Table 1-1. Specifications (1 of 5)

(All specifications apply over the nominal Frequency Bands and over the top 10 dB of the output level vernier range unless otherwise specified.)

FREQUENCY CHARACTERISTICS

Range: 500 kHz to 512 MHz in 10 Octave Bands (to 1024 MHz with External Frequency Doubler).

Bands and Band Overlap: Bands extend 10% below and 7% above the nominal Frequency Bands shown below.

Frequency Bands (MHz)	Frequency Range (MHz) (with overlap)
0.5 - 1	0.45 - 1.07
1 - 2	0.9 - 2.1
2 - 4	1.8 - 4.2
4 - 8	3.6 - 8.5
8 - 16	7.2 - 17.1
16 - 32	14.4 - 34.3
32 - 64	28.8 - 68.7
64 - 128	57.5 - 137.5
128 - 256	115 - 275
256 - 512	230 - 550
External Doubler Band[1] 512 - 1024	460 - 1100

Internal Counter Resolution:

Frequency Bands (MHz)	Normal Mode	Expand X10	Expand X100
0.5 - 1	10 Hz	1 Hz	0.1 Hz
1 - 16	100 Hz	10 Hz	1 Hz
16 - 128	1 kHz	100 Hz	10 Hz
128 - 1024	10 kHz	1 kHz	100 Hz

Accuracy: 6-digit LED display with X10 and X100 expand; accuracy depends on internal or external reference used.

$$\left[\begin{array}{l}\text{Total}\\ \text{Count}\\ \text{Accuracy}\end{array}\right] = {}^{2}\left[\begin{array}{l}\text{Counter}\\ \text{Resolution}\\ (\pm 1\ \text{count})\end{array}\right] + \left[\begin{array}{l}\text{Reference}\\ \text{Error}\\ (\text{INT or EXT})\end{array}\right]$$

Internal Reference Error $<\pm 2$ ppm
(when calibrated at 25°C every 3 months and operated between 15°C and 35°C)

Fine Tuning:
Unlocked: >200 ppm total range.
Locked mode: $>\pm 20$ ppm by varying internal time base vernier.

Stability:

	Normal	Locked[3]
Time (after 2-hour warm-up)	<10 ppm/10 min	<0.05 ppm/hr
Temperature	<50 ppm/°C	<2 ppm total[4] variation (room ambient 15 to 35°C)
Line Voltage[5] (+5% to −10% line voltage change)	<1 ppm	<0.1 ppm
Load (with any passive load change)	<1 ppm	None measurable
Level Change (10 dB on output level vernier)	<1 ppm	
Mode Change (CW to FM)	<1% of selected peak deviation or <200 Hz whichever is greater	

1 In the External Doubler Band, the 8640B counter displays the actual doubled output frequency, and the FM meter indicates the proper peak deviation.

2 When phase locked, Counter Resolution error is eliminated.

3 These specifications are given for the 8640B internal reference. When using an external reference, drift in the locked mode will depend on the external reference characteristics.

4 Phase lock may break due to temperature change (i.e., during warm-up). Simply relock at desired frequency.

5 This specification is for short term, transient line changes.

Table 1-1. Specifications (2 of 5)

FREQUENCY CHARACTERISTICS (Cont'd)

Restabilization Time:

	Normal	Locked[1]
After frequency change	<15 min	<1 min after relocking to be within 0.1 ppm of steady-state frequency
After band change	None	
After 1 min in RF OFF Mode	<10 min	

SPECTRAL PURITY

Harmonics: (at 1 volt, +13 dBm, output range and below)
>35 dB below fundamental of 0.5 to 128 MHz.
>30 dB below fundamental of 128 to 512 MHz.

Subharmonics and Nonharmonic Spurious: (excluding frequencies within 15 kHz of carrier whose effects are specified in Residual AM and FM): >100 dB below carrier.

Noise: Averaged rms noise level below carrier stated in a 1 Hz bandwidth.

SSB Phase Noise at 20 kHz offset from carrier. (See Figures 1-2 and 1-3.)
256 MHz to 512 MHz: >130 dB from 230 to 450 MHz increasing linearly to >122 dB down at 550 MHz.
0.5 MHz to 256 MHz: Decreases approximately 6 dB for each divided frequency range until it reaches SSB Broadband Noise Floor of >140 dB.

SSB Broadband Noise Floor at maximum vernier greater than 500 kHz offset from carrier. (See Figures 1-2 and 1-3.)
0.5 to 512 MHz: >140 dB.

Residual AM: (Averaged rms)

Post-detection Noise Bandwidth	
300 Hz to 3 kHz	**20 Hz to 15 kHz**
>85 dB down	>78 dB down

Residual FM: (Averaged rms)

	CW and up to 1/8 maximum allowable peak deviation		Up to maximum allowable peak deviation	
Post-detection Noise Bandwidth	300 Hz to 3 kHz	20 Hz to 15 kHz	300 Hz to 3 kHz	20 Hz to 15 kHz
230 to 550 MHz	<5 Hz	<15 Hz	<15 Hz	<30 Hz

Note: Residual FM decreases by approximately ½ for each divided frequency range until limited by broadband noise floor. This limit for 300 Hz to 3 kHz is about 1 Hz, and for 20 Hz to 15 kHz is about 4 Hz. These are measured values in the 230 to 550 MHz range and calculated for divided ranges, knowing the noise distribution.

OUTPUT CHARACTERISTICS

Range: 10 dB steps and 18 dB vernier provide output power settings from +19 to −145 dBm (2V to 0.013 μV) into 50Ω.

Level Flatness: <±0.5 dB from 0.5 to 512 MHz referred to output at 50 MHz. (Flatness applies to +13 to −7 dBm and for top 10 dB of vernier range.)

[1] These specifications are given for the 8640B internal reference. When using an external reference, drift in the locked mode will depend on the external reference characteristics.

Table 1-1. Specifications (3 of 5)

OUTPUT CHARACTERISTICS (Cont'd)

Impedance: 50Ω, ac coupled, 40 Vdc maximum, VSWR <2.0 on 2V and 1V output ranges; <1.3 on all other ranges.

Reverse Power: 20 dBm maximum on 2V and 1V output ranges; 30 dBm maximum on all other ranges.

Auxiliary Output: Rear panel BNC output is ≥−5 dBm into 50Ω, source impedance is approximately 500Ω.

Leakage: (With all unused outputs terminated properly.) Leakage limits are below those specified in MIL-I-6181D. Furthermore, less than 3 μV is induced in a 2-turn, 1-inch diameter loop 1 inch away from any surface and measured into a 50Ω receiver. This permits receiver sensitivity measurements to at least <0.03 μV in a shielded system.

Level Accuracy:

	Using Top 10 dB of Vernier Range			Using Full Vernier Range
Output Level (dBm)	+19 to −7	−7 to −47	−47 to −137	+19 to −145
Total Accuracy as Indicated on Level Meter	±1.5 dB	±2.0 dB	±2.5 dB	Add ±0.5 dB

Note: Level Accuracy error consists of allowances for: meter accuracy, detector linearity, temperature, flatness, attenuator accuracy, and twice the measurement error. All but the attenuator accuracy and the measurement error can be calibrated out with a power meter at a fixed frequency and a fixed vernier setting.

MODULATION CHARACTERISTICS

General

Types: Internal AM and FM.
External AM, FM, and PULSE.
Simultaneous AM and FM or PULSE and FM.

Internal Modulation Sources: (independently adjustable output is available at front panel).

Standard:
Frequency: Fixed 400 Hz and 1 kHz, ±2%.
Output Level: Indicated 10 mV to 1 Vrms into 600Ω.

Optional: (Internal Variable Audio Oscillator Option 001).
Frequency: Variable 20 Hz to 600 kHz, ±10% in 5, decade continuous bands plus fixed 400 Hz and 1 kHz ±2%.

Output Level: 20 mV to 3V into 600Ω.

Total Harmonic Distortion:

<0.25%	400 Hz and 1 kHz fixed tones
<0.5%	20 Hz to 2 kHz
<1.0%	2 kHz to 600 kHz

Amplitude Modulation

(AM specifications apply to the top 10 dB of output vernier range unless otherwise specified.)

Depth: 0 to 100% for output level range of +13 dBm and below and for top 10 dB of vernier range.[1]

AM Rates: INT and EXT ac; 20 Hz to AM 3 dB bandwidth below. EXT dc; dc to AM 3 dB bandwidth below.

AM 3 dB Bandwidth: (See Figure 1-4).

Frequency Bands	0 to 50% AM	50 to 90% AM
0.5 - 2 MHz	20 kHz	12.5 kHz
2 - 8 MHz	40 kHz	25 kHz
8 - 512 MHz	60 kHz	50 kHz

[1] AM is possible above +13 dBm as long as the combination of the AM depth plus carrier output level does not exceed +19 dBm.

Table 1-1. Specifications (4 of 5)

MODULATION CHARACTERISTICS (Cont'd)

Amplitude Modulation (Cont'd)

AM Distortion: (at 400 Hz and 1 kHz rates)

Frequency Bands	0 to 50% AM	50 to 90% AM
0.5 to 512 MHz	<1%	<3%

External AM Sensitivity: (400 Hz and 1 kHz rates) (0.1 ± 0.005)% AM per mV peak into 600Ω with AM vernier at full CW position.

Indicated AM Accuracy: (400 Hz and 1 kHz rates using internal meter)
±8% of reading on 0 - 10 scale.
±9% of reading on 0 - 3 scale (for greater than 10% of full scale).

Peak Incidental PM (at 30% AM)
Less than 0.15 radians, 0.5 to 128 MHz.
Less than 0.3 radians, 128 to 512 MHz.

Peak Incidental Frequency Deviation: Equals PEAK INCIDENTAL PM x MODULATION RATE.

Pulse Modulation

(Specifications apply for top 10 dB of output vernier range.)

Frequency Bands (MHz)	0.5 - 1	1 - 2	2 - 8	8 - 32	32 - 512
Rise and Fall Times	<9 μs	<4 μs	<2 μs	<1 μs	
Pulse Repetition Rate	50 Hz to 50 kHz		50 Hz to 100 kHz	50 Hz to 250 kHz	50 Hz to 500 kHz
Pulse Width Minimum for level accuracy within 1 dB of CW (>0.1% duty cycle)	10 μs		5 μs	2 μs	
Pulse ON/OFF ratio at maximum vernier	>40 dB				
Peak Input Required	Nominally +0.5V (+5V max) waveform, return to zero, into 50Ω Schmitt trigger.				

Frequency Modulation

Deviation: Maximum allowable deviation equals 1% of lowest frequency in each band as below.

Frequency Band (MHz)	Maximum Peak Deviation (kHz)
0.5 - 1	5
1 - 2	10
2 - 4	20
4 - 8	40
8 - 16	80
16 - 32	160
32 - 64	320
64 - 128	640
128 - 256	1280
256 - 512	2560
512 - 1024	5120

FM 3 dB Bandwidth:[1]
Internal and External ac; 20 Hz to 250 kHz.
External dc; dc to 250 kHz.

FM Distortion: (at 400 Hz and 1 kHz rates) See Figure 1-6.
<1% for deviations up to 1/8 maximum allowable.
<3% for maximum allowable deviation.

External FM Sensitivity: 1 volt peak yeilds maximum deviation indicated on PEAK DEVIATION switch with FM vernier at full CW position.

External FM Sensitivity Accuracy: ±6% from 15 to 35°C for FM excluding maximum peak deviation position. Maximum peak deviation position, ±9% typically.

[1] With 8640B in LOCKED MODE, external FM is possible only for rates greater than 50 Hz.

Table 1-1. Specifications (5 of 5)

MODULATION CHARACTERISTICS (Cont'd)

Frequency Modulation (Cont'd)

Indicated FM Accuracy:
(400 Hz and 1 kHz rates using internal meter) ±10% of meter reading (for greater than 10% of full scale).

Incidental AM: (at 400 Hz and 1 kHz rates)
<0.5% AM for FM up to 1/8 maximum allowable deviation.
<1% AM for FM at maximum allowable deviation.

COUNTER CHARACTERISTICS

External RF Input:

Frequency Range: 1 Hz to 550 MHz.
Sensitivity: 100 mVrms, ac only, into 50Ω (−7 dBm).
Maximum Input: 1.3 Vrms (+15 dBm).

External Count Resolution: 6-digit LED DISPLAY

Mode	Normal	Expand X10	Expand X100
0 - 10 MHz	100 Hz	10 Hz	1 Hz
0 - 550 MHz	10 kHz	1 kHz	100 Hz

External Reference Input: 5 MHz, nominally >0.5 Vp-p (5V maximum) into 1000Ω.

Internal Reference Characteristics: (after 2-hr. warm-up)

Accuracy: (after calibration at 25°C)
Better than ±1 ppm for 15 to 35°C.
Better than ±3 ppm for 0 to 55°C.

Drift Rate:
Time: <0.05 ppm per hr, <2 ppm per year.
Temperature: <2 ppm total variation for room ambient 15 to 35°C.
Line Voltage: <0.1 ppm.

Frequency Tuning:
>±20 ppm using internal time base vernier.

Rear Output: nominally >0.5 Vp-p into 500Ω. This will drive another 8640B.

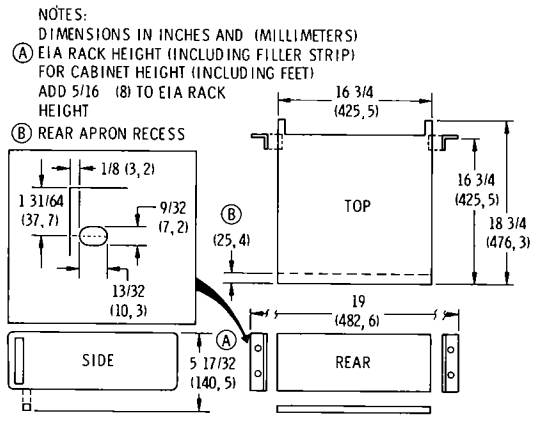
GENERAL CHARACTERISTICS

Operating Temperature Range: 0 to 55°C.

Power Requirements: 100, 120, 220, and 240 volts, +5%, −10%, 48 to 440 Hz; 175 VA maximum. 7½ ft. (2,29 m) power cable furnished with mains plug to match destination requirements.

Weight: Net, 45 lb (20,4 kg).

Dimensions:[1]



[1] Dimensions are for general information only. If dimensions are required for building special enclosures, contact your HP office.