Giga-tronics

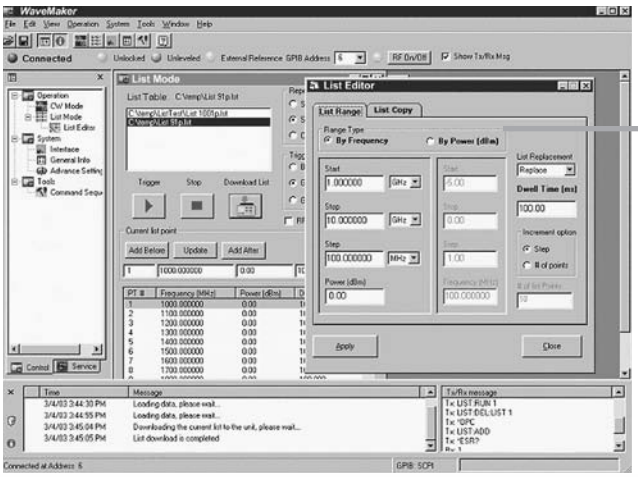
2400 Series

Microwave Synthesizer

CW Generator	Signal Generator	Frequency Range
2408L/AL	2408M/AM	10 MHz - 8 GHz
2420L/AL	2420M/AM	10 MHz - 20 GHz
2426L/AL	2426M/AM	10 MHz - 26.5 GHz
2440L/AL	2440M/AM	10 MHz - 40 GHz

Available Options and Accessories

22	Rear RF output (standard for A Series)
24	Internal Modulation Generator (M Series only)
26	Step Attenuator
28	High Stability Timebase (standard for L/M Series)
43	Frequency & Power Sweep (L/M Series only)
45	Rack Ears (L/M Series only)
48	Automation Xpress Software/Automation Xpress Interface (AXI)



Fast Frequency Switching

The fast frequency switching of the Giga-tronics 2400 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 2400 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 2400 Series Automation Xpress software and interface option ensures unmatched 2.5 ms CW frequency and power switching performance, providing fast and flexible data exchange rates for faster testing and more device throughput.

Low Phase Noise

The Giga-tronics 2400 Series Microwave Synthesizers deliver state of the art phase noise and fast switching simultaneously. The 2400 Series low noise, high power and excellent phase stability are ideal for serving as your measurement system's local oscillator and makes it suitable to serve as a low jitter clock.

Faster to Program

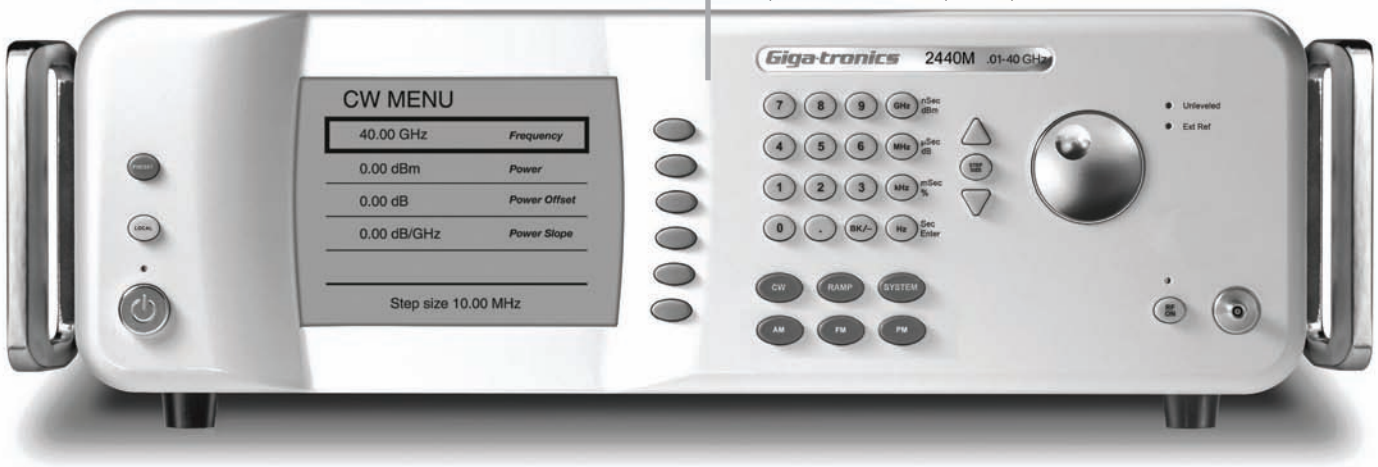
Every 2400 Series Microwave Synthesizer comes with Giga-tronics WaveMaker, a PC based software package designed for enhanced user interface and automatic test systems. WaveMaker leverages industry-leading software applications and familiar Windows drop-down menus and other functions to perform tasks. Using any Windows-based application, such as Microsoft™ Excel or Notepad, engineers can create, manage and download complex lists in a matter of seconds-right from the comfort of their desktop PC.

Simpler to Operate

From the first glance, it's clear the Giga-tronics 2400 Series is different. Its innovative design and intuitive interface will make you productive right out of the box. The 2400 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.

2400A Series Optimized for ATE

With the 2400A Series, ATE integrators now have a system source specifically designed to match their unique performance needs. The 2400A Series works seamlessly with other instruments. It includes hardware triggering and synchronization signals with programmable delay to allow coordination with other test products in your system. Emulating other industry-standard microwave synthesizers can be accommodated, making the 2400A Series the ideal choice for upgrading older systems. The 2400A Series standard features include a 3U rack mountable microwave synthesizer with rack ears, a high stability timebase option, rear RF-output, GPIB-interface, and a blank front panel-all for one competitive price.



2400 Series
Technical Specifications

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

Frequency

Accuracy:	Same as time-base
Resolution:	0.1 Hz
Power Slope:	0 to 0.5 dB/GHz
Internal Reference:	100 MHz
Aging Rate:	< 1 X 10^{-8}/day
Temperature Stability:	< ± 2 X 10^{-8}/ºC
10 MHz Reference Output:	TTL level into 50 Ω
External Reference Input:	10 MHz or 100 MHz ± 1ppm > - 5 dBm into 50 Ω
High Stability Time Base (Option 28)	10 MHz
Aging Rate	< 5 X 10^{-10}/day
Temperature Stability	< ± 5 X 10^{-10}/ºC
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	10 – 15.99 MHz	512
1	16 – 30.99 MHz	256
2	31 – 62.99 MHz	128
3	63 – 124.99 MHz	64
4	125 – 249.99 MHz	32
5	250 – 499.99 MHz	16
6	500 – 999.99 MHz	8
7	1.0 – 1.99 GHz	4
8	2.0 – 3.99 GHz	2
9	4.0 – 7.99 GHz	1
10	8.0 – 15.99 GHz	1/2
11	16.0 – 31.99 GHz	1/4
12	32.0 – 40.00 GHz	1/8

Output Power

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

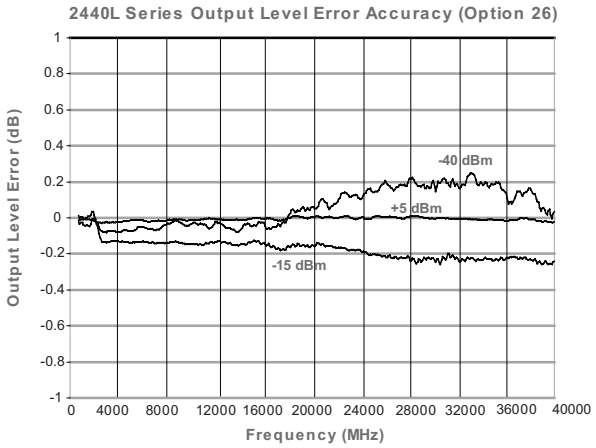
Model	.01 - 8 GHz	8 - 20 GHz	20-40 GHz[2]
20 GHz	+ 16	+ 15	—
26.5 GHz	+ 13	+ 9	+10
40 GHz	+ 10	+ 9	+9

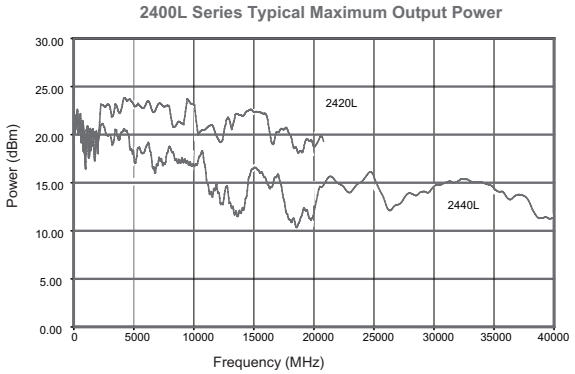
Minimum Settable:	-20 dBm; -10 dBm, >20 GHz
(Option 26)	-110 dBm ; -100 dBm, >20 GHz
Power Offset:	0 to 10 dB
Resolution	0.05 dB
Temperature Stability:	0.025 dB/ºC
Output Source Match (typical):	< 2.0:1

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

Model	> 5 dBm	> -20 dBm	> -110 dBm
.01 - 20 GHz	± 1.0	± 0.8	± 1.3
20 - 40 GHz	± 1.2	± 1.0	± 1.5

Output Power and Level Accuracy for the 2400 Series





Spectral Purity

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

Frequency (GHz)	Standard (at +6 dBm)
.01 – 2 GHz[3]	– 50 dBc
2 – 20 GHz	– 55 dBc
20 – 40 GHz	– 30 dBc

Sub-Harmoncs

Frequency (GHz)	Standard (at +6 dBm)
.01 – 2 GHz	– 80 dBc
2 – 20 GHz	– 60 dBc
20 – 40 GHz	– 50 dBc

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

Frequency (GHz)	Offsets > 300 Hz
.01 – 16 GHz	– 60 dBc
16 – 32 GHz	– 54 dBc
32 – 40 GHz	– 48 dBc

[1] Step Attenuator (Option 26) reduces power by 1.5 dB to 18 GHz, 2.0 dB 18- 26.5 GHz, and 2.5 dB above 26.5 GHz.
[2] 20 - 26.5 GHz for model 2426
[3] .01- 2 GHz range- (-30 dBc below 100 MHz)

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

Spectral Purity Continued:

Residual FM (typical)

Frequency (GHz)	50 Hz - 15 kHz Bandwidth
.01 – 16 GHz	< 40 Hz
16 – 32 GHz	< 80 Hz
32 – 40 GHz	< 120 Hz

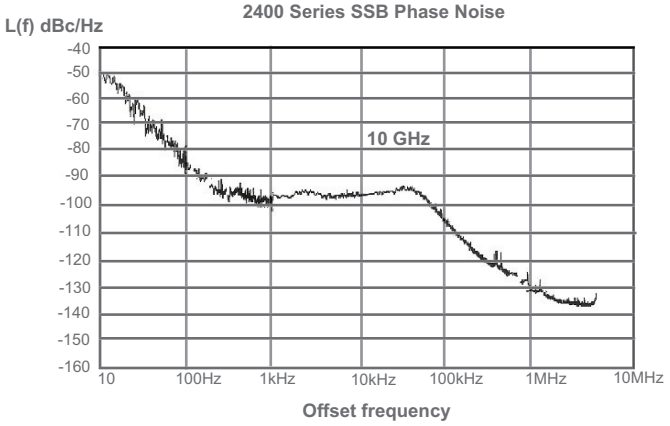
AM Noise (typical)

Frequency (GHz)	Offsets > 5 MHz
.01 – 2 GHz	– 130 dBm/Hz
2 – 20 GHz	– 145 dBm/Hz
20 – 40 GHz	– 140 dBm/Hz

SSB Phase Noise

Frequency (GHz)	Offset from Carrier (dBc/Hz) 100 Hz	1 kHz	10 kHz	100 kHz	1 MHz
0.85	-92	-111	-112	-123	-130
1.85	-86	-105	-106	-117	-135
5.6	-75	-97	-98	-105	-130
10	-74	-92	-92	-101	-128
18	-68	-89	-90	-99	-123
23	-63	-85	-86	-93	-118
30	-61	-83	-84	-91	-115

2400 Series SSB Phase Noise



Frequency & Power Sweep - L/M Series only (Option 43)

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
Sweep Time[4]:	10 msec — 30 secs

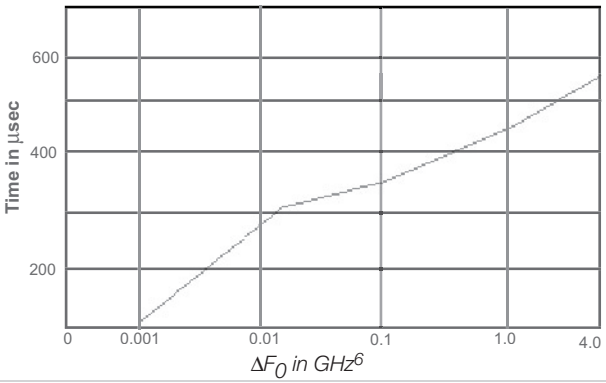
List Mode

Number of List Points:	4000
Frequency Settling Time[5]:	< 550 µsec for ΔF_0[6] ≤ 500 MHz
Amplitude Settling Time[7]:	< 500 µsec
Step Time:	150 µsec - 1 sec
	2 ms - 1 sec (option 31)
Sync Out Delay[8]:	50 µsec - 10 msec
Trigger Modes:	EXT, GPIB GET, Software

List Mode Continued:

Sweep Modes: Continuous, Single Step,& Single Sweep

2400 Typical Frequency Settling Time



Remote Programming

Hardware Interface:	IEEE 488.2 RS-232 & USB (w/supplied adapter)
Software Interface:	SCPI & GT-12000A Automation Xpress Interface (option 48)

Execution Speed (IEEE 488.2):

	AXI	SCPI	GT-12000A
CW Switching	2.5 ms	28 ms	22 ms
4000 pt. download	20 sec	28 sec	288 sec

Automation Xpress Interface (AXI) (Option 48)

For use with Giga-tronics Automation Xpress software. The AXI provides Xpress 2.5 ms CW Frequency/Power switching, faster data exchange and functional downloads/executions, and a stable API programming interface for the ATE programming environment.

Modulation Specifications: M/AM Series Only

Amplitude Modulation[9]

Depth[10]:	0 to 75% (Level = 0 dBm)
Rate (3 dB Bandwidth):	DC — 5 kHz (depth = 30%)
Sensitivity:	0 — 95% /V selectable
Accuracy:	± 10% of setting at 1 kHz rate, 0 - 90%/V
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
Scan Pattern:	Sin (x) / X
Minimum # of Lobes:	1

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

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

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

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

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

[9] Modulation peaks must be less than maximum available power.

[10] Levels noted can be offset using step attenuator (option 26).

Modulation Specifications: M/AM Series Only

Frequency Modulation (Specification applies for frequencies above 10 MHz)

Narrow Mode: (Deviation Limited Modulation Index)

Rate (3 dB bandwidth):	DC - 50 kHz
Peak Deviation:	1 MHz N
Accuracy:	± 5% at 5 kHz rate with 1V peak input
Input:	
Range:	± 1V
Impedance:	50 Ω

Wide Mode: (Modulation Index < 50/N)

Rate (3 dB bandwidth):	1 kHz - 3 MHz
Peak Deviation:	20 MHz N
Accuracy:	± 5% at 5 kHz rate with 1V peak input
Input	
Range:	± 1V
Impedance:	50 Ω

Pulse Modulation (Specifcation applies for frequencies above 500 MHz)

On/Off Ratio: 80 dB

Rise/Fall Times:

Frequency	Rise Time
.5 - 20 GHz	< 10 ns
20- 40 GHz	< 25 ns

Minimum Width: 150 ns

Level Accuracy[11]:	± 0.5 dB	Pulse Width > 350 ns
(relative to CW)	+1.5 / -0.5 dB	Pulse Width 250 - 350 ns
	+3.0 / -0.5 dB	Pulse Width 150 - 250 ns

PRF (50% duty cycle): DC - 3.33 MHz

Pulse Fidelity (typical):

Overshoot & Ringing:	0.5 - 2 GHz (< 10%), 2 - 40 GHz (< 10%)
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

WaveMaker Requirements

20 MB Disk Space
Windows 2000, Windows XP
128 MB RAM or greater

Inputs & Outputs:

Connector	2400AL	2400L	2400AM	2400M
RF Output	X	X	X	X
EXT REF Input	X	X	X	X
10 MHz REF Output	X	X	X	X
V/GHz Output	X	X	X	X
Trigger Input	X	X	X	X
Sync Output	X	X	X	X
Blanking Output		X		X
Ramp Output		X		X
AM IN			X	X
FM IN			X	X
PULSE IN			X	X
AM OUT			X	X
FM OUT			X	X
PULSE OUT			X	X
PM SYNC OUT			X	X
PM TRIG IN			X	X

Physical

Environmental:	MIL-PRF 28800F. Class 3
Safety:	EN61010
Weight:	< 35 lbs
Emissions:	EN61326
Rack Height:	3U (5.25 inches)
Connector Types (All Series):	2408 (N(f)), 2420/2426 (SMA(f)) 2440 (K(f))

2400AL/2400AM Series Models Only

2400A Series include:

- Rear RF Output
- Rack Mount Ready Blank Front Panel
- Front Panel LED Indicators: Power, EXT REF, Unleveled
- WaveMaker Software

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.

www.gigatronics.com/emailupdates
Get the latest information on Giga-tronics products & applications

[11] Duty Cycle must be > 0.01%)

Data subject to change without notice.

Giga-tronics Incorporated
4650 Norris Canyon Road
San Ramon, California 94583
Telephone: 800 726 4442 or
925 328 4650
Telefax: 925 328 4700
Web Site: www.gigatronics.com