M2i.40XX - 4-Channel, up to 50 MS/s, 14 bit, PCI-based Transientrecorders

Features:

- **PCI-X interface (100% compatible to PCI)**
- **Fastest 14 bit A/D converter board**
- **Up to 50 MS/s on one, two or four channels**
- **Separate ADC and Amplifier per channel**
- **Simultaneous sampling on all channels**
- **6 input ranges: ±200 mV up to ± 10 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 +/- 200%**
- **Synchronization option for up-to 16 boards**
- **ABA mode option: combination of data logging and digitizing on trigger**
- **Software support for Windows and LINUX**

Description:

The M2i.40xx series is best suitable for applications that need high sampling rates as well as a maximum signal dynamic. These boards offer a resolution four times higher than 12 bit boards. On the M2i.40xx every channel has its own amplifier and A/D converter. Each input channel can be adapted to a wide variety of signal sources. This is done by software selecting a matching input range, an input impedance and an individual input offset compensation. The user will easily find a matching solution from the six offered models. These versions are working with sampling rates of 20MS/s or 50 MS/s and have one, two or four channels. They can also be updated to a multi-channel system using the synchronization option.Data is written in the internal 32 MSample up to 2GSample large memory. This memory can also be used as a FIFO buffer. In FIFO mode data can be transferred on-line directly into the PC RAM or to hard disk.

- Completely new developed base card
- 4 GByte memory with one slot width
- Optimized low jitter clock section

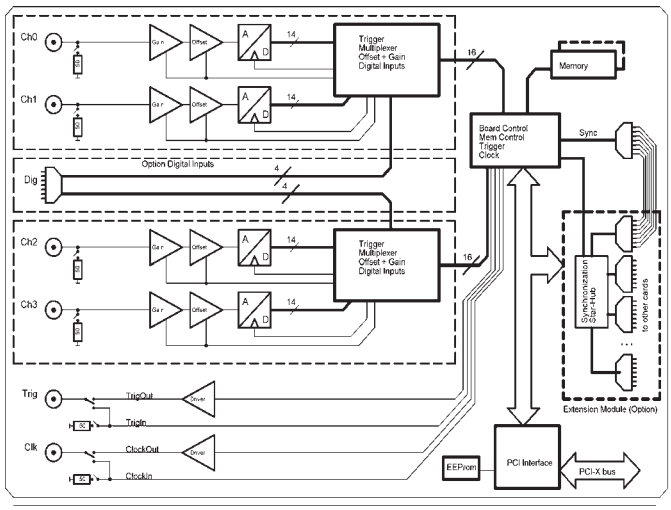
M2i.40xx 23062006

Model	1 channel	2 channels	4 channels
M2i.4020	20 MS/s		
M2i.4021	20 MS/s	20 MS/s	
M2i.4022	20 MS/s	20 MS/s	50 MS/s
M2i.4030	50 MS/s		
M2i.4031	50 MS/s	20 MS/s	
M2i.4032	50 MS/s	20 MS/s	50 MS/s

- Multi, Gate with programmable pre, posttrigger and timestamp
- Zero phase delay synchronization
- AND/OR conjunction of trigger/gate

Applications:

- **LDA/PDA**
- **Production Test**
- **Spectroscopy**
- **Laboratory equipment**
- **RADAR / SONAR**
- **Military**
- **Automotive**
- **Test of mobile communication**
- **Medical equipment**



Hardware block diagram

Product range overview

All four cards of the M2i.40xx series may use the whole installed on-board memory completely for the currently activated number of channels.

FAST ComTec GmbH · Grünwalder Weg 28a · D-82041 Oberhaching · Germany
Tel 49-(0)89-66 51 80 50 · FAX 49-(0)89-66 51 80 40 · e-mail: info@fastcomtec.com

Specifications:

RESOLUTION: 14bit
DIFF. NONLINEARITY: ≤ 0.5 LSB typ. (ADC)
INTEGRAL NONLINEARITY: ≤ 1 LSB typ. (ADC)
OFFSET ERROR: can be calibrated by the user
GAIN ERROR: <1% of current value
PROGRAMMABLE INPUT OFFSET: +/-100% of current input range
CROSSTALK @ 1 MHz, 50 Ohm: <-80db between any adjacent channel
CROSSTALK @ 1 MHz, 1 MOhm: <-65db between any adjacent channel
INPUT SIGNAL with 50 Ohm termination: max. 5V rms
OVER VOLTAGE PROTECTION ≤+/-1V: +/-5V
OVER VOLTAGE PROTECTION ≥+/-1V: +/-50V
CONNECTOR (analog and trigger/clock): 3mm SMB m

MULTI, GATE, re-arming time: <4 Samples
MAX PRETRIGGER at MULTI, GATE; FIFO: 8176 samples as sum of all active channels
CHANNEL TRIGGER RES.:
TRIGGER OUTPUT delay:
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
INT. CLOCK RANGE: 1 kS/s to max.
INT. CLOCK max. jitter (PPL mode):
INT. CLOCK max. jitter (Quartz mode):
INT. CLOCK stepsize: ≤1% of range (100M, 10M..)
INT. CLOCK stepsize example: range 1 to 10MMS/s: stepsize ≤ 100k
EXT. CLOCK RANGE: 1 MS/s to max.-see table
EXT. CLOCK DELAY to int. clock:
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
REF. CLOCK-EXT.CLOCK RANGE: ≥4 MHz ≤125 MHz

DIGITAL INPUTS input impedance: 110 Ohm @ 2.5V
DIGITAL INPUTS delay to analog sample:
MAXIMUM VOLTAGE: -0.3 to +5.5V
INPUT VOLTAGE: low ≤ 0.8V, high ≥2.0V
CONNECTOR digital inputs: 40 pin half pitch (Hirose FX2 series)

DIMENSION: 312 x 107 mm (full lengths PCI board)
With STAR-HUB 5 / 16: 1 / 2 full size slot
With DIG.INPUTS: 1 full size slot + 1/2 size slot
WEIGHT: from 290g to 460g depending on channels and options (w/o packing)

WARMUP TIME: 10 min
OPERATING TEMP RAMGE: 0 to 50 °C
STORAGE TEMP RAMGE: -10 to70 °C
HUMIDITY: 10% to 90%

Please note: The M2i.40x-Series Transientrecorders extensively use SMB connectors. Cables with theses connectors are not included with the boards. They ordered separately if required.

FAST ComTec supports LINUX

Software programmable parameters M2i.40xx		Software programmable parameters M2i.40xx	
Input range	±200 mV to ±10 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	±200% of input range in steps of 1%	Triggerlevel	TBD
Clock mode	Int. PLL, int. Quartz, ext clock, ext.div. Ext.ref.	Triggeredge	rising edge, falling edge or both edges
	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. Seg.	8 up to (installed memory/2/active
	in steps of 4		channels in steps of 4
Channel selection	Any 1, 2, or 4 channels	Multi/Gated pretrigger	0 up to (8k sampl./active chan.-16)
			in increments of 16 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.40x0 (32 MS memory)	2.0 A	0.6 A	n.u.	n.u.	9.6 W
M2i.40x1 (32 MS memory)	2.2 A	0.8 A	n.u.	n.u.	12.1 W
M2i.40x2 (32 MS memory)	2.5 A	1.6 A	n.u.	n.u.	16.3 W
M2i.4032 (32 MS memory)	3.6 A	1.6 A	n.u.	n.u.	19.9 W

FAST ComTec GmbH · Grünwalder Weg 28a · D-82041 Oberhaching · Germany
Tel 49-(0)89-66 51 80 50 · FAX 49-(0)89-66 51 80 40 · e-mail: info@fastcomtec.com

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 compi-led kernel modules are included for the most common dis-tributions 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)

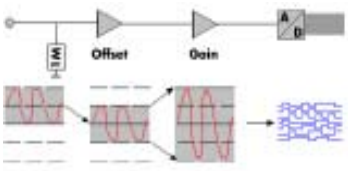
Third-party products

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

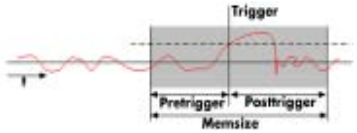


The analog inputs can be adapted to real world signals using a wide variety of settings that are individual for each channel. By using software commands the input termination can be changed between 50 Ohm and 1 MOhm, one can select a matching input range and the signal offset can be compensated for.

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.

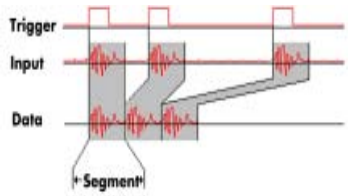
External trigger I/O

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

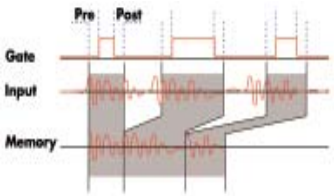
Defines the minimum or maximum width that a trigger pulse must have to generate a trigger event. Pulse width can be combined with channel trigger, pattern trigger and external trigger.

Multiple Recording



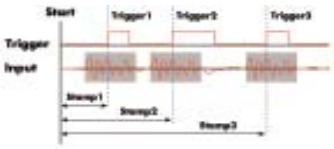
The Multiple Recording option allows the recording of se-veral trigger events with an extremely short re-arming time. The hardware doesn't need to be restarted in between. The on-board memory is divided in several segments of the same size. Each of them is filled with data if a trigger event occurs. 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 recor-ded 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.

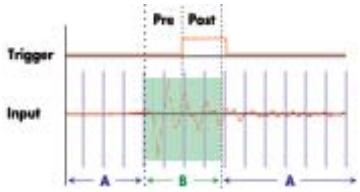
Timestamp



The timestamp option writes the time positions of the trigger events in an extra memo-ry. 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.

FAST ComTec GmbH · Grünwalder Weg 28a · D-82041 Oberhaching · Germany
Tel 49-(0)89-66 51 80 50 · FAX 49-(0)89-66 51 80 40 · e-mail: info@fastcomtec.com

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 ex-tra 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.

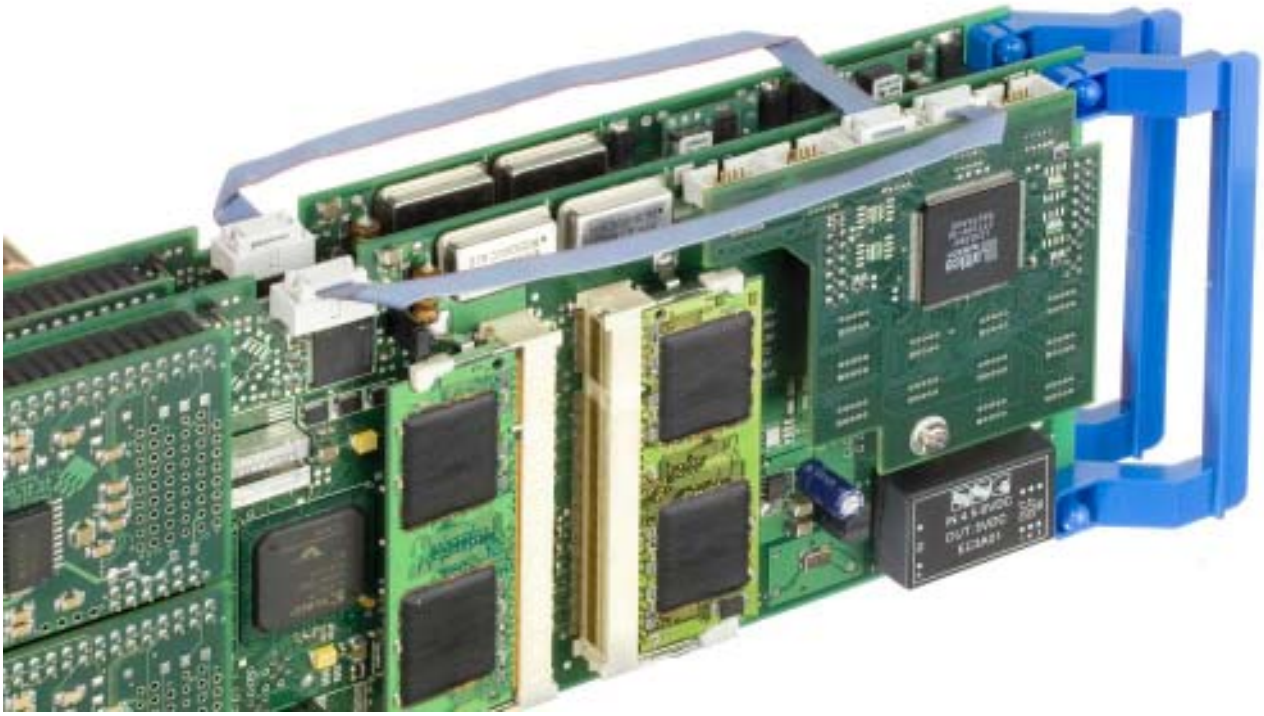
Reference clock

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 sta-ble synchronisation of up to 16 boards. Independent of the number of boards there is no phase delay between all chan-nels. 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.



Dynamic Parameters	M2i.4020 M2i.4021	M2i.4022	M2i.4030 M2i.4031	M2i.4032
Max internal clock	20 MS/s	20 MS/s	50 MS/s	50 MS/s
Max external clock	20 MS/s	20 MS/s	50 MS/s	50 MS/s
-3 dB bandwidth	DC..10 MHz	DC..10 MHz	DC..25 MHz	DC..25 MHz
Zero noise level at 50 Ohm	TBD	TBD	TBD	TBD
Test Srate	20 MS/s	20 MS/s	50 MS/s	50 MS/s
Test signal frequency	0,9 / 1 MHz	0,9 / 1 MHz	1 / 4 MHz	1 / 9 MHz
SNR typ (dB)	TBD	TBD	TBD	TBD
THD typ. (dB)	TBD	TBD	TBD	TBD
SFDR typ. excl. harmonics (dB)	TBD	TBD	TBD	TBD
ENOB based on SNR (LSB)	TBD	TBD	TBD	TBD
ENOB based on SINAD (LSB)	TBD	TBD	TBD	TBD

Certifications and Compliances: **EMC Immunity and emission:** compliant with CE Mark

Ordering Information

M2i.40xx-14 bit high dyn. transient recorder, up to 50 MS/s, memory 32 MS (64MB), PCI-Bus					
Model				**Description**	
	1ch	2ch	4ch		
M2i.4020	20MS			Input: ±(200mV ... 10V)	TR4020
M2i.4021	20MS	20MS		Input: ±(200mV ... 10V)	TR4021
M2i.4022	20MS	20MS	20MS	Input: ±(200mV ... 10V)	TR4022
M2i.4030	50MS			Input: ±(200mV ... 10V)	TR4030
M2i.4031	50MS	50MS		Input: ±(200mV ... 10V)	TR4031
M2i.4032	50MS	50MS	50MS	Input: ±(200mV ... 10V)	TR4032
Drivers M2i.40x					
M2i.ml				MATLAB driver for all M2i cards	TRml
M2i.40-lv				LabVIEW driver for all M2i.40xx cards	TR40lv
M2i.40-dl				DASYLab driver for all M2i.40xx cards	TR40dl
M2i.40-vee				Agilent VEE driver for all M2i.40xx cards	TR40vee

Memory Expansions M2i.3x, M2i.4x		
Model	**Description**	**Order No**
M2i.64MS	Mem. Exp. to 64 MS (128MB) for M2i.3x and M2i.4x series	TR64MS
M2i.128MS	Mem. Exp. to 128 MS (256MB) for M2i.3x and M2i.4x series	TR128MS
M2i.256MS	Mem. Exp. to 256 MS (512MB) for M2i.3x and M2i.4x series	TR256MS
M2i.512MS	Mem. Exp. to 512 MS (1 GB) for M2i.3x and M2i.4x series	TR512MS
M2i.1GS	Mem. Exp. to 1 GS (2 GB) for M2i.3x and M2i.4x series	TR1GS
M2i.2GS	Mem. Exp. to 2 GS (4 GB) for M2i.3x and M2i.4x series	TR2GS
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 lines, timestamp ref-clock	TRbxio
	addit. external trigger lines, addit. bracket with 8 SMB connectors	
Options for M2i.40x		
M2i.4-dig	Additional synchronous digital inputs	TR4dig
	(4 per analog channel) including Cab-d40-idc-100	
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	Cab-3f-9f-5
	(short cable especially for oscilloscope probes)	
Cables for M2i.4x and M2i.3x		
Cab-d40-idc-100	Flat ribbon cable 40 pin FX2 for dig. Conn. to 2x20 pin IDC conn, 100 cm	Cab-d40-idc-100
Cab-d40-d40-100	Flat ribbon cable 40 pin FX2 for dig. Conn. to 40 pin dig. FX2 conn. 100 cm	Cab-d40-d40-100

FAST ComTec GmbH · Grünwalder Weg 28a · D-82041 Oberhaching · Germany
Tel 49-(0)89-66 51 80 50 · FAX 49-(0)89-66 51 80 40 · e-mail: info@fastcomtec.com