

HARDWARE REFERENCE MANUAL

Power PMAC 1040 CPCI CPU



UMAC CPCI CPU Board

3-4256BEC-200-A000

August 4, 2022

Document # MN-000241



COPYRIGHT INFORMATION

© 2022 Delta Tau Data Systems, Inc. All rights reserved.

This document is furnished for the customers of Delta Tau Data Systems, Inc. Other uses are unauthorized without written permission of Delta Tau Data Systems, Inc. Information contained in this manual may be updated from time-to-time due to product improvements, etc., and may not conform in every respect to former issues.

To report errors or inconsistencies, email: odt-support@omron.com.

For inquiries about the product, contact your local OMRON representative.

Trademarks

All encoder protocols and industrial networks mentioned in this manual are registered trademarks to their corresponding owners. They are only used in the purpose of product and technical description. E.g. EtherCAT® is a registered trademark of Beckhoff.

OPERATING CONDITIONS

All Delta Tau Data Systems, Inc. motion controller, accessory, and amplifier products 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.

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. When our products are used in an industrial environment, install them into an industrial electrical cabinet 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.

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 CPCI systems. They have sharp edges on the faceplates, sharp components installed and exposed circuit card edges.
- Both processors and accessory cards may not be removed or inserted (hot plugged) while power is applied to UMAC CPCI 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.
- SSD has a write limitation of 100,000 cycles and 10 years data retention.

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	Preliminary	07/12/21	SM	RN
B	Manual creation for Power PMAC CPCI CPU	10/05/21	AE	SS
C	Micro USB Accessory Update	11/23/21	AE	SS
D	Update UKCA Standard compliance	05/05/22	AE	SF
E	Added Security Measures Update	08/04/22	AE	SS

*This page intentionally left
blank*

Table of Contents

COPYRIGHT INFORMATION	2
Trademarks	2
OPERATING CONDITIONS.....	2
SAFETY INSTRUCTIONS.....	6
WARNINGS	9
INTRODUCTION.....	12
Associated Manuals	13
SPECIFICATIONS.....	14
Part Number	14
Environmental Specifications	15
Electrical Specifications	16
General Product Specifications	17
Task Control	19
Agency Approval and Safety	20
HARDWARE SETUP.....	21
Switch S1	21
MOUNTING.....	22
Compact UBUS Connector.....	22
Rear Field Wiring Connector.....	22
CAD Drawing	23
CONNECTORS, SWITCHES & INDICATORS.....	24
Board Front View/Side View.....	24
User Interfaces	25
Ethernet/EtherCAT [®] Connections.....	26
<i>ETH0</i>	26
<i>ETH1 / ECM</i>	26
USB Connections.....	27
<i>USB Host Port</i>	27
<i>USB Device Port</i>	28
LED Indicators.....	30
Connector pinouts	31
<i>UBUS32 Backplane Connector (P6) Pinout</i>	31
<i>Field Wiring Connector (P7)</i>	31
ACCESSORIES	32
ACC-Cx Compact UBUS Backplane Boards	32
ACC-8CR Test Breakout Board	32
ACC-11C Sinking I/O Board.....	32
ACC-24C2A Analog Axis Board	33

WARNINGS



Warning

Observe warnings for proper ground bonding of equipment in system rack



Warning



Warning

Follow the instructions in the Hardware Manual to correctly verify connector wiring and insertion. Double-check all wiring and connector insertion before turning ON the power supply.



Warning



Warning

Sensitive signals may require the use of shielded wire or other specifically rated wiring for the application type. Refer to the Hardware manuals when selecting wire types.



Warning



Warning

Before applying power after installation, verify that there is no contamination developed in the product. Contamination may cause unpredictable operation of the product.



Warning



Warning

Machine integrator is responsible to verify that the encoders are programmed to operate in the correct direction prior to engaging motors to spin.



Warning



Warning

Machine integrator is responsible to provide safe machine shutdown and user isolation in case of watchdog or power cycle condition.



Warning



Warning

“WARNING- THIS MACHINE STARTS AND STOPS AUTOMATICALLY” sign is expected to be placed on the machine containing this control equipment.



Warning



Warning

E-stop and safety interlocks must be verified for operation before commissioning machine and during periodic maintenance.



Warning



Warning

Machine integrator is responsible to prepare machinery so that safety zones and physical stops are implemented in a responsible manner. Refer to "HOW TO MAKE YOUR APPLICATION SAFE" in the software reference manual.



Warning



Warning

Machine integrator is responsible to insure that external controlling programs (HMIs) are implemented in a responsible manner. Machinery must stop in a manner similar to an E-Stop when external control programs cease to communicate with the UMAC CPCI control system. Refer to "HOW TO MAKE YOUR APPLICATION SAFE" in the software reference manual.



Warning



Warning

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 comms ceases to communicate correctly with the UMAC CPCI control system. Refer to "EtherCAT Configuration" in the software reference manual.



Warning



Warning

Operators, Maintenance Operators and Machine Integrators must read the Product Manuals and Safety Precaution sheet prior to operating the UMAC CPCI products.



Warning



Warning

Use of Lockout/Tagout procedures are expected when product is accessed in control cabinets of machinery.



Warning



Warning

If a fuse in the UMAC CPCI product is replaceable, it must be replaced with a fuse of the same rating. Not all fuses in the UMAC CPCI product are user replaceable.



Warning

INTRODUCTION

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

All field wiring is available on rear connectors, suitable for a user-designed distribution system to the machine. UMAC CPCI systems provide integrated connectivity as well as ease of assembly, diagnostics, and repair. UMAC CPCI systems differ from standard UMAC systems in that all field wiring comes to the back of the rack, behind the backplane, instead of direct top and bottom access.

The Power PMAC 1040 CPCI CPU can communicate with all accessory boards that the older Turbo PMAC2 UMAC CPCI CPU board could use.

The Power PMAC 1040 CPCI 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.

Note: A 1040 CPCI CPU interface does not come with a UMAC CPCI system automatically, nor is one necessary to communicate with the system.

This device optionally supports EtherCAT network communications.

The user can flexibly allocate different tasks among the four cores on the CPU.

Associated Manuals

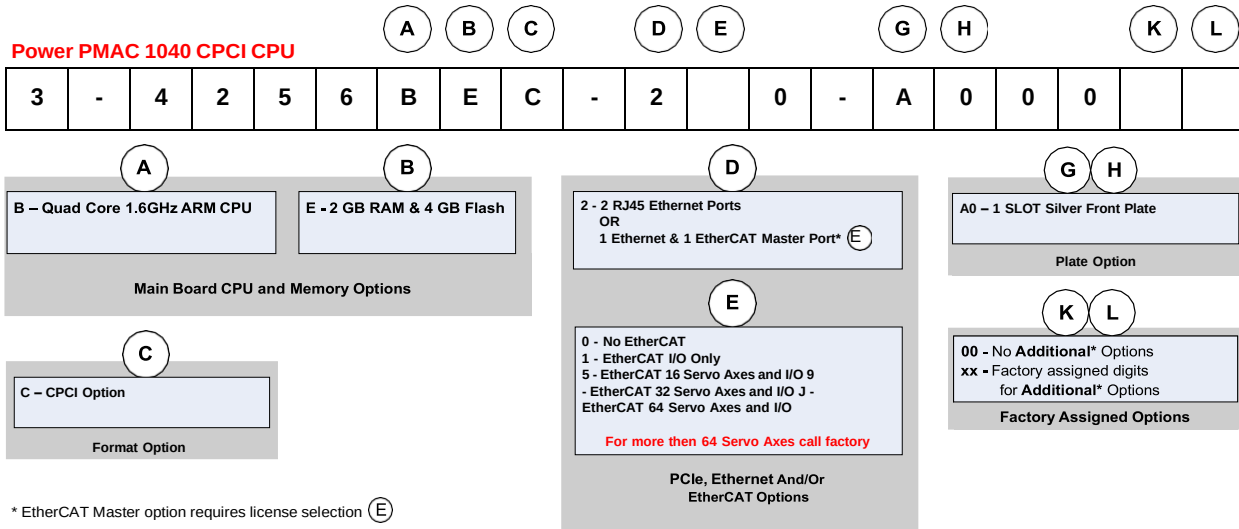
This document is the Hardware Reference Manual for the Power PMAC 1040 CPCI CPU board for a UMAC CPCI system. It describes the hardware features and provides setup instructions.

Other manuals are needed as well to use the UMAC CPCI system. Each accessory to the 1040 CPCI CPU board has its own manual, describing its operation and any required software setup of the Power CPU.

The Power PMAC Software Reference Manual and the Power PMAC User's Manual are also needed.

SPECIFICATIONS

Part Number



Part Number	Description
3-4256BEC-200-A00000	2 ETHERNET PORTS, 4GB FLASH, 2GB RAM
3-4256BEC-210-A00000	1 ETHERNET & 1 ECAT I/O PORTS, 4GB FLASH, 2GB RAM
3-4256BEC-250-A00000	1 ETHERNET & 1 ECAT 16 SERVO & I/O PORTS, 4GB FLASH, 2GB RAM
3-4256BEC-290-A00000	1 ETHERNET & 1 ECAT 32 SERVO & I/O PORTS, 4GB FLASH, 2GB RAM
3-4256BEC-2J0-A00000	1 ETHERNET & 1 ECAT 64 SERVO & I/O PORTS, 4GB FLASH, 2GB RAM

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

The UMAC CPCI 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 (provided through backplane)	5 VDC	3.3 VDC
Current consumption	2000 mA max. 1750 mA typical	125 mA max. 110 mA typical

General Product Specifications

Description	Specification
Enclosure	Mounted in a panel
Grounding method	Ground to Earth at 100Ω or less
Weight	250 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
Ethernet Transmission media	STP (shielded, twisted pair) cable of Ethernet CAT5e or higher
EtherCAT® Transmission media	Straight STP (shielded twisted-pair) cable of CAT5e 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: Micro USB 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)
Local Axis control performance		8 axes / 15 us, 16 axes / 23 us, 28 axes / 42us
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
EtherCAT® communications specifications (Optional License)	Communications protocol	EtherCAT® protocol
	EtherCAT Axis control performance	8 axes / 16 kHz, 32 axes / 8 kHz, 64 axes / 4 kHz, 96 axes / 1 kHz
	Baud rate	100 Mbps
	Physical layer	100BASE-TX (IEEE 802.3)
	Topology	Line, daisy chain, and branching
	Transmission media	Twisted-pair cable of CAT5e or higher (double-shielded cable with aluminum tape and braiding)
	Transmission distance	Distance between nodes: 100 m or less

Task Control

The processor in the Power PMAC 1040 CPCI CPU board has 4 cores (numbered 0, 1, 2, and 3) that can execute different tasks simultaneously. The default assignment of tasks to these different cores (called the “balanced load” assignment) is suitable for a large majority of applications. The user does not need to take any action to use this configuration.

However, there may be some applications where it is desirable to change this configuration because one or two tasks require intensive use of a single core, and other tasks need to be assigned to other cores. In these cases, a control in the Integrated Development Environment (IDE) software can be used to change the task assignments, as shown below.

CPU Core Task Management (Quad Core with Gate)			
Option	Core	Tasks	
☒ Balanced load (Default)	0	Background Tasks	OS and Applications
☐ Servo/Phase Intensive	1	Phase Interrupt	Servo Interrupt
☐ RTI Intensive; Background Intensive	2	Real Time Interrupt	
☐ Phase/Background Intensive	3	EtherCAT Tasks	
☐ Background Intensive			

The assignment of tasks to cores for each of these possible configurations is shown in the following table.

Quad Core Affinity with Gate						
Option	Phasetask	Servotask	RTItask	ECATtask	Backgroundthread	EIPtask
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

Agency Approval and Safety

Item	Description
CE Mark	EN61326-1
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
UKCA	2016 No. 1091

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 CPCI CPU in the system.

Switch S1

S1 is a 4 pole switch. This is intended for factory use only. Functionality is listed here for reference.

Switch	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.



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

In a typical installation, the Power PMAC 1040 CPCI CPU is simply slid into a slot of a 3U-Eurocard rack until it inserts into the mating connectors on the backplane board already installed in the rack. In actual operation, all signals to the board come into the CPU board through the backplane.

Compact UBUS Connector

The Compact UBUS connector at the bottom of the back edge of the board provides the means for the Power PMAC 1040 CPCI CPU to communicate with axis and I/O boards through a common backplane board, such as a Delta Tau ACC-Cx board, or a user-designed backplane board. It also provides the 3.3V and 5V power supply lines to the CPU board.

Getting the backplane connector on the CPU board to mate firmly with the socket on the backplane requires some force, but can easily be done by hand. In a standard Compact UBUS 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.

Rear Field Wiring Connector

The field-wiring connector at the top of the back edge of the board provides the path for all of the signals between the CPU board and the outside system. In a typical configuration, this connector is mated with a pass-through connector on the Compact UBUS backplane board, and a system-specific distribution system is installed behind the backplane.

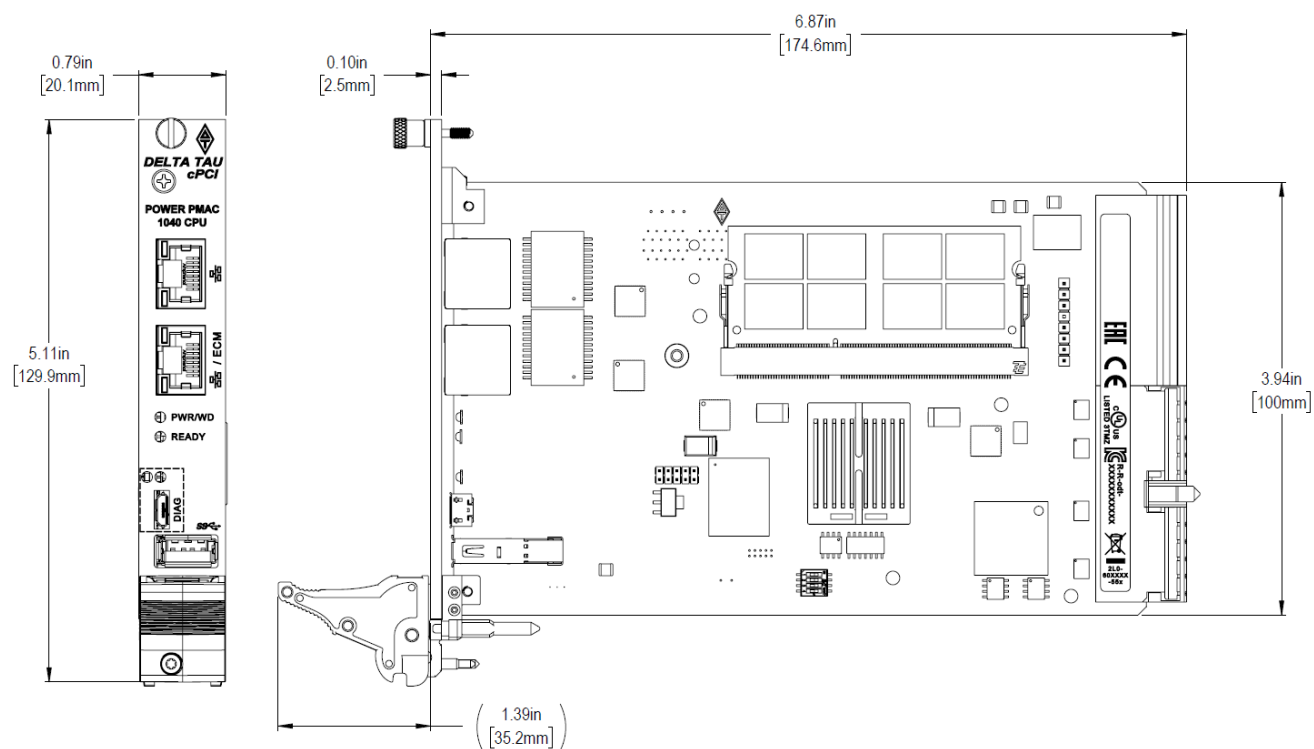


Caution

Always turn OFF the power supply before you attempt any of the following:

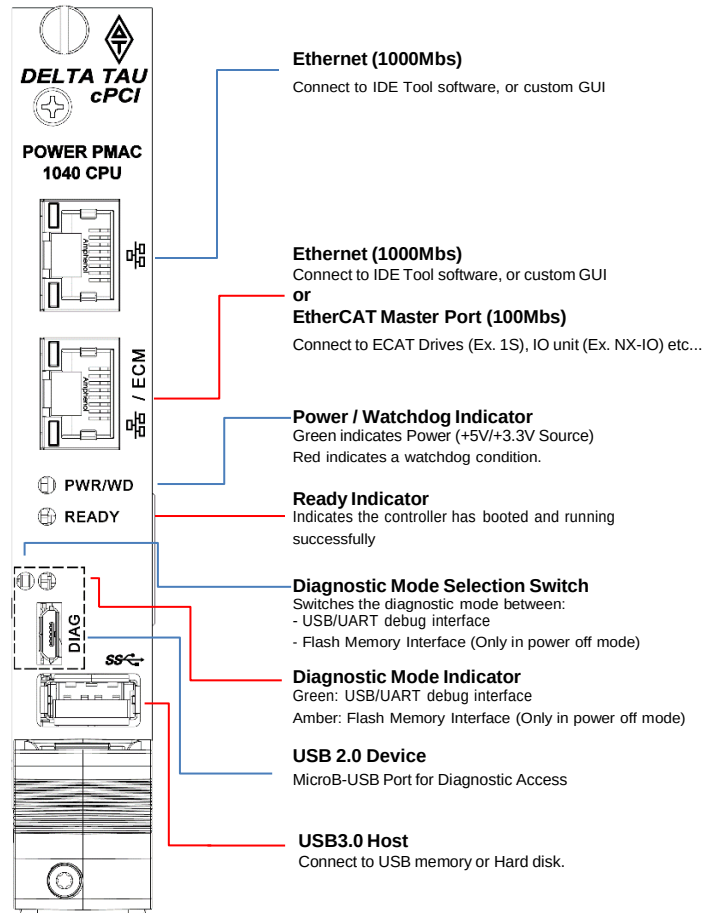
- Installing or removing the product
 - Assembling the units or installing and removing components connected to the product
 - Connecting or disconnecting the terminal block connector
-

CAD Drawing



CONNECTORS, SWITCHES & INDICATORS

Board Front View/Side View



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
Serial Port (USB 2.0 Device)	USB Serial UART Diagnostic port/mass storage connectivity
CPCI/UBUS	Connect to Accessory Units

Ethernet/EtherCAT® Connections

The Power PMAC 1040 CPCI 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-5e 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.

This port can also be used for standard Ethernet communications.



Warning

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 CPCI CPU provides two USB ports.



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

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 1040 CPCI 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 1040 CPCI CPU 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.

A USB stick can be used to change the IP address, update firmware, load a configuration, or factory reset the CPU. To use this functionality, place a folder on the top level of the USB with one of the following names and reboot the PMAC with the usb stick inserted into USB 1.

- **PowerPmacIP**
 - With an empty folder, PMAC will create an interfaces file containing the current network settings. You can use this file as a template to create an interfaces file that will update PMAC’s network settings.
- **PowerPmacFactoryReset**
 - Performs \$\$\$*** during boot.
- **PowerPmacFirmwareInstall**
 - Place a firmware in here named “powerpmac.deb”
- **PowerPmacConfigLoad**
 - Copies project to PMAC. Place “usrflash” folder directly inside “/PowerPmacConfigLoad”. Project must be recovered from PMAC.

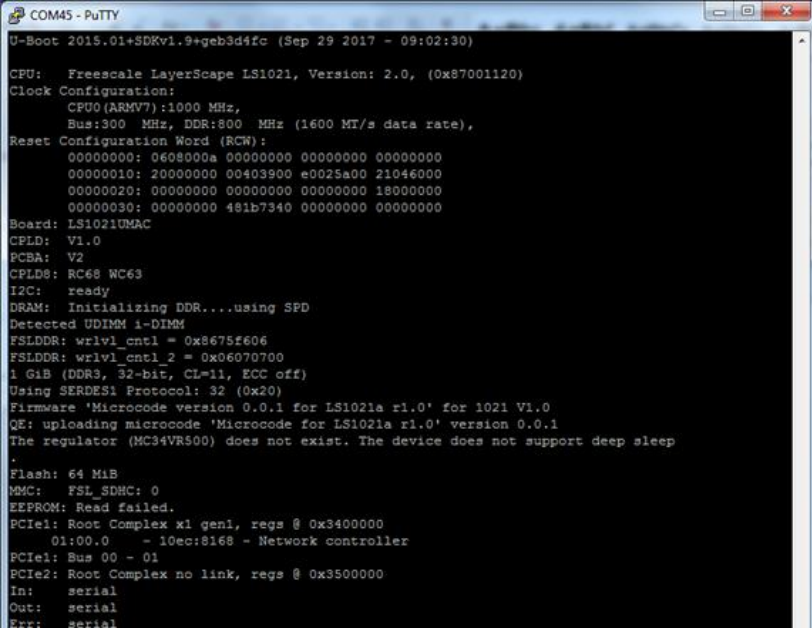
- **PowerPmacFirmwareInstallandConfigLoad**
 - Copies project and installs firmware. Place firmware in “/PowerPmacFirmwareInstallandConfigLoad/usrflash/”
- **PowerPmacNoRTLoad**
 - CPU runs as a generic computer without loading the Power PMAC firmware.

USB Device Port

The USB Device Port is labeled “DIAG” on the front panel. It is a “Micro-B” format connector. This port has dual functionality. This port is not intended for the end-user to use. It is only meant for diagnostic purposes by technicians during troubleshooting the hardware at factory or repair facility.

USB Serial Port Functionality

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



```
COM45 - PuTTY
U-Boot 2015.01+SDKv1.9+geb3d4fc (Sep 29 2017 - 09:02:30)

CPU: Freescale LayerScope LS1021, Version: 2.0, (0x87001120)
Clock Configuration:
CPU0 (ARMV7):1000 MHz,
Bus:300 MHz, DDR:800 MHz (1600 MT/s data rate),
Reset Configuration Word (RCW):
00000000: 0608000a 00000000 00000000 00000000
00000010: 20000000 00403900 e0025a00 21046000
00000020: 00000000 00000000 00000000 18000000
00000030: 00000000 481b7340 00000000 00000000

Board: LS1021UMAC
CPLD: V1.0
PCBA: V2
CPLD6: RC68 WC63
I2C: ready
DRAM: Initializing DDR....using SPD
Detected UDIMM 1-DIMM
FSLDDR: wr1vl_cnt1 = 0x8675f606
FSLDDR: wr1vl_cnt1_2 = 0x06070700
1 GiB (DDR3, 32-bit, CL=11, ECC off)
Using SERDES1 Protocol: 32 (0x20)
Firmware 'Microcode version 0.0.1 for LS1021a r1.0' for 1021 V1.0
QE: uploading microcode 'Microcode for LS1021a r1.0' version 0.0.1
The regulator (MC34VR500) does not exist. The device does not support deep sleep
.
Flash: 64 MiB
MMC: FSL_SDHC: 0
EEPROM: Read failed.
PCIe1: Root Complex x1 gen1, regs @ 0x3400000
01:00.0 - 10ec:8168 - Network controller
PCIe1: Bus 00 - 01
PCIe2: Root Complex no link, regs @ 0x3500000
In: serial
Out: serial
Err: serial
```

USB Flash Memory Functionality

To place the processor in the USB Flash Memory Mode, see the procedure below:

- Make sure power is NOT applied to the UMAC CPCI CPU Board and plug a micro USB cable from the PC to the side of the UMAC CPCI CPU (see figure 1). There will be a green LED indicating the UMAC CPCI CPU is receiving power from the PC USB connector to power its built in USB Serial port.
- Using a small non-conductive screwdriver click the switch S2 (see figure 2) internal to the UMAC CPCI 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 the UMAC ARM CPU Board 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.

USB Accessory

Due to dimension requirements of the MicroB USB connector, customers may be advised to purchase the following USB cable, sold by Delta Tau for use with Power PMAC 1040 CPCI CPU for diagnostic purposes:

Part Number	Description	Image
100-000058	USB A MALE TO MICRO MALE 3 FT CABLE WITH 10 MM MICRO USB TIP	

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
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
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

UBUS32 Backplane Connector (P6) Pinout

Row	Z	A	B	C	D	E	F
25	GND	5V			3.3V	5V	GND
24	GND	BD10	5V	V(I/O)	BD09	BD08	GND
23	GND	3.3V	BD13	BD12	5V	BD11	GND
22	GND	BD17	BD16	3.3V	BD15	BD14	GND
21	GND	3.3V	BD21	BD20	BD19	BD18	GND
20	GND	BD25	GND	BD24	BD23	BD22	GND
19	GND	3.3V	BD28	BD27	GND	BD26	GND
18	GND	BD31	GND	3.3V	BD30	BD29	GND
17	GND	3.3V	BD02	BD01	GND	BD00	GND
16	GND	BD06	GND	BD05	BD04	BD03	GND
15	GND	3.3V	BWR-	BRD-	GND	BD07	GND
14	(KEY)	(KEY)	(KEY)	(KEY)	(KEY)	(KEY)	(KEY)
13	(KEY)	(KEY)	(KEY)	(KEY)	(KEY)	(KEY)	(KEY)
12	(KEY)	(KEY)	(KEY)	(KEY)	(KEY)	(KEY)	(KEY)
11	GND	CS10-	CS4-	CS3-	GND	CS2-	GND
10	GND	CS16-	GND	3.3V	CS14-	CS12-	GND
9	GND	IREQ2-	IREQ1-	VMECS1-	GND	DPRCS1-	GND
8	GND	PHASE+	GND	SERVO+	WAIT-	UMACINT-	GND
7	GND	PHASE-	WDO	SERVO-	GND	CS05-	GND
6	GND	BA02	GND	3.3V	BA01	BA00	GND
5	GND	BA05	BA04	RESET	GND	BA03	GND
4	GND	BA08	GND	V(I/O)	BA07	BA06	GND
3	GND	BA12	BA11	BA10	5V	BA09	GND
2	GND		5V	BA15	BA14	BA13	GND
1	GND	5V	-12V	PWMENA	+12V	5V	GND

Notes:

- Row 25 is physically at the top of the connector in its “normal” orientation; Row 1 is at the bottom. Looking from the front of the rack, Column Z is on the left; Column F is on the right.
- Supply (Vxx & xxV) and ground pins are in the same locations as the Compact PCI bus.
- Spaces marked *(KEY)* are for the mechanical key; these are not pins.

Field Wiring Connector (P7)

This connector is unused on the CPCI CPU processor.

ACCESSORIES

The Power PMAC 1040 CPCI CPU board is always used with accessory boards. Delta Tau provides several accessory boards in the UMAC CPCI family that can be used with the CPU board; other parties may produce accessory boards as well. Each accessory board has its own hardware reference manual.

ACC-Cx Compact UBUS Backplane Boards

The ACC-Cx family of Compact UBUS backplane boards provides the means for the CPU board to communicate with other accessory boards. The x in the name of the backplane board refers to the number of backplane data slots provided.

This picture shows an ACC-C8 8-slot backplane board. It has a P47-style power connector suitable for a standard 1-slot CPCI-format power supply.

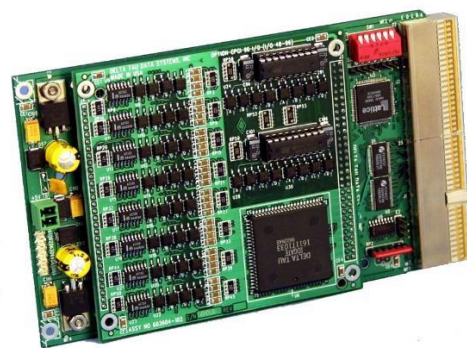


ACC-8CR Test Breakout Board

The ACC-8CR board provides a behind-the-backplane breakout scheme for the field wiring connector on any of the 3U-format UMAC CPCI board. It is designed to plug into the rear of an ACC-Cx Compact UBUS backplane board, and it meets the Compact PCI physical specification (100mm x 80mm) for rear distribution boards. It has 110 screw-down terminal points, one for each signal on the field wiring connector.

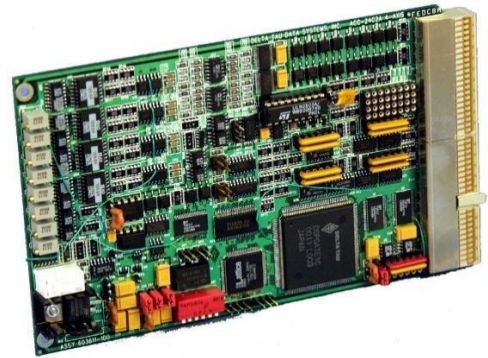
ACC-11C Sinking I/O Board

The ACC-11C board provides 32 isolated 12V-24V sinking inputs and 16 isolated sinking outputs up to 24V and 100mA per output. With its Option 1 mezzanine board, an additional 32 inputs and 16 outputs are provided, for a total of 96 I/O points in a single slot.



ACC-24C2A Analog Axis Board

The ACC-24C2A analog axis board provides the interface circuitry for four axes of control in a single slot, with analog interface to the servo drives. It also has one pulse-and-direction output per axis for stepper drives, or stepper-replacement servo drives. One 18-bit D/A converter comes standard for each axis; Option 1 provides a second D/A converter per axis, which can be used as part of a sine-wave control scheme, or for non-servo use. Option 2 provides eight 12-bit A/D converters.



Terms and Conditions Agreement

Warranties.

(a) Exclusive Warranty. Delta Tau's exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by Delta Tau (or such other period expressed in writing by Delta Tau). Delta Tau disclaims all other warranties, express or implied.

(b) Limitations. DELTA TAU MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE.

Delta Tau further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right.

(c) Buyer Remedy. Delta Tau's sole obligation hereunder shall be, at Delta Tau's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Delta Tau be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Delta Tau's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Delta Tau before shipment. Delta Tau shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty.

See <http://www.omron.com/global/> or contact your Omron representative for published information.

Limitation on Liability; Etc.

DELTA TAU SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY.

Further, in no event shall liability of Delta Tau exceed the individual price of the Product on which liability is asserted.

Suitability of Use.

Delta Tau shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer's application or use of the Product. At Buyer's request, Delta Tau will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer's application, product or system. Buyer shall take application responsibility in all cases.

NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE DELTA TAU PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Programmable Products.

Delta Tau shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.

Performance Data.

Data presented in Delta Tau websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of Delta Tau's test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the Delta Tau's Warranty and Limitations of Liability.

Change in Specifications.

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron's representative at any time to confirm actual specifications of purchased Product.

Errors and Omissions.

Information presented by Delta Tau has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or