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SST-DHP-PCI / 5136-SD-PCI

Hardware Reference Guide

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Document Edition: 1.1

Date: October 13, 2005

This document applies to the SST-DHP-PCI and 5136-SD-PCI interface cards.

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Preface

Preface Sections:

- Purpose of this Guide
- Conventions

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Purpose of this Guide

This manual is a user guide for the SST-DHP-PCI and 5136-SD-PCI interface cards with 32-bit applications under Windows NT, 2000 and XP. These cards allow an application running on a host computer to communicate with Allen-Bradley programmable controllers over Data Highway Plus networks.



Note

Differences between the cards will be indicated wherever applicable.

Conventions

This guide uses stylistic conventions, special terms, and special notation to help enhance your understanding.

Style

The following stylistic conventions are used throughout this guide:

Bold	indicates field names, button names, tab names, and options or selections
Italics	indicates keywords (indexed) or instances of new terms and/or specialized words that need emphasis
CAPS	indicates a specific key selection, such as ENTER, TAB, CTRL, ALT, DELETE
`Code Font`	indicates command line entries or text that you would type into a field
Underlining	indicates a hyperlink
“>” delimiter	indicates how to navigate through a hierarchy of menu selections/options
“0x”	indicates a hexadecimal value

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Special Terms

The following special terms are used throughout this guide:

Card	the SST-DHP-PCI / 5136-SD-PCI interface card
Firmware	the software running on the card
Module	a synonym for *firmware*

Special Notation

The following special notations are used throughout this guide:



Warning

Warning messages alert the reader to situations where personal injury may result. Warnings are accompanied by the symbol shown, and precede the topic to which they refer.



Caution

Caution messages alert the reader to situations where equipment damage may result. Cautions are accompanied by the symbol shown, and precede the topic to which they refer.



Note

A note provides additional information, emphasizes a point, or gives a tip for easier operation. Notes are accompanied by the symbol shown, and follow the text to which they refer.

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1 Card Overview

Chapter Sections:

- Warnings and Cautions
- Card Features
- Hardware Description

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1.1 Warnings and Cautions

The card is an electrical component and must be treated with the following precautions:



Warning

Only qualified electrical personnel familiar with the construction/ operation of this equipment and the hazards involved should install, adjust, operate, and/or service this equipment. Read and understand this guide in its entirety before proceeding. Failure to observe this precaution could result in severe bodily injury or, in extreme cases, loss of life.



Warning

You must provide an external, hand-wired emergency stop circuit outside the programmable controller circuitry. This circuit must disable the system in case of improper operation. Uncontrolled machine motion may result if this procedure is not followed. Failure to observe this precaution could result in bodily injury.



Caution

The card contains static-sensitive components. Careless handling may severely damage the card. Do not touch any of the connectors or pins on the card. When not in use, the card should be stored in an anti-static bag. Failure to observe this precaution could result in damage to or destruction of the equipment.

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1.2 Card Features

- The card is a PCI interface for communication with Data Highway Plus networks. The main features of the card are:
- 33 MHz, 32 bit PCI interface (fully compliant with PCI 2.2 Spec)
- 29.4912 MHz Z182 microprocessor with 64K of RAM
- 64K of shared RAM
- 6-pin Phoenix connector
- Data rates of 57.6 Kbaud, 115.2 Kbaud, and 230.4 Kbaud
- Visual indicators showing card and network status

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1.3 Hardware Description

The main features of the card are described in more detail in the following sections.

Figure 1: The SST-DHP-PCI Interface Card

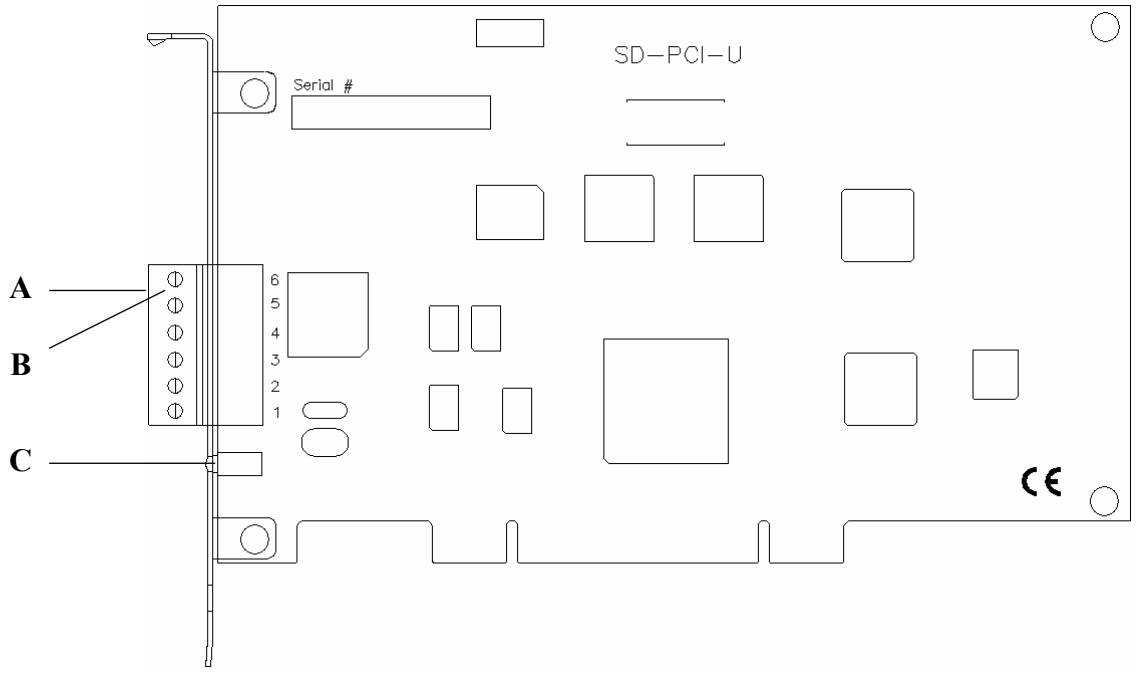


Table 1: Card Components

Feature	Description
A	PCI Edge Connector
B	Pin 6
C	LEDs

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Figure 2: The 5136-SD-PCI Interface Card

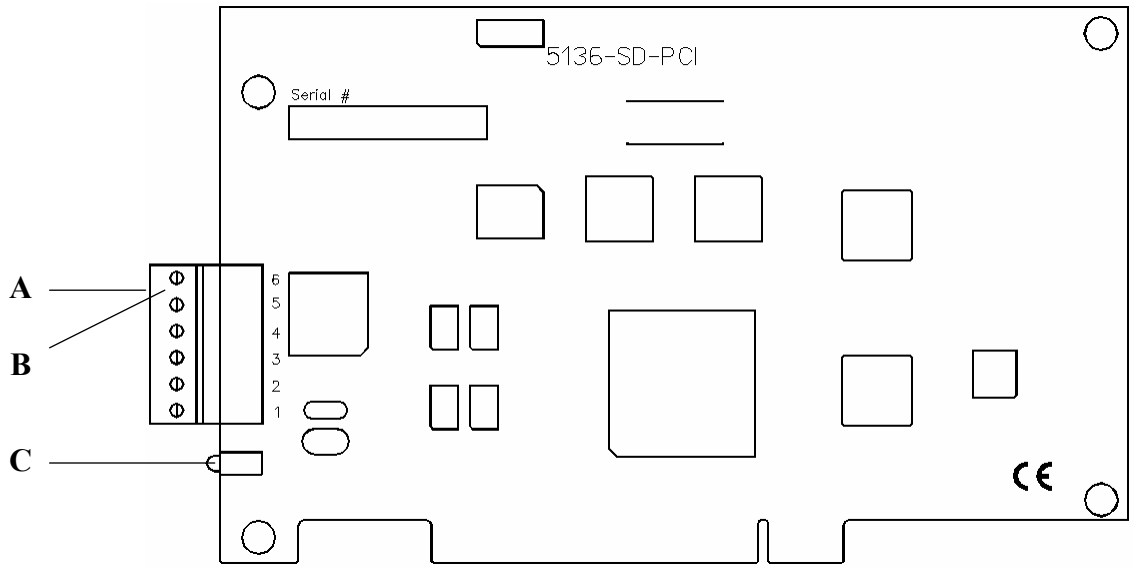


Table 2: Card Components

Feature	Description
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B	Pin 6
C	LEDs

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1.3.1 PCI Edge Connector

The PCI edge connector can plug in to any 2.1 and 2.2 PCI-compliant motherboard. The card requires that the motherboard connector supply both 3.3V and 5Vpower.

1.3.2 Pin 6

For information on this pin, refer to Section 2.8.1, Pin Numbering.

1.3.3 LEDs

There are two (2) bi-color LEDs on the card, visible through the mounting bracket. The LED closest to the card's printed circuit board is the Network LED; the LED furthest from the card's printed circuit board is the SYS LED.

After the computer has booted and before a firmware module is downloaded to the card, the SYS LED is red. After the firmware module successfully downloads using any SST-brand tools, it turns the SYS LED off. If the loader does not run successfully, SYS LED remains red.



Note

Third-party applications may not use the SYS LED, as described above, to change the state of the LEDs. Refer to the application's documentation for information on how it controls the SYS LED.

The Network LED is controlled by the software module running on the card.

The Data Highway Plus module turns the Network LED green whenever the card is active (transmitting) on the network. If the Network LED flickers rapidly, it means that the card is active on the network. In some cases the Network LED flickers so rapidly that it may appear to be solid green. The Network LED should never go off if there are other nodes on the network; however, it may be dim. Since the card must pass the token, it transmits on the network even if it is not sending commands or replies. If there is an error on the network, the Network LED will flicker red and return to solid green.

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2
Installation

Chapter Sections:

- System Requirements
- Handling Precautions
- Preparing the Computer
- Installing the Card
- Installing the Software
- Loading the Card
- Verifying Resource Settings
- Downloading Firmware to the Card
- Connecting the Card to the Network

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2.1 System Requirements

To install and operate the card, the following system requirements must be met:

- An available PCI 2.2 or 2.3 slot. The card will also operate in PCI 2.1-compliant systems with 3.3v supply available.
- At least one physical interrupt

2.2 Handling Precautions

The card contains components that are sensitive to electrostatic discharge (ESD). Do not touch the card without following these precautions:



Caution

- Always follow correct ESD procedures before handling the card. We strongly recommend the use of a grounding wrist strap.
- Never touch any of the card's connectors or pins. Handle the card by its edges or bracket.
- When the card is not in your computer, always store it in its protective anti-static bag.

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2.3 Preparing the Computer

The card is a Plug and Play, PCF 2.2-compliant interface.

The BIOS of the computer, in combination with the operating system, assigns the location of the memory address and port address of the card. Sometimes Windows will reassign these resources.

Resource settings can be verified by running the Direct-Link Configuration Tool (Windows NT) or the Windows Device Manager (Windows 2000 and XP). Refer to Section 2.6, Verifying Resource Settings, for more information.

2.4 Installing the Card

This section provides general directions for installing the card in your computer.

To install the card:

1. Ensure that all power to the computer is *off*.
2. Adequately ground yourself, as explained in Section 2.2, Handling Precautions.
3. Unplug the power cord (be sure that your grounding wrist strap isn't connected to the computer chassis because when you unplug the power cord you will lose your connection to ground), modem (if applicable), and any network cables.
4. Remove the computer cover. Consult the computer user's guide for information on installing add-in boards.
5. Take the card out of its shipping container, being careful not to touch any of the connectors, pins, or electronic components.
6. Install the card in any PCI slot.
7. Press the card firmly into place and tighten the mounting bracket screw to the host chassis.
8. Replace the computer cover and power up the computer.

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2.5 Installing the Software

The card is shipped with a CD containing tools and example applications. DOS example software is not included, as the card will be assigned an address greater than the conventional memory space limit of 1 Mbyte and therefore cannot be accessed by any 16-bit code (such as DOS examples).



Note

If you are using a third-party application/software with the card, you may not need to install any Woodhead software, and in some cases, doing so can cause the third-party software not to function. Please consult the third-party documentation before installing any Woodhead software. In most cases, third-party software installs all necessary software components automatically.

To install the software:

1. Insert the CD. The startup should auto-run; if it does not, run setup32.exe from the root folder of the CD.
2. Select **Installation**.
3. Select **SD Products Install 2.2 for Windows NT/2000/XP** and follow the Install Wizard.
4. Reboot the computer when prompted.

2.6 Verifying Resource Settings

This section explains how to use the Direct Link Configuration Tool (Windows NT) and Windows Device Manager (Windows 2000 and XP) to inspect the card's resources and change its name.



Note

The Direct Link Configuration Tool and the Device Manager do not support changing PCI device resources.

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2.6.1 Changing the Card Name

When using the card with any Windows-based applications from Woodhead and some third-party Windows applications, the card is accessed using a *card name*. If you need to change this name, the following two sections explain how.



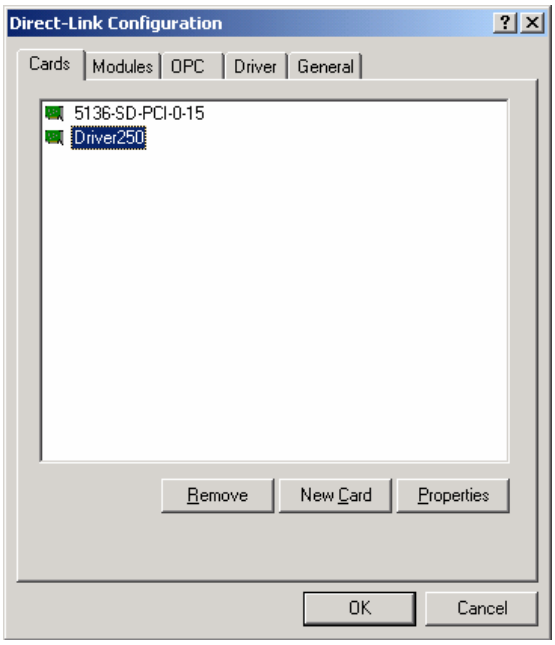
Note

Changing the card name is only necessary if the software application you're using requires the name to always be predetermined.

Using the SST Direct-Link Configuration Tool under Windows NT

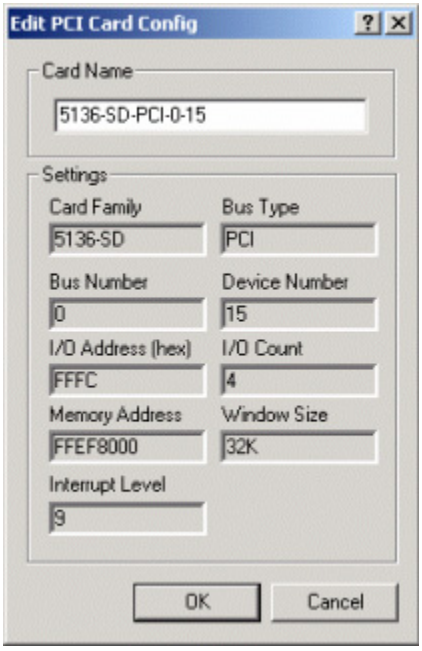
To view the card's resources or change its name in Windows NT:

1. Open the Direct-Link Configuration tool. The Main screen is displayed.



2. Select the desired card and click **Properties**. The Edit screen is displayed.

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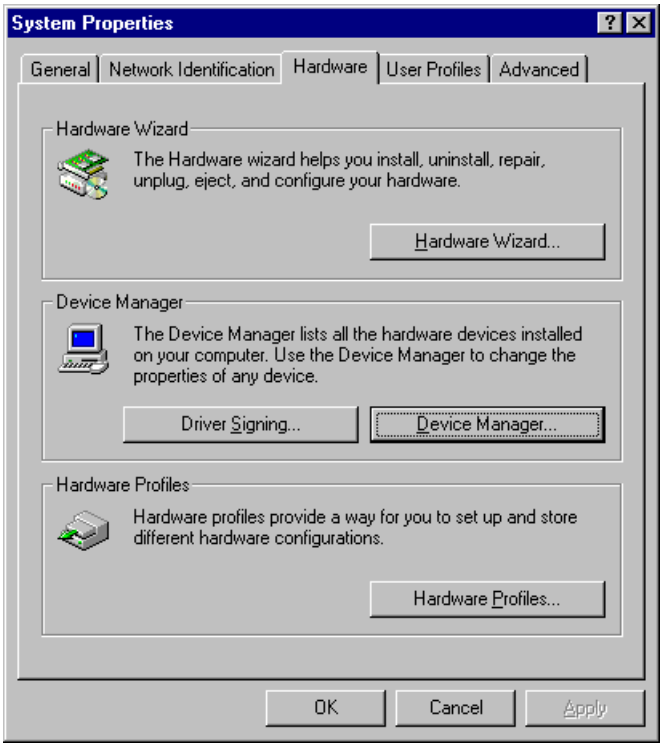
3. Enter a new name for the card and click **OK**.

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Using the Device Manager under Windows 2000/XP

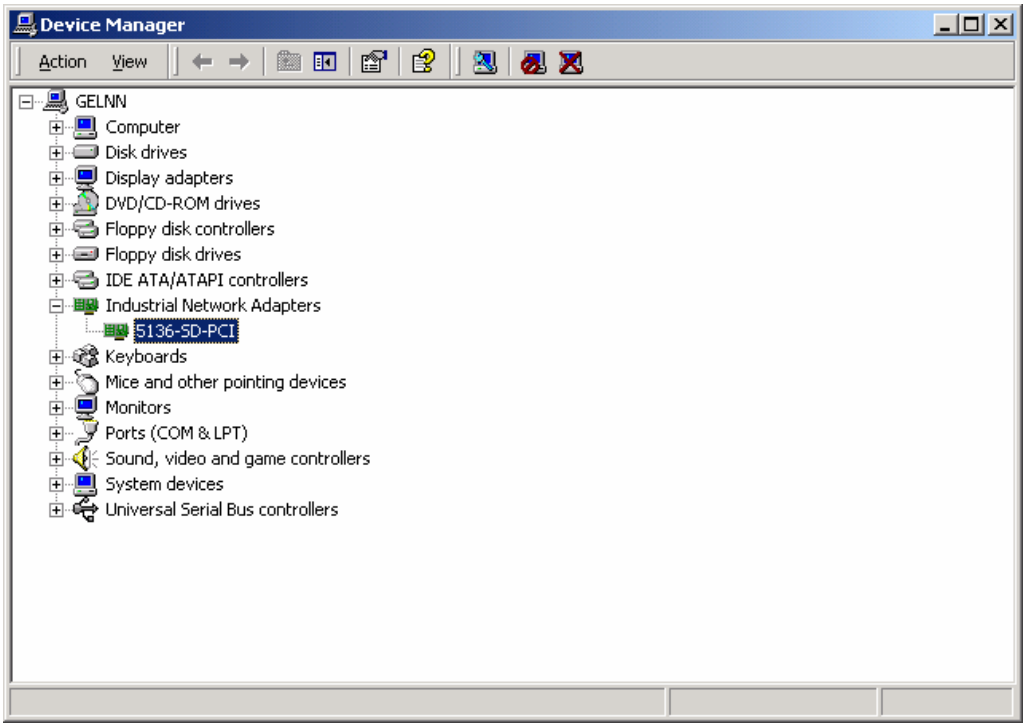
To view the card's resources or change its name in Windows 2000/XP:

1. Go to Start > Settings > Control Panel > System > Hardware. The Hardware screen is displayed.



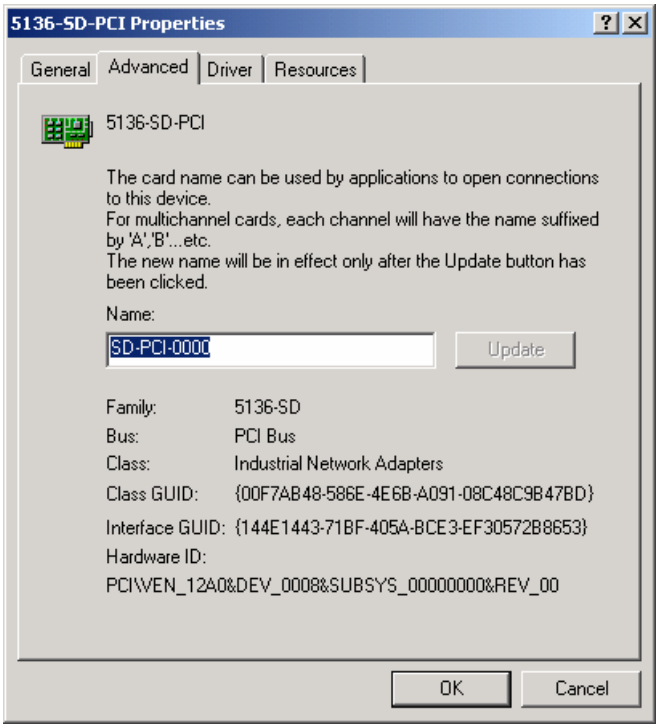
2. Click **Device Manager…** .The Device Manager screen is displayed.

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3. Expand the **Industrial Network Adapters** tree and double-click the card. The Properties screen is displayed.

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To change the name of the card, click the **Advanced** tab, enter a new name, and click **Update**.

Note

The name that appears under this tab is the name you will need to choose when running any of the Windows tools. This name is different from the one shown in the directory tree when **Industrial Network Adapters** is expanded.

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2.7 Loading a Firmware Module to the Card

To load a firmware module, you can use the supplied Windows utilities, or, if you are writing your own application, you can make a call to the DLL function (see the API reference guide).



Note

If you are using a third-party application, it will usually load the firmware to the card automatically.

Every time PC power is cycled, the card loses its firmware, which must be reloaded. The module will remain in the card's memory until the power is cycled again or a command is issued to unload the card.

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2.7.1 Using the Card Manager

The Card Manager allows you to configure the card to load automatically on startup. This offers the following advantages:

- It is easy to upgrade to a new firmware module version; you just have to replace a disk file
- It is easy to replace a card; nothing is stored permanently on the card
- One card can be used for more than one function; you just download a different firmware module

The disadvantage of loading the card at startup is that it gets loaded each time the computer is started, even if you don't intend to use the card.

To access the Card Manager, go to Start > Programs > SST AB > SD Card Startup Manager. Refer to the online help provided with the Card Manager for detailed information on configuring the software. You can use the SD Card Manager to download firmware to the card. You can also run sdload32.exe, or daicfg.exe, or one of the sample programs provided on the disk.

2.7.2 Card Software Modules

You must tell the loader which module to download to the card, using the module ID number.

The following modules exist for the card. Not all modules are shipped with the standard cards.

Module Name	Purpose	Module ID (HEX)
sdpdhp.ss1	Standard Data Highway Plus module	00A0
sdphdhp.ss1	115 Kbaud Data Highway Plus module, forces the baud rate to 115 Kbaud	01A0
sdpudhp.ss1	230 kbaud Data Highway Plus module, forces the baud rate to 230 Kbaud	02A0
sdpipds.ss1	KT emulation module, with dual application interface WinNT only	10A0
sdphipds.ss1	115 Kbaud KT emulation module, forces the baud rate to 115 Kbaud WinNT only	11A0
sdpuipds.ss1	230 Kbaud KT emulation module, forces the baud rate to 230 Kbaud WinNT only	12A0
sdpdai.ss1	Dual application module for WinNT only	20A0
sdpdai.ss1	115 Kbaud dual application module for WinNT only	21A0
sdpudai.ss1	230 Kbaud dual application module for WinNT only	22A0

Refer to the Win32 API manual that is included on the CD for more information.

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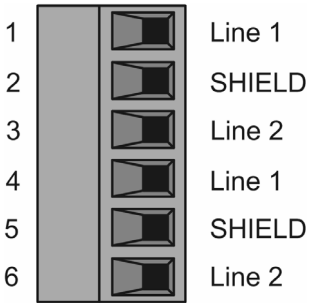
2.8 Connecting the Card to the Network

This section explains on how to connect the card to an Allen-Bradley Data Highway Plus communication network.

2.8.1 Pin Numbering

Connect the card to a network using the green 6-pin solderless Phoenix Combicon connector.

Figure 3: Phoenix Combicon Connector



Pin 1 is closest to the LEDs, and pin 6 is furthest from the LEDs. Pin 1 is internally connected to 4, pin 2 to pin 5, and pin 3 to pin 6 to make it easy to daisy-chain connections. Any connections to pins 1, 2 or 3 can also be made to pins 4, 5 or 6 respectively.



Note

If you daisy chain in this fashion and then remove the connector from the card, the connection through the card will be broken. In other words, this is like cutting the Blue Hose cable at the point where it is connected to the card.

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2.8.2 DHP Connection

When connecting to a Data Highway Plus network, the card acts as a single station on the network, making the card's cabling requirements the same as for any other network station. A station is connected to the network using Belden 9463 twin-axial cable (Blue Hose). The standard rules for cable routing and termination apply.

The card is supplied with a solderless Phoenix Combicon connector. For Data Highway Plus communication, connect Line 1 of the network to Pin 1 or 4 of the Phoenix connector, the SHIELD (bare) to Pin 2 or 5 and line 2
to Pin 3 or 6.

Usually, Data Highway Plus networks are cabled with line 1 clear and line 2 blue. Although there is no difference in the physical characteristics of the "Blue" and the "Clear" wires, it is important to be consistent throughout the network. So, if "Clear" is on Pin 1 of all the other nodes on the network, then it should be wired to Pin 1 or 4 on the card.

2.8.3 Termination

The nodes at the two physical ends of the network should have terminating resistors. All other nodes should not. Every network should have two and only two terminators.

The card does not have an onboard terminator. If you require a terminator, it consists of a resistor between the blue and clear wires. Allen-Bradley recommends an 82-ohm terminating resistor unless you have older Allen-Bradley modules on the network that require 150-ohm resistors. Refer to the Allen-Bradley documentation for further details.

Effects of Cabling Errors

An incorrect connection can disrupt the entire network. This applies to any connected device, not just the card. Watch for interchanging wires, incorrect termination, shorts to signal lines, or leads on terminating resistors shorting to the shield line. Also make sure that individual strands of the braided wires do not short to adjacent wires.

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3

Hardware Register Details

Chapter Sections:

- Card Configuration Registers
- PCI Interface Registers

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3.1 Card Configuration Registers

This section provides hardware register details for the card. These registers should only be of interest when writing your own application to access the card directly.

Three (3) read/write registers are used in the host I/O map. The following table lists those registers:

Register Offset	Register Name
0	Board Control Register (BCR)
1	Memory Configuration Register (MCR)
2	Interrupt Select Register (ISR)

Each of these registers is described in detail in the following sections.

3.1.1 The Board Control Register (BCR)

7	6	5	4	3	2	1	0
0	0	0	0	Red LED	Clear INT	0	1

Bit 3 controls the SYS LED on the card. Setting the bit to *0* turns *on* the SYS LED; setting it to *1* turns it *off*. After a successful installation, the normal state is for the LED to be OFF. However, applications are free to change the state of the LED.

Bit 2 is the interrupt clear bit. Set this bit to 1 to enable interrupts. If an interrupt occurs:

1. Check the present bit in the ISR.
2. Set this bit to 0 to acknowledge the interrupt.
3. Set this bit to 1 to enable further interrupts.

Always set Bit 0 to 1 and Bit 1 to 0. Set the rest of the bits to 0. If you are not using interrupts and you are not going to turn off the SYS LED, you do not need to modify this register.

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3.1.2 The Memory Configuration Register (MCR)

7	6	5	4	3	2	1	0
Mem Enable	0	0	0	0	0	Bank Sel 1	Bank Sel 0

The card contains 64 Kbytes of memory. Either 32 Kbytes or 16 Kbytes can be mapped into the host memory at one time. The MCR determines which bank of the card memory maps into the host memory. It also determines the host address where the memory appears.

The PCI card always occupies 32K of memory, but you can configure it in blocks of 16K. This is allowed for backwards compatibility with applications written for ISA cards running in 16k mode.

MCR Bit Usage

The MCR bits are used as follows:

- Bit 7 is the memory enable bit. Setting the bit to 1 enables access to the card memory. Setting the bit to 0 disables the card memory.
- Bits 0 and 1 are used to select which area of memory on the card maps into the host memory. The card has 64K of memory accessible from the host in 32K or 16K blocks.

In 32K window mode, bit 1 must be 0 and bit 0 selects the banks. A 0 selects the lower 32K on the card; a 1 selects the upper 32K. Normally bit 0 is 1, selecting the 8000h-FFFFh range of addresses on the card to map into the host memory in the card processor's address space.

In 16K window mode, both bits select which 16K block of the memory on the card maps into the host memory.

Bit 1	Bit 0	Address range
0	0	0000h – 7FFFh
0	1	8000h – FFFFh

Normally bit 1 is *1* and bit 0 is *0*, selecting the *8000h-BFFFh* range.

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3.1.3 The Interrupt Select Register (ISR)

The ISR is a read-write port register that selects whether or not the memory is divided into 16K blocks.

The ISR bits are defined as follows:

7	6	5	4	3	2	1	0
IRQ Present	0	0	16K win	0	0	0	0

Bit 4 is the 16K Win bit. If this bit is set, the 64K memory is fragmented into 16K blocks that are mapped into memory. The default is 0, meaning that the 64K memory is fragmented into 32K fragments.

IRQ Present Bit (Bit 7) is set if there has been an interrupt that has not been cleared by the BCR register (Bit 2, Clear Int).

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3.2 PCI Interface Registers

In the following table, all information relevant to the SST-DHP-PCI and 5136-SD-PCI cards is bolded.

PCI CFG Register Address	Register Functions 32 24 23 16 15 8 7 0				PCI Writable
0x00	**Device ID 0x9050**			**Vendor ID 0x10B5**	**0x00**
0x04	Status			Command	0x04
0x08	Class Code			Revision ID	0x08
0x0C	BIST	Header ID	0x0C	BIST	Header ID
0x10	PCI Base Address 0 for Memory Mapped Config Registers				Y
0x14	PCI Base Address 1 for I/O Mapped Config Registers				Y
0x18	**PCI Base Address 2 for Local Address Space 0 Shared RAM Access Window**				**Y**
0x1C	**PCI Base Address 3 for Local Address Space 1 I/O Space Access Window**				**Y**
0x20	PCI Base Address 4 for Local Address Space 2				Y
0x24	PCI Base Address 5 for Local Address Space 3				Y
0x28	Cardbus CIS Pointer (Not Supported)				N
0x2C	**Subsystem ID 0x0495**		**Subsystem Vendor ID 0x133D**		**0x2C**
0x30	PCI Base Address for Local Expansion ROM				Y
0x34	Reserved				N
0x38	Reserved				N
0x3C	Max_Lat	Min_Gnt	0x3C	Max_Lat	Min_Gnt

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4
Troubleshooting

Chapter Sections:

- General Troubleshooting Strategies



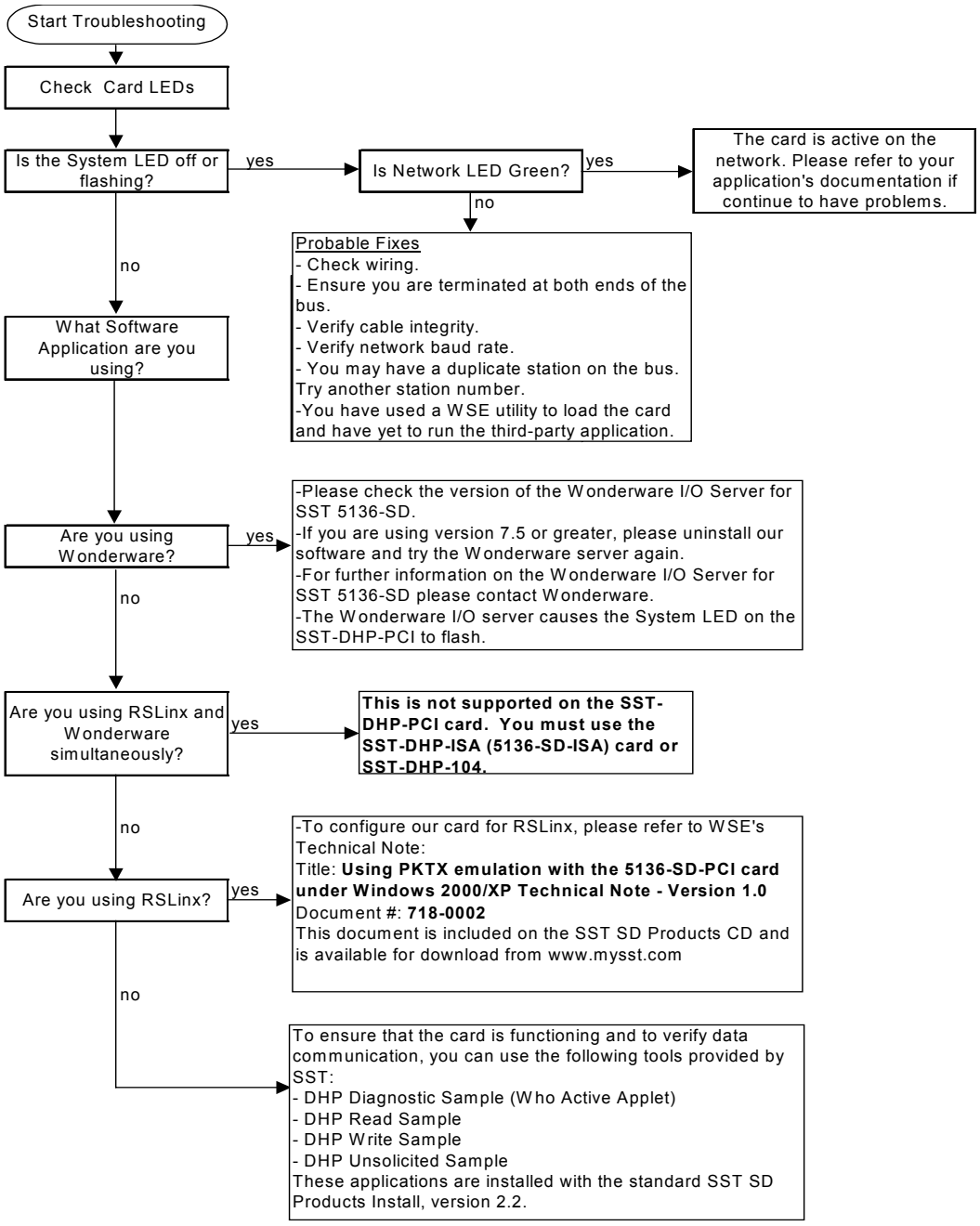
Warning

Only qualified electrical personnel familiar with the construction and operation of this equipment and the hazards involved should install, adjust, operate, or service this equipment. Failure to observe this precaution could result in severe bodily injury or loss of life.

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4.1 General Troubleshooting Strategies

This chapter contains general strategies for troubleshooting the card. If the following steps do not fix the problem, please consult Appendix B, Warranty and Support.



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A

Technical Specifications

Appendix Sections:

- Technical Specifications

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A.1 Technical Specifications

The following tables list the card's technical specifications.

Table 3: Environmental Specifications

		SST-DHP-PCI	5136-SD-PCI
Ambient Conditions	Storage temp:	-40°C to +85°C	-40°C to +85°C
	Operating temp:	0°C to 50°C	0°C to 60°C
	Humidity:	5% to 95% non-condensing	5% to 95% non-condensing
Typical Current Draw		220mA	600mA
PCI Compliance		Compliant with PCI 2.2 and 2.3.	Compliant with PCI 2.1 and 2.2.

Table 4: PCI Bus Specifications

		SST-DHP-PCI	5136-SD-PCI
Dimensions	Height:	4.2 inches	4.2 inches
	Width:	6.875 inches	6.875 inches
Resources		PCI Region 0 = 128b of 32-bit PCI Memory PCI Region 1 = 128b of I/O Port Memory PCI Region 2 = 4b of I/O Port Memory PCI Region 3 = 32Kb of 32-bit PCI Memory One PCI interrupt	PCI Region 2 = 256K of 32-bit PCI memory PCI Region 3 = 32 bytes of 32-bit PCI memory One PCI interrupt

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B

Warranty and Support

Appendix Sections:

- Warranty
- Reference Documents
- Technical Support

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B.1 Warranty

For warranty information pertaining to the card, refer to http://www.mysst.com/warranty.asp.

B.2 Reference Documents

- Refer to the appropriate Allen-Bradley documentation for information on Allen-Bradley hardware, cabling, programming and network protocols
- If you are developing an application for the card on Data Highway Plus networks, or if you need information about message formats or network status values, refer to the Allen-Bradley documentation
- Refer to Woodhead's Data Highway/Data Highway Plus Shared Memory Interface Software Development Guide for detailed information on how to program the card
- Refer to Woodhead's Win32 Interface Card API User Guide for information on the use of DLLs

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B.3 Technical Support

Please ensure that you have the following information readily available before calling for technical support:

- Card type and serial number
- Computer's make, model and hardware configuration (other cards installed)
- Operating system type and version
- Details of the problem you are experiencing: application module type and version, target network, and circumstances that may have caused the problem

B.3.1 Getting Help

Technical support is available during regular business hours by telephone, fax or email from any Woodhead Software & Electronics office, or from http://www.woodhead.com. Documentation and software updates are also available on the Web site.



Note

If you are using the card with a third-party application, refer to the documentation for that package for information on configuring the software for the card. Technical notes for many supported third-party applications are also available on the Woodhead Web site.

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Fax: 86-21- 5835-9980
Email: SupportAP@woodhead.com

For the most current contact details, please visit http://www.woodhead.com/.

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C
CE Compliance

Appendix Sections:

- CE Compliance

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C.1 CE Compliance

C.1.1 SST-DHP-PCI Compliance

This device meets or exceeds the requirements of the following standard:

- EN 61326:1998 including amendments A1 and A2: - Class A - “Electrical equipment for measurement, control and laboratory use - EMC requirements.



Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case you may be required to take adequate measures.



Caution

This equipment is neither designed for, nor intended for operation in installations where it is subject to hazardous voltages and hazardous currents.

Marking of this equipment with the symbol CE indicates compliance with European Council Directive 89/336/EEC - The EMC Directive as amended by 92/31/EEC and 93/68/EEC.



Note

To maintain compliance with the limits and requirements of the EMC Directive, it is required to use quality interfacing cables and connectors when connecting to this device. Refer to the cable specifications in the Hardware Guide for selection of cable types.

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C.1.2 5136-SD-PCI Compliance

This device meets or exceeds the requirements of the following standard:

- CISPR22:1997/EN 55022:1998 - Class A – Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement.



Warning

This is a Class A product. In a domestic environment this product may cause radio interference in which case you may be required to take adequate measures.



Caution

This equipment is neither designed for, nor intended for operation in installations where it is subject to hazardous voltages and hazardous currents.

Marking of this equipment with the symbol CE indicates compliance with European Council Directive 89/336/EEC - The EMC Directive as amended by 92/31/EEC and 93/68/EEC.



Note

To maintain compliance with the limits and requirements of the EMC Directive, it is required to use quality interfacing cables and connectors when connecting to this device. Refer to the cable specifications in the Hardware Guide for selection of cable types.

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