



# APX-GNET-2/4

**Two/ Four Port Gigabit  
AFDX/ ARINC664/ Ethernet  
Test, Simulator and Monitor  
Module for PCI-X**



## General Features

The APX-GNET is AIM's new ultra high performance intelligent PCI-X Bus module offering two or four Ports with full function test, simulation, monitoring and analyser functions for Gigabit AFDX (Avionics Full Duplex Switched Ethernet/ ARINC664) and Ethernet networks. A new, low power, dual core processor with 2x 1200MHz clock frequency and an internal bandwidth of 12GB/s provides onboard processing capabilities for even the most demanding AFDX and Ethernet applications. For high data throughput up to 4GB DDR2 RAM is accessible for the processors via a 64-bit databus running at 533MHz.

The latest high performance FPGA implementing the customised AFDX/ Ethernet MAC's enables the board to analyse incoming and modify outgoing data in real time. The APX-GNET-2 module provides two Gigabit AFDX/ ARINC664/ Ethernet ports configurable as two single ports or one dual redundant (AFDX/ ARINC664) channel each implementing either an optical (IEEE Std 802.3z/ 1000 Base-SX) or an electrical (IEEE Std 802.3ab/ 1000 Base-T, Twisted Pair/ RJ45) full duplex Ethernet Interface.

The APX-GNET-4 module provides four Gigabit AFDX/ ARINC664/ Ethernet ports configurable as four single ports or two dual redundant channels each implementing either an optical (IEEE Std 802.3z/ 1000 Base-SX) or an electrical (IEEE Std 802.3ab/ 1000 Base-T, Twisted Pair/ RJ45) full duplex Ethernet Interface.

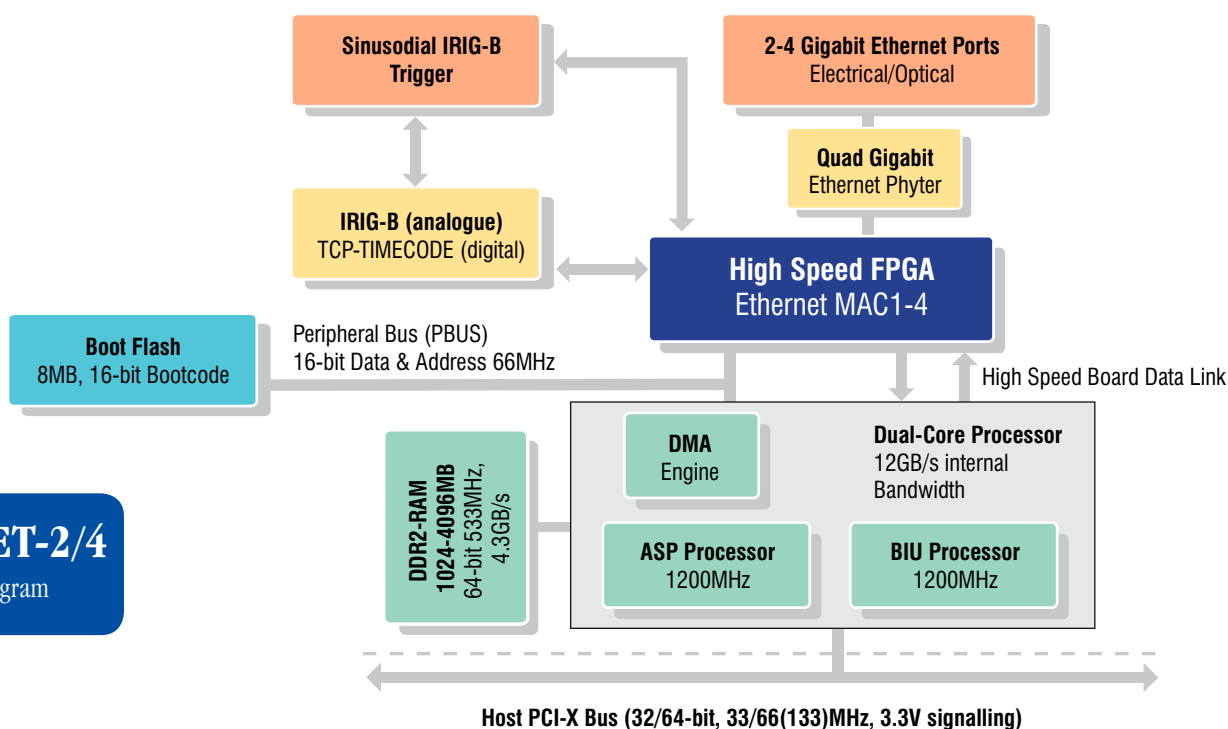
Ports can operate concurrently in Traffic Simulator or Receiver/ Monitor modes with support for AFDX/ ARINC664 port related Frame Statistics. Virtual Link (VL) packet

capturing and monitoring features are complimented with powerful triggering and filtering capabilities.

The APX-GNET module uses a new dual core processor design for highest performance. Up to 4GB DDR2 RAM is provided to implement large receive buffers and complex transmit scenarios onboard.

The APX-GNET module is available with following optional software:

- *PBA.pro™, the most scalable and flexible application framework focusing on Test, Simulation and Integration under Windows and Linux offering AFDX/ ARINC664 or Standard Ethernet Analyser functionality including decoding of Payload Data*
- *fdXplorer, the AFDX/ ARINC664 Network Analyser Software for Windows*
- *ParaView, the Parameter Visualiser Software for Windows*
- *EasyLOAD-615A, the AFDX/ ARINC664/ Ethernet Dataloader for Windows*



**APX-GNET-2/4**  
Block Diagram



## Traffic Generation

The APX-GNET provides real time Traffic Generation on all ports concurrently. Different Traffic Generation modes are available:

### **Generic Traffic Simulation (based on the Setup of Frame Lists):**

- Simulation of Standard Ethernet Traffic with fully programmable Frame Attributes (Protocol Headers, Protocol Payload Data, Timing, Physical Error Injection)
- Simulation of AFDX/ ARINC664 Traffic with fully programmable Frame Attributes (VL Number, IP/UDP Headers and Payload, Sequence Numbering control, Physical and Logical Error Injection)
- Autonomous Payload Generation Modes with support for Timetag Insertion into Frame Payload for Delay/ Latency Measurements in Network Integration Applications
- Fully programmable Timing and Sequencing of Frames

### **AFDX/ ARINC664 Message Simulation (based on Virtual Links and IP/UDP Protocol):**

- Support for VL based Traffic Shaping and Sequence Numbering of UDP Messages and single Ethernet Frames
- Onboard IP/UDP Protocol Stacks implemented on ASP
- Automatic UDP Sampling Port Simulation controlled by onboard ASP
- Support for UDP Queuing Port Simulation

### **Physical Replay of previously recorded, looped or pre-generated streams of Ethernet/ AFDX/ ARINC664 Frames:**

- Based on Frame Timestamp and Inter Frame Gap for highest precision Timing and Accuracy
- Replay Synchronisation of multiple Ports via external Time Code

Synchronisation of transmissions across multiple ports is achieved by using Strobe Inputs/ Outputs. Physical Error Injection is supported for generation of CRC, Inter Frame Gap, Alignment and Frame Size Errors in the Generic Simulation and the AFDX/ ARINC664 Message Simulation mode.

AFDX/ ARINC664 specific Redundancy Handling is supported in Generic Simulation and the AFDX/ ARINC664 Message Simulation mode.

## Traffic Reception and Monitoring

The APX-GNET provides real time Traffic Reception on all ports concurrently. Different Traffic Receiver modes are available:

### **Chronological Receive Mode:**

- Sequential Storage of Frames in a dynamically adapted onboard Buffer
- Programmable Data Capture Modes - Trace after Trigger & Recording
- Time Stamping of captured Frames with extended IRIG-B Time Code with 100ns Resolution incl. Inter Frame Gap Measurement
- Physical Error Detection for CRC, Gap, Size and Alignment Errors
- Powerful Filtering, Complex Triggering and Capture Modes allows users to select only the Frames, Data and Errors of Interest
- Support for AFDX/ ARINC664 specific Virtual Link Activity Information (e.g. Error, Counters, Utilisation)
- Support for AFDX/ ARINC664 specific VL oriented Filtering
- Configurable AFDX/ ARINC664 specific Error Detection (invalid MAC/IP Addresses, Traffic Shaping Violation, invalid VL Frame Size/ Frame Integrity) on a per VL Basis

### **AFDX/ ARINC664 Message Reception (based on Virtual Links and IP/UDP Protocol):**

- Individual circular Buffer Queues (configurable) for each UDP Message including Time Stamping of each stored Message with extended IRIG-B Time Code with 100ns resolution
- Configurable AFDX/ ARINC664 specific Error Detection (invalid MAC/IP Addresses, Traffic Shaping Violation, invalid VL Frame Size/ Frame Integrity) on a per VL Basis

In both modes Global Statistics Information is available providing information about the received number of frames, the number/ type of errors detected, the size distribution of received frames, etc. Furthermore AFDX/ ARINC664 specific redundancy handling is fully supported in both Receiver modes.

In a special mode (Loop/ Pollution), the Chronological Receiver and Replay Transmit modes can be combined to receive and re-transmit data with an optional modification (e.g. for in-line data modification/ corruption purposes).

## Application Support Processor

The 1200MHz Application Support Processor (ASP) provides unique on-module processing functions typically provided by host PC processing systems.

- IP and UDP Layer of the AFDX Protocol
- Onboard Driver Software Execution
- Frame Loop and Pollution between Rx and Tx Ports
- Runs under Real Time Operating System

## IRIG-B Time Encoder/ Decoder

An onboard IRIG-B time encoder/ decoder allows synchronisation of multiple AFDX ports using multiple APX-GNET modules. Modules can be synchronised using an external IRIG-B time source or the onboard time decoder of one module as the reference for accurate correlation of data across multiple AFDX ports.

## Physical Bus Interface

The APX-GNET provides 2 or 4 ports with either an electrical IEEE Std 802.3ab or an IEEE Std 802.3z front end.

- Customised Media Access Controllers (MAC's) implemented in FPGA optimised for AFDX
- Large internal FPGA Burst Buffers running at full system speed
- SFP (Small Form Pluggable) Transceiver allowing the customer to change the front end from optical to electrical or vice versa

### **IEEE Std 802.3ab/ 1000 Base-T**

- 8-socket Network Interface connectors - RJ45 Twisted Pair

### **IEEE Std 802.3z/ 1000 Base-SX**

- 850nm Oxide VCSEL laser transmitter
- Duplex LC connector
- 50/ 125µm MMF or 62.5/ 125µm MMF usable

## Driver Software Support

The APX-GNET module is supplied with an Application Programming Interface (API) and Drivers compatible with Windows and Linux.

# APX-GNET-2/4

## APX-GNET-2/4

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AFDX/ ARINC664/ Ethernet  
Test, Simulator and Monitor  
Module for PCI-X

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Right on Target

## Technical Data

### Sub-System Interface:

PCI-X (133)bus 1.0b with up to 1066MB/s of bandwidth. (PCI compatible) 3.3V only

### Processors:

Dualcore, 2x 1200MHz RISC Processors

### Memory:

up to 4GB DDR2 RAM running at 533MHz

### Encoder/Decoder:

Two/ Four Gigabit AFDX specific Ethernet MAC's

### Time Tagging:

IRIG-B Time with 100ns resolution

### Physical Bus Interface (PBI):

APX-GNET-2 Two full duplex AFDX/ Ethernet ports configurable to one dual-redundant AFDX/ Ethernet channel

APX-GNET-4 Four full duplex AFDX/ Ethernet ports configurable to two dual-redundant AFDX/ Ethernet channels

### Connectors:

- PCI-X back plane connector

### APX-GNET-2 electrical:

- 2x RJ-45 connector in SFP Module
- 1x 15-way D-SUB connector (female) for Time Code and Trigger I/O
- 1x 16-way board to board connector for Time Code and Trigger I/O (no front connector)

### APX-GNET-2 optical:

- 2x Duplex LC connector in SFP Module
- 1x 15-way D-SUB connector (female) for Time Code and Trigger I/O
- 1x 16-way board to board connector for Time Code and Trigger I/O (no front connector)

### APX-GNET-4 electrical:

- 4x RJ-45 connector in SFP Module
- 1x 16-way board to board connector for Time Code and Trigger I/O (no front connector)

### APX-GNET-4 optical:

- 4x Duplex LC connector in SFP Module
- 1x 16-way board to board connector for Time Code and Trigger I/O (no front connector)

### Dimensions:

175mm x 107mm 'short length' Standard PCI Format

### Power Consumption:

Appr. 12W (APX-GNET-2/ operating)

### Operating Temp. Range:

Standard: 0°C... +55°C ambient

### Storage Temp.

-40°C ... +85°C ambient

### Humidity:

0 to 95% non-condensing

## Ordering Information

### APX-GNET-2-p-m

Two Port PCI-X to Gigabit AFDX/ Ethernet Interface: Traffic Simulator, Receiver and Chronological Monitor; Including IRIG-B Time Encoder/ Decoder

### Ordering options:

-p: physical front end (e = electrical interface or o = optical interface)

-m: onboard memory option (1GB, 2GB or 4GB)

### APX-GNET-4-p-m

Four Port PCI-X to Gigabit AFDX/ Ethernet Interface: Traffic Simulator, Receiver and Chronological Monitor; Including IRIG-B Time Encoder/ Decoder

### Ordering options:

-p: physical front end (e = electrical interface or o = optical interface)

-m: onboard memory option (2GB or 4GB)

Please contact AIM for further types of optical front end SFP modules.

Electrical SFP



Optical SFP

