Output —	16 volts peak-to-peak (symmetrical about ground)
EXTERNAL LEVELING	
External Monitor (ALC) —	An external negative signal, between 0.2 and 2 volts, may be used to level the RF output
MARKER SPECIFICATIONS	
Type —	Birdy by-pass markers with provisions for six plug-in marker modules, plus Front Panel external marker input. Markers may be either single frequency or harmonic (comb.) type. (See Options A1 and A2)
Accuracy —	0.005%

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

External Market Input —	Front Panel BNC connector accepts external CW signal for conversion to a Birdy marker. Input level: 100 mV into 50 ohms
Marker Width —	Adjustable from (approx.) 15 to 400 kHz in four steps
Marker Size	
Large —	Adjustable from (approx.) 12 V to 15 mV peak-to-peak
Small —	Adjustable from (approx.) 50 mV to 100 uV peak-to-peak
Rectified Birdy (for use with X-Y plotters) —	Size varies with detector's impedance. Adjustable from (approx.) 6 V to 1 mV with detector impedance of 1 meg ohm, or from 0.5V to 1 mV with detector impedance of 0 ohms. Rectified birdy is positive polarity
Marker Tilt —	Provides horizontal markers have 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.

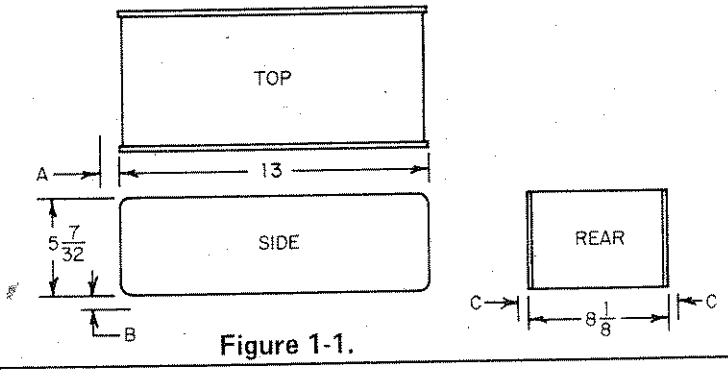


Figure 1-1.

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 jacks.

1.4.2 Accessories Available:

a. Wide-band RF Detector — Model D-152.
b. Service Kit — K102. Contains a module extender and extension cables.
c. Rack Mount Kit — K103. Mounts single instruments in a 5-1/4 inch space. See Figure 2-1.
d. Rack Mount Kit — K104. Mounts one or two instruments in a 7 inch space. See Figure 2-2.

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 5 1/4" 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.	C000-610
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.

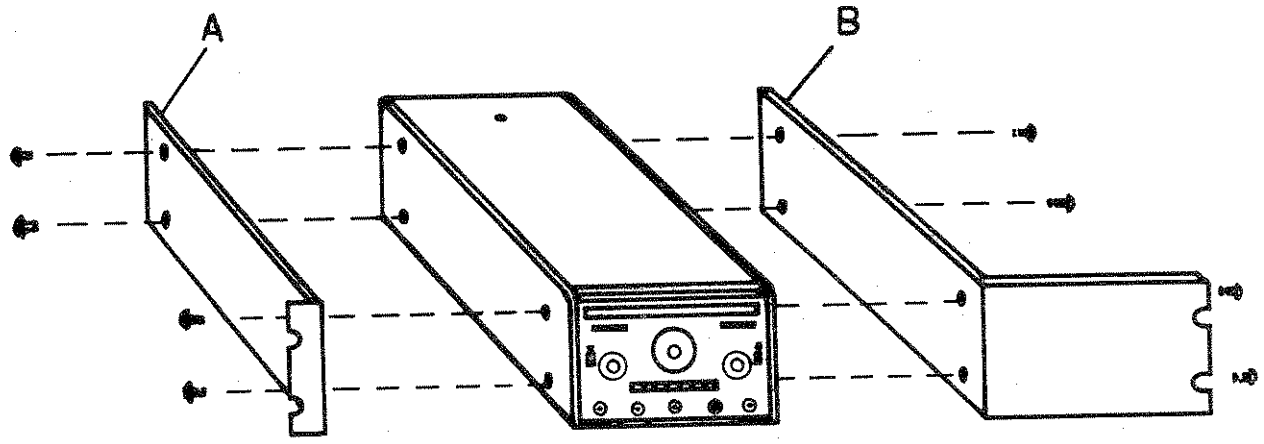


Figure 2-1. K-103 Rack Mounting

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

CONTENTS

Item	Qty.	Part No.
A (Tray)	2	C000-729
B (Side)	2	A500-230
C (Screw)	12	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 bale, it must be removed before installing in the K104 rack mounting kit.

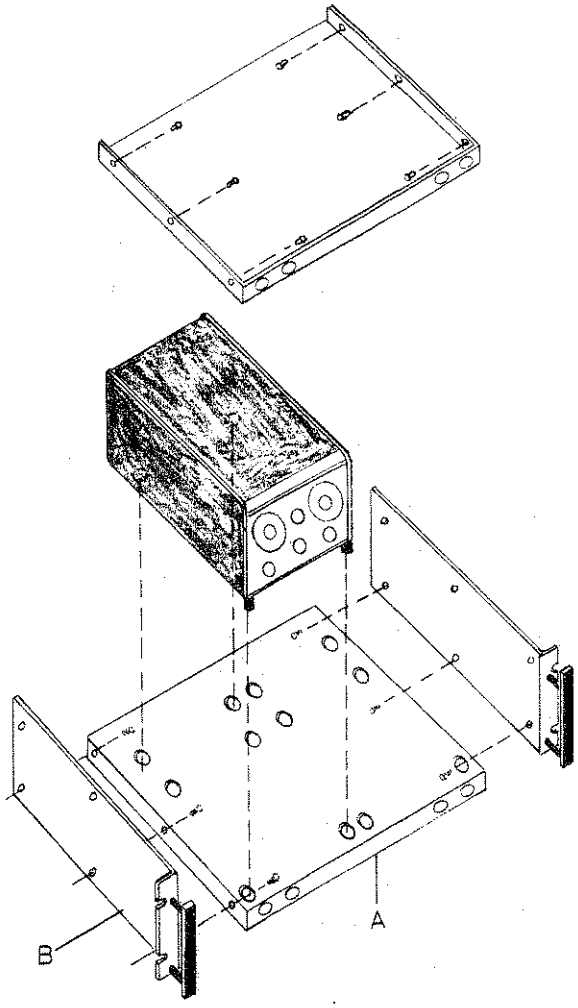


Figure 2-2. K-104 Rack Mounting

2.2 ELECTRICAL INSTALLATION

2.2.1 Primary Power Requirements

These instruments operate from either 115 VAC or 230 VAC 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 VAC, and 0.25 amp for 230 VAC.

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 adjust to operate at 115 VAC, 60 Hz unless specified for 230 VAC 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

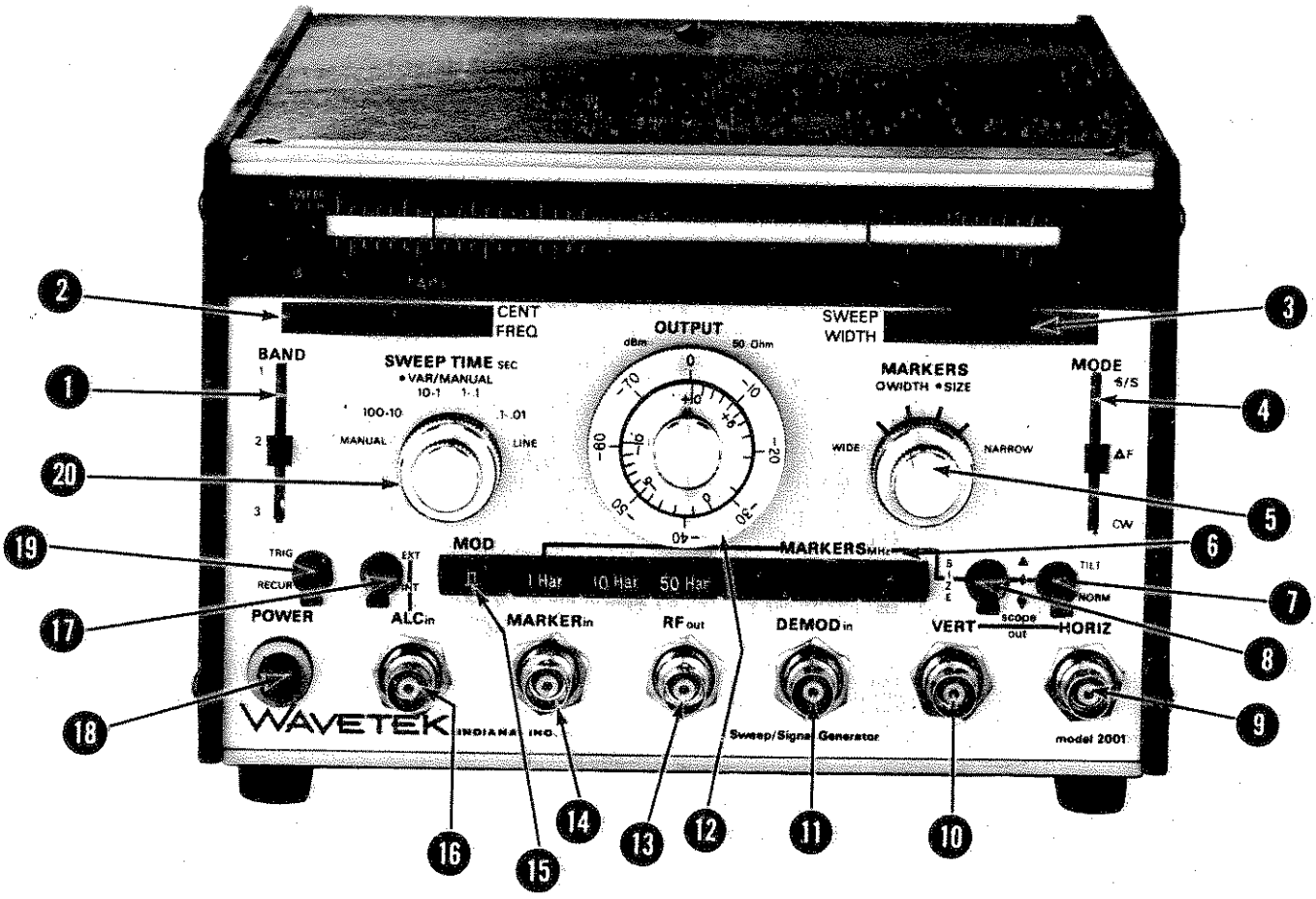


Figure 3-1. Front Panel

3.1 INTRODUCTION

This section provides complete functional control description, operating instructions, and programming instructions for the Model 2001 Sweep/Signal Generator.

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

3.2 DESCRIPTION OF FRONT PANEL (Refer to Figure 3-1 for control location)

(1) BAND Switch – Selects desired band; 1 to 500 MHz, 450 to 950 MHz or 900 to 1400 MHz.

(2) START/CENTER FREQ. – Controls Start Frequency when MODE Switch is set to S/S (Start/Stop) or Center Frequency when MODE Switch is set to Δf and C.W.

(3) STOP/SWEEP WIDTH – Controls Stop Frequency when MODE Switch is set to S/S (Start/Stop) or controls Sweep Width when MODE Switch is set to Δf.

(4) MODE Switch - Selects Start/Stop, Δf or continuous wave operation.

(5) MARKERS O WIDTH • SIZE –	Dual concentric control; outer knob adjusts marker width from 15 to 400 kHz in four steps; inner knob controls marker size.
(6) MARKERS –	Six push button switches control A1 and A2 Marker Options (Marker frequency is engraved on push button).
(7) TILT/NORM Switch –	Provides vertical markers in the NORM (down) position. In the TILT (up) position provides horizontal markers having a fixed amplitude of approximately 10% of the horizontal display, when MARKER SIZE is set to minimum. NOTE: Increasing the marker size will cause the horizontal marker to tilt toward a vertical position. This feature is used to identify frequencies on Steep response skirts.
(8) MARKER SIZE Switch –	This three position switch provides; large markers in its Lower position (12 V to 50mV peak-to-peak), small markers in its Center position (50mV to 100uV volts peak-to-peak) and rectified positive markers in its Up position. These rectified markers are for use with X-Y recorders.
(9) SCOPE HORIZ. Out –	BNC connector provides a 16 volt peak-to-peak triangle wave, symmetrical about ground, to drive the Horizontal (x) axis of the oscilloscope or other indicating device. (An alternate connection is available at the Rear Panel).
(10) SCOPE VERT. Out –	BNC connector provides the combined markers and demodulated RF (when DEMOD in is connected) for connection to the oscilloscope Vertical (y) axis input.
(11) DEMOD in –	BNC connector accepts the demodulated, swept, signal from the device under test so RF markers may be added. (The combined signal is available at the SCOPE VERT. OUTPUT connector).
(12) OUTPUT-dBm-50 ohm –	Attenuator; Outer knob provides calibrated adjustment of the RF output in 10 dB increments from 0 dBm to -70 dBm; inner knob provides calibrated vernier adjustment of the RF output from +10 dBm to -10 dBm.
(13) RF out –	BNC connector provides a connection for RF output signal.
(14) MARKER in –	BNC connector accepts an externally generated continuous wave signal to produce a frequency marker on the display.
(15) MOD –	Push button switch for A4 option (1 kHz square wave amplitude modulation).
(16) ALC in –	BNC connector accepts an automatic leveling control signal from a remote monitor when EXT/INT switch is in the EXT (up) position.
(17) EXT/INT Switch –	Closes the internal automatic leveling loop when in INT (down) position. NOTE: When this switch is in the EXT position, and no external monitor is in use, the RF output is unleveled and not controlled by the 20 dB vernier attenuator.
(18) POWER –	Push button applies A.C. power to the power supply. The light indicates that the instrument is operating.

⑲ TRIG/RECUR Switch — Selects recurring sweep of the time selected by SWEEP TIME Control when in RECUR (down) position and with MODE Switch in either S/S or ΔF. When TRIG/RECUR Switch is in the center position, the sweep may be triggered for single sweep operation by momentarily contacting the TRIG (up) position

⑳ SWEEP TIME Sec. VAR/MANUAL Control — 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 triggered in the four decade ranges only).

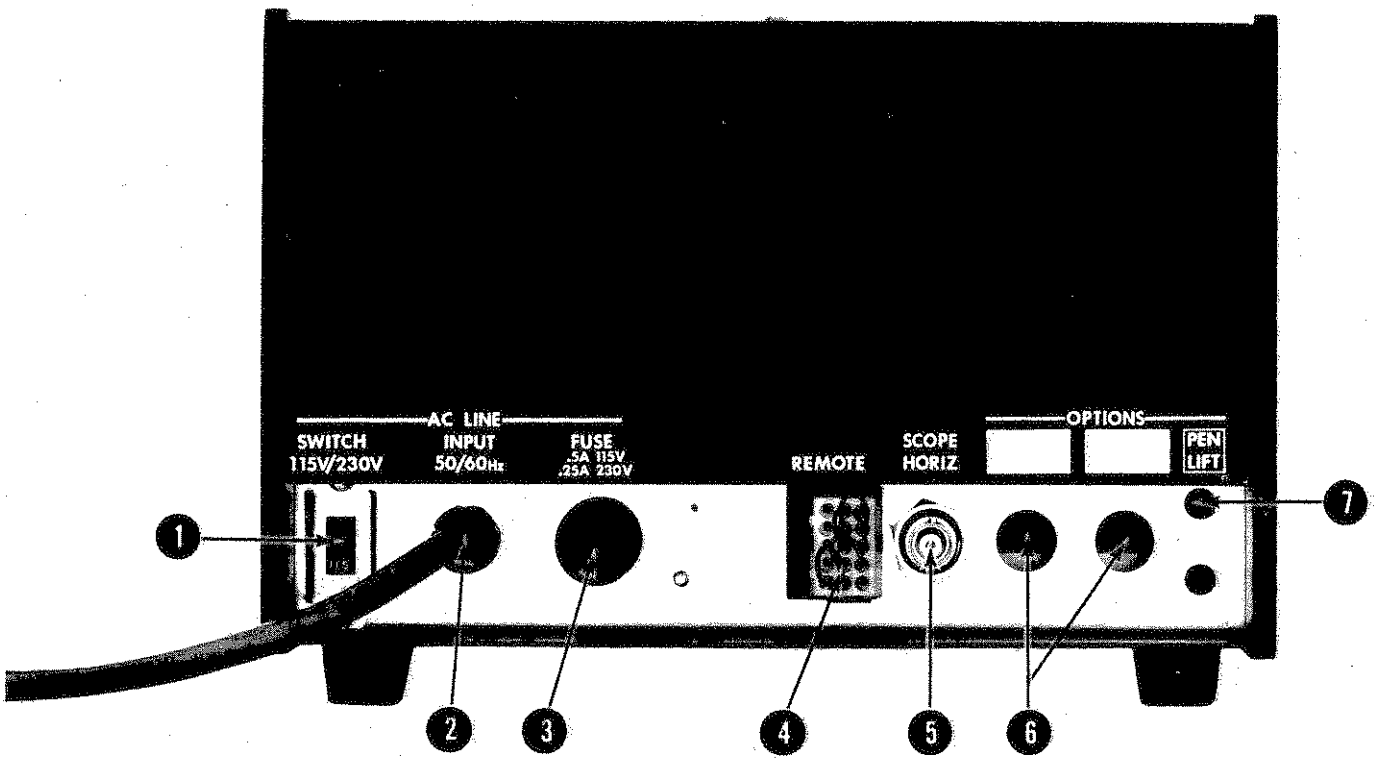


Figure 3-2. Rear Panel

3.3 DESCRIPTION OF REAR PANEL (Refer to Figure 3-2 for location)

① SWITCH 115/230V — Selects 115 or 230 V line voltage.

② INPUT 50/60Hz — 3 prong AC plug provides connection to AC mains.

③ AC LINE FUSE — 0.5A for 115 V AC or 0.25A for 230 V 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. This connector is in parallel with the SCOPE HORIZ. connector located on the Front Panel.

⑥ OPTIONS – Provides mounting holes for BNC connectors used with special modifications or options.

⑦ PEN LIFT OPTION (A-5) – 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.

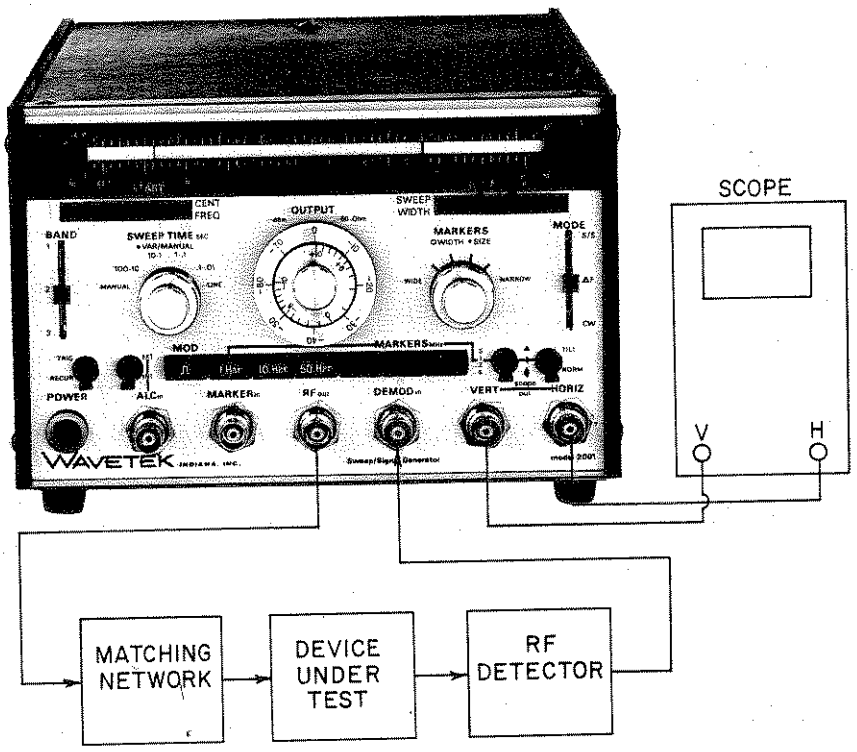


Figure 3-3. Typical Operating Set-up

3.4 TYPICAL OPERATING SET-UP

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

Make connections between the Model 2001, 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 setup. Use coaxial cables with BNC connectors wherever possible. The RF OUTPUT cable is especially critical. It should have a characteristic impedance of 50 ohms, and should be kept as short as practical (under 3 feet). If the input impedance of the device under test is not 50-ohms, a matching network, as shown in Figure 3-3, should be used to ensure 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 Model 2001. 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 D152 RF Detector is recommended for 50-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 Model 2001 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.

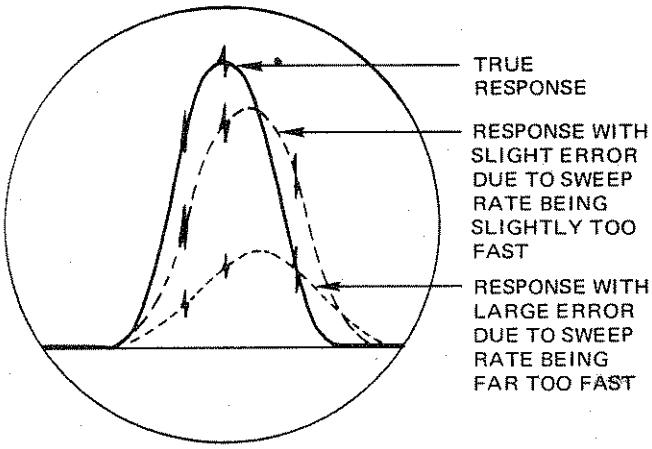


Figure 3-4. Sweep Rate Effects

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.

3.5.2 Effects From Overloading

The use of excessive signal from the Model 2001 can overload the receiver circuits. 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 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.

3.5.5 Operation With X-Y Plotters

Two features are incorporated into the Model 2001 to facilitate operation with X-Y plotters. First, a marker clamp switch that is a part of the Front Panel SIZE Selector Switch. This marker clamp switch converts the hi-frequency marker signals to a lower frequency which is compatable with the operating speed of the plotter pen.

Second is an optional feature (A5). This feature provides a contact closure during the sweep time to operate the plotter's pen lift. The A5 feature operates only when the sweep time selector switch is set to its slowest position, 10 to 100 sec.

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, since the 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, +10 dBm. Next, connect the output from the external monitor to the Front Panel BNC jack labeled ALC IN and set the ALC EXT/INT Switch to the EXT position. 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 the less than 2 volts signal. 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.)

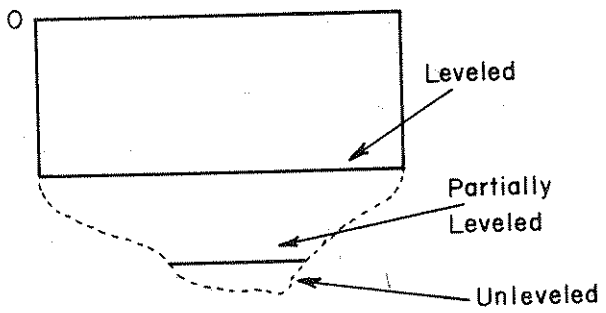
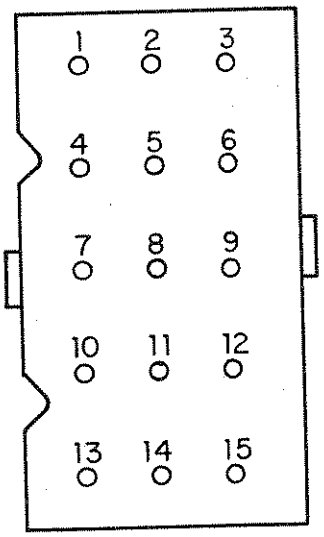


Figure 3-5. External Monitor Output Signal

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
Pin 15 – Same as Pin 10 Except Inverted

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)

INTERNAL CONTROL

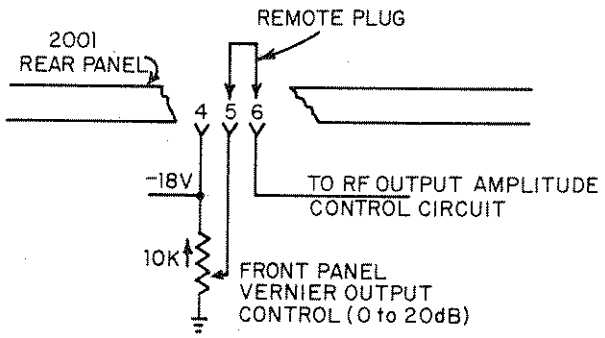
Pins 5, 8 and 11 are used to program internal operation of Output, Frequency and Sweep Width.

UNUSED

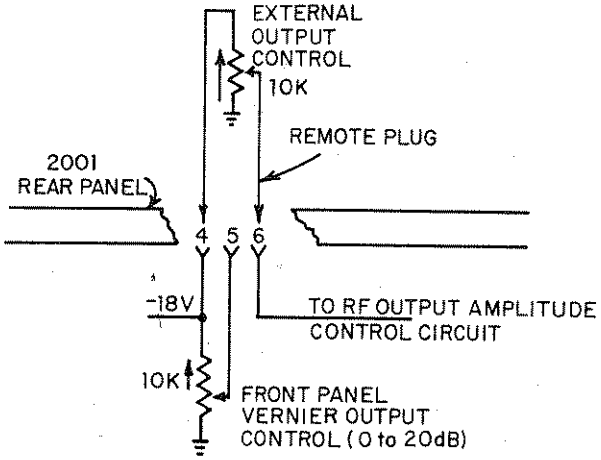
Pins 13 and 14 are unused

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.



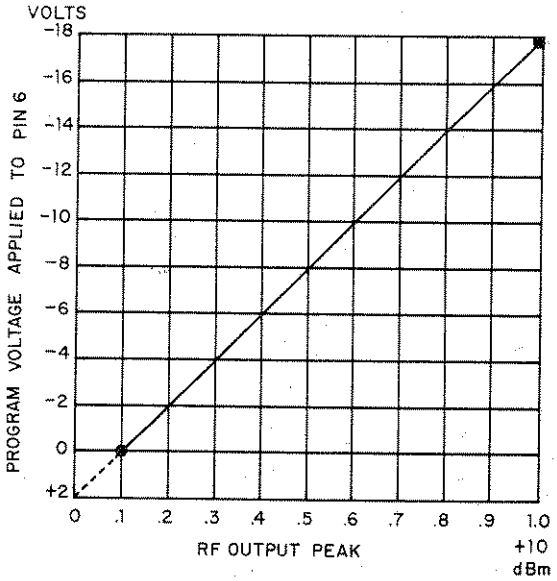
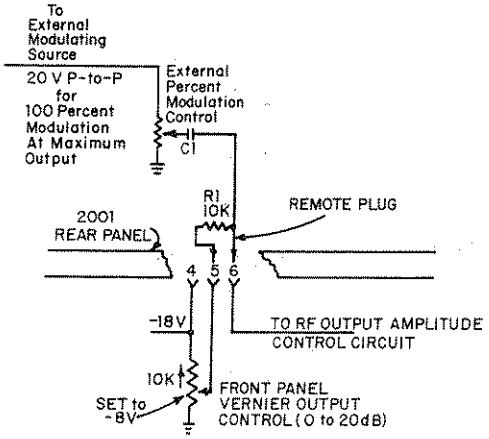


Figure 3-6. Program Voltage/RF Output

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 useable percentage of modulation as shown in Figure 3-7. This graph was obtained with the DC level set to -8 volts.



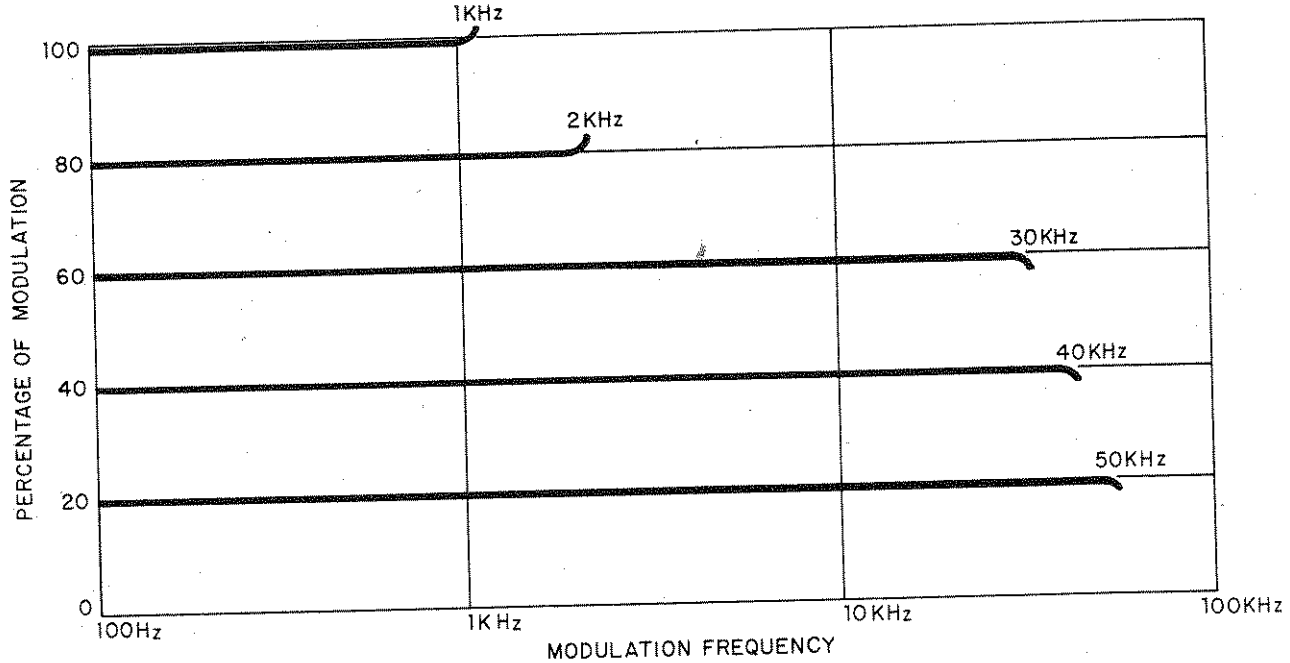
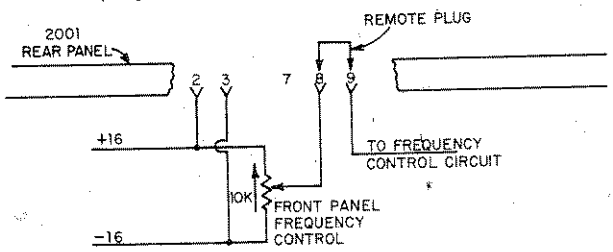


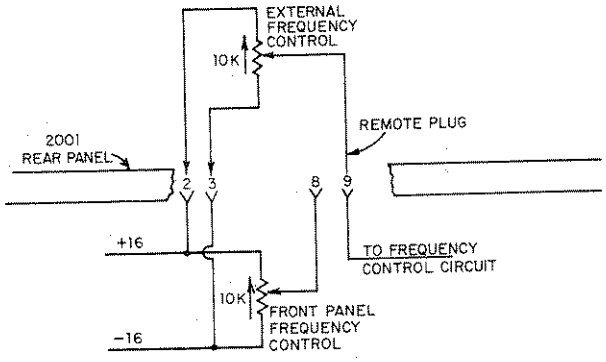
Figure 3-7. Percentage Modulation/Modulating Frequency

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.



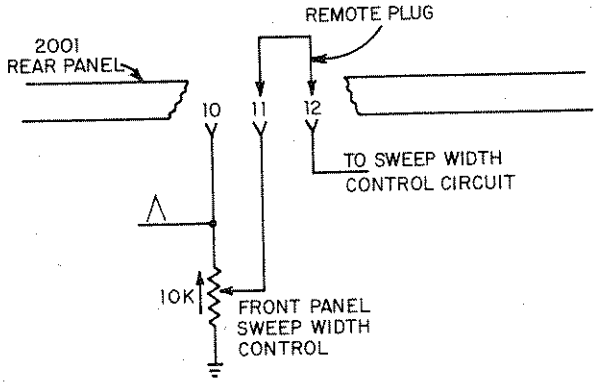
To provide external control, remove the jumper and connect pin 9 to an external Frequency control as shown below.



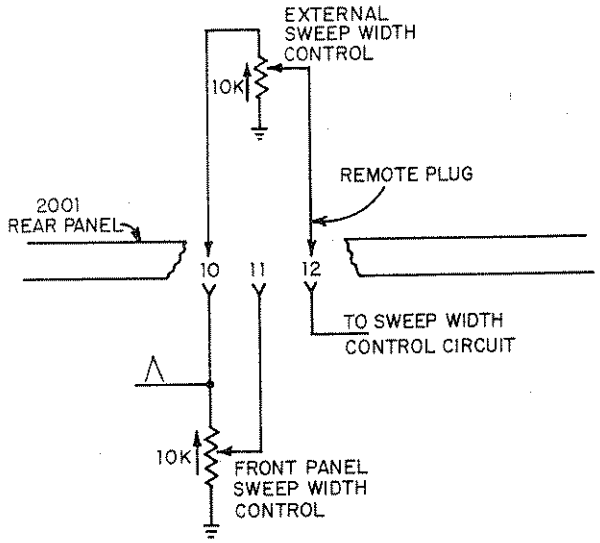
Tuning sensitivity, which is approximatley 16 MHz/volt, is shown graphically in Figure 3-8.

3.6.3 SWEEP WIDTH CONTROL (FM Modulation)

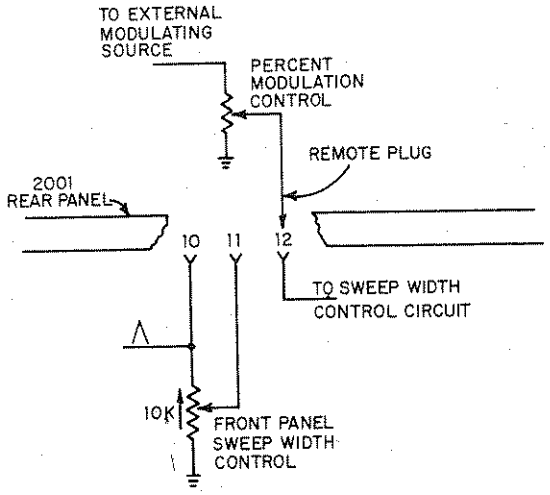
Normal internal control of sweep width is provided by a jumper wire between pins 11 and 12 of the REMOTE plug as shown below.



To provide external control, remove the jumper and connect pin 12 to an external Sweep Width control as shown on page 3-10.



To provide FM modulation, connect as shown at right and set the Front Panel MODE Switch for CW operation.



The modulating wave form should have an average potential of zero volts. Frequency sensitivity, which is approximately 16 MHz/volt, is shown graphically in Figure 3-8. The maximum modulating frequency, while still maintaining the 16 MHz/volt relationship, 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 on page 3-11.

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.

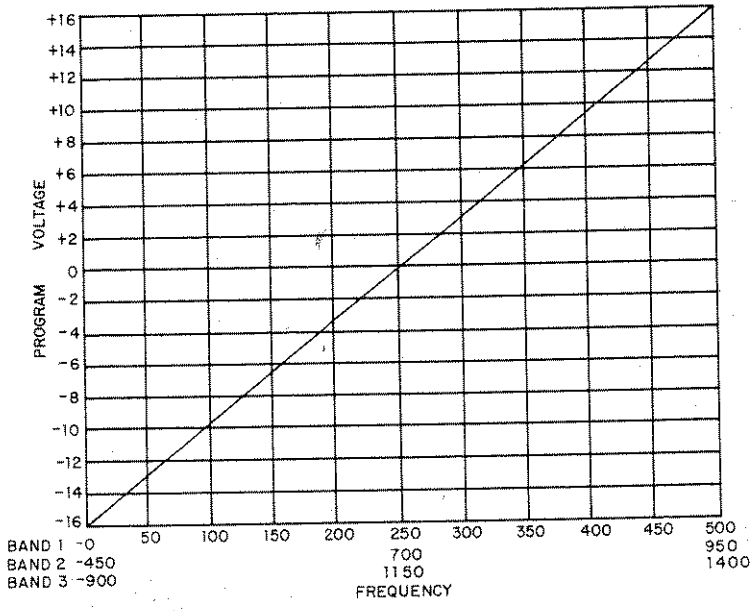


Figure 3-8. Program Voltage (pin 9 or 12)/Frequency

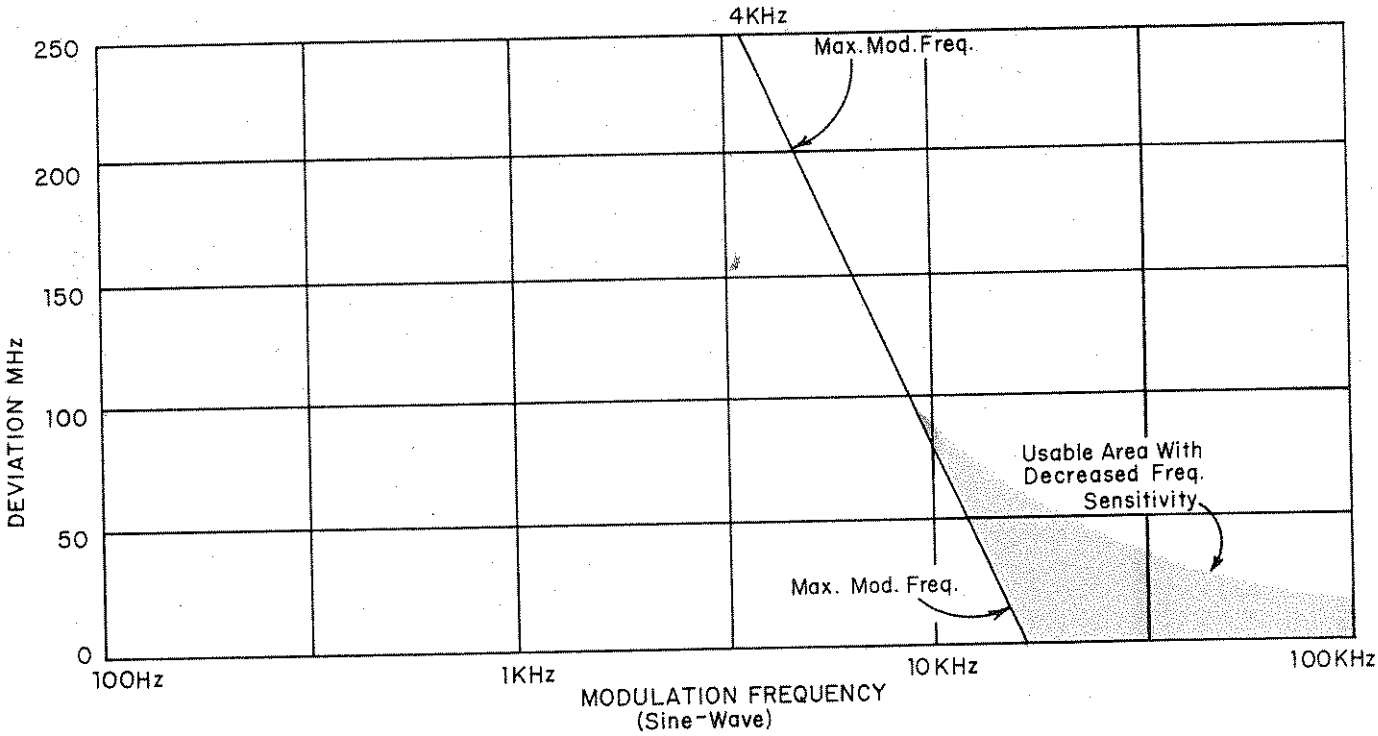


Figure 3-9. FM Modulation Frequency Limits

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 TRIG/RECUR Switch set to the TRIG position. The repetition rate of the external trigger should be slower than the frequency running rate set by the Front Panel SWEEP TIME Selector and VAR/MANUAL Control.