



**M2i digitizer
DASYLab driver
Library mi.dll**

English version

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General Information

Driver - structure

This driver for DASYLab is based on the standard Spectrum driver for Windows XP, Windows Vista, Windows 7 and Windows 8. New versions of the standard driver may be downloaded from the internet www.spectrum-instrumentation.com without any cost. The driver supports the DASYLab versions beginning with 5.0.

The driver consists of a DLL for the selected board.

Installation Spectrum driver

The standard Spectrum driver should be installed first. An installation guide is found in the hardware manual of the specific board. After a driver update, the PC must be rebooted.

Installation DASYLab driver

The DLL files must be copied in the installation directory of DASYLab. When installing from CD, the corresponding setup program must be called. After typing the licence code the DLL is copied to the DASYLab directory.

After starting the program the driver file must be selected. After restarting DASYLab the board could be accessed.

Board installed in the system	Driver to select	Limits of DASYLab driver
M2i.30xx/MI.30xx/MC.30xx/MX.30xx	mi.dll	
M2i.31xx/MI.31xx/MC.31xx/MX.31xx	mi.dll	
M2i.40xx/MI.40xx/MC.40xx/MX.40xx	mi.dll	
MI.45xx/MC.45xx/MX.45xx	mi.dll	
M2i.46xx	mi.dll	
M2i.47xx	mi.dll	Only channel 0 to 7 can be trigger source
M2i.49xx	mi.dll	Differential inputs not supported. Digital inputs only partly supported.
M2i.60xx/MI.60xx/MC.60xx/MX.60xx	mi.dll	
M2i.61xx/MI.61xx/MC.61xx/MX.61xx	mi.dll	
M2i.70xx/MI.70xx/MC.70xx/MX.70xx	mi.dll	
PCI.DIO32	pcidio32.dll	
PCI.248	pci248.dll	
PCI.258	pci248.dll	
PCI.412-10	pci412.dll	
PCI.412-40	pci412.dll	
PAD82a	pad82a.dll	
PAD82b	pad82b.dll	
PAD52	pad52.dll	

Channels in DASyLab

Analog Channels

The Spectrum digitizers offer up to 16 analog channels within DASyLab. If the option Digital Inputs (as long as it is supported by your hardware) is installed there is one additional digital channel the corresponding number of bits. When option Timestamp is installed there are four 16 bit wide counters available.

Additional Digital Inputs

Digital inputs are only available if the option "Digital Inputs" is installed on the board. The digital inputs are recorded in the upper 2 or 4 bits of the analog channels. For this reason the digital inputs could only be read out if the corresponding analog channel is also activated for recording.

The numbering and the connector location is described in the hardware manual.

Counter (Timestamp)

Counters are only available if the option "Timestamp" is installed on the board. Every 64 bit wide timestamp is read out parallel on four counters. The relation is as follows:

Counter 0	Bit 0 bis Bit 15
Counter 1	Bit 16 bis Bit 31
Counter 2	Bit 32 bis Bit 47
Counter 3	Bit 48 bis Bit 63

If external reference clock mode is used, the start time of the counter is automatically added to the timestamp. Counter 2 and 3 then hold the absolute time of the event in seconds elapsed since 01.01.1970 0:00.

Synchronization

On synchronisation systems the channels are available in DASyLab beginning with the index 0. if different options are installed on the boards, there could be shifting of the channels.

Example:

Board 0: M2i.3131, 4 analog channels, option "Timestamp"

Board 1: M2i.3022, 2 analog channels, option "Digital Inputs"

Board 2: M2i.3131, 4 analog channels, option "Timestamp"

Analog In	Board	Digital In	Board	Counter	Board
0	0 channel 0	0	1 digital 0	0	0 TimeStamp 0
1	0 channel 1	1	1 digital 1	1	0 TimeStamp 1
2	0 channel 2	2	1 digital 2	2	0 TimeStamp 2
3	0 channel 3	3	1 digital 3	3	0 TimeStamp 3
4	1 channel 0	4	1 digital 4	4	2 TimeStamp 0
5	1 channel 1	5	1 digital 5	5	2 TimeStamp 1
6	2 channel 0	6	1 digital 6	6	2 TimeStamp 2
7	2 channel 1	7	1 digital 7	7	2 TimeStamp 3
8	2 channel 2				
9	2 channel 3				

Recording/Replay modes

The Spectrum cards can be used in two different modes. The selection between the two modes is done in DASYLab by the Acquisition Mode:

DASYLab	Spectrum board	Description
Continuous	FIFO mode	Data is continuously recorded and transferred to DASYLab block by block.
One series	Standard mode	One acquisition (singleshot) is made.
Single series	Standard mode	A defined number of single acquisitions is made (multiple singleshots)
Continuous Series	Standard mode	Single acquisitions are made in a loop.

Standard Recording

In Standard Recording mode the data is recorded in the on-board memory and read out after finishing of the measurement. The memory size is selected in the board parameter section. DASYLab reads the memory in blocks starting at position 0. If the recording memory on the board is larger than the blocksize from DASYLab the matching number of blocks must be read out to process the complete recording.

It is necessary to record at least the number of samples to fill one block.

If the number of blocks has been read out that was defined by "blocks per series", the board is automatically restarted by DASYLab.

If more blocks are read out than there are recorded blocks on the board, the board is automatically restarted by the driver when the last recorded block had been read out.

Example: Memsize = 128k, DASYLab block size = 32k (automatic)

Block No.	Blocks per series			
	2	4	6	8
0	Rec 0 Pos 0 - 32k	Rec 0 Pos 0 - 32k	Rec 0 Pos 0 - 32k	Rec 0 Pos 0 - 32k
1	Rec 0 Pos 32k - 64k	Rec 0 Pos 32k - 64k	Rec 0 Pos 32k - 64k	Rec 0 Pos 32k - 64k
2	Rec 1 Pos 0 - 32k	Rec 0 Pos 64k - 96k	Rec 0 Pos 64k - 96k	Rec 0 Pos 64k - 96k
3	Rec 1 Pos 32k - 64k	Rec 0 Pos 96k - 128k	Rec 0 Pos 96k - 128k	Rec 0 Pos 96k - 128k
4	Rec 2 Pos 0 - 32k	Rec 1 Pos 0 - 32k	Rec 1 Pos 0 - 32k	Rec 1 Pos 0 - 32k
5	Rec 2 Pos 32k - 64k	Rec 1 Pos 32k - 64k	Rec 1 Pos 32k - 64k	Rec 1 Pos 32k - 64k
6	Rec 3 Pos 0 - 32k	Rec 1 Pos 64k - 96k	Rec 0 Pos 0 - 32k	Rec 1 Pos 64k - 96k
7	Rec 3 Pos 32k - 64k	Rec 1 Pos 96k - 128k	Rec 0 Pos 32k - 64k	Rec 1 Pos 96k - 128k
8	Rec 4 Pos 0 - 32k	Rec 2 Pos 0 - 32k	Rec 0 Pos 64k - 96k	Rec 2 Pos 0 - 32k
9	Rec 4 Pos 32k - 64k	Rec 2 Pos 32k - 64k	Rec 0 Pos 96k - 128k	Rec 2 Pos 32k - 64k
Remarks	Pos 64k to 128k is lost	Memsize and Blocks are matching, all data is read out.	Pos 64k to 128k of every second recording is lost	Board is automatically restarted after block 3.

FIFO Mode Recording

The driver holds an intermediate buffer that is large enough to hold about 500 ms of data. DASYLab is working with a blocksize of max. 32k, data must be copied by the driver. For this reason DASYLab can not work with the same FIFO speed that may be reached when programming the driver directly. Depending on the number of activated channels and the used display windows, FIFO mode is working up to a sum sample rate of about 500 kHz. When only streaming to disk with no display one can achieve a transfer rate of up to 10 MB/s.

Timestamp

It is not possible to use two input channels really asynchronously within DASYLab. For this reason one timestamp is read out from the board with every block that is read out. The user must select the parameters in this way that no timestamp is lost.

If there are less timestamps recorded than there are read out, the other timestamps are set to 0.

The timestamps are copied to 4 counters of 16 bit width.

Example with memsize = 256k, Multiple Recording with 64k segment size and 32k DASYLab block size

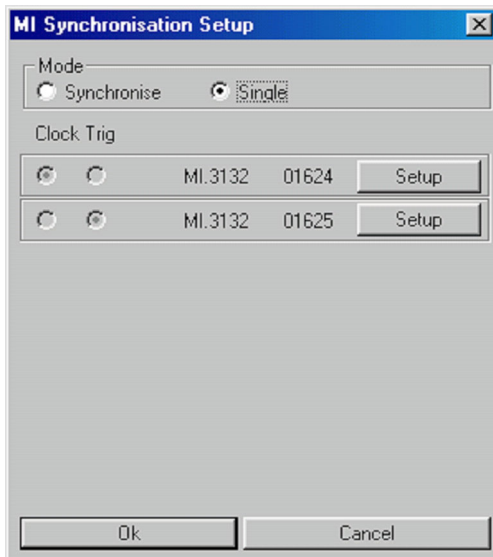
Block	Standard Recording		FIFO mode	
	Data	Counter 0-3	Data	Counter 0-3
0	Segment 0 Pos 0 - 32k	TimeStamp Segment 0	Segment 0 Pos 0 - 32k	TimeStamp Segment 0
1	Segment 0 Pos 32k - 64k	TimeStamp Segment 1	Segment 0 Pos 32k - 64k	0
2	Segment 1 Pos 0 - 32k	TimeStamp Segment 2	Segment 1 Pos 0 - 32k	TimeStamp Segment 1
2	Segment 1 Pos 32k - 64k	TimeStamp Segment 3	Segment 1 Pos 32k - 64k	0
0	Segment 0 Pos 0 - 32k	0	Segment 0 Pos 0 - 32k	TimeStamp Segment 2
1	Segment 0 Pos 32k - 64k	0	Segment 0 Pos 32k - 64k	0
2	Segment 1 Pos 0 - 32k	0	Segment 1 Pos 0 - 32k	TimeStamp Segment 3
2	Segment 1 Pos 32k - 64k	0	Segment 1 Pos 32k - 64k	0

Setup the hardware

The following chapters show how the hardware setup is done under DASLab. For further details on the different settings one must have a look in the hardware manual that has been delivered together with the board.

Synchronization

The synchronisation window is only available if more than one Spectrum board is used in the system. This window defines whether the boards are running independently or synchronously. Trigger master, clock master and board enable are also set in this window. Details are found in the hardware manual.



Mode

In Single mode all boards are running independently. If Synchronise is selected, Clock and Trig are synchronized.

Clock

If the boards are running synchronized, select the clock master board with this radio button. Depending on the hardware configuration when using cards with different maximum sampling speeds it can be that single cards are not able to be clock master. These cards are then grayed.

Trig

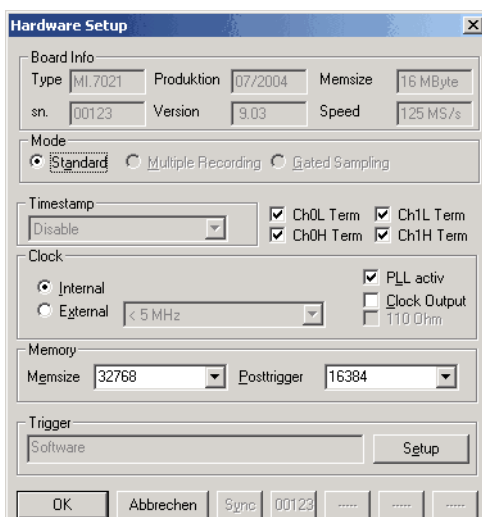
For MI/MC/MX cards inhere the trigger master board is selected for the synchronisation. M2i cards automatically have an OR/AND combined trigger and all cards are selected for trigger detection.

Setup

The setup window for this board is called. See below for the settings that could be made there.

Board Setup

If only one board is installed in the system, all setup is done in this window. If several boards are installed, one setup window is available for every installed board.



Board Info

Board information of the currently selected board from the on-board EEPROM is shown here. You'll find the type, serial number, production date, hardware version, installed memory size and speed here.

Mode

Select the recording mode for the board. The modes are explained in detail in the hardware manual. Depending on the selected mode some of the other settings may change also.

Timestamp

If Timestamp is installed on the board, the timestamp mode could be selected here.

Termination

This part is only visible when using a digital I/O board. Each 16 bit input channel of the digital i/o board can be terminated against ground with 110 Ohms by activating one of the checkboxes.

Clock-Mode

If board is running in Single mode or as a clock master, the clock source could be selected with the radio button. The external clock range must be selected in external clock mode. See hardware manual for details.

Clock-PLL

PLL is used for clock generation. If deactivated the internal quartz clock is used

Clock Output

Activates internal clock output to connector.

Clock 50/110 Ohm

Activates the clock input termination. Only available if external clock is selected.

Memory

Memsize and Posttrigger value for standard mode. The memsize must be at least as large as the DASYLab block size.

Trigger

Start the trigger window if board is running in Single mode or as a trigger master

Sync

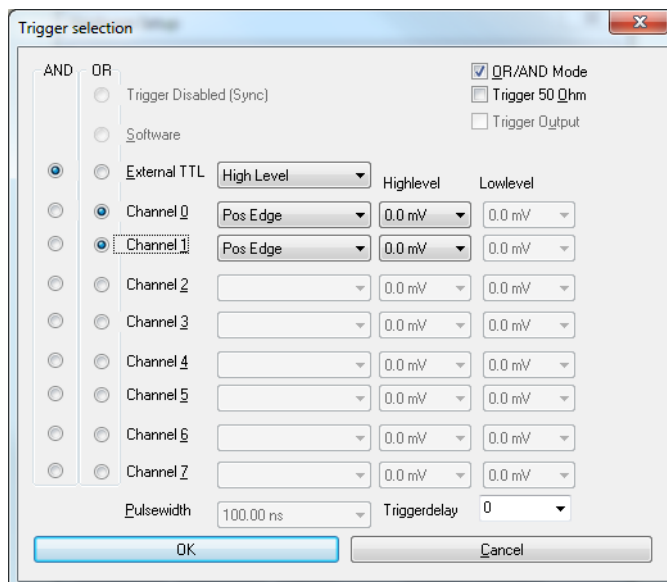
Call the synchronisation window to set up the synchronization. The synchronization window itself is explained in the chapter before.

Serial number

These buttons select the board setup of the particular board. With the buttons at the bottom it is possible to switch between the setup screens of the different boards.

Trigger Setup

This window defines the used trigger. The trigger setup is called directly from the setup window of the board. Settings that are not available at the moment are disabled. The selected trigger mode is used for the next acquisition or generation and is also used for Multiple Recording or Gated Sampling mode if one of these options is installed and activated on your board.

**Trigger Disabled**

M2i cards only: disables the trigger engine of this card if the cards run synchronously.

Software

Software trigger will start the board immediately without waiting for a trigger event.

External TTL

External TTL waits for a TTL signal on the trigger connector. There are several different external trigger modes selectable.

Channel # 0 to 7

Activates one of the channel trigger modes. Depending on the installed hardware there are between 1 and 8 different channel triggers available. The detailed meaning of the different trigger modes is explained in the hardware manual.

OR/AND Mode

When activated one can use more than one channel trigger as source. All trigger conditions are AND and OR combined in hardware. If any of the trigger conditions is detected, the board

will trigger. After activation of this mode one has an AND and an OR button for each trigger source. In here the trigger source can be added to one of the trigger combination masks or again deleted from it.

Pulswidth

Pulswidth is used with some trigger modes and defines the time a trigger condition must be present. Depending on the selected mode a trigger event is detected if either the condition is present longer than the programmed pulswidth or if it's present for a shorter time.

Highlevel + Lowlevel

These two registers define the levels for the channel trigger modes. Depending on the selected mode one or two of the level registers are activated.

50 Ohm

When activated the external trigger input is terminated with 50 Ohm against ground. Only available if external trigger is selected.

Trigger Output

Enables the trigger signal output of an internally recognized module trigger.

DASYLab messages

Error messages

This list of error messages explains all errors that could occur when using the Spectrum boards with DASYLab. Not all of these error messages are relevant for all boards.

Please use the DrvCfg Utility...

When using Windows NT, Windows 2000 or Windows XP ISA boards are installed using the DrvCfg utility. If this error message is shown this board is not matching the loaded driver. Either DASYLab has loaded the wrong driver or the board was not set-up correctly under Windows NT. Please have a look at the hardware manual for a detailed description.

The Samplerate (Frequency) is not valid...

The samplerate is not in the valid range. Please compare the selected value with the allowed values from the hardware description. The samplerate could only be set to even divider from the maximal possible samplerate. No other settings are allowed.

An internal error occurred...

This message is shown if an internal error occurred in the driver. Please document the values shown in the error message as well as all other settings and the action that was made before this error occurs. Send this information to the developer of the driver to get an error free version.

The blocksize is larger the programmed memsize

The block size defined in DASYLab for data transfer is larger than the programmed memory size on the board. Either the memory size on the board must be increased or the block size in DASYLab must be decreased. A recording with the given parameters is not useful.

FIFO Buffer overrun. Recording stopped !

The internal FIFO buffer of the board or the FIFO buffer of the driver overruns because DASYLab could not process the data fast enough. Recording has been stopped. Start recording again with a slower samplerate or minimise the number of modules that process the data.

Synchronisation of Timestamp to external Clock failed.

The synchronisation to the external seconds signal of the radio clock did not work. Perhaps the connection is interrupted. If no radio clock is installed, please use another timestamp mode.

FIFO mode is only possible up to a sum frequency of 125 MHz.

The sum frequency of all activated channels is higher than 125 MHz. FIFO mode could only work up to a sum frequency of 250 MB/s (125 MHz). Deactivate some channels or select a lower samplerate.

No Spectrum PCI board found in the system. Please check installation of board and driver.

No Spectrum board was found in the system. Please check whether the board is installed properly in the system and whether the driver of the operating system was loaded correctly.

Output channels are not to be allowed as asynchronous. Please change setup.

This board could only make a data output that is synchronously with the data acquisition. An asynchronous output is not possible. Please change the experiment setup to have synchronous outputs.

Mixing input and output. Channels of one module must have same direction

Due to hardware limitations all channels on one module must be programmed in the same direction. Please change the setup and use other channels to perform the desired task.

Mixing input and output. Not possible with this board type

This hardware type doesn't allow to mix input channels and output channels.

Mixing input and output. Not possible when using FIFO mode (continuous)

It is not possible to use FIFO mode at the same time for output and for data acquisition. Please change the acquisition mode in the experiment setup.

Output channels are not allowed to be asynchronous. Please change them to synchronous.

The output channels are synchronous fast channels. Therefore the output mode is not allowed to be set to asynchronous mode. Please change the setting before proceeding.

Singleshot and Continuous mode are only allowed if output is enabled.

The both modes singleshot and continuous are pure output modes. Therefore these modes can only be used if the board is used as an output mode. They cannot be used with acquisition mode or mixed mode.