

# PI-2005 Pattern Generator

## Features:

- 225 MHz Clock Rate
- Multi-level Looping
- 256 Kbit Memory Depth Per Channel
- Start/Stop/Trigger Inputs
- Up To 64 Channels in 16 Channel Increments



## Applications:

- Device Characterization
- FPA/CCD Testing
- Complex Digital Patterns
- Digital Timing for Systems
- Verify DAC, FPGA and ASIC Devices

## Introduction:

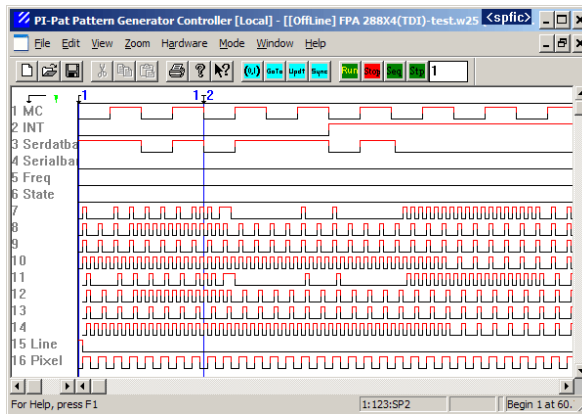
The PI-2005 Pattern Generator generates a wide range of simple to complex digital patterns for many test applications requiring serial or parallel digital data streams. Its CompactPCI® modular instrumentation platform combines mainstream PC technology and rugged packaging to create a high performance, low cost test instrument. Because of its small size the PI-2005 can be used in portable, bench and rack-mount applications. In particular, it is well suited for production test applications where manufacturing floor space is always at a premium.

## Instrument Description

As a test engineer or digital designer you must have state-of-the-art tools to test, characterize and verify your complex semiconductor devices and digital circuit boards. To meet the requirements of the present day complex devices and digital circuits the pattern generator can be configured from 16 to 64 output channels.

With almost infinite looping capability and 256 Kbits per channel, the PI-2005 can create a digital pattern at speeds and complexities that will fulfill the most demanding requirements. The pattern generator internal clock provides frequencies from 12 KHz to 225 MHz with a <1% programming accuracy. The phase-locked loop clock gives you high resolution timing for precise placement of the timing signals. An external clock can also be used.

The output voltage of the data channels can be LVTTTL, TTL, or 5V/CMOS, determined by the pattern card selected. Output are back-matched with 50  $\Omega$  to maintain output waveform fidelity. The channel-to-channel skew for all channels is less than 600 picoseconds. Each channel can be individually programmed for RZ/NRZ and inverted/ non-inverted output. Each channel can be individually programmed for tri-state operation. Additionally, the



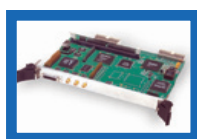
outputs can be dynamically tri-stated in channel pairs during pattern output.

There is an optional delay feature that will delay the output channels independently from 0 to 5.8 nanoseconds.

To program the instrument, the pattern memory is divided into sections, called subpatterns, from 20 bits to 256 Kbits long. The user can define up to 13,107 subpatterns, and subpattern definitions are common across all channels of the instrument. The subpatterns are output from the instrument in a programmed sequence with repeat factors and looping. The repeated and looping factors can be programmed with fixed values or compile-time variables to vary execution time of a test function, such as integration time for imaging devices. Multiple programs can be stored within a single pattern file and can use the same subpattern definitions.

Deeply nested looping provides virtually unlimited pattern depth for applications that use repeatable data, such as testing of array-structured devices.

The PI-2005 permits fine control over program execution. In Run mode the output loops continuously. In Step Mode the instrument will output exactly n sub-pattern statements. In Sequence Mode the instrument will output the entire compiled instruction set n times. At the end of Step or Sequence the execution stops and all outputs are held low.



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The PI-2005 also has external Start and Stop triggers that allow the user to apply an external signal to stop or start the execution of the instruction set. When a start signal is received the pattern generator will begin execution at the beginning of the program. When a stop signal is received the PI-2005 will stop at the end of the subpattern being executed.

The PI-2005 also provides an I<sup>2</sup>C Serial Bus interface for programming the DUT.

### Software Description

The PI-2005 is programmed, as a standalone instrument, using Pulse Instruments' PI-PAT software running under Windows XP.

Pulse Instruments PI-PAT software makes programming the PI-2005 as easy as drawing timing patterns on the large graphical display. Cut/Copy/Paste and Multiple Paste accelerate complex pattern creation. Patterns can also be entered algorithmically. Timing markers and zoom views allow the user to quickly check timing alignment of critical patterns. The 'Go To' function allows the user to quickly view and edit any position in the data pattern.

Each channel installed in the instrument can be given a mnemonic signal name to identify how each output channel is used in the test application.

The PI-2005 can also be programmed via an OLE/Automation interface or via GPIB from a remote PC. The controlling application can be PI-PAT or 3rd-party software written in a variety of environments including C++, LabVIEW, VisualBasic, etc. Patterns, instructions, comments, and channel names can also be imported and exported directly as text files. The command set is fully documented and highly backward-compatible with applications written for Pulse Instruments' PI-5800A pattern generator.

### Specifications:

#### Clock:

Frequency: 12 kHz-225 MHz (Int. Clock)  
<1 Hz-225 MHz (Ext. Clock)

Accuracy: <1.0%  
Resolution: <0.625% of Prog. Value  
Period Jitter: <100 ps

External Clock Input: TTL or ECL levels,  
software selectable  
External Clock Output: LVTTTL levels into 1 M $\Omega$

#### Output Characteristics:

Channel to channel skew: <600 ps

#### Output Levels:

PI-21100: LVTTTL-compatible into 1 M $\Omega$ /50  $\Omega$   
PI-21101: TTL-compatible into 1 M $\Omega$ /50  $\Omega$   
PI-21102: 0-5 V/1 M $\Omega$ , 0-2.5 V/50  $\Omega$

#### Rise/Fall times (10%-90%):

PI-21100: < 3.2 ns  
PI-21101: < 2.5 ns  
PI-21102:

Output Impedance: 50  $\Omega$   $\pm$ 10%

Min Pulse Width: 4.4 ns

#### Channel Formats:

Invert/Non-invert: Independently selectable  
RZ/NRZ Mode: Independently selectable  
Tri-state: Independently selectable

Channels can be tri-stated dynamically, in pairs (Ch 1-2, 3-4, etc.), defined at each Subpattern instruction.

#### Program Lines:

Max. Number of Lines: 256 K (262,144)

#### Subpatterns:

Maximum Length: 256 K (262,144) bits

Minimum Length: 20 bits

Max. # of Subpatterns: 13,107

Max. First Level Repeats: 1,023

Max. Repeats of Loops: 1,023

Looping Levels: Limited by program memory

**Power:** 105/240 VAC @ 50/60Hz

#### Mechanical:

Outside Dimensions: 5.25" H x 17.5" W x 11.75" D

Card Slots: Size 6U Eurocard

Output Connectors: 9 Pin ULTI-MATE™  
Commercial Micro D

Clock I/O Connector: CONEC  
3-003W3-P-C-X-41-A1-0X

Auxiliary I/O Conn: CONEC  
3-013W3-P-C-X-41-A1-0X

#### Ordering Information:

Contact Pulse Instruments Sales at (310) 515-5330 or  
sales@pulseinstruments.com

Unless otherwise specified, dynamic measurements are made with all outputs terminated into 50  $\Omega$ .