ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Molex / Woodhead SST-DN3-PCI-1 / SST-DN3-PCU-1* at our website: *Click HERE*

SST-DN3-PCI-1 and SST-DN3-PCI-2

Hardware Reference Guide

Document Edition: 1.1

Document #: 715-0083

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Document Edition: 1.1

Date: December 1, 2004

This document applies to the SST-DN3-PCI-1 and SST-DN3-PCI-2 interface cards.

Copyright ©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited

This document and its contents are the proprietary and confidential property of Woodhead Industries Inc. and/or its subsidiaries and may not be used or disclosed to others without the express prior written consent of Woodhead Industries Inc. and/or its subsidiaries.

SST is a trademark of Woodhead Software & Electronics. All other trade names are trademarks or registered trademarks of their respective companies.

At Woodhead, we strive to ensure accuracy in our documentation. However, due to rapidly evolving products, software or hardware changes occasionally may not be reflected in our documents. If you notice any inaccuracies, please contact us (see Appendix D of this document).

Written and designed at Woodhead Software & Electronics, 50 Northland Road, Waterloo, Ontario, Canada N2V 1N3.

Hardcopies are not controlled.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Preface

Preface Sections:

- Purpose of this Guide
- Using this Guide
- Conventions

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Purpose of this Guide

This guide contains technical and product-related information on the SST-DN3-PCI-1 and SST-DN3-PCI-2 network interface cards.

The SST-DN3-PCI-1 consists of a single DeviceNet network interface (or *channel*), and the SST-DN3-PCI-2 comprises two independent interfaces, controlled by independent CPUs. Each CPU executes downloadable application firmware modules, which enable application-level product behavior. For more details, refer to relevant firmware documentation.



Note

An application running on one channel does not affect the performance of other channels, as it does not share memory or processor resources with them.



Note

In this manual, the SST-DN3-PCI-1 and SST-DN3-PCI-2 will be referred to as the *card*, except where product differences apply.

Using this Guide

If you are running a 3rd party application or writing your own application using the card's DLL calls, the sections of interest in this guide will be "Card Overview", "Installation" and potentially "Troubleshooting". If you are writing your own application in a non-Windows environment (interfacing directly with the card's memory registers), we recommend that you read the whole guide.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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” or “-H”	indicates a hexadecimal value

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Terminology

The following special terms are used throughout this guide:

Card	the SST-DN3-PCI-1 or SST-DN3-PCI-2 network interface card
Channel	a DeviceNet network interface on the card
Firmware Module	the embedded software module that gets loaded to the card's memory and runs on the card. This is the operating system of the card, enabling it to respond to commands from the host and manage network communications.
Host	the computer system in which the card is installed
.bin	an unencrypted firmware module for the card
.ss3	an encrypted firmware module for the card

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Contents

Preface iii
Purpose of this Guide iv
Using this Guide iv
Conventions v
Style v
Terminology vi
Special Notation vii

Card Overview 13
1.1 Warnings and Cautions 14
1.2 Card Features 15
1.3 Byte Ordering 15
1.4 DN3 Compatibility Overview 16
1.5 Hardware Description 17
1.5.1 CAN Connector 18
1.5.2 LEDs 20

Installation 23
2.1 System Requirements 24
2.2 Handling Precautions 24
2.3 Installing the Card 25
2.4 Connecting to a Network 26
2.4.1 Connecting to a DeviceNet Network 26
2.4.2 Connecting to a CAN Network 27

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Hardware Register Details 29
3.1 Introduction 30
3.2 Card Configuration Space 30
3.3 DN3 Card Configuration Registers 32
3.3.1 Host Register Layout 32
3.3.2 Control Register 33
3.3.3 AddrMatch Register 34
3.3.4 Bank Address Register 35
3.3.5 BankSize Register 37
3.3.6 HostIrq Register 38
3.3.7 LedReg Register 38
3.3.8 Debug Register 39
3.3.9 Host Data Register (FamilyID) 39

Troubleshooting 41
4.1 HLTH LED is Red 42
4.2 Memory Conflict 43
4.3 Card Not Found 43
4.4 General Troubleshooting 43

Error Messages 45
A.1 Introduction 46
A.2 FamilyID Messages 46
A.3 Fatal Hardware Self-Test Flash Codes 46

Technical Specifications 47
B.1 Technical Specifications 48

Loading Firmware 51
C.1 Loading Firmware 52
C.1.1 Verify Card Presence 52
C.1.2 Check for Conflicting RAM 53
C.1.3 Test Channel RAM 54
C.1.4 Load and Start the Firmware Module 55

Warranty and Support 57
D.1 Warranty 58
D.2 Reference Documents 58
D.3 Technical Support 58
D.3.1 Getting Help 59

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CE Compliance 61
E.1 CE Compliance 62

Index 63

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1 Card Overview

Chapter Sections:

- Warnings and Cautions
- Card Features
- Byte Ordering
- DN3 Compatibility Overview
- Hardware Description

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

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, hard-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.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.2 Card Features

The card is a PCI interface for communication with DeviceNet and other CAN-based networks. The main features of each channel are:

- 32-bit PCI interface (fully compliant with PCI v2.3)
- 33 MHz ColdFire Processor
- 256 KB of shared RAM
- DeviceNet-compliant 5-pin CAN connector
- Data rate of up to 1 Mbaud for CAN, and 125K, 250K and 250K for DeviceNet
- Bi-color LEDs showing card status
- Isolated CAN physical layer on each channel
- Compatible with CAN specification 2.0 part A and part B

1.3 Byte Ordering

The card uses Intel-style (little endian) byte ordering for multi-byte entities LSB-low address and MSB-high address. If your host system uses Motorola (big endian) byte ordering (MSB-low address and LSB-high address), you must compensate for byte ordering in software.

The following language macro will compensate for byte ordering in a 16-bit data entity:

```
#define SWAP_WORD (WordData) ((WordData<<8) | (WordData>>8))
```


©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.4 DN3 Compatibility Overview

For a comparison of DN3 with DNP, refer to Section D.2, Reference Documents.

The following table outlines the requirements of different PCI revisions and the PCI requirements of the card.

Table 1: PCI Compatibility Table

PCI Specification Revision	Supply Voltage Provided by Motherboard		PCI I/O Signaling Voltage Level of Motherboard	
	3.3V	5V	3.3V	5V
2.1	[1]Optional	Required	Not supported	Supported
2.2	Required	Required	Supported	Supported
2.3	Required	Required	Supported	Not supported
SST Product				
SST-DN3-PCI-1 and SST-DN3-PCI-2	Required	Required	[2]Supported	[2]Supported

[1] The card requires both 3.3V and 5V to be supplied by the motherboard. Because 3.3V supply voltage is optional in PCI specification revision 2.1, the card may not function in some PCI 2.1-compliant motherboards.

[2] The card will auto-detect the motherboard PCI I/O signaling level and adjust its signaling level accordingly, allowing it to function in PCI systems that support either 5V or 3.3V I/O signaling levels.

Summary

The card's compatibility can be summarized as follows:

- It will operate in PCI v2.2- and v2.3-compliant systems
- It will also operate in PCI 2.1-compliant systems that have implemented the optional 3.3V supply voltage

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.5 Hardware Description

The main features of the card are described in more detail in the following sections. For information on card dimensions, refer to Section B.1, Technical Specifications.

Figure 1: The SST-DN3-PCI-1 and 2 Interface Card

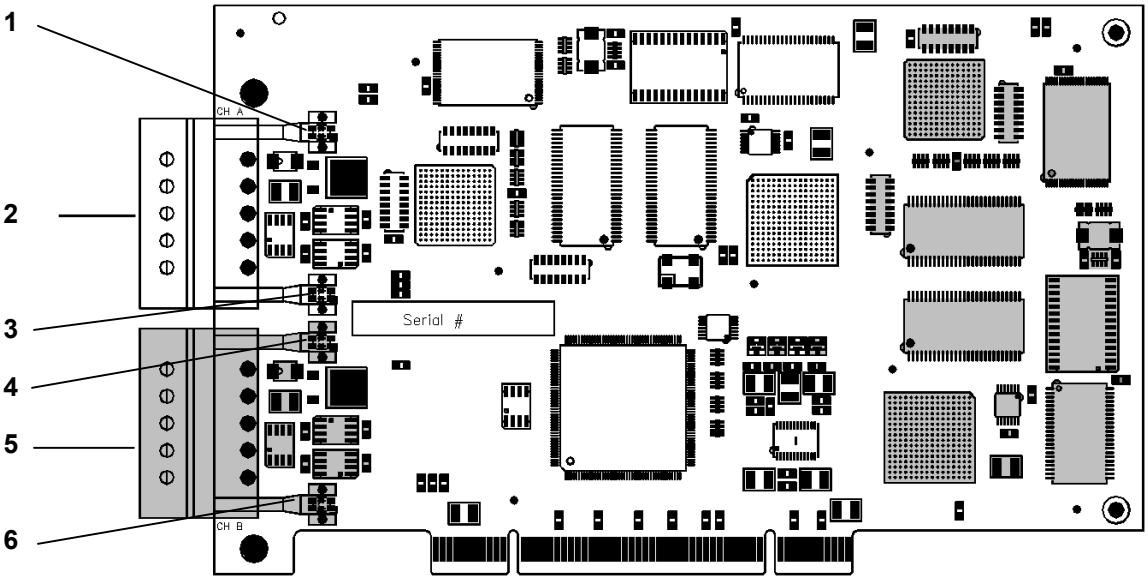


Table 2: Card Components

Feature	Description
1	Channel A HLTH LED
2	Channel A CAN Connector
3	Channel A COMM LED
4	Channel B HLTH LED
5	Channel B CAN Connector
6	Channel B COMM LED

Legend

1- and 2-channel

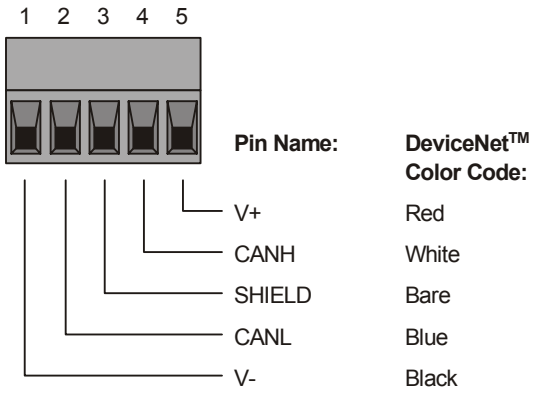
2-channel only

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.5.1 CAN Connector

The 5-pin connector is a standard removable connector that conforms to the standard DeviceNet pinout. Pin numbers, names, and color codes are identified in the figure below.

Figure 2: 5-Pin CAN Connector



1.5.1.1 V+, V-

These terminals provide power to the isolated section of the network interface, and must be connected in order for the card to function. On DeviceNet networks, they connect directly to the red (V+) and black (V-) wires of the DeviceNet cable. On non-powered CAN networks, they must be connected to an external 11-24VDC supply.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.5.1.2 CANH, CANL

These are the CAN communication bus signal terminals. Use only shielded twisted pair cable.

1.5.1.3 SHIELD

This is the shield connector. This terminal is “snubbed” to the PC/PCI chassis ground via a 1M-ohm resistor.



Note

According to the DeviceNet specification, the snubber circuit can be omitted if the card has no local connection to ground.



Note

The shield should be connected directly to earth ground at only one point in the network. Refer to Section 2.4, Connecting to a Network, for more information.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.5.2 LEDs

There are two LEDs per channel: Health (HLTH) and Communications (COMM).

Note

For information on troubleshooting using LEDs, refer to Section 4.1, HLTH LED is Red.

Figure 3: Mounting Bracket, Front View

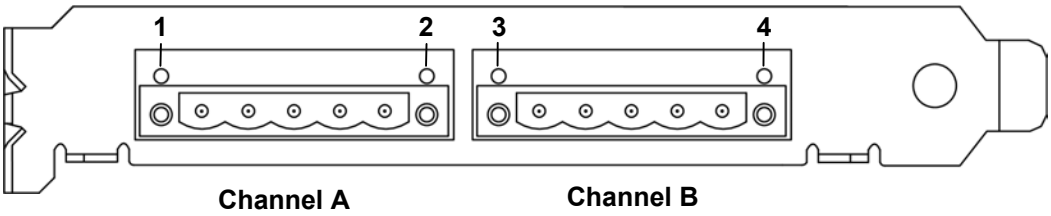


Table 3: LED Descriptions

Feature	Description
1	Channel A HLTH LED
2	Channel A COMM LED
3	Channel B HLTH LED
4	Channel B COMM LED

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

1.5.2.1 HLTH LED

The HLTH LED indicates the channel's health status. The HLTH LED's behavior is described in the following table.

Table 4: HLTH LED Behavior

Color	Status
Off	Card initialization failed or the card is not powered
Green	The firmware is loaded and running
Red	The card has not loaded, an error occurred during the load or there is a firmware run-time error
Amber	Startup self-test complete, no firmware loaded. The firmware must be reloaded (refer to Section 4.1, HLTH LED is Red).



Note

If the HEALTH LED is flashing, there may have been a startup failure. For more details, refer to Section A.3, Fatal Hardware Self-Test Flash Codes.

1.5.2.2 COMM LED

The COMM LED indicates the network status. This LED's meaning and behavior are determined by the currently loaded firmware module. Refer to the module's reference guide for more details.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2
Installation

Chapter Sections:

- System Requirements
- Handling Precautions
- Installing the Card
- Connecting to a Network

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.1 System Requirements

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

- An available PC v2.2 or v2.3 slot. The card will also operate in some PCI v2.1-compliant systems. Refer to Section 1.4, DN3 Compatibility Overview, for more compatibility details.
- If interrupts are required, you will need a physical interrupt. On the 2-channel card, this will be shared between channels.

2.2 Handling Precautions

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



Caution

- Always follow correct ESD procedures before handling the card. We strongly recommend the use of a grounding wrist strap as a standard handling practice.
- 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.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.3 Installing the Card

To install the card in your computer:

1. Ensure that all power to your computer is off.
2. Adequately ground yourself, as cautioned in Section 2.2, Handling Precautions.
3. Unplug the power cord, modem (if applicable), and any network cables.
4. Remove the computer cover. Consult your computer user's guide for information on installing add-in boards.
5. Take the card out of its shipping container and anti-static bag, being careful not to touch any of the connectors or pins.
6. Firmly press the card into a compatible PCI-compliant connector.
7. Secure the card using the screws provided. Re-connect any items unplugged in Step 3.
8. Replace the computer cover and power up the machine.
9. Connect the card to the DeviceNet network, as explained in the following section.
10. Replace the computer cover and power up the machine.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.4 Connecting to a Network

This section is divided into two parts: connecting to a DeviceNet network, and connecting to a CAN network.

2.4.1 Connecting to a DeviceNet Network

Connect either a DeviceNet Trunk or Drop cable to the 5-pin connector according to the color code in Section 1.5.1, CAN Connector. Make sure that all strands of wire go into the connector, as bent strands may cause shorts to the adjacent terminal.

Directly connecting DeviceNet thick cable to the card is not recommended due to the mechanical stress that the cable places on the connector. If you must attach thick cable, secure it to prevent undue stress.

2.4.1.1 Termination

The card does not have a built-in termination resistor. Each network must have two termination resistors—one at each end of the trunk. Always refer to the DeviceNet Specification (see Section D.2, Reference Documents) for proper network termination and wiring directions.

2.4.1.2 Power

Refer to http://www.odva.org/ for basic network guidelines, and to the DeviceNet Specification for proper powering directions.

2.4.1.3 Grounding

The network shield should be connected directly to earth ground at a single point in the network. Refer to http://www.odva.org/ for basic network guidelines, and to the DeviceNet Specification for proper grounding directions.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

2.4.2 Connecting to a CAN Network

Connect the CAN cable to the 5-pin connector and tighten all screws. Make sure that all strands of wire go into the connector as bent strands may cause shorts to an adjacent terminal.

2.4.2.1 Termination

The card does not have a built-in termination resistor. You must add termination in accordance with the requirements of the target CAN network.

2.4.2.2 Power

If the CAN Network does not supply 11-24 VDC power, connect an external power supply to the V+ and V- pins on the connector.

2.4.2.3 Grounding

Refer to the CAN network documentation for grounding directions.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3
Hardware Register Details

Chapter Sections:

- Introduction
- Card Configuration Space
- Card Configuration Registers

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3.1 Introduction

This section provides technical hardware information. The following information is intended for programmers familiar with hardware-level PC programming.

3.2 Card Configuration Space

This section provides card configuration details for the card.



Note

Refer to the PCI specification and your particular OS documentation for the function of all other PCI configuration space registers and their typical uses.



Note

Typically, the PCI configuration space registers do not need to be written to by the host system driver. A Plug & Play BIOS and/or host operating system will ensure there are no resource conflicts in the system.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 5: Card Configuration Space

In this table, information relevant to the card is bolded.

PCI CFG Register Address	Register Function 32 24 23 16 15 8 7 0				PCI Writable
0000H	**Device ID 0x9030**		**Vendor ID 0x10B5**		N
0004H	Status 0x0000		Command 0x0000		Y
0008H	Class Code 0x0280000			Revision ID Factory set	N
000CH	BIST 0x00	Header ID 0x00	PCI Latency 0x00	CacheLineSize 0x00	Y[7:0]
0010H	PCI Base Address 0 for Memory-Mapped Config Registers				Y
0014H	PCI Base Address 1 for I/O-Mapped Config Registers				Y
0018H	**PCI Base Address 2 for Local Address Space 0 Shared RAM Access Window for all channels**				**Y**
001CH	**PCI Base Address 3 for Local Address Space 1 I/O Space Access Window for all channels**				**Y**
0020H	PCI Base Address 4 for Local Address Space 2				Y
0024H	PCI Base Address 5 for Local Address Space 3				Y
0028H	Cardbus CIS Pointer (Not supported)				N
002CH	**Subsystem Device ID SST-DN3-PCI-2 = 0x0039 SST-DN3-PCI-1 = 0x003A**		**Subsystem Vendor ID 0x133D**		**N**
0030H	PCI Base Address for Local Expansion ROM 0x00000000				Y
0034H	Reserved 0x00000000				N
0038H	Reserved 0x00000000				N
003CH	Max_Lat 0x00	Min_Gnt 0x00	Interrupt Pin 0x01	Interrupt Line 0x00	Y[7:0]

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3.3 DN3 Card Configuration Registers

This section provides hardware register details for the card.

3.3.1 Host Register Layout

Each channel has its own set of registers, located in I/O space.



Note

Upon card power up, or after a physical reset from the system, it typically takes 1 second for the channel to initialize (though it is recommended that applications wait up to 2 seconds). Initialization can be confirmed by monitoring the LEDs or by reading the FamilyID register, as described in Section C.1.1, Verify Card Presence.

Table 6: Host Register Layout

The following “offsets” are offsets from the base address. An “X” means that the bit is reserved (writing to it will result in undefined behavior).

Offset	Register Name	Bit Name							
		7	6	5	4	3	2	1	0
00h	Control	CardRun (r/w)	MemEn (r/w)	IntEn (r/w)	WdTout (read)	HostIrq1 (r/w)	HostIrq0 (r/w)	CardIrq1 (r/w)	CardIrq0 (r/w)
01h (rd)	AddrMatch	X	X	X	X	X	X	X	X
02h	BankAddress	0	0	0	BA16	BA15	BA14	BA13	BA12
03h	BankSize	WS19	WS18	WS17	WS16	WS15	WS14	WS13	WS12
04h	HostIrq (r/w)	X	X	X	X	X	X	X	X
05(rd)	LedReg (read)	X	X	PwrRed	PwrGrn	HealthRed	HealthGrn	CommRed	CommGrn
06h	Debug (r/w)	X	X	X	X	X	X	X	X
07 (rd)	HDR (FamilyID)	HostDataReg (written by CPU)							

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3.3.2 Control Register

This register is a group of control and status bits.

Table 7: Control Register Settings

Bit	7	6	5	4	3	2	1	0
Name	CardRun	MemEn	IntEn	WdTout	HostIrq1	HostIrq0	CardIrq1	CardIrq0
Read/Write	R/W	R/W	R/W	R	R/W	R/W	R/W	R/W
Reset	0	0	0	0	0	0	0	0

Each channel has four interrupt flags, two for use in each direction. Setting CardIrq1 or CardIrq0 generates an interrupt to the card with the relevant flag set. When HostIrq1 OR HostIrq0 is '1' and IntEn is '1', the card drives the IRQ pin (as set by IrqLevel) high.

One flag could be used for a command interface, and another for changing I/O data. The firmware module dictates how these flags are used. If the module uses only one flag, it will be Flag 0.

Table 8: Control Register Bit Descriptions

Bit Name	Description
CardRun	This bit controls and indicates whether or not the channel's processor is running. It also affects the Health LED. • When this bit is 0, the processor is halted, and the LED is RED • When this bit is 1, the processor is running normally, and the LED is under channel processor control • When this bit is 1, and watchdog has timed out, processor is halted, and the LED is RED • This bit must remain low for at least 50 µs to guarantee proper reset.
MemEn	This bit indicates and controls whether or not the channel's shared memory will respond to host memory accesses. This may be used to multiplex several SST-DN3-PCI-1 or SST-DN3-PCI-2 cards or channels at the same base address by enabling the memory on one channel at a time. MemEn high ('1') enables shared memory decoding of addresses in this board's range.
IntEn	• Writing 1 enables interrupts • Writing 0 disables interrupts (the HostIrq flags still function as described)
WdTout	WdTout high ('1') indicates that a watchdog timeout has occurred, or that the channel's processor has been held in RESET by some other means. To restore this bit to 0, clear CardRun.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Bit Name	Description
HostIrq1	• This bit is used by the channel's processor to indicate that the channel generated an interrupt. If IntEn is set to 1, this also means that the channel generated a physical interrupt on the PCI bus. • Writing 1 acknowledges the interrupt and clears it • Writing 0 has no effect • Reading 1 indicates interrupt in progress • Reading 0 indicates interrupt complete
HostIrq0	• This bit is used by the channel's processor to indicate that the channel generated an interrupt. If IntEn is set to 1, this also means that the channel generated a physical interrupt on the PCI bus. • Writing 1 acknowledges the interrupt and clears it • Writing 0 has no effect • Reading 1 indicates interrupt in progress • Reading 0 indicates interrupt complete
CardIrq1	This bit is used by the host to send interrupts to interrupt flag 1 of the channel's processor. • Writing 1 generates an interrupt • Writing 0 has no effect • Reading 1 indicates interrupt in progress • Reading 0 indicates interrupt complete
CardIrq0	This bit is used by the host to send interrupts to interrupt flag 0 of the channel's processor. • Writing 1 generates an interrupt • Writing 0 has no effect • Reading 1 indicates interrupt in progress • Reading 0 indicates interrupt complete

3.3.3 AddrMatch Register

This register is reserved.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3.3.4 Bank Address Register

This register is used to switch banks of shared memory into host memory space.

Table 9: Bank Address Register Settings

Bit	7	6	5	4	3	2	1	0
Name	BA19	BA18	BA17	BA16	BA15	BA14	BA13	BA12
Read/Write	R	R	R/W	R/W	R/W	R/W	R/W	R
Reset	0	0	0	0	0	0	0	0

Table 10: Bank Address Register Values

In this table, the default window size is highlighted, and a value of "x" indicates "don't care".

Bit and Value								Window Size and Bank Number					
BA19	BA18	BA17	BA16	BA15	BA14	BA13	BA12	8k	16k	32k	64k	128k	256k
x	x	0	0	0	0	0	x	0	0	0	0	0	0
x	x	0	0	0	0	1	x	1	0	0	0	0	0
x	x	0	0	0	1	0	x	2	1	0	0	0	0
x	x	0	0	0	1	1	x	3	1	0	0	0	0
x	x	0	0	1	0	0	x	4	2	1	0	0	0
x	x	0	0	1	0	1	x	5	2	1	0	0	0
x	x	0	0	1	1	0	x	6	3	1	0	0	0
x	x	0	0	1	1	1	x	7	3	1	0	0	0
x	x	0	1	0	0	0	x	8	4	2	1	0	0
x	x	0	1	0	0	1	x	9	4	2	1	0	0
x	x	0	1	0	1	0	x	10	5	2	1	0	0
x	x	0	1	0	1	1	x	11	5	2	1	0	0
x	x	0	1	1	0	0	x	12	6	3	1	0	0
x	x	0	1	1	0	1	x	13	6	3	1	0	0
x	x	0	1	1	1	0	x	14	7	3	1	0	0
x	x	0	1	1	1	1	x	15	7	3	1	0	0
x	x	1	0	0	0	0	x	16	8	4	2	1	0
x	x	1	0	0	0	1	x	17	8	4	2	1	0
x	x	1	0	0	1	0	x	18	9	4	2	1	0
x	x	1	0	0	1	1	x	19	9	4	2	1	0
x	x	1	0	1	0	0	x	20	10	5	2	1	0
x	x	1	0	1	0	1	x	21	10	5	2	1	0
x	x	1	0	1	1	0	x	22	11	5	2	1	0
x	x	1	0	1	1	1	x	23	11	5	2	1	0
x	x	1	1	0	0	0	x	24	12	6	3	1	0

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Bit and Value								Window Size and Bank Number					
BA19	BA18	BA17	BA16	BA15	BA14	BA13	BA12	8k	16k	32k	64k	128k	256k
x	x	1	1	0	0	1	x	25	12	6	3	1	0
x	x	1	1	0	1	0	x	26	13	6	3	1	0
x	x	1	1	0	1	1	x	27	13	6	3	1	0
x	x	1	1	1	0	0	x	28	14	7	3	1	0
x	x	1	1	1	0	1	x	29	14	7	3	1	0
x	x	1	1	1	1	0	x	30	15	7	3	1	0
x	x	1	1	1	1	1	x	31	15	7	3	1	0

* x = don’t care

Table 11: Bank Address Register Bit Descriptions

Bit Name	Description
BA17-13	Each channel has 256k of memory accessible to the host. The Bank Address bits select which bank of memory the host can access. For example, in 16k mode, the bank number may be 0 through 15 (or 0x0 - 0xf). • BA17-BA13 represent the bank address • Bank numbers depend on the window size, selected using the WinSize bits. Refer to Table 13: BankSize Register Values, for more information.

To access any flat address of memory, “ADDR” in any window size, set the Bank Address bits to bits 19-12 of the address. In C, you would write:

```
outport( BankSelect, addr>>12);
offset= addr & ((inport( WinSize ) <<12 ) | 0x3FFF);
```


©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3.3.5 BankSize Register

This register controls the window size by masking off bits BA19-BA12 in the Bank Address register. Table 13, BankSize Register Values, maps the WS values required for each valid window size.

Table 12: BankSize Register Settings

Bit	7	6	5	4	3	2	1	0
Name	WS19	WS18	WS17	WS16	WS15	WS14	WS13	WS12
Read/Write	R	R	R/W	R/W	R/W	R/W	R/W	R
Reset	0	0	0	0	0	0	1	1

Table 13: BankSize Register Values

In this table, the default window values are highlighted.

Bit and Value								Window Size	Description
WS19	**WS18**	**WS17**	**WS16**	**WS15**	**WS14**	**WS13**	**WS12**		
0	0	0	0	0	0	0	1	8K	BA19-BA13 used, BA12 ignored
0	0	0	0	0	0	1	1	16K	BA19-BA14 used, BA13-BA12 ignored
0	0	0	0	0	1	1	1	32K	BA19-BA15 used, BA14-BA12 ignored
0	0	0	0	1	1	1	1	64K	BA19-BA16 used, BA15-BA12 ignored
0	0	0	1	1	1	1	1	128K	BA19-BA17 used, BA16-BA12 ignored
0	0	1	1	1	1	1	1	256K	BA19-BA18 used, BA17-BA12 ignored

Table 14: BankSize Register Bit Descriptions

Bit Name	Description
WS19-WS12	WS19-WS12 represent the window size, according to Table 13: BankSize Register Values. • Writing any value other than those above has no effect The size of the memory window affects the number of banks required to access all memory. Refer to Table 10: Bank Address Register Values, for more information.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

3.3.6 HostIrq Register

This register is reserved.

3.3.7 LedReg Register

This register reflects the state of the channel's LEDs, allowing host software to monitor the LEDs and display them on-screen.

Table 15: LedReg Register Settings

			PWR		HLTH		COMM	
Bit	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Name	Reserved		PwrRed	PwrGrn	HealthRed	HealthGrn	CommRed	CommGrn
Read/Write	R	R	R	R	R	R	R	R
Reset	0	0	0	0	0	0	0	0



Note

Although the card does not have a physical power LED, the power status can be determined via the PWR bits. Refer to Section 1.5.2, LEDs, for more details.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Table 16: LedReg Register Values

Bit Name/Value		Description
PwrRed	**PwrGrn**	These bits indicate the channel's power state
0	0	Invalid
0	1	LED is green
1	0	LED is red
1	1	Invalid
HealthRed	**HealthGrn**	These bits indicate the channel's health LED state
0	0	LED is off
0	1	LED is green
1	0	LED is red
1	1	LED is amber
CommRed	**CommGrn**	These bits indicate the channel's communications LED state
0	0	LED is off
0	1	LED is green
1	0	LED is red
1	1	LED is amber

3.3.8 Debug Register

This register is reserved.

3.3.9 Host Data Register (FamilyID)

The Host Data register can be used to pass 1 byte of data from Card to Host. This register is written by the CPU and is read-only by the Host. Its use is determined by firmware/boot.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4 Troubleshooting

Chapter Sections:

- HLTH LED is Red
- Memory Conflict
- Card Not Found
- General Troubleshooting

For a list of hardware-related errors that can be generated by the card, refer to Appendix A, Error Messages.



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.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.1 HLTH LED is Red

This section describes strategies for troubleshooting a red HLTH LED.



Note

For information on LED flash codes, refer to Section A.3, Fatal Hardware Self-Test Flash Codes.

If the HLTH LED is red, the channel is not running or there has been a firmware run-time error. Check the WdTout bit (refer to Table 8, Control Register Bit Descriptions) to determine whether or not there has been a watchdog timeout, and consult the appropriate firmware manual if necessary. If you continue to experience difficulties, refer to Section 4.4, General Troubleshooting.



Note

The firmware must be reloaded to restart the channel.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

4.2 Memory Conflict

If a memory conflict is detected, examine the resource allocations in the operating system. If the operating system does not manage resources, review the requirements of the other hardware installed in the machine to select a non-conflicting memory window. If you continue to experience difficulties, refer to Section 4.4, General Troubleshooting.

4.3 Card Not Found

If a "card not found" message is displayed, check for memory I/O and IRQ conflicts. If you continue to experience difficulties, refer to Section 4.4, General Troubleshooting.

4.4 General Troubleshooting

If you experience problems with the card:

1. Check the website at http://www.mysst.com for technical notes and DeviceNet release notes.
2. Check the FAQs on the website.
3. Refer to Section D.3, Technical Support.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

A
Error Messages

Appendix Sections:

- Introduction
- FamilyID Messages
- Flashing LEDs

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

A.1 Introduction

Error messages are posted in the Host Interface Memory's message area (0040h) and can be displayed using one of the status applications, such as DNSTAT, provided with the card. For details on the shared Host Interface Memory layout, refer to the Firmware Reference Guide.

A.2 FamilyID Messages

If FamilyID reads anything other than 0x40, the card has not been found. Check for memory and I/O conflicts. If you continue to experience difficulties, refer to Section 4.4, General Troubleshooting.

A.3 Fatal Hardware Self-Test Flash Codes

Fatal failures during startup are accompanied by an 8-bit fault code, flashed on the HealthLed. The fault code will be output MSB first, with a 1 (one) bit shown as a green LED, and a zero (0) bit shown as a red LED. This will occur for a period of 900ms, followed by 100ms of off time. The LSB will be followed by an additional 1000ms of off time, after which the sequence will repeat.

The following table describes each possible fault code.

Table 17: LED Flash Codes

Value	Name	Description
01	BITTEST8	Bit test failure of an 8-bit memory range
02	BITTEST16	Bit test failure of a 16-bit memory range
03	BITTEST32	Bit test failure of a 32-bit memory range
04	ADDRTEST8	Address test failure of an 8-bit memory range
05	ADDRTEST16	Address test failure of a 16-bit memory range
06	ADDRTEST32	Address test failure of a 32-bit memory range
07-10	-	Reserved for future fatal start-up errors
11	JTAG_ UNKNOWN	JTAG programming error
12	JTAG_TDOMISMATCH	JTAG output data failed to match expected pattern
13	JTAG_MAXRETRIES	JTAG output data failed to match expected pattern after several attempts
14	JTAG_ILLEGALCMD	JTAG programming file contained an unknown/malformed command
15	JTAG_ILLEGALSTATE	JTAG programming file commanded an illegal TAP state transition
16	JTAG_DATAOVERFLOW	JTAG programming file contained a shift pattern in excess of MAX_LEN * 8 bits
20-FF	-	Reserved for firmware-specific fatal errors

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

B

Technical Specifications

Appendix Sections

- Technical Specifications

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

B.1 Technical Specifications

The following tables list the technical specifications for the card.

Table 18: Environmental Specifications

Ambient Conditions	Storage temp:	-40°C to +85°C
	Operating temp:	0°C to 55°C
	Humidity:	5% to 95% non-condensing
Typical Current Draw		+5V, +/-5%, 1.03A (2-channel)

Table 19: Network Specifications

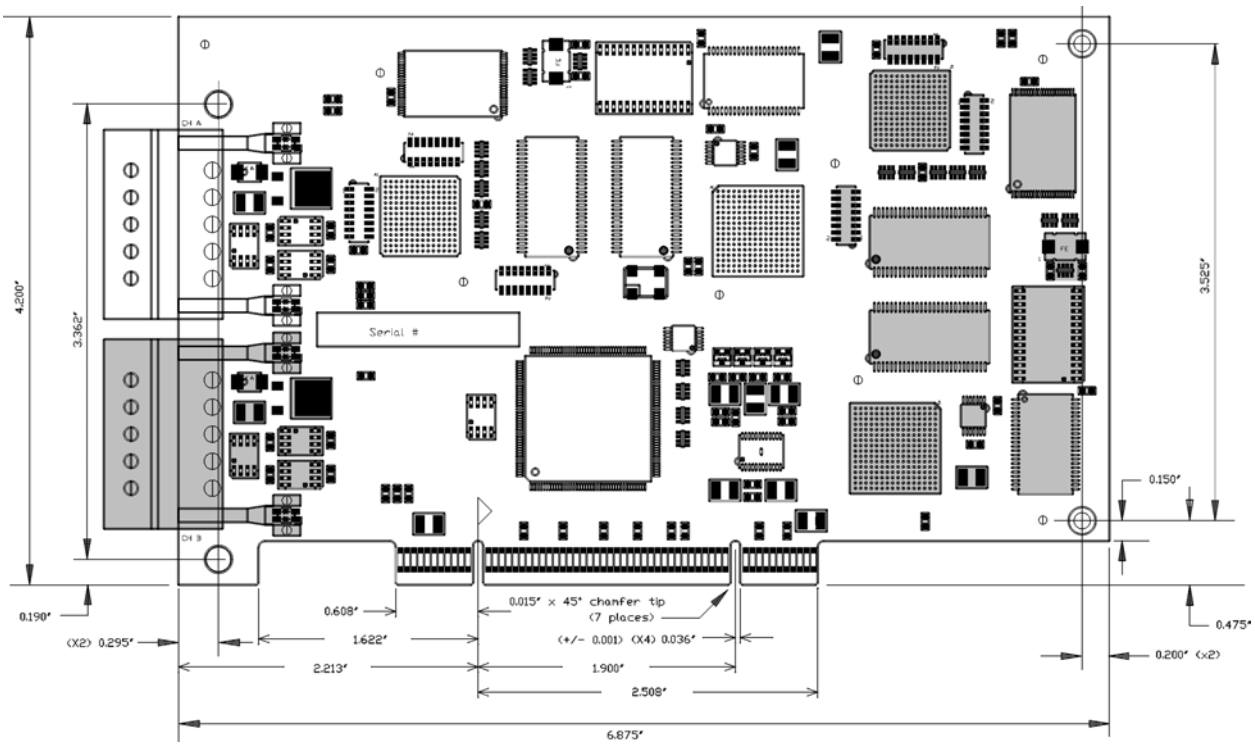
Cable	Shielded twisted pair, compatible with target network
External Power	11-24 VDC, 50mA (typical)
Isolation	500V
Protocol	CAN 2.0 A/B
Data Rate	Up to 1 Mbaud for CAN 125K, 250K and 500K baud for DeviceNet

Table 20: PCI Bus Specifications

Compliance	Compliant with PCI 2.2; will operate in 2.3 and some 2.1-compliant systems. Refer to Table 1: PCI Compatibility Table, for more information.
Size	Standard half-length, 32-bit, 33MHz, universal PCI card
Resources	(memory) 512KB available per card, with a 256KB window available to the host per channel (I/O) 16-byte range available per card, with 8 bytes allocated per channel (memory) 128 bytes for PCI configuration, per card

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Figure 4: Card Dimensions



For information on card components, refer to Section 1.5, Hardware Description.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C
Loading Firmware

Appendix Sections:

- Loading Firmware



Note

This appendix describes how to load the card manually, or how to write your own loader. If you are using a Windows loader provided by Woodhead Software & Electronics, the following instructions are not required.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1 Loading Firmware

Firmware modules for the card are supplied as .ss3 files, found on the software CD-ROM or on the website at http://www.mysst.com/.

If you are developing a driver for the card or producing a stand-alone embedded application, the following section describes the basic sequence of steps to load a module into the channel's memory.



Note

These procedures should be repeated for each channel.



Note

For register descriptions, refer to Chapter 3, Hardware Register Details.

C.1.1 Verify Card Presence

To verify the channel's presence, follow these steps:

1. Start up your computer.
2. Following release of the backplane reset, wait up to 2 seconds.
3. Verify a FamilyID Register value of 0x40.
4. If FamilyID reads anything other than 0x40, the card is still in Reset or has not been found. Refer to Section 4.4, General Troubleshooting.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1.2 Check for Conflicting RAM

Before the channel's shared memory can be safely enabled, you must determine that no other system devices are using the intended memory address range.



Note

Any task switching, interrupts or processes should be disabled during this procedure.

To check for conflicting RAM, follow these steps:

1. Write zero (0) to the Control Register to disable the channel.
2. Read a word from the target memory window and save it.
3. Write 0xAA55 to the target address.
4. Read the target address. It should not contain 0xAA55.
5. If 0xAA55 is read, a conflict exists. Perform the following steps:
   - Restore the saved value to the target address
   - Abort the load procedure
   - Examine the resource allocations in your operating system. If your operating system does not manage resources, review the requirements of other hardware installed in your machine to select a non-conflicting memory window. If you continue to experience difficulties, please refer to Section 4.4, General Troubleshooting.



Note

If you are unsure of the system's memory usage, you may want to do a full memory window verification to ensure that there are no memory conflicts.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1.3 Test Channel RAM

To test the channel's RAM, follow these steps:

1. Write the desired window size to the BankSize register (refer to Section 3.3.5, BankSize Register, for details).
2. Write 0x40 (MemEn) to the Control Register.
3. Set the Bank Address Register (refer to Section 3.3.4, Bank Address Register, for details).
4. Fill the shared memory with a test pattern.



Note

We recommend using a test pattern with a unique value for each word in a given bank. In C language this could be:

```
~offset + bank.
```

5. Repeat steps 3-4 for all memory banks.
6. Verify the test pattern.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

C.1.4 Load and Start the Firmware Module

To load and start the firmware module, follow these steps:

1. Write the contents of the entire firmware file into shared memory, starting at bank zero (0), offset zero (0).

2. If the application requires interrupts from the card, bit-wise OR value 0x20 (IntEn) to the Control Register.

3. Bit-wise OR value 0x80 (CardRun) to the Control Register to start the firmware module.

4. Start a 2-second timeout timer and wait for value 0x04 (HostIrq0) in the Control Register to set.

5. If the timer expires, the firmware module failed to start. Write zero to the Control Register to disable the channel's processor. If this problem persists, contact Technical Support for assistance.

6. Check the load status, as per the firmware manual.

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

D

Warranty and Support

Appendix Sections:

- Warranty
- Reference Documents
- Technical Support

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

D.1 Warranty

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

D.2 Reference Documents

- **DeviceNet Specification**, Volumes I and II, V2.0, Errata 5
- **ODVA Publication**, March 2002
  http://www.odva.org/
- **PCI Local Bus Specification v2.2**
  PCI Special Interest Group, December 1998
- **PCI9030 Datasheet v1.4**
  PLX Technology Publications, May 2002
- **SST-DN3-PCI and 5136-DNP-PCI Comparison Technical Note**
  http://www.mysst.com/download

D.3 Technical Support

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

- Card model, type and serial number
- Computer's make, model, CPU speed 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

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

D.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 website.



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.

North America

Canada:
Tel: 1-519-725-5136
Fax: 1-519-725-1515
Email: techsupportna@woodhead.com

Europe

France:
Tel: 33-(0)2-32-96-04-22
Fax: 33-(0)2-32-96-04-21
Email: supportfr@applicom-int.com

Germany:
Tel: 49-711-782-374-22
Fax: 49-711-782-374-11
Email: supportde@applicom-int.com

Italy:
Tel: 39-01-059-540-52
Fax: 39-0-10-59-56-925
Email: supportit@applicom-int.com

United Kingdom:
Tel: 33-(0)2-32-96-04-23
Fax: 44-161-285-8686
Email: supportintl@applicom-int.com

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Asia-Pacific

Japan:
Tel: 81-452-24-3560
Fax: 81-52-745-7622
Email: techsupport@woodhead.co.jp

Singapore:
Tel: 65-64-67-96-52
Fax: 65-6261-3588
Email: info@woodhead.com.sg

China:
Tel: 86-21-5032-8080
Fax: 86-21-5031-8833
Email: techsupport@woodhead.co.jp

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

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

E

CE Compliance

Appendix Sections:

- CE Compliance

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

E.1 CE Compliance

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

- EN 61326:1998 including amendments A1 and A2: - “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.



Note

The backplane voltage supply for this equipment must be delivered as Separated Extra Low Voltage (SELV).

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Index

A

AddrMatch Register, 34

B

Bank Address Register, 35
BankSize Register, 37
bin files, definition of, vi
byte ordering, 15

C

cable, description of, 48
CAN Connector, 18
CAN network, 27
card
  byte ordering, 15
  cautions, 14, 24, 62
  CE compliance, 62
  compared to DNP card, 16
  connecting to a network, 26
  definition of, vi
  error messages, 46
  features of, 15
  hardware, 17
  installing, 25
  loading firmware to, 52
  registers, 32
  status of, 20
  system requirements, 24
  technical specifications, 48
  technical support, 58
  troubleshooting, 42
  warnings, 14, 41, 62
  warranty, 58
Card Not Found, 43
card presence, testing for, 52
cautions
  definition of, vii
  electrostatic discharge, 14, 24
  high voltage, 62
CE compliance, 62
channel
  definition of, vi
  testing RAM on, 54
COMM LED
  description of, 21
  status of, 39
compatibility, with DNP card, 16
compliance, with CE Standard, 62
Control Register, 33
conventions
  special notation, vii

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

special terms, vi
style, v
current draw, 48

D

Debug Register, 39
DeviceNet network, 26

E

electrostatic discharge (ESD), 14, 24
emergency stop circuit, 14
error messages, 46
external power, 48

F

FamilyID errors, 46
FamilyID Register, 39
fatal flash codes, 46
firmware module
definition of, vi
loading, 52, 55

G

grounding
for CAN network, 27
for DeviceNet network, 26
grounding wrist strap, 24

H

hardware
CAN Connector, 18
diagram of, 17
fatal flash codes, 46
LEDs, 20
hardware registers, 32
height, of card, 48
HLTH LED
description of, 21
status of, 39
Host Data Register (FamilyID), 39
Host Register, 32
host, definition of, vi
HostIrq Register, 38
humidity, 48

I

installation
card, 25
firmware, 52
interrupts, 33, 48
isolation, 48

L

LedReg Register, 38
LEDs
description of, 20
flash codes, 46
status of, 39
troubleshooting with, 42

M

memory conflict, 43
memory space, 48
module
definition of, vi
loading, 52, 55

N

network
CAN, 27
connecting to, 26
DeviceNet, 26
specifications, 48
termination, 26, 27
note, definition of, vii

O

operating temperature, 48

P

PCI configuration registers, 30
power
external, 48
for CAN network, 27
for DeviceNet network, 26
on channel, 39

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

precautions, 14
  card handling, 14
  electrostatic discharge, 24
  high voltage, 62
  installation, 41
  radio interference, 62
protocol, 48
purpose, of guide, iv

R

RAM
  conflicting, 53
  testing on channels, 54
reference documents, 58
registers, 30, 32
requirements, system, 24

S

ss3 files, definition of, vi
status
  of card, 20
  of LEDs, 38
storage temperature, of card, 48
support, 58
system requirements, 24

T

technical specifications, 48
technical support, 58
temperature
  operating, 48
  storage, 48
termination
  for CAN network, 27
  for DeviceNet network, 26
testing card presence, 52
troubleshooting, with LEDs, 42

V

verifying card presence, 52

W

warnings
  card handling, 14
  definition of, vii
  emergency stop circuit, 14
  installation, 41
  radio interference, 62
warranty, 58
wattage, 48
width, of card, 48
wrist strap, 24

©2004 Woodhead Software & Electronics, Division of Woodhead Canada Limited
Document Edition: 1.1, Document #: 715-0083, Template Edition: 1.1, Template #: QMS-06-045
Use, duplication or disclosure of this document or any of the information contained herein is subject to the restrictions on page ii of this document.
Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP