OPERATIONS MANUAL
PPM-CARDBUS

REVISION HISTORY

P/N   403-0309-000C

ECO Number	Date Code	Rev Level
ORIGINATED	030214	B
03-46	030618	C
08-96	080708	C.1

Table of Contents

Visual Index – Quick Reference

Top View - Connectors

For the convenience of the user, a Visual Index has been provided with direct links to connector and jumper configuration data.
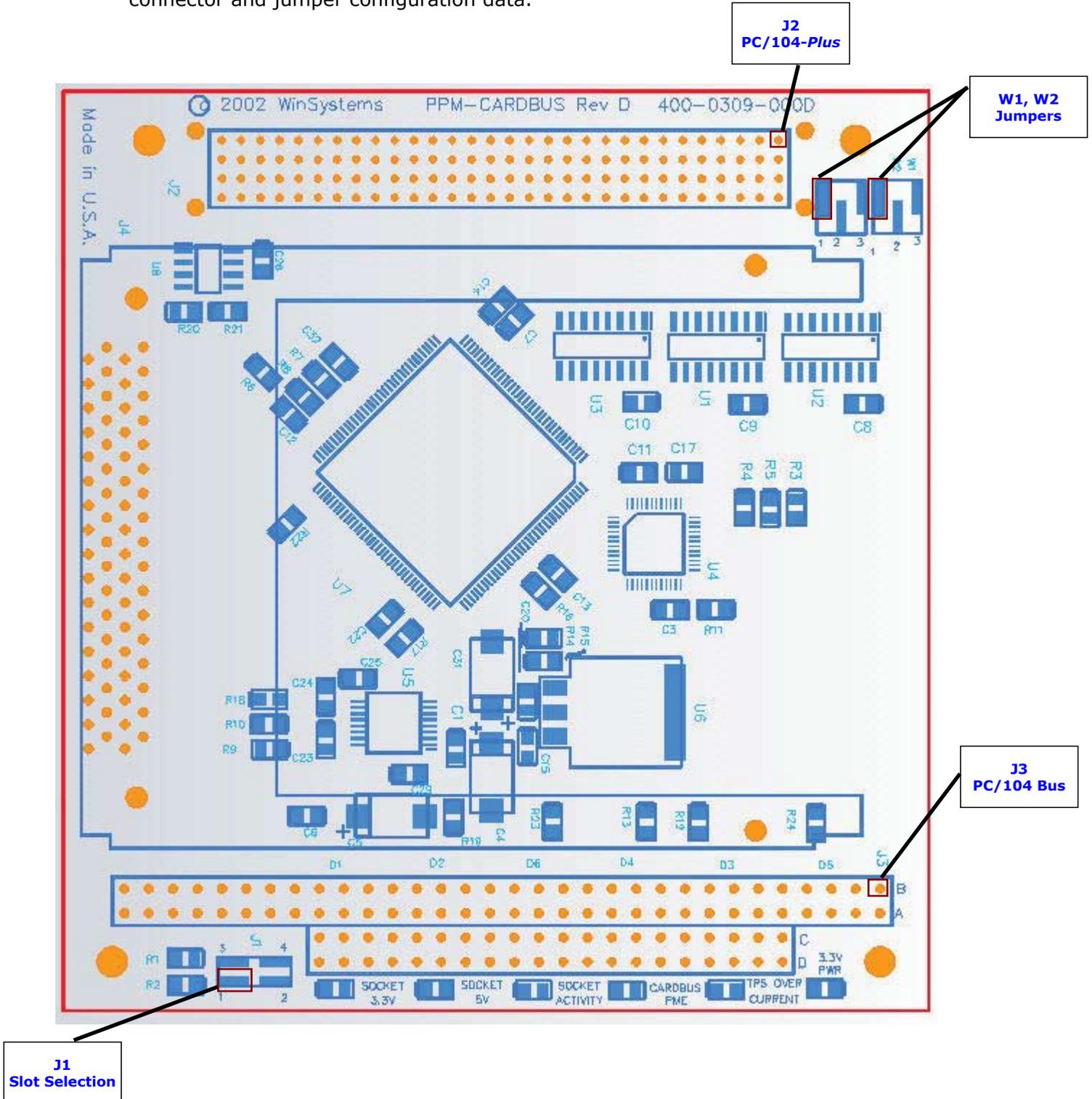
**J2
PC/104-*Plus***

**W1, W2
Jumpers**

**J3
PC/104 Bus**

**J1
Slot Selection**

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

Introduction

This manual is intended to provide the necessary information regarding configuration and usage of the PPM-CARDBUS adapter. WinSystems maintains a Technical Support Group to help answer questions regarding usage or programming of the board. For answers to 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).

General Information

Features

PC Card/Cardbus
- One 32-bit PC/104-*Plus* Adapter (PCI1510)
- Plug-and-Play and Auto Configuration Support
- Supports 3.3V/5V PC Cards

Data Transmit Rate
- Up to 33 MHz of PCI Performance
- Burst Transfer support maximizes throughput

Power
- +5V @ 25 mA (PC-Card uninstalled) required

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

Form Factor
- PC/104-*Plus*-compliant
- 3.60 in x 3.80 in (90 mm x 96 mm)

WinSystems' PPM-CARDBUS is a PC/104-*Plus* module that supports both Cardbus and PCMCIA cards. Its purpose is to allow expansion of additional functions such as 802.11 (a/g/b) wireless networking, IEEE-1394 Firewire, USB 2.0, SCSI, high-speed Ethernet and other high-performance functions that have been developed for mobile computing environments. Cardbus supports 32-bit PC Cards operating at bus speeds up to 33MHz.

The PPM-CARDBUS module supports either 32-bit PC cards operating at bus speeds up to 33 MHz or 16-bit PCMCIA cards. An on-board regulator generates 3.3V required by some cards. It automatically detects and switches the correct voltage to the socket.
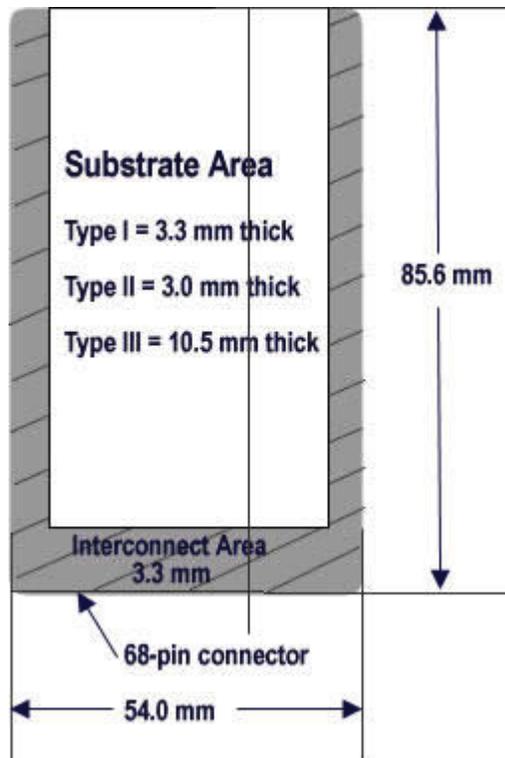
Software Support

Normally, cardbus cards are automatically recognized by operating systems such as Windows XP. Also, the individual PC card manufacturer will have drivers either with their card or at their website. Contact them directly for specific operating systems that they support. WinSystems does not offer technical support for direct programming of the PCI1510 controller.

Functional Capability

PC Card Overview

PC Cards are credit card size peripherals that add memory, mass storage, and I/O capabilities to computers in a rugged, compact form factor. There are three (3) types of PC Cards that all measure the same length and width, and use the same 68-pin connector. The standard length is 85.6 mm (3.370") and standard width is 54.0 mm (2.126"). The card types differ only in thickness which measures 3.3, 5.0 and 10.5 mm for Type I, Type II and Type III cards, respectively. Because they differ only in thickness, a thinner card can be used in a thicker slot, but a thicker card cannot be used in a thinner slot.

Substrate Area

Type I = 3.3 mm thick

Type II = 3.0 mm thick

Type III = 10.5 mm thick

85.6 mm

Interconnect Area
3.3 mm

68-pin connector

54.0 mm

The term *PC card* can be used as a generic term to refer to both existing 16-bit cards, as well as the new 32-bit Cardbus PC Cards. The PPM-CARDBUS will accept both 16-bit and 32-bit cards.

There are a variety of cards available on the market with many different I/O functions. A partial list of card functions include:

Flash Memory Card	Cellular Phone Interface
Ethernet LAN Adapters	GPS (Global Positioning System)
Hard Drives	Wireless LAN Adapters
ISDN Card	Memory Cards - Flash, SRAM and many others
Modem and Ethernet Combination Cards	Radio LAN Adapters
SCSI Adapters	Token Ring LAN Adapter Cards
Video Capture/Frame Grabber Cards	USB Controller
1394 Firewire controller	

Type I through Type II cards have features that fit the needs of different applications. Type I PC cards typically are used for memory devices such as RAM, Flash, OTP and SRAM cards. Type II PC Cards are mainly used for I/O devices such as data/fax modems, LANs, wireless and mass storage devices. Type III PC Cards are used for devices whose components are thicker, such as rotating mass storage devices. These cards can be extended length cards to allow the addition of components that must remain outside the system for proper operation, such as antennas for wireless applications.

For more information about PC cards, go to http://www.pcmcia.org. PCMCIA (Personal Computer Memory Card International Association) is an international standards body and trade association with over 200 member companies. It was founded in 1989 to establish trade standards for integrated circuit cards and to promote interchangeability among mobile computers where ruggedness, low power, and small size are critical factors. Their website addresses cardbus and PC card technical specifications and provides technology overviews, a resource guide, and bookstore.

Cardbus

Cardbus is a 32-bit high performance bus-mastering architecture for PC cards. It is a method to add high-bandwidth capabilities to the PC card technology and to match the system performance achieved by PC/104-*Plus* bus-based embedded computers. The PPM-CARDBUS has both a 16-bit PC/104 and a 32-bit PC/104-*Plus* interface and connector. PC/104 is the ISA bus and PC/104-*Plus* is the PCI bus for I/O functions requiring higher data transfer speeds.

The Cardbus resource configuration architecture allows reallocation of system resources whenever cards are added to or removed from a system at boot time or dynamically during runtime. This is achieved through an enhanced version of the PC card standard card and socket services software interface.

Because it shares its protocol and performance level with PCI, exchanging information between PCI and Cardbus is very efficient. The Cardbus hot-insertion and PnP capabilities allow a Cardbus card-resident device to be treated as a normal PCI device for the purposes of configuration and usage, with the added benefit that cardbus devices can be added to or removed from the system at will.

Cardbus vs. PC Card

PC Card-16 cards use an 8-bit or 16-bit interface that operates at ISA bus speeds (8 MHz) using an ISA-like asynchronous protocol. In contrast, Cardbus provides a 32-bit multiplexed address/data path, which operates at PCI local-bus speeds of up to 33 MHz that yields a peak bandwidth of 132 MB/sec. Besides supporting a PCI-like data rate, Cardbus devices are capable of acting as system bus masters. They can assume control of the system bus to effect data transfers. This capability contrasts with PC Card 16-devices that can only act as slaves to system resident master devices.

Cardbus Controller

A Texas Instrument PCI1510 PCI to Cardbus controller supports a single PC card socket compliant with the PC Card Standard (rev 7.2). It retains compatibility with the 16-bit PC Card specification as well as the 32-bit PC Card (Cardbus). It is capable of full 32-bit transfers at 33 MHz.

The PCI1510 is register compatible with the Intel 82365SL-DF and 82365SL ExCA controllers. The PCI1510's internal data path logic allows the host to access 8-, 16- and 32-bit PCI cycles for maximum performance. Independent buffering plus pipeline architecture provides an unsurpassed performance level with sustained bursting.

To obtain a detailed datasheet, go to the Texas Instruments website (http://www.ti.com). For more information see the PCI1510 Manual.

Please note that WinSystems does not offer technical support for direct programming of the PCI1510 controller. This support must be obtained from either Texas Instruments, from the supplier of the PC Card or from the operating system/real-time OS vendor.

Interrupts
Interrupts are a way for the controller to let the microprocessor know that a PC card requires service. The PCI1510 provides several interrupt schemes for card status change or functional interrupts. The **J1** slot jumper routes the PCI interrupts appropriately at the PC/104-*Plus* connector.

For a detailed discussion plus register definitions, please refer to the TI PCI1510 technical data manual. However, modern driver software provided by the PC card manufacturer should not require any additional programming by the user.

A few of the older PC cards may require parallel IRQ interrupt support. If this is an issue, contact a WinSystems' factory application engineer.

EEPROM Data Storage

An on-board EEPROM is used to load and store subsystem identification infromation and selected register defaults. When the PC/104-*Plus* (PCI) bus is reset and the serial bus is detected, the PCI1510 will read the serial EEPROM data. This information is preloaded at the factory and should not need to be reprogrammed.

Power Interface

The PPM-CARDBUS is a +5V only board. It contains an on-board 3.3V linear regulator capable of supplying up to 1A. A red 3.3V power LED will illuminate to visually show that the power source is operational. The PPM-CARDBUS is not wired to the 3.3V pin on the PC/104-*Plus* connector.

These two voltages are sufficient for most all PC cards. However, a switched +12V is available at the Cardbus connector for use by PC cards as a programming voltage. The +12V source is wired from the PC/104-*Plus* or PC/104 connector and is not generated on-board by the PPM-CARDBUS.

The board automatically detects and switches the correct power to the PC card.

Parallel Power Switch Interface

The PPM-CARDBUS uses a TI TPS2211A integrated power management device to control a single PC card socket. All of the discrete MOSFETs, logic section, current limiting and thermal protection for a PC card are contained on this chip. The circuit allows the distribution of +3.3V, +5V and/or +12V card power. The current limiting feature eliminates the need for fuses. More information can be found on the TPS2211A Datasheet.

The TPS2211A automatically detects and switches the required +5V or +3.3V to the PC card. A green light emitting diode (LED) will illuminate indicating the presence of +3.3V (SOCKET 3.3V) and a red LED will illuminate indicating the presence of +5V (SOCKET 5V). When +5V are present, the SOCKET 3.3V LED will also be illuminated.

The TPS2211A inputs and outputs are designed with ESD protection circuitry to withstand a 2 kV human body discharge as defined in MIL-STD-883C, Method 3105.

Live Insertion

The TPS2211A supports break before make switching so that PC cards can be inserted into the PPM-CARDBUS module while system power is on.

Overcurrent Protection

Overcurrent sensing is provided for each output voltage separately. When an overcurrent condition is detected, only the power output affected is limited; all other power outputs will continue to function normally. Current limit reporting helps users isolate a system fault to a PC card or connector. A red LED will illuminate if the TPS2211A detects an overcurrent condition. It is labeled TPS OVERCURRENT.

Socket Activity Indicator

A SOCKET ACTIVITY LED is provided to indicate when the PC card is being accessed. It is pulsed for 64 ms. It flashes when a card is inserted in the socket, powered and not in reset and is being accessed. The red socket activity LED is located at the edge of the board and next to the PC/104 connector.

There is also a yellow LED to provide a visual status of a Power Management Event. It is labeled CARDBUS PME.

PC/104 Mounting Holes

There are four plated through holes for PC/104 mounting. These holes are tied to the ground plane inside the printed circuit board.

W1 and W2 Jumpers

On revisions A and B of the PPM-CARDBUS, there are two jumper blocks labeled **W1** and **W2**. They support routing signals to the interrupt deserializer which is not needed for most PC card applications. Therefore this device has not been populated on the board. However, it requires that **W1** have a jumper (or 0Ω resistor) from pins 2 or 3. **W2** does not require a jumper to be installed.

Visual Index

W1, W2

1	2	3
o	o	o
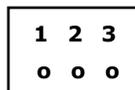
PC/104 Bus Interface

There is also a PC/104 bus connector, located at **J3** on the board that supplies +5V, +12V and ground. The control and data signals are passed through the connector to allow additional PC/104 modules on a stack. These signals are not used on the PPM-CARDBUS. Refer to the PC/104 Bus Specification for specific signal and mechanical specifications.

J3

GND	**D0 o o C0**	GND	IOCHK#	**A1 o o B1**	GND
MEMCS16#	**D1 o o C1**	SBHE#	SD7	**A2 o o B2**	RESET
IOCS16#	**D2 o o C2**	LA23	SD6	**A3 o o B2**	+5V
IRQ10	**D3 o o C3**	LA22	SD5	**A4 o o B4**	IRQ9
IRQ11	**D4 o o C4**	LA21	SD4	**A5 o o B5**	-5V
IRQ12	**D5 o o C5**	LA20	SD3	**A6 o o B6**	DRQ2
IRQ15	**D6 o o C6**	LA19	SD2	**A7 o o B7**	-12V
IRQ14	**D7 o o C7**	LA18	SD1	**A8 o o B8**	SRDY#
DACK0#	**D8 o o C8**	LA17	SD0	**A9 o o B9**	+12V
DRQ0	**D9 o o C9**	MEMR#	IOCHRDY	**A10 o o B10**	KEY
DACK5#	**D10 o o C10**	MEMW#	AEN	**A11 o o B11**	SMEMW#
DRQ5	**D11 o o C11**	SD8	SA19	**A12 o o B12**	SMEMR#
DACK6#	**D12 o o C12**	SD9	SA18	**A13 o o B13**	IOW#
DRQ6	**D13 o o C13**	SD10	SA17	**A14 o o B14**	IOR#
DACK7#	**D14 o o C14**	SD11	SA16	**A15 o o B15**	DACK3#
DRQ7	**D15 o o C15**	SD12	SA15	**A16 o o B16**	DRQ3
+5V	**D16 o o C16**	SD13	SA14	**A17 o o B17**	DACK1#
MASTER#	**D17 o o C17**	SD14	SA13	**A18 o o B18**	DRQ1
GND	**D18 o o C18**	SD15	SA12	**A19 o o B19**	REFRESH#
GND	**D19 o o C19**	KEY	SA11	**A20 o o B20**	BCLK
			SA10	**A21 o o B21**	IRQ7
			SA9	**A22 o o B22**	IRQ6
			SA8	**A23 o o B23**	IRQ5
			SA7	**A24 o o B24**	IRQ4
			SA6	**A25 o o B25**	IRQ3
			SA5	**A26 o o B26**	DACK2#
			SA4	**A27 o o B27**	TC
			SA3	**A28 o o B28**	BALE
			SA2	**A29 o o B29**	+5V
			SA1	**A30 o o B30**	OSC
			SA0	**A31 o o B31**	GND
			GND	**A32 o o 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.

PC/104-*Plus* Bus Interface

The PPM-CARDBUS provides 32-bit of addressing and data, as well as the complete control interface to operate on the PC/104-*Plus* BUS. The PPM-CARDBUS PCI1510 controller has a PCI bus master interface and is compliant with the PCI Bus Specification.

Multiple PPM-CARDBUS modules can be installed and supported on a single PC/104-*Plus* stack. There is a jumper block (**J1**) that selects the modules slot position. **J2** is the PC/104-*Plus* bus connector. The pin definitions for this connector as shown here for reference. Refer to the PC/104-*Plus* Bus Specification for signal definitions, timing and mechanical details.
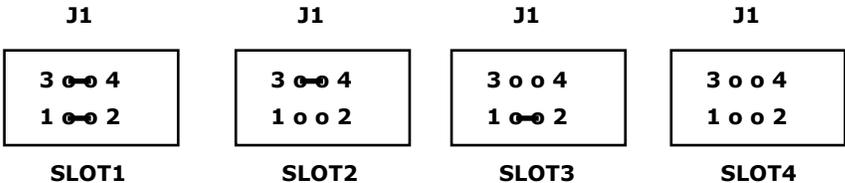
Pin	A	B	C	D
1	GND	RESERVED	+5	AD00
2	VI/O	AD02	AD01	+5V
3	AD05	GND	AD04	AD03
4	C/BE0#	AD07	GND	AD06
5	GND	AD09	AD08	GND
6	AD11	VI/O	AD10	M66EN
7	AD14	AD13	GND	AD12
8	+3.3V	C/BE1#	AD15	+3.3V
9	SERR#	GND	RESERVED	PAR
10	GND	PERR#	+3.3V	RESERVED
11	STOP#	+3.3V	LOCK#	GND
12	+3.3V	TRDY#	GND	DEVSEL#
13	FRAME#	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

Note: 1. The shaded area denotes power or ground signals.

### Slot Selection Jumper Header (J1)

J1 is used to select the slot number of the PC/104-*Plus* (PCI) connection for the board. Each PC/104-*Plus* board installed in a system must have a unique slot assignment and must not conflict with any other slot. The jumper assignents for **J1** are as follows:

J1	J1	J1	J1
3 o—o 4	3 o—o 4	3 o o 4	3 o o 4
1 o—o 2	1 o o 2	1 o—o 2	1 o o 2
SLOT1	**SLOT2**	**SLOT3**	**SLOT4**

Jumper Reference

Drawings Only - for more detailed information on these parts, refer to the descriptions shown previously in this manual.
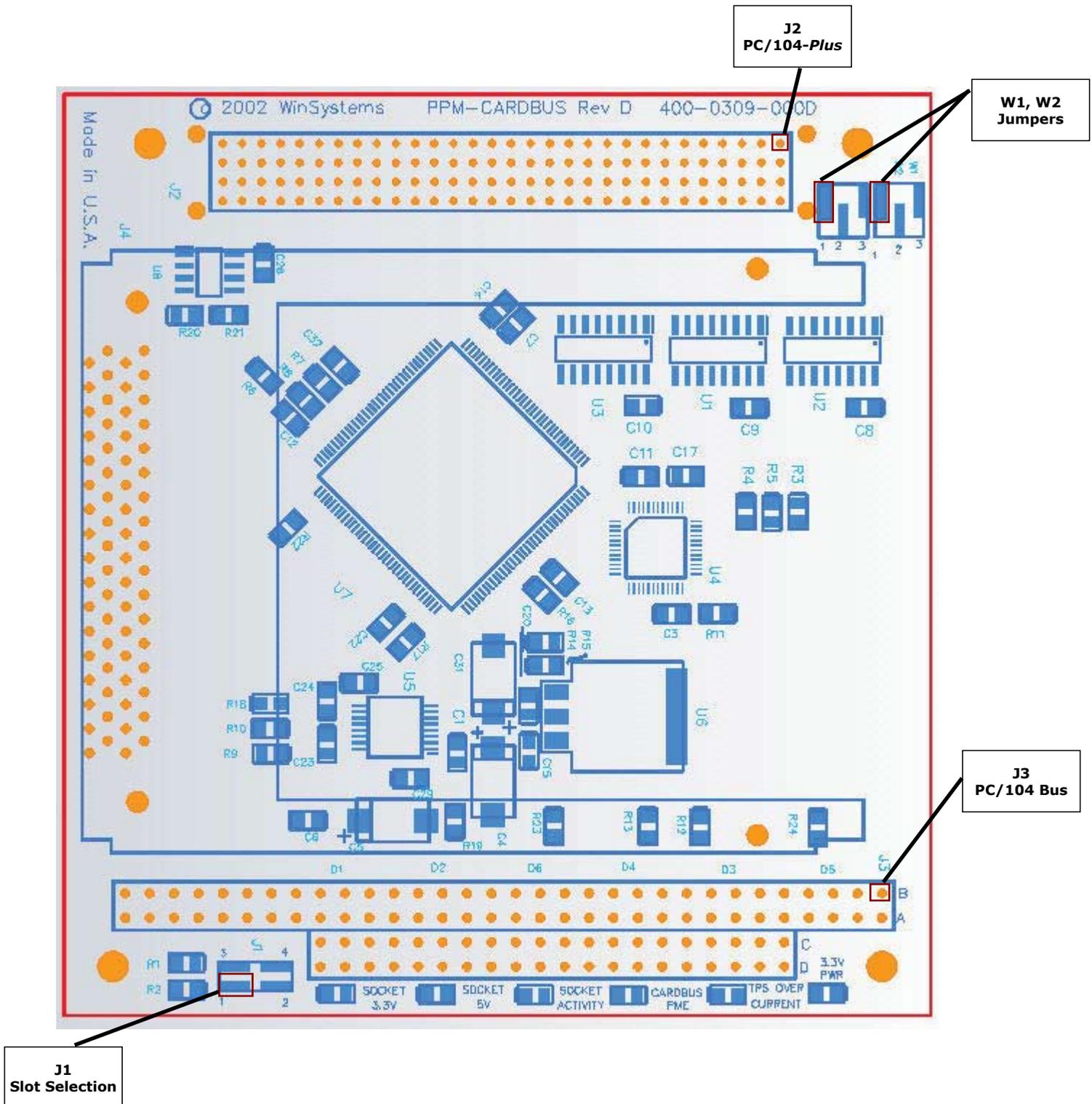
J2
PC/104-*Plus*

W1, W2
Jumpers

J3
PC/104 Bus

J1
Slot Selection

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

Specifications

Electrical
    VCC   :+5V ±5% @ 25 mA typical (without a PC card installed)
                              :+12V ±5% @ TBD mA
                              (Note that this voltage is only required bya few PC Cards. Refer to the manufacturer's datasheet and specifications.)

Mechanical
    Dimensions   : 3.6" x 3.8" (90 mm x 96 mm)
    Weight   : 3.5 oz (With no card in socket)

Connectors

    Cardbus   :68-pin PC card
    PC/104 Bus   :16-bit stackthrough
    PC/104-*Plus*   :120-pin (4x30; 2 mm) stackthrough with shrouded header

Environmental
    Operating Temperature   :-40°C to +85°C
    Noncondensing relative
     Humidity   : 5% to 95%

WARRANTY REPAIR INFORMATION

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

WARRANTY

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2.   You must send the product postage prepaid and insured. You must enclose the products in an anti-static bag to protect from damage by static electricity. WinSystems is not responsible for damage to the product due to static electricity.