Model 4001 Series
Single Channel Controller

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APPLICABILITY & EFFECTIVITY

This manual provides instructions for the following Sierra Monitor products:

Model	Description
4001-01	Controller 4-20 mA Input, DC NEMA 4X
4001-11	Controller 4-20 mA Input, AC NEMA 4X
4001-12	Controller 4-20 mA Input, AC NEMA 7

The instructions are effective for the above models as of December 1, 1998

Instruction Manual Part Number: T14002
Rev. B1

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1. PRODUCT DESCRIPTION

1.1 INTRODUCTION

The Model 4001 Single Loop Controller is an 18 to 24 volt DC operated, single channel, 4- 20 mA controller with liquid crystal display. The controller is designed for use with most two or three wire 4-20 mA transmitters, is easily configured for various set-point and alarm functions and is available in alternative power supply and packaging configurations.

This manual provides a description of the controller standard features, settings and packaging and the options which are available. The manual also provides instructions for installation and set-up and adjustment of the controller.

1.2 DESCRIPTION

Packaging: The Model standard 4001 is supplied in a NEMA/4X, fiberglass enclosure with a viewing window in a hinged door with snap closing latches suitable for padlocking. A NEMA-7 explosion-proof enclosure is also available.

Standard Features: Three (SPDT) relays provide dry contact closure for two alarm set-points and for trouble alarm conditions. The set-points are user adjustable and the relays are individually programmable for latching or non-latching operation and for rising or falling trip point. The controller has provision for an alarm acknowledge input.

Connections to the controller electronics are made via two modular terminal contact blocks which allow disassembly without removal of individual wires. These terminals include connections for a three wire sensor module, reset switch input, chart recorder power, chart recorder signal, relay contacts, system power, battery and optional local alarm buzzer.

Programmable Functions: Electrical jumpers are used to select the following functions:

- Set Point 1 Latch/Non Latch (Factory setting: Non Latch)
- Set Point 1 Alarm High/Alarm Low (Factory setting: Alarm High)
- Set Point 1 Acknowledge (Always available via reset input).
- Set Point 2 Latch/Non Latch (Factory setting: Non Latch)
- Set Point 2 Alarm High/Alarm Low (Factory setting: Alarm High)
- Set Point 2 Acknowledge (Always available via reset input).
- 5 Volt Buzzer Output on First Alarm (rising)
- 5 Volt Buzzer Output on First Alarm (falling)

Hardware Options: Optional configurations include the following:

- Power Supply 110 VAC / 24 DC: The open frame power supply is a 120 VAC to 24 VDC linear supply. The load capacity is 1.2 amps and the AC input is fused.
- Battery for battery back-up: A twelve volt 6.5 ampere hour sealed battery is trickle charged by the control electronics and provides the specified back-up operation.
- Nema 7X enclosure

Part Numbering: Ordering part numbers for the loop controller are as follows:

Model Number	Description
4001-01	Controller 4-20 mA Input, DC NEMA 4X
4001-11	Controller 4-20 mA Input, AC NEMA 4X
4001-12	Controller 4-20 mA Input, AC NEMA 7

2. INSTALLATION

2.1 CONTROLLER INSTALLATION

1.1 Select a location based on the following considerations:

- Provide normal security from unauthorized access.
- Reliable AC power supply.
- Mount the controller at a height which allows easy visual inspection of the digital display.
- The enclosure must be accessible for normal calibration and maintenance.
- Avoid exposure of the window to direct sunlight.

1.2 Mount the controller enclosure using mounting flanges provided on each configuration.

1.3 Pull all required wiring for power supply, alarm devices etc. through electrical 3/4" conduit hubs located on the bottom of the enclosure following appropriate installation code.

1.4 Make any jumper configuration changes following the instructions titled “Alarm and Relay Configuration”. (Table 1)

1.5 Terminate all wiring following the instructions titled “Electrical Wiring”.

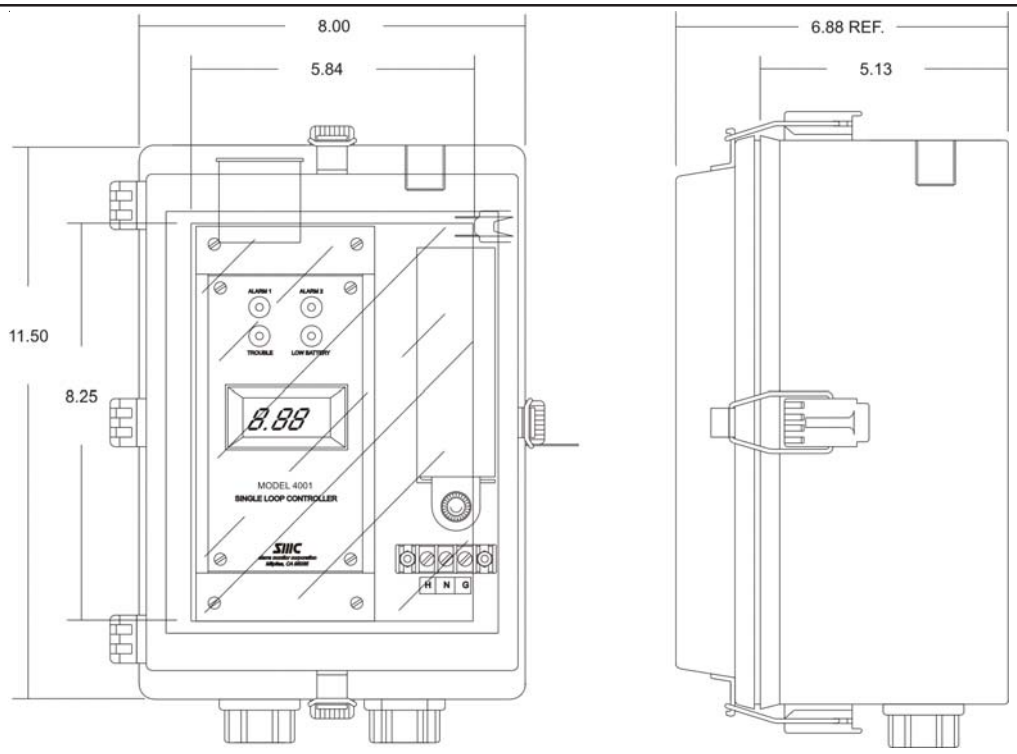

Figure 1
Model 4001 Loop Controller

W3		W10	Alarm 1 Latch
W3		W10	Alarm 1 Non Latch (factory)
W4		W11	Alarm 1 Alarm High (factory)
W4		W11	Alarm 1 Alarm Low
W5		W12	Alarm 1 Acknowledge (always)
W5		W12	Not Used
W6		W13	Alarm 2 Non Latch (factory)
W6		W13	Alarm 2 Latch
W7		W14	Alarm 2 Alarm Hight (factory)
W7		W14	Alarm 2 Alarm Low
W8		W15	Alarm 2 Acknowledge (always)
W8		W15	Not Used
W9		W16	Buzzer Alarm on High (factory)
W9		W18	Buzzer Alarm on Low

Table 1
Model 4001: Alarm Function Jumpers

2.2 ALARM AND RELAY CONFIGURATION

Figure 2 indicates the location of the jumpers W3 through W16. Table 1 shows the location of the jumpers for each alarm function with the factory settings identified.

To change the settings turn off all power sources, remove the four screws in the corners of the display panel and lift out of the way to gain access to the jumpers. Lift the jumpers using needle nose pliers and replace them as required.

2.3 ELECTRICAL WIRING

All electrical wiring except the AC supply terminates at the two 12 position terminal strips which are located accross the bottom section of the electronics card (figure 2). The connector closest to the end of the card is identified as "TB2" and the other connector is "TB1". These terminal strips are also pin connectors so that the entire strip can be removed by pulling the body from the pins for termination or service. See Table 2 for identification of each of the terminals.

The AC supply (where applicable) which should be into the connected to the appropriate terminals labeled "H" "N" "G" beside the open frame power supply.

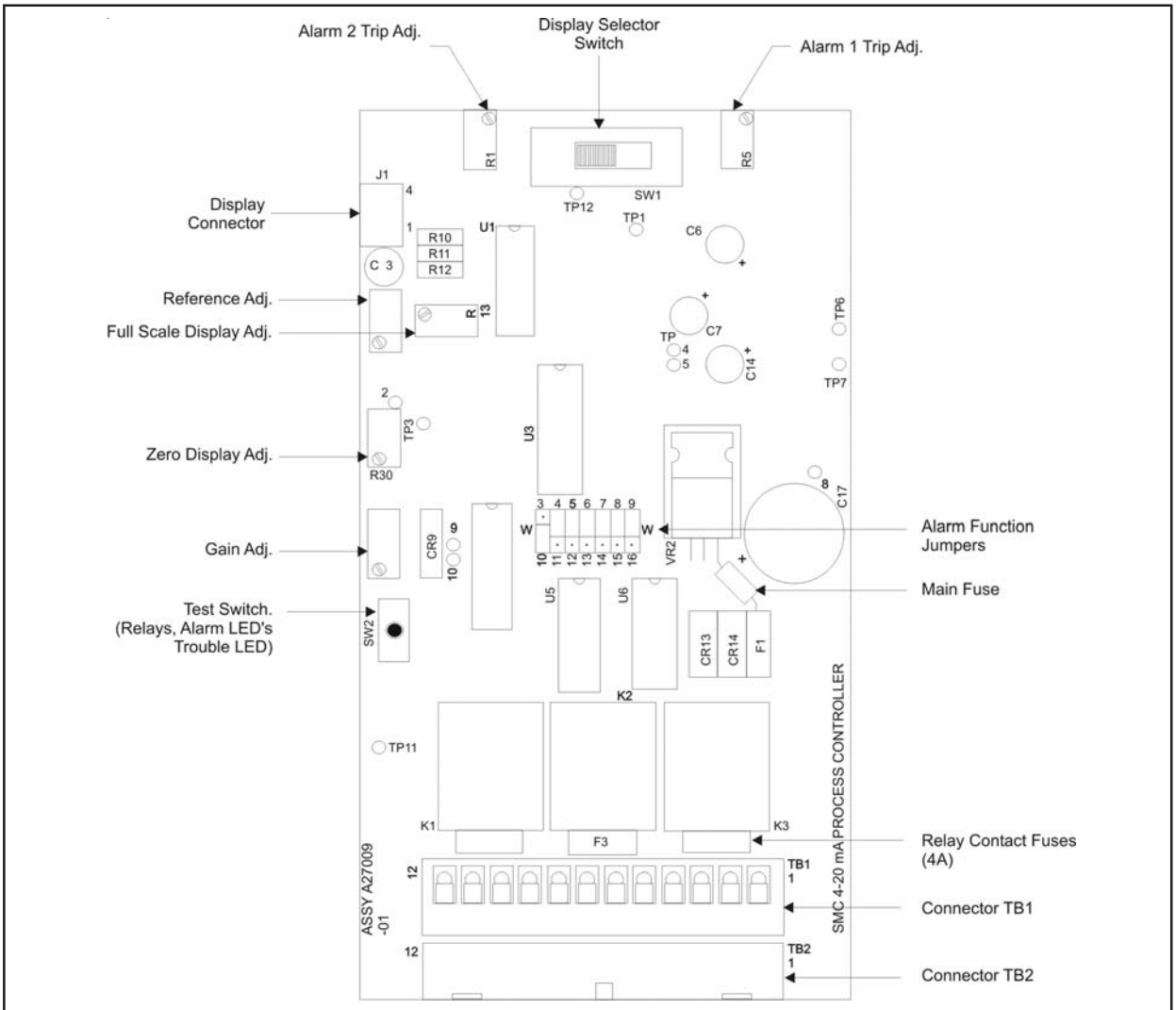

Figure 2
Model 4001: Component Locator

As the controller has no "on/off" switch the AC fuse should be removed until installation is complete. The system operation can be tested without connection of the battery but when continuous operation is initiated connect the battery to the appropriate terminal blocks (Table 2).

2.4 ALARM ADJUSTMENT

To change alarm levels move the digital display panel down to access the top of the controller electronics card including the selector switch and potentiometers. Figure 2 shows the location of the Alarm 1 and Alarm 2 adjustment potentiometers and display selector switch.

TB 1

12	11	10	9	8	7	6	5	4	3	2	1

1	Alarm 1 N/C	7	Trouble N/O
2	Alarm 1 C	8	Trouble C
3	Alarm 1 N/O	9	Trouble N/C
4	Alarm 2 N/C	10	Sensor Ground
5	Alarm 2 C	11	Sensor Signal
6	Alarm 2 N/O	12	Sensor Power

TB 2

12	11	10	9	8	7	6	5	4	3	2	1

1	Battery "+"	7	Recorder + Signal
2	Battery "-"	8	Recorder - Signal
3	VDC In "+"	9	Buzzer "-"
4	Common	10	Buzzer "+"
5	Recorder + VDC	11	Reset "+"
6	Recorder - VDC	12	Reset "-"

Table 2
Model 4001 Controller Electrical Connections

NOTES TO TABLE 2:

Alarms 1 & 2:	SPDT Dry contact Relays 10 Amp (fused to 4 amps).
Trouble:	SPDT Dry contact Relay 10 Amp (fused to 4 amps).
Sensor:	Power is the input voltage. Current Loop is between Signal and Ground
Battery:	Connect 12 VDC, 4 - 8 AH sealed rechargeable Lead Acid battery for uninterrupted operation during loss of AC supply.
VDC In:	On AC Controllers this connection is factory installed. On DC controllers connect 18 - 24 VDC (1 amp) supply.
Recorder +VDC:	This is a 12 volt (50 mA) output to provide power to operate a chart recorder.
Recorder Signal:	This is a 0 - 2 VDC signal proportional to the current input (min. R_L = 2K).
Buzzer:	+5V with open collector output (for external buzzer)
Reset:	Connect a momentary switch to provide for alarm acknowledge or for reset of latched relays.

To change the concentration at which Alarm 1 will activate:

- Slide the three position selector switch full right to the third position. The display will indicate the factory set Alarm 1 level of 10 ppm.

- Adjust Alarm 1 potentiometer until the display reads the required new Alarm 1 set point.

To change the concentration at which Alarm 2 will activate:

- Move the three position selector switch to the second (center) position and follow the same procedure as above (factory setting is 20 ppm).

When alarm adjustments are complete return the selector switch to the first (full left) position for display of the actual concentration.

2.5 ALARM TEST

To test the alarm relay functions press the relay test switch marked SW2 on the control board (figure 2). The relay test switch which will cause both alarms to activate simultaneously. Correctly functioning alarms will cause both the relay to activate and the respective LED on the control board to turn on. (Note that there is a deliberate hysteresis built into the alarm function to avoid oscillation when the gas concentration remains close to the set point. This hysteresis will cause the alarm to activate at the set point and to turn off at a slightly lower level than the set point).

3. CALIBRATION

Calibration of input devices should be accomplished using the procedures for the individual devices.

The controller should not require periodic calibration. If adjustments are necessary (see figures 2 and 3):

1. With 4 mA loop current adjust “Zero Display Adj.” for 0.00V ($^{+}$ 0.01) at TP12.

2. With 20 mA loop current adjust “Gain Adj.” for 2.00V ($^{+}$ 0.01) at TP12.

3. With 20 mA loop current adjust “Full Scale Display Adj.” for desired full scale reading.

TEST POINTS

TP1 -5V
TP2 -2.49V REF
TP3 LOOP CURRENT VOLTAGE
4mA = 0.400V
20mA = 2.00V
TP4 ALARM 2 TRIP LEVEL
TP5 ALARM 1 TRIP LEVEL
TP6 + 5V
TP7 INPUT DC VOLTAGE
TP8 BATTERY VOLTAGE
TP9 RESET
0V = RESET
5V = NOT RESET
TP10 TROUBLE
5V = TROUBLE
0V = OK
TP11 + 2.49V REF.
TP12 0 = 2V SIGNAL

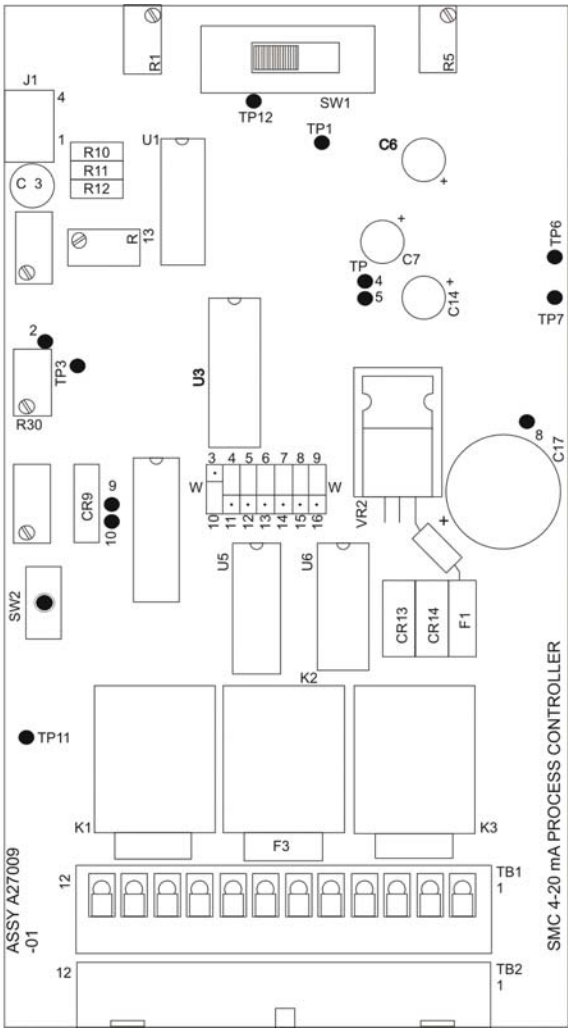

Figure 3
Model 4001 Electrical Test Points

4. SPECIFICATIONS

INPUT POWER:	18-24 VDC, Nominal 350mA, Max 500mA
ENCLOSURE:	NEMA/4X (11.5" x 8.0" x 7.0") (29.2 x 20.3 x 17.8 cm)
DISPLAY:	3 1/2 Digit Liquid Crystal
ALARM LEVELS:	Low and High Alarms User Adjustable
ALARM RELAYS:	Low and High Alarms selectable Latching/Non latching, Alarm Acknowledge Trouble (includes loop failure) Contact rating 28 VDC @ 4A (fused) 120 VAC @ 4A
RECORDER OUTPUT:	0-2 VDC Output proportional to display
CHARGER OUTPUT:	12 VDC Trickle Charge for battery back-up

OPTIONS

POWER SUPPLY	110 VAC (200 mA)
BATTERY BACK-UP	4 AH 12 VDC gell cell
ENCLOSURE	NEMA 7 (12" X 11" X 9") (30.4 x 27.9 x 22.8 cm)

5. LIMITED WARRANTY

SIERRA MONITOR CORPORATION warrants its products to be free from defects in workmanship or material under normal use and service for two years after date of shipment. SMC will repair or replace without charge any equipment found to be defective during the warranty period. Final determination of the nature and responsibility for defective or damaged equipment will be made by SMC personnel.

All warranties hereunder are contingent upon proper use in the application for which the product was intended and do not cover products which have been modified or repaired without SMC approval or which have been subjected to accident, improper maintenance, installation or application, or on which original identification marks have been removed or altered. This Limited Warranty also will not apply to interconnecting cables or wires, consumables (ie. calibration gases, batteries, sensors), nor to any damage resulting from battery leakage.

In all cases SMC's responsibility and liability under this warranty shall be limited to the cost of the equipment. The purchaser must obtain shipping instructions for the prepaid return of any item under this warranty provision and compliance with such instruction shall be a condition of this warranty.

Except for the express warranty stated above, SMC disclaims all warranties with regard to the products sold hereunder including all implied warranties of merchantability and fitness and the express warranties stated herein are in lieu of all obligations or liabilities on the part of SMC for damages including, but not limited to, consequential damages arising out of/or in connection with the use or performance of the product.