

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



HP 3577B Network Analyzer

The HP 3577B is a high-performance, yet economical, two-channel, (optional three-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.

With the 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 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. HP also offers a wide range of accessories, including S-parameter and reflection/transmission test sets, as well as signal injection devices for feedback control systems such as power supplies and servo loops. Contact your local HP office for a full listing.

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. Take advantage of features such as discrete sweep, comparison to limit lines, and PASS/FAIL testing to speed your manufacturing test of crystals, filters, and other devices.

Specifications Summary

Source

Frequency

Range: 5 Hz to 200 MHz

Resolution: 0.001 Hz

Stability (Opt 1 only/instrument on ≥ 48 hrs):
 $\pm 5 \times 10^{-8}$ /day, 0 to 55° C

Amplitude

Range: +15 dBm to -49 dBm (1.26 V rms to 793 μ V rms: 2 dB V 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 dB p-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

Receiver

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 M Ω in parallel with approximately 30 pF

Input connectors: 50 Ω Type-N female

Resolution bandwidth: Selectable 1 kHz, 100 Hz, 10 Hz, or 1 Hz

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 | | Input level relative to full scale input |
|----------------------|---------------|--|
| Resolution bandwidth | | |
| 1 kHz, 100 Hz, 10 Hz | 1 Hz | |
| $\pm .04$ dB | $\pm .04$ dB | 0 dB to -10 dB |
| $\pm .02$ dB | $\pm .02$ dB | -10 dB to -50 dB |
| $\pm .05$ dB | $\pm .05$ dB | -50 dB to -60 dB |
| $\pm .15$ dB | $\pm .25$ dB | -60 dB to -80 dB |
| $\pm .75$ dB | $\pm .75$ dB | -80 dB to -90 dB |
| $\pm .75$ 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 dB p-p from 20 Hz to 20 MHz; 0.6 dB p-p from 5 Hz to 200 MHz

Ratio (A/R, B/R, A/B): 0.3 dB p-p from 20 Hz to 20 MHz; 0.4 dB from 5 Hz to 200 MHz

Stability

Temperature: Typically $< \pm 0.02$ dB/° C

Time: Typically ± 0.05 dB/hour at 25° C

Phase Characteristics (A/R, B/R, A/B)

Range: $\pm 180^\circ$

Accuracy: At 100 kHz, 25° C, and Full Scale Input: $\pm 2.0^\circ$

Dynamic Accuracy

| Error | Input Level Relative to Full Scale Input |
|------------------|--|
| $\pm .4$ degree | 0 dB to -10 dB |
| $\pm .2$ degree | -10 dB to -50 dB |
| $\pm .5$ 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 $< \pm 0.05^\circ$ C

Time stability: Typically $< \pm 0.05^\circ$ hr at 25° C

Delay Characteristics

Range: 1 ps to 20,000s

Resolution: 0.01 ns/div to 1000s/div

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

Network Analyzers

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HP 3577B, 35677A/B, 35676A/B

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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.

Reference Line Position

Rectangular graticule: 0% to 100% full scale deflection in 0.05% increments. Logarithmic and linear.

Polar/Smith chart graticule: $\pm 500^\circ$ in 0.001° increments

Limit Test

Twenty segments for each trace per limit test. Added 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 $-72,000^\circ/\text{span}$ to $+72,000^\circ/\text{span}$.

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 $+55^\circ\text{C}$

Power: 115 V $\pm 10\%$, -25% (47 Hz to 440 Hz), or 230 V $\pm 10\%$, -15% (47 Hz to 66 Hz), 450 VA maximum

Weight: Net, 31 kg (67 lb); shipping, 41 kg (90 lb)

Size: 222 mm H \times 426 mm W \times 578 mm D (8.7 in \times 16.75 in \times 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 without changing device connections. The HP 35677A is used for 50- Ω systems and the HP 35677B is used for 75- Ω 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, $\pm 5^\circ$

Reflection (S11, S22): ± 1 dB, $\pm 5^\circ$

Accessories

All accessories needed to connect the test set to the analyzer are provided.

General Characteristics

Weight: Net, 6 kg (13 lb); shipping, 122 kg (25 lb)

Size: 90 mm H \times 425 mm W \times 584 mm D (3.5 in \times 16.75 in \times 22.75 in).

Add $1\frac{1}{4}$ 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: 50 $\Omega \pm 2\%$ typical (HP 35676A) 75 $\Omega \pm 2\%$ 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 | \$21,750 |
| Opt 001 Frequency Reference | + \$850 |
| Opt 002 Third Receiver | + \$3,800 |
| Opt 1C2 HP Instrument BASIC/ 640 KB RAM | + \$1,000 |
| 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 624) | + \$450 |
| HP 35676A 50 Ω Reflection/Transmission Test Kit | \$1,525 |
| Opt W30 Extended Repair Service (see page 624) | + \$45 |
| HP 35676B 75 Ω Reflection/Transmission Test Kit | \$1,825 |
| HP 35677A 50 Ω S-Parameter Test Set | \$4,450 |
| HP 35677B 75 Ω S-Parameter Test Set | \$4,450 |
| 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 | \$860 |
| HP 35678B 75 Ω type N Calibration Kit | \$1,625 |
| HP 35679A 50 Ω type N Port Extension Cables | \$575 |
| HP 35679B 75 Ω type N Port Extension Cables | \$1,900 |
| HP 85024A High-Frequency Probe | \$2,500 |