BridgeWay

PROFIBUS to DeviceNet Gateway

User Manual

Part No**. AB7605**

For Firmware Revision **2.01.01** and Later

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Preface

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There are many applications of the BridgeWay module. Those responsible for the use of this device must satisfy themselves that all necessary steps have been taken to verify an application meets all performance and safety requirements including any applicable laws, regulations, codes, and standards.

The illustrations and samples in this guide are intended solely for the purpose of example. Pyramid Solutions does not assume responsibility or liability for actual use based upon the examples shown in this publication.

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Related Documentation

Document Name	Author	Web Page
DeviceNet Specification	ODVA	www.odva.org
PROFIBUS Specification	PROFIBUS International	www.profibus.com

Table 1-1 Related Documentation

PROFIBUS is a trademark of PROFIBUS International.

DeviceNet is a trademark of the Open Device Vendor Association, Inc. (ODVA)

RSLinx and RSNetWorx are trademarks of Rockwell Software.

MS-DOS, and Windows are trademarks of Microsoft Corporation.

BridgeWay Module Description

Overview

The BridgeWay PROFIBUS to DeviceNet Gateway allows you to monitor and control data on a DeviceNet network using a PROFIBUS-DP master device. The BridgeWay acts as a DeviceNet master, collecting and distributing input and output data to modules on DeviceNet. The I/O table used by the DeviceNet master is accessible for I/O data exchange with the PROFIBUS-DP master.

Theory of Operation

The BridgeWay provides centralized data storage, the "PassageWay™", for data that is shared between the DeviceNet and PROFIBUS networks. Data is placed into the PassageWay by one network interface, allowing the data to be read through the other network interface.

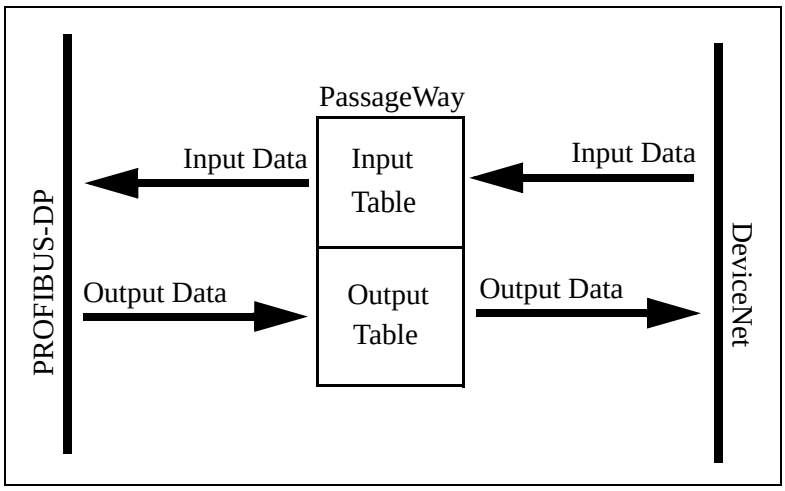

Figure 1-1 BridgeWay PassageWay Operation

The BridgeWay appears as a single device on either network using standard protocol mechanisms. No special, or extended, protocol features are required of the devices on either network to read or write the data flowing through the PassageWay; all cross-network activity is transparent to the devices on either network.

DeviceNet Features

- DeviceNet Master scanner functionality supporting up to 63 DeviceNet slave devices
- Explicit Messaging and Bit Strobe, Poll, Change of State (COS), and Cyclic I/O connections.
- Baud rates of 125, 250, and 500 Kbps.
- Automatic baud rate detection option may be enabled or disabled.
- Automatic Address Recovery can be configured to replace a faulted slave device with a replacement device at the same MAC ID.
- Configuration Recovery can be configured for slave devices so that a newly replaced slave can be configured to the same settings of the device it replaces. Combined with Automatic Address Recovery this feature is known as Automatic Device Recovery (ADR).
- DeviceNet Quick Connect
- Configurable input safe state mode determines the state of slave input data when a slave's I/O connection times out.

PROFIBUS Features

- PROFIBUS-DP slave.
- Cyclic I/O data transmission.
- Device diagnostic transmission.
- Baud rates ranging from 9.6 Kbps to 12 Mbps.

System Requirements

The following hardware and software components are needed to use the BridgeWay PROFIBUS to DeviceNet Gateway.

Required Hardware

- BridgeWay module.
- DeviceNet network connection.
- PROFIBUS-DP network connection
- PROFIBUS-DP master device.
- 24 VDC power connection
- PC to execute DeviceNet Configuration Software. The DeviceNet scanner configuration is done using DeviceNet configuration software tool such as RSNetWorx for DeviceNet from Rockwell Software or HMS NetTool-DN-D.

Optional Hardware

- DIN rail to mount the BridgeWay.
- A PC with a serial RS232 COM port to be used by the BridgeWay Configuration Tool Software for setting DeviceNet network configuration.
- RS-232 null-modem cable (pins 2 and 3 swapped) from the PC to the BridgeWay module for field firmware updates. The PC may use either a serial port or a USB serial adapter.

Required Software

- DeviceNet configuration software such as RSNetWorx for DeviceNet or HMS NetTool-DN-D to configure DeviceNet devices and the BridgeWay's DeviceNet operation. If RSNetWorx is to be used to configure the BridgeWay. RSLinx version 2.31 or later is required. **RSNetworx v7.0 or later is required to support the full 128K bytes of ADR configuration recovery data; earlier versions support up to 64K bytes of data. NetTool-DN-D, as of v3.3.1, supports up to 64K bytes of configuation data.**

Optional Software

- BridgeWay Configuration Tool Software (BWConfig) for DeviceNet node configuration and module status information.BWConfig requires that the PC be running Microsoft Windows 98, NT, 2000 or XP.

Hardware Description

All connections, whether power or fieldbus, to the BridgeWay are made on one end of the module. Phoenix-style connectors are provided for power and DeviceNet connections. A 9-pin D-Subminiature connector is provided for PROFIBUS connection. There is a 9-pin D-Subminiature connector for the auxiliary RS-232 port that is used for field firmware upgrades. See “Installation” Page 2-1 for details on using these connections.

Also on the end of the BridgeWay are switches that set the PROFIBUS network configuration. 2 Rotary switches are used to set the network address. A single DIP switch allows internal network termination to be enabled and disabled. See “BridgeWay Configuration Tool (BWConfig)” Page 3-1 for details on configuring the PROFIBUS network interface.

The front of the module has a set of 6 LEDs that are used for status indication. These LEDs provide visual status for the overall module, the DeviceNet interface, and the PROFIBUS interface. See “Status and Diagnostics” Page 7-1 for details on how the LEDs are used.

The back of the module has a DIN rail mount to allow the module to be mounted on a DIN rail.

Installation

Installation and Operation Requirements

•Power, input and output (I/O) wiring must be in accordance with Class 1, Division 2 wiring methods - article 501-4(b) of the National Electric Code, NFPA 70 and in accordance with local codes.

•**Warning - Explosion Hazard** - Substitution of components may impair suitability for Class 1, Division 2.

•**Warning - Explosion Hazard** - When in hazardous locations turn off power before replacing or wiring modules.

•**Warning - Explosion Hazard** - Do not disconnect equipment unless power has been switched off or the area is known to be nonhazardous.

•Terminal tightening torque must be between 5-7 lbs-in (0.5-0.8 Nm).

•For use in Class 2 circuits only.

•Suitable for surrounding temperature of 65 degrees C maximum.

•Use 60/75 C copper wire only.

Power and Network Connections

The power and network connections to the BridgeWay are made on the end of the module. Figure 2-1 indicates the location of each connector.

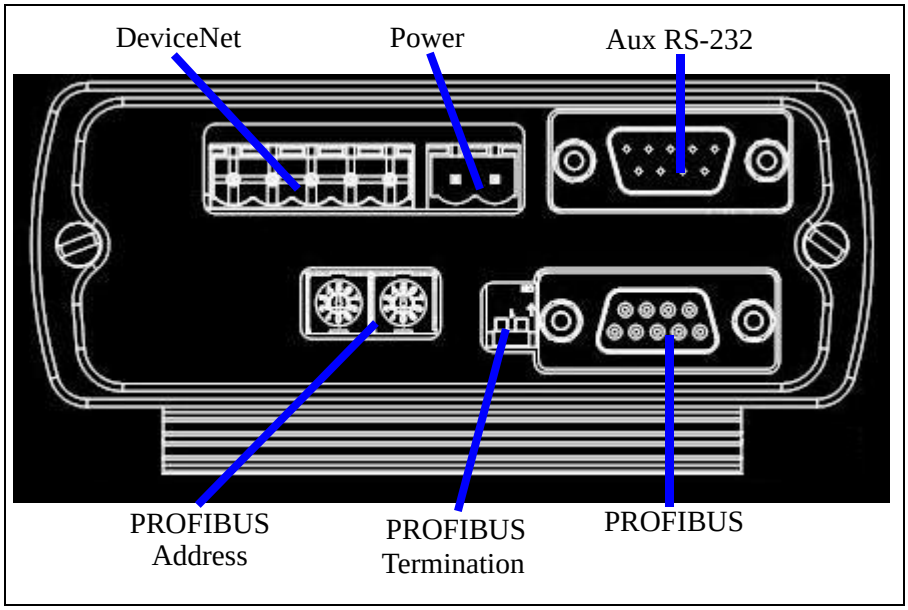

Figure 2-1 BridgeWay Power and Network Connections

Connecting Power

The power connection is a 2-pin terminal block located on the end of the module. The female terminal block connector is provided with the BridgeWay. Connections to be made are illustrated in Figure 2-2.

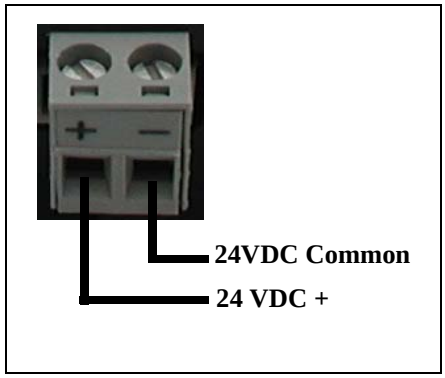

Figure 2-2 Power Connection

The BridgeWay requires 24 volts DC power. The module will start immediately when power is applied (There is no On/Off switch on the module).

Connecting DeviceNet

The DeviceNet network connection is a 5-pin terminal block located next to the power connection on the end of the module. The female terminal block connector is provided with the BridgeWay. Connections to be made are illustrated in Figure 2-3.

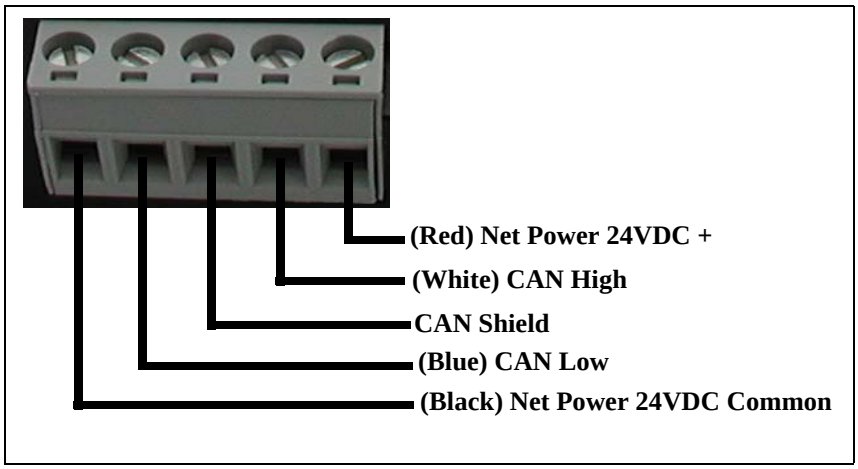

Figure 2-3 DeviceNet Connection

A 120 ohm termination resistor (not provided) may be required for proper network termination. See the DeviceNet Specification for specific rules on DeviceNet connections and termination.

For information on setting the DeviceNet network configuration (MAC ID, baud rate, etc.), see “DeviceNet Network Configuration” on page 3-5.

Connecting to PROFIBUS

The PROFIBUS network connection is a 9-pin D-Subminiature female connector located on the end of the module next to the PROFIBUS termination switch. Connections to be made are as shown below.

Pin	Connection
3	B-Line
4	RTS
5	GND Bus
6	+5 V Bus
8	A-Line

The +5V Bus and GND Bus connections are used for bus termination. Some devices like optical transceivers (RS-485 to fiber optics) might require external power from these pins.

The RTS connection is used in some equipment to determine the direction of transmission.

In typical applications only the A-Line, B-Line and Shield connections are used.

For information on setting the PROFIBUS network configuration (address, baud rate, etc.), see “BridgeWay Configuration Tool (BWConfig)” on page 3-1.

Configuration Port Connector

The configuration port is the 9-pin D-Subminiature male connector on the end of the BridgeWay. The connector has a standard RS-232 DTE pin configuration. The connections to be made as shown below.

Pin	Connection
2	Receive Data
3	Transmit Data
5	Signal Ground

The BridgeWay is connected to a PC for configuration using a null-modem cable. A null-modem cable has pins 2 and 3 swapped so that the PC's Transmit line is connected to the BridgeWay's Receive line, and the PC's Receive line is connected to the BridgeWay's Transmit line.

Note: The BridgeWay does not make use of the modem control signals specified for a DTE connector. Connecting the module through devices, such as isolation modules, which assume control of these lines may cause the BWConfig communications to be unreliable.

Configuration

This chapter describes how the BridgeWay PROFIBUS to DeviceNet Gateway is configured. The next chapter walks the reader through the configuration of the BridgeWay using the commonly available configuration tools.

BridgeWay Configuration Tool (BWConfig)

The BridgeWay Configuration Tool allows you to configure the parameters associated with the DeviceNet network interfaces.

BWConfig is a Microsoft Windows application that communicates with the BridgeWay over a standard RS-232 serial link using the PC serial port or USB serial adapter. BWConfig is compatible with Microsoft Windows 98, NT, 2000, and XP.

Installing the Tool

Install BWConfig from the CD by running *Setup.exe* which is found in the CD's root directory.

If you have downloaded BWConfig from the web site, unzip the downloaded file into a temporary directory and run *Setup.exe* which is found in the temporary directory.

Connecting to the BridgeWay Module

Connect the PC running BWConfig to the BridgeWay module using a standard Null-Modem (pins 2 and 3 swapped) serial cable between the PC serial port or USB adapter and the 9-pin D-Sub connector on the module. It does not matter which PC serial port you use, BWConfig will scan each available port and detect the connection automatically. No serial port configuration is required; BWConfig will automatically set the buad rate.

Starting the Tool

Launch BWConfig from the *BridgeWay Configuration* folder in the Windows Start Menu.

When BWConfig is started, it will attempt to locate a BridgeWay module on one of the PC serial ports. If a module is found, the status area of the tool will be updated to show the module type and status of the module that was located.

If a module is not connected to the PC, or is powered off, when the tool is started, the status area will indicate that no module was detected. Make sure that the module is powered and the connection is made, then press the Refresh button on the BWConfig tool bar; this will cause the tool to rescan the serial ports for a module.

BWConfig User Interface

The BridgeWay Configuration Tool's user interface is shown in Figure 3-1.

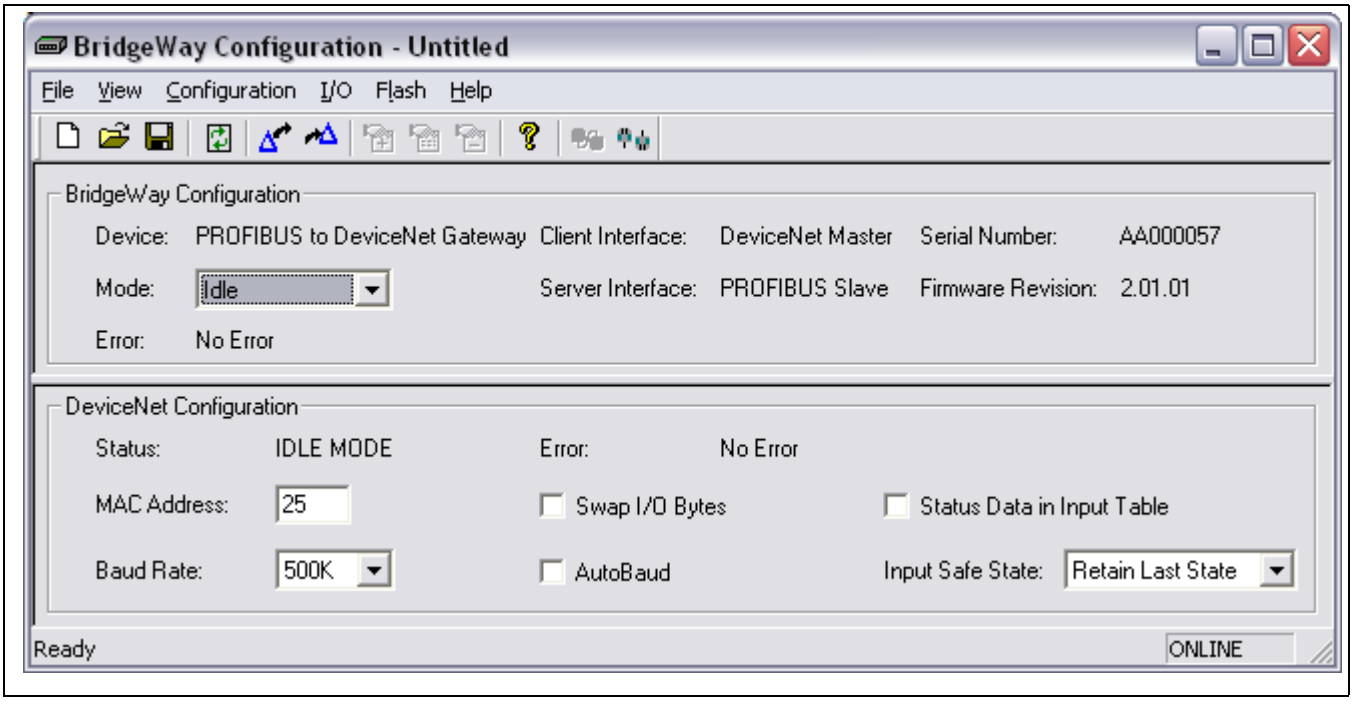

Figure 3-1 BWConfig User Interface

Display Panes

The BWConfig display is divided into 2 panes.

BridgeWay Configuration	Module type and status information about the BridgeWay module that was detected.
DeviceNet Configuration	Configuration of DeviceNet network parameters and status of the network interface.

Tool Operations

The following operations are available through the BWConfig menus and tool bar.

New File	Create a new BridgeWay configuration for the selected type of module.
Open File	Open a previously saved BridgeWay configuration.
Save File	Save the current BridgeWay configuration to a file.
Refresh Device Status	Refresh the module identity and status information. This will update the current status information shown by the tool. This can also be used to start the detection process if a module has not been detected by the tool, or the connection has been changed to a different module.
Upload Configuration	Read the configuration that is currently stored in the BridgeWay module. This will overwrite any configuration that is displayed on the tool's user interface.
Download Configuration	Send the configuration shown on the tool's user interface to the BridgeWay module.
Offline Configuration	Offline configuration will allow a configuration to be created and saved without being connected to a module.

Flash Update	Perform a field upgrade of the BridgeWay module's firmware. **Note:** Care should be taken when upgrading firmware, an incomplete update could cause irreparable harm to the module.

DeviceNet Network Configuration

Setting the DeviceNet Configuration with BWConfig

The DeviceNet network configuration pane in BWConfig contains the parameters used to control the behavior of the DeviceNet network interface. The parameters are described in Table 3-1 below. Refer to Figure 3-1 to see how each parameter is displayed on the user interface.

Parameter	Description	Allowable Range
MAC Address	The network address the BridgeWay will use on the DeviceNet network. The MAC address factory default is 63.	0-63
Baud Rate	The baud rate of the DeviceNet network. The baud rate factory default is 125K	125K 250K 500K
Auto Baud	Enable or disable automatic baud rate detection on the BridgeWay. The factory default setting for automatic baud detection is Disabled. **Note**: If the BridgeWay is the primary master on the DeviceNet network, do not enable automatic baud detection.	Enabled or Disabled
Swap I/O Bytes	Enable or disable I/O data byte swapping. This option will swap bytes in the I/O tables on 16-bit boundaries. This is helpful when using PROFIBUS, which expects data to be stored in reverse byte orientation from DeviceNet.	Enabled or Disabled

Table 3-1 DeviceNet Network Configuration Parameters

Parameter	Description	Allowable Range
Status Data in Input Table	Enable or disable the inclusion of status data in the Input table. This option will allow the user to configure the module to add DeviceNet scanner status data to the front of the input table. This option provides the same data that is used in the PROFIBUS Diagnostic data, but that is readable directly in the input data. If this option is enabled, the usable DeviceNet slave input data is reduced by 18 bytes to make room for the status data. See “Input Table Organization” on page 5-4 for details on the status data and input data.	Enabled or Disabled
Input Data Safe State	Define the safe state for the DeviceNet input data. The safe state determines what will happen to the data in the input table associated with a DeviceNet slave when the connection to that slaves times out. Setting the safe state to “Retain Last State” will cause the slave’s data to freeze at the last value received from the slave. Setting the value to “Zero Data” will cause all input data associated with the slave to be set to zero.	Retain Last State or Zero Data

Table 3-1 DeviceNet Network Configuration Parameters

Note: The BridgeWay will automatically reset after the DeviceNet configuration is downloaded from BWConfig.

Setting the DeviceNet Configuration with Node Commissioning Tools

The DeviceNet network configuration may be set using DeviceNet node commissioning tool like RSNetworx or NetTool-DN-D. The parameters discussed above must be set through the parameter editing function of these tools. See the next chapter for details on setting the DeviceNet network configuration using these tools.

EDS File

Each device on a DeviceNet network has an associated EDS file containing all necessary information about the device. This file is used by the network configuration tools, such as RSNetWorx or NetTool-DN-D, during configuration of the network.

The latest version of the EDS file for the BridgeWay can be downloaded from Pyramid Solution's web site, or received by contacting Pyramid Solutions.

DeviceNet I/O Configuration

I/O Mapping

The DeviceNet I/O configuration defines the format of the DeviceNet slave Input and Output tables in the PassageWay, or the *mapping* of DeviceNet slaves' I/O data to the I/O tables. See "Theory of Operation" on page 1-1 for a discussion on the PassageWay and the use of I/O tables in the BridgeWay. As slaves are added to the BridgeWay's DeviceNet scanner configuration, the location in the I/O tables of each part of the slave's I/O data is determined and stored.

Note: The organization of the I/O tables is very important. This defines the format of the data that will be exposed to the PROFIBUS master. The Input and Output table formats should be planned and documented to ensure the PROFIBUS master is working with the correct data from the DeviceNet network.

I/O Size Limitations

The size of the I/O data that can be exchanged with the PROFIBUS master and, hence, the size of the I/O tables is restricted as explained below.

- The Input table (data coming from DeviceNet devices) size cannot be larger than 244 bytes including the status data if the Status Data In Input option is enabled.
- The Output table (data being sent to DeviceNet devices) size cannot be larger than 244 bytes.
- The total size of the Input and Output tables combined cannot be larger than 400 bytes. (Including the status data if the Status Data In Input option is enabled.)
- There must be at least 1 byte of Input or Output configured. i.e. Both the Input and Output sizes cannot be 0.

It is important to remember that, although the BridgeWay is capable of handling up to 244 bytes in the Input or Output table, the limitation on the total I/O size may restrict either table to less than 244 bytes.

If an I/O configuration is saved that exceeds the size limitations, the BridgeWay status and PROFIBUS diagnostics will indicate that there is an I/O size configuration error.

DeviceNet Configuration Tools

The DeviceNet I/O configuration is set using a DeviceNet configuration tool. This manual is not intended to replace the user manual for the configuration tool; hence it will not provide details on using the tool.

The next chapter provides an example application, and provides an overview of the use of Rockwell Software's RSNetWorx for DeviceNet and HMS' NetTool-DN-D.

PROFIBUS Network Configuration

PROFIBUS Network Address

The PROFIBUS network address is set using two rotary switches on the end of the BridgeWay. Each switch sets a digit of the address from 1 to 9, allowing for a range of network addresses from 1 to 99.

The rotary switch nearest the 9-pin D-Sub PROFIBUS network connector sets the 10's digit. The other switch sets the 1's digit

Hint: If you look at the end of the BridgeWay with the 9-pin D-Sub PROFIBUS network connector on your left, the node address is easier to read.

PROFIBUS Baud Rate

The PROFIBUS baud rate is set during the configuration of the PROFIBUS Master. The BridgeWay has automatic baud rate detection so no configuration of the BridgeWay itself is required.

9.6 Kbps	1.5 Mbps
19.2 Kbps	3 Mbps
93.75 Kbps	6 Mbps
187.5 Kbps	12 Mbps
500 Kbps	

Table 3-2 Supported PROFIBUS Baud Rates

PROFIBUS Network Termination

The end nodes on a PROFIBUS-DP network must be terminated to avoid reflections on the bus line. The BridgeWay is equipped with a termination switch to enable termination for the node if it is required.

ON Position	Network termination enabled. If the module is the last or first module in the network, the bus termination should be set to ON, or an external connector used.
OFF Position	Network termination disabled.

Table 3-3 PROFIBUS Termination Switch Function

Note: If an external termination connector is used, the termination switch must be in the OFF position.

PROFIBUS Master Configuration

GSD File

Each device on a PROFIBUS-DP network has an associated GSD file containing all necessary information about the device. This file is used by the network configuration program during configuration of the network and PROFIBUS master.

The latest version of the GSD file for the BridgeWay can be downloaded from Pyramid Solution's web site, or received by contacting Pyramid Solutions.

Modular Interface

The BridgeWay provide a modular interface to the PROFIBUS master. The I/O size and layout is defined in the PROFIBUS master configuration by combining I/O modules defined in the GSD file.

The size of the I/O tables configured using the modules in the PROFIBUS master configuration must exactly match the I/O sizes defined in the DeviceNet I/O configuration defined by the DeviceNet network configuration tool including the status data, if enabled. The actual modules used to make up the I/O tables is not as critical as the requirement that the total input and output sizes agree with the BridgeWay's configuration.

The GSD file module collection includes several special purpose modules and a collection of general purpose modules. The modules that are provided are listed in the table below.

Module	Description	Data Size
DNet Status Data	DeviceNet Status Data in the Input	9 words in
IN/OUT: 1 Byte	Single byte in both Input and Output	1 byte in 1 byte out
IN/OUT: 1 Word	Single 16-bit word in both Input and Output	1 word in 1 word out
IN/OUT: 2 Words	2 16-bit words in both Input and Output	2 words in 2 words out
IN/OUT: 4 Words	4 16-bit words in both Input and Output	4 words in 4 words out
IN/OUT: 8 Words	8 16-bit words in both Input and Output	8 words in 8 words out
IN/OUT: 16 Words	16 16-bit words in both Input and Output	16 words in 16 words out
IN/OUT: 32 Words	32 16-bit words in both Input and Output	32 words in 32 words out
IN/OUT: 64 Words	64 16-bit words in both Input and Output	64 words in 64 words out
INPUT: 1 Byte	Single byte in Input	1 byte in
INPUT: 1 Word	Single 16-bit word in Input	1 word in
INPUT: 2 Words	2 16-bit words in Input	2 words in
INPUT: 4 Words	4 16-bit words in Input	4 words in
INPUT: 8 Words	8 16-bit words in Input	8 words in
INPUT: 16 Words	16 16-bit words in Input	16 words in
INPUT: 32 Words	32 16-bit words in Input	32 words in
INPUT: 64 Words	64 16-bit words in Input	64 words in
OUTPUT: 1 Byte	Single byte in Output	1 byte out
OUTPUT: 1 Word	Single 16-bit word in Output	1 word out
OUTPUT: 2 Words	2 16-bit words in Output	2 words out

Module	Description	Data Size
OUTPUT: 4 Words	4 16-bit words in Output	4 words out
OUTPUT: 8 Words	8 16-bit words in Output	8 words out
OUTPUT: 16 Words	16 16-bit words in Output	16 words out
OUTPUT: 32 Words	32 16-bit words in Output	32 words out
OUTPUT: 64 Words	64 16-bit words in Output	64 words out

Module combinations in the PROFIBUS master configuration are limited to a maximum of 24 modules.

Step By Step Configuration

This chapter provides a step by step explanation of configuration of the BridgeWay PROFIBUS to DeviceNet Gateway. It is intended to be used as a beginner's guide to configuring the BridgeWay using RSNetWorx for DeviceNet or NetTool-DN-D.

PROFIBUS Network Configuration

The PROFIBUS network configuration is set using the switches on the end of the BridgeWay. Since the module has automatic baud rate detection, all that needs to be set is the network address and the bus termination. See "BridgeWay Configuration Tool (BWConfig)" on page 3-1 for complete details on the network configuration.

DeviceNet Network Configuration

The configuration of the DeviceNet network interface involves using a DeviceNet node commissioning tool to set the BridgeWay's MAC ID and baud rate. The following sections explain how this is done using either Rockwell Software's RSNetWorx for DeviceNet or HMS' NetTool-DN-D.

Note: The BridgeWay defaults to 125K baud out of the box. If your DeviceNet network is not running at 125K baud, the BridgeWay must be powered up on a local network with the node commissioning tool at 125K baud. Do not attempt to commission the BridgeWay on a network configured at a different baud rate.

Node Commissioning with BWConfig

See "DeviceNet I/O Configuration" on page 3-17 for an explanation of the DeviceNet configuration parameters and how they are set using BWConfig.

If BWConfig is used for DeviceNet node commissioning, skip to DeviceNet I/O Configuration below.

Node Commissioning with RSNetWorx for DeviceNet

Step 1: Connect the module to your DeviceNet network.

- Make sure a PC running RSNetWorx for DeviceNet is connected to the DeviceNet network.
- With the BridgeWay un-powered, connect the DeviceNet network cable to the DeviceNet connector of the module. (See “Connecting DeviceNet” on page 2-4)
- Power up the BridgeWay.

Step 2: Locate the module on the network.

- RSNetWorx allows browsing on the network to identify devices.
- Select the *Network* menu option and pull down menu.
- Select the *Single Pass Browse* option and wait for browsing to complete. If this is the first time RSNetWorx has been used with a BridgeWay, the BridgeWay’s icon should indicate “Unrecognizable Device”.

Step 3: Register the BridgeWay EDS file in RSNetWorx.

RSNetWorx requires an electronic data sheet (EDS) to recognize a device and its capabilities. An EDS file is available on the Pyramid Solutions web site. The EDS file must be registered with RSNetWorx before configuration can continue.

- Select the *Tools* menu option and pull down menu.
- Select the *EDS Wizard* option.
- Click on *Next*.
- Select *Register an EDS File* option and click *Next*.
- Select *Register a Single File* and enter, or browse to, the location of the EDS file for BridgeWay.
- Click *Next* or *Finish* for the remaining option screens.
- Select the *Single Pass Browse* option and wait for browsing to complete. Now an icon identifying the device as the BridgeWay module should appear.

Step 4: Put the BridgeWay in Idle Mode

The BridgeWay powers up in Idle mode. The Run/Idle mode of the module is controlled by the PROFIBUS Online/Offline state. Make sure that the module is in Idle mode by verifying that the BridgeWay Status LED is flashing green (the LED is solid green when the module is in Run mode). If the module is not in Idle mode, close the PROFIBUS I/O connection.

Step 5: Set the DeviceNet MAC ID and Baud Rate

- Select the *Tools* menu option and pull down menu.
- Select the *Node Commissioning* option. Another screen appears.
- Click on *Browse* and choose the DeviceNet network.
- When the browse is completed, double click on the BridgeWay icon.
- Enter the desired MAC address and/or baud rate, then click the *Apply* button.

Note: The BridgeWay will automatically reset if a new MAC ID is entered. If only the baud rate is changed the BridgeWay must be power cycled before the new baud rate will take effect.

Note: When the MAC ID is changed, the BridgeWay's I/O configuration is cleared.

Step 6: Enabling the Autobaud Option

If it is desirable to have the BridgeWay automatically determine the network baud rate, the Autobaud option must be enabled. (see the explanation of this option in “Automatic Baud Rate Detection” on page 6-1.)

- Highlight the BridgeWay module by left clicking on its icon.
- Select the *Device* menu option and pull down menu.
- Select the *Class Instance Editor* option. A pop up Message box appears. Click on *Yes*. Another screen appears.
- There are several parts to this screen. Make sure the check box titled *Values in Decimal* is NOT checked. At the top right is an *Object Address* with 3 text boxes. Set the values in these boxes as follows:

  - *Class* set to 3.
  - *Instance* set to 1.
  - *Attribute* set to 64h.

- To the left of the *Object Class* section is one titled *Service Code*. There’s a text box with a pull down selection titled *Description*. Pull down the selections and select “Set Single Attribute”.
- The box titled *Data Sent to the Device* is now available. At the far left of this box enter a “01” to enable autobaud, or a “00” to disable it. Then click on the *Execute* button.
- A message should appear in the *Data received from device box* saying the execution was completed.

Note: Changes to the autobaud option configuration do not take effect until the module has been power cycled.

Note: If the BridgeWay is the only master on the DeviceNet network, DO NOT enable autobaud. Automatic baud detection requires there to be traffic on the network, there is typically no traffic until the master establishes connections.

Step 7: Setting the I/O Byte Swapping Option

If it is desirable to have the BridgeWay byte swap each 16-bit word in the I/O table, the Byte Swap option must be enabled. (see the explanation of this option in “DeviceNet Network Configuration” on page 3-15.)

- Highlight the BridgeWay module by left clicking on its icon.
- Select the *Device* menu option and pull down menu.
- Select the *Class Instance Editor* option. A pop up Message box appears. Click on *Yes*. Another screen appears.
- There are several parts to this screen. Make sure the check box titled *Values in Decimal* is NOT checked. At the top right is an *Object Address* with 3 text boxes. Set the values in these boxes as follows:

  - *Class* set to 3.
  - *Instance* set to 1.
  - *Attribute* set to 65h.

- To the left of the *Object Class* section is one titled *Service Code*. There’s a text box with a pull down selection titled *Description*. Pull down the selections and select “Set Single Attribute”.
- The box titled *Data Sent to the Device* is now available. At the far left of this box enter a “01” to enable byte swapping, or a “00” to disable it. Then click on the *Execute* button.
- A message should appear in the *Data received from device box* saying the execution was completed.

Note: Changes to the byte swapping option do not take effect until the module has been power cycled.

Step 8: Setting the Status in Input Table Option

If the application requires that the DeviceNet scanner status data be included inthe input table this option must be enabled. (see the explanation of this option in “DeviceNet Network Configuration” on page 3-15.)

- Highlight the BridgeWay module by left clicking on its icon.
- Select the *Device* menu option and pull down menu.
- Select the *Class Instance Editor* option. A pop up Message box appears. Click on *Yes*. Another screen appears.
- There are several parts to this screen. Make sure the check box titled *Values in Decimal* is NOT checked. At the top right is an *Object Address* with 3 text boxes. Set the values in these boxes as follows:

  - *Class* set to 3.
  - *Instance* set to 1.
  - *Attribute* set to 67h.

- To the left of the *Object Class* section is one titled *Service Code*. There’s a text box with a pull down selection titled *Description*. Pull down the selections and select “Set Single Attribute”.
- The box titled *Data Sent to the Device* is now available. At the far left of this box enter a “01” to include the status in the input table, or a “00” to leave it out. Then click on the *Execute* button.
- A message should appear in the *Data received from device box* saying the execution was completed.

Note: Changes to this option do not take effect until the module has been power cycled.

Step 9: Setting the Input Data Safe State Option

If the input data safe state is to be “Zero Data”, this option must be configured. (The default value is “Retain Last Value”) (see the explanation of this option in “DeviceNet Network Configuration” on page 3-15.)

- Highlight the BridgeWay module by left clicking on its icon.
- Select the *Device* menu option and pull down menu.
- Select the *Class Instance Editor* option. A pop up Message box appears. Click on *Yes*. Another screen appears.
- There are several parts to this screen. Make sure the check box titled *Values in Decimal* is NOT checked. At the top right is an *Object Address* with 3 text boxes. Set the values in these boxes as follows:

  - *Class* set to 3.
  - *Instance* set to 1.
  - *Attribute* set to 68h.

- To the left of the *Object Class* section is one titled *Service Code*. There’s a text box with a pull down selection titled *Description*. Pull down the selections and select “Set Single Attribute”.
- The box titled *Data Sent to the Device* is now available. At the far left of this box enter a “01” to set the safe state to “Zero Data”, or a “00” to set it to “Retain Last State”. Then click on the *Execute* button.
- A message should appear in the *Data received from device box* saying the execution was completed.

Note: Changes to this option do not take effect until the module has been power cycled.

Node Commissioning with NetTool-DN-D

Step 1: Connect the module to your network

- Make sure a PC running NetTool-DN-D (version 1.0.0.1 or later) is connected to the DeviceNet network via the NetTool-DN-D RS-232 interface adapter.
- With the BridgeWay un-powered, connect the DeviceNet network cable to the DeviceNet connector of the module. (See “Connecting DeviceNet” on page 2-4)
- Power up the BridgeWay.

Step 2: Locate the module on the network.

- Start NetTool-DN-D on the PC.
- NetTool-DN-D starts up and displays a screen prompting for a network name. Enter a name such as “BridgeWay” to refer to the network and click *Ok.* A blank screen then appears.
- Select the *Tools* menu item and pull down its menu selections. Select *Configure Drivers For...* option.
- Highlight the name of the network and click on it. A Driver Dialog box appears.
- Click on *7262 Serial RS232 DeviceNet Tool Adapter* to highlight it and click *Ok.* A screen to configure the RS-232 communications between the Adapter and the PC appears.
- Select the PC serial port being used to connect to the NetTool-DN-D RS-232 adapter.
- Set the DeviceNet baud rate to125K baud. Set the MAC ID to a value that will not conflict with devices already on the network. (including the BridgeWay)
- Click *Go Online.* A confirmation message indicating that the adapter has gone online should appear. Click *Ok.*
- NetTool-DN-D should now display a network screen with the icons for the devices it finds on the DeviceNet network. If this is the first time that NetTool-DN-D has been used with a BridgeWay, the BridgeWay’s icon will indicate “No EDS file registered for this device”.

Step 3: Register the BridgeWay EDS file with NetTool-DN-D

NetTool-DN-D requires an electronic data sheet (EDS) to recognize a device and its capabilities. An EDS file is available on the Pyramid Solutions web site. The

EDS file must be registered with NetTool-DN-D before configuration can continue.

- From the *Tools* menu, select *Install EDS Files*.
- Enter the path, or browse to the location of the EDS file for the BridgeWay.
- Click *Open*.
- Select the *Tools* menu option, then *Update*, and click on the network name. The BridgeWay icon should be properly displayed on the network screen.

Step 4: Put the BridgeWay in Idle Mode

The BridgeWay powers up in Idle mode. The Run/Idle mode of the module is controlled by the PROFIBUS Online/Offline state. Make sure that the module is in Idle mode by verifying that the BridgeWay Status LED is flashing green (the LED is solid green when the module is in Run mode). If the module is not in Idle mode, remove the PROFIBUS I/O connection.

Step 5: Set the DeviceNet MAC ID

- Right click on the BridgeWay icon and select *Device*.
- Pull down the next menu and select *Change Node Address*.
- Select or enter the desired MAC ID and click *Ok*.

Note: The BridgeWay will automatically reset if a new MAC ID is entered.

Note: When the MAC ID is changed, the BridgeWay's I/O configuration is cleared.

Step 6: Configuring the Other Options

The remaining DeviceNet configuration parameters are set through the parameter editor in NetTool-DN-D. (See the explanation of these parameters in “DeviceNet Network Configuration” on page 3-15.)

- Highlight the BridgeWay module by right clicking with the cursor on its icon.
- Select the *Device* menu option and pull down menu, then select *Properties*. A parameter screen is displayed.
- Click on *Upload*. The parameter values will be read from the device.
- The Baud Rate, Autobaud, and I/O Byte Swapping, Status In Input Table, and Input Safe State parameters can be set by clicking on each parameter and selecting the desired value from the drop down box.
- Click *Download* to send the changes to the BridgeWay.
- Click *Close*.

Note: Changes to the DeviceNet configuration parameters do not take effect until the module has been power cycled.

Note: If the BridgeWay is the only master on the DeviceNet network, DO NOT enable autobaud. Automatic baud detection requires there to be traffic on the network, there is typically no traffic until the master establishes connections.

DeviceNet I/O Configuration

DeviceNet I/O configuration involves using a DeviceNet configuration tool to set the BridgeWay's scan list and I/O table mapping. The following sections explain how this is done using either Rockwell Software's RSNetWorx for DeviceNet or HMS' NetTool-DN-D.

I/O Configuration Using RSNetWorx

Step 1: Set up BridgeWay module's DeviceNet scan list

It is suggested that you disconnect the PROFIBUS master before changing the scan list. This will put the BridgeWay into Idle mode. Once in Idle mode the following steps should be taken to configure the scan list.

- Select the *Network* menu and *Browse Single Scan*. Wait for browsing to complete.
- Select the *Network* menu and *Upload*. Wait for the device information to be uploaded from the network.
- Double click on the BridgeWay icon to bring up the module description screen. Several tabs appear on the top of the screen.
- Click the *Scanlist* tab. The screen shows 2 columns. On the left is a list of "Available devices" that may be added to the scan list. On the right is a list of devices that are configured in the scan list.
- Check the *AutoMap on Add* check box.
- Select the devices whose I/O is to be exchanged with the PROFIBUS master from the "Available devices" column. Click the ">" button for each one to move it to the scan list.
- Select the *Input* tab. The Input mapping screen is displayed. The top portion gives a list of the devices in the scan list that the BridgeWay receives input data from. The bottom shows the location in the Input table where the data will be placed for each device. **This shows the format of the Input table of the BridgeWay. This is the format of the input data that will be sent to the PROFIBUS master. See "I/O Mapping" on page 3-8.**

- Select the *Output* tab. The Output mapping screen is displayed. The top portion gives a list of the devices in the scan list that the BridgeWay will send output data to. The bottom shows the location in the Output table where the data will be placed for each device. **This shows the format of the Output table of the BridgeWay. This is the format of the output data that will be sent to the BridgeWay from the PROFIBUS master. See "I/O Mapping" on page 3-8**

- Click the *Apply* button, and *Yes* to download the scanlist to the Bridge-Way.

- The BridgeWay starts scanning as soon as it finds entries in its scanlist. However, in Idle mode, output data will not be sent to the devices.

Note: Automap is used in this example for simplicity. In some cases, the user may wish to organize the I/O data in other ways; this can be done using the *Advanced* data table editor in the Input and Output tabs. See the RSNetWorx manual for complete details.

Step 2: Put the BridgeWay in Run Mode

The BridgeWay will automatically switch to Run mode when the PROFIBUS master is connected.

Note: Once the BridgeWay is placed into Run mode, it will begin sending output data to the devices configured in its scan list.

I/O Configuration Using NetTool-DN-D

Step 1: Set up BridgeWay module's DeviceNet Scanlist

It is suggested that you disconnect the PROFIBUS master before changing the scan list. This will put the BridgeWay into Idle mode. Once in Idle mode the following steps should be taken to configure the scan list.

- From the network display screen right click on the BridgeWay icon and select *Device*. Pull down its associated menu and select *Properties*. This displays the Parameters screen.
- Click on the *Scanner* tab. The scan list display screen appears with two columns. The left column displays a list of devices found on the network that can be added to the scanlist. The right column displays the devices that are configured in the scanlist.
- Click *Upload* to get the current settings.
- Select the devices whose I/O is to be exchanged with the PROFIBUS master from the left column. Click the ">" button for each one to move it to the scan list. A screen displaying the I/O configuration for the device will be displayed; click *Ok*.
- Click the *Input* tab. A screen is displayed for mapping the input data.
- Select the device whose input data is to be mapped and click *AutoMap*. **This sets the format of the Input table of the BridgeWay. This is the format of the input data that will be sent to the PROFIBUS master. See "I/O Mapping" on page 3-8.**
- Click the *Output* tab. A screen is displayed for mapping the output data.
- Select the device whose output data is to be mapped and click *AutoMap*. **This sets the format of the Output table of the BridgeWay. This is the format of the output data that will be sent to the BridgeWay from the PROFIBUS master. See "I/O Mapping" on page 3-8**
- Select the *Scanlist* tab, and click the *Download* button to download the scanlist to the BridgeWay.
- The BridgeWay starts scanning as soon as it finds entries in its scanlist. However, in Idle mode, output data will not be sent to the devices.

Note: Automap is used in this example for simplicity. In some cases, the user may wish to organize the I/O data in other ways. See the NetTool-DN-D manual for complete details on how to accomplish this.

Step 2: Put the BridgeWay in Run Mode

The BridgeWay will automatically switch to Run mode when the PROFIBUS master is connected.

Note: It is normal for an error message to be displayed about an “Object State Conflict” downloading parameter 2. This error message can be ignored.

Note: Once the BridgeWay is placed into Run mode, it will begin sending output data to the devices configured in its scan list.

PROFIBUS Interface

Network Communication

Protocol

The BridgeWay PROFIBUS to DeviceNet Gateway acts as a PROFIBUS-DP slave node. It can be read and written to from a PROFIBUS-DP master. The BridgeWay will not initiate communication to other nodes on the PROFIBUS network; it will only respond to incoming commands.

Details of the supported protocol features are listed below.

- PROFIBUS-DP EN 50 170 (DIN 19245).
- Protocol version 1.10.
- Baud rate range 9.6 Kbps - 12 Mbps.
- Cyclic I/O data transmission.
- Device diagnostic messages supported.

Physical Interface

Feature	Specification
Media	PROFIBUS bus line type A or B specified in EN50170.
Topology	Master-Slave.
Connector	9-pin D-Subminiature female.
Cable	Shielded twisted pair.
Isolation	The bus is galvanically isolated from the BridgeWay electronics.
Termination	Switch selectable internal bus termination.

Table 5-1 PROFIBUS Physical Interface

Device Diagnostics

The BridgeWay sends PROFIBUS device diagnostic messages to the PROFIBUS master whenever there is a change in module status. The diagnostic data contains information about the state of the module, the DeviceNet communications, and an indication of I/O data integrity. If the Status In Input Table option is set in the configuration, the information in the diagnostic message will also be included at the front of the input table. The diagnostic data is presented in detail in “PROFIBUS Device Diagnostic Data” on page 7-4

Interaction with I/O Tables

I/O Table Updates

The PROFIBUS interface in the BridgeWay accesses the I/O tables as requests from the PROFIBUS master are processed; there is no buffering or timed updates of the I/O within the module. Safeguards are in place to ensure data integrity by prohibiting simultaneous access by the PROFIBUS and DeviceNet interfaces. There is no synchronization between the 2 network interfaces.

When output data is received from the PROFIBUS master, the module will copy the data to the Output table. The data is always placed at the beginning (offset 0) of the DeviceNet slave output data. This data is available to be read by the DeviceNet interface as soon as it has been written.

When it is time to transmit input data to the PROFIBUS master, the module will retrieve the data that is currently in the Input table. Data is always read from the beginning (offset 0) of the Input table. The data will be what was placed there by the last write to the Input table by the DeviceNet interface. Note that when the Status In Input option is enabled, the DeviceNet slave input data will be offset by the size of the status data. See “I/O Data Summary” on page 5-5 for details on the I/O data and status data association.

Data Endian-ness

The BridgeWay transfers I/O data between PROFIBUS and DeviceNet without regard to data content or format. Due to this, the user is responsible for making sure that the devices on either network understand the format of the data.

DeviceNet is a little endian protocol; values are transmitted least significant byte first. Hence, all data in the I/O tables is assumed to be stored as little endian by the DeviceNet nodes.

Care should be taken to make sure that the PROFIBUS master handles input data and transmits output data least significant byte first.

The I/O Byte Swap option will aid this issue by swapping the bytes on 16-bit boundaries. However, the user is still responsible for knowing where in the I/O tables DeviceNet data has been mapped. See “DeviceNet Network Configuration Parameters” on page 3-5 for details on this option.

Input Table Organization

The input data from the DeviceNet slaves is in the input table in the format that is laid out by the I/O mapping done in RSNetworx or NetTool-DN. If the Status In Input Table option is not set, the DeviceNet slave data starts at the front of the input table. If the Status In Input Table option is set, the DeviceNet data will be offset by 18 bytes (9 words) in the input table, and the status data will be at the front of the table.

The status data included in the input table conforms to the format defined below. See the full details of the fields of this structure in “Diagnostic Data Format” on page 7-4.

Byte Offset	Description
0	BridgeWay module status.
1	DeviceNet network status.
2-9	DeviceNet active node table.
10-17	DeviceNet faulted node table.

Table 5-2 DeviceNet Scanner Status Data Format

The GSD file for the BridgeWay provides a module of the correct size for the status data to allow for easy PROFIBUS configuration when this option is set.

I/O Data Summary

The following diagram illustrates how the various components of the input data are used to create the input data accessible from PROFIBUS.

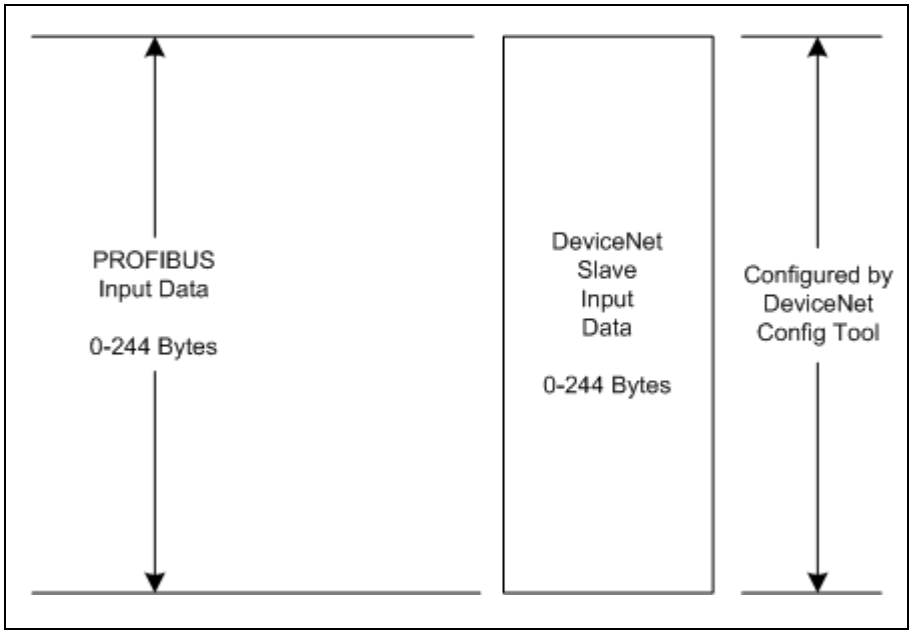

Figure 5-1 Input Data Association - Status In Input Option Disabled

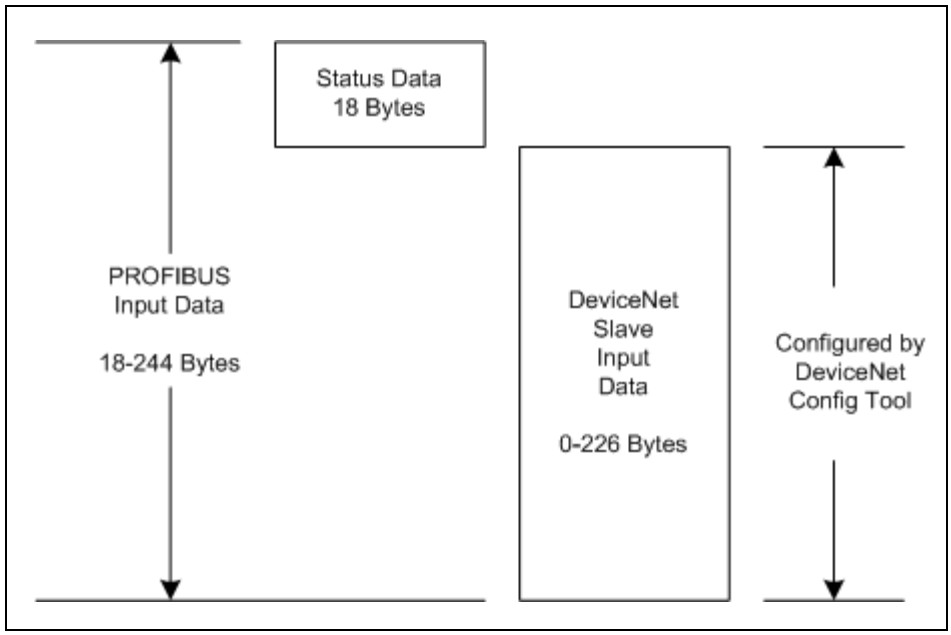

Figure 5-2 Input Data Association - Status In Input Option Enabled

The following diagram illustrates how the various components of the output data are used to create the output data accessible from PROFIBUS.

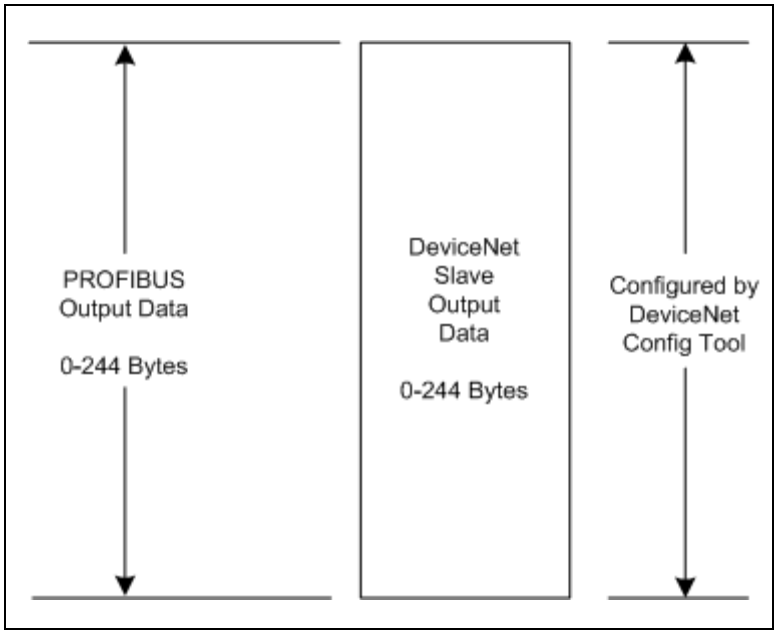

Figure 5-3 Output Data Association

DeviceNet Interface

Network Communications

The BridgeWay PROFIBUS to DeviceNet Gateway acts as a DeviceNet Master or a slave. The BridgeWay, as a master, can exchange I/O data with up to 63 nodes. The module can also act as a slave to another DeviceNet Master, exchanging the contents of its I/O tables with the second master.

Configuration

The BridgeWay is configured using a DeviceNet configuration tool such as RSNetWorx for DeviceNet or NetTool-DN-D. The tool will access the module over the DeviceNet network. The BridgeWay supports a Scanner Configuration and Scan List object as the configuration interface over DeviceNet.

Automatic Baud Rate Detection

Depending on its configuration, the BridgeWay can set its DeviceNet baud rate automatically. If the autobaud option is enabled, the module will detect the current network baud rate and set its baud rate accordingly before joining the network. If the option is disabled, the module will join the network with the configured baud rate.

Slave Device Communication

The BridgeWay continuously attempts to establish connections with devices configured in the scan list (list of configured slaves). Once connections are established, the module performs all necessary steps to configure the required I/O messaging.

The BridgeWay provides explicit message proxy services for all group 2 only slaves. Once any Group 2 only devices are configured, the BridgeWay sends “keep alive” messages to the devices in addition to the I/O messages. This function prevents the explicit message connections between the BridgeWay and the slave from timing out. This eliminates the need to re-establish an explicit connection should the BridgeWay need to send configuration data or serve as a proxy.

Scan Cycles

The BridgeWay employs a scan cycle for producing poll and strobe I/O messages. A scan cycle consists of the following:

- A bit-strobe output message (if any devices in the scan list are configured for bit-strobe).
- A poll command message for each device configured for polled I/O.
- A configurable delay before the next scan cycle.

The configurable delay is the Inter-Scan Delay (ISD). The ISD is a Scanner Configuration Object attribute. The delay begins when the last poll command message is transmitted and ends after the specified time has elapsed.

The BridgeWay also supports a background polling mechanism. A foreground to background polling ratio can be specified to allow polling of devices at certain scan cycle intervals.

I/O Message Types

The BridgeWay supports all I/O messaging types specified by the DeviceNet protocol. These include strobe, poll, COS, COS Unacknowledged, Cyclic, and Cyclic Unacknowledged I/O messages. I/O messaging and I/O parameters are configured using the DeviceNet configuration tool.

I/O Mapping

The contents and layout of the data in the I/O tables is defined during configuration of the scan list. The input and output data of each slave is configured, or mapped, to specific locations in the DeviceNet slave input and output tables.

I/O Table Byte Swapping

The BridgeWay provides an I/O byte swapping option. If the option is enabled, the data in the I/O tables is byte swapped on 16-bit boundaries. This is very useful since PROFIBUS assumes the byte ordering is opposite of that of DeviceNet.

Input Data Safe State

The BridgeWay provides the option of configuring how the DeviceNet input data will be set when a DeviceNet slave connection faults. The safe state behavior may be configured as either “Maintain Last State” or “Zero Data”. If the option is set to Maintain Last State, the input data associated with a DeviceNet slave will be frozen to the last value received from the slave prior to the connection fault. If the option is set to Zero Data, the input data associated with the slave will be set to 0 when the connection is faulted. Only the input data associated with the particular slave’s I/O mapping configuration will be affected, all other non-faulted slaves’ data will continue to update normally. Note that this is a global setting and all slave connections will be treated in the same manner.

Proxy for Group 2 Only Devices

The BridgeWay provides the capabilities necessary for being a Group 2 Only Client as defined for the Predefined Master/Slave Connection Set. Group 3 explicit messages destined for a group 2 only device that is configured as a slave to the BridgeWay will be intercepted and relayed to the slave.

Quick Connect Feature

The BridgeWay supports DeviceNet Quick Connect. Quick Connect is a special, shortened establishment procedure for connections to slaves. Quick Connect can be used in applications where the normal delay between when a slave comes online and the scanner establishes a connection cannot be tolerated. Quick Connect is enabled on a per-slave basis using the RSNetworx Tools->Quick Connect menu.

Run/Idle Mode

The BridgeWay has two modes of operation, Run and Idle. In both modes the BridgeWay's DeviceNet master maintains communication with slave devices in its scan list.

In Run mode the BridgeWay sends output data to the slaves and receives input data. Since it is actively sending output data affecting slave device operation, the BridgeWay rejects attempts to alter its configuration and disrupt communications; it must first be put in Idle mode.

In Idle mode the BridgeWay still receives input data from the slaves but it does not send output data. In Idle mode the BridgeWay configuration can be changed.

The Run/Idle mode is automatically switched to Run when a connection is established with a PROFIBUS master. When the PROFIBUS connection is broken, the module automatically switches to Idle mode.

Alternatively, the Run/Idle mode of the BridgeWay may be set through an attribute of the Identity object. To change the Run/Idle mode, use a DeviceNet messaging tool and send the following message:

Service:	Set_Attribute_Single
Class:	1
Instance:	1
Attribute:	103 (67h)
Request Data:	00 for Idle, 01 for Run

See "DeviceNet Network Configuration" on page 4-1 for explanation of setting the BridgeWay Run/Idle mode using RSNetWorx or NetTool-DN-D.

Note: When the BridgeWay is reset or powered up, it begins operation in Idle mode.

Automatic Device Recovery (ADR)

This is a feature of the DeviceNet master which allows a slave node that has dropped off the network (Fault, power loss, etc.) to be replaced with another device of the same type. There are 2 parts to ADR, Address Recovery, and Configuration Recovery.

Address Recovery

Address Recovery is responsible for automatically setting a new device's address to that of a slave that has lost communications.The steps followed by ADR are:

1. When the master detects loss of a slave, it begins to monitor for a device at MAC ID 63.
2. An identical device is added to the network at MAC ID 63.
3. The master verifies that the new device at 63 is exactly the same kind as the slave that was lost.
4. The master changes the new device's MAC ID from 63 to that of the lost slave.

Configuration Recovery

Configuration Recovery is responsible for setting the configuration of a slave device to the configuration that is stored in the BridgeWay. The slave's configuration is stored in the BridgeWay's non-volatile memory. Whenever the BridgeWay establishes communication with the slave device, the configuration is downloaded to the slave.

Configuration recovery serves 2 purposes. 1. If a new device is added to the network to replace a faulted slave, after Address Recovery is completed, Configuration Recovery will configure the new device. 2. Configuration Recovery guarantees that the slave devices will always run the same configuration.

The BridgeWay will hold up to 130,560 bytes (approximately 128K) of configuration recovery data.

Note: RSNetworx v7.0 or later is required to support the full 128K bytes of configuration recovery data; earlier versions support up to 64K bytes of data. NetTool-DN-D, as of v3.3.1, supports up to 64K bytes of configuration data.

Interaction with I/O Tables

The DeviceNet interface in the BridgeWay accesses the I/O tables as slave I/O connections are processed by the DeviceNet master; there is no buffering or timed updates of the I/O within the module. Safeguards are in place to ensure data integrity by prohibiting simultaneous access by the PROFIBUS and DeviceNet interfaces. There is no synchronization between the 2 network interfaces.
Transmission of data on Change of State (COS) connections is triggered when new output data is provided by the PROFIBUS interface in the region mapped by the connection.

When an I/O connection with a slave requires that output data be sent to the slave, it will be read from the Output table. The data read is what was placed there by the last write to the Output table by the PROFIBUS interface.

When input data is received on a slave's I/O connection, it is copied to the Input table. This data is available to be read by the PROFIBUS interface and sent to the PROFIBUS master on the next data exchange.

Status and Diagnostics

BridgeWay LEDs

There is a group of LED indicators on the front of the BridgeWay that is used to annunciate the current status of the module and the network interfaces. The layout of the LEDs is shown in Figure 7-1.

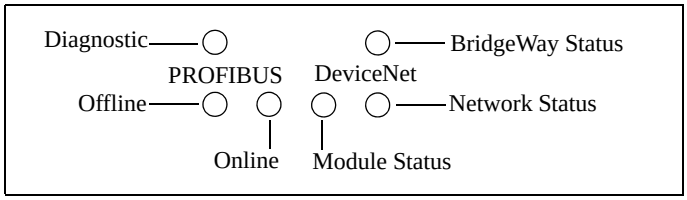

Figure 7-1 BridgeWay LEDs

BridgeWay Status LED

State	Summary	Description
Off	No Power	No power to the module.
Flashing Green	Idle	Module is in Idle mode.
Solid Green	Run	Module is in Run mode.
Solid Orange	Hardware Initialization	The LED will be in this state immediately after power is applied.
Flashing Red/Green	Error	A fault has been detected.

Table 7-1 BridgeWay Status LED States

Major unrecoverable faults are indicated by a series of green and red flashes. If the BridgeWay Status LED is flashing red and green for an extended period of time, count the number of red and green flashes and call technical support.

DeviceNet Network Status LED

State	Summary	Description
Solid Green	Online with no errors	The BridgeWay is on the DeviceNet network and all I/O connections are running correctly.
Flashing Green	Online, no communication	The BridgeWay is on the DeviceNet network and is not currently communicating with any devices.
Solid Red	DeviceNet interface fault	A major fault in the DeviceNet interface has been detected. Possible causes include Bus-off or duplicate MAC ID.
Flashing Red	Connection time-out	A connection with at least 1 slave device has timed out.

Table 7-2 DeviceNet Network Status LED States

DeviceNet Module Status LED

State	Summary	Description
Flashing Green	Initializing or Not configured	The module is initializing. The DeviceNet network configuration has not been configured and is currently using default values.
Solid Green	Normal	Normal operation.
Solid Red	Unrecoverable major fault	A fault the requires user intervention has been detected. Correct the problem and reset the BridgeWay.
Flashing Red	Recoverable minor fault.	A fault that can be corrected and does not require a BridgeWay reset has been detected. This is typically a configuration error.

Table 7-3 DeviceNet Module Status LED States

PROFIBUS Online LED

State	Summary	Description
Off	Offline, or no module power	The BridgeWay is either not powered, or not online on PROFIBUS.
Solid Green	Online	The BridgeWay is online on the PROFIBUS network.

Table 7-4 PROFIBUS Online LED States

PROFIBUS Offline LED

State	Summary	Description
Off	Online, or no module power	The BridgeWay is either not powered or is online on PROFIBUS.
Solid Red	Offline	The BridgeWay is powered up, but is not participating in PROFIBUS activity.

Table 7-5 PROFIBUS Offline LED States

PROFIBUS Diagnostic LED

State	Summary	Description
Off	Normal	No diagnostics are present.
Flashing Red at 1Hz	Configuration error	The input and/or output length set in module configuration does not match the value(s) set during network configuration.
Flashing Red at 4Hz	Hardware error	An error occurred while initializing the PROFIBUS ASIC.

Table 7-6 PROFIBUS Diagnostic LED States

DeviceNet Scanner Status in the Input Table

If the Status In Input Table option is set in the configuration, the DeviceNet scanner status data will be included at the front of the input table. See “Input Table Organization” on page 5-4 for details.

PROFIBUS Device Diagnostic Data

Device diagnostic data is sent to the PROFIBUS master whenever there is a change in module status. The diagnostic data can be used by the master to determine the current status of the module, as well as a measure of I/O data integrity.

Diagnostic Data Format

The diagnostic data consists of 19 bytes with the following layout. Note that this data appears after the 6 byte header in the PROFIBUS diagnostic message.

Byte Offset	Description
0	PROFIBUS Diagnostic Control Byte
1	BridgeWay module status.
2	DeviceNet network status.
3-10	DeviceNet active node table.
11-18	DeviceNet faulted node table.

Table 7-7 PROFIBUS Diagnostic Data Format

BridgeWay Module Status

The BridgeWay module status value is a bit-string with the following bit definitions.

Bit	Description
0	Module in Run mode. The bit is cleared when the module is in Idle mode.
1	A DeviceNet network error is active. See the DeviceNet network status value for the specific error.

Table 7-8 BridgeWay Module Status Bit Definitions

Bit	Description
2	A DeviceNet slave error is active. See the DeviceNet faulted node table to determine which slave connection is faulted.
3	PROFIBUS I/O size error. The input or output size, or both, resulting from the scan list configuration is invalid.
4-7	Not used.

Table 7-8 BridgeWay Module Status Bit Definitions

DeviceNet Network Status

The DeviceNet network status value is an enumerated value. The possible status values are listed below.

Status Code	Description
0	Ok. Note that this value will be used for nodes both in and out of the scan list to indicate that there is no issue with the node.
60	Duplicate MAC ID test in progress. This status is only used for the local MAC ID.
70	Duplicate MAC ID failure. Another node on the DeviceNet network has the same MAC ID. This status is only used for the local MAC ID.
72	Device communications failed. The I/O connections with a slave have timed out.
73	Incorrect device type. Device verification has failed with a slave when attempting to start I/O connections. The level of verification is determined by the scanlist entry. The following identity information may be checked during verification depending on the configuration: Vendor ID Revision Device Type Product Code
75	CAN network quiet. No CAN packets have been received from the network for more than 10 seconds. This status is only used for the local MAC ID.

Table 7-9 Node Status Codes

Status Code	Description
76	No messages for scanner. No CAN packets specifically for the DeviceNet scanner have been received in more than 10 seconds. This status is only used for the local MAC ID.
77	Incorrect connection size. The connection size configured in the scanlist entry for the slave does not match the actual required connection size specified by the slave.
78	No device response. A connection could not be established with the slave because it did not respond.
79	CAN DUP-MAC transmit failure. The scanner was unable to transmit the duplicate MAC detection message on the CAN network. This status is only used for the local MAC ID.
80	In Idle mode. The device is in Idle mode. This status is only used for the local MAC ID.
81	In Fault mode. The device is in Fault mode. Fault mode is set using the Fault bit in the output command register. i.e. Fault mode is controlled by the EtherNet/IP or Modbus/TCP master controller. It can be used to indicate a system fault detected at a higher level. When the device is in Fault mode, all DeviceNet network activity is disabled. This status is only used for the local MAC ID.
83	Error during slave connection initialization. An error occurred while creating the I/O connections to the slave (beyond the identity mismatch or I/O size errors). This error is triggered by error responses from the slave during the connection establishment sequence.

Table 7-9 Node Status Codes (Continued)

Status Code	Description
84	Slave connection initialization in progress. The I/O connection establishment sequence to this slave is in progress.
85	Incorrect data size received on connection. The amount of data received with the last connected message does not match the connection size.
86	Device went into Idle mode. The slave is in Idle mode as indicated by the slave sending idle packets on the input connection. Idle packets are of zero length and are used to keep the connection open, yet not move any data when the device is in Idle mode.
87	Shared master error. The slave scanlist entry is configured for input sharing and the primary master has not made connection to the device.
88	Shared master choice error. The slave scanlist entry is configured for input sharing and the primary master has not made the right type of connections to the device.
89	ADR error. An error occurred during auto device replacement or auto configuration. This is triggered when the slave returns an error response during an auto device replacement or auto configuration message sequence.
90	CAN network disabled. The CAN network has been disabled. The network is disabled by setting the Disable bit in the output command register. This status is only used for the local MAC ID.
91	CAN bus-off. Indicates that the CAN controller is in the Bus-Off state. This status is only used for the local MAC ID.

Table 7-9 Node Status Codes (Continued)

Status Code	Description
92	No DeviceNet power. Indicates that there is no network power detected on the DeviceNet network. This status is only used for the local MAC ID.
95	Flash update in progress. Indicates that a firmware update is currently in progress. This status is only used for the local MAC ID.

Table 7-9 Node Status Codes (Continued)

DeviceNet Active Node Table

The active node table is a 64-bit bit-string that indicates the devices which are configured as slaves to the BridgeWay on DeviceNet. Each bit in the table corresponds to a MAC ID, from 0-63. If a bit is set, the device at the corresponding MAC ID is configured as a slave to the BridgeWay.

DeviceNet Faulted Node Table

The faulted node table is a 64-bit bit-string that indicates the devices which are configured as slaves to the BridgeWay and have faulted. Each bit in the table corresponds to a MAC ID, from 0-63. If a bit is set in the faulted node table, connections to the device at the corresponding MAC ID are not working correctly.

Static Diagnostic Control Bit

The BridgeWay makes use of the *Static* bit in the diagnostic control byte to notify the PROFIBUS master that the I/O data integrity is in question. If the Static bit is set, it is suggested that the PROFIBUS master ignore the input data and stop updating the output data.

The Static bit is set in the diagnostic control byte if any of the following conditions are true.

- The BridgeWay is in Idle mode.
- The DeviceNet network status is *Offline*. (DeviceNet interface fault)

- The I/O sizes resulting from the current scan list configuration are invalid.

Specifications

Environmental Specifications

Temperature

Operating: 0 to 70 degrees Celsius

Non-Operating: -25 to 85 degrees Celsius

EMC Directive Compliance

This product is tested to meet the Council Directive 89/336/EC Electromagnetic Compatibility (EMC) by applying the following standards, in whole or in part, documented in a technical construction file:

- EN50081-2-EMC Generic Emission Standard, Part 2 - Industrial Environment
- EN50082-2-EMC Generic Immunity Standard, Part 2 - Industrial Environment

This product is intended for use in an industrial environment.

Electrical Specifications

DC Power

Operating voltage: 12-30 VDC.

Current Requirements: 105-110 mA at 24 VDC.

Mechanical Specifications

Mechanical Rating

IP20/NEMA 1

DIN Rail Mount

The BridgeWay connects to a DIN 3 rail.

Dimensions

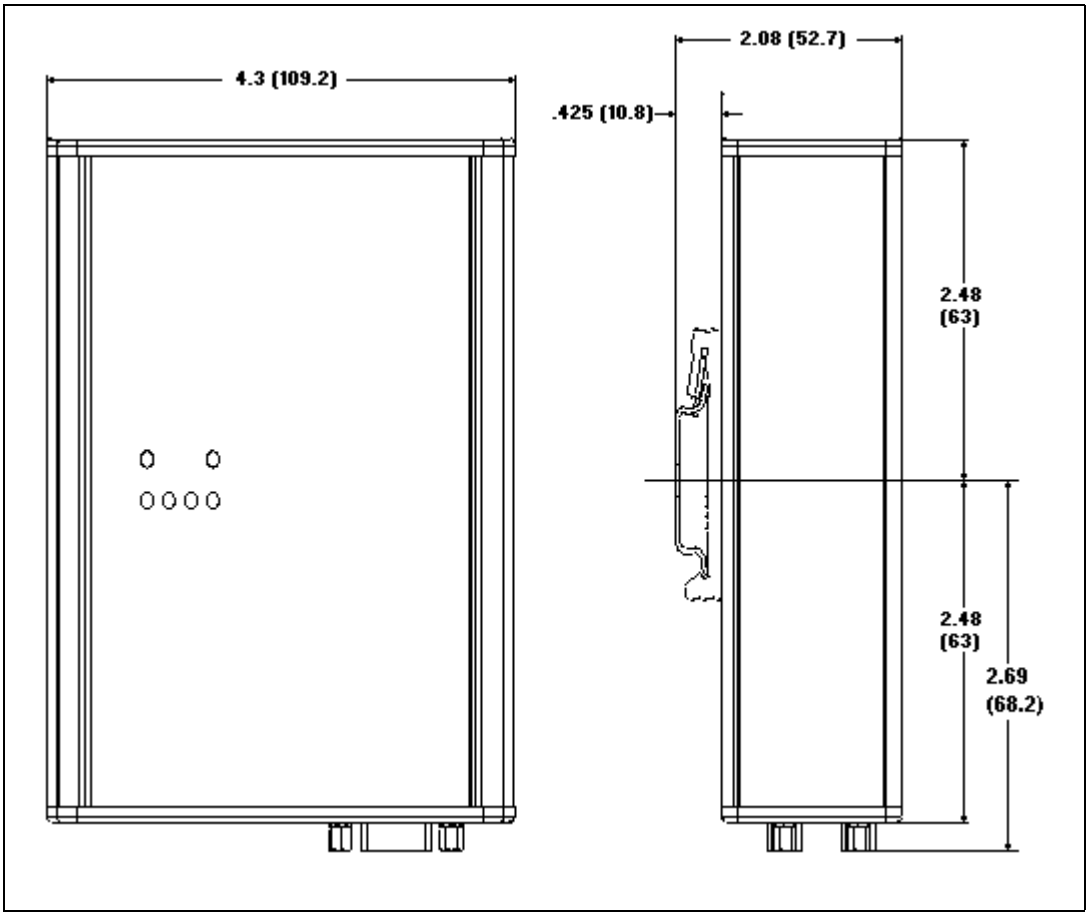

Figure 8-1 BridgeWay PROFIBUS to DeviceNet Gateway Mechanical Dimensions

Data Sizes

Input and Output

Maximum 244 bytes input including any status data.

Maximum 244 bytes output

Combined Input and Output size must not be more than 400 bytes.

There must be at least 1 byte of Input or Output data configured.

ADR Configuration Recovery

Up to 130,560 bytes of ADR configuration recovery data.

Connectors

Power

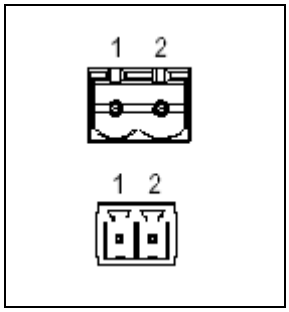

Figure 9-1 Power Connector

Pin	Connection
1	24 VDC +
2	24 VDC Common

Table 9-1 Power Connector Pin Definitions

DeviceNet

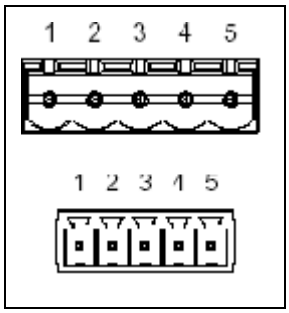

Figure 9-2 DeviceNet Connector

Pin	Connection
1	24 VDC Common
2	CAN Low
3	Shield
4	CAN High
5	24 VDC

Table 9-2 DeviceNet Connector Pin Definitions

PROFIBUS

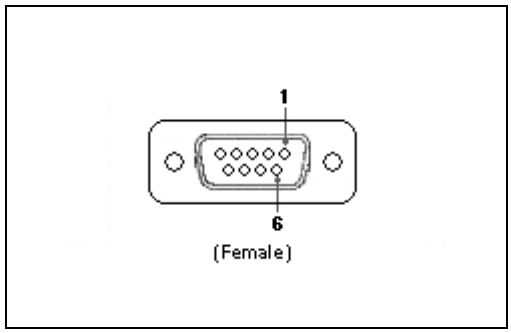

Figure 9-3 PROFIBUS Connector

Pin	Connection
1	Not used
2	Not used
3	B-Line
4	RTS
5	GND Bus
6	+5 V Bus
7	Not used
8	A-Line
9	Not used

Table 9-3 PROFIBUS Connector Pin Definitions

Auxiliary RS-232

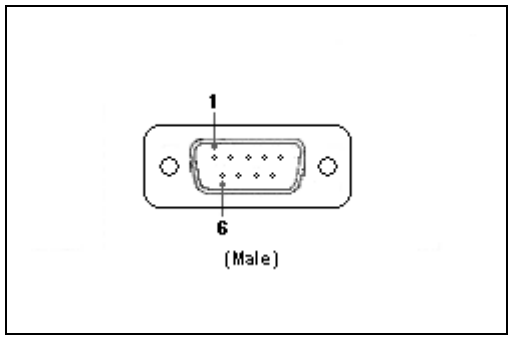

Figure 9-4 Auxiliary RS-232 Connector

Pin	Connection
1	Not used
2	Receive Data
3	Transmit Data
4	Not used
5	Signal Ground
6	Not used
7	Not used
8	Not used
9	Not used

Table 9-4 Auxiliary RS-232 Pin Definitions

Support

Technical Product Assistance

If you require BridgeWay product technical support by phone:

Call 248-549-1200

Dial 0 for the Operator

Ask for BridgeWay Support.

If you require support by email:

productsupport@pyramidsolutions.com

Subject: “AB7605 Support Request”

Provide a detailed explanation of your question or issue in the email text.

You can also obtain AB7605 files and information online at the following URL:

http://support.pyramidsolutions.com/support-nc-bridgeway-products.html

Contact Information

Pyramid Solutions, Inc.

30150 Telegraph Road

Suite 200

Bingham Farms, Michigan 48025

Phone: 1-248-549-1200 or toll free 1-888-PYRASOL

FAX: 1-248-549-1400

Corporate web site:http://www.pyramidsolutions.com

Support web site: http://support.pyramidsolutions.com

