

NETWORK ANALYZERS

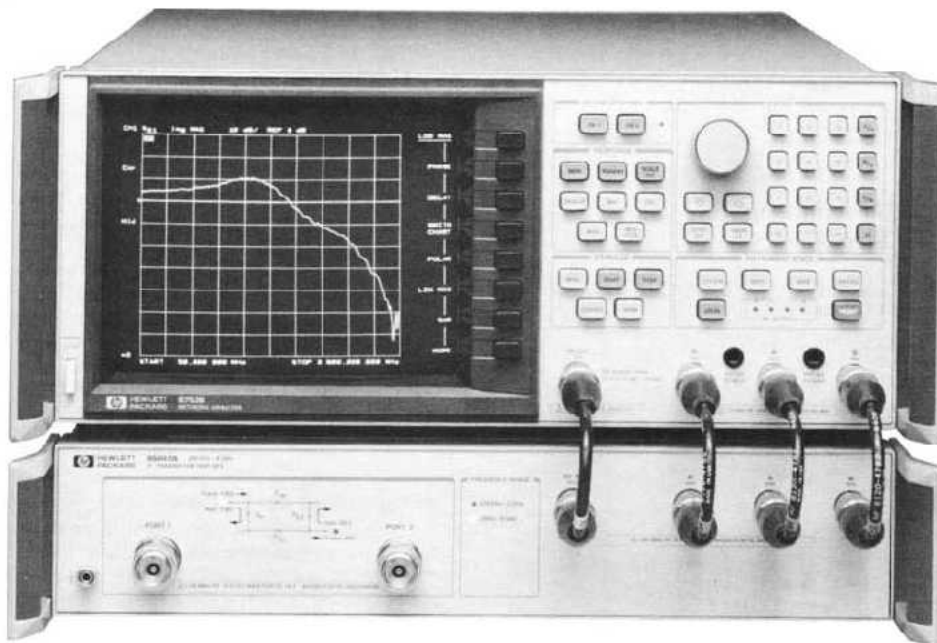
RF Network Analyzer, 300 kHz to 6 GHz

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Model 8753B

- 300 kHz to 6 GHz
- Integrated 1 Hz resolution synthesized source
- Direct save/recall to an external disc drive
- Time domain analysis
- Execute complex test procedures with the test sequence function

- 100 dB of dynamic range
- Group delay and deviation from linear phase
- 0.001 dB, 0.01 deg, 0.01 nanosec marker resolution
- Built-in accuracy enhancement
- Swept harmonic measurements



HP 8753B with HP 85047A



Description

The HP 8753B provides excellent RF network measurements for the lab and production test areas. When combined with a test set, it yields a complete solution for characterizing the linear behavior of either active or passive networks, devices, or components from 300 kHz to 6 GHz. With two independent display channels available, you can simultaneously measure and display the reflection and transmission characteristics of the device under test in overlay or split screen format. The easy-to-use softkey selection of measurement functions allows you to measure the magnitude, phase, or group delay characteristics of your device under test.

The test sequence function allows rapid and consistent execution of complex repetitive tests with a single keystroke. In sequencing mode, you make the measurement once from the front panel and the instrument "learns" the keystrokes so no additional programming expertise is required. You can even set other HP-IB instruments via a test sequence. Other productivity enhancements include a plot/print buffer, limit testing, arbitrary frequency testing, and marker tracking functions. Finally, segmented calibration and interpolative error correction allow you to apply vector accuracy enhancement over a subset of the frequency range that you initially calibrated the HP 8753B.

The HP 8753B's integrated synthesized source provides > 100 mW of output power, 1 Hz frequency resolution, and linear, log, list, power, and CW sweep types. Three tuned, 300 kHz to 3 GHz (Option 006 - extends to 6 GHz) receivers allow versatile independent power measurements or simultaneous ratio measurements over a 100 dB dynamic range. By employing the HP 85047A Test Set with the HP 8753B, the reflection and transmission characteristics of the device under test can be investigated from 300 kHz to 3 GHz or from 3 MHz to 6 GHz with the test set's frequency doubler enabled.

Non-linear Device Testing

Non-linear device characterization is possible with the HP 8753B. Swept 2nd and 3rd harmonic levels of an amplifier can be displayed directly or relative to the fundamental carrier (dBc) when employing the optional harmonic measurement capability (Option 002). Amplifier harmonics up to 40 dBc can be measured quickly and conveniently on a swept-frequency basis for fundamental signals as low as 16 MHz, using the same test configuration used to measure gain. Power meter calibration provides a leveled absolute power to devices that are sensitive to absolute input or output levels. The HP 8753B automatically controls an HP 436A, 437B, or 438A Power Meter to set the power anywhere in the test configuration with power meter accuracy.

The HP 8753B has the capability to perform mixer tracking and conversion loss measurements. These are possible because the HP 8753B's tuned receiver can be offset from its synthesized source by the LO frequency of the mixer.

Time Domain Analysis

Time domain responses can be displayed by the HP 8753B with Option 010. The instrument computes the Inverse Fourier Transform of the frequency domain data to display the reflection or transmission coefficient versus time. The HP 8753B offers two time domain modes. The Low Pass mode provides the traditional Time Domain Reflectometer (TDR) measurement capability and gives the response of the network to a mathematically simulated step or impulse response. This mode gives information of the type of impedance (R, L, C) at the discontinuity. The Band Pass time domain mode, which has only the impulse stimulus, has no frequency restrictions and provides the time domain response of frequency selective devices such as SAW filters or antennas. Gating may be used to selectively isolate a single response to view the frequency domain response of individual portions of a component without disturbing the circuit itself.

NETWORK ANALYZERS

RF Network Analyzer, 300 kHz to 6 GHz (cont'd)

Model 8753B

HP 8753B Specifications Summary

Source

Frequency Characteristics

Frequency Range: 300 kHz to 3 GHz

Frequency Resolution: 1 Hz

Frequency Accuracy (25 C): ± 10 ppm

Output Characteristics

Power Range: -5 to $+20$ dBm

Power Accuracy (50 MHz, $+10$ dBm): ± 0.5 dB

Power Linearity (relative to $+10$ dBm, 25 ± 5 C):

-5 to $+15$ dBm: ± 0.2 dB

$+15$ to $+20$ dBm: ± 0.5 dB

Impedance: 50

Harmonics: ≤ -25 dBc (20 dBm output level)

typically ≤ -50 dBc (0 dBm output level)

Nonharmonics:

Mixer Related: ≤ -32 dBc (20 dBm output level)

typically ≤ -55 dBc (0 dBm output level)

Other Spurious:

$f < 135$ MHz: -60 dBc

$f \geq 135$ MHz: -60 dBc + $20 \cdot \log(f/135 \text{ MHz})$

Phase Noise (0 kHz offset in 1 Hz BW):

$f < 135$ MHz: -90 dBc

$f \geq 135$ MHz: -90 dBc + $20 \cdot \log(f/135 \text{ MHz})$

Receiver

Frequency Range: 300 kHz to 6 GHz

Inputs: A, B 100 dB dynamic range < 3 GHz

95 dB dynamic range 3 to 6 GHz

Sensitivity (noise level):

3 kHz BW: -90 dBm < 3 GHz, -85 dBm 3 to 6 GHz

10 Hz BW: -100 dBm < 3 GHz, -95 dBm 3 to 6 GHz

Maximum Input Level: 0 dBm

Impedance: 50

Input Crosstalk:

300 kHz to 1 GHz: -100 dB

1 GHz to 3 GHz: -90 dB

3 GHz to 6 GHz: -80 dB

Dynamic Accuracy: ≤ 0.05 dB, ± 0.5 deg over a 50 dB input range

Delay Characteristics:

Range: $1/2^*$ (1/minimum aperture)

Aperture: selectable (frequency span)/(# points -1) to 20% of the frequency span

Resolution: $27.8/(\text{aperture in Hz})$

typically 0.01 nanoseconds

Accuracy: (phase accuracy)/($360 \cdot \text{aperture in Hz}$)

Dimensions:

178mm H x 425mm W x 498mm D

(7.0 x 16.75 x 20.0 in)

Weight:

Net 22 kg (48 lb); Shipping 25 kg (55 lb)

HP 8753B Accessories

HP 85044A 50 Ohm Transmission/Reflection Test Set

HP 85044B 75 Ohm Transmission/Reflection Test Set

The HP 85044 A/B Transmission/Reflection test sets provide the capability to simultaneously measure the impedance and transmission characteristics of 50 and 75 ohm devices. Two-port devices must be physically turned around to measure their reverse direction characteristics. Test port connectors are precision 7 mm and 75 ohm type N (f), respectively.

Specifications	HP 85044A	HP 85044B
Impedance:	50 ohms	75 ohms
Frequency Range:	300 kHz to 3 GHz	300 kHz to 2 GHz
Directivity³:	35 dB to 1.3 GHz	35 dB to 1.3 GHz
	30 dB to 3.0 GHz	30 dB to 2.0 GHz

Typical Tracking:	HP 85044A	HP 85044B
Transmission Magnitude, Phase^{1,3}:		
.3 MHz to 2.0 MHz	± 1.5 dB, $\pm 10^\circ$	± 1.5 dB, $\pm 10^\circ$
2.0 MHz to F_{max}^2	± 1.5 dB, $\pm 10^\circ$	± 1.5 dB, $\pm 10^\circ$
Reflection Magnitude, Phase^{1,3}:		
.3 MHz to 2.0 MHz	± 1.5 dB, $\pm 25^\circ$	± 1.0 dB, $\pm 25^\circ$
2.0 MHz to F_{max}	± 1.5 dB, $\pm 10^\circ$	± 1.0 dB, $\pm 10^\circ$
Effective Source Match³:		
(Test Ports):		
.3 MHz to 2.0 MHz	14 dB	14 dB
2.0 MHz to 1.3 GHz	20 dB	17 dB
1.3 GHz to F_{max}	16 dB	16 dB

RF Connectors:

Test Port: precision 7 mm 75 ohm type N (f)

All others: 50 ohm type N (f) 50 ohm type N (f)

Includes:

HP 85044A—one precision 7 mm to

50 ohm type N (f) adapter;

HP 85044B—one HP 11852B

minimum loss pad.

Recommended

Accessories:

HP 11851B RF cable kit

Dimensions:

615H x 101 W x 204 mm D

(2.44 x 7.5 x 8.0 in)

Weight:

net 1.7 kg (3.8 lb)

S-Parameter Test Sets

The S-parameter test sets provide the capability to measure impedance and transmission characteristics (including s-parameters) of 2 port devices in either direction with a single connection. The test sets are controlled from the HP 8753B and include a programmable step attenuator.

HP 85046A/B S-Parameter Test Set

Test port connectors are precision 7 mm and 75 ohm type N (f) respectively. Both connectors can be adapted to other interfaces with the appropriate precision adapters.

Specifications

	HP 85046A	HP 85046B
Impedance:	50 ohms	75 ohms
Frequency Range:	300 kHz to 3 GHz	300 kHz to 2 GHz
Directivity:	35 dB to 1.3 GHz	35 dB to 1.3 GHz
	30 dB to 3.0 GHz	30 dB to 2.0 GHz

Typical Tracking:

Transmission Magnitude, Phase^{1,3}:

.3 MHz to 2.0 MHz ± 1.5 dB, $\pm 20^\circ$ ± 1.5 dB, $\pm 20^\circ$

2.0 MHz to F_{max}^2 ± 1.5 dB, $\pm 10^\circ$ ± 1.5 dB, $\pm 10^\circ$

Reflection Magnitude, Phase^{1,3}:

.3 MHz to 2.0 MHz ± 1.5 dB, $\pm 25^\circ$ ± 1.5 dB, $\pm 25^\circ$

2.0 MHz to F_{max} ± 1.5 dB, $\pm 10^\circ$ ± 1.5 dB, $\pm 10^\circ$

Effective Source Match³:

(Test Ports):

.3 MHz to 2.0 MHz 14 dB 14 dB

2.0 MHz to 1.3 GHz 20 dB 17 dB

1.3 GHz to F_{max} 16 dB 16 dB

RF Connectors:

Port 1, 2: precision 7 mm 75 ohm type N (f)

All others: 50 ohm type N (f) 50 ohm type N (f)

Includes:

Four 190 mm (7.5") cables with type N

(m) connectors for connection to the

HP 8753B. One HP 8753B test set

interconnect cable.

Recommended

Accessories:

HP 11857D cables HP 11857B cables

Dimensions:

90 H x 426 W x 553 mm D

(3.5 x 16.75 x 21.5 in.)

Weight:

9.1 kg (20 lb)

¹Degrees, specified as deviation from linear phase.

² F_{max} is the upper frequency limit of the associated test set.

³Can be improved through Accuracy Enhancement.

HP 85047A S-parameter Test Set

This test set includes a frequency doubler that can be switched in to measure 3 MHz to 6 GHz in a single sweep or switched out to measure 300 kHz to 3 GHz in a single sweep. The HP 8753B controls the frequency doubler. HP 8753B Option 006 (6 GHz receiver) is required to activate the HP 85047A. There are two rear panel BNC outputs. One provides a TTL signal which indicates the result of HP 8753B Test Sequence function.

Specifications

Impedance: 50 ohms

Frequency ranges: 300 kHz to 3 GHz
3 MHz to 6 GHz

Directivity: 300 kHz to 1.3 GHz 35 dB
1.3 GHz to 3 GHz 30 dB
3 GHz to 6 GHz 25 dB

Typical tracking:

Transmission magnitude, phase:

300 kHz to 3 GHz ± 1.5 dB, ± 10 deg.
3 GHz to 6 GHz $+0.5$, -2.5 dB, ± 20 deg.

Reflection magnitude, phase:

300 kHz to 3 GHz ± 1.5 dB, ± 10 deg.
3 GHz to 6 GHz ± 1.5 dB, ± 20 deg.

Effective source match: 300 kHz to 1.3 GHz 20 dB
1.3 GHz to 3 GHz 16 dB
3 GHz to 6 GHz 14 dB

RF connectors:

Port 1, 2: 7 mm precision
All others: 50 ohm type N(f)
Includes: Four 190 mm (7.5") cables with Type N(m) connectors for connection to the HP 8753B. One HP 8753B test set interconnect cable.

Recommended accessories: HP 11857D cables

Dimensions: 90 H x 426 W x 533 mm D

Weight: 10 kg (22 lb.)

HP 11850C/D Three-Way Power Splitters

Specifications

	HP 11850C	HP 11850D
Impedance:	50 ohms	75 ohms
Frequency Range:	DC to 3 GHz	DC to 2 GHz
Tracking:	± 25 dB, $+3^\circ$	± 2 dB, $\pm 2.5^\circ$
Equivalent Source Match (ratio or leveling)	30 dB @ 1.3 GHz 20 dB @ 3 GHz	30 dB @ 1.3 GHz 20 dB @ 3 GHz
Nominal Insertion Loss:	9.5 dB +1 dB/GHz	7.8 dB
Input Port Match:		
DC to 1.3 GHz	20 dB	20 dB
1.3 GHz to F_{max}^1	10 dB	10 dB
RF Connectors:		
RF Input:	50 ohm type N (f)	50 ohm type N (f)
All Others:	50 ohm type N (f)	75 ohm type N (f)
Includes:		3 ea HP 11852B 50 to 75 ohm min. loss pads

Recommended

HP 11851B RF Cable Kit

Accessories:

¹ F_{max} is the upper frequency limit of the associated power splitter.

HP 11851B RF Cable Kit

General: three 610 mm (24 in.) 50 Ω cables phase matched to 4° at 1.3 GHz and one cable 860 mm (34 in.). Connectors are Type N Male. Recommended for use with HP 85044A/B Transmission/Reflection Test Set and HP 11850C/D Power Splitter.
Weight: net, 0.91 kg (2 lb); shipping, 1.36 kg (3 lb).

HP 11852B 50 Ω /75 Ω Minimum Loss Pad

General: the HP 11852B is a low SWR minimum loss pad required for transmission measurements on 75 Ω devices with HP 8753B receiver (50 Ω).

Frequency range: dc to 2.0 GHz.

Insertion loss: 5.7 dB.

Return loss: 75 Ω typically ≥ 30 dB. 50 Ω typically ≥ 26 dB.

Maximum input power: 250 mW (+24 dBm).

Connectors: 50 Ω Type N female and 75 Ω Type N male.

Type N Accessory Kits

Kit contains a Type N Female short, a Type N Male short, two Type N Male barrels, two Type N Female barrels and storage case.

HP 11853A 50 Ω Type N Accessory Kit

General: the HP 11853A furnishes the RF components required for measurement of devices with 50 Ω Type N Connectors using the HP 11850C, 85044A, 85046A or 85047A.

HP 11855A 75 Ω Type N Accessory Kit

General: the HP 11855A provides the RF connecting hardware generally required for measurement of devices with 75 Ω Type N connectors using the HP 85044B, 85046B or 11850D. This kit also contains a 75 Ω Type N Male termination.

BNC Accessory Kits

Kit contains two Type N Male to BNC Female adapters, two Type N Male to BNC Male adapters, two Type N Female to BNC Female adapters, two Type N Female to BNC Male adapters, a BNC Male short and storage case.

HP 11854A 50 Ω BNC Accessory Kit

General: the HP 11854A furnishes the RF components required for measurement of devices with 50 Ω BNC Connectors using the HP 11850C, 85044A, 85046A or 85047A.

HP 11856A 75 Ω BNC Accessory Kit

General: the HP 11856A provides the RF connecting hardware generally required for measurement of devices with 75 Ω BNC connectors using the HP 85044B, 11850D, or 85046B. This kit also contains a 75 Ω BNC Male termination, and storage case.

HP 11857D 50 Ω APC-7 Test Port Extension Cables

General: two precision 61 cm (24 in.) cables, phase matched to 2° at 1.3 GHz for use with HP 85046 A S-parameter test set. Connectors are 50 Ω APC-7.

HP 11857B 75 Ω Type N Test Port Extension Cables

General: two precision 61 cm (24 in.) cables, phase matched to 2° at 1.3 GHz for use with HP 85046B S-parameter test set. One cable has 75 Ω Type N Male connectors on both ends; the other has one Type N Male and one Type N Female connector.

HP 11600B/11602B Transistor Fixtures

Function: mounts on front of HP 8745A S-Parameter Test Sets, holds devices for s-parameter measurements in a 50 ohm, coax circuit.

Transistor Base Patterns

Model 11600B: accepts TO-18/TO-72 packages.

Model 11602B: accepts TO-5/TO-12 packages.

Calibration references: short circuit termination and a 50 ohm through-section.

Frequency range: dc to 2 GHz.

Impedance: 50 ohms nominal.

Reflection coefficient: <0.05 , 100 MHz to 1.0 GHz: <0.09 , 1.0 to 2 GHz.

Connectors: hybrid APC-7; Option 001, type N female.

HP 11858A Transistor Fixture Adapter

General: the HP 11858A adapts the HP 11600B and 11602B transistor fixtures (vertical test port configuration) to the HP 85046A or 85047A S-parameter test set. Connectors are APC-7.

HP 85043B Systems Cabinet

The HP 85043B systems cabinet has been ergonomically designed specifically for the HP 8753B and the HP 85046A/B or 85047A S-parameter test sets. The 122 cm (48-inch) system cabinet includes a bookcase, a drawer, and a convenient work surface.

Calibration Kits

Accuracy enhancement procedures characterize the systematic errors of the measurement system by measuring known devices (standards) on the system over the frequency range of interest. The calibration kits in the HP 8753B family contain precision standards with which to characterize the systematic errors of a HP 8753B measurement system.

HP 85031B 7 mm Calibration Kit

The HP 85031B 7 mm calibration kit contains a set of precision 7 mm fixed terminations, an open circuit, and a short circuit used to calibrate the HP 8753B and its 50 ohm test sets for measurement of devices with precision 7 mm connectors.

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Accessories (cont'd)

8753B Series

HP 85032B 50 Ω Type N Calibration Kit

The HP 85032B Calibration Kit contains precision 50 Ω type N standards used to calibrate the HP 8753B and its 50 Ω test sets for measurement of devices with 50 Ω type N connectors. Precision phase-matched 7 mm to 50 Ω type N adapters are included for accurate measurements of non-insertable devices. Standards include fixed terminations, open circuits, and short circuits.

HP 85033C 3.5 mm Calibration Kit

The HP 85033C Calibration Kit contains precision 3.5 mm standards used to calibrate the HP 8753B and its 50 Ω test sets for measurement of devices with 3.5 mm and SMA connectors. Standards include fixed terminations, open circuits, and short circuits. Precision 7 mm to 3.5 mm adapters are included for accurate measurements of non-insertable devices.

HP 85036B 75 Ω type N Calibration Kit

The HP 85036B Calibration Kit contains precision 75 Ω type N standards used to calibrate the HP 8753B and its 75 Ω test sets for measurement of devices with 75 Ω type N connectors. Standards include fixed terminations, open circuits, and short circuits. Precision phase-matched adapters are included for accurate measurements of non-insertable devices.

Verification Kits

Measuring known devices, other than the calibration standards, is a convenient way of verifying that the HP 8753B measurement system is operating properly.

HP 85029B 7 mm Verification Kit

The HP 85029B Verification Kit contains a set of precision 7 mm devices, with data traceable to NBS, used to verify the calibrated performance of an HP 8753B measurement system. The devices have precision 7 mm connectors and include a 20 dB pad, a 50 dB pad and a mismatch attenuator. Verification process requires only an HP 85031B calibration kit, an HP 85029B verification kits and an external 3.5" disc drive connected to the HP 8753B.

Software

Software operates with a BASIC operating system using an HP Series 300 computer (2 megabytes of memory required).

HP 85160A Measurement Automation Software

Measurement Automation Software simplifies device measurements by providing guided measurements, limit testing, sequencing to test all four S-parameters, data formatting flexibility (data files can be formatted to be compatible with Touchstone® linear circuit simulation programs) and complete save/recall capability to a floppy disc. Once configured, simply recall a test file and calibration data, connect the device-under-test, and output the results.

HP 85165A Resonator Measurement Software

Resonator Measurement Software performs complete characterization of crystals, SAWs, and other resonant devices using the HP 8753B. The software guides the user through the measurement process and calculates key parameters of the device under test according to the EIA-512 resonator measurement standard.

HP 85024A High Frequency Probe

The HP 85024A High Frequency Probe makes it easy to perform in-circuit measurements. An input capacitance of only 0.7 pF shunted by 1 Megohm of resistance permits high frequency probing without adversely loading the circuit under test. Excellent frequency response and unity gain guarantees high accuracy in swept measurements with this probe. High probe sensitivity and low distortion levels allows measurements to be made while taking advantage of the full dynamic range of HP RF analyzers. Spectrum analyzers which supply probe power from the front panel include the HP 8568B, 8590A, 8562A/B, and 71100A. RF network analyzers like the HP 8753B, 3577A, and 4195A are also directly compatible. You can use the HP 85024A with other instruments by using the HP 1122A Probe Power Supply or any dual \pm 15V, 130 mA supply.



HP 85024A



Specifications

Input Capacitance (@ 500 MHz): <0.7 pF (nominal)

Input Resistance: 1 Megohm (nominal)

Bandwidth: 300 kHz to 3 GHz

Gain (@ 500 MHz): 0 dB \pm 1 dB

Average Noise Level (10 Hz to 10 MHz): <1 mV

Frequency Response: \pm 1.25 dB (300 kHz to 1 GHz)
+ 2, -3 dB (1 GHz to 3 GHz)

Input Voltage for 1 dB Compression: 0.3 V

Supplemental Characteristics

Noise Figure: <50 dB (<100 MHz)

<25 dB (100 MHz to 3 GHz)

Distortion (@ 0.3 V): <-30 dBc

Includes

Type N Male Adapter, 10:1 Divider, Spare probe tips, 2.5-inch Ground Lead, Hook Tip, Spanner Tip, and Probe Tip Nut Driver.

Service and Support Products

Service and support products are available for HP 8753B measurement systems. On-site support products require a specific 50 ohm two-port measurement configuration.¹ Contact your local HP sales office for availability and price.

Ordering Information

	Price
HP 8753B Network Analyzer	\$25,500
Option 002 Harmonic Measurement Capability	3,000
Option 006 6 GHz Receiver Option	3,000
Option 010 Time Domain Capability	4,800
Option 802 add Dual Disc Drive and HP 10883A cable	1,495
Option 908 Rack Mount Kit (without handles)	35
Option 910 Extra Operating and Service Manual	75
Option 913 Rack Mount Kit	40
HP 85047A 6 GHz S-Parameter Test Set	9,800
Option 913 Rack Mount Kit	40
HP 85046A 50 Ohm S-Parameter Test Set	7,800
Option 913 Rack Mount Kit	40
HP 85046B 75 Ohm S-Parameter Test Set	7,800
Option 913 Rack Mount Kit	40
HP 85044A 50 Ohm Transmission/Reflection Test Set	3,500
HP 85044B 75 Ohm Transmission/Reflection Test Set	3,500
HP 85029B Precision 7 mm Verification Kit	1,600
HP 85031B Precision 7 mm Calibration Kit	1,000
HP 85032B 50 Ohm type N Calibration Kit	1,500
HP 85033C Precision 3.5 mm Calibration Kit	2,500
HP 85036B 75 Ohm type Calibration Kit	2,000
HP 85043B Systems Rack	2,900
HP 85033A SMA Kit	1,000
HP 85160A Measurement Automation Software	1,500
HP 85165A Resonator Measurement Software	5,000
HP 11850C 50 Ohm Power Splitter	900
HP 11850D 75 Ohm Power Splitter	1,400
HP 11851B type N RF Cable Kit	800
HP 11852B 50 to 75 Ohm Minimum Loss Pad	350
HP 11853A 50 Ohm type N Accessory Kit	350
HP 11854A 50 Ohm BNC Accessory Kit	350
HP 11855A 75 Ohm type N Accessory Kit	450
HP 11856A 75 Ohm BNC Accessory Kit	450
HP 11857B 75 Ohm type N Test Port Extension Cables	1,455
HP 11857D 50 Ohm APC-7 Test Port Extension Cables	1,050
HP 11600B/11602B Transistor Fixtures	1,800
HP 11858A Transistor Fixture Adapter	980
HP 85024A High Frequency Probe	1,900

☎ Fast-Ship Product — See Page 766.

¹The specific 50 ohm two-port measurement system includes the HP 8753A, the HP 85046A S-parameter test set, the HP 85031B 7 mm calibration kit, and the HP 11857D 7 mm test port extension cable set. This is a minimum configuration required for on-site verification.