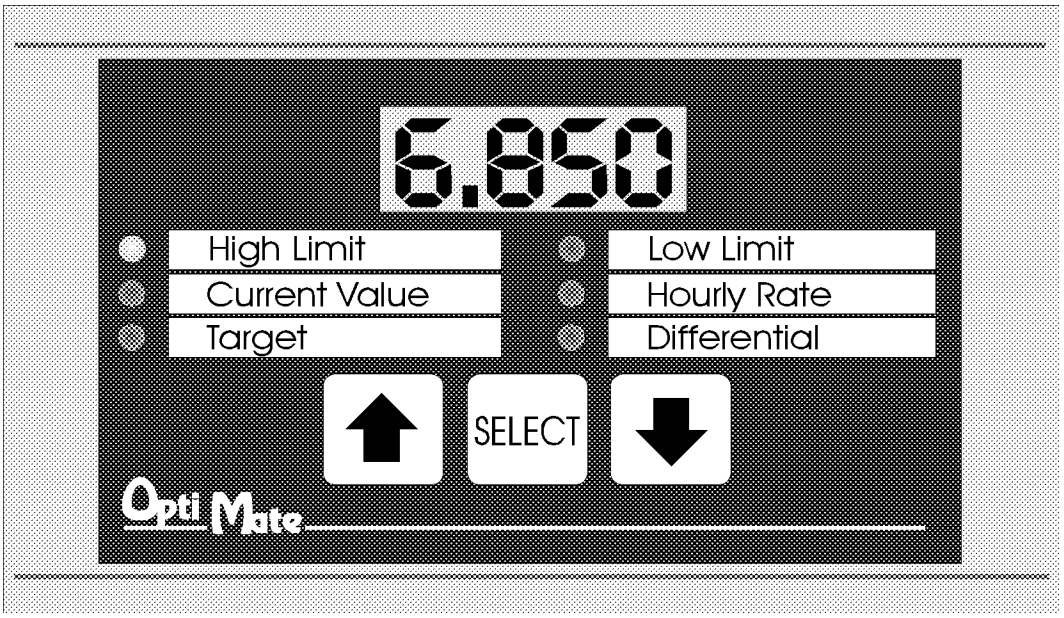
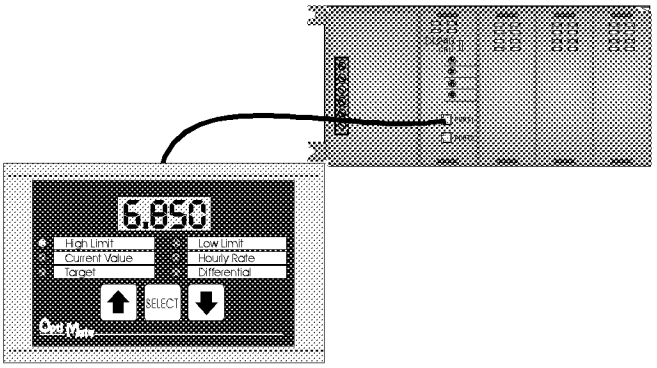
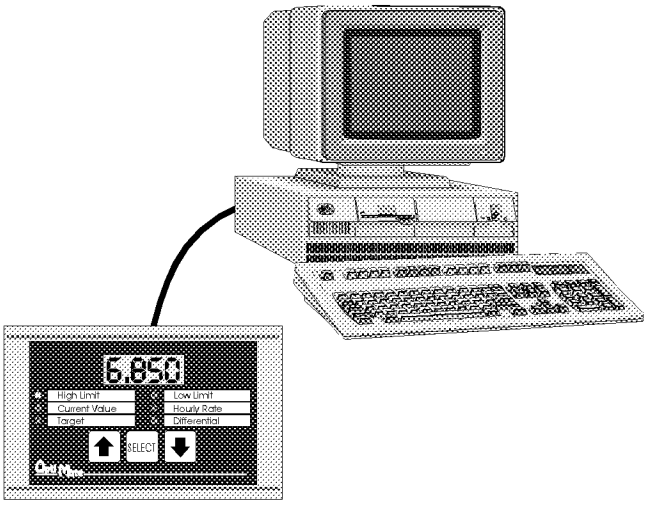


Setpoint adjustment can be performed by use of the arrow keys to move the value up or down. Once set, the value is saved into non-volatile memory. It is permanently stored,

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 OM413 Setpoint/Display Panel uses a bank of PLC registers. Complete operator interface is performed with 8 PLC registers for data entry and display. The OM413 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.

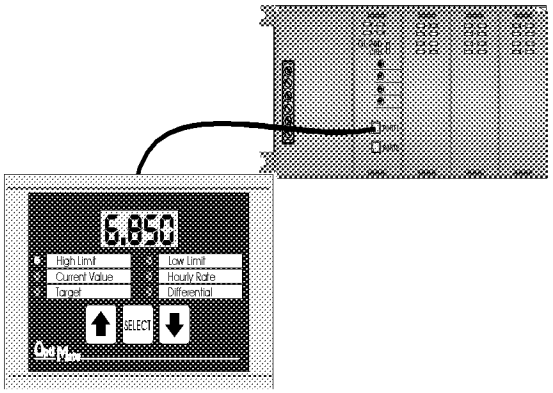
Microprocessor Based Systems

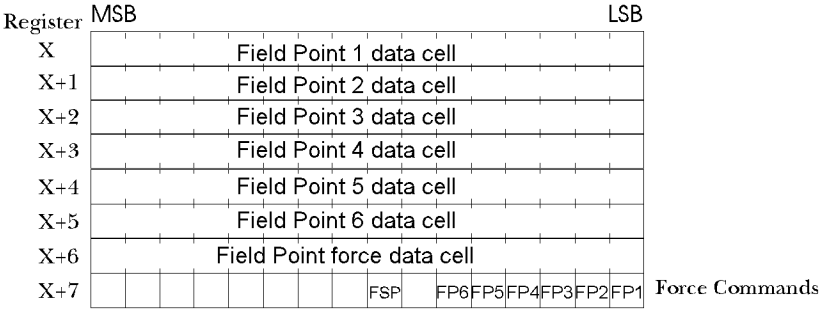
OptiMate 400 Series modules can interface directly to most computers or microcontrollers. The modules communicate over RS232 serial communications. All that is required to interface OptiMate modules is an RS232 serial port and the ability to send and receive Hex numbers. The OptiMate Hex communications protocol, detailed in this document, allows the user to directly read setpoint values and write data to display points.

Since the OptiMate 400 Series panels can only communicate on RS232, only 1 panel can be interfaced on each serial communications port.

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 OM413, these commands are requests for setpoint values and messages that update display points.

Use with a PLC





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 OM413. 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 OM413 Setpoint/Display Panel uses a bank of 8 contiguous PLC registers. The register set definition is shown in the table below.

OM413 Panel PLC Register Map

PLC Register	Register Function
X (first register of bank)	Field point 1 data cell
X+1	Field point 2 data cell
X+2	Field point 3 data cell
X+3	Field point 4 data cell
X+4	Field point 5 data cell
X+5	Field point 6 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 - Field point 1 data (either setpoint input or display output, as configured)
- Register X+1 - Field point 2 data.
- Register X+2 - Field point 3 data.
- Register X+3 - Field point 4 data
- Register X+4 - Field point 5 data.
- Register X+5 - Field point 6 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. The least significant bits of this register control setpoint force.
  - > FSP - When active, the Field point force data (X+6) will be forced into the field points set to be forced (FP1-FP6). Once the force operation takes place, the OM413 will automatically clear FSP.
  - > FP1-FP6 - Used to identify which setpoints must be forced.

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 relevant PLC register (X 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 OM413 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 OM413 panel has forced the setpoint to the required value, it will clear registers X+6 and X+7.

Examples of Use with a PLC Direct PLC

Register Usage

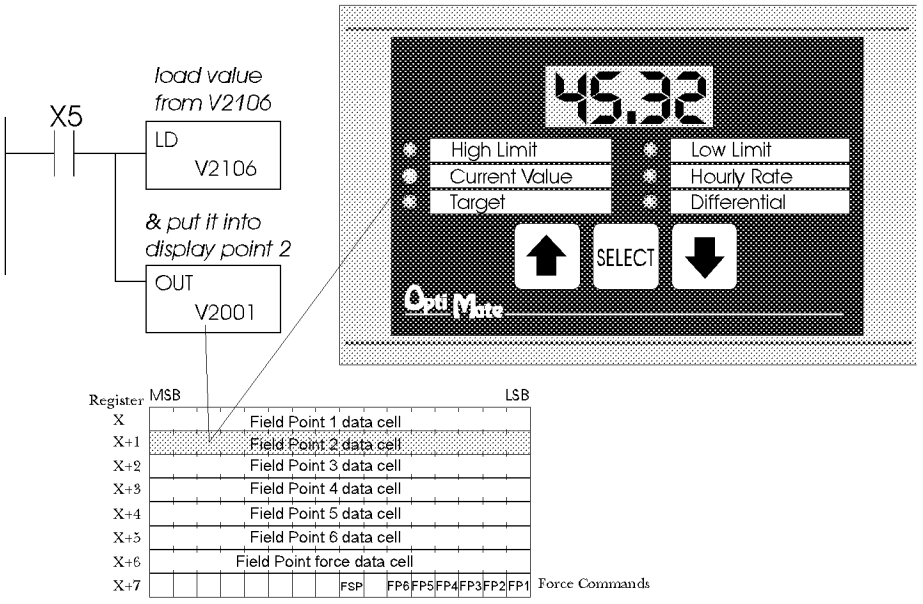
The OM-WINEDIT Configuration Editor allows you to configure a module to use a block of registers at a starting value that you define. For a PLC Direct 105, 205, 350 or 405 PLC the recommended memory to use is the general purpose data words starting at V2000 and V4000. For the 305 family, except for the DL350, the recommended memory is the registers beginning at R400. Any block of registers within the data word range can be used.

Setpoint & Display Operations

Displaying Numeric Data

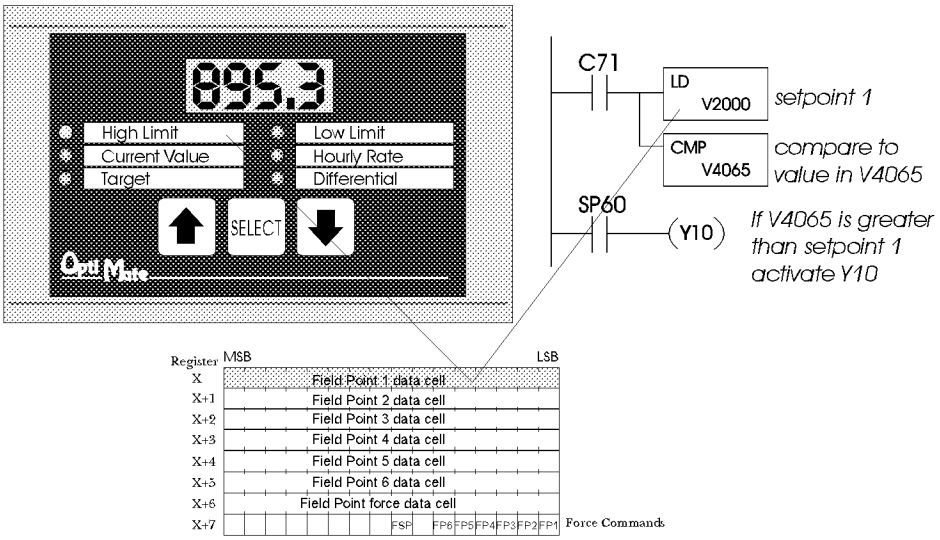
Displaying numeric data in one of the 6 field points is a very simple process. During the initial configuration, make sure you define the point as a display point, not a setpoint. When this is done, the PLC program must simply put data to be displayed into the register associated with the display data field.

The figure below illustrates a numeric display application with a PLC Direct 105,205,350 or 405 series PLC. In this application, the OM413 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 X5 is active. The example shows the value transferred from V2106 to V2001. It will be displayed as field point 2.



Reading a Setpoint

The following example uses an OM413 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.



Forcing Setpoints

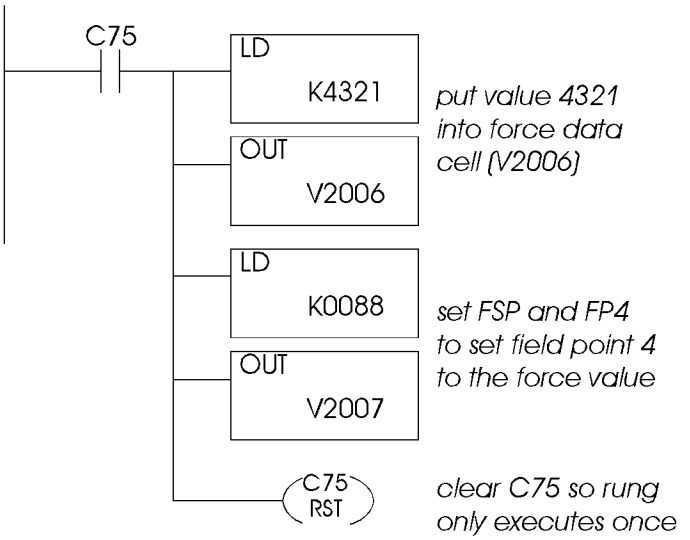
The OM413 gives you the capability to force a setpoint to a value from the PLC.

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 OM413 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 OM413 will automatically clear this register when the force is complete. This will normally happen very quickly (less than a second). The fact that the OM413 clears the force control and data registers when the operation is done can be used by the PLC program to verify operation. However, this is generally not necessary.

Note: To force setpoints, the Force Enable option must be selected in the OM-WINEDIT software.



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 documentation for information on setting up and using "N" type files.

Note: When using an OM413 with an A-B PLC, always ensure that at least 8 words of memory are allocated to ensure proper communications.

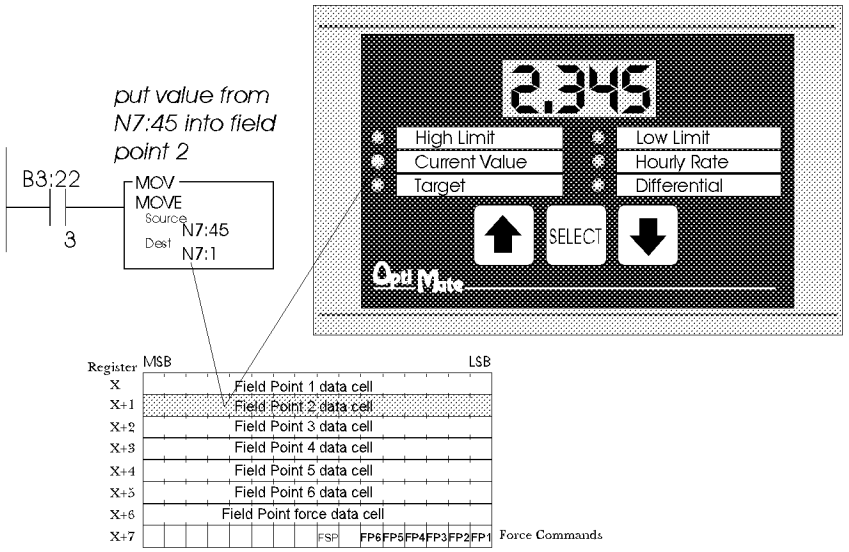
All of the examples that follow assume that the OM413 module has been configured, through the OptiMate Configuration Editor, for a file number 7 and base register address 0.

Setpoint & Display Operations

Displaying Numeric Data

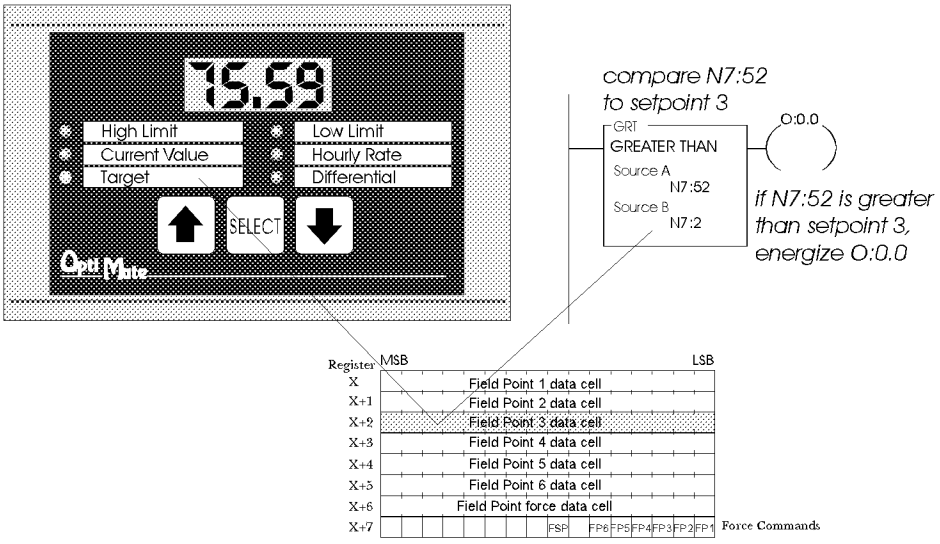
Displaying numeric data in one of the 6 field points is a very simple process. During the initial configuration, make sure you define the point as a display point, not a setpoint. When this is done, the PLC program must simply put data to be displayed into the register associated with the display data field.

The figure on the right illustrates a numeric display application with an Allen-Bradley PLC. In this application, the OM413 is configured for a base address of N7:0 and field point 2 for display. A value, held in N7:45 will be displayed in field point 2 as long as B3:22/3 is active. The example shows the value transferred from N7:45 to N7:1. It will be displayed as field point 2.



Reading a Setpoint

The following example uses an OM413 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.



Forcing Setpoints

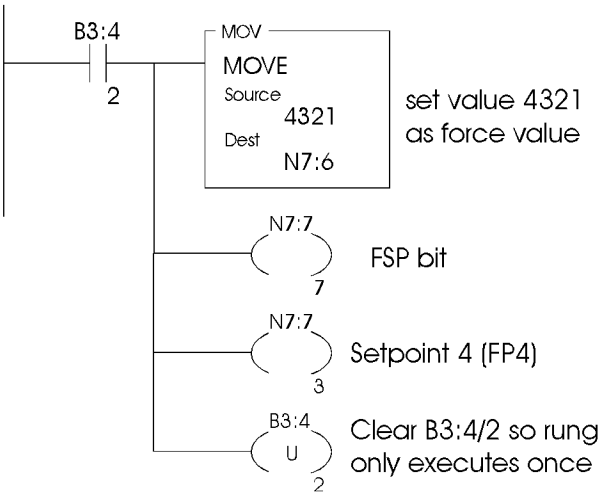
The OM413 gives you the capability to force a setpoint to a value from the PLC.

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 OM413 completes the force operation, it will clear the force control and data registers (X+6 and X+7).

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

Notice that B3:4/2 is a latch/unlatch type relay. The force command should be written to the force register once. The OM413 will automatically clear this register when the force is complete. This will normally happen very quickly (less than a second). The fact that the OM413 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.

Note: To force setpoints, the Force Enable option must be selected in the OM-WINEDIT software.



Use in a Microprocessor Based System

OptiMate modules can interface a microprocessor based controller over a serial link. For the 400 Series line of OptiMate modules, this link is only RS232.

The microprocessor acts as the master. It can write data to the module or read data from the module.

The OM413 uses the OptiMate Hex protocol for fast and easy communications. The OptiMate Hex protocol is defined on the following page.

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. For the OptiMate 400 Series, the module address is normally 0. 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 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 module.

Computer Based Operation

The OM413 protocol for computer based operation is OptiMate Hex protocol.

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 page.

Reading a Setpoint

Under computer based operation, each of the OM413's field points can either be configured for setpoint operation or display. If a field point(s) is/are configured for a setpoint, the value of each field point can be read individually. The "Read Setpoint Data"message (0xA8), detailed on the next page, is transmitted to the panel in hex format. The panel will respond with that particular field points setpoint data in the hex format.

Writing a Display Point

If a field point or multiple field points are configured for data display, the data can be sent to each field point individually using the "Write Display Point" message (0xA9). The message including the data is sent in the hex format.

Forcing a Setpoint

In some instances, it may be necessary to "force" a setpoint to a particular value to override its current value. That can be done by sending the "Force Setpoint" message (0xAA). The message and data should be sent in the hex format

OM413 OptiMate Hex Protocol

General Format

STX Module address function ftn_data checksum

Where STX = 0x02
Module address = 0 to 30
Function = 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. 0xXX denotes a Hex number.

Read Setpoint Data

STX Module address 0xA8 setpt_no checksum

where setpt_no = number (0-5) of setpoint data to returned. Numbered 0 - 5 from top to bottom, left to right.

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

Where NAK = 0x15

Write Display Point

STX Module address 0xA9 displaypt_no data_MSB data_LSB checksum

where displaypt_no = 0 - 5 corresponding to field points in module. Points are numbered 0-5 from top to bottom, left to right.
data_MSB, data_LSB = data in integer format, MSB first.

Response

ACK if message received and processed OK

Where ACK = 0x06

or

NAK if any errors in message

Force Setpoint

STX Module address 0xAA setpt_no data_MSB data_LSB checksum

where setpt_no = number (0-5) of setpoint data to returned. Numbered 0 - 5 from top to bottom, left to right.
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 checksum

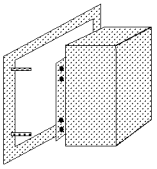
where Broadcast address = 99
Function = 0 ; Synchronize lamp flash timing

Set Up and Interconnect

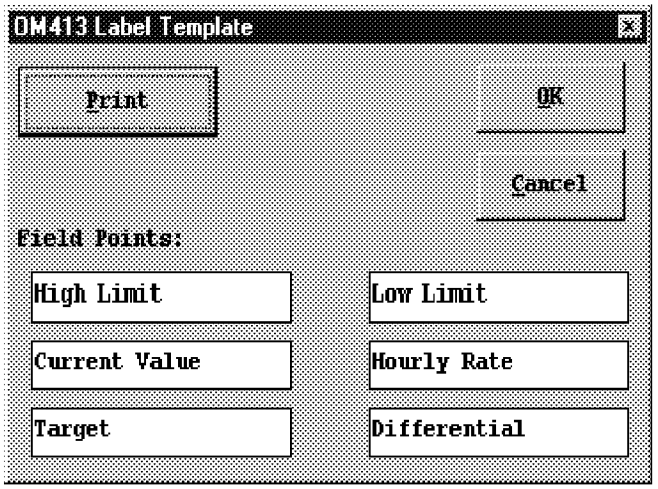
Legending the Field Points

Legending the OM413 module is a relatively simple process that basically involves sliding a legend transparency into a pocket 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.

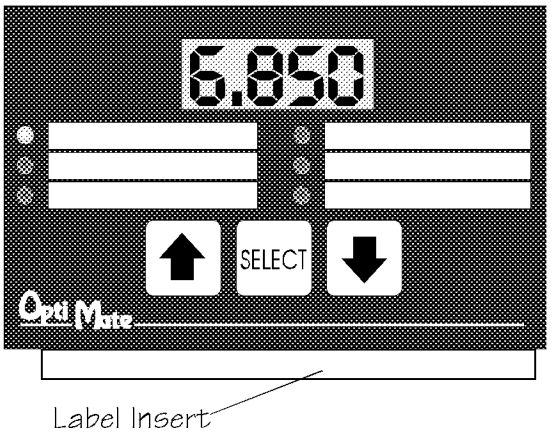


- Create legend transparencies. There are a number of available options for doing so. Patterns are provided on the next to last sheet of this document.
  - > Use the built in label making capability of the OM-WINEDIT software to create labels. Either print on the transparency directly or print on paper and photocopy onto the transparency. The figure below is a screen from OM-WINEDIT which illustrates the process.
  - > 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. The legend slides in from the bottom.
- Re-attach bezel. Push bezel onto box until it snaps together. Ensure that the bezel covers all the housing snaps before installing the panel.

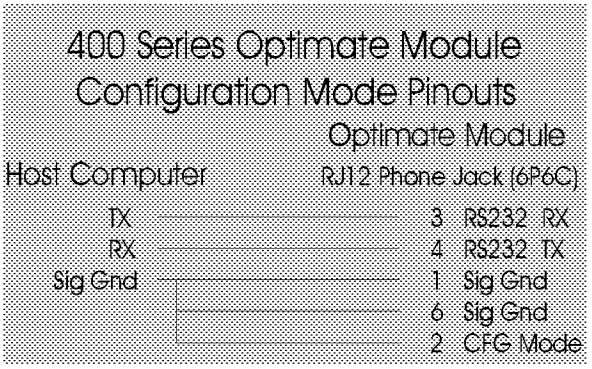


Connection to the System

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

Connection to a Computer for Configuration

Connection of a 400 Series OptiMate module to a computer for configuration can be accomplished over an RS232 link. RS232 is limited to one OptiMate module to a computer serial port. See the figure below for 400 Series OptiMate Module pinouts.

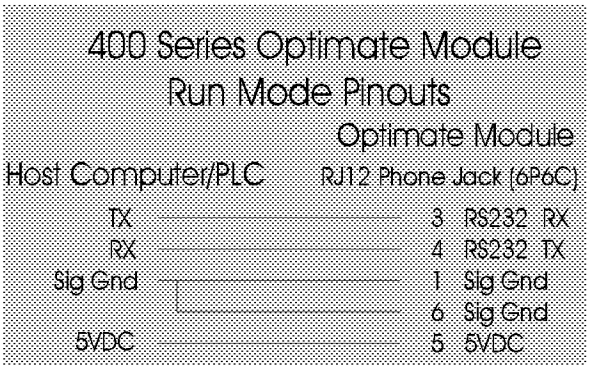


Refer to manufacturer's documentation for computer serial link connector pinouts.

Configuration cables are available for connection to IBM PC-AT compatible ports.

Run Mode Connection to a Computer or PLC

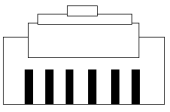
Connection of a 400 Series OptiMate module to a computer or PLC can be accomplished over an RS232 link. RS232 is limited to one OptiMate module to one computer serial port. Since PLCs are slave devices, the RS232 link for a PLC is limited to one OptiMate module. See the figure below for 400 Series OptiMate Module pinouts.



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 PC-AT compatible ports.

The figure below shows the RJ12 connector pinout for connection to an OptiMate 400 Series module.



RJ12 Connector
Optimate End

Power

The OM413 Setpoint/Display Panel will operate only on a DC voltage of *5VDC*. Steady state current is listed on the specification page.

The OM413 panel can draw power from its communications cable making a single 6 wire phone type cable the only cable necessary for installation. PLC Direct DL105, DL205, DL350, or DL405 CPUs are the only PLC CPUs that can connect to the OM413 in this manner. Microprocessor based devices can also be used in this way if they have a 5VDC connection in their comm ports.

The OM413 panel can be powered from a 5VDC adapter for panel configuration or connection to PLCs or microprocessor based devices that do not have a 5VDC connection in their communication ports. Examples are the PLC Direct DL340 and the Allen-Bradley 5/03, 5/04 and Micrologix CPUs. A description of the DC power connector is listed on the specification page.

> **Note: Only use an Optimation approved 5VDC power supply or equivalent that contains a center negative DC power jack.**

There is a very brief (0.1 -1 millisecond) power on surge up to 0.35 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

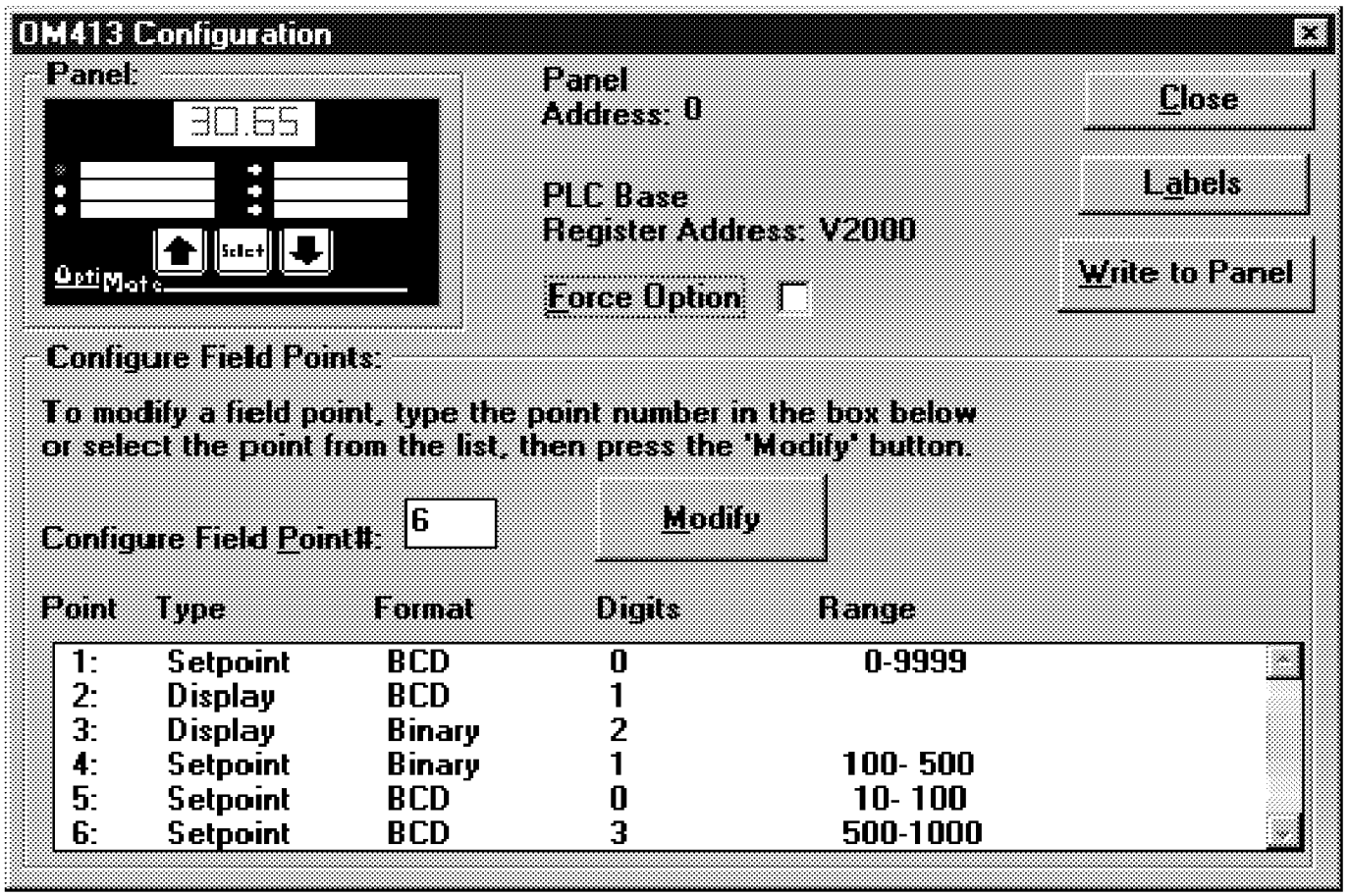
Configuration of the OM413 Setpoint/Display Panel is performed via an IBM PC compatible computer. The OM-WINEDIT configuration software allows you to select panel type, panel application and PLC protocol definition.

If the OM413 is to be operated with a PLC, the configuration selection must be made to select the proper PLC protocol information.

Specific configuration of the OM413 begins with defining the block of PLC registers to be used. Next, each of the field points must be configured for setpoint or display. Additional options exist for setpoint range limits and force enable/disable.

Note : When configuring an OM413, always remember to use the programming cable that connects the OM413 to an IBM PC compatible computer's serial communications port. Also, always insert the programming cable into the panel to place it into configuration mode.

When you are finished downloading the configuration, wait at least 5 seconds before removing the programming cable. This will return the panel to PLC run mode.



Configuration Selections

OptiMate modules can be configured for a specific application by using the OptiMate Configuration Editor (OM-WINEDIT). 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 OM413 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. Normally 0 for the OM413.
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.
Field Points	Define as setpoints or display points as required. Define number format (binary or BCD) and # digits after decimal. For setpoints, define limits.
Force option	If you intend to force setpoint values, enable the force option.

Single Panel PLC Based Systems

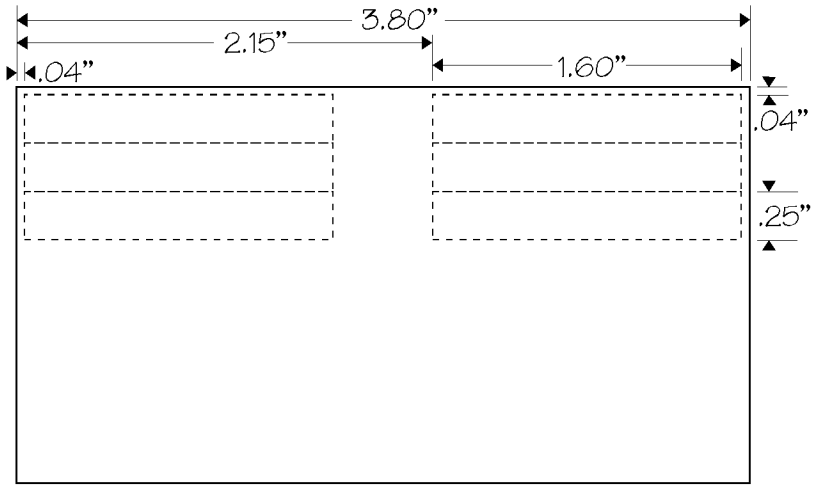
Decision	Selection
Single/ Multi Module	Choose single module configuration
Configuration starting point	First time configuration start with defaults for module. Subsequent configurations can utilize disk files you create
PLC Type	Select appropriate PLC type
Protocol	Select appropriate baud rate, # data bits, # stop bits & parity. Note that if 8 data bits and even or odd parity selected, only 1 stop bit is available
Field Points	Define as setpoints or display points as required. Define number format in PLC (binary or BCD) and # digits after decimal. For setpoints, define limits.
Force option	If you intend to force setpoint values, enable the force option.

Multi Panel PLC Applications (Uses Communications Master)

Not applicable with the 400 Series Modules.

Note: Configuration must be downloaded from an IBM PC compatible computer to each module. This is done over the serial link. Insert the programming cable into the panel to place it into configuration mode. When you are finished downloading the configuration, wait 5 seconds before removing the programming cable. This will return the panel to PLC run mode. Then insert the proper PLC to OM413 cable so the module will operate with the selected host. Communication cables are available from Optimation.

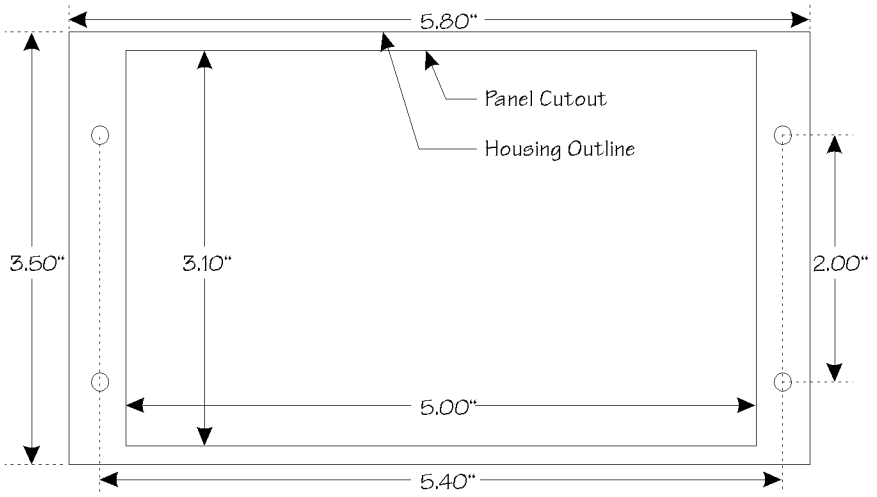
Field Point Label Insert Template



Specifications

Physical

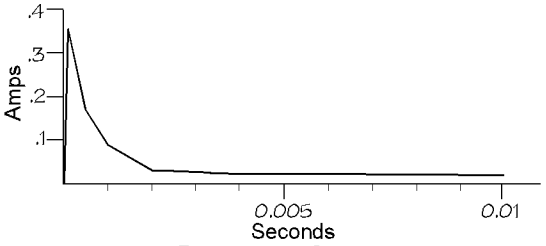
- Recessed Mount Housing: 6.00"L x 3.50"H x 1.25"D
- Cutout size: 3.20"H x 5.10"L
- Panel Fasteners:Four, 6x32 threaded studs, shown at right (on ends, symmetrical about center line)
- Weight : 8 ounces
- Colors : Dark gray housing with dark gray panel. Keypad keys; white with gray letters.
- Numeric LED height : 0.35 inch
- Pushbutton life : 1,000,000 switch cycles



Panel Mounting Dimensions

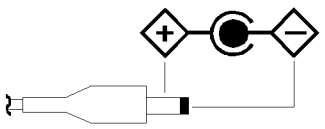
Electrical

- Power: 5VDC @ 0.80Watts
  160mA @ 5VDC
- Power On Surge (see figure below)
  0.35A for 1 millisecond max



Power on Surge

- Power connector :
  DC power plug, center negative (see figure below)
  DC power plug is necessary for panel configuration and for connection to PLCs that do not have a 5VDC connection in their communication ports.



Always use an Optimation approved 5VDC power supply with a center negative plug.

Communications

- RS232
- 4800 to 19200 baud
- Compatible with major PLC protocols
- Microprocessor compatible OptiMate Hex protocol
- 6 pin RJ12 phone jack type connector

Communications Failure Operation

Should the panel (when not selected for configuration) ever fail to communicate successfully for a period of 12 seconds, the LEDs on the panel front will flash rapidly.

Environmental

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