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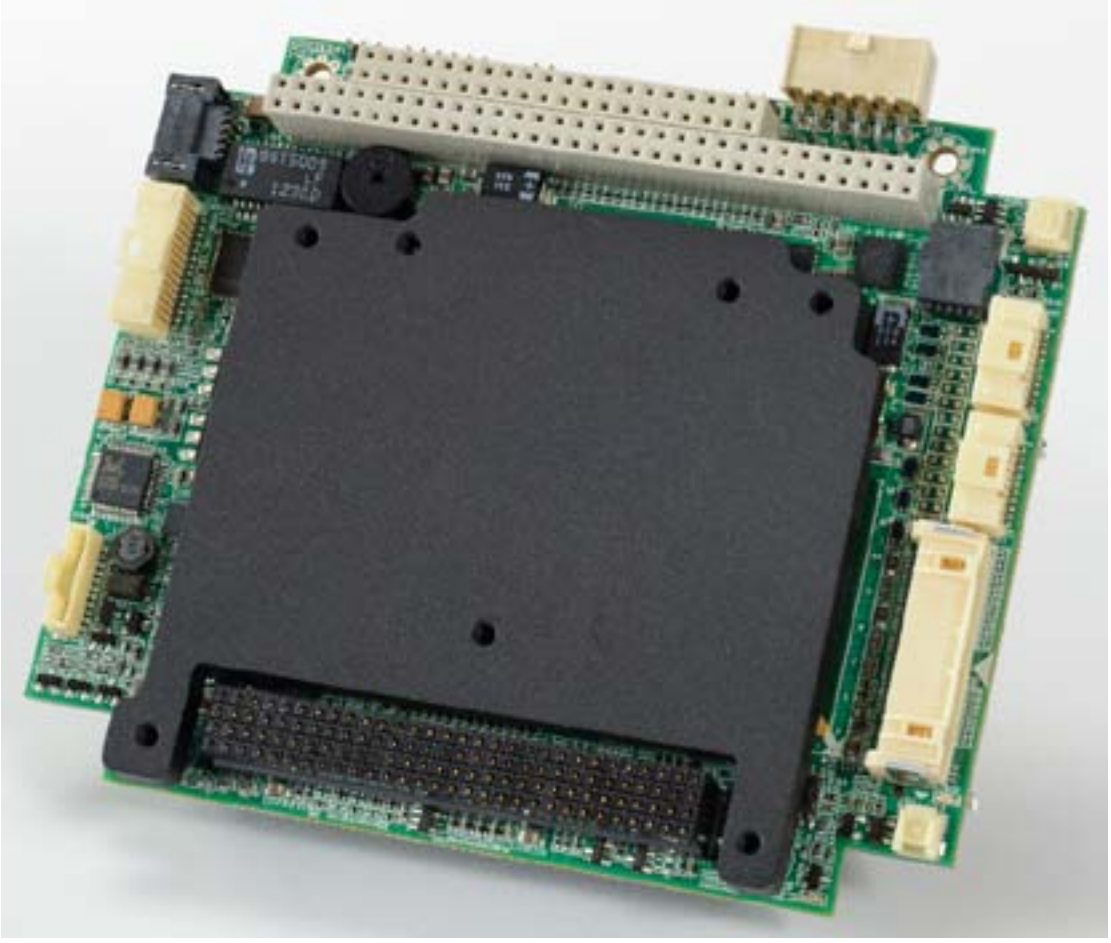
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PPM-C393-S

1.66 GHz Intel® Atom™ N455 SBC with PC/104-*Plus* Expansion

PRODUCT MANUAL



WinSystems, Inc.
715 Stadium Drive
Arlington, TX 76011

http://www.winsystems.com

MANUAL REVISION HISTORY

P/N 400-0393-000

Revision Date Code	ECO Number
130118	
130404	
130711	
130729	

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BEFORE YOU BEGIN

WinSystems offers best practice recommendations for using and handling WinSystems embedded PCs. These methods include valuable advice to provide an optimal user experience and to prevent damage to yourself and/or the product.

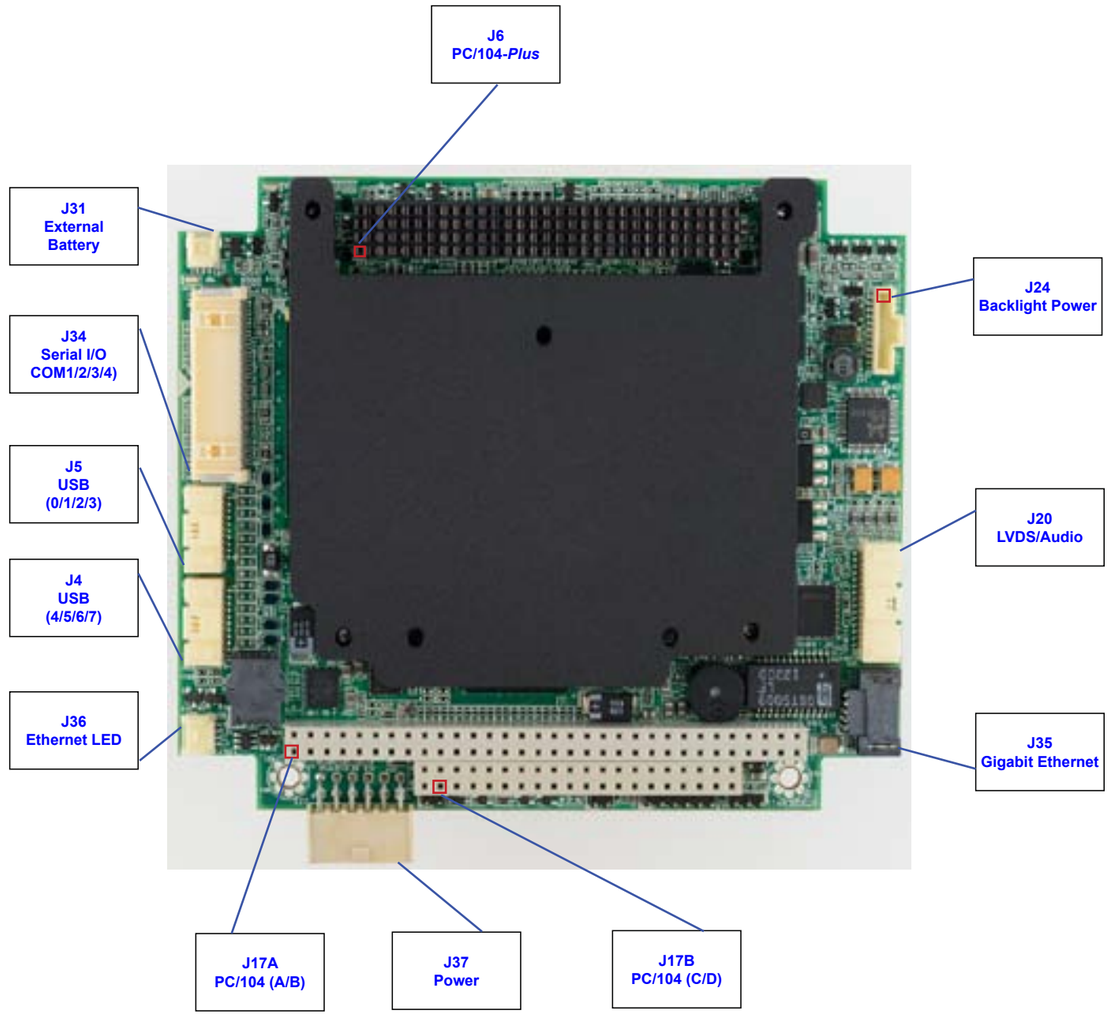
YOU MAY VOID YOUR WARRANTY AND/OR DAMAGE AN EMBEDDED PC BY FAILING TO COMPLY WITH THESE BEST PRACTICES.

Reference Appendix - A for **Best Practices**.

Please review these guidelines carefully and follow them to ensure you are successfully using your embedded PC.
This product ships with a heat sink. Product warranty is void if the heat sink is removed from the product.

For any questions you may have on WinSystems products, contact our Technical Support Group at (817) 274-7553, Monday through Friday, between 8 AM and 5 PM Central Standard Time (CST).

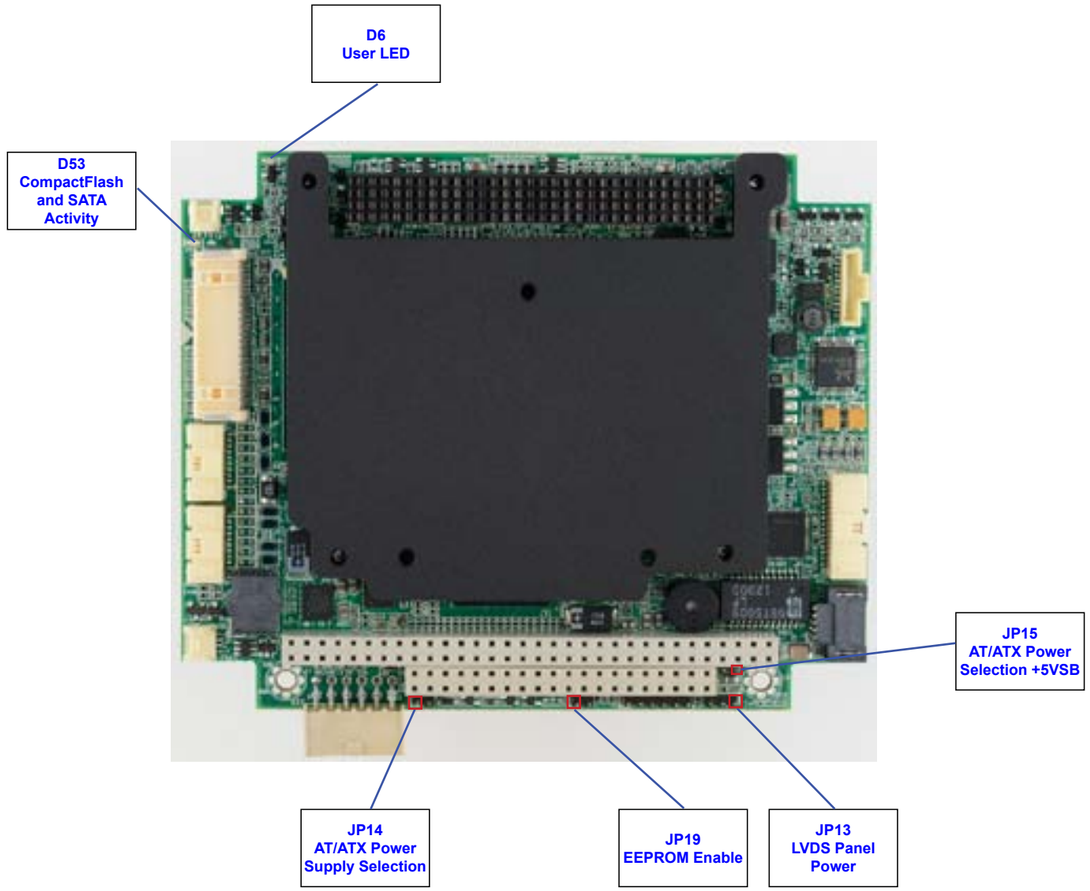
Visual Index - Top View (Connectors)



RESERVED - JP3

NOTE: The reference line to each component part has been drawn to Pin 1, and is also highlighted with a square, where applicable.

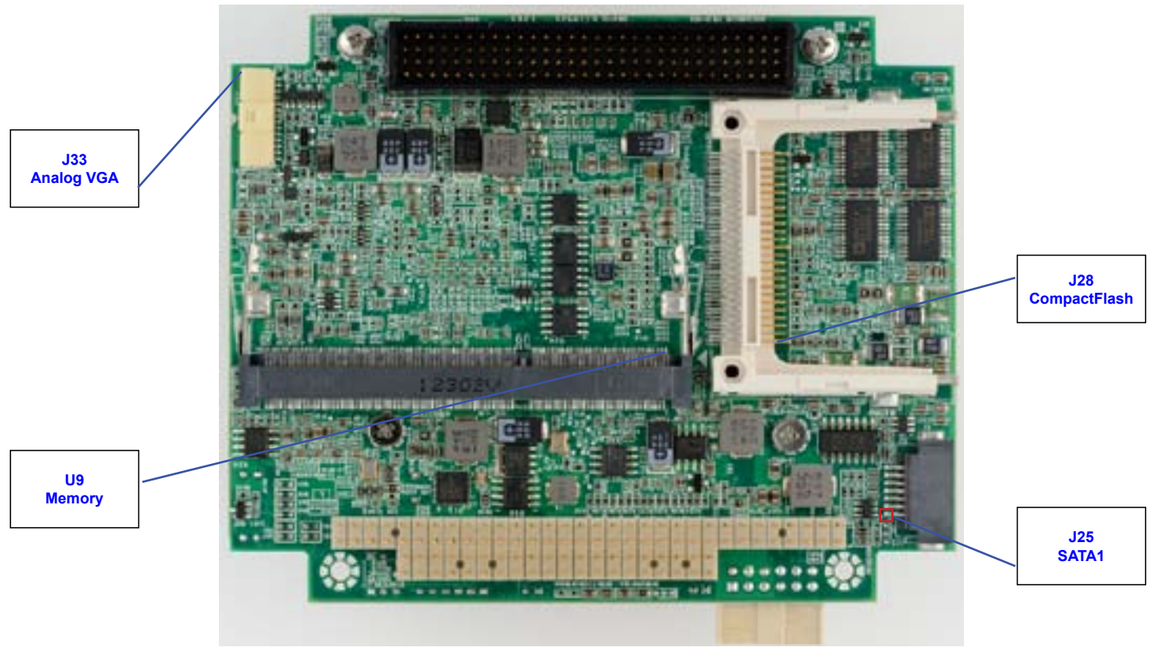
Visual Index - Top View (Jumpers & LEDs)



RESERVED - JP3

NOTE: The reference line to each component part has been drawn to Pin 1, and is also highlighted with a square, where applicable.

Visual Index - Bottom View



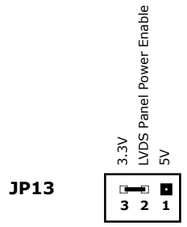
RESERVED - JP3

NOTE: The reference line to each component part has been drawn to Pin 1, and is also highlighted with a square, where applicable.

Jumper Reference

NOTE: Jumper Part# SAMTEC 2SN-BK-G is applicable to all jumpers. These are available in a ten piece kit from WinSystems (Part# KIT-JMP-G-200).

JP13 - LVDS Panel Power



JP14, JP15 - Power Selection

JP14 and **JP15** should both be open when the PPM-C393-S is used with an ATX compatible power supply. Both should be jumpered to use the PPM-C393-S with an AT mode power supply.



JP19 - EEPROM Enable



EEPROM Enable	JP19
CMOS EEPROM Enable (default)	1-2
CMOS EEPROM Disable	Open

INTRODUCTION

This manual is intended to provide the necessary information regarding configuration and usage of the PPM-C393-S single board computer. WinSystems maintains a Technical Support Group to help answer questions not adequately addressed in this manual. Contact Technical Support at (817) 274-7553, Monday through Friday, between 8 AM and 5 PM Central Standard Time (CST).

FEATURES

CPU
- Intel® Atom™ N455 single core @ 1.66 GHz PC/104-*Plus* compatible Single Board Computer (SBC)

Compatible Operating Systems
- Linux, Windows, and other x86 compatible OS

Memory
- Up to 2 GB of DDR3 SODIMM (Socketed)

BIOS
- Phoenix

Video
- Analog VGA resolution up to SXGA 1400x1050
- LVDS 18-bit support up to 1366x768 or 1280x800
- Simultaneous LVDS and CRT video supported

Ethernet
- Intel® 10/100/1000 Mbps controllers (ICH8M)

Storage
- 1 SATA (2.0) channel
- CompactFlash Types I and II memory socket supported

Serial I/O
- 4 Serial ports (2 RS-232, 2 RS-232/422/485)

Bus Expansion
- PC/104-*Plus*
- PC/104

USB
- 8 USB 2.0 ports with polyfuse protection

Watchdog Timer
- Adjustable from 1 second to 255 minute reset

Audio
- HD Audio supported

Power
- 5V required, 2.5A typical

Industrial Operating Temperature
- -40°C to 85°C

Mechanical
- Dimensions: 4.6 x 3.8 inches (116 mm x 96 mm)
- Weight: 7.42 oz (211g), without optional heatsink

Additional Features
- RoHS compliant
- LED Backlight supported
- Custom splash screen on start-up
- Real-time clock

System

WinSystems' PPM-C393-S is a Single Board Computer (SBC) with PC/104-*Plus* expansion that uses Intel's Atom™ N455 single core 1.66 GHz processor paired with the ICH8M controller hub.

This SBC is a full-featured unit with on-board I/O that supports CRT/LVDS video simultaneously, a Gigabit Ethernet port, eight USB 2.0 ports, two serial RS-232/422/485 COM channels, two serial RS-232 COM channels, audio, and a watchdog timer. Also it has a PC/104 and PC/104-*Plus* connectors for additional I/O expansion.

Memory

The PPM-C393-S board supports up to 2 GB DDR3 SODIMM system memory via an on-board socket located at **U9**.

FUNCTIONALITY

The PPM-C393-S is well suited for directly upgrading existing PC/104 based designs with Intel's Atom™ processor family. The single core processor provides improved performance while maintaining a fanless solution to run over extended temperatures.

I/O Port Map

Following is a list of I/O ports used on the PPM-C393-S.

NOTE: The PPM-C393-S uses a PnP BIOS resource allocation. Care must be taken to avoid contention with resources allocated by the BIOS.

HEX Range	Usage
0000h-001Fh	DMA Controller 82C37
0020h-0021h	Interrupt Controller PIC 8259
0024h-0025h	Interrupt Controller
0028h-0029h	Interrupt Controller
002Ch-002Dh	Interrupt Controller
002Eh-002Fh	Forward to Super IO
0030h-0031h	Interrupt Controller
0034h-0035h	Interrupt Controller
0038h-0039h	Interrupt Controller
003Ch-003Dh	Interrupt Controller
0040h-0043h	Timer counter 8254
004Eh-004Fh	Forward to Super IO
0050h-0053h	Timer counter 8254
0060h	Keyboard data port
0061h	NMI controller
0062h	8051 download 4K address counter
0064h	Keyboard status port
0066h	8051 download 8-bit data port
0070h-0077h	RTC Controller
0080h-0091h	DMA Controller
0092h	Reset Generator
0093h-009Fh	DMA Controller
00A0h-00A1h	Interrupt Controller PIC 8259
00A4h-00A5h	Interrupt Controller
00A8h-00A9h	Interrupt Controller
0ACh-00ADh	Interrupt Controller
00B0h-00B1h	Interrupt Controller
00B2h-00B3h	Power Management
00B4h-00B5h	Interrupt Controller
00B8h-00B9h	Interrupt Controller
00C0h-00DFh	DMA Controller 82C37
00F0h	FERR#/IGNNE/Interrupt Controller
0120h-012Fh	Digital I/O (Default)
0140h-01FFh	Reserved *
0170h-0177h	IDE1 Controller
0180h-01FFh	Reserved
0298h-029Bh	Reserved for Super I/O Configuration
029C	Interrupt Status Register
029D	Status LED Register
029E-029F	Watchdog Timer Control
02E8h-02EFh	COM4 (Default)
02F8h-02FFh	COM2 (Default)

HEX Range	Usage
0340h-03E7h	Reserved *
0376h	IDE1 Controller
0378h-037Bh	LPT (Default)
03E8h-03EFh	COM3 (Default)
03F0h-03F5h	Reserved
03F6h	IDE0 Controller
03F8h-03FFh	COM1 (Default)
04D0h-4D1h	Interrupt Controller
0564h-0568h	Advanced Watchdog
0CF9h	Reset Generator

This product utilizes a LPC to ISA Bridge to address the PC/104 bus. The majority of legacy PC/104 modules are I/O mapped and function as expected. However, neither DMA nor memory mapped PC/104 modules are supported with this product. The PC/104-*Plus* PCI signals are completely supported.

*** The ICH8M limits the LPC (ISA) decode ranges to four windows, two of which can be adjusted in the BIOS. For example, the 0300-033Fh range can be changed to 0600-06FFh so the full 256 bytes are available for PC/104 modules. Resources addressed internally may still exist in these ranges so please check the I/O map for availability.**

The advanced watchdog timer is the only on-board device affected by adjusting LPC (ISA) decode range. It will not be available if the 0564-0568h decode range is disabled.

The default is for the PC/104 decode ranges are shown below. Please contact an Applications Engineer if you have questions regarding the decode ranges.

0100-013Fh	**64 Bytes**	**(Fixed)**
0200-02FFh	**256 Bytes**	**(Fixed)**
0300-033Fh	**64 Bytes**	**(BIOS Selectable)**
0500-05FFh	**256 Bytes**	**(BIOS Selectable)**

Interrupt Map

Hardware Interrupts (IRQs) are supported for both PC/104 (ISA), PCI and PCIe devices. The user must reserve IRQs in the BIOS CMOS configuration for use by legacy devices. The PCIe/PnP BIOS will use unreserved IRQs when allocating resources during the boot process. The table below lists IRQ resources as used by the PPM-C393-S.

IRQ0	18.2 Hz heartbeat
IRQ1	Keyboard
IRQ2	Chained to Slave controller (IRQ9)
IRQ3	COM2 *
IRQ4	COM1 *
IRQ5	COM3 *
IRQ6	COM4 *
IRQ7	LPT *
IRQ8	Real Time Clock
IRQ9	FREE **
IRQ10	Digital I/O
IRQ11	PCI Interrupts
IRQ12	Mouse
IRQ13	Floating point processor
IRQ14	IDE
IRQ15	IDE

*	These IRQ references are default settings that can be changed by the user in the CMOS Settings utility. Reference the Super I/O Control section under Intel.
**	IRQ9 is commonly used by ACPI when enabled and may be unavailable (depending on operating system) for other uses.
***	IRQ15 is currently unavailable under the Windows operating systems.
Some IRQs can be freed for other uses if the hardware features they are assigned to are not being used. To free an interrupt, use the CMOS setup screens to disable any unused board features or their IRQ assignments.	

Interrupt Status Register - 29CH

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
N/A	N/A	N/A	N/A	COM4	COM3	COM2	COM1

Note: A **1** will be read for the device(s) with an interrupt pending.

WinSystems does not provide software support for implementing the Interrupt Status Register to share interrupts. Some operating systems, such as Windows XP and Linux, have support for sharing serial port interrupts and examples are available. The user will need to implement the appropriate software to share interrupts for the other devices.

Watchdog Timer

The PPM-C393-S features an advanced watchdog timer which can be used to guard against software lockups. Two interfaces are provided to the watchdog timer. The Advanced interface is the most flexible and recommended for new designs. The other interface option is provided for software compatibility with older WinSystems single board computers.

Advanced

The watchdog timer can be enabled in the BIOS Settings by entering a value for Watchdog Timeout on the Intel → Super I/O Control screen. Any non-zero value represents the number of minutes prior to reset during system boot. Once the operating system is loaded, the watchdog can be disabled or reconfigured in the application software.

NOTE: It is recommended that a long timeout be used if the watchdog is enabled when trying to boot any operating system.

The watchdog can be enabled, disabled or reset by writing the appropriate values to the configuration registers located at I/O addresses 565h and 566h. The watchdog is enabled by writing a timeout value other than zero to the I/O address 566h and disabled by writing **00h** to this I/O address. The watchdog timer is serviced by writing the desired timeout value to I/O port 566h. If the watchdog has not been serviced within the allotted time, the circuit resets the CPU.

The timeout value can be set from 1 second to 255 minutes. If port 565h bit 7 equals **0**, the timeout value written into I/O address 566h is in minutes. The timeout value written to address 566h is in seconds if port 565 bit 7 equals **1**.

Watchdog Timer Examples

Port Address	Port Bit 7 Value	Port Address	Value	Reset Interval
565H	x	566H	00h	DISABLED
565H	1	566H	03h	3 SECONDS
565H	1	566H	1Eh	30 SECONDS
565H	0	566H	04h	4 MINUTES
565H	0	566H	05h	5 MINUTES

Software watchdog timer PET = PORT 566H, write the timeout value.

Real-Time Clock/Calendar

A real-time clock is used as the AT-compatible clock/calendar. It supports a number of features including periodic and alarm interrupt capabilities. In addition to the time and date keeping functions, the system configuration is kept in CMOS RAM contained within the clock section. A battery must be enabled for the real-time clock to retain time and date during a power down.

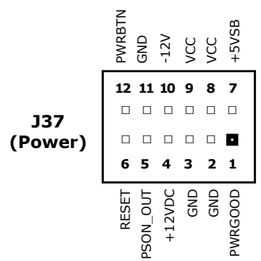
CONNECTOR REFERENCE

POWER

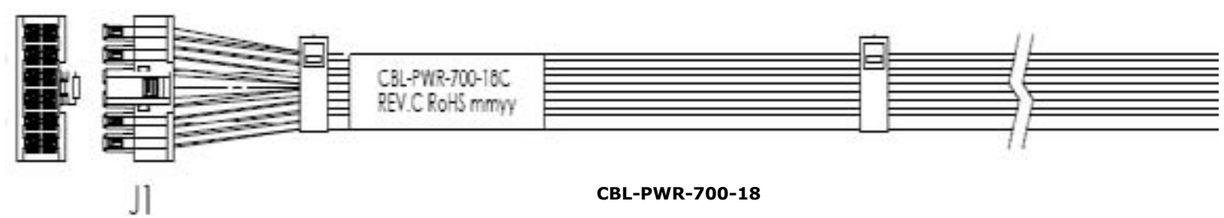
J37 - Power

Visual Index

PCB Connector: **SAMTEC IPL1-105-01-L-D-RA-K (J37)**
Mating Connector: **SAMTEC IPD1-06-D-K (Housing)**
SAMTEC CC79L-2024-01L or CC79R-2024-01L (Crimp)



Power is applied to the PPM-C393-S via the connector at **J37**. WinSystems offers the cable CBL-PWR-700-18 to simplify this connection. See the list of Cables in this manual for additional cables for other power supplies.



CBL-PWR-700-18

JP14, JP15 - Power Supply Selection

Visual Index

The PPM-C393-S supports either AT (standard power supply) or ATX type power supplies. Zero load supplies are recommended. An AT power supply is a simple on/off supply with no interaction with the single board computer. Most embedded systems use this type of power supply and it is the default setting. **JP14** and **JP15** should always be jumpered with an AT style power supply.

ATX type power supplies function with a “soft” on/off power button and a +5 VSB (standby). If an ATX compatible power supply is connected, **JP14** and **JP15** should be open and a power button (momentary contact) connected between pin 12 (power button) and pin 11 (ground) of **J37**. The +5 VSB signal provides the standby voltage to the PPM-C393-S but does not power any other features of the board. When the power button is pressed, the PPM-C393-S pulls PSON (Power Supply On) low and the power supply turns on all voltages to the single board computer. When the power button is pressed again, the BIOS signals the event so ACPI-compliant operating systems can be shutdown before the power is turned off. In ATX mode, if the power button is held for 4 seconds, the power supply is forced off, regardless of ACPI.

It is possible to use an ATX power supply without a power button. Simply jumper **JP14** and **JP15** and it will boot when the supply is turned on.

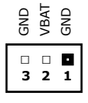


J31 - External Battery

Visual Index

PCB Connector: **MOLEX 501953-0307 (J31)**

J31



(For external battery. Provides battery backup to RTC and BIOS CMOS.)

WARNING: BAT-LTC-E-36-16-2 or BAT-LTC-E-36-27-2 must be connected at J31. Improper installation of the battery could result in explosive failure. Please be careful to note correct connection at location J31.

An optional external battery, connected at **J31**, supplies the PPM-C393-S board with standby power for the real-time clock and CMOS setup RAM. An extended temperature lithium battery is available from WinSystems, part number BAT-LTC-E-36-16-2 or BAT-LTC-E-36-27-2.

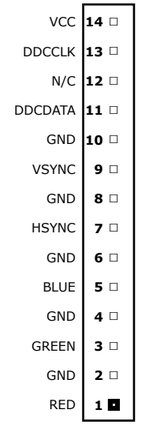
A power supervisory circuit contains the voltage sensing circuit and an internal power switch to route the battery or standby voltage to the circuits selected for backup. The battery automatically switches ON when the VCC of the systems drops below the battery voltage and back OFF again when VCC returns to normal.

J33 - ANALOG VGA

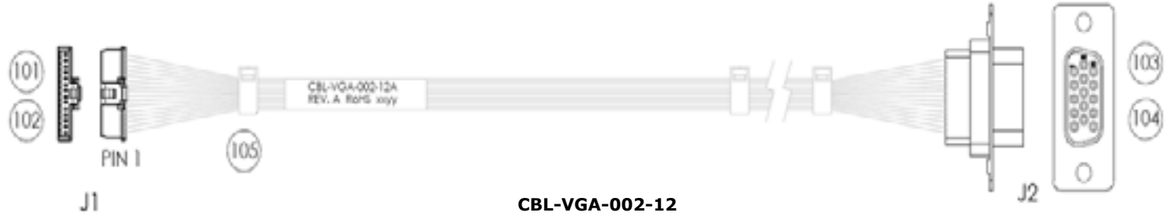
Visual Index

PCB Connector: **MOLEX 501568-1407 (J33)**
Mating Connector: **MOLEX 501330-1400 (Housing)**
MOLEX 501334-0000 (Crimp)

J33



PIN 1



CBL-VGA-002-12

The PPM-C393-S has an integrated display controller that interfaces to both Analog VGA and flat panel displays. The video output mode is selected in the CMOS setup. Simultaneous flat panel and Analog VGA mode is also supported. The Analog VGA connector is located at **J33**. WinSystems offers the cable CBL-VGA-002-12 to simplify the connection.
The LVDS interface connector is located at **J20** to interface to flat panels. A backlight power connector is located at **J24**.
Panel power option selection is made at **JP13**.

Contact your WinSystems' Applications Engineer for information about available cable kits and supported panels.
This manual does not attempt to provide any information about how to connect to specific LCDs.

J20 - LVDS

Visual Index

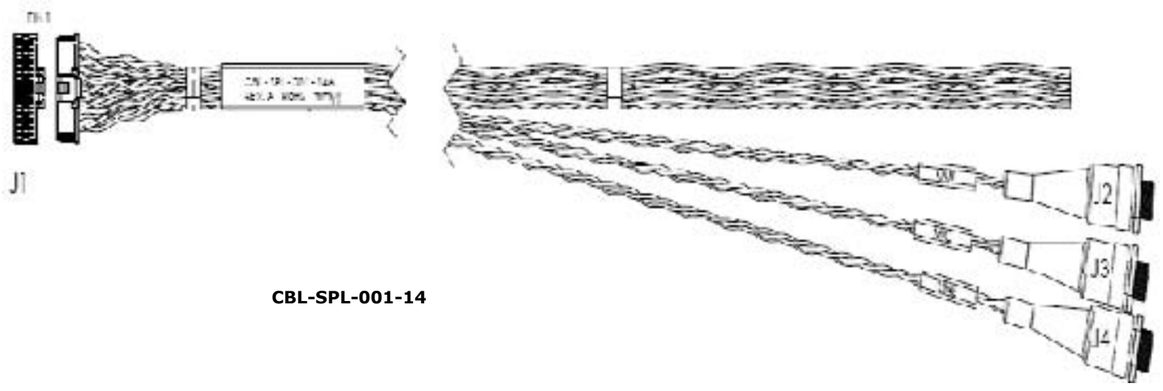
PCB Connector: MOLEX 501571-3007 (J20)
Mating Connector: MOLEX 501189-3010 (Housing)
MOLEX 501193-2000 (Crimp)

J20

SWVDD (LVDS)	1	2	GND (LVDS)
D0- (LVDS)	3	4	D0+ (LVDS)
D1- (LVDS)	5	6	D1+ (LVDS)
SWVDD (LVDS)	7	8	GND (LVDS)
D2- (LVDS)	9	10	D2+ (LVDS)
NC (LVDS)	11	12	NC (LVDS)
SWVDD (LVDS)	13	14	GND (LVDS)
CLK-(LVDS)	15	16	CLK+ (LVDS)
DDC_CLK (LVDS)	17	18	GND (LVDS)
DDC_DATA (LVDS)	19	20	GND (LVDS)
GND (LVDS)	21	22	ANALOG_GND (AUDIO)
OUT_R (AUDIO)	23	24	MIC_R (AUDIO)
OUT-L (AUDIO)	25	26	MIC_L (AUDIO)
ANALOG_GND (AUDIO)	27	28	ANALOG_GND (AUDIO)
LINE_R (AUDIO)	29	30	LINE_L (AUDIO)

The LVDS interface connector is located at **J20**. WinSystems provides cable CBL-SPL-001-14 to adapt to this connector.

The native resolution of the LCD panel is configured in the BIOS.



CBL-SPL-001-14

J24 - Backlight Power

Visual Index

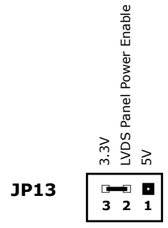
PCB Connector: MOLEX 501131-1107 (J24)
Mating Connector: MOLEX 501330-1100 (Housing)
MOLEX 501334-0000 (Crimp)

J24

VCC	1
ENABLE (Low)	2
ENABLE (High)	3
GND	4
+12V	5
BKLT_A	6
BKLT_A	7
BKLT_C	8
BKLT_C	9
LCTL_B DATA	10
LCTL_A CLK	11

HAZARD WARNING: LCD panels can require a high voltage for the panel backlight. This high-frequency voltage can exceed 1000 volts and can present a shock hazard. Care should be taken when wiring and handling the inverter output. To avoid the danger of shock and to avoid the panel, make all connection changes with the power removed.

JP13 - LVDS Panel Power



Panel power option selection is made at **JP13**. **JP13** sets the voltage supply on V_{DD} of the LVDS connector **J20** to either +3.3V (default) or +5V.

AUDIO

J20 - Audio

Visual Index

PCB Connector: MOLEX 501571-4007 (J20)
Mating Connector: MOLEX 501189-4010 (Housing)
MOLEX 501193-2000 (Crimp)

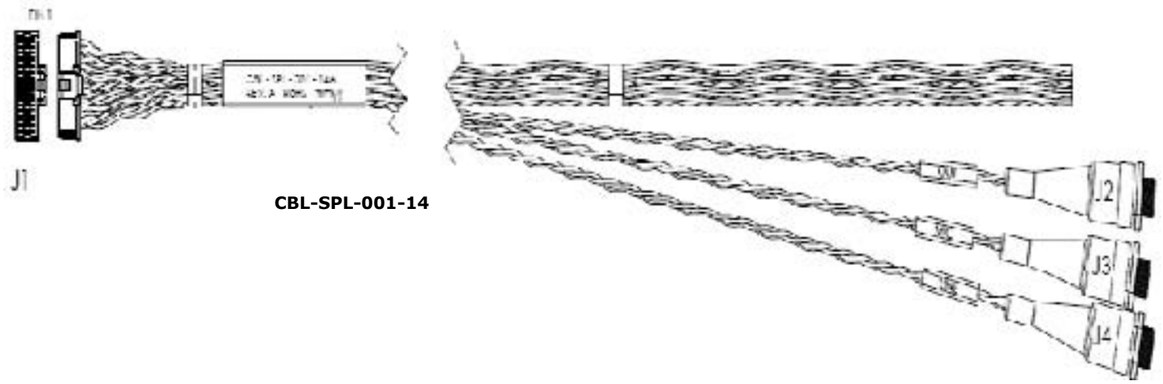
J20

SWVDD (LVDS)	1	2	GND (LVDS)
D0- (LVDS)	3	4	D0+ (LVDS)
D1- (LVDS)	5	6	D1+ (LVDS)
SWVDD (LVDS)	7	8	GND (LVDS)
D2- (LVDS)	9	10	D2+ (LVDS)
NC (LVDS)	11	12	NC (LVDS)
SWVDD (LVDS)	13	14	GND (LVDS)
CLK-(LVDS)	15	16	CLK+ (LVDS)
DDC_CLK (LVDS)	17	18	GND (LVDS)
DDC_DATA (LVDS)	19	20	GND (LVDS)
GND (LVDS)	21	22	ANALOG_GND (AUDIO)
OUT_R (AUDIO)	23	24	MIC_R (AUDIO)
OUT-L (AUDIO)	25	26	MIC_L (AUDIO)
ANALOG_GND (AUDIO)	27	28	ANALOG_GND (AUDIO)
LINE_R (AUDIO)	29	30	LINE_L (AUDIO)

Audio External Connection

The Intel HD Audio controller is included with a Realtek ALC886 codec.

Audio connection is provided at **J20**. To maintain the smaller form factor, only the line out, line in, and front microphone signals are accessible. WinSystems offers cable CBL-SPL-001-14 to simplify connection to **J20**.



CBL-SPL-001-14

BZ1 - Speaker

Speaker

An on-board speaker, **BZ1**, is available for sound generation.

Beep Codes

Reference the chart Appendix-B section of this manual for the appropriate beep codes.

SERIAL

J34 - COM1, COM2, COM3, COM4

Visual Index

PCB Connector: MOLEX 502046-4070 (J34)
Mating Connector: MOLEX 503110-4000 (Housing)
MOLEX 501930-1100 (Crimp)

J34

DCD (COM1)	1	2	DSR (COM1)
RXD (COM1)	3	4	RTS (COM1)
TXD (COM1)	5	6	CTS (COM1)
DTR (COM1)	7	8	RI (COM1)
GND	9	10	GND
DCD (COM2)	11	12	DSR (COM2)
RXD (COM2)	13	14	RTS (COM2)
TXD (COM2)	15	16	CTS (COM2)
DTR (COM2)	17	18	RI (COM2)
GND	19	20	GND
DCD (COM3)	21	22	DSR (COM3)
RXD (COM3)	23	24	RTS (COM3)
TXD (COM3)	25	26	CTS (COM3)
DTR (COM3)	27	28	RI (COM3)
GND	29	30	GND
DCD (COM4)	31	32	DSR (COM4)
RXD (COM4)	33	34	RTS (COM4)
TXD (COM4)	35	36	CTS (COM4)
DTR (COM4)	37	38	RI (COM4)
GND	39	40	GND

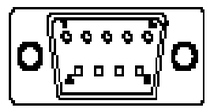
Four independent, asynchronous serial channels are on-board. Interface is provided at connector **J34**. WinSystems offers the cable CBL-SER4-002-12 to simplify the connection.

All serial ports are configured as Data Terminal Equipment (DTE). Both the send and receive registers of each port have a 16-byte FIFO. All serial ports have 16C550-compatible UARTs. The RS-232 transceivers have charge pumps to generate the plus and minus voltages so the PPM-C393-S only requires +5V to operate.

Each port is setup to provide internal diagnostics such as loopback and echo mode on the data stream. An independent, software programmable baud rate generator is selectable from 50 through 115.2 kbps. Individual modem handshake control signals are supported for all ports.

RS-232 interface levels are supported on all four serial ports which can be enabled in the BIOS. COM1 and COM2 also have RS-422/RS-485 support.

COM1, COM2, COM3, COM4 [DB9 Male]



Pin	RS-232	RS-422	RS-485
1	DCD	N/A	N/A
2	RX	TX+	TX/RX+
3	TX	TX-	TX/RX-
4	DTR	N/A	N/A
5	GND	GND	GND
6	DSR	RX+	N/A
7	RTS	RX-	N/A
8	CTR	N/A	N/A
9	RI	N/A	N/A

COM1 and COM2 Configuration Options in BIOS

1. RS-232 Mode
2. RS-422 Mode with RTS transmitter enable
3. RS-422 Mode with auto transmitter enable
4. RS-485 Mode with RTS transmitter enable
5. RS-485 Mode with RTS transmitter enable and echo back
6. RS-485 Mode with auto transmitter enable
7. RS-485 Mode with auto transmitter enable and echo back

Mode(s)	Configuration Note
2, 4, 5	Require the RTS bit (MCR Bit 1) to be set in order to transmit.
3, 6, 7	Require TX/RX(300) termination on one node.
4	Requires the RTS (MCR Bit 1) be de-asserted in order to receive.

USB

J4, J5 - USB

Visual Index

PCB Connector: MOLEX 501571-2007 (J4, J5)
Mating Connector: MOLEX 501189-2010 (Housing)
MOLEX 501193-2000 (Crimp)

J5
USB (0/1/2/3)

USBPWR2	1	2		USBPWR3
D2-	3	4		D3-
D2+	5	6		D3+
GND	7	8		GND
GND	9	10		GND
GND	11	12		GND
USBPWR0	13	14		USBPWR1
D0-	15	16		D1-
D0+	17	18		D1+
GND	19	20		GND

J4
USB (4/5/6/7)

USBPWR6	1	2		USBPWR7
D6-	3	4		D7-
D6+	5	6		D7+
GND	7	8		GND
GND	9	10		GND
GND	11	12		GND
USBPWR4	13	14		USBPWR5
D4-	15	16		D5-
D4+	17	18		D5+
GND	19	20		GND



CBL-USB4-002-12 with ADP-I0-USB-002

Up to two USB cables may be attached to the PPM-C393-S via the connectors for a total of eight USB 2.0 ports. These are terminated to 20-pin connector at **J4** and **J5**. An adapter cable CBL-USB4-002-12 is available from WinSystems for connection along with ADP-IO-USB-002.

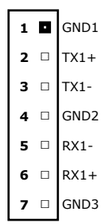
SERIAL ATA

J25 - SATA

Visual Index

PCB Connector: **MOLEX 47080-4001 (J25)**

J25



The PPM-C393-S supports one SATA interface located at **J25**.

COMPACTFLASH

J28 - CompactFlash

Visual Index

When using a CompactFlash device, the device is set to Master. The PPM-C393-S supports solid state CompactFlash storage devices for applications where the environment is too harsh for mechanical hard disks.

The CompactFlash socket at **J28** supports modules with TrueIDE support. WinSystems offers industrial grade CompactFlash modules that provide high performance and extended temperature operation (-40ºC to +85ºC).

STATUS LED

D53 - CompactFlash and SATA Activity

Visual Index

A status activity LED is located at **D53** on the PPM-C393-S. This LED will flash when data is transferred on either the CompactFlash or SATA interfaces.

D55 - 3.3 VSB Present

Visual Index

The LED at **D55** will light when +3.3V standby voltage is present, signaling that the PPM-C393-S is in standby mode.

D6 - User LED

Visual Index

A user LED is populated on the board at **D6** which can be used for any application specific purpose. The LED will turn on when the board is powered. It can be turned off in software by writing a **0** to I/O port 29DH and turned on by writing a **1** to 29DH.

ETHERNET

J35 - Gigabit Ethernet

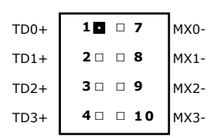
Visual Index

PCB Connector: **SAMTEC TFM-105-02-L-DH (J35)**
Mating Connector: **SAMTEC ISDF-05-D-M (Housing)**
SAMTEC CC03L-2830-01-G or CC03R-2830-01-G (Crimp)

Gigabit Ethernet Controllers

The PPM-C393-S is equipped with an Intel Gigabit Ethernet controller, internal to the ICH8M. This provides a standard IEEE 802.3 Ethernet interface for 1000/100/10BASE-T networks. The RJ-45 connection for the Ethernet port is available at **J35**.

J35
(Gigabit)





CBL-ENET1-302-12

J36 - Ethernet LED

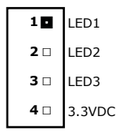
Visual Index

PCB Connector: **MOLEX 501953-0307 (J36)**
Mating Connector: **MOLEX 501939-0400 (Housing)**
MOLEX 501334 (Crimp)

Ethernet LED

On-board Ethernet activity signals are provided at **J36**. These activity signals are also available off-board for enclosures or other applications that have remote mounting requirements. See the pin definition below.

J36



J36
(Gigabit Ethernet Controller)

Pin	LED	Signal
1	LED1	ACTIVITY
2	LED2	SPEED1000
3	LED3	SPEED100
4	-	+3V



CBL-LED3-000-14

J17A, J17B - PC/104

Visual Index

PCB Connector: **TEKA PC232-A-1BD-M (J17A)**
TEKA PC220-A-1BD-M (J17B)

The PC/104 bus is electrically equivalent to the 16-bit ISA bus. Standard PC/104 I/O cards can be populated on PPM-C393-S's connectors, located at **J17A** and **J17B**. The interface does not support hot swap capability. The PC/104 bus connector pin definitions are provided below for reference. Refer to the PC/104 Bus Specification for specific signal and mechanical specifications.

J17B (C/D)

GND	D0	C0		GND
MEMCS16#	D1	C1		SBHE#
IOCS16#	D2	C2		LA23
IRQ10	D3	C3		LA22
IRQ11	D4	C4		LA21
IRQ12	D5	C5		LA20
IRQ15	D6	C6		LA19
IRQ14	D7	C7		LA18
DACK0#	D8	C8		LA17
DRQ0	D9	C9		MEMR#
DACK5#	D10	C10		MEMW#
DRQ5	D11	C11		SD8
DACK6#	D12	C12		SB9
DRQ6	D13	C13		SD10
DACK7#	D14	C14		SD11
DRQ7	D15	C15		SD12
+5V	D16	C16		SD13
MASTER#	D17	C17		SD14
GND	D18	C18		SD15
GND	D19	C19		KEY

J17A (A/B)

IOCHK#	A1	B1		GND
SD7	A2	B2		RESET
SD6	A3	B3		+5V
SD5	A4	B4		IRQ
SD4	A5	B5		-5V
SD3	A6	B6		DRQ2
SD2	A7	B7		-12V
SD1	A8	B8		SRDY#
SD0	A9	B9		+12V
IOCHRDY	A10	B10		KEY
AEN	A11	B11		SMEMW#
SA19	A12	B12		SMEMR#
SA18	A13	B13		IOW#
SA17	A14	B14		IOR#
SA16	A15	B15		DACK3#
SA15	A16	B16		DRQ3
SA14	A17	B17		DACK1#
SA13	A18	B18		DRQ1
SA12	A19	B19		REFRESH#
SA11	A20	B20		BCLK
SA10	A21	B21		IRQ7
SA9	A22	B22		IRQ6
SA8	A23	B23		IRQ5
SA7	A24	B24		IRQ4
SA6	A25	B25		IRQ3
SA5	A26	B26		DACK2#
SA4	A27	B27		TC
SA3	A28	B28		BALE
SA2	A29	B29		+5V
SA1	A30	B30		OSC
SA0	A31	B31		GND
GND	A32	B32		GND

= Active Low Signal

NOTES:

1. Rows C and D are not required on 8-bit modules.
2. B10 and C19 are key locations. WinSystems uses key pins as connections to GND.
3. Signal timing and function are as specified in ISA specification.
4. Signal source/sink current differ from ISA values.

J6 - PC/104-*Plus*

Visual Index

PCB Connector: **TEKA 2MR430-A7WM-368-00**

The PC/104-*Plus* is electrically equivalent to the 33 MHz PCI bus and is terminated to a 120-pin, nonstackthrough connector. The standard PC/104-*Plus* I/O modules can be populated on PPM-C393-S's PC104-*Plus* bus. The interface does not support hot swap capability. The PC/104-*Plus* bus connector is located at **J6**. Refer to the PC/104-*Plus* Bus Specification for specific signal and mechanical specifications. The pin definitions are:

PIN	A	B	C	D
1	GND	RESERVED	+5V	AD00
2	VI/O	AD02	AD01	+5V
3	AD05	GND	AD04	AD03
4	C/BE0#	AD007	GND	AD06
5	GND	AD009	AD08	GND
6	AD11	VI/O	AD10	M66EN
7	AD14	AD13	GND	AD12
8	+3.3V	C/BE1#	AD15	+3.3V
9	SERR#	GND	RESERVED	PAR
10	GND	PERR#	+3.3V	RESERVED
11	STOP#	+3.3V	LOCK#	GND
12	+3.3V	TRDY#	GND	DEVSEL#
13	FRAME#	GND	IRDY#	+3.3V
14	GND	AD16	+3.3V	C/BE2#
15	AD18	+3.3V	AD17	GND
16	AD21	AD20	GND	AD19
17	+3.3V	AD23	AD22	+3.3V
18	IDSEL0	GND	IDSEL1	IDSEL2
19	AD24	C/BE3#	VI/O	IDSEL3
20	GND	AD26	AD25	GND
21	AD29	+5V	AD28	AD27
22	+5V	AD30	GND	AD31
23	REQ0#	GND	REQ1#	VI/O
24	GND	REQ2#	+5V	GNT0#
25	GNT1#	VI/O	GNT2#	GND
26	+5V	CLK0	GND	CLK1
27	CLK2	+5V	CLK3	GND
28	GND	INTD#	+5V	RST#
29	+12V	INTA#	INTB#	INTC#
30	-12V	REQ3#	GNT3#	GND

BIOS SUPPLEMENTAL

General Information

The PPM-C393-S includes BIOS from Phoenix Technologies to assure full compatibility with PC operating systems and software. The basic system configuration is stored in battery backed CMOS RAM within the clock/calendar. As an alternative, the CMOS configuration may be stored in EEPROM for operation without a battery. For more information of CMOS configuration, see the BIOS Settings Storage Options section of this manual. Access to this setup information is via the Setup Utility in the BIOS.

Entering Setup

To enter setup, power up the computer and press **F2** when either the splash screen is displayed or when the **Press F2 for Setup** message is displayed. It may take a few seconds before the main setup menu screen is displayed.

Navigation of the Menus

Use the **Up** and **Down** arrow keys to move among the selections and press **Enter** when a selection is highlighted to enter a sub-menu or to see a list of choices. Following are images of each menu screen in the default configuration along with a brief description of each option where applicable. Available options are listed in reference tables. Menu values shown in **bold** typeface are factory defaults.

BIOS Splash Screen

Custom BIOS Splash Screens can be accommodated for OEM customers. Please contact one of our Application Engineers for details.

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Main Menu	
System Time:	**00:05:32**
System Date:	**01/26/2012**
>IDE Primary/Master	**None**
>SATA Port 1	**None**
System Memory:	633 KB
Extended Memory:	2085888 KB
LAN MAC Addr:	xx:xx:xx:xx:xx:xx

Each available option is listed in detail in the following sections.

Navigation to the screens is located at the top of each screen’s layout.

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Depending on the Primary Master **Type**, various Primary Master options will be available. See the following screens.

Main Menu > **IDE Primary/Master [None]**	
Type:	**Auto**
Multi-Sector Transfers:	**Disabled**
LBA Mode Control:	**Disabled**
32 Bit I/O:	**Disabled**
Options: Disabled Enabled	
Transfer Mode:	**Standard**
Ultra DMA Mode:	**Disabled** | **(Mode 2 for IDE Primary Slave only)**
SMART Monitoring	**Disabled**

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Depending on the Primary Master **Type**, various Primary Master options will be available. See the following screens.

Main Menu > **SATA Port 1**	
Type:	**Auto**
Multi-Sector Transfers:	**Disabled**
LBA Mode Control:	**Disabled**
32 Bit I/O:	**Disabled**
Options: Disabled Enabled	
Transfer Mode:	**Standard**
Ultra DMA Mode:	**Disabled**
SMART Monitoring	**Disabled**

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Advanced	
Installed O/S:	**Win95**
Options: Other Win95 Win98 WinMe Win2000	
Reset Configuration Data:	**No**
Options: No Yes	
Large Disk Access Mode:	**DOS**
Options: Other DOS	
Summary screen:	**Disabled**
Options: Disabled Enabled	
Boot-time Diagnostic Screen:	**Disabled**
Options: Disabled Enabled	
QuickBoot Mode:	**Enabled**
Options: Disabled Enabled	
Extended Memory Testing:	**None**
Options: Normal Just zero it None	

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Intel
> CPU Control Sub-Menu
> Video (Intel IGD) Control Sub-Menu
> ICH Control Sub-Menu
> I/O Device Configuration
> Hardware Monitor
> ACPI Control Sub-Menu
> PCI/PNP ISA IRQ Resource Exclusion

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Intel > CPU Control Sub-Menu	
Hyperthreading:	**Enabled**
Options: Disabled Enabled	
Processor Power Management:	**Enabled**
Options: Disabled GV3 Only C-States Only Enabled	
Timestamp Counter Updates	**Enabled**
Options: Disabled Enabled	
> CPU Thermal Control Sub-Menu	
Set Max Ext CPUID = 3	**Disabled**
Options: Disabled Enabled	

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Intel > CPU Control Sub-Menu > CPU Thermal Control Sub-Menu	
Thermal Control Circuit:	**Disabled**
Options: Disabled TM1 TM2 TM1 and TM2	
DTS Enable:	**Disabled**
Options: Disabled Enabled	
Passive Cooling Trip Point:	**95 C**
Options: Disabled 15 C 23 C 31 C 39 C 47 C 55 C 63 C 71 C 79 C 87 C 95 C 103 C 111 C 119 C	
Passive TC1 Value:	**0**
Passive TC2 Value:	**10**
Options: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
More CPU Thermal Control Sub-Menu options are continued on the next page.	

Intel > CPU Control Sub-Menu > CPU Thermal Control Sub-Menu (continued)

Passive TSP Value:	**2**
Options: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
Critical Trip Point:	**POR**
Options: POR 15 C 23 C 31 C 39 C 47 C 55 C 63 C 71 C 79 C 87 C 95 C 103 C 111 C 119 C 127 C	

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Intel > Video (Intel IGD) Control Sub-Menu

IGD - VBIOS Boot Type:	**CRT+LFP**
Options: VBT Default CRT LFP CRT+LFP	
> IGD - LCD Control Sub-Menu	
DVMT 4.0 Mode:	**Auto**
Options: Fixed DVMT Auto	

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Intel > Video (Intel IGD) Control Sub-Menu > **IGD - LCD Control Sub-Menu**	
IGD - LCD Panel Type:	**3: 1024x768 LVDS**
Options: 1: 640x480 LVDS 2: 800x600 LVDS 3: 1024x768 LVDS 4: 1024x600 LVDS 5: 800x480 LVDS 6: Reserved 7: Reserved 8: 1280x768 LVDS 9: Reserved 10: Reserved 11: Reserved 12: Reserved 13: Reserved 14: 1280X800 LVDS 15: 1280X600 LVDS 16: Reserved	
IGD - Panel Scaling:	**Auto**
Options: Auto Force Scaling Off	
GMCH BLC Control:	**GMBus**
Options: Disabled PWM GMBus	
BIA Control	**Disabled**
Options: Automatic Disabled Level 1 Level 2 Level 3 Level 4 Level 5	
Spread Spectrum Clock Chip:	**Off**
Options: Off Hardware Software	

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Intel > **ICH Control Sub-Menu**	
> Integrated Device Control Sub-Menu	
Serial IRQ Quiet Mode:	**Enabled**
Options: Disabled Enabled	
Pop Up Mode Enable:	**Enabled**
Options: Disabled Enabled	
Pop Down Mode Enable:	**Enabled**
Options: Disabled Enabled	
PXE OPROM	**Disabled**
Options: Disabled Enabled	
LPC Decode Range 1 Base Address:	**300h**
LPC Decode Range 1 Size:	**64 Bytes**
Options: 128 Bytes 64 Bytes 32 Bytes 16 Bytes 8 Bytes 4 Bytes	
LPC Decode Range 2 Base Address:	**500h**
LPC Decode Range 2 Size:	**256 Bytes**
Options: 256 Bytes 128 Bytes 64 Bytes 32 Bytes 16 Bytes 8 Bytes 4 Bytes	

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Intel > ICH Control Sub-Menu > **Integrated Device Control Sub-Menu**	
> PCI Express Control Sub-Menu	
> ICH USB Control Sub-Menu	
Azalia - Device 27, Function 0:	**Auto**
Options: Disabled Auto	
SATA - Device 31, Function 2:	**Enhanced**
Options: Compatible Enhanced	
AHCI Configuration:	**Disabled**
Options: Disabled Enabled	
Disable Vacant Ports:	**Disabled**
Options: Disabled Enabled	

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Intel > ICH Control Sub-Menu > Integrated Device Control Sub-Menu > **ICH USB Control Sub-Menu**	
USB Dev #29	**Fun #0,1,2,7**
Options: Disabled Fun #0 Fun #0,1 Fun #0,1,2 Fun #0,1,2,7	
USB Dev #26	**Fun #0,1,7**
Options: Disabled Fun #0,7 Fun #0,1,7	
Overcurrent Detection	**Enabled**
Options: Disabled Enabled	

Intel > I/O Device Configuration

Serial port 1:	**Enabled**			
Speed:	**Low**			
Base I/O address:	**3F8**			
Interrupt:	**IRQ 4**			
Interface:	**RS232**			
Options:				
Port x: Disabled Enabled	**Speed:** Low High	**Base I/O address:** 3F8 2F8 3E8 2E8	**Interrupt:** Disabled IRQ 3 IRQ 4 IRQ 5 IRQ 6 IRQ 7	**Interface:** RS232 RS422 RTS RS422 Auto RS485 RTS RS485 RTS w/Echo RS485 Auto RS485 Auto w/Echo
Serial port 2:	**Enabled**			
Speed:	**Low**			
Base I/O address:	**2F8**			
Interrupt:	**IRQ 3**			
Interface:	**RS232**			
Options:				
Port x: Disabled Enabled	**Speed:** Low High	**Base I/O address:** 3F8 2F8 3E8 2E8	**Interrupt:** Disabled IRQ 3 IRQ 4 IRQ 5 IRQ 6 IRQ 7 IRQ 9 IRQ 10	**Interface:** RS232 RS422 RTS RS422 Auto RS485 RTS RS485 RTS w/Echo RS485 Auto RS485 Auto w/Echo
Serial port 3:	**Enabled**			
Speed:	**Low**			
Base I/O address:	**3E8**			
Interrupt:	**IRQ 5**			
Interface:	**RS232**			
Options:				
Port x: Disabled Enabled	**Speed:** Low High	**Base I/O address:** 3F8 2F8 3E8 2E8	**Interrupt:** Disabled IRQ 3 IRQ 4 IRQ 5 IRQ 6 IRQ 7	**Interface:** RS232 RS422 RTS RS422 Auto RS485 RTS RS485 RTS w/Echo RS485 Auto RS485 Auto w/Echo

Intel > Super I/O Control Sub-Menu (continued)

Serial port 4:	**Enabled**			
Speed:	**Low**			
Base I/O address:	**2E8**			
Interrupt:	**IRQ 6**			
Interface:	**RS232**			
Options:				
Port x: Disabled Enabled	**Speed:** Low High	**Base I/O address:** 3F8 2F8 3E8 2E8	**Interrupt:** Disabled IRQ 3 IRQ 4 IRQ 5 IRQ 6 IRQ 7	**Interface:** RS232 RS422 RTS RS422 Auto RS485 RTS RS485 RTS w/Echo RS485 Auto RS485 Auto w/Echo
Watchdog:	**0**			
Options: {Enter any value between 0-255 for seconds.}				
SIO Firmware:	Rev 0005			

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Intel > **Hardware Monitor**	
CPU Temp =	**55 Celsius**
Remote Temp1 =	**57 Celsius**
VCC 3.3 Voltage =	**3.33 V**
VCC Voltage =	**5.16 V**
VCore Voltage =	**0.95 V**

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Intel > **ACPI Control Sub-Menu**	
Passive Cooling Trip Point:	**95 C**
Options: Disabled 15 C 23 C 31 C 39 C 47 C 55 C 63 C 71 C 79 C 87 C 95 C 103 C 111 C 119 C	
Passive TC1 Value:	**0**
Passive TC2 Value:	**10**
Options: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
Passive TSP Value:	**2**
Options: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15	
More CPU Thermal Control Sub-Menu options are continued on the next page.	

Intel > **ACPI Control Sub-Menu** (continued)	
Critical Trip Point:	**POR**
Options: POR 15 C 23 C 31 C 39 C 47 C 55 C 63 C 71 C 79 C 87 C 95 C 103 C 111 C 119 C 127 C	
FACP - RTC S4 Flag Value:	**Enabled**
Options: Disabled Enabled	
FACP - PM Timer Flag Value:	**Enabled**
Options: Disabled Enabled	
HPET Support:	**Disabled**
Options: Disabled Enabled	

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Intel > **PCI/PNP ISA IRQ Resource Exclusion**	
IRQ 3:	**Available**
IRQ 4:	**Available**
IRQ 5:	**Available**
IRQ 6:	**Available**
IRQ 7:	**Available**
IRQ 9:	**Available**
IRQ 10:	**Reserved**
IRQ 11:	**Available**

Options:
Available
Reserved

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Security	
Supervisor Password Is:	Clear
User Password Is:	Clear
Set Supervisor Password:	**Enter**
Set User Password:	Enter
Password on boot:	Disabled
Options: Disabled Enabled	

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Boot

Boot priority order:
1:
2:
3:
4:
5:
6:
7:
8:

Options:

Excluded from boot order:

Options:
All IDE HDD
All USB Floppy
All USB Key
All USB HDD
All USB CDROM
All USB ZIP
All USB LS120
All PCI BEV
Legacy Network Card

Note: Defaults are indicated in **bold** for BIOS properties. Default options that cannot be user-modified are indicated with grey text.

Exit
Exit Saving Changes
Exit Saving Changes to CMOS and EEPROM
Exit Discarding Changes
Load Setup Defaults
Discard Changes
Save Changes

BIOS SETTINGS STORAGE OPTIONS

CMOS Storage Locations

The PPM-C393-S's BIOS configuration is stored in three (3) locations:

(1) CMOS RAM (nonvolatile if battery backed)

(2) EEPROM (nonvolatile storage for user defaults)

(3) FLASH PROM (nonvolatile storage for factory defaults)

Saving the CMOS Configuration

The Real-Time Clock and the CMOS RAM settings can be maintained by an optional battery when the board is powered off. A battery is always required to maintain time and date functions when the board is powered off.

The EEPROM feature allows the user to save CMOS configuration settings to nonvolatile storage that does not require a battery. This feature can be enabled/disabled using **JP19**. When enabled, the user's CMOS settings can be saved to EEPROM from the BIOS utility's Main Menu. If the board is powered off with no battery, the user's CMOS settings will be restored from EEPROM but time and date information will be lost and returned to default values.

JP19 - EEPROM Enable

JP19



EEPROM Enable	JP19
CMOS EEPROM Enable (default)	1-2
CMOS EEPROM Disable	Open

At system boot, the BIOS first performs a checksum validation on the contents of the CMOS RAM. Invalid checksums usually occur due to a low or disabled battery. If the checksum is valid, the system boots using values stored in CMOS RAM. If a checksum error occurs, the BIOS attempts to load CMOS values from the EEPROM.

After a checksum validation, the BIOS configuration is loaded from the EEPROM and the boot process continues. If the EEPROM is disabled or the contents of the EEPROM fail the checksum validation, the system loads the factory default settings from the FLASH PROM and continues the boot sequence.

For applications where the battery is present, CMOS settings should be saved to both the CMOS RAM and to the EEPROM so the system can continue to function without user interaction.

Resetting CMOS to EEPROM defaults

If a battery is present, you can reset the CMOS RAM to the values stored in EEPROM by turning the system off and removing the external battery. Replace the battery and reboot. When power is applied to the board, the system will boot with the CMOS settings that were stored in EEPROM.

Resetting CMOS to EEPROM to Factory Defaults

The PPM-C393-S can normally be returned to the factory default BIOS configuration by selecting option Load Setup Defaults on the BIOS Exit menu.

If you have saved EEPROM values that prevent you from accessing BIOS menus, the board can be reset to factory defaults as follows:

1) Turn the system off.
2) Remove the jumpers from **JP19**.
3) Turn the system on and enter the BIOS Main Menu using the **F2** key.
4) Select Load Defaults from the Exit menu.
5) Install the jumpers to **JP19**.
6) Save the restored defaults to CMOS and EEPROM.

Updating the BIOS FLASH PROM

The most recent PPM-C393-S BIOS is available on the WinSystems website. However, it is highly recommended that an Applications Engineer be consulted prior to any BIOS FLASH PROM update. If the BIOS PROM is updated, the steps described above must be followed to reset the CMOS and EEPROM to the newly loaded factory defaults and to clear the data from the previous BIOS version.

CABLES

Part Number	Description
Additional Cables	
ADP-IO-USB-001	Dual 8-pin, 2-mm. 4 USB ports (2 each)
CBL-BKLT-000-14	Backlight 1x11, 1-mm., Unterminated Pico-Clasp
CBL-ENET1-302-12	ENET 2X5 1.27-mm. to RJ-45 Female Jack,12-in.
CBL-ENET1-303-12	ENET 2X5 1.27-mm. to RJ-45 Male Plug,12-in.
CBL-LED3-000-14	LED, Ethernet 1x4, 1-mm. Unterminated, 14-in.
CBL-LED3-001-12	LED, Ethernet 1x4, 1-mm. to 1x4 1-mm.
CBL-PWR-114-18	Dual 4-pin Molex to PXM/PPM single board computers
CBL-PWR-602-18	Auxiliary Power and Reset
CBL-PWR-803-18	C388 to SDK Power Cable
CBL-PWR-903-18	ATX to SDK Power Cable
CBL-SATA-701-20	SATA, Latching, Mirror, Straight 20-in. long
CBL-SER4-000-14	Serial Cable 2x20, 1.25-mm. to Unterminated, 14-in.
CBL-SER4-001-12	Serial Cable 2x20, 1.25-mm. to 2x20 1.25-mm., 12-in.
CBL-SER4-002-12	Serial Cable 2x20, 1.25-mm. to 4EA DB9, 12-in.
CBL-SPL-001-14	LVDS Unterminated and Audio,PICO
CBL-USB4-000-14	4x USB ports - Unterminated (2 each)
CBL-USB4-001-12	4x USB ports with 2x 15 pins with clasp (2 each)
CBL-USB4-002-12	4x USB ports with two, 8-pin, 2-mm. clasps
CBL-VGA-002-12	Video 1x14 1-mm. to DB15, 12-in.
CBL-SET-393-1	Cable set for PPM-C393-S includes:
ADP-IO-USB-002	Dual 8-pin, 2-mm. to 4 USB ports
BAT-LTC-E-36-16-2	External 3.6V, 1650 mAH battery with plug-in connector
CBL-ENET1-302-12	ENET 2X5 1.27-mm. to RJ-45 Female Jack,12-in.
CBL-PWR-700-18	Power ATX, 18-in. Unterminated
CBL-SER4-002-12	Serial Cable 2x20, 1.25-mm. to 4EA DB9, 12-in.
CBL-USB4-002-12	4x USB ports with two, 8-pin, 2-mm. clasps
CBL-VGA-002-12	Video 1x14 1-mm. to DB15, 12-in.
External Batteries	
BAT-LTC-E-36-27-2	External 3.6V, 2750 mAH battery with plug-in connector
BAT-LTC-E-36-16-2	External 3.6V, 1650 mAH battery with plug-in connector

SOFTWARE DRIVERS

See the WinSystems website.

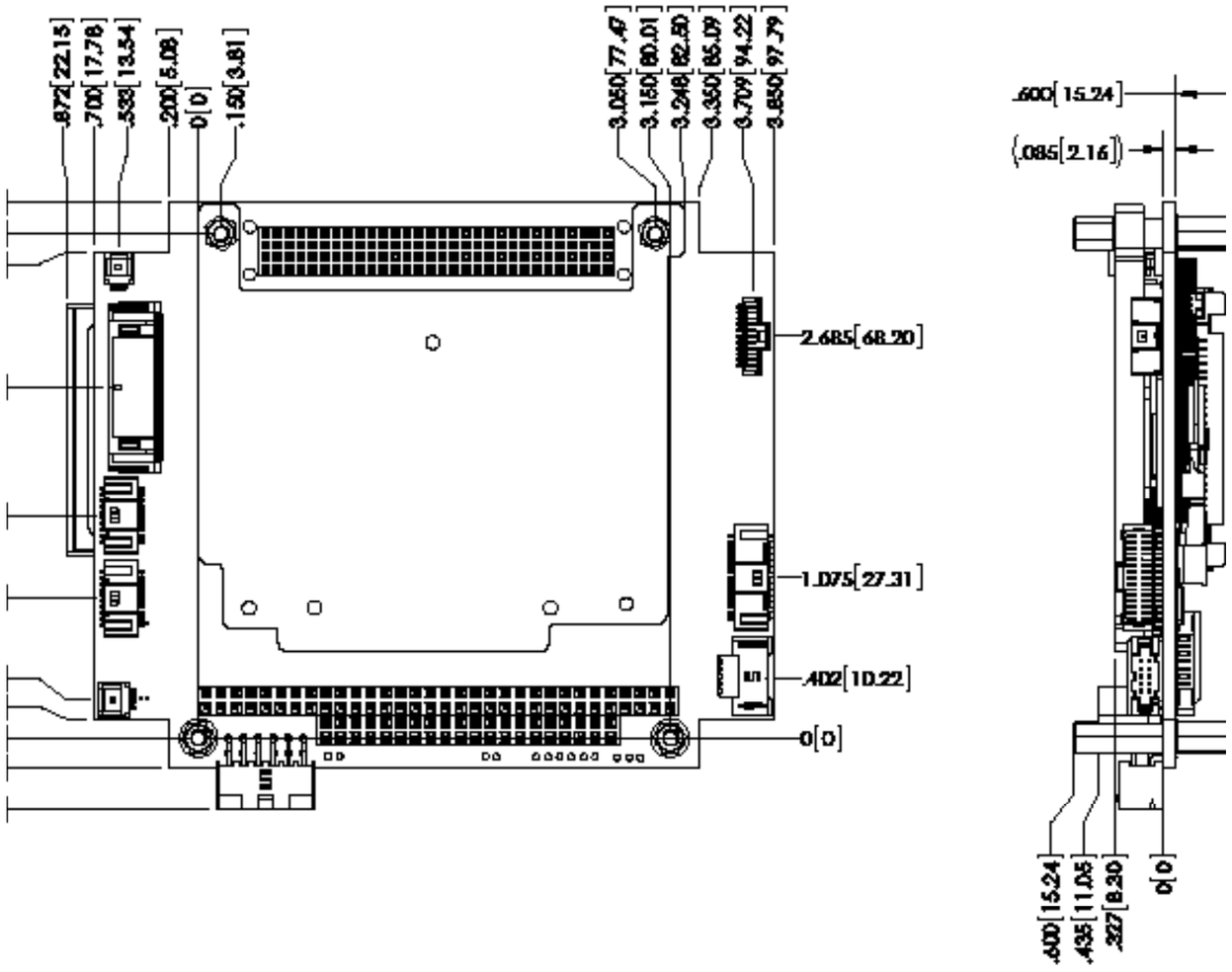
SPECIFICATIONS

Electrical		
VCC	±5V ±5% required, 2.5A typical	
	MODELS **PPM-C393-S1-0-0(-ST)** **PPM-C393-S1-0-1(-ST)**	
Power	Typical	2.5A
	Maximum	<3A
	Standby (S3)	<300 mA
MTBF	282,254 hours Bellcore TR-332, Issue 6 at 55 degress C	
Mechanical		
Dimensions	4.6 x 3.8 inches (116 x 96 mm)	
Weight	7.42 oz (211g), without optional heatsink	
Environmental		
Operating Temperature	-40°C to 85°C*	
Random Vibration	MIL-STD-202G, Method 214A, Condition D .1g/Hz (11.95g rms), 20 minutes per axis, 3 axis	
Mechanical Shock	MIL-STD-202G, Method 213B, Condition A 50g half-sine, 11 ms duration per axis, 3 axis	

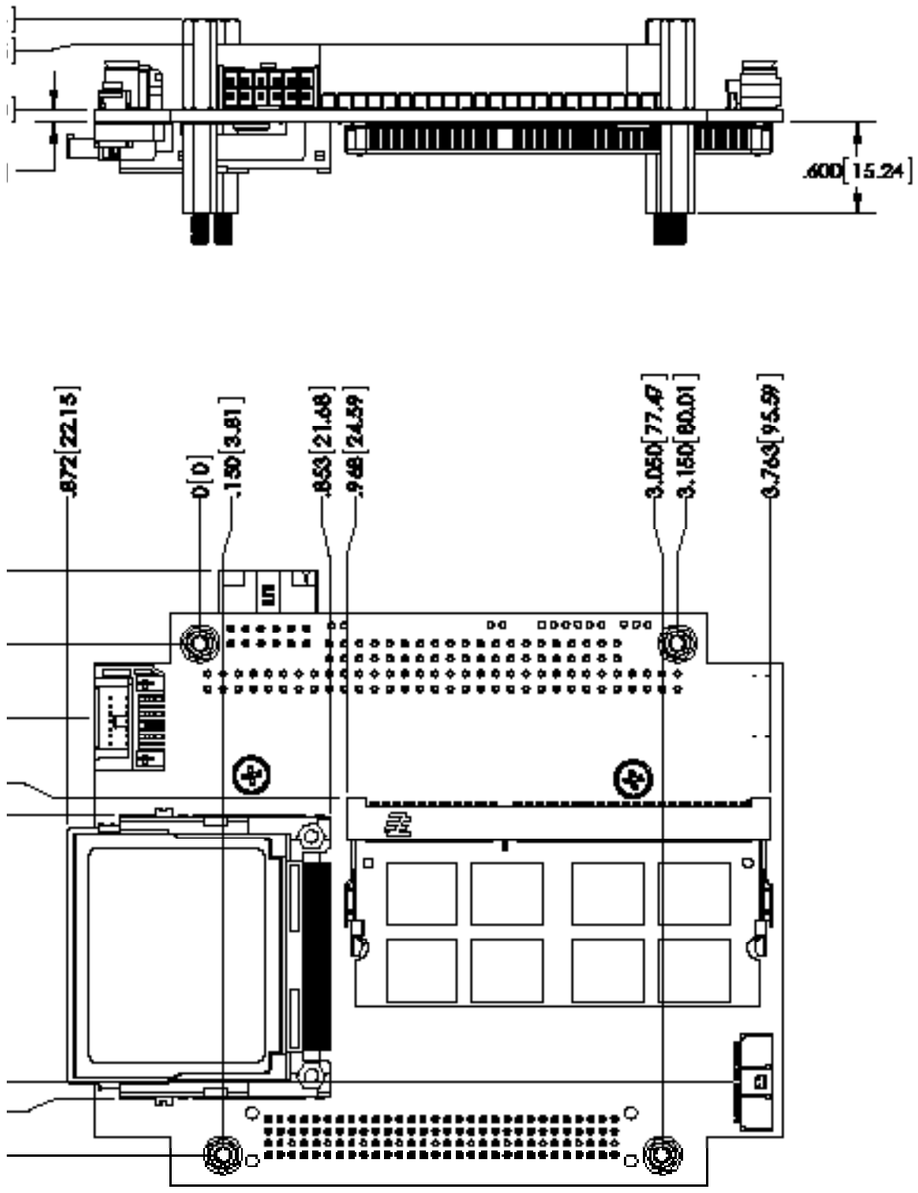
* - Thermal profiles can also vary greatly depending on the operating system and applications being used. WinSystems uses the Intel TAT (Thermal Analysis Tool) for testing with Intel processors. This program heavily loads the system and creates a worst case scenario for the single board computer. Specific real world applications will rarely tax the system as heavily and may allow for extending the fanless operational range. WinSystems conducts temperature verification with PassMark Burn-InTest to provide a more realistic real world example. The PassMark Burn-InTest is performed with all internal tests operating at 50% duty cycle.

Thermal Qualification Testing						
SBC	**Test Application**	**Air Flow (linear ft/min)**	**Low Temp (Celsius)**	**High Temp (Celsius)**	**CPU Freq. (GHz)**	**CPU Throttling**
PPM-C393-S1-0-1(-ST)	PassMark BurnInTest	160	-40	85	1.66	No
PPM-C393-S1-0-1(-ST)	Intel TAT	160	-40	80	1.66	No
PPM-C393-S1-0-1(-ST)	PassMark BurnInTest	0	-40	63	1.66	No
PPM-C393-S1-0-1(-ST)	Intel TAT	0	-40	60	1.66	No
PPM-C393-S1-0-0(-ST)	PassMark BurnInTest	160	-40	71	1.66	No
PPM-C393-S1-0-0(-ST)	Intel TAT	160	-40	66	1.66	No
PPM-C393-S1-0-0(-ST)	PassMark BurnInTest	0	-40	51	1.66	No
PPM-C393-S1-0-0(-ST)	Intel TAT	0	-40	46	1.66	No

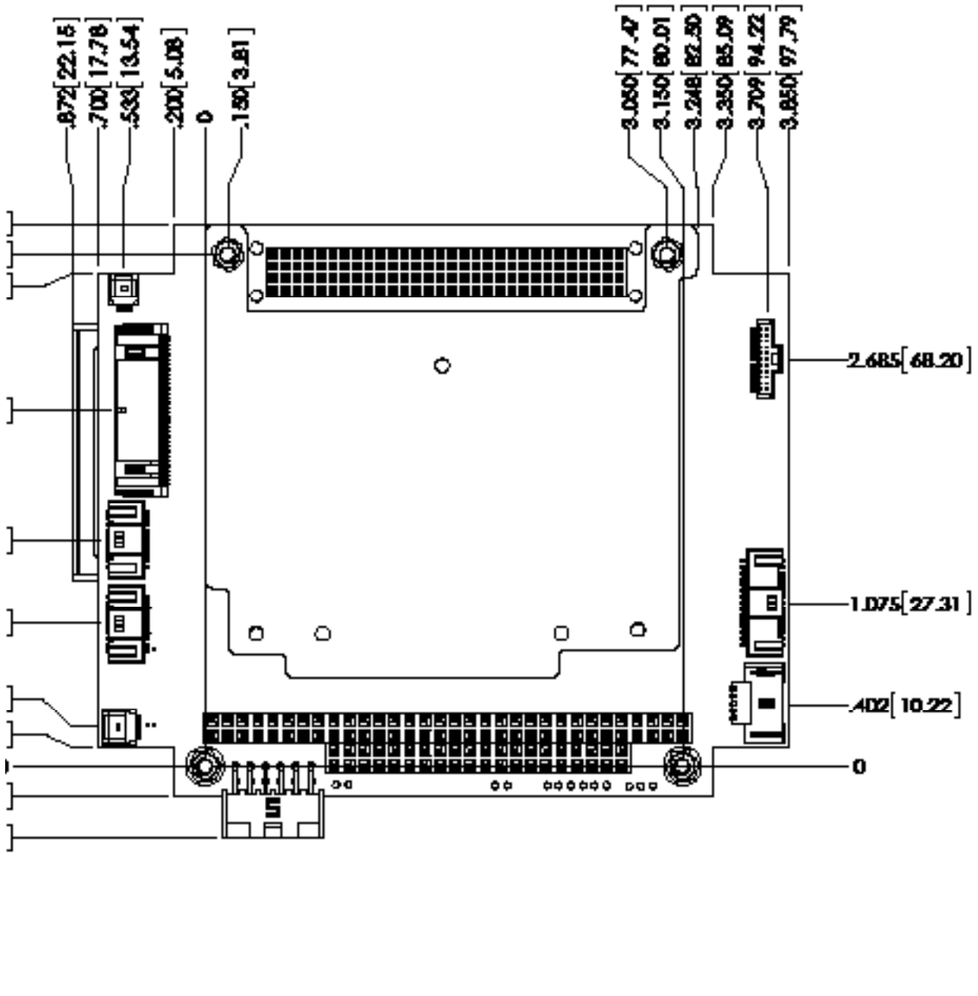
MECHANICAL DRAWING



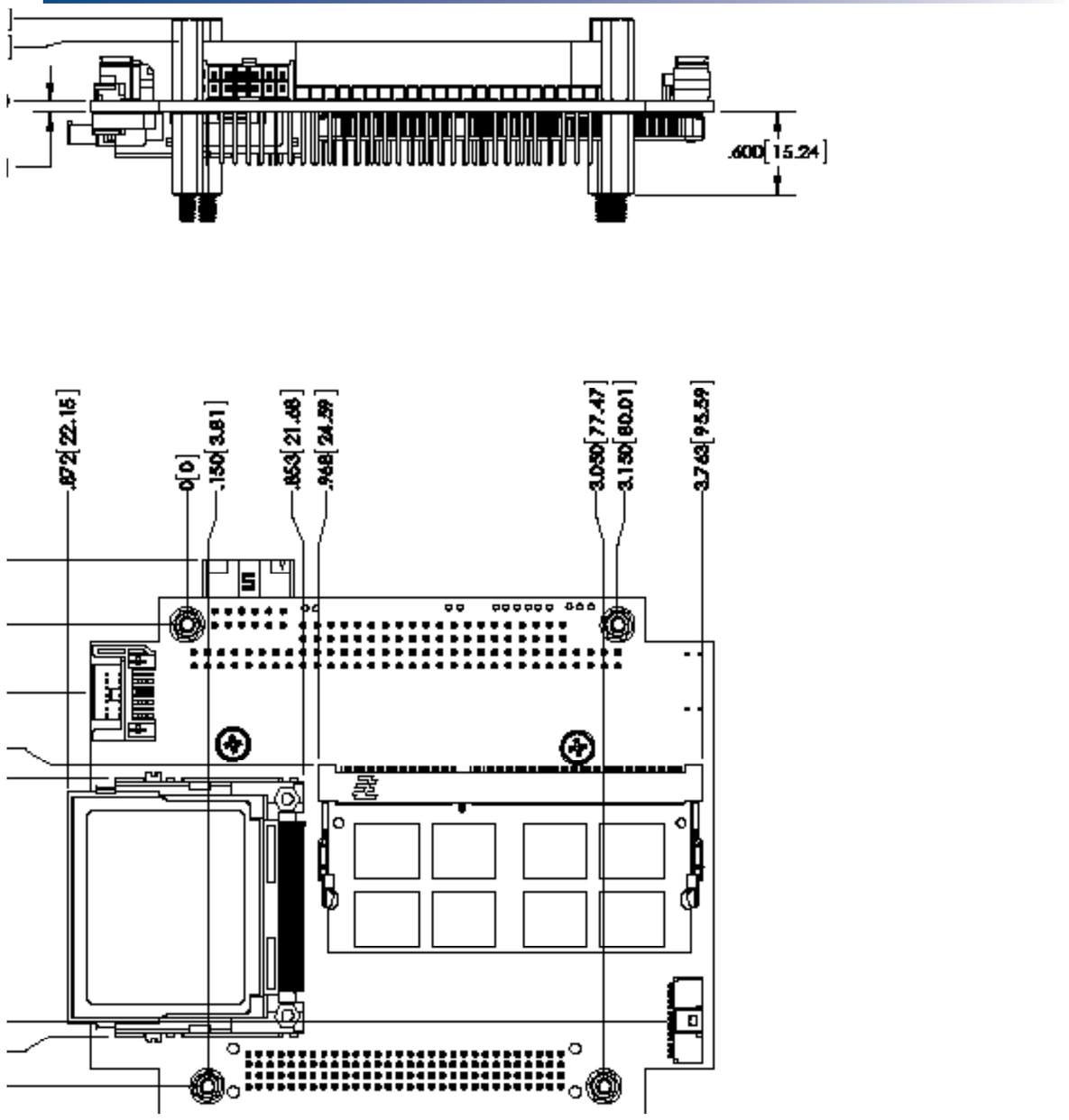
PPM-C393-S1-0-0 Mechanical Drawing



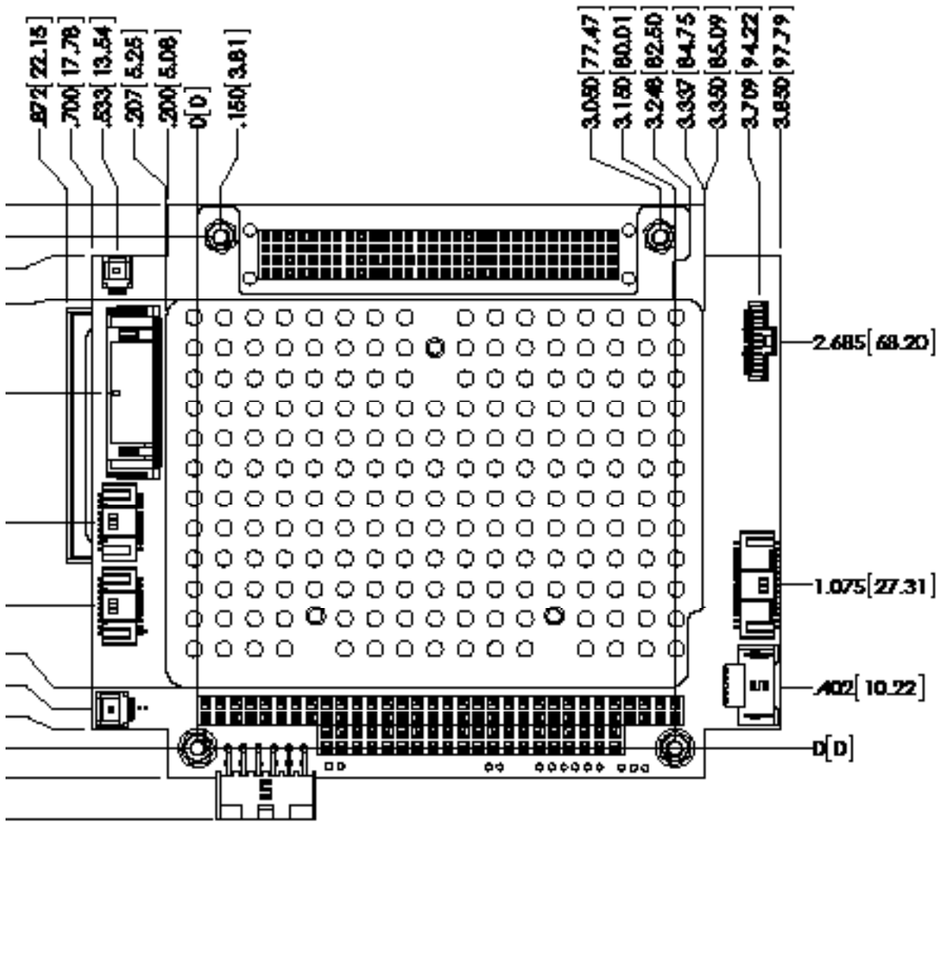
PPM-C393-S1-0-0 Mechanical Drawing

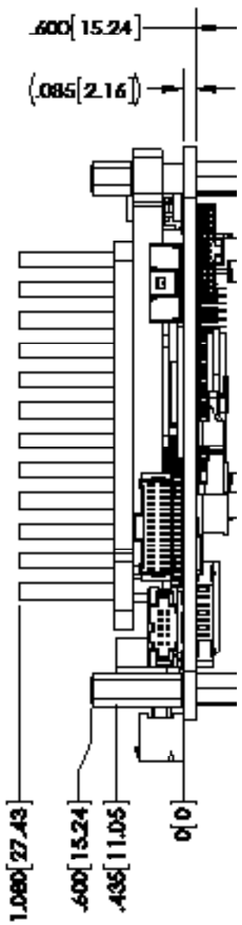


PPM-C393-S1-0-0-ST Mechanical Drawing

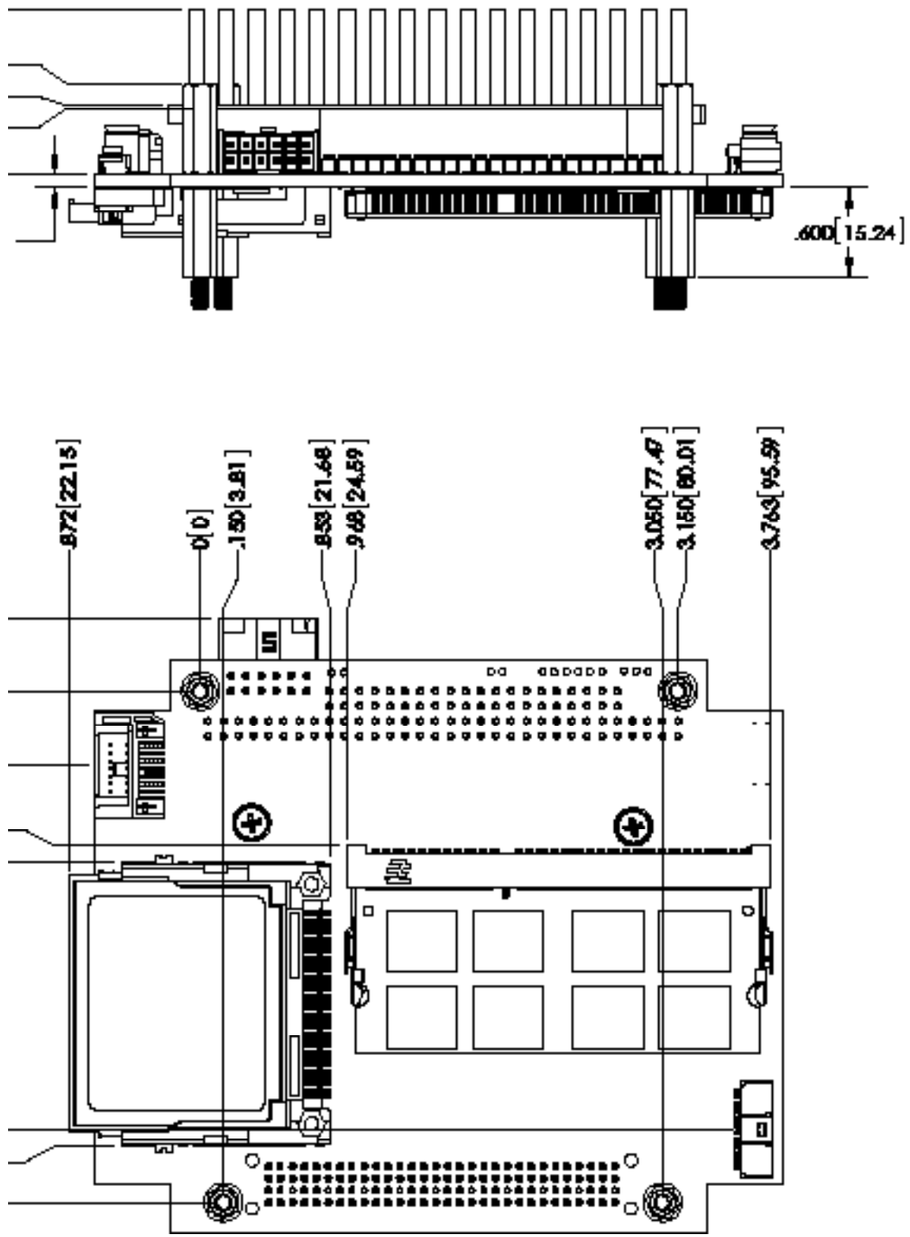


PPM-C393-S1-0-0-ST Mechanical Drawing

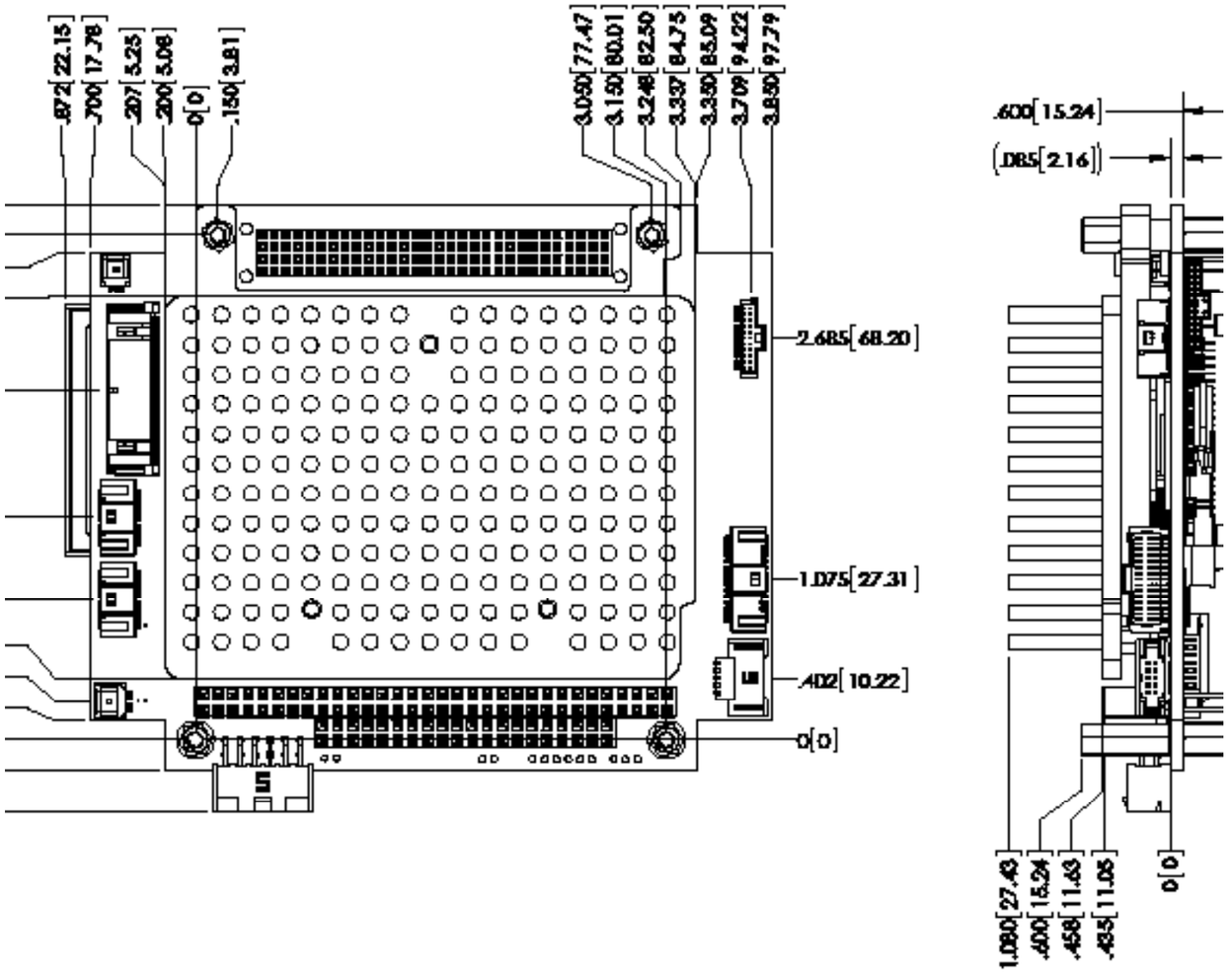




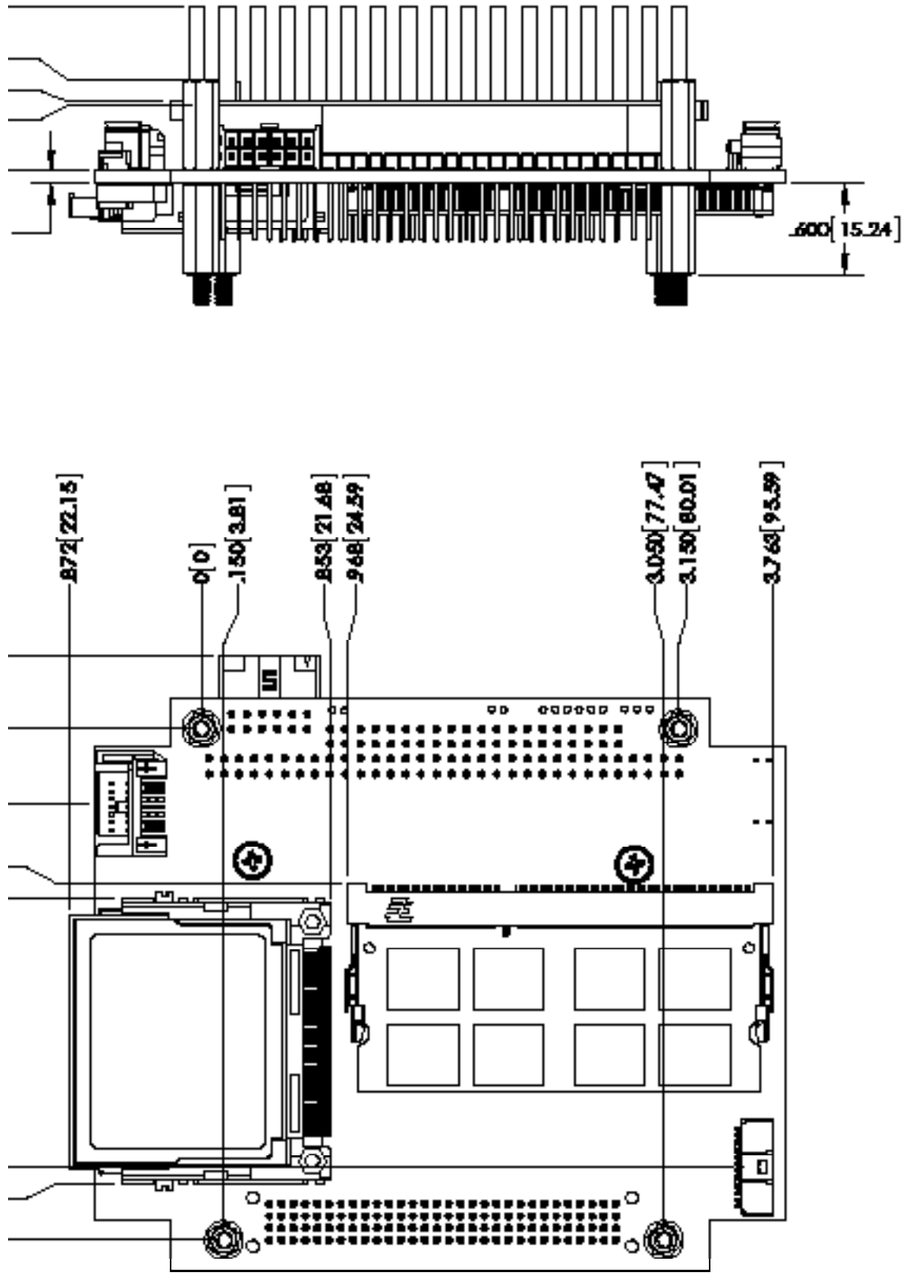
PPM-C393-S1-0-1 Mechanical Drawing



PPM-C393-S1-0-1 Mechanical Drawing



PPM-C393-S1-0-1-ST Mechanical Drawing



PPM-C393-S1-0-1-ST Mechanical Drawing

APPENDIX - A

BEST PRACTICES

POWER SUPPLY

The power supply and how it is connected to the Single Board Computer (SBC) is very important.

Avoid Electrostatic Discharge (ESD)
Only handle the SBC and other bare electronics when electrostatic discharge (ESD) protection is in place. Having a wrist strap and a fully grounded workstation is the minimum ESD protection required before the ESD seal on the product bag is broken.

Power Supply Budget
Evaluate your power supply budget. It is usually good practice to budget 2X the typical power requirement for all of your devices.

Zero-Load Power Supply
Use a zero-load power supply whenever possible. A zero-load power supply does not require a minimum power load to regulate. If a zero-load power supply is not appropriate for your application, then verify that the single board computer's typical load is not lower than the power supply's minimum load. If the single board computer does not draw enough power to meet the power supply's minimum load, then the power supply will not regulate properly and can cause damage to the SBC.

Use Proper Power Connections (Voltage)
When verifying the voltage, you should always measure it at the power connector on the SBC. Measuring at the power supply does not account for voltage drop through the wire and connectors.

The single board computer requires +5V (±5%) to operate. Verify the power connections. Incorrect voltages can cause catastrophic damage.

Populate all of the +5V and ground connections. Most single board computers will have multiple power and ground pins, and all of them should be populated. The more copper connecting the power supply to the single board computer the better.

Adjusting Voltage
If you have a power supply that will allow you to adjust the voltage, it is a good idea to set the voltage at the power connector of the SBC to 5.1V. The SBC can tolerate up to 5.25V, so setting your power supply to provide 5.1V is safe and allows for a small amount of voltage drop that will occur over time as the power supply ages and the connector contacts oxidize.

Power Harness
Minimize the length of the power harness. This will reduce the amount of voltage drop between the power supply and the single board computer.

Gauge Wire
Use the largest gauge wire that you can. Most connector manufacturers have a maximum gauge wire they recommend for their pins. Try going one size larger; it usually works and the extra copper will help your system perform properly over time.



Contact Points
WinSystems' boards mostly use connectors with gold finish contacts. Gold finish contacts are used exclusively on high speed connections. Power and lower speed peripheral connectors may use a tin finish as an alternative contact surface. It is critical that the contact material in the mating connectors is matched properly (gold to gold and tin to tin). Contact areas made with dissimilar metals can cause oxidation/corrosion resulting in unreliable connections.

Pin Contacts
Often the pin contacts used in cabling are not given enough attention. The ideal choice for a pin contact would include a design similar to Molex's or Trifurcons' design, which provides three distinct points to maximize the contact area and improve connection integrity in high shock and vibration applications.

POWER DOWN

Make sure the system is **completely off/powered down** before connecting anything.



Power Supply OFF
The power supply should always be off before it is connected to the single board computer.

I/O Connections OFF
I/O Connections should also be off before connecting them to the single board computer or any I/O cards. Connecting hot signals can cause damage whether the single board computer is powered or not.

MOUNTING AND PROTECTING THE SINGLE BOARD COMPUTER

Do Not Bend or Flex the SBC
Never bend or flex the single board computer. Bending or flexing can cause irreparable damage. Single board computers are especially sensitive to flexing or bending around Ball-Grid-Array (BGA) devices. BGA devices are extremely rigid by design and flexing or bending the single board computer can cause the BGA to tear away from the printed circuit board.

Mounting Holes
The mounting holes are plated on the top, bottom and through the barrel of the hole and are connected to the single board computer's ground plane. Traces are often routed in the inner layers right below, above or around the mounting holes.

Never use a drill or any other tool in an attempt to make the holes larger.

Never use screws with oversized heads. The head could come in contact with nearby components causing a short or physical damage.

Never use self-tapping screws; they will compromise the walls of the mounting hole.

Never use oversized screws that cut into the walls of the mounting holes.

Always use all of the mounting holes. By using all of the mounting holes you will provide the support the single board computer needs to prevent bending or flexing.



Plug or Unplug Connectors Only on Fully Mounted Boards
Never plug or unplug connectors on a board that is not fully mounted. Many of the connectors fit rather tightly and the force needed to plug or unplug them could cause the single board computer to be flexed.

Avoid cutting of the SBC
Never use star washers or any fastening hardware that will cut into the single board computer.

Avoid Overtightening of Mounting Hardware
Causing the area around the mounting holes to compress could damage interlayer traces around the mouting holes.

Use Appropriate Tools
Always use tools that are appropriate for working with small hardware. Large tools can damage components around the mounting holes.

Placing the SBC on Mounting Standoffs
Be careful when placing the single board computer on the mounting standoffs. Sliding the board around until the standoffs are visible from the top can cause component damage on the bottom of the single board computer.

Avoid Conductive Surfaces
Never allow the single board computer to be placed on a conductive surface. Almost all single board computers use a battery to backup the clock-calendar and CMOS memory. A conductive surface such as a metal bench can short the battery causing premature failure.

ADDING PC/104 BOARDS TO YOUR STACK

Be careful when adding PC/104 boards to your stack.

Never allow the power to be turned on when a PC/104 board has been improperly plugged onto the stack. It is possible to misalign the PC/104 card and leave a row of pins on the end or down the long side hanging out of the connector. If power is applied with these pins misaligned, it will cause the I/O board to be damaged beyond repair.

CONFORMAL COATING

Applying conformal coating to a WinSystems product will not in itself void the product warranty, if it is properly removed prior to return. Coating may change thermal characteristics and impedes our ability to test, diagnose, and repair products. Any coated product sent to WinSystems for repair will be returned at customer expense and no service will be performed.

OPERATIONS / PRODUCT MANUALS

Every single board computer has an Operations manual or Product manual.



Manual Updates
Operations/Product manuals are updated often. Periodicially check the WinSystems website (http://www.winsystems.com) for revisions.

Check Pinouts
Always check the pinout and connector locations in the manual before plugging in a cable. Many single board computers will have identical headers for different functions and plugging a cable into the wrong header can have disastrous results.

Contact an Applications Engineer with questions
If a diagram or chart in a manual does not seem to match your board, or if you have additional questions, contact your Applications Engineer.

APPENDIX - B

POST CODES

If the system hangs before the BIOS can process the error, the value displayed at the I/O port I/O address 80h is the last test that performed. In this case, the screen does not display an error code.

The following is a list of the checkpoint codes written at the start of each test and their corresponding audio beep codes issued for terminal errors.

Code	Beeps	Location	Description
01h			IPMI initialization
02h			Verify real mode
03h			Disable non-maskable interrupt (NMI)
04h			Get CPU type
06h			Hardware initialization
07h			Chipset BIOS deshadow
08h			Chipset initialization
09h			Set IN POST flag
0Ah			CPU initialization
0Bh			CPU cache on
0Ch			Cache initialization
0Eh			I/O initialization
0Fh			FDISK initialization
10h			Power management initialization
11h			Register initialization
12h			Restore CR0
13h			PCI bus master reset
14h			8742 initialization (keyboard/embedded controller)
16h	1-2-2-3	Checksum BIOS ROM	
17h			Pre-size RAM (initialize cache before memory auto size)
18h			Timer initialization (8254 CTC)
1Ah			DMA initialization (8237 DMAC)
1Ch			Reset PIC (8259 PIC)
20h	1-3-1-1	Test DRAM refresh	
22h	1-3-1-3		Test 8742 Keyboard Controller
24h			Set huge ES (segment register to 4 GB)
26h			Enable A20
28h			Auto size DRAM
29h			POST memory manager (PMM) initialization
2Ah			Zero base (clear 512 KB base RAM)
2Bh			Enhanced CMOS initialization
2Ch	1-3-4-1	Address test (RAM failure on address line **xxxx***)	
2Eh	1-3-4-3	Base RAM Low (RAM failure on data bits **xxxx*** of low byte)	
2Fh			Pre-sys shadow (Enable cache before system BIOS shadow)
30h			Base RAM High (RAM failure on data bits **xxxx*** of high byte)
32h			Compute speed (test CPU bus-clock frequency)
33h			Post Dispatch Manager (PDM) initialization
34h			CMOS test
35h			Register re-initialization
36h			Check shutdown (perform warm restart)

Code	Beeps	Location	Description
37h			Chipset re-initialization
38h			System shadow (shadow BIOS ROM)
39h			Cache re-initialization
3Ah			Cache auto-size
3Bh			Debug server initialization
3Ch			Advanced chipset initialization
3Dh			Advanced register configuration
3Eh			Read hardware
3Fh			RomPilot memory initialization
40h			Speed
41h			RomPilot initialization
42h			Interrupt vectors initialization
44h			Set BIOS interrupt
45h			Device initialization
46h	2-1-2-3	Check ROM copyright	
48h			Config (Check video configuration against CMOS)
49h			PCI initialization
4Ah			Video initialization (Initialize all video adapters)
4Bh			QuietBoot start
4Ch			Video shadow (Shadow video BIOS)
4Eh			Copyright display
4Fh			MultiBoot-XP initialization
50h			CPU type display
51h			EISA initialization
52h			Keyboard test
54h			Set key click (if enabled)
55h			USB initialization
56h			Enabled keyboard
57h			1394 Firewire initialization
58h	2-2-3-1	HOT (Test for unexpected interrupts)	
59h			POST display service (PDS) initialization
5Ah			Display prompt **Press F2 to enter SETUP**
5Bh			CPU cache off
5Ch			Test RAM between 512 KB to 640 KB
60h			Test extended memory
62h			Test extended memory address
64h			Jumper to UserPatch1
66h			Configure advanced cache registers
67h			Initialize Multi Processor APIC
68h			Cache configuration (enable internal and external caches)
69h			PM setup System Management Mode (SMM)
6Ah			Display external L2 cache size
6Bh			Load custom defaults (optional)
6Ch			Display shadow-area messages
70h			Display error messages
72h			Check for configuration errors

Code	Beeps	Location	Description
74h			RTC test
76h			Keyboard test
7Ah			Key lock
7Ch			Hardware interrupts
7Dh			Intelligent System Monitoring (ISM) initialization
7Eh			Coprocessor initialization (if present)
80h			I/O initialization (before)
81h			Late device initialization
82h			RS-232 initialization
83h			FDISK config IDE
84h			LPT initialization
85h			PCI PCC initialization (PC-compatible PnP ISA devices)
86h			I/O initialization (after)
87h			Motherboard Configurable Devices (MCD) initialization
88h			BIOS data-area initialization (BDA)
89h			Enable Non-Maskable Interrupt (NMI)
8Ah			Extended BIOS Extended Data Area (EBDA)
8Bh			Mouse initialization
8Ch			Floppy initialization
8Fh			FDISK fast pre-initialization
90h			FDISK initialization
91h			FDISK fast initialization
92h			Jump to UserPatch2
93h			Build MPTABLE for multi-processor boards
95h			CDROM initialization
96h			Clear huge ES
97h			MultiProcessor table fix-up
98h	1-2		Option ROM scan
99h			FDISK check SMART
9Ah			Miscellaneous shadow (shadow option ROMs)
9Bh			PM CPU speed
9Ch			Power Management (PM) setup
9Dh			Intialize security engine
9Eh			IRQS
9Fh			FDISK fast initialization #2
A0h			Time of day - set
A2h			Keylock test
A4h			Key rate initialization (typematic rate)
A8h			Erase F2 prompt
AAh			Scan for F2 keystroke
ACh			Setup check
AEh			Clear bootflag
B0h			Error check
B1h			RomPilot unload
B2h			POST done - prepare to boot operating system
B4h	1		One beep (before boot)

Code	Beeps	Location	Description
B5h			Terminate QuietBoot
B6h			Check password
B7h			ACPI initialization
B8h			System initialization
B9h			Prepare to boot
BAh			DMI - SMBIOS initialization
BBh			BCV (Boot Connection Vectors) initialization
BCh			Parity - clear parity checkers
BDh			MultiBoot-XP boot menu display
BEh			Clear screen
BFh			Check reminders (virus and backup)
C0h			INT19 - boot
C1h			POST Error Manager (PEM) - Initialization
C2h			POST Error Manager (PEM) - Logging initialization
C3h			POST Error Manager (PEM) - Initialize error display function
C4h			POST Error Manager (PEM) - Initialize system error handler
C5h			PNP'ed dual CMOS
C6h			Initialize note dock
C7h			Initialize note dock late
C8h			Force check
C9h			Extended checksum

Embedded Extensions	
Code	**Description**
CAh	TP_SERIAL_KEY - Redirect INT15h to serial keyboard
CBh	TP_ROMRAM - Redirect INT13h to Memory Technologies Devices Such as ROM, RAM, PCMCIA, and serial disk
CCh	TP_SERIAL_VID - Redirect INT10h to enable remote serial video
CDh	TP_PCMATA - Re-map I/O and memory for PCMCIA
CEh	TP_PEN_INIT - Initialize digitizer and display message
CFh	TP_XBDA_FAIL - Extended BIOS Data Area (XBDA) failure

More Post Codes	
Code	**Description**
D1h	TP_BIOS_STACK_INIT
D3h	TP_SETUP_WAD
D4h	TP_CPU_GET_STRING
D5h	TP_SWITCH_POST_TABLES
D6h	TP_PCCARD_INIT
D7h	TP_FIRSTWARE_CHECK
D8h	TP_ASF_INIT
D9H	TP_IPMI_INIT_LATE
DAh	TP_PCIE_INIT
DBh	TP_SROM_TEST
DCh	TP_UPD_ERROR
DDh	TP_REMOTE_FLASH
DEh	TP_UNDI_INIT
DFh	TP_UNDI_SHUTDOWN
E0h	TP_EFI_NV_INIT
E1h	TP_PERIODIC_TIMER

Boot Block	
Code	**Description**
80h	TP_BB_CS_INIT - Chipset Init
81h	TP_BB_BRIDGE_INIT - Bridge Init
82h	TP_BB_CPU_UNIT - CPU Init
83h	TP_BB_TIMER_INIT - System timer Init
84h	TP_BB_IO_INIT - System I/O Init
85h	TP_BB_FORCE - Check force recovery boot
86h	TP_BB_CHKSUM - Check BIOS Checksum
87H	TP_BB_GOTOBIOS - Go to BIOS
88h	TP_BB_MP_INIT - Init Multi Processor
89h	TP_BB_SET_HUGE - Set Huge Seg
8Ah	TP_BB_OEM_INIT - OEM Special Init
8Bh	TP_BB_HW_INIT - Init PIC and DMA
8Ch	TP_BB_MEM_TYPE - Init Memory Type
8Dh	TP_BB_MEM_SIZE - Init Memory Size
8Eh	TP_BB_SHADOW - Shadow Boot Block
8Fh	TP_BB_SMM_INIT - Init SMM
90h	TP_BB_RAMTEST - System Memory Test
91h	TP_BB_VECS_INIT - Init Interrupt Vectors
92h	TP_BB_RTC_INIT - Init RTC
93h	TP_BB_VIDEO_INIT - Init Video
94h	TP_BB_OUT_INIT - Init Beeper
95h	TP_BB_BOOT_INIT - Init Boot
96h	TP_BB_CLEAR_HUGE - Clear Huge Seg
97h	TP_BB_BOOT_OS - Boot to OS
98h	TP_BB_USB_INIT - Intialize the USB Controller
99h	TP_BB_SECUR_INIT - Init Security

***** If the BIOS detects error 2C, 2E, or 30 (base 512 KB RAM error), it displays an additional word-bitmap (**xxxx**) indicating the address line or bits that failed.

For example, “2C 0002” means address line 1 (bit one set) has failed. “2E 1020” means data bits 12 and 5 (bits 12 and 5 set) have failed in the lower 16 bits. Note that error 30 cannot occur on 386SX systems because they have a 16 rather than 32-bit bus. The BIOS also sends the bitmap to the port-80h LED display. It first displays the checkpoint code, followed by a delay, the high-order byte, another delay, and then the low-order byte of the error. It repeats this sequence continuously.

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(http://www.winsystems.com/warranty.cfm)

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