mesytec MSPI-16 is a parallel data interface and controller unit for neutron detector readout electronics. Frontend devices are connected over the highspeed serial event bus. It provides the possibility to control all internal settings of the connected modules. It interfaces up to 16 MPDS-8+ via point to point connection on 16 eventbus branches to a parallel output for external data acquisition systems and histogrammers. Data are presented buffered (256 events buffer). Basic features of the connected modules like pulser test and amplitude/position mode can be controlled via front panel elements. The RS-232 and USB interfaces allow detailed setup of all parameters of the connected frontend electronics. Up to 128 position sensitive detector tubes can be handled with one module.

Features:

- 16 high speed event buses

- Up to 16 MPSD-8+
  = up to 128 position sensitive detectors
- Front panel control allows quick test routines and mode selection

- Full remote control (RS-232 / USB) for all MSPI-16 and MPSD-8+ parameters

- Buffered parallel data output for external histogramming

Setup:

Bus Connection

All frontend modules are connected via the serial event bus over point to point connections. Bus medium is a standard RG174 coaxial cable.
A total of 16 modules (MPSD-8+ or MSTD-16) can be connected with the MSPI.

Adressing

Each frontend electronic module is addressed by the bus number (0...15) used for connection.

Operation:

Frontpanel operation

Basic features of the frontend electronics can be directly accessed by frontpanel elements:

- Operating mode (Position/Amplitude)
- Initialization
- Pulser test

Modes

There are two modes for MPSD-8 modules which can be toggled by a pushbutton:

- Position mode (default setting):
  data represent the calculated 10 bit position.
  This is the mode for position resolved neutron measurements.
- Amplitude mode:
  data represent 10 bit amplitude signals.
  Useful for diagnosis and detailed setup of HV, gain and threshold.

Position mode is the power up default mode.

Pulser

MPSD-8+ have integrated test pulsers for diagnosis. They can be activated by a pushbutton at the MSPI-16. The pulser cycles through all connected channels in left / middle / right position (in position mode) or high / medium amplitude. This allows an easy check for electronic functionality.

Init

Pressing the init button for more than 1 second starts a re-initialisation of all connected frontend modules, using the saved configuration.

Event buses, indicators

Status LEDs show activity and errors on the eventbus, one for each possible device address.

Remote control operation

Remote control over the RS-232 or the USB interface allows detailed settings for each individual channel (gains) or module (threshold), as well as for the integrated test pulser. Saved setup is downloaded to connected peripheral devices on power up and by pushing the "init" button.

Interface setting

RS-232: 9600 Bd., 8N1
(eight data bist, no parity, one stop bit)

USB:
using the FTDI generic comport driver allows communication live over a serial com port. Up to data drivers for most common operating systems can be found at:
http://www.ftdichip.com/FTDriver.htm

Command set

The following command set is used to control the parameters of the connected MPSD-8+ or MSTD-16. Just enter the commands in a terminal window with a serial connection to the MSPI.

General

addr	module address = bus number [0...15, 16 = all]
chan	channel number [0...7, 8 = all]
value	nummerical value to be settable
<CR>	menas the <carriage return> or <enter> key

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Commands:

General

?	list available commands / "Help"
H	
DS	display status

MSPI-16 commands

MP	switch to position mode
MA	switch to amplitude (energy) mode
DO val	set data offset to val [0...63], default = 32
PT	start/stop pulser test
D1	start data acquisition
D0	stop data acquisition

MPSD-8+ commands

GA addr chan val	set gain for module addr and channel chan to val [0...255], default = 128
TH addr val	set common threshold for module addr to val [0...255], default = 20
PA addr val	set pulser amplitude for module addr to val [0...255]
PP addr chan pos	set pulser position for module addr to chan and pos [l, m, r]
P1 addr	switch pulser in module addr on
P0 addr	switch pulser in module addr off
RI addr	read device ID of module addr (return s 0 if not connected)
IN addr	initialize module addr (dump saved settings)

Typical Examples

At power on, the MSPI-16 should be in a reasonable status, checking all connected peripheral devices and initializing them to setup values saved in memory.
(Which are reasonable defaults if not changed.)

Adjusting threshold

TH 0 25	sets threshold for the module connected on bus 0 to numerical value 25
TH 8 25	sets threshold for all connected modules to numerical value 25

Adjusting gain

GA 0 0 120	sets gain for channel 0 of the module connected on bus 0 to numerical value 120
GA 0 8 120	sets gain for all channels of the module connected on bus 0 to numerical value 120
GA 16 8 120	sets gain for all channels of all connected modules to numerical value 120

Using the test pulser

PA 0 80	sets pulser amplitude of the module connected on bus 0 to numerical value 80
PP 0 4 m	sets pulser position of the module connected on bus 0 to channel 4, middle
P1 0	switches pulser of the module connected on bus 0 on

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Quick start:

For a first look on the operation of MSPI-16 together with MPSD-8+, proceed like follows:

- Connect MSPI-16 and MPSD-8+ with the event bus cable
- Press "Init" at the MSPI-16, default initialisation is sent to MPSD-8+
- Click "Pulser" at the MSPI-16 Eventbus LEDs should now show activity at MSPI-16 and MPSD-8+. Data are output at the Sub-D 25 parallel port.

Data output format:

MSPI presents the following signals at its parallel data interfaces

- 4 bit bus (module) address (M0...M3)
- 4 bit channel address (C0...C3)
  for MPSD-8+: C3 = position/amplitude mode)
- 10 bit conversion data (amplitude/position)
- strobe for data ready (active low)

Parallel interface

- Eight bit address
  (higher nibble: bus number,
  lower nibble: channel)
- 10 bit conversion data (P0...P9)
  (P = Position, A = Amplitude/Energy)

Name	A7	A6	A5	A4	A3	A2	A1	A0
Comment	M3	M2	M1	M0	C3	C2	C1	C0
MSPI pin	20	19	6	18	5	17	4	16

Name	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
Comment	P/A 9	P/A 8	P/A 7	P/A 6	P/A 5	P/A 4	P/A 3	P/A 2	P/A 1	P/A 0
MSPI pin	24	11	23	10	22	9	21	8	25	12

| Name	L (strobe)	gnd	gnd	gnd	gnd
Comment	75 ns pulse				
MSPI pin	2	1	7	13	

Detailed setup

A more detailed electronics setup of a 3He psd detector system can be performed with the following steps:

- Change MSPI-16 to amplitude mode (either with frontpanel pushbutton or with rc command "MA")
- Ramp detector bias voltage to estimated value.
- Check the resulting amplitude spectrum and adjust bias voltage. The thermal peak position of the amplitude spectrum should be shifted to about 80 % of maximum range.
- Set threshold accordingly to cut off the gamma tail in the lower part of the spectrum using the rc command "TH"
- If necessary, adjust individual channel gains using the rc command "GA"

Data transfer rate

Mean transfer rate 1.6 MHz at 20 % deadtime (100 kHz per serial bus), 5 MHz maximum rate. For higher rates the system can be parallelized.

Parallel output transmit cycle
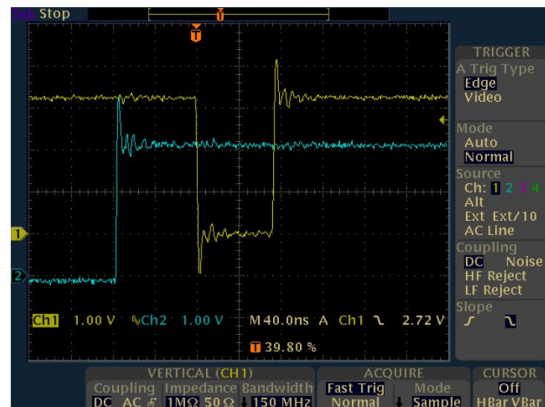
TDS 3034C - 16:20:41 08.10.2010

blue: data line, yellow: L-strobe signal

Data valid 75 ns before strobe goes nagative, until 50 ns after rising edge of strobe. Strobe length: 75 ns / Full transmit cycle: 200 ns

Technical Data:

Power consumption

+6 V: 230 mA
–6 V: 30 mA
total: 1.6 W

Size: overall size 800 x 222 x 34 mm
        (1/12 NIM case)
Weight: 980 g

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