



Electro-Sentry 16 Installation & Operation Manual



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Introduction To This Manual

What is in this manual? This installation and operation manual provides detailed technical information about the Electro-Sentry 16. It should serve as your technical resource to install, set up, operate, and test the Electro-Sentry 16.

Who should use this manual (audience) Keep in mind that the function of the Electro-Sentry 16 installed in a mechanical process is to monitor temperature; therefore, it must be installed by qualified personnel only. This manual is designed for persons who have the primary responsibility to install, set up, operate, and test the Electro-Sentry 16.

The secondary audience would be those persons seeking technical information about the electrical concepts and operation of the Electro-Sentry 16.

Knowledge level Persons installing, setting up, and operating the Electro-Sentry 16 should have good knowledge and understanding of electrical and mechanical concepts and principles pertaining to temperature monitoring and associated alarms.

Again, the Electro-Sentry 16 should be installed by qualified personnel only.

Notices

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Electro-Sentry 16 Quick Start Guide

Here are the basic questions/steps the user needs to perform to get the Electro-Sentry 16 (a.k.a. ES16) up and running:

1) **What is the application's voltage? 115 or 230 Vac?**

VAC	SW1 Position	Fuse F12	Notes:
115	Towards Right	115Vac/0.4Amp Slo-Blo	Factory Setting
230	Towards Left	230Vac/0.2Amp Slo-Blo	User Selectable

(The ES16 is shipped with one 230Vac/0.2 Amp Slo-Blo fuse, and one extra 115Vac/0.4 Amp Slo-Blo fuse).

2) **The application's sensors connect to the Electro-Sentry 16's Analog Inputs, and correspond to the Front Panel displays as follows:**

Terminal Block	Analog Input #	Front-Panel Display correlation
TB1	1	Top row left
TB2	2	Top row right
TB3	3	2nd row left
TB4	4	2nd row right
TB5	5	3rd row left
TB6	6	3rd row right
TB7	7	4th row left
TB8	8	4th row right
TB9	9	5th row left
TB10	10	5th row right
TB11	11	6th row left
TB12	12	6th row right
TB13	13	7th row left
TB14	14	7th row right
TB15	15	8th row left
TB16	16	8th row right

For the TB1 through TB16 terminal blocks:

Pin 1 = +24Vout_A,

Pin 2 = 4-20 mA Signal Input,

Pin 3 = Gnd_A.

3) **The 16 Analog Inputs are divided into two groups of eight sensors, and can be setup for sensors having either a Temperature Proportional 4-20mA output, or then a Contact Closure output, as shown in the following table:**

Input Group	Terminal Block	Analog Input #	Sensor Type Selection ⁴
Group A	TB1	1	See Var10
	TB2	2	See Var10
	TB3	3	See Var10
	TB4	4	See Var10
	TB5	5	See Var10
	TB6	6	See Var10
	TB7	7	See Var10
	TB8	8	See Var10
Group B	TB9	9	See Var11
	TB10	10	See Var11
	TB11	11	See Var11
	TB12	12	See Var11
	TB13	13	See Var11
	TB14	14	See Var11
	TB15	15	See Var11
	TB16	16	See Var11

Note⁴: Factory default for Var 10 and Var11 is 0000, for all Analog Inputs are set for 4-20 mA Temperature sensors.

See the Reference portion of the User Manual, pages 2 and 3 for details on **Var10** and **Var11**.



- 4) **For those Analog Inputs that you are not using:** (i.e., those Analog Inputs having no Temperature sensors or no Contact-Closure sensors connected to them): You must turn ‘OFF’ the effect of any unused Analog Inputs by setting the corresponding BIAS Temperature Setpt variable to ‘0999’. The BIAS Setpts are in **Var14 through Var29**, and correspond to the Analog Inputs as follows:

Var#	Description	Default Value	User's Value
14	Input #1 BIAS Temperature SetPt.	0000	
15	Input #2 BIAS Temperature SetPt.	0000	
16	Input #3 BIAS Temperature SetPt.	0000	
17	Input #4 BIAS Temperature SetPt.	0000	
18	Input #5 BIAS Temperature SetPt.	0000	
19	Input #6 BIAS Temperature SetPt.	0000	
20	Input #7 BIAS Temperature SetPt.	0000	
21	Input #8 BIAS Temperature SetPt.	0000	
22	Input #9 BIAS Temperature SetPt.	0000	
23	Input #10 BIAS Temperature SetPt.	0000	
24	Input #11 BIAS Temperature SetPt.	0000	
25	Input #12 BIAS Temperature SetPt.	0000	
26	Input #13 BIAS Temperature SetPt.	0000	
27	Input #14 BIAS Temperature SetPt.	0000	
28	Input #15 BIAS Temperature SetPt.	0000	
29	Input #16 BIAS Temperature SetPt.	0000	

The factory default settings for all the BIAS Temperature Setpts Var14 through Var29 is 0000, which enables all Analog Inputs, but which disables their BIAS alarm feature. (Complete details about the BIAS alarm feature are found on page 3 of the Reference portion of the User Manual).

5) **How to set-up your Electro-Sentry 16 for Temperature Sensor Monitoring:**

- A) For Group A sensors, setup Var10 for Temperature Sensors.
 B) For Group B sensors, setup Var11 for Temperature Sensors.

Note⁴: Factory default for Var 10 and Var11 is 0000, for all Analog Inputs are set for 4-20 mA Temperature sensors.

See the Reference portion of the User Manual, pages 2 and 3 for details on **Var10** and **Var11**.

- C) What temperature scale do you want to use, F° Fahrenheit or C° Celsius?
 Set **Var30** Temperature_Display_Select as needed.

Variable	Default Value	User's Value
Var30 Temperature_Display_Select. 0000 = Fahrenheit, F°. 0001 = Celsius, C°.	0000 (F°)	

- D) What temperature levels do you want for the ‘Yellow_Alarm’ Warning Setpt, and the ‘Red_Alarm’ Shutdown Setpt?
 Set the following variables as needed:

Variable	Default Value	User's Value
Var12 Warning_Setpt_Temperature (‘Yellow_Alarm’)	0160 degrees	
Var13 Shutdown_Setpt_Temperature (‘Red_Alarm’)	0175 degrees	

- E) Do you want to use the **BIAS Temperature Setpt** alarm feature?
 This is where the temperature difference (or deviation) of a left-side temperature sensor triggers a BIAS Setpt ‘Yellow_Alarm’ if it exceeds its right-side companion sensor by the left-side BIAS Setpt amount (and likewise vice-versa). The BIAS Setpts are in **Var14 through Var29** (as shown in the table to the left).
The factory default settings for all the BIAS Temperature Setpts Var14 through Var29 is 0000, which enables all Analog Inputs, but which disables their BIAS alarm feature.

See the table on page 3 of the Reference portion of the User Manual for more details about left-side/right-side temperature sensor BIAS companion pairs.

- If you want to use the **BIAS Temperature Setpt** alarm feature, then set the desired Analog Input’s **VarXX** BIAS Temperature Setpt to the deviation desired, in degrees.



- For example, set left-side Input #1 temperature sensor's BIAS setpt **Var14** to 0020 degrees if you want a BIAS Setpt 'Yellow_Alarm' to happen when Input #1's temperature rises 20 degrees higher than its right-side companion's temperature at Input #2.

- If you do NOT want to use the **BIAS Temperature Setpt** alarm feature, then set (or leave) the desired Analog Input's **VarXX** BIAS Temperature Setpt to 0000 (to disable the BIAS Setpt feature).

See section (2) above for which Analog Input is a left-side input and which Analog Input is a right-side input (as set by the position of the Analog Input's corresponding 3-digit LED display on the ES16's Front-Panel).

See section (4) above for the correlation between **VarXX** BIAS Temperature Setpts and the Analog Input #'s.

See the "UserVar Variables" section in the Reference portion of the User Manual for details on any of the above mentioned **VarXX**'s, if so needed.

6) How to setup your Electro-Sentry 16 for Contact Closure sensor monitoring.

- A) Setup Var09 Contact Closure Logic Select as needed.
- B) For Group A sensors, setup Var10 for Contact Closure sensors.
- C) For Group B sensors, setup Var11 for Contact Closure sensors.

Note⁴: Factory default for Var 10 and Var11 is 0000, for all Analog Inputs are set for 4-20 mA Temperature sensors.

See the Reference portion of the User Manual, pages 2 and 3 for details on **Var09**, **Var10** and **Var11**.

- D) Install external resistor between 360Ω to 390Ω (1 watt minimum) in-line with each corresponding Analog Input (TBx Pin2) that is being used with a Contact Closure sensor. See page 3 of the Reference portion of the User Manual for details.

7) What Temperature or Contact Closure alarms do you need?

Is a Temperature or Contact Closure Warning Alarm or a Temperature Shutdown Alarm needed?

If so, connect the application's 'alarm' circuitry to the ES16's terminal blocks as shown in the following table:

Function	Relay Output#	Terminal Blocks
Group A Temperature Shutdown alarm (N.A. to Contact Closure)	4	TB24 TB23
Group A Temperature/ Contact Closure Warning alarm	3	TB22 TB21
Group B Temperature Shutdown alarm (N.A. to Contact Closure)	2	TB20 TB19
Group B Temperature/Contact Closure Warning alarm	1	TB18 TB17

(These four ES16 relay outputs are 'Dual Form C SPDT').

See section (3) above for explanation of Group A vs. Group B.

8) Do you need a Horn, a Red Light, a Yellow Light, or a Green Light for audio/visual alarm indication, whenever a Temperature alarm or Contact Closure alarm occurs?

- A) If you need a Horn, then set **Var33** Horn_Operation_Select, as needed:

Variable	Default Value	User's Value
Var33 Horn_Operation_Select. See details in Reference Section. Note: A setting of 0999 is for a solid blast until a manual 'Silence_Horn/Alarm_RESET' command is given.	0999	

See Reference portion Page4 for details on **Var33**. Then connect the application's 'Horn' circuitry to the ES16 as shown in the next table.



- B) If you need a Red Light, a Yellow Light, or a Green Light then connect the application's 'Light(stack)' circuitry to the ES16's terminal blocks as shown in the following table:

Horn or Light(stack)	Relay Output #	Terminal Block
Horn	8	TB28
Red Light(stack)	7	TB27
Yellow Light(stack)	6	TB26
Green Light(stack)	5	TB25

(These four ES16 relay outputs are 'Single Form A SPST').

- 9) Leave **Var35** Test Mode Select at the default value of '0000', to operate the ES16 in the 'real-live-data-mode'.
- 10) Please see the Reference Section of the User Manual for details of any of the UserVars.
- 11) Please see the Reference Section of the User Manual for details of the TBx terminal blocks (found on pages 12 and 13 of the Reference Section), or use the handy diagram silkscreened into the back side of the Front-Panel.
- 12) For easy reference, log your user variable values in the chart on the inside of the Electro-Sentry 16's front cover.



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Electro-Sentry 16 Reference Manual

Description

The Electro-Sentry 16 (a.k.a. ES16) is a Hazard Monitoring System that contains the following:

- At-a-glance Temperature monitoring with alarm identification, for up to sixteen 4-20 mA analog Temperature or Contact Closure sensors.
- 8 relay outputs, for Temperature or Contact Closure alarms, for a Green/Yellow/Red Lightstack operation, and for a Horn.
- Minimal end-user calibration and setup, with calibration stored in non-volatile EEPROM memory.
- Easy one-button tests of systems and alarms, for simulating temperature increases.
- Rugged, industrial-duty systems and sensors.

Front-Panel Displays

- Sixteen Temperature or Contact Closure 3-digit LED displays, each with its own discrete Green/Yellow/Red status LED.
- One Four-digit LCD display to aid in programming UserVars (located in lower-left-corner of Front-Panel).

Front-Panel User Interface

- Four Push-buttons for programming UserVars. The buttons are ENTER, SHIFT-LEFT, INCRement, and DECPT.
- One Push-button for Test_Left_Side_Temperature_Rise.
- One Push-button for Test_Right_Side_Temperature_Rise.

Enclosure

The enclosure is rated: NEMA 3R, NEMA 4, NEMA 4X, and NEMA 12. Customer to cut their own conduit holes, preferably in the bottom wall of the enclosure.

Modes of Operation:

The Electro-Sentry 16 has two modes of operation, **Normal Mode** and **Program Mode**.

When in either mode the Front-Panel temperature displays, and their alarms are active. The presence of either mode can be seen by looking at the small four-digit LCD display located in the lower-left-corner of the Front-Panel, as follows.

Normal Mode

This mode is the normal operation mode, and it is to be used when the user is NOT changing any of the UserVars.

The Normal Mode is indicated by the absence of the “VAR” icon in the lower-left-corner of the LCD display.

During normal mode the LCD shows “ES:16”.

Program Mode

This mode allows the user to change the UserVar variables. The LCD display will display the name of the present active variable (as ‘PrXX’) or its value (as ‘XXXX’).

The Program Mode is indicated by the presence of the “VAR” icon in the lower-left-corner of the LCD display.

Entering and Using Program Mode:

Programming is accomplished by using the four pushbuttons located in the lower left corner of the Front-Panel.

The four UserVar programming buttons are ENTER, Shift-left, INCRement, and DECPT.

- a) Press the ENTER button. The “Var” icon will display on the LCD and the 4 digits will show “PR09”. (Only active UserVars are shown).
- b) Press the INCRement button repeatedly until you get to the variable you want to change.
- c) Press the ENTER button to access that variable.
- d) While in that variable you must press the INCRement button to change the active digit (flashing digit), then press the Shift-left button to work your way through all accessible digits. (Not all digits are accessible in all UserVars).
- e) When you are done with that variable press the ENTER button to save that new UserVar value, and return to the ‘PrXX’ list.
- f) To step to the next variable in the ‘PrXX’ list press the INCRement button.
- g) To exit the Program Mode and get back to Normal Mode, repeatedly press the INCRement button while in the ‘PrXX’ list until the “VAR” icon disappears, or simply press the DECPT button while in the ‘PrXX’ list to make a ‘quick-exit’ out of Program Mode.

Note: If the user does NOT manually exit the Program Mode, and if there is no further activity in Program Mode for one minute, then the ES16 **automatically exits** the Program Mode.

- When this ‘**auto-exit**’ is performed, any UserVar that was changed and accepted by pressing the ENTER button during the present Program Mode session will have their new value properly retained.
- If the LCD screen was displaying a UserVar’s value (and not displaying the name ‘PrXX’) at the instant the ‘**auto-exit**’ was performed, then that particular UserVar value is restored to its previous value (and its new unsaved value is lost). This since the user had NOT pressed the ENTER button during the present Program Mode session to accept the present ‘flashing’ new value of that UserVar.

Note: Electro-Sentry 16’s UserVars all have the decimal point locked in the far right position.



Free Catalog and Application Assistance

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How to reset the Electro-Sentry 16's UserVars back to factory-defaults

Use this procedure to reset the Electro-Sentry 16's UserVars back to factory-default values:

- 1) Remove the Vac power.
- 2) Simultaneously press and hold the INCRement and ENTER buttons (located just below the small four-digit LCD display in the lower-left-corner of the Front-Panel).
- 3) Re-apply the Vac power.
- 4) When the small LCD display shows "rESE", release the buttons. (The UserVars have now been automatically reset to their factory-default values).

The UserVar Variables:

Sensor Type Select Variables (Var09 through Var11)

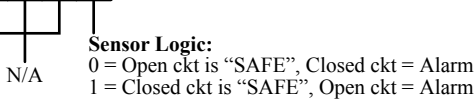
Var09. Contact_Closure_Sensor_Logic_Select.

Note: **Var09** is applicable to Contact Closure Sensors only.

Var09 range is 0000 to 0001.

Var09=

0	0	0	X
---	---	---	---



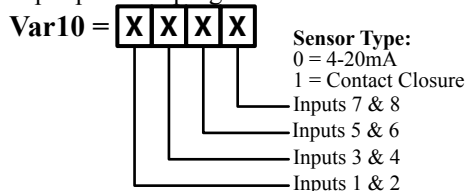
- Right-most-digit = '0': programs the normally 'Open-circuit' case as the 'non-alarm' Green zone state, and the Contact-Closure's 'Closed-circuit' case as the 'Yellow_Alarm' state.
- Right-most-digit = '1': programs the normally 'Closed-circuit' case as the 'non-alarm' Green zone state, and the Contact-Closure's 'Open-circuit' case as the 'Yellow_Alarm' state.

Factory default for Var09 is 0000 for "Open ckt is SAFE".

Var10. Group_A_Sensor_Type_Select.

Var10 allows the Analog Inputs #'s 1, 2, 3, 4, 5, 6, 7, and 8, to be programmed for either 4-20 mA Temperature type sensors or for Contact-Closure type sensors. Rub Block sensors are always expected to be operated in pairs and are horizontally across from each other on the ES16's Front-Panel.

Var10 range is 0000 to 1111, with only 0's and 1's allowed. The associated input pairs are programmed as follows:



Factory default for Var10 is 0000, for all associated Analog Inputs are set for 4-20 mA Temperature sensors.

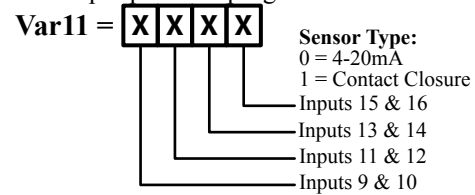
Var11. Group_B_Sensor_Type_Select.

Var11 allows the Analog Inputs #'s 9, 10, 11, 12, 13, 14, 15,

and 16, to be programmed for either 4-20 mA Temperature type sensors or for Contact-Closure type sensors. Rub Block sensors are always expected to be operated in pairs and are horizontally across from each other on the ES16's Front-Panel.

Var11 range is 0000 to 1111, with only 0's and 1's allowed.

The associated input pairs are programmed as follows:



Factory default for Var11 is 0000, for all associated Analog Inputs are set for 4-20 mA Temperature sensors.

Notes: For Var10 and Var11.

- When a Contact-Closure sensor gives an alarm it is a 'Yellow_Alarm' only (i.e., no 'Red_Alarm' for a Contact-Closure).
- When a Contact-Closure sensor 'alarms', it alarms with the corresponding 3-digit display's discrete Yellow-LED / Yellow-Lightstack-Relay / Temperature-Warning-Relay / Horn-Relay, and the 3-digit LED display shows 'ALr'. If the Contact-Closure sensor were to return to the Green zone 'non-alarm' state, then the 'Yellow_Alarm' remains 'latched', with the 3-digit LED display remaining at 'ALr'. Once the Contact-Closure sensor has returned to the Green zone 'non-alarm' state, then to 'clear' the latched 'Yellow_Alarm' the user must give a 'Silence_Horn/Alarm_RESET' command to the ES16. (See Operating Note Section "How to Clear Alarms" for details).
- When the message 'bAd' is shown on the Contact-Closure's corresponding 3-digit LED display, the associated relays go into a 'Yellow_Alarm' to indicate that something is NOT normal. Most likely the user has programmed for a Contact-Closure sensor, while they are still using a 4-20 mA type temperature sensor. ('bAd' means verify sensor type).

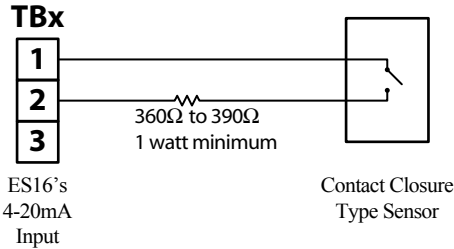
Contact Closure's Input Current Range	Defined State	Message on 3-digit LED display
20.83mA or more	Closed-Circuit (Valid)	SAF or ALr, as per Var09 (Valid)
1.1mA to 20.8mA	Bad Sensor (Invalid)	bAd (Verify sensor type)
1mA or less	Open-Circuit (Valid)	SAF or ALr, as per Var09 (Valid)

- Changes to the "Var10 or Var11_Group_Sensor_Type_Select" automatically clear any corresponding 'orphaned' alarms when changing sensor pairs from Temperature sensors to Contact-Closure sensors, and vice versa.



- A Contact-Closure input can be turned ‘OFF’ completely by setting the input’s BIAS setpt to ‘0999’. See discussion on **Var14** through **Var29** setpts below. (However note, the BIAS feature itself is not applicable to Contact-Closure sensors).

IMPORTANT NOTE: If an analog input is programmed for use with a Contact-Closure type sensor, then an external **resistor between 360Ω to 390Ω (1 watt minimum)** must be used ‘in-line’ with the corresponding Analog Input’s Signal terminal (**TBx pin2**), as shown in the figure below. The Electro-Sentry 16 is supplied with (8) eight 360Ω, 1 watt resistors.



The Warning and Shutdown SetPt Temperature Variables (Var12 and Var13)

Var12. Warning_Setpt_Temperature degrees (for all temperature sensors).

If a Temperature Sensor exceeds this SetPt, then the ES16 gives an alarm by the corresponding temperature display’s discrete Yellow-LED / Yellow-Lightstack-Relay / Temperature-Warning-Relay / Horn-Relay, and the 3-digit LED display ‘Latches’ the highest value reached.

Var12 range is 0000 to 0250 degrees.

Factory default for Var12 is 0160 degrees.

Var13. Shutdown_Setpt_Temperature degrees (for all temperature sensors).

If a Temperature Sensor exceeds this SetPt, then the ES16 gives an alarm by the corresponding temperature display’s discrete Red-LED / Red-Lightstack-Relay / Temperature-Shutdown-Relay / Horn-Relay, and the 3-digit LED display ‘Latches’ the highest value reached.

Var13 range is 0000 to 0250 degrees.

Factory default for Var13 is 0175 degrees.

Notes: For Var12 and Var13: To ‘clear’ the latched Yellow or Red_Alarm the user must give a ‘Silence_Horn/Alarm_RESET’ command to the ES16 once the temperature has dropped below the associated setpt. (See Operations Notes Section “How to Clear Alarms” for details).

The BIAS Setpt Temperature Variables (Var14 through Var29)

The below listed BIAS Setpts set the temperature difference (or deviation) at which a left-side temperature sensor triggers a BIAS Setpt ‘Yellow_Alarm’ if it exceeds its right-side companion

sensor by the left-side BIAS Setpt amount.

And likewise vice-versa if a right-side sensor exceeds its left-side companion sensor by the right-side BIAS Setpt amount. Each sensor input has its own BIAS Setpt, with range 0000 to 9999.

- A BIAS Setpt = 0000 enables the Analog Input, but disables its BIAS Alarm “Left-side sensor vs. Right-side sensor” comparison feature.
- A BIAS Setpt between 0001 and 0998 enables the Analog Input, and enables its BIAS Alarm feature by giving it the desired temperature deviation SetPt value.
- A BIAS Setpt = 0999 disables an Analog Input completely by turning ‘OFF’ that particular temperature sensor’s input and its effects on the temperature alarms. The sensor’s 3-digit LED display then shows ‘OFF’.

Note: Even though the BIAS setpts accept up to 0998 degrees, typical ESI sensors only run up to 248 degrees.

The BIAS Setpts are in **Var14** through **Var29**, and all have a **factory default of 0000, which enables all analog inputs, but which disables their BIAS alarm feature.**

The left-side/right-side BIAS ‘companion’ pairs are listed below with their associated analog input, UserVar variable, and nomanclature.

Input #	Variable	Nomanclature
1	Var14	Input #1 BIAS SetPt (Left)
2	Var15	Input #2 BIAS SetPt (Right)
3	Var16	Input #3 BIAS SetPt (Left)
4	Var17	Input #4 BIAS SetPt (Right)
5	Var18	Input #5 BIAS SetPt (Left)
6	Var19	Input #6 BIAS SetPt (Right)
7	Var20	Input #7 BIAS SetPt (Left)
8	Var21	Input #8 BIAS SetPt (Right)
9	Var22	Input #9 BIAS SetPt (Left)
10	Var23	Input #10 BIAS SetPt (Right)
11	Var24	Input #11 BIAS SetPt (Left)
12	Var25	Input #12 BIAS SetPt (Right)
13	Var26	Input #13 BIAS SetPt (Left)
14	Var27	Input #14 BIAS SetPt (Right)
15	Var28	Input #15 BIAS SetPt (Left)
16	Var29	Input #16 BIAS SetPt (Right)

When a BIAS Setpt’s deviation value is exceeded, it gives an alarm by turning ON the corresponding temperature display’s discrete Yellow-LED, plus putting the Yellow-Lightstack-Relay / Temperature-Warning-Relay / Horn-Relay, all into their alarm states.

Also, once a sensor goes into a BIAS Setpt ‘Yellow_Alarm’,



its 3-digit LED display 'Latches' the highest value reached. To 'clear' the latched BIAS Setpt 'Yellow_Alarm' the user must give a 'Silence_Horn/Alarm_RESET' command to the ES16 once the temperature has dropped below the BIAS setpt. (See Operations Notes Section "How to Clear Alarms" for details).

Var30. Temperature_Display_Select. (Temperature in F° Fahrenheit or C° Celsius).

The **Var30** range is limited to these below listed choices:

- '0000' = display temperatures in F° Fahrenheit.
- '0001' = display temperatures in C° Celsius.

Note: If you setup your ES16 to display temperatures in Fahrenheit F° and have your temperature setpts in F°, and then later change **Var30** to Celsius C°, the ES16 does NOT automatically convert the setpts over to equivalent C° values, (or vice versa C° to F°)

Factory default for Var30 is 0000 for degrees Fahrenheit.

The System Variables (Var33, 35, 36.)

Var33. Horn_Operation_Select.

Var33 selects how the user wants the Horn-Relay to sound.

Var33 range is 0000 to 1999.

The **Var33** value is limited to these below listed choices.

Var33=

X	X	X	X
---	---	---	---

The three right-most digits set the Horn sounding 'time':
 000 to 998 = the number of minutes to sound the Horn.
 (See Note⁵).
 999 = sound the Horn indefinitely.⁵

The left-most digit selects Horn 'type':
 0 = the Horn is a solid blast.
 1 = the Horn is an oscillating blast.
 (1 sec ON, 3 sec OFF, etc.).

Note⁵: The user can always give a manual 'Silence_Horn/Alarm_RESET' command at any time to turn OFF the Horn, and keep it OFF, until the Horn sounds again for the next alarm event.

The usable values of **Var33** are 0000 to 1999. Some examples are shown in the table below:

Var33 Value	Horn Type	Horn Time	Notes
0000	Solid Blast	Indefinite	This has the same effect as Var33=0999
0001	Solid Blast	1 Min.	---
0030	Solid Blast	30 Min.	---
0999 ⁶	Solid Blast	Indefinite	Solid Horn until a 'Silence_Horn/Alarm_RESET' given
1000	Oscillating	0	This is an oscillating blast for '0' minutes, consisting of only one 'beep' lasting 1 second ON and then a continuous OFF
1001	Oscillating	1 Min.	---
1030	Oscillating	30 Min.	---
1999	Oscillating	Indefinite	Oscillate Horn until a 'Silence_Horn/Alarm_RESET' given.

Note⁶: **Factory default for Var33 is 0999 for solid blast until a 'Silence_Horn/Alarm_RESET' command is given.**

Note: The **Var33** Horn_Operation_Select can be changed at any time, whether or not an alarm event is present. Also, while the Horn Relay #8 is sounding, **Var33** can be changed 'on-the-fly' from solid blast to oscillating blast, or from oscillating blast to solid blast, and its effects are immediately heard (as long as the Horn 'time' has not expired following an alarm event.)

Note: The Horn-Relay is also used to tell the user that a 'Silence_Horn/Alarm_RESET' command has existed for 60 or more seconds. This happens independently of how **Var33** is programmed. See Troubleshooting Section "LCD Display Error Messages, Err6" for details.

Var35. Test_Mode_Select.

This variable selects whether to operate the ES16 in the ‘real-live-data-mode’ or in a ‘test-data-mode’.

The **Var35** range is limited to these below listed choices:

Var35 Value	LED Display Operation Mode	Method of Relay Output Testing
0000	Live Data	N.A.
0001	Test Data	In simulated alarm events (as described below)
0002	Test Data	All relays held ‘energized’
0003	Test Data	All relays held ‘de-energized’
0004	Test Data	Test each of the 8 digital inputs with each of the 8 relay outputs. (See next table for details on Var35 = 0004).

When **Var35** is set to a ‘non-zero’, (i.e. a ‘0001’, a ‘0002’, a ‘0003’, or a ‘0004’), then the LCD and LED displays cycle through and display all ‘0000’, all ‘1111’, all ‘2222’, etc, all the way up to all ‘9999’, then wrap back around to all ‘0000’, repeating the cycle indefinitely.

Also when **Var35** is set to ‘non-zero’ the following happens:

- When the LCD/LED displays all show ‘0000’, then the small discrete LED warning lights are all OFF, and all four of the LCD’s decimal points are ON as ‘0.0.0.0.’.
 - And with **Var35** = ‘0001’ the 8 output Relays are all de-energized.
- When the LCD/LED displays all show ‘1111’, ‘2222’, or ‘3333’, then the small discrete LED warning lights are all Green.
 - And with **Var35** = ‘0001’ the 8 output Relays simulate a ‘Green zone’ event (i.e., all is okay – no alarms present).
- When the LCD/LED displays all show ‘4444’, ‘5555’, or ‘6666’, then the small discrete LED warning lights are all Yellow.
 - And with **Var35** = ‘0001’ the 8 output Relays simulate a ‘Yellow_Alarm’ event (i.e., a warning event).
- When the LCD/LED displays all show ‘7777’, ‘8888’, or ‘9999’, then the small discrete LED warning lights are all Red.
 - And with **Var35** = ‘0001’ the 8 output Relays simulate a ‘Red_Alarm’ event (i.e., a shutdown event).

When **Var35** is set to a ‘0004’, then the ‘test-data-mode’ correspondence between the 8 digital switch/button inputs and the 8 Relay outputs is shown in the table below. (Momentarily closing the following Remote Switch Digital Inputs or pressing the associated Front Panel button will momentarily de-energize the following relay, otherwise the relay is energized):

Input	Nomanclature	Relay
TB32*	Var35 Relay 8 Test Only *	8
TB33	Silence_Horn/Alarm_Reset	7
TB34*	Var35 Relay 6 Test Only *	6
TB31: 1-2*	Var35 Relay 5 Test Only *	5
TB31: 3-4	Aux_Test_Left_Side or TEST_LEFT_SIDE button on Front Panel	4
TB31: 5-6	Aux_Test_Right_Side or TEST_RIGHT_SIDE button on Front Panel	3
TB31: 7-8*	Var35 Relay 2 Test Only *	2
TB31: 9-10	Aux_Silence_Horn/Alarm_Reset	1

***Note: These TBx inputs are active only for the Var35 = 0004 relay test, and are not used during normal ES16 operation.**

CAUTION: Doing this Var35 test may cause actual system alarms.

Factory default for Var35 is 0000 for operate in ‘real-live-data-mode’.

Var36. Software Identification. (Read Only)

This variable shows which version of software is loaded into the Electro-Sentry 16. **Var36**’s value is viewable only, with NO changes allowed.

- Note: The Software Identification is also shown for 2 seconds on the LCD display during power-up.



Electro-Sentry 1 Operation Notes Section:

Alarms

- 1) The Unit_Alarm_LEDs blink when there is an alarm on the unit, so operator can identify which unit has the alarm.
- 2) Temperature and Contact-Closure alarms are always active, unless turned 'OFF' by the associated BIAS SetPt Var.

Latching and holding of Alarms

3) Concerning the Temperature displays and 'setpt violation latching':

During any Temperature 'Yellow_Alarm' or 'Red_Alarm' (i.e., a BIAS Setpt Alarm, a Warning Alarm, or a Shutdown Alarm), the corresponding 3-digit LED temperature display is only allowed to increase in value as the violation escalates. This means that if the temperature input cools down on its own accord, the maximum temperature reached will be 'latched' on the display, the discrete Yellow/Red LEDs will 'latch', and the associated relays will 'latch'. To return the 3-digit LED temperature display to show 'live' temperatures, the user must manually acknowledge the alarm by giving a 'Silence_Horn/Alarm_RESET' command.

4) Concerning the Contact-Closure displays and 'alarm latching':

When a Contact-Closure sensor 'alarms', it alarms with the corresponding 3-digit display's discrete Yellow-LED / Yellow-Lightstack-Relay / Temperature-Warning-Relay / Horn-Relay, and the 3-digit LED display shows 'ALr' (for "Alarm"). If the Contact-Closure sensor were to return to the Green zone 'non-alarm' state, then the 'Yellow_Alarm' remains 'latched', with the 3-digit LED display remaining at 'ALr'. Once the Contact-Closure sensor has returned to the Green zone 'non-alarm' state, then to 'clear' the latched 'Yellow_Alarm' the user must give a 'Silence_Horn/Alarm_RESET' command to the ES16. After that, the 3-digit LED display then shows "SAF" (for "Safe").

How to 'clear' Alarms

- 5) There are four ways to give a manual 'Silence_Horn/Alarm_RESET' command to the ES16.
 - By 'closing' the regular 'Silence_Horn/Alarm_RESET' input at TB33 pins 1 and 2.
 - By 'closing' the AUXILARY 'Silence_Horn/Alarm_RESET' input at TB31 pins 9 and 10.
 - By simultaneously pressing the Front-Panel's TEST_LEFT_SIDE and TEST_RIGHT_SIDE Temperature Rise test buttons.
 - By simultaneously 'closing' the AUX_TEST_LEFT_SIDE and AUX_TEST_RIGHT_SIDE inputs at TB31 pins 3-4 and 5-6.

A 'Silence_Horn/Alarm_RESET' command is used to first turn OFF the Horn-Relay unconditionally, and further used to 'clear' a Temperature or Contact Closure alarm (provided the alarm event has dissipated).

Note: There are a few instances where an active existing Temperature or Contact-Closure alarm is 'automatically cleared' without the user having to give a manual 'Silence_Horn/Alarm_RESET' command to the ES16, and these are the following cases:

- A Temperature or Contact-Closure alarm is automatically 'cleared' when a sensor with an active alarm (either a Temperature Setpt 'Red_Alarm', a 'Yellow_Alarm', a BIAS Setpt 'Yellow_Alarm', or a Contact-Closure alarm) has its BIAS Setpt changed to '999' to turn 'OFF' that sensor.
- A Temperature or Contact Closure Alarm is automatically cleared if the sensor type is changed.
- A Contact Closure Alarm can be automatically cleared when **Var09's** Logic Selection is changed.
- If one of the TEST_Features have been used (i.e., the TEST_LEFT_SIDE or the TEST_RIGHT_SIDE Temperature Rise tests), and if a 'Red_Alarm' or 'Yellow_Alarm' was generated by one of those tests, then that alarm will automatically 'clear-out' 60 seconds after the last TEST_Feature was used.
 - Also, if a 'real' alarm event has dissipated during those 60 seconds following a TEST_Feature operation, then it too will be automatically 'cleared' 60 seconds after the last TEST_Feature was used.

Using multiple Electro-Sentry 16's in the same application

- 6) Multiple Electro-Sentry 16's can be connected together to the same external Green/Yellow/Red Lightstack status indicator to monitor a larger overall system, as follows:
 - Connect all of the individual ES16's Green-Lightstack-Relays in series with each other and with the external Lightstack.
 - Connect all of the individual ES16's Yellow-Lightstack-Relays in parallel with each other and with the external Lightstack.
 - Connect all of the individual ES16's Red-Lightstack-Relays in parallel with each other and with the external Lightstack.

With multiple Electro-Sentry 16's connected together as described, the following alarm behavior is seen:

- The external Green Lightstack is lit if-and-only-if all ES16's have no alarms present.
- The external Green Lightstack is unlit if any ES16 has any alarm present.
- The external Yellow Lightstack is lit if any ES16 has a 'Yellow_Alarm' present.
- The external Yellow Lightstack is unlit if-and-only-if all ES16's have no 'Yellow_Alarms' present.
- The external Red Lightstack is lit if any ES16 has a 'Red_Alarm' present.
- The external Red Lightstack is unlit if-and-only-if all ES16's have no 'Red_Alarms' present.

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Built-in Test Features Section:

Temperature Rise Alarm Test Features

1) Press and hold the 'TEST_LEFT_SIDE' button on the Front-Panel to artificially increase the temperature readings in the left side column of temperature displays. Keep the button pressed-in to increase the temperatures to levels above the **Var12_Warning_Setpt_Temperature**, the **Var13_Shutdown_Setpt_Temperature**, and/or the individual **BIAS_Temperature_Setpts**. (This test can also be accessed by TB31 pins 3-4). This test can be used to test the effectiveness of how the temperature alarm output relays will work with the overall application. Give a manual 'Silence_Horn/Alarm_RESET' command to the ES16 to 'clear' any alarms generated by this test. (See Operations Notes Section "How to Clear Alarms" for details).

CAUTION: This test will cause actual system alarms.

2) Press and hold the 'TEST_RIGHT_SIDE' button on the Front-Panel to artificially increase the temperature readings in the right side column of temperature displays. Keep the button pressed-in to increase the temperatures to levels above the **Var12_Warning_Setpt_Temperature**, the **Var13_Shutdown_Setpt_Temperature**, and/or the individual **BIAS_Temperature_Setpts**. (This test can also be accessed by TB31 pins 5-6). This test can be used to test the effectiveness of how the temperature alarm output relays will work with the overall application. Give a manual 'Silence_Horn/Alarm_RESET' command to the ES16 to 'clear' any alarms generated by this test. (See Operations Notes Section "How to Clear Alarms" for details).

CAUTION: This test will cause actual system alarms.

Note: Concerning the TEST_LEFT_SIDE and TEST_RIGHT_SIDE temperature tests, only one of these tests can be performed at a time. If both of these temperature tests are attempted at the same time, then the test feature is disabled, and the dual activation is actually an "Alarm_RESET" command. (See the Operation Notes "How to Clear Alarms" for details).

Troubleshooting Section:

Standard Temperature vs. 4-20mA Temperature Sensors

As a quick troubleshooting guide for any of the 4-20 mA Temperature Sensors, the following voltages can be seen at the 4-20 mA Input terminals TB1 thru TB16 (voltages as measured between pin 2 Signal and pin 3 Analog Ground), corresponding to the following standard temperatures:

F°	C°	mA	TBx Vdc
248	120	20.000	9.60
212	100	18.000	8.64
175	79.44	15.944	7.64
160	71.11	15.111	7.25
100	37.78	11.778	5.65
80	26.67	10.667	5.11
70	21.11	10.111	4.85
60	15.56	9.555	4.58
32	0	8.000	3.85
0	-17.78	6.222	2.99
-40	-40	4.000	1.92

'Out-of-Range' Sensor Detection

1) A 4-20 mA out-of-normal-range Temperature Sensor Detection feature works as shown in the table below:

Temperature Sensor's Input Current Range	Message shown on 3-digit LED Display	Type of Alarm
3.9mA to 20.1mA	N.A. (Live Temperature)	N.A. (Green zone.)
20.83mA or higher	CLS (Closed Circuit)	Red_Alarm
20.1mA to 20.83mA	HI (High_mA)	Red_Alarm
1.0mA to 3.9mA	LO (Low_mA)	Yellow_Alarm ⁷
1.0mA or lower	OPn (Open Circuit)	Yellow_Alarm ⁷

Note⁷: Because the 'out-of-range' Temperature Sensor LO and OPn cases have 4-20mA signals less than 3.9mA, they are not **Var12** and **Var13** over-temperature setpoint violations, (but rather would be under-temperature cases). Because the ES16 monitors for over-temperature behavior and not under-temperature behavior, these cases are not outright temperature violations. However, the Temperature Sensor LO and OPn cases are treated as 'Yellow_Alarm' events because the effected sensor could be programmed for the **BIAS** setpt feature. And if a sensor goes 'out-of-range', then the user needs to know this.

LCD Display Error Messages

- 1) There are other messages displayed on the LCD display.

The hardware error messages are:

LCD Display Message	Definition
Err6	'Silence_Horn/Alarm_RESET' command existing for a continuous 60 seconds or more

- Note: If the 'Silence_Horn/Alarm_RESET' command exists for a continuous 60 seconds or more, then it is assumed that one of the following has occurred:
- the 'Silence_Horn/Alarm_RESET' input at TB33 is 'shorted-out',
 - or the 'AUX_Silence_Horn/Alarm_RESET' at TB31 Pins 9 and 10 are both 'shorted-out',
 - or the Front-Panel's TEST_LEFT_SIDE and TEST_RIGHT_SIDE Temperature Rise test buttons are somehow both 'shorted-out'.
 - or the AUX_TEST_LEFT_SIDE and AUX_TEST_RIGHT_SIDE inputs at TB31 pins 3-4 and 5-6 are both 'shorted-out'.

If any one of these four events occurs, then a 'Yellow_Alarm' or 'Red_Alarm' could happen, but the ES16 would not be able to latch those alarms and they would automatically 'clear' once their offending alarm event dissipated. This results in the user never knowing an 'Alarm' came and went, unacknowledged. This defeats one of the main reasons for using an ES16 in the first place (i.e., latch and hold alarms). To warn the user of such a 'short-out', the Horn-Relay goes into a 0.25 second ON, 0.25 second OFF, repeating cycle, and the LCD shows 'Err6'.

- A) If a Temperature sensor fails as 'LOW_mA' or 'Open_ckt', then its 3-digit display shows the "LO" or "OPn" message respectively, and it alarms with its discrete Yellow-LED / Yellow-Lightstack-Relay / Temperature-Warning-Relay /Horn-Relay.
 - Also in this situation the opposite side companion sensor does NOT go into a BIAS Setpt 'Yellow_Alarm' as a BIAS response, for code is in place to see that the first sensor failed. Because of this the second sensor does NOT compare to an 'out-of-range' sensor.

- B) If a Temperature sensor fails as 'HI_mA' or 'Closed_ckt', then its 3-digit display shows the "HI" or "CLS" message respectively, and it alarms with its discrete Red-LED / Red-Lightstack-Relay / Temperature-Shutdown-Relay / Horn-Relay.

Note: Since the HI and CLS cases have 4-20 mA signals exceeding 20.1 mA, these cases must be treated as over-temperature "Red_Alarms".

- C) **Concerning the Temperature displays and 'out-of-range' sensor latching:**

During any 'out-of-range' Temperature Sensor 'Yellow_Alarm' or 'Red_Alarm' (the OPn, LO, HI, or CLS cases), the corresponding 3-digit LED temperature display 'latches' the most recent message, and will not automatically return to showing 'live' temperature values (even if the sensor 'recovers'). This means that once an 'out-of-range' Temperature Sensor has been detected, the corresponding 3-digit LED display will show the most recent message. This allows the ES16 to show if a Temperature Sensor's condition goes from bad to worse, such as a LO case turning into an OPn case, or a HI case turning into a CLS case, and vice versa. To return the 3-digit LED temperature display to show 'live' temperatures, the user must manually acknowledge the alarm by giving a 'Silence_Horn/Alarm_RESET' command.

- 2) If an analog input is programmed as a 'Contact-Closure' input by **Var10 or Var11**, then the 3-digit messages shown are SAF, ALr, or bAd. For 'Contact-Closure' sensors the SAF and ALr are normal valid messages, and the bAd message is used for invalid sensor indication. See **Var10 or Var11** Group_Sensor_Type_Select section for details.

The Green Indicator LEDs, the Replaceable Fuse F12, and the Resettable Fuses F1 through F11:

- 1) The Electro-Sentry 16 has two **Green indicator LEDs** for the on-board power circuits.
 - The **Green indicator LED D34** is for the digital power circuit.
 - The **Green indicator LED D28** is for the analog power circuit.
 - If one or both of the Green LEDs D34 and D28 are 'OFF', then perform the following troubleshooting steps:
 - a) Is the SW1 Vac Selection Switch set **FIRMLY** to the proper 115Vac or 230Vac position (and **NOT** inadvertently sitting part-way between the selections)?
 - b) Is there proper Vac power applied to the ES16 unit at terminal block TB29?
 - c) Is the main **replaceable Fuse F12** still **GOOD**?
Note: F12 is a replaceable fuse (it is not the resettable type).
 - d) If one or both of the Green LEDs D34 and D28 are still 'OFF' after successfully performing the first three steps, then the Electro-Sentry 16's main power circuitry has been damaged.

- 2) The Electro-Sentry 16 uses on-board **resettable fuses** in the output circuits of the digital power supply (**Fuse F11**), and the analog power supply (**Fuse F10**).
 - If a higher than normal current occurs in the ES16's digital circuit section, then Fuse F11 heats-up and effectively removes the +24Vout_D voltage and the **Green indicator LED D32** turns 'OFF'.
 - If a higher than normal current occurs in the ES16's analog circuit section, then Fuse F10 heats-up and effectively removes the +24Vout_A voltage and the **Green indicator LED D30** turns 'OFF'.
 - If either the Green LEDs D32 or D30 are 'OFF', then perform the following troubleshooting steps:
 - a) First, verify that the Green LEDs D34 and D28 are both 'ON'. If not, then see section (1) above.
 - b) Next, remove the Vac power from the ES16 unit for about 2 minutes (to allow Fuse F11, or Fuse F10, to cool-down).
 - c) Then, re-apply the Vac power to the ES16 unit.
 - d) If the **Green LED D32** or **D30** is still 'OFF', then the on-board digital power supply or the analog power supply (whatever the case may be), has been damaged.

- 3) The Electro-Sentry 16 uses on-board **resettable fuses** in the power supply paths going to the Temperature or Contact-Closure sensors.

For the Temperature or Contact-Closure sensors the resettable fuses are in series with pins #1 of TB1 thru TB16. There is one on-board **resettable fuse** for each pair of Inputs, as follows:

Input Fuse	Input Terminal Blocks	Analog Input Pairs
F1	TB1 & TB2	#1 & #2
F2	TB3 & TB4	#3 & #4
F3	TB5 & TB6	#5 & #6
F4	TB7 & TB8	#7 & #8
F5	TB9 & TB10	#9 & #10
F6	TB11 & TB12	#11 & #12
F7	TB13 & TB14	#13 & #14
F8	TB15 & TB16	#15 & #16

If a higher than normal current occurs in any of the Temperature or Contact-Closure sensors, then the corresponding resettable fuse heats-up and effectively removes the +24 Vdc output power from the sensor's TBx terminal block pin #1. If it appears any one of these sensors have no +24 Vdc power at their TBx terminal block, then perform the following troubleshooting steps to try to restore the +24 Vdc power:

- a) First, verify that all four Green indicator LEDs D28, D30, D32, and D34 are 'ON'. If not, see sections (1) and (2) above.
- b) Next, remove the corresponding TBx terminal block for about 2 minutes and let the effected resettable fuse cool-down. (This means for the 4-20 mA Temperature/Contact-Closure sensors you must unplug **BOTH** of the TBx terminal blocks of an Input pair to remove all electrical current flowing through the effected resettable fuse in order for it to cool-down).
- c) Finally, plug-in the corresponding TBx terminal block, and see if the resettable fuse holds or then trips again. If the fuse trips again, then check for a **BAD** sensor or **BAD** wiring going out to that sensor.

Specifications Table	
Power	Parameters
Voltage	115 Vac or 230 Vac
Frequency	50 - 60 Hz
Electrical Connection	3-Pos Pluggable Terminal Block
Fuse (F12) 115 Vac	0.4 Amp Slo-Blo
Fuse (F12) 230 Vac	0.2 Amp Slo-Blo
Input Signal	Parameters
TB1 through TB16	16 - Analog Temperature (4-20mA) or Contact Closure (See Var10 and Var11)
Temperature Sensor Calibration	4mA @ -40°C (-40°F) 20mA @ +120°C (+248°F)
Set Point Data	Parameters
Temperature	Two (Warning and Shutdown)
Temperature Bias	Sixteen (Warning Only)
Relay Output Data	Parameters
Relays 1, 2, 3, 4	5 Amp Dual Form C SPDT
Relays 5, 6, 7, 8	5 Amp Single Form A SPST
Relay Contact Rating	5 Amp @ 30 Vdc, or 250 Vac resistive
Physical/Environment	Parameters
Enclosure Material	Polycarbonate
Recommended Minimum Installation Area	15.4" x 14.7"
Operating Temperature	-30°C to +70°C (-22°F to +158°F)
Storage Temperature	-40°C to +80°C (-40°F to +176°F)
Shipping Weight	12 pounds

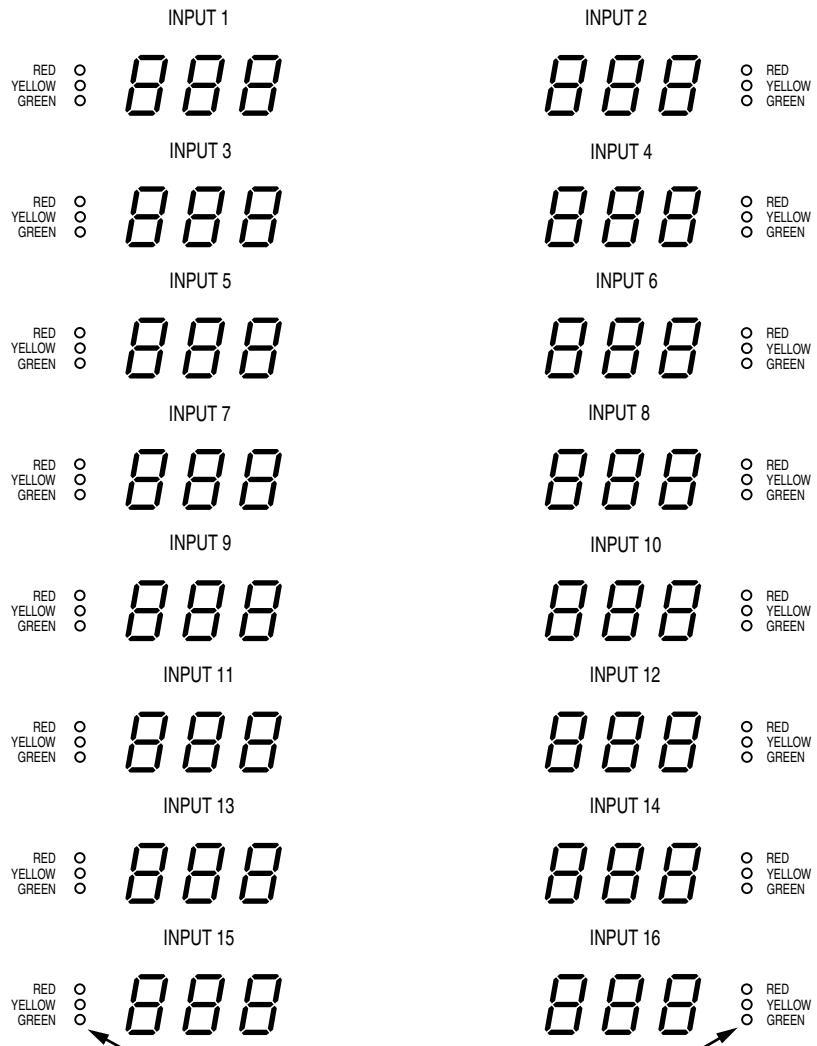
Setpoint Accuracy	Parameters
Temperature setpts	±1° Fahrenheit

Specifications are subject to change without notice.

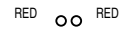


Front Panel Drawing

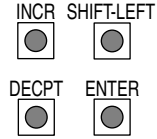
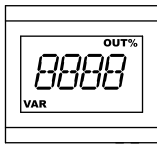
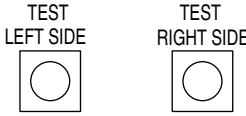
ELECTRO-SENTRY 16 FRONT PANEL



UNIT ALARM



The "discrete" LEDs



Messages:
For 4-20mA Sensors:
 OPn = Open Circuit
 LO = 1.0 To 3.9 mA
 HI = 20.1 To 20.8 mA
 CLS = Closed or Shorted Circuit

For Contact Closure Sensors:
 bAd = Check Sensor Type
 ALr = Alarm State
 SAF = Safe Non-Alarm State

Other:
 Err6 = Continuous Alarm RESET command

Terminal Block Connections			
Analog Inputs (4-20mA)			
Analog Inputs 1 - 16	TB1 Through TB16	1	+24 Vout Analog (Resettable fused at 50mA per pair max, at 70°C/158°F) See** note below
		2	4-20mA Signal
		3	Analog Ground
Relay Outputs (Dual Form C SPDT)			
Relay #1 Group B Warning	TB17	1	Normally Open
		2	Common
		3	Normally Closed
	TB18	1	Normally Open
		2	Common
		3	Normally Closed
Relay #2 Group B Shutdown	TB19	1	Normally Open
		2	Common
		3	Normally Closed
	TB20	1	Normally Open
		2	Common
		3	Normally Closed
Relay #3 Group A Warning	TB21	1	Normally Open
		2	Common
		3	Normally Closed
	TB22	1	Normally Open
		2	Common
		3	Normally Closed
Relay #4 Group A Shutdown	TB23	1	Normally Open
		2	Common
		3	Normally Closed
	TB24	1	Normally Open
		2	Common
		3	Normally Closed
Relay Outputs (Single Form A SPST)			
Relay #5 Green Light (Stack)	TB25	1	Normally Open
		2	Common
Relay #6 Yellow Light (Stack)	TB26	1	Normally Open
		2	Common
Relay #7 Red Light (Stack)	TB27	1	Normally Open
		2	Common
Relay #8 Horn	TB28	1	Normally Open
		2	Common

AC Power Inputs			
115Vac/ 230Vac	TB29	1	Hot (115Vac)
		2	Earth Ground
		3	Neutral (Hot 230Vac)
N/A	TB30	1	No Connection
		2	No Connection
		3	No Connection
Remote Switch Digital Inputs (Contact Closure)			
Var35 Relay 5 Test Only*	TB31	1	Input
		2	Digital Ground
Aux Test Left Side Temp Rise		3	Input
		4	Digital Ground
Aux Test Right Side Temp Rise		5	Input
		6	Digital Ground
Var35 Relay 2 Test Only*		7	Input
		8	Digital Ground
Aux Silence Horn /Alarm Reset		9	Input
		10	Digital Ground
Var35 Relay 8 Test Only*	TB32	1	Input
		2	Digital Ground
Silence Horn/Alarm Reset	TB33	1	Input
		2	Digital Ground
Var35 Relay 6 Test Only*	TB34	1	Input
		2	Digital Ground

***Note: These TBx inputs are active only for the Var35 = 0004 relay test, and are not used during normal ES16 operation.**

****Note: Analog input “pairs” and their corresponding terminal blocks are described on Page 9.**

Example: Two sensors per pair with each drawing 25mA each is permissible. One sensor drawing 50mA is permissible as long as no sensor is used in its corresponding “paired” input.

SW1 Vac Selection Switch

The Vac power is selectable via selector switch SW1 located next to the Vac TB29 terminal block on the I/O terminal board. Slide the switch to the right for 115 Vac or to the left for 230 Vac.

The ES16 is shipped with SW1 set for 115Vac, and with the replaceable fuse, F12, as a 115Vac/0.4Amp Slo-Blo fuse.

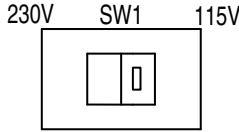
If your application needs SW1 switched to 230Vac, then also install a 230Vac/0.2Amp Slo-Blo fuse into F12

The ES16 is shipped with one extra 115Vac/0.4Amp Slo-Blo fuse and one 230Vac/0.2Amp Slo-Blo fuse.

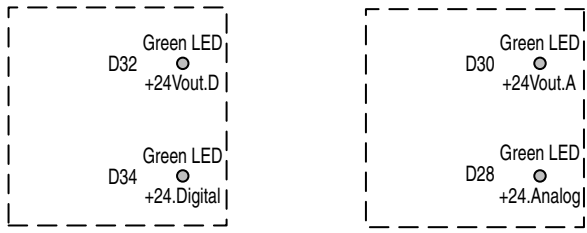
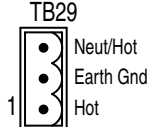
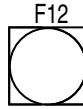
I/O Board - Terminal Drawing

ELECTRO-SENTRY 16
USER ACCESSIBLE TERMINALS
ON I/O BOARD

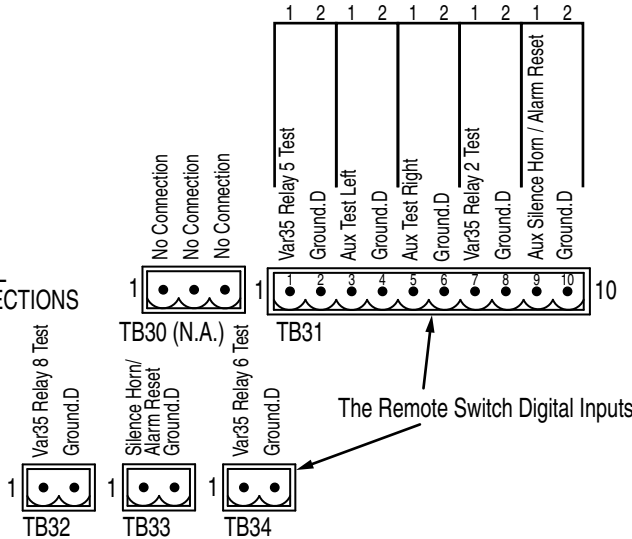
VAC SELECTOR SWITCH



FUSE F12: SLO-BLO 0.4A/115VAC
 SLO-BLO 0.2A/230VAC

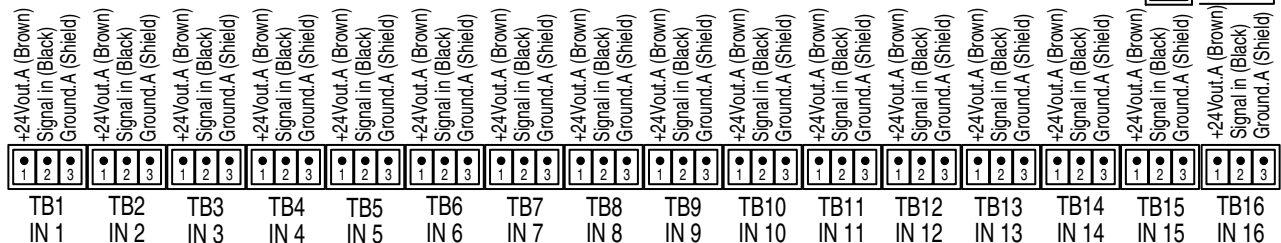


DIGITAL CONNECTIONS

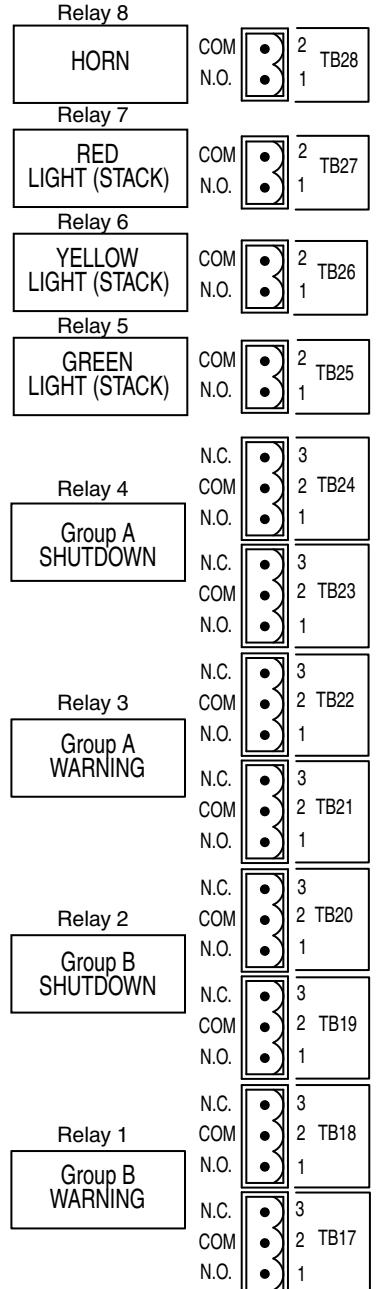


NOTE: Analog and Digital circuits are NOT the same
 (+24Vout.A Vs. +24Vout.D)
 (Ground.A Vs. Ground.D)

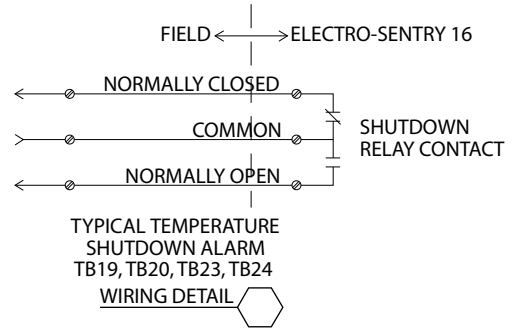
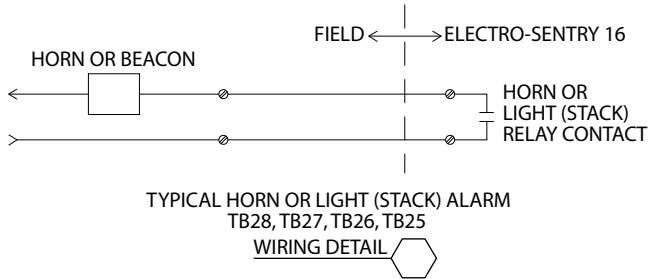
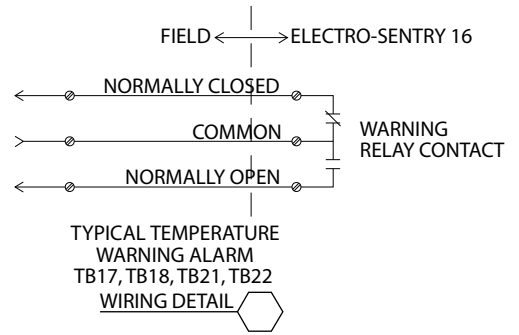
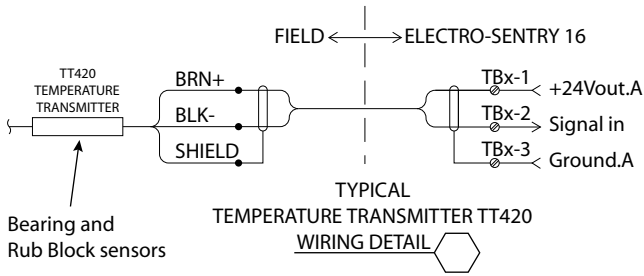
Brown, Black, and Shield refers to the wires used on Electro-Sensors TT420 temperature sensors.



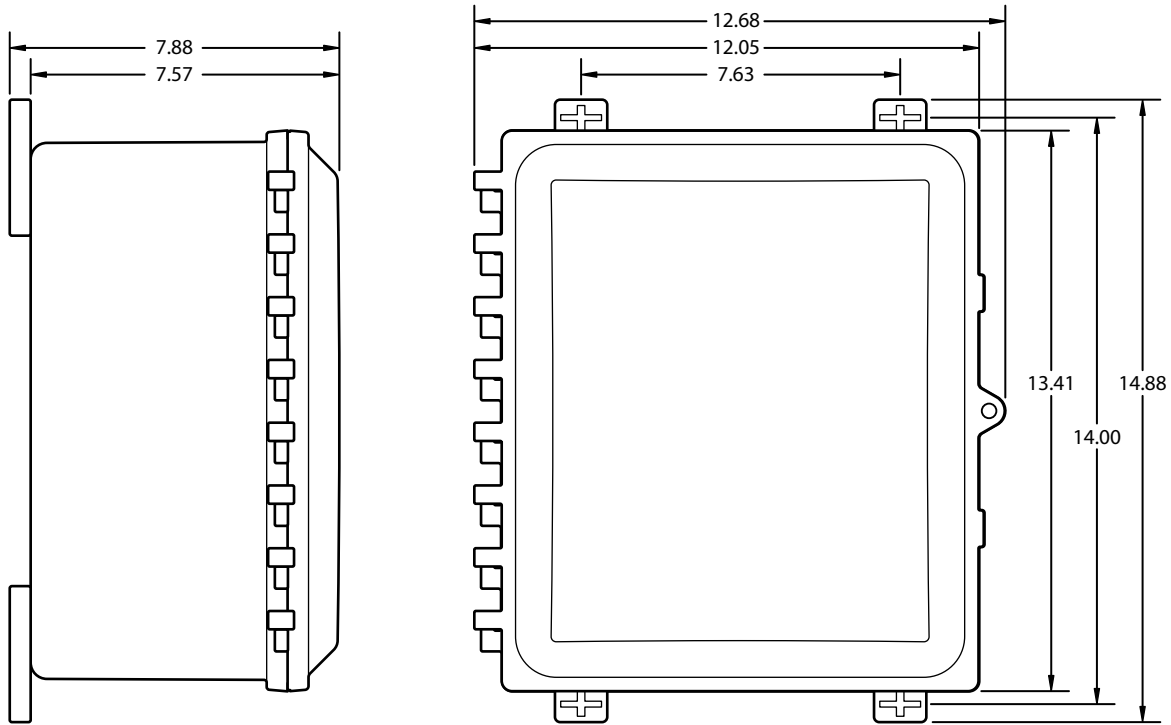
4-20mA ANALOG CONNECTIONS



Typical Wiring Connection Examples



Electro-Sentry 16 Enclosure Dimensions, With and Without Mounting Feet



User Variable List				
Var #	Description	Pg #	Default Value	User's Value
Var01	Unused	—	—	—
Var02	Unused	—	—	—
Var03	Unused	—	—	—
Var04	Unused	—	—	—
Var05	Unused	—	—	—
Var06	Unused	—	—	—
Var07	Unused	—	—	—
Var08	Unused	—	—	—
Var09	Contact_Closure_Sensor_Logic_Select 0000 = Open Ckt = SAFE 0001 = Closed Ckt = SAFE	2	0000	
Var10	Group A Sensor Type Select (4-20mA or Contact Closure) 0 = 4-20mA Sensor 1 = Contact Closure Sensor xxx? = (Inputs 7,8) xx?x = (Inputs 5,6) x?xx = (Inputs 3,4) ?xxx = (Inputs 1,2)	2	0000	
Var11	Group B Sensor Type Select (4-20mA or Contact Closure) 0 = 4-20mA Sensor 1 = Contact Closure Sensor xxx? = (Inputs 15,16) xx?x = (Inputs 13,14) x?xx = (Inputs 11,12) ?xxx = (Inputs 9,10)	2	0000	
Var12	Temp Warning SetPoint	3	0160	
Var13	Temp Shutdown SetPoint	3	0175	
Var14	Input #1 Bias Temp Set-Point	3	0000	
Var15	Input #2 Bias Temp Set-Point	3	0000	
Var16	Input #3 Bias Temp Set-Point	3	0000	
Var17	Input #4 Bias Temp Set-Point	3	0000	
Var18	Input #5 Bias Temp Set-Point	3	0000	

Var19	Input #6 Bias Temp Set-Point	3	0000	
Var20	Input #7 Bias Temp Set-Point	3	0000	
Var21	Input #8 Bias Temp Set-Point	3	0000	
Var22	Input #9 Bias Temp Set-Point	3	0000	
Var23	Input #10 Bias Temp Set-Point	3	0000	
Var24	Input #11 Bias Temp Set-Point	3	0000	
Var25	Input #12 Bias Temp Set-Point	3	0000	
Var26	Input #13 Bias Temp Set-Point	3	0000	
Var27	Input #14 Bias Temp Set-Point	3	0000	
Var28	Input #15 Bias Temp Set-Point	3	0000	
Var29	Input #16 Bias Temp Set-Point	3	0000	
Var30	Temp Display Select 0000 = °F 0001 = °C	4	0000	
Var31	Unused	—	—	—
Var32	Unused	—	—	—
Var33	Horn Operation Select 0xxx = Solid Horn 1xxx = Oscillating Horn x000 - x999 = Horn 'time' in Minutes.	4	0999	
Var34	Unused	—	—	—
Var35	Test Mode Select 0000 = Operate 0001 = Test w/Relays 0002 = Test w/o Relays 0003 = Test w/o Relays 0004 = Test w/Manual Relay control	5	0000	
Var36	Software Identification (Read Only)	5	N/A	

