



EIP Microwave, Inc.

# EIP VXIbus Synthesized Signal Generators

## High-Performance Microwave Signal Generation for VXIbus Systems

- ❑ 0.01 to 20 GHz Frequency Range
- ❑ +13 to -90 dBm Levelled Output Power
- ❑ Excellent Spectral Purity
- ❑ 1 Hz Frequency Resolution
- ❑ AM, Pulse, and  
Complex Modulation



# EIP VXibus Synthesized Signal Generators . . .

## High-Performance Signal Generation for VXibus Systems

### EIP 1140A Specification Summary

- 0.01 to 20 GHz Frequency Range
- 1 Hz Frequency Resolution
- <-30 dBc Harmonics
- <-60 dBc Spurious
- <-80 dBc/Hz SSB Phase Noise (10 kHz offset from 10 GHz)
- +13 to -90 dBm Leveled Output Power
- 0.1 dB Power Resolution
- Pulse Modulation
- DC to 10 MHz PRF's
- 50 ns Minimum Pulse Width
- >80 dB On/Off Ratio
- <10 ns Rise/Fall Time
- Amplitude Modulation
- DC to 100 kHz Rates
- 0% to 90% Depth
- External IF Input for Complex Modulation
- 40 MHz Instantaneous Bandwidth
- VXibus Revision 1.3/1.4
- C-size, 3 Slots Wide
- SCPI Version 1993.0



The 1140A's small size is ideal for portable flight line systems.

### EIP 1140A - Ideal Synthesizer for ATE Applications

The EIP 1140A family of VXibus synthesized signal generators are the ideal synthesizers for ATE applications. In only 3 VXi slots, they combine 0.01 to 20 GHz performance with 1 Hz resolution, unique complex modulation capability and outstanding spectral purity. Three models cover 4 to 12.4 GHz, 2 to 20 GHz, or 0.01 to 20 GHz. All are fully compliant with VXibus specification Revision 1.3/1.4 and Standard Commands for Programmable Instruments (SCPI) version 1993.

### Superb Spectral Purity

Microwave performance is not compromised for VXibus compliance. The 1140A utilizes full modular shielding and post-regulation with double filtering to ensure outstanding performance, even when sharing a system with digital instruments. And the 1140A doesn't sacrifice spurious and phase noise performance for small size. With spurious signals below -60 dBc and phase noise as low as -80 dBc/Hz at a 10 kHz offset, the 1140A is ideal for local oscillator duty in radar/EW testing, narrowband device characterization, and communications systems testing.

### High Performance Amplitude, Frequency and Pulse Modulation

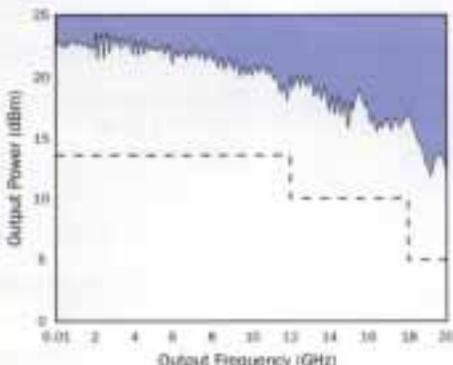
The 1140A family features simultaneous and independent amplitude, frequency and pulse modulation capabilities. AM up to 90% at rates from DC to 100 kHz make the 1140A ideal for antenna scan pattern modulation, power control, and satellite beacon simulation. Pulse modulation operates with pulse widths as narrow as 50 ns and PRF's up to 10 MHz for radar testing and pulsed device characterization. Frequency modulation rates (option 02) to 5 MHz with deviations up to 25 MHz peak facilitate testing of telemetry receivers and satellite communications.

### Unmatched Complex Modulation Performance

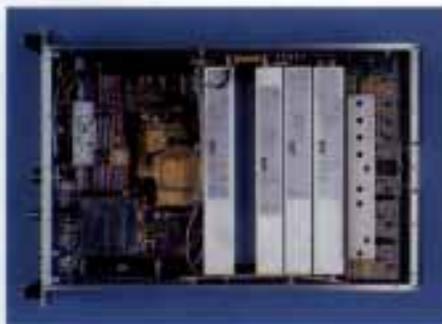
The IF modulation input on the EIP 1140A provides you with the means to upconvert complex digital signals or complex jamming scenarios onto the microwave output signal. The IF input has a 40 MHz instantaneous bandwidth and supports wideband frequency, phase, amplitude, and noise modulation as well as complex digital modulation. For communications systems, the IF modulation input makes it easy to test digital receivers as well as simulate co-channel and adjacent channel interference. In addition, this input (standard on all of the 1140A family) allows for sub-microsecond frequency hopping within the 40 MHz instantaneous bandwidth: fast enough to simulate many spread spectrum sources.



The microwave synthesizer is a key component in complete VXibus RF/ $\mu$ W stimulus/response test suites.



EIP 1140A typical maximum available output power. High output level compensates for ATE system cable losses and provides adequate LO drive signal.



Attention to grounding, shielding, and power supply regulation assures output signal purity and EMI/EMC integrity.

## Powerful Waveform Simulation

Using one or more companion SimCards (a single width, C size card), a virtually unlimited number of microwave signals can be simulated. Each SimCard can create up to 4 synchronized signals with CW, FSK, PSK, or QAM modulation. The fully programmable card allows complex communications signals such as multilevel TDM, packet protocols, fast frequency hopped signals, or complex CDMA signals to be created without the need of external pattern generators. The SimCard drives the IF modulation input of the 1140A synthesizer to create any of these waveforms to frequencies as high as 20 GHz.

## Plenty of Power

The EIP 1140A can provide up to +13 dBm leveled output power, sufficient to compensate for cable losses. In addition, the 1140A's custom Calibration feature enables you to provide leveled power at any point in your system. The 1140A's high output power and excellent close-in phase noise make it the paramount choice as a local oscillator for your VXibus test system.

## Flexible Programming

Full compliance with VXibus specification Revision 1.3/1.4 and Standard Commands for Programmable Instruments (SCPI) version 1993.0 minimizes your programming interface time. And the 1140A synthesizers provide synchronization and trigger capability that is as simple or complex as you need. For example, the 1140A's unique triggered list function allows you to step through up to 201 arbitrary instruments setups from a single trigger input. And to ease system integration, EIP supports the 1140A with software drivers for the most popular development environments.

## Small Size and Light Weight

No other products combine high performance and very small size as effectively as the EIP 1140A family. The 1140A is less than one fourth the size of comparable "rack-and-stack" microwave synthesizers. The small size and low weight of the EIP 1140A make it the perfect fit for down-sized, portable and flight-line VXibus automatic test systems.

## Accessory Modules Enhance the 1140A's Capability

A host of accessory modules, including pulse generators, down-converters and power amplifiers are available to complement the 1140A synthesizers. EIP can supply all your microwave VXibus product needs.

# EIP 1140A/1141A/1142A PERFORMANCE

	1142A	1141A	1140A
Frequency Range	4 to 12.4 GHz	2 to 20 GHz	0.01 to 20 GHz
Power Range (levelled)			
10 MHz to 2 GHz	-----	-----	+13 to -80 dBm
2 to 12 GHz	+10 to -100 dBm <sup>1</sup>	+13 to -90 dBm	+13 to -90 dBm
12 to 18 GHz	+10 to -100 dBm <sup>1</sup>	+10 to -90 dBm	+10 to -90 dBm
18 to 20 GHz	-----	+10 to -90 dBm	+5 to -90 dBm
Source Impedance	50 ohms	50 ohms	50 ohms
Output Connector Type	N Female	APC-3.5 Female	APC-3.5 Female
VSWR (typical)	2:1	2:1	2:1
Reverse Power Tolerance	1 watt	1 watt	1 watt

	Frequency	Power
Resolution	1 Hz	0.1 dB
Accuracy	Same as time base	>-50 dBm: 1 dB <sup>2</sup> <-50 to -80 dBm: 2 dB <sup>2</sup> <-80 dBm: 2 dB typ.
Switching Time <sup>3</sup>	<50 ms	Without Atten Change: < 50 ms With Atten Change: < 150 ms
Switching Time (IF Input) <sup>4</sup>	<100 ns	

## Spectral Purity (Specifications apply at +10 dBm CW output level, Complex Modulation off)

### Spurious

	1142A	1141A/1140A			
	4 to 12.4 GHz	0.01 to 2 GHz	2 to 4.84 GHz	4.84 to 10 GHz	10 to 20 GHz
Subharmonic	None	None	None	None	<-60 dBc
Harmonic	<-40 dBc	<-40 dBc	<-30 dBc	<-30 dBc	<-30 dBc
Power Line Related	<-45 dBc	<-45 dBc	<-51 dBc	<-45 dBc	<-45 dBc

### Non-Harmonically Related Spurious

	1142A	1141A/1140A			
	4 to 12.4 GHz	0.01 to 2 GHz	2 to 4.84 GHz	4.84 to 10 GHz	10 to 20 GHz
Offset Frequency					
<100 kHz	<-40 dBc	<-40 dBc	<-46 dBc	<-40 dBc	<-34 dBc
100 kHz to 1 MHz	<-50 dBc	<-50 dBc	<-56 dBc	<-50 dBc	<-44 dBc
1 MHz to 100 MHz	<-60 dBc	<-60 dBc	<-60 dBc	<-60 dBc	<-60 dBc
>100 MHz	<-70 dBc	<-60 dBc	<-70 dBc	<-70 dBc	<-60 dBc

### Residual Modulation (50 Hz to 15 kHz bandwidth)

	1142A	1141A/1140A			
	4 to 12.4 GHz	0.01 to 2 GHz	2 to 4.84 GHz	4.84 to 10 GHz	10 to 20 GHz
FM	<150 Hz rms	<150 Hz rms	<75 Hz rms	<150 Hz rms	<300 Hz rms
AM	<0.1% peak	<0.1% peak	<0.1% peak	<0.1% peak	<0.1% peak

### Single-Sideband Phase Noise (dBc/Hz)

Offset From Carrier	Frequency (GHz)									
	<2	4	6	8	10	12	14	16	18	20
30 Hz	-85	-83	-82	-78	-77	-75	-72	-72	-71	-71
100 Hz	-83	-85	-84	-81	-80	-78	-78	-77	-77	-77
1 kHz	-90	-90	-88	-87	-85	-83	-82	-80	-80	-80
10 kHz	-90	-90	-88	-88	-85	-82	-82	-78	-78	-78
100 kHz	-93	-97	-92	-88	-88	-88	-84	-82	-80	-78

### Internal Time Base

Frequency	10 MHz
Aging Rate	<1x10 <sup>-9</sup> /day at 25°C after 72 hour warm-up
Temperature Stability	<1x10 <sup>-7</sup> change over 0°C to 50°C

<sup>1</sup> EIP 1142A frequency range is 4.0 GHz to 12.4 GHz.

<sup>2</sup> EIP 1140A accuracy is degraded by 1 dB from 0.01 GHz to 2 GHz.

<sup>3</sup> Switching time is to within 500 Hz, triggered list mode.

<sup>4</sup> I/F input less than 40 MHz deviation.

# SPECIFICATIONS

<b>Pulse Modulation (external)</b>		(Specifications apply at +10 dBm output power.)							
Pulse Repetition Frequency	DC to 10 MHz								
Minimum Pulse Width	50 ns								
On/Off Ratio	>80 dB								
Rise/Fall Time	<10 ns, 10% to 90%								
Pulse Overshoot, Ringing	<10% for PFR's <1MHz								
Pulse Width Compression	<10 ns at 50% points (<5 ns typical)								
Video Feedthrough	<20 mV peak-to-peak (<10 mV peak-to-peak typical)								
Delay Time	<55 ns, 50% TTL to 50% RF (<30 ns typical)								
Peak-to-CW Level Accuracy	<0.5 dB change (>50 ns pulse widths excluding leading edge overshoot/ringing)								
Input Level	TTL compatible								
Input Level Tolerance	-0.5 ≤ Vin ≤ +7.0 VDC continuous								
Polarity	RF output is ON with a TTL logical "1" input								
Connector	BNC female								
<hr/>									
<b>Amplitude Modulation (external)</b>									
Rate	DC to 100 kHz (3 dB bandwidth)								
Depth	0 to 90% minimum								
Distortion	<5% (50% depth, 1 kHz rate)								
Sensitivity	Programmable from 0 to 100%. 2.0V peak-to-peak input gives full-scale modulation								
Modulation Index Accuracy	±10% (50% depth, 1 kHz rate, 2.0 V peak-to-peak modulating input)								
Modulation Overdrive Threshold	±2 VDC ±10%								
Average Power Output	-20log[1+(Modulation Index)/100] ± 2 dB relative to set CW level with AM OFF								
Input Impedance	10 kohm ± 10%								
Input Level Tolerance	±20 VDC continuous								
Connector	BNC female								
<hr/>									
<b>IF (Complex Modulation) Input</b>									
Input Frequency	300 MHz to 1 GHz, programmable	Input Impedance	50 ohms nominal						
Input Level	-6 dBm nominal	Input VSWR	<2.0:1 typical						
Instantaneous 3 dB Bandwidth	>40 MHz typical (ALC OFF)	Connector	BNC female						
Spurious Output (+10 dBm output level, ALC ON, -6 dBm input level)									
	<table border="1"> <thead> <tr> <th>IF Input</th> <th>Level</th> </tr> </thead> <tbody> <tr> <td>300 to &lt; 750 MHz</td> <td>&lt; -30 dBc</td> </tr> <tr> <td>750 MHz to 1 GHz</td> <td>&lt; -60 dBc</td> </tr> </tbody> </table>	IF Input	Level	300 to < 750 MHz	< -30 dBc	750 MHz to 1 GHz	< -60 dBc		
IF Input	Level								
300 to < 750 MHz	< -30 dBc								
750 MHz to 1 GHz	< -60 dBc								
<hr/>									
<b>Frequency Modulation (external)</b>									
Rate	5 kHz to 5 MHz (3 dB bandwidth)	Input Impedance	600 ohms nominal						
Deviation	25 MHz p-p, f <sub>0</sub> 0.05 - 20 GHz 1 MHz p-p, f <sub>0</sub> 10 - 50 MHz	Input Level Tolerance	±20 VDC						
Distortion	< 5% typical	Connector	BNC female						
Sensitivity	5 MHz p-p per volt								
<hr/>									
<b>10 MHz Input/Output</b>									
Frequency	10 MHz	Impedance	50 ohms nominal						
Level	0 dBm ± 3 dB	Connector	BNC female						
<hr/>									
<b>Programming</b>		Conforms to SCPI Version 1993.0							
Sweep Mode	Triggered List								
<hr/>									
<b>General</b>									
Temperature Range									
Operating	0° to 50° C								
Non-operating	-40° to 70° C								
Relative Humidity	0 to 95% non-condensing								
EMI									
Below 1 GHz	Complies with VXibus Revision 1.3/1.4 specification								
Above 1 GHz	Complies with RE02 of MIL-STD-461C								
Warm-up Time	<15 minutes at 25°C ambient temperature								
Weight	<18 lbs								



# EIP VXIbus Synthesized Signal Generators



### VXIbus Specifications

<b>VXIbus Specifications</b>	Complies fully with Revision 1.3/1.4 of VXIbus Specification for message-based instruments.
Module Size	C-size, 3 slots wide
Device Type	Message-based instrument
Protocol	Word Serial
Address/Data Modes Supported	A16/D16
Local Bus	Not used
ECLTRG Utilization	Available for triggerable functions
TTLTRG Utilization	Available for triggerable functions
CLK10 Utilization	Not used
Cooling	
1142A	1.2 mm H <sub>2</sub> O @ 9 liters/sec for < 15°C internal temperature rise
1141A/1140A	1.2 mm H <sub>2</sub> O @ 9 liters/sec for < 25°C internal temperature rise

### Power Requirements

	Power	I <sub>max</sub> (Amperes)						
		+5V	+12V	+24V	-2V	-5.2V	-12V	-24V
1142A	<126 Watts	2.0	2.2	1.7	0.2	0.2	0.8	1.6
1141A	<155 Watts	2.0	2.8	2.5	0.2	0.2	0.8	1.7
1140A	<160 Watts	2.0	2.8	2.9	0.2	0.2	0.8	2.0

### ORDERING INFORMATION

<b>EIP Model 1140A</b>	0.01 to 20 GHz VXIbus Synthesized Signal Generator
<b>EIP Model 1141A</b>	2 to 20 GHz VXIbus Synthesized Signal Generator
<b>EIP Model 1142A</b>	4 to 12.4 GHz VXIbus Synthesized Signal Generator

**Option 02** FM Modulation

<b>Accessories</b>	EIP Model 1313A	1 to 20 GHz VXIbus Microwave Downconverter
	EIP Model 1911A	VXIbus 4 Channel Pulse Generator
	EIP Model 1355A	1 to 20 GHz VXIbus Microwave Power Amplifier
	SimCard	IF Modulation Source

**Warranty** EIP has a proven commitment to quality and reliability in instrumentation. This commitment is demonstrated in the 1140A family of synthesizers with a full 3 year standard warranty. Parts, labor, even shipping are all included at no cost to you.

### For More Information Contact:

Phase Matrix, Inc.  
109 Bonaventura Dr.  
San Jose, CA 95134 USA

tel: 408.428.1000  
fax: 408.428.1500  
toll free: 877.4PhaseM  
www.phasematrix.com