The Sapphire Plus
Digital Delay Pulse Generator

The Sapphire Plus is an upgrade to our standard Sapphire, with this enhanced version you will have better performance and higher specifications. This unit is perfect for those on a budget but looking for more precise resolution and jitter.
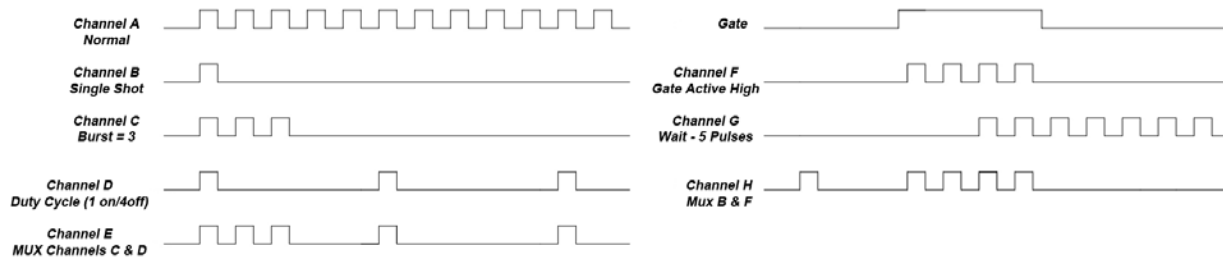
- 2 or 4 Independent Channel Outputs
- 5 ns Resolution
- < 50 ps RMS Jitter
- "Virtual" channel timers
- Up to 20MHz eternal trigger rate
- Fast Rise Time, <2ns
- Optional 1ppm Clock
- Wireless Option Via Bluetooth
- Full Customer Support
- 2 Year Warranty

The Sapphire Plus Pulse Generator

The Sapphire Plus, with 2 or 4 independent outputs, gives you features and spec's not found on our standard 9200. The resolution and accuracy of the width, delays, and period counters improves to 5ns. This allows for finer adjustments (5ns) on the widths, delays and period. Virtual Channels- 2 channel adds 2 "virtual" channels and the 4 channel adds 4 "virtual" channels - this effectively doubles the number of channel timers the unit may utilize. A "Period Counter" has been added which measures the time between incoming external trigger pulses - this can help in adding greater accuracy. The Sapphire Plus also has an optional 1ppm crystal oscillator for improved performance. With intuitive, streamlined GUI control of timing parameters and quick recall of up to 6 system configurations, the instrument is instantly ready for use. Complete control of the Sapphire is provided through the standard USB interface and optional Bluetooth connectivity.

Digital Delay Output Modes

Channel A Normal	Gate
Channel B Single Shot	Channel F Gate Active High
Channel C Burst = 3	Channel G Wait - 5 Pulses
Channel D Duty Cycle (1 on/4off)	Channel H Mux B & F
Channel E MUX Channels C & D	

Special Features

Bluetooth Wireless Connectivity

The Bluetooth wireless capabilities are truly unique with this unit. With the Bluetooth option, you can control the instrument wirelessly using the included software application, Comm Terminal or other terminal program. This unique feature allows you to communicate with Bluetooth equipped devices, such as laptops and some tablets or smartphones.

Graphical User Interface

The Sapphire uses an included software application as the primary means of communication. The software allows simple and easy control of the unit via USB or optional Bluetooth wireless, enabling the user to create complex pulse trains and save them for future recall. The software also allows users to manually input SCPI (Standard Commands for Programmable Instruments) based commands via the Command Terminal Section.
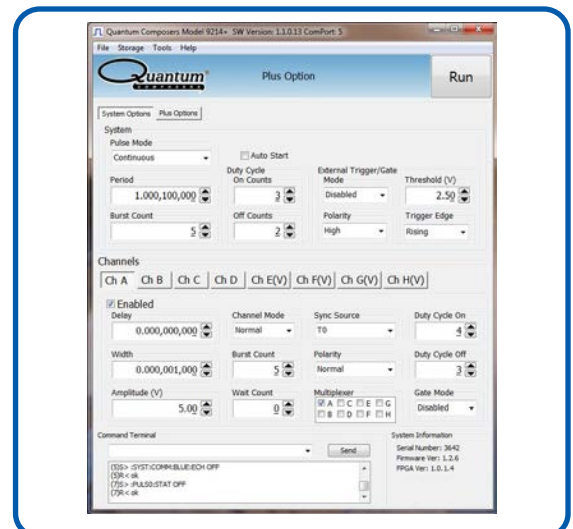
Sapphire Plus Specifications

MODEL	9212+	2 independent channel outputs	Standard Communications: USB Port
	9214+	4 independent channel outputs	Configurations: 6 Memory Slots

INTERNAL RATE GENERATOR

Rate (To period)	0.001Hz to 20MHz (1000s to 50ns)
Resolution & Accuracy	5 ns
Jitter	< 50 ps RMS
Burst / Duty Cycle Mode	1 to 1,000,000 pulses
Timebase	100 MHz, low jitter PLL
Oscillator	50 MHz, 50 ppm crystal oscillator, optional 1ppm clock
Pulse Control Modes	Internal rate generator, external trigger / gate
System Output Modes	Single, continuous, burst, duty cycle, cycle counts
Pulse & Period Counter	32 Bit
Synchronized Update Mode	Updates widths and delays on command

PULSE / DELAY GENERATION

Width / Delay Resolution	5 ns
Width Range	10 ns - 1000 s
Width Accuracy	10 ns + 0.0001 x (width + delay)
Delay Range	±1000 s
Delay Accuracy	5 ns + (0.0001 x delay)
Multiplexer	Any/All channels may be OR'd to any/ALL outputs. 2x the number of outputs via virtual channels for muxing.
Channel Output Modes	Single Shot, normal, burst, duty cycle
Channel Control Modes	Internally triggered or externally gated. Each channel may be independently set to any of the modes.
Jitter (Channel to Channel)	< 250 ps RMS

EXTERNAL GATE / TRIGGER INPUT

Threshold	0.2 to 15 VDC
Max Input Voltage	30 V Peak
Gate Polarity	Active high / active low
Gate Control Modes	Pulse inhibit / output inhibit
Trigger Edge	Rising or falling
Trigger Rate	DC to 20 MHz
Trigger Input Jitter	< 5 ns RMS
Trigger Minimum Pulse Width	20 ns
Trigger Insertion Delay	< 100 ns
Pulse Inhibit Delay	< 150 ns
Output Inhibit Delay	< 100 ns
Trigger Input Function	System can generate a single, burst or duty cycle response of pulses for every external trigger pulse.

OUTPUTS

Output Impedance	50 ohm
Output Level	3.3 – 5 VDC into ≥ 1 K ohm, 1.7 – 2.5 VDC into 50 ohm
Current	20 mV
Rise Time	5 mA into 1 K ohm, 50 mA into 50 ohm
Overshoot	< 2ns @ 5 V (high impedance), < 1ns @ 2.5 V (50 ohm)
	< 100 mV + 10 % of pulse amplitude

GENERAL

USB	Standard USB 2.0
Antenna	Class II Radio, 4 dBm output transmitter, - 80 dBm typical receiver sensitivity
	115200 bits / second
Baud Rate	7.125 x 5.1 x 1.5 inches (18.1 x 13 x 3.8 cm). 1lb
Dimensions/Weight	+ 5 VDC ± 250 mVDC
Voltage	< 470 mA
Current	

OPTIONS

	3.3 - 4VDC into 50ohm
TZ50	1ppm Crystal Oscillator (this option is not field upgradable)
1ppm Clock	Bluetooth 2.1
Bluetooth Wireless Communications	