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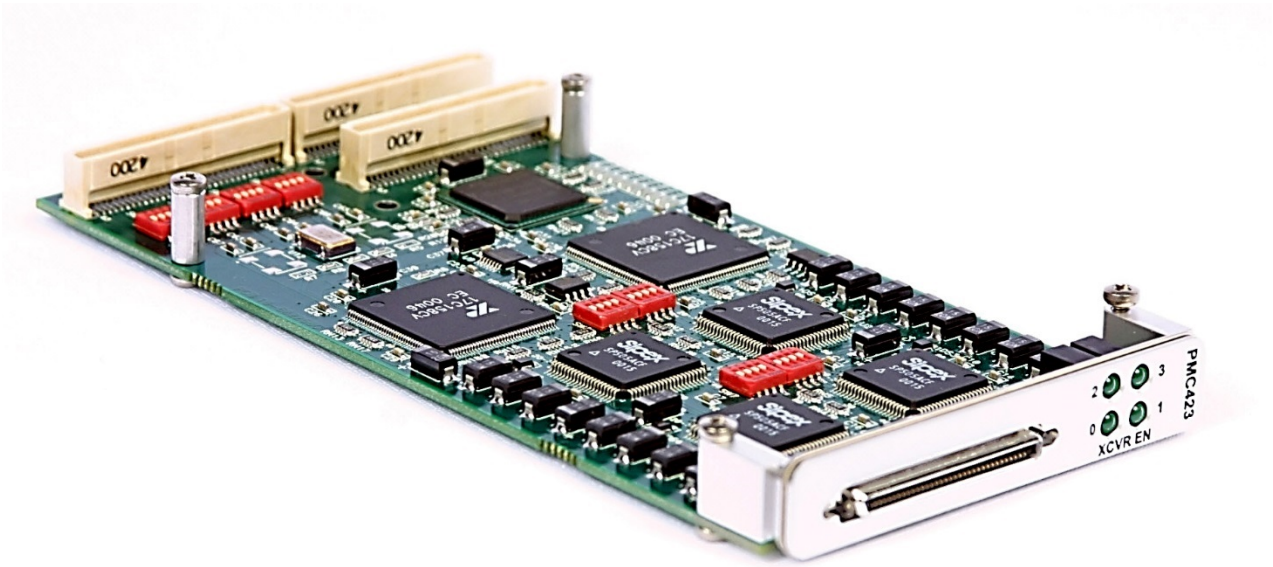
Find the *Abaco Systems / Ramix PMC423* at our website: *Click HERE*

Hardware Reference Manual

PMC423* Port Serial, Front/Rear I/O

THE PMC423 IS DESIGNED TO MEET THE EUROPEAN UNION (EU) RESTRICTIONS OF HAZARDOUS SUBSTANCE (ROHS) DIRECTIVE (2002/95/EC) CURRENT REVISION.

Publication No. RX-URMH 006 Rev. E.0



abaco SYSTEMS

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Document History

Revision	Date	Description
C.0	July 2011	Hardware Reference Manual
D.0	October 2016	Reformatted
E.0	December 2016	Corrected error in Table 1 per ECO 28084

Waste Electrical and Electronic Equipment (WEEE) Returns



Abaco Systems is registered with an approved Producer Compliance Scheme (PCS) and, subject to suitable contractual arrangements being in place, will ensure WEEE is processed in accordance with the requirements of the WEEE Directive.

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About This Manual

Conventions

Notices

This manual may use the following types of notice:



WARNING

Warnings alert you to the risk of severe personal injury.



CAUTION

Cautions alert you to system danger or loss of data.



NOTE

Notes call attention to important features or instructions.



TIP

Tips give guidance on procedures that may be tackled in a number of ways.



LINK

Links take you to other documents or websites.

Numbers

All numbers are expressed in decimal, except addresses and memory or register data, which are expressed in hexadecimal. Where confusion may occur, decimal numbers have a “D” subscript and binary numbers have a “b” subscript. The prefix “0x” shows a hexadecimal number, following the ‘C’ programming language convention. Thus:

One dozen = 12_D = 0x0C = 1100_b

The multipliers “k”, “M” and “G” have their conventional scientific and engineering meanings of $x10^3$, $x10^6$ and $x10^9$, respectively, and can be used to define a transfer rate. The only exception to this is in the description of the size of memory areas, when “K”, “M” and “G” mean $x2^{10}$, $x2^{20}$ and $x2^{30}$ respectively.

In PowerPC terminology, multiple bit fields are numbered from 0 to n where 0 is the MSB and n is the LSB. PCI terminology follows the more familiar convention that bit 0 is the LSB and n is the MSB.

Text

Signal names ending with a tilde (“~”) denote active low signals; all other signals are active high. “N” and “P” denote the low and high components of a differential signal respectively.

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Additional Notes

Introduction

The PMC423* is a versatile sixteen port serial controller in PCI Mezzanine Card (PMC) format. Signaling characteristics of each port can be controlled for RS232, RS422 or RS485 operations. The signaling protocol configuration is per four channels, providing four independent configuration settings. The serial interfaces are implemented using an Octal UART. This combines compatibility with the most commonly used components (16C550 compatible register set), with full support of PCI attributes (e.g., 32-bit data transfers) for increased performance. This allows rapid integration to legacy systems, while providing an evolutionary path for enhanced software to improve performance.

Product Features

The PMC423 is a powerful and flexible method to integrate serial data channels to a PCI system. Features include:

- Sixteen independent serial channels
- Programmable baud rate from 100-bits/second to 921.6Kbits/s (*with default Crystal at 14.7456 MHz)
- UART register sets compatible with 16C550
- 64 Byte First-in/First-out (FIFO) per channel
- Full PCI compatibility (32-bit/33 and 66 MHz PCI capable)
- Signaling characteristics of each channel pair (RS232/RS422/RS485) configured with software
- Two Input/Output (I/O) routings:
    - Sixteen ports front connection
    - Sixteen ports rear (J4) connection

NOTE

*Customer may specify the speed of the Crystal.

Software Support

Abaco provides full software support for all of the popular software environments (e.g., VxWorks®, LynxOS®, Windows NT®, Solaris™). Each driver has been developed specifically for the real-time data acquisition market.

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Safety Summary

The following general safety precautions must be observed during all phases of the operation, service and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of this product.

Abaco assumes no liability for the customer's failure to comply with these requirements.

Ground the System

To minimize shock hazard, the chassis and system cabinet must be connected to an electrical ground. A three-conductor AC power cable should be used. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adapter with the grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet.

Do Not Operate in an Explosive Atmosphere

Do not operate the system in the presence of flammable gases or fumes. Operation of any electrical system in such an environment constitutes a definite safety hazard.

Keep Away from Live Circuits

Operating personnel must not remove product covers. Component replacement and internal adjustments must be made by qualified maintenance personnel. Do not replace components with power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

Do Not Service or Adjust Alone

Do not attempt internal service or adjustment unless another person capable of rendering first aid and resuscitation is present.

Do Not Substitute Parts or Modify System

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the product. Return the product to Abaco for service and repair to ensure that safety features are maintained.

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1 • Handling and Installation

1.1 Handling Precautions

CAUTION

Handle the board by the edges or front panel only.



Electronic assemblies use devices that are sensitive to static discharge. Some of the components assembled on Abaco Systems products may be sensitive to electrostatic discharge and damage may occur on boards that are subjected to a high energy electrostatic field. Observe anti-static procedures when handling these boards. All products should be in an anti-static plastic bag or conductive foam for storage or shipment. Work at an approved anti-static workstation when unpacking boards. When the board is placed on a bench for configuring, etc., it is suggested that conductive material be inserted under the board to provide a conductive shunt. Unused boards should be stored in the same protective boxes in which they were shipped.

1.2 Unpacking Procedures

Any precautions found in the shipping container should be observed. All items should be carefully unpacked and thoroughly inspected for damage that might have occurred during shipment. The board(s) should be checked for broken components, damaged printed circuit board(s), heat damage and other visible contamination. All claims arising from shipping damage should be filed with the carrier and a complete report sent to Abaco Technical Support.

Remove the PMC423 from the shipping box and anti-static packaging. Verify that it is not damaged and that all items are present by referring to the packing list.

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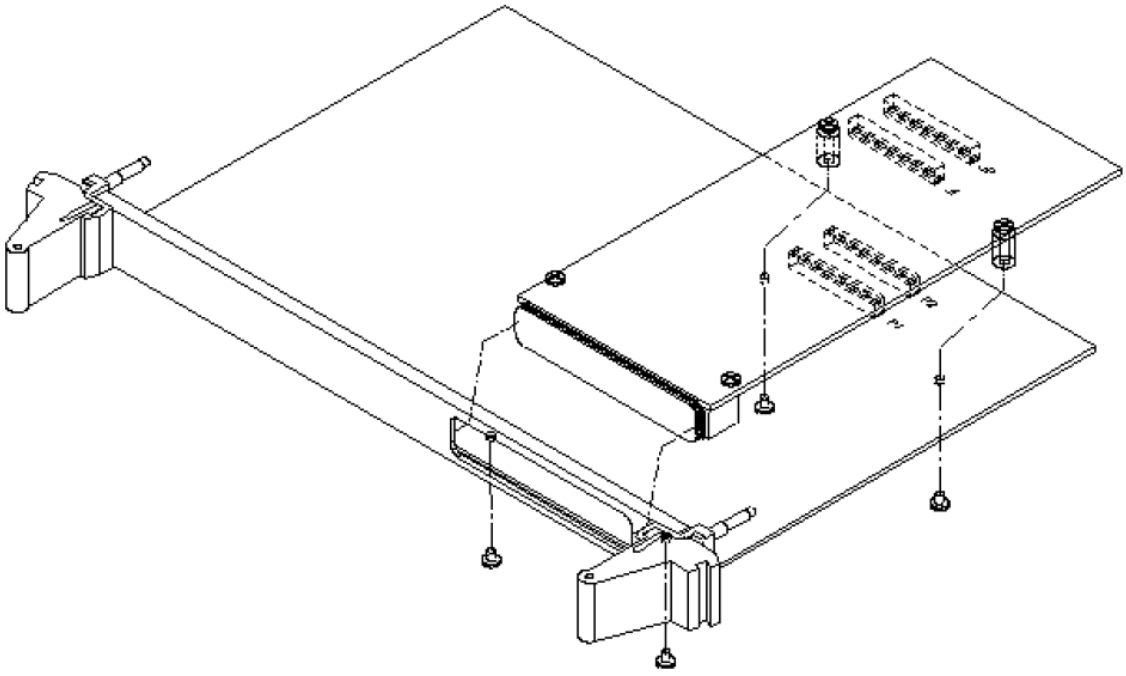
1.3 Installation

The PMC module is now ready for installation. Installation is done generically as with the commercial versions of the card. Follow any specific procedures recommended by the manufacturer of the chassis used. Perform the following steps:

1. Turn all system power OFF.
2. Remove the host board from the chassis (if currently installed).
3. Locate the PMC connectors on the host board.
4. Carefully plug the PMC module into the mating connectors on the host's printed circuit board.
5. Make sure the PMC module is seated properly into the common mezzanine card (CMC) connectors on the host.
6. Use screws to fasten PMC to the host CMC.
7. Remove the four screws from the bottom of the stand-offs of the PMC.
8. Lineup the J1 and J2 connectors on the host CMC to the J1 and J2 connectors on the PMC.
9. Ensure all connectors are properly aligned before pushing the connectors together.
10. Use the four screws to connect the PMC stand-offs to the host CMC.
11. The chassis may now be powered up.

Refer to Figure 1-1 below:

Figure 1-1 Installation of PMC Module

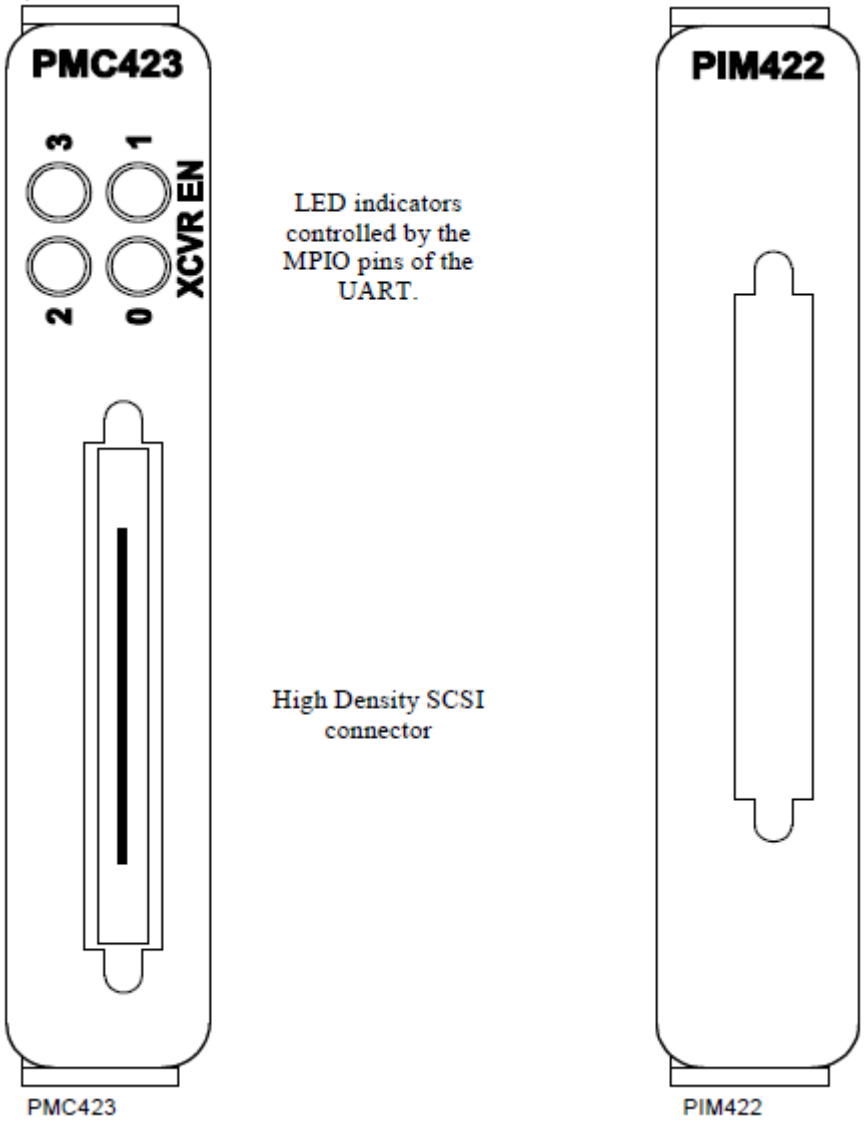


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1.4 Front Panel Connectors and Indicators

The front panel connector is a high-density, small computer system interface (SCSI) female connector, AMP part number AMP-796055-1.

Figure 1-2 Front Panel Connectors and Indicator

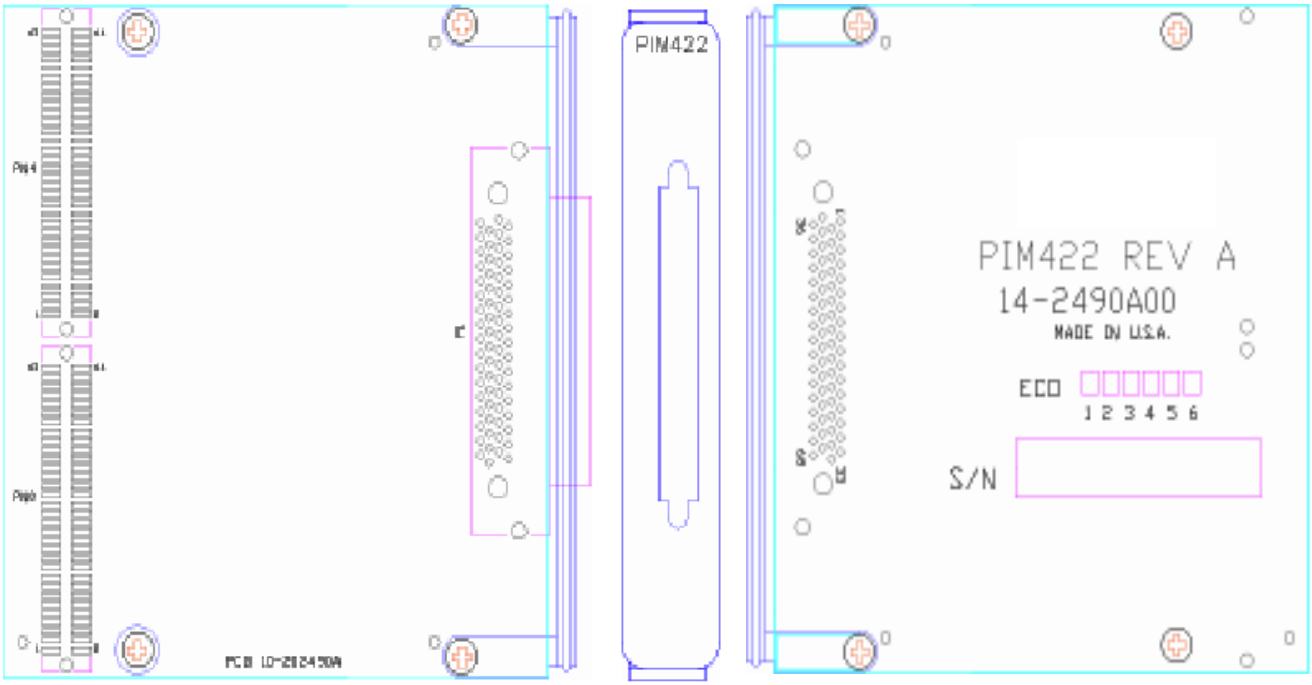


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Figure 1-3 PIM422

TOP

BOTTOM



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1.5 I/O Signal Pinouts

Each serial port has two control signals:

- TX - Transmitted Data
- RX - Received Data

To support differential signaling standards (e.g., RS422), each signal has a positive and negative line. When using a single ended standard (e.g., RS232), use the negative version.

All I/O signals are available both at the front panel connector and on the J4 “backplane” connector. The following table details all connections.

Table 1-1 I/O Signal Pinouts PMC423

Port	Signal	Front Panel Pin		J4 Pin	
		Positive	Negative	Positive	Negative
1	RX	2	1	2	1
	TX	4	3	4	3
2	RX	6	5	6	5
	TX	8	7	8	7
3	RX	11	10	10	9
	TX	13	12	12	11
4	RX	15	14	14	13
	TX	17	16	16	15
5	RX	19	18	18	17
	TX	21	20	20	19
6	RX	23	22	22	21
	TX	25	24	24	23
7	RX	28	26	26	25
	TX	30	29	28	27
8	RX	32	31	30	29
	TX	34	33	32	31
9	RX	36	35	34	33
	TX	38	37	36	35
10	RX	40	39	38	37
	TX	42	41	40	39
11	RX	45	44	42	41
	TX	47	46	44	43
12	RX	49	48	46	45
	TX	51	50	48	47

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Port	Signal	Front Panel Pin		J4 Pin	
		Positive	Negative	Positive	Negative
13	RX	53	52	50	49
	TX	55	54	52	51
14	RX	57	56	54	53
	TX	59	58	56	55
15	RX	62	60	58	57
	TX	64	63	60	59
16	RX	66	65	62	61
	TX	68	67	64	63



NOTE

Ground is available on the front panel connector on pins 9, 27, 43 and 61.

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1.5.1 RS485 Support (SW2-SW12)

These switches are used when running a port in RS485 signaling mode. When running RS485 (half duplex), the three switches associated with the port should be ***Closed***. In all other signaling modes, the switches should be ***Open*** (see table below for port/switch position assignments).



NOTE

The use of RS485 requires use of the correct software interface. Consult the driver manual for the operating system used for details.

As shipped from factory, all switches are in the Open state.

Table 1-2 RS485 Support Switches (SW2-SW12)

Port			
1	SW1:1	SW2:1	SW9:1
2	SW1:2	SW2:2	SW9:2
3	SW1:3	SW2:3	SW9:3
4	SW1:4	SW2:4	SW9:4
5	SW3:1	SW4:1	SW10:1
6	SW3:2	SW4:2	SW10:2
7	SW3:3	SW4:3	SW10:3
8	SW3:4	SW4:4	SW10:4
9	SW5:1	SW6:1	SW11:1
10	SW5:2	SW6:2	SW11:2
11	SW5:3	SW6:3	SW11:3
12	SW5:4	SW6:4	SW11:4
13	SW7:1	SW8:1	SW12:1
14	SW7:2	SW8:2	SW12:2
15	SW7:3	SW8:3	SW12:3
16	SW7:4	SW8:4	SW12:4

Where SW3:4 means Switch pack 4, switch 4, etc.

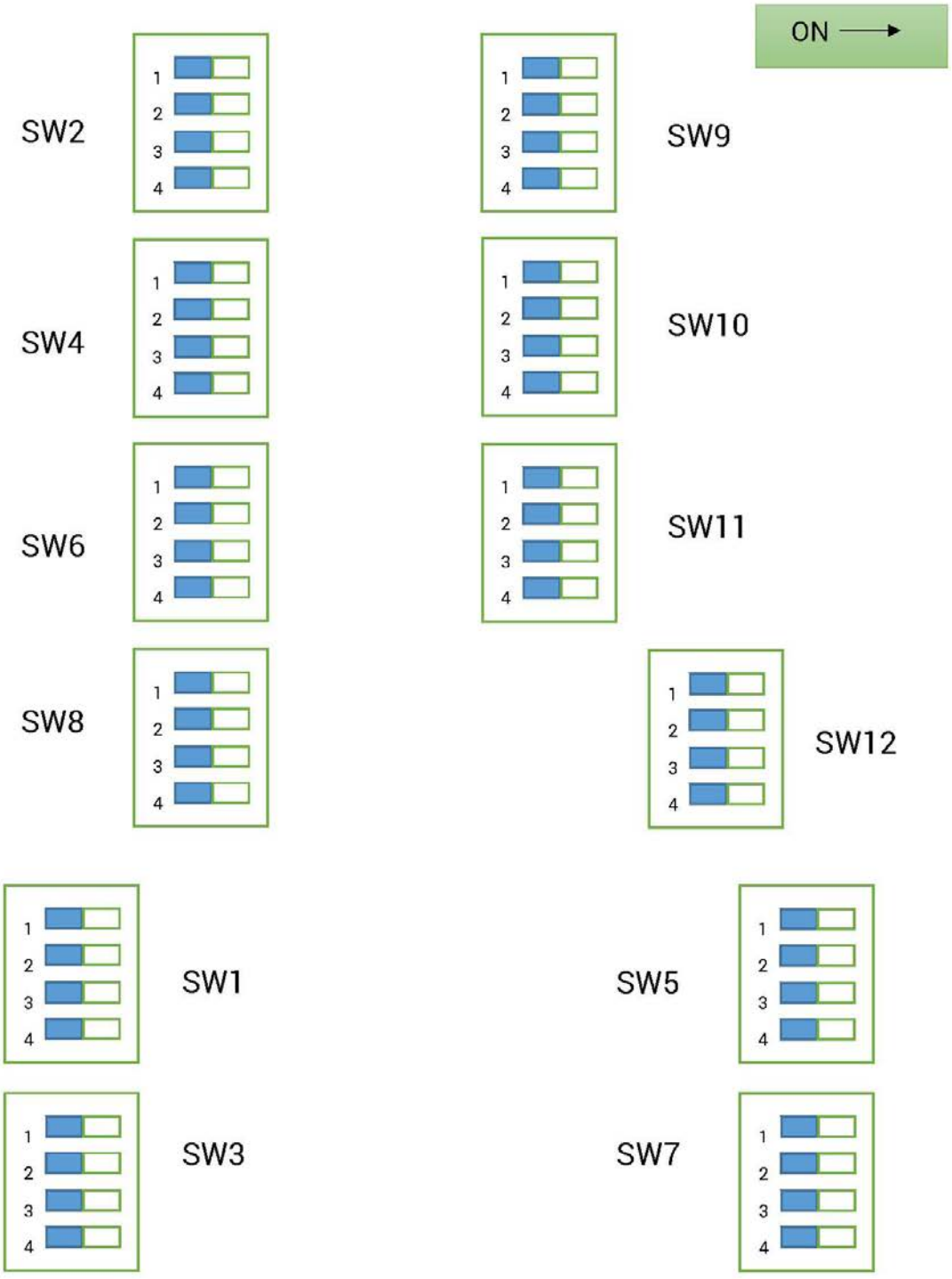


NOTE

The above applies to the Rev. D and later revisions of the board. For earlier revisions, please e-mail: support@abaco.com

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Figure 1-4 Default Switch Settings



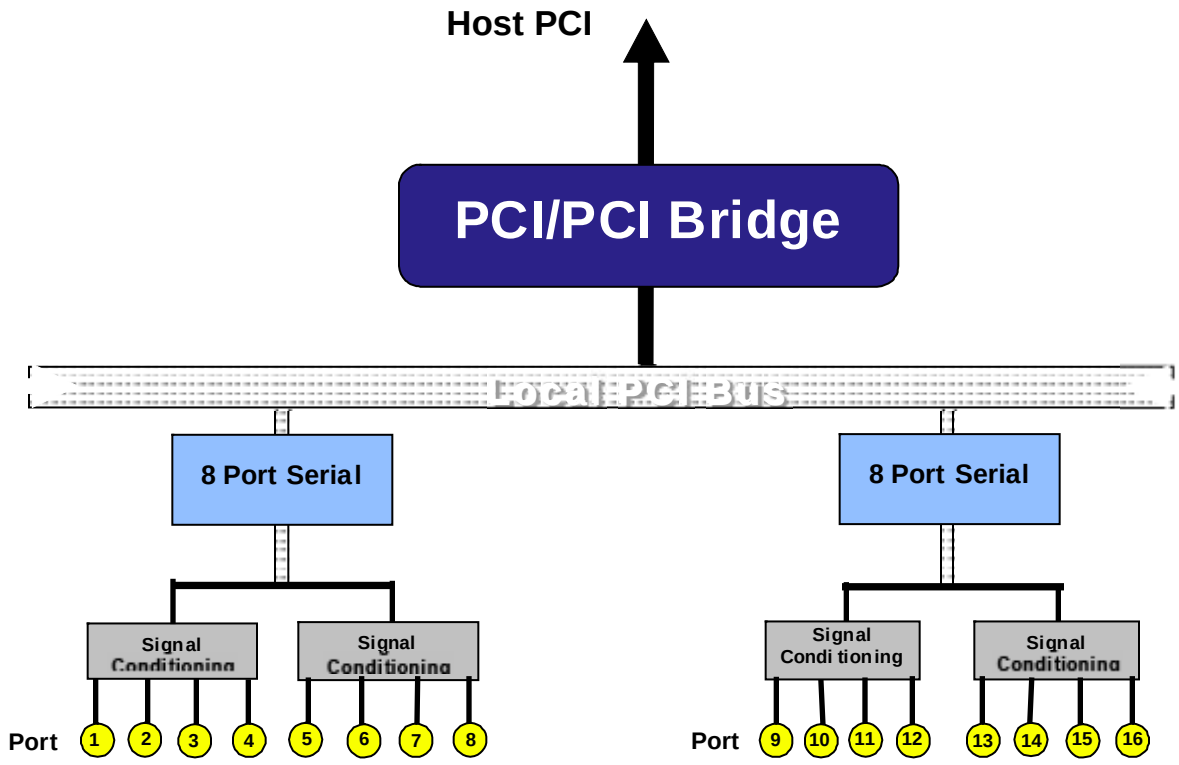
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2 • Theory of Operation

This chapter provides information for local device connections, the bridge to the host PCI and the general system's function. The design of the PMC423 is illustrated in the block diagram that follows.

2.1 PMC423 Block Diagram

Figure 2-1 PMC423 Block Diagram



The PMC423 can operate with the 32-bit 33/66-MHz PCI bus, +3.3 V or +5 V PCI signaling. This allows for the maximum flexibility for the different PCI bus speeds and signaling. The signaling level for the serial communication (RS232, RS422, etc.) is configured via the software. The card generates the necessary voltage for the serial signaling onboard using the +5 V supply. This allows the PMC423 to operate from the +3.3 V and +5 V supply only.

There are two eight-port serial devices that are after the PCI to PCI bridge for a total of sixteen ports. Due to the density of the serial ports, the hardware handshake signals have not been routed to the front or the rear of the card.

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The PMC423 is a flexible solution for integrating multiple serial I/O channels onto a Single Board Computer (SBC). Efficiently packaging sixteen channels onto a single PMC makes effective use of the few PMC locations available. Routing I/O to the rear (via the 'J4' connector to the host card) enhances flexibility in developing economical, and non-intrusive cabling solutions. Each serial port is implemented with an independent UART (Asynchronous Receiver and Transmitter) with a separate programmable baud rate. Accessing the UART controllers via PCI integrates more effectively to modern SBC implementations than proprietary or legacy devices.

Traditional UART controllers are limited to 8-bit access, incurring all bus protocol overhead for every character transferred (and control operations). The Octal UART utilized on the PMC423 supports 32-bit transfers, allowing four characters to be transferred in a single bus operation. Reducing programmed I/O operations is critical to achieving good performance in PCI systems.

While the extended transfer options offer an opportunity to maximize performance, in many cases, the first (and sometimes only) criteria are software development and integration. The 16C550 register set definition is in common usage for serial I/O devices in all environments. Maintaining compatibility with this de facto standard can markedly reduce the time required to integrate the PMC423 into existing software environments. Having the software integration based upon earlier drives reduces the risk of unexpected (and undesirable) changes in application interfaces, which can be critical when creating an evolutionary improvement of existing systems.

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