PanelMate®
DeviceNet Communication
Driver Manual

Eaton Corporation
Cutler-Hammer Business Unit
811 Green Crest Drive
Columbus, OH 43081

EATON | Cutler-Hammer

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This center, located in Zurich, Switzerland, provides high-level quality support and product repair services for your PanelMate products. You will receive real-time technical and application support.

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Introduction

1

In this chapter, you will learn:

- *The network description*
- *About the DeviceNet communications interface*
- *About driver installation*
- *How to download drivers to a PanelMate*

Introduction

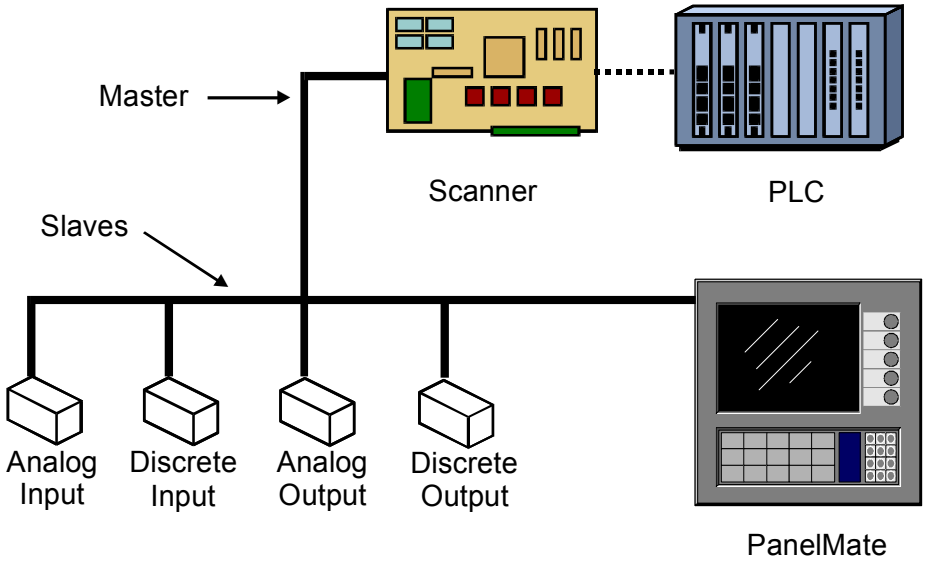
This manual describes the PanelMate Power Series communications driver for DeviceNet. DeviceNet is a low level network protocol that provides connections between simple industrial devices and a higher level device such as a PLC. DeviceNet is based upon the Controller Area Network (CAN) 2.0A specification. CAN is a communications protocol that defines the Media Access Control (MAC) and Physical Signaling layers of the ISO Seven Layer Model.

Note: The DeviceNet communications driver described in this manual is available for all models of the PanelMate Power Series except PanelMate PC. DeviceNet communications for PanelMate PC is available using Cutler-Hammer's NetSolver automation software.

Only the **Master/Slave** implementation of DeviceNet is currently supported.

Network Description

DeviceNet is made up of a scanner, a number of input and output devices, a PLC (or PC) and a Cutler-Hammer Operator Station. The figure below shows a **typical DeviceNet block diagram**. The devices at the bottom of the figure are slaves that respond only when interrogated by the master. The exception to this is the Operator Station that continuously monitors network activity.



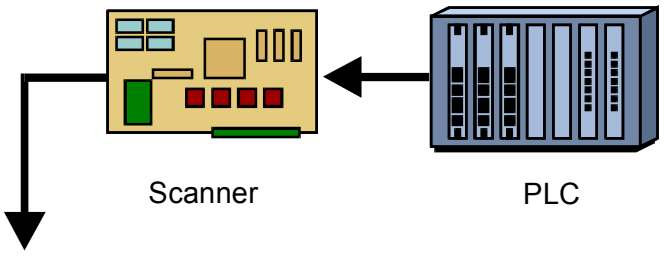
Master

The master controls the operation of one or more slave devices. The master may be a PLC, a PC with control logic, or a scanner/PLC combination. In this discussion, we assume the master to be a scanner/PLC, but the following topics pertain to any type of master.

Scanner

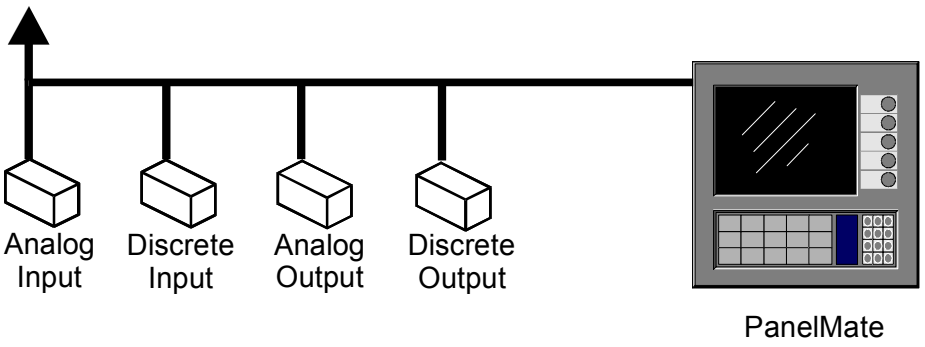
A scanner is an electronic device that provides an interface between the PLC and the DeviceNet network. In this type of network, the scanner/PLC is the master and is responsible for exchanging information with the slave devices.

The master initiates a dialog with a slave device by issuing a pre-defined Request (for data) or



Command (to do something) message. The figure below shows the Master initiating a dialog.

The slave responds by performing some operation and/or sending back data to the scanner. The response is in the form of a pre-defined Response message. The figure below shows a slave responding.



DeviceNet Communications Interface

A PanelMate Power Series unit requires a DeviceNet communications interface to connect to a DeviceNet network. On 120VAC PanelMate units, the interface is a printed circuit board that is installed in the PanelMate unit's electronics module. For 24VDC PanelMate units, a DeviceNet module is attached to the rear of the PanelMate unit.

The PanelMate unit can be configured to provide any combination of inputs and outputs, both analog and discrete. This is done by consuming one slave address on the network. The master is responsible for establishing communications with the PanelMate node as well as controlling its communications.

The PanelMate DeviceNet communications interface does not have the node address switches and baud rate select switches often found on DeviceNet interface units. These functions are performed within the PanelMate Configuration software.

Power Requirements

All power required by the PanelMate DeviceNet communications interface is supplied by the Operator Station. The interface neither draws power from nor supplies power to the network.

Installing Drivers

PanelMate Configuration Editor software is installed using a CD-ROM. To install the drivers from the CD-ROM, select the **Install Software** option and then **Install Drivers**. From the dialog box, select the driver you wish to install.

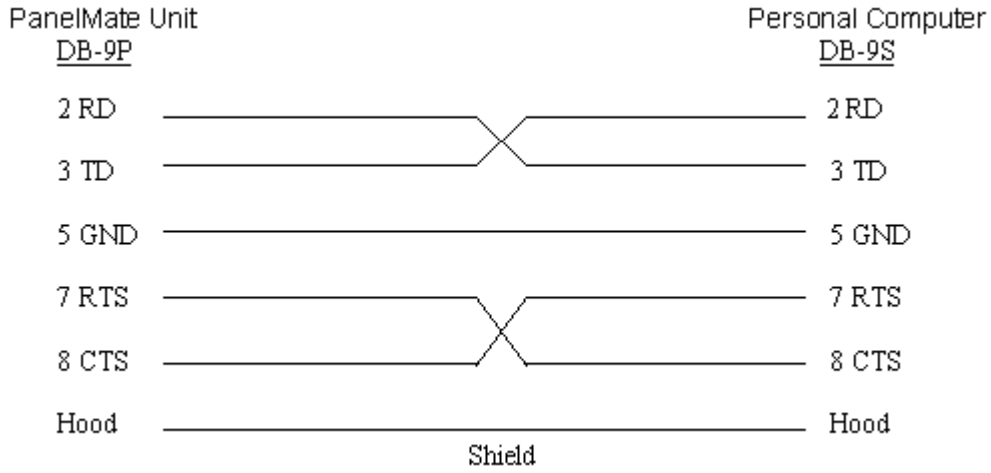
Downloading Drivers to a PanelMate Unit

- In the VCP Transfer Utility, choose the "Executive" tab and select the proper Executive Firmware to download to the PanelMate unit.
- Click the button labeled "Add to Operation List."

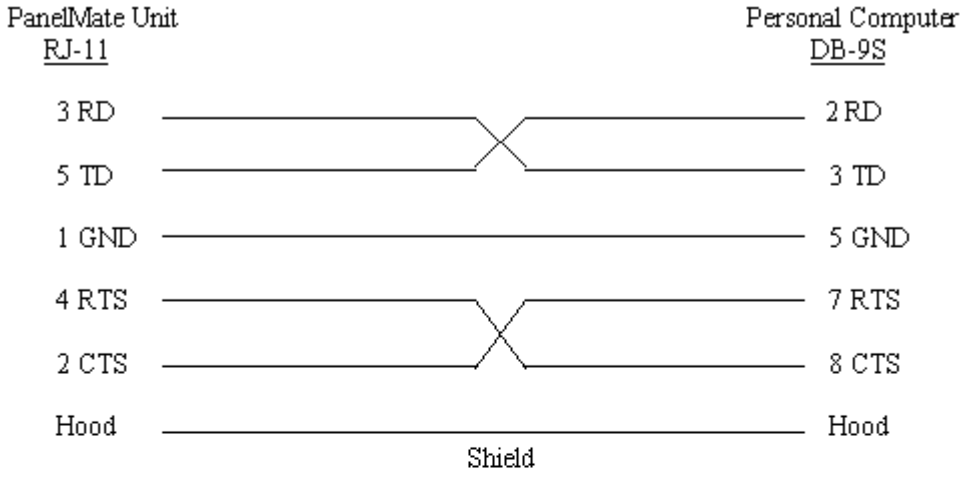
  Note: In order to download to a PanelMate for the first time or to clear the existence of another driver, the PanelMate must first be loaded with Executive Firmware.
- Choose the "Driver" tab.
- Select the appropriate driver to be downloaded to the PanelMate.
- Click the button labeled "Add to Operation List."
- Place the PanelMate unit in Serial Transfer Mode.
- Connect a serial transfer cable from the correct port on the PC to port 1 on the PanelMate. (See cabling below.)
- Click "Start" at the bottom of the VCP Transfer Utility window.
- **Note:** For a more detailed description of downloading procedures and troubleshooting see *PanelMate Power Series, PowerPro, Pro LT Transfer Utility User's Guide.*

Serial Transfer Cables

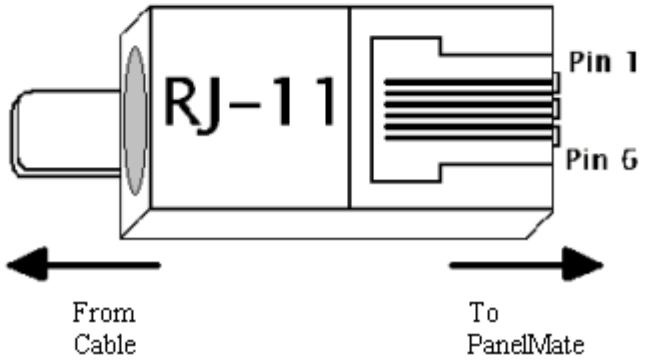
Cable P/N 0518



Cable P/N 0818
(PanelMate Power Series 1500 and PanelMate 500 only)



RJ-11 pin configuration



Network Connection Information

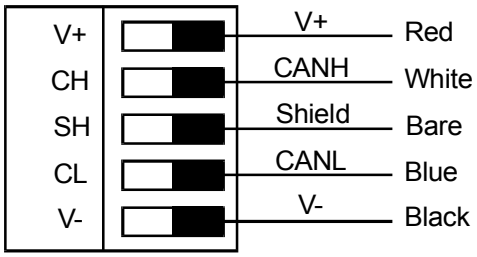
2

In this chapter, you will learn:

- *Cabling*
- *Network termination*

Cable Diagram

A 5-pin Phoenix-type connector is used to connect the PanelMate DeviceNet communications interface to the DeviceNet network.



Note: Since the DeviceNet module neither draws power from nor supplies power to the network, pins 5 and 1 are not internally connected. It is not necessary to make the V+ (pin 5) and V- (pin 1) connections, but you should do so just to secure the wires and prevent shorting.

Network Termination

If the Operator Interface is the last node (at the end of) the network, you must terminate the Operator Interface. Either install a 120 Ohm resistor between pins 4 and 2 of the Phoenix type connector, or install a 120 Ohm network terminator in the unused plug of the Tee connector attached to the PanelMate unit's network drop cable.

Supported Messages

3

In this chapter, you will learn:

- *The messages supported by PanelMate*

PanelMate Connection with Master

The following tables summarize the messages supported by the PanelMate unit and how the messages are used. The messages are described in Chapter 4.

Description	Msg Group	Msg Type	Transmit Receive Monitor	Use
Group 2 Only Unconnected Explicit Request	2	6	Receive	Establish connection with Master
Explicit Request	2	4	Receive	Access to DeviceNet Objects
Explicit Response	2	3	Transmit	Access to DeviceNet Objects
Duplicate MAC ID Check	2	7	Transmit/ Receive	MAC ID verification
Poll Command	2	5	Receive	Update display and trigger response
Poll Response	1	15	Transmit	Operator input
Bit Strobe Command (Broadcast)	1	0	Receive	Trigger response
Bit Strobe Response	1	14	Transmit	Operator Input

Master Connection to other Slaves

Description	Msg Group	Msg Type	Monitor Only	Use
Poll Command	2	5	Monitor	Update Display
Poll Response	1	15	Monitor	Update Display
Bit Strobe Command	2	0	Monitor	Update Display
Bit Strobe Response	1	14	Monitor	Update Display

Message Descriptions

4

In this chapter, you will learn:

- *The different types of messages*

Duplicate MACID Check Request

These messages are used to ensure that no two nodes in the same subnet have the same node address. After a node configures itself to default values at powerup, the node sends a Duplicate MACID Check.

Each node on the network responds with its own Duplicate MACID Check message. The new node waits for one second for a response from a node having the same MACID.

- If a response is received, the node immediately enters a Communication Fault state.
- If no response is received, the new node sends the message again and waits for another second.

If no response is received from the second message, the node now enters the online state, and continues to respond to all Duplicate MACID Check Request messages.

Communication Fault State

A node enters the Communication Fault State (Duplicate MACID) when it receives a Duplicate MACID Check message having a MACID the same as its own. To exit the Communication Fault State, the operator follows the standard reset procedure. See your Online Operation User's Guide for information about the reset procedure.

Explicit Messages

This message set is used mainly for:

- Establishing network connections
- Setting and accessing node configuration information

To establish a connection with a slave device, the Master sends a Group 2 Only Unconnected Explicit Request message having the service "Allocate Master/Slave Connection".

To establish a slave's configuration information, the Master sends an Explicit Request Message to access an attribute of an object contained in the node.

Poll I/O Messages

The Poll I/O Command is used to send any amount of data to a destination slave. The Poll I/O Response is used to return any amount of input data and/or status information. The command and/or response message can be fragmented.

The PanelMate unit can consume the Poll Command destined for its node address and produce the appropriate Poll Response to the Master.

Also, to monitor the data exchange between the master and the other Slave nodes on the network (for display purposes), the PanelMate unit can consume the Polled Commands and Responses between the Master and the other Slave nodes.

Multicast Bit Strobed I/O Messages

Bit Strobed Command and Bit Strobed Response messages are used to rapidly move small amounts of I/O data between the Master and its Bit Strobed Slaves.

Note: A BSC is a single broadcast message sent to all slaves.

Each of the 64 bits in the Bit Strobed Command Message corresponds to a node address. A Bit Strobed device will react to the command in one of two ways:

- A single bit output device can set its output according to the corresponding bit and responds with a status.
- An input device can use the command as a trigger and send a response message.

Note: The Bit Strobed Response Message is limited to a maximum of eight bits of input data.

The PanelMate unit supports the Bit Strobed Message as an input device. When the Bit Strobe command is detected, the PanelMate unit responds by sending a Bit Strobe Response message containing input data.

The PanelMate unit can also monitor Bit Strobe Commands and Responses for the other Slave nodes if it is configured to do so.

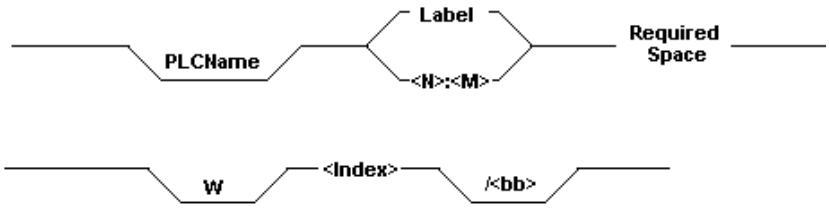
DeviceNet Reference String Format

5

In this chapter, you will learn:

- *The format for a DeviceNet reference string*

Reference String Format



The <Label> is defined in the DeviceNet Node/Message Type Table that is in the Configuration Editor Manual.

The <Label> syntax is the preferred method of data access because the message accessed by the PanelMate unit must be defined in the Label table. The alternative N : M (Node : Message Type) syntax is provided for convenience and for use with Maintenance Templates.

Byte Format

```
[PLCName,<Label> XXX/bb] or [PLCName,N:M XXX/bb]
```

Example: `[PLC1,PM 0/0] or [PLC1,10:PR 0]`

Item	Description
PLCName	An optional field that specifies the remote PLC name found in the PLC Name Table. If this field is left blank, the default PLC name is used.
,	PLC Delimiter. Omit if PLCName is not used.
<Label>	The name given to the label in the DeviceNet Node/Message Type Table.
	Required Space Delimiter
XXX	Byte Index (Numeric, base 0). The byte in which the data is contained.
N	DeviceNet Node Number (MACID)
:	Node Number Delimiter
M	Message Type in which the data is contained.
/bb	Optional bit reference. See the topic Bit Format.

Word Format

[PLCName,<Label> WXXX/bb] or [PLCName,N:M WXXX/bb]

Example: [PLC1,PM W0/0] or [PLC1,10:PR W0]

Item	Description
PLCName	An optional field that specifies the remote PLC name found in the PLC Name Table. If this field is left blank, the default PLC name is used.
,	PLC Delimiter. Omit if PLCName is not used.
<Label>	The name given to the label in the DeviceNet Node/Message Type Table.
	Required Space Delimiter
W	Word Reference Identifier
XXX	Word Index (Numeric, base 0). The word in which the data is contained. First byte is LSB.
N	DeviceNet Node Number (MACID)
:	Node Number Delimiter
M	Message Type in which the data is contained.
/bb	Optional bit reference. See the topic Bit Format.

Bit Format

[PLCName,<Label> XXX/bb] or [PLCName,N,M XXX/bb]

or

[PLCName,<Label> WXXX/bb] or [PLCName,N,M WXXX/bb]

Example: [PLC1,PM W0/0]

Item	Description
/	Bit Delimiter
bb	Bit Number. Range is 0 to 7 for bytes and 0 to 15 for words.
NOTE:	The default data type is Byte.

Message Type Syntax

Message	MAC ID	Message Type
Bit Strobe Command	Master MAC ID	BSC
Bit Strobe Response	Slave MAC ID	BSR
Poll Command	Slave MAC ID	PC
Poll Response	Slave MAC ID	PR
Change Of State	Slave MAC ID	CS
Change Of State Ack.	Slave MAC ID	CSA
Master Change Of State	Slave MAC ID	MCS
Master Change Of State Ack.	Slave MAC ID	MCSA

PanelMate on DeviceNet

1. Determine the amount and type of information that you would like to send and receive from the PanelMate. The more information you send and receive will directly affect the responsiveness of the network through put and the PanelMates ability to process the information.

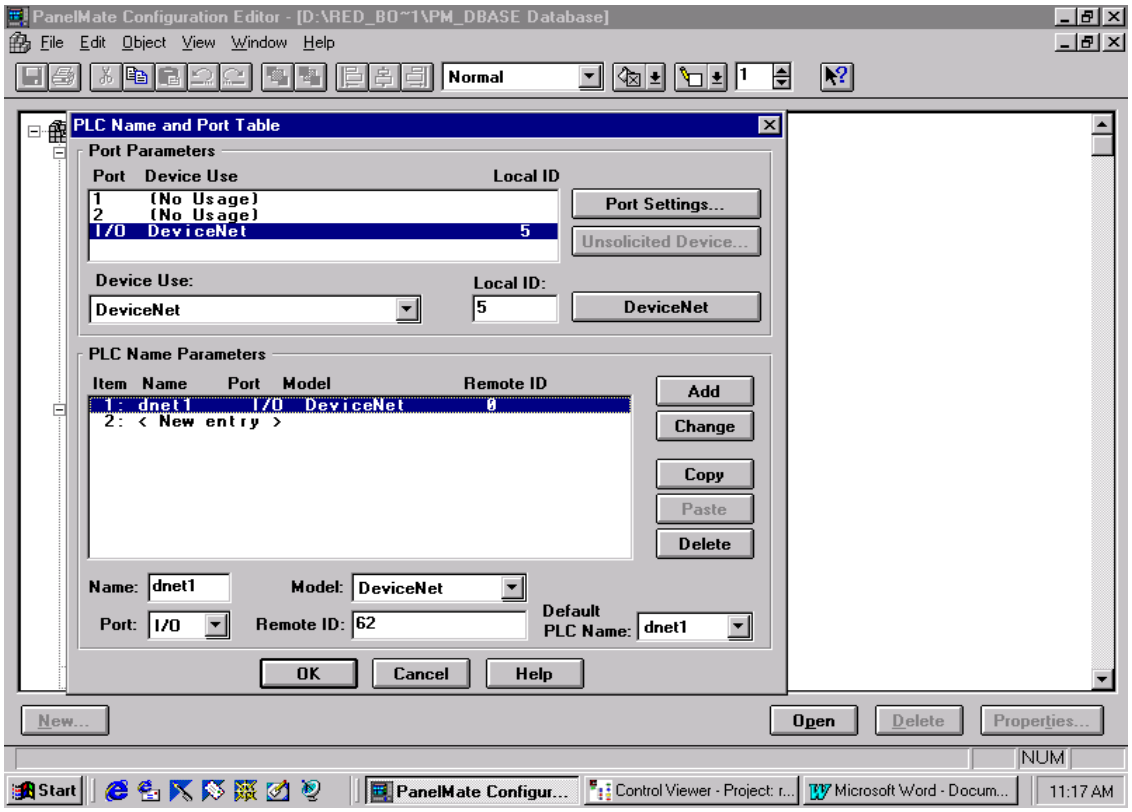
   a) Sending information to the PanelMate from your master over DeviceNet is considered a Polled Command (PC).

   b) Receiving information to the master on DeviceNet from the PanelMate is considered a Polled Response (PR).

   c) You can also send Bit Strobed Responses (BSR). The difference between a BSR and a PR is a BSR will create less traffic on your network where as by using a PR it will almost double the amount of traffic on the network. Bit Strobed Commands can only be sent from the master and are normally not used for the PanelMate setup.

   d) PanelMate can also monitor the network traffic. Any and all information sent over DeviceNet can be picked up and monitored through the PanelMate.

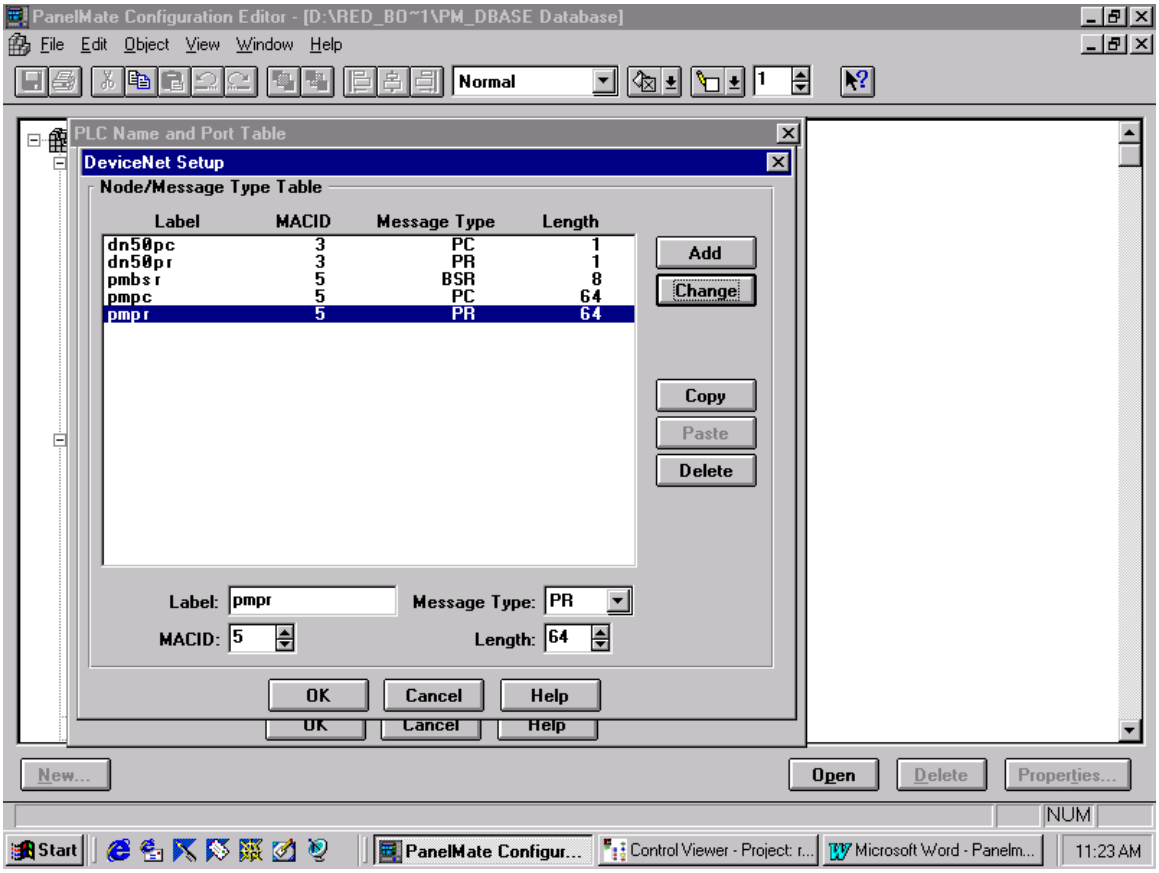
2. The PanelMate PLC name and port table should be set up as follows



   a) The local ID will be the MAC ID of your PanelMate on DeviceNet. This is set in the PanelMate software **only**, and must be downloaded with a configuration and the driver to be seen over DeviceNet.

   b) The remote ID is the Masters Mac ID (Scanner Card.)

3. If you click on the DeviceNet button in the PLC name and port table it will take you to the DeviceNet setup screen this is where we will setup the amount and type of information passed over DeviceNet.



a. The label is a generic name given to the message that will be used later to setup the Panelmate screens.

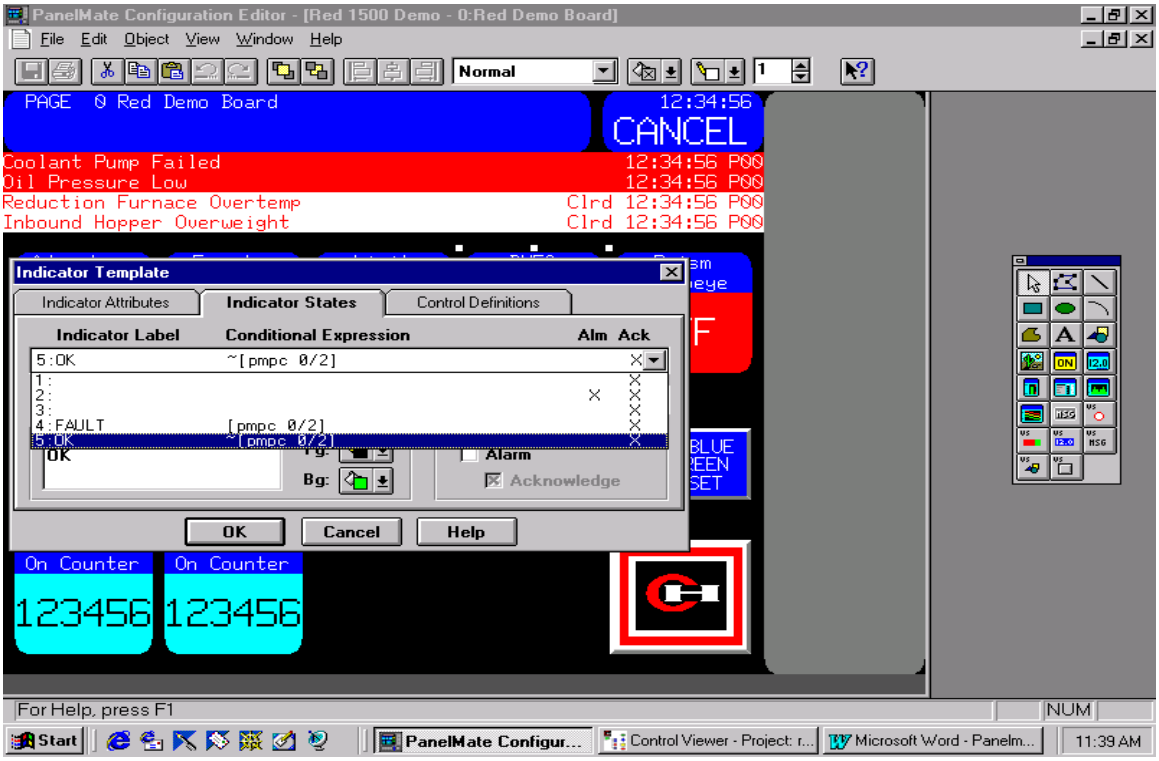
b. The Mac ID is the Mac ID of the device that you are reading or if you are sending or receiving information from the master it will be the Panelmate Mac ID.

c. The message type is described above in section 1.

d. The length is given in bytes. The length of the PMPR and the PMPC message **MUST** match what the master (scanner) is setup to send and receive to the Panelmate.

e. The dn50pr and dn50pc are setup so that the Panelmate can monitor PC's and PR's sent to the DN50 on the network. The length of these messages **MUST** match what is found in the I.L or EDS file for the device. You could also check your master to verify the information size being sent to the device or in this case the DN50.

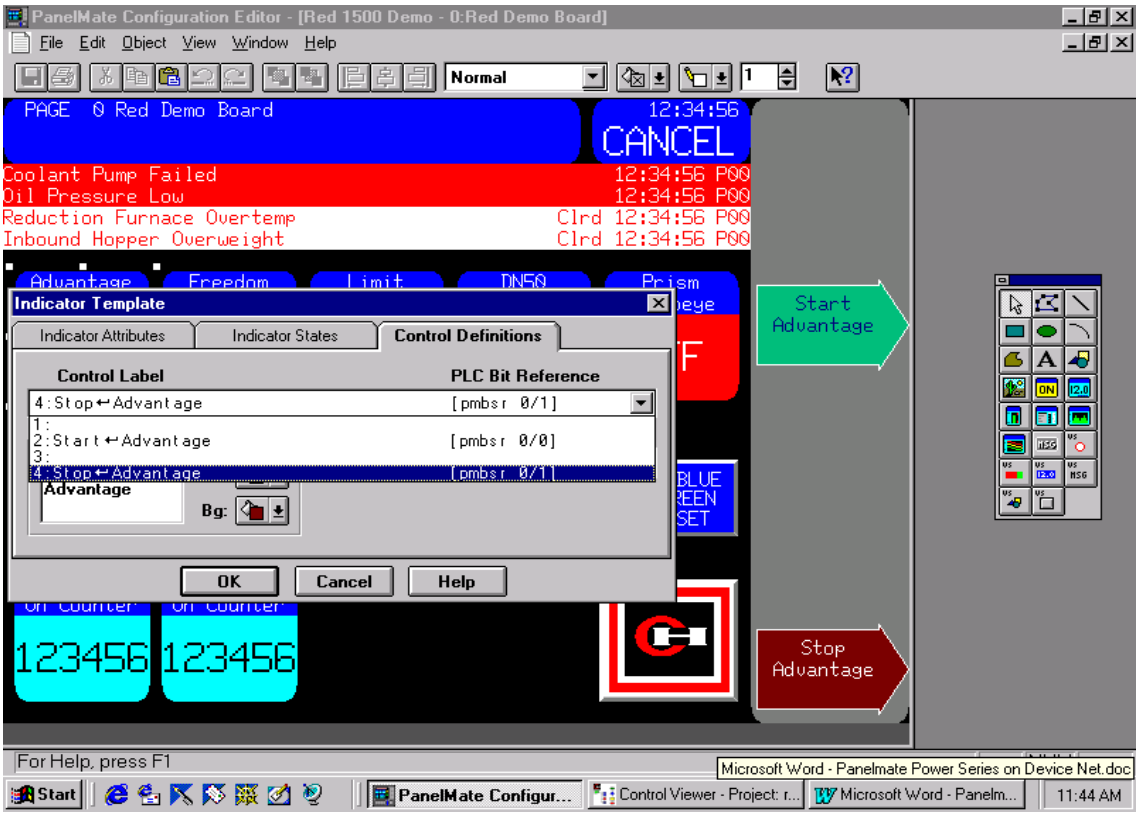
4. The only part left is to configure the screens for the Panelmate.



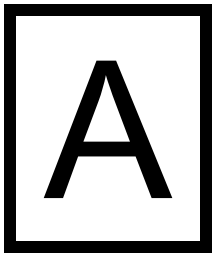
a. Above is a snapshot of an Indicator state viewing a Panelmate PC byte 0 bit 2. If you recall the PC is being sent from the master to the Panelmate. The reference 0/2 is a bit reference. A byte reference would read [pmpc 3] this is byte 3 of the pmpc being sent to the Panelmate(8 bits), a word reference would read [pmpc W1] this is a 16 bit word, remember when using words they use up 2 bytes. W1 would use bytes 2 and 3.

b. Below we are sending a response back to the master to turn on an Advantage starter. As you can see our label is pmbsr which was our Bit Strobed response to the master. And the format of the bit, byte and word follow as described in 4a.

Panelmate can only write to the master over the network, it **CANNOT** write directly to another device. So when I say that the Panelmate turns on the Advantage Starter what is really happening is that Panelmate is changing a bit in the masters logic to a one and the master is processing the logic and telling the Advantage to turn on.



Error Codes



In this chapter, you will learn:

- *About DeviceNet specific errors*

DeviceNet Specific Errors

Error #	Description	Possible Cause
201	Sys:201 DevNet:Bad or missing communication card	Bad or missing DeviceNet card Replace DeviceNet Board and restart.
1756	Sys:1756 DevNet:Invalid reference <MacID>:<MsgType> <Index>	The specified reference is invalid. Check the PanelMate Template configurations.
1757	Sys:1757 DevNet:Label <label> not defined in table	DeviceNet label reference not included in Label Table. Check the Label Table entries in the Name and Port.
1758	Sys:1758 DevNet:Data not updated Mac ID <MacID> <Msgtype>	Data has not been updated recently for that Mac ID msgtype. Check communication to/from that particular Mac ID. It may have gone off the network, or the Master isn't communicating to it.
1759	Sys:1759 DevNet:Mac ID <MacID> <Msgtype> not detected	Data has not yet been received for that Mac ID msgtype. Check communication to/from that particular Mac ID.
1760	Sys:1760 DevNet:msg too small Mac ID <MacID> <Msgtype>	DeviceNet message size received is smaller than the message size specified in the Label Table, or the Master is Program or Idle mode. Check the Label Table entries in the Name and Port Table.
1761	Sys:1761 DevNet:msg too large Mac ID <MacID> <Msgtype>	DeviceNet message size received is larger than the message size specified in the Label Table. Check the Label Table entries in the Name and Port Table.
1762	Sys:1762 DevNet:Connection not config from Mac ID <MacID>	DeviceNet connection establish error from the specified Mac ID. Check the DeviceNet Network Configuration and the Label Table configuration for the DeviceNet message types specified.
1763	Sys:1763 DevNet:HMI connection timeout Mac ID <MacID>	DeviceNet connection timeout error from the specified Mac ID. Check the DeviceNet Network to verify the Master is still communicating.
1764	Sys:1764 DevNet:Multiple master connection from Mac ID <MacID>	Check the DeviceNet Network Configuration.

Error #	Description	Possible Cause
1765	Sys:1765 DevNet:Duplicate Mac ID <MacID> detected	Another node has sent out a Duplicate Mac for the specified Mac ID after we were on the network. Check the DeviceNet Network Configuration for other units with the same Mac ID as the PanelMate.
1766	Sys:1766 DevNet:Comm Fault, Mac ID <MacID> in use	There is already another node on the network with the same Mac ID as the PanelMate. Check the DeviceNet Network Configuration for other units with the same Mac ID as the PanelMate.
1767	Sys:1767 DevNet:Physical connection error, Bus Off	PanelMate has gone Bus Off on the DeviceNet network. Check DeviceNet Baudrate and wiring.
1768	Sys:1768 DevNet:Firmware RAM test failure	DeviceNet Board's initialization Ram Test has failed. Cycle power and retry, or replace DeviceNet Board.
1769	Sys:1769 DevNet:Firmware CRC test failure	DeviceNet Board's initialization CRC Test has failed. Cycle power and retry, or reload Driver, or replace DeviceNet Board.
1770	Sys:1770 DevNet:Firmware CRC missing	DeviceNet Board's initialization CRC is missing. Cycle power and retry, or reload Driver, or replace DeviceNet Board.

Object Information

B

In this chapter, you will learn:

- *The identity object table*

Identity Object

Attribute ID	Name	Value
1	Vendor ID	68 (44 Hex)
2	Device Type	24 (18 Hex)
3	Product Code	1 (1 Hex)

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