Product Manual

TCS Basys Controls®

SZ2141

Refrigeration Controller

SUPERTROL™ Communicating Controls

Description

The SZ2141 is a microprocessor-based refrigeration controller and alarm interface designed to control three coolers or freezers and monitor up to six additional.

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
- Status LEDs
- Relay output to activate additional auxiliary communication devices or external alarm circuit
- Six RTD temperature inputs
- Five analog inputs suitable for a broad variety of transducers
- Programmable defrost cycles with time or temp termination
- Temperature or pressure monitoring inputs
- Monitor compressor and door status

Contents

Mounting

The SZ2181 is designed for mounting using four #10 sheet metal screws. Prior to mounting, the jumpers should be placed. (See setup instructions.) If the unit will be stand-alone, all programming should be completed before installation. If the unit will be wired for communications, a unique address should be programmed into the unit. (See programming instructions.)

Wiring

The SZ2141 terminal designations are shown below.

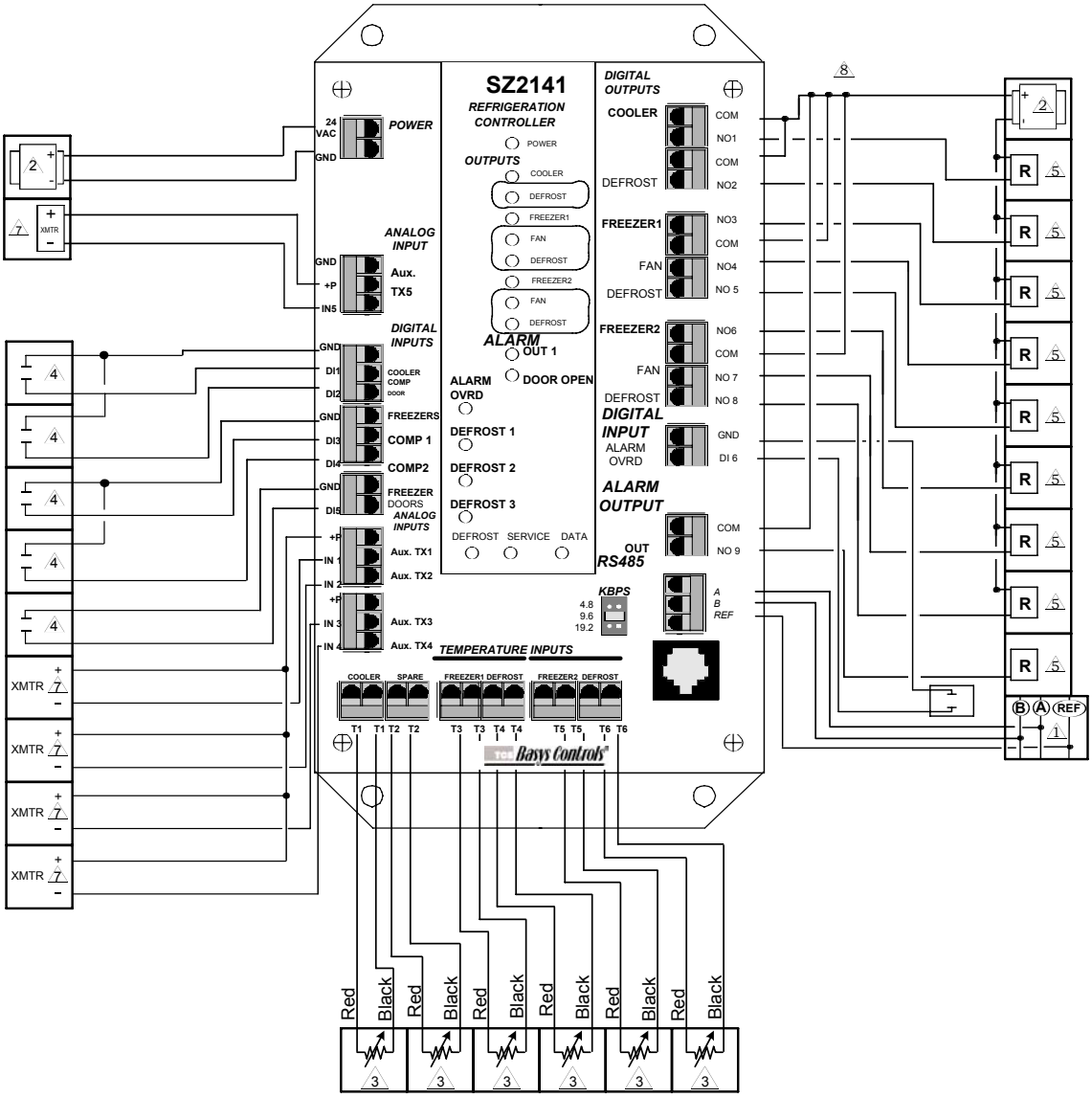
REMOTE SENSOR WIRING

The SZ2141 accepts six 1000 Ω two-wire platinum sensors. Use TS1002, TS2001 or TS3001 for freezer and cooler temperature sensing. When using TCS/Basys Controls three-wire sensors, use the black and red leads, and either clip or twist off the white lead. The wiring length should not exceed 250 ft. The SZ2141 also accepts up to 5 TX1500 Series imputs for additional temperature sensing.

POWERING THE SZ2141

The SZ2141 is powered from 24 VAC +/- 20 %. If wiring for communications, dedicated power must be used to power the SZ2141. Several S-series controllers may be powered from the same transformer, provided that the transformer has enough power.

Caution: Do not connect to 120VAC. 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.

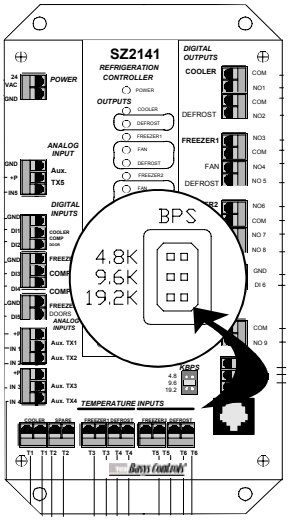


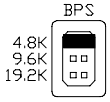
1. For communication wiring, use twisted, shielded 18 or 20 AWG. Must be run separately.
2. 24 VAC transformer. See powering instructions.
3. Sensor input wiring 18 AWG, twisted, shielded pair.
4. Dry contact. Must not be powered.
5. External relay. 24 VAC Coil
6. 4 to 20 mA output. 600 ohm max. Do not power actuator with power from the controller. The controllers are half-wave rectified, whereby the power ground is common with the signal ground.
7. 2-wire, 4 to 20 mA transmitter.Sensor input wiring 18 AWG, twisted, shielded pair.
8. These may be connected together for a common transformer or they may be ran from separate transformers.

Setup

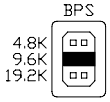
BAUD RATE SELECTION

The SZ2141 must be programmed using a PC and TCS/Basys Controls software. A communication baud rate must be set by placing one jumper in the area shown above. This baud rate must be the same for all devices.

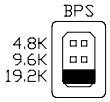




For a 4.8K baud rate.



For a 9.6K baud rate.



For a 19.2K baud rate

Note: for 28.8K baud, install shunts at 19.2K + 9.6K baud.

Programming

The SZ2141 must be programmed with a PC if other than factory default settings are desired. A port on the face allows local access for programming. If you plan to program the controller while it is on a network, prior to putting the controller on the network, a unique address must be set in the controller by accessing it through the port on the front.

For more information on programming through the PC, consult your TCS software manuals.

CONTROLLER ADDRESS

To initialize a controller, you must first put the address of the controller here. You can either type in the address, or choose the particular controller by location. For controllers with multiple initialization screens, the address of the controller is only entered on the first screen. To write to multiple controllers, click on “Enable Multiple Writes”. A list of controllers of this type are listed by location name. Select individual controllers addresses by clicking on them. You will need to use “Control”-Click or “Shift”-Click for your selection.

INTERNAL TIME CLOCK

When you read a controller, this screen displays the time (military time), the day of the week, the date and year the controller is using. When you click on “PC Clock”, these same parameters are read from the computer. When “Writing” a screen of parameters to a controller, click on “PC Clock” immediately before “Write Page”. This will ensure that the controller will have the proper time, day and date.

OCCUPANT OVERRIDE

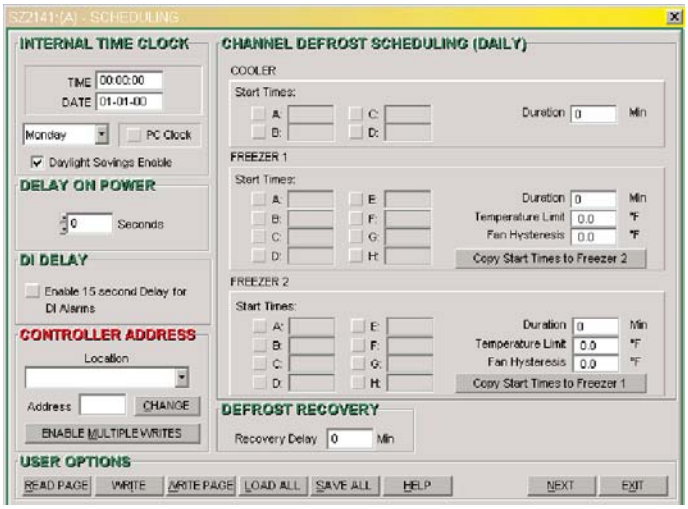
This is the number of minutes from 0 to 255 (4 hours, 15 minutes) which the controller will bring an unoccupied system occupied, when its override button is pressed.

EVENT SCHEDULING

There are two occupied time periods per day, and thus two time schedules (A and B). Let us say that the occupied time for a particular day is from 8:00AM to 12:00PM and from 1:00PM to 5:00PM. In the “A” schedule you could enter 8:00 to 12:00, and in the “B” schedule you could enter 13:00 to 17:00. You can reverse the “A” and “B” schedules also. You can also enter 8:00 to 17:00 for the “A” schedule and 0:00 to 0:00 for the “B” schedule. 0:00 (12:00AM) starts the day, and 24:00 (12:00AM) ends the day. Occupied times that span midnight have to be coordinated using two days’ time schedules.

Note: the start of an occupied period is delayed by the power-on delay value.

SZ2141 screen “A”



CHANNEL DEFROST SCHEDULING (DAILY)

Select defrost time periods and enter the starting times for each one. Enter duration the defrost cycle should last. Enter the temperaturelimit that will terminate the defrost cycle before full timed cycle has occurred and enter the fan hysteresis. The fan will continue to run until the temperature falls from the Temperature Limit by the amount of the Fan Hysteresis. These values pertain to all selected time periods.

DELAY ON POWER

On a loss of power, when the power comes back, the controller will wait this amount of time before starting to control. Different controllers in one building can have different delays so that all units don't com on at the same time. Enter a delay time (in seconds) that you want the controller to use on power-up.

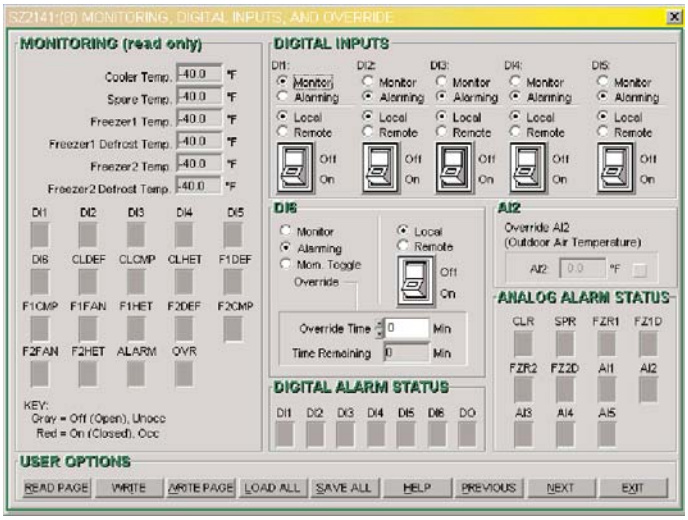
DI DELAY

Enable the Digital Input Delay if you want the Digital Input to be present for 15 seconds before it takes effect. This can prevent cycling. Note, this delay if selected, will apply to all six digital inputs.

DEFROST RECOVERY

Enter a Defrost Recovery Delay during which time no alarms will be triggered after coolers or freezers have completed a defrost cycle.

SZ2141 screen "B".



DIGITAL INPUTS

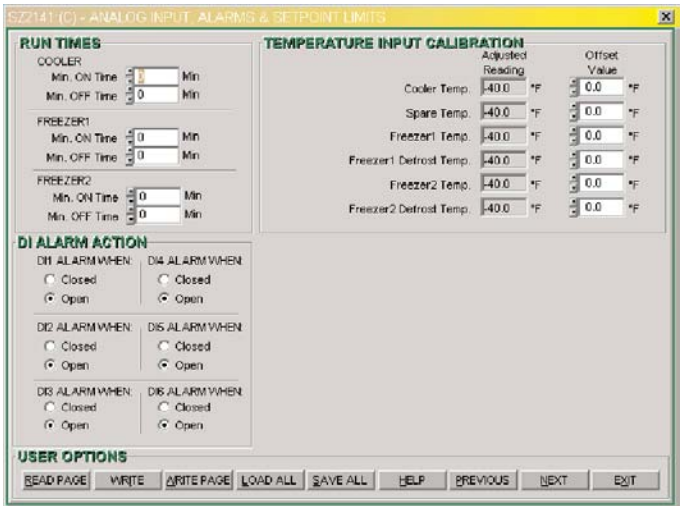
Select whether you want "DI1", "DI2", "DI3", "DI4" "DI5" or "DI6" to be "Local" or "Remote". Local means that the controller uses its own control program when looking at these inputs. Remote means that it will take a PC to make any changes to these inputs.

Digital Inputs One through five (DI1 thru DI5) can be configured to be uses in one of 2 functions (MONITOR or ALARMING). When a digital input is selected to be in MONITOR mode, the SZ2141 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 6 (DI6) can be configured to be used as MONITOR, ALARMING or MOMENTARY TOGGLE OVERRIDE. In the "Momentary Toggle Override" mode, momentarily closing DI6 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.

AI2

The outdoor air temperature may be overridden from a PC. This would allow only one controller in a building to have an outdoor air sensor. Revelation could use this value and rebroadcast it to the remaining controllers in a building. Choose whether to use this function. You can type in a temperature that the controller will use for 10 minutes. After 10 minutes, the controller reverts back to reading its analog input. i.e. if this function is used, in practice the reading must be updated at least every 10 minutes.

SZ2141 screen "C".



RUN TIMES

Enter minimum ON run times and minimum OFF times for the cooler and freezer compressors. These times are selectable in minute increments.

DI ALARM ACTION

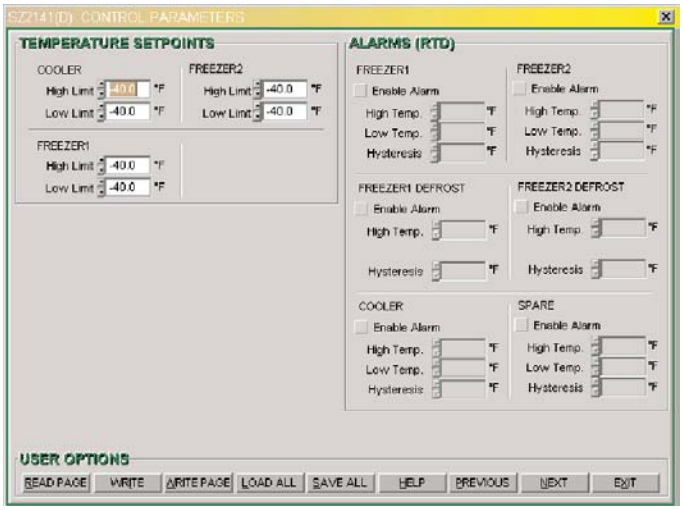
When a digital input is selected to be in ALARMING mode, you need to select whether the "Alarm Condition" will occur when the digital input is "Open" or "Closed". The SZ1144 monitors the input. When the input "Opens" or "Closes", based on your selection, an "Alarm Condition" is generated. Open refers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

TEMPERATURE INPUT CALIBRATION

The six temperature inputs are factory calibrated. However, depending on the application (long wire runs, etc.), there may need to be a field adjustment done to these readings. The "Adjusted Reading" is the reading that the SZ2141 actually uses for control. The " Offset

Value" is the number of degrees that the actual input temperature has been adjusted. For example: You measure the cooler temperature and it reads 40°. The SZ2141 reading is 41° and the cooler already has an offset of -2.0°. All you need to do is change the offset value to -3.0° and you're done. The SZ2141 will now read 40°. The temperature inputs are scaled -40 to160°F (-40 to 71.1°C). These ranges are fixed and cannot be changed.

SZ2141 screen "D".



TEMPERATURE SETPOINTS

Enter the cooler and freezer setpoints here. The setpoint high limit is the point that the compressor will turn on and the setpoint low limit is the point at which the compressor will turn off.

ALARMS

The SZ1144 generates an "Alarm Condition" whenever any of the six 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 six 1000 ohm PtRTD inputs available. Each one is scaled -40 to 160°F (-40 to 71.1°C) and cannot be changed. Each input (FREEZER 1, FREEZER 2, FREEZER 1 DEFROST, FREEZER 2 DEFROST, COOLER and SPARE) can be enabled to generate an alarm. Once enabled, you need to set a "High Limit", a "Low Limit" (where applicable) 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 160°F, it is disabled. If a Low Limit is set to -40°F, it is also disabled.

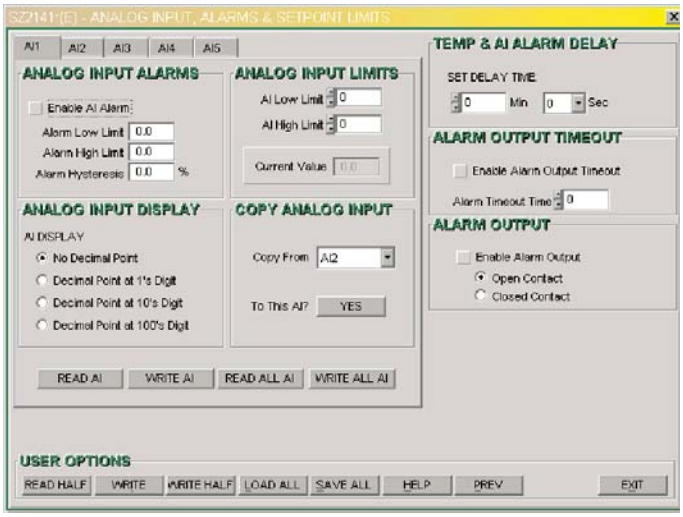
ANALOG INPUTS

There are also five 4-20mA inputs available. These five 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. Each input (AI1, AI2, AI3, AI4 and AI5) 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.

SZ2141 screen "E".



TEMP AND AI ALARM DELAY

There is an Alarm Delay Time which, when set, applied to all analog inputs (6 RTD's and 5 AI's). 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 appropriate setting. If a delay time other than 0 minutes and 0 seconds, the SZ12141 makes sure that the analog input has been at the appropriate setting for that amount of time before generating (or releasing) an alarm.

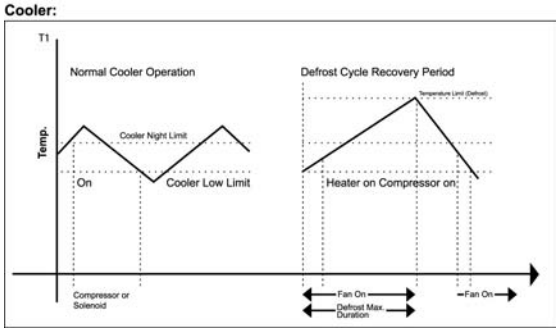
Note: The time set for the Alarm Delay Time is used for all analog inputs that are set to generate an alarm.

ALARM OUTPUT TIMEOUT

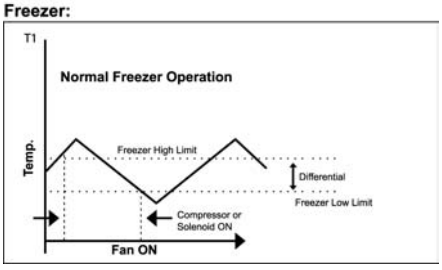
If the relay alarm output is enabled, meaning set to normally open or closed, then you may enable an alarm timeout feature by selecting " Enable Alarm Output Timeout" from the menu. If enabling this function is chosen, you need to enter a time adjustable from 0 to 255 seconds, after which the relay output 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.

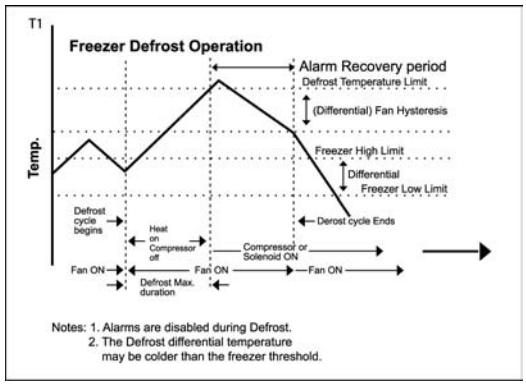
Sequence of Operation

Cooler:



Freezer:





Checkout & Troubleshooting

CHECKOUT

1. Be sure to check and verify all wiring before powering the SZ2141.

2. Turn power on. The SZ2141 "Power" LED should light up. Then the Service LED will blink for 15 seconds while the electronics stabilize.

3. If the SZ2141 has not been pre-programmed, It should be programmed at this time.

4. Increase and decrease the setpoints. This must be done from a PC. Observe the operation of the relay and/or analog ouput(s).

5. Note that the operation of the SZ2141 will depend on how it is programmed.

The SZ2141 is now ready for operation.

TROUBLESHOOTING

Power LED will not come on

Check for 24 VAC on terminals "24 VAC" and "GND". The rest of the trouble shooting must be done with a PC and the Revelation Professional software.

No communications

Make sure baud rate selection jumper for the QD1010 and the SZ2141 are the same, and that Revelation is configured for that same baud rate. Address 248 will always work provided that the SZ2141 is NOT connected to a network.

Inputs do not read correctly

The SZ2141 is calibrated at the factory. For the supply temperature and other temperature readings make slight adjustments (+/- 12% of the input span). on "Screen D" of the SZ2141 programming screens. (See Temperature Input Calibration on page 4.)

Output operation is not correct

Check programmed parameters, in particular. Defrost time duration and temperature setpoints. Check wiring.

LED Description

Fourteen LEDs on the unit allow the occupant to view the current operating status of the SZ2141.

POWER: This LED will be lit whenever the unit has power.

OUTPUTS: These LEDs will be lit when the corresponding relay outputs are on. Relay outputs include heating and cooling stages, fan and timeclock output.

ALARM: This LED will be on whenever the unit is in an alarm state or when a freezer or cooler door is open.

DEFROST: This LED will be on whenever the unit is in a defrost mode.

SERVICE: This LED will be on whenever the unit has a service condition. This LED also blinks on powerup until the electronics stabilize.

DATA: This LED will blink when the unit is being accessed by a PC.