



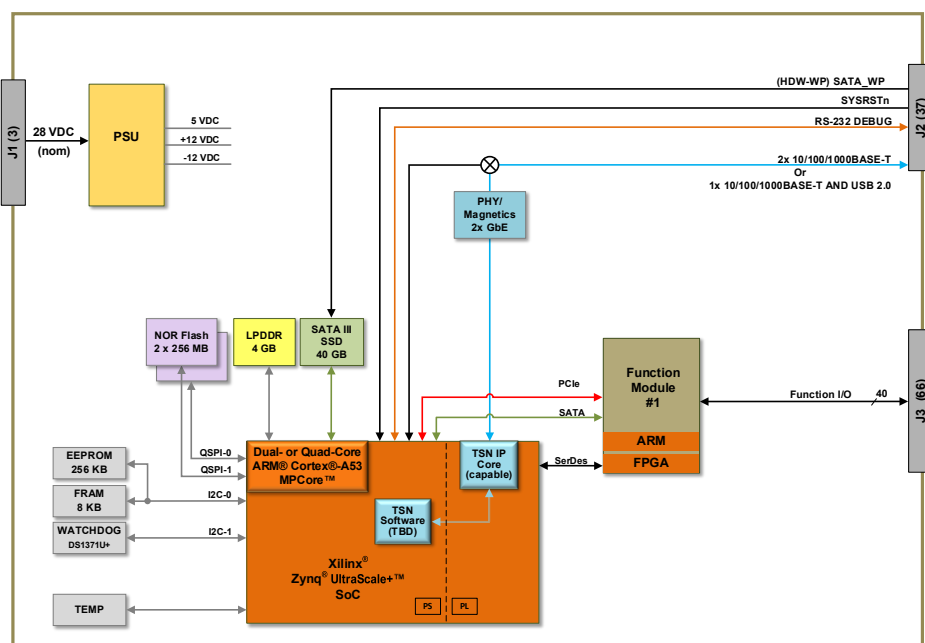
NIU1U – Nano Interface Unit

Rugged Embedded Multifunction I/O System with 1 Expansion COSA® Module Slot

The NIU1U is a compact, rugged, low-power, self-contained multifunction I/O system that can be configured with a single smart Configurable Open Systems Architecture™ (COSA®) function module. It incorporates a dual-core or quad-core ARM® Cortex®-A53 processor to support customer applications, as well as I/O and communications management.

The NIU1U supports either two 10/100/1000BASE-T (GbE) Ethernet ports, or one 10/100/1000BASE-T (GbE) Ethernet port with USB 2.0 and an RS-232 interface for maintenance, diagnostics, or configuration. Designed for rugged military and aerospace applications, the NIU1U provides a COTS-based solution that supports rapid deployment of SWaP-optimized systems across air, land, and sea platforms.

The NIU1U multifunction I/O and communications platform enables scalable system-level architectures for network-centric operations. The single module slot supports PCIe-capable COSA modules, including options for single-channel, tri-redundant TTEthernet/AFDX (ARINC 664 Part 7)/best-effort Ethernet, dual 10/100/1000BASE-T Ethernet, or dual-node, three-port FireWire (IEEE 1394).



Features

- **Supports one NAI smart I/O function module**
 - 100+ modules to choose from
 - Customer-configurable
 - COSA® architecture
- **Minimized SWaP Footprint**
 - 7.4" x 2.8" x 2.2" (incl. connectors)
 - ~1.75 lbs. (794 g)
 - 28 VDC Input @ ~0.25 A (est.) + Module Power (5-25 W typ. Operating, depending on configuration & application)
- **Ideally suited for:**
 - Nodal Access Unit (NAU)
 - Data Concentrator Unit (DCU)
 - Remote Interface Unit (RIU)
 - Health & Usage Monitoring System (HUMS)
- **Xilinx Zynq UltraScale+ SoC with Dual/Quad Core ARM-A53**
 - 4 GB LPDDR4 RAM
 - 40 GB SATA Flash
- **Connectivity**
 - 2x 10/100/1000 Base-T (GbE) (Optional)
 - 1x RS-232 debug port
 - 1x USB 2.0 (Optional)
- **Power Supply Hold-up (Optional)**
 - 50+ milliseconds of Holdup time
- **Continuous Background BIT**
- **Operating System Support**
 - Xilinx PetaLinux 2023.x
 - Wind River® VxWorks 7.x
 - DDC-I Deos
- **Commercial and Rugged applications***
 - MIL-STD-810
 - MIL-STD-461
 - MIL-STD-704
 - Operating temp: -40°C to +71°C

*Designed to meet. Characterizations pending. EMI/EMC requires shielded cables and proper grounding practices.

Select 1 independent function for your application

I/O Modules					
Function	Module	Description	Function	Module	Description
Analog-to-Digital	<u>AD1</u>	12 CH. A/D, ± 10 V, Dedicated, 256 kHz (max), Sigma-Delta	Digital IO - Differential Transceiver	<u>DF1</u>	16 CH. Differential I/O, Input: -10 V to +10 V (422), -7 V to +12 V (485) Output: -.25 V to +5 V
	<u>AD2</u>	12 CH. A/D, ± 100 V (max), Dedicated, 256 kHz (max), Sigma-Delta		<u>DF2</u>	16 CH. 16 Channel Enhanced Differential I/O
	<u>AD3</u>	12 CH. A/D, ± 25 mA, Dedicated, 256 kHz (max), Sigma-Delta	Discrete IO - Multichannel, Programmable	<u>DT1</u>	24 CH. Discrete I/O, 0-60 VDC Input/Output, Max Iout 500 mA - 2 A, Source/Sink (out)
	<u>AD4</u>	16 CH. A/D, ± 10 V, Multiplexed, 500 KHz Agg / 8 Ch, SAR		<u>DT2</u>	16 CH. Discrete I/O, ± 80 V Input/Output, Max Iout 600 mA, Isolated/Ch Switch (out)
	<u>AD5</u>	16 CH. A/D, ± 50 V, Multiplexed, 500 KHz Agg / 8 Ch, SAR		<u>DT3</u>	4 CH. Discrete Hi & Lo Side Switch Output @ 65V/2A (max), external individual supplied VCC & VSS per channel pair
	<u>AD6</u>	16 CH. A/D, ± 100 V, Multiplexed, 500 KHz Agg / 8 Ch, SAR		<u>DT4</u>	24 CH. Enhanced DT1
	<u>ADE</u>	16 CH. A/D, ± 10 V, Individual 16-bit SAR, 200 kHz max., Simultaneous Sampling		<u>DT5</u>	16 CH. Enhanced DT2
	<u>ADF</u>	16 CH. A/D, ± 100 V, Individual 16-bit SAR, 200 kHz max., Simultaneous Sampling	Relay	<u>RY1</u>	4 CH. Relay, 220V/2A @ 60W/62.5VA (Max), Non Latching
Digital-to-Analog	<u>DA1</u>	12 CH. D/A, ± 10 V, 25 mA Per Channel, Current or Voltage Control		<u>RY2</u>	4 CH. Relay, 220V/2A @ 60W/62.5VA (Max), Latching
	<u>DA2</u>	16 CH. D/A, ± 10 V, 10 mA Per Channel, No Current Control	Digital IO - TTL/CMOS	<u>TL1</u>	24 CH. TTL I/O, Standard Functionality, Programmable
	<u>DA3</u>	4 CH. D/A, ± 40 V, ± 100 mA, Voltage or Current Output		<u>TL2</u>	24 CH. TTL I/O, Enhanced Functionality, Programmable
	<u>DA4</u>	4 CH. D/A, ± 20 to ± 80 , 10 mA, Voltage Control Only	Variable Reluctance	<u>VR1</u>	8 CH. Variable Reluctance Signal Input and General-Purpose Pulse Counter, ± 100 V, 100 kHz (max)
	<u>DA5</u>	4 CH. D/A, High-Voltage/High-Current Half-Bridge (2 Channels Full-Bridge) External VCC Sourced Outputs			
Measurement & Simulation Modules					
Function	Module	Description	Function	Module	Description
AC Reference	<u>AC2</u>	2 CH. AC Reference Source, 47 Hz - 20 KHz, $\pm 3\%$ Acc, 2 - 28 Vrms, 6 VA (Max/Ch) Power	LVDT RVDT Measurement and Simulation	<u>LD4</u>	4 CH. LVDT/RVDT to Digital, 2-28 Vrms Input, 2-115 Vrms Exc, 10 KHz - 20 KHz Freq
	<u>AC3</u>	2 CH. AC Reference Source, 47 Hz - 2.5 KHz, $\pm 3\%$ Acc, 28 - 115 Vrms, 6 VA (Max/Ch) Power		<u>LD5</u>	4 CH. LVDT/RVDT to Digital, 28-90 Vrms Input, 2-115 Vrms Exc, 47 Hz - 1 KHz Freq
LVDT RVDT Measurement and Simulation	<u>LD1</u>	4 CH. LVDT/RVDT to Digital, 2-28 Vrms Input, 2-115 Vrms Exc, 47 Hz - 1 KHz Freq	Thermocouple and RTD Measurement	<u>RT1</u>	8 CH. Resistance Temperature Detectors (RTD), 2, 3, or 4 wire, 16 Bit Res, 16.7 Hz/Ch
	<u>LD2</u>	4 CH. LVDT/RVDT to Digital, 2-28 Vrms Input, 2-115 Vrms Exc, 1 KHz - 5 KHz Freq		<u>TC1</u>	8 CH. Thermocouple, 4.17 - 470 Hz, ± 100 mV A/D
	<u>LD3</u>	4 CH. LVDT/RVDT to Digital, 2-28 Vrms Input, 2-115 Vrms Exc, 5 KHz - 10 KHz Freq	Strain Gauge Measurement	<u>SG1</u>	4 CH. Strain Gauge, 4.7 Hz - 4.8 KHz, Measurement, Conventional 4-Arm Bridge

Communication Modules					
Function	Module	Description	Function	Module	Description
ARINC Communications	<u>AR1</u>	12 CH. ARINC 429, 100 KHz or 12.5 KHz, RX/TX, 256 Word Tx/Rx Buffer	MIL-STD-1553B	<u>FTE</u>	2 CH. MIL-STD-1553 (AMC), BC, RT, BM, BM/RT, 128 KB RAM Per Channel, Direct Coupled
	<u>AR2</u>	1 CH. ARINC 568 (CH-1, RX & TX) & 1 Channel ARINC 579 (CH-2, Programmable RX or TX), 1024-Word TX & RX Buffers per Ch.		<u>FTF</u>	4 CH. MIL-STD-1553 (AMC), BC, RT, BM, BM/RT, 128 KB RAM Per Channel, Direct Coupled
CANBus Communications	<u>CB1</u>	8 CH. CANBus, CAN 2.0 A/B, 16 K RX/TX Buffer, 1 Mb/s Max Data Rate	MIL-STD-1760	<u>FTJ</u>	1 CH. MIL-STD-1760 (1553), BC, RT, BM, BM/RT, 128 KB RAM, Transformer Coupled
	<u>CB2</u>	8 CH. CANBus, J1939, 16 K RX/TX Buffer, 500 kb/s Max Data Rate		<u>FTK</u>	2 CH. MIL-STD-1760 (1553), BC, RT, BM, BM/RT, 128 KB RAM Per Channel, Transformer Coupled
	<u>CB3</u>	8 CH. CANBus, CAN 2.0 A/B (CB1) or J1939 (CB2) protocol layer programmable per channel	Serial Communications	<u>SC1</u>	4 CH. Serial, RS-232/422/423 (MIL-STD-188C)/485, Non Isolated
MIL-STD-1553B	<u>FTA</u>	1 CH. MIL-STD-1553 (AMC), BC, RT, BM, BM/RT, 128 KB RAM, Transformer Coupled		<u>SC3</u>	8 CH. (max) RS-232/422/485 Serial Communications or GPIO, Programmable, Non-isolated
	<u>FTB</u>	2 CH. MIL-STD-1553 (AMC), BC, RT, BM, BM/RT, 128 KB RAM Per Channel, Transformer Coupled		<u>SC5</u>	4 CH. RS-232/422/485 communications, isolated per channel and from SYS GND
	<u>FTC</u>	4 CH. MIL-STD-1553 (AMC), BC, RT, BM, BM/RT, 128 KB RAM Per Channel, Transformer Coupled		<u>SC6</u>	4 CH. RS-232/422/485 communications, individual SYS GND provided per channel (non-isolated)
	<u>FTD</u>	1 CH. MIL-STD-1553 (AMC), BC, RT, BM, BM/RT, 128 KB RAM, Direct Coupled			
Storage					
Function	Module	Description	Function	Module	Description
SATA Solid State Drive (SSD)	<u>FM2</u>	1 CH. 480 GB MLC SATA Flash, extended temp -40°C to 85°C operation	SATA Solid State Drive (SSD)	<u>FM8</u>	1 CH. 1 TB SATA TLC NAND Flash, Extended Temperature Operation
	<u>FM7</u>	1 CH. 1 TB SATA Flash, 3D NAND MLC, 0-70 °C operation		<u>FM9</u>	1 CH. 1.92 TB SATA TLC NAND Flash, Extended Temperature Operation
Combination Modules					
Function	Module	Description	Function	Module	Description
Combo	<u>CM5</u>	2 CH. Dual-redundant MIL-STD-1553 & 8 Channel ARINC 429/575, 100 KHz or 12.5 KHz, RX or TX, 256 Word Tx/Rx Buffer	Combo	<u>CME</u>	8 CH. ±10V A/D (ADE-type) & 8 Channels ±10V D/A (DA2-type), Combination
	<u>CM8</u>	2 CH. Dual-redundant MIL-STD-1553 & 12 Channel Discrete I/O, 0-60 VDC Input/Output, Max Iout 500 mA - 2 A, Source/Sink (out)			

Board Support Package and Software Support

The NIU1U includes BSP and SDK support for Wind River® VxWorks® / Linux and Xilinx® PetaLinux tools. In addition, software support kits are supplied, with source code and board-specific library I/O APIs, to facilitate system integration. Each I/O function has dedicated processing, unburdening the SBC from unnecessary data management overhead.

Background Built-In-Test (BIT)

BIT continuously monitors the status of all I/O during normal operations and is totally transparent to the user. SBC resources are not consumed while executing BIT routines. This simplifies maintenance, assures operational readiness, reduces life-cycle costs and— keeps your systems mission ready.

Architected for Versatility

NAI's Configurable Open Systems Architecture™ (COSA®) offers a choice of over 100 smart I/O, communications, or Ethernet switch functions, providing the highest packaging density and greatest flexibility of ruggedized embedded product solutions in the industry. Preexisting, fully-tested functions can be combined in an unlimited number of ways quickly and easily.

One-Source Efficiencies

Eliminate man-months of integration with a configured, field-proven system from NAI. Specification to deployment is a seamless experience as all design, state-of-the-art manufacturing, assembly and test are performed - by one trusted source. All facilities are located within the U.S. and optimized for high-mix/low volume production runs and extended lifecycle support.

Product Lifecycle Management

From design to production and beyond, NAI's product lifecycle management strategy ensures the long-term availability of COTS products through configuration management, technology refresh and obsolescence component purchase and storage.

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