



Electrical Specifications

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

DC Input

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| Input Voltage Range Absolute Max Operational Max Operational Min Reduced performance Min non-operational | +16V to -16V (reverse protected) +8v +6V Recommended Operation Voltage +4.8 to 5.8V (output power reduced) +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 Source 1 or Source 2 on Source and Source 2 off | 560mA Output Enabled 330m Output disabled 190mA Output disabled 270mA Output enable 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 setting 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 Min | 6000MHz 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 5009 output waveform is a clipped sine wave. Harmonics are typically 12dBc. Odd harmonics are most prominent. | | | | | | | |
| Spurious | | Non-Harmonic <-60dBc except boundary spurs | | | | | | | |

5009 Dual Frequency Synthesizer Specifications

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|---------------------------|------------|-------------|--|
| 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 | |
| Connectors | SMA Female | | |

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

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

| | | | | |
|---|------------------------------------|---------------|----------|----------|
| Output Amplitude Frequency Response (PLEV=4, ATT=0) | Freq. Range (MHz) | Min dBm | Typ. dBm | Max. dBm |
| | 25~100 | >12 | 17 | <17.5 |
| | 100~4000 | >13 | 15 | <17 |
| | 4000~6000 | >10 | 14 | <16 |
| Attenuator | Relative Attenuation Range | 0dB to 31.5dB | | |
| | Attenuation Step Size | 0.5dB | | |
| RF output On/OFF | When off power is reduced by ~30dB | | | |

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| 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: 8-bit, 10-bit after 12/2016 |
| Internal Phase Frequency Detector (PFD) | Max 140MHz, 125MHz Fractional mode Min 1 MHz |
| External Reference | 50Ω nominal impedance Frequency Range: 10MHz to 210MHz (max PFD 140MHz integer mode, 125MHz fractional mode) Input power range: -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 | 10dB typical 50Ω nominal impedance |
| | 10MHz: >24dB |
| | 20MHz: >20dB |
| | 50MHz: >14dB |
| | 100MHz: >6dB |
| | 200MHz: >5dB |

5009 Dual Frequency Synthesizer Specifications

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| EFC Electronic frequency Control at external reference input | Pulling range $>\pm 10\text{ppm}$ Voltage $\pm 3\text{V}$ Input resistance $20\text{k}\Omega$ Frequency response $0\text{Hz}\sim 5\text{kHz}$ |
|--|--|

Interface

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|------------------------------|---|
| 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 <i>(see section 5)</i> 115200, 8, N, 1, N default Hirose DF11-8DP-2DS Mates with Hirose DF11-8DS-2C plug and pre-crimped wire H3BXT-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

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|--|--|
| Operational full specifications: No damage functional: Humidity: IP rating: | $-20^{\circ}\text{C}\sim +70^{\circ}\text{C}$ (case temperature) $-40^{\circ}\text{C}\sim +85^{\circ}\text{C}$ (case temperature) 5%~95% minimal condensation allowed 50 No water protection. |
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Mechanical Dimensions

3.625"W x 2.685"L x 0.55"H

Weight: 0.2lbs, 91g

Material: AL-6061-T6

Finish: Clear Alodine (conductive)

