



System Manager TS II Technical Guide

VCB-X Controller Code: SS1051 Version 2.0 and up
VCM-X Controller: SS1026 & Y200920 Version 2.0 and up;
VCM-X Modular Controller: Tulsa - SS1030; Coil - SS1034
VCM-X WSHP Controller: Tulsa - SS1032; Coil - SS1033
VAV/Zone Controller: SS1001, SS1005, SS1025



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OVERVIEW

System Manager TS II

Features

The ASM01897 System Manager TS II (Touch Screen) provides a direct, graphic-enhanced, menu-driven link to enable you to view the status and adjust the setpoints of most controllers on the Orion Controls System. (See **Figure 1.**)

The System Manager TS II provides the following useful functions:

- Provides a 4.3" 480 x 272 WQVGA RGB TFT LCD Graphical Touch Screen LCD display with 16 million colors
- Utilizes a graphical touch screen menu system with easy-to-understand menu trees and icons and non-cryptic, plain English language messages
- Makes entering data quick and easy with instructions on each configuration and setpoint screen
- Graphic programming and status screens provide easy setup and operation without the need for specialized training
- Provides protection from unauthorized users through integral multi-level passcode authorization programming
- Comes equipped with real-time clock backup power supply for short power losses
- Provides icons to indicate alarm conditions
- LEDs behind plastic panel indicate power, communications, and operation
- Plastic enclosure allows for easy flush wall mounting in hollow drywall or surface mounting on solid wall surface

System Requirements

- The System Manager TS II is packaged and assembled as flush wall mount. Surface mount components are also included for your convenience.
- If using the surface mount version, you will need a double duplex outlet box (by others).
- The System Manager TS II only works with the following VAV/Zone Controller EPROMs: SS1001, SS1005, SS1025.
- The System Manager TS II only works with the following VCM-X, VCM-X Modular, VCM-X WSHP, and VCB-X Controller EPROMs: All standard SS1016, SS1026, SS1030, SS1032, SS1033, SS1034, SS1051 and later.
- *• USB-Link, CommLink, or MiniLink Polling Device

***NOTE:** Alarm polling must first be set up in Prism 2. This requires a personal computer with Prism 2 software and a USB-Link or CommLink and a MiniLink Polling Device. Ongoing alarm polling on the *System Manager TS II Main Screen* requires a MiniLink to be connected to the system.



Figure 1: System Manager TS II

COMPONENTS AND WIRING

Mounting, Wiring, Initializing, and Updating

Environmental Requirements

The System Manager TS II needs to be installed in an environment that can maintain a temperature range between 14°F and 158°F with less than 90% RH levels (non-condensing).

Mounting

The System Manager TS II is housed in a plastic enclosure designed for mounting in hollow drywall construction or a control panel cover with the flush wall mount version (shown in **Figure 3, page 6**) or on a concrete, brick, or other solid wall surface with the surface mount version (shown in **Figure 4, page 7**).

The flush wall mount version has integral wingnut paddles that are tightened after installation to grip the drywall and hold the System Manager TS II in place. For mounting in a control panel cover or other thin material, (4) adhesive backed rubber pads are provided to assist in securing the System Manager TS II into the cutout in the panel. These pads are applied to the wingnut paddles to provide a non-slip mounting against the panel's sheet metal surface. See **Figure 2** for pad placement details.

The surface mount version is designed to be installed in a double duplex outlet box (by others). Both mounting styles of the System Manager TS II feature an integral, magnetically-secured face plate which can be easily removed for reset of the display when required.

The System Manager TS II should be mounted at approximately eye level to allow for ease of programming and reading of the display. The System Manager TS II is typically mounted in the building manager's or superintendent's office or in an equipment room, but is also quite suitable for mounting in any location or with most decors.

Care

The System Manager TS II should be cleaned with a soft, dust-free cloth. Do not use any liquid to clean your System Manager TS II. You should *press* the **<Suspend>** button located behind the cover to temporarily freeze the touch pad before you attempt to clean your screen. See the Troubleshooting section on **page 53** for details.

Wiring

The System Manager TS II is connected to the local communications loop of the Orion system via 18 AWG 2-conductor, twisted pair with shield wire connected to the T, SHLD & R communication terminals on the back of the System Manager TS II. The communications wire used can be either our WattMaster #WR-LL-WG-18 communications wire or Belden #82760 wire or its equivalent.

The System Manager TS II also requires that 24 VAC (6 VA) power be supplied (by others) to its + and - wiring terminal located on the back of the System Manager TS II.

See **Figures 5-8, pages 8-11** for wiring details. These wiring diagrams depict wiring the System Manager TS II to the VCM-X Controller, VCB-X Controller and VAV/Zone Controller. The System Manager TS II can also be wired to the local loop terminals on the MiniLink PD, Power Comm Board, or any other add-on controller's local loop terminals. It will still require a transformer to be wired as shown in **Figures 5, 6 & 7, pages 8-10**.

Dipswitch and Jumper Settings

If you are using a VCB-X Controller set at high speed, Dipswitch OPT1 should be set to ON; in all other instances, it should be set to OFF. As of April 2014, Dipswitch OPT4 should be set to ON by default. Previous versions should be set to OFF. If you see your screen is not centered correctly, switch OPT4 to the opposite position. Dipswitches OPT2 and OPT3 should always be set to OFF. See **Figures 5-8, pages 8-11** for details.

If you have a Stand-Alone system (no CommLink or MiniLink, the TERM Jumpers must be ON. For applications with CommLink(s) and/or MiniLink(s), the TERM Jumpers must be OFF. See **Figures 5-8, pages 8-11** for details.

Technical Support

Call (866) 918-1100 to talk to an AAON Technical Support Representative. Support is available Monday through Friday, 7:00 AM to 5:00 PM central standard time.

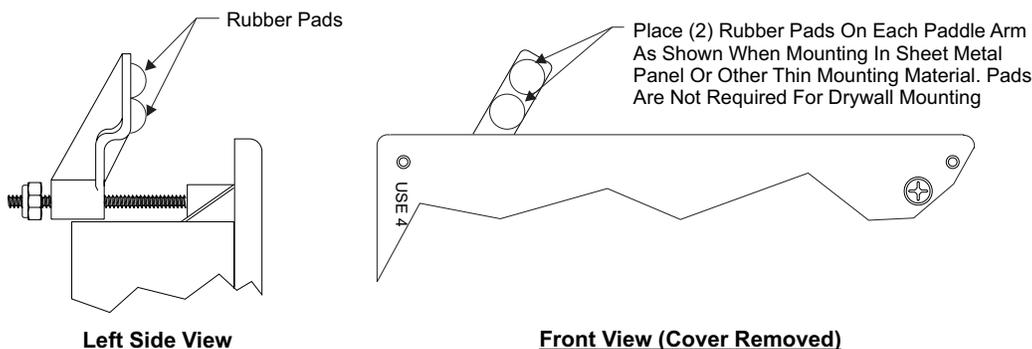


Figure 2: System Manager TS II - Control Panel Mounting Pad Placement Detail (Flush Wall Mount)

COMPONENTS AND WIRING

Wall Mount Dimensions and Components

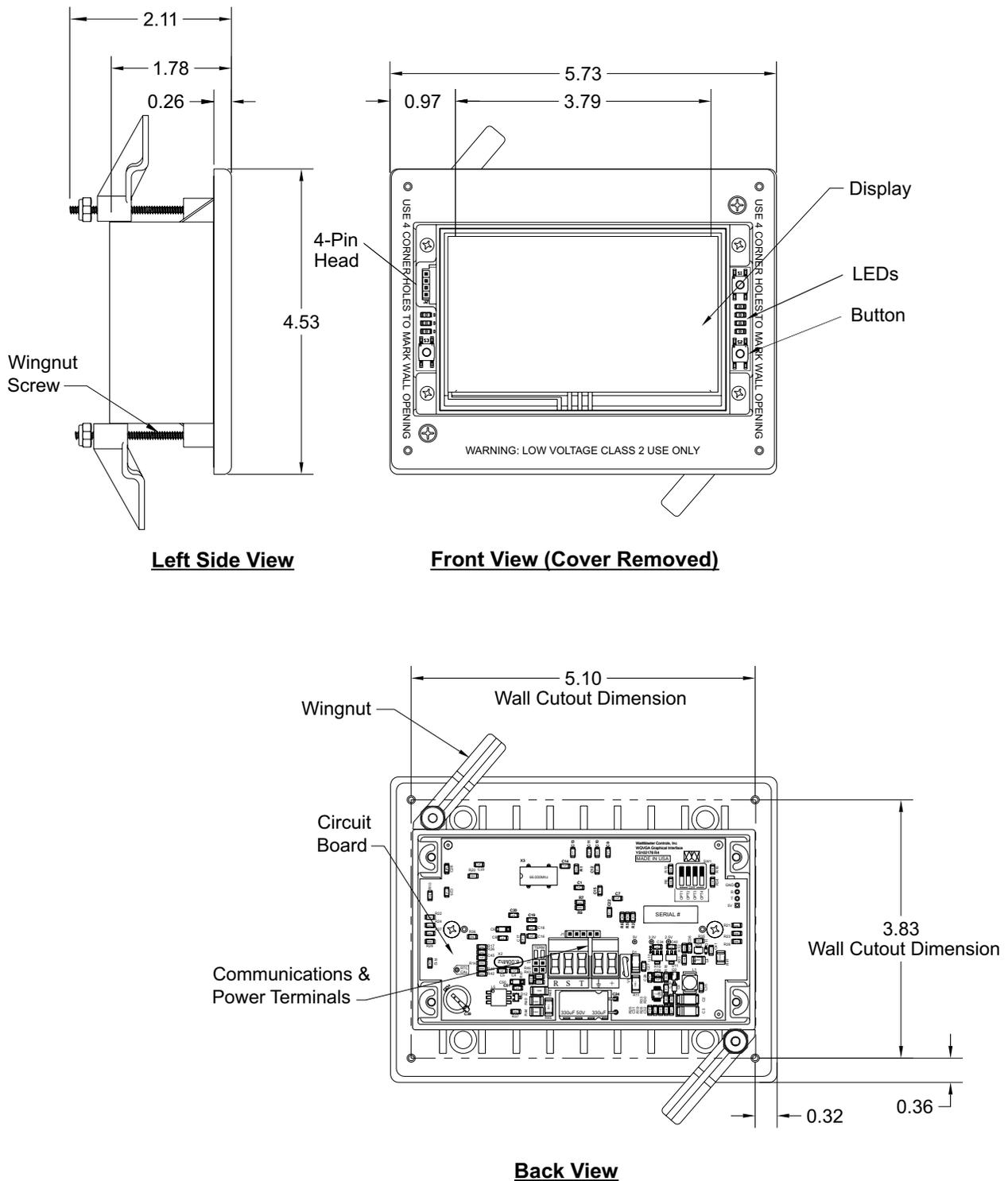
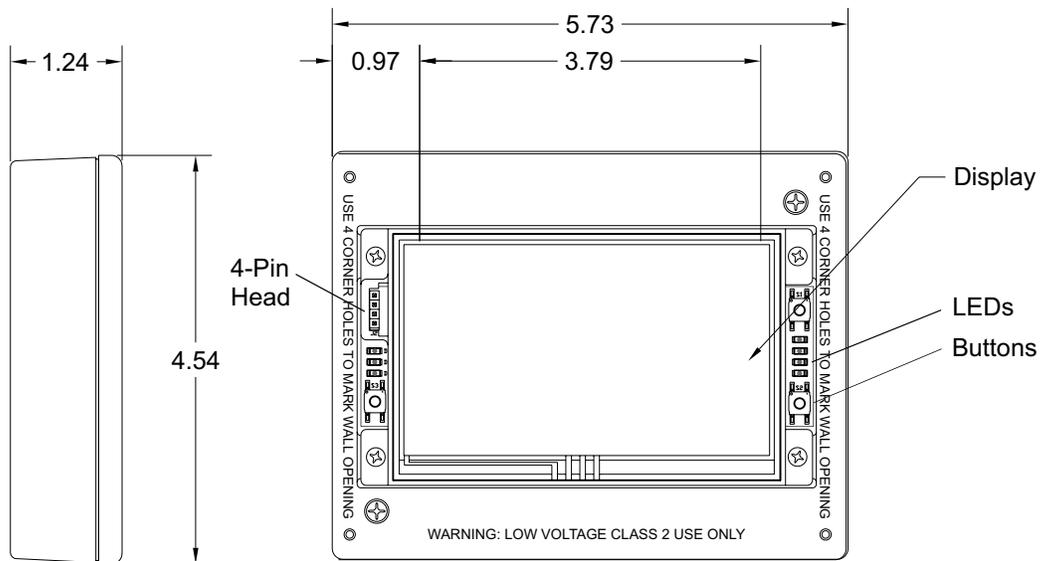


Figure 3: System Manager TS II Dimensions and Components (Flush Wall Mount)

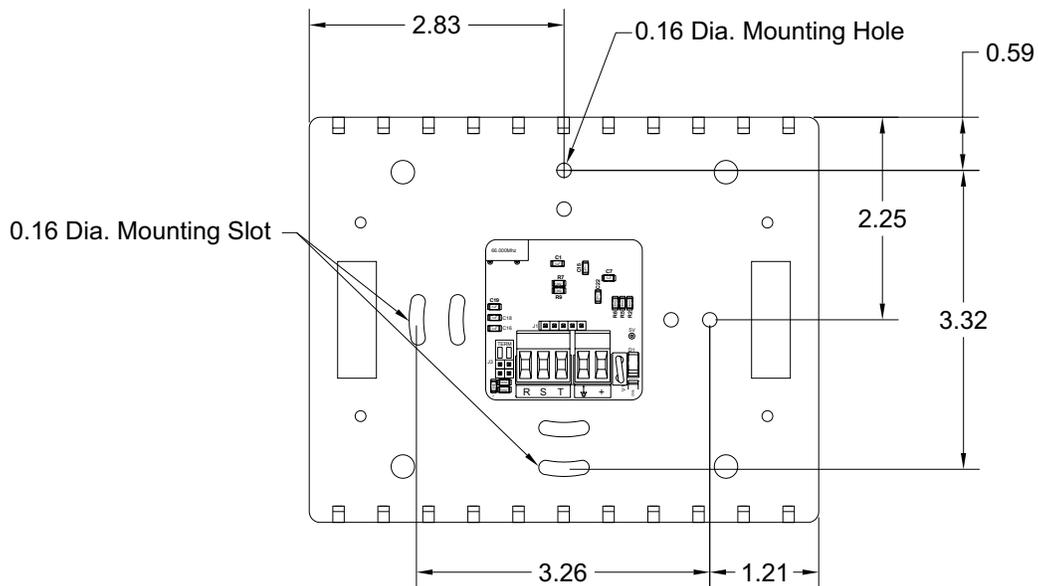
COMPONENTS AND WIRING

Surface Mount Components and Dimensions



Left Side View

Front View (Cover Removed)



Back View

Figure 4: System Manager TS II Dimensions and Components (Surface Mount)

COMPONENTS AND WIRING

SMTS II to VCM-X Controller Wiring

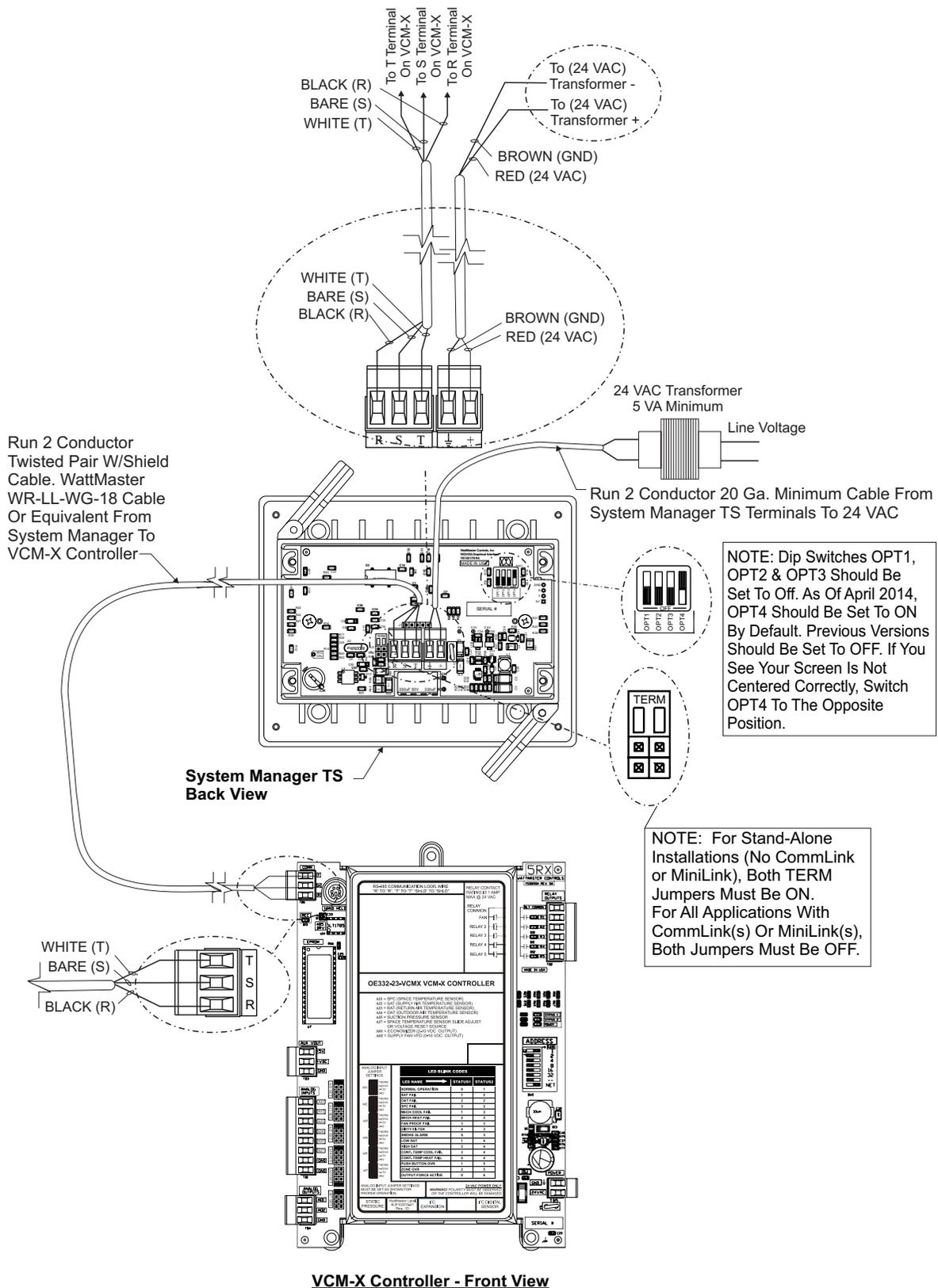


Figure 6: System Manager TS II to VCM-X Controller Wiring

COMPONENTS AND WIRING

SMTS II to VCB-X Controller Wiring

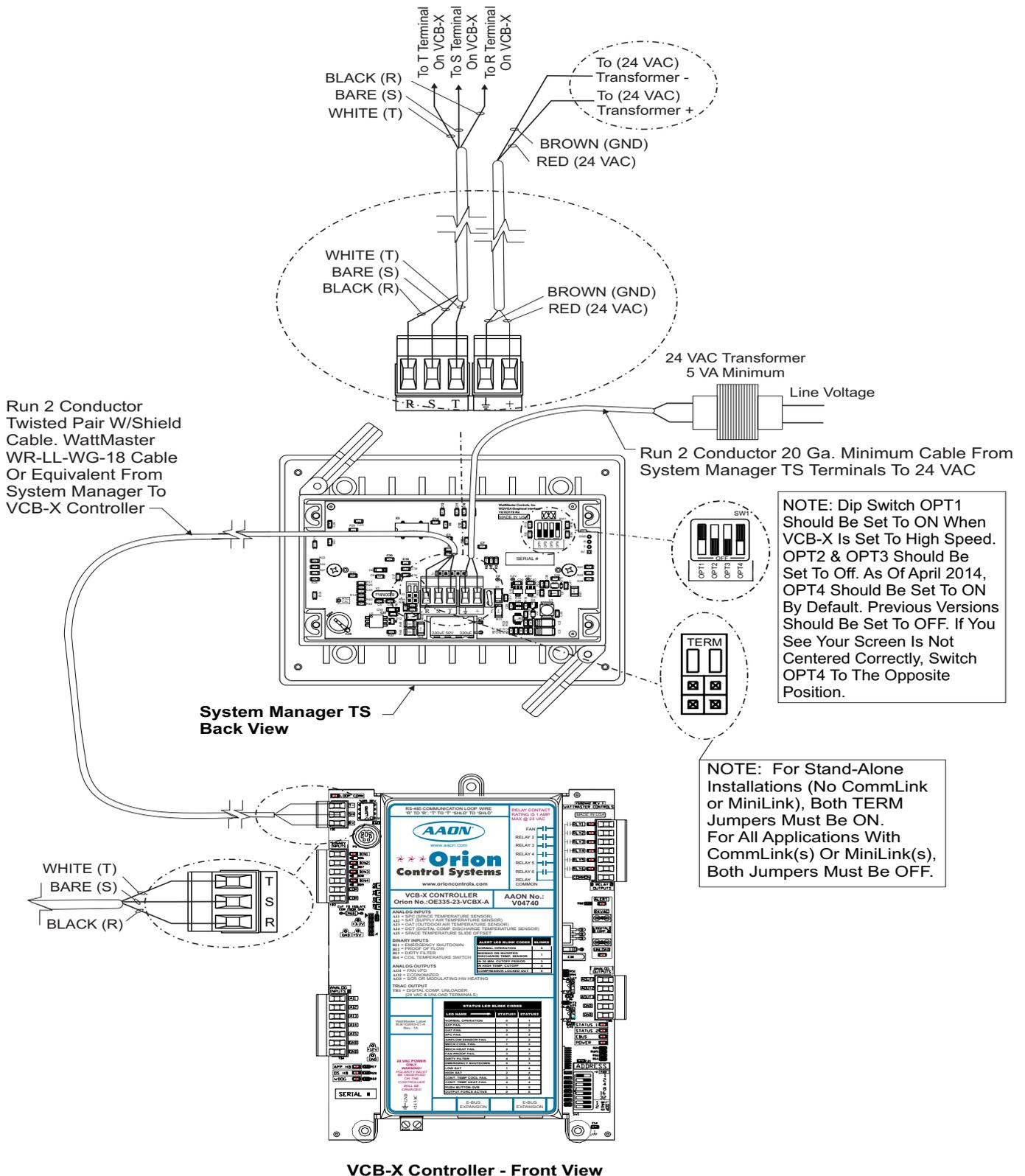


Figure 7: System Manager TS II to VCB-X Controller Wiring

COMPONENTS AND WIRING

SMTS II to VAV/Zone Controller Actuator Package Wiring

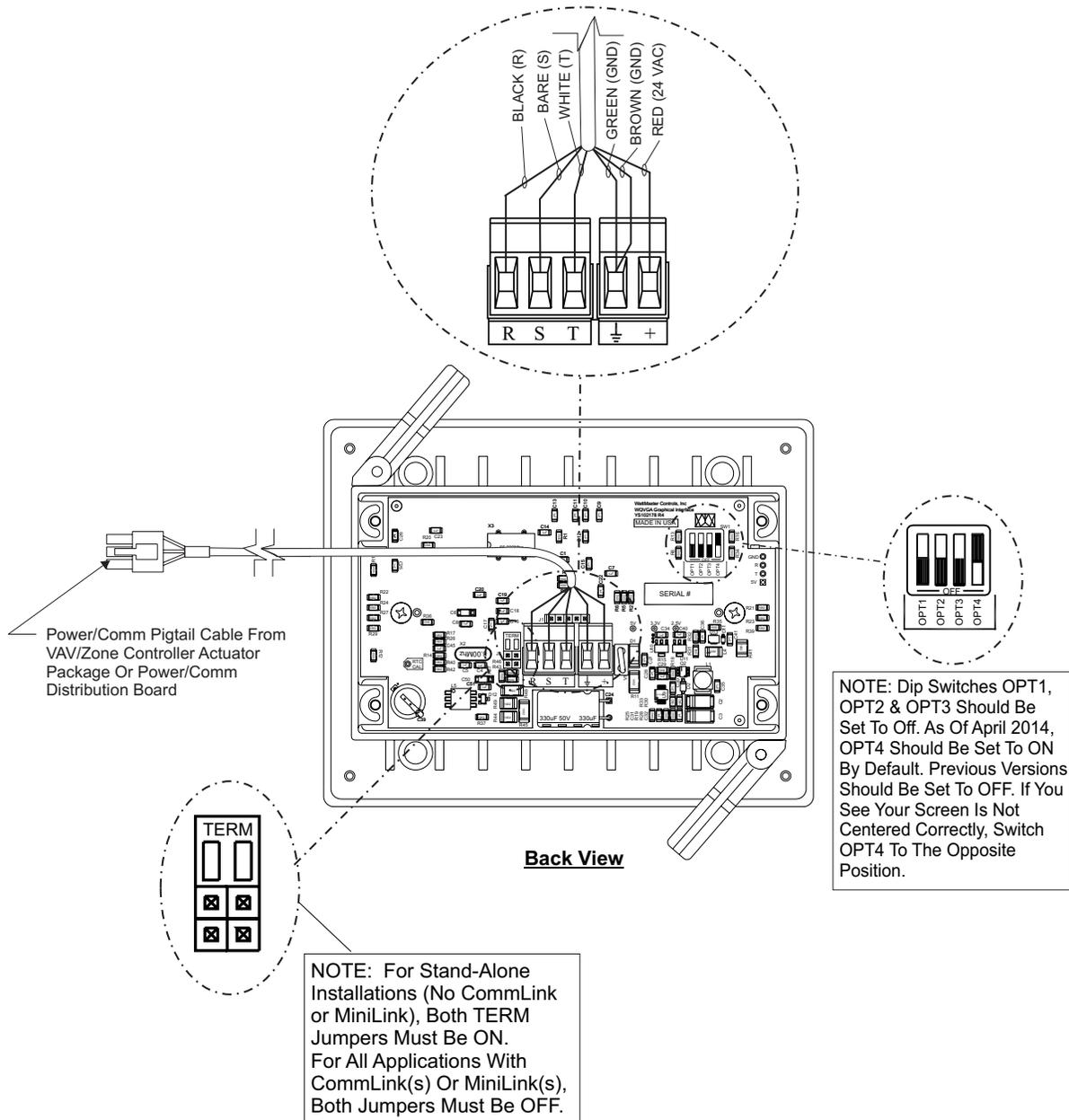


Figure 8: System Manager TS II Wiring to Power/Comm Distribution Board or VAV/Zone Actuator Package Wiring

NAVIGATION

Main Screen Icons and Button Functions

Icons and Button Functions

System settings and screens are easily accessible by simply *touching* one of the six icons on the *Main Screen*. The subscreens contain yellow highlighted data entry boxes with accessible number keypads for data entry and screen maneuvering buttons such as **<Esc>**, **<Back>**, and **<OK>**.

NOTE: Do not attempt to make changes to the Touch Screen while the Unit Controller is initializing. This can cause programming errors.

Main Screen Icons

There are six *Main Screen* icons. See **Table 1** for a list of the *Main Screen* icons and their functions.

| Icon | Main Screen Icons |
|---|---|
|  | The <My System> icon takes you to a <i>Unit Selection Screen</i> which takes you directly to the selected controller's <i>Status Screen</i> . |
|  | When bright red, the <Alarms> icon takes you to the <i>Alarms Screen</i> . When bright green, no alarms are present. This icon is only useful when your SMTS II is set for multiple managers or network mode and you have configured alarm polling using Prism 2 software. |
|  | |
|  | The <Login> icon takes you to the <i>Login Screen</i> where you enter your passcode. |
|  | The <User Passcodes> icon takes you to the <i>System Manager Passcode Levels Screen</i> if you are a Level 3 user. |
|  | The <Settings> icon takes you to the <i>System Settings Screen</i> where you can change the Backlight settings, set the System Manager address, and enable alarm polling. System settings are only accessible to a Level 3 user. |
|  | The <Set Time & Date> icon takes you to the <i>Set Time and Date Screen</i> . Any level of user can set the time and date. |

Table 1: Main Screen Icon Functions

Navigation Buttons

See **Table 2** for a list of Navigation buttons and their functions.

| Button | Function |
|--|--|
|  | Use the <Esc> (Escape) key to exit from data entry without saving any new data. |
|   | Use the small <Back> button located in the top right corner of a <i>Data Entry Screen</i> to return to the controller's <i>Status Screen</i> . Use the large <Back> button located at the bottom left of other screens to return to the previous screen. |
|  | Use the <+> key to step to the next screen. |
|  | Use the <-> key to step to the previous screen. |

Table 2: Navigation Button Functions

Selection, Configuration, and Setpoint Buttons

See **Table 3** for a list of Selection, Configuration, and Setpoint buttons and their functions.

| Button | Function |
|---|--|
|  | Use the <OK> key to save the data you just selected or entered. |
|  | <i>Touch</i> the grey radio button to make your selection. A white circle will designate that the item is selected. You can only select one radio button item per screen. |
|  | <i>Touch</i> the grey square selection box to make your selection. A white square will designate that the item is selected. You can make numerous square box item selections per screen. |
|  | The <Setpoints> button, appearing on the controller's <i>Status Screen</i> , takes you directly to the controller's <i>Temperature Setpoint Screen</i> . |
|  | The <Overrides> button, appearing on various controllers' <i>Status Screens</i> , takes you directly to the controller's <i>Force Schedules Screen</i> . |
|  | The <Schedules> button, appearing on various controllers' <i>Status Screens</i> , takes you directly to the controller's <i>Schedule Screen</i> . |
|  | The <Holidays> button, appearing on various controllers' <i>Status Screens</i> , takes you directly to the controller's <i>Holidays Screen</i> . |
|  | The <Alarm> button, appearing on the controller's <i>Status Screen</i> , takes you directly to the controller's <i>Alarms Screen</i> . If red, alarm(s) are present. If black, no alarm(s) are present. |

Table 3: Configuration Selection Buttons

NAVIGATION

Main Screen Icons and Button Functions

VCM-X & VCB-X Setpoint Buttons

The VCM-X & VCB-X Setpoint Buttons are located at the bottom of each controller's *Setpoints Screen*. See **Table 4** for a list of the Setpoint buttons and their functions. Level 1 and Level 2 users can view these screens and change occupied heating and cooling setpoints, but only a Level 3 user can make changes to all setpoints.

| Button | Function |
|---|--|
|  | The <Temps> button, located at the bottom of the controller's <i>Setpoints Screen</i> , takes you directly to the controller's <i>Temperature Setpoints Screens</i> . |
|  | The <Static> button, located at the bottom of the controller's <i>Setpoints Screen</i> , takes you directly to the controller's <i>Static & Air Setpoints Screens</i> . |
|  | The <Staging> button, located at the bottom of the controller's <i>Setpoints Screen</i> , takes you directly to the controller's <i>Staging Delays Screens</i> . |
|  | The <Misc> button, located at the controller's <i>Setpoints Screen</i> , takes you directly to the controller's <i>Miscellaneous Setpoints Screens</i> . |
|  | The <Relays> button, located at the bottom of the controller's <i>Setpoints Screen</i> , takes you directly to the controller's <i>Outputs Screens</i> . |
|  | The <Config> button, located at the controller's <i>Setpoints Screen</i> , takes you directly to the controller's <i>Configuration Screens</i> . |

Table 4: VCM-X & VCB-X Setpoint Icons

VAV/Zone Setpoint Buttons

The VAV/Zone Setpoint Buttons are located at the bottom of the *VAV/Zone Setpoints Screen*. See **Table 5** for a list of the Setpoint buttons and their functions. Level 1 and Level 2 users can view these screens and change occupied heating and cooling setpoints, but only a Level 3 user can change all setpoints.

| Button | Function |
|---|--|
|  | The <Temps> button, located at the bottom of the controller's <i>Setpoints Screen</i> , takes you directly to the controller's <i>Temperature Setpoints Screens</i> . |
|  | The <Damper/Airflow> button, located at the bottom of the controller's <i>Setpoints Screen</i> , takes you directly to the controller's <i>Damper/Airflow Setpoints Screens</i> . |
|  | The <Alarms> button, located at the bottom of the controller's <i>Setpoints Screen</i> , takes you directly to the controller's <i>Alarm Settings Screen</i> . |
|  | The <Misc> button, located at the bottom of the controller's <i>Setpoints Screen</i> , takes you directly to the controller's <i>Miscellaneous Setpoints Screen</i> . |
|  | The <Calibrate> button, located at the bottom of the controller's <i>Setpoints Screen</i> , takes you directly to the controller's <i>Calibration Setpoints Screen</i> . |
|  | The <Config> button, located at the bottom of the controller's <i>Setpoints Screen</i> , takes you directly to the controller's <i>Configuration Setpoints Screens</i> . |

Table 5: VAV/Zone Setpoint Icons

MAIN SCREEN FUNCTIONS

Logging In

First Things First

The first thing you need to do when setting up your Touch Screen is to Login. The second thing you need to do is establish user passcodes. The third thing you need to do is set the clock. After you complete these simple tasks, you are ready to set your system's settings, view controller status screens, and change schedules and setpoints.

NOTE: Do not attempt to make changes to the Touch Screen while the Unit Controller is initializing. This can cause programming errors.

Main Screen

Once you have connected your System Manager TS II to a controller and have powered it up with the proper power supply, the *Main Screen* will appear. See **Figure 9**.



Figure 9: Main Screen

Entering Your System Manager Passcode

NOTE: There are three available passcode levels. Level 1 defaults to 1111, Level 2 defaults to 2222, and Level 3 defaults to 3333. These defaults can be changed by anyone who logs in at Level 3.

When you power-up your System Manager TS II, the message **System Secured** is displayed on the bottom left corner of the *Main Screen*.



Touch the **<Login>** icon found on bottom left of the *Main Screen* and type the default Level 3 passcode of "3333" using the number keypad to gain access to all setpoint and configuration items. See **Figure 10**.

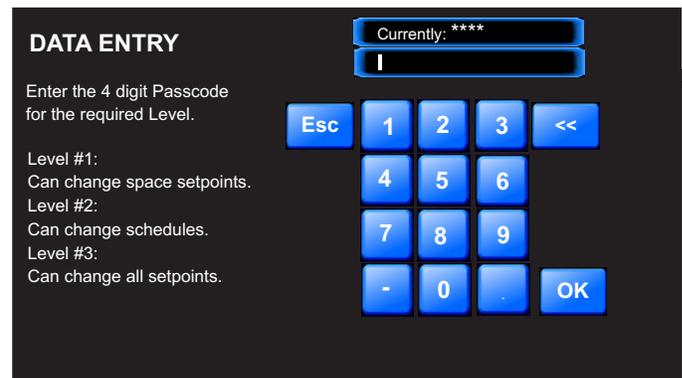


Figure 10: Login Screen

NOTE: For security reasons, the current passcode characters displayed at the top of the screen are never shown and appear as asterisks.

Touch **<OK>**. Touch **<Esc>** if you accessed this screen by mistake and do not wish to change the current access level.

The *Login Screen* will automatically close, and the passcode will be tested against all previously defined passcodes to determine the passcode's access level.

If 3333 is still the active Level 3 code, the status message **System Access Level 3** will now be displayed on the bottom left corner of the *Main Screen*.

NOTE: System Access will automatically default to **System Secured** after time set for **Backlight Timeout** in the *System Manager Settings Screen* (see **Figure 15, page 17**). If timeout is set to zero, the passcode will timeout after two minutes.

MAIN SCREEN FUNCTIONS

Editing Passcodes

Passcode Clearance Levels

Below is a list of the passcode levels, default codes, and actions that can be performed at the various levels.

Level 0—No Passcode Needed, System Secured

Level 0 users can view temperatures and status points. They can also change the system date and time, but no changes to any controller setpoints can be made.

Level 1—Default: 1111

Level 1 users can view temperatures and change space temperature setpoints. No changes to schedules or other settings can be made.

Level 2—Default: 2222

Level 2 users can change space temperature setpoints and operating schedules but not configuration settings.

Level 3—Default: 3333

Level 3 users have system manager access and can change all setpoints and configurations, including default passcodes. Level 3 users can also access force modes. This Level is normally reserved for qualified HVAC service personnel.

Edit Passcodes

WARNING: MAKE SURE YOU CHANGE ALL PASSCODES AS SOON AS POSSIBLE TO SECURE THE SYSTEM!

NOTE: Only a Level 3 user (system manager level) can change Level 1, 2, and 3 passcodes.

NOTE: Do not use the same passcode for all 3 levels. If you do, each passcode will default to Level 1.



From the *Main Screen*, touch the **<User Passcodes>** icon. The *System Manager Passcode Levels Screen* will appear. See **Figure 11**.

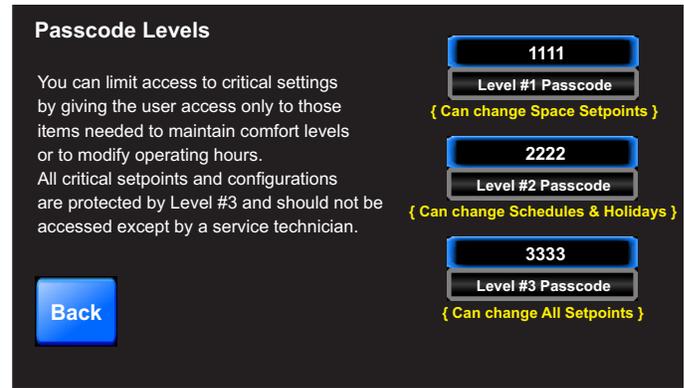


Figure 11: System Manager Passcode Levels Screen

To change a passcode, touch the blue highlighted box containing the current passcode. The keypad will appear with instructions for changing the passcode. See **Figure 12**.

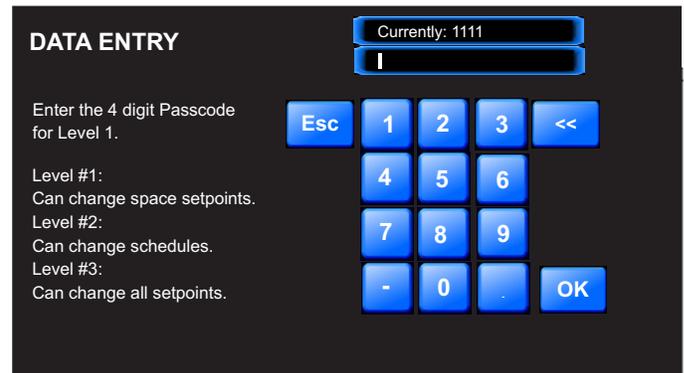


Figure 12: Change Passcode Screen

The current passcode will appear on the top menu bar. Type in the new four-digit passcode. You cannot use the period or minus characters in your passcode. Use the **<<<>** key if you make a mistake. Touch **<Esc>** to return to the previous screen without changing the passcode. When you have typed in the new passcode, touch **<OK>**. The *System Manager Passcode Levels Screen* should display the passcode you entered.

NOTE: If you change the Level 3 passcode, make sure to write it down. If you should happen to forget the Level 3 passcode, contact WattMaster Technical Support.

Touch **<Back>** to return to the *Main Screen*.

MAIN SCREEN FUNCTIONS

Setting the System Clock

Set Time and Date

When you first power up your System Manager TS II, you will need to change the day of the week, the time, and the month, day, and year to the current time and date. If your system has been turned off or has been down for a long time, you may have to do the same, although the time and date can maintain itself for several days. Any level of user can change the time and date settings.

The day of the week, the time, and the date appear at the top right on the *Main Screen*. See **Figure 9**, page 14.



From the *Main Screen*, touch the **<Set Time & Date>** icon. The *Set Time & Date Screen* will appear. See **Figure 13**.

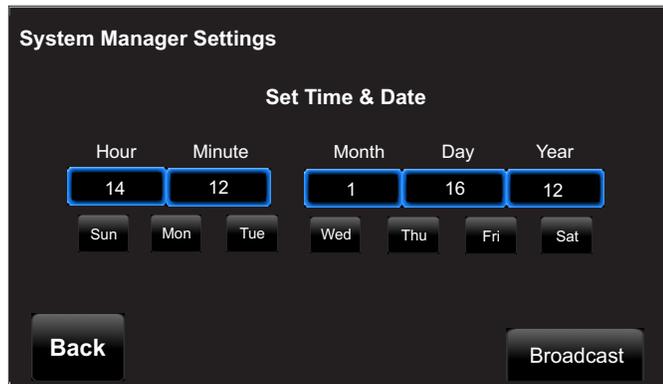


Figure 13: Set Time & Date Screen

In the example above, the current time and date is 2:12 PM, January 16, 2012. There is no day of the week selected yet.

Set Day of the Week: Select the day of the week by simply *touching* your selection. The day of the week text will change from white to blue.

Set Hour, Minute, Month, Day, and Year: *Touch* the blue highlighted box to have each selection screen appear. See **Figures 13 & 14**. Read the instructions on each screen for entering data.

Broadcast: When you are finished setting the clock, *touch* the **<Broadcast>** button to broadcast the Time and Date to all Units. The following message will appear:

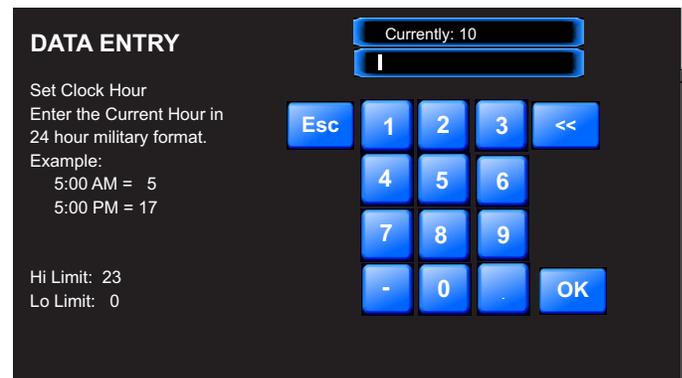


Figure 14: Set Clock Hour

Set Clock Hour: *Touch* the number buttons to enter the current hour in 24 hour military format. Valid entries are from 0-23. Press **<OK>**.

NOTE: See **Appendix** for Military Time Conversion table.

Set Clock Minute: *Touch* the number buttons to enter the current minutes. Valid entries are from 0-59. Press **<OK>**.

Set Clock Month: *Touch* the number buttons to enter the current month. Valid entries are from 1-12. Press **<OK>**.

Set Clock Day: *Touch* the number buttons to enter the current day of the month. Valid entries are from 1-31. *Touch* **<OK>**.

Set Clock Year: *Touch* the number buttons to enter the current year. Valid entries are from 0-99. *Touch* **<OK>**. **Note:** The year is based on the current century; therefore, 12 = 2012. If you enter more than two digits, e.g. 2012, the system will not recognize your entry.

MAIN SCREEN FUNCTIONS

System Manager Settings

System Manager Settings

Additional system settings are available under the **<Settings>** icon. These include setting the Backlight Timeout, the Backlight Intensity Percentage, the System Manager Address, Alarm Polling, and One to One Unit Connection.



From the *Main Screen*, touch the **<Settings>** icon. The *System Manager Settings Screen* will appear. See **Figure 15**.

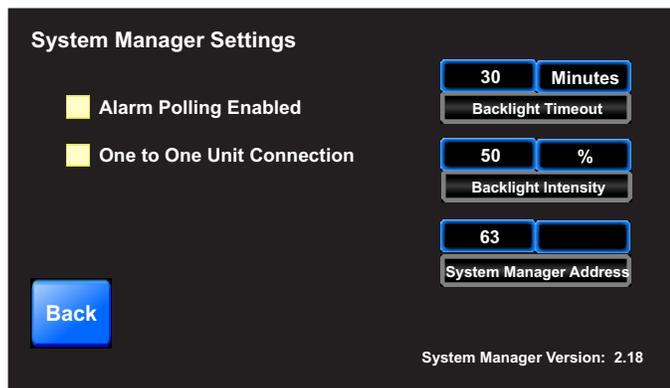


Figure 15: System Manager Settings Screen

Backlight Timeout: This setting is actually a setting for three separate functions—Backlight Timeout, *Main Screen* Timeout, and Passcode Timeout. To set the Backlight Timeout, *enter* the amount of time you wish the screen to maintain the active intensity level after the last touch pad activity occurs. The High limit is 30 and the Low limit is 0. 0 = No Timeout. The System Manager TS II will return to the *Main Screen* display at the same rate as the Backlight Timeout, except that if set to 0, the *Main Screen* will display after 2 minutes. The Passcode will timeout at the same rate as the Backlight Timeout, except that if set to 0, the Passcode will timeout after 2 minutes and will return to System Secured Setting.

Backlight Intensity Percentage: *Enter* the percentage of light level you wish to maintain whenever touch pad activity occurs. The High limit is 100 and the Low limit is 0.

System Manager Address: *Enter* the address of the System Manager TS II. 0 = Stand Alone Mode. 63 = Network System. 1-60 = Multiple Managers based on the following definitions:

- **Stand Alone**—If your System Manager TS II is connected to one controller and you are not using a CommLink or MiniLink anywhere on the loop, your system is **Stand Alone**. If your System Manager TS II is connected to more than one controller daisy-chained together and you are not using a CommLink or MiniLink anywhere on the loop, your system is **Interconnected**. If you have either a **Stand Alone** or **Interconnected** system, you must *enter <0>* for **Stand Alone Mode**. In order to view all controllers on an **Interconnected System**, make sure that One to One Unit Connection, described below, is not selected.
- **Network**—If you are using this System Manager TS II on a communications loop that has a MiniLink or CommLink installed and you have a single System Manager TS II for your entire system, you must *enter <63>* for **Network System**.
- **Multiple Managers**—If you are using this System Manager TS II on a communications loop, have a MiniLink or CommLink installed, and have more than one System Manager TS II, then you need to operate in **Multiple Managers Mode**. *Enter* the address **<1-60>** at which you want this particular System Manager TS II to be set. When more than one System Manager TS II is used on a local loop, each must be set with a unique address different from any other device on that loop. If you want one of the System Manager TS II's to be able to indicate alarms for the entire system, you must *enter <63>* for **Network System** for that particular System Manager TS II.

Alarm Polling Enabled: If you wish for the system to poll for alarms, *touch* the black box to the left of this item to select it. The box will turn white and the system will immediately check all loops for alarms. *Touch <Cancel>* to stop the process. If you wish to have Alarm Polling Disabled, you must now *touch* the white box to deselect this option. The box will return to its previously fully black state.

NOTE: For the System Manager TS II to poll for alarms, you must also configure the unit(s) to poll for alarms on the *MiniLink Polling Device Setpoints Screen* using Prism 2. See the Appendix in this guide for more information.

One to One Unit Connection: If your System Manager TS II is directly connected to only one unit, you may wish to select this option to bypass the *Unit Selection Screen* and go directly to the unit's *Status Screen*. The controller must be set to address #1 for this to work. *Touch* the black box to the left of this item on the screen to select it. The box will turn white. If you wish to deselect this option, simply *touch* the box again.

System Manager Version: The version number of the System Manager software appears on the bottom menu bar. This version number is important to know for troubleshooting purposes.

Polling for Alarms

Alarm Polling

In order for Alarm Polling to appear on the *Main Screen*, you must have the following items in place:

1. **Alarm Polling Enabled** must be selected in the *Systems Settings Screen* (see **Figure 15, page 17**).
2. You must have a MiniLink connected to your system and have your System Manager TS II set to Network Mode.
3. You must configure each unit to poll for alarms on the *MiniLink Polling Device Setpoint Screen* using Prism 2. See the Appendix in this guide for more information.

The **<Alarms>** icon on the *Main Screen* allows you to check for alarms, review alarms, and clear alarms. Only a Level 3 user can clear the alarm log.



A green **<No Alarms>** icon appears on the Main Screen when no alarms are present. This icon changes to a red **<Active Alarms>** icon when alarms are present.



To check for alarms, review alarms, or clear alarms, from the *Main Screen*, touch the **<Active Alarms>** icon. The *System Alarm Status Screen* will appear. See **Figure 16**.

NOTE: Even if you don't set up Alarm Polling using Prism 2, a controller's first status screen will still alert you of an active alarm.

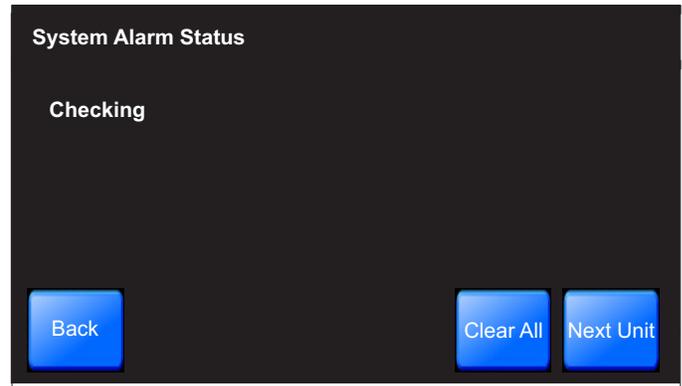
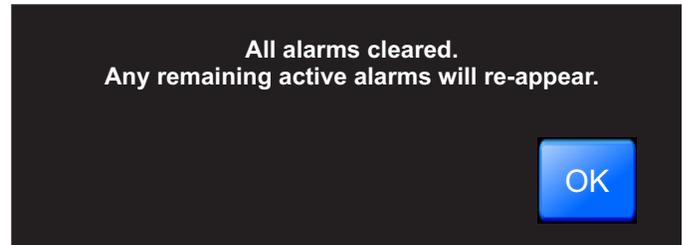


Figure 16: System Alarm Status Screen

Next Unit: Touch **<Next Unit>** to access the next unit's alarms.

Clear All: Touch **<Clear All>** to clear all alarms logs. Active alarms will remain. You must be a Level 3 user to access this option. When all alarms have cleared, the following message will appear on the screen:



NOTE: You can also view alarms while in individual controller's status screens. For more information, see **pages 20, 21 & 48**.

VCM-X & VCB-X CONTROLLERS

Selecting Units and Viewing VCM-X & VCB-X Status Screens

My System Unit Selection



From the *Main Screen*, touch the **<My System>** icon. The *Selected Unit Screen* will appear. See **Figure 17**.

NOTE: If you have chosen the **One to One Unit Connection** in the *System Manager Settings Screen*, this screen will not appear. Instead, the unit's *Status Screen* will appear.

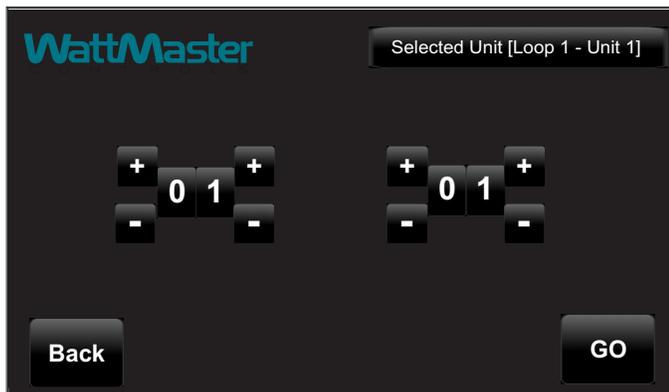


Figure 17: Unit Selection Screen

In **Figure 17**, Loop 1 and Unit 1 are selected as indicated in the figure with white text. They also appear in the *Top Menu Bar* in brackets.

Use the **<+>** and **<->** buttons to move up and down through the loops and units. Enter the desired **Loop #** and **Unit #** and then touch **<GO>** to access the unit's *Status Screen*.

NOTE: Instructions for configurations and setpoints are included in this guide separately for VCM-X Controllers, VCB-X Controllers, and VAV/Zone Controllers. See **page 23** for VCM-X Controllers, **page 34** for VCB-X Controllers, and **page 49** for VAV/Zone Controllers.

Viewing VCM-X & VCB-X Status Screens

Figures 18 & 19 depict the first *Controller Status Screens*. Notice that the controller is identified by loop number and unit number - in this case, 0102 represents Loop 1, Unit 2. Images vary based on controller type.

While in the *Status Screen*, touch the **<+>** and **<->** buttons to view more status screens displaying relays and operating setpoints. These screens roll back to the first *Status Screen*.

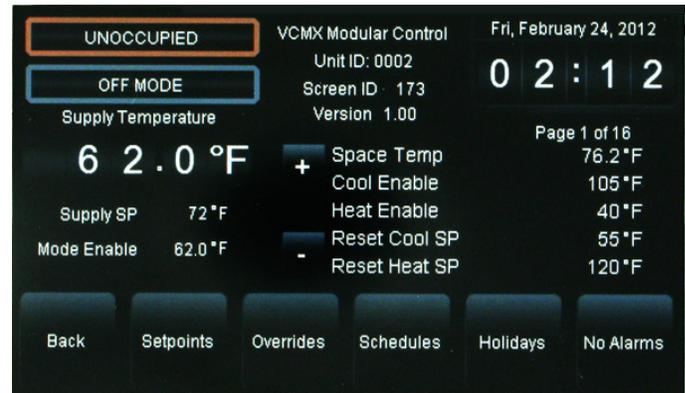


Figure 18: VCM-X & VCM-X Modular Controller Status Screen 1



Figure 19: VCB-X Controller Status Screen 1

VCM-X & VCB-X CONTROLLERS

Viewing and Enabling/Disabling VCM-X & Module Alarms

Viewing VCM-X & Module Alarm Status

ALARM To view alarm status, *touch* the **<ALARM>** button on the unit's first *Status Screen*. See **Figure 20**. The *Alarm Status Screen* will display. See **Figure 21**.

NOTE: The **<ALARM>** button only appears on the screen if the unit has an active alarm condition. Only a Level 3 user has the option to enable or disable each type of alarm.

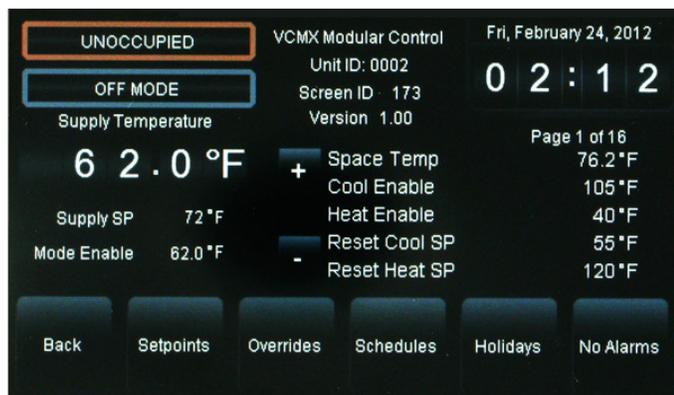


Figure 20: VCM-X Controller Status Screen 1



Figure 21: VCM-X Controller Alarm Status Screen

Touch the **<Next>** button to go to the next *Alarm Status Screen*. *Touch* the **<Modules>** button to go to the *Head Pressure Module Alarms Screen*, *Dual/Full Digital Module Alarms Screen*, and *Heat Pump Module Alarms Screen*.

NOTE: Even if you don't set up Alarm Polling using Prism 2, a controller's first status screen will still alert you of an active alarm.

Enabling/Disabling VCM-X & Module Alarms

Alarm configuration is accessed by *touching* the **<ALARM>** button on the lower right of the unit's first *Status Screen*. See **Figure 20**. Only a Level 3 user can configure alarms. *Touch* the **<Next>** button to go to the next *Alarm Status Screen*.

In addition to simply viewing alarms, the *Alarm Status Screen* can also be used for enabling and disabling alarms that will be emailed or texted. The emailing and texting feature will only work if Prism 2 is running and has emailing capability.

The alarms must first be configured using Prism 2 software. See the Appendix in this guide for instructions.

Once the alarm settings have been established in Prism 2, the settings you choose in the *Alarm Status Screen* will be stored in the controller so that you will not have to reconfigure the alarms for that controller in Prism 2. Once configuration is complete, Prism 2 does not have to be running in order to view alarms on individual *Alarm Status Screens* in the System Manager TS II. However, as mentioned previously, Prism 2 does have to be running for emailing or texting alarms to occur.

To enable an alarm category—Sensors, Mechanical, Fail Modes—simply *touch* the black square next to Group 1, Group 2, and/or Group 3. A white box designates that the alarm category is enabled. To disable an alarm category, simply *touch* the square again. A grey box designates that the alarm category is disabled. See **Figure 21** for an example.



Figure 22: VCM-X Controller Alarm Screen

In the example above (**Figure 22**), there is an ALARM (designated by the word ALARM in red.) There is a red box in front of Dirty Filter, designating the alarm. If there is no alarm condition, the word OK appears in a box below the Group Number (as shown in **Figure 21**).

Touch the **<Next>** button to go to the next *Alarm Status Screen*. *Touch* the **<Modules>** button to go to the *Head Pressure Module Alarms Screen*, *Dual/Full Digital Module Alarm Screen*, and *Heat Pump Module Alarms Screen*.

VCM-X & VCB-X CONTROLLERS

Viewing and Enabling/Disabling VCB-X Alarms

Viewing VCB-X Alarm Status

 To view alarm status, *touch* the **<ALARM>** button on the unit's first *Status Screen*. See **Figure 23**. The *Alarm Status Screen* will display. See **Figure 24**.

NOTE: The **<ALARM>** button only appears on the screen if the unit has an active alarm condition. Only a Level 3 user has the option to enable or disable each type of alarm.



Figure 23: VCB-X Controller Status Screen 1



Figure 24: VCB-X Controller Alarm Status Screen

NOTE: Even if you don't set up Alarm Polling using Prism 2, a controller's first status screen will still alert you of an active alarm.

Touch the **<Next>** button to go to the next *Alarm Status Screen*.

Enabling/Disabling VCB-X Alarms

Alarm configuration is accessed by *touching* the **<ALARM>** button on the lower right of the unit's first *Status Screen*. See **Figure 23**. Only a Level 3 user can configure alarms.

In addition to simply viewing alarms, the *Alarm Status Screen* can also be used for enabling and disabling alarms that will be emailed or texted. The emailing and texting feature will only work if Prism 2 is running and has emailing capability.

The alarms must first be configured using Prism 2 software. See the Appendix in this guide for instructions.

Once the alarm settings have been established in Prism 2, the settings you choose in the *Alarm Status Screen* will be stored in the controller so that you will not have to reconfigure the alarms for that controller in Prism 2. Once configuration is complete, Prism 2 does not have to be running in order to view alarms on individual *Alarm Status Screens* in the System Manager TS II. However, as mentioned previously, Prism 2 does have to be running for emailing or texting alarms to occur.

To enable an alarm category—Sensors, Mechanical, Fail Modes—simply *touch* the black square next to Group 1, Group 2, and/or Group 3. A white box designates that the alarm category is enabled. To disable an alarm category, simply *touch* the square again. A grey box designates that the alarm category is disabled. See **Figure 24** for an example.



Figure 25: VCB-X Controller Alarm Screen

In the example above (**Figure 25**), there is an ALARM (designated by the word ALARM in red.) There is a red box in front of CO₂ Sensor, designating the alarm. If there is no alarm condition, the word OK appears in a box below the Group Number shown in **Figure 24**.

Touch the **<Next>** button to go to the next *Alarm Status Screen*.

VCM-X & VCB-X CONTROLLERS

Viewing and Setting Schedules & Holidays

Viewing and Setting Schedules

To view and set schedules for VCM-X, and VCB-X controllers, touch the **<Schedules>** button found at the bottom of the *Status Screen* (Figure 23, page 21). The *Schedules Screen* will appear. See Figure 26. The default day will be Sunday and the default event start/stop times will be midnight.

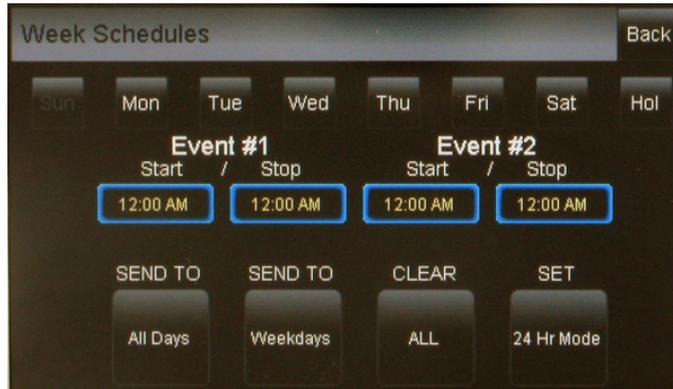


Figure 26: VCM-X/VCB-X Controller Schedules

A Level 2 user can set two schedules per day for individual days of the week, all weekdays, weekends, and holidays. All times are entered in military time format.

If you wish to enter a schedule for a certain day of the week, first touch the day of the week at the top of the screen. Otherwise, the day defaults to Sunday. Touch the start and stop time for each Event and enter the desired times. See Figure 27. All times must be entered in military time format. See the Military Time Table in the Appendix, page 59.

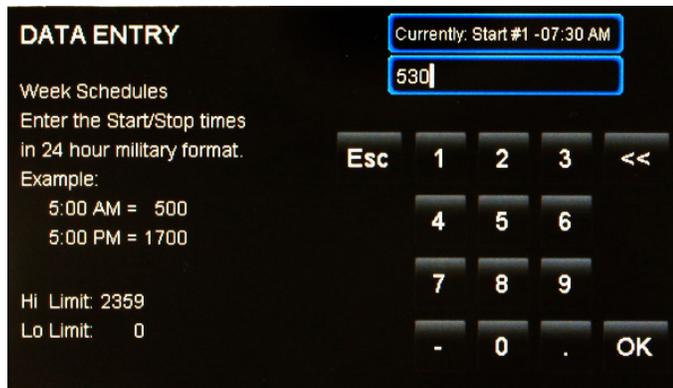


Figure 27: Schedule Times Screen

Touch **<OK>** to save the time you entered or touch **<Esc>** to exit the *Schedule Times Screen* without changing the time and return to the *Schedules Screen* (Figure 26).

To eliminate a schedule from any event, simply enter a zero for the Start and Stop time for that day. The screen will display 12:00 am for both the Start and Stop times, indicating that the equipment will not activate on that day.

Once back at the *Schedules Screen*, you can continue setting schedules day by day or use following options:

SEND TO <All Days> - Touch this button to send the schedule appearing on the screen to all days of the week, except for holidays.

SEND TO <Weekdays> - Touch this button to send the schedule to weekdays only. You will need to set up a separate schedule for Saturday and Sunday when selecting this option.

CLEAR <All Schedules> - Touch this button to clear all schedules.

SET <24 Hr Mode> - Touch this button to have the system run continuously, 24 hours a day, 7 days a week including holidays. All event times will display 11:59 PM.

Viewing and Setting Holidays

To view and set holidays for a VCM-X/VCB-X controller, touch the **<Holidays>** button found at the bottom of the *Status Screen* (Figure 23, page 21). The *Holidays Schedule Screen* will appear. See Figure 28. The holidays in the screen will initially not be set. You can only set holidays for the current year. You must be a Level 2 user in order to set holidays.



Figure 28: Holidays Schedule Screen

Simply touch the day(s) of the month to select holidays. Touch the **<<>** button to go back one month and the **>>>** button to go forward one month.

There are 14 holiday periods available for each year. These holiday periods can be a single day or they can span days, weeks, or even months.

For example, if you want to schedule a summer break, you need only schedule one holiday period to define a two or three month break from operating in the occupied mode.

Every defined holiday uses the Holiday operating schedule programmed in the controller's *Schedules Screen*.

Holidays can only be programmed for the current year. You cannot program holidays before the next year occurs. Holidays do not automatically adjust for the new year, so you will need to access this screen after the new year and make necessary adjustments to the days that float, such as Memorial Day.

VCM-X & VCB-X CONTROLLERS

Forcing Schedules & Accessing & Entering Setpoints

Schedule Override

To Force Schedules, from the *VCM-X* or *VCB-X* Main Status Screen, touch the Occupied/Unoccupied wording located below the time and date display. The following options will appear:

Schedule Auto Mode

Touch the radio button to select the schedule option. Default is Schedule AUTO Mode. This selection will remain in effect unless it is changed again on this screen. Schedule overrides do not automatically time out after a certain period of time.

- **Schedule AUTO Mode**—Select this to restore normal schedule operations.
- **Schedule FORCED ON**—Select this to Force the unit into continuous Occupied Mode operation.
- **Schedule FORCED OFF**—Select this to Force the unit into continuous Unoccupied Mode operation.

Accessing and Entering VCM-X Setpoints

While in the VCM-X Status Screen (see **Figure 29**), touch the **<Setpoints>** button found on the bottom menu bar. The VCM-X Controller's *Temperature Setpoints Screen* will appear. See **Figure 30**. Level 1 and Level 2 users can change occupied space temperature setpoints, but only Level 3 users can change all setpoints.

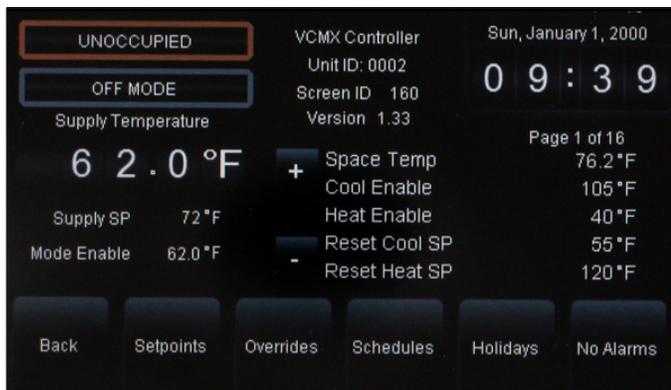


Figure 29: VCM-X Controller Status Screen

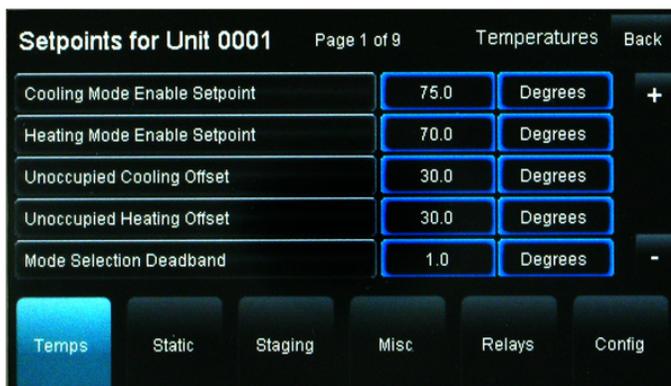


Figure 30: VCM-X Controller Temperature Setpoints

Individual setpoint and configuration buttons are located at the bottom of the *Setpoint Screens*. See **Figure 31**. Simply touch a specific button to access that category.



Figure 31: VCM-X Setpoint Buttons

Within each Setpoint Screen, touch the **<Status>** button to return to the *Status Screen* or touch **<Home>** to return to the *Main Screen*.

Use the **<+>** and **<->** buttons to scroll through the setpoints and configurations. Simply touch the blue highlighted box to change the setpoint. Each setpoint data entry screen will provide a definition of the setpoint and specific instructions for entering the setpoint and will include the setpoint range as in the example below, **Figure 32**.

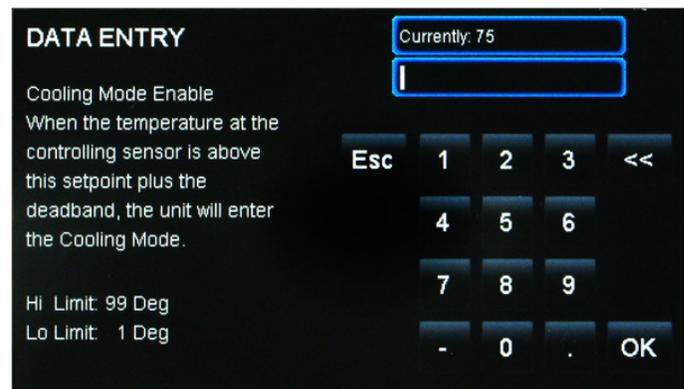


Figure 32: VCM-X Cooling Mode Setpoint Data Entry Screen

Touch **<OK>** to have the system accept the new value. If you enter a setpoint that is not in the valid range, the setpoint will remain as is and will not change.

Each setpoint data entry screen is self-explanatory; however, each setpoint and configuration is explained in the next section, *Configuring VCM-X Setpoints*. To easily reference a particular setpoint or configuration, refer to the **Index**, page 60.

VCM-X Configuration

VCM-X Configuration

Config

Touch the **<Configuration>** button to access the *Configuration Setpoints Screens*.

For screens that contain radio buttons, *touch* the radio button next to your selection. For screens with square buttons, *touch* one or more square buttons to make your configuration selections for the unit.

CONFIGURATION PAGE 1 OF 14

HVAC Mode Enable Source

Touch the radio button to select the Temperature Sensor that will determine the Heating, Cooling, or Vent Mode of operation. The available selections are as follows:

- **Supply Air Temperature**—This is typical for VAV applications. Occupied Cooling with Morning Warm-up.
- **Outdoor Air Temperature**—This is for 100% Outdoor Air (MUA) units. Dehumidification utilizing a Dewpoint Calculation if equipped with an Outdoor Air Humidity Sensor.
- **Space Temperature**—This is for any unit that conditions a space and is not 100% Outdoor air. Occupied/Unoccupied Heating, Cooling, and Vent Modes of operation.
- **Return Air Temperature**—This selection can be used when an Average Building Temperature (the Return Air Temperature) needs to determine Heating, Cooling, and Vent Modes of operation.
- **Supply Air w/ Supply Air Tempering**—This selection is for VAV “cooling only” applications where because of cold outdoor temperatures, even at minimum damper position, you may need to enable heat to maintain the cooling near its Cooling Supply Air Setpoint. When heat is enabled during this sequence, it will control to a non-adjustable setpoint that is 2°F less than the Cooling Supply Air Setpoint.

CONFIGURATION PAGE 2 OF 14

HVAC Reset Source

The Supply Air Heating and Cooling Temperature Setpoints can be reset using various input sources. Default is No Reset. Touch the radio button to select the desired Reset Source for Supply Air Temperature Reset. The Single Zone VAV option should be selected in applications where the Supply Fan VFD speed is reset based on the Space Temperature. If you select No Reset, then neither the Supply Air Setpoint nor Supply Fan VFD Reset will occur. The available selections are as follows:

- No Reset
- Space Temperature
- Return Air Temperature
- External Analog Input
- Fan VFD Signal Percentage
- Outdoor Air Temperature
- Single Zone VAV
- Single Zone VAV w/CV Heat

CONFIGURATION PAGE 3 OF 14

Heat Pump Control

Select this item if the HVAC unit is a Heat Pump.

Reversing Valve Used for Cooling

Select this item if your Heat Pump unit activates its reversing valve during the Cooling operation. Do not select this item if your Heat Pump unit activates its reversing valve during the Heating operation.

Fan Proving Switch Installed

Select this item if your HVAC unit has a fan proving switch installed.

Fan Cycles with Heating & Cooling

Select this item if you want the HVAC unit's Supply Fan to only run during Heating, Cooling, or Dehumidification Modes. DO NOT select this item if you want the HVAC unit's Supply Fan to run continuously while in the Occupied Mode, regardless of the Heating, Cooling, or Dehumidification Modes.

Has Static Pressure Control

Select this item if the HVAC unit has a Supply Fan that delivers a Variable Volume of Air using a VFD or a Bypass Damper to maintain Duct Static Pressure. DO NOT select this item if the HVAC unit has a Supply Fan that delivers a Constant Volume of air. If you have a VFD on a constant volume unit, select this option for Filter Loading Control.

Controls Economizer

Select this item if the VCM-X is controlling the economizer.

Economizer Title 24 Option

Select this item if your unit has Title 24 Economizer operation.

CONFIGURATION PAGE 4 OF 14

Outdoor RH Sensor Installed

Select this item if the HVAC unit is equipped with an Outdoor Air Humidity Sensor.

Indoor RH Sensor Installed

Select this item if the HVAC unit is equipped with an Indoor Air Humidity Sensor.

Has Humidity Control

Select this item if your system has Dehumidification control.

Has Night Humidity Control

Select this item if your system has Dehumidification control during unoccupied hours. Unoccupied Dehumidification is activated based on Indoor Air Humidity only.

Humidity Control Has Priority

Select this item if Dehumidification is a priority during the Occupied Mode. Priority means that the Cooling stages will activate based on the Coil temperature, and Reheat will be used regardless of Heating, Cooling or Vent Modes of operation.

Emergency Shutdown Enabled

Select this item if an emergency shutdown device is connected to the binary input. If the shutdown is active, the Supply Fan, Heating, and Cooling Relay outputs will be disabled.

VCM-X CONTROLLERS

VCM-X Configuration

CONFIGURATION PAGE 5 OF 14

Has Building Pressure Mod Control

Select this item if your system needs Modulating Building Pressure Control. Modulating building pressure control is used for a VFD exhaust fan or a modulating exhaust fan damper actuator for direct acting building pressure control. Modulating building pressure control is also used for a modulating outdoor air damper actuator or a supply fan VFD for reverse acting building pressure control.

Building Pressure Reverse Acting

Select this item if your system needs Reverse Acting Building Pressure control. On a drop in Building Pressure below the Building Static Pressure Setpoint the Outdoor Air Damper will modulate open to increase pressure or the supply Fan VFD will ramp-up.

Building Pr. Output is 2-10 VDC

Select this item if your application needs a 2-10 VDC Building Pressure Output Signal as required by the device you are using to control the pressure. Do not select this item if your application needs a 0-10 VDC signal.

Use Heat During Re-Heat

Select this item if your application needs to use unit heat during Dehumidification to supplement Reheat. If Reheat is not available, this selection will allow the unit heat to operate in place of Reheat.

Outdoor Air Damper Control Based on Airflow CFM

Select this item to modulate the outdoor damper based on airflow setpoint.

Head Pressure Module Installed (VCM-X Modular, VCM-X WSHP)

Select this item if you have a Head Pressure Module installed on your system.

CONFIGURATION PAGE 6 OF 14

Has Modulating Cooling

Select this item if the HVAC unit is controlling Modulating Cooling through use of a modulating chilled water valve or a digital compressor.

Modulating Cooling is Reverse Acting

Select this item if Modulating Cooling requires 0 VDC to open and 10 VDC to close. You cannot use a reverse acting signal your application is using a digital compressor.

Has Modulating Heating

Select this item if the HVAC unit is controlling Modulating Heating through use of a modulating hot water valve, modulating steam valve, or a SCR controlled electric heater.

Modulating Heating is Reverse Acting

Select this item if Modulating Heating requires 0 VDC to open and 10 VDC to close.

Has Return Bypass Control

Select this item if your HVAC unit requires Return Air Bypass Control.

Full Digital Module Installed, Dual Digital Module Installed, or using VCM-X WSHP Controller (VCM-X Modular or VCM-X WSHP)

Select this item if you have multiple Digital Scroll Compressors installed on your system.

CONFIGURATION PAGE 7 OF 14

Has Demand Ventilation Control

Select this item if the HVAC unit has demand ventilation control.

Condenser HP Module Installed

Select this item if the HVAC unit has split condensers.

CONFIGURATION PAGE 8 OF 14

Broadcast Real Time Clock to VAV Boxes

Select this item to have the HVAC unit broadcast the real time clock to all controllers on its local loop. This broadcast sends the time from the VCM-X's Internal Time Clock to all controllers on its local loop. This broadcast needs to be configured on a VAV or Zoning System using the VCM-X with Orion VAV/Zone controllers. A network communications device is required in order for this feature to operate, but can also be used to synchronize all controllers on the local loop

Broadcast Supply Air to VAV Boxes

Select this item to broadcast the VCM-X's Supply Air Temperature to all controllers on its local loop. This broadcast needs to be configured on a VAV or Zoning System using the VCM-X with Orion VAV/Zone Controllers. A network communications device is required in order for this feature to operate.

Broadcast AHU Schedule to VAV Boxes

You must select this item if you have VAV/Zone controllers connected to the VCM-X controller. This will broadcast the Occupied and Unoccupied Schedule of the VCM-X controller to all VAV/Zone controllers on the local loop.

Broadcast Main Fan and Heat Status to VAV Boxes

Select this item to broadcast the VCM-X's Supply Fan and Heating Status to all controllers on its local loop. This broadcast needs to be configured on a VAV or Zoning System using the VCM-X with Orion VAV/Zone Controllers. A network communications device is required in order for this feature to operate.

Broadcast Outdoor Air to All Other Units

Select this item to broadcast the VCM-X's Outdoor Air Temperature Reading to other HVAC units on the local loop if they are not equipped with their own Outdoor Air Temperature sensors. A network communications device is needed in order for this feature to operate.

CONFIGURATION PAGE 9 OF 14

Broadcast Relative Humidity to All Other Units

Select this item if to have the VCM-X broadcast its Outdoor Air Humidity reading to other HVAC units if they are not equipped with their own Outdoor Air Humidity sensors. A network communications device is required in order for this feature to operate.

Force Max Damper During Warm-Up & Night Heat

Select this item to ensure the VAV/Zone Controllers will drive their dampers to the Max Airflow Damper Position during Morning Warm-up. This is important to allow the proper amount of airflow for Heating in the HVAC unit.

VCM-X CONTROLLERS

VCM-X Configuration & Temperature Setpoints

Force Fixed Damper During Warm-Up & Night Heat

Select this item to have all VAV/Zone controllers connected to this VCM-X controller forced to their “Fixed Airflow” Position during the Morning Warm-up Mode of operation. See the VAV/Zone controller Setpoint Screens for setting of the “Fixed Airflow” position.

One HVAC Unit with Boxes on Multiple Loops

This selection allows other VAV/Zone controllers connected on additional local loops to receive the required broadcasts. This is only allowed when you have a single VCM-X controller with VAV/Zone controllers on multiple loops. Other VCM-X or add-on devices may be connected, but no other VCM-X with VAV/Zone controllers can be connected on the system. Select this item to have real time, supply air, and main supply fan and heating status broadcast to all local loops on the entire system, not just the local loop the VCM-X controller is on. This is normally only required if you have a large HVAC unit that requires more than the 58 VAV/Zone controllers normally allowed on the local loop.

CONFIGURATION PAGE 10 OF 14

Modulating Cooling Output

Select either a 0-10 VDC signal or 2-10 VDC signal to a Modulating Cooling source such as a Chilled Water Valve or select a 1.5-5 VDC signal to a Digital Compressor.

CONFIGURATION PAGE 11 OF 14

Modulating Heating Output

Select 0-10 VDC signal or 2-10 VDC signal to a Modulating Heating source such as a Hot Water Valve or SCR Electric Heater.

CONFIGURATION PAGE 12 OF 14

Carbon Dioxide Sensor Scaling

If you have a CO₂ sensor installed on your system, select whether it is a current (4-20 mA) sensor or a voltage (0-10 VDC) sensor. If you have a communicating CO₂ sensor, select Voltage Sensor.

CONFIGURATION PAGE 13 OF 14

Refrigerant

Select whether your HVAC unit is using R-22 or R-410A refrigerant.

CONFIGURATION PAGE 14 OF 14

Airflow

Select each type of airflow sensor that you have installed on your system.

Type of Monitoring Station

Touch the radio button to select the type of airflow monitoring station:

- **EBTRON Sensors**—Select this item if using an Ebtron or Greentrol Airflow Monitoring Station.
- **Paragon Sensors**—Select this item if using a Paragon Airflow Monitoring Station.

Temperature Setpoints

Temps

Touch the **<Temperatures>** button to access the *Temperature Setpoint Screens*.

TEMPERATURE SETPOINTS PAGE 1 OF 7

Cooling Mode Enable

This setpoint is used to determine the Cooling Mode of operation in reference to the HVAC Mode Enable Sensor. If the Supply Air Sensor is configured to be the HVAC Mode Enable, this Setpoint is used in conjunction with the Unoccupied Setbacks if equipped with a Space Temperature Sensor. Above this temperature plus the deadband, the unit will switch to Cooling Mode. High limit = 99°F; Low limit = 1°F; Default = 75°F.

Heating Mode Enable

This setpoint is used to determine the Heating Mode of operation in reference to the HVAC Mode Enable Sensor. If the Supply Air Sensor is configured to be the HVAC Mode Enable, this Setpoint is used in conjunction with the Unoccupied Setbacks if equipped with a Space Temperature Sensor. Below this temperature minus the deadband, the unit will switch to Heating Mode. High limit = 90°F; Low limit = 1°F; Default = 70°F.

Night Cooling Offset

During the Unoccupied Mode of Operation, this setpoint adjusts the Cooling Mode Enable Setpoint up by this amount. If you do not want Cooling to operate during the Unoccupied Mode, use the default setting of 30°F for this setpoint. High limit = 30°F (no offset); Low limit = 0°F; Default = 30°F.

Night Heating Offset

During the Unoccupied Mode of Operation, this setpoint adjusts the Heating Mode Enable Setpoint down by this amount. If you do not want Heating to operate during the Unoccupied Mode, use the default setting of 30°F for this setpoint. High limit = 30°F (no offset); Low limit = 0°F; Default = 30°F.

Occupied Deadband

The deadband is added to the Cooling Setpoint to generate a cooling demand and is subtracted from the Heating Setpoint to create a heating demand. High limit = 10°F; Low limit = 0°F; Default = 1°F.

TEMPERATURE SETPOINTS PAGE 2 OF 7

Coil Setpoint

During the Dehumidification Mode, the VCM-X uses the calculated Coil Temperature to activate DX Cooling based on this Dehumidification Coil Temperature Setpoint. The VCM-X uses a Suction Pressure Transducer to read Suction Pressure (the Saturation Vapor Pressure of the refrigerant) and converts this Suction Pressure reading to a Coil Temperature value. This calculation is based on using R22 or R410A refrigerant only and will not work with any other refrigerant. This setpoint determines the number of compressor stages that need to be activated to maintain the Dehumidification Coil Temperature Setpoint. The Coil Temperature is maintained at this setpoint during Dehumidification. High limit = 70°F; Low limit = 35°F; Default = 45°F.

VCM-X Temperature Setpoints

Morning Warm-up Setpoint

When the VCM-X is configured for VAV operation and the controller enters the Occupied Mode, the VCM-X looks at the Return Air Temperature to determine if the unit should initiate Morning Warm-up Mode. If the Return Air Temperature is below the Morning Warm-up Setpoint and the Max Length is greater than "0," the VCM-X will initiate Heating. This is considered Morning Warm-up and will run until the Return Air Temperature rises above the Morning Warm-up Setpoint or until the Warm Up Timeout expires. High limit = 90°F; Low limit = 50°F; Default = 72°F.

Dewpoint Dehumidification Setpoint

On MUA configured units that are using 100% Outdoor Air, when the OA Dewpoint Temperature rises above the Dewpoint Dehumidification Setpoint, the unit will start operating in Dehumidification Mode. High limit = 80°F; Low limit = 35°F; Default = 55°F.

Economizer Enable Setpoint

If an OA Humidity Sensor is not connected to the VCM-X and the OA Temperature falls below this Setpoint, the Economizer can be used for Free Cooling. If an OA Humidity Sensor is connected to the VCM-X, then a Wetbulb Temperature will be calculated and used instead of the OA Drybulb Temperature to determine when Free Cooling can be used. High limit = 80°F; Low limit = 0°F; Default = 55°F.

Pre-Heat/Low Ambient Setpoint Temperature

For cold climates where freezing temperatures may be experienced, a Pre-Heater relay output, if configured, can be activated based on the Outdoor Air Temperature to prevent freezing of Water Coils. If the Outdoor Air Temperature falls below the Low OAT Ambient Protection Temperature Setpoint and the HVAC unit is in Occupied Mode, the Pre-Heater relay will activate. This setpoint will also be used to enable the Preheater if the PREHEAT-X Controller is being used in conjunction with the VCM-X Controller. High limit = 70°F; Low limit = 0°F; Default = 0°F.

TEMPERATURE SETPOINTS PAGE 3 OF 7

Cooling SAT/Low Reset Limit

For VCM-X, if no reset is configured, this is the Supply Air Temperature maintained during the Cooling Mode of operation. If reset is configured, this is the lowest temperature the Supply Air can be reset to. High limit = 80°F; Low limit = 40°F; Default = 55°F.

Cooling SAT/High Reset Limit

For VCM-X, if your system requires reset of the Supply Air Temperature in the Cooling Mode, this is the highest temperature the Supply Air can be reset to. High limit = 150°F; Low limit = 40°F; Default = 55°F.

Cool Staging Window

This is the level below the Supply Air Setpoint that causes the Compressors to Stage Off. High limit = 20°F; Low limit = 1°F; Default = 5°F.

Cooling OAT Lockout

If the Outdoor Air Temperature is below this value, the mechanical cooling is prevented from activating. High limit = 100°F; Low limit = 0°F; Default = 50°F.

Low Temperature Cutoff

If the Supply Air Temperature drops below this value, all cooling is immediately cut off to protect the equipment. High limit = 250°F; Low limit = 0°F; Default = 40°F.

TEMPERATURE SETPOINTS PAGE 4 OF 7

Heating SAT/Low Reset Limit

For VCM-X, if no reset is configured, this is the Supply Air Temperature maintained during the Heating Mode of operation. If reset is configured, this is the lowest temperature the Supply Air can be reset to. High limit = 200°F; Low limit = 40°F; Default = 120°F.

Heating SAT/High Reset Limit

For VCM-X, if your system requires reset of the Supply Air Temperature in the Heating Mode, this is the highest temperature the Supply Air can be reset to. High limit = 200°F; Low limit = 40°F; Default = 120°F.

Heat Staging Window

This is the level above the Supply Air Setpoint that causes the Heating to Stage Off. High limit = 20°F; Low limit = 1°F; Default = 5°F.

Heating OAT Lockout

If the Outdoor Air Temperature is above this value, the mechanical heating is prevented from activating. High limit = 150°F; Low limit = 50°F; Default = 70°F.

High Temperature Cutoff

If the Supply Air Temperature rises above this value, all heating is immediately cut off to protect the equipment. High limit = 250°F; Low limit = 0°F; Default = 170°F.

TEMPERATURE SETPOINTS PAGE 5 OF 7

Reset Interval Rate

This is the rate at which a new Supply Setpoint is calculated if a Reset Source has been selected. This value determines how fast the Supply Air Temperature Setpoint is adjusted as the Reset Source changes. High limit = 250 seconds; Low limit = 1 second; Default = 20 seconds.

Reserved (VCM-X, VCM-X Modular, VCM-X WSHF)

The Supply Setpoint proportionally resets to its maximum setting as the Outdoor Air Temperature drops to this low reset temperature. For VCM-X, this field will display Reserved. High limit = 100°F; Low limit = 0°F

Reserved (VCM-X, VCM-X Modular, VCM-X WSHF)

The Supply Setpoint proportionally resets to its minimum setting as the Outdoor Air Temperature rises to this high reset temperature. For VCM-X, this field will display Reserved. High limit = 100°F; Low limit = 0°F

Heat Wheel Defrost

The Heat Wheel Defrost Mode occurs when the Outdoor Air Temperature is below this setpoint. High limit = 50°F; Low limit = 0°F; Default = 30°F.

TEMPERATURE SETPOINTS PAGE 6 OF 7

Cooling High Reset Source

As the Reset Source Temperature rises to this level, the Supply Air Setpoint drops to its minimum setting (Cooling SAT/Low Reset Limit Setpoint). If doing VFD Reset in a Single Zone VAV application, this Space Temperature will cause the VFD to modulate toward its 30% minimum. High limit = 200; Low limit = 0; Default = 75.

VCM-X CONTROLLERS

VCM-X Temperature & Static Setpoints

Cooling Low Reset Source

As the Reset Source Temperature drops to this level, the Supply Air Setpoint rises to its maximum setting (Cooling SAT/High Reset Limit Setpoint). If doing VFD Reset in a Single Zone VAV application, this Space Temperature will cause the VFD to modulate toward 100%. High limit = 200; Low limit = 0; Default = 75.

Heating High Reset Source

As the Reset Source Temperature rises to this level, the Supply Air Setpoint drops to its minimum setting (Heating SAT/Low Reset Limit Setpoint). If doing VFD Reset, the Space Temperature will cause the VFD to modulate toward its 50% minimum. High limit = 200; Low limit = 0.; Default = 70.

Heating Low Reset Source

As the Reset Source Temperature drops to this level, the Supply Air Setpoint rises to its maximum setting (Heating SAT/High Reset Limit Setpoint). If doing VFD Reset, the Space Temperature will cause the VFD to modulate toward 100%. High limit = 200; Low limit = 0; Default = 70.

TEMPERATURE SETPOINTS PAGE 7 OF 7

Heat Pump Defrost Temperature

If the Coil Temperature is below this value, the Defrost Mode is activated if the Heat Pump Defrost Interval is satisfied. High limit = 50°F; Low limit = 0°F; Default = 30°F. (This setpoint is only available if your unit has this feature.)

Heat Pump Defrost Interval

The Heat Pump Defrost Mode can only occur this often when the Coil Temperature is below the Defrost Temperature Setpoint. High limit = 90 minutes; Low limit = 10 minutes; Default = 30 minutes. (This setpoint is only available if your unit has this feature.)

Defrost Adaptive Timer (VCM-X Modular)

Enter a value greater than zero to enable the Adaptive Defrost Cycle Mode. High limit = 30 minutes; Low limit = 0 minutes; Default = 30 minutes.

Static Setpoints



Touch the **<Static>** button to access the *Static Setpoint Screens*.

STATIC SETPOINTS PAGE 1 OF 5

Duct Static Setpoint

For VAV units, a Supply Fan VFD or Bypass Damper Actuator is used to maintain the Duct Static Pressure Setpoint. The Static Pressure Output Signal varies to control the Static Pressure Setpoint. The Duct Static Pressure is maintained at this setpoint while the Main Fan is running. High limit = 3.00"WG; Low limit = 0.10"WG; Default = 0.50"WG.

Static Setpoint Deadband

The Duct Static Setpoint accuracy is controlled by this value. No Main Fan VFD changes are made if the static is within this range of this setpoint. High limit = 1.00"WG; Low limit = 0.01"WG; Default = 0.10"WG.

Static Control Interval

The Duct Static Control output is adjusted at a rate equal to this value. If the Duct Static Pressure is above the Static Setpoint plus the Deadband, the Static Pressure Output Signal will be reduced at every Control Rate interval. If the Static Pressure is below the Static Setpoint minus the Deadband, the Output signal will be increased at every Control Rate interval. High limit = 30 seconds; Low limit = 1 second; Default = 10 seconds.

Building Pressure Setpoint

The Building Pressure is maintained at this setpoint while the Main Fan is running. *See detailed explanation in next column.* High limit = 0.20"WG; Low limit = -0.20"WG; Default = 0.10"WG.

Building Setpoint Deadband

The Building Pressure Setpoint accuracy is controlled by this value. No Relief Fan VFD changes are made if the pressure is within this range of this setpoint. *See detailed explanation in next column.* High limit = 0.10"WG; Low limit = 0.01"WG; Default = 0.02"WG.

Building Pressure Setpoint and Deadband

Direct Acting Control:

If an Exhaust Fan Relay is configured, when the Building Static Pressure rises above the Building Pressure Setpoint plus the Deadband, the Exhaust Fan Relay will activate. It will remain on until the Building Pressure falls below the Building Pressure Setpoint minus the Deadband. If Modulating Building Pressure is configured, when the Building Static Pressure rises above the Building Pressure Setpoint plus the Deadband, the Building Pressure Output Signal will increase until the Building Static Pressure falls within the Deadband. If the Building Static Pressure falls below the Building Pressure Setpoint minus the Deadband, the Building Pressure Output Signal will decrease until the Building Static Pressure rises within the Deadband. The Building Pressure Output Signal is configurable for 0-10 or 2-10 VDC. For more detailed operation information, see the *VCM-X Controller Technical Guide* for the complete Building Pressure Control Sequence of Operation.

Reverse Acting Control:

The Building Pressure Output Signal remains a Direct Acting 0-10 or 2-10 VDC signal, but the logic is reversed. On a drop in Building Static Pressure below the Building Pressure Setpoint minus the Deadband, the Building Pressure Output Signal will increase to modulate open the Outdoor Air Damper. When this option is used, no economizer or IAQ operation will be available.

STATIC SETPOINTS PAGE 2 OF 5

Economizer Minimum Position

The Economizer (Outdoor Air Damper) Min Position Setpoint is maintained during the Occupied Mode even if the Economizer is disabled due to the Outdoor Air Temperature or Wetbulb Temperature being above the Economizer Enable Setpoint. Anytime the Economizer is not modulating for a cooling demand, it will remain at this Minimum Ventilation Position during Occupied hours. High limit = 100%; Low limit = 1%; Default = 10%.

VCM-X CONTROLLERS

VCM-X Static Setpoints

Economizer Control Rate

The speed at which the Outdoor Air Damper Actuators are controlled in the Economizer Mode can be controlled with this setting. The higher the number, the faster the rate. High limit = 99 seconds; Low limit = 10 seconds; Default = 90 minutes.

Carbon Dioxide Max Economizer

This Setpoint allows you to set the Maximum Position the Economizer will open if high CO₂ conditions occur in the space. The Maximum Economizer Position Setpoint is used to limit the amount of Outdoor Air that will be introduced to the HVAC unit in order to ensure the unit is operating within its Heating and Cooling design limitations. The Minimum setting for this Setpoint is the value previously set for the Economizer Minimum Position Setpoint. High limit = 100%; Low limit = 0%; Default = 100%.

Carbon Dioxide Setpoint

When the CO₂ level rises above the CO₂ Protection Limit Max Level, the Economizer's Minimum Position will begin to reset open proportionally between the CO₂ Protection Limit Max Level Setpoint and the Reset Range Setpoint. The Reset Range value is added to the Max Level value. High limit = 3000 PPM; Low limit = 0 PPM; Default = 900 PPM.

Carbon Dioxide Reset Range

During the IAQ mode, this is the maximum amount above the CO₂ limit that will cause the Economizer to reset to its maximum position. If the CO₂ levels are equal to or above the Max Level plus the Reset Range, the Economizer will be opened to its Maximum Economizer Position if high CO₂ levels occur. High limit = 1500 PPM; Low limit = 0 PPM; Default = 100 PPM.

STATIC SETPOINTS PAGE 3 OF 5

Outdoor Airflow Intake Area

For the controller to properly calculate the Outside Air CFM, you need to enter the inside area (sq. ft.) of the Outdoor Air Duct/Damper. When measuring the Outdoor Air Damper area, be sure to measure the inside dimensions of the damper. The more accurate the measurements, the more accurate the CFM reading will be. This value needs to be accurate to 2 decimal places. High limit = 200 sq. ft.; Low limit = 0 sq. ft.; Default = 0 sq. ft.

Exhaust Airflow Duct Area

For the controller to properly calculate the Exhaust Air CFM, you need to enter the area in square feet of the Exhaust Air Duct/Damper. When measuring the Exhaust Air Damper area, be sure to measure the inside dimensions of the damper. The more accurate the measurements, the more accurate the CFM reading will be. This value needs to be accurate to 2 decimal places. High limit = 200 sq. ft.; Low limit = 0 sq. ft.; Default = 0 sq. ft.

Supply Air Duct Area

For the controller to properly calculate the Supply Air CFM, you need to enter the area in square feet of the Supply Air Duct/Damper. When measuring the Supply Duct Damper area, be sure to measure the inside dimensions of the damper. The more accurate the measurements, the more accurate the CFM reading will be. This value needs to be accurate to 2 decimal places. High limit = 200 sq. ft.; Low limit = 0 sq. ft.; Default = 0 sq. ft.

Minimum Outdoor Air CFM

If controlling the Outdoor Air Damper to a CFM Setpoint, this screen allows you to enter the design minimum required Outdoor Airflow for the air handler. High limit = 200 K CFM; Low limit = 0.10 K CFM; Default = 0.10 K CFM.

Maximum Outdoor Air CFM

If controlling the Outdoor Air Damper to a CFM Setpoint, this screen allows you to enter the design maximum required Outdoor Airflow for the air handler. This is only used during CO₂ override conditions. High limit = 200 K CFM; Low limit = 0.10 K CFM; Default = 0.10 K CFM.

STATIC SETPOINTS PAGE 4 OF 5

OA CFM Proportional Window

If the CFM reading is this far from setpoint, the controller will make 5% signal adjustments to try to get to setpoint. High limit = 1000 CFM; Low limit = 10 CFM; Default = 10 CFM.

Max OA Damper Tempering Limit

The Maximum OA Damper Tempering Limit Setpoint allows you to set the Maximum Damper position the Economizer can open to while the heat is running during the Tempering Mode in this sequence (to prevent potential wasting of energy). Enter the maximum position the Economizer can open in the Supply Air Tempering Mode. High Limit = 60%; Low limit = 0%; Default = 50%.

Mod Cooling Window

The Modulating Cooling Window is the control range of the Modulating Signal above and below the Active Supply Air Setpoint. The larger the Modulating Cooling Window, the smaller the signal adjustment per Time Period will be for each °F the supply air is from the Active Supply Air Temperature Setpoint. If the Supply Air Temperature is this amount away from the SAT setpoint, 10% of the possible output signal will be applied. High Limit = 30°F; Low limit = 1°F; Default = 10°F.

Mod Heating Window

The Modulating Heating Window is the control range of the Modulating Signal above and below the Active Supply Air Setpoint. The larger the Modulating Heating Window, the smaller the signal adjustment per Time Period will be for each °F the supply air is from the Active Supply Air Temperature Setpoint. If the Supply Air Temperature is this amount away from the SAT setpoint, 10% of the possible output signal will be applied. High Limit = 30°F; Low limit = 1°F; Default = 10 °F.

Heating Minimum VFD

If the Supply Fan VFD signal falls below this setpoint, Heating will be disabled. The Main Fan VFD signal must be at or above this percentage before any heat is allowed to activate. High limit = 100%; Low limit = 0%; Default = 30%.

VCM-X Static & Staging Delay Setpoints

STATIC SETPOINTS PAGE 5 OF 5

Minimum Outdoor Air Content

If Demand Ventilation is being used, this is the minimum outdoor air content required to provide the minimum ventilation requirements. High Limit = 100%; Low limit = 1%; Default = 10%.

Maximum Outdoor Air Content

If Demand Ventilation is being used, this is the maximum outdoor air content required to provide the minimum ventilation requirements. High Limit = 100%; Low limit = 1%; Default = 50%

Ambient Outdoor CO₂ Level

Enter the ambient CO₂ level for the outdoor air conditions in the area where this unit is installed. High limit = 1000 PPM; Low limit = 0 PPM; Default = 400 PPM.

Altitude

Enter the altitude or elevation above sea level for the location of the building this unit is installed in. High limit = 15,000 feet; Low limit = 0 feet; Default = 500 feet.

CO₂ Fail Mode Offset

If communication is lost with the polling device, this offset will be added to the minimum economizer position, in an attempt to maintain minimum ventilation requirements. High Limit = 100%; Low limit = 0%; Default = 0%.

Staging Delays Setpoints



Touch the <Staging Delays> button to access the *Staging Delays Setpoint Screens*.

STAGING DELAY SETPOINTS PAGE 1 OF 3

Cooling Stage Down

This is the amount of time that must elapse between each Compressor deactivation to prevent all Compressors from deactivating at once as the cooling demand decreases. High limit = 15 minutes; Low limit = 1 minute; Default = 1 minute.

Cooling Stage Up

This is the amount of time that must elapse between each Compressor activation to prevent all Compressors from activating at the same time due to large cooling demands. High limit = 15 minutes; Low limit = 3 minutes; Default = 3 minutes.

Cooling Min Run Time

This is the minimum amount of time the Compressors must remain on once they have been activated. This overrides the Stage Down Delay if that is not as long as this delay. High limit = 15 minutes; Low limit = 5 minutes; Default = 5 minutes.

Cooling Min Off Time

Once a Compressor has been staged back off, it must remain off for this amount of time to prevent short cycling. High limit = 15 minutes; Low limit = 3 minutes; Default = 3 minutes.

Mechanical Fail Timeout

When Heating or Cooling Mode is initiated and staging is activated, if the Supply Air Temperature does not rise or fall 5°F within the Mechanical Fail Timeout Setpoint, a Mechanical Heating or Cooling failure alarm will be generated. The Alarm is for status reporting only. The HVAC unit will continue to run. High limit = 255 minutes; Low limit = 0 minutes; Default = 15 minutes.

STAGING DELAY SETPOINTS PAGE 2 OF 3

Heating Stage Down

This is the amount of time that must elapse between each Heat Stage deactivation to prevent all Heat Stages from deactivating at once as the heating demand decreases. High limit = 15 minutes; Low limit = 1 minute; Default = 1 minute.

Heating Stage Up

This is the amount of time that must elapse between each Heat Stage activation to prevent all Heat Stages from activating at the same time due to large heating demands. High limit = 15 minutes; Low limit = 3 minutes; Default = 3 minutes.

VCM-X Staging Delay & Miscellaneous Setpoints

Heating Min Run Time

This is the minimum amount of time the Heat Stages must remain on once they have been activated. This overrides the Stage Down Delay if that is not as long as this delay. High limit = 15 minutes; Low limit = 2 minutes; Default = 2 minutes.

Heating Min Off Time

Once a Heat Stage has been staged back off, it must remain off for this amount of time to prevent short cycling. High limit = 15 minutes; Low limit = 1 minute; Default = 1 minute.

Warm-up Timeout

If the equipment has entered the Morning Warm-up Mode, it will remain in that mode until the Return Air Temperature rises above the Morning Warm-up Setpoint or until this Warm-up Timeout expires. The Warm-up Timeout must be greater than zero for Morning Warm-up to occur. High limit = 240 minutes; Low limit = 0 minutes; Default = 60 minutes.

STAGING DELAY SETPOINTS PAGE 3 OF 3

Fan Starting Delay

This is the Supply Fan Starting Delay Timer initiated whenever the VCM-X initiates Supply Fan operation. This is useful when you are using multiple VCM-X-controlled HVAC units and want to be sure that all the units do not start at exactly the same time when the Occupied schedule occurs. Each VCM-X should be set with staggered Fan Starting Delay Setpoint values. When the 255-second default setpoint is used, it multiplies each VCM-X controller's address by 5 and uses this value in seconds as the Fan Starting Delay Time. This provides a staggered start for each VCM-X controller on the system without having to individually set each VCM-X controller for its own time delay. High limit = 255 seconds; Low limit = 0 seconds; Default = 255 seconds.

Heat Pump Delay

If your VCM-X is configured to operate as a Heat Pump, the Heat Pump Auxiliary Heating Delay Setpoint can be configured to provide a time delay period before Auxiliary Heating Stages can be activated once activation of the Compressor Heating Stages have been initiated. High limit = 30 minutes; Low limit = 0 minutes; Default = 3 minutes.

Mod Cooling Time Period

The Time Period is the delay before another signal increase or decrease can be made and is user-adjustable. Short Time Periods may cause hunting of the Modulating Signal. This is the rate at which the Modulating Cooling Signal is calculated. High limit = 250 seconds; Low limit = 5 seconds; Default = 30 seconds.

Mod Heating Time Period

The Mod Heating Time Period is the delay before another signal increase or decrease can be made and is user-adjustable. Short Time Periods may cause hunting of the Modulating Signal. This is the rate at which the Modulating Heating Signal is calculated. High limit = 250 seconds; Low limit = 5 seconds; Default = 5 seconds.

Miscellaneous Setpoints



Touch the **<Miscellaneous>** button to access the *Miscellaneous Setpoint Screens*.

MISCELLANEOUS SETPOINTS PAGE 1 OF 4

Controlling Week Schedule

If the VCM-X is not using its own internal week schedule, enter the external schedule number that will control this unit. Enter 0 to use the internal schedule. Enter 1 through 5 to use an external schedule. A GPC Plus is required for schedules 1 through 5. High limit = 5; Low limit = 0; Default = 0.

Push-Button Override Duration

If the VCM-X has a Space Temperature Sensor installed and it has the Override Button option, the HVAC unit will initiate the Occupied Mode any time the Override Button is pressed and held for less than 3 seconds. The Push-Button Override Duration Setpoint allows you to adjust the amount of time the Override will remain in effect when the Override Button is pressed. To cancel the Override before the Override Duration time period expires, press the Override Button for 5 to 10 seconds. High limit = 8 hours; Low limit = 0 hours; Default = 2 hours.

Maximum Slide Offset Effect

If the VCM-X has a Space Temperature Sensor with the Slide Adjust option installed, the HVAC Mode Enable Heating and Cooling Setpoints can be offset by the Maximum Slide Offset Effect Setpoint. When the Slide Adjust bar is in the middle, no offset will occur. If the Slide Adjust bar is moved all the way to the top of the Sensor, the Heating and Cooling Setpoints will be raised by the Setpoint value you have entered. If the Slide Adjust bar is moved all the way down to the bottom of the Sensor, the Heating and Cooling Setpoints will be lowered by the Setpoint value you have entered. High limit = 10°F; Low limit = 0°F; Default = 0°F.

Optimal Start Soak Factor

If you are using the Optimal Start feature, you can force the calculated start to time to activate. The Optimal Start Soak Factor is a multiplier that if set to a number greater than 0 will be used as a multiplier for calculating the Optimal Start Time for the HVAC unit. This multiplier is only applied if the unit has been off for more than 24 hours. See the *VCM-X E-BUS Controller Technical Guide* for more detailed information regarding the Optimal Start. This multiplier is only applied if you are using the VCM-X Internal Schedule. High limit = 5.0; Low limit = 0.0; Default = 0.0.

CO2 Sensor Scaling

If you have installed a CO₂ sensor for Indoor Air Quality, enter the maximum reading the sensor can provide when the maximum input signal is applied. High limit = 3000 ppm; Low limit = 0 ppm; Default = 2000 ppm

VCM-X Miscellaneous Setpoints

MISCELLANEOUS SETPOINTS PAGE 2 OF 4

Trend Logging Interval

An Internal Trendlog is constantly updated at a rate equal to this value. High limit = 120 minutes; Low limit = 1 minute; Default = 15 minutes.

Indoor Humidity Setpoint

On VAV or CAV configured units that are not using 100% Outdoor Air, when the Indoor Relative Humidity percentage rises above the Indoor Humidity Setpoint, the unit will start operating in Dehumidification Mode. If an Indoor Humidity Sensor is installed, the unit will reset the Coil Suction Temperature Setpoint as needed to maintain this Indoor RH Setpoint. This includes VAV, CAV and MUA applications. High limit = 100%; Low limit = 1%; Default = 50%.

Return Bypass Damper Factor

This setpoint is used when your HVAC unit is configured for Return Air Bypass Damper control. The Return Air Bypass Damper Factor Setpoint is a percentage value that is used to calculate the Return Air Damper position in relation to the Return Air Bypass Damper position. This provides a method for adjusting the airflow through the Return Air Bypass Damper.

Increasing this percentage increases the airflow through the Return Air Bypass Damper by causing the Return Air Damper to move further towards its closed position in relation to the Return Air Bypass Damper moving towards its open position.

Decreasing this percentage decreases the airflow through the Return Air Bypass Damper by causing the Return Air Damper to move further towards its open position in relation to the Return Air Bypass Damper moving towards its closed position. High limit = 100%; Low limit = 0%; Default = 40%.

Head Pressure Setpoint (VCM-X Modular, VCM-X WSHP)

Enter the maximum head pressure setpoint for the Head Pressure Module. High limit = 420 PSI; Low limit = 240 PSI; Default = 315 PSI.

Reheat Head Pressure (VCM-X Modular, VCM-X WSHP)

Enter the maximum head pressure setpoint for the Reheat Mode of operation. High limit = 400 PSI; Low limit = 250 PSI; Default = 400 PSI.

MISCELLANEOUS SETPOINTS PAGE 3 OF 4

Max Fan Voltage All Modes

This is the maximum fan voltage allowed in all modes of operation. High limit = 10.0 vdc; Low limit = 0.0 vdc; Default = 10.0 vdc.

MISCELLANEOUS SETPOINTS PAGE 4 OF 4

Space Sensor Offset

If the Space Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature. Enter a positive Sensor Calibration value to raise the Space Temperature Sensor reading and a negative value to lower the Sensor reading. High limit = 100°F; Low limit = -100°F; Default = 0°F.

Supply Sensor Offset

If the Supply Air Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature. Enter a positive Sensor Calibration value to raise the Supply Air Temperature Sensor reading and a negative value to lower the Sensor reading. High limit = 100°F; Low limit = -100°F; Default = 0°F.

Return Sensor Offset

If the Return Air Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature. Enter a positive Sensor Calibration value to raise the Return Air Temperature Sensor reading and a negative value to lower the Sensor reading. High limit = 100°F; Low limit = -100°F; Default = 0°F.

Outdoor Sensor Offset

If the Outdoor Air Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature. Enter a positive Sensor Calibration value to raise the Outdoor Air Temperature Sensor reading and a negative value to lower the Sensor reading. High limit = 100°F; Low limit = -100°F; Default = 0°F.

Coil Temperature Offset

If the Coil Temperature reading needs to be adjusted, enter a positive value to raise the Coil Temperature reading and a negative value to lower the Coil Temperature reading. High limit = 30°F; Low limit = -30°F; Default = 0°F.

VCM-X CONTROLLERS

VCM-X Relay Setpoints

Relay Setpoints

Relays

Touch the **<Relays>** button to access the *Outputs Setpoints Screens*. Touch the radio button next to the desired relay selection. Choose one relay output from each screen for Relays 2 through 21. Relays #2 through #21 can be individually configured. By using the available relay outputs on the Controller and Expansion Modules, you have the ability to configure up to a combined total of 20 Heating Stages, Cooling Stages, and the rest of the options listed in each *Outputs Setpoints Screen*. Only the Heating and Cooling relays can be configured with multiple outputs. If any other option is selected more than once, it will simply activate redundant relays, but no multiple staging will occur. See **Table 6** for Relay Definitions.

NOTE: Relay #1 is not configurable as it is reserved for the Supply Air Fan.

- **Not Used**
- **Heating Stage**
- **Cooling Stage**
- **Warm Up Command**
- **Reversing Valve**
- **Gas Re-Heat**
- **Exhaust Fan**
- **Pre-Heater**
- **External Heat (Used in previous versions)**
- **Alarm Indicator**
- **Override Indicator**
- **Occupied Indicator**
- **OA Damper**
- **Mod Cooling (Used in previous versions)**
- **Heat Wheel**
- **Emergency Heat**

| No. | Relay Description | Details |
|-----|-------------------------------------|---|
| 1 | Heating Stages | Configure (1) Relay for each stage of heat. Configure (1) Relay for Mod heat. |
| 2 | Cooling Stages | Configure (1) Relay for each stage of cooling. For chilled water, configure (1) Relay for cooling. |
| 3 | Warm-Up Mode (VAV Boxes) | Configure (1) Relay for Warm-Up Mode when Non-Orion VAV/Zone Controllers are used. |
| 4 | Reversing Valve (Heat Pumps) | Configure (1) Relay for Reversing Valve operation. Can be configured for heating or cooling. |
| 5 | Reheat | Configure (1) Relay for On/Off reheat when used. |
| 6 | Exhaust Fan | Configure (1) Relay for enabling exhaust fan when building pressure control is used. |
| 7 | Pre-Heater (low ambient protection) | Configure (1) Relay for pre-heat coil when required. Activated when the outdoor air temperature drops below the ambient protection setpoint. |
| 8 | Alarm | Configure (1) Relay to initiate an alarm output when any VCM-X alarm occurs. |
| 9 | Override | Configure (1) Relay to initiate an output signal when space temperature override button is pushed. |
| 10 | Occupied | Configure (1) Relay to initiate an output signal any time the VCM-X is in occupied mode. |
| 11 | OA Damper | Configure (1) Relay to initiate an output signal when the OA damper moves beyond its minimum during economizer operation, when the OA damper opens, when Hood On/Off is used, when Hood Contact is used, and with MUA applications. |
| 12 | Heat Wheel | Configure (1) Relay that turns heat wheel on when in occupied operation and turns heat wheel off when in economizer mode. |
| 13 | Emergency Heat | Configure (1) Relay for fixed stage Emergency Heat in a heat pump unit. Not available on VCM-X WSHP E-BUS controller. |

Table 6: User-Configurable Relay Outputs

VCB-X CONTROLLERS

Accessing and Entering VCB-X Setpoints

Accessing and Entering VCB-X Setpoints

While in the VCB-X Status Screen (see **Figure 33**), *touch* the **<Setpoints>** button found on the bottom menu bar. The VCB-X Controller's *Temperature Setpoints Screen* will appear. See **Figure 34**.

Level 1 and Level 2 users can change occupied space temperature setpoints, but only Level 3 users can change all setpoints.



Figure 33: VCB-X Controller Status Screen

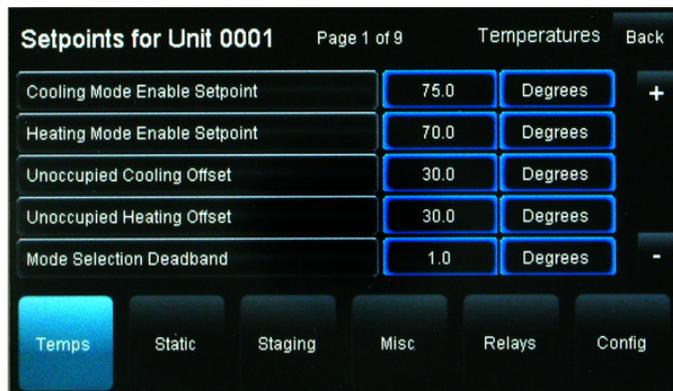


Figure 34: VCB-X Controller Temperature Setpoints Screen

Individual setpoint and configuration buttons are located at the bottom of the *Setpoint Screens*. See **Figure 35**. Simply *touch* a specific button to access that category.



Figure 35: VCB-X Setpoint Buttons

Within each Setpoint Screen, *touch* the **<Status>** button to return to the *Status Screen* or *touch* **<Home>** to return to the *Main Screen*.

Use the **<+>** and **<->** buttons to scroll through the setpoints and configurations. Simply *touch* the blue highlighted box to change the setpoint. Each setpoint data entry screen will provide a definition of the setpoint and specific instructions for entering the setpoint and will include the setpoint range as in the example below, **Figure 36**.

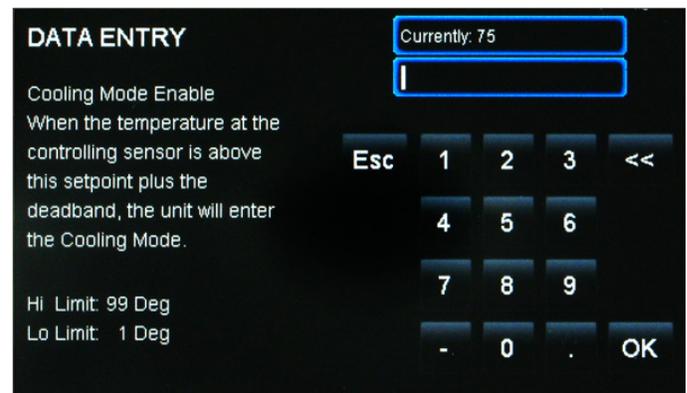


Figure 36: VCB-X Cooling Mode Setpoint Data Entry Screen

Touch **<OK>** to have the system accept the new value. If you enter a setpoint that is not in the valid range, the setpoint will remain as is and will not change.

Each setpoint data entry screen is self-explanatory; however, each setpoint and configuration is explained in the next section, *Configuring VCB-X Setpoints*. To easily reference a particular setpoint or configuration, refer to the **Index, page 60**

VCB-X CONTROLLERS

VCB-X Configuration

VCB-X Configuration

Config

Touch the <Configuration> button to access the *Configuration Setpoints Screens*.

For screens that contain radio buttons, *touch* the radio button next to your selection. For screens with square buttons, *touch* one or more square buttons to make your configuration selections for the unit.

CONFIGURATION SETPOINTS PAGE 1 OF 20

- Check this Box for Celsius Temperature Scaling**—Touch the square button to select Celsius Temperature Scaling. Default is Fahrenheit.

Installed Sensors

Touch the square button to select the sensors that are installed:

- Carbon Dioxide Sensor Installed**
- Suction Pressure Sensor Installed**
- Communicating Indoor Sensor Installed**—This is the E-BUS Digital Room Temperature Sensor or Digital Temperature and Humidity Sensor.
- Communicating Outdoor Sensor Installed**—This is the E-BUS Outdoor Air Temperature and Humidity Sensor.

CONFIGURATION SETPOINTS PAGE 2 OF 20

Installed Expansion Boards and Modules

Touch the square button to select the Expansion Board(s) and Modules that are installed. The available selections are as follows:

- Main Expansion Board Installed**—This is the EM1 Module. The following IO is available on EM1:
 - VAV Capabilities
 - Building Pressure
 - Head Pressure Control
 - Return Air Temperature
 - Remote Forced Occupied
 - Water Source Heat Pump Monitoring
 - Modulating Chilled Water
 - Water Temperature
 - Hood On/Off
 - Proof of Flow
 - Condenser Control
- ReHeat Expansion Board Installed**—This is the MHGRV-X Controller.
- Mod Gas Expansion Board Installed**—This is the MODGAS-X Controller.
- 12 Relay Expansion Board Installed**—This is the E-BUS 12 Relay Expansion Module.
- DPAC/Remote Control Expansion Installed**—This is the EM2 Expansion Module.
- PreHeater Expansion Installed**—This is the PREHEAT-X Controller.

CONFIGURATION SETPOINTS PAGE 3 OF 20

HVAC Mode Enable Source

Touch the radio button to select the Temperature Sensor/Application that will determine the Heating, Cooling, or Vent Mode of operation. Default is Single Zone VAV. The available selections are as follows:

- **Single Zone VAV**—Recirculating unit using the Space Temperature Sensor to determine the mode of operation. Heating and Cooling are controlled to a Leaving Air Setpoint. Space Temperature resets the Supply Fan VFD speed to maintain the Space Temperature. Modulating Heating and Cooling must be used for VAV operation. Can be configured for CAV Heating using staged Heat.
- **Space Temperature**—Typical recirculating unit using a Space Temperature Sensor to determine the Heating, Cooling, and Vent Modes of operation.
- **Outdoor Air Temperature**—This is for a 100% Outdoor Air Unit (MUA) using the Outdoor Air Temperature Sensor to determine the Heating, Cooling, and Vent Modes of operation. Dehumidification utilizes an Outdoor Air Dewpoint Setpoint
- **Supply Air Cooling Only**—This is for a standard Cooling Only VAV unit with optional Morning Warm Up. In the Occupied Mode, the unit will be in the Cooling Mode controlling to the Cooling Supply Air Setpoint.
- **Return Air Temperature**—Optional recirculating unit configuration using the Return Temperature Sensor to determine the Heating, Cooling, and Vent Modes of operation.
- **Space Temp w/ High OA Content**—If it is preferable to use Space conditions (instead of Outside Air) to control a 100% or high percentage outdoor air unit, this option allows tempering of the outdoor air in the Space Vent Mode of operation to prevent dumping of hot or cold air into the space.

CONFIGURATION SETPOINTS PAGE 4 OF 20

Static Pressure Control

This configuration option is available if expansion module EM1 is installed and configured. Default is Fan VFD. The options are:

- **None**—This unit is not controlling Duct Static Pressure.
- **Fan VFD or Single Zone VAV**—This unit has a Supply Fan VFD that modulates to control the Duct Static Pressure.
- **Bypass Damper**—This unit uses a Bypass Damper to control the Duct Static Pressure.

CONFIGURATION SETPOINTS PAGE 5 OF 20

SAT Reset Source

This configuration option is not available if Single Zone VAV was selected as the HVAC source. The Supply Air Setpoint can be “automatically” adjusted based on a selected reset source. This screen allows you to choose this source. Select No Reset for Single Zone VAV units. **Default is No Reset.** The available selections are as follows:

- **No Reset**—No SAT Setpoint Reset will occur. The SAT Setpoints remain fixed.

VCB-X Configuration

- **Outdoor Air**—The SAT Setpoints will be adjusted based on the Outdoor Air Temperature.
- **Return Air**—The SAT Setpoints will be adjusted based on the Return Air Temperature.
- **Fan VFD Signal**—The SAT Setpoints will be adjusted based on the VFD Signal. This is good for Adjusting the Setpoints based on the building's load by looking at the VFD speed.

NOTE: This screen will be grayed-out if Single Zone VAV was selected as the HVAC Mode Enable Source.

CONFIGURATION SETPOINTS PAGE 6 OF 20

- **Use Fan Cycle Mode**—*Touch* the square button to select this item if you want the HVAC unit's Supply Fan to only run during Heating or Cooling Mode. DO NOT select this item if you want the HVAC unit's Supply Fan to run continuously while in the Occupied Mode, regardless of the Heating or Cooling Mode.
- **Has Head Pressure Control**—*Touch* the square button to select this item if you have the EM1 Module installed and configured and if a Head Pressure Sensor is installed for Head Pressure Control.
- **Has Water Side Condenser**—*Touch* the square button to select this item if you have the EM1 Module installed and configured and if using a Water Side Condenser.

CONFIGURATION SETPOINTS PAGE 7 OF 20

Dehumidification Control

Touch the radio button to select the type of Dehumidification control. Default is None.

- **None**—The unit does not have a Dehumidification Mode.
- **Dehumidify in Occupied Vent Mode Only**—The unit can only enter Dehumidification during the Occupied Vent Mode (when there is no call for Cooling or Heating).
- **Dehumidify in Vent Mode Anytime**—The unit can only enter Dehumidification during the Vent Mode (when there is no call for Cooling or Heating) in both the Occupied and Unoccupied operation.
- **Dehumidification in All Modes Occupied**—This is Occupied Mode Dehumidification Priority. The unit can enter Dehumidification during Cooling, Heating, or Vent Modes, but only while in Occupied operation.
- **Dehumidification in All Modes Anytime**—This is Occupied and Unoccupied Dehumidification Priority. The unit can enter Dehumidification during Cooling, Heating, or Vent Modes while in Occupied or Unoccupied operation.

For units controlled by space humidity sensors, Dehumidification is initiated based on an Indoor Humidity Setpoint. For 100% OA units (MUA), Occupied Dehumidification is initiated based on an Outdoor Air Dewpoint Setpoint. For MUA units, Unoccupied Dehumidification can only occur if the unit is configured for Night Setback recirculating operation and has a Space Humidity sensor and a Space Humidity Setpoint.

CONFIGURATION SETPOINTS PAGE 8 OF 20

Reheat Type

This configuration option is available if expansion module EM1 has been installed and configured and if Dehumidification has been configured. If you need Reheat in the Dehumidification mode, this screen allows you to configure what kind of reheat will be used. The output(s) will be staged or modulated to maintain the Active Supply Air Setpoint. *Touch* the radio button to select the desired Reheat Type. Default is None.

- **None**—No Reheat.
- **On/Off HGR Relay**—Single On/Off Reheat stage (Reheat Relay).
- **Modulating HGR**—Modulating Hot Gas Reheat (MHGR)
- **Use Unit Heat for Reheat**—Using the unit's heat as Reheat when Hot Gas Reheat is not available.
- **Mod HGR AND Unit Heat**—Using MHGR as the 1st form of Reheat, supplemented by unit Heat if necessary.
- **On/Off HGR AND Unit Heat**—Using "Reheat Relay" stage as the 1st form of Reheat, supplemented by unit Heat if necessary.

NOTE: This screen will be grayed-out if not using Dehumidification.

CONFIGURATION SETPOINTS PAGE 9 OF 20

Reversing Valve (Heat Pump Configuration)

If you are using a Heat Pump, *touch* the radio button to select the desired Reversing Valve Signal if your Heat Pump unit activates its reversing valve during Cooling or Heating operation. Default is None.

- **None**—Not a Heat Pump and no externally controlled reversing valve.
- **Air to Air Heat Pump Fail to Heating**—Air to Air Heat Pump and Reversing Valve fails to Heating.
- **Air to Air Heat Pump Fail to Cooling**—Air to Air Heat Pump and Reversing Valve fails to Cooling.
- **Water Source Heat Pump Fail to Heating**—Water Source Heat Pump and Reversing Valve fails to Heating.
- **Water Source Heat Pump Fail to Cooling**—Water Source Heat Pump and Reversing Valve fails to Cooling.

CONFIGURATION SETPOINTS PAGE 10(A) OF 20

Heating Type

Touch the radio button to select the desired Heating Type. Modulating Heat is always initiated first. Default is None.

- **None**—The unit has no Heat.
- **Staged Control**—On/Off Hot Water or fixed stage(s) of Heat.
- **Modulating Control**—Only fully modulating forms of Heat which would be Modulating Hot Water, Modulating Steam Heat or Modulating SCR Electric Heat. Does not include Modulating Gas using the AAON MODGAS-X Controller.

VCB-X CONTROLLERS

VCB-X Configuration

- **Space Temperature**—The SAT Setpoints will be adjusted based on the Space Temperature.
- **Mod Gas Control**—Only Modulating Gas Heat controlled by the AAON MODGAS-X Controller.
- **Modulating and Staged Control**—Fully modulating as the 1st form of Heat and Stage(s) of Heat as the 2nd form of Heat.
- **Mod Gas and Staged Control**—ModGas Heat as the 1st form of Heat and Stage(s) of Heat as the 2nd form of Heat.

See the *VCB-X Controller Field Technical Guide* for a more detailed description of these operations.

NOTE: If you are using a Heat Pump, this screen will not appear.

CONFIGURATION SETPOINTS PAGE 10B OF 20

Aux Heating Type

If you are using a Heat Pump, *touch* the radio button to select the desired Aux Heat option. Default is None.

- **None**—This unit does not have Heat Pump Auxiliary Heat.
- **Staged Control**— This unit has a stage(s) of Auxiliary Heat. Multiple relays can be configured as Aux Heat in which case the relays will stage up as required.
- **Modulating Control**—This unit has a form of modulating heat being used as Auxiliary Heat. ModGas cannot be used as the modulating heat source.
- **Mod Heat AND Staged Heat**—This unit has modulating heat that will be used as the 1st form of Auxiliary Heat followed by a stage(s) of Aux Heat.

NOTE: If you are not using a Heat Pump, this screen will not appear.

CONFIGURATION SETPOINTS PAGE 11 OF 20

Cooling Type

Touch the radio button to select the desired Cooling Type. If your HVAC unit is equipped with a Digital Compressor, *touch* the radio button to select Modulating Control or Modulating and Staged Control. Modulating Cooling is always initiated first. Default is None.

- **None**—The unit has no Cooling.
 - **Staged Control**—On/Off Chilled Water or fixed stage(s) DX Cooling only.
 - **Modulating Control**—Modulating Chilled Water or Digital Scroll Compressors.
 - **Modulating and Staged Control**—Digital Scroll Compressor(s) as the 1st form of Cooling and fixed stage(s) of Cooling as the 2nd form of Cooling.
- Digital Compressor**—*Touch* this square if your HVAC unit is using a Digital Compressor. Default is No.

CONFIGURATION SETPOINTS PAGE 12 OF 20

Economizer Control

Touch the radio button to select type of Economizer Control. Default is None. *Touch* the square button to allow Economizer Control in Unoccupied Mode. Default is No Economizer Allowed in Unoccupied Mode.

- **None**—No Economizer being controlled directly by this controller.
- **Economizer Only**—Economizer being controlled but no CO₂ control.
- **Economizer with CO₂ Reset**—Economizer controlled but with the ability for CO₂ to reset the Minimum position.
- Economizer Allowed in Unoccupied Mode**—Default is NO. This configuration option is available if Economizer Control is configured.
 - **YES**—You want to use the Economizer as necessary during Unoccupied Night Setback cooling calls. It will be utilized just as it would be in the Occupied mode with the same outdoor enable temperature. The Economizer will remain closed unless there is a call to run while in the Unoccupied Mode.
 - **NO**—You want the Economizer to always remain fully Closed in the Unoccupied mode even if there is a call to run from a zone or space temp.
- Economizer Title 24 Option**—Select this item if your unit has Title 24 Economizer operation.

CONFIGURATION SETPOINTS PAGE 13 OF 20

Economizer Enable Source

This configuration option is available if the unit was configured for Economizer Control. *Touch* the radio button from the Economizer Enable methods listed below that will allow the Economizer to be used as the first stage of cooling. Default is OA Drybulb.

- **OA Drybulb**— If the Outdoor Air Drybulb temperature is below the enable setpoint, the Economizer can be used as the first stage of cooling.
- **OA Wetbulb (OA RH sensor needed)**—If the Outside Air Wetbulb temperature is below the enable setpoint, the Economizer can be used as the first stage of cooling.
- **OA Dewpoint (OA RH sensor needed)**—If the Outdoor Air Dewpoint temperature is below the enable setpoint, the Economizer can be used as the first stage of cooling.

CONFIGURATION SETPOINTS PAGE 14 OF 20

Building Pressure Control

This configuration option is available if the EM1 Module has been installed and configured. *Touch* the radio button to select type of Building Pressure Control. Default is None.

- **None**—No Building Pressure Control by this controller.
- **On/Off Control**—If the building pressure rises above setpoint, a relay configured as Exhaust Fan will energize in order to turn on an On/Off exhaust fan. You must configure one of the output relays as Exhaust Fan.
- **Modulating Control**—If the building pressure rises above setpoint, a modulating signal will be used to control an exhaust fan VFD or a modulating damper. A relay configured as Exhaust Fan can be used to enable this device so that the modulating signal can control it.

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- **Reverse Acting OA Damper Control**—Select if reverse acting Building Pressure Control using the Outdoor Air Damper is required. If the building pressure falls below setpoint, the OA Damper (Economizer) signal will be used to modulate the OA Damper to maintain setpoint.
- **Reverse Acting Supply Fan VFD Control**—Contact WattMaster Factory regarding this reverse acting Building Control option. This should not be used in most applications.

CONFIGURATION SETPOINTS PAGE 15 OF 20

Morning Warm-Up

Touch the radio button to select type of Morning Warm-Up control. Default is None.

- **None**— There is no Morning Warm Up required.
- **Stand Alone Warm-up Control**—The VCB-X Controller is not communicating to Orion VAV Box controls, but a Morning Warm Up Relay can be configured to signal boxes by other to open.
- **Warm-up w/Broadcast to Fixed Airflow**—The VCB-X Controller is communicating to Orion VAV Boxes and will broadcast a command to the boxes to go to a Fixed Percentage Position or Airflow while in Morning Warm Up. This fixed position is configured in the VAV box controller.
- **Warm-up w/Broadcast to Maximum Airflow**—The VCB-X Controller is communicating to Orion VAV Boxes and will broadcast a command to the boxes to go to a Maximum Percentage Position or Airflow while in Morning Warm Up. This maximum position is configured in the VAV box controller.

CONFIGURATION SETPOINTS PAGE 16 OF 20

Morning Cool-Down

Touch the radio button to select type of Morning Cool-Down control. Default is None.

- **None**— There is no Morning Cool Down required.
- **Stand Alone Cool-Down Control**—The VCB-X Controller is not communicating to Orion VAV Box controls, but a Morning Cool Down Relay can be configured to signal boxes by other to open.
- **Cool-Down w/Broadcast to Fixed Airflow**—The VCB-X Controller is communicating to Orion VAV Boxes and will broadcast a command to the boxes to go to a Fixed Percentage Position or Airflow while in Morning Cool-Down. This fixed position is configured in the VAV box controller.
- **Cool-Down w/Broadcast to Maximum Airflow**—The VCB-X Controller is communicating to Orion VAV Boxes and will broadcast a command to the boxes to go to a Maximum Percentage Position or Airflow while in Morning Cool-Down. This maximum position is configured in the VAV box controller.

CONFIGURATION SETPOINTS PAGE 17 OF 20

Binary Input Configuration

Touch the square button to select the binary inputs on the VCB-X Controller.

- Emergency Shutdown Input is Required**
Select this item for YES if a Smoke Detector/Firestat or other Emergency Shutdown input is connected to the Emergency Shutdown binary input. If a Shutdown condition occurs and the 24V signal is removed from this input, the Supply Fan and Heating and Cooling Relay Outputs will be de-energized and an alarm will be generated. Default is NO.
- Proof of Flow Input is Required**
Select this item if the unit is equipped with a Proof of Flow Switch and it is connected to the VCB-X. If selected as YES and the Proof of Flow Switch is open, only the Supply Fan Relay will be active. If any other relays such as Heating Stages or Cooling Stages are active, they will be deactivated when the Proof of Flow Switch input is lost. Default is NO.
- Dirty Filter Input is Required**
Select this item if a Dirty Filter switch is connected to the Dirty Filter binary input. If the Dirty Filter input is active, an alarm will be generated. Default is NO.
- Defrost Coil Switch Installed**
Select this item if a Defrost Coil Temperature Switch is installed and is connected to the Defrost Coil Temperature Switch binary input. If this switch closes, it will initiate a Defrost Mode. Default is NO.

CONFIGURATION SETPOINTS PAGE 18 OF 20

Installed Sensors

Touch the square button to select the desired airflow sensor monitoring:

- Monitor Return Airflow Sensor**—Select this item if you have an Airflow Monitoring station measuring the CFM of the Return Air airflow stream of this unit. Default is NO.
- Monitor Supply Airflow Sensor**—Select this item if you have an Airflow Monitoring station measuring the CFM of the Supply Air airflow stream of this unit. Default is NO.
- Monitor Exhaust Airflow Sensor**—Select this item if you have an Airflow Monitoring station measuring the CFM of the Exhaust Air airflow stream of this unit. Default is NO.
- Monitor Outdoor Airflow Sensor**—Select this item if you have an Airflow Monitoring station measuring the CFM of the Outdoor Air airflow stream of this unit. Default is NO.
- Control Outdoor Airflow**—Select this item if you have an Airflow Monitoring station and are controlling the OA Damper to an airflow (CFM) setpoint. Default is NO.
- Has Outdoor Air Temperature Sensor**—Select this item if you have any type of Outdoor Air Temperature Sensor installed.

VCB-X CONTROLLERS

VCB-X Configuration & Temperature Setpoints

Type of Monitoring Station

Touch the radio button to select the type of airflow monitoring station:

- **EBTRON Sensors**—Select this item if using an Ebtron or Greentrol Airflow Monitoring Station.
- **Paragon Sensors**—Select this item if using a Paragon Airflow Monitoring Station.

CONFIGURATION SETPOINTS PAGE 19 OF 20

- ❑ **Broadcast Outdoor Air Humidity**—The VCB-X will broadcast its Outdoor Air Humidity Reading to other HVAC units if they are not equipped with their own Outdoor Air RH sensors. A network communications device (MiniLink PD or CommLink) is needed in order for this feature to operate.
- ❑ **Broadcast Outdoor Air Temperature**—The VCB-X will broadcast its Outdoor Air Temperature Reading to other HVAC units if they are not equipped with their own Outdoor Air Temperature sensors. A network communications device (MiniLink PD or CommLink) is needed in order for this feature to operate.
- ❑ **Broadcast Commands to VAV Boxes**—The VCB-X will broadcast all applicable information and commands to the VAV Boxes.
- ❑ **Broadcast Building Pressure**—The VCB-X will broadcast Building Pressure from this unit to any other unit requiring this value.

CONFIGURATION SETPOINTS PAGE 20 OF 20

Glycol Percentage for Water Source Heat Pumps

Select the percentage that applies to your unit.

Temperature Setpoints

Touch the <Temperatures> button to access the



Temperature Setpoint Screens.

TEMPERATURE SETPOINTS PAGE 1 OF 9

Cooling Mode Enable

This setpoint is used to determine the Cooling Mode of operation in reference to the HVAC Mode Enable Sensor. Above this temperature plus the deadband, the unit will switch to Cooling Mode. High limit = 110°F / 43.3°C; Low limit = 1°F / -17.2°C. Default = 75°F / 24°C.

Heating Mode Enable

This setpoint is used to determine the Heating Mode of operation in reference to the HVAC Mode Enable Sensor. Below this temperature minus the deadband, the unit will switch to Heating Mode. High limit = 110°F / 43.3°C; Low limit = 1°F / -17.2°C. Default = 70°F / 21°C.

Unoccupied Cooling Offset

During the Unoccupied Mode of Operation, this setpoint adjusts the Cooling Mode Enable Setpoint up by this amount. If you do not want Cooling to operate during the Unoccupied Mode, use the default setting of 30°F / 16.66°C for this setpoint. High limit = 30°F / 16.66°C (no offset); Low limit = 0°F / 0°C; Default 30°F / 16.66°C.

Unoccupied Heating Offset

During the Unoccupied Mode of Operation, this setpoint adjusts the Heating Mode Enable Setpoint down by this amount. If you do not want Heating to operate during the Unoccupied Mode, use the default setting of 30°F / 16.66°C for this setpoint. High limit = 30°F / 16.66°C (no offset); Low limit = 0°F / 0°C; Default = 30°F / 16.66°C.

Mode Selection Deadband

This Setpoint is added to and subtracted from the HVAC Mode Setpoints to determine when the unit enters and leaves a mode of operation. High limit = 10°F / 5.55°C (no offset); Low limit = 0°F / 0°C; Default = 0°F / 0°C.

TEMPERATURE SETPOINTS PAGE 2 OF 9

Control Mode High Alarm Offset

If the Temperature of the controlling sensor rises above the Occupied Cooling Setpoint by this amount during the Cooling Mode, the controller will generate a High Control Temp Alarm. The unit must be configured for Space Temperature Control, Return Air Temperature Control, or as a Single Zone VAV unit for this alarm to be generated. High limit = 50°F / 27.77°C; Low limit = 0°F / 0°C; Default = 30°F / 16.66°C.

Control Mode Low Alarm Offset

If the Temperature of the controlling sensor falls below the Occupied Heating Setpoint by this amount during the Heating Mode, the controller will generate a Low Control Temp Alarm. The unit must be configured for Space Temperature Control, Return Air Temperature Control, or as a Single Zone VAV unit for this alarm to be generated. High limit = 50°F / 27.77°C; Low limit = 0°F / 0°C; Default = 30°F / 16.66°C.

Hood On MUA Cooling Setpoint

If the Hood On switch closes, this is the Cooling Setpoint used to generate the Cooling Mode based on the Outdoor Air Temperature. High limit = 110°F / 43.3°C; Low limit = 1°F / 0.55°C; Default = 75°F / 24°C.

Hood On MUA Heating Setpoint

If the Hood On switch closes, this is the Heating Setpoint used to generate the Heating Mode based on the Outdoor Air Temperature. High limit = 110°F / 43.3°C; Low limit = 1°F / 0.55°C; Default = 70°F / 21°C.

MUA Outdoor Air Dewpoint Setpoint

On MUA configured units (100% or high percentage Outdoor Air units), or if this is a unit in Hood On MUA operation, Dehumidification will be initiated if the Outdoor Air Dewpoint rises above this setpoint. High limit = 80°F / 26.6°C; Low limit = 35°F / 1.7°C; Default = 55°F / 12.8°C.

VCB-X Configuration & Temperature Setpoints

TEMPERATURE SETPOINTS PAGE 3 OF 9

Economizer Enable Setpoint

If an Outdoor Air Temperature Sensor is connected to the VCB-X and the Outdoor Air Temperature falls below this Setpoint, the Economizer can be used for Free Cooling. High limit = 80°F / 26.66°C; Low limit = -30°F / -34.44°C; Default = 55°F / 12.80°C.

Pre-Heat Enable Temperature

For cold climates where freezing temperatures may be experienced, a Pre-Heater relay output can be activated to control a preheater coil based on the Outdoor Air Temperature to prevent freezing of Water Coils. One of the VCB-X Relay Outputs must be configured for the Pre-Heater control. When configured, any time the Outdoor Air Temperature falls below the Preheat Setpoint (during Occupied or Unoccupied Mode) and the HVAC unit's fan is running, the Pre-Heater relay will activate. This setpoint will also be used to enable the Preheater if the PREHEAT-X Controller is being used in conjunction with the VCB-X Controller. High limit = 70°F / 21.11°C; Low limit = -30°F / -34.44°C; Default = 30°F / -1.11°C.

Low Ambient Temperature

Similar to the Pre-Heat Relay, a Low Ambient Relay can be configured to energize anytime (during Occupied or Unoccupied Mode) the Outdoor Air Temperature falls below this setpoint. The Low Ambient Relay, though, can energize whether the fan is running or not. This could be used to energize a boiler, for instance. High limit = 70°F / 21.11°C; Low limit = -30°F / -34.46°C; Default = 30°F / -1.11°C.

Warmup Target Temperature

If the Return Air Temperature is below this value on a change to the Occupied Mode, the unit will enter the Warm-Up Mode until this target temperature is satisfied or times out (based on Warmup Mode Timeout Period). High limit = 90°F / 32.2°C; Low limit = 50°F / 10°C; Default = 70°F / 21°C.

Space Sensor Slide Adjustment

If the VCB-X Controller has a Space Temperature Sensor with the Slide Adjust option installed, the HVAC Mode Enable Heating and Cooling Setpoints can be offset by the HVAC Mode Sensor Slide Offset Setpoint value. When the Slide Adjust bar is in the middle, no offset will occur. If the Slide Adjust bar is moved all the way to the top of the Sensor, the Heating and Cooling Setpoints will be raised by the Setpoint value you have entered. If the Slide Adjust bar is moved all the way down to the bottom of the Sensor, the Heating and Cooling Setpoints will be lowered by the Setpoint value you have entered.

If the Space Temperature is the SAT Reset Source, then the Slide Adjust will adjust the HVAC Mode Enable Setpoints and the SAT Reset Source Setpoints simultaneously. High limit = 10°F / 5.5°C; Low limit = 0°F / 0°C; Default = 0°F / 0°C.

TEMPERATURE SETPOINTS PAGE 4 OF 9

Coil Setpoint Reset Limits

Based on the Indoor Humidity Reset Range configured with the Indoor Humidity Low and High Reset Limits and the Coil Suction Temperature Setpoint can be reset between the High Reset Limit and Low Reset Limit configured on this screen during the Dehumidification Mode. If the High Reset Limit and the Low Reset Limit are set at the same value, no Coil Temperature Reset will occur.

Coil Setpoint High Reset Limit

The Coil Temperature Setpoint can be reset to this maximum level when the Indoor Humidity drops to its Low Reset Limit. See Reset description on page 46. If no reset of the Coil Temperature is required, set this value the same as the following Coil Setpoint Low Reset Limit. High limit = 70°F / 21.1°C; Low limit = 35°F / -1.7°C; Default = 45°F / 7.2°C.

Coil Setpoint Low Reset Limit

The Coil Temperature Setpoint can be reset to this minimum level when the Indoor Humidity rises to its High Reset Limit. See Reset description on page 46. If no reset of the Coil Temperature is required, set this value the same as the above Coil Setpoint High Reset Limit. High limit = 70°F / 21.1°C; Low limit = 35°F / -1.7°C; Default = 40°F / 4.4°C.

Heat Wheel Defrost Temperature

The Heat Wheel Defrost Mode occurs when the Outdoor Air Temperature is below this setpoint. High limit = 50°F / 10°C; Low limit = 0°F / 0°C; Default = 30°F / -1.7°C.

TEMPERATURE SETPOINTS PAGE 5 OF 9

Supply Air Cooling Setpoint

If No Reset has been configured for the SAT Reset Source, then this setpoint will be the Cooling Mode Supply Air Setpoint. If a Reset Source has been configured, then this setpoint will be the lowest temperature the Supply Air Setpoint can be reset to. High limit = 80°F / 26.66°C; Low limit = 30°F / -1.11°C; Default = 55°F / 12.80°C.

Supply Air Cooling High Reset Limit

If a SAT Reset Source has been configured, then this is the maximum that the Cooling Mode Supply Air Setpoint can be reset up to. High limit = 100°F / 37.77°C; Low limit = 1°F / -17.22°C; Default = 55°F / 12.80°C.

Cooling Reset Source High Limit

If a SAT Reset Source has been configured, then the Cooling Mode Supply Air Setpoint will be reset to its minimum limit (Supply Air Cooling Setpoint) as the reset source rises to this level. If this unit has been configured for Single Zone VAV operation, then the Supply Fan VFD will be reset towards 100% as the Space Temperature rises towards this setpoint. High limit = 150°F / 65.55°C; Low limit = 1°F / -17.20°C. Default = 75°F / 24°C.

Cooling Reset Source Low Limit

If a SAT Reset Source has been configured, then the Cooling Mode Supply Air Setpoint will be reset to its maximum limit (Supply Air Cooling Reset Limit) as the reset source drops to this level. If this unit has been configured for Single Zone VAV operation, then the Supply Fan VFD will be reset towards the Cooling Minimum Fan VFD Signal Setpoint as the Space Temperature falls towards this setpoint. High limit = 150°F / 65.55°C; Low limit = -10°F / -23.30°C. Default = 70°F / 21°C.

TEMPERATURE SETPOINTS PAGE 6 OF 9

Cooling Staging Window

When the VCB-X Controller is in Cooling Mode, if the Supply Air Temperature drops below the Active Supply Air Cooling Setpoint minus the Cooling Staging Off Deadband value, a Cooling Stage will be deactivated after its Minimum Run Time. High limit = 30°F / 16.66°C (no offset); Low limit = 1°F / 0.55°C; Default = 5°F / 2.8°C.

VCB-X Temperature Setpoints

Cooling Outdoor Air Lockout

If the Outdoor Air Temperature drops below this level, the Mechanical Cooling is locked out. High limit = 100°F / 37.77°C; Low limit = -30°F / -34.44°C; Default = 50°F / 10°C.

Cooling Minimum Fan VFD Signal

If this unit is configured for Single Zone VAV operation, the Cooling Minimum Fan VFD Signal will be the fan speed at which the VFD will start operating at when cooling is initiated. It can then modulate up to 100% as the space temperature rises within the range created by the Cooling Reset Source Low Limit and the Cooling Reset Source High Limit. If this is a CAV unit this should be set to 100%. High limit = 100%; Low limit = 0%; Default = 30%.

Cooling Low Temperature Cutoff

The VCB-X controller will temporarily disable Cooling if while in Cooling Mode, the Supply Air Temperature drops below this Cooling Low Temperature Cutoff Setpoint. The unit will restart when the Supply Air Temperature has risen 5° above this level. See the *VCB-X Controller Field Technical Guide* for detailed information on the Low and High Supply Air Temperature Cutoff sequence of operation. High limit = 100°F / 37.77°C; Low limit = 0°F / -17.77°C; Default = 40°F / 4.50°C.

Mod Cooling Proportional Window

The Modulating Cooling Window is the control range of the Modulating Signal above and below the Active Supply Air Temperature Setpoint. The larger the Modulating Cooling Window, the smaller the signal adjustment per Time Period will be for each 1°F the Supply Air Temperature is from the Active Supply Air Temperature Setpoint. If the Supply Air Temperature is this amount away from the SAT setpoint, 10% of the possible output signal will be applied. High limit = 30°F / 16.66°C; Low limit = .1°F / .055°C; Default = 10°F / 5.55°C.

TEMPERATURE SETPOINTS PAGE 7 OF 9

Supply Air Heating Setpoint

If No Reset has been configured for the SAT Reset Source, then this setpoint will be the Heating Mode Supply Air Setpoint. If a Reset Source has been configured, then this setpoint will be the lowest temperature the Supply Air Setpoint can be reset to. High limit = 240°F / 115.55°C; Low limit = 40°F / 4.50°C; Default = 120°F / 48°C.

Supply Air Heating High Reset Limit

If a SAT Reset Source has been configured, then this is the maximum that the Heating Mode Supply Air Setpoint can be reset up to. High limit = 250°F / 121.11°C; Low limit = 0°F / -17.77°C; Default = 120°F / 48°C.

Heating Reset Source High Limit

If a SAT Reset Source has been configured, then the Heating Mode Supply Air Setpoint will be reset to its minimum limit (Supply Air Heating Setpoint) as the reset source rises to this level. If this unit has been configured for Single Zone VAV operation, then the Supply Fan VFD will be reset towards the Heating Minimum Fan VFD Signal Setpoint as the Space Temperature rises towards this setpoint. High limit = 150°F / 65.55°C; Low limit = 1°F / -17.22°C. Default = 75°F / 24°C.

Heating Reset Source Low Limit

If a SAT Reset Source has been configured, then the Cooling Mode Supply Air Setpoint will be reset to its maximum limit (Supply Air Heating Reset Limit) as the reset source drops to this level. If this unit has been configured for Single Zone VAV operation, then the Supply Fan VFD will be reset towards the Heating Maximum Fan VFD Signal Setpoint as the Space Temperature falls towards this setpoint. High limit = 150°F / 65.55°C; Low limit = -10°F / -23.3°C. Default = 70°F / 21°C.

Supply Setpoint Reset Loop Rate

If you selected Space, Outdoor Air Temperature, Return Air Temperature, or Fan VFD Signal as the SAT Reset Source, *enter* a value in seconds between 1-255. This value determines how fast the Supply Air Temperature Setpoint is adjusted as the Reset Source changes. High limit = 255 seconds; Low limit = 1 second; Default = 30 seconds.

TEMPERATURE SETPOINTS PAGE 8 OF 9

Heating Staging Window

When the VCB-X Controller is in Heating Mode, if the Supply Air Temperature rises above the Active Supply Air Heating Setpoint plus the Heating Staging Off Deadband value, a Heating stage will be deactivated after its Minimum Run Time. High limit = 30°F / 16.66°C (no offset); Low limit = 1°F / 0.55°C; Default = 5°F / 2.80°C.

Heating Outdoor Air Lockout

The VCB-X controller will Lockout Mechanical Heating when the Outdoor Air Temperature is above this Setpoint. High limit = 150°F / 65.55°C; Low limit = 35°F / 1.66°C; Default = 90°F / 32.2°C.

Heating Minimum Fan VFD Signal

If this unit is configured for Single Zone VAV operation, and you have a modulating heat source that will allow VAV heating, then the Heating Minimum Fan VFD Signal will be the fan speed at which the VFD will start operating at when heating is initiated. It can then modulate up to the Heat Mode Maximum Fan VFD Signal as the Space Temperature falls within the range created by the Hi Space Setpoint and the Low Space Setpoint. If this is a CAV unit or a Single Zone VAV unit that will have CAV Heating, these setpoints should both be set at the same value which represents the constant speed you want the fan to operate at during the Heating Mode.

On a unit controlling to a Duct Static Pressure Setpoint, if the Supply Fan VFD Signal falls below this setpoint in the Heating Mode, Heating will be disabled.

Minimum Signal High limit = 100%; Minimum Signal Low limit = 30%; Default = 50%.

Heating High Cutoff Temperature

The VCB-X controller will temporarily disable Heating if while in Heating Mode, the Supply Air Temperature rises above this Heating High Temperature Cutoff Setpoint. See the *VCB-X Controller Field Technical Guide* for detailed information on the Low and High Supply Air Temperature Cutoff sequence of operation. High limit = 250°F / 121.11°C; Low limit = 0°F / -17.77°C; Default = 150°F / 65.50°C.

Mod Heating Proportional Window

The Modulating Heating Window is the control range of the Modulating Signal above and below the Active Supply Air Temperature Setpoint. The larger the Modulating Heating Window, the smaller the signal adjustment per Time Period will be for each 1°F the Supply Air Temperature is from the Active Supply Air Temperature Setpoint. If the Supply Air Temperature is this amount away from the SAT setpoint, 10% of the possible output signal will be applied. High limit = 30°F / 16.66°C; Low limit = .1°F / .055°C; Default = 10°F / 5.55°C.

VCB-X Temperature & Static Setpoints

TEMPERATURE SETPOINTS PAGE 9 OF 9

Mod Heating Unoccupied Position

This screen can be used to ensure that a Modulating Hot Water Valve will open to a certain position when the fan is not operating in order to prevent freezing. For other forms of Modulating Heat, this would normally be set to 0%. High limit = 100%; Low limit = 0%; Default = 0%.

Heat Pump Outdoor Air Lockout

If the Outdoor Air Temperature is below this value, the Heat Pump Compressor heat will be disabled. High limit = 100°F / 37.77°C; Low limit = -30°F / -34.44°C; Default = 35°F / 1.6°C.

Warmup Mode Supply Air Setpoint

Heating will be controlled to this Supply Air Setpoint during Morning Warm-Up. High limit = 240°F / 115.55°C; Low limit = 40°F / 4.5°C; Default = 100°F / 37.77°C.

Cooldown Mode Supply Air Setpoint

Cooling will be controlled to this Supply Air Setpoint during Cool-Down. High limit = 80°F / 26.6°C; Low limit = 30°F / -1.11°C; Default = 55°F / 12.8°C.

Static Setpoints

Static

Touch the <Static> button to access the *Static Setpoint Screens*.

STATIC SETPOINTS PAGE 1 OF 4

Heating Maximum Fan VFD Speed

If this unit is configured for Single Zone VAV operation, and you have a Modulating Heat source that will allow VAV heating, then the Heat Mode Minimum Fan VFD Signal will be the fan speed at which the VFD will start operating at when heating is initiated. It can then modulate up to the Heating Maximum Fan VFD Signal Setpoint as the Space Temperature falls within the range created by the High Space Setpoint and the Low Space Setpoint. If this is a CAV unit or a Single Zone VAV unit that will have CAV Heating, these minimum and maximum setpoints should both be set at the same value which represents the constant speed you want the fan to operate at during the Heating Mode. High limit = 100%; Low limit = 30%; Default = 100%.

Vent Mode Minimum Fan VFD Signal

The Vent Mode Minimum Fan VFD Signal is the speed at which the fan will operate at during the Vent Mode in a unit configured for Single Zone VAV operation. High limit = 100%; Low limit = 0%; Default = 20%.

Economizer Minimum Position

The Economizer (OA Damper) Minimum Position Setpoint is maintained during the Occupied Mode even if the Economizer is disabled due to the OA Temperature being above the Economizer Enable Setpoint. High limit = 100%; Low limit = 0%; Default = 10%.

Economizer Max Pos in High CO₂

This Setpoint allows you to set the Maximum Position the Economizer will open if high CO₂ conditions occur in the space. The Maximum Economizer Position Setpoint is used to limit the amount of Outdoor Air that will be introduced to the HVAC unit in order to ensure the unit is operating within its Heating and Cooling design limitations. The

Minimum setting for this Setpoint is the value previously set for the Economizer Min Position Setpoint. High limit = 100%; Low limit = 0%; Default = 50%.

Economizer Max Pos in Heating Mode

This Setpoint allows you to set the Maximum Position the Outdoor Air Damper will open to while Heating is operating. This takes priority over the Economizer Maximum Position in High CO₂ Setpoint. High limit = 100%; Low limit = 0%; Default = 50%.

STATIC SETPOINTS PAGE 2 OF 4

Minimum Outdoor CFM

If controlling the Outdoor Air Damper to an airflow setpoint, this screen allows you to set the design Minimum Outdoor Air CFM Setpoint. High limit = 200.00 kCFM; Low Limit = 0.10 kCFM; Default = 2.00 kCFM.

Outdoor CFM Deadband

The Outdoor CFM Setpoint uses this proportional value to calculate the maximum reset of the minimum CFM requirements. High limit = 9999 CFM; Low Limit = 10 CFM; Default = 200 CFM.

IAQ Altitude {For CO₂ Sensor}

Enter the distance above sea level for the installed Carbon Dioxide Sensor. Altitude correction is required for valid readings if you are above 500 feet. High limit = 15,000 feet; Low limit = 0 feet; Default = 1000.

IAQ Minimum CO₂ Setpoint

The CO₂ Minimum Setpoint is the threshold CO₂ level at which the Economizer Minimum Position will begin to be reset higher. In between the set minimum and maximum CO₂ levels, the Economizer Minimum Position will be proportionally reset between the set Economizer Minimum and Maximum position. High limit = 2000 PPM; Low limit 0 PPM; Default = 900 PPM.

IAQ Maximum CO₂ Setpoint

The CO₂ Maximum Setpoint is the CO₂ level at which the Economizer Minimum Position will be reset to the Economizer Maximum Position. In between set minimum and maximum CO₂ levels, the Economizer Minimum Position will be proportionally reset between the set Economizer Minimum and Maximum position. High limit = 2000 PPM; Low limit 0 PPM; Default = 1000 PPM.

STATIC SETPOINTS PAGE 3 OF 4

Static Pressure Setpoint

For VAV units, a Supply Fan VFD or Bypass Damper Actuator is used to maintain the Duct Static Pressure Setpoint. The Static Pressure Output Signal varies to control to the Static Pressure Setpoint. The Duct Static Pressure is maintained at this setpoint anytime the Main Fan is running. High limit = 3.00"WG; Low limit = 0.10"WG; Default = 1.50"WG.

Static Setpoint Deadband

The Duct Static Setpoint accuracy is controlled by this value. No Main Fan VFD changes are made if the static is within this range of this setpoint. High limit = 0.50"WG; Low limit = 0.01"WG; Default = 0.10"WG.

Building Pressure Setpoint

The Building Pressure is maintained at this setpoint while the Main Fan is running. *See detailed explanation that follows.* High limit = 0.20"WG; Low limit = -0.20"WG; Default = 0.02"WG.

VCB-X Static Setpoints & Staging Delays

Building Setpoint Deadband

The Building Pressure Setpoint accuracy is controlled by this value. No Relief Fan VFD changes are made if the pressure is within this range of this setpoint. *See detailed explanation that follows.* High limit = 0.10"WG; Low limit = 0.01"WG; Default = 0.01"WG.

Building Pressure Control

The VCB-X can maintain Building Static Pressure anytime the Supply Fan is operating. A Building Pressure Transducer must be connected to the VCB-X EM1 Expansion Module. The following are the available control options.

Direct Acting Building Pressure Control

- **On/Off Exhaust Fan**—If an On/Off Exhaust Fan is being used, a relay output must be configured for "Exhaust Fan". This relay will energize whenever the Building Pressure rises above the Building Pressure Setpoint by the Deadband amount. The relay will de-energize when the Building Pressure falls below the Building Pressure Setpoint by the Deadband amount.
- **Exhaust Fan VFD or Modulating Exhaust Damper**—If configured for Modulating Exhaust, a user-adjustable voltage output (AOUT1 – Building Pressure Output on the VCB-X EM1 Expansion Module) will be used to control this fan or damper. An Exhaust Relay can be configured if necessary to enable the fan or damper. Whenever the Building Pressure rises above the Building Pressure Setpoint by the Deadband amount, the Exhaust Fan Relay will energize and the Modulating Signal will activate to control to the Building Pressure Setpoint. If the Building Pressure falls below the Building Pressure Setpoint by the Deadband amount, the Modulating Signal will modulate towards 0% as it attempts to maintain the Building Pressure Setpoint. The Exhaust Fan Relay is energized whenever the Modulating Signal is above 0%.

Reverse Acting Building Pressure Control

- **Outdoor Air Damper**—If this option is configured, the VCB-X will use the user-adjustable Economizer/Outdoor Air Damper output signal (AOUT2 – Economizer Control Signal) to maintain the Building Pressure Setpoint. Whenever the Building Pressure falls below the Building Pressure Setpoint by the Deadband amount, the modulating Economizer Output Signal will modulate the damper open to control to the Building Pressure Setpoint. If the Building Pressure rises above the Building Pressure Setpoint by the Deadband amount, the damper will modulate towards closed as it attempts to maintain the Building Pressure Setpoint. When this option is selected, no Economizer free cooling or CO₂ IAQ operation will be available.
- **Supply Fan VFD** – Contact WattMaster regarding this Reverse Acting Building Pressure Control option. It should not be used in most applications. If this option is selected, the user-adjustable Supply Fan VFD Output (AOUT1 on the VCB-X) will be used to control the Supply Fan VFD to maintain the Building Pressure Setpoint in similar fashion to the Outdoor Air Damper control described above.

STATIC SETPOINTS PAGE 4 OF 4

Outside CFM Intake Area

For the controller to properly calculate the Outside Air CFM, you need to enter the inside area (sq. ft.) of the Outdoor Air Duct/Damper. When measuring the Outdoor Air Damper area, be sure to measure the inside dimensions of the damper. The more accurate the measurements, the more accurate the CFM reading will be. This value needs to be accurate to 2 decimal places. High limit = 200 sq. ft.; Low limit = 0 sq. ft.; Default = 0 sq. ft.

Exhaust CFM Area

For the controller to properly calculate the Exhaust Air CFM, you need to enter the inside area in square feet of the Exhaust Air duct/damper. When measuring the Exhaust Air damper area, be sure to measure the inside dimensions of the damper. The duct size needs to be accurate to two decimal places. The more accurate the measurements, the more accurate the CFM reading will be. High limit = 200 sq. ft.; Low limit = 0 sq. ft.; Default = 0 sq. ft.

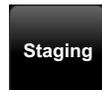
Supply CFM Area

For the controller to properly calculate the Supply Air CFM, you need to enter the area in square feet of the Supply Air Duct/Damper. When measuring the Supply Duct Damper area, be sure to measure the inside dimensions of the damper. The more accurate the measurements, the more accurate the CFM reading will be. This value needs to be accurate to 2 decimal places. High limit = 200 sq. ft.; Low limit = 0 sq. ft.

Return CFM Area

For the controller to properly calculate the Return Air CFM, you need to enter the area in square feet of the Return Air Duct/Damper. When measuring the Return Air Damper area, be sure to measure the inside dimensions of the damper. The more accurate the measurements, the more accurate the CFM reading will be. This value needs to be accurate to 2 decimal places. High limit = 200 sq. ft.; Low limit = 0 sq. ft.; Default = 0 sq. ft.

Staging Delays Setpoints



Touch the <Staging Delays> button to access the *Staging Delays Setpoint Screens*.

STAGING DELAYS SETPOINTS PAGE 1 OF 5

Cooling Stage Up Delay Time

This is the amount of time that must elapse between each Compressor activation to prevent all Compressors from activating at the same time due to large cooling demands. High limit = 15 minutes; Low limit = 3 minutes; Default = 3 minutes.

Cooling Stage Down Delay Time

This is the amount of time that must elapse between each Compressor deactivation to prevent all Compressors from deactivating at once as the cooling demand decreases. High limit = 15 minutes; Low limit = 1 minute; Default = 1 minute.

Cooling Minimum Run Time

This is the minimum amount of time the Compressors must remain on once they have been activated. This overrides the Stage Down Delay if that is not as long as this delay. High limit = 15 minutes; Low limit = 5 minutes; Default = 5 minutes.

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VCB-X Staging Delays

Cooling Minimum Off Time

Once a Compressor has been staged back off, it must remain off for this amount of time to prevent short cycling. High limit = 15 minutes; Low limit = 3 minutes; Default = 3 minutes.

Mod Cooling Time Period

The Mod Cooling Time Period is the delay before another Modulating Cooling Signal increase or decrease can be made and is user-adjustable. Short Mod Cooling Time Periods may cause hunting of the Modulating Cooling Signal. This is the rate at which the Modulating Cooling Signal is calculated. High limit = 240 seconds; Low limit = 5 seconds; Default = 30 seconds.

STAGING DELAYS SETPOINTS PAGE 2 OF 5

Heating Stage Up Delay Time

This is the amount of time that must elapse between each Heat Stage activation to prevent all Heat Stages from activating at the same time due to large heating demands. High limit = 15 minutes; Low limit = 3 minutes; Default = 3 minutes.

Heating Stage Down Delay Time

This is the amount of time that must elapse between each Heat Stage deactivation to prevent all Heat Stages from deactivating at once as the heating demand decreases. High limit = 15 minutes; Low limit = 1 minute; Default = 1 minute.

Heating Minimum Run Time

This is the minimum amount of time the Heat Stages must remain on once they have been activated. This overrides the Stage Down Delay if that is not as long as this delay. High limit = 15 minutes; Low limit = 2 minutes; Default = 5 minutes.

Heating Minimum Off Time

Once a Heat Stage has been staged back off, it must remain off for this amount of time to prevent short cycling. High limit = 15 minutes; Low limit = 1 minutes; Default = 1 minute.

Mod Heating Time Period

The Mod Heating Time Period is the delay before another Modulating Heating Signal increase or decrease can be made and is user-adjustable. Short Mod Heating Time Periods may cause hunting of the Modulating Heating Signal. This is the rate at which the Modulating Heating Signal is calculated. High limit = 240 seconds; Low limit = 5 seconds; Default = 10 seconds.

STAGING DELAYS SETPOINTS PAGE 3 OF 5

Heat/Cool Changeover Delay

The amount of time that must elapse after the last stage has turned off before switching to the opposite HVAC mode. High limit = 20 minutes; Low limit = 0 minutes; Default = 5 minutes.

Mechanical Heat/Cool Alarm Timer

Enter a time delay between 0-240 minutes for a delay in the time that it takes the Mechanical Heat/Cool Alarm to be generated. When Heating or Cooling Mode is initiated and staging is activated, if the Supply Air Temperature does not rise or fall 5°F within this time period, a Mechanical Heating or Cooling failure alarm will be generated. The Alarm is for Status Reporting only. The HVAC unit will continue to run. This alarm does not apply if Modulating Cooling or Heating are configured. High limit = 240 minutes; Low limit = 0 minutes; Default = 15 minutes.

Heat Pump Aux Heat Delay

If the Supply Air is not reaching setpoint, Auxiliary Heat can be added after this amount of delay running at full heating. High limit = 60 minutes; Low limit = 0 minutes; Default = 3 minutes.

Economizer Control Loop Time

This is the time period between changes to the Economizer position. High limit = 30 seconds; Low limit = 1 seconds; Default = 10 seconds.

Building Pressure Control Rate

The Building Pressure Control Rate is the time period between changes to the Building Pressure Control signal. High limit = 30 seconds; Low limit = 1 second; Default = 10 seconds.

STAGING DELAYS SETPOINTS PAGE 4 OF 5

Fan Starting Delay

Enter the number of seconds you want the fan to delay starting. This is the Supply Fan Starting Delay initiated whenever the VCB-X initiates Supply Fan operation upon going occupied or after power-up. This is useful when you are using multiple VCB-X-controlled HVAC units and want to be sure that all the units do not start at exactly the same time when the Occupied schedule occurs. Each VCB-X should be set with staggered Fan Starting Delay Setpoint values. When the -1 value is used, it multiplies each VCB-X Controller's address by 5 and uses this value in seconds as the Fan Starting Delay. This provides a staggered start for each VCB-X Controller on the system without having to individually set each VCB-X Controller for its own time delay. High limit = 240 seconds; Low limit = -1 second; Default = -1 second.

Fan Purge Mode Delay

This is the number of seconds you want the unit to stay in Purge Mode before going into Occupied Mode. In Purge Mode, the fan runs with the Economizer at minimum position and all Cooling and Heating is de-energized. High limit = 900 seconds; Low limit = 0 seconds; Default = 10 seconds.

Static/Fan Speed Control Rate

This value determines the time interval between changes to the Supply Fan Speed or the Bypass Damper Position during duct static pressure control. It also determines the time interval between changes to the Fan Speed during Single Zone VAV Reset of the Supply Fan VFD Speed. High limit = 30 seconds; Low limit = 1 second; Default = 10 seconds.

Heat Pump Defrost Interval

If this is a Heat Pump unit with a Defrost Coil Temperature Switch installed and configured, a Heat Pump Defrost Mode is available. If the Defrost Coil Temperature Switch closes during Heat Pump Heating operation, the unit will enter the Defrost Mode for 10 minutes or until the Defrost Coil Temperature Switch opens. The Heat Pump Defrost Interval is the length of time that must be met between Defrost Modes. The length of this Defrost Interval can be automatically adjusted by the Heat Pump Defrost Adaptive Timer. High limit = 120 minutes; Low limit = 10 minutes; Default = 30 minutes.

Heat Pump Defrost Adaptive Timer

Once initiated, the Defrost Mode is active until the Defrost Coil Temperature Switch opens or until a 10 minute timer has expired. Enter a value greater than zero to enable the Adaptive Defrost Adjustment of the Heat Pump Defrost Interval. This adjustment value will be subtracted from the Heat Pump Defrost Interval if the Defrost Mode lasts the entire 10 minutes. A proportion of this adjustment value will be added to the

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Heat Pump Defrost Interval if the Defrost Mode only lasts between 8 minutes and 0 minutes. High limit = 30 minutes; Low limit = 0 minutes; Default = 0 minutes.

STAGING DELAYS SETPOINTS PAGE 5 OF 5

Warmup Mode Timeout Period

This sets the amount of time the unit can remain in Warmup Mode if the Return Air still hasn't reached its target temperature. High limit = 240 minutes; Low limit = 0 minutes; Default = 60 minutes.

Trendlog Interval

An internal Trend Log is constantly updated at a rate equal to this value. Trend Logs can only be accessed with Prism 2 software. High limit = 120 minutes; Low limit = 1 minutes; Default = 15 minutes.

Miscellaneous Setpoints

Misc

Touch the **<Misc>** button to access the *Miscellaneous Setpoint Screens*.

MISCELLANEOUS SETPOINTS PAGE 1 OF 6

Indoor Humidity Reset of the Coil Temperature Setpoint

The Indoor Humidity Low and High Reset Limit Setpoints below can be used to reset the Coil Temperature between its High and Low Reset Limits (see **pages 39 & 40**).

On units where Indoor Humidity is used to initiate Dehumidification (non MUA units), the Indoor Humidity Low Reset Limit is the Dehumidification Setpoint, and as the Indoor Humidity rises above this setpoint, Dehumidification will be initiated. If the humidity falls 1% below this setpoint, the unit will leave the Dehumidification Mode.

If no reset of the Coil Temperature Setpoint is desired, set the Indoor Humidity High Reset Limit at the same value as the Indoor Humidity Low Reset Limit. If reset of the Coil Temperature Setpoint is desired, when the Indoor Humidity rises above the Indoor Humidity Low Reset Limit, Dehumidification will be initiated and the Coil Temperature Setpoint will be set at the Coil Setpoint High Reset Limit.

The Indoor Humidity High Reset Limit is the Indoor Humidity level at which the Coil Temperature will be reset to the Coil Setpoint Low Reset Limit. As the Indoor Humidity rises between the Low Reset Limit and the High Reset Limit, the Coil Temperature Setpoint will be proportionally reset between the Coil Setpoint High Reset Limit down to the Coil Setpoint Low Reset Limit.

On MUA units where the Outdoor Dewpoint Setpoint is used to initiate Dehumidification, this screen is only used to set the Indoor Humidity values that will reset the Coil Temperature Setpoint. As described above, as the Indoor Humidity rises within the range created by the Low and High Reset Limits, the Coil Temperature Setpoint will be proportionally reset between the Coil Setpoint High and Low Reset Limits.

Indoor Humidity Low Reset Limit

High limit = 100%; Low limit = 0%; Default = 50%.

Indoor Humidity High Reset Limit

High limit = 100%; Low limit = 0%; Default = 60%.

Head Pressure Setpoint

If the unit is configured for Head Pressure Control, this is the pressure maintained by the condenser fans whenever a compressor is running. High limit = 420 PSI; Low limit = 240 PSI; Default = 315 PSI.

Re-Heat Head Pressure Setpoint

If the unit is configured for Head Pressure Control, this is the pressure maintained by the condenser fans whenever a compressor is running in dehumidification. High limit = 420 PSI; Low limit = 240 PSI; Default = 400 PSI.

MISCELLANEOUS SETPOINTS PAGE 2 OF 6

Controlling Week Schedule

The VCB-X has an internal schedule. If you want the VCB-X to use its own internal schedule, enter **<0>** for Internal.

External Schedules are available by using one of the GPC-X family of General Purpose Controllers. Depending on which generation of GPC-X Controller you have, you may have up to 5 or up to 8 schedules available to use. To use the schedules on one of these controllers, enter the number of the schedule on that controller (either 1 through 5 or 1 through 8) you will be using. High limit = 8; Low limit = 0; Default = 0.

Push Button Override Duration

If the VCB-X has a Space Temperature Sensor installed and it has the Override Button option, the HVAC unit will initiate Override Mode any time the Override Button is pressed and held for less than 3 seconds. This puts the unit into Occupied operation. The Push-Button Override Duration Setpoint allows you to adjust the amount of time the Override will remain in effect when the Override Button is pressed. To cancel the Override before the Override Duration time period expires, press the Override Button for 5 to 10 seconds. High limit = 8 hours; Low limit = 0 hours; Default = 2 hours.

Daylight Savings Start Date

This is the date in the Spring when the time clock automatically adjusts itself forward one hour. If you are in a time zone that does not have daylight savings time or do not want to use this feature, leave this value at zero. High limit = 1231; Low limit = 0; Default = 0.

NOTE: The U.S. government has the authority to determine the switch-over dates each year. Currently, the time changes the second Sunday in March and then switches back the first Sunday in November.

Daylight Savings Stop Date

This is the date in the Fall when the time clock automatically adjusts itself backward one hour. If you are in a time zone that does not have daylight savings time or do not want to use this feature, leave this value as zero. High limit = 1231; Low limit = 0; Default = 0.

MISCELLANEOUS SETPOINTS PAGE 3 OF 6

Main Fan Minimum VFD Voltage

Enter a value between 0.0 and 10.0 VDC for the main fan's minimum output voltage. The *Fan Speed Status Screen* will display 0% to 100%, but the output will range from the minimum value set to the maximum value set.

The VCB-X will reverse the logic of the output signal when a Zoning Bypass Damper is used. High limit = 10 VDC; Low limit = 0 VDC; Default = 0 VDC.

VCB-X Miscellaneous Setpoints

Main Fan Maximum VFD Voltage

Enter a value between 0.0 and 10.0 VDC for the main fan's maximum output voltage. The *Fan Speed Status Screen* will display 0% to 100%, but the output will range from the minimum value set to the maximum value set. The VCB-X will reverse the logic of the output signal when a Zoning Bypass Damper is used. High limit = 10 VDC; Low limit = 0 VDC; Default = 10 VDC.

Economizer Signal Closed Volts

Enter a value between 0.0 and 10.0 VDC for the Economizer minimum output voltage when the Economizer is fully closed. High limit = 10 VDC; Low limit = 0 VDC; Default = 2 VDC.

Economizer Signal Open Volts

Enter a value between 0.0 and 10.0 VDC for the Economizer maximum output voltage when the Economizer is fully open. High limit = 10 VDC; Low limit = 0 VDC; Default = 10 VDC.

MISCELLANEOUS SETPOINTS PAGE 4 OF 6

Mod Heat Signal Low Volts

Voltage at which the Heating is at 0%. Enter a value between 0.0 and 10.0 VDC for the Modulating Heat minimum output voltage. When performing reverse acting heating, the minimum position volts will be the highest value. High limit = 10 VDC; Low limit = 0 VDC; Default = 0 VDC.

Mod Heat Signal High Volts

Voltage at which the Heating is 100%. Enter a value between 0.0 and 10.0 VDC for the Modulating Heat maximum output voltage. When performing reverse acting heating, the minimum position volts will be the highest value. High limit = 10 VDC; Low limit = 0 VDC; Default = 10 VDC.

Mod Cool Signal Low Volts

Voltage at which the Cooling is at 0% if this is not a Digital Compressor. Enter a value between 0.0 and 10.0 VDC for the Modulating Cool minimum output voltage. When performing reverse acting cooling, the minimum position volts will be the highest value. High limit = 10 VDC; Low limit = 0 VDC; Default = 0 VDC.

Mod Cool Signal High Volts

Voltage at which the Cooling is at 100% if this is not a Digital Compressor. When performing reverse acting cooling, the minimum position volts will be the highest value. High limit = 10 VDC; Low limit = 0 VDC; Default = 10 VDC.

MISCELLANEOUS SETPOINTS PAGE 5 OF 6

Building Pressure Control High Volts

Voltage at which the control signal for Building Pressure is increasing the pressure by the maximum amount. High limit = 10 VDC; Low limit = 0 VDC; Default = 10 VDC.

Building Pressure Control Low Volts

Voltage at which the control signal for Building Pressure is lowering the pressure by the maximum amount. High limit = 10 VDC; Low limit = 0 VDC; Default = 0 VDC.

Single Zone VAV Integral

If the Single Zone VAV Fan Speed Control requires integral control, enter the Integral Constant here. High limit = 10; Low limit = 0; Default = 0.

Leaving Water Calibration Offset

If the Leaving Water Temperature Sensor is reading incorrectly, you can use this option to enter an offset reading to adjust the Sensor's Sensitivity. Enter a positive Sensor Calibration to increase the Leaving Water Temperature Sensor reading or a negative value to lower the Sensor reading. High limit = 100 PPM; Low limit = -100 PPM; Default = 0 PPM.

CO2 Sensor Calibration Offset

If the CO₂ Sensor is reading incorrectly, you can use this option to enter an offset reading to adjust the Sensor's Sensitivity. Enter a positive Sensor Calibration to increase the CO₂ Sensor reading or a negative value to lower the Sensor reading. High limit = 500 PPM; Low limit = -500 PPM; Default = 0 PPM.

MISCELLANEOUS SETPOINTS PAGE 6 OF 6

Space Sensor Calibration Offset

If the Space Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature. Enter a positive Sensor Calibration value to raise the Space Temperature Sensor reading and a negative value to lower the Sensor reading. High limit = 100°F / 55.5°C; Low limit = -100°F / -55.5°C; Default = 0°F / 0°C.

Supply Sensor Calibration Offset

If the Supply Air Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature. Enter a positive Sensor Calibration value to raise the Supply Air Temperature Sensor reading and a negative value to lower the Sensor reading. High limit = 100°F / 55.5°C; Low limit = -100°F / -55.5°C; Default = 0°F / 0°C.

Outdoor Sensor Calibration Offset

If the Outdoor Air Temperature Sensor is reading incorrectly, you can use this option to enter an offset temperature to adjust the Sensor's Temperature. Enter a positive Sensor Calibration value to raise the Outdoor Air Temperature Sensor reading and a negative value to lower the Sensor reading. High limit = 100°F / 55.5°C; Low limit = -100°F / -55.5°C; Default = 0°F / 0°C.

Return Sensor Calibration Offset

If the Return Air Temperature Sensor is reading incorrectly, you can use this option to enter an offset reading to adjust the Sensor's Sensitivity. Enter a positive Sensor Calibration value to raise the Return Air Temperature Sensor reading and a negative value to lower the Sensor reading. High limit = 100°F / 55.5°C; Low limit = -100°F / -55.5°C; Default = 0°F / 0°C.

Coil Temperature Calibration Offset

If the Coil Temperature Sensor is reading incorrectly, you can use this option to enter an offset reading to adjust the Sensor's Sensitivity. Enter a positive Sensor Calibration value to raise the Coil Temperature Sensor reading and a negative value to lower the Sensor reading. High limit = 100°F / 55.5°C; Low limit = -100°F / -55.5°C; Default = 0°F / 0°C.

VCB-X CONTROLLERS

VCB-X Relays

Relays Setpoints

Relays

Touch the <Relays> button to access the *Outputs Setpoints Screens*. Touch the radio button next to the desired relay selection. Choose one relay output from each screen for Relays 2 through 23 depending on whether you have the EM1 Module and/or 12 Relay Module installed and configured. See **Table 7** on the next page for Relay Definitions.

NOTE: Relay #1 is not configurable as it is reserved for the Supply Air Fan.

- Not Used
- Digital Compressor
- Cooling Stage
- Heating Stage
- Condenser Fan #1
- Condenser Fan #2
- Heat Pump Water Valve
- Heat Pump Compressor
- Heat Pump Reversing Valve
- Heat Pump Aux Heat
- Heat Pump Emergency Heat
- Mod Heat Enable
- Mod Cool Enable
- Morning Warm-Up / Cool-Down
- Reheat
- Preheat
- Low Ambient
- Exhaust Fan
- Economizer
- Heat Wheel
- Occupied Mode
- Override Mode
- Alarm Indicator

| No. | Relay Description | Details |
|-----|---|--|
| 1 | Digital Compressor | Configured for a Digital Compressor. |
| 2 | Cooling Stage | Configured for each fixed stage of cooling (except heat pump compressor). |
| 3 | Heating Stage | Configured for each fixed stage of heating. |
| 4-5 | Condenser #1 Condenser #2 | Configured for Condenser Fan/Valve operation. This relay(s) will be active anytime the respective compressors are active, except if the unit is in Heat Pump Defrost Mode. |
| 6 | Heat Pump Water Valve | On a Water Source Heat Pump, this relay will be active anytime compressors are active. |
| 7 | Heat Pump Compressor | Configured for a Fixed Heat Pump Compressor stage. |
| 8 | Reversing Valve | Configured for the Reversing Valve of a heat pump unit. |
| 9 | Aux Heat | Configured for a fixed stage of Aux Heat in a heat pump unit. |
| 10 | Emergency Heat | Configured for a fixed stage Emergency Heat in a heat pump unit. |
| 11 | Mod Heat Enable | Configure if a 0-10 VDC Modulating Heat source needs a relay to enable it. |
| 12 | Mod Cool Enable | Configure if a 0-10 VDC Modulating Cool source needs a relay to enable it. |
| 13 | Morning Warm-Up/ Cool-Down (VAV Boxes) | Configure (1) Relay for Morning Warm-Up/Cool-Down when Non-Orion VAV/Zone Controllers are used. |
| 14 | Reheat | Configure (1) Relay for On/Off Reheat when used. |
| 15 | Pre-Heat | Configure for Pre-Heat operation. |
| 16 | Low Ambient | Configure for Low Ambient operation. |
| 17 | Exhaust Fan | Configure (1) Relay for enabling exhaust fan when Building Pressure Control is used. |
| 18 | Economizer Active | If configured, this relay will energize if unit is in Economizer mode and the damper has moved 5% above its Economizer Minimum Setpoint position. |
| 19 | Heat Wheel | Configure (1) Relay that turns heat wheel on when in Occupied operation and turns heat wheel off when in Economizer Mode. |
| 20 | Occupied Active | If configured, this relay will energize whenever the unit is in the Occupied Mode. |
| 21 | Override Active | If configured, this relay will energize anytime the space sensor Push-button override is active. |
| 22 | Alarm Active | If configured, this relay will energize anytime a VCB-X alarm is active. |

Table 7: User-Configurable Relay Outputs

VAV/ZONE CONTROLLERS

Viewing VAV/Zone Status Screens and Enabling Alarms

Viewing VAV/Zone Status Screens

Figure 37 depicts a *VAV/Zone Controller Status Screen*. Notice that the controller is identified by loop number and unit number - in this case, 0101 represents Loop 1, Unit 1.



Figure 37: VAV/Zone Controller Status Screen

Viewing Alarm Status

To view alarm status, touch the **<ALARM>** button on the unit's *Status Screen* located at the right of the temperature display. See Figure 38. The *Alarm Status Screen* will display. See Figure 39. Only a Level 3 user has the option to enable or disable each type of alarm.

NOTE: The red **<ALARM>** button only appears on the screen if the unit has an active alarm condition.

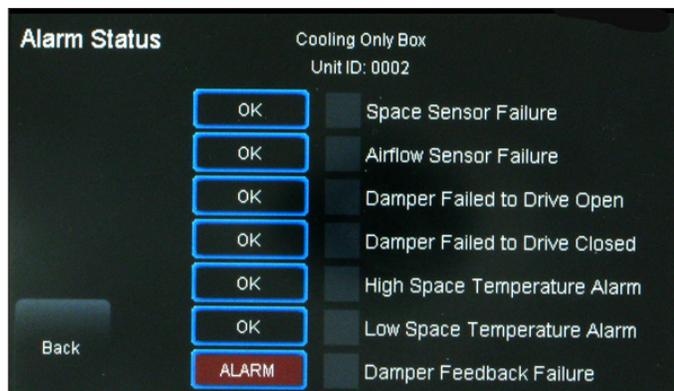


Figure 38: VAV/Zone Controller Alarm Status Screen

Enabling/Disabling VAV/Zone Alarms

Alarm configuration is accessed by touching the **<ALARM>** button located at the far right bottom of the *Status Screen*. Only a Level 3 user can configure alarms.

In addition to simply viewing alarms, the *Alarm Status Screen* can also be used for enabling and disabling alarms that will be emailed or texted. The emailing and texting feature will only work if Prism 2 is running and has emailing capability.

The alarms must first be configured using Prism 2 software. See the Appendix in this guide for instructions.

Once the alarm settings have been established in Prism 2, the settings you choose in the *Alarm Status Screen* will be stored in the controller so that you will not have to reconfigure the alarms for that controller in Prism 2. Once configuration is complete, Prism 2 does not have to be running in order to view alarms on individual *Alarm Status Screens* in the System Manager TS II. However, as mentioned previously, Prism 2 does have to be running for emailing or texting alarms to occur.

To enable an alarm, simply touch the grey square to the left of the alarm. A white box designates that the alarm is enabled. To disable the alarm, simply touch the square again.

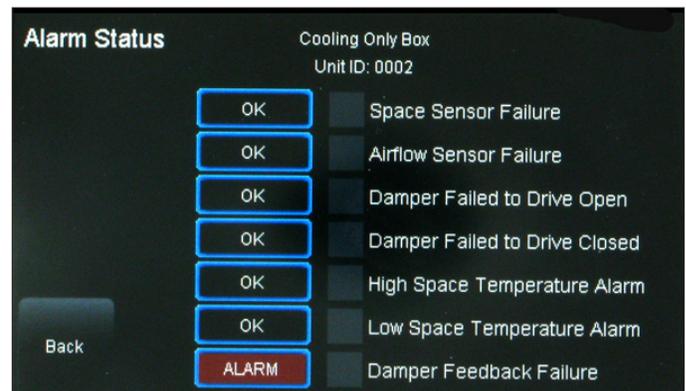


Figure 39: VAV/Zone Controller Alarm Screen

In the example above (Figure 39), there is an ALARM, designated by the word ALARM in red linear to Damper Feedback Failure. If there is no alarm condition, the word OK appears in a box linear to each alarm.

VAV/ZONE CONTROLLERS

Accessing and Entering VAV/Zone Setpoints

Accessing and Entering VAV/Zone Setpoints

While in the *VAV/Box Status Screen* (see **Figure 40**), touch the **<Setpoints>** button found on the bottom menu bar.

NOTE: Level 1 and Level 2 users can change occupied space temperature setpoints, but only Level 3 users can change all setpoints.



Figure 40: VAV/Zone Controller Status Screen

The *Setpoint Screen* that first appears will always be the *Temperature Setpoints Screen*. **Figure 41** depicts a *VAV/Zone Controller Temperature Setpoint Screen*.

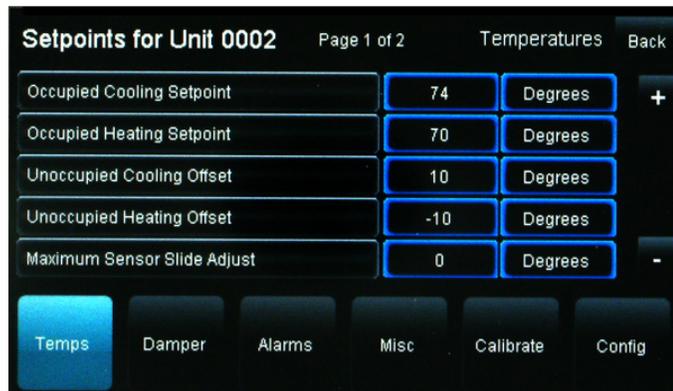


Figure 41: VAV/Zone Controller Temperature Setpoint Screen

Individual setpoint and configuration buttons are located at the bottom of the *Setpoint Screens*. See **Figure 42**. Simply touch a specific button to access that category.



Figure 42: VAV/Zone Setpoint Buttons

Within each *Setpoint Screen*, touch the **<Status>** button to return to the *Status Screen*, or touch **<Home>** to return to the *Main Screen*.

Use the **<+>** and **<->** buttons to scroll through the setpoints and configurations. Simply touch the blue highlighted box to change the setpoint. Each setpoint data entry screen will provide a definition of the setpoint and specific instructions for entering the setpoint and will include the setpoint range as in the example below, **Figure 43**.

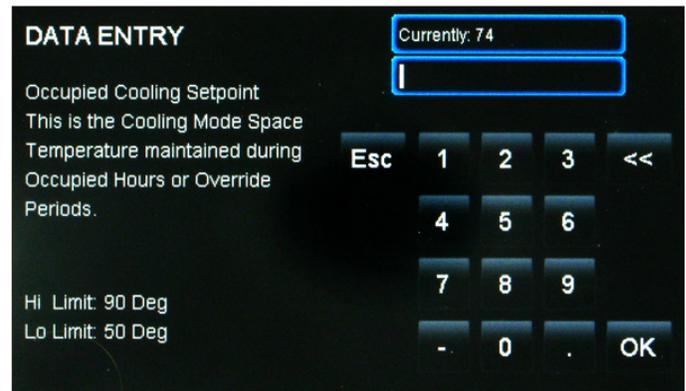


Figure 43: Occupied Cooling Setpoint Data Entry Screen

Touch **<OK>** to have the system accept the new value. If you enter a setpoint that is not in the valid range, the setpoint will remain as is and will not change.

Each setpoint data entry screen is self-explanatory; however, each setpoint and configuration is explained in the next section, *Configuring VAV/Box Setpoints*. To easily reference a particular setpoint or configuration, refer to the **Index**, page 60.

VAV/ZONE CONTROLLERS

VAV/Zone Configuration & Temperature Setpoints

VAV/Zone Configuration

Config

Touch the <Configuration> button to access the Configuration Setpoints Screens.

CONFIGURATION SETPOINTS PAGE 1 OF 3

Box Configuration

Touch the radio button that pertains to your type of box—single duct cooling only, heating/cooling changeover, series fan powered, or parallel fan powered.

CONFIGURATION SETPOINTS PAGE 2 OF 3

Proportional Heat [2-10 vdc]

Touch the square if this unit has 2-10 vdc proportional heat. Leave blank for 0-10 vdc operation.

This Box Needs the Main Fan Status

Touch the square if this unit needs Main Fan status. This setting only applies to the unoccupied mode of operation. Choose this setting to activate the heating stages only when the main fan is operating on non-fan terminal units.

For series fan terminal units, if this setting is selected, the series box fan will only run when the main HVAC unit fan is running or when a space heating demand is made. If this setting is NOT selected, the series box fan will only run when a space heating demand is made. This setting has no effect on the parallel flow fan terminal unit.

Damper is Reverse Acting [Opens CCW]

Touch the square if this unit's damper is reverse acting (opens counter-clockwise).

Voting Zone on Zoned Systems

Touch the square if this unit is a voting zone.

Allow Box Heat to remain on in HVAC Heat Mode

Touch the square to have box heat remain on in HVAC heat mode. This will allow the Heating Relay's Controlling Box Heat to remain on even when the AHU is in Supply Air Heating Mode. This is used as a method to provide supplemental heat if for some reason the AHU heat cannot satisfy the heating demand.

CONFIGURATION SETPOINTS PAGE 3 OF 3

No Air Valve Control [Dump Zone]

A Dump Zone is used when you want to control a duct heater or baseboard heater independently. A VAV/Zone Controller board with a relay expansion board is used for this purpose. No damper or actuator is used. Touch the square if this unit has no air valve control (Dump Zone). If you need to control an auxiliary heater, do not select this option.

Use Broadcast from HVAC Unit on Separate Loop

Touch the square if this unit is installed on a system with one HVAC unit having multiple VAV loops.

Temperature Setpoints

Temps

Touch the <Temperatures> button to access the Temperature Setpoint Screens.

TEMPERATURE SETPOINTS PAGE 1 OF 2

Occupied Cooling Setpoint

This is the Cooling Mode Space Temperature maintained during Occupied hours Override periods. Enter the Occupied Cooling Setpoint as the maximum temperature you would like the zone to reach before modulating the damper open to bring in more cold air to cool the space. High limit = 90°F; Low limit = 50°F

Occupied Heating Setpoint

This is the Heating Mode Space Temperature maintained during Occupied hours or Override periods. Enter the Occupied Heating Setpoint as the minimum temperature you would like the zone to reach before activating the Reheat Stages on the optional Expansion Relay board. If this is a Cooling Only box that doesn't contain reheat, this setpoint will be ignored. High limit = 90°F; Low limit = 50°F

Unoccupied Cooling Offset

During Unoccupied hours, the Cooling Setpoint is adjusted up by this amount. High limit = 30°F; Low limit = 0°F

Unoccupied Heating Offset

During Unoccupied hours, the Heating Setpoint is adjusted down by this amount. High limit = 0°F; Low limit = -30°F

Maximum Sensor Slide Adjust

If the Optional Slide Offset is available on the wall sensor, this is the maximum amount that the Heat/Cool Setpoints can be adjusted up or down as the slide is moved from the center position to its full up or down position. High limit = 5°F; Low limit = 0°F

TEMPERATURE SETPOINTS PAGE 2 OF 2

EMS Setpoint Offset

If the Energy Management Mode (EMS) is activated, the heat and cool setpoints can be spread apart by this amount. High limit = 10°F; Low limit = 0°F

AHU Heating Call Setpoint

If the Space Temperature drops below this setpoint by 0.5 degrees, a call for heat to the HVAC unit is broadcast from the VAV/Zone box. This only occurs in the Unoccupied Mode. High limit = 90°F; Low limit = 50°F

SAT HVAC Mode Deadband

If the Supply Air Temperature is above the Space Temperature by this amount, the VAV/Zone controller enters the Supply Air Heating Mode. It will remain in the Supply Air Heating Mode until the supply air drops to 2° above the space temperature. At that point the unit enters the Supply Air Vent Mode and remains there until the Supply Air drops this deadband below the Space Temperature. At that point the VAV/Zone Controller enters the Supply Air Cooling Mode and will remain there until the Supply Air Temperature rises to 2° below the Space Temperature. High limit = 20°F; Low limit = 2°F

VAV/ZONE CONTROLLERS

VAV/Zone Temperature & Damper/Airflow Setpoints

Auxiliary Heat Setpoint

This setpoint is generally used for Baseboard Heat or a heating source that is separate from Box Heat. If the Space Temperature drops below this setpoint by 0.5 degrees, the Aux Heat Relay activates. The Aux Heat Setpoint de-activates at 0.5 degrees above this setpoint. High limit = 90°F; Low limit = 50°F

Damper/Airflow Setpoints

Damper

Touch the <Damper/Airflow> button to access the *Damper/Airflow Setpoint Screens*.

DAMPER/AIRFLOW SETPOINTS PAGE 1 OF 4

Air Valve Sizing [Pr Indep Only]

If this is a Pressure Independent Box, enter the manufacturer's airflow constant (flow coefficient) at 1" water gauge for the duct diameter this box is mounted on. High limit = 9999 CFM; Low limit = 0 CFM

Max Position [All Modes]

The VAV/Zone controller will not allow the damper or airflow calculation to exceed the Maximum setpoint while it is allowing the damper to modulate. Enter the maximum damper or airflow setting used by all modes of operation. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%

Min Position in Vent Mode

During Vent Mode when there is no heating or cooling demand, the damper or airflow will maintain at least the Vent Minimum amount of airflow into the zone for ventilation. Enter the minimum damper or airflow setting used during Supply Air Vent Mode of operation. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%

Min Position in Cooling Mode

During Supply Air Cooling Mode, if the space being served by this damper is satisfied and has no cooling demand, the damper will close to this Cool Minimum setting. This provides a minimum amount of airflow into the space for ventilation, even if the space does not require additional cooling. Enter the minimum damper or airflow setting used during Supply Air Cooling Mode of operation. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%

Min Position in Heating Mode

During Supply Air Heating Mode, if the space being served by this damper is satisfied and has no heating demand, the damper will close to this Heat Min setting. This provides a minimum amount of airflow into the space for ventilation, even if the space does not require additional heating. Enter the minimum damper or airflow setting used during supply air heating mode of operation. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%

DAMPER/AIRFLOW SETPOINTS PAGE 2 OF 4

Min Position Reheat Mode

Enter the minimum damper or airflow setting used during the Space Reheat Mode of operation. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%

Min Position Night Mode

Enter the minimum damper or airflow setting used during unoccupied hours. The Night Min is the position the damper will move to when the system is in Override Mode and this particular damper is not part of the override group. This Night Min position only affects non-fan powered boxes. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%

Fixed Position in Force Mode

Many times while troubleshooting a system, it is useful to have the zone damper set to a specific damper position or airflow setting. This setpoint can be used to determine where the damper/airflow will remain when the VAV/Zone Controller receives a *Force to Fixed Position* command. Enter the fixed damper or airflow setting used by the fixed position force mode during the morning warm-up. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%

Min Position for Parallel Fan

Enter the minimum damper or airflow setting used to activate the parallel fan if installed. Pressure Independent = CFM. Pressure Dependent = %. High limit = 9999 CFM / 100%; Low limit = 0 CFM / 0%

CO2 Altitude Adjust Factor

Enter the distance above sea level for the installed Carbon Dioxide Sensor. Altitude correction is required for valid readings if you are above 500 feet. High limit = 15,000 feet; Low limit = 0 feet

DAMPER/AIRFLOW SETPOINTS PAGE 3 OF 4

Space CO2 Low Level Reset Limit

The Space CO₂ Low Level Reset Limit is the value at which the CO₂ ventilation restart starts. High limit = 2000 PPM; Low limit 0 PPM

Space CO2 High Level Reset Limit

The Space CO₂ High Level Reset Limit is the value at which the CO₂ ventilation reset stops. High limit = 2000 PPM; Low limit 0 PPM

OA CFM Low Level Reset Limit

Minimum OA CFM content required for occupied operations in the space. High limit = 2000 PPM; Low limit = 0 PPM

OA CFM High Level Reset Limit

Maximum OA CFM content required for occupied operations in the space. High limit = 2000 PPM; Low limit = 0 PPM

DAMPER/AIRFLOW SETPOINTS PAGE 4 OF 4

Heat Mode Distribution Effectiveness

This value represents how efficient the space is in receiving Outdoor CFM content. Enter the Zone Air Distribution Effectiveness as shown in ASHRAE Table 6-2. High limit = 100%; Low limit 1%

Cool Mode Distribution Effectiveness

This value represents how efficient the space is in receiving Outdoor CFM content. Enter the Zone Air Distribution Effectiveness as shown in ASHRAE Table 6-2. High limit = 100%; Low limit 1%

VAV/ZONE CONTROLLERS

VAV/Zone Alarm Settings & Miscellaneous & Calibration Setpoints

Alarm Settings



Touch the **<Alarm Settings>** button to access the *Alarm Settings Screen*.

ALARM SETTINGS PAGE 1 OF 1

Cooling Setpoint Alarm Offset

The VAV/Zone controller can be set up to generate an alarm anytime the box goes into the Occupied Mode and the Space Temperature exceeds the user-defined alarm limits for a user-defined period of time. A High Temperature Alarm Setpoint is created by adding the Cooling Setpoint Alarm Offset to the current Cooling Setpoint. If the Space Temperature exceeds this limit for a period defined by the Alarm Delay Period Setpoint, the controller can generate an alarm callout if all the optional hardware components required for this to occur are installed. High limit = 50°F; Low limit = 1°F

Heating Setpoint Alarm Offset

The VAV/Zone controller can be set up to generate an alarm anytime the box goes into the Occupied Mode and the Space Temperature exceeds the user-defined alarm limits for a user-defined period of time. A Low Temperature Alarm Setpoint is created by adding the Heating Setpoint Alarm Offset to the current Heating Setpoint. If the Space Temperature exceeds this limit for a period defined by the Alarm Delay Period Setpoint, the controller can generate an alarm callout if all the optional hardware components required for this to occur are installed. High limit = -1°F; Low limit = -50°F

Heat/Cool Alarm Delay Period

As mentioned above, if you configure the controller to generate Space Temperature alarms, this is the amount of time after the box goes into the Occupied Mode that the temperature must be outside the alarm limits before an alarm is generated. A Space Temperature Alarm is generated when the Space Temperature is out of the specified range for this amount of time. High limit = 300 minutes; Low limit = 1 minute

Miscellaneous Setpoints



Touch the **<Miscellaneous>** button to access the *Miscellaneous Setpoints Screen*. The figure that follow shows the screen and describes each setpoint in detail.

MISCELLANEOUS SETPOINTS PAGE 1 OF 1

Damper Integral Constant {Kp}

The VAV/Zone controller normally opens its damper based on a proportional error from setpoint. That means if the zone temperature is 4°F from setpoint, the damper would be 100% open, or it would be modulating to provide the Maximum CFM on Pressure Independent boxes. If the error is less than 4°F, the damper may stagnate at that position and never satisfy the zone. If you add Integral into the damper calculation process, this will cause the damper or airflow calculations to continue to increase as long as the zone temperature is still above the setpoint. That means it can provide 100% or Maximum CFM before the 4°F error is achieved, bringing the zone under control faster than it normally would. Start with a small (5 or 10) value, if you use this, and monitor the effect it has. If you enter too large a value, you can create “hunting” situations that can cause the damper actuator to prematurely wear out. High limit = 100; Low limit = 0

Override Group ID#

Use this to group zones that need to activate together during Push-Button Override conditions. Enter 0 to ignore other box overrides. High limit = 16; Low limit = 0

Push-Button Override Duration

If the Flush Mount Wall Sensor has the optional Push-Button Override, this is the amount of the VAV/Zone controller will resume using its Occupied Setpoints during Unoccupied Mode. This will generate a call for the Air Handler to start its fan and provide heating or cooling, depending on how you configure the Air Handler. High limit = 8.0 hours; Low limit = 0 hours

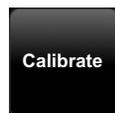
Controlling Week Schedule

Use this to operate on a different schedule than the HVAC unit associated with this zone. Enter 0 to operate on the HVAC unit’s schedule. Enter 1 through 5 to use an external schedule. A GPC Plus is required for schedules 1 through 5. High limit = 5; Low limit = 0.

Stages of Box Heat

Enter the number of Box Heat/Re-Heat Stages to be controlled on the expansion board. High limit = 3; Low limit = 0

Calibration Setpoints



Touch the **<Calibration>** button to access the *Calibration Setpoints Screen*.

CALIBRATION SETPOINTS PAGE 1 OF 1

Space Sensor Offset

Enter a positive value to raise the reading and a negative value to lower the reading. High limit = +100; Low limit = -100

Discharge Sensor Offset

Enter a positive value to raise the reading and a negative value to lower the reading. High limit = +100; Low limit = -100

NOTE: The Discharge Sensor Offset setting only operates on the reading when the VAV/Zone controller has its own Supply Air Temperature Sensor installed on the AUX2 input. If the Supply Temperature is received from a global broadcast, you will need to go to the air handler to calibrate the temperature reading.

Troubleshooting

System Manager TS II LEDs, Buttons, Dipswitches & Jumpers

LEDs and system function buttons are located behind your System Manager TS II's cover. See **Figure 44** for locations. Dipswitches and jumpers are located on the back of your System Manager TS.

Power LED

This LED will light up and stay on as long as power is supplied to your TS.

Operation LED

This LED will blink once a second to indicate that the system is alive.

Update LED

This LED will turn on when the Update program is running.

Screen Refresh LED

This LED will turn on when the screen refreshes.

Communications LED

This LED will light up and blink when there is a connection with the CommLink and/or network. If you are using your TS in stand-alone mode, this LED will not light up.

Reset Button

Press this button to reset the screen. The screen should refresh itself to the *Main Screen* within 2 minutes.

Diagnostics Button

Under the direction of WattMaster Controls Technical Support, you may have to perform diagnostics on your System Manager TS II. Press this button to do so.

Touch Screen Suspend Button

Press this button to temporarily freeze the touch screen function of your System Manager TS II in order to clean the screen. Always use a dry, dust-free cloth to clean the screen.

OPT1 Dipswitch

For High Speed applications, the OPT1 Dipswitch should be ON. For all other applications, it should be OFF. This Dipswitch is located on the back of the System Manager TS. See **Figures 5-8**, pages 8-11 for location.

OPT4 Dipswitch

As of April 2014, Dipswitch OPT4 should be set to ON by default. Previous versions should be set to OFF. If you see your screen is not centered correctly, switch OPT4 to the opposite position. This Dipswitch is located on the back of the System Manager TS. See **Figures 5-8**, pages 8-11 for location.

TERM Jumpers

Both TERM Jumpers must be ON for Stand-Alone applications (No CommLink or MiniLink). Both TERM Jumpers must be OFF for applications with CommLink(s) and/or MiniLink(s). See **Figures 5-8**, pages 8-11 for location.



Figure 44: System Manager TS II LEDs & Buttons

System Configuration

System Configuration Options

A VCM-X / VCB-X Controller can be used as a Stand-Alone System (one VCM-X / VCB-X Controller only), connected together on an Interconnected System (multiple VCM-X / VCB-X Controllers only) or connected together on a Network System (multiple VCM-X / VCB-X Controllers, VAV/Zone Controllers, or Add-On Controllers) to form a complete Controls System that can be programmed and monitored with one or more of the available Operator Interfaces.

For detailed information about the various Orion Controls Systems that are available and their related wiring requirements and options, please see the technical guide that pertains to the particular controller.

Operator Interfaces

The Orion Operator Interfaces are designed to provide for programming and monitoring of VCM-X / VCB-X Controller(s) and/or any VAV/Zone or Add-on Controller(s) connected to your Orion System. You can use one or all of these interfaces on the same Orion System. See **Figure 45**. The Operator Interfaces available for use with the Orion Systems are as follows:

- Modular Service Tool SD
- Modular System Manager SD
- System Manager TS II
- Personal Computer with Prism 2 Computer Front End Software Installed and a CommLink

Stand-Alone System

The Stand-Alone System is used when you have a single controller only. Programming and status monitoring are accomplished by selecting and installing one or more of the Operator Interfaces. See **Figure 46**, page 55 for a Typical Stand-Alone System Layout diagram.

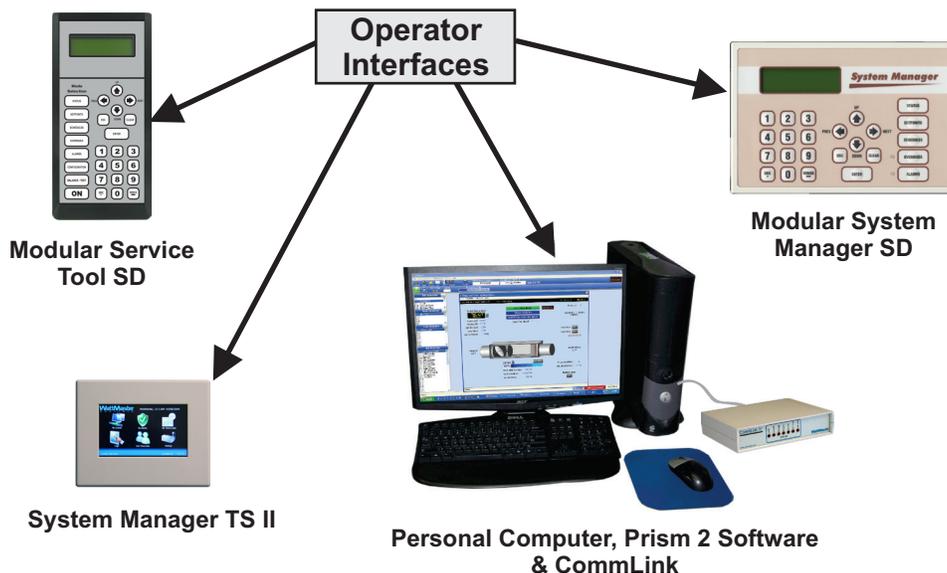


Figure 45: Available Operator Interfaces

Interconnected System

The Interconnected System is used when you have multiple controllers of the same type on your job. With this system, you simply connect the controllers together using WattMaster communications wire or 18-gauge, 2-conductor twisted pair with shield wire (Belden #82760 or equivalent). This allows for all controllers that are connected on the communications loop to be programmed and monitored from one or more of the available Operator Interfaces connected on the communications loop. See **Figure 47**, page 56 for a Typical Interconnected System Layout diagram.

Networked System

If you have 1 to 59 VCM-X / VCB-X Controllers that require information sharing, simply connect the controllers together using WattMaster communications wire or 18-gauge, 2-conductor twisted pair with shield wire (Belden #82760 or equivalent). The Networked Single Loop System requires that either a MiniLink PD communication interface and/or CommLink communication interface are purchased and wired into the communications loop in a similar manner to the VCM-X / VCB-X Controllers.

The Networked Multiple Loop system is used when you have more than 59 VCM-X / VCB-X Controllers and/or are using multiple VCM-X / VCB-X Controllers that are connected to VAV/Zone controllers. These groups of controllers are broken up into multiple "Local Loops" that connect to each other via the "Network Loop." Each individual MiniLink PD handles its specific local loop's communications requirements. The CommLink communications interface handles all the communications between the individual MiniLink PDs to form the network loop. Up to 60 local loops can be connected together with this configuration. This provides the capability for over 3500 controllers to be networked together. See **Figure 48**, page 57 for a Typical Networked System Layout diagram.

Stand-Alone System Layout

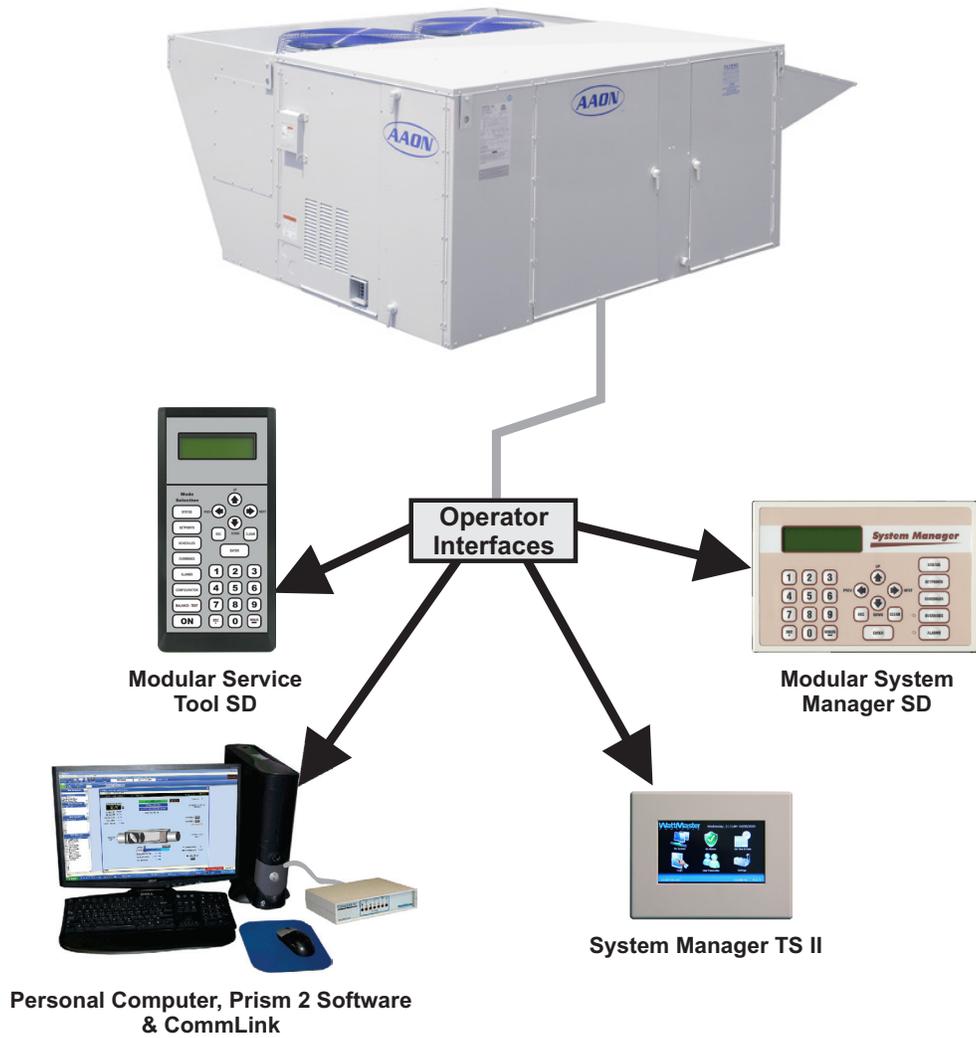


Figure 46: Typical Stand-Alone System Layout

Interconnected System Layout

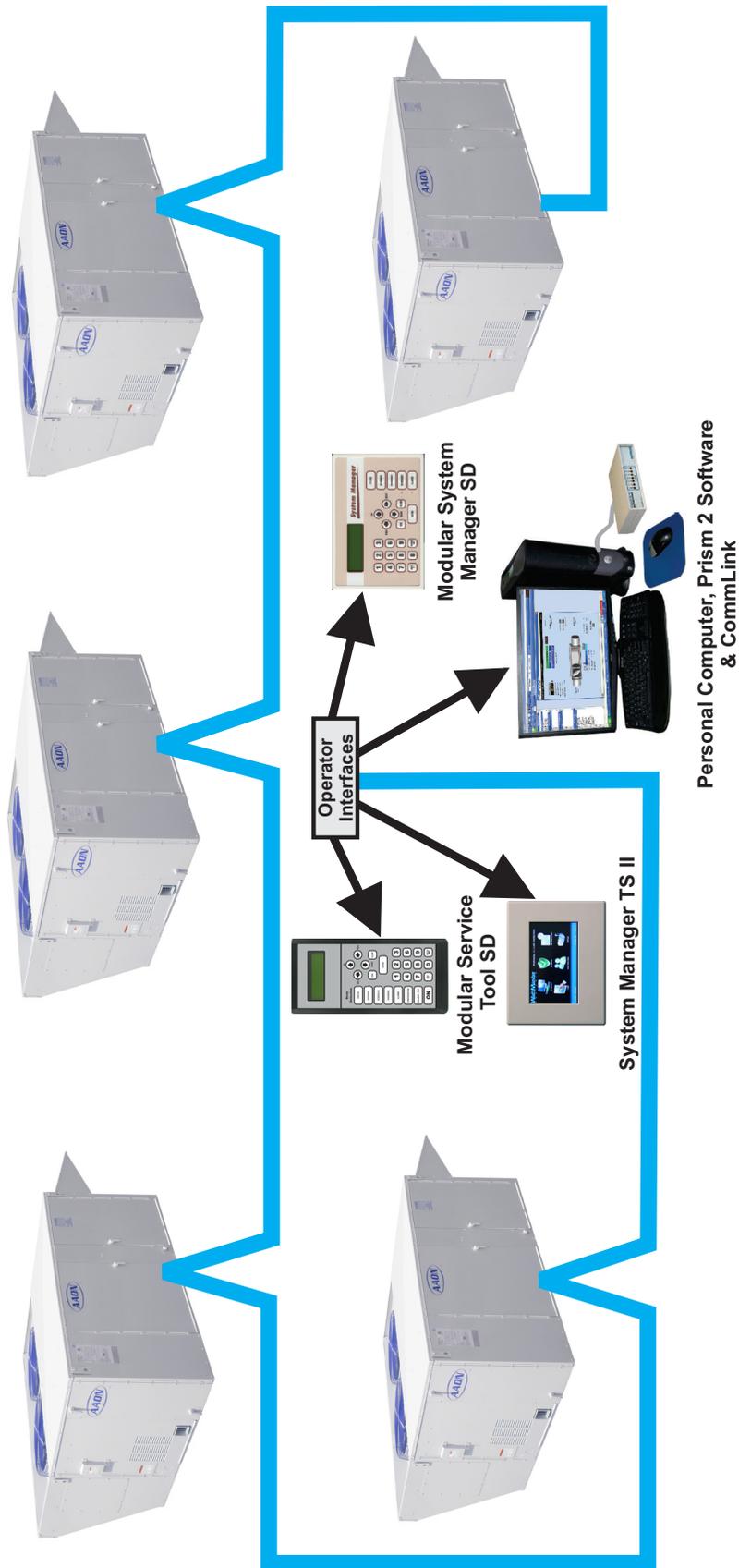


Figure 47: Typical Interconnected System Layout

Networked System Layout

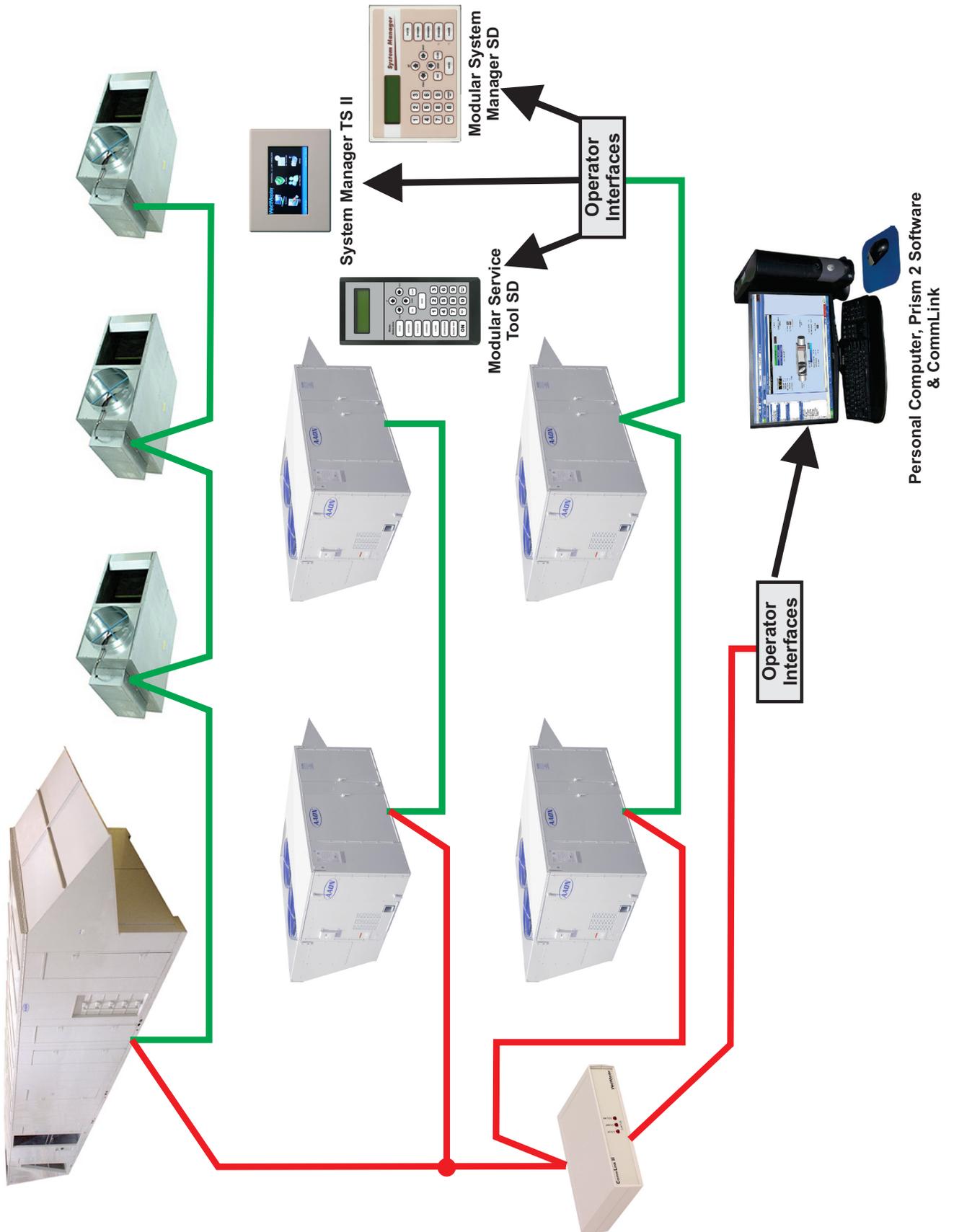
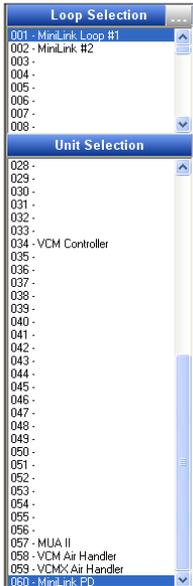


Figure 48: Typical Networked System Layout

Alarm Polling Setup Using Prism 2

Setting Up Alarm Polling for Controllers

In order to set up Alarm Polling to work with the System Manager TS II, you must have a Commlink and MiniLink Polling Device installed on your system. The following procedure must be done for the MiniLink Polling Device on each loop.



In the *Loop Selection Window* of the *Prism 2 Main Screen*, select the loop where your MiniLink Polling Device is located. Then, in the *Unit Selection Window* scroll down to Address 60 - MiniLink PD and click once on your selection. (Figure 49)

Figure 49: Loop & Unit Selection Windows

The *Polling Device Window* will appear. (Figure 50)

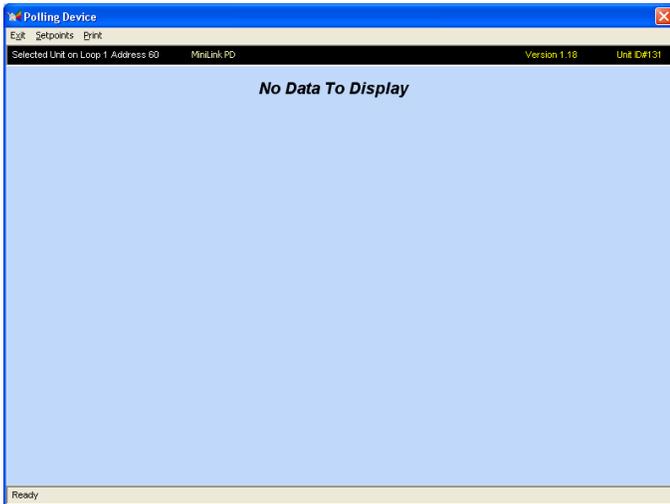


Figure 50: Polling Device Window

Click **<Setpoints>** at the top of the screen. The *Polling Device Setpoints Window* will appear. (Figure 51)

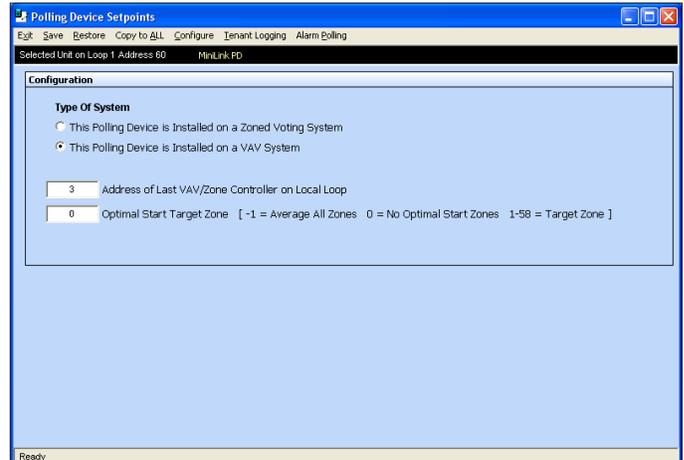


Figure 51: Polling Device Setpoints Window

Click the **<Alarm Polling>** option at the top far right of the *Polling Device Setpoints Window*. The *Alarm / Override Polling Window* will appear. (Figure 52)

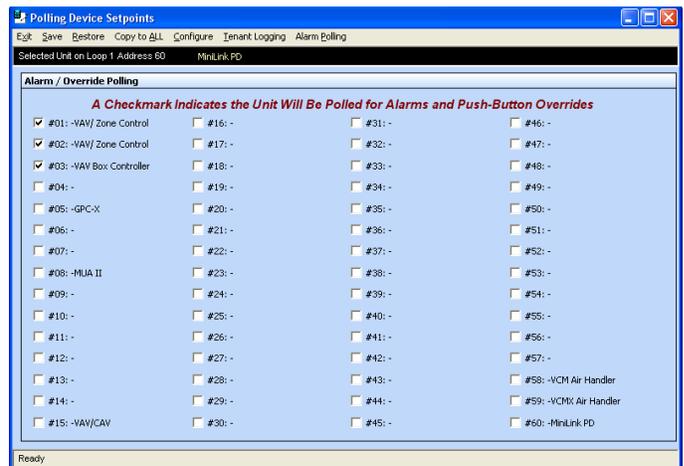


Figure 52: Alarm / Override Polling Window

In the *Alarm / Override Polling Window*, click the box to the left of each controller to choose alarm polling and push-button overrides for that controller. A check mark in the box designates alarm polling/push-button override.

Military Time Conversion

Military Time Conversion

The main difference between regular and military time is how hours are expressed. Regular time uses numbers 1 to 12 and a.m. and p.m. to identify each of the 24 hours in a day. In military time, the hours are numbered from 0000 to 2300.

Military time is based on a 24-hour day. Hours are numbered 0000 through 2300 and are recorded first. The last two digits indicate the minute after the hour. Military time does not exceed 2359 hours. For example, midnight is recorded as 0000; one minute past midnight is 0001; 1 a.m. is 0100, 1 p.m. is 1300, and so on.

Regular and military time express minutes and seconds in exactly the same way. When converting from regular to military time and vice versa, the minutes and seconds do not change.

Regular time requires the use of a.m. and p.m. to clearly identify the time of day. Since military time uses a unique two-digit number to identify each of the 24 hours in a day, a.m. and p.m. are unnecessary.

The following table summarizes the relationship between regular and military time.

| Regular Time | Military Time |
|--------------|---------------|
| 12:00 a.m. | 0000 |
| 12:30 a.m. | 0030 |
| 1:00 a.m. | 0100 |
| 1:30 a.m. | 0130 |
| 2:00 a.m. | 0200 |
| 2:30 a.m. | 0230 |
| 3:00 a.m. | 0300 |
| 3:30 a.m. | 0330 |
| 4:00 a.m. | 0400 |
| 4:30 a.m. | 0430 |
| 5:00 a.m. | 0500 |
| 5:30 a.m. | 0530 |
| 6:00 a.m. | 0600 |
| 6:30 a.m. | 0630 |
| 7:00 a.m. | 0700 |
| 7:30 a.m. | 0730 |
| 8:00 a.m. | 0800 |
| 8:30 a.m. | 0830 |
| 9:00 a.m. | 0900 |
| 9:30 a.m. | 0930 |
| 10:00 a.m. | 1000 |
| 10:30 a.m. | 1030 |
| 11:00 a.m. | 1100 |

Table 8: Military Time Conversion

| Regular Time | Military Time |
|--------------|---------------|
| 11:30 a.m. | 1130 |
| 12:00 p.m. | 1200 |
| 12:30 p.m. | 1230 |
| 1:00 p.m. | 1300 |
| 1:30 p.m. | 1330 |
| 2:00 p.m. | 1400 |
| 2:30 p.m. | 1430 |
| 3:00 p.m. | 1500 |
| 3:30 p.m. | 1530 |
| 4:00 p.m. | 1600 |
| 4:30 p.m. | 1630 |
| 5:00 p.m. | 1700 |
| 5:30 p.m. | 1730 |
| 6:00 p.m. | 1800 |
| 6:30 p.m. | 1830 |
| 7:00 p.m. | 1900 |
| 7:30 p.m. | 1930 |
| 8:00 p.m. | 2000 |
| 8:30 p.m. | 2030 |
| 9:00 p.m. | 2100 |
| 9:30 p.m. | 2130 |
| 10:00 p.m. | 2200 |
| 10:30 p.m. | 2230 |
| 11:00 p.m. | 2300 |
| 11:30 p.m. | 2330 |

Table 8, cont.: Military Time Conversion



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