Pro*MOTION*

Hand Held Operator Interface
Technical User Reference Manual

The ProMotion is an ASCII terminal for use with computers or properly equipped instruments or industrial machinery. It features a 20, 30 or 45 key keypad with tactile feedback, and a 192 X 128 Pixel liquid crystal alphanumeric display showing 8 lines of 24 or 16 lines of 32 characters. Four LED's may be added as an option. A Graphics Mode as well as Advanced Control Mode are included.

The terminal provides user selectable communications parameters, programmable function keys, and other features which make it ideal for motion control applications requiring flexibility and solid, reliable operation.

The ProMotion is available in a number of configurations. The particular configuration is identified by a suffix applied to the model number, as shown below:

PRM ☐ ☐ ☐ ☐ — ☐ ☐ ☐

CASE COLOR
BK = Black
GY = Gray
BU = Blue
YL = Yellow

LED OPTIONS
LED = 4 LEDs

POWER SUPPLY
1= 5V 2= 7.5 to 12V**
H= 9V to 28V***

INTERFACE
R2= RS232
R4= RS422
RT= CMOS/TTL

KEYPAD TYPE
Blank= Membrane
EK= Elastomeric
KL= Backlit Keypad

 # KEYS
20, 30, 45

DISPLAY TYPE
Blank= LCD
N= Supertwist
NEL= Supertwist Backlit

Figure 1: Selection Matrix

**1 An inexpensive linear regulator (7805A) with a minimum input of 7.5V and a maximum voltage of 28V.

 It is designed to dissipate 1 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 9V and a maximum voltage of 28V.

Input voltage is not dependent on current draw of terminal and may be used with all options of   Two Technologies terminals.

POWER REQUIRMENTS

The table below summarizes the power requirements for the various configurations. Operating voltages specified are measured at the terminal interface connector. In the table "xx" represents"20", "30" or "45."

Table 1: Typical Power Requirements

CONFIGURATION	POWER REQUIREMENT
PRMxxR2-1	5 volts ±5% volts DC @ 85mA
PRMxxR2-2	7.5-12 volts DC @ 90mA
PRMNELxxR2-1	5 volts ±5% DC @ 95mA
PRMNELxxR2-2	7.5-12 volts DC @ 110mA
PRMxxR4-1	5 volts ±5% volts DC @ 90mA
PRMxxR4-2	7.5-12 volts DC @ 95mA
PRMNELxxR4-1	5 volts ±5% volts DC @ 110mA
PRMNELxxR4-2	7.5-12 volts DC @ 120mA

PRM Series CURRENT VALUES
Table 2: PRM Series Typical Current Requirements

| Base unit current draw (for -1 and -2 units)	
RS232 Option	85 mA
RS422 Option	90mA
Options	
Add current to Base unit to calculate total current requirements.	
EL BACKLIGHT (NEL)	10mA
BACKLIT KEYPAD (KL)	80 mA

MAXIMUM ALLOWABLE VOLTAGES
MAXIMUM VOLTAGES ALLOWED FOR -2 REGULATED POWER SUPPLY
OTHER VOLTAGE INPUTS MUST USE A SWITCH MODE TYPE POWER SUPPLY (-H)

The charts on this page should be used to determine if the standard regulated power supply or the switch mode regulator power supply is required for the terminal.

Restricted Input Voltage vs. Current Draw
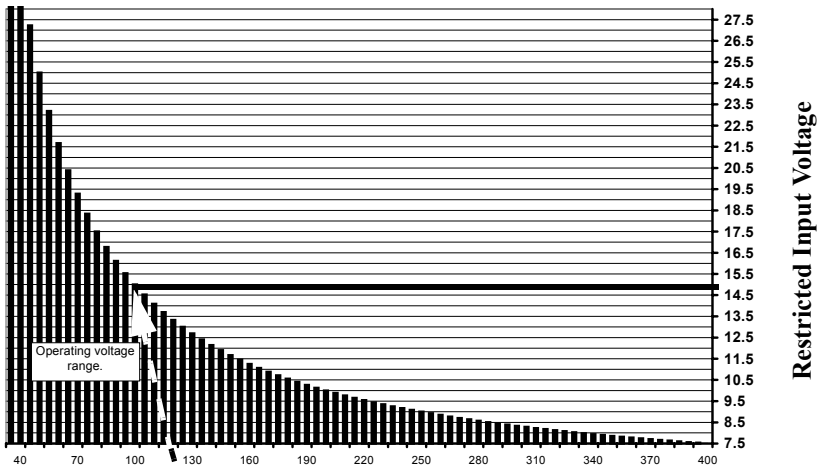
Figure 2: Calculated Operating Current

For example: A current draw of 99mA was calculated requiring a maximum voltage of 15 Volts on the chart above.

Should the input voltage exceed the 15 Volt limit, a -H (switching mode supply) will have to be substituted for the -2 supply.

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Table of Contents

Section 1 Overview

1.1 Connecting the Terminal

A Permanent wire is provided for all connections to the terminal.

The pinout of the cable on the bottom of the terminal is described below. The connector is shown as viewed from the outside of the terminal.

Cable End (Viewed from Back of Connector)

Figure 3: ProMotion Interface

PIN NUMBER	RS-232C assignment
1	COMMON
2	DATA OUT FROM TERMINAL
3	HANDSHAKE OUT FROM TERMINAL
4	LIVEMAN 2 COMMON
5	LAMP
6	E-STOP 2 COMMON
7	LIVEMAN 1 COMMON
8	E-STOP 1 COMMON
9	DATA IN TO TERMINAL
10	HANDSHAKE IN TO TERMINAL
11	+SUPPLY TO TERMINAL
12	LIVEMAN 2 NORMALY OPEN
13	E-STOP 2 NORMALLY CLOSED
14	LIVEMAN 1 NORMALLY OPEN
15	E-STOP 1 NORMALLY CLOSED

PIN NUMBER	RS-422 assignment
1	COMMON
2	+DATA OUT FROM TERMINAL
3	-DATA OUT FROM TERMINAL
4	LIVEMAN 2 COMMON
5	LAMP
6	E-STOP 2 COMMON
7	LIVEMAN 1 COMMON
8	E-STOP 1 COMMON
9	+DATA IN TO TERMINAL
10	-DATA IN TO TERMINAL
11	+SUPPLY TO TERMINAL
12	LIVEMAN 2 NORMALY OPEN
13	E-STOP 2 NORMALLY CLOSED
14	LIVEMAN 1 NORMALLY OPEN
15	E-STOP 1 NORMALLY CLOSED

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INTERFACE OPTIONS

The ProMotion is delivered with a four-wire interface, see above table.

Table 3: Interface Devices

Interface Type	Device
RS-232	Linear Technology LT1281
RS-422	Linear Technology LTC490
CMOS/TTL	Linear Technology LTC490
Data sheets for these devices are available directly from Linear Technologies	

DISPLAY OPERATION

The terminal screen displays the standard U.S. ASCII 96 character set. Characters are placed into the display at the current cursor location. In the absence of commands which alter the cursor location, the cursor moves from left to right as characters are received. The display will scroll when a character is written in the last position in any of the first three rows, the cursor moves to the left most position on the next row. The display will scroll when a character is written to the LAST or LAST+1 character position, depending on which parameter setting is selected The cursor is selectable as blinking, non-blinking, visible or invisible. When visible, the cursor style will indicate the states of the modifier keys SHIFT and CONTROL.

KEYPAD OPERATION

The standard 45 position keypad consists of, the uppercase alphabet, digits 0 through 9, punctuation marks and symbols, and keys for Escape, Space, Backspace and ENTER (CR or CRLF). Modifier keys SHIFT and CONTROL may be selected to operate in normal or locked mode. In the locked mode, pressing a modifier key will toggle its respective state. Transmission of control characters will cause the control state to be canceled. If SHIFT and CONTROL states are both active, lower case alphabetic characters will replace the corresponding upper case 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.

OPERATING MODES

The ProMotion has several operating modes. The default, or start-up mode, is terminal mode. In this mode, the terminal displays characters received, responds to commands received, and sends characters when keys are pressed. This is the mode in which the terminal is normally used. Other modes, described in the fol-

lowing sections, allow setting the operating parameters of the terminal and pro-
gramming the definitions of its function keys.

SELF TEST

After the ProMotion has been turned on it will execute a self-test.
The first screen will show all alpha-numeric characters.
This will be followed by a test of the contrast (Viewing Angle) as shown below.

```
    .. SELF TEST ..

VIEW ANGLE SETTING = 4
```
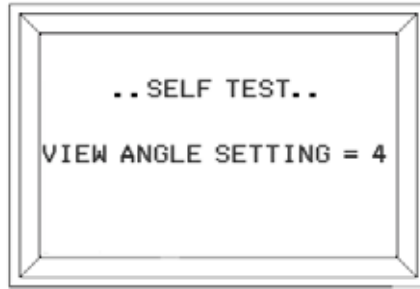
Figure 4: Power on self-test screen 2

The Display, Memory and Extended Memory will then be tested.

```
    .. SELF TEST ..

DISPLAY......PASSED
MEMORY TEST...PASSED
EXT.MEM TEST..PASSED

ID = XXXX XX XXXX
```
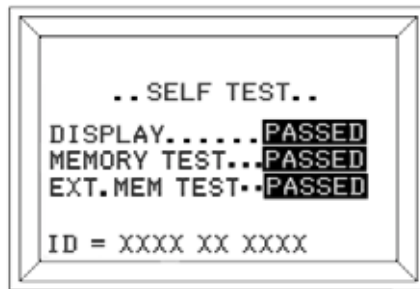
Figure 5: Power on self-test screen 3

The software ID is displayed.
The ProMotion will then display a blank screen with a fixed or blinking cursor in
Row 1, Column 1, (if selected)

PROMOTION LED OPTION

Figure 6: ProMotion with LED Option

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Section 2 Configuration

2.1 Configurations

CONFIGURATION

A comprehensive set of user-settable operating parameters and program-mable function keys makes the ProMotion suitable for diverse applications. Parameter settings and data for the programmable function keys are stored in the terminal's built-in nonvolatile memory.

Any operation which causes data to be stored in the non-volatile memory causes the display to be cleared, and the message "SAVING DATA" to be displayed. When the terminal has finished saving the data, the display is again cleared.

If the Save operation is invoked while in the set parameters or program function key modes described later in this manual, the terminal prompts with the message "ARE YOU SURE?", accompanied by the alert sound (three consecutive short beeps). To proceed with the save, press F1. To exit without saving, press F5.

DEFAULT CONFIGURATION

Each settable parameter and programmable function key is assigned a default value. These values are stored in the terminal's permanent memory, and can be transferred to the nonvolatile memory at any time. To do so, remove power from the terminal. While simultaneously pressing the CTRL, SHIFT and F1 keys, reapply power. After the message "LOAD DEFAULTS" has appeared, the keys can be released. Press the F1 key to reload defaults. This procedure returns all parameters and the program-mable function keys to the default configuration. Any changes made to the parameters and characters previously programmed into the function keys will be overwritten. Pressing the F5 key will leave parameters unchanged.

Load factory Default Settings

Hold down the SHIFT, CTRL and F1 key while applying power. The BKSP and
ENTER as well as F1 are depressed for the 20 key model (if applicable).
The Following screen will appear

45 or 30 key screen

20 key keypad screen
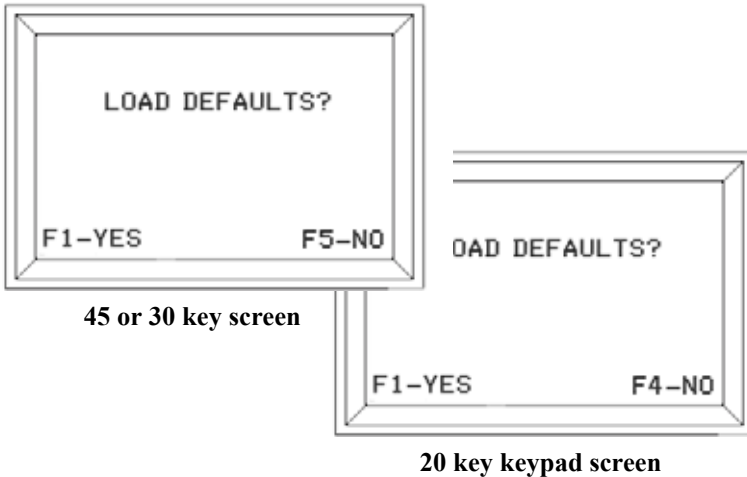
Selecting no will continue onto self test without changing parameter settings.

The screen below will appear upon acceptance of LOAD DEFAULTS.

Figure 7 : Loading Factory Defaults

**The self test will then be initiated unless the applicable model which has con-
trast midpoint is being used.**

CONTRAST MID-POINT SETTING
(if applicable)
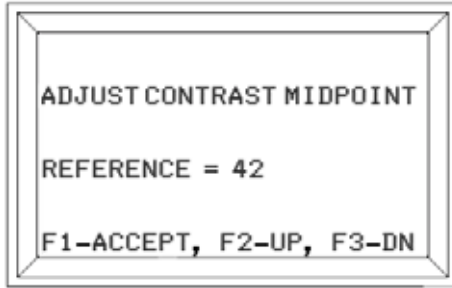
Figure 8 : Contrast mid-point setting (if applicable)

Contrast mid-point is settable from 00 (Lightest) to 99 (Darkest) in increments of 3.
The contrast settings will then be adjusted around this mid point.

This allows the optimization of the display contrast for various environmental conditions which could effect character brightness.

There are 16 levels which may be selected from the menu settings. These are limited to 8 when setting via **HOST CONTROL.**

After completion and acceptance of this setting the ProMotion will go into self test.
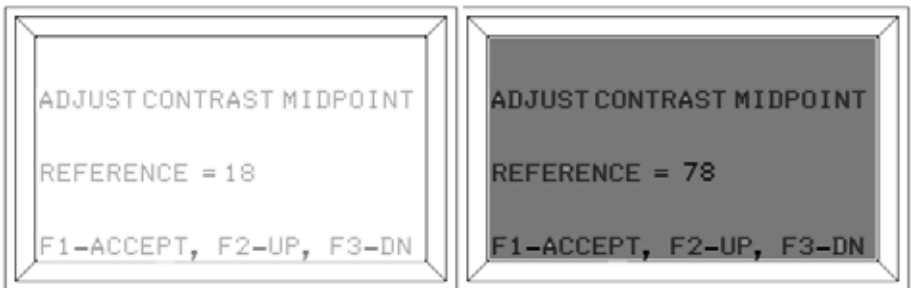
Contrast Low Setting

Contrast High Setting

DISABLE MODIFICATIONS

To disable modifications, simultaneously press the CTRL, SHIFT and F3 keys, then apply power. To re-enable modifications, perform the same procedure. When modifications are disabled, menus may not be accessed and escape sequences that program the function keys (ESC[5z), set all parameters (ESC[1z, ESC[2z) and set all defaults (ESC[3z), will be invalid.

2.2 Parameters

his section discusses each of the configuration parameters in detail. A summary of the parameters and their initial delivery values is shown on page 3.7.

SETTABLE PARAMETERS:

Note: On the ProMotion, the setup parameters *STOP BITS and *DISPLAY PE may or may not be displayed, depending on the settings selected for *DATA BITS and *PARITY. The table below shows when *STOP BITS and/or *DISPLAY PE will be accessible (displayed).

Table 4: Non-displayable Parameters

SETTINGS		DISPLAY	
DATA BITS	PARITY	STOP BITS	DISPLAY PE
7	NONE	N	N
7	IGNORE	Y	N
7	EVEN	Y	Y
7	ODD	Y	Y
7	MARK	Y	Y
7	SPACE	Y	Y
8	NONE	Y	N
8	IGNORE	N	N
8	EVEN	N	Y
8	ODD	N	Y
8	MARK	N	Y
8	SPACE	N	Y

BAUD

The data rate can be set to: 300, 600, 1200, 2400, 4800, 9600 or 19200 baud.

*DATA BITS

The number of data bits in each character. Either 7 or 8 data bits can be selected. (See Chart)

*PARITY

When employed, an extra bit is added to each character the terminal sends. This bit is used by the receiving device to perform a simple error check on incoming data. The ProMotion can be set to transmit an EVEN, ODD, MARK or SPACE parity bit. With any of these settings, the receiver in the terminal will perform the corresponding check on incoming data. In addition, the PARITY option can be set to NONE or IGNORE. Selecting IGNORE still causes the transmitter to add a parity check bit to each character, but the value of that bit is indeterminate. Selecting NONE prevents the parity bit from being sent entirely. With either of these settings, the receiver performs no error check on incoming characters. (See Chart)

*STOP BITS

One or two stop bits may be selected with two exceptions. If 7 data bits and NONE parity is selected, TWO stop bits must be used. If 8 data bits and any parity (including ignore) are selected, ONE stop bit must be used. In either case, the selection is automatic and the menu selection for stop bits is not displayed. (See Chart)

*DISPLAY PE

If the terminal is set to perform parity checking on incoming characters, it is possible for the received data to fail the error check. Setting this option determines the action taken by the terminal in response to such an occurrence. When set to ENABLE, the terminal will display a special character in place of the one which caused the error. When set to DISABLE, the terminal simply ignores the error. Since the setting of this parameter is irrelevant if parity checking is not enabled, it will not appear in the parameter menu if the PARITY setting is NONE or IGNORE. (See Chart)

REPEAT

The terminal can be set to repeat a keypad character while the key remains pressed at a SLOW, MEDIUM or FAST rate. The repeats are approximately 6, 10 and 36 characters per second respectively.

In all cases, there is a short delay between the initial character and the start of the repeat. When set to DISABLED, key repeat is inoperative. If the KNP function is enabled, the repeat for the keys is disabled by default. In this condition, the REPEAT parameter will not be displayed in the "PARAMETERS" menu.

KEY CLICK

When set to ENABLE, the terminal will emit an audible click through the built-in speaker each time a key is pressed, and for each repeated character.

KNP FUNCTION

This function is used to detect when a key is released or not pressed. When set to ENABLE, the terminal will transmit a keypad character or function key data only once when the key is pressed. When the key is released, a null (00h) character is transmitted. The setting of the REPEAT parameter is ignored if this option is set to ENABLE.

CURSOR

When set to ENABLE, a rectangular cursor appears at the next character position.

CURSOR BLINK

When set to ENABLE, the cursor will blink at a steady rate, when set to DISABLE the cursor will not blink.

XON/XOFF

In addition to hardware handshaking, data flow may also be controlled through software with the XON/XOFF protocol.

HANDSHAKE (HARDWARE)

The ProMotion can be set to generate and recognize the commands XON and XOFF, as well as use the handshake (DTR - DSR or RTS - CTS) lines in models equipped with the RS-232C interface. If enabled, the terminal can inform the host when it is unable to accept data. When the terminal returns to the ready state, it then will inform the host accordingly. Likewise, the terminal will recognize the same commands from the host.

In the terminal, the HANDSHAKE OUT line is the signal to the host, and the HANDSHAKE IN line is the signal from the host. If both XON/XOFF and HANDSHAKE are enabled, HANDSHAKE has priority over XON/XOFF. E.g. XON/XOFF cannot be sent to the host if the HANDSHAKE line from the host is false. If the terminal has received an XOFF command (if XON/XOFF enabled) or the HANDSHAKE line from the host is false (if HANDSHAKE enabled), the terminal will not transmit information to the host. If a key is pressed and the handshake condition has not changed to allow transmission

within one second, the terminal will display a special cursor ▓ (if CURSOR

is enabled). Any additional keys pressed will cause an audible tone to be emitted. Pressing CTRL and F5 together will permit the waiting keystroke to be sent and the waiting condition canceled until the next keystroke.

ECHO
May be set to ENABLE or DISABLE. Setting this parameter to ENABLE causes the terminal to echo characters sent by the keypad to the display.

ESCAPE MODE
This setting determines which control sequence set the terminal will recognize. The terminal is capable of responding to a PRIVATE set of sequences as well as ANSI standard 3.64 sequences. See section describing the control sequences for complete information. The default mode is ANSI.

CR/LF MODE
This parameter determines what the ENTER key sends, and how the terminal treats a received linefeed character. In NORMAL mode, the ENTER key sends a carriage return character (ODH), and a received linefeed character (0AH) moves the cursor to the same column in the next line. In NEWLINE mode, the ENTER key sends the carriage return and linefeed characters as a pair (CR+LF). A received linefeed character will be treated as both CR + LF and will move the cursor to the beginning of the next line.

SELF-TEST
This setting determines whether or not the terminal will display a confidence test at the time power is applied. The test shows the entire display character set, and performs a number of internal tests. After the character set has been displayed, the memory test will be performed. During the memory test, a 'SELF-TEST' message will display along with a model identifier string with checksum. The terminal beeps when the test

is completed. Should an error be found, a message will be displayed.

SHIFT LOCK

Enable: When the SHIFT key is pressed, subsequent presses will yield shifted characters until the shift key is pressed again. When the CTRL key is pressed, the

cursor will change to ⌐.   and the next key pressed will be a CTRL character.

All subsequent key presses will be normal.

Disable: Shift or CTRL must be held while other keys are pressed to send Shifted or CTRL characters.

Autocancel: When either the Shift or CTRL key is pressed, the next key pressed will be shifted (Shift Key) or a control character (CTRL Key). *Subsequent presses will produce normal characters.*

SCROLL

When set to "LAST CHR" and a character is received in the last display position, the display will scroll up one line with the cursor positioned in the first column of the last line. When set to "LAST CHR+1" and a   character is received in the last display position, the display will not scroll until the next displayable character is received. In the latter condition, the cursor is suspended until another display-able character, or escape sequence that manipulates the cursor, is received. The cursor will now be positioned in the second column of the last row. If a control code or escape sequence which can alter the cursor position is received, the cursor is restored at the last position and the pending scroll condition is canceled.

VIEW ANGLE (CONTRAST)

Adjusts the viewing angle of the display to one of sixteen (16) positions around a mid-point which may only be set after RESTORE FACTORY DEFAULTS only.

(MIN, 2 - 7, MID, 9 - 15, MAX).

00   **99**

Adjustable Mid-Point
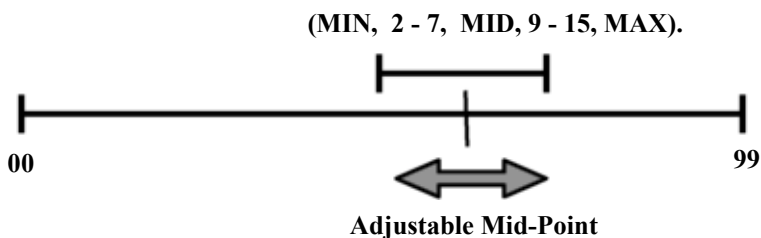
Viewing angle may also be adjusted without entering the menu by using the CTRL and F5 keys. Holding the CTRL key and pressing the F5 key will adjust the viewing angle through the full range in a circular fashion.

ENABLE BREAK

There are two recognized BREAK functions. A BREAK condition occurs when the transmit data line remains in the SPACE condition for either 250 milliseconds or 3.5 seconds. To generate either of the BREAK functions, ENABLE the BREAK command in the Set-up menu and program a function key with one of two BREAK commands. Programming a function key with hex BB will produce a 250 millisecond BREAK, or programming hex BC will produce a 3.5 second BREAK condition.

SCREEN SIZE

Eight (8) lines of twenty-four (24) characters or sixteen (16) lines of thirty-two (32) characters may be selected.

BACKLIGHT (IF EQUIPPED)

The settings for the display backlight are ON, TIMED and OFF. When set to TIMED the backlighting of the display will automatically shut off after 10 minutes if inactivity. Any key pressed will reset the backlight timer or turn the backlighting on.

MENU MODES

DESTRUCTIVE or NON DESTRUCT. When set to NON DESTRUCT, the contents of the display will be preserved upon exiting menu setup. If SCREEN SIZE is changed, the new screen size will not take effect until power is removed and re-applied. DESTRUCTIVE mode will clear the display upon exiting menu setup and SCREEN SIZE changes will immediately take effect.

VIEW PARAMETER SETTINGS SUMMARY

Hold CTRL and SHIFT, then press F5 to display the current setting of each parameter. The terminal will automatically display each setting for approximately 2 seconds then move to next. The display will be cleared at the start of this routine.

SETTING THE PARAMETERS

To enter the set parameters mode, simultaneously hold the CTRL and SHIFT keys while pressing F1. The change menu now appears on the display. The parameter selected and current setting is shown on the top line. To move through the possible values for this parameter, press F1. To move through the list of parameters, press F2 to move forward, or F3 to move backward. Both F4 and F5 return to terminal mode. Exiting by pressing F5 will provide an opportunity to save the selected values in the built-in nonvolatile memory. Press F4 to exit without saving the settings. Exiting without saving the settings will leave any new settings in effect only until power is removed.

PARAMETER SUMMARY

Table 5: Parameter Summary

PARAMETER	OPTIONS (PRESETS IN **BOLD**)
BAUD	300-600-1200-2400-4800- **9600**-19200
DATA BITS	7-**8**
PARITY	EVEN-ODD-MARK- SPACE-**NONE**-IGNORE
STOP BITS	**1** or 2
DISPLAY PE	ENABLE-**DISABLE**
REPEAT	SLOW-**MEDIUM**-FAST NONE
ENABLE KEY CLICK	**ENABLE**-DISABLE
DISABLE KNP FUNCTION	ENABLE-**DISABLE**
ENABLE CURSOR	**ENABLE**-DISABLE
ENABLE CURSOR BLINK	**ENABLE**-DISABLE
DISABLE XON/XOFF	ENABLE-**DISABLE**
DISABLE HANDSHAKE	ENABLE-**DISABLE**
DISABLE ECHO	ENABLE-**DISABLE**
ESCAPE MODE	**ANSI**-PRIVATE
CR/LF MODE	**NORMAL**-NEWLINE
ENABLE TEST	ENABLE-**DISABLE**
DISABLE SHIFT LOCK	ENABLE-**DISABLE**- CANCEL
SCROLL ON LAST CHR	**LAST CHR** - LAST CHR+1
VIEWING ANGLE =	MIN, 2, 3, 4, **5**, 6, 7, MAX
DISABLE BREAK CMD	ENABLE-**DISABLE**
SCREEN SIZE	**24 x 8** or 32 x 16
MENU MODE	NON DESTRUCT or **DESTRUCT**
BACKLIGHT*	**ON**, TIMED, OFF

* if equipped

Note: Display always show the status of the Parameter.

Example: DISABLE SHIFT LOCK means that the Shift Lock is Disabled.

Programmable keys

All Keys may be programmed with any sequence of up to two hundred and twenty (220) characters, including non-printing characters. All programmable key settings are stored in the ProMotion's non volatile memory.

Function Keys

The table below shows the function key characters at delivery. **The notation Hnn indicates hexadecimal notation.**
ESC indicates the ASCII escape character, H1B.
The HEX value is always preceded by a capital H.

PROMOTION 45 ESCAPE MODE

Table 6: 45 Key Escape Mode

Key	Alone (fixed)	SHIFT	ANSI CTRL	PVT CTRL
F1	H11	H06	ESC[A	ESC A
F2	H12	H07	ESC[B	ESC B
F3	H13	H08	ESC[C	ESC C
F4	H14	H09	ESC[D	ESC D
F5	H15	H0A	ESC[E	ESC E*

PROMOTION 30 ESCAPE MODE

Table 7: 30 Key Escape Mode

Key	Alone (fixed)	SHIFT	ANSI CTRL	PVT CTRL
F1/A	A	H11	H01	a
F2/B	B	H12	H02	b
F3/C	C	H13	H03	c
F4/D	D	H14	H04	d
F5/E	E	H15	H05	e

*Note that CTRL F5 is only accessible if SHIFT LOCK is set to ENABLE. Holding the CTRL key while pressing F5 will increment the display viewing angle to one of eight (8) levels. This is a circular type of adjustment. After the eight level is reached, the next increment will be level one.

PROMOTION 20 ESCAPE MODE

Table 8: 30 Key Escape Mode

Key	Alone (fixed)
F1	A
F2	B
F3	C
F4	D

PROGRAMMING THE KEYS

To program any key;

1. Hold the CTRL and SHIFT keys while pressing F2. The terminal then will display the screen shown below.
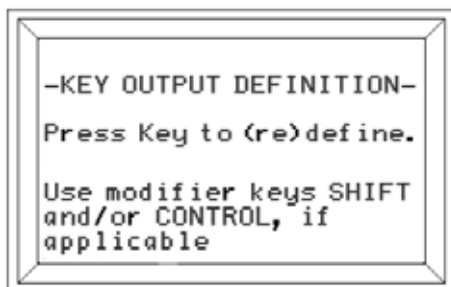
Figure 9 : Key Output Definition Screen

2. Select which key to program by pressing that key. The terminal will then display the current programmed data for that function key. The terminal will then display the location (Row and Column) of the selected key. Displayable characters are surrounded by single quote marks. Non-printable characters are displayed in hexadecimal notation, with an uppercase H prepended.

3. The menu system that instructs the user with available editing functions for programming keys is shown in the next section.

PROGRAMMING KEYS

```
-KEY OUTPUT DEFINITION-

Press Key to (re)define.

Use modifier keys SHIFT
and/or CONTROL, if
applicable
```

F2

F4

ANY

F3

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

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

F1

```
H11 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=017, Hex=11
Insert = Off. Free Memory = 222
```

F5

EXAMINE / EDIT MENU

Current Value of the button in HEX unless it is a printable character in which case it will be surrounded in single quotes ' '.

Go to INSERT / DELETE MENU

F3

NOTE: For a 20 Key Keypad replace the F5 key with the YES key.

YES

F4 TOGGLES BETWEEN HEX AND DECIMAL NUMBER ENTRY (See NOTE on following page)

```
H11 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
```

F4

F4

```
H11 END


F2 = Backspace
F3 = Go back to Edit Menu
F4 = Enter HEX data  instead
Enter 2 DECIMAL Digits:  (255 MAX)

Cursor Data: Decimal=017, Hex=11
Insert = Off. Free Memory = 222
```

ONCE A VALID DECIMAL OR HEX NUMBER IS ENTERED, THE DISPLAY WILL GO TO THE EXAMINE / EDIT MENU

```
H11 END


       UNSHIFTED Row 1, Col 1

F1 = DO NOT Save, edit another key
F2 = DO NOT Save, exit session
F3 = OOPS, not done yet, Go back
F4 = Save definition, exit session
F5 = Save & then edit another key
```

F4

ARE YOU SURE?

F5

F1-YES   F5-NO
    F4-NO (20 Key)

F3

GO TO EXAMINE / EDIT MENU

```
H11 END


F1 = Toggle Insert Mode
F2 = Delete from cursor to end
F3 = Go back to Edit Menu
F4 = Delete string, set default
F5 = Delete data at cursor only

Cursor Data: Decimal=017, Hex=11
Insert = Off. Free Memory = 222
```

F1   **F3**
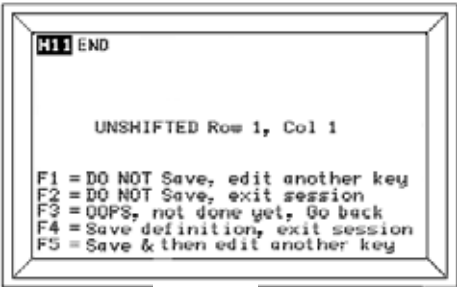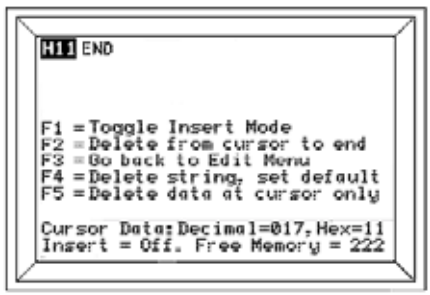
GO TO EXAMINE / EDIT MENU

INSERT / DELETE MENU

IMPORTANT

When YES has been selected the following message will be displayed.

```
REMOVAL OF POWER
WHILE THIS MESSAGE IS
DISPLAYED WILL CORRUPT
ALL DATA
```
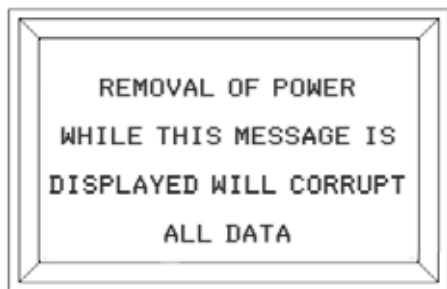
Until the new key definition has been saved the power must not be removed. During this time the voltage levels required to program the memory with the new key change and removal of power will corrupt ALL data.
If this does occur then the LOAD DEFAULTS function will have to be performed.

NOTE: When the 20 key keypad is used there are no Alpha Characters.
Refer to the Appendices for the appropriate Decimal number for the desired ASCII code.
Example:
If F1 is being programmed to output a Hex A4, a Decimal 164 will need to be entered during the switch setup.

Section 3 Specifications

Specifications subject to change without notice.

Table 9: ProMotion Specifications

CPU:
                        87C451
Speed: 11.059 Mhz

POWER
Voltage: 5V +\- *5%*
                        7.5 to 12V**
                        9V to 28V***
Current: 30 - 35 mA (RS-232, RS-422)
Backlight: Adds 50 mA
Battery :   NiCAD
Battery Run Time: up to 48 hours, no backlight

**1 An inexpensive linear regulator (7805A) with a minimum input of 7.5V and an absolute maximum voltage of 35V. It is designed to dissipate 1 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 9V and an absolute maximum voltage of 35V. Input voltage is not dependent on current draw of terminal and may be used with all options of Two Technologies terminals.

MECHANICAL SPECIFICATIONS:
Dimensions
Height: 7.15.inches (181.6mm)
Width: 4.10 inches (104.1 mm)
Depth: 1.00 inch (25.4 mm)
Weight: 8 ounces (369 grams)
Case: General Electric Cycolac® ABS
                        with retractable hanger

DISPLAY
Type: Reflective/Transreflective LCD
                        192 x 128 Pixel Liquid Crystal Display
Standard: Supertwist Nematic
                        Dark Characters on Light Background
                        Extended U.S. ASCII Character Set
Format: 8 rows of 24 characters or 16 rows of 32 characters

KEYS, SWITCHES and INDICATORS
KEYPAD
Type: Membrane or Elastomeric
Layout: 45-key (9 rows x 5 columns)
                         30-key (6 x 5) 32-key (8 x 4)
                         20-key (5 x 4) 15-key (5 x 3)
Options: standard and custom keypad layouts
Feedback: Tactile and Audible
Programmability: Five function key with fifteen definitions
EMERGENCY STOP
Type: 2 pole "press and twist"
Contact rating: 0.5A, 30Vdc
LIVEMAN
Type: 3 position, Jokab Model # JSHD2B
Contact rating: 0.5A, 30Vdc
.

ENVIRONMENTAL
Storage temperature: -20^0 to $+ 70^0$C

Operating temperature: 0 to $+ 50^0$C
Humidity: 5% -90% (non-condensing)

CUSTOM OPTIONS

Custom Firmware
Custom keypad graphics
Custom I/O interface
Custom and molded-in logos
Custom default settings
Custom case color

INTERFACE
Type: RS-232, RS-422, RS-485 or CMOS/LSTTL level
Handshake: RTS,CTS (RS-232)
Data Rates: 300 to 9,600 bps
                         19,200 and 57,600
Parity: Even, Odd, Mark, Space, Ignore
Control Bits: 1 Start, 1 Stop
Connectors: Permanent or custom cables

Section 4 Operation

4.1 Controls and Indicators

Item	Name	Description
1.	LCD DISPLAY	Type: Reflective/Transreflective LCD 192 x 128 Pixel Liquid Crystal Display Standard: Supertwist Nematic Optional: Backlit Supertwist Nematic Dark Characters on Light Background Extended U.S. ASCII Character Set Format: 8 rows of 24 characters or 16 rows of 32 characters

Item	Name	Description
2.	KEYPAD	Membrane or Elastomeric 45-key (9 rows x 5 columns) 30-key (6 x 5) 32-key (8 x 4) 20-key (5 x 4) 15-key (5 x 3) Tactile and Audible Feedback Programmable (Five) function key with fifteen definitions.
3.	POWER and HOST INTERFACE CONNECTOR	The interface is via a permanent cable for communications and E-Stop and LiveMan Switches.
4.	E-Stop	Push off and twist on switch
5.	LiveMan	3 position switch. Center is active. Switch out or all the way in is off.

ProMotion Safety Switches

LiveMan Operation

The Liveman switch has three positions as shown below:

| OFF | ON | OFF |
| Switch Released | Center Position | Switch Fully Depressed |

Figure 4.10: Liveman Switch Detail
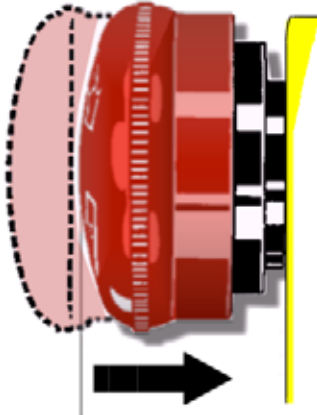
E-Stop Operation

Push Switch to Lock   Twist to Release
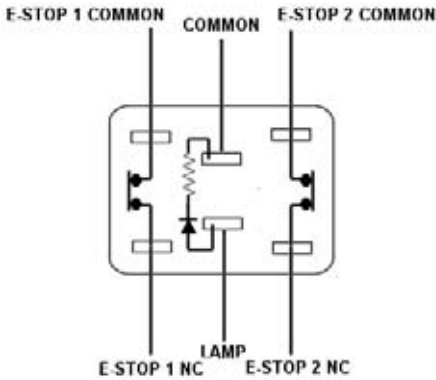
The LAMP is only used for the illuminated switch. The terminals are not present on non-lighted switches

The E-Stop switch is made up of two normally closed switches as shown above. Pressing the switch opens both sets of contacts. See SEction 1 for wiring details.

4.2 Host Control of the Terminal

The ProMotion has been designed to allow it to be controlled by the device to which it is connected, referred to in this manual as the host.

By sending the terminal special character sequences, the host can move the cursor to any position on the display, clear selected regions of the display, sound the beep, alert or key click, program the function keys and set any of the operating parameters.

Because all of these command sequences begin with the ASCII escape character, they are ordinarily called escape sequences.

There are two separate sets of escape sequences built into the terminal. The set in use is determined by the setting of the ESCAPE MODE parameter.

ANSI
When set to ANSI, the terminal recognizes a command set compatible with the American National Standards Institute standard X3.64.

PRIVATE
When set to PRIVATE, the terminal recognizes a smaller, non-standard set of commands. The host can change the ESCAPE MODE at any time by means of an escape sequence.

In the following description of escape sequences, ESC is used to indicate the ASCII escape character, hex 1B. Any occurrence of a numeric parameter is indicated by the notation Pn. Escape sequences are required to be sent to the terminal exactly as shown, **with no embedded spaces permitted.**

SECTION 4

ANSI MODE HOST COMMANDS

If the ESCAPE MODE parameter is set to ANSI, the terminal recognizes the following commands.

CURSOR MOVEMENT COMMANDS

In these sequences, Pn indicates an optional repeat count. If absent, the count is taken to be 1. The cursor will not move beyond the start or end of a line, and will not cause the display to scroll.

Cursor up	ESC [Pn A
Cursor down	ESC [Pn B
Cursor right	ESC [Pn C
Cursor left	ESC [Pn D
Cursor position	ESC [Pr ; Pc f
Cursor position	ESC [Pr ; Pc H

In these sequences, Pr is the row number and Pc is the column number of the target cursor location. Row and column numbers are absolute, with Pr = 1, Pc = 1 representing the upper left corner of the display.

Cursor home	ESC [f
Cursor home	ESC [H
Cursor home & Clear Display	ESC [1 s

The first two forms of this command simply move the cursor to the home position. Note that these commands are functionally equivalent to the Cursor Position command with the row and column both set to 1. The third form of the command moves the cursor to the home position and clears the display.

Save cursor position	ESC [s
Restore cursor position	ESC [u

The save cursor position command causes the terminal to save the current cursor position. The cursor can subsequently be returned to that position by sending the restore position command. The position restored will always be the one most recently saved. Cursor position is saved in RAM memory and will be lost when power is removed.

ERASING

Cursor to end of line	ESC [K
Start of line to cursor	ESC [1 K
Entire line	ESC [2 K
Cursor to end of display	ESC [J
Start of display to cursor	ESC [1 J
Entire display	ESC [2 J

Note that all erase commands include the character at the cursor location. The cursor position is not altered.

CHARACTER ATTRIBUTES

Set Blink Attribute	ESC[2s
Clear Blink Attribute	ESC[3s
Set Reverse Video Attribute	ESC[7;m
Set Blink Attribute	ESC[5;m
Normal (Clear All Attributes)	ESC[0;m

Character Blink and Reverse Video are character attributes. Characters written subsequent to the setting or clearing of attributes will assume the new attribute characteristics. When Reverse Video is set, functions which clear any portion of the screen (e.g. scrolling and erase line) will use a solid fill character.

SOUNDS

Short Bell	ESC [0 q
Long Bell	ESC [1 q
Alert	ESC [2 q
Key Click	ESC [3 q

These commands cause the terminal to emit the indicated sound through the built-in speaker. There is no "buffering" of commands which   generate sounds. Since these sounds can last many character times, to produce a properly spaced chain of any of these sounds the host must delay a short time between issuing these commands.

RESET

Reset Terminal   ESC c

This command causes the terminal to be reset. This is equivalent to removing and reapplying operating power. Parameter settings will be loaded from the nonvolatile memory. Then, if the TEST parameter is set to ENABLE, the confidence test will be run.

REPORTS

Device Status   ESC [4 n
Device Status   ESC [5 n

The first form causes the terminal to perform the built-in confidence test, and report the result. The second form merely reports the result of the last confidence test run since the terminal was turned on. A response of ESC [0 n indicates that the terminal passed the confidence test. A response of ESC [3 n indicates that the confidence test has not run, or that a malfunction was detected.

Cursor position   ESC [6 n

Causes the terminal to send the current location in the form ESC[Pr;PcR where Pr is the row number and Pc is the column number. E.g. ESC[1;1R represents the upper left corner of the display, and ESC[4;21R represents the cursor position after a character is written in row 4 and column 20 when SCROLL is set to 81st character.

Device Attributes   ESC [c

Causes the terminal to send a device attributes string. The terminal responds with ESC [? 8 ; 4 c.

Device ID   ESC [p

Causes the terminal to send an identifier string.
The Terminal responds with:

ESC[0xPRM45XNNNN   ESC[1x   for the ProMotion 45 key
ESC[0xPRM30XNNNN   ESC[1x   for the ProMotion 30 key

Where NNNN is replaced with the four byte hexadecimal checksum of
the terminals' program memory.

PARAMETER MODIFICATION

All of the settable operating parameters may be changed by the host
through escape sequences. In addition to those commands which
affect a single parameter, there are commands which can be used to
change all of the parameter settings at one time, and to cause the
terminal to report the current settings. Refer to the manual section
which describes the parameters for information on the effect of
these commands.

KEY REPEAT

Enable Key Repeat   ESC [? 8 h
Disable Key Repeat   ESC [? 8 l

The first command turns on the key repeat, using the most recent rate
setting. The second command turns off the key repeat. The final char-
acter in this command is a lowercase L.

KEY CLICK

Enable Key Click   ESC [0 t
Disable Key Click   ESC [1 t

These commands set the KEY CLICK parameter. The first sets it to
ENABLE. The second sets it to DISABLE.

KNP FUNCTION

Enable KNP Function   ESC [2 t
Disable KNP Function   ESC [3 t

These commands set the KNP FUNCTION parameter.
The first sets it to ENABLE. The second sets it to DISABLE.

CURSOR

Enable Cursor   ESC [4 t
Disable Cursor   ESC [5 t
Blinking Block Cursor   ESC [3 ; 0 z
Steady Block Cursor   ESC [3 ; 1 z
Invisible Cursor   ESC [3 ; 4 z

These commands set the CURSOR parameter. The first sets it to
ENABLE. The second sets it to DISABLE. The ESC [3 ; 0 z and
ESC [3 ; 1 z perform the same function as the CURSOR BLINK com-
mands listed below.

CURSOR BLINK
Enable Cursor Blink   ESC [6 t
Disable Cursor Blink   ESC [7 t

These commands set the CURSOR BLINK parameter. The first sets it
to ENABLE. The second sets it to DISABLE.

<u>LED CONTROL</u>

ESC [6q	LED 1 Off
ESC [7q	LED 1 On
ESC [8q	LED 2 Off
ESC [9q	LED 2 On
ESC [10q	LED 3 Off
ESC [11q	LED 3 On
ESC [12q	LED 4 Off
ESC [13q	LED 4 On
ESC [16q	All Off

On Applicable models equipped with optional LED indicators, the above sequences are used to control the LED's

SECTION 4

ESCAPE MODE
Switch to Private Mode   ESC [? 2 l

This command sets the ESCAPE MODE parameter to PRIVATE.   This causes the terminal to switch from recognizing ANSI compatible commands to recognizing private commands. The final character in this command is a lowercase L.

CR/LF MODE
Normal Mode   ESC [2 0 l
Newline Mode   ESC [2 0 h

These commands set the CR/LF MODE parameter. The first sets it to NORMAL. The final character in this command is a lowercase L. The second command sets CR/LF MODE to NEWLINE.

SETTING ALL PARAMETERS

Set All Parameters   ESC [1 z
Set All Parameters   ESC [2 z

These commands can be used to set all of the terminals operating parameters with a single command. The first form of the command allows the parameters to be changed, but the new settings are not written to the nonvolatile memory.

This is equivalent to leaving the set parameters mode with the QUIT key. The second form of the command allows the parameters to be changed and saved. (If modifications have been disabled parameters cannot be set)

The format of these two commands is the same. The command is followed by a list of parameter values, separated by semicolons. The list is terminated by the escape sequence ESC [0 z.
The complete form of the first command is:

ESC[1zP1;P2;P3;P3A;P4;P5;P6;P7;P8;P9;P10;P11;P12;P13;P14; P15;P16;P17;P18;P19 ESC[0 z

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Each of the twenty-two parameters (note P3A) specified by this sequence corresponds to one of the settable parameters. The order of the parameters in the list is fixed. One digit or letter is used to specify the setting of each parameter. The table on page 24 shows the order of the parameters. The underlined character in the OPTIONS column is the one used to set that value.

Any or all of the parameters may be omitted. This is done 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) P3A can not be substituted with a place holder. Entering a semicolon as a place holder in the P3A position will be interpreted as a place holder for P4.

2) P3A may be specified even if P3 has a place holder.

3) The number of stop bits are automatically set to one (1) if eight data bits and any parity is selected, and will be set to two (2) if seven data bits and no parity is selected. The setting of P3A will have no effect in these two cases.

Also, sending the escape sequence ESC [0 z after any parameter value will terminate the sequence. Any parameter value not specified will remain unchanged.

After the terminal has processed the command, it will respond by reporting the complete list of parameters as they are set.

This list is presented in simple ASCII format, using the same form as the settings are shown in the display during Set Parameters mode.

Each setting is followed by a carriage return and linefeed.

The escape sequence ESC [0 x precedes the settings, and ESC [1 x indicates the end of the response. To cause the terminal to send the current settings without changing any values, simply send ESC [1 z ESC [0 z.

This is just the first form of the Set All Parameters command with no values specified.

SET PARAMETERS COMMAND TABLE

Table 10: Set Parameters Commands

PARAMETER	NAME	OPTIONS
P1	BAUD	**3**00-**6**00-**1**200-**2**400-**4**800-**9**600-192**0**0
P2	DATA BITS	**7** or **8**
P3	PARITY	**E**VEN-**O**DD-**M**ARK-**S**PACE-**N**ONE-**I**GNORE
P3A	STOP BITS	**1** or **2**
P4	DISPLAY PE	**E**NABLE-**D**ISABLE
P5	REPEAT	**S**LOW-**M**EDIUM-**F**AST **D**ISABLE
P6	KEY CLICK	**E**NABLE-**D**ISABLE
P7	KNP FUNC-TION	**E**NABLE-**D**ISABLE
P8	CURSOR	**E**NABLE-**D**ISABLE
P9	CURSOR BLINK	**E**NABLE-**D**ISABLE
P10	XON/XOFF	**E**NABLE-**D**ISABLE
P11	HANDSHAKE	**E**NABLE-**D**ISABLE
P12	ECHO	**E**NABLE-**D**ISABLE
P13	ESCAPE MODE	**A**NSI-**P**RIVATE
P14	CR/LF MODE	**N**ORMAL-NEW**L**INE
P15	TEST	**E**NABLE-**D**ISABLE
P16	SHIFT LOCK	**E**NABLE-**D**ISABLE
P17	SCROLL ON	**0** (LAST CHR) or **1** (LAST CHR +1)
P18	VIEWING ANGLE	**1** (MIN) , **2**, **3**, **4**, **5**, **6**, **7**, **8** (MAX)
P19	BREAK COM-MAND	**E**NABLE-**D**ISABLE
P20	SCREEN SIZE	**0** (32x16) or **1** (24x8)
P21	MENU MODE	**N**ON DESTRUCTor **D**ESTRUCT

Example:
Esc[1z9;8;E;1;D;F;E;D;E;E;D;E;E;A;N;E;D;0;8;D;0;NEsc[0z

    P1...P21

LOADING DEFAULT VALUES

Set All Defaults   ESC [3 z

This command resets all of the parameter values and function key strings to their delivery state, and saves them. This command accepts no   parameters. It must be followed by the escape sequence ESC [0 z. (If modifications have been disabled ,defaults cannot be loaded.)

PROGRAMMING KEYS

Program FKEY   ESC [5 z
Report FKEY settings   ESC [4 z

Any of the keys (except SHIFT and CTRL) may be programmed to transmit a single character or a string of characters. The complete form of the Program KEY command is shown below. (If modifications have been disabled, CTRL, SHIFT, F3 AT POWER UP, function keys cannot be programmed.)

ESC[5zKn;C1;C2;C3; ...CnESC[0z

The Kn parameter selects the key number (in ASCII Hexadecimal format) to be programmed.
Key numbering is shown in the KEY NUMBER CHART, see page 13 in this section.
Keys are numbered starting with 01H corresponding to the upper left corner of the keypad. Each column movement to the right increases the key number by one. Each row movement down increases the key number by five. The offset 2DH (45 decimal) must be added for the Shifted key programming. Similarly, 5AH (90 decimal) for Control, and 87H (135 decimal) for Shifted & Control must be added. This is also true with a 30 key keypad.
Each character represented by C1 through Cn must also be specified in ASCII Hexadecimal format. For example, the character 'T' is represented by the Hex code 54. The ASCII characters 5 & 4 must be used to specify the character 'T'. Sending the Hex code 54 instead of the ASCII representations of 5 & 4 will be interpreted as an error. The list must be confined to the limitations of available Key memory. Key memory is capable of storing 222 bytes of key data. Each key that is programmed to a string or value (other than its default) will require two

bytes of memory in addition to the number of characters in its corresponding string. The only way to free memory, is to re-program keys to their default settings.

 NOTE: All key programming is returned to default setting (and all memory is freed) when power on defaults are loaded or the escape sequence for default load is given.

Any key programmed with no character data will have no output (as well as no key click) and is effectively disabled. Two bytes of key memory are required for any disabled key.

If an error is encountered during the programming of a key, an error code (ASCII Hex) is returned and the programming operation terminated with NO modification to Programmable KEY memory.

ERROR CODE
01	=Kn improper
02-F0H	=Cn-1 format error
FEH	=Not Enough memory available
FFH	=Key memory data corrupted

IMPORTANT NOTE: When the final terminator **ESC[0z** is successfully received, the programming information is inserted into the EEPROM KEY data storage area. To allow for variable length strings, this data area is dynamically allocated. For this reason if power is removed within .75 seconds (the maximum time to copy KEY image to EEPROM) of the final terminator (ESC[0z), all Programmable KEY data may become corrupted, subsequently requiring a Default Load.

To report Programmable KEY settings, the second form of the Programmable KEY command (ESC[4z) is used. The report starts immediately and has the following format:

ESC[0xKn;C1;C2;...CnKn;C1;C1;...CnESC[1x

Only keys that have been programmed with other than default character codes will be reported.
EXAMPLE:
Program key in 2nd column, 3rd row to transmit the string "TESTING"

ESC[5zK0C;54;45;53;54;49;4E;47ESC[0z

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KEY NUMBER CHARTS

Indicates 30 Key Data

Unshifted

	Col 1	Col 2	Col 3	Col 4	Col 5
Row 1	01H	02H	03H	04H	05H
Row 2	06H	07H	08H	09H	0AH
Row 3	0BH	0CH	0DH	0EH	0FH
Row 4	10H	11H	12H	13H	14H
Row 5	15H	16H	17H	18H	19H
Row 6	1AH	1BH	1CH	1DH	1EH
Row 7	1FH	20H	21H	22H	23H
Row 8	24H	25H	26H	27H	28H
Row 9	29H	2AH	2BH	2CH	2DH

Shifted

	Col 1	Col 2	Col 3	Col 4	Col 5
Row 1	2EH	2FH	30H	31H	32H
Row 2	33H	34H	35H	36H	37H
Row 3	38H	39H	3AH	3BH	3CH
Row 4	3DH	3EH	3FH	40H	41H
Row 5	42H	43H	44H	45H	46H
Row 6	47H	48H	49H	4AH	4BH
Row 7	4CH	4DH	4EH	4FH	50H
Row 8	51H	52H	53H	54H	55H
Row 9	56H	57H	58H	59H	5AH

Control

	Col 1	Col 2	Col 3	Col 4	Col 5
Row 1	5BH	5CH	5DH	5EH	5FH
Row 2	60H	61H	62H	63H	64H
Row 3	65H	66H	67H	68H	69H
Row 4	6AH	6BH	6CH	6DH	6EH
Row 5	6FH	70H	71H	72H	73H
Row 6	74H	75H	76H	77H	78H
Row 7	79H	7AH	7BH	7CH	7DH
Row 8	7EH	7FH	80H	81H	82H
Row 9	83H	84H	85H	86H	87H

Shifted & Control

	Col 1	Col 2	Col 3	Col 4	Col 5
Row 1	5BH	5CH	5DH	5EH	5FH
Row 2	60H	61H	62H	63H	64H
Row 3	65H	66H	67H	68H	69H
Row 4	6AH	6BH	6CH	6DH	6EH
Row 5	6FH	70H	71H	72H	73H
Row 6	74H	75H	76H	77H	78H
Row 7	79H	7AH	7BH	7CH	7DH
Row 8	7EH	7FH	80H	81H	82H
Row 9	83H	84H	85H	86H	87H

SECTION 4

ANSI Escape Sequence Table

Table 11: ANSI Escape Sequence Table

SEQUENCE	DESCRIPTION
ESC[?2l	Switch To Private Mode
ESC[?8l	Disable Key Repeat
ESC[?8h	Enable Key Repeat
ESC[0;m	Clear Reverse Video Attributes
ESC[5;m	Set Character Blink Attribute
ESC[7;m	Reverse Video Attribute
ESC[p	Device Id (Name & Check Sum)
ESC[s	Save Cursor Position
ESC[1;0z	Set Screen to 32 x 16
ESC[1;1z	Set Screen to 24 x 8
ESC[3;0z	Cursor Attributes (Blink)
ESC[3;1z	Cursor Attributes (Steady)
ESC[3;4z	Cursor Attributes (Invisible)
ESC[2s	Set Character Blink Attribute
ESC[3s	Clear Blink Attribute
ESC[0t	Enable Key click
ESC[1t	Disable Key Click
ESC[2t	Enable KNP Function
ESC[3t	Disable KNP function
ESC[4t	Enable Cursor
ESC[5t	Disable Cursor
ESC[6t	Enable Cursor Blink
ESC[7t	Disable Cursor Blink
ESC[u	Restore Cursor Position
ESC[v	Adjust LCD Contrast*
*Of the 16 hardware settings, only 8 may be adjusted via host mode but will provide the same range of contrast control just more course.	
ESC[0q	Short Bell

Table 11: ANSI Escape Sequence Table

SEQUENCE	DESCRIPTION
ESC[1q	Long Bell
ESC[2q	Alert
ESC[3q	Key Click
ESC[0z	Confirm Default Load (Must Follow ESC[3z)
ESC[1z	Set All Parameters
ESC[2z	Set All Parameters & Save To NVram
ESC[3z	Set All Defaults & Save To NVram
ESC[4z	Report key Programming
ESC[5z	Program key & Custom Characters
ESC[20l	CR = CR (normal)
ESC[20h	CR = CRLF (newline)
ESC[4n	Do Selftest & Report Results
ESC[5n	Report If Selftest Passed
ESC[6n	Report Cursor Position
ESC[J	Erase Cursor To End Of Display
ESC[1J	Erase Start Of Display To Cursor
ESC[2J	Erase Entire Display
ESC[K	Erase from Cursor To End Of Line
ESC[1K	Erase Start Line To Cursor
ESC[2K	Erase Entire Line
ESC[c	Send Device Attributes
ESC[PnA	Cursor Up Pn Times (Or 1 If Pn Absent)
ESC[PnB	Cursor Down Pn Times (Or 1 If Pn Absent)
ESC[PnC	Cursor Right Pn Times (Or 1 If Pn Absent)
ESC[PnD	Cursor Left Pn Times (Or 1 If Pn Absent)

Table 11: ANSI Escape Sequence Table

SEQUENCE	DESCRIPTION
ESC[E	Clear Display & Home Cursor
ESC[H	Position Cursor At Home
ESC[f	Position Cursor At Home (Same As Above)
ESC[Pr;PcH	Position Cursor At Pr, Pc
ESC[Pr;Pcf	Position Cursor At Pr; Pc (Same As Above)
ESCc	Reset Terminal
ESC [8+	Backlight ON**
ESC [9+	Backlight OFF**

** if equipped

Table 12: ANSI LED CONTROLS

ESCAPE SEQ.	DESCRIPTION
ESC [6q	LED 1 Off
ESC [7q	LED 1 On
ESC [8q	LED 2 Off
ESC [9q	LED 2 On
ESC [10q	LED 3 Off
ESC [11q	LED 3 On
ESC [12q	LED 4 Off
ESC [13q	LED 4 On
ESC [16q	All Off

4.3 Private mode (host commands)

If the ESCAPE MODE parameter is set to PRIVATE, the terminal recognizes the following commands.

CURSOR MOVEMENT COMMANDS

Cursor up   ESC A
Cursor down   ESC B
Cursor right   ESC C
Cursor left   ESC D

In the above sequences, the cursor moves one position in the indicated direction. The cursor will not move beyond the start or end of a line, and will not cause the display to scroll.

CURSOR POSITION COMMANDS

Cursor position   ESC Y Pr Pc

In the above sequence the Pr is the row number and Pc is the column number of the target cursor location. These parameters are formed by adding hexadecimal 1F to the row and column numbers. Row and column numbers are absolute, with row 1, column 1 (Pr=H20,Pc=H20)* representing the upper left corner of the display.

*Note that the hexadecimal number is represented by the ASCII character which is used in the string to position the cursor. (see chart next page)

Examples:
ESCY!) Will send the cursor to Row 2, Column 10
ESCY#0 Will send the cursor to Row 4, Column 17
ESCY!+ Will send the cursor to Row 2, Column 12

Cursor home   ESC H

Note that this command is functionally equivalent to the Cursor Position command with Pr = H20 and Pc = H20.

FOR ROW SPECIFICATION

Row	Hex	ASCII		Row	Hex	ASCII
1	20	SP		9	28	(
2	21	!		10	29	)
3	22	"		11	2A	*
4	23	#		12	2B	+
5	24	$		13	2C	,
6	25	%		14	2D	-
7	26	@		15	2E	.
8	27	'		16	2F	/

FOR COLUMN SPECIFICATION

Col	Hex	ASCII		Col	Hex	ASCII
1	20	SP		17	30	0
2	21	!		18	31	1
3	22	"		19	32	2
4	23	#		20	33	3
5	24	$		21	34	4
6	25	%		22	35	5
7	26	&		23	36	6
8	27	'		24	37	7
9	28	(		25	38	8
10	29	)		26	39	9
11	2A	*		27	3A	:
12	2B	+		28	3B	;
13	2C	,		29	3C	<
14	2D	-		30	3D	=
15	2E	.		31	3E	>
16	2F	/		32	3F	?

ERASING

Cursor to end of line	ESC K
Cursor to end of display	ESC J
Line containing cursor	ESC M
Clear display and home	ESC E

Note that the erase commands include the character at the cursor location. The first three do not alter the cursor position.

CHARACTER ATTRIBUTES

Begin Blink	ESC W	(or CTRL Z)
End Blink	ESC X	(or CTRL X)
Begin Reverse Video	ESC w	(or CTRL V)
End Reverse Video	ESC x	(or CTRL W)

Character Blink and Reverse Video are character attributes. Characters written subsequent to the setting or clearing of attributes will assume the new attribute characteristics. When Reverse Video is set, functions which clear any portion of the screen (e.g. scrolling and erase line) will use a solid fill character.

SOUNDS

Short Bell	ESC T
Long Bell	ESC L
Alert	ESC Q

These commands cause the terminal to emit the indicated sound through the built-in speaker. There is no "buffering" of commands which generate sounds. Since these sounds can last many character times, to produce a properly spaced chain of any of these sounds the host must delay a short time between issuing these commands.

REPORTS

Identify	ESC Z

Causes the terminal to send an identifier string. The ProMotion responds with

PRM45 XM NNNN	ProMotion 45
PRM30 XM NNNN	ProMotion 30
PRM20 XM NNNN	ProMotion 20

Where NNNN is replaced by a four-byte hexadecimal checksum of the terminal's program memory .

MODE SWITCHING

Switch to ANSI Mode	ESC <

This command causes the terminal to switch from recognizing private commands to recognizing ANSI compatible commands.

PRIVATE ESCAPE SEQUENCE TABLE

Table 13: Private Esc Sequence Table

SEQUENCE	DESCRIPTION
ESC A	Cursor Up
ESC B	Cursor Down
ESC C	Cursor Right
ESC D	Cursor Left
ESC d	Set Display Size To 24x8
ESC E	Clear Display & Home Cursor
ESC F	Cursor On
ESC G	Cursor Off
ESC H	Cursor Home
ESC I	Adjust Viewing Angle
ESC J	Erase To End Of Screen
ESC K	Erase To End Of Line
ESC L	Long Bell
ESC M	Erase Line
ESC N	Enable KNP
ESC O	Disable KNP
ESC P	(RESERVED)
ESC Q	Alert Sound
ESC R	Enable Cursor Blink
ESC S	Disable Cursor Blink
ESC s	Set Display Size To 32x16
ESC T	Short Tone
ESC U	Enable Key Click
ESC V	Disable Key Click
ESC W	Set Blink Attribute
ESC w	Set Reverse Video Attribute
ESC X	Clear Blink Attribute
ESC x	Clear Reverse Video Attribute

Table 13: Private Esc Sequence Table

SEQUENCE	DESCRIPTION
ESC Y Pr pc	Position Cursor At Pr,Pc (Row1,Col1 = H20,H20)
ESC Z	Report Device ID
ESC <	Switch To ANSI Mode
ESC f	Backlight OFF**
ESC n	Backlight ON**

** if equipped

ADDITIONAL CONTROL CODES

Table 14: Additional Control Codes

CODE	HEX	DEC.	ASCII	FUNCTION
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 Col 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

4.4 Control Character Commands

Table 15: Control Characters

CONTROL CODE	DEC	HEX	ASCII	FUNCTION
CTRL + E	5	05H	ENQ	Enquire
CTRL + G	7	07H	BEL	Sounds Bell
CTRL + H	8	08H	BS	Back Space Cursor
CTRL + J	10	0AH	LF	Line Feed
CTRL + K	11	0BH	VT	CURSOR DOWN
CTRL + M	13	0DH	CR	Cursor Left to Column 1
DEL	127	7FH	DEL	Delete Char. At Cursor

Example:
When Ctrl+E (DEC 5) is sent to the ProMotion, it will answer with an ASCII Acknowledge ACK (06H) in standard mode and an ASCII DLE (10H) in Robot Mode.

The ProMotion will only respond to the above CTRL codes
Any other CTRL code will be ignored.

Extended operations

Note: In the command summary the H preceding the code indicates HEX.

EXTENDED FUNCTION KEY COMMAND SUMMARY

HBF = Toggle Serial Outport Command (Defaults to serial output)

HBE = Toggle Display Echo Command (Defaults to setting of ECHO in settings Menu)

HBD(nn) = Pause until (nn) Character Received Command
Wait for (nn) character from serial input.

HBC = Execute Long Break Command (3.5 seconds)

HBB = Execute Short Break Command (250mS)

HBA(nn) = Branch Always command To a LABEL (nn).

HB9 = Assert Handshake Out Equals +V Command
(Only active if handshaking setting in menu is set to DISABLE).

HB8 = Assert Handshake Out Equals -V Command
(Only active if handshake setting in menu is set to DISABLE).

HB7 = Pause Until Handshake Line Input +V
(Only active if handshake setting in menu is set to DISABLE).

HB6 = Pause Until Handshake Line Input -V
(Only active if handshake setting in menu is set to DISABLE).

HB5 (nn) = Branch Conditional command Branch to LABEL (nn)
if handshake line into ProMotion terminals equals -V. If branch is false, key execution continues at the character following the branch label (nn). (Only active if handshake setting in menu is set to DIS-ABLE)

HB4 (nn) = The Label Designator Command for label (nn)

HB3, HB2, HB1, HB0= Reserved, do not use

EXTENDED PROGRAMMABLE KEY COMMAND USAGE

In order to utilize the extended Programmable KEY commands, you must first ENABLE the BREAK command. BREAK may be enabled either throughout the setup menu or through the serial set-up parameter string.

Extended Programmable KEY commands are special codes embedded in the KEY data string. When enabled, they modify the way programmed KEY strings are interpreted. Extended KEY commands may be assimilated into the following categories:

Break functions-	HBB, HBC
Output controls-	HBF, HBE
Pause commands-	HBD, HB7, HB6
Branching Commands-	HBA, HB5
Handshake out line manipulation-	HB9, HB8

BREAK FUNCTIONS

Break commands momentarily place the transmit line into a condition known as Spacing (for 3.5 seconds if command HBC is used and 250mS if HBB is used). When no data is being transmitted, the normal condition of the transmit line is known as Marking. Spacing is the opposite of Marking. Some types of host equipment may recognize a break as a special command (such as reset).

OUTPUT CONTROL

Normally, data from the Programmable KEY string is transmitted serially. If the setting of the ECHO function is ENABLED, data is also output to the display.

The Toggle Display Echo Command (HBE) is a toggle function which will allow any or all parts of a Programmable KEY string to be both transmitted and displayed simultaneously. With the terminal echo disabled, all characters after the HBE command will be sent to both the display and the serial port. Remember that is a toggle function and will operate according to the state of the terminal's ECHO function. Escape sequences echoed to the display that do not require serial output are processed normally. Sequences which do require serial output are

stored in the receiver buffer until the end of the current KEY string execution.

The Toggle Serial Output Command (HBF) is a toggle function which will prevent characters within a Programmable KEY string from being transmitted. This may be used in conjunction with the Toggle Echo Command where certain parts of strings which are Echoed to the display will not be transmitted (e.g. An application requires that a "RUN" command string be sent to the host while a message explaining the command be sent to the display. In the following example, the command string sent to the host consists of the following string "#STRT*9" while the message sent to the display should read "RUNNING". Key 01 is programmed with the Following:

#STRT*09 **BF BE** RUNNING **BE BF**

When key 01 (upper left hand corner) is pressed, the string "#STRT*09" is transmitted to the host. The command HBF turns off output to the serial port while the next command HBE causes the string "RUNNING" to be sent to the display only and not to the serial port. The trailing commands HBE and HBF enables transmission and disables echo. If no other KEY operations follow the "RUNNING string, the trailing toggle commands are not necessary.

PAUSE COMMANDS
The output of the Programmable KEY string may be programmed to pause either for a specific character to be received, or a specific handshake line input status.

Pause Until Handshake Line Input +V (HB7) will cause Programmable KEY output to suspend until the ProMotion's handshake line (at the interface connector) is at +V (valid handshake line input voltage levels for RS-232 are +3V to +30V and -3V to -30V). A special waiting cursor consisting of horizontal bars (▦) is displayed in place of the regular cursor after approximately one half second of waiting. The suspend condition may be canceled by pressing CTRL and F5 simultaneously. If the handshake line was already at +V, no delay in output would be encountered. This command is only recognized if the HANDSHAKE setting is set to DISABLE.

Pause Until Handshake Line Input -V (HB6) will cause Programmable KEY output to suspend until the ProMotion's handshake line (at the interface connector) is at -V (valid handshake line input voltage levels for RS-232 are +3V to +30V and -3V to -30V). A special waiting cursor consisting of horizontal bars (▤) is displayed in place of the regular cursor after approximately one half second of waiting. The suspend condition may be canceled by pressing CTRL and F5 simultaneously. If the handshake line was already at -V, no delay in output would be encountered. This command is only recognized if the HANDSHAKE setting is set to DISABLE.

Pause Until (nn) Character Received Command (HBD) will cause Programmable KEY output to suspend until the following value (nn) is received by the ProMotion. This command may be useful in a number of applications where the terminal must wait for a certain character from the host before continuing. e.g.
Note: [CR] = H0D
> 1) Send the string "STOP[CR]" to the host.
> 2) Wait for the host to send "STOPPED" back to terminal.
> 3) Send the string "A=A+1[CR]" to host.
> 4) Wait for host to send ">" prompt.
> 5) Send the string "RUN [CR]."

The following string programmed into a Programmable Key will execute the example above:

S T O P **0D BF BD** D **BF** A = A + 1 **0D BF BD** > **BF** R U N **0D**

Note that Serial output is toggled off (HBF) prior to the pause commands (HBD). When the pause command has been executed, the wait character is echoed to the serial port/display unless toggled off.
Note: The seventh character "D" is the last character in the word STOPPED. If necessary, you may verify the entire string with the following string:

BD 'S' **BD** 'T' **BD** 'O' **BD** 'P' **BD** 'P' **BD** 'E' **BD** 'D'

Whenever the terminal is waiting for the reception of a character, a special cursor consisting of horizontal bars (▤) will flash in place in of the regular cursor. The PAUSE command may be aborted at any time by simultaneously pressing the CTRL and F5 keys.   If you are waiting to verify an entire string as in the example above, you must press the CTRL+F5 combination seven (7) times.

BRANCHING COMMANDS
Branching commands may be used to reprocess or conditionally process all or portions of a Programmable KEY string.

The Label Designator Command (HB4) must always be followed by a label (nn). The label may be any value. Branch commands are always followed by the label value which to search for. Searches for labels always begin at the start of the string and proceed to the end of the string. Any search for a non-existent label will result in the termination of Programmable KEY string processing, and normal exit. Label Designator Commands and their respective values are ignored in all cases except for searches initiated by a branch condition. Programmable KEY processing and output continue normally with the character following the label value.

Branch Always Command (HBA) will unconditionally branch to label value (nn) that follows. The above Label Designator Command (HB4) is always used to specify the label value (nn).

Branch Conditional Command (HB5) branches to the label value (nn) that follows only if Handshake Input Line is -V. If Handshake Input Line is +V, Programmable KEY processing and output continue   normally with the character following the Conditional Branch's label value.
In the following example, suppose the ProMotion is only used as a remote monitoring device. Assume the following to be true of the host device:

1) The host will power up "stopped"
2) When the unit begins to run, "R" is transmitted

3) When the unit stops, "S" is transmitted from the host
4) When the paper is low, +V is asserted on line connected to Hand-shake Input of ProMotion

It is desirable to display "STOPPED" when stopped and "RUNNING" when running, as well as the paper status. The example below will demonstrate the use of the branch commands.

BF BE B4 1 1B E STOPPED B5 2 0D 0A PAPER LOW 4B 2 BD R
1B E RUNNING B5 3 0D 0A PAPER LOW B4 3 BD S BA 1

Note: Spaces are shown for clarity only. No coded spaces required

This example assumes the setting of ECHO is DISABLED, and the setting of ESCAPE MODE is PRIVATE. SCREEN SIZE may be set to 24 x 8.
Stepping through the above example:
Note: <esc>= H1B.

1) Serial output is toggled off (HBF)
2) Echo to the display is toggled on (HBE)
3) Label is placed (H4B '1')
4) The screen is cleared (<esc>'E')
5) 'STOPPED' is displayed
6) If paper is good, jump to step 9 (HB5 '2')
7) 'PAPER LOW' is displayed on the next line
8) Label is placed (H4B '2')
9) Wait for "R" (HBD 'R')
10) The screen is cleared (<esc>'E')
11) 'RUNNING' is displayed
12) If paper is good, jump to step 15 (HB5 '3')
13) 'PAPER LOW' is displayed on the next line
14) Label is placed (HB4 '3')
15) Wait for 'S' (HBD 'S')
16) Jump to step 4 (HBA '1')

HANDSHAKE OUT LINE MANIPULATION

Handshake Out Line Manipulation command are useful when the need to signal an external device is needed. the handshake out line will maintain voltage levels between either +3V to +15V or -3V to -15V. Effective line load resistance should always be greater than 3K ohms (RS-232 interface only).

Assert Handshake Out Equals +V Command (HB9) will assert the Handshake out line (at interface connector) to +V. (This command is only active if Handshake setting is set to DISABLE).

Assert Handshake Out Equals -V Command (HB8) will assert the Handshake out line (at interface connector) to -V. (This command is only active if Handshake setting is set to DISABLE).

Display characters

PROGRAMMABLE DISPLAY CHARACTERS

Several custom characters may be programmed into the display. Each
character consists of a standard 5 x 7 or a 7 x 14 dot matrix. Although
a total of thirty two (32) characters are available, several programmable
are used by the terminal for special functions, as shown in the follow-
ing table.

Character 24 X 8 mode	Character 16 X 32 mode	HEX	DESCRIPTION
		9B	char 27 (Hardware handshake disabled from host)
		9C	char 28 (parity error indication)
		9D	char 29 (non-shifted, non-CTRL cursor)
		9E	char 30 (non-shifted, CTRL cursor) (Not available on 20 Key)
		9F	char 31 (shifted, CTRL cursor) (Not available on 20 Key)
		A0	char 32 (shifted, non-CTRL cursor) (Not available on 20 Key)

User characters 29 - 32 are used as cursors, thereby allowing custom-
ized cursor shapes. User character 28 is the symbol displayed when a
parity error occurs and DISPLAY PE is enabled.

DISPLAY CHARACTER PROGRAMMING

A working knowledge of binary and hexadecimal notation is helpful for use of this feature. The following ANSI escape sequence is used to redefine a programmable display character:

For a 32 X 16 mode display:

ESC[5zCn;R1;R2;R3;R4;R5;R6;R7;R8ESC[0z

For a 24 X 8 mode display:

ESC[5zCn;R1;R2;R3;R4;R5;R6;R7;R8;R9;R10;R11;R12;R13;R1 4;R15;R16ESC[0z

"Cn" is substituted by C1 - C32 signifying programmable characters 1 through 32. R1 - R8 represent row one through row eight (R1-R16 for 24 x 8 Mode) of the display character and should be replaced with a pair of ASCII Hexidecimal characters. Bit 7 of each byte represents the leftmost column of the character. Character C1 is stored at HEX location 81, C2 at HEX 82 and so forth.

To display user characters (8 bit data mode is required). Simply send H81 - HB0 (Decimal 129 to 176), to the terminal via host control or program any of the keys to output the appropriate HEX location. ECHO must be ENABLED to view the characters in this manner.

Note: When programming custom characters, the mode in which those characters will be displayed must be selected. If you program a character in 24 X 8 mode and then switch to 32 X 16 mode the character will not appear when the appropriate HEX code is received.

Note: For the 20 key keypad option there are no Alpha keys. Refer to the Decimal to HEX conversion tables to enter the equivalent value for the HEX key required

EXAMPLE 1: The ProMotion is set for 16 X 32 display mode. Program the user character "C1" to display an upper case "A." The character cell is organized as 8 rows and columns. Bits 0 and 1 are ignored. If all row information is not sent, zeros will be inserted.

Bit Number	7 6 5 4	3 2 1 0	
Row 1 (R1)	0 **1 1 1**	0 0 x x	70 (hexadecimal)
Row 2 (R2)	**1** 0 0 0	**1** 0 x x	88 (hexadecimal)
Row 3 (R3)	**1** 0 0 0	**1** 0 x x	88 (hexadecimal)
Row 4 (R4)	**1** 0 0 0	**1** 0 x x	88 (hexadecimal)
Row 5 (R5)	**1 1 1 1**	**1** 0 x x	F8 (hexadecimal)
Row 6 (R6)	**1** 0 0 0	**1** 0 x x	88 (hexadecimal)
Row 7 (R7)	**1** 0 0 0	**1** 0 x x	88 (hexadecimal)
Row 8 (R8)	0 0 0 0	0 0 x x	00 (hexadecimal)
x = Don't Care			

ESC[5zC1;70;88;88;88;F8;88;88;00ESC[0z

Program any key for a Hex 81 (129 D) and be sure the ECHO is ENABLED.

	b7	b6	b5	b4	b3	b2	b1	b0
Row 1		■	■	■				
Row 2	■				■			
Row 3	■				■			
Row 4	■				■			
Row 5	■	■	■	■	■			
Row 6	■				■			
Row 7	■				■			
Row 8								

Figure 4. 11: Character Example

Shaded areas are ignored.

When the programmed key is depressed the character above will be displayed.

EXAMPLE 2: Terminal is set for 8 X 24 mode.
Program the user character "C32" to display a superscript Copyright symbol. The character cell is organized as 16 rows and 8 columns. If all row information is not sent, zeros will be inserted.

Bit Number	7 6 5 4	3 2 1 0	
Row 1 (R1)	0 0 1 1	1 0 0 0	38(hexadecimal)
Row 2 (R2)	0 1 0 0	0 1 0 0	44 (hexadecimal)
Row 3 (R3)	1 0 1 1	1 0 1 0	BA (hexadecimal)
Row 4 (R4)	1 0 1 0	0 0 1 0	A2 (hexadecimal)
Row 5 (R5)	1 0 1 0	0 0 1 0	A2 (hexadecimal)
Row 6 (R6)	1 0 1 1	1 0 1 0	BA (hexadecimal)
Row 7 (R7)	0 1 0 0	0 1 1 0	44 (hexadecimal)
Row 8 (R8)	0 0 1 1	1 0 0 0	38 (hexadecimal)
Row 9 (R9)	0 0 0 0	0 0 0 0	00 (hexadecimal)
Row 10 (R10)	0 0 0 0	0 0 0 0	00 (hexadecimal)
Row 11 (R11)	0 0 0 0	0 0 0 0	00 (hexadecimal)
Row 12 (R12)	0 0 0 0	0 0 0 0	00 (hexadecimal)
Row 13 (R13)	0 0 0 0	0 0 0 0	00 (hexadecimal)
Row 14 (R14)	0 0 0 0	0 0 0 0	00 (hexadecimal)
Row 15 (R15)	0 0 0 0	0 0 0 0	00 (hexadecimal)
Row 16 (R16)	0 0 0 0	0 0 0 0	00 (hexadecimal)

The sequence is as follows:
**ESC[5zC32;38;44;BA;A2;A2;BA;44;38;00;00;00;00;00;00;00;00
ESC[0z**

Program any key for a Hex B0 (176 D) and be sure the ECHO is ENABLED.

Example 2 (Continued).

	b7	b6	b5	b4	b3	b2	b1	b0
Row 1			■	■	■			
Row 2		■				■		
Row 3	■		■	■	■		■	
Row 4	■		■				■	
Row 5	■		■				■	
Row 6	■		■	■	■		■	
Row 7		■				■		
Row 8			■	■	■			
Row 9								
Row 10								
Row 11								
Row 12								
Row 13								
Row 14								
Row 15								
Row 16								

Figure 4. 12: Character Example

When the programmed key is depressed the character above will be displayed.

EXAMPLE 3: Terminal is set for 8 X 24 mode.
Program the user character "C20" to display a Pound Sterling symbol.
The character cell is organized as 16 rows and 8 columns. If all row
information is not sent, zeros will be inserted.

Bit Number	7 6 5 4	3 2 1 0	
Row 1 (R1)	0 0 0 0	**1 1** 0 0	0C(hexadecimal)
Row 2 (R2)	0 0 0 **1**	0 0 **1** 0	12 (hexadecimal)
Row 3 (R3)	0 0 0 **1**	0 0 0 0	10 (hexadecimal)
Row 4 (R4)	0 0 0 **1**	0 0 0 0	10 (hexadecimal)
Row 5 (R5)	0 **1 1 1**	**1 1** 0 0	7C (hexadecimal)
Row 6 (R6)	0 0 0 **1**	0 0 0 0	10 (hexadecimal)
Row 7 (R7)	0 0 0 **1**	0 0 0 0	10(hexadecimal)
Row 8 (R8)	0 0 0 **1**	0 0 0 0	10 (hexadecimal)
Row 9 (R9)	0 0 0 **1**	0 0 0 0	10 (hexadecimal)
Row 10 (R10)	0 **1** 0 **1**	0 0 0 0	50 (hexadecimal)
Row 11 (R11)	**1** 0 **1 1**	0 0 0 0	B0 (hexadecimal)
Row 12 (R12)	**1** 0 0 **1**	**1** 0 0 **1**	99 (hexadecimal)
Row 13 (R13)	**1** 0 **1** 0	0 **1 1** 0	A6 (hexadecimal)
Row 14 (R14)	0 **1** 0 0	0 0 0 0	40 (hexadecimal)
Row 15 (R15)	0 0 0 0	0 0 0 0	00 (hexadecimal)
Row 16 (R16)	0 0 0 0	0 0 0 0	00 (hexadecimal)

The sequence is as follows:
ESC[5zC20;0C;12;10;10;7C;10;10;10;50;B0;99;A6;40;00;00
ESC[0z

Program any key for a Hex 95 (149 D) and be sure the ECHO is
ENABLED.

	b7	b6	b5	b4	b3	b2	b1	b0
Row 1					■	■		
Row 2				■			■	
Row 3				■				
Row 4				■				
Row 5		■	■	■	■	■		
Row 6				■				
Row 7				■				
Row 8				■				
Row 9				■				
Row 10		■		■				
Row 11	■		■	■				
Row 12	■			■	■			■
Row 13	■		■			■	■	
Row 14		■						
Row 15								
Row 16								

Figure 4. 13: Character Example

When the programmed key is depressed the character above will be displayed.

4.5 ProMotion GRAPHICS MODE

There are two ways in which graphics may be handled by the ProMotion.
1. Graphics File Transfer and,
2. Manipulation of Graphics Memory Pixels. (See Page 44)

Graphics Memory exists on a different layer and is independent of the Text Memory.
There a two Graphics memory locations; Buffer0 and Buffer1
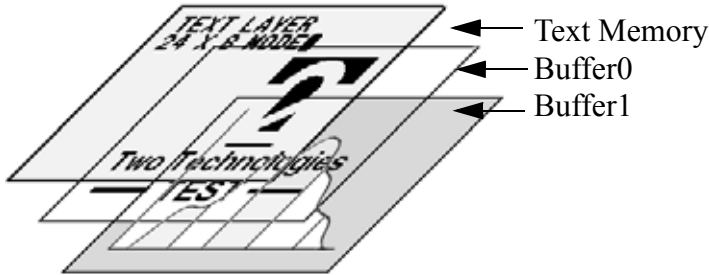
Figure 4. 14: Text and Graphics Memory

Graphics Memory is inactive until the contents are displayed via the **esc**[5zGD0 or **esc**[5zGD1 sequence.

Text will be superimposed on top of the Graphic Image.
It is important to note that the graphic image not be displayed in a manner which will obstruct any text on the screen or vice versa.

Text Displayed Graphics: Display Buffer 0   Display Buffer 1

Figure 4. 15: Selecting Graphics Memory

Upon completion of the first image download, the second image may be downloaded. Alternatively, one Graphic image may be loaded as the other is being displayed.

 THE TWO GRAPHICS BUFFERS MAY NOT BE DISPLAYED SIMULTANEOUSLY

The two may be toggled using the **esc**[5zGD0 **esc**[0z or **esc**[5zGD1 **esc**[0z sequence.

Graphic images representing two operating modes may be an example of this operation.

Graphics may be downloaded to one of two buffers in the ProMotion memory via the serial port using the sequence below:

DOWNLOAD GRAPHICS FILE TO PROMOTION

Load binary data to graphics buffer 0   **esc**[5zGL0;
Load binary data to graphics buffer 1   **esc**[5zGL1;

A Two Technologies Utility (PROCNV.EXE See Page 40), is used to convert a 192 X 128 one bit per pixel (2 color) graphics bit map file (.bmp) to binary format <filename>.ttb. The file size is 3K (3072) bytes.

The syntax is as follows:

esc[5zGL0;<transmission of serial string> esc[0z

IMPORTANT: The sequence **esc**[0z must be appended else the keypad will not respond.

In order to display either image the **esc**[5zGD0 **esc**[0z or **esc**[5zGD1 **esc**[0z sequence must be issued.

Note:
Text processing will occur as normal provided no graphic image is being displayed. Due to the processing of Graphics, as soon as an image is selected for display there will be a slow down in Text processing especially when switching between text modes (24 X 8 to 32 X 16 or vice versa).

The graphics memory will lie on top of the text layer which will allow text to be superimposed with the graphic. If Text is not desired on the graphic image, the text must first be cleared.
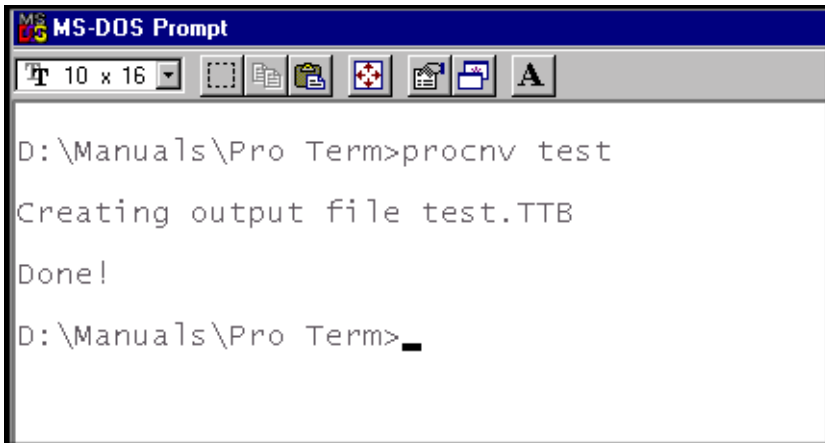
Text and graphics are individually controlled.

FILE CONVERSION UTILITY (PROCNV.EXE)

The file conversion utility PROCNV.EXE is used to convert a standard two color (1 bit) bitmap (*.bmp) image into a binary file with an extension of ttb.
The syntax for the proper execution is:

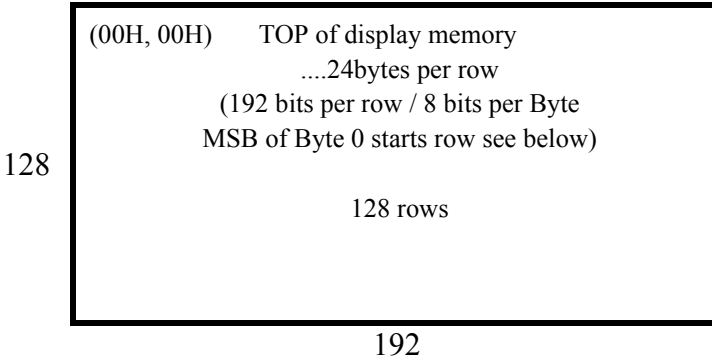**procnv <bitmap filename with no extension>**
See sample screen below:

```
MS-DOS Prompt
T 10 x 16

D:\Manuals\Pro Term>procnv test

Creating output file test.TTB

Done!

D:\Manuals\Pro Term>_
```

The ProMotion screen format can be described as follows:
The resolution of the display is 192x128 pixels - black & white (monochrome)

Each pixel is controlled with one bit of screen memory and is formatted as follows:

```
          (00H, 00H)      TOP of display memory
                    ....24bytes per row
                (192 bits per row / 8 bits per Byte
                MSB of Byte 0 starts row see below)

128
                         128 rows




                           192
```

Black = 1 (bit set)
White = 0 (bit clear)

Figure 4. 16: Display Overview

BYTE 0

7	6	5	4	3	2	1	0

Bit 7 of Byte 0 is the first Pixel ➤

Byte 0 ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ─ ➤ Byte 24

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47

128 Rows

Byte 3072

3048	3049		3071	3072

Figure 4. 17: Pixel Detail

GRAPHICS CONTROL ESCAPE SEQUENCES
used with applicable model
Table 16: Graphics ANSI Control Summary

ESCAPE SEQUENCE	DESCRIPTION
Download Graphics file to ProMotion	
esc[5zGL0	Load binary data to graphics buffer 0
esc[5zGL1	Load binary data to graphics buffer 1
Display Buffer Contents	
esc[5zGD0	Display Buffer 0 contents
esc[5zGD1	Display Buffer 1 contents
Clear Buffer Contents	
esc[5zGB0	Clear contents of Buffer 0
esc[5zGB1	Clear contents of Buffer 1
Draw Real-time Graphics	
esc[5zGS0	Set Pixel in Buffer 0
esc[5zGS1	Set Pixel in Buffer 1
esc[5zGC0	Reset Pixel in Buffer 0
esc[5zGC1	Reset Pixel in Buffer 0
esc[0z	Terminate operation

SECTION 4

IMPORTANT NOTE: When the final terminator **esc[0z** (**esc** = H1B) is successfully received, the programming information is inserted into the Graphics data storage area.

Display Buffer Escape sequences

NOTE: Use of higher BAUD rates (19,200 and 57,600), facilitates faster transfer and display of graphics. Handshaking must be enabled at higher BAUD rates to insure proper transfer of a graphics file.

The commands are shown below:

Clear Buffer Contents

Clear contents of Buffer 0	**esc**[5zGB0 **esc**[0z
Clear contents of Buffer 1	**esc**[5zGB1 **esc**[0z

Note: No spaces required.
Note: esc[0z must be appended for the command to execute

Once the contents of the buffer have been loaded, the terminal must be prompted to display the graphics image as follows:
Display Buffer Contents

Display Buffer 0 contents	**esc**[5zGD0 **esc**[0z
Display Buffer 1 contents	**esc**[5zGD1**esc**[0z

Note: esc[0z must be appended for the above command to execute. If the contents of the memory buffer are displayed prior to new data being loaded or the contents cleared, what ever random pattern has been stored will be displayed.

Example:
A typical series of commands to Clear Buffer contents, transfer a graphics image and display the contents on the LCD display;

esc[5zGB0H1B[0z esc[5zGL0;<Serial string (*.ttb File)> esc[0z esc[5zGD0H1B[0z
Note: The Buffer may be displayed before transfer of ttb file. The only difference being that the screen will display the image as it is being transferred which gives the appearance of a scrolling display.

REAL TIME GRAPHICS MODE

The second method is direct manipulation of display Pixels in real time.
Draw Real-time Graphics

Set Pixel in Buffer 0   **esc**[5zGS0;xx,yy **esc**[0z
A HEX value for the location of each Pixel must be defined.
xx is the HEX value along the horizontal and yy is the HEX value
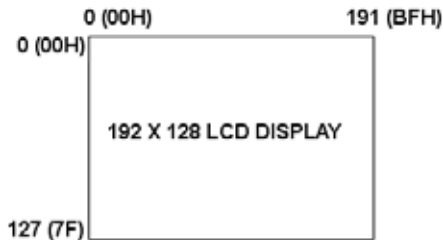along the vertical.
Example:

esc[5zGS0;20;30 esc[0z

Set Pixel in Buffer 1   **esc**[5zGS1;xx,yy **esc**[0z
Example:

esc[5zGS1;45;1A esc[0z

The same rules apply for this mode as with image mode. The buffer
must first be cleared then the contents of the buffer must be displayed.
The following illustration shows the display layout;

Reset Pixel in Buffer 0   **esc**[5zGC0 **esc**[0z
Reset Pixel in Buffer 0   **esc**[5zGC1 **esc**[0z
The syntax is as follows:

esc[5zGC0;xx;yy esc[0z

Terminate operation   **esc**[0z

IMPORTANT NOTE: When the final terminator **esc[0z** is successfully received, the programming information is inserted into the Graphics data storage area.

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4.6 Advanced Control Mode (ACM)

ACM is accessible when the ProMotion is in ANSI mode.
There are no PRIVATE Mode escape sequences in ACM, however, the ProMotion may be set to PRIVATE Mode after completion of ACM functions via ESC[?2l then returned to ANSI (ESC <).

There are several restrictions which are imposed when operating in ACM :

1. The setup menus are disabled when in ACM ; CTRL, SHIFT, F1 or CTRL, SHIFT, F2, as well as CONTRAST, CTRL F5, will not respond.
2. If any keys have been redefined, they will return to their default settings until the suspension of ACM activities.
3. Only the host may enable ACM and these settings cannot be saved; If power is removed all ACM settings will be disabled.
4. The modifier keys (CTRL, SHIFT) will only effect the display and not the key code outputs; (e.g., The F1 key will output 41H with no modifier keys pressed.
If the CTRL key is pressed and then F1, 41H will be output. The same applies for the SHIFT key)

The ⬦ ⬎ ⬏ display characters will be shown as normal, provided the SHIFT and CTRL keys are enabled.
(See following pages).
Note: Cursors shown in 24 X 8 Screen Mode

Table 17: ANSI ACM CONTROLS

ESCAPE SEQ.	DESCRIPTION
ESC [1v	Enable ACM
ESC [21v	Disable ACM
SHIFT and CTRL key controls *In ACM the following only effects the display.*	
ESC [4v	Disable SHIFT, Disable CTRL
ESC [5v	Enable SHIFT, Disable CTRL
ESC [6v	Disable SHIFT, Enable CTRL
ESC [7v	Enable SHIFT, Enable CTRL
Note: SHIFT and CTRL key controls may be used with ACM enabled or disabled.	

ENQ ACKNOWLEDGEMENT

The normal response to the Inquiry ENQ (05H) from the host will be an ACK (06H) character.

When ACM is enabled (ESC[1v), the terminal will respond with a DLE (10H) Character.
This will insure that the host can verify that ACM has indeed been enabled on the ProMotion.

It is important to note, that only the HOST may select ACM via the ESC[1v sequence.

When an ENQ (05H) is sent from the HOST and ACM has not been selected an ACK (06H) will be received from the ProMotion.

Once the ACM has been selected by the HOST an ENQ should be sent and the response from the ProMotion will be a DLE (10H).

The HOST should then periodically check for DLE at a fixed time interval (e.g., 25mS) to verify;

> 1. The ProMotion is attached and,
> 2. The ProMotion is in Advanced Control Mode.

KEY CODES

When not in ACM any key may be redefined.

As soon as ACM is selected ALL key codes will revert to their default settings.
The Parameter Setup and the Key Output Definition Setup Menus are disabled as well as Contrast Control when in ACM

ACM Transition

The HOST may send a request for ACM at any time. In some situations the Operator may have one of the keys held down on the ProMotion while the HOST is requesting ACM or, one or more keys may be pressed while the HOST is releasing ACM.

See Application Note 2 in Appendix C for more **IMPORTANT INFORMATION** on the proper use of DLE.

KEY RELEASE CODE FUNCTION

⚠️ Communication must be set to 8 data bits in Advanced Control Mode

During normal operation of the ProMotion, the terminal will only send the appropriate key code upon key depression unless KNP has been ENABLED. In this case a NULL (00H) will be sent when the key is released. See Section 2 page 6.

When ACM is enabled, (ESC[1v from HOST), the terminal will send a unique code when the key is released.

The most significant digit of the ASCII key code will be set to a one and the corresponding HEX code will be transmitted to the host.

Example:
Press the F1/A key.
The terminal will send a HEX 41 to the host.
Release the F1/A key.
The terminal will send a HEX C1 to the host.

Press F1/A = 41H = 01000001
Release   = C1H = 11000001

                    ▲
               MSB Set

N-KEY ROLLOVER

Note: N-Key rollover is only active when in ACM.
Any combination of keys may be pressed simultaneously or in any order with the exception of the restrictions listed below.
Restrictions:

If any combination of 3 or more keys results in any two being in the same Column and Row, the resulting key codes will not be transmitted. Example below:

Because of the matrix system used for key detection, this combination will result in a "Ghost" Key as shown.

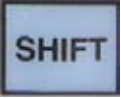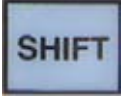**Figure 4. 18: Restricted key combination example**

However, if the "7" and "1" keys are pressed, their codes will be transmited. If, while they are being held down, the "3" key is pressed, no key code will be sent for the "3" key.

There is no key repeat when ACM N-Key Rollover is in use.

The keys may be pressed in any order. When any key is released, the corresponding release code (Key Code + 80H), will be transmitted to the host

KEY CODES

In ACM, the CTRL and SHIFT will create specific Key Codes:

KEY	DISPLAY CHARACTER	HEX CODE	KEY RELEASE CODE
CTRL		7CH	FCH
SHIFT		5CH	DCH
CTRL + SHIFT		7CH, 5CH	FCH, DCH

These keys are no longer modifier keys.

The display will show the appropriate display character as shown above.

When in normal mode the CTRL and SHIFT keys send no codes but rather act as modifiers.
The exception to this is when either key is disabled.
In the case of the disabled key, it will no longer act as a modifier and will send the corresponding key code when pressed.
If KNP is enabled, the key's release code will be sent when the key is released.
See the following page for details.

SHIFT AND CTRL ENABLE/DISABLE

ESC [4v   Disable SHIFT, Disable CTRL
ESC [5v   Enable SHIFT, Disable CTRL
ESC [6v   Disable SHIFT, Enable CTRL
ESC [7v   Enable SHIFT, Enable CTRL

These escape codes will function differently for ACM and Non-ACM.

ACM only changes the cursor's appearance on the display where the non-ACM transmits the key output codes for the disabled key as well as the cursor display for the enabled key.
Also, the disabled keys function as a modifier is also disabled.

SECTION 4

Table 18: Enable/Disable Function

ESC[4v

Key	Cursor Display	Output	Release Code
ACM			
SHIFT	No Change	5CH	DCH
CTRL	No Change	7CH	FCH
Normal Mode			
SHIFT	No Change	5CH	n/a
CTRL	No Change	7CH	n/a

ESC[5v

Key	Cursor Display	Output	Release Code
ACM			
SHIFT	⊹	5CH	DCH
CTRL	No Change	7CH	FCH
Normal Mode			
SHIFT	⊹	No Output	n/a
CTRL	No Change	7CH	n/a

ESC[6v

Key	Cursor Display	Output	Release Code
ACM			
SHIFT	No Change	5CH	DCH
CTRL		7CH	FCH
Normal Mode			
SHIFT	No Change	5CH	n/a
CTRL		No Output	n/a

ESC[7v

Key	Cursor Display	Output	Release Code
ACM			
SHIFT		5CH	DCH
CTRL		7CH	FCH
SHIFT + CTRL		5CH + 7CH	DCH + FCH
Normal Mode			
SHIFT		No Output	n/a
CTRL		No Output	n/a
SHIFT + CTRL		No Output	n/a

Section 5 Troubleshooting

No cursor on display	
CAUSE	**SOLUTION**
Power Problems	
No power to terminal (host supplied).	Verify proper voltage to terminal.
No power to terminal (adapter supplied).	a. Verify wall plug is functional. b. Check wiring of adapter if wired as kit.
Reversed Polarity	***Cable Wiring or Host connector wiring*** For Cable Connector Pinout See Section 1 page 1
Cursor Problems	
Cursor not enabled	If Host control sends an ESC[5t in ANSI mode or ESC G in Private Mode, the cursor will be disabled. Use ESC[4t (ANSI) or ESC F (Private), to re-enable cursor The terminal Parameter Settings may have been changed as well to disable cursor. Use CTRL, SHIFT, F1 to reset (BKSP, ENTER, F1 on 20 Key keypad).
Resets by Itself	
CAUSE	SOLUTION
Low voltage output	Verify proper voltage to terminal.
Cable resistance too high	Cable should be 26 AWG or larger
Wire gauge too small	Cable should be 26AWG or larger.

Not receiving or displaying correct characters	
CAUSE	SOLUTION
Incorrect BAUD rate	Open parameter menu. Change to correct BAUD rate. **KEYS TO ACCESS SET PARAMETERS** BAUD = 9600 F1–CHANGE THE SETTING F2–NEXT OPTION F3–PREVIOUS OPTION F4–QUIT WITHOUT SAVING F5–SAVE & EXIT

CAUSE	**SOLUTION**
ProTerm waiting for handshake line to be asserted.	If handshaking is being used: a. Verify that the wiring between the host and terminal is correct. b. For RS-232, TTL/CMOS, verify that the handshake line from the host is asserted. If handshaking is not being used: Access the Setup Parameter Menu by depressing the CTRL, SHIFT and F1 keys. The terminal will be in the SETUP PARAMETER MODE and the BAUD rate should show on the display. Press the F2 key until the display shows the HAND-SHAKE parameter. If the parameter is ENABLED, press F1 to disable handshaking.


```
ENABLE HANDSHAKE


F1-CHANGE THE SETTING
F2-NEXT OPTION
F3-PREVIOUS OPTION
F4-QUIT WITHOUT SAVING
F5-SAVE & EXIT
```

PE is Displayed

CAUSE	**SOLUTION**
Parity Error ⸬	Open Parameter menu. Change PARITY to correct settings.

Double Characters Displayed

CAUSE	**SOLUTION**
Echo Turned On.	Open Parameter menu. Change ECHO parameter to DISABLE.

Section 5

Unit seems to lock-up on power up	
CAUSE	**SOLUTION**

ProTerm waiting for hand-shake line to be asserted.	*If handshaking is being used:*
	a. Verify that the wiring between the host and terminal is correct.
	
	    b. For RS-232, TTL/CMOS, verify that the handshake line from the host is asserted.
	
	If handshaking is not being used:
	    a. Access the Setup Parameter Menu by depressing the CTRL, SHIFT and F1 keys. The terminal will be in the SETUP PARAMETER MODE and the BAUD rate should show on the display. Press the F2 key until the display shows the HANDSHAKE parameter. If the parameter is ENABLED, press F1 to disable handshaking.

Unit does not perform self-test	
CAUSE	**SOLUTION**
Self-test parameter disabled	Open parameter menu. Change TEST parameter to ENABLED

Cannot access parameter mode	
Cannot access function key programming mode	

CAUSE	SOLUTION
Configuration Menus are locked out	**Remove power. Depress the CTRL, SHIFT and F3 keys while applying power to re enable modifications.**

Cannot access parameter mode or function key programming mode (cont'd.)

CAUSE	SOLUTION
ProTerm waiting for hand-shake line to be asserted	See solution on Section 8 page 11.

Incorrect characters displayed.	

CAUSE	SOLUTION
Parity settings incorrect	Open parameter menu. Change PARITY to correct setting.
Data bits incorrect	Open parameter menu. Change DATA BITS to correct setting.
Incorrect BAUD rate	**Open parameter menu. Change the BAUD rate by depressing the F1 key until the correct BAUD rate is visible.**
Inverted data lines.	Verify wiring is correct.

Section 5

Function keys not sending correct values	
CAUSE	SOLUTION
Key has been accidentally reprogrammed.	**Reprogram function key. See Section 4**
E**EPROM corrupted by line disturbance.**	**Disconnect power. Hold down keys as illustrated below.** **Reapply power. This will restore factory defaults.** **Reprogram parameters and function keys.**
Terminal reset to factory defaults after repair.	**Reprogram function keys.** **See Section 4 .**

Lost characters	
CAUSE	**SOLUTION**
Needs to handshake	ProTerm waiting for handshake line to be asserted.

Key does not repeat when pressed	
CAUSE	**SOLUTION**
Repeat parameter disabled	Open parameter menu. Change repeat parameter to SLOW or FAST

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Section 6 Miscellaneous

6.1 CUSTOMIZATIONS

Many customizations of the ProMotion are possible. Those available include, but are not limited to, keypad graphics overlays, keypad character reassignments, custom packaging and special programming. Contact Two Technologies to discuss your requirements.

Section 6

Figure 1.1: Custom ProMotion Example

6.2 ACCESSORIES

Some of the accessories available for the ProMotion hand held terminal are described below. For information on all accessories, contact Two Technologies, Inc.

Connecting Cables
Permanent cables are available which feature 15 Pin D Shell terminations on the end. Lengths are 7 feet and 15 feet.
Custom cable configurations are available.
Contact Two Technologies, Inc. for more information.

WIRED ADAPTERS

Refer to Accessories section (on-line catalog) at http://www.2t.com for other Con-nection Peripherals and cables.

POWER SUPPLY/BATTERY CHARGER

Note Polarity of Connector
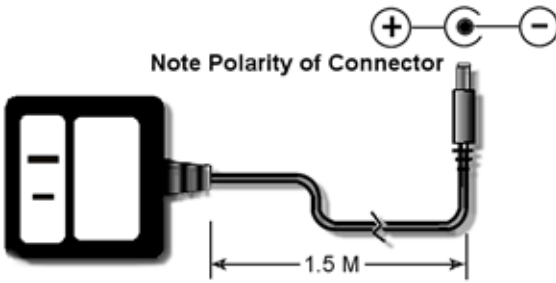
#1226-1- 7.5VDC @ 500 MA. or 9V @ 300 mA.
Wall Mount Power Supply

Note: This power supply does not connect directly onto the ProMotion.

Miscellaneous   *Copyright© 2000 Two Technologies, Inc.*

7ft. or 15 ft. w/DA-15P, termination

Section 6

7ft or 15 ft. with stripped leads

*NOTE: Custom wiring configurations are available.

CONTACT TWO TECHNOLOGIES, INC. FOR INFORMATION ON ANY CUSTOM CONFIGURATIONS

Section 7 Appendices

APPENDIX A

Note: Cn designates programmable key identifier.

Table 19: ASCII TABLE

DEC	HEX	ASCII	Cn	DISP CHAR	DEC	HEX	ASCII	Cn	DISP CHAR
0	00	NUL	n/a	n/a	32	20	space	n/a	space
1	01	SOH	n/a	n/a	33	21	!	C21	!
2	02	STX	n/a	n/a	34	22	"	C22	"
3	03	ETX	n/a	n/a	35	23	#	C23	#
4	04	EOT	n/a	n/a	36	24	$	C24	$
5	05	ENQ	n/a	n/a	37	25	%	C25	%
6	06	ACK	n/a	n/a	38	26	&	C26	&
7	07	BEL	n/a	n/a	39	27	'	C27	'
8	08	BS	n/a	n/a	40	28	(	C28	(
9	09	HT	n/a	n/a	41	29	)	C29	)
10	0A	LF	n/a	n/a	42	2A	*	C2A	*
11	0B	VT	n/a	n/a	43	2B	+	C2B	+
12	0C	FF	n/a	n/a	44	2C	'	C2C	'
13	0D	CR	n/a	n/a	45	2D	-	C2D	-
14	0E	SO	n/a	n/a	46	2E	.	C2E	.
15	0F	SI	n/a	n/a	47	2F	/	C2F	/
16	10	DLE	n/a	n/a	48	30	0	C30	0
17	11	DC1	n/a	n/a	49	31	1	C31	1
18	12	DC2	n/a	n/a	50	32	2	C32	2
19	13	DC3	n/a	n/a	51	33	3	C33	3
20	14	DC4	n/a	n/a	52	34	4	C34	4
21	15	NAK	n/a	n/a	53	35	5	C35	5
22	16	SYNC	n/a	n/a	54	36	6	C36	6
23	17	ETB	n/a	n/a	55	37	7	C37	7
24	18	CAN	n/a	n/a	56	38	8	C38	8
25	19	EM	n/a	n/a	57	39	9	C39	9
26	1A	SUB	n/a	n/a	58	3A	:	C3A	:
27	1B	ESC	n/a	n/a	59	3B	;	C3B	;
28	1C	FS	n/a	n/a	60	3C	<	C3C	<
29	1D	GS	n/a	n/a	61	3D	=	C3D	=
30	1E	RS	n/a	n/a	62	3E	>	C3E	>
31	1F	US	n/a	n/a	63	3F	?	C3F	?

SECTION 7

Table 19: ASCII TABLE

DEC	HEX	ASCII	Cn	DISP CHAR	DEC	HEX	ASCII	Cn	DISP CHAR
64	40	@	C40	@	96	60	`	C60	`
65	41	A	C41	A	97	61	a	C61	a
66	42	B	C42	B	98	62	b	C62	b
67	43	C	C43	C	99	63	c	C63	c
68	44	D	C44	D	100	64	d	C64	d
69	45	E	C45	E	101	65	e	C65	e
70	46	F	C46	F	102	66	f	C66	f
71	47	G	C47	G	103	67	g	C67	g
72	48	H	C48	H	104	68	h	C68	h
73	49	I	C49	I	105	69	i	C69	i
74	4A	J	C4A	J	106	6A	j	C6A	j
75	4B	K	C4B	K	107	6B	k	C6B	k
76	4C	L	C4C	L	108	6C	l	C6C	l
77	4D	M	C4D	M	109	6D	m	C6D	m
78	4E	N	C4E	N	110	6E	n	C6E	n
79	4F	O	C4F	O	111	6F	o	C6F	o
80	50	P	C50	P	112	70	p	C70	p
81	51	Q	C51	Q	113	71	q	C71	q
82	52	R	C52	R	114	72	r	C72	r
83	53	S	C53	S	115	73	s	C73	s
84	54	T	C54	T	116	74	t	C74	t
85	55	U	C55	U	117	75	u	C75	u
86	56	V	C56	V	118	76	v	C76	v
87	57	W	C57	W	119	77	w	C77	w
88	58	X	C58	X	120	78	x	C78	x
89	59	Y	C59	Y	121	79	y	C79	y
90	5A	Z	C5A	Z	122	7A	z	C7A	z
91	5B	[	C5B	[	123	7B	{	C7B	{
92	5C	\	C5C	\	124	7C	|	C7C	|
93	5D	]	C5D	]	125	7D	}	C7D	}
94	5E	^	C5E	^	126	7E	~	C7E	→
95	5F	_	C5F	_	127	7F	DEL	C7F	n/a

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Appendix B
ProTerm Extended Character Set
(PT Limited to 32 characters)

Characters beginning with A1 are reverse video

Table 20: Extended Decimal to HEX

Dec	HEX	Cn	Display Character	Dec	HEX	Cn	Display Character
128	80	n/a	n/a	164	A4	CA4	$
129	81	C1	n/a	165	A5	CA5	%
130	82	C2	n/a	166	A6	CA6	&
131	83	C3	n/a	167	A7	CA7	'
132	84	C4	n/a	168	A8	CA8	(
133	85	C5	n/a	169	A9	CA9	)
134	86	C6	n/a	170	AA	CAA	*
135	87	C7	n/a	171	AB	CAB	+
136	88	C8	n/a	172	AC	CAC	'
137	89	C9	n/a	173	AD	CAD	-
138	8A	CA	n/a	174	AE	CAE	.
139	8B	CB	n/a	175	AF	CAF	/
140	8C	CC	n/a	176	B0	CB0	0
141	8D	CD	n/a	177	B1	CB1	1
142	8E	CE	n/a	178	B2	CB2	2
143	8F	CF	n/a	179	B3	CB3	3
144	90	C10	n/a	180	B4	CB4	4
145	91	C11	n/a	181	B5	CB5	5
146	92	C12	n/a	182	B6	CB6	6
147	93	C13	n/a	183	B7	CB7	7
148	94	C14	n/a	184	B8	CB8	8
149	95	C15	n/a	185	B9	CB9	9
150	96	C16	n/a	186	BA	CBA	:
151	97	C17	n/a	187	BB	CBB	;
152	98	C18	n/a	188	BC	CBC	<
153	99	C19	n/a	189	BD	CBD	=
154	9A	C1A	n/a	190	BE	CBE	>
155	9B	C1B	*Cursor*	191	BF	CBF	?
156	9C	C1C	*Characters*	192	C0	CC0	@
157	9D	C1D	*See*	193	C1	CC1	A
158	9E	C1E	*Section*	194	C2	CC2	B
159	9F	C1F	*4*	195	C3	CC3	C
160	A0	C20	*Page 32*	196	C4	CC4	D
161	A1	CA1	!	197	C5	CC5	E
162	A2	CA2	"	198	C6	CC6	F
163	A3	CA3	#	199	C7	CC7	G

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Table 20: Extended Decimal to HEX

Dec	HEX	Cn	Display Character	Dec	HEX	Cn	Display Character
200	C8	CC8	H	236	EC	CEC	l
201	C9	CC9	I	237	ED	CED	m
202	CA	CCA	J	238	EE	CEE	n
203	CB	CCB	K	239	EF	CEF	o
204	CC	CCC	L	240	F0	CF0	p
205	CD	CCD	M	241	F1	CF1	q
206	CE	CCE	N	242	F2	CF2	r
207	CF	CCF	O	243	F3	CF3	s
208	D0	CD0	P	244	F4	CF4	t
209	D1	CD1	Q	245	F5	CF5	u
210	D2	CD2	R	246	F6	CF6	v
211	D3	CD3	S	247	F7	CF7	w
212	D4	CD4	T	248	F8	CF8	x
213	D5	CD5	U	249	F9	CF9	y
214	D6	CD6	V	250	FA	CFA	z
215	D7	CD7	W	251	FB	CFB	{
216	D8	CD8	X	252	FC	CFC	|
217	D9	CD9	Y	253	FD	CFD	}
218	DA	CDA	Z	254	FE	CFE	→
219	DB	CDB	[	255	FF	CFF	←
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				
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				

This example shows a simple graphics down load to the ProMotion using a commercially available Terminal Program
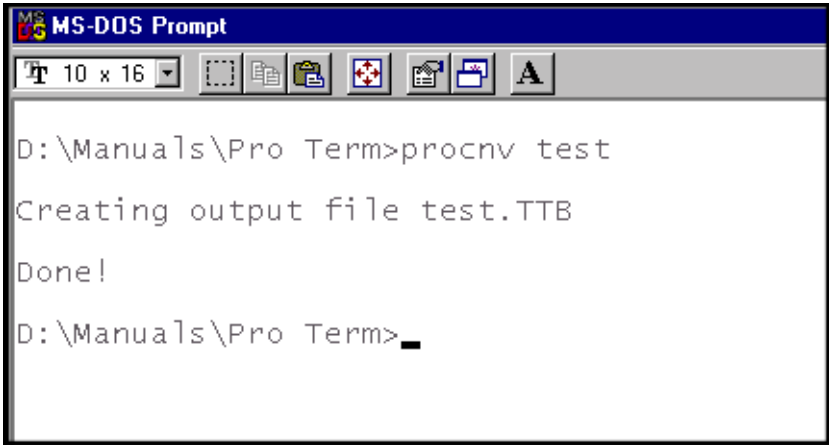

Figure 1: Procnv DOS screen

1. Once a 1 Bit graphics bitmap image has been created, it needs to be converted to a binary file.
The example above illustrates this simple utility.

2. The corresponding ttb file created will be transferred to the ProMotion.

3. On power up, the ProMotion's graphic memory will contain some random information. First clear this memory. This is a good practice but is not absolutely necessary as long as the contents will not be displayed until the valid 'ttb' Graphics file is transferred. The new graphic should over write whatever is in memory.

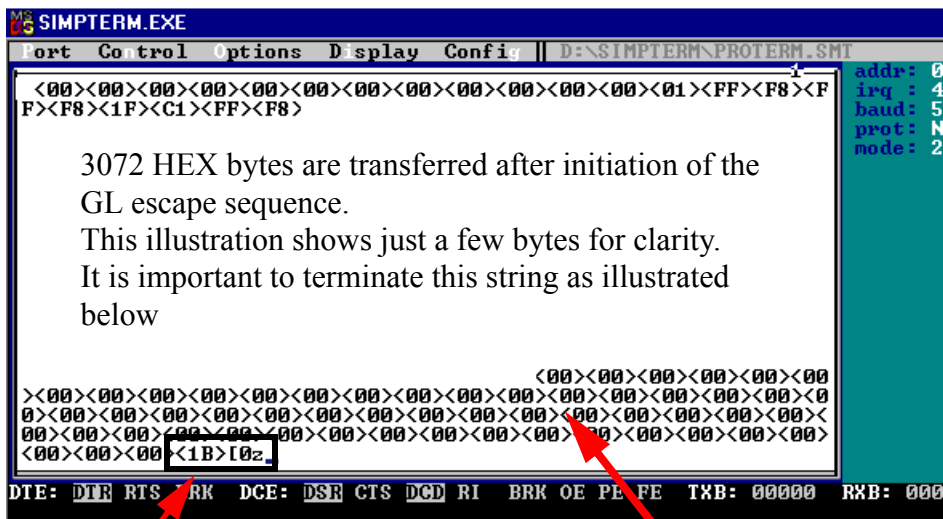*SECTION 7*

Examples of initialization are shown below.

Figure 2: ProMotion Graphics Memory Initialization

Each ASCII sequence for any memory function must be terminated with ESC[0z.
Only when the dump to memory command is issued is it not necessary to enter ESC[0z.

The Illustration below show the result of the memory transfer from the terminal program.

Termination ESC sequence   test.ttb File contents in ASCII

Figure 3: Graphics Dump

The display will show the graphics image as long as the display graphics memory command ESC[5zGD0, has been issued prior to the transfer. The terminal will not respond to any further keystroke commands until the ESC[0z has been issued. The termination command in the above sequence was manually entered from the host after the transfer.

The same process may be repeated for Graphics memory buffer #1 after completion of the operation for Memory Buffer #0

The esc[5zGD0 or GD1 command may be issued at this point to display the graphic.

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AN2   Use of ACM in Robot Environment

Overview

The use of Advance Control Mode requires some attention to safety during operation when using a pendant for setup and operation of an industrial robot.

This Application note will address some of the considerations to be taken into account by the end user as well as features built into the ProMotion

Refer to Section 4 of the ProMotion manual MAN0328.

Setup

Table 21: Summary of ACM Escape Sequences

ESCAPE SEQ.	DESCRIPTION
ESC [1v	Enable ACM Mode
ESC [21v	Disable ACM Mode
SHIFT and CTRL key controls	
ESC [4v	Disable SHIFT, Disable CTRL
ESC [5v	Enable SHIFT, Disable CTRL
ESC [6v	Disable SHIFT, Enable CTRL
ESC [7v	Enable SHIFT, Enable CTRL
Note: SHIFT and CTRL key controls may be used with ACM mode enabled or disabled.	

It is important to note, as mentioned in the ACM section of the manual, that only the HOST may select ACM via the ESC[1v sequence.

Note: The ProMotion is set as follows:

> Mode: ANSI
> Baud Rate: As determined by HOST
> Parity: As determined by HOST
> Data Bits: 8 (for proper detection of key release codes)
> *KNP FUNCTION: ENABLE
> *'KEY REPEAT = DISABLE

All other parameters: default

*KNP and Key Repeat not required for ACM. Used for this example.

Note: When KNP is ENABLED, the key repeat function is automatically DISABLED.

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When any key is pressed on the ProMotion and ACM has not been selected, a NULL (00H) will be transmitted from the ProMotion on Key Release.
When an ENQ (05H) is sent from the HOST and ACM has not been selected an ACK (06H) will be received from the ProMotion.

Once the ACM has been selected by the HOST an ENQ (05H) should be sent and the response from the ProMotion will be a DLE (10H) to verify ACM has been engaged.

The HOST should then periodically check for DLE at a fixed time interval (e.g., 25mS) to verify;

> 1. The ProMotion is attached and,
> 2. The ProMotion is in Advanced Control Mode.

KEY CODES

When not in ACM any key may be redefined.

As soon as ACM is selected ALL key codes will revert to their default settings.
**The Parameter Setup and the Key Output Definition Setup Menus are disabled as well as Contrast Control when in ACM**

ACM Transition

The HOST may send a request for ACM at any time. In some situations the Operator may have one of the keys held down on the ProMotion while the HOST is requesting ACM or, one or more keys may be pressed while the HOST is releasing ACM.

<u>**ALL KEYS MUST BE RELEASED AND THEIR CORRESPONDING KEY RELEASE CODES AND THE PROPER RESPONSE TO ENQ RECEIVED BY THE HOST PRIOR TO ANY MODE CHANGE.**</u>

Scenario #1: "Normal" operation to ACM
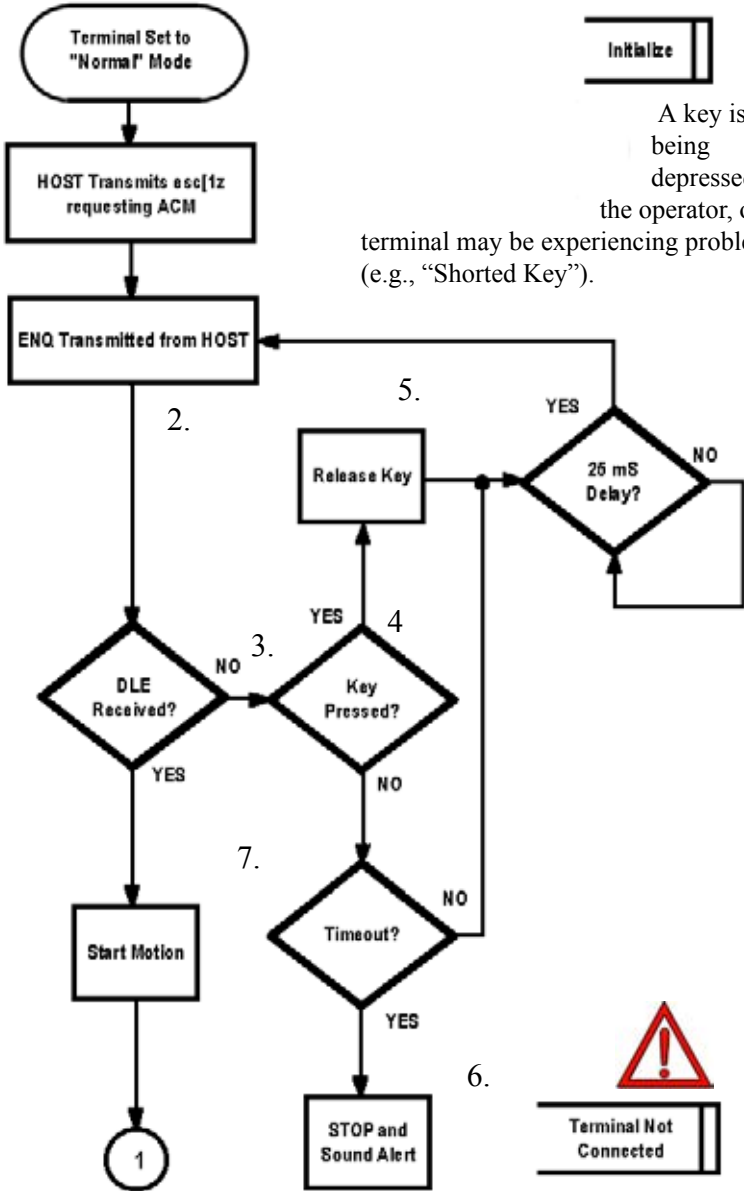
A key is being depressed by the operator, or the terminal may be experiencing problems (e.g., "Shorted Key").

Note: The ProMotion is configured with KNP Enabled to send a key release code of NULL (00H).
See following page for text.

2. The HOST should then Transmit an ENQ (05H) to verify ACM.

3. A response of ACK (06H) is received. The HOST recognizes the fact that the terminal is still responding as in "Normal" mode.

4. When the Terminal is set to KNP, a NULL (00H) will be transmitted to the HOST **UPON KEY RELEASE**.

5. The HOST once again Transmits an ENQ to the terminal. A response of DLE (10H) is received by the HOST verifying ACM and allowing the robot to respond to key strokes transmitted from the terminal.

6. If after repeated ENQ and a defined time limit, there is no DLE received, The HOST may sound an alarm or the system may inform the user of the problem by another method. The user should suspend any operation of the system and attend to the problem.

7. After successful transition to ACM, the HOST should send an ENQ and expect a DLE every 25 mS. See next Flow Diagram.

HELPFUL HINTS:

As a means of alerting the operator that the equipment is/could be in motion, you could do one or both of the following;

- Equip the terminal with optional LEDs and send commands to flash these during motion

- Send commands to the terminal that will activate Audio Tones during equipment motions.
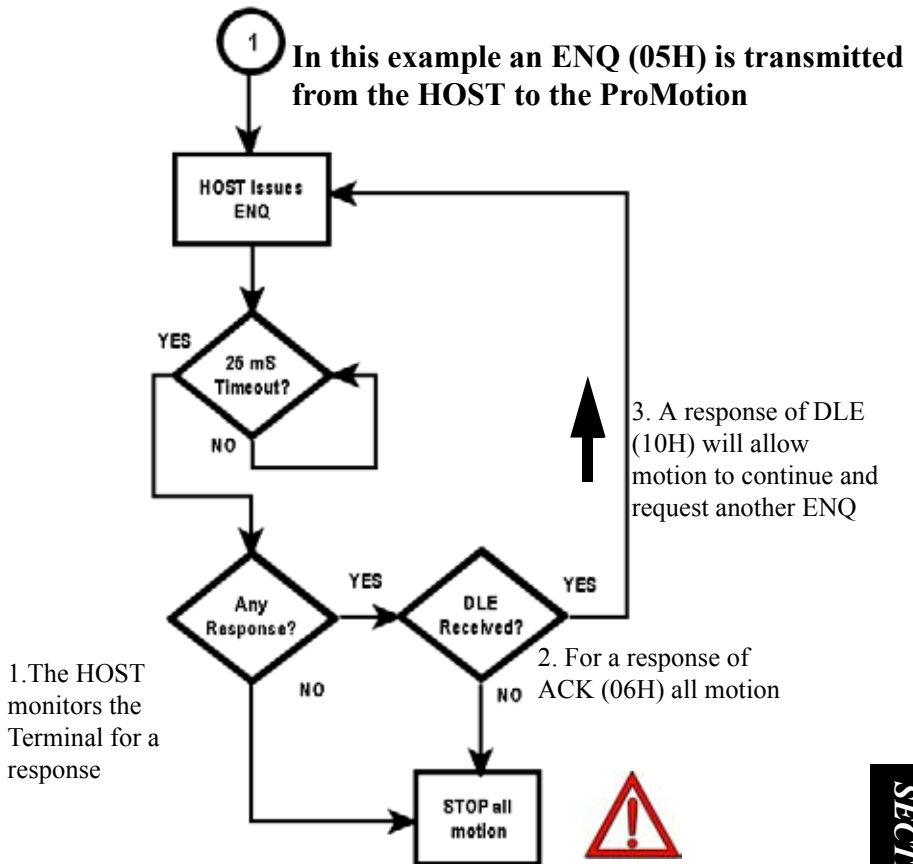
Scenario #2: ACM Operation

In this example an ENQ (05H) is transmitted from the HOST to the ProMotion

1 → HOST Issues ENQ

YES — 25 mS Timeout?
NO

Any Response? — YES — DLE Received? — YES

3. A response of DLE (10H) will allow motion to continue and request another ENQ

1.The HOST monitors the Terminal for a response

NO

NO

2. For a response of ACK (06H) all motion

STOP all motion

Figure 4: ENQ Response

In this example there are two failures which could cause a cessation of machine motion.
1. The ProMotion has reverted back to "Normal" Mode which results in an ACK (06H) being issued in response to an ENQ and;
2. A physical break has resulted in loss of all communication with the HOST.
See Illustrations on page 15.

Scenario #2: ACM operation to "Normal"
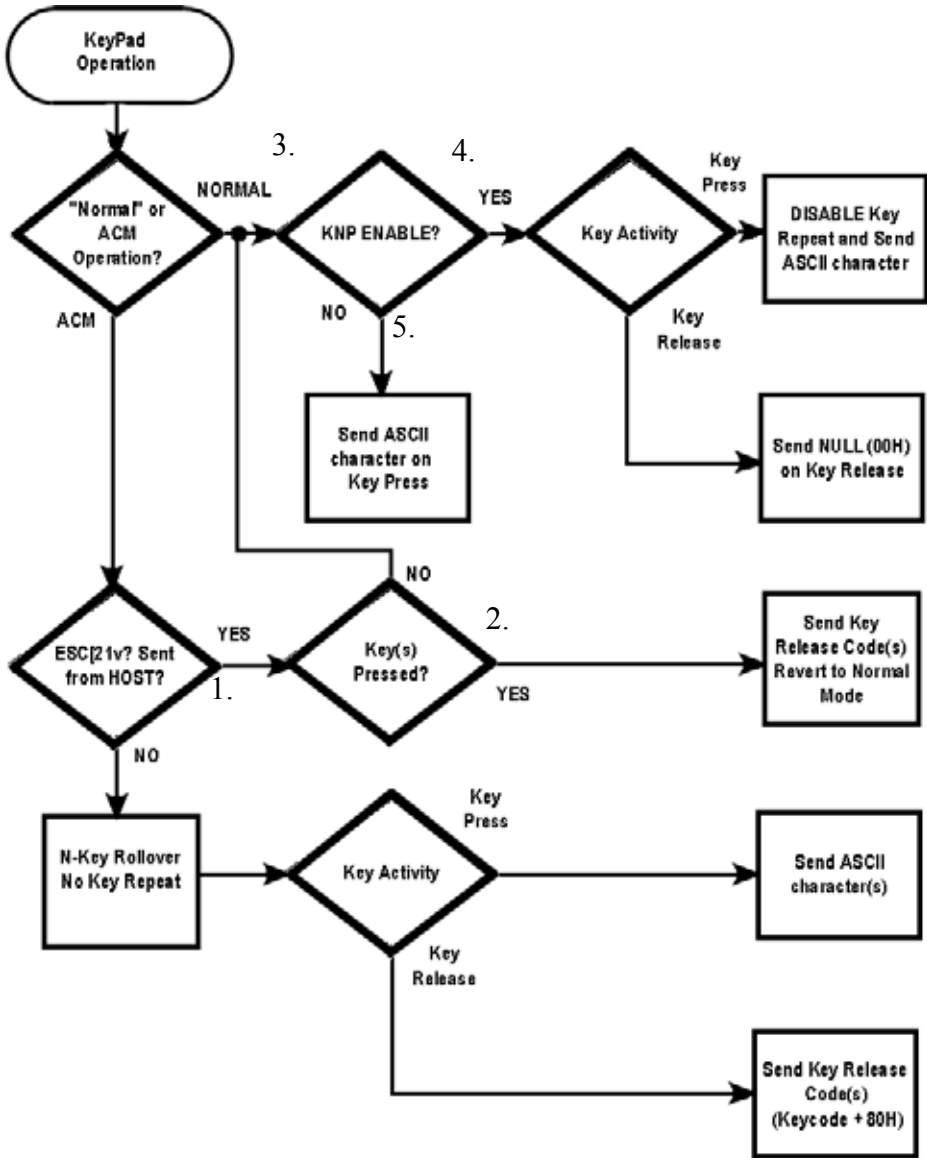See following page for text.

Figure 5: KeyPad Operation

1. The HOST sends the escape sequence of [21v to the Terminal to disable ACM while a key is being held down by the operator.

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2. Immediately the Terminal sends the key release code corresponding of any key(s) being pressed at the time the release ACM was issued.

3. An ENQ is transmitted to the terminal. The HOST receives a ACK (06H) from the terminal. (See Figure 4).
The Terminal operation is suspended until all keys are released.

4. The HOST will then respond to key strokes received from the terminal.

5.Key repeat (if ENABLED) will resume unless KNP is ENABLED. Any programmed keys will now resume normal operation.

DLE for detection of disconnection

The Robot Controller send an ENQ every 25mS
As long as a DLE returns robot motion will be normal

DLE (10H)   ENQ (05H)

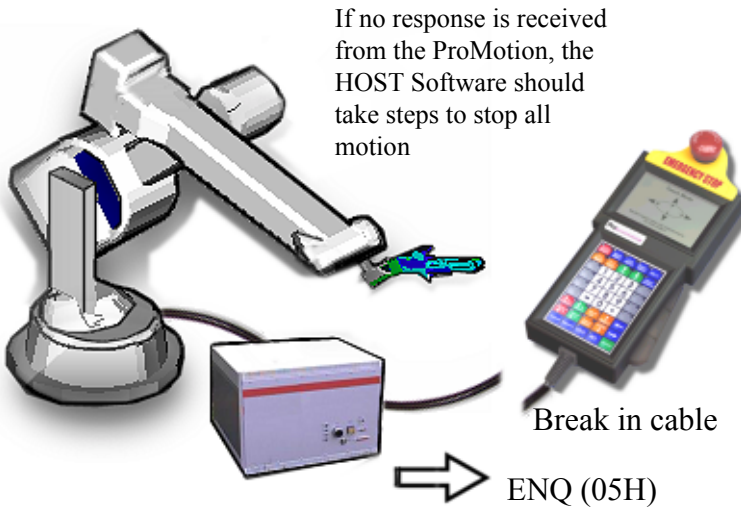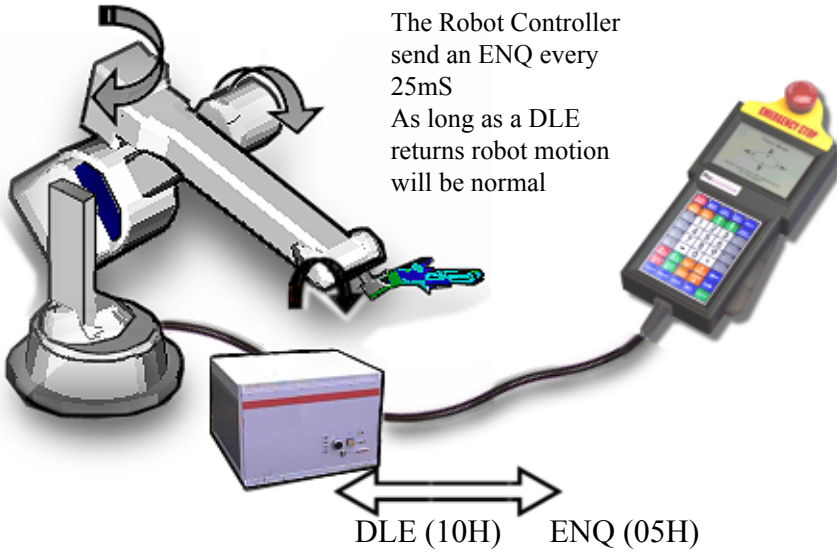If no response is received from the ProMotion, the HOST Software should take steps to stop all motion

Break in cable

ENQ (05H)

Figure 6: Connection of ProMotion to HOST