


North Atlantic Industries

Configurable Open Systems Architecture Selection Guide


Smart Function Modules


I/O & SBC Boards


Rugged COTS Systems


Rugged Power Supplies


Test & Measurement

Configurable Open Systems Architecture

Our Configurable Open Systems Architecture™ (COSA®) combines the best of both worlds – custom solutions from COTS products.

Leverage our rich portfolio of fully tested modules, boards, systems and power supplies to quickly and easily meet a wide range of complex and time-critical mission processing requirements. COSA delivers a distributed, intelligent, software-driven architecture that allows you to rethink the way you engineer power-critical and I/O-intensive mission systems.

Configure a Board or System to Your Requirements With Ease

NAI's library of over 70 pre-integrated, field-proven Smart Function Modules form the foundation for our Configurable Architecture.

Covering a wide variety of I/O, Communications, Measurement and Simulation requirements, this deep library of modules drives our ability to meet virtually any complex I/O requirement off-the-shelf, without the need for NRE.

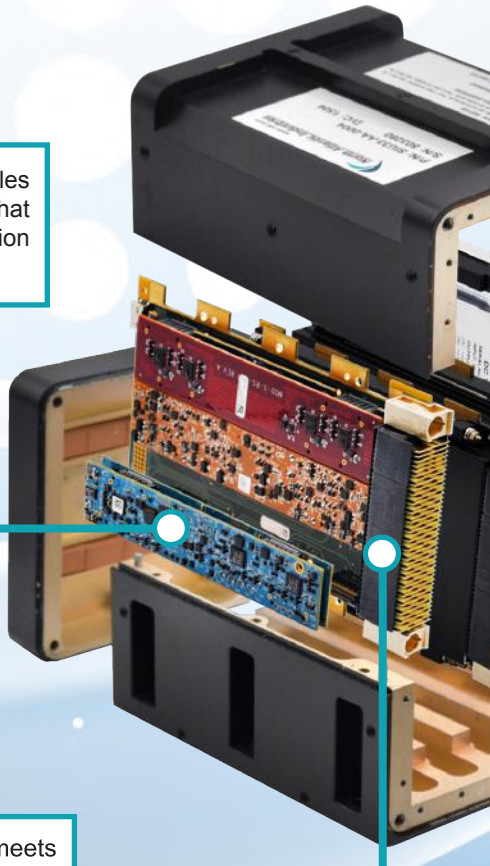
Smart Function Modules are placed in a mix-and-match fashion onto rugged 3U or 6U Boards (with or without processing) which can then be integrated, along with a power supply, to create a standalone Rugged System.

Available Rugged System chassis are scalable to support a single function or up to 60 functions for distributed, networked and high-density centralized systems. (See pages 11-12 for details).

Your IP & Application

+

2 Select 3-6 Smart Function Modules (based on 3U or 6U form factor) that deliver the functionality your application requires.



1 Select an I/O Board or SBC that meets your form factor & Operating System needs.

Deliver More I/O Capability & Intelligence in a Smaller Footprint

Programmability, intelligence and self-monitoring capabilities built into each smart module reduce, or eliminate, the processing load on the SBC and deliver more capabilities at the edges of your application.

Distributed I/O with Single API Programmability

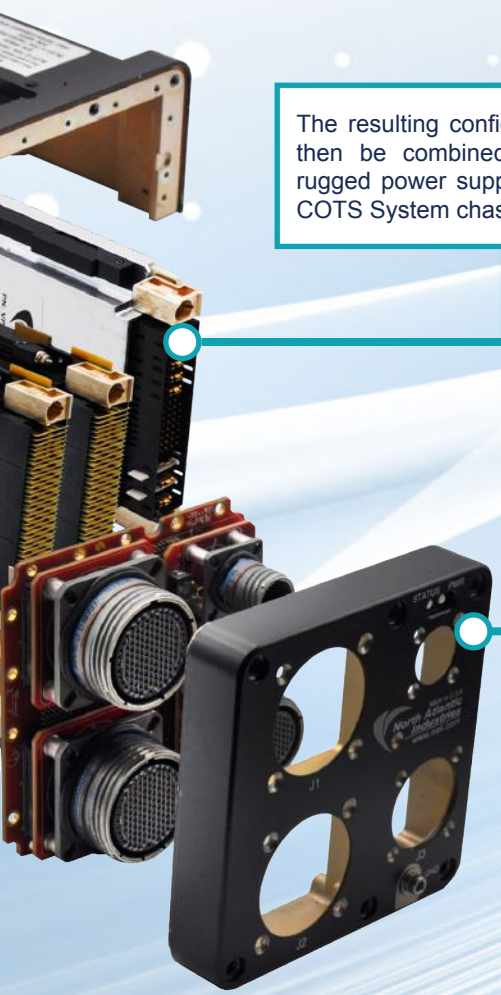
Single API Programmability and our free software libraries drive faster integration of your application to rapidly create configurable mission systems.

Optimized SWaP

Unmatched I/O densities drive SWaP-optimized solutions.

Elimination of Non-Recurring Engineering Charges

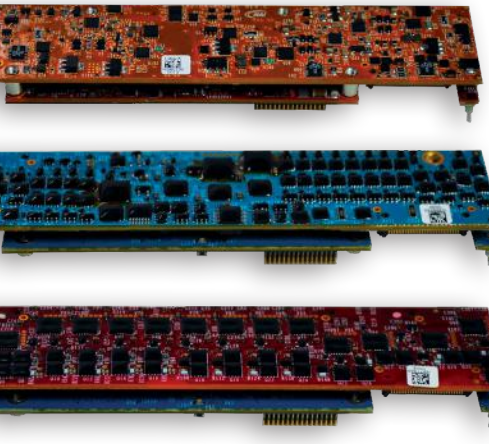
Pre-integrated, modular solutions from COTS products typically eliminates the need for Non-Recurring Engineering charges.



3 The resulting configured board(s) can then be combined with one of our rugged power supplies into a Rugged COTS System chassis of your choice.

5 Embedded FPGAs, SoCs and free software libraries drive faster integration of your IP to rapidly create configurable mission systems – while reducing or eliminating SBC overhead.

4 Easily update board configuration or swap functional capabilities if requirements change. A wide range of Rugged Chassis are available.



Pre-Integrated Smart Function Modules

NAI's library of over 70 pre-integrated smart function modules provides the most configurable and highest density I/O solutions in the industry meeting virtually any I/O requirement.

All modules have dedicated ARM and FPGA intelligence that support customer configurability, programmability, health monitoring and user application capabilities. This puts more I/O capability into the modules themselves and drives time and cost out of your design, development and qualification schedules.

Use these independent modules to configure a Multifunction I/O, Single Board Computer or Rugged System that meets your requirements.

See chart below for information on our most commonly selected modules. View complete list and detailed specs on all at www.naii.com/products

I/O

Function	Module	Description
A/D Converter	AD1	12 A/D Channels (±1.25 to ±10.0 VDC FSR); 24-bit Sigma-Delta
	AD2	12 A/D Channels (±12.5 to ±100.0 VDC FSR); 24-bit Sigma-Delta
	AD3	12 A/D Channels (±25 mA FSR); 24-bit Sigma-Delta
	AD4	16 A/D Channels (±1.25 to ±10.0 VDC FS or ±25 mA); 16-bit SAR, 8 Channels x 2 A/D multiplexed
	AD5	16 A/D Channels (±6.25 to ±50.0 VDC FS); 16-bit SAR, 8 Channels x 2 A/D multiplexed
	AD6	16 A/D Channels (±12.5 to ±100.0 VDC FS); 16-bit SAR, 8 Channels x 2 A/D multiplexed
	ADE	16 A/D Channels (±10 VDC); 16-bit SAR per channel
	ADF	16 A/D Channels (±100 VDC); 16-bit SAR per channel
	ADG	16 A/D Channels (±25 mA); 16-bit SAR per channel
	ADH	8 A/D Channels (±100 VDC); Individual SAR (ADF-type) +8 Channel A/D, High Current with external shunt (details to follow)
D/A Converter	DA1	12 D/A Output Channels (±10 VDC or ± 25 mA)
	DA2	16 D/A Output Channels (± 10 VDC @ 10 mA max. / Channels)
	DA3	4 (high-current) D/A Output Channels (±40 VDC or ± 100 mA)
	DA4	4 (high-voltage) D/A Output Channels (±20 to ± 80 VDC @ ±10 mA max. / Channels)
	DA5	2 (very high current) D/A Output Channels (+65 VDC (from external applied source) @ ±2 A max.)

Function	Module	Description
I/O Discrete	DT1	24 Channels, Discrete I/O (0 to 60 VDC, 500 mA / Channels)
	DT2	16 Channels, Discrete/Switch I/O (±80 V, 625 mA / Channels)
	DT3	4 Channels, Discrete/Switch I/O (±100 V, 3 A / Channels)
	DT4	Enhanced 24 Channels, Discrete I/O (0 to 60 VDC, 500 mA / Channels)
	DT5	Enhanced, 16 Channels, Discrete/Switch I/O (±80 V, 625 mA / Channels)
	DT6	Enhanced 4 Channels, Discrete/Switch I/O (± 100 V, 3 A / Channels)
I/O TTL/CMOS	TL1	Serial, CDI Repeat-Back, TTL level data stream
	TL2	Enhanced Serial, CDI Repeat-Back, TTL level data stream
I/O Differential	DF1	16 Differential I/O Multi-Mode Transceiver Channels
	DF2	Enhanced 16 Differential I/O Multi-Mode Transceiver Channels
Relay	RY1	4 Channels Relay, Non-latching
	RY2	4 Channels Relay, latching

Measurement / Simulation

Function	Module	Description
AC Reference	AC1	1 Channel, 2-115 Vrms, 47 Hz - 20 kHz (max. range), programmable
	AC2	2 Channels, 2-28 Vrms, 47 Hz -20 kHz (max. range), programmable
	AC3	1 Channel, 28-115 Vrms, 47 Hz - 2.5 kHz (max. range), programmable
L(R)VDT/D (Meas.)	LD1	4 Channels, LVDT/RVDT to Digital, 2-28 Vrms Input, 2-115 Vrms Exc, 47 Hz - 1 Hz Freq
	LD2	4 Channels, LVDT/RVDT to Digital, 2-28 Vrms Input, 2-115 Vrms Exc, 1 kHz - 5 kHz Freq
	LD3	4 Channels, LVDT/RVDT to Digital, 2-28 Vrms Input, 2-115 Vrms Exc, 5 kHz - 10 kHz Freq
	LD4	4 Channels, LVDT/RVDT to Digital, 2-28 Vrms Input, 2-115 Vrms Exc, 10 kHz - 20 kHz Freq
	LD5	4 Channels, LVDT/RVDT to Digital, 28-90 Vrms Input, 2-115 Vrms Exc, 47 Hz - 1 kHz Freq

Function	Module	Description
SYN(RSL)/D (Meas.)	SDx	Synchro/Resolver to Digital, 2-28 Vrms Input, 2-115 Vrms Exc, 47 Hz -1 kHz Freq
D/SYN(RSL) (Sim.)	DSx	D/S(R) (Module DS*, DR*) - SYN, RSL; three, two or one channel(s) @ 0.5 VA, 1.5 VA or 3.0 VA
Thermocouple (Meas.)	TC1	8 Channels Thermocouple, LV A/D
	TR1	8_RTD (2,3 or 4 wire) or Thermocouple (multi-type), Programmable per Channel
RTD (Meas.)	RT1	Eight Channel RTD Measurement
GPS	GP1	Multi-channel (satellite) GPS & IRIG Tx & Tx, 2x wide module Javad TR2 high-performance
	GP2	Multi-channel (satellite) GPS & IRIG Tx & Tx, 1x wide module uBlox Neo
IRIG	RG1	IRIG Tx & Tx, digital & analog w/ master timer function
Starin Gage	SG1	4 Channels Strain Gage Measurement

Communications

Function	Module	Description
ARINC Communications	AR1	12 Channels ARINC 429/575 Communications
	AR2	2 Channels ARINC 568/579 Communications
CANBus	CB1	8 Channels CANBus, CAN 2.0 A/B Protocol
	CB2	8 Channels CANBus, J1939 Protocol
	CB3	8 Channels CANBus, CAN 2.0 A/B Protocol or J1939 Protocol
Ethernet Switch	EM1	Dual Port Ethernet NIC, Intel 82850, 10/100/1000, PCIe module interface to processor (local or off-board host)
	ES2	Managed Ethernet Switch with L2/L3 Layer support and Fiber Optic option.
MIL-STD-1553	FT1, FT2, FT3	1-4 Channels, MIL-STD-1553, Dual Redundant, Transformer Coupled
	FT4, FT5, FT6	1-4 Channels, MIL-STD-1553, Dual Redundant, Direct Coupled
	FTA, FTB, FTC	1-4 Channels, MIL-STD-1553, Dual Redundant, Transformer Coupled, Assisted Mode Capable
	FTD, FTE, FTF	1-4 Channels, MIL-STD-1553, Dual Redundant, Direct Coupled, Assisted Mode Capable

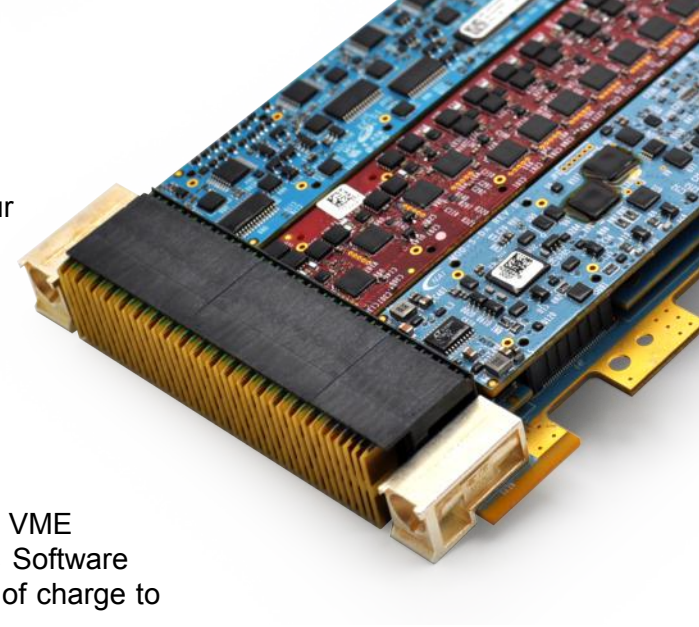
Function	Module	Description
MIL-STD-1760	FTJ	1 Channel, MIL-STD-1553/1760 Communications Interface
	FTK	2 Channels, MIL-STD-1553/1760 Communications Interface
Serial Communication	SC1	4 Channels Serial Communications, multi-mode programmable, non-isolated
	SC2	4 Channels Serial Communications, multi-mode programmable, isolated
	SC3	8 Channels Serial Communications, programmable RS-232/422/485 non-isolated
	SC7	4 Channels Serial Communications, multi-mode programmable, non-isolated
Time-Triggered Ethernet	TE2	Time-Triggered Ethernet / ARINC 664 Part 7 (AFDX®) / IEEE 802.3 Ethernet Deterministic Communications

Combination and Specialty Modules

Function	Module	Description
Combination	CM2	8 Channels 100 kHz or 12.5 kHz, RX/TX, 256 Word Tx/Rx Buffer & 12 Channels Discrete I/O
	CM4	12 Channels Discrete (DT1-type) & programmable 2 Channels SC1-type (w/Sync) or 4 Channels SC3-type (w/Async)
	CM5	2 Channels MIL-STD-1553, 8 Channels ARINC 429/575
	CM8	2 Channels MIL-STD-1553B communications and 12 Channels of discrete I/O
	CME	8 Channels D/A ± 10 VDC @ 10 mA max. / Channels; A/D ±10 VDC 16-bit SAR per channel
	CMF	8 Channles D/A ± 10 VDC @ 10 mA max. / Channels; A/D ±100 VDC 16-bit SAR per channel
	CMG	8 Channels D/A ± 10 VDC @ 10 mA max. / Channels; A/D ±25 mA 16-bit SAR per channel

Function	Module	Description
Flash	FM1	240 GB SSD Flash Module, SATA II, MLC, -40° C to +85° C
	FM2	480 GB SSD Flash Module, SATA II, MLC, -40° C to +85° C
	FM4	128 GB SSD Flash Module, SATA II, SLC, -40° C to +85° C
	FM5	256 GB SSD Flash Module, SATA II, SLC, -40° C to +85° C
	FM7	1 TB SSD Flash Module, SATA II, TLC, 0° C to +70° C
	FM8	1 TB SSD Flash Module, SATA II, TLC, -40° C to +85° C
	FM9	2 TB SSD Flash Module, SATA II, TLC, -40° C to +85° C

Multifunction I/O Boards



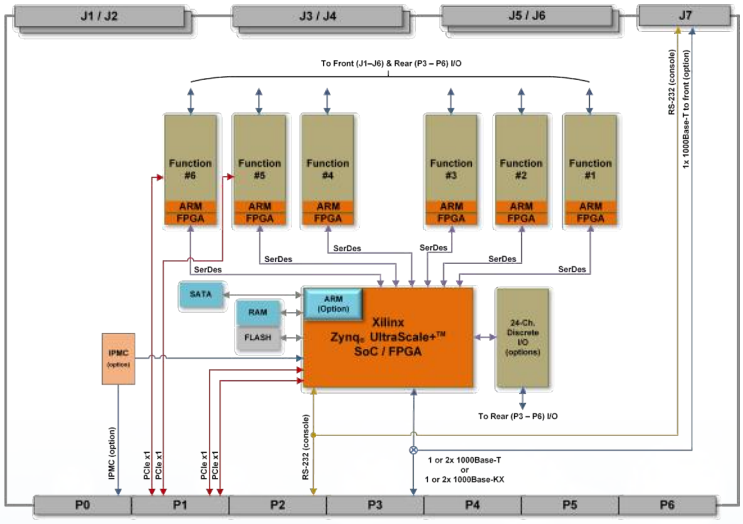
Capable of hosting 3 or 6 independent I/O function modules of your choice, NAI's rugged 3U and 6U boards offer industry leading I/O densities and are offered with and without SBC processing.

Leveraging the modularity of COSA, your ability to configure a board that meets your exact I/O and connectivity requirements with exceptional levels of performance and power efficiency has never been easier.

Monitor, manage and control I/O via Ethernet, OpenVPX, cPCI, VME or PCI/PCIe depending on the bus architecture required. NAI's Software Support Kit & Board-Specific I/O Library APIs are provided free of charge to facilitate integration.

Configurable Multifunction I/O Boards

We will integrate your choice of board and I/O functions (see list pg. 5-6) to quickly meet your specific requirements and deliver a configured, custom board without NRE.



* 67G6 6U OpenVPX Multifunction I/O Board Block Diagram.

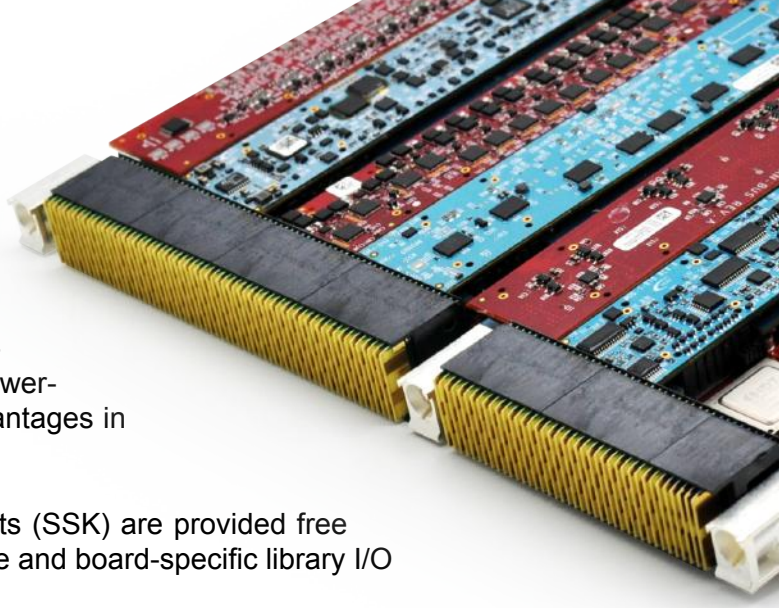
Typical Board Features

- Support for 3-6 independent, Smart Function Modules (based on 3U or 6U form factor)
- Background Built-In-Test (BIT) continually checks and reports on the health of each channel
- Independent x1 SerDes interface
- Operating Temperatures:
  - Rugged Models: -40° C to +85° C
  - Commercial Models: 0° C to 70° C
- Connections via front and/or rear I/O
- Configure hardware registers with single API call as required

Multifunction I/O Boards					
Form Factor	**Model**	**Board Architecture**	**Function Slots**	**Ethernet Capable**	**Features / Options**
3U OpenVPX	68G5	Xilinx 7015 ARM® Cortex®-A9	3	2x 1000Base-T or -KX	1 x1 PCIe, 1x RS-232 (debug-console), IPMC
6U OpenVPX	67G6	Xilinx UltraScale+ ARM® Cortex®-A53	6	2x 1000Base-T or -KX	2 x1 PCIe for motherboard communications, 2 x1 PCIe for direct module communications, 24x
3U cPCI	75G5	Xilinx 7015 ARM® Cortex®-A9	3	2x 1000Base-T	PCI, 1x I²C 1x RS-232 (debug-console)
6U VME	64G5	2x Xilinx 7015 ARM® Cortex®-A9	6	2x 1000Base-T	VME64x (bus master or slave), 1x RS-232 (debug-console)
PCI/PCIe	79G5	Xilinx 7015 ARM® Cortex®-A9	3	N/A	Single slot, full height, half-size PCIe 1 x1 PCIe, 1x RS-232 (debug-console)

Visit www.naii.com/products for a complete listing of available boards and specification detail.

Single Board Computers



Specifically designed for harsh environments in a range of demanding, embedded computing applications, NAI offers a comprehensive line of rugged Single Board Computers (SBCs) specifically designed for SWaP-constrained environments. These Commercial Off-the-Shelf SBCs are based on the latest Intel®, NXP® (Power-PC) and ARM® processors – each delivering unique advantages in deployed applications.

Board Support Packages (BSP) and Software Support Kits (SSK) are provided free of charge. In addition, SSKs are supplied with source code and board-specific library I/O APIs to facilitate system integration.

Configurable Single Board Computers

NAI's modular 3U and 6U rugged Single Board Computers can be configured with up to six NAI smart function modules (see list pg. 5-6) to deliver the highest packaging density and greatest flexibility in the industry.

Operating Systems:

- Windows® Embedded Standard 7 OS
- Wind River® VxWorks®
- Xilinx® PetaLinux
- Red Hat Linux®
- Wind River Linux®
- DDC-I Deos™

Single Board Computers					
Form Factor	**Model**	**Processor**	**Function Slots**	**SDRAM / On-board NVM SATA Flash**	**Features / Options**
3U OpenVPX	68ARM1	Xilinx 7015 ARM® Cortex®-A9	3	512 MB DDR3 / 32 GB	4 x1 PCIe, 1x SATA II (external), 2x 1000Base-T or -KX, 1x USB 2.0, 1x RS-232 (debug-console), IPMC
	68ARM2	Xilinx UltraScale+ ARM® Cortex®-A53	3	4 GB DDR4 w/ECC / 32 GB	6 x1 PCIe, 1x I²C or SATA II (external), 8x TTL (or 6x TTL & I2C), 2x 1000Base-T or -KX, 2x USB 2.0, 1x RS-232 (debug-console), IPMC
	68PPC2	NXP® QorIQ® T2080	2	8 GB DDR3 / 32 GB	4 x1 & 1 x4 PCIe, 1x I²C or SATA II (external), 4x TTL, 2x 1000Base-T or -KX, 2x USB 3.0, 1x RS-232 (debug-console), IPMC
	68INT4	Xeon ES-1505L	2	16 GB DDR4 w/ECC / 32 GB	4 x1 & 1 x4 PCIe, 1x PCIe (module slot), SATA II (external), 1x HDMI, 2x 1000Base-T or -KX, 1x USB 3.0, 1x RS-232 (debug-console), IPMC
6U OpenVPX	67PPC2	NXP® QorIQ® T2080	6	8 GB DDR3L w/ECC / 32 GB	Up to 8x PCIe, 1x I²C, SATA II (external), 4x TTL, 2x 1000Base-T or -KX, 2x USB 3.0, 1x RS-232 (debug-console), IPMC
3U cPCI	75INT2	Intel® Core™ i7	2	8 GB DDR3L / 32 GB	cPCI (master or slave), 2x 1000Base-T, VGA/ Video, 2x USB 2.0, 1x I²C, 1x RS-232 (debug-console)
	75PPC1	NXP® QorIQ® P2041	2	8 GB DDR3L / 32 GB	cPCI (master or slave), 1x I²C, SATA II (onboard), 8x TTL, 2x 1000Base-T, 1x USB 2.0, 1x RS-232 (debug-console)
	75ARM1	Xilinx 7015 ARM® Cortex®-A9	3	512 MB DDR3 / 32 GB	cPCI (master or slave), 2x 1000Base-T, 2x USB 2.0, 1x I²C, 1x RS-232 (debug-console)
6U VME	64ARM1	Xilinx 7015 ARM® Cortex®-A9	6	512 MB DDR3 / 32 GB	VME64x (master or slave), 1x I²C, 2x 1000Base-T, 1x USB 2.0, 1x RS-232 (debug-console)

Visit www.naii.com/products for a complete listing of available boards and specification detail.

Test & Measurement

NAI offers air cooled, commercial grade boards for production automated test & simulation as well as a portfolio of field-proven, high-precision instruments to support a range of applications including:

- Signal processing validation
- Prototype test & development
- Systems & control monitoring
- Calibration of navigation control, fire control, LVDT/RVDT simulation & test systems

Providing the ultimate in accuracy, speed, and repeatability, NAI's simulation & measurement instruments have become the industry standard for use in defense, commercial aerospace and industrial applications.

The embedded T&M circuit cards are available in 3U and 6U cPCI/VME/VPX and PCI/PCIe form factors. All Instrument models are available as rack mount or benchtop units and are self-calibrating. Easy to use high-resolution touch screens and programmable display options are standard across all models.

Air Cooled, Commercial Grade Boards

Most of NAI's COTS boards are available as either conduction or air-cooled models. Commercial grade, air-cooled models have an operating temperature range of 0° C to +70° C. More ruggedized versions available if required. Contact factory for additional details.

Angle Position Indicator - 8810A

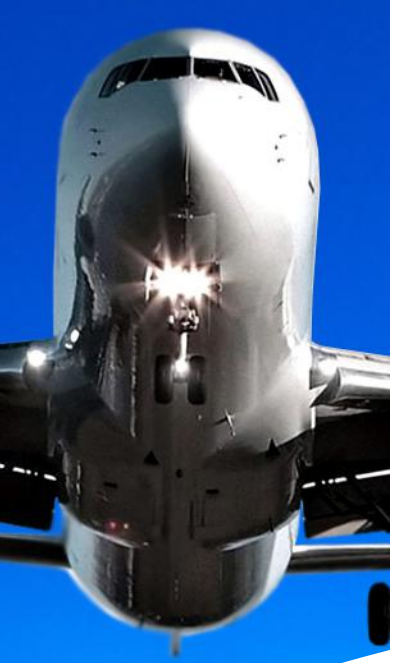
- Resolution: 0.0001°
- Accuracy: Up to ±0.0015°
- Two Isolated Input Channels
- Single or Two-Speed Measurements: Programmable Ratio from 2 to 255
- Three display modes: 0-360°, ±180° or degrees, minutes & seconds

Synchro/Resolver Simulator - 5330A

- Resolution: 0.001°
- Accuracy: up to ±0.003°
- One or Two Output Channels (Up to 6 VA per channel)
- Single or Two-Speed Simulation: Programmable Ratio from 2 to 255
- Two display modes: 0-360° and ±180°

Phase Angle Voltmeter - 2250A

- Two Galvanic Isolated Input Channels (Signal and Reference)
- Measures: Total, Fundamental, Harmonic, In-Phase, Quadrature, Frequency, THD, Ratio, Gain and LVDT/RVDT
- High Accuracy: 1 uV Nulling Sensitivity / Resolution: 0.00001°
- Frequency: Up to 1 MHz / Voltage: Up to 500 Vrms




Smarter, Smaller, Faster Solutions for Air, Land & Sea

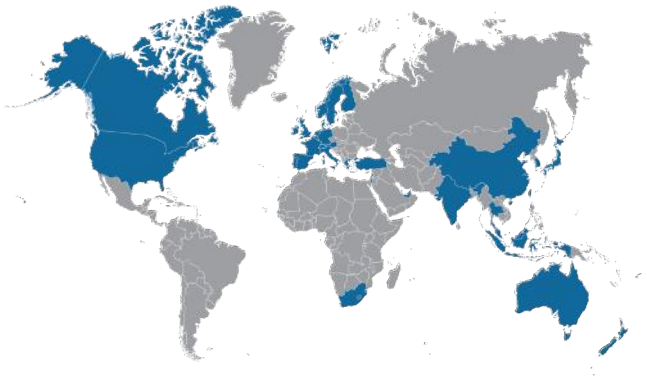
NAI's COSA® Architecture is helping some of the world's largest defense, commercial aerospace and industrial companies meet complex I/O & power requirements with high-density, COTS-based solutions in less space, with lower power requirements, no NRE and faster timelines than is possible with alternative solutions.

Quality

Our products use open standards, innovative designs and tight quality control to deliver reliability that reduces program risk and accelerates your time to mission. NAI's quality systems are certified to AS9100 Rev. D and ISO9001:2015 standards plus Federal Aviation Regulations FAR 21 & FAR 45.15

Support You Can Count On

NAI's network of 33 sales offices covering 35 countries support customers and programs on a global basis. Our technical sales and application engineers bring decades of experience in helping customers design and develop high-performance systems for mission critical applications. Call on us any time to discuss your requirements, investigate design options or troubleshoot a technical issue.



NAI Sales Coverage

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