MODEL 562
SCALAR NETWORK ANALYZER

OPERATION MANUAL

WILTRON

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SECTION I
GENERAL INFORMATION

1-1 SCOPE OF THE MANUAL

This manual provides general, installation, and operation information for the Model 562 Scalar Network Analyzer (Figure 1-1).

1-2 INTRODUCTION

Section I provides information about the equipment identification number, performance specifications, and options.

1-3 IDENTIFICATION NUMBER

All WILTRON instruments are assigned a six-digit ID number, such as "505001." This number appears on a decal affixed to the rear panel. Please use this identification number in any future correspondence with WILTRON Customer Service about this instrument.

1-4 DESCRIPTION OF 562 SYSTEM

The Model 562 Scalar Network Analyzer is a microprocessor-based analyzer used to make scalar (magnitude) reflection and transmission measurements and absolute power measurements over a frequency range determined by the source sweeper and the external detectors used. The 562 is programmable over the IEEE–488 interface bus (GPIB). Also, because of the extensive use of internal microprocessors, the 562 can make the majority of measurements without an external controller.

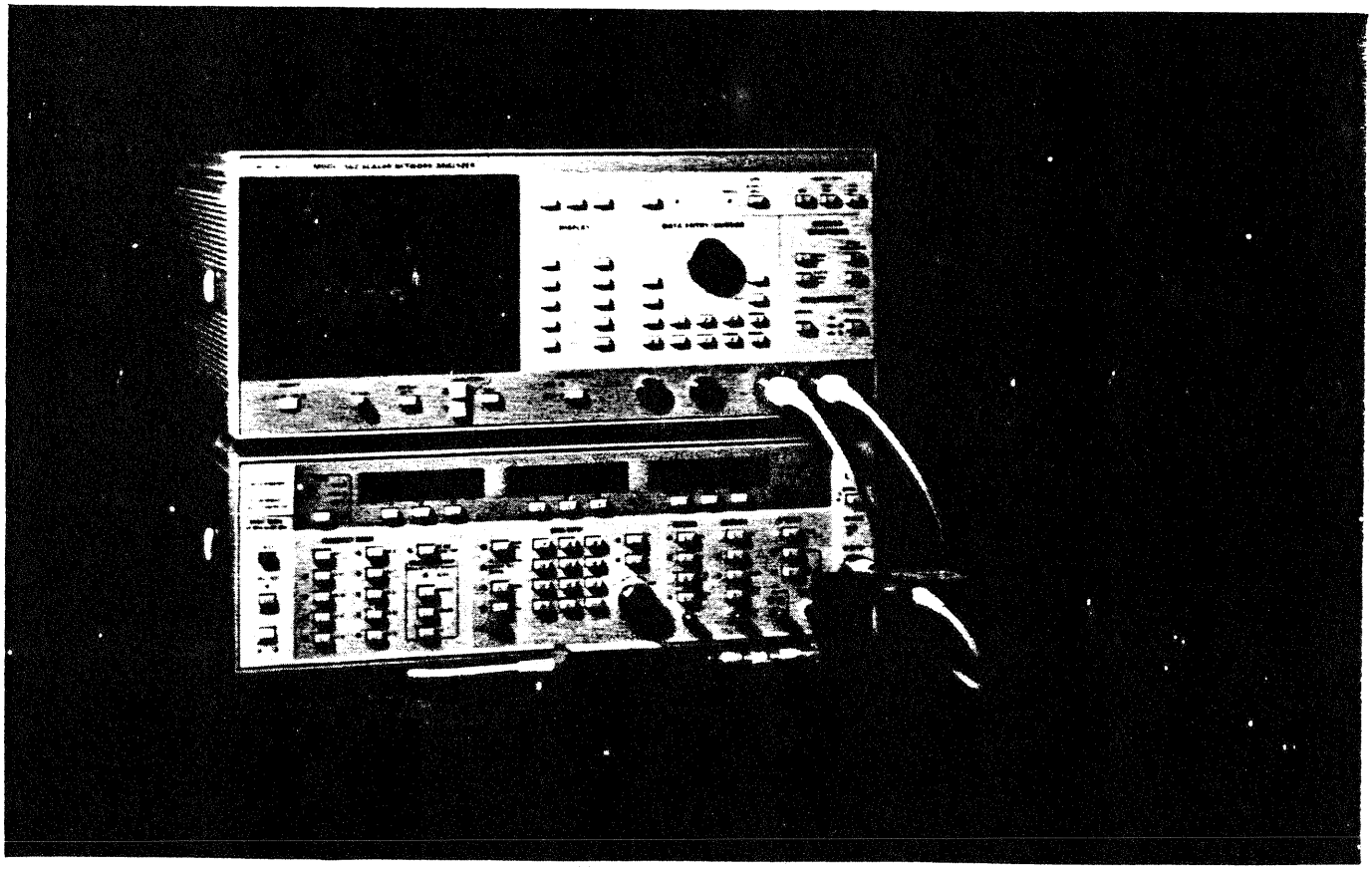


Figure 1-1. Model 562 Scalar Network Analyzer Shown With a WILTRON 6669B 40 GHz Sweep Generator

to the RF component connector. (A destructive pin depth has a center pin that is too long in respect to the connector's reference plane.)

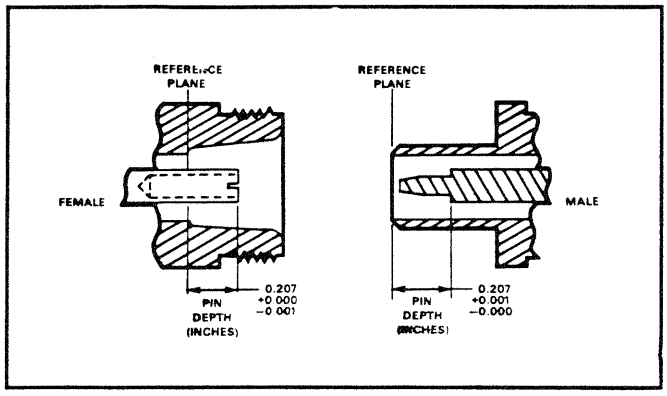


Figure 1-2. Reading N Connector Pin Depth

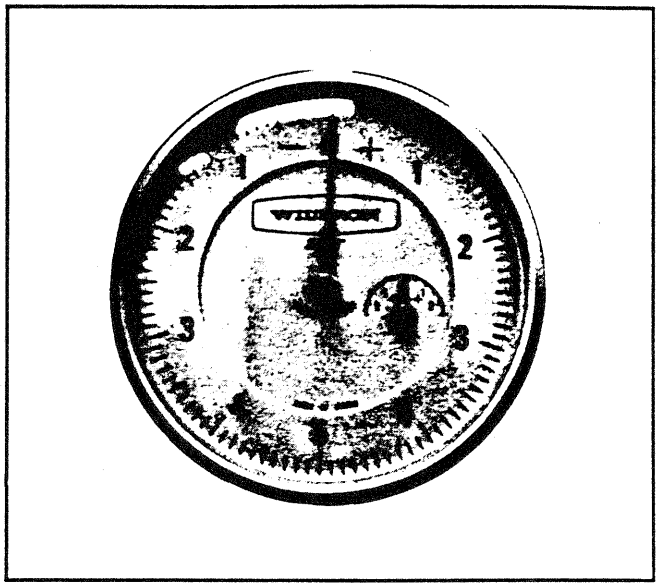


Figure 1-3. Pin Depth Gauge

The center pin on an RF component connector has a precision tolerance measured in mils (1/1000 inch), whereas connectors on test devices that mate with RF components may not be precision types, and their pins may not have the proper depth. Consequently, they must be measured before mating to ensure suitability. When gauging pin depth, if the test device connector measures out of tolerance (Table 1-1) in the "+" region, the center pin is too long. Mating under this condition will likely damage the RF component connector. On the other hand, if the test device connector measures out of tolerance in the "–" region, the center pin is too short. While this will not cause any damage, it will result in a poor connection and a consequent degradation in performance.

Table 1-1. RF Component Pin Depth Tolerance

Test Port Connector Type	Pin Depth (Mils)	Wiltron Gauge Reading
N-Male	207 –0.000 +0.003	210 –0.000 +0.003
N-Female	207 +0.000 –0.003	same as pin depth

b. Avoid Over-Torquing Connectors

Over-torquing connectors is destructive; it may damage the connector center pin. Finger-tight is usually sufficient, especially on Type N connectors. *Never* use pliers to tighten connectors.

c. Do Not Disturb Teflon Tuning Washers On Connector Center Pins

The center conductor on many RF component connectors contains a small teflon tuning washer located near the point of mating (interface). This washer compensates for minor impedance discontinuities at the interface. The washer's location is critical to the RF component's performance. *Do not disturb it.*

d. Avoid Mechanical Shock

RF components are designed to withstand years of normal bench handling. However, do not drop or otherwise treat them roughly. They are laboratory-quality devices, and like other such devices, they require careful handling.

e. Keep Connectors Clean

The precise geometry that makes possible the RF component's high performance can be easily disturbed by dirt and other contamination adhering to connector interfaces. When not in use, keep the connectors covered.

Table 1-2. Specifications (2 of 3)

Cursor "X" dB: Moves cursor to "X" value on either trace.

Cursor Delta "X" dB: Moves the main Cursor to "X" value relative to Reference Cursor.

Cursor "X" dB Bandwidth: Moves both main Cursor and Reference Cursors to the first "X" dB value to the left and to the right of the initial reference position.

SIGNAL SOURCE

Recommended Signal Sources: The WILTRON 6600B Sweep Generators and 6700A synthesizers are directly compatible with the 562. A dedicated GPIB system interface supplies frequency annotation on the 562 display to form an intelligent link.

Compatibility: The 562 is compatible with any signal source that meets the following minimum requirements:

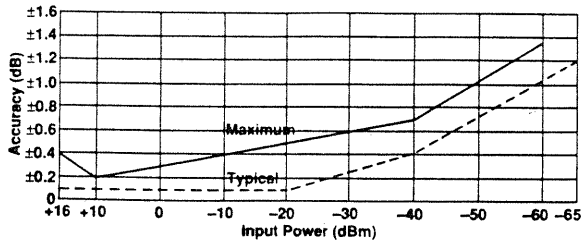
- **Horizontal Ramp:** Provides a 0V to +10V nominal ramp signal, +12 V maximum.
- **Blanking Signal:** Provides + 5V during retrace and bandswitching.
- **Dwell Signal:** Outputs TTL–Low signal to dwell sweep ramp.

ACCURACY

Transmission Loss or Gain Accuracy: Uncertainties from frequency response of components are automatically subtracted from test data during the calibration procedure.

Overall accuracy is then:

Channel Accuracy (25°C)



Transmission Loss or Gain Accuracy = Channel Accuracy + Mismatch Uncertainty*

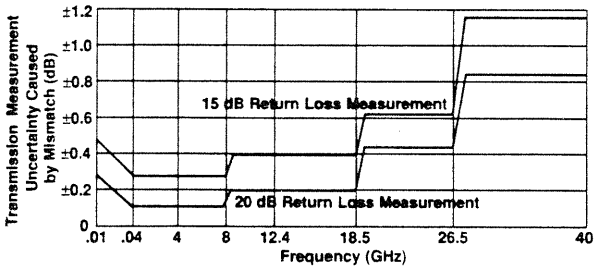
**Effects of sweep generator, test device, SWR Autotester and detector mismatch can be significant. This mismatch uncertainty is minimized by Wiltron's exceptionally low reflection characteristics of the detector, sweep generator and SWR Autotester.*

Overall Coaxial Return Loss Measurement Accuracy: Uncertainties resulting from SWR Autotester and sweep generator frequency response and from system open and short characteristics are automatically subtracted from test data. Overall accuracy is then:

Overall Waveguide Return-Loss Measurement Accuracy:

Return Loss Accuracy = Channel Accuracy + SWR Autotester Accuracy

Mismatch Uncertainty (Typical)*



**Varies with the return loss of the detector, SWR Autotester, connecting cables, the source impedance of the sweep generator, and the value of the measured reflection.*

SWR Autotester Accuracy:

Model	Accuracy of Measured Reflection Coefficient (ρ)**			
	10 MHz–8 GHz	8–18 GHz	18–26.5 GHz	26.5–40 GHz
560–97A50 560–97A50–1	$0.016\pm0.06\rho^2$ $0.010\pm0.06\rho^2$	$0.016\pm0.1\rho^2$ $0.010\pm0.1\rho^2$	N/A	N/A
560–97N50 560–97N50–1	$0.018\pm0.08\rho^2$ $0.013\pm0.08\rho^2$	$0.018\pm0.12\rho^2$ $0.013\pm0.12\rho^2$	N/A	N/A
560–97NF50 560–97NF50–1	$0.018\pm0.08\rho^2$ $0.013\pm0.08\rho^2$	$0.018\pm0.12\rho^2$ $0.013\pm0.12\rho^2$	N/A	N/A
560–98K50 560–98KF50	$0.018\pm0.15\rho^2$	$0.018\pm0.15\rho^2$	$0.025\pm0.15\rho^2$	$0.032\pm0.18\rho^2$
560–98S50 560–98S50–1	$0.018\pm0.1\rho^2$ $0.013\pm0.1\rho^2$	$0.018\pm0.1\rho^2$ $0.013\pm0.1\rho^2$	$0.025\pm0.12\rho^2$ $0.018\pm0.12\rho^2$	N/A
560–98SF50 560–98SF50–1	$0.018\pm0.1\rho^2$ $0.013\pm0.1\rho^2$	$0.018\pm0.1\rho^2$ $0.013\pm0.1\rho^2$	$0.025\pm0.12\rho^2$ $0.018\pm0.12\rho^2$	N/A

***Accuracy includes the effects of directivity and test port reflection over the frequency range.*

1-10 SYSTEM ELEMENTS

a. *Network Analyzer*

The 562 Scalar Network Analyzer provides a simultaneous display of transmission loss/gain and return loss or power, SWR, volts, and custom measurements. A complete measurement system includes a signal source, a 560 Series SWR Autotester and Detector (6400 Series Autotesters and Detectors may also be used). Interface with waveguide detectors is provided by the 560-10BX or 560-10BX-1 Adapter Cables. The system makes direct connection to a printer or plotter and does not require an external controller. An interface cable to measure volts is also available (P/N 562-15BX).

b. *Signal Source*

The 562 is compatible with the WILTRON 6600A, 6600B, and HP 8350B Sweep Generators and WILTRON 6700, HP 8340A, and HP 8341A Synthesizers or other signal sources that meet the interface requirements listed under SIGNAL SOURCE Compatibility in Table 1-2.

c. *SWR Autotester*

The 560 Series SWR Autotesters (Table 1-3) integrate in one small package a broadband, high directivity bridge, a detector, a low reflection test port, a reference termination, and a connecting cable. The output of the SWR Autotester is a detected signal, varying in proportion to reflections from the test device connected to the test port. Optional extender cables can be used without degradation in performance.

Accuracy: See accuracy chart on page 1-7.
Maximum Input Power: 500 mW
Cable Length: 122 cm (4 ft)
Insertion Loss: 6.5 dB nominal from input port to test port.

Dimensions and Weight:

Model	Dimensions*	Weight
560-97A50, -1	7.6 x 5 x 2.8 cm	340 g
560-97N50, -97NF50, -1	(3 x 2 x 1-1/8 in.)	425g
560-98K50, -98KF50	5.3 x 3.8 x 1.9 cm	198 g
560-98S50, -98SF50, -1	(2-1/8 x 1-1/2 x 3/4 in.)	

**Plus Connectors and cable.*

Table 1-3. SWR Autotesters

Model	Frequency Range (GHz)	Directivity (dB)	Frequency Sensitivity (dB)	Test Port Connector	Input Connector
560-97A50 560-97A50-1	0.01-18	36 40	±1.2	GPC-7	N Female
560-97N50 560-97N50-1	0.01-18	35 38	±1.5	N Male	N Female
560-97NF50 560-97NF50-1	0.01-18	35 38	±1.5	N Female	N Female
560-98S50 560-98S50-1	0.01-26.5	32 35	±2	WSMA Male	Ruggedized WSMA Female
560-98SF50 560-98SF50-1	0.01-26.5	32 35	±2	WSMA Female	Ruggedized WSMA Female
560-98K50 560-98KF50	0.01- 40	30 30	±3	K Male K Female	Ruggedized K Female

Table 1-5. Recommended Test Equipment

INSTRUMENT	CRITICAL SPECIFICATION	RECOMMENDED MANUFACTURER	USE *
Power Meter	*Power Range:* –30 to +20 dBm *Other:* GPIB Controllable	Hewlett-Packard, Model 436A, with Opt 022 (HPIB)	O, P, C
Power Sensor	*Frequency Range:* 0.01 to 18 GHz *Power Range:* +16 to –20 dBm	Hewlett-Packard, Model 8481A	O, P, C
Power Sensor	*Power Range:* –20 to –60 dBm	Hewlett-Packard, Model 8484A	O, P, C
Digital Multimeter	Resolution: 4-1/2 digits (to 20V) *DC Accuracy:* 0.002% + 2 counts *DC Input Impedance:* 10 MΩ *AC Accuracy:* 0.07% + 100 counts (to 20 kHz) *AC Input Impedance:* 1 MΩ	John Fluke, Inc., Model 8840A, with Option 8840A-09 True RMS AC	T
Oscilloscope	*Bandwidth*: DC to 150 MHz *Sensitivity:* 2 mV *Horiz. Sensitivity:* 50 ns/division	Tektronix, Inc. Model 2445	O, P, C,T
Sweep Generator	*Horizontal Output:* 0 to 10V Sweep Dwell, Seq Sync lines as defined in Table 1-2, 50 MHz, +10 dBm	WILTRON 6647B	O, P, C
Step Attenuator	60 dB range	WILTRON HP 355D	P, C

*C-Calibration, O-Operational, P-Performance, T-Troubleshooting

SECTION II
INSTALLATION

CONTENTS

SECTION II
INSTALLATION

2-1 INTRODUCTION

This section provides information on initial inspection, preparation for use, General Purpose Interface Bus (GPIB) interconnections and sweep generator interconnections. It also includes reshipment and storage information.

2-2 INITIAL INSPECTION

Inspect the shipping container for damage. If the container or cushioning material is damaged, retain until the contents of the shipment have been checked against the packing list and the instrument has been checked for mechanical and electrical operation.

If the analyzer is damaged mechanically, notify your local sales representative or WILTRON Customer Service. If either the shipping container is damaged or the cushioning material shows signs of stress, notify the carrier as well as WILTRON. Keep the shipping materials for the carrier's inspection.

2-3 PREPARATION FOR USE

Preparation for use consists of checking for the correct line voltage. The line voltage selector on the rear panel enables the analyzer to be used with either 100, 120, 220, or 240Vac. Before leaving the factory, each analyzer is preset and tagged for the line voltage present in the customer's area. If the actual line voltage is different from that stated on the tag, change the LINE SELECT switch (Figure 2-1) to the correct setting and the line fuses to the correct value.

2-4 GPIB SETUP AND INTERCONNECTION

The analyzer provides automated microwave measurements via the GPIB. The following paragraphs provide information about interface connections, cable requirements, and the addressing of the analyzer.

2-4.1 Interface Connector

Interface between the analyzer and other devices on the GPIB is via a 24-wire interface cable. This cable uses connector shells having two connector faces. These double-faced connectors allow for the parallel connection of two or more cables to a single device. Figure 2-2 shows the pin assignments for the Type 57 GPIB connector installed on the rear panel.

2-4.2 Cable Length Restrictions

The GPIB system can accommodate up to 15 instruments at any one time. To achieve design performance on the bus, proper timing and voltage level relationships must be maintained. If either the cable length between separate instruments or the accumulated cable length between all instruments is too long, the data and control lines cannot be driven properly and the system may fail to perform. Cable length restrictions are as follows:

- No more than 15 instruments may be installed on the bus.
- Total accumulative cable length in meters may not exceed two times the number of bus instruments or 20 meters—whichever is less.

NOTE

For low EMI applications, the GPIB cable should be a fully shielded type, with well-grounded metal-shell connectors.

2-4.3 GPIB Interconnection

The only interconnection required for GPIB operation is between the analyzer and the controller. This interconnection is via a GPIB cable. The WILTRON Part number for such a cable is 2000-1, 2000-2, or 2000-4 (1, 2, or 4 meters in length).

2-4.4 GPIB Address

The analyzer leaves the factory preset to address 6. If a different address is desired, it can be set by entering a new address from the front panel GPIB key.

2-4.5 Data Delimiting

Data used for the input and output functions of the 562 are terminated as follows:

a. Output Functions of the 562:

- Ends of all output binary data strings are terminated with EOI (End or Identify) true.
- Ends of all output ASCII data strings are terminated with CR LF and EOI. The EOI provides complete data termination and is sent with the LF character.

b. Input Functions of the 562:

- All binary data strings received by the 562 must be terminated with EOI true with the last data byte.
- All ASCII data strings received by the 562 must be terminated with either EOI, LF and EOI, CR LF, or CR LF and EOI.

2-5 SWEEP GENERATOR INTERCONNECTION

Paragraphs 2-5.1 and 2-5.2 give instructions for connecting the 562 Network Analyzer to various sweep generators.

2-5.1 WILTRON 6600B Sweep Generator

The 562 Analyzer is supplied with a dedicated system bus cable (PN 2100-1) and auxillary I/O cable (PN 806-7) for use with a 6600B Sweep Generator. After turning power off for both the 562 and 6600B, install the I/O cable between the AUX I/O connectors of both devices. Next connect the system bus cable between the Dedicated System GPIB connector of the analyzer and the IEEE-488 Interface connector of the sweep generator. The system is now ready for operation.

2-5.2 Other Sweep Generators

The 562 Analyzer requires interconnection with a sweep generator capable of supplying the necessary horizontal, blanking, and dwell signals specified in Table 1-2 Signal Source Compatibility (see Section III, Table 3-7 for instructions on interconnecting the 562 to other sweep generators and frequency synthesizers using male BNC to male BNC cables).

2-6 PREPARATION FOR STORAGE AND/OR SHIPMENT

Paragraphs 2-6.1 and 2-6.2 give instructions for preparing the analyzer for storage or shipment.

2-6.1 Preparation for Storage

Preparing the analyzer for storage consists of cleaning the unit, packing the inside with moisture-absorbing dessicant crystals, and storing the unit in a temperature environment that is maintained between –40 and +70 degrees centigrade.

2-6.2 Preparation for Shipment

To provide maximum protection against damage in transit, the analyzer should be repackaged in the original shipping container. If this container is no longer available and the analyzer is being returned to WILTRON for repair, advise WILTRON Customer Service; they will send a new shipping container free of charge. In the event neither of these two options is possible, instructions for packaging and shipment are given below.

a. Use a Suitable Container

Obtain a corrugated cardboard carton with a 275-pound test strength. This carton should have inside dimensions of no less than six inches larger than the instrument dimensions to allow for cushioning.

b. Protect the Instrument

Surround the instrument with polyethylene sheeting to protect the finish.

c. Cushion the Instrument

Cushion the instrument on all sides by tightly packing dunnage or urethane foam between the carton and the instrument. Provide at least three inches of dunnage on all sides.

Table 2-1. WILTRON International Sales Representatives

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SECTION III
FRONT PANEL OPERATION

CONTENTS

SECTION III
FRONT PANEL OPERATION

3-1 INTRODUCTION

This section describes:

1. The operation of the 562 Scalar Network Analyzer using the control panel controls.
2. The controls and rear panel connectors.
3. How to make transmission, return loss, power, and alternating setup measurements.
4. How to check that the instrument is operating properly.

3-2 CONTROL PANEL CONTROLS

Operation of the control panel controls is described in Figure 3-1 and in paragraphs 3-2.1 thru 3-2.8.

3-2.1 CRT Display (Figure 3-2)

The CRT displays the measurement traces, the present settings for the 562, cursors, markers, limit lines, menu options, and the frequency source parameters.

a. CRT Screen
Displays channels 1 and traces as set up in the display channel menu. If the source is alternating settings or frequencies, then trace 1 displays the main setting and trace 2 displays the alternate settings.

b. NETWORK ANALYZER Settings
The two lines labeled "1" and "2" across the top of the screen display the type of measurement selected and the offset and vertical resolution values set for traces 1 and/or 2.

c. SOURCE Information
Source information is displayed in the box in the top right side of the screen. This box displays the source model number, or "ALTERNATE SETUP" when an alternating setup has been selected, or "HOLD" when the instrument is in the HOLD mode.

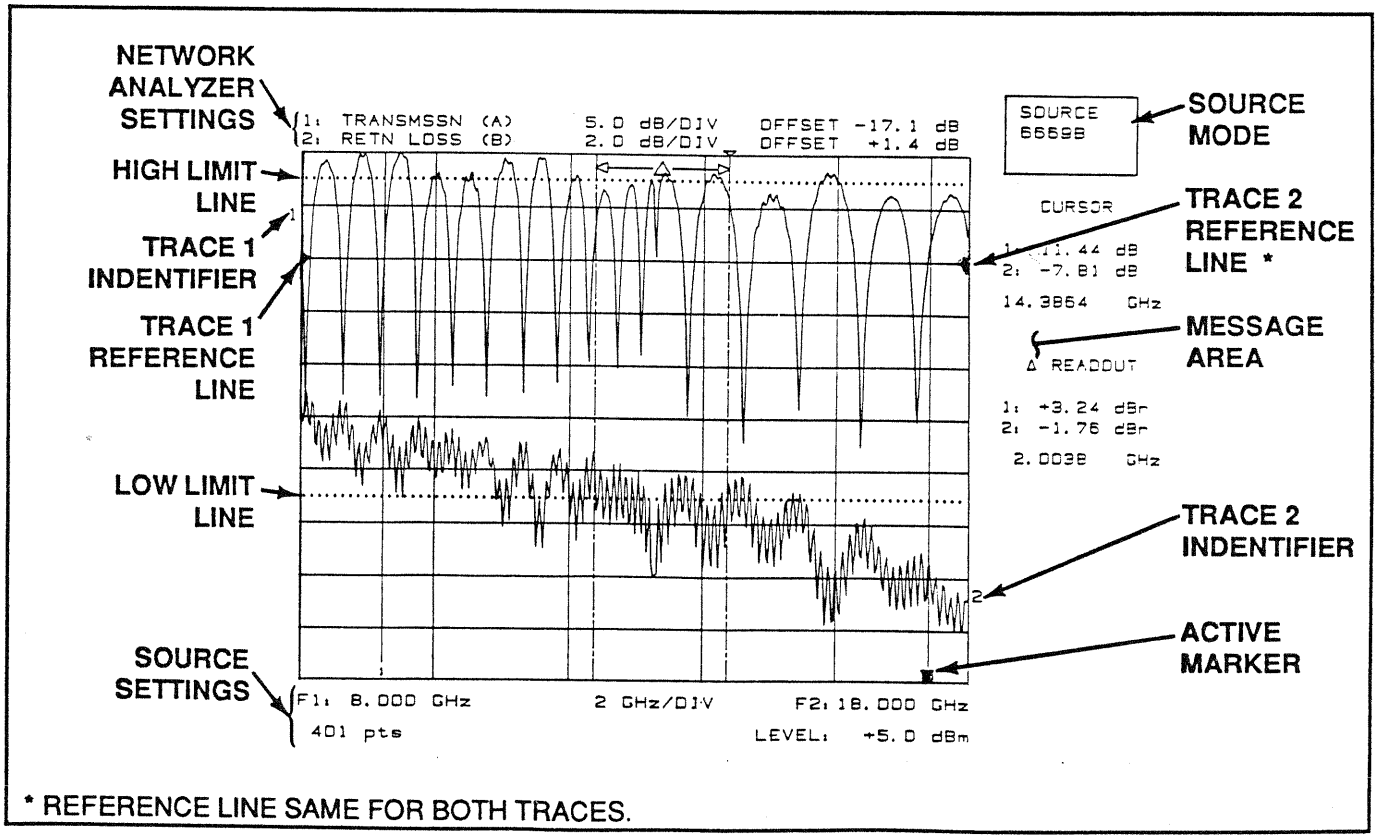


Figure 3-2. Typical Model 562 CRT Display

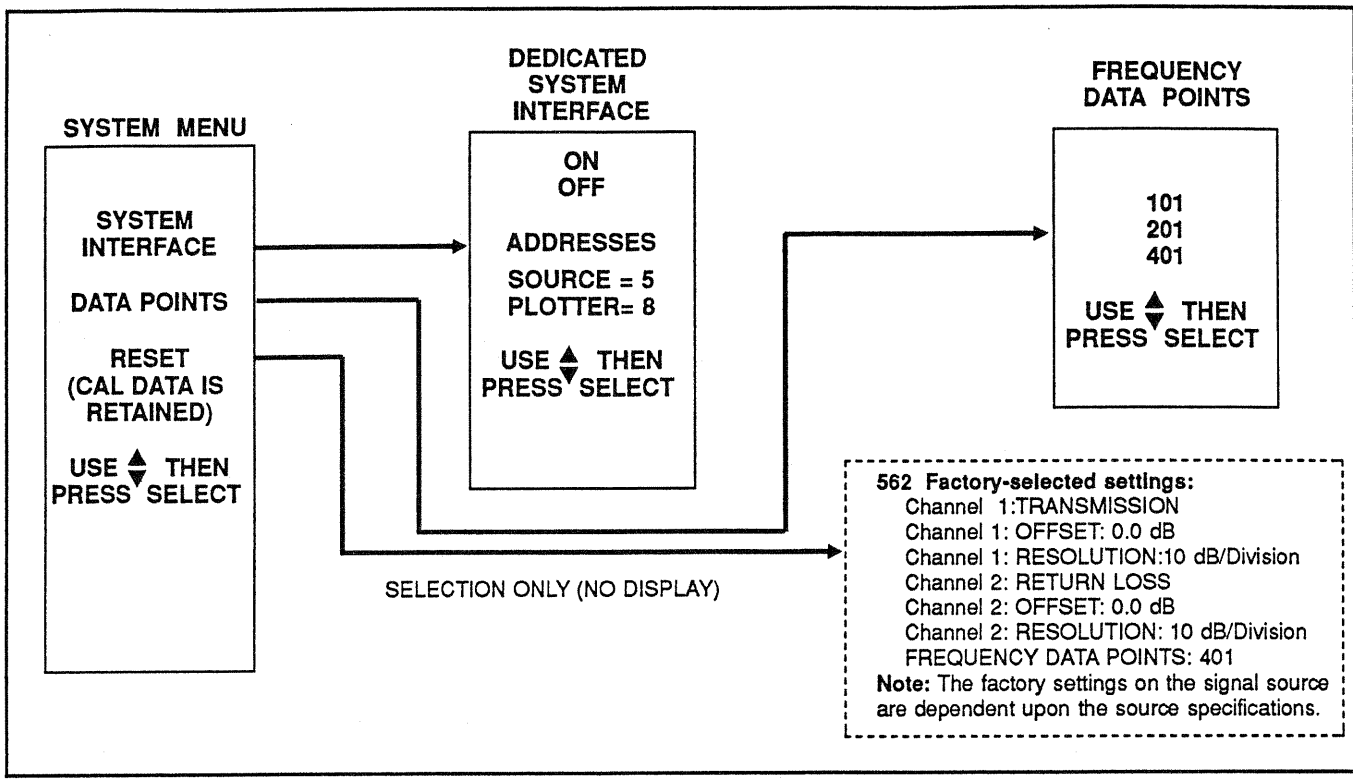


Figure 3-5. SYSTEM MENU and Factory-selected Settings

3-2.3 DISPLAY Keys and Indicator (Figure 3-6)

The DISPLAY keys and indicator described below are the same for both channels. Generally, with the exception of DISPLAY ON/OFF and AUTOSCALE, should one of these keys be pressed and then not wanted, the CLEAR (Figure 3-11) key can be used to cancel the key action.

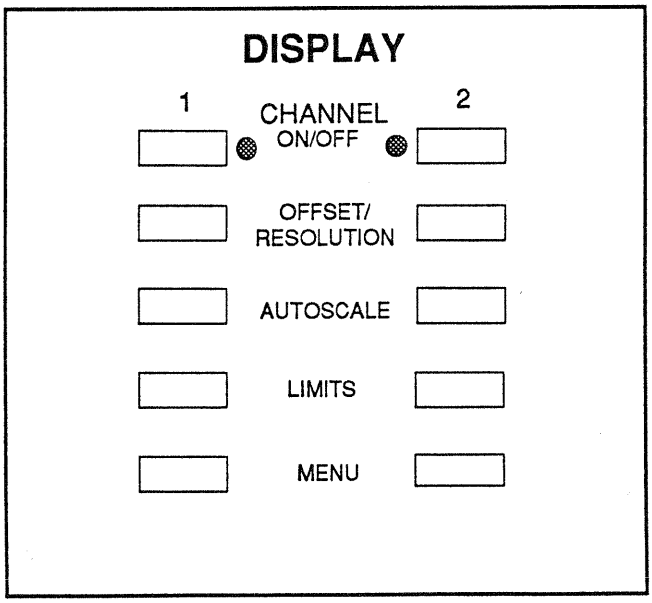


Figure 3-6. DISPLAY Keys and Indicators

a. **CHANNEL ON/OFF *Key and Indicator***
Key turns its associated trace and reference line indicator on or off (Figure 3-2). The associated indicator is lit when the trace is on.

b. **OFFSET/RESOLUTION *Key***
Displays a menu (Figure 3-8) that lets the operator select OFFSET and RESOLUTION. Pressing SELECT when the cursor is on automatically sets the offset to put the trace at the cursor to the reference line.

c. **AUTOSCALE *Key***
Sets the associated trace at optimum offset and resolution values for viewing the measured data

d. **LIMITS *Keys***
Allows the operator to use limit lines that may be used to establish go/no-go data limits (Figure 3-9). Limit lines may be either single lines or complex. Complex limits allow for setting up to ten different values for both the upper and lower limit lines.

e. **MENU *Key***
Displays a menu (Figure 3-7) that allows the operator to: select the measurement type (transmission, return loss, SWR, volts, or power), view the calibration, select the input, move the reference line, or obtain access to trace memory.

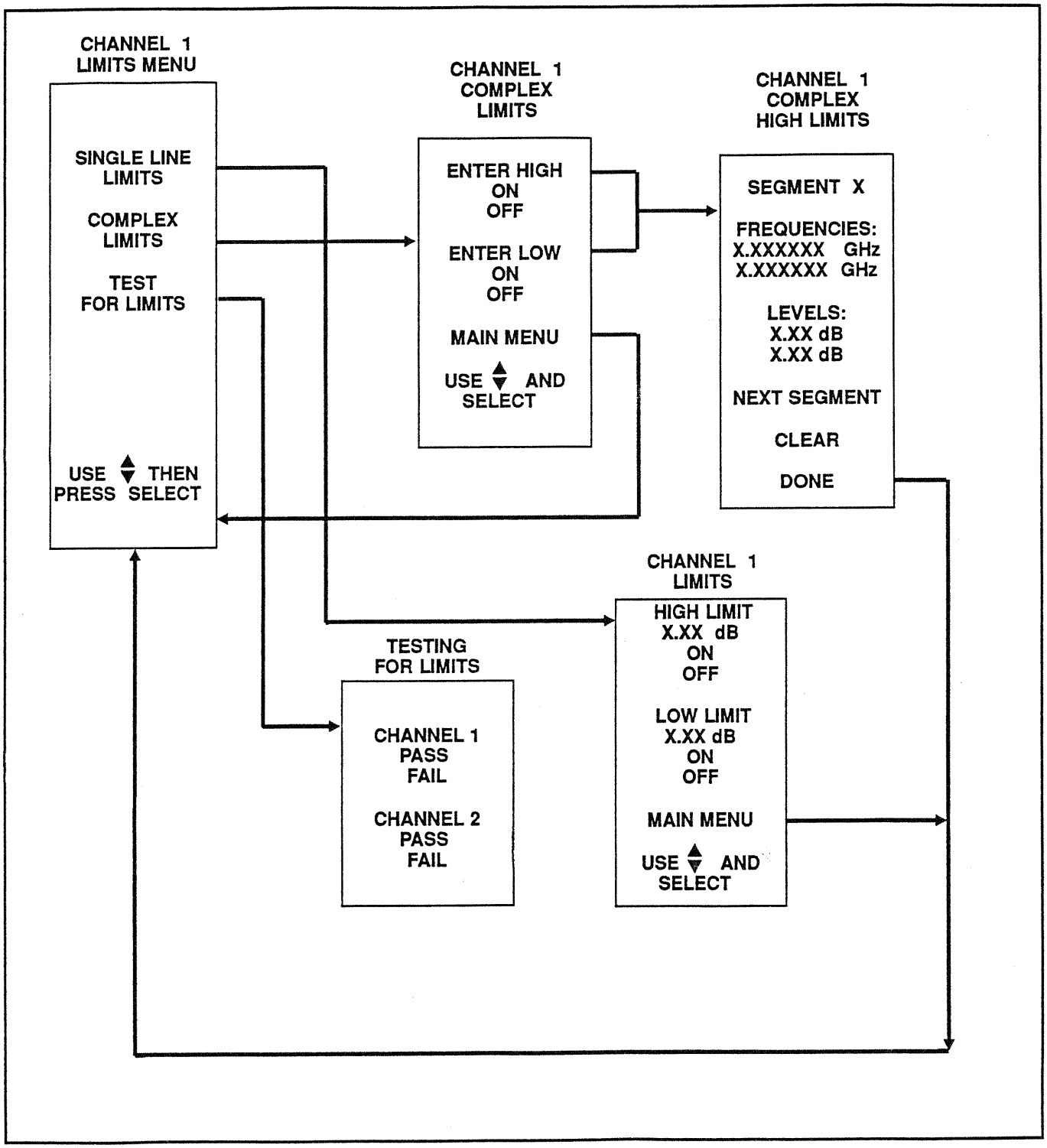


Figure 3-9. LIMITS Menus

f. **CALIBRATION *Key***
Displays a series of instructions (Figure 3-10 on facing page) that guide the operator through the calibration cycle. The calibration sequence is determined by the measurements chosen. This key also allows low level trim to be performed (when required), and allows entry of detector offsets. Low level trim is required when retrace RF is ON or VOLTS mode is selected.

Detector offsets allow a dB offset to be set for any of the A,B,R1,or R2 detectors. These values remain in memory, even after the 562 is reset and powered down. The offsets are only cleared by entering "0dB". If any detector offset is active, a status message displays at the bottom of the screen.

g. **UNCAL *Indicator***
Lights when either measurement trace is uncalibrated.

h. **BEGIN *Indicator***
Lights at the beginning of the calibration cycle and remains lit until the cycle is completed.

3-2.4 DATA ENTRY Keys and Knob (Figure 3-11)

The DATA ENTRY keys and knob are described in subparagraphs a through d.

a. ***Knob***
Enters variably adjusted measurement values (e.g. cursor position, offset, resolution, etc.).

b. ***Keypad***
Enters discrete measurement values.

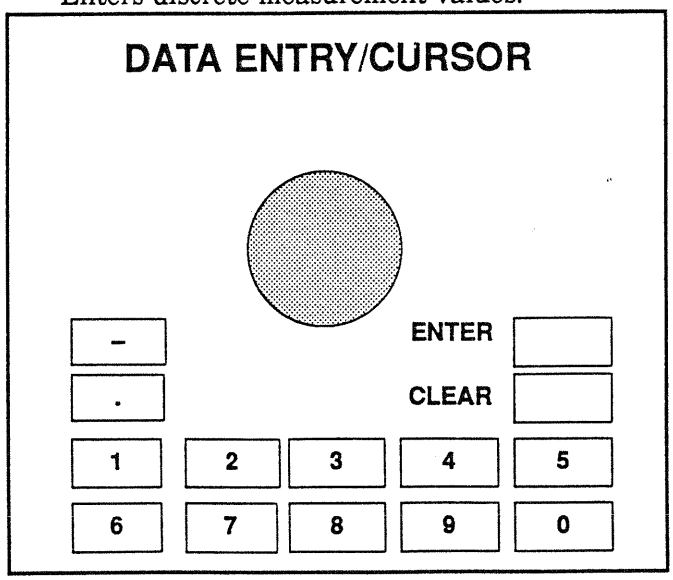


Figure 3-11. DATA ENTRY Keys and Knob

c. **ENTER *Key***
Terminates data entries made from the keypad.

d. **CLEAR *Key***
Clears entered value, if pressed before the ENTRY key. Also clears a displayed menu, entry errors, complex limit segment identifiers, and cursor NOT FOUND message.

3-2.5 HARD COPY Keys (Figure 3-12)

The HARD COPY keys are described in subparagraphs a through c.

a. **MENU *Key***
Displays a menu (Figure 3-13) that allows the operator to select the printing of any of the following:

- The graphic display.
- A tabulation of the measured values to a printer.
- The graphic values to a plotter.
- Complex limit values in tabulated form.

b. ***START PRINT Key***
Freezes the displayed data and starts printing it. The type of printout then obtained, graphic or tabulated, is based on the last DISPLAY MENU key item selected.

c. ***STOP PRINT Key***
Stops printing the data immediately. In the case of plotting, the end of a data string is finished and the plotter left in a reset state.

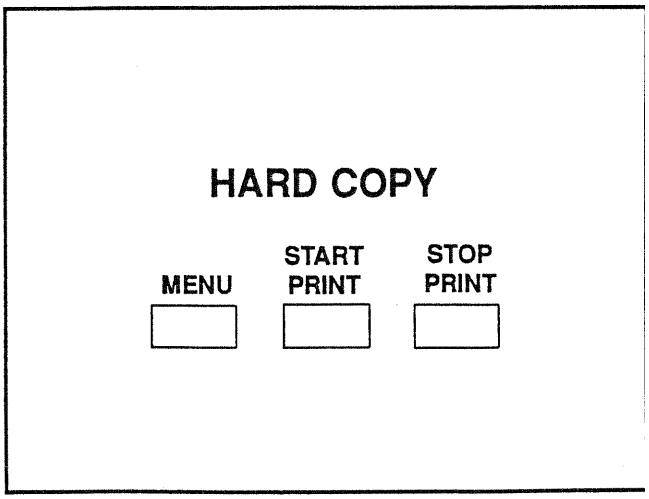
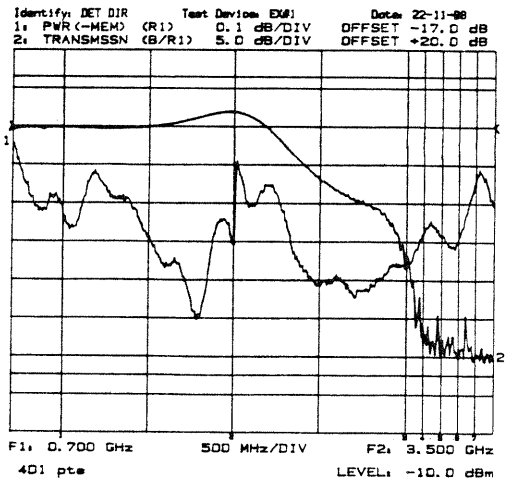


Figure 3-12. HARD COPY Keys



SOURCE
6647B

LIMIT TESTS
1: - Pass -

WILTRON 562 Scalar Network Analyzer

Identify : DET DIR
Test Device : EX#1

Date : 22-11-88
Source : 6647B

	FREQUENCY	1:POWER (-MEM) (R1)	2:TRANSMISSION (B/R1)	
	0.7000 GHz	-17.02 dBm	+19.44 dB	
	0.8120 GHz	-17.18 dBm	+19.66 dB	
M1	1.0000 GHz	-17.22 dBm	+19.84 dB	.MARKER
	1.0360 GHz	-17.26 dBm	+19.84 dB	
	1.1480 GHz	-17.15 dBm	+19.76 dB	
	1.2600 GHz	-17.17 dBm	+19.70 dB	
	1.3720 GHz	-17.18 dBm	+19.78 dB	
	1.4840 GHz	-17.28 dBm	+19.87 dB	
	1.5960 GHz	-17.36 dBm	+20.19 dB	
	1.7080 GHz	-17.39 dBm	+20.65 dB	
	1.8200 GHz	-17.46 dBm	+21.32 dB	
M2	2.0000 GHz	-17.30 dBm	+21.88 dB	.MARKER
	2.0440 GHz	-17.14 dBm	+21.68 dB	
	2.1560 GHz	-17.16 dBm	+20.46 dB	
	2.2680 GHz	-17.20 dBm	+18.18 dB	
	2.3800 GHz	-17.34 dBm	+15.51 dB	
	2.4920 GHz	-17.40 dBm	+13.11 dB	
	2.6040 GHz	-17.38 dBm	+11.39 dB	
	2.7160 GHz	-17.43 dBm	+9.96 dB	
	2.8280 GHz	-17.40 dBm	+9.11 dB	
M3	3.0000 GHz	-17.36 dBm	-0.08 dB	.MARKER
M4	3.1000 GHz	-17.26 dBm	-7.36 dB	.MARKER
M5	3.2000 GHz	-17.27 dBm	-8.72 dB	.MARKER
M6	3.3000 GHz	-17.28 dBm	-8.66 dB	.MARKER
M7	3.4000 GHz	-17.13 dBm	-10.98 dB	.MARKER
[M8]	3.5000 GHz	-17.20 dBm	-10.10 dB	.ACTIVE

---------- System Conditions ----------

	Channel 1	Channel 2	Analyzer
High Limit :	-16.87 dB	-- off --	Smoothing : min
Low Limit :	-17.65 dB	-- off --	Averaging : off
Limit Testing:	- pass -	-- off --	Autozero : RF off
Cursor :	-- off --	-- off --	
at :	-- off --	-- off --	(-- off --) Bandwidth
Delta Readout:	-- off --	-- off --	F(min) : -- off --
at :	-- off --	-- off --	F(max) : -- off --

Detector offsets: A: +0.00 dB B: +0.00 dB R1: +0.00 dB R2: +0.00 dB

Page : 1

WILTRON 562 Scalar Network Analyzer

Identify : DET DIR
Test Device : EX#1

Date : 22-11-88
Source : 6647B

	FREQUENCY	1:POWER (-MEM) (R1)	2:TRANSMISSION (B/R1)	
M1	1.0000 GHz	-17.23 dBm	+19.83 dB	.MARKER
M2	2.0000 GHz	-17.30 dBm	+21.92 dB	.MARKER
M3	3.0000 GHz	-17.36 dBm	+3.27 dB	.MARKER
M4	3.1000 GHz	-17.27 dBm	-5.44 dB	.MARKER
M5	3.2000 GHz	-17.27 dBm	-5.68 dB	.MARKER
M6	3.3000 GHz	-17.28 dBm	-7.98 dB	.MARKER
M7	3.4000 GHz	-17.13 dBm	-8.29 dB	.MARKER
[M8]	3.5000 GHz	-17.20 dBm	-7.77 dB	.ACTIVE

Figure 3-14. Hard Copy Examples

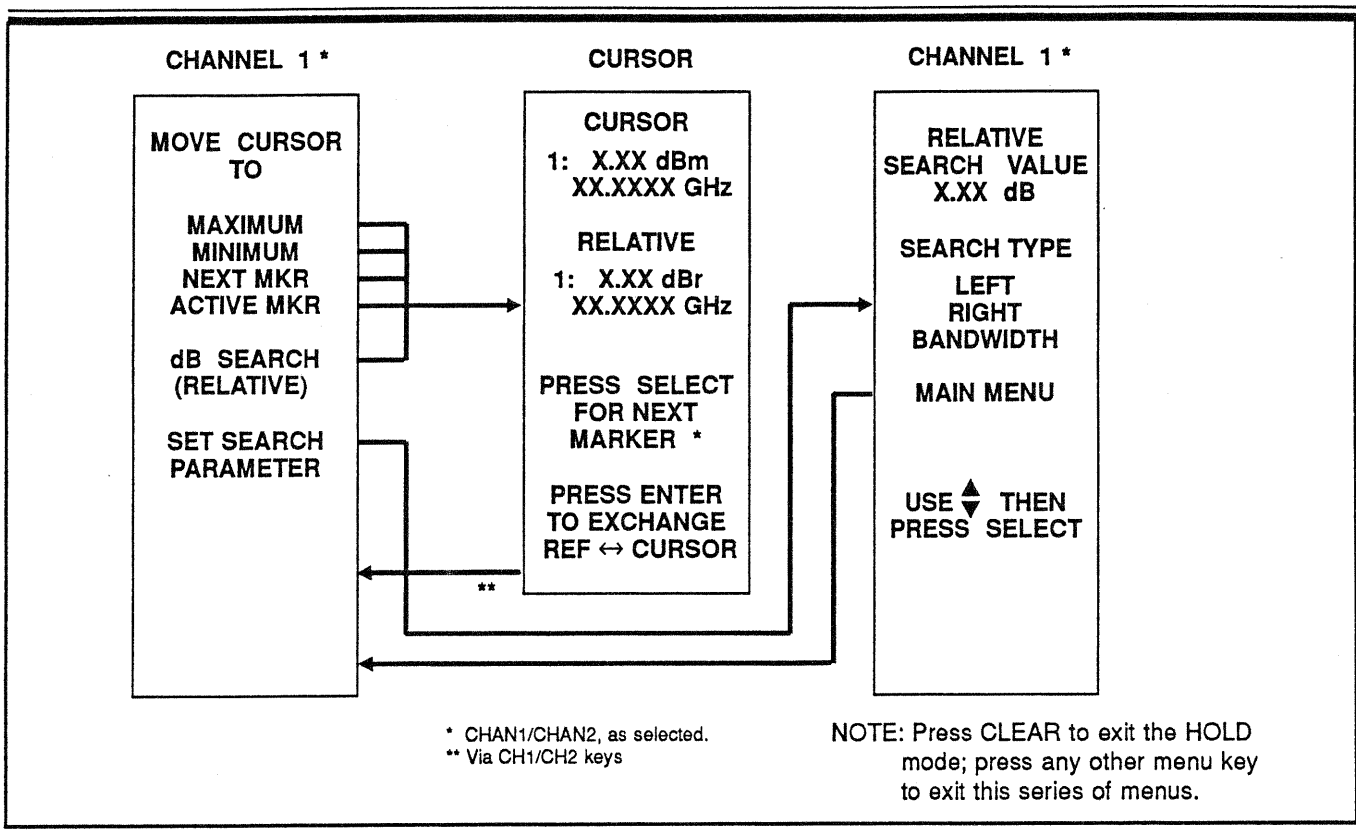


Figure 3-17. CURSOR MEASUREMENTS Menus (with RELATIVE CURSOR on)

3-2.7 ENHANCEMENT Keys and Indicators

a. SMOOTHING *Key and Indicator*
Key provides two levels of filtering, MIN and MAX, that improve the display at low-signal levels. The OFF indicator lights when no smoothing (low-level filtering) is supplied.

b. AVERAGING *Key and Indicator*
When you select averaging, 4 to 256 successive sweeps can be averaged to smooth the trace display. The AVERAGING Menu is shown in Figure 3-18.

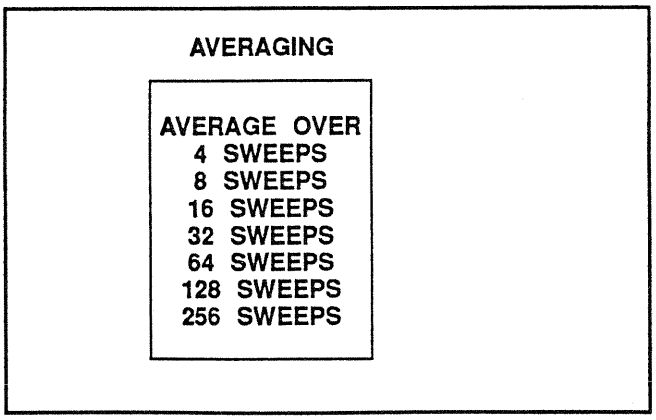


Figure 3-18. AVERAGING Menu

3-2.8 GPIB Indicator and Key (Figure 3-19)

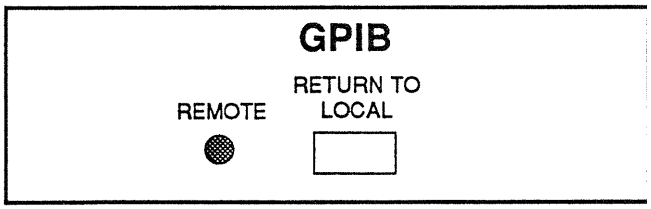
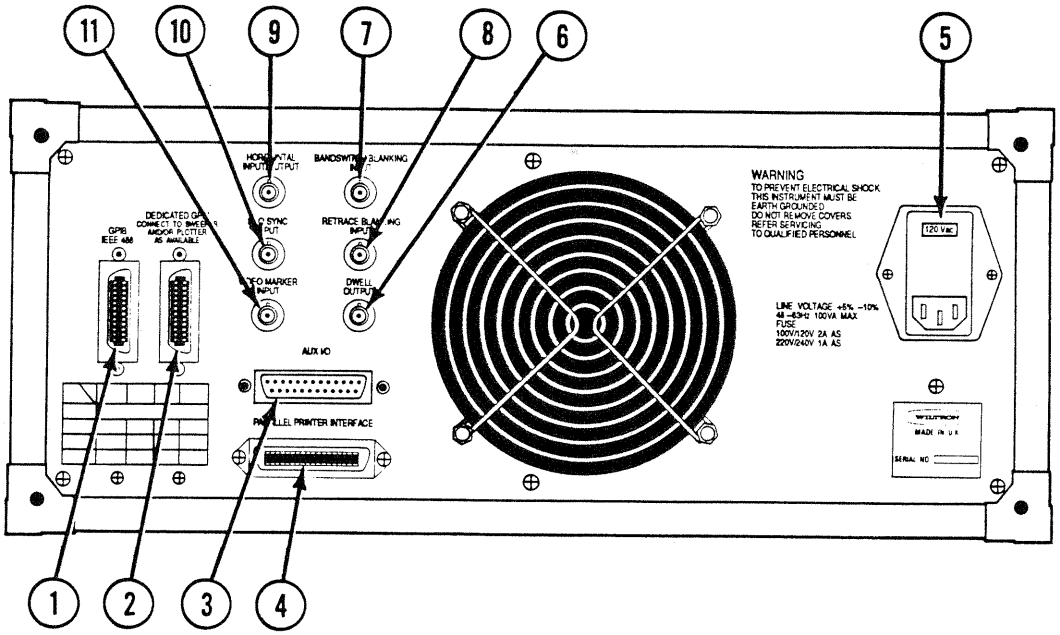


Figure 3-19. GPIB Indicator and Key

a. REMOTE *Indicator*
Lights when in the remote (GPIB) mode (Figure 3-20). When lit, a menu providing GPIB status appears at the bottom right side of the screen.

b. RETURN TO LOCAL *Key*
If pressed while in the GPIB mode, the analyzer returns to the local mode. This occurs unless the local lockout (LLO) message has been programmed, in which case the key causes no action. If pressed while in the local mode, the analyzer's GPIB address displays in the MENU area of the screen. It can be altered by entering a new value from the numeric keypad and pressing ENTER. The new address is saved on power down and RESET.



1. **GPIB CONNECTOR:** See Figure 2-2, page 2-4

2. **DEDICATED GPIB:** Connects 562 to signal source and plotter.

3. **AUX I/O:** Connects 562 to WILTRON 6600B Sweep Generator, 6700A Swept Frequency Synthesizer, HP 8350B Sweeper, and HP 8340A/8341A Synthesizers.

4. **PARALLEL PRINTER INTERFACE:** Provides standard Centronics parallel interface with a printer.

5. **LINE VOLTAGE MODULE:** See Figure 2-1, page 2-4.

6. **SWEEP DWELL OUTPUT:** TTL-Low signal stops sweep. Sweep continues when signal is removed. BNC connector.

7. **BANDSWITCH BLANKING INPUT:** Accepts ± 5V signal coincident with bandswitching points. BNC connector.

8. **RETRACE BLANKING INPUT:** ±5V causes retrace to occur. BNC connector.

9. **HORIZONTAL (SWEEP RAMP) INPUT/OUTPUT:** 0 to +10V nominal, +12V maximum input. BNC connector, 100 kΩ impedance. When selected, can also provide a 0-10 V output.

10. **SEQUENTIAL SYNC INPUT:** +3.5V to +10V blanks trace during retrace or bandswitching. –3.5V to –10V defines a marker which, when in the range of –8V to –10V, is an active marker. BNC connector, 10 kΩ impedance.

11. **VIDEO MARKER INPUT:** +2V to +10V peak input. BNC connector.

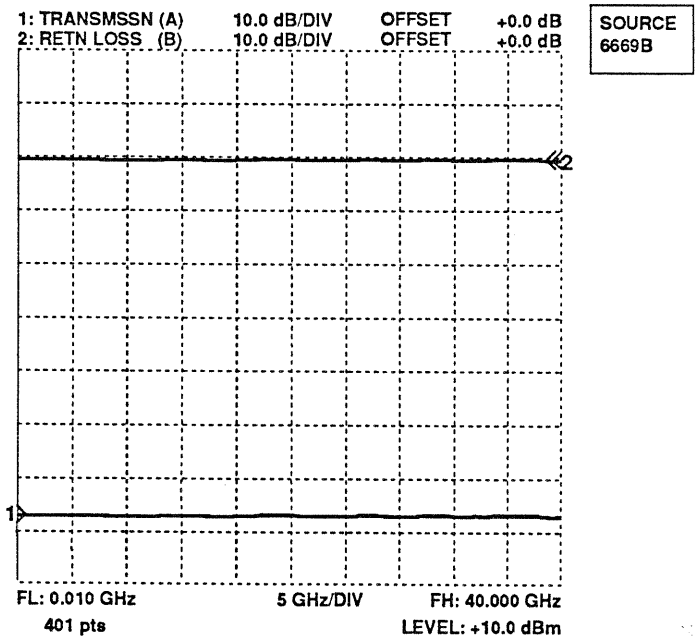
Figure 3-21. Location of Rear Panel Connectors

Table 3-1. Transmission and Return Loss Measurements

1. Connect test equipment per Figure 3-22, except do not connect the test device. Turn the printer on.

2. Turn on the 6600B sweep generator, then press POWER on the 562 to ON. At the conclusion of the built-in self test, the screen displays "ALL TESTS PASSED," and the CRT resembles that shown below. Control settings may be different from those shown, which are the RESET control settings*. The instrument comes on line with the same control settings it had when last turned off. Ensure that both channels are ON and that Channel 1 is set for TRANSMISSION and Channel 2 for RETURN LOSS.

3. Press the CALIBRATION key and follow the directions given in the calibration-cycle sequence of menus. If necessary, refer to Figure 3-10 for an explanation of the menus. After finishing the calibration, connect the test device and RF detector as shown in Figure 3-22.



Transmission Loss Measurement

4. Measure the transmission loss as follows:
   a. Press the Channel 2 DISPLAY ON/OFF key to off.
   b. Press the Channel 1 AUTOSCALE key. This gives an optimum vertical display of the test data.

5. Read the transmission loss by interpolating the displayed graphic, or read it directly using the main and/or relative cursors with the readout function as described in step 6. The transmission loss is approximately 0 dB in the pass band and 66 dB at the bottom of the skirt for the 2 GHz LPF shown on the following page.

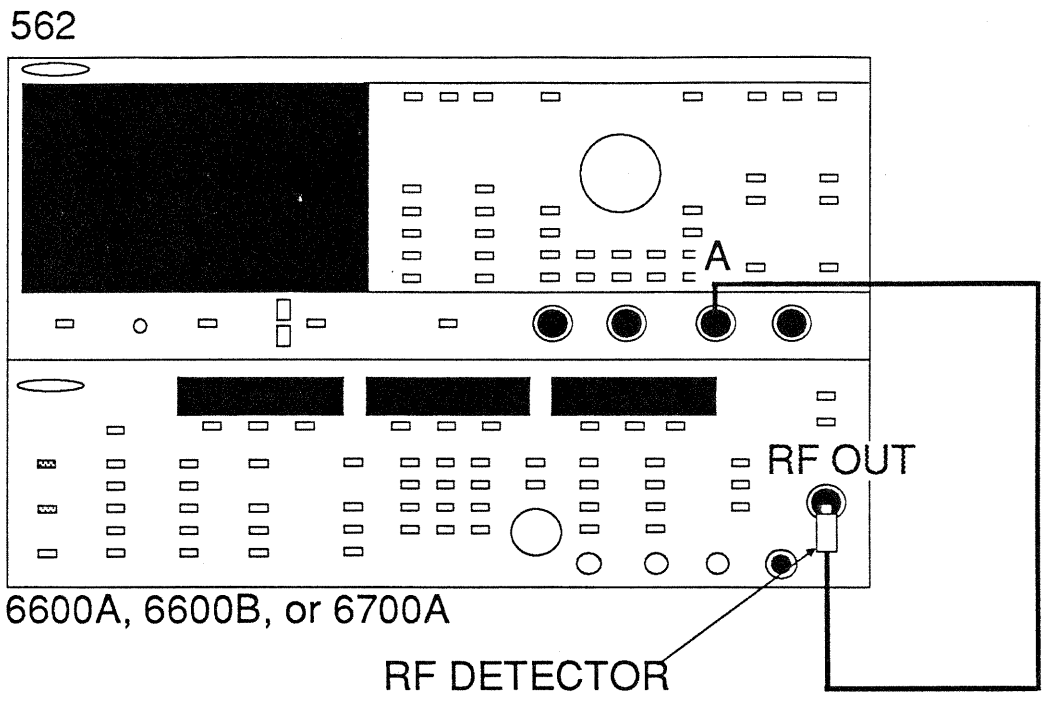
6. To use the main cursor and delta cursor to read the results of the above measurement directly, proceed as follows:
   a. For an absolute measurement press the Cursor ON/OFF to on, then position the cursor using the rotary knob or the CURSOR MEASUREMENTS—CH1 key in conjunction with the MENU SELECT key to the required measurement point.

* Reset conditions depend upon the sweep generator.

Table 3-2. Absolute Power Measurement

1. Connect the RF detector between Connector A and the RF output connector as shown below.

2. Press POWER, on the analyzer, to ON. At the conclusion of the built-in self test the screen displays "ALL TESTS PASSED." Control settings may be different from those shown, which are the factory RESET control settings. The instrument comes on line with the same control setting it had when last turned off.



3. Press the channel 2 DISPLAY ON/OFF key to off.

4. Press the channel 1 MENU key.

5. When the menu appears, select the POWER option using the MENU and SELECT keys.

6. Press the Channel 1 AUTOSCALE key. This gives an optimum vertical display of the test data.

7. Press the CURSOR ON/OFF key to on.

8. Using the DATA ENTRY rotary knob and/or the CURSOR MEASUREMENTS-CH1 key in conjunction with the MENU SELECT switch, move the cursor from the low to the high ends of the trace and read the source output power, in dBm, at the frequencies of interest.

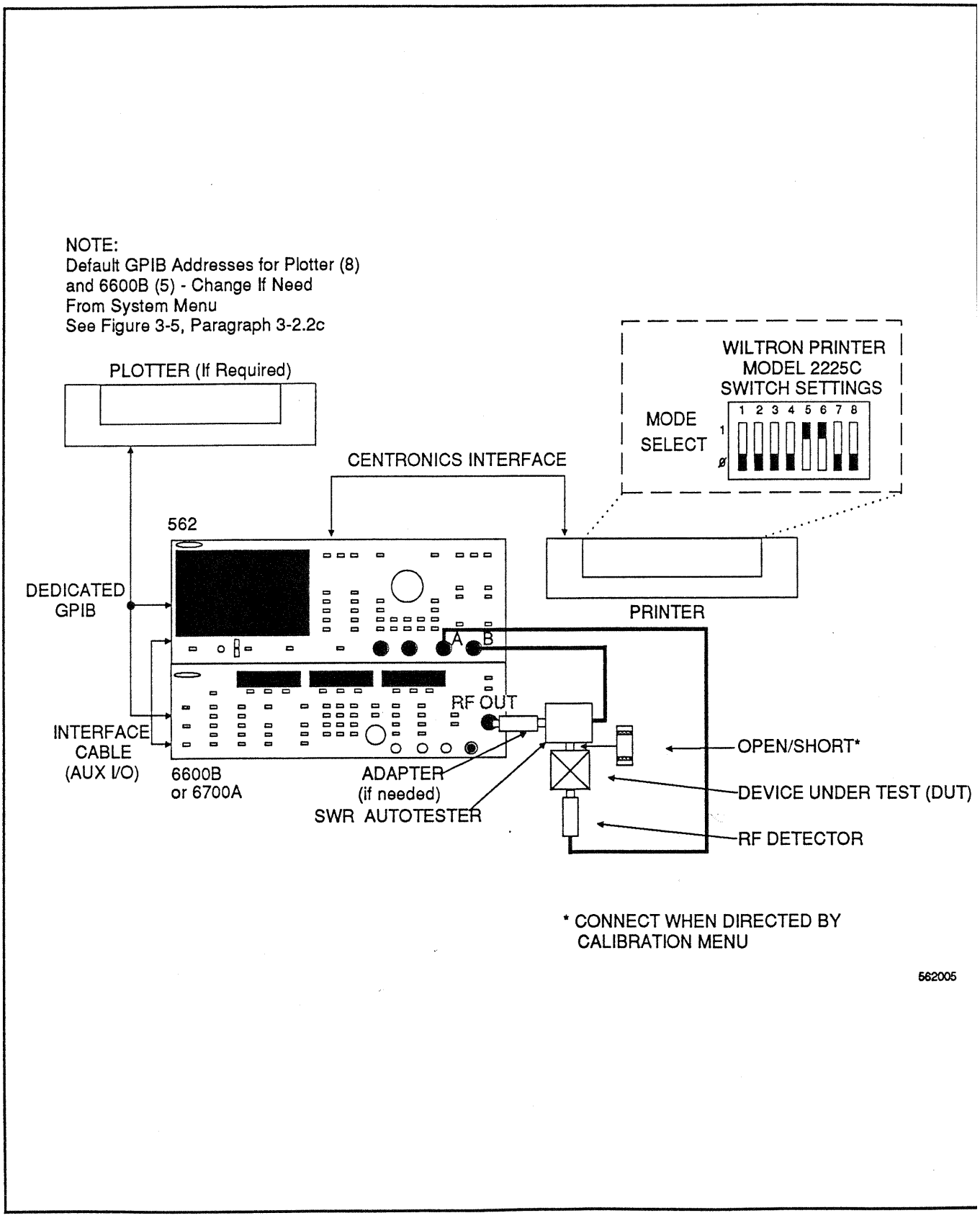


Figure 3-23. Test Setup for Alternate Setup Measurements

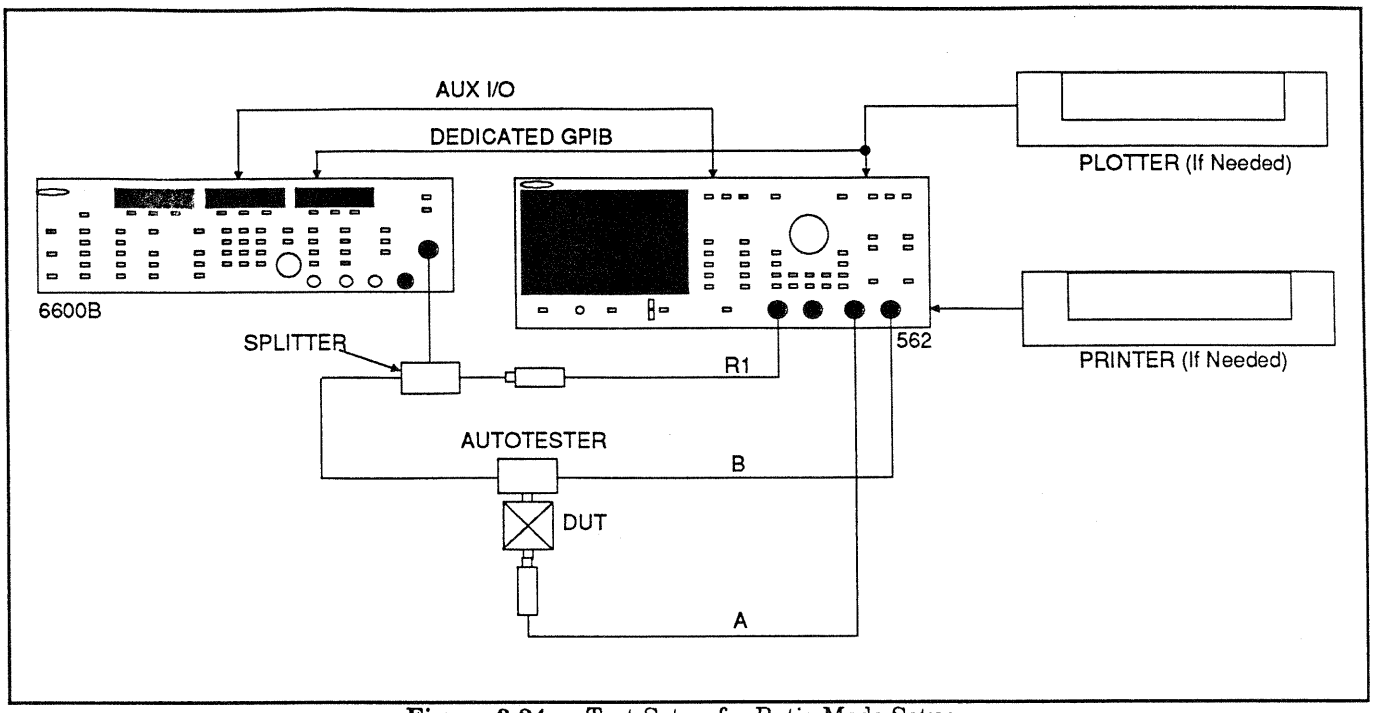


Figure 3-24. Test Setup for Ratio Mode Setup

Table 3-5. Ratio Mode Measurements

1. Connect test equipment per Figure 3-24, except do not connect the test device. Turn the printer (or plotter) on.

2. Turn on the 6600B and 562. At the conclusion of self test, the screen displays "ALL TESTS PASSED."

3. Select transmission mode and ratio input A/R1 for channel 1, and return loss and ratio input B/R1 for channel 2 (section 3-2.3b).

4. On the 562, press the CALIBRATION key and follow the directions given in the calibration-cycle sequence of menus. If necessary, refer to Figure 3-10 for an explanation of the menus. After finishing the calibration, connect the test device and RF detector as shown in Figure 3-24.

5. On the 562, measure the transmission loss in the ratio mode as follows:
   a. Press the channel 1 AUTOSCALE key. This gives an optimum vertical display of the test data.
   b. Read the transmission loss. This is the transmission loss for the A/R1 ratio mode input.

6. To use the main cursor and relative cursor to read the results of the above measurement directly, proceed as follows:
   a. Press the cursor ON/OFF to ON, then position the cursor using the rotary knob or the CURSOR MEASUREMENTS—CH1 key in conjunction with the MENU SELECT switch.
   b. Turn the relative cursor on and the CURSOR MEASUREMENTS—CH1 key to ON, then select the desired parameter from the menu.
   c. Read the resultant cursor position data from the menu screen.

Table 3-6. Control Panel LED Error Codes

FLASHING LED*	FAULT	FAULT LOCATION
HOLD (Initial Turn On)	No Communication With 2nd C.P.U.	A6
CHANNEL 1 (Initial Turn On)	Unable To Send Self Test To Sweeper	
CURSOR ON/OFF (Initial Turn On)	Fatal Error While Attempting To Calibrate Ramp	A4
CHANNEL 2	Ramp Not Calibrated	A4, or Sweep Ramp Too Slow
CHANNEL 1	CPU EPROM Checksum	A5 (Observe Initial Test To Identify)
AVERAGING	U22 RAM or U23 RAM	A5
SMOOTHING MINIMUM	Front Panel Key; Error	A13
SMOOTHING OFF	U24 RAM or U30 RAM	A5
SMOOTHING MAXIMUM	System GPIB	A8
CAL BEGIN	Dedicated GPIB	A10
UNCAL	ADC Converter	A3
CURSOR	Test Reading Failed	A3 (A1/A2)
RELATIVE CURSOR	Channel A/B Null/Zero Failure/PCB Not Detected	A2 (A3)
REMOTE	Channel R1/R2 Null/Zero Failure/PCB Not Detected	A1 (A3)
HOLD	Tick/Time Scheduling Failure	A9/A5

* After a period of flashing, the option is given, at the users discretion, to continue to attempt operation by pressing SELECT.

SECTION IV
REMOTE (GPIB) OPERATION

CONTENTS

SECTION IV
REMOTE (GPIB) OPERATION

4-1 INTRODUCTION

This section provides a description of the GPIB and the analyzer command codes. It also provides several examples of bus programming.

4-2 DESCRIPTION OF THE IEEE-488 INTERFACE BUS

The IEEE-488 bus (General Purpose Interface Bus, or GPIB) is an instrumentation interface for integrating instruments, calculators, and computers into systems. The bus uses 16 signal lines to effect transfer of data and commands to as many as 15 instruments.

The instruments on the bus are connected in parallel, as shown in Figure 4-1 on the facing page. Eight of the signal lines (DIO 1 thru DIO 8) are used for the transfer of data and other messages in a byte-serial, bit-parallel form. The remaining eight lines are used for communications timing (handshake), control, and status information. Data is transmitted as eight-bit characters, referred to as bytes. Normally, a seven-bit ASCII (American Standard Code for Information Interchange) code is used. The eighth (parity) bit is not used. Data is transferred using an interlocked handshake technique.

This technique permits asynchronous communications over a wide range of data rates. The following paragraphs provide an overview of the data, management, and handshake buses, and describe how these buses interface with the analyzer.

4-2.1 Data Bus Description

The data bus is the conduit for transmitting control information and data between the controller and the analyzer. It contains eight bi-directional, active-low signal lines—DIO 1 thru DIO 8. One byte of information (eight bits) is transferred over the bus at a time. DIO 1 represents the least-significant bit (LSB) in this byte and DIO 8 represents the most-significant bit (MSB). Each byte represents a peripheral address (either primary or secondary), a control word, or a data byte. Data bytes are usually formatted in ASCII code, without parity.

4-2.2 Management Bus Description

The management bus is a group of five signal lines used to control the operation of the bus system. Functional information regarding the individual control lines is provided below.

a. ***ATN (Attention)***
When TRUE, the analyzer responds to appropriate interface messages—such as, device clear and serial poll—and to its own listen/talk address.

b. ***EOI (End Or Identify)***
When TRUE, the last byte of a multibyte message has been placed on the line. Also used in conjunction with ATN to indicate a parallel poll.

c. ***IFC (Interface Clear)***
When TRUE, the analyzer interface functions are placed in a known state—such as, unaddressed to talk, unaddressed to listen, and service request idle.

d. ***REN (Remote Enable)***
When TRUE, the analyzer is enabled—upon receipt of its listen address—for entry into the remote state. The mode is exited either when the REN line goes FALSE (high) or when the analyzer receives a go-to-local (GTL) message.

e. ***SRQ (Service Request)***
This line is pulled LOW (true) by the analyzer to indicate that certain preprogrammed conditions exist.

Table 4-1. 562 IEEE-488 Bus Subset Capability

GPIB SUBSET	FUNCTION	DESCRIPTION
AH1	Acceptor Handshake	Complete Capability
SH1	Source Handshake	Complete Capability
T6	Talker	No Talk Only (TON)
TE0	Talker With Address Extension	No Capability
L4	Listener	No Listen Only (LON)
LE0	Listener With Address Extension	No Capability
SR1	Service Request	Complete Capability
RL1	Remote/ Local	Complete Capability
PP1	Parallel Poll	Complete Capability
DC1	Device Clear	Complete Capability
DT1	Device Trigger	No Capability
C1, C2, C3, C28	Controller	No Capability

```
SI1 A, SM1 R, OFF 1 20 dB, GON, CRF 1
20GHz, OCF 1
```

The above command string would do the following:

1. Set the channel 1 signal trace to be from input A
2. Set the measurement type to be displayed on channel 1 and to be the return loss of the test device.
3. Set the channel 1 offset to be 20 dB.
4. Turn on the graticule grid display.
5. Move the cursor to 20 GHz on the channel 1 trace.
6. Return to the controller the cursor frequency for channel 1.

4-4.2 Reserved Mnemonics

In writing command strings, the following mnemonics may be used for clarity, or they may be omitted for brevity: dB, dBm, GHz, MHz. If the units of frequency (MHz, GHz) are not specified, GHz is assumed.

4-5 BUS MESSAGES, ANALYZER RESPONSE TO

Table 4-11 (page 4-22) lists the bus messages responded to by the analyzer. Table 4-12 (page 4-23) lists programming statements showing how the WILTRON 85 and HP Series 200 bus controllers implement the recognized bus messages.

4-6 ALPHABETICAL INDEX TO ANALYZER COMMAND CODES

Table 4-13 (pages 4-24 and 4-25/4-26) provides an alphabetical index to the analyzer command codes.

Table 4-2. Command Codes: Display Channel Control (Continued)

MNEMONIC CODE	FUNCTION	DESCRIPTION
TCR(N)	Trace At Cursor to Reference Line	Automatically adjusts the offset such that the trace at the cursor is placed on the reference line for channel N.
LHI(N)(n) LHF(N) LLO(N)(n) LLF(N)	High Limit On High Limit Off Low Limit On Low Limit Off	Sets the straight line limits to n dB on the selected channel or turns off the limits. The limits can be used as a guide to test signal trace response. Setting these limits cancel any complex limits previously sent for that channel.
CLH(N)(limits) CLL(N)(limits) CHI (N) (S) CLO (N) (S)	Enter Complex Limits High Enter Complex Limits Low Complex High Limit ON/OFF Complex LowLimit ON/OFF	Sets the complex limits on the selected channel. See Appendix for format of data. See Figure 4-3 for a programming example. Displays or turns off the High Complex Limits for channel N. Displays or turns off the Low Complex Limits for channel N.
LTM (N)	Learn Trace Memory	562 Receives Trace Memory data sent from the controller for channel N
OCH (N) OCL (N)	Output Complex Limits High Output Complex Limits Low	Complex limits previously setup on the 562 may be returned to the controller. The data is returned in ASCII format.
DSI (S)	Display Segment Identifiers	If enabled, a numeric identifier is displayed to identify each segment of complex limit lines.
OLT(N)	Output Limits Test Result	Returns a pass/fail message to the controller. If the test fails, the failed frequency in GHz is returned with the fail message.
DLT	Display Limits Test	Displays a menu that performs pass/fail testing on every sweep for pre-entered limits.
ASC(N)	Autoscale	Automatically adjusts the resolution and offset to fit the signal trace for channel N on the screen.
GSN GSF	GPIB Status Indication On GPIB Status Indication Off	Turns the GPIB status indication display on. Turns the GPIB status indication display off
TM1(S) TM2(S)	Apply trace memory to Channel 1 Apply trace memory to Channel 2	Used to subtract Trace Memory from Signal Trace on the selected channel
TMD (N)	Load Trace Memory with signal trace data	Stores signal trace data for channel N to trace memory
TMH (N)	Load Trace Memory with complex high limits	Stores Complex High Limits for channel N to Trace Memory
TML (N)	Load Trace Memory with complex low limits	Stores Complex Low Limits for channel N to Trace Memory

Table 4-3. Command Codes: Calibration, Graticule Display, System Functions, Diagnostic Facilities,

The following is a list of Mnemonic parameters as indicated within parenthesis:
N = 1 or 2 for channel selection
n = a number within range +/–99.99
F = a frequency within range +/–0 to 999.9999 GHz
S = 0 or 1 for ON/OFF indication (1 = ON, 0 = OFF)
M = 1 to 9, Marker numbers, used for SAVE, RECALL, STORE Marker#, etc.
P = 0 to 400, to select pixel position
X = a variable that will be defined next to the instruction or Mnemonic

MNEMONIC CODE	FUNCTION	DESCRIPTION
	CALIBRATION	
CAL (X)	Perform 562 calibration	Initiates the calibration sequence on the 562. If (X) is "N" or omitted, calibration data at the number of data points selected is stored. If (X) is "H", up to 2000 points are stored for a high resolution calibration.
CTN	Continue Calibration	Continues a paused calibration routine
NUL	Low Level Null	Low level null is only used in Autozero RF Mode ON Establishes an equality between dummy loads and RF OFF conditions (only used when no RF is present).
DOA (N)	Detector Offset A	Offsets the measurement for the selected input without affecting the calibration data
DOB (N)	Detector Offset B	
DO1 (N)	Detector Offset R1	
DO2 (N)	Detector Offset R2	
	GRATICULE DISPLAY	
GON	Turn Graticule On	Turns the graticule grid display on.
GOF	Turn Graticule Off	Turns the graticule grid display off leaving small tick marks.
	SYSTEM FUNCTIONS	
SVS(M)	Save Front Panel Setup	Saves the current control panel setup to memory M.
SVC(X)	Save Setup with Calibration Data	Saves the current control panel setup together with all relevant calibration data to memory X, where X = 1 to 4.
RCS(M)	Recall Setup	Recalls the control panel setup from memory M.
RCC(X)	Recall with Calibration Data	Recalls the control panel setup from memory X (X = 1 to 4), together with calibration data.
PRV(X)	Preview	Looks at control panel setup X (X=1 to 9) from memory without recall. If an intelligent sweeper is connected, it's setup is also displayed. When Preview mode is selected, only the following functions are allowed: other Preview setups, stop print function, and print graph function. Mnemonic command "PRV 0 "deselects the Preview mode.
CN	Configure Normal	Resets the hardware link between 562 and source for normal operation
CNR	CW No Ramp	Only available with non-intelligent sweepers.
CRO	Configure Ramp Output	Provides 0-10v ramp output from 562 via the RAMP INPUT/OUTPUT BNC connector
CML (data)	Configure Manual Labelling	Allows monitor display to be annotated when using a non-intelligent source, e.g. "2 GHz 8 GHz 10 dBm".

Table 4-4. Command Codes: Service Request

MNEMONIC CODE	FUNCTION	DESCRIPTION
SQ1 SQ0	Enable SRQ Disables SRQ	The 562 defaults to SQ0, SRQ being disabled.
SQS(X)	Program Number of Sweeps	After X number of sweeps, an SRQ will be generated.
IPM(X)	Input Primary Mask	Provides an 8-bit mask (X) for the primary status byte. The mask argument (X) can be a number from 0 to 255. The default value is zero. See Figure 4-4 for an example of the status bytes and how they are used.
IEM(X)	Input Extended Mask	Provides an 8-bit mask (X) for the extended status byte. The mask argument (X) can be a number from 0 to 255. The default value is zero.
CSB	Clear Primary Status Byte	Clears the primary status byte.

When an instrument on the dedicated GPIB requests service, bit 7 in the primary status byte is set. This generates an SRQ. Two data bytes are available to be read. They will indicate which instrument on the dedicated GPIB has requested service and its status. The first byte contains the status information. The second byte contains the address of the instrument requesting service, see below.

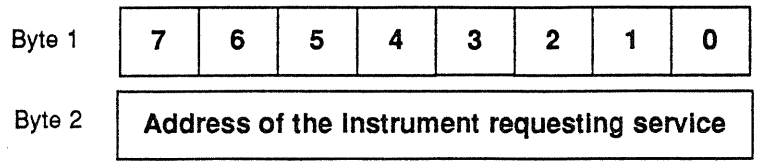


Figure 4-5. Redirected Status Byte

Table 4-5. Command Codes: Cursor Control and Search Facility

The following is a list of Mnemonic parameters as indicated within parenthesis:
N = 1 or 2 for channel selection
n = a number within range +/–99.99
F = a frequency within range +/–0 to 999.9999 GHz
S = 0 or 1 for ON/OFF indication (1 = ON, 0 = OFF)
M = 1 to 9, Marker numbers, used for SAVE, RECALL, STORE Marker#, etc.
P = 0 to 400, to select pixel position
X = a variable that will be defined next to the instruction or Mnemonic

MNEMONIC CODE	FUNCTION	DESCRIPTION
	CURSOR CONTROL	
COF	Cursor Off	Controls the movement of the main or reference cursor,either by specifying position or frequency, and also the on/off states of the cursors. EXAMPLE: Bus command RCF 1 20 GHz will move the reference cursor to a frequency of 20 GHz on the channel 1 trace. This is the relative cursor operation. This is a Relative Cursor function and requires the Relative Mode to be selected.
CON	Cursor On	
CRP(P)	Move Cursor to Position P	
CRF(N)(F)	Move Cursor to Frequency F	
DON	Relative Mode On	
DOF	Relative Mode Off	
RCF(N)(F)	Move Reference Cursor to Frequency F	
RCP(P)	Move Reference Cursor to Position P	
	SEARCH FACILITY	
CMX(N)	Move Cursor to Max	General cursor search on channel N. The cursor will be moved to either the maximum or minimum trace position, a specific marker, or the active marker.
CMN(N)	Move Cursor to Min	
CMK(M)	Move Cursor to Marker M	
CAM	Move Cursor to Active Marker	
CLT(N)(n)	Move Cursor Left to n dB	If the relative cursor is off, then the search will be for an absolute value left or right of the cursor. If the relative cursor is on, the search will be for a value relative to the current reference cursor value.
CRT(N)(n)	Move Cursor Right to n dB	
CBW(N)(n)	Bandwidth	Displays the bandwidth of value n dB on channel N. The reference cursor is left at the lower frequency and the main cursor at the higher.

Bus Command: **SCP (mask)**

The "mask" is a 16-bit ASCII string of 1's and 0's, where the first four characters are zeros. It must be set to select the desired plot function. Mask selections for plot functions are as follows:

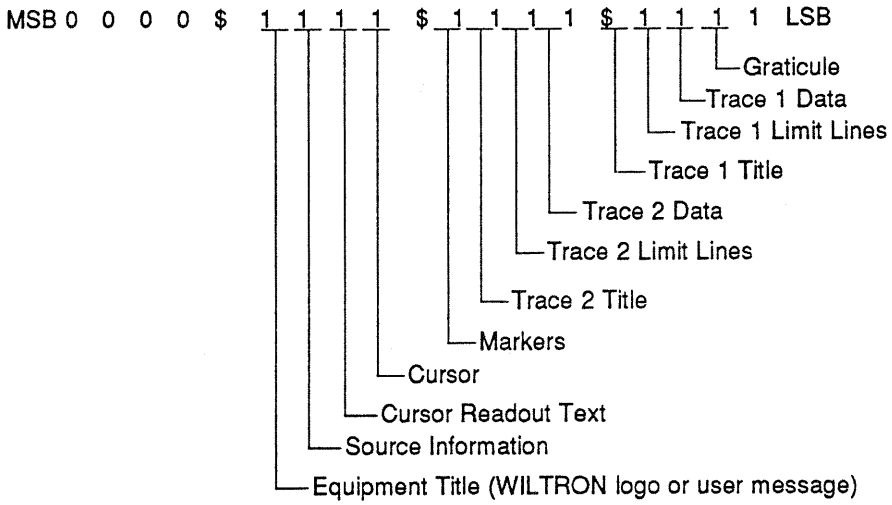


Figure 4-6. Programming Example: SCP (mask)

1	Offset Channel 1 (dB)
2	Offset Channel 2 (dB)
3	Resolution Channel 1 (dB/Div)
4	Resolution Channel 2 (dB/Div)
5	High Limit Channel 1 (dB)
6	Low Limit Channel 1 (dB)
7	High Limit Channel 2 (dB)
8	Low Limit Channel 2 (dB)
9	Sweeper Start Frequency (GHz)
10	Sweeper Stop Frequency (GHz)
11	562 GPIB Address
12	Sweeper GPIB Address
13	Reserved
14	Marker M1 Frequency (GHz)
15	Marker M2 Frequency (GHz)
16	Marker M3 Frequency (GHz)
17	Marker M4 Frequency (GHz)
18	Marker M5 Frequency (GHz)
19	Marker M6 Frequency (GHz)
20	Marker M7 Frequency (GHz)
21	Marker M8 Frequency (GHz)
22	Marker M9 Frequency (GHz)
23	Power Level From Sweeper (dBm)
24	Reserved
25	Reserved
26	dB/Sweep Value (dB)
27	Cursor Position
28	Reference Cursor Position
29	Plotter Address Parameter
30	Reserved
31	Graticule Spacing (GHz/Div)
32	Reserved
33	Reading At Cursor for Channel 1
34	Reading At Cursor for Channel 2
35	Alternate Start Frequency (GHz)
36	Alternate Stop Frequency (GHz)
37	Alternate Power Sweep Level (dB)
38	Alternate Power Level (dBm)
39	Reserved

Figure 4-7. Available Parameters, OPM(X)

Table 4-9. Command Codes: Pass Through Codes

The following is a list of Mnemonic parameters as indicated within parenthesis:
N = 1 or 2 for channel selection
n = a number within range +/–99.99
F = a frequency within range +/–0 to 999.9999 GHz
S = 0 or 1 for ON/OFF indication (1 = ON, 0 = OFF)
M = 1 to 9, Marker numbers, used for SAVE, RECALL, STORE Marker#, etc.
P = 0 to 400, to select pixel position
X = a variable that will be defined next to the instruction or Mnemonic

MNEMONIC CODE	FUNCTION	DESCRIPTION
RDB (X)	Pass Through Command for Binary Data	Redirects binary data to an instrument on the dedicated bus.
RDR(X)	Pass Through Command for ASCII Data	Addresses and programs instruments connected to the dedicated GPIB interface, where X is the address of the instrument receiving the data. For example, RDR 5 COMMAND STRING would pass the command string data to any instrument on the dedicated GPIB having address 5. "CR LF" at the end of the pass through command string terminates the data transmission. See Figure 4-8 for a sample program using this command.
SDP(X) SDS(X) SDX(X)	Set Plotter Address Set Sweeper Address Set 562 Address	Sets the plotter, sweeper, or 562 address where X= the new address of the instrument. Valid instrument addresses for X are 0 to 30.
FRD (X) (data)	Fast Redirection	High speed data communications with device at address X. This command is used in place of the RDR command when high speed data transfer is required.
FRE	Fast Redirection Ends	This command terminates the Fast Redirection (FRD) command.

Table 4-10. Command Codes: General Functions

MNEMONIC CODE	FUNCTION	DESCRIPTION
ARF(S)	Autozero RF Mode On/Off	Autozero occurs every retrace. This establishes if the 562 is to expect the RF to still be on (in which case zeroing is performed using dummy loads) or off (zeroing is performed at the detectors).
BC(S)	Blank CRT	Either blanks (BUS COMMAND = BC1), or unblanks (BUS COMMAND = BC0) the CRT display.
CTN	Continue	Continues to next calibration step, or continues after self test failed.
HON HOF	Hold Enable Release Hold	Holds the current data being displayed on the screen. Continue displaying measurement data.
NUL	Low Level Null	Used in conjunction with autozero RF mode on to establish an equality between dummy loads and actual RF off conditions (when no RF present). Used to calibrate the dummy load.
RTL	Return To Local	Returns the analyzer from the GPIB mode to the local mode.

Table 4-12. Methods of Generating Bus Commands

FUNCTION	METHOD OF EXECUTION	
	WILTRON 85	HP SERIES 200
Go to Local (GTL)	LOCAL 6 * LOCAL 706	LOCAL 6 LOCAL 706
Group Execute Trigger	TRIGGER 6 TRIGGER 706	TRIGGER 6 (GET) TRIGGER 706
Interface Clear (IFC)	ABORTIO 6	ABORT 6
Device Clear (DC) (SDC)	CLEAR 6 CLEAR 706	CLEAR 6 CLEAR 706
Local Lockout (LLO)	LOCAL LOCKOUT 6	LOCAL LOCKOUT 6
Remote Enable (REN)	REMOTE 6 REMOTE 706	REMOTE 6 REMOTE 706
Serial Poll	A=SPOLL (706)	A=SPOLL (706)
Parallel Poll Configure (PPC)	SEND 6; UNL LISTEN 6 CMD 3 SCG 6	PPOLL CONFIGURE 706;6
Parallel Poll	A=PPOLL (6)	A=PPOLL (6)
Parallel Poll Unconfigure (PPU)	SEND 6; CMD 21 SEND 6; UNL LISTEN 6 CMD 21	PPOL UNCONFIGURE 6 PPOL UNCONFIGURE 706

* Assumes GPIB address set to 6.

Table 4-13. Alphabetical Index to the Command Codes (Continued)

MNEMONIC CODE	NAME	PAGE NUMBER
ODR(N)	Output Relative Cursor Readout	4-16
OEB	Output Extended Status Byte	4-16
OFF(N)(n)	Set Channel Offset (dB)	4-6
OID	Output Identify	4-16
OLT(N)	Output Limits Test Result	4-7
OPM(X)	Output Parameter X	4-16
OPB	Output Primary Status Byte	4-16
ORB	Output Redirected Status Bytes	4-16
ORD	Output Redirected Data	4-16
ORF(N)	Ref. Cursor Readout	4-16
ORP	Output Reference Cursor Position	4-16
ORR(N)	Ref. Cursor Readout	4-16
OSB	Output Status Byte	4-18
OSS	Output Stored Setup	4-18
OTM (N)	Output Trace Memory	4-18
PC	Output Custom Plot	4-14
PGR	Print Graph	4-14
PLA	Plot All	4-14
PLC	Plot Cursor	4-14
PLG	Plot Graticule	4-14
PLR	Plot Trace	4-14
PLT	Plot Titles	4-14
PRV(X)	Preview	4-9
PST	Stop Print	4-14
PT(X)	Print Tab Data	4-14
PTL	Print Complex Limits	4-14
RCC(X)	Recall With Calibration Data	4-9
RCF(N)(F)	Move Reference Cursor To Frequency	4-13
RDB(X)	Pass Through Command For Binary Data	4-19
RDR(X)	Pass Through Command For ASCII Data	4-19
RCP(P)	Move Reference Cursor To Position P	4-13
RCS(M)	Recall Front Panel Setup	4-9
REF(N)(X)	Set Reference Line Position	4-6
ROF(N)	Reference Line Display Off	4-6
RON(N)	Reference Line Display On	4-6
RST	Reset Instrument	4-10
RTL	Return To Local	4-21
SCL(N)(X)	Set Resolution (dB/Div.)	4-6
SCP(bit mask)	Specify Custom Plot	4-14
SDP(X)	Set Plotter Address (Dedicated GPIB)	4-19
SDS(X)	Set Sweeper Address (Dedicated GPIB)	4-19
SDX(X)	Set 562 Address	4-19
SI1 (X)	Set Input For Channel 1	4-6
SI2 (X)	Set Input For Channel 2	4-6
SIF(S)	User Interface ON/OFF	4-6
SM1(X)	Set Channel 1 Measurement Display	4-6
SM2(X)	Set Channel 2 Measurement Display	4-6
SMO (X)	Set Smoothing	4-10
SOF	Smoothing Off	4-10
SON(X)	Smoothing On	4-11
SQ0	Disable SRQs	4-11
SQ1	Enable SRQs	4-11
SQS(X)	Program Number of Sweeps	4-11
SVC(X)	Save Setup With Calibration Data	4-9
SVS(M)	Save Front Panel Setup	4-9
TCR(N)	Adjust Offset so that Trace at Cursor Moves To Ref. Line	4-7
TM1 (S)	Apply Trace Memory to Channel 1	4-7
TM2 (S)	Apply Trace Memory to Channel 2	4-7
TMD (N)	Load Trace Memory With Signal Trace Data	4-7
TMH (N)	Load Trace Memory With Complex High Limits	4-7
TML (N)	Load Trace Memory With Complex Low Limits	4-7
TMO	Turn Off Manual Labelling	4-10
TSS "title"	Title Stored Setups	4-6
TST	Run Instrument Test Routine	4-10
XCG	Exchange Cursor and Reference Cursor	4-13