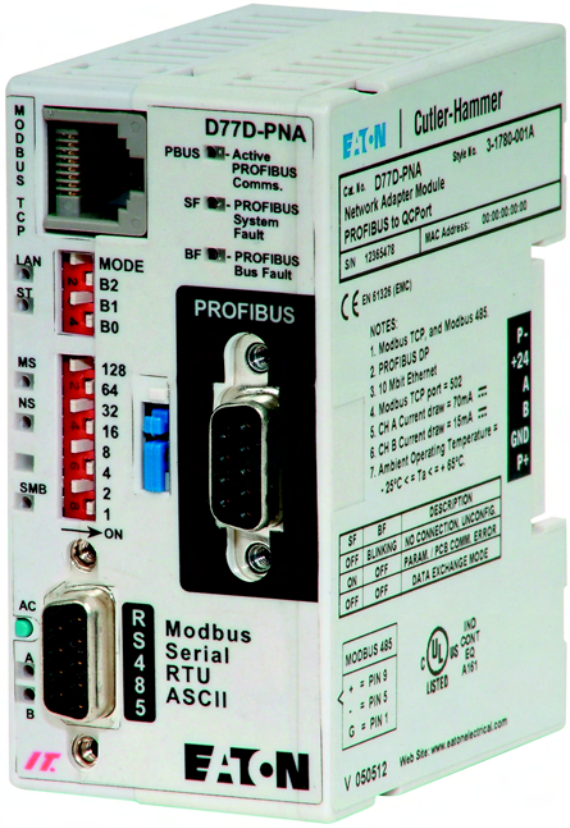
Cutler-Hammer

Intelligent Technologies

Profibus DP to QCPort Adapter (D77D-PNA)

Installation and User Manual

June 2005



June 2005

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Product Overview

Description

Eaton Electrical Intelligent Technologies (***IT.***) D77 Profibus Adapter (D77D-PNA) has greatly increased the functionality of the ***IT.*** communicating products, allowing monitoring and control for ***IT.*** I/O and ***IT.*** motor control devices. The Adapter scans the devices and then concentrates all configured data into a single Profibus station.

To simplify the configuration of the Profibus Adapter, a simple button press will auto configure the system for default operation. This feature automatically configures the I/O data into an input and output table from a single QCPort scan table.

For more information on the ***IT.*** family of products, visit our web site at: www.eatonelectrical.com

Features and Benefits

The ***IT.*** D77D-PNA includes the following significant features:

- Communications to Profibus DP
- Large I/O size of up to 242 in, 178 out on Profibus
- Provides for control of all ***IT.*** communicating devices connected to the Adapter
- Single button press auto configures the Adapter, setting up the system for default operation
- Advanced configuration using CH Studio
- Isolated DB9 Connection to Profibus
- Two independent QCPort (communication) channels
- QCPort powers the Adapter; no need for an extra power supply
- Channel B QCPort Isolated
- Status LEDs
- Provides for configuration of QCPort devices and the Profibus Gateway from Ethernet
- DIN rail mountable
- Monitoring and configuration of QCPort devices from Modbus TCP
- Innovative Pass-Through mode to control Serial Modbus RS485 devices from Modbus TCP while controlling over Profibus
- 10 Base T connection for Modbus TCP

Safety

The following safety statements relate to the installation, setup, and operation of the Eaton Electrical ***IT.*** Profibus Adapter.

Notice

Make sure you read and understand the installation procedures in this manual **before** you attempt to operate or setup the equipment.

WARNING

This instruction manual should be used for proper installation, setup, and operation of the ***IT.*** Profibus Adapter. Improperly installing and maintaining this product can result in serious personal injury or property damage. Before attempting installation, setup or operation, read and understand this entire manual.

WARNING

Only apply 24V DC to the Profibus Adapter connectors and terminals. Use of any other voltage may result in personal injury, property damage, and damage to the ***IT.*** Profibus Adapter.

WARNING

To provide continued protection against fire or shock hazard, the ***IT.*** Profibus Adapter must be replaced if it becomes inoperative.

Environmental Ratings

Table 1: Environmental Ratings

Description	Specification
Transportation and Storage	
Temperature	-50°C to 80°C [-58°F to 176°F]
Humidity	5 – 95% non-condensing
Operating	
Temperature	-25°C to 65°C [-13°F to 131°F]
Humidity	5 – 95% non-condensing
Altitude	Above 2000 meters [6600 feet] consult factory
Shock **IEC 68-2-27**	15G any direction for 11 msecs
Vibration **IEC 68-2-6**	5 – 150 Hz, 5G, 0.7 mm maximum peak-to-peak

Approvals/Certifications

Table 2: Approvals/Certifications

Standard	Approval/Certificate
Electrical/EMC	
ESD Immunity (IEC61000-4-2)	+/- 8kV air, +/- 4kV contact
Radiated RF (IEC61000-4-3)	10V/m 80-1000 MHz, 80% amplitude modulation @ 1kHz
Fast Transient (IEC61000-4-4)	+/- 2kV supply and control +/- 1kV communications
Surge (IEC61000-4-5)	+/- 1kV line-to-line +/- 2kV line-to-ground
RF Conducted (IEC61000-4-6)	10V, 0.15 – 80MHz
Magnetic Field (IEC61000-4-8)	30 A/m, 50Hz
Other Standards	
Agency Certifications	UL 508 CE (Low Voltage Directive) CUL (CSA C22.2 No. 14) PTO Certified (DPV0) (Certification #)
Radiated and Conducted Emissions	EN55011 Class A
Ingress Protection	IP20

General Specifications

Table 3: D77D-EMA General Specifications

Communications Channels	PROFIBUS DP
	Modbus TCP
	Modbus Serial
QCPort Channels	2 independent
24Vdc Power Consumption	PROFIBUS DP - 0 mA
	Modbus TCP - 0 mA
	QCPort Channel A - 50 mA
	QCPort Channel B - 15 mA

Profibus Specifications

Table 4: Profibus Specifications

Profibus Communications	DPV0
PNO Identification Number	0966 (hexadecimal)
Maximum Profibus I/O Size	244 bytes
Profibus Data Rate (K Baud)	9.6K, 19.2K, 45.5K, 93.75K, 187.5K, 500K, 1500K, 3000K, 6000K, 12000K

Modbus Specifications

Table 5: Modbus Specifications

Modbus Specifications	Register I/O Scan 10 Modbus TCP Connections (Sockets) Pass-through Port 2000 and 2001
Maximum Modbus I/O Size	1024 bytes input 1024 bytes output
Serial Modbus RS485 Baud Rate	1200, 2400, 4800, 9600, 19.2K, 38.4K, 57.6K, 115.2K
Modbus Ethernet Baud Rate	10Mb

Catalog Numbering System

There is only one catalog number for the ***IT.*** D77 Profibus Adapter: D77D-PNA.

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Physical Features

Physical Description

The following figure illustrates the various features of the ***IT.*** Profibus Adapter (D77D-PNA).

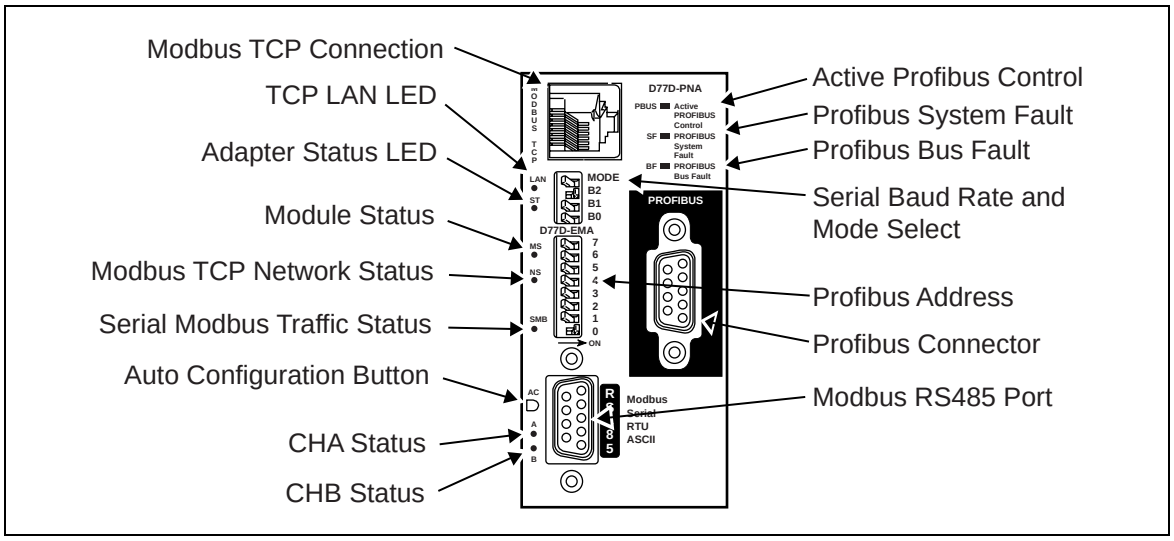

Figure 1: Profibus Adapter (D77D-PNA) Front Features

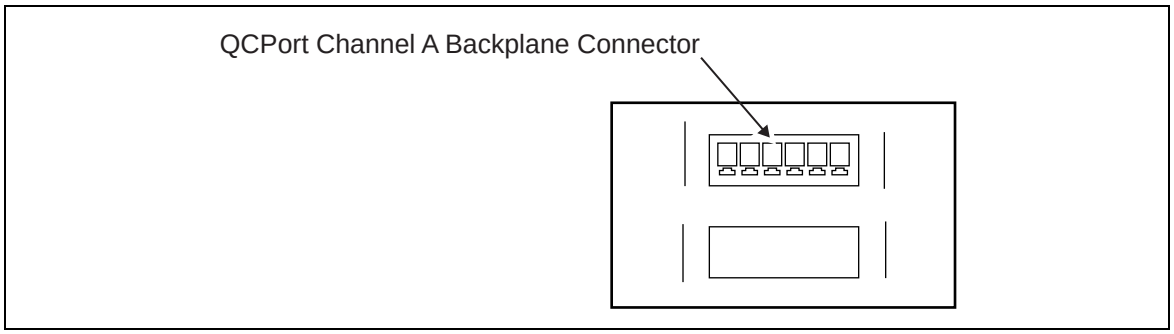

Figure 2: Profibus Adapter (D77D-PNA) Back Features

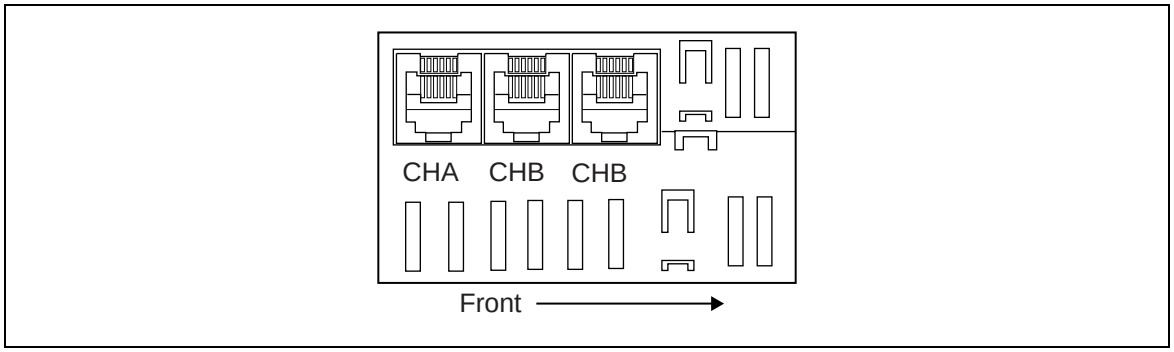

Figure 3: Profibus Adapter (D77D-PNA) Bottom Features

Dimensions

The following figures illustrate the dimensions of the ***IT.*** Profibus Adapter and ventilation space requirements for the device.

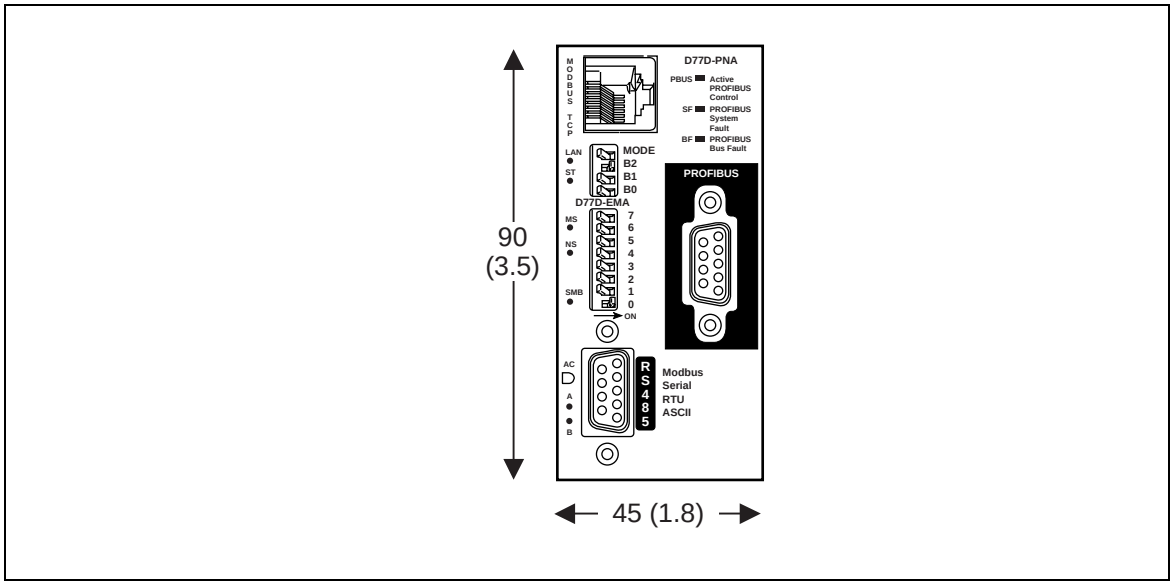

Figure 4: Profibus Adapter (D77D-PNA) Dimensions, mm [in]

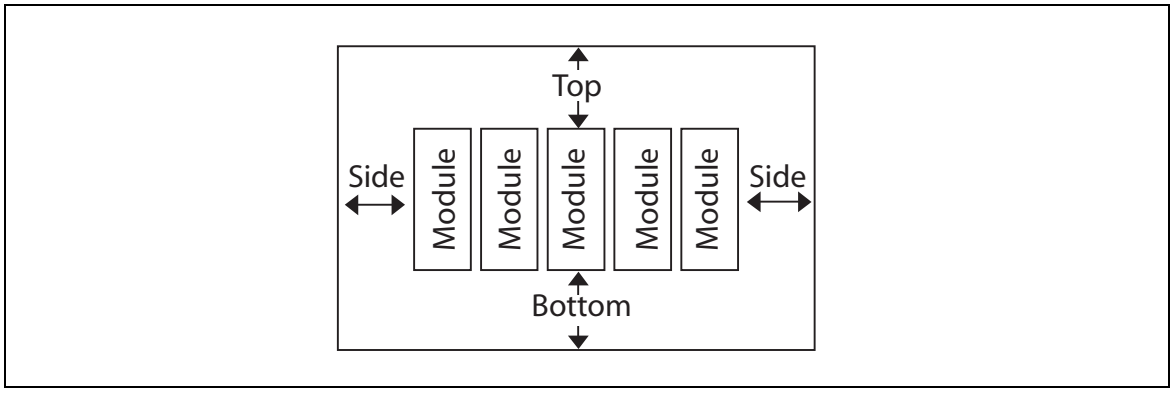

Figure 5: Device Ventilation

Notice

Allow a minimum of 50mm (2 in) of ventilation space on the top and bottom of each device and to each side of a grouping of devices.

Power Supply Requirements

Power from only a single source is necessary when only a QCPort channel A is utilized. Power from multiple sources is required for operation of the Profibus Adapter when both QCPort channels are utilized. The Profibus Adapter CPU and Ethernet port operate from power supplied on QCPort Channel A. The isolation between QCPort and Profibus is performed at the Profibus communication processor. QCPort channel B is also isolated.

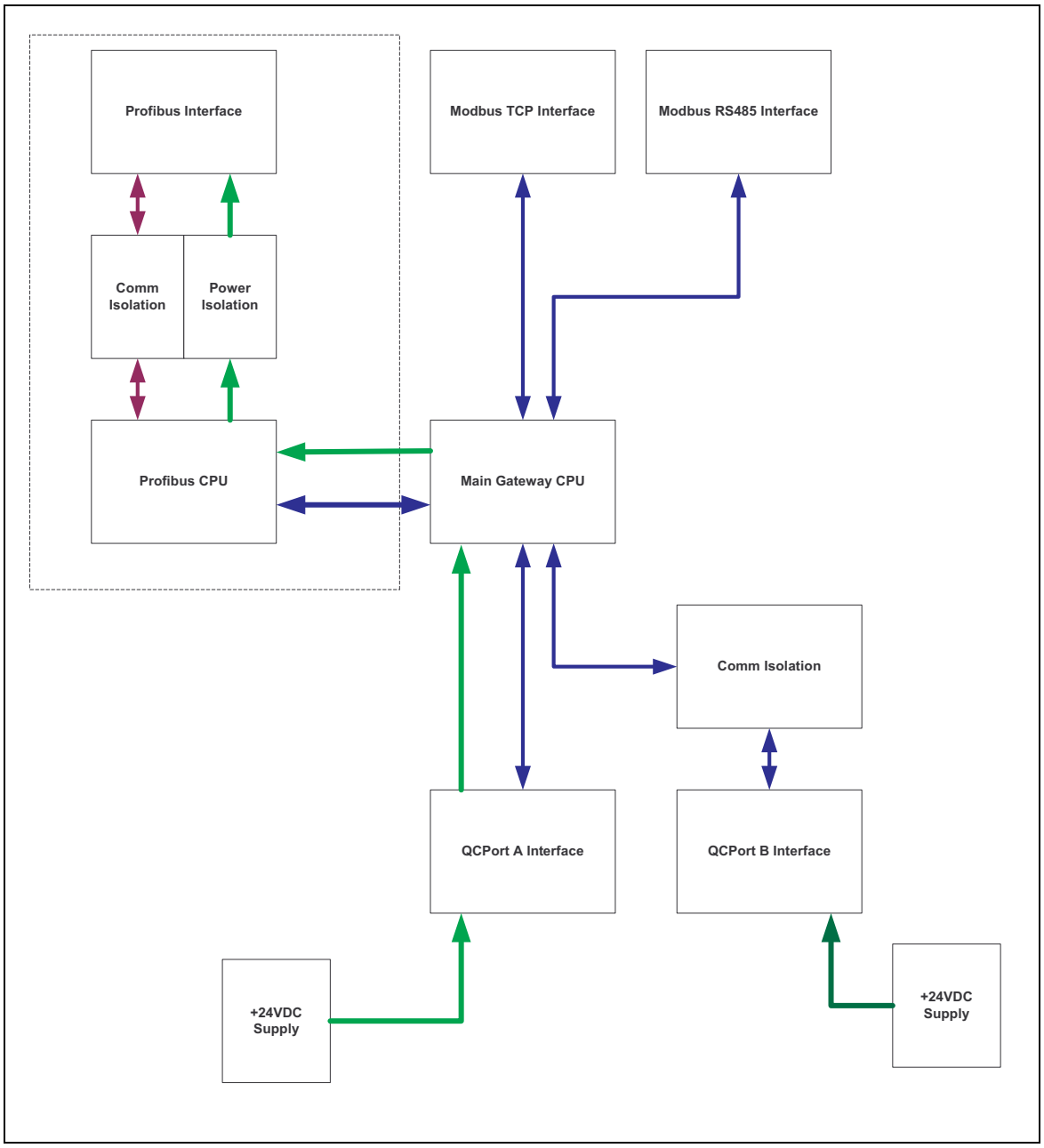

Figure 6: Profibus Adapter (D77D-PNA) Power Isolation

Operation

This section provides details about the following features and aspects of D77D-PNA operation:

- Quick Start
- Connect to Profibus
- Ethernet and Modbus Setup
- Auto Configuration
  - Overview
  - Preparation
  - Soft Configuration
  - Hard Configuration
- Configuration Using CH Studio
- Dynamic Device Addition (DDA)
  - Adding or removing devices
  - Replacing an existing device on QCPort
  - Typical Application
  - Modbus Pass-Through
  - Connect Modbus slaves to Channel A or B
  - Status LEDs
- Scanning

Quick Start

Configuring the Profibus to QCPort Network Adapter

The Eaton Electrical Profibus to QCPort Network Adapter is shipped in a factory-configured state. As such, you must first configure the Network Adapter prior to use with a system controller. The items that must first be configured are as follows:

1. All QCPort devices must be attached to either Channel A or Channel B of the Network Adapter.
2. The QCPort devices as well as the QCPort Network Adapter must be properly powered from a +24Vdc power supply. (See *D77E-QPLR* in Publication MN05001002E, *Intelligent Technologies QCPort System Install and Users Manual*.)
3. Each of the QCPort devices must have a valid, unique address.
4. The Network Adapter must be configured for the QCPort devices either by CH Studio or the AC (Auto Configuration) button on the Network Adapter. Auto configuration discovers the devices on QCPort and automatically builds an I/O table of those devices.
5. If any of the QCPort or Network Adapter parameters are to be modified, perform it at this time using CH Studio.
6. The I/O mapping and data size can be hand calculated or CH Studio can provide the I/O mapping.
7. The Profibus master must import the QCPort to Profibus Network Adapter GSD file (See EAEL0966.GSD).
8. Profibus configuration and parameterization selections must be made from the options provided in the GSD file, as well as the I/O information provided from CH Studio.
9. A system controller program must be written which will utilize the I/O mapped in the Profibus to QCPort Network Adapter.

CH Studio and the Profibus to QCPort Network Adapter

CH Studio is an advanced configuration tool that is capable of configuring and communicating to the Profibus to QCPort Network Adapter via the TCP port located on the front of the Network Adapter. CH Studio will automatically discover and communicate with any Eaton Electrical ***IT.*** products attached to QCPort Channel A or Channel B. See the TCP/IP and IP addressing section of the user manual for other information with regard to configuring the Network Adapter for TCP/IP networking.

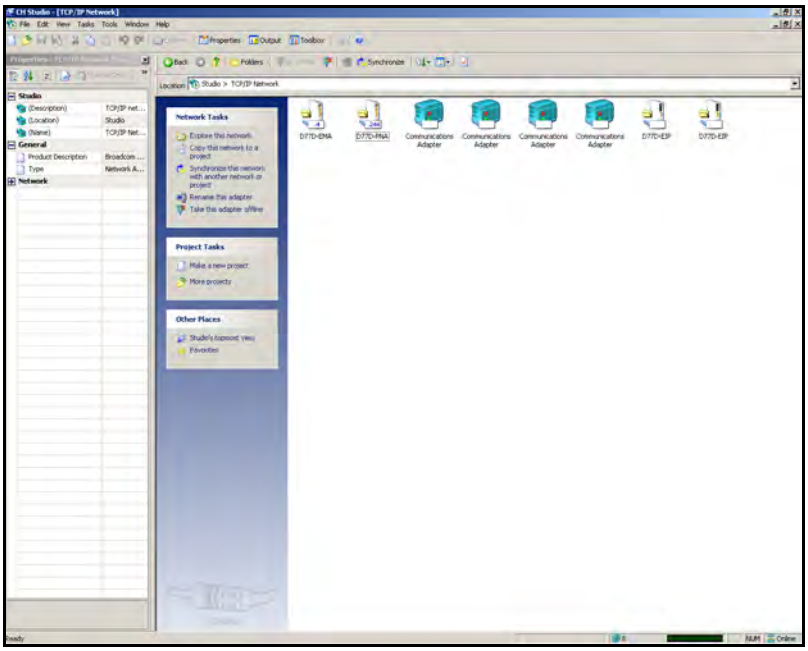

Figure 7: CH Studio TCP/IP Network Level

Prior to going on-line, highlight the TCP/IP icon to view or change any of the configuration parameters for the TCP/IP network. Here is where the subnet mask, start and end auto address, and other parameters are set up. You must set the IP address of the computer under the network setup for the operating system. By default, CH Studio uses BootP to discover all the Network Adapters connected to TCP/IP. Press the Go On-line button to discover all network adapters.

When CH Studio is on-line, the Profibus Network Adapter is at the top most level. By highlighting the Network Adapter, you can view its properties in the Property Inspector. The Property Inspector provides information specific to the highlighted device in the explorer window.

The Network Adapter is made up of a mother card (TCP/IP portion) and a daughter card (Profibus portion). The mother card manages all communications to QCPort while the daughter card manages all communications to Profibus.

The “Profibus DP” properties area provides information regarding the current state of the Profibus DP portion of the Network Adapter.

- Baud Rate - baud rate of the Profibus DP connection.
- Daughter Card Consumption data size (in bytes) — The number of bytes the Network Adapter consumes (receives from Profibus).
- Daughter Card Data CRC —This value can be used during commissioning of the Profibus system when configuring the Profibus DP master for use with the Network Adapter. By copying this number to the corresponding Profibus configuration area, the Network Adapter returns an error response to the Profibus master any time the Data I/O Mapping differs from what was initially configured.
- Daughter Card Faults —Advanced configuration information for troubleshooting and diagnostics.
- Daughter Card Firmware revision —The current firmware version of the daughter card.
- Daughter Card Hardware version — The current hardware version of the daughter card.
- Daughter Card Mode — Advanced configuration information for troubleshooting and diagnostics.
- Daughter Card Node ID —The Profibus DP Slave address as set by the DIP switches on the Mother card (note that the address only changes after power is cycled to the Network Adapter). Address switches set higher than 125 always result in a Profibus address of 125.
- Daughter Card Production Data Size (in bytes) — The number of bytes the Network Adapter produces (sends to Profibus).
- Serial Number — The serial number of the Profibus card.
- Daughter card stat— Advanced configuration information for troubleshooting and diagnostics.
- Daughter card type —The value 1 indicates Profibus.

CH Studio QCPort Device Observation

By selecting (double-clicking) the Network Adapter of interest, CH Studio "drills down" to the QCPort device of the selected Network Adapter. **Figure 8** shows the QCPort devices located on the Network Adapter of interest.

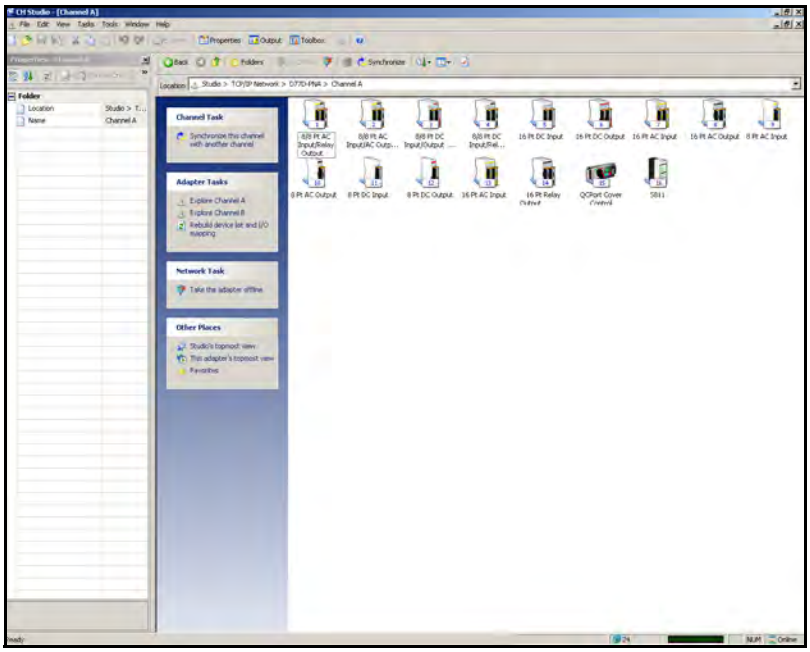

Figure 8: CH Studio at QCPort Device Level

You can obtain further information about these devices by selecting the device of interest, right-clicking on it and choosing “Properties,” or by double-clicking on the device. A dialog box displays general, I/O and other information available to aid you in configuring the device or using the device.

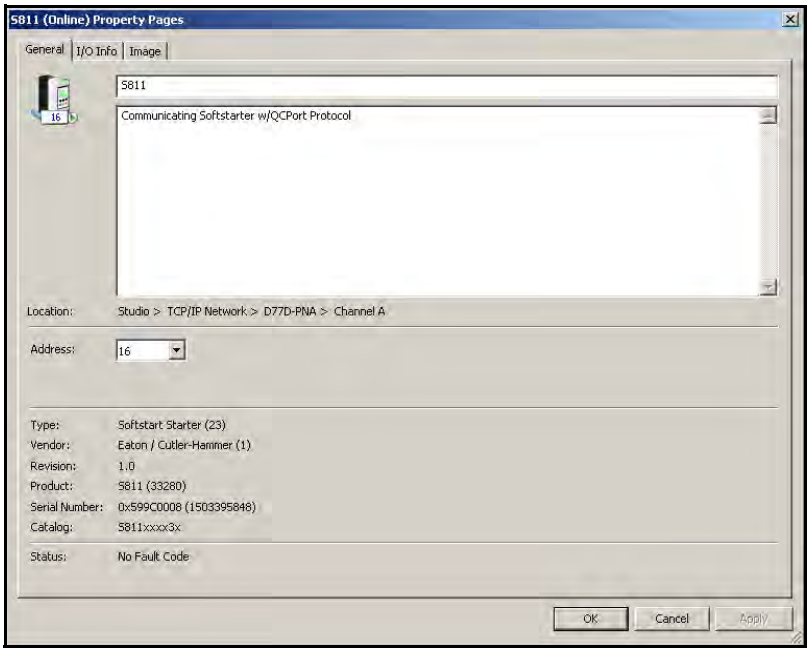

Figure 9: Property Page

The I/O size for each QCPort device is viewable and changeable from this Property Page, by selecting the I/O tab. This information is useful when understanding how the I/O data is mapped to the Profibus system.

CH Studio and I/O Mapping

When focus is on the QCPort Network Adapter of interest in CH Studio, you can obtain an I/O map of all QCPort devices attached to the Network Adapter by selecting “Tasks,” then “Reports” from the toolbar. A report is generated for the Network Adapter of interest. The Profibus I/O mapping for the Network Adapter is part of this report. You can save this report to an HTML file to view using any browser.

I/O Mapping General Rules

- All **word** data is automatically swapped high byte/low byte for Profibus from QCPort since Profibus is Big Endian and QCPort is Little Endian.
- All word data starts on even word boundaries, therefore pad bytes are added before the word data as needed automatically by the Network Adapter.
- All data is sized as even words — therefore a pad byte is added to the end of the data table automatically when needed in order to make the data table even.
- Input data cannot exceed 244 bytes for Profibus, and output data cannot exceed 178 bytes.
- Profibus scan data can be set smaller than the actual QCPort device data, but not larger.

Configuring Simatic Step 7 for Use with the Network Adapter

After installing the GSD file and adding/configuring the appropriate CPU and Profibus DP network, locate and add the Profibus to QCPort Network Adapter as shown.

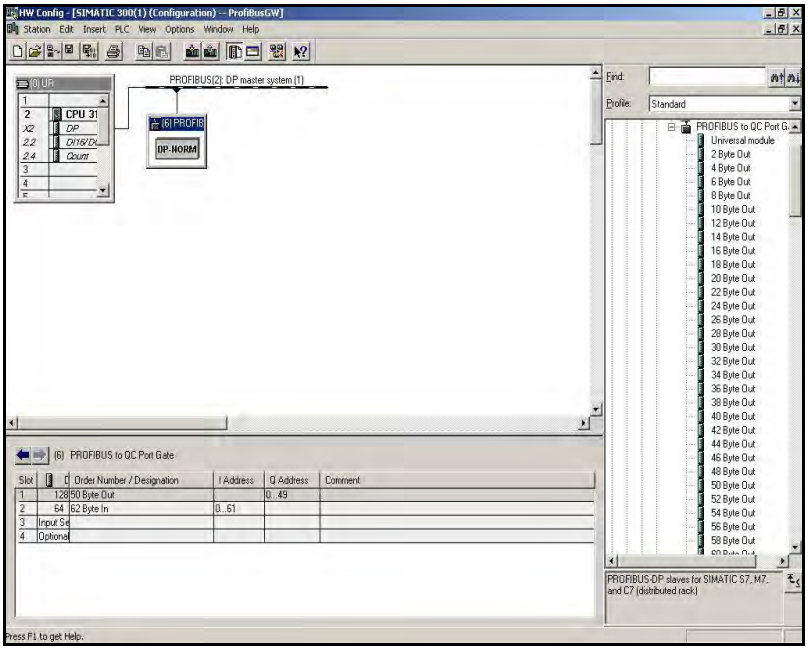

Figure 10: Network Adapter View

Double-click the Profibus to QCPort Network Adapter Icon to bring up the properties pane for the Network Adapter. Select the "Parameter Assignment" tab to parameterize the Network Adapter.

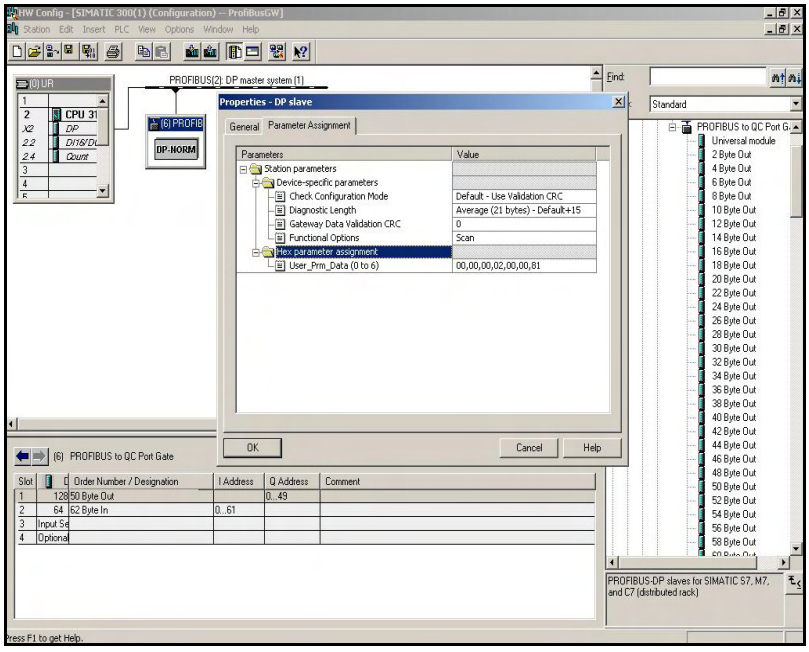

Figure 11: Parameter Assignment

Parameterization

I/O Validation Using CRC

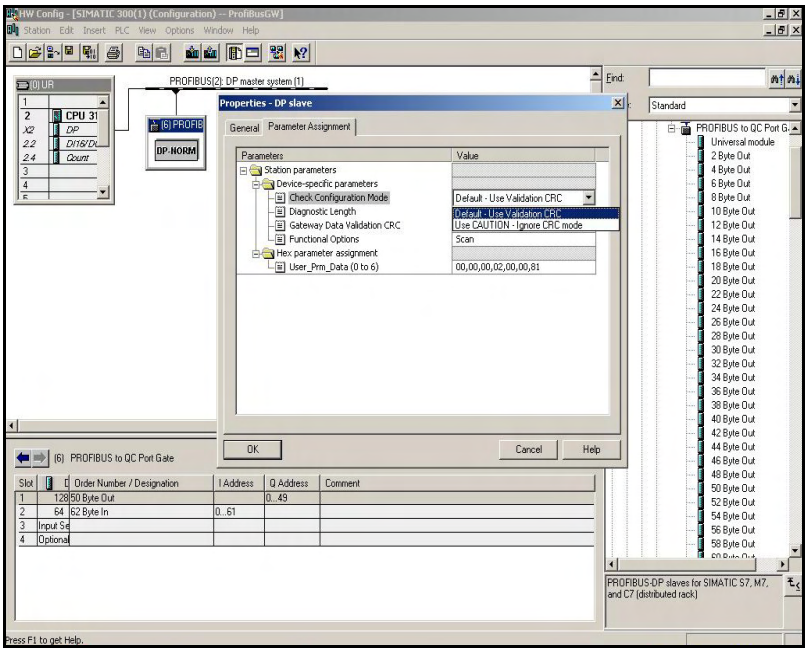

Figure 12: I/O Validation Using CRC

The “Check Configuration Mode” device-specific parameterization setting has two settings:

1. Default - Use Validation CRC
2. Use CAUTION - Ignore CRC mode

Note: When option “1” is selected, enter the actual data validation CRC that you read from CH Studio into the “Network Adapter Data Validation CRC” field.

When option 1 is set, the Network Adapter only allows data exchange if the validation CRC value sent by the master during parameterization agrees with the value it calculates, based on the current QCPort I/O configuration. A CRC value of “0” is allowed and overrides the actual required CRC. The validation CRC is a 16-bit number calculated based on the current QCPort I/O data set by the Network Adapter motherboard. You can obtain the value from CH Studio in the “Profibus DP” properties window.

When option 2 is set, the Network Adapter allows data exchange without checking for a CRC value during parameterization.

Setting the Diagnostic Message Length

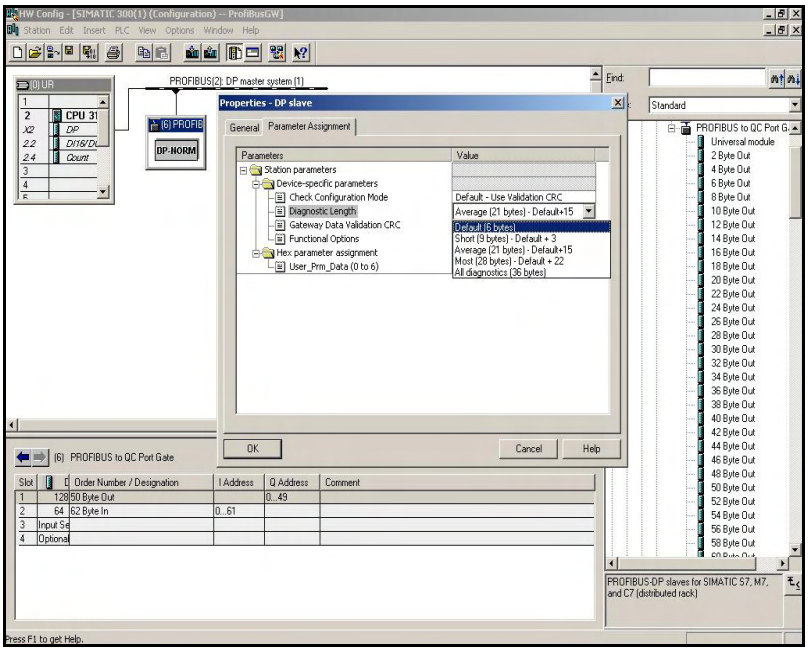

Figure 13: Diagnostic Message

As shown above, you can set the Diagnostic message to a number of different lengths, depending on the amount of feedback you desire from the Network Adapter.

1. Profibus Minimum (6 bytes) — (this is the minimum required by Profibus)
2. Short (9 bytes) — Minimum + 3
3. Average (21 bytes) — Minimum + 15
4. Most (28 bytes) — Minimum + 22
5. All Diagnostics (36 bytes)

For detailed information on the diagnostics message, see **Table 45** on **Page 77** in **Appendix C: Register Mapping**.

Parameterization Functional Options

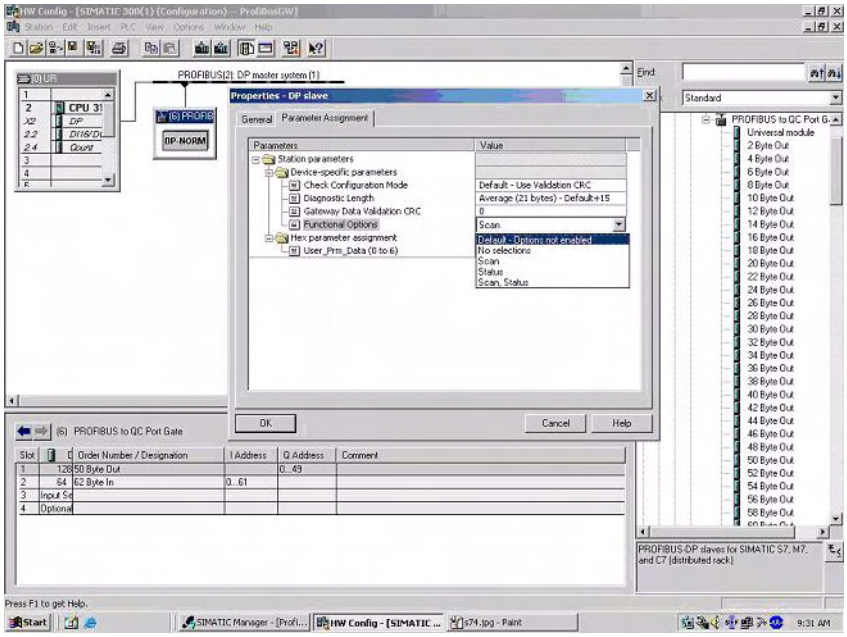

Figure 14: Parameterization Options

The functional options allow the addition of a scan control word to the output data, which is interpreted by the Network Adapter for QCPort scan enable, and a status word added to the input data that indicates the status of the QCPort network. The selections are:

1. Default — Options not enabled
2. No selections
3. Scan Control
4. Scan Status
5. Scan Control and Status

The definition for the Scan control is shown in **Table 6**.

Table 6: Profibus Scan Control Word

Bit	Byte 0	Byte 1
0	Scan Enable	CHA and CHB Activate Scan 0 = Scanning deactivated for QCPort channels 1 = Scanning activated for QCPort channels
1 - 15	Reserved	Reserved

The definition for the Scan status is shown in **Table 7**.

Table 7: Profibus Scan Status Bytes

Bit	Byte 0	Byte 1
0	CHA Active 0 = Not actively scanning 1 = Actively scanning	CHB Active 0 = Not actively scanning 1 = Actively scanning
1	CHA Active 0 = Not actively scanning 1 = Actively scanning	CHB Active 0 = Not actively scanning 1 = Actively scanning
2	Faulted device CH A 0 = No faulted devices 1 = One or more faulted devices	Faulted device CH B 0 = No faulted devices 1 = One or more faulted devices
3	Reserved	Reserved
4	Duplicate Address CH A 0 = No two devices have the same group address 1 = Two ore more of the devise have the same group address	Duplicate Address CH B 0 = No two devices have the same group address 1 = Two ore more of the devise have the same group address
5	QCPort Configuration Corrupt on CHA 0 = QCPort channel configuration OK 1 = QCPort channel configuration not OK	QCPort Configuration Corrupt on CHB 0 = QCPort channel configuration OK 1 = QCPort channel configuration not OK
6	Reserved	Reserved
7	Reserved	Reserved

I/O Configuration

You can set the I/O size for the Profibus Network Adapter by selecting the corresponding input and output data sizes from the selections listed in the GSD file. Note that you must single-click on the Profibus Network Adapter icon in the hardware manager, to "select" it (blue), in order to add the I/O to its configuration.

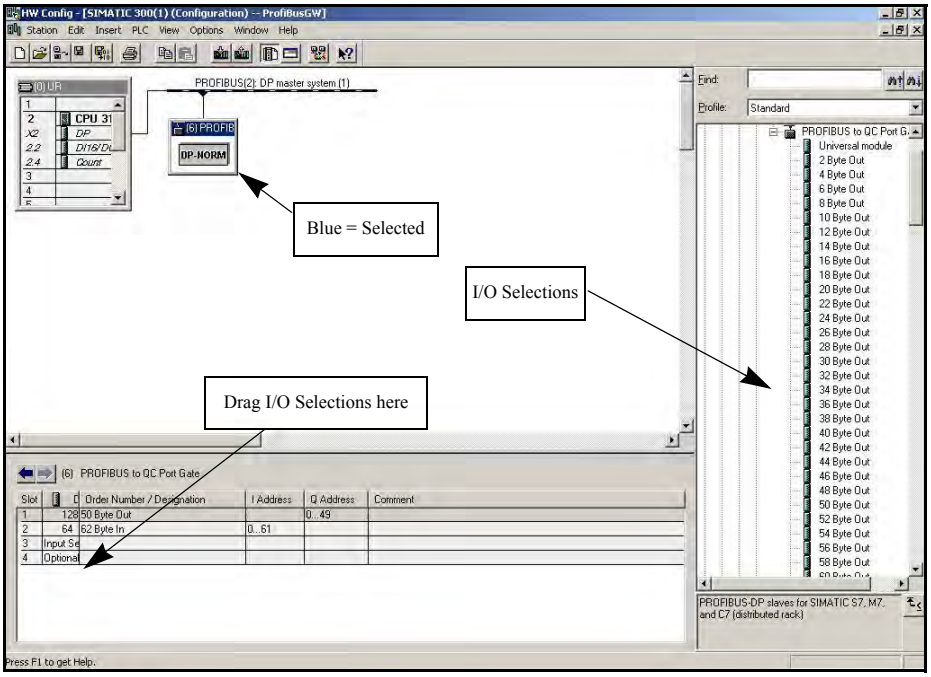

Figure 15: I/O Configuration

If more the 128 bytes of input data, or 128 bytes of output data, are needed, you can add a second selection for both input data and output data to the I/O table.

Note: The I/O data sizes chosen cannot exceed the I/O data configured/available in the Network Adapter. CH Studio lists the production and consumption data sizes available for Profibus. However, you can select the Profibus data sizes chosen to be less than the data size listed as available.

Connect to Profibus

Profibus is connected to the D77D-PNA using the Profibus DB9 connector located on the face of the adapter. The Profibus connector is the connector most often used on Profibus and is located on the right side of the D77D-PNA.

Profibus Addressing

The Profibus adapter is addressed from the DIP switches located on the face of the D77D-PNA; the address can only be set through the hardware DIP switches. A software tool (such as CH Studio) can view the settings for the Profibus Adapter address and baud rate, but cannot be used to modify them.

Refer to the following instructions and **Figure 16** when setting the address.

Instructions

Moving a DIP switch to the right is **ON** and moving the switch to the left is **OFF**. The address is in binary with the major units numbered to the right of the switch on the label. Adding up the major units set to **ON** will provide the address of the Modbus RTU/ASCII and the Profibus networks.

Notice

Any Profibus Station Address selection greater than 125 will result in the D77D-PNA using Station Address 125.

To set the Profibus address, place the address DIP switches in the desired positions.
The following example is set to address=25.

Notice

The address specified in the switches is only used by the adapter at the time the adapter is powered on or power cycle reset. Changing these switches during operation will have no affect until the next power cycle or reset.

Example: To set the address to 25, start from the top (or 128) and set the switches from the top down to OFF, OFF, OFF, ON, ON, OFF, OFF, ON (16+8+1=25).

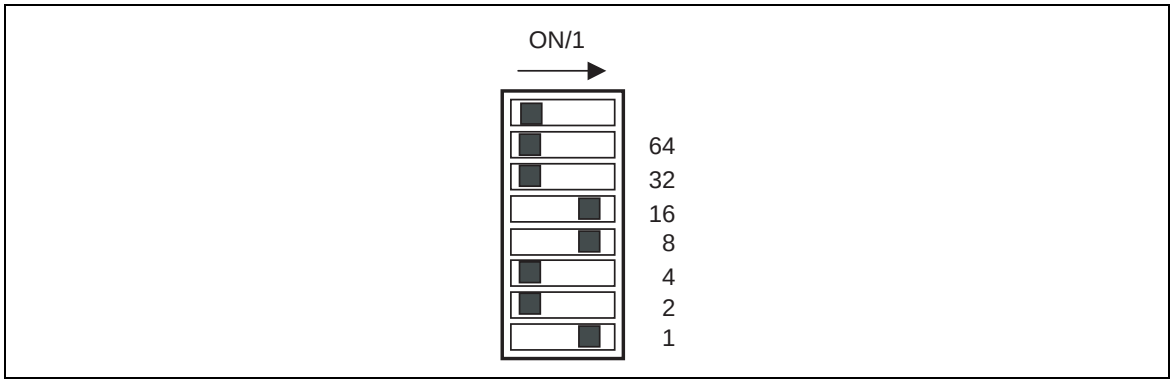

Figure 16: Address DIP Switch Designation

Profibus Connection

The Profibus port uses the standard DB9 Profibus connection. Refer to the figure below for details on the pin out of this connector.

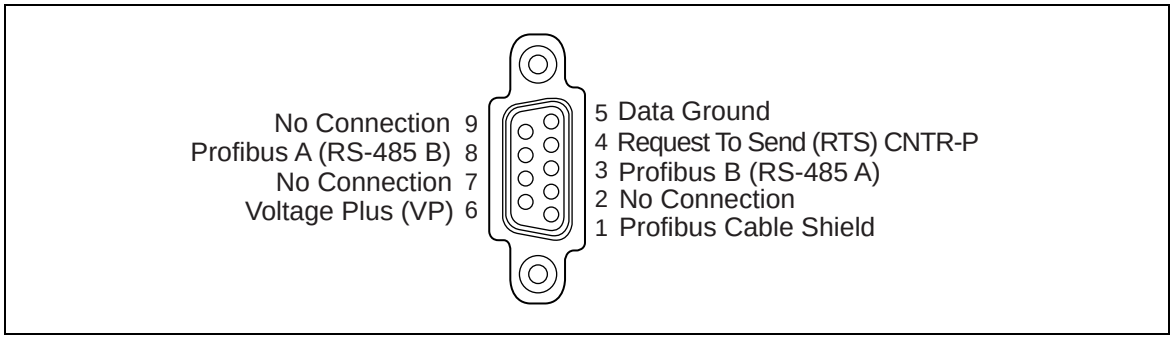

Figure 17: Pin Out for DB9

Ethernet and Modbus Setup

Configure and Monitor over Modbus

Modbus TCP is used for configuration of the QCPort devices using the CH Studio configuration tool. The Modbus port can also be used by a Modbus Master for monitoring all of the devices on the QCPort channels asynchronously with Profibus. It is not possible to control any of the outputs on QCPort from Modbus while Profibus is scanning. The Ethernet port is a RJ45 10 Base T connection and communicates at 10Mb/s. It is suggested that Cat5 or better cable be used; shielded cable is not required but is suggested if the shields can be tied to ground at one central location.

Notice

Never allow the ground signal to be connected to both ends of a connector in an RJ-45 cable. Only allow one connector end to connect to ground (shield).

The Modbus Adapter Ethernet port supports 10 active server connections over port 502. Each of the server connections can be used to read and write to any of the supported registers (some registers are read only) within the Profibus Modbus Adapter. It is not required to choose the server connection to communicate with the Adapter, the Adapter will automatically choose the next available when another connection is made. For example multiple devices such as a HMI, system controller and a tool can all be connected to adapter each using a unique connection.

To support the pass-through feature from Ethernet to QCPort Channel A and Channel B, ports 2000 and 2001 each support 1 active server connection. For more information on Pass-Through, refer to the **Modbus Pass-Through** section.

Ethernet Addressing

The Modbus Ethernet Adapter portion of the D77D-PNA supports addressing using a Static IP address and also using BootP (default). The following registers are used to set up and configure the TCP address.

Table 8: TCP/IP Configuration

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
MAC ID	7527	3	48 bit Hardware address	R
IP address	7530	2	The current active IP address HH.HL.LH.LL Word 7530 - HH HL Word 7531 - LH LL	R/W
IP address mode	7532	1	0 – 192.168.10.1 1 – Static IP 2 – BootP (default) 3 – Save (saves the BootP address as static and sets mode to static IP)	R/W
Subnet Mask	7533	2	The current active subnet mask HH.HL.LH.LL Word 7533 – HH HL Word 7534 – LH LL	R/W
Default Gateway	7535	2	The currently set default Gateway HH.HL.LH.LL Word 7535 - HH HL Word 7536 - LH LL	R/W
Allowed Sockets	7537	1	# of Modbus socket connections allowed	R/W
Modbus TCP Slave Address	7538	1	The MBAP header unit ID which this Modbus Adapter will respond to (default 1)	R/W

It is suggested that a BootP service is used to set the original IP address within the Adapter. Once the IP is chosen, set Register 7532 to 3 and the IP address will be saved as the static address and will use that address at every power-up. Register 7532 will be set to 1 automatically after the IP address is saved to non-volatile memory.

If a BootP service is to be used to set the IP address at every power-up, it is not necessary to change the setting for register 7532.

Serial Modbus RS485

The Modbus serial port uses the standard Serial MODBUS RS485 connection, a DB9.
Refer to the figure below for details on the pin out.

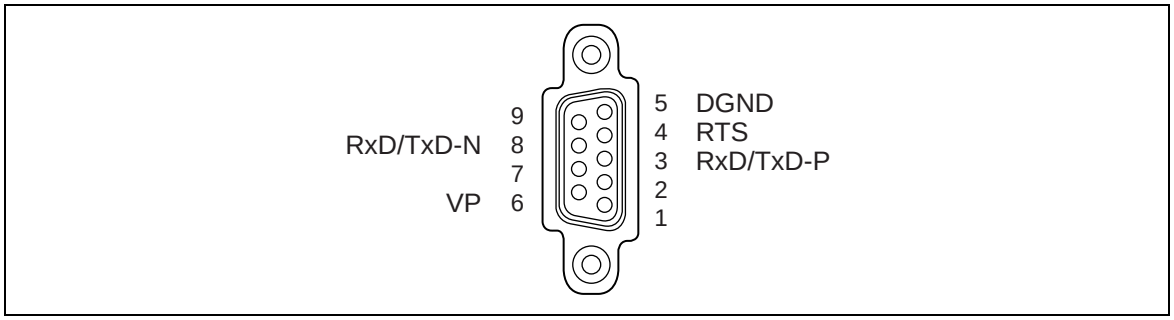

Figure 18: Modbus Connection

Set the Serial Modbus Address

The address for the serial Modbus slave address is the same as the address for Profibus. Once the address is set for Profibus, it is set for the Modbus Serial as well.

Set the Serial Modbus RS485 Baud Rate

To set the baud rate for the serial Modbus, change the B0 through B2 DIP Switch settings. The following table displays valid baud rates.

Table 9: Baud Rate Table

B0	B1	B2	Baud
OFF	OFF	OFF	1200
ON	OFF	OFF	2400
OFF	ON	OFF	4800
ON	ON	OFF	9600
OFF	OFF	ON	19200
ON	OFF	ON	38400
OFF	ON	ON	57600
ON	ON	ON	115200

To set the serial Modbus baud rate, place the baud DIP switches in the desired positions. The following example is set to baud of 1200.

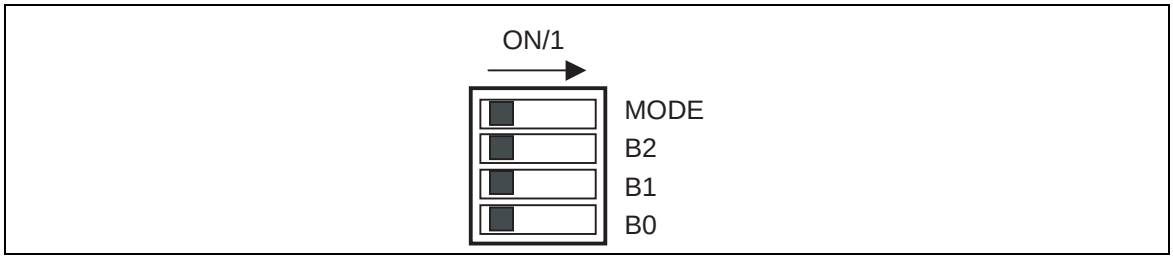

Figure 19: Baud Rate DIP Switch Designation

Set the Serial Modbus RS485 Mode

To set the serial Modbus mode to ASCII or RTU, use the MODE DIP switch. To set the serial Modbus MODE, place the MODE DIP Switch in the desired position.
OFF = RTU
ON = ASCII

The following example is set to RTU.

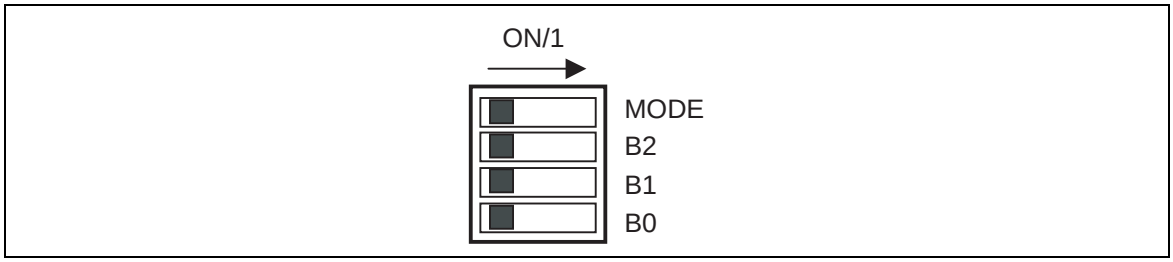

Figure 20: MODE DIP Switch Designation

Auto Configuration

Overview

When an auto configuration is performed, the D77D-PNA assembles the I/O data into input data registers and output data registers for the devices on QCPort channels CHA and CHB. The data is assembled by QCPort channel and then in ascending order by device Group ID (address switch setting on device) using the default I/O assembly for each device. For further assistance on the I/O size and how data is mapped within the registers, refer to the user manual for that device or to CH Studio for on-line help.

Once the QCPort system is assembled, powered and properly addressed, one of two types of auto configuration can be performed. The procedure for performing a Soft Configuration or Hard Configuration starts on **Page 27**. No additional configuration of the D77D-PNA is required for normal operation.

Notice

Use CH Studio when it is necessary to configure enhanced features.

Preparation

Prior to performing an auto configuration procedure, take the following steps to ensure a properly assembled system.

- Verify that all QCPort devices are set to a unique Group ID (QCPort address). For Group ID settings above the Group ID switch range, CH Studio is required.
- Verify the sizing of the power supply.
- Check that QCPort is properly wired and properly terminated.
- Refer to MN05001002E *(QCPort System Installation and Planning Guid*e) for further information on QCPort System design.

When the system is powered properly and Profibus is connected properly, the status LEDs should be in the following state:

Table 10: Proper State of LEDs

LED	State
LAN	Amber Flashing (If connected to ethernet)
ST (Status)	LED Blinking Green
MS	Solid Green or Flashing Green
NS	Solid Green or Flashing Green
SMB	Amber Flashing (If SMB connected)
CHA	Off or Intermittent Flash
CHB	Off or Intermittent Flash
Net (Profibus Network Activity)	Amber (Flashing or solid indicating Profibus network activity with the adapter)
SF (Profibus Module Status)	Off (Red indicates an abnormal operating condition)
BF (Profibus Network Status)	Off (Red indicates an abnormal operating condition) or flashing red when no Profi comms

For more information on the LED state meanings, refer to the **Status LEDs** section.

Soft Configuration

Performing a soft configuration reconfigures the internal QCPort scan list to match all physically connected devices on CHA and CHB. It generates the register mappings that contain the I/O information for these connected devices. To disable the auto configure (AC) push button, use CH Studio or refer to register 7556 in **Appendix C**.

Soft Configuration:

- Erases the old QCPort scan list and creates a new scan list.
- Erases the old Profibus telegrams and creates new Profibus telegrams.
- Leaves the QCPort device's parameters unchanged.

Notice

If an active network needs to be reconfigured, the Profibus scan of the specific D77D-PNA must cease and the scan bits for Channel A and Channel B must be cleared. If the Auto Configuration button is pressed during Profibus network scanning of the D77D-PNA, configuration will not occur.

Soft Configuration Procedure

1. Set each QCPort device to a unique non-zero Group ID (per QCPort channel) using the manual Group ID switches. To set the Group ID to an extended address greater than the setting on the switch, use CH Studio.
2. Apply power to each QCPort channel that has QCPort devices on it. This ensures that each device is powered and that the D77D-PNA is powered.
3. Using a pointed tool (such as a ball point pen), lightly press the Auto Configuration button and hold for five seconds. During this time, the D77D-PNA status LED will turn on solid green. After three seconds, the D77D-PNA status LEDs will all turn on, then blink three times in one second and then go off, signalling the start of the Soft Configuration process. At this time, release the AC button.

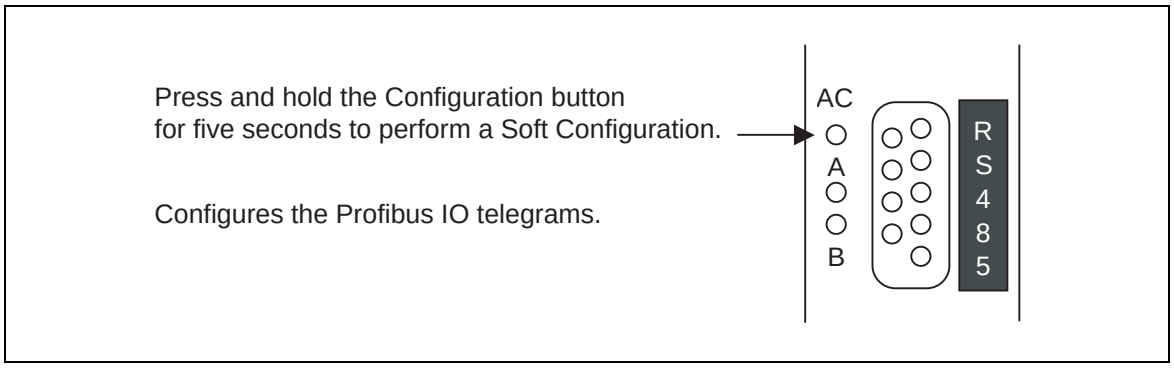

Figure 21: Soft Configuration

None of the QCPort devices may be faulted while performing an I/O Configuration. To verify that the devices are not faulted, check status LED for each device. The status LED for most devices is in upper left of most products and may not be marked. A faulted state will have a LED flash of 500 milliseconds on, 500milliseconds off.

Notice

If, for any reason, the system is not configured properly, when the Auto Configuration button is pressed the MS LED will go to solid red or flashing red. This indicates that further configuration is required. For example, this would occur if two devices on the same QCPort channel have the same Group ID.

Hard Configuration

Performing a Hard Configuration reconfigures the internal QCPort scan list to match all physically connected devices on CHA and CHB. It generates the Profibus I/O telegram mappings that contain the input/output information for these connected devices. In addition, the QCPort device parameters for all devices on QCPort CHA and CHB are set to "factory default."

Hard Configuration:

- Sets all QCPort device parameters to their "factory default" settings.
- Erases the old QCPort scan list and creates a new scan list.
- Erases the old Profibus I/O telegrams and creates new Profibus I/O telegrams.

⚠ WARNING

If any connected device has been custom configured, a Hard Configuration will return the device's parameters to "factory default."

Hard Configuration Procedure

1. Set each QCPort device to a unique non-zero Group ID (per QCPort channel) using the manual Group ID switches. To set the Group ID to an extended address greater than the setting on the switch, use CH Studio.
2. If Channel B is being used, apply power to that channel so that the devices on Channel B are active when the configuration takes place.
3. Using a pointed tool (such as a ball point pen), lightly press the Auto Configuration button **while applying power to CHA and the D77D-PNA**. You must hold the AC button during the power-up for a minimum of 5 seconds to begin the Auto Configure process. During this time, the D77D-PNA Status LED will be solid green. Once it is viewed that the Status LEDs on the QCPort devices change from fast flashing to a slow flash (mostly off), the AC button can be released.

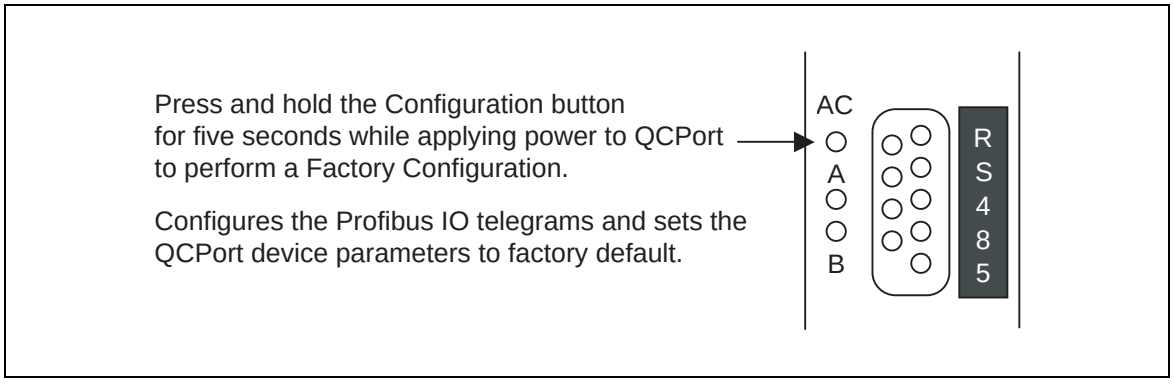

Figure 22: Hard Configuration

None of the QCPort devices may be faulted while performing an I/O Configuration. To verify that the devices are not faulted, check status LED for each device. The status LED for most devices is in upper left of most products and may not be marked. A faulted state will have an LED flash of 500 milliseconds on, 500 milliseconds off.

Notice

If, for any reason, the system is not configured properly, when the Auto Configuration button is pressed the MS LED will go to solid red or flashing red. This indicates that further configuration is required. For example, this would occur if two devices on the same QCPort channel have the same Group ID.

Configuration Using CH Studio

CH Studio Component Manager

Pressing the Auto Configuration button performs a basic setup of the D77D-PNA and connected devices that is sufficient for most applications. When an application requires that parameters have to be modified from default, use CH Studio Component Manager.

The CH Studio tool is used for configuration, maintenance and monitoring of Eaton Electrical nodes and QCPort devices. After going on-line using CH Studio, the Studio Explorer will display the Eaton Electrical nodes on Profibus and allow the user to drill down through the D77D-PNA to view and configure the QCPort devices.

Part of the setup of the TCP/IP network is to select the range of temporary IP address to assign devices and the setup of the subnet mask and default gateway. For most users, these settings will not need to be modified from default since CH Studio uses current network settings to preconfigure the TCP/IP network settings. Once these parameters are setup, pressing the Go On-line button will allow CH Studio to search for Eaton Electrical nodes on Modbus TCP.

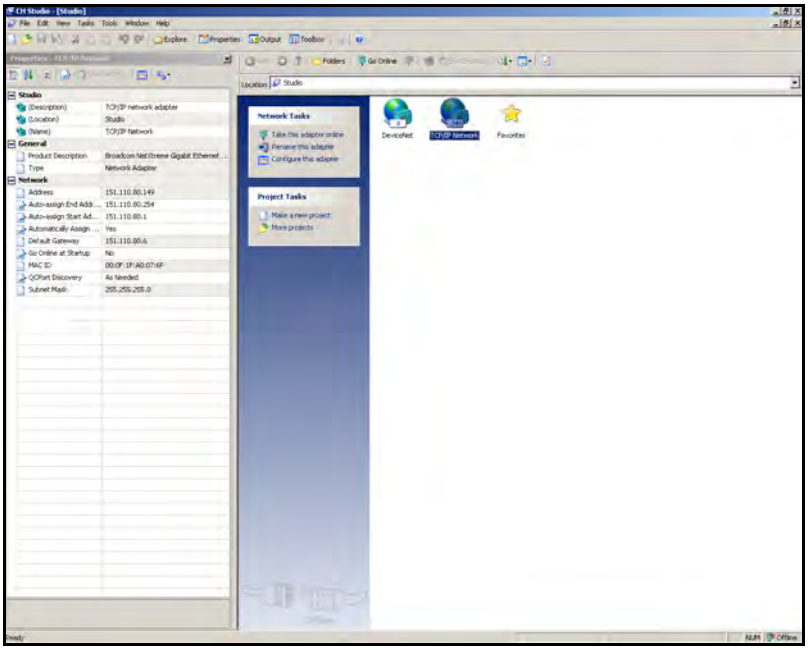

Figure 23: TCP/IP Setup

An unconfigured D77D-PNA without an IP address will be visible from CH Studio due to a feature called Discovery that is built into each Eaton Electrical Ethernet Node. Once the node shows up on the explorer within CH Studio, a temporary IP address is assigned to the D77D-PNA from the range of IP addresses in the TCP/IP network setup.

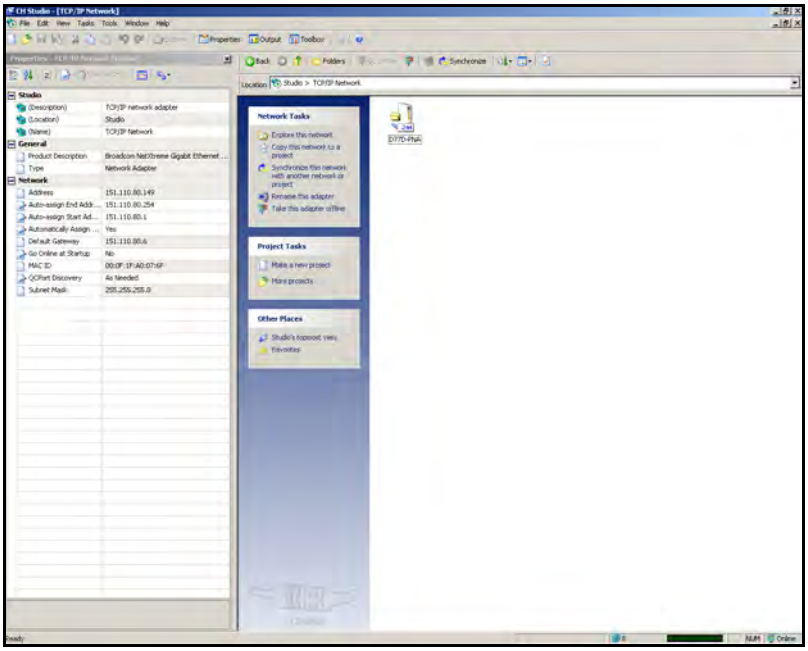

Figure 24: Studio Explorer (Docked View)

General Tab

Once a Profibus node or QCPort device is selected, the Properties Window will display the attributes and parameters of that device. From this window, node/device parameters can be viewed and modified. This information is also contained within the Property Pages of the node/device that is being viewed by going to the toolbar and selecting View and then Property Pages (Shift + F4).

The parameters such as the IP address, address mode and other D77D-PNA parameters can be directly modified. It is also possible to drill down into the QCPort channels to configure the QCPort devices once an IP address has been set on the D77D-PNA. The general tab will provide the ability to set a static IP address or assign the IP address using BootP and set the other network parameters.

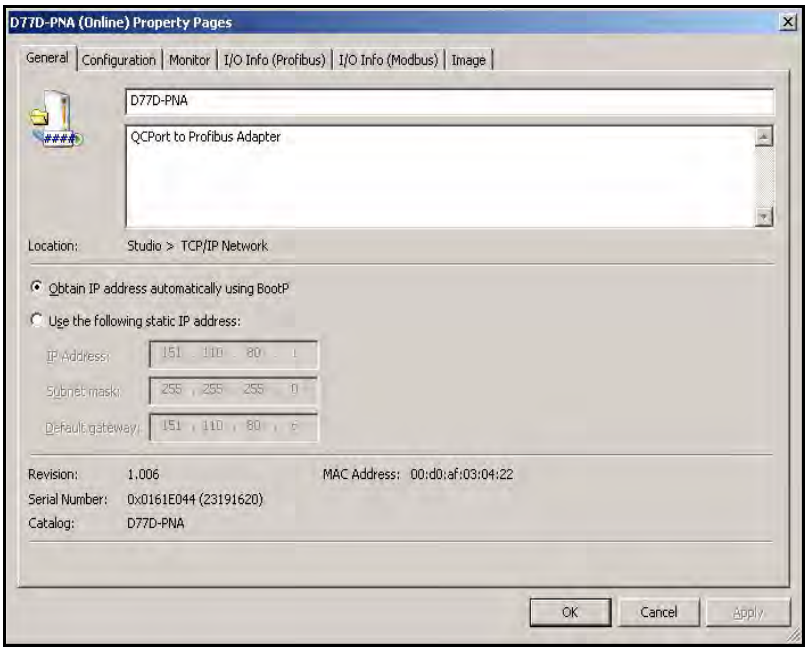

Figure 25: General Tab

Configuration Tab

The configuration tab is only used for setting up the Modbus Pass-Through parameters. If Modbus Pass-Through is not going to be used, then it is not necessary to set any of these parameters. If Modbus Pass-Through is going to be used, it is important to set up the Serial Modbus baud rate and parity of the Modbus network devices. All the Serial Modbus devices must be set to the same baud rate as the D77D-PNA Pass-Through settings. If a device takes more than 100 ms to respond to a Serial Modbus message, it is important to set the Allow slow response check box.

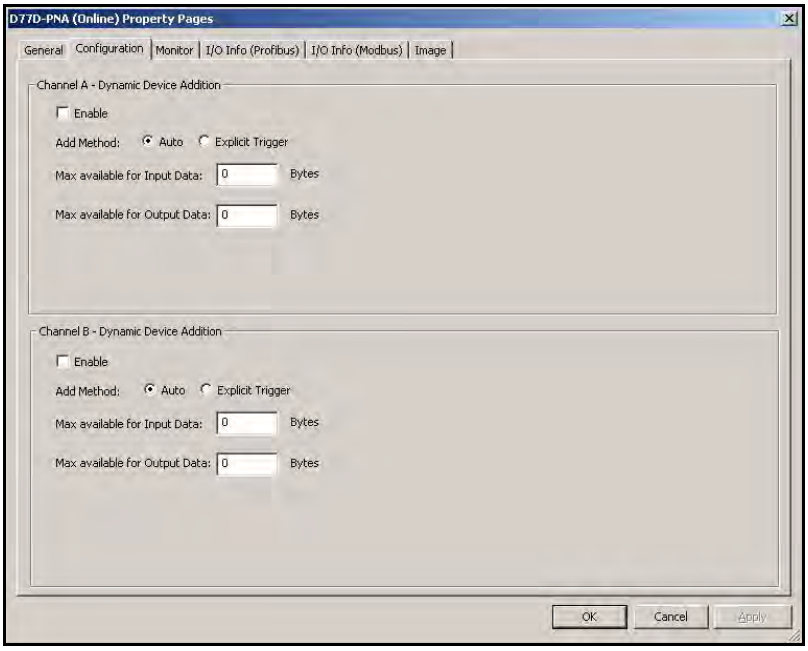

Figure 26: Configuration Tab

Monitor Tab

Once the D77D-PNA is configured, viewing the Monitor Tab will provide information as to the state of the D77D-PNA.

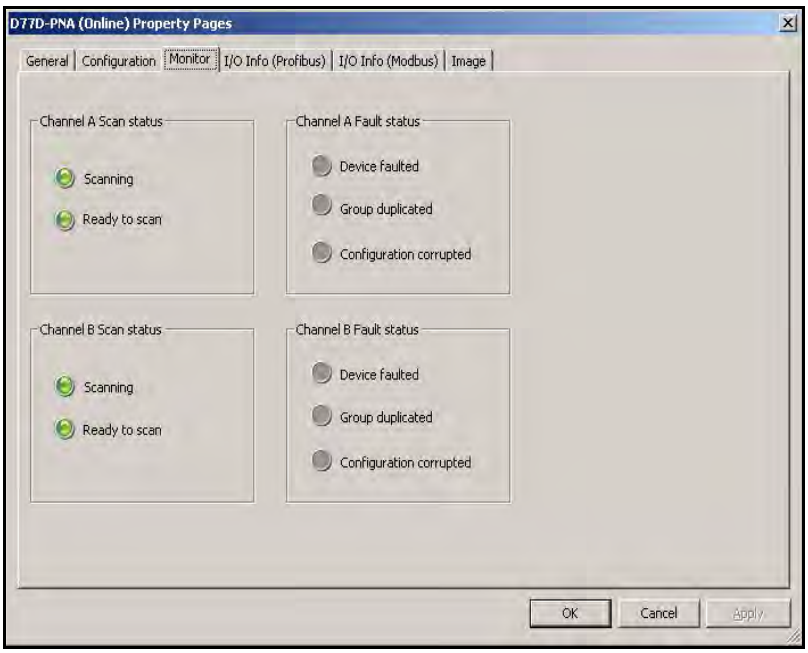

Figure 27: Monitor Tab

I/O Info Tab

The I/O Info Tab provides all the information as to the I/O telegram mapping of the connected QCPort devices. Not only will it give the order of the mapped I/ Data, but also the register telegram information for the QCPort inputs, outputs and the status registers for diagnostics. To simplify the I/O data mapping, mappings to both the PROFIBUS and Modbus connections are provided under separate tabs.

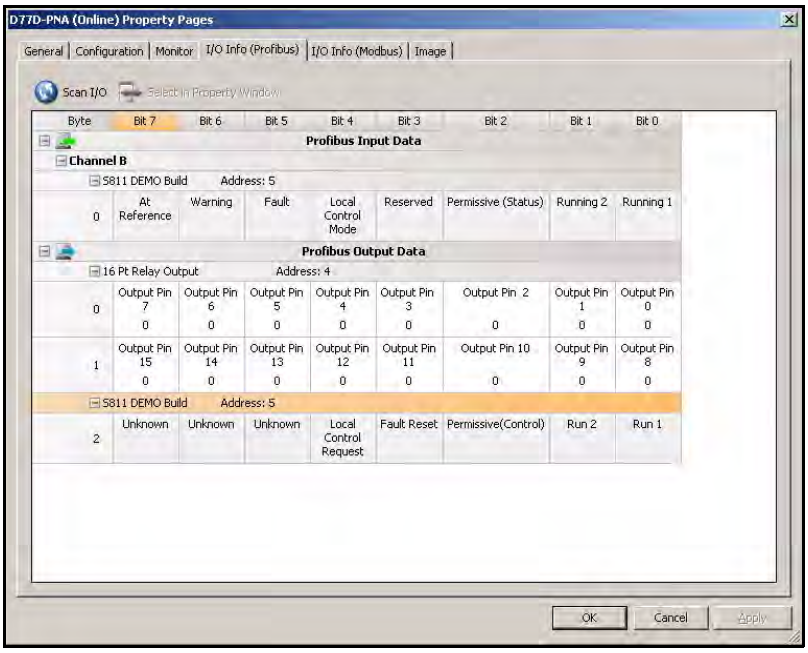

Figure 28: I/O Info Tab

Using a Profibus Configuration Tool

To properly configure QCPort devices, CH Studio is required. For configuration of the D77D-PNA via a Profibus PLC or software tool, a GSD file is provided. See **Appendix C: Register Mapping**.

Dynamic Device Addition (DDA)

You can automatically add devices to QCPort without affecting the I/O telegram. A feature called Dynamic Device Addition (DDA) allows you to preconfigure the size of the QCPort scan list for CHA and CHB to allow for future additions. For example, the system may be commissioned with 25 devices connected to QCPort but, in the future, there will be more devices added. Using DDA, you can set up the max I/O size that is expected to be used in the future so that when the devices are added, the D77D-PNA will not require a soft or hard configuration and the PLC scanner will not have to be reconfigured for the change in I/O telegram size.

Using CH Studio, select the Configuration tab from the D77D-PNA property page to enable DDA and to set the expected maximum I/O size. This is also where you choose the Add method.

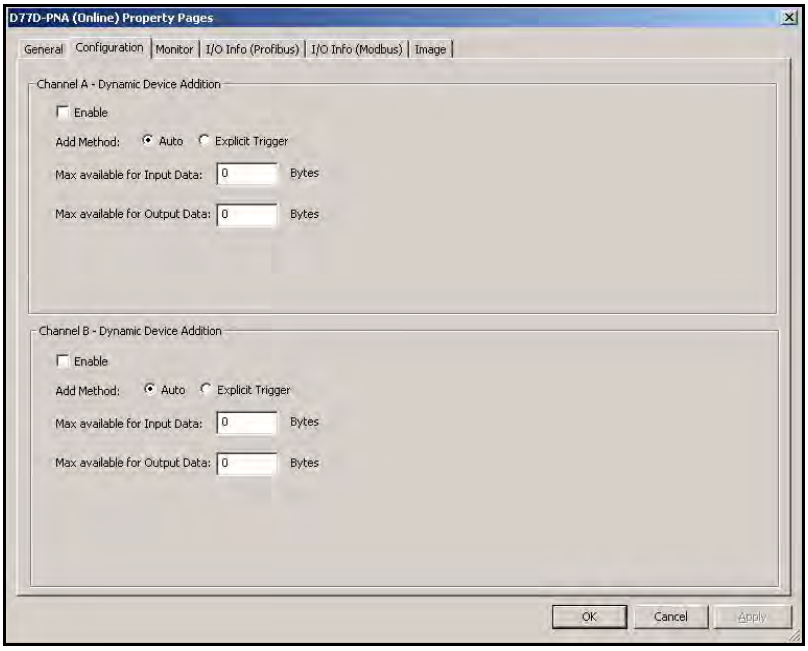

Figure 29: Configuration Tab

Disabling Dynamic Device Addition

Disable Dynamic Device Addition by setting the DDA Enable to FALSE. Fieldbus scanning must be inactive to disable Dynamic Device Addition. When disabled, the Data Max values return to zero and any buckets that were added stay as part of the assemblies. The assemblies are reduced to the size of the original devices plus the added devices.

Reconfiguring Dynamic Device Addition

To unlock controlling attributes, you must first disable Dynamic Device Addition. Follow the configuring Dynamic Device Addition sequence, defined above, again. You can reconfigure Dynamic DEvice Addition at any time that scanning is not active.

Scanning

The Profibus Adapter is a scanner for the QCPort devices. The scan places QCPort input data in Profibus telegrams and sets the QCPort outputs from Profibus telegrams. The CPU prevents data tearing by letting QCPort or Profibus (QCPort and Modbus) gain access to the shared memory at a given time.

The QCPort scan is master/slave poll request/response. Since the slave devices only talk when talked to, collisions are eliminated, providing for a deterministic scan time. Both channels are independent and the Modbus Adapter scans each channel simultaneously, asynchronously and in a deterministic fashion.

Once a Profibus connection is established, the D77D-PNA will start to scan the QCPort devices providing control from Profibus. It is not necessary to set any bits to initialize scanning (unless configured as such).

Notice

A minor recoverable fault may occur if QCPort scanning is stopped by the system controller, and then reinitiated in less then 3 seconds from when the scan was stopped. The fault will indicate that not all the QCPort devices are on line. This fault will self-clear as the devices are brought back into the scan list. If the time between stopping scanning and starting scanning is greater than 3 seconds, this fault will not occur.

Adding or Removing Devices from QCPort

If at any time devices are added or removed from QCPort, the I/O registers telegrams will have to be revised using the Soft Configuration procedure or CH Studio. When a Soft Configuration is performed, it erases the old register telegram mappings and creates new ones based on the remapped information from QCPort CHA and CHB.

⚠ WARNING

When adding or removing a device and performing the Soft Configure procedure, the I/O telegram mappings are erased and recompiled. Because of this, data in the controller registers may be different than prior to re-configuration. Care should be taken to verify the register mapping before bringing the controller/D77D-PNA back on-line.

When adding a new device to QCPort, it is desirable for register mapping to change as little as possible (to minimize PLC programming changes). To achieve this, add the new device at a Group ID that is larger than the largest ID currently on CHA (when only CHA is used), when both channels are used, add to CHB. This will add the device to the end of the I/O telegram mapping, minimizing the programming changes within the controller.

When removing a device from QCPort, reprogramming of the I/O data in the controller is necessary. Remove the device and perform a soft configuration; this will remap all register data within the Adapter.

Replacing an Existing Device on QCPort

It is possible to replace a QCPort device with a like device when the system is scanning and active, a feature called "Hot Swap." There are only a few rules to follow, they are:

- The new device has to have the same product code as the replaced device (same type of device). For example, if an MCC bucket (Cover Control) is to be replaced, the new MCC bucket must have the same device type (Cover Control) as the old one. It is not permissible to replace non-like type of products with out performing a soft configuration. For example an S811 soft start cannot replace an S751 soft start with a cover control.
- The new device must have the same I/O configuration as the replaced device. If the I/O configuration was changed from default (look in user manual for that device), then a tool will be required to reconfigure the I/O configuration to match.

⚠ WARNING

Configuration parameters such as communication loss action, debounce times, initial state, thresholds and fault/warnings enable/disable are not required to match. Once the system is running, it is strongly suggested that a tool be used to synchronize the old device settings to the new device. The hot swap feature is designed to bring a system back up and running as quickly as possible with minimal user intervention and may cause limited functionality.

Typical Application

The following figure illustrates a typical Profibus Adapter application for a motor control center (MCC). In this application, the motor control (cover control units) is located on CHA.

This application has many devices (not shown) on Profibus, and the Profibus Adapter is a single node on that network. The Profibus Adapter presents the QCPort devices on CHA and CHB as telegrams on Profibus so the controller can monitor and control the I/O and motor control connected to the Profibus Adapter. In an effort to simplify the graphic, the power supply and terminating resistors for QCPort are not shown in this example.

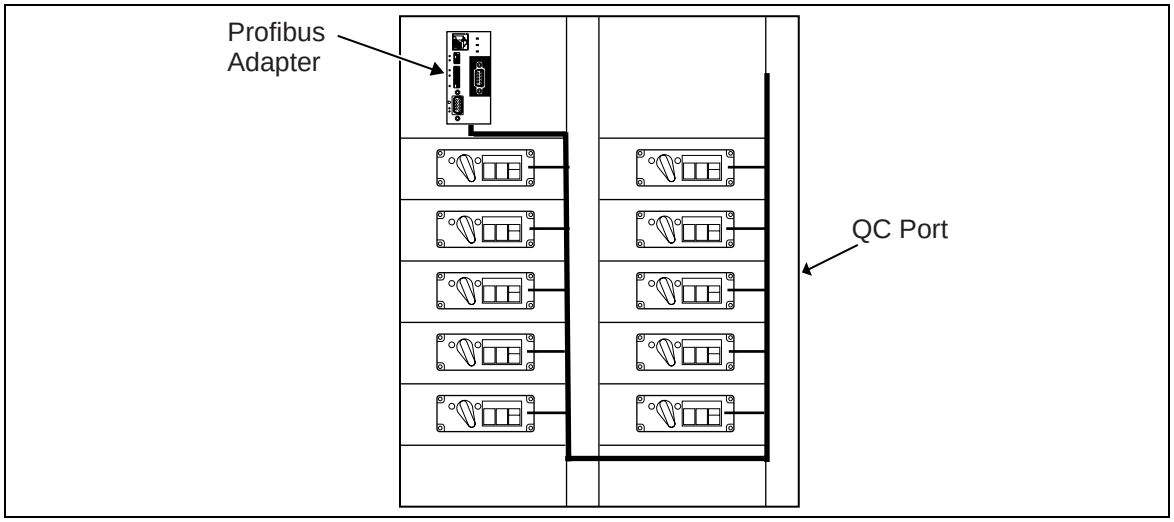

Figure 30: Typical Profibus Adapter (D77D-PNA) Application

Due to the way the Profibus telegrams are created, each device's data (I/O) parameters are located in a unique byte or word. For a device that has multiple parameters, each parameter will be located in a byte or word that is adjacent to the next parameter. An example will be given in a later section.

Optional Channel Scan Control Word (Read/Write)

Scan Control Bytes are optional. The default configuration excludes them. To enable scanning on CHA and CHB when the scan control word is included, the low order bit of the word must be set to one.

Refer to **Table 6** for details on the scan control bytes.The scan control has been combined into a single bit within the word. Also, the ability to include or exclude this word from the data exchange telegram is a selectable feature.

Optional Channel Status Bytes (Read)

Channel Status Bytes are optional. The default configuration excludes them.

For feedback on the status of the QCPort channels, refer to the following tables. The first two bytes of the input data will contain this data.

Table 11: Input Control Bytes

Bit	Name	Description
Byte 0 Channel A		
0	Channel A Active	0 – Selected channel not scanning.
		1 – Selected channel scanning.
1	Channel A Ready to Scan	0 – Selected channel scan list registry requirements have been met.
		1 – Selected channel scan list registry requirements have not been met.
2	Faulted Device Channel A	0 – Selected channel does not have any faulted devices.
		1 – Selected channel has at least one faulted device.
3	Reserved	
4	Duplicate Group ID Channel A	1 – A duplicate Group ID exists on Channel A.
5	QCPort Config Corrupt Channel A	0 – Selected channel has a valid registry.
		1 – Selected channel has a corrupt registry.
6 –7	Reserved	
Byte 1 Channel B		
0	Channel B Active	0 – Selected channel not scanning.
		1 – Selected channel scanning.
1	Channel B Ready to Scan	0 – Selected channel scan list registry requirements have been met.
		1 – Selected channel scan list registry requirements have not been met.
2	Faulted Device Channel B	0 – Selected channel does not have any faulted devices.
		1 – Selected channel has at least one faulted device.
3	Reserved	
4	Duplicate Group ID Channel B	1 – A duplicate Group ID exists on Channel B.
5	QCPort Config Corrupt Channel B	0 – Selected channel has a valid registry.
		1 – Selected channel has a corrupt registry.
6 –7	Reserved	

Notice

Your control program uses this information to detect fault conditions.

Diagnostic Message

The diagnostic response from the D77D-PNA may consist of up to 36 bytes of information. Six of the 244 bytes are mandatory, while the rest are user selectable. For the Profibus gateway, the diagnostic messaging is defined as follows:

Table 12: Profibus Gateway Diagnostic Message Format

Byte	Information	Description
1	Station status 1	Standard diagnosis see EN 50170 Vol. 2
2	Station status 2	
3	Station status 3	
4	Master address	
5	Manufacturer code High Byte	
6	Manufacturer code Low Byte	
7	Device-Specific Length Field	Length of device-specific message
8	Combined QCPort A status	QCPort A and B Channel Status
9	Fault Byte 1	Fault indicators from Register 2305, bits 0-7
10	Fault Byte 2	Fault indicators from Register 2305, bits 8-15
11	Fault Byte 3	Fault indicators from Register 2306, bits 0-7
12	Fault Byte 4	Fault indicators from Register 2306, bits 8-15
13	Fault Byte 5	Fault indicators from Register 2307, bits 0-7
14	Fault Byte 6	Fault indicators from Register 2307, bits 8-15
15	Fault Byte 7	Fault indicators from Register 2308, bits 0-7
16	Fault Byte 8	Fault indicators from Register 2308, bits 8-15
17	Fault Byte 9	Fault indicators from Register 2309, bits 0-7
18	Fault Byte 10	Fault indicators from Register 2309, bits 8-15
19	Fault Byte 11	Fault indicators from Register 2310, bits 0-7
20	Fault Byte 12	Fault indicators from Register 2310, bits 8-15
21	Fault Bit Array a1	Node fault bits for channel QCPort A
22	Fault Bit Array a2	Node fault bits for channel QCPort A
23	Fault Bit Array a3	Node fault bits for channel QCPort A
24	Fault Bit Array a4	Node fault bits for channel QCPort A
25	Fault Bit Array a5	Node fault bits for channel QCPort A
26	Fault Bit Array a6	Node fault bits for channel QCPort A
27	Fault Bit Array a7	Node fault bits for channel QCPort A
28	Fault Bit Array a8	Node fault bits for channel QCPort A
29	Fault Bit Array b1	Node fault bits for channel QCPort B
30	Fault Bit Array b2	Node fault bits for channel QCPort B
31	Fault Bit Array b3	Node fault bits for channel QCPort B
32	Fault Bit Array b4	Node fault bits for channel QCPort B
33	Fault Bit Array b5	Node fault bits for channel QCPort B

Byte	Information	Description
34	Fault Bit Array b6	Node fault bits for channel QCPort B
35	Fault Bit Array b7	Node fault bits for channel QCPort B
36	Fault Bit Array b8	Node fault bits for channel QCPort B

Up to 30 bytes of device-specific information may follow the diagnostic information. The first six bytes of diagnostic data are required, while the remainder of the diagnostic information is optionally selectable via parameterization.

I/O Telegram Mapping

Sample Profibus I/O Register Mapping

When an auto configuration is completed, the device data will be located in concurrent registers within the input and output ranges of the I/O telegrams. The device data will start with the first device (lowest ID) and finish at the last device with all the I/O data one right after another.

Following are some very simple rules that govern how the I/O data registers are constructed:

- All device parameters will be located in a unique word or byte.
- An 8-bit parameter will be in a single byte.
- A 16-bit parameter will be in two concurrent bytes.
- A 32-bit parameter will use four concurrent bytes.

Example: Example 1 illustrates a typical MCC with factory I/O configuration. For this example, the MCC will have two buckets (cover control) of address 1 and 2. Each device has the following I/O parameters.

Cover Control Data

Table 13: Default Cover Control I/O Data

Byte	Data
Cover Control Produced Data	
0	Fault Word Low Byte (word)
1	Fault Word High Byte
2	% FLA Word Low Byte (word)
3	% FLA Word High Byte
4	% Thermal Memory (byte)
5	Motor Status Byte
Cover Control Consumed Data	
0	Motor Control Byte

Profibus Telegrams

Note: Channel status has been configured when commissioning the gateway with a Profibus tool.

Table 14: Input Telegram – Example 1

Byte	Description	Device Address
Input Bytes		
0 (if enabled)	QCPort Channel A Status	N/A
1 (if enabled)	QCPort Channel B Status	N/A
2	Fault Word (high byte)	1
3	Fault Word (low byte)	1
4	% FLA (high byte)	1
5	% FLA (low byte)	1
6	% Thermal Memory	1
7	Pad Byte	N/A
8	Fault Word (high byte)	2
9	Fault Word (low byte)	2
10	% FLA (high byte)	2
11	% FLA (low byte)	2
12	% Thermal Memory	2
13	Motor Status Byte	2
Output Telegram		
0 (if enabled)	QCPort Channel A Control	N/A
1 (if enabled)	QCPort Channel B Control	N/A
2	Motor Control Byte	1
3	Motor Control Byte	2

Example: Example 2 illustrates a typical MCC with user-defined I/O configuration. For this example, the MCC will have two buckets (cover control) of address 1 and 2 and one 8-point input module at address 3. Each device has the following I/O parameters.

Cover Control Data

Table 15: Cover Control I/O Data

Byte	Data
Cover Control Produced Data	
0	Application Status Low Byte (word)
1	Application Status High Byte
2	RMS Scaled Current Low Byte (word)
3	RMS Scaled Current High Byte
4	Breaker Status (byte)
5	% Thermal Memory (byte)
6	Motor Status Byte (byte)

8 point Input Module Produced Data

0	I 7	I 6	I 5	I 4	I 3	I 2	I 1	I 0

Cover Control Consumed Data

0	Motor Control Byte

Profibus Telegrams

Table 16: Input Telegram – Example 2

Telegram	Description	Device Address
Input Telegram		
0 (if enabled)	QCPort Channel A Status	N/A
1 (if enabled)	QCPort Channel B Status	N/A
2	Application Status (high byte)	1
3	Application Status (low byte)	1
3	RMS Scaled Current (high byte)	1
5	RMS Scaled Current (low byte)	1
6	Breaker Status	1
7	% Thermal Memory	1
8	Motor Status Byte	1
9	Pad Bye	N/A or 1
10	Application Status (high byte)	2
11	Application Status (low byte)	2
12	RMS Scaled Current (high byte)	2
13	RMS Scaled Current (low byte)	2
14	Breaker Status	2
15	% Thermal Memory	2
16	Motor Status Byte	2
17	8-Point Input Status	3
Output Telegram		
0 (if enabled)	QCPort Channel A Control	N/A
1 (if enabled)	QCPort Channel B Control	
2	Motor Control Byte	1
3	Motor Control Byte	2

Modbus Pass-Through

Pass-Through Setup

When configuring either Channel A or Channel B as a Pass-Through, it is important to set up the properties of the network so it matches the properties of the slave devices being communicated to. What will need to be configured are minimally the baud rate and the parity. The following chart has all the properties of the Modbus network that can be edited. Since either Channel A or Channel B can be configured as a Modbus, which ever channel is used is required to be configured. Once the configuration is set, the values are set in non-volatile memory and stored through a power cycle.

Table 17: Register Settings for Pass-Through Channel Setup

Description	**Modbus Register**	**Size**	**Usage**	**Read/** Write
QCPort Channel A Modbus Parity	7547	1	Even = 0 Odd = 1 None = 2 (default)	R/W
QCPort Channel A Modbus baud.	7548	1	1200 = 384 2400 = 192 4800 = 96 9600 = 48 19200 = 24 = (default) 38400 = 12 57600 = 8 115200 = 4 230400 = 2 460800 = 1	R/W
QCPort Channel B Modbus Parity	7552	1	Even = 0 Odd = 1 None = 2 (default)	R/W
QCPort Channel B Modbus baud	7553	1	1200 = 384 2400 = 192 4800 = 96 9600 = 48 19200 = 24 = (default) 38400 = 12 57600 = 8 115200 = 4 230400 = 2 460800 = 1	R/W

Pass-Through on Ethernet Using Port 2000 and 2001

It is possible to connect Modbus RTU slaves on QCPort Channel A and Channel B while QCPort devices are connected and scanning. This Pass-Through feature will slow the scan rate for that channel so it is recommended that if this feature is used, that all the Modbus devices be connected to a channel that is not scanning QCPort devices.

The format for Ethernet Port 2000 and 2001 will be the same as the format used for standard Modbus TCP messaging (Modbus frame pre-pended with an MBAP header). The difference between Port 502 Modbus messages and Ethernet Port 2000 and 2001 Modbus messages will be with routing. The port 2000/2001 Modbus messages will be stripped of the TCP frame and sent to the appropriate channel. A Modbus CRC will be automatically added to the end of the message, and the message will be transmitted on the corresponding port. If a response is received on the serial port before the receive message timeout, the response will be formatted as a Modbus TCP message, and sent back to the Modbus master. If no serial receive message is received before the timeout period, an ACK will be sent back to the Master indicating a receipt of message.

Notice

Ethernet Port 2000 and 2001 use the unit ID from the MBAP header when constructing the serial Modbus frame.

Within the control program, connect to Ethernet Port 2000 for Channel A or Ethernet Port 2001 for Channel B. To read/set a register of a specific device, send the message to the Modbus Device ID to read/set and construct the functions and data just as if communicating directly to Modbus slave device. The data in the response field will be constructed just as if the Modbus master was directly communicating to a Modbus slave. The message is constructed low byte high byte, but gets sent on the wire low high byte low byte; refer to the example below.

High	Low	High	Low
Function Code	To Address	Data	Data

High	Low
Last word of Modbus Message	

Figure 31: Modbus Ethernet Pass-Through Transmit Message Format

Example: Transmit Message:

Read Register 40111 (nominal frequency) from an SV drive
SV drive address is 01
Read using function code 03

Message will be constructed:
0x01 for the Modbus node ID
0x03 for the function code
0x006E to read register 111

Notice

Modbus is address-based, not register-based. The address is equal to 1 minus the register; therefore register 111 is address 110, which is why to read register 111 a 0x006E (110 decimal) was written.

The response will be 0x003C (60).

High	Low
Data	Data

High	Low
Last word of Modbus Message	

Figure 32: Modbus Ethernet Pass-Through Receive Message Format

Pass-Through on Serial or Ethernet Using Registers

Modbus Pass-Through messages can be transmitted by writing to the Modbus Pass-Through special function registers. The first register in this series (offset 0) specifies the number of bytes in the Modbus message (CRC should not be included), and the second register in the series is the start of the message. The Modbus CRC must not be included as part of the message, as the Modbus Adapter calculates and appends the CRC to the message before transmission. Due to the fact that the message length register triggers the Modbus Pass-Through message transmission, the Modbus frame registers (register 1..n) should be written first, followed by the message length. All of the registers can be written at the same time if the "write multiple registers" command is used. Once the Modbus Adapter has queued the message for transmission, the message length will be set back to zero. Because of this feature, the message length should always be read before any data is written to the Modbus Pass-Through special function register area. If the message length is a non-zero number, this will indicate that a Modbus Pass-Through transmission is still occupying the register space and has not yet been queued for transmission.

Table 18: Pass-Through Register Information

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
Modbus Wormhole Tx Channel A	12395	251	Modbus wormhole transmit area A	R/W
Modbus Wormhole Rx Channel A	12646	251	Modbus wormhole receive area A	R/W
Modbus Wormhole Tx Channel B	12897	251	Modbus wormhole transmit area B	R/W
Modbus Wormhole Rx Channel B	13148	251	Modbus wormhole receive area B	R/W

High	Low	High	Low	High	Low
Not Used	Modbus Message Byte Count	Function Code	To Address	Data	Data

High	Low
Last word of Modbus Message	

Figure 33: Modbus Pass-Through Transmit Message Format

If the Modbus wormhole transmission invokes a response on the destination port, the received response will be placed in the Modbus Wormhole receive register area. The format of the receive registers is identical to the format of the transmit registers, except that the Message length register will be replaced by a sequence number register indicating the sequence # of the received message.

Example: Transmit Message:

Read Register 40111 (nominal frequency) from an SV drive
SV drive address is 01
Read using function code 03

Notice

Modbus is address-based, not register-based. The address is equal to 1 minus the register; therefore register 111 is address 110, which is why to read register 111 a 0x006E (110 decimal) was written.

12897 = 0000
12898 = 0301
12899 = 6E00
12900 = 0100

After the data portion is written, then write the message length (12897 = 0006) (6 bytes of data).

The slave will then see this message: 0103 006E 0001.

If the Modbus transmission invokes a response on the destination port, the received response will be placed in the Modbus receive registers.

High	Low	High	Low	High	Low		High	Low
Not Used	Message Sequence Number	Message Length (bytes)		Function Code	To Address	Data	Last word of Modbus Message	

Figure 34: Modbus Pass-Through Receive Message Format

Example: Receive Message:

13148 = 00XX (sequence number)
13149 = 0007 (7 bytes of data)
13150 = 0301 (function code 03, address 01)
13151 = 0002 (high byte of data 00, 2 bytes of data)
13152 = B93C (high byte CR B9, low byte of data 3C [60])
13153 = 0055 (n/a, low byte of CRC 55)

Connect Modbus Slaves to Channel A or B

When one or both of the QCPort channels are reconfigured for Modbus, it will be required to wire the Modbus communication wires to the proper pins. If Channel B is used for the Modbus Pass-Through, the desired port if also using QCPort, then it is recommended to use a D77E-QPLR as the interface between the Modbus network and the D77D-PNA.

Connect a standard QCPort interconnect between the Channel B of the D77D-PNA and the D77E-QPLR, and apply power to the + and - from a 24Vdc power supply. It is required to power Channel B externally since the channel is electrically isolated from the D77D-PNA and requires power to operate RS485 circuitry. The terminal block on the D77E-QPLR will have connection points for connecting the Serial Modbus RS485 connections; the connections are A, B and –.

Status LEDs

The status LEDs are located along the left of the Modbus Adapter, as pictured in **Figure 1**. The LEDs status changes depending on the state of the Modbus Adapter.

The following tables list and describe the various states of the LAN, Profibus Adapter Status LEDs; Profibus Module Status, Profibus Network Status and QCPort Channels.

Table 19: Status LED

Profibus LED

SF	BF	Meaning
OFF	ON Blinking	Daughter card initializing, connection to Profibus master failed, not yet configured
ON	OFF	Incorrect parameterization, daughter to mother board communication failure
OFF	OFF	Data exchange mode

LAN LED

LED State	Meaning
Amber	Flashes to signal network transmission or reception

Modbus Adapter Status LED

Flashing	The adapter is healthy
On Solid	CPU Fault
Off	No Power or CPU Fault
Rapid Flash	Identify when CH Studio is connected

Module Status LED (MS)

Off	There is no power to the device
Green	Device is operating normally
Flashing Green	Adapter needs commissioning (minor or soft fault)
Flashing Red	A recoverable fault has been detected; See **Appendix D: Modbus Adapter Fault List**
	A QCPort device is missing from the scan list
Red	A non-recoverable fault has been detected, the device may need to be replaced
Flashing Green-Red	The device is performing a self test

TCP Network Status LED (NS)

Off	IF the MS LED is on or flashing, then the D77D-PNA does not have a valid IP address
Flashing Green	No Connection established
Green	A Connection has been established
Red	Device cannot communicate on the network (may have a duplicate IP address)
Red-Green blink	Self Test
Flashing Red	Network connection error or timeout

SMB (Serial Modbus RS485)

Amber	Flashes to signal network transmission or reception

CHA/CHB Status LED

Off	No Power on QCPort or no communication taking place on that channel
Solid Amber	A Connection has been established to all devices

TCP Network Status LED (NS)

Flashing	One or more of the devices have a fault and the D77D-PNA can't scan QCPort
	The D77D-PNA is in idle mode (not scanning)
	The D77D-PNA is looking for a faulted device
	The D77D-PNA is attempting a Hot Swap
	Indicates QCPort traffic

Notice

The CHA and CHB status LED is an indication as to the traffic on each of the channels. When a message is sent or received, the LED will be lit. A solid LED, or one that is mostly solid, indicates healthy QCPort activity.

Installation

This section provides details about the following features and aspects of D77D-PNA Installation:

- Installation on a DIN Rail
- Replace Existing Module
- Connect to Devices
  - Connections/Interconnects

Installation on a DIN Rail

Use one of the following two procedures to install the Adapter on a DIN rail:

- Install on a DIN Rail (no backplane)
- Install on DIN a Rail with backplane

Install on a DIN Rail (No Backplane)

Prepare Module for Installation

The DIN rail locking tab is on the right middle of the Profibus Adapter. When installing the Profibus Adapter on a DIN rail, verify that the slide of the DIN Rail Lock is extended to the unlocked position.

Insert a screwdriver under the DIN rail locking tab and lift up to unlock the locking tab.

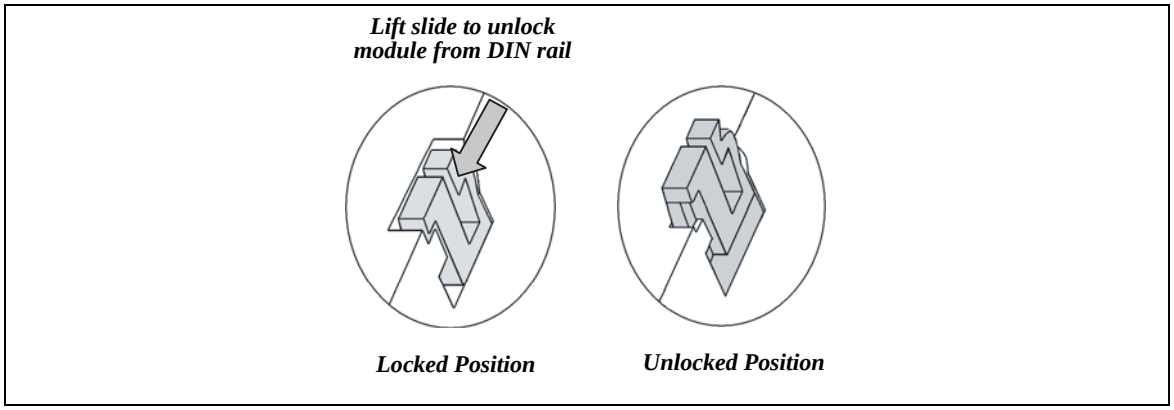

Figure 35: Unlock DIN Rail Locking Tab

Install Module

The module is now ready for installation on the DIN rail.

⚠ WARNING

Do not "rock" the Profibus Adapter module onto the DIN rail. The rocking action could damage the module.

1. The module must always be inserted perpendicular to the DIN rail. **Push the module straight back** onto the DIN rail.
2. Depress the locking tab to secure the module to the DIN rail.

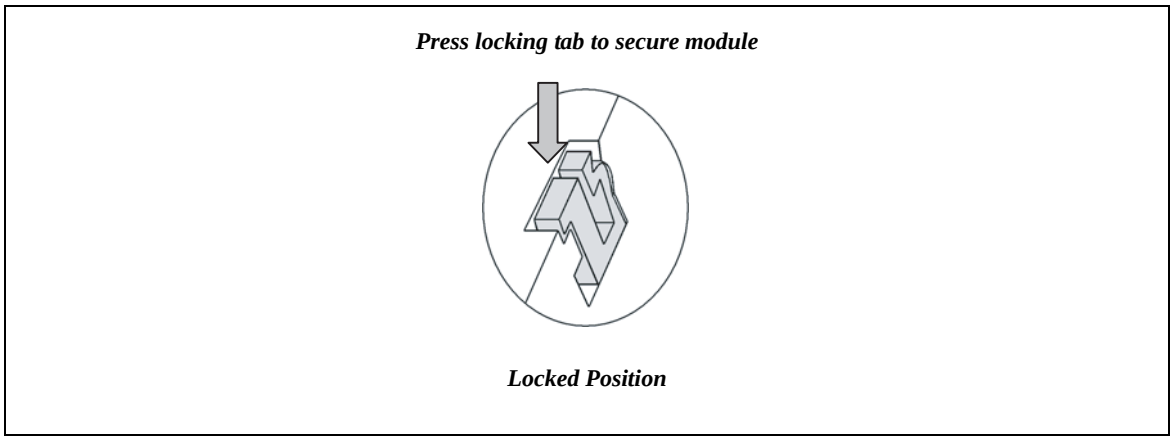

Figure 36: Lock DIN Rail Locking Tab

Notice

After the Profibus Adapter is installed, interconnects will need to be installed; see the *QCPort System Install and User Manual* (Publication MN05001002E) for more information.

Install on DIN Rail with Backplane

Prepare Module for Installation

The DIN rail locking tab is on the right middle of the Profibus Adapter. When installing the Profibus Adapter on a DIN rail, verify that the slide of the DIN Rail Lock is extended to the unlocked position.

Insert a screwdriver under the DIN rail locking tab and lift up to unlock the locking tab.

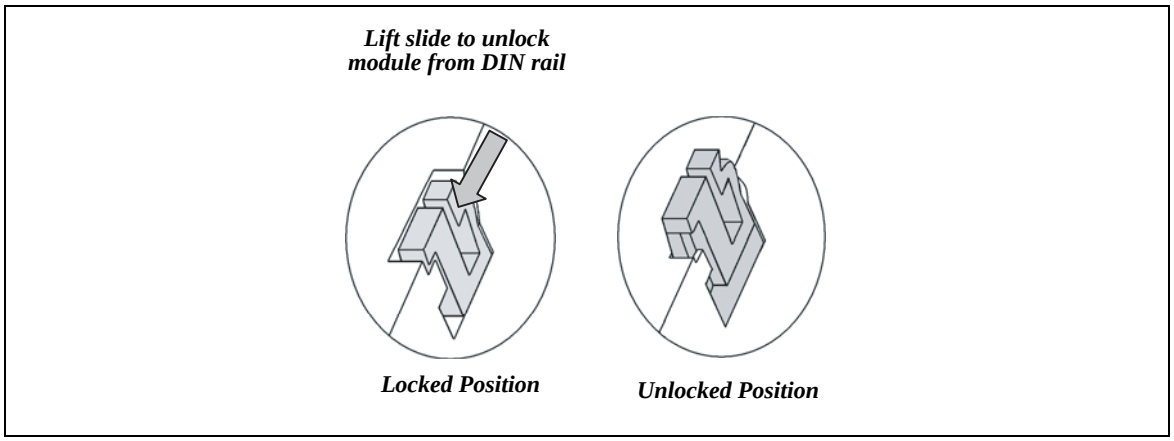

Figure 37: Unlock DIN Rail Locking Tab

Install Module

The module is now ready for installation on the DIN rail.

WARNING

Do not "rock" the Profibus Adapter module onto the DIN rail. The rocking action could damage the module.

1. Line the center of the module up with the backplane connector on the DIN rail. Ensure the backplane connector is installed with the arrows up. The module must always be inserted perpendicular to the DIN rail.

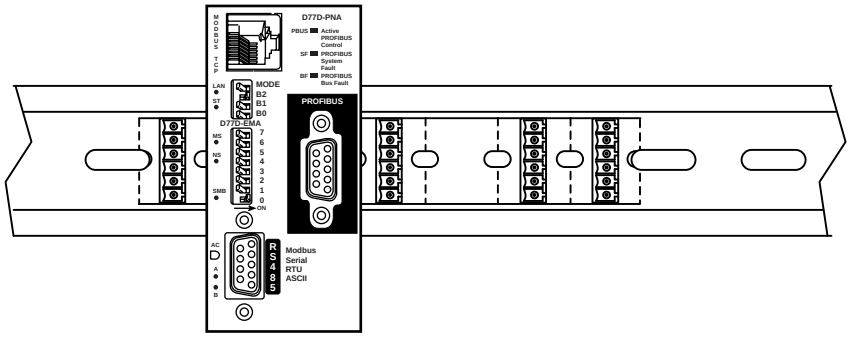

Figure 38: Adapter Installation on a Backplane

2. Push the module straight back onto the DIN rail and backplane connector.
3. Depress the locking tab to secure the module to the DIN rail.

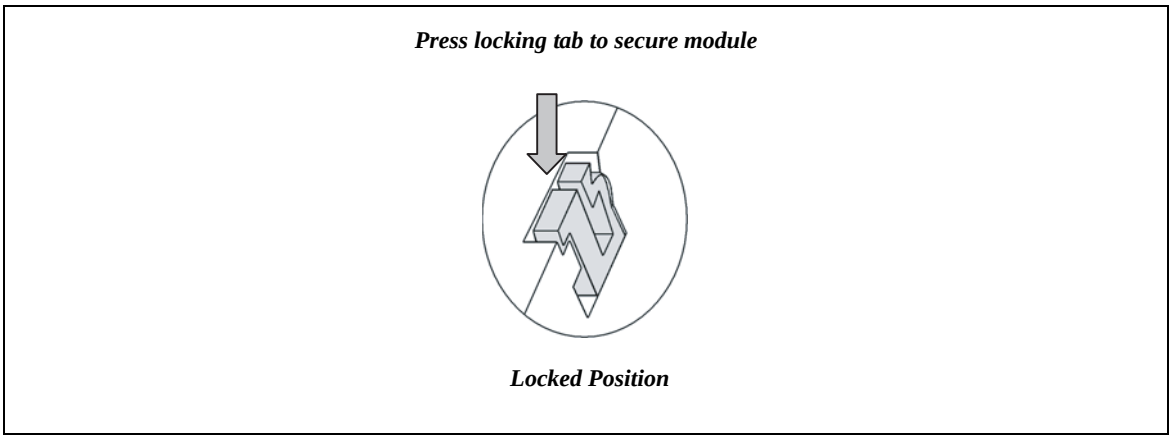

Figure 39: Lock DIN Rail Locking Tab

Replace Existing Module

To replace an existing Profibus Adapter, first remove the old one.

1. Remove all connectors (Profibus and QCPort) from the Adapter.
2. Insert a screwdriver under the DIN rail locking tab and lift up to unlock the locking tab.

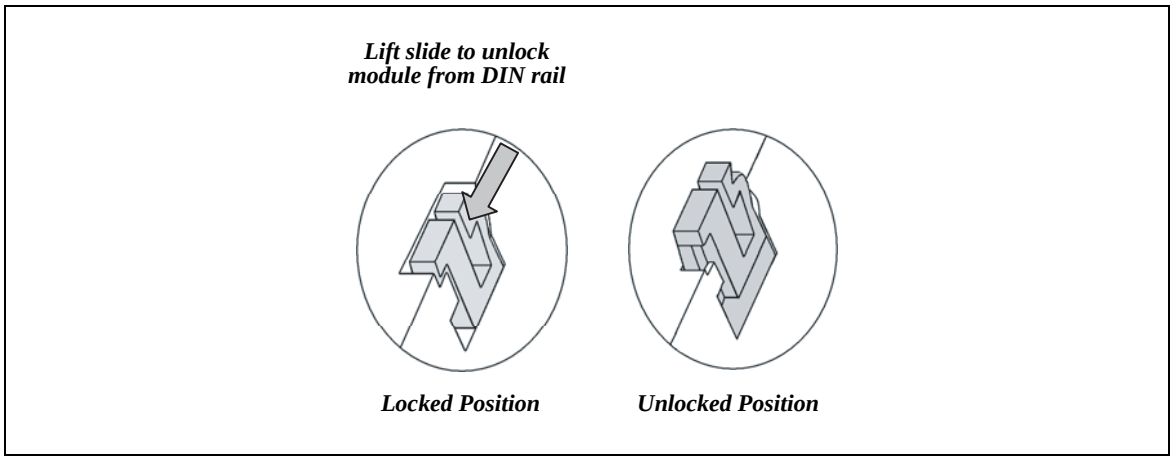

Figure 40: Unlock DIN Rail Locking Tab

3. Remove the old module by pulling straight off the DIN rail.
4. Align the new module where the old one was removed. The module must always be inserted perpendicular to the DIN rail. **Push the module straight back** onto the DIN rail.
5. Depress the locking tab to secure the module to the DIN rail.

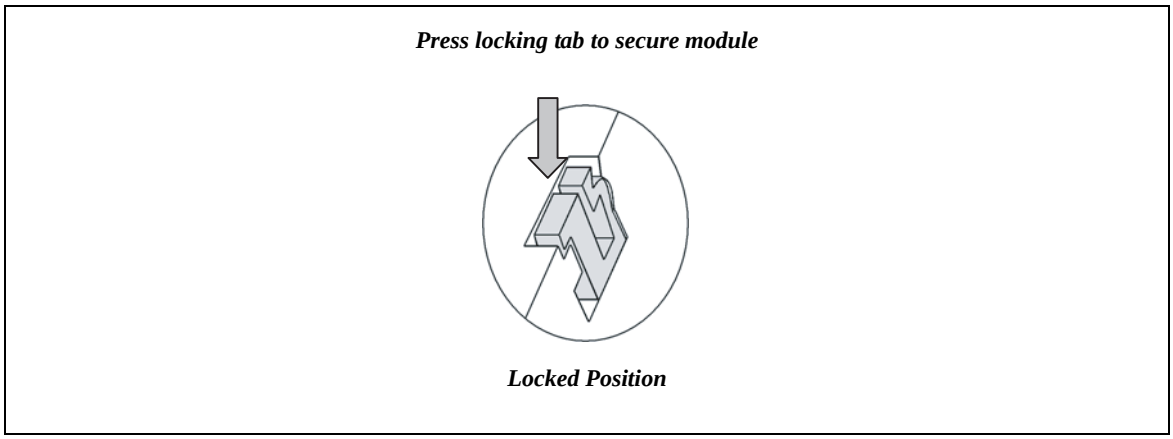

Figure 41: Lock DIN Rail Locking Tab

6. Reconnect the Profibus and QCPort connectors.
7. Reconfigure the device according to the I/O Configure procedure in ***Operation*** or with a configuration tool.

Connect to Devices

Connections/Interconnects

Connecting the Profibus Adapter and other ***IT.*** family products involves using one or more of the QCPort interconnects. The Profibus Adapter employs two types of connectors — one is the backplane interconnect and the other is the short run interconnect. These interconnects provide the QCPort products with both power and communications.

The backplane interconnect fits within the DIN rail and has plugs on it that connect one module to another module seated on the DIN rail. The backplane interconnect supports the power and communication for QCPort and is a passive device. The short run interconnect uses the RJ style connectors that are ordered in standard lengths.

For more information on making interconnects and applying interconnects, refer to the *QCPort System Install and User Manual* (Publication MN05001002E).

Connections to the QCPort Channels

The Profibus Adapter has two independent QCPort channels: CHA and CHB. CHA has connections on the backplane (plug) and the RJ12 port closest to the back of the Profibus Adapter. CHB has two RJ12 connections, the two closest to the front of the Profibus Adapter.

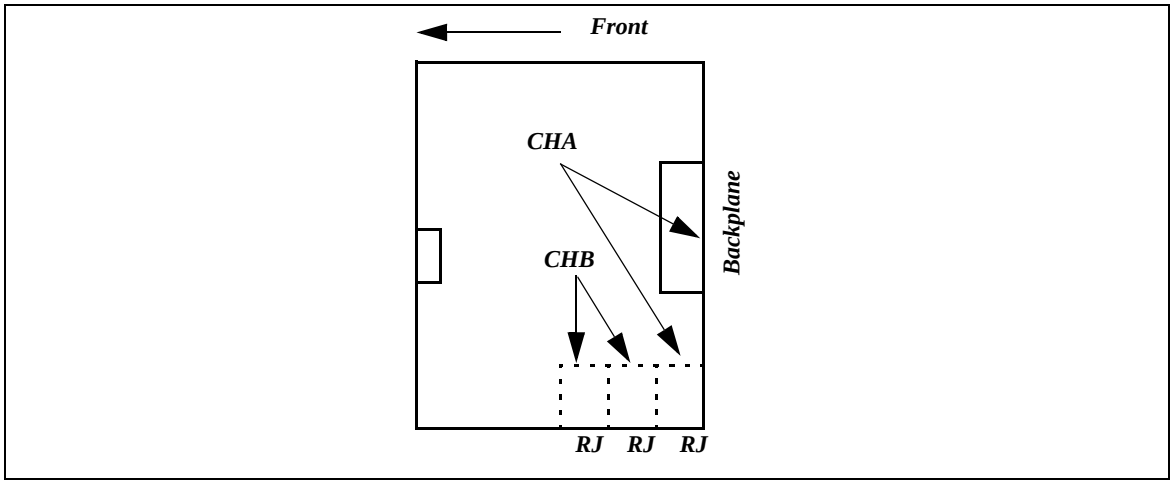

Figure 42: QCPort Channels

Backplane Interconnect

The backplane interconnect is used when connecting Adapter and I/O products on a DIN rail. The interconnect fits inside the channel of the DIN rail and provides for connection of power and communication to Adapter and I/O products.

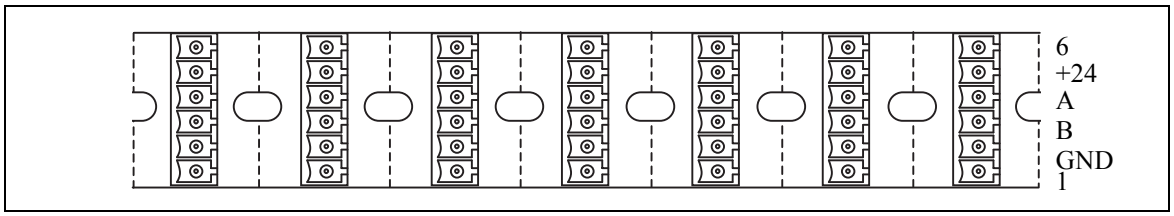

Figure 43: Backplane Interconnect

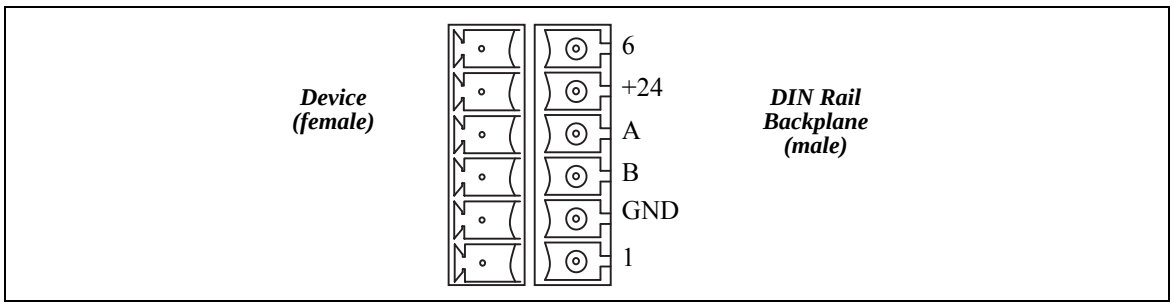

Figure 44: Device/Backplane Interconnect

Short Run Interconnect

To connect the Profibus Adapter to devices without using a backplane, use the RJ style connectors that are located at the bottom of the D85 I/O module. There are two connections located next to each other that are in parallel with each other; this allows daisy chaining using Pre-Manufactured cables. There are standard sizes for the Pre-Manufactured cables. These sizes are listed in the **Renewal Parts** portion of *Troubleshooting and Maintenance*.

When making this interconnect, refer to the *QCPort System Install and User Manual* (Publication MN05001002E) for the recommended cable and connections.

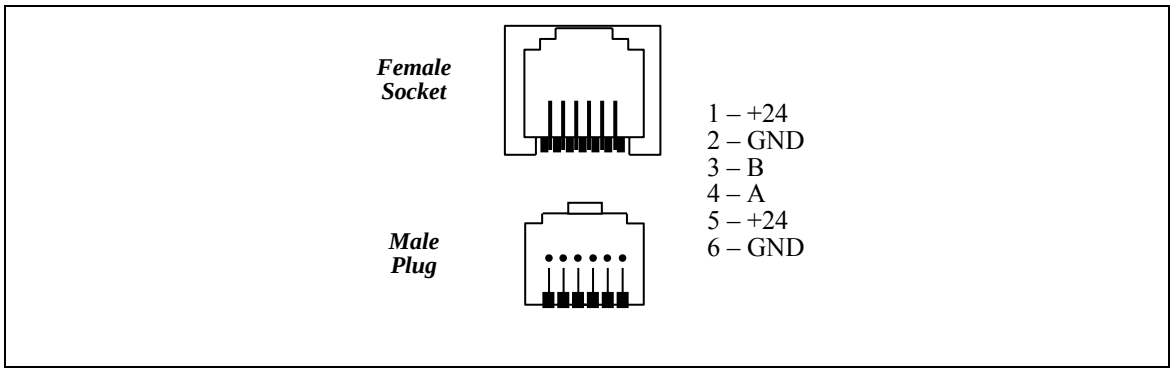

Figure 45: RJ Connector

Troubleshooting and Maintenance

Renewal Parts

There are no renewal parts on the Profibus Adapter (D77D-PNA); the only related parts are the following accessories.

Table 20: Accessories

Part Number	Description
D77E-BP7	Expansion Backplane for 7 slots
D77E-BP12	Expansion Backplane for 12 slots
D77E-BP25	Expansion Backplane for 25 slots
D77E-QPLR	Terminator and Power Tap for QCPort
D77E-TERRJ	Terminator for QCPort RJ Style
D77E-QPIP25 25 CM	QCPort Interconnect Cable
D77E-QPIP100 1 M	QCPort Interconnect Cable
D77E-QPIP200 2 M	QCPort Interconnect Cable
D77E-QPIP300 3 M	QCPort Interconnect Cable
D77E-PS1	85 – 260 VAC input 24 VDC@1A output Power Supply
97-190x-42	Cover Control Products for Motor Control Center Product Line

Troubleshooting

Use the following chart for assistance in troubleshooting the Profibus Adapter; the chart contains the most common faults and corrective actions.

Table 21: Troubleshooting Chart

Observation	Possible Cause/Action
None of the LEDs are illuminated	Verify that power (24 VDC) is applied to the Profibus terminal and that power is on the QCPort channels.
I/O Configuration will not complete	Verify that all devices on the QCPort ports are set to unique addresses.
	Verify that you are holding the Configure button for the required 5 seconds.
	Power cycle the Profibus Adapter and QCPort devices.
The data in the Profibus input assembly is all zeros	Verify that the Scan Active bit in the Profibus register 2049, 2050 or 1025 is set to one.
Can't auto configure QCPort or can't see any devices on QCPort	Verify that QCPort has a biasing resistor installed such as the D77E-QPLR or the D77E-TERRJ.
Unit ID	1 (always 1 but can be changed).
IP Lost	Use CH Studio to rediscover the device.
	Power Up Reset.
Not scanning	Is scan enabled in register 1025?
Controller can't see after setting IP address	Check subnet mask.
Can't communicate over Serial Profibus RS485	Verify valid range, 1 – 246.

Appendix A: Supported Modbus Function Codes

Table 22: Modbus Function Codes

Access	Type	Description	Code
Data Access			
Bit	Physical Discrete Inputs	Read Discrete Input	0x02 (2)
	Internal Bits or Physical Coils	Read Coils	0x01 (1)
		Write Single Coil	0x05 (5)
		Write Multiple Coils	0x0F (15)
16 bits	Physical Input Registers	Read Input Register	0x04 (04)
	Internal Registers or Physical Output Registers	Read Holding Registers	0x03 (3)
		Write Single Register	0x06 (6)
		Write Multiple Registers	0x10 (16)
		Read/Write Multiple Registers	0x17 (23)
		Mask Write Register	0x16 (22)
Diagnostics			
		Read Exception status	0x07 (7)
		Diagnostics	0x08 (8)
User Defined			
		QCPort Pass-Trough	0x41 (65)
		Reset Services	0x42 (66)

Notice

The entire register space for the D77D-PNA is a shared register space, therefore each register supports each function code.

Table 23: Read Exception Status 0x07 (7)

Bit	Description
0	1 = Adapter Faulted 0 = Adapter OK
1 – 7	Reserved

Table 24: Modbus Addressing

Output Coils

Description	Decimal Addressing
Type	Boolean
Format	0xxxx
Security	Read/Write
Range	1 – 65536

Input Coils

Description	Decimal Addressing
Type	Boolean
Format	1xxxx
Security	Read
Range	1 – 65536

Holding Registers

Description	Decimal Addressing
Type	Word, Short, BCD
Format	4xxxx
Security	Read/Write
Range	1 – 65536
Type	Boolean
Format	4xxxx bb
Security	Read/Write
Range	xxxx 0 – xxxx 15
Type	Float, DWord, Long, LBCD
Format	4xxxx
Security	Read/Write
Range	1 – 65535

Notice

Unless noted, every Modbus Register documented in this manual is a holding register.

Floating Point Mapping

Floating point data formats are 32-bit quantities; consequently, floating point numbers are stored in two consecutive registers.

Table 25: IEEE-754 Floating Point Format

Bit 31	Bits 30..23	Bits 22……0
Sign	Exponent	Fractional Portion

The IEEE-754 Floating Point Single Precision Standard is used to format QCPort 24-bit floating point numbers for use on the Modbus network. Due to the Big Indian requirements of Modbus, multi-register floating point data will be formatted as shown in **Table 26**.

Table 26: Modbus Floating Point Format

Bits 15…..8	Bits 7…..0	Bits 31…..24	Bits 23…..16
1st Byte	0th byte	3rd byte	2nd byte

Connection Timeout

A Connection Timeout register guards against loss of communication to the Modbus Adapter. Every time a valid message is sent to the consumption data area (registers 1025 - 2048), the timer is reset and starts timing again. When the timer expires, the scan for Channel A and Channel B will be disabled allowing the QCPort devices to enter their communication loss action. This is a safety feature that can be disabled (default) or set to 200ms increments.

Notice

The Modbus Adapter will round up to the nearest 200ms if a value is chosen that is not a multiple of 200.

Once this timer expires, the scan registers 2049 and 2050 or 1025 will need to be set to re-enable scanning.

Table 27: Connection Timeout

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
Connection Timeout	7526	1	Milli-second connection timeout. 0 = disabled, increments of 200ms (automatically rounds up to the nearest 200ms)	R/W

Modbus Register Mapping

Table 28: Modbus Register Mapping

Register Name	Starting Register (Dec)	Length (Dec)	Bytes (Dec)
Production Data (Read Only)	0x0001 (1)	0x0400 (1024)	0x0800 (2048)
Consumption Data (Read/Write)	0x0401 (1025)	0x0400 (1024)	0x0800 (2048)
Control (Read/Write)	0x0801 (2049)	0x0100 (256)	0x0200 (512)
Status (Read Only)	0x0901 (2305)	0x0350 (848)	0x06A0 (1696)
Registry (Read/Write)	0x0C51 (3153)	0x1000 (4096)	0x2000 (8192)
Scan List (Read)	0x1C51 (7249)	0x0100 (256)	0x0200 (512)
Configuration (Read)	0x1D51 (7505)	0x0100 (256)	0x0200 (512)
Data Copy Area (Read/Write)	0x1E51 (7761)	0x1000 (4096)	0x2000 (8192)
Special Function Registers	0x2E51 (11857)	0x1000 (4096)	0x2000 (8192)

Pass-Through 0x41 (65)

Table 29: Pass-Through 0x41 (65)

Request PDU

Function code	1 byte	0x41
QCPort Channel	1 byte	0 = channel A; 1 = channel B
QCPort request message	n bytes	

Response PDU

Function code	1 byte	0x41
QCPort response message	n bytes	

Error

Function code	1 byte	0xC1
Exception code	1 byte	0x03: Illegal data value 0x0B: Modbus Adapter target device failed to respond 0x0A: Modbus Adapter path unavailable — if an illegal channel is specified

Reset Services 0x42 (66)

Table 30: Reset Services 0x42 (66)

Request PDU

Function code	1 byte	0x42
QCPort Channel	1 byte	0 = Channel A; 1 = Channel B
Modbus Adapter/Node ID	2 bytes	0xffff = Modbus Adapter, any other = QCPort device ID
Reset type	1 byte	0 = Reset Processor 1 = Hard Reconfiguration 2 = Soft Reconfiguration 3 = Regather 4 = Set to Factory Defaults

Response PDU

Function code	1 byte	0x42
Asynchronous channel	0 or 1 bytes	If the reset occurs asynchronously (reset type 1,2,3,4), these are copies of Channel and Reset type from the Request PDU; otherwise, these are omitted.
Asynchronous reset type	0 or 1 bytes	
Asynchronous completion status	0 or 1 bytes	If reset type is 1,2,3,4: 0 = In progress 1 = Complete Otherwise, omitted.

Error

Function code	1 byte	0xC2
Exception code	1 byte	0x03: Illegal data value

Appendix B: Modbus Exception Responses

When a client device sends a request to a server device it expects a normal response. One of four possible events can occur from the master's query:

- If the server device receives the request without a communication error, and can handle the query normally, it returns a normal response.
- If the server does not receive the request due to a communication error, no response is returned. The client program will eventually process a timeout condition for the request.
- If the server receives the request, but detects a communication error (parity, LRC, CRC...), no response is returned. The client program will eventually process a timeout condition for the request.
- If the server receives the request without a communication error, but cannot handle it (for example, if the request is to read a non-existent output or register), the server will return an exception response informing the client of the nature of the error.

The exception response message has two fields that differentiate it from a normal response:

Function Code Field: In a normal response, the server echoes the function code of the original request in the function code field of the response. All function codes have a most-significant bit (MSB) of 0 (their values are all below 80 hexadecimal). In an exception response, the server sets the MSB of the function code to 1. This makes the function code value in an exception response exactly 80 hexadecimal higher than the value would be for a normal response.

With the function code's MSB set, the client's application program can recognize the exception response and can examine the data field for the exception code.

Data Field: In a normal response, the server may return data or statistics in the data field (any information that was requested in the request). In an exception response, the server returns an exception code in the data field. This defines the server condition that caused the exception.

Example: Example of a client request and server exception response

Request		**Response**	
Field Name	**(Hex)**	**Field Name**	**(Hex)**
Function	01	Function	81
Starting Address Hi	04	Exception Code	02
Starting Address Lo	A1		
Quantity of Outputs Hi	00		
Quantity of Outputs Lo	01		

In this example, the client addresses a request to server device. The function code (01) is for a Read Output Status operation. It requests the status of the output at address 1245 (04A1 hex). Note that only that one output is to be read, as specified by the number of outputs field (0001).

If the output address is non-existent in the server device, the server will return the exception response with the exception code shown (02). This specifies an illegal data address for the slave.

Table 31: Modbus Exception Codes

Code	Name	Meaning
01	Illegal function	The function code received in the query is not an allowable action for the server (or slave). This may be because the function code is only applicable to newer devices, and was not implemented in the unit selected. It could also indicate that the server (or slave) is in the wrong state to process a request of this type, for example because it is unconfigured and is being asked to return register values.
02	Illegal data address	The data address received in the query is not an allowable address for the server (or slave). More specifically, the combination of reference number and transfer length is invalid. For a controller with 100 registers, a request with offset 96 and length 4 would succeed, a request with offset 96 and length 5 will generate exception 02.
03	Illegal data value	A value contained in the query data field is not an allowable value for server (or slave). This indicates a fault in the structure of the remainder of a complex request, such as that the implied length is incorrect. It specifically does NOT mean that a data item submitted for storage in a register has a value outside the expectation of the application program, since the Profibus protocol is unaware of the significance of any particular value of any particular register.
04	Slave device failure	An unrecoverable error occurred while the server (or slave) was attempting to perform the requested action.
05	Acknowledge	Specialized use in conjunction with programming commands. The server (or slave) has accepted the request and is processing it, but a long duration of time will be required to do so. This response is returned to prevent a timeout error from occurring in the client (or master). The client (or master) can next issue a Poll Program Complete message to determine if processing is completed.
06	Slave device busy	Specialized use in conjunction with programming commands. The server (or slave) is engaged in processing a long-duration program command. The client (or master) should retransmit the message later when the server (or slave) is free.
08	Memory parity error	Specialized use in conjunction with function codes 20 and 21 and reference type 6, to indicate that the extended file area failed to pass a consistency check. The server (or slave) attempted to read record file, but detected a parity error in the memory. The client (or master) can retry the request, but service may be required on the server (or slave) device.
0a	Profibus adapter path unavailable	Specialized use in conjunction with Profibus adapter, indicates that the Profibus adapter was unable to allocate an internal communication path from the input port to the output port for processing the request. Usually means that the Profibus adapter is misconfigured or overloaded.
0b	Profibus adapter target device failed to respond	Specialized use in conjunction with Profibus adapter, indicates that no response was obtained from the target device. Usually means that the device is not present on the network.

Appendix C: Register Mapping

Modbus Register Extensions

Table 32: Modbus Register Extensions

Description	Profibus Register	Size (Reg)	Usage	Read/ Write
Daughter Card Type	2723	1	1 = Profibus	R
Daughter Card Serial Number	2724	2	Serial Number read from daughter card.	R
Daughter Card Firmware Revision	2726	2	The version of firmware resident in the daughter card.	R
Daughter Card Baud	2728	2	Interpretation depends on card type.; See daughter card documentation for interpretation.	R
Daughter Card Node ID	2730	1	Node ID of daughter card on its respective network. Derived from mother board DIP switches and set by mother board.	R
Daughter Card State	2731	2	Configuring/Ready/Faulted (0,1,2).	R
Daughter Card Faults	2733	2	No faults 0x0000.	R
			Hardware failure 0x0001.	R
			Parameterization failure 0x0002.	R
			Configuration failure 0x0004.	R
			Fieldbus communications failure 0x0010.	R

Production, Consumption, Control, and Status (Holding Register Areas)

Table 33: Production, Consumption, Control, and Status (Holding Register Areas)

Production (holding register area)

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
QCPort Channel Status	0001	1	Status of QCPort Channel A and B	R
Production Data First Device	0002	1023	Production Data area	R
Production Last Register	1024	1	Production Data Last Register	R

Consumption (holding register area)

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
QCPort Channel Control	1025	1	Control of QCPort Channel A and B	R
Consumption Data First Device	1026	1023	Consumption Data area	R
Consumption Last Register	2048	1	Consumption Data Last Register	R

Control (holding register area)

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
QCPort Channel A Command	2049	1	0 disable/1 enable scan	R/W
QCPort Channel B Command	2050	1	0 disable/1 enable scan	R/W

Status (holding register area)

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
Faults	2305	6	Modbus Adapter Faults 6 registers – raw hex representing faults. See **Appendix D Modbus Adapter Fault List.**	R

Channel A Status (Holding Register Area)

Table 34: Channel A Status (Holding Register Area)

Description	Modbus Register	Size (Reg)	Usage		Read/ Write
Channel A Status	2311	1	0	1 = Channel A Active	R
			1	1 = Channel A Not Ready to Scan	
			2	1 = Faulted Device Channel A	
			3	Reserved	
			4	1 = Duplicate Group ID Channel A	
			5	1 = QCPort Config Corrupt Channel A	
			6 – 15	Reserved	
Channel A Total Transactions	2312	1	Number of good messages on channel.		R
Channel A Wormhole Transactions	2313	1	Number of Wormhole messages passed including transmit and receive on Channel A.		R
Channel A Collisions	2314	1	Number of detected collisions since last power cycle.		R
Channel A CRC Error Count	2315	1	Number of message frame CRC errors detected since power cycle.		R
Expected Devices Channel A	2316	1	The number of devices detected during the last configuration cycle.		R
Actual Devices Channel A	2317	1	The number of devices that are actually communicating.		R
Expected Scan Devices Channel A	2318	1	The number of devices added to the scan list during configuration.		R
Actual Scan Devices Channel A	2319	1	The actual number of devices communicating in the scan.		R
Fault Bit Array Channel A	2320	4	64 bits – 1 bit per device for error indication.		R
Channel A Gateway State	2324	1	Configuring/Ready/Faulted (0,1,2).		R
Production Data Size Channel A	2325	1	The number of bytes of data in the consumption scan.		R
Consumption Data Size Channel A	2326	1	The number of bytes of data in the production scan.		R
Channel A Attached Device Listing	2343	190	Total registers in listing (2343).		R
			Starting at 2344 format is as follows per QCPort device: Device ID Starting Production Register Starting Consumption Resister		
Channel A Interscan Delay	7545	1	Adds a dead time in the QCPort scan of the register value times 5ms. 0-65536 x 5ms.		R/W

Channel B Status (Holding Register Area)

Table 35: Channel B Status (Holding Register Area)

Description	Modbus Register	Size (Reg)	Usage		Read/ Write
Channel B Status	2327	1	0	1 = Channel B Active	R
			1	1 = Channel B Not Ready to Scan	
			2	1 = Faulted Device Channel B	
			3	Reserved	
			4	1 = Duplicate Group ID Channel B	
			5	1 = QCPort Config Corrupt Channel B	
			6 – 15	Reserved	
Channel B Total Transactions	2328	1	Number of good messages on channel.		R
Channel B Wormhole Transactions	2329	1	Number of Wormhole messages passed including transmit and receive on Channel A.		R
Channel B Collisions	2330	1	Number of detected collisions since last power cycle.		R
Channel B CRC Error Count	2331	1	Number of message frame CRC errors detected since power cycle.		R
Expected Devices Channel B	2332	1	The number of devices detected during the last configuration cycle.		R
Actual Devices Channel B	2333	1	The number of devices that are actually communicating.		R
Expected Scan Devices Channel B	2334	1	The number of devices added to the scan list during configuration.		R
Actual Scan Devices Channel B	2335	1	The actual number of devices communicating in the scan.		R
Fault Bit Array Channel B	2336	4	64 bits – 1 bit per device for error indication.		R
Channel B Gateway State	2340	1	Configuring/Ready/Faulted (0,1,2).		R
Production Data Size Channel B	2341	1	The number of bytes of data in the consumption scan.		R
Consumption Data Size B	2342	1	The number of bytes of data in the production scan.		R
Channel B Attached Device Listing	2533	190	Total registers in listing (2343).		R
			Starting at 2344 format is as follows per QCPort device: Device ID Starting Production Register Starting Consumption Resister		
Channel B Interscan Delay	7550	1	Adds a dead time in the QCPort scan of the register value times 5ms. 0-65536 x 5ms.		R/W

Modbus Adapter Configuration (Holding Register Area)

Table 36: Modbus Adapter Configuration (Holding Register Area)

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
Modbus Adapter Serial Number	7505	2	This device's serial number	R
Modbus Adapter Hardware Revision	7507	1	This device's hardware revision number	R
Modbus Adapter Firmware Revision	7508	1	Major firmware revision	R
Modbus Adapter Firmware Build	7509	1	Minor firmware build	R
Catalog Number	7510	16	ASCII text product description	R
Connection Timeout	7626	1	Millisecond connection timeout. 0 = disabled (default), increments of 200ms in FRS (automatically rounds up to the nearest 200ms)	R/W

TCP/IP Configuration (Holding Register Area)

Table 37: TCP/IP Configuration (Holding Register Area)

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
MAC ID	7527	3	48 bit Hardware address R	R
Address	7530	2	The current active IP address HH.HL.LH.LL Word 7530 – HH HL Word 7531 – LH LL	R/W
Address Mode	7532	1	0 – 192.168.10.1 1 – Static (will save current IP address) 2 – BootP (default)	R/W
Subnet Mask	7533	2	The current active subnet mask HH.HL.LH.LL Word 7533 – HH HL Word 7534 – LH LL	R/W
Default Gateway	7535	2	The currently set default gateway HH.HL.LH.LL Word 7535 – HH HL Word 7536 – LH LL	R/W
Connection Limit	7537	1	Number of Profibus socket connections allowed	R/W
Modbus TCP Slave Address	7538	1	The MBAP header unit ID which this Profibus Adapter will respond to (default 1)	

Serial Modbus RS485 Configuration (Holding Register Area)

Table 38: Serial Modbus RS485 Configuration (Holding Register Area)

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
Serial Modbus RS485 Baud Rate	7539	1	The currently selected Serial Profibus RS485 baud. Uses Profibus Adapter baud rate enumerations.	R
Serial Modbus RS485 Node ID	7540	1	The currently active Serial Profibus RS485 node ID.	R
Serial Modbus RS485 Protocol	7541	1	0 = RTU (Default) 1 = ASCII	R
Parity	7542	1	0 = even (default) 1 = odd 2 = none	R/W

QCPort A Configuration (Holding Register Area)

Table 39: QCPort A Configuration (Holding Register Area)

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
Modbus Adapter QCPort Device IDA	7544	1	Default 0xffff	R
QCPort Channel A Baud	7546	1	9600 = 48 19200 = 24 38400 = 12 57600 = 8 115200 = 4 230400 = 2 460800 = 1 (default)	R/W
QCPort Channel A Modbus Parity	7547	1	0 = even (default) 1 = odd 2 = none	R/W
QCPort Channel A Modbus baud	7548	1	1200 = 384 2400 = 192 4800 = 96 9600 = 48 19200 = 24 (default) 38400 = 12 57600 = 8 115200 = 4 230400 = 2 460800 = 1	R/W

QCPort B Configuration (Holding Register Area)

Table 40: QCPort B Configuration (Holding Register Area)

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
Modbus Adapter QCPort Device IDB	7549	1	Default 0xffff	R
QCPort Channel B Baud	7551	1	9600 = 48 19200 = 24 38400 = 12 57600 = 8 115200 = 4 230400 = 2 460800 = 1 (default)	R/W
QCPort Channel B Modbus Parity	7552	1	0 = even (default) 1 = odd 2 = none	R/W
QCPort Channel B Modbus baud	7553	1	1200 = 384 2400 = 192 4800 = 96 9600 = 48 19200 = 24 (default) 38400 = 12 57600 = 8 115200 = 4 230400 = 2 460800 = 1	R/W

Serial Slow Response Setup (Holding Register Area)

Table 41: Serial Slow Response Setup (Holding Register Area)

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
Modbus Allow Channel A Slow Response	7554	1	0 – Disable 1 – Enable When performing serial Pass-Through, some Serial Profibus devices respond slower than 100ms. Because of this, if this register is set to true, the response time will be lengthened to 750 ms prior to timing out the message.	R/W
Modbus allow Channel B Slow Response	7555	1	0 – Disable 1 – Enable When performing serial Pass-Through, some Serial Profibus devices respond slower than 100ms. Because of this, if this register is set to true, the response time will be lengthened to 750 ms prior to timing out the message.	R/W

Auto Configuration (AC) Push Button Functionality (Holding Register Area)

Table 42: Auto Configuration (AC) Push Button Functionality (Holding Register Area)

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
AC Push Button Enable	7556	1	0 – Disable 1 – Enable (default) The AC push button is used for auto configuration of the QCPort system. To disable the use of the AC push button, disable this register. If the button is disabled, then a power-up reset will reset the IP address and mode to BootP.	R/W

Special Functions (Holding Register Area)

Table 43: Special Functions (Holding Register Area)

Description	Modbus Register	Size (Reg)	Usage	Read/ Write
Power Cycle D77D-PNA	11857	1	0xaa55 to activate, register is cleared when action complete.	R/W
Reset D77D-PNA to Out of Box	11858	1	0xaa55 to activate, register is cleared when action complete.	R/W
Reset Service – hard reconfiguration	11859	1	Channel(s) 0x0001 A, 0x0002 B 0x0003, both cleared when complete	R/W
Reset Service – soft reconfiguration	11860	1	Channel(s) 0x0001 A, 0x0002 B 0x0003, both cleared when complete	R/W
Modbus Wormhole TxA	12395	251	Modbus wormhole transmit area A	R/W
Modbus Wormhole RxA	12646	251	Modbus wormhole receive area A	R/W
Modbus Wormhole TxB	12897	251	Modbus wormhole transmit area B	R/W
Modbus Wormhole RxB	13148	251	Modbus wormhole receive area B	R/W
Get QCPort Device Fault	14485	3	Register 14485 =Channel Register 14486 =QCPort Device ID Register 14487 =Fault	R/W
Power Supply Volatage	14490	1	Power Supply voltage x 10	R
Flash CPU Status LED	14493	1	0 = CPU status LED flash normal 1 = CPU status LED rapid flash	R/W

Dynamic Device Addition Registers

Table 44: Dynamic Device Addition Registers

Control Byte (Same for QCPort Channel A and Channel B)							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
Reserved	Reserved	Reserved	DDA Add Device	Reserved	Reserved	Reserved	Scan Enable Bit
Status Byte (Same for QCPort Channel A and Channel B)							
Bit 7	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
DDA Device Added	DDA New Device	Corrupt Registry	Duplicate Group ID	Faulted CRitical Node Bit	Faulted Node Bit	Not Ready To Scan	Scanning Bit

Profibus Network Adapter Diagnostic Message Format

Table 45: Profibus Network Adapter Diagnostic Message Format

Profibus Network Adapter Diagnostic (SAP 60, 0x3C) Message Format - Response from DP Slave			
Byte	**Bit**	**Information**	**Description**
			Standard diagnosis octets - See EN 50170 Vol. 2
1		Station status 1	
	0 0x01	Station not existent [Not set by a slave]	(Set by a master if no response is received by a slave)
	1 0x02	Station not ready for Data Exchange	Comment: This bit appears to be automatically generated by the SPOC3/VPC3 ASIC when the DP State Machine is not in the "10=DATA_EX" state.
	2 0x04	Configuration sent by master is not supported by the slave	
	3 0x08	Slave has extended diagnostic data (High priority)	
	4 0x10	Slave does not support Parameter Function (e.g. Sync, Freeze or reserved bit is set)	Comment: This bit appears to be automatically generated by the SPC3/VPC3 ASIC when a Set_Param (SAP 61 0x3D) Parameter telegram is received with a Sync, Freeze or some reserved bit is set in the first octet (Station Status). The validity of the Sync and Freeze bits appear to be established via the setup established in the Mode Register 0 specification.
	5 0x20	Invalid slave response [Not set by a slave]	(Set by a master on reception of an invalid response by a slave).
	6 0x40	Slave does not support a parameter assignment sent by the master	Comment: This bit appears to be generated by the SPC3 ASIC due to transactions performed by the host Processor when the Set_Param (SAP 61 0x3D) Parameter telegram is processed. This is a result of the "User_Prm_Data_Not_Okay_Cmd". This response also indicates the SPC3 ASIC either remains in, or transitions to, the "Wait_Prm" DP State-machine state.
	7 0x80	Slave Parameterized (Locked or controlled by another Master) [Not set by a slave]	(Set by a master).

Profibus Network Adapter Diagnostic (SAP 60, 0x3C) Message Format - Response from DP Slave			
Byte	**Bit**	**Information**	**Description**
2 0x01		Station status 2	
	0 0x01	Slave must be parameterized	
	1 0x02	Static Diagnostic - Slave can not process I/O Data	
	2 0x04	Always set to one (1)	
	3 0x08	Response monitoring function 0 = Inactive (not monitoring) 1 = Active (Monitoring)	Comment: This bit is actually set when the DP Watchdog is running. (Not running/not set)
	4 0x10	Slave Freeze Mode 0 = Not in freeze mode 1 = Freeze Mode active	
	5 0x20	Slave Sync Mode 0 = Not in sync mode 1 = Sync mode active	
	6 0x40	Reserved Send as zero (0)	
	7 0x80	Slave is Deactivated. Slave taken out of Poll Cycle	(Set by master).
3 0x02		Station status 3	
	0.6	Reserved	
	7 0x80	Ext Overflow	If this bit is set there exists more diagnostic information than specified in Ext_Diag_Data. For Example, the DP-Slave sets this bit if there are more channel diagnostics than the DP-Slave can enter in its send buffer; or the DP-Master sets this bit if the DP-Slave sends more diagnostic information than the DP-Master can enter in its diagnostic buffer.
4 0x03		Master address	Address of the master device whose parameterization was last accepted by the slave. If no master parameterization has been accepted (or is not now relevant), this value is transmitted as 0xFF.
5 0x04		Manufacturer code High Byte	Profibus Device Code (High Octet - BIG Endian)
6 0x05		Manufacturer code Low Byte	Profibus Device Code (Low Octet - BIG Endian)

Profibus Network Adapter Diagnostic (SAP 60, 0x3C) Message Format - Response from DP Slave			
Byte	**Bit**	**Information**	**Description**
		Beginning at Byte #7 (offset 0x06) is the Extended Diagnostic Data area of the Diagnostic telegram message. The extended diagnostic data area may contain any (or combinations of) the following (qualification codes are contained in bits 6&7): ● Device related diagnostic data -(0b00) ● Identifier/module related diagnostic data - (0b01) ● Channel related diagnostic data - (0b10) ● Revision diagnostic - (0b11)	The extended diagnostic data area is an extension of the standardized diagnostic telegram message. NOTICE: Data received during Profibus training indicates that, even though defined, the Diagnostic extensions for "Identifier/ Module" related data and "Channel" related data probably should not be implemented. This data is based upon the following facts: a. Not every Profibus master device is implemented to recognize these style of extended data. b. Usually, the equivalent data can easily be transmitted using the more traditional "Device" related extended diagnostic data format.
7 [0]		Device-related diagnostic identifier & Data Length Field	Length of device-specific message
	0..5	Length specification	
	6..7	Type of diagnosis data ● 0b00 = Device related diagnostic data ● 0b01 = Identifier/Module related diagnostic data ● 0b10 = Channel related diagnostic data ● 0b11 = Revision diagnostic data	The high order two bits shall be 0b00 to indicate the following data is "Device related diagnostic data".
8 [1]		QCPort A and B status	QCPort A and B Channel Status
	0 0x01	CHA Active	Activity of QC Port 0 = Not scanning 1 = scanning
	1 0x02	CHA Ready to Scan	0 = Channel registry requirements HAVE been established 1 = Channel registry requirements HAVE NOT been established
	2 0x04	CHA Faulted Device	0 = Channel does not have any faulted devices 1 = Channel does have at least one faulted device
	3 0x08	Reserved	
	4 0x10	CHB Active	Activity of QC Port B 0 = Not scanning 1 = scanning
	5 0x20	CHB Ready to Scan	0 = Channel registry requirements HAVE been established 1 = Channel registry requirements HAVE NOT been established
	6 0x40	CHB Faulted Device	0 = Channel does not have any faulted devices 1 = Channel does have at least one faulted device
	7 0x80	Reserved	

Profibus Network Adapter Diagnostic (SAP 60, 0x3C) Message Format - Response from DP Slave			
Byte	**Bit**	**Information**	**Description**
9 [2]		Fault Byte 1	Fault indicators from Register 2305, bits 0-7
10 [3]		Fault Byte 2	Fault indicators from Register 2305, bits 8-15
11 [4]		Fault Byte 3	Fault indicators from Register 2306, bits 0-7
12 [5]		Fault Byte 4	Fault indicators from Register 2306, bits 8-15
13 [6]		Fault Byte 5	Fault indicators from Register 2307, bits 0-7
14 [7]		Fault Byte 6	Fault indicators from Register 2307, bits 8-15
15 [8]		Fault Byte 7	Fault indicators from Register 2308, bits 0-7
16 [9]		Fault Byte 8	Fault indicators from Register 2308, bits 8-15
17 [10]		Fault Byte 9	Fault indicators from Register 2309, bits 0-7
18 [11]		Fault Byte 10	Fault indicators from Register 2309, bits 8-15
19 [12]		Fault Byte 11	Fault indicators from Register 2310, bits 0-7
20 [13]		Fault Byte 12	Fault indicators from Register 2310, bits 8-15
21 [14]		Fault Byte Array a1	Node fault bits for channel QCPort A
22 [15]		Fault Byte Array a2	Node fault bits for channel QCPort A
23 [16]		Fault Byte Array a3	Node fault bits for channel QCPort A
24 [17]		Fault Byte Array a4	Node fault bits for channel QCPort A
25 [18]		Fault Byte Array a5	Node fault bits for channel QCPort A
26 [19]		Fault Byte Array a6	Node fault bits for channel QCPort A
27 [20]		Fault Byte Array a7	Node fault bits for channel QCPort A
28 [21]		Fault Byte Array a8	Node fault bits for channel QCPort A
29 [22]		Fault Byte Array b1	Node fault bits for channel QCPort B
30 [23]		Fault Byte Array b2	Node fault bits for channel QCPort B

Profibus Network Adapter Diagnostic (SAP 60, 0x3C) Message Format - Response from DP Slave			
Byte	**Bit**	**Information**	**Description**
31 [24]		Fault Byte Array b3	Node fault bits for channel QCPort B
32 [25]		Fault Byte Array b4	Node fault bits for channel QCPort B
33 [26]		Fault Byte Array b5	Node fault bits for channel QCPort B
34 [27]		Fault Byte Array b6	Node fault bits for channel QCPort B
35 [28]		Fault Byte Array b7	Node fault bits for channel QCPort B
36 [29]		Fault Byte Array b8	Node fault bits for channel QCPort B

Appendix D: Modbus Adapter Fault List

Hard – Solid Red MS LED (Major Fault)
Medium – Flashing Red MS LED (Recoverable Fault)
Soft – Flashing Green MS LED (Minor Fault)

Register 2305 (Holding Register Area)

Table 46: Register 2305 (Holding Register Area)

Bit	Fault	Fault Name	Type	Fault Description
0				Reserved
1	1	Interdevice comm. failure	Hard	Processor unable to communicate with Ethernet. This could be caused by extreme noise, esd or eft. Try removing potential problems and cycle power to the D77D-PNA. Ultimately this may mean that the circuit board is faulty.
2	2	TCP Poll Timeout	Medium	A TCP connection has timed out. This may mean that no traffic has occurred on the connection for a long time, or that the Ethernet cable has been disconnected. Logical connections that are not properly terminated can result in "half-open connections." Half-open connections actually use up a connection on the D77D-PNA and can result in no resources being left to connect to. Check Ethernet physical connections and attempt to re-connect using a client tool. If no connections can be obtained, cycle power to the D77D-PNA to clear all logical connections.
3	3	Serial Modbus RS485 ID Fault	Medium	Modbus dip switches are set illegally. Either 0 or a number greater than 247 has been selected on the D77D-PNA. Select a valid Profibus ID and cycle power to the D77D-PNA.
4-6				Reserved
7	7	NV Flash Fault	Hard	The non-volatile flash data check failed. Stored data may be corrupted. D77D-PNA should be power-cycled. If the fault still exists the D77D-PNA should be totally re-configured.
8-11				Reserved
12	12	Phantom ISR	Hard	An unexpected interrupt occurred.
13-15				Reserved

Register 2306 (Holding Register Area)

Table 47: Register 2306 (Holding Register Area)

Bit	Fault	Fault Name	Type	Fault Description
0-2				Reserved
3	3 19 0x13	QCPort Channel A Busy	Hard	D77D-PNA can't get QCPort channel A. QCPort channel fault. Line may be oscillating due to lack of termination or from a shorted line.
4	20 0x14	QCPort Channel B Busy	Hard	D77D-PNA can't get QCPort channel B. QCPort channel fault. Line may be oscillating due to lack of termination or from a shorted line.
5-15				Reserved

Register 2307 (Holding Register Area)

Table 48: Register 2307 (Holding Register Area)

Bit	Fault	Fault Name	Type	Fault Description
0-2				Reserved
3	3 32 0x20	Device ID Channel A	Hard	Device ID is wrong. (Group out of range)
4	33 0x21	Invalid Device ID Channel B	Hard	Device ID is wrong. (Group out of range)
5-15				Reserved

Register 2308 (Holding Register Area)

Table 49: Register 2308 (Holding Register Area)

Bit	Fault	Fault Name	Type	Fault Description
0-1				Reserved
2	50 0x32	Too Many Devices connected to Channel A	Medium	Too many devices were attached to the channel.
3	51 0x33	Too Many Devices connected to Channel B	Medium	Too many devices were attached to the channel.
4	52 0x34	Duplicate Device ID Channel A	Hard	Two or more devices have the same ID.
5	53 0x35	Duplicate Device ID Channel B	Hard	Two or more devices have the same ID.
6	54 0x36	Device Failed to Respond Channel A	Medium	Request to device went unanswered. A device is not responding with necessary information.
7	55 0x37	Device Failed to Respond Channel B	Medium	Request to Device went unanswered. A device is not responding with necessary information.
8	56 0x38	Device Config CRC Error Channel A	Medium	Device configuration CRC is bad.
9	57 0x39	Device Config CRC Error Channel B	Medium	Device configuration CRC is bad.
10	58 0x3A	Scan Fail to respond Channel A	Medium	Medium Device failed to send data in its scan slot.
11	59 0x3B	Scan Fail to respond Channel B	Medium	Device failed to send data in its scan slot.
12	60 0x3C	Configuration Channel A Fault	Medium	A non-recoverable error occurred while trying to obtain configuration regarding a device on channel A. Since the configuration is necessary to run, this is an unrecoverable fault. Recommended action: try performing the appropriate reset service in an attempt to obtain the correct configuration information.
13	61 0x3D	Configuration Channel B Fault	Medium	A non-recoverable error occurred while trying to obtain configuration regarding a device on channel B. Since the configuration is necessary to run, this is an unrecoverable fault. Recommended action: try performing the appropriate reset service in an attempt to obtain the correct configuration information.
14-15				Reserved

Register 2309 (Holding Register Area)

Table 50: Register 2309 (Holding Register Area)

Bit	Fault	Fault Name	Type	Fault Description
0	64 0x40	QCPort Device Fault	Medium	A QCPort device has responded with a fault or a fault has been logged specific to a QCPort device.
1	65 0x41	OS Mailbox Fault	Hard	A software problem has occurred — it is no longer safe to continue running. Reset the D77D-PNA, or cycle power.
2	66 0x42	Duplicate Group ID		The physical group ID switch is set the same on two QCPort devices.
3	67 0x43	Invalid Group ID	Hard	A QCPort device is using a reserved group ID.
4	68 0x44	Power Fail	Hard	The main QCPort supply is failing.
5	69 0x45	Gather Configuration A Fault	Hard	We failed to successfully build up configuration for devices on channel A.
6	70 0x46	Gather Configuration B Fault	Hard	We failed to successfully build up configuration for devices on channel B.
7	71 0x47	No QCPort Devices Found	Soft	No QCPort devices were found or are registered.
8	72 0x48	Too much consumption data Fault	Medium	Devices connected to the D77D-PNA consume more data than the D77D-PNA is allowed to consume.
9	73 0x49	Too much production data Fault	Medium	Devices connected to the D77D-PNA produce more data than the D77D-PNA is allowed to produce.
14-15				Reserved

Register 2310 (Holding Register Area)

Table 51: Register 2310 (Holding Register Area)

Bit	Fault	Fault Name	Type	Fault Description
0	80 0x50	Unexpected Fault	Hard	Some unexpected or irregular sequence has occurred.
1-3				Reserved
4	84 0x54	Data Change Fault Ch A	Medium	The production or consumption data on A does not agree with stored data. Something has changed the data size or type in one or more devices, such that the data size or type no longer agrees with the expected data size.
5	85 0x55	Data Change Fault Ch B	Medium	The production or consumption data on A does not agree with stored data. Something has changed the data size or type in one or more devices, such that the data size or type no longer agrees with the expected data size.
6-15				Reserved

Technical Support

- For additional information on this product, please call our Customer Support Center at: 1-800-356-1243
- For service or start-up assistance 24 hours/day, 7 days/week, please call: 1-800-498-2678

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