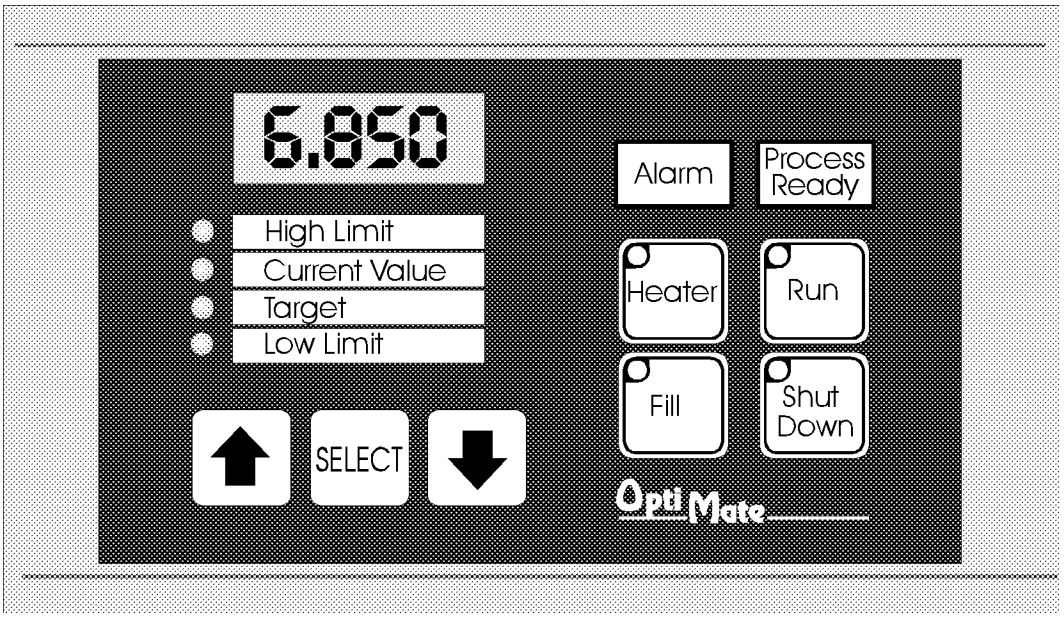


OM613 Operator Panel

The OM613 Operator Panel is a low cost/high performance man/machine interface with a broad range of operator input and display capabilities. The panel includes four field points which can be used for either setpoint entry or data display, four pushbuttons and two large indicator lamps.

The four digit numeric LED display is associated with four field points. The user can select which field point to project on the display by use of the SELECT button. The LEDs adjacent to the user defined field point labels highlight which field point is active. Once selected, the display will either show the related data or project the current setpoint value.

Setpoint adjusment can be performed by use of the arrow keys to move the value up or down. Once set, the value is saved into non-volatile memory. It is permanently stored, whether power remains on or not, until the next time it is changed by the operator.

Lamps and buttons can be custom labeled by the user with plastic inserts. The inserts can be custom legended with text and/or graphics, and slip into a protective pocket behind the faceplate.

The OM613 Operator Terminal is part of Optimation's **OptiMate**® series. Each OptiMate module is designed to connect to a microprocessor or most PLC's with a single cable connection. OptiMate panels can be used individually, or together with any combination of other OptiMate panels.

When used with a microprocessor system, simple communications over either an RS232 or RS422 communications cable allows the microprocessor to directly control the lights and numeric display as well as read numeric data entry and pushbutton status.

When used with a PLC, operation is transparent to the user. Panel functions tie directly into your PLC ladder logic program. The OM613 takes care of the rest.

Applications

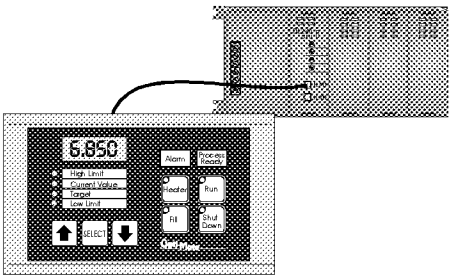
- Machine control
- Process control
- Security systems
- HVAC
- Plant monitoring/control
- PLC applications
- Microprocessor applications

Features

- Setpoints or display points
- Four digit numeric display
- Two large LED light bars
- Four tactile snap membrane function buttons
- Buttons independently configurable for momentary or alternate action operation
- PLC compatible
- RS232/RS422 communications
- Stand alone operation capable
- Multipanel operation capable

Contents

Configuration Options

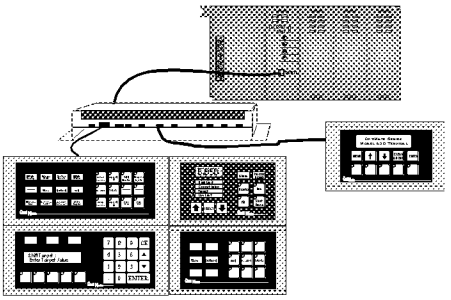


PLC Stand Alone

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

The OM613 operator panel uses a bank of PLC registers. Complete operator interface is performed with 8 PLC registers for data entry and display, function key interface and indicator light control. The OM613 continuously accesses these PLC registers and 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.



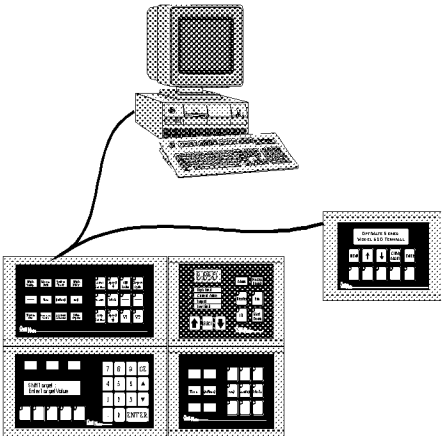
PLC Multi Panels

Larger systems involving operator panels can be successfully addressed using OptiMate panels. These applications utilize the OM9001 Communications Master to transfer data between the PLC and the individual OptiMate panels. OptiMate panels can be located together to form custom panels or they can be distributed anywhere within 4000 feet.

The OM9001 Communications Master provides a transparent interface between the PLC and a group of OptiMate modules. The communication interface between panels requires only four wires.

System configuration is simple via an interactive configuration program that runs on any IBM PC compatible computer.

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



Microprocessor Based Systems

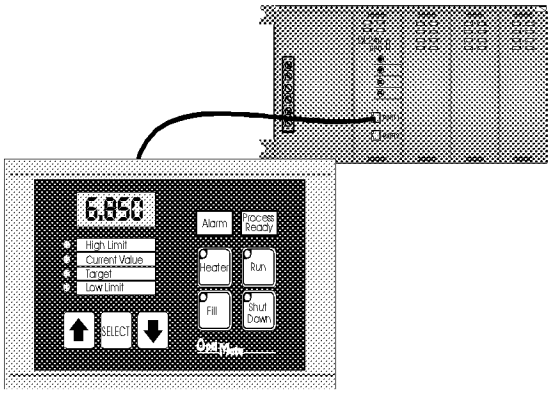
OptiMate panels can interface directly to most computers or microcontrollers. The panels communicate over either RS422 or RS232 serial communications. All that is required to interface OptiMate panels is a serial port. The OptiMate Hex protocol, detailed in this document, allows the user to directly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

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

In a microprocessor based system, the host microprocessor is the system master. The OptiMate panels are slave devices that respond to commands from the host. In the case of the OM613, these commands are messages for data display, lamp control, setpoint retrieval and function button status.

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

Use with a PLC



Register	MSB															LSB	
X		L2F	L1F		B4F	B3F	B2F	B1F		L2	L1		B4	B3	B2	B1	Indicator Light/LED On/Off/Flash
X+1													B4	B3	B2	B1	Button On/Off Status
X+2	Field Point 1 data cell																
X+3	Field Point 2 data cell																
X+4	Field Point 3 data cell																
X+5	Field Point 4 data cell																
X+6	Field Point force data cell																
X+7	FSP			FP4	FP3	FP2	FP1				F1	F2	F3	B4	B3	B2	B1	Force Commands

Register Bit Association

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 the specific OptiMate panel is mapped, this data can be moved, changed or monitored using ladder logic.

The term PLC register is used for the area of memory within the programmable controller used for data exchange with the OM613. PLC registers are sometimes know 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 OM613 Terminal Panel uses a bank of 8 contiguous PLC registers. The register set definition is shown in the table below.

OM613 Panel PLC Register Map	
PLC Register	**Register Function**
X (first register of bank)	Lamp and inset LED control
X+1	Function button status
X+2	Field point 1 data cell
X+3	Field point 2 data cell
X+4	Field point 3 data cell
X+5	Field point 4 data cell
X+6	Field point force data cell
X+7	Force control

Register Definition

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

- Register X - Control outputs for the 2 indicator lamps and, it LED separation is selected, the inset LEDs in the momentary pushbuttons.
- Register X+1 - Button status for the four function buttons.
- Register X+2 - Field point 1 data (either setpoint input or display output, as configured)
- Register X+3 - Field point 2 data.
- Register X+4 - Field point 3 data.
- Register X+5 - Field point 4 data
- Register X+6 - Force data. Value to force setpoint equal to when force operation is initiated by the PLC program.
- Register X+7 - Force control. This register controls the forcing of setpoints or button state. The most significant bits of this register control setpoint force. The least significant control pushbutton force.
  - > FSP - When active, the Field point force data (X+6) will be forced into the field points set to be forced (FP1-FP4). Once the force operation takes place, the OM613 will automatically clear FSP.
  - > FP1-FP4 - Used to identify which setpoints must be forced.
  - > F1 - When set, all alternate action buttons B1-B4 will be forced to the state (on or off) selected in the low 4 bits (B1-B4) of this register. Once the force operation takes place, the OM613 will automatically clear F1.
  - > F2 - When set, all alternate action buttons matching the bits set in B1-B4 of this register will be forced on. Once the force operation takes place, the OM613 will automatically clear F2.
  - > F3 - When set, all alternate action buttons matching the bits set in B1-B4 of this register will be forced off. Once the force operation takes place, the OM613 will automatically clear F3.

Operational Overview

Reading a Setpoint

Setpoint data is continuously and transparently written to the associated PLC register. To access and use the setpoint data, simply reference the relavent PLC register (X+2 through X+5) in your PLC program.

Writing a Display Point

Writing a display value simply requires writing data into the associated PLC register. The OM613 will automatically retrieve and display the data.

Forcing a Setpoint

There are times when it is necessary for the PLC program to initialize or override a setpoint. The capability to do so is provided as the Force Setpoint function.

To force a setpoint to a given value, the value should be placed in register X+6. Next the bit(s) corresponding to the setpoint(s) to be forced and the FSP bit must be set. When the OM613 panel has forced the setpoint to the required value, it will clear register X+7.

Reading Pushbutton Status

Once the panel is configured and connected to the PLC, reading a button's status simply entails reading the appropriate register bit. In typical applications, a pushbutton appears in PLC ladder logic as a contact. The register bit association is shown in the table on the previous page. The OptiMate panel will automatically place status into this register. A 1 (or contact closed) indicates active or "on" condition.

Turning on a Lamp

When configured for PLC operation, turning on a lamp simply requires the writing of a 1 to the appropriate register bit. With most PLCs this is accomplished by activating a coil in the PLCs ladder logic. The OptiMate panel will automatically retrieve the register data and light any lamps whose bits are set.

A lamp must be turned on in order for the flash control bits to have any effect.

Flashing an Inset LED

As shown in the table, the second register will initiate lamp flash. To flash a lamp, the lamp must be on and lamp flash bit must be set.

Lamp flash is approximately .5 seconds on and .25 seconds off.

Turning on the Inset Indicator Light

In most cases, the LED inset in each button simply provides a visual indication of the status of the button. However, if a module is configured for LED separation mode, a momentary button's indicator light can be set directly from the PLC. In LED separation mode, turning on a lamp simply requires the writing of a 1 to the appropriate register bit. The register bit association is shown in the table on the previous page. The OptiMate panel will automatically retrieve the register data and light any lamps whose bits are set.

LED separation is available only for momentary pushbuttons.

Flashing an Inset LED

As shown in the table, the fourth register will initiate inset LED flash. To flash an LED, the LED must be on and LED flash bit must be set. In normal mode, LED "on" status simply reflects pushbutton status. In LED separation mode, LED "on" status is set directly via PLC register bits.

Lamp flash is approximately .5 seconds on and .25 seconds off.

Button Force Commands

If the OM613 panel is configured for force capability, the PLC can directly control button status when desired. This may be desirable for initialization purposes.

The force capability also may prove useful for functions initiated from the panel pushbuttons. For example, consider a situation where an operator initiates a control process by pressing an alternate action panel button. The button status and indicator light would stay on and lighted to indicate that the function is still in process. At the end of the process, the PLC program could force the button status off.

There are three types of force functions available. These are described below.

Force function	Description
F1 (Force buttons status)	When the F1 bit is set, all buttons will be forced to the status set in the force register (X+7) bits B1-B4. Once these buttons are forced to the status set, the OM613 will automatically clear register X+7.
F2 (Force buttons on)	When the F2 bit is set, all buttons matching the bits set in the force register (X+7) will be forced on. Once these buttons are forced on, the OM613 will automatically clear register X+7.
F3 (Clear buttons)	When the F3 bit is set, all buttons matching the bits set in the force register (X+7) will be forced off. Once these buttons are forced off, the OM613 will automatically clear register X+7.

Force obviously applies only to alternate action pushbuttons.

Examples of Use with a PLC Direct PLC

Register Usage

The OP-WINEDIT Configuration Editor allows you to configure a module to use a block of registers at a starting value that you define. For a PLC Direct 105, 205, 350 or 405 PLC the recommended memory to use is the general purpose data words starting at V2000 and V4000. For the 305 family, the recommended memory is the registers beginning at R400. Any block of registers within the data word range can be used.

The middle 5 PLC registers (X+2 thru X+6) in the block used by the OM613 panel are used for numeric information. As such they are ideally suited for the general purpose data registers (V2000 and V4000 area for the 105/205/350/405 and R400 range for the 305). The first two and last 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 first and last registers to/from control relay registers.

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

PLC Direct CPU	Control Relay Register address range
DL130	V40600-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

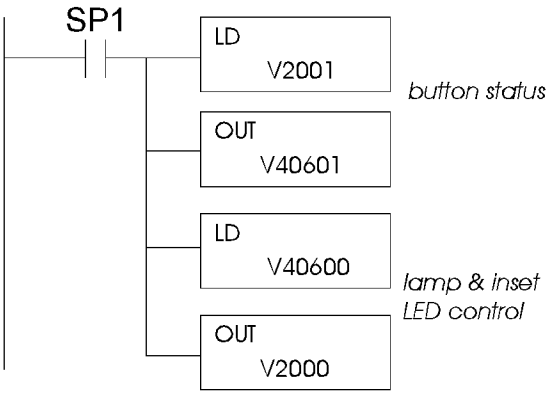
The examples on the following pages use an OM613 connected to a PLC Direct 105/205/405 series PLC. The OM613 is configured for a base address of V2000. **The program rung on the right should be placed in the program to copy the status register to V40600 and copy from V40601 to the control register**.

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

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	bit
	MSB															LSB	
Register V40600	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Lamp Control
V40601	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Button Status

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

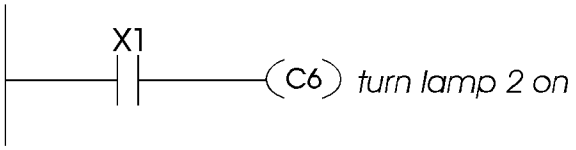
Lamp Control Register			Button Status Register	
bit	relay		bit	relay
B1	C0		B1	C20
B2	C1		B2	C21
B3	C2		B3	C22
B4	C3		B4	C23
L1	C5			
L2	C6			
B1F	C10			
B2F	C11			
B3F	C12			
B4F	C13			
L1F	C15			
L2F	C16			



Operations with Lights & Buttons

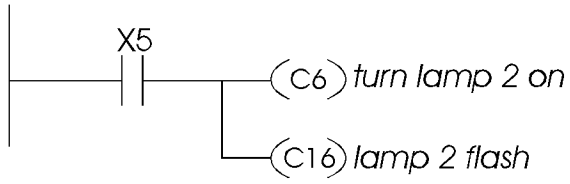
Turning on a Lamp

Turning on a lamp in the OM613 simply requires activating its associated control relay coil. In the figure below, lamp 2 will be turned on whenever input X1 is active (energizing C6).



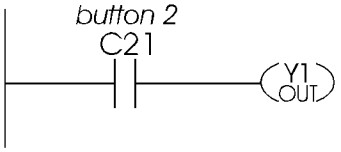
Flashing a Lamp

To flash a lamp, you simply need to both turn it on and set the associated flash bit. The example below shows a 105/205/350/405 program used to flash lamp 2 whenever X5 is energized.



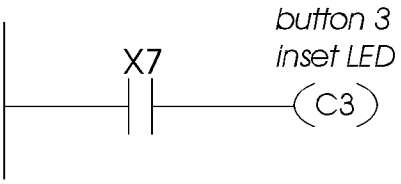
Using a Function Button

The four function buttons will appear as control relay coils in your program (assuming the register copy rung described previously is in your program). The following example turns on output Y1 when button B2 is active.



Lighting an Inset LED

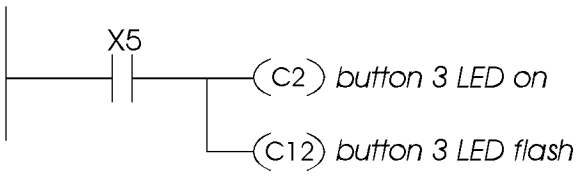
In LED separation mode, the LEDs in the corner of each momentary pushbutton may be directly controlled by the PLC program. The following example shows a segment of a 105/205/350/405 program that will light button 4's inset LED whenever input X7 is energized. *In order for this to work, the panel must be configured for LED separation and button 4 must be a momentary pushbutton.*



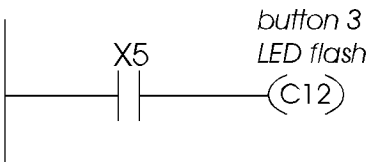
Flashing an Inset LED

To flash an inset LED, you simply need to both turn it on and set the associated flash bit. If the panel is not set up for LED separation, status is simply the button state. For momentary buttons with LED separation enabled, the on/off state is controlled by the PLC as shown in the previous example. For alternate action buttons, on/off state is always the button state.

The example below shows a 105/205/350/405 program used to set the LED inset in momentary button 3 to flash whenever X5 is



energized. If the panel has been configured with button 3 being an alternate action button, the LED will operate as shown in the example and table below.



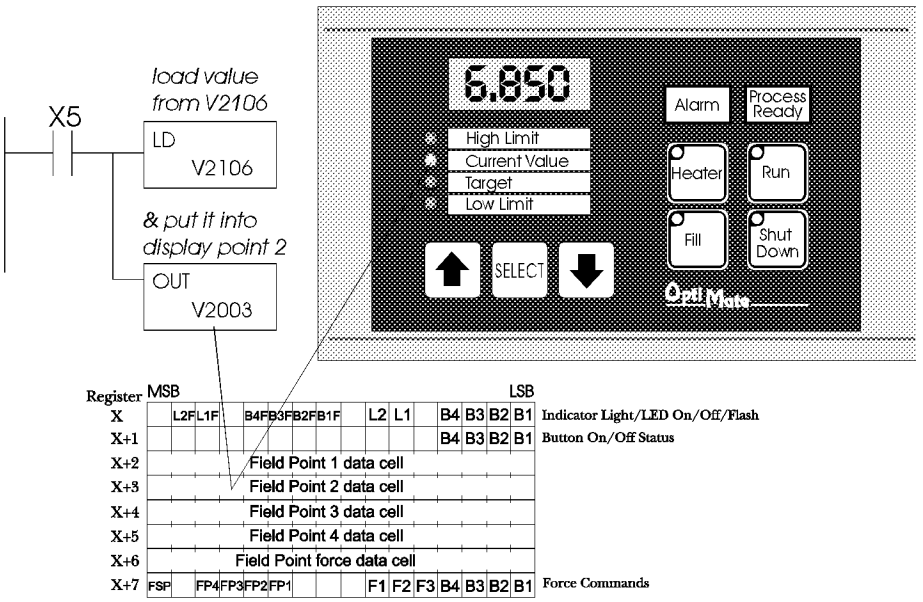
Button State	X5 State	LED operation
Inactive	de-energized	Off
Inactive	energized	Off
Active	de-energized	On solid
Active	energized	Flashing

Setpoint & Display Operations

Displaying Numeric Data

Displaying numeric data in one of the 4 field points is a very simple process. During the initial configuration, make sure you define the point as a display point, not a setpoint. When this is done, the PLC program must simply put data to be displayed into the register associated with the display data field.

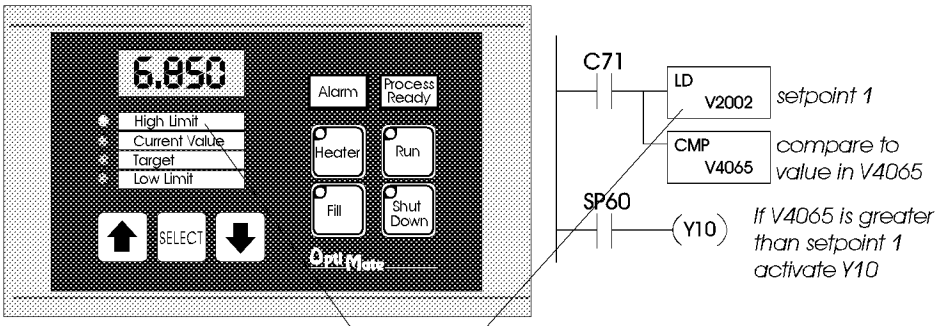
The figure below illustrates a numeric display application with a PLC Direct 105,205,350 or 405 series PLC. In this application, the OM613 is configured for a base address of 2000 and field point 2 for display. A value, held in V2106 must be displayed in field point 2 as long as X1 is active. The example shows the value transferred from V2106 to V2003. It will be displayed as field point 2.



Register	MSB														LSB	
X	L2F	L1F	B4F	B3F	B2F	B1F			L2	L1	B4	B3	B2	B1		Indicator Light/LED On/Off/Flash
X+1											B4	B3	B2	B1		Button On/Off Status
X+2	Field Point 1 data cell															
X+3	Field Point 2 data cell															
X+4	Field Point 3 data cell															
X+5	Field Point 4 data cell															
X+6	Field Point force data cell															
X+7	FSP		FP4	FP3	FP2	FP1			F1	F2	F3	B4	B3	B2	B1	Force Commands

Reading a Setpoint

The following example uses an OM613 at base address 2000. Field point 1 has been configured as a setpoint. In the example program, field point 1 is a High Limit setpoint. The program shown checks a value, held in V4065 against the setpoint whenever C71 is active. If the value exceeds the setpoint, Y10 will be turned on.



Register	MSB														LSB	
X	L2F	L1F	B4F	B3F	B2F	B1F			L2	L1	B4	B3	B2	B1		Indicator Light/LED On/Off/Flash
X+1											B4	B3	B2	B1		Button On/Off Status
X+2	Field Point 1 data cell															
X+3	Field Point 2 data cell															
X+4	Field Point 3 data cell															
X+5	Field Point 4 data cell															
X+6	Field Point force data cell															
X+7	FSP		FP4	FP3	FP2	FP1			F1	F2	F3	B4	B3	B2	B1	Force Commands

Using Force Functions

The OM613 gives you the ability to force alternate buttons to a given state and force setpoints to a given value. This capability may or may not be used on a given application. There are applications when it is desirable to have the PLC program automatically set or clear a button based on operational state. There are also cases when forcing a setpoint to a predetermined value is useful. Obviously, this capability should be used carefully.

The last two registers in the register bank are associated with force operations. Their use is detailed below.

Forcing Button Status

One of the more advanced capabilities of the OM613 panel is the ability to force button state from the PLC program. This may be desirable, for example, if an alternate action is used to start a function process. When it is pushed and while the function is active, the button will remain on. You may want the PLC program to clear the button at the end of the function process.

Another example is one of a system that has individual enable or on/off (alternate action) buttons for several different device. You may also have other buttons (probably momentary) that enable a group of these same devices. You may want your program to force on the device enable buttons when the group enable button is pressed.

There are many other cases where button force capability can be useful in a system.

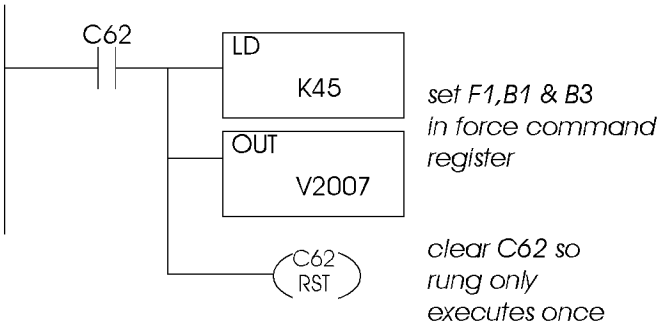
There are three types of force functions available for the OM613 panel - force status, force on and force off. All three functions require moving appropriate data into the PLC registers defined as Force Data & Commands (see the table described in "Use with a PLC").

Note : Force only applies to Alternate Action pushbuttons

Force Button Status

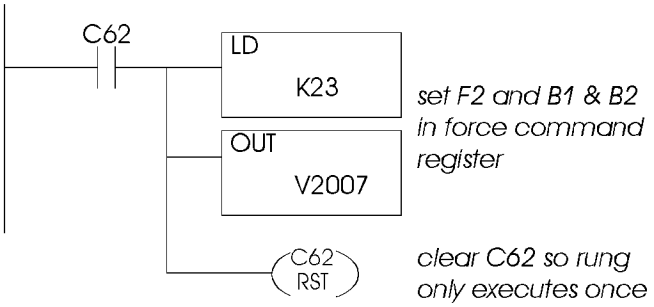
This function is used to set the state (on or off) of every alternate action pushbutton in the panel. To use the "Force Button Status" function, simply set the F1 bit to 1 and all buttons that you want to be on to 1, while leaving all other bits off. The example on the right shows buttons 1 and 4 being forced on and the other two buttons forced off when C62 is active.

Notice that C62 is used as a set/reset type relay. The force should be written to the force register once. The OM613 will automatically clear this register when the force is complete. This will normally happen very quickly (less than a second). The fact that the OM613 clears the force control register when the operation is done can be used by the PLC program to verify operation. However, this is generally not necessary.



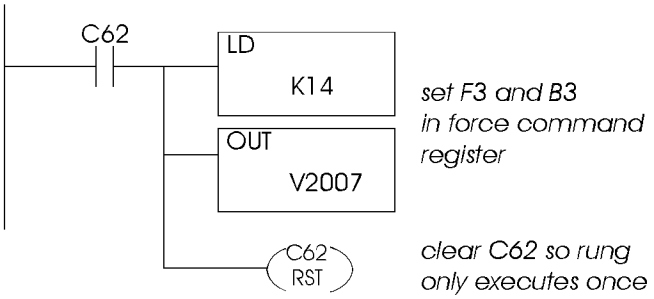
Force Button(s) On

This function is used to turn individual button(s) on without affecting the state of any other buttons. To use the "Force Buttons On" function, set the F2 bit to 1 and all buttons that you want to turn on to 1. Any buttons associated with bits that are left at '0' will not be affected. The following example shows buttons 1 and 2 being forced on when C62 is active.



Clear Button(s)

This function is used to selectively turn individual button(s) off without affecting the state of any other buttons. To use the "Clear Buttons" function, set the F3 bit to 1 and all buttons that you want to turn off to 1. Any buttons associated with bits that are left as '0' will not be affected. The example on the right shows button 4 being cleared when C62 is active.



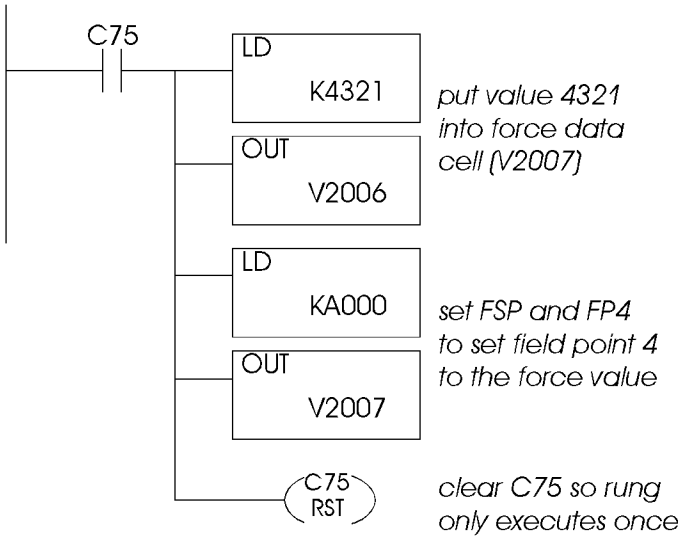
Forcing Setpoints

The OM613 gives you the capability to force a setpoint to a value from the PLC.

To force a setpoint to a value, the value should be placed in register X+6. Next the force setpoint bit FSP and the bit(s) corresponding to the setpoint(s) to force to this value must be set in the force control register (X+7). When the OM613 completes the force operation, it will clear the force control register.

The following example shows setpoint 4 being forced to 4321 when C75 is active.

Notice that C75 is used as a set/reset type relay. The force command should be written to the force register once. The OM613 will automatically clear this register when the force is complete. This will normally happen very quickly (less than a second). The fact that the OM613 clears the force control register when the operation is done can be used by the PLC program to verify operation. However, this is generally not necessary.



Examples of Use with an Allen Bradley PLC

Interfacing to A/B Memory

OptiMate modules 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 documentaion for information on setting up and using "N" type files.

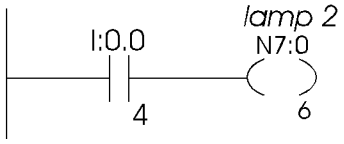
All of the examples that follow assume that the OM613 module has been configured, through the OptiMate Configuration Editor, for a file number 7 and base register address 0. With this configuration, the lamp control and button status registers will be at N7:0 and N7:1 respectively. The following is a table relating lamp control and button status register bits to their N7 locations.

Lamp Control Register			Control Register	
bit	location		bit	location
B1	N7:0/0		B1	N7:1/0
B2	N7:0/1		B2	N7:1/1
B3	N7:0/2		B3	N7:1/2
B4	N7:0/3		B4	N7:1/3
L1	N7:0/5			
L2	N7:0/6			
B1F	N7:0/8			
B2F	N7:0/9			
B3F	N7:0/10			
B4F	N7:0/11			
L1F	N7:0/13			
L2F	N7:0/14			

Operations with Lights & Buttons

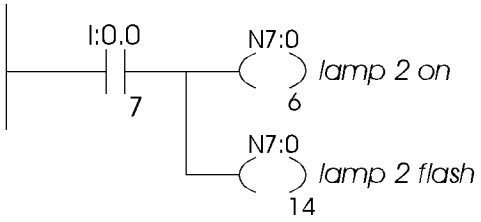
Turning on a Lamp

Turning on a lamp in the OM613 simply requires activating its associated control relay coil. In the figure below, lamp 2 will be turned on whenever input I:0.0/4 is active (energizing N7:0/6).



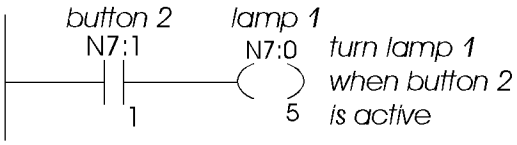
Flashing a Lamp

To flash a lamp, you simply need to both turn it on and set the associated flash bit. The example below shows a SLC program used to flash lamp 2 whenever I:0.0/7 is energized.



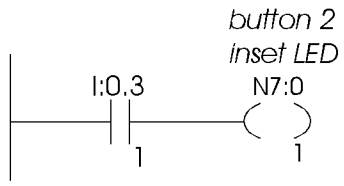
Using a Function Button

The four function buttons will appear as control relay coils in your program. The following example Turns on output Lamp 1 when button B2 is active.



Lighting an Inset LED

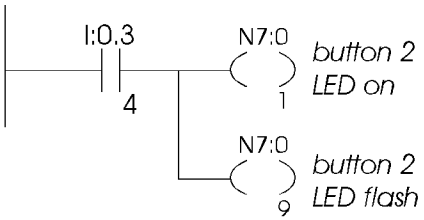
In LED separation mode, the LEDs in the corner of each momentary pushbutton may be directly controlled by the PLC program. The following example shows a segment of a 205/405 program that will light button 2's inset LED whenever input I:0.3/1 is energized. *In order for this to work, the panel must be configured for LED separation and button 2 must be a momentary pushbutton.*



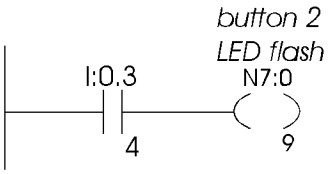
Flashing an Inset LED

To flash an inset LED, you simply need to both turn it on and set the associated flash bit. If the panel is not set up for LED separation, status is simply the button state. For momentary buttons with LED separation enabled, the on/off state is controlled by the PLC as shown in the previous example. For alternate action buttons, on/off state is always the button state.

The example below shows an A/B program used to set the LED inset in momentary button 2 to flash whenever input



I:0.3/4 is energized. If the panel has been configured with button 2 being an alternate action button, the LED will operate as shown in the example and table below.



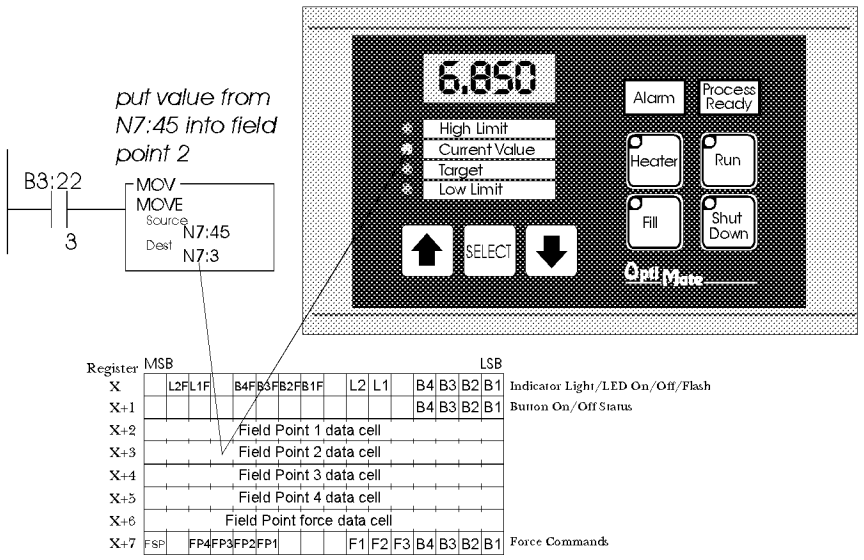
Button State	I:0.3/4 State	LED operation
Inactive	de-energized	Off
Inactive	energized	Off
Active	de-energized	On solid
Active	energized	Flashing

Setpoint & Display Operations

Displaying Numeric Data

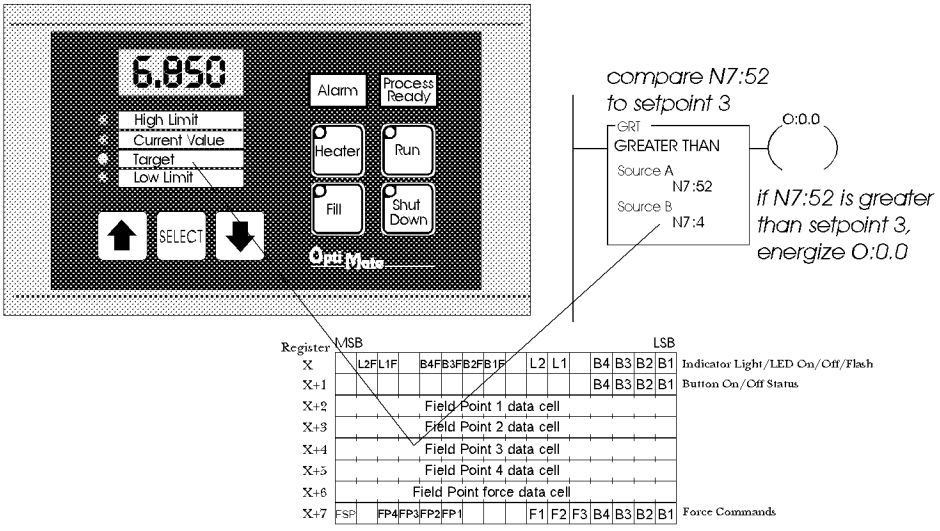
Displaying numeric data in one of the 4 field points is a very simple process. During the initial configuration, make sure you define the point as a display point, not a setpoint. When this is done, the PLC program must simply put data to be displayed into the register associated with the display data field.

The figure on the right illustrates a numeric display application with an Allen-Bradley PLC. In this application, the OM613 is configured for a base address of 2000 and field point 2 for display. A value, held in N7:45 must be displayed in field point 2 as long as is active. The example shows the value transferred from N7:45 to N7:3. It will be displayed as field point 2.



Reading a Setpoint

The following example uses an OM613 at base address N7:0. Field point 3 has been configured as a setpoint. In the example program, field point 3 is a Target value setpoint. The program shown on the right checks a value, held in N7:52 against the setpoint. If the value exceeds the setpoint, O:0.0 will be turned on.



Using Force Functions

The OM613 gives you the ability to force alternate buttons to a given state and force setpoints to a given value. This capability may or may not be used on a given application. There are applications when it is desirable to have the PLC program automatically set or clear a button based on operational state. There are also cases when forcing a setpoint to a predetermined value is useful. Obviously, this capability should be used carefully.

The last two registers in the register bank are associated with force operations. Their use is detailed below.

Forcing Button Status

One of the more advanced capabilities of the OM613 panel is the ability to force button state from the PLC program. This may be desirable, for example, if an alternate action is used to start a function process. When it is pushed and while the function is active, the button will remain on. You may want the PLC program to clear the button at the end of the function process.

Another example is one of a system that has individual enable or on/off (alternate action) buttons for several different device. You may also have other buttons (probably momentary) that enable a group of these same devices. You may want your program to force on the device enable buttons when the group enable button is pressed.

There are many other cases where button force capability can be useful in a system.

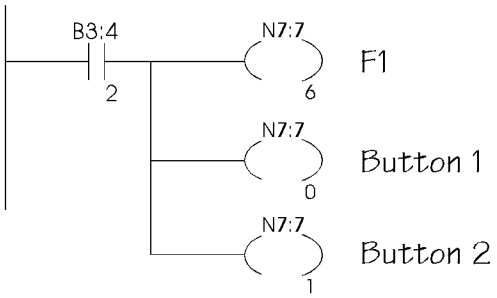
There are three types of force functions available for the OM613 panel - force status, force on and force off. All three functions require moving appropriate data into the PLC registers defined as Force Data & Commands (see the table described in "Use with a PLC").

Note : Force only applies to Alternate Action pushbuttons

Force Button Status

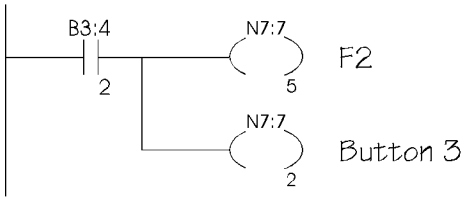
This function is used to set the state (on or off) of every alternate action pushbutton in the panel. To use the "Force Button Status" function, simply set the F1 bit to 1 and all buttons that you want to be on to 1, while leaving all other bits off. The example on the right shows buttons 1 and 2 being forced on and the other two buttons forced off when B3:4/2 is active.

The OM613 will automatically clear register X+7 when the force is complete. This will normally happen very quickly (less than a second). The fact that the OM613 clears the force control register when the operation is done can be used by the PLC program to verify operation. However, this is generally not necessary.



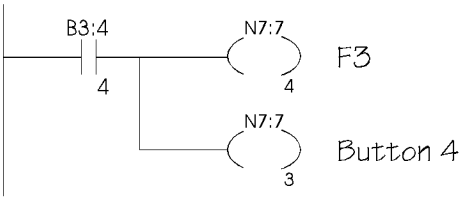
Force Button(s) On

This function is used to turn individual button(s) on without affecting the state of any other buttons. To use the "Force Buttons On" function, set the F2 bit to 1 and all buttons that you want to turn on to 1. Any buttons associated with bits that are left at '0' will not be affected. The following example shows button 3 being forced on when B3:4/2 is active.



Clear Button(s)

This function is used to selectively turn individual button(s) off without affecting the state of any other buttons. To use the "Clear Buttons" function, set the F3 bit to 1 and all buttons that you want to turn off to 1. Any buttons associated with bits that are left as '0' will not be affected. The example on the right shows button 4 being cleared when B3:4/4 is active.



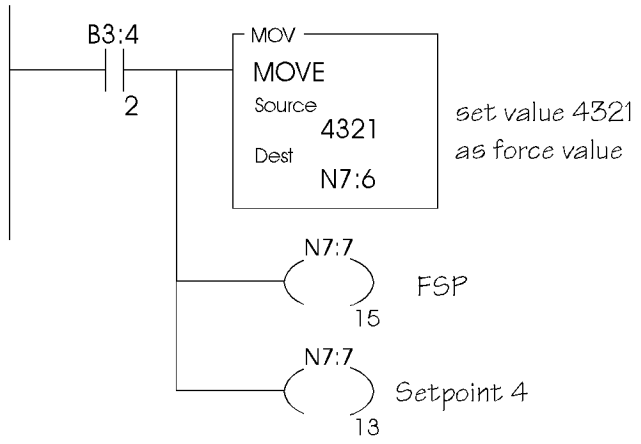
Forcing Setpoints

The OM613 gives you the capability to force a setpoint to a value from the PLC.

To force a setpoint to a value, the value should be placed in register X+6. Next the force setpoint bit FSP and the bit(s) corresponding to the setpoint(s) to force to this value must be set in the force control register (X+7). When the OM613 completes the force operation, it will clear the force control register.

The following example shows setpoint 4 being forced to 4321 when B3:4/2 is active.

The force command should be written to the force register once. The OM613 will automatically clear this register when the force is complete. This will normally happen very quickly (less than a second). The fact that the OM613 clears the force control register when the operation is done can be used by the PLC program to verify operation. However, this is generally not necessary.



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 module or read data from the module.

The OM613 uses OptiMate Hex protocol for fast and easy communications. The OptiMate Hex protocol is defined in subsequent pages.

Module Address

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

Communications Protocol

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

The OM613 protocol for computer based operation is OptiMate Hex protocol.

Computer Based Operation

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

The details of messages involved are covered in the protocol documentation on the following pages.

OptiMate OM613 Hex Protocol

General Format

STX Module function ftn_data checksum
address

where Module address = 0 to 30
Function = 0xA0 ; General status/control
= 0xA2 ; Force Buttons
= 0xA8 ; Read setpoint
= 0xA9 ; Write display point
= 0xAA ; Force setpoint
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 no spaces between message fields

General status/control

STX Module 0xA0 lite_on lite_flash checksum
address

where lite_on = Corresponds to Light Bars and LEDs inset in buttons. On/off state. If flash not set, on will cause On solid. If not on (0), lamp will be off regardless of flash bit.
bit 0 : button LED 1 bit 1 : Button LED 2
bit 2 : button LED 3 bit 3 : button LED 4
bit 5 : Light bar 1 bit 6 : Light bar 2
Lite_flash = Flash bits for Light Bars and LEDs inset in buttons
bit 0 : button LED 1 bit 1 : button LED 2
bit 2 : button LED 3 bit 3 : button LE4 2
bit 5 : Light bar 1 bit 5 : Light bar 2

Response

STX pb_stat checksum if message received and processed OK
where pb_stat = pushbutton status
bits 0 - 3 = Button status for function buttons 1 - 4 respectively (1 = button active, 0 = button inactive)
or
NAK if any errors in message

Force Buttons message

STX Module 0xA2 flags pb_ctl checksum
address

where flags = bit 7 - All buttons forced to following data
bit 6 - Set the following selected buttons states on
bit 5 - Clear the following selected buttons
Pb_ctl = bits 0-3 - Corresponds to buttons. LSB corresponds to button 1, etc. For force state command, Identifies required button states of all 4 buttons. For Set or Clear commands, identifies the Buttons to set or clear.

Response

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

Read Setpoint Data

STX Module 0xA8 setpt_no checksum
address

where setpt_no = number (0-3) of setpoint data to returned. Numbered 0 - 3 from top to bottom.

Response

STX data_MSB data_LSB checksum if message received and processed OK
where data_MSB, data_LSB = data in integer format, MSB first

or

NAK if any errors in message

Write Display Point

STX Module address 0xA9 displaypt_no data_MSB data_LSB checksum

where displaypt_no = 0 - 3 corresponding to field points in module. Points are numbered 0-3 from top to bottom.
data_MSB, data_LSB = data in integer format, MSB first.

Response

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

Force Setpoint

STX Module address 0xAA setpt_no data_MSB data_LSB checksum

where setpt_no = number (0-3) of setpoint data to returned. Numbered 0 - 3 from top to bottom.
data_MSB, data_LSB = data in integer format, MSB first.

Response

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

Broadcast message (sent to all modules, no response)

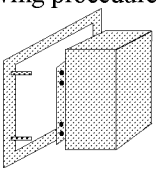
STX Broadcast address function

where Broadcast address = 99
Function = 0 ; Syncronize lamp flash timing

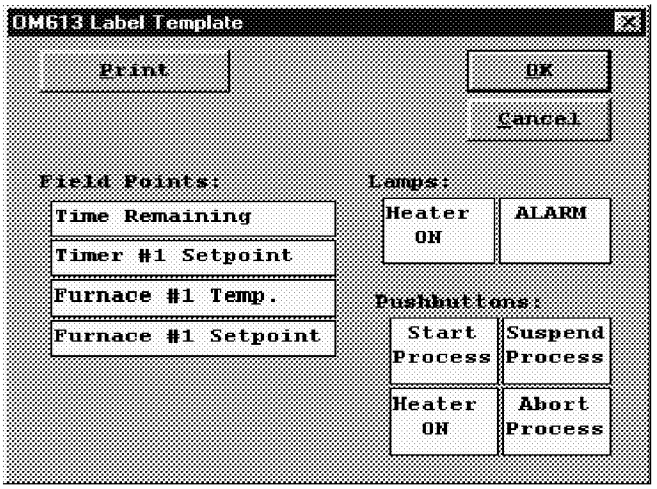
Set Up and Interconnect

Legending the Lamps and Function Keys

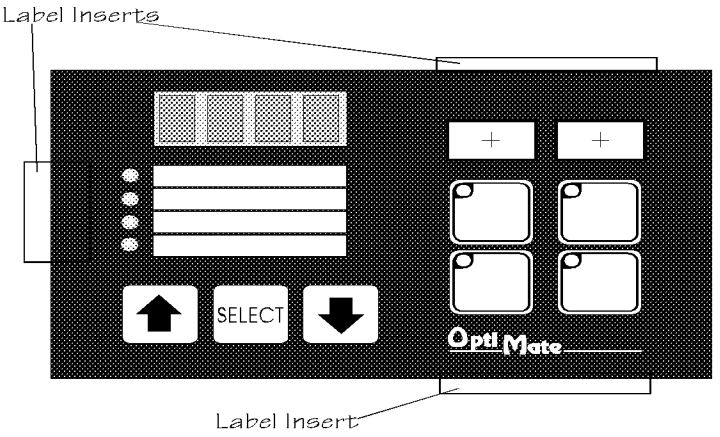
Legending the OM613 module is a relatively simple process that basically involves sliding a legend transparencies into a pockets in the panel overlay. Use the following procedure.



- Remove the bezel from the module. The bezel snaps to the module 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 OP-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 OP-WINEDIT which illustrates the process.



  - > Use 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 or lettering machine to letter onto paper, then photocopy



- Cut along outline. Slide into overlay pocket. Pushbutton legends slide in from the bottom.
- Re-attach bezel. Push bezel onto box until it snaps together.

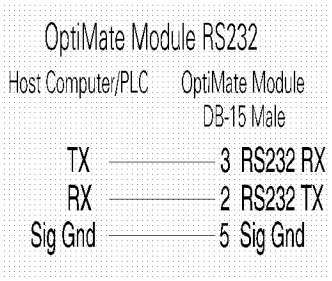
Connection to the System

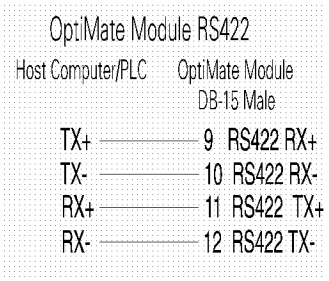
OptiMate modules are designed for communications connection to system devices. The module can be connected to a computer, PLC or communication master over the serial port (RS232 or RS422).

Connection to a Computer or PLC

Connection of an OptiMate module 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.

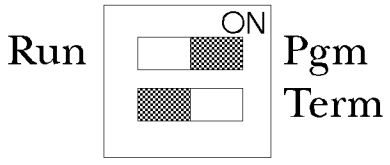
Standard cables are available for connection to several different PLCs as well as to IBM PCAT compatible ports.

Serial Connection to Communications Master

Connection to an Optimation Communications Master over a serial link is via RS422. The Communication master port connections are reversed from the module 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.

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 an RS422 connected system, such as with the OP-9001 Communication Master, the termination should be on in the last, and only the last, panel on the cable.



Power

The OM613 panel will operate on any DC voltage between 8 and 30VDC. Steady state current is listed on the specification page.

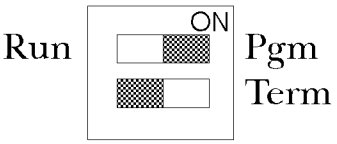
There is a very brief (0.5 - 2 millisecond) power on surge up to 1.5 amps. This is typical of nearly any type of electronic equipment and is due to the initial charging of power capacitors. This surge is not normally a problem for a commercial power supply.

Configuration

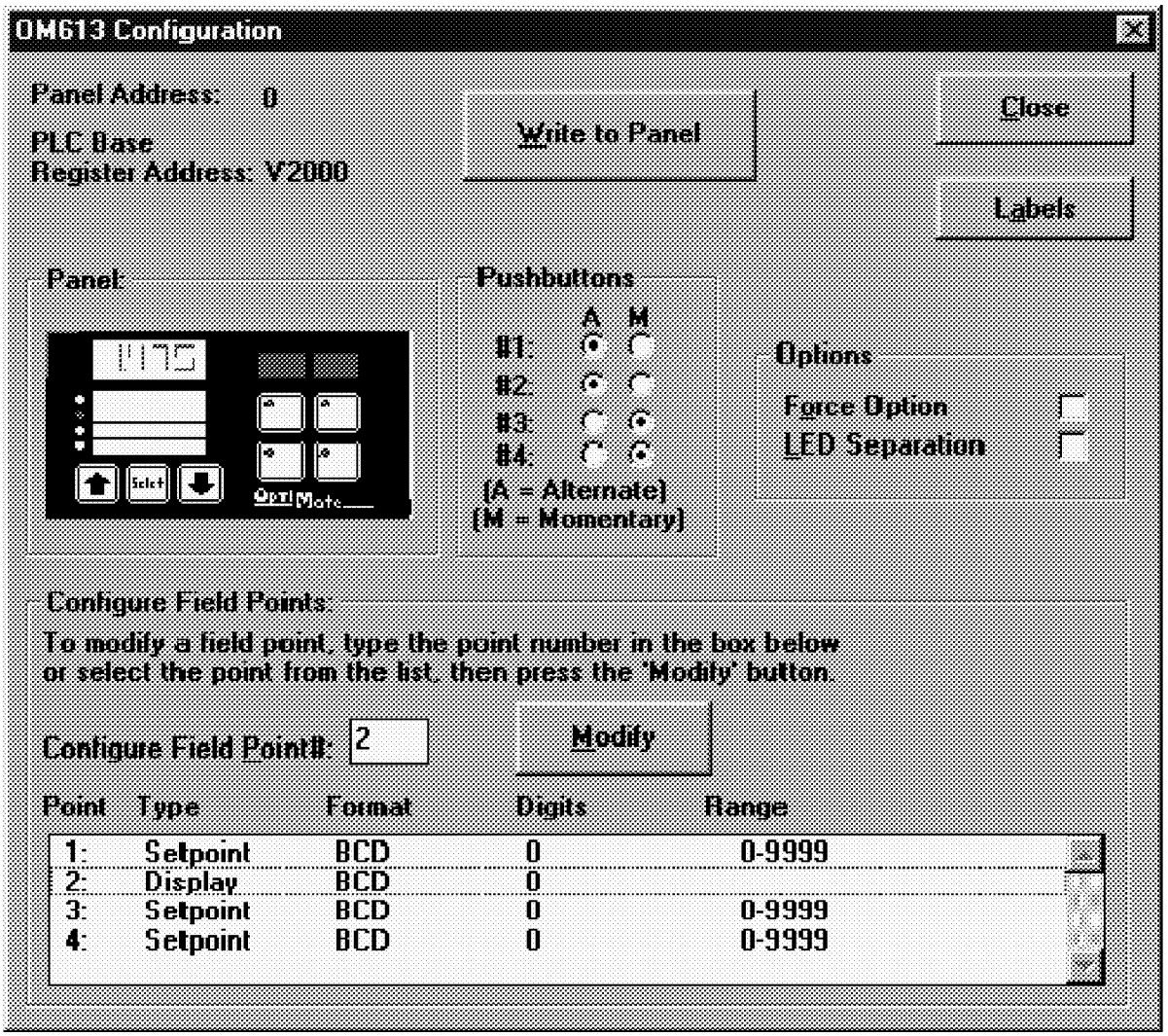
Configuration of the OM613 operator panel or system of OptiMate panels is performed via and IBM PC compatible computer. The OP-WINEDIT configuration software that will allow you to select panel type, panel application, system configuration and PLC protocol definition.

If the OM613 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, the OP-WINEDIT software will automatically set up communications between the OP-9001 and the panel via OptiMate Hex..

Note : When configuring, always remember to set the Run/Pgm DIP switch on the back of the panel to Pgm (towards the "ON") before app;ying power to the module. When you are finished downloading configuration, power down the panel and switch to the "Run" position before connecting to the PLC.



Specific configuration of the OM613 begins with defining the block of PLC register data to be used. Next, each of the function buttons must be configured for either momentary or alternate action operation. Then each of the field points must be configured for setpoint or display. Additional options exist for setpoint range limits, LED separation (or not), and force enable/disable



Configuration Selections

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

For the OM613 module, the following are important configuration parameters.

Computer 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. After configuration, multiple modules can be connected together to form a system.
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.
Buttons	Select momentary or alternate action as required for your application
Field Points	Define as setpoints or display points as required. Define number format in PLC (binary or BCD) For setpoints, define limits.
LED separation	If the LEDs inset in the momentary pushbuttons are to be controlled by the PLC program, rather than reflect button state, enable. Otherwise, disable.
Force option	If you intend to force button states of setpoint values, enable the force option.

Single Panel PLC Based Systems

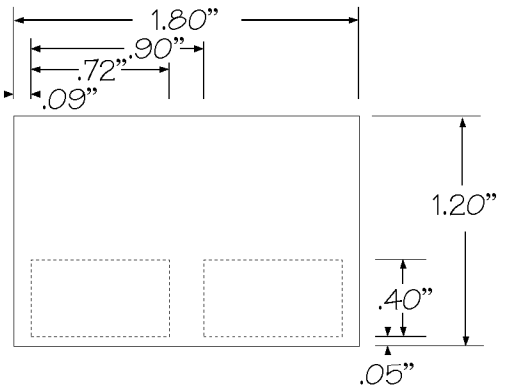
Decision	Selection
Single/ Multi Module	Choose single module configuration
Configuration starting point	First time configuration start with defaults for module. Subsequent configurations can utilize disk files you create
PLC Type	Select appropriate PLC type
Protocol	Select appropriate baud rate, # data 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
Field Points	Define as setpoints or display points as required. Define number format in PLC (binary or BCD) For setpoints, define limits.
LED separation	If the LEDs inset in the momentary pushbuttons are to be controlled by the PLC program, rather than reflect button state, enable. Otherwise, disable.
Force option	If you intend to force button states of setpoint values, enable the force option.

Multi Panel PLC Applications (Uses Communications Master)

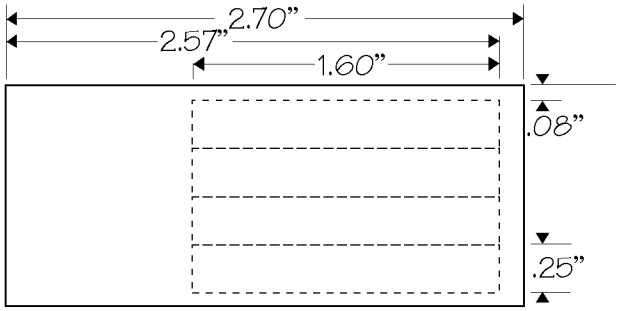
Decision	Selection
Single/Multi Module	Chose Multi panel
PLC Type	This applies to the Communications master. Choose appropriate type
Address	Each panel must have a unique address.
Protocol	This applies to the Communications master. Choose appropriate baud rate, # bits, # stop bits & parity. Note that if 8 data bits and even or odd parity are selected, only 1 stop bit is available.
Module Protocol	Choose OptiMate Hex
Buttons	Select momentary or alternate action as required for your application
Messages	Define messages as required for your application.
LED separation	If the LEDs inset in the momentary pushbuttons are to be controlled by the PLC program, rather than reflect button state, enable. Otherwise, disable.
Force option	If you intend to force button states of setpoint values, enable the force option.

Configuration must be downloaded from the IBM PC compatible to each module. This is done over the serial link. Module address must be selected for PGM (DIP switch on back of module) prior to application of power for module to accept configuration data. The module must be powered down and the DIP switch changed to "Run" before re-applying power for the module to operate with the selected host. Communication cable is available from Optimation.

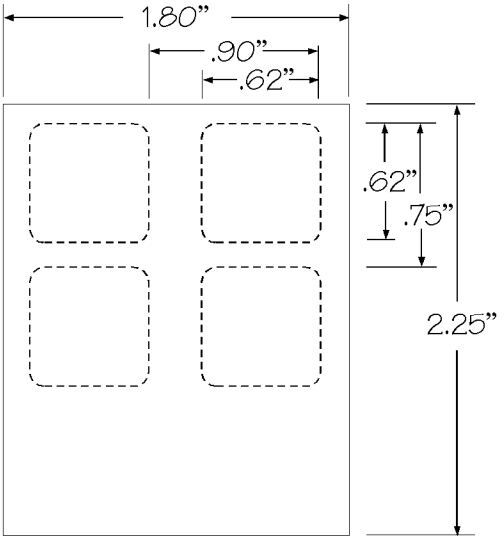
Label Templates



Lamp Label Insert Template



Field Point Label Insert Template

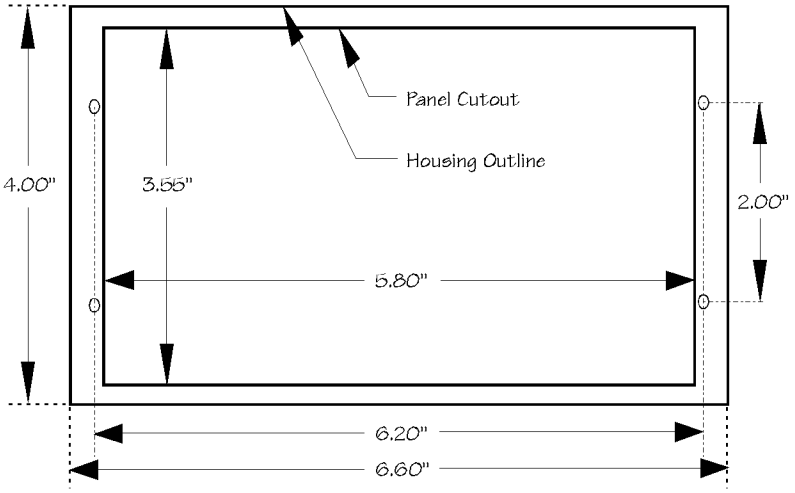


Pushbutton Label Insert Template

Specifications

Physical

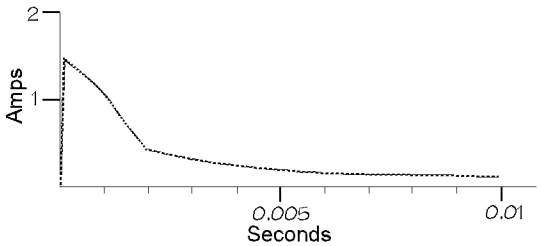
- Recessed Mount Housing 6.6"L x 4.0"H x 1.25"D
- Cutout size for above 3.55"Hx5.80"L
- Panel Fasteners : Four, 6x32 threaded studs, shown above (on ends, symmetrical about center line)
- Weight : 10 ounces
- Colors : Dark gray housing with dark gray panel. Keypad keys; white with gray letters. Function keys ; White with user supplied label.
- Numeric LED height : 0.35 inch
- Pushbutton life : 1,000,000 switch cycles
- Lamp Colors : Red, Green
- Lamp window size : 0.7" x 0.4"



Panel Mounting Dimensions

Electrical

- Power (all lamps on) : 8 - 30VDC @ 2.2Watts
  180 mA @ 12VDC 90 mA @ 24VDC
- Power On Surge (see figure below)
  1.5 A for 2 milliseconds maximum



Power on Surge

Power connector : Pluggable terminal block, 2 position

Communications

- RS232 and RS422
- 4800 to 19200 baud
- Compatible with most major PLC protocols
- OptiMate Hex Protocol for computer based systems
- 15 pin female 'D' shell connector

Communications Failure Operation

Should the module (when not selected for configuration) ever fail to communicate successfully for a period of 12 seconds, the light bars and LEDs will flash rapidly.

Environmental

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