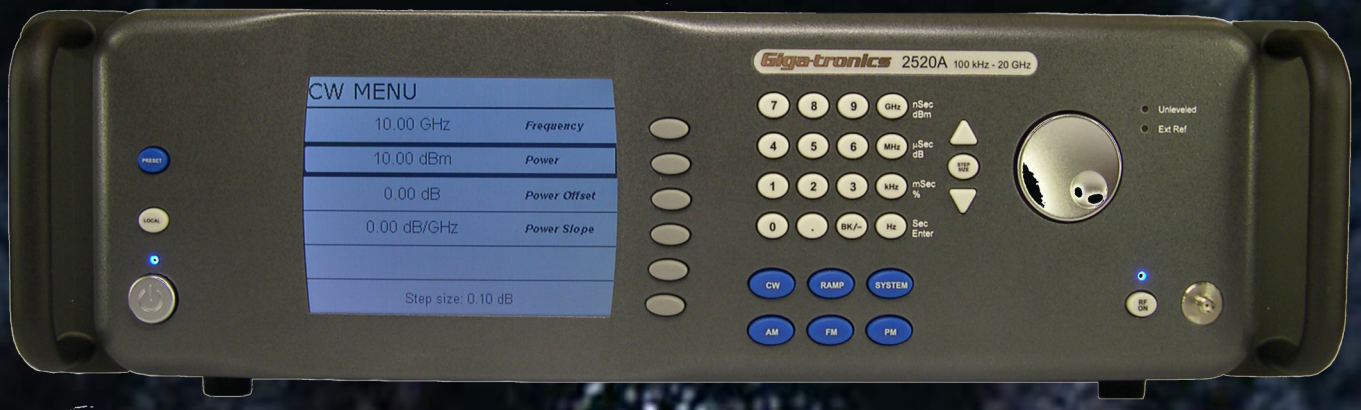
Technical Data Sheet

Panther 2500A

RF/Microwave Signal Generator

100 kHz to 40 GHz



Combines the best offset phase noise performance and fast switching speed in a single unit

Analog, RF & Microwave

Giga-tronics

Signal Generation, Routing & Measurement

Datasheet

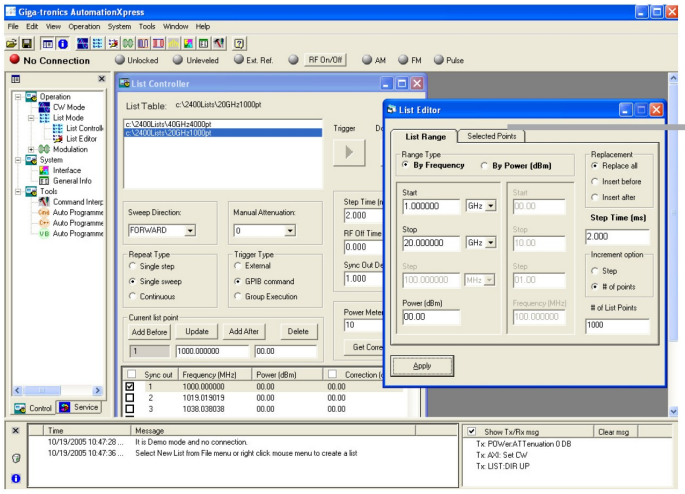
Panther 2500A Series

Microwave Signal Generators

Signal Generator	Frequency Range
2508A/2508AS	100 kHz - 8 GHz
2520A/2520AS	100 kHz - 20 GHz
2526A/2526AS	100 kHz - 26.5 GHz
2540A/2540AS	100 kHz - 40 GHz

Available Options and Accessories

17	Delete Modulation Suite
18	Delete 100 kHz to 2 GHz
23	Type N Connector (2520 Series only)
26	Delete Step Attenuator
31	2 msec. Switching Speed Limit
44	Delete Front Panel, 2500AS series only
46	Rack Slide Kit
55	Command Sets



The new Panther 2500A series signal generators delivers industry-best offset phase noise performance, high output power, and fast frequency switching speeds in a single unit. The Panther series signal generators are offered in two different configurations designed for bench top and ATE applications covering 100 kHz to 8 GHz, 20 GHz, 26.5 GHz, and 40 GHz with frequency resolution of 0.0001 Hz over the entire band.
Loaded with standard performance features such as high time base stability, frequency modulation (FM), high-speed pulse/square wave modulation (PM), amplitude modulation (AM) and high leveled output power makes the new Panther series an excellent test solution for a wide range of CW, modulation, swept frequency, and fast frequency switching applications in both R&D and manufacturing environment.

Advanced Synthesizer Technology

The Panther 2500A series signal generator utilizes Giga-tronics' new Advanced Synthesizer Technology that delivers excellent close in phase noise performance of -84 dBc @ 100 Hz and -104 dBc @ 1kHz offset and ultra low phase noise performance of -111 dBc @ 10 kHz and 100 kHz offset on a 10 GHz carrier frequency.

Fast Frequency Switching

The fast frequency switching of the Giga-tronics Panther 2500 Series Microwave Synthesizer pays dividends in any test environment where large amounts of data are collected. Regardless of the complexity of your application, such as antenna characterization or RFIC testing, the 2500 Series will quickly prove itself as your best test investment by providing quick settling of amplitude and frequency for minimum waiting between measurement points. In addition, the 2500 Series Automation Xpress software and interface option ensures unmatched 1.0 ms CW frequency and power switching performance, providing fast and flexible data exchange rates for faster testing and more device throughput.

Faster to Program

Every 2500A Series Microwave Synthesizer comes with Giga-tronics Automation Xpress, a PC based software package designed for enhanced user interface and automatic test systems. Automation Xpress leverages industry leading software applications, familiar Windows drop-down menus and other functions to perform tasks. Using Windows-based applications, such as Microsoft™ Excel or Notepad, engineers can create, manage and download complex lists in seconds.

Simpler to Operate

The 2500A was designed to streamline user navigation by moving complex testing functions from the front panel to the desktop PC. The result is a groundbreaking system that reduces training time, speeds workflow and dramatically boosts end-user productivity. To enhance user navigation, we minimized the number of soft screens and menu layers, simplifying content and improving operational performance. That means you'll spend less time scrolling through data menus and more time getting your work done.

All specifications apply over a 0˚C to +55˚C range after 30 minutes of warm-up time unless otherwise stated.

Optimized for ATE

With the 2500A Series, ATE integrators now have a system source specifically designed to match their unique performance needs. The 2500A Series works seamlessly with other instruments. It includes hardware triggering and synchronization signals with programmable delays to allow coordination with other test products in your system. Replacing other industry-standard microwave synthesizers can also be accommodated, making the 2500 Series an ideal choice for upgrading older systems.

Compatibility

The Panther 2500A series unit has full command compatibility with the 2400 series and previous generation signal generators from Giga-tronics. In addition, Giga-tronics offers optional command sets for the legacy signal generators offered by other manufacturers allowing customers to replace all the legacy signal generators with a single unit from Giga-tronics.

Standard 4 Year Warranty

The Excellent reliability and trouble-free operation are features that you demand in a microwave synthesizer. Built on proven 2400B series Signal Generator technology and excellent reliability history, the 2500A signal generator comes with a 4 year warranty at no additional cost!

2500A SERIES SPECIFICATIONS

Frequency

Accuracy: Same as time-base

Resolution: 0.1 Hz

Power Slope: 0 to 0.5 dB/GHz

Internal Reference: 10 MHz, 100 MHz

Aging Rate: (after 30 days of warm up)

< 5 x 10^{-10}/day (10 MHz)

Temperature Stability: (after 30 days of warm up)

< 2.5 x 10^{-8}/˚C (10 MHz)

10 MHz Reference Output: TTL level into 50 Ω

External Reference Input: 10 MHz or 100 MHz ± 1ppm

> - 5 dBm into 50 Ω

Volts/GHz: 0 to 10 V range:

0.50 V/GHz, 0.01 – 20 GHz

0.25 V/GHz, 20 – 40 GHz

Lock/Level Indicator: Sync Out = TTL High

FREQUENCY BANDS

Band	Frequency	N
0	0.1– 9.99 MHz	N/A
1	10 – 16.00 MHz	512
2	16.01 – 31.00 MHz	256
3	31.01 – 63.00 MHz	128
4	63.01 – 125.00 MHz	64
5	125.01 – 250.00 MHz	32
6	250.01 – 500.00 MHz	16
7	500.01 – 1000.00 MHz	8
8	1.01 – 2.00 GHz	4
9	2.01 – 4.00 GHz	2
10	4.01 – 10.1 GHz	1
11	10.11 – 20.20 GHz	1/2
12	20.21 – 40.00GHz	1/4

Output Power

Maximum Leveled (dBm)[1] (Specification applies over 0 to 35ºC range and degrades <2.0 dB from 35ºC to 55ºC)

Model	0.1-10 MHz	0.01-2 GHz	2-8 GHz	8-20 GHz	20-26.5 GHz	26.5-40 GHz
2508	10	14	17	N/A	N/A	N/A
2520	10	14	17	20	N/A	N/A
2526	10	14	13	15	10	N/A
2540	10	14	13	15	10	9

Power Offset: 0 to 10 dB

Resolution: 0.05 dB

Temperature Stability: 0.025 dB/ºC

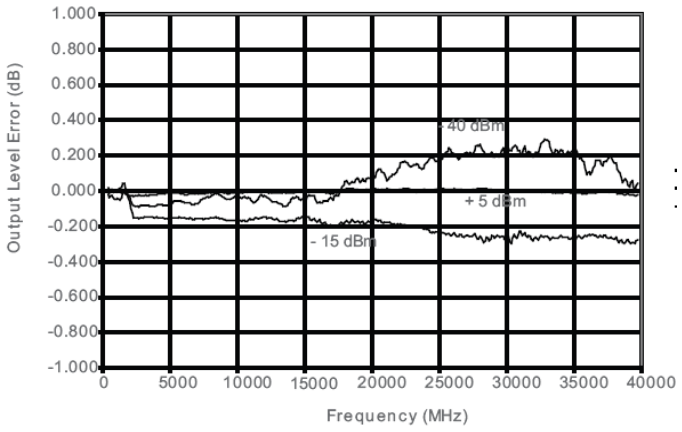
Output Source Match (typical): < 2.0:1

Accuracy (dB) (Specifications apply over 15 to 35ºC range and degrades <0.5 dB outside the range)

Output Power and Level Accuracy for the 2500A Series

Frequency Range	> 5 dBm	> -20 dBm	> -110 dBm
100 kHz - 20 GHz	± 0.85	± 0.65	± 1.15
20 - 40 GHz	± 1.05	± 0.85	± 1.35

2540A Output Level Error Accuracy



Spectral Purity

Harmonics

Power out =max level or +10 dBm, whichever is lower

(Specifications for harmonics above instrument frequency range are typical.)

Frequency Range	Harmonics
0.1 - 10 MHz	-30 dBc
10 - 100 MHz	-45 dBc
0.1 - 2.0 GHz	-55 dBc
2.0 - 20.0 GHz	-55 dBc
20.0 - 40.0 GHz	-30 dBc

[1] With Option 26, Delete Step Attenuator. For standard models, the step Attenuator reduces power by 1.5 dB to 18 GHz; 2.0 dB, 18- 26.5 GHz, and 2.5 dB above 26.5 GHz.

Sub-Harmonics

Power out =max level or +10 dBm, whichever is lower

Frequency Range	Sub-Harmonics
100 kHz - 2.0 GHz	-80 dBc
2.01 - 20.2 GHz	-60 dBc
20.21 - 40.0 GHz	-50 dBc

Spurious (Specification is -45 dBc typical for offsets < 300 Hz)

Frequency Range	Sub-Harmonics
100 kHz - 10.10 GHz	-65 dBc
10.11 - 20.20 GHz	-60 dBc
20.21 - 40.00 GHz	-54 dBc

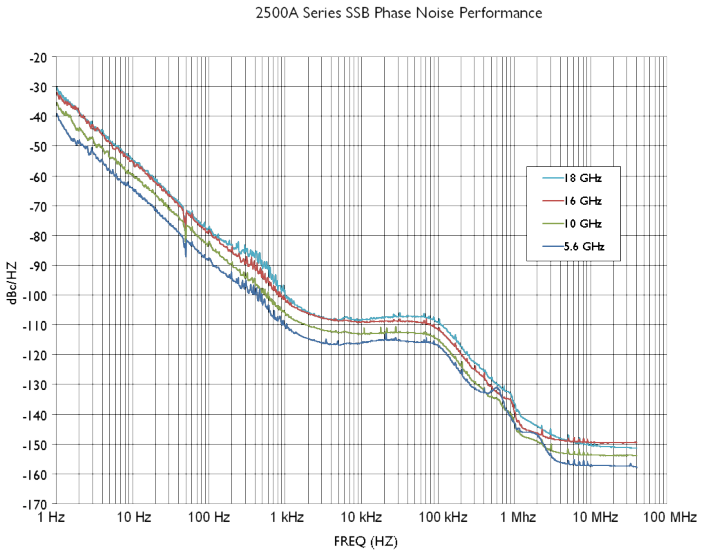
Residual FM (typical): 50 Hz - 15 kHz Bandwidth

Frequency Range	Residual FM
100 kHz - 20.20 GHz	<6 Hz
20.21 - 40.00 GHz	<12 Hz

AM Noise (typical) offset > 5 MHz

Frequency Range	AM Noise
100 kHz - 2.00 GHz	-130 dBm/Hz
2.01 - 20.20GHz	-145 dBm/Hz
20.21 - 40.00 GHz	-140 dBm/Hz

SSB Phase Noise (Plotted without Spurs)



[2] Sweep rate must be < 500 MHz/msec.

[3] Time for frequency to settle within 50 kHz of final value after a frequency switch.

Output Power

Frequency/Power Sweep - A Series and S Series

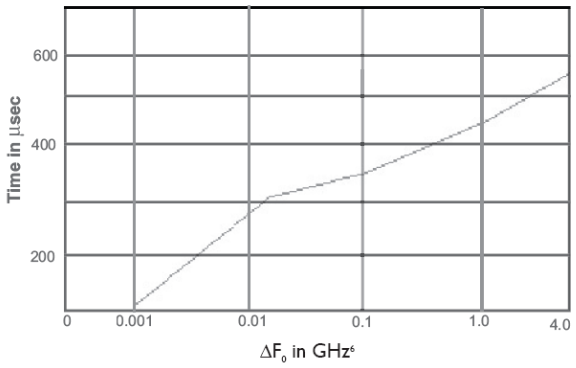
Ramp Frequency Sweep:	Full Frequency Coverage
Ramp Power Sweep:	0 to 25 dB
Power Slope:	0 to 0.5 dB/GHz
Power Flatness:	See Accuracy table
Ramp Output:	0 to 10V
Z-Axis Blanking:	+ 5V (Positive Only)
Sweep Time[2]:	10 ms - 200 ms

List Mode

Number of List Points: 4000

Frequency Settling Time[3]:	< 550 µsec for ΔF_0 [4] ≤ 500 MHz
Amplitude Settling Time[5]:	< 500 µsec
Step Time:	150 µsec - 1 sec
	2 ms - 1 sec (option 31)
Sync Out Delay[6]:	50 µsec - 10 msec
Trigger Modes:	EXT, GPIB GET, Software
Sweep Modes:	Continuous, Single Step, & Single Sweep

2500A Series Typical Frequency Settling Time



Modulation Specifications:

Amplitude Modulation[7] (Specification applies for frequencies above 10 MHz)

Depth:	0 — 90% (Level = 0 dBm)
Rate (3 dB Bandwidth):	DC — 10 kHz (depth = 30%)
Sensitivity:	0 — 95% /V selectable
Accuracy:	± 10% of setting at 1 kHz rate
Input:	
Range:	± 1 V
Impedance:	600Ω

Scan Modulation (Specification applies for frequencies below 20 GHz)

Depth:	> 60 dB
Scan Time:	200 ms - 10 sec
Maximum Number of Points:	4000
Minimum Time per Point:	1 ms

[4] $\Delta F_0 = | (F_{stop} \times N_{stop}) - (F_{start} \times N_{start}) |$ - See Frequency Bands Table for N values.

[5] Time for amplitude to settle within 0.1 dB of final value after an amplitude switch.

[6] Delay is specified from edge of trigger pulse.

[7] Modulation peaks must be less than maximum available power

Modulation Specifications (Continue):

Scan Pattern: $\frac{\text{Sin (x)}}{\text{X}}$

Minimum # of Lobes: 1

Frequency Modulation (Specification applies for frequencies above 10 MHz)

Narrow Mode: (Deviation Limited Modulation Index)

Rate (3 dB bandwidth): DC - 50 kHz

Peak Deviation: $\frac{1\text{ MHz}}{\text{N}}$

Accuracy: ± 5% at 5 kHz rate with 1V peak input

Wide Mode: (Modulation Index < 2.5/N)

Rate (3 dB bandwidth): 50 kHz - 8 MHz

Peak Deviation: $\frac{20\text{ MHz}}{\text{N}}$

Accuracy: ± 5% at 200 kHz rate with 1V peak input

Input (Narrow Mode, Wide Mode):

Range: ± 1V

Impedance: 50 Ω

Pulse Modulation (Specification applies for frequencies above 500 MHz)

On/Off Ratio: > 80 dB

Rise/Fall Times:

Frequency	Rise Time
0.5 - 20 GHz	< 10 ns
20 GHz - 40 GHz	< 25 ns

Minimum Leveled Pulse Width: 100 ns

Minimum Unleveled Pulse Width: 10 ns external
50 ns internal

Level Accuracy[8]: ± 0.5 dB, Pulse Width > 250 ns (relative to CW)
+1.5 / -0.5 dB, Pulse Width >150 -250 nS
+2.5 / -0.5 dB, Pulse Width 125 - 150 nS

PRF (50% duty cycle): DC - 5 MHz Leveled
DC - 10 MHz Unleveled

Pulse Fidelity (typical):

Overshoot & Ringing: < 15%

Video feed through: 0.5 - 2 GHz (< 5%)
2 - 40 GHz (< 1%)

Compression: < ± 5ns

Delay: < 75 ns

Input

Sensitivity: TTL levels (polarity selectable)

Impedance: 50 Ω

Internal Function Generator:

AM Modulation Source

Waveforms: Sine, Square, Triangle, Ramp, Gaussian Noise

Rate: 0.01 Hz to 10 kHz, all waveforms

Resolution: 0.01 Hz

Accuracy: Same as time base

AM Out: 2V, peak to peak into 10 kΩ Load

FM Modulation Source

Waveforms: Sine, Square, Triangle, Ramp, Gaussian Noise

Rate: 0.01 Hz to 1 MHz, all waveforms

Resolution: 0.01 Hz

Accuracy: Same as time base

FM Out: 2V, peak to peak into 10 kΩ Load

PM Modulation Source

Width: 0.05 µs. to 0.01 s.

Pulse Repetition Interval: 0.2 µs to 1 s.

Sync. Out Delay: 0 to 10 ms.

Resolution: 10 ns.

Accuracy: Accuracy: +/-0.1% typical, worst case: ±2% of setting or ±20 ns whichever is greater

PM Out: 2 Volts into 50 Ω

Inputs & Outputs:

Lock/Level Output

Connector		
EXT REF Input	RF Output	AM Output
AM IN	10 MHz REF Output	FM Output
FM IN	100 MHz REF Output	Pulse Output
PM/PM Trigger IN	V/GHz Output	Pulse Sync Output
External ALC	Sync Output	
Trigger In	Blanking Output	
Stop Sweep I/O	Ramp Output	
	Lock/Level Output	

Remote Programming

Hardware Interface: IEEE 488.2 RS-232 & USB (w/supplied adapter)

Software Interface: SCPI, GT12000, GT9000, GT900
Automation Xpress Interface (Standard)

Execution Speed (IEEE 488.2):

	AXI	SCPI
CW Switching	1.0 ms	28 ms
4000 Point List Download	13 sec	28 sec

[8] Duty Cycle must be > 0.01%)

Remote Programming

Automation Xpress Interface (AXI)

For use with Giga-tronics Automation Xpress software. The AXI provides Xpress 1.0 ms CW Frequency/Power switching, faster data exchange and functional downloads/executions, and a stable API programming interface for the ATE programming environment.

Automation Xpress Requirements- All 2500 Series models
20 MB Disk Space
Windows 2000, Windows XP
128 MB RAM or greater

Remote Interface

GPIB (IEEE 488.2, 1987) with listen and talk
RS - 232

Physical

Environmental:	MILPRF-28800F. Class 3
Safety:	EN61010
Weight:	< 35 lbs
Emissions:	EN61326
Rack Height:	3U (5.25 inches)
Connector Types (All Series):	2508 (N(f)), 2520/2526 (SMA(f)) 2540 (K(f))

2500AS Series Only

2500AS Series include:
Rear RF Output
Delete Front Panel Option
includes front panel LED Indicators: Power, EXT REF, Unleveled

Giga-tronics Support Services

At Giga-tronics, we understand the challenges you face. Our support services begin from the moment you call us. We help you achieve both top-line growth and bottom-line efficiencies by working to identify your precise needs and implement smart and result orientated solutions. We believe and commit ourselves in providing you with more than our superior test solutions.

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