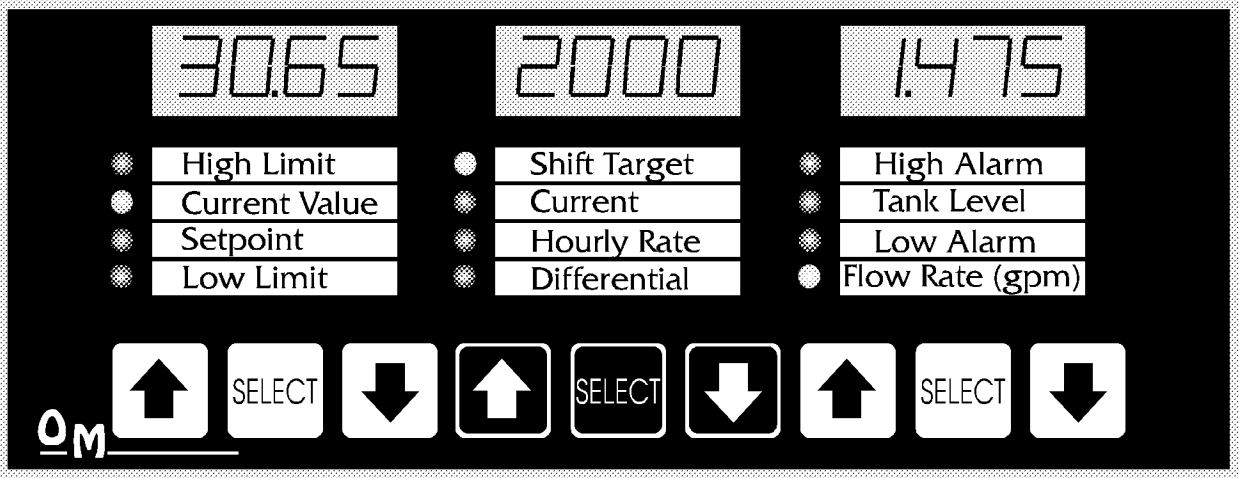


OM1312 Setpoint/ Display Module

General Overview

The OM1312 Setpoint/Display Panel provides twelve numeric field points which can be used for either setpoint entry or data display.

Each of the three (3) four-digit displays 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 adjustment can be performed by use of the arrow keys to move the value up or down. Once set, the value is burned into non-volatile memory. It is permanently stored, whether power remains on or not, until the next time it is changed by the operator.

The OM1312 Panel is part of Optimation's **OptiMate**® series. Each OptiMate panel is designed to connect to a microprocessor or most PLCs with a single cable connection. OptiMate modules can be used individually, or together with any combination of other OptiMate modules.

Applications

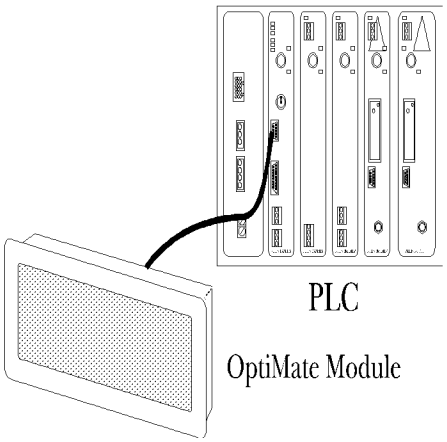
- Machine control
- Process control
- Security systems
- HVAC
- Plant monitoring/control
- PLC applications
- Microprocessor applications

Features

- 12 Setpoints or display points
- 3 Four-digit numeric displays
- Pushbutton item selection
- PLC compatible
- RS232/RS422 communications
- Stand-alone operation capable
- Multimodule operation capablity

Contents

Configuration Options

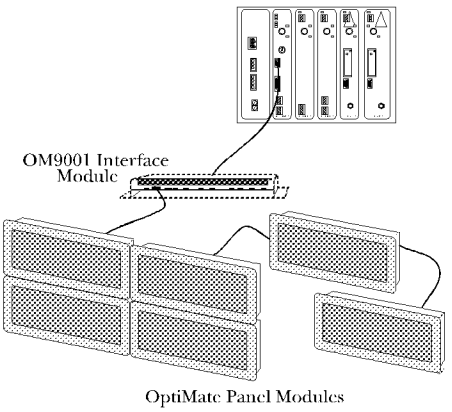


PLC Stand Alone

OptiMate modules plug directly into most PLCs. A simple cable connection allows you to interface and control the OptiMate module via PLC data registers.

The OM1312 setpoint module uses a bank of PLC registers. Each of the 12 field points is assigned a register. If this field point is a display point, the OM1312 continuously reads and updates the display to reflect the number held in the register. If the field point is a setpoint, the OM1312 continuously updates the setting to the PLC register.

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 modules will perform these communications for most major PLC protocols. Configuration for particular PLC protocols and interconnect cabling is covered in the following pages.



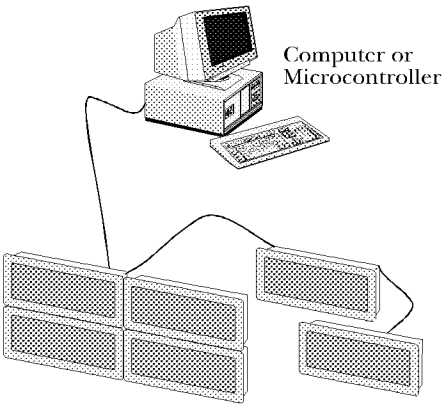
PLC Multi Modules

Larger systems involving operator panels can be successfully addressed using OptiMate modules. These applications utilize the OM9001 Communications Master to transfer data between the PLC and the individual OptiMate modules. OptiMate modules 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 modules 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 modules can interface directly to most computers or microcontrollers. The modules communicate over either RS422 or RS232 serial communications. All that is required to interface OptiMate modules is a serial port. The OptiMate Hex protocol, detailed in this document, allows the user to directly read setpoints and output display data.

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

In a microprocessor-based system, the host microprocessor is the system master. The OptiMate modules are slave devices that respond to commands from the host. In the case of the OM1312, these commands are primarily requests for setpoint data and display data outputs.

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

Use with a PLC

Memory Mapping

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

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

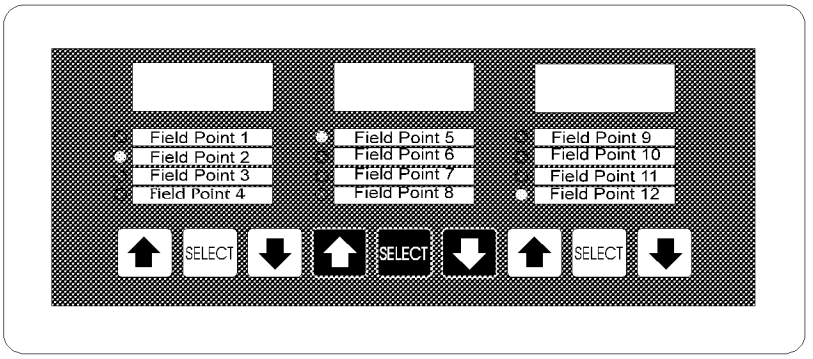
MSB															LSB
16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

PLC Register

The OM1312 Setpoint/Display Module uses a bank of 12 or 14 contiguous holding registers (depending on the configuration options selected by the user). The register set definition is shown in the table below.

OM1312 Setpoint/Display Module PLC Register Map

Holding Register	Register Type	Register Function
X (first register of bank)	datacell	Field Point #1 data (single precision numeric data from 0 - 9999)
X+1	datacell	Field Point #2
X+2	datacell	Field Point #3
X+3	datacell	Field Point #4
X+4	datacell	Field Point #5
X+5	datacell	Field Point #6
X+6	datacell	Field Point #7
X+7	datacell	Field Point #8
X+8	datacell	Field Point #9
X+9	datacell	Field Point #10
X+10	datacell	Field Point #11
X+11	datacell	Field Point #12
X+12	force/ flag	Bit 16 - Force flag. If this bit is set, the setpoint(s) selected by bits 1-12 will be forced
X+13	force value datacell	Field Point force data (single precision values from 0 - 9999)



Reading a Setpoint

Setpoint data is continuously and transparently written to the associated holding register. To access and use the setpoint data simply reference the relevant holding register in the PLC program.

Writing a Display Point

Writing a display value simply requires writing data into the associated holding register. The OptiMate module 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+13. Next, the bit corresponding to the setpoint(s) to be forced and the most significant bit of X+12 must be set. When the OM1312 module has forced the setpoint to the required value, X+12 will be cleared.

Configuration

Each of the twelve field points can be configured by the user to be either a setpoint or a display point. Configuration software provided by Optimation allows you to configure the OM1312 module or the entire system from any IBM PC compatible computer.

In addition to defining which field points are setpoints and which are display points, the placement of the decimal point and the adjustment limits for each setpoint can be established. Decimal points are fixed in place once established (or until changed though the configuration program). Setpoint limits establish a minimum and maximum value that each setpoint can be adjusted.

If the application calls for a single OM1312 module connected directly to a PLC, the OM1312 must be configured directly by connecting it to the IBM PC compatible and running the setup software. If the OM1312 is part of a system with a number of OptiMate modules, the entire system can be configured by connecting the OM9001 Communications Master to the IBM PC and running the setup software.

> Note: DIP switch 6 is a termination switch for RS422. It should always be OFF unless the panel is at the end of the cable in an RS422 system.

Further configuration details are covered in the OptiMate Configuration Editor manual.

Examples of Use with a PLC Direct PLC

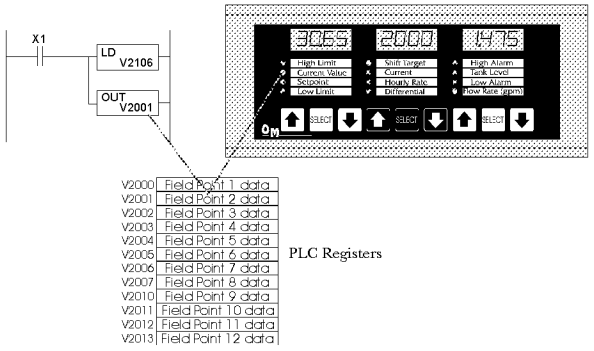
Register Usage

The OptiMate 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 205 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.

Displaying Numeric Data

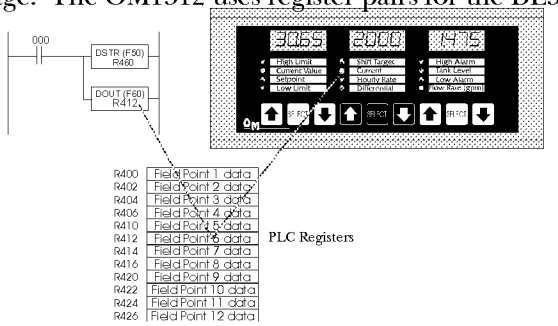
Displaying numeric data in one of the twelve field points is a very simple process. During the initial configuration, make sure you define the point as a display point, and not a setpoint. When this is done the PLC program must put the data to be displayed into the register associated with the display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

The figure below illustrates a numeric display application with a PLC Direct 205 or 405 series PLC. In this application, we have configured the OM1312 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 V2001. It will be displayed in field point 2.



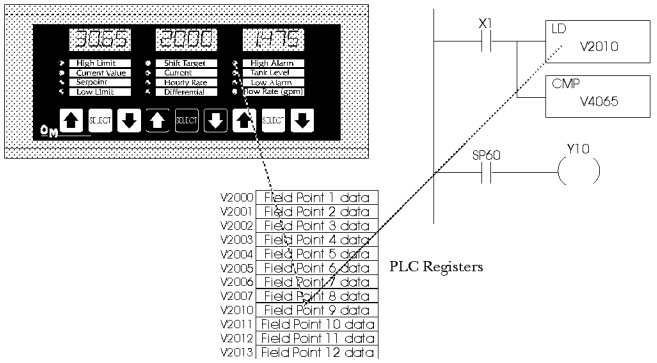
The following is a similar example using a PLC Direct 305 series PLC. In this example, we have configured the OM1312 with a base address of 400 (for R400). We are using field point 6 to display a pressure value that is coming from R460. The example shows the value transferred from R460 to R412. It will be displayed in field point 3.

Note : The 305 series PLCs have 8 bit registers instead of the 16 bit registers shown in the table on the preceding page. The OM1312 uses register pairs for the DL305.



Reading a Setpoint

The following example uses an OM1312 at base address 2000. Field point 9 has been configured as a setpoint. In the example program, field point 9 is a high alarm setpoint. The 205/405 program shown checks a value, held in V4065, against the setpoint whenever X1 is active. If the value exceeds the setpoint, Y10 will be turned on.

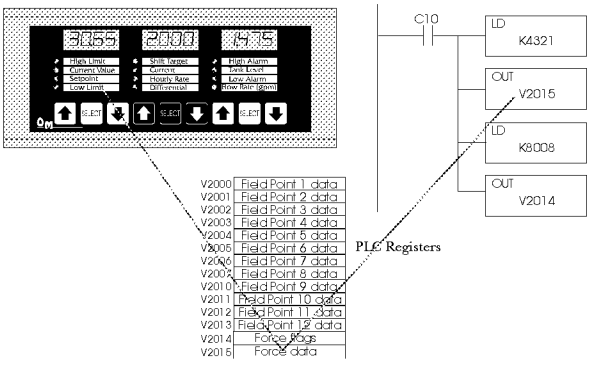


Forcing a Setpoint

The OM1312 gives you the capability to force a setpoint to a value from the PLC. Obviously, this is a capability that should be used very carefully.

To force a setpoint to a value, the value should be placed in register X+13. Next the bit, in X+12, corresponding to the setpoint must be set. When the OM1312 module has forced the setpoint to the required value, X+12 will be cleared.

The following 205/405 example shows setpoint 4 being forced to 4321 when C10 is active.



Examples of Use with an Allen Bradley PLC

Interfacing to A/B Memory

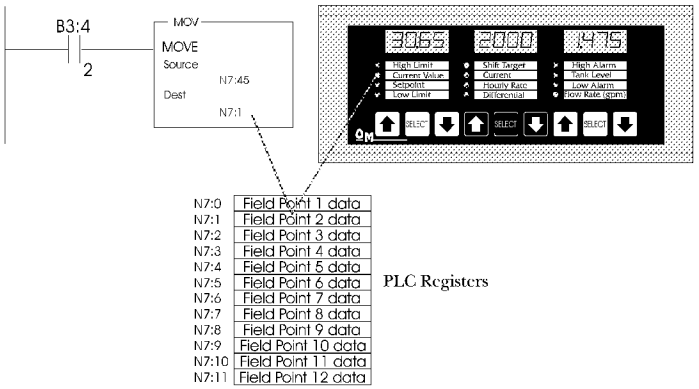
OptiMate modules interface to Allen Bradley SLC 5/03, SLC 5/04 and Micrologix PLCs via integer file type N. The 5/03 and 5/04 have file type N7 as standard. Other "N" type files can be created. The Micrologix has a fixed file type N7. Please refer to Allen Bradley programming documentation for information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

The OptiMate Configuration Editor allows you to configure a module to use a block of registers at a starting value that you define. Any block of registers within an "N" type file range can be used.

Displaying Numeric Data

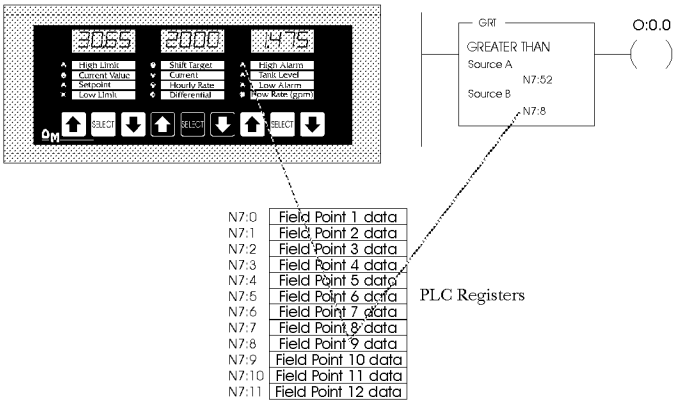
Displaying numeric data in one of the twelve field points is a very simple process. During the initial configuration, make sure you define the point as a display point and not a setpoint. When this is done the PLC program must simply put the data to be displayed into the register associated with the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

The figure below illustrates a numeric display application with a SLC or Micrologix PLC. In this application, we have configured the OM1312 for a file number 7, a base register address of 0 and field point 2 for display. A value, held in N7:45, must be displayed in field point 2 as long as B3:4/2 is active. The example shows the value transferred from N7:45 to N7:1. It will be displayed in field point 2.



Reading a Setpoint

The following example uses an OM1312 at file N7, base register address 0. Field point 9 has been configured as a setpoint. In the example program, field point 9 is a high alarm setpoint. The SLC or Micrologix program shown checks a value, held in N7:52, against the setpoint. If the value exceeds the setpoint, O:0.0 will be turned on.

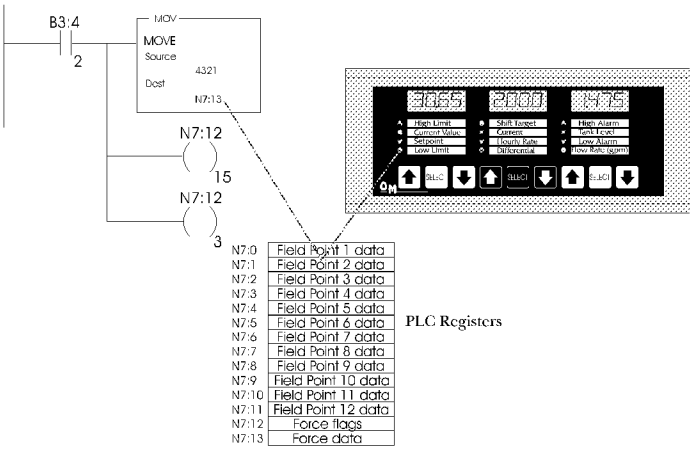


Forcing a Setpoint

The OM1312 gives you the capability to force a setpoint to a value from the PLC. Obviously, this is a capability that should be used very carefully.

To force a setpoint to a value, the value should be placed in register X+13. Next the bit, in X+12, corresponding to the setpoint, must be set. When the OM1312 module has forced the setpoint to the required value, X+12 will be cleared.

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



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.

Module Address

Switches 1 through 5 of a six-position DIP switch on the back of each OptiMate module provide a method for setting the address. By use of this DIP switch you can set the module address to any number between 0 and 31. See the addressing section of this manual for more information about addressing.

Configuration

Each of the twelve field points can be configured by the user to be either a setpoint or a display point. Configuration software provided by Optimation allows you to configure the OM1312 module or the entire system from any IBM PC compatible computer.

In addition to defining which field points are setpoints and which are display points, the placement of the decimal point and the adjustment limits can be established. Once established, decimal points are fixed in place (until changed through the configuration editor). Setpoint limits establish a maximum and minimum value that each setpoint can be adjusted.

Communications Protocols

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 baud rate, parity, number of data bits 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.

Hex Protocol

General Format

STX	**Module address**	**function number**	**text** **checksum**

where Module address = 0 to 30
Function = 0xA8 ; Read setpoint
= 0xA9 ; Write display point
= 0xAA ; Force setpoint
checksum = 8 bit sum of all character after address until checksum

Note : These functions are normally performed by the configuration editor

For function type A8 : Read setpoint

STX	**Module address**	**0xA8**	**setpt_no** **checksum**

where setpt_no = field point number 0 - 11

Response

STX **data_MSB** **data_LSB** **checksum**

where data is an integer value sent MSB first. No sign or decimal point

For function type A9 : Write display setpoint

STX	**Module address**	**0xA9**	**displaypt_no**	**data_MSB** **data_LSB**	**checksum**

where displaypt_no = display point number 0 - 11
data is an integer value sent MSB first. No sign or decimal point.

Response

ACK
or
NAK **if any errors in message**

For function type AA : Force setpoint

STX	**Module address**	**0xAA**	**setpt_no**	**data_MSB** **data_LSB**	**checksum**

where setpt_no = set point number 0 - 11
data is an integer value sent MSB first. No sign or decimal point.

Response

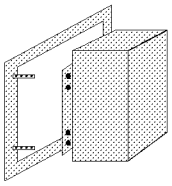
ACK
or
NAK **if any errors in message**

Set Up and Configuration

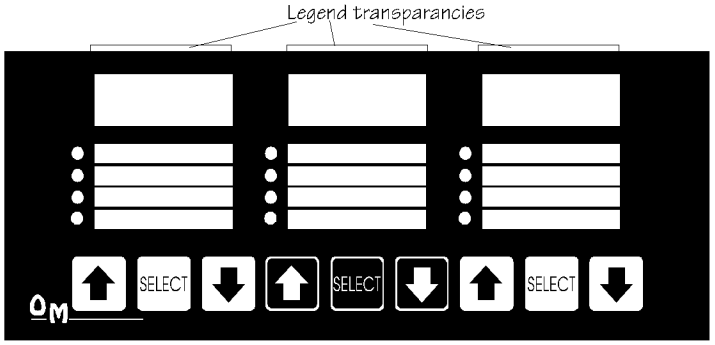
Legending the Field Points

Legending the OM1312 module is a relatively simple process that basically involves sliding a legend transparency into the three 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. A pattern is provided on the specification sheet of this document.
  - > 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
- 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.

OptiMate Module RS232

Host Computer/PLC		OptiMate Module DB-15 Male
TX	———	3 RS232 RX
RX	———	2 RS232 TX
Sig Gnd	———	5 Sig Gnd

OptiMate Module RS422

Host Computer/PLC		OptiMate Module DB-15 Male
TX+	———	9 RS422 RX+
TX-	———	10 RS422 RX-
RX+	———	11 RS422 TX+
RX-	———	12 RS422 TX-

Optimation sells interface cables 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.

Configuration

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 OM1312 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
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. Hex protocol requires 8 data bits.
Field Points	Set as setpoint or display as required for application. Set decimal point placement
Force option	Force capability is always available for computer based systems.

Single Module PLC-Based Systems

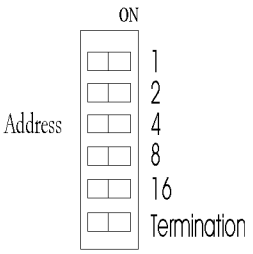
Decision	Selection
Single/ Multi Module	Choose single module configuration
Configuration starting point	First-time configuration start with defaults for module. Subsequent configurations can utilize disk files you create.
PLC Type	Select appropriate PLC type
Protocol	Select appropriate baud rate, # data bits, # stop bits & parity. Note that if 8 data bits and even or odd parity selected, only 1 stop bit is available
Field points	Set as setpoint or display as required for application. Set decimal point placement.
Force Option	Set as required for application

Multi Module PLC Applications (Uses Communications Master)

Decision	Selection
Single/Multi Module	Choose Multi module
PLC Type	This applies to the Communications master. Choose appropriate type.
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.
Field points	Set as setpoint or display as required for application. Set decimal point placement.
Force option	Set as required for application.

Addressing

Setting the module address is a matter of turning the module over and pressing the appropriate dip switches. There are 6 DIP switches; 5 of which have a numeric value listed next to the switch. To select an address, push (with a pencil or small screwdriver) the appropriate combination of switches down to the right.



For example, to select address 14, the 2, 4 and 8 switches should be pressed down to the right and the 1 and 16 switches down to the left.

Remember that for configuration, address 31 (numeric switches 1-16 on) must be selected first, then apply power to the module. The termination switch must always remain in the OFF position unless the module is the last, and only the last, module on the cable in an RS422 system.

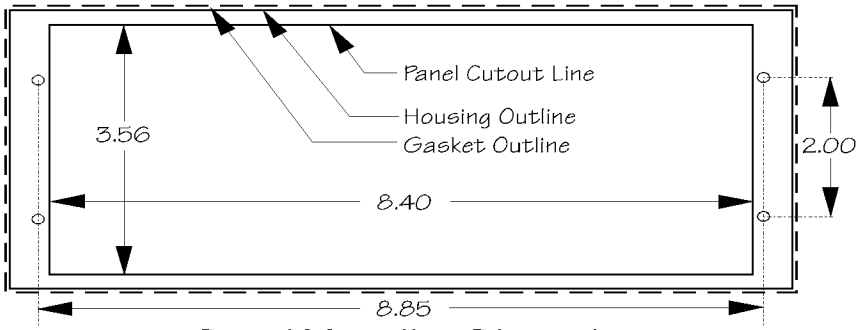
Power

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

Specifications

Physical

- Recessed Mount Housing 9.5"L x 4.0"H x 1.75"D
- Cutout size for above
  3.55"Hx8.6"L



Panel Mounting Dimensions

- Panel Fasteners : Four, 6x32 threaded studs, shown above (on ends, symmetrical about center line)
- Numeric LED height : 0.35 inch
- Housing color : Dark gray

Electrical

- Power (all lamps on) : 8 - 30VDC @ 6VA
  525 mA @ 12VDC
  280 mA @ 24VDC
- Power connector : Pluggable terminal block,
  2 position

Communications

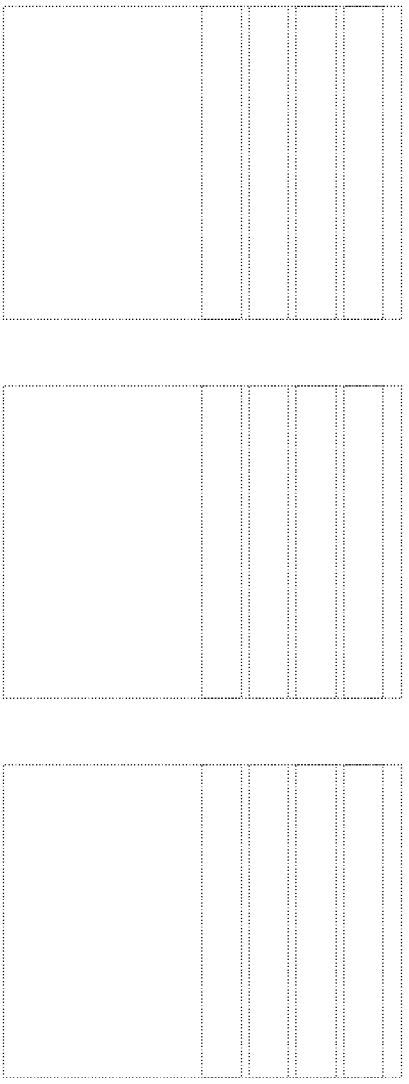
- RS232 and RS422
- 4800 to 19200 baud
- Compatible with most major PLC protocols
- Microprocessor compatible protocol
- 15 pin female 'D' shell connector (screw terminal adapter available)

Communications Failure Operation

Should the module (when set to any address other than 31) ever fail to communicate successfully for a period of 12 seconds, all 12 field point selection indicator lights will flash rapidly

Environmental

- Enclosure - NEMA 4 recessed mount
- Temperature - 0 to 50 C
- Humidity - 95% Non-condensing



Label Strip Pattern