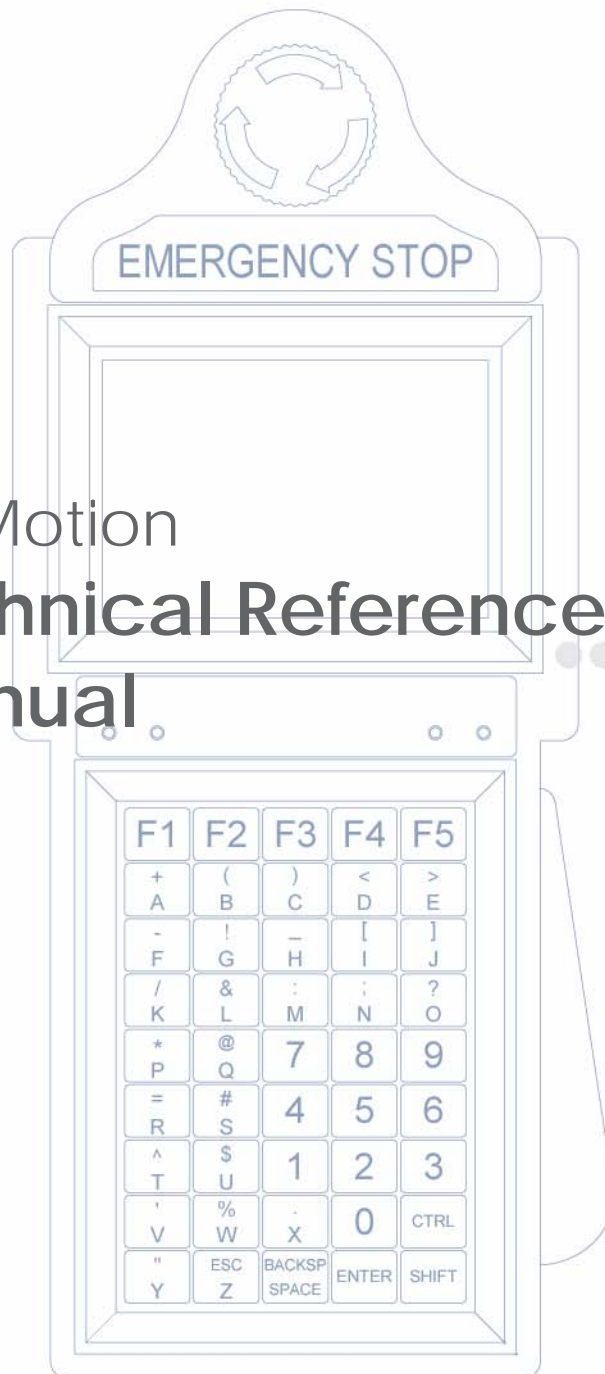




# ProMotion Technical Reference Manual





# ProMotion Technical Reference Manual

Document Number: MAN0328, Rev. B

Date of Last Revision: July 28, 2004

Copyright © 1998 – 2004, Two Technologies, Inc.

All rights reserved.

Printed in the United States of America

## Copyrights and Trademarks

The 2T logo is a registered trademark and ProMotion is a trademark of Two Technologies, Inc.

Other products or company names mentioned herein may be the trademarks or registered trademarks of their respective companies.

## Reproduction Rights

This manual contains proprietary information. Permission to reproduce or otherwise use portions of the material presented herein is explicitly given to Two Technologies OEMs incorporating the ProMotion into their products. Please note that this publication contains material that may not be appropriate for disclosure to some end users and that Two Technologies assumes no responsibility for technical support burdens incurred, or any other consequences of OEM documentation decisions.

## Changes and Addendum

Since Two Technologies is continuously improving the functionality and quality of its products, certain information may not be included in this manual at its time of release. As a result, Two Technologies may provide changed material as separate sheets included with this manual or separately in the form of a change package, as it deems necessary.

## Contact Information

Two Technologies, Inc.  
419 Sargon Way  
Horsham, PA 19044  
Phone: 215 441-5305  
Fax: 215 441-0423  
Web: [www.2T.com](http://www.2T.com)

To contact Two Technologies by e-mail:

- Sales: [sales@2t.com](mailto:sales@2t.com)
- Customer Service: [customersupport@2t.com](mailto:customersupport@2t.com)
- Technical Support: [techsupport@2t.com](mailto:techsupport@2t.com)

## Warranty Information

Seller warrants that the product specified in this agreement are free of defects in materials and workmanship, and shall conform to the latest specifications published prior to Buyer's acceptance of the agreement for a period of three years.

Product specifications as defined supersede previous specifications and are complete. Any parameter that is not specifically defined in the specifications is expressly excluded from the warranty. This warranty does not apply to any product which have been subject to misuse, accident, alteration, or if the unit has been serviced by anyone other than an authorized representative of Seller.

Seller's sole obligation to Buyer for products failing to meet specifications shall be, at Seller's discretion, to repair or replace the non-conforming device.

After receiving a Return Authorization (RA) number and a mailing address from Seller, a defective unit covered under this warranty may be returned freight prepaid. Any replacement or repaired product shall carry only the unexpired term of the warranty plus any the period required for repair.

If Buyer has been expressly designated as an Original Equipment Manufacturer (OEM) by Seller, the warranty period shall commence upon the earlier date of (i) delivery to Buyer's first customer, or (ii) 180 days from the original date of shipment by Seller. In the events that products for which: (a) Buyer has title and, (b) have never been used, and (c) have been in the Buyer's possession for more than 180 days and, (d) have an unaltered date code attached, may for an established fixed fee which will not exceed ten percent (10%) of the original purchase price, have the date code updated by the Seller and thereby reestablish those products with a new warranty.

THE FOREGOING WARRANTY AND REMEDIES ARE EXCLUSIVE AND ARE MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, EITHER IN FACT OR BY OPERATION OF LAW, STATUTORY OR OTHERWISE, INCLUDING WARRANTIES OR MERCHANTABILITY AND FITNESS FOR USE. TWO TECHNOLOGIES NEITHER ASSUMES NOR AUTHORIZES ANY OTHER PERSON TO ASSUME FOR IT ANY OTHER LIABILITY IN CONNECTION WITH THE SALE, INSTALLATION OR USE OF ITS PRODUCTS AND TWO TECHNOLOGIES MAKES NO WARRANTY WHATSOEVER FOR PRODUCTS NOT MANUFACTURED BY TWO TECHNOLOGIES.

TWO TECHNOLOGIES SHALL NOT BE LIABLE FOR DAMAGES DUE TO DELAYS IN DELIVERIES OR USE AND SHALL IN NO EVENT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY KIND, WHETHER ARISING FROM CONTRACT, TORT OR NEGLIGENCE, INCLUDING, BUT NOT LIMITED TO, LOSS OF PROFITS, LOSS OF GOODWILL, OVERHEAD OR OTHER LIKE DAMAGES.

To maintain your warranty and to avoid creating hazards, only qualified personnel should perform authorized modifications to Two Technologies' products. Two Technologies cannot assume responsibility for any condition affecting the proper operation of this equipment that may result from unauthorized modifications.

## Product Returns

If, after inspection, you note any product damage or discrepancies, please contact us promptly within five days of receipt. If the exterior of the package shows obvious signs of damage, please contact your carrier directly.

All items returned to Two Technologies require a Return Material Authorization number (RMA). Please contact Two Technologies' Service department to request an RMA number.

# Regulatory Notices

## FCC Compliance

This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his or her own expense.

## Canadian Compliance

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications

Le present appareil numerique n'émet pas de bruits radioelectrique dépassant les limites applicables aux appareils numeriques de la class A prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.

## Certifications

### UL

This product is a UL 1740 recognized component and meet the safety standard for industrial robots and robotic equipment as set forth by Underwriters Laboratories Inc. (UL).

### CENELEC



#### EMI Standards

- EN55022: 1998 (CISPR22, Class B) Information Technology
- EN55011 (CISPR11, Class A) Industrial, Scientific and Medical

#### EMC Standards

- EN50082-1: 1997, General Immunity Part 1
- EN55024: 98 (CISPR24: 1997) Information Technology Equipment

#### Safety Standards

- EN60950: 2000 Safety of Information Technology Equipment

\* Standard Configuration

## Warnings

Changes or modifications to this unit, which are not expressly approved by the party responsible for regulatory compliance, could void the user's authority to operate the equipment.

## Electrostatic Discharge (ESD)

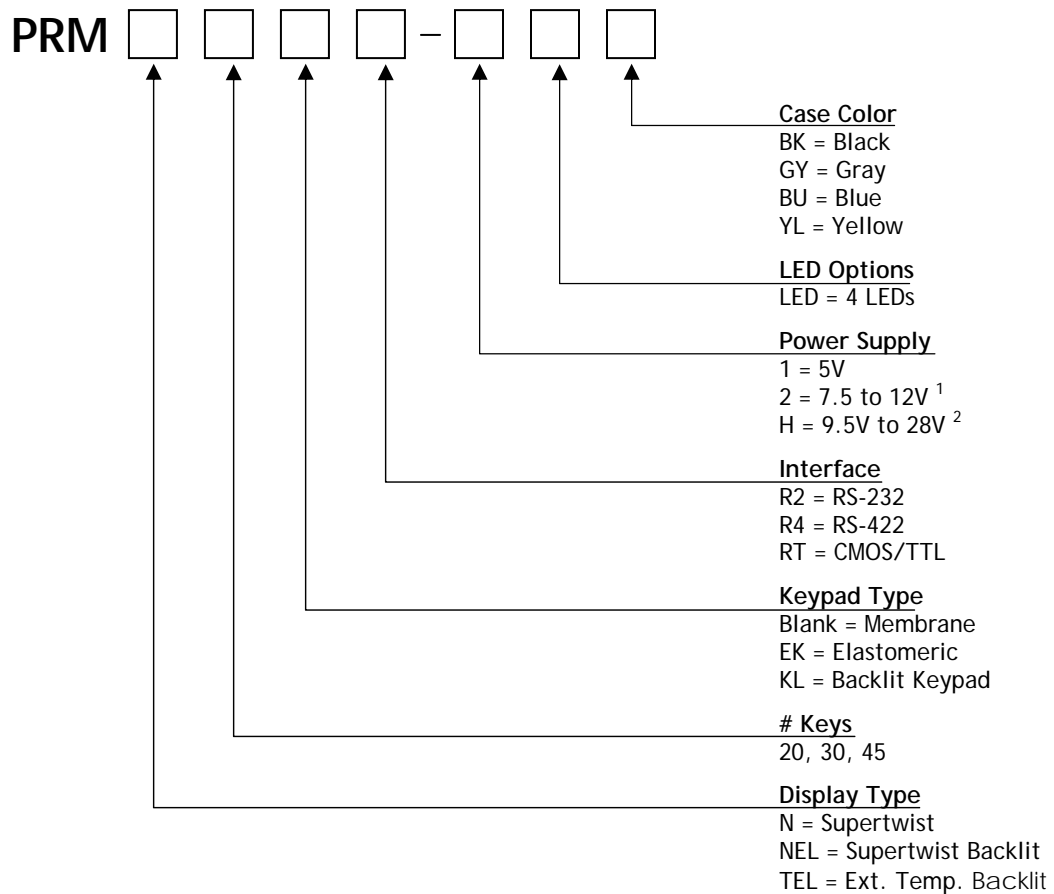


Electrostatic discharge (static electricity) can have unpredictable adverse effects on any electronic device. Although the design of this product incorporates extensive ESD-related precautions, ESD can still cause problems. It is good practice to discharge static by touching a grounded metal object before inserting cards or connecting devices.

# Product Selection Guide

The ProMotion is an ASCII terminal for use with computers, properly equipped instruments and industrial machinery. It features a 20, 30 or 45-key keypad with tactile feedback and a 192 x 128-pixel liquid crystal alphanumeric display that can show either 8 lines of 24 or 16 lines of 32 characters. Four programmable LEDs are optional.

The ProMotion is available in a number of configurations. A suffix applied to the model number identifies the configuration as shown below:



1. A linear regulator (7805A) with a minimum input of 7.5 V and a maximum voltage of 28.0 V that dissipates one watt of power thereby limiting maximum permissible input voltage according to current draw of terminal.
2. A switching type voltage regulator with a minimum input of 9.5 V and a maximum voltage of 28.0 V. Since input voltage is not dependent on the terminal's current draw, it is suitable for all options.

# Power Requirements

## Power Supply Options

Depending on the current draw requirements, the ProMotion may require the use of different power supplies. Use the configuration number listed below (see previous page) to determine the correct power supply:

- "-1" – requires connection to a 5-volt  $\pm$  5% regulated power source.
- "-2" – requires connection to a power source between 7.5 and 12 VDC that can source adequate current. However, depending on a unit's total current draw, an input of up to 28 VDC may be applied. See chart on next page.
- "-H" – requires connection to a power source between 9.5 and 28 VDC that can source adequate current. However, input voltage is not dependent on a terminal's current draw and may be used with all terminal options.

## Calculating Total Current Draw

The table below summarizes the current draw requirements for the ProMotion in various configurations (measured at its interface connector). Values listed are approximate due to variations in individual components – actual values may vary.

| <i>Current Draw for Basic Configuration</i> |                            |                  |
|---|----------------------------|------------------|
| <i>Configuration</i>                        | <i>Description</i>         | <i>Draw</i>      |
| PRM45R2                                     | Base Unit with RS-232      | 55 mA            |
| PRM45R4                                     | Base Unit with RS-422      | 65 mA            |
| <i>Current Draw for Options</i>             |                            |                  |
| NEL   | Supertwist Backlit Display | Add 60 mA        |
| KL  | Backlit Keypad             | Add 80 mA        |
| LED   | LED Indicators             | Add 4 mA per LED |

To calculate the total current draw for your terminal configuration:

1. Read the model number on the back of your terminal.
2. Using the model number and the table above, add the current draw for each option to that of the base unit.

Example 1 – PRMNEL45R2:

|                                   |              |
|-----------------------------------|--------------|
| RS-232 Option                     | 55 mA        |
| <u>Supertwist Backlit Display</u> | <u>60 mA</u> |
| Calculated Total Current          | 115 mA       |

Example 2 – PRMNEL45KLR2:

|                            |              |
|----------------------------|--------------|
| RS-232 Option              | 55 mA        |
| Supertwist Backlit Display | 60 mA        |
| <u>Backlit Keypad</u>      | <u>80 mA</u> |
| Calculated Total Current   | 195 mA       |

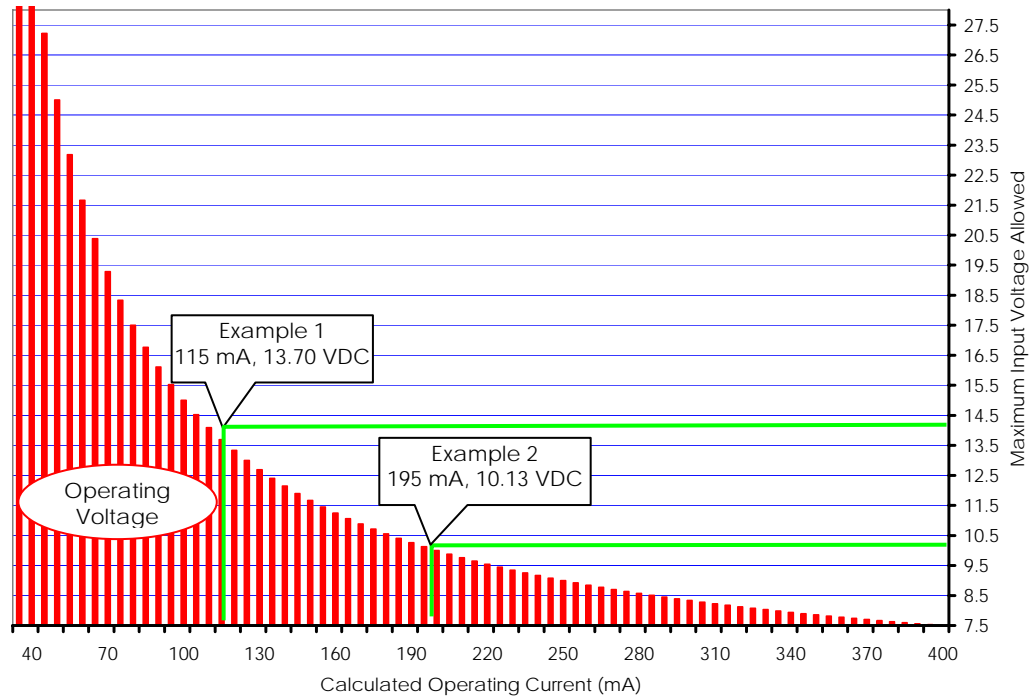
## Determining the Maximum Input Voltage Allowed

The maximum input voltage allowed is based on a unit's current draw.

To determine the maximum input voltage allowed based on current:

1. Calculate the maximum current draw using the table on the previous page.
2. On the following chart, locate the Calculated Total Current on the **Calculated Operating Current** axis of the chart, and then move to the top of **Operating Voltage** range.
3. Look at the corresponding **Maximum Input Voltage Allowed** where the intersection occurs to find the maximum useable voltage for your terminal configuration.

Restricted Input Voltage vs. Current Draw



Using Example 1 and the chart above, the 115 mA drawn by the PRMNEL45R2 intersects with 13.70 volts. If the maximum supply voltage to the terminal is greater than 13.70 VDC, it requires a -H power supply configuration.

Using Example 2 and the chart above, the 195 mA drawn by the PRMNEL45KLR2 intersects with 10.13 volts. If the maximum supply voltage to the terminal is greater than 10.13 VDC, it requires a -H power supply configuration.

To clarify, if your system is supplying 12.00 VDC, the power is acceptable for the PRMNEL45R2 (Example 1), but not for the PRMNEL45KLR2 (Example 2). Applying 12.00 VDC to the PTNEL45KLR2 (Example 2) will **damage** it.

# Contents

|  |            |
|--|------------|
| <b>Chapter 1: Overview</b> .....             | <b>1-1</b> |
| About this Manual .....                      | 1-1        |
| Symbols and Conventions.....                 | 1-1        |
| About Two Technologies .....                 | 1-1        |
| About the ProMotion.....                     | 1-2        |
| ProMotion Features.....                      | 1-2        |
| <b>Chapter 2: Operation</b> .....            | <b>2-1</b> |
| Controls and Indicators.....                 | 2-1        |
| ProMotion Safety Switches .....              | 2-2        |
| Liveman Operation .....                      | 2-2        |
| E-Stop Operation .....                       | 2-2        |
| Connecting the Terminal.....                 | 2-3        |
| Internal Communication Devices.....          | 2-3        |
| Signal and Pin Assignments.....              | 2-3        |
| The Boot Sequence .....                      | 2-4        |
| Keypad Operation.....                        | 2-5        |
| Display Operation.....                       | 2-5        |
| Cursor Position .....                        | 2-5        |
| Contrast Adjustment.....                     | 2-5        |
| Operating Modes.....                         | 2-6        |
| Host Control .....                           | 2-6        |
| <b>Chapter 3: Manual Configuration</b> ..... | <b>3-1</b> |
| Introduction .....                           | 3-1        |
| Parameter Menu Settings.....                 | 3-1        |
| Baud Rate.....                               | 3-1        |
| Data Bits.....                               | 3-1        |
| Parity .....                                 | 3-1        |
| Stop Bits .....                              | 3-2        |
| Display PE .....                             | 3-2        |
| Repeat .....                                 | 3-2        |
| Key Click.....                               | 3-3        |
| KNP Function.....                            | 3-3        |
| Cursor .....                                 | 3-3        |
| Cursor Blink .....                           | 3-3        |
| XON/XOFF .....                               | 3-3        |
| Handshake.....                               | 3-3        |
| Echo.....                                    | 3-3        |
| Escape Mode .....                            | 3-4        |
| CR/LF Mode.....                              | 3-4        |
| Self-Test.....                               | 3-4        |
| Shift Lock.....                              | 3-4        |
| Scroll.....                                  | 3-4        |
| View Angle (Contrast) .....                  | 3-5        |
| Break Commands .....                         | 3-5        |
| Screen Size .....                            | 3-5        |
| Backlight .....                              | 3-5        |
| Menu Modes .....                             | 3-5        |
| Parameter Menu Summary .....                 | 3-6        |
| Viewing Parameter Settings.....              | 3-7        |
| Changing Parameter Settings .....            | 3-7        |
| Loading Factory Default Settings.....        | 3-8        |
| Setting the Contrast Midpoint .....          | 3-9        |
| Restricting Access.....                      | 3-9        |
| <b>Chapter 4: Key Programming</b> .....      | <b>4-1</b> |
| Introduction .....                           | 4-1        |
| Defining Key Output .....                    | 4-1        |

|  |            |
|--|------------|
| Extended Key Functionality .....                 | 4-4        |
| Break Commands.....                              | 4-4        |
| Output Control Commands.....                     | 4-4        |
| Pause Commands .....                             | 4-5        |
| Branching Commands.....                          | 4-5        |
| Handshake-Out Manipulation Commands.....         | 4-6        |
| Extended Function Key Command Summary .....      | 4-7        |
| <b>Chapter 5: ANSI Mode Host Commands .....</b>  | <b>5-1</b> |
| Introduction.....                                | 5-1        |
| Cursor Commands .....                            | 5-1        |
| CR/LF Commands.....                              | 5-2        |
| Erasure Commands.....                            | 5-3        |
| Reset Commands.....                              | 5-3        |
| Escape Mode Commands .....                       | 5-3        |
| Character Attribute Commands .....               | 5-4        |
| Key Attribute Commands .....                     | 5-4        |
| Self-Test & Return Commands .....                | 5-5        |
| Display Attribute Commands.....                  | 5-6        |
| Sound Commands.....                              | 5-6        |
| LED Control Commands.....                        | 5-7        |
| Parameter Modification Commands.....             | 5-8        |
| Programming Key Commands.....                    | 5-10       |
| Custom Character Commands.....                   | 5-12       |
| Graphics Mode.....                               | 5-14       |
| Graphic Files.....                               | 5-14       |
| Graphics Mode Commands.....                      | 5-15       |
| Real-Time Graphic Commands.....                  | 5-16       |
| Advanced Control Mode.....                       | 5-17       |
| ACM Control Commands.....                        | 5-18       |
| Shift and Ctrl Key Control Commands.....         | 5-18       |
| ANSI Mode Host Command Summary.....              | 5-21       |
| <b>Chapter 6: Private Host Commands .....</b>    | <b>6-1</b> |
| Introduction.....                                | 6-1        |
| Cursor Commands .....                            | 6-1        |
| Erasure Commands.....                            | 6-3        |
| Character Attribute Commands .....               | 6-3        |
| Escape Mode Commands .....                       | 6-4        |
| Key Attribute Commands .....                     | 6-4        |
| Sound Commands.....                              | 6-4        |
| Return Commands .....                            | 6-5        |
| Display Attribute Commands.....                  | 6-5        |
| Private Mode Host Command Summary .....          | 6-6        |
| <b>Chapter 7: Control Codes.....</b>             | <b>7-1</b> |
| <b>Chapter 8: Troubleshooting .....</b>          | <b>8-1</b> |
| <b>Appendix A: Specifications.....</b>           | <b>A-1</b> |
| <b>Appendix B: Character Sets .....</b>          | <b>B-1</b> |
| ASCII Character Set.....                         | B-1        |
| ProMotion Extended Character Set.....            | B-2        |
| <b>Appendix C: Keypad Hex Output Values.....</b> | <b>C-1</b> |
| 45-Key Keypad Hex Output.....                    | C-1        |
| 30-Key Keypad Hex Output.....                    | C-2        |
| 20-Key Keypad Hex Output.....                    | C-2        |
| <b>Index .....</b>                               | <b>I-1</b> |

## List of Figures

|  |      |
|--|------|
| Figure 2-1: ProMotion Controls and Indicators.....             | 2-1  |
| Figure 2-2: Liveman Switch Positions.....                      | 2-2  |
| Figure 2-3: E-Stop Operation .....                             | 2-2  |
| Figure 2-4: E-Stop Switch Wiring.....                          | 2-2  |
| Figure 2-5: DA-15 Interface Connector .....                    | 2-3  |
| Figure 2-6: Standard Keypads .....                             | 2-5  |
| Figure 3-1: Parity Error Symbol.....                           | 3-2  |
| Figure 3-2: Wait Symbol.....                                   | 3-3  |
| Figure 3-3: Shift/Control Key Indicators .....                 | 3-4  |
| Figure 5-1: Graphics Rendering.....                            | 5-14 |
| Figure 5-2: PROCNV.EXE .....                                   | 5-14 |
| Figure 5-3: Ghost Key .....                                    | 5-17 |
| Figure 5-4: Using ACM in a Robotic Environment .....           | 5-19 |
| Figure 5-5: Using ACM in a Robotic Environment Flowchart ..... | 5-20 |
| Figure A-1: ProMotion Case Dimensions.....                     | A-2  |

## List of Tables

|  |      |
|--|------|
| Table 2-1: ProMotion Controls and Indicators .....                   | 2-1  |
| Table 2-2: Interface Devices.....                                    | 2-3  |
| Table 2-3: DA-15 Interface Connector Signal and Pin Assignments..... | 2-3  |
| Table 3-1: Communication Parameters Accessibility .....              | 3-2  |
| Table 3-2: Parameter Menu Summary .....                              | 3-6  |
| Table 4-1: Extended Function Key Command Summary.....                | 4-7  |
| Table 5-1: Set Parameters Commands .....                             | 5-9  |
| Table 5-2: Key Positions (Hex Values).....                           | 5-11 |
| Table 5-3: ACM Mode- SHIFT and CTRL Key Results.....                 | 5-18 |
| Table 5-4: ANSI Mode Host Command Summary .....                      | 5-21 |
| Table 6-1: Private Mode Host Command Summary.....                    | 6-6  |
| Table 7-1: Control Codes .....                                       | 7-1  |
| Table B-1: ASCII Character Set .....                                 | B-1  |
| Table B-2: ProMotion Extended Character Set .....                    | B-3  |
| Table C-1: 45-Key Keypad Hex Output Values.....                      | C-1  |
| Table C-2: 30-Key Keypad Hex Output Values.....                      | C-2  |
| Table C-3: 20-Key Keypad Hex Output Values.....                      | C-2  |





# Chapter 1: Overview

## About this Manual

---

Intended for developers familiar with operator interface applications, this manual describes the advanced features, operations and interface capabilities of Two Technologies' ProMotion terminals. It is not for use by end-users.

Unless otherwise stated, the operational characteristics described herein correspond to factory default configurations and settings as shipped from Two Technologies with a standard 45-key keypad.

Because the ProMotion is a highly customizable product with many optional configurations and special keypad layouts, this manual only describes the standard features and operation of the ProMotion. For custom configurations and special options, consult the appropriate supplemental manual or addendum.

It is beyond the scope of this manual to provide operating system tutorials or information about commercial or customized ProMotion application programs and connected equipment. This information should be available in the manuals that accompany those products.

Wherever used herein, the term "ProMotion" applies to all models (except as noted).

## Symbols and Conventions

Unless otherwise noted, this manual uses the following format conventions to distinguish elements of text:

- New terms used in this manual initially appear in *Italics*, for example: *host*.
- Names of keys as shown on a keypad appear in **bold type**, for example: **CTRL**.
- Names of parameter values appear in **uppercase letters**, for example: **ENABLE**.
- Esc represents the ASCII escape character in **Escape commands**, for example: **Esc [4n**.
- A lowercase "h" appearing after a number denotes a **hexadecimal value**, for example: **1Bh**.

## About Two Technologies

---

Two Technologies has been producing rugged hand held and panel mount terminals and computers for over fifteen years. By implementing state of the art design and manufacturing techniques, we revolutionized hand held terminals and computers inside and out. Today, Two Technologies offers over a dozen cost-effective solutions serving virtually every market.

# About the ProMotion

---

The ProMotion is a UL recognized hand held terminal that boasts the highest level of safety standards with its double-pole, 3-position (off, on, off) "Liveman" switch and double-pole Emergency Stop (E-Stop). It also provides users with selectable communications parameters, programmable function keys, and other features that make it ideal for motion control applications requiring flexibility and solid, reliable operation.

## ProMotion Features

The ProMotion offers the following features. You can find additional information regarding specifications in [Appendix A](#).

### *Display*

The ProMotion features a standard 192 x 128 monochrome supertwist liquid crystal display with dark characters on a light background. Its large viewing area (menu or host selectable, 8 rows x 24 characters or 16 rows x 32 characters) supports the U.S. ASCII character set.

The display also has menu-controlled contrast settings with blinking and inverse video attributes, as well as graphics capabilities. Backlit and extended temperature displays are also available.

### *Keypad*

Securely framed and clamped into place, the keypad surface provides excellent splash resistance and prevents curling or peeling of the keypad overlay. Keypad layouts include 45, 30, and 20 keys available with standard or custom graphics and 32 and 15 keys available with custom graphics. Keypads can be made from your choice of elastomeric or membrane material.

### *Switches and Indicators*

The ProMotion has both an Emergency Stop switch and a Liveman Switch.

The E-Stop switch has a push-off, turn-reset motion. A fully depressed E-Stop opens all the circuits and can bring the machinery to a complete halt.

The 3-position Liveman switch provides a closed circuit when depressed to a midpoint. A fully released or depressed switch opens the switch circuit, which could cause the machine to stop operation.

Four host-controlled LED indicators are available as an option on the ProMotion.

### *Advanced Control Mode (ACM)*

The ProMotion's host activated Advanced Control Mode (ACM) provides an increased level of safety when controlling motion oriented tasks on a robotic device. ACM enables the host and the ProMotion to monitor one another and react to event changes. Host actions are dependent on host software).

### *Interface Options*

The ProMotion interface options include RS-232, RS-422 or CMOS/TTL protocols. Communication (up to 57,600 bps) with a host device is through a Permanent Wire Cable with a molded DA-15 connector.

### *Durability*

Like all Two Technologies' products, the ProMotion is remarkably rugged. The case consists of Cyclocac ABS, one of the most durable, chemical-resistant materials available on the market today.



# Chapter 2: Operation

## Controls and Indicators

Table 2-1 describes the possible components and indicators found on the front of a ProMotion as shown in Figure 2-1.

Figure 2-1: ProMotion Controls and Indicators

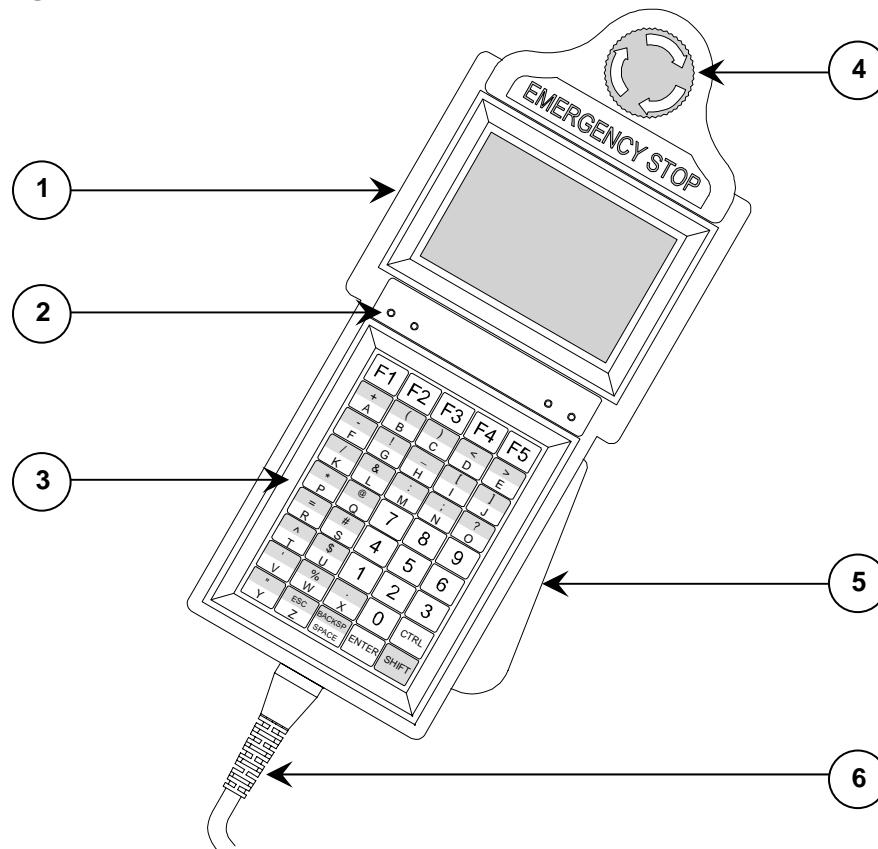


Table 2-1: ProMotion Controls and Indicators

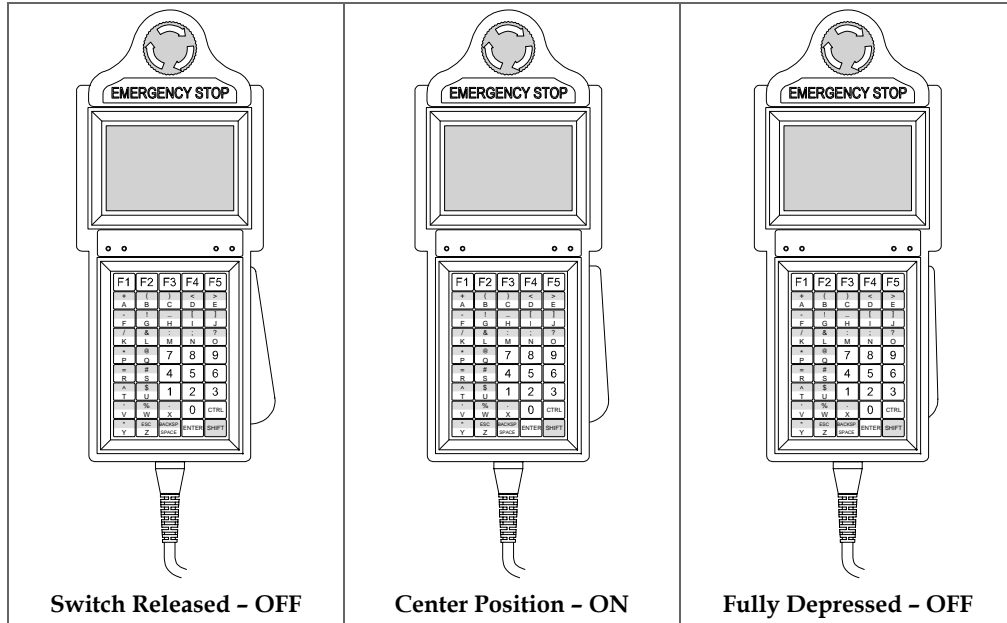
| Item | Control/Feature | Description   |
|------|-----------------|---|
| 1    | Display         | 192 x 128 pixel supertwist nematic LCD (standard)           |
| 2    | Indicators      | Four programmable LEDs (optional)                           |
| 3    | Keypad          | 45-key keypad (standard)                                    |
| 4    | E-Stop          | Push off/ twist on switch                                   |
| 5    | Liveman Switch  | 3-position switch (Center: active; Switch in or out: off)   |
| 6    | Interface Cable | Permanent cable for power, communications, E-Stop & Liveman |

# ProMotion Safety Switches

## Liveman Operation

The Liveman switch has three positions as shown below.

Figure 2-2: Liveman Switch Positions



## E-Stop Operation

The E-Stop switch consists of two normally closed switches. Pressing the switch opens both sets of contacts. Lamp connections are available only on optional illuminated switches.

Figure 2-3: E-Stop Operation

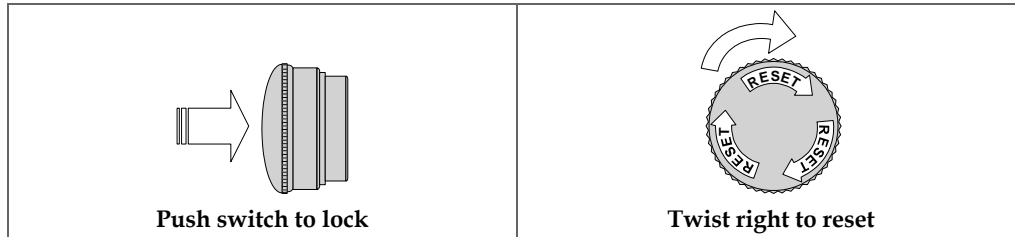
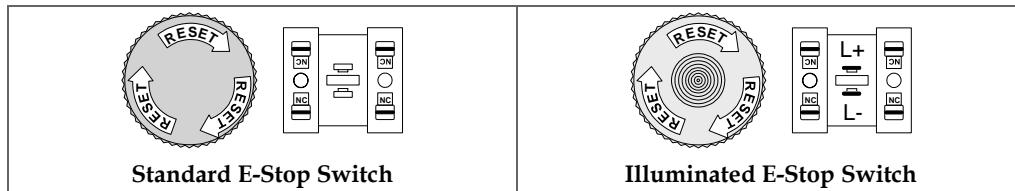


Figure 2-4: E-Stop Switch Wiring



# Connecting the Terminal

## Internal Communication Devices

The following table lists the internal interface devices used in the ProMotion:

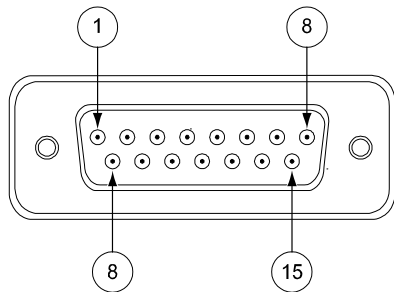
Table 2-2: Interface Devices

| <i>Interface</i> | <i>Manufacturer</i> | <i>Device</i> |
|------------------|---------------------|---------------|
| RS-232           | Linear Technology   | LT1281        |
| RS-422           | Linear Technology   | LTC490        |

## Signal and Pin Assignments

The ProMotion has a permanent wire cable with a four-wire interface to a host device. The standard interface connector is a DA-15 (Figure 2-5). Table 2-3 lists the RS-232 and RS-422 signal and pin assignments for the connector.

Figure 2-5: DA-15 Interface Connector



Viewed facing connector

Table 2-3: DA-15 Interface Connector Signal and Pin Assignments

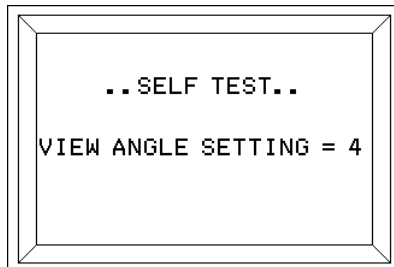
| <i>Pin</i> | <i>RS-232/CMOS/TTL</i>      | <i>RS-422</i>              |
|------------|-----------------------------|----------------------------|
| 1          | Common                      | Common                     |
| 2          | Data-Out from terminal      | - Data-Out from terminal   |
| 3          | Handshake-Out from terminal | + Data-Out from terminal   |
| 4          | Liveman 2 (common)          | Liveman 2 (common)         |
| 5          | E-Stop Lamp                 | E-Stop Lamp                |
| 6          | E-Stop 2 (common)           | E-Stop 2 (common)          |
| 7          | Liveman 1 (common)          | Liveman 1 (common)         |
| 8          | E-Stop 1 (common)           | E-Stop -1 (common)         |
| 9          | Data-In to terminal         | - Data-In to terminal      |
| 10         | Handshake-In to terminal    | + Data-In to terminal      |
| 11         | + Supply to terminal        | + Supply to terminal       |
| 12         | Liveman 2 (normally open)   | Liveman 2 (normally open)  |
| 13         | E-Stop 2 (normally closed)  | E-Stop 2 (normally closed) |
| 14         | Liveman 1 (normally open)   | Liveman 1 (normally open)  |
| 15         | E-Stop 1 (normally closed)  | E-Stop 1 (normally closed) |

# The Boot Sequence

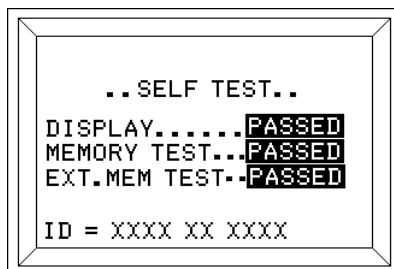
---

Once you have connected the ProMotion to a host device and supplied power, the ProMotion will boot-up and perform a self-test as shown below.

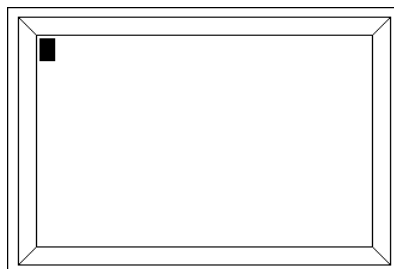
1. The first screen in the boot sequence briefly displays the standard U.S. ASCII character set, followed by a contrast test (Viewing Angle).



2. The ProMotion will then perform a display test, a memory test, an extended memory test and display the software ID.



3. Upon completion of the self-test, the ProMotion will emit an alert (three consecutive beeps) and display a blank screen with a fixed or blinking cursor in Row 1, Column 1.



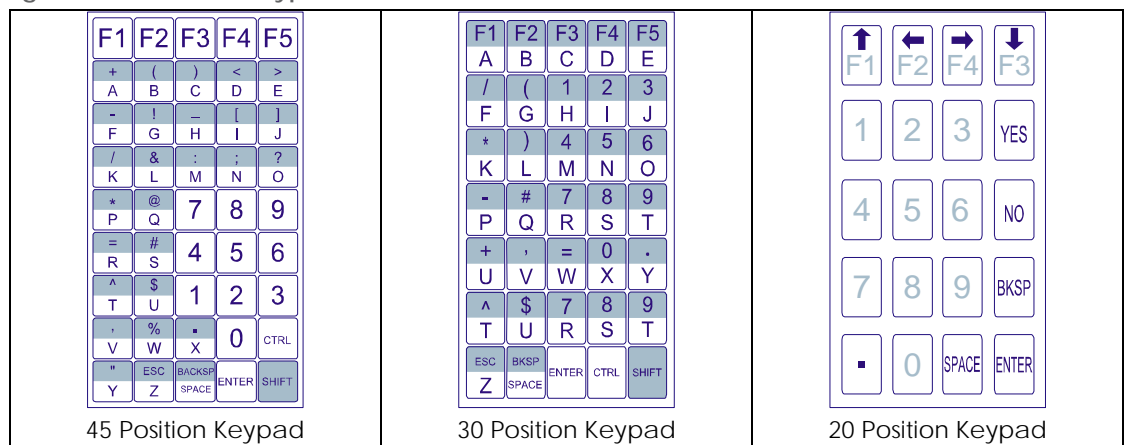
# Keypad Operation

The standard 30 position and 45 position keypads consist of uppercase letters, digits 0 through 9, punctuation marks, symbols, function keys and keys for Escape (**ESC**), Space (**SPACE**), Backspace (**BACKSP/BKSP**), Control (**CTRL**), Shift (**SHIFT**) and Enter (**ENTER**). You can program the **SHIFT** key to operate in normal or locked mode. In the locked mode, pressing a modifier key will toggle its respective state.

The standard 20 position keypads consist of the digits 0 through 9, functions keys and keys for Yes (**YES**), No (**NO**), Backspace (**BKSP**), Space (**SPACE**) and Enter (**ENTER**).

Transmission of control characters will cancel the control state. If both the Shift and Control states are active, lowercase alphabetic characters will replace corresponding uppercase alphabetic characters. All keys, with the exception of **CTRL** and **SHIFT**, may be re-assigned with user-programmed characters or character strings from the key output definition menu. For information about control states, refer to the [Shift Lock](#) parameter setting.

Figure 2-6: Standard Keypads



# Display Operation

The ProMotion screen displays the standard U.S. ASCII 96 character set. Characters appear on the display at the current cursor location.

## Cursor Position

Typically, the cursor moves from left to right as the ProMotion receives characters (unless altered by Escape commands). The display will scroll when a character appears in the last position in any of the first seven rows for an 8 x 24 display or the first fifteen rows for a 16 x 32 display. The cursor then moves to the left most position on the next row.

The display will also scroll when a character in the "LAST" (Row 8, Column 24 or Row 16, Column 32) or the "LAST + 1" character position, depending upon the parameter selection (refer to the [Scroll](#) parameter for details).

The cursor is selectable as blinking, non-blinking, visible or invisible. When visible, the cursor style will indicate the states of the **SHIFT** and **CTRL** modifier keys (refer to the [Cursor](#) and [Cursor Blink](#) parameters for details).

## Contrast Adjustment

You can adjust the contrast on the ProMotion by pressing **CTRL** and **F5**. There are sixteen adjustments levels. Each key press combination will make the display darker until it reaches the darkest maximum setting, in which case the next key press combination will result in the lightest maximum setting. You can also adjust the contrast using the [View Angle \(Contrast\)](#) parameter or by [Setting the Contrast Midpoint](#).

# Operating Modes

---

The ProMotion has several operating modes. The default mode is Terminal mode. It allows the ProMotion to display characters, respond to commands sent by a connecting device, and send characters to the connecting device as keys are pressed. Other modes, described later in this manual, enable you to [set operating parameters](#) and [program function key definitions](#)

## Host Control

---

The ProMotion's design allows a connecting device (or "*host*") to control its functions through the transmission of a string of special characters.

Referred to as "*Escape commands*" (because each character string begins with the ASCII escape character), these character strings enable the host to move the cursor to any position on the display, clear selected regions of the display, sound a beep, alert or key click, program the function keys and set any of the operating parameters.

The ProMotion has two sets of built-in Escape command modes, ANSI and Private. The set in use is determined by the setting of the Escape Mode parameter.

When set to ANSI mode, the ProMotion recognizes a command set compatible with the American National Standards Institute Standard X3.64.

When set to Private mode, the ProMotion recognizes a smaller, non-standard set of commands.

The host can change the current Escape mode type at any time by issuing the corresponding Escape command.

Information about using ANSI and Private Mode Escape commands appears later in this manual.



# Chapter 3: Manual Configuration

## Introduction

---

A comprehensive set of user-settable operating parameters and programmable function keys makes the ProMotion suitable for diverse applications. Each settable parameter and programmable function key has a default value. These values are stored in the ProMotion's permanent memory.

This chapter describes each operating parameter in detail, as well as how to set the parameters and load the default values. [Chapter 4](#) covers programming function keys.

***Note:** You can also program the ProMotion remotely using ANSI mode host commands. For more information, see [Chapter 5](#).*

## Parameter Menu Settings

---

The following section describes the parameters that you can program in the ProMotion. A summary ([Table 3-2](#)) appears at the end of the section.

### Baud Rate

This parameter sets the number of bits per second transmitted. The data rate can be set to: 300, 600, 1200, 2400, 4800, 9600, 19200 or 57600 baud. The default value is 9600.

***Note:** Baud rates above 9600 require handshaking.*

### Data Bits

This parameter sets the number of data bits transmitted per character, either 7 or 8. The default value is eight (8).

***Note:** Depending on the Data Bits and Parity settings, the Stop Bits and Display PE parameters may not be accessible. See [Table 3-1](#) for details.*

### Parity

This parameter enables/disables the host's ability to perform error checking on incoming characters and ensure accuracy. Allowable settings are EVEN, ODD, MARK, SPACE, NONE and IGNORE. The default value is NONE.

Selecting IGNORE will still add a parity bit to each character, but the value is indeterminate. Selecting NONE will prevent the sending of the parity bit. In either case, the host will not perform an error check on incoming characters.

***Note:** Depending on the Data Bits and Parity settings, the Stop Bits and Display PE parameters may not be accessible. See [Table 3-1](#) for details.*

## Stop Bits

This parameter sets the number of stop bits between each character transmission, either 1 or 2 (the default value is 1) with the following exceptions:

- A. When using 7-data bits and no parity, the ProMotion will automatically select 2-stop bits.
- B. When using 8-data bits and any parity the ProMotion will automatically select 1-stop bit.

In either case, the Stop Bits parameter will not be accessible. See [Table 3-1](#) for accessibility.

## Display PE

When using parity checking, you can enable/disable this parameter to display a special character ([Figure 3-1](#)) when a parity error occurs. The default value is DISABLE.

If the Parity parameter is set to IGNORE or NONE, the Display PE parameter will not be accessible. See [Table 3-1](#) for accessibility.

Figure 3-1: Parity Error Symbol



Table 3-1: Communication Parameters Accessibility

| <i>Parameter Setting</i> |               | <i>Parameter Access</i> |                   |
|--------------------------|---------------|-------------------------|-------------------|
| <i>Data Bits</i>         | <i>Parity</i> | <i>Stop Bits</i>        | <i>Display PE</i> |
| 7                        | NONE          | No                      | No                |
| 7                        | IGNORE        | Yes                     | No                |
| 7                        | EVEN          | Yes                     | Yes               |
| 7                        | ODD           | Yes                     | Yes               |
| 7                        | MARK          | Yes                     | Yes               |
| 7                        | SPACE         | Yes                     | Yes               |
| 8                        | NONE          | Yes                     | No                |
| 8                        | IGNORE        | No                      | No                |
| 8                        | EVEN          | No                      | Yes               |
| 8                        | ODD           | No                      | Yes               |
| 8                        | MARK          | No                      | Yes               |
| 8                        | SPACE         | No                      | Yes               |

## Repeat

This parameter determines the repeat keypad character rate while the key remains pressed. The allowable values are SLOW (6 characters per second), MEDIUM (10 characters per second), FAST (36 characters per second) and DISABLED. The default value is MEDIUM. In all cases, there is a short delay between the initial character and the start of the repeat.

**Note:** Should you enable the KNP function (disabled by default), the Repeat parameter will not be accessible.

## Key Click

This parameter enables/disables the ProMotion's ability to emit an audible click each time a key is pressed, and for each repeated character. The default value is DISABLE.

## KNP Function

The Key Not Press (KNP) parameter enables/disables the ProMotion's ability to detect the release of a key press. When set to ENABLE, the ProMotion will transmit the keypad character or function key data after a key press and a null (00h) character after a key release. The default value is DISABLE.

**Note:** *Should you enable the KNP function (disabled by default), the Repeat parameter will not be accessible.*

## Cursor

This parameter enables/disables the ProMotion's ability to display a rectangular cursor at the next character position. The default value is ENABLE.

## Cursor Blink

This parameter enables/disables the cursor's ability to blink at a steady rate. The default value is ENABLE.

## XON/XOFF

This parameter enables/disables the ProMotion's ability to control data flow with XON/XOFF protocol (i.e., When the receiving device is ready to receive data, it sends an XON signal to the sending device. When its buffer is full, the receiving device then sends an XOFF message to the sending device, which stops sending data). The default value is DISABLE.

## Handshake

This parameter enables/disables use of handshake lines (DTR-DSR or RTS-CTS) for ProMotions with an RS-232 interface. The default value is DISABLE.

When enabled, the ProMotion informs the host when it can and cannot accept data and vice versa. The Handshake-Out line is the signal to the host, and the Handshake-In line is the signal from the host.

If you enable both XON/XOFF and Handshake parameters, Handshaking has priority. For example, the ProMotion cannot send an XON/XOFF command to the host if the Handshake-In line is false (low).

Should you press a key on the ProMotion and the existing handshake condition prevents transmission to the host within approximately one second, the ProMotion will display a wait symbol (Figure 3-2).

Any subsequent key presses on the ProMotion will generate an audible tone. To cancel the waiting condition and send the waiting keystroke until the next keystroke, press **CTRL** and **F5** simultaneously.

Figure 3-2: Wait Symbol



## Echo

This parameter enables/disables the ProMotion's ability to display (echo) keypad entries on the screen. The default value is DISABLE.

## Escape Mode

This parameter sets the Escape Command type used by the ProMotion to either ANSI or PRIVATE. The default mode is ANSI.

## CR/LF Mode

This parameter determines which character is sent by the ProMotion to the host when the **ENTER** key is pressed, and how the ProMotion interprets a linefeed character sent by the host. Available options are NORMAL and NEWLINE. The default value is NORMAL.

In NORMAL mode, pressing **ENTER** on the ProMotion sends a carriage return to the host. A linefeed received by the ProMotion moves the cursor to the same column on the next line.

In NEWLINE mode, pressing **ENTER** on the ProMotion sends both a carriage return and a linefeed to the host. A linefeed received by the ProMotion moves the cursor to the first column on the next line.

## Self-Test

This setting determines if the ProMotion will perform a confidence test at boot-up. The test initially displays the U.S. ASCII Character Set, performs a number of internal tests, and shows the model identifier string with checksum. The ProMotion will beep when the test is completed. If an error occurs, the ProMotion will display an error message.

## Shift Lock

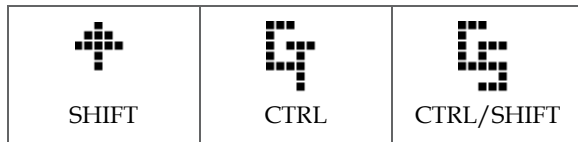
This parameter determines how the **SHIFT** and **CTRL** modifier keys are used. Typically, pressing the **SHIFT** key displays the symbols and characters that appear on the upper half of each key, while pressing the **SHIFT** key sends control characters to the host. Available options are ENABLE, DISABLE and CANCEL. The default value is DISABLE.

With Shift Lock enabled, pressing **SHIFT** will lock the keypad into Shift mode until you press **SHIFT** again.

With Shift Lock disabled, you must hold **SHIFT** and/or **CTRL** while pressing other keys.

With Shift Lock cancelled, pressing **SHIFT** and/or **CTRL** will modify only the next key press.

Figure 3-3: Shift/Control Key Indicators



## Scroll

This parameter determines how the scrolling function will work when the ProMotion displays a character in the last display position (lower right corner). Available options are LAST CHR and LAST CHR+1.

When set to LAST CHR, the screen will scroll up one line and position the cursor in the first column of the last line (lower left corner) after displaying a character in the last display position.

When set to LAST CHR+1, the screen will scroll up one line and position the cursor in the second column of the last line after displaying a character in the last display position and receiving the next displayable character from the host.

If the ProMotion receives a control code or an escape command that alters the cursor position, the cursor will remain at the last position and the pending scroll condition canceled.

## View Angle (Contrast)

This parameter adjusts the viewing angle for various environmental conditions based on contrast midpoint (which is set when you restore factory defaults). There are 16 available settings: MIN, 2, 3, 4, 5, 6, 7, MID, 9, 10, 11, 12, 13, 14, 15 and MAX. The default value is MID.

*Notes: Should you use host control, there are only eight available settings. You can also adjust the contrast by pressing CTRL and F5.*

## Break Commands

This parameter enables/disables the Break commands that define programmable keys. The default value is DISABLE.

## Screen Size

This parameter defines the screen size, either 24 (characters) x 8 (lines) or 16 x 32. The default value is 24 x 8.

## Backlight

For units equipped with the backlight option, this parameter turns the backlight on, completely off or off after 10 minutes of inactivity (in which case, any key press will reset the backlight timer and turn the backlight on). Allowable settings are ON, OFF or TIMED. The default value is ON.

## Menu Modes

This parameter preserves or clears the contents of the screen that were visible prior to exiting the Parameter Setup menu.

DESTRUCTIVE mode clears the contents of the display that were visible prior to entering the Parameter Setup menu. NON DESTRUCT mode preserves the contents of the display that were visible prior to entering the Parameter menu.

Allowable settings are DESTRUCTIVE or NON DESTRUCT. The default value is DESTRUCTIVE.

*Note: While in NON DESTRUCT mode, if you change the screen size, you must reboot the unit before the new screen size takes effect.*

## Parameter Menu Summary

Table 3-2 lists the allowable settings and default values available through the Parameter menu.

Table 3-2: Parameter Menu Summary

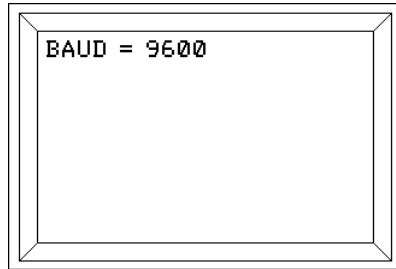
| <i>Parameter</i>         | <i>Options (Default In Bold)</i>                                   |
|--------------------------|--|
| Baud                     | 300, 600, 1200, 2400, 4800, <b>9600</b> , 19200, 57600             |
| Data Bits                | <b>7</b> , <b>8</b>  |
| Parity                   | EVEN, ODD, MARK, SPACE, <b>NONE</b> , IGNORE                       |
| Stop Bits <sup>1</sup>   | <b>1</b> , <b>2</b>  |
| Display PE <sup>1</sup>  | ENABLE, <b>DISABLE</b>   |
| Repeat <sup>2</sup>      | SLOW, <b>MEDIUM</b> , FAST, DISABLED                               |
| Key Click                | <b>ENABLE</b> , DISABLE  |
| KNP Function             | ENABLE, <b>DISABLE</b>   |
| Cursor                   | <b>ENABLE</b> , DISABLE  |
| Cursor Blink             | <b>ENABLE</b> , DISABLE  |
| XON/XOFF                 | ENABLE, <b>DISABLE</b>   |
| Handshake                | ENABLE, <b>DISABLE</b>   |
| Echo                     | ENABLE, <b>DISABLE</b>   |
| Escape Mode              | <b>ANSI</b> , PRIVATE  |
| CR/LF Mode               | <b>NORMAL</b> , NEWLINE  |
| Test                     | ENABLE, <b>DISABLE</b>   |
| Shift Lock               | ENABLE, <b>DISABLE</b> , CANCEL                                    |
| Scroll on Last Character | <b>LAST CHR</b> , LAST CHR +1                                      |
| Viewing Angle            | MIN, 2, 3, 4, 5, 6, 7, <b>MID</b> , 9, 10, 11, 12, 13, 14, 15, MAX |
| Break Commands           | ENABLE, <b>DISABLE</b>   |
| Screen Size              | <b>24 x 8</b> , 32 x 16  |
| Menu Mode                | NON-DESTRUCT , <b>DESTRUCTIVE</b>                                  |
| Backlight <sup>3</sup>   | <b>ON</b> , TIMED, OFF   |

1. Access to parameter is dependent on Data Bits and Parity settings
2. Access to parameter is dependent on KNP Function setting
3. Only if the terminal has an optional backlit display

# Viewing Parameter Settings

---

To scroll through the current parameter settings, simultaneously hold **CTRL** and **SHIFT**, and then press **F5** (**YES** on 20-key keypads). The ProMotion will display each setting for approximately two seconds.



# Changing Parameter Settings

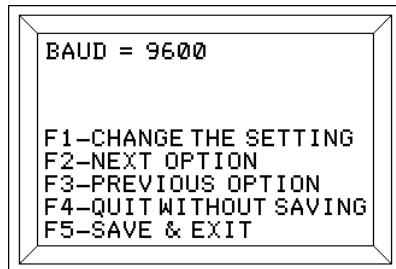
---

To enter the Parameters menu and change settings:

1. For 45 or 30-key ProMotions, simultaneously hold **CTRL** and **SHIFT**, then press **F1**.

For 20-key ProMotions, simultaneously hold **BKSP** and **ENTER**, then press **F1**.

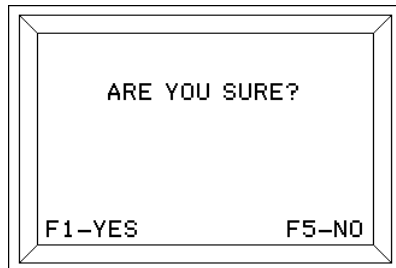
The Parameter menu appears with the first parameter on the top line.



2. To change the value of the current parameter, press **F1**.
3. To view the next parameter, press **F2**.
4. To view the previous parameter, press **F3**.
5. To exit the menu without saving any changes on 45 or 30-key ProMotions, press **F4**.
6. To save any changes and exit the menu on 45 or 30-key ProMotions, press **F5**.

To save any changes and exit the menu on 20-key ProMotions, press **F4**.

The ProMotion will sound an alert (three consecutive short beeps and prompt you to confirm your changes.



7. To confirm the changes, press **F1**.

To exit the menu without saving any changes on 45 or 30-key ProMotions, press **F5**.

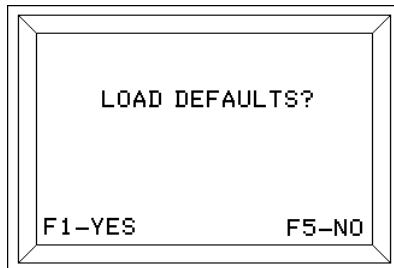
To exit the menu without saving any changes on 20-key ProMotions, press **F4**.

# Loading Factory Default Settings

---

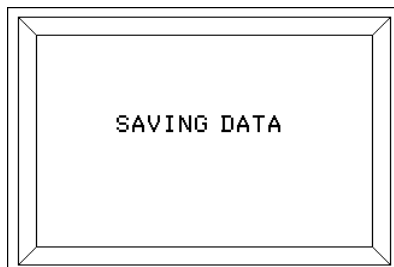
To load the factory default settings:

1. Remove power from the ProMotion.
2. For 45 or 30-key ProMotions, simultaneously hold **CTRL**, **SHIFT** and **F1**, and reapply power.  
For 20-key ProMotions, simultaneously hold **BKSP**, **ENTER** and **F1**, and reapply power.
3. After the ProMotion sounds an alert and displays the "LOAD DEFAULTS?" message, release the keys.



4. For 45 or 30-key ProMotions, press **F1** to reload the default values. Press **F5** to leave the parameters unchanged.  
For 20-key ProMotions, press **F1** to reload the default values. Press **F4** to leave the parameters unchanged.

When you reload the default values, the ProMotion will save the data and then prompt you to adjust the [Setting the Contrast Midpoint](#). Should you leave the parameters unchanged, the ProMotion will continue on to the [self-test](#).

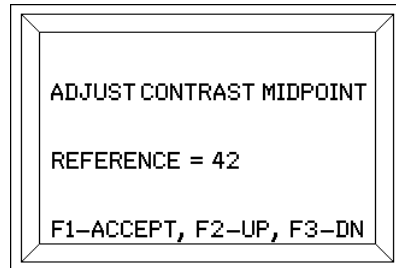


## Setting the Contrast Midpoint

The contrast midpoint enables you to optimize the display contrast for various environmental conditions that can affect character brightness based on a range of values where 00 is the lightest setting and 99 is the darkest. The contrast midpoint is also the MID value for the View Angle Parameter setting, where it is the midpoint of eight lighter and eight darker settings.

To set the contrast midpoint:

1. Load the factory default values described previously. The ADJUST CONTRAST MIDPOINT screen appears and displays the current midpoint value.



2. To increment the reference value by three, press **F2**.
3. To decrement the reference value by three, press **F3**.
4. To save any changes, press **F1**.
5. After setting contrast midpoint, the ProMotion will then perform a self-test.

## Restricting Access

---

If needed, you can prevent access to the Parameter menu and disable the following Escape commands: Set All Parameters (Esc [1z), Set and Save All Parameters (Esc [2z), Set All Defaults (Esc [3z) and Program Function Keys (Esc [5z).

To restrict access to the Parameter menu and disable related Escape commands:

1. Remove power from the ProMotion.
2. For 45 or 30-key ProMotions, simultaneously hold **CTRL**, **SHIFT** and **F3**, and reapply power.  
For 20-key ProMotions, simultaneously hold **BKSP**, **ENTER** and **F3**, and reapply power.

In either case, the ProMotion will save the change and then perform a self-test

To re-enable access to the Parameter menu and related Escape commands after restricting access, simply repeat the above procedure.





# Chapter 4: Key Programming

## Introduction

---

You can reprogram all the keys on the ProMotion’s keypad. However, you are limited to a total of 222 bytes of memory (one character per byte plus an additional two bytes for each key programmed). For example, to program a key to display, “HELLO” would take seven bytes of memory.

In addition to programming characters, you can enter special hex codes to control the transmission and display of characters between the host and terminal.

All programmable key settings are stored in the ProMotion’s non-volatile memory.

When pressed separately or in tandem with the **SHIFT** and/or **CTRL** modifiers, the keys on the terminals output preset values as shown in [Appendix C](#).

To display the results of key programming on your terminal, you should first enable ECHO.

When programming keys that use both the **CTRL** and **SHIFT** modifier keys, you should enable SHIFT LOCK to avoid conflicts with existing functions (e.g., pressing **CTRL**, **SHIFT** and **F1** accesses the Parameter menu) as well as prevent “Phantom Key” syndrome.

If your keypad has limited alphanumeric capability, you can program the function key using ANSI mode host commands. See [Programming Key Commands](#) for more information.

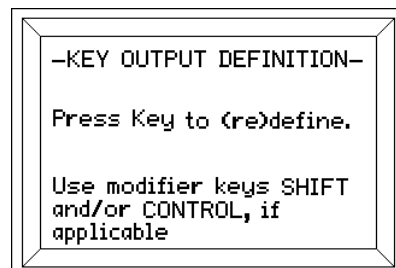
## Defining Key Output

---

To create a key output definition:

1. For 45 or 30-key ProMotions, simultaneously hold **CTRL**, **SHIFT** and **F2**.  
For 20-key ProMotions, simultaneously hold **BKSP**, **ENTER** and **F2**.

In either case, the ProMotion then will display the following screen:



2. Press a key (for example, F1) to define its key output definition. The screen will then show the row and column location for that key (Row 1, Column1).

```

You have selected the
UNSHIFTED key at
location Row 1, Col 1.

F1=Examine/Edit Data
F3=Pick some other key
F4=Quit

```

- Press **F1** to display the Examine/Edit Data menu. Displayable characters appear within single quotes (for example, 'A'). Non-printable characters appear in hexadecimal notation, prefixed with an uppercase H (for example, F1 = HCA). Note the available free memory appears in the lower right corner.

```

HCA END

F1 = ← (Decrement cursor posit.)
F2 = → (Increment cursor posit.)
F3 = Use Insert/Delete Menu
F4 = Enter numeric data
F5 = Save & exit or abort & exit
All other keys = direct input
Cursor data: Decimal=202, Hex=CA
Insert = OFF. Free Memory = 222

```

- To change the current value (indicated a blinking cursor), either press any alphanumeric key for direct character input (i.e., press **A** to enter A) or press **F4** to enter the hex (A = 41) or decimal equivalent (A = 065).

*Note: Since there are no alphabetical characters or symbols a 20-key keypad, you must use the hex or decimal equivalent (See [Appendix B](#)).*

```

HCA END

F2 = Backspace
F3 = Go back to Edit menu
F4 = Enter Decimal data instead

Enter 2 Hex digits:
Cursor data: Decimal=017, Hex=11
Insert = OFF. Free Memory = 222

```

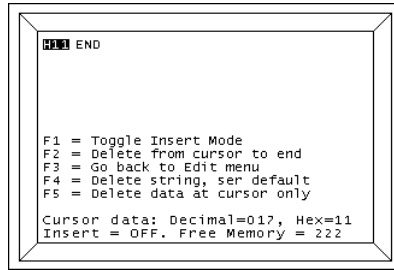
```

HCA END

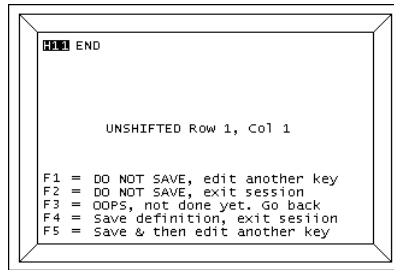
F2 = Backspace
F3 = Go back to Edit menu
F4 = Enter Hex data instead
      (255 MAX)
Enter Enter 3 DECIMAL digits:
Cursor data: Decimal=017, Hex=11
Insert = OFF. Free Memory = 222

```

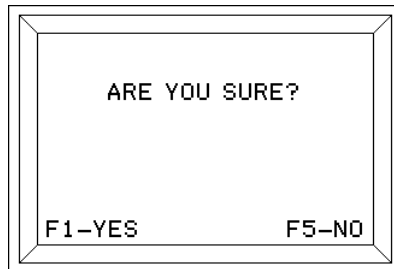
- To add an additional value, press **F2** to move the cursor right and over the "END" field and then repeat Step 4. To move the cursor left, back to its original position, press **F1**.
- To make insertions or deletions between fields or reset a key's default value, press **F3** to access the Insert/Delete menu.



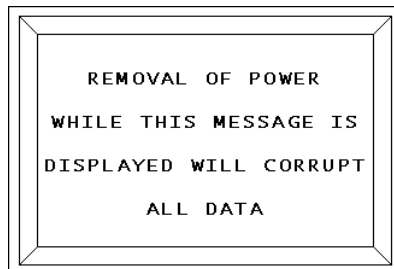
- After making a selection from the Insert/Delete menu, you will return to the Examine/Edit Data menu. After completing your entries, press **F5** to go to the Save menu.



- To save the definition and exit the session, press **F4**. To save the definition and edit another key, press **F4**. In either case, a confirmation screen will appear.



- Press **F1** to save the session, or **F5** to abort (for 20-key keypads, press **F4**). If you select **YES**, the following screen appears:



- Do **not** remove power from the ProMotion while the above message appears on the screen or you will corrupt **all** stored data. Should you remove power during this time, you will have [load default values](#).

# Extended Key Functionality

---

Extended Key commands are special hex codes that you use while defining key output to control the transmission and display of characters on both the terminal side and host side. For example, sending the string "START" to the host, while displaying "RUNNING" on the terminal. Extended Key commands fall into the following categories:

- Break Commands
- Output Control Commands
- Pause Commands
- Branching Commands
- Handshake-Out Line Manipulation Commands

*Note: Before attempting to program keys with extended functionality, you must enable the Break Command parameter by using either the [Parameter Setup menu](#) or [ANSI Host Commands](#).*

## Break Commands

When a communication line is idle, the normal state of the terminal, the line is *marking* or transmitting continuous series of ones. The marking signal is a voltage between -3 and -30 VDC. Break commands place the transmit line into a condition known as *spacing*, where the terminal is sending zeroes for a specified time (either 250 ms or 3.5 seconds). The spacing signal is a voltage between +3 and +30 VDC.

### *Short Break*

When defining key output, enter BB as the two HEX digits to specify a break of 250 ms.

### *Long Break*

When defining key output, enter BC as the two HEX digits to specify a break of 3.5 seconds

## Output Control Commands

Normally, the ProMotion transmits data from a programmable key string serially. If you enable the Echo parameter, data also outputs to the display.

### *Toggle Display Echo*

When defining key output, enter BE as the two HEX digits to allow any or all parts of a programmable key string to both transmit and display simultaneously. With terminal echo disabled, the terminal will transmit all characters after the Toggle Display Echo command to both the display and the serial port.

Escape commands echoed to the display that do not require serial output will process normally.

Commands that require serial output are stored in the receiver buffer until the end of the current key string execution. Remember that this command is a toggle function and will operate according to the state of the terminal's Echo parameter setting.

### *Toggle Serial Output*

When defining key output, enter BF as the two HEX digits to prevent the terminal from transmitting characters within a programmable key string.

When used in conjunction with the Toggle Echo command, you can control which parts of a programmable key strings display on the terminal parts of strings and which parts transmit to the host. For example, to send the string "START" to the host while displaying "RUNNING" on the terminal, your key output definition would look like:

```
'S' 'T' 'A' 'R' 'T' HBF HBE 'R' 'U' 'N' 'N' 'I' 'N' 'G'
```

## Pause Commands

With the use of extended key functionality, you can program a key string to pause while either waiting to receive a specific character or a specific handshake line input.

### *Pause until Handshake Line Input is +V*

When defining key output, enter B7 as the two HEX digits to suspend programmable key output until the ProMotion's handshake line (at the interface connector) is between +3 and +30 volts.

If the handshake line is already in the +V range, there should be no delays in output. Should the terminal wait for a response for more than 0.50 seconds, it will display the Wait character. To abort the pause, press **CTRL** and **F5** simultaneously.

*Note: Use of this command requires that you disable the terminal's Handshake parameter.*

### *Pause until Handshake Line Input is -V*

When defining key output, enter B6 as the two HEX digits to suspend programmable key output until the ProMotion's handshake line (at the interface connector) is between -3 and -30 volts.

If the handshake line is already in the -V range, there should be no delays in output. Should the terminal wait for a response for more than 0.50 seconds, it will display the Wait character. To abort the pause, press **CTRL** and **F5** simultaneously.

*Note: Use of this command requires that you disable the terminal's Handshake parameter.*

### *Pause until n Character Received*

When defining key output, enter BD as the two HEX digits to suspend communication until the ProMotion receives a specified character (n) from the host before continuing.

For example to have the terminal send the string "START," wait for a specific character (in this case, the letter "G" in the string "STARTING") and then respond to the host by sending the string "RUNNING" to the host, your key output definition would look like:

```
'S' 'T' 'A' 'R' 'T' HBF HBD 'G' HBF 'R' 'U' 'N' 'N' 'I' 'N' 'G'
```

Should the terminal wait for a response for more than 0.50 seconds, it will display the Wait character. To abort the pause, press **CTRL** and **F5** simultaneously.

## Branching Commands

Branching commands enable you to reprocess or conditionally process all or portions of a programmable key string. Branch commands make use of a label that it will search for within a key output definition, starting at the beginning of the string.

When a Branch command finds the correct label, programmable key processing and output will continue normally with the character following the label. Any search for a non-existent label will result in the termination of programmable key string processing and a normal exit.

The terminal will ignore Label Designator commands and their respective values in all cases except for searches initiated by a branch condition.

### *Label Designator Command*

When defining key output, enter B4 as the two HEX digits to define the next character as a label. The label may be any value, such as "1," "A," or ">."

For example to define "1" as your label, your key output definition would look like:

```
HB4 '1'
```

### *Branch Always Command*

When defining key output, enter BA as the two HEX digits to unconditionally branch to the label value that follows.

For example, to jump unconditionally to label "1" after the terminal receives the character "Y," your key output definition would look like:

```
HB4 '1' 'N' 'E' 'X' 'T' HBD 'Y' HBA '1'
```

### *Conditional Branch Command*

When defining key output, enter B5 as the two HEX digits to branch to the label value that follows when the Handshake-In line is between -3 and -30 volts.

If the Handshake-In line is between +3 and +30 volts, programmable key processing and output will continue normally with the character following the conditional branch's label value.

In the following example, the terminal acts as a remote monitoring device that checks the paper status and assumes the following:

1. The host will power up in a "STOPPED" state.
2. When the paper is low, the host asserts a -V on the line connected to handshake input of the terminal.
3. When the unit begins to run, the host will transmit "R."
4. When the unit stops, the host will transmit "S."
5. Parameters settings for the terminal include DISABLE ECHO, ESCAPE MODE = PRIVATE and SCREEN SIZE = 24 x 8.

```
HBF HBE HB4 '1' H1B 'E' 'S' 'T' 'O' 'P' 'E' 'D' HB5 '2' H0D H0A 'P' 'A' 'P' 'E' 'R' ' ' 'L' 'O' 'W' '
H4B '2' HBD 'R' H1B 'E' 'R' 'U' 'N' 'N' 'I' 'N' 'G' 'HB5 '3' H0D H0A 'P' 'A' 'P' 'E' 'R' ' ' 'L' 'O' 'W' '
HB4 '3' HBD 'S' HBA '1'
```

## Handshake-Out Manipulation Commands

Handshake-Out Manipulation commands are useful to signal an external device. The Handshake-Out line will maintain voltage levels between +3 and +15 volts or -3 and -15 volts. Effective line load resistance should always be greater than 3K ohms (RS-232 interface only).

### *Assert Handshake-Out Equals -V Command*

When defining key output, enter B8 as the two HEX digits to assert the Handshake-Out line at the interface connector to between -3 and -15 volts (-V).

*Note: Use of this command requires that you disable the terminal's Handshake parameter.*

### *Assert Handshake-Out Equals +V Command*

When defining key output, enter B9 as the two HEX digits to assert the Handshake-Out line at the interface connector to between +3 and +15 volts (+V).

*Note: Use of this command requires that you disable the terminal's Handshake parameter.*

## Extended Function Key Command Summary

The following table is a summary of extended function key commands.

Table 4-1: Extended Function Key Command Summary

| <i>Hex Code/Syntax</i> | <i>Command/Summary</i>   |
|------------------------|--|
| BC                     | Execute Long Break – specifies a break of 3.5 seconds  |
| BB                     | Execute Short Break – specifies a break of 250 ms  |
| BE                     | Toggle Display Echo – defaults to ECHO parameter setting   |
| BF                     | Toggle Serial Output – defaults to serial output   |
| BD <i>n</i>            | Pause until <i>n</i> Character Received – wait to receive a specific character ( <i>n</i> ) from serial input  |
| B7                     | Pause Until Handshake Line Input +V – suspend programmable key output until handshake line is between +3 and +30 volts   |
| B6                     | Pause Until Handshake Line Input -V – suspend programmable key output until handshake line is between -3 and -30 volts   |
| B4 <i>n</i>            | Label Designator – define the next character ( <i>n</i> ) as the label for branch commands   |
| BA <i>n</i>            | Branch Always – jump to <i>n</i> , where <i>n</i> is the character specified in the Label Designator command   |
| B5 <i>n</i>            | Branch Conditional – jump to <i>n</i> , where <i>n</i> is the character specified in the Label Designator command, provided that the Handshake-In line is between -3 and -15 volts |
| B8                     | Assert Handshake-Out Equals -V Command – assert the Handshake-Out line, at the interface connector to between -3 and -15 volts   |
| B9                     | Assert Handshake-Out Equals +V Command – assert the Handshake-Out line, at the interface connector to between +3 and +15 volts   |





# Chapter 5: ANSI Mode Host Commands

## Introduction

---

As discussed previously, the ProMotion's design allows a host to control its functions by sending commands that begin with the Escape character. When set to ANSI mode, the ProMotion will recognize commands that are compatible with the American National Standards Institute X3.64 standard. For example, sending an Esc [H (1Bh 5Bh 48h) will move the cursor to the home position (upper right corner). A command summary appears at the end of this section.

*Note: Do not use spaces between characters in Escape commands. Any spacing shown for Escape commands in this chapter is for clarity only unless otherwise noted.*

## Cursor Commands

---

### *Cursor Up*

*Syntax*      Esc [*Pn* A

*Notes*        *Pn* indicates an optional repeat count. If the count is absent, the cursor will move one position. The cursor will not move beyond the start or end of a line, nor will it scroll the display.

### *Cursor Down*

*Syntax*      Esc [*Pn* B

*Notes*        *Pn* indicates an optional repeat count. If the count is absent, the cursor will move one position. The cursor will not move beyond the start or end of a line, nor will it scroll the display.

### *Cursor Right*

*Syntax*      Esc [*Pn* C

*Notes*        *Pn* indicates an optional repeat count. If the count is absent, the cursor will move one position. The cursor will not move beyond the start or end of a line, nor will it scroll the display.

### *Cursor Left*

*Syntax*      Esc [*Pn* D

*Notes*        *Pn* indicates an optional repeat count. If the count is absent, the cursor will move one position. The cursor will not move beyond the start or end of a line, nor will it scroll the display.

### *Cursor Position*

*Syntax* Esc [*Pr*; *Pc* f or Esc [*Pr*; *Pc* H

*Notes* *Pr* and *Pc* are the optional row and column numbers of the target cursor location, respectively. If the row and column are absent, the command simply moves the cursor to the home position.

### *Cursor Home & Clear Display*

*Syntax* Esc [1s

### *Save Cursor Position*

*Syntax* Esc [s

*Notes* Temporarily stores the current cursor position in RAM memory and is lost when you remove power.

### *Restore Cursor Position*

*Syntax* Esc [u

*Notes* Returns the cursor to the stored position

### *Enable Cursor*

*Syntax* Esc [4t

### *Disable Cursor*

*Syntax* Esc [5t

### *Enable Cursor Blink*

*Syntax* Esc [3; 0z or Esc [6t

### *Disable Cursor Blink*

*Syntax* Esc [3; 1z or Esc [7t

### *Hide Cursor*

*Syntax* Esc [3; 4z

## CR/LF Commands

---

### *Normal Mode*

*Syntax* Esc [20l

*Notes* Sends a carriage return character (0Dh) to the host

### *New Line Mode*

*Syntax* Esc [20h

*Notes* Sends a carriage return character (0Dh) and a line feed character (0Ah) to the host

## Erasure Commands

---

### *Erase Cursor to End of Line*

*Syntax*      Esc [K

*Notes*        Includes the character at the cursor location and does not alter the cursor position

### *Erase Start of Line to Cursor*

*Syntax*      Esc [1K

*Notes*        Includes the character at the cursor location and does not alter the cursor position

### *Erase Entire Line*

*Syntax*      Esc [2K

*Notes*        Includes the character at the cursor location and does not alter the cursor position

### *Erase Cursor to End of Display*

*Syntax*      Esc [J

*Notes*        Includes the character at the cursor location and does not alter the cursor position

### *Erase Start of Display to Cursor*

*Syntax*      Esc [1J

*Notes*        Includes the character at the cursor location and does not alter the cursor position

### *Erase Entire Display*

*Syntax*      Esc [2J

*Notes*        Includes the character at the cursor location and does not alter the cursor position

## Reset Commands

---

### *Reset Terminal*

*Syntax*      Esc c

*Notes*        This command is equivalent to removing and reapplying operating power from the terminal.

## Escape Mode Commands

---

### *Switch to Private Mode*

*Syntax*      Esc [?2l

*Notes*        This command causes the terminal to switch from recognizing ANSI host commands to recognizing Private host commands.

## Character Attribute Commands

---

### *Set Blink Attribute*

*Syntax* Esc [2s or Esc [5; m

*Notes* Characters written subsequent to the setting or clearing of attributes will assume the new attribute characteristics.

### *Clear Blink Attribute*

*Syntax* Esc [3s

*Notes* Characters written subsequent to the setting or clearing of attributes will assume the new attribute characteristics.

### *Set Reverse Video Attribute*

*Syntax* Esc [7; m

*Notes* Characters written subsequent to the setting or clearing of attributes will assume the new attribute characteristics.

When Reverse Video is set, functions that clear any portion of the screen (e.g., scrolling and erase line) will use a solid fill character.

### *Clear All Attributes*

*Syntax* Esc [0; m

*Notes* Characters written subsequent to the setting or clearing of attributes will assume the new attribute characteristics.

## Key Attribute Commands

---

### *Enable Key Repeat*

*Syntax* Esc [?8h

*Notes* This command enables key repeat, using the most recent rate setting.

### *Disable Key Repeat*

*Syntax* Esc [?8l

### *Enable Key Click*

*Syntax* Esc [0t

### *Disable Key Click*

*Syntax* Esc [1t

### *Enable KNP Function*

*Syntax* Esc [2t

### *Disable KNP Function*

*Syntax* Esc [3t

# Self-Test & Return Commands

---

## *Perform Self-Test & Return Results*

*Syntax* Esc [4n

*Notes* This command performs the built-in confidence test and reports the result. A response of Esc [0n indicates that the terminal passed the confidence test; a response of Esc [3n indicates that the confidence test has not run or that a malfunction occurred.

## *Return Last Self-Test Results*

*Syntax* Esc [5n

*Notes* This command reports the result of the last confidence test run since the terminal power up. A response of Esc [0n indicates that the terminal passed the confidence test; a response of Esc [3n indicates that the confidence test has not run or that a malfunction occurred.

## *Return Device Attributes*

*Syntax* Esc [c

*Notes* This command sends the following string to the host indicating that the ProMotion is ANSI 3.64/VT100 compatible: Esc [?8; 4c.

## *Return Terminal Identifier String*

*Syntax* Esc [p

*Notes* This command sends the following identifier string to the host:  
Esc [0x PT *NN* XM *CCCC* Esc [1x  
Where *NN* is the keypad type (20, 30 or 45) and *CCCC* is the four-byte hexadecimal checksum of the terminal's program memory.  
When using this command to identify the terminal type, do not include the checksum as it may change.

## *Return Cursor Position*

*Syntax* Esc [6n

*Notes* This command sends the cursor's current location to the host in the form:  
Esc [*Rn*; *Cn* R  
Where *Rn* is the row number and *Cn* is the column number. For example, a return of Esc [4; 21R indicates a cursor position of Row 4, Column 21.  
When the Scroll parameter is set to LAST CHR+1, a return of Esc [8; 25R or Esc [16; 33R (depending on the screen size) represents the cursor position after a character is written to Row 8, Column 24 or Row 16, Column 32.

## Display Attribute Commands

---

### *Set Screen Size to 32 x 16*

*Syntax*      Esc [1; 0z

### *Set Screen Size to 24 x 8*

*Syntax*      Esc [1; 1z

### *Adjust LCD Contrast*

*Syntax*      Esc [v

*Notes*      This command increases the contrast one level

### *Enable Backlight*

*Syntax*      Esc [8t

*Notes*      Applies only to terminals with optional backlit displays

### *Disable Backlight*

*Syntax*      Esc [9t

*Notes*      Applies only to terminals with optional backlit displays

## Sound Commands

---

You cannot buffer sound commands. To produce properly spaced chain sounds, the host must delay a short time between issuing sound commands.

### *Short Bell*

*Syntax*      Esc [0q

### *Long Bell*

*Syntax*      Esc [1q

### *Alert*

*Syntax*      Esc [2q

### *Key Click*

*Syntax*      Esc [3q

# LED Control Commands

---

On models equipped with optional LED indicators, the following commands control LEDs usage:

## *Disable LED 1*

*Syntax*      Esc [6q

## *Enable LED 1*

*Syntax*      Esc [7q

## *Disable LED 2*

*Syntax*      Esc [8q

## *Enable LED 2*

*Syntax*      Esc [9q

## *Disable LED 3*

*Syntax*      Esc [10q

## *Enable LED 3*

*Syntax*      Esc [11q

## *Disable LED 4*

*Syntax*      Esc [12q

## *Enable LED 4*

*Syntax*      Esc [13q

## *Disable All LEDs*

*Syntax*      Esc [16q

# Parameter Modification Commands

---

You can change the ProMotion's parameter settings from the host using Escape commands. You can issue commands for individual settings, all settings or simply report the current settings.

The Set Defaults command resets all parameters and keys to their default settings. The Set Parameters command enables you to change but not save parameters to memory. The Set and Save Parameters command enables you to change and save parameters to memory.

*Note: If you have [restricted access](#) to the Parameter menu, you cannot use these commands.*

## *Set Defaults*

*Syntax*      Esc [3z Esc [0z

## *Set Parameters*

*Syntax*      Esc [1z P1; P2; P3; P3A; . . . P22 Esc [0z

## *Set and Save Parameters*

*Syntax*      Esc [2z P1; P2; P3; P3A; . . . P22 Esc [0z

### *Set Parameters & Set and Save Parameters Command Notes*

Both commands can specify up to twenty-three single character parameters from a fixed list (see [Table 5-1](#)).

You can omit any or all of the parameters by using the semicolon as a placeholder, except in the case of P3A (STOP BITS). P3A is only significant if specified.

P3A has the following characteristics:

1. You cannot substitute P3A with a placeholder. The terminal will interpret a placeholder in the P3A position as a placeholder for P4.
2. You can specify P3A even if P3 has a placeholder.
3. In certain situations, the terminal will automatically set the number of stop-bits to either one (when you select eight data-bits and any parity) or two (when you select seven data-bits and no parity). In either case, the setting of P3A will have no effect.

Parameter values not specified in the Set All Parameters and Set and Save All Parameters commands will remain unchanged.

After the terminal has processed a Set All Parameters or Set and Save All Parameters command, it will send the new parameters setting the host as ASCII text, with each parameter followed by a carriage return and line feed.

To send the current parameter values to the host without changing any values, simply send: Esc [1z Esc [0z.

Table 5-1: Set Parameters Commands

| <i>Parameter</i> | <i>Name</i>            | <i>Options</i>  |
|------------------|------------------------|---|
| P1               | Baud                   | <u>3</u> 00, <u>6</u> 00, <u>1</u> 200, <u>2</u> 400, <u>4</u> 800, <u>9</u> 600, 1920 <u>0</u> , <u>5</u> 7600 |
| P2               | Data Bits              | <u>7</u> or <u>8</u>  |
| P3               | Parity                 | <u>E</u> VEN, <u>O</u> DD, <u>M</u> ARK, <u>S</u> PACE, <u>N</u> ONE, <u>I</u> GNORE                            |
| P3A              | Stop Bits              | <u>1</u> or <u>2</u>  |
| P4               | Display PE             | <u>E</u> NABLE, <u>D</u> ISABLE   |
| P5               | Repeat                 | <u>S</u> LOW, <u>M</u> EDIUM, <u>F</u> AST, <u>D</u> ISABLE   |
| P6               | Key Click              | <u>E</u> NABLE, <u>D</u> ISABLE   |
| P7               | KNP Function           | <u>E</u> NABLE, <u>D</u> ISABLE   |
| P8               | Cursor                 | <u>E</u> NABLE, <u>D</u> ISABLE   |
| P9               | Cursor Blink           | <u>E</u> NABLE, <u>D</u> ISABLE   |
| P10              | XON/XOFF               | <u>E</u> NABLE, <u>D</u> ISABLE   |
| P11              | Handshake              | <u>E</u> NABLE, <u>D</u> ISABLE   |
| P12              | Echo                   | <u>E</u> NABLE, <u>D</u> ISABLE   |
| P13              | Escape Mode            | <u>A</u> NSI, <u>P</u> RIVATE   |
| P14              | CR/LF Mode             | <u>N</u> ORMAL, <u>N</u> EW <u>L</u> INE  |
| P15              | Test                   | <u>E</u> NABLE, <u>D</u> ISABLE   |
| P16              | Shift Lock             | <u>E</u> NABLE, <u>D</u> ISABLE   |
| P17              | Scroll On              | <u>0</u> (LAST CHR) or <u>1</u> (LAST CHR +1)   |
| P18              | Viewing Angle          | <u>1</u> (Min) , <u>2</u> , <u>3</u> , <u>4</u> , <u>5</u> , <u>6</u> , <u>7</u> , <u>8</u> (Max)               |
| P19              | Break Command          | <u>E</u> NABLE, <u>D</u> ISABLE   |
| P20              | Screen Size            | <u>0</u> (32 x 16) or <u>1</u> (24 x 8)   |
| P21              | Menu Mode              | <u>N</u> ON-DESTRUCT, <u>D</u> ESTRUCTIVE   |
| P22              | Backlight <sup>1</sup> | <u>O</u> N, <u>T</u> IMED, <u>O</u> FF  |

**Example**

The following command will enable communications at 9600 baud, 8 data bits, even parity and 1 stop bit. In addition it will disable the parity error symbol, use fast repeat, disable the key click, disable the KNP function, enable the cursor, disable cursor blink, enable XON/XOFF protocol, and enable handshaking. It will also use ANSI escape mode commands, set CR/LF Mode to normal, enable self-test, disable the shift lock, set the scroll on to the last character, set the viewing angle to 4, disable the break command, use a 32 x 16 screen size, set the menu mode to non-destruct mode and turn on the backlight.

Esc [1z 9; 8; E; 1; D; F; E; D; E; E; D; E; E; A; N; E; D; 0; 8; D; 0; N; 0; Esc [0z

# Programming Key Commands

---

You can issue ANSI host commands to reprogram any keys, except for **SHIFT** and **CTRL** to transmit a single character or a string of characters. However, if you have [restricted access](#) to the Parameter menu, you cannot use these commands.

## Program Key

**Syntax** Esc [5z *Kn*; C1; C2; . . . C*n* Esc [0z

**Notes** This command reprograms a key , where *Kn* is the key position as defined in [Table 5-2](#) and C1, C2 . . . C*n* are the character values in ASCII Hex notation (“A” = 41, “B” = 42, etc.).

For example, to program a non-shifted key in Row 1, Column 1 with the string “STOP,” issue the following command:

```
Esc [5z K01; 53; 54; 4F; 50 Esc [0z
```

When programming keys, there is a limit of 222 bytes of available memory. In addition to the number of characters programmed (one character per byte), each key requires an additional two bytes of memory. For example, programming the string “STOP” uses six bytes.

A key programmed without data is effectively inoperative (no output or key click), but still uses two bytes of key memory. The only way to free memory is to re-program keys to their default settings.

Should the terminal encounter an error during key programming, it will terminate the programming operation without allocating memory and return the following error string:

```
Esc [0x ERROR CODE= XX PARAMETERS UNCHANGED Esc [1x3
```

Where *XX* is one the following ACSII Hex error codes:

```
01      =  Kn improper
02-F0H  =  C1 . . . Cn format error
FEH     =  Not Enough memory available
FFH     =  Key memory data corrupted
```

After the terminal successfully receives the Esc [0z termination command, it inserts the programming information into memory. Should you remove power within 0.75 seconds of this time, all programmed key data may become corrupt and subsequently require you to load the default parameters.

## Report Key Settings

**Syntax** Esc [4z

**Notes** This command sends a list of keys programmed with values other than the default values to the host using the format:

```
Esc [0x Kn; C1; C2; . . . Cn; Kn C1; C2; . . . Cn Esc [1x
```




Where *Kn* is the key position as defined in [Table 5-2](#) and C1, C2 . . . C*n* are the character string values in ASCII Hex notation (“A” = 41, “B” = 42, etc.).

For example, an un-shifted key in Row 1, Column 1 programmed with the string “STOP” will return:

```
Esc [0x K01H; 53H; 54H; 4FH; 50H Esc [1x
```

Table 5-2: Key Positions (ASCII Hex Values)

| <i>Modifier Key/Row</i> |   | <i>Col 1</i> | <i>Col 2</i> | <i>Col 3</i> | <i>Col 4</i> | <i>Col 5</i> |
|-------------------------|---|--------------|--------------|--------------|--------------|--------------|
| <i>Normal</i>           | 1 | 01           | 02           | 03           | 04           | 05           |
|                         | 2 | 06           | 07           | 08           | 09           | 0A           |
|                         | 3 | 0B           | 0C           | 0D           | 0E           | 0F           |
|                         | 4 | 10           | 11           | 12           | 13           | 14           |
|                         | 5 | 15           | 16           | 17           | 18           | 19           |
|                         | 6 | 1A           | 05           | 1C           | 1D           | 1E           |
|                         | 7 | 1F           | 0A           | 21           | 22           | 23           |
|                         | 8 | 24           | 0F           | 26           | 27           | 28           |
|                         | 9 | 29           | 14           | 2B           | 2C           | 2D           |
| <i>SHIFT</i>            | 1 | 2E           | 19           | 30           | 31           | 32           |
|                         | 2 | 33           | 1E           | 35           | 36           | 37           |
|                         | 3 | 38           | 39           | 3A           | 3B           | 3C           |
|                         | 4 | 3D           | 3E           | 3F           | 40           | 41           |
|                         | 5 | 42           | 43           | 44           | 45           | 46           |
|                         | 6 | 47           | 48           | 49           | 4A           | 4B           |
|                         | 7 | 4C           | 4D           | 4E           | 4F           | 50           |
|                         | 8 | 51           | 52           | 53           | 54           | 55           |
|                         | 9 | 56           | 57           | 58           | 59           | 5A           |
| <i>CTRL</i>             | 1 | 5B           | 5C           | 5D           | 5E           | 5F           |
|                         | 2 | 60           | 61           | 62           | 63           | 64           |
|                         | 3 | 65           | 66           | 67           | 68           | 69           |
|                         | 4 | 6A           | 6B           | 6C           | 6D           | 6E           |
|                         | 5 | 6F           | 70           | 71           | 72           | 73           |
|                         | 6 | 74           | 75           | 76           | 77           | 78           |
|                         | 7 | 79           | 7A           | 7B           | 7C           | 7D           |
|                         | 8 | 7E           | 7F           | 80           | 81           | 82           |
|                         | 9 | 83           | 84           | 85           | 86           | 87           |
| <i>SHIFT+CTRL</i>       | 1 | 88           | 89           | 8A           | 8B           | 8C           |
|                         | 2 | 8D           | 8E           | 8F           | 90           | 91           |
|                         | 3 | 92           | 93           | 94           | 95           | 96           |
|                         | 4 | 97           | 98           | 99           | 9A           | 9B           |
|                         | 5 | 9C           | 9D           | 9E           | 9F           | A0           |
|                         | 6 | A1           | A2           | A3           | A4           | A5           |
|                         | 7 | A6           | A7           | A8           | A9           | AA           |
|                         | 8 | AB           | AC           | AD           | AE           | AF           |
|                         | 9 | B0           | B1           | B2           | B3           | B4           |

Legend:  20-key keypad,  30-key keypad,  45-key keypad

# Custom Character Commands

You can customize most display characters in both the ACSII Character set and the ProMotion Extended Character set as defined in [Appendix A](#), with the exception of characters with hex values 00 through 20 and 80. A working knowledge of binary and hexadecimal notation is helpful for use of this feature.

## Program Custom Character

**Syntax** Esc [5z C*n*; R1; R2; . . . R*n* Esc [0z

**Notes** This command is case sensitive, where *Cn* is the character number as defined in one of the character sets found in [Appendix A](#), and R1; R2; . . . R*n* represent the corresponding row numbers for either a 16 x 32 screen (8 rows) or a 24 x 8 screen (16 rows) which contain ASCII hexadecimal characters (see Examples).

To display user characters, you must set the Data Bits parameter to 8 and enable Echo. You can then send the Esc [5z command to the terminal or program a key to output the character. For example, to program the F1 key to display Character C1, you would define the key output value as Hex 81.

When programming custom characters, you must have the correct screen size set. If you switch display modes, the characters will not appear.

**Examples** Program Character C1 as a box for a 16 x 32 Screen

| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Hex |
|-----|---|---|---|---|---|---|---|---|-----|
| R1  | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | F8  |
| R2  | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 88  |
| R3  | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 88  |
| R4  | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 88  |
| R5  | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 88  |
| R6  | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 88  |
| R7  | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | F8  |
| R8  | 0 | 0 | 0 | 0 | 0 | 0 | 0 |   | 00  |

Legend:  Bit on,  Bit off,  Bit ignored

Esc [5z C1; F8; 88; 88; 88; 88; 88; 88; 88; 88; 00 Esc [0z

bit 7 of each byte represents the leftmost column of the character.

As shown above, the hex values for the high order and low order byte are concatenated; the results are the values entered for each row (for example, F8h = 11111000).

Program Character C1 as a box for a 8 x 24 Screen

| <i>Bits</i> | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | <i>Hex</i> |
|-------------|---|---|---|---|---|---|---|---|------------|
| <i>R1</i>   | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 00         |
| <i>R2</i>   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | FE         |
| <i>R3</i>   | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | FE         |
| <i>R4</i>   | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | C6         |
| <i>R5</i>   | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | C6         |
| <i>R6</i>   | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | C6         |
| <i>R7</i>   | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | C6         |
| <i>R8</i>   | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | C6         |
| <i>R9</i>   | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | C6         |
| <i>R10</i>  | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | C6         |
| <i>R11</i>  | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | C6         |
| <i>R12</i>  | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | C6         |
| <i>R13</i>  | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | C6         |
| <i>R14</i>  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | FE         |
| <i>R15</i>  | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | FE         |
| <i>R16</i>  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 00         |

Legend:  Bit on,  Bit off ,

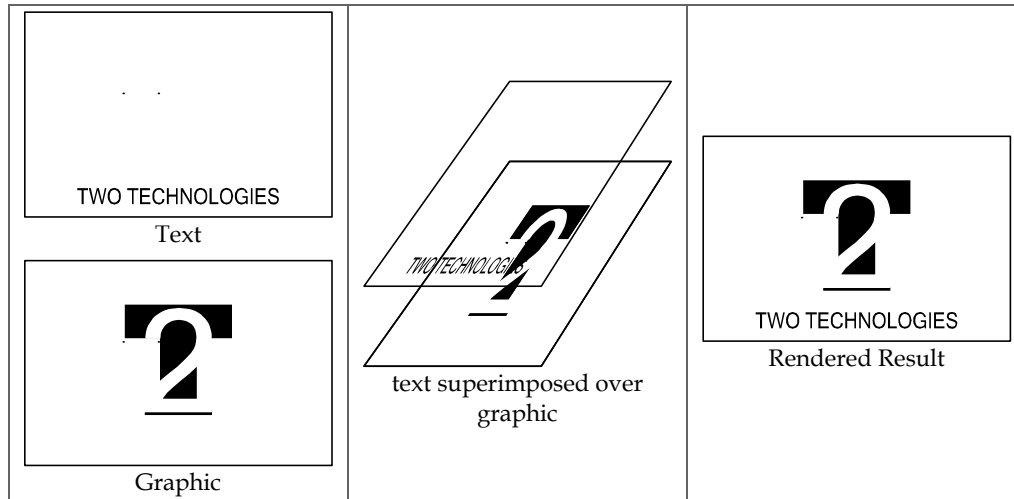
Esc [5z C1; 00; FE; FE; C6; C6; C6; C6; C6; C6; C6; C6; C6; C6; FE; FE; 00 Esc [0z  
 Bit 7 of each byte represents the leftmost column of the character.

As shown above, the hex values for the high order and low order byte are concatenated; the results are the values entered for each row (for example, FEh = 11111110).

# Graphics Mode

The ProMotion can display graphics by either downloading a proprietary graphics file or by manipulating graphic pixels to two graphic memory locations (Buffer0 and Buffer1) that are independent of text memory. As a result, the ProMotion superimposes the text over the images (see figure below). It cannot however, display the contents of both graphics buffers simultaneously. If you do not want to superimpose text over the image, you must first clear the text.

Figure 5-1: Graphics Rendering



**Note:** When overlaying text and graphics together, make sure the image does not wash out the text.

## Graphic Files

Before you can download graphic files from the host, you must convert the source file to a format (\*.ttb) that the ProMotion can process using the PROCNV.EXE file conversion command line utility (available from Two Technologies).

The source bitmap files must be monochrome (black and white) and 192-pixels wide x 128-pixels high. Each pixel is one bit. Each byte is eight bits. Total files size is 3072 bytes.

Figure 5-2: PROCNV.EXE

```
Microsoft Windows [Version 5.00.2195]
(C) Copyright 1985-2000 Microsoft Corp.

C:\TermDemo2>procnv logo

Creating output file logo.TTB

Done!

C:\TermDemo2>_
```

The syntax to convert a file is:

`procnv bitmap_filename (no extension)`

For example, `procnv logo`

## Graphics Mode Commands

**Note:** To facilitate faster transfer and the displaying of graphics, enable handshaking and use a baud rate between 19200 and 57600 bps.

### Load Binary Data to Graphics Buffer

**Syntax**      Esc [5z GL0; <transmission\_string> Esc [0z  
                 Esc [5z GL1; <transmission\_string> Esc [0z

**Notes**        Use the above commands to download image files from a host PC to one of two buffers in the ProTerm memory, where GL0 indicates Buffer 0, GL1 indicates Buffer 1 and *transmission\_string* is a string of ASCII characters that represent the hex values of the image's data bytes. For example, A = 41h (turns on Bit 6 and Bit 0 in a data byte).

When using communications programs, such as HyperTerminal, you can send the TTB file as a text file instead of specifying the *transmission\_string*.

Upon completion of an image download, you must issue a Display Buffer command to view the image on the terminal. However, in some cases, the graphic buffer may display during the download and give the appearance of a scrolling display.

You can download one image while displaying the other.

Text processing will slow while the terminal displays an image, especially when switching between screen sizes (24 x 8 to 32 x 16 or vice versa).

### Display Buffer Contents

**Syntax**      Esc [5z GD0 Esc [0z  
                 Esc [5z GD1 Esc [0z

**Notes**        Use the above commands to display the contents of the graphics buffers, where GD0 indicates Buffer 0 and GD1 indicates Buffer 1.

Should you attempt to display the contents of a graphics buffer prior to loading or clearing new data, whatever random pattern has been stored will display.

### Clear Buffer Contents

**Syntax**      Esc [5z GB0 Esc [0z  
                 Esc [5z GB1 Esc [0z

**Notes**        Use the above commands to clear the contents of the graphics buffers, where GB0 indicates Buffer 0 and GB1 indicates Buffer 1.

## Real-Time Graphic Commands

An alternative method to displaying images on the ProMotion is the direct manipulation of display pixels in real time.

### Set Pixels

**Syntax**      Esc [5z GS0; *Pr*; *Pc* Esc [0z  
Esc [5z GS1; *Pr*; *Pc* Esc [0z

**Notes**        Use the above commands to set a pixel in real-time, where GS0 indicates Buffer 0 and GS1 indicates Buffer 1, *Pr* is the hex value of the row position (along the horizontal axis) and *Pc* is the hex value of the column position (along the vertical axis).  
You should clear the buffer prior to displaying the contents of the buffer.

### Reset Pixels

**Syntax**      Esc [5z GC0; *Pr*; *Pc* Esc [0z  
Esc [5z GC1; *Pr*; *Pc* Esc [0z

**Notes**        Use the above commands to clear a set pixel in real-time, where GC0 indicates Buffer 0 and GC1 indicates Buffer 1, *Pr* is the hex value of the row position (along the horizontal axis) and *Pc* is the hex value of the column position (along the vertical axis).

## Graphics Mode Command Examples

### Example 1

The following example shows a series of commands that will clear the buffer contents, transfer a graphics image and display the contents on the display:

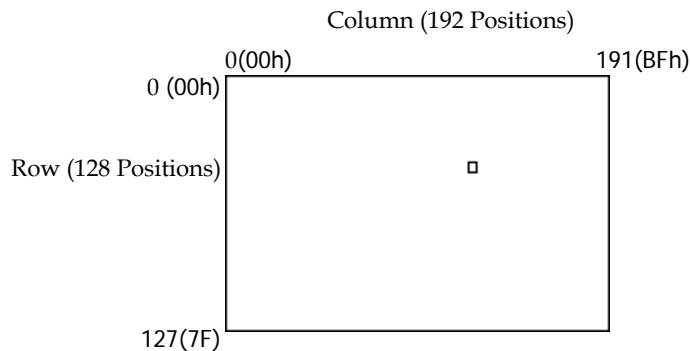
```
Esc [5z GB0 Esc [0z Esc [5z GL0; image_contents Esc [0z Esc [5z GD0 Esc [0z
```

**Note:** *image\_contents* is either a TIB file or a string of ASCII characters that represent the hex values of the image's data bytes.

### Example 2

The following example shows a series of commands that that will clear the buffer contents and draw a small box on the display:

```
Esc [5z GB0 Esc [0z Esc [5z GS0; 72;32 Esc [0z Esc [5z GS0; 72;33 Esc [0z Esc [5z GS0; 72;34 Esc [0z  
Esc [5z GS0; 72;35 Esc [0z Esc [5z GS0; 72;36 Esc [0z Esc [5z GS0; 73;32 Esc [0z Esc [5z GS0; 73;36 Esc  
[0z Esc [5z GS0; 74;32 Esc [0z Esc [5z GS0; 74;36 Esc [0z Esc [5z GS0; 75;32 Esc [0z Esc [5z GS0; 75;36  
Esc [0z Esc [5z GS0; 76;32 Esc [0z Esc [5z GS0; 76;33 Esc [0z Esc [5z GS0; 76;34 Esc [0z Esc [5z GS0;  
76;35 Esc [0z Esc [5z GS0; 76;36 Esc [0z
```



# Advanced Control Mode

Advanced Control Mode (ACM) enables you to restrict the input and output of the terminal's keypad by assigning specific hex values to each key press and each subsequent key release, making it ideal to control devices or applications in environments where safety is a primary concern. While in ACM, the following terminal features and functions are affected:

- **Terminal Parameters** – to use ACM, you must ensure that the Data Bits parameter is set to eight data bits.

While in ACM mode, terminal echo and key repeat are disabled.

You cannot save ACM settings. If power is lost, the terminal will revert to Normal mode.

- **Menu Access** – access to the Parameter Setup menu, the Key Output Definition Setup menu and Contrast Control is disabled.
- **ENQ Acknowledgement** – when the host enables ACM, the terminal's response to an ENQ (05h) becomes a DLE (10h) instead of an ACK (06h). This response will enable the host to verify that the terminal is in ACM.

The host should then periodically check for DLE at a fixed time interval as required for your application (such as 25 ms) to verify ACM and connection of the terminal. Communication must be set to eight data bits.

- **Key Codes** – while in ACM, the terminal makes a distinction between a key press and key release when transmitting data to the host.

For key presses, the terminal sends the default hex value of the key (i.e., A = 41h, B = 42h, etc.). Any keys redefined in Normal (non-ACM) mode will return to their default settings until the suspension of ACM activities.

For key releases, the terminal adds a hex value of 80 to the default hex value (i.e., A = 41h + 80h = C1, B = 42h + 80h = C2, etc.).

For example, pressing F1 sends 11h, while releasing F1 sends a 91h.

- **nKey Rollover** – while in ACM, you can press any combination of keys in any order, and the terminal will send the resultant key codes in tandem (i.e., pressing CTRL, SHIFT and F1 will send 11h, 7Ch, and 5Ch) and then the corresponding key codes in tandem, when you release the keys (91h, FCh, and DCh).

However, if a combination of three pressed keys results in a pressed key sharing a common column or row with another pressed key (i.e., form a corner), the terminal will not transmit the resulting key codes because the matrix system used by the terminal for key detection will find a "Ghost" key as illustrated below:

Figure 5-3: Ghost Key

|    |     |        |       |       |
|----|-----|--------|-------|-------|
| F1 | F2  | F3     | F4    | F5    |
| +  | (   | )      | <     | >     |
| A  | B   | C      | D     | E     |
| -  | !   | -      | [     | ]     |
| F  | G   | H      | I     | J     |
| /  | &   | :      | ;     | ?     |
| K  | L   | N      | O     |       |
| *  | @   | 7      | 8     | 9     |
| P  | Q   |        |       |       |
| =  | #   | 4      | 5     | 6     |
| R  | S   | 1      | 2     | 3     |
| ^  | \$  |        |       |       |
| T  | U   |        |       |       |
| '  | %   | .      | 0     | CTRL  |
| V  | W   | X      |       |       |
| "  | ESC | BACKSP | ENTER | SHIFT |
| Y  | Z   | SPACE  |       |       |

- **Modifier Keys** – while in ACM, the **CTRL** and **SHIFT** keys will not work as modifier keys; they can only change the mode indicator on the display as shown in the table below.

Table 5-3: ACM Mode– SHIFT and CTRL Key Results

| <i>Command</i> | <i>Function</i> | <i>Key</i>  | <i>Indicator</i> | <i>Press</i> | <i>Release</i> |
|----------------|-----------------|-------------|------------------|--------------|----------------|
| Esc [4v        | Disabled        | SHIFT       | None             | 5C           | DC             |
|                | Disabled        | CTRL        | None             | 7C           | FC             |
| Esc [5v        | Enabled         | SHIFT       | ⦿                | 5C           | DC             |
|                | Disabled        | CTRL        | None             | 7C           | FC             |
| Esc [6v        | Disabled        | SHIFT       | None             | 5C           | DC             |
|                | Enabled         | CTRL        | ⦿                | 7C           | FC             |
| Esc [7v        | Enabled         | SHIFT       | ⦿                | 5C           | DC             |
|                | Enabled         | CTRL        | ⦿                | 7C           | FC             |
|                | Enabled         | CTRL, SHIFT | ⦿                | 5C, 7C       | DC ,FC         |

## ACM Control Commands

Only the host can enable/disable ACM.

Because the host can send a request for ACM at any time, even while the operator is pressing or releasing keys, you should ensure that the host receives all keys press codes, their corresponding release codes and the proper ENQ response prior to any mode change.

### *Enable ACM*

*Syntax* Esc [1v

### *Disable ACM*

*Syntax* Esc [21v

## Shift and Ctrl Key Control Commands

### *Disable Shift, Disable Ctrl*

*Syntax* Esc [4v

### *Enable Shift, Disable Ctrl*

*Syntax* Esc [5v

### *Disable Shift, Enable Ctrl*

*Syntax* Esc [6v

### *Enable Shift, Enable Ctrl*

*Syntax* Esc [7v

## Example: Using ACM in a Robotic Environment

The following example shows the use of ACM in an industrial environment where safety during operation is a primary concern.

In this scenario, the ProMotion controls a robotic free-swinging arm (Figure 5-4), where:

1. The host transmits an ENQ (05h) every 25 ms to the terminal to determine its state (Normal mode or ACM).
2. The terminal in response will either send an ACK (06h) to indicate Normal mode, or a DLE (10h) to indicate DLE. If a timeout occurs for any reason, the host will stop the robotic arm.
3. In Normal mode, you can perform operations such as displaying graphics and switching to ACM (Esc [1v).
4. In ACM, you can press a key to move the arm and release a key to stop the arm. You can also switch back to Normal mode (Esc [21v).

A flowchart (Figure 5-5) appears on the following page.

Figure 5-4: Using ACM in a Robotic Environment

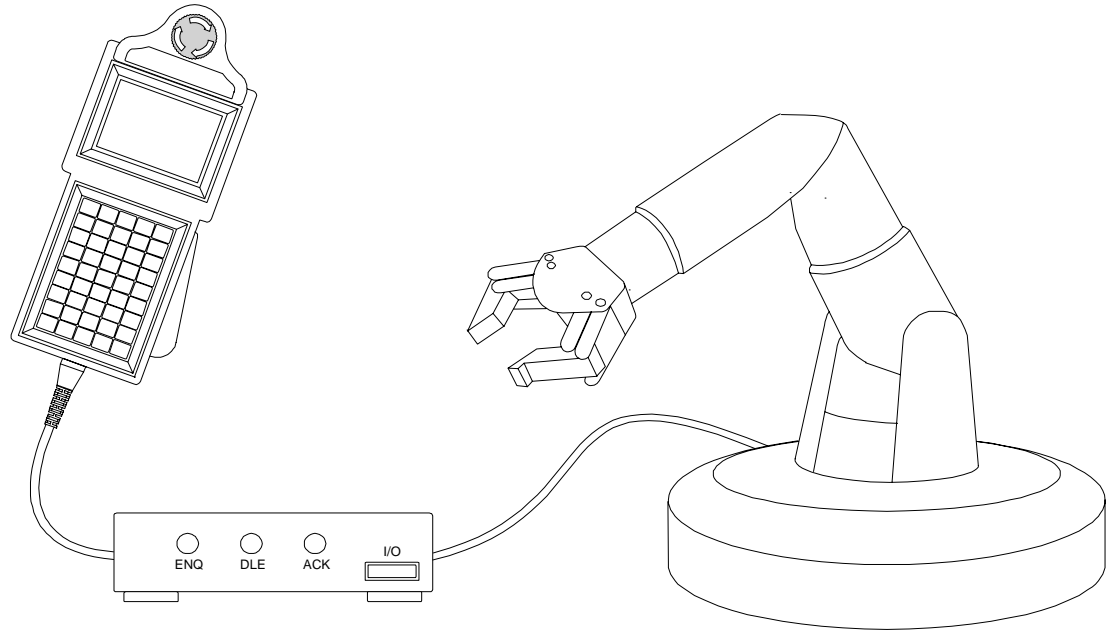
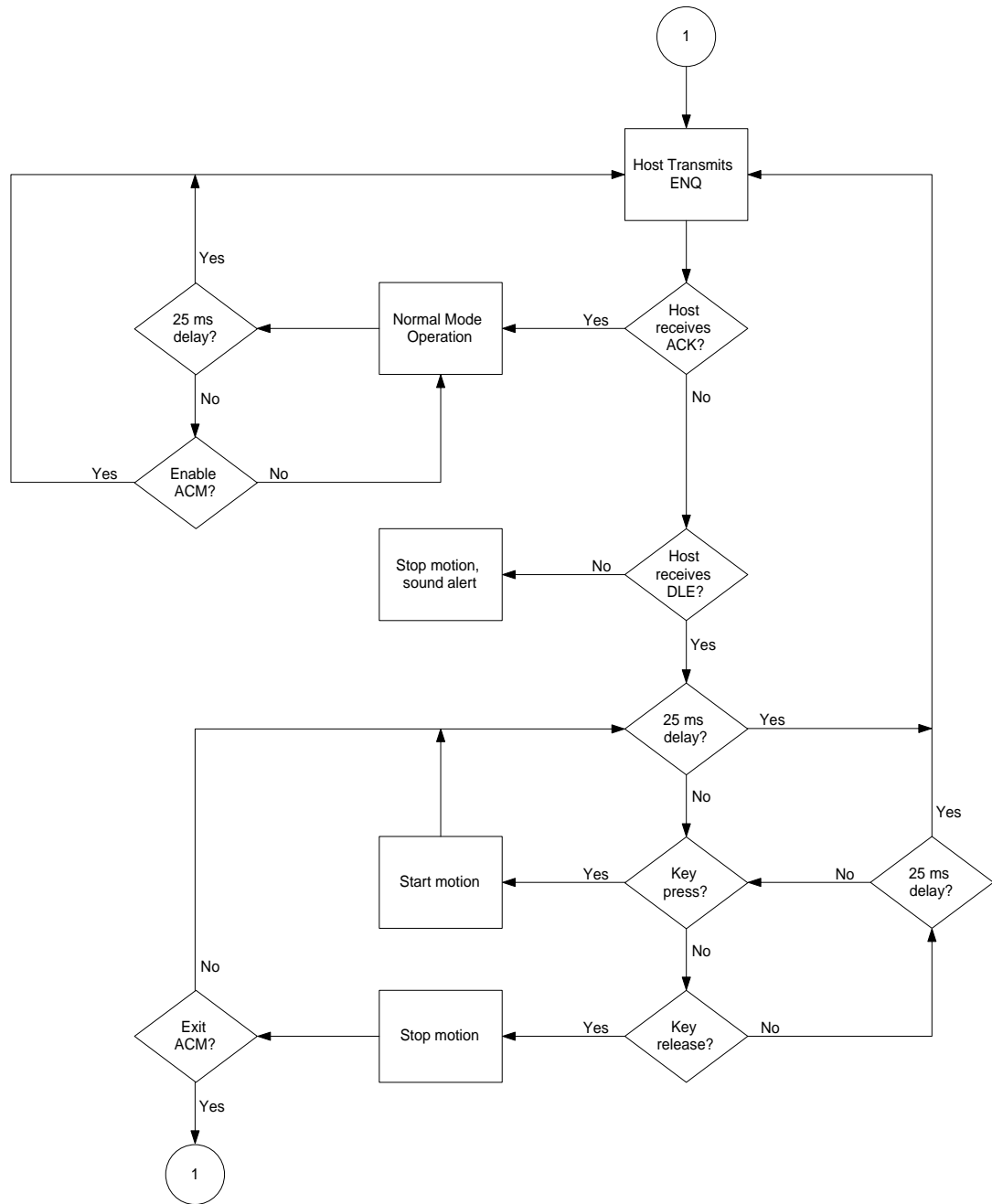


Figure 5-5: Using ACM in a Robotic Environment Flowchart



# ANSI Mode Host Command Summary

The following table is a summary of the available ANSI mode host commands.

Table 5-4: ANSI Mode Host Command Summary

| <i>Type</i>          | <i>Command</i>                     | <i>Syntax</i>  |
|----------------------|------------------------------------|--|
| Cursor               | Cursor Up                          | Esc [ <i>Pn</i> A  |
|                      | Cursor Down                        | Esc [ <i>Pn</i> B  |
|                      | Cursor Right                       | Esc [ <i>Pn</i> C  |
|                      | Cursor Left                        | Esc [ <i>Pn</i> D  |
|                      | Cursor Position                    | Esc [ <i>Pr</i> ; <i>Pc</i> f or Esc [ <i>Pr</i> ; <i>Pc</i> H |
|                      | Cursor Home & Clear Display        | Esc [1s  |
|                      | Save Cursor Position               | Esc [s   |
|                      | Restore Cursor Position            | Esc [u   |
|                      | Enable Cursor                      | Esc [4t  |
|                      | Disable Cursor                     | Esc [5t  |
|                      | Enable Cursor Blink                | Esc [6t or Esc [3; 0z  |
|                      | Disable Cursor Blink               | Esc [7t or Esc [3; 1z  |
|                      | Invisible Cursor                   | Esc [3; 4z   |
| Erasure              | Erase Cursor to End of Line        | Esc [K   |
|                      | Erase Start of Line to Cursor      | Esc [1K  |
|                      | Erase Entire Line                  | Esc [2K  |
|                      | Erase Cursor to End of Display     | Esc [J   |
|                      | Erase Start of Display to Cursor   | Esc [1J  |
|                      | Erase Entire Display               | Esc [2J  |
| Character Attributes | Set Blink Attribute                | Esc [2s or Esc [5; m   |
|                      | Clear Blink Attribute              | Esc [3s  |
|                      | Set Reverse Video Attribute        | Esc [7; m  |
|                      | Clear All Character Attributes     | Esc [0; m  |
| Sound                | Short Bell                         | Esc [0q  |
|                      | Long Bell                          | Esc [1q  |
|                      | Alert                              | Esc [2q  |
|                      | Key Click                          | Esc [3q  |
| Display Attributes   | Set Screen Size to 32 x 16         | Esc [1; 0z   |
|                      | Set Screen Size to 24 x 8          | Esc [1; 1z   |
|                      | Adjust LCD Contrast                | Esc [v   |
|                      | Enable Backlight <sup>1</sup>      | Esc [8t  |
|                      | Disable Backlight <sup>1</sup>     | Esc [9t  |
| Reset                | Reset Terminal                     | Esc c  |
| Reports              | Perform Self-Test & Return Results | Esc [4n  |
|                      | Return Last Self-Test Results      | Esc [5n  |
|                      | Return Cursor Position             | Esc [6n  |
|                      | Send Device Attributes             | Esc [c   |
|                      | Send Identifier String             | Esc [p   |

| <i>Type</i>              | <i>Command</i>                       | <i>Syntax</i>                                 |
|--------------------------|--------------------------------------|---|
| Key                      | Enable Key Repeat                    | Esc [?8h                                      |
|                          | Disable Key Repeat                   | Esc [?8l                                      |
|                          | Enable Key Click                     | Esc [0t                                       |
|                          | Disable Key Click                    | Esc [1t                                       |
|                          | Enable KNP Function                  | Esc [2t                                       |
|                          | Disable KNP Function                 | Esc [3t                                       |
| LED Control <sup>2</sup> | LED 1 Off                            | Esc [6q                                       |
|                          | LED 1 On                             | Esc [7q                                       |
|                          | LED 2 Off                            | Esc [8q                                       |
|                          | LED 2 On                             | Esc [9q                                       |
|                          | LED 3 Off                            | Esc [10q                                      |
|                          | LED 3 On                             | Esc [11q                                      |
|                          | LED 4 Off                            | Esc [12q                                      |
|                          | LED 4 On                             | Esc [13q                                      |
|                          | All Off                              | Esc [16q                                      |
| Escape Mode              | Switch to Private Mode               | Esc [?2l                                      |
| CR/LF Mode               | Normal Mode                          | Esc [20l                                      |
|                          | New Line Mode                        | Esc [20h                                      |
| Parameter Modification   | Set Parameters                       | Esc [1z P1; . . . Esc [0z                     |
|                          | Set and Save Parameters              | Esc [2z P1; . . . Esc [0z                     |
|                          | Set Defaults                         | Esc [3z Esc [0z                               |
| Program Keys             | Report Key Settings                  | Esc [4z Esc [0z                               |
|                          | Program Keys                         | Esc [5z <i>Kn</i> ; <i>Cn</i> ; . . . Esc [0z |
| Custom Characters        | Program Custom Character             | Esc [5z <i>Cn</i> ; <i>Rn</i> ; . . . Esc [0z |
| Graphics                 | Load Binary Data to Graphic Buffer 0 | Esc [5z GL0; . . . Esc [0z                    |
|                          | Load Binary Data to Graphic Buffer 1 | Esc [5z GL1; . . . Esc [0z                    |
|                          | Display Graphic Buffer 0             | Esc [5z GD0 Esc [0z                           |
|                          | Display Graphic Buffer 1             | Esc [5z GD1 Esc [0z                           |
|                          | Clear Graphic Buffer 0               | Esc [5z GB0 Esc [0z                           |
|                          | Clear Graphic Buffer 1               | Esc [5z GB1 Esc [0z                           |
|                          | Set Pixel in Graphic Buffer 0        | Esc [5z GS0; <i>Pr</i> ; <i>Pc</i> Esc [0z    |
|                          | Set Pixel in Graphic Buffer 1        | Esc [5z GS1; <i>Pr</i> ; <i>Pc</i> Esc [0z    |
|                          | Reset Pixel in Graphic Buffer 0      | Esc [5z GC0; <i>Pr</i> ; <i>Pc</i> Esc [0z    |
|                          | Reset Pixel in Graphic Buffer 0      | Esc [5z GC1; <i>Pr</i> ; <i>Pc</i> Esc [0z    |
| Advance Control Mode     | Enable ACM                           | Esc [1v                                       |
|                          | Disable ACM                          | Esc [21v                                      |
|                          | Disable SHIFT and CTRL               | Esc [4v                                       |
|                          | Enable SHIFT and Disable CTRL        | Esc [5v                                       |
|                          | Disable SHIFT and Enable CTRL        | Esc [6v                                       |
|                          | Enable SHIFT and CTRL                | Esc [7v                                       |

1. Only if the terminal has an optional backlight display

2. Only if the terminal has optional LEDs



# Chapter 6: Private Host Commands

## Introduction

---

As previously discussed, the ProMotion's design allows a host to control its functions by sending Escape commands. When set to Private mode, the ProMotion will recognize the simple compact command set discussed in this chapter. For example, sending an Esc H (Hex 1B 48) will move the cursor to the home position. A command summary appears at the end of this chapter.

*Note: Do not use spaces between characters in Escape commands. Any spacing shown for Escape commands in this chapter is for clarity only unless otherwise noted.*

## Cursor Commands

---

### *Cursor Up*

*Syntax*      Esc A

*Notes*        This command moves the cursor up one position. The cursor will not move beyond the start or end of a line, nor will it scroll the display.

### *Cursor Down*

*Syntax*      Esc B

*Notes*        This command moves the cursor down one position. The cursor will not move beyond the start or end of a line, nor will it scroll the display.

### *Cursor Right*

*Syntax*      Esc C

*Notes*        This command moves the cursor one position to the right. The cursor will not move beyond the start or end of a line, nor will it scroll the display.

### *Cursor Left*

*Syntax*      Esc D

*Notes*        This command moves the cursor one position to the right. The cursor will not move beyond the start or end of a line, nor will it scroll the display.

### *Cursor Home & Clear Display*

*Syntax*      Esc E

### *Enable Cursor*

*Syntax*      Esc F

### *Disable Cursor*

*Syntax*      Esc G

### *Cursor Home*

*Syntax*      Esc H

### *Enable Blinking Cursor*

*Syntax*      Esc R

### *Disable Blinking Cursor*

*Syntax*      Esc S

### *Cursor Position*

*Syntax*      Esc Y *Pr Pc*

*Notes*      This command moves the cursor to a specified location where *Pr* is the ASCII character equivalent of the row numbers and *Pc* is the ASCII character equivalent of the column numbers shown below.

| <i>Row</i> | <i>ASCII</i> |
|------------|--------------|
| 1          | SP           |
| 2          | !            |
| 3          | "            |
| 4          | #            |
| 5          | \$           |
| 6          | %            |
| 7          | @            |
| 8          | '            |
| 9          | (            |
| 10         | )            |
| 11         | *            |
| 12         | +            |
| 13         | ,            |
| 14         | -            |
| 15         | .            |
| 16         | /            |

| <i>Column</i> | <i>ASCII</i> | <i>Column</i> | <i>ASCII</i> |
|---------------|--------------|---------------|--------------|
| 1             | SP           | 17            | 0            |
| 2             | !            | 18            | 1            |
| 3             | "            | 19            | 2            |
| 4             | #            | 20            | 3            |
| 5             | \$           | 21            | 4            |
| 6             | %            | 22            | 5            |
| 7             | &            | 23            | 6            |
| 8             | '            | 24            | 7            |
| 9             | (            | 25            | 8            |
| 10            | )            | 26            | 9            |
| 11            | *            | 27            | :            |
| 12            | +            | 28            | ;            |
| 13            | ,            | 29            | <            |
| 14            | -            | 30            | =            |
| 15            | .            | 31            | >            |
| 16            | /            | 32            | ?            |

*Examples*    Esc Y ! )    Sends the cursor to Row 2, Column 10  
Esc Y % 0    Sends the cursor to Row 6, Column 17  
Esc Y / ?    Sends the cursor to Row 16, Column 32

## Erase Commands

---

### *Erase Cursor to End of Line*

*Syntax*      Esc K

*Notes*        Includes the character at the cursor location and does not alter the cursor position

### *Erase Cursor to End of Display*

*Syntax*      Esc J

*Notes*        Includes the character at the cursor location and does not alter the cursor position

### *Erase Entire Line*

*Syntax*      Esc M

*Notes*        Includes the character at the cursor location and does not alter the cursor position

### *Erase Display and Home Cursor*

*Syntax*      Esc E

## Character Attribute Commands

---

### *Set Blink Attribute*

*Syntax*      Esc W

*Notes*        Characters written subsequent to the setting or clearing of attributes will assume the new attribute characteristics.

### *Clear Blink Attribute*

*Syntax*      Esc X

*Notes*        Characters written subsequent to the setting or clearing of attributes will assume the new attribute characteristics.

### *Set Reverse Video Attribute*

*Syntax*      Esc w

*Notes*        Characters written subsequent to the setting or clearing of attributes will assume the new attribute characteristics.

When Reverse Video is set, functions that clear any portion of the screen (e.g., scrolling and erase line) will use a solid fill character.

### *Clear Reverse Video Attribute*

*Syntax*      Esc x

*Notes*        Characters written subsequent to the setting or clearing of attributes will assume the new attribute characteristics.

## Escape Mode Commands

---

### *Switch to ANSI Mode*

*Syntax*      Esc <

*Notes*        This command causes the terminal to switch from recognizing Private host commands to recognizing ANSI host commands.

## Key Attribute Commands

---

### *Enable Key Click*

*Syntax*      Esc U

### *Disable Key Click*

*Syntax*      Esc V

### *Enable KNP Function*

*Syntax*      Esc N

### *Disable KNP Function*

*Syntax*      Esc O

## Sound Commands

---

**Note:** You cannot buffer sound commands. To produce properly spaced chain sounds, the host must delay a short time between issuing sound commands.

### *Short Bell*

*Syntax*      Esc T

### *Long Bell*

*Syntax*      Esc L

### *Alert*

*Syntax*      Esc Q

## Return Commands

---

### *Return Terminal Identifier String*

*Syntax*      Esc Z

*Notes*        This command sends the following identifier string to the host:

Esc [0x PT *NN* XM *CCCC* Esc [1x

Where *NN* is the keypad type (20, 30 or 45) and *CCCC* is the four-byte hexadecimal checksum of the terminal's program memory.

## Display Attribute Commands

---

### *Set Screen Size to 32 x 16*

*Syntax*      Esc s

### *Set Screen Size to 24 x 8*

*Syntax*      Esc d

### *Adjust LCD Contrast*

*Syntax*      Esc l

*Notes*        This command increases the contrast one level

### *Enable Backlight*

*Syntax*      Esc n

*Notes*        Applies only to terminals with optional backlit displays

### *Disable Backlight*

*Syntax*      Esc f

*Notes*        Applies only to terminals with optional backlit displays

# Private Mode Host Command Summary

The following table is a summary of the available Private mode host commands.

Table 6-1: Private Mode Host Command Summary

| <i>Type</i>          | <i>Command</i>                    | <i>Syntax</i> |
|----------------------|-----------------------------------|---------------|
| Cursor               | Cursor Up                         | Esc A         |
|                      | Cursor Down                       | Esc B         |
|                      | Cursor Right                      | Esc C         |
|                      | Cursor Left                       | Esc D         |
|                      | Cursor Home & Clear Display       | Esc E         |
|                      | Enable Cursor                     | Esc F         |
|                      | Disable Cursor                    | Esc G         |
|                      | Cursor Home                       | Esc H         |
|                      | Enable Blinking Cursor            | Esc R         |
|                      | Disable Blinking Cursor           | Esc S         |
|                      | Cursor Position                   | Esc Y Pr Pc   |
| Erasure              | Erase Cursor to End of Line       | Esc K         |
|                      | Erase Cursor to End of Display    | Esc J         |
|                      | Erase Entire Line                 | Esc M         |
|                      | Erase Display and Home Cursor     | Esc E         |
| Character Attributes | Set Blink Attribute               | Esc W         |
|                      | Clear Blink Attribute             | Esc X         |
|                      | Set Reverse Video Attribute       | Esc w         |
|                      | Clear Reverse Video Attribute     | Esc x         |
| Escape Mode          | Switch to ANSI Mode               | Esc <         |
| Key Attributes       | Enable Key Click                  | Esc U         |
|                      | Disable Key Click                 | Esc V         |
|                      | Enable KNP Function               | Esc N         |
|                      | Disable KNP Function              | Esc O         |
| Sound                | Short Bell                        | Esc T         |
|                      | Long Bell                         | Esc L         |
|                      | Alert                             | Esc Q         |
| Return               | Return Terminal Identifier String | Esc Z         |
| Display Attributes   | Set Screen Size to 32 x 16        | Esc s         |
|                      | Set Screen Size to 24 x 8         | Esc d         |
|                      | Adjust LCD Contrast               | Esc l         |
|                      | Enable Backlight <sup>1</sup>     | Esc n         |
|                      | Disable Backlight <sup>1</sup>    | Esc f         |

1. Only if the terminal has an optional backlit display



# Chapter 7: Control Codes

In addition to ANSI and Private mode commands, the ProMotion will also respond to the control codes shown in the table below.

Table 7-1: Control Codes

| <i>Code</i> | <i>Hex</i> | <i>Dec.</i> | <i>ASCII</i> | <i>Function</i>                |
|-------------|------------|-------------|--------------|--------------------------------|
| Ctrl E      | 05         | 5           | ENQ          | Enquire                        |
| Ctrl G      | 07         | 7           | BEL          | Sounds Bell                    |
| Ctrl H      | 08         | 8           | BKSP         | Back Space Cursor              |
| Ctrl J      | 0A         | 10          | LF           | Line Feed                      |
| Ctrl K      | 0B         | 11          | VT           | Cursor Down                    |
| Ctrl M      | 0D         | 13          | CR           | Cursor Left to Column 1        |
| Ctrl V      | 16         | 22          | SYN          | Sets Reverse Video Attribute   |
| Ctrl W      | 17         | 23          | ETB          | Clears Reverse Video Attribute |
| Ctrl X      | 18         | 24          | CAN          | Clears Blink Attribute         |
| Ctrl Z      | 1A         | 26          | SUB          | Sets Blink Attribute           |
| DEL         | 7F         | 127         | DEL          | Delete Character at Cursor     |

**Note:** When the host transmits a Ctrl E, the ProMotion will respond with either an ACK (ANSI or Private mode) or a DLE (ACM mode).





# Chapter 8: Troubleshooting

## *Cursor does not appear on display*

*Possible Cause:* No power to terminal (host supplied)

*Solution:* Verify proper voltage to terminal

*Possible Cause:* No power to terminal (adapter supplied)

*Solution:* Verify wall plug is functional and wiring of adapter (if wired as kit)

*Possible Cause:* Reversed polarity, improper wiring or wrong cable type

*Solution:* Check cable and connector wiring

*Possible Cause:* Cursor not enabled

*Solution:* Re-enable the cursor by sending an Esc [4t (ANSI mode) or Esc F (Private mode) or by changing the CURSOR parameter setting

## *Terminal resets or locks-up*

*Possible Cause:* Low voltage output

*Solution:* Verify proper voltage to terminal

*Possible Cause:* Cable resistance too high or wire gauge too small

*Solution:* Cable should be 26 AWG or larger

*Possible Cause:* Handshaking between host and terminal

*Solution:* When using handshaking, verify that the wiring between the host and terminal is correct, that you have the HANDSHAKE parameter enabled and that the handshake line from the host is asserted

When not using handshaking, make sure you have the HANDSHAKE parameter disabled

### *Terminal not receiving or displaying correct characters*

*Possible Cause:* Parity settings incorrect

*Solution:* Change PARITY parameter to correct setting

*Possible Cause:* Data bits incorrect

*Solution:* Change DATA BITS parameter to correct setting

*Possible Cause:* Incorrect BAUD rate

*Solution:* Change BAUD parameter to correct setting

*Possible Cause:* Handshaking between host and terminal

*Solution:* When using handshaking, verify that the wiring between the host and terminal is correct, that you have the HANDSHAKE parameter enabled and that the handshake line from the host is asserted

When not using handshaking, make sure you have the HANDSHAKE parameter disabled

*Possible Cause:* Reversed polarity, improper wiring or wrong cable type

*Solution:* Check cable and connector wiring

### *Terminal displays PE character*

*Possible Cause:* Incorrect parity setting

*Solution:* Change the PARITY setting on the terminal to match the host or vice versa

*Possible Cause:* Handshaking between host and terminal

*Solution:* When using handshaking, verify that the wiring between the host and terminal is correct, that you have the HANDSHAKE parameter enabled and that the handshake line from the host is asserted

When not using handshaking, make sure you have the HANDSHAKE parameter disabled

### *Terminal generates continuous sound while pressing key*

*Possible Cause:* Handshaking between host and terminal

*Solution:* When using handshaking, verify that the wiring between the host and terminal is correct, that you have the HANDSHAKE parameter enabled and that the handshake line from the host is asserted

When not using handshaking, make sure you have the HANDSHAKE parameter disabled

### *Terminal displays double characters*

*Possible Cause:* Echo turned on

*Solution:* Disable ECHO parameter

### *Terminal does not perform self-test*

*Possible Cause:* Self-test parameter disabled

*Solution:* Change SELF TEST parameter to ENABLE

### *Cannot access parameter mode or function key programming*

*Possible Cause:* Menu lock-out enabled

*Solution:* Remove power, simultaneously hold **CTRL**, **SHIFT** and **F5**, and reapply power

*Possible Cause:* Handshaking between host and terminal

*Solution:* When using handshaking, verify that the wiring between the host and terminal is correct, that you have the HANDSHAKE parameter enabled and that the handshake line from the host is asserted

When not using handshaking, make sure you have the HANDSHAKE parameter disabled

### *Terminal losing characters*

*Possible Cause:* Handshaking between host and terminal

*Solution:* When using handshaking, verify that the wiring between the host and terminal is correct, that you have the HANDSHAKE parameter enabled and that the handshake line from the host is asserted

When not using handshaking, make sure you have the HANDSHAKE parameter disabled

### *Key does not repeat when pressed*

*Possible Cause:* Repeat parameter disabled

*Solution:* Change repeat parameter to either SLOW, MEDIUM or FAST

### *Function keys not sending correct values*

*Possible Cause:* Key accidentally reprogrammed

*Solution:* Reprogram function key

*Possible Cause:* EEPROM corrupted by line disturbance

*Solution:* Restore factory defaults and then reprogram parameters and function keys

*Possible Cause:* Terminal reset to factory defaults after repair

*Solution:* Reprogram function keys





# Appendix A: Specifications

|  |
|--|
| <p><b>Display</b></p> <ul style="list-style-type: none"> <li>▶ Supertwist Nematic 192 x 128 Pixel Liquid Crystal Display with Graphics Capabilities</li> <li>▶ U.S. ASCII Character Set, Dark Characters on Light Background with Blinking and Inverse Video Attributes</li> <li>▶ 8 x 24 or 16 x 32 Display Format (Menu or Host Selectable)</li> <li>▶ Menu-Controlled Contrast Settings</li> <li>▶ Backlit or Extended Temperature Backlit Options Available</li> </ul>   |
| <p><b>Keys &amp; Switches</b></p> <ul style="list-style-type: none"> <li>▶ Type: Membrane or Elastomeric</li> <li>▶ Standard Layouts: 45-key (9 rows x 5 columns), 30-key (6 x 5) and 20-key (5 x 4)</li> <li>▶ Custom Layouts: 32-key (8 x 4) and 15-key (5 x 3)</li> <li>▶ Feedback: Tactile and Audible</li> <li>▶ Programmability: Five Function Keys with Fifteen Definitions</li> <li>▶ Emergency Stop: 2 Pole "Press and Twist," Contact Rating: 0.5 A, 28 VDC</li> <li>▶ Liveman Switch: 3 Position, Jokab JSHD2B, Contact Rating: 0.5 A, 28 VDC/0.2 A, 2 8VAC</li> <li>▶ Options: Backlit Keypad and Custom Keypad Layouts Options Available</li> </ul> |
| <p><b>Power</b></p> <ul style="list-style-type: none"> <li>▶ Voltage: 5 VDC +/- 5%, 7.5-12 VDC<sup>1</sup> Linear Regulator or 9.5-28 VDC Switching Regulator</li> <li>▶ Current: 85-90 mA Nominal (RS-232, RS-422)<sup>2</sup></li> </ul> <p>1. Maximum voltage depends on current draw<br/> 2. Some options require additional current (for example, a backlight adds 50 mA)</p>   |
| <p><b>CPU</b></p> <ul style="list-style-type: none"> <li>▶ Type: Atmel AT89C55WD</li> <li>▶ Speed: 11.059 MHz</li> </ul>   |
| <p><b>Interface</b></p> <ul style="list-style-type: none"> <li>▶ Type: RS-232, RS-422 or CMOS/LSTTL level</li> <li>▶ Handshaking: 2 Lines (DTR, DTS) for RS-232, CMOS/LSTTL</li> <li>▶ Data Rates: 300 to 19,200 bps and 57,600 bps (9,600 Requires Handshaking)</li> <li>▶ Parity Range: Even, Odd, Mark, Space, None, Ignore</li> <li>▶ Control Bits: 1 Start and 1-2 Stop Bits</li> <li>▶ Permanent Wire Cable: 10ft, 15ft. or 25ft. Straight with Molded DA-15 Connector</li> </ul>  |

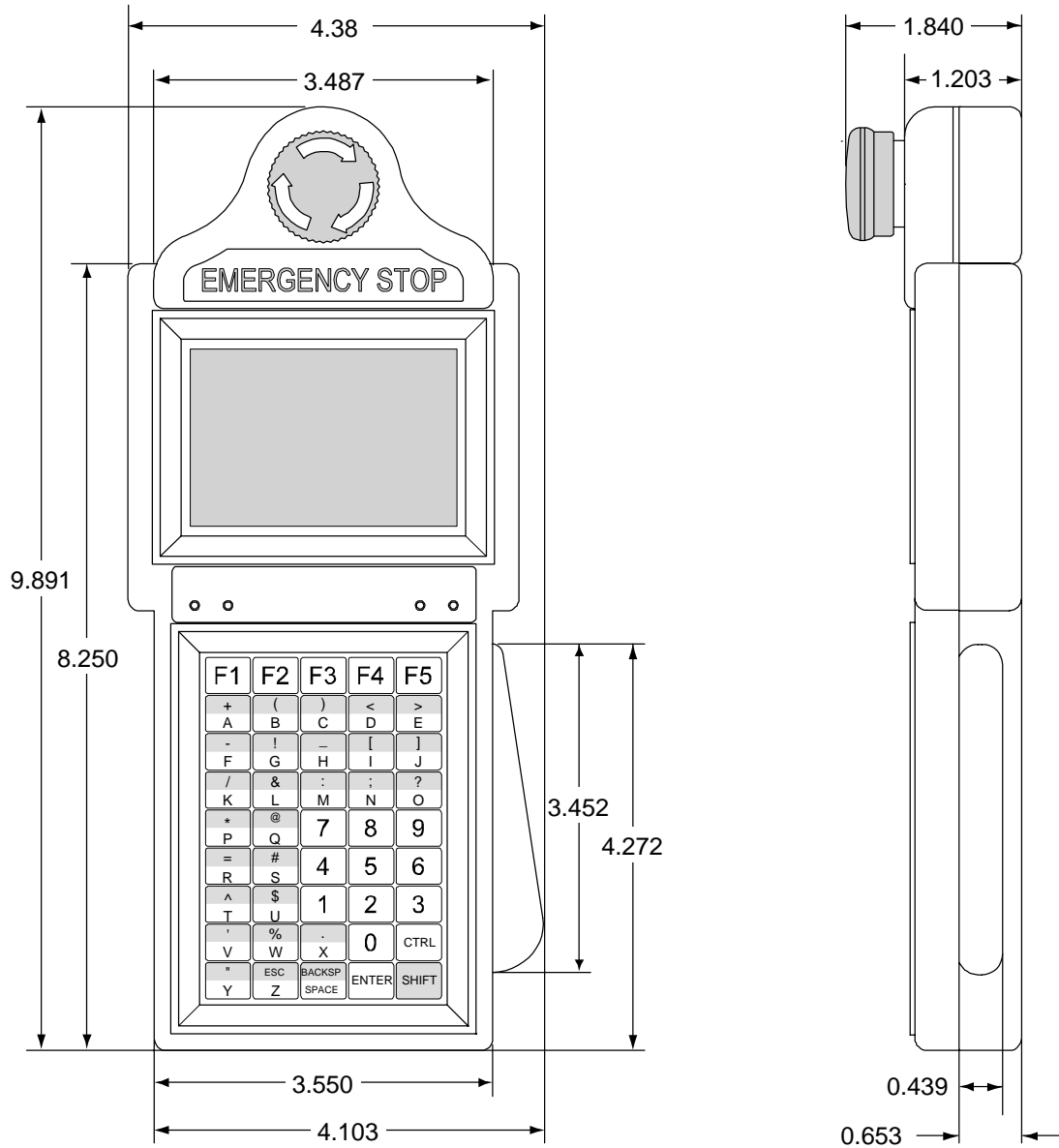
**Environmental**

- ▶ Storage Temperature: -20° to + 70°C (Standard), -30° to + 70°C (Extended Temperature)
- ▶ Operating Temperature: 0° to + 50°C(Standard), -20° to +60°C (Extended Temperature)
- ▶ Humidity: 5-95% (Non-condensing)

**Physical**

- ▶ Height: 9.89.inches (251.2 mm)
- ▶ Width: 4.38 inches (111.3 mm)
- ▶ Depth: 1.84 inches (46.7 mm)
- ▶ Weight: 26 ounces (746 grams)
- ▶ Case: General Electric Cyclocac ABS

Figure A-1: ProMotion Case Dimensions



*Note: Specifications are subject to change without notice*



# Appendix B: Character Sets

## ASCII Character Set

The following table contains the ProMotion ASCII character set and corresponding Decimal, Hex and Two Technology conversion codes:

Table B-1: ASCII Character Set

| <i>Dec</i> | <i>Hex</i> | <i>ASCII</i> | <i>Cn</i> | <i>Display</i> |
|------------|------------|--------------|-----------|----------------|
| 0          | 00         | NUL          | n/a       | n/a            |
| 1          | 01         | SOH          | n/a       | n/a            |
| 2          | 02         | STX          | n/a       | n/a            |
| 3          | 03         | ETX          | n/a       | n/a            |
| 4          | 04         | EOT          | n/a       | n/a            |
| 5          | 05         | ENQ          | n/a       | n/a            |
| 6          | 06         | ACK          | n/a       | n/a            |
| 7          | 07         | BEL          | n/a       | n/a            |
| 8          | 08         | BS           | n/a       | n/a            |
| 9          | 09         | HT           | n/a       | n/a            |
| 10         | 0A         | LF           | n/a       | n/a            |
| 11         | 0B         | VT           | n/a       | n/a            |
| 12         | 0C         | FF           | n/a       | n/a            |
| 13         | 0D         | CR           | n/a       | n/a            |
| 14         | 0E         | SO           | n/a       | n/a            |
| 15         | 0F         | SI           | n/a       | n/a            |
| 16         | 10         | DLE          | n/a       | n/a            |
| 17         | 11         | DC1          | n/a       | n/a            |
| 18         | 12         | DC2          | n/a       | n/a            |
| 19         | 13         | DC3          | n/a       | n/a            |
| 20         | 14         | DC4          | n/a       | n/a            |
| 21         | 15         | NAK          | n/a       | n/a            |
| 22         | 16         | SYNC         | n/a       | n/a            |
| 23         | 17         | ETB          | n/a       | n/a            |
| 24         | 18         | CAN          | n/a       | n/a            |
| 25         | 19         | EM           | n/a       | n/a            |

| <i>Dec</i> | <i>Hex</i> | <i>ASCII</i> | <i>Cn</i> | <i>Display</i> |
|------------|------------|--------------|-----------|----------------|
| 26         | 1A         | SUB          | n/a       | n/a            |
| 27         | 1B         | ESC          | n/a       | n/a            |
| 28         | 1C         | FS           | n/a       | n/a            |
| 29         | 1D         | GS           | n/a       | n/a            |
| 30         | 1E         | RS           | n/a       | n/a            |
| 31         | 1F         | US           | n/a       | n/a            |
| 32         | 20         | space        | n/a       | space          |
| 33         | 21         | !            | C21       | !              |
| 34         | 22         | "            | C22       | "              |
| 35         | 23         | #            | C23       | #              |
| 36         | 24         | \$           | C24       | \$             |
| 37         | 25         | %            | C25       | %              |
| 38         | 26         | &            | C26       | &              |
| 39         | 27         | '            | C27       | '              |
| 40         | 28         | (            | C28       | (              |
| 41         | 29         | )            | C29       | )              |
| 42         | 2A         | *            | C2A       | *              |
| 43         | 2B         | +            | C2B       | +              |
| 44         | 2C         | ,            | C2C       | ,              |
| 45         | 2D         | -            | C2D       | -              |
| 46         | 2E         | .            | C2E       | .              |
| 47         | 2F         | /            | C2F       | /              |
| 48         | 30         | 0            | C30       | 0              |
| 49         | 31         | 1            | C31       | 1              |
| 50         | 32         | 2            | C32       | 2              |
| 51         | 33         | 3            | C33       | 3              |

| <i>Dec</i> | <i>Hex</i> | <i>ASCII</i> | <i>Cn</i> | <i>Display</i> |
|------------|------------|--------------|-----------|----------------|
| 52         | 34         | 4            | C34       | 4              |
| 53         | 35         | 5            | C35       | 5              |
| 54         | 36         | 6            | C36       | 6              |
| 55         | 37         | 7            | C37       | 7              |
| 56         | 38         | 8            | C38       | 8              |
| 57         | 39         | 9            | C39       | 9              |
| 58         | 3A         | :            | C3A       | :              |
| 59         | 3B         | ;            | C3B       | ;              |
| 60         | 3C         | <            | C3C       | <              |
| 61         | 3D         | =            | C3D       | =              |
| 62         | 3E         | >            | C3E       | >              |
| 63         | 3F         | ?            | C3F       | ?              |
| 64         | 40         | @            | C40       | @              |
| 65         | 41         | A            | C41       | A              |
| 66         | 42         | B            | C42       | B              |
| 67         | 43         | C            | C43       | C              |
| 68         | 44         | D            | C44       | D              |
| 69         | 45         | E            | C45       | E              |
| 70         | 46         | F            | C46       | F              |
| 71         | 47         | G            | C47       | G              |
| 72         | 48         | H            | C48       | H              |
| 73         | 49         | I            | C49       | I              |
| 74         | 4A         | J            | C4A       | J              |
| 75         | 4B         | K            | C4B       | K              |
| 76         | 4C         | L            | C4C       | L              |
| 77         | 4D         | M            | C4D       | M              |
| 78         | 4E         | N            | C4E       | N              |
| 79         | 4F         | O            | C4F       | O              |
| 80         | 50         | P            | C50       | P              |
| 81         | 51         | Q            | C51       | Q              |
| 82         | 52         | R            | C52       | R              |
| 83         | 53         | S            | C53       | S              |
| 84         | 54         | T            | C54       | T              |
| 85         | 55         | U            | C55       | U              |
| 86         | 56         | V            | C56       | V              |
| 87         | 57         | W            | C57       | W              |
| 88         | 58         | X            | C58       | X              |
| 89         | 59         | Y            | C59       | Y              |

| <i>Dec</i> | <i>Hex</i> | <i>ASCII</i> | <i>Cn</i> | <i>Display</i> |
|------------|------------|--------------|-----------|----------------|
| 90         | 5A         | Z            | C5A       | Z              |
| 91         | 5B         | [            | C5B       | [              |
| 92         | 5C         | \            | C5C       | \              |
| 93         | 5D         | ]            | C5D       | ]              |
| 94         | 5E         | ^            | C5E       | ^              |
| 95         | 5F         | _            | C5F       | _              |
| 96         | 60         | `            | C60       | `              |
| 97         | 61         | a            | C61       | a              |
| 98         | 62         | b            | 62        | b              |
| 99         | 63         | c            | C63       | c              |
| 100        | 64         | d            | C64       | d              |
| 101        | 65         | e            | C65       | e              |
| 102        | 66         | f            | C66       | f              |
| 103        | 67         | g            | C67       | g              |
| 104        | 68         | h            | C68       | h              |
| 105        | 69         | i            | C69       | i              |
| 106        | 6A         | j            | C6A       | j              |
| 107        | 6B         | k            | C6B       | k              |
| 108        | 6C         | l            | C6C       | l              |
| 109        | 6D         | m            | C6D       | m              |
| 110        | 6E         | n            | C6E       | n              |
| 111        | 6F         | o            | C6F       | o              |
| 112        | 70         | p            | C70       | p              |
| 113        | 71         | q            | C71       | q              |
| 114        | 72         | r            | C72       | r              |
| 115        | 73         | s            | C73       | s              |
| 116        | 74         | t            | C74       | t              |
| 117        | 75         | u            | C75       | u              |
| 118        | 76         | v            | C76       | v              |
| 119        | 77         | w            | C77       | w              |
| 120        | 78         | x            | C78       | x              |
| 121        | 79         | y            | C79       | y              |
| 122        | 7A         | z            | C7A       | z              |
| 123        | 7B         | {            | C7B       | {              |
| 124        | 7C         |              | C7C       |                |
| 125        | 7D         | }            | C7D       | }              |
| 126        | 7E         | ~            | C7E       |                |
| 127        | 7F         | DEL          | C7F       | n/a            |

**Note:** *Cn* is the character number used when programming custom characters (see [Custom Character Commands](#))

# ProMotion Extended Character Set

The following table contains the ProMotion extended character set and corresponding Decimal, Hex and Two Technology conversion codes:

Table B-2: ProMotion Extended Character Set

| <i>ex</i> | <i>Hex</i> | <i>Cn</i> | <i>Display</i> |
|-----------|------------|-----------|----------------|
| 128       | 80         | n/a       | n/a            |
| 129       | 81         | C81       | n/a            |
| 130       | 82         | C82       | n/a            |
| 131       | 83         | C83       | n/a            |
| 132       | 84         | C84       | n/a            |
| 133       | 85         | C85       | n/a            |
| 134       | 86         | C86       | n/a            |
| 135       | 87         | C87       | n/a            |
| 136       | 88         | C88       | n/a            |
| 137       | 89         | C89       | n/a            |
| 138       | 8A         | C8A       | n/a            |
| 139       | 8B         | C8B       | n/a            |
| 140       | 8C         | C8C       | n/a            |
| 141       | 8D         | C8D       | n/a            |
| 142       | 8E         | C8E       | n/a            |
| 143       | 8F         | C8F       | n/a            |
| 144       | 90         | C90       | n/a            |
| 145       | 91         | C91       | n/a            |
| 146       | 92         | C92       | n/a            |
| 147       | 93         | C93       | n/a            |
| 148       | 94         | C94       | n/a            |
| 149       | 95         | C95       | n/a            |
| 150       | 96         | C96       | n/a            |
| 151       | 97         | C97       | n/a            |
| 152       | 98         | C98       | n/a            |
| 153       | 99         | C99       | n/a            |
| 154       | 9A         | C9A       | n/a            |
| 155       | 9B         | C9B       | ☒              |
| 156       | 9C         | C9C       | ☒              |
| 157       | 9D         | C9D       | ☒              |
| 158       | 9E         | C9E       | ☒              |
| 159       | 9F         | C9F       | ☒              |
| 160       | A0         | CA0       | ☒              |
| 161       | A1         | CA1       | !              |
| 162       | A2         | CA2       | "              |
| 163       | A3         | CA3       | #              |

| <i>Dex</i> | <i>Hex</i> | <i>Cn</i> | <i>Display</i> |
|------------|------------|-----------|----------------|
| 164        | A4         | CA4       | \$             |
| 165        | A5         | CA5       | %              |
| 166        | A6         | CA6       | &              |
| 167        | A7         | CA7       | '              |
| 168        | A8         | CA8       | (              |
| 169        | A9         | CA9       | )              |
| 170        | AA         | CAA       | *              |
| 171        | AB         | CAB       | +              |
| 172        | AC         | CAC       | ,              |
| 173        | AD         | CAD       | -              |
| 174        | AE         | CAE       | .              |
| 175        | AF         | CAF       | /              |
| 176        | B0         | CB0       | 0              |
| 177        | B1         | CB1       | 1              |
| 178        | B2         | CB2       | 2              |
| 179        | B3         | CB3       | 3              |
| 180        | B4         | CB4       | 4              |
| 181        | B5         | CB5       | 5              |
| 182        | B6         | CB6       | 6              |
| 183        | B7         | CB7       | 7              |
| 184        | B8         | CB8       | 8              |
| 185        | B9         | CB9       | 9              |
| 186        | BA         | CBA       | :              |
| 187        | BB         | CBB       | ;              |
| 188        | BC         | CBC       | <              |
| 189        | BD         | CBD       | =              |
| 190        | BE         | CBE       | >              |
| 191        | BF         | CBF       | ?              |
| 192        | C0         | CC0       | @              |
| 193        | C1         | CC1       | A              |
| 194        | C2         | CC2       | B              |
| 195        | C3         | CC3       | C              |
| 196        | C4         | CC4       | D              |
| 197        | C5         | CC5       | E              |
| 198        | C6         | CC6       | F              |
| 199        | C7         | CC7       | G              |

| <i>ex</i> | <i>Hex</i> | <i>Cn</i> | <i>Display</i> |
|-----------|------------|-----------|----------------|
| 200       | C8         | CC8       | H              |
| 201       | C9         | CC9       | I              |
| 202       | CA         | CCA       | J              |
| 203       | CB         | CCB       | K              |
| 204       | CC         | CCC       | L              |
| 205       | CD         | CCD       | M              |
| 206       | CE         | CCE       | N              |
| 207       | CF         | CCF       | O              |
| 208       | D0         | CD0       | P              |
| 209       | D1         | CD1       | Q              |
| 210       | D2         | CD2       | R              |
| 211       | D3         | CD3       | S              |
| 212       | D4         | CD4       | T              |
| 213       | D5         | CD5       | U              |
| 214       | D6         | CD6       | V              |
| 215       | D7         | CD7       | W              |
| 216       | D8         | CD8       | X              |
| 217       | D9         | CD9       | Y              |
| 218       | DA         | CDA       | Z              |
| 219       | DB         | CDB       | [              |
| 220       | DC         | CDC       | \              |
| 221       | DD         | CDD       | ]              |
| 222       | DE         | CDE       | ^              |
| 223       | DF         | CDF       | _              |
| 224       | E0         | CE0       | '              |
| 225       | E1         | CE1       | a              |
| 226       | E2         | CE2       | b              |
| 227       | E3         | CE3       | c              |

| <i>Dex</i> | <i>Hex</i> | <i>Cn</i> | <i>Display</i> |
|------------|------------|-----------|----------------|
| 228        | E4         | CE4       | d              |
| 229        | E5         | CE5       | e              |
| 230        | E6         | CE6       | f              |
| 231        | E7         | CE7       | g              |
| 232        | E8         | CE8       | h              |
| 233        | E9         | CE9       | i              |
| 234        | EA         | CEA       | j              |
| 235        | EB         | CEB       | k              |
| 236        | EC         | CEC       | l              |
| 237        | ED         | CED       | m              |
| 238        | EE         | CEE       | n              |
| 239        | EF         | CEF       | o              |
| 240        | F0         | CF0       | p              |
| 241        | F1         | CF1       | q              |
| 242        | F2         | CF2       | r              |
| 243        | F3         | CF3       | s              |
| 244        | F4         | CF4       | t              |
| 245        | F5         | CF5       | u              |
| 246        | F6         | CF6       | v              |
| 247        | F7         | CF7       | w              |
| 248        | F8         | CF8       | x              |
| 249        | F9         | CF9       | y              |
| 250        | FA         | CFA       | z              |
| 251        | FB         | CFB       | {              |
| 252        | FC         | CFC       |                |
| 253        | FD         | CFD       | }              |
| 254        | FE         | CFE       | →              |
| 255        | FF         | CFE       | ←              |

**Note:** *Cn* is the character number used when programming custom characters (see [Custom Character Commands](#))



# Appendix C: Keypad Hex Output Values

## 45-Key Keypad Hex Output

The following table contains the hex output for a standard 45-key keypad, where “CS” is CTRL + SHIFT (Locked) key output, “C” is CTRL key output, “S” is SHIFT key output and “U” is single key output:

Table C-1: 45-Key Keypad Hex Output Values

| Key = Hex  | Key = Hex  | Key = Hex  | Key = Hex  | Key = Hex   |
|--|--|--|--|---|
| CS1 = 11<br>C1 <sup>1</sup> = 1B 5B 41<br>S1 = 06<br>U1 = 11 | CS10 = 12<br>C10 <sup>1</sup> = 1B 5B 42<br>S10 = 07<br>U10 = 12 | CS19 = 13<br>C19 <sup>1</sup> = 1B 5B 43<br>S19 = 08<br>U19 = 13 | CS28 = 14<br>C28 <sup>1</sup> = 1B 5B 44<br>S28 = 09<br>U28 = 14 | CS37 = 15<br>C37 <sup>1</sup> = 1B 5B 45<br>S37 = 0A<br>U3 = 15 |
| CS2 = 61<br>C2 = 01<br>S2 = 2B<br>U2 = 41                    | CS11 = 62<br>C11 = 02<br>S11 = 28<br>U11 = 42                    | CS20 = 63<br>C20 = 03<br>S20 = 29<br>U20 = 43                    | CS29 = 64<br>C29 = 04<br>S29 = 3C<br>U29 = 44                    | CS38 = 65<br>C38 = 05 06<br>S38 = 3E<br>U38 = 45                |
| CS3 = 66<br>C3 = 06<br>S3 = 2D<br>U3 = 46                    | CS12 = 67<br>C12 = 07<br>S12 = 21<br>U12 = 47                    | CS1 = 68<br>C21 = 08<br>S21 = 5F<br>U21 = 48                     | CS1 = 69<br>C30 = 09<br>S30 = 5B<br>U30 = 49                     | CS1 = 6A<br>C39 = 0A<br>S39 = 5D<br>U39 = 4A                    |
| CS4 = 6B<br>C4 = 0B<br>S4 = 2F<br>U4 = 4B                    | CS13 = 6C<br>C13 = 0C<br>S13 = 26<br>U13 = 4C                    | CS22 = 6D<br>C22 = 0D<br>S22 = 3A<br>U22 = 4D                    | CS31 = 6E<br>C31 = 0E<br>S31 = 3B<br>U31 = 4E                    | CS40 = 6F<br>C40 = 0F<br>S40 = 3F<br>U40 = 4F                   |
| CS5 = 70<br>C5 = 10<br>S5 = 2A<br>U5 = 50                    | CS14 = 71<br>C14 = 11<br>S14 = 40<br>U14 = 51                    | CS23 = 37<br>C23 = _<br>S23 = 37<br>U23 = 37                     | CS32 = 38<br>C32 = _<br>S32 = 38<br>U32 = 38                     | CS41 = 39<br>C41 = _<br>S41 = 39<br>U41 = 39                    |
| CS6 = 72<br>C6 = 12<br>S6 = 3D<br>U6 = 52                    | CS15 = 73<br>C15 = 13<br>S15 = 23<br>U15 = 53                    | CS24 = 34<br>C24 = _<br>S24 = 34<br>U24 = 34                     | CS33 = 35<br>C33 = _<br>S33 = 35<br>U33 = 35                     | CS42 = 36<br>C42 = _<br>S42 = 36<br>U42 = 36                    |
| CS7 = 74<br>C7 = 14<br>S7 = 5E<br>U7 = 54                    | CS16 = 75<br>C16 = 15<br>S16 = 24<br>U16 = 55                    | CS25 = 31<br>C25 = _<br>S25 = 31<br>U25 = 31                     | CS32 = 32<br>C34 = _<br>S34 = 32<br>U34 = 32                     | CS43 = 33<br>C43 = _<br>S43 = 33<br>U43 = 33                    |
| CS8 = 76<br>C8 = 16<br>S8 = 2C<br>U8 = 56                    | CS17 = 77<br>C17 = 17<br>S17 = 25<br>U17 = 57                    | CS26 = 78<br>C26 = 18<br>S26 = 2E<br>U26 = 58                    | CS35 = 30<br>C35 = _<br>S35 = 30<br>U35 = 30                     | CTRL  |
| CS9 = 79<br>C9 = 19<br>S9 = 22<br>U9 = 59                    | CS18 = 7A<br>C18 = 1A<br>S18 = 1B<br>U18 = 5A                    | CS27 = 20<br>C27 = 20<br>S27 = 08<br>U27 = 20                    | CS36 = 0D<br>C36 = 0D<br>S36 = 0D<br>U36 = 0D                    | SHIFT   |

1. While in Private mode, C1, C10, 19, C28 and C37 will not return a 5Bh (e.g., C1 = 1B 41, C2 = 1B 42, etc).

## 30-Key Keypad Hex Output

The following table contains the hex output for a standard 30-key keypad, where “CS” is CTRL + SHIFT (Locked) key output, “C” is CTRL key output, “S” is SHIFT key output and “U” is single key output:

Table C-2: 30-Key Keypad Hex Output Values

| Key = Hex                                  | Key = Hex                                     | Key = Hex                                     | Key = Hex                                     | Key = Hex  |
|--|---|---|---|--|
| CS1 = 61<br>C1 = 01<br>S1 = 11<br>U1 = 41  | CS7 = 62<br>C7 = 02<br>S7 = 12<br>U7 = 42     | CS13 = 63<br>C13 = 03<br>S13 = 13<br>U13 = 43 | CS19 = 64<br>C19 = 04<br>S19 = 14<br>U19 = 44 | CS25 = 65<br>C25 = 05 06<br>S25 = 15<br>U25 = 45 |
| CS2 = 66<br>C2 = 06<br>S2 = 2F<br>U2 = 46  | CS8 = 67<br>C8 = 07<br>S8 = 28<br>U8 = 47     | CS14 = 68<br>C14 = 08<br>S14 = 31<br>U14 = 48 | CS20 = 69<br>C20 = 09<br>S20 = 32<br>U20 = 49 | CS26 = 6A<br>C26 = 0A<br>S26 = 33<br>U26 = 4A    |
| CS3 = 6B<br>C3 = 0B<br>S3 = 2A<br>U3 = 4B  | C9 = 6C<br>C9 = 0C<br>S9 = 29<br>U9 = 4C      | CS15 = 6D<br>C15 = 0D<br>S15 = 34<br>U15 = 4D | CS21 = 6E<br>C21 = 0E<br>S21 = 35<br>U21 = 4E | CS27 = 6F<br>C27 = 0F<br>S27 = 36<br>U27 = 4F    |
| CS4 = 70<br>CS4 = 10<br>S4 = 2D<br>U4 = 50 | CS10 = 71<br>C10 = 11<br>S10 = 23<br>U10 = 51 | CS16 = 72<br>C16 = 12<br>S16 = 37<br>U16 = 52 | CS22 = 73<br>C22 = 13<br>S22 = 38<br>U22 = 53 | CS28 = 74<br>C28 = 14<br>S28 = 39<br>U28 = 54    |
| CS5 = 75<br>CS5 = 15<br>S5 = 2B<br>U5 = 55 | CS11 = 76<br>C11 = 16<br>S11 = 2C<br>U11 = 56 | CS17 = 77<br>C17 = 17<br>S17 = 3D<br>U17 = 57 | CS23 = 78<br>C23 = 18<br>S23 = 30<br>U23 = 58 | CS29 = 79<br>C29 = 19<br>S29 = 2E<br>U29 = 59    |
| CS6 = 7A<br>C6 = 1A<br>S6 = 1B<br>U6 = 5A  | CS12 = 20<br>C12 = __<br>S12 = 08<br>U12 = 20 | CS18 = 0D<br>C18 = __<br>S18 = 0D<br>U18 = 0D | CTRL  | SHIFT  |

## 20-Key Keypad Hex Output

The following table contains the hex output for a standard 20-key keypad:

Table C-3: 20-Key Keypad Hex Output Values

| Key = Hex | Key = Hex | Key = Hex | Key = Hex |
|-----------|-----------|-----------|-----------|
| 1 = 41    | 6 = 42    | 11 = 43   | 16 = 44   |
| 2 = 31    | 7 = 32    | 12 = 33   | 17 = 2B   |
| 3 = 34    | 8 = 35    | 13 = 36   | 18 = 2D   |
| 4 = 37    | 9 = 38    | 14 = 39   | 19 = __   |
| 5 = 2E    | 10 = 30   | 15 = 20   | 20 = __   |



# Index

|  |               |
|--|---------------|
| <b>2</b>   |               |
| 20-Key Keypad Hex Output Values .....                      | C-2           |
| <b>3</b>   |               |
| 30-Key Keypad Hex Output Values .....                      | C-2           |
| <b>A</b>   |               |
| About the ProMotion.....                                   | 1-2           |
| About this Manual.....                                     | 1-1           |
| About Two Technologies.....                                | 1-1           |
| ACM Control Commands.....                                  | 5-18          |
| Adjust LCD Contrast.....                                   | 5-6, 6-5      |
| Advanced Control Mode .....                                | 5-17          |
| Advanced Control Mode (ACM) .....                          | 1-2           |
| Alert.....   | 5-6, 6-4      |
| ANSI 3.64/VT100 compatibility .....                        | 5-5           |
| ANSI Mode Host Command Summary .....                       | 5-21          |
| ANSI Mode Host Commands .....                              | 4-1, 5-1      |
| ASCII Character Set.....                                   | B-1           |
| Assert Handshake-Out Equals +V Command .....               | 4-6           |
| Assert Handshake-Out Equals -V Command .....               | 4-6           |
| <b>B</b>   |               |
| Backlight.....   | 3-5           |
| Baud Rate.....   | 3-1           |
| Branch Always Command.....                                 | 4-5           |
| Branch Conditional Command .....                           | 4-6           |
| Branching Commands.....                                    | 4-5           |
| Break Commands.....  | 3-5, 4-4      |
| <b>C</b>   |               |
| Case Dimensions.....                                       | A-2           |
| Changing Parameter Settings.....                           | 3-7           |
| Character Attribute Commands.....                          | 5-4, 6-3      |
| Character Sets.....  | B-1           |
| Clear All Attributes .....                                 | 5-4           |
| Clear Blink Attribute .....                                | 5-4, 6-3      |
| Clear Buffer Contents.....                                 | 5-15          |
| Clear Reverse Video Attribute .....                        | 6-3           |
| Communication Parameters Accessibility .....               | 3-2           |
| Connecting the Terminal .....                              | 2-3           |
| Contrast Adjustment .....                                  | 2-5           |
| Control Codes .....  | 7-1           |
| CPU Specifications .....                                   | A-1           |
| CR/LF Commands.....  | 5-2           |
| CR/LF Mode.....  | 3-4           |
| Current Draw.....  | vii           |
| Cursor .....   | 3-3           |
| Cursor Blink .....   | 3-3           |
| Cursor Commands .....                                      | 5-1, 6-1      |
| Cursor Down.....   | 5-1, 6-1      |
| Cursor Home.....   | 6-2           |
| Cursor Home & Clear Display.....                           | 5-2, 6-1      |
| Cursor Left .....  | 5-1, 6-1      |
| Cursor Position.....                                       | 2-5, 5-2, 6-2 |
| Cursor Right.....  | 5-1, 6-1      |
| Cursor Up.....   | 5-1, 6-1      |
| Custom Character Commands .....                            | 5-12          |
| <b>D</b>   |               |
| DA-15 Interface Connector.....                             | 2-3           |
| DA-15 Interface Connector Signal and Pin Assignments ..... | 2-3           |
| Data Bits.....   | 3-1           |
| Defining Key Output .....                                  | 4-1           |
| Disable ACM.....   | 5-18          |
| Disable All LEDES.....                                     | 5-7           |
| Disable Backlight.....                                     | 5-6, 6-5      |
| Disable Blinking Cursor .....                              | 6-2           |
| Disable Cursor .....                                       | 5-2, 6-2      |
| Disable Key Click .....                                    | 5-4, 6-4      |
| Disable Key Repeat .....                                   | 5-4           |
| Disable KNP Function .....                                 | 5-4, 6-4      |
| Disable LED 1.....   | 5-7           |
| Disable LED 2.....   | 5-7           |
| Disable LED 3.....   | 5-7           |
| Disable LED 4.....   | 5-7           |
| Disable Shift, Disable Ctrl .....                          | 5-18          |
| Disable Shift, Enable Ctrl.....                            | 5-18          |
| Display .....  | 1-2, 2-1      |
| Display Attribute Commands.....                            | 5-6, 6-5      |
| Display Buffer Contents .....                              | 5-15          |
| Display Operation .....                                    | 2-5           |
| Display PE .....   | 3-2           |
| Display Specifications .....                               | A-1           |
| Durability .....   | 1-2           |

|   |          |
|---|----------|
| <b>E</b>                                    |          |
| Echo .....                                  | 3-3      |
| Enable ACM .....                            | 5-18     |
| Enable Backlight.....                       | 5-6, 6-5 |
| Enable Blinking Cursor.....                 | 5-2, 6-2 |
| Enable Cursor.....                          | 5-2, 6-1 |
| Enable Key Click.....                       | 5-4, 6-4 |
| Enable Key Repeat.....                      | 5-4      |
| Enable KNP Function.....                    | 5-4, 6-4 |
| Enable LED 1.....                           | 5-7      |
| Enable LED 2.....                           | 5-7      |
| Enable LED 3.....                           | 5-7      |
| Enable LED 4.....                           | 5-7      |
| Enable Shift, Disable Ctrl.....             | 5-18     |
| Enable Shift, Enable Ctrl.....              | 5-18     |
| Enable Steady Block Cursor.....             | 5-2      |
| Environmental Specifications.....           | A-2      |
| Erase Cursor to End of Display.....         | 5-3, 6-3 |
| Erase Cursor to End of Line.....            | 5-3, 6-3 |
| Erase Display and Home Cursor.....          | 6-3      |
| Erase Entire Display.....                   | 5-3      |
| Erase Entire Line.....                      | 5-3, 6-3 |
| Erase Start of Display to Cursor.....       | 5-3      |
| Erase Start of Line to Cursor.....          | 5-3      |
| Erasure Commands.....                       | 5-3, 6-3 |
| Escape Mode.....                            | 3-4      |
| Escape Mode Commands.....                   | 5-3, 6-4 |
| E-Stop.....                                 | 2-1      |
| E-Stop Operation.....                       | 2-2      |
| E-Stop Switch Wiring.....                   | 2-2      |
| Extended Function Key Command Summary.....  | 4-7      |
| Extended Key Functionality.....             | 4-4      |
| <b>G</b>                                    |          |
| Graphic Files.....                          | 5-14     |
| Graphics Mode.....                          | 5-14     |
| Graphics Mode Commands.....                 | 5-15     |
| <b>H</b>                                    |          |
| Handshake.....                              | 3-3      |
| Handshake-Out Manipulation Commands.....    | 4-6      |
| Hide Cursor.....                            | 5-2      |
| Host Control.....                           | 2-6      |
| <b>I</b>                                    |          |
| Indicators.....                             | 2-1      |
| Interface Cable.....                        | 2-1      |
| Interface Options.....                      | 1-2      |
| Interface Specifications.....               | A-1      |
| Internal Communication Devices.....         | 2-3      |
| <b>K</b>                                    |          |
| Key & Switch Specifications.....            | A-1      |
| Key Attribute Commands.....                 | 5-4, 6-4 |
| Key Click.....                              | 3-3, 5-6 |
| Key Positions (Hex Values).....             | 5-11     |
| Key Programming.....                        | 4-1      |
| Keypad.....                                 | 1-2, 2-1 |
| Keypad Hex Output Values.....               | C-1      |
| Keypad Operation.....                       | 2-5      |
| KNP Function.....                           | 3-3      |
| <b>L</b>                                    |          |
| Label Designator Command.....               | 4-5      |
| LED Control Commands.....                   | 5-7      |
| Liveman Operation.....                      | 2-2      |
| Liveman Switch.....                         | 2-1      |
| Load Binary Data to Graphics Buffer.....    | 5-15     |
| Loading Factory Default Settings.....       | 3-8      |
| Long Bell.....                              | 5-6, 6-4 |
| Long Break.....                             | 4-4      |
| LT1281.....                                 | 2-3      |
| LTC490.....                                 | 2-3      |
| <b>M</b>                                    |          |
| Manual Configuration.....                   | 3-1      |
| Menu Modes.....                             | 3-5      |
| <b>N</b>                                    |          |
| New Line Mode.....                          | 5-2      |
| Normal Mode.....                            | 5-2      |
| <b>O</b>                                    |          |
| Operating Modes.....                        | 2-6      |
| Operation.....                              | 2-1      |
| Output Control Commands.....                | 4-4      |
| Overview.....                               | 1-1      |
| <b>P</b>                                    |          |
| Parameter Menu Settings.....                | 3-1      |
| Parameter Menu Summary.....                 | 3-6      |
| Parameter Modification Commands.....        | 5-8      |
| Parity.....                                 | 3-1      |
| Parity Error.....                           | 3-2      |
| Pause Commands.....                         | 4-5      |
| Pause until Handshake Line Input is +V..... | 4-5      |
| Pause until Handshake Line Input is -V..... | 4-5      |
| Pause until n Character Received.....       | 4-5      |
| Perform Self-Test & Return Results.....     | 5-5      |
| Physical Specifications.....                | A-2      |
| Power Requirements.....                     | vii      |
| Power Specifications.....                   | A-1      |
| Private Host Commands.....                  | 6-1      |
| Private Mode Host Command Summary.....      | 6-6      |
| Product Selection Guide.....                | vi       |
| Program Custom Character.....               | 5-12     |
| Program Key.....                            | 5-10     |
| Programming Key Commands.....               | 5-10     |
| ProMotion Extended Character Set.....       | B-3      |
| ProMotion Features.....                     | 1-2      |
| ProMotion Safety Switches.....              | 2-2      |

## R

|   |          |
|---|----------|
| Real-Time Graphic Commands.....         | 5-16     |
| Repeat.....                             | 3-2      |
| Report Key Settings .....               | 5-10     |
| Reset Commands .....                    | 5-3      |
| Reset Pixels .....                      | 5-16     |
| Reset Terminal.....                     | 5-3      |
| Restore Cursor Position .....           | 5-2      |
| Restricting Access .....                | 3-9      |
| Return Commands.....                    | 6-5      |
| Return Cursor Position.....             | 5-5      |
| Return Device Attributes .....          | 5-5      |
| Return Last Self-Test Results.....      | 5-5      |
| Return Terminal Identifier String ..... | 5-5, 6-5 |

## S

|  |          |
|--|----------|
| Save Cursor Position .....               | 5-2      |
| Screen Size .....                        | 3-5      |
| Scroll .....                             | 3-4      |
| Self-Test.....                           | 3-4      |
| Self-Test & Return Commands.....         | 5-5      |
| Set and Save Parameters .....            | 5-8      |
| Set Blink Attribute .....                | 5-4, 6-3 |
| Set Defaults.....                        | 5-8      |
| Set Parameters.....                      | 5-8      |
| Set Pixels .....                         | 5-16     |
| Set Reverse Video Attribute .....        | 5-4, 6-3 |
| Set Screen Size to 24 x 8.....           | 5-6, 6-5 |
| Set Screen Size to 32 x 16.....          | 5-6, 6-5 |
| Setting the Contrast Midpoint.....       | 3-9      |
| Shift and Ctrl Key Control Commands..... | 5-18     |
| Shift Lock .....                         | 3-4      |

|                                    |          |
|------------------------------------|----------|
| Shift/Control Key Indicators ..... | 3-4      |
| Short Bell.....                    | 5-6, 6-4 |
| Short Break .....                  | 4-4      |
| Signal and Pin Assignments .....   | 2-3      |
| Sound Commands.....                | 5-6, 6-4 |
| Specifications .....               | A-1      |
| Stop Bits .....                    | 3-2      |
| Switch to ANSI Mode .....          | 6-4      |
| Switch to Private Mode.....        | 5-3      |
| Switches and Indicators.....       | 1-2      |
| Symbols and Conventions.....       | 1-1      |

## T

|                           |     |
|---------------------------|-----|
| The Boot Sequence .....   | 2-4 |
| Toggle Display Echo ..... | 4-4 |
| Toggle Serial Output..... | 4-4 |

## U

|  |      |
|--|------|
| Using ACM in a Robotic Environment Example ..... | 5-19 |
|--|------|

## V

|                                 |     |
|---------------------------------|-----|
| View Angle (Contrast).....      | 3-5 |
| Viewing Parameter Settings..... | 3-7 |

## W

|                  |     |
|------------------|-----|
| Wait Symbol..... | 3-3 |
|------------------|-----|

## X

|                |     |
|----------------|-----|
| XON/XOFF ..... | 3-3 |
|----------------|-----|