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MODELS
PCIe-COM-8SM, PCIe-COM-4SM, PCIe-COM485-8, PCIe-COM485-4, PCIe-COM422-8, PCIe-COM422-4

PCI Express Multi-Port, Multi-Protocol Low Profile Serial Communications Cards

USER MANUAL

FILE: MPCIe-COM-8SM.A1n

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Chapter 1: Introduction

The PCI Express Multiport Serial cards were designed for RS232, RS422 and RS485 asynchronous communications for use in a variety of applications. These boards were designed to offer compatibility with the PCI Express bus and to be used by system integrators and manufacturers in the design of industrial and commercial communication systems. The card is available in 8-port and 4-port versions and is compatible with all popular operating systems. Each COM port is capable of supporting data rates up to 3Mbps (460.8kbps in RS232 mode is standard) and implements full RS-232 modem control signals to ensure compatibility with a wide range of serial peripherals. Existing serial peripherals can connect directly to the industry standard DB9M connectors which are provided via an available cable. The board features a x1 lane PCI Express connector which can be used in any length PCI Express slot.

Features

- Eight- or four-port PCI Express serial communication cards
- Serial protocol (RS-232/422/485) SOFTWARE CONFIGURED per port, stored in EEPROM for auto-configure at next boot
- Low profile PCIe MD2 form factor can be used in standard *OR* Low Profile computers
- High performance 16C950 class UARTs with 128-byte FIFO for each TX and RX
- Very high speed card supports communication rates up to 3Mbps (standard model RS-232 is 460.8kbps)
- ESD protection +/-15kV on all signal pins
- Full modem control signals in RS-232 mode
- Software compatible with all operating systems
- Jumper selectable termination for RS-485 applications
- 3’ breakout cable available terminating with industry-standard DB9M connectors

Applications

- POS (Point-of-sale) Systems
- Gaming Machines
- Telecommunications
- Industrial Automation
- ATM (Automated Teller Machine) Systems
- Multiple terminal control
- Office Automation
- Kiosks

Functional Description

These cards feature high performance 16C950 class UARTs which support the complete register set of the standard 16C550-type devices. The UARTs support operations in 16C450, 16C550 and 16C950 modes. Each port is capable of data communication speeds up to 3Mbps (standard model up to 460.8kbps in RS-232 mode) in asynchronous mode and has 128-byte deep transmit and receive FIFOs to protect against lost data in multitasking operating systems, to help reduce CPU utilization and to improve data throughput.

The low profile MD2 form factor allows the card to be installed in small embedded systems. The card can be used in both a standard profile chassis or in a low profile chassis when used with the correct mounting bracket. Our PCI Express COM-8SM and -4SM cards ship with a standard height PCIe mounting bracket installed. This bracket also has threaded inserts above and below the VHDCI 68-pin connector to facilitate installation of the strengthening bracket accessory. The industrialized strengthening bracket accessory protects against damage to the very high density I/O card-mounted connector when side-to-side tension can occur on the breakout cable.

A crystal oscillator is located on the card. This oscillator permits precise selection of standard baud rates. Custom baud rates are available on request, please refer to the “Special Order” paragraph.

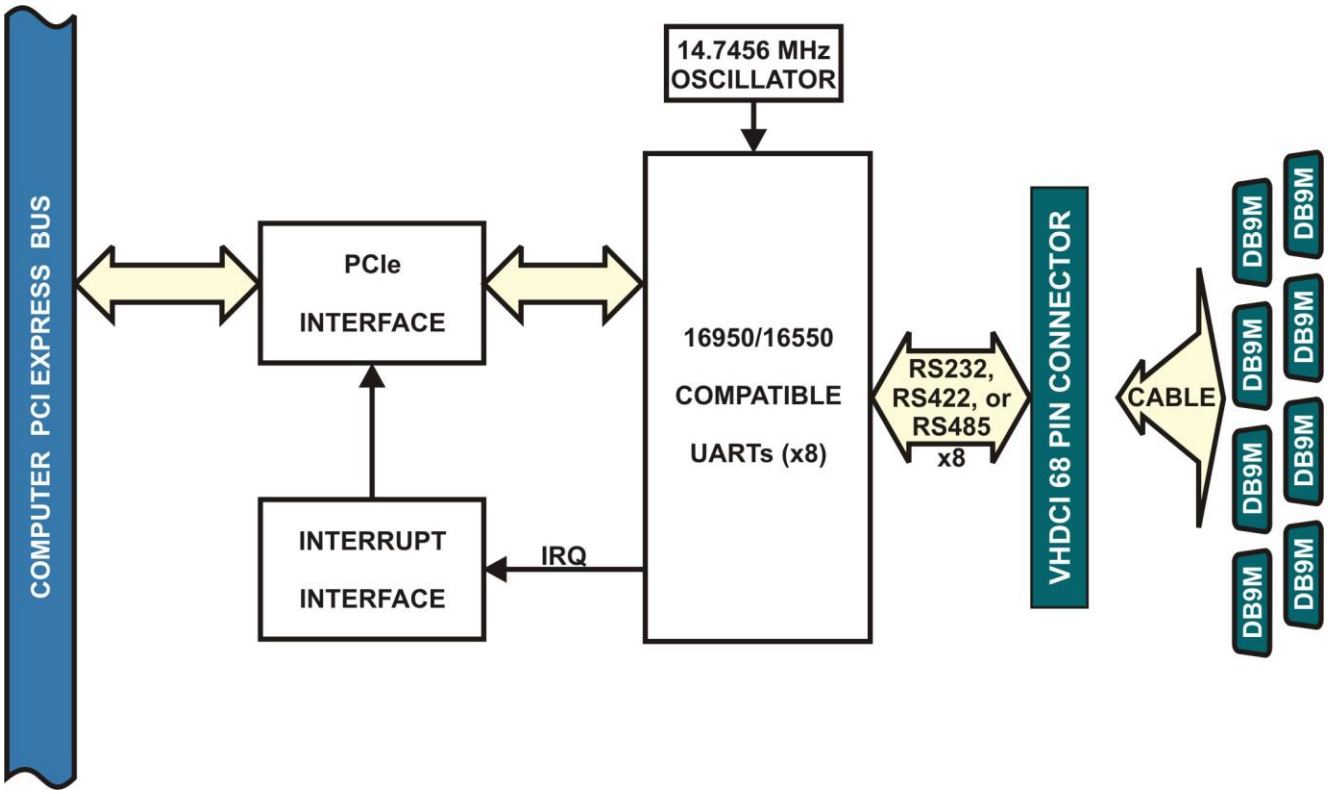


Figure 1-1: Block Diagram

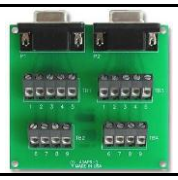
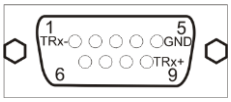
Ordering Guide

- PCIe-COM-8SM Eight-port RS-232/422/485 card with breakout cable
- PCIe-COM-8SMNC Eight-port RS-232/422/485 card without breakout cable
- PCIe-COM-4SM Four-port RS-232/422/485 card with breakout cable
- PCIe-COM-4SMNC Four-port RS-232/422/485 card without breakout cable
- PCIe-COM485-8 Eight-port 2-wire RS-485 card with breakout cable
- PCIe-COM485-8NC Eight-port 2-wire RS-485 card without breakout cable
- PCIe-COM485-4 Four-port 2-wire RS-485 card with breakout cable
- PCIe-COM485-4NC Four-port 2-wire RS-485 card without breakout cable
- PCIe-COM422-8 Eight-port RS-422 (or 4-wire 485) card with breakout cable
- PCIe-COM422-8NC Eight-port RS-422 (or 4-wire 485) card without breakout cable
- PCIe-COM422-4 Four-port RS-422 (or 4-wire 485) card with breakout cable
- PCIe-COM422-4NC Four-port RS-422 (or 4-wire 485) card without breakout cable

Model Options

- -T Extended Operating Temperature of -40°C to +85°C
- -F Fast RS-232 transceivers (up to 921.6kbps)
- -RoHS RoHS compliant version
- -W Wake-up enable (see Chapter 3: Hardware Details)
- -L Low-profile mounting bracket

Optional Accessories

BRKT-551-SCB	Strengthening bracket (for use with standard height PCIe bracket only)	
ADAP9	Screw terminal adaptor DB9F to 9 screw terminals	
ADAP9-2	Screw terminal adaptor with two DB9F connectors and 18 screw terminals	
CAB-PCIe-485-8	3’ light beige breakout DB9M cable pin-compatible with legacy 2-wire RS-485 products such as PCI-COM485-8	

Special Order

Virtually any custom baud rate can be achieved with the standard card (see Table 5-2: Higher Baud Rate Register Settings) and still be within the standard tolerance range for serial communications. If that method doesn't produce an exact enough baud rate a custom crystal oscillator may be specified, contact factory with your precise requirement. Other specials: conformal coating, custom software, RJ-45 connectivity, special breakout boxes, etc., we will work with you to provide exactly what is required.

Included with your board

The following components are included with your shipment, depending on options ordered. Please take the time now to ensure that no items are damaged or missing.

- **Eight-** or **four-port** card with standard height mounting bracket
- 3' breakout cable to DB9M connectors
- Software Master CD
- Quick-Start Guide

Chapter 2: Installation

A printed Quick-Start Guide (QSG) is packed with the card for your convenience. If you've already performed the steps from the QSG, you may find this chapter to be redundant and may skip forward to begin developing your application.

The software is provided with this card on the CD and must be installed onto your hard disk prior to use. Perform the following steps as appropriate for your operating system.

A complete driver support package is provided including an easy-to-use Windows terminal program for testing out your COM ports. This simplifies the verification of proper COM port operating. The card installs as standard COM ports in all operating systems.

A software reference manual is installed as part of the software and support package for this product. Please refer to this document for extensive information and guidance on software tools and programming support at your disposal.

CD Software Installation

The following instructions assume the CD-ROM drive is drive "D". Please substitute the appropriate drive letter for your system as necessary.

DOS

1. Place the CD into your CD-ROM drive.
2. Type D : Enter to change the active drive to the CD-ROM drive.
3. Type I N S T A L L Enter to run the install program.
4. Follow the on-screen prompts to install the software for this board.

Windows

1. Place the CD into your CD-ROM drive.
2. The system should automatically run the install program. If the install program does not run promptly, click START | RUN and type D : I N S T A L L, click OK or press Enter.
3. Follow the on-screen prompts to install the software for this board.

Linux

1. Please refer to linux.htm on the CD-ROM for information on installing under linux.

Note: COM boards can be installed in virtually any operating system. We do support installation in earlier versions of Windows, and are also likely to support future versions.

Hardware Installation

Caution! * ESD ***A single static discharge can damage your card and cause premature failure! Please follow all reasonable precautions to prevent a static discharge such as grounding yourself by touching any grounded surface prior to touching the card.***

1. Do not install the card into the computer until the software has been fully installed.
2. Turn OFF computer power AND unplug AC power from the system.
3. Remove the computer cover.
4. Carefully install the card in an available PCIe expansion slot (you may need to remove a backplate first).
5. Inspect for proper fit of the card and install and tighten the mounting bracket screw. Make sure that the card mounting bracket is properly screwed into place and that there is a positive chassis ground.
6. Install a cable onto the card's bracket mounted connector
7. If you purchased the optional DB9M breakout cable, you may have also purchased the connector / cable stabilization bracket, which should be installed at this time

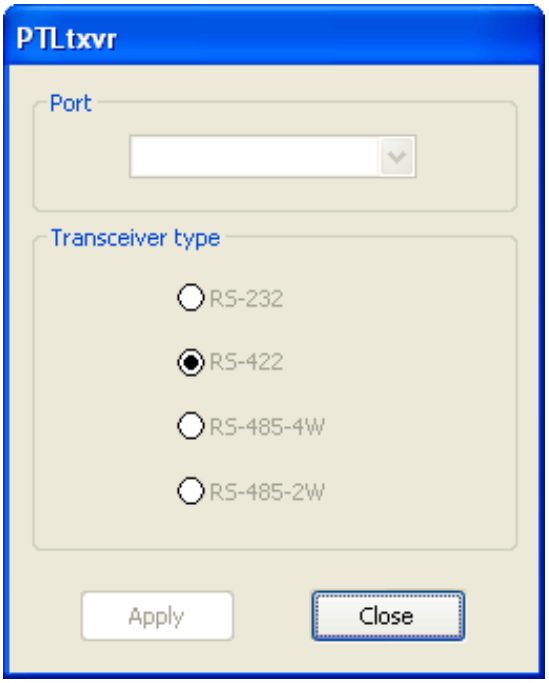


Figure 2-1: Port Configuration Utility Screenshot

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8. Replace the computer cover and turn ON the computer.
9. Most computers should auto-detect the card (depending on the operating system) and automatically finish installing the drivers.
10. Run the Port Configuration Utility program (setup.exe) to configure the protocol (RS-232/422/485) for each COM port.
11. Run one of the provided sample programs that was copied to the newly created card directory (from the CD) to test and validate your installation.

Chapter 3: Hardware Details

There only user-selectable options for this card are for applying a termination load to the RS-485 lines. Channel protocols are selected via software.

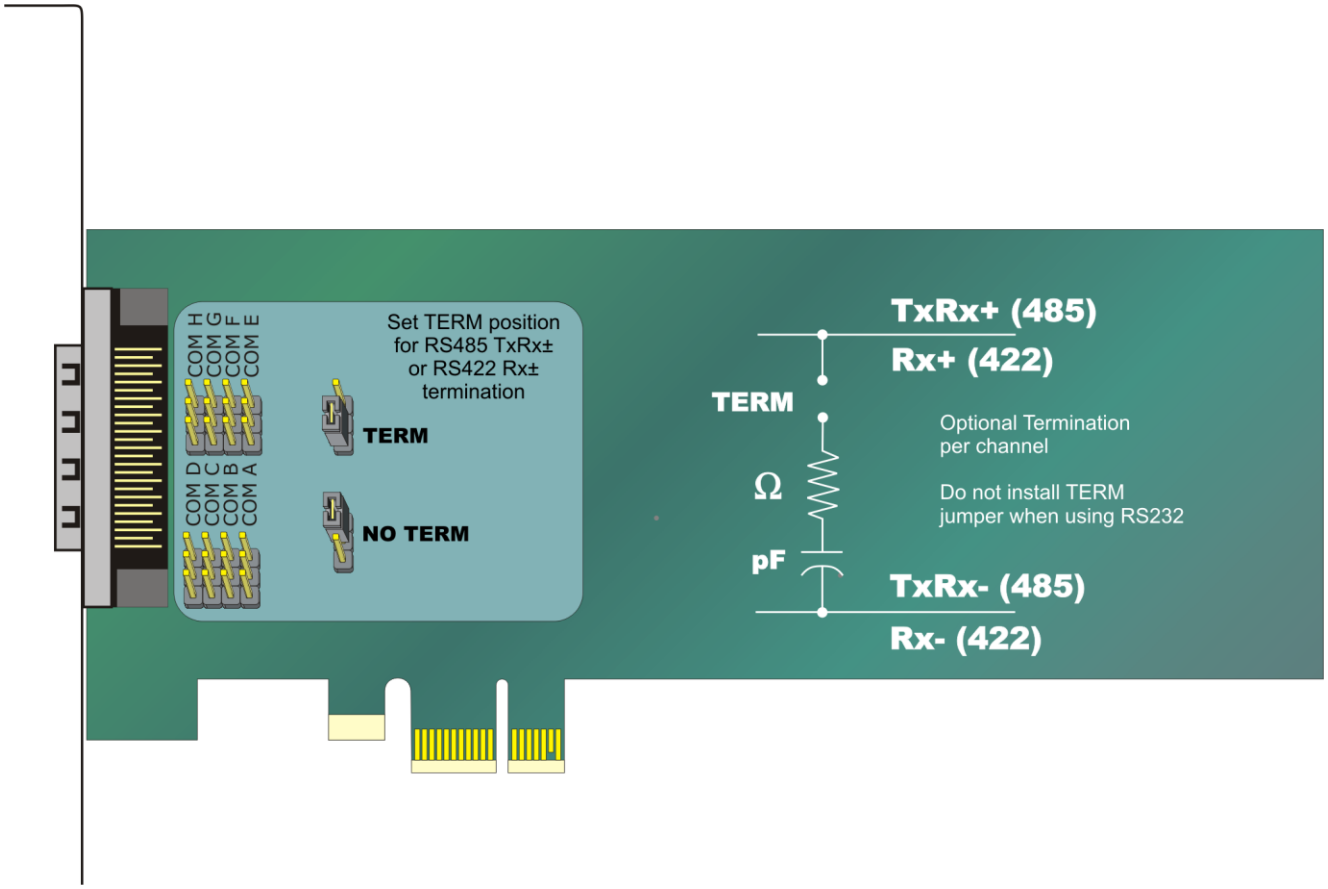


Figure 3-1: Option Selection Map

Factory Option Descriptions

Fast RS-232 transceivers (-F)

The standard RS-232 transceivers used are capable of speeds up to 460.8kbps which is adequate in many applications. For this factory option, the board is populated with high-speed RS-232 transceivers enabling error-free communications at up to 921.6kbps.

Low-profile mounting bracket (-L)

For system designers where space is limited we offer a low profile mounting bracket option. The strengthening bracket accessory can not be used with this option.

Remote Wake-Up (-W)

The “Remote Wake-Up” factory option is for use in applications where the host computer (the one this card would be installed in) enters the L2 low-power state where it’s main power is turned off though VAUX is still applied. When the Ring Indicator is received on serial port channel A in the L2 power state, Wake-Up is asserted.

Extended temperature (-T)

This factory option is for use in harsh environments and is populated with all-industrial rated components, specified at a minimum temperature range of -40°C to +85°C.

RoHS compliance (-RoHS)

For international customers and other special requirements, this factory option is available in RoHS compliant versions.

VHDCI connector

These cards use an Amphenol 68-pin VHDCI (Very High Density Cable Interconnect) connector. They are SCSI-III type, female, right-angle with screw locks and a 1.6mm pitch.

Chapter 4: Address Selection

The card uses one I/O address space PCI BAR[0].

COM A, COM B, COM C, COM D, COM E, COM F, COM G and COM H each occupy eight consecutive register locations. These COM designations correlate to the corresponding DB9 on breakout cable, which are labeled as such.

Please note - for 4-port card versions, the ports will be installed as:
COM A, COM B, COM C and COM H.
The breakout cable will have the corresponding port labels near the DB9 connectors.

The Vendor ID for all cards is 494F.
The Device ID for the PCIe-COM-8SM card is 10E9h.
The Device ID for the PCIe-COM422-8 card is 106Ah.
The Device ID for the PCIe-COM485-8 card is 106Bh.
The Device ID for the PCIe-COM-4SM card is 10D9h.
The Device ID for the PCIe-COM422-4 card is 105Ah.
The Device ID for the PCIe-COM485-4 card is 105Bh.

Chapter 5: Programming

Sample Programs

There are sample programs with source-code provided with the card in a variety of common languages. DOS samples are located in the DOS directory and Windows samples are located in the WIN32 directory.

Windows COM Utility Program

WinRisc is a COM utility program provided on CD with the installation package for this card that is very useful when working with any serial ports and serial devices. If you haven't used this program yet, do yourself a favor and run this program to test out your COM ports.

Windows Programming

The card installs into Windows as COM ports so standard API functions can be used:

►CreateFile() and CloseHandle() for opening and closing a port.
►SetupComm(), SetCommTimeouts(), GetCommState(), and SetCommState() to set and change a port's settings.
►ReadFile() and WriteFile() for accessing a port.

See the documentation for your chosen language for details.
In DOS the process is identical to programming 16550- compatible UARTs.

Baud Rate Generation

The built-in Baud Rate Generator (BRG) allows a wide range of input frequency and flexible Baud Rate generation. To obtain the desired Baud Rate, the user can set the Sample Clock Register (SCR), Divisor Latch Low Register (DLL), Divisor Latch High Register (DLH) and Clock Prescale Registers (CPRM and CPRN). The Baud Rate is generated according to the following equation:

$$BaudRate = \frac{InputFrequency}{Divisor * \mathrm{Pr}escaler}$$

The parameters in the equation above can be programmed by setting the "SCR", "DLL", "DLH", "CPRM" and "CPRN" registers according to the table below.

Setting	Description
Divisor	DLL + (256 * DLH)
Prescaler	2^{M-1} *(SampleClock + *N*)
SampleClock	16 - *SCR* , (SCR = '0h' to 'Ch')
M	CPRM, (CPRM = '01h' to '02h')
N	CPRN, (CPRN = '0h' to '7h')

Table 5-1: Baud Rate Generator Setting

To ensure the proper operation of the Baud Rate Generator, users should avoid setting the value ‘0’ to Sample Clock, Divisor and Prescaler.

The following table lists some of the commonly used Baud Rates and the register settings that generate a specific Baud Rate. The examples assume an Input Clock frequency of 14.7456 Mhz. The SCR register is set to ‘0h’, and the CPRM and CPRN registers are set to ‘1h’ and ‘0h’ respectively. In these examples, the Baud Rates can be generated by different combination of the DLH and DLL register values.

Baud Rate	DLH	DLL
1,200	3h	00h
2,400	1h	80h
4,800	0h	C0h
9,600	0h	60h
19,200	0h	30h
28,800	0h	20h
38,400	0h	18h
57,600	0h	10h
115,200	0h	08h
921,600	0h	01h

Table 5-2: Sample Baud Rate Setting

We re-define the parameter of "Baudrate" on DCB structure,

Bit[30:28]: User Defined Baudrate, this value has to be non-zero

Bit[27:24]: to indicate the value of SCR (SampleClock)

Bit[23:16]: to indicate the value to put in DLH

Bit[15:8]: to indicate the value to put in DLL

Bit[7:3]: to indicate the value to put in M (CPRM)

Bit[2:0]: to indicate the value to put in N (CPRN)

If you want to set

DLL=1

DLH=0

SCR=12

then, the parameters of Baudrate in the DCB structure should be set to 0x1c000108. When the driver finds the parameter "Baudrate" does not exist on the default baudrate table, and Bit 28 is set to "1", it will get the values of SCR, DLL, DLH, M and N from the Baudrate parameter and set to the registers directly.

Chapter 6: Connector Pin Assignments

Input/Output Connections

The serial communications ports are interfaced at the card mounting bracket via a female 68-pin VHDCI D-connector. There are two different breakout cables available terminating in eight (or four) individual D-sub 9-pin connectors. These cables are permanently labeled near each DB9 connector with the port letter. The cable that ships as standard is black PVC and the DB9 pin-out is listed in Table 6-1. Four port cards ordered with a breakout cable will have four D-sub 9-pin connectors, labeled as COM A, COM B, COM C and COM H.

PIN	RS-232	RS-422 and 4-Wire RS-485	2-Wire RS-485
1	DCD	TX-	-
2	RX	TX+	-
3	TX	RX+	TX+/RX+
4	DTR	RX-	TX-/RX-
5	GND	GND	GND
6	DSR	-	-
7	RTS	-	-
8	CTS	-	-
9	RI	-	-

Table 6-1: DB9 Male Connector Pin Assignments on Standard Cable



Figure 6-1: Male DB9 Connector Pin Locations

For applications that require a 2-wire RS-485 pin-out that is compatible with our PCI-COM485-8 card and breakout cable, specify the card model ending in “NC” (no cable) and the legacy cable (see ordering guide). This legacy compatibility cable is easily identified as it is light beige in color, while the standard cable is black molding with a black cable jacket. The RS-485 pin-out for the DB9 connectors on that cable follows:

PIN	2-Wire RS-485
1	TX/RX-
2	TX/RX+
3	TX/RX-
4	-
5	GND
6	-
7	-
8	-
9	TX/RX+

Table 6-2: DB9 Male Connector Pin Assignments on Legacy CAB-PCIe-485-8

RS-232 Signals	RS-232 Signal Descriptions	RS-422 Signals (4-w 485)	RS-422 Signal Descriptions	RS-485 Signals (2-wire)	RS-485 Signal Descriptions
DCD	Data Carrier Detected	TX+	Transmit Data +	TX/RX +	Transmit / Receive +
RX	Receive Data	TX-	Transmit Data -	TX/RX -	Transmit / Receive -
TX	Transmit Data	RX+	Receive Data +	GND	Signal Ground
DTR	Data Terminal Ready	RX-	Receive Data -		
GND	Signal Ground	GND	Signal Ground		
DSR	Data Set Ready				
RTS	Request To Send				
CTS	Clear to Send				
RI	Ring Indicator				

Table 6-3: COM signal names to corresponding signal descriptions

VHDCI 68-Pin D-Connector

Connections will normally be made to the D-Sub 9-pin connectors through the breakout cable. In case you wish to connect directly to the 68-pin connector, the pins translate as follows.

DB9 pins	To	VHDCI pins						
	Ch A	Ch B	Ch C	Ch D	Ch E	Ch F	Ch G	Ch H
1	37	41	45	49	53	57	61	65
2	1	5	9	13	17	21	25	29
3	2	6	10	14	18	22	26	30
4	3	7	11	15	19	23	27	31
5	33[1]	33[1]	33[1]	33[1]	67[2]	67[2]	67[2]	67[2]
6	38	42	46	50	54	58	62	66
7	35	39	43	47	51	55	59	63
8	36	40	44	48	52	56	60	64
9	4	8	12	16	20	24	28	32

Table 6-4: VHDCI 68-Pin Female D-Connector Pin Assignments

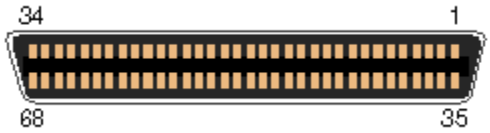


Figure 6-2: VHDCI 68-Pin Female D-Connector Pin Locations

To ensure that there is minimum susceptibility to EMI and minimum radiation, it is important that the card mounting bracket be properly screwed into place and that there be a positive chassis ground. Also, proper EMI cabling techniques (cable connect to chassis ground at the aperture, shielded twisted-pair wiring, etc.) should be used for the input/output wiring.

Chapter 7: Specifications

Communications Interface

- I/O connection: 68-pin female VHDCI SCSI-Type III connector with screw locks
- Serial ports: 8 or 4 RS-232/422/485 ports
- Serial data rates: Up to 3M baud asynchronous (460.8k standard for RS-232)
- UART: Octal type 16C950 with 128-byte transmit & receive FIFO, 16C550 compliant
- Character length: 5, 6, 7, or 8 bits
- Parity: Even, Odd, None, Space, Mark
- Stop interval: 1, 1.5, or 2 bits
- Flow control: RTS/CTS and/or DSR/DTR, Xon/Xoff
- ESD protection: ±15kV on all signal pins
- Cable: 3' shielded breakout cable terminated with male D-sub 9-pin connectors

Environmental

- Operating Temp.: Commercial: 0°C to +70°C
  Industrial: -40°C to +85°C
- Storage Temp.: -65°C to +150°C
- Humidity: 5% to 95%, non-condensing
- Power Required: +3.3VDC at 0.9W (typical)
- Size: 6.6 inches long x 2.20 inches high (167.64 mm long x 55.8mm high)

Customer Comments

If you experience any problems with this manual or just want to give us some feedback, please email us at: ***manuals@accesio.com.*** Please detail any errors you find and include your mailing address so that we can send you any manual updates.

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