



Sentry Process Monitor



Up to four programmable 10A SPST alarm relay outputs

Up to four programmable process inputs

Four digit LCD display

Advanced microprocessor retains programmed values even with power interruption

AC input 90-250 VAC

+24V for sensor operation

Programmable scale and offset

Mix and match input types for unique applications

NEMA 4X enclosure

Output relays can be “daisy-chained” to combine sensor functions logically

Hysteresis and Averaging available

The Sentry Process Monitor is designed to provide the greatest flexibility to the process engineer, facility technician, or instrumentation personnel to monitor almost any process or combination of processes.

Each input of the Sentry Process Monitor can be configured by means of a plug-in module for 4-20ma, 0-10 or 0-5 volt, proximity sensor, or speed measurement.

Each input can be scaled to select units meaningful to the particular application.

Each output can be assigned to an input so that multiple setpoints can be derived from one sensor input.

The Sentry Process Monitor is designed to be a stand-alone economical means of quick process monitoring.

The Sentry Process Monitor is a quick low cost solution for valve, pump, alarm, or actuator operation.



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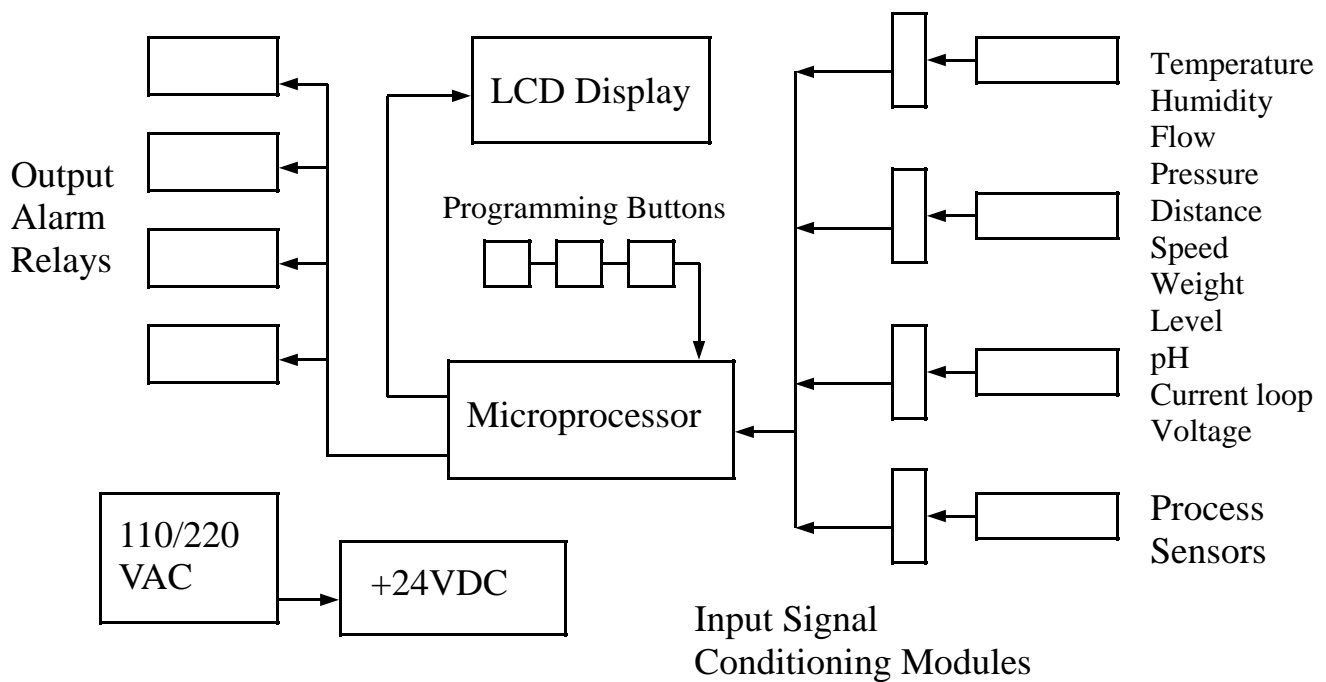
Theory of Operation

The Sentry Process Monitor operates by measuring up to four input signals, comparing the measurements with programmed setpoints, and then operating up to four output alarm relays if needed. The Sentry Process Monitor can be powered from 90-250VAC and supplies +24VDC for sensor operation.

Because the Sentry Process Monitor can receive so many different types of inputs, each input channel requires an input module to both protect the microprocessor from hazardous voltages as well as convert the input signal to a form compatible with the microprocessor.

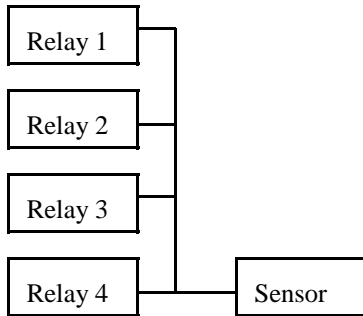
Programming is the key to configuring the Sentry Process Monitor. There are three main programming options, Inputs, Outputs, and selecting which input channel is displayed. The programming flow chart more fully describes this feature.

Any alarm can be assigned to any input by programming. This allows for the option of having multiple setpoints for one input source. Each alarm relay has an LED to indicate when the relay has been operated.

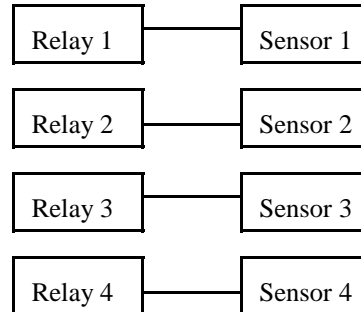


With the exception of the speed inputs which are measured as they occur, the Sentry Process Monitor makes measurements of input channel conditions about every half second. An averaging option exists in software to allow the measurements to be smoothed out over time. Programming options provide for selection of alarm delay and recovery options that allow each alarm channel to be selected for a specific operate and release condition.

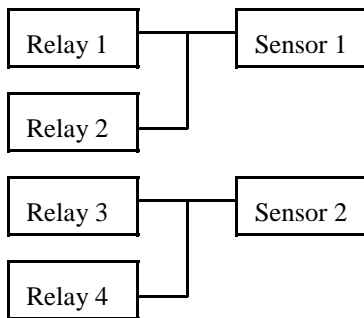
Typical Applications



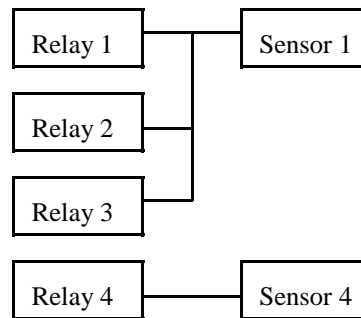
One sensor with four set-point relays.



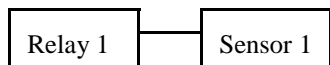
Four sensors with one setpoint relay each.



Two sensors with two set-point relays each.



Two sensors, one with three set-point relays and one with one set-point relay.

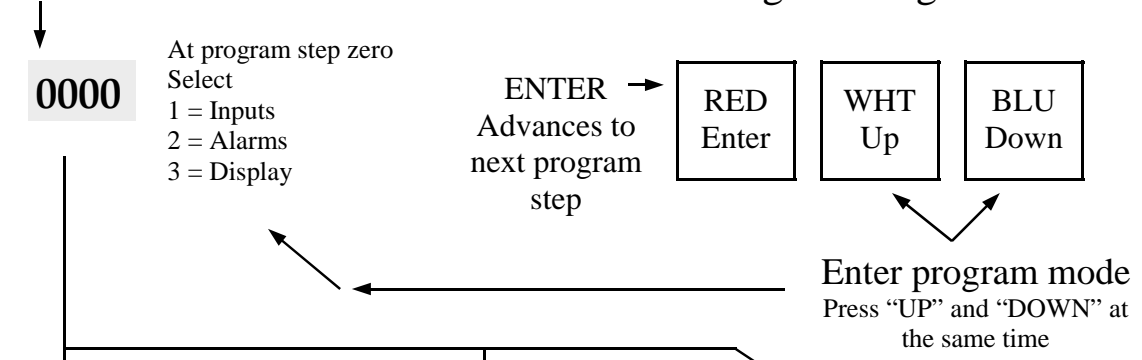


Basic one sensor with one set-point relay.

Programming quick reference sheet

Left most digit shows the program step

Programming buttons



	Inputs	Alarms	Display
1000	Step 1 Channel select 1,2,3,4	1000	Step 1 Alarm select 1,2,3,4
2000	Step 2 Type select 1 = 20ma 2 = 10V 3 = 5V 5 = rate 6 = logic	2000	Step 2 Channel select 1,2,3,4 (10-25 logic)
3000	Step 3 Decimal point 1 = XX.X 2 = X.XX 3 = .XXX	3000	Step 3 Setpoint 000-999
4000	Step 4 LV scale factor 000-999	4000	Step 4 Over / under 0 = under 1 = over
5000	Step 5 LS scale factor 000-999	5000	Step 5 Alarm delay 0-30 seconds
6000	Step 6 HV scale factor 000-999	6000	Step 6 Recover delay 0-30 seconds
7000	Step 7 HS scale factor 000-999	7000	Step 7 Hysterisis 0-30 counts
8000		8000	Step 8 Averaging

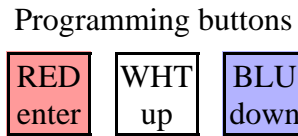
When the last "ENTER" is pressed in a programming series, the operating mode is automatically entered

Programming

The programming mode can be entered into at any point the unit is powered up. Care should be taken if the unit is connected to an existing process that interruption of the monitoring process does not cause a problem with the process.

The program mode is entered by pressing both the white (up) and blue (down) buttons at the same time. The display will show all zeros and the blue or white buttons can be pressed to select options 1 (input channel programming), 2 (output alarm programming), or 3 (display selection programming). Pressing the red (enter) button accepts the selected value and moves to the next program state.

Use the UP and DOWN buttons to select the program value and press ENTER to save the value and advance to the next program step.



Enter the program mode by pressing the UP and DOWN buttons at the same time

Input Channel Programming

Once the input channel program option has been selected, the next programming option is to select which input channel will be programmed. There can be up to four input channels. Programming unequipped input channels could result in undetermined conditions. It is best to leave unused inputs in a zero state.

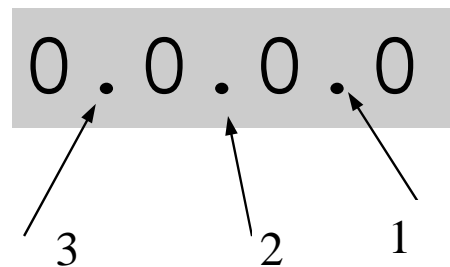
The next program step is to select the type of input to be configured to the channel. It is important to make sure that the input type is compatible with the input module that will be used with the input channel. For example, a 4-20ma input module will not give an accurate reading for a channel that has 0-5V or other type selected.

Input channel types

- | | |
|-----------------------------------|--------------------------|
| 1 = 20ma (4-20, 0-20, 20-4, 20-0) | 4 = reserved |
| 2 = 5V (0-5, 5-0) | 5 = Speed or rate input |
| 3 = 10V (0-10V, 10-0V) | 6 = Logic or state input |

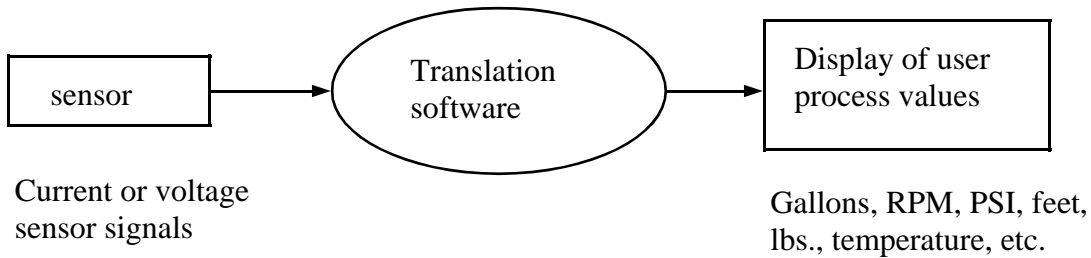
Decimal Points

Because the measured sensor signal (process variable) is scaled, the display needs to know where to put a decimal point. This is selected for the ease of use of the operator or installer to aid in seeing the scaled process valued displayed in terms meaningful to the application.



Scaling

Because the Sentry Process Monitor can be used in so many different configurations, the display can be configured to display almost any units such as weight, speed, volume, pressure, etc. Scaling is the means to “translate” the sensor information into the user defined display information.



Scale values

In order to program the Sentry Process Monitor to scale the sensor information into the proper process values, four numbers need to be selected. The first two numbers need to be some range of the sensor output. For a 4-20 mA sensor the maximum range of output could be 040-200 (the full range does not have to be used). The range can be selected by specifying the lowest and highest values (040 and 200) or a segment of the range can be selected (i.e. 080 and 150).

Once the two sensor values have been selected, the next step is to select two corresponding

High and low sensor values

High and low process scale values

LV	040	=	000	LS
HV	200	=	999	HS

The example above would be used if a 4-20 mA pressure sensor was used to measure the fluid in a 0-1000 gallon tank.

Process values

Once the Sentry Process Monitor has been programmed to translate the sensor values into user process values, the output can be programmed using these values. For example, if it is desired to turn a pump on or off when a certain number of gallons are reached, the SPM can be programmed in gallons instead of having to convert the sensor value each time.

The Display will be meaningful to the user because the values will be displayed in terms of the process they are running

Output Alarm Programming

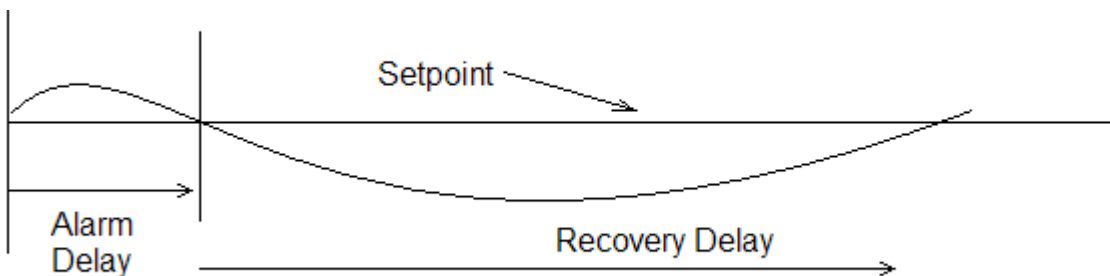
Once the output alarm program option has been selected, the next programming option is to select which output alarm will be programmed. There can be up to four output alarms. Programming unequipped output alarms should result in no undetermined conditions since there are no relays to operate.

Input channel assignment

Once the output alarm has been selected, the next program step is to select which input channel is going to supply the measurement value to be monitored. The assignment of input channel allows for multiple alarms to be configured from just one input.

Setpoint Programming

A value is selected (using the up and down buttons) against which the assigned input will be compared.



Over / Under programming

The next selection is to decide if the output alarm relay should operate if the measured value is over or under the selected setpoint value. A “1” is selected if an over condition and a “0” is selected for an under condition.

Alarm Delay Programming

The next value to be selected is the alarm delay. Some process operations require a tolerance of brief alarm conditions such as the start up of pump, motor, or other mechanical processes. A delay of from 0-30 seconds can be selected to accommodate brief alarm conditions without actually operating the alarm relay.

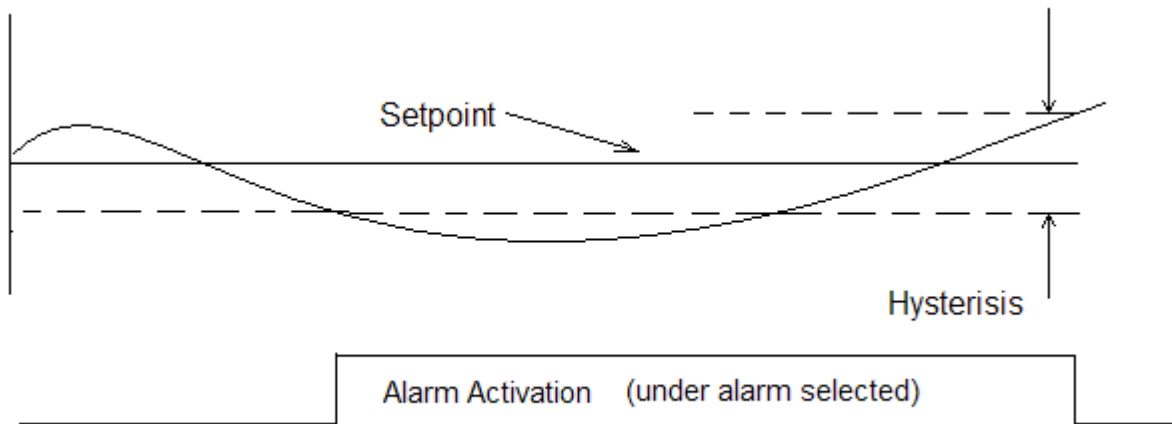
Recovery Delay Programming

Similar to the alarm delay, the recovery delay can be selected from 0-30 seconds to establish the time before a “return to normal” condition is accepted.

WARNING - Extreme care needs to be taken when selecting these values so that operation of machinery will not occur that might cause harm to personnel

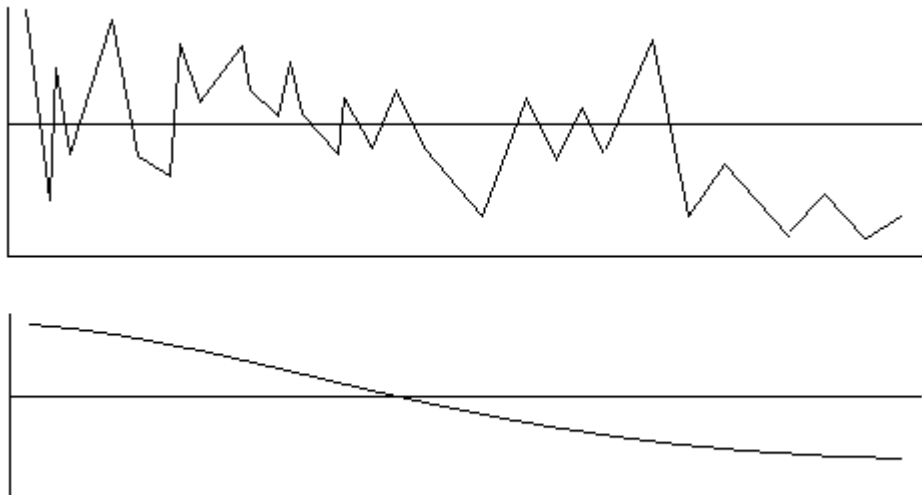
Hysterisis Programming

Hysterisis is the amount above and below the setpoint that the input has to change before the output alarm relay will be effected. It can be selected from 0-30. A value of thirty means that an input condition has to reach the setpoint plus (or minus) thirty units before the alarm condition can be removed. This is useful in cases where the input can very close to the setpoint to avoid relay “chatter”.



Averaging

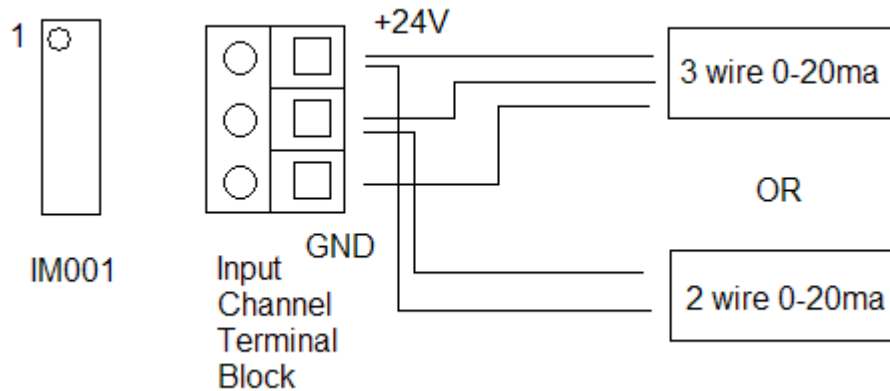
The output alarm can be programmed to average the measured input value from 0-30 samples. This is a rolling average of the last “X” number of measurements. This can be useful to make erratic measurements more consistent. However, it does slow down the ability to respond to sudden input changes.



Wiring

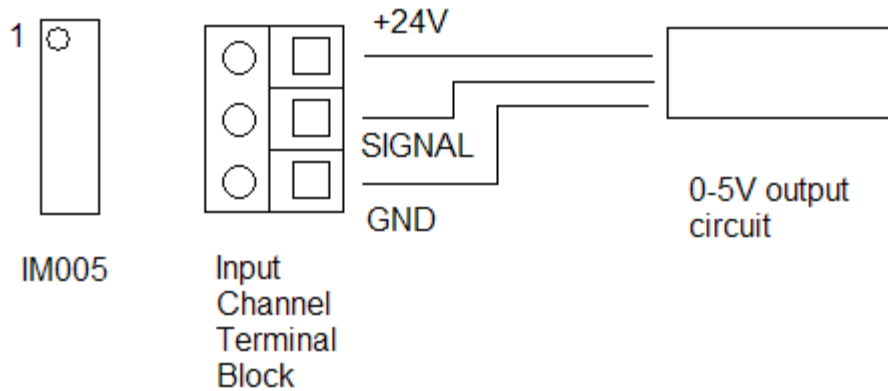
Current Loop

Current loop sensors and other devices can be monitored using the IM001 input module. 0-20ma, 4-20ma, 20-0ma, 20-4ma, two wire and three wire (current sourcing) devices can all be used with the IM001. The scaling portion of input channel programming provides for signal inversion or offset.



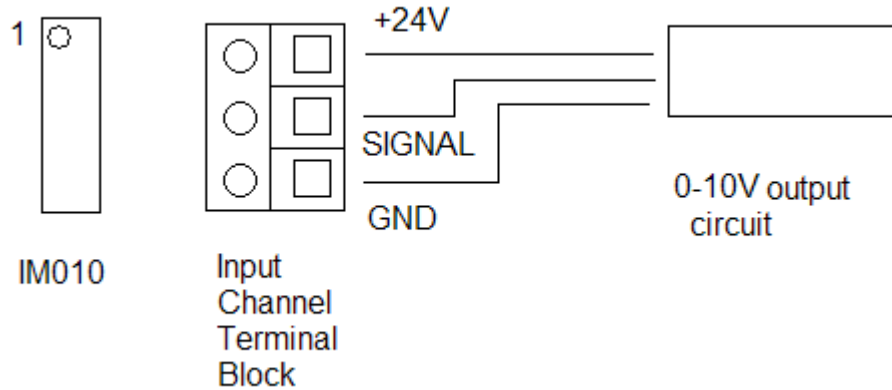
0-5V

Devices that provide a 0-5V output signal can be used with the IM005 input module. Care should be taken not to exceed the input voltage to prevent damage to the Sentry Process Monitor.



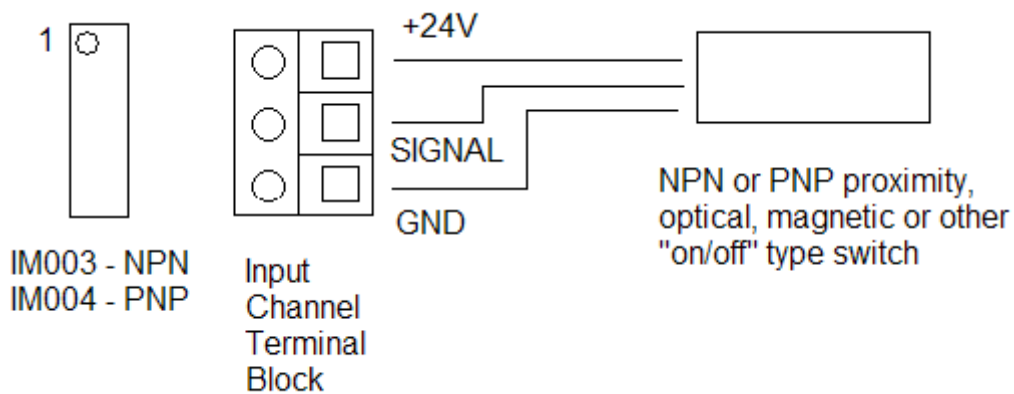
0-10V

Devices that supply a 0-10V output require the IM010 input module. This has a different scaling resistor network than the IM005. Care must also be taken to insure that the input voltage is not exceeded to avoid damage to the Sentry Process Monitor.



Speed / Logic

Both the speed and logic inputs are either high or low and can operate from a variety of switch type devices such as inductive proximity sensors, optical beam detectors, magnetic reed switches, etc. The IM003 is used for NPN or open collector type switches and the IM004 is used for PNP type switches.

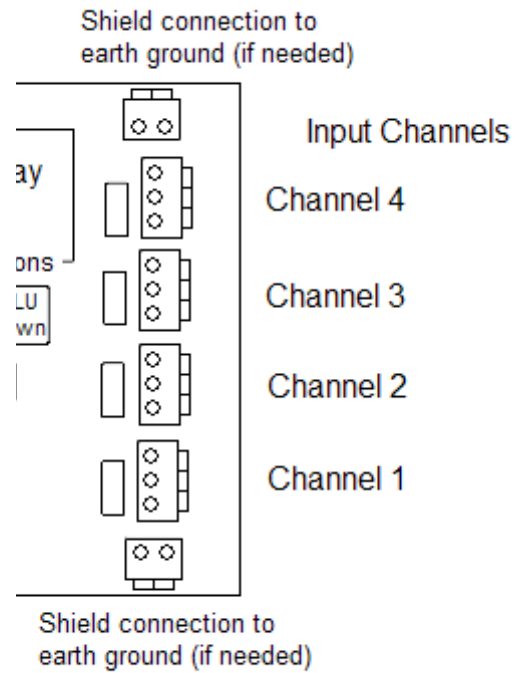


Sensor Shield Wiring

Most applications do not need to make use of an earth ground connection to shield wires for the sensor cables. However, if this type of connection is required, it is available above and below the channel input terminal blocks.

There is no provision for connection of AC voltage to any of the terminals on the right side of the Sentry Process Monitor. Such connections will cause damage to the unit and possibly cause exposure of hazardous voltages to personnel.

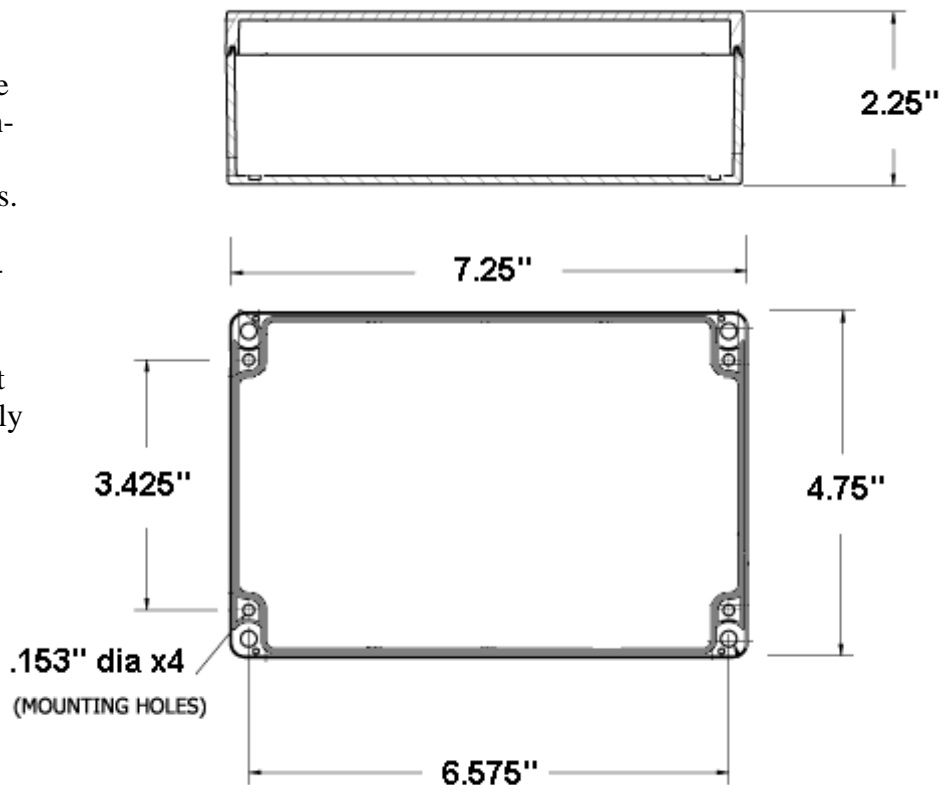
Care should be taken in wiring not to put wrong DC voltages to input channel terminal block pins as this also can result in equipment failure.



Enclosure dimensions

Consideration should be given to the final dimensions including conduit fittings and cable glands.

A mounting kit is available with a bracket to provide for installation where it is preferred not to mount the unit directly to equipment.



Using the Logic function

An output alarm can be assigned a logic function. In this state an alarm will operate if a combination of input conditions exists. These conditions are based on proximity or other switch type inputs giving either a zero or one condition. Input channels that have not be configured as a logic input are automatically considered to be a “zero” value.

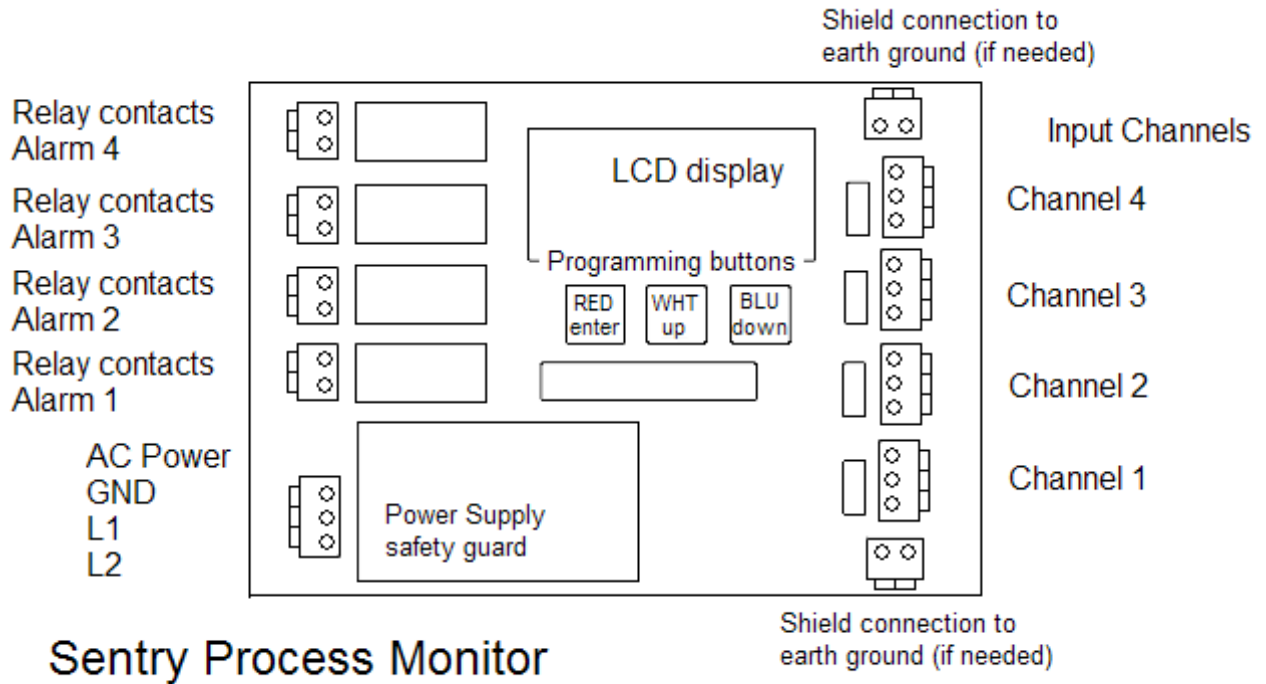
	CH4	CH3	CH2	CH1
10	0	0	0	0
11	0	0	0	1
12	0	0	1	0
13	0	0	1	1
14	0	1	0	0
15	0	1	0	1
16	0	1	1	0
17	0	1	1	1
18	1	0	0	0
19	1	0	0	1
20	1	0	1	0
21	1	0	1	1
22	1	1	0	0
23	1	1	0	1
24	1	1	1	0
25	1	1	1	1

For example;

If an output alarm channel select of “17” was selected and input channels 1,2, and 3 were set to type 6 (logic), then a one on all three of these inputs would produce an alarm on that output.

This feature allows a digital input such as a shut door condition to be included in the types of processes monitored by the Sentry Process Monitor.

Scale and averaging are not available for logic channels.



Sentry Process Monitor

Specifications:

Input Voltage: 90-250VAC

Output Voltage (sensors): +24VDC

Output Relays: SPST 10A NO

Accuracy : +/- 1% (scale and offset can often be used to recalibrate to better specs)

Analog Measurements:

0-20mA

0-5V

0-10V

Digital Measurements

Logic input

Rate or Speed (6-1000 rpm)

Enclosure

NEMA 4X

Installation

Because the Sentry Process Monitor can be configured in a variety of ways and because the possible connection to hazardous voltages, the Sentry Process Monitor should only be installed by qualified personnel and in accordance with all applicable building and wiring codes and regulations. In addition, the Sentry Process Monitor should not be as a sole element in a critical, safety, or life dependent application. Such applications should always be designed with redundancy to account for equipment failure, misapplication, or operator error.

Warning

Improper installation can result in hazardous voltages and / or machinery operation. Installation should only be performed by qualified personnel and in accordance with all safety and regulatory procedures.

Power Wiring

The earth ground should not be left disconnected. This connection is passed along to the sensor input side of the Sentry Process Monitor. It can be used for sensor shield connection (if required) to reduce electrical noise that may interfere with proper signal transmission. If this connection is inadvertently wired to L1 or L2 of the input power, damage to equipment and electrical shock to personnel can result.

It is a good practice to use a contactor or other device to remove power until a manual reset in the event of power loss. The connection of pumps, motors, or other active devices to the alarm relays can result in a safety hazard if power is returned unexpectedly or if power returns intermittently.

Enclosure integrity

The Sentry Process Monitor has a water and dust tight enclosure. However, the installation of conduit fittings can reduce the effectiveness of the enclosure. If it is desired to retain the water and dust protection, electrical fittings need to be selected and installed to accomplish this. Allowing water or other material to enter the Sentry Process Monitor can result in equipment failure and even danger to personnel. Condensation cycling should be avoided to prevent equipment damage.

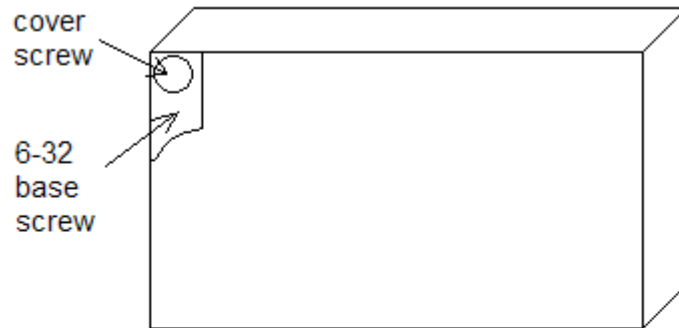
The plastic of the enclosure is subject to breakage with larger size drills. For this reason it is recommended that conduit holes be bored out with a conical rasp, reamer, or step drill to insure that the correct hole size is obtained with a minimum risk of damage to the enclosure.

Power supply safety shield

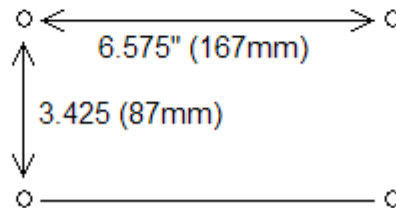
The clear plastic shield over the power supply should not be removed. It prevents operators from contacting the input voltage and removal could result in electrical shock. This cover should not be removed. If the cover is missing or broken, the unit should be returned for repair.

Enclosure cover

The Sentry Process Monitor is shipped with a clear plastic enclosure cover. This should only be removed for programming and installation purposes. The cover allows the display values to be observed, but protects the electronics from foreign objects which could cause damage. Personnel are also protected from exposure to electrical shock by keeping the enclosure cover installed. A missing or broken cover should be replaced to insure safety and protect the equipment from damage.



Mounting Hole Pattern



An aluminum mounting kit is available (with screws) - see appendix

Part Numbers

Sentry Process Monitor SPM—X—Y

X = Number of input channels (1-4)

Y = Number of output alarm channels (1-4)

Input Modules

Current Loop input module SPM-IM001

NPN prox input module SPM-IM003

PNP prox input module SPM-IM004

0-5V input module SPM-IM005

0-10V input module SPM-IM010

Accessories

Mounting kit with hardware SPM-MTGK

PG7 cable gland (.5" dia. mtg. hole) .12-.26 cable dia. SPM-CG7

PG11 cable gland (.75" dia. mtg. hole) .2-.39 cable dia. SPM-CG11

Replacement enclosure

Caution

The Sentry Process Monitor is used in conjunction with sensors and other devices. Total system performance is dependent upon these components as well as the programming and scale factors. Since there are so many programming options, each application needs to be tested during installation to make sure that the Sentry Process Monitor works with all application conditions. This testing is essential. In addition, the Sentry Process Monitor should not be used as a sole element in any safety, critical process, or life dependent application. These applications should always be designed with redundancy.