

## HARDWARE REFERENCE MANUAL

# PMAC2A-PC/104 COMMUNICATIONS BOARD ACC-2P

PMAC2A-PC/104 ACC-2P Hardware Reference

4Ax-603672-xHxx

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## **REVISION HISTORY**



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## INTRODUCTION

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The PMAC2A PC/104 motion controller is a compact, cost-effective version of Delta Tau's PMAC family of controllers. The PMAC2A PC/104 can be composed of three boards in a stack configuration. The Accessory-2P board provides for high speed communications and I/O.

### Board Configuration

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#### Acc-2P: Communications Board

Without any options, the PMAC2A PC/104 communicates through the RS-232 serial interface using the optional Acc-3L flat cable. Only one method of communication is allowed at a time.



**PMAC2A PC/104 Base Board shown stacked with the Option-1P and Option-2P boards**

#### Acc-2P Option 1A: USB Interface

Option 1A it provides a 12 Mbit/sec USB interface allowing USB communications with the PMAC2A PC/104 motion controller.

#### Acc-2P Option 1B: Ethernet Interface

Option 1B provides a 10 Mbit/sec Ethernet interface allowing Ethernet communications with the PMAC2A PC/104 motion controller.

#### Acc-2P Option 2: DPRAM Circuitry

Option 2 provides an 8K x 16 dual-ported RAM for USB, Ethernet or PC/104 ports on board of the Acc-2P communications board. If using for USB or Ethernet communications, Acc-2P-Opt-1A or Acc-2P-Opt-1B must be ordered. If used for PC/104-bus communications, PMAC2A PC/104 Option-2A must be ordered. The key component installed with this option is U17.

#### Acc-2P Option 3: I/O Ports

Option 3 provides the following ports on the Acc-2P communications board for digital I/O connections.

- Multiplexer Port: this connector provides eight input lines and eight output lines at TTL levels. When using the PMAC Acc-34x type boards these lines allow multiplexing large numbers of inputs and outputs on the port. Up to 32 of the multiplexed I/O boards may be daisy-chained on the port, in any combination.
- I/O Port: this port provides 16 general-purpose digital I/O lines at TTL levels and these can be configured as all inputs, all outputs or eight inputs and eight outputs.
- Handwheel port: this port provides two extra channels, each jumper selectable between encoder input or pulse output.



## HARDWARE SETUP

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On the Acc-2P, there are a number of jumpers called E-points or W-points. That customize the hardware features of the CPU for a given application and must be setup appropriately. The following is an overview grouped in appropriate categories. For an itemized description of the jumper setup configuration, refer to the E-Point Descriptions section.

### **General-Purpose Digital Inputs and Outputs (JOPT Port)**

---

The JOPT connector provides sixteen lines of general-purpose I/O. In contrast with the Acc-1P JOPTO (J7) connector, the lines on the Acc-2P JOPT connector are limited to TTL levels and are usually used with external I/O modules. Each I/O line has its own corresponding ground pin in the opposite row. The 34-pin connector was designed for easy interface to OPTO-22 or equivalent optically isolated I/O modules. Delta Tau's Acc-21F is a six-foot cable for this purpose.

Jumpers E9 and E10 select the I/O lines direction of the JOPT connector. This allows configuring this port as all inputs, all outputs or half inputs and half outputs. Further software settings are required to configure this port. See the Software Setup section for details on this.

### **Thumbwheel Multiplexer Port (JTHW Port)**

---

The Thumbwheel Multiplexer Port, or Multiplexer Port, on the JTHW connector has sixteen lines. These lines can be used to multiplex large numbers of inputs and outputs on the port, and Delta Tau provides accessory boards and software structures (special M-variable definitions) to capitalize on this feature. Up to 32 of the multiplexed I/O boards may be daisy-chained on the port, in any combination. Either the Acc-1P or the Acc-2P boards, but not both, can use this connector as a multiplexing port. This is selected by jumper E6 on the Acc-1P board and jumper E5 on the Acc-2P board.

Alternatively, the inputs and outputs on this port may be used as discrete, non-multiplexed I/O. In this case, these I/O lines can be accessed through M-variables. See the Software Setup section for details on this.

When used as non-multiplexed I/O, jumpers E7 and E8 select the I/O lines direction of the JTHW connector. This allows configuring this port as all inputs, all outputs or half inputs and half outputs. If E7 is removed or E8 is installed then the multiplexing feature of the JTHW port cannot be used.

### **Handwheel Port (JHW / PD Port)**

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This port provides an extra encoder input or a set of pulse and direction outputs. Jumpers E3 and E4 select the function of this connector between encoder input or pulse and direction outputs. The handwheel encoder input can be linked to a servomotor for manual displacement or used by a motor as a secondary encoder for dual-feedback applications. There is no C index channel input on the handwheel encoder port.

### **Ethernet RJ45 Connector (J10 Port)**

---

This connector is used for Ethernet communications and it is provided when Acc-2P Option 1B is ordered. The appropriate Category 5 10/100-Base T network cable that mates to this connector can be readily purchased from any local computer store. The type of network cable to purchase depends on the configuration to the host PC.

When making a direct connection to a Host communication Ethernet card in a PC a cat 5 networking crossover cable must be used. A standard cat 5 straight through networking cable cannot be used in this scenario. When using a connection to a network hub or switch, the standard cat 5 straight through networking cable must be used, and not a crossover cable.

Performance can be degraded seriously by the use of a hub or switch. Network hubs or the more intelligent network switches have processors inside them, which can add delays of at least 15msec to the PMAC communications.

## USB Connector (J1 Port)

This connector is to be used in conjunction with USB A-B cable, which can be purchased from any local computer store, and it is provided when Acc-2P Option 1A is ordered. The A connector is connected to a PC or Hub device; the B connector plugs into the Acc-2P J1 port.

## I/O Configuration Jumpers

**E3-E4: JHW, PD Function Select** – When jumper E3 connects pins 2 and 3, a set of pulse and direction signals can be output on channel 1 (pins 2 to 5) of the JHW, PD port. If E3 connects pins 1 and 2, then channel 1 is configured as a handwheel encoder input. When jumper E4 connects pins 2 and 3, a set of pulse and direction signals can be output on channel 2 (pins 6 to 9) of the JHW, PD port. If E4 connects pins 1 and 2, then channel 2 is configured as a handwheel encoder input.

**E5: I/O Gate address select** – If jumper E5 connects pins 1 and 2 the I/O features on the Acc-2P will be accessed at the regular addresses and the JTHW port can be used as a multiplexer port. When E5 connects pins 2 and 3 the I/O features on the Acc-2P board will be accessed at the regular addresses plus \$40, and this is necessary only when both Acc-2P and Acc-1P are used with the same PMAC2A PC/104 baseboard.

**E7-E10: Ports Direction Control** – These jumpers select the I/O lines direction of the JTHW and the JOPT connectors. This allows configuring these ports as all inputs, all outputs or half inputs and half outputs according to the following tables:

JTHW Connector			
E7	E8	DATx lines	SELx lines
OFF	OFF	Output	Output
OFF	ON	Output	Input
ON	OFF	Input	Output
ON	ON	Input	Input

JOPT Connector			
E9	E10	MOx lines	Mix Lines
OFF	OFF	Output	Output
OFF	ON	Output	Input
ON	OFF	Input	Output
ON	ON	Input	Input

If E7 is removed or E8 is installed then the multiplexing feature if the JTHW port cannot be used.

## Communication Jumpers

**E1: USB/Ethernet Micro Controller Firmware reload enable** – This jumper was added on revision – 103 and above of the Acc-2P. Factory default position is ON, and it should remain ON. If the firmware was corrupted due to a previous firmware download, the card firmware may be reloaded by powering on the card with the jumper off, installing the jumper without powering off, then downloading firmware without powering off. Under normal circumstances, this jumper should be on even when upgrading firmware.

**E6: Communications Port Selection** – When jumper E6 connects pins 1 and 2 the PC/104 communications port is enabled. If E6 connects pins 2 and 3 the Ethernet or USB ports are enabled. Only one port can be used at a time. If either the Ethernet or USB ports are used then jumper E19 on the base board must be installed and jumper E18 on the base board must be removed. In order to communicate through the RS-232 serial port jumper E6 must be installed, either in position 1-2 or 2-3.

## Handwheel Encoder Termination Resistors

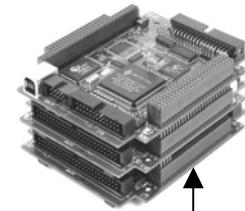
The PMAC provides a socket for termination resistors on the handwheel encoder differential input pairs coming into the board. As shipped, there is no resistor pack in the RP23 socket. If these signals are brought long distances into the PMAC board and ringing at signal transitions is a problem, a SIP resistor pack may be mounted on the RP23 socket to reduce or eliminate the ringing. The 6-pin termination

resistor pack is the type that has independent resistors (no common connection) with each resistor using two adjacent pins.

## Mounting

The PMAC2A PC/104 is always installed either using standoffs, when it is stacked to a PC/104 computer or used as a stand-alone controller. At each of the four corners of the PMAC2A PC/104 board, there are mounting holes that can be used to mount the board on standoffs.

The PMAC2A PC/104 baseboard is placed always at the bottom of the stack. The order of the Acc-1P or Acc-2P with respect to the baseboard does not matter.



Baseboard mounted at  
the bottom of the stack

## SOFTWARE SETUP

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**Note:**

The PMAC2A PC/104 requires the use of V1.17 or newer firmware. There are few differences between the previous V1.16H firmware and the V1.17 firmware other than the addition of internal support for the Flex CPU design.

### PMAC I-Variables

PMAC has a large set of Initialization parameters (I-variables) that determine the "personality" of the card for a specific application. Many of these are used to configure a motor properly. Once set up, these variables may be stored in non-volatile EAROM memory (using the **SAVE** command) so the card is always configured properly (PMAC loads the EAROM I-variable values into RAM on power-up).

The programming features and configuration variables for the PMAC2A PC/104 are described fully in the PMAC2 User and Software manuals.

### General-Purpose Digital Inputs and Outputs

If no Acc-1P is present on the PMAC2A PC/104 stack configuration, and only Acc-2P is used, then jumper E5 on the Acc-2P board should connect pins 1 and 2. In this case the lines on its JOPT general-purpose I/O connector will be mapped into PMAC's address space in register Y:\$C080.

If both Acc-1P and Acc-2P are used, then jumper E5 on the Acc-2P board should connect pins 2 and 3 and its I/O lines can be accessed at address Y:\$C0C0.

Typically, these I/O lines are accessed individually with M-variables. Following is a suggested set of M-variable definitions to use these data lines.

#### Jumper E5 on Position 1-2

```
M0->Y:$C080,0 ; Digital Output M00
M1->Y:$C080,1 ; Digital Output M01
M2->Y:$C080,2 ; Digital Output M02
M3->Y:$C080,3 ; Digital Output M03
M4->Y:$C080,4 ; Digital Output M04
M5->Y:$C080,5 ; Digital Output M05
M6->Y:$C080,6 ; Digital Output M06
M7->Y:$C080,7 ; Digital Output M07
M8->Y:$C080,8 ; Digital Input MI0
M9->Y:$C080,9 ; Digital Input MI1
M10->Y:$C080,10 ; Digital Input MI2
M11->Y:$C080,11 ; Digital Input MI3
M12->Y:$C080,12 ; Digital Input MI4
M13->Y:$C080,13 ; Digital Input MI5
M14->Y:$C080,14 ; Digital Input MI6
M15->Y:$C080,15 ; Digital Input MI7
M32->X:$C080,0,8 ; Direction Control bits 0-7 (1=output, 0 = input)
M34->X:$C080,8,8 ; Direction Control bits 8-15 (1=output, 0 = input)
M40->X:$C084,0,24 ; Inversion control (0 = 0V, 1 = 5V)
M42->Y:$C084,0,24 ; J7 port data type control (1 = I/O)
```

In order to properly setup the digital outputs an initialization PLC must be written scanning through once on power-up/reset, then disabling itself:

```
OPEN PLC1 CLEAR
M32=$FF ;BITS 0-8 are assigned as output
```

```
M34=$0 ;BITS 9-16 are assigned as input
M40=$FF00 ;Define inputs and outputs
M42=$FFFF ;All lines are I/O type
DIS PLC1 ;Disable PLC1 (scanning through once on
;power-up/reset)
CLOSE
```

---

**Note:**

After loading this program, set I5=2 or 3 and ENABLE PLC 1.

---

### **Jumper E5 in Position 2-3**

```
M0->Y:$C0C0,0 ; Digital Output M00
M1->Y:$C0C0,1 ; Digital Output M01
M2->Y:$C0C0,2 ; Digital Output M02
M3->Y:$C0C0,3 ; Digital Output M03
M4->Y:$C0C0,4 ; Digital Output M04
M5->Y:$C0C0,5 ; Digital Output M05
M6->Y:$C0C0,6 ; Digital Output M06
M7->Y:$C0C0,7 ; Digital Output M07
M8->Y:$C0C0,8 ; Digital Input MI0
M9->Y:$C0C0,9 ; Digital Input MI1
M10->Y:$C0C0,10 ; Digital Input MI2
M11->Y:$C0C0,11 ; Digital Input MI3
M12->Y:$C0C0,12 ; Digital Input MI4
M13->Y:$C0C0,13 ; Digital Input MI5
M14->Y:$C0C0,14 ; Digital Input MI6
M15->Y:$C0C0,15 ; Digital Input MI7
M32->X:$C0C0,0,8 ; Direction Control (1=output, 0 = input)
M34->X:$C0C0,8,8 ; Direction Control (1=output, 0 = input)
M40->X:$C0C4,0,24 ; Inversion control (0 = 0V, 1 = 5V)
M42->Y:$C0C4,0,24 ; JI/O port data type control (1 = I/O)
```

In order to properly setup the digital outputs, an initialization PLC must be written scanning through once on power-up/reset, and then disabling itself:

```
OPEN PLC1 CLEAR
M32=$FF ;BITS 0-8 are assigned as output
M34=$0 ;BITS 9-16 are assigned as input
M40=$FF00 ;Define inputs and outputs
M42=$FFFF ;All lines are I/O type
DIS PLC1 ;Disable PLC1 (scanning through once on
;power-up/reset)
CLOSE
```

---

**Note:**

After loading this program, set I5=2 or 3 and ENABLE PLC 1.

---

## Thumbwheel Port Digital Inputs and Outputs

The inputs and outputs on the thumbwheel multiplexer port of the Acc-2P board may be used as discrete, non-multiplexed I/O. In this case, these I/O lines can be accessed through M-variables that are defined according to the setup of the address selection jumpers. Jumper E5 determines which set of the following M-variables are used:

### Jumper E5 in Position 1-2

```
M40->Y:$C082,8,1          ; SEL0 Output
M41->Y:$C082,9,1          ; SEL1 Output
M42->Y:$C082,10,1         ; SEL2 Output
M43->Y:$C082,11,1         ; SEL3 Output
M44->Y:$C082,12,1         ; SEL4 Output
M45->Y:$C082,13,1         ; SEL5 Output
M46->Y:$C082,14,1         ; SEL6 Output
M47->Y:$C082,15,1         ; SEL7 Output
M48->Y:$C082,8,8,U        ; SEL0-7 Outputs treated as a byte
M50->Y:$C082,0,1          ; DAT0 Input
M51->Y:$C082,1,1          ; DAT1 Input
M52->Y:$C082,2,1          ; DAT2 Input
M53->Y:$C082,3,1          ; DAT3 Input
M54->Y:$C082,4,1          ; DAT4 Input
M55->Y:$C082,5,1          ; DAT5 Input
M56->Y:$C082,6,1          ; DAT6 Input
M57->Y:$C082,7,1          ; DAT7 Input
M58->Y:$C082,0,8,U        ; DAT0-7 Inputs treated as a byte
```

### Jumper E5 in Position 2-3

```
M40->Y:$C0C2,8,1          ; SEL0 I/O Line
M41->Y:$C0C2,9,1          ; SEL1 I/O Line
M42->Y:$C0C2,10,1         ; SEL2 I/O Line
M43->Y:$C0C2,11,1         ; SEL3 I/O Line
M44->Y:$C0C2,12,1         ; SEL4 I/O Line
M45->Y:$C0C2,13,1         ; SEL5 I/O Line
M46->Y:$C0C2,14,1         ; SEL6 I/O Line
M47->Y:$C0C2,15,1         ; SEL7 I/O Line
M48->Y:$C0C2,8,8,U        ; SEL0-7 I/O Lines treated as a byte
M50->Y:$C0C2,0,1          ; DAT0 I/O Line
M51->Y:$C0C2,1,1          ; DAT1 I/O Line
M52->Y:$C0C2,2,1          ; DAT2 I/O Line
M53->Y:$C0C2,3,1          ; DAT3 I/O Line
M54->Y:$C0C2,4,1          ; DAT4 I/O Line
M55->Y:$C0C2,5,1          ; DAT5 I/O Line
M56->Y:$C0C2,6,1          ; DAT6 I/O Line
M57->Y:$C0C2,7,1          ; DAT7 I/O Line
M58->Y:$C0C2,0,8,U        ; DAT0-7 I/O Lines treated as a byte
```

## ETHERNET SOFTWARE SETUP

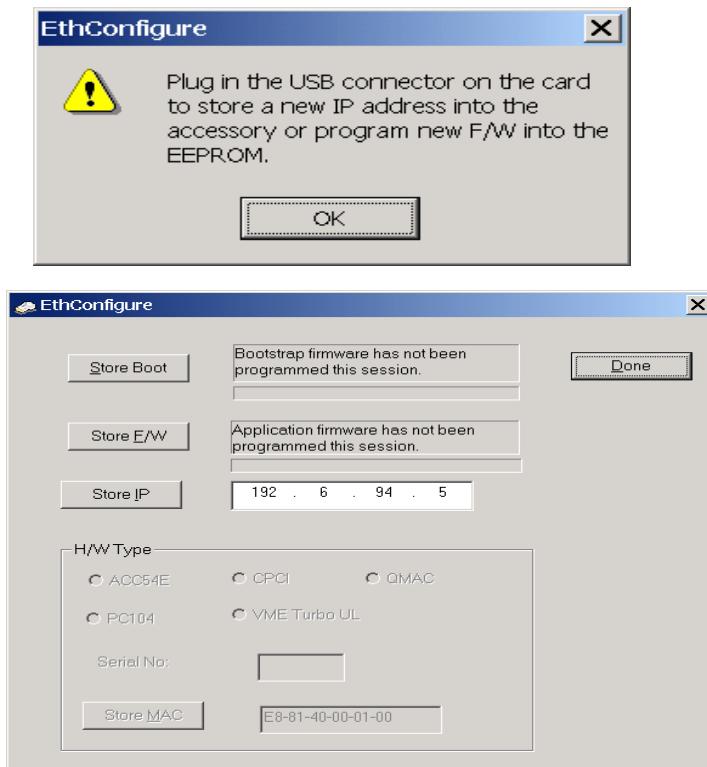
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### IP Setup

Using the Ethernet port requires Pewin Pro with at least Service Pack 2.0. Earlier revisions of software are not capable of communicating with the Ethernet port. Ethernet devices are configured by launching the Eth2Configure.EXE application, provided by Delta Tau as a part of the Pewin 32 Pro Suite or any other Delta Tau standard installation. Installation and configuration of Ethernet devices is independent of the operating system. Therefore, Ethernet devices are compatible with Windows NT 4.0, in addition to Windows 98/ME/2000 and Windows XP.

To configure the Communications Board side, run the application Eth2Configure.EXE from the Programs\Pewin32Pro\ program group. This application is provided as part of the standard installation and is placed in c:\Program files\Delta Tau\Common\ folder. The Communications Board side comes preprogrammed with a default IP (internet protocol) address of 192.6.94.5 stored in an on-board EEPROM. To change the IP address stored in the EEPROM, plug in the USB cable to reconfigure the card after powering on the UMAC.

When launching the Eth2Configure.EXE program with the USB cable not plugged into the Ethernet card, the following message displays. If the default IP address of the Communications Board does not need to be changed, click OK to the run the EthConfigure program.



By default, the address 192.6.94.5 should appear in the Store IP edit box. If it does not, enter it there. To alter the address from the default, enter a unique IP in the Store IP edit box. Click the **Store IP** button. If plugged in via USB, the address will be stored into Communications Board EEPROM; otherwise, the following message displays:



Click on **YES** to store the IP address in the registry so that software from the Pewin Pro Suite can recognize the Ethernet accessory as an available PMAC Device. Afterwards, a dialog box displays requesting a card. This number is changed from 0 to another number only when using multiple PMACs simultaneously from a single host. When doing so, the additional PMACs must be programmed with a unique IP address.

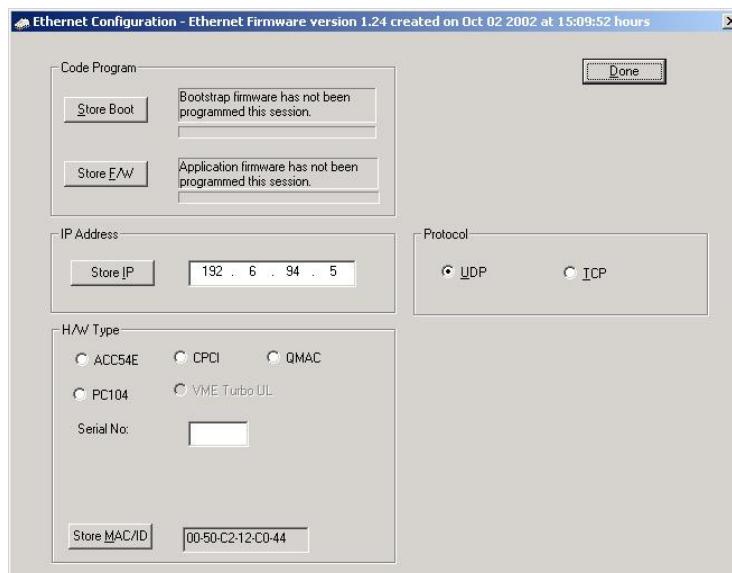
## Protocol Setup

The Communications Board default protocol is TCP.

To use TCP, it is necessary that the PC Application be configured into TCP mode using the Eth2Configure.exe program supplied with Pewin Pro. To configure the Communications Board,

1. Plug a USB cable to the Communications Board.
2. Launch Eth2Configure.exe.
3. Click the **TCP** radio button in the Protocol Box (see the picture). This will set up the Windows registry of the PC so that the Pcomm32 library of Delta Tau opens a TCP connection when a program using the Library executes.

After the protocol is configured, remove the USB cable and power cycle.

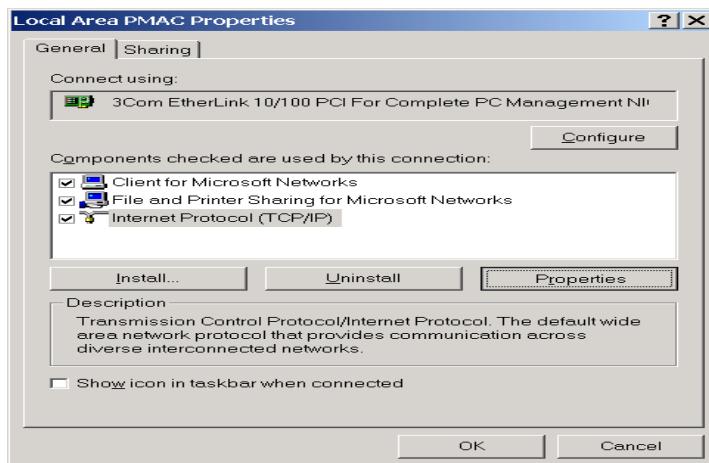


## Windows OS TCP/IP Setup

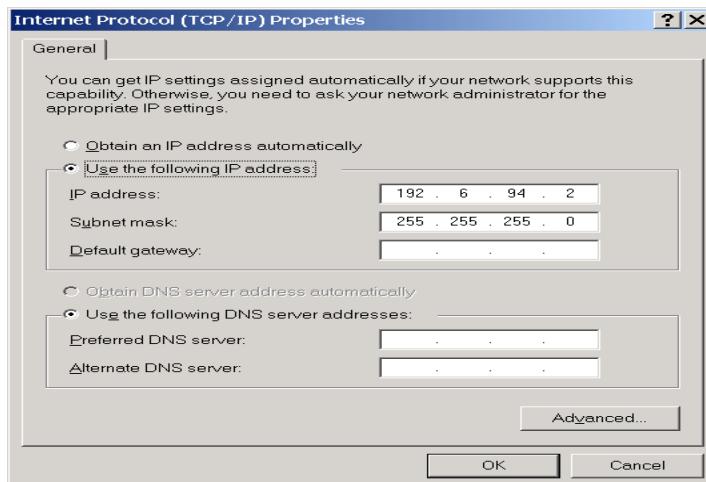
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Ethernet mode of communication is supported by dedicated network only. A network card must be configured on the computer to which the Communications Board connection is used before completing the following steps. Further, a crossover Ethernet cable or a private hub along with two straight cables is required for this setup. (See the RJ45 section of Hardware Setup.)

1. From the control panel, select properties of the network card that will communicate to Communications Board via Ethernet.

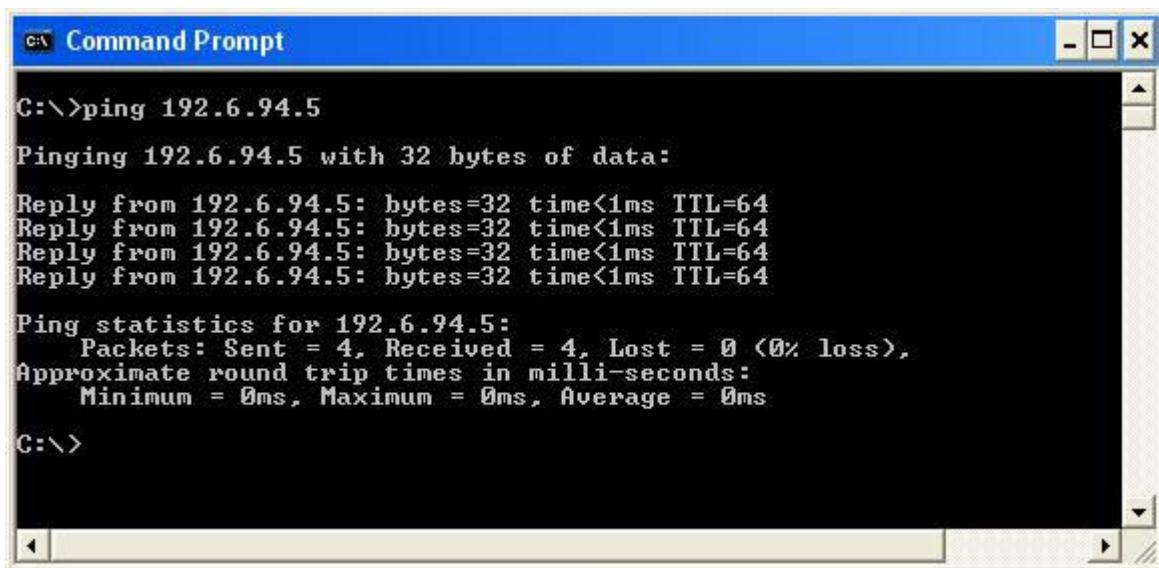


2. Highlight the Internet Protocol (TCPIP) and select properties.
3. Write the private area IP address (e.g., 192.6.94.2) for this card and enter the subnet mask (255.255.255.0) in the provided spaces.
4. Close the Properties page and restart the computer. The Ethernet card configuration on the computer is complete. Note that the last digit in the IP address field must be a different value from any IP addresses set via the EthConfigure program.



## Determining if TCP/IP is Setup Correctly

To determine if the TCP settings on the CPU board and the PC are compatible from a Windows command prompt, type Ping IP address where IP address is the IP address of the card (i.e., 192.6.94.5).



```
C:\>ping 192.6.94.5

Pinging 192.6.94.5 with 32 bytes of data:

Reply from 192.6.94.5: bytes=32 time<1ms TTL=64

Ping statistics for 192.6.94.5:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

## **USB SOFTWARE SETUP**

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### **Device Driver Installation**

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Starting with Pewin Pro and Service Pack 2.0, the USB driver support for this revision of the card is bundled with the Pewin Pro installation program. The USB card will work only with Windows 98, Windows ME, Windows 2000 and Windows XP. It will not function with Windows NT 4.0; this version of Windows does not support plug and play, which is required by all USB devices.

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**Note:**

Windows XP is recommended since the UMAC has on-board USB 2.0 and only Windows XP has native USB 2.0 support.

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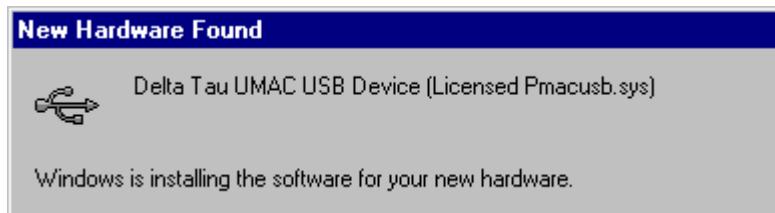
One file is placed on the PC to achieve USB connectivity – device driver PMACUSB.SYS in the WINDOWS\SYSTEM32\DRIVERS directory and the PMACUSB.INF plug and play information file in the WINDOWS\INF directory. When the UMAC is plugged into the PC, a New Hardware Found Message displays. A series of dialog boxes will appear, indicating that Windows is installing the device drivers for the system.

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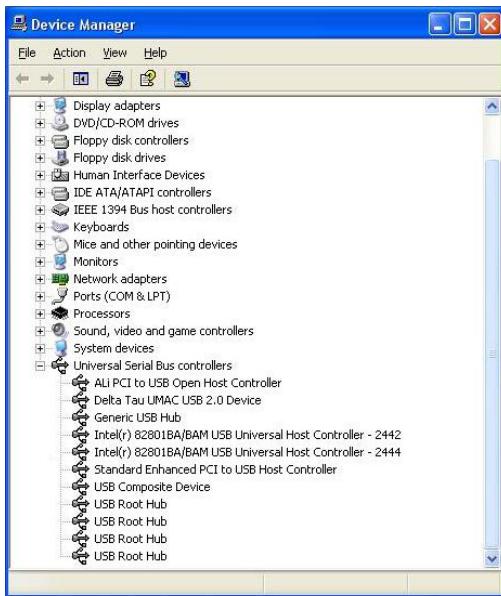
**Note:**

Plug in the USB cable from the UMAC to the PC after the software Pewin Pro and its Service Pack 2.0 has been installed. If the USB cable is plugged in before the software has been installed, restart Windows.

---



To verify that the software device drivers have been installed properly, right click on the My Computer icon on the desktop. Select Properties from the drop down menu that appears. The System Properties Windows dialog box appears. Click the tab titled Device Manager. At this point, a list of device categories appears. Click the + to see a list of USB devices. Provided the device driver for the Communications Board has been installed properly, a dialog box displays, similar to the following:



If Delta Tau USB 2.0 Device is not on the list, the device driver has not been installed. If there is a red x through that line or a yellow exclamation point through that line, then Windows had a problem installing the device.

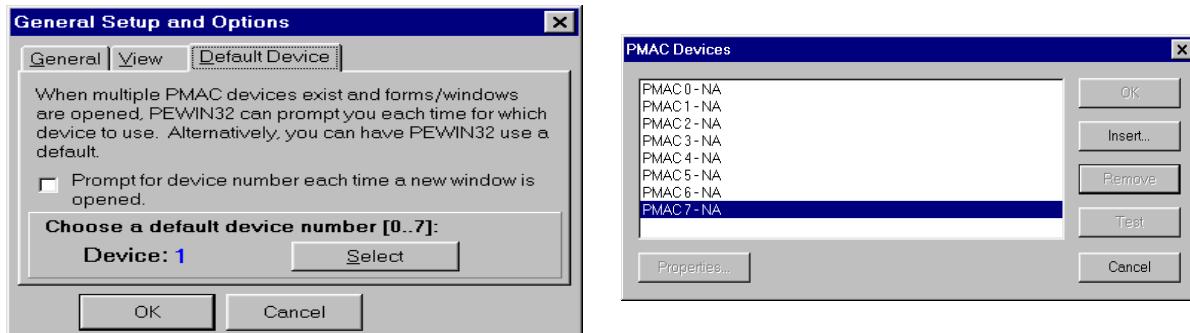
The appropriate trouble-shooting steps are:

5. Reboot the computer and examine this list again.
6. If that does not work, ensure that pmacusb.sys is in the Windows\system32\Drivers directory.
7. If this is true, when using an older computer, check with the manufacturer to make sure that there is not an update to the BIOS to enable USB on the PC.
8. If the Universal Serial Bus Controllers in the device manager dialog box are not on the list, make sure that it is enabled in the BIOS of the computer.

## PEWIN PRO SOFTWARE SETUP

### First Time User (Register the Newly Installed Devices)

- Once the driver is installed, it needs additional configuration by using the PmacSelect dialog. The PmacSelect dialog is accessible by all programs created with PComm 32 Pro (via the PmacSelect() function call). Launch the supplied Delta Tau application (Pewin 32 Pro, PMAC Test Pro, or any application) from the program menu and display the PmacSelect dialog.

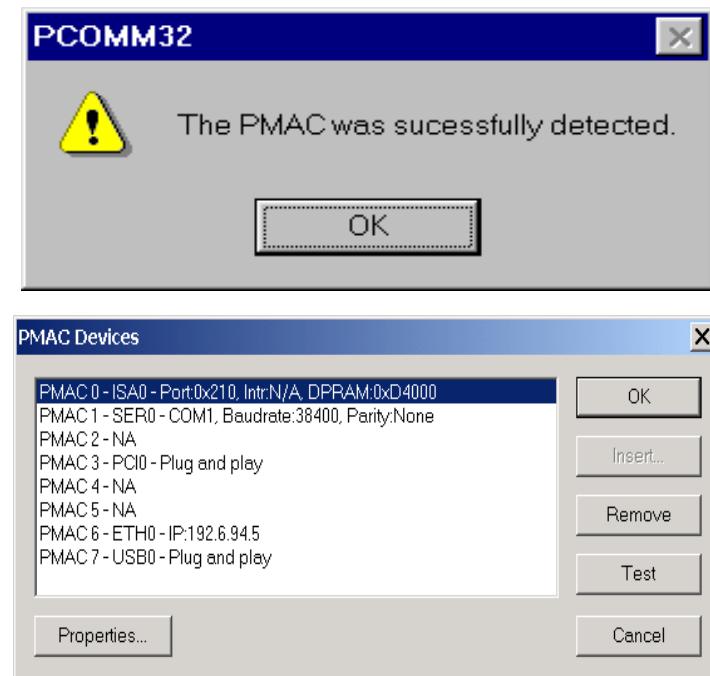


Product	Display the PmacSelect Dialog
Pewin 32 Pro	From the main menu item setup, go to Setup\General Setup and Options. Select the <b>Default Device</b> tab. Click on the <b>Select</b> button.
Pcomm 32 Pro	Run the supplied PmacTest application. From the main menu, select <b>Configure\Communications</b> . Also, the <b>PmacSelect()</b> function can be called from any application that has been coded.
Ptalk DT Pro	Call the <b>SelectDevice()</b> method of Ptalk from the supplied or self-created programs.

- From the device selection screen, select the device number to insert a device and click **Insert**. Another window listing all configured devices will appear.



- Select the device to configure and click **OK**.
- Once a PMAC is listed in the Pmacselect window, it is registered and can accept communication. It is recommended to test a device upon registering. At this time, a screen displays and this device is ready for use in any application.



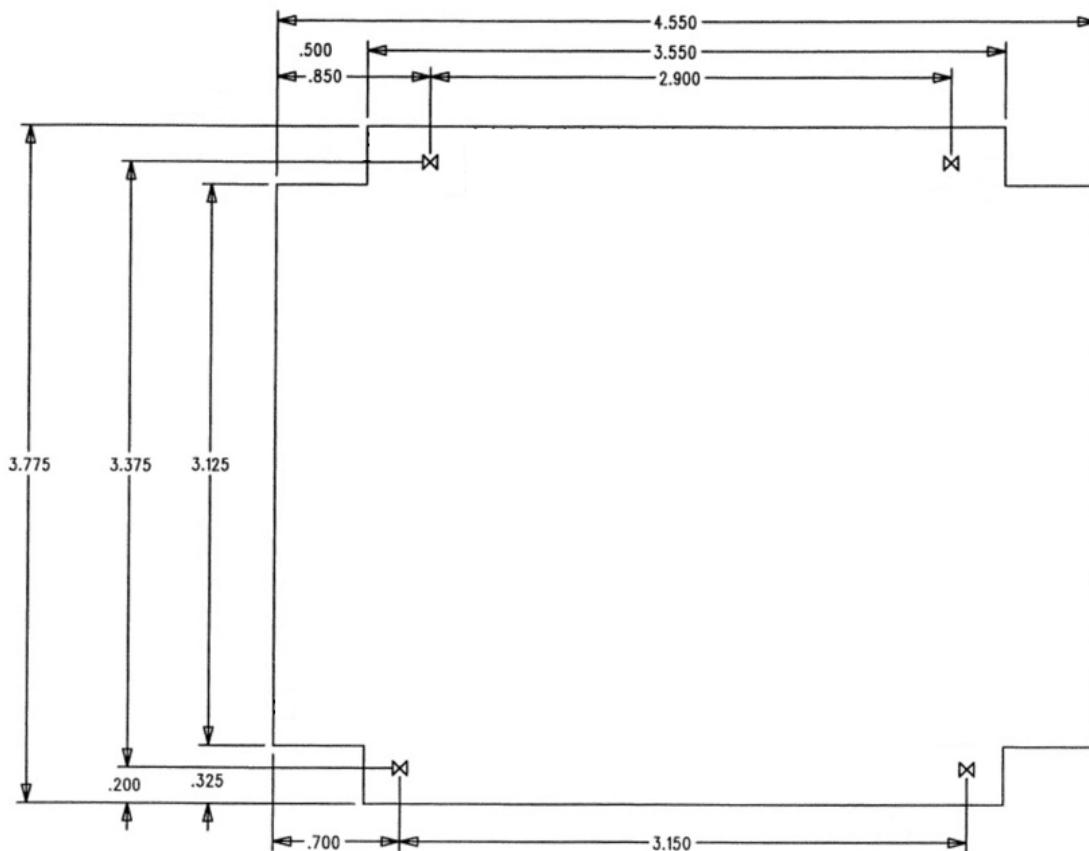
## HARDWARE REFERENCE SUMMARY

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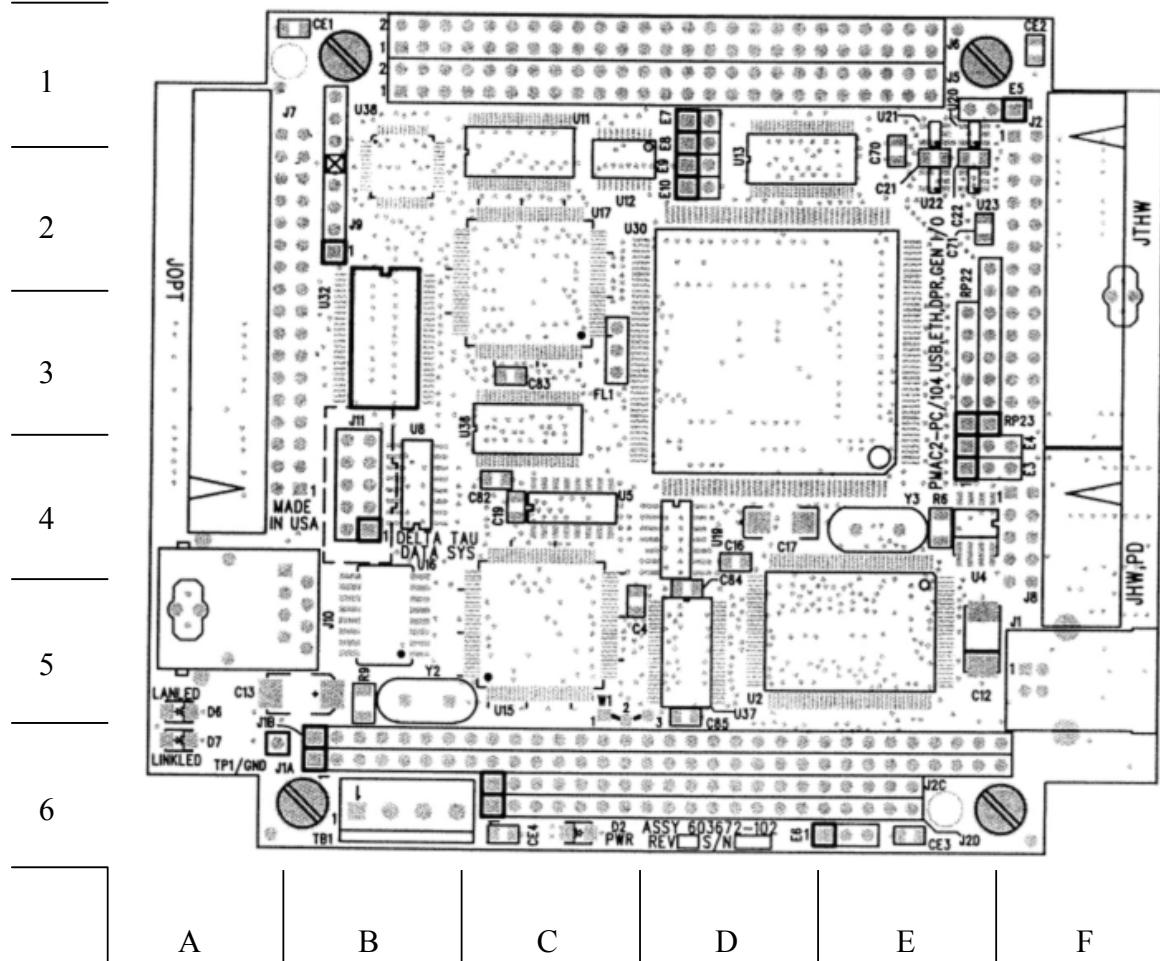
The following information is based on the Acc-2P board, part number 603672-100.

### Board Dimensions

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## Board Layout



<b>Feature</b>	<b>Location</b>	<b>Feature</b>	<b>Location</b>
<b>E3</b>	F4	<b>D2</b>	C6
<b>E4</b>	F3	<b>D6</b>	A5
<b>E5</b>	F1	<b>D7</b>	A6
<b>E6</b>	E6	<b>TB1</b>	B6
<b>E7</b>	D1	<b>J1</b>	F6
<b>E8</b>	D1	<b>JTHW</b>	F2
<b>E9</b>	D2	<b>JOPT</b>	A2
<b>E10</b>	D2	<b>JHW / PD</b>	F4
<b>RP22</b>	E3	<b>J10</b>	B5
<b>RP23</b>	E3		

## **Connectors and Indicators**

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### **J1 – USB Communications Port**

This connector provides access to the USB communications feature ordered through Option-1A. See the Machine Connections section for details on using this port.

### **J2 - Thumbwheel Multiplexer Port (JTHW Port)**

The Thumbwheel Multiplexer Port, or Multiplexer Port, on the JTHW connector has eight input lines and eight output lines. The output lines can be used to multiplex large numbers of inputs and outputs on the port, and Delta Tau provides accessory boards and software structures (special M-variable definitions) to capitalize on this feature. Up to 32 of the multiplexed I/O boards may be daisy-chained on the port, in any combination.

1. 26-pin female flat cable connector T&B Ansley P/N 609-2641
2. Standard flat cable stranded 26-wire T&B Ansley P/N 171.26
3. Phoenix varioface module type FLKM 26 (male pins) P/N 22 81 05 0

### **J7 - General-Purpose Digital Inputs and Outputs (JOPT Port)**

Acc-2P's JOPT connector provides eight general-purpose digital inputs and eight general-purpose digital outputs. Each input and each output has its own corresponding ground pin in the opposite row. The 34-pin connector was designed for easy interface to OPTO-22 or equivalent optically isolated I/O modules. Delta Tau's Acc-21F is a six-foot cable for this purpose.

1. 34-pin female flat cable connector T&B Ansley P/N 609-3441
2. Standard flat cable stranded 34-wire T&B Ansley P/N 171-34
3. Phoenix varioface module type FLKM 34 (male pins) P/N 22 81 06 3

### **J8 – Handwheel/Pulse and Direction Port (JHW / PD Port)**

This port provides an extra encoder input or a set of pulse and direction outputs and its function is selectable by jumpers.

1. 10-pin female flat cable connector T&B Ansley P/N 609-1041
2. Standard flat cable stranded 10-wire T&B Ansley P/N 171-10
3. Phoenix varioface module type FLKM 10 (male pins) P/N 22 81 01 8

### **J10 – Ethernet Communications Port**

This connector provides access to the Ethernet communications feature ordered through Option-1B. See the Machine Connections chapter for details on using this port.

### **TB1 – Power Supply Terminal Block (JPWR Connector)**

In almost all cases the PMAC2A PC/104 will be powered from the PC/104 bus when it is installed in a host computer's bus, or from the JMACH1 connector. This terminal block may be used as an alternative power supply connector or to easily measure the voltages applied to the board.

1. 4-pin terminal block, 0.150 pitch

## **LED Indicators**

**D2:** When this green LED is lit, it indicates that power is applied to the +5V input.

**D6 – D7:** These two LEDs monitor the operation of the Ethernet communications circuitry.



## E-POINT JUMPER DESCRIPTIONS

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### E1: USB/Ethernet Micro-Controller Firmware Reload Enable

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E Point and Physical Layout	Location	Description	Default
<b>E1</b> 		Remove jumper to reload firmware on power-up reset. Jump pin 1 to 2 for normal operations	1-2 Jumper Installed

**Note:** This jumper was added on revision -103 and above of the Acc-2P

### E3 – E4: JHW, PD Function Select

---

E Point and Physical Layout	Location	Description	Default
<b>E3</b> 	F4	Jump pin 1 to 2 to enable handwheel channel 1 inputs. Jump pin 2 to 3 to enable pulse and direction channel 1 outputs.	1-2 Jumper installed
<b>E4</b> 	F3	Jump pin 1 to 2 to enable handwheel channel 2 inputs. Jump pin 2 to 3 to enable pulse and direction channel 2 outputs.	1-2 Jumper installed

### E5: I/O Gate Address Select

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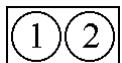
E Point and Physical Layout	Location	Description	Default
<b>E5</b> 	F1	Jump pin 1 to 2 to address Acc-2P I/O ports at the regular addresses. Jump pin 2 to 3 to address Acc-2P I/O ports at the regular addresses plus \$40.	1-2 Jumper installed

### E6: Communications Port Select

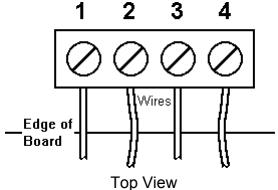
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E Point and Physical Layout	Location	Description	Default
<b>E6</b> 	E6	Jump pin 1 to 2 to enable the PC/104 communications port. Jump pin 2 to 3 to enable either the USB or Ethernet communications port.	1-2 Jumper installed

## E7- E10: Ports Direction Control

<b>E Point and Physical Layout</b>	<b>Location</b>	<b>Description</b>	<b>Default</b>
<b>E7</b> 	D1	Install jumper to make DATx lines inputs. No jumper to make DATx lines outputs.	Jumper installed
<b>E8</b> 	D1	Install jumper to make SELx lines inputs. No jumper to make SELx lines outputs.	No jumper
<b>E9</b> 	D2	Install jumper to make MOx lines inputs. No jumper to make MOx lines outputs.	No jumper
<b>E10</b> 	D2	Install jumper to make MIx lines inputs. No jumper to make MIx lines outputs.	Jumper installed

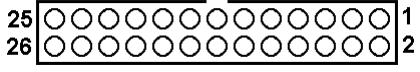
## ACC-2P CONNECTOR PINOUTS

TB1 (JPWR): Power Supply (4-Pin Terminal Block)				
Pin#	Symbol	Function	Description	Notes
1	GND	Common	Reference Voltage	
2	+5V	Input	Positive Supply Voltage	Supplies all PMAC digital circuits
3	+12V	Input	Positive Supply Voltage	Ref to digital GND
4	-12V	Input	Negative Supply Voltage	Ref TO Digital GND

This terminal block can be used to provide the input for the power supply for the circuits on the PMAC board when it is not in a bus configuration. When the PMAC is in a bus configuration, these supplies automatically come through the bus connector from the bus power supply; in this case, this terminal block should not be used.

J1 (USB) Universal Serial Bus Port (Optional)		
Pin #	Symbol	Function
1	VCC	N.C.
2	D-	DATA-
3	D+	DATA+
4	GND	GND
5	SHELL	SHIELD
6	SHELL	SHIELD

This connector is to be used in conjunction with USB A-B cable, which can be purchased from any local computer store and it is provided when Acc-2P Option 1A is ordered. The A connector is connected to a PC or Hub device; the B connector plugs into this port.

<b>J2 (JTHW): Multiplexer Port Connector (26-Pin Connector)</b>				 Front View
<b>Pin#</b>	<b>Symbol</b>	<b>Function</b>	<b>Description</b>	<b>Notes</b>
1	GND	Common	PMAC Common	
2	GND	Common	PMAC Common	
3	DAT0	Input	Data-0 Input	Data input from multiplexed accessory
4	SEL0	Output	Select-0 Output	Multiplexer select output
5	DAT1	Input	Data -1 Input	Data input from multiplexed accessory
6	SEL1	Output	Select -1 Output	Multiplexer select output
7	DAT2	Input	Data -2 Input	Data input from multiplexed accessory
8	SEL2	Output	Select -2 Output	Multiplexer select output
9	DAT3	Input	Data -3 Input	Data input from multiplexed accessory
10	SEL3	Output	Select -3 Output	Multiplexer select output
11	DAT4	Input	Data -4 Input	Data input from multiplexed accessory
12	SEL4	Output	Select -4 Output	Multiplexer select output
13	DAT5	Input	Data -5 Input	Data input from multiplexed accessory
14	SEL5	Output	Select -5 Output	Multiplexer select output
15	DAT6	Input	Data -6 Input	Data input from multiplexed accessory
16	SEL6	Output	Select -6 Output	Multiplexer select output
17	DAT7	Input	Data -7 Input	Data input from multiplexed accessory
18	SEL7	Output	Select -7 Output	Multiplexer select output
19	N.C.	N.C.	No Connection	
20	GND	Common	PMAC Common	
21	N.C.	Output	Buffer Request	Low is Buffer Request
22	GND	Common	PMAC Common	
23	N.C.	Output	In Position	Low is In Position
24	GND	Common	PMAC Common	
25	+5V	Output	+5VDC Supply	Power supply out
26	N.C.	Input	PMAC Reset	Low is Reset

The JTHW multiplexer port provides 8 inputs and 8 outputs at TTL levels. While these I/O can be used in unmultiplexed form for 16 discrete I/O points, most users will utilize PMAC software and accessories to use this port in multiplexed form to greatly multiply the number of I/O that can be accessed on this port. In multiplexed form, some of the SELn outputs are used to select which of the multiplexed I/O are to be accessed.

The direction of the input and output lines on this connector are set by jumpers E7 and E8. If E7 is removed or E8 is installed then the multiplexing feature of the JTHW port cannot be used.

<b>J7 (JOPT): I/O Port Connector</b> (34-Pin Connector)				
<b>Pin#</b>	<b>Symbol</b>	<b>Function</b>	<b>Description</b>	<b>Notes</b>
1	MI8	Input	Machine Input 8	Direction selectable
2	GND	Common	PMAC Common	
3	MI7	Input	Machine Input 7	Direction selectable
4	GND	Common	PMAC Common	
5	MI6	Input	Machine Input 6	Direction selectable
6	GND	Common	PMAC Common	
7	MI5	Input	Machine Input 5	Direction selectable
8	GND	Common	PMAC Common	
9	MI4	Input	Machine Input 4	Direction selectable
10	GND	Common	PMAC Common	
11	MI3	Input	Machine Input 3	Direction selectable
12	GND	Common	PMAC Common	
13	MI2	Input	Machine Input 2	Direction selectable
14	GND	Common	PMAC Common	
15	MI1	Input	Machine Input 1	Direction selectable
16	GND	Common	PMAC Common	
17	MO8	Output	Machine Output 8	Direction selectable
18	GND	Common	PMAC Common	
19	MO7	Output	Machine Output 7	Direction selectable
20	GND	Common	PMAC Common	
21	MO6	Output	Machine Output 6	Direction selectable
22	GND	Common	PMAC Common	
23	MO5	Output	Machine Output 5	Direction selectable
24	GND	Common	PMAC Common	
25	MO4	Output	Machine Output 4	Direction selectable
26	GND	Common	PMAC Common	
27	MO3	Output	Machine Output 3	Direction selectable
28	GND	Common	PMAC Common	
29	MO2	Output	Machine Output 2	Direction selectable
30	GND	Common	PMAC Common	
31	MO1	Output	Machine Output 1	Direction selectable
32	GND	Common	PMAC Common	
33	+5	Output	+5 Power I/O	
34	GND	Common	PMAC Common	

This connector provides means for 16 general-purpose inputs or outputs at TTL levels. The direction of the input and output lines on this connector are set by jumpers E9 and E10. Further software settings are required to configure this port. See the Software Setup section for details.

<b>J8 (JHW) Handwheel Encoder Connector</b>			
<b>Pin#</b>	<b>Symbol</b>	<b>Function</b>	<b>Description</b>
1	GND	Common	Reference voltage
2	HWA1+ / PUL1+	Input/Output	HW1 channel A or pulse output selected by jumpers E3 and E4
3	HWA1- / PUL1-	Input/Output	HW1 channel a or pulse output selected by jumpers E3 and E4
4	HWB1+ / DIR1+	Input/Output	HW1 channel b or direction output selected by jumpers E3 and E4
5	HWB1- / DIR1-	Input/Output	HW1 channel b or direction output selected by jumpers E3 and E4
6	HWA2+ / PUL2+	Input/Output	HW2 channel a or pulse output selected by jumpers E3 and E4
7	HWA2- / PUL2-	Input/Output	HW2 channel a or pulse output selected by jumpers E3 and E4
8	HWB2+ / DIR2+	Input/Output	HW2 channel b or direction output selected by jumpers E3 and E4
9	HWB2- / DIR2-	Input/Output	HW2 channel b or direction output selected by jumpers E3 and E4
10	+5V	Output	Supply voltage

### **J10 Ethernet Port (Optional)**

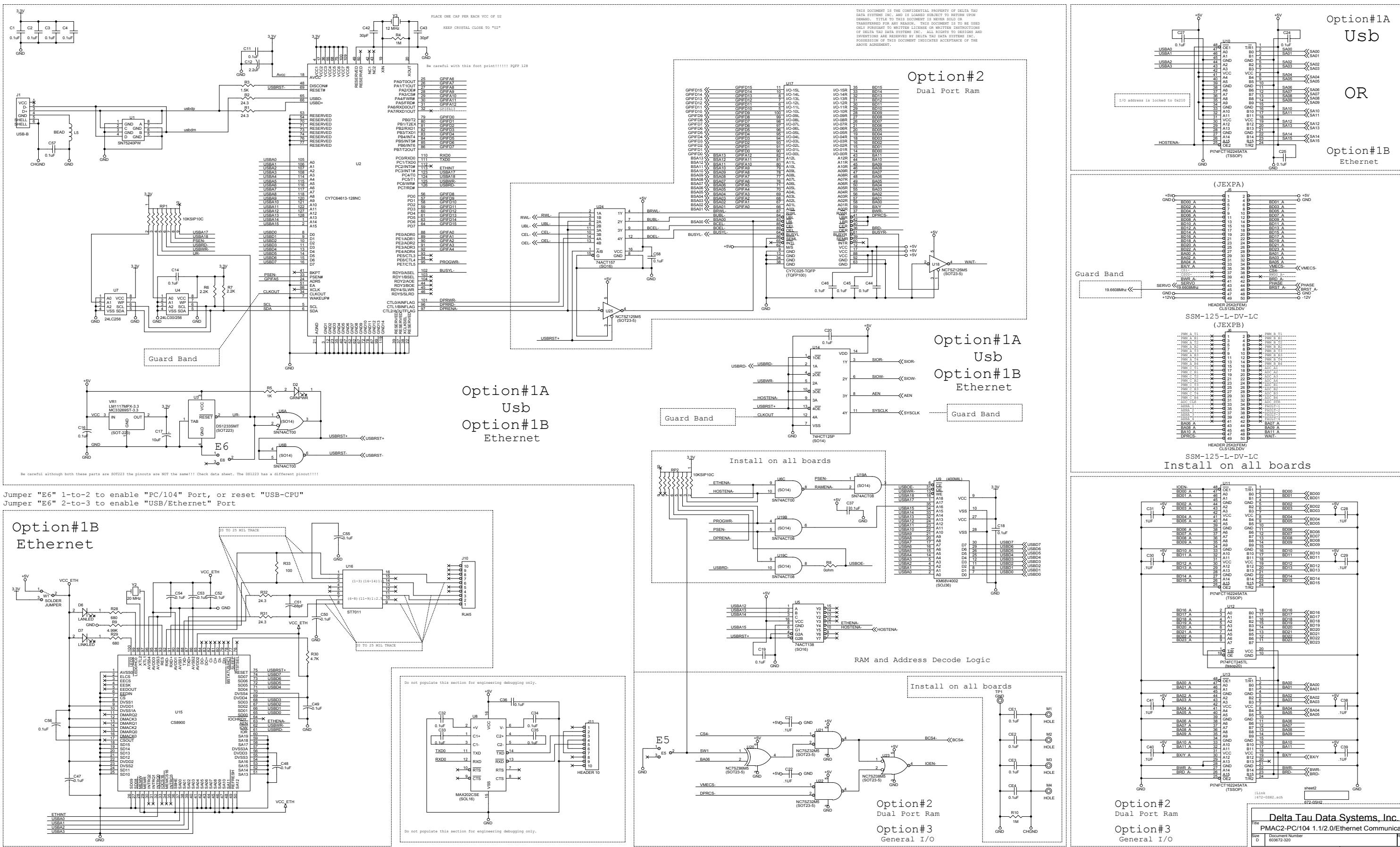
<b>Pin #</b>	<b>Function</b>
1	TXD+
2	TXD-
3	RXD+
4	No Connect
5	No Connect
6	RXD-
7	No Connect
8	No Connect
9	No Connect
10	No Connect

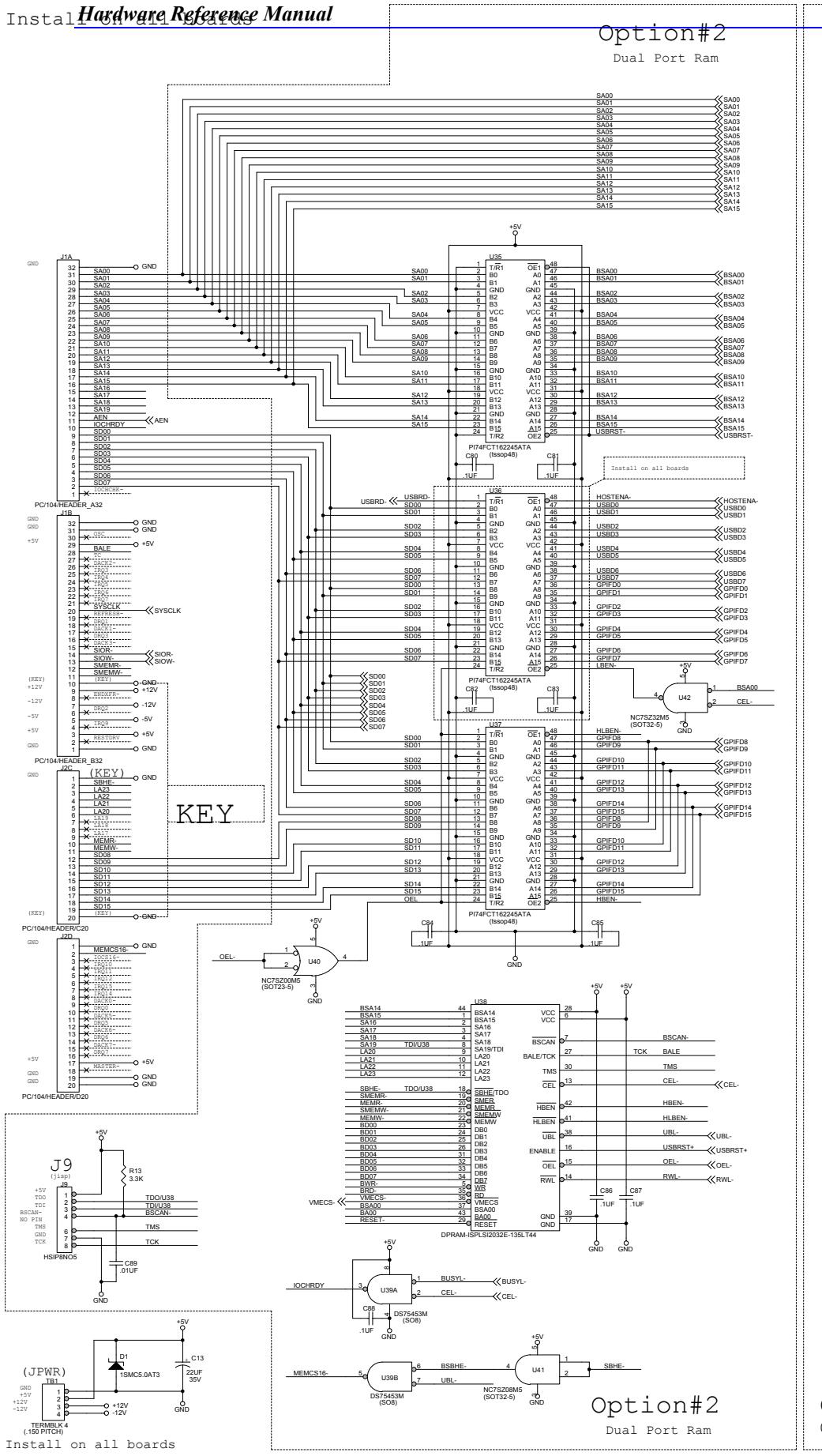
This connector is used for Ethernet communications from the Acc-2P to a PC, and it is provided when Acc-2P Option 1B is ordered. The appropriate Category 5 10/100-Base T network cable that mates to this connector can be readily purchased from any local computer store. The type of network cable to purchase depends on the configuration to the host PC.

When making a direct connection to a Host communication Ethernet card in a PC a cat 5 networking crossover cable must be used. A standard cat 5 straight through networking cable cannot be used in this scenario. When using a connection to a network hub or switch, the standard cat 5 straight through networking cable must be used, and not a crossover cable.

## **SCHEMATICS**

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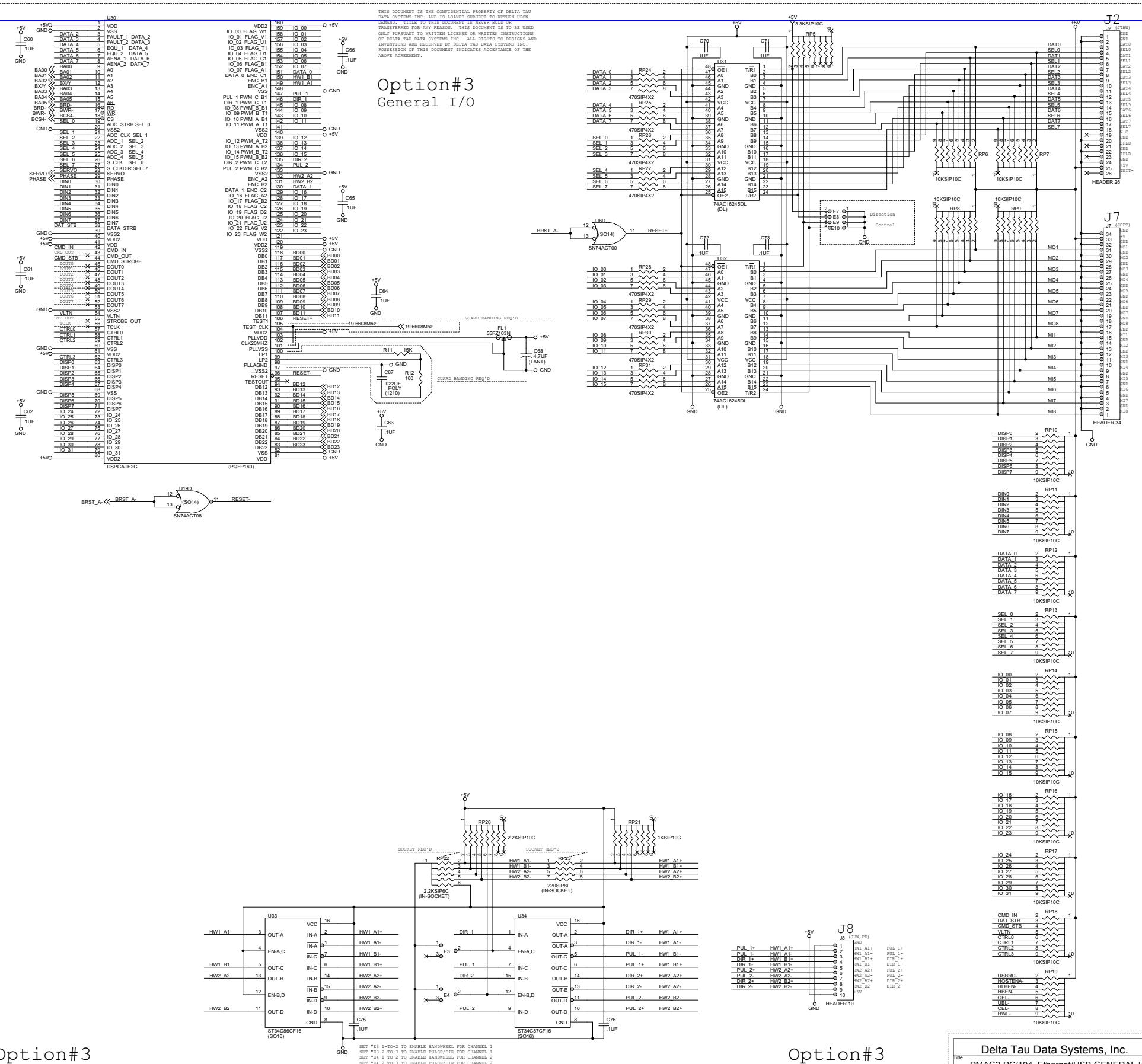


## Option#2

## Dual Port Ram

## Option#3

### General I/O



tion#3  
eral I/O

## option#3 general I/O