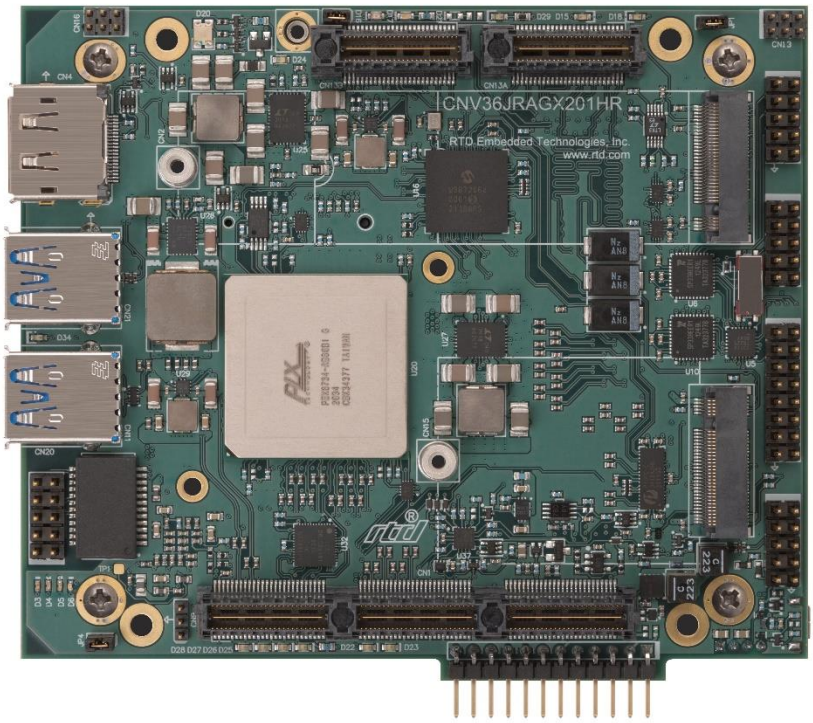
CNV36JRAGX cpu/gpuModules™



User's Manual

BDM-610000091 **Revision A**

PC/104

www.rtd.com

DESIGNED AND MADE IN THE UNITED STATES

AS9100 - ISO 9001 CERTIFIED

rtd®

"Accessing the Analog World"®

CNV36JRAGX cpu/gpuModules™ User's Manual

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Revision History

Revision	Date	Reason for Change
A	4/01/2025	Initial release

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Chapter 1 Introduction

This manual provides comprehensive hardware and software information for users developing with the CNV36JRAGX PCIe/104 PCIe/104 cpu/gpuModule.

Note: Read the specifications beginning on page 12 prior to designing with the cpu/gpuModule.

This manual is organized as follows:

Chapter 1 ***Introduction***
Introduces main features and specifications.

Chapter 2 ***Getting Started***
Provides abbreviated instructions to get started quickly.

Chapter 3 ***Connecting the cpu/gpuModule***
Provides information on connecting the cpu/gpuModule to peripherals.

Chapter 4 ***Using the cpu/gpuModule***
Provides information to develop applications for the cpu/gpuModule, including general cpu/gpuModule information, detailed information on storing both applications and system functions, and using utility programs.

Appendix A ***Hardware Reference***
Lists jumper locations and settings, physical dimensions, and processor thermal management.

Appendix B ***Troubleshooting***
Offers advice on debugging problems with your system.

Appendix C ***IDAN® Dimensions and Pinout***
Provides connector pinouts for the cpu/gpuModule installed in an RTD Intelligent Data Acquisition Node (IDAN®) frame.

Appendix D ***Additional Information***
Lists sources and websites to support the cpu/gpuModule installation and configuration.

Appendix E ***Limited Warranty***

CNV36JRAGX cpu/gpuModule

RTD's CNV36JRAGX cpu/gpuModule represents the latest in high performance PCIe/104 embedded controllers with a Type 2 bus. This design is based on the NVIDIA® Jetson AGX Orin system-on-module (SOM).

The CNV36JRAGX carrier utilizes the PLX PEX8734 to bifurcate the Jetson Orin x8 PCIe Gen 3 lane into 4x1 and 2x4 lanes that can be access on the PCIe/104 Type 2 bus. This feature allows the user to access to vast selection of PCIe/104 peripheral cards, this expands the capabilities of the NVIDIA® Jetson Orin SOM.

The carrier also breaks out three additional PCIe lanes from the Jetson Orin SOM. A PCIe x1 to the M.2 E-key socket board for wireless modules, PCIe x1 lane to the M.2 B-key socket board for cellular modules, and PCI x4 lane the M.2 M-key socket for NVMe SSDs. The Jetson Orin SOM doesn't provide any SATA ports, due to this limitation the users can expanded storage by using an additional carrier board (SSD34200/SSD34100). This addon carrier provides one or two addition M.2 B+M-keys, via the PCIe/104 connector. The user may populate these slots with additional NVMe drives.

The Jetson Orin SOM features an xHCI controller that supplies three USB 3.2 connections, each with up to 10 Gb/s data throughput. These ports are connected as follows: USB Type A (**CN11**), and onboard USB hub. The use of a USB hub allows for four additional USB 3.2 ports, though these will share the 10 Gb/s bandwidth. Two of these connections route to the top PCIe/104 connector, one provided to M.2 B-Key, and one connects to the USB A (**CN21**) connector. An additional USB 2.0 port is available through the Utility port (**CN5**), which, when used with the XK-CM107 cable kit, provides two USB ports ideal for connecting a keyboard and mouse.

Other features of the CNV36JRAGX include two RS-232/422/485 software-configurable serial ports. One of these ports (**CN7**) is multiplexed with a CAN transceiver, allowing the user to select between serial and CAN communication. RTD provides a simple shell script to configure the ports at runtime. Additionally, the CNV36JRAGX offers 14 digital I/O (DIO) pins, with a shell script available from RTD to demonstrate how to utilize them.

Furthermore, the NVIDIA® Jetson Orin SOM includes both a display controller and an Ethernet interface. The CNV36JRAGX carrier connects to these interfaces as follows: the display controller connects to a DisplayPort (DP++) connector, providing audio and video, while the Ethernet interface is available through a DIL 0.1" header, with the XK-CM83 offering a standard RJ-45 connector.

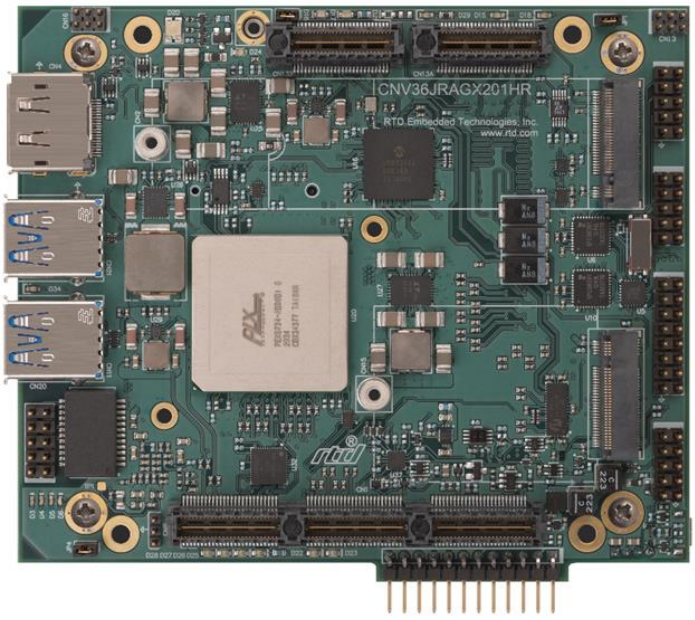

Figure 1 CNV36JRAGX cpu/gpuModule (top view)

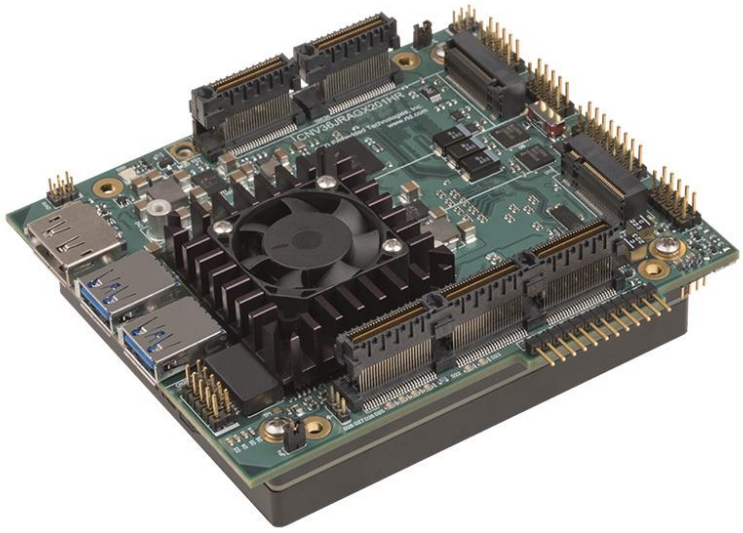

Figure 2 CNV36JRAGX cpu/gpuModule (With AGX and no fan heatsink)

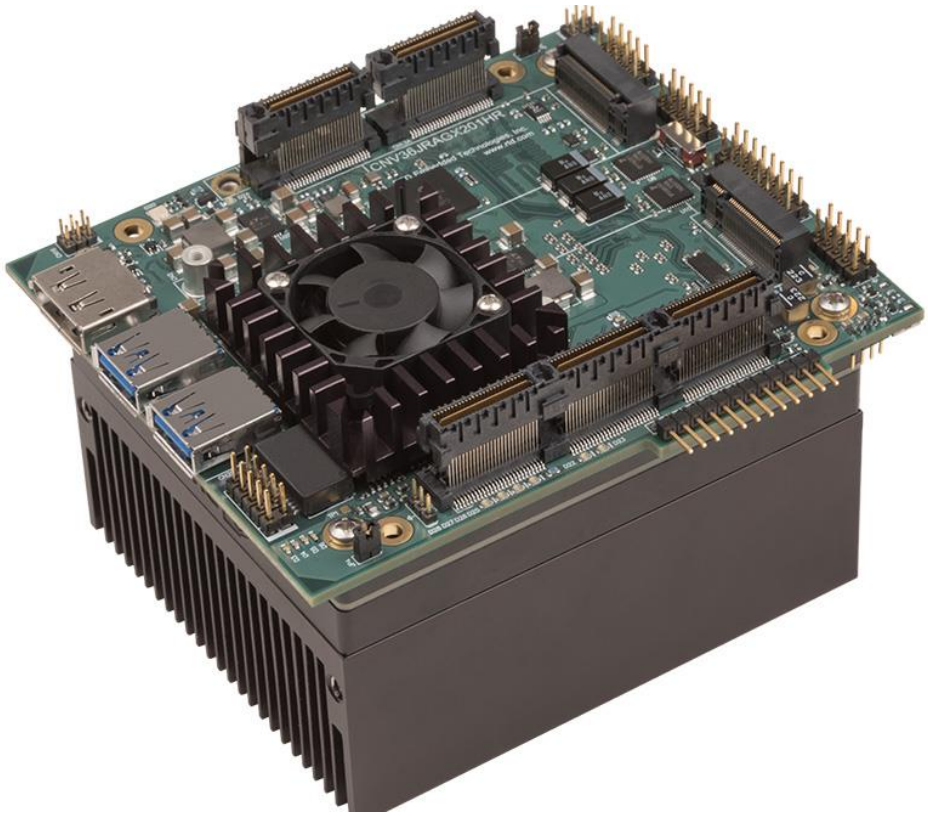

Figure 3 CNV36JRAGX cpu/gpuModule (With AGX and fan heatsink)

You can easily customize the cpu/gpuModule by stacking PCI/104-Express or PCIe/104 modules such as video controllers, Digital Signal Processors, drive carriers, LAN controllers, or analog and digital data acquisition modules. Stacking modules onto the cpu/gpuModule avoids expensive installations of backplanes and card cages and preserves the module's compactness.

The cpu/gpuModule is verified with Linux for Tegra operating system. Contact tech support for latest tested and supplied NVIDIA jetpack version.

Ordering Information

The CNV36JRAGX cpu/gpuModule is available with two heatsink solutions: an actively cooled heatsink or a passively cooled flat heat spreader. The cpu/gpuModule can also be purchased as part of an Intelligent Data Acquisition Node (IDAN®) building block, which consists of the cpu/gpuModule and a milled aluminum IDAN® frame. The IDAN® building block can be used in just about any combination with other IDAN® building blocks to create a simple but rugged PC/104 stack.

Refer to Appendix C IDAN® Dimensions and Pinout, for more information. The CNV36JRAGX cpu/gpuModule can also be purchased as part of a custom-built RTD HiDAN® or HiDANplus® High Reliability Intelligent Data Acquisition Node. Contact RTD for more information on its high reliability PC/104 systems.

CNV36JRAGX Model Options

The basic cpu/gpuModule model options are shown below. Refer to the RTD website (www.rtd.com) for more detailed ordering information and any new variations that may be available.

Table 1 CNV36JRAGX cpu/gpuModule Model Options

Part Number	Description
CNV36JRAGX201HR-X01	NVIDIA® Jetson AGX Orin CPU module with standard heat sink (8 CPU, 1792 GPU, 56 Tensor cores, 32GB memory, external storage)
CNV36JRAGX201HR-X02	NVIDIA® Jetson AGX Orin CPU module with standard heat sink (12 CPU, 2048 GPU, 64 Tensor cores, 64GB memory, external storage)
CNV36JRAGX201HR-A01	NVIDIA® Jetson AGX Orin Industrial CPU module with standard heat sink (12 CPU, 2048 GPU, 64 Tensor cores, 64GB memory, external storage)
CNV36JRAGX201HRF-###	NVIDIA® Jetson AGX Orin /AGX Orin Industrial CPU module listed above with flat heat spreader
IDAN-CNV36JRAGX201HR-###	NVIDIA® Jetson AGX Orin /AGX Orin Industrial CPU module listed above in an IDAN® frame

Cable Kits and Accessories

For maximum flexibility, RTD does not provide cables with the cpu/gpuModule. You may wish to purchase the CNV36JRAGX cpu/gpuModule cable kit (XK-CM124), which contains:

- Utility Port 2.0 multi-function cable
  - 2x USB 2.0 ports, battery, reset button, power button, speaker
- Digital I/O cable (DIL-16 to DSUB-25)
- Two serial port cables (DIL-10 to DSUB-9)
- One Ethernet cable (DIL-10 to RJ-45)

For additional accessories, refer to the RTD website.

Board Features

NVIDIA® Jetson Orin system-on-module Options

Part Number	Cores	Core Frequency	Memory	AI Performance	NVIDIA P-Number
CNV36JRAGX201HR-40	8	2.2GHz	32GB	200 TOPs	P3701-0004
CNV36JRAGX201HR-50	12	2.2GHz	64GB	275 TOPs	P3701-0005
CNV36JRAGX201HR-80	12	2GHz	64GB	248 TOPs	P3701-0008
IDAN-CNV36JRAGX201HR-40	8	2.2GHz	32GB	200 TOPs	P3701-0004
IDAN-CNV36JRAGX201HR-50	12	2.2GHz	64GB	275 TOPs	P3701-0005
IDAN-CNV36JRAGX201HR-80	12	2GHz	64GB	248 TOPs	P3701-0008

I/O

- Networking
  - 10/100/1000 Gigabit Ethernet
- Display Controller
  - One DisplayPort 1.4a
  - Support for MST (Multi-Stream Transport)
  - Maximum Resolution 7680x4320
- Software-configurable RS-232/422/485 serial ports, CAN port
  - 120 Ohm Termination resistors for RS-422/485 through sof0tware Configuration
  - Fully jumper-less configuration
  - CN7 Configurable as Serial or CAN
- Digital I/O (DIO)
  - 14-bit programmable GPIO
- PCIe/104 Type 2 bus
  - Four PCI Express x1 Links
  - Two PCI Express x4 Links
  - Two USB 3.2 (10Gb/s, Shares Bandwidth CN21)
- Two USB 3.2 Type A
  - CN21 (10Gb/s, Shares Bandwidth with PCIe/104 USB Ports)
  - CN11 (10Gb/s, Direct Connect)
  - Automatic resettable over-current protection (1A @ 5 Vdc)
- M.2 expansion slots
  - E-key slot for Wi-Fi/Bluetooth connectivity with PCIe, USB 2.0 and I2S interfaces (supported card sizes 3030 or 2230)
  - M-key slot for SSD with PCIe (supported card size 2282)
  - B-key slot for cellular modems or SSDs
- Utility Port 2.0 Connector
  - 1x USB 2.0 (Universal Serial Bus) Port with 500 mA over-current protection
  - Hardware Reset input
  - Soft Power Button input
  - Battery input for Real Time Clock

- Auxiliary Power Connector
  - Supplies both 5V and 12V to the system.
  - If you plan to power the board through the Auxiliary connector you must connect all pins to ensure enough power is supplied to the board. The power cable should be twisted together and not be more than 2 ft. in length to ensure proper power delivery.
- Advanced Thermal Management
  - Thermal Throttling reduces clock speed to prevent thermal runaway.
  - Auto Fan Control only runs fan when needed.
  - Mini Fan Heatsink with Auto Fan control.
  - Passive Structural Heatsink & Heatpipes in IDAN® and HiDAN® System Configurations
- Power Management
  - ATX support for “Soft Off”
  - ATX Power signals

Block Diagram

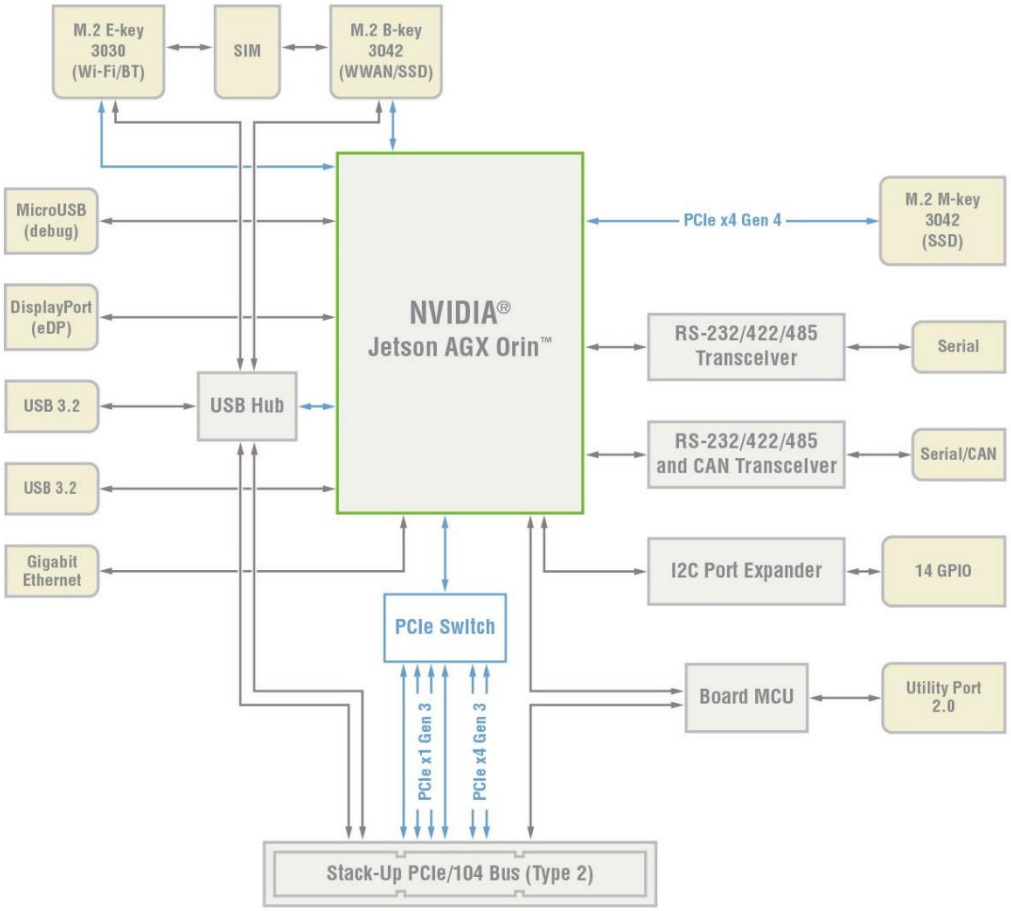

Figure 4 CNV36JRAGX cpu/gpuModule Simplified Block Diagram

Specifications

Physical Characteristics

Basic dimensions and the weight of the CNV36JRAGX are listed below. For a more detailed dimensional drawing, refer to the Physical Dimensions section.

- Dimensions
  - Board Size (connectors not included)
    - Length (L): 95.885mm L (3.775")
    - Width (W): 115.57 mm W (4.550")
- Stand-off Height Above the CPU:
  - All versions: 22.0mm (0.866")
- Weight: Approximately 0.840 Kg (1.85 lbs.) with fan Heatsink
- Weight: Approximately 0.489 Kg (1.08 lbs.) with flat Heat spreader
- Weight: Approximately 0.184 Kg (0.41 lbs.)
- IDAN Weight: Approximately 1.38 Kg (3.05 lbs.)

Power Consumption

Exact power consumption depends on the actual application. Typical power consumption of the CNV36JRAGX is listed in **Table 2**.

Table 2 Max Power Consumption

Part Number	Max Power Consumption
CNV36JRAGX201HR-40	56 W
CNV36JRAGX201HR-50	TBD W
CNV36JRAGX201HR-80	90 W

Operating Conditions

Table 3 Operating Conditions

Symbol	Parameter	Test Condition	Min.	Max.
V_{CC5}	5V Supply Voltage		4.75V	5.25V
V_{CC12}	12V Supply Voltage		11.4V	12.6V
V_{CCSTBY}	5V Standby Voltage		4.75V	5.25V
I_{CCSTBY}	5V Standby Current			- 800mA
T_a	Ambient Operating Temperature[1]		-25	+70°C
		CNV36JRAGX201HR-80	-40	+85°C
T_S	Storage Temperature		-40	+85°C
R_h	Humidity	Non-Condensing	0	90%
MTBF	Mean Time Before Failure (hours)	CNV36JRAGX201HR	TBD	

1. With supplied heat sink solution. Depending on the CPU usage, performance may degrade as the ambient temperature approaches the maximum. Contact RTD Tech Support for more information.
2. Calculation Model: Telcordia Issue 2; Calculation Method: Method 1 Case 3; Temperature: +30°C; Environment: Ground Benign, Controlled

Electrical Characteristics

The **Table 4** below lists the Electrical Characteristics of the CNV36JRAGX. Operating outside of these parameters may cause

permanent damage to the cpu/gpuModule.

Table 4 Electrical Characteristics

Symbol	Parameter	Test Condition	Min.	Max.
		USB Ports		
I_{OC}	Overcurrent Limit	Each Port USB 2.0	500 mA	750 mA
I_{OC}	Overcurrent Limit	Each Port USB 3.2	1.0 A	1.3 A
		Serial Ports - RS-232		
V_I	Input Voltage Range	—	-15 V	+15V
V_O	Output Voltage Swing	R_L= 3k	±-5.0 V	±7.0 V
V_{IH}	Input Voltage High	—	1.5 V	2.0 V
V_{IL}	Input Voltage Low	—	0.6 V	1.2 V
		Serial Ports - RS-422/485		
V_{OD1}	Differential Output	R_L = 100 Ohm	2.0 V	—
V_{OD2}	Differential Output	R_L = 54 Ohm	1.5 V	—
V_{OC}	Common Mode Output	R_L = 54 or 100 Ohm	—	3.0 V
V_{TH}	Differential Input Threshold	—	-200 mV	-50 mV
V_I	Absolute Max Input Voltage	—	-12 V	-12 V
		CAN Bus		
$V_{O(D)H}$	Bus Output Voltage Dominant CANH	R_L=60Ω	2.45 V	3.3V
$V_{O(D)L}$	Bus Output Voltage Dominant CANL	R_L=60Ω	0.5 V	1.25V
$V_{O(R)}$	Bus Output Voltage Recessive	R_L=60Ω	—	1.85 V
$V_{OD(D)}$	Differential Output Voltage Dominant	R_L=50-65Ω	1.6 V	3V
$V_{OD(R)}$	Differential Output Voltage Dominant	R_L=60Ω	-120 mV	120 mV
$I_{OS(D)}$	Output Short Circuit Current Dominant	V_{CANH}=-12V	-200 mA	—
$I_{OS(D)}$	Output Short Circuit Current Dominant	V_{CANL}=12V	—	200mA
$I_{OS(R)}$	Output Short Circuit Current Recessive	$V_{CANH,CANL}$ =-12V…+12V	-5 mA	5 mA
V_{TH}	Differential Input Threshold		500 mV	900 mV
V_{CM}	Common Mode Range		-12 V	-12 V
		DIO		
I_{OH}	Output Current Source	V_{OH} = 2.4 V	29 mA	
I_{OL}	Output Current Sink	V_{OL} = 0.5 V	17 mA	
V_{IH}	Input Voltage High	—	1.8 V	6 V
V_{IL}	Input Voltage Low	—	-0.3 V	0.8 V
I_{DIOvcc}	Supply current	—		1 A
		Utility Port 2.0 Connector (CN5)		
V_{RTC}	Input RTC Voltage[1]	—	1.85 V	3.6 V
I_{RTC}	RTC Battery Current	—		50 uA
$I_{UTILvcc}$	Utility Supply Current	—		1 A

1. Date and time lost when power is completely removed from the system including the CMOS battery. Date and time are not required for board operation. Default values will be set on the next power cycle.

Contact Information

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Chapter 2 Getting Started

For many users, the factory configuration of the CNV36JRAGX cpu/gpuModule can be used to get a PC/104 system operational. You can get your system up and running quickly by following the simple steps described in this chapter, which are:

1. Before connecting the cpu/gpuModule, the user must be properly grounded to prevent electrostatic discharge (ESD). For more information, refer to Proper Grounding Techniques on page 18
2. Connect the Utility Port 2.0.
3. Connect a USB keyboard and mouse.
4. Connect a monitor to the DisplayPort.
5. Connect power.
6. Boot

Refer to the remainder of this chapter for details on each of these steps.

Selecting the Stack Order for the CNV36JRAGX

There are several things to consider when selecting the order of boards in the stack. Before selecting the order, be sure to determine which bus connector on each board is the “Active” bus. Typically, if a peripheral module has both PCIe and PCI bus connectors, only the PCIe is active, and the PCI is pass-through. The following is a list of rules to use to determine the stack order:

1. The PCIe connector is on the top of the cpu/gpuModule, therefore it must be the bottom most card in the stack.
2. The CPU module has no direct SATA links. Any added SSD functionality will consume PCIe resources.
3. Generally, keep higher speed boards closer to the CPU.
4. If using lane repopulation, consume all lanes before making the last lane repopulate, to preserve bandwidth.
5. Keep the power supply as close as possible to the CPU due to the high instantaneous current demands of the CPU.

Connecting to the Stack

The bus connectors of the cpu/gpuModule are simply plugged onto a PC/104 stack to connect to other devices. Follow the procedure below to ensure that stacking of the modules does not damage connectors or electronics.

WARNING: Do not force the module onto the stack! Wiggling the module or applying too much pressure may damage it. If the module does not readily press into place, remove it, check for bent pins or out-of-place keying pins, and try again.

For mechanical dimensions, including board-to-board spacing, see Physical Dimensions.

1. Turn off power to the PC/104 system or stack.
2. Always work at an ESD protected workstation and wear a grounded wrist-strap.
3. Select and install stand-offs to properly position the cpu/gpuModule on the stack.
4. Remove the cpu/gpuModule from its anti-static bag.
5. Check that pins of the bus connector are properly positioned.
6. Check the stacking order; make sure all the busses used by the peripheral cards are connected to the cpu/gpuModule.
7. Hold the cpu/gpuModule by its edges and orient it so the bus connector pins line up with the matching connector on the stack.
8. Gently and evenly press the cpu/gpuModule onto the PC/104 stack.

Connecting to the Utility Port 2.0

The Utility Port 2.0 connector (**CN5**) implements the following interfaces:

- One USB 2.0 port
- Hardware Reset input
- Battery input for Real Time Clock
- Soft Power Button input

To use these interfaces, you must connect to the Utility Port 2.0 connector (**CN5**). The Utility Port 2.0 cable from the RTD cable kit provides a small speaker, two USB 2.0 ports for a keyboard and mouse, a push-button for resetting the system, a soft-power button, and a lithium battery to provide backup power for the real time clock.

Refer to Utility Port 2.0 Connector (CN5) on page 21 to connect devices to the Utility Port 2.0 connector.

Power Input Connections

Power to the board must come from the top PCIe/104 Type 2 bus connector (**CN1**), or the auxiliary power connector (**CN3**). These connectors provide the required +5V DC and +12V DC voltage rail input to the cpu/gpuModule.

Booting the CNV36JRAGX cpu/gpuModule for the First Time

You can now apply power to the cpu/gpuModule. The CNV36JRAGX will be shipped with pre-loaded image of Linux for Tegra (L4T) based on Ubuntu. Upon first boot, the cpu/gpuModule will boot to the Ubuntu software license agreement page. After agreeing to the software license, the user will be prompted to assign a username and password. This will be the root username and password for the system.

Chapter 3 Connecting the cpu/gpuModule

This chapter provides information on all CNV36JRAGX cpu/gpuModule connectors.

Connector Locations – page 18

Auxiliary Power (CN3) – page 20

Utility Port 2.0 Connector (CN5) – page 21

DisplayPort Connector (CN4) – page 23

Serial Port 1 (CN7) and Serial Port 2 (CN8) – page 24

Ethernet (10/100/1000Base-T and -TX) Connector (CN20) – page 28

PCIe/104 Type 2 Bus (CN1 - TOP) – page 29

Reserved Connectors – page 32

Proper Grounding Techniques

Before removing the CNV36JRAGX from its static bag, proper grounding techniques must be used to prevent electrostatic discharge (ESD) damage to the cpu/gpuModule. Common grounding procedures include an anti-static mat on a workbench, which may connect to an anti-static wrist strap (also known as an ESD wrist strap) on the wrist of the technician or engineer.

Connector Locations

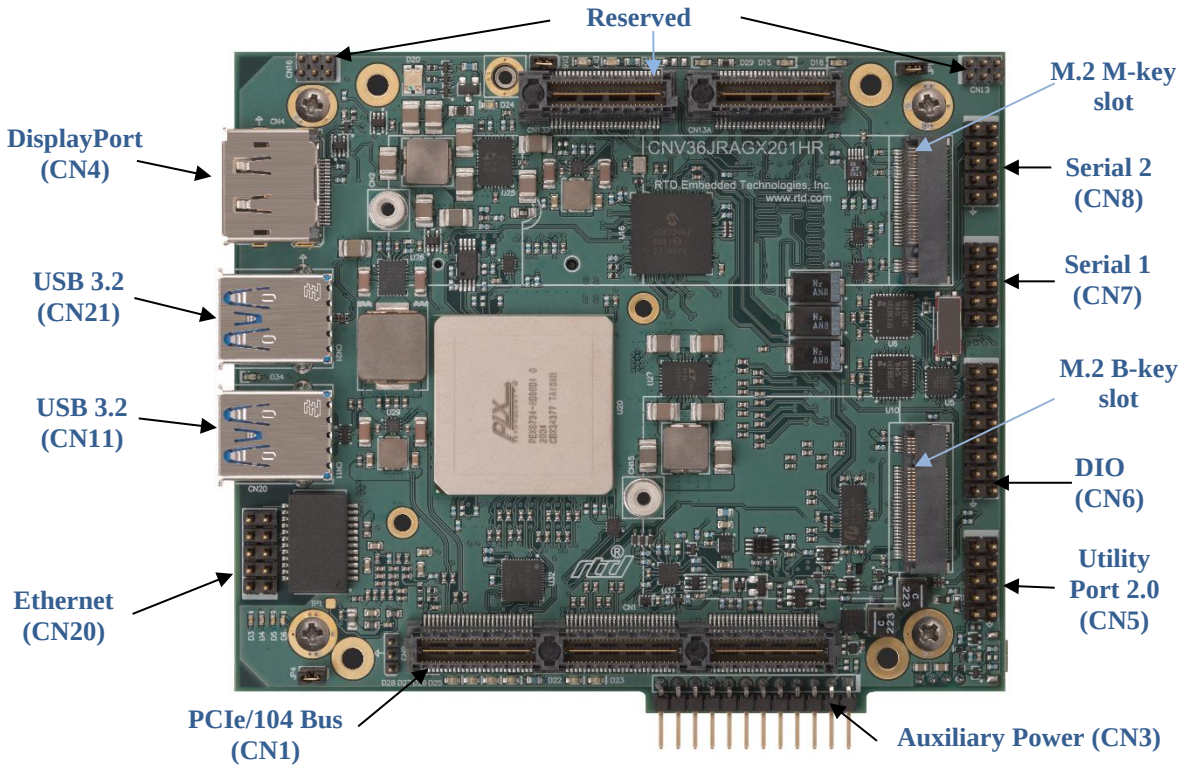


Figure 5 CNV36JRAGX cpu/gpuModule (top view)

Note Pin 1 of each connector is indicated by a white silk-screened square on the top side of the board and a square solder pad on the bottom side of the board. Pin 1 of the bus connectors match when stacking PC/104 modules.

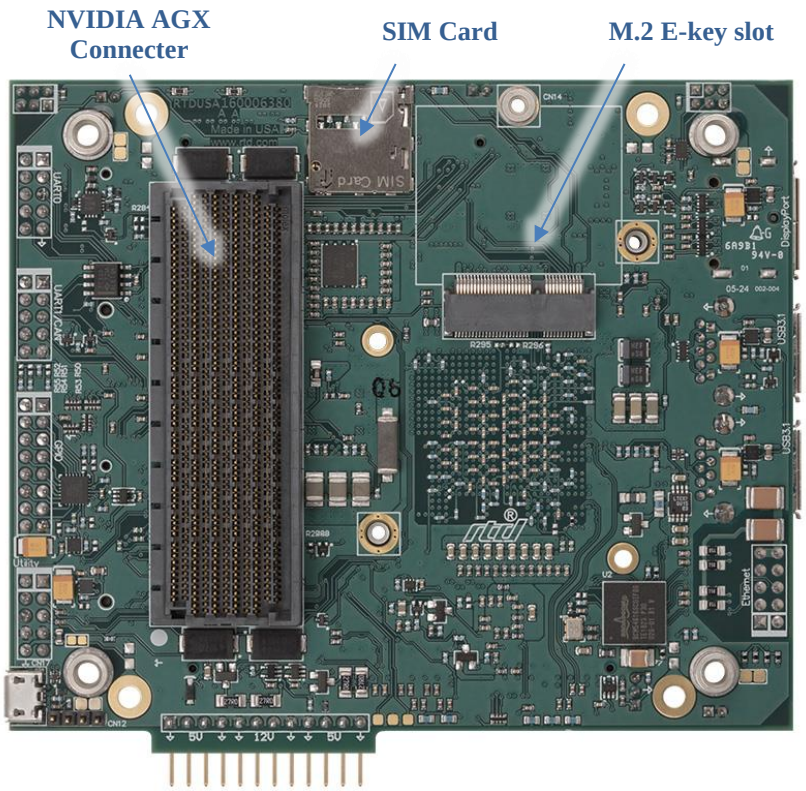


Figure 6 CNV36JRAGX cpu/gpuModule (bottom view)

Table 5 CNV36JRAGX Basic Connectors

Connector	Function	Size and Pitch	Mating Connector
CN1	PCIe/104 Type 2 Bus	—	Samtec ASP-129637-03
CN3	Auxiliary Power	1x12, 0.1”	FCI 65039-025LF (housing model number)
CN4	DisplayPort	—	—
CN5	Utility Port 2.0	2x5, 0.1”	3M 89110-0001
CN6	Digital I/O	2x8, 0.1”	3M 89116-0001
CN7	Serial Port 1 / CAN	2x5, 0.1”	3M 89110-0001
CN8	Serial Port 2	2x5, 0.1”	3M 89110-0001
CN9	Fan	1x3 2mm	FCI 69305-003LF
CN11	USB 3.2	—	—
CN21	USB 3.2	—	—
CN12	Fan	1x4 2mm	FCI 69305-004LF
CN20	Ethernet	2x5 0.1”	3M 89110-0001
CN12	M.2 E-Key	—	—
CN2	M.2 M-Key	—	—
CN15	M.2 B-Key	—	—
CN17x	USB Debug Port	—	—

Auxiliary Power (CN3)

The Auxiliary Power connector can be used to supply power to devices that are attached to the cpu/gpuModule. These devices include hard drive, front-end boards for data acquisition systems, and other devices.

Power can also be conveyed to the module through the Auxiliary Power connector (**CN3**). The CNV36JRAGX cpu/gpuModule requires +5 VDC, +12VDC and ground for operation.

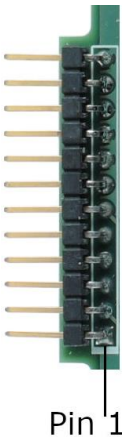
Note: Although it is possible to power the cpu/gpuModule through the Auxiliary Power connector, the preferred method is to power it through the bus connector from a power supply in the stack. The cpu/gpuModule can have large current transients during operation, which make powering it through wires difficult. Powering through the bus eliminates problems such as resistive voltage drop and lead inductance transients.

WARNING: There is no reverse voltage or over-voltage protection on CN3. The user is responsible for any over-voltage and reverse voltage protection that would be necessary to power through CN3. Over-voltage and reverse voltage damage on CN3 will void the warranty.

If using the Auxiliary Power connector to power the system, care must be taken to ensure good power connections. The power and ground leads must be twisted together, or as close together as possible to reduce lead inductance. A separate lead must be used for each of the power pins. All 5V, 12V pins and all ground pins must be connected. Do not use wire smaller than 20 gauge. The power supply solution must be verified by measuring voltage at the Auxiliary Power Connector and verifying that it meets the input voltage specifications. The voltage at the connector should be checked with an oscilloscope while the system is operational.

Table 6 Auxiliary Power Connector (CN3)

Pin	Signal	Function
1	GND	Ground
2	+5 V	+5 Volts DC
3	+5 V	+5 Volts DC
4	GND	Ground
5	GND	Ground
6	+12 V	+12 Volts DC
7	+12 V	+12 Volts DC
8	GND	Ground
9	GND	Ground
10	+5 V	+5 Volts DC
11	+5V	+5 Volts DC
12	GND	Ground



Utility Port 2.0 Connector (CN5)

The Utility Port 2.0 connector implements the following functions:

- USB 2.0 (Universal Serial Bus) Port
- Hardware Reset input
- Soft Power Button input
- Battery input for Real Time Clock

The NVIDIA® Jetson series cpu/gpuModule does not provide speaker functionality, therefore pin 1 is not connected. It is safe to use any device that has speaker connected to pin 1 (eg. ADP076 utility module).

Figure 7. Utility Port 2.0 Accessory Cable XK-CM107

Table 7 provides the pinout of the Utility Port 2.0 connector.

Table 7 Utility Port 2.0 Connector (CN5)

Pin	Signal	Function	In/Out
1	NC	Not Connected	—
2	PWR	+5 V	out
3	RESET#	Manual Push-Button Reset	in
4	DATA–	Bidirectional data line for USB	in/out
5	PWRSW#	Soft Power Button	in
6	DATA+	Bidirectional data line for USB	in/out
7	GND	Ground	out
8	GND	Ground	out
9	BAT	RTC Battery Input	in
10	Shield GND	Shield Ground	out

WARNING: The pinout of the Utility Port 2.0 connector is **not** compatible with some older generations of RTD cpuModules. Attaching a legacy Utility Port harness to the Utility Port 2.0 connector may damage or destroy the cpu/gpuModule.

USB 2.0 Connection

One USB 2.0 compliant connector is available on connector CN5. **Table 8** provides the pinout of the USB connector.

System Reset

Pin 3 of the Utility Port 2.0 connector allows connection of an external push-button to manually reset the system. The push-button is normally open and connected to ground when pushed.

Soft Power Button

Pin 5 of the Utility Port 2.0 connector allows connection of an external push-button to send a soft power signal to the system. The power button can be used to enter recovery mode. When the cpu/gpuModule is turned off, press and hold the power button will enter recovery mode. Details of recovery mode can be found in the *Force Recovery Mode* section on page 34.

For more information on the modes of the Soft Power Button, refer to the *Power Management* section in Chapter 4, *Using the cpu/gpuModule*

Battery

Pin 9 of the Utility Port 2.0 connector is the connection for an external backup battery. This battery is used by the cpu/gpuModule when system power is removed to preserve the date and time of the real time clock (RTC).

Connecting a battery is only required to maintain time when power is completely removed from the cpu/gpuModule. A battery is not required for board operation.

DisplayPort Connector (CN4)

The DisplayPort connector on the CNV36JRAGX cpu/gpuModule is a standard PC DisplayPort connector completed with latch holes to provide a rugged connecting solution for latching DisplayPort cables.

The DisplayPort supports all mandatory features of the VESA DisplayPort (DP) 1.4 standard and supports audio over the connection. Full bandwidth transmission is supported over a 2-meter cable, with reduced bandwidth transmission supported up to a length of 15 meters.

The DisplayPort connector supports MST (Multi-Stream Transport) therefore multiple monitors may be used with the cpu/gpuModule if they support MST.

The connection can directly output single-link HDMI and DVI signals by using active converter cables. Simple passive cables are not supported.

Table 8 provides the pinout of the DisplayPort connector.

Table 8 DisplayPort Connector (CN4)

Pin	Signal	Standard Function	DVI / HDMI mode[1]	In/Out
1	LN0+	Main Link, Lane 0 (positive)	TMDS Channel 2 (positive)	out
2	GND	Ground	Ground	out
3	LN0-	Main Link, Lane 0 (negative)	TMDS Channel 2 (negative)	out
4	LN1+	Main Link, Lane 1 (positive)	TMDS Channel 1 (positive)	out
5	GND	Ground	Ground	out
6	LN1-	Main Link, Lane 1 (negative)	TMDS Channel 1 (negative)	out
7	LN2+	Main Link, Lane 2 (positive)	TMDS Channel 0 (positive)	out
8	GND	Ground	Ground	out
9	LN2-	Main Link, Lane 2 (negative)	TMDS Channel 0 (negative)	out
10	LN3+	Main Link, Lane 3 (positive)	TMDS Clock (positive)	out
11	GND	Ground	Ground	out
12	LN3-	Main Link, Lane 3 (negative)	TMDS Clock (negative)	out
13	CFG1	Configuration Pin 1	Cable Adapter Detect	out
14	CFG2	Configuration Pin 2	Consumer Electronics Control[2]	out
15	AUX+	Auxiliary Channel (positive)	DDC Clock	in/out
16	GND	Ground	Ground	out
17	AUX-	Auxiliary Channel (negative)	DDC Data	in/out
18	HPD	Hot Plug Detect	Hot Plug Detect	in
19	DPG	Return for DPV	Return for DPV	out
20	DPV	+3.3V DC Power	+3.3V DC Power	out

1. Requires special passive adapter.
2. HDMI mode only

Serial Port 1 (CN7) and Serial Port 2 (CN8)

The CNV36JRAGX carrier module provides serial port transceivers that can be configured using the setup shell script *cvn36jragx_serial.sh* found in SWP-700020072. The serial port transceivers are disabled at power on. The setup script, *cvn36jragx_serial.sh*, must be used to set a mode.

Serial Port 1 (COM1) is implemented on connector CN7, and Serial Port 2 (COM2) is implemented on connector CN8. The serial ports are normally configured as PC compatible full-duplex RS-232 ports, but you may reconfigure these ports as half-duplex RS-422 or full-duplex RS-422 or RS-485. Serial ports can be accessed from Linux according to **Table 9**.

Table 9 Linux Device Serial Ports

Connector	Device file
CN7	/dev/ttyTHS1
CN8	/dev/ttyTHS2

Serial Port UART

NVIDIA's serial ports are implemented with a 16550/16450-compatible UART (Universal Asynchronous Receiver/ Transmitter). This UART is capable of baud rates up to 12.5 Mbps. The transceiver when in RS232 is limited to a 1 Mbps. The transceiver in RS422/RS485 mode can be used up to the max speed of 12.5 Mbps. NVIDIA sets the default baud rate as 16450.

Refer to the NVIDIA Jetson AGX Orin datasheet for more information about the serial capabilities.

RS-232 Serial Port

Table 10 provides the serial port connector pinout and shows how to connect to an external DB-25 or DB-9 compatible serial connector. The AGX module does not implement: DCD, DSR, DTR, and RI pins. They are connected to the transceiver; however they are not functional.

Table 10 Serial Port in RS-232 Mode

Pin	Signal	Function	In/Out	DB-25	DB-9
1	—	N/C	—	8	1
2	—	N/C	—	6	6
3	RXD	Receive Data	in	3	2
4	RTS	Request To Send	out	4	7
5	TXD	Transmit Data	out	2	3
6	CTS	Clear To Send	in	5	8
7	—	N/C	—	20	4
8	—	N/C	—	22	9
9	GND	Signal Ground	—	7	5
10	GND	Signal Ground	—	—	—

RS-422 or RS-485 Serial Port

You may use *cnv36jragx_serial.sh* setup shell script to configure the serial ports as RS-422 or RS-485. In this case, you must connect the serial port to an RS-422 or RS-485 compatible device.

When using RS-422 mode, you can use the serial ports in either half-duplex (two-wire) or full-duplex (four-wire) configurations.

***Note** The cpu/gpuModule incorporates a software 120 Ohm termination resistor. Termination is usually necessary on all RS-422 receivers and at the ends of the RS-485 bus. Termination resistors can be enabled using the cvn36jragx_serial.sh setup shell script.*

When using full-duplex in RS-422 mode, connect the ports as shown in **Table 11**.

Table 11 Full-Duplex Connections

Port 1	Port 2
RXD+	TXD+
TXD+	RXD+
RXD–	TXD–
TXD–	RXD–

In RS-485 mode, the connection of the ports is always half-duplex, as the transceivers' transmitters are connected to the receivers internally.

RS-422 Mode Pinout

Table 12 provides the serial port connector pinout when RS-422 mode is enabled.

Table 12 Serial Port in RS-422 Mode

Pin	Signal	Function	In/Out	DB-9
1	TXD–	Transmit Data (–)	out	1
2	—	Reserved	—	6
3	TXD+	Transmit Data (+)	out	2
4	—	Reserved	—	7
5	RXD+	Receive Data (+)	in	3
6	—	Reserved	—	8
7	RXD–	Receive Data (–)	in	4
8	—	Reserved	—	9
9	GND	Signal Ground	—	5
10	GND	Signal Ground	—	—

***WARNING** The pinout of the COM ports in RS-422 mode is **not** compatible with some older generations of RTD cpuModules.*

RS-485 Mode Pinout

Table 13 provides the serial port connector pinout when RS-485 mode is enabled.

Table 13 Serial Port in RS-485 Mode

Pin	Signal	Function	In/Out	DB-9
1	D–	Data (–)	in/out	1
2	—	Reserved	—	6
3	D+	Data (+)	in/out	2
4	—	Reserved	—	7
5	—	Reserved	—	3
6	—	Reserved	—	8
7	—	Reserved	—	4
8	—	Reserved	—	9
9	GND	Signal Ground	—	5
10	GND	Signal Ground	—	—

WARNING The pinout of the COM ports in RS-485 mode is **not** compatible with some older generations of RTD cpuModules.

Note When using the serial port in RS-485 mode, the serial transmitters are enabled and disabled under software control. The transmitters can be enabled by manipulating the Request To Send (RTS*) signal of the serial port controller.

- RTS* = 0, and serial transmitters are disabled
- RTS* = 1, and serial transmitters are enabled

CAN Bus

Using the *cvn36jragx_serial.sh* setup shell script to configure the CN7 for CAN Bus. The CAN transceiver on the CNV36JRAGX can support data rates up to 5 Mbps.

Table 14 provides the CN7 connector pinout when CAN Bus is enabled.

Table 14 CN7 in CAN Bus Mode

Pin	Signal	Function	In/Out	DB-9
1	—	Reserved	—	1
2	—	Reserved	—	6
3	CANL	Data Low	in/out	2
4	CANH	Data High	in/out	7
5	—	Reserved	—	3
6	—	Reserved	—	8
7	—	Reserved	—	4
8	—	Reserved	—	9
9	GND	Signal Ground	—	5
10	GND	Signal Ground	—	—

Note When using the serial port in CAN Bus mode, you must load the kernel modules. Below are the commands needed to load the kernel modules.

modprobe can
modprobe can-raw
modprobe mttcan

You can use the Ubuntu network interface to setup the can network Below is the following command to setup a network with bitrate at 500kbps.

ip link set can0 up type can bitrate 500000

Digital I/O Port (CN6)

Connector CN6 is configured as a DIO port. DIO is 14 digital bits configured as an 8-bit programmable and 6-bit programmable I/O, providing any combination of inputs and outputs. Refer to Digital I/O —page *34* for information on programming the DIO.

Table 15 Digital I/O Pinout (CN6)

CN6 Pin	Function	CN6 Pin	Function
1	CN6-1	2	CN6-2
3	CN6-3	4	CN6-4
5	CN6-5	6	CN6-6
7	CN6-7	8	CN6-8
9	CN6-9	10	CN6-10
11	CN6-11	12	CN6-12
13	CN6-13	14	CN6-14
15	GND	16	+5 V

Ethernet (10/100/1000Base-T and -TX) Connector (CN20)

This connector provides a 10/100/1000Base-T Ethernet connection. **Table 17** provides the pinout of the Ethernet connector. For 1000Base-T, all four pairs are used for transmit and receive.

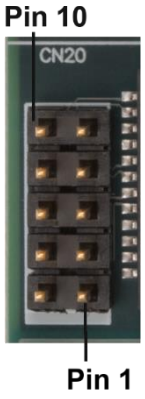
The LEDs D3 and D4 (red and yellow LEDs) indicates the speed of the of the link and D5 (red LED) blinks when there is activity on the link.

Table 16 Ethernet Link Speeds

D3	D4	Speed
ON	ON	1000BASE-T
OFF	ON	100BASE-TX
ON	OFF	10BASE-T
OFF	OFF	No link

Table 17 Ethernet Connector (CN20)

RJ-45 Pin	10-Pin DIL Pin	Signal	Function
3	1	B+ (RX+)	Receive+ (10/100)
6	2	B- (RX–)	Receive– (10/100)
4	3	C+	—
5	4	C-	—
1	5	A+ (TX+)	Transmit+ (10/100)
2	6	A- (TX–)	Transmit– (10/100)
7	7	D+	—
8	8	D-	—
—	9	AGND	Ethernet Ground
—	10	AGND	Ethernet Ground



PCIe/104 Type 2 Bus (CN1 - TOP)

Connector CN1 carries the signals of the PCIe/104 PCIe bus. These signals match definitions found in the ***PCI/104-Express & PCIe/104 Specification Version 3.1*** from the PC/104 Consortium. **Table 18** lists the pinouts of the PC/104-Express bus connector.

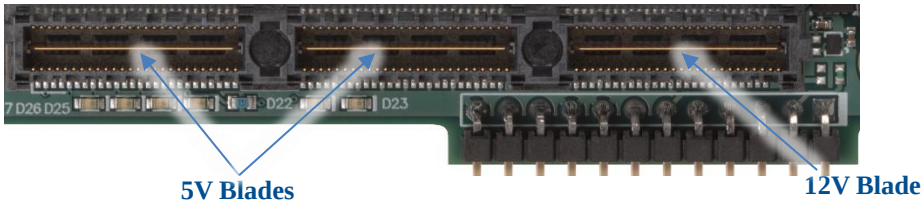


Figure 8 Locations of 5V and 12V Power Blades

WARNING: Not all PCIe cards are compatible with the PCIe/104 Type 2 connector. Be sure that all boards attached to this bus are compatible before powering the system.

Table 18 PCIe/104 Type 2 Bus Signal Assignments [1]

Pin	Signal		Signal	Pin
1	USB_OC#		PE_RST#	2
3	+3.3V2		+3.3V[2]	4
5	USB_1p		USB_0p	6
7	USB_1n		USB_0n	8
9	GND		GND	10
11	PEx1_1Tp		PEx1_0Tp	12
13	PEx1_1Tn		PEx1_0Tn	14
15	GND		GND	16
17	PEx1_2Tp		PEx1_3Tp	18
19	PEx1_2Tn		PEx1_3Tn	20
21	GND		GND	22
23	PEx1_1Rp		PEx1_0Rp	24
25	PEx1_1Rn		PEx1_0Rn	26
27	GND	+5 Volts	GND	28
29	PEx1_2Rp		PEx1_3Rp	30
31	PEx1_2Rn		PEx1_3Rn	32
33	GND		GND	34
35	PEx1_1Clkp		PEx1_0Clkp	36
37	PEx1_1Clkn		PEx1_0Clkn	38
39	+5V_STBY		+5V_STBY	40
41	PEx1_2Clkp		PEx1_3Clkp	42
43	PEx1_2Clkn		PEx1_3Clkn	44
45	CPU_DIR		PWRGOOD	46
47	Reserved		Reserved	48
49	Reserved		Reserved	50
51	Reserved		PSON#	52

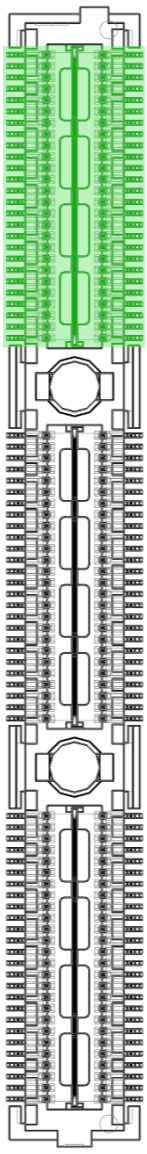


Table 18 PCIe/104 Type 2 Bus Signal Assignments [1]

Pin	Signal		Signal	Pin
53	WAKE#		STK1	54
55	GND		GND	56
57	PEx4_1T(0)P		PEx4_0T(0)P	58
59	PEx4_1T(0)N		PEx4_0T(0)N	60
61	GND		GND	62
63	PEx4_1T(1)P		PEx4_0T(1)P	64
65	PEx4_1T(1)N		PEx4_0T(1)N	66
67	GND		GND	68
69	PEx4_1T(2)P		PEx4_0T(2)P	70
71	PEx4_1T(2)N		PEx4_0T(2)N	72
73	GND		GND	74
75	PEx4_1T(3)P		PEx4_0T(3)P	76
77	PEx4_1T(3)N		PEx4_0T(3)N	78
79	GND	+5 Volts	GND	80
81	NC (SATA_T1_P)		NC (SATA_T0_P)	82
83	NC (SATA_T1_N)		NC (SATA_T0_N)	84
85	GND		GND	86
87	USB 3_T1_P		USB 3_T0_P	88
89	USB 3_T1_N		USB 3_T0_N	90
91	GND		GND	92
93	Reserved		Reserved	94
95	Reserved		Reserved	96
97	GND		GND	98
99	Reserved		Reserved	100
101	Reserved		Reserved	102
103	GND		GND	104

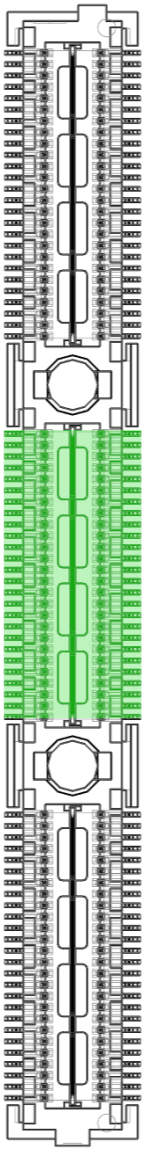
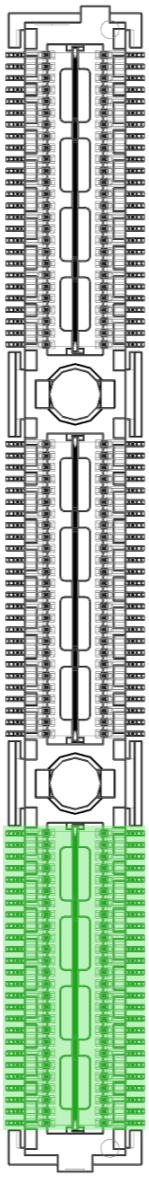


Table 18 PCIe/104 Type 2 Bus Signal Assignments [1]

Pin	Signal		Signal	Pin
105	STK2		Reserved	106
107	GND		GND	108
109	Reserved		Reserved	110
111	Reserved		Reserved	112
113	GND		GND	114
115	Reserved		Reserved	116
117	Reserved		Reserved	118
119	GND		GND	120
121	Reserved		Reserved	122
123	Reserved		Reserved	124
125	GND		GND	126
127	Reserved		Reserved	128
129	Reserved	+12 Volts	Reserved	130
131	GND		GND	132
133	Reserved		NC (SATA_0Rp)	134
135	Reserved		NC (SATA_0Rn)	136
137	GND		GND	138
139	Reserved		Reserved	140
141	Reserved		Reserved	142
143	GND		GND	144
145	Reserved		Reserved	146
147	Reserved		Reserved	148
149	GND		GND	150
151	Reserved		Reserved	152
153	Reserved		Reserved	154
155	GND		GND	156



1. Signals marked with (#) are active low.
2. +3.3V is not required for board operation.

PCIe/104 Type 2 Compatibility

The PCIe/104 Type 2 connector is compatible with any PCI/104-Express or PCIe/104 peripheral module that does not use the x16 Link. This includes any card that uses the PCIe x1 or x4 links, USB, or a power supply.

If a card is installed that is not compatible with the Type 2 connector, the CPU will keep the system in soft-off, and the LED D27 will be lit to indicate that there is a Bus Stacking Error.

PCIe Link Configuration

This cpu/gpuModule supports a total of four PCIe x1 links and two PCIe x4 links for system expansion. The PCIe links are routed to CN1.

Reserved Connectors

CN16/CN13

CN16 and CN13 are reserved for factory use and should be left unconnected.

Fan Connectors

CN12 and CN9 are the fan connectors and is for factory use only (CPU module fan and PCIe switch fan connectors respectively). Make sure not to disconnect any fan connectors during assembly, as this may result in overheating.

Chapter 4 Using the cpu/gpuModule

This chapter provides information for users who wish to develop their own applications programs for the CNV36JRAGX cpu/gpuModule.

This chapter includes information on the following topics:

Operating System Specific Usage – page 34

Digital I/O – page 34

Power Management – page 35

Thermal Management – page 36

Operating System Specific Usage

Flashing the OS onto the NVIDIA eMMC

Force Recovery Mode

NVIDIA® Jetson Orin™ AGX must be in Force Recovery Mode to flash the onboard eMMC. To place the AGX in Force Recovery Mode, follow the steps below using the power button on the Utility Port (**CN5**). For this you need a host machine running at least Ubuntu version 20.04 LTS with the software package provided by RTD installed.

1. Connect a micro-USB cable from the host machine to the debug port (**CN17**).
2. Power on the board.
3. Place the board into soft off by holding the power button for five seconds.
4. Once in soft off, press and hold the power button for 10 seconds.

If the process was successful, the attached host CPU will show a new USB device named “NVIDIA Corp. AGX” and you can use the RTD flashing utility. If you wish to exit programming mode without flashing a new image, press the reset button.

Note: If you are flashing a system that is working Linux OS. The user can issue a reboot into force recovery by using the following command.

sudo reboot --force forced-recovery

Linux for Tegra®

At the time of publication, RTD has validated Linux for Tegra (L4T) 36.3. Earlier versions of the L4T kernel may not contain drivers for all devices and may not work as expected. RTD distributes a wrapper build script to include all the changes necessary for the CNV36JRAGX carrier board. The latest revision of this software can be found on our website at https://www.rtd.com with instructions for its use and modification.

See https://developer.nvidia.com/embedded/jetson-linux-r363 for NVIDIA® Jetson™ Linux Driver Package.

Digital I/O

This board supports 14 bits of 5V tolerant TTL/CMOS compatible digital I/O (TTL signaling).

When the CPU powers on, all digital I/O lines are programmed as inputs, with 100K pull ups on each line. Meaning that all inputs are known to be logic high at power on or when left floating and set as inputs. The digital I/O is accessed using the *gpiod* Linux programs such as *gpioinfo*, *gpioset*, and

Power Management

The CNV36JRAGX cpu/gpuModule supports powering mechanisms which allow the cpu/gpuModule to change power consumption and temperature and achieve minimal power consumption states. These features include thermal throttling, as well as low power modes. Various wake options are also available to resume normal system power.

Power Management

The cpu/gpuModule supports several different low power modes, including the S3 and S5 sleeping states. These suspend modes are described below:

- **S3 (Suspend to RAM):** When the system wakes from this mode, operating systems allow applications to resume where they left off, as the state of the application is preserved in memory.
- **S5 (Soft-Off):** The system is in a soft off state and must be rebooted when it wakes.

Power Button Modes

The soft power button input of the Utility Port 2.0 connector (**CN5**) can be configured by the operating system as a suspend button (transition to S3) or as soft power button (transition to S5). Consult your operating system documentation for information on how to configure it. The power button will always cause a transition to S5 if pressed for 4 seconds or longer, without interaction from the operating system.

The soft power button of the Utility Port 2.0 connector (**CN5**) is the only mechanism to wake the system from S5.

Low-Power Wake Options

The cpu/gpuModule supports several methods of waking from a low power state.

- **Resume from USB:** Operating systems that support S3 permit waking the system from the USB interfaces. Common USB wake methods include insertion of a USB device, a USB keyboard stroke, or movement from another USB device, such as mouse.

AT vs. ATX Power Supplies

Both AT and ATX power supplies may be used with the CNV36JRAGX cpu/gpuModule, however AT power supplies do not provide any standby power to the cpu/gpuModule.

ATX power supplies do provide a standby power, thus allowing the system to utilize all low power modes supported by the hardware. When an ATX supply is used to power the cpu/gpuModule, lower power modes can be achieved. During these low power modes, the standby power from the ATX power supply provides power to a small circuit on the CPU, which is used to watch for a system wake event.

ATX Power Supply Signals

The PCIe/104 Type 2 Bus connector (**CN1**) provides two ATX style signals., +5V Standby and PSON#. The +5V Standby rail is used to power certain parts of the cpu/gpuModule when the main power supply is turned off, i.e., during Suspend-to-RAM (S3) or Soft-Off (S5) power modes. The PSON# signal is an active low open-drain output that signals the power supply to turn on.

Multi-Color LED

The mutli-color LED is currently reserved for manufacturing purposes only.

Thermal Management

The NVIDIA Jetson AGX Orin SOM has an Operating Temperature Range of -25℃ to +80℃. The NVIDIA Jetson AGX ORIN Industrial SOM has an Operating Temperature Range of -40℃ to +85℃. Environmental testing was performed using RTD active solution using an environmental chamber. RTD evaluated the functionality of the AGX module by running Jetson Benchmarks provided by NVIDIA. All parts, on the CNV36JRAGX carrier module, are rated for -40℃ to +85℃ temperature range. It is important to note that the NVIDIA Jetson module has its own temperature ratings separate from the RTD carrier.

For a proper thermal solution, it is the customer's responsibility to maintain the NVIDIA core junctions below the specified temperatures, shown in the table below.

Table 19 NVIDIA® Jetson™ AGX Orin Operating Junction Temperatures

Parameter	Temperature
Maximum AGX Orin SOC Operating Temperature	SOC = 99.0℃
Maximum AGX Orin Industrial SOC Operating Temperature	SOC = 115.0℃
AGX Orin SOC Shutdown Temperature	SOC = 105.0℃
AGX Orin Industrial SOC Shutdown Temperature	SOC = 118.0℃

Appendix A Hardware Reference

This appendix provides information on CNV36JRAGX cpu/gpuModule hardware, including:

Jumper Settings and Locations – page 38

Onboard PCI/PCIe Devices – page 38

Physical Dimensions – page 39

Heatsink Dimensions – page 40

Jumper Settings and Locations

Some cpu/gpuModule configuration options are configured by jumpers. Jumpers are labeled on the board as **JP** followed by a number.

Figure 9 shows the jumper locations that are used to configure the cpu/gpuModule. **Table 20** lists the jumpers and their settings.

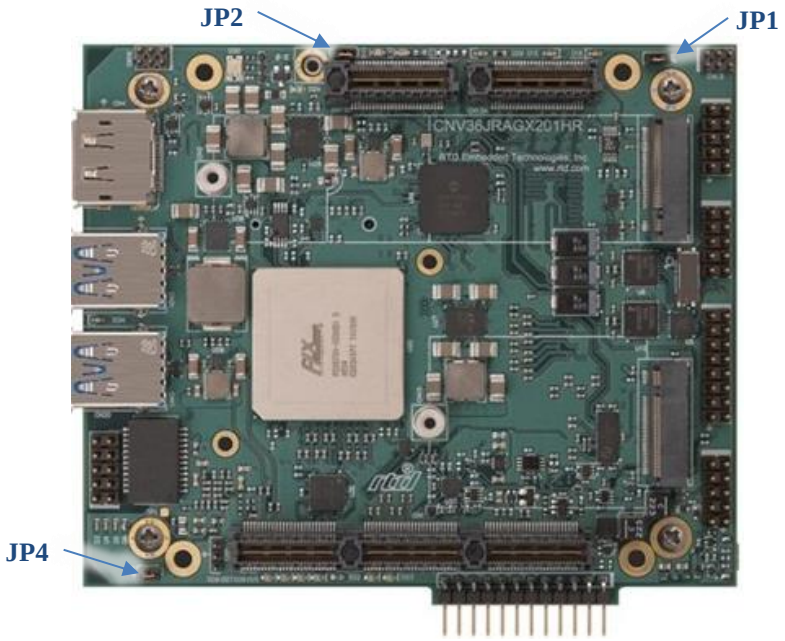


Figure 9 CNV36JRAGX Jumper Locations (top side)

Table 20 CNV36JRAGX Jumpers

Jumper	Pins	Function	Default
JP1	2	M.2 NFC bypass. Shorting will bypass M.2 E-Key control of the sim card power.	open
JP2	2	W_DISABLE1 signal of the M.2 socket. Used to disable all wireless connection. Short to disable. Open for enable	open
JP4	2	Stacking error detection is bypassed if this jumper is shorted	open

Onboard PCI/PCIe Devices

The CNV36JRAGX cpu/gpuModule has several onboard PCIe devices, they are listed in the table below.

Table 21 Onboard PCI/PCIe Devices

Device ID	Vendor ID	Description
8734	10B5	PEX 8-Port PCI Express Switch [1]
1AD0	10DE	NVIDIA AGX Orin

1. This device will appear eight times in PCI configuration space.

Physical Dimensions

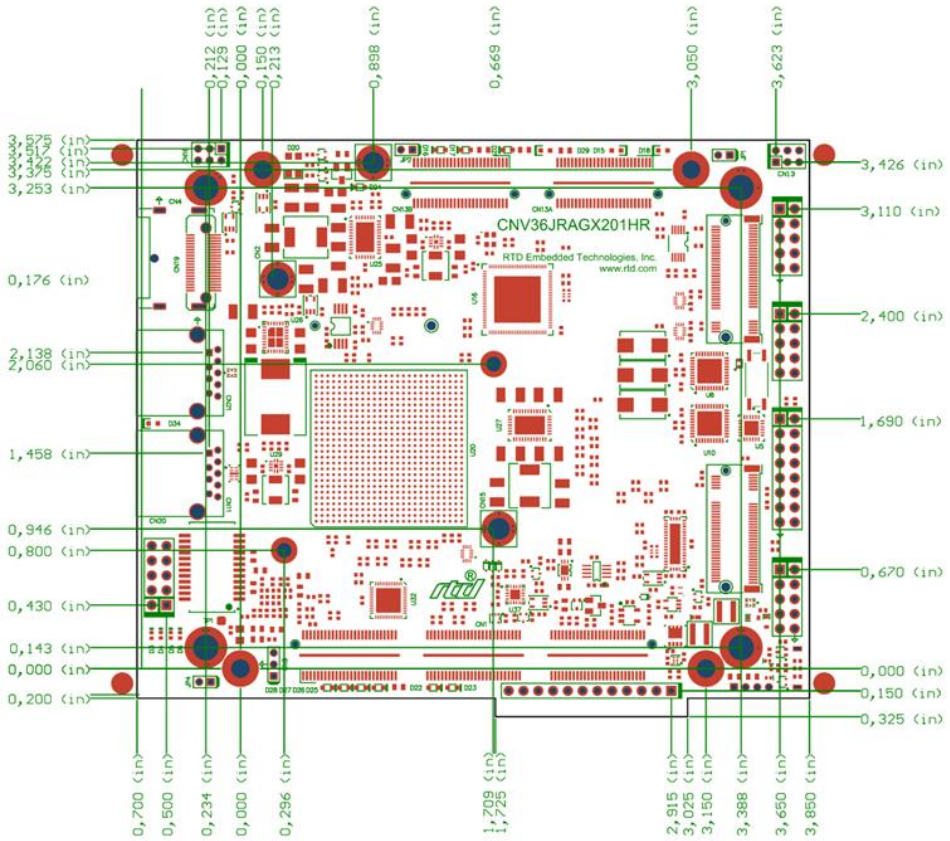


Figure 10CNV36JRAGX Physical Dimensions (±0.005 inches)

Heatsink Dimensions

To maximize the thermal performance of the cpu/gpuModule while keeping the total board weight to a minimum, various heatsinks are offered with each ordering part number.

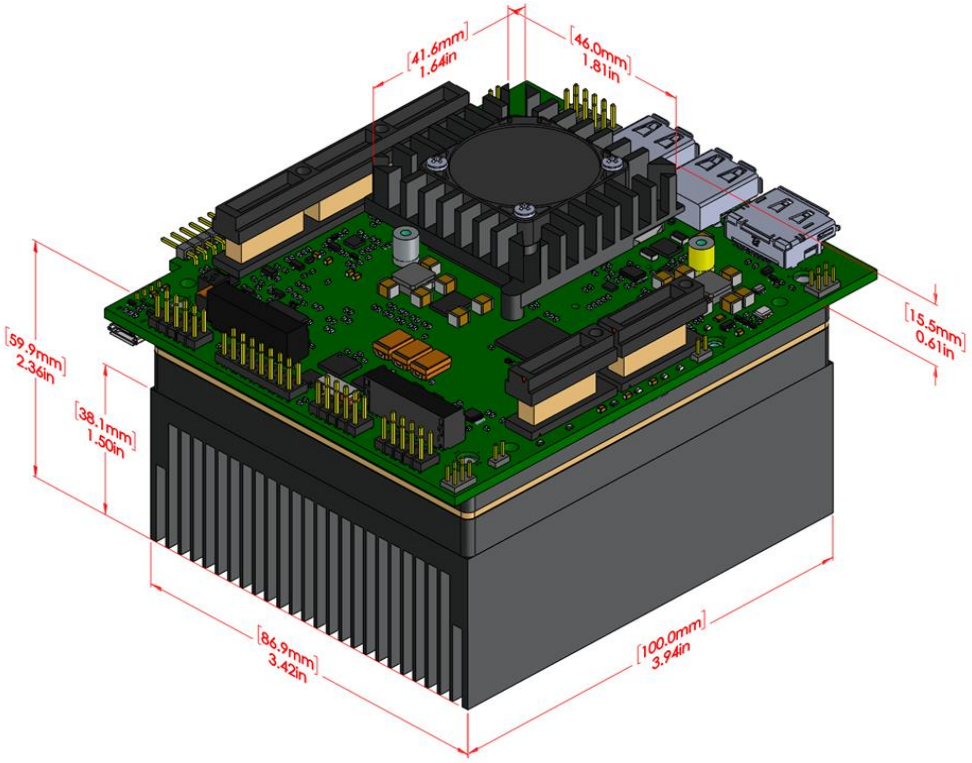


Figure 11 CNV36JRAGX Heatsink with Height from Board

Appendix B Troubleshooting

Many problems you may encounter with operation of your CNV36JRAGX cpu/gpuModule are due to common errors. This appendix includes the following sections to help you get your system operating properly.

Common Problems and Solutions – page 42

Troubleshooting a PC/104 System – page 43

How to Obtain Technical Support – page 43

Common Problems and Solutions

Table 22 lists some of the common problems you may encounter while using your CNV36JRAGX cpu/gpuModule and suggests possible solutions.

If you are having problems with your cpu/gpuModule, review this table before contacting RTD Technical Support.

Table 22 Troubleshooting

Problem	Additional Symptoms	Possible Cause(s)
cpu/gpuModule does not boot (no video output)		Input power is inadequate. Refer to *Electrical Characteristics*. Verify input voltages are correct. If power is supplied via CN3, check for cabling issues.
		Malfunctioning peripheral card. Remove all peripheral cards from the system.
		cpu/gpuModule is in "Soft Off" due to operating system shutdown. Press power button to wake.
		ATX power supply is not turning on. Check jumpers on power supply. Verify PSON# signal.
		cpu/gpuModule may be booted, but video is not connected properly. Attach a keyboard and verify the operation of the Num Lock and Caps Lock LEDs. If they respond as expected, the cpu/gpuModule is booted. Check the video cable connections.
cpu/gpuModule reboots unexpectedly	cpu/gpuModule is powered via Auxiliary Power Connector (**CN3**)	Power cabling issues. Verify all pins on CN3 are reliably connected with proper gauge wires.
		Power supply noise or current limiting. Check power pins with an oscilloscope and verify they remain in range.
		Power supply may not respond quickly enough to changes in power consumption. Switch to a different power supply (a PCI Express power supply is recommended)
	Peripheral card(s) installed	Peripheral card(s) may be overloading the power supply. Reduce the system to just the cpu/gpuModule and power supply and see if the problem re-appears. (Note that CN3 is intended for powering the cpu/gpuModule only.)
Date/time not saved when system is off	No RTC battery	A battery must be attached to the Utility Port 2.0 connector (**CN5**) to maintain date/time when main power is removed.
SIM Card not detected		When not using a NFC card in M.2 E-Key slot, populate JP1.

Troubleshooting a PC/104 System

If you have reviewed the preceding table and still cannot isolate the problem with your CNV36JRAGX cpu/gpuModule, please try the following troubleshooting steps. Even if the resulting information does not help you find the problem, it will be very helpful if you need to contact technical support.

1. **Simplify the system**. Remove items one at a time and see if one particular item seems to cause the problem.
2. **Swap components**. Try replacing items in the system one-at-a-time with similar items.

How to Obtain Technical Support

If after following the above steps, you still cannot resolve a problem with your CNV36JRAGX cpu/gpuModule, please gather the following information:

- cpu/gpuModule model, and serial number
- List of all boards in system
- Description of problem
- Circumstances under which problem occurs.

Then contact RTD Technical Support:

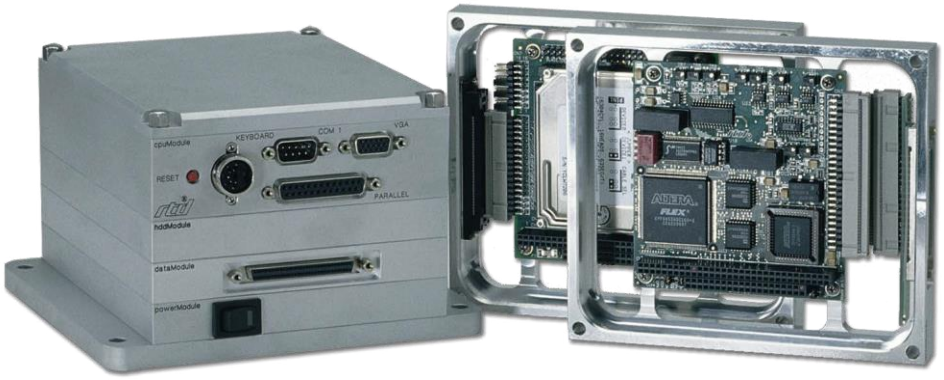
Phone: 814-234-8087
Fax: 814-234-5218
E-mail: techsupport@rtd.com

Appendix C IDAN® Dimensions and Pinout

Like all other PCIe/104 modules, cpu/gpuModules can be packaged in Intelligent Data Acquisition Node (IDAN®) frames, which are milled 6061 aluminum frames with integrated heat sinks and heat pipes for fan-less operation. RTD modules installed in IDAN® frames are called building blocks. IDAN® building blocks maintain the simple but rugged stacking concept of and PCIe/104. Each RTD module is mounted in its own IDAN® frame, and all I/O connections are brought to the walls of each frame using standard PC connectors.

On the CNV36JRAGX, no connections are made from module to module internal to the system other than through the PCIe/104 Type 2 bus, enabling quick interchangeability and system expansion without hours of rewiring and board redesign.

This appendix provides the dimensions and pinouts of the CNV36JRAGX installed in an IDAN® frame. Contact RTD for more information on high reliability IDAN® systems.



IDAN®—Adhering to the PC/PCI-104 and PCIe/104 stacking concept, IDAN® allows youto build a customized system with any combination of RTD modules.

IDAN® Heat Pipes—Advanced heat pipe technology maximizes heat transfer to heat fins.

HiDAN*plus*®—Integrating the modularity of IDAN® with the ruggedization of HiDAN®, HiDAN*plus*® enables connectors on all system frames, with signals running between frames.

IDAN® Contents

Iside the IDAN-CNV36JRAGX unit is a CMOS battery which is connected to the battery input connection of the cpu/gpuModule's Utility Port 2.0 connector. The frame of the IDAN-CNV36JRAGX brings out the cpu/gpuModule's reset button.

For additional flexibility, the 25-pin "D" connector which provides connections to the cpu/gpuModule's DIO connector (**CN6**) includes connections to several pins on the Utility Port 2.0 connector, which include the reset button input, power button input, and RTC battery input.

For more information on cpu/gpuModule's battery input and reset button input on the Utility Port 2.0 connector, refer to the *Utility Port 2.0 Connector (CN5)* on page 21.

IDAN® Dimensions

The IDAN® frame for the CNV36JRAGX is shown in the figure below:

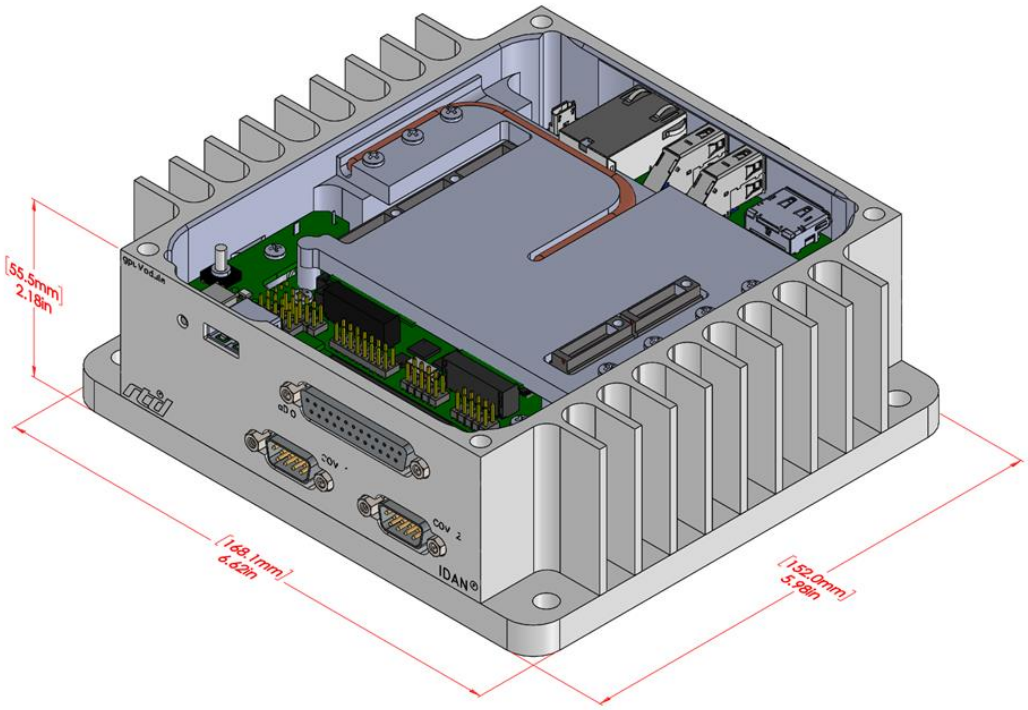


Figure 12 IDAN® Frame Outside Dimensions

IDAN® Connectors

The figures below show the connector locations for the CNV36JRAGX as they are brought out on the front and back panels of the IDAN-CNV36JRAGX. For a full description of each connector on the CNV36JRAGX, refer to Connecting to the Stack page 16.

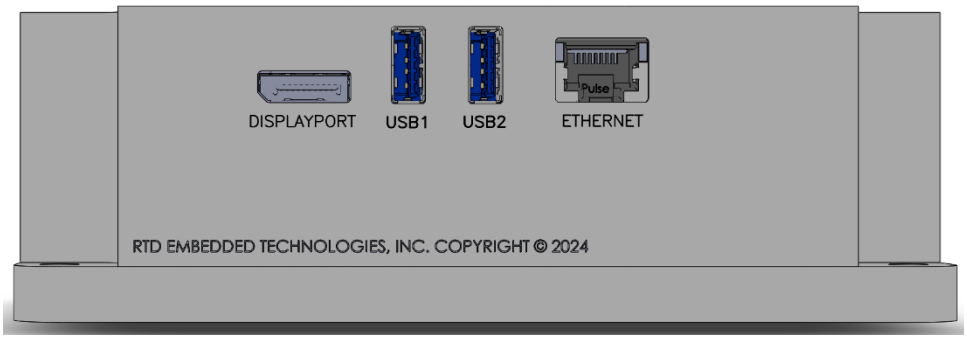


Figure 13 IDAN-CNV36JRAGX Rear Panel

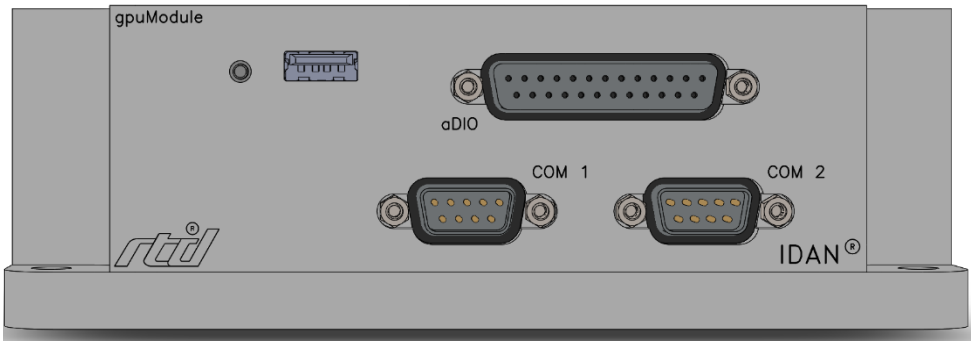


Figure 14 IDAN-CNV36JRAGX Front Panel with Height

Table 23 IDAN- CNV36JRAGX Connectors

Board Designator	Function	Connector Description	IDAN® Panel Connector	Mating Connector
CN3	DisplayPort	DisplayPort (female)	—	—
CN12	USB Port (Utility Port 2.0)	USB Type A Receptacle	—	—
CN9	DIO	25-pin D (female)	Adam Tech DB25SD	Adam Tech DB25PD
CN7	Serial Port 1	9-pin D (male)	Adam Tech DE09PD COM1	Adam Tech DE09SD
CN8	Serial Port 2	9-pin D (male)	Adam Tech DE09PD COM2	Adam Tech DE09SD
CN6	USB 3.2	USB Type A Receptacle	—	—
CN11	USB 3.2	USB Type A Receptacle	—	—
CN4	Ethernet	RJ45	—	—

External I/O Connections

Table 24 COM1/COM2 9-Pin D Connector (male)

CPU Pin	IDAN Pin (DB-9)	Single RS-232	Single RS-422	Single RS-485
1	1	—	TXD–	D–
2	6	—	—	—
3	2	RXD	TXD+	D+
4	7	RTS	—	—
5	3	TXD	RXD+	—
6	8	CTS	—	—
7	4	—	RXD–	—
8	9	—	—	—
9	5	GND	GND	GND

Table 25 DIO — 25-Pin D Connector (female)

IDAN Pin #	DIO Port	CPU Pin # (CN9)
1	I/0-00	1
2	I/0-02	3
3	I/0-04	5
4	I/0-06	7
5	I/0-12	9
6	I/0-08	11
7	I/0-10	13
8	GND	15
9	N/C	—
10	N/C	—
11	N/C	—
12	N/C	—
13	N/C	—
14	I/0-01	2
15	I/0-03	4
16	I/0-05	6
17	I/0-07	8
18	I/0-13	10
19	I/0-09	12
20	I/0-11	14
21	+5 V	16
22	N/C	—
23	N/C	—
24	N/C	—
25	N/C	—

Table 26 DisplayPort Connector

Pin	Signal	Standard Function	DVI / HDMI mode[1]	In/Out
1	LN0+	Main Link, Lane 0 (positive)	TMDS Channel 2 (positive)	out
2	GND	Ground	Ground	out
3	LN0-	Main Link, Lane 0 (negative)	TMDS Channel 2 (negative)	out
4	LN1+	Main Link, Lane 1 (positive)	TMDS Channel 1 (positive)	out
5	GND	Ground	Ground	out
6	LN1-	Main Link, Lane 1 (negative)	TMDS Channel 1 (negative)	out
7	LN2+	Main Link, Lane 2 (positive)	TMDS Channel 0 (positive)	out
8	GND	Ground	Ground	out
9	LN2-	Main Link, Lane 2 (negative)	TMDS Channel 0 (negative)	out
10	LN3+	Main Link, Lane 3 (positive)	TMDS Clock (positive)	out
11	GND	Ground	Ground	out
12	LN3-	Main Link, Lane 3 (negative)	TMDS Clock (negative)	out
13	CFG1	Configuration Pin 1	Cable Adapter Detect	out
14	CFG2	Configuration Pin 2	Consumer Electronics Control[2]	out
15	AUX+	Auxiliary Channel (positive)	DDC Clock	in/out
16	GND	Ground	Ground	out
17	AUX-	Auxiliary Channel (negative)	DDC Data	in/out
18	HPD	Hot Plug Detect	Hot Plug Detect	in
19	DPG	Return for DPV	Return for DPV	out
20	DPV	+3.3V DC Power	+3.3V DC Power	out

1. Requires special passive adapter 2. HDMI mode only

Table 27 Ethernet RJ45 Connector T568A Color Code

IDAN Pin #	RJ-45 Pin	Signal[1]	CPU Pin #
1	1	A+ (TX+)	1
2	2	A- (TX–)	2
3	3	B+ (RX+)	3
4	4	C+	4
5	5	C-	5
6	6	B- (RX–)	6
7	7	D+	7
8	8	D-	8

Note 1: White stripe indicated in cell fill color.

Appendix D Additional Information

NVIDIA Driver Information:

https://developer.nvidia.com/embedded-computing

PC/104 Specifications

A copy of the latest PC/104 specifications can be found on the webpage for the PC/104 Consortium:

https://www.pc104.org

Appendix E Limited Warranty

RTD Embedded Technologies, Inc. warrants the hardware and software products it manufactures and produces to be free from defects in materials and workmanship for one year following the date of shipment from RTD Embedded Technologies, Inc. This warranty is limited to the original purchaser of product and is not transferable.

During the one-year warranty period, RTD Embedded Technologies will repair or replace, at its option, any defective products, or parts at no additional charge, provided that the product is returned, shipping prepaid, to RTD Embedded Technologies. All replaced parts and products become the property of RTD Embedded Technologies. Before returning any product for repair, customers are required to contact the factory for a Return Material Authorization number.

This limited warranty does not extend to any products which have been damaged as a result of accident, misuse, abuse (such as: use of incorrect input voltages, improper or insufficient ventilation, failure to follow the operating instructions that are provided by RTD Embedded Technologies, “acts of god” or other contingencies beyond the control of RTD Embedded Technologies), or as a result of service or modification by anyone other than RTD Embedded Technologies. Except as expressly set forth above, no other warranties are expressed or implied, including, but not limited to, any implied warranties of merchantability and fitness for a particular purpose, and RTD Embedded Technologies expressly disclaims all warranties not stated herein. All implied warranties, including implied warranties for merchantability and fitness for a particular purpose, are limited to the duration of this warranty. In the event the product is not free from defects as warranted above, the purchaser's sole remedy shall be repair or replacement as provided above. Under no circumstances will RTD Embedded Technologies be liable to the purchaser or any user for any damages, including any incidental or consequential damages, expenses, lost profits, lost savings, or other damages arising out of the use or inability to use the product.

Some states do not allow the exclusion or limitation of incidental or consequential damages for consumer products, and some states do not allow limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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State College PA 16803USA
https://www.rtd.com

PC/104

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