Product Manual

TCS Basys Controls®

SZ1144

Refrigeration Temperature Monitor

SUPERTROL™ Communicating Controls

Description

The SZ1144 is a microprocessor-based monitoring and alarm interface designed to monitor up to four 1000 Ω platinum temperature sensor inputs and up to two 4-20 mA inputs. The RTD inputs, scaled -40 to +60°F (-40 to +15.6°C), are suitable for monitoring refrigeration temperatures. If any of these inputs exceed their high or low limits, the alarm output relay is energized.

Features

- Stand-alone or network operation
- Independently programmable high and low limits for each input
- Independently programmable manual or automatic alarm reset
- Change of state factor with programmable hysteresis
- 32 character LCD display
- Two Status LEDs
- Relay output to activate additional auxiliary communication devices or external alarm circuit
- Direct RTD temperature inputs
- Two 4-20 mA analog inputs suitable for a broad variety of transducers

Mounting

The SZ1144 is designed for mounting using two #10 sheet metal screws.

Contents

Wiring

The SZ1144 uses terminal designations for wiring. See diagram below.

TRANSMITTER WIRING

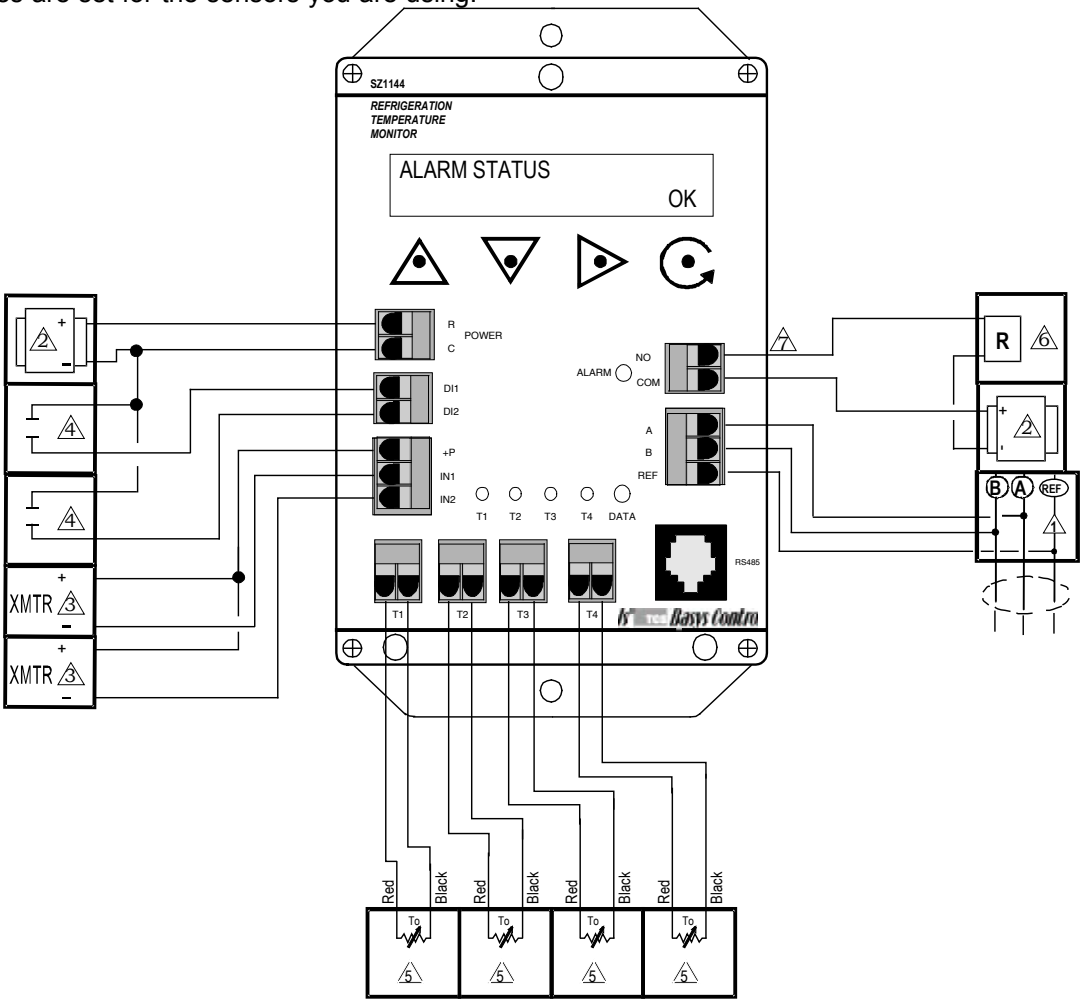
The SZ1144 accepts two 2-wire, 4-20mA transmitters. Use TH Series for relative humidity sensing, TS/TX Series for temperature sensing, TD/TL Series for differential air sensing, or TR Series for high pressure sensing. The SZ1144 also accepts four two-wire remote temperature sensors for refrigeration temperature monitoring. Consult the Series Temperature Sensor Submittal Data sheet for a complete listing of packaging and application styles. When using TCS/Basys Controls three-wire sensors, use the black and red leads and either clip or twist off the white lead. Make sure that the dip switches are set for the sensors you are using.

POWERING THE SZ1144

The SZ1144 is powered from 24 VAC +/- 20 %.

Caution: Do not connect to 120 VAC. When multiple TCS/Basys Controls devices are using a single transformer, the polarity of the power wiring must be maintained because all TCS devices are half-wave rectified and have common return paths.

If wiring for communications, dedicated power must be used to power the SZ1144. Several “S” series controllers may be powered from the same transformer, provided that the transformer has sufficient power. (Supertrols require 5 VA @ 24 VAC.)



1. For communication wiring, use twisted, shielded 18 AWG. Must be run separately.
2. 24 VAC transformer. See powering instructions.
3. 2-wire, 4-20mA transmitter. Sensor input wiring 18 AWG, twisted, shielded pair.
4. Dry contact. Must not be powered.
5. Sensor input wiring 18 AWG, twisted, shielded pair.
6. External relay. 24 VAC coil.
7. Up to nominal 28 VAC from transformer.

Programming

The SZ1144 may be programmed through the display and keypad, or with a PC.

If programming with a PC, the following must be set through the keypad prior to programming:

• Address (step #2)
• Baud rate (step #3)
For more information on programming through the PC, consult your TCS software manual.

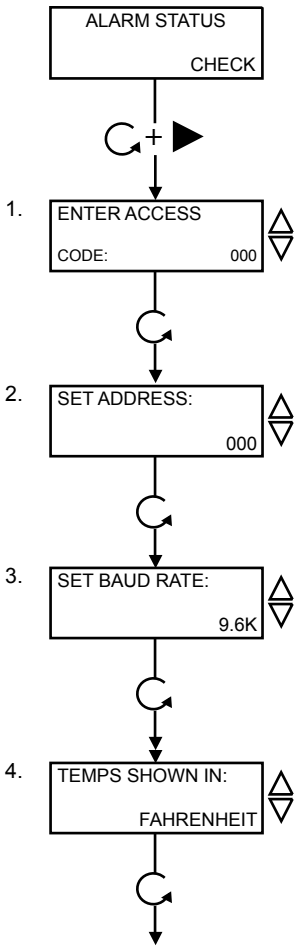
PROGRAMMING THROUGH THE KEYPAD

To access the programming screens, press both the “Scroll” and “Next” keys simultaneously.

Scroll Key - The "Scroll" key is also used to save any changes to the "current" screen and advance to the next screen while programming. The "Scroll" key is used to enter the Programming Mode when pressed with the "Next" key.

Next Key - Used to enter Programming Mode when pressed with the “Scroll” key. Also used to exit programming without saving changes to the current screen.

Increment/Decrement Keys - Used to select the desired value.



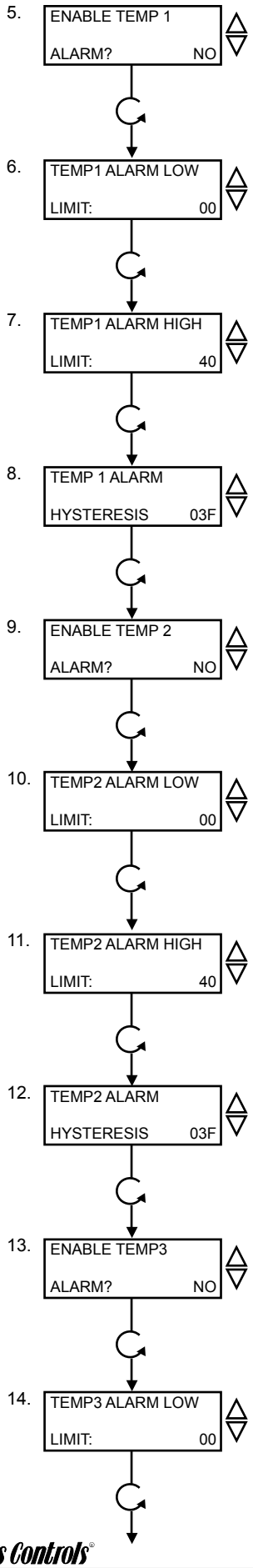
Main Monitoring Screen. Press the scroll and next buttons to access the following screens.

Access Code Entry Screen. Enter the access code. If the wrong code is entered, the program reverts to the main screen. 248 is the default access code.

Controller Address Screen. If using a PC to access the SZ1144, set a unique address from 0 to 255, excluding 248.

Communication Baud Rate Screen. If using a PC to access the SZ1144, all controllers on a network must be set to the same baud rate. Choose between 2.4K, 4.8K, 9.6K and 19.2K.

Display Type Screen. Choose between FAHRENHEIT and CELSIUS for temperature indication.



Enable Temp1 Alarm Screen. Choose whether or not to enable the Temp1 input alarm function.

Temp1 Alarm Low Limit Screen. Enter a low limit temperature setting. When the Temp1 input temperature falls to this value, an alarm will be generated. (This screen is not shown if the Temp1 alarm is not enabled.)

Temp1 Alarm High Limit Screen. Enter a high limit temperature setting. When the Temp1 input temperature rises to this value, an alarm will be generated. (This screen is not shown if the Temp1 alarm is not enabled.)

Temp1 Alarm Hysteresis Screen. Enter the number of degrees that the temperature must fall (for a high alarm) or must rise (for a low alarm) before an existing alarm condition for the Temp1 input will be automatically cleared. (This screen is not shown if the Temp1 alarm is not enabled.)

Enable Temp2 Alarm Screen. Choose whether or not to enable the Temp2 input alarm function.

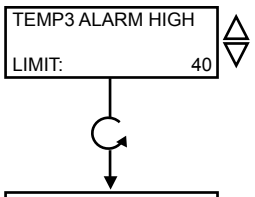
Temp2 Alarm Low Limit Screen. Enter a low limit temperature setting. When the Temp2 input temperature falls to this value, an alarm will be generated. (This screen is not shown if the Temp2 alarm is not enabled.)

Temp2 Alarm High Limit Screen. Enter a high limit temperature setting. When the Temp2 input temperature rises to this value, an alarm will be generated. (This screen is not shown if the Temp2 alarm is not enabled.)

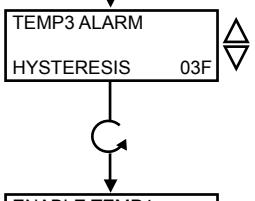
Temp2 Alarm Hysteresis Screen. Enter the number of degrees that the temperature must fall (for a high alarm) or must rise (for a low alarm) before an existing alarm condition for the Temp2 input will be automatically cleared. (This screen is not shown if the Temp2 alarm is not enabled.)

Enable Temp3 Alarm Screen. Choose whether or not to enable the Temp3 input alarm function.

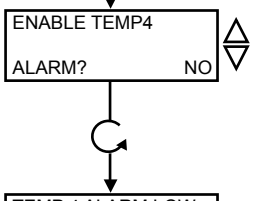
Temp3 Alarm Low Limit Screen. Enter a low limit temperature setting. When the Temp3 input temperature falls to this value, an alarm will be generated. (This screen is not shown if the Temp3 alarm is not enabled.)

15. 

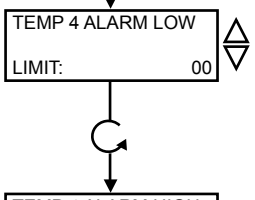
Temp3 Alarm High Limit Screen. Enter a high limit temperature setting. When the Temp3 input temperature rises to this value, an alarm will be generated. (This screen is not shown if the Temp3 alarm is not enabled.)

16. 

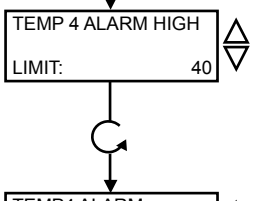
Temp3 Alarm Hysteresis Screen. Enter the number of degrees that the temperature must fall (for a high alarm) or must rise (for a low alarm) before an existing alarm condition for the Temp3 input will be automatically cleared. (This screen is not shown if the Temp3 alarm is not enabled.)

17. 

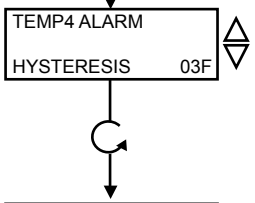
Enable Temp4 Alarm Screen. Choose whether or not to enable the Temp4 input alarm function.

18. 

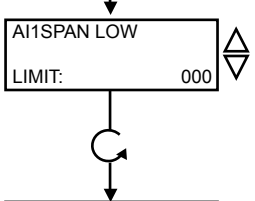
Temp4 Alarm Low Limit Screen. Enter a low limit temperature setting. When the Temp4 input temperature falls to this value, an alarm will be generated. (This screen is not shown if the Temp4 alarm is not enabled.)

19. 

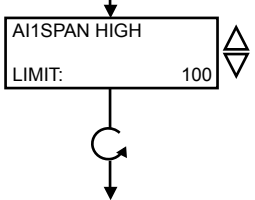
Temp4 Alarm High Limit Screen. Enter a high limit temperature setting. When the Temp4 input temperature rises to this value, an alarm will be generated. (This screen is not shown if the Temp4 alarm is not enabled.)

20. 

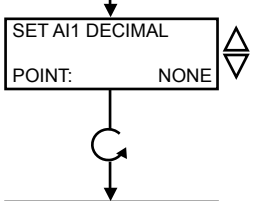
Temp4 Alarm Hysteresis Screen. Enter the number of degrees that the temperature must fall (for a high alarm) or must rise (for a low alarm) before an existing alarm condition for the Temp4 input will be automatically cleared. (This screen is not shown if the Temp4 alarm is not enabled.)

21. 

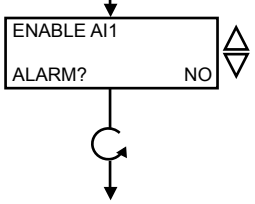
AI1 Low Limit Span Screen. Enter the lowest value of the span range of the transmitter connected to AI1 (i.e., value at 4mA).

22. 

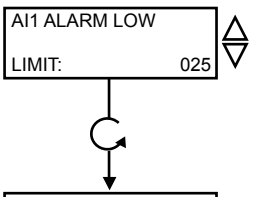
AI1 High Limit Span Screen. Enter the highest value of the span range of the transmitter connected to AI1 (i.e., value at 20mA).

23. 

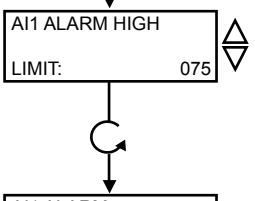
AI1 Decimal Point Screen. For display purposes, the SZ1144 allows a decimal point to be turned on. No scaling is done. Select NONE for no decimal point, XX.X for a decimal point in the tenths position, X.XX for a decimal point in the hundredth position or .XXX for a decimal point in the thousandths position.

24. 

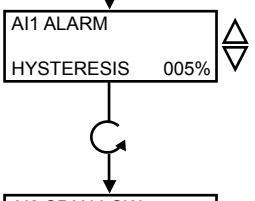
Enable AI1 Alarm Screen. Choose whether or not to enable the AI1 input alarm function.

25. 

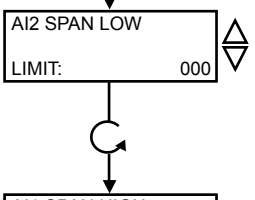
AI1 Alarm Low Limit Screen. Enter a low limit value. When the AI1 input falls to this value, an alarm will be generated. (This screen is not shown if the AI1 alarm is not enabled.)

26. 

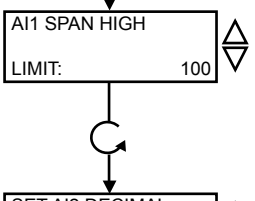
AI1 Alarm High Limit Screen. Enter a high limit value. When the AI1 input rises to this value, an alarm will be generated. (This screen is not shown if the AI1 alarm is not enabled.)

27. 

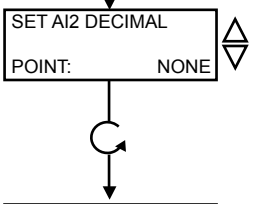
AI1 Alarm Hysteresis Screen. Enter the number of units that the input must fall (for a high alarm) or must rise (for a low alarm) before an existing alarm condition for the AI1 input will be automatically cleared. (This screen is not shown if the AI1 alarm is not enabled.)

28. 

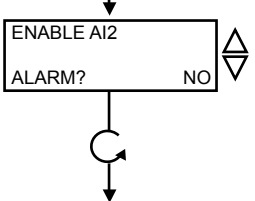
AI2 Low Limit Span Screen. Enter the lowest value of the span range of the transmitter connected to AI2 (i.e., value at 4mA).

29. 

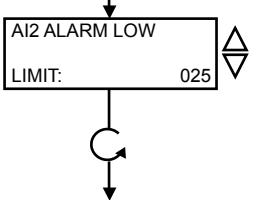
AI2 High Limit Span Screen. Enter the highest value of the span range of the transmitter connected to AI2 (i.e., value at 20mA).

30. 

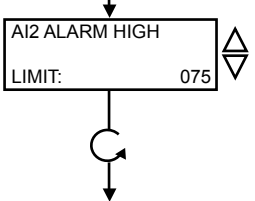
AI2 Decimal Point Screen. For display purposes, the SZ1144 allows a decimal point to be turned on. No scaling is done. Select NONE for no decimal point, XX.X for a decimal point in the tenths position, X.XX for a decimal point in the hundredth position or .XXX for a decimal point in the thousandths position.

31. 

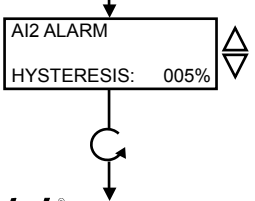
Enable AI2 Alarm Screen. Choose whether or not to enable the AI2 input alarm function.

32. 

AI2 Alarm Low Limit Screen. Enter a low limit value. When the AI2 input falls to this value, an alarm will be generated. (This screen is not shown if the AI2 alarm is not enabled.)

33. 

AI2 Alarm High Limit Screen. Enter a high limit value. When the AI2 input rises to this value, an alarm will be generated. (This screen is not shown if the AI2 alarm is not enabled.)

34. 

AI2 Alarm Hysteresis Screen. Enter the number of units that the input must fall (for a high alarm) or must rise (for a low alarm) before an existing alarm condition for the AI2 input will be automatically cleared. (This screen is not shown if the AI2 alarm is not enabled.)

35. ALARM DELAY WAIT / 15 SEC

Alarm Delay Wait Increment. Select the desired increment (15 seconds or 1 minute) for the Alarm Delay Wait Time.

36. ALARM DELAY WAIT / TIME 000MIN 00SEC

Alarm Delay Wait Time Screen. Set the amount of time that an analog alarm condition (Temp1-4, AI1&2) must be present before actually generating the alarm. The time is adjustable in 15 second increments from 0 minutes and 0 seconds to 63 minutes and 45 seconds.

37. DI USED FOR: / ALARM

Digital Input 1 Mode Screen. Choose DI1 as MONITOR, ALARM or TOGGLE MOMENTARY. Select MONITOR if unused.

38. DI1 ALARM / WHEN: CLOSED

Digital Input 1 Alarm Mode Screen. Choose OPEN or CLOSED as the condition which will trigger the DI1 alarm. This screen only appears if the DI1 mode is set to ALARM.

39. SET OVERRIDE / TIME: 60 MINUTTES

Digital Input 1 Override Delay Screen. Set the override time (0 to 255 minutes) that will be used when DI1 is activated with a momentary contact. This screen only appears if the DI1 mode is set to TOGGLE MOMENTARY.

40. DI2 USED FOR: / MONITOR

Digital Input 2 Mode Screen. Choose DI2 as MONITOR or ALARM. Select MONITOR if unused.

41. DI2 ALARM / WHEN: CLOSED

Digital Input 2 Alarm Mode Screen. Choose OPEN or CLOSED as the condition which will trigger the DI2 alarm. This screen only appears if the DI2 mode is set to ALARM.

42. 15 SEC DI DELAY / DISABLE

15 Second DI Delay Screen. Used to indicate whether to apply a 15 second delay to the digital inputs, before recognizing an alarm condition. This screen is only shown if the mode for either DI1 or DI2 is set to ALARM.

43. ALARM OUTPUT / ACTIVE= CLOSED

Alarm Relay Output Mode Screen. Choose whether to have the relay output be OPEN or CLOSED when in alarm, or choose DISABLE if the relay output is not being used.

44. ALLOW ALARM / TIMEOUT? NO

Automatic Alarm Time-out Screen. Choose whether to allow the relay output to automatically expire after a set amount of time. This screen is not shown if the Alarm Relay Output Mode Screen is set to DISABLED.

45. SET ALARM TIME - / OUT TIME: 00SEC

Set Alarm Time-out Time Screen. Enter the time in seconds (0 to 255 seconds) that the relay output should be active before becoming inactive. This screen is not shown if the Automatic Alarm Time-out Screen is set to NO.

46. SET ACCESS / CODE: 248

Access Code Screen. Enter an access code (0 to 255) that will be used to enter the programming mode. The default is 248.

ALARM STATUS / CHECK

Main Monitoring Screen.

Operation

ALARMS

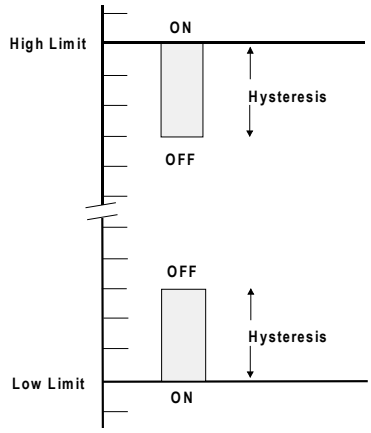
The SZ1144 generates an "Alarm Condition" whenever any of the four RTD inputs, any of the two 4-20mA analog inputs or any of the two digital inputs have been programmed to generate an alarm, and that respective input is in alarm. An "Alarm" occurs when an RTD or analog input exceeds the high limit setting or falls below the low limit setting, or when a digital input opens (closes). Whenever an "Alarm Condition" occurs, the main monitoring screen shows CHECK indicating that an alarm is present. Keep in mind that any or all of these inputs can be used for monitoring purposes when alarming is disabled.

RTD INPUTS

There are four 1000 Ω PtRTD inputs available. Each one is scaled -40 to 60°F (-40 to 15.56°C) and cannot be changed. Each input (TEMP1, TEMP2, TEMP3 & TEMP4) can be enabled to generate an alarm. Once enabled, you need to set a "High Limit", a "Low Limit" and a "Hysteresis" (in degrees). When the temperature reaches the High or Low limit, an alarm is generated. The alarm is automatically cleared when the temperature falls from the High Limit by the amount of the Hysteresis (for a High Alarm Condition) or when the temperature rises from the Low Limit by the amount of the Hysteresis (for a Low Alarm Condition).

Note: If a High Limit is set to 60°F, it is disabled. If a Low Limit is set to -40°F, it is also disabled.

ANALOG INPUTS



There are also two 4-20mA inputs available. These two inputs can be used to generate an alarm based on any 4-20mA signal.

The analog inputs need to be scaled, i.e. the SPAN LOW LIMIT is the value at 4mA and the SPAN HIGH LIMIT is the value at 20mA. The Low and High limits are adjustable from -200 to 800. A decimal point can be turned on also. The decimal point is for display purposes only on the SZ1144 display. For example if you are sensing differential pressure from 0 to 1", you could scale the analog input to be 0 to 100 and then turn on

the 100ths decimal point (X.XX). The display on the SZ1144 would then read 0.00 to 1.00. The scaling is still 0 to 100 internal to the SZ1144.

Each input (AI1 & AI2) can be enabled to generate an alarm. Once enabled, you need to set a "High Limit" and a "Low Limit" (in units), and a "Hysteresis" (in percent of input span). For example, if your input was -40 to 160°F and you put in a hysteresis of 5%, the actual hysteresis would be 10°F because of the 200°F span. When the temperature reaches the High or Low limit, an alarm is generated. The alarm is automatically cleared when the temperature falls from the High Limit by the amount of the Hysteresis (for a High Alarm Condition) or when the temperature rises from the Low Limit by the amount of the Hysteresis (for a Low Alarm Condition).

Note: If a High Limit is set to the maximum span setting, it is disabled. If a Low Limit is set to the minimum span setting, it is also disabled.

ALARM DELAY WAIT TIME

There is an Alarm Delay Wait Time which, when set, applied to all analog inputs (TEMP1-4 and AI1&2). If no delay is desired, set the delay time to 0 minutes and 0 seconds. When this is done, an alarm is generated (or released) immediately when the input reaches the reaches the appropriate setting. If a delay time other than 0 minutes and 0 seconds, the SZ1144 makes sure that the analog input has been at the appropriate setting for that amount of time before generating (or releasing) an alarm.

Note: The time set for the Alarm Delay Wait Time is used for all analog inputs that are set to generate an alarm.

DIGITAL INPUT MODES

Digital Input One (DI1) can be configured to use one of 3 modes (MONITOR, ALARM or TOGGLE MOMENTARY).

Digital Input Two (DI2) can be configured to use one of 2 modes (MONITOR or ALARM).

DIGITAL INPUT MONITOR MODE

When a digital input is selected to be in MONITOR mode, the SZ1144 just monitors that input. No control action is taken. Open refers to the input as being "Open" or "Off", and closed refers to the input as being "Closed" or "On".

DIGITAL INPUT ALARM MODE

When a digital input is selected to be in ALARM mode, you need to select whether the "Alarm Condition" will occur when the digital input is "Open" or "Closed". The SZ1144 monitors the input. When the input "Opens" or "Closes", based on your selection, an "Alarm Condition" is generated. Open refers to the input as being "Open" or "Off", and closed refers to the input as being "Closed" or "On".

15 SECOND DI DELAY

If either of the two digital inputs are selected to use "Alarm" mode, then you will be given a choice of whether to enable a 15 second digital input delay. If not enabled, an alarm is generated (or released) immediately upon a change of status for the digital input. If enabled, the SZ1144 makes sure that the digital input has been present for 15 seconds before generating (or releasing) an alarm.

Note: If the 15 Second DI Delay is enabled, it is enabled for all digital inputs that are set to ALARM mode.

DI1 TOGGLE MOMENTARY MODE

Digital input one can be set for "Toggle Momentary" mode. In this mode, momentarily closing DI1 will activate an "Override" condition where all new alarms will be suspended. There is an "Override Time" to set which is adjustable from 0 to 255 minutes. This feature is useful for coolers and freezers during cleaning periods. Alarms can be suspended while the cleaning is done.

ALARM OUTPUT

Whenever an input of the SZ1144 is in an alarm condition, based on its settings, the SZ1144 will indicate the alarm from its display and through communications. In addition to this, the SZ1144 has a relay output which can be programmed to indicate an alarm. It can be set to be N.O. (normally open) or N.C. (normally closed) when an alarm occurs, or it can be disabled.

AUTOMATIC ALARM TIME-OUT

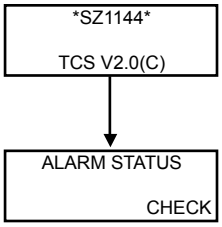
If the relay output is enabled, meaning set to normally open or closed, then you may enable an automatic alarm time-out feature by choosing "Yes" in the "Allow Alarm Time-Out" menu. If "Yes" is chosen, then you need to enter a time adjustable from 0 to 255 seconds, after which the relay output will revert back to its "Non-Alarm" state. This is useful if an audible horn is attached to the relay output. The horn can indicate the alarm condition and then automatically time out without having to have someone go through the programming menus to disable the alarm.

Checkout & Troubleshooting

CHECKOUT

You may verify the status of the alarm status, relay output and all of the inputs in the monitoring screens, which are accessed by pressing the "Scroll" key.

1. Verify all wiring prior to powering the controller.
2. Turn power on. The controller will display a momentary screen with the model and version number, and then the main monitoring screen. The "Alarm LED" will blink for 15 seconds. During this time no alarms will be generated. This time gives the circuit time to stabilize and prevents false alarm conditions immediately after a power outage.



3. Take note of the current temperature and other input readings. If the SZ1144 will be used only for monitoring, and the readings appear to be correct, you are done.
4. For all analog inputs which will be used to generate an alarm condition, go into programming mode and adjust the high and/or low limits below and/or above the current readings. For all digital inputs which will be used to generate and alarm condition, go into programming mode and change the setting from open to closed (or vice versa). Through the monitoring screens, verify that the alarm condition(s) is (are) recognized.
5. If the relay output is not disabled, verify its operation when at least one alarm is present and also when no alarms are present. If using the alarm time-out feature, verify that once an alarm occurs the relay goes back to its non-alarm state after the programmed time.
6. If DI1 will be set to "Toggle Momentary" mode when there are no alarms present, momentarily short DI1 to C. Through the monitoring screens, verify that the "Override" is on and that the "Time Remaining" number counts down.
7. Go back into programming mode and set up the SZ1144 with all of the desired settings.

TROUBLESHOOTING

No Display

Check for 24 VAC on terminals “R” and “C”.

Relay Output Does Not Come On

Check the High and Low Limits for analog inputs, and open or closed settings for digital inputs. Check to be sure that the relay output has been selected to be open or closed upon alarm. Verify through the monitoring screens that indeed there is an alarm present.

Relay Output Does Not Shut Off

Verify that the "Alarm Status" in the monitoring menu is "OK", signifying that there are no alarms present. If this is the case, verify that the relay output is set to normally closed for an alarm condition. Remove power from the SZ1144. Remove the wires (or terminal block) from terminals “NO” to “COM”. Measure Ω from terminals “NO” to “COM”. If the reading is 0Ω, the mechanical relay is defective.

Wrong Temperature Display

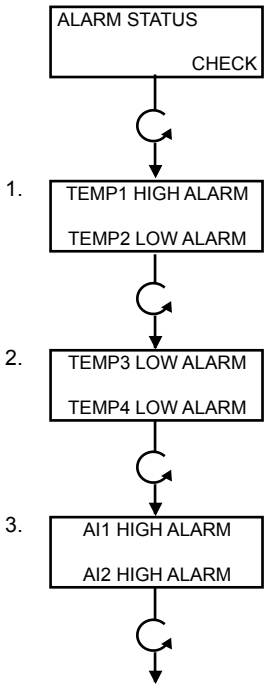
If either of the four temperature input readings is slightly high or low +/- 5°F, they can be adjusted. The "T1" input adjustment pot is labeled "T1" and so on. You should also remove the wires from (or terminal block) from terminals "T1" to "T1", etc., and measure Ω on the wires. The sensor will read 1000 Ω at 32°F (0°C). The sensor has a positive temperature coefficient and the reading will change 2.16 Ω per °F. If the actual temperature was 34°F the reading would be 1004.32 Ω. Using this knowledge, you can determine whether the problem is with the controller or sensor, or a wiring problem.

Wrong Analog Input Display

If either of the two analog input readings is slightly high or low, the respective Low and High scaling limits can be adjusted slightly. Let's say that the AI1 value is 5°F low and AI1 has a span from -40°F to 160°F. Change the scaling for the Low and High Limits to be -35°F to 165°F, instead of -40°F to 160°F. You can also measure DC voltage from "AI1" to "C" and "AI2" to "C". The 4 to 20mA inputs are represented as 1 to 5VDC signals here. Using this knowledge, you can determine whether the problem is with the controller or your input device, or a wiring problem.

MONITORING SCREENS

Continually pressing the scroll button allows more extensive monitoring. The screens are shown below.

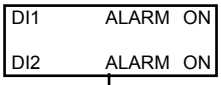


Alarm Status. Either check or ok.

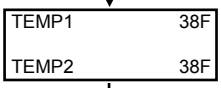
Temp1 & Temp2 Alarm Screen. Shows the Temp1 and/or Temp2 alarm condition if either is in alarm.

Temp3 & Temp4 Alarm Screen. Shows the Temp3 and/or Temp4 alarm condition if either is in alarm.

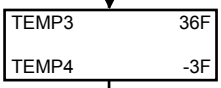
AI1 & AI Alarm Screen. Shows the AI1 and/or AI2 alarm condition if either is in alarm.

4. 

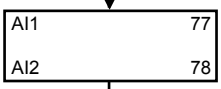
DI1 & DI2 Alarm Screen. Shows the DI1 and/or DI2 alarm condition if either is in alarm.

5. 

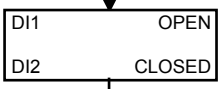
Temp1 & Temp2 Status Screen. Shows the actual temperature readings for the Temp1 and Temp2 inputs.

6. 

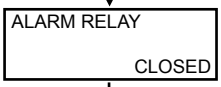
Temp3 & Temp4 Status Screen. Shows the actual temperature readings for the Temp3 and Temp4 inputs.

7. 

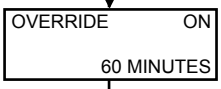
AI1 & AI Status Screen. Shows the actual readings for the AI1 and AI2 inputs.

8. 

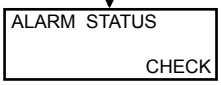
DI1 & DI2 Status Screen. Shows the DI1 and DI2 status.

9. 

Alarm Relay Status Screen. Shows alarm relay output status.

10. 

Override Status Screen. Shows whether the override is active and if so, how many minutes remaining. This screen does not appear unless DI1 mode is set to TOGGLE MOMENTARY.



Main Monitoring Screen.

LED Description

PROGRAM/DATA

This LED will be lit when the controller is within the programming setup menus. It will blink when the unit is being accessed by a PC.