

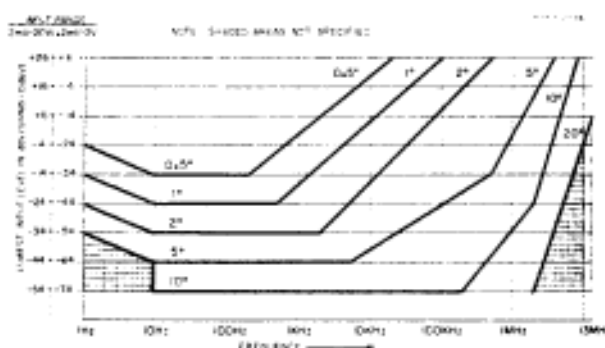
3575-A-2843

Figure 1-1. Model 3575A Gain-Phase Meter.

Table 1-1. Specifications.

PERFORMANCE RATING

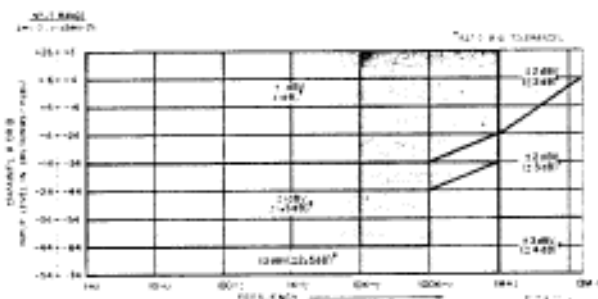
Phase Accuracy (At Analog Output)*



*Conditions:

- 1) Temperature Range 15° to 35° C.
- 2) Lowest applicable Voltage Range settings must be used.
- 3) Lowest applicable Frequency Range setting must be used.
- 4) Analog Output Voltage = 10 mV per degree with > 2 Megohm load resistance.
- 5) Phase Stability and Accuracy is specified for a period of 90 days after calibration.

Amplitude Accuracy (At Analog Output)**



**Conditions:

- 1) Temperature Range 15° to 35° C.
- 2) The accuracy of ratio (B/A) measurements is determined by the lowest input level and highest input frequency. If the two input signals are not of the same frequency, add ± 0.5 dB to existing ratio tolerances.
- 3) Analog Output Voltage = 10 mV per dB/dBV with > 2 Megohm load resistance.
- 4) Amplitude Stability and Accuracy is specified for a period of 90 days after calibration.

Panel Meter Accuracy: ± 3 counts (0.3 degrees, 0.3 dB/dBV)†

†Must be added to Amplitude Accuracy and Phase Accuracy specifications to obtain total error tolerances for panel meter readings.

Input Shunt Capacitance: < 30 pF (Also see Input Impedance listing in Table 1-2.)

SECTION I

GENERAL INFORMATION

1-1. DESCRIPTION.

1-2. The Hewlett-Packard Model 3575A Gain-Phase Meter is a versatile, wide-range ac voltage analyzer which affords direct, convenient measurement of amplitude and phase parameters. The major features of the instrument include broadband frequency response, wide dynamic range, digital readout plus a unique detection scheme which ensures accurate phase measurements in the presence of noise and distortion. These standard features, along with a variety of options including dual panel meters, BCD output and remote control, make the 3575A a truly flexible instrument that is well suited for bench or systems applications.

1-3. The broadband frequency response of the Model 3575A extends from 1 Hz to 13 MHz in four overlapping frequency ranges. For maximum operating convenience, each range is designed to cover a wide band of frequencies while range selectability allows the user to optimize measurement accuracy and settling time over the entire frequency spectrum.

1-4. The 3575A is equipped with two independent input channels. Each channel provides an 80 dB dynamic range which allows "hands off" operation with a wide range of input levels. In addition, each channel is equipped with a 20 dB input attenuator which provides an extended operating capability of 100 dB in two voltage ranges. Input sensitivity is from 0.2 mV rms to 2 V rms on the lower range and 2 mV rms to 20 V rms on the higher range. The 1 Megohm < 30 pF input impedance of each channel permits the use of 10:1 divider probes which further extend the maximum input level to 200 V rms and the overall operating range to 120 dB.

1-5. The 3575A contains a built-in dc digital voltmeter which provides a direct indication of amplitude or phase on a 3 1/2 digit (LED) display. Lighted annunciators on the panel meter indicate dB V, dB or degrees depending on the parameter being measured. The panel meter display is determined by the front panel Display switch which permits selection of Amplitude or Phase presentation. For recording purposes, an Analog Output (BNC) connector is provided on the rear panel of the instrument. The Analog Output supplies a dc voltage proportional to the panel meter reading.

1-6. When Amplitude Display is selected, the panel meter presentation is controlled by the front panel Amplitude Function switch which permits selection of three different functions. These functions are Log A, Log B and Log B/A. When Log A or Log B is selected, the panel meter indicates the logarithmic amplitude of the respective input signal in

dBV (1 V rms = 0 dBV). Input levels from 0.2 mV rms (-74 dBV) to 20 V rms (+26 dBV) can be measured with 0.1 dBV resolution in two voltage ranges. When Log B/A is selected, the panel meter indicates the relative amplitude of the two input signals in dB. The display range for relative measurements is from -100 dB to +100 dB with 0.1 dB resolution. Since the two input channels each contain ac/dc converters and are totally independent, relative measurements can be made between two signals that differ in frequency.

1-7. The 3575A amplitude functions are particularly useful for measuring gain, attenuation and other characteristics where amplitude comparison is required. The Log B/A function eliminates the need for separate input and output measurements and time consuming difference calculations.

1-8. When Phase Display is selected, the 3575A measures the phase difference between two input signals. The phase measurement range is from -180 degrees to +180 degrees with 12 degrees overrange and 0.1 degree display resolution. Due to the wide dynamic range of the instrument, phase difference can be measured between two signals that differ in amplitude by as much as 100 dB.

1-9. An accurate phase meter is of little value unless the accuracy can be maintained in the presence of noise and distortion. Unlike conventional phase meters, the 3575A uses two phase detectors rather than a single phase detector. This, in conjunction with a highly effective error correction scheme, greatly reduces the effects of noise and distortion on phase readings.

1-10. SPECIFICATIONS.

1-11. Table 1-1 is a complete list of the Model 3575A critical specifications that are controlled by tolerances. Table 1-2 contains general information that describes the operating characteristics of the Model 3575A.

1-12. Any changes in specifications due to manufacturing, design, or traceability to the U.S. National Bureau of Standards are included in Table 1-1 in this manual. Specifications listed in this manual supersede all previous specifications for the Model 3575A.

1-13. OPTIONS.

1-14. There are presently three instrument and two accessory options available for the Model 3575A. These options are as follows:

Option	Factory Installed*
Dual Panel Meters	Option 001
Dual Panel Meters, BCD Outputs and Remote Control	Option 002, 003**
Kit, Rack Mount Additional Manual	Option 908 Option 910

* Field installable option kits are available.

** Options 002 and 003 are identical except for assertion states of BCD outputs (see Table 1-2).

Table 1-2. General Information.

INPUTS

Front Panel Inputs: Female BNC connectors

Input Impedance: 1 Megohm (nominal) shunted by < 30 pF

Rear Panel Inputs: Holes are provided on the rear panel for installing BNC input connectors in place of the front panel input connectors. When rear-panel inputs are used, the shunt capacitance increases to approximately 40 pF (not compatible with 10:1 divider probes).

ANALOG OUTPUTS

Connectors: Female BNC connectors, labeled ANALOG OUTPUT 1 and ANALOG OUTPUT 2 are located on the rear panel of the instrument. Analog Output 2 is used only in instruments equipped with dual panel meters (Options 001 and 002).

Resistance: 1 Kilohm (nominal)

Output Voltage:

Amplitude Measurements: 10 mVdc per dB/dBV with > 2 Megohm load resistance.

Phase Measurements: 10 mVdc per degree with > 2 Megohm load resistance.

RESPONSE TIME

Typical Settling Time: (following a change in input parameters):

Frequency Range	100 % * Settled	95 % * Settled	90 % * Settled
1 Hz - 1 kHz	30 sec.	20 sec.	17 sec.
10 Hz - 100 kHz	3 sec.	2 sec.	1.7 sec.
100 Hz - 1 MHz	0.3 sec.	0.2 sec.	0.17 sec.
1 kHz - 13 MHz	30 ms.	20 ms.	17 ms.

* Percent of final reading

RANGES

Frequency Range: 1 Hz to 13 MHz in four ranges:

1 Hz to 1 kHz
10 Hz to 100 kHz
100 Hz to 1 MHz
1 kHz to 13 MHz

Dynamic Range: 80 dB

Operating Range (Each Channel): 100 dB in two ranges:

0.2 mV rms to 2 V rms (-74 dBV to +6 dBV)
2 mV rms to 20 V rms (-54 dBV to +26 dBV)

DISPLAY MODES

Amplitude or Phase (front panel DISPLAY switch)

AMPLITUDE MEASUREMENTS

Amplitude Functions: A dBV, B dBV, or B/A (front panel AMPLITUDE FUNCTION switch)

Display Range (A dBV, B dBV): -74.0 dBV to +26.0 dBV (in two Voltage Ranges)

Display Range (B/A): -100.0 dB to +100.0 dB*

* Both input signals must be within the range of 0.2 mV rms to 20 V rms.

Display Resolution: 0.1 dBV, 0.1 dB

Amplitude Reference (A dBV, B dBV): 1 V rms = 0 dBV

Reference Channel (B/A): Channel A*

* A negative reading means that the signal applied to Channel B is lower in amplitude than the signal applied to channel A; a positive reading means that the signal applied to Channel B is greater in amplitude than the signal applied to Channel A.

PHASE MEASUREMENTS

Phase Measurement Range: -180 degrees to +180 degrees with 12 degrees overrange

Display Resolution: 0.1 degree

Phase Reference: A or -A (front PHASE REFERENCE switch)*

*1) Channel A is the reference channel. A negative reading means that B lags A; a positive reading means that B leads A.

*2) With the Phase Reference set to -A, Channel A is inverted and the phase reading is offset by 180 degrees.

Error Introduced by Noise: < 2 degrees (nominal) for a 1 V rms 10 kHz sine wave and 1 MHz gaussian noise on one channel with 30 dB signal to noise ratio using the 100 Hz to 1 MHz Frequency Range.

Error Introduced by Distortion:

Even Harmonics: Cancelled - No Error

Odd, In-Phase Harmonics: No Error

Odd, Out-of-Phase Harmonics: < 0.6 degrees (nominal) when total odd harmonic distortion is more than 40 dB below the fundamental.

Table 1-2. General Information (Cont'd).

DIGITAL READOUT

Display: 3 1/2 digits with fixed decimal indicator, polarity sign and annunciators.

Reading Rate (Internal Sampling): 4 readings per second

GENERAL

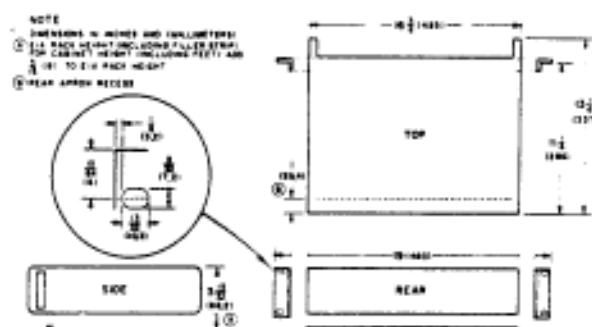
Operating Temperature Range: 0°C to +55°C, unless otherwise specified

Storage Temperature: -40°C to +75°C

Power Requirements: 115 V or 230 V $\pm 10\%$, 48 Hz to 440 Hz, 50 VA, maximum.

Weight:

Net Weight: 18 1/4 lbs.
Shipping Weight: 25 lbs.

Dimensions:**OPTIONS**

Dual Panel Meters (Option 001): The 3575A Option 001 is equipped with dual panel meters and dual analog outputs for simultaneous amplitude and phase presentations.

Left-Hand Panel Meter: Indicates A dBV, B dBV or B/A as determined by the Amplitude Function switch setting.

Right-Hand Panel Meter: Indicates B dBV or phase as determined by the Amplitude B/Phase switch setting.

Dual Analog Outputs: Rear panel BNC connectors provide dc output voltages that correspond with the respective panel meter readings (also see Analog Output heading).

Dual Panel Meters, BCD Output and Remote Control (Options 002, 003): The 3575A Options 002, and 003 are equipped with dual panel meters and dual analog outputs (same as Option 001) plus dual BCD outputs and a complete remote control capability.

Remote Logic: The 3575A Option 002 uses Low True TTL logic for BCD outputs and remote control lines. The 3575A Option 003 uses High True TTL logic for BCD Outputs and Low True TTL logic for remote control lines.

State	BCD Outputs *	Remote Control Lines
"0"	+2.4 V to +5 V	Open or +2.4 V to +5 V
"1"	0 V to +0.4 V	Gnd. or -0.5 V to +0.4 V

* In 3575A Option 003, BCD Outputs are High True.

BCD Outputs: Provide parallel binary-coded data that corresponds with the respective panel meter reading. Fourteen lines for each panel meter include three 8-4-2-1 BCD-coded digits, a single line overrange ("1") digit and a single line polarity indicator.

Overload Outputs: Three output lines, A_{OL}, B_{OL} and "overload", indicate overload on A, overload on B and overload on A OR B.

Remote Control Lines: Eight input lines accept parallel binary instructions for remote control of all front panel functions, ranges and settings (except LINE ON/OFF). Internal storage is not provided.

Control Modes: Local or Remote (1 control line)

Remote Measure: 1 control line*

* In the Remote Control mode, the panel meters must be externally triggered by applying a ground-true momentary pulse (> 1 ms) to the Remote Measure line each time a reading is required. The Remote Measure command should not be applied for at least 0.5 ms following any change that affects the programmed state of the instrument.

Isolation: Remote input and output lines are *not* isolated.

Trigger Mode: Delayed or Non-Delayed (1 control line)*

* The trigger mode determines the time required to obtain panel meter readings or BCD outputs initiated by the Remote Measure command. In the Delayed mode the time is variable and is controlled by the Frequency Range setting:

Frequency Range	Delay Time (nominal)
1 Hz to 1 kHz	33 seconds
10 Hz to 100 kHz	4 seconds
100 Hz to 1 MHz	1.1 seconds
1 kHz to 13 MHz	0.66 seconds

In the Non-Delayed mode, the measurement time is fixed at 600 ms regardless of the Frequency Range setting.

Data Flags: + Data Flag and - Data Flag (2 output lines)*

* Provide a "Data Ready" indication to the external controller. Flags are "set" by the Remote Measure pulse and "reset" at the end of the delay (Trigger Model cycle).

Condition	Indication	+ Data Flag	- Data Flag
"Set"	Data Not Ready	1	0
"Reset"	Data Ready	0	1

1-15. For further information concerning these options, refer to Table 1-2 (General Information) or Section III in this manual or contact the nearest -hp- Sales and Service Office.

1-16. ACCESSORIES SUPPLIED.

1-17. Table 1-3 is a list of accessories supplied with the Model 3575A.

1-18. ACCESSORIES AVAILABLE.

1-19. Table 1-4 is a list of Hewlett-Packard accessories that are available for use with the Model 3575A.

1-20. INSTRUMENT AND MANUAL IDENTIFICATION.

1-21. Hewlett-Packard uses a two-section serial number. The first section (prefix) identifies a series of instruments. The last section (suffix) identifies a particular instrument within the series. If a letter is included with the serial number, it identifies the country in which the instrument was manufactured. If the serial number of your instrument is lower than the one on the title page of this manual, refer to Appendix C for backdating information that will adapt this manual to your instrument. All correspondence with Hewlett-Packard should include the complete serial number.

Table 1-3. Accessories Supplied.

Description	Quantity	-hp- Part No.
Interface Connector (Opt. 002, 003)	1 ea.	1251-0086
Accessory Kit Includes the following:	1 ea.	03575-84411
PC Board Extender (22 pin)	1 ea.	5060-5989
PC Board Extender (12 pin)	1 ea.	5060-5988
PC Board Extender (10 pin)	1 ea.	5060-5987

Table 1-4. Accessories Available.

-hp- Model	Description
10004A	Voltage Divider Probe (miniature)
456A	AC Current Probe
562A-16C	Printer Cable (for 5050A and 5055B Printers)
11048C	50 Ohm Feed-Thru Termination
11094B	75 Ohm Feed-Thru Termination
11095A	600 Ohm Feed-Thru Termination
5060-8739	Rack Mounting Kit