



PCI-C429

Advanced Four, Eight, 16, or 32 Channel ARINC429 Test & Simulation Module for PCIbus

AIT's PCI-C429-4/8/16/32 is a rugged, reliable, full-featured PCIbus module designed to provide a stand-alone, flight-ready ARINC 429 interface for avionics applications. Up to 32 channels are provided on the module. Each channel can be individually configured to Transmit (Tx) or Receive (Rx) and to operate at the high or low bit rates defined by ARINC 429. AIT's PCI-C429 offers advanced test, simulation, monitoring, and databus analyzer functions.

The PCI-C429 module utilizes a simple and reliable FPGA-based hardware architecture with a flexible platform that provides the highest data throughput performance in the industry and that can be easily adapted to meet a wide range of application needs. Each module is configured with 128 MBytes of onboard memory, providing ample capacity to support high volumes of data and complex simulations.

AIT's PCI-C429 module is equipped with a single trigger output that can be used for synchronization with external measurement equipment. Additionally, the PCI-C429 module can be reconfigured to mount on any of AIT's advanced carriers to provide PMC, PCI, PCI-X, PC104+, USB, VME, or VXI solutions.



SOFTWARE SUPPORT

AIT's PCI-C429 is delivered with AIT's ARINC 429 Software Development Kit (SDK) which includes software driver support for Windows, Linux, and LabVIEW RT. The SDK provides multiple application interfaces including support for C/C++, C#, and VB.NET. High-level LabVIEW Virtual Instruments (VI) are provided with each module in support of intuitive application development. A simple soft front panel Graphical User Interface (GUI) application is also delivered with each module. The ARINC 429 SDK optionally includes AIT's Flight Simulyzer analyzer software.

APPLICATION INTERFACE

In support of application interfaces to the PCI-C429, the modules are supplied with AIT's ARINC 429 Object Wrapper Layer (OWL) C/C++ interface library. The OWL provides an intuitive and easy-to-use object-oriented interface to the card. Adaptions supporting C#, Python, and other common programming languages are available upon request. A rich suite of sample application and full documentation is also provided.

PHYSICAL BUS REPLAY

AIT's PCI-C429 module is able to electronically reconstruct previously recorded ARINC 429 data traffic physically to the bus with excellent timing accuracy. Recorded data files can be selected for physical bus replay to perform systems integration and test with the ability to disable any or all ARINC 429 label from the recorded file.

Key Features

- Four, Eight, 16, or 32 Software Programmable Tx/Rx Channels
- Programmable High/Low Speed Operation
- All Tx/Rx Channels can operate concurrently at High Speed rates
- Full Error Injection & Detection
- Rate-oriented Label Transmission
- Label Selective Trigger for Capture/Filtering
- Sort by SDI field
- IRIG-B Time Code Encoder/Decoder for Data Correlation
- Real-Time Recording & Post Analysis of Multiple Channels
- Application Interface supporting C++, C#, and .net Development
- Device Driver Support: Windows, Linux, VxWorks, and other operating systems
- Flight Simulyzer™ ARINC 429 Analyzer Software

RECEIVER CHANNEL OPERATION

AIT's PCI-C429 provides real-time simulation of up to 32 ARINC429 receiver channels concurrently.

- Label/SDI selective receive, sequential receive modes
- Multi-buffering with real-time data buffer updates
- Triggering and filtering:
- Upper and lower limit check
- Trigger on specific or any error
- Label contents and sequential- dependent trigger
- Filter for label and label data contents
- Interrupt for selected labels and label data contents

TRANSMITTER CHANNEL OPERATION

AIT's PCI-C429 provides real-time simulation of up to 32 ARINC429 transmitter channels concurrently. Bit transmission rates and duty cycles are selectable for each channel, 12.5 kbits/sec and 100 kbits/sec transmit modes are supported. Associated rise and fall times are in accordance with the ARINC429 electrical specification.

- Rate-oriented, block, and acyclic label transmission modes support all simulation needs
- Error injection for each label transfer: short gap, parity, bit count, coding
- Programmable gap between labels

TRIGGER OUTPUT

For external notification of ARINC429 bus events, a TTL trigger output signal is supported. Output signals can be generated on complex conditions of received labels or on the occurrence of transmit simulation events.

IRIG-B TIME CODE ENCODER/DECODER

The onboard IRIG-B time code encoder and decoder allows synchronization of ARINC429 channels using single or multiple PCI-C429 modules. Multiple PCI-C429 modules can be synchronized to one common time IRIG-B time code encoder/decoder allowing synchronized time tagging of multiple ARINC429 channels. Multiple modules can be synchronized using one common IRIG-B time source or to the free-wheeling onboard time code generator.

ARINC 429 TRANSCEIVER INTERFACE

AIT's PCI-C429 card has integrated ARINC 429 line transmitter/receivers that are software programmable for Transmit (Tx) or Receive (Rx) mode and selectable transmission rate for each channel independently. All ARINC 429 channels and controls are available at the front panel output connector and the rear input/output connector.

Technical Data

Subsystem Interface	64-bit, 33/66MHz PCIbus compliant
Memory	128 MByte DDR2 SDRAM
Encoder/Decoder	Up to 32 encoders and decoders with error injection and detection
Time Tagging	14 digit (400 day) absolute IRIG-B Time with 1 usec resolution
Physical Bus Interface	32 ARINC429 independent and full software programmable (as Tx or Rx) ARINC 429 channels; Primary and secondary ANSI/VITA 20-2001 (R2005) interfaces
Connectors	Front panel 68-pin VHDCI connector; All signals also available at rear I/O connector (P14); 4x Standard PCI connectors
Dimensions	Standard single wide PMC; 143.7 x 74 mm; Hole and connector dimensions and locations per: ANSI/VITA 20-2001 (R2005)
Power Consumption	TBD
Operating Temp. Range	-40° C...+85° C ambient
Storage Temp. Range	-40° C...+85° C ambient
Humidity	0 to 95% non-condensing



PCIe-C429

Advanced Four, Eight, 16, or 32 Channel ARINC429 Test & Simulation Module for PCI Express

AIT's PCIe-C429-4/8/16/32 is a full-featured PCIe x4 bus module designed to provide a stand-alone ARINC429 interface for avionics applications. Up to 32 channels are provided on the module. Each channel can be individually configured to Transmit (Tx) or Receive (Rx) and to operate at the high or low bit rates defined by ARINC429. AIT's PCIe-C429 offers advanced test, simulation, monitoring, and databus analyzer functions.

The PCIe-C429 module utilizes a simple and reliable FPGA-based hardware architecture with a flexible platform that provides the highest data throughput performance in the industry and that can be easily adapted to meet a wide range of application needs. Each module is configured with 128 MBytes of onboard memory, providing ample capacity to support high volumes of data and complex simulations. AIT's PCIe-C429 module is equipped with a single trigger output that can be used for synchronization with external measurement equipment.



SOFTWARE SUPPORT

AIT's PCIe-C429 is delivered with AIT's ARINC 429 Software Development Kit (SDK) which includes software driver support for Windows, Linux, and LabVIEW RT. The SDK provides multiple application interfaces including support for C/C++, C#, and VB.NET. High-level LabVIEW Virtual Instruments (VI) are provided with each module in support of intuitive application development. A simple soft front panel Graphical User Interface (GUI) application is also delivered with each module. The ARINC429 SDK optionally includes AIT's Flight Simulyzer™ analyzer software.

APPLICATION INTERFACE

In support of application interfaces to the PCIe-C429, the modules are supplied with AIT's ARINC429 Object Wrapper Layer (OWL) C/C++ interface library. The OWL provides an intuitive and easy-to-use object-oriented interface to the card. Adaptions supporting C#, Python, and other common programming languages are available upon request. A rich suite of sample application and full documentation is also provided.

PHYSICAL BUS REPLAY

AIT's PCIe-C429 module is able to electronically reconstruct previously recorded ARINC429 data traffic physically to the bus with excellent timing accuracy. Recorded data files can be selected for physical bus replay to perform systems integration and test with the ability to disable any or all ARINC429 label from the recorded file.

Key Features

- Four, Eight, 16, or 32 Software Programmable Tx/Rx Channels
- Programmable High/Low Speed Operation
- All Tx/Rx Channels can operate concurrently at High Speed rates
- Full Error Injection & Detection
- Rate-oriented Label Transmission
- Label Selective Trigger for Capture/Filtering
- Sort by SDI field
- IRIG-B Time Code Encoder/Decoder for Data Correlation
- Real-Time Recording & Post Analysis of Multiple Channels
- Application Interface supporting C++, C#, and .net Development
- Device Driver Support: Windows, Linux, VxWorks, and other operating systems
- Flight Simulyzer™ ARINC 429 Analyzer Software

RECEIVER CHANNEL OPERATION

AIT's PCIe-C429 provides real-time simulation of up to 32 ARINC429 receiver channels concurrently.

- Label/SDI selective receive, sequential receive modes
- Multi-buffering with real-time data buffer updates
- Triggering and filtering:
- Upper and lower limit check
- Trigger on specific or any error
- Label contents and sequential- dependent trigger
- Filter for label and label data contents
- Interrupt for selected labels and label data contents

TRANSMITTER CHANNEL OPERATION

AIT's PCIe-C429 provides real-time simulation of up to 32 ARINC429 transmitter channels concurrently. Bit transmission rates and duty cycles are selectable for each channel, 12.5 kbits/sec and 100 kbits/sec transmit modes are supported. Associated rise and fall times are in accordance with the ARINC429 electrical specification.

- Rate-oriented, block, and acyclic label transmission modes support all simulation needs
- Error injection for each label transfer: short gap, parity, bit count, coding
- Programmable gap between labels

TRIGGER OUTPUT

For external notification of ARINC429 bus events, a TTL trigger output signal is supported. Output signals can be generated on complex conditions of received labels or on the occurrence of transmit simulation events.

IRIG-B TIME CODE ENCODER/DECODER

The onboard IRIG-B time code encoder and decoder allows synchronization of ARINC429 channels using single or multiple PCIe-C429 modules. Multiple PCIe-C429 modules can be synchronized to one common time IRIG-B time code encoder/decoder allowing synchronized time tagging of multiple ARINC429 channels. Multiple modules can be synchronized using one common IRIG-B time source or to the free-wheeling onboard time code generator.

ARINC 429 DATA CORRUPTION OPERATION

AIT's PCIe-C429 board has integrated the ability to corrupt ARINC429 labels "on-the-fly." ARINC429 receive channels can be matched with transmission channels enabling the user to corrupt ARINC429 data in-line. Data corruption features include removing labels, modifying data (using AND, OR and XOR functions), and adding labels. The latency introduced by data corruption is less than 1 bit-time on the ARINC429 channel. Up to 16 channels (Rx and Tx Pairs) can be corrupted simultaneously.

Technical Data

Subsystem Interface	x4 Lane PCI Express
Memory	128 MByte DDR2 SDRAM
Encoder/Decoder	Up to 32 encoders and decoders with error injection and detection
Time Tagging	14 digit (400 day) absolute IRIG-B Time with 1 usec resolution
Physical Bus Interface	32 ARINC429 independent and full software programmable (as Tx or Rx) ARINC 429 channels; Primary and secondary ANSI/VITA 20-2001 (R2005) interfaces
Connectors	Front panel 68-pin VHDCI connector; All signals also available at rear I/O connector (P14); 4x Standard PCIe connectors
Dimensions	Standard single wide PMC; 143.7 x 74 mm; Hole and connector dimensions and locations per: ANSI/VITA 20-2001 (R2005)
Power Consumption	TBD
Operating Temp. Range	-40° C...+85° C ambient
Storage Temp. Range	-40° C...+85° C ambient
Humidity	0 to 95% non-condensing



PXI-C429

Advanced Four, Eight, 16, or 32 Channel ARINC429 Test & Simulation Module for PCIbus

The PXI-C429 module is a member of AIT's family of ARINC 429 test and simulation modules. This module is a 3U PXI Hybrid Slot compatible instrument that is designed to enable monitoring, analysis, simulation, and testing of ARINC 429 data channels. The PXI-C429 module supports up to 32 fully programmable (as inputs or outputs) ARINC 429 channels. The PXI-C429 provides full error injection and detection capabilities.



PXI FEATURES

The PXI-C429 is 3U PXI Hybrid Slot compatible module which supports synchronization of its onboard time tagging clock to either the PXI 10MHz system clock or an IRIG-B input signal. When using the PXI system clock, the time-tagging clock can be reset via the PXI star trigger. Additionally, the module supports input and output of triggers to and from the PXI trigger bus. PXI triggers can be generated by the module based on detected ARINC 429 bus events and PXI triggers can be used as input to initiate the start of ARINC 429 data simulation operations, data captures, and many other operations.

RECEIVER CHANNEL OPERATION

The PXI-C429 provides real-time simulation of up to 32 ARINC429 Receiver (Rx) Channels concurrently.

- Label/SDI selective receive, sequential receive modes
- Multi-buffering with real-time data buffer updates
- Triggering and filtering:
- Upper and lower limit check
- Trigger on specific or any error
- Label content and sequential dependent trigger
- Filter for label and label data contents
- Interrupt for selected labels and label data contents

TRANSMITTER CHANNEL OPERATION

The PXI-C429 provides real-time simulation of up to 32 ARINC429 Transmitter (Tx) Channels concurrently. Bit transmission rates and duty cycles are selectable for each channel and the 12.5 kbits/sec and 100 kbits/sec transmit modes are supported. Associated rise and fall

Key Features

- Four, Eight, 16, or 32 Software Programmable Tx/Rx Channels
- Programmable High/Low Speed Operation
- Concurrent operation of all Tx/Rx Channels at High Speed rates
- PXI Interrupts, Star Trigger, and PXI Clock
- Full Error Injection and Detection
- Rate-oriented Label Transmission
- Label Selective Trigger for Capture/Filtering
- IRIG-B Time Code Encoder/Decoder
- Real-Time Recording and Post Analysis of Multiple Channels
- Application Interface supporting C++, C#, and .net Development
- Device Driver Support: Windows, Linux, VxWorks and other operating systems



PXI

times are in accordance with the ARINC 429 electrical specification.

- Rate Oriented, Block, and Acyclic Label Transmission modes support all simulation needs
- Error injection for each Label Transfer: short gap, parity, bit count, coding
- Programmable gaps between Labels

ARINC 429 TRANSCEIVER INTERFACE

PXI-C429 card has integrated ARINC 429 line transmitter/receivers programmable by software for Rx or Tx mode and selectable transmission rate for each channel independently. All ARINC 429 channels and controls are available at the front panel output connector.

REMOTE OBJECT SERVICES

AIT's Remote Object Services (ROS) makes PXI-C429 hardware available to network clients running in other processes or on other hosts in the network. It runs on its host as either a Window's service or as a Linux daemon. This client/server application and a user library allows for the easy creation of distributed multi-process and distributed applications.

SOFTWARE SUPPORT

The PXI-C429 is delivered with AIT's ARINC 429 Software Development Kit (SDK) which includes software driver support for Windows, Linux, and LabVIEW RT. The SDK provides multiple application interfaces including support for C/C++, C#, and VB.NET. High-level LabVIEW Virtual Instruments (VI) are provided with each module in support of intuitive application development. A simple soft front panel Graphical User Interface (GUI) application is also delivered with each module. The ARINC 429 SDK optionally includes AIT's Flight Simulyzer analyzer software.

Technical Data

Form Factor	3U Hybrid Slot Compatible PXI module
System Interface	32-bit / 33 MHz PCI plus PXI Trigger Bus, PXI System Clock, and PXI Star Trigger
Connectors	J1 and XJ4 PXI backplane connectors; 68-pin VHDCI front panel connector holding bus signals, IRIG-B input/output, and trigger lines
Memory	128 MByte DDR2 SDRAM
Operating Temp. Range	0° C...+45° C
Storage Temp. Range	-40° C...+85° C
Humidity	0 to 95% non-condensing



PXIe-C429

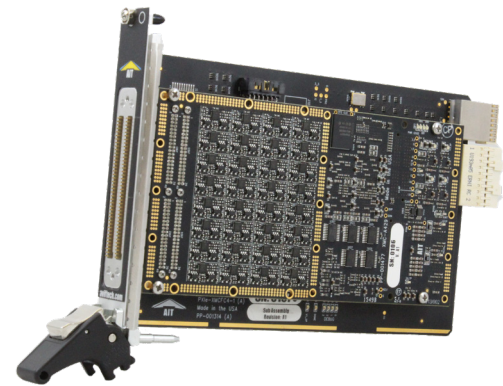
16, 32, or 64 Channel ARINC 429/PXI Express Instrument

The PXIe-429-64 is the PXI Express member of AIT's family of stand-alone, flight-ready ARINC 429 interface test and simulation modules, providing simulation, monitoring, testing, and data analysis of avionics bus applications. It may be mounted in either a PXI Express slot or a PXI Hybrid slot.

The PXIe-429-64 incorporates significant innovations:

- Up to 64 fully configurable ARINC429 channels (32 Tx & 32 Rx).
- The amplitude of each Transmit (Tx) channel may be programmed independently to allow rigorous tolerance testing.

Combining a reliable FPGA-based hardware architecture with a flexible software platform, the PXIe-429-64 provides the highest data throughput performance in the industry, and is easily adaptable to a wide range of application needs. Configured with 128 MBytes of onboard memory, the PXIe-429-64 module has ample capacity to support high data volumes and complex simulations.



**PXIe-429 Express
Instrument**

TRANSMIT CHANNEL OPERATION

- The PXIe-429-64 provides real-time simulation of up to 32 ARINC 429 transmit (Tx) channels concurrently.
- Tx channel amplitude may be programmed on a perchannel basis, 0v to 16.38v.
- Bit transmission rates are selectable for each channel.
- Both the 12.5 Kbits/sec and 100 Kbits/sec transmit modes are supported.
- Associated rise and fall times are in accordance with the ARINC 429 electrical specification.
- Rate-oriented, block, and acyclic label transmission modes support all simulation needs.
- Error injection for each label transfer: short gap, parity, bit count, coding.
- Programmable gaps between labels.

RECEIVER CHANNEL OPERATION

- The PXIe-429-64 provides real-time simulation of up to 32 ARINC 429 receiver (Rx) channels concurrently.
- Label/SDI selective receive, sequential receive modes
- Multi-buffering with real-time data buffer updates
- Triggering and filtering capabilities:
 - Upper and lower limit check
 - Trigger on specific or any error

Key Features

- 16, 32, or 64 ARINC 429 Channels (up to 32 Tx & 32 Rx)
- x4 lane PCI Express 2.0 host interface
- Programmable Tx channel output amplitude
- Programmable High/Low Speed Operation
- Concurrent operation of all Tx/Rx Channels at high data rates
- Full error injection & detection
- Rate-oriented label transmission
- Label Selective Trigger for capture/filtering
- IRIG-B Time Code Encoder/Decoder for data correlation
- Real-time recording & post analysis of multiple channels
- Application Interface supporting C++, C#, and .net Development
- Device driver support: Windows, Linux, and LabVIEW Real Time (others provided on request)
- AIT's Flight Simulyzer analyzer software

- Label content and sequential dependent trigger
- Filter for label and label data contents
- Interrupt for selected labels and label data contents

TRIGGER OUTPUT

Four TTL GPIO inputs and four GPIO outputs are provided. All GPIO signals are available at the front panel.

PHYSICAL BUS RELAY

The PXIe-429 module can replay previously recorded ARINC 429 data traffic physically to the bus with the same timing accuracy. Recorded data files may be selected for physical bus replay in order to perform systems integration and testing.

SOFTWARE SUPPORT

- The PXIe-429-64 is delivered with AIT's ARINC 429 Software Development Kit (SDK) which includes software driver support for Windows, Linux, and LabVIEW RT.
- The SDK provides multiple application interfaces including support for C/C++, C#, and VB.NET.
- High-level LabVIEW Virtual Instruments (VI) are provided with each module, supporting intuitive application development.
- A simple soft front panel Graphical User Interface (GUI) application is also included with each PXIe-429-64 module.
- AIT's Flight Simulyzer analyzer software is optionally available with the ARINC 429 SDK.

IRIG-B TIME CODE ENCODER/DECODER

- An onboard IRIG-B time code encoder and decoder is available, allowing synchronization of ARINC 429 channels employing single or multiple PXIe-429 modules.
- The PXIe-429 can be configured to operate as an IRIG-B source.
- The encoder/decoder includes an onboard free-wheeling mode.

ARINC 429 TRANSCEIVER INTERFACE

- The PXIe-429 has integrated ARINC 429 line transmitter/receivers, which have independently selectable data bit rates for each channel.
- The amplitude of each channel in Transmit (Tx) mode may be programmed independently for 0-to-1 signal swing between 0V and 16.38V. Also, a DC offset of 0 - 4.095 volts is software

configurable.

- All Arinc 429 channels and controls are available at the front panel output connector.

ORDERING INFORMATION

PXIe-429-8T8R

ARINC 429 interface module for PXI Express with 8 Tx & 8 Rx Channels, IRIG-B time sync, 4 GPIO Inputs, 4 GPIO outputs.

PXIe-429-16T16R

ARINC 429 interface module for PXI Express with 16 Tx & 16 Rx Channels, IRIG-B time sync, 4 GPIO Inputs, 4 GPIO outputs.

PXIe-429-32T32R

ARINC 429 interface module for PXI Express with 32 Tx & 32 Rx Channels, IRIG-B time sync, 4 GPIO Inputs, 4 GPIO outputs.

Custom channel counts and configurations are also available on request.

