P3000 Slave Marquee Message Display Hardware User Manual

(Manual Part Number MAN-P3000-001)

WARNING!

Programmable control devices such as UTICOR's P3000 Slave Marquee, must not be used as stand-alone protection in any application. Unless proper safeguards are used, unwanted start-ups could result in equipment damage or personal injury. The operator must be made aware of this hazard and appropriate precautions must be taken.

In addition, consideration must be given to the use of an emergency stop function that is independent of the programmable controller.

The diagrams and examples in this user manual are included for illustrative purposes only. The manufacturer cannot assume responsibility or liability for actual use based on the diagrams and examples.

Trademarks

Manual P/N MAN-P3000-001

MANUFACTURED and MARKETED by **UTICOR TECHNOLOGY, L. P.**
4140 Utica Ridge Rd. • Bettendorf, IA 52722-1327

Phone: **1-563-359-7501** • Fax: **1-563-359-9094** • ***www.UTICOR.net***

LIST OF FIGURES

LIST OF TABLES

This page intentionally left blank.

1

Introduction

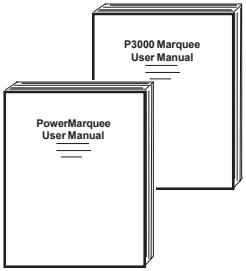
In this chapter....

Manual Organization

The P3000 Slave Marquee Hardware User Manual is arranged in chapters. A description of key information contained in each chapter is provided below.

Chapter	Description
1	**Introduction** This chapter introduces you to the manual organization and overview. Information is provided on how to find help with installation of the hardware and programming. Also provided is an introduction to the P3000 Slave Marquee, its physical characteristics, master control, computer control and messages. Specifications for the various models of the P3000 are provided on page 7 of this chapter.
2	**Unit Hardware** This chapter provides information on the P3000 Slave Marquee Hardware. Included are sections on Slave Interfacing, DIP Switches, Changing Input Power from 115VAC to 230VAC, and Changing the Fuse. Control board features and settings are discussed, as well as accessing the board.
3	**PMD Master Control** In this chapter, using a UTICOR PMD Master or Touch Panel to control the P3000 is discussed. Instructions on how to prepare the P3000 for Master Control and a description of what happens during such control are provided. Slave Addressing and unique features of the P3000 are discussed. You will find sections on the LED Field, Frame Definitions, Character Height, Displaying Messages, Embedded Codes for Computer Interface, and Slave Control by Computer Controlled Master.
4	**Computer Control** This chapter discusses how a computer can be used to control a P3000 slave. You will be instructed on how to prepare the P3000 for computer control. Information is provided on Unit Addressing and General Message Format. Detailed descriptions of Message Codes and Message Replies, and how they work, are provided. At the end of the chapter, Computer Interface Samples are provided.
5	**ASCII Protocol** Chapter 5 defines ASCII Protocol and provides instructions on how to set up the P3000 Slave to receive ASCII communication. A table of Valid ASCII Characters is provided. There are sections discussing Blink Delimiters and Writing Characters to the Display. Operating Commands and sample messages for an ASCII slave are also provided.
A	**Appendix A** The appendix includes outline dimension drawings, part numbers, and configuration for the 4 P3000 model types. Error Messages, XOR Checksum, and International Character Sets are also included in the appendix.

Manual Overview



This manual, the P3000 Marquee Hardware User Manual, P/N MAN-P3000-001, and the PowerMarquee Programming Software User Manual, P/N MAN-P3000-002 will take you through the steps necessary to get your P3000 Marquee up and running in the shortest possible time. Although your familiarity with programmable message display devices will determine how quickly you move through the steps — we've provided you with easy, step-by-step instructions.

Need HELP?

PowerMarquee Programming Software Onscreen HELP

If you are using PowerMarquee Programming Software, context sensitive onscreen help is available. To access the Help windows, simply press the F1 function key while on the topic where you need help. For example, if you need help while working with screens, press the F1 function key while in that area and a popup window will be displayed. You may also click on the Help button located at the bottom of most dialog boxes to go to the help topic.

PowerMarquee Programming Software Fly-Over HELP

When the mouse cursor comes to rest over any tool bar item for a short while, a small window will appear containing a brief description of the function of that particular button. The window will disappear as soon as the cursor has been moved off the button.

Technical Support

Although most questions can be answered with this manual,PowerMarquee Programming Software HELP topics, or the Master PMD manual, you may find answers to your questions on our web site @ www.uticor.net. If you still need assistance, please call our technical support at **1-800-832-3647 or FAX us at 1-563-359-9094.**

1.0 The P3000 Slave Marquee

The P3000 Slave Marquee is a cost-efficient, alphanumeric slave display. It is the newest of UTICOR's line of Programmable Message Displays (PMD) The P3000 is a large-character LED display that is available in four sizes. It will display messages sent to it from a PMD master display, a computer, or other intelligent device with serial communications capabilities. An optional Ethernet connector is also available, see page 8 for part number and Appendix B for information on Ethernet configuration.

The P3000 is a large LED slave display available in 2 widths and 2 heights for a total of 4 different sizes. The P3000 is a red LED (also available in High-Bright Red LED display and, in certain sizes, Tri-Color display — see page 8) display that displays messages in 2", 4", 6", and 8" characters. The P3000 uses suspended mounting: the unit is suspended using a hole in the top of each end plate. The P3000 is composed of blocks of 2 sticks high, so it cannot have an odd number of sticks high.

1.1 Physical Characteristics

The P3000 is housed in an anodized aluminum case. Two capped holes are provided for routing wires through the back access plate. The fuse, connectors, and switches can be accessed by removing the back access plate.

The front panel of the P3000 contains a lens that covers the LED field and protects the inside of the unit. The LED field is offered in 4 sizes. The display area is 4.8" or 9.6" high. Field width sizes are 36" or 72" wide.

Chapter 2 provides hardware information for the slave displays. Wiring requirements, switch settings, fuse locations, etc. are found in Chapter 2. Outline dimensions are located in Appendix A.

1.2 Master Control

Chapter 3 of this manual provides information for controlling the P3000 slave and displaying messages with a PMD master unit. A slave can be controlled by a Master PMD unit which is controlled by a PLC or it can be controlled by a computer. The system provides a few more options for slave control when the master is under computer control. When slaves are interfaced to a PMD master display controlled by a PLC, the master display is usually interfaced to discrete, data, or relay output modules on the controller. The controller selects a programmed message in the master display by manipulating the unit's input lines. These input lines are read by the master as a message number which was assigned to the message when the message was programmed into the display or as a data set which is placed within the displayed message.

When the programmed message itself indicates that it should be sent to slave displays, the address of the slave or slaves in that particular message will designate which of the displays will receive and display the selected message.

1.3 Computer Control

Chapter 4 of this manual supplies information for communication between a P3000 slave display and a computer (or serial interface) using UTICOR message protocol. With this mode of operation, slaves do not require the use of a master display.

By using various codes and specified formats, a computer or other device can duplicate the input requirements of the slave as provided by the master. Additionally, when information is sent to an individual slave in this manner, the slave will send a reply to the computer to indicate success or failure of the communications or to provide information about the unit interrogated.

Chapter 5 of this manual provides information for communication between a P3000 slave display and a computer (or serial interface) using ASCII message protocol. With this mode of operation, slaves do not require the use of a master display.

1.4 Messages

How messages look depend on the way they were programmed. Messages programmed into PMD masters have message options that determine message outputs and visual appearance. One of the master message output options is sending messages to slaves. When the message contains this option, the message can be displayed on one, some, or all slaves.

The behavior of the message is determined by selected message options and/or embedded codes. Messages can be stationary, flashing, or scrolling. Scrolled messages scroll up or left. Other options determine if message text is centered on lines, if previous text remains on the display or is removed, etc. (See Paragraph 4.12 for specific options available.) Embedded codes place time, date, and variable data locations in the message. These locations display the continuously-updated information it receives from the controller or computer.

The P3000 Slave displays also feature international character sets. This option is switch-selectable to allow message display in U.S., English, French, Danish, Swedish, German, Cyrillic, or Japanese Kana for the P3000 Slave displays.

The P3000 Slave has a large, LED field on which to display messages. The size of this field varies (see part numbers) and provides a variety of ways to display messages. 2", 4", 6", 8", and 8” compressed characters

can be displayed simultaneously, even within the same message. Because of this, programmed embedded codes are used to change character size (which is otherwise read from a DIP switch setting). Another code, a frame definition code, can be used to determine which lines of the display are used by a particular message.

Since the LED field differs from vacuum fluorescent displays (which have distinct character locations), the P3000 displays scrolled messages differently than the smaller displays. Left-scroll messages feature “smooth scrolling”, that is, letters move one LED at a time. Each portion of a letter will illuminate every dot in that row when it scrolls across the display. Upward-scrolling messages actually do not scroll at all. Rather, they “wipe on” to the display in an upward fashion. The first section of message lines appear, then the display pauses, clears, and displays the next section of text.

1.5 Conclusion

Application of the P3000 slave display is as diverse as individual business needs. Think of it, if you will, as a mailbox into which messages addressed to that location are delivered (and subsequently displayed).

Now consider several mailboxes in various locations within your company. Delivery of these messages take a matter of milliseconds. And remember that these messages were written ***by*** employees of your company ***for*** employees of your company to keep everyone informed.

1.6 Specifications

POWER REQUIREMENTS:	115/230 VAC (102-132)(194-250) 47-63 Hz (Jumper Selected — see 2.6) 1W2H: 70 VA 2W2H/1W4H: 130 VA 2W4H: 250 VA
OPERATING TEMPERATURE:	0 to 60 ºC (0 to 140 ºF) Ambient
STORAGE TEMPERATURE:	–40 to +95 ºC (–40 to +203 ºF) Ambient
HUMIDITY:	0-95% RH Noncondensing
ELECTRICAL INTERFERENCE TOLERANCE:	NEMA ICS 2-230 Showering Arc Test , ANSI C37.90a-1974 (SWC) Surge Withstand Capability Test
FUSE TYPE:	**1W2H/2W2H/1W4H**: **115 VAC:** 1.5 Amp @ 250 V **230 VAC:** 1.0 Amp @ 250 V **2W4H:** **115 VAC:** 3.0 Amp @ 250 V **230 VAC:** 2.0 Amp @ 250 V 2AG Subminiature Slo-Blo, 5 mm x 15 mm (.177" x .580")
OVERALL DISPLAY:	2", 4", 6", 8", or 8" compressed Red LED Characters 5 x 7 Dot Matrix — 50.8 mm (2") High Characters 10 x 14 Dot Matrix — 101.6 (4") High Characters 15 x 21 Dot Matrix — 152.4 (6") High Characters 20 x 28 Dot Matrix — 203.2 (8") High Characters 10 x 28 Dot Matrix — 203.2 (8") High Characters
CHARACTER SET:	All Standard ASCII Upper/Lower Case and Symbols
INTERNATIONAL CHARACTER SETS:	U.S., Cyrillic, English, Swedish, Danish, French, German, Japanese Kana
SPACE REQUIREMENTS:	Dependent upon unit size (see Appendix A)
HOUSING:	Extruded and Flat Plate Aluminum
WEIGHT:	1W2H : 18 lbs., 1W4H: 34 lbs., 2W2H: 34 lbs., 2W4H: 70 lbs.
CONNECTORS:	**Power Input:** 3 Wire-Clamp Screws for 12-18 AWG **Serial/Repeater Port:** 11 Wire-Clamp Screws for 18-22 AWG

Continued on next page —

P3000 Slave Marquee

PART NUMBERS/DIMENSIONS:

UPM- X W X X H - X X 1
1 **2** **3** **4** **5**

1 (Width):	1 = 1 Wide, 2 = 2 Wide
2 (Height):	2 = 2 High, 4 = 4 High
3 (Ethernet):	1 = Ethernet, 0 = w/o Ethernet
4 (Color):	0 = Red, 1 = High Bright Red, 3 = Tri-Color* *Tri-Color is only available in the 1W x 4H and 2W x 4H sizes.
5 (Slave/Master):	1 = Slave

UPM-1WX2H-XX1	(7.32" x 37.0" x 4.3")
UPM-2WX2H-XX1	(12.1" x 37.0" x 4.3")
UPM-1WX4H-XX1	(7.3" x 73.0" x 4.3")
UPM-2WX4H-XX1	(12.1" x 73.0" x 4.3")

2

Unit Hardware

In this chapter....

2. 0 INTRODUCTION TO P3000 SLAVE MARQUEE HARDWARE

All wiring terminations and adjustments are located inside the P3000. Figure 2-1 shows the P3000 with the access plate removed. General components referenced in following chapter are labeled. Please note that P3000 display comes in 4 sizes. Figure 2-1 shows one of the smallest units. The access area is the same on all units, but the access location is different.

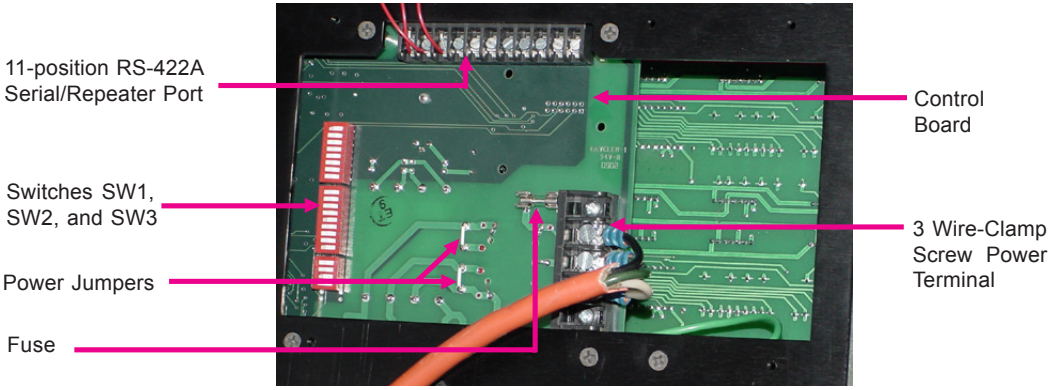


Figure 2-1. Back View of the P3000 Marquee Slave Display with Access Plate Removed

2.1 SLAVE INTERFACING

Terminal blocks are located inside the P3000. There are two 7/8"holes drilled in the access plate to accommodate routing the communication and power cables in and out of the cabinet (for 1/2" conduit fittings).

2.1.1 Power Input Terminals

Three terminals are provided for connecting operating power to the unit. These terminals are located on the Control Board (see figure 2-1, above). Power Input terminals are labeled L1, L2, and chassis ground (///). Always connect the ground terminal to the safety ground. Also located on the Control Board (and shown on figure 2-1) are the Power Jumpers and the Fuse.

The P3000 slaves are shipped from the factory set for 115 VAC operation. Refer to paragraph 2.4 to reconfigure these slaves for 230 VAC operation.

2.1.2 RS-422A SERIAL/REPEATER PORT

The RS-422A Serial/Repeater Port is an 11-position terminal block through which all communications to the unit take place. This port is located on the Control Board. The P3000 Control Board and its components is shown in figure 2-2.

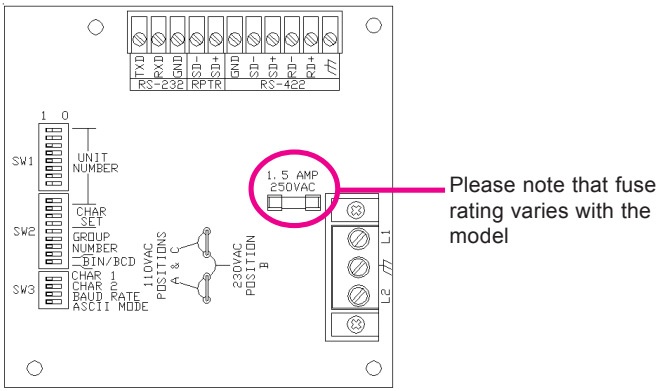
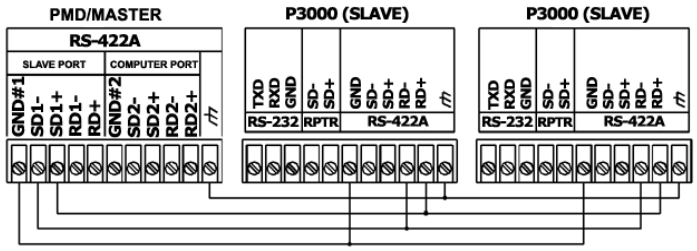


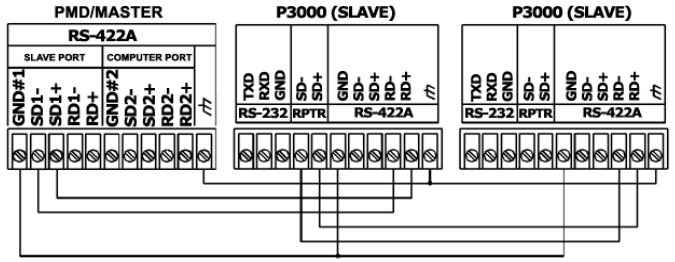
Figure 2-2. P3000 Control Board Components

The P3000 also has alternative RS-232C transmission capabilities (see paragraph 2.1.3). Typical wiring options for the Serial/Repeater Port are found in figure 2-3 on the next page.

*The following text refers to figure 2.3 on the next page.*The two configurations at the top can be used to interface slave units to either a Master PMD or to a computer or PLC when only unidirectional communication is to take place. The two configurations on the bottom are for bidirectional communication which can only take place using computer control. The PMD master in the third from the top configuration is optional and is not controlling the slave. Notice that since PMD masters do not have repeater ports, they can only begin daisy-chains and cannot be included anywhere within the chain. Daisy-chain wiring provides signal boosting through the repeater circuits of each slave, and a 4000 foot distance between each device is possible. (No provision is made for boosting the reply channel, however.)

An RS-422 “link” consists of a two-wire transmitting line, a two-wire receiving line (optional), signal common and the shield that is usually terminated to safety ground. Each two-wire line should physically be implemented with the two wires of one of the twisted pairs in the cable. (The cable specified for RS-422 connections consists of three twisted pairs.) Each twisted pair is individually shielded, and each shield is brought out to a drain wire. DO NOT USE WIRES FROM DIFFERENT TWISTED PAIRS TO MAKE UP A TWO-WIRE SIGNAL LINE.

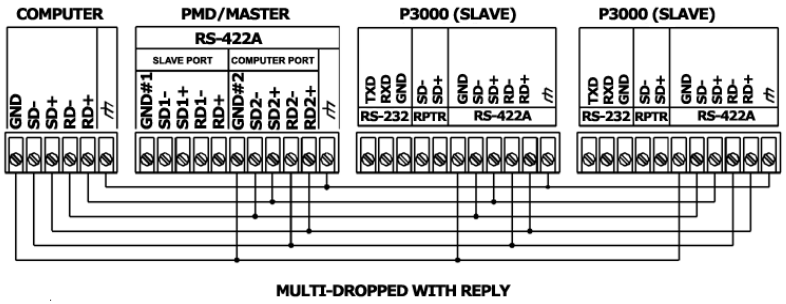




Note: Reference designation levels of the terminals when using figure 2-4 for wiring purposes.

All RS-422 connections should be made with cable of similar or superior specifications and characteristics to those specified for * Belden cable number 9730.

* Belden is a registered trademark of Belden Electrical Wire Products, a division of Cooper Industries.



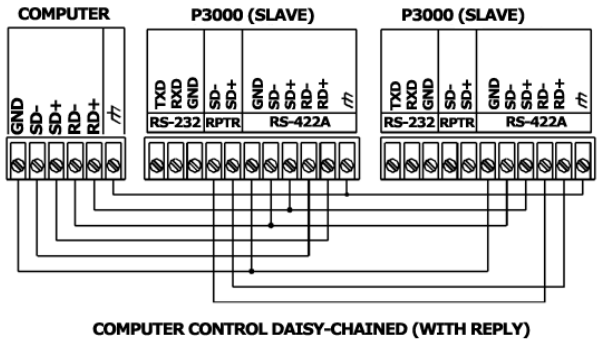


Figure 2.3 RS-422A Serial/Repeater Port Interfacing

2.1.3 P3000 RS-232 PORT

The P3000 Port provides an optional RS-232 port for communication from a computer. Figure 2-4 (below) shows RS-232 interfacing. RS-232 wiring (from computer to the P3000) should not exceed 50 feet. Additional P3000 Slave displays can be daisy-chained from the P3000 RS-422 Repeater port. 4000 feet between these slaves is possible.

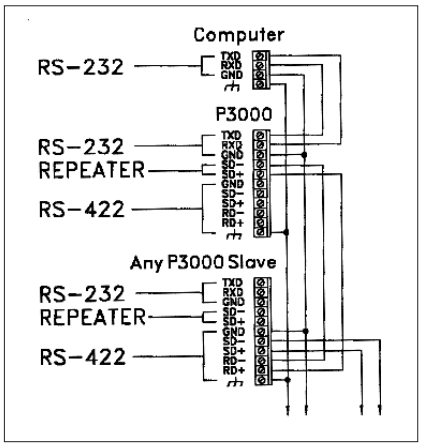


Figure 2-4. RS-232 Interfacing

2.2 SWITCH ONE AND SWITCH TWO — UNIT ADDRESS

Switches One and Two define the Unit Address (the Group and Unit Number that the slave will respond to). Switch One is an 8-position dip switch and Switch Two is a 9-position dip switch. These switches are located on the Control Board of the P3000 (see figure 2-2.) The switches are labeled open. Open corresponds to a logic 1. All eight positions of Switch One and the first position of Switch Two determine the Unit Number. Positions five through eight of Switch Two determine the Group Number. Switch Two - position nine designates whether the other switches represent two BCD numbers or two binary numbers.

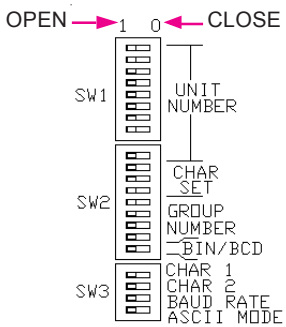
The P3000 allows Unit Numbers up to 511 binary. The switch selectable extended U.S./Japanese Kana character set is selected on positions 2 through 4 of Switch 2. Switch 2 positions 2 through 4 settings are: 1) 2-4 Open = U.S. with Japanese Kana extension and 2) 2-4 Closed = Standard U.S. character set. Figure 2-5 shows how Switch One and Switch Two are read. Table 2-1 defines the numerical value or setting for each position of these switches.

Table 2-1. Switch One and Switch Two Definitions.

SWITCH ONE AND SWITCH TWO UNIT ADDRESS IDENTIFICATION			
SWITCH POSITION	**BINARY**	**BCD**	**DESIGNATION**
SW1-1	1	1	Unit Number
SW1-2	2	2	Unit Number
SW1-3	4	4	Unit Number
SW1-4	8	8	Unit Number
SW1-5	16	10	Unit Number
SW1-6	32	20	Unit Number
SW1-7	64	40	Unit Number
SW1-8	128	80	Unit Number
SW2-1	256	100	Unit Number
SW2-5	1	1	Group Number
SW2-6	2	2	Group Number
SW2-7	4	4	Group Number
SW2-8	8	8	Group Number
SW2-9	0	1	BCD/Binary
Binary and BCD values refer to when the switch is in the "1" position.			

P3000 SLAVE INTERNATIONAL CHARACTER SET			
CHARACTER SET	SW2-2	SW2-3	SW2-4
United States	0	0	0
Cyrillic	1	0	0
French	0	1	0
German	1	1	0
English	0	0	1
Danish	1	0	1
Swedish	0	1	1
Japanese Kana	1	1	1

Reference: 3.3 —- Addressing Slaves
4.2.1 — Addressing Slaves



NOTE: For BCD addressing, numbers greater than 9 in any position will have unpredictable results.

CAUTION—Messages sent to unit number zero are processed by all units within a specified group, therefore any unit that is assigned a Unit Number of zero cannot be individually addressed.

In binary numbering, the maximum values are 16 groups (0–15) and 512 units (0–511). When set for BCD, the maximum values are 10 groups (0–9) and 200 units (0–199).

Figure 2-5. Switch One, Two, and Three Definitions

2.3 SWITCH THREE — CHARACTER HEIGHT/BAUD RATE/ ASCII MODE

The P3000 also has Switch Three located on its Control Board (see figure 2-3). Switch Three settings are shown in Table 2-2.

Positions 1 and 2 of Switch Three set the default character height for displayed messages. The default character height determines what size the message character will be when character height is not indicated within the message.

P3000 Slaves can operate at 1200 or 9600 baud. To communicate with a PMD master, slaves must be set to 9600 baud (factory set). When controlled by a computer, PLC serial interface, or other intelligent device, the P3000 slave can be set to either 1200 or 9600 baud. To change the baud rate, you must restart (remove and reapply power) to the unit before the new baud rate setting is recognized. Baud Rate is set on position 3 of Switch Three.

To operate in ASCII Mode change the setting as shown on position 4 of Switch Three. For information about ASCII Protocol, see chapter 5.

Table 2-2. P3000 Switch Three Definitions

SWITCH THREE CHARACTER HEIGHT/BAUD RATE/PMD MODE/ASCII MODE DEFAULT IDENTIFICATION				
ATTRIBUTE	**POSITION 1**	**POSITION 2**	**POSITION 3**	**POSITION 4**
CHARACTER HEIGHT TWO-INCH FOUR-INCH SIX-INCH EIGHT-INCH	 OPEN CLOSED OPEN CLOSED	 OPEN OPEN CLOSED CLOSED	 - - - -	 - - - -
BAUD RATE 9600	-	-	OPEN	-
BAUD RATE 1200	-	-	CLOSED	-
PMD MODE	-	-	-	OPEN
ASCII MODE	-	-	-	CLOSED

2.4 CHANGING FROM 115 VAC TO 230 VAC INPUT POWER • CHANGING THE FUSE

AC powered units can be changed from 115 VAC operation to 230 VAC operation. This change involves moving internal jumpers and changing the fuse. All AC units are shipped from the factory set for 115 VAC operation.

> ***WARNING!!*** **DISCONNECT AC POWER FROM THE UNIT BEFORE CHANGING THE FUSE or MOVING JUMPERS!!**

*To operate the P3000 at **115 VAC** (as shipped from the factory):*

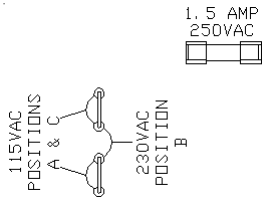
1W2H/2W2H/1W4H units — the jumpers must be in positions A and C with 1.5 Amp 250V Slo-Blo fuse*.

2W4H units — the jumpers must be in positions A and C with 3.0 Amp 250V Slo-Blo fuse*.

*To operate the P3000 at **230 VAC**:*

1W2H/2W2H/1W4H units — remove the jumpers from positions A and C and put one of these jumpers in position B. Replace the fuse with a 1.0 Amp 250V Slo-Blo fuse*.

2W4H units — remove the jumpers from positions A and C and put one of these jumpers in position B. Replace the fuse with a 2.0 Amp 250V Slo-Blo fuse*.



* 2AG Subminiature Slo-Blo, 5 mm x 15 mm (.177" x .580")

Figure 2-6. P3000 Jumper Settings for 115/230 VAC Operation and Fuse Location

2.5 CONCLUSION

Chapter 2 covered the P3000 Slave Marquee hardware. Unit power is connected to three input power terminals. All communications take place through the RS-422 Serial/Repeater Port. PMD Slaves are identified by their unit address that is determined by the positioning of Switch One and Switch Two. Switch Three lets you select a default setting for display character size and baud rate, and select ASCII or PMD Mode.

P3000 Slave Marquees also contain jumpers for changing the input power requirements. Fuse location is also shown in this section. Chapter 3 explains slave operation.

3

PMD Master Control

In this chapter....

3.0 PMD MASTER CONTROL INTRODUCTION

The overseer of a P3000 Slave Marquee or any other PMD slave can be a computer or a PMD master. This chapter covers master control of a P3000 Slave Marquee. Several of UTICOR's Programmable Message Displays (PMDs) or touch panels can communicate with the P3000 Slave Marquee. Consult the manual of your UTICOR PMD or Panel to determine whether it can be used as a Master Control for a Slave Marquee.

Messages are programmed into the master in a format that is understood by the slave display. The way a message is displayed (blinking characters, scrolling text, etc.) is programmed into the message along with the text. Slaves display the message exactly as the master does (given the message's individual display options). But because PMDs vary widely in configuration, they have dissimilar ways to adapt to messages of different sizes (discussed later).

Messages with real-time and variable data are updated from the PMD master. When the P3000 Slave receives new time/date/data information, the message currently being displayed is updated. While this information is sent to all slave displays, the P3000 slave displays only messages that were programmed with an address acceptable to the particular unit. (Refer to paragraph 3.3.)

3.1 MASTER CONTROL PREPARATION

To prepare the P3000 slave for master control:

1. Set the unit address on Switch One and Switch Two.

2. Connect the RS-422A Serial/Repeater Port to the programmed master and other slave(s) as shown in one of the first two examples of Figure 2.3.

3. Connect service power to the unit. (For 230 VAC operation, you **must** move the power input jumpers and change the fuse first.)

Reference: PMD Master Manual

3.2 WHAT HAPPENS DURING MASTER CONTROL

When the P3000 Slave display is put into master control:

1. The P3000 Slave display is ready to communicate and displays a message to indicate the software revision code, the unit address (group and unit number), and the baud rate. (PMD units must be set to operate at 9600 baud when under master control.)

2. The P3000 Slave displays this message until the PMD master begins communicating with the slave(s).

3. The display clears and then displays the selected message until the slave is addressed again with a new selected message.

4. The master sends time and date information to all slaves each second. Once a slave receives this information, it expects to continue receiving it each second. If seven seconds lapse between time and date information, the slave displays a “NO COMMUNICATION” message until it receives either the time and date or until a new message is selected.

5. Any changes to data set (variable data) information in the master causes the master PMD to send all four data sets to all slaves. Only computer interface operation permits selective transmission of data values (see 3.5).

6. Time, date and data information are updated continuously on the P3000 for displayed non-scrolling messages only. Scrolled messages are updated at each repetition. Please note that the P3000 will update time, date, and data of static messages when a scrolling message is being displayed.

7. Non-scrolling messages can contain blinking characters also Scrolled messages cannot have blinking characters; stationary messages can blink but not while a scrolling message is being simultaneously displayed.

3.3 ADDRESSING SLAVES

Each P3000 or other PMD slave display is assigned a unit address. A unit address is programmed into each message (programmed for slave output) to specify which unit or units should display that message.

The unit address of a P3000 Slave display is defined by the setting of the dip switches located inside the back panel under the access plate. These switches can be changed at any time to alter the address of the unit.

Each unit address consists of two identifiers—a group and a unit number. The unit addresses are divided into group and unit numbers to allow the master to address selected subsets of all the PMD displays connected to it. The following list shows the possibilities:

1. GROUP #00, UNIT #0000 - addresses all units in all groups
2. GROUP #XX, UNIT #0000 - addresses all units in group #XX
3. GROUP #XX, UNIT #XXXX - addresses the specific unit indicated

When the group and unit number equal zero, messages sent by the master are displayed by all slaves. With a non-zero group number and a unit number of zero, all units with that group number display the message. With a non-zero group and unit number, only the display with the indicated address displays the message.

Reference 2.2 - Switch One and Switch Two

3.4 MIXING DISPLAYS

Displays of all sizes can be used in the same network (a 2-line master with 4-line slaves, etc.). P3000 Slaves can be used with any PMD master (except the PMD 150 that does not have a slave port).

3.5 FEATURES OF THE P3000 SLAVE MARQUEE

The P3000 is offered in several size configurations and has variable character height. Therefore, behavior of the P3000 depends on: message options and the actual message sent, the size of the P3000's display, character height, and frame definition. Advanced features of the P3000 are defined in the following paragraphs.

3.5.1 The LED Field

The P3000 display area is composed of up to 8 LED "sticks". These sticks are denoted in your display size by the W and H numbers, that is, a 2W4H display is 2 sticks wide and 4 sticks high. When formatting your message for your particular size display, keep in mind the display's stick-height. For instance, a 4H unit can display:

4 lines of 2-inch characters
2 lines of 4-inch characters
1 line of 4-inch characters and 2 lines of 2-inch characters
1 line of 6-inch characters and 1 line of 2-inch characters
1 line of 8-inch characters

Each stick-height represents a 2-inch high character. Two stick-heights represents a 4-inch tall character or two 2-inch characters. One stick-width supports 20 2-inch characters. Two stick-widths support 40 2-inch characters or 20 4-inch characters, etc.

Each stick is 8 LEDs high and 120 LEDs wide. Together, these LED sticks form the LED display "field". Character size and field definitions can change continuously and can be hardware and/or software defined.

3.5.2 Frame Definitions

Frame definition specifies the portion of the LED field that will display the message. This "enables" a defined number of LED sticks (the entire width

is always enabled) for message display. This can be done, either by “default” or by frame definition.

Default specification is calculated from the character height specified + the actual message. For instance, a scroll-left message with 4-inch characters programmed to scroll on line 2 will be displayed on stick 3 and 4 (and leave 2 sticks or one 4" stick-area above it).

Embedded frame definition can be indicated by **the first six bytes** of the message sent. This frame definition lets you define “message lines” on your LED field which helps you set up your P3000 for multiple character heights and/or multiple message display. This definition must contain 6 bytes. The first 2 bytes indicate the frame definition code - <ESC> <F>. This is followed by the top stick definition (2 bytes) and the bottom stick definition (2 bytes). Frame definition is defined as follows:

<ESC><F>(n1)(n2)

n1 is the top stick enabled and represents a 2-digit number between 01 and 04. n1 must be <= the stick-height of the display. n2 must be >= n1 and <= the stick height of the display.

<ESC><F> (in ASCII)	- 1B 46 (in HEX)	• 2 bytes
n1 <0><1> to <0><4> (in ASCII)	- 30 to 34 (in HEX)	• 2 bytes
n2<0><1> to <0><4> (in ASCII)	- 30 to 34 (in HEX)	• 2 bytes

To enter the <ESC> code on your keyboard, enter the **^** character, followed by the **[** character. For example, to enable sticks 2-4 enter:

^[F0204

When the top stick specification is larger than (below) the bottom stick specification, the message will not be displayed.

If no frame definition is specified, the P3000 will specify the frame according to the character height (read from Switch Three settings) and the number of lines in the message.

3.5.3 Character Height

The P3000 supports four character heights: 2-inch, 4-inch, 6-inch, and 8-inch characters. P3000 default character height is defined on Switch Three —positions 1 and 2. When no character definition exists within the message, the message is displayed according to the height set on the dip switches.

Embedded character-height definitions can be placed anywhere within the message. All characters following a character-height definition will be dis-

played in the specified size until another definition appears (that is, they are not limited by the end-of-line, just the end-of-message).

Embedded character definitions are as follows:

2-inch = <ESC><0> (in ASCII)	- 1B 30 (in HEX)	• 2 bytes
4-inch = <ESC><1> (in ASCII)	- 1B 31 (in HEX)	• 2 bytes
6-inch = <ESC><2> (in ASCII)	- 1B 32 (in HEX)	• 2 bytes
8-inch = <ESC><3> (in ASCII)	- 1B 33 (in HEX)	• 2 bytes
8-inch compressed = <ESC><4> (in ASCII)	- 1B 34 (in HEX)	• 2 bytes

As mentioned, use the ^[escape sequence to enter the <ESC> code when using an ASCII keyboard.

3.5.4 Displaying Messages

When the P3000 receives a message, it will count the number of lines in the message and assign it a frame according to the number of lines and the default character height. It first checks for invalid character dimension sequences. This check looks for character dimensions that will not fit within the frame specified for the message. A sequence that will not fit is invalid. Invalid sequences are converted to the maximum character dimension that will fit within the message's frame. When no frame is specified, the P3000 defines the frame according to the **default** (dip switch) character size.

For example, when the dip switch is set for 2-inch characters and no frame is specified, the first four sticks are enabled for a standard message. If the message contains 4- or 6-inch characters, they will be displayed in their programmed size and that message line will be located to accommodate the size. However, lower lines of the message may not fit and therefore will not be displayed.

Please note the following about P3000 message behavior:

1. A message programmed to clear the display will clear all information from the display prior to displaying itself.

2. All sticks designated by the message frame will be cleared for the message. Non-scroll messages with blank lines (end-of-line marker only) will **not** clear messages from these lines unless programmed to do so. The size of the blank line (i.e., number of blank sticks) is determined by the character height preceding the blank line.

3. For a standard message, a message line displays only the number of characters physically allowed. The remainder of the message line is truncated.

4. You may display multiple scroll-up and scroll-left messages at the same time so long as they do not overlap. All scroll-left messages will move synchronously. Scroll rates for left-scroll messages are fixed and cannot be changed by scroll rate settings of the master display.

5. Scroll-up messages of the P3000 behave differently than those of the vacuum fluorescent displays. P3000 scroll-up messages wipe onto the display in an upward direction. The P3000 first figures how many message lines can be placed within the frame. Then these message lines are visually "brushed" across the display from bottom to top, the bottom line of text being revealed first, on up to the first line.

   The display then pauses with this portion of the message, then clears and repeats the process with the second portion of message lines to fit the frame, etc. The pause time (scroll-up rate times the number of lines to be unveiled) is determined by:

PMD master default rate or programmed scroll rate × **Number of lines in the message frame** = **Pause Time**

Example: ***1 second scroll rate x 3 lines = 3 second pause time.***

6. Standard message lines that do not fit the LED field are truncated. Standard messages that do not fit the stick-height structure of the display are truncated.

7. Blinking characters sent by masters do not blink when using scroll up or scroll left.

EMBEDDED CODES FOR COMPUTER INTERFACE

When programming packet messages in computer interface for the P3000 display, frame definitions and character height definitions are programmed as embedded escape codes. For computer interface, escape codes in Basic are programmed using the escape code CHR$(27). Examples follow:

CHR$(27)+"0" — TWO-INCH CHARACTER CODE
CHR$(27)+"1" — FOUR-INCH CHARACTER CODE
CHR$(27)+"2" — SIX-INCH CHARACTER CODE
CHR$(27)+"3" — EIGHT-INCH CHARACTER CODE
CHR$(27)+"4" — EIGHT-INCH COMPRESSED CHARACTER CODE
CHR$(27)+"F"+"nn"+"NN"— FRAME DEFINITION CODE

"nn" indicates top LED stick and ranges from 01 to 04. "NN" indicates the bottom LED stick, also ranges from 01 to 04, and must be >= "nn".

3.6 SLAVE CONTROL BY COMPUTER CONTROLLED MASTER

Several options for control of slave units are available only when the master PMD controlling them is operating via the computer port. These options allow the controlling computer to select, during operation, subsets of a master's slaves to receive variable data and to display messages.

This will allow the slaves controlled by one master to display message data from a number of groups of four data sets. (A master operating in the normal display mode can send only one group of variable data to all of its slaves.) It also allows data **not** sent from a master to be displayed on selected slaves.

The sequence for these options are as follows (see the Master PMD Manual for complete descriptions of the commands mentioned below):

1. The control computer sends a Select Active Slave command (Code 15) to the master PMD. The data in the command will specify which of the master's slaves are to be made active, and which to be made inactive.

2. The master passes the Select Active Slave command on to its slaves, causing the specified activations and deactivations.

3. The control computer sends a Write Data Set Data To Master command (Code 16) to the master. The data contained in the command will include four sets of variable data and should indicate that the master is to pass the data on to active slaves only.

4. The master PMD will then retransmit the variable data it received to the active slaves by sending the Write Data Set Data command (Code 14) with the unit number to select active slaves only (Group #15, Unit #4095). This will cause active slaves only to display the message.

5. Only slaves that were activated will receive the new data. All others will continue to display the data that they had received previously. This sequence can be repeated as many times as needed to send different data sets to different groups of a master's slaves.

The same sequence can be used to send messages from the control computer to specific slaves. In this case, the control computer (Step 3 above) will send the Display Packet Message command (Code 02) to the master (in place of Code 16). Then the master (Step 4 above) will send the Slave Display Packet Message command (Code 17) to the slaves (in place of Code 14) using the address Group #15, Unit #4095. This will cause active slaves only to display the message.

Notice that with this type of operation, a PMD master display may use the address active display (Group #15, Unit #4095) addressing described in 4.2.1. Since slaves can only be deactivated using computer interface, messages addressed to active slaves would be processed by all slaves (as in Group #00, Unit #0000) when no type of computer control is being used.

Reference 4.0 - Computer Control
4.2.1 - Addressing Slaves
UTICOR's PMD Master or Touch Panel Manuals

3.7 CONCLUSION

Because P3000 Slave displays contain no message program, all message text displayed on the slave is received from an outside source. When controlled by a master, a slave receives its information from the master's programmed messages that are, in turn, selected by the device that controls that PMD master.
Information concerning the PMD master display and its message program is found in PMD (Programmable Message Display) Master User's Manuals. Reference to those manuals are necessary for programming the master and preparing it for the master/slave network.

The following chapter of this manual covers the alternate method for communication with a P3000 Slave display. With this type of interfacing, the device controlling the slave display is a computer, and master displays may or may not be involved. In addition to receiving and displaying message, individual slave displays can also send replies to the computer.

This page intentionally left blank.

4

Computer Control

In this chapter....

4.0 COMPUTER CONTROL INTRODUCTION

The P3000 Slave Display may also receive its information from a computer (mainframe, minicomputer, personal computer or PLC ASCII interface that can handle 8-bit binary). By sending data in a format similar to that used in the memory of a PMD master display (in 8-bit binary), a computer can display messages directly on P3000 Slave displays without the use of a master. Using this mode of communication, the slave will respond to communication messages it receives and send replies to the controlling device.

If you have a slave with which you are going to use ASCII protocol, you should refer to Chapter 5. This chapter will be of little or no use to you.

This chapter of the manual describes the communication protocol that is acceptable to the P3000 and the commands to which it will respond. This protocol is of the same design as the computer interface format for the PMD Master Display. Each user will have to develop a program for his control computer using the commands and protocol that follow.

4.1 COMPUTER COMMUNICATION PREPARATION

For computer communication, the P3000 Slave RS-422A Serial/Repeater Port is set to the following parameters:

Baud Rate	=	9600 or 1200 Baud
Stop Bits	=	1 Stop Bit
Parity	=	No Parity
Checksum	=	XOR checksum

The baud rate is switch selectable. This switch (SW3) is located on a circuit board inside the unit. The unit is shipped from the factory with this switch set for 9600 baud communication. To change the port to 1200 baud, refer to Chapter 2.

For information concerning the XOR checksum, refer to Appendix A.

Use the following procedure to prepare for computer communication with P3000 Slave display(s):

1. Set computer parameters to match those of the P3000 Slave. If necessary, change baud rate on the slave unit.

2. Connect serial port of the computer to the RS-422A Serial Port(s) of the P3000. Refer to figure 2-3 to construct appropriate cable(s), and proper connections.

3. Connect power to the Power Input Terminal Block.

4. The P3000 Slave display(s) will be 'active' and ready to communicate. The unit(s) will display a message to indicate the software revision number, the unit address, and the baud rate.

Reference 2.2 - RS-422A Serial/Repeater Port
2.3 - Switch Three — Character Height/Baud Rate/ASCII Mode
Appendix A - XOR Checksum

4.2 UNIT ADDRESS

Each P3000 or other PMD slave display is assigned a unit address. A unit address is sent in each message to specify which unit or units should respond.

The unit address in a communications message consists of two bytes which contain two identifiers. These identifiers consist of a group number and a unit number and are located at Byte 2 and Byte 3 of the communications message. Refer to figure 4-1 for bit assignments of the unit address bytes.

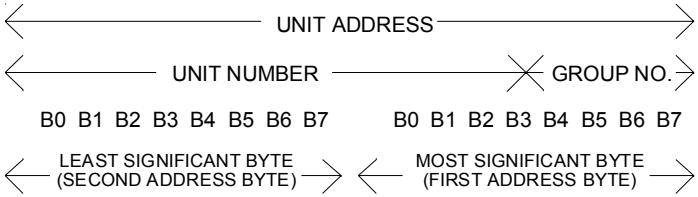


Figure 4-1. Unit Address Byte Designation

The unit address of a P3000 Slave display is defined by the setting of the dip switches located on the control board behind the access plate on the back of the unit, see figure 2-2. The unit address will only be read from these switches during power up transition.

Reference 2.2 - Switch One And Switch Two — Unit Address

4.2.1 Addressing Slaves

The unit address is divided into group and unit numbers to allow the controlling computer to communicate with selected subsets of all the P3000 Slave displays connected to it. The following list shows the possibilities:

1. Group #00, Unit #0000 — addresses all units in all groups
2. Group #XX, Unit #0000 — addresses all units in group #XX
3. Group #15, Unit #4095 — addresses all 'active' slave units
4. Group #XX, Unit #XXXX — addresses the specific unit indicated

When the group and unit number equal zero, messages broadcast by the control computer will be processed by all units attached.

With a non-zero group number with the unit number of zero, all units with that group number will process the message.

Messages sent to Group #15 and Unit #4095 will be processed by all slave units that are currently 'active' and ignored by all 'inactive' slaves.

Reference 4.2.2 - Active/Non-Active Slave Units
4.9 - Select Active Slave

When a message sent to an individual display is received, that display sends a reply to the control computer. When a message is received that used any of the above mentioned address grouping techniques, no reply is returned. Note that certain messages (those that require a reply other than the standard reply) cannot be processed when the units are addressed by any of the grouping techniques. The specific message types which cannot be processed with these techniques are noted in Table 4-1

WARNING! Do NOT use the same unit address for PMDs that are connected together serially using bidirectional communications. This could result in more than one reply to a computer interface command. If more than one reply is sent on the serial line, the serial drivers of the PMDs may become damaged.

Note: The unit address is only read when the unit is powered up.

4.2.2 Active/Non-Active Slave Units

The computer interface protocol provides another means to send messages to specific collections of P3000 Slave units beyond using group numbers. A computer interface command is provided to allow the controlling computer to 'activate' or 'de-activate' the slaves connected to it. Slaves power up 'activated' and the controlling computer can, by group or individual unit, activate or deaactivate the slaves. Then it can utilize the Group #15, Unit #4095 addressing mode described in 4.2.1.

Reference 4.9 - Code 15 - Select Active Slave

4.3 GENERAL MESSAGE FORMAT

General message format for messages sent via computer is shown below in figure 4-2.

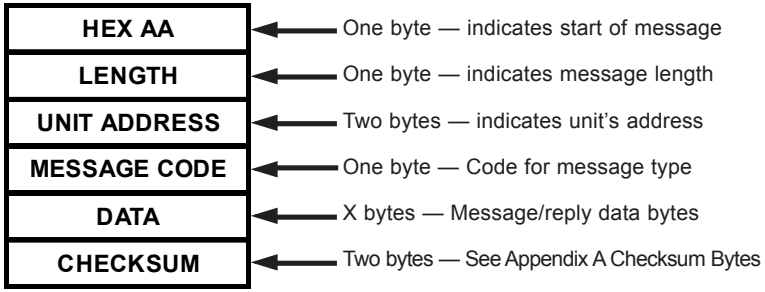


Figure 4-2. Message Format For Computer

Note that **all** messages, including replies sent from the P3000 Slave, must begin with a hex byte equal to AA to indicate the start of a message.

Also note that the checksum of a message is calculated by using the bytes that represent: Length, Unit Address, Message Code, and Data. (See Appendix A.)

The length byte is always the length of the entire communications message, less one (for the AA). The length specifically does include the length byte and checksum.

Unit address bytes are stored most significant byte first, least significant byte second.

Except where noted otherwise, all parts of the message are composed of Hex bytes (as opposed to ASCII or BCD).

4.4 MESSAGE CODES

Message codes are required to define the type of communication to take place. The P3000 Slave is programmed to process various types of messages, and these have been assigned Message Code Numbers. Table 4-1 defines message code numbers.

Table 4-1. Message Code Number Designations

CODE	COMMAND
00	STANDARD REPLY
13	SET TIME AND DATE
14	WRITE DATA SET DATA
15	SELECT SLAVE(S)
17	SLAVE DISPLAY PACKET MESSAGE
*18	STATUS/ID MESSAGE

Note: All numbers are in decimal.
*Allowed only when individual units are addressed.

4.5 MESSAGE REPLIES

All messages sent to individual P3000 Slave displays (as opposed to any of the group addressing techniques described in 4.2.1) will cause the slave to send a reply. The reply will indicate the success or failure of processing the command and will indicate that the display is ready to process another command.

In most cases, this message will be the “standard reply” described in the next section. One command (Status/ID Message) will cause the unit to send a special form of reply.

The following section of this chapter covers the format of the message codes and provides a description of each.

The time delay between when the control computer finishes sending a command until the P3000 Slave begins to reply depends upon the specific command and the amount of data sent with the command. P3000 Slave displays, like the PMD master, do not “stack” commands. It is best to wait for a reply to a command before sending any more commands.

4.6 CODE 00 — STANDARD REPLY FORMAT

FORMAT

REPLY	
BYTE NUMBER	**VALUE**
1	HEX AA = Start of Message Byte
2	8 Length
3	B1–B3 = Not Used B0 = Most Significant Bit of 9-Bit Unit Number
4	8 Least Significant Bits of 9-bit Unit Number
5	00 Message Code
6	Message Code of Received Message
7	Reply Error Code 0 = No Error 1 = Checksum Error 2 = Timeout 3 = Invalid Message Code 8 = Invalid Message Length
8	Checksum (2 bytes) LSB, MSB

DESCRIPTION

This is the standard format for a P3000 Slave reply to the computer. When using the message commands described in this section, refer to this chart whenever a message command chart indicates that the reply is of standard format.

4.7 CODE 13 — SET TIME AND DATE

FORMAT

COMMAND	
BYTE NUMBER	**VALUE**
1	HEX AA = Start Of Message Byte
2	13 Length
3	B4-B7 = 4-Bit Group Number B1-B3 = Not Used B0 = Most Significant Bit of 9-bit Unit Number
4	8 Least Significant Bits of 9-bit Unit Number
5	13 Message Code
6	HOUR MODE: 0 = 12 Hour Mode, 1 = 24 Hour Mode
7	HOURS: 1–12 for 12 Hour Time (D7 = 1 = PM) 0–23 for 24 Hour Time
8	MINUTES: 00–59
9	SECONDS: 00–59
10	MONTHS: 1–12
11	DATE: 1–31
12	YEAR: 00–99
13	Checksum (2 bytes) LSB, MSB
REPLY = STANDARD REPLY	

DESCRIPTION

This command, when processed by a P3000 Slave display, will store the real-time information contained in the command in the slave displays addressed. This will update the time and date currently being displayed in a message once the command has been processed. When sent to a single slave display, a standard reply will be returned to the computer.

Byte 6 (Hour Mode)— select 12 or 24 hour mode. Only used bits of this byte should be set. All other bits should be kept to '0'.

Byte 7 (Hours) —when Byte 6 selects the 12-hour format, the hours byte indicates AM or PM in the high bit (D7). D7 of byte 7: 0 = AM, 1 = PM

NOTES: When controlled by a master PMD, a slave display has its time and date updated every 1 second.

When the P3000 Slave unit is communicating via computer control, the "NO COMMUNICATIONS" timeout error is disabled.

Reference 3.2 - What Happens During Master Control
C.1 - PMD Master Control Errors

4.8 CODE 14 — WRITE DATA SET DATA

FORMAT

COMMAND	
BYTE NUMBER	**VALUE**
1	HEX AA = Start Of Message Byte
2	15 Length
3	B4-B7 = 4-bit Group Number B1-B3 = Not Used B0 = Most Significant Bit of 9-bit Unit Number
4	8 Least Significant Bits of 9-bit Unit Number
5	14 Message Code
6	Status Byte: 0 = BCD, 1 = Binary
7	Data Set 1 (2 bytes) MSB, LSB
9	Data Set 2 (2 bytes) MSB, LSB
11	Data Set 3 (2 bytes) MSB, LSB
13	Data Set 4 (2 bytes) MSB, LSB
15	Checksum (2 bytes)
REPLY = STANDARD REPLY	

DESCRIPTION

This command is used to define the values of the four data sets used by the P3000 Slave. All four data sets must be defined in the command. The data sent by this command will be used by the P3000 Slave(s) to which it is addressed.

Byte 6 (Status Byte) - indicates whether the data is BCD or binary.

0 = BCD
1 = Binary

4.9 CODE 15 — SELECT ACTIVE SLAVE

FORMAT

COMMAND	
BYTE NUMBER	**VALUE**
1	HEX AA = Start Of Message Byte
2	7 + X Length
3	B4-B7 = 4-bit Group Number B1-B3 = Not Used B0 = Most Significant Bit of 9-bit Unit Number
4	8 Least Significant Bits of 9-bit Unit Number
5	15 Message Code
6	Active Units Control Byte
7	X amount of data in the form of 2 byte group and unit numbers. Form is the same as bytes 3 and 4 in message.
* 7 + X	Checksum (2 bytes)
REPLY = STANDARD REPLY	
** X must be less than, or equal to, 248, which can represent 124 (Group, Unit) number combinations.*	

DESCRIPTION

This command allows the control computer to specify which of the P3000 Slaves are to be activated or de-activated.

Bytes 3 & 4 (Unit Address Bytes) — specify the unit and group number of the slave displays to be affected by the command (typically Group #0, Unit #0).

Byte 6 (Active Units Control Byte) — this byte is used to specify the application of the activate or de-activate command to the various slaves. (Refer to Table 4-2.)

Table 4-2. Byte 6 - Active Unit Control Byte

B7	B0	APPLICATION
0	0	De-activate specified slaves only
0	1	Activate specified slaves only
1	0	De-activate specified slaves — Activate other slaves
1	1	Activate specified slaves — Deactivate other slaves

Bit 0 of this byte indicates the requested state of the slaves whose addresses are contained in the list beginning at Byte 7. A “1” in this position indicates those slaves are to be activated. A “0” indicates they should be de-activated.

Bit 7 of this byte indicates what all other slaves (addressed by Bytes 3 & 4) status should become. If it is a “0”, all of the other slaves activation status is unchanged by this command. If it is set to “1”, all other slaves are activated when bit 0 is a “0” and de-activated when bit 0 is a “1”.

Byte 7 — A list of unit and group numbers of slave displays to be activated or de-activated. Note that only units in the address at Bytes 3 and 4 will be affected by this command.

Reference 4.2.2 - Active/Non-Active Slave Units

4.10 CODE 17 - SLAVE DISPLAY PACKET MESSAGE

FORMAT

COMMAND	
BYTE NUMBER	**VALUE**
1	HEX AA = Start of Message Byte
2	10 + X Length
3	B4–B7 = 4-bit Group Number B1–B3 = Not Used B0 = Most Significant Bit of 9-bit Unit Number
4	8 Least Significant Bits of 9-bit Unit Number
5	17 Message Code
6	Blink ON Time Interval
7	Blink OFF Time Interval
8	Time Interval between upward Scrolls
9	Time Interval between right to left Scrolls
* 10 + X	Checksum (2 bytes)
REPLY = STANDARD REPLY	
** X must be less than, or equal to, 235.*	

DESCRIPTION

This command will display a valid message on the P3000 Slave’s display. The message to be displayed must follow the format of a stored message in a PMD master display’s message program.

Table 4-3. Bytes 6 through 9 — Definitions

BYTE NUMBER	ATTRIBUTE	VALID VALUES
6	Blink On Time Interval	1–99
7	Blink Off Time Interval	1–99
8	Time Interval Between Upward Scrolls	1–99
9	Time Interval Between Right-to-Left Scrolls	1–99

Byte 6 (Blink On Time Interval Byte) — indicates the length of time that each blinking character of the message will blink on.

Byte 7 (Blink Off Time Interval Byte) — indicates the length of time that each blinking character of the message will blink off.

Byte 8 (Time Interval Between Upward Scrolls) — indicates the length of time that each line of message text will remain on each line of the display before being replaced by the subsequent line of the message.

Byte 9 (Time Interval Between Right-To-Left Scrolls) — indicates the length of time that each character will remain at each character location as it moves across the display. Valid values for **Bytes 6 through 9** range from 1 (0.1 second) to 99 (9.9 seconds).

Byte 10 (First Message Text Byte) — is where the message to be displayed begins. As specified in paragraph 4.12, the first byte of the message to be displayed is the length byte. It must occupy Byte 10, followed by the balance of the message.

Reference 4.12 - PMD Stored Message Format
4.12.1 - Message Example

4.11 CODE 18 — STATUS/ID MESSAGE

FORMAT

COMMAND		REPLY	
BYTE NUMBER	VALUE	BYTE NUMBER	VALUE
1	HEX AA = Start of Message Byte	1	HEX AA = Start of Message Byte
2	6 Length	2	9 Length
3	B4–B7 = 4-bit Group Number B1–B3 = Not Used B0 = MSB of 9-bit Unit Number	3	B4–B7 = 4-bit Group Number B1–B3 = Not Used B0 = MSB of 9-bit Unit Number
4	8 Least Significant Bits of 9-bit Unit Number	4	8 Least Significant Bits of 9-bit Unit Number
5	18 Message Code	5	18 Message Code
6	Checksum (2 bytes)	6	Device Type: HEX 01 = 200 Master HEX 02 = 300 or 400 Master HEX 82 = 200 Slave HEX 83 = 300 or 3000 Slave HEX 8D = 3500 Slave
		7	Revision Code: ASCII Character for Revision Letter HEX 41 = Revision A HEX 42 = Revision B
		8	State: Active = 1, Non-Active = 0
		9	Checksum (2 bytes)

DESCRIPTION

This command requests status and ID information from a P3000 Slave display. The command **must** be sent to a specific display to get a reply. The (nonstandard) reply contains the requested information.

Reply Description:

Byte 6 (Reply Device Type) — identifies the addressed device as either a master or slave PMD. This byte will equal 83 to indicate that it is a P3000 Slave display.

Byte 7 (Reply Revision Code) — indicates the revision code letter of the software in the display and will be in the form of an ASCII character. (HEX revision codes shown in the table are examples only.)

Byte 8 (Reply State) — indicates whether the P3000 Slave is active or non-active.

Reference 4.2.2 - Active/Non-Active Slaves
4.9 - Select Active Slave

4.12 PMD MESSAGE FORMAT

The formats for message storage within a PMD master's memory and for messages sent from a control computer to a master or slave display is shown in Table 4-4. This is the structure of the "Message To Display" in Code 17. The beginning of the message is made up of option selection bytes. Depending on the message options selected, the number and meaning of option bytes vary. There are seven different message formats. Three of these formats pertain to master PMDs only.

Which of the four formats that pertain to slaves is appropriate depends upon the options required by the message. Table 4-5 relates the selected options to the formats shown in Table 4-4 (A)-(D). For example, a message with no options selected, would be structured as shown in 4-4 (A). A message that should scroll left would be formatted as in 4-4 (C).

Table 4-4. Message Format of PMDs

BYTE	1	2	3	4	5	6	n
FORMAT A	LENGTH BYTE (n)	CONTROL BYTE #1	MSG DATA ----------				LAST BYTE MSG/DATA
FORMAT B	LENGTH BYTE (n)	CONTROL BYTE #1	CONTROL BYTE #2	MSG DATA ----------			LAST BYTE MSG/DATA
FORMAT C	LENGTH BYTE (n)	CONTROL BYTE #1	CONTROL BYTE #2	SCROLL OPTIONS	MSG DATA ----------		LAST BYTE MSG/DATA
FORMAT D	LENGTH BYTE (n)	CONTROL BYTE #1	CONTROL BYTE #2	SCROLL OPTIONS	SCROLL TUNE	MSG DATA	LAST BYTE MSG/DATA

Table 4-5. Message Options Versus Message Formats

FORMAT A	Chained, Printout, Print On One Line, Send <CR><LR> At Message End Clear Display, Center Message
FORMAT B	Same as Format A, plus Energize Alarm, Blink Entire Message
FORMAT C	Same as Format B, plus Scroll up, Scroll Left, Repeat Message
FORMAT D	Same as Format C, plus Select Scroll Time Interval

NOTE: Slaves receiving formats which contain slave addresses (Formats E, F, and G shown in the PMD master manual) will ignore those slave addresses in the message.

4.12.1 Message Example

Figure 4-3 illustrates a “byte diagram” of a message example to show how bytes are utilized in message memory. The third through sixteenth bytes in this example represent the message data itself and are contained in the message/data bytes area shown in Table 4-4.

The column on the left shows the actual Hex bytes which make up the message. The other column is in decimal, binary, or ASCII, for ease of interpretation.

HEX CODE		
10	16	Indicates that the message text is 16 bytes long (Byte 1 in table 4-4)
10	00010000	Indicates the message is centered (Byte 2 in table 4-4). Up to 6 control bytes are used for each message (1 control byte per message minimum) *** Location of optional frame definition code for the P3000 Slave
41	A	‘A’ is the first character of the first line
20		<SPACE> byte
4D	M	
53	S	
47	G	
2E	.	
FF	FF	End of line marker for line 1
53	S	‘S’ is the first character of the second line
41	A	
4D	M	
50	P	
4C	L	
45	E	
FF	FF	End of line marker for line 2

Figure 4-3. Message Example Byte Diagram

.

As shown in Figure 4-3, every byte needed to represent the message counts as a byte of the message and is counted as part of the total size of the message. Notice that the length byte also counts itself.

4.12.2 Control Byte 1

Control byte one selects some of the options possible for the message. A diagram of this byte is shown in Table 4-6 to illustrate the definitions of the 8 bits of this byte. Table 4-7 designates how byte 2 of each message is read.

Table 4-6. Bit Diagram of Control Byte 1

B7	Chained Msg Bit
B6	Clear Display Bit
B5	Send to RS-232 Bit
B4	Center Message Bit
B3	On One Line Bit
B2	<CR><LF> Bit Repeat Chain Bit
B1	Control Character Bit
B0	Byte 3 Bit

NOTE: **B7** — Slave displays do not support chained messages. If this bit is set, the message will not be displayed.
B5, B3, & B2 — Refer to RS-232 port printouts on master PMD and are ignored by slaves.
B1— Set if message contains any ASCII control characters (HEX 00-1F). (Does not include time, date, or data set characters.)
B0 — Set to enable second options byte.

Table 4-7. Bit Designations for Control Byte 1

BIT NUMBER	IF BIT = 1	IF BIT = 0
B7	Message is Chained	Message is Not Chained
B6	B7 = 0 then Overlay Existing Msg B7 = 1 then Repeat Chain	Message Clears Display Chain Does Not Repeat
B5	Send Message to RS-232	Do Not Output Message
B4	Center Message	Message Not Centered
B3	Send on One Line (B5 must equal 1)	Send on Multiple Lines (B5 must equal 1)
B2	<CR><LF> at end of Message (B5 must equal 1)	No <CR><LF> at end of Message (B5 must equal 1)
B1	Message has Control Characters	No Control Characters
B0	Byte 3 Control Byte	No More Control Bytes Entire Msg Does Not Blink or Scroll No Relay Alarm Output Message Not Logged or Invisible Message Not Sent to Slave

4.12.3 Option Byte 2

Control byte one indicates whether the third byte of the message is a control byte (Control Byte 2). Control byte 2 will indicate if the message is to energize the alarm relay output, if the message is logged or invisible, if the message will scroll, and if the entire message is to blink. As noted, some of these options do not pertain to slave displays. A diagram is shown in Table 4-8 of control byte 2. Table 4-9 designates how byte 3 (as control byte 2) of a message is read.

Table 4-8. Bit Diagram of Control Byte 2

B7	Energize Alarm Relay Output
B6	Scrolled Message Bit
B5	Message Sent to Slave Bit Indicates 2 bytes after last control byte
B4	Blink Entire Message Bit
B3	Invisible Msg Bit
B2	Log Message Bit
B1	Not Used
B0	Not Used

NOTE: **B7**, **B3**, and **B2** are ignored by P3000 Slaves.

Table 4-9. Bit Designations for Control Byte 2

BIT NUMBER	IF BIT = 1	IF BIT = 0
B7	Message Energizes Alarm Relay Output	Message Does Not Energize Relay
B6	Message Scrolls Enable Scroll Options Byte	Message Does Not Scroll
B5	Message Sent to Slaves Enable Unit Number Bytes	Message Not Sent to Slaves
B4	Entire Message Blinks	Message Does Not Blink
B3	Message is Not Displayed	Display Message on Master
B2	Log Message on Data Log Stack	Do Not Log Message
B1	Not Used	(Default = 0)
B0	Not Used	(Default = 0)

4.12.4 Scroll Options Byte

As noted previously in 4.12.3, if control byte two indicates that a message will scroll, a third control byte (byte 4) is necessary to determine control options for scrolling. Table 4-10 shows a diagram of byte 4 as the scroll option control byte. Table 4-11 designates how byte 4 (as control byte 3) of a message is read.

Table 4-10. Bit Diagram of Control Byte 3

B7	Scroll Time Byte Enable
B6	Repeat Message Bit
B5	Display Lines to Scroll Msg On Bit
B4	Display Lines to Scroll Msg On Bit
B3	Display Lines to Scroll Msg
B2	Display Lines to Scroll Msg
B1	Scroll Msg Right to Left Bit
B0	Scroll Msg Up Bit

Table 4-11. Bit Designations for Control Byte 3

BIT NUMBER	IF BIT = 1	IF BIT = 0
B7	Message Contains Scroll Time Interval Information in Byte 5	Message Does Not Contain Scroll Time Interval
B6	Message Repeats	Message Does Not Repeat
B5	Message Scrolls on Line 4	Message Does Not Scroll on Line 4
B4	Message Scrolls on Line 3	Message Does Not Scroll on Line 3
B3	Message Scrolls on Line 2	Message Does Not Scroll on Line 2
B2	Message Scrolls on Line 1	Message Does Not Scroll on Line 1
B1	Scrolls Right to Left	Message Does Not Scroll Left
B0	Message Scrolls Upward	Message Does Not Scroll Upward

NOTE: B2– B5 — Select which lines of the display a scrolling message will be displayed on. For left-scrolling messages, one of these bits must = “1” and the other three must = “0”. For upward-scrolling messages, one, two, three, or four contiguous lines can be set.

4.12.5 Scroll Time Byte

If byte 5 is used as the scroll time byte, the contents of the byte will specify how often the P3000 Slave will shift the scrolled message, either upwards or left. The time is specified in units of 0.1 seconds.

4.13 MESSAGE TEXT

Message text is to be entered as the last part of the message. A non-scrolling message must have two or four lines of 0 to 40 (230 maximum) ASCII characters, each line terminated by HEX FF.

A scrolling message's text can be composed of any number of lines, each terminated by HEX FF. The total length of the message, including all control bytes and the size byte must be 235 characters or less. P3000 Slave scroll-up time interval can vary, but scroll-left time is fixed and cannot be changed.

4.13.1 Blinking Characters

Blinking of individual characters is coded into the message text by setting the most significant bit (B7) of the byte of the ASCII character to be blinked. Blink delimiters are not used in the stored message format. Also, note that time, date, and data set bytes have the most significant bit set, but cannot be made to individually blink.

4.13.2 Time and Date Characters

To enter the time into a message, enter the Hex character code for the time (HEX 81) eight times (to represent the eight time characters HH:MM:SS).

To enter the date into a message, enter the Hex character code for the date (HEX 82) nine times (to represent the nine date characters DD-MMM-YY).

If you enter too few characters to represent the entire time or date in a message, the right-most character(s) will be deleted from the message. For instance, entering 5 time characters will represent HH:MM only.

You may place the time and date next to each other. Two time or two date strings must be separated by a displayable non-time/date character.

Table 4-12. Character Codes For Time and Date

HEX 81	Character Code Used to Indicate Character of Time in a Message
HEX 82	Character Code Used to Indicate Character of Date in a Message

4.13.3 Variable Data Characters

Table 4-13 lists the character codes for all five characters of each of the four data sets maintained by the P3000 Slave displays. These codes can be entered in any order, anywhere in a message.

Table 4-13. Character Codes For Variable Data

CHARACTER CODES USED TO REPRESENT DATA SET # 1 CHARACTERS				
MSD				LSD
HEX 85	HEX 86	HEX 87	HEX 88	HEX 89
CHARACTER CODES USED TO REPRESENT DATA SET # 2 CHARACTERS				
MSD				LSD
HEX 8A	HEX 8B	HEX 8C	HEX 8D	HEX 8E
CHARACTER CODES USED TO REPRESENT DATA SET # 3 CHARACTERS				
MSD				LSD
HEX 8F	HEX 90	HEX 91	HEX 92	HEX 93
CHARACTER CODES USED TO REPRESENT DATA SET # 4 CHARACTERS				
MSD				LSD
HEX 94	HEX 95	HEX 96	HEX 97	HEX 98

To put variable data into a message via computer control, enter the Hex character code for the desired digit(s) for the desired data set(s) into the message at the desired location(s).

4.13.4 P3000 Slave Embedded Codes

The P3000 Slave reads embedded codes within the message text. These codes can change character size or specify the frame definition. Character size codes can be placed anywhere within message text. These codes toggle the character size between 2", 4", 6", 8", and 8" compressed characters. A frame definition codes sets up which LED “sticks” will display the message. This 6-byte code must be located where shown in figure 4-3. These codes are shown in the following table, Table 4-14.

Table 4-14. P3000 Slave Embedded Code Definitions

Character Size	ASCII Code	HEX Code
2"	<ESC><0>	1B 30
4"	<ESC><1>	1B 31
6"	<ESC><2>	1B 32
8"	<ESC><3>	1B 33
8" Compressed	<ESC><4>	1B 34
Frame Definition Code	Top Stick	Bottom Stick
<ESC><F>	## 2-digit number	## 2-digit number

In BASIC, <ESC> is programmed as CHR$(27), so an escape sequence to enable sticks 3 and 4 would be: CHR$(27)+”F”+”03"+”04". Note that this is an example for a BASIC program and will vary for other program languages. Also note that these codes instruct the P3000 only. Messages that include character size codes and frame definitions are displayable on the master and other kinds of slaves. All characters and digits within the codes are displayed on units other than the P3000 Slave. To avoid displaying these extra characters, set up the P3000 Slave message as invisible to the master. Program a separate message for master (and other slave) display.

4.14 COMPUTER INTERFACE SAMPLES

The following paragraphs, 4.14.1 and 4.14.2, show sample programs for computer interface command 02 (Display Packet Message). The sample display packet messages are for master displays only. The first sample shows a typical program using BASIC. The second example uses QUICKBASIC.

4.14.1 SAMPLE OF DISPLAY SLAVE PACKET MESSAGE IN BASIC

```
PROGRAM                                                    COMMENTS

 20   OPEN "com1:9600,n,8,1"  FOR RANDOM AS #1            sets RS-232 port for 9.6K baud, no parity, 8 data bits, 1 stopbit

 25   MSG(1)=170                                                    HEX AA, start of message byte
 30   MSG(2)=96                                          length of message (not including HEX AA)
 35   MSG(3)=0                                           4-bit group number/1 MSB of 9-bit unit number
 40   MSG(4)=0                                                      8 LSBs of 9-bit unit number
 45   MSG(5)=17                                          message code 17 = display slave packet message
 50   MSG(6)=0                                                      blink On
 55   MSG(7)=0                                                      blink Off
 60   MSG(8)=0                                                      scroll Up
 65   MSG(9)=0                                                      scroll Left
 70   MSG(10)=86                                                    message to display
 75   MSG(11)=0                                                     message control attributes
 80   MSG(32)=255                                                   end of line marker for line 1
 85   MSG(53)=255                                                   end of line marker for line 2
 90   MSG(74)=255                                                   end of line marker for line 3
 95   MSG(95)=255                                                   end of line marker for line 4

100   A$="FRONT AXLE 12500"                                         message to be displayed on line 1
105   B$="DRIVE AXLES 31440"                                        message to be displayed on line 2
110   C$="TRAILER AXLES 36000"                                      message to be displayed on line 3
115   D$="GROSS WEIGHT 79940"                                       message to be displayed on line 4

120   FOR I=1 TO 20:MSG(I+11)=ASC(MID$(A$,I,1)):NEXT I
125   FOR I=1 TO 20:MSG(I+32)=ASC(MID$(B$,I,1)):NEXT I              message 1-4 being set up in ASCII
130   FOR I=1 TO 20:MSG(I+53)=ASC(MID$(C$,I,1)):NEXT I              (note - message 1 starts as byte 10)
135   FOR I=1 TO 20:MSG(I+74)=ASC(MID$(D$,I,1)):NEXT I

140   GOSUB 500                                                     go to checksum routine
      END                                                           do you want to send message?
145   CLS:INPUT "SEND AGAIN?";Y$                                    if yes send string again
150   IF MID$(Y$,1,1)="Y" THEN 25
155   END

500   REM CHECKSUM ROUTINE
505   CKSUM=0                                                       checksum routine
510   FOR I=1 TO 95
515   IF I>1 THEN CKSUM=CKSUM XOR MSG(I)

520   PRINT #1,CHR$(MSG(I));:NEXT I                                 send message to comm port
525   PRINT #1, CHR$(CKSUM);CHR$(255-CKSUM)::RETURN
```

4.14.2 SAMPLE OF DISPLAY SLAVE PACKET MESSAGE IN QUICKBASIC*

MESSAGE TEXT	COMMENTS
ms1$ = "LINE 1 OF DISPLAY" + CHR$(255)	'CHR$(255) is end of line marker
ms2$ = "LINE 2 OF DISPLAY" + CHR$(255)	
ms3$ = "LINE 3 OF DISPLAY" + CHR$(255)	
ms4$ = "LINE 4 OF DISPLAY" + CHR$(255)	
messages$ = ms1$ + ms2$ + ms3$ + ms4$	'complete message text
meslength = LEN(message$) + 2	'message$ + control byte + meslength byte
comlength = meslength + 10	'total length less start byte
start = 170	'start of command message HEX AA
unit1 = 0	'group and unit number
unit2 = 0	'unit number
code = 17	'command code (SLAVE DISPLAY PACKET MESSAGE)
blinkon = 0	
blinkoff = 0	
scrollup = 0	
scrollleft = 0	
control = 0	
'calculate checksum	
checksum = 0	'calculate checksum
checksum = checksum XOR comlength	
checksum = checksum XOR unit1	
checksum = checksum XOR unit2	
checksum = checksum XOR code	
checksum = checksum XOR blinkon	
checksum = checksum XOR blinkoff	
checksum = checksum XOR scrollup	
checksum = checksum XOR scrollleft	
checksum = checksum XOR meslength	
checksum = checksum XOR control	
FOR I = 1 TO LEN(message$)	
checksum = checksum XOR ASC(MID$(message$,I,1))	
NEXT I	
OPEN "COM1:9600,N,8,1" FOR RANDOM AS #1	
PRINT #1, CHR$(start);	
PRINT #1, CHR$(comlength);	
PRINT #1, CHR$(unit1);	
PRINT #1, CHR$(unit2);	
PRINT #1, CHR$(code);	
PRINT #1, CHR$(blinkon);	
PRINT #1, CHR$(blinkoff);	
PRINT #1, CHR$(scrollup);	
PRINT #1, CHR$(scrollleft);	
PRINT #1, CHR$(meslength);	
PRINT #1, CHR$(control);	
PRINT #1, message$;	
PRINT #1, CHR$(checksum);	
PRINT #1, CHR$(255 - checksum);	

*QUICKBASIC is a registered trademark of Microsoft Corporation.

4.15 CONCLUSION

When interfaced (via an RS-232/RS-422 adapter) to the RS-422A Serial/ Repeater Port(s) of P3000 Slave(s), a computer can be the controlling force of the message display network. Using an individually developed program and specified hexadecimal character codes, the computer can send information to and receive information from all displays.

A control computer can send messages, including time, date, and variable data, to be displayed on one or more slaves. Slaves can be addressed individually or in groups (by using group addressing techniques or by using the activation/deactivation method). When an individual slave is addressed, that slave will send a reply to the computer.

5

ASCII Protocol

In this chapter....

5.0 INTRODUCTION TO ASCII PROTOCOL

All P3000 Slave Marquees can be set up to use either standard PMD protocol or ASCII protocol. If you plan to use the slave with ASCII protocol, this chapter will be vitally important to you.

In this chapter we will discuss the different commands that can be used in the ASCII Slave, their format and several examples. With this protocol you will not need, or be able to use, a PMD master to control the slave display. Any device that can send ASCII characters can be used to manage the slave display.

International character sets are available for any slave with ASCII protocol.

NOTE *ASCII communication will be conducted with 8 data bits, no parity, and 1 stop bit at 1200 or 9600 baud. Factory baud rate setting is 9600 baud.*

5.1 PREPARATION OF THE UNIT

All slave units are equipped with an RS-422A port. This is the port that will be used for reception of the ASCII commands to control the display. On the P3000 Slave, this port is located internally. The units will come to you set up for UTICOR protocol. To change them to ASCII protocol, you must change an internal switch setting. The location of the protocol select switch position is shown in paragraph 5.4.

The P3000 Slave is equipped with a repeater port. This port allows the P3000 Slave to echo the information received by the RS-422A Serial Port. Beside echoing the received information, the repeater also provides a signal boost for it. The slave units may be located 4000 feet (1200 meters) from one another.

Each unit is assigned a two part unit address consisting of a group and a unit number. The unit address is assigned to the unit with two dip switches under the access plate on the back of each unit.

The eight position DIP switch (SW1) defines the first eight bits of the unit number. The nine position DIP switch (SW2) assigns the ninth bit of the unit number and the four bits of the group number. There are three switches on the nine position DIP switch (SW2, positions 2, 3, and 4) that are used to select the International Character Sets. The other position (position nine) of the nine position switch is used to indicate BCD or Binary interpretation. Refer to table 2-1 for complete details of these switches.

When the BCD/Binary interpretation switch is open, the numbers represented by the dip switches are interpreted as BCD digits. When it is closed, the dip switches are interpreted as binary bits. In BCD interpretation mode, the group number can range from 0–9 and the unit number from 0–199. In Binary interpretation mode, the group number can range from 0–15 and the unit number can range from 0–511.

After the unit's identification has been determined and all physical connections and adjustments have been made, you are ready to power the unit up. The unit's identification will only be read during the power-up sequence. When the unit is powered it will come up with an initial message. This will be a two line message consisting of some or all of the following information: Software revision; unit address; and RS-422 serial link baud rate. (There is a minimum of 2 messages lines on the P3000 Slave).

The power-up sequence gives the following unit parameters their initial values.

Blink On Interval	1/2 second
Blink Off Interval	1/2 second
Scroll Interval	2/10 second
Blink Mode	Off
Center Mode	Off
Delimited Blink	Off
New Line	On
Wrap	On

These values can be changed through ASCII commands.

5.2 TERMINAL OPERATION

The ASCII slave accepts and displays information one character at a time. This type of operation is similar to most terminals. The following ASCII codes are accepted by the unit. All other codes are simply thrown away. Please note that the ASCII circumflex **^** character is not accepted. This character is used to start different commands usable with this particular protocol.

Table 5-1. Valid ASCII Characters (1 of 2)

DECIMAL/ HEXADECIMAL VALUE	CHARACTER and DESCRIPTION (if necessary)
32/20	(Space)
33/21	! (Exclamation Point)
34/22	“ (Double Quote)
35/23	# (Number/Pound)
36/24	$ (Dollars)
37/25	% (Percent)
38/26	& (Ampersand)
39/27	‘ (Single Quote)
40/28	((Left Parenthesis)
41/29	) (Right Parenthesis)
42/2A	* (Asterisk)
43/2B	+ (Plus)
44/2C	, (Comma)
45/2D	- (Hyphen)
46/2E	. (Period)
47/2F	/ (Forward Slash)
48/30	0
49/31	1
50/32	2
51/33	3
52/34	4
53/35	5
54/36	6
55/37	7

DECIMAL/ HEXADECIMAL VALUE	CHARACTER and DESCRIPTION (if necessary)
56/38	8
57/39	9
58/3A	: (Colon)
59/3B	; (Semicolon)
60/3C	< (Less Than)
61/3D	= (Equals)
62/3E	> (Greater Than)
63/3F	? (Question Mark)
64/40	@ (At)
65/41	A
66/42	B
67/43	C
68/44	D
69/45	E
70/46	F
71/47	G
72/48	H
73/49	I
74/4A	J
75/4B	K
76/4C	L
77/4D	M
78/4E	N
79/4F	O

Table 5-1. Valid ASCII Characters (2 of 2)

DECIMAL/ HEXADECIMAL VALUE	CHARACTER and DESCRIPTION (if necessary)
80/50	P
81/51	Q
82/52	R
83/53	S
84/54	T
85/55	U
86/56	V
87/57	W
88/58	X
89/59	Y
90/5A	Z
91/5B	[(Left Bracket)
92/5C	\ (Backslash)
93/5D	] (Right Bracket)
95/5F	_ (Underscore)
96/60	‘ (ASCII Grave)
97/61	a
98/62	b
99/63	c
100/64	d
101/65	e
102/66	f
103/67	g
104/68	h

DECIMAL/ HEXADECIMAL VALUE	CHARACTER and DESCRIPTION (if necessary)
105/69	i
106/6A	j
107/6B	k
108/6C	l
109/6D	m
110/6E	n
111/6F	o
112/70	p
113/71	q
114/72	r
115/73	s
116/74	t
117/75	u
118/76	v
119/77	w
120/78	x
121/79	y
122/7A	z
123/7B	{ (Left Brace)
124/7C	| (Broken Vertical Bar)
125/7D	} (Right Brace)
126/7E	~ (ASCII Tilde)

BLINK DELIMITERS

The ASCII characters **[** and **]** are used as the blink on and blink off delimiter characters respectively. When a blink delimiter is received, it causes the blink character status to be setup accordingly. A blink on delimiter will set it up to indicate blink characters received and a blink off delimiter will set it up to indicate not to blink characters received. These delimiters are only valid when using the U.S. character set. To blink individual characters with the other character sets, use the ^Xn command.

WRITING CHARACTERS TO THE DISPLAY

When a character is written to the display, it is written to the current cursor position. The cursor is an invisible cursor whose position the unit keeps internally. After the character has been written to the display, the cursor is advanced one character.

Whether or not a character blinks when it is written to the display depends upon the blink status most recently set up by a blink delimiter. The result of writing a carriage return to the display is dependent upon the unit's current new line setting. When the new line setting is on, the cursor is advanced to the left-most column of the next display line. If this line is past the bottom of the display, the contents of the display is shifted up one line, the bottom line of the display cleared, and the cursor positioned on the left-most column of the bottom line. When the new line setting is off the cursor is advanced to the beginning of the current.

After a character is written to the display, the cursor is advanced to the next character on the display. If the cursor is not advanced past the end of the line, then nothing more is done. What happens to the display and its cursor when it is advanced past the end of a line is dependent upon the unit's current wrap setting. When wrap is on, this indicates that the cursor should be advanced to the front of the next line when it is advanced past the end of the line. If the next line is a valid display line, the cursor is simply positioned on the next line. When the cursor is advanced past the end of the bottom display line and a character is written, the contents of the display is shifted up one line and that character is written at the start of the bottom line.

When the cursor advances past the end of a line and wrap is off, the cursor is simply positioned at the end of the line again. The next character written overwrites the character at the end of the line.

5.3 OPERATING COMMANDS

The ASCII Slave has several commands which are considered advanced operation features for the unit. Each of these commands are preceded by a circumflex (**^**). That is why the unit will not display that character. Every time that the unit receives the ASCII code for a circumflex, it looks for a

command to follow it. If this symbol is received while the unit is still reading another command, the first command is ignored and the command following the second circumflex will be executed.

Following is a list of the different valid ASCII commands. It should be noted that all of these commands will be ignored by the unit unless it has been selected by a **^A** command.

^Agguuuu	=	Select Unit
^Bn	=	Select Blink Mode
^Cn	=	Select Center Mode
^Dn<message text><CR>	=	Display Scrolling Text
^dCc	=	Select Character Color
^En	=	Reset Display
^Gbbcc	=	Select On/Off Rate
^Hrrcc	=	Position Cursor
^In	=	Select New Line
^Jn	=	Select Wrap
^Kn	=	Select Character Size
^Ln	=	Select Number of Sticks per Line
^Mrrcc	=	Position Cursor Without Clearing the Line
^Xn	=	Blink Delimiters On/Off

^Agguuuu SELECT UNIT

This command selects which unit(s) will process the ASCII commands sent. It allows multiple units to be connected and addressed. These units can be addressed as a whole, as a subset, or as individual units. Only units that have been selected process commands.

gg = a 2-digit group number
uuuu = a 4-digit unit number

For width, pad the number with zeroes (i.e., for unit 45, the number would be 0045). All units always process all **^A** commands to see if they have been selected or deselected. A unit is deselected by not being selected in a **^A** command.

There are three basic rules for selecting units.

1. Group x and Unit x selects only the unit with matching numbers.
2. Group x and Unit 0 selects all units in group x.
3. Group 0 and Unit 0 selects all units.

^Bn SELECT BLINK MODE

This command indicates to the display that all text on the display should blink.

n = 0 = turn blink off
n = 1 = turn blink on

^Cn SELECT CENTER MODE
This command allows the user to center text on the display.

n = 0 = turn centering off
n = 1 = turn centering on

^Dn<message text><CR> DISPLAY SCROLLING TEXT
This command lets the host scroll data from right to left on a display line. The line that the cursor is on when this command is accepted as the line the text scrolls on. Prior to the text being scrolled onto the line, the line is cleared of all data. The <message text> portion of the command consists of any printable ASCII character mentioned in Table 5-1. This portion of the command can consist of no more than 255 characters. On the P3000, the <message text> portion can also include the command to change character size, **^Kn.** Each three change character size packets count as two characters toward the 255 maximum.

n = 0 = no repeat
n = 1 = repeat
<CR> = ASCII carriage return (0D HEX, 13 DEC)

Once the text begins to scroll, the terminal cursor is positioned on the line as if the cursor had been advanced there from another. Scrolling messages are shifted up with any other terminal text when the terminal cursor is advanced past the display bottom. When scrolling text does not repeat, the text is scrolled onto the display once and then scrolled off the display. When scrolling text repeats, each time the end of the text is met, a space is shifted in before the text repeats in order to separate the beginning from the end of the text. On the P3000 Slave, the scroll rate is fixed at a display dependent value.

On the P3000 Slave, blinking anywhere on the display is not possible when there is a scrolling message displayed. The blink delimiters **[** and **]** or the ^Xn command are ignored within scrolling text. Scrolling text is terminated and the line it used cleared when a character is written to the display terminal on the line the scrolling text occupies.

^dCc SELECT CHARACTER COLOR
This command is used to select the color of the message's characters (if you have a unit with the Tri-Color option).

^dCc c = 1 = red
c = 2 = green
c = 3 = yellow

Characters received prior to this command will be red. The last select color command in a scrolling message determines the starting color for

the next scrolling message or static text entered if no other select color command is sent.

^En RESET DISPLAY
This command performs clear and/or reset of the selected unit. The user can specify which level of reset to perform.

n	= 0 =	clear the display and home the cursor
n	= 1 =	clear the display, home the cursor, and reset all parameters modified by ASCII protocol
n	= 2 =	clear the display and leave the cursor at its current position
n	= 3=	clear the line and set the cursor to the beginning of the line

The line consists of one to four sticks determined by the sticks per line parameter.

^Gbbcc SELECT ON/OFF RATE
The user selects the rate at which the display will blink on and off. The valid range is between 1 and 99. Values less than 10 must be padded with zeroes.

bb	= 01 - 99 blink on interval
cc	= 01 - 99 blink off interval
01	= .1 second
99	= 9.9 seconds

^Hrrcc POSITION CURSOR
This command allows the user to position the cursor anywhere on the display. The values for row and column must be within the range for the display being used.

rr	= 01 - 04 row...valid range for 200S/300S displays
cc	= 01 - 20 column...valid range for 200S/300S displays
rr	= 01 - 04 row...valid range for P3000*
cc	= 01 - 40 column...valid range for P3000*
	* Dependent on size of display

^In SELECT NEW LINE
This command controls how a carriage return sent to the display will effect the cursor. If new line is on, then a carriage return will cause the cursor to be advanced to the beginning of the next line. If new line is off, then a carriage return will cause the cursor to be advanced to the beginning of the line that it is currently on. The default value for New Line is ON.

n	= 0 = New Line is off
n	= 1 = New Line is on

^Jn SELECT WRAP

This command controls how the cursor will advance past the end of a display line. When wrap is on, the cursor will advance to the beginning of the next line. When wrap is off, the cursor will remain at the end of the line the cursor is currently on.

n = 0 = wrap is off
n = 1 = wrap is on

^Kn SELECT CHARACTER SIZE

This command lets the host select the displayed character size and stays in effect until another size command is received or the unit loses power. When power is reapplied, the dip switches decide character size. If there are not enough sticks in the current line to display the character size commanded, the largest character that fits is displayed. This is the only command that can be within a scroll command sequence. The last character size change command within a scroll command sequence specifies the default character size for future static messages. The format for this command is as follows:

n = 0 = two-inch characters
n = 1 = four-inch characters
n = 2 = six-inch characters
n = 3 = eight-inch characters
n = 4 = eight-inch compressed characters (4"x8")

^Ln SELECT NUMBER OF STICKS PER LINE

This command selects the number of sticks per display line and takes effect only when the cursor position is such that there are enough sticks above it to form the line and there are no characters on the current line. If characters exist on the current line, the command takes effect when a new line is formed. The stick the cursor occupies becomes the bottom stick of the line. This command also takes effect when it is the first command after power up or immediately after a Clear/Home/Reset, **^E1**, command. The format of the command is:

n = 0 = one stick per line
n = 1 = two sticks per line
n = 2 = three sticks per line
n = 3 = four sticks per line

^Mrrcc POSITION CURSOR WITHOUT CLEARING THE LINE

This command positions the cursor without clearing the line. The valid values for the variables are relative to two-inch characters and where they would be positioned. If the value for either variable is less than 10, that

value must be padded with a leading zero. Characters received after this command overwrite characters already on the display. The character size in effect when this command is received is usually be the same after it is received. The only exception is if the system character size is too big for the line the cursor was moved to. Then the system character size will be changed to the largest character that fits in the line. Once the cursor is moved, the character size may be changed. Characters may overwrite characters of a different size already on the display. Overwritten characters will not appear if the line is ever shifted up on the display. Since internally there is a one-to-one correspondence between characters received and characters on the display , even those of different size, some of the characters that appear whole on the display may disappear when the line is shifted up. The system value for number of sticks per line will remain the same after this new command is sent but the number of sticks for the line moved to will remain the same.

If the stick specified in the command is part of a scrolling line or on a line with centered text, the result will be the same as if the position cursor command (**^Hrrcc**) had been received.

rr = 01 - 04...valid range for P3000*
cc = 01 - 40...valid range for P3000*
* Dependent on the size of display

^Xn BLINK DELIMITER

The ^Xn command lets you turn blink on and off so that only certain characters on the display blink. If the U.S. character set is selected, the '[' and ']' characters can still be used. The international character will be displayed in the other character sets.

n = 0 = blink off
n = 1 = blink on

All variables in these commands that are represented by two or more of the same letter must be padded by leading zeroes if the desired value does not have enough digits to replace all of the variable letters.

5.4 ASCII SLAVE CONFIGURATION

The P3000 comes from the factory set for UTICOR protocol. However, it has the ability to be set to ASCII protocol. This portion of the manual discusses how to set up the P3000 Slave for ASCII protocol. ASCII protocol is selected by Switch 3, position 4.

In order to set up your P3000 Slave for ASCII Mode, you must first remove all power to the unit. Once power is off, remove the back access plate of the unit to access the control board. As the unit comes from the factory, the switch will be set in the “OPEN” position. You must move the switch to the “CLOSED” position. After the switch is changed, replace the access plate, apply power to the unit, and the P3000 Slave is ready to be used.

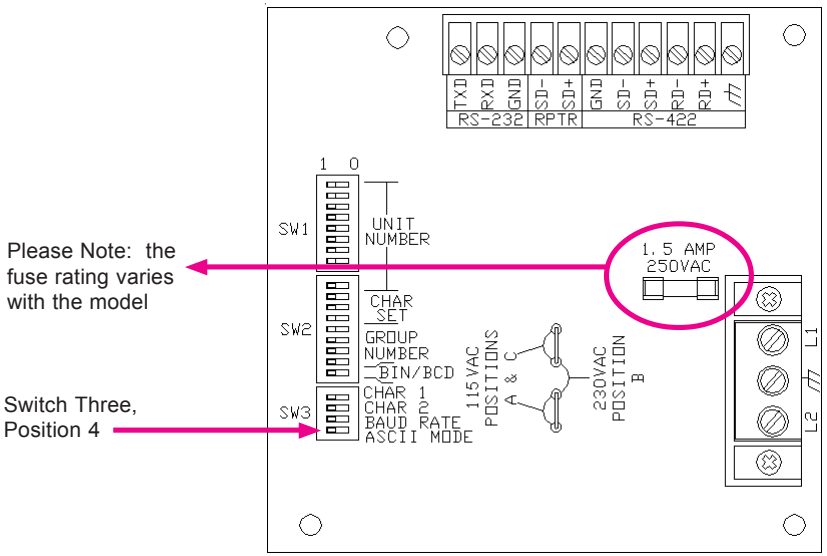


Figure 5-1. P3000 Back View with Access Plate Removed — Switch 3, Position 4

5.5 SAMPLE MESSAGES

In this section we will give you samples of some messages with an ASCII format.

The first example can be sent to several types of slaves, including the P3000 Slave Marquee. The first message will be sent to group 04, unit 0312. This message will be centered with the message “Bin 6 is EMPTY.” The word “EMPTY” will be flashing.

^A040312^C1Bin 6 is [EMPTY] for U.S. character set
or
^A040312^C1Bin 6 is ^X1EMPTY^X0 for the other sets

It should be noted that all messages after this one, except scroll left messages, will be centered after this until another **^C** command is received turning centering off.

The second sample message provides an example of a message that is designed for another type slave display. It can be sent to a P3000 Slave also, but some commands will be ignored.

^A070000^F03^B1^H0201^D1Current Regulator Out of Range/Unit #3<CR>

The P3000 can receive this message, but the **^F** command, to set the scroll rate would be ignored due to the fixed scroll rate. Also, the positioning of the cursor can be to any column. The message will start on the right side of the display regardless.

The third sample message will be for a P3000 Slave only. This message will be sent to the unit addressed group 45, unit 1234. A Clear/Home/Reset command is sent to clear the display and make the display willing to accept the Sticks per Line command **^L**. Each line will be 4 sticks high. The first word (ALERT) will be in compressed 8-inch high characters*. The rest of the message will be displayed in 4-inch characters*.

* Provided there are enough sticks to accommodate the character size.

^A451234^E1^L3^K4ALERT^K1 Valve 3 is open

If the message were to have another line, after a carriage return, the cursor would be placed on the next line. This next line would be located four sticks lower than the bottom of the last line. This is due to having selected four sticks per line.

In conclusion, the different options that your messages have are very versatile. You can operate the unit in many different ways to get the information necessary to the people who need it.

The page intentionally left blank.

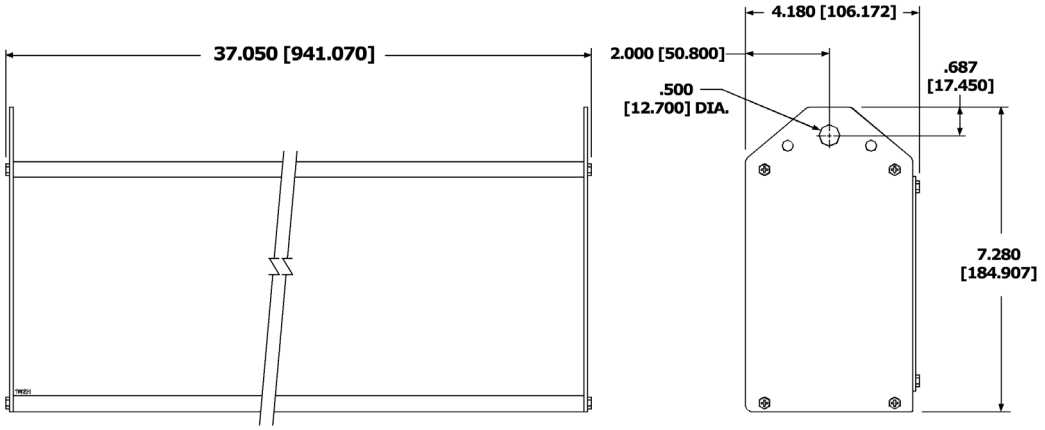
Appendix A

In this appendix....

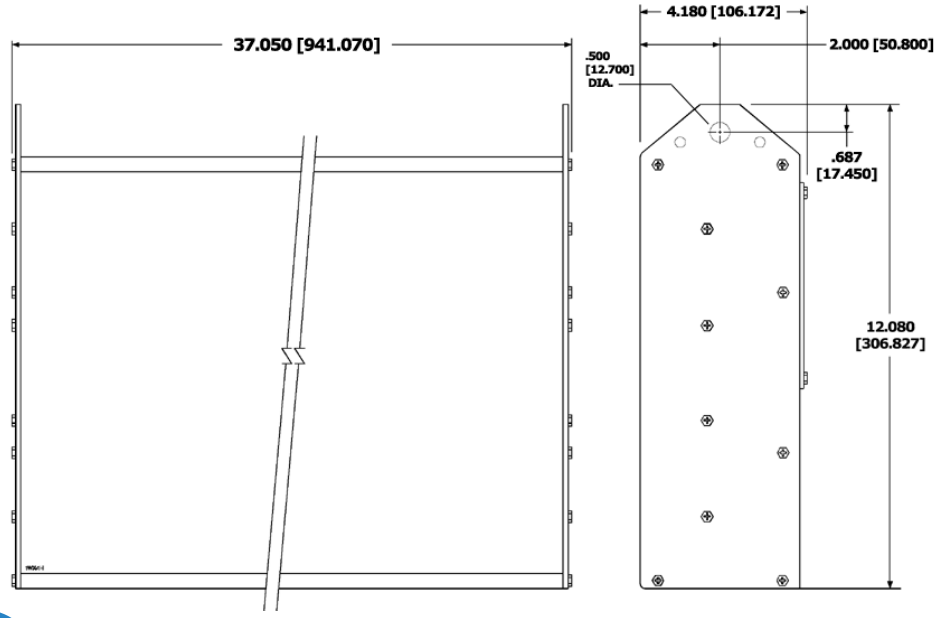
OUTLINE DIMENSIONS

The following figures provide information necessary for mounting the P3000 Marquee Slave Displays.

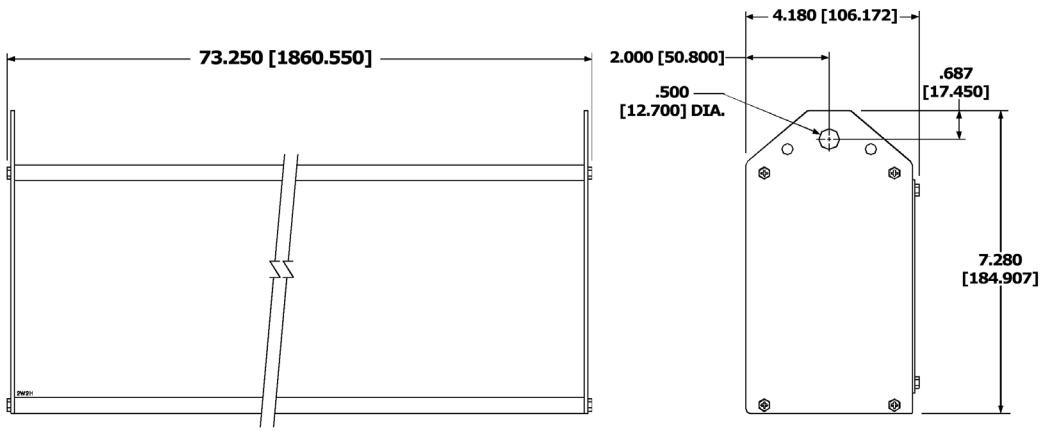
1W x 2H



1W x 4H



2W x 2H


73.250 [1860.550]
4.180 [106.172]
2.000 [50.800]
.500
[12.700] DIA.
.687
[17.450]
7.280
[184.907]

2W x 4H

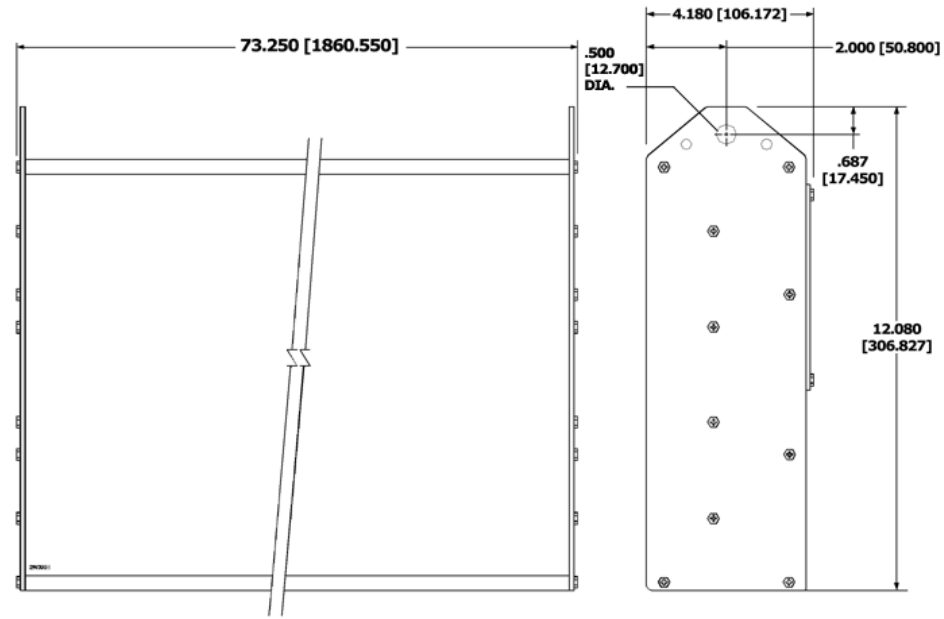

73.250 [1860.550]
4.180 [106.172]
2.000 [50.800]
.500
[12.700]
DIA.
.687
[17.450]
12.080
[306.827]

Table A-1 below shows the P3000 Slave Marquee dimensions and configurations. All P3000 Slave Marquee displays have a 4.18" unit depth. Unit weights are found in the general specifications section.

Note: The 8-inch narrow characters are denoted by “8N.” These characters are half the width of the other 8-inch characters.

Table A-1. P3000 Part Numbers, Dimensions, and Configurations.

Part Number	Unit Width	Unit Height	Display Area		Character Height (")	Characters Per Line	Number of Lines
			Width	Height			
1W2H	37.05"	7.28"	36"	4.8"	2/4	20/10	2/1
1W4H	37.05"	12.08"	36"	9.6"	2/4/6/8/8N	20/10/6/5/10	4/2/1/1/1
2W2H	73.25"	7.28"	72"	4.8"	2/4	40/20	2/1
2W4H	73.25"	12.08"	72"	9.6"	2/4/6/8/8N	40/20/13/10/20	4/2/1/1/1

ERROR MESSAGES

The P3000 Slave Marquee will return error message — either on its display or in computer i\control command message replies — when problems occur during operation. The following sections cover the error messages sent by the P3000 Slave.

PMD MASTER CONTROL ERRORS

No Communications
This message indicates that communications between a Master PMD display and a P3000 Slave has been broken.

Once a P3000 Slave has received time and date information from a PMD Master display, the slave will expect to receive this information every one second from this point on.

After seven seconds lapse since receiving this information, the P3000 Slave will display the “NO COMMUNICATION” message until time and date information is received or a new message is sent. If time/date data is received, the display will clear the error message. If a messages is sent, this message will be displayed.

NOTES: Communication between a master and slave is temporarily terminated when a PMD Master’s memory is being loaded.

When switching from master control to computer control, a slave should have power removed and then reapplied.

COMPUTER CONTROL ERRORS

Error Code 1
Checksum Error—returned if the checksum received at the end of a command does not agree with the checksum the display calculated as it received the message.

Error Code 2
Timeout Error—returned if control computer waits too long between sending characters once it has begun a message. Once a message has begun, no more than 800 msec. should be allowed between characters. If the slave detects this timeout, it will return the standard reply with Error Code 2 and will ignore the message than was being transmitted.

Error Code 3
Invalid Message Code—returned if the message code sent by the control computer is an invalid number.

Error Code 8
Invalid Message Length—returned in reply to Code 17 if message to be displayed contains a length byte of greater than 235.

XOR CHECKSUM

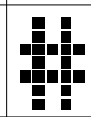
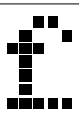
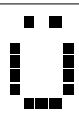
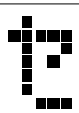
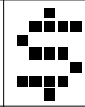
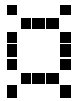
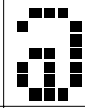
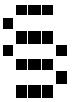
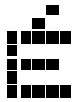
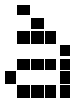
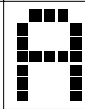
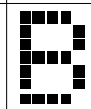
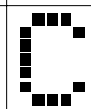
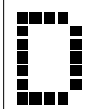
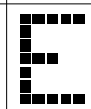
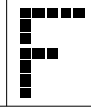
P3000 Slaves use the XOR (Exclusive-OR) communications error detection code when communicating via computer control.

The XOR checksum of a message for the P3000 Slave computer interface applications is derived as follows:

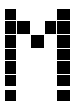
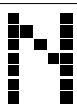
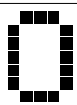
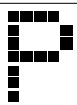
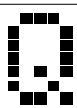
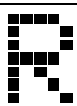
The length byte is XORed with the unit number bytes. The result is XORed with the first data byte, etc. until the XOR of the last data byte is taken. The result of this XOR operation is the first byte of the two-byte XOR checksum. The one's complement of the first byte becomes the second byte of the checksum. If, for instance, the first byte happens to be 06 HEX (MSB), then the two-byte XOR checksum would be 06F9 HEX (LSB).

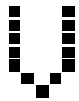
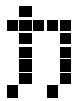
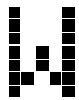
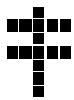
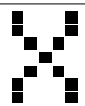
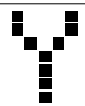
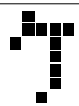
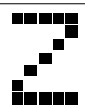
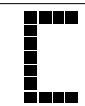
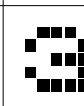
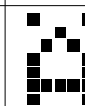
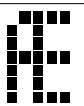
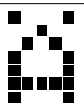
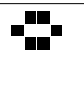
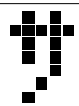
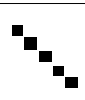
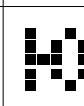
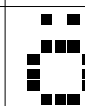
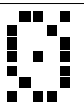
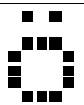
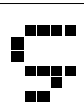
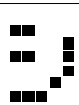
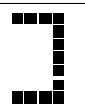
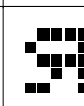
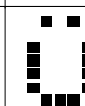
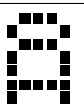
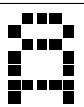
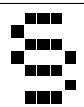
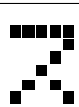
INTERNATIONAL CHARACTER SETS

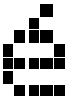
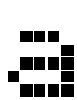
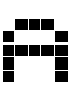
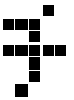
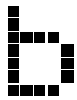
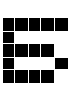
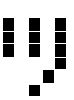
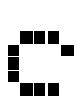
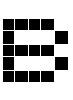
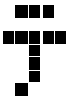
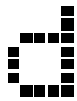
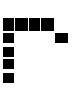
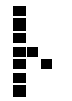
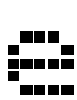
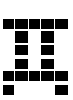
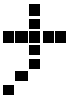
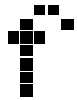
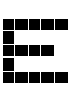
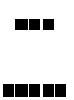
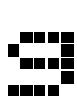
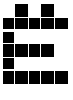
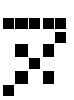
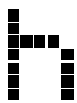
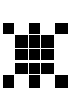
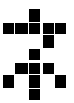
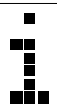
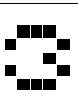
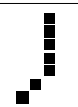
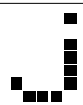
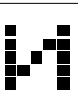
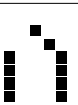
The P3000 Slaves display messages in 7 international character sets in addition to the U.S. character set. The slave is set to the specific character set on positions 2, 3, and 4 on Switch Two (see pages 2-6 and 2-7 of this manual). The slave will display messages according to the ASCII conversion chart on the following pages. To program messages (into a master display or the computer) in a non-U.S. character set, refer to the ASCII conversion chart. Enter the ASCII character or code equivalent to the non-U.S. character desired. Blank areas on the chart indicate no change from the American set. If no character is shown for the character set in use, the American character is displayed. For example, when using the English character set, enter the "#" character (Program Mode) or HEX 23 (Computer Interface Mode) to program and display the "£" character. All international character sets use the standard ASCII codes. The programming terminal always shows only the American character set. To check your messages, use the View command of the Program Mode.

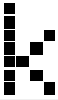
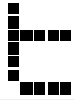
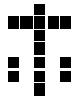
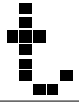
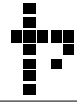
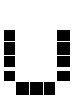
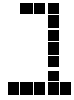
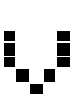
	AMERICA	CYRILLIC	GERMANY	ENGLAND	DENMARK	SWEDEN	FRANCE	KANA
#								
$ 36								
@ 64								<SPACE>
A 65								
B 66								
C 67								
D 68								
E 69								
F 70								

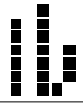
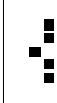
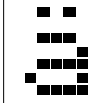
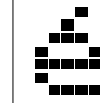
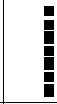
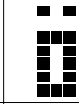
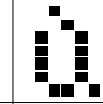
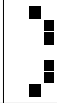
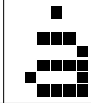
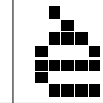
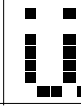
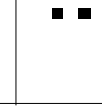
P3000 Slave Marquee

	AMERICA	CYRILLIC	GERMANY	ENGLAND	DENMARK	SWEDEN	FRANCE	KANA
G 71								
H 72								
I 73								
J 74								
K 75								
L 76								
M 77								
N 78								
O 79								
P 80								
Q 81								
R 82								

	AMERICA	CYRILLIC	GERMANY	ENGLAND	DENMARK	SWEDEN	FRANCE	KANA
S 83								
T 84								
U 85								
V 86								
W 87								
X 88								
Y 89								
Z 90								
[91								
\ 92								
] 93								
^ 94								

	AMERICA	CYRILLIC	GERMANY	ENGLAND	DENMARK	SWEDEN	FRANCE	KANA
95								
96								
97								
98								
99								
100								
101								
102								
103								
104								
105								
106								

	AMERICA	CYRILLIC	GERMANY	ENGLAND	DENMARK	SWEDEN	FRANCE	KANA
k 107								
l 108								
m 109								
n 110								
o 111								
p 112								
q 113								
r 114								
s 115								
t 116								
u 117								
v 118								

	AMERICA	CYRILLIC	GERMANY	ENGLAND	DENMARK	SWEDEN	FRANCE	KANA
w 119								
x 120								
y 121								
z 122								
{ 123								
| 124								
} 125								
~ 126								

B

Appendix B

In this appendix....

— Ethernet Interface

P3000 Slave Marquee

The Ethernet Converter allows you to connect a P3000 to an Ethernet Network.

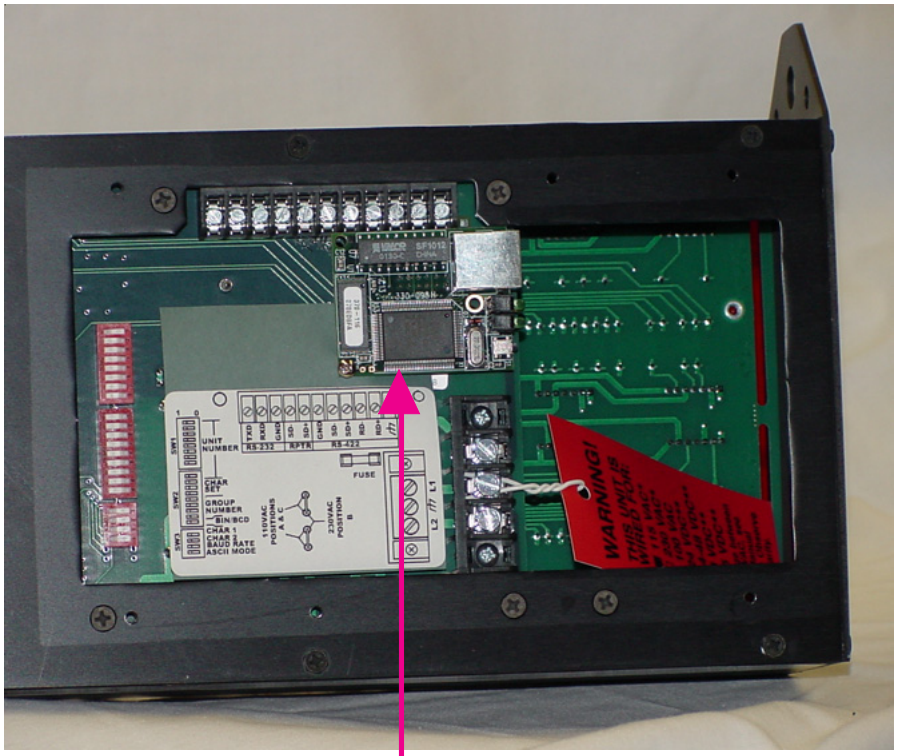
This appendix to the P3000 Slave Marquee Manual will describe the Ethernet Interface and familiarize you with its features.

Included with your unit is a CD with the following Lantronix software applications:

- DeviceInstaller.exe
- DeviceComm.exe (Windows 2000, NT, and XP operating systems only)

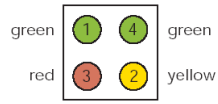
If you use Windows 95 or Windows 98, you will need Comredir.exe instead of DeviceComm.exe. Please call UTICOR Technical Support.

Use Lantronix's DeviceInstaller and DeviceComm Manager Software to configure the Ethernet Interface. These software applications enable you to communicate with and configure the P3000 on your Ethernet network. Simple instructions are provided in this manual to help you get started.



Ethernet Interface

Connectors, Wiring, and Indicators



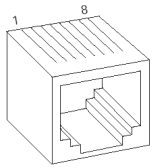
Status LEDs

The Ethernet Interface has 4 status LEDs located on the top of the unit. The LEDs are shown in the diagram to the left. LED 1 is a green LED indicating the status of Port 1. LED 2 is a yellow LED indicating the status of Port 2. LED 3 is a red diagnostic LED, and LED 4 is a green Network Link Status indicator. Refer to the table below for a description of the Status LED funtions.

LED	Description	LED Functions
1	Serial Port Chan 1 Status (see note 1, below)	Lights solid green to indicate Channel 1 is idle. Blinks green to indicate Channel 1 is connected to the network and active.
2	Serial Port Chan 2 Status (see note 2, below)	Lights solid yellow to indicate Channel 2 is idle. Blinks yellow to indicate Channel 2 is connected to the network and active.
3	Diagnostics	Blinks or lights solid red in combination with the green (Channel 1) LED to indicate diagnostics and error detection. Red solid, green (Channel 1) blinking: 1x: EPROM checksum error 2x: RAM error 3x: Network controller error 4x: EEPROM checksum error 5x: Duplicated IP address on the network* 6x: Software does not match hardware* Red blinking, green (Channel 1) blinking: 4x: Faulty network connection* 5x: No DHCP response received*
4	Network Link Status	Lights solid green to indicate network port is connected to the network.
*non-fatal error Note 1: This port is connected internally to the P3000 Note 2: This port is not used on the P3000		

RJ45 Connector

The RJ45 10BASE-T Ethernet Connector is located on the top of the Ethernet Interface. This connector is used to connect to the Ethernet.



Pin	Signal
1	Tx+
2	Tx-
3	Rx+
4	None
5	None
6	Rx-
7	None
8	None

Getting Started

This section covers the required steps to get the **P3000** on-line and working. There are two basic methods used to log into the P3000 and set up the IP address:

- Network Port Login: Make a Telnet connection to the network port (9999).
- Lantronix's DeviceInstaller and DeviceComm Software applications provided on the CD shipped with the unit.

It is important to consider the following points before logging into and configuring the Device Server:

- The P3000's IP address must be configured before a network connection is available.
- Only one person at a time may be logged into the network port. This eliminates the possibility of several people simultaneously attempting to configure the P3000.
- Network port logins can be disabled. The system manager will not be able to access the unit. This port can also be password protected.

Setting the IP Address

The Ethernet Interface's IP address must be configured before a network connection is available. If the IP address was not set automatically via DHCP, set it now using a network login and the setup (configuration) menu.

DHCP Naming

The DHCP name of the P3000 can be changed. The default name of the P3000 is Cxxxxxx, where xxxxxx is the last 6 digits of the Mac address. This option can be changed to LTXdd, where 0.0.0.dd is the IP address assigned (dd should be a number between 1 and 99). For example, if the IP address is set to 0.0.0.5, the resulting DHCP name is LTX05.

A DHCP name of the customer's own choosing (up to 8 characters) can also be designed. This option can be set in the server configuration menu.

Figure 1: Server Configuration Menu

```
Change DHCP device name (LTRX) ? (N) Y
Enter new DHCP device name : LTRXYES
```

Network Port Login

The ARP method is available under UNIX and Windows-based systems. The P3000 will set its address from the first directed TCP/IP packet it receives.

1 On a **UNIX** host, create an entry in the host's ARP table using the intended IP address and the hardware address of the P3000, which is found on the product label.

Figure 2: ARP on UNIX

```
arp  -s 191.12.3.77  00:20:4a:xx:xx:xx
```

In order for the ARP command to work on **Windows**, the ARP table on the PC must have at least one IP address defined other than its own. If the ARP table is empty, the command will return an error message. Type ARP -A at the DOS command prompt to verify that there is at least one entry in the ARP table.

If the local machine is the only entry, ping another IP address on your network to build a new entry in the ARP table; the IP address must be a host other than the machine on which you are working. Once there is at least one additional entry in the ARP table, use the following command to ARP an IP address to the P3000:

Figure 3: ARP on Windows

```
arp  -s 191.12.3.77  00-20-4a -xx-xx-xx
```

2 Now open a Telnet connection to port 1. The connection will fail quickly (3 seconds), but the ECM will temporarily change its IP address to the one designated in this step.

Figure 4: Telnet to Port 1

```
telnet  191.12.3.77 1
```

3 Finally, open a Telnet connection to port 9999 and set all required parameters.

Figure 5: Telnet to Port 9999

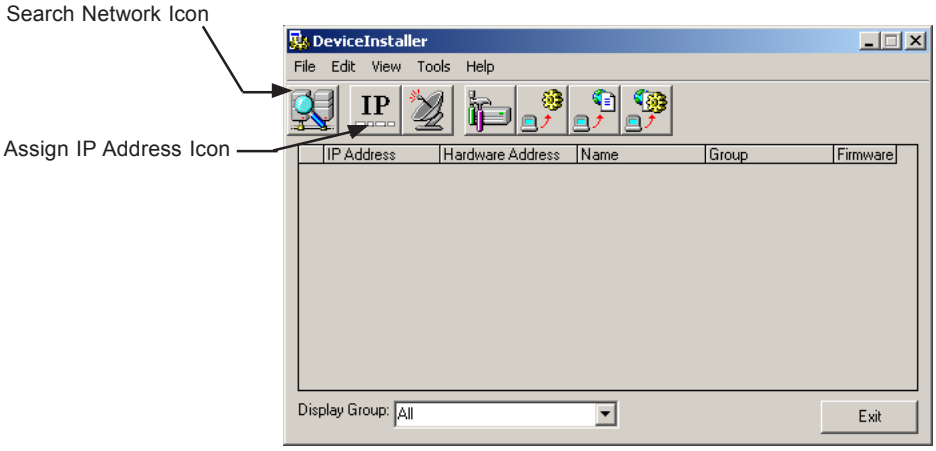
```
telnet  191.12.3.77  9999
```

Note: *This IP address is temporary and will revert to the default value when the P3000's power is reset, unless you log into the P3000 and store the changes permanently.*

Device Installer Login

Installation

DeviceInstaller.exe is a device server configuration utility and is found on the CD included with the Ethernet Converter Module. Place the CD in the drive and execute “setup.exe”.

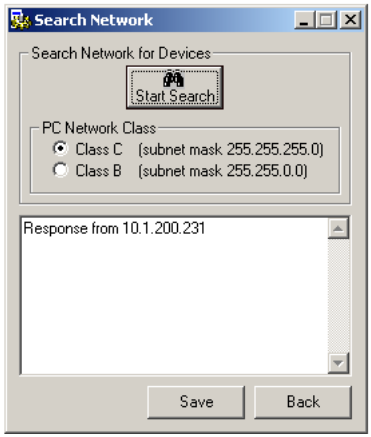


1 Open the DeviceInstaller application. The window shown above will appear. If the target device is already assigned an IP Address and is on the network click on the **Search Network** icon or click on **File > Search Network.** (DHCP must be running for **Search Network** to find the device.) The window shown to the right will appear.

2 Select the **PC Network Class** and then click on the **Start Search** button. (Class C is the default.)

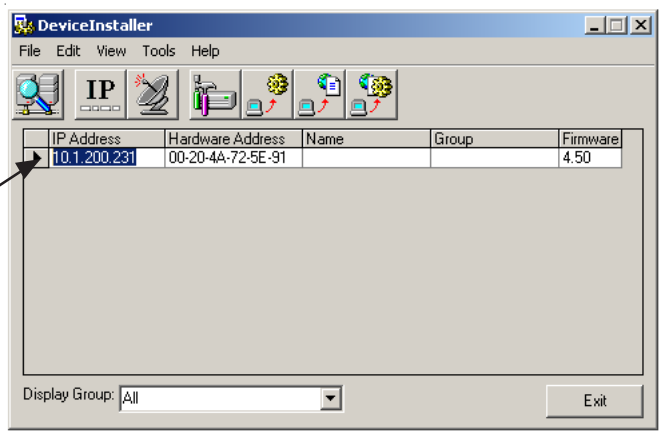
3 IP Addresses of devices on the network will appear. Click on the one you want to highlight it and then click on the **Save** button.

4 Click on the **Back** button to return to the DeviceInsaller screen.



5 You will notice that the device(s) you have saved now appears in the window as shown below.

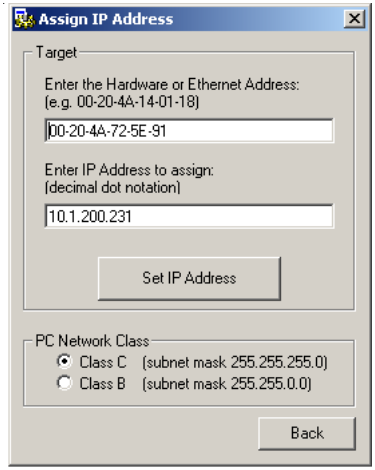
IP Address of Device(s) you save will appear here



6 If you need to assign the target device an IP Address, click on the **IP Address icon** or click on T**ools > Assign IP Address**. The window shown to the right will appear.

7 Enter the **Hardware or MAC Address** and then enter the **IP Address**. Click on the **Set IP Address** button.

8 The **Hardware Address** for UTICOR's P3000 will be the same as the **MAC ID number** found on the unit label.



See the Lantronix DeviceInstaller Help topics for more information on DeviceInstaller.

Configuration

Certain parameters must be configured before theP3000 can function on a network. The P3000 can be locally or remotely configured using the following procedures:

- Use a Telnet connection to configure the unit over the network.
- Use a standard Web browser to access the P3000's internal Web pages and configure the unit over the network. This is the easiest and preferred method.

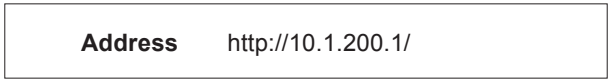
The P3000's configuration is stored in nonvolatile memory (NVRam) and is retained without power. The configuration can be changed at any time. The P3000 performs a reset after the configuration has been changed and stored.

Network Configuration Using a Web Browser

If your P3000 already has an IP address you can log into it using a standard Web browser with Java enabled.

1 Type the P3000's IP address into the Web browser's URL (Address/ Location) field.

Figure 6: Web Browser Login



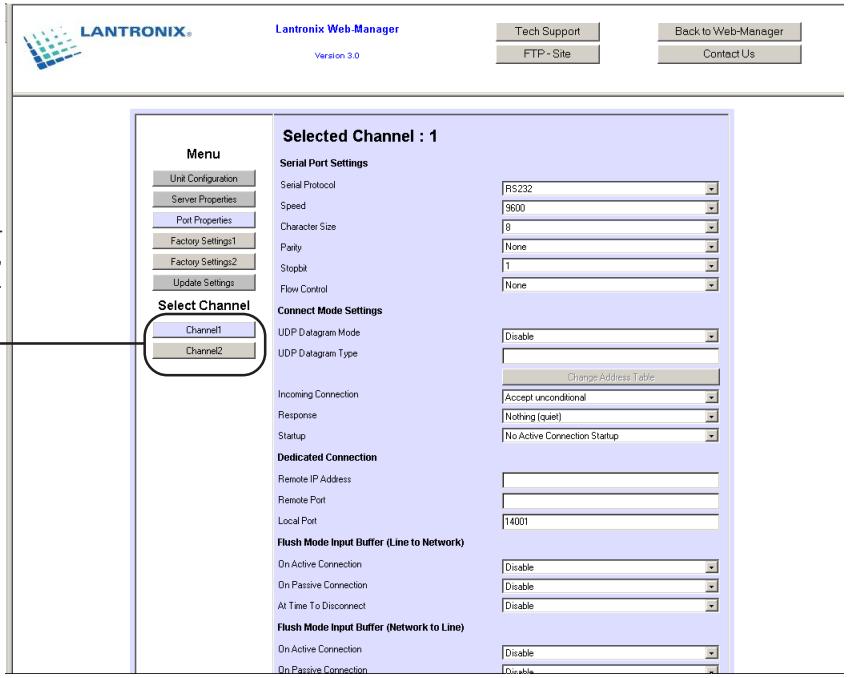
Once you have connected to P3000, you will see the Lantronix Web Manager interface.

2 You will automatically be logged in and have access to the configuration menu.

3 Use the menu to navigate to subpages where you can configure server settings.

Figure 7: Web Manager Interface

Channel 1 is is connected to the P3000, Channel 2 is not used.



When using Ethernet with the P3000, you must configure the Ethernet Interface to use specific communication settings. They are as follows: Baud Rate = 9600, Parity = None, Stop bits = 1, Flow Control = None.

Network Configuration Using a Telnet Connection Configuration

To configure the P3000 over the network, establish a Telnet connection to port **9999**. From the Windows Start menu, click **Run** and type the following command, where x.x.x.x is the IP address and 9999 is the P3000's fixed network configuration port number.

Figure 8: Network Login Using Telnet

```
telnet x.x.x.x 9999
```

Note: *Be sure to include a space between the IP address and 9999.*

Using DeviceComm Manager

Lantronix DeviceComm Manager provides support for up to 256 virtual COM ports, on the following platforms: Windows 2000; Windows NT 4.0; Windows XP single processor PC's.

Lantronix DeviceComm Manager is a COM port redirection software application for PC platforms. Its function is to re-direct customer application data destined for a local serial (COM) port on a PC. Rather than going out the local port, the data is transmitted across the Ethernet network using TCP/IP. A device server attached to the network receives the data and presents it on its serial port. Conversely, data into the serial port of the device server is sent back to the customer application via the network to the DeviceComm Manager. The DeviceComm Manager then presents the data to the customer application as if it were from a local serial COM port.

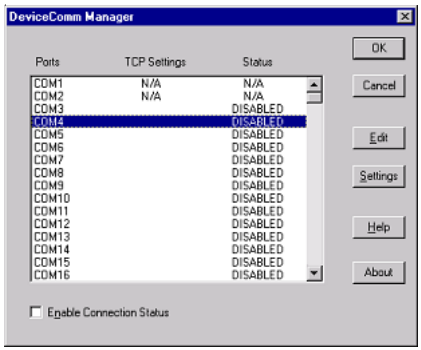
One of the main objectives of the DeviceComm Manager software is to eliminate the need for a customer to modify his/her application. If the application knows how to connect to a local serial port, it can by default talk to a remote serial port on a device server using the DeviceComm Manager software. No understanding of how to develop networking software is required.

Breaking down the DeviceComm Manager software application, it consists of a Control Panel applet, a device driver, and a Windows service. These components are wrapped in an installation application (InstallShield).

Installation
DeviceComm Manager is on the CD included with all P3000 Slave units that have an Ethernet Interface. Place the CD in the drive, find **DeviceComm.exe**, and click on it to launch the application.

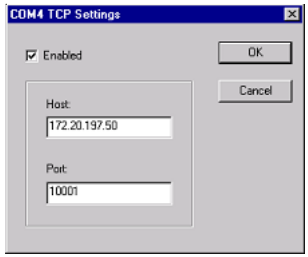
Setup
Follow the steps provided below.

1 Open Control Panel.



2 Double click on the "DeviceComm Manager" Icon. The following window will open.
3 Ports marked "N/A" are being used by other hardware / software on your system.

4 Select one of the “DISABLED” ports by clicking on it, and then press the “Edit” button. The following window will appear.



5 Select the “Enabled” check box.

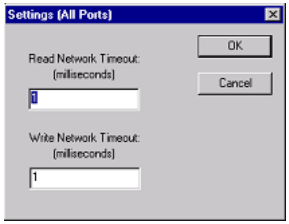
6 Type in the IP address of the target device server in the “Host:” section.

7 Enter the Port number of the target device server in the “Port:” section. Please note that because this is a raw mode redirector, you cannot use ports 14000 through 14009. You will be required to reboot your system when enabling COM ports. You may want to set them all up at one time and then reboot.

8 Select the “Enable Connection Status” checkbox at the bottom of the screen titled “DeviceComm Manager” if you wish to be notified via screen pop-up when the connection to the remote port is established. If your application is very time sensitive regarding the initial connection, or you do not wish to have a screen pop-up, leave this box unchecked.

9 No other setup is required. In the above example, all data sent to COM4 will be sent across the network to the device server at “172.20.197.50”, port “10001”.

There is also a “settings” button, which allows for advanced configuration. Some serial applications do not work well when redirected because they are not expecting the latency (delay) that an Ethernet network may cause. Increasing the “Read Network Timeout” and the “Write Network Timeout” values may help the situation. Network latency varies depending on a number of factors. You can get a rough idea of the delay at a given time by “pinging” the device server from the PC and looking at the “time” column. You may also find the PC command “tracert” helpful. See your Windows OS documentation for more details on these commands. Both “ping” and “tracert” are DOS prompt commands.



Index

Symbols

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

X

This page intentionally left blank.