Communication
Devices Manual

Version 1
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CHAPTER 1

Introduction

Getting Started

This chapter provides an overview of communication devices and protocols, including the following:

- “Overview of Communication Devices” on page 8
- “Working with Communication Protocols” on page 8
  - “RS-232” on page 9
  - “RS-422” on page 9
  - “RS-485” on page 10

Note: This manual may reference legacy part numbers and product names. Please refer to the 3M Parking Price Book for current product names or contact your customer service representative with questions.
Overview of Communication Devices

3M produces several communication devices that allow the hardware in your parking facility to interface with your ScanNet Central Management System or MiniSCAN system. The communication devices include:

- Communication Isolator. Provides isolation of the communication wires between devices, to prevent damage to devices, to boost the communication signal, or to split the communication line.

- Communication Converter. Converts communication protocols. Communication Converters are used to convert one type of communication to another, for example, RS-232 to RS-422. These are necessary in certain configurations, such as those that include modems to link remote devices to a central computer.

- Port Controller. Port Controllers are most commonly used as an interface between ScanNet computers and other access, revenue, and parking devices. They may also be used as an interface between MiniSCAN and devices; or without ScanNet or MiniSCAN, a Port Controller can provide basic, online access control with the Passport Plus system.

- NetPort. Similar to the Port Controller, the NetPort is a central communications processor that acts as an interface between communicating devices. The NetPort operates at a faster communication speed than the Port Controller, and it has more message buffer storage space and can store more IDs.

This manual contains information for all these devices, even though your system may not utilize all these devices. For example, you may be using NetPorts in place of Port Controllers.

Working with Communication Protocols

The ScanNet and MiniSCAN systems allow you to use one central communication processor to communicate with several parking, access, and revenue control devices. 3M has designed the communication wiring between Port Controllers and devices using a 422 daisy chain configuration. The daisy chain wiring configuration is a straight-line, station-to-station configuration. Daisy chain wiring allows data communications to pass from device to device where each has an optical separation. The signal is repeated by a Communication Isolator and passed to each device on the chain in a way that minimizes total distortion and reduces the effect of inter-connect wiring problems.

The following describes the different communications protocols that may be used in 3M systems:
RS-232

The RS-232 communications protocol has the following characteristics:

- Communication must be received at one station and re-transmitted to the next.
- Most communications employ only a small portion of the entire standard.
- Uses three wires (transmit, receive, and ground) from point to point.
- Both positive and negative voltages are employed on the same lines. Since only two signal wires are used, there is no subtraction (cancellation) of common noise.
- Recommended maximum transmission distance is 50 feet/15 meters, due to noise susceptibility.
- Communication typically occurs at rates up to 9,600 bits per second (bps).

RS-422

The RS-422 communications protocol has the following characteristics:

- Four-wire communications protocol.
- Employs two wires each for transmit (Tx+ and Tx-) and two wires for receive (Rx+ and Rx-).
- The data signal on each pair of wires is a differential voltage which allows the subtraction (cancellation) of common noise on the conductors.
- Ideal for long runs of communications up to 4,000 feet/1,220 meters.

The voltage on the RS-422 and the RS-232 transmitter chip is +5 volts. This voltage on the data line normally signifies a voltage high (commonly a “1” data bit) with respect to the complementary data line. Five volts on the complementary data line normally means a data low or “0” data bit with respect to complimentary data. There is a ten volt difference between a “1” bit and a “0” bit in the data line voltage pertaining to complimentary data.

The receive path of an RS-422 communication device should always be terminated with a 100 ohm resistor. Receive termination is generally achieved by using a DIP switch for this purpose. Figure 1.1 on page 10 illustrates how receive paths are terminated at the end of a direct current signaling path.

In a common arrangement, the Port Controller’s receive termination is achieved by closing DIP switch 8 on the external DIP switch bank on the front of the Port Controller. Refer to “Setting DIP Switches on the External DIP Switch Bank,” on page 30.

Note: Receive termination is not necessary on the Parking Pay Station.
RS-485

The RS-485 communications protocol has the following characteristics:

- A multiple station protocol.
- Each station is connected in parallel fashion to the data bus by a pair of wires.
- Communication is accomplished in a poll-and-response manner.
- The master station broadcasts a message that is received by all stations, but is addressed to a special specific station.
- Used for the MiniSCAN system for communication between the HHC (hand held computer) and the MiniSCAN Port Controller.

Following the broadcast from the master station, the lines go into high-impedance state, or tri-state, during which no voltage pulses are present on the line. During this period, the roles are reassigned, such that the addressed station moves into the retransmit mode to issue its response. After the response, the data bus moves back into the tri-state, followed by the next poll from the master.


Chapter 2

Communication Isolators and Communication Converters

Overview of Communication Isolators

The 422/422 Communication Isolator provides optical isolation of the communication wires between devices to isolate, boost, or split communication. The Communication Isolator is powered from a 115 VAC outlet. Communication Isolators can do the following:

- Isolate communication. Isolating equipment in a communication string may prevent damage to communication equipment caused by noise or over voltage conditions induced in the string. When one unit in the communication string is damaged by a power fluctuation, the Isolator may prevent other equipment in the same string from damage. In Figure 2.1 on page 12 the Communication Isolator isolates communication between the Port Controller and the card readers.
Figure 2.1  Comm Isolator Isolating Communication Between Port Controller and Card Readers

Figure 2.2  Communication Isolator PCB Board

- Boost the signal if the communication devices are located more than 4,000 ft. (1,220 m) apart. A signal sent through a Communication Isolator can be transmitted an additional 4,000 ft. (1,220 m). Figure 2.3 on page 13 illustrates a Communication Isolator as a booster. In this example, both DIP switches on the Communication Isolator are closed to terminate the receive paths, because only one cable is connected to TB1 and one cable is connected to TB2.
- Split or “T” the communication line when it would be more cost effective than wiring devices directly. In this case the Communication Isolator also acts as an isolator between the devices providing this additional benefit. Figure 2.4 on page 14 illustrates a Communication Isolator as a splitter. Figure 2.5 on page 14 illustrates the DIP switch settings in an example where a Communication Isolator is used as a splitter.
Overview of Communication Converters

Communication Converters are used to convert one type of communication to another, for example, RS-232 to RS-422. These are necessary in certain configurations, such as those that include modems to link remote devices to a central computer. Communication Converters are
powered from a 115 VAC outlet.

There are two types of Communication Converters:

**Table 2.1** Types of Communication Converters

<table>
<thead>
<tr>
<th>Device</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>422/232 Communication Converter</td>
<td>• Converts RS-232 to RS-422 and vice versa.</td>
</tr>
<tr>
<td></td>
<td>• Allows the use of phone modems and/or auxiliary printers to be installed at remote locations.</td>
</tr>
<tr>
<td></td>
<td>Each time an RS-232 signal is sent through a communication converter, the signal is converted to RS-422 and boosted, and can be transmitted an additional 4,000 ft. Can be connected to another 422/232 Converter and converted back to RS-232. Refer to Figure 2.6 on page 16 and Figure 2.7 on page 17.</td>
</tr>
<tr>
<td>485/232 Communication Converter</td>
<td>Two Functions:</td>
</tr>
<tr>
<td></td>
<td>• Acts as a Hand Held Computer (HHC) Desktop Printer Interface allowing you to print reports from a MiniSCAN HHC or program from a Passport Plus HHC¹.</td>
</tr>
<tr>
<td></td>
<td>• This also allows remote programming of a MiniSCAN port controller, using a HHC. This requires two 485/232 converters and two modems. Refer to Figure 2.8 on page 17.</td>
</tr>
</tbody>
</table>

¹ Requires an Internal jumper on J1. Once the jumper is installed, you can connect a serial printer to the RS-232 port and an HHC to the RS-485 port of the HHC Desktop Printer Interface.
Figure 2.6 Link Remote Readers Over Modem to ScanNet System

422/232 Communication Isolator
Figure 2.7 Split Communications from ScanNet Port Controller to Remote Readers Over Modems

422/232 Communication Isolator

Figure 2.8 Remote Programming of a MiniSCAN Port Controller

Using a 485/232 Converter to remotely program a MiniSCAN Port Controller
Overview of Port Controllers

Port Controllers are most commonly used as an interface between ScanNet computers and other access, revenue, and parking devices. They may also be used as an interface between MiniSCAN and devices; or without ScanNet or MiniSCAN, a Port Controller can provide basic, online access control with the Passport Plus system. In general, Port Controllers may have the following capabilities, depending on the type:

- Communication of data between devices and the central processing location.
- Anti-Passback control. Prevents authorized card holders, who have already entered the parking facility, from passing back their cards to enable other parkers to park without paying.
- Information buffering. The Port Controller can store system activity messages. When the Port Controller buffer is full, the devices start buffering the remainder of the messages. The devices’ messages are stored until ScanNet or MiniSCAN can retrieve them.
- Master time storage. The Port Controller synchronizes all reader clocks every hour on the hour (except 12 midnight) and updates them to the time in the Port Controller.

Each Port Controller requires specific firmware, which is installed at the factory for the number and types of devices with which it interfaces. However, you must set the DIP switches and connect the proper cables to the equipment and Port Controller.
This chapter may not pertain to your system if you are using NetPorts instead of Port Controllers. This chapter includes the following topics:

- “Types of Port Controllers” on page 20
  - “Firmware” on page 23
  - “CPU Board Components” on page 24
  - “Connectors” on page 26
  - “LED Indicators” on page 28
- “Setting DIP Switches on the External DIP Switch Bank” on page 30
  - “DIP Switch Settings for Printer Only Port Controllers” on page 30
  - “DIP Switch Settings for ScanNet and MiniSCAN Port Controllers” on page 31
- “Setting DIP Switches on the Internal DIP Switch Bank” on page 33
  - “Setting the Baud for RS-232 Connection” on page 34
- “Connecting a Remote ScanNet Port Controller” on page 35
  - “Setting ScanNet/MiniSCAN Functionality” on page 35
- “Performing Port Controller Diagnostics” on page 35

**Types of Port Controllers**

There are three types of Port Controllers:

- MiniSCAN Port Controller
- ScanNet Port Controller
- Printer Only Port Controller
Table 3.1 outlines each of these types and their associated functionality. Table 3.2, on page 22 outlines the input and output communication signals for various Port Controllers.

### Table 3.1 Port Controllers and Associated Functionality

<table>
<thead>
<tr>
<th>Port Controller Type</th>
<th>Functionality</th>
</tr>
</thead>
</table>
| ScanNet              | • Interfaces with communicating devices.  
                      | • May control Anti-Passback in either full or passive modes (if reader is not host-based).  
                      | • Contains a battery backup for Anti-Passback.  
                      | • Can automatically resynchronize at a pre-specified time.  
                      | • Contains a clock calendar.  
                      | • Programmable.  
                      | • Message buffer can store from 300 to 600 messages if ScanNet is offline.  
                      | • RS-232 connects to ScanNet.  
                      | • Messages are sent to the ScanNet System Activity Monitor.  
                      | • You must use ScanNet to retrieve Port Controller reports and to program Anti-Passback and Auto Resync. |
Table 3.1 Port Controllers and Associated Functionality

<table>
<thead>
<tr>
<th>Port Controller Type</th>
<th>Functionality</th>
</tr>
</thead>
</table>
| MiniSCAN             | • Interfaces with communicating devices.  
                      | • Controls Anti-Passback in either full or passive modes.  
                      | • Can automatically resynchronize at a pre-specified time.  
                      | • Contains a clock calendar.  
                      | • Programmable.  
                      | • Allows Port Controller passwords.  
                      | • Retrieves total quantity of IDs and specific ID Numbers of card holders in Primary and Secondary areas.  
                      | • Message buffer can store from 300 to 600 messages if the system printer is offline.  
                      | • Accesses MiniSCAN Port Controller reports, including the Active Device report.  
                      | • RS-232 connects to serial printer; messages print at the printer connected to the Port Controller. |
| Printer Only         | • Basic, online access control with the Passport Plus system.  
                      | • Allows printing of real-time transaction messages and full and passive Anti-Passback.  
                      | • Message buffer can store from 300 to 600 messages if the system printer is offline.  
                      | • Does not allow for online reader programming.  
                      | • Does not communicate with ScanNet or the MiniSCAN HHC.  
                      | • The DIP switch settings in this Port Controller are used to set its functionality, such as Anti-Passback and Auto Resync options. |

Table 3.2 Port Controller Communication Signals

<table>
<thead>
<tr>
<th>Device</th>
<th>Connecting Devices</th>
<th>Input Signal</th>
<th>Output Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port Controller</td>
<td>ScanNet computer</td>
<td>RS-232</td>
<td>RS-232</td>
</tr>
<tr>
<td>Port Controller</td>
<td>3M Devices</td>
<td>RS-422</td>
<td>RS-422</td>
</tr>
<tr>
<td>MiniSCAN Port Controllers</td>
<td>Any device</td>
<td>RS-485</td>
<td>RS-422</td>
</tr>
</tbody>
</table>
Firmware

The Port Controller must have the correct firmware for the number of devices it will be used for. This firmware is generally installed at the factory when the Port Controller is built. The following firmware options are currently available:

- **ScanNet Port Controller**
  - 32 devices (standard)
  - 32 devices with Prime Area Parking
  - 100K readers

- **MiniSCAN Port Controller**
  - 32 devices
  - 32 devices with Prime Area Parking

- **Printer-Only Port Controller**
  - 8 devices
  - 16 devices

Figure 3.1 on page 24 illustrates the top CPU board of the Port Controller (side view), showing the location of the Port Controller firmware.
Figure 3.1 Port Controller Firmware ROM

CPU Board Components

The following two photographs identify some of the components on the Port Controller CPU Boards.
Figure 3.2 Top CPU Board in Port Controller
Figure 3.3 Bottom CPU Board in Port Controller

Connectors

Connector ports are located at the rear of the Port Controller. Figure 3.4 on page 27 illustrates the connectors on the rear view of the Port Controller.
The following describes the Port Controller connectors:

- **AC Power** — The AC power connector uses a 12 VAC input transformer that plugs into a 115 VAC outlet.

- **RS-422** — The RS-422 connector is the communication port for connecting up to 32 system devices. It uses 5-wire cable, 2 twisted pair of 22 AWG non-shielded cable and an 18 AWG communication common connected to a male RS-422 terminal connector block. Figure 3.5 on page 28 shows the field connections from the Port Controller’s RS-422 port.

  *Note:* Communication cable is available from 3M in 500 and 1,000 foot spools.

- **RS-232** — The RS-232 connector is the communication port for connection to ScanNet without the local printer interface option. This port will connect to an 80-column serial printer with the local printer interface option. The format for this connector is 8 data bits, no parity, and 2 stop bits. The 25 pin, RS-232 female port connects an RS-232 style 25-pin male connector. Figure 3.6 on page 28 shows the field connections from the Port Controller’s RS-232 port.

- **Programmer (RS-485)** — The RS-485 port uses a 6-wire standard telephone cord to connect to MiniSCAN and ScanNet Port Controllers, the programmer connector is the communication port for the HHC (hand held computer) or ScanNet with the local printer interface option. Printer Only Port Controllers do not use this connector.

- **P.U.P.S.** — The P.U.P.S. connector is designed to plug into 3M’s optional Passport Uninterruptable Power Supply. It will accept from 11 VDC to 13 VDC.
Figure 3.5 Port Controller RS-422 Field Connections

Wiring is 2 twisted pair 22 AWG stranded non-shielded cable with 18 AWG common.

Figure 3.6 Port Controller RS-232 Field Connections

For ScanNet applications, a 25-pin cable connects to a 9-pin RS-232 port on the computer. Pin 2 from the Port Controller connects to pin 3 at the computer; pin 3 from the Port Controller connects to pin 2 at the computer.

For MiniSCAN applications, the RS-232 port is used for a 25-pin null cable to the printer, pins 1-25 connect to pins 1-25 on opposite end.

LED Indicators

LED indicators are located on the front of the port controller. When lit up or flashing, they indicate specific conditions. Figure 3.7 on page 29 illustrates the front view of the Port Controller and the location of the LED indicators.
Table 3.3 outlines the LED indicators and the condition each indicates.

**Table 3.3 LED Indicators**

<table>
<thead>
<tr>
<th>LED Indicator</th>
<th>Condition it Indicates When Lit</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER</td>
<td>A voltage is present on the unregulated 12 VAC input.</td>
</tr>
<tr>
<td>RST (Reset)</td>
<td>The internal micro-computer is being held in reset mode by either DIP switch #8 or low power.</td>
</tr>
<tr>
<td>RST (Reset)</td>
<td>This LED must be off for proper operation.</td>
</tr>
<tr>
<td>IRQ (Interrupt Request)</td>
<td>The internal microprocessor’s interrupt input is currently active.</td>
</tr>
<tr>
<td>R/W (Read/Write)</td>
<td>If dimly lit, the state of the internal microprocessor’s read/write control line input is normal.</td>
</tr>
<tr>
<td>R/W (Read/Write)</td>
<td>If brightly lit, the Port Controller is either in reset mode, needs to be reset, or there is a failure.</td>
</tr>
<tr>
<td>TX (Transmit)</td>
<td>Data is being sent from the Port Controller out to the RS-232C connector.</td>
</tr>
<tr>
<td>RCV (Receive)</td>
<td>Data is being sent to the Port Controller on the RS-232C connector.</td>
</tr>
<tr>
<td>Device TX (Device Transmit)</td>
<td>Data is being sent from the Port Controller out the RS-422 connector to readers or other system devices.</td>
</tr>
</tbody>
</table>
Setting DIP Switches on the External DIP Switch Bank

Each port controller has a DIP switch bank on the outside of the device and one on the inside of the device. Follow the instructions in this section for setting the DIP switches on the external switch bank. Figure 3.7 on page 29 illustrates the location of the external DIP switch bank.

Note: DIP Switch 1 is used to terminate the RS-422 receive data lines and should remain closed for all Port Controller types.

DIP Switch Settings for Printer Only Port Controllers

Table 3.4, on page 30 outlines the external DIP switch settings for Printer Only Port Controllers.

<table>
<thead>
<tr>
<th>DIP Switch</th>
<th>What it Does</th>
<th>Open/Closed Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Terminates the RS-422 receive data lines.</td>
<td>Should always be closed.</td>
</tr>
</tbody>
</table>
| 2          | Turns Anti-Passback on and off. When Anti-Passback is first turned on, the system sets all IDs as “out.” If vehicles are in the lot when you turn Anti-Passback on and their IDs must be presented to exit, they will be in passback violation when they exit the lot. | open = Anti-Passback on  
closed = Anti-Passback off                                                                |
| 3          | Sets Anti-Passback mode.                                                                                                                          | open = Full Anti-Passback, cardholder will not be allowed access if card used out of sequence.  
closed = Passive Anti-Passback, cardholder will be allowed access, but message will be printed on the Port Controller printer. |
Setting DIP Switches on the External DIP Switch Bank

DIP Switch Settings for ScanNet and MiniSCAN Port Controllers

DIP switch 1 is used to terminate the RS-422 receive data lines and should remain closed for all Port Controller types.

---

Table 3.4 Printer Only Port Controller External DIP Switch Settings

<table>
<thead>
<tr>
<th>DIP Switch</th>
<th>What it Does</th>
<th>Open/Closed Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Sets Auto Resync on or off. If on, Auto Resync resets the Anti-Passback system at 05:00 each morning so that cardholders’ next use will not be out of sequence. This is useful for maintaining proper sequence in non-24 hour lots that raise the gates each night allowing card holders to exit without using their cards in the exit readers. A message is printed when Auto Resync occurs.</td>
<td><strong>open</strong> = Auto Resync on (occurs at 5:00 A.M.)&lt;br&gt;<strong>closed</strong> = Auto Resync off</td>
</tr>
<tr>
<td>5</td>
<td>Determines whether or not access messages received by the Port Controller from access devices will be printed on the printer.</td>
<td><strong>open</strong> = Access messages will not be printed, but all other messages will print.&lt;br&gt;<strong>closed</strong> = Access messages will be printed.</td>
</tr>
<tr>
<td>6</td>
<td>Not used for Printer Only Port Controllers.</td>
<td>Does not matter how set.</td>
</tr>
<tr>
<td>7</td>
<td>Sets the Port Controller’s internal clock to be reset or not be reset to the value of each access granted message (based on the time in the reader) or Cashier Station message received.</td>
<td><strong>open</strong> = Time and date are reset each time an access granted or Cashier Station message is received.&lt;br&gt;<strong>closed</strong> = Time and date are not reset when messages are received.</td>
</tr>
<tr>
<td>8</td>
<td>Used to reset the Port Controller. This is recommended after changes are made to the Port Controller’s hardware or software settings.</td>
<td><strong>open</strong> = Reset (resets the Port Controller once; close it again to resume normal operation).&lt;br&gt;<strong>closed</strong> = Normal operation</td>
</tr>
</tbody>
</table>
Table 3.5, on page 32 outlines the DIP switch settings for DIP switches 2-4 of the ScanNet and MiniSCAN Port Controllers, which set the Port Controller device address:

**Table 3.5 External DIP Switches 2-4 for ScanNet and MiniSCAN Port Controller**

<table>
<thead>
<tr>
<th>Device Address Value</th>
<th>Switch 2</th>
<th>Switch 3</th>
<th>Switch 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>closed</td>
<td>closed</td>
<td>closed</td>
</tr>
<tr>
<td>1</td>
<td>open</td>
<td>closed</td>
<td>closed</td>
</tr>
<tr>
<td>2</td>
<td>closed</td>
<td>open</td>
<td>closed</td>
</tr>
<tr>
<td>3</td>
<td>open</td>
<td>open</td>
<td>closed</td>
</tr>
<tr>
<td>4</td>
<td>closed</td>
<td>closed</td>
<td>open</td>
</tr>
<tr>
<td>5</td>
<td>open</td>
<td>closed</td>
<td>open</td>
</tr>
<tr>
<td>6</td>
<td>closed</td>
<td>open</td>
<td>open</td>
</tr>
<tr>
<td>7</td>
<td>open</td>
<td>open</td>
<td>open</td>
</tr>
</tbody>
</table>

Table 3.6, on page 32 outlines the DIP switch settings for DIP Switches 5-8 of the ScanNet and MiniSCAN Port Controllers, which set various features on the Port Controller:

**Table 3.6 External DIP Switches 5-8 for ScanNet and MiniSCAN Port Controllers**

<table>
<thead>
<tr>
<th>DIP Switch</th>
<th>What it Does</th>
<th>Open/Closed Settings</th>
</tr>
</thead>
</table>
| 5          | Turns parity on and off. Systems with only ScanNet Port Controllers should have parity on. Systems with both MiniSCAN and ScanNet Port Controllers should have parity off. | open = Parity on  
closed = Parity off |
| 6          | Turns the ScanNet/MiniSCAN message buffer on and off. When the message buffer is on, the Port Controller sends system activity messages to ScanNet/MiniSCAN (and prints messages if printer used), and it also stores messages in the buffer when ScanNet/MiniSCAN is offline. When the message buffer is off, the Port Controller prints system activity messages if a printer is used, but it does not send messages to ScanNet/MiniSCAN nor does it store messages in the buffer. | open = SCAN message buffer off  
closed = SCAN message buffer on |
Setting DIP Switches on the Internal DIP Switch Bank

Each port controller has a DIP switch bank on the outside of the device and one on the inside of the device. Follow the instructions in this section for setting the DIP switches on the internal switch bank. These DIP switch settings have the same functionality for all Port Controller types. Figure 3.8 on page 34 illustrates the bottom CPU board of the Port Controller, showing the location of the internal DIP switch bank. (Note: The labels shown here on some of the components do not appear on the actual boards.)

### Table 3.6 External DIP Switches 5-8 for ScanNet and MiniSCAN Port Controllers

<table>
<thead>
<tr>
<th>DIP Switch</th>
<th>What it Does</th>
<th>Open/Closed Settings</th>
</tr>
</thead>
</table>
| 7          | Used for running Port Controller diagnostics. Refer to: Connecting a Remote ScanNet Port Controller on page 35. | **open** = Diagnostics mode
|            |                                                                               | **closed** = Normal operation                     |
| 8          | Used to reset the Port Controller. This is recommended after changes are made to the Port Controller’s hardware or software settings. | **open** = Reset (resets the Port Controller once; close it again to resume normal operation). |
|            |                                                                               | **closed** = Normal operation                     |

Setting DIP Switches on the Internal DIP Switch Bank
Setting the Baud for RS-232 Connection

To set the baud for an RS-232 connection, close one of the DIP switches on the internal DIP switch bank, leaving the other two open, as indicated in Table 3.7, on page 34.

Table 3.7 Baud Settings for RS-232 Connection

<table>
<thead>
<tr>
<th>Baud</th>
<th>Switch 1</th>
<th>Switch 2</th>
<th>Switch 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>9600</td>
<td>closed</td>
<td>open</td>
<td>open</td>
</tr>
<tr>
<td>4800</td>
<td>open</td>
<td>closed</td>
<td>open</td>
</tr>
<tr>
<td>2400</td>
<td>open</td>
<td>open</td>
<td>closed</td>
</tr>
</tbody>
</table>
Setting ScanNet/MiniSCAN Functionality

To set the functionality of the Port Controller to work for either ScanNet or MiniSCAN, set DIP switch 8 on the internal DIP switch bank, as shown on Table 3.8, on page 35:

<table>
<thead>
<tr>
<th>Function</th>
<th>DIP Switch 8 Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>ScanNet</td>
<td>open</td>
</tr>
<tr>
<td>MiniSCAN</td>
<td>closed</td>
</tr>
</tbody>
</table>

Connecting a Remote ScanNet Port Controller

Figure 3.10 on page 37 illustrates the use of a ScanNet Port Controller at a location remote from the ScanNet computer. With this configuration the Port Controller can still provide Anti-Passback even if it is not currently online with ScanNet.

Performing Port Controller Diagnostics

You may perform the Port Controller diagnostics procedure to check the internal hardware of the Port Controller. To perform diagnostics, you must use an HHC and have MiniSCAN firmware in the Port Controller. Port Controller diagnostics run the tests shown in Table 3.9, on page 36:
Table 3.9 Port Controller Diagnostic Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>What it Does</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>Reads/writes the 128 bytes of RAM internal to the CPU.</td>
</tr>
<tr>
<td>RAM</td>
<td>Read/writes the 8K RAM twice.</td>
</tr>
<tr>
<td>Clock</td>
<td>Read/writes 128 bytes of RAM internal to the clock chip.</td>
</tr>
<tr>
<td>ROM</td>
<td>Reads ROM and verifies check sum.</td>
</tr>
<tr>
<td>RS-485</td>
<td>Sends and receives 256 bytes through the programmer plug.</td>
</tr>
<tr>
<td></td>
<td>This test, the UART, is internal to the CPU.</td>
</tr>
<tr>
<td>RS-232</td>
<td>Sends and receives 256 bytes through the 25-pin RS-232 port.</td>
</tr>
<tr>
<td>RS-422</td>
<td>Sends and receives 256 bytes through the 5-pin RS-422 port.</td>
</tr>
<tr>
<td>RELAY</td>
<td>Pulses the relay output.</td>
</tr>
</tbody>
</table>

To test the Port Controller, complete the following steps:

1. Place DIP switch 7 (TEST) on the external DIP switch bank (front of the Port Controller) to the OPEN position.

2. Insert an RS-422 connector in the RS-422 port on the back of the Port Controller, with 1 and 4 jumpered and 2 and 5 jumpered; or just use wiring to jumper 1 and 4 and to jumper 2 and 5. Figure 3.10 on page 37 illustrates this wiring.

3. Insert the RS-232 connector in the RS-232 port on the back of the Port Controller, with 2 and 3 jumpered; or just use wiring to jumper 2 and 3. Figure 3.10 on page 37 illustrates this wiring.
Performing Port Controller Diagnostics

4. Plug the HHC (handheld computer) Port Controller (E/Mode>Port Options>Initialize Port, on the HHC).

5. Unplug the HHC from the Programmer connection. Before the HHC is unplugged, the Port Controller will beep.

   The R/W LED blinks three times at the start of each test.

   If the test detects no errors in the Port Controller, the following occurs:

   ● No beeps will sound.
   ● The Power and IRQ LEDs will be solidly lit.
   ● The TX, RX, and Device TX LEDs will flash once.

   The diagnostic test will continue to run again and again if the Port Controller is operating without error. The test will stop running only if the Port Controller has a ROM, RAM, CPU or Clock failure.

6. Use Table 3.10, on page 38, to diagnose any problems with the Port Controller:
### Table 3.10 Diagnostics Table for the Port Controller Test

<table>
<thead>
<tr>
<th>R/W LED Blinks On/Off Continuously?(^1)</th>
<th>Indicator</th>
<th>Type of Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>Short Buzzer(^2)</td>
<td>1 time</td>
</tr>
<tr>
<td>X</td>
<td>Short Buzzer(^2)</td>
<td>1 time</td>
</tr>
<tr>
<td>X</td>
<td>Long Buzzer(^3)</td>
<td>2 times</td>
</tr>
<tr>
<td>X</td>
<td>Long Buzzer(^3)</td>
<td>2 times</td>
</tr>
<tr>
<td>X</td>
<td>Long Buzzer(^3)</td>
<td>3 times</td>
</tr>
<tr>
<td>X</td>
<td>Other</td>
<td>3 times</td>
</tr>
<tr>
<td>X</td>
<td>No</td>
<td>1 time</td>
</tr>
<tr>
<td>X</td>
<td>No</td>
<td>2 times</td>
</tr>
<tr>
<td>X</td>
<td>No</td>
<td>3 times</td>
</tr>
<tr>
<td>X</td>
<td>No</td>
<td>4 times</td>
</tr>
</tbody>
</table>

\(^1\)The R/W LED blinks 3 times at the start of every test.

\(^2\)Indicates at least 10 of the 256 bytes of data received had errors.

\(^3\)Indicates at least 3 time-outs. No data was received.
Chapter 4

NetPorts

About the NetPort

The NetPort is a central communications processor that acts as an interface between communicating devices. Each NetPort can communicate with up to 32 devices, and each system may have up to a maximum of 253 NetPorts. The NetPort may be used in place of the Port Controller. The two function identically, with the following exceptions:

Table 4.1 Differences between NetPort and Port Controller

<table>
<thead>
<tr>
<th>Function</th>
<th>Port Controller</th>
<th>NetPort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication Speed</td>
<td>9600 baud maximum from computer and to devices</td>
<td>10 MBS on a 10 MBS network; effective rate depends on network traffic. (9600 baud to devices)</td>
</tr>
<tr>
<td>Message Buffer</td>
<td>2K RAM buffer</td>
<td>64K RAM buffer</td>
</tr>
<tr>
<td>Anti-Passback Control</td>
<td>Up to 24,000 IDs (Up to 100,000 IDs with 100K firmware)</td>
<td>Up to 100,000 IDs</td>
</tr>
<tr>
<td>Master Time Storage</td>
<td>Synchronizes all reader clocks every hour on the hour (except 12 midnight) and updates them to the time in the Port Controller.</td>
<td>To synchronize reader clocks, use the ScanNet Event Control System to create a Daily Timer Event and link it to an Event Action created as follows: Command&gt;Any Reader&gt;Set Time and Date. It is recommended that you set this event to occur 2-4 times per day. Make sure that 12 midnight is not one of the times you set.</td>
</tr>
</tbody>
</table>
This chapter includes the following topics:

- “Wiring the NetPort” on page 40
- “Setting Up the IP Address for the NetPort” on page 43
- “Programming the NetPort” on page 50
  - “Set Up the Hardware Connection for Programming” on page 50
- “Programming the NetPort IP Address” on page 51
- “Updating the Monitor Program” on page 53
  - “View Your Monitor Program Version” on page 53
  - “Update the Monitor Program” on page 54
- “ Updating the NetPort Application Code” on page 55

**Wiring the NetPort**

Figure 4.1 on page 40 shows, in general, what each of the connections on the NetPort is used for. Note that it is recommended that the NetPort wiring go through the EDCO power surge suppressor before going to the devices.

![Figure 4.1 NetPort Connections](image)

Figure 4.2 on page 41 shows the recommended wiring from the NetPort to the devices.
Figure 4.2 Recommended Wiring to Device

NetPort 422
Wiring Harnesses

Figure 4.3 on page 42 shows how NetPorts may typically be distributed on a network. It is strongly recommended that NetPorts be configured on a private network, dedicated to this type of physical device and separate from the corporate intranet and the Internet.
Figure 4.3  Typical NetPort Distribution

HUB w/ local NetPorts

HUB w/ local NetPorts

HUB w/ local NetPorts

Multi-Mode Fiber to Remote Hubs

Multi-Mode Fiber to Remote Hubs

Multi-Mode Fiber to Remote Hubs

Direct Connected NetPorts (11) via multi-mode fiber

Direct Connected NetPorts (11) via multi-mode fiber

Direct Connected NetPorts (11) via multi-mode fiber

8 Port 10baseFL HUB

8 Port 10baseFL HUB

8 Port 10baseFL HUB

12 Port 10/100 Switch

12 Port 10/100 Switch

12 Port 10/100 Switch

10baseT Cat5 drop

10baseT Cat5 drop

10baseT Cat5 drop

To lane devices

To lane devices

To lane devices

Server

Server

Server

LAN

LAN

LAN

Workstation

Workstation

Workstation

Media Converter

Media Converter

Media Converter

NetPort

NetPort

NetPort

10 base FL

10 base FL

10 base FL

8 Port 10baseT HUB

8 Port 10baseT HUB

8 Port 10baseT HUB

NetPort

NetPort

NetPort

Hub 8/TPM 3C 16710

Hub 8/TPM 3C 16710

Hub 8/TPM 3C 16710

Connect

Connect

Connect

Port Status

Port Status

Port Status

Net Utilization

Net Utilization

Net Utilization

Media Converter

Media Converter

Media Converter

SD SUPER STACK™ Super Stack II Port Switch

SD SUPER STACK™ Super Stack II Port Switch

SD SUPER STACK™ Super Stack II Port Switch

MDI MDIX Segment Tcvr 1

MDI MDIX Segment Tcvr 1

MDI MDIX Segment Tcvr 1

Tcvr 2

Tcvr 2

Tcvr 2

6x 12 x 1x 7x

6x 12 x 1x 7x

6x 12 x 1x 7x

Connect

Connect

Connect

Alert green = link OK, off = link fail, yellow = partition

Alert green = link OK, off = link fail, yellow = partition

Alert green = link OK, off = link fail, yellow = partition

1% 2% 3% 6% 12% 25% 50% 80%

1% 2% 3% 6% 12% 25% 50% 80%

1% 2% 3% 6% 12% 25% 50% 80%

8 Port 10baseT HUB

8 Port 10baseT HUB

8 Port 10baseT HUB

Mult-Mode Fiber

Mult-Mode Fiber

Mult-Mode Fiber

To lane devices

To lane devices

To lane devices

10baseT Cat5 drop

10baseT Cat5 drop

10baseT Cat5 drop

Direct Connected NetPorts (11) via multi-mode fiber

Direct Connected NetPorts (11) via multi-mode fiber

Direct Connected NetPorts (11) via multi-mode fiber

NetPort

NetPort

NetPort

Media Converter

Media Converter

Media Converter

12 Port 10/100 Switch

12 Port 10/100 Switch

12 Port 10/100 Switch
Setting Up the IP Address for the NetPort

Each NetPort must have a unique IP (network) address, which you must set before using the NetPort for communications. The IP address is written as four numbers separated by periods, for example: 10.0.0.1

The ScanNet computer must have its own IP address, but it must have the same network ID as all NetPorts on the network. The network ID is the first two or three numbers of the IP address, depending on the subnet mask\(^1\). The default would be to have the first two numbers of the NetPort’s and ScanNet’s IP addresses match. So, for the IP address in the above example, the ScanNet computer’s IP address would be 10.0.xx.xx.

The default configuration for most ScanNet systems has the ScanNet computer addressed as 10.0.0.1 and the NetPorts as 10.0.2.xxx. **NetPorts are preprogrammed at the factory with that address, unless the customer has specified otherwise.** The fourth number of a NetPort’s IP address, which ranges from 1 to 255, is determined by the physical switches on the NetPort and is set by following the instructions later in this section of the manual. This number must be different from the fourth number in the ScanNet computer’s IP address. This number must also be different from all other NetPorts on the network.

Figure 4.4 on page 43 is an example of how NetPort and ScanNet addresses are related:

![NetPort Addresses diagram](image)

**Note:** It is strongly recommended that NetPorts be configured on a private network, dedicated to this type of physical device and separate from the corporate intranet and the Internet.

---

1 The subnet mask is used in network addressing and represents the relationship between the network address and the network ID. The default subnet mask is 255.255.0.0. With this default, the first two numbers of the NetPorts’ and the ScanNet computer’s network addresses must match. If the subnet mask were 255.255.255.0, then the first three numbers must match. For more information about the subnet mask, contact your network administrator.
Following are six steps that may be necessary for you to set up the IP address for the NetPort. The steps you need to take depend on your system.

1. Review/Determine the IP Address

If necessary, review the ScanNet IP address to determine what the ScanNet computer’s network address is and what the network address of the NetPort should be. Refer to Table 4.2, on page 44.

<table>
<thead>
<tr>
<th>Operating System</th>
<th>Windows NT</th>
<th>Windows 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Click</strong> Start&gt;Settings&gt;Control Panel.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Double-click</strong> the <strong>Network</strong> icon.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Click</strong> the <strong>Protocols</strong> tab.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Highlight</strong> TCP/IP Protocol, and then click the <strong>Properties</strong> button.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>**On the IP Address tab, select the <strong>Specify an IP Address</strong> radio button.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Click</strong> Start&gt;Settings&gt;Control Panel.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Double-click</strong> Network and Dial-up Connections.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Right-click</strong> the network connection, and then click <strong>Properties</strong> from the drop-down menu.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Highlight</strong> TCP/IP Protocol, and then click the <strong>Properties</strong> button.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>**In the Internet Protocol (TCP/IP) Properties window, select the <strong>Use the following IP address</strong> radio button.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Set the Device Address Switches on the NetPort.

The fourth number of a NetPort’s IP address is determined by setting the physical switches on the NetPort. The switches represent a two-digit number in hexadecimal numbering, which uses a combination of letters and numbers. For an explanation of hexadecimal numbering, refer to Appendix B “Hexadecimal Numbering” starting on page 61.

The device address you set on the NetPort must match the port number you specify for the NetPort in the ScanNet initialization (ini) file. (See “Add the NetPort to the ScanNet ini File” on page 46.)

a. Locate the opening on the top of the NetPort that contains the two rotary switches with alpha and numeric characters printed on them, and turn the NetPort so that the characters read upright.

b. With a small screwdriver or similar tool, turn the switches so that the arrows on the switches point to the correct two-character address of the NetPort. The first switch should be set to the first character of the device address, and the second switch should be set to the second character of the device address.
3. Add the NetPort to the ScanNet ini File

After ScanNet is installed on the computer, you must edit the Scan_NT.ini file so that the NetPort port number matches the device address that you set on the NetPort, following the steps in this section. The port number in the ini file must be the same as the number you set using the physical switches on the NetPort. This is a hexadecimal number. For ScanNet versions 4.6.0.x and later, you must also set the IP address in the ini file, following the steps in this section.

a. Start ScanNet on the computer, and log on to ScanNet.

b. From the ScanNet Main Navigator, click the Configuration button. Then select ScanNet Properties.

c. In the ScanNet Properties window, click the Devices tab.

d. Click the Add button.

e. In the Edit Device window, enter the following information:
   - In the Port box, enter the device address for the NetPort.
   - Under Device Type, select the NetPort button.
   - For ScanNet Version 4.6.3.6 or later: In the Netport Address box, enter the IP address for the NetPort. ScanNet automatically enters the fourth digit of the IP address, and you cannot change it. This digit is the decimal equivalent of the port number, which is a hexadecimal number.
   - For ScanNet versions later than 4.6.0.x but earlier than 4.6.3.6, follow the instructions in the next section, “Set the NetPort IP Address in the ScanNet ini File (Certain ScanNet Versions)” after completing the steps in this section.
   - For ScanNet versions earlier than 4.6.0.x, skip the steps in the next section, “Set
Setting Up the IP Address for the NetPort

the NetPort IP Address in the ScanNet ini File (Certain ScanNet Versions)” and go to “Configure the HOSTS File for the NetPort.” after completing the steps in this section.

◆ Under Baud Rate, select the baud rate for communication between the NetPort and lane devices.

◆ Under Parity, leave Odd selected.

◆ In the Delay box, leave the default or enter a number in milliseconds to set the time for delay between polls.

f. Click the OK button.

g. In the ScanNet Properties window, click the Apply button.

h. For each additional NetPort you have on the system, repeat the above steps, using a different device address for each NetPort.

i. When you are done configuring NetPorts, click the OK button in the ScanNet Properties window

Here is an example of the DM (Device Manager) section in a Scan_NT.ini file with NetPort information. In this example, the computer has three NetPorts, with device addresses of 1A, 20, and 60:

```
[DM]
poll_delay = 15
Port_1A= SMITH NPC 2 9600 O 10.0.2.26
Port_20= SMITH NPC 2 9600 O 10.0.2.32
Port_60= SMITH NPC 2 9600 O 10.0.2.96
```
4. Set the NetPort IP Address in the ScanNet ini File (Certain ScanNet Versions)

If you are using a ScanNet version 4.6.0.x or later, you must set the IP address in the Scan_NT.ini file. The steps you follow depend on the ScanNet version you are using:

- If you are using a ScanNet version later than 4.6.0.x but earlier than 4.6.3.6, follow the steps in this section.
- If you are using ScanNet Version 4.6.3.6 or later, skip the steps in this section and follow the steps in the previous section, “Add the NetPort to the ScanNet ini File.”
- If you are using a ScanNet version prior to 4.6.0.x, skip the steps in this section, and go to the next section “Configure the HOSTS File for the NetPort.”

a. In ScanNet versions later than 4.6.0.x but earlier than 4.6.3.6, if you edit port controller information in ScanNet Properties (Devices tab) and then apply your changes, your NetPort’s IP addresses are deleted from the Scan_NT.ini file. If you are using multiple subnets, since the IP addresses must be in the ini file, you must re-enter them if they are deleted. (You may want to print your ini file before editing port controller information to keep a record of your IP addresses.)

b. Find and open the Scan_NT.ini file in the Scan NT/Initial folder on the drive where you installed ScanNet.

c. In the DM section, at the end of each line defining a port number for a NetPort, enter the IP address of the NetPort. Here is an example:

```
[DM]
poll_delay = 15
Port_1A= SMITH NPC 2 9600 O 10 10.0.2.26
Port_20= SMITH NPC 2 9600 O 10 10.0.2.32
Port_60= SMITH NPC 2 9600 O 10 10.0.2.96
```

It does not matter what number you specify for the fourth number in the IP address. ScanNet will automatically use the decimal equivalent of the port number, which is a hexadecimal number.

d. Save and close the Scan_NT.ini file.
5. Configure the HOSTS File for the NetPort.

If you are using a ScanNet version prior to 4.6.0.x, in order for a NetPort to work, you must configure the HOSTS file on the ScanNet computer. This file contains mappings of IP addresses to host names. If you are using a ScanNet version 4.6.0.x or later, you do not need to configure the HOSTS file--skip this step.

a. On the ScanNet computer, go to the `winnt\system32\drivers\etc` folder.

b. Double-click the `Hosts` file.

c. In the **Open with** window, double-click **NOTEPAD**.

d. After the last line in the HOSTS file, enter the IP address for the NetPort. The default address for the NetPort is 10.0.2.x. The fourth number in the address can be any number from 1 to 255. Only the first three numbers of the address are used here; it does not matter what number you specify for the fourth number. That number is set using the physical switches on the NetPort device.

   If you use an address different from 10.0.2.x, make sure it is correct for your network’s configuration. The IP address in the HOSTS file must match the address programmed in the NetPort. (See “Program the IP Address in the NetPort.” on page 50.) This address must also share the same network ID as the ScanNet address. (See “Setting Up the IP Address for the NetPort” on page 43.)

e. After you enter the address, press the **Tab** key, and then enter **Netport**.

f. Enter the IP address for any additional NetPorts in your network. Specify a different fourth number for each one.

g. From the **File** menu, click **Save**. Then close the window.
6. Program the IP Address in the NetPort.

If the first three numbers of your IP address are something other than the default 10.0.2, and your IP address was not programmed in your NetPort(s) at the factory, you must program the network address in the NetPort. To program the network address, follow the instructions in “Programming the NetPort” on page 50.

Programming the NetPort

⚠️ CAUTION ⚠️ Programming the NetPort should be performed only by qualified technicians or factory personnel. Mistakes in programming may prevent your system from running properly.

Set Up the Hardware Connection for Programming

To program the NetPort, you must connect an RJ-45 patch cable from the RJ-45 connector on the NetPort to the serial port on the computer. (See Figure 4.1 on page 40 for the location of the RJ-45 connector on the NetPort.) The cable must have an adapter to convert the RJ45 end to a 9-pin Sub-D connection, or be re-wired for this. Figure 4.5 on page 51 illustrates the cable adapter pin-out for this.
Programming the NetPort IP Address

If the first three numbers of your NetPort’s network, or "IP," address are something other than the default 10.0.2, and your IP address was not programmed in your NetPort(s) at the factory, you must program the network address in the NetPort following these instructions.

1. Make sure the NetPort interface cable is connected from the NetPort to the serial port on the computer, and that the NetPort power cord is plugged in.

2. Start a terminal emulator program such as Tera Term Pro, Procomm Plus, or HyperTerminal. Select the desired COM port and set the baud rate to 115,200, data to 8 bit, parity to none, and stop to 1 bit.

3. Push down the Reset switch located in the NetPort, using a tiny screwdriver or another similar, long thin object (see Figure 4.6 on page 52), and immediately type the A key on the computer keyboard (within 1 second). The prompt `es86mon:` is displayed. If the NetPort is unresponsive, try this again, making sure you type A soon enough.
4. Type p and then press Enter to display current settings. Figure 4.7 on page 52 illustrates a typical screen showing network settings.

![Figure 4.7 Example of NetPort Settings](image)

5. To change the IP address, enter the new address as follows:

Type `p ip_address` and then type the new address. Then press Enter.

**Note:** It doesn’t matter what you enter for the fourth number of the IP address. This number is determined by the physical switches on the NetPort.

The Monitor will repeat the new address and display a warning. This warning does not apply to changes in the IP address.

6. When you are prompted to test the new value, enter N for no.

7. When you are prompted to make the change permanent, if the value is correct, type Y for yes.
8. Reset the NetPort and allow it to restart the program.

9. If you must change the IP subnet mask, follow the instructions above, except in step 5., type `p ip_mask` before the new subnet mask. Your need to change this depends on your network topography. Consult with your network administrator for more information about this.

10. If the NetPort IP address has changed, update the HOSTS file on the ScanNet computer. See “Configure the HOSTS File for the NetPort.” on page 49.

**Updating the Monitor Program**

The Monitor Program is programmed in the NetPort at the factory. The Monitor Program is similar to an operating system for the NetPort.

No further programming should be necessary at your site. However, an update may be necessary if 3M makes a change to the Monitor Program, which you need in order to take advantage of a new NetPort feature.

---

**CAUTION**

This procedure should be performed only by qualified technicians or factory personnel. Mistakes in programming may prevent your system from running properly.

---

**View Your Monitor Program Version**

To determine the version of the Monitor Program that is currently installed on your computer, follow these steps.

1. Make sure the NetPort interface cable is connected from the NetPort to the serial port on the computer, and that the NetPort power cord is plugged in.

2. Start a terminal emulator program such as Tera Term Pro, Procomm Plus, or HyperTerminal. Select the desired COM port and set the baud rate to 115,200, data to 8 bit, parity to none, and stop to 1 bit.

3. Push down the Reset switch located in the NetPort, using a tiny screwdriver or another similar, long thin object (see Figure 4.6 on page 52), and immediately type the A key on the computer keyboard (within 1 second). The prompt `es86mon:` is displayed. If the NetPort is unresponsive, try this again, making sure you type A soon enough.
4. At the es86mon: prompt, type ? (a question mark).

The following window displays. The version number is located at the top of the window.

![Monitor Program Window](image)

**Update the Monitor Program**

Before you begin this procedure, make sure you have the program file NPortMon.hex.

1. Make sure the NetPort interface cable is connected from the NetPort to the serial port on the computer, and that the NetPort power cord is plugged in.

2. Start a terminal emulator program such as Tera Term Pro, Procomm Plus, or HyperTerminal. Select the desired COM port and set the baud rate to 115,200, data to 8 bit, parity to none, and stop to 1 bit.

3. Push down the Reset switch located in the NetPort, using a tiny screwdriver or another similar, long thin object (see Figure 4.6 on page 52), and immediately type the A key on the computer keyboard (within 1 second). The prompt es86mon: is displayed. If the NetPort is unresponsive, try this again, making sure you type A soon enough.

4. Type xa and then press Enter. This erases the existing flash memory.

5. Click the File menu, and then select Send file.

6. When the File dialog box is displayed, select the directory where the program file NPortMon.hex is located, and then open the file. The download process will begin. When the download is completed, the message “Device programmed successfully” is displayed.

7. Start the new monitor: type G, press Enter, and then type A within 1 second.
Updating the NetPort Application Code

8. Re-burn the monitor program: type Z, and then press Enter. When prompted to confirm, type Y.

If something happens during the monitor programming, such as a power failure or accidental reboot, the NetPort will not be usable. The unit, or at least the flash memory chip, must be replaced. So, make sure everything is ready before confirming.

9. Proceed to step 3. of “ Updating the NetPort Application Code” to update the NetPort Application Code. You must do this when you update the Monitor Program.

Updating the NetPort Application Code

The NetPort Application Code is the software that allows the NetPort to run. It is programmed into the NetPort at the factory.

No further programming should be necessary at your site. However, an update may be necessary if 3M makes a change to the NetPort firmware.

To update the NetPort application code:

1. Make sure the NetPort interface cable is connected from the NetPort to the serial port on the computer, and that the NetPort power cord is plugged in.

2. Start a terminal emulator program such as Tera Term Pro, Procomm Plus, or HyperTerminal. Select the desired COM port and set the baud rate to 115,200, data to 8 bit, parity to none, and stop to 1 bit.

3. Push down the Reset switch located in the NetPort, using a tiny screwdriver or another similar, long thin object (see Figure 4.6 on page 52), and immediately type the A key on the computer keyboard (within 1 second). The prompt es86mon: is displayed. If the NetPort is unresponsive, try this again, making sure you type A soon enough.

4. Make sure autorun is set to 1.

   ● If autorun is set to 1, go to step 5.
   ● If autorun is not set to 1, follow these steps:
     1) Type p autorun 1 and then press Enter.
     2) When you are prompted to test the change before making it permanent, type n.

   When prompted to confirm, type y.
5. Type **xa** and then press **Enter**. This erases the existing flash memory.

6. When the erasing is complete, type **w netport** and then press **Enter**.

7. When the message “Begin hex file transfer (using XON/OFF) now...” is displayed, click the **File** menu, and then select **Send file**.

8. When the File dialog box is displayed, select the directory where the program file **Netport.hex** is located, and then open the file. The download process will begin. When the download is completed, the message “Device programmed successfully” is displayed.

9. Type **p** and then press **Enter** to display current settings.

10. The fourth number of the NetPort IP address shown here does not need to match the device address set up using the physical switches on the NetPort, because when you program the IP address in the Monitor Program, you can enter any number for the fourth place of the address.

11. Restart the NetPort application, by pushing down the Reset switch again.

12. Once the reset is complete, the screen should display initialization information. Verify that you have the correct version of the NetPort software (shown on the NetPort line on the screen).
13. If you have to program another NetPort, repeat the above steps, beginning with step 3. Otherwise, close the terminal emulator program, and disconnect the NetPort.
Appendix A

Standard 5 Conductor Color Code

Standard 5 Conductor Color Code

Figure A.1 on page 60 illustrates the standard 5 conductor color code for the 3M communication cable.
Figure A.1 Standard 5 Conductor Color Code.
APPENDIX B

Hexadecimal Numbering

The fourth number of the NetPort’s IP address (sometimes referred to as the device address) is set on the physical switches on the NetPort. This address is in hexadecimal numbering. This same hexadecimal device address is used in the ScanNet ini file. The fourth number of the IP address in the HOSTS file and in the IP address programmed in the NetPort use "dummy" numbers; they have no bearing on the device address.

Whereas decimal numbering is a base 10 system (based on ten numbers, 0-9) hexadecimal numbering is a base 16 system. Each digit may be represented by 16 possible numbers. This is represented with 0 to 9 for the first 10 numbers and A to F for the six remaining numbers. Thus, hexadecimal numbering counts like this: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, B, C, D, E, F, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 1A, 1B, 1C, 1D, 1E, 1F, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 2A, etc.

In hexadecimal, just as in decimal, the bottom digit is the one's place. The next digit is the 16's place (10 for decimal, 10's place; 16 for hexadecimal, 16's place). Thus, 3E in hexadecimal is 3 times 16 (48) plus 14 for a total of 62.

In decimal, the third digit from the right is the 100's place. This corresponds to 102. The 1000's place is 103. For each position n, n >= 0, the place is 10n. Even the first place is 100 (which is 1).

Hexadecimal works the same way. For each position n, n >= 0, the place is 16n.

Use the following table to convert between decimal and hexadecimal.

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Hexadecimal</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 15</td>
<td>00 to 0F</td>
</tr>
<tr>
<td>16 to 31</td>
<td>10 to 1F</td>
</tr>
<tr>
<td>32 to 47</td>
<td>20 to 2F</td>
</tr>
<tr>
<td>48 to 63</td>
<td>30 to 3F</td>
</tr>
<tr>
<td>64 to 79</td>
<td>40 to 4F</td>
</tr>
</tbody>
</table>
### Table B.1 Decimal to Hexadecimal Conversion

<table>
<thead>
<tr>
<th>Decimal</th>
<th>Hexadecimal</th>
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</thead>
<tbody>
<tr>
<td>80 to 95</td>
<td>50 to 5F</td>
</tr>
<tr>
<td>96 to 111</td>
<td>60 to 6F</td>
</tr>
<tr>
<td>112 to 127</td>
<td>70 to 7F</td>
</tr>
<tr>
<td>128 to 143</td>
<td>80 to 8F</td>
</tr>
<tr>
<td>144 to 159</td>
<td>90 to 9F</td>
</tr>
<tr>
<td>160 to 175</td>
<td>A0 to AF</td>
</tr>
</tbody>
</table>
APPENDIX C

Product Support

Getting Help

If you have a product question that is not addressed in the documentation, contact your 3M Parking Value Added Reseller (VAR). If you are a VAR or you do not have a VAR, call 3M Product Support at one of the telephone numbers listed in the table below.

Whether you call, write, or fax, please have the following information available:

- A description of the events and the order in which they occurred
- The type of hardware you are using, with serial number and model number
- Firmware version, if applicable
- The type and configuration of software you are using
- Original sales order number
- Any messages that appear on your display screen and the exact wording
- Project name
- Returned Materials Authorization (RMA) number, if applicable

<table>
<thead>
<tr>
<th>Location</th>
<th>Phone</th>
<th>Fax</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>(877) 777-3571</td>
<td>(512) 984-3367</td>
</tr>
<tr>
<td>Canada</td>
<td>(877) 777-3571</td>
<td>(512) 984-3367</td>
</tr>
<tr>
<td>Central America</td>
<td>(512) 984-9255</td>
<td>(512) 984-3367</td>
</tr>
<tr>
<td>South America</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Accessing the 3M Parking VAR Resource Center

If you are a 3M Parking Value Added Reseller (VAR), please request the link to the VAR resource center by emailing:

parkingtechsupport@mmm.com.

The resource center site will contain the following:

- Product information
- Software upgrades when they are available
- Frequently Asked Questions
- Explosion drawings and product part numbers for some products

<table>
<thead>
<tr>
<th>Location</th>
<th>Phone</th>
<th>Fax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>(512) 984-9255</td>
<td>(512) 984-3367</td>
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<tr>
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<td></td>
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<td>Bahrain</td>
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<td>UAE</td>
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</table>
APPENDIX D

Order and Repair Procedures

Placing an Order

To place an order:

1. Locate the applicable part number. Refer to “Finding a Part Number,” on page 66.
   
   If the part number is not included in this manual, contact 3M Customer Support for part names, part numbers, prices, and delivery information at one of the following telephone numbers:
   
   USA and Canada: 877-777-3571
   Global support: 512-984-9255
   
2. Fill out a purchase order from your company.

3. For U.S. orders:
   
   Fax, email, mail, or telephone the purchase order to:

   3M Company - MVSS
   3M Center, Bldg 235-3A-09
   St. Paul, MN 55144-1000

   Email: parkingorderprocessing@mmm.com
   Phone: 1-877-777-3571
   Fax: 1-800-591-9293

   For International orders not through a 3M subsidiary:

   Fax, email, mail, or telephone the purchase order to:

   3M Company
   3M Center, Global Channel Services
   I-94 & McKnight Rd
   Saint Paul, MN 55144-1000

   Email: 3MGCSOrders@mmm.com
   Office: 1-651-736-5381
   Fax: 1-651-736-5672
Finding a Part Number

Contact a 3M Parking Customer Support representative for part number information. For the United States and Canada, call 877-777-3571; the 3M global number is 512-984-9255.

Requesting a Repair

If a problem occurs with a product part, in many cases you can return the part to the Repair Center for repair. All repairs require the following:

- Returned Materials Authorization (RMA) form.
- Purchase order (PO) number. A PO number is required whether the repair is under warranty or not.

To request a repair:

1. Contact Product Support at 877-777-3571; the 3M global number is 512-984-9255.
2. Acquire a PO number from your company.
3. Fill out the RMA form. In addition to the Customer and Product information, be sure to include the following information:
   - In the Customer PO Number field, enter the PO number assigned by your company. A PO number is required whether the repair is under warranty or not.
   - If the part is under warranty, enter the original sales order number in the Warranty box.
   - If the part is no longer under warranty, check the Billable box.
   - To expedite the repairs, check Yes next to Expedited Service Requested.

   Note: The cost of expedited service is indicated on the RMA form.

4. E-mail or fax the form to the e-mail address or fax number provided on the bottom of the form. Within 36 hours, you will receive an RMA number from 3M Customer Support.
5. Ship the part to the address indicated on the RMA approval.

SHIPPING/RECEIVING NOTICE

Include the RMA number on the shipping label. 3M cannot accept packages without RMA numbers.
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For sales and service, contact your 3M Value Added Reseller: