

# NETWORK ANALYZERS

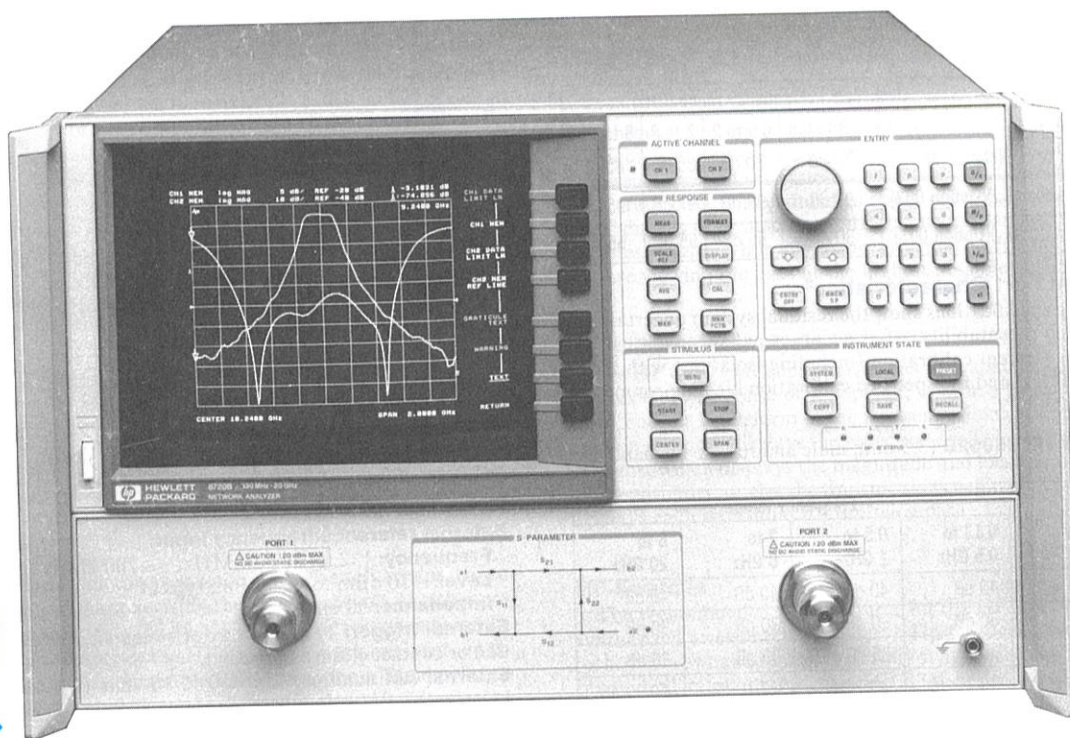
## Microwave Network Analyzers, 130 MHz to 13.5 or 20 GHz

HP 8719A, 8720B, 85162A

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- 130 MHz to 13.5 or 20 GHz frequency range
- Fast-sweeping synthesized source built in
- Integrated switching s-parameter test set

- Direct save/recall to an external disk drive
- Up to 95 dB dynamic range
- Built-in accuracy enhancement



HP 8720B

### HP 8719A, 8720B Microwave Network Analyzers

The HP 8719A or 8720B microwave network analyzers characterize microwave components and networks to 13.5 or 20 GHz. These vector network analyzers include a fast-sweeping synthesized source, switching s-parameter test set, and large, full color display in a single integrated package. These compact instruments are economical and easy to use. They are ideal choices for manufacturing, incoming inspection, and final test.

#### Affordable Analyzers with Excellent Performance

The integral source is fully synthesized, even while sweeping, and it provides stability and accuracy within 10 ppm (typical). Yet, the source sweeps extremely fast: measurement update times are typically about 1 ms per point. Frequency resolution is 100 kHz standard; option 001 provides 1 Hz resolution for narrow-band or long devices.

With tuned receivers and variable-bandwidth IF filters, the HP 8719A and 8720B microwave network analyzers provide over 85 dB of dynamic range. Option 003 boosts the forward dynamic range to 95 dB; solutions to 100 dB are available. The built-in test set measures all four s-parameters (both forward and reverse) with a single connection.

A step attenuator controls incident power level from -10 to -65 dBm in 5 dB steps, and two internal tees provide bias to active devices through the test ports.

Two independent channels can display reflection and transmission characteristics at the same time. The receiver detects both magnitude and phase, and presents results in a variety of useful formats, including group delay, deviation from linear phase, complex impedance, or SWR, on rectangular, polar, or Smith charts.

Built-in vector accuracy enhancement supports calibration kits in 3.5 mm, 7 mm, and type-N connectors; a user kit supports waveguide. Choose from a simple response normalization to full 2-port error correction. And the frequency subset feature lets you zoom in on a response without recalibrating.

Time domain capability (option 010) computes and displays the DUT's response versus time or distance (instead of frequency). Use time domain to locate and quantify individual discontinuities in a network. Or apply the gating feature to remove the effects of unwanted reflections (separated in time), then view the DUT's true response versus frequency.

#### Time-Saving Productivity Features

Limit test capability makes pass/fail decisions quantitative and decisive. Define up to 22 test limits per channel, based on the specifications of your components. Tuning is faster, and testing is more consistent.

To document results without a computer, the copy feature sends the entire display to a compatible plotter or printer.

Annotate specific trace features with markers — up to four per channel, all displayed at once. Advanced marker functions track a maximum or minimum point (while tuning), or compute the delta between two markers. For bandpass filters, markers automatically determine center frequency, bandwidth, and Q.

With save/recall capability, an experienced user can define and save test configurations for each DUT. Other users can recall identical conditions later, and align/test each DUT consistently. Use five internal memory registers, or save/recall directly to an external CS80 disk drive.

#### Software

Automate the HP 8719A or 8720B microwave network analyzers with HP-IB for added capability. The HP 85162A Measurement Automation Software guides you through measurements and simplifies test configuration. You can measure transistors quickly and completely with the HP 85014C Active Device Measurements Application Pac. The software includes models to de-embed the HP 85014A transistor fixture, and also controls the bias supply. Or, you can use the HP 85165A Resonator Measurement Software to characterize SAW devices and crystal.



# NETWORK ANALYZERS

## Microwave Network Analyzer, 130 MHz to 13.5 or 20 GHz

Models 8719A, 8720B, 85162A (cont'd)

### HP 8719A/8720B System Performance

All specifications apply to the HP 8719A up to 13.5 GHz.

#### Dynamic Range<sup>1</sup>

	Frequency range (GHz)			
	0.13 to 0.5	0.5 to 2	2 to 8	8 to 20*
Transmission ( $S_{21}$ or $S_{12}$ )(standard)	70 dB	80 dB	85 dB	85 dB
Forward Transmission ( $S_{21}$ )(Option 003)	99 dB	98 dB	97 dB	95 dB
Reverse Transmission ( $S_{12}$ )(Option 003)	30 dB	55 dB	65 dB	65 dB

#### Measurement Port Characteristics<sup>2</sup>

The following specifications show the residual system uncertainties (including switch repeatability) after accuracy enhancement using a full 2-port measurement calibration (including isolation) with an IF bandwidth of 10 Hz, and the specified calibration kit. Environmental temperature is  $23 \pm 3^\circ\text{C}$ .

**Calibration Kit: HP 85052B** (3.5 mm, male and female lowband and sliding loads)

	Frequency Range			
	0.13 to 0.5 GHz	0.5 to 2 GHz	2 to 8 GHz	8 to 20 GHz
Directivity	40 dB	40 dB	40 dB	40 dB
Source Match	30 dB	30 dB	30 dB	30 dB
Load Match	35 dB	35 dB	30 dB	30 dB
Reflection Tracking	$\pm 0.10$ dB	$\pm 0.10$ dB	$\pm 0.10$ dB	$\pm 0.20$ dB
Transmission Tracking	$\pm 0.10$ dB <sup>6</sup>	$\pm 0.10$ dB <sup>6</sup>	$\pm 0.12$ dB	$\pm 0.15$ dB

**Calibration Kit: HP 85052D** (3.5 mm, male and female broadband precision fixed load)

	Frequency Range			
	0.13 to 0.5 GHz	0.5 to 2 GHz	2 to 8 GHz	8 to 20 GHz
Directivity	40 dB	40 dB	38 dB	36 dB
Source Match	30 dB	30 dB	30 dB	29 dB
Load Match	35 dB	35 dB	30 dB	30 dB
Reflection Tracking	$\pm 0.10$ dB	$\pm 0.10$ dB	$\pm 0.10$ dB	$\pm 0.20$ dB
Transmission Tracking	$\pm 0.10$ dB <sup>6</sup>	$\pm 0.10$ dB <sup>6</sup>	$\pm 0.12$ dB	$\pm 0.15$ dB

#### System Accessories

	3.5 mm	7 mm <sup>3</sup>	Type N <sup>3</sup>
Test port cables			
Standard	HP 85131C/D	HP 85132C/D	HP 85132C/D <sup>4</sup>
Flexible <sup>5</sup>	HP 85131E/F	HP 85132E/F	HP 85132E/F <sup>4</sup>
Adapter sets	HP 85130D	HP 85130B	HP 85130C
Calibration kits			
Standard	HP 85052B	HP 85050B	HP 85054B
(sliding loads)			
Economy	HP 85052D	HP 85050D	HP 85054D
(fixed loads)			
Verification kits	HP 85053B	HP 85051B	HP 85055A

<sup>1</sup>Limited by maximum output power and system noise floor. Specified for an IF bandwidth of 10 Hz, using a full 2-port measurement calibration (including an isolation calibration performed with an averaging factor of 16).

<sup>2</sup>Crosstalk, after an isolation calibration, is below the system noise floor and can be ignored.

<sup>3</sup>HP 85130B/C Special Adapter Sets required if devices with 7 mm or Type N connectors are to be connected directly to the HP 8719A/HP 8720B's test ports.

<sup>4</sup>Use the cables recommended for 7 mm devices. Precision 7 mm to Type N adapters are included in the HP 85054B/D Type N calibration kits.

<sup>5</sup>Standard cables are warranted for 90 days. Flexible cables carry a standard one-year warranty.

<sup>6</sup>With Option 003, reverse transmission tracking and maximum Port 2 power level are reduced.

### General Characteristics

#### Source Frequency Characteristics

**Range:** HP 8719A, 130 MHz to 13.5 GHz

HP 8720B, 130 MHz to 20.0 GHz

**Resolution:** 100 kHz (1 Hz with Option 001)

**Stability:** typically  $\pm 7.5$  ppm @  $0^\circ$  to  $55^\circ\text{C}$

typically  $\pm 3$  ppm/year

**Accuracy:** 10 ppm @  $25^\circ \pm 3^\circ\text{C}$

**Output characteristics** (at test ports,  $25^\circ \pm 3^\circ\text{C}$ )

**Power range:**  $-10$  to  $-65$  dBm in 5 dB steps<sup>6</sup>

**Power level:**  $-10$  dBm  $\pm 3$  dB<sup>6</sup>

**Harmonics:**  $< -15$  dBc @  $-10$  dBm (typical)

#### Test ports

**Connector type:** 3.5 mm (male)

**Impedance:** 50 ohms nominal

**Switch type:** Mechanical

**Switch lifetime:**  $> 3$  million cycles (typical)

**Maximum input level:**  $+20$  dBm

**DC bias:** 500 mA, 40 VDC maximum

#### Rear Panel Connectors

**External reference frequency input:**

**Frequency:** 1, 2, 5, and 10 MHz;  $\pm 200$  Hz at 10 MHz

**Level:**  $-10$  dBm to  $+20$  dBm, typical

**Impedance:** 50 ohms

**External trigger:** Triggers start of sweep on a negative TTL transition or contact closure to ground.

**External AM auxiliary input:** 0 to 10 volts ( $-1$  dB/volt) into a 10 kohm resistor, 5 kHz max.

**Auxiliary voltage input:**  $-10$  to  $+10$  V

**IO interconnect:**

**Type:** DB-25

**Output:** Standard LS TTL output (active high logic) on pin 17 indicative of PASS/FAIL status during limit testing. Output voltage remains at  $+5$  Vdc (nominal) until a FAIL condition occurs. Remains at 0 Vdc until a PASS condition occurs.

#### HP 85162A Measurement Automation Software

The HP 85162A Measurement Automation software is designed specifically to operate on an HP 9000 series 200 or 300 computer with BASIC 3.0 or higher. The software complements the HP 8720A microwave network analyzer, providing calibration, measurement, and data output capabilities with a minimum of operator interaction.

#### Ordering Information

**HP 8719A Network Analyzer** (130 MHz to 13.5 GHz) **Price** **\$44,000**

**Option W30** Extended Repair Service. See page 725. **1,100**

**Option W31** On-site Repair Service. See page 725. **1,980**

**Option W32** Calibration Service. See page 725. **665**

**HP 8720B Network Analyzer** (130 MHz to 20.0 GHz) **\$55,000**

**Option W30** Extended Repair Service. See page 725. **1,375**

**Option W31** On-site Repair Service. See page 725. **2,500**

**Option W32** Calibration Service. See page 725. **665**

Following options available for both HP 8719A and 8720B:

**Option 001** 1 Hz frequency resolution **9,500**

**Option 003** High forward dynamic range **N/C**

**Option 010** Time Domain Capability **9,000**

**Option 802** add HP 9122C Dual Disc Drive, HP 10833A cable **1,495**

**Option 830** add HP 85052D Cal Kit, HP 85131E cable **5,100**

**Option 913** Rack Mount Kit **40**

**HP 85162A Measurement Automation Software**

Requires BASIC 3.0 or above and 2 Mbytes of RAM **1,500**

Must select media option (no charge):

**Option 630** for 3.5 in. disc media **N/C**

**Option 655** for 5.25 in. disc media **N/C**