The HP 85644A and HP 85645A Tracking Sources

The HP 85644A and HP 85645A tracking sources complement and expand the measurement capability and versatility of your HP spectrum analyzer. They are designed primarily as general purpose accessories for spectrum analyzers (referred to as the host instrument).

What the HP 85644A and HP 85645A tracking sources offer. A tracking source combined with a host spectrum analyzer allows you to measure the swept amplitude response of a device, such as an amplifier or a filter. These measurements have the advantage of high dynamic range and speed. In addition, since the spectrum analyzer is a tuned receiver, measurements are not affected by spurious signals or harmonics.

Performance options

The HP 85644A tracking source is ac coupled. The frequency range is from 300 kHz to 6.5 GHz with selectable RF output power.

The HP 85645A tracking source allows you to choose ac or dc coupling. The frequency range is from 300 kHz to 26.5 GHz with selectable RF output power.

Versatility and compatibility

The tracking sources can easily be configured to track the input frequency of a variety of spectrum analyzers or the output frequency of a microwave sweep oscillator. A configuration menu, accessible at the press of a front-panel key or via HP-IB, allows you to choose from among the following compatible host instruments:

- HP 8560 Series portable spectrum analyzers
- HP 8566A/B spectrum analyzers
- HP 8590 Series portable spectrum analyzers
- HP 8340A/B synthesized sweepers
- HP 8350 Series sweep oscillators

The HP 85644A and HP 85645A tracking sources extend measurement capability.

Offset tracking

The tracking sources have offset tracking capability. Offset tracking makes possible the amplitude response measurements of many frequency translation devices (such as mixers), and of systems with delays (such as satellite links). The advantage of the host spectrum analyzer (a tuned receiver) minimizes the effects of other mixing products.

Swept TOI

With two tracking sources set to appropriate offset frequencies, swept TOI (third-order-intercept) measurements are possible over a continuous range of frequencies. The time required for the swept TOI measurement is minimal.

Power sweep

The tracking source also offers power sweep capability. Power sweep is useful for characterizing saturation effects of devices under test.

Rugged CW source

The tracking sources can generate stand-alone, CW signals at fixed, non-synthesized, frequencies of your choosing. No connections to a host instrument are required. The CW signal from the tracking source can be used, along with a host spectrum analyzer, for measuring harmonics generated by a device such as an amplifier.

EMC measurements

The tracking source combined with a transducer can make swept measurements of circuit immunity to electromagnetic interference.

Specifications and Characteristics

What's in this chapter

This chapter contains specifications and characteristics for the HP 85644A and HP 85645A tracking source.

Amplitude	Amplitude-related specifications and characteristics.
Frequency	Frequency-related specifications and characteristics.
Inputs and Outputs	Input and Output characteristics.
General	General specifications and requirements.

The distinction between specifications and characteristics is described as follows.

- Specifications describe warranted performance over the temperature range −10 °C to +55 °C (unless otherwise noted). All specifications apply under the following conditions:
  - The instrument's temperature has been stabilized after 30 minutes of continuous operation (for ambient conditions).
  - The instrument's controls are autocoupled.
  - The instrument is ac coupled.
  - The instrument is on a 2-year calibration cycle.
  - The environmental requirements are met.
- Characteristics provide useful, but nonwarranted information about the functions and performance of the instrument. Characteristics are specifically identified.
- Typical Performance, where listed, is not *warranted*, but indicates performance that most units will exhibit.
- Nominal Value indicates the expected, but not warranted, value of the parameter.

This section contains the amplitude-related specifications and characteristics.

Maximum Leveled Power Output

HP 85644A	band 0, 300 kHz to 1.8 GHz*: +10 dBm band 0, 1.8 to 2.9 GHz*: +4 dBm band 1, 2.0 to 6.5 GHz*: +5 dBm
HP 85645A	band 0, 300 kHz to 1.8 GHz*: +10 dBm band 0, 1.8 to 2.9 GHz*: +5 dBm band 1, 2.0 to 7.0 GHz*: +10 dBm band 2, 5.8 to 13.5 GHz*: +5 dBm band 3, 12.4 to 20.0 GHz*: +5 dBm band 4, 12.1 to 26.5 GHz*: −2 dBm

* Frequency ranges of the bands vary with the host instrument selected.

Minimum Leveled Power Output (characteristic)

HP 85644A	−80 dBm
HP 85645A	−70 dBm

Amplitude Resolution

0.01 dB

Vernier Range (characteristic)

Bands 0 to 3: >16 dB

Band 4: >10 dB

Dynamic Range (characteristic)

Dynamic range is a measure of the difference between the tracking source maximum power output and the spectrum analyzer displayed average noise level, with some system losses.

HP 85644A.

With HP 8566A/B:

Band 0, <1.8 GHz	141 dB
Band 0, <2.5 GHz	135 dB
Band 1, 2.0 to 5.8 GHz	134 dB

With HP 8562A Option 026

Band 0, <1.8 GHz	122 dB
Band 0, <2.9 GHz	116 dB
Band 1, 2.7 to 6.5 GHz	118 dB

With HP 8593A/E

Band 0, <1.8 GHz	119 dB
Band 0, <2.9 GHz	113 dB
Band 1, 2.7 to 6.4 GHz	116 dB

HP 85645A.

With HP 8566A/B

Band 0, <1.8 GHz	141 dB
Band 0, <2.5 GHz	136 dB
Band 1, 2.0 to 5.8 GHz	139 dB
Band 2, 5.8 to 12.5 GHz	127 dB
Band 3, 12.5 to 18.6 GHz	121 dB

Band 4, 18.6 to 23 GHz	109 dB

With HP 8562A Option 026

Band 0, <1.8 GHz	122 dB
Band 0, <2.9 GHz	117 dB
Band 1, 2.7 to 6.5 GHz	123 dB
Band 2, 5.9 to 13.0 GHz	117 dB
Band 3, 12.4 to 19.7 GHz	102 dB
Band 4, 19.1 to 26.5 GHz	90 dB

With HP 8593A/E

Band 0, <1.8 GHz	119 dB
Band 0, <2.9 GHz	114 dB
*Band 1, 2.7 to 6.4 GHz	121 dB
Band 2, 6.0 to 12.8 GHz	104 dB
Band 3, 12.4 to 19.4 GHz	100 dB
Band 4, 19.1 to 22.0 GHz	87 dB

*Band 1 in the HP 8593E is actually 2.75 to 6.5 GHz.

Amplitude Accuracy

The accuracy is measured with respect to −2 dBm, with the tracking source ac coupled and at room temperature (20 − 30°C). It is measured at 300 MHz in the low band and at 3 GHz for the high bands.

±1 dB

Output Signal Flatness

The output signal flatness is measured relative to −2 dBm at 300 MHz for the low band and at 3 GHz for the high bands.

HP 85644A	±2 dB
HP 85645A	
<10 MHz, dc coupled	±2 dB
≥10 MHz, ac coupled	±2 dB

Attenuator Range

HP 85644A	70 dB
HP 85645A	60 dB

Attenuator Accuracy (characteristic)

HP 85644A	1.2 dB maximum, over 70 dB
HP 85645A	1.9 dB maximum, over 60 dB

Power Sweep (characteristic)

Maximum Range (for 0 to 10 V)	band 0 to 3: > 16 dB band 4: > 10 dB
Slope	0 to 3 dB/V

Harmonics (characteristic)

HP 85644A	band 0, > 5 MHz: −25 dBc band 1: −15 dBc
HP 85645A	band 0, > 5 MHz: −25 dBc band 1 to 4: −30 dBc

Maximum Sweep Speed

250 MHz/ms

External AM (characteristic)

Logarithmic amplitude modulation may be generated by applying an external modulation source to the SWEEP IN connector on the rear panel.

AM rates: >1 kHz, up to 50 kHz available in some settings

This section contains the frequency-related specifications and characteristics. In this section, N equals the harmonic number.

Frequency Range

HP 85644A	300 kHz to 6.5 GHz
HP 85645A	dc coupled, 300 kHz to 26.5 GHz ac coupled, 10 MHz to 26.5 GHz

CW Frequency (characteristic)

Accuracy	±5 MHz × N
Resolution	250 kHz

The frequency accuracy in the tracking mode is dependent on the host being used.

Offset Frequency Tracking Range

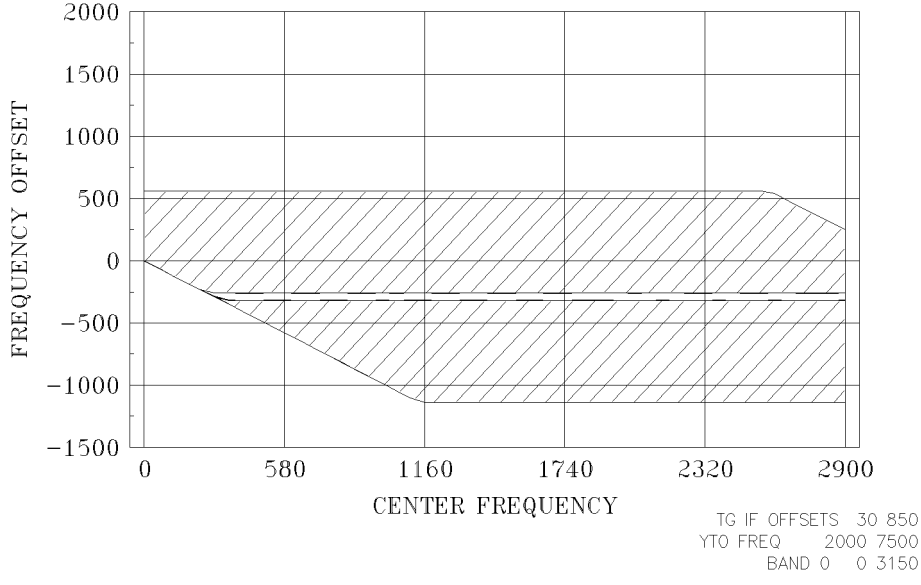
Maximum offset available with spectrum analyzer hosts	±200 MHz
Resolution	10 Hz × N

The typical maximum offset available varies with the frequency and host selected. Refer to the following graphs for details.

Available Offset Frequencies for the HP 8560 Series Portable Spectrum Analyzer (characteristic)

The available offset frequencies for each host vary within each band. Also, there is a gap in the useable range that is dependent on the host instrument being used.

HP 8560 Series Available Offset Tracking Range, Band 0

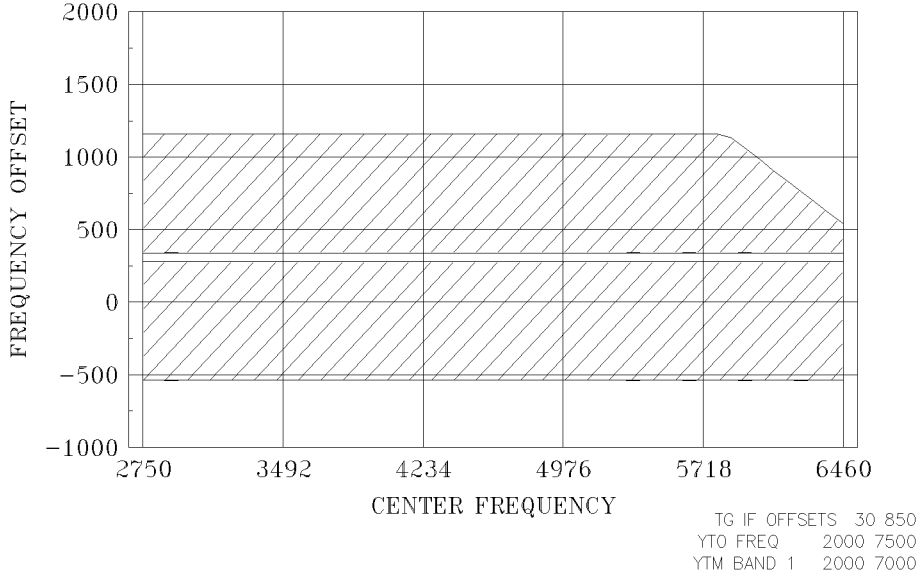


HP 8560 Series Band 0 (characteristic)

Unavailable Offset Range

Band 0, minimum	−316 MHz
Band 0, maximum	−262 MHz

HP 8560 Series Available Offset Tracking Range, Band 1

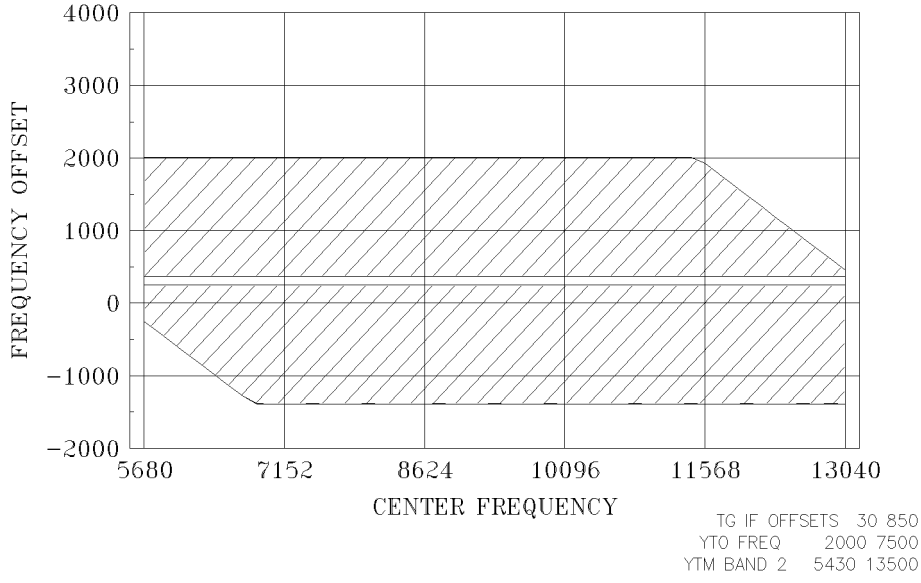


HP 8560 Series Band 1 (characteristic)

Unavailable Offset Range

Band 1, minimum	284 MHz
Band 1, maximum	338 MHz

HP 8560 Series Available Offset Tracking Range, Band 2

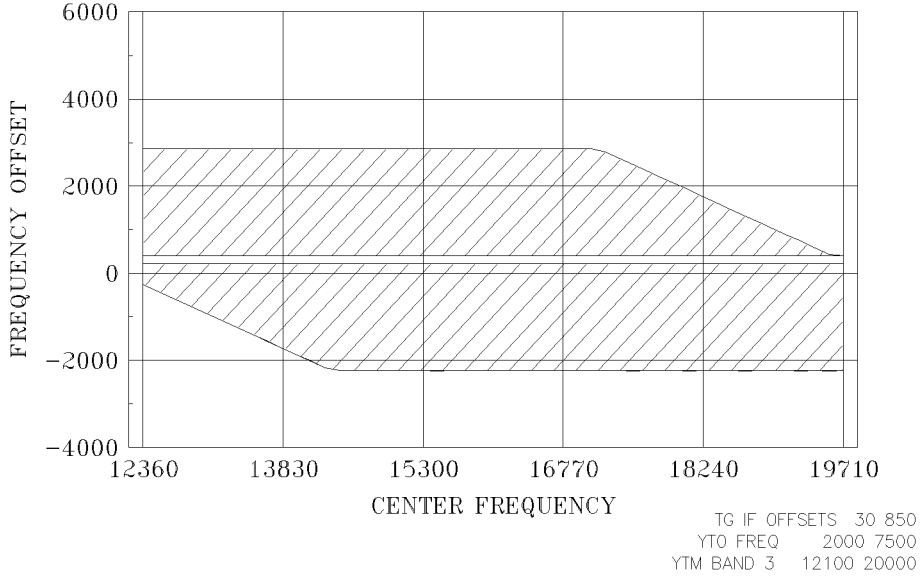


HP 8560 Series Band 2 (characteristic)

Unavailable Offset Range

Band 2, minimum	257 MHz
Band 2, maximum	365 MHz

HP 8560 Series Available Offset Tracking Range, Band 3

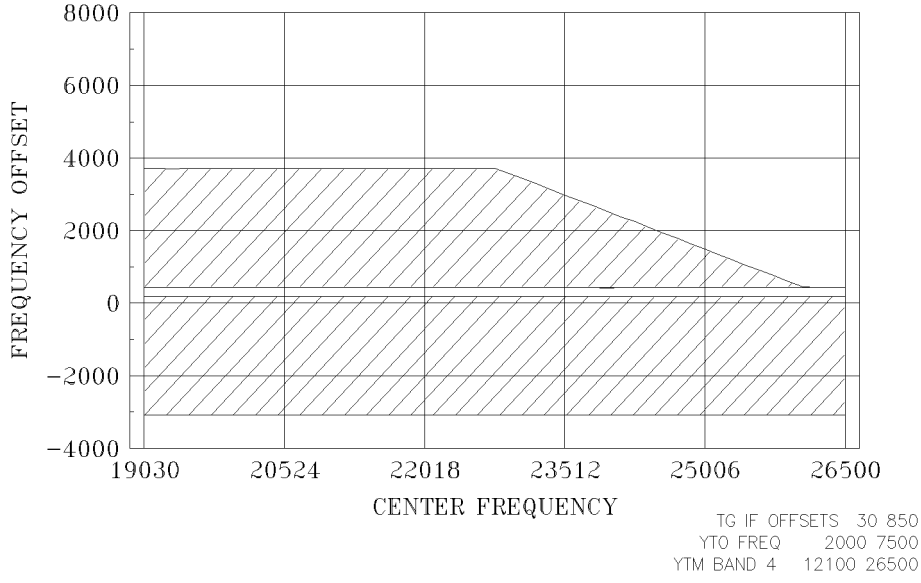


HP 8560 Series Band 3 (characteristic)

Unavailable Offset Range

Band 3, minimum	230 MHz
Band 3, maximum	392 MHz

HP 8560 Series Available Offset Tracking Range, Band 4



HP 8560 Series Band 4 (characteristic)

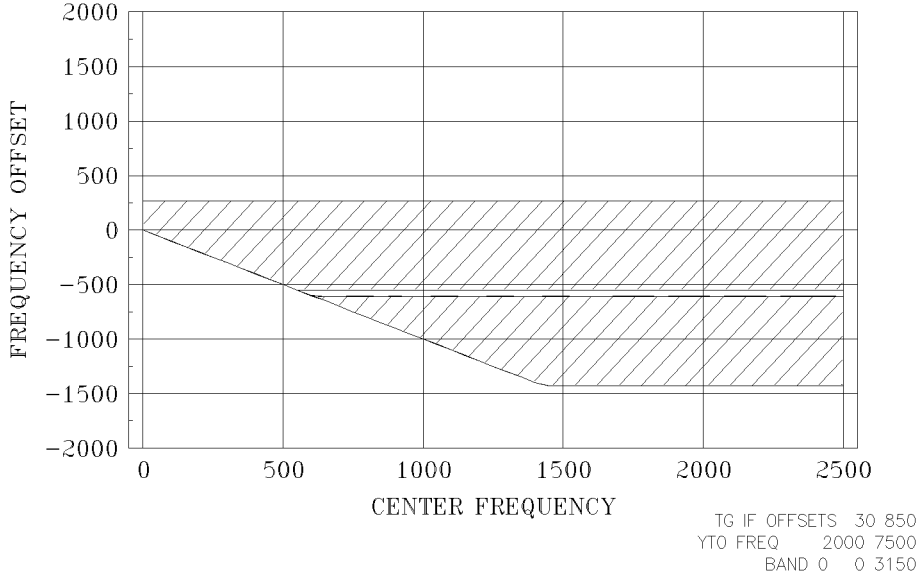
Unavailable Offset Range

Band 4, minimum	203 MHz
Band 4, maximum	419 MHz

Available Offset Frequencies for the HP 8566A/B Spectrum Analyzer (characteristic)

The available offset frequencies for each host vary within each band. Also, there is a gap in the useable range that is dependent on the host instrument being used.

HP 8566A/B Available Offset Tracking Range, Band 0

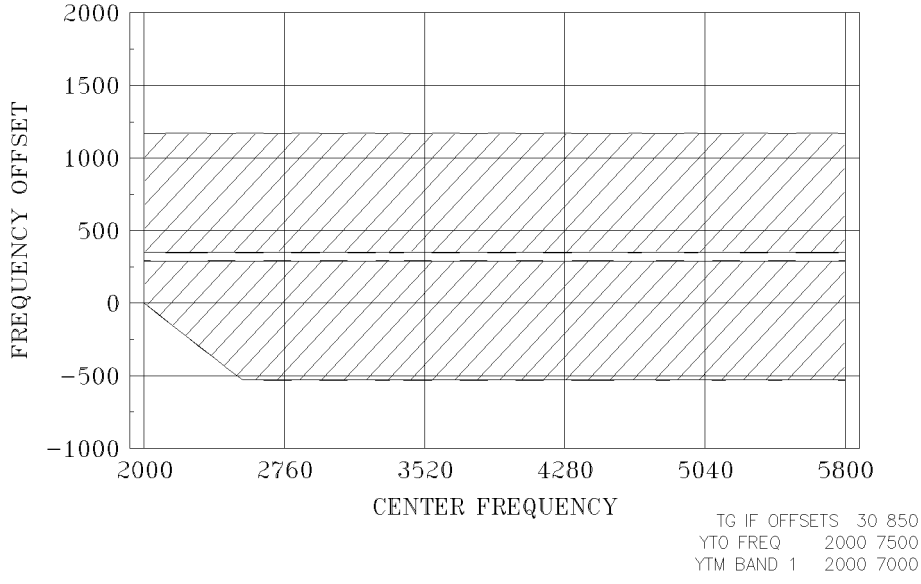


HP 8566A/B Band 0 (characteristic)

Unavailable Offset Range

Band 0, minimum	−606 MHz
Band 0, maximum	−552 MHz

HP 8566A/B Available Offset Tracking Range, Band 1

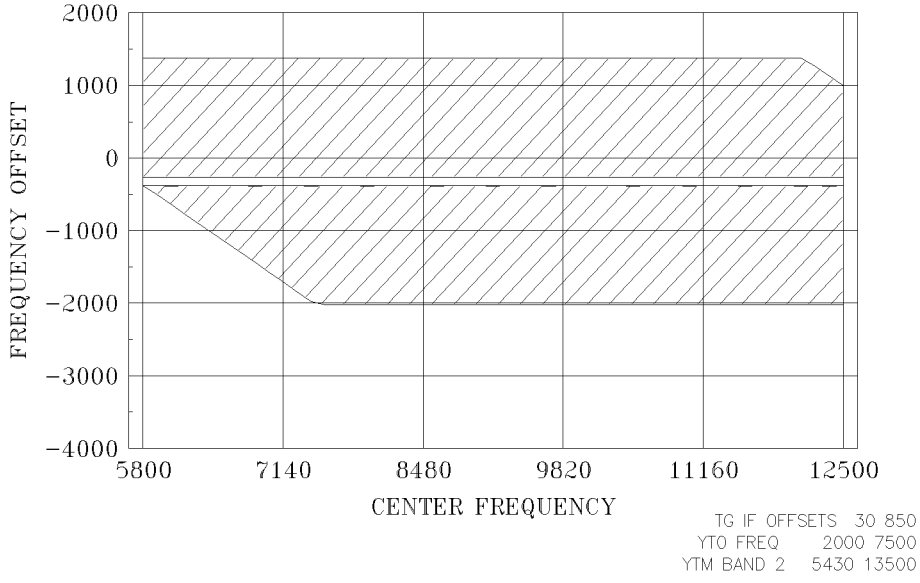


HP 8566A/B Band 1 (characteristic)

Unavailable Offset Range

Band 1, minimum	294 MHz
Band 1, maximum	348 MHz

HP 8566A/B Available Offset Tracking Range, Band 2

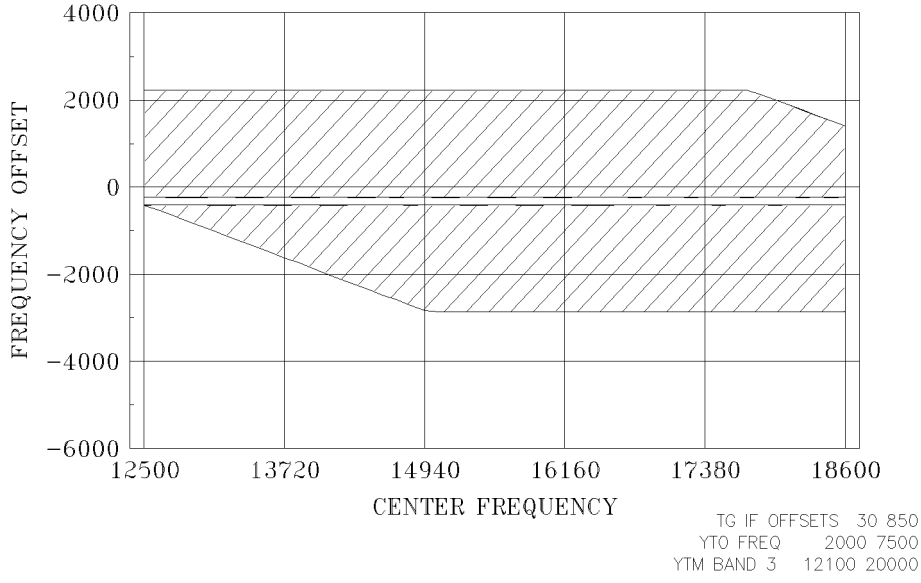


HP 8566A/B Band 2 (characteristic)

Unavailable Offset Range

Band 2, minimum	−267 MHz
Band 2, maximum	−375 MHz

HP 8566A/B Available Offset Tracking Range, Band 3

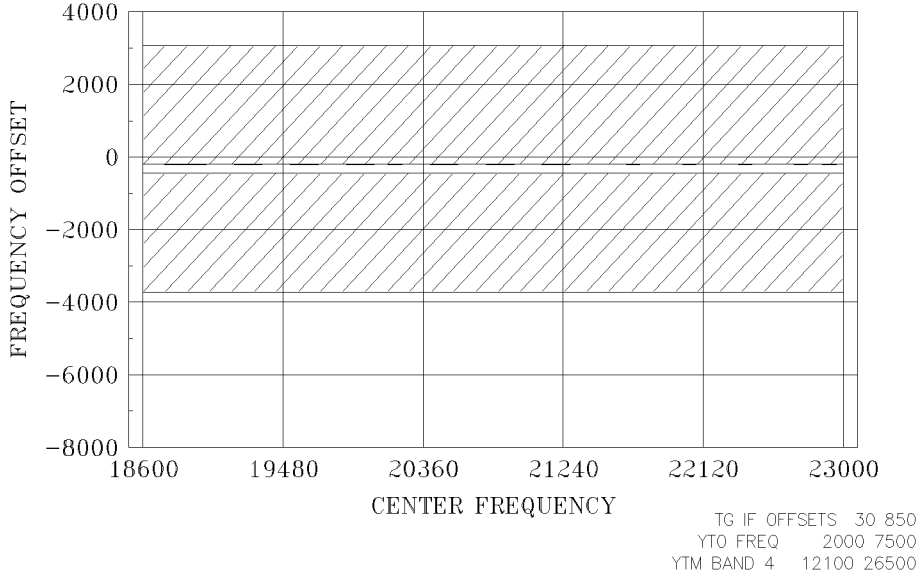


HP 8566A/B Band 3 (characteristic)

Unavailable Offset Range

Band 3, minimum	−240 MHz
Band 3, maximum	−402 MHz

HP 8566A/B Available Offset Tracking Range, Band 4



HP 8566A/B Band 4 (characteristic)

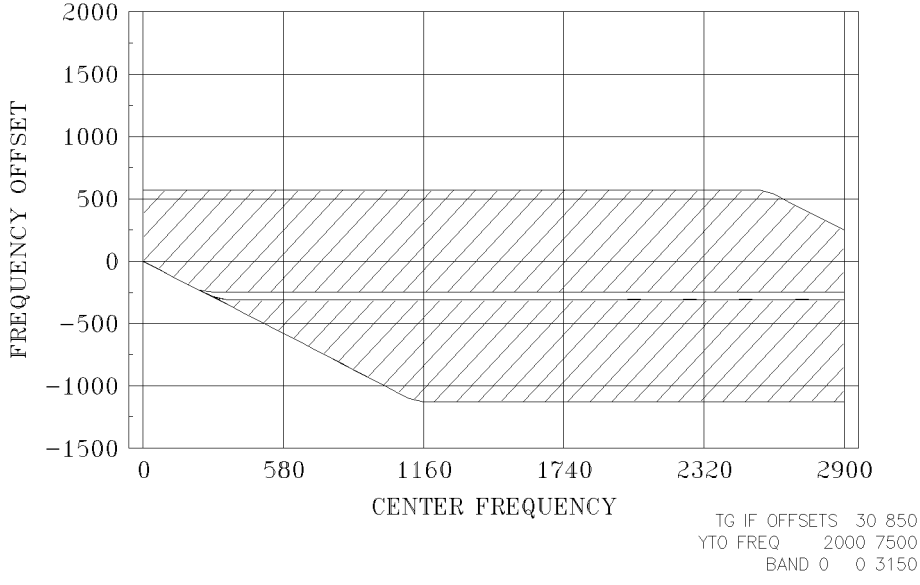
Unavailable Offset Range

Band 4, minimum	−213 MHz
Band 4, maximum	−429 MHz

Available Offset Frequencies for the HP 8590 Series Portable Spectrum Analyzer (characteristic)

The available offset frequencies for each host vary within each band. Also, there is a gap in the useable range that is dependent on the host instrument being used.

HP 8590 Series Available Offset Tracking Range, Band 0

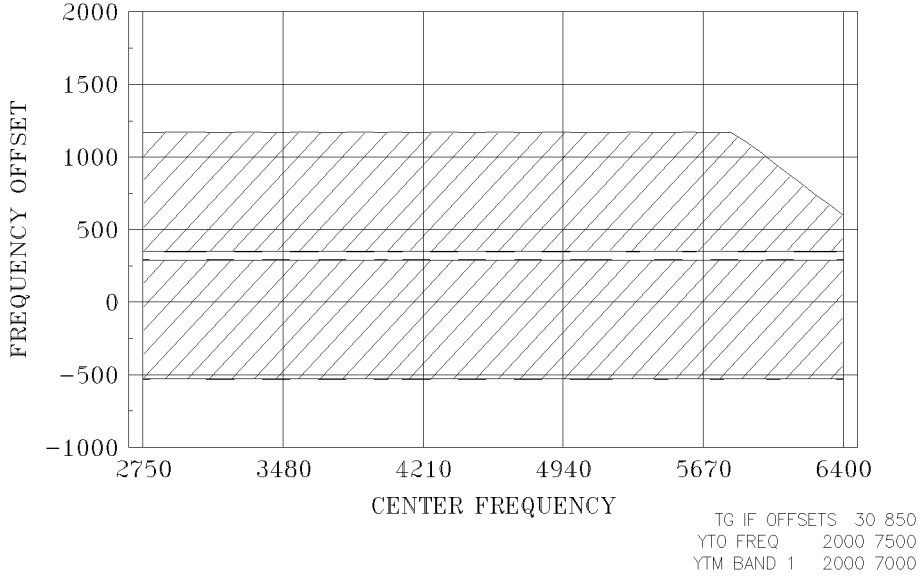


HP 8590 Series Band 0 (characteristic)

Unavailable Offset Range

Band 0, minimum	−306 MHz
Band 0, maximum	−252 MHz

HP 8590 Series Available Offset Tracking Range, Band 1

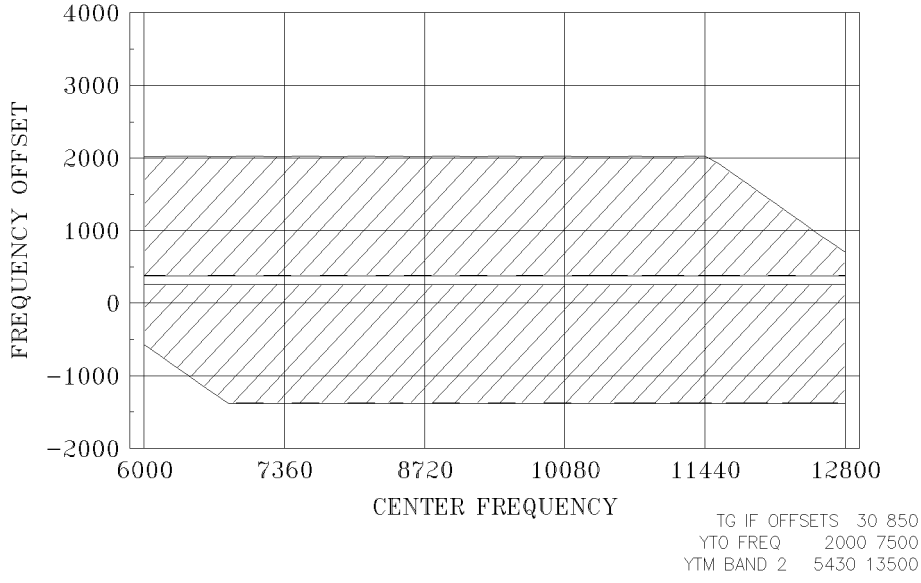


HP 8590 Series Band 1 (characteristic)

Unavailable Offset Range

Band 1, minimum	295 MHz
Band 1, maximum	349 MHz

HP 8590 Series Available Offset Tracking Range, Band 2

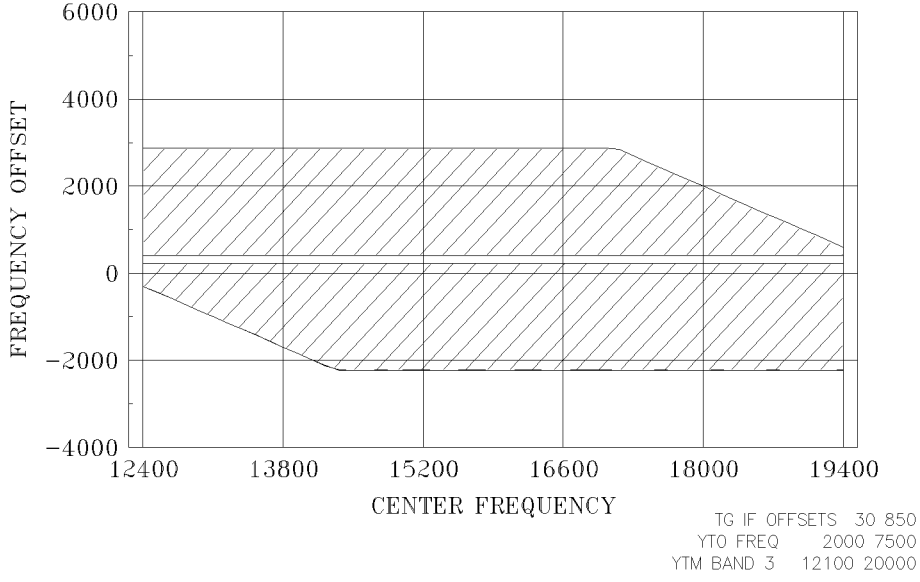


HP 8590 Series Band 2 (characteristic)

Unavailable Offset Range

Band 2, minimum	267 MHz
Band 2, maximum	375 MHz

HP 8590 Series Available Offset Tracking Range, Band 3

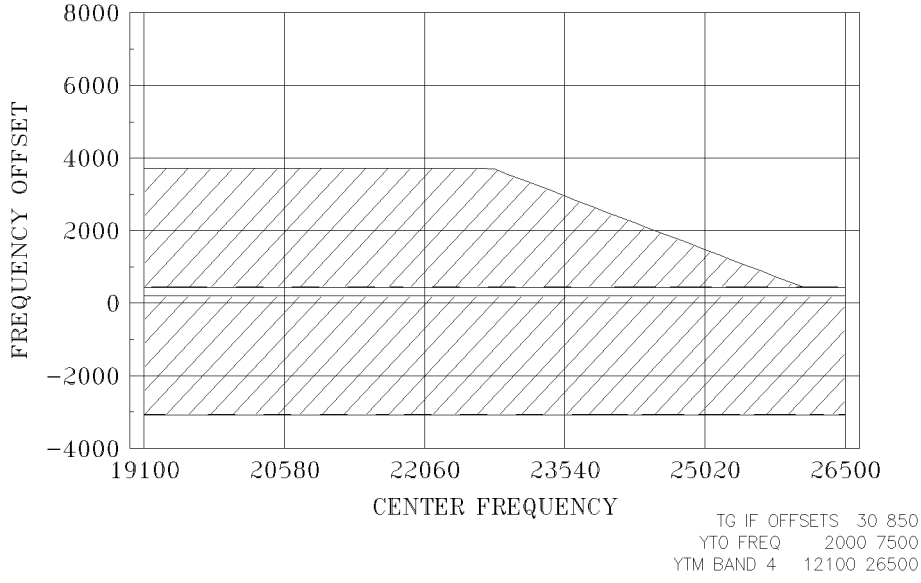


HP 8590 Series Band 3 (characteristic)

Unavailable Offset Range

Band 3, minimum	240 MHz
Band 3, maximum	402 MHz

HP 8590 Series Available Offset Tracking Range, Band 4



HP 8590 Series Band 4 (characteristic)

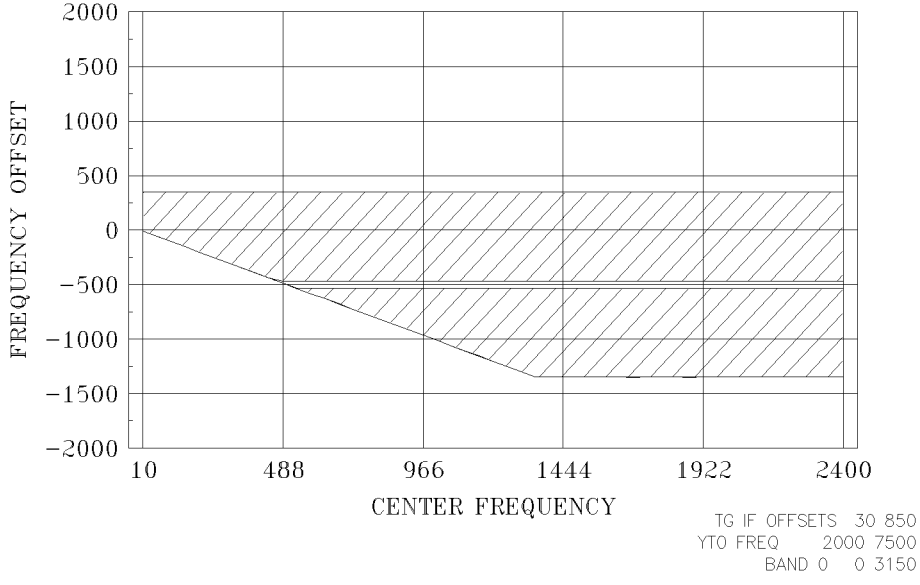
Unavailable Offset Range

Band 4, minimum	213 MHz
Band 4, maximum	429 MHz

Available Offset Frequencies for the HP 8340A/B Synthesized Sweeper (characteristic)

The available offset frequencies for each host vary within each band. Also, there is a gap in the useable range that is dependent on the host instrument being used.

HP 8340A/B Available Offset Tracking Range, Band 0

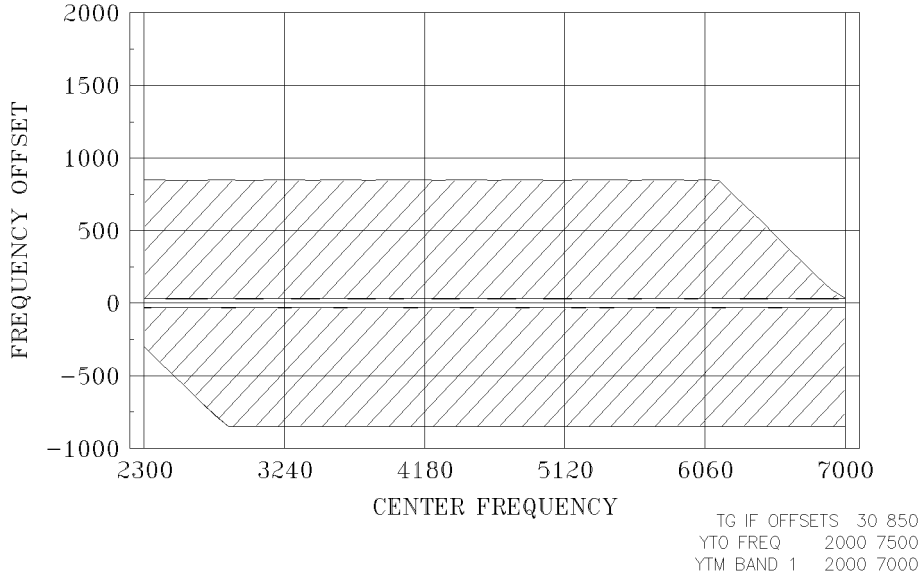


HP 8340A/B Band 0 (characteristic)

Unavailable Offset Range

Band 0, minimum	−527 MHz
Band 0, maximum	−473 MHz

HP 8340A/B Available Offset Tracking Range, Band 1

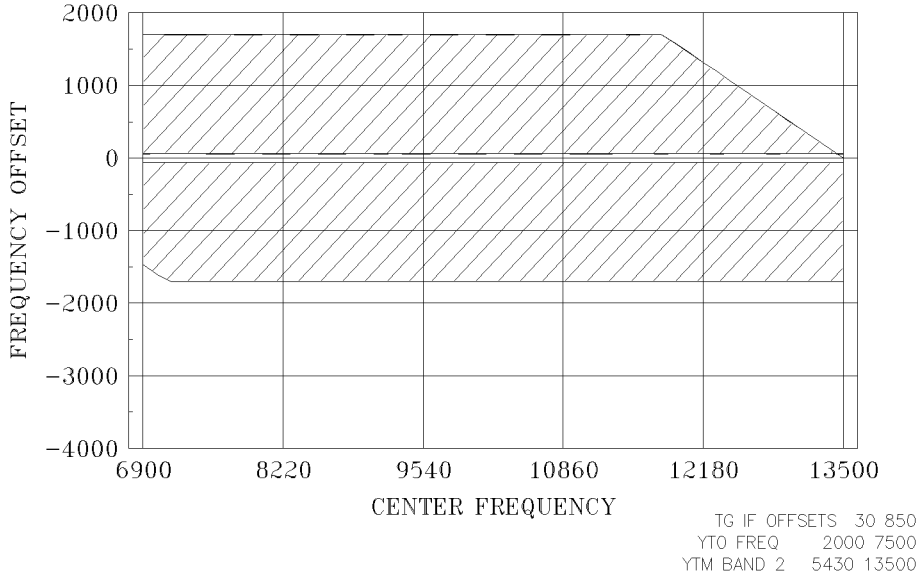


HP 8340A/B Band 1 (characteristic)

Unavailable Offset Range

Band 1, minimum	−27 MHz
Band 1, maximum	27 MHz

HP 8340A/B Available Offset Tracking Range, Band 2

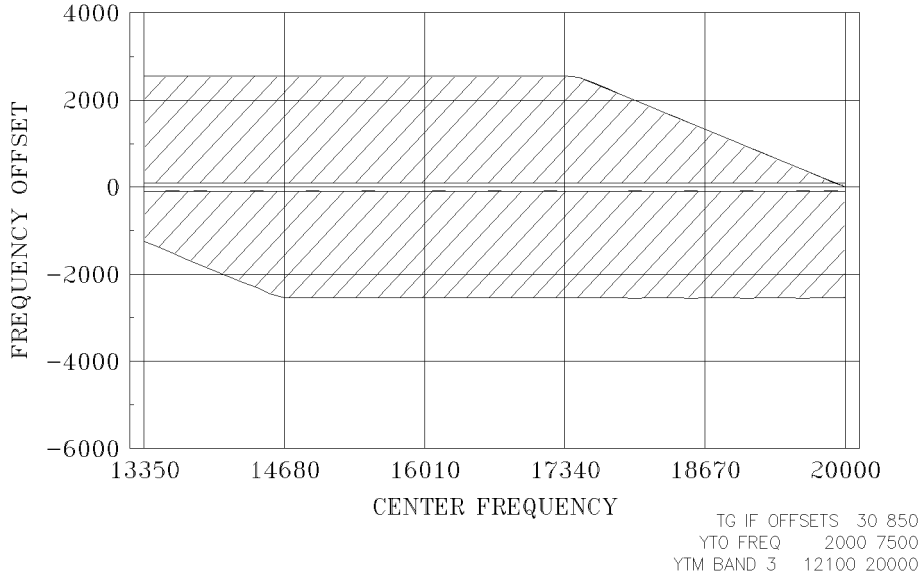


HP 8340A/B Band 2 (characteristic)

Unavailable Offset Range

Band 2, minimum	−54 MHz
Band 2, maximum	54 MHz

HP 8340A/B Available Offset Tracking Range, Band 3

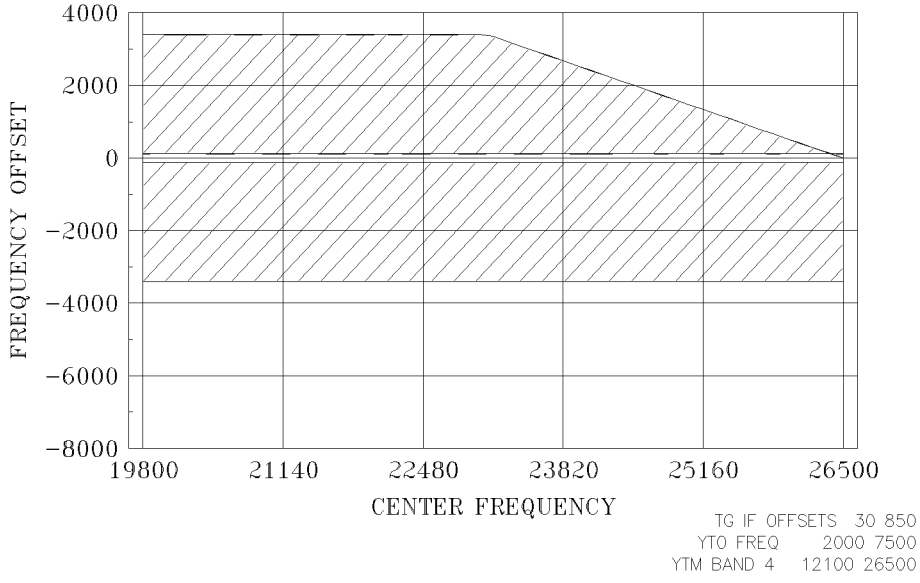


HP 8340A/B Band 3 (characteristic)

Unavailable Offset Range

Band 3, minimum	−81 MHz
Band 3, maximum	81 MHz

HP 8340A/B Available Offset Tracking Range, Band 4



HP 8340A/B Band 4 (characteristic)

Unavailable Offset Range

Band 4, minimum	−108 MHz
Band 4, maximum	108 MHz

o

This section contains the input and output characteristics.

Front Panel (characteristic)

RF Output HP 85644A	Type N (f)
VSWR (internally leveled only),	
0 dB attenuation	
300 kHz to 2.9 GHz:	1.8:1
2.9 GHz to 6.5 GHz:	1.6:1
RF Output HP 85645A	SMA (f)
VSWR (internally leveled only),	
0 dB attenuation	
300 kHz to 2.9 GHz:	1.5:1
2.9 GHz to 18 GHz:	1.6:1
18 GHz to 26.5 GHz:	2.0:1
LO Input	SMA (f), >−10 dBm, required for tracking
LO Output	SMA (f), >+7 dBm, used for tracking with second tracking source

Rear Panel (characteristic)

10 MHz Input	BNC (f), >−10 dBm, required for tracking in narrower resolution bandwidths and for the low frequency band (band 0)
SWP + TUNE IN	BNC (f), required for tracking
SWP + TUNE OUT	BNC (f), required for tracking with a second HP 85644A or HP 85645A tracking source
HI SWEEP IN/OUT	BNC (f), required for tracking with some hosts (HP 8590 Series spectrum analyzers)
BLANK IN	BNC (f), used to blank unleveled indicator during retrace
SWEEP IN	BNC (f), 0 to 10 V, used to control power sweep or to generate AM
EXT ALC	BNC (f), used with negative or positive detector for external leveling
AUX	9-pin, D-type connector, for future expanded capabilities

This section contains the general specifications and requirements.

Warmup

30 minutes, starting from ambient temperature

Calibration Interval

2 years

Environmental Specifications

Type tested to MIL-T-28800D, Type III, Class 5 environmental conditions as listed below:

Temperature (Operating)	−10°C to 55°C
Temperature (Non-operating)	−51°C to 71°C
Humidity	Type tested at 95% relative humidity and 40°C for 5 days
Altitude (Operating)	15,000 feet
Altitude (Non-operating)	50,000 feet
Vibration 5 to 15 Hz	0.059 inch peak-to-peak excursion

Vibration 15 to 25 Hz	0.039 inch peak-to-peak excursion
Vibration 25 to 55 Hz	0.020 inch peak-to-peak excursion
Pulse Shock	Half Sine at 40 g's for 11 ms duration
Transit Drop	8 inch drop on six faces and eight corners
Electromagnetic Compatibility	Conducted and radiated interference is in compliance with CISPR publication II (1985) and FTZ 526/527/79. meets MIL-STD-461B, Part 7 REO2 and CEO3 (narrowband, full limits; broadband, 20 dB relaxation 15 kHz to 100 kHz).

Power Requirements 115 V ac Operation

Voltage	110 V ±10% 120 V ±10%
Current (HP 85644A)	1.6 A rms maximum
Current (HP 85645A)	2.0 A rms maximum
Frequency	47 to 66 Hz, 400 Hz

Power Requirements 230 V ac Operation

Voltage	220 V ±10% 240 V ±10%
Current (HP 85644A)	0.8 A rms maximum
Current (HP 85645A)	1.0 A rms maximum
Frequency	47 to 66 Hz

Power Dissipation (nominal)

HP 85644A	< 150 VA, < 80 W
HP 85645A	< 200 VA, < 110 W

Weight (nominal)

HP 85644A	10 kg (22 lb)
HP 85645A	12 kg (26 lb)

Dimensions (nominal)

HP 85644A/HP 85645A Standard.

Height:	138 mm (5.5 in)
Width:	337 mm (13.5 in)
Depth:	461 mm (18.3 in)

HP 85644A/HP 85645A Option 919.

Height:*	133 mm (5.25 in)
Width:	457 mm (18 in)
Depth:	559 mm (22 in)

* not including feet