## Spectrum Tera-Store Data Streaming Solutions

- **Continuous (seamless) Data Recording**
- **Guaranteed Streaming Speed up to 3 GByte/s**
- **Complete turn-key PC solution**
- **Data Storage Options from 1 to 96 Terabyte**
- **Single-Shot and Multiple (segmented) Acquisition Modes**
- **Sampling rates up to 3 GS/s (segmented) and 2.5 GS/s (single-shot)**
- **Configurations with 1 to 128 channels in one chassis**
- **Configurations up to 256 channels with docking station**
- **SBench 6 Professional software for easy control, display and analysis**
- **Factory Integrated and Performance Tested**

- Base system SPcB8-E6
- Streaming speed up to 3.0 GB/s
- Storage up to 32 Terabyte
- Up to 6 data acquisition cards from Spectrum
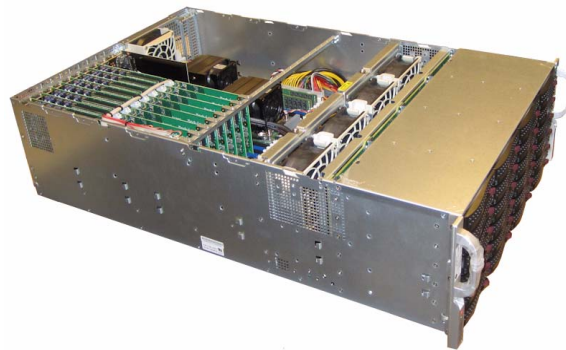
- Base system SpcB24-E8
- Streaming speed up to 3.0 GB/s
- Storage up to 96 Terabyte
- Up to 8 x M4i or M2i data acquisition cards from Spectrum
- Up to 10 x M2p data acquisition cards from Spectrum

General Information

Combining a number of Spectrum M2p, M2i, M3i or M4i PCIe digitizers with a Tera-Store Data Streaming solution allows the capture and storage of long complex signals for extended periods of time. With systems available offering from 1 to 96 TB of storage and streaming rates up to 3 GB/s signals can be digitized and stored seamlessly for hours on end.

At the heart of the system is one of to carefully selected base PC systems. This powerful computer includes a Supermicro 4U/Tower with 8/24 drive bays, 6 to 10 free PCIe slots for Spectrum cards. The PC is powered by a single/dual Xeon processor, has a passive cooled graphics card, 16/64 GB RAM, a separate 256 GB SSD for the system installation, a DVD drive, and runs under Windows 10 Professional 64 Bit. The chassis hosts a powerful power supply and has powerful fan-based cooling.

If more acquisition channels are needed, than can fit into the base PC system, a special 16 slot docking station can be connected to extend the number of synchrnous streaming data acquisition channels up to 256.

The system is factory configured with Spectrum's SBench 6 Professional software to provide a simple turnkey solution for digitizer control, data capture, display and analysis. For more information on SBench 6 please refer to the data sheet or visit http://spectrum-instrumentation.com/en/sbench-6-overview.

For large multi-digitizer systems Spectrum also provides Star-Hub, a unique clock and trigger distribution system, which allows all the installed digitizer cards of one family to be clocked synchronously and to share a common trigger. The star-hub is already included in the base system. You simply have to add digitizer cards.

Storage systems are available offering a range of streaming rates, from 500 MB/s up to 3 GB/s, and storage capacities, from 1 TB to 96 TB. The options consist of a high performance RAID controller and a number of solid-state or hard-disk drives (SSD/HDD's) configured to support the required transfer rates and storage times.

Spectrum integrates the complete system, providing factory configuration and performance testing. This includes the PC setup, software and hardware installation and digitizer calibration. Hardware and software are both optimized and tested to guarantee the specified streaming rates.

Seamless Single-shot recording

With a single hardware or software induced trigger event a Spectrum digitizer can stream digitized signals in a First-In-First-Out (FIFO) fashion over the PCIe bus directly to the Tera-store storage system. The digitized data is then continuously stored, in a totally seamless fashion, without any breaks or lost information. The control of the data stream is done automatically by the driver on an interrupt request basis. The complete installed onboard memory of the digitizer is used to buffer the data making the continuous streaming process extremely reliable.

Seamless Single-shot Recording is extremely useful in applications where signals need to be acquired continuously without the loss of ANY information. Examples include communications, wireless and mobile telephony, surveillance, electronic warfare, data logging, seismology, power monitoring and radiation monitoring.

Multiple (Segment) Recording

The Multiple Recording mode allows the recording of several trigger events with an extremely short re-arming time. The digitizer hardware doesn't need to be restarted in between events. In this mode memory on the digitizer is divided into several segments of the same size. Each memory segment is filled with data whenever a valid trigger event occurs. Pre- and post-trigger data can be acquired in each segment and the number of acquired segments is only limited by the used memory. The number of segments is virtually unlimited when using FIFO transfer mode to stream the data continuously to a Tera-store storage system.
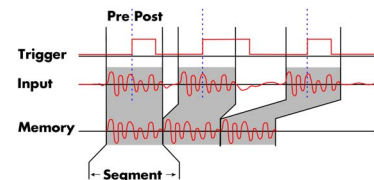
Multiple Recording is ideal for applications where signals arrive in bursts or are generated in a stimulus-response manner. Examples include RADAR, LIDAR, SONAR, Ultrasound, Medical Imaging, RFID, Wireless Communications, Biomechanics, Laser Imaging, Lightening Studies, Nuclear Physics and Radio Astronomy.

Configuration

A streaming system consists of three components:

Item 1: One of the two **base systems** including the powerful complete PC with installed operating systems and drivers and SBench 6. The base systems are designed to hold up to 6 Spectrum cards and include the star-hub and the Professional (and Multi card if needed) license of SBench 6. The only one difference between the two base systems is the available space for the streaming option:

- SPcB8-E6: designed for streaming up to 3.0 GByte/s with SBench 6 while holding up to 8 SSDs/HDDs
- SPcB24-E8: designed for streaming up to 3.0 GByte/s with SBench 6 while holding up to 24 SSDs/HDDs

Item 2: Up to 6 (10) **digitizer cards** of one family. Please note that the Streaming Option Speed states the write transfer rate to SSD/HDD array. Each card family has its own bus transfer speed capability that limits the transfer rate between a single card and the hard disk array. Most Spectrum digitizer cards can run with higher sampling speeds than it is possible to transfer continuously through the bus interface:

- M2p PCIe x4 Gen1 series data acquisition: 700 MByte/s
- M4i PCIe x8 Gen2 series data acquisition: 3.0 GByte/s
- M4i PCIe x8 Gen2 series data replay: 2.5 GByte/s
- M3i PCIe x1 Gen1 series: 160 MByte/s
- M2i PCIe x1 Gen1 series: 160 MByte/s

Item 3: One of the **streaming options** which consists of a RAID controller and either fast HDD's (for low speed transfer, high storage space) or fast SSD's (for high speed transfer, lower storage space). There are some predefined standard streaming options but other options are also available on request. All predefined options are listed in the order options chapter at the end of the data sheet.

A streaming option order code looks like SPc-Str(XX)T(YY) where the (XX) stands for the sustained streaming speed and (YY) for the storage size in TByte. The streaming option SPc-Str30T8 will read to 3.0 GByte of sustained streaming with 8 TByte of storage space.

Configuration Examples

Acquisition of 32 Channels 16 Bit @10 MS/s
1 x SPcB8-E6 Base System with SBench 6 Pro
1 x Spc-Str08T16 (750 MB/s, 16 TByte)
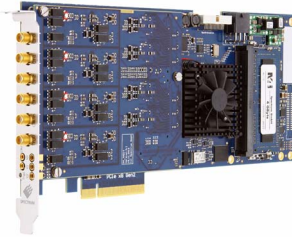4 x M2i.4912-exp (8 channel 10 MS/s each)

Continuous Streaming Speed 640 MByte/s
Storage Space 7 hours
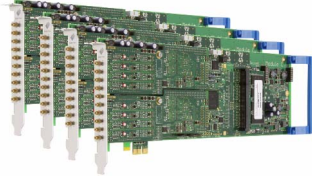
Acquisition of 4 Channels 16 Bit @ 250 MS/s
1 x SPcB8-E6 Base System with SBench 6 Pro
1 x Spc-Str30T8 (3.0 GB/s, 8 TByte)
1 x M4i.4421-x8 (4 channel 250 MS/s)

Continuous Streaming Speed 2 GByte/s
Storage Space >1 hour

Acquire + Replay 2 Channel @ 100 MS/s
1 x SPcB8-E6 Base System with SBench 6 Pro
1 x Spc-Str04T8 (0.4 GB/s, 8 TByte)
1 x M4i.4410-x8 (2 channel 130 MS/s A/D)
1 x M4i.6621-x8 (2 channel 625 MS/s D/A)
Continuous Streaming Speed 400 MByte/s
Storage Space >5 hours

Technical Data

Base System SpcB8-E6 Specification

Specification is defined at document printing and may be changed without notice to compensate for system components that are no longer available or components that had to be exchanged to improve performance, stability or maintenance. Please check for the quotation details to see the current system configuration.

Dimension of Chassis	L x W x H	4U Tower: 648 mm x 452 mm x 178 mm
Dimension of Shipment Package	L x W x H	approximately 800 mm x 710 mm x 320 mm
Shipment Package Weight		approximately 31 kgs
Chassis Color		Black
Cooling		4 Fans
Operating Temperature		5°C to 35°C
Power Supply		865 Watts Super Quiet High Efficiency
CPU		Xeon Quad Core 3.5 GHz
System Memory		16 GByte DDR3
System Drive		256 GByte internal SSD
Streaming Drive Bays		8 (usage depends on streaming option)
Available Instrument Card Slots		3 x PCIe x8 Gen2, 3 x PCIe x4 Gen2 in PCIe x8 physical slot
Graphics		GeForce 2 GByte, DVI, HDMI (occupying one slot) or compatible on-board Matrox G200eW, 16 MByte (optional if all 6 instrument slots + RAID are needed)
Connectors	Front	2 x USB
Connectors	Rear	VGA, 2 x GBit Ethernet, 2 x USB, 1 x COM, 2 x PS/2
Devices		DVD RW
Operating System		Microsoft Windows 10 Professional 64 Bit English
Setup		Spectrum Drivers + Examples + Control Center + SBench 6 installed and tested, cards tested and calibrated in system.

Base System SpcB24-E8 Specification

Specification is defined at document printing and may be changed without notice to compensate for system components that are no longer available or components that had to be exchanged to improve performance, stability or maintenance. Please check for the quotation details to see the current system configuration.

Dimension of Chassis	L x W x H	4U Tower: 737 mm x 437 mm x 178 mm
Dimension of Shipment Package	L x W x H	approximately 900 mm x 710 mm x 320 mm
Shipment Package Weight		approximately 48 kgs
Chassis Color		Black
Cooling		5 hot-plug cooling Fans
Operating Temperature		5°C to 35°C
Power Supply		1200 Watts Platinum Level, redundant
CPU		Dual Xeon Octa-Core 1.7 GHz
System Memory		2 x 32 GByte DDR3
System Drive		256 GByte internal SSD
Streaming Drive Bays		24 (usage depends on streaming option)
Available Instrument Card Slots		9 x PCIe x8 Gen3 full length 1 x PCIe x8 Gen3 half length 1 x PCIe x4 Gen2 in PCIe x8 slot half length
Graphics		GeForce 2 GByte, DVI, HDMI (occupying one slot) or compatible optional: on-board VGA graphics
Connectors	Front	2 x USB
Connectors	Rear	2 x GBit Ethernet, 4 x USB, 1 x VGA
Operating System		Microsoft Windows 10 Professional 64 Bit English
Setup		Spectrum Drivers + Examples + Control Center + SBench 6 installed and tested, cards tested and calibrated in system.

Delivery Content

Base System with installed streaming option and installed cards + Power Cord

SBench 6 Professional + Multi license (installed in system)

Star-Hub of used card family (M2p, M2i, M3i or M4) if more than one card installed in system. Star-Hub is installed

Mainboard, Card(s), SBench 6 Software Manuals

System and Cards Driver CD's

no keyboard, no mouse, no monitor, no additional cables.

Operating Software SBench 6

SBench 6 Professional is included in the streaming system and allows to store, view and replay data files at the given streaming speed.

Introduction

SBench 6 provides a way for the user of Spectrum hardware to have a powerful and versatile software package for viewing, logging and post processing of captured signals. No text programming is required and the set up is very rapid. An easy-to-use pull down menu allows full control over the hardware set up, logging settings, type and size of displays, export functions and post processing:

- Designed to acquire and handle GBytes of data
- Fast data acquisition includes support for RAID disk arrays
- Fast data preview function of big files; isolate areas and zoom in!
- Handles analog, digital and frequency spectrum data
- Y(t), FFT and logic analyzer displays
- Enhanced display cursor functions with dynamic XY values
- Integrated signal analysis functions
- Import and export filter for data files
- State-of-the-art drag-and-drop technology
- Thread based program structure
- Easy usage with docking windows and context menus

SBench 6 is a powerful and intuitive interactive measurement software. Besides the possibility to commence the measuring task immediately, without programming, SBench 6 combines the setup of hardware, data display, oscilloscope, transient recorder, analysing functions and export functions under one easy-to-use interface. All current Spectrum M2i, M3i and M4i cards are supported.
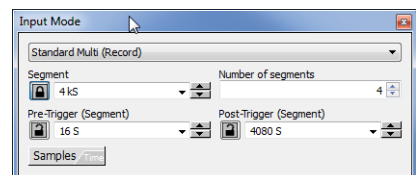
Data Storage
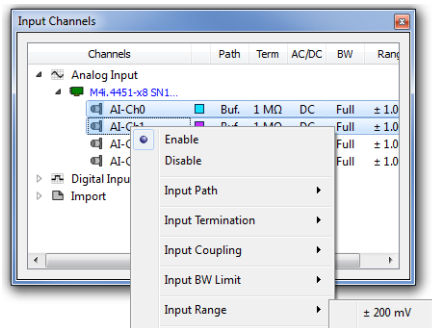
All configuration, acquired data, reports, calculations and stored files are placed within a separate project folder. Projects can be used to organize measurement setups in production, to store, archive and share complete data sets, including all calculation and display details, or to generate default and write protected project templates for specific measurement jobs. A project is either stored as a set of sub-folders with separate files, that can be accessed individually, or it can be stored as a zip-archive which can be easily exchanged.

The project and also the separate data acquisitions can be extended by a user defined number of additional information fields. These can be made mandatory in cases that need to have a defined data set for each acquisition. The information fields can hold environmental details like temperature, used equipment, operator, additional test settings or it can be used to describe the DUT (device under test).

A project can hold a single acquisition as well as a number of automatically or manually stored acquisitions. All acquisitions can be found in a separate project data browser that also displays the acquisition information on the side.

Hardware Setup Windows

All hardware settings can be accessed using neat yet sophisticated setup windows for many aspects of the card operation, this includes sample (clock) rate, desired number of samples, trigger type and card capture mode (short capture or continuous streaming). Individual card channel amplification and impedance can be set and any channel disabled to reduce memory requirements. The target for data storage can be selected, be it cards own memory or the PC memory. If more than one card is used in a system individual sampling rate and memory settings can be assigned (licence option SBench6-Multi required).

Project Organization
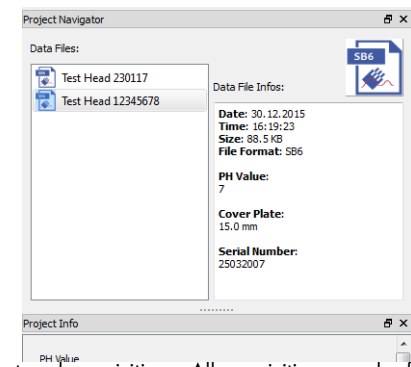
All configuration, acquired data, reports, calculations and stored files is placed within a separate project folder. Projects can be used to organize measurement setups in production, to store, archieve and share complete data sets including all calculation and display details or to generate default and write protected project templates for defined important measurement jobs. A project is either stored as a set of sub-folders with separate files that can be accessed individually or it can be stored as a zip-archieve which can be easily exchanged.

The project and also the separate data acquisitions can be extended by a user defined number of additional information fields which can be set to mandatory to have a defined data set for each acquisition. The information fields can hold environmental details like temperature, used equipment, operator, additional test settings or it can be used to describe the DUT (device under test).

A project can hold a single acquisition as well as a number of automatically or manually stored acquisitions. All acquisitions can be found in aseparate project data browser that also display the acquisition information aside.

Trigger Setup

One of the main strengths of Spectrum hardware is the versatility and variety of available trigger options. SBench 6 allows access to all the trigger options including edge, level, steepness, gradient, pulse width and window. New for version 6 are illustrative windows to help in the selection of trigger type, level(s) and time (pulse width).

All available trigger sources can be accessed from SBench 6 including OR and AND combination of channel triggers and external sources. Even trigger sources that are only available as an option like BaseXIO have been incorporated into SBench 6 allowing to set up any trigger combination that is supported by the hardware.
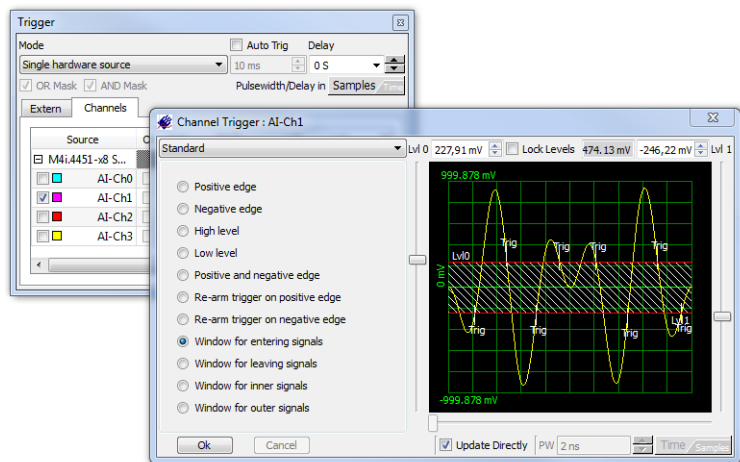
Reports
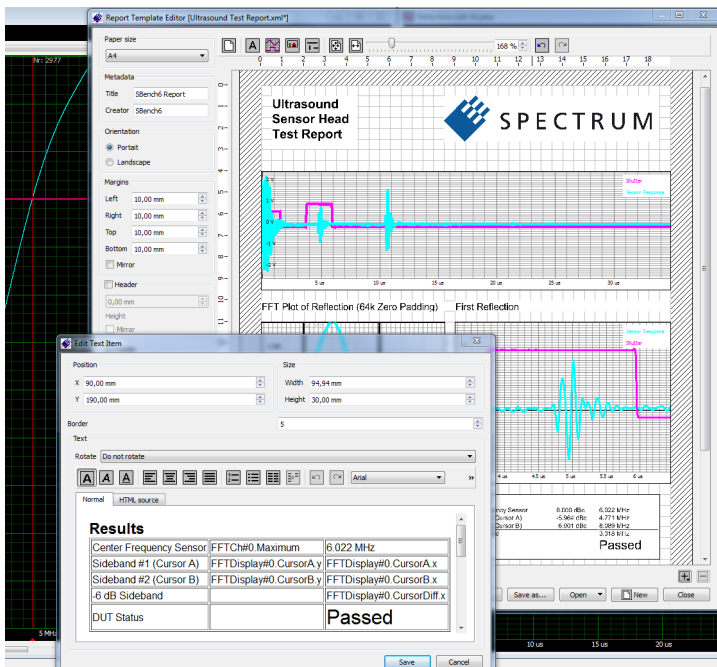
SBench 6 contains a powerful report editor and generator that documents the use of all components of SBench 6 for individual reports.

A report can contain analog, FFT, digital, histogram, spread and X-Y displays. Furthermore, all measurement results, cursor positions, project information, hardware information and the complete hardware configuration can be added to a report as single values or as overview tables.

Free text fields, lines and pictures can be used to add additional information to the report.

The report template itself is xml code and can be changed manually or archived with standard code managing software.

The report is generated as a pdf and can be printed on any installed printer or stored as a pdf file. Different European and US paper formats are supported with freely definable borders, header and footer area.

The printout can be made in portrait or landscape format.

Order Information

Base Systems

Order no.	
SPcB8-E6[2]	Base System 4U with 8 drive bays for storage options, 6 free slots for Spectrum PCIe cards. Maximum 3.0 GByte/s streaming options.
SPcB24-E8[2]	Base System 4U with 24 drive bays for storage options, 8 to 10 free slots for Spectrum PCIe cards. Maximum 3.0 GByte/s streaming options.

System Options

Order no.	
SPc-Rail19[2]	Rail-Kit for 19" mounting
SPc-SDD256[2]	Additional SSD for base system B8 and B16, 400 MByte/s streaming speed, 256 GByte storage.

Streaming Options

Order no.	
SPc-Str30T2[2]	Streaming Option for base system B8 and B24. 3.0 GByte/s streaming, 2 TByte storage.
SPc-Str30T4[2]	Streaming Option for base system B8 and B24. 3.0 GByte/s streaming, 4 TByte storage.
SPc-Str30T8[2]	Streaming Option for base system B8 and B24. 3.0 GByte/s streaming, 8 TByte storage.
SPc-Str30T16[2]	Streaming Option for base system B8 and B24. 3.0 GByte/s streaming, 16 TByte storage.
SPc-Str15T1[2]	Streaming Option for base system B8 and B24. 1.5 GByte/s streaming, 1 TByte storage.
SPc-Str15T2[2]	Streaming Option for base system B8 and B24. 1.5 GByte/s streaming, 2 TByte storage.
SPc-Str15T4[2]	Streaming Option for base system B8 and B24. 1.5 GByte/s streaming, 4 TByte storage.
SPc-Str15T8[2]	Streaming Option for base system B8 and B24. 1.5 GByte/s streaming, 8 TByte storage.
SPc-Str08T16[2]	Streaming Option for base system B8 and B24. 750 MByte/s streaming, 16 TByte storage.
SPc-Str08T32[2]	Streaming Option for base system B8 and B24. 750 MByte/s streaming, 32 TByte storage.
SPc-Str04T8[2]	Streaming Option for base system B8 and B24. 375 MByte/s streaming, 8 TByte storage.
SPc-Str02T4[2]	Streaming Option for base system B8 and B24. 185 MByte/s streaming, 4 TByte storage.
SPc-Str30T24[2]	Streaming Option for base system B24. 3.0 GByte/s streaming, 24 TByte storage.
SPc-Str30T48[2]	Streaming Option for base system B24. 3.0 GByte/s streaming, 48 TByte storage.
More streaming options available upon request	