

# AIMVIEW



THE NEWSLETTER OF AIM GMBH · VOLUME 25

FEBRUARY 2018



## Introduction

Welcome to the special 25<sup>th</sup> volume of the AIM VIEW where we keep you up date with the latest developments from AIM. Hard to believe, the first AIM VIEW Vol. 1 was published 18 years ago, back in 1999! As a testimony to AIM's commitment to the Avionics Test market, a number of the products promoted in that edition are still in service and operating today!

With this 25<sup>th</sup> issue we share with you our latest product developments designed to serve you, our valued customers. You will read about several of our latest technological innovations to enable you to take head on the most demanding and challenging avionics test, simulation and monitoring requirements in the market.

Since the introduction of the AFDX (Avionics Full Duplex Switched Ethernet) standard being adopted for the Airbus, A380 and the ARINC664P7 for the Boeing B787, AIM has lead the way providing test & simulation modules, databus analyser software and ARINC615A data loaders to a world-wide market for almost 2 decades. Our tried and trusted family of AFDX®/ARINC664P7 has now been redesigned using the latest SoC devices



supporting the next generation aircraft projects which have embraced the AFDX®/ARINC664P7 standards. Continuing with our rugged theme, we made some significant investments to test and qualify our ANET-MaAy-R mixed protocol rugged unit and the dedicated embedded family of MIL-STD-1553 and ARINC429 cards to the environmental requirements defined in MIL-STD-810G Standard.

We continue to update and enhance our PBA.pro Software which has become the Industries premier choice for any and all your Databus Test & Analysis needs. We do hope you enjoy this, our 25<sup>th</sup> edition and as always welcome your feedback!

Yours sincerely

**Douglas Ullah**

Director of Sales & Marketing

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[www.aim-online.com](http://www.aim-online.com)

New:

# AMCE1553/429: Rugged & Ready

## AIM's PMC modules target MIL-STD-1553/ARINC429 Embedded Applications

AIM GmbH has introduced 2 variants of its PMC modules, the AMCE1553-x and AMCE429-x, being conduction cooled PMC cards designed specifically for rugged, embedded MIL-STD-1553/MIL-STD-1760 and ARINC429 applications.

The AMCE cards use the field proven AIM Common Hardware Core derived from the existing AMCX1553-x/AMCX429-x test and simulation PMC cards delivering low power consumption required for rugged environments and embedded applications.

The cards are qualified for VITA-47 shock and vibration for class V3 in conduction cooled applications and class V2 in air-cooled applications. They are also designed to meet the shock requirements specified in ANSI/VITA 47 for class OS2. As standard, the AMCE cards

provide conduction cooling, Rear I/O only and support the extended temperature range from -40° to +85°C. Conformal coating is optional.

With onboard flash memory, the cards boot up autonomously after power up. Therefore, the cards are prepared for embedded applications requiring fast and autonomous boot up to operational mode such as with the MIL-STD-1760. The DMA engine is optimized for bus transfers and low PCI utilization for real time applications.

An onboard IRIG-B analogue time decoder is included with sinusoidal output and free-wheeling mode for time tag synchronization.

AMCE1553-x modules handle up to 4 dual redundant MIL-STD-1553 channels with 8 Open/Ground Avionics Level (+35V) Discrete I/O signals plus Trigger I/O. A 'Bus Controller Disable' function supports 'Remote Terminal Only' Applications. Transmit Inhibit for

Monitoring Only Applications is an assembly option. Single Function variants of the cards are also available.

AMCE429-x modules handle up to 32 fully programmable (Tx/Rx) ARINC429 channels with a maximum of 8 Open/Ground Avionics Level (+35V) Discrete Inputs and eight Open/Ground Avionics Level (+35V) Discrete Output signals in addition to Trigger I/O. Transmit Inhibit for Monitoring Only Applications is an assembly option.

An easy to use Application Programming Interface (API) is provided along with low level 32/64-bit operating system specific drivers for Windows 7/8/10, Linux and VxWorks to ease systems integration.

AIM has offices in the UK and the USA with the main design and manufacturing facilities based in Freiburg, Germany. ■



AMCE1553-x

> For AMCE429 click here

> For AMCE1553 click here



APE-FDX-2/AXC-FDX-2/AMCX-FDX-2:

# New AFDX®/ARINC664P7 family released

## On track with Express for triple speed AFDX®/ARINC664P7 Test & Simulation

AIM has now developed a family of modules which not only handle all of the AFDX®/ARINC664P7 features, but can also be easily adapted to other types of applications and Ethernet variants.

The hardware platforms for testing the Ethernet based AFDX®/ARINC664P7 have been updated with the new APE-FDX-2 PCI Express board design, utilizing the latest SoC (System on Chip) technology. This offers compatibility with previous hardware generations, but can also support other Ethernet 10/100/1000Mbps based applications due to a flexible hardware and software design with a customized FPGA MAC (media access controller), external time sync and hardware trigger I/O capability and an embedded LINUX-based onboard dual core CPU. A major goal for this new interface – also available as AXC-FDX-2 (XMC) and AMCX-FDX-2 (PMC) – was ‘flexibility first’; in addition to AFDX®/ARINC664P7, it handles other Ethernet-based data communication standards up to 1Gbps.

In addition to its predecessor’s rich set of field proven test and simulation features, 2 additional features have been introduced.

- 2 triple speed Ethernet (10/100/1000Mbps) interface ports with standard RJ-45 copper front end connectors support single or redundant configured AFDX®/ARINC664P7 links
- Built-in tapping function for inline traffic analysis

Support for IRIG-B synchronization and generator capability, Trigger I/O and Discrete I/O’s are included. An onboard LINUX operating system is executed on one CPU of the dual

core processor. The second core CPU implements the real time Bus Interface Unit communicating with a customized MAC Controller in the FPGA section.

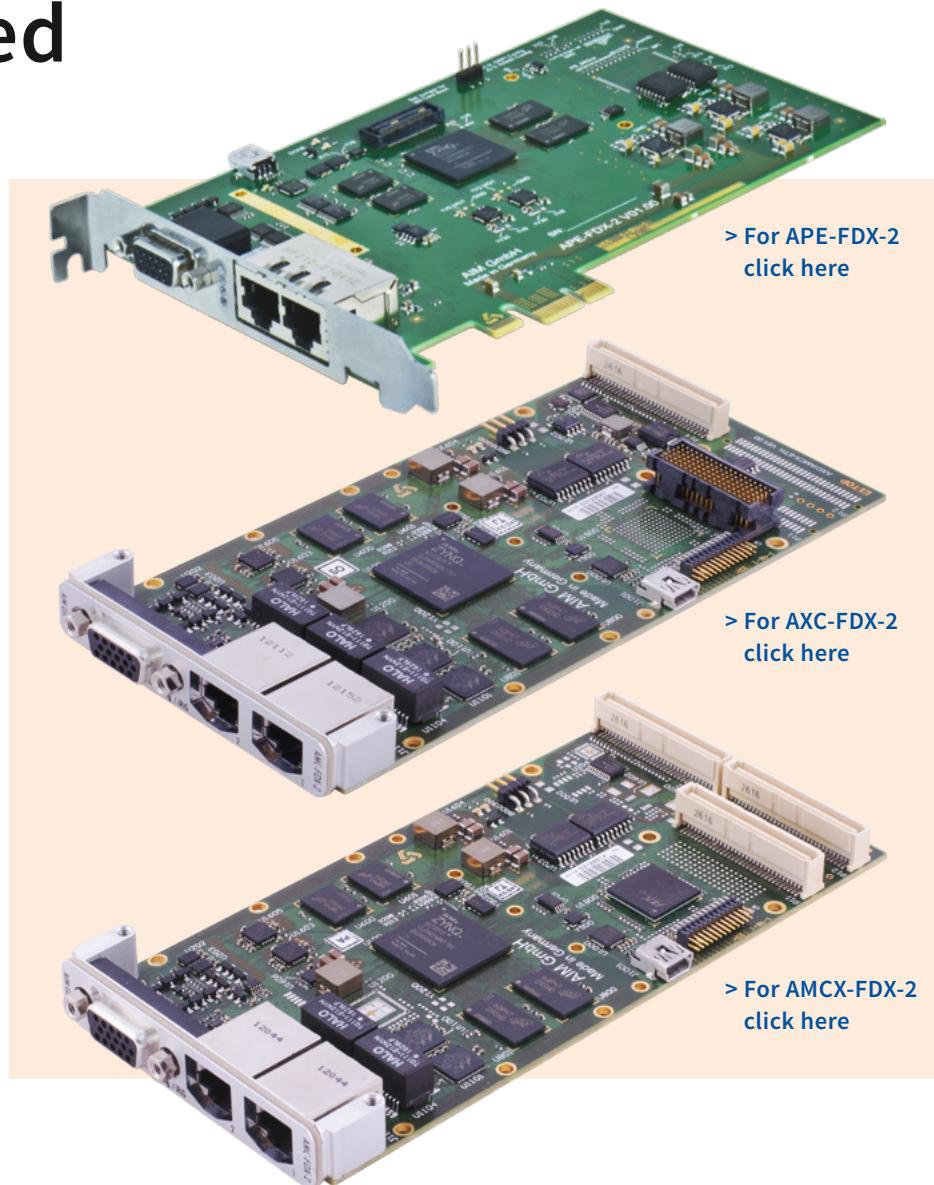
Joachim Schuler, General Manager at AIM GmbH says: “This new architecture offers a powerful and flexible platform for today’s and future standard AFDX®/ARINC664P7 test and simulation tasks including support of the Boeing ARINC664P7 variant. The use of Ethernet based communications is growing in all areas including Industrial Automation, Railway, Automotive and of course Defense and Aerospace. With the XMC and PMC card variants of the APE-FDX-2, these new products

are open to support further Ethernet based standards and positions AIM to maintain our market leadership”.

The APE-FDX-2/AXC-FDX-2/AMCX-FDX-2 includes the driver software bundled into the price, supporting Windows, Linux and LabVIEW VI/LabVIEW RT.

The PBA.pro (Light or Full Version) Data Bus Test and Analysis Software is available as an option for Windows and Linux.

Optional EasyLOAD-615A Dataloading Software for Windows can be used for loading AFDX®/ARINC664P7 target End Systems or Switches. ■



> For APE-FDX-2  
click here

> For AXC-FDX-2  
click here

> For AMCX-FDX-2  
click here

## Magic Formula:

**Tablet PC**  
**+ ASC429 SmartCable**  
**+ PBA.pro-LIGHT-ARINC429**  
**= Low Cost ARINC429 Portable Tester!**



AIM has recently delivered a cost efficient and highly portable test solution for a customer who required an easy to use tester to monitor Labels and Data from ARINC429 channels.

The AIM solution comprised AIM's latest ASC429 ARINC429 USB SmartCable interfaces to an off-the-shelf 10" Tablet PC running Windows 10 installed with a copy of the PBA.pro-LIGHT-ARINC429 Bus Analyzer Software providing PBA.pro Light GUI (Graphical User Interface) as well as a dedicated and simple to use GUI for the particular use case. The complete bundle comes with a carry soft case for ultimate portability and convenience.

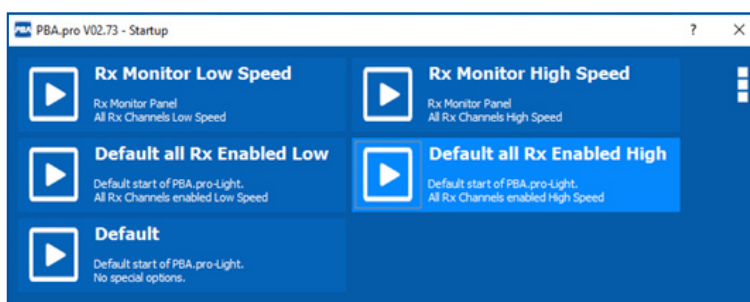
With this bundled solution we also included some 'One Click easy to Load' project files such that initializes the ARINC429 Analyzer ready to read and receive all ARINC429 labels and data with minimum friction and effort. The easy to view display PBA.pro panels are simply loaded on startup via the PBA.pro startup menu. The startup menu offers 5 basic setups, but can easily be customized by AIM or the customer.

Since the Tablet PC is battery operated with the ASC429 taking power from the USB2.0 interface, the Tablet based ARINC429 Analyzer bundle can operate for around 6 hours from a full charge.

If required, customers can easily update the PBA.pro-LIGHT-ARINC429 software to the PBA.pro full functional version which has very comprehensive test, simulation, recoding with customized display capabilities, plus optional PBA.pro Software components like the Database Manager for Engineering Units, Test and Scripting for automating test tasks (using Python Scripts) and a User Administration Component to secure user access and setup for different groups and classes of PBA.pro users. ■

> For ASC429 click here

> More about PBA.pro Light





Fully Qualified:

# Rugged ANETs for Harsh Environments

To satisfy a number of customer requirements and applications for AIM's rugged ANET for harsh environments, AIM have taken the important step to fully qualify the model ANET-MxAy-R in accordance with the environmental tests defined within the MIL-STD-810G Standard.

All the environmental tests covering temperature, vibration, shock, humidity and altitude have been executed and passed. Furthermore, standard EMC tests covering radio interference and immunity characteristics have been passed, too!

All these qualifications are becoming from now on a standard feature of the existing ANET-MxAy-R (rugged ANET) variants, based on the mixed protocol standard ANET for MIL-STD-1553 and ARINC429 ANET-MxAy. For applications requiring rugged and qualified MIL-STD-1553 or ARINC429 interfacing only, variants with up to 2 MIL-STD-1553 streams or up to 12 ARINC429 channels are also offered.

The ANET-MxAy-R is designed using a metal housing with mounting holes. It supports up to 2 MIL-STD-1553 dual redundant data buses and up to 12 ARINC429 channels for simulation, monitoring and test applications. It has sealed standard connectors for Ethernet, USB2.0, Trigger/Discrete and IRIG-B, plus a 5 pin LEMO push pull connector for power, reset and maintenance purposes. The default power input range of the ANET-MxAy-R is 9 to 36VDC. The optional MIL-STD-704 compliant power input ANET-MxAy-R-704 variant supports a wide input range from 18 to 50VDC if required.

For more information please contact your local AIM sales office or authorised representative near you. ■



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> [For ANET-MxAy-R click here](#)

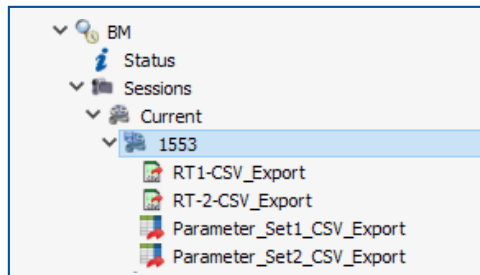
## Innovative Features:

# PBA.pro – What's New

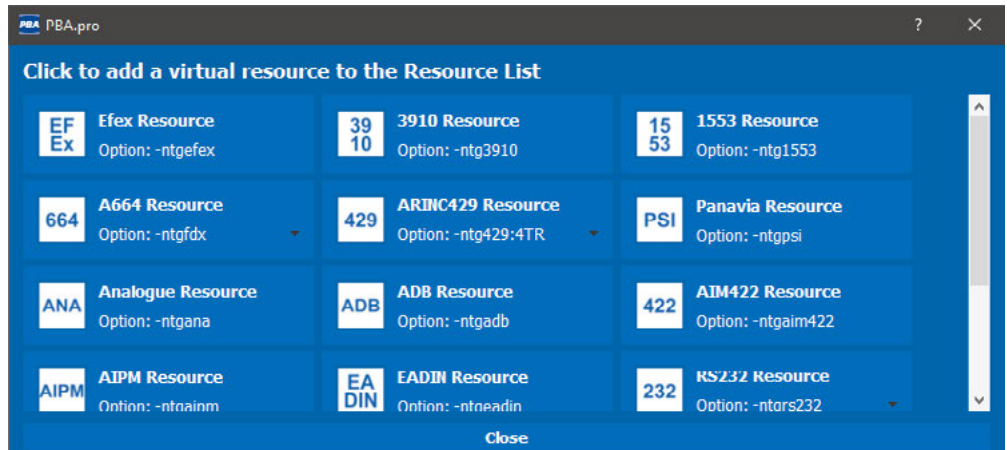


> More about  
PBA.pro

### Increased interoperability with other applications



- Recording Data and Parameter Export capabilities have been significantly improved
- Persistent Exporters, allowing to save Exporters in setup and re-start with a few mouse clicks
- Exports can be started automatically with Bus Monitor, so Export is finished when recording is finished
- Exports may run from live Bus Monitor data (without recording)
- Export to network (TCP server, TCP client, UDP and named pipes on windows)
- Export Start/Stop Trigger and Filter



### Improved setup of virtual resources

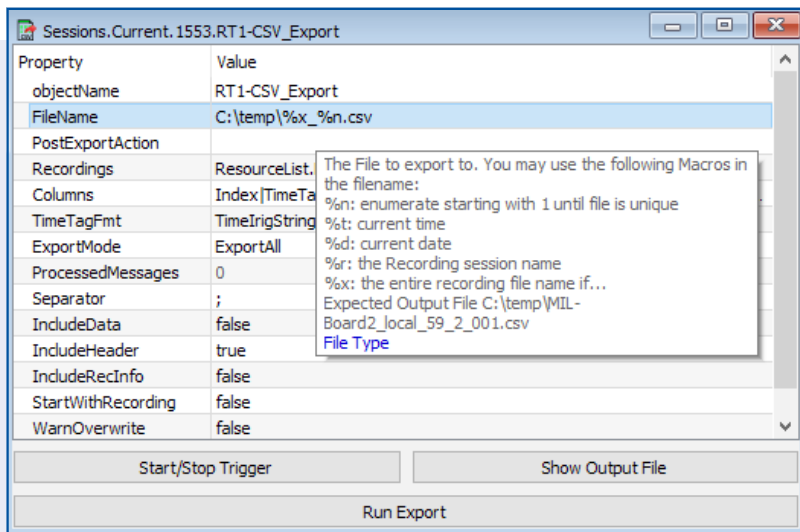
Allow to add easily virtual resources via the Resources Menu or via the Resource Selection dialog without PBA.pro restart or dedicated command line option setup.

### New features for AFDX®/ARINC664P7

- "Parameter" database support extended towards "System" database capability (Capture and Send sampling & queuing setups can be completely generated by the DBS/Parameters-Tree by adding BAG and timing properties)
- PBA.pro REROS operation can now be operated concurrently to a chronologic capture via the Bus Monitor (possible with AFDX®/ARINC664P7 BSP 19.0.1 or later)
- Support of the network TAP mode of new APE/AXC/AMCX-FDX-2 interface board family

### Easier configuration of ARINC429 resources

- Tx Label Framing setup like in legacy PAA ARINC429 Analyzer
- "Parameter" database support extended towards "System" database capability (Tx and Rx setups can now be completely generated by the DBS/Parameters-Tree by adding a Timing (Label Rate) property)



- Post Export action to start e.g. automatically Excel after the Export is finished
- Faster Export in many cases
- Parameter Export to JSON. This allows e.g. parameter data to external application, if a network Export is used

Note: PBA.pro virtual resources support PBA.pro project and script creation without having a real hardware interface connected and require a corresponding PBA.pro NTG software license key.



PBA.pro:

# Turnkey solution for Cyber Security Testing on Avionics Databusses

## Solving Cyber Security on Avionics Databusses

The need for Cyber Security is well-known today, more than ever, and affects everyone's daily life. With that being said, it is surprising that some of the most sensitive data out there is barely protected at all. I am referring to Avionics Databusses, found on every major (Military and Commercial) aircraft flying today.

In addition, as more avionics types of buses are being deployed and interconnected (in both new and updated aircraft) there is an increasing concern that these vulnerabilities in security might allow unauthorized access to devices communicating on these buses.

The most concerning bus is MIL-STD-1553, which was designed before the term "Cyber Security" was even invented. The concern is that this bus, which was designed with no infiltration protection, could be easily corrupted or manipulated if any unintended data made it on to the databus.

There are already multiple government and private industry organizations studying the problem with the goal of establishing suitable methods to assure complete aircraft databus cyber security.

To support these efforts, AIM is able to offer a suite of tools that can be utilized to interface with MIL-STD-1553 (and other protocol) equipment to analyze, attack, detect and remove potential security vulnerabilities.

## Vulnerability Detection

Since there are thousands of fielded avionics computers using MIL-STD-1553 today, the most logical initial approach would be to see if any vulnerabilities exist. More simply put, "can the computer be made to do something it's not supposed to."



PBA.pro contains a concurrent real-time 1553 Bus Monitor (BM), so all 100% of the data that is on the bus can be recorded and post-analyzed at any time. Depot, lab or rugged units are available to support all aspects of flight test.

In addition, recorded data can be always be replayed to reproduce any scenario.

The issue with just looking at "Raw" 1553 data is that most 1553 data requires further decoding (such as a scale factor) to determine its true meaning to perform a "credibility analysis".

PBA.pro handles this with ease by including a **Database Manager (ICD) component**, which can decode and interpret the raw 1553 data

in its true **Engineering Unit (EU)**. Once the Engineering Unit is decoded, PBA.pro can then scan the recorded data and verify that every bit of data is valid, comprehensible and documented (see Figure 1).

PBA.pro has the ability to perform real-time or post-time credibility analysis in the following areas:

**EU is within ICD Range and valid**

**EU Rate is valid and within tolerance**

**Undocumented ICD Data detected on bus**

**1553 Errors detected on bus**

**Table 1: Data credibility analysis**

Next part: ►

Index	TimeTag	DiffTime	Alias	DO	Type	Source	TransferType	XmtRt	XmtSa	RcvRt	RcvSa	ModeCode	Bus
12	339d12h35m56.780762000s	16,000	000D		1553	MIL...	BcToRt			1	3		Pri
13	339d12h35m56.796763000s	16,001	000E		1553	MIL...	BcToRt			1	3		Pri
14	339d12h35m56.812763000s	16,000	000F		1553	MIL...	BcToRt			1	3		Pri
15	339d12h35m56.828762000s	15,999	0010		1553	MIL...	BcToRt			1	3		Pri
16	339d12h35m56.844762000s	16,000	0011		1553	MIL...	BcToRt			1	3		Pri
17	339d12h35m56.860763000s	16,001	0012		1553	MIL...	BcToRt			1	3		Pri
18	339d12h35m56.876763000s	16,000	0013		1553	MIL...	BcToRt			1	3		Pri
19	339d12h35m56.892763000s	16,000	0014		1553	MIL...	BcToRt			1	3		Pri
20	339d12h35m56.908762000s	15,999	0015		1553	MIL...	BcToRt			1	3		Pri
21	339d12h35m56.924763000s	16,001	0016		1553	MIL...	BcToRt			1	3		Pri
22	339d12h35m56.940762000s	15,999	0017		1553	MIL...	BcToRt			1	3		Pri
23	339d12h35m56.956763000s	16,001	0018		1553	MIL...	BcToRt			1	3		Pri
24	339d12h35m56.972763000s	16,000	0019		1553	MIL...	BcToRt			1	3		Pri
25	339d12h35m56.988763000s	16,000	001A		1553	MIL...	BcToRt			1	3		Pri
26	339d12h35m57.004763000s	16,000	001B		1553	MIL...	BcToRt			1	3		Pri
27	339d12h35m57.020763000s	16,000	001C		1553	MIL...	BcToRt			1	3		Pri
28	339d12h35m57.036762000s	15,999	001D		1553	MIL...	BcToRt			1	3		Pri
29	339d12h35m57.052762000s	16,000	001E		1553	MIL...	BcToRt			1	3		Pri
30	339d12h35m57.068762000s	16,000	001F		1553	MIL...	BcToRt			1	3		Pri
31	339d12h35m57.084762000s	16,000	0020		1553	MIL...	BcToRt			1	3		Pri
32	339d12h35m57.100763000s	16,001	0021		1553	MIL...	BcToRt			1	3		Pri
33	339d12h35m57.116762000s	15,999	0022		1553	MIL...	BcToRt			1	3		Pri
34	339d12h35m57.132764000s	16,002	0023		1553	MIL...	BcToRt			1	3		Pri

**Figure 1: Verifying EU in-range data**

## PBA.pro: Turnkey solution ... (part 2)



> See all AIM  
Software Solutions

**Figure 2:**  
1553 RT Validation  
Testing

### Intrusion Simulation

Once the “expected and accepted” data is known, it’s time to see how a 1553 Unit-Under-Test (UUT) reacts to unexpected anomalies.

PBA.pro has the ability to **inject many electrical** errors (see Table 2) that violate the MIL-STD-1553 specification, with the intention to determine how a UUT reacts. In addition to the above, PBA.pro can simulate a multiple BC or duplicate RT scenario or even inject 1553 messages during detected Bus Idle (dead) time.

### MIL-STD-1553 Compliance Testing

Although it is expected that a deployed (flying) 1553 UUT is already compliant to the MIL-STD-1553 specification, there have been exceptions and equipment has been found to fail.

PBA.pro has a completely automated off-the-shelf **SAE 4111/4112 Test Plan Suite**. These tests – published by the Society of Automotive Engineers (SAE) – are designed to validate that a 1553 Remote Terminal UUT meets all electrical and protocol requirements of the MIL-STD-1553 specification (see Figure 2).

### Platform-Level Analysis

Some of the capabilities already mentioned involve PBA.pro and a single UUT. But, in reality an Avionics databus is an interaction of many subsystems. Those interactions create another cyber security concern, requiring testing at the full system level and the vulnerabilities that come with it. PBA.pro is a **modular multi-protocol solution**, supporting numerous bus types and multiple bus instances. Below is a list of some of the more popular protocols supported by PBA.pro (see Table 3).

**Table 2: MIL-STD-1553 error injection sampling**

CMD/Data Sync Inverse	Word/Bit Count Changes	Gap Error Insertion
Manchester Bit Faults	Zero Crossing Errors	Parity Error Insertion

**Table 3: PBA.pro protocol sampling**

MIL-STD-1553/1760	AFDX®/ARINC-664/EDE	FIBRE CHANNEL (FC-AE)
ARINC-429	10/100/1000 ETHERNET	CAN bus®/ARINC825

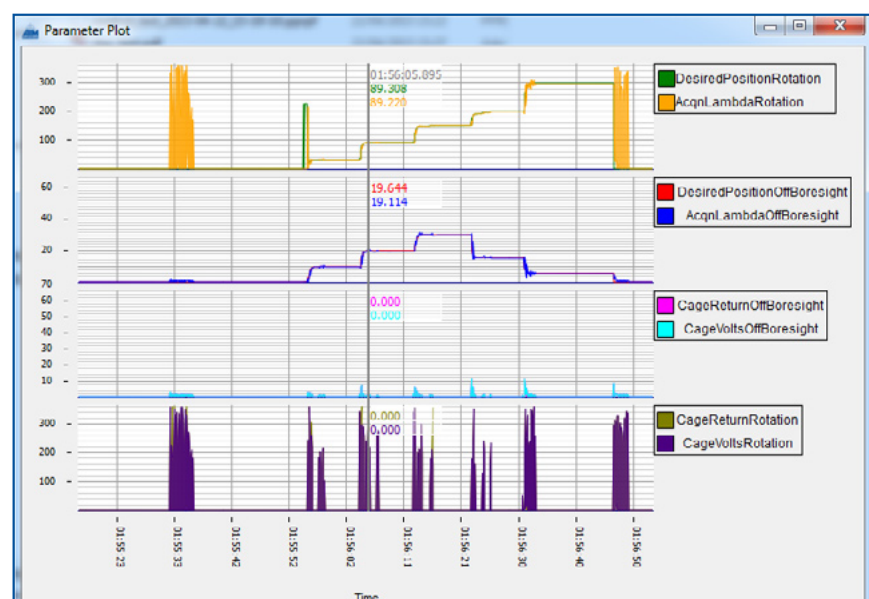
To simplify the complex analysis of multiple systems, PBA.pro includes a **Scripting Component**, which can tackle repetitive or time-consuming tasks with ease. All scripting is done with the popular Python® language, allowing easy integration with other tools, such as LabVIEW® and MATLAB (see Figure 3).

Beyond MIL-STD-1553, AIM has a suite of tools that are just as focused for other Avionics Protocols. Comprehensive Monitoring and inline data modification capabilities are currently

available for ARINC429, AFDX®/ARINC664P7, 10/100/1000 Ethernet, ARINC825/CAN bus and Fibre Channel protocols.

PBA.pro is an invaluable tool to assist engineers analyzes and develops methods to assure the cyber security of any Avionics databus. From laboratory to real-time flight analysis, PBA.pro offers a time-saving and powerful solution.

*Michael J. Randazzo, Director of Applications Engineering AIM-USA*



**Figure 3: Verifying data across multiple databusses and protocols**



Introduced:

## New AIM Website

From the start of 2018, the all new AIM Website has been online. We are happy to serve our customers with a fresh look and feel plus some new features like support for mobile platforms, a product filter and finder and access to downloads for product related documentation and software directly via the product page.

☒ Modules
 ☐ Software
 ☐ Systems

**by Form Factor**

- ☐ CPCI
- ☐ CPCle
- ☐ Ethernet
- ☐ ExpressCard
- ☒ PCI
- ☐ PCle
- ☐ PMC
- ☐ PXI
- ☐ PXIe
- ☐ USB
- ☐ VME
- ☐ XMC
- ☐ Others

**by Protocol**

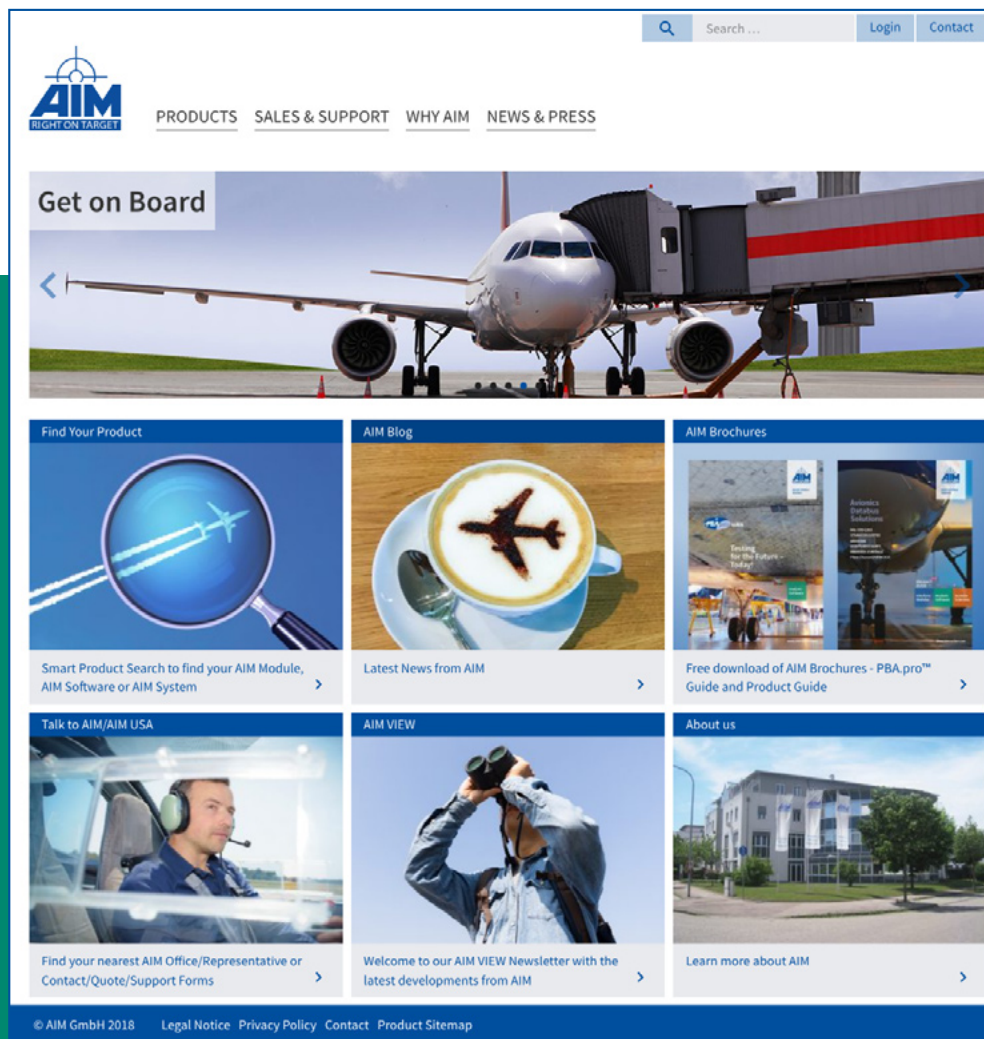
- ☐ AFDX®/ARINC664P7
- ☒ ARINC429
- ☐ ARINC818
- ☒ ARINC825
- ☐ ETHERNET
- ☐ Fibre Channel
- ☐ MIL-STD-1553
- ☐ MIXED
- ☐ PANAVIA
- ☐ STANAG3910/EFEX
- ☐ Others

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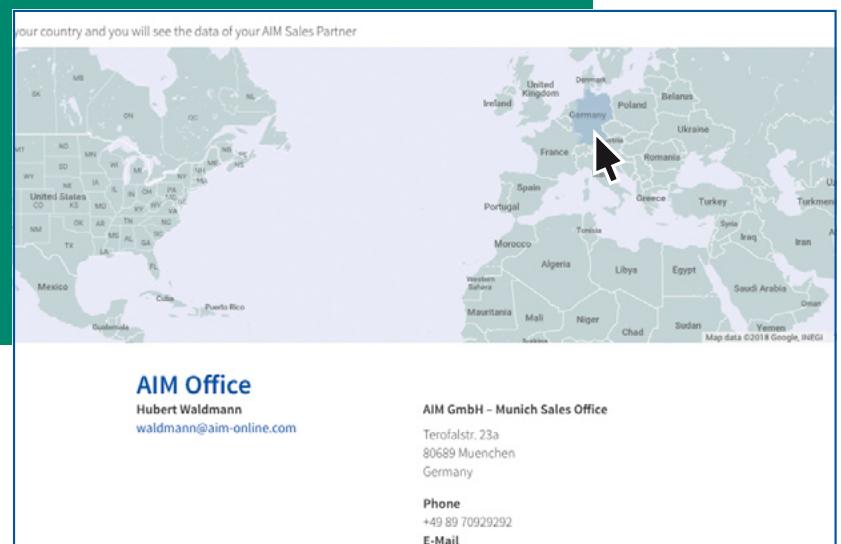


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With "Sales&Support" the website also supports a quick and efficient routing of all your online requests to your AIM sales representative and the AIM technical support team at the head office.

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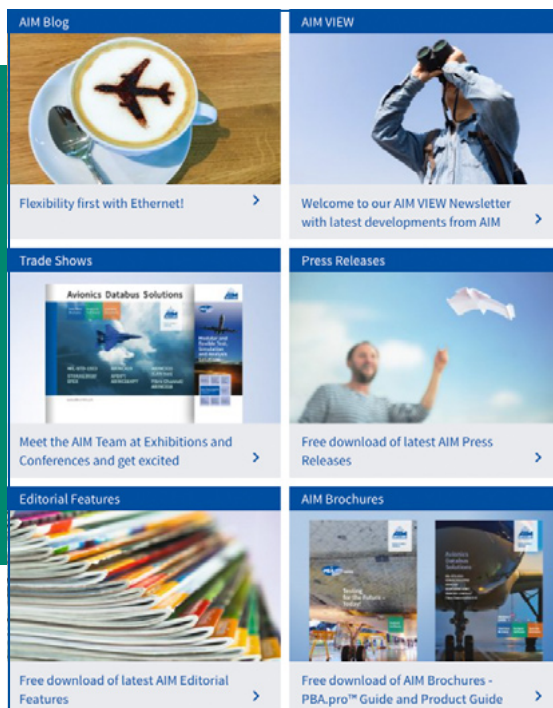
## New AIM Website (part 2)

Under "News&Press" an AIM Blog is available as a platform for our latest announcements about our products and the company.

You find our AIM VIEW Newsletters, Press Releases and Editorial Features or check for Trade Shows where you can meet the AIM team face to face. And you can here download the AIM brochures.

So don't hesitate to visit us online!

> For "News&Press" click here



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Welcome Kvalitest!

## New Representative for AIM products in Finland



**AIM has appointed Kvalitest Nordic Ltd. as our exclusive distributor to provide local sales, marketing and technical support for our customers in Finland.**

Kvalitest is a value adding technical distributor providing high performance Test & Measurement products and solutions to the research, production and maintenance sectors in the Nordic region.

Pekka Jolnaki – Managing Director says:  
“We are a dynamic and motivated business partner focusing on creating value to our customers and world leading supplier partners.”



**Pekka Jolnaki**

Kvalitest currently have offices in Finland and Sweden with totally 9 Test & Measurement professionals. All their guys are active in the field and have a strong product competence and application experience, and combined we have over 100 years of experience in marketing, selling and using Test & Measurement instruments and systems.

At Kvalitest we always strive for long term relations with our customers and supplier partners. We feel that we are successful when we can help our stakeholders to increase their quality, performance and profitability.” ■

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