PPC-E4

ARM9 SOM-9307M Based Panel PC

User Manual

REV. 1.3

EMAC, inc.
EQUIPMENT MONITOR AND CONTROL
2390 EMAC Way, Carbondale, IL 62902
World Wide Web: http://www.emacinc.com
(618) 529-4525 FAX: (618) 457-0110

Table of Contents

Disclaimer

EMAC Inc. does not assume any liability arising out of the application or use of any of its products or designs. Products designed or distributed by EMAC Inc. are not intended for, or authorized to be used in, applications such as life support systems or for any other use in which the failure of the product could potentially result in personal injury, death or property damage.

If EMAC Inc. products are used in any of the aforementioned unintended or unauthorized applications, Purchaser shall indemnify and hold EMAC Inc. and its employees and officers harmless against all claims, costs, damages, expenses, and attorney fees that may directly or indirectly arise out of any claim of personal injury, death or property damage associated with such unintended or unauthorized use, even if it is alleged that EMAC Inc. was negligent in the design or manufacture of the product.

EMAC Inc. reserves the right to make changes to any products with the intent to improve overall quality, without further notification.

1 PPC-E4 Product Summary

1.1 Features

- **SoM-210ES Carrier with 200 Pin SODIMM SoM Connector**
  - **Cirrus ARM9 EP9307 200Mhz Based SOM-9307 Fanless Low Power Processor installed**
  - **MaverickCrunch Hardware Floating-Point Math Coprocessor**
  - **Up to 128 MB of SDRAM**
  - **Up to 64 MB of Flash**
  - **128K Bytes of Serial Flash**
  - **Graphic LCD Interface with 2D acceleration**
- **Inexpensive Open-Frame Design**
- **10/100BaseT Ethernet with on-board PHY**
- **3 Serial ports with handshake**
- **2 USB 2.0 Full Speed Host ports with Type A connectors and access to an additional Host port**
- **Battery backed Real Time Clock**
- **Micro SD Flash Card Interface**
- **1 SPI & 1 I2S port**
- **1 Audio Beeper**
- **Timer/Counters and Pulse Width Modulation (PWM) ports**
- **4 Channel 12-bit Analog-to-Digital converter**
- **WQVGA LCD (480 x 272) Resolution with LED Backlight**
- **Touchscreen Interface and Software Controlled Backlight On/Off & Brightness**
- **FREE Eclipse IDE with GCC & GDB development tools**
- **WinCE 6.0 BSP and SDK available**

1.2 Standard PPC Specifications

- **CPU: Embedded Cirrus EP9307 processor running at 200 MHz with Hardware Floating-Point Math Engine**
- **Main board: SOM-210ES Carrier board**
- **Flash: 64 MB External NOR Intel P30 Flash & 128K of utility serial Flash.**
- **RAM: 64 MB 100 MHz SDRAM.**
- **Video: 2D Accelerated Video Interface**
- **Touchscreen: 12-Bit, 4 wire analog resistive Touchscreen**
- **Flash Disk: SPI serial Micro HCSD interface.**
- **System Reset: Supervisor with external Reset Button provision.**
- **RTC: Battery backed Real Time Clock/Calendar.**
- **Timers: 2, general purpose 16-bit, 1 32-bit timer, & 2 16-bit PWMs.**
- **Watchdog Timer: Reset-on-Timeout**
- **Analog I/O: 4 channel, 12-bit Analog-to-Digital converter (ADC)**
- **GPIO: 4 Programmable 3.3V I/O lines**
- **Expansion: 30-pin, 2mm dual row header**

LCD

- **Display Type:** 4.3" TFT Color LCD
- **Resolution:** 400 x 272 WQVGA @ 256K Colors
- **Dot pitch:** 0.66mm x 0.198mm
- **Luminance:** 400 (cd/m²) typical
- **Contrast Ratio:** 500 typical
- **Viewing Angle:** 70° typical
- **Brightness:** Software controlled

Backlight: White LED (10 LEDS)

Touchscreen

- **Type:** 4 Wire Analog Resistive
- **Resolution:** Continuous
- **Light Transparency:** 80%
- **Controller:** Built-In
- **Driver:** WinCE, Linux
- **Durability:** Over one million touches

Ethernet interface

- **Ethernet MAC:** Built-In
- **Ethernet PHY:** Intel/Cortina LXT927ALC with software PHY shutdown control
- **Ethernet Type:** 10/100 Base-T Ethernet
- **Ethernet Interface:** On-Board RJ-45 connector

Solid-state Flash Disk

- **Resident:** up to 64 MB of on-board NOR flash
- **Removable:** 2 GB of SD, MMC Flash Disk
- **Utility:** 128 KB of serial on-board Flash

Mechanical and Environmental

- **Dimensions:** 4.8 " L x 3.0" W x 1.2" H
- **Weight:** 5.7 oz.
- **Power Supply Voltage:** +5V DC.
- **Power Consumption:** typical <~1.0A. @ 5V DC.
- **Operating Temperature**: 0 ~ 60° C (32 ~ 140° F)

Standard Parts Inventory

- PPC-E4 Assembly with 4.3” Touchscreen
- Molded plastic LCD mounting bracket and standoffs
- SoM-9307-130 System on Module
- Resident on-board flash disk loaded with Operating System
- Two Serial Port cables

2 PPC-E4 Product Details

2.1 Jumper Configuration & Connector Descriptions

The PPC-E4 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 Settings.

Table 1: Jumpers

Label	Function	Default
JB1	Boot Source Selection	Position A
JB2	Boot Source Selection	Position A

Table 2: Connectors

Label	Function
JK1	Ethernet
JK2	USB C
JK3	USB A
JK4	5v power barrel jack
HDR1	Power
HDR2	I/O Interface
HDR3 COM C	COM 3 Serial Port
HDR4 COM B	COM 2 Serial Port
HDR5 COM A	COM 1 Serial Port
HDR6	USB Host A & B
SOK1	200 pin SOM Socket
SOK2	MicroSD Card Socket
SOK3	LCD &Touch Interface Cable Socket

2.2 Power Connectors

The PPC-E4 provides two power connectors. HDR4 is a standard PC Floppy disk power connector, four-pin type connector that mates with standard Floppy disk drive power connector. Using this power input provides for a more rugged/industrial locking connection. JK4 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-00032). The PPC-E4's power input uses a switching regulator and allows a voltage input of +5V DC.

The pinout for the J1 power connector is as follows:

1 **Pin** **Signal**+5V DCChassis GND
3 Chassis GND
4 +12V DC (unused)

2.3 Ethernet

The PPC-E4 provides 10/100 Base-T full duplex Ethernet and uses a standard RJ-45 connector. It can be connected straight to a hub, or another computer via a crossover Ethernet cable. The Ethernet MAC is integrated into the EP9307 processor and the Cortina (formally Intel) LXT972ALC performs the PHY responsibilities. Activity and Link LEDs are integrated into the RJ45 connector.

2.4 Serial Ports

The PPC-E4 is equipped with three serial ports, all of which terminate to 10-pin 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 compliment 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 the RTS and CTS handshake lines.

COM C can be configured to RS232, RS422, and RS485 via four software controlled port pins (see table 1 below). To select RS232 set SoM pin 109 & 120 Low and pin 118 & 119 High (this is the default). For RS422 set SoM pin 109 & 120 High and pin 118 & 119 Low. To select RS485, selectively set SoM pin 109 & 119 as required while keeping pin 118 Low.

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

Table 1

SODIMM Pin#	SoM Pin Name	Processor Pin Name(s)	Function
109	COMD_RTS	EGPIO3/485EN	RS422/485 Tx Enable
118	GPIO4	COL0/GPIODO	~RS232 Shutdown
119	GPIO5	COL1/GPIOD1	~RS422/485 Rx Enable
120	GPIO6	COL2/GPIOD2	~RS232 Enable

Table 2 (COM A Pinout)

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

Table 3 (COM B Pinout)

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

Table 4 (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	-

2.5 USB Host Ports

The PPC-E4 provides two, USB 2.0 full speed host ports. USB PortA and PortC can be accessed from the on-board USB connectors JK3 and JK2.

In addition to the two USB PortA and PortC Host ports, the PPC-E4 provides access to an additional, USB 2.0 Host port. USB PortA and PortB can be accessed from the on-board USB connector HDR6. EMAC can provide an optional cable (CAB-40-004) to access these ports.

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 (option on Rev1 and greater boards)

The PPC-E4 provides Audio Line Out and Line In capability through a 10-pin 2mm header. A special cable converts the signals present on the header to two miniature audio jacks. 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.

2.5 LCD Brightness Control

The PPC-E4 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 30 volts at about 20mA. The processor provides a PWM 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 by reducing the PWM rate to 0. 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.

2.6 SD/MMC Card Socket

The PPC-E4 provides a high capacity MicroSD socket. This socket is hot-swappable and can accept a wide variety of Flash Cards. There is not a native SD card interface on the Cirrus EP9307 processor so the SPI bus is utilized. A green activity light (LED LD2) is located towards the left side of the socket. 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-E4 can be read by another computer using an MicroSD card reader. The MicroSD interface is compatible with Standard and High Capacity MicroSD cards.

2.7 Keyboard/Mouse

The PPC-E4 does not provide a PS/2 type keyboard/mouse interface. However, a USB keyboard and mouse can be used if required.

2.8 Analog Inputs

The analog inputs are available on HDR2 (see table 5 below) and are labeled as analog_04, analog_05, analog_06 and analog_07. Voltages applied to the inputs must be in the range of 0V to 3.3V with reference to ground. Different operating systems may provide access to the analog inputs differently or even not at all. See the operating system documentation for details.

2.9 I/O Expansion

The Processor used by the PPC-E4 provides a number of unused I/O lines. The PPC-E4 provides access to these lines on connector HDR2. This 30-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	GND	2	3.3V
3	CANRX	4	CANTX
5	I2DAT	6	I2CLK
7	RESET_OUT	8	SPI_MI
9	SPI_CK	10	SPI_MO
11	SPI_CS1	12	SPI_CS0
13	SPI_CS3/FRM	14	SPI_CS2
15	AUD_DOUT	16	AUD_MCLK
17	ANALG_05	18	AUD_SCLK
19	ANALG_07	20	AUD_DIN
21	ANALG_04	22	AUD_LRCLK
23	GPIO12	24	GPIO11
25	ANALG_06	26	GPIO13
27	GPIO15	28	IRQA
29	3.3V	30	GND

2.10 Real-Time Clock

The PPC-E4 is equipped with an external, battery-backed, Real-Time Clock (RTC). The EP9307 processor provides an internal RTC but there is no provision for battery backing it. The external RTC is based on the I^2C PCA8565TS chip from NXP. The EP9307 does not have a true I^2C interface but does offer a couple of lines that can act in that capacity. These are referred to as EECLK and EEDAT. Drivers to access the RTC are included in the operating systems.

In addition, processor line EGPIO[9]/RTC_~INTRQ is connected to the IRQ line of the RTC. Using this line the RTC can wake the processor up from sleep modes on the second, minute, hour, day of the week, or month. The RTC also provides 32.768 kHz clock required by the processor.

> NOTE: Do not change this frequency output in software or the processor will not run and power will need to be turned off and the battery will have to be removed to restore normal operation.

2.11 Serial Flash

Also equipped is 128K Bytes of SPI based serial flash. To select this device SFRM1 (SPI Frame) and EGPIO[7]/EE_SEL are logically ORed together. The SFRM1 signal is automatically generated so control comes from the EGPIO[7]/EE_SEL line. SO, SI, and SCLK of the serial flash are connected to SSPRX1, SSPTX1, and SSCLK1 respectively. The serial flash is a handy place to store non-volatile configuration data. The PPC-E4 is shipped with the ethernet MAC address stored in the serial flash. See the software drivers for details on accessing this.

2.12 Status LEDs and Reset

The PPC-E4 provides two status LEDs on the SoM-9307 module, LD1 (Green) and LD5 (Red). These can be controlled independently via software. LD1 and LD5 are located top center of the module. When power is applied or the PPC is reset the boot loader will light LD1 and LD1 will stay lit until turned off by the user.

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

3 Software

3.1 Introduction

The PPC-E4 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-E4 to be programmed in C, BASIC or Assembly languages. EMAC has Board Support Packages available for 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-E4 can be programmed via the JTAG or by the following methods:

3.2.1 DOWNLOAD.EXE

Cirrus Logic provides a PC based utility, download.exe, which allows you to download code to on-board flash via COM0. Instructions for its use and the actual application source code are available on the Cirrus website. This requires the jumper at JP2 is set to SER. This application is normally used for programming the bootloader and setting the MAC address in the EEPROM.

3.2.2 EBOOT.NB0

This is a bootloader that is included with the 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 RedBoot

Cirrus Logic provides a port of the eCos-2.0 RedBoot bootloader [9] for the EP9307. This bootloader, included with the Linux support option, is capable of booting both Linux and Windows CE, and can execute independently of user intervention through a scripted flash interface. This bootloader can be loaded to the board using the download.exe utility.

RedBoot™ is an acronym for "Red Hat Embedded Debug and Bootstrap", and is the standard embedded system debug/bootstrap environment from Red Hat, replacing the previous generation of debug firmware: CygMon and GDB stubs. It provides a complete bootstrap environment for a range of embedded operating systems, such as embedded Linux™ and eCos™, and includes facilities such as network downloading and debugging. It also provides a simple flash file system for boot images.

RedBoot provides a wide set of tools for downloading and executing programs on embedded target systems, as well as tools for manipulating the target system's environment. It can be used for both product development (debug support) and for end product deployment (flash and network booting).

Here are some highlights of RedBoot's capabilities:

1• Boot scripting support

2• Simple command line interface for RedBoot configuration and management, accessible via serial (terminal) or Ethernet (telnet)

3• Integrated GDB stubs for connection to a host-based debugger via serial or ethernet. (Ethernet connectivity is limited to local network only)

4• Attribute Configuration - user control of aspects such as system time and date (if applicable), default Flash image to boot from, default failsafe image, static IP address, etc.

5• Configurable and extensible, specifically adapted to the target environment

6• Network bootstrap support including setup and download, via BOOTP, DHCP and TFTP

7• X/YModem support for image download via serial

8• Power On Self Test

Although RedBoot is derived from eCos, it may be used as a generalized system debug and bootstrap control software for any embedded system and any operating system. For example, with appropriate additions, RedBoot could replace the commonly used BIOS of PC (and certain other) architectures. Red Hat is currently installing RedBoot on all embedded platforms as a standard practice, and RedBoot is now generally included as part of all Red Hat Embedded Linux and eCos ports. Users who specifically wish to use RedBoot with the eCos operating system should refer to the Getting Started with eCos document, which provides information about the portability and extendibility of RedBoot in an eCos environment.

3.3 Linux Tools

3.3.1 Eclipse

EMAC provides sample code for the PPC-E4 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-E4. The Eclipse environment and JRE for Linux are available online along with user manuals.
ftp://ftp.emacinc.com/EMAC_Linux/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-E4 at the following location.
ftp://ftp.emacinc.com/EMAC_Linux/EMAC_Open_Tools/Linux/

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-E4 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-E4 will work out of the box with EMAC's Embedded Linux distribution, and EMAC provides the most up to date distribution via ftp. It comes preinstalled with a 2.6.20 or later Linux kernel.

3.4.2 Linux Modules

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

3.4.3 Linux 2.6 patches

In addition to standard Embedded Linux support, EMAC has released a number of patches and device drivers from the open source community and from internal EMAC engineering into its standard distribution. Currently, the kernel patches and some useful scripts may be downloaded from EMAC's SoM ftp site at:
ftp://ftp.emacinc.com/../SoM/SoM-9307M/Driver/Software/Linux-Kernel/

Along with kernel patches, EMAC provides the binaries for the kernel and root file system.

3.4.4 Open Embedded

The Linux build for the PPC-E4 is based on the Open Embedded (www.openembedded.org) Linux build system. The current kernel is Linux 2.6.20 or higher patched to support the PPC-E4. Open Embedded is a superior Linux distribution for embedded systems. Custom Linux builds are also available on request.
The basic root filesystem includes:

- Busybox 1.11.1 or higher Hotplugging support
- SSH server
- Telnet/FTP support running under inetd
- busybox-httpd HTTP server
- JFFS2 filesystem with utilities

3.5 Windows CE 6.0

In addition to EMAC's Linux distribution, a Windows CE 6.0 BSP for the PPC-E4 is available. When using Windows CE 6.0, development and debugging can be done using Visual Studio with the PPC-E4 SDK installed..

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 (JK1)

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 Host connector Port A & B (JK3 and JK2)

4.2.1 PortA (JK3)

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

4.2.2 PortC (JK2)

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

4.3 USB Dual Host header connector (HDR6)

Pin	Signal	Pin	Signal
1	USB_A _ VBUS	2	USB_B _VBUS
3	USB_A _HOST-	4	USB_B _HOST-
5	USB_A _HOST+	6	USB_B _HOST+
7	GND	8	GND
9	NC	10	NC

4.4 Power Jack (JK4)

Pin	Signal
Center	5V DC
Barrel	GND

4.5 Power Connector (HDR1)

Pin	Signal
1	5V DC
2	GND
3	GND
4	+Vin

4.6 Micro SD Socket (SOK2)

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
10	GND

4.7 LCD/Touch/Backlight (SOK3)

Pin	Signal
FN1	GND
1	LED-
2	LED+
3	GND
4	VCC
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	CLK
31	DISP ON/OFF
32	NC
33	NC
34	DATA ENABLE
35	NC
36	GND
37	TCHSCR X1 [RE]
38	TCHSCR Y1 [BE]
39	TCHSCR X2 [LE]
40	TCHSCR Y2 [TE]
FN2	GND

4.8 COM A RS-232 Serial Port (HDR5)

Pin	HD3 Signal	DB9 Signal
1	DCD	DCD
2	DSR	RxD
3	RxD	TxD
4	RTS	DTR
5	TxD	GND
6	CTS	DSR
7	DTR	RTS
8	RI	CTS
9	GND	RI
10	NC	-

4.9 COM B RS-232 Serial Port (HDR4)

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

4.10 COM C RS-232/422/485 Serial Port (HDR3)

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	-

4.11 Misc. I/O (HDR2)

Pin	Signal	Pin	Signal
1	GND	2	3.3V
3	CANRX	4	CANTX
5	I2DAT	6	I2CLK
7	RESET_OUT	8	SPI_MI
9	SPI_CK	10	SPI_MO
11	SPI_CS1	12	SPI_CS0
13	SPI_CS3/FRM	14	SPI_CS2
15	AUD_DOUT	16	AUD_MCLK
17	ANALG_05	18	AUD_SCLK
19	ANALG_07	20	AUD_DIN
21	ANALG_04	22	AUD_LRCLK
23	GPIO12	24	GPIO11
25	ANALG_06	26	GPIO13
27	GPIO15	28	IRQA
29	3.3V	30	GND

5 Appendix B: *Jumper Settings*

JB1 Boot Source Selection

Jumper	**Position**	**Setting**
Pins 1 & 2	A	Serial Boot Loader Download
Pins 2 & 3*	B	Normal Boot from NOR Flash

* Default setting

JB2 Boot Option Selection

Jumper	**Position**	**Setting**
Pins 1 & 2	A	Not Used
Pins 2 & 3*	B	Not Used

* Default Setting

6 Appendix C: *Mechanical drawing with dimensions*