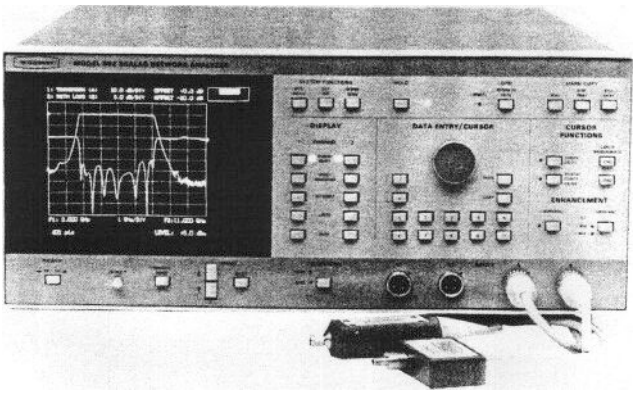
Scalar Network Analyzer

Model 562, 10 MHz to 40 GHz



562 Scalar Network Analyzer Highlights

- Full Compatibility with Wiltron and HP Sources
- Crisp, Clear, High Resolution Display
- 76 dB Dynamic Range, –60 dBm Sensitivity
- 10 MHz to 40 GHz Coverage
- Accurate DC Detection
- Direct Plotter and Printer Output
- Synthesized Step Sweep with Wiltron 6700B
- Available with Distance-to-Fault-Location System

High Performance Scalar Measurements

The Wiltron 562 Scalar Network Analyzer combined with a Wiltron sweeper or synthesizer forms a powerful swept frequency measurement system for both production and design applications. Measure insertion loss, insertion gain, or RF power with 76 dB dynamic range over the 10 MHz to 40 GHz frequency range—the widest frequency range available in coax. Measure device match as return loss in dB or as SWR. Separate detectors can be used on all four inputs for multiple transmission measurements on duplexers or matched amplifiers. Direct detection allows simultaneous RF power measurement at different frequencies, for example, at the RF, IF, and LO frequencies of mixers and converters. Wiltron offers a complete line of precision accessories including detectors and directional bridges to support your measurement requirements.

Superior Accuracy

The 562 is designed to provide superior accuracy over the 10 MHz to 40 GHz frequency range. The 562 uses DC detection, which eliminates uncertainty from RF modulation. A detector low level calibration is made on every retrace giving sensitivity of –60 dBm.

When used with the 6700B Swept Frequency Synthesizer, in Step Sweep Mode, all measurement frequencies, including markers and cursors, have synthesizer accuracy.

Versatile

Transmission and reflection measurements can be viewed simultaneously. Both traces can be scaled independently in dB, dBm or SWR. Measurement of the ratio of two detector inputs may be applied to either channel for enhancing accuracy or for viewing differences. Built-in calibration allows subtraction of the unwanted transmission frequency response or the average of open/short reflections from either trace. A Volt Mode is available for displaying voltage (with Volt Mode Adapter Cable). A 0 to 10 Volt Sweep Ramp Output Mode is also available. These modes, combined with a versatile Trace Memory Mode, allow easy testing of VCOs, PIN diodes, and detectors.

Easy to Use

Great care was placed on the 562 front panel operation to make it straightforward and easy to use; the extra crisp high resolution display allows easy viewing over long hours of use. At each step, the instrument provides a comprehensive display of all pertinent parameters. Ten display cursor functions are available to locate important frequencies, amplitudes, deltas, or bandwidths. Step-by-step guidance is provided for measurement calibration. Straight or complex limit lines are available with Pass/Fail indication for high speed production testing. Nine complete system setups (including source settings) may be saved for later recall; four may include calibration data and trace memory. All can be previewed on the CRT prior to selection.

Multi-Vendor Source Compatibility

The Wiltron 562 is the first scalar analyzer to offer full compatibility with both Wiltron and HP sweepers and synthesizers. The 562 has a dedicated port for source and plotter interface. It interfaces with *all frequency models* of any of the following sources to provide complete interaction during measurements: Wiltron 6600A/B
Wiltron 6700A/B
HP 8350B
HP 8340A/B, 8341A/B

Full band, start-stop, and CW ΔF sweep ranges are displayed. All marker functions from the source may be viewed. Save/Recall also saves and recalls the source settings. The dedicated interface may be turned off to allow control of the source by another instrument such as a noise figure meter.

Cursors and Markers

The 562 has the most extensive set of cursor functions available on a scalar network analyzer:

- **Cursor:** Position of the cursor is continuously variable with the tuning knob. The frequency and amplitude of the test data at the cursor on both traces are digitally displayed.
- **Relative Cursor:** The difference in amplitude and frequency between the main Cursor and the Relative Cursor positions on the test data are displayed for both traces. To establish a new reference, the position of the two cursors can be reversed through a menu selection.

- **Cursor Min/Max:** The 562 automatically moves the cursor to the minimum or maximum value of test data on either trace and displays the value in dB or dBm.
- **Cursor "X" dB:** The cursor automatically moves to the amplitude on either trace where the test data is equal to the entered value of "X" dB or dBm.
- **Cursor "X" Bandwidth:** Cursors are automatically displayed above and below the cursor at the frequencies where the test data are equal to the entered value "X" dB. The frequencies of the low and high cursors and the bandwidth between them are displayed.
- **Cursor Next Marker:** The cursor automatically moves to the next highest frequency marker.
- **Cursor Active Marker:** The cursor automatically moves to the frequency of the active marker.

These cursor functions are in addition to the eight markers available when the Wiltron 6600B Sweep Generator is used as the system signal source. Through a dedicated GPIB link, the 562 communicates with the signal source and displays an identifier for each marker, as well as the frequency and amplitude of the active marker.

Averaging and Smoothing

Even when characteristics of the test device vary rapidly with frequency at very low signal levels, the trace can be smoothed by averaging and/or smoothing. The Smoothing control has three selections: Off, Min, and Max. To maintain the accuracy of the measurement data, smoothing is performed by reducing bandwidth, rather than by averaging adjacent data points in order to preserve measurement detail.

When averaging is selected, 4 to 256 successive traces can be averaged to smooth the trace display. As various combinations of smoothing and averaging are selected, the trace update time is automatically adjusted.

Measurement Accuracy

The return-loss accuracy of the 562 is largely attributable to the high directivity of the Wiltron SWR Autotesters. For example, the 560-97A50-1 with its GPC-7 test port connector has a directivity of better than 41 dB from 10 MHz to 18 GHz. On the 560-98K50, the directivity exceeds 36 dB up to 18 GHz, 34 dB up to 26.5 GHz, and 31 dB up to 40 GHz. The same unit has a test port match of better than 23 dB up to 26.5 GHz and 15 dB up to 40 GHz. To avoid the use of error-producing adapters, SWR Autotesters are available with either male or female test ports in Type N, WSMA, or K Connectors all with high directivity. When the GPC-7 test port is selected, the lowest reflection adapters obtainable are offered in Type N and WSMA, which is optimized for testing SMA devices.

Transmission loss, gain, or power measurement accuracy is affected by reflections from the test port, the device under test, and the detector. These errors are minimized by the very low reflections from the Wiltron SWR Autotesters and detectors.

All detectors use zero-biased Schottky diodes to minimize drift and circuit complexity. Except for the 560-7K50, diode modules are field-replaceable, eliminating the expense and inconvenience of returning detectors to service centers for repair.

The accuracy of the 562 is high also because modulation of the input signal is not required. The need for modulation is avoided by using self-balancing amplifiers, which are stable at low signal levels. As a result, errors from modulation asymmetry and modulation-sensitive test devices are nonexistent. Without the insertion loss of a modulator, measurements can be made at higher input levels, increasing measurement dynamic range.

Recommended Signal Sources

There are many advantages in selecting the Wiltron 6600B Sweep Generator as the 562 signal source. One advantage is the power sweep. In this mode, the output power is swept over a 15 dB range, enhancing gain compression measurements. In the alternate sweep mode, the 562 can display frequency response over different frequency ranges and/or power levels.

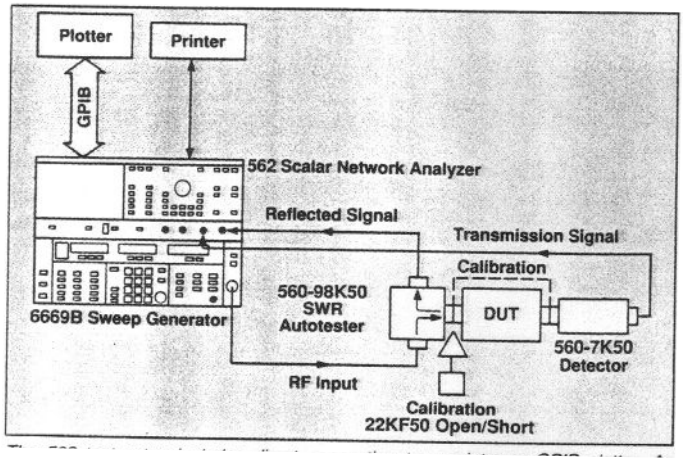
Another advantage of using a Wiltron signal source is that the 6600B uses fundamental oscillators from 2 to 26.5 GHz, avoiding the serious errors introduced by the subharmonics of frequency multipliers.

Stored Test Setups

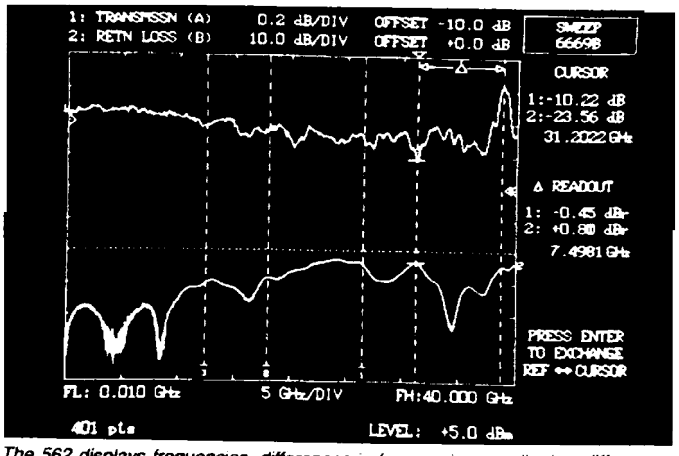
Set-up time is reduced substantially by storing up to nine front-panel setups, four of which include their own calibration data and trace memories. A unique preview feature allows stored setup parameters to be reviewed before recalling or storing a new setup in the memory location. The stored data are backed by a battery with an estimated 10-year life.

Full GPIB

All 562 capability can be controlled via the IEEE-488 GPIB port. Mnemonics are logical and easy to use. A high speed data transfer mode is included for sophisticated ATE applications.



automated



The 562 displays frequencies, differences in frequencies, amplitudes, differences in amplitudes, and pass/fail performance on the large, easy-to-read screen.

Scalar Network Analyzer (Cont.)

Model 562

Specifications

MEASUREMENTS

Function: The 562 has four detector inputs and two independent channels for measurement and display of detected RF power from Wiltron 560 Series Detectors and SWR Autotesters. Two independent traces may be viewed as the logarithmn of RF power (in dB, dBm) or linear reflected power (in SWR). Voltage may also be displayed (with optional Volt Mode Adapter Cable).
Measurement Modes: Measures and displays in dB swept transmission and return loss characteristics. Power is displayed in dBm. Complete measurement parameters for all modes are displayed.
Frequency Range: 10 MHz to 40 GHz in coax using Wiltron 560 Series Detectors and SWR Autotesters. Measurements can be made at higher frequencies with user-supplied waveguide detectors and Wiltron 560-10BX or 560-10BX-1 Adapter Cables.
Inputs: Four inputs, A, B, R1, and R2 accept detected outputs from Wiltron 560 Series Detectors and SWR Autotesters.
Dynamic Range: 76 dB (–60 dBm to +16 dBm) on all channels, useable to –65 dBm.
Data Correction: System residuals, including the average of open and short reflections, are stored during normalization for automatic subtraction from test data.
Normalization: During the normalization sequence, each trace is stored with 0.002 dB resolution over any user-selected frequency range. Normalization data are automatically interpolated for ranges less than the original normalized range.
Save/Recall: Nine sets of front-panel settings can be stored for later recall. All stored data can be previewed on the CRT or printer output prior to selection. Four of the setups include their own calibration data.

DISPLAY

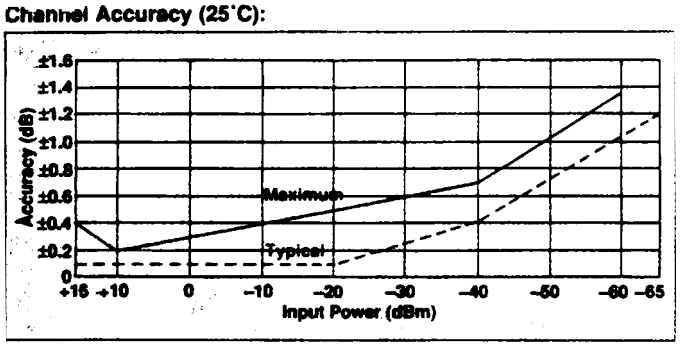
Channels: Two channels are used to select and simultaneously display any two inputs from A, B, R1, or R2. The same inputs can be displayed as ratios of A/R1, A/R2, B/R1, or B/R2.
Alternate Sweep: Displays alternate sweeps between the current front-panel setup and any of nine stored setups.
Graticule: Ten vertical divisions. Horizontal divisions are set automatically in frequency increments of a 1, 2, 5 sequence. Graticule On/Off control turns all graticule lines off. Tick marks remain on axis to indicate graticule position.
Display Resolution:
Horizontal: 101, 201, or 401 points over selected frequency range.
Vertical: 0.005 dB
Limit Lines: Two lines, either straight or complex, for each trace. Complex lines may be made from up to 10 segments. Measurement data may be compared with limit lines for Pass/Fail testing.
Scaling:
Resolution: 0.1 dB to 10 dB per division in 0.1 dB steps with independent control for each channel.
Offset Range: –99 dB to +99 dB in 0.1 dB steps.
Autoscale: Automatically selects offset and resolution to provide optimum display of test data.
Trace Update Time: Typically less than 100 ms, varying with frequency range and the averaging and smoothing settings.
Smoothing: Off, Minimum, and Maximum selections use analog techniques to reduce noise on low-level traces. Trace update time is automatically adjusted for any combination of averaging and smoothing.
Averaging: 4, 8, 16, 32, 64, 128, or 256 successive traces can be averaged to smooth the trace display.
CRT Intensity: Continuously adjustable from off to bright.

MARKERS AND CURSOR

Markers: Displays up to eight numerically identified markers generated by the 6600B Sweep Generator; nine are numerically identified with the 6700B Synthesizer. When a marker is selected as "Active," the cursor can be moved directly to the marker. The cursor can also be moved sequentially through markers until the desired marker is reached.
Cursor: Continuously variable with the tuning knob. The frequency and amplitude of test data at the cursor on both traces are digitally displayed.
Relative Cursor Displays the frequency and amplitude difference between the main Cursor and the Relative Cursor for both traces. A menu selection reverses the position of the two cursors.
Cursor Min/Max: Automatically moves the cursor to the minimum or maximum value of test data on either trace.
Cursor "X" dB: Automatically moves cursor on either trace to an amplitude that is equal to the entered value of "X" dB or dBm.
Cursor "X" Bandwidth: Automatically displays cursors to the right and left of the cursor at the frequencies where the test data are equal to the entered value of "X" dB. The frequencies of the low and high cursors and the bandwidth between them are displayed.
Cursor Next Marker: Moves cursor to next highest frequency marker.
Cursor Active Marker: Moves cursor to the frequency of the active marker.

ACCURACY

Channel Accuracy (25°C):

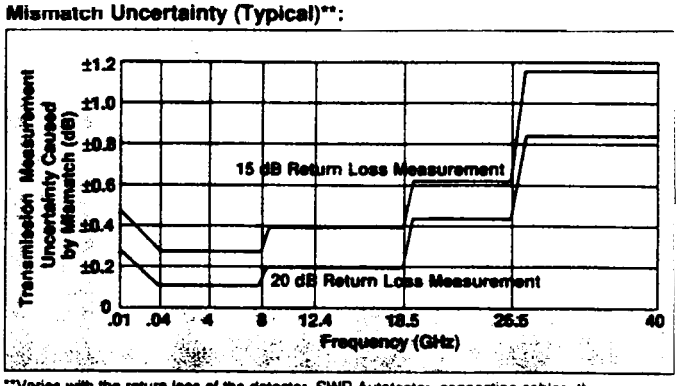


Transmission Loss or Gain Accuracy: Uncertainties from frequency response of components are automatically subtracted from test data during the normalization procedure. Overall accuracy is then:

Transmission Loss or Gain	=	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.

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.

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

Return Loss Accuracy	=	Channel Accuracy	+	SWR Autotester Accuracy

SWR Autotester Accuracy:

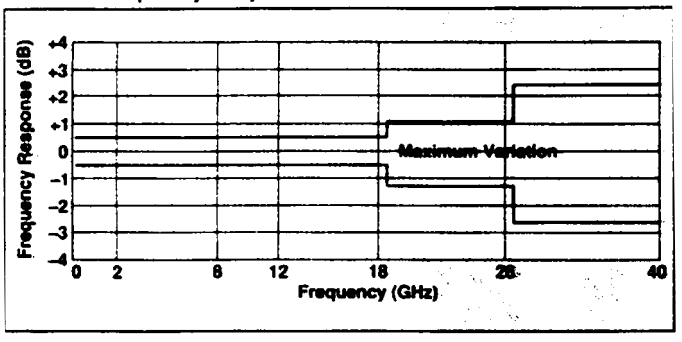
Model	Accuracy of Measured Reflection Coefficient (ρ)[1]			
	10 MHz-8 GHz	8-18 GHz	18-26.5 GHz	26.5-40 GHz
560-97A50 560-97A50-1	$0.016 \pm 0.06\rho^2$ $0.010 \pm 0.06\rho^2$	$0.016 \pm 0.10\rho^2$ $0.010 \pm 0.10\rho^2$	N/A	N/A
560-97N50 560-97N50-1	$0.018 \pm 0.08\rho^2$ $0.013 \pm 0.08\rho^2$	$0.018 \pm 0.12\rho^2$ $0.013 \pm 0.12\rho^2$	N/A	N/A
560-97NF50 560-97NF50-1	$0.018 \pm 0.08\rho^2$ $0.013 \pm 0.08\rho^2$	$0.018 \pm 0.12\rho^2$ $0.013 \pm 0.12\rho^2$	N/A	N/A
560-98S50 560-98S50-1	$0.018 \pm 0.10\rho^2$ $0.013 \pm 0.10\rho^2$	$0.018 \pm 0.10\rho^2$ $0.013 \pm 0.10\rho^2$	$0.025 \pm 0.12\rho^2$ $0.018 \pm 0.12\rho^2$	N/A
560-98SF50 560-98SF50-1	$0.018 \pm 0.10\rho^2$ $0.013 \pm 0.10\rho^2$	$0.018 \pm 0.10\rho^2$ $0.013 \pm 0.10\rho^2$	$0.025 \pm 0.12\rho^2$ $0.018 \pm 0.12\rho^2$	N/A
560-98K50 560-98KF50	$0.018 \pm 0.15\rho^2$	$0.018 \pm 0.15\rho^2$	$0.025 \pm 0.15\rho^2$	$0.032 \pm 0.18\rho^2$

[1] Accuracy includes the effects of directivity (first term) and test port reflection (second term) over the frequency range.

Power Measurement Accuracy:

Absolute Power Accuracy = Channel Accuracy + Detector Frequency Response

Detector Frequency Response:



Overall Waveguide Return Loss Measurement Accuracy:

Return Loss Accuracy = Channel Accuracy + User-Selected Coupler Accuracy

In addition, mismatch uncertainties introduced by the detectors used in a waveguide reflectometer setup can be significant.

GPIB

Interface: IEEE-488 interface is standard on all instruments. All front-panel controls are GPIB controllable except power on/off and CRT intensity. Pass-through commands allow control of the microwave signal source through the 562 GPIB port.
Data Transfer: The 562 does not require an external controller; nevertheless, it is capable of providing high speed data transfer of test data and normalization data to an external GPIB controller.

PRINTER/PLOTTER

Plotter: Dedicated GPIB interface is compatible with HP 7440A, HP 7470A, and HP 7475A Plotters. Display traces, markers, cursor, and graticule information are copied. When overlay traces are desired, data traces only can be plotted.
Printer: Parallel printer interface is compatible with most dot-matrix printers, including Epson FX and the optional 2225C Ink Jet Printer. Hard copy output in graphical or tabular format can be selected. Selections include graphics with measurement parameters, test data tabulated for 26, 51, 101, 201, or 401 points, marker parameters only, or stored setup parameters.
Internal Print Buffer: After approximately 10 seconds of print formatting, a new test can be conducted while previously taken test data are being printed out from an internal printer buffer.

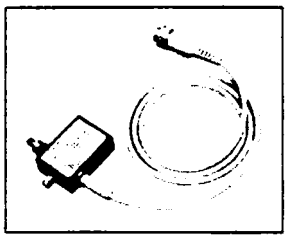
INPUT/OUTPUT CONNECTIONS

Horizontal Sweep Ramp Input: 0 to +10V nominal, +12V maximum
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. Rear panel BNC connector, 10 KΩ impedance.
Sweep Dwell Input: TTL-low signal stops sweep. Sweep continues when signal is removed. Rear panel BNC connector.
Bandswitching Blanking Input: Accepts ±5V signal coincident with bandswitching points. Rear panel BNC connector.
Retrace Blanking Input: +5V blanks traces during retrace. Rear panel BNC connector.
Video Marker Input: ±1V to ±10V peak input. Rear panel BNC connector.
System GPIB: Connects 562 to GPIB. Rear panel GPIB connector.
Dedicated GPIB: Connects 562 to signal source and plotter. Rear panel GPIB connector.
Parallel Printer (Centronics): Connects 562 to printer. Rear panel.
AUX I/O: Connects 562 to compatible source. Rear panel.

GENERAL

Temperature Range:
Operating: 0°C to +50°C
Storage: −40°C to +70°C
Power: 100V/120V/220V/240V ±10%, 48–63 Hz, 130 VA maximum
Dimensions: 177 H x 432 W x 476 D mm + 10 mm for feet
(7 H x 17 W x 18-3/4 D in. + 3/8 in. for feet)
Weight: 16 kg (35 lb.)

MEASUREMENT COMPONENTS



SWR Autotester: The 560 Series SWR Autotesters 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. A mating Open/Short is shipped with each 560 Autotester.

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
560-97N50 560-97N50-1	0.01-18	35 38	±1.5	N Female	N Female
560-98S50 560-98S50-1	0.01-26.5	36 38	±2.0	WMSA Male	Ruggedized K Female
560-98SF50 560-98SF50-1	0.01-26.5	36 38	±2.0	WSMA Female	Ruggedized K Female
560-98K50 560-98KF50	0.01-40	30	±3.0	K Male K Female	Ruggedized K Female

Maximum Input Power: 0.5 W
Cable Length: 122 cm (4 ft.)
Insertion Loss: 6.5 dB nominal from input port to test port

Dimensions and Weight:

Model	Dimensions[1]	Weight
560-97A50,-1 560-97N50,-97NF50,-1	7.6 x 5 x 2.8 cm (3 x 2 x 1-1/8 in.)	340 g (12 oz.)
560-98K50,-98KF50 560-98S50,-98SF50,-1	1.9 x 3.8 x 2.9 cm (3/4 x 1-1/2 x 2-1/8 in.)	198 g (7 oz.)

[1] Plus connectors and cable.

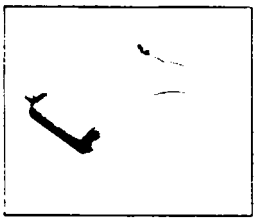
Scalar Network Analyzer (Cont.)

Model 562

Specifications

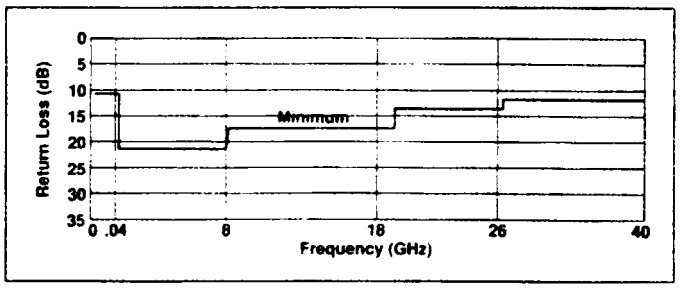
MEASUREMENT COMPONENTS (Cont.)

Detectors: The 560 Series Detectors are for absolute power and relative transmission measurements. The 560 Series Detectors use zero-biased, field-replaceable Schottky diodes. Measurement range is –60 dBm to +16 dBm (typically useable to –65 dBm with 562). Optional extender cables can be used without degradation in performance.



Model	Frequency Range	Input Connector
560-7A50	10 MHz to 18 GHz	GPC-7
560-7N50	10 MHz to 18.5 GHz	N Male
560-7S50	10 MHz to 18.5 GHz	WSMA Male
560-7S50-2	10 MHz to 26.5 GHz	WSMA Male
560-7K50	10 MHz to 40 GHz	K Male

Detector Return Loss:



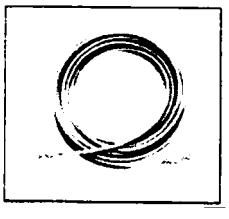
Maximum Input Power: 100 mW
Cable Length: 122 cm (4 ft.)
Dimensions: 7.6 x 2.9 x 2.2 cm (3 x 1-1/8 x 7/8 in.)
Weight: 170 g (6 oz.)

Replaceable Diode Modules:

Detector Model	Diode Module Model
560-7A50	560-A-7219-A (To 18 GHz)
560-7N50	560-A-7219-A (To 18 GHz)
560-7S50	560-A-7219-A (To 18 GHz)
560-7S50-2	560-A-7219-B (To 26.5 GHz)
560-7K50	Factory Repair Only

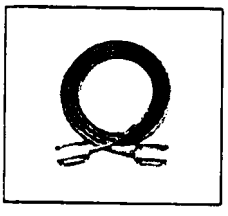
ACCESSORIES

Extender Cables: These Extender Cables can be installed between the SWR Autotester or detectors and the 562, thereby permitting measurements from up to 200-feet away.



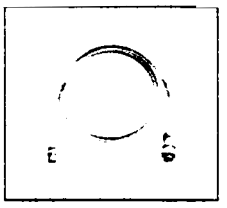
Model	Cable Length
800-109	7.6 m (25 ft.)
800-110	15.2m (50 ft.)
800-111	30.5 m (100 ft.)
800-112	61 m (200 ft.)

GPIB Cables: These cables interconnect instruments on the GPIB (IEEE–488 bus).



Model	Cable Length
2100-1	1 m (3.3 ft.)
2100-2	2 m (6.6 ft.)
2100-4	4 m (13.2 ft.)
2100-5	0.5 m (1.65 ft.)

Adapter Cables: These 122 cm (4 ft.) cables allow the 562 to be used with waveguide or other detectors having a BNC or SMA female output connector.



Model	Connector
560-10BX	BNC Female
560-10BX-1	SMA Female

Open/Shorts: An Open/Short is used to establish a 0 dB return loss reference during the normalization procedure

Model	Connectors
21A-1[1]	GPC-7 Short Only
22A50	GPC-7
22K50	K Male
22KF50	K Female
22N50	N Male
22NF50	N Female
22S50	WSMA Male
22SF50	WSMA Female

[1] Supplied with collet for mating with beadless end of air line.

562-15BX Volt Mode Adapter Cable: Allows the 562 to be used in Volt Mode. BNC Male Connectors

760-56 Transit Case for RF components
760-75 Transit Case for the 562

2225C Ink Jet Printer, including 2225-1 Interface Cable, 1 ink cartridge, and 50 sheets of Ink Jet paper.
2225-1 Printer Interface Cable
2225-2 Ink Cartridges (2 each)
2225-3 Fan-Fold Ink Jet Paper (2500 sheets)

Ordering Information

562 Scalar Network Analyzer

SWR Autotesters:

560-97A50	10 MHz to 18 GHz, 36 dB directivity
560-97A50-1	10 MHz to 18 GHz, 40 dB directivity
560-97N50	10 MHz to 18 GHz, 35 dB directivity
560-97N50-1	10 MHz to 18 GHz, 38 dB directivity
560-97NF50	10 MHz to 18 GHz, 35 dB directivity
560-97NF50-1	10 MHz to 18 GHz, 38 dB directivity
560-98K50	10 MHz to 40 GHz, 31 dB directivity
560-98KF50	10 MHz to 40 GHz, 31 dB directivity
560-98S50	10 MHz to 26.5 GHz, 36 dB directivity
560-98S50-1	10 MHz to 26.5 GHz, 38 dB directivity
560-98SF50	10 MHz to 26.5 GHz, 36 dB directivity
560-98SF50-1	10 MHz to 26.5 GHz, 38 dB directivity

Detectors:

560-7A50	10 MHz to 18 GHz, GPC–7, 50Ω
560-7K50	10 MHz to 40 GHz, K Male, 50Ω
560-7N50	10 MHz to 18.5 GHz, N Male, 50Ω
560-7S50	10 MHz to 18.5 GHz, WSMA Male, 50Ω
560-7S50-2	10 MHz to 26.5 GHz, WSMA Male, 50Ω

Rack Mounting, Option 1: Unit supplied with mounting ears and chassis track slide (90° tilt) installed

Connecting Cables: A 2100-1 GPIB Cable, 1 m (3.3 ft.) long, and an 806-7 Interconnect Cable for the 6600B Sweep Generator are included with each 562.
806-7 Replacement Interconnect Cables