5009a Dual Frequency Synthesizer Specifications

The 5009a Dual Frequency Synthesizer module provides two independent RF frequency synthesizers covering the frequency range 23.5MHz to 6 GHz. Each synthesizer is phase locked to the same internal TCXO reference or can be locked to a high stability external reference. Programming the non-volatile settings can be accomplished using 5009 Configuration Manager or any terminal emulation program including the Valon 5000term.exe through the micro-USB interface. List Mode and Sweep Step mode is also provided as well as serial TTL control through the User Port.

Electrical Specifications

Note: The 5009a is **NOT** USB powered. You may purchase a Valon **PS6V-1** power supply kit.

DC Input

Input Voltage Range	
Absolute Max	+16V to -16V (reverse protected)
Operational Max	+8v
Operational Min	**+6V Recommended Operation Voltage**
Reduced performance	+4.8 to 5.8V (output power reduced)
Min non-operational	+3.5V (synthesizer remains locked and serial port ok)
	>10V for >10sec resets the synthesizer to factory default settings
Input Current	
Source 1 and Source 2 on	560mA Output Enabled
	330mA Output disabled
Source 1 or Source 2 on	190mA Output disabled
	270mA Output enable
Source and Source 2 off	30mA both disabled
DC Input Connector	Hirose DF3A-2P-2DS Mates with Hirose DF3-2S-2C plug and pre-crimped wire H2BXT-10112-R4 (red) and H2BXT-10112-B4 (black). Custom 20” dc cables supplied with synthesizer, additional cables available.

Full performance is obtained when the dc input voltage is in the operational range. If the input voltage is increased above the operational range, the output will be disabled and the synthesizer will be in standby mode. The synthesizer may be operated with reduced RF output power in the reduced performance voltage range. If the dc voltage is in the Min non-operational range, the output will be disabled but all user settings will be retained. Input voltages below the minimum non-operational range will cause a reset condition.

RF Synthesizer Specifications (Unless otherwise noted, all specifications apply equally to both synthesizers.)

Frequency Range		
Max	6000MHz	
Min	23.5MHz	
Frequency Increment (Fractional-N Mode)	20MHz reference	20MHz reference
Frequency Range (MHz)	Reference Doubler ON	Reference Doubler OFF
3000~6000	10 kHz	5 kHz
1500~3000	5 kHz	2.5 kHz
750~1500	2.5 kHz	1.25 kHz
375~750	1.25 kHz	1 kHz
187.5~375	1 kHz	500 Hz
93.75~187.5	500 Hz	250 Hz
46.875~93.75	250 Hz	100 Hz
23.4375~46.875	100 Hz	50 Hz
	(minimum step size)	(minimum step size)
Frequency Lock Time	<100uS Lock time is from the time the frequency command is sent, or a frequency step in sweep mode, or input from User Port in List mode to a stable Lock Detector output	
Frequency Increment (Integer-N Mode)	20MHz reference	20MHz reference
Frequency Range (MHz)	Reference Doubler ON	Reference Doubler OFF
3000~6000	40 MHz	20 MHz
1500~3000	20 MHz	10 MHz
750~1500	10 MHz	5 MHz
375~750	5 MHz	2.5 MHz
187.5~375	2.5 MHz	1.25 MHz
93.75~187.5	1.25 MHz	625 kHz
46.875~93.75	625 kHz	312.5 kHz
23.4375~46.875	312.5 kHz	156.25kHz
Sweep rate	0.1ms to 1sec in 0.1ms steps	
Phase Noise	Typical phase noise as measured with Berkeley Nucleonics 7300 Signal Source Analyzer	

	10Hz	**100Hz**	**1kHz**	**10kHz**	**100kHz**	**1MHz**	**10MHz**	
6GHz	-54	-59	-85	-90	-94	-126	-147	dBc/Hz
5GHz	-57	-61	-86	-93	-94	-127	-149	dBc/Hz
4GHz	-76	-82	-89	-98	-95	-129	-150	dBc/Hz
3GHz	-60	-65	-93	-101	-100	-134	-150	dBc/Hz
2GHz	-64	-69	-96	-104	-100	-130	-152	dBc/Hz
1GHz	-70	-99	-99	-107	-106	-140	-152	dBc/Hz
500MHz	-76	-81	-105	-113	-112	-124	-152	dBc/Hz
200MHz	-83	-89	-113	-121	-124	-152	-155	dBc/Hz
40MHz	-90	-104	-126	-132	-135	-156	-157	dBc/Hz

Harmonics	The 5009a output waveform is a clipped sine wave. Harmonics are typically 12dBc. Odd harmonics are most prominent.	
Spurious	Non-Harmonic <-60dBc except boundary spurs	
Output Return loss	Min.(dB)	Typical(dB)
25~ 100MHz	>5	8dB
100 ~ 1000MHz	>9	15
1000 ~ 2000MHz	>8	10
2000 ~ 4000MHz	>6	8
4000 ~ 6000MHz	>7	10

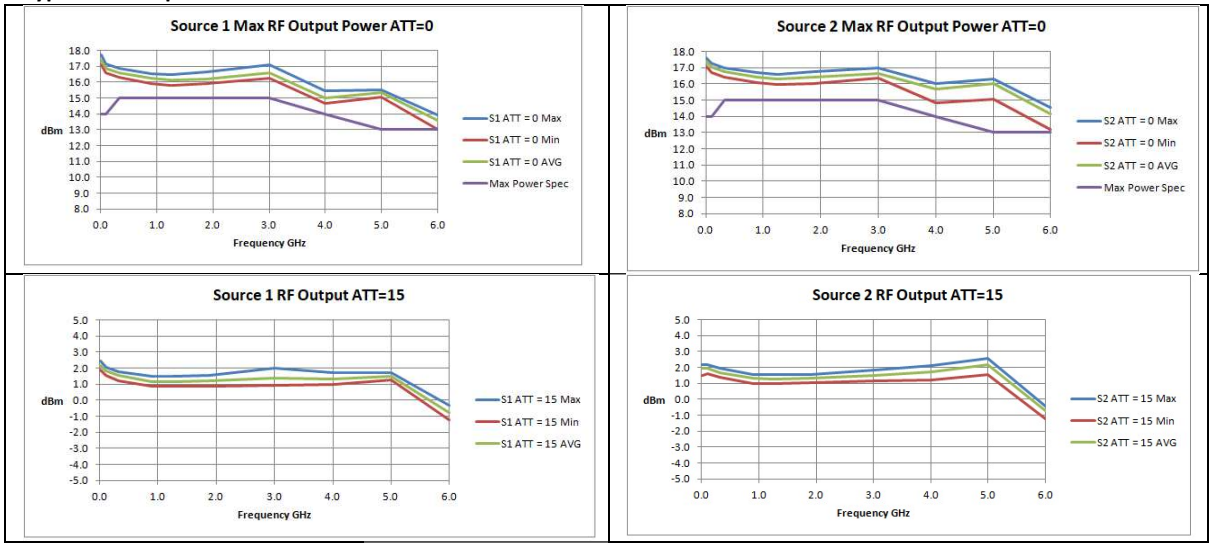
RF Connectors	SMA Female

Unless otherwise noted, all specifications apply equally to both synthesizers.

AM Modulation	0.5dB to 31.5dB
AM Frequency	
Range	0.5Hz to 10kHz
Accuracy	±0.5Hz
AM Waveform	50% duty cycle square wave

Maximum Output Amplitude (PLEV=4, ATT=0) Freq. Range (MHz)	Min dBm	Typ. dBm	Max. dBm
25~100	>14	17	<17.5
100~3000	>15	16	<17
3000~6000	>13	15	<16
See power plots below			
Attenuator			
Relative Attenuation Range	0dB to 31.5dB		
Attenuation Step Size	0.5dB		
RF output On/OFF	When off power is reduced by ~30dB		

Typical RF Output Power Plots



Reference Frequency

Internal Reference	
Frequency	20.000MHz
Initial Accuracy	± 2ppm (23°C)
Temperature Stability	±0.5ppm -20°C to +70°C (case temp)
Reference Trim Range	± 10ppm
Reference Trim Resolution	10-bit (8-bit before 2016)
Internal Phase Frequency Detector (PFD)	Max 140MHz, 125MHz Fractional mode Min 1 MHz
External Reference	50Ω nominal impedance
Frequency Range	10MHz to 210MHz

Input power range	(max PFD 140MHz integer mode, 125MHz fractional mode) -10dBm min. +13dBm max. (note, external reference as low as -50dBm with reduced phase noise performance)
External Reference Connector	SMA Female 50Ω nominal impedance Note: Ext input is ac coupled to synthesizer but dc coupled to internal VCTCXO control circuit. External reference should be disconnected when using internal reference.
External Reference Return Loss 10MHz 20MHz 50MHz 100MHz 200MHz	10dB typical 50Ω nominal impedance >24dB >20dB >14dB >6dB >5dB
EFC Electronic frequency Control at external reference input	Pulling range >±10ppm Voltage ±3V Input resistance 20kΩ Frequency response 0Hz~>5kHz

Interface

USB	**Micro-B socket** FTDI virtual com port 9600, 8, N,1,N default- Automatically shift to 115200 with GUI See FTDI for drivers for your computer. Note: The Configuration Manager GUI will automatically configure the USB port and switch to 115200 baud rate.
USER PORT	**3.3V TTL TXD & RXD** *(see section 5)* 115200,8,N,1,N default Hirose DF11-8DP-2DS Mates with Hirose DF11-8DS-2C plug and pre-crimped wireH3BXT-10112-** (DigiKey) **LSW-1** LIST Mode switch and cable accessory is also available. External Trigger Input: 3.3V TTL Hi-Z input
Selectable Baud Rates	Either port: 9600, 19200, 38400, 57600,115200, 230400, 460800, 921600

Environmental

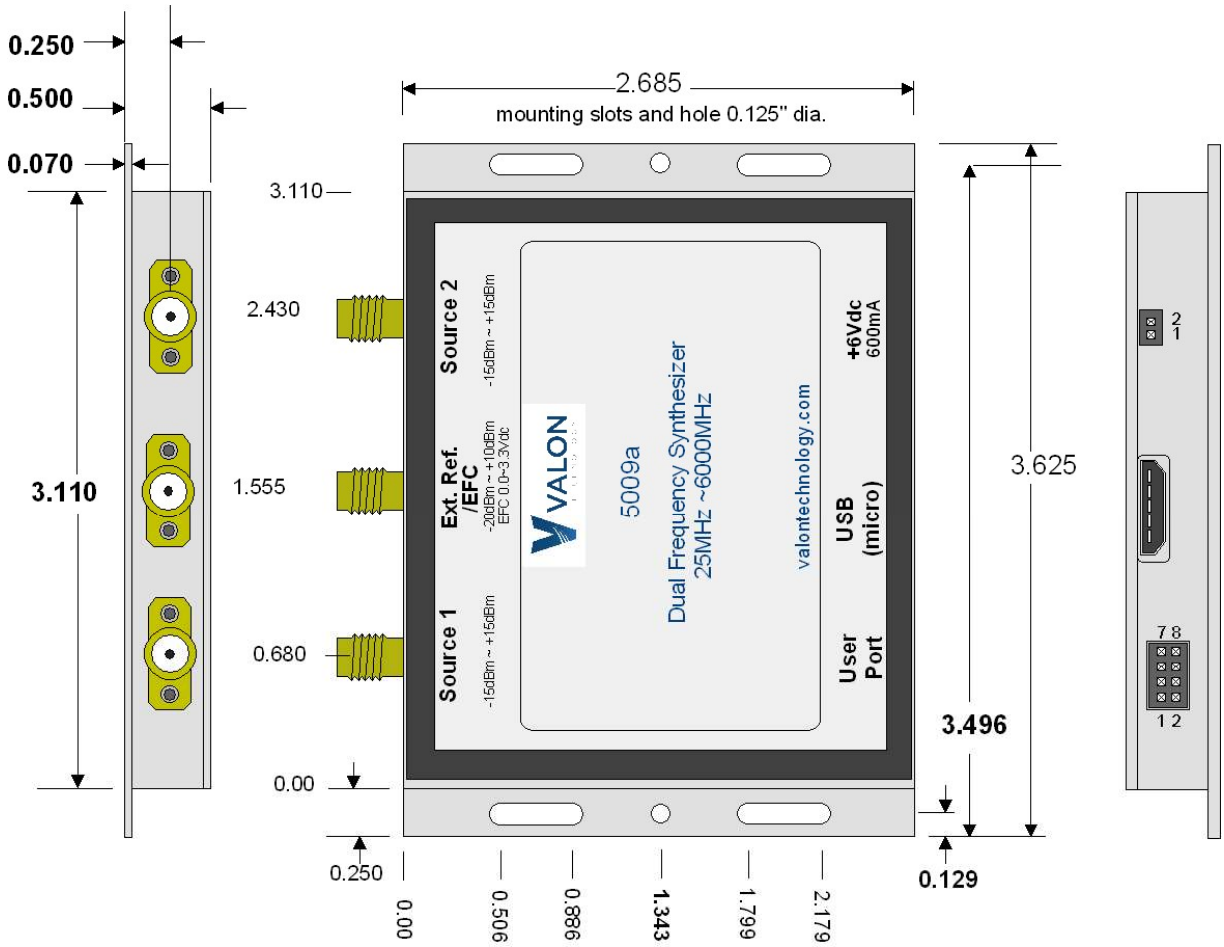
Operational full specifications:	-20°C~+70°C (case temperature)
No damage functional:	-40°C~+85°C (case temperature)
Humidity:	5%~95% minimal condensation allowed
IP rating:	50 No water protection.

Mechanical Dimensions

3.625"W x 2.685"L x 0.50"H

Weight: 0.2lbs, 91g

Material: AL-6061-T6
Finish: Clear Alodine (conductive)



Dimensions are Inches