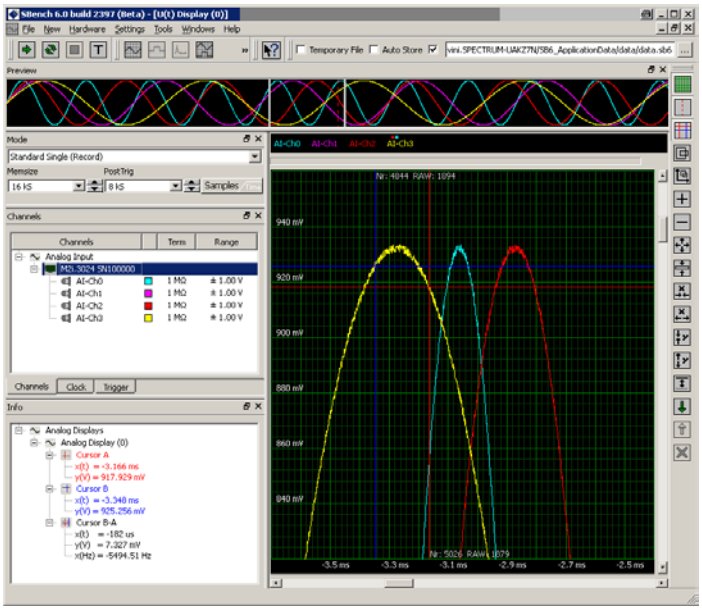
SPECTRUM
SYSTEMENTWICKLUNG MICROELECTRONIC GMBH

SBench 6 - the fast and easy data acquisition software

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:

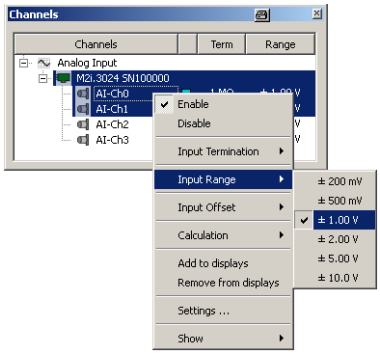
- **Designed to acquire and handle GBytes of data**
- **Fast data acquisition includes support for RAID disk arrays**
- **Fast data preview function of big files; isolate areas and zoom in!**
- **Handles analog, digital and frequency spectrum data**
- **Y(t), FFT and logic analyzer displays**
- **Enhanced display cursor functions with dynamic XY values**
- **Integrated signal analysis functions**
- **Import and export filter for data files**
- **Free base version**
- **Upgrade possible for enhanced post processing and multiple cards**
- **Fully functional 30-start Professional trial version available**
- **State-of-the-art drag-and-drop technology**
- **Available for Linux KDE/Gnome**
- **Available for Windows 2000/XP/Vista and Windows 7**
- **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 and M3i cards as well as all MI, MC and MX data acquisition cards are supported.

The software is available for Windows and Linux. Both versions are based on the same source code to ensure that the Windows and the Linux version are equally provided for. The software development is based on a common API that is available for Windows, KDE and Gnome still providing the look and feel of the specific window manager.

Using SBench 6



Data Storage

The SBench 6 Engine controls the complete data transfer to the PC. This software component has been designed for fast data transfer. The strict separation within SBench between the display layer and hardware control provides maximum performance for data acquisition; this allows the same average streaming speed that is also possible with standard C++ text programming. Data is stored in an intelligent and compact data format allowing maximum system performance. To make post process of data even more manageable, the Professional version allows data to be automatically split into multiple files at set size intervals.

Capture to the limit of the cards on-board memory can be utilised with no restriction on sample speed. Long-term continuous data storage to current hard disks of multi GByte files is possible too and when combined with RAID real-time transfer speeds in excess of 100 MB/s are easily achieved. Data exports are possible, currently SBench 5, SBench 6, MATLAB, ASCII, Wave (*.wav) and binary

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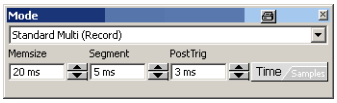
Hardware Setup Windows

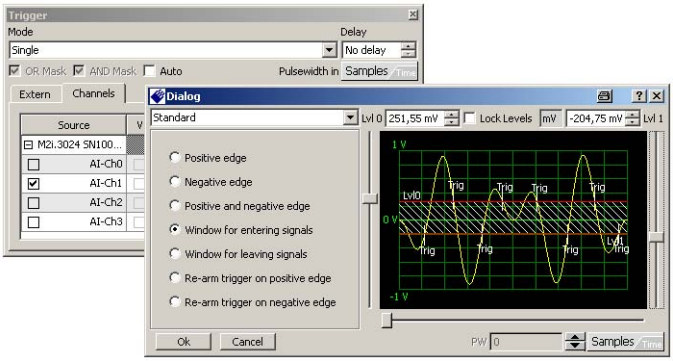


All hardware settings can be accessed using neat yet sophisticated setup windows for many aspects of the card operation, this includes sample (clock) rate, desired number of samples, trigger type and card capture mode (short capture or continuous streaming). Individual card channel amplification and 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.

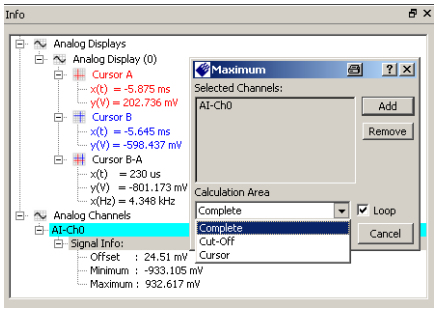
Trigger Setup

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.



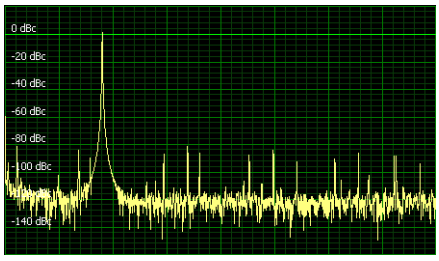
Calculation Routines and Measuring Results



A special info window shows extended information on the current cursor positions on the signal trace. With only one mouse click it is possible to use additional calculation routines on any signal. The signal used as calculation base can be any acquired signal, any loaded signal or even a freshly calculated signal like FFT. The calculation area can be selected to be the whole signal, visible display window area, or that defined by two cursor positions. The version overview on the next page shows the available calculation routines and suggestions for new calculation routines are always welcome!

FFT Analysis and Display (Professional Version)

Using the FFT calculation adds a Spectrum analyzer to SBench's time-based oscilloscope functionality, with FFT analysis providing the frequency domain information of the signal. The input signal can be weighted by different window functions such as Hanning, Hamming, Blackman, (many being available). The resulting FFT plot is shown as dBc, dBFS, dBuV, dBm or plain voltage. The FFT signal can be used for further calculations, such as SNR, THD, MAX value - with others available. A harmonics cursor is available for FFT display in addition to the standard measurement cursor. This cursor shows a programmable number of harmonics based on the current cursor position.

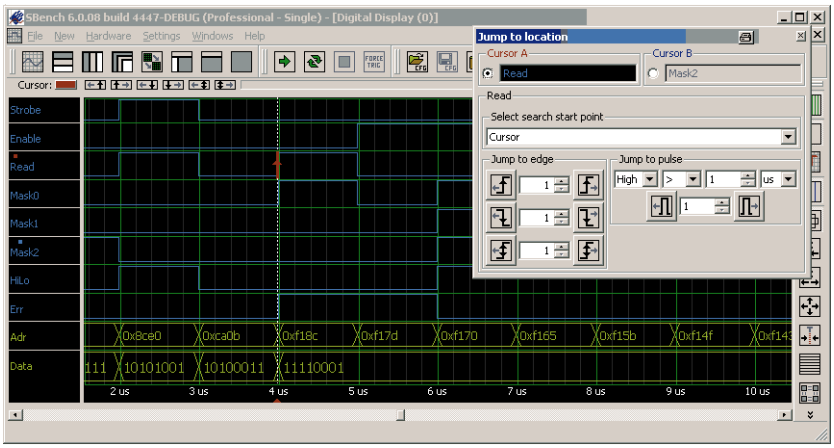


Digital Data Display (Logic Analyzer)

Besides the acquisition and display of analog data SBench 6 also contains a powerful digital data display allowing to group signals to a bus and to navigate through data by edge detection and pulse measurements. The digital data display is available for pure digital acquisition cards as well as for additional digital inputs of an analog data acquisition card.

Analog data can be converted to digital data and vice versa to combine different signals into a mixed mode display.

Digital displays and analog displays can be synchronized to have cursor and zoom settings automatically synchronous between different displays.



Version Overview

The Base version (with no time limit) is included in the delivery of each card and can also be freely downloaded from Web page www.spec.de/sbench6.html. The Professional version requires a license purchase. Updates within an SBench version can be downloaded from the web page at any time free of charge to take advantage of software operational improvements.

	Base	Professional
Operating Systems		
Windows XP/Vista/7	Supported	Supported
Linux + KDE Environment	Supported	Supported
Linux + Gnome Environment	Supported	Supported
Card + Configuration		
Single Card	Supported	Supported
Multiple Cards (one system)	n.a.	Option -Multi
License	free	purchase
Configuration Load/Store	Supported	Supported
Modes and Features		
Standard Acquisition/Replay	Supported	Supported
FIFO Acq of several GSamples	n.a.	Supported
Multiple Recording/Replay	Simple display	Segmented display
Gated Sampling/Replay	Simple display	Segmented display
ABA Mode	Simple display	Segmented display
Timestamp	n.a.	Supported
Digital Inputs/Outputs	Supported	Supported
BaseXIO trigger lines	n.a.	Supported
Setup Functions		
Channel Setup	Included	Included
Clock Setup	Included	Included
Trigger Setup	Included	Included
Mode + Memory Setup	Included	Included
Streaming Setup	n.a.	Included
Display Functions		
Preview Display	Included	Included
Analog Waveform Display	Included	Included
Spread Waveform Display	Included	Included
Digital Waveform Display	Included	Included
Digital Signals Bus Feature	n.a.	Included
Digital Bus Inspection	n.a.	Included
History Mode	Included	Included
FFT Display	n.a.	Included
FFT Signal Harmonics Cursor	n.a.	Included
Cursor Measurement Functions	Included	Included
Physical Units	n.a.	Included
Layout/Auto Layout Functions	Included	Included
Define Shortcuts	Fixed set	Configurable
Comments Display/Channel	n.a.	Included

	License
File functions	
Auto Storage	Prof.
Split Files	Prof.
Acquisition format	
SBench 6	Base.
Wave File (*.wav)	Prof.
Pure Binary File	Prof.
Export Functions	
Screenshot	Prof.
SBench 6	Base
MATLAB	Prof.
SBench 5.	Prof
ASCII	Prof.
Wave File (*.wav)	Prof.
Pure Binary File	Prof.
Signal cut-off	Prof.
Import Functions	
SBench 6	Base
SBench 5	Prof.
ASCII	Prof.
Wave File (*.wav)	Prof.
Pure Binary File	Prof.

	License
Basic Calculations	
Min/Max	Base
Average	Base
Peak-Peak	Base
Effective	Base
Signal Info	Base
Slope	Base
Cycle based Calc	
Number of Cycles	Prof
Frequency/Period	Prof
Duty Cycle	Prof
Pos/Neg Width	Prof
Cycle Min/Max	Prof
Cycle Average	Prof
Cycle Peak-Peak	Prof
Cycle Effective	Prof
Cycle Rise/Fall Time	Prof
Math Signals	
ADD/SUB/MUL/DIV	Prof.
AND/OR/XOR	Prof.
NAND/NOR/XNOR	Prof.
Copy as Reference	Prof.
Conversion A-to-D	Prof.
Conversion D-to-A	Prof.
Signal Averaging	Prof.
Multi Averaging	Prof.
FIR Filter	Prof.
Frequency Calc	
FFT	Prof.
SNR/THD/SINAD	Prof.
SFDR, ENOB	Prof.
Enhanced Calc	
RMS Noise	Prof.
Histogram	Prof.

SBench 6 can be used with a Spectrum virtual demo card, this allowing a test of the all software options Professional version without time limitation. If you would like to test SBench 6 Professional with your Spectrum hardware it is possible to obtain a demo licence that can be used for 30 starts of the Professional version. Newly delivered cards automatically come with a 30-day Professional trial on the driver CD.

Supported Cards and Features

The following table lists all cards and features that are supported by SBench 6. Note that it may be necessary to purchase a Professional license to use the feature, so please refer to the following version overview for more information SBench 6 is under permanent development - please check the latest version of the data sheet on the Internet at www.spec.de/sbench6.html to see which new features are supported

Supported Cards

M2i.20xx + M2i.20xx-Exp series	M2i.70xx + M2i.70xx-Exp series
M3i.21xx + M3i.21xx-Exp series	M2i.72xx + M2i.72xx-Exp series
M2i.30xx + M2i.30xx-Exp series	
M2i.31xx + M2i.31xx-Exp series	MI/MC/MX.20xx series
M3i.32xx + M3i.32xx-Exp series	MI/MC/MX.30xx series
M2i.40xx + M2i.40xx-Exp series	MI/MC/MX.31xx series
M3i.41xx + M3i.41xx-Exp series	MI/MC/MX.40xx series
M2i.46xx + M2i.46xx-Exp series	MI/MC/MX.45xx series
M2i.47xx + M2i.47xx-Exp series	MC/MX.46xx series
M3i.48xx + M3i.48xx-Exp series	MC/MX.47xx series
M2i.60xx + M2i.60xx-Exp series	MI/MC/MX.70xx series
M2i.61xx + M2i.61xx-Exp series	MX.9010

Supported Features

All analog input settings (range, termination, coupling, offset)	Multiple Recording/Multiple Replay
All output setting (offset, range , filter, stoplevel)	Gated Sampling/Gated Replay
All clock settings	Timestamps (M2i and M3i only)
All trigger settings	ABA mode (M2i and M3i only)
All memory, pretrigger, posttrigger, segment settings	Synchronization Star-Hub (one system)
Standard + FIFO Mode	Digital Inputs/Outputs
All Memory options up to 2 GSample (4 GByte)	Multi Purpose I/O Lines (M3i only)
	BaseXIO Trigger Lines (M2i and M3i only)

Order information

SBench6

Order no.	
SBench6	Base version which support standard mode for one card
SBench6-Pro	Professional version for one card: FIFO mode, export/import, calculation functions
SBench6-Pro3	3 Licenses of professional version for one card each
SBench6-Pro5	5 Licenses of professional version for one card each
SBench6-Pro10	10 Licenses of professional version for one card each
SBench6-Multi	Option multiple cards: needs Professional version. Handles multiple synchronized cards in one system.
SBench6-Mul3	3 Licenses of option multiple cards
SBench6-Mul5	5 Licenses of option multiple cards
SBench6-Mul10	10 Licenses of option multiple cards

Ordering hints

- The software license is stored on-board the Spectrum card and cannot be transferred to another card. Moving a card to another system will also move the license together with the card.
- Each single independent card needs its own Professional licence.
- Systems with multiple synchronised cards (Star-Hub) only need one Professional (Pro) and one Multi (-Multi) license.
- Systems of multiple synchronised cards that are already equipped with a Professional and Multi license can be extended with no extra cost.
- Multiple license packages - also with a different number of licences - can be combined in any way to get the desired number of total licenses.

License Examples:

System 1	System 2	System 3	Professional License	Multi License
1 Card	-	-	1 x Pro License	-
3 Cards with Star-Hub	-	-	1 x Pro License	1 x Multi License
1 Card	1 Card	1 Card	3 x Pro License	-
3 Cards with Star-Hub	4 Cards with Star-Hub	-	2 x Pro License	2 x Multi License
3 Cards with Star-Hub	2 Cards with Star-Hub	1 Card	3 x Pro License	2 x Multi License

System Requirements

Supported platforms

- Intel x86 and x64, AMD (no ARM)
- Windows 2000, XP, Vista, 7 - 32 bit platform
- Windows XP, Vista, 7 - 64 bit platform
- Linux with kernel 2.6.x - 32 and 64 bit platform
- Linux with KDE/Gnome

Hardware recommendations

The following recommendations are based on experience and test installtions. In general SBench 6 will run on all machines that support the above mentioned platforms but may become slow if not sticking to the hardware recommendations.

- CPU
  - All Intel CPUs starting with Pentium 4, Core2Duo, Core2Quad, Core i3, Core i5, Core i7, Xeon + Celeron counterparts.
  - All AMD CPUs starting with Athlon 64: Athlon, Opteron, Sempron (K8 series), Athlon 64 X2 (K9 series), Phenom, Athlon, Opteron, Sempron (K10 series).
- Memory
  - Standard acquisition: 1 GByte.
  - Usage with high channel counts: 2 GByte.
  - Fast FIFO streaming: 3 GByte.
- Hard disks and hard disk space
  - Program and supporting files ca. 20 MB.
  - Temporary data and acquisitions depending on selected acquisition length. May be up to several GBytes
- Special High-Speed FIFO streaming requirements:
  - Recommended: 1 processor core for each acquisition card in the system
  - Seperate hard disk array for data using RAID 0.
  - Data throughput of hard disk array at least 20% higher than planned acquisition speed
  - SATA, SAS or SSD hard disks.