MMI-840

Installation & Operation

GN3-MMIa

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January 20, 1993

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Chapter 1
Welcome

1. Welcome

This manual tells you about ORMEC's **MMI-840** Man-Machine Interface. The manual describes installing, configuring and using the **MMI-840**.

The manual is divided into the following chapters:

Chapter 1	**Welcome** introduces you to this manual and how it is organized.
Chapter 2	**General Description** provides an overview of the MMI-840, including a description of the unit and its functionality. This chapter also covers accessories for the MMI-840.
Chapter 3	**Installation** explains how to connect the unit to an ORMEC Model 20 & 40 Motion Controller. It also provides a complete hardware description.
Chapter 4	**Operation** provides instructions on how to use the MMI-840.
Chapter 5	**Configuration** provides instructions on how to change the configuration of the unit.
Chapter 6	**Specifications** provides specifications for the MMI-840 and documents the product history.
Chapter 7	**Advanced Information** provides information about how MotionBASIC® supports the MMI-840 and documentation on ANSI control sequences supported by the MMI-840.
Appendices	**Appendices** contain detailed drawings which document the dimensions and system interface.

NOTE: This manual concentrates on the MMI-840. Detailed information on ORMEC's MotionBASIC® programming language is found in the on-line MotionBASIC® Hypertext Software Manual. Hard copy is included with the documentation for ORMEC's MotionPRO™ software development and maintenance systems.

Chapter 2
General Description

2.1 General Description

The ORMEC MMI-840 is a NEMA 4 rated, compact industrial terminal. It has been engineered as a cost-effective alternative for a wide variety of operator interface needs.

The MMI-840 industrial terminal provides an eight-line by 40-character backlit LCD display. The unit is rugged and compact (8.5" wide x 8.5" high x 2.44" deep) and has a water-tight front panel to withstand harsh plant floor environments.

It operates on 24 VDC power supplied by ORMEC's Model 20 & 40 Motion Controllers. Its RS-422 communications interface uses telephone jack style connectors, which are pin compatible with the MotionNET™ port provided with all Model 20 and 40 Motion Controllers.

The MMI-840 has large, full-travel rubber keys with tactile feedback for alpha-numeric entry and editing. Function keys are provided along the bottom of the screen. MotionBASIC® also supports user defined labeling of the keys, using either one or two lines at the bottom of the screen.

2.2 MMI-840 & Accessory Module Part Numbers

MMI-840	*Compact industrial terminal, 8-line by 40 character display, RS-422.*
CBL-MMIPWR/X	*Power cable, 24 VDC for MMI-840, 1-150 ft.* Use this cable to supply power to the MMI-840.
CBL-MOD8/X	*Cable, 8-wire Modular, 1-150 ft.* Use this cable for the RS-422 communications link to the MMI-840.
CON-422MOD8	*Connector from GN3-422 to CBL-MOD8.* Use this connector to convert from a 9-pin D-Sub to an 8-pin modular connector.

When ordering cable the X in the part number is replaced by the desired length (in feet).

Chapter 3
Installation

3.1 Receiving & Inspection

ORMEC's MMI-840 Industrial Interface is tested at the factory and carefully packaged for shipment. After unpacking, however, check for damage which may have been sustained in transit.

3.2 Panel Mounting & Environment

Panel mounting data is available in the Specifications Section and **Appendix A**.

For through panel mounting:

- cut an opening in the panel. See **Appendix A** for size.
- carefully insert the MMI-840 through the panel opening from the front. Note, if the MMI-840 is to be used in continuously wet applications, we recommend that the installer apply a silicone sealer to the gasket prior to installation.
- while holding the MMI-840 insert the mounting brackets to the sides, as shown in **Appendix A**
- tighten the mounting screws to apply pressure to the panel and secure the MMI-840. Be sure to apply enough pressure to compress the gasket material.
- inspect that the MMI-840 fits snugly up against the front panel and that there are no gaps or holes that may allow water or dirt to enter the cabinet.

The MMI-840's environment should be maintained as follows:

- Temperature should be between 0 and 50C
- Avoid use in corrosive atmospheres which may cause damage over time.

3.3 Input Power Connector

The input power connector is a 4-pin Phoenix pluggable terminal block. The removable piece is Phoenix part number 1779437 and one is provided with the MMI-840. This connector provides power to operate the MMI-840, a ground

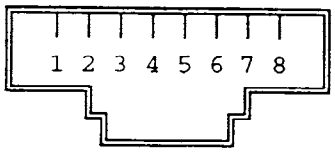
reference for the RS-422 communications and a safety ground. ORMEC offers cable part number **CBL-MMIPWR** for providing the power. The input power connector has the functionality described below.

Signal	Function	Description
DC IN+ DC IN-	Input Power	Power to operate the MMI-840 is provided between pins DC IN+ and DC IN-. This must be between 9 and 30 VDC at 5 W and it is recommended that the 24 VDC supply of the Model 20 or 40 be used. The 24 VDC supply can be accessed at TB6 of the Motion Controller, pins 24 and R2. At start up the MMI-840 attempts to begin working when the input power exceeds 4.5 V. The start up current can be as high as 1.3 Amps. The power supply selected should be able to handle this current surge. Only connect the DC power source to the DC IN+ and DC IN- terminals. These inputs are reverse protected. DO NOT connect the DC power ground to LOGIC GROUND. Logic Ground is optically isolated from the I/O. Connecting Logic Ground to DC IN- will result in lower noise immunity.
LOGIC GROUND	RS-422 reference	This input provides a reference point for the RS-422 signals. It should be tied to the ground reference used on the RS-422 device. When used with an ORMEC Motion Controller it should be tied to the ground reference of the +5 VDC power, which can be found on TB6 pin R5.
SHIELD	Cable Shield	This pin is internally connected to the chassis and provided for termination of a shield for the power cable. When used with an ORMEC Motion Controller it should be tied to the shield connection, which can be found on TB6 pin SH.

3.4 Serial Communications Connector

The serial communications connector is a telephone jack style connector (compatible with AMP Part # 5-555178-3). Connections are for an RS-422 serial interface. ORMEC provides cable part number **CBL-MOD8** for direct connection to a Model 20 or 40 MotionNET™ port.

The pinout of the serial communications connector is shown below (viewed looking into the connector). Note that signals are in pairs due to the balanced differential configuration.



Pin#	Signal Name	Description
1	RDATA	Receive Data
2	RDATA'	
3	TDATA	Transmitted (Send) Data
4	TDATA'	
5	Reserved	Do not connect to this pin
6	Reserved	Do not connect to this pin
7	Reserved	Do not connect to this pin
8	Reserved	Do not connect to this pin

Chapter 4
Operation

4.1 Powerup

Whenever power is initially applied to the unit it will turn on and display the following.

ORMEC SYSTEMS CORP
MMI-840 Industrial Terminal
8-Line x 40-Character Display
Firmware version x.xx

RS-422, Comm=9600,N,8,1

Note that the firmware version and the protocol will display the actual current settings and therefore may appear different from that shown above.

When the message is displayed, the MMI-840 is waiting for either a carriage return character to be received at the serial port or a **SHIFT-ENTER** to be pressed at the keyboard. When a carriage return character is received the MMI-840 will clear the screen and begin normal operation. Simultaneously pressing the **SHIFT** and **ENTER** keys on the keyboard provides access to the configuration menu. Chapter 5 will explain the options available on that menu.

While waiting for the carriage return or **SHIFT-ENTER** the MMI-840 will not display any characters typed at the keyboard, though they will be sent out the RS-422 port. Also, any characters received at the RS-422 port before the carriage return will be displayed on the last line of the display. This display of characters received can be helpful in diagnosing incorrect baud rates and other communication problems.

4.2 Getting Started

In order for the MMI-840 to do anything a program must be run which sends characters to the MMI-840 and accepts characters from it. Before running the program you will need to supply power and an RS-422 communications link. Supply power from TB6 of your ORMEC Motion Controller to the MMI-840 power connector using ORMEC part CBL-MMIPWR, or equivalent (see Appendix A-2). Connect the serial communications from the MotionNET™ port (connector J6) of the Motion Controller to the MMI-840 using ORMEC part CBL-MOD8, or equivalent. Now the following program can be used to demonstrate operation of the MMI-840. The program will initiate communications to the MMI-840, clear the screen (by sending the needed carriage return), print some messages on the screen, read a number from the keyboard and print it on line 7.

```
 10 MMI.TEST:
 20 CLOSE 0                    ' Make certain device is closed before opening
 30 OPEN "R",0,"SRL2:MMI"      ' Open device 0 for MMI
 40 CLS                        ' Clear the screen
 50 PRINT @1,1;"This is line 1"
 60 LOCATE 4,20                ' Move the cursor
 70 PRINT "Middle of line 4"
 80 INPUT @5,1;"Enter a number then hit ENTER:"; NUMBER
 90 PRINT @7,1;"The number entered was ";NUMBER
100 RETURN
```

After typing this routine into the Model 20 or 40 type *MMI.TEST* and press the **RETURN** to execute it. You should then see messages on lines 1, 4 and 5 of the MMI-840. Enter a number and press the ENTER key. The number entered will be displayed on line 7 of the MMI. If you have problems check that:

- the program was entered correctly
- both cables (power and serial comm.) are connected to the MMI-840
- the serial cable is using the MotionNET™ port, J6

4.3 MotionBASIC® Support

ORMEC's MotionBASIC® has built in support for the MMI-840 for doing many of the following things.

- cursor positioning
- reading values, with echo
- supporting function keys
- scrolling the screen

This manual concentrates on the hardware aspects of the MMI-840. To learn about the software support in MotionBASIC® please consult the MotionBASIC® On-line Hypertext manual. Items of interest should include.

- OPEN MMI
- PRINT @
- LOCATE
- INPUT @
- MMI
- KEY

Chapter 5
Configuration

5.1 Configuring the MMI-840

The MMI-840 has 8 configuration parameters that can be changed. The value of these parameters is stored in non-volatile memory on the MMI-840 and will not change during a power cycle. The values can be changed from the configuration menu of the MMI-840. This chapter discusses these parameters and their possible settings.

When power is applied the MMI-840 will start up and display a sign on screen as in chapter 4. To get to the configuration menu press the **SHIFT** and **ENTER** keys at the same time. The following screen will appear (shown with factory default values).

```
Baud Rate --> 9600        CR ---------> CR
Parity -----> NONE        XON/XOFF ---> OFF
Data Bits -->  8          Key Repeat -> 250,20
Stop Bits -->  1          Backlight --> AUTO

 Use the UP & DOWN arrows to select the
items to be changed,  Use the LEFT & RIGHT
arrows to toggle,    Press ENTER when done.
```

To change one of the parameter settings first move the cursor to the parameter using the UP (↑) and DOWN (↓) arrows on the MMI-840. Then use the LEFT (←) and RIGHT (→) arrows to cycle through the list of possible values. When done changing one parameter use the UP and DOWN arrows to select another. When all desired changes have been made press the ENTER key. This will make the changes effective, save them in non-volatile memory and exit from the configuration menu screen.

The description and possible settings for each of the parameters is described on the next page.

Parameter	Factory Default	Possible Settings	Description
Baud Rate	9600	1200, 2400, 4800 9600, 19200	This determines the rate at which characters are transmitted. This must match the value of the sending device.
Parity	NONE	NONE, EVEN, ODD	Determines the type of parity used in the RS-422 communications. This must match the value of the sending device.
Data Bits	8	7, 8	Determines whether a character is sent as 7 or 8 bits. This must match the value of the sending device.
Stop Bits	1	1, 2	Determines the number of stop bits in the RS-422 character. This must match the value of the sending device.
CR	CR	CR, CR/LF	Selects the cursor action performed by the MMI-840 when a carriage return character is received. With CR it is interpreted as a carriage return only and moves the cursor to the beginning (far left) of the line it is on. With CR/LF the cursor is moved to the left screen edge and down 1 line, thus the beginning of the next line.
XON/XOFF	OFF	ON, OFF	Determines whether XON/XOFF software flow control is used. ORMEC Model 20 & 40 Motion Controllers do not support this flow control so it must be OFF to work with them.
Key Repeat	250,20	250, 20 500, 10 750, 4 1000,2 NONE	This controls how fast characters are automatically sent when a key is held down. Normally, when you press a key that character is immediately sent. If the key is held down, then, after some delay the character is again sent, continuing as long as the key is held. The 1st value indicates the delay time, in milliseconds, before repeating begins. The 2nd value indicates how fast, in characters/second, characters will be sent when repeating begins. With setting NONE there will be no key repeat. For example, with the factory setting of 250,20 let's press and hold a 1. Immediately a 1 will be sent. After a 250 millisecond delay the MMI-840 will automatically begin sending a 1 at the rate of 20 per second.
Backlight	AUTO	AUTO, ON, OFF	Controls the operation of the BACKLIGHT feature. Setting ON has the backlight always on. Setting OFF has the backlight always off. With setting AUTO the backlight goes off after ten minutes of inactivity and comes back on when a key is pressed.

Chapter 6
Specifications

6.1 MMI-840 Specifications

Dimensions: 8.5"w x 8.5"h x 2.44" d

Weight: 4.2 lbs

Power: 9-30 VDC at 5 watts with 1.3 A inrush

Communications: RS-422, fully optically isolated

Operating Temperature: 0 to 50C

Humidity: 5 to 95% relative humidity (non-condensing)

Environment: Designed to NEMA 4 (water-tight) and NEMA 12 (dust-tight) specifications.

Panel Mounting Cutout: 7.75" x 7.75" ± .031"

6.2 MMI-840 Product History

Version 1.0 - May 1992 - Product Introduction

Version 1.1 - December 1992 - Key repeat adjustment added.

Added the ability to disable automatic key repeat or change the key repeat delay time and repeat rate. Key repeat can be adjusted from the MMI configuration screen as described in Chapter 5 or from ANSI escape sequences as described in Chapter 7.

Chapter 7
Advanced Information

7.1 MotionBASIC® Support

MotionBASIC® supports the MMI-840 by using a device driver. A device driver is a hardware dependent software routine which translates a command from MotionBASIC® to the necessary command sequence for the hardware. The goal is to make the hardware dependencies as transparent to the programmer as possible. For example, the MotionBASIC® statement - **PRINT @2,4;"This is a test";** - requests that the phrase "This is a test" be printed at line 2 column 4. The type of hardware determines the method of positioning the text on line 2 column 4. For the MMI-840 the device driver would send the escape sequence ESC[2;4H out the MotionNET™ serial port, followed by "This is a test". If, however, the display were an ORMEC OIT terminal then the device driver would direct the string to the video display card. In both cases the programmer didn't need to know the specifics of how to get the information to the hardware, only that the **PRINT @2,4;** statement in MotionBASIC® would end up where it was wanted.

In order for MotionBASIC® to help with the MMI-840 interface you need to tell it about the hardware, what it is and where it is. The **OPEN** statement is the mechanism for doing this. The on-line MotionBASIC® Hypertext Software Manual is the source for all of the variation of the OPEN statement. However, for an MMI connected to the MotionNET™ port (connector J6), the correct statement is **OPEN "R",0, "SRL2:MMI"**.

7.2 MMI-840 Control Sequences

When used with the built in MotionBASIC® support there is little need to know of the control sequences available on the MMI-840. Almost everything can be done from MotionBASIC®. However, the MMI-840 may be used without the aid of MotionBASIC® and then the information below may be useful.

It is assumed that the reader is familiar with programming ANSI control sequences and so the presentation is brief.

WARNING: Using many of the control sequences along with MotionBASIC® controlling the MMI may result in display errors. MotionBASIC® keeps track of cursor position and other things it does to the MMI screen with standard commands and statements. If you change aspects

of the MMI with a control sequence MotionBASIC® will not know and subsequent commands from MotionBASIC® may produce unexpected results. There are two groups of control sequences below. The first group is safe to use with MotionBASIC® the second is not.

In all of these sequences the # indicates that a numeric value is to be placed there. An explanation of the value follows the summary table. ESC is the ASCII escape character. There is not a space after the ESC in an actual control sequence, it looks that way to make it more readable. For example, the sequence ESC[?35;10k could be sent using the MotionBASIC® statement

```
PRINT chr$(27);"[?35;10k";
```

7.2.1 MotionBASIC® Compatible Control Codes

You MAY use these sequences while MotionBASIC® is also controlling the MMI-840.

Summary

Command	Control Sequence
Change Key Repeat Rate	ESC [?#;#k
Clear to End of Line	ESC [K
Set Backlight Function	ESC [1;#v

Detailed Explanation

Change Key Repeat Rate ESC [?#;#k

This is used to set the key repeat delay and repeat rate, see the configuration menu explanation. This does not change the power up value saved in non-volatile memory. The 1st # is the delay time, in units of 10's of milliseconds, range is 25 to 100 (250 to 1000 msec.), 0 is NONE. The 2nd # is the repeat rate, in units of character/second, range is 2 to 20.

Example: ESC[?35;10k 350 msec delay with 10 character/sec repeat rate.

Clear to End of Line ESC [K

Clears the line from current cursor position to the right edge of the screen, including the cursor position.

Set Backlight Function ESC [1;#v

Configures the backlight option as described in the configuration section. This does not change the power up value saved in non-volatile memory. Replace the # with 0 for always OFF, 1 for always ON, and 2 for AUTO.

Example: ESC[1;0v Turns OFF the backlight function.

7.2.2 MotionBASIC® Incompatible Control Codes

WARNING: Using any of the following control sequences while MotionBASIC® is controlling the MMI-840 will result in unexpected results on the display. These sequences either are used by MotionBASIC® or affect things controlled by MotionBASIC®.

Summary

Command	Control Sequence
Cursor Position	ESC [#;#H
Cursor Up	ESC [A
Cursor Down	ESC [B
Cursor Forward	ESC [C
Cursor Backward	ESC [D
Clear Screen	ESC [2J
Print Large Text	ESC [#;#;"string"y
Line Wrap On	ESC [?7h
Line Wrap Off	ESC [?7l
Set Cursor Type	ESC [#?c
Set Scrolling Region	ESC [#;#r
Set CR Interpretation	ESC [2;#v
Set Handshaking	ESC [3;#v
Reset	ESC c
Change Color	ESC [0;#;4#;#;3#m

Detailed Explanation

Cursor Position **ESC [#;#H**

Move the cursor to position specified. The 1st # specifies the line number and the 2nd # the column number. Default is 1 and if no parameter is given , the cursor is moved to the home position. The upper left corner is position line 1 column 1.

Example: ESC[3;34H Move cursor to line 3, column 34.

Cursor Up **ESC [A**

Move the cursor up 1 line, without changing the column position. This is ignored if the cursor is already at the top line.

Cursor Down **ESC [B**

Move the cursor down 1 line, without changing the column position. This is ignored if the cursor is already at the bottom line.

Cursor Forward **ESC [C**

Move the cursor forward (right) 1 column, without changing the line position. This is ignored if the cursor is already at the rightmost position.

Cursor Backward **ESC [D**

Move the cursor backward (left) 1 column, without changing the line position. This is ignored if the cursor is already at the left most position.

Clear Screen **ESC [2J**

Clears the screen.

Print Large Text **ESC [#;#;"string"y**

Allows printing of large (double size) text on the screen. This effectively makes the display 4 lines by 20 characters. The 1st # sets the beginning line position (1-4) and the 2nd # sets the beginning column (1-20) for the specified string. The string does not wrap no matter what is specified for standard text.

Example: ESC[2;1;"Large"y Prints the word Large in double size characters beginning at line 2, column 1. (This position is for the new screen size of 4x20. The position in the example would be on line 4 of the original 8x40 display.)

Line Wrap On **ESC [?7h**

Turns auto line wrap ON.

Line Wrap Off **ESC [?7l**

Turns auto line wrap off. Characters past the end of the line are lost.

Set Cursor Type **ESC [#?c**

Selects the type of cursor visible on the MMI-840. Replace # with 0 for cursor off, to 1 for insert type cursor or 2 for overtype cursor.

Example: ESC[1?c Selects an insert type cursor.

Set Scrolling Region **ESC [#;#r**

This allows a specific region of the screen to be set up as a scrolling region. The 1st # specifies the top line of the scrolling region and the 2nd # specifies the bottom line. The 2nd # must be greater than the 1st and both can range from 1-8. Scrolling of Large text is not supported.

Example: ESC[1;4r Set to scroll lines 1 through 4.

Set CR Interpretation **ESC [2;#v**

Selects the CR response as in the configuration menu. If #=0 a CR is interpreted as a CR only. This does not change the power up value saved in non-volatile memory. If #=1 a CR is interpreted as a CR/LF.

Example: ESC[2;1v Select CR/LF response to CR.

Set Handshaking **ESC [3;#v**

Selects the XON/XOFF mode as in the configuration menu. This does not change the power up value saved in non-volatile memory. Use #=0 to select OFF and #=1 to select ON.

Example: ESC[3;0v Turn OFF XON/XOFF handshaking.

Reset **ESC c**

This command resets the MMI-840 to its power up configuration mode. Note that several seconds will be needed for the reset and that the MMI-840 will not be ready until it is done.

Change Color **ESC [0;#;4#;#;3#m**

Sets the foreground and background colors of the display. Also allows the setting of the Blink and Hi-Intensity Attributes. If the 1st # is a 5 then Blink is on. The 2nd # selects the background color and has a range of 0-7. If the 3rd # is a 1 then Hi-Intensity is on. The 4th # selects the foreground color and has a range of 0-7. The 1st and 3rd # are optional and are omitted to leave that feature OFF. When they are omitted then the ; following them is also omitted.

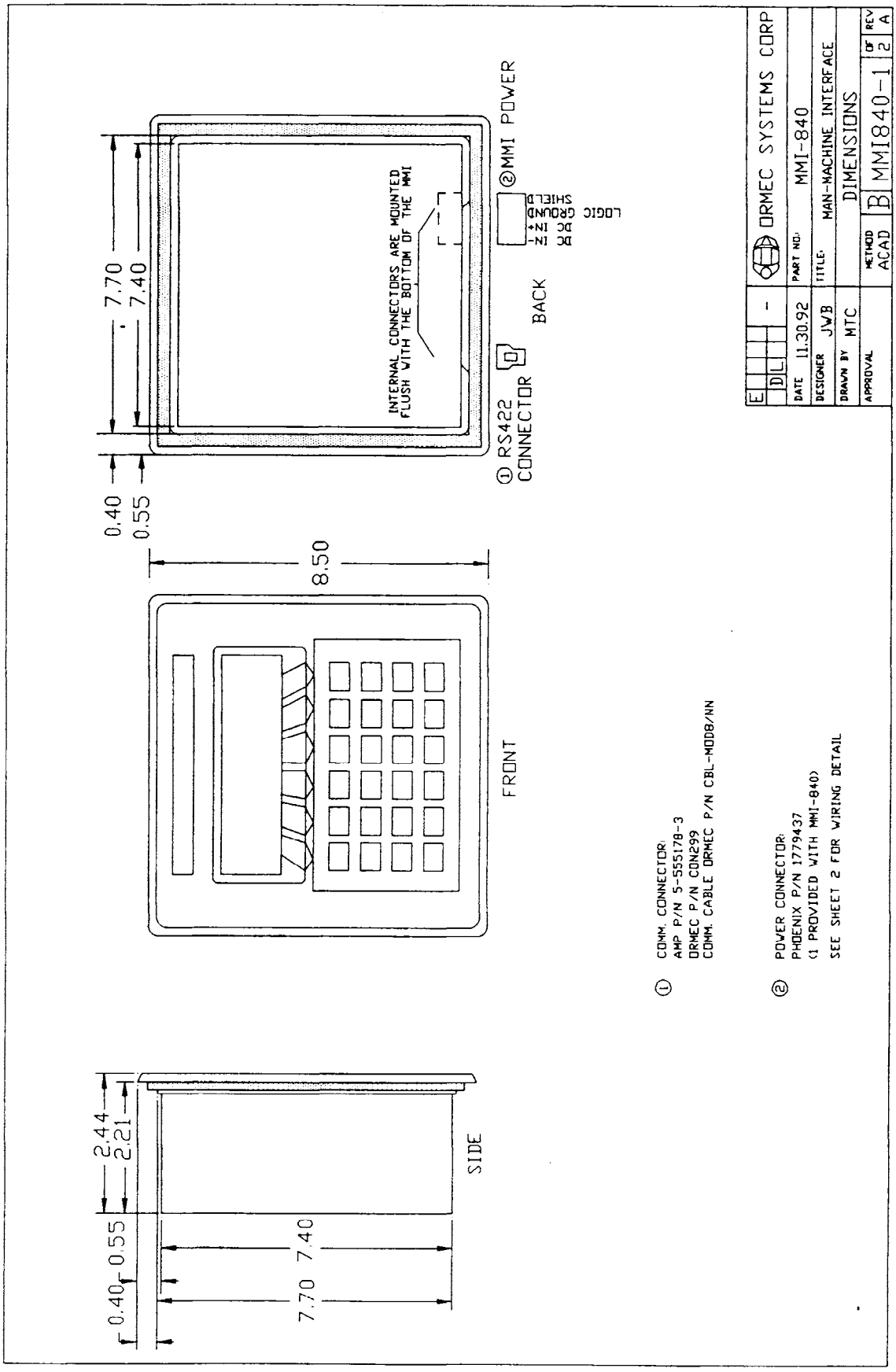
Example: ESC[0;41;30m Set the background color to 1 and the foreground color to 0. Notice that the optional 1st and 3rd # are left out.

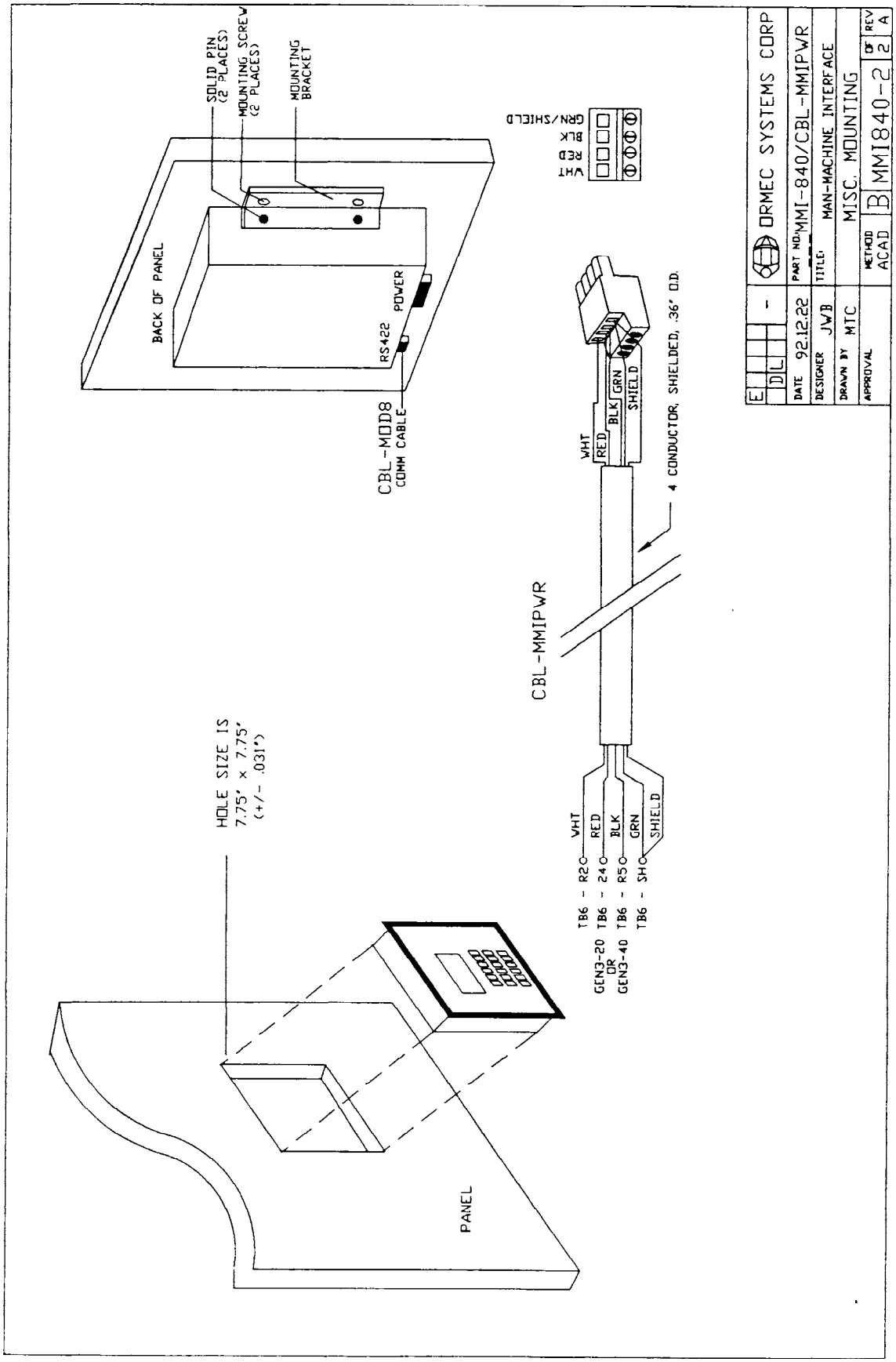
ESC[0;5;42;1;37m Set foreground color to 7, background to 2, Blink ON and Hi-Intensity ON.

Keyboard Reassignment **ESC [#;#;...#p**

This allows you to change the ASCII codes generated when a key is pressed. The new code can be more than 1 character.

The 1st # defines which key is being changed and is the decimal value of its ASCII character. The remaining # define the sequence of characters to be returned when the key is pressed. If the 1st code in the new sequence is 0 (NULL) then the 1st and 2nd codes make up an extended ASCII redefinition. To reset a specific key back to its default, don't specify any new ASCII codes. The maximum number of key reassignments is 16. The maximum number of bytes for each assignment is 32. To clear all keyboard reassignments use ESC[127p


INTERNAL CONNECTORS ARE MOUNTED FLUSH WITH THE BOTTOM OF THE MMI
7.70
7.40
0.40
0.55
8.50
① RS422 CONNECTOR
②MMI POWER
BACK
FRONT
SIDE
2.44
2.21
0.40
0.55
7.40
7.70
① COMM. CONNECTOR:
AMP P/N 5-555178-3
ORMEC P/N CON299
COMM. CABLE ORMEC P/N CBL-MODB/NN
② POWER CONNECTOR:
PHOENIX P/N 1779437
(1 PROVIDED WITH MMI-840)
SEE SHEET 2 FOR WIRING DETAIL
ORMEC SYSTEMS CORP
PART NO: MMI-840
TITLE: MAN-MACHINE INTERFACE
DIMENSIONS
DATE 11.30.92
DESIGNER JWB
DRAWN BY MTC
APPROVAL
METHOD ACAD
B MMI840-1
SHT 2 OF 2
REV A


SOLID PIN (2 PLACES)
MOUNTING SCREW (2 PLACES)
MOUNTING BRACKET
BACK OF PANEL
POWER
RS422
CBL-MDD8
COMM CABLE
WHT
RED
BLK
GRN
SHIELD
GRN/SHIELD
BLK
RED
WHT
4 CONDUCTOR, SHIELDED, .36" O.D.
CBL-MMIPWR
TB6 - R2
TB6 - 24
TB6 - R5
TB6 - SH
GEN3-20 OR GEN3-40
HOLE SIZE IS 7.75" x 7.75" (+/- .031")
PANEL
ORMEC SYSTEMS CORP
PART NO: MMI-840/CBL-MMIPWR
TITLE: MAN-MACHINE INTERFACE
MISC. MOUNTING
METHOD ACAD
B MMI840-2
SHT 2
REV A
DATE 92.12.22
DESIGNER JWB
DRAWN BY MTC
APPROVAL