MILscope™ Option
MIL-STD-1553 Testing

AVX1553-x

**One, Two, Four or Eight
Stream MIL-STD-1553A/B
Test & Simulation Module
for VMEbus**

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Avionics Databus Solutions

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AVX1553-x

General Features

The AVX1553-1/2/4/8 is a member of AIM's new (fourth generation) family of advanced VME bus modules for analysing, simulating, monitoring and testing MIL-STD-1553A/B databuses. The AVX1553-x modules concurrently act as the Bus Controller, Multiple Remote Terminals (31) and Chronological Bus Monitor / Mailbox Monitor.

The AVX1553-1/2-DS version known as MILScope™, has an on-board A/D converter on the first MIL-STD-1553A/B channel. The MILScope™, option provides a unique capability to test & verify the MIL-STD-1553A/B waveform and detect faulty bus conditions without the need of an external Oscilloscope.

A full range of MIL-STD-1553A/B protocol errors can be injected/ detected. The AVX1553-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 AVX1553-x offers an interface for 1, 2, 4 or 8 dual redundant bus streams. All versions are 6U VME-module card formats.
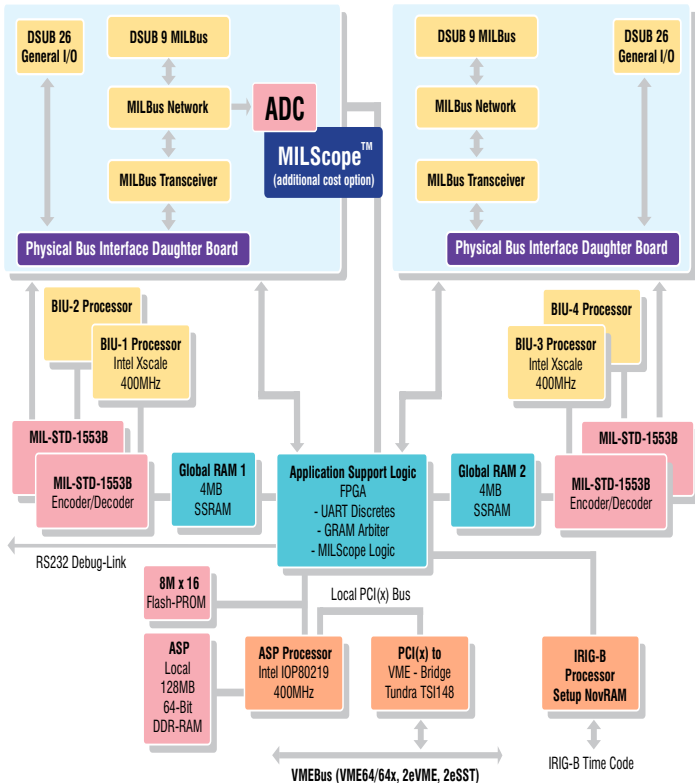
The AVX1553-x card uses AIM's Next Generation 'Common Core' (NCC) hardware design utilising multiple RISC processors with up to 32MB of global RAM and 128MB of ASP RAM. The use of an onboard Application Support Processor (ASP) runs the Driver software on the card minimising the host PC interaction. The 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 having a sinusoidal output and free wheeling mode for time tag synchronisation on the system level using one or more AVX1553-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.
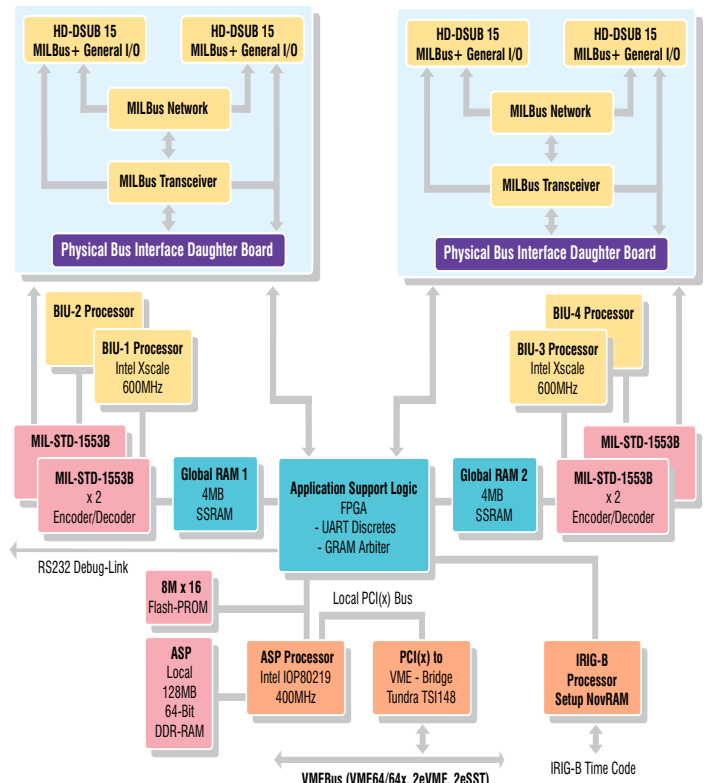
The AVX1553-x cards have the capability to stimulate/ monitor five general purpose discrete I/O (GPIO) signals. The AVX1553-x cards are available as Full Function, Single Function & Simulator only versions.

Full function driver software (incl. C/C++ source code) is delivered with the AVX1553-x Cards.

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AVX1553-1/2/4-DS Block Diagram

DSUB 26 General I/O | DSUB 9 MILBus

MILBus Network | ADC

MILScope™ (additional cost option)

MILBus Transceiver

Physical Bus Interface Daughter Board

DSUB 9 MILBus | DSUB 26 General I/O

MILBus Network

MILBus Transceiver

Physical Bus Interface Daughter Board

BIU-2 Processor
BIU-1 Processor Intel Xscale 400MHz

BIU-4 Processor
BIU-3 Processor Intel Xscale 400MHz

MIL-STD-1553B
MIL-STD-1553B Encoder/Decoder

Global RAM 1 4MB SSRAM

Application Support Logic FPGA
- UART Discretes
- GRAM Arbiter
- MILScope Logic

Global RAM 2 4MB SSRAM

MIL-STD-1553B
MIL-STD-1553B Encoder/Decoder

RS232 Debug-Link

8M x 16 Flash-PROM

Local PCI(x) Bus

ASP Local 128MB 64-Bit DDR-RAM

ASP Processor Intel IOP80219 400MHz

PCI(x) to VME - Bridge Tundra TSI148

IRIG-B Processor Setup NovRAM

VMEBus (VME64/64x, 2eVME, 2eSST)

IRIG-B Time Code

AVX1553-8 Block Diagram

HD-DSUB 15 MILBus+ General I/O | HD-DSUB 15 MILBus+ General I/O

MILBus Network

MILBus Transceiver

Physical Bus Interface Daughter Board

HD-DSUB 15 MILBus+ General I/O | HD-DSUB 15 MILBus+ General I/O

MILBus Network

MILBus Transceiver

Physical Bus Interface Daughter Board

BIU-2 Processor
BIU-1 Processor Intel Xscale 600MHz

BIU-4 Processor
BIU-3 Processor Intel Xscale 600MHz

MIL-STD-1553B
MIL-STD-1553B x 2 Encoder/Decoder

Global RAM 1 4MB SSRAM

Application Support Logic FPGA
- UART Discretes
- GRAM Arbiter

Global RAM 2 4MB SSRAM

MIL-STD-1553B
MIL-STD-1553B x 2 Encoder/Decoder

RS232 Debug-Link

8M x 16 Flash-PROM

Local PCI(x) Bus

ASP Local 128MB 64-Bit DDR-RAM

ASP Processor Intel IOP80219 400MHz

PCI(x) to VME - Bridge Tundra TSI148

IRIG-B Processor Setup NovRAM

VMEBus (VME64/64x, 2eVME, 2eSST)

IRIG-B Time Code

Bus Controller

The AVX1553-x provides real time Bus Controller functions on all dual redundant MIL-STD-1553A/B buses concurrently with Multiple RT (31) and Chronological Monitor operation.

A 400MHz 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 to word and bit level (AS4112 Compliant)*
- *Multi-Buffering with Real Time Data Buffer Updates*
- *Synchronisation of BC operation to external trigger inputs*
- *4 μsec Inter-message Gaps*
- *Start on External Trigger input or Digital I/O input*

Multiple Remote Terminal

The AVX1553-x can simulate up to 31 Remote Terminal 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 (AS4112 Compliant)*
- *Multi-Buffering with Real Time Data Buffer Updates*

Chronological Bus Monitor

The AVX1553-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 synchronisation 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 Time Out*

Physical Bus Replay

The AVX1553-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 record files enables smart systems integration and test to be performed.

MILScope™ *(available as an additional cost option)*

The model AVX1553-1/2 -DS integrates on one channel of the PBI, a two channel differential A to D 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

AVX1553-x cards have an on-board IRIG B time decoder and generator with a sinusoidal output and free wheeling mode for time tag synchronisation. This allows synchronisation of multiple AVX1553-x cards to one common IRIG B time input source or to the on-board Time code generator of one AVX1553-x card as the reference for the correlation of data across multiple MIL-STD-1553A/B streams.

Application Support Processor (ASP)

The onboard ASP offers processing functions typically provided by the host. Operational features include:

- *Driver Software execution on the board*
- *Dynamic Data Generation*
- *Customer Specific Programming of the ASP*
- *Runs under Nucleus+*

MIL-STD-1553A/B Physical Bus Interface

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

General Purpose Digital I/O

The AVX1553-x provides five General Purpose Discrete I/O's (GPIO) at the front plate D-Sub connector). The GPIO's can be used as simple discrete inputs or outputs to generate strobes (to another AVX1553-x card) or to sample an external digital input signal or an AVX1553-x card.

Driver Software Support

The AVX1553-x is supplied with a BSP (Board Software Package) for integration of the AVX1553-x into embedded VME Systems. The BSP comprises an Application Interface Library, Sample Code for VxWorks and Manuals. VxWorks Operating System is supported per default, for an easy integration of the AVX1553-x under other Operating Systems, the source code of the Driver Library, which includes support for OS specific abstraction is included in the BSP.

AVX1553-x

*One, Two, Four or Eight Stream
MIL-STD-1553A/B Test &
Simulation Module
for VMEBus*

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Technical Data

Sub-System Interface: 32-/64-bit VMEbus Master & Slave MBLT, BLT, ADOH, RMW and LOCK support. A32, A24 & A16 Addressing
Compliance: ANSI/VITA 1-1994 VME64, ANSI/VITA 1.1-1997 VME64 Extensions, ANSI/VITA 1.5-199x 2eSST.
Controller: Tundra TSI148

Processors: 2 or 4 32-bit 400MHz Xscale Processors for BIU(s) and 400MHz Intel IOP as ASP

Global Memory: 4MB - for AVX1553-2, 8MB for AVX1553-4 and AVX1553-8
(additional cost option for 32MB) ASP Memory: 128MB

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

Time Tagging: 46-bit absolute IRIG B Time with $1\mu sec$ resolution, sinusoidal IRIG-B input and output with free wheeling mode

Physical Bus Interface (PBI): 1, 2, 4 or 8 Dual Redundant, MIL-STD-1553B Trapezoidal Transceivers with variable Output Amplitude, Programmable Bus Coupling modes with on-board terminated Bus Network

Connectors: For AVX1553-1/2/4 - VME64x compliant Backplane connectors P1, P2, (P0 optional), 9-way D-sub for Bus connections, 26-way High Density D-sub connector for Trigger and Time code I/O.
For model AVX1553-8 - VME64x compliant Backplane connectors P1, P2, (P0 optional), 15-way High Density D-sub for Bus Connections, Trigger I/O & Time code I/O

Dimensions: 233mm x 160mm - VME standard 6U card

Power Consumption: Two Channel: 8.5W at 5V typical / Four Channel: 10W at 5V typical / Eight Channel: 12W at 5V typical

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

Storage Temp. Range: -40 to +85°C **Humidity:** 0 to 95% non-condensing

Weight: AVX1553-1/2 appr. 410g / AVX1553-4 appr. 520g / AVX1553-8 appr. 550g

Ordering Information

AVX1553-1 Single Stream, Dual Redundant VMEbus to MIL-STD-1553A/B Interface:
BC, Multi RT Simulator with Mailbox & Chronological Monitor. IRIG-B Encoder/ Decoder. 4MB Global RAM, 128MB ASP RAM. 5 General Purpose Discrete I/O's.

AVX1553-1-DS Single Stream, Dual Redundant VMEbus to MIL-STD-1553A/B Interface:
BC, Multi RT Simulator with Mailbox & Chronological Monitor. IRIG-B Encoder/ Decoder. 4MB Global RAM, 128MB ASP RAM. Digitising Scope for Waveform Analysis & Measurement. 5 General Purpose Discrete I/O's.

AVX1553-2 Dual Stream, Dual Redundant VMEbus to MIL-STD-1553A/B Interface:
BC, Multi RT Simulator with Mailbox & Chronological Monitor. IRIG-B Encoder/ Decoder. 4MB Global RAM, 128MB ASP RAM. 5 General Purpose Discrete I/O's.

AVX1553-2-DS Dual Stream, Dual Redundant VMEbus to MIL-STD-1553A/B Interface:
BC, Multi RT Simulator with Mailbox & Chronological Monitor. IRIG-B Encoder/ Decoder. 4MB Global RAM, 128MB ASP RAM. Digitising Scope for Waveform Analysis & Measurement (Stream 1).
5 General Purpose Discrete I/O's.

AVX1553-4 Quad Stream, Dual Redundant VMEbus to MIL-STD-1553A/B Interface:
BC, Multi RT Simulator with Mailbox & Chronological Monitor. IRIG-B Encoder/ Decoder. 2x 4MB Global RAM, 128MB ASP RAM. 5 General Purpose Discrete I/O's.

AVX1553-8 Octal Stream, Dual Redundant VMEbus to MIL-STD-1553A/B Interface:
BC, Multi RT Simulator with Mailbox & Chronological Monitor. IRIG-B Encoder/ Decoder. 2x 4MB Global RAM, 128MB ASP RAM. 2 General Purpose Discrete I/O's.

**AVX1553-x modules will be delivered with VME64x compliant IEEE Ejector Handles.
VME compliant Scanbe Ejector Handles available upon request when specified on order.**

Simulator Only versions available (except for AVX1553-1/2-DS): BC, Multi RT Simulator with Mailbox Monitor.

Single Function versions available (except for AVX1553-1/2-DS): Chronological Monitor and Mailbox Monitor or Bus Controller or Multi-RT and Mailbox Monitor.

ACB-PCI-1 Ready Made Adaptor Cable (2.0 m): From D-Sub to two Twinax Connectors for all variants of AVX1553-1 cards.

ACB-PCI-2 Ready Made Adaptor Cable (2.0 m): From D-Sub to four Twinax Connectors for all variants of AVX1553-2 and AVX1553-4 cards.

ACB-HD15-2 Ready Made Adaptor Cable (2.0 m): From 15-pin HD-Sub to four Twinax Connectors for all variants of AVX1553-8 cards.

ACB-HD15-2-F Ready Made Adaptor Cable (2.0 m): From 15-pin HD-Sub to four Twinax Connectors and 9-pin D-Sub Connector for Trigger I/O, IRIG-B and Discrete I/O's for all variants of AVX1553-8 cards.