SECTION 1
GENERAL INFORMATION

DESCRIPTION

The EIP Models 1140A, 1141A, and 1142A VXIbus Synthesized Microwave Frequency Generators are message-based VXI modules capable of generating microwave signals. The 1140A has a frequency range of 0.01 to 20 GHz with a dynamic range of +10 to -90 dBm. The 1141A has a frequency range of 2 GHz to 20 GHz with a dynamic range of +10 to -90 dBm. The 1142A has a frequency range of 4 GHz to 12.4 GHz with a dynamic range of +10 to -100 dBm. Other than interface address switches, the instruments have no manual controls. The instruments are normally controlled via a computer using SCPI type commands. The instruments also provide, as standard, a variety of external modulation inputs including: AM, FM, Pulse, and complex modulation. The 1140A, 1141A, and 1142A are VXIbus "C" size, 3-wide plug-in modules that require a VXIbus mainframe for operation.

OPERATING CONDITIONS

The EIP 1140A, 1141A, and 1142A synthesizers are designed to operate at temperatures from 0 to 50 °C at a relative humidity not to exceed 95% (75% over 25 °C; 45% over 40 °C). The synthesizers will perform to specifications at altitudes not exceeding 10,000 ft (3050 m). They are fungus resistant. The module housings are not designed to provide protection from severe mechanical shock or liquids and are intended for normal VXIbus use in an environmentally clean area.

The 1140A, 1141A, and 1142A synthesizers meet the requirements of MIL-T-28800D, Type III, Class 7, Style G, Color R with the following modifications and exceptions:

1. The non-operating temperature requirement is limited to the range of -40 to +70 °C.
2. The operating and non-operating altitude requirements are not invoked.
3. The EMI requirement is modified as follows:
   a. For frequencies ≥1 GHz, RE02 of MIL-STD-461C applies.
   b. For frequencies <1 GHz, VXIbus System Specifications Revision 1.3/1.4 applies.
4. The warm up time is 15 minutes at 25 °C ambient temperature.

STORAGE

To prevent possible damage to the synthesizers, they must be stored in an antistatic bag or enclosure and in an environment that is protected from moisture, dust, and other contaminants. Do not expose the instruments to temperatures below -40 °C or above 70 °C, altitudes above 40,000 ft (12,000 m), nor vibration exceeding 2 g.

1141A SPECIFICATIONS

GENERAL

Operating Temperature Range	0 to 50 °C
Non-operating Temperature Range	-40 to 70 °C
Relative Humidity	0 to 95%, non-condensing
EMI	
Below 1 GHz	Complies with VXIbus Revision 1.3/1.4 specifications
Above 1 GHz	Complies with RE02 of MIL-STD-461C
Warm-up Time	15 minutes at 25 °C ambient temperature
Weight	<18 lbs

VXIbus

Compatibility	Full compliance with 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	0.1 mm H_2O @ 5 liters/sec for <25 °C internal temperature rise
Power Dissipation	<155 watts

Current Requirements

Voltage (VDC)	+5	+12	+24	-2	-5.2	-12	-24
I_{PEAK} (Amperes)	2.0	2.8	2.5	0.2	0.2	0.8	1.7

FREQUENCY

Range	2 to 20 GHz
Resolution	1 Hz
Accuracy	Same as timebase
Internal Timebase	
Frequency	10 MHz
Aging Rate	<1 x 10^{-9}/day at 25 °C after 72 hours warm-up
Temperature Stability	<1 x 10^{-7} change over 0 to 50 °C
Switching Time	<50 ms to within 500 Hz (Triggered List Mode, 2 to 20 GHz step)

1141A SPECIFICATIONS (Continued)

PROGRAMMING

Compatibility	Conforms to SCPI Version 1993.0
Sweep Mode	Triggered List/Sweep

SPECTRAL PURITY (at +10 dBm CW output level, Complex Modulation OFF)

	2 to 4.84 GHz	4.84 to 10 GHz	10 to 20 GHz
Subharmonic Spurious	None	None	<-60 dBc
Harmonic Spurious	<-25 dBc	<-25 dBc	<-25 dBc
Power Line Related Spurious	<-51 dBc	<-45 dBc	<-39 dBc

Non-Harmonically Related Spurious

	2 to 4.84 GHz		4.84 to 10 GHz		10 to 20 GHz	
Offset Frequency	Level	Typical	Level	Typical	Level	Typical
<100 kHz	<-46 dBc	<-56 dBc	<-40 dBc	<-50 dBc	<-34 dBc	<-44 dBc
100 kHz to <1 MHz	<-56 dBc	<-66 dBc	<-50 dBc	<-60 dBc	<-44 dBc	<-54 dBc
1 to 100 MHz	<-60 dBc	<-70 dBc	<-60 dBc	<-70 dBc	<-60 dBc	<-63 dBc
>100 MHz	<-70 dBc	<-75 dBc	<-70 dBc	<-75 dBc	<-60 dBc	<-75 dBc

Residual Modulation (50 Hz to 15 kHz bandwidth)

	2 to 4.84 GHz	4.84 to 10 GHz	10 to 20 GHz
FM	<75 Hz rms	<150 Hz rms	<300 Hz rms
AM	<0.1% peak	<0.1% peak	<0.1% peak

Single-sideband Phase Noise (dbc/Hz)*

Frequency	Offset from Carrier					Frequency	Offset from Carrier				
GHz	30 Hz	100 Hz	1 kHz	10 kHz	100 kHz	GHz	30 Hz	100 Hz	1 kHz	10 kHz	100 kHz
2.0	-85	-86	-89	-92	-93	12.0	-75	-78	-79	-79	-81
3.0	-83	-85	-88	-91	-93	13.0	-74	-77	-78	-79	-81
4.0	-83	-85	-84	-86	-87	14.0	-72	-77	-77	-78	-80
5.0	-83	-84	-84	-85	-87	15.0	-72	-76	-77	-78	-79
6.0	-81	-84	-84	-85	-87	16.0	-72	-75	-76	-77	-78
7.0	-78	-82	-83	-84	-86	17.0	-72	-75	-76	-76	-78
8.0	-78	-81	-82	-83	-84	18.0	-71	-73	-76	-76	-78
9.0	-77	-79	-80	-82	-84	19.0	-71	-73	-76	-75	-76
10.0	-77	-79	-80	-80	-80	20.0	-71	-73	-76	-74	-74
11.0	-76	-78	-80	-79	-81						

* Typical performance is >7 dB lower than specified.

1141A SPECIFICATIONS (Continued)

RF OUTPUT	
Range (Leveled) 2 to 10 GHz 10 to 20 GHz	 +13 to -90 dBm +10 to -90 dBm
Resolution	0.1 dB
Power Accuracy (In CW mode with attenuator and ALC coupled)	± 1.0 dB, >-50 dBm ± 2.0 dB, -50 to -80 dBm ± 2.0 dB typical, <-80 dBm
Output Level Switching Time (Triggered List mode)	With attenuator change: <100 ms typical Without attenuator change: <5 ms/dB typical
Source Impedance	50 Ω nominal
VSWR	<2.0:1 (0 dB attenuation) typical
Connector	APC 3.5 female
Reverse Power Tolerance	1 watt continuous

10 MHz INPUT/OUTPUT	
Frequency	10 MHz
Level	0 dBm ± 3 dB
Impedance	50 Ω nominal
Connector	BNC female

PULSE MODULATION (external) (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	<15 ns, 10% to 90%
Pulse Overshoot, Ringing	<10% for PRF's <1 MHz
Pulse Width Compression	<10 ns at 50% points (<5 ns typical)
Video Feedthrough	<20 mV p-p (<10 mV p-p 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 logic "1" input
Connector	BNC female

1141A SPECIFICATIONS (Continued)

AMPLITUDE MODULATION (external)	
Rate	DC to 100 kHz (3 dB bandwidth, typical)
Depth	0% to 90% minimum
Distortion	<5% (50% depth, 1 kHz rate)
Sensitivity	Programmable from 0% to 100%. 2.0 V p-p input gives full-scale modulation.
Modulation Index Accuracy	± 10% (50% depth, 1 kHz rate, 2.0 V p-p modulating input)
Modulation Overdrive Threshold	± 2 Vdc ± 10%
Average Power Output	$-20 \log\left(1 + \frac{\text{Modulation Index}}{100}\right) \pm 2$ dB relative to set CW level with AM OFF
Input Impedance	10 kΩ ± 10%
Input Level Tolerance	± 20 Vdc continuous
Connector	BNC female

IF INPUT (Complex Modulation)	
Input Frequency	300 MHz to 1 GHz, programmable
Input Level	-6 dBm nominal
Instantaneous 3 dB Bandwidth	>50 MHz typical (ALC OFF)
Spurious Output (+10 dBm output level, ALC ON, -6 dBm input level), typical	

IF Input	Level
300 to <700 MHz	<-30 dBc
700 MHz to 1 GHz	<-60 dBc

Input Impedance	50 Ω nominal
Input VSWR	<2.0:1 typical
Connector	BNC female

Note: Specifications subject to change without notice.