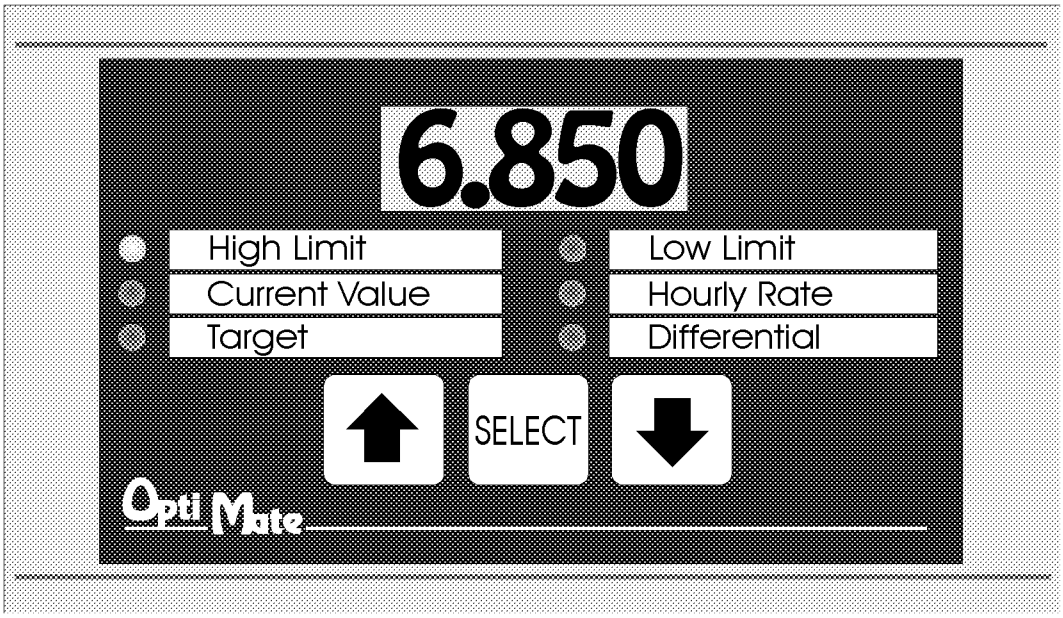


KM413 Setpoint/ Display Panel

The KM413 Setpoint/Display Panel is a low cost/high performance man/machine interface with a broad range of operator input and display capabilities. The panel includes six field points which can be used for either setpoint entry or data display.

The four digit numeric LED display is associated with six 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 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, whether power remains on or not, until the next time it is changed by the operator.

Each field point 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 KM413 Setpoint/Display Panel is part of Optimation's **OptiMate®** series. Each OptiMate module is designed to connect to a PLC with a single cable connection. OptiMate 400 Series panels can be used individually with a PLC or in a Microprocessor system.

When used with a microprocessor system, a simple communications cable allows the microprocessor to directly read the state of each setpoint and update each display point.

When used with a PLC, operation is transparent to the user. Panel functions tie directly into your PLC ladder logic program. The KM413 takes care of the rest.

Applications

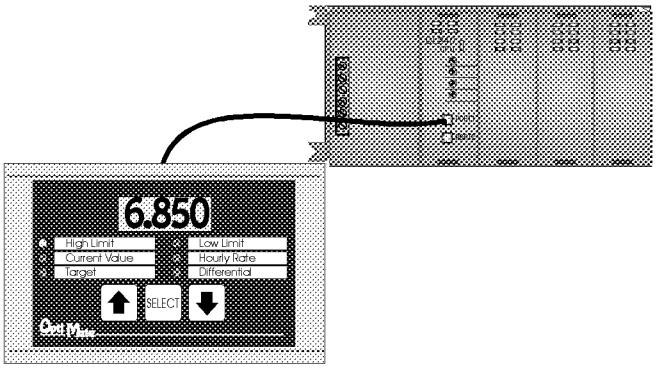
- Machine control
- Process control
- Security systems
- HVAC
- Plant monitoring/control
- PLC applications
- Microprocessor applications

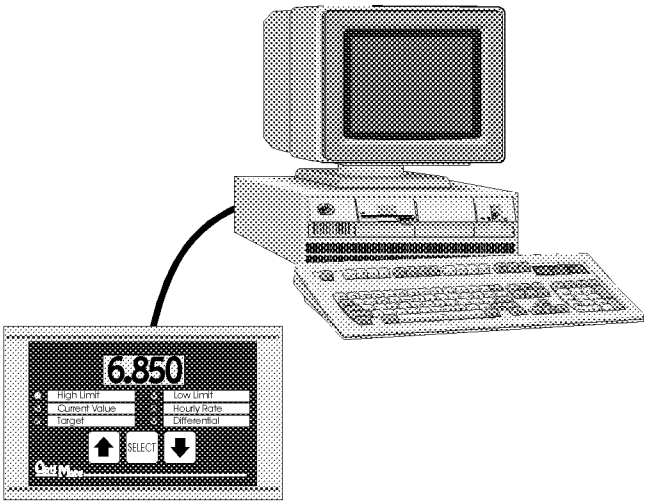
Features

- 6 Setpoints or display points
- Four-digit numeric display
- Pushbutton item selection
- PLC compatible
- RS232 communications
- Stand alone 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 KM413 Setpoint/Display Panel uses a bank of PLC registers. Complete operator interface is performed with 8 PLC registers for data entry and display. The KM413 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.

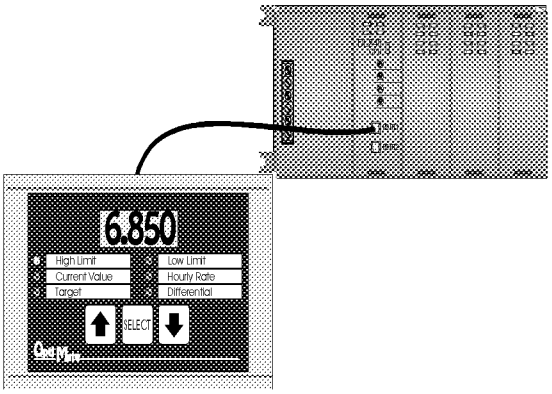
Microprocessor-Based Systems

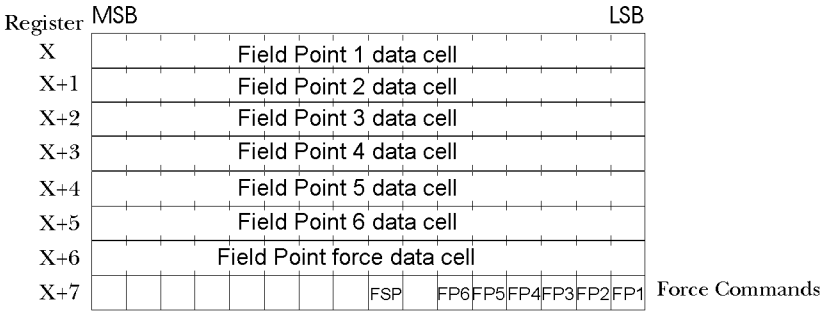
OptiMate 400 Series modules can interface directly to most computers or microcontrollers. The modules communicate over RS232 serial communications. All that is required to interface OptiMate modules is an RS232 serial port and the ability to send and receive Hex numbers. The OptiMate Hex communications 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 KM413, 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 KM413. 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 KM413 Setpoint/Display Panel uses a bank of 8 contiguous PLC registers. The register set definition is shown in the table below.

KM413 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 KM413 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 KM413 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 KM413 panel has forced the setpoint to the required value, it will clear registers X+6 and X+7.

Examples of Use with a Keyence 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. The memory block has to be in the Data Memory (DM) area of memory. For a Keyence PLC, the recommended memory starting register is address DM0000.

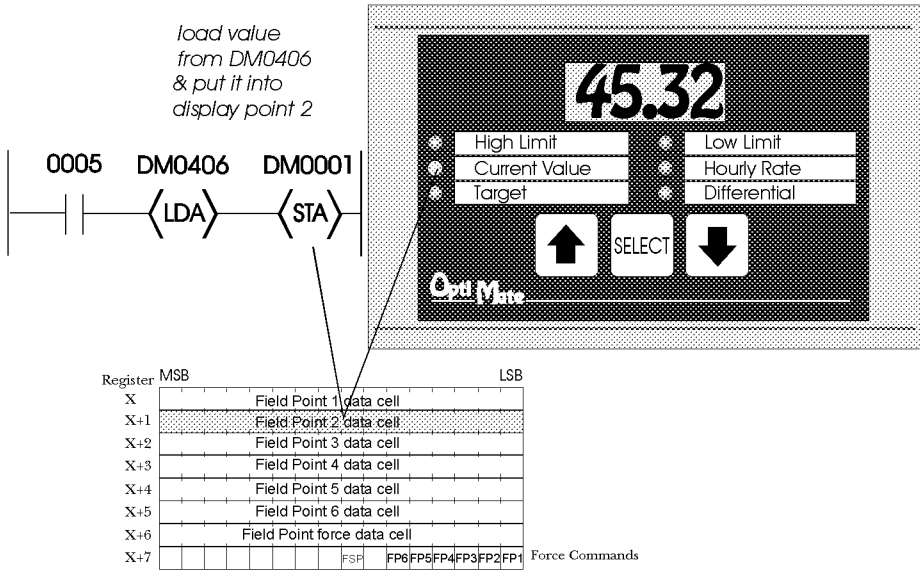
Any address within the DM area of memory is valid for the panel. However, Keyence PLCs use some data memory registers for specific instructions. Also, your program may be using registers in the data memory. Refer to your Keyence User's Manual to ensure that the registers you define for the panel do not conflict with registers that are already in use.

Setpoint & Display Operations

Displaying Numeric Data

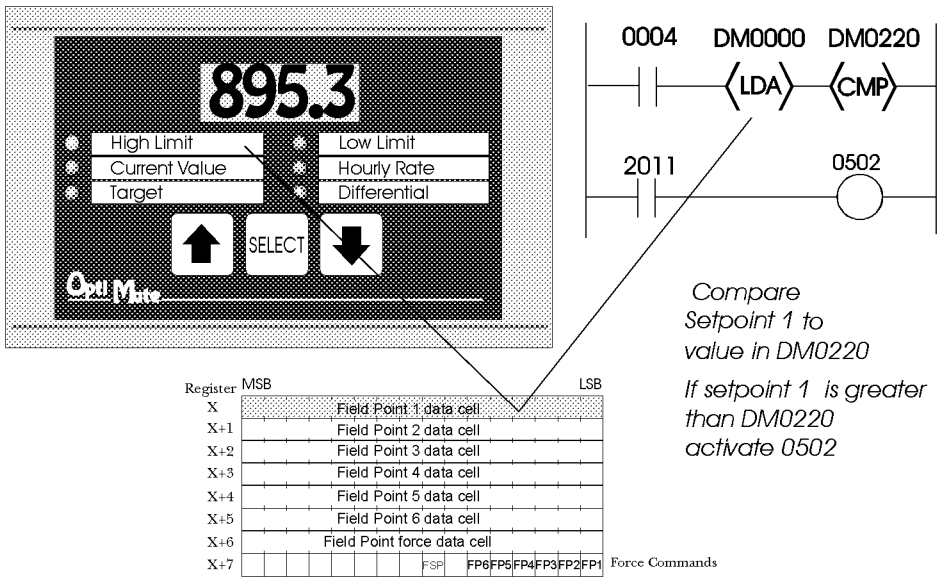
Displaying numeric data in one of the 6 field points is a very simple process. During the initial configuration, make sure you define the point as a display point, not a setpoint. When this is done, the PLC program must put data to be displayed into the register associated with the display data field.

The figure below illustrates a numeric display application with a Keyence PLC. In this application, the KM413 is configured for a base register address of DM0000 and field point 2 for display. A value, held in DM0406 must be displayed in field point 2 as long as 0005 is active. The example shows the value transferred from DM0406 to DM0001. It will be displayed as field point 2.



Reading a Setpoint

The following example uses a KM413 at base address DM0000. Field point 1 has been configured as a setpoint. In the example program, field point 1 is a High Limit setpoint. Whenever 0004 is active, the program shown compares the value of setpoint 1 with a value held in DM0220. If setpoint 1 exceeds the value of DM0220, output 0502 will be turned on.



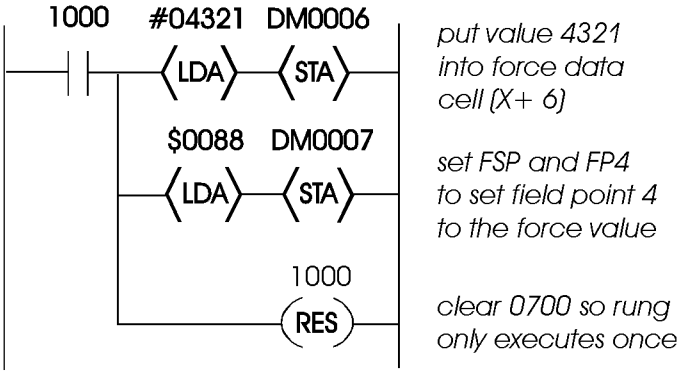
Forcing Setpoints

The KM413 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 KM413 completes the force operation, it will clear the force control register.

The following example shows setpoint 4 being forced to 4321 when 1000 is active.

Notice that 1000 is used as a set/reset type relay. The force command should be written to the force register once. The KM413 will automatically clear this register when the force is complete. This will normally happen very quickly (less than a second). The fact that the KM413 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 a Modicon PLC

Register Usage

The OptiMate Configuration Editor, OM-WINEDIT, allows you to configure the KM413 to use a block of 8 contiguous registers at a starting value that you define. The memory block has to be in the **4x** area of memory between 40001 and 40617. For a Modicon PLC, the recommended memory starting register address is 40001.

Any address between 40001 and 40617 area of memory is valid for the panel. However, Modicon PLCs use some data memory registers for specific instructions. Also, your program may be using registers in the 4x memory area. Refer to your Modicon PLC User's Manual to ensure that the registers you define for the panel do not conflict with registers that are already in use.

Memory Mapping

The OptiMate panels communicate in two basic ways with a PLC. They either read data from a register or write data to a register.

The KM413 uses a block of 8 contiguous registers. It *reads* data to display data and to force setpoints. It *writes* data to the setpoint registers to indicate the value of the setpoints.

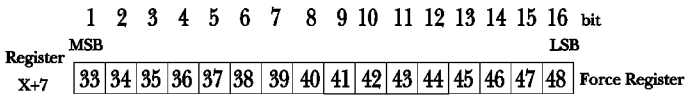
The first seven PLC registers (X-X+6) in the block used by the KM413 panel are used for numeric information. As such they are ideally suited for the 4x memory registers (40001-40617). Since individual bits are used to indicate control and status, register X+7 is better suited for the 0x relay register range of memory. However, the KM413 only communicates with the 4x memory area. The solution to this minor conflict is to define the base register address in 4x area of memory and place a rung in your PLC program to copy from 0x relay registers to register X+7.

Note: Modicon's bit-numbering convention is backwards from the standard (i.e. the least significant register bit is bit 16, while the most significant is bit 1). By carefully documenting bit association, you can avoid confusion.

The examples on the following pages use a KM413 connected to a Modicon PLC. The KM413 is configured for a base address of 40001. **The program rung on the right should be placed in the program only if you intend to use the Setpoint Force Option. It copies a relay block starting with 00033 to the Force Control register (X+7).**

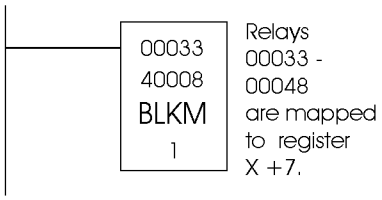
The data memory registers (X-X+7) depend on the base register address that you define. In this case, the base register address is 40001. Any valid internal relays may be used in the memory map. (If you do not use the relays shown, adjust each to correspond to the relays that you define.)

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



The table below shows the relay correlation for a KM413 when the data memory register X+7 is mapped from the 0x relays beginning with 00033 (as shown in the program rung below).

Force Command Register **(X+7)**
00048 (FP1)
00047 (FP2)
00046 (FP3)
00045 (FP4)
00044 (FP5)
00043 (FP6)
00042
00041 (FSP)
00040
00039
00038
00037
00036
00035
00034
00033

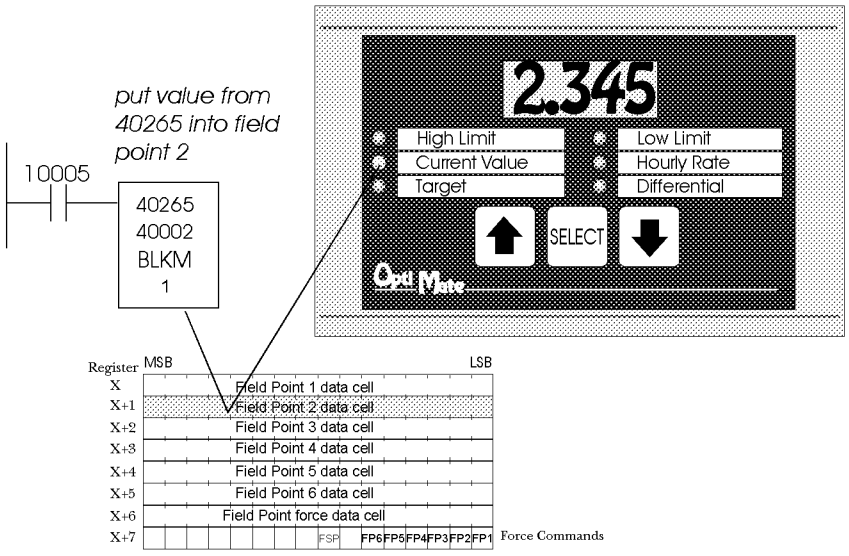


Setpoint & Display Operations

Displaying Numeric Data

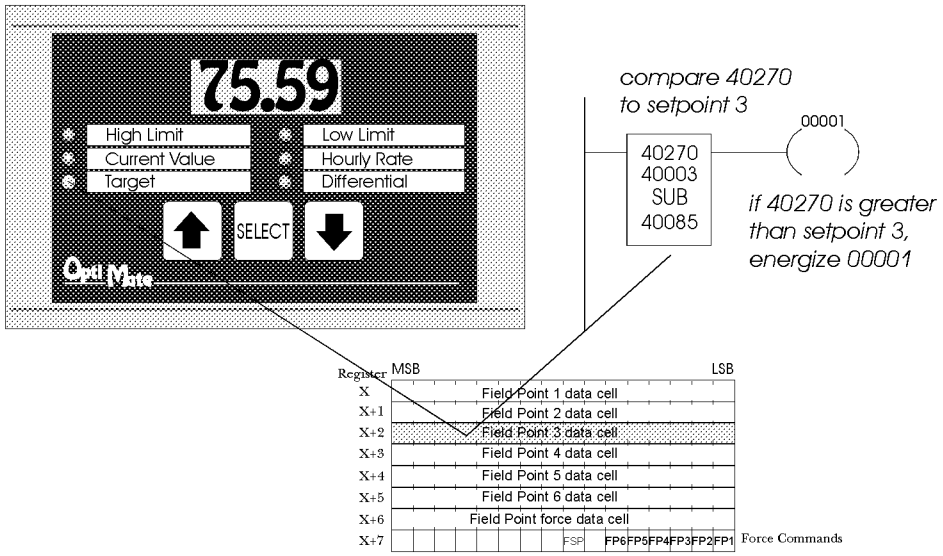
Displaying numeric data in one of the 6 field points is a very simple process. During the initial configuration, make sure you define the point as a display point, not a setpoint. When this is done, the PLC program must simply put data to be displayed into the register associated with the display data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

The figure on the right illustrates a numeric display application with a Modicon PLC. In this application, the KM413 is configured for a base address of 40001and field point 2 for display. A value, held in 40265 must be displayed in field point 2 as long as 10005 is active. The example shows the value transferred from 40265 to 40002. It will be displayed as field point 2.



Reading a Setpoint

The following example uses a KM413 at base address 40001. 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 40270 against setpoint 3. If the value exceeds setpoint 3, output 00001 will be turned on.



Forcing Setpoints

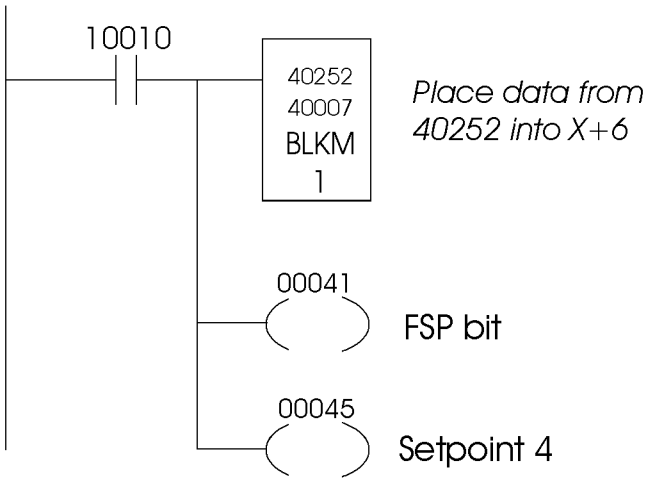
The KM413 gives you the capability to force a setpoint to a value from the PLC.

To force a setpoint to a value, the value should be placed in register X+6. Next ,the (FSP)bit and the bit(s) corresponding to the setpoint(s) to force to this value must be set in the force control register. When the KM413 completes the force operation, it will clear the force registers X+6 and X+7.

The following example shows setpoint 4 being forced to the value contained in register 40252 whenever 10010 is active.

The force command should be written to the force register once. The KM413 will automatically clear this register when the force is complete. This will normally happen very quickly (less than a second). If the program continues to set the FSP bit, the force will continue to happen until the program stops setting that bit. The fact that the KM413 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 KM413 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 KM413 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 KM413'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.

KM413 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

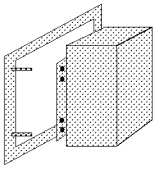
where Broadcast address = 99
Function = 0 ; Synchronize lamp flash timing

Set Up and Interconnect

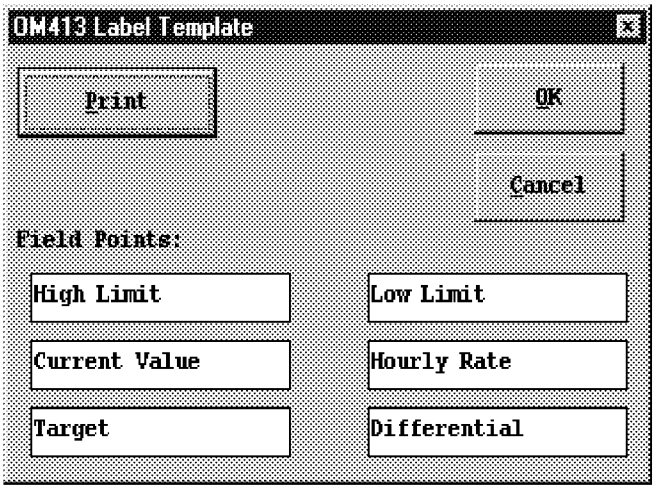
Legending the Field Points

Legending the KM413 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.

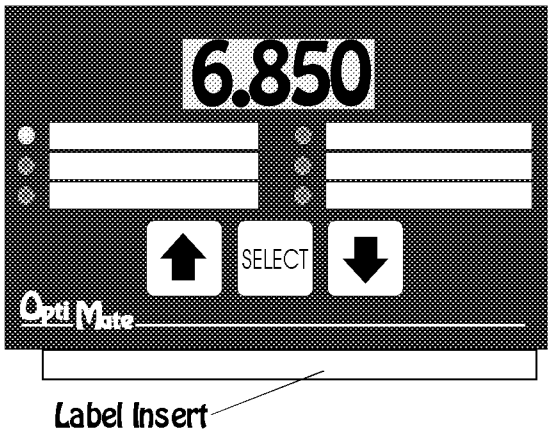


- Create legend transparencies. There are a number of available options for doing so. Patterns are provided on the next to last sheet of this document.
  - > Use the built-in label-making capability of the OM-WINEDIT software to create labels. Either print on the transparency directly or print on paper 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.

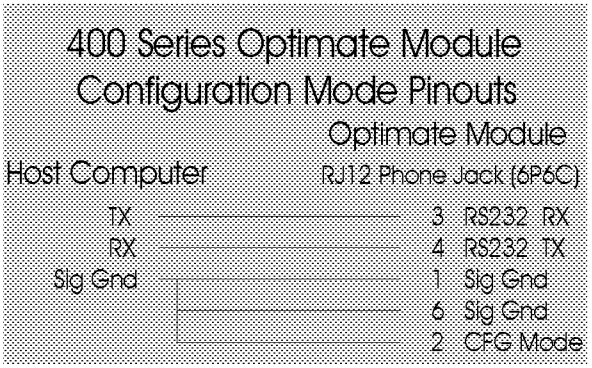


Connection to the System

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.

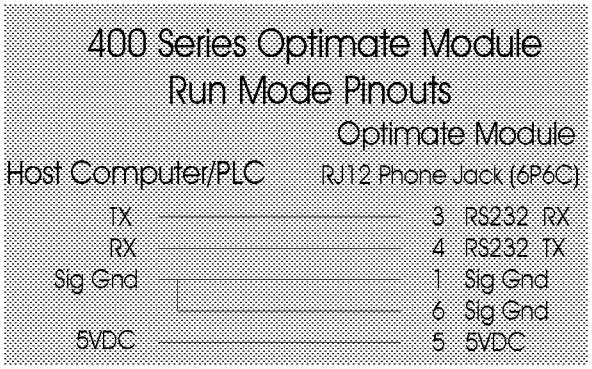


Refer to manufacturer's documentation for computer serial link connector pinouts.

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

Run Mode Connection to a Computer or PLC

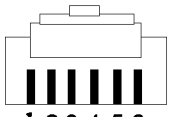
Connection of a 400 Series OptiMate module to a computer or PLC can be accomplished over an RS232 link. RS232 is limited to one OptiMate module to one computer serial port. Since PLCs are slave devices, the RS232 link for a PLC is limited to one OptiMate module. See the figure below for 400 Series OptiMate 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 KM413 Setpoint/Display Panel will operate only on a DC voltage of *5VDC.* Steady state current is listed on the specification page.

The KM413 panel can draw power from its communications cable if the host device has a 5VDC connection on its comm port.

The KM413 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. 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

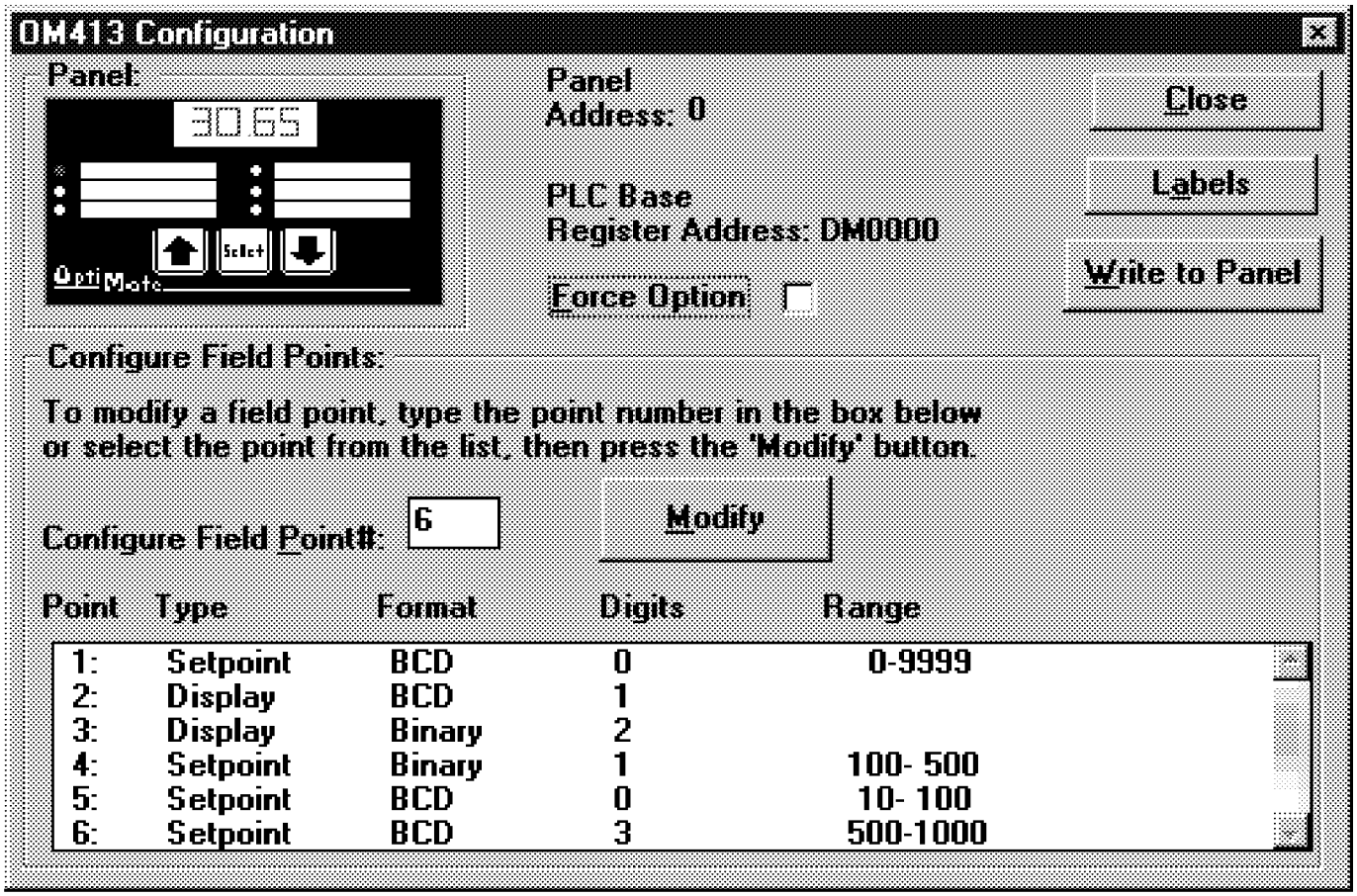
Configuration of the KM413 Setpoint/Display Panel is performed via an IBM PC compatible computer. The OM-WINEDIT configuration software allows you to select panel type, panel application and PLC protocol definition.

If the KM413 is to be operated with a PLC, the configuration selection must be made to select the proper PLC protocol information.

Specific configuration of the KM413 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 a KM413, always remember to use the programming cable that connects the KM413 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 using a Keyence PLC

The KM413 requires that certain parameters be set in order for it to communicate with a Keyence PLC. The parameters are PLC type, protocol, baud rate, parity, stop bits and base register address.

If you are using the KV10, KV16, KV24, KV40 or the KV80 PLCs the KM413 should always be set to the following:

KM413 Communication Parameters KV10, KV16, KV24, KV4, KV80, KV300, KV-L2	
Baud rate	9600
Parity	even
Stop Bits	1
Data Bits	8

Communications with a KV300 CPU can be accomplished by two means:
(1) direct connection to the communications port on the CPU
(2) connecting the panel to a KV-L2 Serial Interface Module

Note: If a KV-L2 Serial Interface Module is connected in the PLC system, you must use it to connect to the KM413. If you try to connect the panel to the KV300 CPU's communcations port, the panel will not communicate because the CPU will not recognize the protocol.

Direct Connection to the CPU

If you are connected to the KV300 through the CPU communications port, configure the KM413 with the parameters shown in the table above.

The KM413 uses the KV mode protocol to communicate with the PLC, therefore, the port that the panel is communicating with should be set for KV mode also.

Communications through the KV-L2

If you are using a KV-L2, the following dip switch paramenters apply:

Port 1		Port 2	
A1	A2	A3	A3
OFF	OFF	OFF	OFF

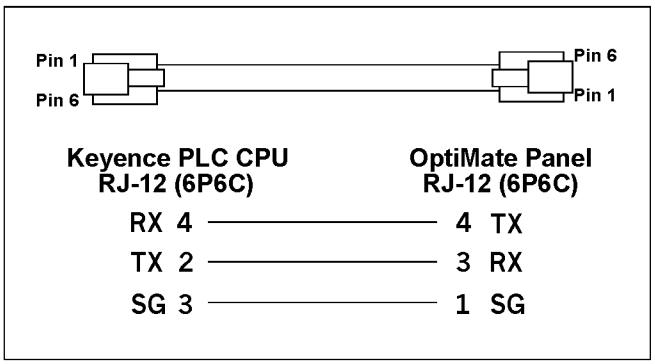
The dip switch settings shown above are dependent on the on the port that the KM413 is connected to. If the panel is connected to Port 1, then switches A1 and A2 should be OFF. If you have another device on Port 2, then the switches for Port 2 should be set to the proper protocol for that device.

The KM413 uses the KV Mode protocol to communicate with Keyence PLCs. Regardless of the "B" dip switch settings, the port that the panel is connected to will automatically default to the communication parameters shown in the table above.

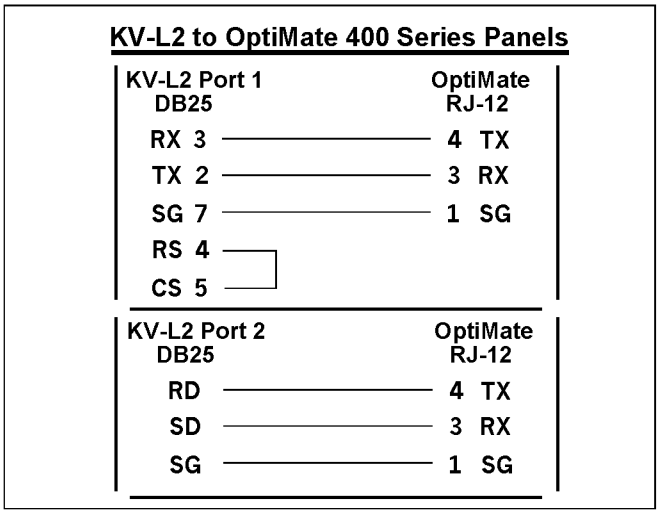
Note: If using Port 2, ensure that the port switch is set for RS232.

Refer to the chapter on the KV-L2 Serial Interface Module in the Keyence User's Manual for more details.

The figure below shows the pinouts to connect a KM413 to a Keyence PLC CPU. This cable is available from Optimation.



The figure below shows the pinouts to connect a KM413 to a KV-L2 Serial Interface Module. The pinouts shown are for RS232.



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 KM413 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 KM413.
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

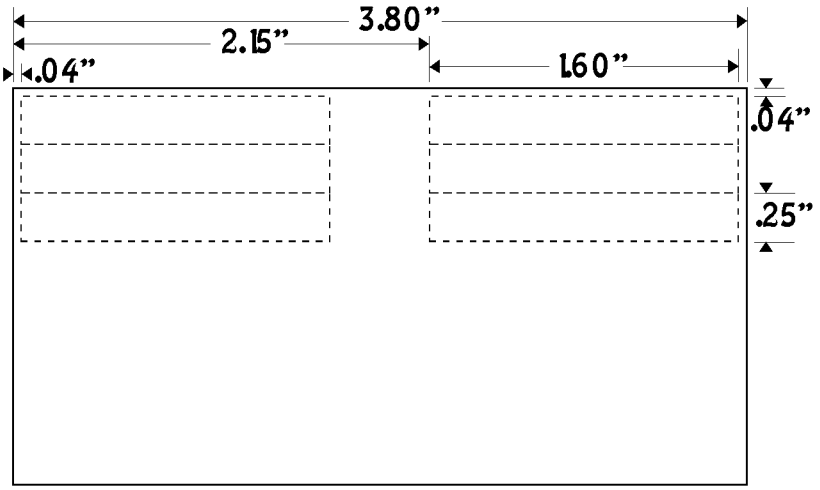
Decision	Selection
Single/ Multi Module	Choose single module configuration
Configuration starting point	First-time configuration start with defaults for module. Subsequent configurations can utilize disk files you create
PLC Type	Select appropriate PLC type
Protocol	Select appropriate baud rate, # data 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 KM413 cable so the module will operate with the selected host. Communication cables are available from Optimation.

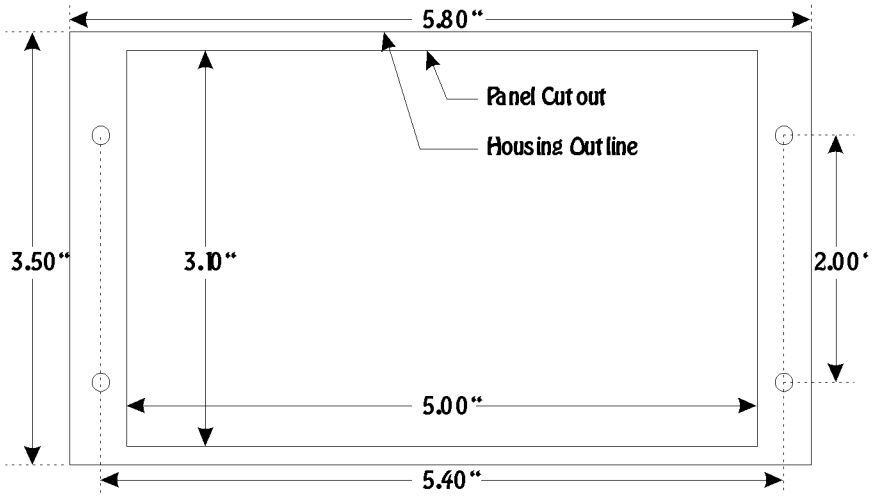
Field Point Label Insert Template



Specifications

Physical

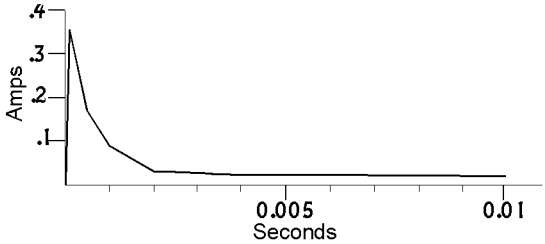
- Recessed Mount Housing: 6.00"L x 3.50"H x 1.25"D
- Cutout size: 3.20"H x 5.10"L
- Panel Fasteners:Four, 6x32 threaded studs, shown at right (on ends, symmetrical about center line)
- Weight : 8 ounces
- Colors : Dark gray housing with dark gray panel. Keypad keys; white with gray letters.
- Numeric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



Panel Mounting Dimensions

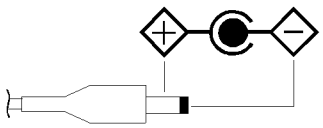
Electrical

- 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