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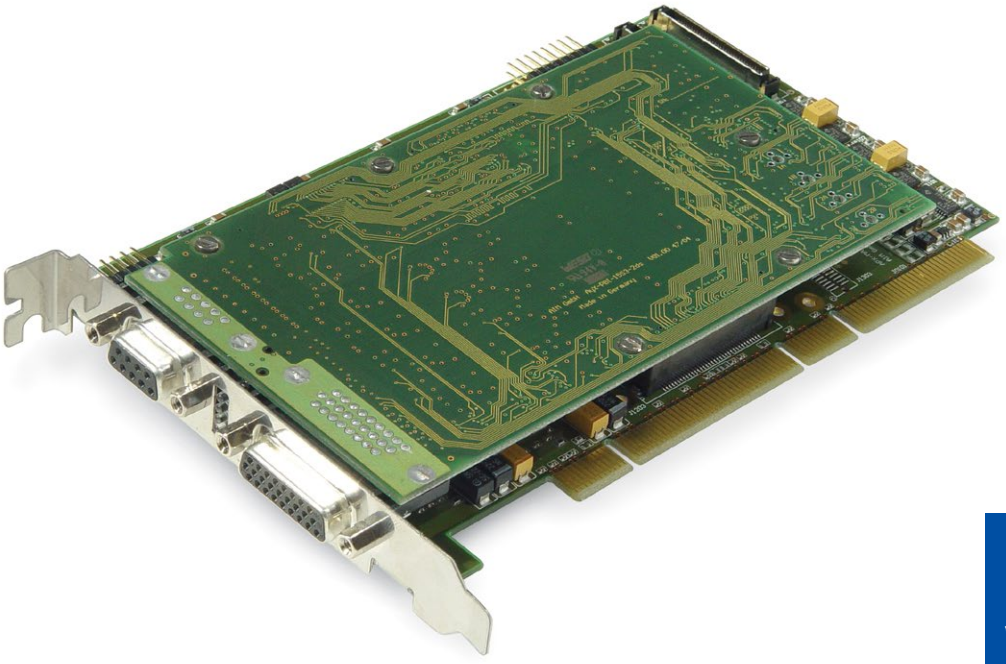
MILscope™ Option

MIL-STD-1553 Testing

APX1553-x

Single, Dual or Quad Stream
MIL-STD-1553A/B
Test & Simulation Module
for PCI-X





data sheet

www.aim-online.com

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Avionics Databus Solutions

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General Features

The APX1553-x is a member of AIM's new fourth generation family of advanced PCI-X bus modules for analysing, simulating, monitoring and testing MIL-STD-1553A/B databuses.
The APX1553-x modules concurrently act as the Bus Controller, Multiple Remote Terminals (31) and Chronological/ Mailbox Bus Monitor. The APX1553-x-DS versions known as MILScope™, have an onboard A/D Converter on the first MIL-STD-1553 channel. The MILScope™ option provides a unique capability to test & verify the MIL-STD-1553 waveform and detect faulty bus conditions without the need of an external oscilloscope.

A full range of MIL-STD-1553 protocol errors can be injected/ detected. The APX1553-x cards can electrically reconstruct and replay previously recorded MIL-STD-1553A/B record files physically to the MIL-STD-1553A/B bus with excellent timing accuracy.

The APX1553-x offers an interface for 1, 2 or 4 dual redundant bus streams. All versions are short length PCI-X card formats. The module can be installed in PCI-X slots and legacy PCI slots (3.3V and 5V signalling voltage).

The APX1553-x card uses AIM's Next Generation 'Common Core' (NCC) hardware design utilizing multiple RISC processors with up to 4MB of Global RAM and 128MB of ASP RAM.
An Application Support Processor (ASP) runs the driver software on the card minimising the host PC interaction.
The use of onboard processing and large memory enables autonomous operation with minimal interaction with the host PC for real time applications.

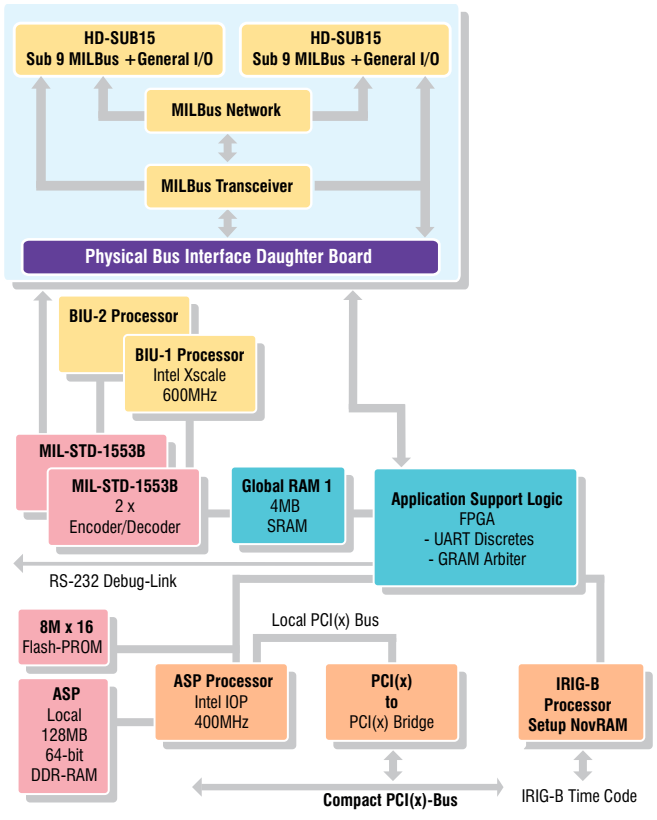
An onboard IRIG-B time encoder/ decoder is included with sinusoidal output and 'free wheeling' mode for time tag synchronization on the system level using one or more APX1553-x cards. The Physical Bus Interface (PBI) daughter board provides programmable bus coupling modes and variable Output Amplitude to the MIL-STD-1553A/B bus.

The APX1553-x cards have the capability to stimulate/ monitor eight General Purpose Discrete I/O (GPIO) signals.
The APX1553-x cards are available as Full Function, Single Function & Simulator Only versions.

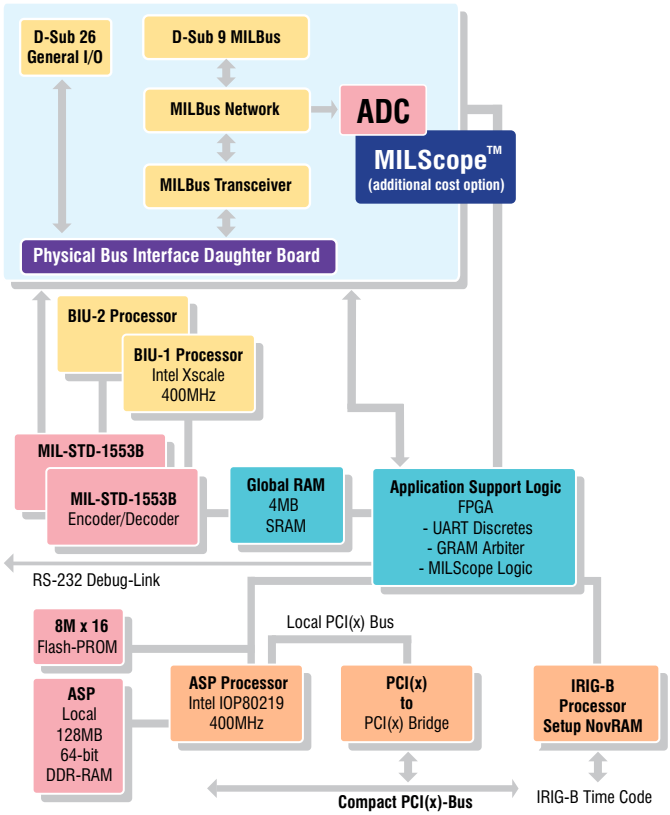
Full function driver software is delivered with the APX1553-x cards in a comprehensive Board Software Package (BSP).
The optional PBA.pro™ Databus Test & Analysis Tool (for Windows & Linux) and PBA-2000/ ParaView Databus Analyser/ Visualiser Software (for Windows) can also be purchased for use with APX1553-x cards.

PBA.pro™ software components are available to support the MILScope™ capability of APX1553-x-DS cards to view & verify the MIL-STD-1553 waveform. Also off the shelf test scripts are available to support the automatic execution of the 'AS4112 RT Production Test Plan' Protocol and Electrical Waveform Tests.

APX1553-4
Block Diagram



APX1553-2
Block Diagram



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Bus Controller

The APX1553-x provides real time Bus Controller (BC) functions on all dual redundant MIL-STD-1553A/B buses concurrently with Multiple RT (31) and Chronological Monitor operation. A 400MHz (APX1553-4: 600MHz) Xscale Processor provides true simulation of Bus Controller operations with minimum host computer interaction.

Key features of the Bus Controller Mode include:

- *Autonomous operation including sequencing of Minor/ Major Frames*
- *Acyclic message insertion/ deletion*
- *Programmable BC Retry without host interaction*
- *Full Error Injection down to word and bit level*
- *Multi-Buffering with Real Time Data Buffer Updates*
- *Synchronization of BC operation to external Trigger Inputs*
- *4µs Inter Message Gaps*
- *Start on external Trigger Input or Digital Input*

Multiple Remote Terminal

The APX1553-x can simulate up to 31 Remote Terminals on each MIL-STD-1553A/B bus stream including all sub-addresses concurrently with BC and Chronological Monitor. Each of the 31 Remote Terminals can operate in a message oriented 'Mailbox Monitor Mode' to monitor non simulated RT's.

Key features of the Remote Terminal Simulation Mode include:

- *Programmable Response Time for each RT with fast RT Response at 4µs*
- *Programmable & Intelligent Response to Mode Codes*
- *Full Error Injection down to word and bit level*
- *Multi-Buffering with Real Time Data Buffer Updates*

Chronological Bus Monitor

The APX1553-x provides full bus monitoring and bus analysis with time tagging of all bus traffic to 1µs and response time and inter message gaps to 250ns.
Bus Monitor Mode can operate concurrently with BC and RT simulation modes.

Key features of the Chronological Monitor include:

- *100% Data Capture on all streams at full bus rates*
- *Autonomous message synchronization and Full Error Detection*
- *Two Dynamic Complex Trigger with sequencing*
- *Message Filter and Selective Capture*
- *Bus Activity recording independent from trigger and capture mode*
- *External Trigger Outputs*
- *Programmable Response Timeout*

Physical Bus Replay

The APX1553-x cards can electrically reconstruct and replay previously recorded MIL-STD-1553A/B record files physically to the MIL-STD-1553A/B bus with excellent timing accuracy. Record files can be selected for Bus Replay. The additional capability to disable any or all RT responses from the MIL-STD-1553A/B replay enables smart systems integration and test to be performed.

MILScope™ *(available as a cost option)*

The APX1553-x-DS versions integrate on one channel of the PBI a two channel differential Analogue to Digital Converter (ADC) providing 50Msamples for primary & secondary data acquisition or 100Msamples for either the primary or secondary bus. Accurate measurements of physical bus parameters such as rise/ fall time, overshoot, undershoot, pulse width & amplitude, can be triggered by the complex trigger of the Bus Monitor.



IRIG-B Time Code Decoder

APX1553-x modules include an onboard IRIG-B time encoder/ decoder with sinusoidal output and 'free wheeling' mode for time tag synchronization. This allows synchronization of multiple APX1553-x cards to one common IRIG-B time input source or the onboard time code generator of one APX1553-x card as the reference for the correlation of data across multiple MIL-STD-1553A/B streams.

Application Support Processor (ASP)

The onboard Application Support Processor (ASP) offers processing functions typically provided by the host processor system.

Operational features include:

- *Driver Software Execution onboard*
- *Dynamic Data Generation*
- *Possibility of Customer Specific Programming of the ASP*
- *Runs under Real Time Operating System*

MIL-STD-1553A/B Physical Bus Interface

A Physical Bus Interface (PBI) daughter board provides software programmable transformer or direct coupling with software programmable variable output transceivers and a terminated bus network to enable the direct connection of a single BC or RT device. The coupling to the external bus is software programmable.



General Purpose Discrete I/O

The APX1553-x provides eight General Purpose Discrete I/O's (GPIO). The GPIO's can be used as simple discrete inputs or outputs to generate strobes (e.g. to another APX1553-x card) or to sample external digital input signals (e.g. from another APX1553-x card). Up to 5 GPIO's are available on the front plate connectors. For access to all eight GPIO's the optional Breakout Panel (BOP-APX) can be offered which occupies an additional slot bracket position of the PC (connection to APX main board via ribbon cable).

Driver Software Support

The Driver Software resides on the APX1553-x module. A full function Application Programming Interface (API) is provided compatible with Windows 2000/XP/Vista and Linux. Host applications can be written in C++, LabWindows/CVI etc. A LabView/VI application interface as well as LabViewRT drivers are provided.

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APX1553-x

Single, Dual or Quad Stream MIL-STD-1553A/B Test & Simulation Module for PCI-X

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Technical Data

Sub-System Interface: PCI-X Bus Master & Slave, Revision 2.3, 33/66/100/133MHz, 32/64-bit, 5V & 3.3V compatible

Processors: One or two 32-bit, 400MHz (APX1553-4: 600MHz) Xscale Processors for BIU(s) 64-bit, 400MHz Intel IOP as ASP

Memory: Global RAM: 1MB (APX1553-1); 4MB (APX1553-2/4 - costed option for 16MB); ASP RAM: 128MB

Encoder/ Decoder: One MIL-STD-1553A/B Encoder and Decoder per MILbus-Channel with full error injection & detection

Time Tagging: 46-bit absolute IRIG-B Time with 1μs resolution, sinusoidal IRIG-B output and 'free wheeling' mode

Physical Bus Interface (PBI): One, two or four MIL-STD-1553A/B Transceivers with variable Output Amplitude, Programmable Bus Coupling modes with onboard terminated Bus Network

Connectors: PCI-X Bus standard backplane connector

APX1553-1/2: 9-way D-Sub for Bus connections, 26-way High Density D-Sub for Trigger, General Purpose Discrete I/O and Time Code I/O

APX1553-4: Two 15-way High Density D-Sub for Bus connections, Trigger, General Purpose Discrete I/O and Time Code I/O

Dimensions: 175mm x 107mm, short length PCI format

Power Consumption: -1 variants typ. 8W @ 5V/ 3W @ 12V
-2 variants typ. 9W @ 5V/ 5W @ 12V
-4 variants typ. 16.5W @ 5V/ <0.5W @ 12V
for details see H/W Manual

Operating Temp. Range: Standard 0°C...+45°C Extended -15°C...+65°C

Storage Temp. Range: -40°C to +85°C **Humidity:** 0 to 85% non-condensing

Ordering Information

APX1553-1 Single Stream, Dual Redundant PCI-X bus to MIL-STD-1553A/B Interface:

BC, Multi RT Simulator with Mailbox & Chronological Monitor; IRIG-B Encoder/ Decoder, 8 General Purpose Discrete I/O's (5 on Front I/O, 8 on B2B Connector); 1MB Global RAM, 128MB ASP RAM; Short Length Card

APX1553-1-DS Single Stream, Dual Redundant PCI-X bus to MIL-STD-1553A/B Interface:

BC, Multi RT Simulator with Mailbox & Chronological Monitor; IRIG-B Encoder/ Decoder, 8 General Purpose Discrete I/O's (5 on Front I/O, 8 on B2B Connector); Digitising Scope for Waveform Analysis & Measurement; 1MB Global RAM, 128MB ASP RAM; Short Length Card

APX1553-2 Dual Stream, Dual Redundant PCI-X bus to MIL-STD-1553A/B Interface:

BC, Multi RT Simulator with Mailbox & Chronological Monitor; IRIG-B Encoder/ Decoder, 8 General Purpose Discrete I/O's (5 on Front I/O, 8 on B2B Connector); 4MB Global RAM, 128MB ASP RAM; Short Length Card

APX1553DS-2 Dual Stream, Dual Redundant PCI-X bus to MIL-STD-1553A/B Interface:

BC, Multi RT Simulator with Mailbox & Chronological Monitor; IRIG-B Encoder/ Decoder; 8 General Purpose Discrete I/O's (5 on Front I/O, 8 on B2B Connector); Digitising Scope for Waveform Analysis & Measurement, 4MB Global RAM, 128MB ASP RAM; Short Length Card

APX1553-4 Quad Stream, Dual Redundant PCI-X bus to MIL-STD-1553A/B Interface:

BC, Multi RT Simulator with Mailbox & Chronological Monitor; IRIG-B Encoder/ Decoder, 8 General Purpose Discrete I/O's (2 on Front I/O, 8 on B2B Connector); 4MB Global RAM, 128MB ASP RAM; Short Length Card

Simulator Only Versions available

BC, Multi-RT simulator with Mailbox Monitor

Single Function Versions available

Chronological & Mailbox Monitor Or BC and Chronological & Mailbox Monitor Or Multi-RT and Chronological & Mailbox Monitor

ACB-PCI-1 Ready Made Adaptor Cable:

From D-Sub to two TWINAX Connectors, 2.0m for all variants of APX1553-1 cards

ACB-PCI-2 Ready Made Adaptor Cable:

From D-Sub to four TWINAX Connectors, 2.0m for all variants of APX1553-2 cards

ACB-HD15-2 Ready made Adapter Cable:

From 15-pin HD-Sub to four Twinax Connectors; 2.0m for all variants of APX1553-4 cards

Note: For all variants of APX1553-4 cards use two of ACB-HD15-2/ ACB-HD15-2-F Adapter Cables

ACB-HD15-2-F Ready made Adapter Cable:

From 15-pin HD-Sub to four Twinax Connectors 9-pin D-Sub Connector for Trigger I/O, IRIG-B and Discrete I/O's; 2.0m for all variants of APX1553-4 cards

Note: For all variants of APX1553-4 cards use two of ACB-HD15-2/ ACB-HD15-2-F Adapter Cables

BOP-APX Breakout Panel for APX series modules:

26-pin High Density D-Sub Connector for 8 Purpose Discrete I/O's

Note: BOP-APX occupies one slot bracket position of the PC

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