

What's New in PIXIE-4 Viewer Revision 1.61 (Released May 6, 2008)

Bug Fixes:

- Igor: Modified panel controls to be better compatible with Igor version 6.03 (e.g. color of tabs, size of button text)
- Igor: Separated out the (one) function incompatible with Igor version 4 in a separate procedure window "Version5plus". This function is optional; if Igor complains about not being able to compile properly at startup of Pixie interface, delete (close and kill) the procedure window. Note: Future versions of Pixie-4 interface may not be compatible with Igor version 4.
- DSP: fixed bug in interrupt routine for MCA runs that could cause wrong energies or even cause module to not finish run (trying to process presumed remaining events due to pointer error). Would occur especially for short coincidence windows or high count rates when new event is likely while last event not yet fully processed.
- C library: Fixed incorrect declaration of CSR, WCR variables in "Get_Slow_Trace" function (a test/R&D function used to capture continuous waveforms from ADC)
- C library: Corrected Boot command in sample.c (from 0x1 to 0x1F) and added note to point out need to change compile option in defs.h when compiling sample.exe rather than Igor xop.
- Firmware: Restructured and recompiled Fippi firmware, fixing bug in energy sum capture (may have been overwritten during readout), fixing odd behavior for specific values of energy filter times, and fixing spurious fast triggers observed in some modules.
- Igor: When storing version information on file, module serial number is now written in decimal format (was hex).
- Manuals: Updated release number to 1.61.
- Manuals: Removed last table in PDM manual and corrected the stated output count rate for random pulses in module coincidence firmware to ~18,000 counts/s.

What's New in PIXIE-4 Viewer Revision 1.60 (Released on 3/31/2008) since Revision 1.41

New Features:

1. (1.60) Updated PXI-PDM manual
2. (1.60) Added Igor function for multi-file MCA runs without Igor background task to reduce filling up of PC's virtual memory
3. (1.60) verified Igor (version 6) and Pixie-4 software work ok with Windows Vista. Vista's "transparent" Window frames make Igor look odd, but no problem in performance.
4. (1.56) Revised module coincidence: PXI-PDM in slot 2 can obtain full 48 bit hit pattern from modules in slots 3-14 and make an accept/reject decision specified by user.
5. (1.56) Changed default settings file to depend on "local" coincidence test. Older files (pre-1.55) lack this entry in the MODULEPATTERN variable and thus do never accept events.
6. (1.56) Added function to oscilloscope to capture a pulse (repeating "refresh" until waveforms have variations of more than 100 ADC steps). This is useful to view traces in low count rate applications.
7. (1.56) Report status of front panel input at time of event in list mode data (hit pattern)
8. (1.55) Revised Firmware and DSP code for improved coincidence test. Coincidence test is now applied in FPGA, not DSP, saving processing time and improving accuracy of timing. Integrates

better with (revised) module coincidence performed by PXI-PDM in slot 2, but limited coincidence tests can be applied without PDM

9. (1.55) Event time stamps are now latched in FPGA at time of validated trigger, not in DSP after response to interrupt. This reduces jitter compared to channel time stamps (low words are exactly synchronized). Run time and buffer start time are still based on DSP timer.
10. (1.53) Added new code variant (SAUNA), acquiring 2D spectra
11. (1.53) Minor modifications to ensure compatibility with Igor 6.
12. (1.52) Support the correct recognition of Rev. D modules. The only difference in functionality in Rev. D modules is that it announces itself as "Revision = 3", which affects computation of the serial number. In principle Rev. D modules can be operated with release 1.40, if error messages for "revision mismatch" are ignored.
13. (1.50) Use new "unified" DSP code for Pixie-4 and DGF-4C Rev. F (DSP code version 3.50 and higher).
14. (1.50) Added double buffer function for module readout, to let host read out data from one block in external memory while DSP continues to acquire data and write to other block (Rev. C, D only). See programmer's manual, appendix C for details.

Changes:

DSP code changes

DSP parameters:

- added variable SUMDAC, ChanCSRCx, ModCRSC, NoutA/Bx (still unused)
- moved variable CHANNUM in DSP memory (to just before U00)
- added EMwords2, DblBufCSR for double buffer readout
- DSPBUILD encodes the DGF model in upper 4 bits: Pixie-4 = 0x2
- added DECIMATION to output block, a copy of input FILTERRANGE
- changed usage of MODCSRA, MODULEPATTERN, NNSHAREPATTERN, CHANCSRA

DSP code

- RESUME is set to zero at end of run by the DSP. This allows host to resume runs without having to set the variable explicitly, saving some I/O time.

User DSP code

- made HITPATTERN (= hit pattern of current event) accessible to user code

Output data

- Buffer header variable BUFFORMAT is now 0x2000 + Runttype (not 0x1000)
- HIT Pattern contains additional status information. See user's manual table 4.4
- Added DSP variable INTEGRATOR to data reported in .ifm file

Igor Interface

- Modified RUN Tab to better organize controls for list mode runs
- Modified Chassis Register Panel for now coincidence function
- Modified call to user routines: User_NewFileDuringRun() now called before run is resumed, not after; added User_UpdateMCA(), called after MCA updates.
- Minor changes in Oscilloscope panel, List mode trace display, List mode spectrum display
- (1.60) Added Igor function for multi-file MCA runs without Igor background task to reduce filling up of PC's virtual memory

C library

- After changing NNSHAREPATTERN, call ControlTask 5 to apply to FPGA and PDM.
- After changing CONINWAIT or COINCPATTERN, call ControlTask 5 to apply to FPGA.

- Modified list mode data readout for double buffer mode.

Firmware

- Modified use of PXI backplane lines
- Modified module coincidence logic
- Modified time stamps latching
- Minor changes in waveform capture and trigger generation

Manuals

- Updated user and programmer manual for changes described above. Changes in programmer manual are **highlighted**. Also updated manual for PXI-PDM.

Bug Fixes:

- Igor: Added function to update DSP version after booting
- Igor: Increased maximum binning factor to 8
- DSP: Increased length of intermediate buffer to 4060 (was 2044). This also shifts memory locations of output buffer and user variables in the DSP memory. Use the .lst file to look up DSP memory addresses!
- DSP: The ACTIVE bit in the CR is now set with minimal delay after runstart (prev. may take several 100us)
- C library: Corrected readout of external memory (waiting for CSR bit 7 to clear).
- (1.57) Fixed bug in ControlTasks 3 and 6 where baseline reads from Fippifailed. In controltask 3 this was compensated by using ADC values instead. When controltask 6 was used to compute BLcut, the C library function would use a default value when baseline reads failed. Thus the effect of this error was usually minimal.

What's New in PIXIE-4 Viewer Revision 1.52 (Released on 7/27/2007)

Note: This is a limited release for revision D modules (serial numbers 250 and higher)

New Features:

1. This release supports the correct recognition of Rev. D modules. The only difference in functionality in Rev. D modules is that it announces itself as "Revision = 3", which affects computation of the serial number. In principle Rev. D modules can be operated with release 1.40, if error messages for "revision mismatch" are ignored. (But see Known Issues, below)

Bug Fixes:

1. Updated online help for channel register panel and chassis register panel, especially the trigger sharing modes 0-3.
2. Increased length of intermediate buffer to 4060 (was 2044). This also shifts memory locations of output buffer and user variables in the DSP memory. Programmers should use the .lst file to look up DSP memory addresses.

This modification allows compressed list mode runs to acquire longer traces or more events without rejecting new events, as the intermediate buffer is filled as quickly with events not yet processed into the output buffer. Previously, if the combined trace length was more than 13 microseconds, only one event at a time could be recorded, i.e. the effective dead time for an event was increased by the processing time. Now this limit is 26 microseconds.

Known Issues:

1. The double buffer mode introduced in release 1.50 seems to be broken in this release.
2. Specific Rev. D modules may show bit errors in waveforms when used with Fippi FPGA 1A3A from release 1.40.

What's New in PIXIE-4 Viewer Revision 1.50 (Released on 4/30/2007)

Note: This is a limited release for initial testing of the "double buffer" function

New Features:

1. This release uses the new "unified" DSP code for Pixie-4 and DGF Rev. F (DSP code 3.50). This has the following differences to earlier versions:
DSP parameters:
 - added variable SUMDAC, ChanCSRCx, ModCRSC, NoutA/Bx (still unused)
 - moved variable CHANNUM in DSP memory (to just before U00)
 - added EMwords2, DbIBufCSR for double buffer readout
 - DSPBUILDNUMBER encodes the DGF model in upper 4 bits: Pixie-4 = 0x2

For user DSP code, there are the following changes

- made HITPATTERN (= hit pattern of current event) accessible to user code

For output data, there are the following changes

- Buffer header variable BUFFORMAT is now $0x2000 + \text{Runtype}$ (not $0x1000$)

2. Added double buffer function for module readout, to let host read out data from one block in external memory while DSP continues to acquire data and write to other block (Rev. C only). See separate document for description

Bug Fixes:

1. The ACTIVE bit in the CSR is now set with minimal delay after runstart (previously, may take several 100us)
2. Fixed bug in C library during readout of external memory (waiting for bit 7 to clear).

What's New in PIXIE-4 Viewer Revision 1.41 (Released on 2/16/2007)

New Features:

1. Added option to not parse list mode run at end of run. Avoids long wait when taking long files, but need to load files manually to view events
2. Added option of integrator = 3/4/5, acts same as integrator =1, but multiplies energy by factor 2/4/8.
3. Updated manuals with new features

Bug Fixes:

3. Fixed bug in module coincidence code
4. Fixed bug in CFD computation for compressed list mode runs

What's New in PIXIE-4 Viewer Revision 1.40 (Released on 12/08/2006)

New Features:

1. Added alternative trigger distribution for systems with >7 modules where signals have to cross PXI segment boundaries (no wire-OR possible)
2. Updated description of coincidence window in manual and Igor controls
3. In multi-module systems, all offsets are now adjusted simultaneously in all modules

4. Added user code version tracking variables
5. Added option to estimate energy in channels not reporting a hit (e.g. below trigger threshold or piled up)
6. Added option to latch timestamps based on local trigger only (not distributed trigger as before); this provides time of arrival information for channels without the need for waveform capture
7. Added version tracking register in FPGAs
8. Added description of User_Data for Acquire_Data function in Programmers manual

Bug Fixes:

1. Fixed bug in polling Rev. B modules
2. Fixed bug in chassis control panel
3. Fixed bug in capturing waveforms that arrive at different times indifferent channels (within coincidence window)
4. Changed max. PCI bus number to 128 (for complex PCI bus systems)
5. Modified runtask 0x7001 to count also events with hit=0000
6. Added check for BufNData==0 in list mode parsing routines to avoid infinite loop.

What's New in PIXIE-4 Viewer Revision 1.38 (Released on 09/21/2006)

This is an intermediate release (limited distribution) on the way to version 1.40

Bug Fixes:

1. Fixed bug in adjusting offsets
2. Fixed bug in setting share pattern for module 1 and above
3. Ensured coincwait limit of ~200ms is not exceeded

New Features:

1. Expanded module coincidence function using wire-OR lines. If enabled, the status of 4 module coincidence lines is stored as bits 4-7 in the event hit pattern.
2. The front panel input can contribute to one of the wire-OR lines used in module coincidence test.
3. In long runs, Igor can now break the output data into several files, incrementing run numbers every N spills (or N seconds in MCA runs). This is equivalent to clicking the "Start" button repeatedly.

4. If Igor is set to automatically increment run numbers, it makes an attempt to not overwrite existing files.
5. The panel displaying list mode traces now also shows timestamps and PSA values. List mode data processing uses new routines in the C library (0x7007, 0x7008) for the trace display (instead of 0x7002 and 0x7003). The older routines are still working, but their use is not recommended.
6. Modified filter display for list mode traces and added filter display for ADC traces (for best results, ensure trigger filter time is an integer multiple of the ADC sampling interval)
7. Added user plug-in procedures to Igor code. The main Igor code calls user functions at start run, stop run, etc. The user functions can be customized by the user. A user control panel allows setting of user DSP variables
8. User functions have been customized for several custom applications.
9. Added driver installation section to user manual.

What's New in PIXIE-4 Viewer Revision 1.34 (Released on 03/13/2006)

1. Updated Programmer's manual to include descriptions about DSP parameters related to setting coincidence between modules.
2. Updated User's manual.

What's New in PIXIE-4 Viewer Revision 1.33 (Released on 03/03/2006)

What's New in the Software

Bug Fixes:

3. Fixed bug in updating runtime and output count rate.
4. Fixed bug in saving of list mode data from external memory (32 spills at a time) that caused extra words at end of 32nd buffer when run was manually stopped.
5. Fixed bug for Igor polling time = 0 introduced in Viewer Revision 1.30.

What's New in PIXIE-4 Viewer Revision 1.30 (Released on 01/28/2006)

What's New in the Software

New Features:

1. A module can now accept/reject events based on result of coincidence test from neighboring module(s).
2. Added new panel showing all run statistics, plus run start/stop time and date. This information can be saved to an .ifm file (if desired, automatically after a run). Run start/stop time are also saved in header of .itx file when saving MCA manually.
3. Run statistics can be updated during run.
4. Made period for auto-update of MCA and statistics selectable.

Bug Fixes:

1. Fixed bug in copying parameter Baseline %.
2. Added ModuleCSR as a separate item when copying parameters.
3. Fixed bug in saving of list mode data from external memory (32 spills at a time) that caused extra words at end of 32nd buffer, freezing software when parsing output data.
4. Updated Trigger/Filter FPGA to suppress fast triggers when waiting for readout, which caused occasional wrong timestamps in list mode data due to triggers relatching timestamps.

What's New in PIXIE-4 Viewer Revision 1.23 (Released on 10/04/2005)

What's New in the Software

1. Added option to use the MMCX front panel input (labeled DSP-OUT, between channels 1 and 2) as an input for GFLT (Veto) signals. The front panel input signal is distributed over the backplane to all modules; only one module may use this option which is enabled in software.
2. Added support for clover detectors: In MCA runs the DSP can compute the sum of individual channel energies for events with hits in more than one channel and bin it into an addback spectrum. Currently spectrum length is fixed to 16K in this mode.

What's New in PIXIE-4 Viewer Revision 1.22 (Released on 12/03/2004)

What's New in the Software

1. Speeded up the system booting.
2. Made storing of list mode .dat file optional on the Data Record Option Panel. Since the .dat is saved as a text file so its size could be much bigger than the .bin file.
3. The software now supports 18-slot PXI chassis. A user can select 4/8 slot chassis or 18-slot chassis on the Pixie-4 Start Up Panel. NOTE: for 18-slot chassis, the first module (module #0) must be in the first bus segment, i.e. slots 2 - 6.
4. Resolved a few compatibility issues related to different IGOR PRO versions, mainly IGOR PRO ver. 4 and ver. 5.

What's New in PIXIE-4 Viewer Revision 1.20 (Released on 08/04/2004)

Hardware

Software revision 3.2.0 also supports the new Pixie-4 hardware revision C. Revision C modules are compatible with Revision B modules, but have the following new features:

1. The module can be PXI clock master if residing in slot 2.
2. The module can disconnect from backplane trigger lines, which allows several trigger groups in one chassis.
3. The module can store list data of several runs in the external memory, which can be read out in a fast burst transfer, reducing read-out dead time.
4. The module has additional connections for optional trigger distribution via front panel or backplane (currently not implemented).
5. The module has a front panel LED to indicate host I/O.

Revision B and Revision C modules use different configuration files, which are automatically selected by the software. Note that if both revisions are used together in the same chassis, item 3 is not possible.

PIXIE-4 Viewer - IGOR Interface

1. Added a new “Backplane Option” to the Module Register Edit Panel. If set, connect module trigger lines to backplane. Triggers will be shared with other modules. If not set, triggers are distributed only between channels of this module, depending on channel settings.
2. Added a new “Read 32 list data buffers per spill” option to the Data Record Option Panel. This feature is only available in Revision C Pixie-4 modules. Previously (Revision B modules), the host needs to read out the DSP’s internal 8192-word buffer before it can resume the next run. Now, the host can choose to store 32 consecutive 8192-word buffers in DSP’s external memory before it reads out the whole external memory. This will also improve the data transfer speed since the host can directly access the DSP external memory using fast burst transfer.

PIXIE-4 API (C Driver)

Updated driver to accommodate the new hardware features in Revision C modules.

Firmware

Updated communication FPGA configurations for Revision C modules.

Manuals

1. User’s Manual
 - i. Added descriptions for Revision C clock distribution mode.
 - ii. Added screenshots of Pixie-4 Viewer.
 - iii. Added Pixie-4 functional block diagram.
2. Programmer’s Manual
 - i. Updated the manual to accommodate the new hardware features in Revision C modules.
 - ii. Updated description of MODCSRA.

What’s New in PIXIE-4 Viewer Revision 1.10 (Released on 05/28/2004)

PIXIE-4 Viewer - IGOR Interface

1. Improved “Offline Analysis” functionality. Without using a Pixie-4 module, a user can still excise the features of the Pixie-4 Viewer, or display previously acquired MCA spectra or list mode data.
2. Added a new functionality for the automatic update of MCA spectra every 5 seconds. It can be enabled by clicking on the option “Update MCA every 5 seconds or spills” on the “Data Record Option Panel” (accessible through “Run” tab -> “Record” button).
3. Added a new “Update” button on the MCA Spectrum panel. A user can click on it to update the MCA spectrum while a MCA or list mode run is in progress.
4. Expanded the functionality of the “Sum” button on the MCA Spectrum panel. Now a user has three options for summing a MCA spectrum: (1) Sum-Background between limits; (2) Sum between limits; (3) Sum complete MCA.
5. Expanded the functionality of the file I/O on the MCA Spectrum panel. Now a user has three options for importing or exporting a MCA spectrum: (1) Save MCA to an Igor text file; (2) Read MCA from an Igor text file; (3) Extract MCA from a MCA binary file.
6. Added a “More/Less” button to the Pixie4 Run Control Panel (next to the “Help” button on the bottom of the Control Panel). It can be used to hide some controls. This may be helpful to those first-time Pixie users who only need to use those major controls in the beginning.

PIXIE-4 API (C Driver)

This new version of Pixie-4 API is a major overhaul compared to the previous releases in the following aspects:

1. Streamlined the error message relay from the bottom layer of the API to the host computer. The host computer program should check the return value of each of the API functions, and any negative return value indicates an error in the API. Error message information and error handling methods can be found in the Programmer’s Manual.
2. Improved the user parameter I/O function `Pixie_User_Par_IO`. Now a user parameter is classified as either a “SYSTEM” parameter, or a “MODULE” parameter, or a “CHANNEL” parameter. Please see the Programmer’s Manual for the detailed description of these types of parameters.
3. Module Number and/or Channel Number are now part of the input parameters for functions `Pixie_User_Par_IO`, `Pixie_Acquire_Data` and `Pixie_Set_Current_ModChan`. This will give API programmers more flexibility when using these functions.

Firmware

No change.

Manuals

1. User's Manual
 - i. Added the jumper settings for different clock distribution modes;
 - ii. Added descriptions for those new controls added to the Igor interface.

2. Programmer's Manual
 - i. Rewrote Section 2 where each API function is described;
 - ii. Updated the descriptions of DSP variables in Section 4.