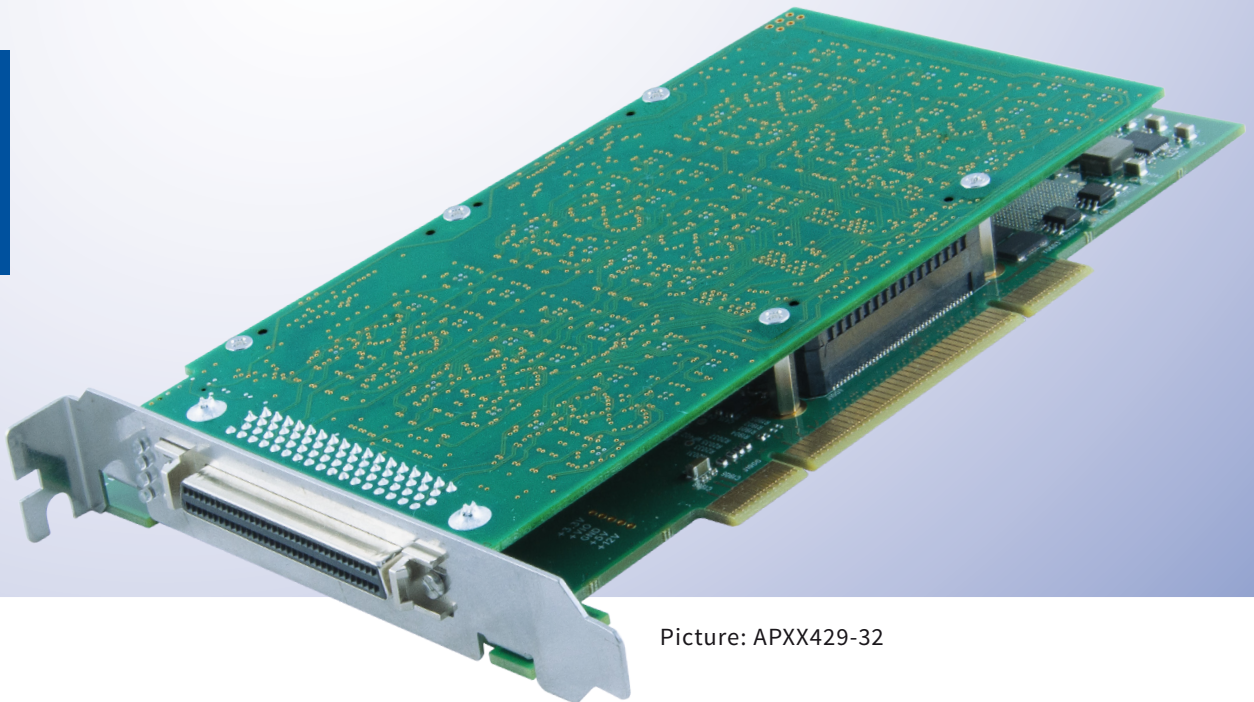


# APXX429-x

4, 8, 16, 32 Channel ARINC429  
Test & Simulation Module for PCI

Data  
Sheet



Picture: APXX429-32

# APXX429-x

## 4, 8, 16, 32 Channel ARINC429 Test & Simulation Module for PCI

### General Features

The APXX429-x is a member of AIM's new family of PCI modules for analyzing, simulating, monitoring and testing ARINC429 channels providing up to 32 channels on a short length PCI standard module format.

4 channels are available on the APXX429-4, 8 channels on the APXX429-8, 16 channels on the APXX429-16 module and 32 channels on the APXX429-32 module. All channels are software programmable for Receive (Rx) or Transmit (Tx) mode. The lower 8 transmit channels provide variable output amplitudes, whereas upper 8 transmit channels are of fixed amplitude for the APXX429-16. All transmit channels are of fixed output amplitude for the APXX429-32 version. APXX429-4 and APXX429-8 versions provide separate Transmit (Tx) and Receive (Rx) pins on all channels and are pin compatible to previous generation APX/APE429-4 and APX/APE429-8 modules.

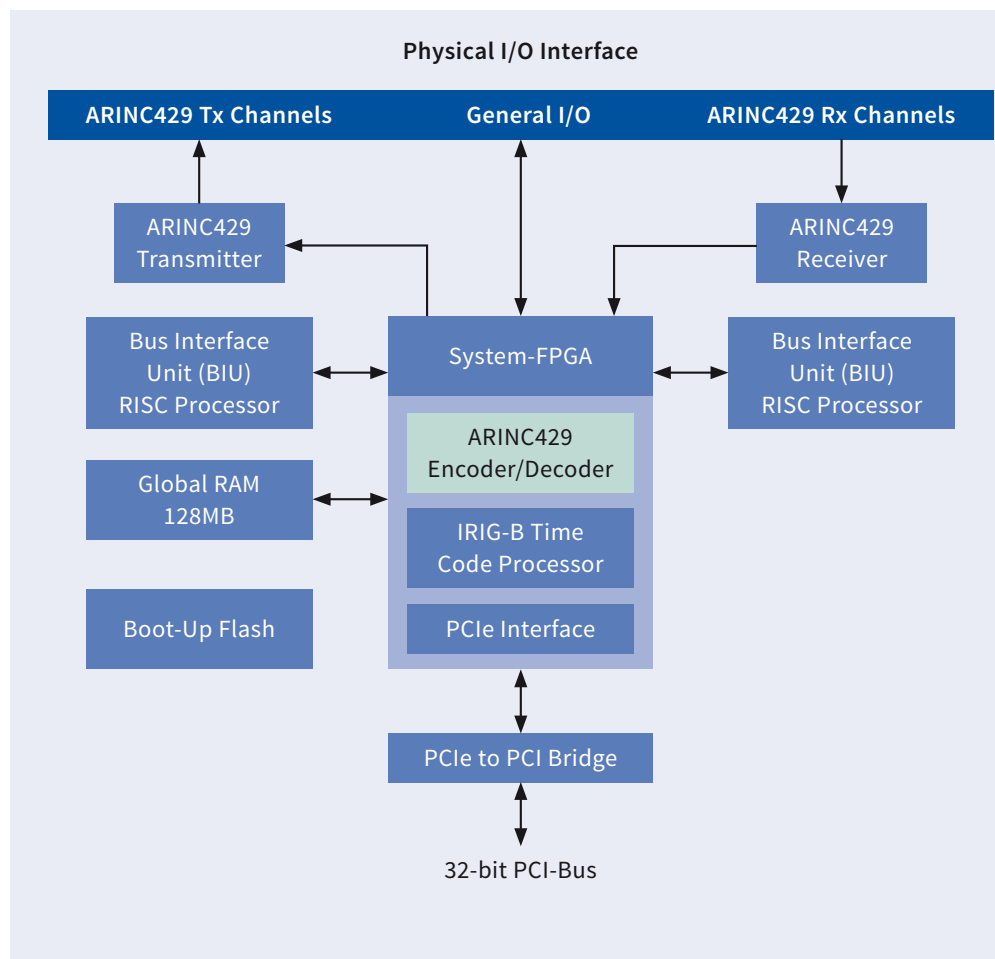
All APXX429-x cards have the capability to handle 8 General Purpose Discrete I/O (GPIO) signals which can be monitored or generated. For access of Discrete I/O's an optional breakout cable can be supplied occupying a slot bracket position of the PC.

The APXX429-x modules use AIM's Common Core hardware design utilising multiple RISC processors with 128MB of Global RAM. This offers a scalable and flexible platform for hosting various onboard applications.

An onboard IRIG-B time encoder/decoder is included with sinusoidal output and free-wheeling mode for time tag synchronisation on system level using 1 or more APXX429-x cards.

Full function driver software is delivered with the APXX429-x cards in comprehensive Board Software Packages (BSP's) for different Operating Systems. The optional PBA.pro™ Databus Test & Analysis Tool (for Windows & Linux) can also be purchased for use with APXX429-x modules.

APXX429-x  
Block Diagram



## Receive Channel Operation

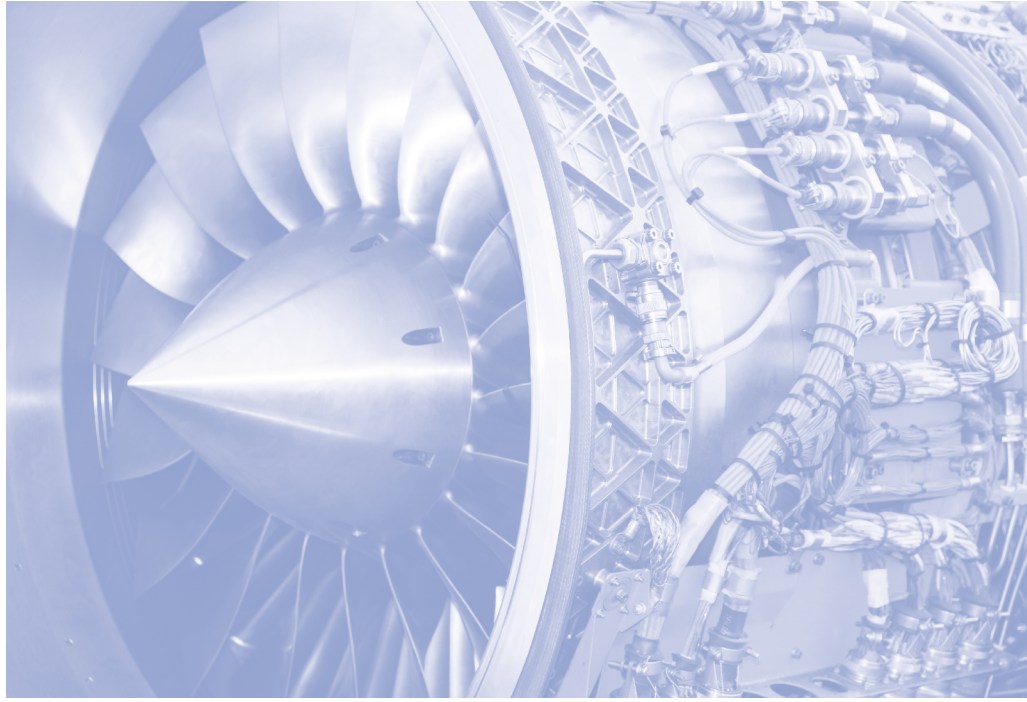
APXX429-x modules provide real time monitoring of up to 32 ARINC429 receiver channels concurrently controlled by an onboard RISC processor.

- Label Oriented Receive Mode (individual Buffers for each Label with Multi-Buffering and Real Time Updates)
- Chronological Receive Mode per channel with 1 $\mu$ s Resolution Time Stamping
- Chronological Mode concurrent to label oriented Receive Mode
- Local (1 Buffer per channel) or Global Monitoring (1 Buffer all channels)
- Continuous or Single Shot Capturing Modes
- Support of SDI Handling
- Event Generation on Label Reception (configurable per Label/SDI)
- Complex Triggering and Filtering Functions
- Loop of received data to configurable Transmit channel with Label Data Modification capability
- High Accuracy FPGA based Label Time stamping

## Transmit Channel Operation

APXX429-x modules provide real time simulation of up to 32 ARINC429 transmitter channels concurrently controlled by the onboard RISC processors via instruction lists. Transmission rates are selectable for each channel at 12.5kbit/s or 100kbit/s with the associated rise/fall time in accordance with the ARINC429 electrical specification.

- Cyclic/Acyclic Label Transmission and Channel Loop Mode
- Label Rate oriented Transmission Mode
- Dynamic, FIFO based Transmission Mode for application scenarios with demand for high flexibility
- Error Injection for each Label Transfer: Short Gap, Parity, Bit Count, Coding
- Programmable Gap between Labels: 4 to 255-bit
- Simulate Zero-Jitter Scenarios using Virtual Label Transfers
- Multi-Buffering with Real Time Update supported per individual Label Transfer
- Reconstruction of previously recorded ARINC429 traffic physically to the bus with excellent Timing Accuracy (Physical Replay)
- Event Generation on Label Transmit (configurable per Label Transfer)



## Loop-back and Pollution Mode

Receiver and transmitter channels can be paired to form a loop-back couple. Data received from the receiver channel are automatically transmitted on the selected transmitter channel with minimum delay. A special receiver function block mode can be used to modify (pollute) the received label prior to its re-transmission.

## Physical Bus Replay

The APXX429-x cards can electrically reconstruct and replay previously recorded ARINC429 channels physically to the ARINC429 bus with excellent timing accuracy. Record files can be selected for bus replay. The additional capability to disable any or all ARINC429 labels from the replay enables smart systems integration and test to be performed.

## Physical Bus Interface

The APXX429-x cards have integrated ARINC429 line transmitter/receiver and selectable transmission rate for each channel independently. Variable output amplitude is provided on the lower 8 channels (-4, -8, -16 versions). The APXX429-32 variant implements 32 fixed amplitude transmit channels. All ARINC429 channels are available at the front plate connector.

## Discretes

APXX429-x modules provide 8 General Purpose Discrete I/O's (GPIO's). GPIO's can be used as simple digital inputs/outputs for a board-to-board connection inside the PC or to sample a digital output of an external system or to generate strobes to an external system. For external use access to GPIO's can be provided through a Breakout Cable (BOC).

## IRIG-B Time Encoder/Decoder

APXX429-x cards include an onboard IRIG-B time encoder/decoder with sinusoidal output and free-wheeling mode for time tag synchronization. This allows synchronization of multiple APXX429-x cards or any IRIG-B compatible modules to 1 common external IRIG-B time input source or to the onboard time code generator of 1 APXX429-x card as the reference for the correlation of data across multiple ARINC429 channels.

## Driver Software

The driver software is supplied with the APXX429-x module. A full function Application Programming Interface (API) is provided compatible with 32/64-bit Windows 7/8/10 and Linux. Host applications can be written in C, C++ and Python. A LabView/VI application interface driver is provided.

## Technical Data

### System Interface

5V tolerant PCI-Bus Master and Slave, compliant with PCI-Standard V3.0 (32-bit, 33/66MHz)

### Processors

2x 400MHz RISC processors for BIUs

### Memory

128MB Global RAM (DDR2-RAM)

2x 8MBit serial flash memory for processors

1x 64MBit serial flash memory for LCA

### Encoder/Decoder

Up to 32 ARINC429 Encoder/Decoder with Error Injection and Detection

### Time Tagging

Sinusoidal 46-bit absolute IRIG-B-122

Time Stamping with 1µs Resolution

### Trigger/General Purpose Discretets

1 Trigger input and 1 Trigger output on the front panel connector and 8 General Purpose Discrete I/O's (avionics level) on board-to-board connector

### Physical Bus Interface

Up to 32 ARINC429 Line Transmitter and 32 ARINC429 Line Receiver for a total of 32 channels; Channels are user programmable for Rx or Tx; Transmitter channels 1-8 with variable output amplitude, Transmitter channels 9-16 with fixed output amplitude (APXX429-4/8/16), all Transmitter channels with fixed output amplitude (APXX429-32)

### Connectors

PCI bus standard edge connector, 37-pin (female) D-Sub connector (APXX429-4/8/16) or 68-pin (female) SCSI-3 HD-Sub connector (APXX429-32) for ARINC429 signals, Trigger & IRIG-B; board-to-board connector for 16-pin ribbon cable

### Dimensions

167.65mm x 106.68mm

## Ordering Information

### APXX429-4

4 channel PCI bus to ARINC429

Interface:

Software programmable Receiver/Transmitter channels with variable output amplitude, IRIG-B Time Encoder/Decoder, 8 General Purpose Discrete I/O's (on board-to-board connector only), 128MB Global RAM, 37-pin D-Sub connector with separate Tx and Rx pins (fully compatible to API/APX429-4)

### APXX429-8

8 channel PCI bus to ARINC429

Interface:

Software programmable Receiver/Transmitter channels with variable output amplitude, IRIG-B Time Encoder/Decoder, 8 General Purpose Discrete I/O's (on board-to-board connector only), 128MB Global RAM, 37-pin D-Sub connector with separate Tx and Rx pins (fully compatible to API/APX429-8)

### Power Consumption

APXX429-4: 3.3W (idle)/3.3W (LS-Operational with No Load)  
APXX429-8: 3.5W (idle)/3.5W (LS-Operational with No Load)  
APXX429-16: 4.3W (idle)/4.5W (LS-Operational with No Load)  
APXX429-32: 5.2W (idle)/5.8W (LS-Operational with No Load)

### APXX429-16

16 channel PCI bus to ARINC429

Interface:

8 Software programmable Receiver/Transmitter channels with variable output amplitude plus 8 Software programmable Receiver/Transmitter channels with fixed output amplitude, IRIG-B Time Encoder/Decoder, 8 General Purpose Discrete I/O's (on board-to-board connector only), 128MB Global RAM, 37-pin D-Sub connector with shared Tx and Rx pins

### APXX429-32

32 channel PCI bus to ARINC429

Interface:

32 Software programmable Receiver/Transmitter channels with fixed output amplitude, IRIG-B Time Encoder/Decoder, 8 General Purpose Discrete I/O's (on board-to-board connector only), 128MB Global RAM, 68-pin (female) SCSI-3 HD-Sub connector with shared Tx and Rx pins

### ACB-AMC-32

Ready Made Adapter Cable (2.0m): SCSI68 (screw-locked type) to 2x D-Sub37 (female) for ARINC429 and 1x D-Sub15 (female) for IRIG-B and Trigger Out for APXX429-32 cards

### Operating Temp. Range

Standard 0°C to +45°C ambient  
Extended temperature range -15°C to +65°C

### Storage Temp. Range

-40°C to +85°C

### Humidity

0 to 95% non-condensing

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