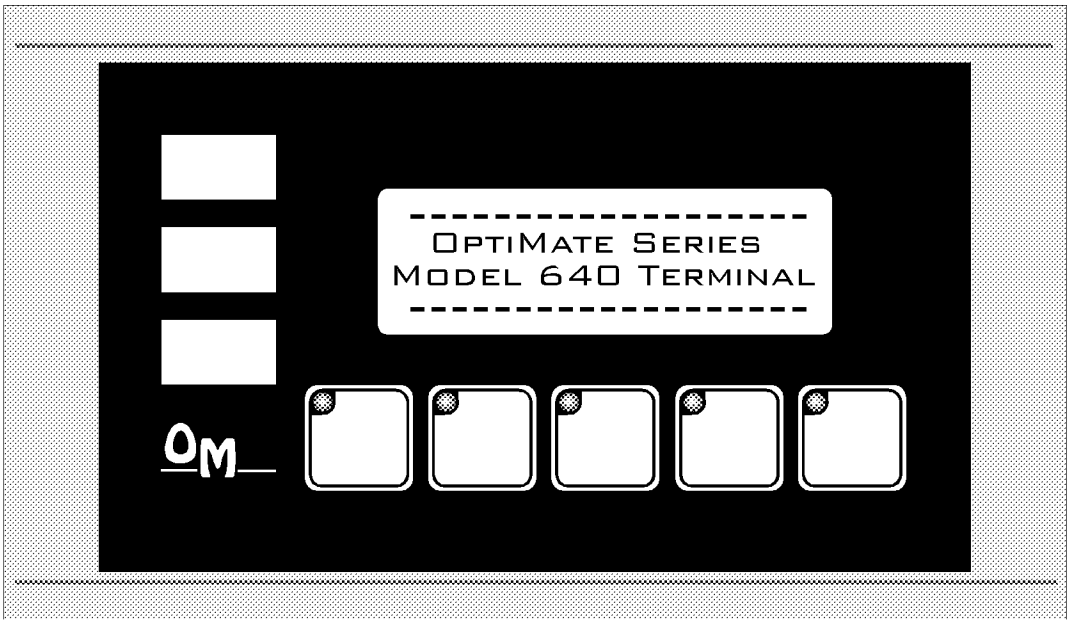


OM640 Operator Panel

The OM640 Operator Panel is a low cost/high performance man/machine interface with a broad range of operator input and display capabilities. The panel includes a 4 line by 20 character LCD display, five function keys, 3 LED light bar indicator lamps, and the capability to display text messages, BCD, BCD Double, Binary and Floating Point numbers.

OM-WINEDIT configuration software allows you to predefine up to 160 messages. These messages can be later selected for display by your PLC program to display status and variable data.

Function keys and indicator lamps can be custom labeled by the user with plastic inserts. The inserts can be custom legended with text and/or graphics, and slipped into a protective pocket behind the faceplate.

The OM640 Operator Panel is part of Optimation's OptiMate® series. Each OptiMate panel is designed to connect to most PLCs with a single cable connection. OptiMate panels can be used individually, or together with any combination of other OptiMate panels.

When used with a PLC, operation is transparent to the user. Terminal functions tie directly into your PLC ladder logic program. The OM640 takes care of the rest.

Applications

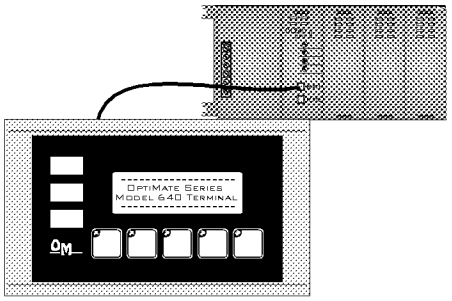
- Machine control
- Process control
- Security systems
- HVAC
- Plant monitoring/control
- PLC applications
- Microprocessor applications

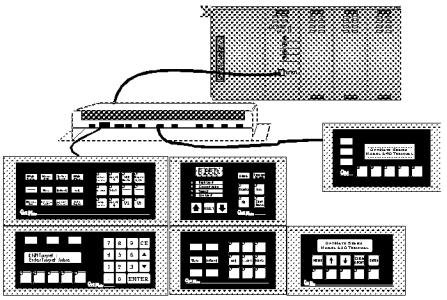
Features

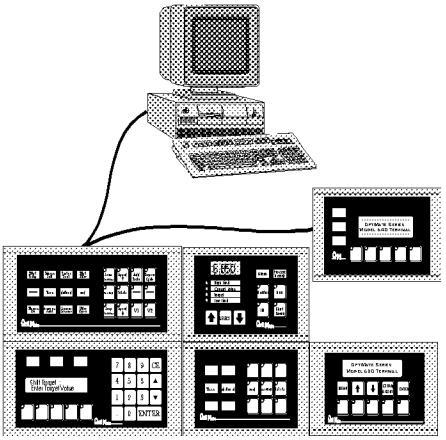
- 4 line x 20 character LCD
- 5 User defined function keys
- 3 LED light bars
- User legendable light bars and function keys
- PLC compatible
- RS232/RS422 communications
- Stand alone operation capable
- Multipanel operation capable

Contents

Configuration Options







PLC Stand Alone

OptiMate panels plug directly into most PLCs. A simple cable connection allows you to interface and control the OptiMate panel via PLC data registers and ladder logic.

The OM640 Operator Terminal uses a bank of PLC registers. Complete operator interface is performed with 14 PLC registers for display message selection, indicator lamp control and function key interface. The OM640 continuously accesses these PLC registers and performs operations under ladder logic control on a real time basis.

PLCs are slave devices on their standard communications ports. This means that a panel attached to the standard port must control the transfer of information by reading and writing the PLC registers. OptiMate panels will perform this communications for most major PLC protocols. Configuration for particular PLC protocols and interconnect cabling is covered in the following pages.

PLC Multi Panels

Larger systems involving operator panels and I/O can be successfully addressed using OptiMate panels. These applications utilize the OP-9001 Communications Master to transfer data between the PLC and the individual OptiMate modules. OptiMate panels can be located together to form custom panels or they can be distributed anywhere within 4000 feet.

The OP-9001 Communications Master provides a transparent interface between the PLC and a group of OptiMate panels. The communication interface between modules requires only four wires.

System configuration is simple using OM-WINEDIT software that runs on any IBM PC compatible computer.

This modular approach to custom applications provides a nearly limitless number of possibilities.

Microprocessor Based Systems

OptiMate panels can interface directly to most computers or microcontrollers. The modules communicate over either RS422 or RS232 serial communications. All that is required to interface OptiMate panels is either an RS422 or RS232 serial port and the ability to send and receive Hex numbers. The OptiMate Hex protocol, detailed in this document, allows the user to directly control panel operation and retrieve operator inputs.

Since each panel has its own unique address, up to 31 modules can be interfaced on one communications cable.

In a microprocessor based system, the host microprocessor is the system master. The OptiMate modules are slave devices that respond to commands from the host. In the case of the OM640, these commands are messages for message display and data as well as function button status and lamp bar control.

Communications over RS422 allows placement of modules anywhere within a 4000 foot cable distance. Panels can be grouped together to form a larger panel. Panels can be grouped in several clusters all on the same communications cable.

Use with a PLC

Memory Mapping

Memory mapping is a technique that "maps" the memory of an OptiMate panel into the registers of the programmable controller. By knowing where the data of a specific OptiMate panel is mapped, this data can be moved, changed or monitored using ladder logic.

The term PLC register is used for describing the area of memory within the programmable controller that can be used for data storage. PLC registers are sometimes known as data registers or internal registers.

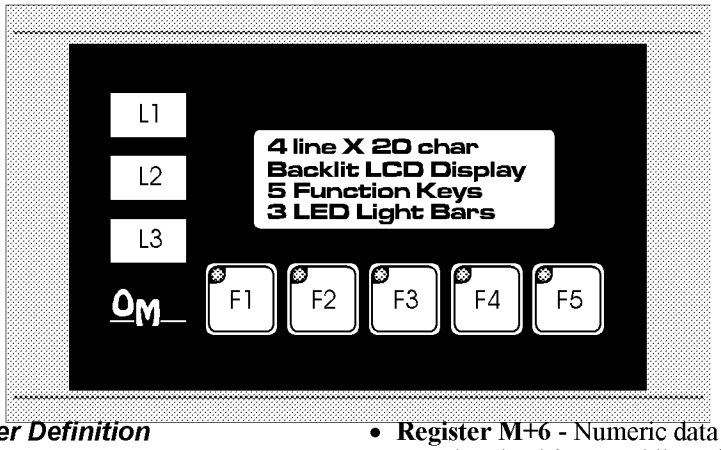
MSB															LSB
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

PLC Register

The OM640 Operator Panel uses a bank of 14 contiguous PLC registers. The register set definition is shown in the table below.

OM640 Panel PLC Register Map

PLC Register	Register Function
M+0 (first register of bank)	Top line message selection
M+1	Second line message selection
M+2	Third line message selection
M+3	Bottom Line message selection
M+4	Top line data
M+5	Top line data 2 (for long BCD and floating point)
M+6	Second line data
M+7	Second line data 2 (for long BCD and floating point)
M+8	Third line data
M+9	Third line data 2 (for long BCD and floating point)
M+10	Bottom line data
M+11	Bottom line data 2 (for long BCD and floating point)
M+12	Status register
M+13	Control register



Register Definition

The following describes the function of the registers shown in the table.

- **Register M+0** - When a number from 1 - 160 is placed in this register, the predefined message associated with that number will be displayed on the top line of the LCD display.
- **Register M+1** - When a number from 1-160 is placed in this register, the predefined message associated with that number will be displayed on the second line of the LCD display.
- **Register M+2** - When a number from 1-160 is placed in this register, the predefined message associated with that number will be displayed on the third line of the LCD display.
- **Register M+3** - When a number from 1-160 is placed in this register, the predefined message associated with that number will be displayed on the bottom line of the LCD display.
- **Register M+4** - Numeric data associated with top line display (described in more detail in following paragraphs)
- **Register M+5** - For long BCD and floating point data only.
- **Register M+6** - Numeric data associated with second line of display.
- **Register M+7** - For long BCD and floating point data only.
- **Register M+8** - Numeric data associated with the third line of display.
- **Register M+9** - For long BCD and floating point data only.
- **Register M+10** - Numeric data associated with bottom line of display.
- **Register M+11** - For long BCD and floating point data only.
- **Register M+12** - Status register

MSB															LSB
											F5	F4	F3	F2	F1

Status Register

> F1-F5 are status of the five function keys. Set to 1 when the button is active.

- **Register M+13** - Control bits

MSB															LSB
										BD	LF3	LF2	LF1	L3	L2	L1

Control Register

> L1-L3 - on/off control bits for each of the three indicator lamps. Set to 1 to turn the lamp on.

> L1F-L3F - Flash control bits for each indicator lamp. To flash, set both the lamp on and lamp flash bits to 1.

> BD - Buzzer disable. When this bit is set to 1, the buzzer that beeps every time a button is pressed will be disabled (i.e. not beep).

Operational Overview

Displaying Messages on the LCD Display

Through the OM-WINEDIT configuration software, up to 160 predefined messages can be entered and stored in the OM640. These messages are 20 characters long and can include a field for the display of numeric data.

Any predefined message can be displayed on either the top, second, third, or bottom line. The messages entered via the configuration editor are numbered 1 through 160. To display a particular predefined message on the display, simply place that message's number in the message selection register.

For example, lets assume that we have defined message #16 as "Mary had a little .." , message #22 as "white fleeced lamb", message #25 as "Everywhere Mary went", and message #26 as "the lamb went also". If we wanted to put these four messages on the top, second, third and bottom lines of the display respectively, we would simply need to put the number 16 in register M, the number 22 in register M+1, the number 25 in register M+2 and the number 26 in register M+3.

If any number other than 1 to 160 is placed in a message selection register, the associated line will not change.

Placing Numeric Data in the Display

Certain predefined messages may incorporate a numeric data field. One numeric field per line is allowed. Messages that contain data are entered through the configuration editor with a caret symbol "^" as a place holder for each numeric digit.

An example of the use of numeric data is the message "#Widgets sold: ^^^^". Assume that this is message # 36 entered through the configuration editor. Also assume that a total of 465 widgets have been sold today. To display the current number of widgets sold on the second line of the display, you would place `36` in register M+1 and `465` in register M+6. The second line of the display would then read "#Widgets sold: 465".

Displaying Data with a Decimal Point

The OM640 panel allows you to display fixed point numbers. Fixed point numbers are numeric values that have a known decimal point placement and are simply handled as integer values within the PLC program. The only time you use an actual decimal point is for display to the operator. An example of a fixed point number is a program that uses temperature as a control variable. Within the program, all temperatures are scaled in tenths of a degree. The values are integer. A temperature of 73.5 degrees would be 735 in a data register. For the convenience of the operator, you would want the display to include the decimal.

Fixed point numbers are handled by simply placing a decimal point or period in the message field during configuration. In other words, the message " Temperature : ^^^.^" would be entered during configuration (say message 47). If 47 were placed in register M and the value 735 in register M+4, the display would read "Temperature : 73.5" on the top line.

Displaying BCD and Binary Numbers

Normally, numeric values to be displayed are values contained in one 16 bit register. One 16 bit register will handle values between 0 and 65535 (in binary format), or 0 to 9999 (in BCD format). For these type numbers, register M+4 is used for numeric value for the top line, register M+6 is used for the second line, register M+8 is used for the third line and register M+10 is used for the bottom line.

Displaying "Double" Numbers

The OM640 will handle larger numeric numbers. If you select the option "BCD double" when the display message is being defined, your display will handle numbers between 0 and 99,999,999. The OM640 will use data in the register pair M+4 and M+5 for the top line. Likewise, M+6 and M+7 are used for the second line, M+8 and M+9 are used for the third line and M+10 and M+11 are used for the bottom line. The data must be in BCD format.

When placing a "BCD double" number in the display registers, the first register numerically in the sequence of two registers (M+4, M+6, M+8 or M+10) will contain the 4 least significant digits of the number. The second register in the sequence (M+5, M+7, M+9 or M+11) contains the data for the 4 most significant digits of the "BCD double" number.

If the data displayed on the third line of the panel is 46378345, the third line data registers will contain the following: (shown in BCD/Hex format)

BCD Double Data	PLC Register
M+8	8345
M+9	4637

Displaying Floating Point Numbers

The OM640 has the capability to display Floating Point (or Real) numbers if you select the option "Floating Point" when the display message is being defined in the OM-WINEDIT software.

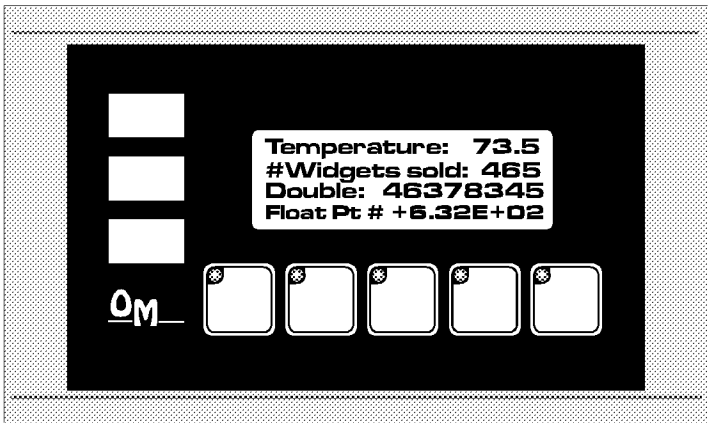
Floating point numbers can only be used with the PLC Direct DL250, DL350 and DL450 CPUs or a microprocessor based system using the OptiMate Hex Protocol since they are the only compatible devices that support the IEEE 32-bit floating point number format. The floating point numbers are stored in the IEEE 32-bit floating point format within the PLC. They always occupy 2 16-bit register locations regardless of the size of the number. Refer to the PLC manufacturer's programming documentation for more information on the IEEE 32-bit floating point number format.

An IEEE 32-bit floating point number has a range of -3.402823E+38 to +3.402823E+38. The OM640 will be able to display any number within that range. The panel always uses the format ±X.XXE±XX display the numbers.

The panel does not have the ability to display all the significant digits of a floating point number, it only displays the first 3 significant digits. The OM640 does not "round" the numbers up or down, instead it truncates the remaining digits so you always see the true number. The two examples in the table below show the data contained in the PLC registers and the value displayed on the panel in its format. Notice how the data is truncated, not rounded.

PLC Registers	OM640 Display
12301.789	+1.23E+04
123.96783	+1.24E+02

The configuration of a floating point number message is similar to any other message. First you select the message number, then you type in the text using 9 caret symbols "^" as a place holder for each of the 9 floating point number



symbols. Next, select the "Floating Point" option for the data format.

Suppose you wanted to configure message #58 to display a floating point number. In the OM-WINEDIT software you would select OM640 as module type. Then to configure message #58 simply select it with the mouse and type in a message in the following manner "Float Pt # ^^^^^^^^^" . Also, select floating point as the message format. To display a number, simply move it into either the top, second, third or bottom line data registers and load the appropriate message number into the corresponding top, second, third or bottom line message selection register. If the number 632.15 is to be displayed in message #58 on the bottom line, it will be displayed as the following: "Float Pt # +6.32E+02".

Function Buttons

The OM640 contains five user definable pushbuttons. These pushbuttons can be custom labeled and used for any purpose.

The pushbuttons can be individually configured as either alternate action or momentary pushbuttons. Alternate action buttons alternate state each time they are pressed. Momentary buttons are active only while they are being pressed.

The status register holds the current state of each of the five pushbuttons. In a typical PLC application, these pushbuttons would be mapped to control contacts for easy ladder logic interface.

Indicator Lamps

Three general purpose indicator lamps are located to the left of the LCD Display. These lamps can be custom labeled and used for any purpose.

There are two control bits for each lamp in the control register. One bit controls whether the lamp is on or off. The other bit controls whether the lamp is flashing. The lamp must be turned on in order for the corresponding flash bit to flash the lamp on and off.

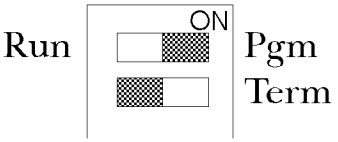
In a typical PLC application, these bits would be mapped to control coils for easy ladder logic interface.

Configuration

Configuration of the OM640 Terminal or system of OptiMate modules is performed via an IBM PC compatible computer with the Windows operating system. Optimation supplies OM-WINEDIT software that will allow you to select module configuration, system configuration and PLC protocol definition.

If the OM640 is to be operated stand alone with a PLC, the configuration selection must be made to select the proper PLC protocol information. If it is part of a multi-panel system, each panel must be configured under the multi-panel selection in OM-WINEDIT.

Note : When configuring, always remember to set Run/Pgm to Pgm (towards the "ON") before trying to download to the module.



Specific configuration of the OM640 begins with defining the block of PLC registers to be used. Next, each of the function buttons must be configured for either momentary or alternate action operation. Then each of the messages used by the PLC program must be defined.

Message definition is very straightforward and easily accomplished. All that is necessary is the following sequence.

- Select the message number to enter.
- Type the message. Up to 20 characters are allowed. Any unused characters will be filled with blanks. One numeric field per message may be defined with caret `^` characters. One decimal point or colon may be placed within the field.

Examples of Use with a PLC Direct PLC

Register Usage

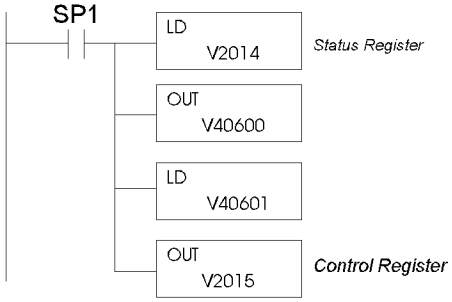
The OptiMate OM-WINEDIT software allows you to configure a module to use a block of registers at a starting value that you define. For a PLC Direct DL105, DL205, DL350 or DL405 PLC the recommended memory to use is the general purpose data words starting at V2000 and V4000. For the 305 family, except for the DL350, the recommended memory is the registers beginning at R400. Any block of registers within the data word range can be used.

The first twelve PLC registers in the block used by the OM640 panel are used for numeric information. As such they are ideally suited for the general purpose data registers (V2000 and V4000 area for the DL105/DL205/DL350/DL405 and R400 range for the 305). The last two registers use individual bits for control and status. These registers are better suited for the control relay register range of memory. The solution to this minor conflict is to define the base register address in general purpose data register memory and place a rung in your PLC program to copy the last two registers to/from control relay registers (see the example below).

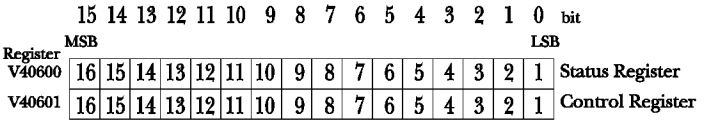
The following table lists the control relay register addresses for the various PLC Direct PLCs.

PLC Direct CPU	Control Relay Register address assignment
DL130	V40500-V40617
DL230	V40600-V40617
DL240	V40600-V40617
DL250	V40600-V40617
DL330	R016-R037
DL330P	R016-R017 and R020-R027
DL340	R016-R037 and R100-R106
DL350	V40600-V40617
DL430	V40600-V40635
DL440	V40600-V40677
DL450	V40600-V40777

The examples on the following pages use an OM640 connected to a PLC Direct DL105/DL205/DL350/DL405 series PLC. The OM640 is configured for a base address of V2000. The following program rung should be placed in the program to copy the status register to V40600 and copy from V40601 to the control register.



With this rung placed in the PLC program, the status and control bits will be control relays. The register association is shown in the figure below.

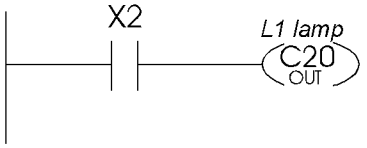


This will result in the following control relay association for the status and control registers.

Status Register			Control Register	
bit	relay		bit	relay
F1	C0		L1	C20
F2	C1		L2	C21
F3	C2		L3	C22
F4	C3		L1F	C23
F5	C4		L2F	C24
			L3F	C25
			BD	C26

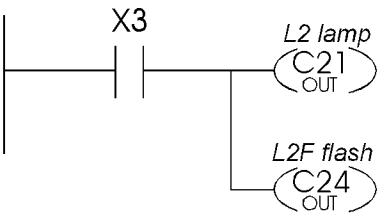
Lighting a Lamp

Lighting a lamp simply requires activating the control relay associated with the lamp. The following example will light the first lamp when input X2 is active (Remember to place the register copy rung described previously in the program).



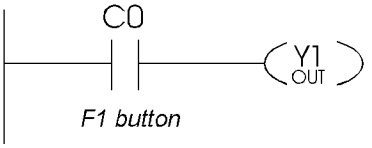
Flashing a Lamp

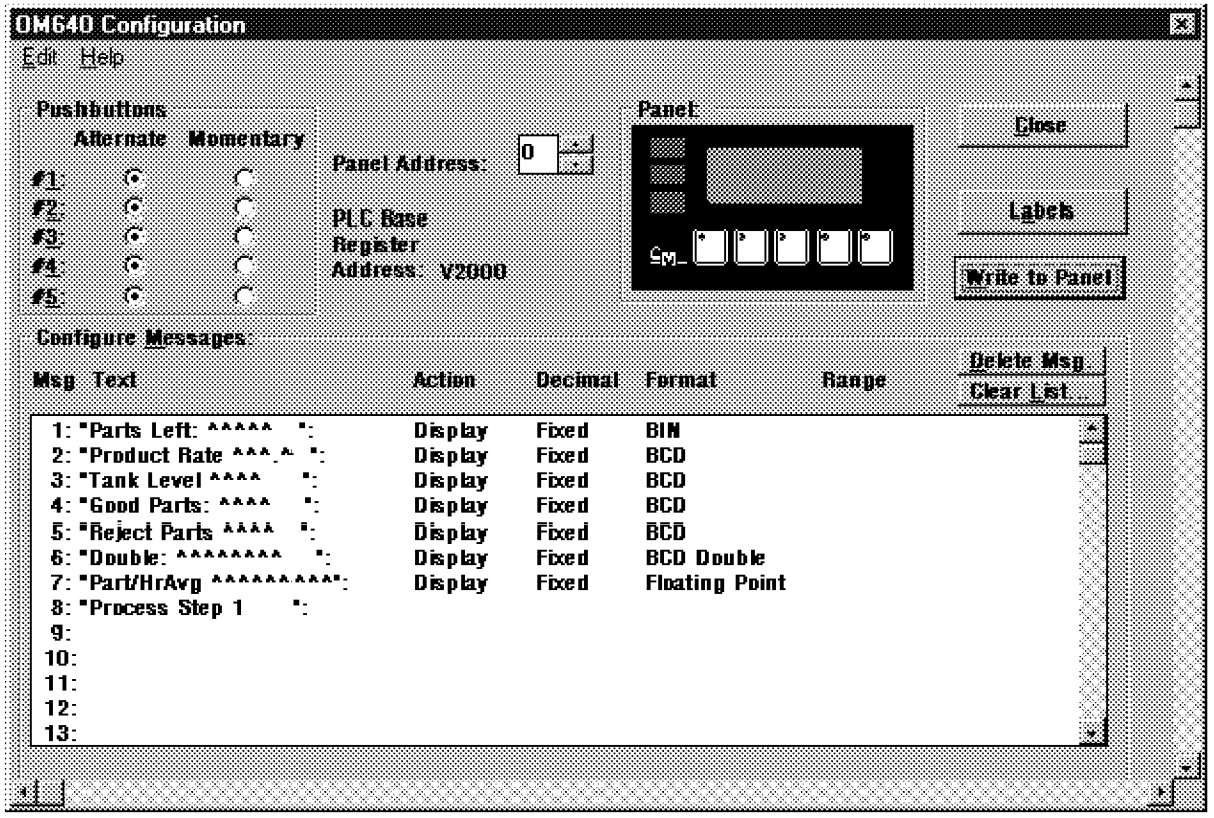
Flashing a lamp simply requires activating the lamp control relay (to turn the lamp on) and the flash control relay. The following example will flash the second lamp when input X3 is active.



Using a Function Button

The five function buttons below the LCD display will appear as control relay coils in your program (assuming the register copy rung described previously is in your program). The example on the right turns on output Y1 when button F1 is active.

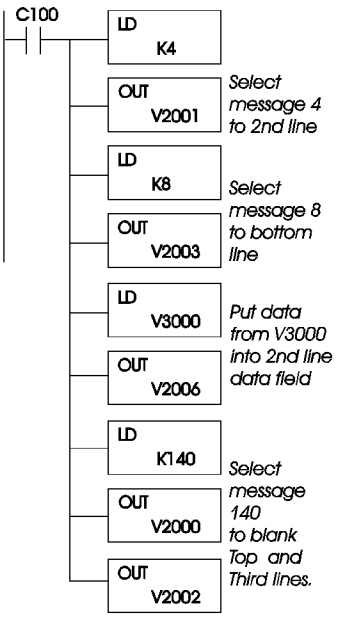


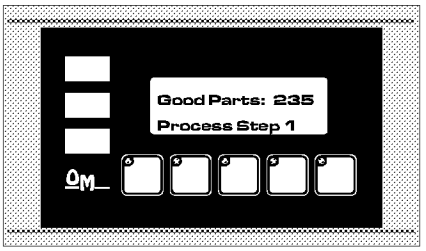


Displaying Messages on the LCD Display

Messages of various types can be configured via OM-WINEDIT and downloaded to the OM640. The message definitions shown in the figure above will be used in all of the examples that follow. Also, assume that message #140 consists of all blanks " ".

The following example shows a couple of messages being displayed to the LCD display as long as C100 is active. The second line uses BCD message #4. The data for the second line data field is coming from V3000. The bottom line is text message #8. The top and third lines use data display message #140, which has been configured as a blank text message.

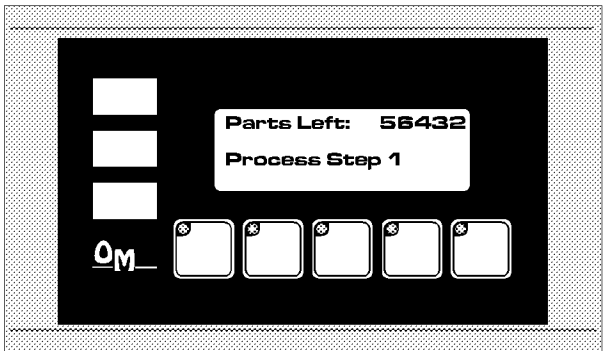


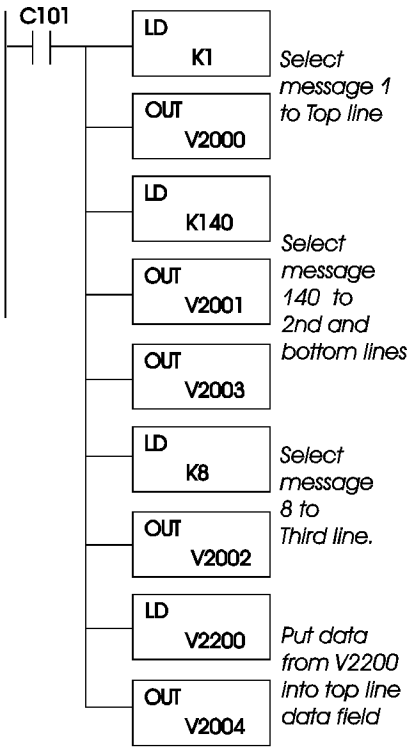


V2000	Top line message selection
V2001	Second line message selection
V2002	Third line message selection
V2003	Bottom line message selection
V2004	Top line data
V2005	Top line data 2 (for long BCD & floating point)
V2006	Second line data
V2007	Second line data 2 (for long BCD & floating point)
V2010	Third line data
V2011	Third line data 2 (for long BCD & floating point)
V2012	Bottom line data
V2013	Bottom line data 2 (for long BCD & floating point)

Displaying Binary Numbers

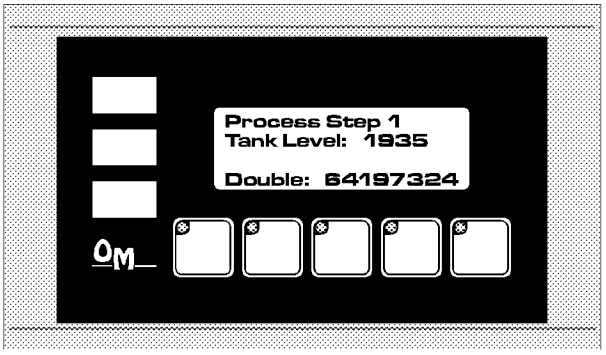
The example shown on the right is similar to the last example. The primary difference is that it uses a Binary number in the top line display. The top line uses data display message #1, which has been configured as a Binary display message. The data for the top line data field is coming from V2200. The third line is text message #8. The second and bottom lines use message #140 which has been configured as a blank text message.

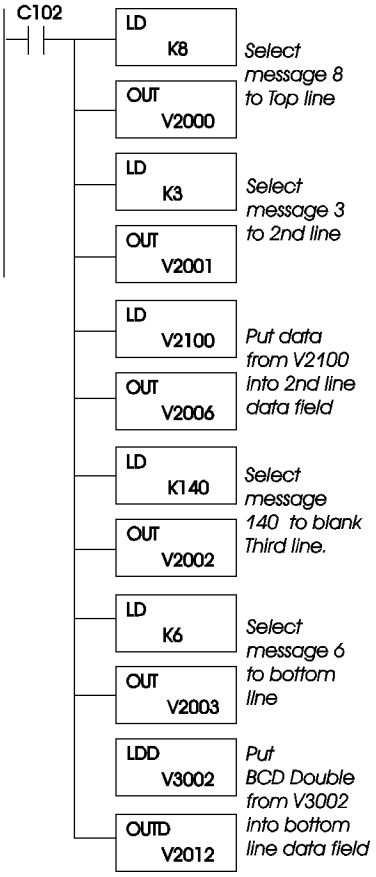




Displaying BCD Double Numbers

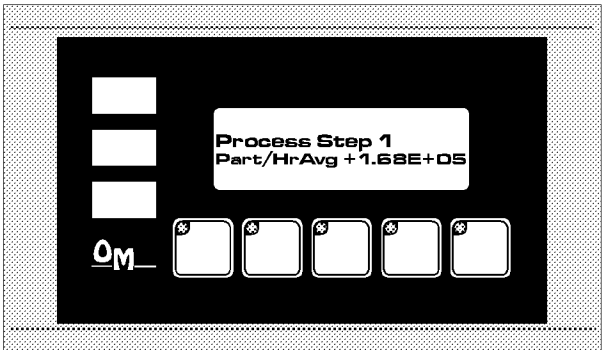
The example shown on the right shows a BCD double number in the bottom line display. The bottom line uses data display message #6, which has been configured as a BCD double display message. The data for the bottom line data field is coming from V3002 and V3003. The top line is text message #8. The second line displays message #3. The data for second line BCD message comes from register V2100. The third line uses message #140 which has been configured as a blank text message.

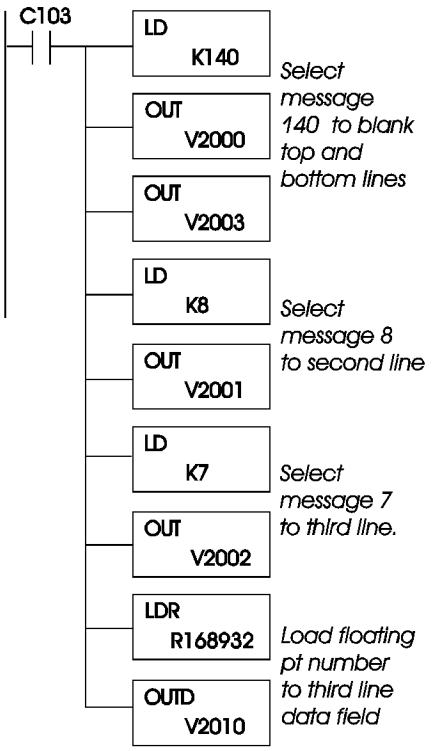




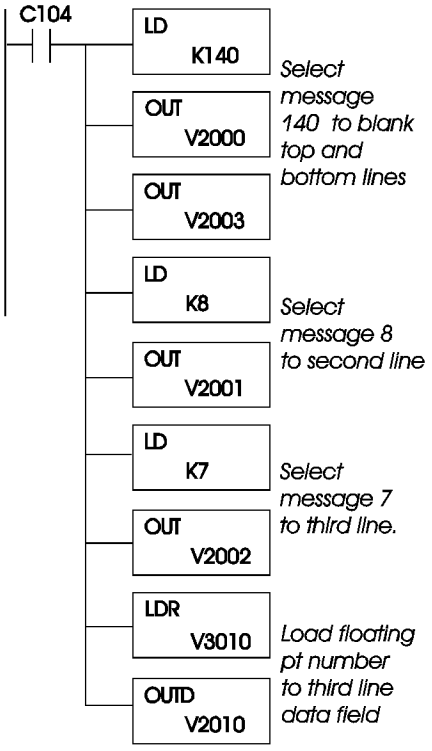
Displaying Floating Point Numbers

The example shown on the right is similar to the previous example. The primary difference is that it uses a floating point number in the third line display message. The third line uses data display message #7, which has been configured as a floating point display message. Since the data is a floating point number, it uses two 16-bit registers. The two registers have to be looked at together, not individually, for you to be able to make any sense of the data. In this example, the data, a constant number (168932), is loaded into the third line data display registers V2010 and V2011 using the LDR (load real number) instruction. The top and bottom lines use message #140 which has been configured as a blank text message. The second line uses message #8, a text message.





The example shown on the right is similar to the previous example. The primary difference is that it gets its value from two PLC registers instead of a constant value as the previous example did. The third line uses data display message #7, which has been configured as a floating point display message. Since the data is a floating point number, it uses two 16-bit registers. The two registers have to be looked at together, not individually, for you to be able to make any sense of the data. In this example, the data is loaded from V3010 and V3011 using the LDR (load real number) instruction to the third line display registers V2010 and V2011. The top and bottom lines use message #140 which has been configured as a blank text message. The second line uses message #8, a text message.



Examples of Use with an Allen-Bradley PLC

Interfacing to A-B Memory

OptiMate panels interface to Allen-Bradley SLC 5/03, SLC 5/04 and Micrologix PLCs via integer file type N. The 5/03 and 5/04 have file type N7 as standard. Other "N" type files can be created. The Micrologix has a fixed file type N7. Please refer to Allen-Bradley documentation for information on setting up and using "N" type files.

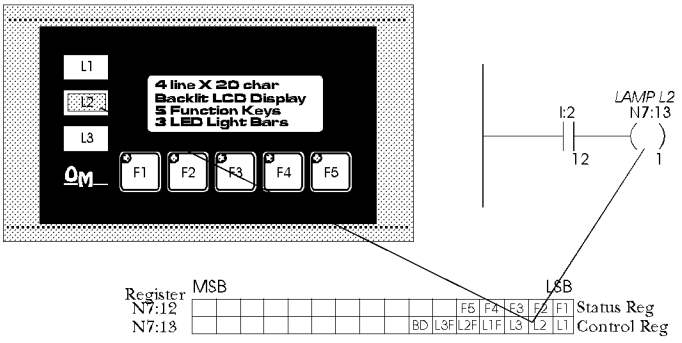
Note: When using an OM640 with an A-B PLC, always ensure that at least 14 words of memory are allocated to ensure proper communications.

All of the examples that follow assume that the OM640 module has been configured, through the OM-WINEDIT Editor, for a file type N7 and base register address 0. With this configuration, the status and control registers will be at N7:12 and N7:13 respectively. The following is a table relating status and control register bits to their N7 locations.

Status Register			Control Register	
bit	location		bit	location
F1	N7:12/0		L1	N7:13/0
F2	N7:12/1		L2	N7:13/1
F3	N7:12/2		L3	N7:13/2
F4	N7:12/3		L1F	N7:13/3
F5	N7:12/4		L2F	N7:13/4
			L3F	N7:13/5
			BD	N7:13/6

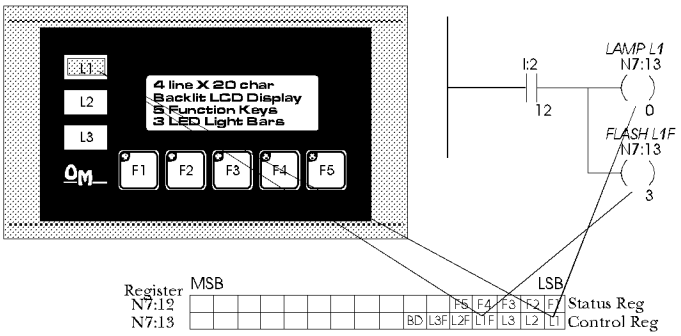
Lighting a Lamp

Lighting a lamp simply requires activating the control relay associated with the lamp. The following example will light the second lamp when input I:2/12 is active.



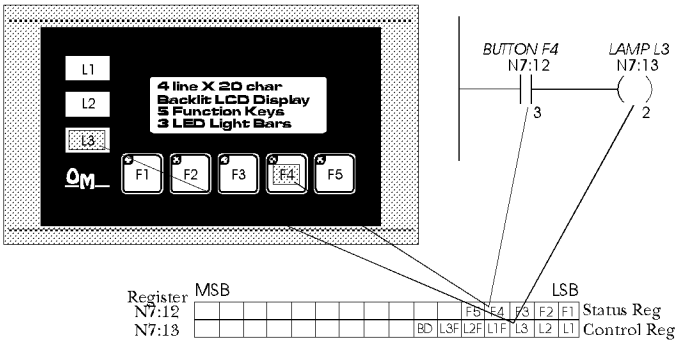
Flashing a Lamp

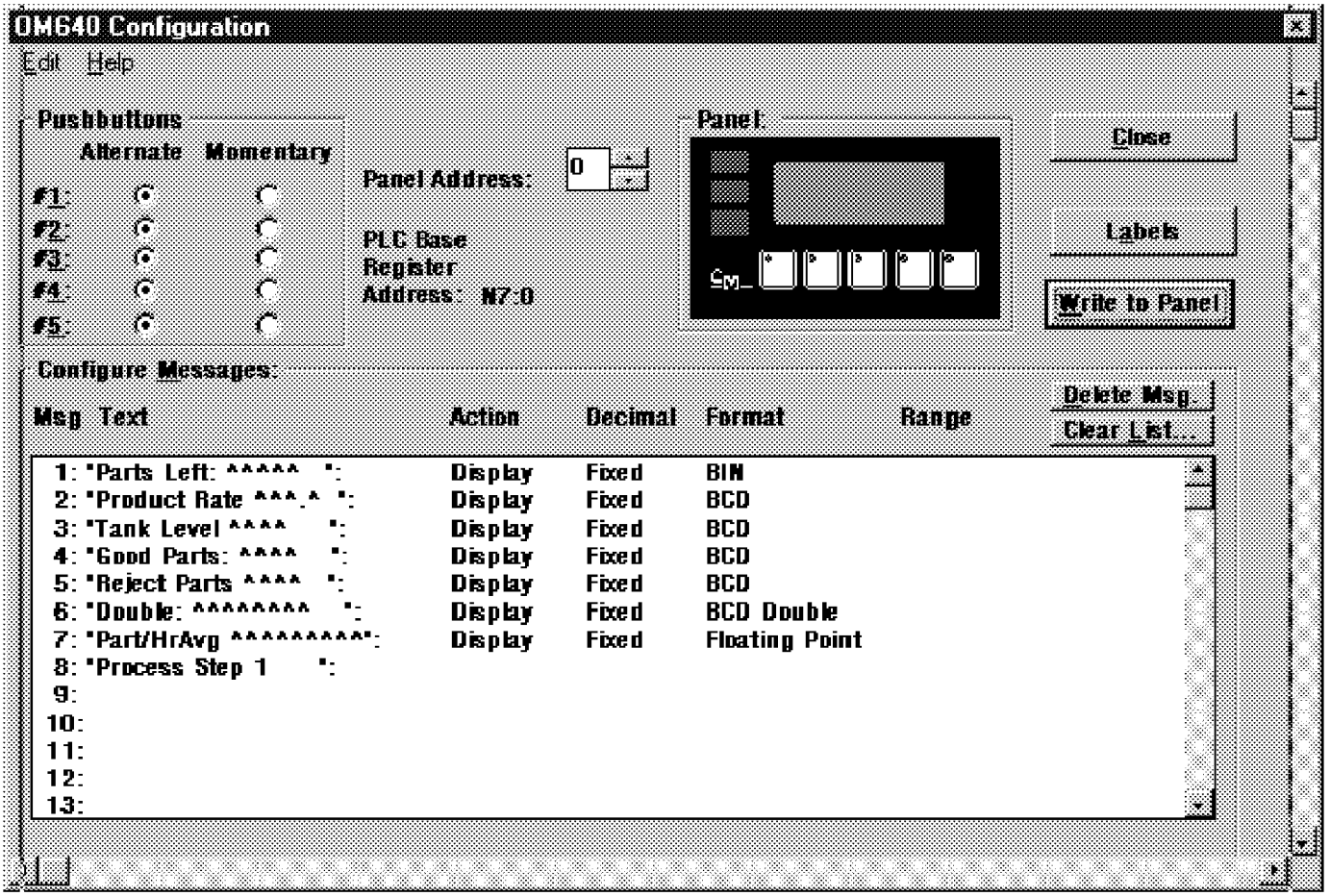
Flashing a lamp simply requires activating the control relay to turn the lamp on and the flash control relay. The following example will flash the first lamp when input I:2/12 is active.



Using a Function Button

The five function buttons below the LCD display will appear as control relay coils in your program. The following example turns on lamp 3 (N7:13/2) when button F4 (N7:12/3) is active.

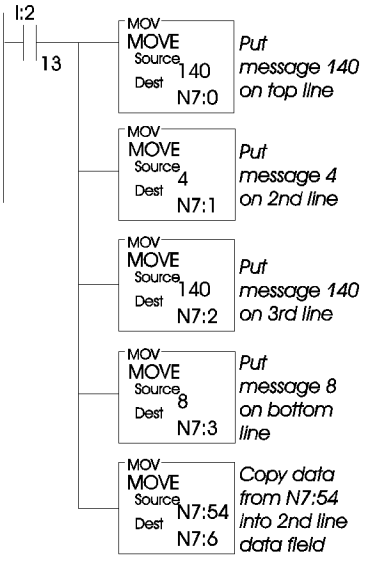


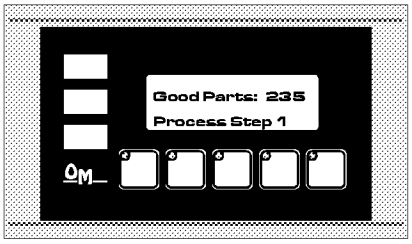


Displaying Messages on the LCD Display

Messages of various types can be configured via OM-WINEDIT and downloaded to the OM640. The message definitions shown in the figure above will be used in all of the examples that follow. Also assume that message #140 consists of all blank characters, " ".

The example on the right shows a couple of messages being displayed to the LCD display as long as I:2/13 is active. The second line uses BCD message #4. The data for the second line data field is coming from N7:54. The bottom line is text message #8. The top and third lines use data display message #140, which has been configured as a blank text message.





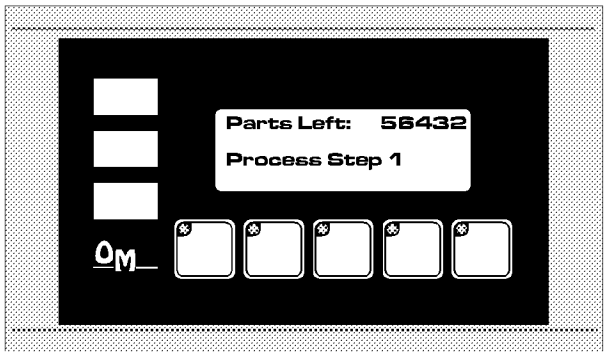
N7:0	Top line message selection
N7:1	Second line message selection
N7:2	Third line message selection
N7:3	Bottom line message selection
N7:4	Top line data
N7:5	Top line data 2 (for long BCD & floating point)
N7:6	Second line data
N7:7	Second line data 2 (for long BCD & floating point)
N7:8	Third line data
N7:9	Third line data 2 (for long BCD & floating point)
N7:10	Bottom line data
N7:11	Bottom line data 2 (for long BCD & floating point)

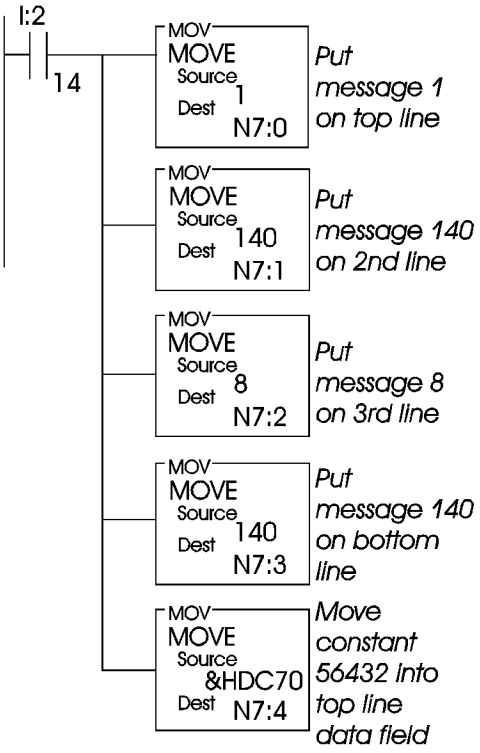
Displaying Floating Point Numbers

Floating point numbers can be displayed by the OM640. This number format is a standard capability for PLC Direct DL250, DL350 and DL450 PLCs. However, the A-B SLC PLCs do not have a means of handling floating point numbers. Due to the limitations of the SLC, this capability will not be commonly implemented with A-B PLCs.

Displaying Binary Numbers

The example shown on the right is similar to the last example. The primary difference is that it uses a Binary number in the top line display. The top line uses data display message #1, which has been configured as a Binary display message. The data for the top line data field is a constant number, 56432 (DC70 Hex) . The third line is text message #8. The second and bottom lines use message #140 which has been configured as a blank text message.

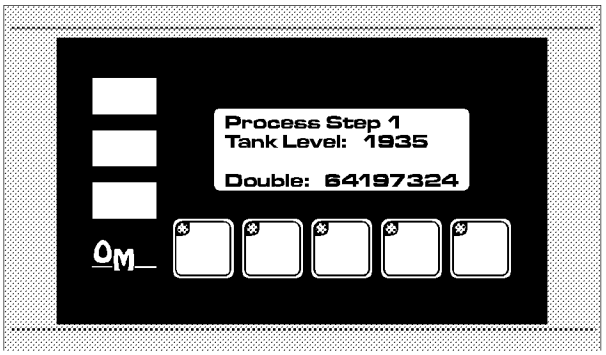


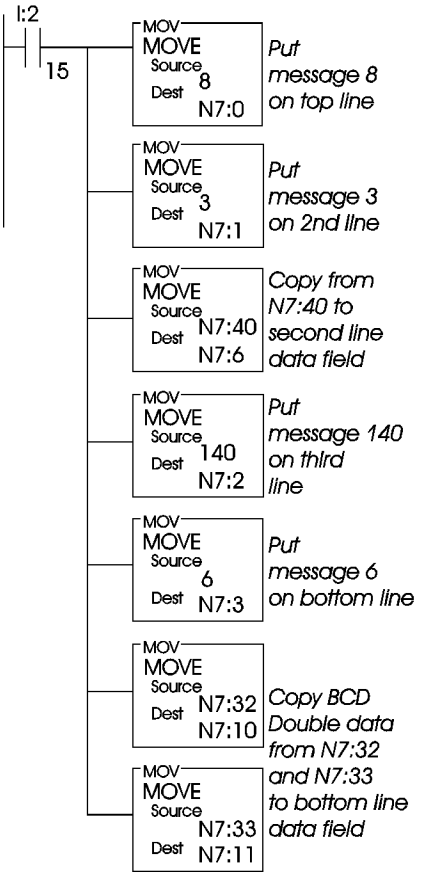


Displaying BCD Double Numbers

Long BCD numbers (up to 8 digit) can be displayed by the OM640. This number format is a standard capability for PLC Direct PLCs. However, the A-B SLC PLCs do not have an easy means of handling long BCD numbers. Due to the limitations of the SLC, this capability will not be commonly implemented.

The example shown on the right shows a BCD double number in the bottom line display. The bottom line uses data display message #6, which has been configured as a BCD double display message. The data for the bottom line data field is coming from N7:32 and N7:33. The top line is text message #8. The second line displays message #3. The data for second line BCD message comes from register N7:40. The third line uses message #140 which has been configured as a blank text message.





Use in a Microprocessor Based System

OptiMate modules can interface a microprocessor based controller over a serial link. This link can be either RS232 (for point to point) or RS422 (for multidrop or point to point). In either case the microprocessor acts as the master. It can write data to the panel or read data from the panel.

The OM640 uses the OptiMate Hex protocol for fast and easy communications. The OptiMate Hex protocol is defined in subsequent pages.

Module Address

In a microprocessor system, each panel must have its own unique address. You define this address (between 0 and 30) using the configuration editor. The panel will respond to the host only if it is properly addressed.

Communications Protocol

To use an OptiMate panel as a slave device in a microprocessor based system, the panel must be configured for the OptiMate Hex protocol. The other options that must be set are module address, baud rate, parity and number of stop bits. If parity is set to even or odd, only one stop bit is allowed. Once selected, it must be downloaded to the panel.

Computer Based Operation

The OM640 protocol for computer based operations is the OptiMate Hex protocol.

All of the basic functionality described for PLC operation is also available to computer or microprocessor based applications.

The following is a synopsis of the OM640 operation as it relates to computer based applications. In certain cases, more detail is provided under the same topic for PLC operation. The details of messages involved are covered in the protocol documentation which follows.

Displaying Messages on the LCD Display

Under computer based operation, the OM640 can be instructed to display predefined messages. Selection of a predefined message simply requires transmitting the proper command (0xA1), the message number, the appropriate line, and initial display data.

To display messages using the "Send data display message", the message text (in the ASCII equivalent) and data must be sent along with the command to send the message (0xA6), the line number, displayed data type and initial display data.

Placing Numeric Data in the Display

Any message containing caret `^` place holders will allow either the display of numeric data or numeric data entry.

Numeric data for the numeric data field can be transmitted by the host computer. This is done by transmitting the proper command (0xA7), the line number, and the data in a message field.

Indicator Lights and Function Buttons

The OM640 contains 3 general purpose indicator light bars located to the left of the LCD display. These lights can be custom labeled and used for any purpose. The computer or microcontroller can control the lights individually by turning them ON/OFF and controlling the flash state.

It also contains five user definable function buttons. These buttons can be custom labeled and used for any purpose.

The buttons can be individually configured as either alternate action or momentary pushbuttons. Alternate action buttons alternate state each time they are pressed. Momentary buttons are active only while they are being pressed.

The General Status/Control message (0xA0) will control the current condition to each indicator light bar and the OM640 will respond with the current state of each of the five buttons.

Note: All OptiMate Hex Protocol messages must be transmitted to the OM640 in the hexadecimal number format.

OM640 OptiMate Hex Protocol

General format

STX Module address function ftn_data checksum

Where STX = 0x02
Module address = 0 to 30
function = 0xA0 ; General status/control
0xA1 ; Select predefined message display
0xA7 ; Send data for data display message
0xA9 ; Display status request
ftn_data = data specific to the function
checksum = 8 bit sum of all characters after address until checksum

Note : Spaces are shown for readability only. There are no spaces between message fields.
0xXX denotes hexadecimal numbers.

General status/control

STX Module Address 0xA0 control checksum

where control = control bits
bit 0 : Lamp 1 on (1)/off (0)
bit 1 : Lamp 2 on (1)/off (0)
bit 2 : Lamp 3 on (1)/off (0)
bit 3 : Lamp 1 flash on (1)/off (0)
bit 4 : Lamp 2 flash on (1)/off (0)
bit 5 : Lamp 3 flash on (1)/off (0)
bit 6 : Buzzer Disable on (1)/off (0)

response

STX term_stat display_stat checksum *if message received and processed OK*

where term_stat = terminal status
bits 0 - 4 : Button status for function buttons 1 to 5 respectively
1 = button active, 0 = button inactive
display_stat = display status (= 1 if displayed message is a display data message)
bit 0 : top line display status
bit 1 : second line display status
bit 2 : third line display status
bit 3 : bottom line display status

or

NAK if any errors

Where NAK = 0x15

Select Predefined Message

STX Module Address 0xA1 line mesg_no data checksum

where line = top (0x00), second (0x01), third (0x02) or bottom (0x03) line
mesg_no = number of the predefined (through the configuration editor) message
(1 - 160, hex integer, i.e. 33 = 0x21)
data = 4 bytes. The format depends on the message type selected
> For an integer type data message, the first two bytes are not used (send as 0's). The Third byte is the high 8 bits of the 16 bit integer data. The fourth byte is the low 8 bits.
> For BCD data type message, the data is sent MSByte through LSByte. For a long BCD Data type message, all 4 bytes (8 digits) are used. For a regular BCD message, only the last two bytes are used.
> For floating point data format, data sent in IEEE 32-bit floating point format, MSB first.
- Used as display data for numeric data display message.
- Ignored for all other message types.

response

ACK *if message received and processed OK*

Where ACK = 0x15

or

NAK *if any errors in message*

Send data display message

STX Module 0xA6 line_type text data checksum
Address
where line_type = line number and data type
bits 0,1 = line number
Top line = 0x00
Second line = 0x01
Third line = 0x02
Bottom line = 0x03
bits 2,3 =unused
bits 4,5 = data type
Binary (integer) = 0x00
BCD = 0x01
BCD Double = 0x02
Floating Point = 0x03
bits 6,7 =unused
text = 20 characters of ASCII text: message including caret characters for numeric display Data placeholders.
Example: STX 0x02 0xA6 0x23 BCD Double ^^^^^^^^ 0x43 0x62 0x78 0x59 0x??(checksum)
will display "BCD Double 43627859 " on the bottom line of the display.
data = 4 bytes. The format depends on the message type selected
> For an integer type data message, the first two bytes are not used (send as 0's). The Third byte is the high 8 bits of the 16 bit integer data. The fourth byte is the low 8 bits.
> For BCD data type message, the data is sent MSByte through LSByte. For a long BCD Data type message, all 4 bytes (8 digits) are used. For a regular BCD message, only the last two bytes are used, the first two bytes are not used (send as 0's).
> For floating point data format, data sent in IEEE 32-bit floating point format, MSB first.

response
ACK *if message received and processed OK*
or
NAK *if any errors in message*

Send data for data display message

STX Module 0xA7 line data checksum
Address
where line = top (0x00), second (0x01), third (0x02) or bottom (0x03) line
data = 4 bytes. The format depends on the message type selected
> For an integer type data message, the first two bytes are not used (send as 0's). The Third byte is the high 8 bits of the 16 bit integer data. The fourth byte is the low 8 bits.
> For BCD data type message, the data is sent MSByte through LSByte. For a long BCD Data type message, all 4 bytes (8 digits) are used. For a regular BCD message, only the last two bytes are used.
> For floating point data format, data sent in IEEE 32-bit floating point format, MSB first.

response
ACK *if message received and processed OK*
or
NAK *if any errors in message*

Display status request

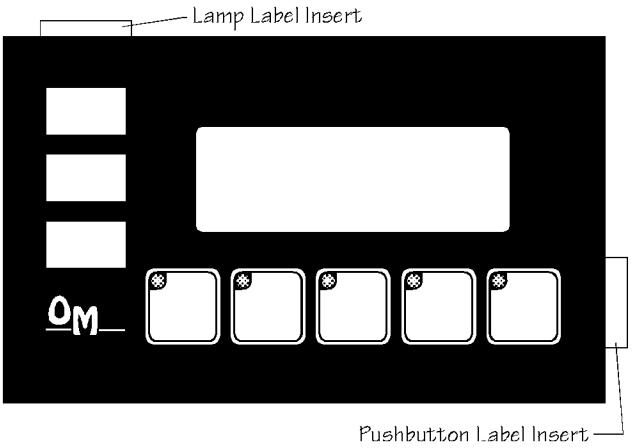
STX Module 0xA9 checksum
Address

response
STX top_line_msg line2_msg line3_msg bot_line_msg checksum *if message received and processed OK*
where top_line_msg = last predefined message selected for top line
line2_msg = last predefined message selected for second line
line3_msg = last predefined message selected for third line
bot_line_msg = last predefined message selected for bottom line

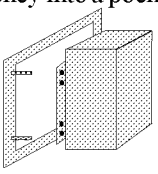
or
NAK *if any errors in message*

Set Up and Interconnect

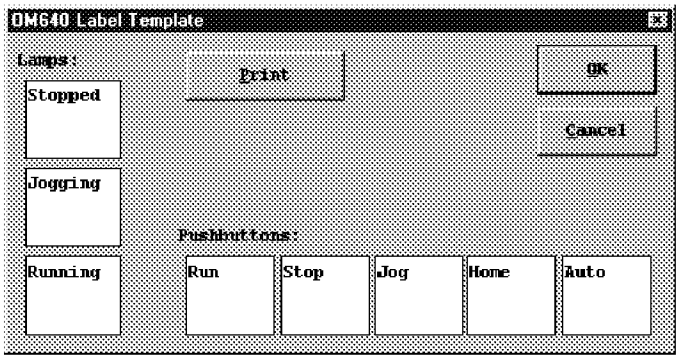
Legending the Indicator Lamps and Function Keys



Legending the OM640 panel is a relatively simple process that basically involves sliding a label transparency into a pocket in the panel overlay. Use the following procedure.



- Remove the bezel from the panel. The bezel snaps to the panel box along the top and bottom edges. Pull the bezel out and over the snaps to remove.
- Create legend transparencies. There are a number of available options for doing so. Patterns are provided on the next to last sheet of this document.
  - > Use the built in label making capability of the OM-WINEDIT software to create labels. Either print on the transparency directly or print on paper and photocopy onto the transparency. The figure below is a screen from OM-WINEDIT which illustrates the process.



Other options include the following

- > Uses a computer graphics program and a laser printer to create the transparency directly. Alternately print on paper and photocopy to a transparency
- > Use press on letters onto a transparency sheet.
- > Use a typewriter, lettering machine or press on letters to letter onto paper, then photocopy.

- Cut along outline. Slide into overlay pocket. Pushbutton legend slides in from the right. Lamp legend slides in from the top.
- Re-attach bezel. Push bezel onto box until the four snaps snap in place.

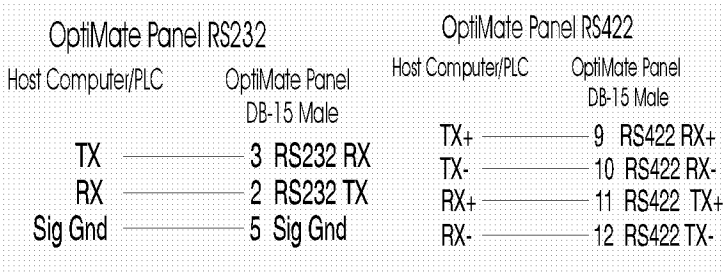
Connection to the System

OptiMate panels are designed for communication connection to system devices. The panel can be connected to a computer, PLC or communication master over the serial port (RS232 or RS422).

Connection to a Computer or PLC

Connection of an OptiMate panel to a computer or PLC can be accomplished over either an RS232 or RS422 link. RS232 is limited to one OptiMate module to one computer serial port. RS422 allows up to 31 modules to be connected to one computer port. Since PLCs are slave devices, the RS422 link for a PLC is limited to one OptiMate module.

Refer to manufacturer's documentation for PLC or computer serial link connector pinouts.



Interface cables for connection to several different PLCs as well as to IBM PCAT compatible ports are available.

Serial Connection to OP-9001 Communications Master

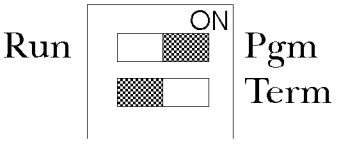
Connection to an OP-9001 Communications Master over a serial link is via RS422. The Communication Master port connections are reversed from the panel ports to enable direct pin to pin connection. For distances under 50 feet (in a low electrical noise environment), a ribbon cable connection works quite well. For longer distances or in noisy environments, a two pair shielded RS422 cable is recommended. We recommend Belden 9729 or equivalent cable.

When using a two pair shielded cable such as Belden 9729, always tie the cable shield to earth ground at only a single location, not multiple points.

When using multiple power supplies, always tie the power supply DC commons (or DC grounds) together (to a common point) to ensure that the grounds for each power supply will not "float" at different levels.

Termination

The termination DIP switch on the back of the panel switches in a terminating resistor. This terminating resistor does not apply to an RS232 connection (and should be in the OFF position for RS232). In a RS422 connected system, such as with the OP-9001 Communication Master, the termination DIP switch should be ON in the last, and only the last, panel on the cable.



Power

OptiMate modules can operate on any voltage between 8 and 30 VDC. Power must be connected to the terminal plug located on the back of the module.

There is a brief (0.5 to 2 millisecond) power on surge to 1.9 amps. This is typical of nearly any type of electronic equipment and is due to the initial charging of power capacitors. This surge is not normally a problem for a commercial power supply.

Configuration

Configuration Selections

OptiMate panels can be configured for the specific application by using the OM-WINEDIT Configuration Editor. The OM-WINEDIT Editor runs on any IBM PC compatible computer with Windows. It allows the user to select the exact functionality to meet application requirements.

For the OM640 module, the following are important configuration parameters.

Microprocessor Based Systems

Decision	Selection
Single/Multi Module	Choose Single module even if the system will contain several modules. The Multi module selection applies only to systems using a communications master. In computer based systems, each module is configured independently.
Configuration starting point	First time configuration, start with defaults for module. Subsequent configurations can utilize disk files you create.
PLC Type	Select OptiMate Hex
Address	Each module must have a unique address.
Protocol	Select appropriate baud rate, 8 data bits, #stop bits & parity. Note that if even or odd parity selected, only 1 stop bit is available.
Messages	Define messages as required for application

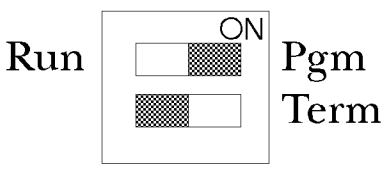
Single Module PLC Based Systems

Decision	Selection
Single/ Multi Module	Choose single panel configuration
Configuration starting point	First time configuration start with defaults for the panel. Subsequent configurations can utilize disk files you create
PLC Type	Select appropriate PLC type
Protocol	Select PLC address, PLC timeout, appropriate baud rate, # data bits, # stop bits & parity. Note that if 8 data bits and even or odd parity selected, only 1 stop bit is available
Buttons	Select momentary or alternate action as required for your application
Messages	Define messages as required for application

Multi Module PLC Applications (Uses OP-9001 Communications Master)

Decision	Selection
Single/Multi Module	Chose Multi module
PLC Type	This applies to the Communications master. Choose appropriate type
Protocol	This applies to the OP-9001 Communications master. Choose PLC address, PLC timeout, appropriate baud rate,# stop bits, # data bits, & parity. Note that if 8 data bits and even or odd parity are selected, only 1 stop bit is available.
Address	Each panel must have a unique address
Panel Protocol	The OM-WINEDIT software will automatically select the OptiMate Hex protocol for communications between the OM-9001 and the panel. (This is all transparent to the user)
Buttons	Select momentary or alternate action as required for your application
Messages	Define messages as required for your application.

Configuration must be downloaded from the IBM PC compatible to each panel. This is done over the serial link. Panel must be selected for "Pgm" (DIP switch in back of the module) for it to accept configuration data. After the download to the panel is complete, wait a few seconds before switching the DIP switch from "Pgm" to "Run" The DIP switch must be in "Run" for the module to operate with the selected host.



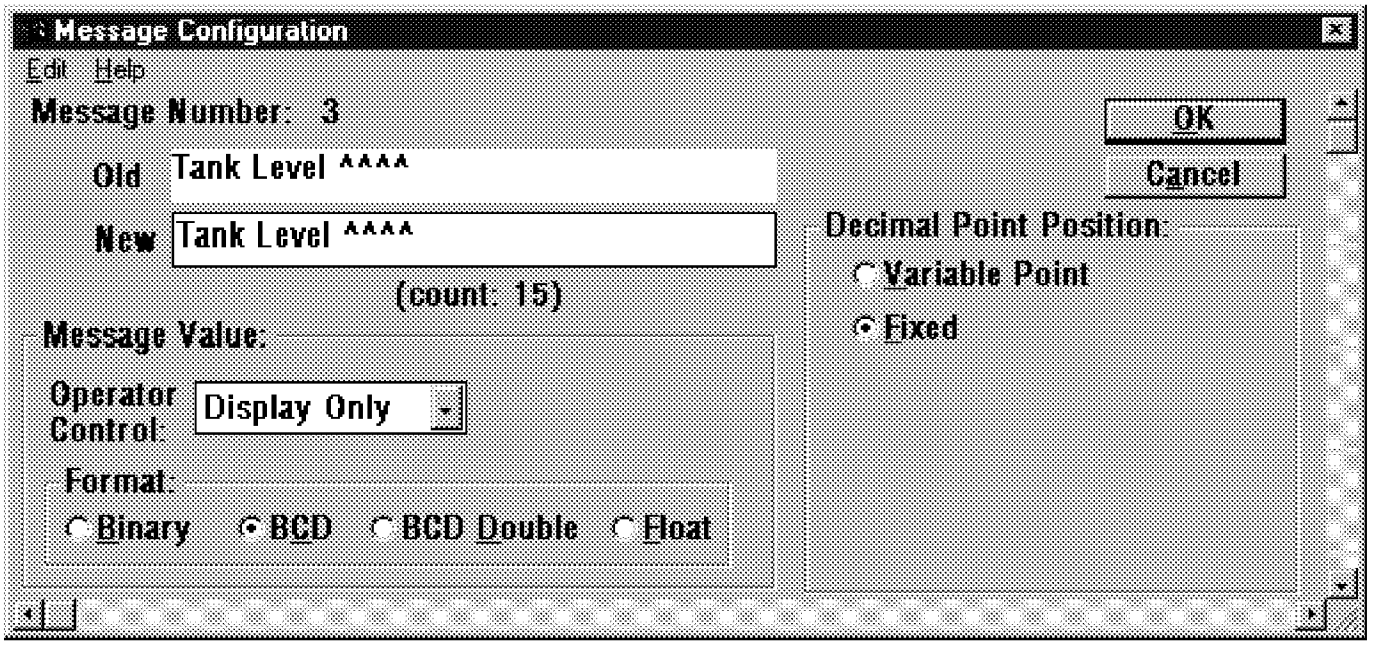
Creating Messages

The figure on right the illustrates the process of creating messages for your program to use. The first step involves simply using a message template to define, on paper, each of the messages. We suggest copying the template page and using it to define all of your messages.

The next step is to use the OM-WINEDIT editor to enter the messages as defined. Remember to use carets wherever variable data is to be used. The OM-WINEDIT editor will guide you through other definable parameters, including data type, message type, etcetera, as shown below.

Message #	Text (20Characters Max.)
1	Enter Setpoint: ^^^^
2	Product Rate: ^^^.^
3	Shift Target: ^^^.^

Example Message Definitions

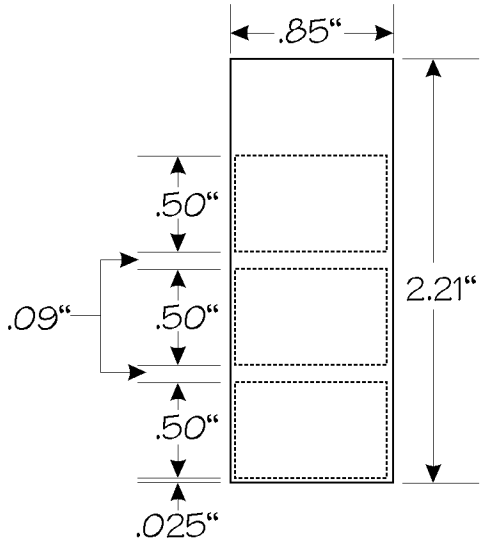


Message Definition Template

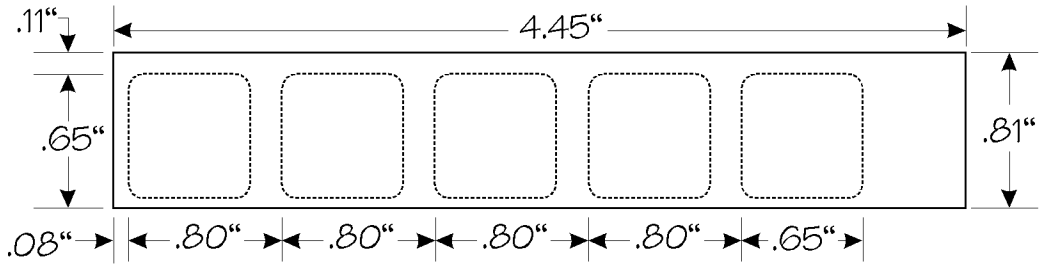
Message #	Text (20Characters Max.)

Message Definition Template

Label Templates



Indicator Lamp Label Strip Pattern

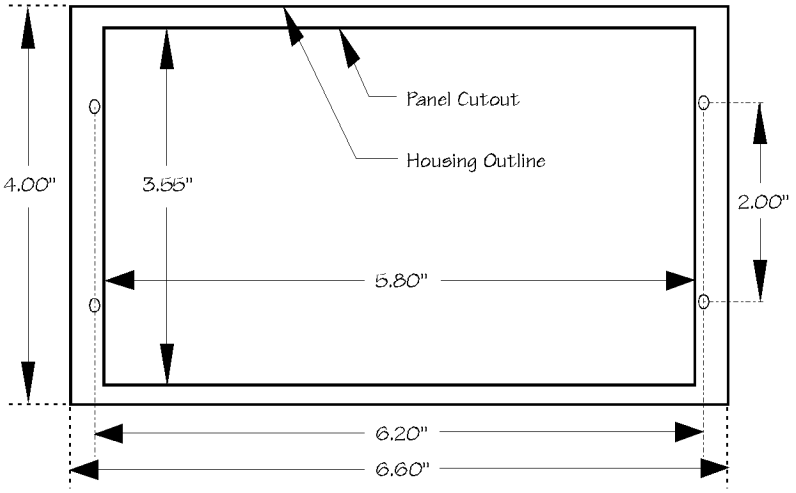


Pushbutton Label Strip Pattern

Specifications

Physical

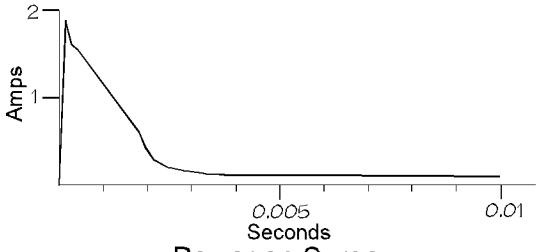
- Recessed Mount Housing 6.6"Lx4.0"H x 1.25"D
- Cutout size for above 3.55"Hx5.80"L
- Panel Fasteners : Four, 6x32 threaded studs, shown above (on ends, symmetrical about center line)
- Weight : 12 ounces
- Colors : Dark gray housing with dark gray panel. Keypad keys; White with user supplied label.
- LCD Display : 4 line x 20 character STN with LED backlight character size : 4.75mm high x 2.95mm wide
- Lamp Colors Available: Red, Yellow, Green
- Lamp Window Size: .7" X .4"



Panel Mounting Dimensions

Electrical

- Power : 8 - 30VDC @ 2.04Watts
  170mA @ 12VDC 85mA @ 24VDC
- Power on surge (see figure below)
  1.9A for 2 milliseconds maximum



Power on Surge

- Power connector : Pluggable terminal block, 2 position

Communications

- RS232 and RS422
- 4800 to 19200 baud
- Compatible with major PLC protocols
- Microprocessor compatible OptiMate Hex protocol
- 15 pin female 'D' shell connector

Communications Failure Operation

Should the panel (when not selected for configuration) ever fail to communicate successfully for a period of 12 seconds, the 3 indicator lamps and the LEDs inset in the corner of the 5 buttons will all simultaneously flash at a rapid rate.

Environmental

- Enclosure - NEMA 4 (when properly installed)
- Temperature - 0 to 50 C
- Humidity - 95% non-condensing

Message Types (160 user defined messages available)

- General Text message
- Data display message (one data value per line)

Numeric Types & Values

- Integer
- Fixed Point
- BCD (Values between 0 & 9999; with appropriate decimal placement)
- BCD Double (Values between 0 & 99999999 with appropriate decimal placement)
- Binary (Values between 0 & 65535 with appropriate decimal placement)
- Floating Point (Values between -3.402823E+38 to +3.402823E+38 in the format of ±X.XE±XX)