

M2i.20XX - 50 MS/s to 200 MS/s, 8 bit, PCI-based Transientrecorders



Features:

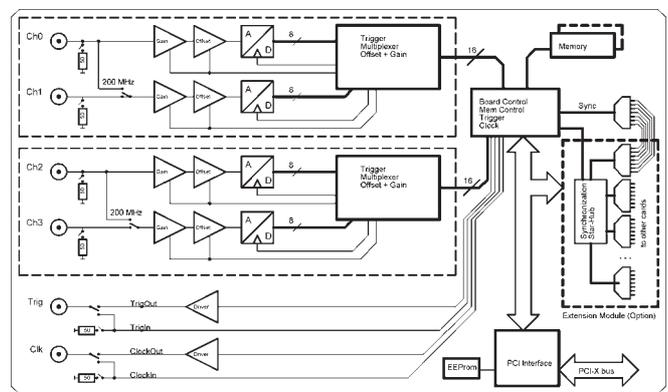
- PCI-X interface (100% compatible to PCI)
- Up to 200 MS/s on two channel
- Up to 100 MS/s on four channels
- Simultaneous sampling on all channels
- 7 input ranges: ± 50 mV up to ± 5 V
- 64 MB on-board memory expandable to 4 GB
- Sustained streaming mode to 200 MB/s
- Window, pulse-width, re-arm, OR/AND trigger
- Programmable input offset up-to +/- 400%
- Synchronization option for up-to 16 boards
- ABA mode option: combination of data logging and fast digitizing on trigger
- Software support for Windows and LINUX

Description:

The four models of the M2i.20xx series are designed for the fast and high quality data acquisition. Each of the up to four input channels has its own A/D converter and its own programmable input amplifier. This allows to record signals on all channels with 8 bit resolution without any phase delay between them. The inputs can be selected to one of seven input ranges by software and can be programmed to compensate for an input offset of $\pm 400\%$ of the input range. The extremely large on-board memory allows long time recording even with highest sampling rates. A FIFO mode is also integrated on the board. This allows the acquisition of data continuously for online processing in the PC or for data storage on hard disk.

Model	1 channel max speed	2 channels max speed	4 channels max speed
M2i.2020	50 MS/s	50 MS/s	-
M2i.2021	50 MS/s	50 MS/s	50 MS/s
M2i.2030	200 MS/s	100 MS/s	-
M2i.2031	200 MS/s	200 MS/s	100 MS/s

Hardware block diagram



Applications:

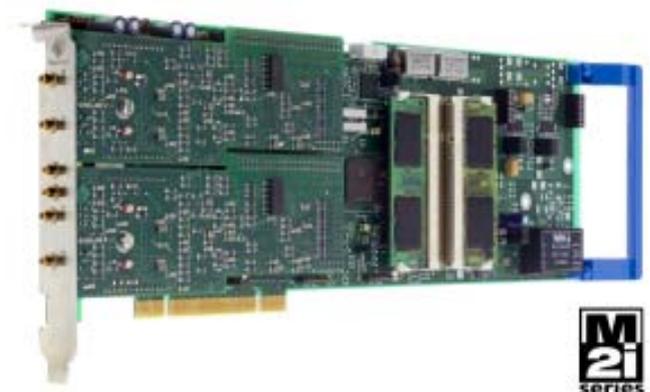
- Laser Spectroscopy
- OEM-Applications
- Physics research
- Chemical reaction studies
- LDA/PDA
- RADAR/LIDAR/SOAR
- Telecommunications



- Completely new developed base card
- 4 GByte memory with one slot width
- Optimized low jitter clock section
- Multi, Gate with programmable pre, posttrigger and timestamp
- Zero phase delay synchronization
- AND/OR conjunction of trigger/gate

Product range overview

All four cards of the M2i.20xx series may use the whole installed on-board memory completely for the currently activated number of channels. See details on next page.



M2i.20xx 23062006

Dynamic Parameters	M2i.2020 M2i.2021	M2i.2030 M2i.2031
Min internal clock	1 kS/s	1 kS/s
Max internal clock	50 MS/s	200 MS/s
Min external clock	1 kS/s	1 kS/s
Max external clock	50 MS/s	100 MS/s
-3 dB bandwidth	≥25 MHz	≥90 MHz
Test Srate for SNR, THD, SFDR, ENOB	50 MS/s	100 MS/s
Test signal frequency	1 / 4 MHz	1 / 9 MHz
SNR typ (dB)		45 / 44.5 dB
THD fin = 10 MHz, +/-200 mV		-49,5 dB
SFDR fin = 10 MHz, +/-200 mV		59 / 57 dB
ENOB based on SNR (dB)		7.3 / 7.2
ENOB based on SINAD (dB)		7.1 / 7.0

Specifications:

RESOLUTION: 8 bit

DIFF. NONLINEARITY: ≤ 0.5 LSB typ. (ADC)

INTEGRAL NONLINEARITY: ≤ 0.5 LSB typ. (ADC)

OFFSET ERROR: can be calibrated by the user

GAIN ERROR: <2% of current value

PROGRAMMABLE INPUT OFFSET: +/-400% of current input range

CROSSTALK 1MHz signa, 50 Ohm trm.: <-62db between any adjacent channel

INPUT SIGNAL with 50 Ohm termination: max. 5V rms

OVER VOLTAGE PROTECTION ≤ +/-0.5V: +/-5V

OVER VOLTAGE PROTECTION ≥ +/-0.5V: +/-5V

CONNECTOR (analog and trigger/clock): 3mm SMB m

MULTI, GATE, re-arming time: <4 Samples

MAX PRETRIGGER at MULTI, GATE; FIFO: 16352 samples as sum of all active channels

TRIGGER ACCURACY (≤100 MS/s): 1 Sample int.or ext.

TRIGGER ACCURACY (≥100 MS/s):

1 Sample int.or ext. trigger mode

CHANNEL TRIGGER RES.: 8 bit

TRIGGER OUTPUT delay: 1 positive edge after internal trigger event

EXT.TRIGGER Accuracy 2/4 channel mode: 1 Sample

EXT.TRIGGER type: TTL compatible

EXT.TRIGGER input: low ≤ 0.8V, high ≥2V, ≥2 clock periods

EXT.TRIGGER max voltage: -0.5V to +5.5V

EXT.TRIGGER output levels: TTL comp.

EXT.TRIGGER output: capable of driving a 50 Ohm load

INTERNAL CLOCK accuracy: 20 ppm

EXT. CLOCK RANGE: 1 MS/s to max. max.

EXT. CLOCK DELAY to int. clock: 5.4 ns

EXT. CLOCK INPUT: low ≤ 0.8V, high ≥2V, duty 45-55%

EXT. CLOCK max. voltage: -0.5V to +5.5V

EXT. CLOCK output: low ≤ 0.4V, high ≥2.4V (TTL)

EXT. CLOCK output: capable of driving a 50 Ohm load

DIMENSION: 312 x 107 mm (full lengths PCI board)

With STAR-HUB 5 / 16: 1 / 2 full lengths slot

WEIGHT: from 290g to 420g depending on channels and options (w/o packing)

WARMUP TIME: 10 min

OPERATING TEMP RANGE: 0 to 50 °C

STORAGE TEMP RANGE: -10 to 70 °C

HUMIDITY: 10% to 90%

Please note: The M2i.20x-Series Transientrecorders extensively use SMB connectors. Cables with theses connectors are not included with the boards. They have to be ordered separately if required.

Software programmable parameters M2i.20xx		Software programmable parameters M2i.20xx	
Input range	±50 mV to ±5 V in steps of 1, 2, 5	Trigger mode	Channel, External, SW, Auto, Pulse
Input Impedance	50 Ohm / 1 MOhm (relais)		Window, Re-arm, OR/AND, Delay
Input Offset	±400% of input range in steps of 1%	Triggerlevel	8 bit res. 1/256..to full input range
Clock mode	Int. PLL, int. Quartz, ext clock, ext.divided	Triggeredge	rising edge, falling edge or both edges
	ext reference clock, sync	Trigger pulsewidth	0 to /64k-1) samp. in steps of 1 samp.
Clock impedance	50 Ohm / high impedance (>4kOhm)	Trigger delay	0 to /64k-1) samp. in steps of 1 samp.
Trigger impedance	50 Ohm / high impedance (>4kOhm)	Post trigger	4 up to (8G-4) samples in steps of 4
Memory depth	8 up to (installed memory/active channels	Multiple Rec. Seq.	8 up to (installed memory/2/active
	in steps of 8		channels in steps of 4
Channel selection	Any 1, 2 or 4 channels (see manual for clock	Multi/Gated pretrigger	0 up to (16k sampl./active chan.-32)
	limits on the selections)		in increments of 32 samples.
ABA Clock Driver	1 up to (64-1) in steps of 1	Sync. Clock driver	2 up to (8k-2) in steps of 2

Power Consumption (max speed)	3.3 V	5 V	-12 V	+12 V	Total
M2i.20x0 (64 MS memory)	2.2 A	0.5 A	n.u.	n.u.	9.8 W
M2i.20x1 (64 MS memory)	2.8 A	0.8 A	n.u.	n.u.	13.3 W
M2i.2031 (4 GS memory), max. power	3.9 A	0.8 A	n.u.	n.u.	16.9 W

Software Support

Windows drivers

The cards are delivered with drivers for Windows 2000, Windows XP, Windows XP64 and Windows Vista (Beta). Programming examples for Visual C/C++, Borland C++ Builder, Gnu C, LabWindows/CVI, Borland Delphi and Visual Basic are included.

Linux Drivers

All cards are delivered with full Linux support. Pre compiled kernel modules are included for the most common distributions like RedHat, Suse or Debian. The linux support is enhanced by SMP support, versatile programming examples as well as the possibility to get the driver sources for own compilation.

SBench

A full licence of SBench the easy-to-use graphical operating software for the Spectrum cards is included in the delivery. The version 6 is running under Windows as well as under Linux (KDE and GNOME)

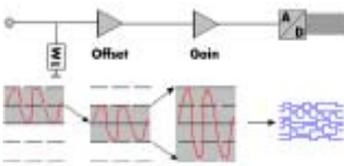
Third-party products

A lot of third-party products are supported as an option. Choose between LabVIEW, MATLAB, DASYLab and Agilent VEE. All drivers come with examples and detailed documentation.

MI Software compatibility layer

To allow an easy change from MI cards to the new M2i cards for existing software a special software compatibility layer is delivered with the cards. This DLL converts MI calls to M2i calls and simulates a MI card in the software.

Hardware features and options



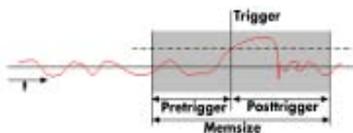
The analog inputs can be adapted to real world signals using a wide variety of settings that are individual for each channel. By using software commands the input termination can be changed between 50 Ohm and 1

MOhm, one can select a matching input range and the signal offset can be compensated for.

Ring buffer mode

Ring buffer mode

The ring buffer mode is the standard mode of all oscilloscope boards. Data is written in a ring memory of the board until a trigger event is detected.



After the event the posttrigger values are recorded. Because of this continuously recording into a ring buffer there are also samples prior to the trigger event visible: Pretrigger = Memsize - Posttrigger.

FIFO mode

The FIFO mode is designed for continuous data transfer between measurement board and PC memory (up to 225 MB/s on a PCI-X slot and up to 115 MB/s on a PCI slot) or hard disk. The control of the data stream is done automatically by the driver on interrupt request. The

complete installed on-board memory is used for buffer data, making the continuous streaming extremely reliable.

Channel trigger

The data acquisition boards offer a wide variety of trigger modes. Besides the standard signal checking for level and edge as known from oscilloscopes it's also possible to define a window trigger. All trigger modes can be combined with the pulsewidth trigger. This makes it possible to trigger on signal errors like too long or too short pulses. In addition to this a re-arming mode (for accurate trigger recognition on noisy signals) the AND/OR conjunction of different trigger events is possible. As a unique feature it is possible to use deactivated channels as trigger sources.

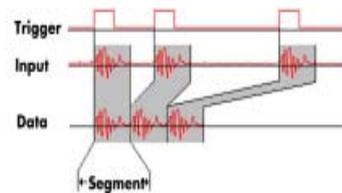
External trigger I/O

All boards can be triggered using an external TTL signal. It's possible to use positive or negative edge also in combination with a programmable pulse width. An internally recognised trigger event can - when activated by software - be routed to the trigger connector to start external instruments.

Pulse width

Defines the minimum or maximum width that a trigger pulse must have to generate a trigger event. Pulse width can be combined with channel trigger, pattern trigger and external trigger.

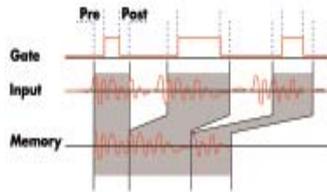
Multiple Recording



The Multiple Recording option allows the recording of several trigger events with an extremely short re-arming time. The hardware doesn't need to be restarted in between.

The on-board memory is divided into several segments of the same size. Each of them is filled with data if a trigger event occurs. Pre- and posttrigger of the segments can be programmed. The number of acquired segments is only limited by the used memory and is unlimited when using FIFO mode.

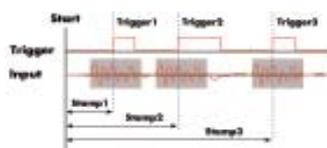
Gated Sampling



The Gated Sampling option allows data recording controlled by an external gate signal. Data is only recorded if the gate signal has a programmed level. In addition a pre-area before start of the gate signal as well as a post area after end of the gate signal can be acquired. The number of gate segments is

only limited by the used memory and is unlimited when using FIFO mode.

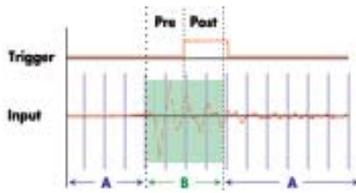
Timestamp



The timestamp option writes the time positions of the trigger events in an extra memory. The timestamps are relative to the start of recording, a defined zero time, externally synchronised to a radio clock, or a GPS receiver.

With this option acquisitions of systems on different locations can be set in a precise time relation.

ABA mode



The optional ABA mode combines slow continuous data recording with fast acquisition on trigger events. The ABA mode works like a slow data logger combined with a fast digitizer. The exact position of the trigger events is stored as

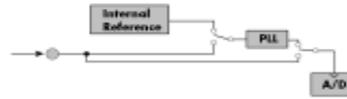
timestamps in an extra memory.

External clock I/O

Using a dedicated connector a sampling clock can be fed in from an external system. It's also possible to output the internally used sampling clock to synchronise external equipment to this clock.

Reference clock

The option to use a precise external reference clock (normally 10 MHz) is necessary to synchronise the board for high-quality measurements with external equipment (like a signal source). It's also possible to enhance the quality of the sampling clock in this way. The driver automatically generates the requested sampling clock from the fed in reference clock.



Star-Hub

The star-hub is an additional module allowing the phase stable synchronisation of up to 16 boards. Independent of the number of boards there is no phase delay between all channels. The star-hub distributes trigger and clock information between all boards. As a result all connected boards are running with the same clock and the same trigger. All trigger sources can be combined with OR/AND allowing all channels of all cards to be trigger source at the same time. The star-hub is available as 5 card and 16 card version. The 5 card version doesn't need an extra slot.



Certifications and Compliances:

EMC Immunity and emission: compliant with CE Mark

FAST ComTec supports LINUX



Ordering Information

M2i.20xx - 8 bit transient recorder, up to 200 MS/s onboard memory 64 MB, PCI-Bus					
Model				Description	Order No
	1ch	2ch	4ch		
M2i.2020	50MS	50MS		Input: $\pm(50\text{mV} \dots 5\text{V})$	TR2020
M2i.2021	50MS	50MS	50MS	Input: $\pm(50\text{mV} \dots 5\text{V})$	TR2021
M2i.2030	200MS	100MS		Input: $\pm(50\text{mV} \dots 5\text{V})$	TR2030
M2i.2031	200MS	200MS	100MS	Input: $\pm(50\text{mV} \dots 5\text{V})$	TR2031
Drivers for M2i.20x					
M2i.-ml				MATLAB driver for all M2i cards	TRml
M2i.20-lv				LabVIEW driver for all M2i.20xx cards	TR20lv
M2i.20-dl				DASyLab driver for all M2i.20xx cards	TR20dl
M2i.20-vee				Agilent VEE driver for all M2i.20xx cards	TR20vee

Memory Expansions for M2i.20x		
Model	Description	Order No
M2i.128MB	Mem. Exp. to 128 MB for M2i.2x series	TR128MB
M2i.256MB	Mem. Exp. to 256 MB for M2i.2x series	TR256MB
M2i.512MB	Mem. Exp. to 512 MB for M2i.2x series	TR512MB
M2i.1GB	Mem. Exp. to 1 GB for M2i.2x series	TR1GB
M2i.2GB	Mem. Exp. to 2 GB for M2i.2x series	TR2GB
M2i.4GB	Mem. Exp. to 4 GB for M2i.2x series	TR4GB
Options		
M2i.mr	Option Multiple Recording	TRmr
M2i.mgt	Option Multiple Recording, Gated Sampling, Timestamp	TRmgt
M2i.mgtab	Option Multiple Recording, Gated Sampling, Timestamp, ABA Modus	TRmgtab
M2i.SH5 (1)	Synchronisation Star-Hub for up to 5 cards, only 1 slot width	TRSH5 (1)
M2i.SH16 (1)	Synchronisation Star-Hub for up to 16 cards, only 1 slot width	TRSH16 (1)
M2i.bxio	Option BaseXIO: 8 digital asynchronous I/O, timestamp ref-clock and add. Ext. trigger lines, add. bracket with 8 SMB connectors	TRbxio
Cables for all M2ix boards		
Cab-1m-9m-80	Adapter cable MMCX male to BNC male, 80 cm (for analog inputs)	Cab-1m-9m-80
Cab-1m-9f-80	Adapter cable MMCX male to BNC female, 80 cm (for analog inputs)	Cab-1m-9f-80
Cab-1m-9m-200	Adapter cable MMCX male to BNC male, 200 cm (for analog inputs)	Cab-1m-9m-200
Cab-3f-9m-80	SMB female to BNC male 80cm	Cab-3f-9m-80
Cab-3f-9f-80	SMB female to BNC female 80cm	Cab-3f-9f-80
Cab-3f-3f-80	SMB female to SMB female 80cm	Cab-3f-3f-80
Cab-3f-9m-200	SMB female to BNC male 200cm	Cab-3f-9m-200
Cab-3f-9f-200	SMB female to BNC female 200cm	Cab-3f-9f-200
Cab-3f-3f-200	SMB female to SMB female 200cm	Cab-3f-3f-200
Cab-3f-9f-5	Adapter cable SMB female to BNC female, 5 cm (short cable especially for oscilloscope probes)	Cab-3f-9f-5