

## 1-4 SPECIFICATIONS

The following paragraphs provide a description and specifications for the 560A Scalar Network Analyzer; 560-97, -98, and -6 series SWR Autotesters; and 560-7 and -71 series RF detectors.

### 1-4.1 Model 560A Scalar Network Analyzer

The Model 560A Scalar Network Analyzer is a GPIB-compatible, three-channel microwave measurement instrument. The three channels consist of two measurement channels (A, B) and one reference channel (R), which allow the network analyzer to

simultaneously display the results of two measurements. The 560A also contains internal memory circuits that provide two different functions — measurement-normalization memory and display-refresh memory. The measurement-normalization memory stores transmission measurement system residuals and return loss calibration data. The display-refresh memory provides a non-flickering display, regardless of sweep generator sweep speed. The refresh memory also provides for a slow, 30-second sweep for an external X-Y plotter.

A complete listing of the 560A specifications is contained in Table 1-1.

Table 1-1. Model 560A Scalar Network Analyzer Specification Chart

**FREQUENCY RANGE:** See SWR Autotester and RF detector specifications, Table 1-2 and Table 1-3, respectively.

**CHANNELS:** Three (A, B, R) with pushbutton selection of A, B, R, A-R and B-R. Detected input signals supplied by detectors or SWR Autotester, which may be interchanged without adjustment. Two channels are displayed simultaneously.

**DYNAMIC MEASUREMENT RANGE AND SENSITIVITY:**

A and B with Detectors:\*

66 dB (+16 dBm to -50 dBm)

A and B with SWR Autotester:

60 dB (+10 dBm to -50 dBm)\*\*

R with Detector:\*

46 dB (+16 dBm to -30 dBm)

\*With 75 $\Omega$  detectors, maximum output is +13 dBm.

\*\*As seen by internal detector, typically 13 dB below input power with 0 dB return loss at test port.

**OFFSET CONTROL:** Positioning of A and B traces is independently and continuously adjustable over  $> \pm 65$  dB range. When trace is on reference line, power is displayed in dBm on 3-digit LED readout with 0.1 resolution. Offset is displayed in dB relative to a 0 dB reference level or in dBm relative to a 0 dBm reference level.

**ZERO dB REFERENCE SET:** Positions reference trace at selected 0 dB reference line.

**REFERENCE POSITION LOCATOR:** Displays reference trace to locate reference line. Position of reference line screwdriver-adjusted.

**OFFSET ZERO POSITION:** Moves trace to the position it would have if OFFSET were adjusted to 0 dB.

**RESOLUTION:** Independent control for A and B in steps of 0.2, 0.5, 1, 2, 5, 10 dB per division. Other values (3, 6, 15 dB, etc.) obtained by depressing multiple pushbuttons.

**MEMORY:**

**STORE TRACE:** Stores displayed trace(s) in 1024-point memory. Used to store system residuals and the average of open/short reflections for subtraction from input test data.

**AVERAGE:** Averages data in memory with input test data and displays the result. Used to average system open/short return loss characteristics for subtraction from input test data.

**SUBTRACTION:** Subtracts data in memory from input test data and displays result.

**RECALL:** Displays stored data.

**UNCALIBRATED SWEEP INDICATOR:** Lights when external sweep generator sweep rate is too fast for memory.

**DISPLAY MODES:**

**REAL TIME:** Horizontal sweep is synchronized with ramp from external sweep generator.

**REFRESH:** External sweep generator ramp is digitized and stored in 1024-point memory (512 points for dual trace). Stored data is updated continuously at sweep generator sweep rate. Steady, nonflickering display is provided regardless of sweep generator sweep rate. Vertical resolution is 512 points for single or dual traces.

**REFRESH HOLD:** Updating of display data is stopped. Display is frozen.

**X-Y PLOT (REAL TIME):** Provides pen lift, vertical, and horizontal signals for X-Y plot. Dual traces are automatically recorded by sweeping A and B channels sequentially.

**X-Y PLOT (REFRESH):** Display is frozen and then plotted at 30-second sweep rate. Dual traces are automatically recorded by sweeping A and B channels sequentially. After 1 second, sweep may be aborted and returned to start.

**SMOOTHING FILTERS:** Three levels of filtering optimize low-level signal displays.

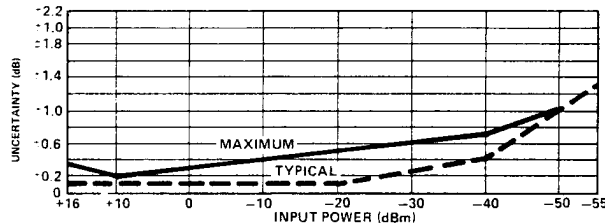
Table 1-1. Model 560A Scalar Network Analyzer Specification Chart (continued)

**MARKERS:** Threshold and tilt control of externally-applied birdie or video markers.

### ACCURACY

#### A AND B CHANNEL ACCURACY:

$\pm 0.2$  dB at +10 dBm; decreasing  $\pm 0.1$  dB/10 dBm to -40 dBm and  $\pm 0.3$  dB to -50 dBm (see graph below).



#### OVERALL RETURN LOSS MEASUREMENT ACCURACY:

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

SWR Autotester Accuracy (Table 1-2)

+

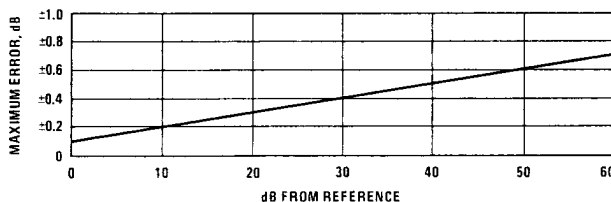
A and B Channel Accuracy (above)

**OVERALL TRANSMISSION LOSS/GAIN MEASUREMENT ACCURACY:** Uncertainties resulting from frequency response of detectors, SWR Autotester, sweep generator and other test system components are subtracted automatically from test data. Overall accuracy is then:

A and B Channel Accuracy \*

- \* Effects of sweep generator, test device, and detector mismatch may be significant. Mismatch errors are either minimized by the exceptional low reflection characteristics of the 560 detectors (see detector return loss specifications) or padded by the insertion loss of the SWR Autotester (paragraph 1-4.2).

#### RATIO MEASUREMENT ACCURACY (A-R, B-R):



Above curve includes all log amplifier uncertainties. Errors due to Detector Mismatch variations must be accounted for separately. The use of memory eliminates errors due to detector frequency variations.

#### OVERALL ABSOLUTE POWER MEASUREMENT ACCURACY:

Absolute power measurement accuracy is determined by the frequency response accuracy of the detector and the absolute

accuracy of the log amplifier. Absolute power accuracy is then:  
Detector Frequency Response Accuracy (Table 1-3)

+

A and B Channel Accuracy (above)

### CRT DISPLAY

**CATHODE RAY TUBE (CRT):** 8 vertical by 10 horizontal divisions. One division = 1.22 cm. Single beam, standard persistence (P31) phosphor CRT with internal graticule.

**CRT BEAM CONTROLS:** Intensity, Focus, Trace Rotation, and Horizontal Position.

**CAMERA:** Compatible with Tektronix C5A, B, or C model camera.

**HOOD:** Compatible with Tektronix 016-0260-00 Hood.

### INPUT CONNECTIONS

**HORIZONTAL INPUT:** HORIZONTAL SELECT switch selects one of three types of sweep ramp inputs at rear panel HORIZONTAL INPUT connector: 0 to +10V, 0 to +15V, and -8 to +8V. BNC connector, 100k ohms input impedance.

**MARKER INPUT:** 1mV to 10V peak input, rear panel BNC connector, 100k ohms input impedance. In addition, a -3V to -10V input to Z AXIS rear panel connector provides markers.

**Z AXIS INPUT:** +3 to +10V blanks and maintains trace amplitude during switching of sweep generator oscillators. -3V to -10V introduces markers which are controlled by THRESHOLD and TILT. Rear panel BNC connector, 10k ohms input impedance.

### OUTPUT CONNECTIONS

**RECORDER/CRT MONITOR CONTROL:** Rear Panel OUTPUT MODE switch selects appropriate horizontal, vertical, blanking, and pen lift output voltages for external CRT monitor or mechanical recorder.

**HORIZONTAL SWEEP RAMP OUTPUT:** 0 to 10V in synchronism with sweep display. Rear panel BNC connector.

**VERTICAL OUTPUT:** Varies from 0 to  $\pm 8V$  (1V/div.) in proportion to display trace position. When OUTPUT MODE switch is in CRT position, voltage alternates between A and B. When the switch is in RCDR position and an X-Y plot is initiated, voltage first varies in proportion to A over full swept range and then in proportion to B. Pen-lift voltage lifts recorder pen between sweeps. Rear panel BNC connector.

**BLANK/PEN LIFT OUTPUT:** Provides either CRT

Table 1-1. Model 560A Scalar Network Analyzer Specification Chart (continued)

blanking output or pen lift control signal, depending upon the position of the OUTPUT MODE switch. In the CRT mode, the positive TTL-compatible voltage is HIGH during retrace and LOW during forward sweep. In the RCDR mode, the pen lift relay contacts are normally-open during retrace. Lifted pen is held off paper until new sweep is started. Internal jumper is available for normally-closed contacts. Rear panel BNC connector.

#### ALTERNATING SWEEP INPUT/OUTPUT

**AUX I/O:** Provides interconnection between compatible sweep generators, such as the WILTRON 6600A Series Programmable Sweep Generator, and the 560A. Eliminates rear panel BNC connections between the compatible sweep generator and the 560A.

#### GPIB

**DIGITAL INTERFACE:** Conforms to IEEE 488 and IEC 625 standard digital interface for programmable instrumentation. Function subsets implemented: SH1, AH1, T6, TE0, L4, LE0, SR1, RL2, PP0, DC1, and DT0.

**GPIB ADDRESS:** TALK and LISTEN addresses selected by rear panel switches.

**DATA DELIMITER:** Rear panel switch selects either CARRIAGE RETURN (CR) or CARRIAGE RETURN and LINE FEED (CR/LF) as data delimiters when in the TALK mode.

**SRQ:** Instrument can be programmed to generate a service

request (SRQ) when data is available. If SRQ implementation is not desired, handshake will be completed when data is available.

**REMOTE INDICATOR:** Lights when test set is operating on GPIB.

#### PHYSICAL

##### TEMPERATURE RANGE:

Operating: 0°C to +50°C  
Storage: -40°C to +70°C

**POWER:** 100V/120V/220V/240V +5%, -10% selectable on rear panel. 50 Hz to 400 Hz, 85VA maximum.

##### WEIGHT:

560A Horizontal or 560A Option 2  
Vertical Configuration: 11kg (24.5 lb)  
560A Option 1  
Rack Mounting: 13.5 kg (30 lb)

##### SIZE:

560A Horizontal Configuration  
133 mm H x 429 mm W x 500 mm D (5.26 x 16.9 x 19.7 in)  
560A Option 2 Vertical Configuration  
267 mm H x 213 mm W x 500 mm D (10.5 x 8.4 x 19.7 in)  
560A Option 1 Rack Mount  
133 mm H x 483 mm W x 500 mm D (5.25 x 19 x 19.7 in)

##### RACK MOUNTING (OPTION 1):

Units supplied with mounting ears and chassis track slides (90° tilt) installed.