



Power PMAC 1020 CPU

Hardware Reference Manual

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Technical Support

Phone: Call 1-800-556-6766, and follow the prompts for technical support on PMAC products.

Email: ODT-Support@omron.com

Alternate Email: ia.techsupport@omron.com

Type "Delta Tau Support" or "PMAC Support" in the subject line.

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.

If the equipment is used in a manner not specified by Delta Tau Data Systems, the protection provided by the equipment may be impaired.

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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.

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.



Warning

A Warning identifies hazards that could result in personal injury or death. It precedes the discussion of interest.



Caution

A Caution identifies hazards that could result in equipment 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
1	Released	11/16/16	SGM	SGM
2	Revision	6/22/18	HB	SGM
3	General Formatting	8/14/18	EH	RN
4	Added KC Conformity	10/17/18	SM	RN
5	General Formatting	3/7/1029	EH	RN
6	Added electrical specifications and dimensions, general formatting	12/13/19	SM	RN
A	Changed title of manual to match name on faceplate. Added document # to cover page. Changing Revision from numeral to character notation. Added information to “USB Connections” section	7/29/20	SM	RN
B	Fixed general formatting and added “Note” about watchdog TB2 connection	9/16/20	SM	RN
C	Fixed part number information, cover page, and general formatting	11/30/20	SM	RN
D	Added UKCA standard	04/11/22	AE	SF
E	Added Security Measures Update	08/04/22	AE	SS
F	Added Environmental Specifications	01/10/23	AE	JG
G	Updated front matter and spec tables	08/05/25	TDO	AA

Table of Contents

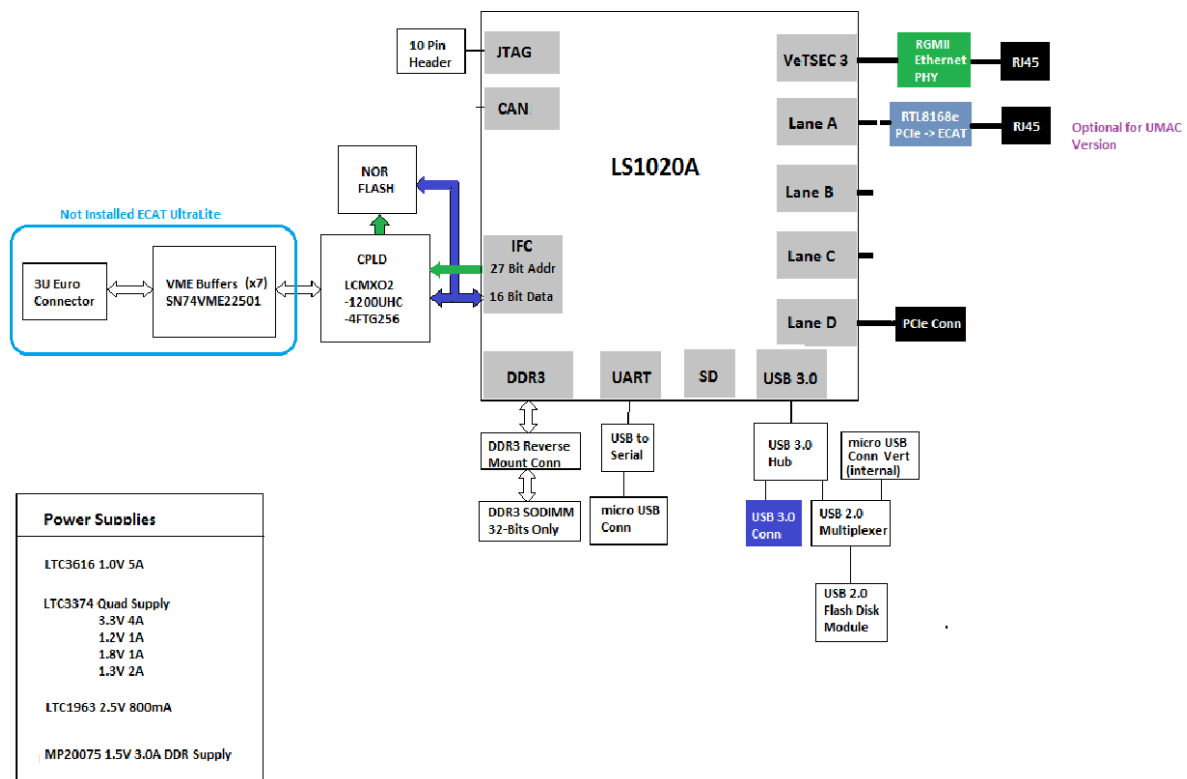
INTRODUCTION.....	8
SPECIFICATIONS.....	9
Agency Approval and Safety	9
Electrical Specifications	10
Dimensions	10
Environmental Specifications	10
CONFIGURATION.....	11
Optional Features	11
Part Number Designation	12
HARDWARE SETUP	13
E-Point Jumpers (Switch)	13
CONNECTORS AND SWITCHES AND INDICATORS	14
Board Front/Back Side.....	14
Backplane (UBUS) Connection	14
Ethernet Connections	14
USB Connections.....	15
Watchdog Timer Connection (TB2)	22
Optional PCI Express Connection	22
LED Indicators	22
Connector Pinouts	23

INTRODUCTION

The Power PMAC 1020 CPU provides a powerful computing engine for UMAC (Universal Motion and Automation Controller) rack-mounted systems. This 3U-format Eurocard (100 mm x 160 mm) 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 1020 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 1020 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

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
Flammability Class	UL 94V-0
KC	EMI: KN 11 EMS: KN 61000-6-2

사 용 자 안 내 문

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.

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Electrical Specifications

Rated voltage (V)	5
Rated Current (A)	3

Dimensions

Height (mm)	130.4
Width (mm)	170.9
Depth (mm)	28.6

Environmental Specifications

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.)
Pollution environment	Degree 2
Measurement category	Category III

CONFIGURATION

The base version of the Power PMAC 1020 CPU provides a 1-slot 3U-format Eurocard board with the following features:

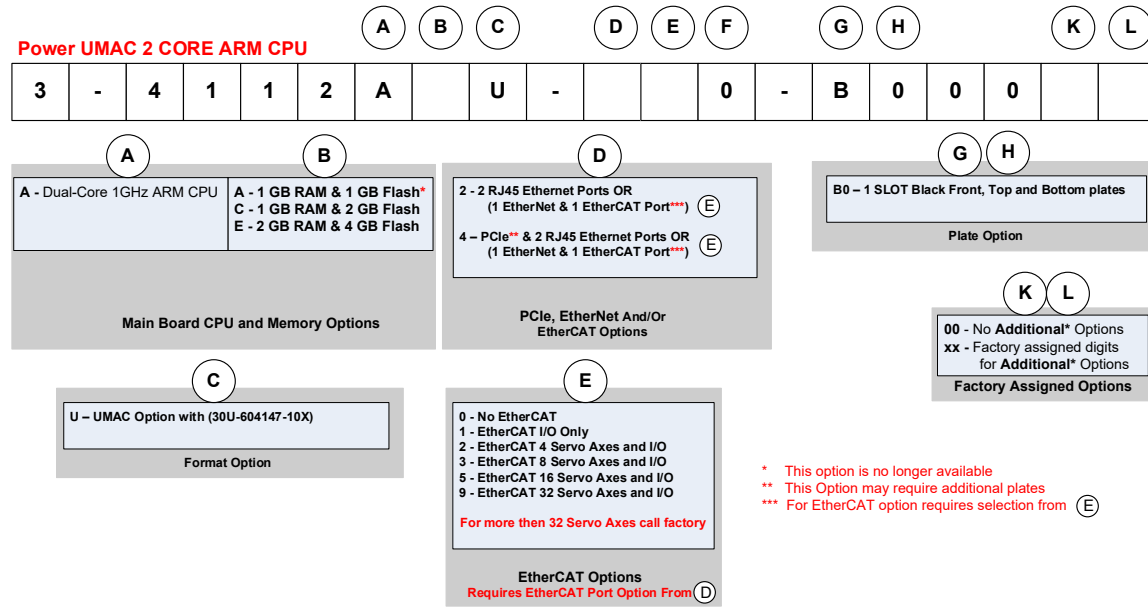
- 1.0 GHz 32-bit Dual Core ARM CPU with built-in hardware floating-point math capabilities
- 1 GByte DDR3L active memory with error correction
- 2 GByte built-in NAND flash memory for user application storage
- 1000-Base-T (1 Gbit/sec) Ethernet communications port
- USB 3.0 Host port
- RS-232 communications port
- 32-bit UBUS backplane port to UMAC accessory boards

Optional Features

The following features are optionally present on the Power PMAC UMAC ARM CPU board:

- 2 GByte DDR3L active memory
- 4G Byte built-in NAND flash memory for user application storage
- PCI Express expansion port
- Optional EtherCAT capability

Part Number Designation



HARDWARE SETUP

There is virtually no hardware setup required before installation of the Power PMAC 1020 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.

S1-1: For factory use only. Must remain off (**open**)

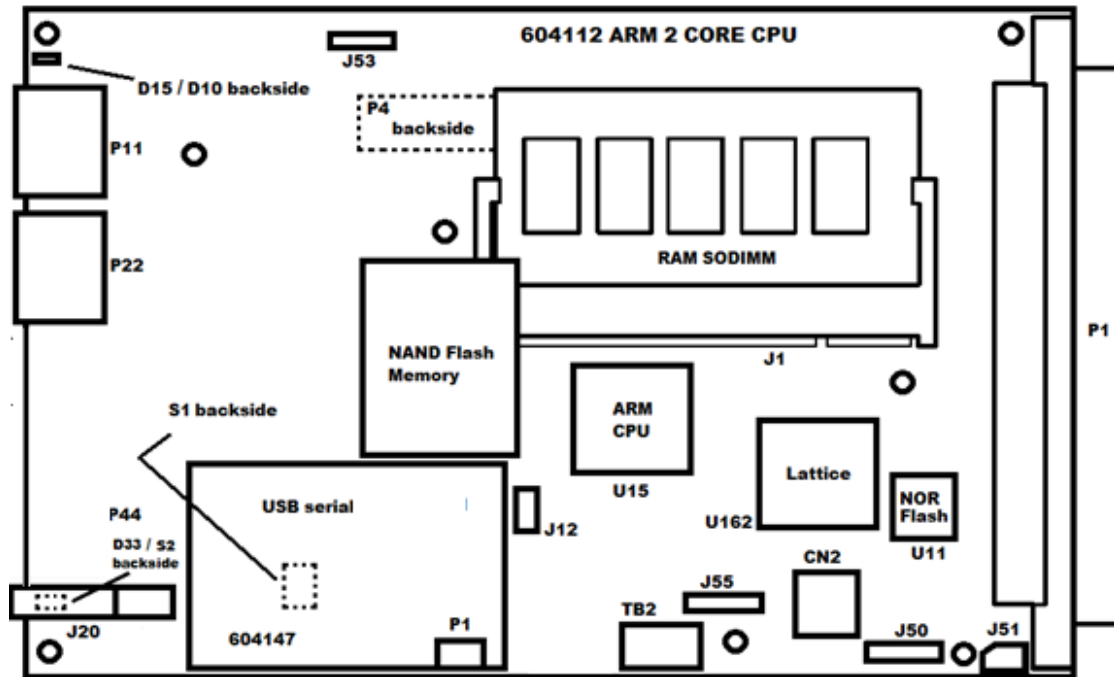
S1-2: Should remain off (**open**) for normal operation. On (**closed**) disables the watchdog timer circuit.

S1-3: Enables PCIe connector when on (**closed**). To disable PCIe connector leave off (**open**)

S1-4: For factory use only. Must remain off (**open**)

CONNECTORS AND SWITCHES AND INDICATORS

Board Front/Back Side



Backplane (UBUS) Connection

To connect the Power PMAC 1020 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.

Getting the P1 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 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 1020 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.

Ethernet Connections

The Power PMAC 1020 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.

ETH 0 Ethernet Port (P11)

The “ETH 0” port is the top Ethernet connector on the front panel. It is the primary port for communicating with the CPU board from a host computer, as 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.

ETH 2 Ethernet Port (P22)

The “ETH 2” port is immediately under the top Ethernet connector on the front panel. It is the auxiliary Ethernet port and may be used as the EtherCAT port.

USB Connections

The Power PMAC 1020 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 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.

Serial Port	USB-Serial UART Diagnostic Port
-------------	------------------------------------

USB Host Port (J20)

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.

Probably the 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.

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**

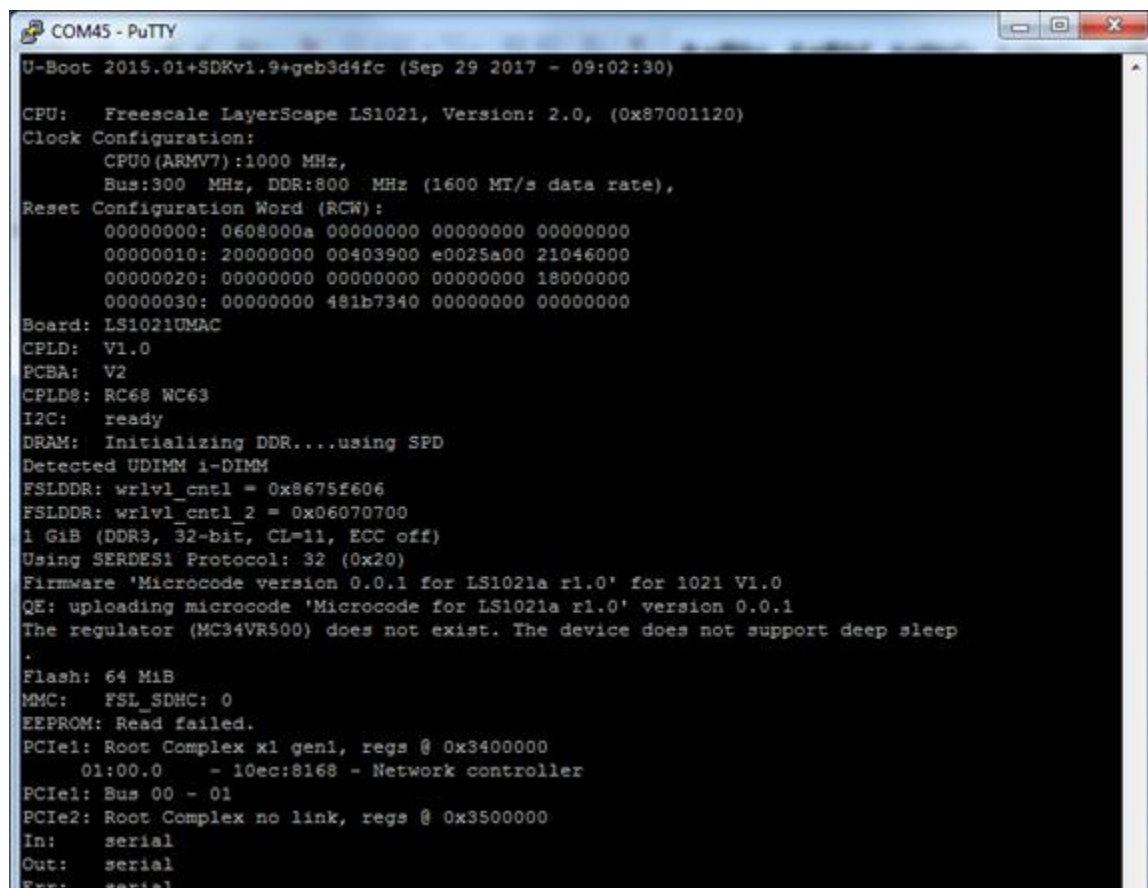
- Copies project to PMAC. Place “usrflash” folder directly inside “/PowerPmacConfigLoad/”. Project must be recovered from PMAC.
- **PowerPmacFirmwareInstallandConfigLoad**
 - Copies project and installs firmware. Place firmware in “/PowerPmacFirmwareInstallandConfigLoad/usrflash/”
- **PowerPmacNoRTLoad**
 - CPU runs as a generic computer without loading the Power PMAC firmware.

USB 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 the 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 PowerPMAC 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 LayerScape 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
CPLD0: RC68 WC63
I2C: ready
DRAM: Initializing DDR....using SPD
Detected UDIMM 1-DIMM
FSLDDR: wr1vl_cntl = 0x8675f606
FSLDDR: wr1vl_cntl_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 Processor in USB Flash memory mode do the following

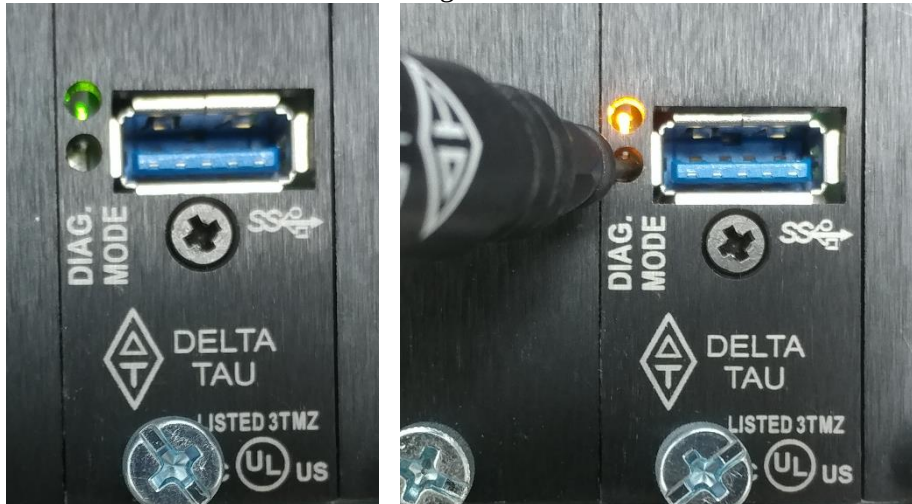
- 1.) Make sure power is **NOT** applied to the UMAC ARM CPU Board and plug a **micro** USB cable from the PC to the side of the UMAC ARM CPU (see figure 1). There will be a green LED indicating the UMAC ARM CPU is receiving power from the PC USB connector to power its built in USB Serial port.
- 2.)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

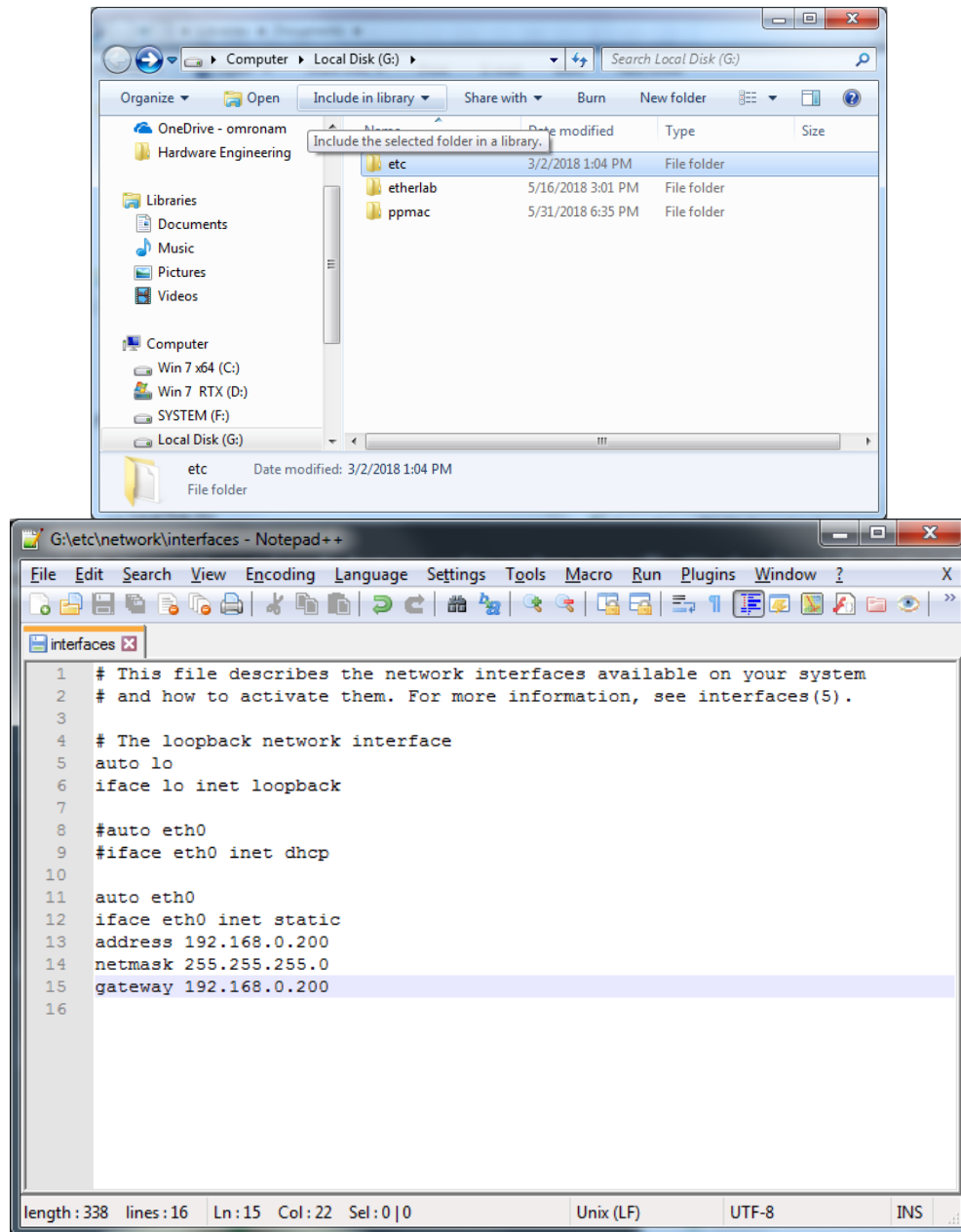
Figure 1. USB Connector is for serial port diagnostics.



Figure 2. USB Connector is for a mass storage device

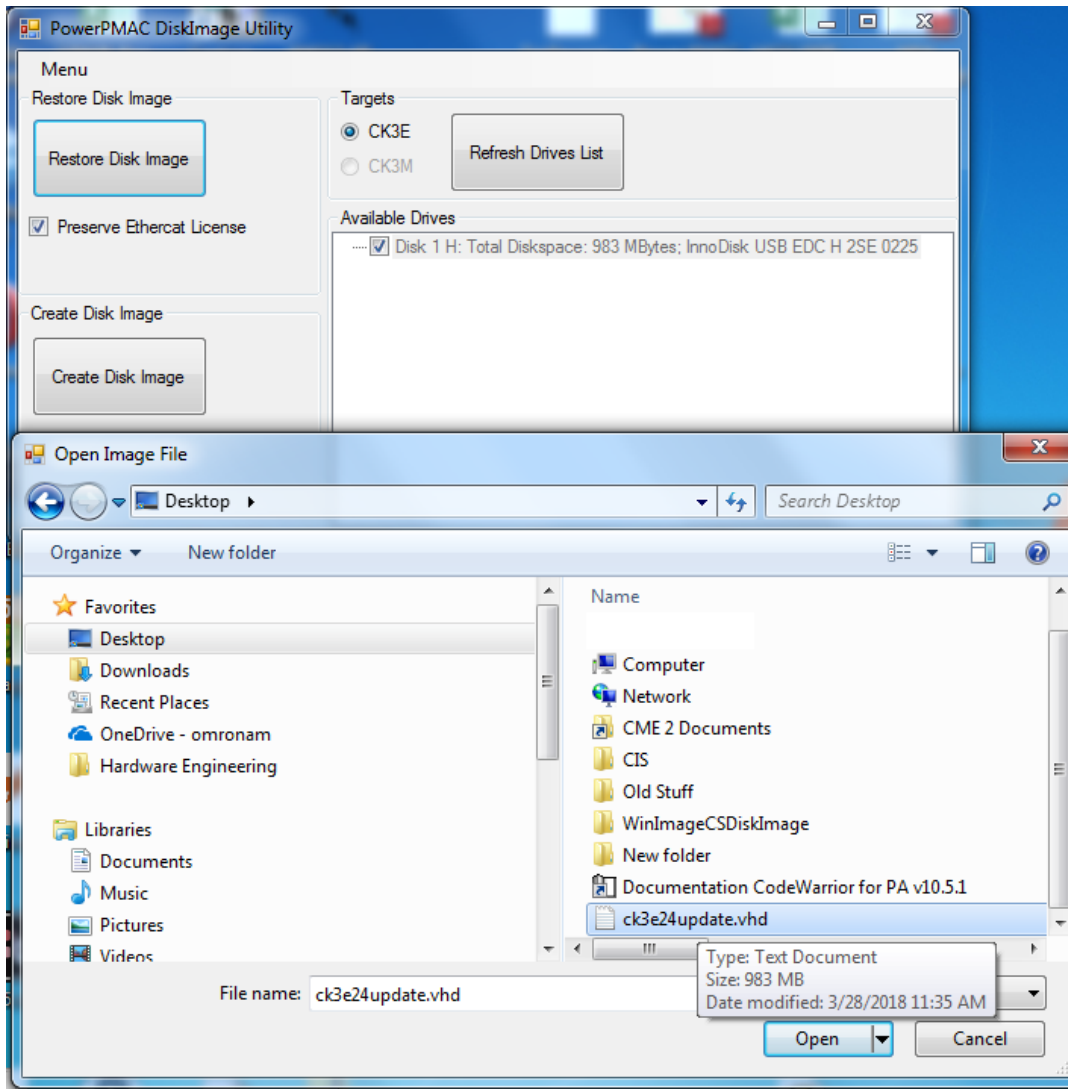


When configuring the USB connection for mass storage three folders will be present, “etc”, “ppmac” and “etherlab”. The “ppmac” folder represents the Power UMAC Firmware binary applications and should not be modified. The “etherlab” folder contains the EtherCAT configuration and should not be modified. The “etc” folder contains the network settings. The file interfaces maybe inspected to determine the current configured network setting of the Power PMAC. WARNING editing the interfaces file with notepad will prevent the network setting from working.

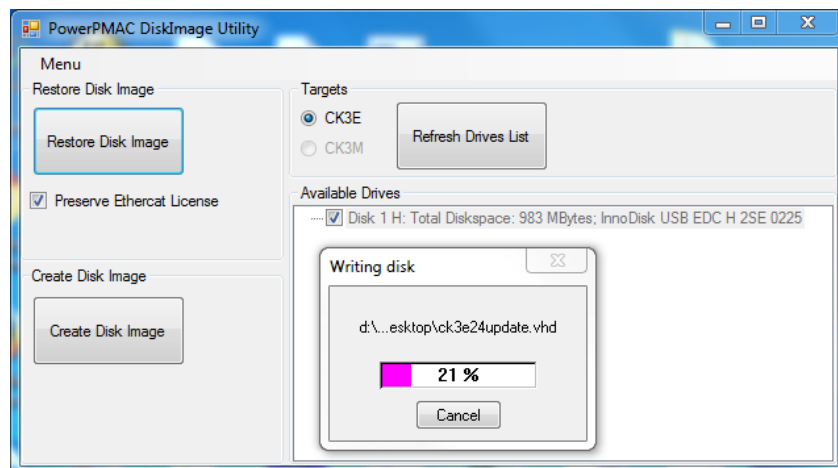


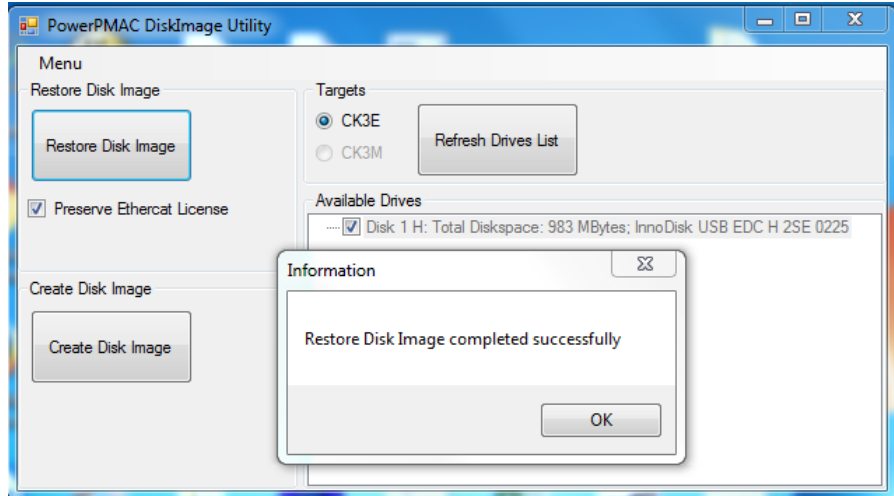
Restore Original Factory Image using CK3e2_4_1_2Update.zip

The Power PMAC CPU maybe restored to its factory image state using the CK3e2_4_1_2Update.zip package available through forums.deltatau.com in the File Depot section under Power PMAC – Firmware –Release – 2.4.1.2 when in USB Flash Memory mode. Launch the program PPMACDiskImage.exe extracted from Ck3e2_4_1_2Update.zip from a Windows PC and select CK3E for the Target Type. Click Restore Disk Image button and use the Open Image File Dialog and browse for the ck3e2_4_1_2update.vhd image file. Then select Restore Disk Image



There will be a progress bar indicating completion of the imaging process followed by a complete message.





As new images updates are made available this same method may be used to upgrade firmware. In addition, using the create disk image button a user may take a complete backup of the CPU state for restoration.

Watchdog Timer Connection (TB2)

The Power PMAC 1020 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 1020 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 (x1) Connector (P4)

The P18 connector near the top of the back side of the CPU board provides a PCI Express connection. It is considered Port 1/Slot 1 by the CPU. PCI Express “x1” 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

D10: This is a dual colored LED. When this LED is green, it indicates that power is applied to the +5V input when this LED is red, it indicates that the watchdog timer has tripped.

D15: This is an amber colored LED. When this LED is lit it indicates that the backplane reset has completed and Power PMAC is ready for communication.

D33: This is a dual colored LED. When this LED is green, it indicates that the “P1” port on the 604147 daughter card is in RS-232 mode. When this LED is yellow it indicates that the “P1” port on the 604147 daughter card is in USB-Flash mode. This is toggled by the micro push button switch “S2”.

Connector Pinouts

P1 UBUS32 Backplane Connector Pinout

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

Front View

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)**[4 3 2 1]**

Front View

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)**[1 2 3]**

Front View

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.

J53 PCIe POWER (4-PIN CONNECTOR)

[4 3 2 1]
Front View

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	

Kyoto, JAPAN

Regional Headquarters

OMRON EUROPE B.V.

Wegalaan 67-69, 2132 JD Hoofddorp
The Netherlands
Tel: (31) 2356-81-300 Fax: (31) 2356-81-388

OMRON ELECTRONICS LLC

2895 Greenspoint Parkway, Suite 200
Hoffman Estates, IL 60169 U.S.A.
Tel: (1) 847-843-7900 Fax: (1) 847-843-7787

OMRON (CHINA) CO., LTD.

Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
PuDong New Area, Shanghai, 200120, China
Tel: (86) 21-6023-0333 Fax: (86) 21-5037-2388

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