Version 1.0.2
37-0302-00

SMART CONTROLS

Application Manual
Smart IAQ™: SI-40-N

IAQ Multi-Sense™

Document Number 37-0302-00

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Printed in the USA

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Device Overview

1.1 Introduction

Smart Controls combines the power of microprocessor-based control and sensing with the precision of solid-state sensors to provide IAQ Multi-Sense technology.

The Smart IAQ SI-40-N provides significant installation configuration capability while maintaining the ultimate in user simplicity.

A simple set of push button allows the end-user to easily obtain set-point comfort adjustment control, signal an override event and review predefined ambient conditions. The end-user is only exposed to comfort creating capability.

Predefined default settings allow the installer to simply connect the desired outputs to another device and have a fully functional sensor interface ready for immediate operation with no programming or configuration necessary. To provide expanded capability, a rich set of menus are available to meet specific end-user needs and system requirements. There are no jumpers to set. All configuration settings can be made through viewing the large LCD display. After pressing the appropriate push buttons for a predefined period of time a simple set of menus are available to configure or adjust parameters to provide the desired performance.

1.2 Application Sections

The functional application of the IAQ Multi-Sense is divided into three sections.

1) User Interface
2) Data Display
3) Configuration

The User Interface screens allows the end-user to view ambient conditions and adjust for comfort as necessary in the in the occupied space with a simple easy to use push button keypad.

The Data Display is for the installer or facilities manager to use for viewing of current and previous ambient conditions in the last 24 hours. A specific set of push buttons must be pressed for a predefined period of time to enter and view the ambient sensor data.

The Configuration section allows access to a rich set of features and parameters to tailor the IAQ Multi-Sense application if necessary. A specific set of push buttons must be pressed for a predefined period of time to enter the initial configuration menus. The Configuration menus allow selection of the specific area for adjustment. All adjustments are saved in non-volatile FLASH memory. Therefore, setting are maintained when power is removed and are available again when power is applied.

2

User Interface

2.1 Overview

The User Interface provides the end-user with comfort adjustment, override activation signal and viewing of ambient conditions.

Figure 2.1 shows the block diagram of the User Interface screens in the IAQ Multi-Sense Application.

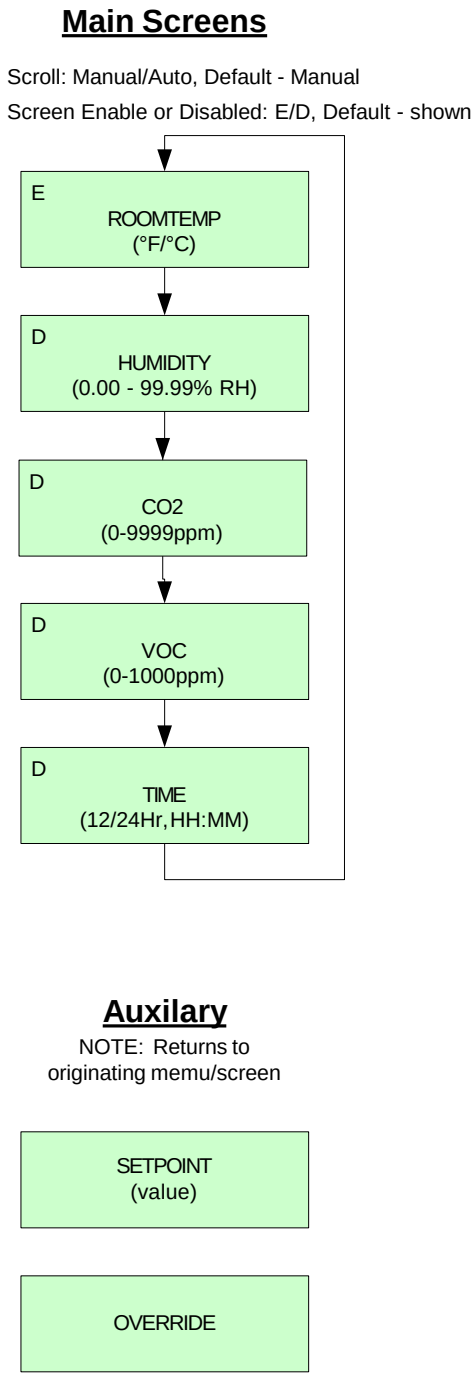


Figure 2.1 User Interface Block Diagram

2.2 Keypad Functions

Table 2.2 defines the keypad push button functions while in the User Interface screens.

Push Button	Duration	Description
Warmer	immediate	Increment comfort adjustment
Cooler	immediate	Decrement comfort adjustment
Override	immediate	Override Signal
Next	immediate	Next screen if available
Warmer+Cooler+Override	8 Seconds	Enter Configuration Menu
Warmer+Cooler+Next	8 Seconds	Enter Data Display Screens

Table 2.2 User Interface Push button Functions

2.3 Temperature Screen

Display

The Temperature Screen displays the ambient temperature provided by the on-board temperature sensor.

> ***Note!*** *The on-board temperature sensor used to display the ambient temperature is an independent sensor and is not the temperature sensor that is directly sensed or connect on the output terminal "TEMP".*

Units

The value can be displayed in Fahrenheit (°F) or Celsius (°C). The default is Fahrenheit.

Resolution

The numeric value of the Temperature Screen can be displayed with different resolutions. There are three different types of resolution. The default value is "Tenths". Table 2.3 shows the different types of resolution.

Resolution	Digits	Examples
Ones	X to XXXX	3, 75, 100
Half-Tenths	X.0 or X.5, XXX.0 or XXX.5	3.0, 3.5 75.0, 75.5 100.0, 100.5
Tenths (Default)	X.X to XXX.X	3.0, 3.3, 3.9 75.1, 75.4, 75.8 100.2, 100.5, 100.7

Table 2.3 Temperature Resolution Options

Viewing Option

The Temperature Screen has the option for the display to be enabled or disable to allow viewing of the ambient temperature value by the end-user. The default is enabled allowing viewing of the Temperature Screen.

2.4 Humidity Screen

Display

The Humidity Screen displays the ambient humidity provided by the on-board Humidity sensor.

Units

The value is displayed in percent (%) relative humidity (RH).

Resolution

The numeric value of the Humidity Screen is displayed with a resolution of Hundredths. Table 2.3 shows the resolution.

Resolution	Digits	Examples
Hundredths (only)	X.XX to XX.XX	3.00, 3.35, 3.99 45.19, 45.46, 45.30 68.28, 68.51, 68.72

Table 2.3 Humidity Resolution (Hundredths)

Viewing Option

The Humidity Screen has the option for the display to be enabled or disable to allow viewing of the humidity value by the end-user. The default is disabled and therefore the Humidity Screen is not displayed.

2.5 CO2 Screen

Display

The CO2 Screen displays the ambient CO2 level measured by the on-board CO2 sensor.

Units

The value is displayed in parts-per-million (ppm).

Resolution

The numeric value of the CO2 Screen is displayed with a resolution of Ones. Table 2.3 shows the resolution.

Resolution	Digits	Examples
One (only)	X to XXXX	400, 732, 1426, 2193

Table 2.3, CO2 Resolution (Ones)

Viewing Option

The CO2 Screen has the option for the display to be enabled or disable to allow viewing of the CO2 value by the end-user. The default is disabled and therefore the CO2 Screen is not displayed.

2.6 VOC Screen

Display

The VOC Screen displays the ambient VOC level measured by the on-board VOC sensor.

Units

The value displayed has a range of 0 to 1000 and is scaled over the range of the VOC sensor.

Resolution

The numeric value of the VOC Screen is displayed with a resolution of Ones. Table 2.3 shows the resolution.

Resolution	Digits	Examples
One (only)	X to XXXX	58, 376, 691, 942

Table 2.3 VOC Resolution (Ones)

Viewing Option

The VOC Screen has the option for the display to be enabled or disable to allow viewing of the VOC value by the end-user. The default is disabled and therefore the VOC Screen is not displayed.

2.7 Time Screen

Display

The Time Screen displays the current time provided by the on-board real-time clock (RTC).

Units

The time can be displayed in 12 or 24-hour format. In the 12-hour format the first two digits are the hours (1-12) and the second two digits (1-60) are the minutes. In the 12-hour mode an AM and PM icon are visible. In the 24-hour mode the first two digits are the hours (1-24) and the second two digits are the minutes (1-60).

Resolution

Only hours and minutes are shown on the Time Screen. Seconds are not provided on the Time Screen Table 2.3 shows the 12 and 24 format.

Format	Digits	Examples
12 hour	HH:MM	2:33 AM, 10:47 PM
24 hour	HH:MM	2:33, 22:47

Table 2.3 VOC Resolution (Ones)

Viewing Option

The Time Screen has the option for the display to be enabled or disable to allow viewing of the current time by the end-user. The default is disabled and therefore the Time Screen is not displayed.

2.8 Set Point Adjust Screen

Warmer/Cooler Push buttons

When either the WARMER or COOLER push button is pressed with any of the User Interface Display present the Set Point Adjust Screen will then be displayed. The value that is first shown is the current set point adjustment value. With any subsequent presses of the WARMER or COOLER push buttons the set point will be adjusted. The WARMER push button will increment the set point adjust value by one over the predefined configurable set point adjustment range. The COOLER push button will decrement the set point adjust value by one over the predefined configurable set point adjustment range. When the maximum or minimum set point adjust range value is reached the incrementing or decrementing process will scroll from the maximum to minimum (example: 3 to –3) or minimum to maximum (example: -3 to 3) set point adjust range value accordingly.

Exit

The NEXT push button can be used to immediately exit out of the Set Point Adjustment Screen. If no push buttons are pressed for a period of five (5) seconds, the Display Screen will revert back to the initial display screen (Temperature Screen) in the User Interface sequence.

Reset Period

When a set point adjustment has been made a configurable time period is started that will reset the set point adjust value back to zero (0). If additional changes are made during the configurable time period, the time period is reset and a new time period will be started.

2.9 Override Screen

Display

The Override Screen display indicates the OVERRIDE push button has been pressed. When the OVERRIDE push button is pressed the Override Screen will be present for period of four (4) seconds. If the OVERRIDE push button is pressed while the display screen is indicating an override response, the override period will begin again with another four (4) second period.

Exit

The NEXT push button can be used to immediately exit out of the Override Screen. When override display period has expired the display will return to the display screen that was present when the OVERRIDE push button was pressed.

Output Relay

When the OVERRIDE push button is present, if properly enabled, a corresponding output relay will be energized for a period of ten (10) seconds. If the OVERRIDE push button is pressed while the relay is still energized a new ten (10) second period will begin again. The OVRD (override) relay or ALM (alarm) relay can be used to provide an override signal. The default is the OVRD relay output.

2.10 Manual/Automatic Scrolling

Scrolling

When more than one screens has been enabled, the display has the ability to have Manual or Automatic Scrolling of the Display Screens. The screens display in the following order:

Temperature
Humidity
CO2
VOC
Time

Manual

When manual scrolling has been selected, the NEXT push button can be used to scroll to the next screen. When the last screen has been reached, the next screen will return to the first screen that was viewed. If the Display is left viewing Humidity, CO2, VOC or Time for thirty (30) seconds, the IAQ Multi-Sense application will revert the display screen back to the Temperature Screen. The Temperature Screen will remain as the current viewing screen until the NEXT push button is pressed again.

Automatic

When automatic scrolling has been select, after a screen has been viewed for a period of four (4) seconds, the IAQ Multi-Sense application will automatically scroll to the next screen. The NEXT push button can be used in the automatic scrolling mode to further increment the scrolling process and manually move to another screen. All screens are viewable for predefined period of four (4) seconds in the automatic scrolling mode.

3

Data Display

3.1 Overview

The Data Display provides the installer, facilities manager or end-user with current and previous ambient conditions in the last 24 hours. A specific set of push buttons must be pressed for a predefined period of time to enter and view the ambient sensor data.

Figure 3.1 shows the block diagram of the Data Display screens in the IAQ Multi-Sense Application.

> ***Note!*** *To enter into and see the Data Display screens you must press the WARMER, COOLER and NEXT push buttons simultaneously for 8 seconds.*

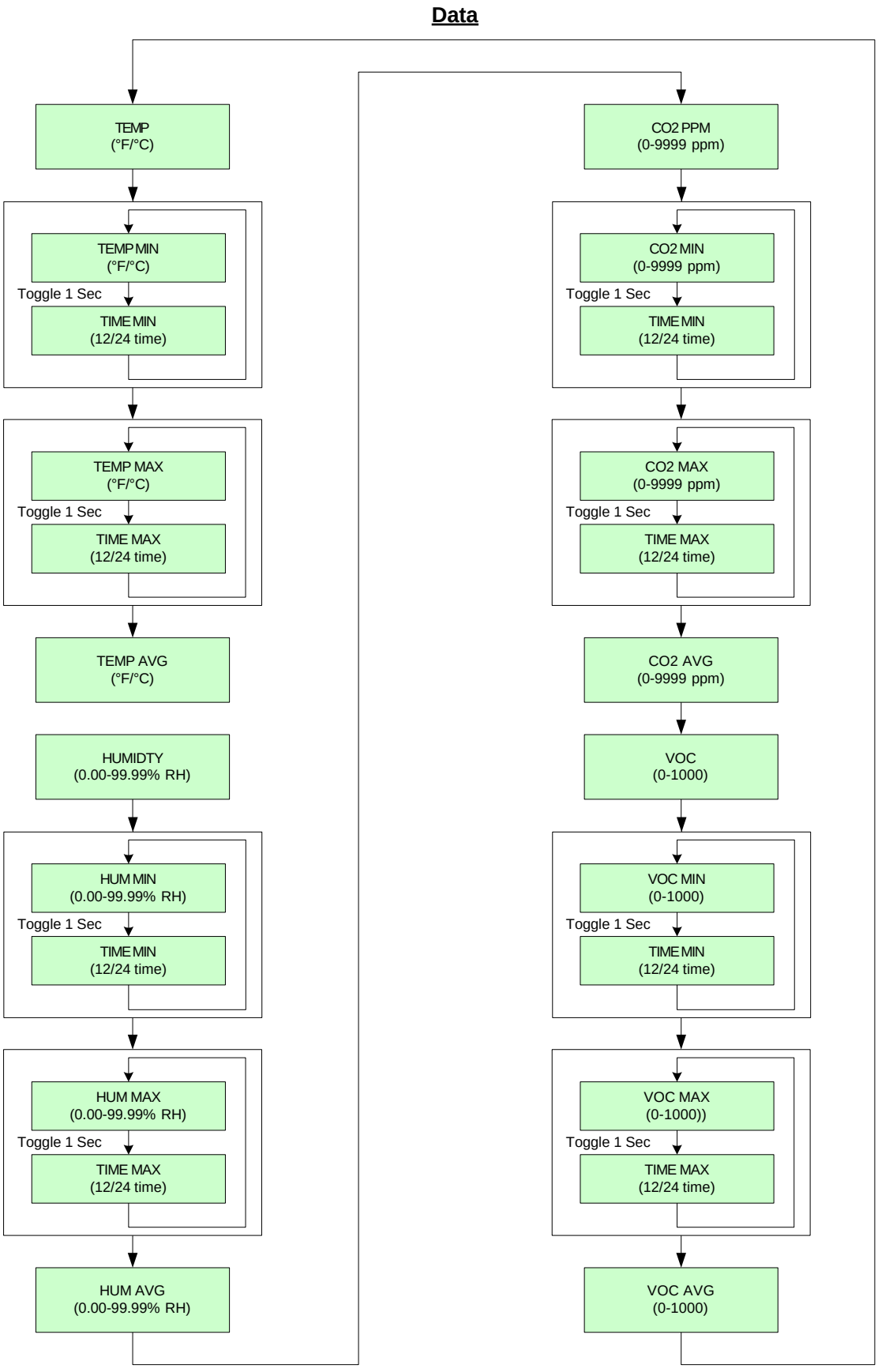


Figure 3.1, Data Display Block Diagram

3.2 Temperature

Current Temperature

The current ambient space temperature is measured and the display is updated every one second.

The current ambient space temperature value can be in degrees Fahrenheit (°F) or Celsius (°C). The selection is dependent upon the configuration setting made in the Configuration section for setting temperature units on the SI-40-N.

Minimum Temperature

The minimum temperature that was measured over the current 24-hour period is displayed.

If a real-time clock (RTC) has been selected with the SI-40-N, the display will alternate between the minimum temperature value and the time the minimum temperature occurred. The 24-hour period is from 12 midnight to 12 midnight. The 24-hour period is fixed and not adjustable. If no RTC has been selected for use with the SI-40-N, the display will not alternate and only the minimum temperature value will be displayed. With no RTC, the 24-hour period will begin when the unit had power first applied. In case of power interruption, a new 24-hour period will begin when power is re-established.

The minimum Temperature data is stored in RAM memory. Any loss of power or power cycling will erase the data obtained in the current 24-hour period. A new 24-hour period will start and a new minimum temperature will be obtained when power is re-established.

The minimum temperature value can be in degrees Fahrenheit (°F) or Celsius (°C). The selection is dependent upon the configuration setting made in the Configuration section for setting temperature units on the SI-40-N.

Maximum Temperature

The maximum temperature that was measured over the current 24-hour period is displayed.

If a real-time clock (RTC) has been selected with the SI-40-N, the display will alternate between the maximum temperature value and the time the maximum temperature occurred. The 24-hour period is from 12 midnight to 12 midnight. The 24-hour period is fixed and not adjustable. If no RTC has been selected for use with the SI-40-N, the display will not alternate and only the minimum temperature value will be displayed. With no RTC, the 24-hour period will begin when the unit had power first applied. In case of power interruption, a new 24-hour period will begin when power is re-established.

The Maximum Temperature data is stored in RAM memory. Any loss of power or power cycling will erase the data obtained in the current 24-hour period. A

new 24-hour period will start and a new maximum temperature will be obtained when power is re-established.

The maximum temperature value can be in degrees Fahrenheit (°F) or Celsius (°C). The selection is dependent upon the configuration setting made in the Configuration section for setting temperature units on the SI-40-N.

Average Temperature

The average temperature is calculated over the current 24-hour period and displayed.

If a real-time clock has been selected with the SI-40-N, the 24-hour period is from 12 midnight to 12 midnight. The 24-hour period is fixed and not adjustable. If no real-time clock (RTC) has been selected for use with the SI-40-N, the 24-hour period will begin when the unit had power first applied. In case of power interruption, a new 24-hour period will begin when power is re-established.

The Average Temperature data is stored in RAM memory. Any loss of power or power cycling will erase the data obtained in the current 24-hour period. A new 24-hour period will start and a new average temperature will be calculated when power is re-established.

The average temperature value can be in degrees Fahrenheit (°F) or Celsius (°C). The selection is dependent upon the configuration setting made in the Configuration section for setting temperature units on the SI-40-N.

3.3 Humidity

Current Humidity

The current ambient space humidity is measured and the display is updated every two seconds.

The current ambient humidity value is in percent relative humidity (%RH).

Minimum Humidity

The minimum humidity that was measured over the current 24-hour period is displayed.

If a real-time clock (RTC) has been selected with the SI-40-N, the display will alternate between the minimum humidity value and the time the minimum humidity occurred. The 24-hour period is from 12 midnight to 12 midnight. The 24-hour period is fixed and not adjustable. If no RTC has been selected for use with the SI-40-N, the display will not alternate and only the minimum humidity value will be displayed. With no RTC, the 24-hour period will begin when the unit had power first applied. In case of power interruption, a new 24-hour period will begin when power is re-established.

The minimum humidity data is stored in RAM memory. Any loss of power or power cycling will erase the data obtained in the current 24-hour period. A new 24-hour period will start and a new minimum humidity will be obtained when power is re-established.

The minimum humidity value is in percent relative humidity (%RH).

Maximum Humidity

The maximum humidity that was measured over the current 24-hour period is displayed.

If a real-time clock (RTC) has been selected with the SI-40-N, the display will alternate between the maximum humidity value and the time the maximum humidity occurred. The 24-hour period is from 12 midnight to 12 midnight. The 24-hour period is fixed and not adjustable. If no RTC has been selected for use with the SI-40-N, the display will not alternate and only the minimum humidity value will be displayed. With no RTC, the 24-hour period will begin when the unit had power first applied. In case of power interruption, a new 24-hour period will begin when power is re-established.

The Maximum Humidity data is stored in RAM memory. Any loss of power or power cycling will erase the data obtained in the current 24-hour period. A new 24-hour period will start and a new maximum humidity will be obtained when power is re-established.

The maximum humidity value is in percent relative humidity (%RH).

Average Humidity

The average humidity is calculated over the current 24-hour period and displayed.

If a real-time clock has been selected with the SI-40-N, the 24-hour period is from 12 midnight to 12 midnight. The 24-hour period is fixed and not adjustable. If no real-time clock (RTC) has been selected for use with the SI-40-N, the 24-hour period will begin when the unit had power first applied. In case of power interruption, a new 24-hour period will begin when power is re-established.

The Average Humidity data is stored in RAM memory. Any loss of power or power cycling will erase the data obtained in the current 24-hour period. A new 24-hour period will start and a new average humidity will be calculated when power is re-established.

The average humidity value is in percent relative humidity (%RH).

3.4 CO2

Current CO2

The current ambient space CO2 is measured and the display is updated every two seconds.

The current ambient CO2 value is in parts per million (ppm).

Minimum CO2

The minimum CO2 that was measured over the current 24-hour period is displayed.

If a real-time clock (RTC) has been selected with the SI-40-N, the display will alternate between the minimum CO2 value and the time the minimum CO2 occurred. The 24-hour period is from 12 midnight to 12 midnight. The 24-hour period is fixed and not adjustable. If no RTC has been selected for use with the SI-40-N, the display will not alternate and only the minimum CO2 value will be displayed. With no RTC, the 24-hour period will begin when the unit had power first applied. In case of power interruption, a new 24-hour period will begin when power is re-established.

The minimum CO2 data is stored in RAM memory. Any loss of power or power cycling will erase the data obtained in the current 24-hour period. A new 24-hour period will start and a new minimum CO2 will be obtained when power is re-established.

The minimum CO2 value is in parts per million (ppm).

Maximum CO2

The maximum CO2 that was measured over the current 24-hour period is displayed.

If a real-time clock (RTC) has been selected with the SI-40-N, the display will alternate between the maximum CO2 value and the time the maximum CO2 occurred. The 24-hour period is from 12 midnight to 12 midnight. The 24-hour period is fixed and not adjustable. If no RTC has been selected for use with the SI-40-N, the display will not alternate and only the minimum CO2 value will be displayed. With no RTC, the 24-hour period will begin when the unit had power first applied. In case of power interruption, a new 24-hour period will begin when power is re-established.

The Maximum CO2 data is stored in RAM memory. Any loss of power or power cycling will erase the data obtained in the current 24-hour period. A new 24-hour period will start and a new maximum CO2 will be obtained when power is re-established.

The maximum CO2 value is in parts per million (ppm).

Average CO2

The average CO2 is calculated over the current 24-hour period and displayed.

If a real-time clock has been selected with the SI-40-N, the 24-hour period is from 12 midnight to 12 midnight. The 24-hour period is fixed and not adjustable. If no real-time clock (RTC) has been selected for use with the SI-40-N, the 24-hour period will begin when the unit had power first applied. In case of power interruption, a new 24-hour period will begin when power is re-established.

The Average CO2 data is stored in RAM memory. Any loss of power or power cycling will erase the data obtained in the current 24-hour period. A new 24-hour period will start and a new average CO2 will be calculated when power is re-established.

The average CO2 value is in parts per million (ppm).

3.5 VOC

Current VOC

The current ambient space VOC is measured and the display is updated every two seconds.

The current ambient VOC value is scaled over the span of the sensor and has a range of 0 to 1000. There are no units.

Minimum VOC

The minimum VOC that was measured over the current 24-hour period is displayed.

If a real-time clock (RTC) has been selected with the SI-40-N, the display will alternate between the minimum VOC value and the time the minimum VOC occurred. The 24-hour period is from 12 midnight to 12 midnight. The 24-hour period is fixed and not adjustable. If no RTC has been selected for use with the SI-40-N, the display will not alternate and only the minimum VOC value will be displayed. With no RTC, the 24-hour period will begin when the unit had power first applied. In case of power interruption, a new 24-hour period will begin when power is re-established.

The minimum VOC data is stored in RAM memory. Any loss of power or power cycling will erase the data obtained in the current 24-hour period. A new 24-hour period will start and a new minimum VOC will be obtained when power is re-established.

The minimum VOC value is scaled over the span of the sensor and has a range of 0 to 1000. There are no units.

Maximum VOC

The maximum VOC that was measured over the current 24-hour period is displayed.

If a real-time clock (RTC) has been selected with the SI-40-N, the display will alternate between the maximum VOC value and the time the maximum VOC occurred. The 24-hour period is from 12 midnight to 12 midnight. The 24-hour period is fixed and not adjustable. If no RTC has been selected for use with the SI-40-N, the display will not alternate and only the minimum VOC value will be displayed. With no RTC, the 24-hour period will begin when the unit had power

first applied. In case of power interruption, a new 24-hour period will begin when power is re-established.

The Maximum VOC data is stored in RAM memory. Any loss of power or power cycling will erase the data obtained in the current 24-hour period. A new 24-hour period will start and a new maximum VOC will be obtained when power is re-established.

The maximum VOC value is scaled over the span of the sensor and has a range of 0 to 1000. There are no units.

Average VOC

The average VOC is calculated over the current 24-hour period and displayed.

If a real-time clock has been selected with the SI-40-N, the 24-hour period is from 12 midnight to 12 midnight. The 24-hour period is fixed and not adjustable. If no real-time clock (RTC) has been selected for use with the SI-40-N, the 24-hour period will begin when the unit had power first applied. In case of power interruption, a new 24-hour period will begin when power is re-established.

The Average VOC data is stored in RAM memory. Any loss of power or power cycling will erase the data obtained in the current 24-hour period. A new 24-hour period will start and a new average VOC will be calculated when power is re-established.

The average VOC value is scaled over the span of the sensor and has a range of 0 to 1000. There are no units.

4

Configuration

4.1 Overview

The Configuration section allows access to a rich set of features and parameters to tailor the IAQ Multi-Sense application if necessary. A specific set of push buttons must be pressed for a predefined period of time to enter the initial configuration menus. The Configuration menus allow selection of the specific area for adjustment. All adjustments are saved in non-volatile FLASH memory. Therefore, setting are maintained when power is removed and are available again when power is applied.

> ***Note!*** *To enter into and see the Configuration Display screens you must press the WARMER, COOLER and OVERRIDE push buttons simultaneously for 8 seconds.*

4.2 Configuration Menu

Table 4.2 provides a description of the headings seen in the Configuration Menu.

Display Heading	Description
SET TIME	Set the current time.
SET DATE	Set the current date.
SET DISP	Set the display screens to be viewed in the User Interface.
SET TEMP	Set the temperature calibration, units, resolution, and alarm values.
SET HUM	Set the humidity calibration and Humidification and Dehumidification values.
SET CO2	Set the CO2 calibration and alarm values.
SET VOC	Set the VOC calibration and alarm values.
SET STPT	Set the Set Point Adjust range, direction, resistance values and reset time.
SET RLY1	Set the functional operation of Relay 1 (OVRD Output)
SET RLY2	Set the functional operation of Relay 2 (ALM Output)
SET SAMP	Set the number of samples sensor measurements are averaged.
SET AO	Set the maximum voltage output for the Analog Outputs.

Table 4.2, Configuration Menu Headings and Descriptions.

Figure 4.2 shows the block diagram of the Configuration Menu screens in the IAQ Multi-Sense Application

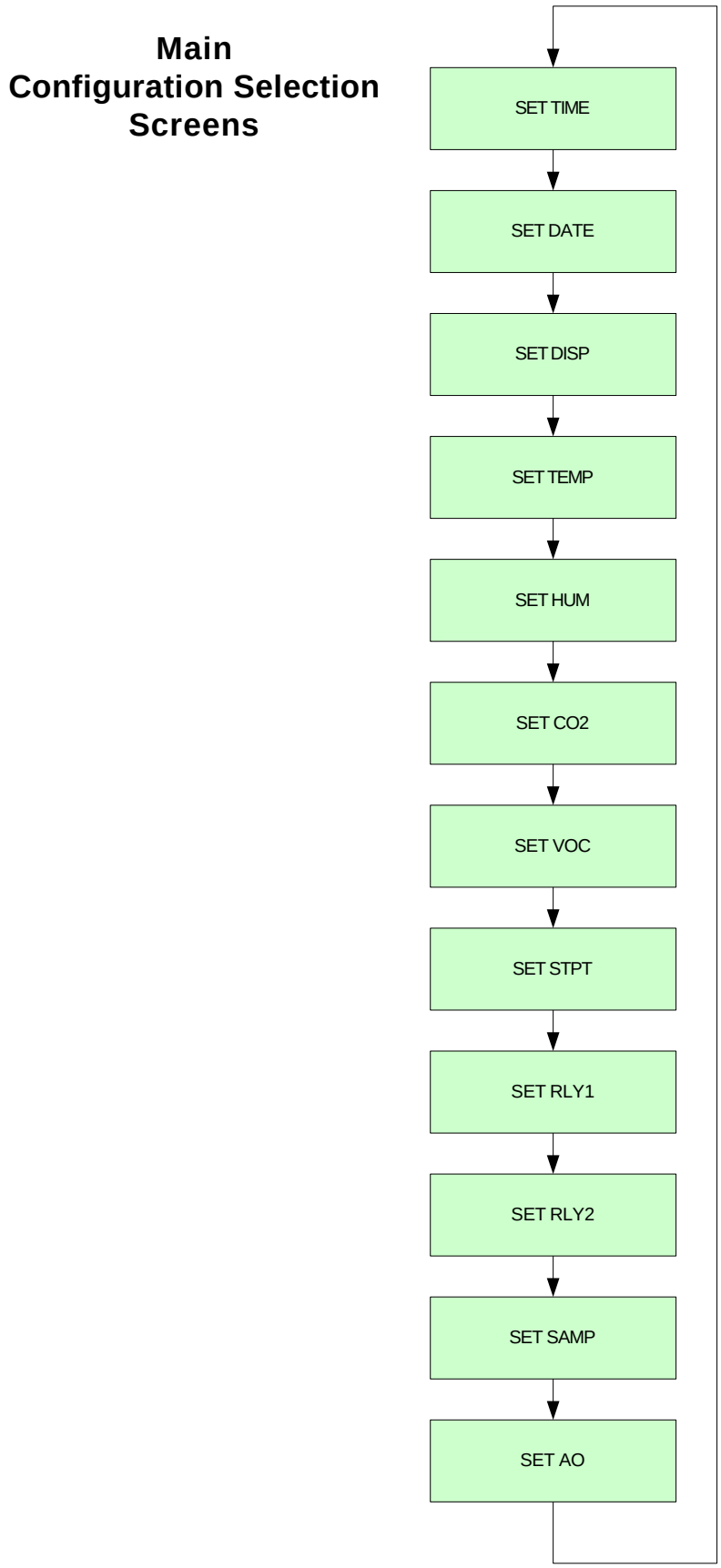


Figure 4.2, Configuration Menu Block Diagram

4.3 Set Time

Block Diagram

Figure 4.3 shows a block diagram of the screens that are available to set the configuration parameters for Time.

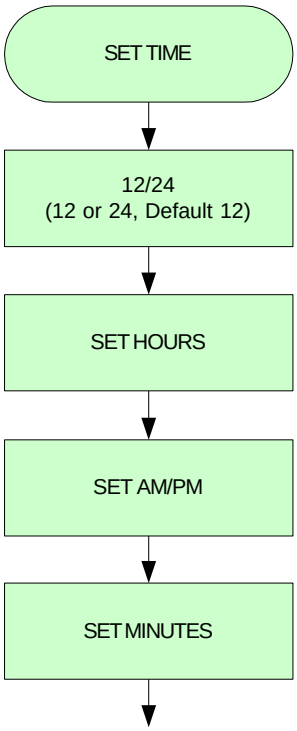


Figure 4.3, Time Configuration Screens

12/24 Mode

Toggle the display between "12" and "24" using the WARMER or COOLER push button to set the clock for 12-hour or 24-hour format.

Hours

When in the 12-hour mode the current hours can be adjusted over a range of adjustment is 1-12. When in the 24-hour mode the current hours can be adjusted over a range of adjustment is 0-23. The WARMER push button will increment the hours and the COOLER push button will decrement the hours.

AM/PM

If in the 12-hour mode, the time of day can be set by toggling between "AM" and "PM" using the WARMER and COOLER push buttons. The "AM" and "PM" are not available in the 24-hour mode.

Minutes

The current time in minutes can be adjusted over a range of 0 to 59. The WARMER push button will increment the minutes and the COOLER push button will decrement the minutes.

4.4 Set Date

Block Diagram

Figure 4.4 shows a block diagram of the screens that are available to set the configuration parameters for Date.

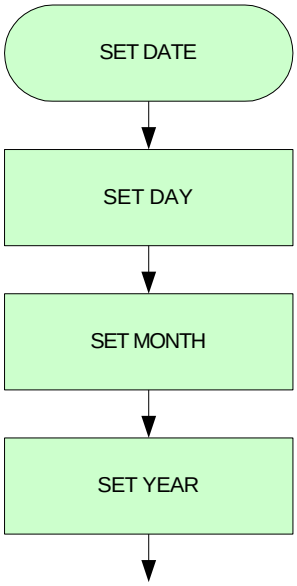


Figure 4.3, Date Configuration Screens

Day

The current Day can be set over a range of 1 to 31 . The WARMER push button will increment the day and the COOLER push button will decrement the day.

Month

The current Month can be set over a range of 1 to 12 . The WARMER push button will increment the month and the COOLER push button will decrement the month.

Year

The current Year can be set over a range of 2014 to 2099. The WARMER push button will increment the year and the COOLER push button will decrement the year.

4.5 Set Display Options

Block Diagram

Figure 4.5 shows a block diagram of the screens that are available to set the configuration parameters for the User Interface screens that can be displayed and if automatic scrolling is enabled.

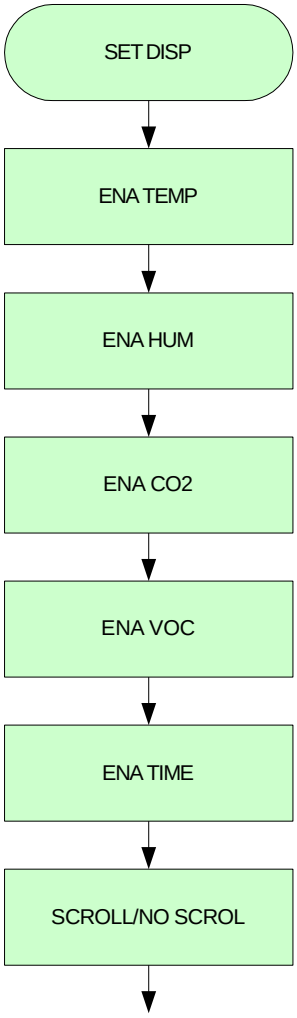


Figure 4.5, User Interface Display Configuration Screens

Temperature

Enable or disable the display of the ambient temperature measurement in the User Interface display screens. Use the WARMER and COOLER push buttons to toggle between “YES” and “NO” to enable or disable the display screen, respectively. A “YES” enables and “NO” disables the ambient temperature display screen.

The default is “YES” with the ambient temperature display screen enabled.

Humidity

Enable or disable the display of the ambient humidity measurement in the User Interface display screens. Use the WARMER and COOLER push buttons to toggle between "YES" and "NO" to enable or disable the display screen, respectively. A "YES" enables and "NO" disables the ambient humidity display screen.

The default is "NO" with the ambient humidity display screen disabled.

CO2

Enable or disable the display of the ambient CO2 measurement in the User Interface display screens. Use the WARMER and COOLER push buttons to toggle between "YES" and "NO" to enable or disable the display screen, respectively. A "YES" enables and "NO" disables the ambient CO2 display screen.

The default is "NO" with the ambient CO2 display screen disabled.

VOC

Enable or disable the display of the ambient VOC measurement in the User Interface display screens. Use the WARMER and COOLER push buttons to toggle between "YES" and "NO" to enable or disable the display screen, respectively. A "YES" enables and "NO" disables the ambient VOC display screen.

The default is "NO" with the ambient VOC display screen disabled.

Time

Enable or disable the display of the Time in the User Interface display screens. Use the WARMER and COOLER push buttons to toggle between "YES" and "NO" to enable or disable the display screen, respectively. A "YES" enables and "NO" disables the Time display screen.

The default is "NO" with the Time display screen disabled.

Scroll/No Scroll

Enable or disable the automatic scrolling of the User Interface display screens. Use the WARMER and COOLER push buttons to toggle between "YES" and "NO" to enable or disable the automatic scrolling of display screens, respectively. A "YES" enables and "NO" disables the automatic scrolling of the User Interface display screens. When the automatic scrolling has been disabled, manual scrolling of the display screens can be done. By pressing the NEXT push button, the next screen in the display sequence is displayed. Two are more display screens have to be enabled for automatic or manual scrolling. If no display screens are enabled the IAQ Multi-Sense application will default to the initial screen (Temperature) in the sequence.

The display screen sequence is as follows:

Temperature
Humidity

CO2
VOC
Time

The default is “NO” with automatic scrolling of the display screen disabled. Manual scrolling is the default method of scrolling when two or more display screens are enabled.

4.6 Set Temperature

Block Diagram

Figure 4.6 shows a block diagram of the screens that are available to set the configuration parameters for Temperature.

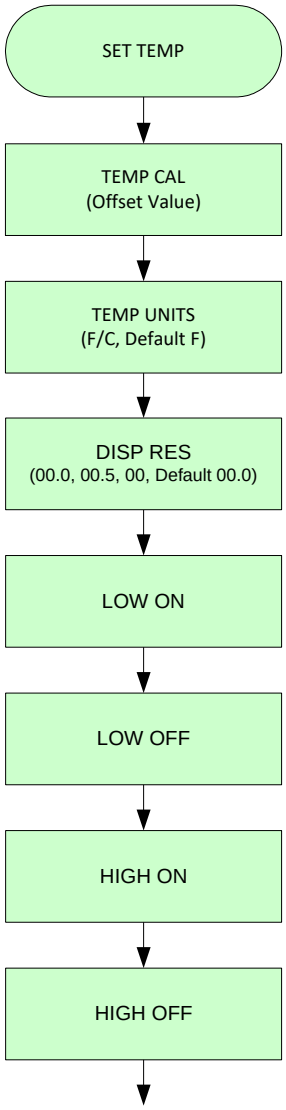


Figure 4.6, Temperature Configuration Screens

Temperature

Adjust the offset value that is added to the measured temperature to provide an adjusted measured temperature. The WARMER push button will increment and the COOLER push button will decrement the temperature-offset value. The offset value can be in Fahrenheit (°F) or Celsius (°C) depending on the temperature configuration units setting. The adjustment resolution is in tenths of a degree in degrees Fahrenheit or Celsius. When switching between units (°F or °C) the offset value will scale to the units selected.

The default offset value is 0.0 degrees.

Temperature Units

Toggle between "°F" (Fahrenheit) and "°C" (Celsius) using the WARMER or COOLER push button to set the units of the temperature displayed in the User Interface and Data Display screens.

Display Resolution

The temperature displayed in the User Interface and Data Display screens can be set to one of three resolutions. The following are the three resolutions that can be selected.

Selection	Resolution	Digits	Examples
00.0	Tenths (Default)	X.X to XXX.X	3.0, 3.3, 3.9 75.1, 75.4, 75.8 100.2, 100.5, 100.7
00	Ones	X to XXXX	3, 75, 100
00.5	Half-Tenths	X.0 or X.5, XXX.0 or XXX.5	3.0, 3.5 75.0, 75.5 100.0, 100.5

Table 4.6, Temperature Display Resolution Selection

Use the WARMER and COOLER push buttons to toggle between 00.0, 00 and 00.5 to selected the desired temperature resolution.

The default resolution setting is Tenths (00.0).

Low Temperature ON Alarm

The IAQ Multi-Sense application has the ability to provide an output relay alarm response when the temperature reaches a low temperature limit.

To enable the Low Temperature Alarm condition, the ambient temperature must go below the low temperature ON limit. When the ambient temperature is below the Low Temperature ON limit, the corresponding output relay contact, if selected, will close.

The temperature setting for the low limit ON alarm can be incremented with the WARMER push button and decremented with the COOLER push button. The Low Temperature ON value can be in Fahrenheit (°F) or Celsius (°C) depending on the temperature configuration units setting. The adjustment resolution is in

tenths of a degree in degrees Fahrenheit or Celsius. The resolution of the Low Temperature ON alarm setting is not affected by the configuration Display Resolution for temperature. When switching between units (°F or °C) the Low Temperature ON value will scale to the units selected. The range of adjustment is over the operating temperature range of the SI-40-N, which is 32.0 to 122.0 °F (0.0 to 50.0°C)

The default Low Temperature ON value is 50.0 °F (10.0 °C).

The IAQ Multi-Sense application prevents the Low Temperature ON Alarm value from being greater than or equal to the Low Temperature OFF Alarm value.

See the Configuration sections Set Relay 1 or Set Relay 2 for selecting and enabling the functionality of the corresponding output relay.

See Low Temperature OFF Alarm in this section (Set Temperature) for more information on setting the Low Temperature OFF Alarm.

See Temperature Units under this section (Set Temperature) to set the temperature units.

Low Temperature OFF Alarm

The IAQ Multi-Sense application has the ability to provide an output relay alarm response when the temperature reaches a low temperature limit.

To disable the Low Temperature Alarm condition, the ambient temperature must go above the low temperature OFF limit. When the ambient temperature is above the Low Temperature OFF limit, the corresponding output relay contact, if selected, will open.

The temperature setting for the low limit OFF alarm can be incremented with the WARMER push button and decremented with the COOLER push button. The Low Temperature OFF value can be in Fahrenheit (°F) or Celsius (°C) depending on the temperature configuration units setting. The adjustment resolution is in tenths of a degree in degrees Fahrenheit or Celsius. The resolution of the Low Temperature ON alarm setting is not affected by the configuration Display Resolution for temperature. When switching between units (°F or °C) the Low Temperature ON value will scale to the units selected. The range of adjustment is over the operating temperature range of the SI-40-N, which is 32.0 to 122.0 °F (0.0 to 50.0°C)

The default Low Temperature ON value is 52.0 °F (11.1 °C).

The IAQ Multi-Sense application prevents the Low Temperature OFF Alarm value from being less than or equal to the Low Temperature ON Alarm value.

See the Configuration sections Set Relay 1 or Set Relay 2 for selecting and enabling the functionality of the corresponding output relay.

See Low Temperature ON Alarm in this section (Set Temperature) for more information on setting the Low Temperature ON Alarm.

See Temperature Units under this section (Set Temperature) to set the temperature units.

High Temperature ON Alarm

The IAQ Multi-Sense application has the ability to provide an output relay alarm response when the temperature reaches a high temperature limit.

To enable the High Temperature Alarm condition, the ambient temperature must go above the high temperature ON limit. When the ambient temperature is above the Low Temperature ON limit, the corresponding output relay contact, if selected, will close.

The temperature setting for the high limit ON alarm can be incremented with the WARMER push button and decremented with the COOLER push button. The High Temperature ON value can be in Fahrenheit (°F) or Celsius (°C) depending on the temperature configuration units setting. The adjustment resolution is in tenths of a degree in degrees Fahrenheit or Celsius. The resolution of the Low Temperature ON alarm setting is not affected by the configuration Display Resolution for temperature. When switching between units (°F or °C) the High Temperature ON value will scale to the units selected. The range of adjustment is over the operating temperature range of the SI-40-N, which is 32.0 to 122.0 °F (0.0 to 50.0°C)

The default High Temperature ON value is 100.0 °F (37.8 °C).

The IAQ Multi-Sense application prevents the High Temperature ON Alarm value from being less than or equal to the High Temperature OFF Alarm value.

See the Configuration sections Set Relay 1 or Set Relay 2 for selecting and enabling the functionality of the corresponding output relay.

See High Temperature OFF Alarm in this section (Set Temperature) for more information on setting the High Temperature OFF Alarm.

See Temperature Units under this section (Set Temperature) to set the temperature units.

High Temperature OFF Alarm

The IAQ Multi-Sense application has the ability to provide an output relay alarm response when the temperature reaches a high temperature limit.

To disable the High Temperature Alarm condition, the ambient temperature must go below the high temperature OFF limit. When the ambient temperature is below the High Temperature OFF limit, the corresponding output relay contact, if selected, will open.

The temperature setting for the high limit OFF alarm can be incremented with the WARMER push button and decremented with the COOLER push button. The High Temperature OFF value can be in Fahrenheit (°F) or Celsius (°C) depending on the temperature configuration units setting. The adjustment resolution is in

tenths of a degree in degrees Fahrenheit or Celsius. The resolution of the Low Temperature ON alarm setting is not affected by the configuration Display Resolution for temperature. When switching between units (°F or °C) the High Temperature OFF value will scale to the units selected. The range of adjustment is over the operating temperature range of the SI-40-N, which is 32.0 to 122.0 °F (0.0 to 50.0°C)

The default High Temperature OFF value is 98.0 °F (36.7 °C).

The IAQ Multi-Sense application prevents the High Temperature OFF Alarm value from being greater than or equal to the High Temperature ON Alarm value.

See the Configuration sections Set Relay 1 or Set Relay 2 for selecting and enabling the functionality of a corresponding output relay.

See High Temperature ON Alarm in this section (Set Temperature) for more information on setting the High Temperature ON Alarm.

See Temperature Units under this section (Set Temperature) to set the temperature units.

4.7 Set Humidity

Block Diagram

Figure 4.7 shows a block diagram of the screens that are available to set the configuration parameters for Humidity.

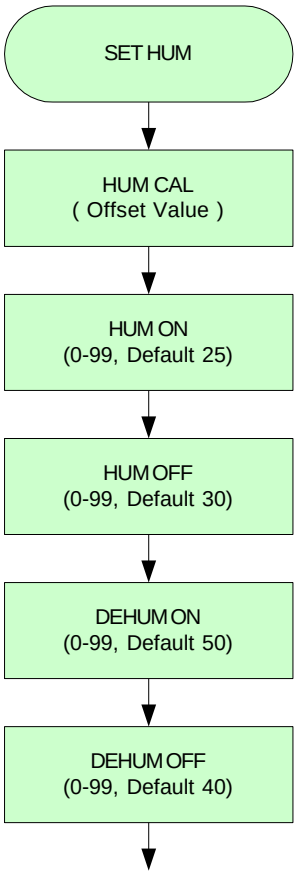


Figure 4.7, Humidity Configuration Screens

Humidity

Adjust the offset value that is added to the measured humidity to provide an adjusted measured humidity. The WARMER push button will increment and the COOLER push button will decrement the humidity-offset value. The offset value is in percent (%) relative humidity (RH). The adjustment resolution is in hundredths (0.01) of percent relative humidity.

The default offset value is 0.00 % RH.

Humidification ON

The IAQ Multi-Sense application has the ability to provide an output relay response signaling when there is a need for humidification.

To provide a Humidification ON signal, the ambient humidity must go below the humidification ON value. When the ambient humidity is below the Humidification ON value, the corresponding output relay contact, if selected, will close.

The humidity setting for the Humidification ON signal can be incremented with the WARMER push button and decremented with the COOLER push button. The Humidification ON value is in percent relative humidity (%RH). The adjustment resolution is in tenths (0.1) of a percent relative humidity. The range of adjustment is from 0.00 to 99.99 %RH.

The default Humidification ON value is 25.00 %RH.

The IAQ Multi-Sense application prevents the Humidification ON value from being greater than or equal to the Humidification OFF value.

See the Configuration sections Set Relay 1 or Set Relay 2 for selecting and enabling the functionality of the corresponding output relay.

See Humidification OFF in this section (Set Humidity) for more information on setting Humidification OFF.

Humidification OFF

The IAQ Multi-Sense application has the ability to provide an output relay response signaling when there is a need for humidification.

To provide a Humidification OFF signal, the ambient humidity must go above the humidification OFF value. When the ambient humidity is above the Humidification OFF value, the corresponding output relay contact, if selected, will open.

The humidity setting for the Humidification OFF signal can be incremented with the WARMER push button and decremented with the COOLER push button. The Humidification ON value is in percent relative humidity (%RH). The adjustment resolution is in tenths (0.1) of a percent relative humidity. The range of adjustment is from 0.00 to 99.99 %RH.

The default Humidification ON value is 30.00 %RH.

The IAQ Multi-Sense application prevents the Humidification OFF value from being less than or equal to the Humidification ON value. In addition, IAQ Multi-Sense application prevents the Humidification OFF value from being greater than the Dehumidification OFF value. Having the Humidification OFF value always lower than the Dehumidification OFF value prevents the possibility of Humidifying and Dehumidifying at the same time.

See the Configuration sections Set Relay 1 or Set Relay 2 for selecting and enabling the functionality of the corresponding output relay.

See Humidification ON in this section (Set Humidity) for more information on setting Humidification ON.

Dehumidification ON

The IAQ Multi-Sense application has the ability to provide an output relay response signaling when there is a need for dehumidification.

To provide a Dehumidification ON signal, the ambient humidity must go above the Dehumidification ON value. When the ambient humidity is above the Dehumidification ON value, the corresponding output relay contact, if selected, will close.

The humidity setting for the Dehumidification ON signal can be incremented with the WARMER push button and decremented with the COOLER push button. The Dehumidification ON value is in percent relative humidity (%RH). The adjustment resolution is in tenths (0.1) of a percent relative humidity. The range of adjustment is from 0.00 to 99.99 %RH.

The default Dehumidification ON value is 50.00 %RH.

The IAQ Multi-Sense application prevents the Dehumidification ON value from being less than or equal to the Dehumidification OFF value.

See the Configuration sections Set Relay 1 or Set Relay 2 for selecting and enabling the functionality of the corresponding output relay.

See Dehumidification OFF in this section (Set Humidity) for more information on setting Dehumidification OFF.

Dehumidification OFF

The IAQ Multi-Sense application has the ability to provide an output relay response signaling when there is a need for dehumidification.

To provide a Dehumidification OFF signal, the ambient humidity must go below the dehumidification OFF value. When the ambient humidity is below the Dehumidification OFF value, the corresponding output relay contact, if selected, will open.

The humidity setting for the Dehumidification OFF signal can be incremented with the WARMER push button and decremented with the COOLER push button. The Dehumidification ON value is in percent relative humidity (%RH). The adjustment resolution is in tenths (0.1) of a percent relative humidity. The range of adjustment is from 0.00 to 99.99 %RH.

The default Dehumidification ON value is 40.00 %RH.

The IAQ Multi-Sense application prevents the Dehumidification OFF value from being greater than or equal to the Dehumidification ON value. In addition, IAQ Multi-Sense application prevents the Dehumidification OFF value from being less than the Humidification OFF value. Having the Dehumidification OFF value always higher than the Humidification OFF value prevents the possibility of Humidifying and Dehumidifying at the same time.

See the Configuration sections Set Relay 1 or Set Relay 2 for selecting and enabling the functionality of the corresponding output relay.

See Dehumidification ON in this section (Set Humidity) for more information on setting Dehumidification ON.

4.8 Set CO2

Introduction

The CO2 Sensor has a built-in self-correcting ABC algorithm. ABC stands for Automatic Baseline Calibration and is a self-calibrating function for achieving long-term stability in sensor performance.

Block Diagram

Figure 4.8 shows a block diagram of the screens that are available to set the configuration parameters for CO2.

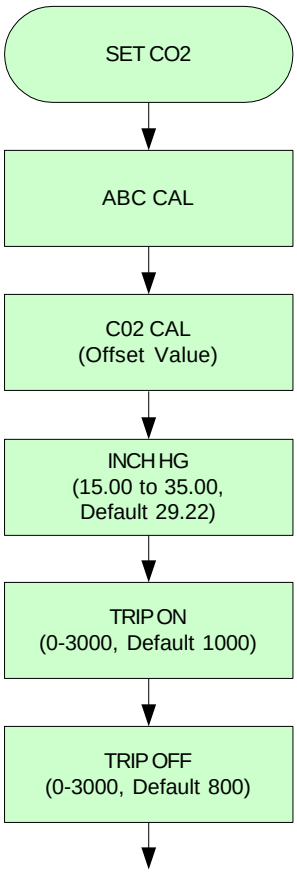


Figure 4.8, CO2 Configuration Screens

ABC Calibration

ABC Calibration of the CO2 sensor can be enabled or disabled. Toggle between enable, “YES” and disable “NO” by using the WARMER or COOLER push buttons.

The default value is enabled, “YES”, to have ABC Calibration performed.

CO2 Calibration

When ABC calibration has been disabled (“NO”) the CO2 Calibration display screen is made available to provide manual calibration of the CO2 sensor. The

value seen on the screen is the actual measured CO2 value plus calibration offset. A measurement can be taken by another accurate CO2 sensing device in close proximity to the SI-40-N and then that measured value can be manually placed on the CO2 Calibration display screen. The desired CO2 value can be incremented with the WARMER push button and decremented with the COOLER push button. The CO2 value is in parts per million (ppm). The adjustment resolution is in one (1) ppm. The range of adjustment is from 1 to 5000 ppm.

The default value is with no calibration adjustment.

Atmospheric Pressure Setting

When ABC calibration has been disabled ("NO") the Atmospheric Pressure Setting display screen is made available to provide compensation for changes in elevation. The desired value can be incremented with the WARMER push button and decremented with the COOLER push button. The Atmospheric Pressure is in inches of mercury (in Hg). The adjustment resolution is in hundredths (0.01) of an inch of mercury. The range of adjustment is from 15.00 to 35.00 in Hg.

The default Atmospheric Pressure is at sea-level and is 29.22 in Hg.

CO2 Trip ON Alarm

The IAQ Multi-Sense application has the ability to provide an output relay alarm response when the CO2 level reaches a Trip ON limit.

To enable the CO2 Trip ON Alarm condition, the ambient CO2 must go above the CO2 Trip ON limit. When the ambient CO2 is above the CO2 Trip ON limit, the corresponding output relay contact, if selected, will close.

The CO2 setting for the CO2 Trip ON alarm can be incremented with the WARMER push button and decremented with the COOLER push button. The CO2 Trip ON value is in parts per million (ppm). The adjustment resolution is ten (10) ppm. The range of adjustment is from 0 to 3000.

The default CO2 Trip ON value is 1200.

The IAQ Multi-Sense application prevents the CO2 Trip ON value from being less than or equal to the CO2 Trip OFF value.

See the Configuration sections Set Relay 1 or Set Relay 2 for selecting and enabling the functionality of the corresponding output relay.

See CO2 Trip OFF Alarm in this section (Set CO2) for more information on setting the CO2 Trip OFF Alarm.

CO2 Trip OFF Alarm

The IAQ Multi-Sense application has the ability to provide an output relay alarm response when the CO2 level reaches a Trip OFF limit.

To enable the CO2 Trip OFF Alarm condition, the ambient CO2 must go below the CO2 Trip OFF limit. When the ambient CO2 is below the CO2 Trip OFF limit, the corresponding output relay contact, if selected, will open.

The CO2 setting for the CO2 Trip OFF alarm can be incremented with the WARMER push button and decremented with the COOLER push button. The CO2 Trip OFF value is in parts per million (ppm). The adjustment resolution is ten (10) ppm. The range of adjustment is from 0 to 3000.

The default CO2 Trip OFF value is 800.

The IAQ Multi-Sense application prevents the CO2 Trip OFF value from being greater than or equal to the CO2 Trip ON value.

See the Configuration sections Set Relay 1 or Set Relay 2 for selecting and enabling the functionality of the corresponding output relay.

See CO2 Trip ON Alarm in this section (Set CO2) for more information on setting the CO2 Trip ON Alarm.

4.9 Set VOC

Block Diagram

Figure 4.9 shows a block diagram of the screens that are available to set the configuration parameters for VOC.

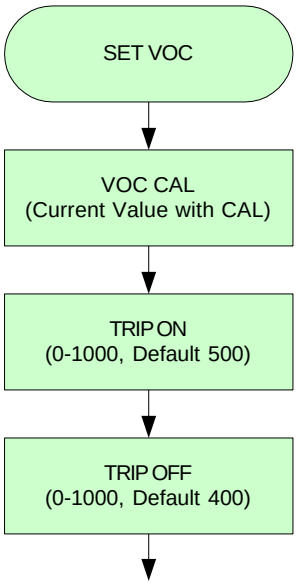


Figure 4.9, VOC Configuration Screens

VOC

Adjust the offset value that is added to the measured VOC to provide an adjusted measured VOC. The WARMER push button will increment and the COOLER push button will decrement the VOC-offset value. The offset value is has no units and is scaled over the range of the VOC sensor. The adjustment resolution is a value of one (1). The range for adjustment is ±500.

The default offset value is 0.

VOC Trip ON Alarm

The IAQ Multi-Sense application has the ability to provide an output relay alarm response when the VOC level reaches a Trip ON limit.

To enable the VOC Trip ON Alarm condition, the ambient VOC must go above the VOC Trip ON limit. When the ambient VOC is above the VOC Trip ON limit, the corresponding output relay contact, if selected, will close.

The VOC setting for the VOC Trip ON alarm can be incremented with the WARMER push button and decremented with the COOLER push button. The VOC Trip ON value is has no units and is scaled over the range of the VOC

sensor. The adjustment resolution is one (1). The range of adjustment is from 1 to 1000.

The default VOC Trip ON value is 500.

The IAQ Multi-Sense application prevents the VOC Trip ON value from being less than or equal to the VOC Trip OFF value.

See the Configuration sections Set Relay 1 or Set Relay 2 for selecting and enabling the functionality of the corresponding output relay.

See VOC Trip OFF Alarm in this section (Set VOC) for more information on setting the VOC Trip OFF Alarm.

VOC Trip OFF Alarm

The IAQ Multi-Sense application has the ability to provide an output relay alarm response when the VOC level reaches a Trip OFF limit.

To enable the VOC Trip OFF Alarm condition, the ambient VOC must go below the VOC Trip OFF limit. When the ambient VOC is below the VOC Trip OFF limit, the corresponding output relay contact, if selected, will open.

The VOC setting for the VOC Trip OFF alarm can be incremented with the WARMER push button and decremented with the COOLER push button. The VOC Trip OFF value is has no units and is scaled over the range of the VOC sensor. The adjustment resolution is one (1). The range of adjustment is from 1 to 1000.

The default VOC Trip OFF value is 400.

The IAQ Multi-Sense application prevents the VOC Trip OFF value from being greater than or equal to the VOC Trip ON value.

See the Configuration sections Set Relay 1 or Set Relay 2 for selecting and enabling the functionality of the corresponding output relay.

See VOC Trip ON Alarm in this section (Set VOC) for more information on setting the VOC Trip ON Alarm.

4.10 Set Point Adjust

Introduction

The Set Point Adjust is used to establish a range that provides comfort adjustment for the ambient temperature within a space. The adjustment mechanism is the variation of resistance in a digital potentiometer on the SI-40-N. An external controller or device can connect to this output resistance and then scale the resistance value to a temperature adjustment range on the controller or device. The comfort adjustment can then be used increase or decrease the ambient temperature in the occupied space.

Block Diagram

Figure 4.10 shows a block diagram of the screens that are available to set the configuration parameters for Set Point (Comfort Adjust).

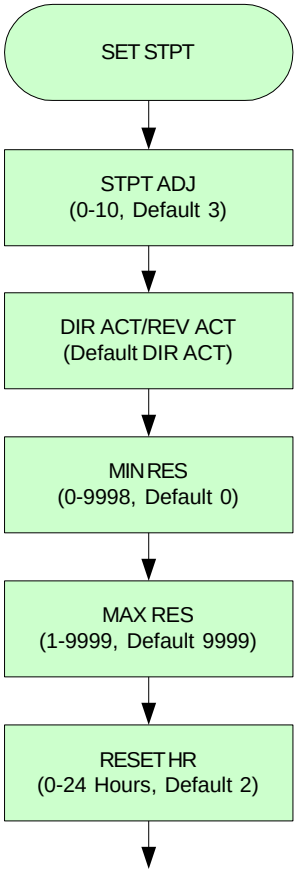


Figure 4.10, Set Point Adjust Configuration Screens

Set Point Adjustment Range

The Set Point Adjustment Range establishes a numeric value that allows the end user an adjustment range to increase or decrease the desired temperature for better comfort. Increasing the numeric value for the Set Point Adjustment Range allows the end user more points or better resolution to provide finer adjustments. Decreasing the numeric value for the Set Point Adjustment Range provides the

end user with less points or a larger resolution to provide a more coarse adjustment.

Increasing or decreasing the numeric range, which the end user can adjust over, does not increase or decrease the maximum or minimum output resistance. See Minimum Resistance and Maximum Resistance sections to increase or decrease the actual output resistance range.

The Set Point Adjustment Range can be incremented with the WARMER push button and decremented with the COOLER push button. The value can be incremented or decremented by one (1). The range of adjustment is from 0 to 10. A value of 0 disables set point adjustment and the output resistance will be fixed at the mid-range of the minimum and maximum resistance values.

The default Set Point Adjustment Range value is 3.

Direct Action/Reverse Action

The Direction Action selection of the Set Point Adjustment allows the output resistance to increase as the Set Point Adjustment value increases and the output resistance to decrease as the Set Point Adjustment value decreases. The Reverse Action selection of the Set Point Adjustment allows the output resistance to decrease as the Set Point Adjustment value increases and the output resistance to increase as the Set Point Adjustment value decreases.

The default value is for Direct Action.

Minimum Resistance

The Minimum Resistance of the set point adjustment output can be changed to meet specific requirements for the range of resistance the Set Point Adjust can travel or span. The Minimum Resistance value can be incremented with the WARMER push button and decremented with the COOLER push button. The value can be incremented or decremented by one (1). The range of adjustment is from 0 to 9998.

The default value is 0.

The IAQ Multi-Sense application prevents the Minimum Resistance value from being less than or equal to the Maximum Resistance value.

Maximum Resistance

The Maximum Resistance of the set point adjustment output can be changed to meet specific requirements for the range of resistance the Set Point Adjust can travel or span. The Maximum Resistance value can be incremented with the WARMER push button and decremented with the COOLER push button. The value can be incremented or decremented by one (1). The range of adjustment is from 0 to 9999.

The default value is 9999.

The IAQ Multi-Sense application prevents the Maximum Resistance value from being less than or equal to the Minimum Resistance value.

Reset Time (RESET HR)

After an end-user has changed the set point value for comfort on the User Interface Display screen a reset timer is started. When the reset timer expires, the IAQ Multi-Sense application will reset the set point value back to the mid-point setting of zero (0). Returning the adjustment back to the mid-point prevents the end-user adjustment from being maintained after the end-user or occupants have left the space.

The value on the configuration screen for the Reset Time is in hours. The Reset Time value can be incremented with the WARMER push button and decremented with the COOLER push button. The value can be incremented or decremented in one (1) hour units. The range of adjustment is from 0 to 24 hours. A value of zero (0) will disable the Reset Time and the set point adjust value entered by the end-user will be maintained until the end-user makes another change or power cycle resets the value.

The default value is 0 hours (Reset Time is disabled).

4.11 Set Relay 1 (OVRD)

Introduction

The SI-40-N has only two relay outputs. By default these relay outputs are set for "Override" and "CO2 Alarm". The IAQ Multi-Sense application has the feature to change the use of these relays. Based on the requirements of the end application the function of SI-40-N, output relays can be changed to meet the specific needs of the control system.

Relay 1 is referenced on the printed circuit board and back plate terminal by the label "OVRD" since this is the default functional operation of the output relay.

Table 4.11 below lists the configurable capabilities of Relay 1 (OVRD).

Screen Name	Name	Function
OVERRIDE	Override	Override request
TEMP LOW	Low Temperature Limit Alarm	Low temperature limit has been exceeded
TEMP HI	High Temperature Limit Alarm	High temperature limit has been exceeded
HUMIDIFY	Humidification	Control signal for humidification
DEHUMID	Dehumidification	Control signal for Dehumidification
CO2 ALM	CO2 Limit Alarm	CO2 limit has been exceeded
VOC ALM	VOC Limit Alarm	VOC limit has been exceeded

Table 4.11, Relay 1 Functional Operation Selections

Block Diagram

Figure 4.11 shows a block diagram of the screens that are available to set the configuration parameters for Relay 1 (OVRD Output).

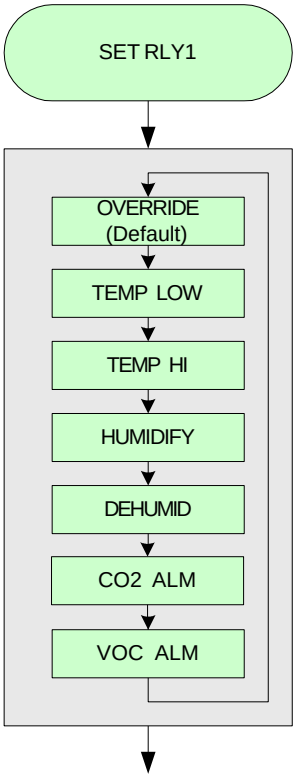


Figure 4.11, Relay 1 (OVRD Output) Configuration Screens

Relay Operation Selection

When entering "SET RLY1" the first value on the display will be the current setting of the relay operation. The display screen can be scrolled through various relay operations. The WARMER push button will scroll forward. The COOLER push button scroll backwards. The relay operation selected when leaving the selection screen will be the operation for the relay. Care must be taken when leaving the selection screen to ensure the proper functional operation has been selected.

The default operation of Relay 1 is override ("OVERRIDE").

4.12 Set Relay 2 (ALM)

Introduction

The SI-40-N has only two relay outputs. By default these relay outputs are set for "Override" and "CO2 Alarm". The IAQ Multi-Sense application has the feature to change the use of these relays. Based on the requirements of the end application the function of SI-40-N output relays can be changed to meet the specific needs of the control system.

Relay 2 is referenced on the printed circuit board and back plate terminal by the label "ALM" since the CO2 Limit Alarm is the default functional operation of the output relay.

Table 4.12 below lists the configurable capabilities of Relay 2 (ALM).

Screen Name	Name	Function
OVERRIDE	Override	Override request
TEMP LOW	Low Temperature Limit Alarm	Low temperature limit has been exceeded
TEMP HI	High Temperature Limit Alarm	High temperature limit has been exceeded
HUMIDIFY	Humidification	Control signal for humidification
DEHUMID	Dehumidification	Control signal for Dehumidification
CO2 ALM	CO2 Limit Alarm	CO2 limit has been exceeded
VOC ALM	VOC Limit Alarm	VOC limit has been exceeded

Table 4.12, Relay 2 Functional Operation Selections

Block Diagram

Figure 4.12 shows a block diagram of the screens that are available to set the configuration parameters for Relay 2 (ALM Output).

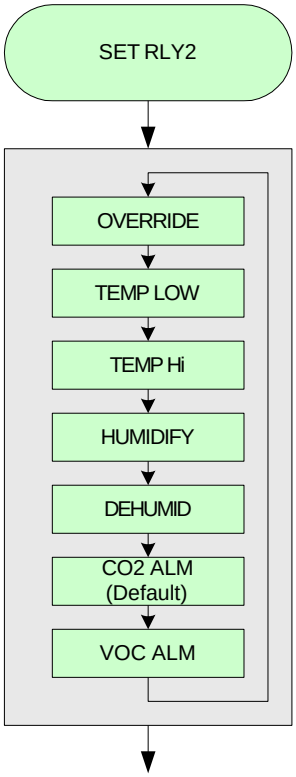


Figure 4.12, Relay 2 (ALM Output) Configuration Screens

Relay Operation Selection

When entering "SET RLY2" the first value on the display will be the current setting of the relay operation. The display screen can be scrolled through various relay operations. The WARMER push button will scroll forward. The COOLER push button scroll backwards. The relay operation selected when leaving the selection screen will be the operation for the relay. Care must be taken when leaving the selection screen to ensure the proper functional operation has been selected.

The default operation of Relay 2 is CO2 Limit Alarm ("CO2 ALM") for models:

SI-40-N-TC (Temperature, CO2)
SI-40-N-THC (Temperature, Humidity, CO2)
SI-40-N-THCV (Temperature, Humidity, CO2, VOC)

The default operation for Relay 2 is DeHumidification (DEHUMID) for model:

SI-40-N-TH (Temperature, Humidity)

.

4.13 Set Samples

Introduction

The conditions in an occupied space can fluctuate due to doors opening, the movement of occupants and other actions that can affect the flow and quality of air in a space. Ambient sensors can sense and respond to the changes in the occupied or unoccupied environment. The concern is with short duration fluctuations in the ambient space. Many times it is not practical for control systems to respond immediately to these changes. Time will dissipate the change and there may not be a need for the control system to provide an immediate response. To minimize the effects of short duration fluctuations in a control system the IAQ Multi-Sense features an adjustable averaging filter. The number of measurements or samples that are taken can be then be averaged to produce a more stable ambient reading. In the IAQ Multi-Sense Application the number of samples taken can be adjusted to meet the requirements for the control system. A default value is used that will provide an accurate response for a control system allowing the installer a quick and simple installation.

The sample value set in the IAQ Multi-Sense application is used for all sensor readings. There is no individual sample value adjustment provided for each sensor.

Block Diagram

Figure 4.13 shows a block diagram of the screens that are available to set the configuration parameters for Samples.

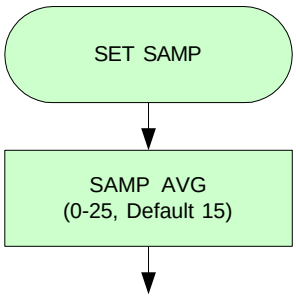


Figure 4.13, Sample Configuration Screens

Measurement Rate

When reviewing the capability to average the sensor measurements, the rate at which a sensor performs a measurement needs to be considered along with the number of samples taken.

The table below shows the rate at which each sensor performs a measurement of the ambient conditions.

Sensor	Measurement Rate (Seconds)
Temperature	1
Humidity	2
CO2	2
VOC	2

Table 4.13, Sensor Measurement Rate

As an example the CO2 sensor takes a reading every 2 seconds. The default number of samples taken when averaging is 15. Therefore, in this particular example, the CO2 reading on the display and value provided on the output is averaged over a 30 second period.

2 seconds per reading x 15 readings = 30 second period

Samples

The number of measurements or samples that are taken and averaged can be adjusted. The range of samples that can be taken is 0 to 25. A value of zero (0) will disable any samples from being taken and each measurement will be displayed as new measurements are taken. A sample value of one (1) will have the same effect except the averaging algorithm will be enabled and the single sample will be averaged over a value of one.

The WARMER push button will increment and the COOLER push button will decrement the number of samples that are taken and averaged.

The default sample average value is 15.

4.14 Set Maximum Analog Output Voltage

Introduction

The IAQ Multi-Sense has the feature for the analog outputs to have a maximum output voltage of 5 or 10 volts. The output voltage is software selectable. There is no jumper setting to adjust.

The analog outputs for the Humidity, CO2 and VOC will then scale accordingly from zero (0) to the maximum output voltage selected.

Block Diagram

Figure 4.14 shows a block diagram of the screens that are available to set the configuration parameters for Maximum Analog Output Voltage.

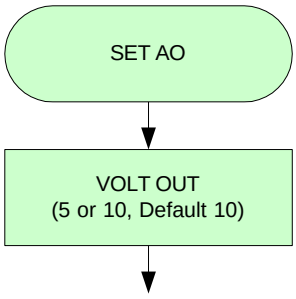


Figure 4.14, Maximum Analog Output Voltage Configuration Screens

Analog Output Voltage

The display screen will indicate “5” for a maximum output voltage setting of 5 volts and “10” for a maximum output voltage of 10 volts. The WARMER and COOLER push button will toggle the display between “5” and “10”.

The default value is for a maximum output voltage of 10 volts (“10”).

5

Specifications

5.1 Overview

This section includes the key electrical and environmental specifications for the SI-40-N.

5.2 Electrical

Power Supply Input

Nominal Input Voltage:	24 VAC/VDC
Input Voltage Range:	19.2-28.8 VAC 21-28 VDC

Maximum Power Consumption

SI-40-N-TC	1.5 VA
SI-40-N-TH	1.4 VA
SI-40-N-THC	1.6 VA
SI-40-N-THCV	2.0 VA

5.3 Environmental

Temperature

Operating	0 to 50 °C, 32 to 122 °F
Non-operating	-20 to 70 °C, -4 to 158 °C

Humidity

Operating	5 – 95% RH @ 25 °C (non-condensing)
Non-operating	5 – 95% RH (non-condensing)

5.4 Temperature Sensor

Display

Range:	Limits of Sensor (-37.22 to 115.56 °C, -35.0 to 240.0 °F), Note: must stay within operating temperature range of SI-40-N (0 to 50 °C, 32 to 122 °F)
Sensor Type:	Thermistor, 10K Type II
Accuracy:	±0.5 °C, ±1.0 °F
Resolution:	0.1 degree both °C and °F (default), Optional software selectable 0.5 and 1 degree.

Output

Sensor Type:	Thermistor, 10K Type II
Accuracy:	±0.2 °C, ±0.36 °F (0 to 70 °C, 32 to 158 °F)

5.5 Humidity Sensor

Display

Range:	0.00 to 99.99 %RH
Type:	Capacitive 4C CMOSens®
Accuracy:	±1.8% RH (10 to 90% RH)
Repeatability:	+0.1 %RH, typical
Hysteresis:	±1 %RH, typical
Long Term Drift:	<0.5 %RH/yr, typical

Output

Analog Output:	0-10 VDC (default), 0-5 VDC (Software selectable)
Resolution:	12 Bit
Accuracy:	±0.5% FS (25°C, 77°F)
Protection Circuitry:	ESD

5.6 CO2 Sensor

Display

Range:	0 to 9999 ppm

Sensor

Type:	Non-Dispersive Infrared (NDIR)
Accuracy:	±30 ppm ±2% of measured value (25°C, 101.325KPa)
Repeatability:	±20ppm ±1% of measured value

Output

Analog Output:	0-10 VDC (default), 0-5 VDC (Software selectable)
Resolution:	12 Bit
Accuracy:	±0.5% FS (25°C, 77°F)
Protection Circuitry:	ESD

5.7 VOC Sensor

Display

Range:	0 to 1000 (no units), scaled over range of sensor

Sensor

Type:	Metal Oxide Semiconductor
Target Gases:	Air Contaminants

Output

Analog Output:	0-10 VDC (default), 0-5 VDC (Software selectable)
Resolution:	12 Bit
Accuracy:	±0.5% FS (25°C, 77°F)
Protection Circuitry:	ESD

5.8 Set Point Adjust

Output

Resistance Range:	0 – 10K ohms
Resolution:	256 bits over range

5.9 Output Relays

Relay Output 1 (OVRD)

Type:	1 form A (normally open)
Max Current Rating:	1 Amp @ 30 VDC resistive load
Max Voltage:	60 Volts peak

Relay Output 2 (ALM)

Type:	1 form A (normally open)
Max Current Rating:	1 Amp @ 30 VDC resistive load
Max Voltage:	60 Volts peak

6

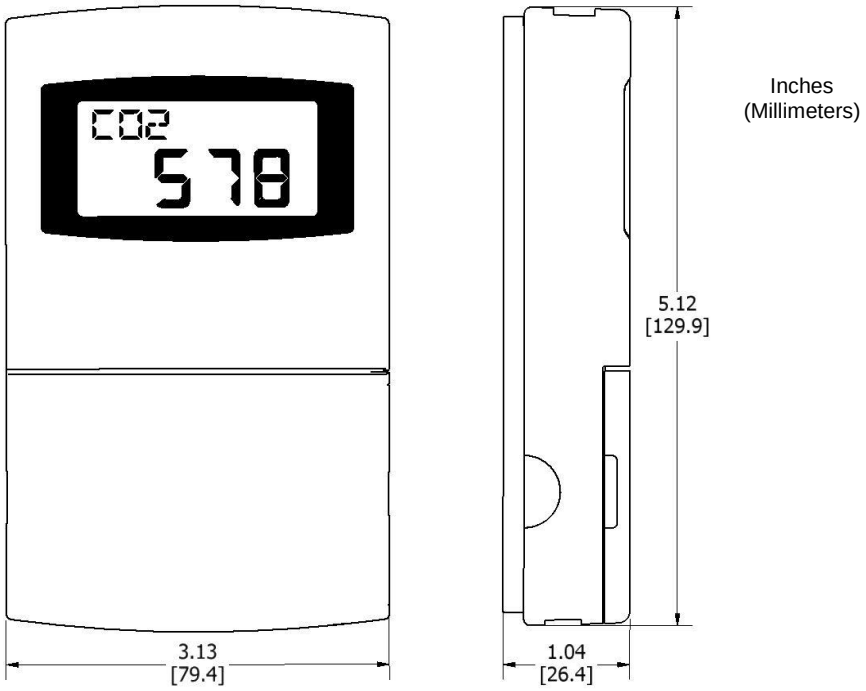
Mechanical

6.1 Overview

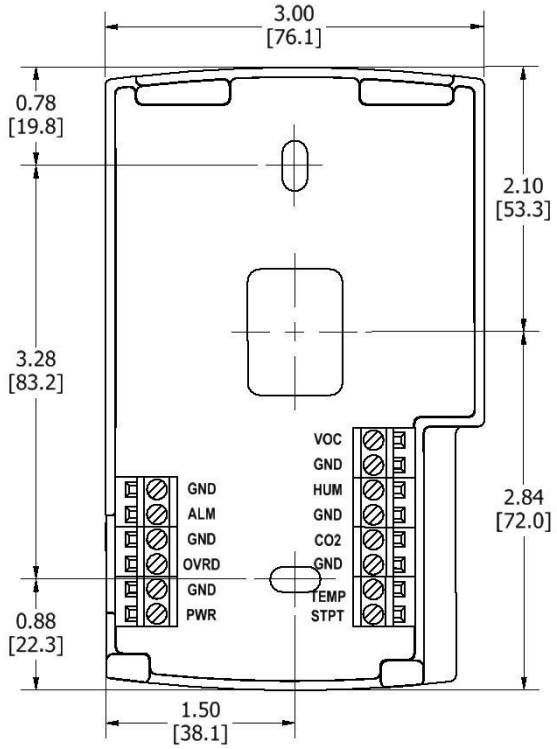
This section includes the key mechanical dimensions and mounting information for the SI-40-N.

6.2 Dimensions

Overall Dimensions



Base Plate



Inches
(Millimeters)

6.3 Mounting

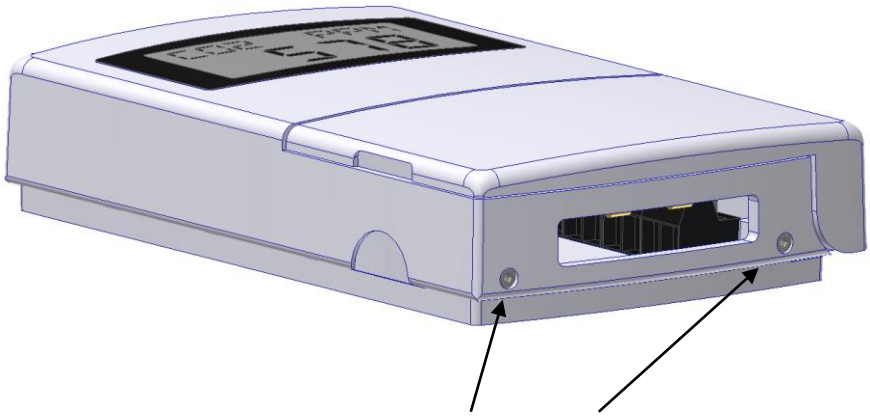
Location

Position the SI-40-N vertically on the wall in the proper up-right position. The SI-40-N should be mounted approximately 4 ½ feet (54 inches) high from the floor and should be located on an interior wall. Do not mount the SI-40-N close to windows, vents or any other type of ventilation or heating/cooling source.

Locking Set Screws

When removing the cover from the base, make sure the two locking set screws at the bottom of the cover are not protruding into the cover and locking the cover in place. To release the cover from the base use a 1/16 inch hex key or allen wrench to back the screws into the base to free the cover for removal.

The locking screws prevent the cover from being easily removed without the necessary tools. Locking the cover to the base also prevents removal of the SI-40-N once mounted at its proper location.

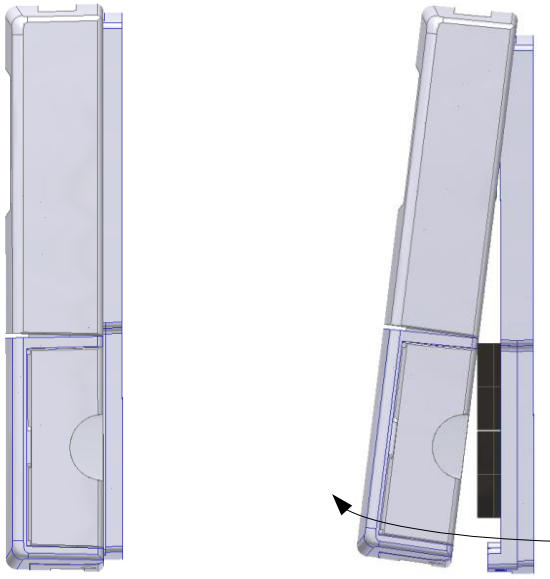


Set Screws to lock Cover to Base. Use 1/16 inch hex key or allen wrench to adjust.

Figure 6.3.1, Set Screw Location

Cover Removal – Not Mounted

When not mounted on a wall, remove the cover by holding onto the base with one hand and then with the other hand, hold the bottom of the cover and gently pull the bottom portion of the cover away from the base. This will create a small lever like motion. See Figure 6.3 for gently pulling on the bottom of the cover.



Pull bottom of Cover away from Base.

Figure 6.3.2, Remove Cover by first gently pulling the bottom portion of the Cover away from the Base.

Note, the mounting tabs on the cover and the mounting slots on the base will still fasten the top of the cover to the base at this point. See Figure 6.3.3.

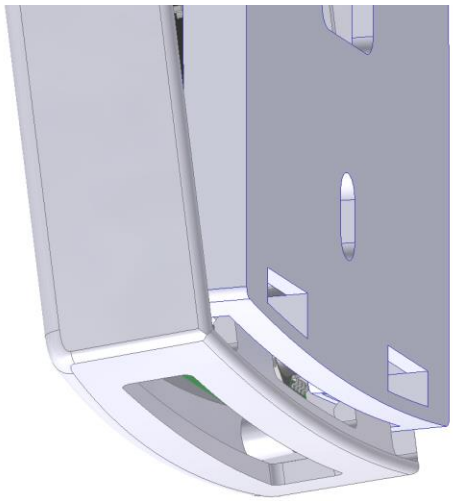


Figure 6.3.3, Top Cover Mounting Tabs and Top Base Mounting Slots

Once the bottom of the cover becomes free from the base, apply a small upward motion to remove the top mounting tabs on the cover from the top mounting slots on the base fully releasing the cover from the base. See Figure 6.3.4. Care must be taken when applying the small upward motion so that the mounting slots on the base do not hit or damage any sensors or circuit components inside the cover.

Move Cover slightly upward and away from base to remove cover mounting tabs from base mounting slots and free the cover from the base.

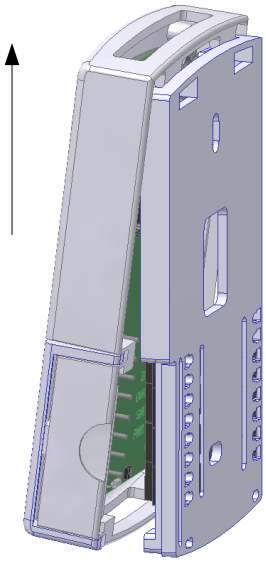


Figure 6.3.4, Remove the Cover mounting tabs from the Base mounting slots.

Cover Removal - Mounted

When mounted on a wall, remove the cover by holding the bottom of the cover by its sides and gently pull the bottom portion of the cover away from the base. This will create a small lever like motion. Note, the mounting tabs on the cover and the mounting slots on the base will still fasten the top of the cover to the base at this point. Once the bottom of the cover becomes free from the base, apply a small upward motion to remove the top mounting tabs on the cover from the top mounting slots on the base, fully releasing the cover from the base. Care must be taken when applying the small upward motion so that the mounting slots on the base do not hit or damage any sensors or circuit components inside the cover.

Base Plate Mounting

There are two mounting holes in the base plate to mount the SI-40-N to a wall, junction box or other fixture. See Section 6.2 for dimensions of base plate and mounting holes. Note, all connection wires are run through the center rectangular hole to the base plate plugs.

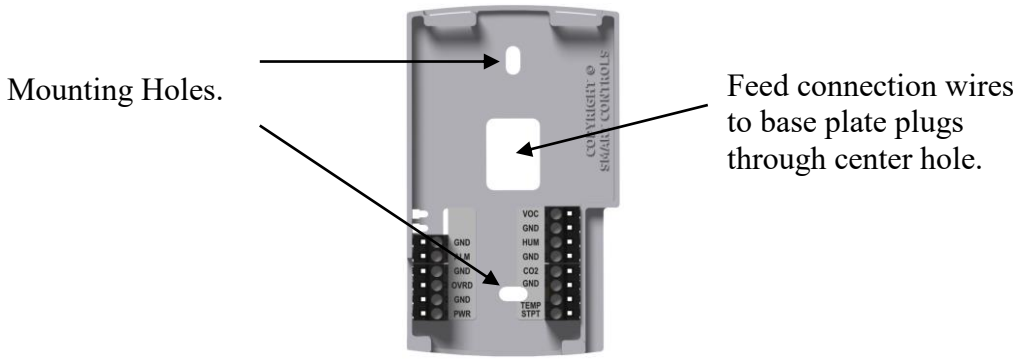


Figure 6.3.5, Mounting Hole Location

Wiring

See section 7.1 for an example of how to wire the SI-40-N.

Cover Placement

To place the cover back on the base, align the mounting tabs on the top of the cover with the mounting slots on the base. See Figure 6.3.6. Slide the mounting tabs into the mounting slots.

Figure 6.3.6, Align Cover Mounting Tabs with Base Mounting Slots

Pivot the bottom of the cover into the base plate connecting the terminals on the cover with the plugs on the base. See Figure 6.3.7. Make sure the locking set screws are not protruding from the base while pivoting the cover. The locking set screws will prevent the base from fully pivoting shut if they are protruding while trying to place the cover on the base.

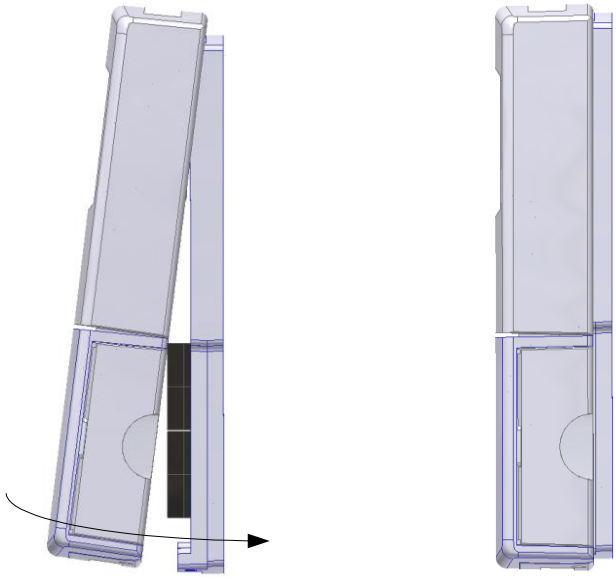


Figure 6.3.7, Pivot the Bottom of the Cover on into the Base

Once the cover is fastened to the base, the locking set screws can be backed out to securely lock the cover to the base.

7

Wiring

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7.1 Example Diagram

This section includes example wiring of the SI-40-N

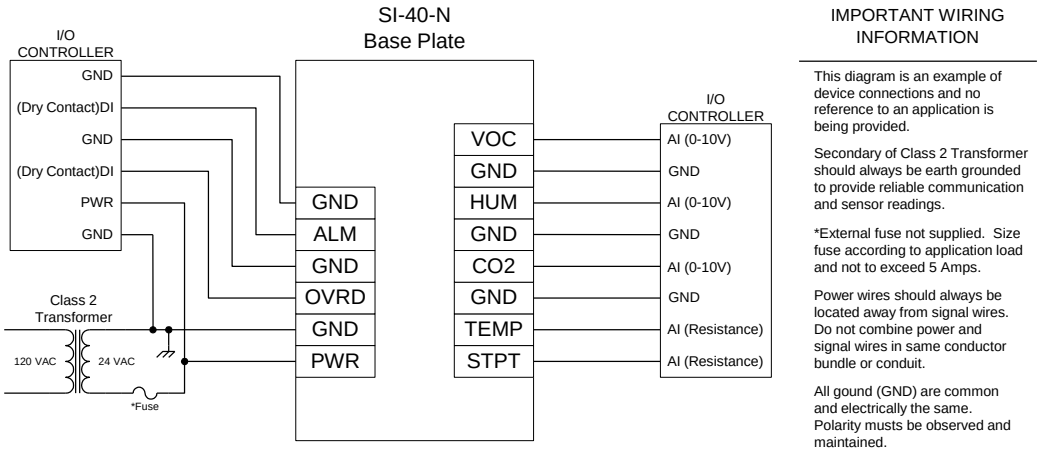

Figure 7.1, Example Wiring Diagram for the SI-40-N

The OVRD and ALM relay outputs can have different functional operations based on the configuration settings for Relay 1 (OVRD) and Relay 2 (ALM). The default for the OVRD relay output is to be controlled by the override push button function. The default for the ALM relay output is to be controlled by the CO2 alarm function. Under Configuration see section 4.11 Set Relay 1 (OVRD) and section 4.12 Set Relay 2 (ALM) for additional information.