



FEATURES

- 2 Analog Signal Recording Channels at up to 160 MHz Sample Rate
- 2 Analog I&Q (or 4 Real) Waveform Generation Channels at up to 1 GHz
- 16 Bits of Sample Data Resolution for Both A/D and D/A
- Analog Capture Bandwidth from 100 KHz-600 MHz
- Continuous Analog Signal Record and Playback Capability with No Breaks in the Signal Record
- 400 MB/s Peak Data Record Rate or Playback Rate
- Up to 2.5 hours of Continuous Record/Playback Memory at 400 MB/s Data Rate
- Data for Recording and Playback Uses Standard Windows File System
- Turnkey Software Provided for Signal Recording, Signal Generation and Signal Analysis with Advanced Digital Oscilloscope and Spectrum Analyzer Capabilities
- Option for User Programming on Both CPU and FPGA Embedded Resources

APPLICATIONS

- SIGINT
- RADAR
- SATCOM
- RF Communications
- Ultrasound
 - Medical Imaging / OCT
 - Non Destructive Testing
- All lab environments that use oscilloscopes, spectrum analyzers and signal generators that require signal recordings or waveform generation that exceed general test equipment memory

OVERVIEW

Signatec's SIG-PRG series portable high-speed data acquisition and waveform generation systems combine the features of oscilloscopes, spectrum analyzers and signal generators with high-speed RAID storage to create a highly integrated and advanced wideband signal test system.

Though conventional signal test equipment are proven general-use instruments, the performance capabilities of traditional oscilloscopes, spectrum analyzers and signal generators are limited and sometimes employed in applications they are ill-suited to perform. This is especially true for applications that require true real-time and continuous signal data (with no breaks in the analog capture or playback) for very long periods of time, as well as applications that require embedded real-time digital signal processing capabilities.

The Signatec SIG-PRG systems are not a replacement of, but rather an answer to, conventional test equipment deficiencies, while still providing the highly integrated, user-friendly commercial off-the-shelf (COTS) product characteristics that allowed the oscilloscope, spectrum analyzer and signal generator to become so widely used within the Test & Measurement industry. The combination of compatible high dynamic range signal capture and signal generation channels with terabytes of data storage, customizable real-time data processing and easy to use turnkey system software has resulted in a

unique platform that gives engineers a new and powerful tool for high frequency wideband signal applications that require significant data storage capabilities.

SIG-PRG Series System Advantages to the Oscilloscope

Most oscilloscopes are limited to the capture of a few million points of information, which is really only useful for human eye analysis. Furthermore they offer little to no custom programming options, produce low dynamic range data and are not always easy to control or transfer data from within an embedded environment.

The Signatec SIG-PRG systems are designed to answer to these deficiencies by allowing for multiple terabytes of continuous signal data capture, enabling embed custom real-time processing (as an option) and provide high dynamic range data at up to 16 bits of resolution. Other benefits include data analysis software for viewing captured data as well as client/server capabilities that allow for the systems to be easily controlled either directly from the embedded computer or from an existing user's network computer.

OVERVIEW (Continued)

SIG-PRG Series System Advantages to the Spectrum Analyzer

The SIG-PRG system spectrum analyzer features are quite advanced and allow for uses that are not possible on traditional spectrum analyzer boxes.

Most spectrum analyzers capture a large spectrum via many narrower consecutive frequency bands and piece these smaller bands together to form a greater spectrum image. One advantage of this narrowband capture method is the better spurious free dynamic range (SFDR) performance versus wider band capture systems. However, a significant disadvantage for some applications is that each discrete narrow band is captured at a different moment in time. For signal communications based applications that not only wish to view a larger captured spectrum of interest, but also need to record all bands of data continuously for possible post analysis; the data from spectrum analyzers would be worthless and provide only snapshots of data rather than a complete recording. The SIG-PRG system on the other hand provides a complete intact signal data record for all narrow-band channels within the greater captured spectrum.

Signatec's Sig-Series systems such as the SIG-PRG are ideal for IF signal data capture and operate by grabbing a single very large band of data at up to 80 MHz bandwidth for 16-bit data. The full wideband spectrum can be captured, displayed and recorded to storage continuously with no breaks in the signal data record for multiple hours worth of recording.

The standard SIG-PRG operating mode for spectrum analysis is to record all raw signal data, perform periodic snapshot FFT processing and display the processed results. Additionally, Signatec offers options for real-time processing to perform digital down conversion (DDC) on selectable frequency bands in the greater spectrum as well as fast Fourier transform (FFT) on all captured data with both raw and FFT data results recorded. Provisions also exist (as an option) for users to program custom processing routines into the embedded FPGA onboard the SIG-PRG's signal recording module.

SIG-PRG Series System Advantages to the Signal Generator

Typical bench-top signal generators are useful for playing very simple and repetitive waveforms. Signatec's SIG-PRG waveform generation module has this same simple ability along with more advanced arbitrary waveform generation capabilities for creating unique waveforms for terabytes worth of data samples. This integrated signal generation component is especially useful for replaying back into analog form previously digitized analog signals from the SIG-PRG's signal recording module.

SIG-PRG Series System Features and Components

The SIG-PRG system is a hand portable computer that encompasses several key components or modules that combine to create an effective tool for continuous wideband signal capture and signal generation applications.

The signal recording module (SRM) is a dual channel 16-bit digitizer that can sample data at up to 160 mega-samples per second (MSPS) per channel. The sampling rate is completely tunable allowing for the selection of any sampling frequency from about 1.4 MHz up to the full 160 MHz peak sampling rate.

The SRM also has inputs for an externally provided clock signal, a reference clock, a data capture trigger and a time-stamp trigger. Signal data recorded from the SRM can be sustained direct to the integrated RAID system at up to 400 MB/s for multiple terabytes (TB) worth of data. The SRM also has options for onboard integrated real-time processing capabilities that are either fixed or customizable.

The waveform generation module (WGM) is designed to be compatible with the signal recording module (SRM) for accurately replaying previously captured signal data. The WGM has up to 4 signal output channels (2 channels in I & Q mode) that can play 16 bit digital data samples at up to 300 MSPS per channel when playing data from the onboard RAM. When playing data from the integrated RAID system, the same 400 MB/s data rates for the signal recording system can also be sustained for the WGM streaming playback. The WGM module also has inputs for an external clock, external reference clock and trigger.

The integrated RAID system allows for very large continuous signal data records to be either captured or generated. The size and performance of the RAID can vary with the selected system options, with peak sustained data rates of up to 400 MB/s for either reading or writing and storage sizes up to 8 TB. Much faster data rates and larger storage capacities can be achieved using Signatec's rackmount based system configurations, which are heavier and much less portable.

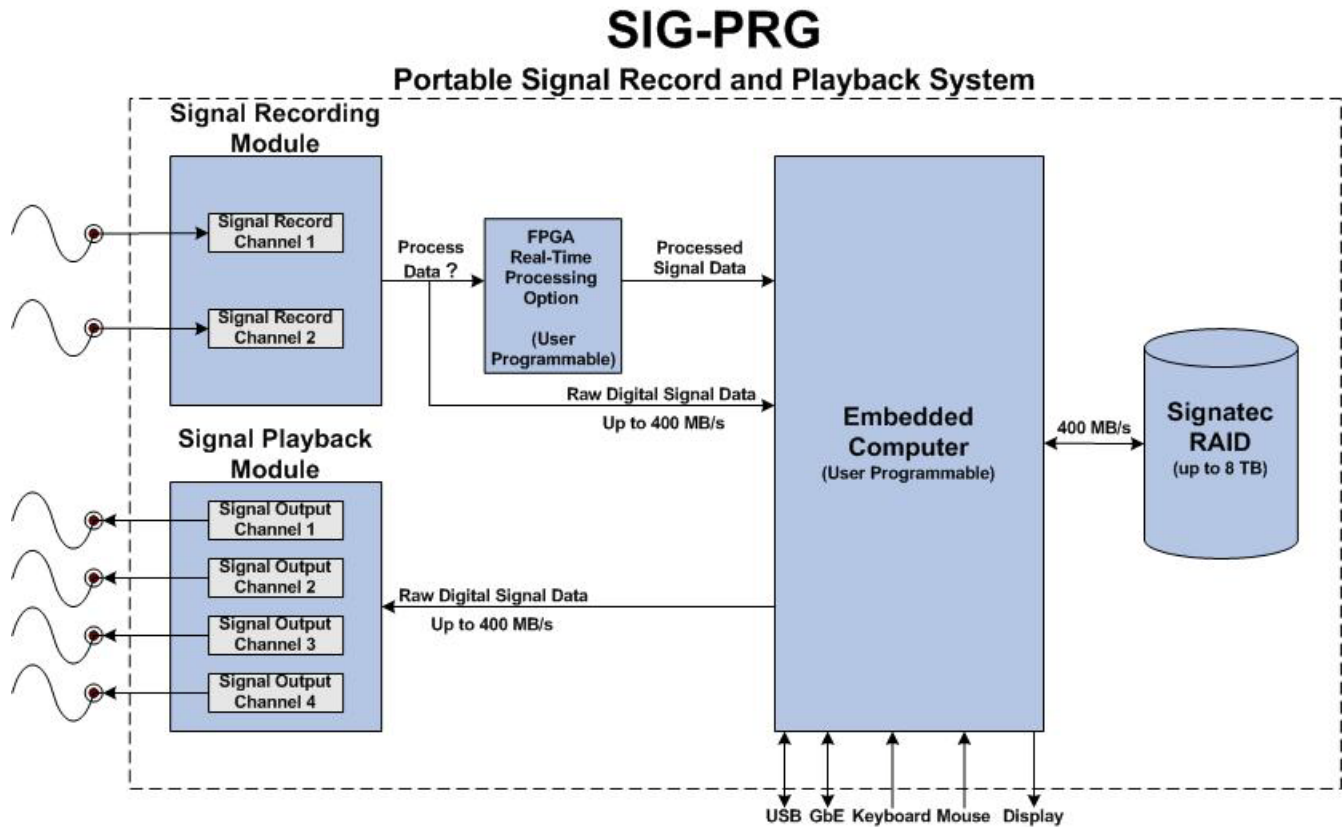
The file system used by the SIG-PRG for the RAID is a standard Windows file system. USB and LAN connections exist on the SIG-PRG for either writing or reading to/from the RAID from a networked computer to copy generated file data for signal generation or to download data previously recorded from the SRM.

Included with the SIG-PRG is GUI based software that allows for performing all signal recordings, signal generation and data analysis in both time and frequency domains. This software runs on the embedded system computer, which is loaded with a standard Windows operating system (Vista by default, with other options).

Users also have the option for creating their own custom software to run on the SIG-PRG computer platform. Software development kits are provided with source code (in C/C++) that demonstrate how to build signal record and playback applications using the embedded SRM and WGM hardware.

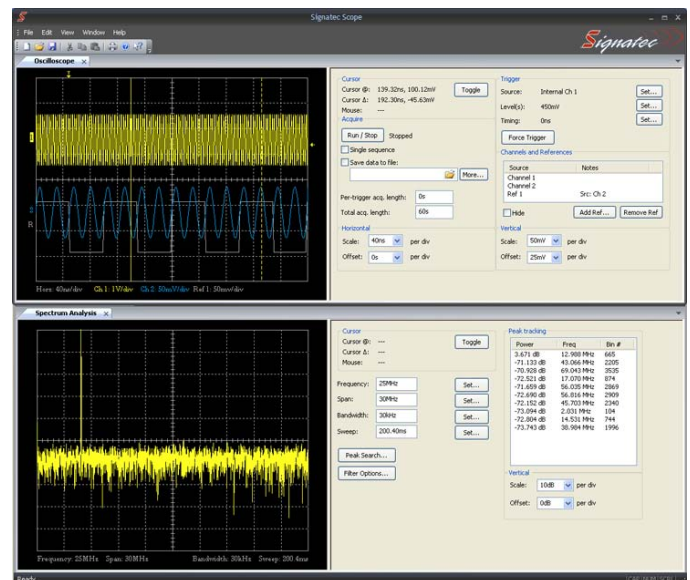
HARDWARE DESCRIPTION

The simplified block diagram below depicts the SIG-PRG resources and data connections. All resource modules in the picture are completely contained within the mobile chassis.



SOFTWARE

The SIG-PRG series systems come complete with GUI based software for performing all system settings, viewing digital data (either captured or generated), performing signal recordings and signal generation as well as the option for viewing data in either time domain or frequency domain. A software development kit is also provided (complete with programmer's manual, an API or library of functions for the SRM and WGM and source code examples in C/C++) for users that plan to create their own custom applications. The SIG-PRG system is loaded standard with Windows Vista. Options for other operating systems are available.



SIG-PRG Software GUI

SIG-PRG SPECIFICATIONS

Signal Recording Module (SRM)

External Signal Connections

Analog Input, Channel 1	: SMA
Analog Input, Channel 2	: SMA
Clock Input	: SMA
Trigger Input	: SMA
Digital Output	: SMA

Analog Inputs

Full Scale Volt. Ranges	: 2.50V, 1.67V, 1.00V, 667mV, : 400mV, 267mV
Impedance	: 50 ohms
Bandwidth	: 600 MHz (with no LP filter)
Coupling	: AC

External Trigger

Signal Type	: digital, TTL signal level
Impedance	: >10k ohms
Bandwidth	: 50 MHz

Internal Synthesized Clock

Frequency range	: 45.0 - 170 MHz
Resolution	: better than 5 PPM
Accuracy	: better than 5 PPM
Unsettable ranges	: 128.9-129.8, 140.6-142.8, 154.7-158.7 MHz

External Clock

Signal Type	: sine wave or square wave
Coupling	: AC
Impedance	: 50 ohms
Frequency	: 10 MHz to 160 MHz
Amplitude	: 100 mV p-p to 2.0 V p-p

Post ADC Clock Divider

Divider Settings	: 1, 2, 4, 8, 16, 32
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Reference Clock

Internal	: 10.0 MHz, ± 5 ppm max.
External	: 10.0 MHz, ± 50 ppm max (required for lock)

Digital Output

Type	: TTL Logic Level
Max. Frequency	: 160 MHz
Suggested Load	: 1k ohms

Digitizer

Resolution	: 16 bits
Aperture Jitter	: 0.07 pS typical
Clock Rate	: 1.4 to 160 MHz

Trigger Modes

Post Trigger	: single start trigger fills active memory
Pretrigger	: single trigger stops acquisition
Segmented	: start trigger for each memory segment

Trigger Options

Pretrigger Samples	: samples prior to trigger are stored; Single Channel: 8k max.; Dual Channel: 4k max per channel
Delayed Trigger	: delay from trigger to data storage; Up to 64k digitizer clock cycles

Memory

Active Size	: Up to 256 MegaSamples
Segment Size	: Up to 128 Megasamples
Segment re-arm time ¹	: 150 nanoseconds
Addressing	: DMA transfer from starting address

Absolute Maximum Ratings

Analog Inputs	: ± 5 volts
Trigger Input	: -0.2 to +4.0 volts DC
Clock Input	: 5 volts peak to peak
Ambient Temperature	: 0 to 50 C

Waveform Generation Module (WGM)

Input Signals

External Trigger
External Clock
Reference Clock

Output Signals

DAC Channel 1 ("I1")
DAC Channel 2 ("Q1")
DAC Channel 3 ("I2")
DAC Channel 4 ("Q2")
Clock Out
Digital I/O

Connectors

MMCX (9 total)

Analog Outputs

F.S. Voltage Ranges	: 400mVp-p to 2.0Vp-p (DC Coupled)
Impedance	: designed for 50 ohm load
Bandwidth	: up to 125 MHz, but determined by selected filter
Coupling	: AC

External Trigger

Trigger Level	: TTL (.8v - Low, 2V-Hi)
Coupling	: DC

External Clock

Signal Type	: sine or square wave
Impedance	: 50 ohms to ground
Frequency	: 16 MHz to 1000 MHz
Amplitude	: 100 mV p-p to 2.0V p-p
Coupling	: AC

Reference Clock

Signal Type	: sine or square wave
Impedance	: 50 ohms to ground
Frequency	: $f_{ref} = f_{vco} * R/N$ where R and N are any 13 bit integer; $f_{ref} (max) = 100MHz$
Amplitude	: 100 mV p-p to 2.0V p-p
Coupling	: AC

DC Offset Voltage

Control	: 12 bit DAC
Range	: $\pm 1/2$ of full scale setting

AC Performance (fdac=1000MHz)

SFDR, fig=100MHz	: 80dB
SNR, fsig=100MHz	: TBD dB

Trigger Modes

Single Shot	: single start trigger runs memory data once
Continuous	: single start trigger runs looped memory data

DAC Memory

512 MBytes DDR SDRAM

Absolute Maximum Ratings

Analog Inputs	: ± 5 volts
Trigger Input	: -0.2 to +4.0 volts DC
Clock Input	: 5 volts peak to peak
Ambient Temperature	: 0 to 50 C

Data Rates

Maximum Rates

The following maximum data rates at various points in the data flow could dictate perform limits for various utilizations.

Input 32-bit Ports	: 500+ MB/s (single port) / 1.0+ GB/s (2 ports)
SDRAM	: 1.3 GB/sec
Input Data Rate to each DAC	: 300 MSPS
DAC Output Rate	: 1000 MSPS (with interpolation)

Minimum Rates

Input Rate to DAC	: 16 MSPS per channel
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SIG-PRG ORDERING INFORMATION

SIG-PRG Ordering Information

Part Numbers

SIG-PRG

Documentation & Accessories

The SIG-PRG is supplied with a comprehensive operator's manual, which thoroughly describes the operation of both the hardware and the software. Also supplied are two four-foot coaxial cables with SMA to BNC connectors (SRM) and two four-foot cables with MMCX to BNC connectors (WGM). Additional cables may be purchased. Supplied software disks contain a function library for Microsoft Visual C/C++, example programs, and all source code to libraries and examples.

Product Warranty

All Signatec products carry a full 1-year warranty. During the warranty period, Signatec will repair or replace any defective product at no cost to the customer. This warranty does not cover customer misuse or abuse of the products or physical damage not reported within 15 days of the time of shipment by Signatec.

Notes:

Signatec reserves the right to make changes in this specification at any time without notice. The information furnished herein is believed to be accurate, however no responsibility is assumed for its use.

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