Sentry Monitor - 101

Universal programmable relay control

Preliminary

Works with almost any analog sensor transmitter

Large Backlit LCD display

10A Relay SPST NO/NC

Programmable
(factory programming available)

IP54 enclosure with bottom flange for mounting

Operates from 12V wall power adapter

6” x 4” x 2”

The Sentry Monitor is intended to provide an economical way to measure almost any process variable and provide a means for operating an alarm or other equipment if a pre-determined condition is met.

The display can be configured for units meaningful to the application and the set-point can be changed similar to a thermostat.

Relay control of various output devices

Variety of input sensors / transmitters

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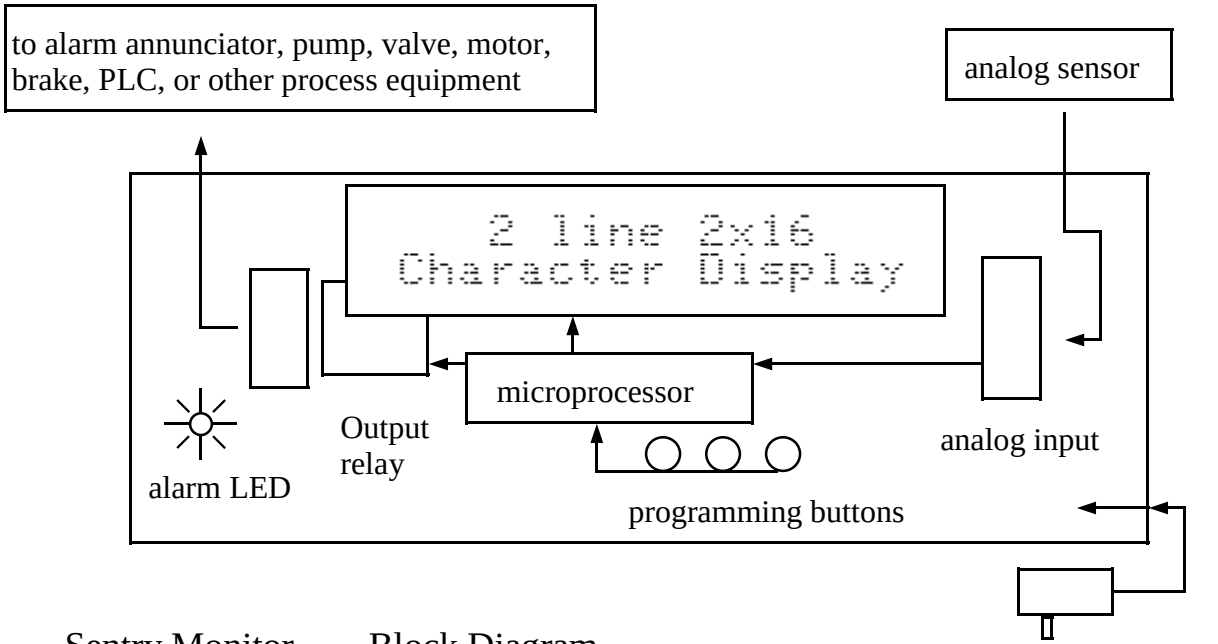
Theory of Operation

The Sentry Monitor operates similar to a thermostat except almost any analog sensor can be used so that most any condition can be monitored and not limited to only temperature. The Sentry Monitor measures an analog input value from a sensor and compares it to a programmed set point. When the set point threshold is exceeded, an output relay is activated.

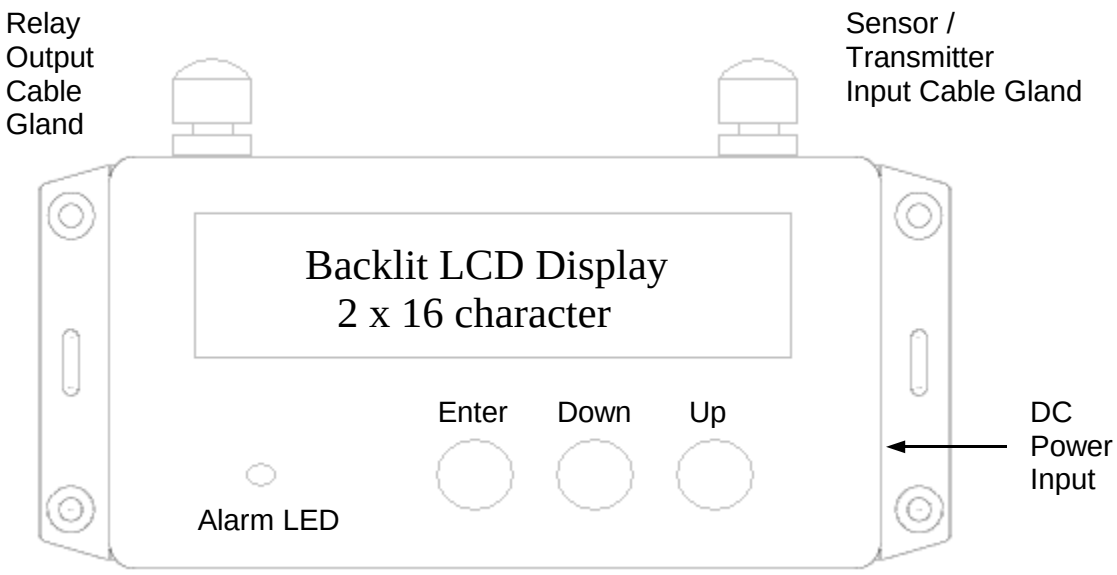
The Sentry Monitor can be scaled to display whatever process value is significant to the user. For example, even though a sensor may provide a 0-5V signal or a 4-20mA signal, the display can be programmed to show units as diverse as gallons, degrees F or C, inches of mercury, distance, sound level, humidity, or any process variable that provides an analog signal. The scaling feature is also a type of calibration and can be used to make a specific sensor perform with greater accuracy.

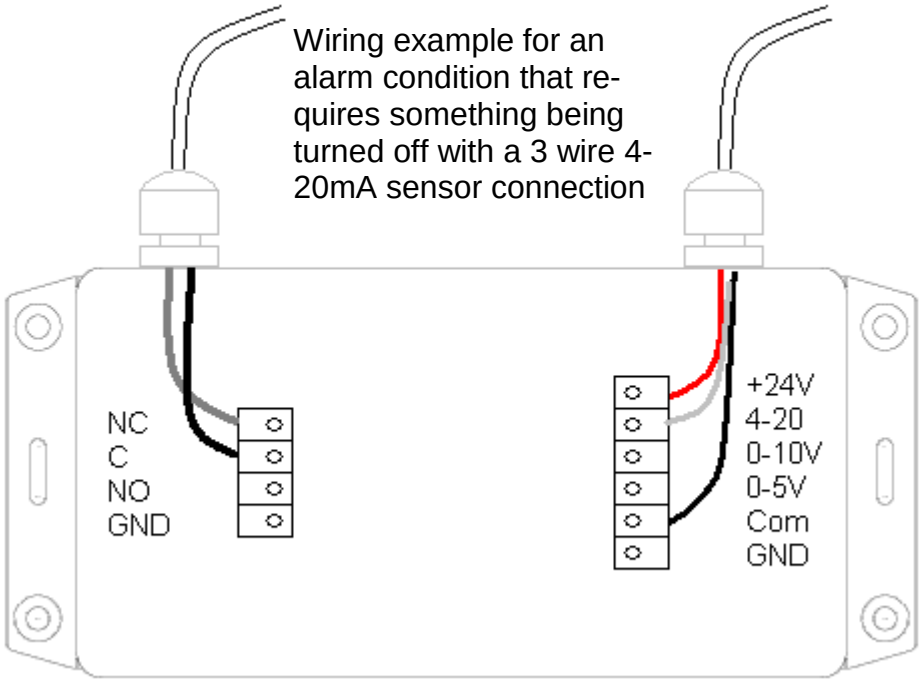
An example of a stand alone application is the operation of an exhaust fan in a poultry barn when the humidity rises to an unacceptable level. The Sentry Monitor can even be used as a sort of auxiliary analog input to a PLC by making the analog measurement and determining the alarm condition such that the PLC is notified by the output contact closure.

The Sentry Monitor can be shipped pre-programmed for a specific sensor and installed with no additional programming.

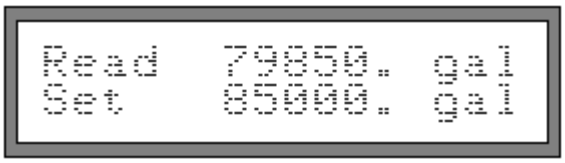


Sentry Monitor — Block Diagram

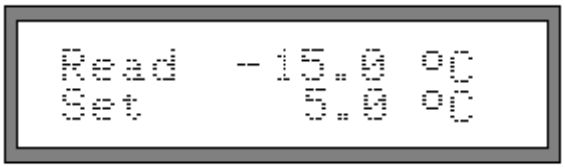

Relay
Output
Cable
Gland
Sensor /
Transmitter
Input Cable Gland
Backlit LCD Display
2 x 16 character
Enter
Down
Up
DC
Power
Input
Alarm LED


Wiring example for an alarm condition that requires something being turned off with a 3 wire 4-20mA sensor connection
NC
C
NO
GND
+24V
4-20
0-10V
0-5V
Com
GND

Typical Applications



Here is an example of a Sentry Monitor calibrated to display gallons. The current reading is 5150 gallons below the set point. A pressure sensor can be used to fill a tank to a preset level of 85,000 gallons

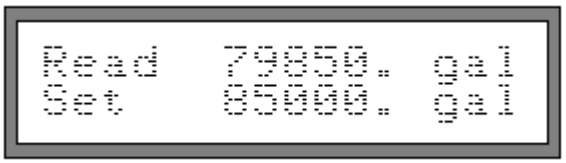


In this example, a temperature of –15 degrees C is being measured and a target temperature of 5 degrees C above zero has been selected. This might be used to turn on a heater to keep equipment above freezing.

Here a sound level sensor can be used to create an alarm when the sound level gets over 85 db. This could monitor mechanical equipment in an unattended location and detect a faulty bearing.

This application is one where an AC voltage transmitter in monitored to detect the instance when the AC voltage drops below 90 volts AC.

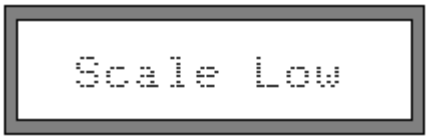
Programming quick reference sheet



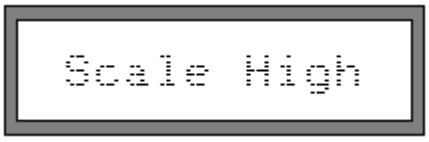
Normal operation

Pressing the up or down buttons simply raises or lowers the set point value.

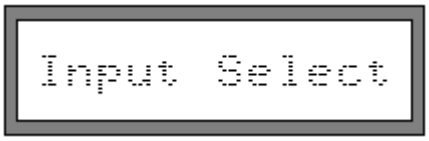
Pressing both the Up and Down buttons enters the program mode. A program step can be by-passed using the Up button or a previous step can be revisited by pressing the Down button. The Enter button allows a program step selection to be saved and advances to the next step.



The first program option is to select a scale value for a “low” sensor reading. This together with the “high” scale value allows the Sentry Monitor to display units meaningful to the application.

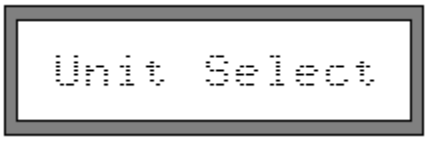


The second program step allows the selection of a “high” scale value. The low and high values establish the span for converting the sensor output into user meaningful units.

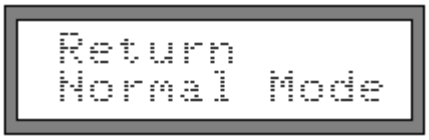


Entering the third program step allows for the selection of the analog input type. (4-20mA, 0-5V, or 0-10V)

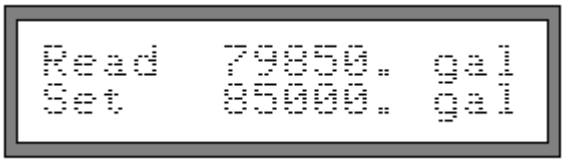
The fourth program step provides the option of setting the placement of the decimal point.



The fifth program step allows for the selection of common units for the display such as ºF, ºC, %H, VAC, “Hg, db, amp, in, ft. Provision is made at this program step to return to the normal mode. Pressing the Up button returns to the normal mode.



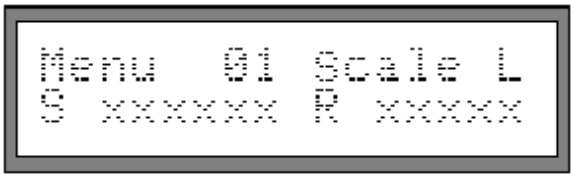
Programming steps



Normal operation

Pressing the up or down buttons simply raises or lowers the set point value.

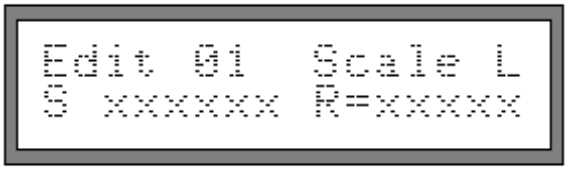
Pressing both the Up and Down buttons enters the program mode.



The first menu step allows setting the lower scale value. Pressing the Up button will skip this step and pressing the Down button can return to a menu step. Pressing the Enter button will select this step.

The value displayed for “S” is whatever set point had been previously selected. A unit that had not been previously programmed would have a value of 00000.

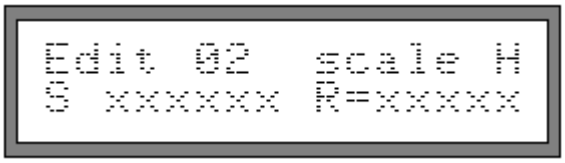
The value displayed for “R” is the output of the A/D converter. This value may not be of interest in programming since whatever process condition exists will determine the set point value. For example, a temperature of –10 degrees F would result in the selection of “S” = -010.00 The value of “R” would be incidental.



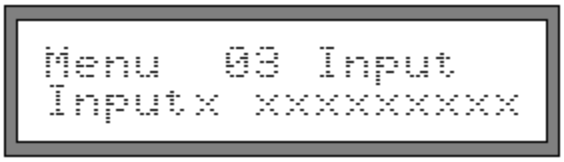
The Up and Down buttons allow for the change of the “S” value. Pressing the Enter button accepts the new value and advances to the next menu step.

The greater the spread between the low and high value, the more accurate the reading will be.

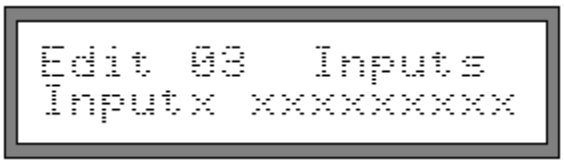
Entry into this menu option via the Enter button allows for the editing of the upper span value.



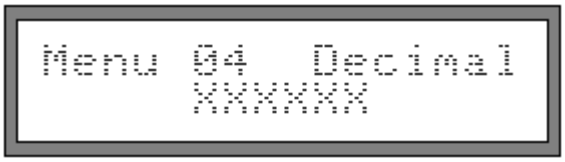
The Up and Down buttons allow for the selection of an “S” value. Pressing the Enter button accepts the new value and advances to the next menu step.



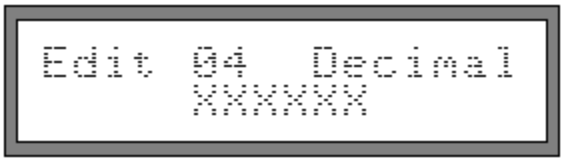
This menu step allows for the selection of the input to the Sentry Monitor. The existing input is displayed. Pushing the enter button allows this selection to be edited.



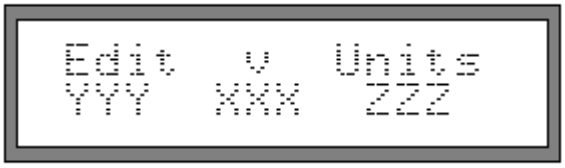
The Up and Down buttons allow scrolling through the (1) 0-5Volt, (2) 0-10Volt, and the (3) 4-20mA options. These correspond to the input terminal block positions. Pushing the Enter button selects the input pin.



The fourth menu step allows for the selection of a decimal point location for the display. Pushing the enter button allows this selection to be edited.

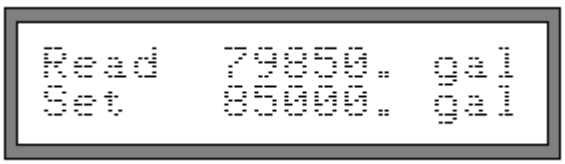


The Up and Down buttons allow the user to scroll through the various decimal point locations. Pushing the enter button allows this selection to be retained.



This programming step allows the user to select one of ten measurement units for the display. The current unit label is displayed. Pushing the enter button allows this selection to be edited.

The Up and Down buttons allow the user to scroll through the various label options. Pushing the enter button allows the center label to be retained and returns the user to the normal operating mode.



Back in the normal mode.

This version of the Sentry Monitor has a fixed hysterisis of +/- 5 LSB and a rolling average of 15 samples. The hysterisis of 5 may be too large if someone has programmed the unit to measure small units for example, such as 10 degrees. It can be helpful to use 10.0 degrees as a way to make the hysterisis have a proportionally lower impact.

The Sentry Monitor allows large values to be displayed to accommodate user preference for relevant units. However, the Sentry Monitor can only resolve 0.1% of a full scale signal. Even thought the Sentry Monitor can be set to display 99,999 gallons, the actual incremental LSB would be 99 gallons.

The calibration of the unit is based on two points. This can be set at the factory to match the Sentry Monitor to a specific sensor or it can be set by the customer using either an actual sensor or a voltage input that simulates a sensor out put. In either case, a low value and a high value are needed to create a scaling range. It is suggested that the two points be as wide as practical to insure greater scaling accuracy.

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

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.

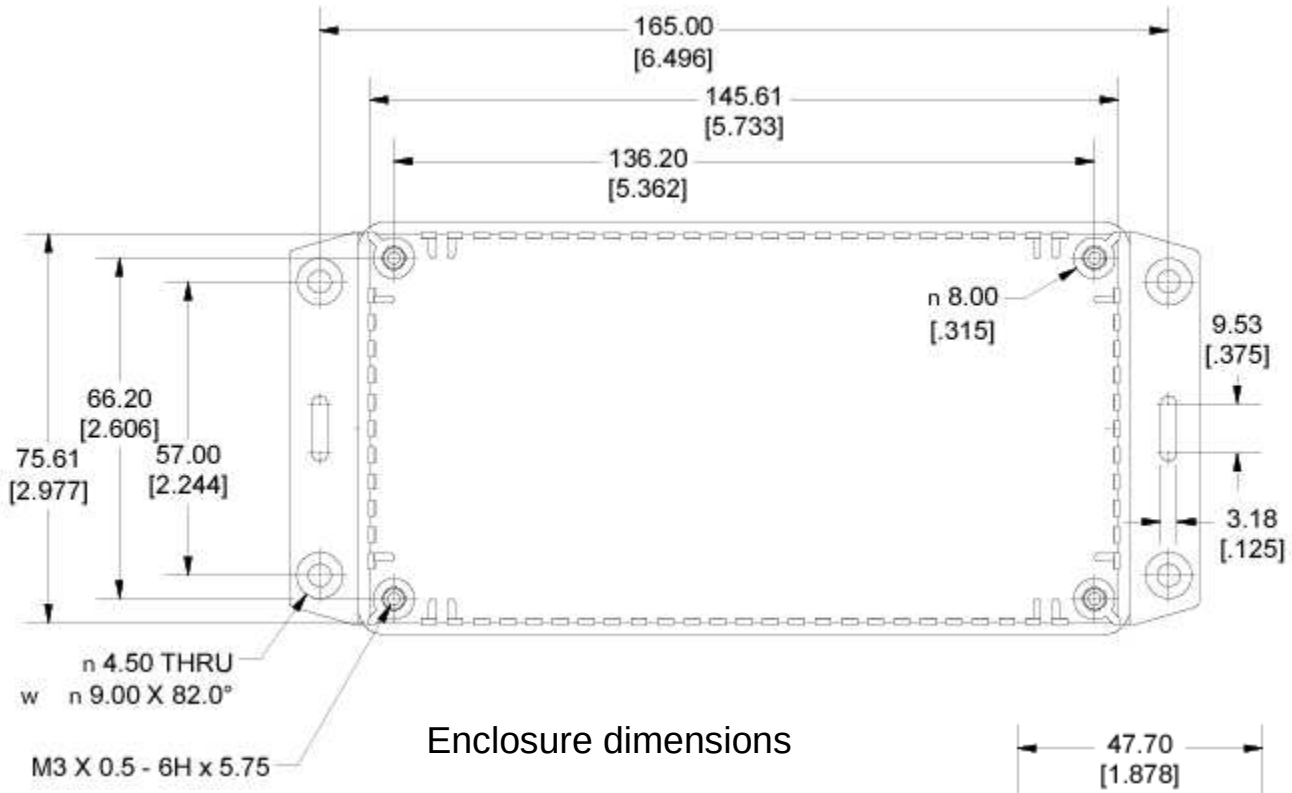
Warning

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 relay can result in a safety hazard if power is returned unexpectedly or if power returns intermittently.



Enclosure dimensions