PPC-E10

ARM9 Panel PC

User Manual

REV. 1.0

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1 PPC-E10 Product Summary

1.1 Features

- **ARM9 400Mhz Fanless Low Power Processor**
- **Inexpensive Open-Frame Design**
- **10/100BaseT Ethernet with on-board PHY**
- **3 RS232 & 1 RS232/422/485 Port**
- **1 USB 2.0 (High Speed) Host port**
- **1 USB 2.0 (High Speed) OTG port**
- **Up to 256MB of SDRAM**
- **Up to 1GB of NAND Flash**
- **Up to 4MB of Serial Flash**
- **Battery backed Real Time Clock**
- **2 Micro SD Flash Card Sockets**
- **1 I2S Audio port with Line-In/Line-Out**
- **Timer/Counters and Pulse Width Modulation (PWM) ports**
- **4 Channel 10-bit Analog-to-Digital converter**
- **Operating Voltage of 12 to 26 Vdc.**
- **Graphic LCD Interface with optional 2D acceleration & Hardware CODECs**
- **WVGA (1024x600) Resolution with LED Backlight**
- **Analog Resistive Touchscreen and Software Controlled Backlight On/Off & Brightness**
- **JTAG for debug, including real-time trace**
- **FREE Eclipse IDE with GCC & GDB development tools for Linux**
- **WinCE 6.0 BSP and SDK available**
- **Android Available**

1.2 Standard PPC Specifications

- **CPU:** Fanless ARM9 400Mhz Processor
- **Flash:** Up to 512MB of NAND Flash, and 4MB of serial data flash.
- **RAM:** Up to 128MB of external DDR2 / SDRAM.
- **Video:** 1024 x 600 WVGA @ 256K Colors
- **Touchscreen:** 10-Bit, 4 wire analog resistive Touchscreen
- **Flash Disk:** 2 Micro SD flash card sockets.
- **System Reset:** Supervisor with external Reset Button provision.
- **RTC:** Battery backed Real Time Clock/Calendar.
- **Timers:** 6, general purpose 16-bit Timers, & Counter/PWM
- **Watchdog Timer:** Reset-on-Timeout
- **Analog I/O:** 4 channel, 10-bit Analog-to-Digital converter (ADC)
- **GPIO:** 16 Programmable 3.3V I/O lines
- **Expansion:** Provision for PCD-E12 I/O module

Serial Interfaces

- **UARTS:** 3 serial RS232 serial ports with handshaking & 1 RS232/422/485 with Auto RS485
- **SPI:** High-Speed SPI ports with Chip Selects.
- **I2C:** I2C port
- **Audio:** I2S Synchronous Serial Controller with Stereo Line In/Out
- **USB:** 1 USB 2.0 (High Speed) Host port
  1 USB 2.0 (High Speed) OTG Host/Device port

LCD

- **Display Type:** 10" TFT Color LCD
- **Resolution:** 1024 x 600 WVGA @ 256K Colors
- **Dot pitch:** 0.19mm x 0.19mm
- **Luminance:** 330 (cd/m²)
- **Viewing Angle:** 55°
- **Brightness:** Software controlled
- **Backlight:** White LED (33 LEDS)

Touchscreen

- **Type:** 4 Wire Analog Resistive
- **Resolution:** Continuous
- **Controller:** Built-In
- **Driver:** WinCE, Linux
- **Durability:** Over one million touches

Ethernet interface

- **Ethernet MAC:** Built-In
- **Ethernet PHY:** Micrel KSZ8041
- **Ethernet Type:** 10/100 Base-T Ethernet
- **Ethernet Interface:** On-Board RJ-45 connector

Solid-state Flash Disk

- **Supports:** SDIO SDHC/MMC interface up to 32+ GB Flash Disk

Mechanical and environmental

- **Power Supply Voltage:** +12 to +26 Vdc.
- **Power Consumption:** typical ~200 ma. @ 24 Vdc.
- **Operating Temperature:** 0 ~ 60° C (32 ~ 140° F)

Standard Parts Inventory

- PPC-E10 Assembly with 10" Touchscreen LCD
- Stainless Steel Mounting Bracket
- Resident on-board flash disk loaded with Operating System
- Three Serial Port cables
- CD ROM with manuals and drivers

2 PPC-E10 Product Details

2.1 Jumper Configuration & Connector Descriptions

The PPC-E10 comes factory configured. In the event that jumpers need to be verified or modified this section provides the information required, including instructions on setting jumpers and connecting peripherals, switches and indicators. Be sure to read all the safety precautions before you begin any configuration procedure. See Appendix A for connector pinouts and Appendix B for Jumper Setting descriptions.

Table 1: Jumpers

Label	Function	Default
JB1	Boot0 Source Selection	Position B
JB2	Boot1 Source Selection	Position A
JB3	Resident Flash Write Protect	Position B
JB4	RTC Battery ON/OFF	Off
JB5	Serial Port RS422/485 Tx Enable	422
JB6	Serial Port RS232 or 422/485 Mode	232

Table 2: Connectors

Label	Function
CN1	7” Touch Screen Connector
CN2	Serial Port COM A
CN3	10” Touch Screen Connector
CN4	7” LCD Backlight Connector
CN6	7” LCD Data Connector
J1	Vin Locking Connector
JK1	Vin Power Barrel Jack
JK2	Ethernet
JK3	USB Host Port A
JK4	USB OTG Port C
JK5	Audio Input Jack
JK6	Audio Output Jack
HDR1	Misc. I/O Connector
HDR2	Serial Port COM D
HDR3	Serial Port COM B
HDR4	Serial Port COM C
HDR5	Bulkhead USB Connector Port A & B
HDR6	LVDS & Touch Signal Connector
SOK1	MicroSD Card Socket
SOK2	200 pin SOM Socket
ABJ1	PCD-E12 Expansion Module Connector

2.2 Power Connectors

The PPC-E10 provides two power connectors. J1 is an AMP/Tyco locking power connector (part# 640445-3), three-pin type connector that mates with TE Connectivity part# 3-640600-3 power connector. Using this power input provides for a more rugged/industrial locking connection. JK1 is a standard 5.5mm barrel jack with an inner diameter of 2.1mm with a center V+ connection. This jack allows for easy connection to a wall mount power

supply (EMAC part number PER-PWR-00035). The PPC-E10's power input uses a switching regulator and allows a voltage input of +12Vdc to +26Vdc.

The pinout for the J1 power connector is as follows:

Pin	Signal
1	+Vin (+12Vdc to 26Vdc)
2	Chassis GND
3	System GND

Before powering up the PPC-E10, jumper JB1 is in the "A" position.

2.3 Ethernet

The PPC-E10 provides 10/100 Base-T full duplex Ethernet and uses a standard RJ-45 connector (JK2). It can be connected straight to a hub, or another computer via a crossover Ethernet cable. The Ethernet MAC & PHY are integrated into the SoM processor module. Activity and Link LEDs are integrated into the RJ45 connector.

2.4 Serial Ports

The PPC-E10 is equipped with four serial ports, one of which terminates to a male DB9 and the other three which terminate to 10pin header connectors (see table 2, 3, & 4 below). Three 10-pin header to male DB9 connector cables are provided, giving easy access to these ports. Baud Rate, stop bits, etc. are all programmable for each port via software.

COM A is an RS232 compatible port with a full complement of handshaking lines allowing it to communicate with modems and other devices requiring hardware flow control.

COM B is an RS232 port. This port offers no handshake lines.

COM C can be configured to RS232, RS422, and RS485 via 2 jumpers. To select RS232 set jumper JB6 to 232 (this is the default). For RS422 set jumper JB6 to 4xx and jumper JB5 to 485. To select RS485, set jumper JB6 to 4xx and jumper JB5 to 422.

When using COM C in the RS422/485 mode, a terminating resistor (~120 Ohm) is recommended on the two far ends of the network.

COM D is an RS232 port. This port offers no handshake lines.

Table 1 (COM A Pinout)

#	Pin Description for DB9 Connector
1	DCD
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI
10	Shield

Table 2 (COM B Pinout)

#	Pin Description for 10-Pin Header	Pin Description for DB9 Connector
1	NC	NC
2	NC	RxD
3	RxD	TxD
4	NC	NC
5	TxD	GND
6	NC	NC
7	NC	NC
8	NC	NC
9	GND	NC
10	NC	-

Table 3 (COM C Pinout)

#	Pin Description for 10-Pin Header	Pin Description for DB9 Connector
1	422/485 TX-	422/485 TX-
2	NC	232 RX, 422/485 TX+
3	232 RX, 422/485 TX+	232 TX, 422/485 RX+
4	RTS	422/485 RX-
5	232 TX, 422/485 RX+	GND
6	CTS	NC
7	422/485 RX-	RTS
8	NC	CTS
9	GND	NC
10	NC	-

Table 4 (COM D Pinout)

#	Pin Description for 10-Pin Header	Pin Description for DB9 Connector
1	NC	NC
2	NC	RxD
3	RxD	TxD
4	NC	NC
5	TxD	GND
6	NC	NC
7	NC	NC
8	NC	NC
9	GND	NC
10	NC	-

2.5 USB Host Ports

The PPC-E10 provides one, USB 2.0 (USB PortA) high speed host port (JK3). USB PortA and PortB can be accessed from the bulkhead connector (HDR5). EMAC can provide a cable (CAB-40-004) to access these ports.

In addition to the one USB Host port, the PPC-E10 provides a USB On-The-Go (OTG) port. This port can be used as either a USB Host or USB Device port.

All of the USB ports are equipped with 500mA re-settable Polyfuses. If a USB Device tries to draw more than 500mA from the port, the fuse will open until the device is unplugged or its current requirement is reduced. There is no software provision for shutting down power to the Ports or detecting when a port is drawing too much current.

Note: When sizing a power supply, make sure to allow for USB Device consumption. A device can potentially draw 500mA, therefore these devices could use a total of up to 1 amp of power.

2.6 Audio Port

The PPC-E10 provides Audio Line Out and Line In capability through two standard audio jacks (JK5 & JK6). Audio Jack JK5 is stereo line level input and Audio Jack JK6 is stereo line level output. The processor interfaces to the Audio CODEC through its I^2S interface. Command control of the CODEC is done using the processor's SPI interface. The CODEC is the Cirrus CS4271, which is a high performance 24-bit Stereo CODEC offering superior sound quality.

Both the input and output are line level. You will probably not be able to drive an unamplified speaker although standard headphones will work. Likewise, an un-amplified microphone probably will not work as an input although the line out of a CD player will work.

2.7 LCD Brightness Control

The PPC-E10 offers LCD brightness control that can change the brightness of the LCD via software. The LCD utilizes LED backlighting. The board provides the backlight with approximately 10 volts at about 220mA. The processor provides a PWM (SoM pin# 85) that is used to drive the LCD backlight. Changing the duty-cycle of the PWM directly affects the brightness of the LCD. In addition, the backlight can be turned off or on via SoM port line GPIO0 (SoM pin#114). This allows screensaver software to automatically turn off the backlight when the unit is not being used and to automatically turn it back on when the touchscreen is touched.

2.8 MicroSD Card Socket

The PPC-E10 provides two a high capacity MicroSD sockets. One socket is resident on the Carrier and accessible from the board coast line, the other is resident on the module. Both sockets are hot-swappable and can accept a wide variety of Flash Cards. A green activity light (LED LD3) is located towards the left side of the socket on the Carrier while the socket on the module does not provide a status LED. When the processor is accessing the Flash card this LED will be lit and the card should not be removed at this time. A card that is written to by the PPC-E10 can be read by another computer using an MicroSD card reader. The MicroSD interface is compatible with Standard and High Capacity MicroSD cards

2.9 Keyboard/Mouse

The PPC-E10 does not provide a PS/2 type keyboard/mouse interface. However, a USB keyboard and mouse can be used if required.

2.10 Analog Inputs

The analog inputs are available on HDR1 (see table 5 below) and are labeled as analog_04, analog_05, analog_06 and analog_07. Note: Using these A/Ds may degrade the touch screen performance and/or accuracy.

2.11 I/O Expansion

The Processor used by the PPC-E10 provides a number of unused I/O lines. The PPC-E10 provides access to these lines on connector HDR1. This 44-pin dual row header contains GPIO lines, SPI bus, I^2C bus, A/D lineS, interrupts and power pins. Signal names listed in the table below are the SoM names as defined in the SoM 200 pin specification.

Pin	Signal	Pin	Signal
1	3.3V	2	3.3V
3	GPIO1	4	GPIO4
5	GPIO2	6	GPIO5
7	GPIO3	8	GPIO6
9	INT0	10	GPIO7
11	INT1	12	GND
13	OSC0	14	GND
15	OSC1	16	GND
17	ADC4	18	GND
19	ADC5	20	GND
21	ADC6	22	GND
23	ADC7	24	GND
25	SPI_MISO	26	GND
27	SPI_MOSI	28	GND
29	SPI_CLK	30	GND
31	SPI_CS3	32	GND
33	SPI_CS1	34	GND
35	I2C_DAT	36	GND
37	I2C_CLK	38	GND
39	*SOM_RSTOUT	40	GND
41	5V_VCC	42	5V_VCC
43	GND	44	GND

2.12 Real-Time Clock

The PPC-E10 is equipped with an external battery for backing up the module's Real-Time Clock (RTC). Drivers to access the RTC are included in the operating systems. Jumper JB4 should be placed in the ON position in order to retain system time when powered down.

2.13 Serial Flash

PPC-E10 is equipped with 4MB of SPI based serial NOR flash. The PPC-E10 can high-level boot from either the Serial Data NOR Flash or the NAND Flash (selected through the low-level bootloader). It is recommended to high-level boot from the Serial Data Flash, as this Flash is more reliable than the NAND Flash. The NAND flash is ideal for the Operating System's File System which can normally handle marked bad blocks.

The Serial Data Flash is connected to SPI0 and uses SPI0_NPCS0 to enable it. The Serial Data Flash also has a Write Protect Provision. To Write Protect the Serial Data Flash set JB3 to position B. See the software drivers for details on accessing this.

2.14 PCD-E12 Expansion

If additional I/O is required the PCD-E12 daughter card can be utilized. This card connects to the PPC-E10 via SPI bus on connector ABJ1. The PCD-E12 features CAN, A/D, D/A, Serial Ports, and GPIO. For more info on the PCD-E12 go to:
www.emacinc.com/sbc_pc_compatible/pcm_53e52.htm.

2.15 Status LEDs and Reset

The PPC-E10 provides two status LEDs, LD1 (Green) and LD2 (Red). These can be controlled independently via software (GPIO13 & GPIO12 respectively). LD1 and LD2 are located just to the left of the SD/MMC socket.

Also provided is a Reset Button (PB1). Pressing this button will cause the system to reset.

3 Software

3.1 Introduction

The PPC-E10 can be programmed in a variety of languages and utilize a variety of Operating Systems. There are a number of free compilers, interpreters, and assemblers available allowing the PPC-E10 to be programmed in C, BASIC or Assembly languages. EMAC has Board Support Packages available for Linux, Xenomai Real Time Linux and Windows CE. For more information on these particular Operating Systems, contact EMAC, Inc.

3.2 Loading Your Software

The resident flash on the PPC-E10 can be programmed by one the following methods:

3.2.1 SAM-BA

Atmel provides the SAM Boot Assistant (SAM-BA) utility that can be used to program the serial dataflash and NAND flash devices on the PPC-E10. SAM-BA is capable of connecting to the USB device or debug serial port on COMB when the unit is set to internal boot mode using the boot configuration jumpers. This is mainly used for recovering a corrupt flash or programming an updated bootstrap or bootloader to the system. Once the bootloader has been successfully programmed, it is generally used for programming the system rather than the SAM-BA utility. Refer to the SoM-9G45 manual for more information on this process.

3.2.2 EBOOT.NB0

This is a bootloader that can be used with Windows CE BSP. If it is loaded in the on-board flash, it allows you to quickly download CE builds to the PPC's RAM or flash via Ethernet. This bootloader can be loaded to the board using the download.exe utility.

3.2.3 Das U-Boot Bootloader

The PPC-E10+ is distributed with Das U-Boot installed. U-Boot is an open source/cross architecture platform independent bootloader. It supports reading and writing to the flash, auto-booting, environmental variables, and tftp. Das U-boot can be used to upload and run and/or reflash the OS on the SoM-9G45/9M10M without the use of a JTAG cable, or to run stand-alone programs without an OS. SoM-9G45/9M10M modules are shipped with a valid MAC address installed in flash in the protected ethaddr environmental variable of U-Boot. At boot time U-Boot automatically stores this address in a register within the MAC, which effectively provides it to any OS loaded after that point.

3.3 Linux Tools

3.3.1 Eclipse

EMAC provides sample code for the PPC-E10 as CDT projects within the free Eclipse IDE. Eclipse is a powerful open-source Java based IDE. It has plug-ins for development and debugging in Java and C, as well as several other languages.
http://www.eclipse.org/

EMAC offers a free download of Eclipse pre-integrated with the CDT plug-in and plug-ins for remote debugging, SVN, and other purposes. Eclipse requires the Java Runtime Environment to be installed on the development system. Currently EMAC only supports the use of Eclipse under the Linux environment for the PPC-E10. The Eclipse environment and JRE for Linux are available online along with user manuals.
ftp://ftp.emacinc.com/PCSBC/Development_Kits/EMAC_Open_Tools/

3.3.2 Eclipse CDT plug-in

The Eclipse CDT plug-in provides a powerful graphical IDE for C development. This plug-in relies on GNU Make to build its files, so its projects are highly portable to other IDE's (or lack of them completely). It also offers a MI based debugger, for plugging into newer gdbs.
http://www.eclipse.org/cdt/

3.3.3 ARM EABI Cross Compiler

The popular open source gcc compiler has a stable build for the ARM family. The Embedded Linux kernel and EMAC Eclipse CDT projects use this compiler for building ARM stand alone, and OS specific binaries. The EMAC Eclipse SDK provides source level debugging over either the JTAG port or over Ethernet or serial using gdbserver. The Linux binaries for the ARM EABI cross compiler are available online along with the SDK for the PPC-E10 at the following location.
ftp://ftp.emacinc.com/Controllers/SoM/SoM-9G45/9M10M/Tools/

3.3.4 EMAC's LDC

EMAC also offers a pre-configured Linux Development Computer (LDC) which allows the user to hit the ground running and not have to worry about setting up Linux Machine with the Eclipse development environment. This is an ideal solution for Windows users who are not familiar with Embedded Linux.

http://www.emacinc.com/operating_systems/linux_ldc.htm

3.4 Linux Operating System

3.4.1 Embedded Linux

EMAC Open Embedded Linux is an open source Linux distribution for use in embedded systems. The current PPC-E10 build uses a Linux 2.6 kernel.

The distribution contains everything a user could expect from a standard Linux kernel, powerful networking features, advanced file system support, security, debugging utilities, and countless other features.

The PPC-E10 will work out of the box with EMAC's Embedded Linux distribution, and EMAC provides the most up to date distribution via FTPSVN. It comes preinstalled with a 2.6.30 or later Linux kernel.

The Bootloader / Linux Console Port defaults to:

- COMB (HDR3)
- 115200 Baud
- N-8-1
- No Handshaking

3.4.2 Linux with Xenomai Real Time Extensions

Xenomai provides real time extensions to the kernel and can be used to schedule tasks with hard deadlines and µs latencies. The Xenomai build is an additional module that can be added to the standard Linux kernel and is available for a one-time inexpensive support/installation fee.
http://www.xenomai.org/

3.4.3 Linux Modules

EMAC provides support for many Linux modules such as: Lighttpd Web Server, PHP, SQLite, Perl, SNMP, DHCP Server, etc. As with the Xenomai module, other modules can be added to the standard Linux filesystem and are available for a one-time inexpensive support/installation fee.

3.4.4 Linux 2.6 Public Repository

EMAC Linux 4.0 Distribution integrates a number of kernel patches and device drivers from the open source community along with support for EMAC engineered products. Currently, the kernel for the SoM-9G45M/9M10 is available via our public SVN repository.

https://svn.emacinc.com/public/linux-2.6.30-at91/trunk/

Along with kernel source, EMAC provides the binaries for the kernel and root file system.
ftp://ftp.emacinc.com/Controllers/SoM/SoM-9G45/9M10M/Software/Linux/

3.4.5 Open Embedded

The Linux build for the PPC-E10 is based on the Open Embedded (www.openembedded.org) Linux build system. The current kernel is Linux 2.6.30 or higher patched to support the PPC-E10. Open Embedded is a superior Linux distribution for embedded systems. Custom Linux builds are also available on request.

The basic root filesystem includes:

- Busybox 1.13 or higher
- Hotplugging support
- APM utilities for power management
- Open BSD SSH server
- Telnet/FTP support running under inetd
- busybox-httpd HTTP server
- JFFS2 filesystem with utilities

3.5 Android Operating System

EMAC offers a preconfigured version of Android 2.1 for the PPC-E10. Android consists of a kernel based on the Linux kernel, with middleware, libraries and APIs written in C and application software running on an application framework which includes Java-compatible libraries based on Apache Harmony. Android uses the Dalvik virtual machine with just-in-time compilation to run compiled Java code. Android has a large community of developers writing applications ("apps") that extend the functionality of the devices. Developers write primarily in a customized version of Java. Note: Android requires significant resources in order to run. The PPC-E10 will run Android but it will be sluggish. If Android is required the PPC-E10+ is recommended.

3.6 Windows CE 6.0

In addition to EMAC's Linux distribution, a Windows CE 6.0 BSP for the PPC-E10 is available. When using Windows CE 6.0, development and debugging can be done using Visual Studio.

The Bootloader / WinCE Console Port defaults to:

- COMB (HDR3)
- 115200 Baud
- N-8-1
- No Handshaking

Note: All of the links in this document are subject to change. Please contact EMAC for updated link locations if necessary.

4 Appendix A: *Connector Pinouts*

4.1 Ethernet 10/100 Base-T connector (JK2)

Pin	Signal
1	XMT+
2	XMT-
3	RCV+
4	N/C
5	N/C
6	RCV-
7	N/C
8	N/C

4.2 USB Connector (JK3, JK4, HDR5)

4.2.1 PortA (JK3 - Host)

Pin	Signal
1	USB_PWR (5Vdc)
2	USB_Data-
3	USB_Data+
4	GND

4.2.2 PortC (JK4 - OTG)

Pin	Signal
1	USB_VBUS
2	USB_Data-
3	USB_Data+
4	USB_ID
4	GND

4.2.3 PortA/B (HDR5)

Pin	Signal	Pin	Signal
1	USB_PWR_A	2	USB_PWR_B
3	USB_HOSTA-	4	USB_HOSTB-
5	USB_HOSTA+	6	USB_HOSTB+
7	GND	8	GND
9	Chassis GND	10	NC

4.3 Power Jack (JK1)

Pin	Signal
Center	5V DC
Barrel	GND

4.4 Power Connector (J1)

Pin	Signal
1	Vin
2	Chassis GND
3	System GND

4.5 MicroSD Socket (SOK1)

Pin	Signal
1	DAT2
2	CD/DAT3
3	CMD
4	VCC (3.3V)
5	SCLK
6	GND
7	DAT0
8	DAT1
9	SD Card Detect

4.6 TTL LCD/Touch/Backlight (CN6)

Pin	Signal
1	CLK
2	HSYNC
3	VSYNC
4	GND
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	GND
12	G0
13	G1
14	G2
15	G3
16	G4
17	G5
18	GND
19	B0
20	B1
21	B2
22	B3
23	B4
24	B5
25	GND
26	DEN
27	VCC
28	VCC
29	R/L
30	U/D

4.7 LVDS LCD/Touch/Backlight (HDR6)

Pin	Signal	Pin	Signal
1	GND	2	GND
3	3.3V	4	3.3V
5	RED -	6	RED +
7	GND	8	GND
9	GREEN -	10	GREEN +
11	GND	12	GND
13	BLUE -	14	BLUE +
15	GND	16	GND
17	CLOCK -	18	CLOCK +
19	VLED +5V	20	VLED +5V
21	BRIGHTNESS	22	GND
23	EDID DATA	24	EDID CLOCK
25	3.3V	26	VLED +5V
27	Y2	28	X2
29	Y1	30	X1
31	GND	32	GND
33	VIN	34	VIN

4.8 PCD-E12 Expansion connector (ABJ1)

Pin	Signal
1	Vin
2	Reset
3	GND
4	SPI_MOSI
5	INT2 (5V)
6	SPI_MISO (5V)
7	SPI_CS0
8	SPI_CLK
9	(5V)
10	GPIO15

Note: The PCD-E12 is a 5V powered board. As such, logic signals are transferred from 3V to 5V and 5V to 3V for communication between the PPC-E10 and the PCD-E12.

4.9 COMA RS-232 serial port (CN2)

Pin	DB9 Signal
1	DCD
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

4.10 COMB RS-232 Serial Port (HDR3)

Pin	HD3 Signal	DB9 Signal
1	NC	NC
2	NC	RxD
3	RxD	TxD
4	NC	NC
5	TxD	GND
6	NC	NC
7	NC	NC
8	NC	NC
9	GND	NC
10	NC	--

4.11 COMC RS-232/422/485 Serial Port (HDR4)

Pin	HD3 Signal	DB9 Signal
1	422/485 TX-	422/485 TX-
2	NC	232 RX, 422/485 TX+
3	232 RX, 422/485 TX+	232 TX, 422/485 RX+
4	RTS	422/485 RX-
5	232 TX, 422/485 RX+	GND
6	CTS	NC
7	422/485 RX-	RTS
8	NC	CTS
9	GND	NC
10	NC	-

4.12 COMD RS-232 Serial Port (HDR2)

Pin	HD3 Signal	DB9 Signal
1	NC	NC
2	NC	RxD
3	RxD	TxD
4	NC	NC
5	TxD	GND
6	NC	NC
7	NC	NC
8	NC	NC
9	GND	NC
10	NC	--

4.13 Misc. General Purpose I/O (HDR1)

Pin	Signal	Pin	Signal
1	3.3V	2	3.3V
3	GPIO1	4	GPIO4
5	GPIO2	6	GPIO5
7	GPIO3	8	GPIO6
9	INT0	10	GPIO7
11	INT1	12	GND
13	OSC0	14	GND
15	OSC1	16	GND
17	ADC4	18	GND
19	ADC5	20	GND
21	ADC6	22	GND
23	ADC7	24	GND
25	SPI_MISO	26	GND
27	SPI_MOSI	28	GND
29	SPI_CLK	30	GND
31	SPI_CS3	32	GND
33	SPI_CS1	34	GND
35	I2C_DAT	36	GND
37	I2C_CLK	38	GND
39	*SOM_RSTOUT	40	GND
41	5V_VCC	42	5V_VCC
43	GND	44	GND

4.14 Touch Screen Connector (CN1)

Pin	Signal
1	Y+
2	X+
3	Y-
4	X-

4.15 Touch Screen Connector (CN3)

Pin	Signal
1	Y+
2	X+
3	Y-
4	X-

4.16 LCD Backlight Connector (CN4)

Pin	Signal
1	VOUT (+)
2	SWITCHED GND (-)

5 Appendix B: *Jumper Settings*

JB1 Boot0 Source Selection

Jumper	Position	Setting
Pins 2 & 3	A	Serial Boot Loader Download (EBI)
Pins 1 & 2*	B	Normal Boot from Flash (DBI)

* Default setting

JB2 Boot1 Option Selection

Jumper	Position	Setting
Pins 2 & 3*	A	Flash Enable (FE)
Pins 1 & 2	B	Flash Disable (FD)

* Default Setting

JB3 Flash Write Protect

Jumper	Position	Setting
Pins 2 & 3	A	Resident Flash Disable
Pins 1 & 2*	B	Resident Flash Enable

* Default setting

JB4 RTC Battery Enable

Jumper	Position	Setting
Pins 1 & 2	ON	Enable Battery Backup
Pins 2 & 3*	OFF	Disable Battery Backup

* Default setting

JB5 RS485/RS422 Select

Jumper	Position	Setting
Pins 1 & 2	485	Select RS485
Pins 2 & 3*	422	Select RS422

* Default setting

JB6 RS232/RS4xx Select

Jumper	Position	Setting
Pins 1 & 2*	232	Select RS232
Pins 2 & 3	4xx	Select either RS422 or RS485 depending on JB5

* Default setting

6 Appendix C: *Mechanical drawing of Mounting Plate with dimensions*