

MC.72xx - 32 bit Digital Pattern Generator with programmable logic levels

- CompactPCI 6U format
- Programmable output levels from -2,0 V up to +10,0 V
- Levels individually programmable per 4 bit
- Up to 40 MS/s at 32 bit
- Possible use of memory saving 8 bit mode
- All Outputs can be separately disabled (Tristate)
- Hardware controlled differential output possible (8 bit and 16 bit)
- Up to 512 MByte on-board memory
- Output in FIFO mode
- Synchronization possible



Product range overview

Model	8 bit	16 bit	32 bit
MC.7210	10 MS/s	10 MS/s	
MC.7211	10 MS/s	10 MS/s	5 MS/s
MC.7220	40 MS/s	40 MS/s	
MC.7221	40 MS/s	40 MS/s	40 MS/s

Software/Drivers

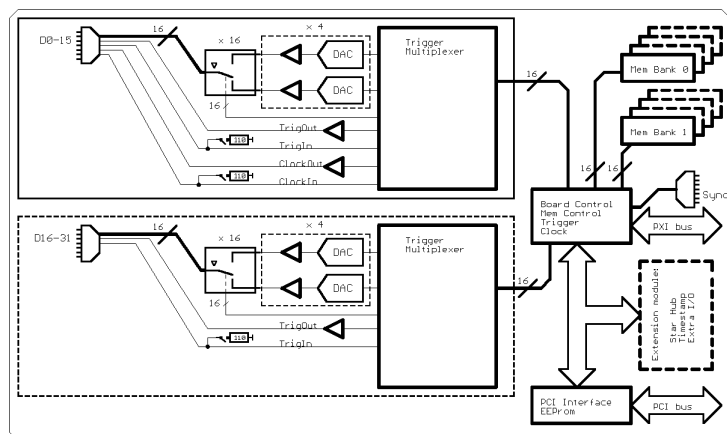
A large number of drivers and examples are delivered with the board or are available as an option:

- Windows NT/2000 32 bit drivers
- Windows XP/Vista/7 32 and 64 bit drivers
- Linux 32bit and 64bit drivers
- SBench 6.x Base version for Windows and Linux
- Microsoft Visual C++ examples
- Borland Delphi examples
- Microsoft Visual Basic & Excel examples
- Python examples
- LabWindows/CVI examples
- LabVIEW - drivers and examples
- MATLAB - drivers and examples
- Other 3rd party drivers (e.g. VEE, DASYLab) are partly available upon request

General Information

The MC.72xx pattern generator series gives the user the possibility to generate digital data with a wide range of output levels. For every 4 bit the LOW and HIGH levels can be programmed from -2.0 V up to +10.0 V. Even at high speeds you are not limited concerning the maximum output swing. This enables the user to drive devices of nearly any logic family, like ECL, PECL, TTL, LVDS, LVTTTL, CMOS or LVCMOS. The potentially necessary differential signals are generated in hardware, so that only one data bit is used for each pair of differential signals. All outputs can be separately disabled allowing the easy connection with digital acquisition boards and the adaption to a wide range of test setups. The internal standard synchronization bus allows synchronisation of several MC.xxxx boards. Therefore the MC.72xx board can be used as an enlargement to any digital or analog board.

Hardware block diagram



Software programmable parameters

sampling rate	1 kS/s to max sampling rate, external clock, ref clock
Output level	LOW/HIGH level p. nibble; -2,0 V up to +10,0 V in steps of 1mV
Clock mode	internal PLL, int.quartz, external, ext. divided, ext. reference clock
Clock impedance	110 Ohm / 50 kOhm
Trigger impedance	110 Ohm / 50 kOhm
Data Enable mask	programmable for every single bit
Trigger mode	External TTL, software
Memory depth	32 up to installed memory in steps of 32
Posttrigger	32 up to 256 M in steps of 32
Multiple Recording segmentsize	32 up to installed memory / 2 in steps of 32

Application examples

Semiconductor test	Production test	Burn-in test
Laboratory purposes	Pattern generator	Semiconductor development
Process control	ATE	

Possibilities and options

FIFO mode

The FIFO mode is designed for continuous data transfer between measurement board and PC memory (up to 100 MB /s) or hard disk (up to 50 MB/s). The control of the data stream is done automatically by the driver on interrupt request.

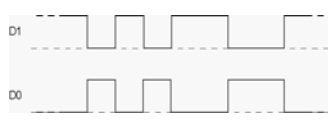
External trigger I/O

All boards could be triggered using an external TTL signal. It's possible to use positive or negative edge. An internally recognised trigger event could - activated by software - routed to the output connector to start external instruments.

External clock I/O

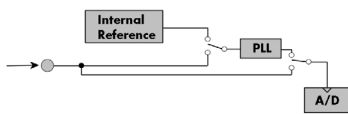
Using a dedicated connector a sampling clock can be fed in from an external system. It's also possible to output the internally used sampling clock to synchronise external equipment to this clock.

ECL Mode



When the ECL mode is activated, differential signals which are needed for e.g. ECL interfacing are generated in hardware on the odd data outputs. This results in the use of only one data bit for every pair of differential outputs and allows a very efficient use of memory.

Reference clock



The option to use a precise external reference clock (normally 10 MHz) is necessary to synchronize the instrument 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.

Cascading

The cascading option synchronises up to 4 Spectrum boards internally. It's the easiest way to build up a multi channel system. There is a phase delay between two boards of about 500 pico seconds when this synchronisation option is used.

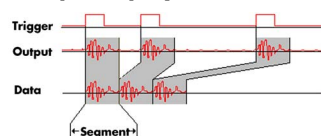
Star-Hub

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.

Extra I/O

The Extra I/O module adds 24 additional digital I/O lines and 4 analog outputs on an extra connector. These additional lines are independent from the standard function and can be controlled asynchronously. There is also an internal version available with 16 digital I/Os and 4 analog outputs that can be used directly at the rear board connector.

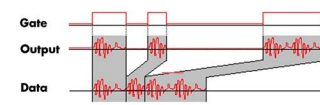
Multiple Replay



The Multiple Replay mode allows the fast repetition output on several trigger events without restarting the hardware. With this option very fast repetition rates can be achieved.

The on-board memory is divided in several segments of same size. Each of them is generated if a trigger event occurs.

Gated Replay



The Gated Sampling mode allows data replay controlled by an external gate signal. Data is only replayed if the gate signal has a pro-

grammed level.

Singleshot output

When singleshot output is activated the data of the on-board memory is replayed exactly one time. As trigger source one can use the external TTL trigger or the software trigger.

Continuous output

When continuous output is activated the data of the on-board memory is replayed continuously until a stop command is executed. As trigger source one can use the external TTL trigger or the software trigger.

Technical Data

Internal samplerate	1 kS/s up to maximum (depending on model)			Dimension	160 mm x 233 mm (Standard 6U)
External samplerate	DC up to maximum (depending on model)			Width (MC.721x)	1 slot
Clock input impedance	110 Ohm / 50 kOhm 15 pF			Width (MC.722x)	2 slots
Trigger input impedance	110 Ohm / 50 kOhm 15 pF			Output connector	40 pole half pitch (Hirose FX2 series)
Output impedance	approximately 80 Ohm			Power connector (MC.722x only)	soldered Y - cable with Molex 8981 (5,25" disc drive connector)
Data signal level	programmable from -2.0 V up to +10.0 V with an accuracy of ± 10 mV				
Output swing	0.1 ... 12.0 V				
	per pin	per nibble	per card	Operating temperature	0°C to 50°C
Maximum output current	100 mA	200 mA	0.5 A (MC.721x only)	Storage temperature	-10°C to 70°C
	1 MHz	40 MHz		Humidity	10% to 90%
Rise time ^a	2.00 ns	2.25 ns		MTBF	100000 hours
Fall time ^a	2.00 ns	2.25 ns			
Multi: Trigger to 1st sample delay	fixed				
Multi: Recovery time	< 20 samples (16 - 32 bit)				
	32 bit	16 bit	8 bit		
Trigger accuracy (samples)	1	1	2		

a. Tested with full output swing from -2.0 V to 10.0 V with no load

Trigger input: Standard TTL level	Low: -0.5 V > level < 0.8 V High: 2.0 V > level < 5.5 V Trigger pulse must be valid ≥ 2 clock periods.	Clock input: Standard TTL level	Low: -0.5 V > level < 0.8 V High: 2.0 V > level < 5.5 V Rising edge. Duty cycle: 50% \pm 5%
Trigger output	Standard TTL, capable of driving 50 Ohm. Low < 0.4 V (@ 20 mA, max 64 mA) High > 2.4 V (@ -20 mA, max -48 mA) One positive edge after the first internal trigger	Clock output	Standard TTL, capable of driving 50 Ohm Low < 0.4 V (@ 20 mA, max 64 mA) High > 2.4 V (@ -20 mA, max -48 mA)

Power consumption (maximum value)	Full speed			
	+3.3 V (CPCI Bus)	+5 V (CPCI Bus)	+12 V (CPCI Bus)	+12 V (Connector)
MC.7211 (32 bit output @ 5 MS/s) ^a	0.65 A (2.1 W)	0.61 A (3.1 W)	0.40 A (4.8 W)	0 A
MC.7221 (32 bit output @ 40 MS/s) ^b	1.07 A (3.5 W)	1.02 A (5.1 W)	0 A	3.6 A (43.2 W)

a. Tested with full output swing from -2.0 to 10.0 V with no load

b. Tested with full output swing from -2.0 V to 10.0 V with 50 mA output current per pin

Order Information

The card is delivered with 64 MByte on-board memory and supports standard mode (Scope), FIFO mode (streaming), Multiple Recording/Replay and Gated Sampling/Replay. Operating system drivers for Windows/Linux 32 bit and 64 bit, examples for C/C++, LabVIEW (Windows), MATLAB (Windows), LabWindows/CVI, Delphi, Visual Basic, Python and a Base license of the oscilloscope software SBench 6 are included. Drivers for other 3rd party products like VEE or DASyLab may be available on request.

One digital connecting cable Cab-d40-idx-100 is included in the delivery for every digital connection (each 16 channels).

Versions	Order no.	8 Bit	16 Bit	32 Bit	Price
	MC.7210	10 MS/s	10 MS/s		
	MC.7211	10 MS/s	10 MS/s	5 MS/s	
	MC.7220	40 MS/s	40 MS/s		
	MC.7221	40 MS/s	40 MS/s	40 MS/s	

Memory	Order no.	Option
	MC.7xxx-128M	Memory upgrade to 128 MB of total memory
	MC.7xxx-256M	Memory upgrade to 256 MB of total memory
	MC.7xxx-512M	Memory upgrade to 512 MB of total memory
	MC.7xxx-up	Additional fee for later memory upgrade

Options	Order no.	Option
	MC.7xxx-cs	Option Cascading: Synchronization of up to 4 cards (one option needed per system)
	MC.7xxx-smod (1)	Option Star-Hub: Synchronization of up to 16 cards (one option needed per system)
	MC.xxxx-xmf (1)	Option Extra I/O with external connector, 24 digital I/O + 4 analog outputs. Including one cable Cab-d40-idx-100.

Cable	Order no.	Option
	Cab-d40-idx-100	Flat ribbon cable 40 pole FX2 for digital connector to 2x20 pole IDC connector, 100 cm
	Cab-d40-d40-100	Flat ribbon cable 40 pole FX2 for digital connector to 40 pole digital FX2 connector, 100 cm

Software SBench6	Order no.	
	SBench6	Base version included in delivery. Support standard mode for one card.
	SBench6-Pro	Professional version for one card: FIFO mode, export/import, calculation functions
	SBench6-Multi	Option multiple cards: Needs Professional version. Handles multiple synchronized cards in one system.
	Volume Licenses	Please ask Spectrum for details.

(1) : Just one of the options can be installed on a card at a time.

(2) : Third party product with warranty differing from our export conditions. No volume rebate possible.

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