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# Specifications and Characteristics

## System Specifications

The specifications and characteristics in this section describe the system performance of the analyzer. The system is defined as the network analyzer itself (which includes a built-in transmission/reflection test set) and the following:

A calibration kit — either HP 85032E (50  $\Omega$ ) or HP 85036E (75  $\Omega$ )

A test port cable — either HP part number 8120-6469 (50  $\Omega$ ) or HP part number 8120-6468 (75  $\Omega$ )

Specifications describe the instrument's warranted performance over the temperature range of  $25^{\circ} \pm 5^{\circ} \text{C}$ , unless otherwise stated.

*Supplemental characteristics* (indicated by italics) are typical, but nonwarranted parameters, intended to provide information useful in applying the instrument.

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## Dynamic Range

Receiver dynamic range is calculated as the difference between the maximum receiver input level and the receiver's noise floor. System dynamic range applies to transmission narrowband measurements only, since reflection measurements are limited by directivity.

Noise floor is specified as the mean of the noise trace at specified CW frequencies. A signal at this level would have a signal/noise power ratio of 3 dB. Noise floor is measured with the test ports terminated in loads, response and isolation calibration, 15 Hz IF bandwidth, 0 dBm test port power and no averaging. Dynamic range specifications are listed later in the "Receiver Specifications" section of this chapter.

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## Measurement Port Specifications

The following specifications describe the residual system uncertainties. These specifications apply after a user calibration has been performed and with an environmental temperature of  $25 \pm 5^\circ \text{C}$ , with less than  $1^\circ \text{C}$  deviation from the calibration temperature.

**Measurement Port Specifications**

Parameter	HP 8711B	HP 8713B
Directivity	40 dB	40 dB
Source Match (Ref)	20 dB	20 dB
<i>Source Match (Trans)</i>		
$\geq 1 \text{ MHz to } 1300 \text{ MHz}$	14 dB	
300 kHz to 1300 MHz		23 dB
1300 MHz to 3000 MHz		20 dB
<i>Load Match</i>		
300 kHz to 1300 MHz	18 dB	20 dB
1300 MHz to 3000 MHz	18 dB	18 dB

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## Instrument Specifications and Characteristics

Specifications describe the instrument's warranted performance over the temperature range of  $25^{\circ} \pm 5^{\circ} \text{C}$ , unless otherwise stated.

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### Source Specifications

#### Frequency

<b>Range</b> HP 8711B HP 8713B	300 kHz to 1300 MHz 300 kHz to 3000 MHz
<b>Resolution</b>	1 Hz
<i>Stability</i>	$\pm 5 \text{ ppm at } 0 \text{ to } 55^{\circ} \text{C}$
<b>Accuracy</b>	$\pm 5 \text{ ppm at } 25^{\circ} \text{C} \pm 5^{\circ} \text{C}$ <i>&lt; 1 Hz at 10% change in line voltage</i>

**Output Power**

<b>Resolution</b> <sup>1</sup>	0.01 dB
<b>Level Accuracy</b> <sup>1</sup>	$\pm 1.0$ dB $\pm 1.5$ dB (Option 1EC) <sup>2</sup> $\pm 2.0$ dB (Option 1E1) <sup>3</sup> $\pm 3.0$ dB (Options 1EC and 1E1) <sup>2,3</sup>

1 All power characteristics for HP 8713B analyzers with option 1EC (75 ohm ports) are typical above 2000 MHz.

2 75 ohm test ports

3 Attenuator option

**Maximum Specified Test Port Power**

Frequency	HP 8711B (Std) <sup>1</sup>	HP 8713B (Std) <sup>1</sup>
$\leq 1000$ MHz	+16 dBm	+10 dBm
$> 1000$ MHz	+13 dBm	+10 dBm

1 This value will change depending upon the options installed in your analyzer. See "Determining Test Port Power" to determine the maximum test port power output for your particular instrument

**Minimum Test Port Power**

Analyzer	HP 8711B (Std)	HP 8713B (Std)
Standard <sup>1</sup>	0 dBm	-5 dBm
Option 1E1 (Attenuator)	-60 dBm	-60 dBm

1 This value will change depending upon the options installed in your analyzer. See "Determining Test Port Power" to determine the minimum test port power output for your particular instrument

**Instrument Specifications and Characteristics****Determining Test Port Power**

The maximum test port power output of your analyzer depends upon the options that are installed. If you have a standard instrument with no options installed, then the values in the table preceding this note apply to your analyzer. Otherwise, use the following table to determine your instrument's maximum test port power:

Option	HP 8711B	HP 8713B
1E1 (Attenuator)	subtract 1 dB	subtract 1 dB
1EC (75 ohm)	subtract 3 dB	subtract 3 dB
1DA or 1DB (AM delay)	subtract 2 dB	subtract 4 dB

For each option installed, subtract the indicated amount from the maximum and minimum powers stated in the standard tables. For example, if you have an HP 8713B with options 1EC and 1DB installed, you would subtract a total of 7 dB from the standard values found in the tables to get a final correct maximum output of 3 dB for your analyzer, and -12 dB for the minimum output power. However, the minimum output power for any analyzer with option 1E1 (attenuator) is -60 dBm, regardless of other options installed.

If you are not sure which options (if any) are installed in your analyzer, press **SYSTEM OPTIONS** **Service Instrument Info** for a display of the options installed.

**Source Harmonics (measured at +7 dBm\*)**

Frequency	HP 8711B	HP 8713B
<1 MHz	<-20 dBc	<-30 dBc
≥1 MHz	<-30 dBc	<-30 dBc

\* The "measured at" value depends on your analyzer's option configuration. Standard instruments are measured at +7dBm. Subtract the amount(s) shown in "Determining Test Port Power" from +7 dBm to determine the "measured at" value for your particular analyzer.

**Signal Purity**

Parameter	HP 8711B	HP 8713B
<i>Nonharmonic Spurious</i>		
$\geq 50$ kHz from carrier		
$< 1$ MHz	$< -20$ dBc	$< -30$ dBc
$\geq 1$ MHz	$< -30$ dBc	$< -30$ dBc
$< 50$ kHz from carrier	$< -25$ dBc	$< -25$ dBc
<i>Phase noise</i> <sup>1</sup>	$-70$ dBc/Hz	$-67$ dBc/Hz
<i>Residual AM</i> <sup>2</sup>	$< -50$ dBc	$< -50$ dBc
<i>Residual FM</i> <sup>3</sup>	$< 1.5$ kHz peak	$< 1.5$ kHz peak

1 at 10 kHz offset

2 in 100 kHz bandwidth

3 30 Hz to 15 kHz

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## Receiver Specifications

### Frequency Range

Type of Detection	HP 8711B	HP 8713B
Narrowband	0.3 to 1300 MHz	0.3 to 3000 MHz
Broadband	10 to 1300 MHz	10 to 3000 MHz

### Dynamic Range

Frequency	HP 8711B (50 ohm)	HP 8711B (75 ohm)	HP 8713B (50 ohm)	HP 8713B (75 ohm)
Narrowband				
<5 MHz	>60 dB <sup>1</sup>	>57 dB <sup>2</sup>	>100 dB <sup>3</sup>	>97 dB <sup>4</sup>
≥5 MHz	>100 dB <sup>3</sup>	>97 dB <sup>4</sup>	>100 dB <sup>3</sup>	>97 dB <sup>4</sup>
Broadband				
All	>66 dB <sup>5</sup>	>63 dB <sup>6</sup>	>66 dB <sup>5</sup>	>63 dB <sup>6</sup>

1 +10 to -50 dBm

2 +10 to -47 dBm

3 +10 to -90 dBm

4 +10 to -87 dBm

5 +16 to -50 dBm

6 +16 to -47 dBm

### Maximum Input

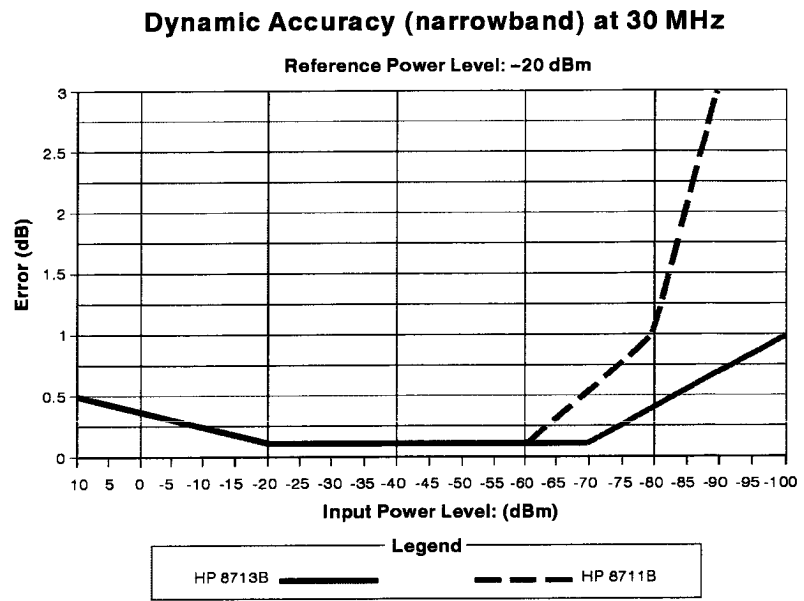
Type of Detection	HP 8711B	HP 8713B
narrowband <sup>1</sup>	+10 dBm	+10 dBm
broadband <sup>2</sup>	+16 dBm	+16 dBm

1 at 0.5 dB compression

2 at 0.55 dB compression

**Damage Level:** +20 dBm or  $\pm 25$  Vdc

**Receiver Dynamic Accuracy (narrowband)**

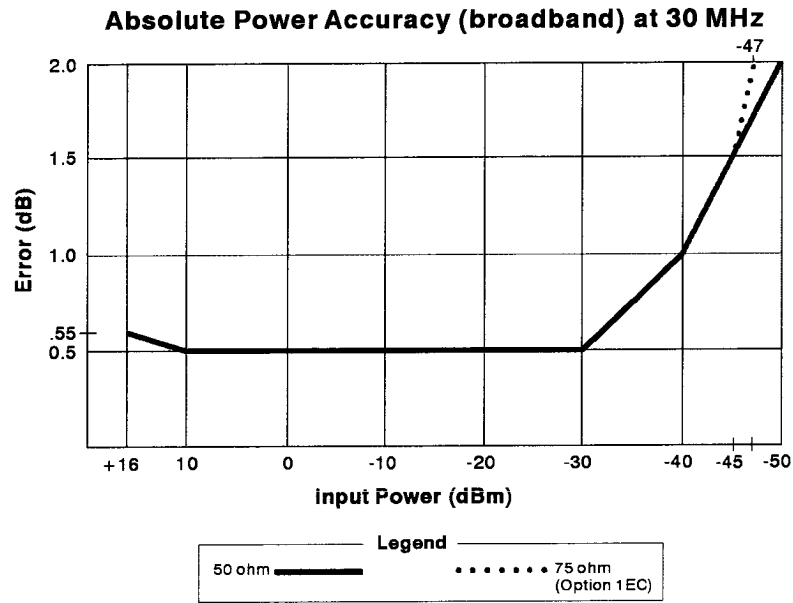


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**Figure 11-1. Receiver Dynamic Accuracy (narrowband)**



**Absolute Power Accuracy (broadband)**



**Figure 11-2. Absolute Power Accuracy (broadband)**

**Frequency Response (broadband)**

**Typical Frequency Response (broadband)**

HP 8711B	HP 8713B
±0.5 dB	±1.0 dB

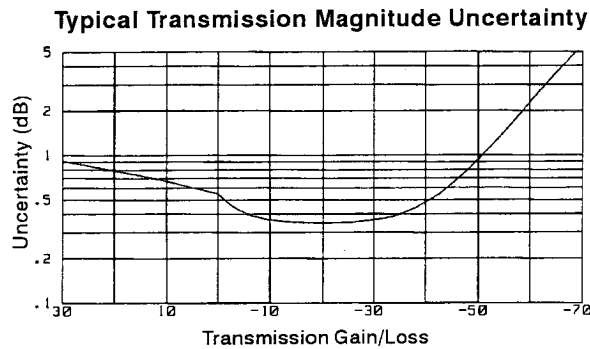
**Total Power Accuracy**    *Total Power Accuracy = Absolute Power Accuracy + Frequency Response*

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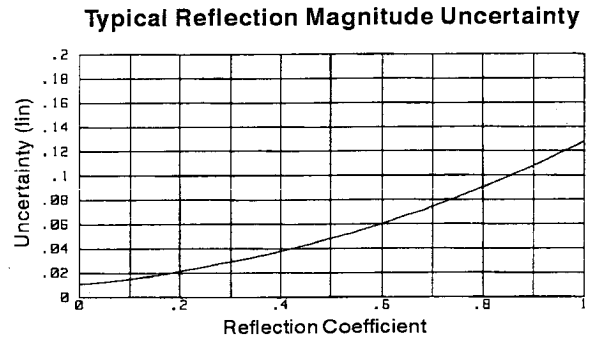
## Typical Measurement Uncertainty

The following graphs show the typical measurement uncertainty for the HP 8711B and HP 8713B. The assumptions made to generate these curves were:

- For transmission uncertainty, the DUT is assumed to be well-matched.
- For reflection uncertainty, the DUT is assumed to be lossless.
- Power = 0 dBm for reflection measurements
- Power = -20 dBm for transmission measurements



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## Delay Specifications

**AM Delay (Options 1DA  
and 1DB)**

Aperture: 55.56 kHz

Resolution: 1 ns/division

Accuracy:  $\pm 4$  ns (specified at 0 dBm, 16 averages, well-matched device, normalized)

Delay Range: 30  $\mu$ sec (9000 m)

*Amplitude Range: -10 to +13 dBm*

***Typical AM Delay Accuracy (calibrated at +10 dBm)***

<b>Power</b>	<b>Delay</b>
0 to +13 dBm	$\pm 10$ ns
-10 to 0 dBm	$\pm 20$ ns

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## Display Characteristics

**Amplitude**

<b>Display Resolution</b>	0.01 dB/division
<b>Marker Reference Level</b>	Range: $\pm 500$ dB Resolution: 0.01 dB

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## General Characteristics

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### Front Panel Connectors

<b>RF Connectors</b>	Connector Type: Type-N female Nominal Impedance: 50 $\Omega$ (standard), 75 $\Omega$ (Option 1EC)
<b>Probe Power</b>	+15 V, 200 mA -12.6 V, 150 mA

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### Rear Panel Connectors

<b>External Reference</b>	Frequency: 10 MHz Level: > -5 dBm Impedance: 50 $\Omega$
<b>Auxiliary Input</b>	Calibrated range: $\pm 10$ V Accuracy: $\pm(3\%$ of reading + 20 mV) Damage Level: >15 Vdc
<b>External Trigger</b>	This rear panel female BNC connector allows external triggering of a sweep. When the TTL level is pulled high, a sweep is triggered. When the TTL level is pulled to ground, the sweep is inhibited.

**General Characteristics**

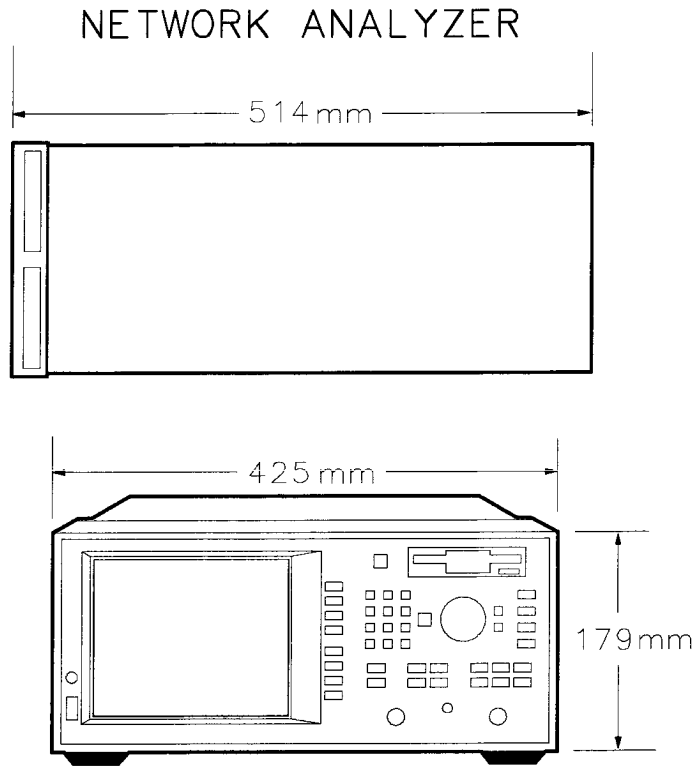
<b>Limit Test Output</b>	This connector outputs a TTL signal of the limit test results. Pass: TTL high; Fail: TTL low.
<b>Video Output</b>	This connector provides an RS-343A compatible multisync video signal that is not compatible with EGA or VGA monitors. Vertical rate: 60 Hz Horizontal rate: 24.1 kHz Pixel rate: 33.3 MHz
<b>HP-IB</b>	This connector allows communication with compatible devices including external controllers, printers, plotters, disk drives, and power meters.
<b>Parallel Port</b>	This 25-pin female connector is used with parallel (or Centronics interface) peripherals such as printers and plotters. It can also be used as a general purpose I/O port, with control provided by IBASIC and SCPI commands.
<b>RS-232</b>	This 9-pin male connector is used with serial peripherals such as printers and plotters.
<b>DIN Keyboard</b>	This connector is used for connecting and using an IBM PC-AT compatible keyboard for title entry, remote front-panel operation, and for IBASIC programming (Option 1C2).
<b>Line Power</b>	47 to 63 Hz 110 V nominal (90 V to 132 V) or 220 V nominal (198 V to 254 V). 230 VA max.
<b>User TTL Input/Output</b>	This connector provides a bi-directional open collector TTL signal that can be accessed by IBASIC and SCPI commands.
<b>X and Y External Detector Inputs</b>	These connectors provide for two external scalar detector inputs.

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## Environmental Characteristics

<b>General Conditions</b>	<p>RFI and EMI susceptibility: defined by CISPR Publication 11, and FCC Class B Standards.</p> <p>ESD (electrostatic discharge): must be eliminated by use of static-safe work procedures and an anti-static bench mat (such as HP 92175T).</p> <p>Dust: The flexible rubber keypad protects key contacts from dust, but the environment should be as dust-free as possible.</p>
<b>Operating Environment</b>	<p>Indoor use only</p> <p>Operating temperature: 0 ° to 55 °C</p> <p>Maximum relative humidity: 80 percent for temperatures up to 31 °C decreasing linearly to 50 percent relative humidity at 40 °C.</p> <p>Altitude: up to 15,000 feet (4,572 meters)</p>
<b>Non-Operating Storage Conditions</b>	<p>Temperature: -40 °C to +70 °C</p> <p>Humidity: 0 to 90 percent relative at +65 °C (non-condensing)</p> <p>Altitude: 0 to 15,240 meters (50,000 feet)</p>
<b>Weight</b>	<p>Net: Approximately 21 kg</p> <p>Shipping: Approximately 35 kg</p>
<b>Cabinet Dimensions</b>	<p>These dimensions exclude front and rear panel protrusions.</p> <p>179 mm H × 425 mm W × 514 mm D (7.0 in × 16.75 in × 20.25 in)</p>

**General Characteristics**



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**Physical Dimensions**