

Modbus Plus PCIe-85 Interface Adapter User Guide

October 2015

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

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Safety Information



Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result in** minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

BEFORE YOU BEGIN

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

WARNING

UNGUARDED EQUIPMENT

- Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.
- Do not reach into machinery during operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

START-UP AND TEST

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check be made and that enough time is allowed to perform complete and satisfactory testing.

CAUTION

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

Failure to follow these instructions can result in injury or equipment damage.

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

OPERATION AND ADJUSTMENTS

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About the Book



At a Glance

Document Scope

This manual details the installation and configuration of the PCIe-85 Modbus Plus interface adapter in Windows XP, Vista, 7, 8, Server 2003, Server 2008 and Server 2012 environments.

Terms and Abbreviations Used

Numbers are written according to international practice as well as according to approved SI (System International d'Unites) presentation; each thousand is separated by a space, along with use of the decimal point, e.g., 12 345.67.

Related Documents

Click the Reference Number of the following documents to download them as PDF files from the www.schneider-electric.com web site.

Title of Documentation	Reference Number
Modbus Plus Network Planning and Installation Guide	31003525
Modbus Plus Network IBM Host-based Devices User's Guide	31000770
Modbus Plus Network I/O Servicing Guide	35012303

Validity Note

The technical characteristics of the devices described in this document also appear online. To access this information online:

Step	Action
1	Go to the Schneider Electric home page www.schneider-electric.com .
2	In the Search box type the reference of a product or the name of a product range. <ul style="list-style-type: none">Do not include blank spaces in the reference or product range.To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the Product Datasheets search results and click on the reference that interests you. If you entered the name of a product range, go to the Product Ranges search results and click on the product range that interests you.
4	If more than one reference appears in the Products search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the data sheet.

Step	Action
6	To save or print a data sheet as a .pdf file, click Download XXX product datasheet .

The characteristics that are presented in this manual should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the manual and online information, use the online information as your reference.

Chapter 1

The PCIe-85 Adapter and Your Computer

Introduction

This chapter provides both general product and configuraton information for the PCIe-85 Modbus Plus interface adapter.

What Is in This Chapter?

This chapter contains the following topics:

Topic	Page
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Configuring the PCIe-85 Adapter	14

Product Overview

Please Note

Electrical equipment should be serviced only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. This document is not intended as an instruction manual for untrained persons.

Before handling the PCIe-85 interface adapter, you should be familiar with methods for handling circuit boards, including methods for anti-static protection. If you are unfamiliar with these precautions, please contact Schneider Electric at <http://www.schneider-electric.com> to find customer support closest to you.

Context

Peripheral Component Interconnect Express (PCIe) is a high-speed serial expansion bus standard designed to replace the older PCI, PCI-X and AGP bus standards. PCIe has numerous improvements over the older standards, including higher maximum system bus throughput, lower I/O pin count and smaller physical footprint, better performance scaling for bus devices, a more detailed error detection and reporting mechanism, and native hot-plug functionality.

PCIe specifications are maintained and developed by the PCI-SIG (PCI Special Interest Group), a group of over 900 companies that also developed and maintain the conventional PCI specifications.

The PCIe standard defines slots and connectors for multiple widths: x1, x4, x8, x12, x16 and x32, representing the number of channels or lanes supported by the slot. PCIe slots are down-ward compatible, such that a single lane PCI Express card (x1) can be inserted in a multi-lane slot (x4, x8, etc.), and the initialization cycle auto-negotiates the highest mutually supported lane count. Special pins on the slot are used to detect the size of the inserted card.

In computers with available PCI slots, Modbus Plus support may be provided using the PCI-85 Modbus Plus adapter. Increasingly, however, manufacturers are eliminating PCI slots from new computers and replacing them with faster and less expensive PCI Express slots. The PCIe-85 is designed to provide Modbus Plus support on these computers.

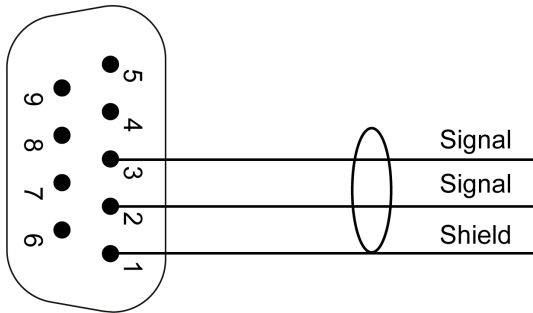
PCIe-85 Modbus Plus Interface Adapter

The PCIe-85 reference 416NHM30042A uses a combination of hardware and firmware to provide a single- or dual-cable Modbus Plus interface to computers equipped with a PCI Express bus.

The PCIe-85 Modbus Plus interface adapter consist of a single board mounting in a single PCI Express slot of an IBM PC or compatible personal computer that will accept full height cards.

It implements a single-lane (x1) PCI Express endpoint, compatible with revision 1.1 of the PCI Express Card Electromechanical Specification and revision 1.1 of the PCI Ex-press Base Specification. As a standard PCI Express single-lane (x1) card edge connector, it is inter-operable with a PCI Express x1, x4, x8 or x16 slot. The connection to the host computer is via a standard single-lane PCI Express connector.

The Modbus Plus medium is a single, twisted shielded pair cable that supports up to 32 nodes without repeaters or 64 nodes with repeaters. The external connection of the 416NHM30042A to the Modbus Plus network is done via a pair of standard 9-pin D-Sub connectors mounted on the external PCI Express bracket (labeled "MB+ A" and "MB+ B" on the bracket), allowing for redundant cabling in dual channel mode. If communications is lost on one cable path, the other continues normally. Both Modbus Plus ports use the pin configuration shown in the following diagram.



Three LED indicators are visible through a cutout in the card mounting bracket. The LEDs provide standard Modbus Plus communications status, along with two fault indicators for cable status when dual cable configuration is selected.

Configuring the PCIe-85 Adapter

Easy Configuration

The PCIe-85 interface adapter is supplied with the Modbus Plus driver suite CD-ROM.

NOTE: The adapter card is compatible with MBX Driver Suite, Version 8.1 or greater. Schneider Electric recommends that you use the software package supplied with the adapter card.

On-board support of the plug and play standard allows easy configuration and operation in Windows XP, Vista, 7, 8, Server 2003, Server 2008 and Server 2012 environments.

These drivers support many existing applications including:

- programming software such as Concept, Modsoft, ProWorx, and Unity
- Monitor Pro Human-Machine Interface (HMI) software
- MBX Suite for monitoring Modbus Plus networks
 - MBX Demo
 - MBX Driver Configuration
 - MBX Backup Configuration
 - MBPSTAT (32 bits OS support only)
- other third-party programming panel software and HMI software

Software Configuration

Before installing the PCIe-85 interface adapter in your PC, you **must first** install the Modbus Plus device driver software on your hard disk.

The selection of single channel or dual channel mode is done from a jumper located in the middle of the PCIe-85 card. The jumper is labeled J9.

- Connecting pin 1 -2 sets the card to operate in a single cable mode.
- Connecting pin 2 -3 sets the card to operate in a dual cable mode.

The activation of single channel or dual channel mode can also be modified by software, from the driver configuration.

NOTE: Single-channel mode only disables the ERR A and ERR B indicators on the PCIe-85 card. It does not actually disable either port. Port B will still be functional, and the peer processor will still report framing errors on the unused port if only one cable is connected. The end user should ignore these errors.

Hardware Configuration

NOTE: Before installing the PCIe-85 interface adapter in your PC, you **must first** install the device driver software.

The board is a PCI plug and play component. Check the position of the jumper prior to installation. You can install the unit into an available PCI slot in your computer's motherboard and connect the network cable.

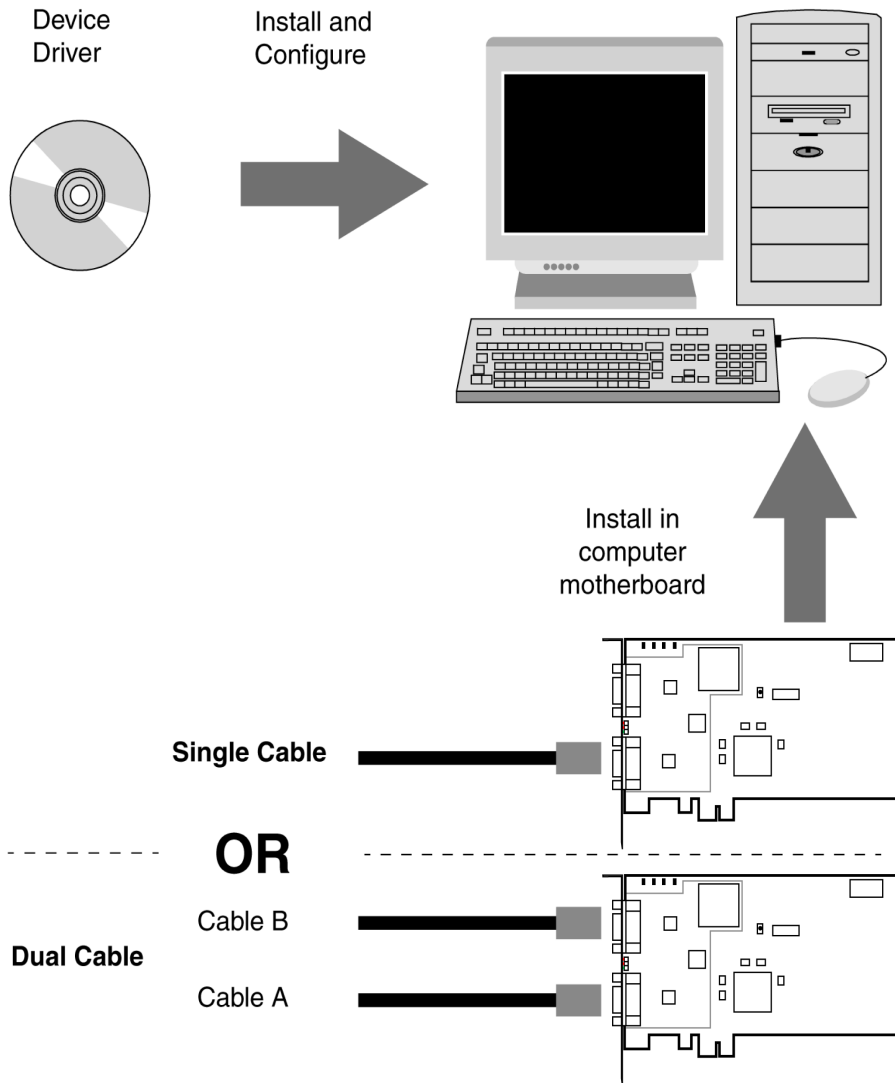
Configuration Overview

The steps and graphic below are merely an overview. For detailed configuration instructions, see the MBX driver help provided on the driver CD ROM.

Configuring the PCIe-85 Adapter.

Step	Action
1	Install the drivers.
2	Shut down the PC and unplug the power cord.
3	Install the PCIe-85 card.
4	Plug in power cord and turn ON the PC.
5	Configure the PCIe cards Modbus Plus addresses and options.

Modbus Plus Network



Note: Photos may not be exact representations of your adapters.

NOTE: For further information about planning your Modbus Plus network system, refer to the [*Modbus Plus Network Planning and Installation Guide \(31003525\)*](#).

Chapter 2

Adding or Deleting Active Nodes

Adding or Deleting Active Nodes

Replacing a Modbus Plus Node

NOTE: Adding and removing nodes to or from an operating Modbus Plus network will temporarily affect network activity. For more information, refer to the [*Modbus Plus Network Planning and Installation Guide \(31003525\)*](#).

If you are replacing a node on an active Modbus Plus network, you can disconnect and reconnect that device's local drop cable without powering down the devices connected to other nodes on the network. The network protocol will bypass the removed device and include it when it is reconnected.

Disconnecting a Modbus Plus Node

If you disconnect a node device from the network, it is not necessary to terminate its local drop connector. The connector should be left open electrically. Cover the cable connector pins to prevent damage, short circuit, and contamination.

Chapter 3

Installation

Introduction

The information in this chapter describes how to install the device driver software and the interface adapter hardware.

What Is in This Chapter?

This chapter contains the following sections:

Section	Topic	Page
3.1	Software	22
3.2	Hardware	23

Section 3.1

Software

Installing the PCIe-85 Device Driver Software

MBX Driver Suite Installation

NOTE: Before installing the PCIe-85 interface adapter in your PC, you **must first** install the device driver software.

Step	Action
1	Insert the CD-ROM labeled Modbus Plus Driver Suite into your CD-ROM drive. The CD will auto-start. If not, click Start Run D:\Setup.exe (where D:\ is your CDROM drive).
2	Follow the prompts to complete the installation. The installer will detect the 32-bit or 64-bit operating system and automatically install the correct version of the software.
3	Reboot the system if prompted.

Once the device driver software is installed, please refer to the PCIe-85 specific sections of the MBX driver help for all software related information.

Section 3.2

Hardware

Installing the PCIe-85 Interface Adapter Hardware

Installing a PCIe-85 Adapter

NOTE: Before installing the PCIe-85 interface adapter in your PC, you **must first** install the device driver software.

NOTE: Ensure that computer power is **off** and the power cord is **not** plugged into the power source **before** installing the adapter.

Follow the steps below to install the PCIe-85 interface adapter and connect the cable(s).

Step	Action
1	Set the computer power switch to OFF, and unplug its power cable from the power source.
2	Remove the computer cover. Retain the screws and other hardware for reassembly.
3	Locate an unused PCIe expansion slot on the computer motherboard. Remove the screw/clip securing the blank faceplate for this slot position and remove the faceplate. Retain the screws and other hardware for re-assembly.
4	Set the single/dual cable mode jumper to the desired setting
5	Insert the PCIe-85 interface adapter into the expansion slot connector. Ensure that the adapter is firmly seated in the connector.
6	Install the screw/clip to secure the board's faceplate to the computer frame. Note that this screw/clip is required for proper grounding of the board.
7	Reinstall the computer cover.
8	Note: Make sure you selected an unused Modbus Plus node address before you connect the network cable(s). Plug the Modbus Plus network cable connector(s) into the board's connector(s). If you have a dual-cable network, your two cables should be labeled A and B. Ensure that you connect the cables into the proper connectors, as follows. <ul style="list-style-type: none"> ● A is on the bottom ● B is on the top
9	Reconnect the computer power cable and power up the computer. Verify normal operation with the board installed.

Chapter 4

Status Indicators

Status Indicators

PCIe-85 Adapter LEDs

The PCIe-85 includes three (3) LED indicators, which are visible through a cutout in the PCIe-85 bracket. These indicators represent the current status of the Modbus Plus connection:

- Two red indicators, labeled **ERR A** and **ERR B** on the bracket, identify faults on the two Modbus Plus cable connections, as follows:
 - If a red indicator blinks momentarily, it indicates that a message error was detected on the cable path.
 - A steady ON state indicates a hard fault either in the cable or in a node device connected to the cable. If you have only one cable plugged in while in Dual Channel mode, the red indicator will light steadily on the channel without a cable connected.
NOTE: The red indicators will only be active in dual-channel mode. In single-channel mode the red indicators will be OFF.
- A green indicator, labeled **ACT** on the bracket, will show the overall Modbus Plus communication status of the node, as follows:

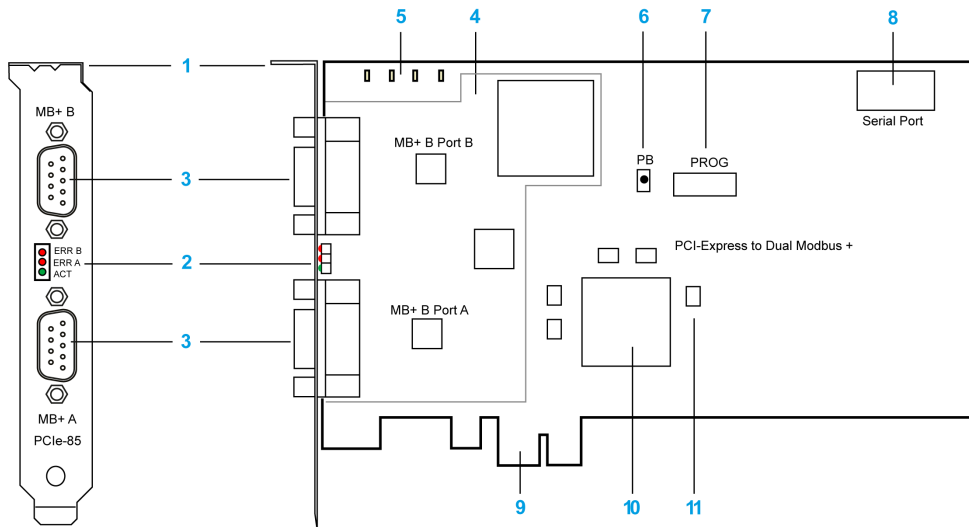
Modbus Plus communication status:

Green LED Pattern	Description
Off	The node is either not powered or is in RESET.
Six flashes per second	Normal operating state for each node. The node is successfully receiving and passing the token. All nodes on a healthy network flash this pattern.
One flash per second	This node is off-line just after power-up/RESET or after exiting four-flashes/second mode. In this state, the node monitors the network and builds a table of active nodes and token holding nodes. After being in this state for five seconds, the node attempts to go to its normal operating state (indicated by six flashes/second).
Two flashes, then OFF for two seconds	The node hears the token being passed among the other nodes, but it never receives the token itself. Check the network for an open circuit or defective termination.

Green LED Pattern	Description
Three flashes, then OFF for 1.7 seconds	The node is not hearing token passing among the other nodes. It periodically claims the token but cannot find another node to which to pass it. Check the network for an open circuit or defective termination.
Four flashes, then OFF for 1.4 seconds	The node has heard a valid message from a node using a network address identical to its own address. The node remains in this state for as long as it continues to hear the duplicate address. If the duplicate address is not heard for five seconds, the node changes to one flash/second mode, then changes to six flashes/second in normal operation.

NOTE: Status indicators are described only after successful boot-up of the host machine.

The two connectors (shown in the following figure) allow for redundant cabling. If one cable is severed, the other cable allows the continued functionality of the Modbus Plus node.



- 1 Bracket
- 2 Status indicators
- 3 Modbus Plus connectors
- 4 Modbus Plus chipset
- 5 Diagnostic indicators
- 6 Reset button
- 7 JTAG programming port
- 8 Serial port
- 9 PCIe x1 edge connector
- 10 FPGA

11 Level shifters

Chapter 5

MBX Suite

MBX Suite

Overview

MBX Suite provides the following programs to configure and monitor your Modbus Plus network.

- MBX Demo
- MBX Driver Configuration
- MBX Backup Configuration
- MBPSTAT (32 bits OS support only)

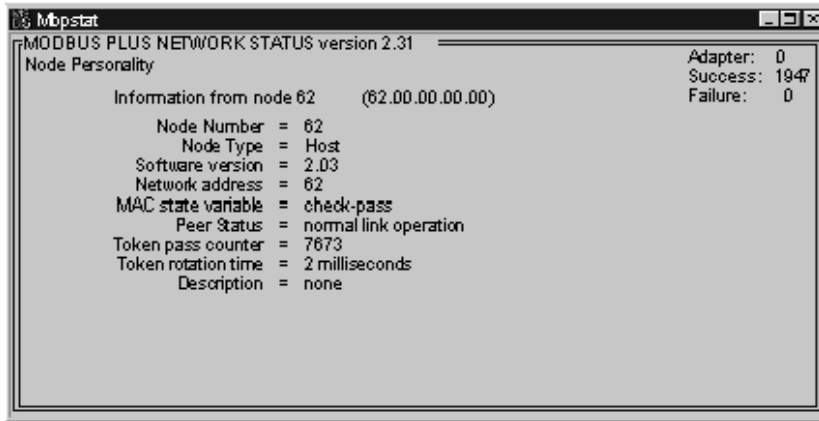
You may also use your Network Diagnostic Utility Program, **MBPSTAT.EXE**, to diagnose suspected faults. This utility is supplied on the distribution disk with your controller. A full description of how to run your MBPSTAT program appears in Appendix D of *Modbus Plus Network IBM Host Based Device's User's Guide* (890USE10200).

MBPSTAT

The following table shows how your MBPSTAT screen messages correspond to the indicator patterns.

Peer Status	Indicator Pattern
Normal Link Operation	Six flashes per second
Monitor Link Operation	One flash per second
Never Receiving Token	Two flashes, then OFF for two seconds
Sole Station	Three flashes, then OFF for 1.7 seconds
Duplicate Station	Four flashes, then OFF for 1.4 seconds

The following figure shows the MBPSTAT screen (option 10).



```
MBPstat
MODBUS PLUS NETWORK STATUS version 2.31
Node Personality
Information from node 62 (62.00.00.00.00)
Node Number = 62
Node Type = Host
Software version = 2.03
Network address = 62
MAC state variable = check-pass
Peer Status = normal link operation
Token pass counter = 7673
Token rotation time = 2 milliseconds
Description = none
Adapter: 0
Success: 1947
Failure: 0
```

MBX SDK Developer's Guide

Schneider offers a separate product, *MBX SDK Developer's Guide for Host Interface Adapters* (890USE16100), which consists of header files, C libraries, and example programs. You can compile and link these components to your applications program using the C-compiler, Microsoft Visual Studio (4.2 or higher). (MBX SDK is part number SW-LNET-SDK, which can be purchased separately.)

Chapter 6

Labeling the Modbus Plus Ports

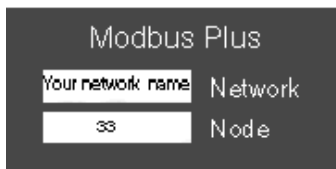
Labeling the Modbus Plus Ports

Labeling

Two sets of labels are provided with the PCI-85 interface adapter to identify the Modbus Plus network and node address. One label should be attached to the computer when you complete the connection to the network. The other label is a spare.

Enter the Modbus Plus network number and node address that you have assigned to the PCI-85 interface adapter on the label. Place the label so it can easily be seen on the PC.

The following figure shows an example of the completed label.



Appendices



Appendix A

Specifications

Specifications

Physical

Physical	
Name	Modbus Plus PCIe bus adapter with plug and play capability
Part Number	416NHM30042A
Size	4.376 inches (111.15 mm) in height by 6.600 inches (167.65 mm) in length

Mechanical and Electrical

Mechanical and Electrical	
Shock (Non-operating 3 shocks/axis)	30g, 11ms (IEC 68-2-27)
Free Fall (Unpackaged)	1 meter (IEC 68-2-32)
Vibration Operating	10-57 Hz 0.07mmDA, 57-150 Hz 1g (IEC 68-2-6)
Voltage	3.3 V and 12 V
Current Consumption, 3.3 V	250 mA
Current Consumption, 12 V	350 mA

Environmental

The following table lists environmental specifications for the PCIe-85 adapter.

Environmental	
Altitude	6,561 ft. (2000m) (MIL-STD-810)
Storage Temperature	+85 degrees C, -40 degrees C
Operating Temperature	0 degrees C, +60 degrees C
Humidity (Non-operating/Operating)	93% RH @ 60 degrees C Non-Condensing



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