

Plug-In Sweep Generator

610D Series, 100 kHz to 40 GHz



610D Sweep Generator Highlights

- Thirty-One Model Selection
- Broadband Phase Lock and FM Capability
- Substantial Initial Cost Savings
- Field-Proven Reliability and Value

Plug-In Economy and Versatility

From a selection of 31 single-band, dual-band, and multi-band plug-ins covering the 100 kHz to 40 GHz range, there is a low-cost solution to almost every swept measurement application. Many options are offered so that the 610D can be readily adapted to widely varying requirements. With years of proven performance in the field, the 610D is the favorite of those who demand top performance at a low initial investment.

Marker Systems

A selectable Intensity, Video, or RF marker is standard. Option 1 adds a crystal-controlled frequency marker comb providing marker intervals of 1, 10, 50, and 100 MHz with 0.01% accuracy. Option 14 is an External RF Marker input which accepts a 1 MHz to 1 GHz signal. Option 11 provides two additional Variable Frequency Markers, which are available in both ΔF and F_1-F_2 sweep modes.

The 610D is the only sweeper with an Intensity Marker system that can be used with any oscilloscope and does not require Z-axis modulation. This patented intensity dot is especially useful in applications where attenuation or AGC is present. Since the dot is generated by merely stopping the sweep briefly and allowing the CRT brightness to build up, it operates independently of all external devices.

Phase Lock and FM Capability

With Option 28, the 610D can be phase locked with an external synchronizer to obtain synthesizer-like stability and noise level. For applications requiring external FM, Option 28 provides dc to 1 MHz frequency response.

Flicker-Free Display

The 610D provides both positive and negative bandswitch blanking to eliminate bright intensity dots at the bandswitch points in multiband plug-ins. In addition, all plug-ins, including the 10 MHz to 18.5 GHz and the 2 to 18.5 GHz models, sweep fast enough to produce a flicker-free display when used with normal CRT phosphors.

Remote Programming

To make the 610D suitable for ATE applications, it has been designed to be frequency programmable. Since the internal oscillators are voltage tunable, an external voltage can be applied to the remote control terminal on the rear panel to obtain a desired CW output. An ac voltage superimposed on a dc level provides a sweep output. Sensitivity is 9.75 volts for a full band frequency change. Also useful in programming applications is the full band dc signal available from the rear panel.

Network Analyzer Compatibility

A standard feature of the 610D is its complete compatibility with all HP8410 network analyzers. Sequential sync, sweep dwell, and 1 volt/GHz are available from the rear panel. The Model 6247D plug-in furnishes continuous coverage over the 10 MHz to 18 GHz range of the 8410C.

Preset Frequencies

Option 4 includes a panel switch on which three bands, such as C, X or Ku, can be preset. This option is particularly useful when tests are made over repetitive frequency ranges.

General Purpose Interface Bus

Option 16 conforms to IEEE-488 and provides digital frequency control with 10,000 point resolution over the full range of the plug-in. Other features included are a programmable remote sweep triggering capability and a programmable residual FM quieting filter.

Specifications

Frequency Range: 100 kHz to 40 GHz, determined by plug-in range. Please see pages 62 and 63.

Frequency Dial: 18.5 cm (7.3 in.) linear scale, machine divided.

Sweep Controls:

Start-Stop: Sweeps from F1 to F2. Both F1 and F2 are independently adjustable over the full range.

ΔF Sweep: Sweep is centered at Variable Frequency Marker setting. Width is adjustable from 0 to 10% of the band. Control reads directly in percent of the band, calibrated up to 10% with ±10% accuracy.

CW Operation: Single-frequency output may be switch-selected at either F1, F2, or Variable Marker settings.

Remote: Permits sweeping with external voltage or programming ΔF sweep and center frequency with external resistors or voltages. (Please see Option 4.)

Marker Outputs:

Variable Frequency Markers: Three types of variable marker outputs available with 1% of the band accuracy.

RF Pip: Reduces RF momentarily, amplitude adjustable.

Video Marker: Adds negative video pulse to vertical output.

Intensity Marker: Develops brightened dot on CRT trace by momentarily slowing sweep.

Sweep Time: Continuously adjustable in four decade ranges from 0.01 to 100 s per sweep.

Sweep Mode:

Auto: Sweep occurs automatically.

Line Sync: Sweep occurs automatically synchronized with power line.

Manual: Front-panel control provides continuous uncalibrated manual adjustment of frequency between the end frequencies set. The horizontal voltage out tracks the frequency.

Triggered: Single sweep is actuated by front-panel pushbutton or external signal (>1 μs, +1 to +25V) applied at rear.

RF Retrace: RF may be switched On or Off during retrace.

Leveling: External leveling may be achieved with a negative detector. In addition, internal leveling is standard on most plug-ins.

Modulation:

Internal AM: Square-wave modulation of 1 kHz, adjustable in frequency, with an On/Off ratio that is typically greater than 30 dB at rated output power.

External AM: 60 kHz bandwidth typical. Input impedance approximately 18K ohms, ac coupled.

External FM:

Sensitivity: ±1% of full band sweep per volt input.

Sensitivity (Option 28): 20 MHz/V or 6 MHz/V, switch selectable.

Maximum Input: ±10V peak.

Bandwidth (3 dB):

Models 6104C and 61084D: 60 kHz at 1% deviations.
40 kHz at 10% deviation.

Other Models (typical): 100 kHz at 10% deviation

Deviation:

Modulation Frequency	Frequency Range	Deviation	
		Standard	With Option 28
DC to 100 Hz	Full Band	10%	N/A
>100 Hz to 1 kHz	Full Band	1%	N/A
DC to 100 kHz	≤ 8 GHz	N/A	± 50 MHz
>100 kHz to 1 MHz	> 8 GHz	N/A	± 30 MHz
	Full Band	N/A	± 2 MHz

1V/GHz Output: Provides a reference voltage proportional to the output frequency.

Trigger Input: Permits external triggering of sweep with a pulse >1 ms, +1V to +25V.

Dwell Input: Slows the sweep when a ground potential is applied.

Horizontal Output: Direct coupled sawtooth 0 to +11.2V concurrent with the sweep.

Pen Lift Contacts: Provides contact closure during sweep.

Blanking Outputs:

Sequential Sync: Provides combined retrace blanking and bandswitch blanking signal.

Retrace Blanking: Provides selectable + or -6V during retrace

Bandswitch Blanking: Provides + or -10V during bandswitching.

Rear Panel Connectors and Switches:

115/230V line selector switch (50 or 400 Hz)

TRIGGER INPUT

BLANKING and BANDSWITCH BLANKING OUTPUTS

1V/GHz OUTPUT

EXT AM and EXT FM INPUTS

DWELL INPUT

INTERNAL AM switch and FREQUENCY ADJUST

REMOTE FREQUENCY PROGRAMMING terminals

FM/NORMAL switch

SEQUENTIAL SYNC OUTPUT

Line Power: 115/230 Vac, 50 to 400 Hz. 140 W max.

Dimensions: 17.8 H x 44.6 W x 34.6 D cm (7 H x 17-9/16 W x 13-5/8 D in.)

Weight:

Model 610D Mainframe: 8.2 kg (18 lb)

Shipping Weight: 11.8 kg (26 lb)

Plug-Ins: 4.5 kg (10 lb)

Shipping Weight (typical): 6.4 kg (14 lb)

Ordering Information

Model 610D Mainframe \$3,150

Options: Up to three can be provided on the front option panel. However, Option 1, 4, and 11 are not available in the same instrument.

Option 1: Crystal-Controlled Frequency Marker Comb providing 1, 10, 50 and 100 MHz marker spacing \$750

Option 2C: RF Detector, 50Ω, Type N female \$300

Option 2D: RF Detector, 75Ω, Type N female \$300

Option 4: Preset Frequencies enabling the setting of up to three output center frequencies and sweep widths on front option panel \$175

Option 7: External Leveling Input on rear panel in parallel with front panel connector \$10

Option 8: Variable Marker Out on rear panel providing pulse coincident with variable frequency marker \$10

Option 11: Three additional variable markers \$500

Option 14: External RF Marker Input on rear panel accepting 1 MHz to 1 GHz signal to produce a frequency marker. Option 1 must be ordered with Option 14 \$25

Option 16: IEEE-488 General Purpose Interface Bus \$1,100

Option 21: 75Ω Output Impedance for Model 6104C \$65

Option 28: Phase Lock Capability. Not available on Models 6104C and 61084D \$300

61084D/75: 75Ω Output Impedance for Model 61084D.

1.4 SWR, max \$350

ACCESSORIES

P/N B383: Plug-In Extender Cable \$95

P/N B533-2: Rack Mount Hardware for 610D \$15

No charge when ordered with 610D.

P/N B588: Extender Card for 610D PC boards \$25

P/N B7478: Adapter Cable for use with HP8410 \$60

P/N 2100-2: Interface Cable for Option 16, 2 m long \$75

P/N 2100-4: Interface Cable for Option 16, 4 m long \$95

2100-1 GPIB Cable, 1 m (3.3 ft) long \$60

2100-2 GPIB Cable, 2 m (6.6 ft) long \$75

2100-4 GPIB Cable, 4 m (13.2 ft) \$95

2100-5 GPIB Cable, 0.5 m (1.65 ft) \$55

Plug-In Sweep Generators (Cont.)

610D Series Plug-Ins

Plug-In Model	Frequency Range	Leveled Output Power (Maximum)	Leveled Power Variations (dB)	Leveling Slope Control	1 dB Step Attenuator Range (dB)	Frequency Accuracy (25°C)	Frequency Stability		
							With Temperature (Per °C)	With 10% Line Voltage Change	Frequency Pulling With 3:1 SWR
Multiband									
6221D 6221D-10	2 to 12.4 GHz	5 mW (+7 dBm) 10 mW (+10 dBm)	±0.6	Yes	–	±100 MHz	±0.05%	0.001%	0.02%
6225D 6225D-10	4 to 18.5 GHz	5 mW (+7 dBm) 10 mW (+10 dBm)	±0.9	Yes	–	±100 MHz	±0.05%	0.001%	0.02%
6237D 6237D-10 6237D-15	2 to 18.5 GHz	5 mW (+7 dBm) 10 mW (+10 dBm) 15 mW (+11.7 dBm)	±0.9	Yes	–	±100 MHz	±0.05%	0.001%	0.02%
6247D 6247D-10	10 MHz to 18.5 GHz	5 mW (+7 dBm) 10 mW (+10 dBm)	±1	Yes	–	±125 MHz	±0.05%	0.001%	0.02%
Dual Band									
6213D	10 MHz to 4.2 GHz	10 mW (+10 dBm)	±0.4	Yes	–	±25 MHz	±0.1%	0.001%	0.02% or 400 kHz
6215D	1 to 4 GHz	20 mW (+13 dBm)	±0.5	Yes	–	±40 MHz	±0.05%	0.001%	0.1%
6219D	2 to 8 GHz	10 mW (+10 dBm)	±0.5	Yes	–	±80 MHz	±0.05%	0.001%	0.02%
6223D	4 to 12.4 GHz	10 mW (+10 dBm)	±0.5	Yes	–	±80 MHz	±0.05%	0.001%	0.02%
6229D	7.9 to 18.5 GHz	8 mW (+9 dBm)	±0.8	Yes	–	±100 MHz	±0.05%	0.001%	0.02%
Single Band									
6104C	0.1 to 110 MHz	20 mW (+13 dBm)	±0.15	No	79	±1 MHz	±50 kHz	0.001%	1 kHz
61084D	1 to 1,500 MHz	10 mW (+10 dBm)	±0.2	Yes	79	±12 MHz	±500 kHz	0.001%	500 kHz
6109D	10 to 2,000 MHz	20 mW (+13 dBm)	±0.3	Yes	–	±20 MHz	±500 kHz	0.001%	500 kHz
6110D	1 to 2 GHz	20 mW (+13 dBm)	±0.5	Yes	–	±10 MHz	±0.01%	0.001%	0.5%
6112D	1.4 to 2.5 GHz	20 mW (+13 dBm)	±0.2	Yes	–	±10 MHz	±0.01%	0.001%	0.05%
6114D	2 to 4 GHz	20 mW (+13 dBm)	±0.5	Yes	–	±20 MHz	±0.01%	0.001%	0.01%
6116D	1.7 to 4.3 GHz	10 mW (+10 dBm)	±0.6	Yes	–	±20 MHz	±0.01%	0.001%	0.01%
6120D	3.6 to 6.5 GHz	20 mW (+13 dBm)	±0.3 (±0.03/30 MHz)	Yes	–	±15 MHz	±0.01%	0.001%	0.01%
6124D	4 to 8 GHz	10 mW (+10 dBm)	±0.4	Yes	–	±30 MHz	±0.01%	0.001%	0.01%
6126D	3.7 to 8.3 GHz	10 mW (+10 dBm)	±0.6	Yes	–	±40 MHz	±0.01%	0.001%	0.01%
6127D	5.9 to 9 GHz	10 mW (+10 dBm)	±0.3	Yes	–	±40 MHz	±0.01%	0.001%	0.01%
6128D	7.9 to 12.4 GHz	10 mW (+10 dBm)	±0.4	Yes	–	±50 MHz	±0.02%	0.001%	0.01%
6130D	12.4 to 18.5 GHz	10 mW (+10 dBm)	±0.5	Yes	–	±50 MHz	±0.03%	0.001%	0.01%
6131D	10 to 15.5 GHz	10 mW (+10 dBm)	±0.4	Yes	–	±40 MHz	±0.02%	0.001%	0.01%
6132D	17 to 22 GHz	5 mW (+7 dBm)	±0.8	Yes	–	±70 MHz	±0.05%	0.001%	0.02%
6136D-1	18 to 26.5 GHz	3 mW (+5 dBm)	–	Yes	–	±100 MHz	±0.05%	0.001%	0.05%
6140D-1	26.5 to 40 GHz	1 mW (0 dBm)	–	Yes	–	±200 MHz	±0.05%	0.001%	0.05%

¹ Measured in 30 Hz–28 kHz bandwidth at 115 Vac. Residual FM is increased approximately twofold at 50 Hz line frequency.

² Measured at maximum rated power.

³ Excluding 5% band edges, where specification is –20 dBc.

⁴ Output SWR is 1.3 from 2 to 8 GHz, 1.5 from 8 to 12.4 GHz, and 1.8 from 12.4 to 18.5 GHz.

⁵ Harmonics are –20 dBc from 10 to 100 MHz and from 2 to 4.2 GHz (–17 dBc on 6247D) and –30 dBc from 100 MHz to 2 GHz and above 4.2 GHz.

⁶ SWR is 1.4 from 10 MHz to 2 GHz, 1.3 from 2 to 8 GHz, 1.5 from 8 to 12.4 GHz, and 1.8 from 12.4 to 18.5 GHz.

⁷ Nonharmonics are –30 dBc from 10 MHz to 2 GHz and –60 dBc from 2 to 4.2 GHz.