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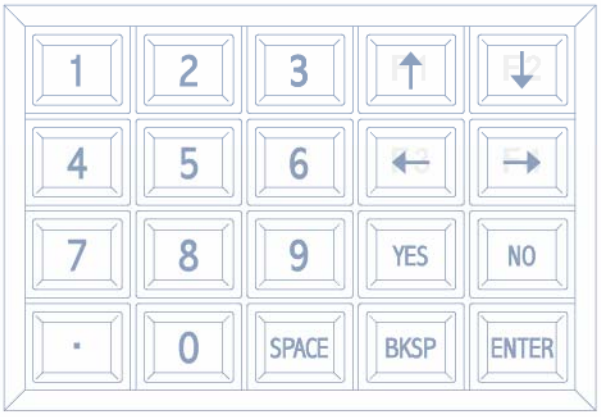
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SMT

Technical Reference Manual





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MAN0019, Rev. G

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SMT Technical Reference Manual

Document Number: MAN0019, Rev. G

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

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

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Regulatory Notices

FCC Compliance

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

Canadian Compliance

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

Le present appareil numerique n.emet pas de bruits radioelectrique depassant les limites applicables aux appareils numeriques de la class A prescrites dans le Reglement sur ie broullage radioelectrique edicte par le ministere des Communications du Canada.

Certifications

CENELEC

CE

EMI Standards

- EN55022: 1998 (CISPR22, Class B) Information Technology

EMC Standards

- EN50082-1: 1997, General Immunity Part 1

Safety Standard

- EN60950: 2000 Safety of Information Technology Equipment

Warnings

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

Electrostatic Discharge (ESD)



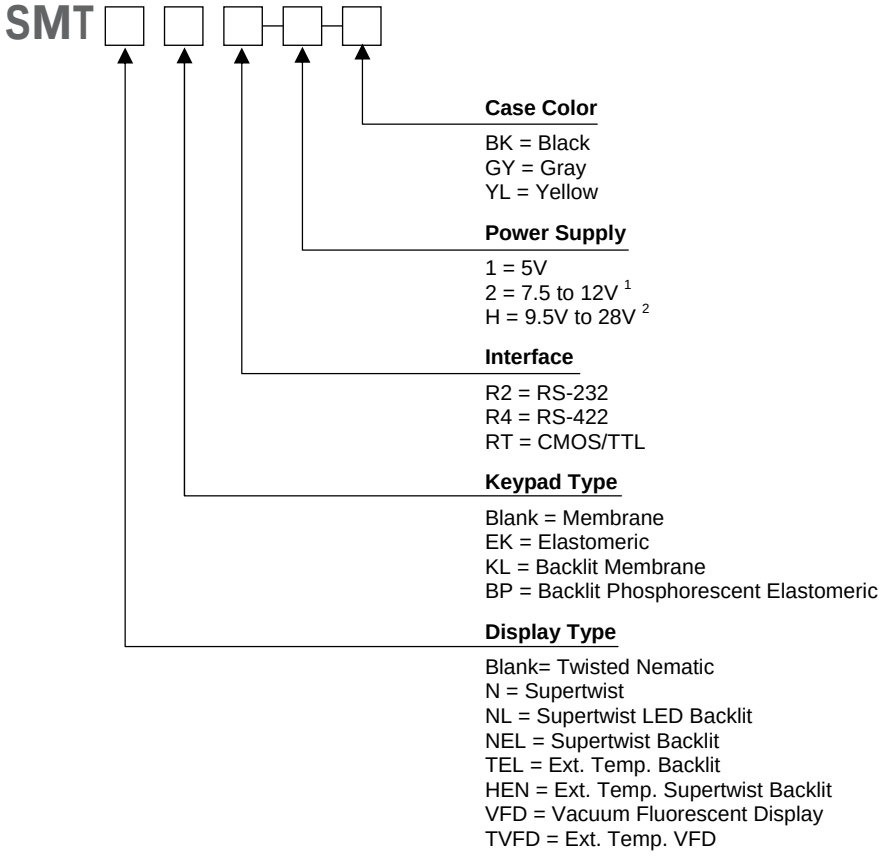
Electrostatic discharge (static electricity) can have unpredictable adverse effects on any electronic device. Although the design of the SMT incorporates extensive ESD-related precautions, ESD can still cause problems. It is good practice to discharge static by touching a grounded metal object before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

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Product Selection Guide

The SMT series is line of ASCII terminals for use with computers, properly equipped instruments and industrial machinery.

Standard configuration includes a membrane keypad, twisted nematic liquid crystal display and modular interface connection, but other configurations are available. A suffix applied to the model number identifies the configuration as shown below:



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

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Power Requirements

Power Supply Options

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

- "**-1**"—requires connection to a 5-volt ± 5% regulated power source.
- "**-2**"—requires connection to a power source between 7.5 and 12 VDC that can source adequate current. However, depending on a unit's total current draw, an input of up to 28 VDC may be applied. See chart on next page.
- "**-H**"—requires connection to a power source between 9.5 and 28 VDC that can source adequate current. However, input voltage is not dependent on a terminal's current draw and may be used with all terminal options. This power supply is strongly recommended for terminals equipped with a Vacuum Fluorescent Display.

Calculating Total Current Draw

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

Current Draw for Basic Configuration		
Configuration	***Description***	***Draw***
SMTR2	Base Unit with RS-232	40 mA
SMTR4	Base Unit with RS-422	20 mA
Current Draw for Options		
NL	Supertwist LED Backlit	Add 185 mA
NEL/HEN	Supertwist Backlit/Extended Temperature Supertwist Backlit	Add 40 mA
VFD/TVFD	Vacuum Fluorescent Display/Extended Temperature VFD	Add 300 mA
KL	Backlit Keypad	Add 80 mA
	External Speaker (when activated)	Add 20 mA
	Handshake Floating (not connected)	Add 1 mA
	Handshake Low Condition	Add 3 mA

To calculate the total current draw for your terminal configuration:

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

Example 1—SMTNELR2:

RS-232 Option	40 mA
Supertwist Backlit Display	40 mA
Calculated Total Current	80 mA

Example 2—SMTVFDR2:

RS-232 Option	40 mA
Supertwist LED Backlit Display	300 mA
Calculated Total Current	340 mA

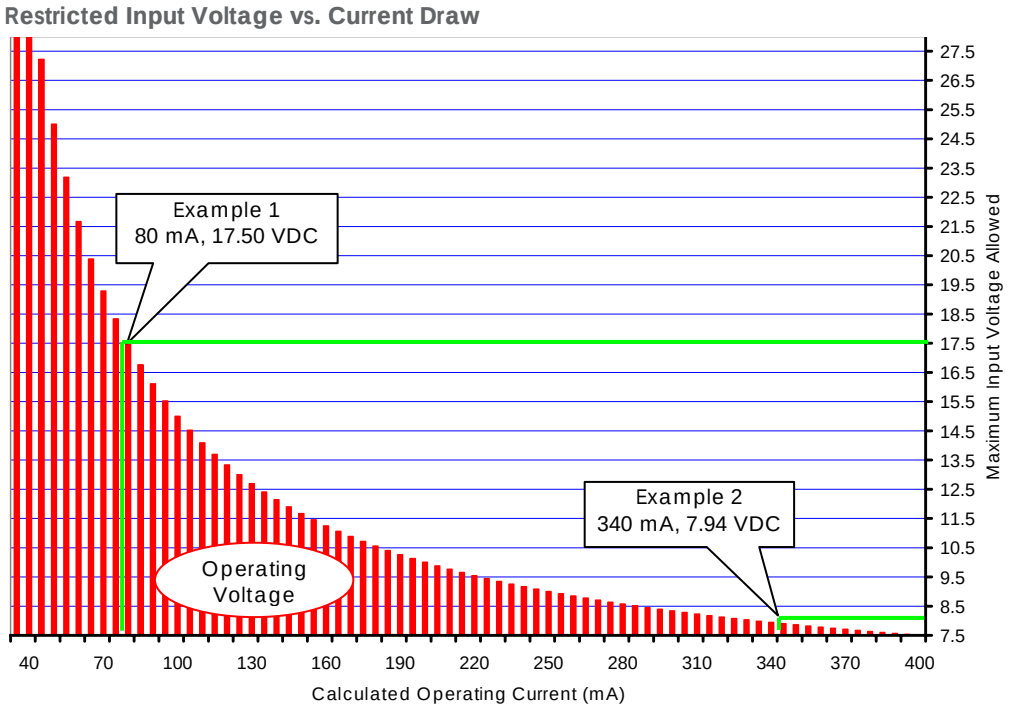
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Determining the Maximum Input Voltage Allowed

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

To determine the maximum input voltage allowed based on current:

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



Using Example 1 and the chart above, the 80 mA drawn by the SMTNELR2 intersects with 17.5 volts. If the maximum supply voltage to the terminal is greater than 17.5 VDC, it requires a -H power supply configuration.

Using Example 2 and the chart above, the 340 mA drawn by the SMTVFDR2 intersects with 7.94 volts. If the maximum supply voltage to the terminal is greater than 7.94 VDC, it requires a -H power supply configuration.

To clarify, if your system is supplying 12.00 VDC, the power is acceptable for the SMTNELR2 (Example 1), but not for the SMTVFDLR2 (Example 2). Applying 12.00 VDC to the SMTVFDLR2 (Example 2) will **damage** it.

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Chapter 1: **Overview**

About this Manual

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

Unless otherwise stated, the operational characteristics described herein correspond to factory default configurations and settings as shipped from Two Technologies.

Because SMT terminals are highly customizable products with several optional configurations and special keypad layouts, this manual only describes standard features and operation. For custom configurations and special options, consult the appropriate supplemental manual or addendum.

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

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

Symbols and Conventions

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

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

Related Manuals

- SMT ANSI Technical Reference Manual

About Two Technologies

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

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About the SMT

Specifically designed for industrial applications, the SMT is a rugged and fully functional ASCII panel mount terminal with selectable operating parameters

The SMT is flexible. Its menu programmable function keys can transmit a user-programmed character, while host equipment has direct control of cursor movement and appearance, clearing all or part of the display. Function key definitions and operating parameters are stored in non-volatile memory.

SMT Features

Two Technologies offers the SMT with the following features. You can find additional information regarding specifications in Appendix A.

Display

SMT terminals come with a standard 80-character monochrome liquid crystal display that features the standard U. S. ASCII character set as dark characters on a light background and a viewing angle of approximately 45 degrees. The operating temperature range for the display is between 0° and 50°C and it can be stores at temperatures between -20° and 70°C.

For applications that require greater viewing angle, a reflective supertwist nematic display is available as an option. This display has a viewing angle of approximately 90 degrees.

For applications without sufficient ambient light, supertwist backlit and LED backlit displays are available as options. The supertwist backlit display is also available with an extended temperature range.

For applications that require easy readability from a distance in either sunlight or low lighting conditions, a Vacuum Fluorescent Display (VFD) is optionally available in both a standard temperature range and an extended temperature version.

Optional character sets, such as Latin 1 or European are also available.

Keypad

Securely framed and clamped into place, the keypad surface provides excellent splash resistance and prevents curling or peeling of the keypad overlay. The 20 (4 rows x 5 columns) standard keypad is available with standard or custom graphics. Keypads can be made from your choice of elastomeric or membrane material.

In addition, you can program up to four function keys with one character each (keypad dependent).

Interface Options

Interface options include RS-232, RS-422 and CMOS/TTL protocols. Communication (up to 9,600 bps standard, higher speeds available on a custom basis) with a host device is through a modular 6-pin connector.

Durability

Like all Two Technologies' products, the SMT terminal is remarkably rugged. The case consists of Valox 420, one of the most durable, chemical-resistant materials available on the market today. Proper mounting with Two Technologies' SMT mounting kit assures NEMA 4/12 compliance.

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Chapter 2: **Operation**

Controls and Indicators

Table 2-1 describes the possible components and indicators found on the front of an SMT terminal as shown in Figure 2-1.

Figure 2-1: SMT Controls and Indicators

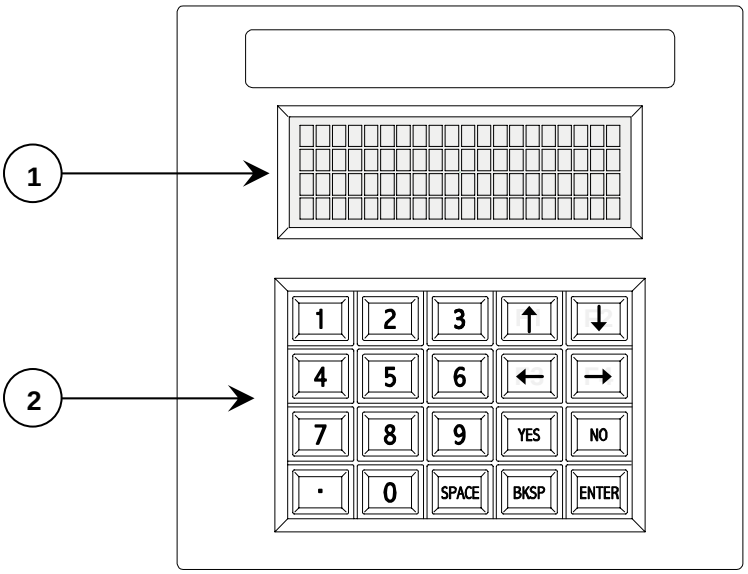


Table 2-1: SMT Controls and Indicators

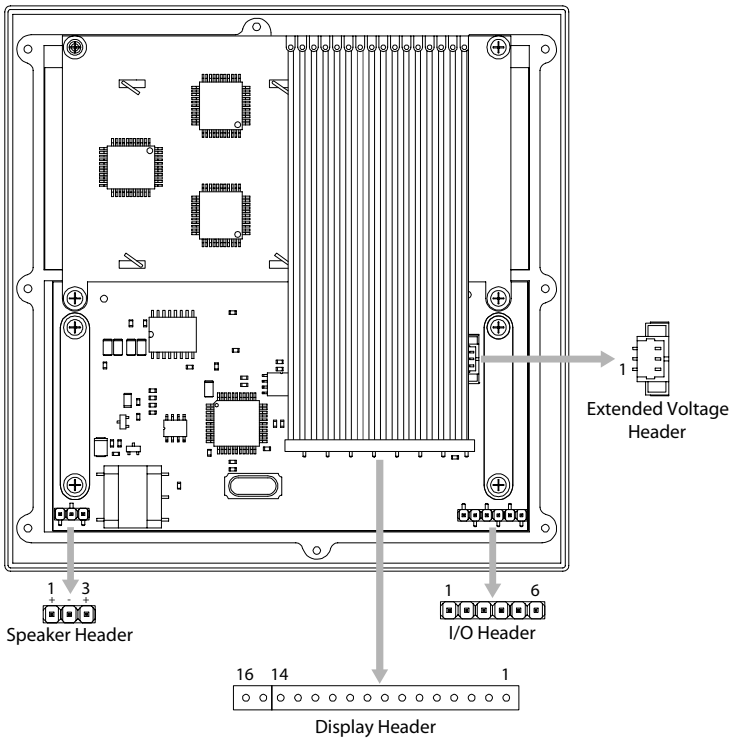
Item	*Control/Feature*	*Description*
1	Display	192 x 128 pixel supertwist nematic LCD (standard)
2	Keypad	20-key keypad (membrane or elastomeric)

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Cable and Power Connections

Internal Connections

Figure 2-2: Header Locations



Speaker Header Connections

You can connect an 8-ohm external speaker to the SMT using the 3-pin header located in the bottom left corner of the main board. Each outside pin is positive, while the center pin is negative.

Display Header Connections

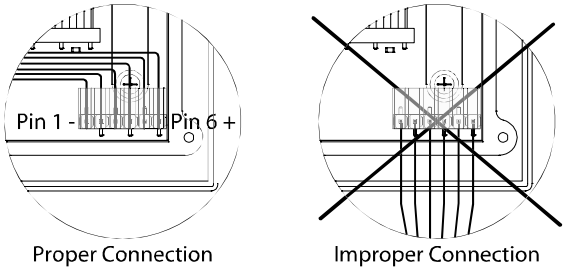
Non-backlight displays connect to the display header using Pins 1 through 14. Backlight displays use all 16 pins.

I/O Header Connections

Exercise caution when removing or reconnecting the I/O cable to the I/O header connections.

Warning! *Reversing the polarity of the input voltage will damage the terminal.*

Figure 2-3: I/O Header Connection



Position wire of cable around display header as shown

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Table 2-2: I/O Header Connections

Pin	RS-232/ TTL	RS-422
1	Common	Common
2	Data In	- Data In
3	Data Out	- Data Out
4	Handshake Out	+ Data
5	Handshake In	+ Data In
6	+ Supply	+ Supply

Extended Voltage Header Connections

The extended voltage header provides connection to an internal DC-to-DC converter, which allows an external source to supply voltages up to 28 volts (i.e., Two Technologies' -H power supply).

***Note**: Only use this connector with a -H power supply from Two Technologies. Any other use of this connection will void the terminal's warranty.*

***Warning!** Reversing polarity of the input voltage will damage the terminal.*

Table 2-3: Extended Voltage Header Connections

Pin	Purpose
1	Output voltage from remote regulator
2	Common (ground)
3	Input voltage from remote regulator

Internal Communication Devices

The following table lists the internal interface devices used in the SMT terminal.

Table 2-4: Interface Devices

Interface	Manufacturer	Device
RS-232	Linear Technology	LT1281
RS-422	Linear Technology	LTC490

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Signal and Pin Assignments

Modular Interface Connector

Figure 2-4 depicts the standard six-pin modular interface connector found on rear of the SMT terminal. Table 2-5 describes its signal and pin assignments.

***Warning**: Use the six-pin modular receptacle for compatible serial devices only. Despite its physical similarity to modular telephone connectors, it is not compatible with telephone lines or signals. Connecting the terminal to a telephone line will damage it and void the warranty.*

Figure 2-4: Modular Interface Connector

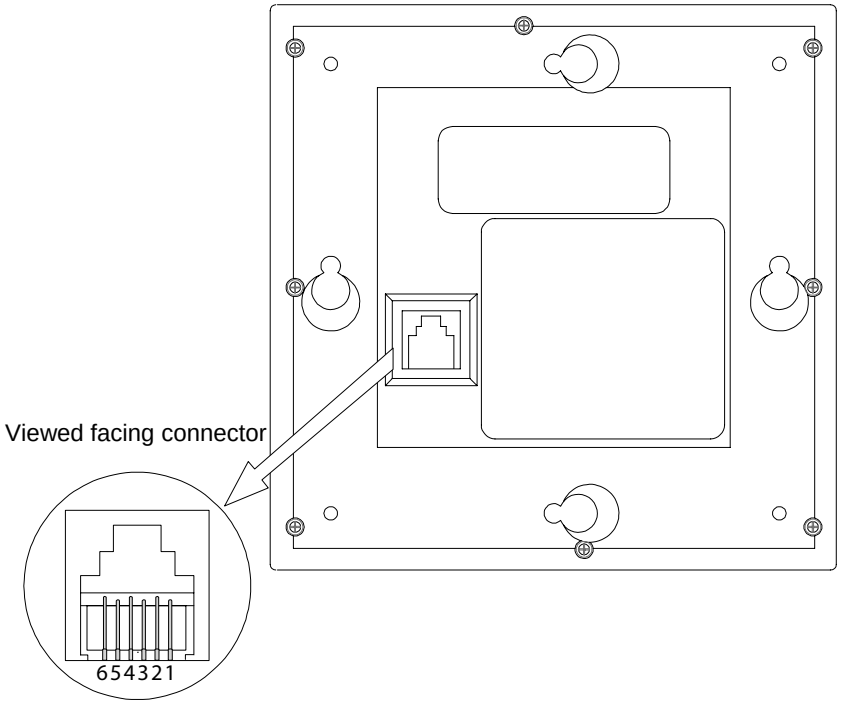


Table 2-5: Modular Interface Connector Signal and Pin Assignments

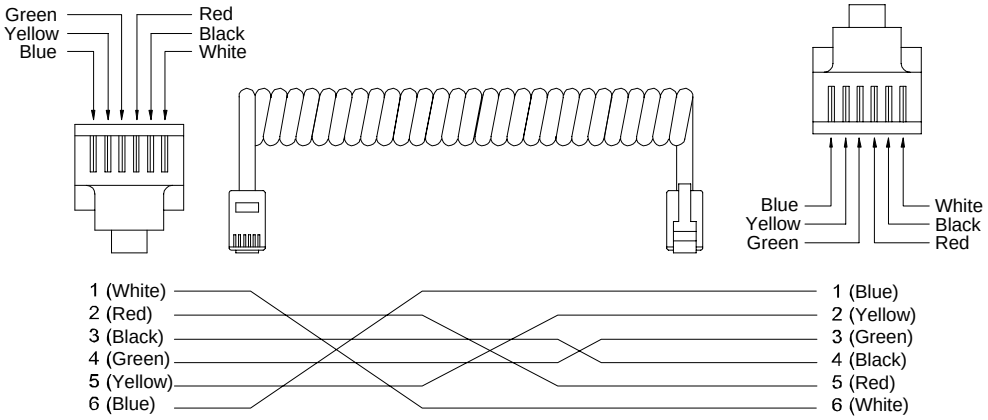
Pin	*RS-232/CMOS/TTL*	*RS-422*
1	+ Supply to terminal	+ Supply to terminal
2	Handshake-In to terminal	+ Data-In to terminal
3	Handshake-Out from terminal	+ Data-Out from terminal
4	Data-In to terminal	- Data-In to terminal
5	Data-Out from terminal	- Data-Out from terminal
6	Common	Common

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Standard Accessory Cables

Standard modular cables (1210-7 and 1210-15) that mate with the terminal's modular interface connector and Two Technologies' PCAT wired adapter are available as optional accessories. These cables will reverse the signal output from the terminal (see illustration below). Non-reversing modular cables (1210-7-NR and 1210-15-NR) are also available.

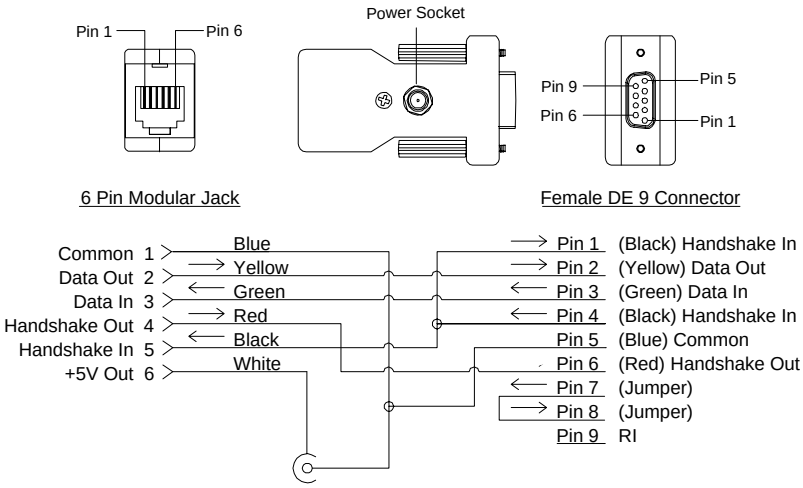
Figure 2-5: 1210 Series Modular Cable



PCAT Wired Adapter

The PCAT modular connector enables connection to a host device as well as supplying a connection for a power supply.

Figure 2-6: PCAT Modular Connector



***Note**: Pin descriptions assume connection through a Two Technologies' 1210 series modular cable to the terminal's modular connector.*

Connecting the Terminal

To connect the terminal to a host device using Two Technologies parts:

1. Plug one end of a 1210 modular cable into the modular connector on the bottom of the terminal. Plug the other end into the PCAT adaptor.
2. Plug the PCAT adapter into the host device.

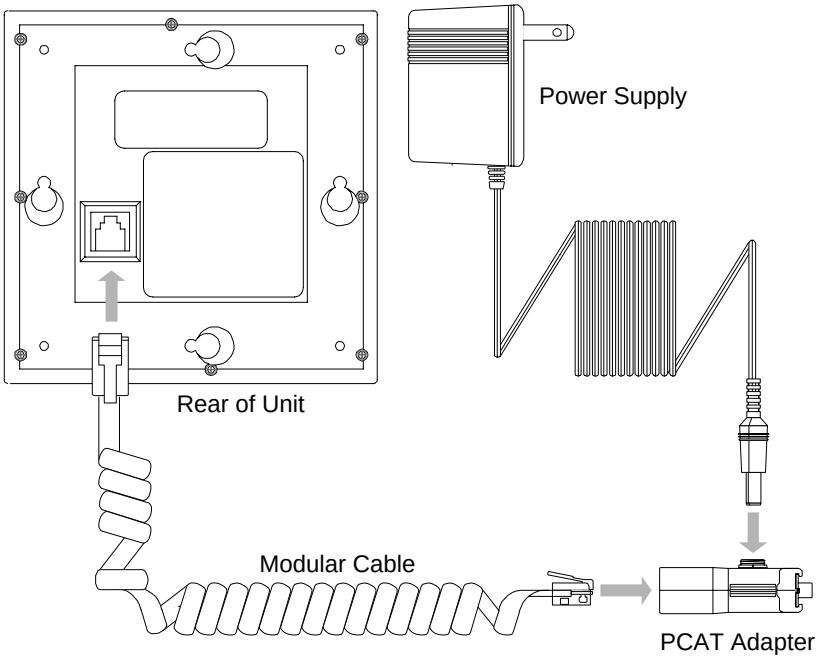
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Power

To supply power to a SMT terminal:

1. Plug one end of a 1210 modular cable into the modular connector on the bottom of the terminal. Plug the other end into the PCAT adaptor.

Figure 2-7: Cable Connections



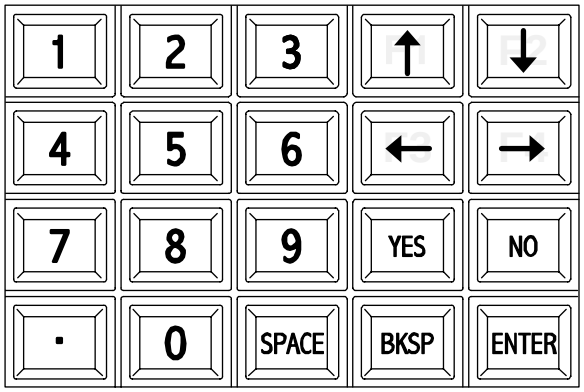
2. Using a Two Technologies' power supply (such as a Two Technologies 1226-1 linear power supply for units with a -2 power supply configuration), plug the power supply connector into the PCAT adapter and then plug the power supply into a 120 VAC 60 Hz power outlet.
3. The terminal should turn on and a blinking cursor should appear on the display. If the terminal does not turn on, refer to the Troubleshooting section of this manual for help.

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Keypad Operation

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

Figure 2-8: Standard 20-Position Keypad



Key Output

The following table lists the Decimal, Hex and ASCII output values transmitted by each key on the SMT.

Table 2-6: Key Output Table

Key	*Dec*	*Hex*	*ASCII*	*KEY*	*Dec*	*Hex*	*ASCII*
0	48	30H	0	**.**	46	2EH	.
1	49	31H	1	**SPACE**	32	20H	SP
2	50	32H	2	**YES**	43	2BH	+
3	51	33H	3	**NO**	45	2DH	–
4	52	34H	4	**BKSP**	08	08H	BS
5	53	35H	5	**ENTER**	13	0DH	CR
6	54	36H	6	**F1**	65	41H	A
7	55	37H	7	**F2**	66	42H	B
8	56	38H	8	**F3**	67	43H	C
9	57	39H	9	**F4**	68	44H	D

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Display Operation

Standard SMT terminals display the U.S. ASCII 96 character set. However, other character sets, such as such as Latin 1 or European, are also available as an option. Characters appear on the display at the current cursor location.

Cursor Position

Typically, the cursor moves from left to right as the terminal displays characters (unless altered by Escape commands). The cursor is selectable as a block (enabled), hidden (disabled), blinking and non-blinking.

Whenever a character appears in the last position of the top three rows, the cursor will move to the leftmost position on the next row. By default, the terminal will hide the character in the last position on the bottom row (Position 80) with the cursor until it displays the next character. In which case, the screen will scroll up one row, the hidden character will appear in Position 80 and the cursor will appear in the rightmost position on a new bottom row. As an option, you can display a character in Position 80 and hide the cursor before the terminal display the next character.

For additional information about cursor and display options, see Chapter 3: Manual Configuration, and Chapter 5: Host Commands.

Operating Modes

SMT terminals have several operating modes. The default mode is Terminal mode. It allows the terminal to display characters, respond to commands sent by a connecting device, and send characters to the connecting device as keys are pressed. Other modes, described later in this manual, enable you to set operating parameters and program function key definitions.

Host Control

The design of SMT terminals allows a connecting device (or "*host*") to control its functions through the transmission of a string of special characters. Referred to as "*Escape commands*" (because each character string begins with the ASCII escape character), these character strings enable the host to move the cursor to any position on the display, clear selected regions of the display, sound a beep, alert or key click, program the function keys and set any of the operating parameters.

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Chapter 3: Terminal Configuration

Introduction

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

This chapter describes each operating parameter in detail, as well as how to set the parameters and load the default values. Chapter 4 covers programmable function keys.

Parameter Menu Settings

The following section describes the parameters that you can program in an SMT terminal. A summary (Table 3-1) appears at the end of the section.

Baud Rate

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

Data Bits

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

Parity

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

Selecting NONE will prevent the sending of the parity bit. In either case, the host will not perform an error check on incoming characters.

Display PE

When using parity checking (EVEN, ODD, MARK or SPACE), you can enable/disable this parameter to display a special character (Figure 3-1) when a parity error occurs. The default value is ENABLED.

Figure 3-1: Parity Error Symbol



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Repeat

This parameter determines the repeat keypad character rate while the key remains pressed. The allowable values are SLOW (10 characters per second), FAST (18 characters per second) and DISABLED. When using REPEAT, there is a short delay between the initial character and the start of the repeat.

Echo

This parameter enables/disables the terminal's ability to display (echo) keypad entries on the screen and for use in half-duplex installations. The default value is DISABLED.

Handshake

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

With handshaking enabled, the terminal will not send characters until the host asserts the Handshake Input line. If the terminal is temporarily unable to process incoming characters, it will turn off the Handshake Output line. As a result, any characters sent in this state will be lost.

When set to DISABLED, the terminal will continuously assert the Handshake Output line and ignore the Handshake Input line.

Self-Test

This setting determines if the terminal will perform a confidence test at boot-up. The test initially displays the U.S. ASCII character set and then performs a number of internal tests. If an error occurs, the terminal will display an error message. The default value is DISABLED

Parameter Menu Summary

The following table lists the allowable settings and default values available through the Parameter menu. Default values appear in bold underlined text.

Table 3-1: Parameter Menu Summary

Parameter	*Options (Default In Bold)*
BAUD	300, 600, 1200, 2400, 4800, **9600**
DATA BITS	7, **8**
PARITY	EVEN, ODD, MARK, SPACE, **NONE**
DISPLAY PE	**ENABLED**, DISABLED
REPEAT	SLOW, **FAST**, DISABLED
ECHO	ENABLED, **DISABLED**
HANDSHAKE	**ENABLED**, DISABLED
SELF TEST	ENABLED, **DISABLED**

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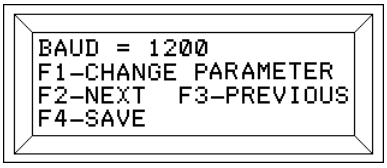
Changing Parameter Settings

You can access the Parameter menu when either terminal power is on or during the startup process.

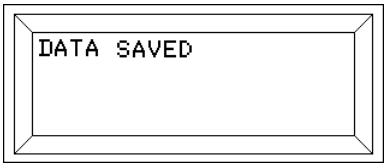
1. To enter the Parameters menu and change settings with the **power on**, simultaneously hold **PERIOD** (**.**) and **ZERO** (**0**), and then press **F1** (↑).

   To enter the Parameters menu and change settings **during the startup process**, with the power **off**, simultaneously hold **PERIOD** (**.**), **ZERO** (**0**) and **F3** (←), and then reapply power.

   In either case, the Parameter menu appears with the first parameter on the top line.

2. To change the value of the current parameter, press **F1**.
3. To view the next parameter, press **F2**.
4. To view the previous parameter, press **F3**.
5. To save any changes and exit the menu, press **F4**. With the Self-Test parameter disabled (the default setting), the terminal will display the following message:

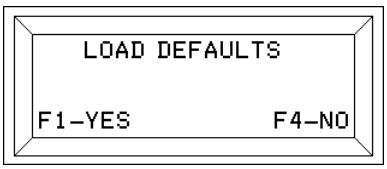
   

   With the Self-Test parameter enabled, the terminal will perform the self-test.

Loading Factory Default Settings

To load the factory default settings and reset all programmable keys to their default values:

1. With the power **off**, simultaneously hold **PERIOD** (**.**), **ZERO** (**0**) and **F1** (↑), and then reapply power. the terminal will display:

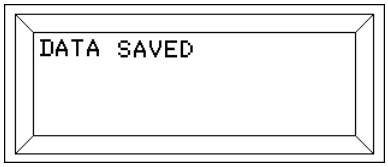
2. Either press **F1** to reload the default values and reset all programmable keys to their default values, or press **F4** to leave all parameters and programmable keys unchanged.

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Restricting Access

If needed, you can prevent access to the Parameter menu by performing the following step:

1. With the power **off**, simultaneously hold **PERIOD** (**.**), **ZERO** (**0**) and **F4** (→), and then reapply power. The terminal will display the following message:



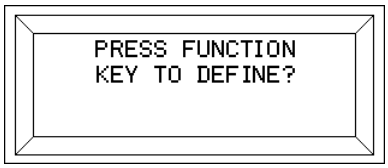
To re-enable access to the Parameter menu, repeat the above procedure.

Key Programming

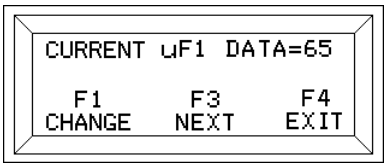
The SMT has four function keys (F1-F4) that you can program with any single character, including non-printing characters. All programmable function key settings are stored in nonvolatile memory.

To program a function key:

1. Simultaneously hold **PERIOD** (**.**) and **ZERO** (**0**), and then press **F2** (↓). The terminal will display:

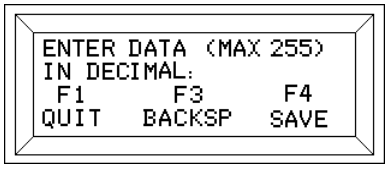


2. Select a key to program, by pressing that key. The terminal will display the current decimal value for that function key in the upper left corner.



3. To change the current value, press **F1**. To select another function key to program, press **F3**. To exit function key programming, press **F4**.

4. When you select a function key to program, the terminal will display:



5. In the example above, the F1 key has a decimal value of 65, which is equivalent to the ASCII value "A."

   To change the value, enter the new decimal value and then press **F4** to save and exit. For example, entering a decimal value of 6 is equivalent to programming the ASCII value for "ACK." For a complete listing of decimal values and their ASCII equivalents, see Appendix A.

   If needed, press **F3** to backspace and correct mistyped entries.

   To quit without saving, press **F1**.

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Chapter 4: **Host Commands**

Introduction

As discussed previously, the SMT terminal's design allows a host to control its functions by sending commands that begin with the Escape character. For example, sending a Hex 1B 48 (Esc H) will move the cursor to the home position (upper right corner). A command summary appears at the end of this section.

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

Escape Commands

Cursor Up

Syntax Esc A

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

Cursor Down

Syntax Esc B

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

Cursor Right

Syntax Esc C

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

Cursor Left

Syntax Esc D

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

Cursor Home & Clear Display

Syntax Esc E

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Enable Underscore Cursor

Syntax Esc F

Notes This command is not available on terminals with VFD displays.

Disable Underscore Cursor

Syntax Esc G

Notes This command is not available on terminals with VFD displays.

Cursor Home

Syntax Esc H

Clear Display

Syntax Esc I

Erase Cursor to End of Display

Syntax Esc J

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

Erase Cursor to End of Line

Syntax Esc K

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

Sound Long Bell

Syntax Esc L

Notes This command requires use of an 8-ohm external speaker connected to the terminal.

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

Erase Line Containing Cursor

Syntax Esc M

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

Sound Click

Syntax Esc P

Notes This command requires use of an 8-ohm external speaker connected to the terminal.

Sound Alert

Syntax Esc Q

Notes This command requires use of an 8-ohm external speaker connected to the terminal.

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

Enable Blinking Cursor

Syntax Esc R

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Disable Blinking Cursor

Syntax Esc S

Sound Short Bell

Syntax Esc T

Notes This command requires use of an 8-ohm external speaker connected to the terminal.

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

Enable Key Click

Syntax Esc U

Notes This command requires use of an 8-ohm external speaker connected to the terminal.

Disable Key Click

Syntax Esc V

Notes This command requires use of an 8-ohm external speaker connected to the terminal

Cursor Position

Syntax Esc Y *Pr Pc*

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

Row (Pr)	*ASCII*
1	SP
2	!
3	"
4	#

Column (Pc)	*ASCII*	*Column (Pc)*	*ASCII*
1	SP	11	*
2	!	12	+
3	"	13	,
4	#	14	-
5	$	15	.
6	%	16	/
7	&	17	0
8	'	18	1
9	(	19	2
10	)	20	3

Examples Esc Y !) will send the cursor to Row 2, Column 10

Esc Y #0 will send the cursor to Row 4, Column 17

Esc Y !+ will send the cursor to Row 2, Column 12

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Send Terminal ID

Syntax Esc Z

Notes This command sends a four-byte hexadecimal checksum of the terminal's program memory, preceded by "SMT."

When using this command to identify the terminal type, do not include the checksum as it may change.

Enable Backlight

Syntax Esc f

Notes This command is only available for use on terminals with a backlit display.

Disable Backlight

Syntax Esc n

Notes This command is only available for use on terminals with a backlit display.

Host Command Summary

The following table summarizes the available host commands for the SMT:

Table 4-1: Host Command Summary

Command	*Syntax*	*Command*	*Syntax*
Cursor Up	Esc A	Erase Line Containing Cursor	Esc M
Cursor Down	Esc B	Sound Key Click[2]	Esc P
Cursor Right	Esc C	Sound Alert[2]	Esc Q
Cursor Left	Esc D	Enable Blinking Cursor	Esc R
Cursor Home & Clear Display	Esc E	Disable Blinking Cursor	Esc S
Enable Underscore Cursor[1]	Esc F	Sound Short Bell[2]	Esc T
Disable Underscore Cursor[1]	Esc G	Enable Key Click[2]	Esc U
Cursor Home	Esc H	Disable Key Click[2]	Esc V
Clear Display	Esc I	Cursor Position	Esc Y Pr Pc
Erase Cursor to End of Display	Esc J	Return Terminal Identifier String	Esc Z
Erase Cursor to End of Line	Esc K	Enable Backlight[3]	Esc f
Sound Long Bell[2]	Esc L	Disable Backlight[3]	Esc n

Notes:

1. Not available on terminals with VFD displays
2. Available for use on terminals with external speakers
3. Available for use on terminals with backlit displays

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Control Codes

In addition to ANSI and Private mode commands, the terminal will also respond to the following control codes:

Table 4-2: Control Codes

Code	Hex	Dec.	ASCII	Function
Ctrl E[1]	05	5	ENQ	Enquire
Ctrl G[2]	07	7	BEL	Sounds Bell
Ctrl H	08	8	BKSP	Back Space Cursor
Ctrl J	0A	10	LF	Line Feed
Ctrl K	0B	11	VT	Cursor Down
Ctrl M	0D	13	CR	Cursor Left to Column 1
DEL	7F	127	DEL	Delete Character at Cursor

Notes:

1. When the host transits a Ctrl E, the terminal will respond with an ACK and ignore all other control commands.
2. Only if the terminal has an external speaker.

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Chapter 5: Mounting the SMT

Introduction

You can mount the SMT permanently or as a detachable unit.

Mounting Configurations

Permanent Mounting

- **Closed Back Flush**—this method enables you to mount the face of the SMT in the front of a panel with the rear cover attached behind the panel. For panel thicknesses between 0.062 and 0.125 inches. For thicker panel walls, contact Two Technologies.
- **Permanent Open Back Flush**—this method enables you to mount the face of the SMT in the front of a panel with out the rear cover attached behind the panel. For panel thicknesses up to 0.062 inches only. For thicker panel walls, contact Two Technologies. Requires Two Technologies #12285 mounting clamps (provided with unit).

Detachable Mounting

- **Detachable**—this method enables you to attach the unit horizontally or vertically to a panel with the ability to lift up or slide out the unit from the panel to use as a hand-held terminal.

Permanent Mounting

Mounting Kit

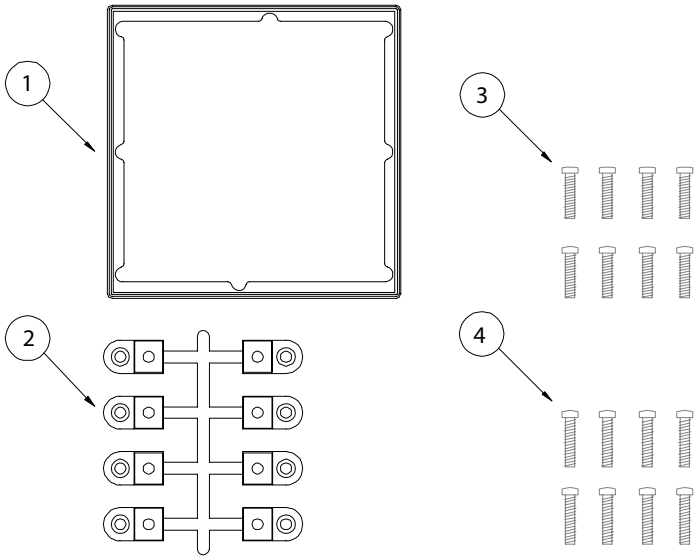
Each SMT shipped from Two Technologies includes a mounting kit (Figure 5-1). This mounting kit includes the following hardware:

Table 5-1: Mounting Kit

Item #	*Part Number*	*Description*	*Quantity*
1	12288	Gasket	1
2	12285	Mounting Clamps (Plastic)	8
3	12311	Screws, Plastite - #1-32 X 1/2" Long (Gold)	8
4	12269	Screws, Plastite - #1-32 X 3/8" Long (Silver)	8

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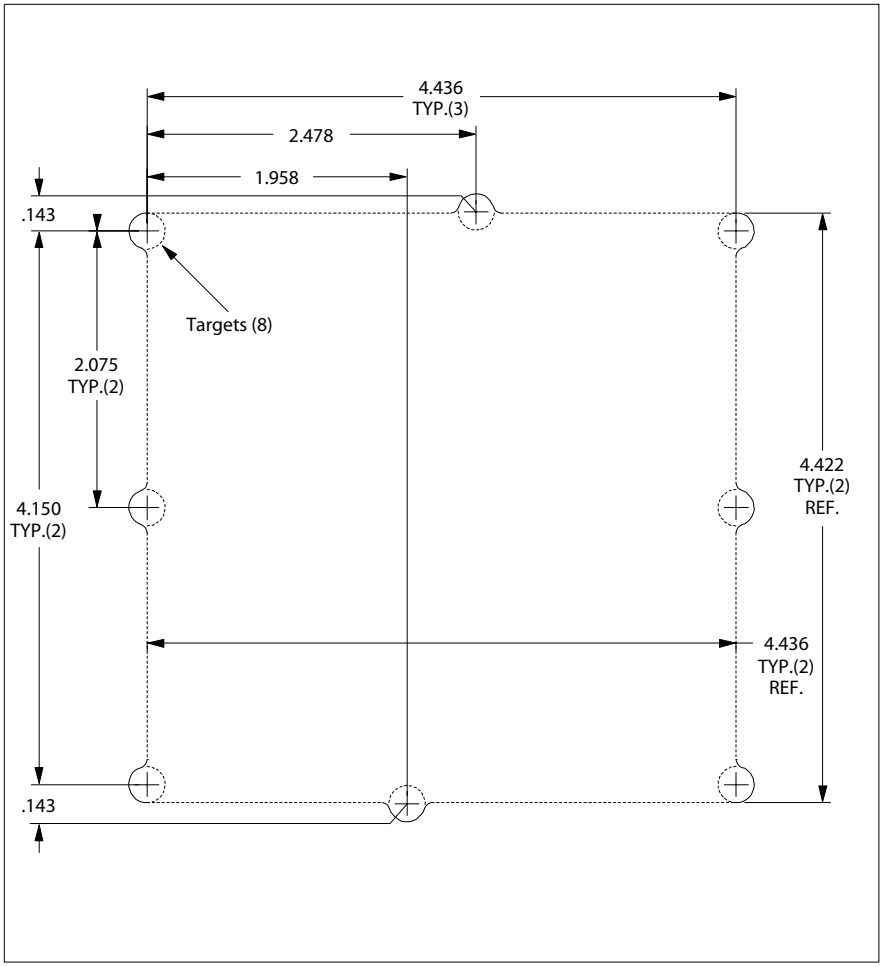
Figure 5-1: SMT Mounting Kit



Mounting Template

Each SMT shipped from Two Technologies also includes a mounting template (Part Number 12555) as shown below:

Figure 5-2: SMT ANSI Series Terminal Permanent Mount Template



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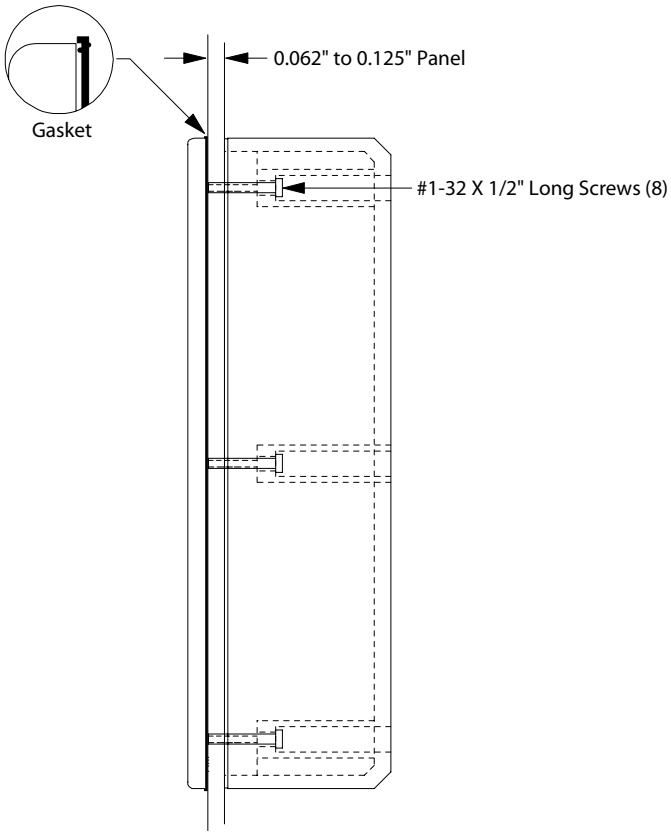
Permanent Closed Back Flush Mounting

Only use this method and the parts listed below for panel thicknesses between 0.062 and 0.125 inches only. For thicker panel walls, contact Two Technologies.

To mount the face of the SMT in the front of a panel with the rear cover attached behind the panel.

1. Remove the template from its cardboard holder (Figure 5-2) and affix it to the front of the panel.
2. Using a center punch, punch out the targets, and then using a letter I drill bit (0.272-inch diameter), drill out the targets.
3. Cut the panel out along the dotted lines of the template.
4. File all corners to 1/16 inch radius.
5. Remove the eight screws from the back of the unit and slowly remove the back case.
6. Disconnect the serial interface connector cable from the main board. Do not remove any components from the front cover assembly.
7. Place the gasket onto the front cover. See Figure 5-3.
8. Insert the front cover assembly into the panel cutout and carefully reconnect the serial interface connector cable to the main board as shown in Figure 2-3.
9. .Secure the front assembly and then attach the rear cover using the eight #1-32 X 1/2 inch screws (gold) included in the SMT Mounting kit.

Figure 5-3: Flush Mount, Closed Back Mounting



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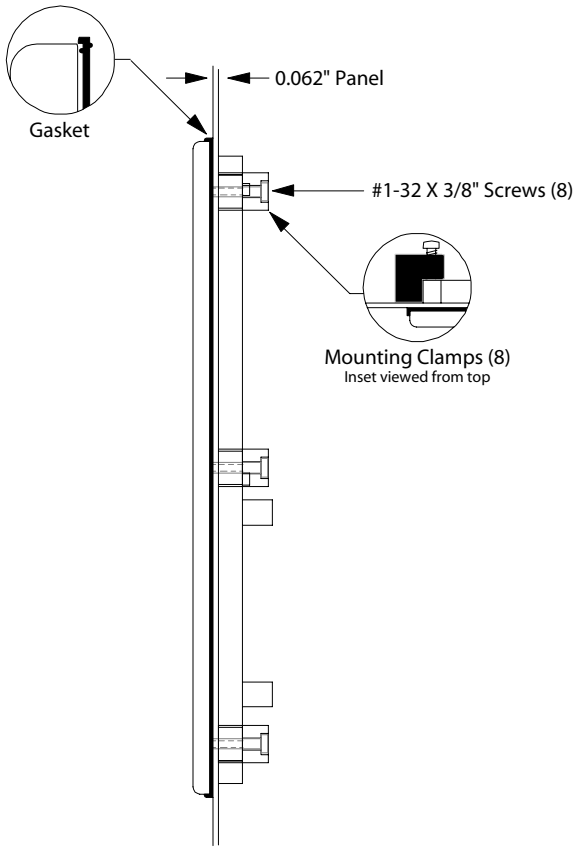
Permanent Open Back Flush Mounting

Only use this method and the parts listed below for panel thicknesses up to 0.062 inches only. For thicker panel walls, contact Two Technologies.

To mount the face of the SMT in the front of a panel with out the rear cover attached behind the panel.

1. Remove the template from its cardboard holder (Figure 5-2) and affix it to the front of the panel.
2. Using a center punch, punch out the targets, and then using a letter I drill bit (0.272-inch diameter), drill out the targets.
3. Cut the panel out along the dotted lines of the template.
4. File all corners to 1/16 inch radius.
5. Remove the eight screws from the back of the unit and slowly remove the back case.
6. Disconnect the serial interface connector cable from the main board. Do not remove any components from the front cover assembly.
7. Place the gasket onto the front cover and insert the front cover assembly into the panel cutout. See Figure 5-4.
8. Insert the #1-32 X 3/8″ silver screws into the mounting clamps (both are included in the SMT Mounting kit) and attach to back of the front cover panel as shown below.
9. Carefully connect your serial interface cable to the main board as shown in Figure 2-3.

Figure 5-4: Flush Mount, Closed Back Mounting



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Detachable Mounting

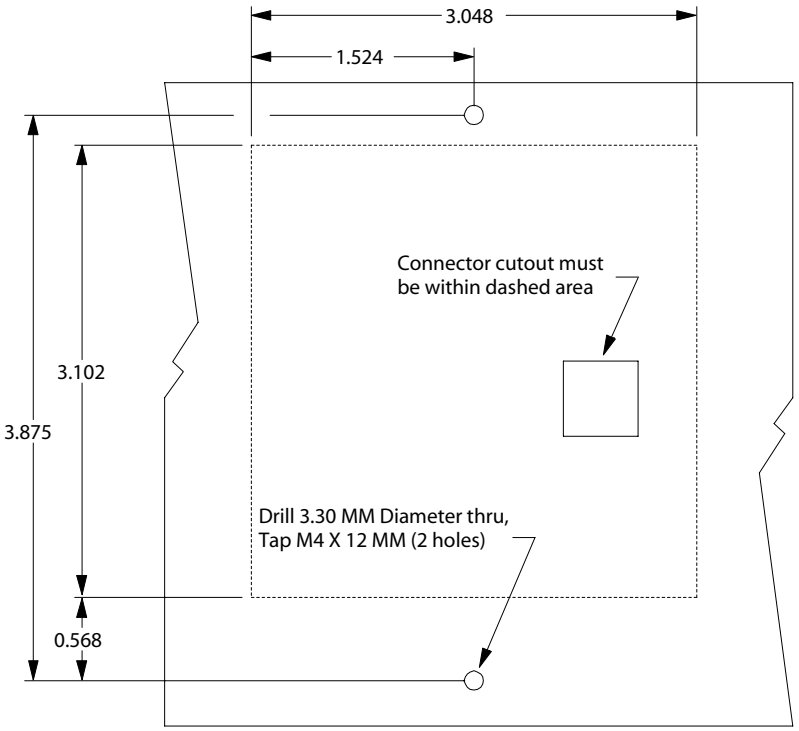
This method enables you to attach the unit horizontally or vertically to a panel with the ability to lift up or slide out the unit from the panel to use as a hand-held terminal. Detachable mounting requires additional hardware not included with the unit.

Horizontal Mounting

To attach the SMT to a panel so that it also slides out to the right and detaches:

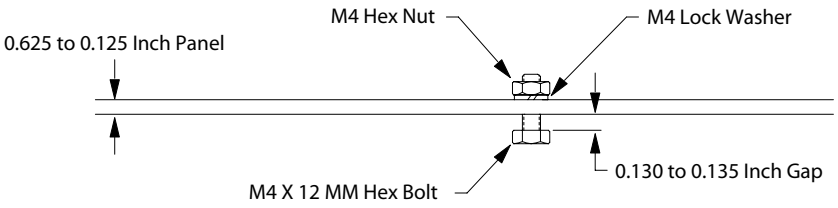
1. Drill and tap two threaded holes as shown in Figure 5-5.
2. Cut out panel for serial interface connector as indicated.

Figure 5-5: Horizontal Detachable Mounting Template



3. Facing the front of the panel, screw two M4 x 12MM hex bolts (Two Technologies Part Number 12341, McMaster Carr Part Number 91280A134) into the M4 threaded holes. See Figure 5-6. There should be a 0.125 inch gap between the bolt head and the panel
4. Place a M4 lock washer (Two Technologies Part Number 12342, McMaster Carr Part Number 91169A160) on each bolt and secure with M4 hex nut (Two Technologies Part Number 12343, McMaster Carr Part Number 90591A141).

Figure 5-6: Horizontal Detachable Mount, Top View

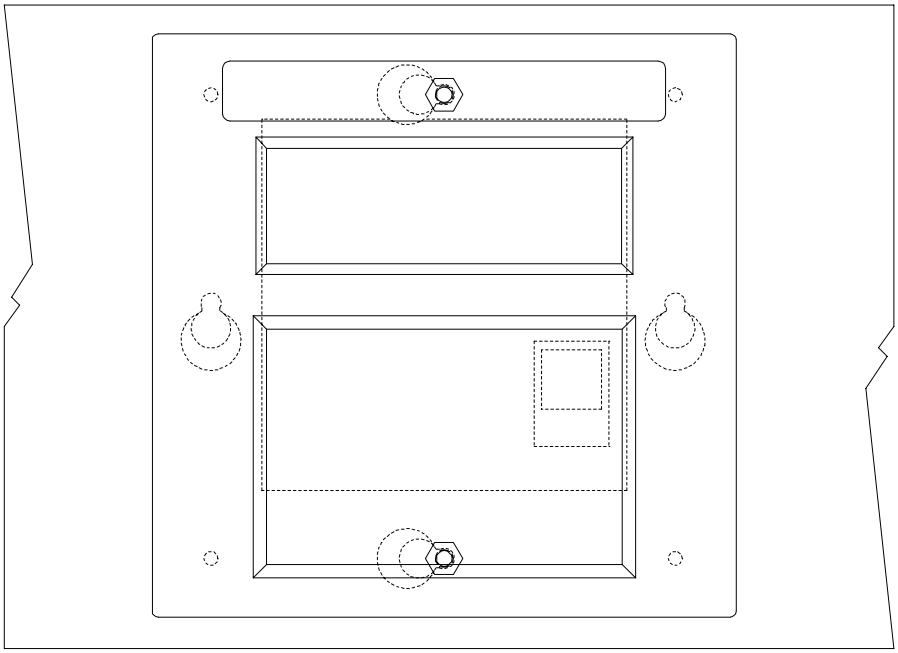


5. Connect the interface cable to the serial interface connector.

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6. Place the unit onto the mounting bolts and then slide the unit left to secure. See Figure 5-7.

Figure 5-7: Horizontal Detachable Mount, Front View

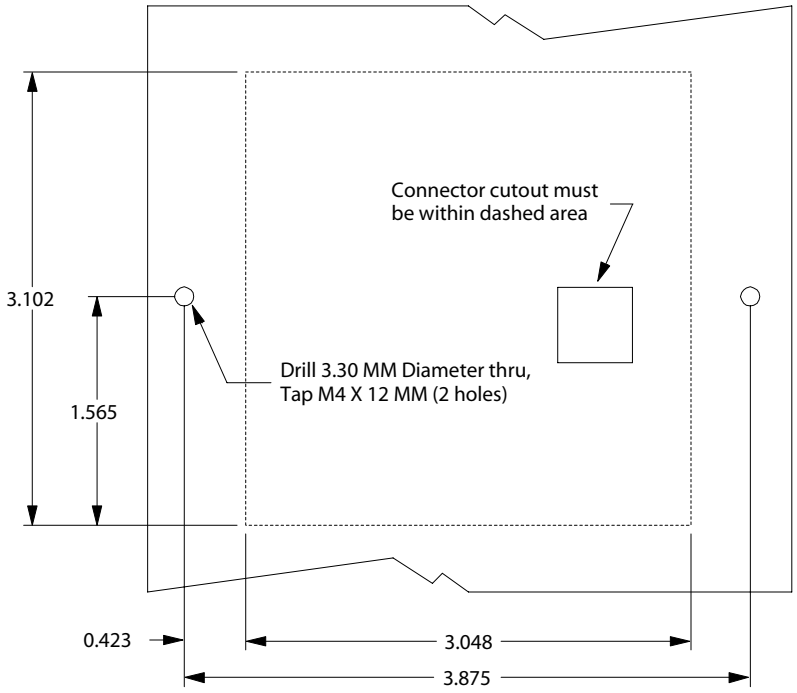


Vertical Mounting

To attach the SMT to a panel so that it also lifts up and detaches:

1. Drill and tap two threaded holes as shown in Figure 5-8.
2. Cut out panel for serial interface connector as indicated.

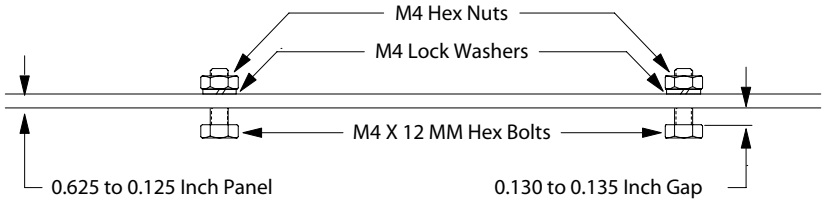
Figure 5-8: Vertical Detachable Mounting Template



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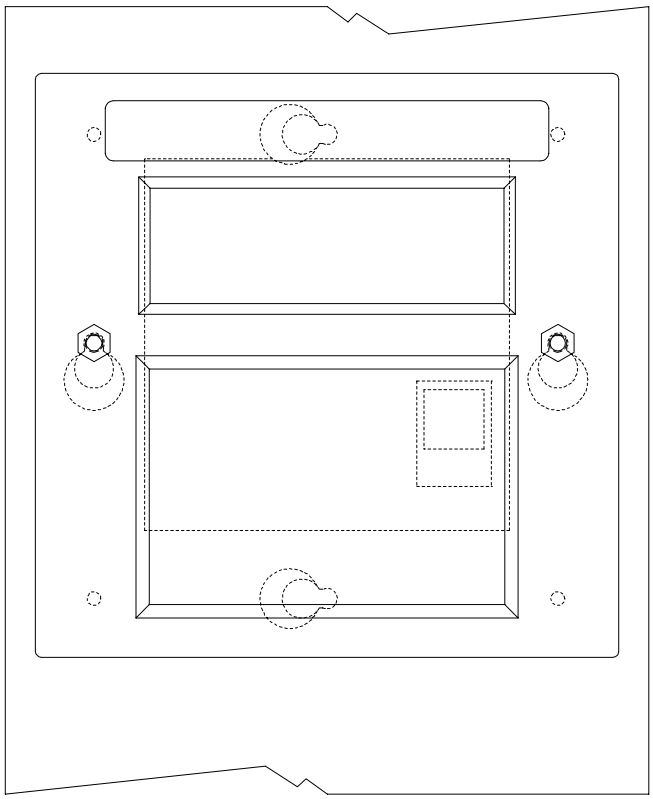
3. Facing the front of the panel, screw two M4 x 12MM hex bolts (Two Technologies Part Number 12341, McMaster Carr Part Number 91280A134) into the M4 threaded holes. See Figure 5-9. There should be a 0.125-inch gap between the bolt head and the panel.
4. Place a M4 lock washer (Two Technologies Part Number 12342, McMaster Carr Part Number 91169A160) on each bolt and secure with M4 hex nut (Two Technologies Part Number 12343, McMaster Carr Part Number 90591A141).

Figure 5-9: Vertical Detachable Mount, Top View



5. Connect the interface cable to the serial interface connector.
6. Place the unit onto the mounting bolts and then slide the unit down to secure. See Figure 5-10.

Figure 5-10: Vertical Detachable Mount, Front View



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Chapter 6: Troubleshooting

Cursor does not appear on display

Possible Cause: No power to terminal (host supplied)
Solution: Verify proper voltage to terminal

Possible Cause: No power to terminal (adapter supplied)
Solution: Verify wall plug is functional and wiring of adapter (if wired as kit)

Possible Cause: Reversed polarity, improper wiring or wrong cable type
Solution: Check cable and connector wiring

Possible Cause: Cursor not enabled
Solution: Re-enable the cursor by sending an Esc R

Terminal resets or locks-up

Possible Cause: Low voltage output
Solution: Verify proper voltage to terminal

Possible Cause: Cable resistance too high or wire gauge too small
Solution: Cable should be 26 AWG or larger

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

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

Possible Cause: Internal IO connection improperly connected
Solution: Reconnect properly (see Figure 2-3)

Terminal displays double characters

Possible Cause: Echo turned on
Solution: Disable ECHO parameter

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Terminal does not perform self-test

Possible Cause: Self-test parameter disabled

Solution: Change SELF TEST parameter to ENABLE

Terminal not receiving or displaying correct characters

Possible Cause: Parity settings incorrect

Solution: Change PARITY parameter to correct setting

Possible Cause: Data bits incorrect

Solution: Change DATA BITS parameter to correct setting

Possible Cause: Incorrect BAUD rate

Solution: Change BAUD parameter to correct setting

Possible Cause: Handshaking between host and terminal

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

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

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

Solution: Check cable and connector wiring

Terminal displays PE character

Possible Cause: Incorrect parity setting

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

Possible Cause: Handshaking between host and terminal

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

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

Terminal generates continuous sound while pressing key

Possible Cause: Handshaking between host and terminal

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

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

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Key does not repeat when pressed

Possible Cause: Repeat parameter disabled

Solution: Change repeat parameter to either SLOW or FAST

Cannot access parameter mode or function key programming

Possible Cause: Menu lock-out enabled

Solution: Remove power, simultaneously hold **PERIOD** (.), **ZERO** (**0**) and **F4,** and then reapply power

Possible Cause: Handshaking between host and terminal

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

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

Possible Cause: Internal IO connection improperly connected

Terminal losing characters

Possible Cause: Handshaking between host and terminal

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

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

Function keys not sending correct values

Possible Cause: Key accidentally reprogrammed

Solution: Reprogram function key

Possible Cause: EEPROM corrupted by line disturbance

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

Possible Cause: Terminal reset to factory defaults after repair

Solution: Reprogram function keys

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Appendix A: **Specifications**

Display

- Reflective/Transreflective Liquid Crystal Display
- 4 Row x 20 Character Display Format
- Standard Character Set: US ASCII (5 x 7 pixels). Latin1 and European Character Sets also available
- Dark Characters on Light Background (except VFD)
- Optional Supertwist, Supertwist Backlit, Extended Temperature Supertwist Backlit, VFD and Extended Temperature VFD available

Keys & Switches

- Type: Membrane or Elastomeric
- Standard Layouts: 20-key
- Feedback: Tactile and Audible
- Four Programmable: Function Keys
- Optional Backlit and Backlit Phosphorescent Keypads available

Power

- Voltage: 5 VDC +/- 5%, 7.5-12 VDC* Linear Regulator or 9.5-28 VDC Switching Regulator
- Current: 45-50 mA typical (some options will require additional current)

*Maximum voltage depends on current draw.

Interface

- Type: RS-232, RS-422 or CMOS/LSTTL level
- Handshaking: 2 Lines (DTR, DTS) for RS-232, CMOS/LSTTL
- Data Rates: 110 to 9,600
- Parity Range: Even, Odd, Mark, Space and None
- Control Bits: 1 Start and 1-2 Stop Bits
- Standard Interface Connector: 6 Pin Female Modular Connector

Environmental

- Nematic Displays
  - Storage Temperature: -20°C to +70°C,
  - Operating Temperature: Standard: 0° to + 50°C, Extended Temperature: -20°C to +70°C
- Vacuum Fluorescent Displays
  - Storage Temperature: -40° to + 85°C
  - Operating Temperature: Standard: -20° to + 70°C, Extended Temperature: -40° to + 85°C
- Humidity: 5-95% (Non-condensing)Humidity: 5-95% (non-condensing)

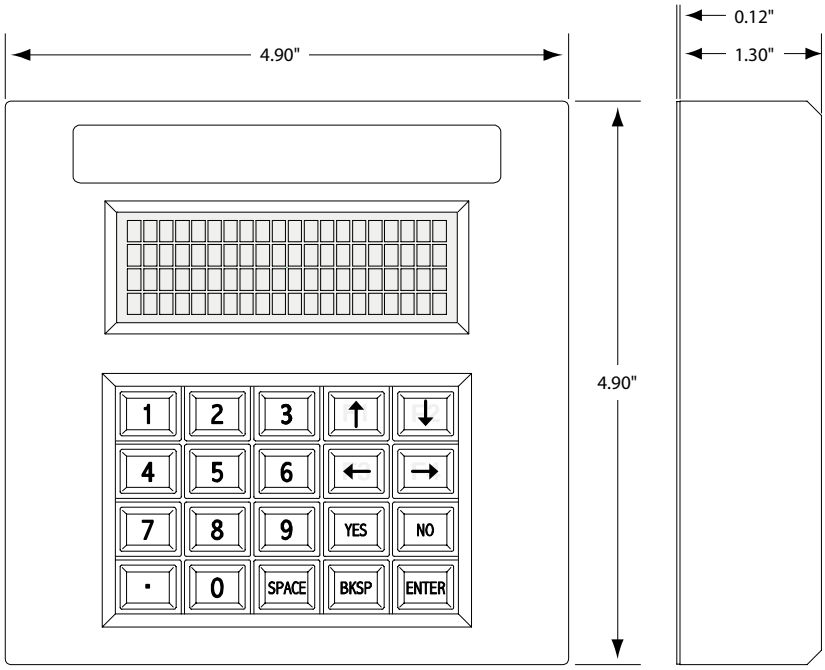
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Physical

- Height: 4.9.inches (124 mm)
- Width: 4.9.inches (124 mm)
- Depth w/cover: 1.3 inches (33 mm)
- Depth w/o cover: 1.1 inches (28 mm)
- Weight: 12 ounces (340 grams)
- Case: Valox 420
- NEMA 4/12 (panel mounted, using supplied hardware)

Specifications are subject to change without notice

Figure A-1: SMT Case Dimensions



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Appendix B: **ASCII Character Set**

Introduction

The following table contains the SMT ASCII character set and corresponding Decimal, Hex and Binary conversion codes as well as the keystroke entry for QWERTY style PC keyboards:

Table B-1: ASCII Character Set and Conversion Codes

ASCII	Decimal	HEX	Binary	PC Key	ASCII	Decimal	HEX	Binary	PC Key
NUL	0	00	00000000	CTRL 1	RS	30	1E	00011110	CTRL =
SOH	1	01	00000001	CTRL A	US	31	1F	00011111	CTRL -
STX	2	02	00000010	CTRL B	Space	32	20	00100000	Space
ETX	3	03	00000011	CTRL C	!	33	21	00100001	!
EOT	4	04	00000100	CTRL D	“	34	22	00100010	“
ENQ	5	05	00000101	CTRL E	#	35	23	00100011	#
ACK	6	06	00000110	CTRL F	$	36	24	00100100	$
BEL	7	07	00000111	CTRL G	%	37	25	00100101	%
BS	8	08	00001000	CTRL H	&	38	26	00100110	&
HT	9	09	00001001	CTRL I	'	39	27	00100111	'
LF	10	0A	00001010	CTRL J	(	40	28	00101000	(
VT	11	0B	00001011	CTRL K	)	41	29	00101001	)
FF	12	0C	00001100	CTRL L	*	42	2A	00101010	*
CR	13	0D	00001101	CTRL M	+	43	2B	00101011	+
SO	14	0E	00001110	CTRL N	,	44	2C	00101100	,
SI	15	0F	00001111	CTRL O	-	45	2D	00101101	-
DLE	16	10	00010000	CTRL P	.	46	2E	00101110	.
DC1	17	11	00010001	CTRL Q	/	47	2F	00101111	/
DC2	18	12	00010010	CTRL R	0	48	30	00110000	0
DC3	19	13	00010011	CTRL S	1	49	31	00110001	1
DC4	20	14	00010100	CTRL T	2	50	32	00110010	2
NAK	21	15	00010101	CTRL U	3	51	33	00110011	3
SYNC	22	16	00010110	CTRL V	4	52	34	00110100	4
ETB	23	17	00010111	CTRL W	5	53	35	00110101	5
CAN	24	18	00011000	CTRL X	6	54	36	00110110	6
EM	25	19	00011001	CTRL Y	7	55	37	00110111	7
SUB	26	1A	00011010	CTRL Z	8	56	38	00111000	8
ESC	27	1B	00011011	ESC	9	57	39	00111001	9
FS	28	1C	00011100	CTRL<	:	58	3A	00111010	:
GS	29	1D	00011101	CTRL	;	59	3B	00111011	;

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ASCII	Decimal	HEX	Binary	PC Key	ASCII	Decimal	HEX	Binary	PC Key
<	60	3C	00111100	<	V	86	56	01010110	V
=	61	3D	00111101	=	W	87	57	01010111	W
>	62	3E	00111110	>	X	88	58	01011000	X
?	63	3F	00111111	?	Y	89	59	01011001	Y
@	64	40	01000000	@	Z	90	5A	01011010	Z
A	65	41	01000001	A	[	91	5B	01011011	[
B	66	42	01000010	B	\	92	5C	01011100	\
C	67	43	01000011	C	]	93	5D	01011101	]
D	68	44	01000100	D	^	94	5E	01011110	^
E	69	45	01000101	E	_	95	5F	01011111	_
F	70	46	01000110	F	`	96	60	01100000	`
G	71	47	01000111	G	a	97	61	01100001	a
H	72	48	01001000	H	b	98	62	01100010	b
I	73	49	01001001	I	c	99	63	01100011	c
J	74	4A	01001010	J	d	100	64	01100100	d
K	75	4B	01001011	K	e	101	65	01100101	e
L	76	4C	01001100	L	f	102	66	01100110	f
M	77	4D	01001101	M	g	103	67	01100111	g
N	78	4E	01001110	N	h	104	68	01101000	h
O	79	4F	01001111	O	i	105	69	01101001	i
P	80	50	01010000	P	j	106	6A	01101010	j
A	65	41	01000001	A	k	107	6B	01101011	k
B	66	42	01000010	B	l	108	6C	01101100	l
C	67	43	01000011	C	m	109	6D	01101101	m
D	68	44	01000100	D	n	110	6E	01101110	n
E	69	45	01000101	E	o	111	6F	01101111	o
F	70	46	01000110	F	p	112	70	01110000	p
G	71	47	01000111	G	q	113	71	01110001	q
H	72	48	01001000	H	r	114	72	01110010	r
I	73	49	01001001	I	s	115	73	01110011	s
J	74	4A	01001010	J	t	116	74	01110100	t
K	75	4B	01001011	K	u	117	75	01110101	u
L	76	4C	01001100	L	v	118	76	01110110	v
M	77	4D	01001101	M	w	119	77	01110111	w
N	78	4E	01001110	N	x	120	78	01111000	x
O	79	4F	01001111	O	y	121	79	01111001	y
P	80	50	01010000	P	z	122	7A	01111010	z
Q	81	51	01010001	Q	{	123	7B	01111011	{
R	82	52	01010010	R	|	124	7C	01111100	|
S	83	53	01010011	S	}	125	7D	01111101	}
T	84	54	01010100	T	→	126	7E	01111110	
U	85	55	01010101	U	Delete	127	7F	01111111	Delete

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