HARDWARE REFERENCE MANUAL

Power PMAC 1040 CPU

Document # MN-000125

Power UMAC Quad Core ARM

3-4241BEU-□□□-B00000

August 4, 2022

Copyright Information

To report errors or inconsistencies, call or email your local Omron representative

Operating Conditions

All Delta Tau Data Systems, Inc. motion controller products, accessories, and amplifiers contain static sensitive components that can be damaged by incorrect handling. When installing or handling Delta Tau Data Systems, Inc. products, avoid contact with highly insulated materials. Only qualified personnel should be allowed to handle this equipment. Before powering, please ensure there is no visible damage to the product.

In the case of industrial applications, we expect our products to be protected from hazardous or conductive materials and/or environments that could cause harm to the controller by damaging components or causing electrical shorts. Our products should not be placed in locations that can accrue a lot of dust, salt, or conductive iron-like powder. When our products are used in an industrial environment, install them into an industrial electrical cabinet or industrial PC to protect them from excessive or corrosive moisture, abnormal ambient temperatures, and conductive materials. If Delta Tau Data Systems, Inc. products are directly exposed to hazardous or conductive materials and/or environments, we cannot guarantee their operation. For your own safety, please keep the product's environmental conditions within the range outlined by the Environment Specifications section that can be located from the table of contents in this manual.

Trademarks

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

Other company names and product names in this document are the trademarks or registered trademarks of their respective companies.

Precaution For Correct Use

- Insure Faceplate mounting screws are tightened for proper grounding of accessory card.

Precaution For Safe Use

- Do not drop the Controller or expose it to abnormal vibration or shock. Doing so may result in the controller malfunctioning or burning.

- Do not operate or store the Controller in the following locations listed below. Doing so may result in a malfunction or halt operations.
  a) Locations subject to direct sunlight.
  b) Locations subject to temperatures or humidity outside the range specified in the specifications.
  c) Locations subject to condensation as a result of severe changes in temperature.
  d) Locations subject to corrosive or flammable gases.
  e) Locations subject to dust (especially iron dust) or salts.
  f) Locations subject to exposure to water, oil, or chemicals.
  g) Locations subject to shock or vibration.

- Take appropriate and sufficient countermeasures when installing the Controller in the following locations.
  a) Locations subject to strong, high-frequency noise.
  b) Locations subject to static electricity or other forms of noise.
  c) Locations subject to strong electromagnetic fields.
  d) Locations subject to possible exposure to radioactivity.
  e) Locations close to power lines.

- Install the Controller away from sources of heat and ensure appropriate ventilation. Not doing so may result in a malfunction, operations halting, or burning.

- Care should be exercised by machine integrator when implementing a mating connector to the product. Consult the Hardware Reference manual for the correct components to use for external interconnects to this product.

- Prior to applying power, machine integrator should verify that the loading of the I/O interfaces will not exceed the parameters published in the Hardware Reference manual.

- Be mindful of a laceration hazard that can occur on Accessory cards used in UMAC systems. They have sharp edges on the faceplates, sharp components installed and exposed circuit card edges.

- The UMAC product line, both processors and Accessory cards may not be removed or inserted (Hot Plugged) while power is applied to UMAC rack. Damage to the product may result.

- Do not remove power during a save operation. Memory corruption may occur causing a system error.

- STATIC SENSITIVE DEVICE: Observe safe static handling practices when making contact with the wiring and electronics of this product.

- Maintenance operator should have a machine diagram and plan developed by the machine integrator for proper service of the machine.

- Please dispose of this product as E-Waste. Product is marked for WEEE.

Security Measures

Anti-virus protection

Install the latest commercial-quality antivirus software on the computer connected to the control system and maintain to keep the software up to date.

Security measures to prevent unauthorized access

Take the following measures to prevent unauthorized access to our products.

• Install physical controls so that only authorized personnel can access control systems and equipment.

• Reduce connections to control systems and equipment via networks to prevent access from untrusted devices.

• Install firewalls to shut down unused communications ports and limit communications hosts and isolate control systems and equipment from the IT network.

• Use a virtual private network (VPN) for remote access to control systems and equipment.

• Adopt multifactor authentication to devices with remote access to control systems and equipment.

• Set strong passwords and change them frequently.

• Scan virus to ensure safety of USB drives or other external storages before connecting them to control systems and equipment.

Data input and output protection

Validate backups and ranges to cope with unintentional modification of input/output data to control systems and equipment.

• Checking the scope of data

• Checking validity of backups and preparing data for restore in case of falsification and abnormalities

• Safety design, such as emergency shutdown and fail-soft operation in case of data tampering and abnormalities

Data Recovery

Backup data and keep the data up-to-date periodically to prepare for data loss.

When using an intranet environment through a global address, connecting to an unauthorized terminal such as a SCADA, HMI or to an unauthorized server may result in network security issues such as spoofing and tampering.

You must take sufficient measures such as restricting access to the terminal, using a terminal equipped with a secure function, and locking the installation area by yourself.

When constructing an intranet, communication failure may occur due to cable disconnection or the influence of unauthorized network equipment. Take adequate measures, such as restricting physical access to network devices, by means such as locking the installation area.

When using a device equipped with the SD Memory Card function, there is a security risk that a third party may acquire, alter, or replace the files and data in the removable media by removing the removable media or unmounting the removable media. Please take sufficient measures, such as restricting physical access to the Controller or taking appropriate management measures for removable media, by means of locking the installation area, entrance management, etc., by yourself.

EN Dispose in accordance with applicable regulations.

Safety Instructions

Qualified personnel must transport, assemble, install, and maintain this equipment. Properly qualified personnel are persons who are familiar with the transport, assembly, installation, and operation of equipment. The qualified personnel must know and observe the following standards and regulations:

IEC364resp.CENELEC HD 384 or DIN VDE 0100
IEC report 664 or DIN VDE 0110
National regulations for safety and accident prevention or VBG 4

Incorrect handling of products can result in injury and damage to persons and machinery. Strictly adhere to the installation instructions. Electrical safety is provided through a low-resistance earth connection. It is vital to ensure that all system components are connected to earth ground.

This product contains components that are sensitive to static electricity and can be damaged by incorrect handling. Avoid contact with high insulating materials (artificial fabrics, plastic film, etc.). Place the product on a conductive surface. Discharge any possible static electricity build-up by touching an unpainted, metal, grounded surface before touching the equipment.

Keep all covers and cabinet doors shut during operation. Be aware that during operation, the product has electrically charged components and hot surfaces. Control and power cables can carry a high voltage, even when the motor is not rotating. Never disconnect or connect the product while the power source is energized to avoid electric arcing.

Warning

A Warning suggests: if not handled properly, this hazard may cause a minor/moderate injury or, in the worst case, lead to a serious injury or death. It precedes the discussion of interest.

Warning

Caution

A Caution suggests: If not handled properly, this hazard may occasionally cause a minor/moderate injury or physical damage. It precedes the discussion of interest.

Note

A Note identifies information critical to the understanding or use of the equipment. It follows the discussion of interest.

REVISION HISTORY				
REV.	**DESCRIPTION**	**DATE**	**CHG**	**APPVD**
A	Initial Release	10/20/20	SM	RN
B	Added ECAT Slave Information	1/8/21	SM	RN
C	Added UKCA standard	05/20/22	AE	SF
D	Added Security Measures Update	08/4/22	AE	SS

Table of Contents

INTRODUCTION

The Power PMAC 1040 CPU (part number 3 - 4241BEU – XXX - B00000) provides a powerful computing engine for UMAC (Universal Motion and Automation Controller) rack-mounted systems. This 3U-format Eurocard can communicate with multiple accessory boards over the UBUS backplane. These accessory boards provide interfaces to the various machine elements for both motion and non-motion I/O, digital and analog.

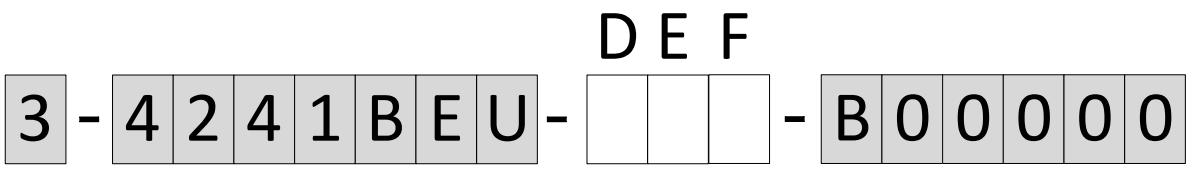
The Power PMAC 1040 CPU can communicate with all accessory boards that the older Turbo PMAC2 UMAC CPU board (603766-10x) could use. In addition, it can communicate with a new generation of "PMAC3" UMAC accessory boards for motion, MACRO ring, and I/O that employ a new generation ASIC and a 32-bit data bus on the backplane.

The Power PMAC 1040 CPU acts as both a dedicated controller and a general-purpose embedded computer. It uses the Linux operating system with a hard-real-time kernel that guarantees determinacy of tasks such as servo loop closure.

SPECIFICATIONS

Please observe “Precautions For Correct Use”, and “Precautions For Safe Use” referenced at the beginning of this manual as well as any cautions/warnings within this section.

Part Number Designation



OPT. D

2:	none
4:	PCIe

OPT. E

0:	none
1:	ECAT I/O
5:	ECAT 16
9:	ECAT 32
J:	ECAT 64

OPT. F

0:	none
1:	ECAT Slave

Power PMAC 1040 CPU Configuration

Standard Configuration

The base version of the Power PMAC 1040 CPU provides:

- 1.6 GHz 32-bit Quad Core ARM CPU
- 2 GB DDR3L active memory
- 4 GB built-in NAND flash memory for user application storage
- 1000-Base-T (1 Gigabit/sec) Ethernet communications port
- USB 3.0 Type A Host port
- USB 2.0 micro Serial device communications port/Mass Storage port
- 32-bit UBUS backplane port to UMAC accessory boards

Optional Features

- PCI Express expansion port
- EtherCAT® Master
  - Available in I/O only, 16 axis, 32 axis, 64 axis
- EtherCAT® Slave
  - Up to 64 non-DC, 32-Bit Input PDOs and 64 non-DC 32-Bit Output PDOs

Environmental Specifications

Description	Specification
Ambient operating temperature	0 to 55 degree C
Ambient operating humidity	10 to 95% RH (with no icing or condensation)
Atmosphere	Must be free from corrosive gases.
Ambient storage temperature	-25 to 70 degree C (with no icing or condensation)
Noise immunity	2kV on power supply line (Conforms to IEC 61000-4-4.)

Caution

UMAC Rack must be mounted with sufficient clearance for cooling. Refer to installation instruction on hardware reference for specified clearances.

Electrical Specifications

Description	Specification
Power supply rated voltage	5 VDC (provided through backplane)
Current consumption	3000 mA max.

General Product Specifications

Description	Specification
Enclosure	Mounted in a panel
Grounding method	Ground to 100 Ω or less
Weight	190 g max.
Dimensions (height x depth x width)	Please refer to “Mounting” section in table of contents.
Network port	Ethernet(1000BASE-T/100BASE-TX) :× 1, EtherCAT®(Master) :× 1 EtherCAT®(Slave): × 2 (In and Out)
Ethernet Transmission media	STP (shielded, twisted pair) cable of Ethernet category 5,5e or higher
EtherCAT® Transmission media	Straight STP (shielded twisted-pair) cable of category 5 or higher with double shielding (braiding and aluminum foil tape)
EtherCAT® slave Transmission media	Straight STP (shielded twisted-pair) cable of category 5 or higher with double shielding (braiding and aluminum foil tape)
USB3.0 Host	Connector: type-A Transmission distance: 3m max. Bus power (5V, 0.9Amax.)
USB 2.0 Device	Connector: type-C Transmission distance: 3m max.(*1) Bus power (5V, 0.5A max.)

(*1) The specification limits the length of USB2.0 cables to 5 meters. But the specification of this unit is limited to 3m max for noise immunity.

Description		Specification
External connection terminals		For EtherCAT® communications RJ45 x 1 (Shield supported)
		For Ethernet communications RJ45 x 1 (Shield supported)
Maximum number of controlled axes		64 Axes
EtherCAT® communications specifications	Communications protocol	EtherCAT® protocol
	Baud rate	100 Mbps
	Physical layer	100BASE-TX (IEEE 802.3)
	Topology	Line, daisy chain, and branching
	Transmission media	Twisted-pair cable of category 5 or higher (double-shielded cable with aluminum tape and braiding)
	Transmission distance	Distance between nodes: 100 m or less
	Maximum number of slaves	64
	Range of node address that can be set	1 to 64
Ethernet communications specifications	Baud rate	1000 Mbps
	Physical layer	1000BASE-TX (IEEE 802.3)
	Frame length	1,514 bytes max.
	Media access method	CSMA/CD
	Modulation	Baseband
	Topology	Star
	Transmission media	Twisted-pair cable of category 5, 5e, or higher(shielded cable)
	Maximum transmission distance between Ethernet switch and node	100 m
	Maximum number of cascade connections	There are no restrictions if an Ethernet switch is used

Task Control

Description	Specification
Task control/ Multi core task priorities	Servo/Phase intensive RTI intensive; Background intensive Phase/Background intensive Background intensive Custom mode (User can select core# for each tasks)

Quad core Affinity (PP-Proj.ini setting) with Gate							
Option	phasetask	servotask	rtitask	ecattask	backgroundthread	eiptask	comment
Servo/Phase Intensive	1	2	3	3	0	0	
RTI intensive; Background Intensive	1	1	2	3	3	0	
Phase/Background intensive	1	2	2	3	3	0	
Background Intensive	1	1	1	3	0	0	
Default	1	1	2	3	0	0	

ECAT Slave

Description		Specification
Modulation		Base band
Baund rate		100 Mbps
Topology		Depends on the specifications of the EtherCAT master.
Transmission Distance		Distance between nodes: 100 m or less
Node address setting		1 to 65535 （Software switch setting）
Send/receive PDO data sizes	Input	8 configurable PDO mappings each containing 8*32bit = 256bits PDOs 1 mapping containing 8*32bit PDOs = 256 bits = 32bytes
	Output	8 configurable PDO mappings each containing 8*32bit = 256bits PDOs 8 mapping containing 8*32bit PDOs = 2048 bit = 256 bytes
Mailbox data size	Input	Maximum 128 bytes
	Output	Maximum 128 bytes
Refreshing methods		Free-Run refreshing
Conformance test		ETG official conformance test

EtherNet/IP

Description		Specification
Implicit (I/O) message service	Number of connection types	32 (32 Produced/Consumed connections for each)
	Packet interval (refresh cycle)	1 to 1,000 ms in 0.5-ms increments
	Allowed communications bandwidth per Unit	3,200 PPS
	Maximum link data size per node	16,128 byte (32 connection x 504 byte) (Produced/Consumed connection for each)
	Maximum data size per connection	504 byte (Produced/Consumed connection for each)
	Multi-cast packet filter	Supported
Explicit message service	Class 3 (number of connections)	Not supported
	UCMM (unconnected)	Number of servers that can communicate at one time: 32 max.
CIP message routing		Not supported
CIP safety I/O routing		Not supported
Conformance test		Conforms to CT17

Agency Approval and Safety

Item	Description
CE Mark	EN61326-1
UKCA	2016 No. 1091
EMC	EN55011 Class A Group 1 EN61000-4-2 EN61000-4-3 EN61000-4-4 EN61000-4-5 EN61000-4-6
UL	UL61010-1 and UL61010-2-201 File E314517
cUL	CAN/CSA C22.2 No. 61010-1 and CAN/CSA C22.2 No. 61010-2-201 File E314517
Flammability Class	UL 94V-0
KC	EMI: KN 11 EMS: KN 61000-6-2

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HARDWARE SETUP

Please observe "Precautions For Correct Use", and "Precautions For Safe Use" referenced at the beginning of this manual as well as any cautions/warnings within this section.

There is virtually no hardware setup required before installation of the Power PMAC 1040 CPU in the system.

E-Point Jumpers (Switch)

The E-point jumpers on the board have been replaced with a 4 pole switch. This is intended for factory use only. Their functionality is listed here primarily for reference.

Jumpers	Purpose
S1-1	For factory use only. Must remain off **(open)**
S1-2	Should remain off (**open**) for normal operation. On (**closed**) disables the watchdog timer circuit.
S1-3	Not used
S1-4	Not used

MOUNTING

Please observe "Precautions For Correct Use", and "Precautions For Safe Use" referenced at the beginning of this manual as well as any cautions/warnings within this section.

Backplane (UBUS) Connection

Caution

STATIC SENSITIVE DEVICE - HANDLE WITH CARE
1. When removing from Anti-static bag, touch bag to the equipment where the product is being installed.
2. Hold the product by the edges and avoid touching the solder or the components on the board as it is removed from the anti-static bag.
3. Do not place the product on a counter while moving it from the Anti-static bag to the equipment.
4. Electrostatic wrist strap is recommended for handling the product.

Caution

To connect the Power PMAC 1040 CPU to the UBUS backplane, simply slide the board into any slot of a UMAC that has a bus connection socket of a UBUS backplane board.

It does not matter which socket on the backplane board is used, although customarily the CPU board is installed in the leftmost slot. In a standard UMAC rack, getting the front plate flush with the front of the rack and turning the front screws firmly will ensure a good connection with the backplane.

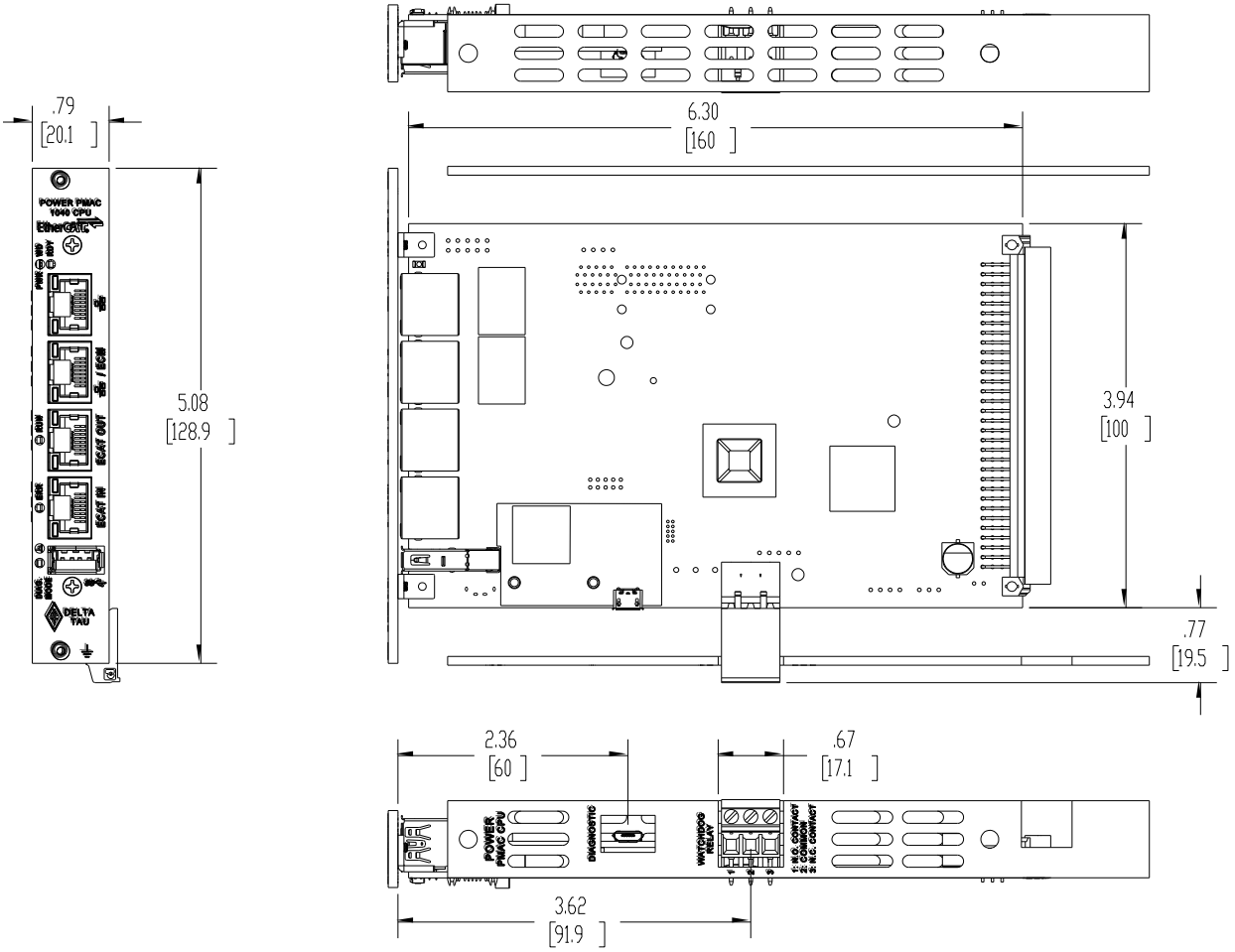
The Power PMAC 1040 CPU gets its electrical power through the UBUS backplane board, whether the power comes from a Delta Tau power supply or an external user-provided supply.

Caution

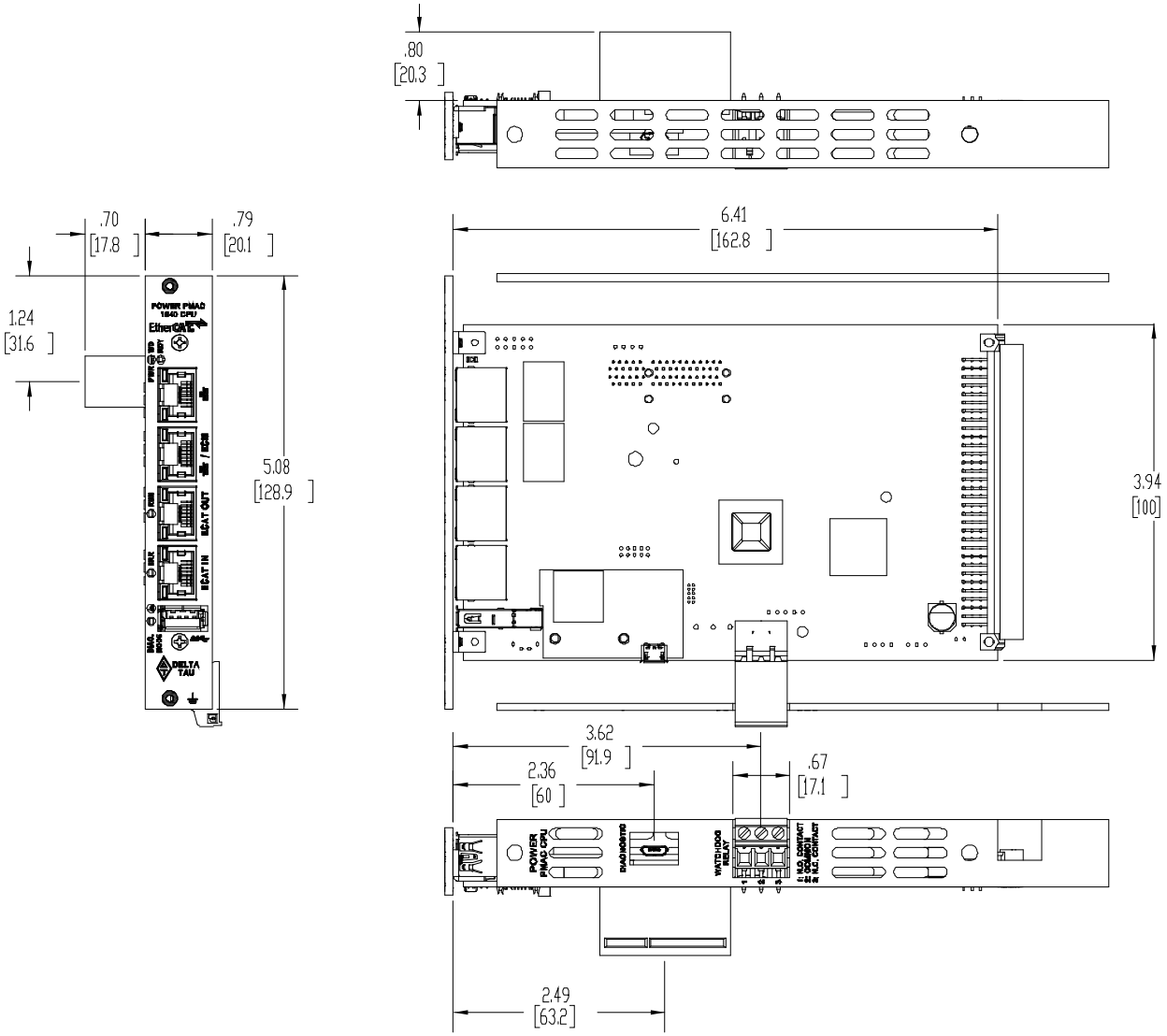
Always turn OFF the power supply before you attempt any of the following:
- Installing or removing the product
- Assembling the units or installing and removing components connected to the product
- Connecting or disconnecting the terminal block connector and PCIe connector

CAD Drawing

Without PCI Connector



With PCI Connector

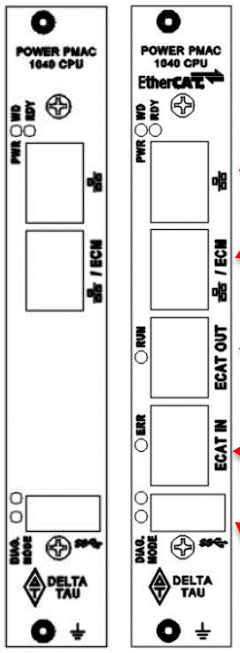


CONNECTORS, SWITCHES & INDICATORS

Please observe "Precautions For Correct Use", and "Precautions For Safe Use" referenced at the beginning of this manual as well as any cautions/warnings within this section.

Board Front View/ Side View

Front View



Ethernet (1000Mbs)
Connect to IDE Tool software, custom GUI NJ/NX via EIP

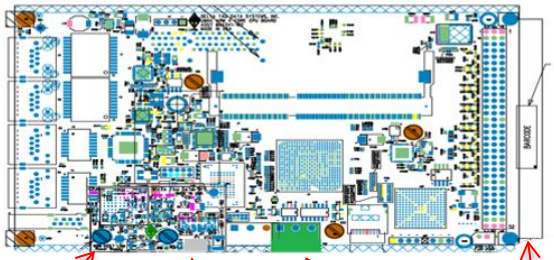
EtherCAT® Master
Connect to ECAT Drives (Ex. 1S), IO unit (Ex. NX-IO) etc...

EtherCAT®
Connect to next slave of ECAT Master Chain

EtherCAT®
Connect to ECAT Master Chain (Ex. From NX/NJ, Beckhoff, PowerPMAC)

USB3.0 Host
Connect to USB memory or Hard disk.

Side View



PCIe option (backside)
PCIe express connector

USB 2.0 Device
Serial port/mass Storage connectivity

Watchdog
Solid State Relay

UBUS

User Interfaces

Interface	Functional Specification
Ethernet (ETH 0)	1000BASE-T/100BASE-TX Connect to IDE Tool software, Custom GUI NJ/NX via EtherNet/IP Modbus/TCP
EtherCAT® master (ECM)	Connect to EtherCAT® Drivers (Ex. 1S), IO unit
EtherCAT slave (OUT)	Connect to next slave of EtherCAT Master Chain
EtherCAT slave (IN)	Connect to previous slave of EtherCAT Master Chain Connect to EtherCAT Master (Ex. From NJ/NX, Beckhoff, Power PMAC)
Serial Port (USB 2.0 Device)	USB Serial UART Diagnostic port/mass storage connectivity
Watchdog output	Solid Sate Relay (DC24V)
UBUS	Connect to Accessary Units

Ethernet/EtherCAT® Connections

The Power PMAC 1040 CPU is provided with two Ethernet TCP/IP communication ports on the front panel: ETH 0 and ETH 1. ETH 1 may be used for the field bus option EtherCAT® provided the option has been purchased. All ports can accept standard CAT-5 Ethernet cables with RJ-45 connectors. All ports provide transformer isolation to prevent ground-loop problems.

ETH0

The top Ethernet connector ( ) on the front panel, also termed the "ETH 0" port, is the primary port for communicating with the CPU board from a host computer when using the Integrated Development Environment (IDE) program running on a Windows™ PC for developing your application.

Note that multiple computers on a single network can independently communicate to the Power PMAC CPU board through this single hardware port.

ETH1 / ECM

Immediately under the top Ethernet connector on the front panel is the EtherCAT® port (/ ECM), also termed the "ETH 1" port. It is the auxiliary Ethernet port and may be used as the EtherCAT® master port to control DS402 EtherCAT® drives as well as EtherCAT® I/O Slave modules.

ECAT OUT

This is the second from the bottom most connector and is used as the EtherCAT® slave output port to connect additional EtherCAT® slaves downstream serviced by an NJ or NX master.

ECAT IN

This is the bottom most connector and is used as the EtherCAT® slave input port to connect to another master so the Power PMAC can receive data from another master such as a NJ or NX PLC.

Machine integrator is responsible to insure that devices connected to the EtherCAT® interfaces are implemented in a responsible manner. EtherCAT® endpoints must be configured to shut down in a manner similar to an E-Stop when EtherCAT® communications ceases to communicate correctly with the UMAC control system. Refer to "EtherCAT® Configuration" in the software reference manual.

USB Connections

The Power PMAC 1040 CPU provides two USB ports one on the front panel as the host port and one device port internal on the PCB.

Caution

USB ports are not electrically isolated, so care must be taken in the grounding interconnection scheme when any separately powered device is connected to one of these ports. Poor-quality communications and even permanent component damage is possible when ground loop issues or significant differences in ground potential exist.

USB Host Port (J3)

The USB "host" port is labeled "USB 1" on the front panel. It is a "Standard-A" USB 3.0 format connector located just below the Ethernet ports and has a horizontal orientation.

With this port, the Power PMAC CPU acts as the host computer and various peripheral devices can be connected through this port.

Most common peripheral device used on this port is the "USB stick" flash drive. The Power PMAC CPU board will automatically recognize standardly formatted flash drives connected to this port.

It is even possible to boot the CPU from this drive if the proper boot files are present on the drive. It is also possible to use USB peripheral devices such as true disk drives and keyboards.

Caution

Please do not plug/unplug the USB connection until the CPU boot up process is complete.

USB Flash Memory and USB serial Port (P1 on 604147 daughter card)

The USB Flash Memory/Serial Port is labeled "P1" on the 604147 daughter card. It is a "Micro-B" format connector. This port has dual functionality.

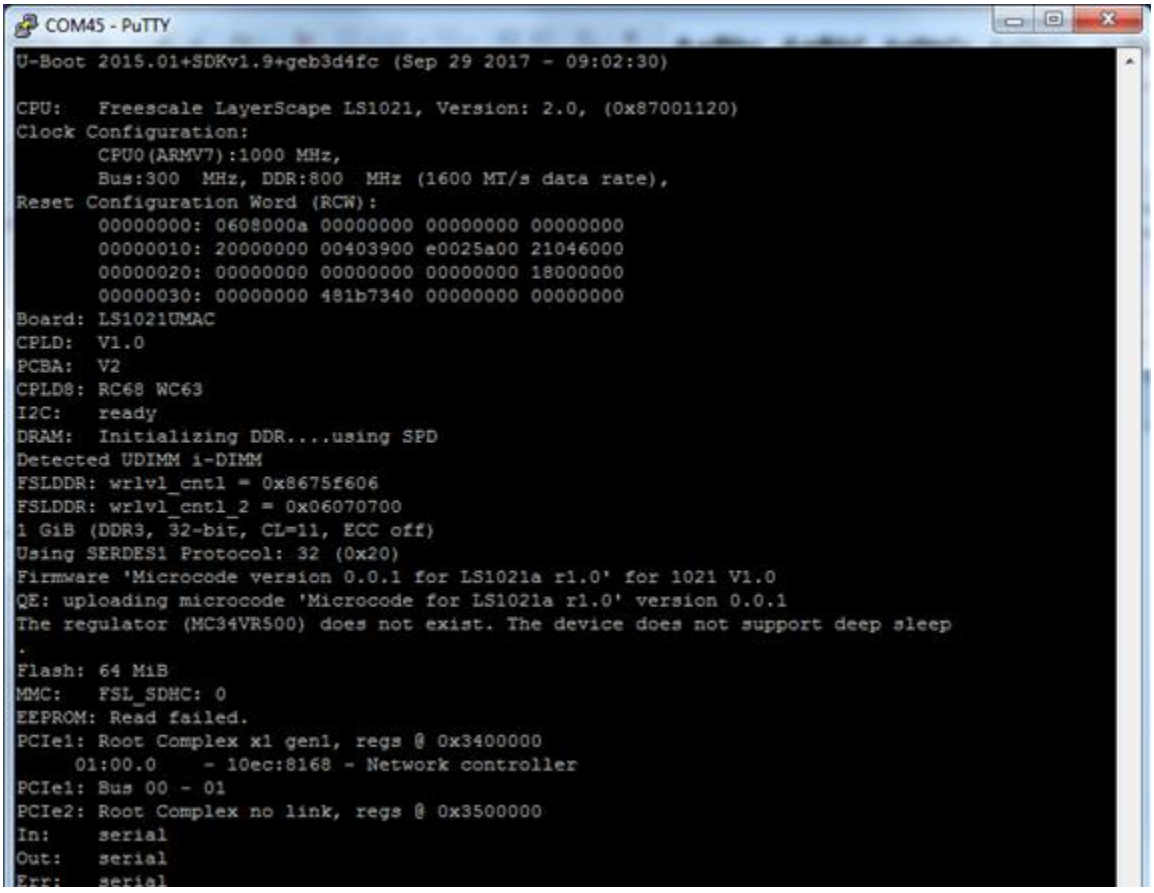
USB serial Port Functionality

When initially plugged in, the DIAG MODE LED is illuminated green. This indicates that the USB connection is serial.

The baud rate for the connection is 115200, 8 data bits, no parity and 1 stop bit. The COM port that is used by the PC is solely determined by Windows.

Please examine the Windows device manager to know what COM port Windows has chosen. The serial mode is useful for diagnostics for use with a Windows serial console program such as putty.exe.

The Power PMAC CPU must be externally powered for data to be present from this port. Below is an example of the startup diagnostic data that the CPU prints over the serial port on startup.



USB Flash Memory Functionality

To place Processor in USB Flash memory mode do the following

1.) Make sure power is **NOT** applied to the UMAC 1040 CPU and plug a **micro** USB cable from the PC to the side of the UMAC 1040 CPU. There will be a green LED indicating the UMAC 1040 CPU is receiving power from the PC USB connector to power its built in USB Serial port.

2.) Using a small screw driver click the switch S2 (see Figure 2 below) internal to the UMAC 1040 CPU board to change the USB Diag. mode connection from USB Serial to USB mass storage. The LED will switch from GREEN to ORANGE once you have successfully switched from USB diagnostic mode to mass storage. In addition, simultaneously, Windows will automatically open an explorer session for the Power PMAC CPU mass storage disk.

The Power PMAC CPU's USB port now acts as a flash memory stick providing internal directory structure and file access from a Windows PC while the board is unpowered.

Figure 1: USB Connector is for serial port diagnostics.

Note

Micro-USB cable should not exceed 3m in length, otherwise functionality may not be guaranteed.

Figure 2: USB Connector is for a mass storage device.

Watchdog Timer Connection (TB2)

The Power PMAC 1040 CPU provides a dedicated connector for the output of the on-board watchdog timer. This 3-point removable terminal block is on the bottom edge of the board, midway. The solid-state relay output on this connector can be used for fail-safe shutdown of power circuitry in case of timer trip or loss of controller power.

Optional PCI Express Connection

The Power PMAC 1040 CPU optionally provides one PCI Express connector on the "back side" of the board (the left side when looking at the rack from the front). This permits the installation of PCI Express expansion cards inside the rack provided there is space available in the rack to the left of the CPU board, such as video cards, vision systems, and additional Ethernet ports in the Power PMAC system.

PCIe (x4) Connector (P4)

The P18 connector near the top of the back side of the CPU board provides a "times 4" (x4 – four serial channels) PCI Express connection. It is considered Port 1/Slot 1 by the CPU. PCI Express "x1" and "x4" accessories can be installed in this connector. This connector is in the right-angle configuration. The PCIe accessory board will be parallel to the CPU board, and the assembly will occupy 2 or 3 slots in the UMAC rack.

LED Indicators

LED		Color	Status	Functionality
PWR/ERR		Not lit	Not lit	No power
		Green	Lit	Power ON
		Red	Lit	Watchdog Error
RDY		Not lit	Not lit	Power off or Initial processing
		Green	Lit	Running application
ECAT RUN		Not lit	Not lit	Init. state
		Green	Blinking	Pre operational state
			Single flash	Safe operational state
			Lit	Operational state
ECAT ERR		Not lit	Not lit	No errors on ECAT
		Red	Blinking	In non-fatal errors (e.g. ECAT communication error)
			Double flash	In Sync Manager WDT timeout
			Lit	In fatal errors (e.g. ECAT initial process failure)
Ethernet	LINK	Not lit	Not lit	No link
		Orange	Lit	100 Mbps Link
		Green	Lit	1 Gbps Link
	ACT	Not lit	Not lit	No activity
		Yellow	Flickering	Activity
EtherCAT® Master	LINK	Not lit	Not lit	No link
		Orange	Lit	100 Mbps Link
		Green	Lit	1 Gbps Link
	ACT	Not lit	Not lit	No activity
			Flickering	Activity
EtherCAT slave IN	LINK	Not lit	Not lit	No link
		Green	Lit	Link
	ACT	Not lit	Not lit	No activity
		Green	Flickering	Activity
EtherCAT slave OUT	LINK	Not lit	Not lit	No link
		Green	Lit	Link
	ACT	Not lit	Not lit	No activity
		Green	Flickering	Activity

LED	Color	Status	Functionality
DIAG.MODE	Not lit	Not lit	Not communicating
	Green	Lit	Communicating by Micro USB will be serial port interface.
	Orange	Lit	Communicating by Micro USB will mass storage. This mode can be used only when the power is off.

Connector Pinouts

P1 UBUS32 Backplane Connector Pinout

Pin #	Row A	Row B	Row C
1	+5V	+5V	+5V
2	GND	GND	GND
3	BD09 (*BD01*)	BD00 (*rsvrd.*)	BD08 (*BD00*)
4	BD11 (*BD03*)	BD01 (*rsvrd.*)	BD10 (*BD02*)
5	BD13 (*BD05*)	BD02 (*rsvrd.*)	BD12 (*BD04*)
6	BD15 (*BD07*)	BD03 (*rsvrd.*)	BD14 (*BD06*)
7	BD17 (*BD09*)	BD04 (*rsvrd.*)	BD16 (*BD08*)
8	BD19 (*BD11*)	BD05 (*rsvrd.*)	BD18 (*BD10*)
9	BD21 (*BD13*)	BD06 (*rsvrd.*)	BD20 (*BD12*)
10	BD23 (*BD15*)	BD07 (*rsvrd.*)	BD22 (*BD14*)
11	BD25 (*BD17*)	reserved	BD24 (*BD16*)
12	BD27 (*BD19*)	reserved	BD26 (*BD18*)
13	BD29 (*BD21*)	reserved	BD28 (*BD20*)
14	BD31 (*BD23*)	BCSDIR(*rsvrd.*)	BD30 (*BD22*)
15	reserved	BCS0-(*rsvrd.*)*	reserved
16	BA01	BCS1-(*rsvrd.*)*	BA00
17	BA04 (*BA03*)	BCS5-(*rsvrd.*)*	BA02
18	BA03 (*BX/Y*)	BA15 (*BA14*)	BA05 (*BA04*)
19	BCS3-	BA07 (*BA06*)	BCS2-
20	BA06 (*BA05*)	BA08 (*BA07*)	BCS4-
21	BCS12-	BA09 (*BA08*)	BCS10-
22	BCS16-	BA10 (*BA09*)	BCS14-
23	BA14 (*BA13*)	BA11 (*BA10*)	BA13 (*BA12*)
24	BRD-	BA12 (*BA11*)	BWR-
25	reserved	DPRCS1-	reserved
26	WAIT-	VMECS1-	BRESET
27	PHASE+	UMAC_INT-	SERVO+
28	PHASE-	INT1- (*EQU1-*)	SERVO-
29	AGND	INT2- (*EQU2-*)	AGND
30	A-15V	PWM_ENA	A+15V
31	GND	GND	GND
32	+5V	+5V	+5V

Notes:

1. These signals are provided primarily for reference, as this is typically an "internal" connector inside the system without direct user access.
2. Names in italics refer to the naming of this pin for the older UBUS24 24-bit backplane. Accessory boards designed for the Turbo PMAC UMAC CPU use these signal designations.
3. "rsvrd" means "reserved for future use"
4. "B" as the first letter means "buffered"

P11- P44 ETH 0 - 3 (8-PIN CONNECTOR)

PIN #	Symbol	Function	Description	Notes
1	P0MDI0+	BIDIR	Line 0 Pos	
2	P0MDI0-	BIDIR	Line 0 Neg	
3	P0MDI1+	BIDIR	Line 1 Pos	
4	P0MDI1-	BIDIR	Line 1 Neg	
5	P0MDI2+	BIDIR	Line 2 Pos	
6	P0MDI2-	BIDIR	Line 2 Neg	
7	P0MDI3+	BIDIR	Line 3 Pos	
8	P0MDI3-	BIDIR	Line 3 Neg	

J20 USB (4-PIN CONNECTOR)

PIN #	Symbol	Function	Description	Notes
1	VCC	Output	Supply voltage	
2	D-	Bidirect.	Data neg.	
3	D+	Bidirect.	Data pos.	
4	GND	Common	Ref. voltage	

P1 USB (4-PIN CONNECTOR)

PIN #	Symbol	Function	Description	Notes
1	VCC	Output	Supply voltage	
2	D-	Bidirect.	Data neg.	
3	D+	Bidirect.	Data pos.	
4	GND	Common	Ref. voltage	

TB2 WATCHDOG OUT (3-PIN CONNECTOR)

PIN #	Symbol	Function	Description	Notes
1	N.O.	Output	Normally open contact	Closed under proper operation
2	COM	Return	Common	Used with n.o. or n.c.
3	N.C.	Output	Normally closed contact	Open under proper operation

Note

Delta Tau recommends connection to the TB2 connector with UL rated wire with a temperature rating greater than 70C to ensure the output of the watchdog timer is properly processed by the machine logic.

J4 PCIe POWER (4-PIN CONNECTOR)

PIN #	Symbol	Function	Description	Notes
1	GND	Output	Ref. voltage	
2	N.C.	Bidirect.		
3	+12V OUT	Bidirect.	Output from internal 12v power supply	Jumper from 3-4 to supply 12v from built in regulator to PCIe connector
4	+V12 PCIe	Common	Connection to PCIe 12v	

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