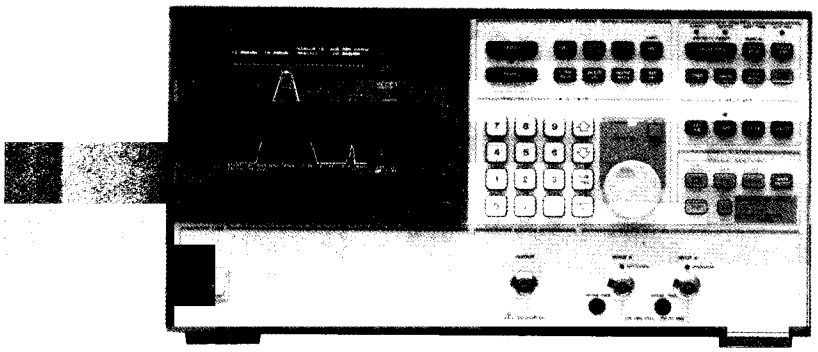
NETWORK ANALYZERS

Audio/Video/Baseband/IF Network Analyzer, 5 Hz to 200 MHz

HP 3577B

- High-speed/high-accuracy measurements
- .001 dB, .005 degree, 1 ps, and .001 Hz resolution
- Discrete sweep and limit lines
- Optional HP Instrument BASIC



HP 3577B

DESIGNED FOR HP-IB SYSTEMS

HP 3577B Network Analyzer

The HP 3577B is a high-performance, yet economical, two-channel network analyzer for use in both research and development and manufacturing. It is used to measure magnitude/phase, insertion loss, group delay, SWR, electrical length, and gain compression from 5 Hz to 200 MHz. When used with the HP 35676A/B reflection/transmission kit, it can also measure return loss, reflection coefficient, and impedance.

An optional third channel is available for use with the HP 35677A/B s-parameter test set or for measuring two devices simultaneously. When used with the HP 35677A/B, the HP 3577B can measure all four s-parameters and any of the parameters listed above without having to manually alter the test configuration. The HP 35677A is used for 50 ohm systems and the HP 35677B is used for 75 ohm systems.

When equipped with optional HP Instrument BASIC, the HP 3577B can execute user-written programs designed to automate measurement systems, compute parameters (such as pass band ripple and 3 dB bandwidth) or customize the user-interface. This includes system control of other HP-IB instruments and peripherals, such as plotters and printers, via the HP-IB. A programmable I/O port, located on the rear panel, extends HP Instrument BASIC control to non-HP-IB devices, such as device handlers, environmental chambers, and even the device-under-test itself.

Of course, the HP 3577B is fully programmable, either internally with HP Instrument BASIC, or externally via the Hewlett-Packard Interface Bus (HP-IB).

An optional high-stability frequency reference oven is available for those users not having an in-house frequency standard.

Unprecedented Measurement Precision

This network analyzer has the accuracy and resolution required to characterize the most demanding narrowband devices and the flexibility to quickly characterize wideband devices. Dynamic magnitude and phase accuracy are 0.02 dB and 0.2 degree, respectively. Device response can be examined in fine detail with 0.001 dB, 0.005 degree, and 1 ps resolution. A built-in synthesized LO and tracking generator provide superb frequency accuracy with 0.001 Hz resolution. The 100 dB plus dynamic range and −130 dBm noise floor meet the needs of the most demanding measurements.

Built-in three-term error correction removes errors due to directivity, frequency response, and source mismatch for one-port measurements. Similarly, vector normalization enhances the accuracy of two-port measurements.

High-Throughput for Manufacturing

The HP 3577B brings high-throughput network analysis to manufacturing without compromising accuracy. Using discrete sweep, the sweep time is typically reduced by a factor of twenty when compared to a traditional linear sweep. Operators select from 2 to 51 frequency points for measurement. High-frequency resolution is used only in important regions of the device response; less important regions are measured with few points or skipped completely. Sweep time is further reduced by selecting the optimum resolution bandwidth and settling time for each frequency point.

Evaluation of test results is completed in a tenth of a second using the limit test feature. Any combination of upper and lower limits, with up to 20 operator-defined segments, is allowed. Test results are compared to the limits at the end of each sweep, and PASS/FAIL is indicated both on the display and on the FAIL line of programmable I/O port.

Optional HP Instrument BASIC completes the high-throughput picture by providing fast, error-free instrument/test system configuration and control of non-HP-IB devices, such as device handlers.

Specifications Summary

Source

Frequency
Range: 5 Hz to 200 MHz
Resolution: 0.001 Hz
Stability (Opt 1 only/instrument on ≥ 48 hrs):
$\pm 5 \times 10^{-6}$/day, 0 to 55° C

Amplitude
Range: +15 dBm to −49 dBm (1.26 Vrms to 793μ Vrms: 2dBV to −62 dBV) into a 50 Ω load
Resolution: 0.1 dB
Accuracy: ±1 dB at + 15 dbm and 100 kHz. Below + 15 dBm, add the greater of ±0.02 dB/dB or 0.2 dB
Flatness: 1.5 dBp-p from 5 Hz to 200 MHz
Impedance: 50 Ω; > 20 dB return loss at all levels
RF output connector: 50 Ω Type N female
Sweep types: Linear, discrete, alternate, cw and log frequency; log amplitude
Sweep time: 100 ms/span to 6553 sec/span for frequency sweep; 1 ms/step to 16 s/step for amplitude sweep.
Sweep modes: Continuous, single, manual
Trigger modes: Free run, immediate, line, external

Input Characteristics
Frequency range: 5 Hz to 200 MHz
Inputs: Two receiver inputs (A,R); third receiver input (B) is optional
Input impedance: Selectable 50 Ω with > 25 dB return loss, or 1 MΩ in parallel with approximately 30 pF.
Input connectors: 50 Ω Type N female.
Full scale input level: −13 dBV from 10 kHz to 200 MHz with internal 20 dB attenuators ON (0 dBm at 50 Ω).
Resolution bandwidth: Selectable 1 kHz, 100 Hz, 10 Hz, or 1 Hz.
Sensitivity (Due to noise and internal crosstalk between source and receiver inputs):

	30 kHz-200 MHz (50 Ω) 300 kHz-20 MHz (1 M Ω)	
Resolution Bandwidth	**Internal 20 dB Attenuator ON**	**Internal 20 dB Attenuator OFF**
10 Hz	−110 dBm	−130 dBm
100 Hz	−105 dBm	−125 dBm
1 kHz	−95 dBm	−115 dBm

Crosstalk: > 100 dB isolation between inputs.
For 1 M Ω inputs, add 5 dB to table.

Magnitude characteristics
Range: Full scale input to sensitivity
Display units: dB, dBm, dBV, V, and linear ratio
Accuracy (at 100 kHz, 25° C, and full scale input)
Absolute (A, B, R): ±0.2 dB
Ratio (A/R, B/R, A/B): ±0.15 dB (50 Ω); ±0.2 dB (1 M Ω)

Dynamic Accuracy

Error (Resolution Bandwidth)		Input Level Relative to Full Scale Input
1 kHz, 100 Hz, 10 Hz	1 Hz	
±.04 dB	±.04 dB	0 dB to −10 dB
±.02 dB	±.02 dB	−10 dB to −50 dB
±.05 dB	±.05 dB	−50 dB to −60 dB
±.15 dB	±.25 dB	−60 dB to −80 dB
±.75 dB	±.75 dB	−80 dB to −90 dB
±.75 dB	± 3.00 dB	−90 dB to −100 dB

Frequency response: (when driven from a 50 Ω source and with 50 Ω receiver input impedance)
Absolute (A,B,R): 0.3 dBpp from 20 Hz to 20 MHz; 0.6 dBpp from 5 Hz to 200 MHz.
Ratio (A/R, B/R, A/B): 0.3 dBpp from 20 Hz to 20 MHz; 0.4 dB from 5 Hz to 200 MHz.

Stability
Temperature: Typically < ±0.02 dB/° C
Time: Typically ±0.05 dB/hour at 25° C

Phase characteristics (A/R, B/R, A/B)
Range: ±180 degree
Accuracy: At 100 kHz, 25° C, and Full Scale Input: ±2.0°

Dynamic Accuracy

Error	Input Level Relative to Full Scale Input
±.4 degree	0 dB to −10 dB
±.2 degree	−10 dB to −50 dB
±.5 degree	−50 dB to −60 dB
±1.5 degree	−60 dB to −80 dB
±7.5 degree	−80 dB to −100 dB

Temperature stability: Typically < ±0.05 degree/° C
Time stability: Typically < ±0.05 degree/hr at 25° C

Delay characteristics
Range: 1 ps to 20,000s
Resolution: 0.01 ns/div to 1000s/div
Normalized accuracy: $\frac{\text{Dynamic Phase Accuracy}}{360 \times \text{Aperture [Hz]}}$ + 2 ns
Aperture range: 0.5% to 16% of frequency span
Reference level: ± 10^3 s
Limit test: Twenty segments for each trace per limit test. Delay between sweeps approximately 10 to 120 ms.

General Characteristics

Traces
Number of traces: Two simultaneous traces may be present with a rectangular graticule. One trace with polar or Smith graticules.
Markers: Each trace has one main marker and an offset marker.

Graticules
Rectangular graticule: 0% to 100% full scale deflection in 0.05% increments. Logarithmic and linear.
Polar/Smith chart graticule: ±500 degree in 0.001 degree increments.

Limit test
Twenty segments for each trace per limit test. Delay between sweeps approximately 10 to 120 ms.

Noise averaging
Type: Exponentially weighted vector averaging on successive sweep data.
Averaging factor: Selectable 1 (off), 4, 8, 16, 32, 64, 128, 256.
Linear phase slope compensation: Provides linear phase slope offset of −72,000 degree/span to +72,000 degree/span.

Calibration
Transmission: Both traces can be normalized to measured data with full accuracy and resolution.
Reflection: Corrects for directivity, frequency response, and source match errors.

Programming
Remote programming: Via the Hewlett-Packard Interface Bus (HP-IB). The HP 35677A/B S-parameter test sets are programmable through the HP 3577A interface only.
Plotter control: Directly compatible with HP-IB graphics plotters that use Hewlett-Packard Graphics Language (HP-GL) with listen-only capability.
Save/recall: Front-panel setups can be stored in non-volatile memory locations 1 through 5. Last state is saved when power is removed.

Operating conditions
Temperature: 0° C to +55° C.
Relative humidity: <95% at 40° C.
Altitude: <4,572m (15,000 ft).

Non-operating conditions
Temperature: −40° C to +75° C.
Altitude: <15,240 m (50,000 ft).
Power: 115 V + 10%, −25% (47 Hz to 440 Hz), or 230 V + 10%, −15% (47 Hz to 66 Hz), 450 VA maximum.
Weight: 31 kg (67 lb) net; 41 kg (90 lb) shipping.
Size: 222 mm H × 426 mm W × 578 mm D (8.7 in × 16.75 in × 22.75 in).

HP 35677A/B S-Parameter Test Set

The HP 35677A/B test set is used to make transmission and reflection measurements in both the forward and reverse directions. The only setup required is to connect the device-under-test to the two measurement ports. Even reverse measurements can be made without changing device connections. The HP 35677A is used for 50-ohm systems and the HP 35677B is used for 75-ohm systems.

HP 35677A/B S-Parameter Test Set Specifications

Frequency range: 100 kHz to 200 MHz
Test port impedance
HP 35677A: 50 Ω; HP 35677B: 75 Ω
Directivity: >40 dB
Frequency response
Transmission (S21, S12): ± 1 dB, ± 5 degrees
Reflection (S11, S22): ± 1 dB, ± 5 degrees

Port match
Test ports 1, 2: HP 35677A, > 26 dB; HP 35677B. >24 dB
Test ports 1, 2 open/short ratio: HP 35677A, < ± 0.75 dB magnitude and < ±5 degrees phase; HP 35677B, < ± 1 dB magnitude and < ±7.5 degrees phase
Input port: >20 dB return loss
Output ports A, B, and R: >26 dB return loss
Test port isolation: > 100 dB

Connectors
Input port and output ports A, B, and R: 50 Ω Type N female. Test Ports 1 and 2: HP 35677A, 50 Ω Type N female; HP 35677B, 75Ω Type N female.
dc bias inputs: BNC female, rear panel
dc bias range: Typically ±30 Vdc and ±20 mA with some degradation of RF specifications; 200 mA damage level.

Accessories Supplied

4 ea. 190-mm (7.5 in) 50 Ω cables with type N male connectors for connection to HP 3577B (HP 8120-4387)
1 ea. test set interconnect cable to HP 3577B (HP 35677-61620)
1 ea. rear-panel lock foot kit (HP 5061-0099).
1 ea. service manual (HP 35677-90010).

NETWORK ANALYZERS

Audio/Video/Baseband/IF Network Analyzer, 5 Hz to 200 MHz

HP 35676A/B, 3575A

General Characteristics

Power: All power is obtained through the HP 35677A interconnect cable.
Weight: Net, 6 kg (13 lb); shipping, 122 kg (25 lb)
Size: 90 mm H × 425 mm W × 584 mm D (3.5 in × 16.75 in × 22.75 in). Add 1⅛ inch to depth for front panel connectors.

HP 35676A/B Reflection/Transmission Test Kits

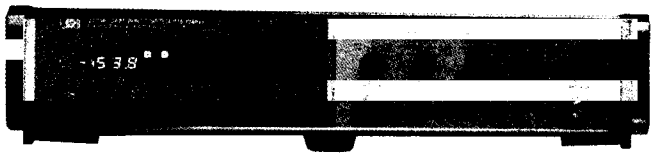
Operating in conjunction with internal calibration routines in the HP 3577B, the HP 35676A/B test kit provides measurements of reflection,transmission and impedance from 5 Hz to 200 MHz. Each test kit contains a precision resistive divider, a reference load, a coaxial short, a carrying case, and miscellaneous cables and hardware.

HP 35676A/B Operating Characteristics*

Frequency range: 5 Hz to 200 MHz.
Test port impedance: 50Ω ± 2% typical (HP 35676A) 75 Ω ± 2% typical (HP 35676B).
Equivalent directivity: 40 dB typical.
Equivalent source match: 30 dB typical (HP 35676A); 25 dB typical (HP 35676B).

*Typical, assuming proper calibration with accessories supplied.

Ordering Information	Price
HP 3577B Network analyzer	$19,750
Opt 001 Frequency reference	+$850
Opt 002 Third receiver	+$3,450
Opt 1C2 HP Instrument BASIC/ 640 Kbytes RAM	+$950
Opt 907 Front handle kit	+$79
Opt 908 Rack Mount kit	+$42
Opt 909 Rack Mount and front handle kit	+$105
Opt 910 Extra operating and service manual	+$250
Opt 911 Extra HP Instrument BASIC manual	+$10
Opt W30 Extended repair service. See page 671.	+$450
HP 35676A 50 Ω reflection/transmission test kit	$1,465
Opt W30 Extended repair service. See page 671.	+$45
HP 35676B 75 Ω Reflection/transmission test kit	$1,750
HP 35677A 50 Ω S-parameter test set	$4,300
HP 35677B 75 Ω S-parameter test set	$4,300
Opt 907 Front handle kit	+$52
Opt 908 Rack Mount kit	+$27
Opt 909 Rack Mount and front handle kit	+$63
Opt 910 Extra operating and service manuals	+$47
HP 35678A 50 Ω type N calibration kit	$825
HP 35678B 75 Ω type N calibration kit	$1,575
HP 35679A 50 Ω type N port extension cables	$550
HP 35679B 75 Ω type N port extension cables	$1,850
HP 85024A high-frequency probe	$2,300



HP 3575A

HP 3575A Gain-Phase Meter

The HP 3575A gain-phase meter is a broadband two-channel analyzer typically used to measure transfer functions such as amplifier gain/loss or the frequency response of filters. It can be used to measure the ratio and relative phase of any two signals on its two-channel inputs and for absolute measurements of signals on each channel. A wide range of input waveforms can be measured, including sine, square, and triangular waveforms. A three-digit display can be selected to read amplitude level/ratio or phase of the input signals. An optional three-digit readout and analog output is available for simultaneous amplitude and phase measurements.

Specifications Summary

Frequency: 1 Hz to 13 MHz
Level: 200 μV rms to 20 V rms
Number of channels: 2
Impedance: 1 MΩ in parallel with 30 pF
Protection: ± 40 V dc, 20 V rms
Nominal amplitude accuracy: ±1 dB (See data sheet for complete accuracy specifications.)
Amplitude functions: A dBV, B dBV, or B/A dB
Range: A dBV, B dBV: −74 dBV to +26 dBV (in two ranges)
B/A dB: −100 to +100 dB
Resolution: 0.1 dB
Nominal phase accuracy: ±0.5 degrees (See data sheet for complete accuracy specifications.)
Range: ±180° with 12° of overrange
Resolution: 0.1°

General

Power: 115 V / 230 V ±10%, 48 Hz to 440 Hz, 40 VA
Weight: net, 8.3 kg (18.4 lb); shipping, 11.3 kg (25.8 lb)
Size: 88 mm H × 425 mm W × 337 mm D (3.47 in × 16.75 in × 13.25 in)
Contact your local HP sales office for more information including a data sheet containing complete specifications.

Ordering Information	Price
HP 3575A Gain/Phase Meter	$7,180
Opt 001 Dual readouts/dual outputs	+$670
Opt 002* BCD programming (negative true)	+$1,135
Opt 003* BCD programming (positive true)	+$1,135
Opt 908 Rack flange kit	+$37
Opt 910 Extra manual	+$53
Opt W30 Extended repair service. See page 671.	+$145

*Note: Includes Option 001