Natural Ventilation Control

The Natural Ventilation Control (NVC-2-12 or NVC-2-24) is a fully programmable controller that provides extensive flexibility for your curtain or awning control needs. The controller automatically controls the temperature in a room by operating a curtain machine and heater according to your programmed settings.

Controlling a curtain machine

- When the temperature is within the **idle band** of the **set point**, the controller maintains the curtain position.
- When the temperature rises above the **idle band**, the controller opens the curtain for the **on duration**, and then pauses for the **off duration**.
- After each **off duration**, the controller checks the temperature and then either opens or closes the curtain (for the preset duration), depending on the temperature.

Controlling a heater

- When the temperature is below the **heat set point**, the controller switches the heater on.
- When the temperature is above the **heat set point**, the controller switches the heater off.

Quick reference

Accessories and kits 23
Alarm connection 7
Alarm settings overview 14
Clock 10
Close duration 13
Close off (idle) duration 13
Control layout 5
Control overview 2
Curtain machine connection ... 6
Curtain set point 10
Curtain settings overview 9
Factory defaults 19
Features 2
Firmware version 20
Growth curve 10
Heater connection 7
Heater set point 14
High alarm 15
Idle band 13
Low alarm 16
Manual Override Box 24
Manual override mode 18
Menu 3
Mounting 4
Open duration 12
Open off (idle) duration 13
override box 24
Power connection 6
power contactors 24
Rain sensor 16
Ratings 2
Temperature probe 6
Temperature test mode 17
Temperature units 16
Troubleshooting 22

Features and ratings

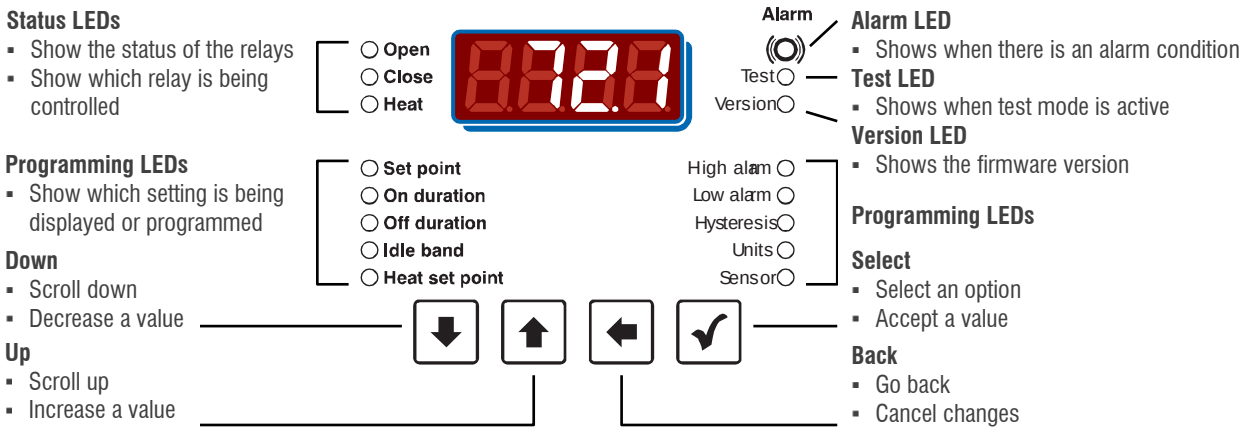
- Automatic temperature-based control, -13 to 125°F (-25 to 51.7°C) range
- Programmable on and off durations for the open and close relays
  1 to 900 seconds (up to 15 minutes)
- Programmable idle band
  1.0 to 10.0°F (0.6 to 5.5°C)
- Programmable heater hysteresis
  0.3 to 5.0°F (0.2 to 2.8°C)
- Programmable temperature alarms
- Two curtain relays (one open, one close)
- Heater control relay
- Alarm relay (for external alarm system)
- Four-button keypad
- Four-character LED display
- Programming and status LEDs
- Manual override and test modes
- Power-failure settings protection
- Six-foot temperature probe
- Optional rain sensor
- NEMA 4X enclosure (corrosion resistant, water resistant, and fire retardant)
- cCSAus approval
- 2-year limited warranty

Electrical ratings

- Input power, NVC-2-12: 12 VDC, 250 mA
  NVC-2-24: 24 VDC, 125 mA
- Open/close/heat relays: 12 A at 30 VDC
  15 A at 120/230 VAC, resistive load
  1/2HP at 120 VAC, 1 HP at 230 VAC
- Alarm relay: 0.4 A at 125 VAC; 2 A at 30 VDC, resistive load
  0.2 A at 125 VAC; 1 A at 30 VDC, inductive load

If you are connecting any equipment that exceeds the ratings of the relays, you must install power contactors. For more information, read **Power contactors** on page 24.

Becoming familiar with the controller



Main display

The main display shows the temperature and any alarm messages. The main display is what you see when you are not in a menu or settings display. Here are some things to know about the main display.

- When a relay is on, the status LED for that relay is lit.
- When there is an alarm condition, the display flashes between the alarm message and the current temperature. For more information about alarms, read **Programming alarm settings** on page 15.
- When the control is in manual override mode:
  - **For the curtain**, the Open and Close LEDs will blink three times and then stay off for one second.
  - **For the heater**, if the heater is ON, the Heat LED will blink three times and then stay ON for one second; if the heater is OFF, the LED will blink three times and then stay OFF for one second.

    For more information, read **Using manual override mode** on page 18

Main menu

When you are in the main menu, the display shows the menu items; the LEDs light up to show you which menu item is selected. Press **Up** or **Down** to move through the menu items.

Menu item	Display	Function
Open Close	CurE	Select automatic or manual override (open, close, or idle).
Heat	hEAt	Select automatic or manual override (on or off).
Alarm	ALAr	Switch the alarm relay on or off.
Test menu	tESt	
└ Test temperature	tEnP	Adjust the test temperature.
└ Factory defaults	FACt	Restore the factory defaults.
Version menu	UEr	
└ Display	di SP	Display the firmware version.
└ Update	UPdt	Update the firmware.
Set point menu	StPt	
└ Set point	SP	Adjust the curtain set point.
└ Growth curve menu	GC	
└ Enable	EnbL	Start or stop the growth curve.
└ Current day	Curd	Adjust the current day of the growth curve.
└ Step # day	St Id	Adjust the start day for step #. *NOTE: step 1 start day is always day 1.*
└ Step # temperature	St It	Adjust the temperature for the last day of step #.
└ Time	CI oc	Set the time of day.
Open on duration	O on	Adjust the curtain open duration.
Open off duration	O oFF	Adjust the open idle duration.
Close on duration	C on	Adjust the close duration.
Close off duration	C oFF	Adjust the close idle duration.
Idle band	bAnd	Adjust the Idle band.
Heat set point	HEAt	Adjust the heater set point.
High alarm	Hi AL	Adjust the high alarm temperature.
Low alarm	LoAL	Adjust the low alarm temperature.
Hysteresis	HYSt	Adjust the hysteresis for the heater.
Units	Uni t	Change between Fahrenheit and Celsius.
Sensor	SEnS	Enable the optional rain sensor.

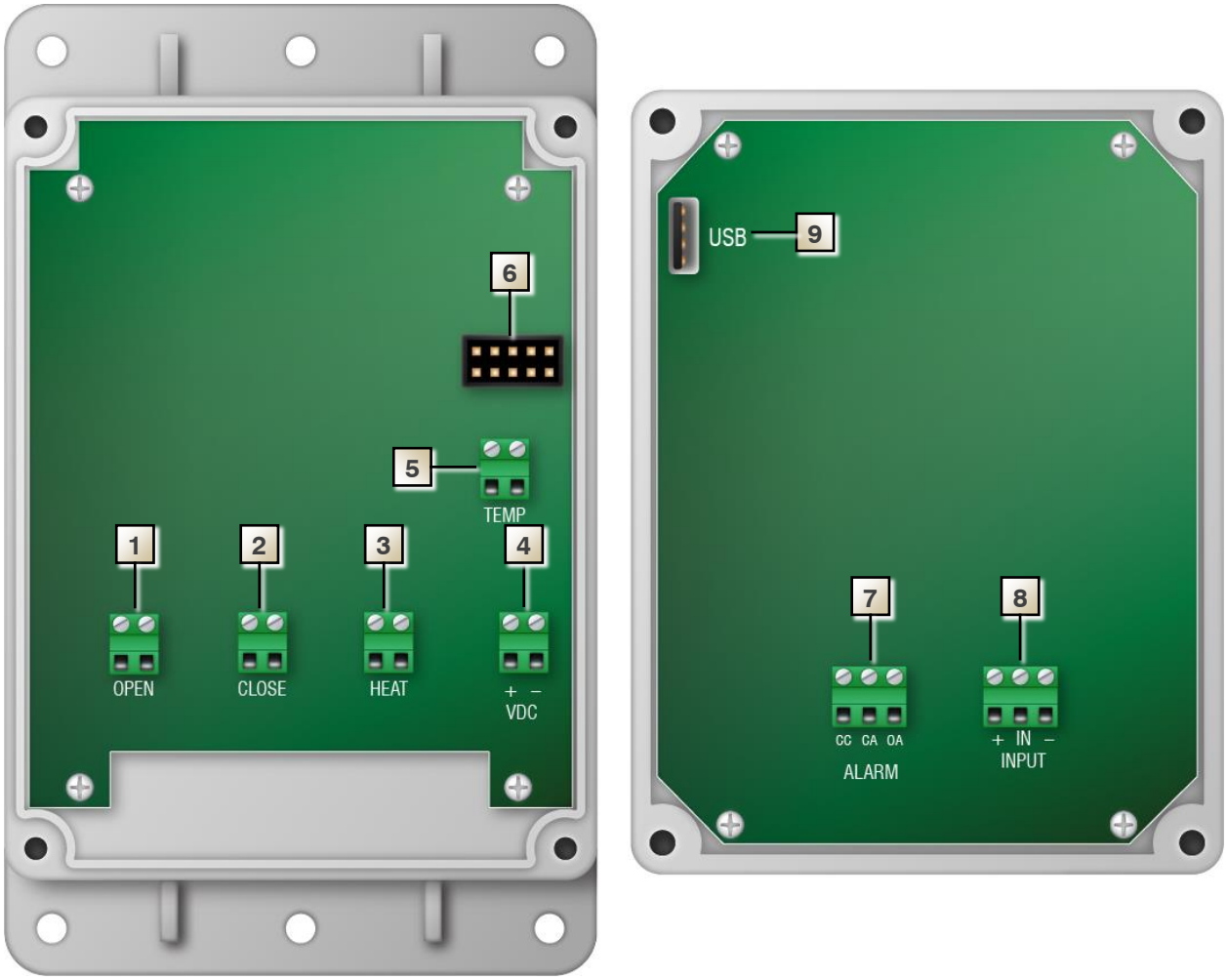
Installing the Natural Ventilation Control

- ◇ Read and follow all instructions when installing the controller and connecting equipment to it.
- ◇ Read **Electrical ratings** on page 2. Do not exceed the electrical ratings of the control.

Mounting the controller

- Select a location for the controller. Make sure you have enough cable and wire to reach the equipment you want to control.
- Remove the screws from the front cover and then gently lift it off.
- Mount the enclosure to a wall using the four screws provided with the controller. Insert the screws into the large holes in each corner of the box and then tighten.

Controller layout



Open and close relay terminals: connect a curtain machine to these terminals. For more information, read **Connecting the temperature probe**

Follow the guidelines below when installing and connecting the temperature probe.

- Do not run the probe cable in the same conduit as AC power cables
- Do not run the sensor cable beside AC power cables or near electrical equipment.
- When crossing other cables or power lines, cross them at a 90-degree angle.

1
2

Replace damaged probes as soon as possible. If there is no probe present or working properly, the controller displays either Pd (probe damage) or PS (probe short) and swi off the relays.

Connecting the power source

- Model NVC-2-12: 12 VDC, 250 mA
- Model NVC-2-24: 24 VDC, 125 mA

- ◇ Before connecting the incoming power, switch OFF the power at the source.
- ◇ Do not switch ON the power until you have finished all wiring and verified all equipment is properly connected and free of obstructions.

Connecting a curtain machine below.

3	**Heater relay terminal:** connect a heater or furnace to this terminal. For more information, read **Connecting a gas-fired furnace or electric heater** on page 7.
4	**DC power terminal:** connect the battery cable to this terminal. The terminal label will be 12 or 24 VDC, depending on the model. For more information, read Error! Reference source not found. **Error! Bookmark not defined.**.
5	**Temperature probe terminal:** connect the temperature probe here. For more information, read **Connecting** below.
6	**Display connector:** make sure the ribbon cable from the display is properly connected.
7	**Alarm relay terminal:** connect an external alarm system or siren here. For more information, read **Connecting an alarm system** on page 7.
8	**Input terminal:** connect an optional Rain Sensor here. For more information, read **Phason Rain Sensor** on page 23.
9	**USB connection:** connect a USB memory stick to this connector to update the firmware. For more information, read **Updating the firmware** on page 21.

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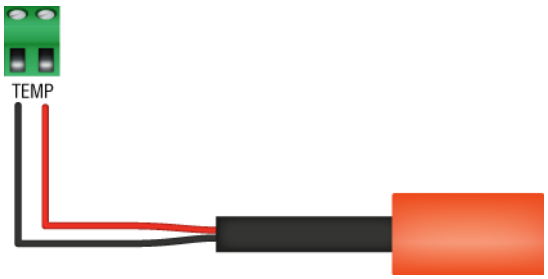
- When crossing other cables or power lines, cross them at a 90-degree angle.



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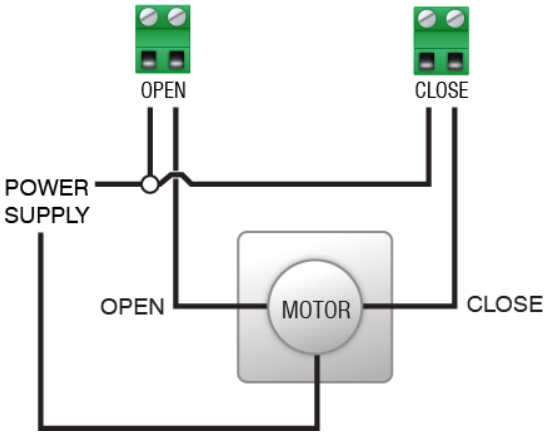
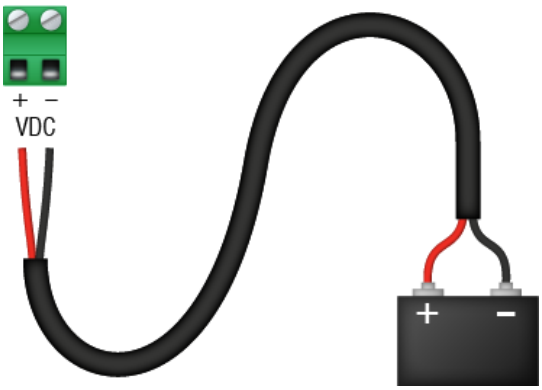
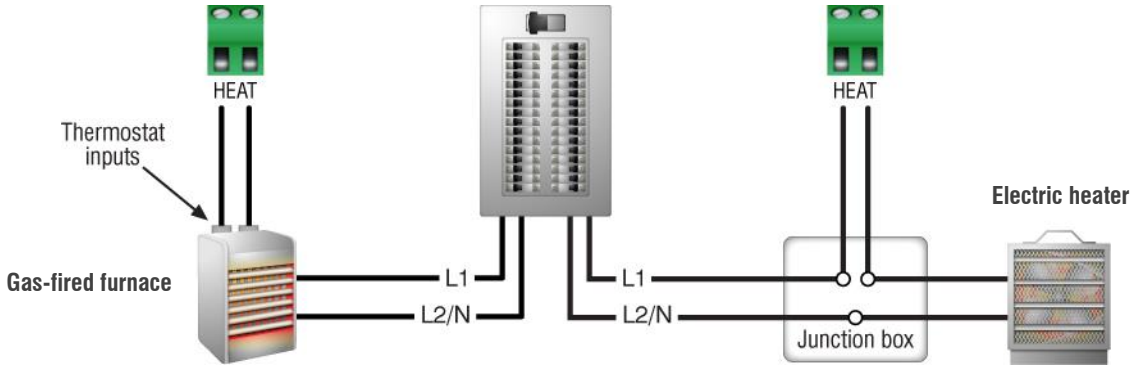


Connecting a curtain machine

The controller opens and closes the curtain to let in more air or less air, the idea being more air will cool the building.



Connecting a gas-fired furnace or electric heater



Gas furnaces using hot-surface ignition or a glow plug can draw more current than indicated on their nameplate, and require power contactors. For more information, read your furnace manual.

Connecting an alarm system

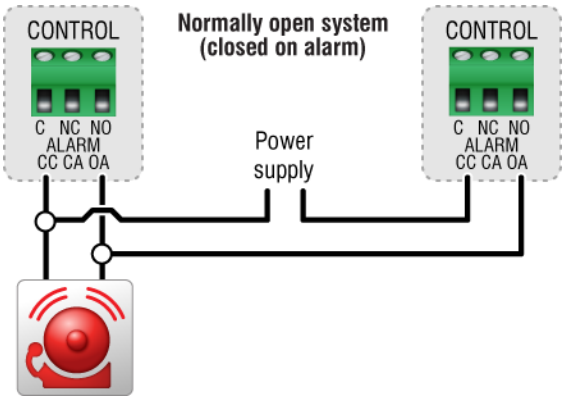
An alarm system can be a siren, an alarm panel, or an auto-dialer. See your alarm siren's installation guide for installation instructions and information about the type of system:

The descriptions for the alarm terminal are as follows: **CC**–common connection, **CA**–closed on alarm, **OA**–open on alarm.

To connect a normally open alarm system

If you are connecting the alarm system to a network of controls and your system uses a **normally open** connection (closes on alarm), connect the system as shown in the normally open diagram.

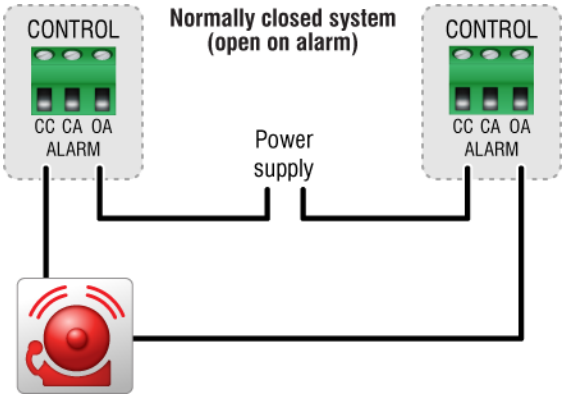
Join all the common (**CC**) connections together and all the closed-on-alarm (**CA**) connections together. The alarm relays must be in parallel with each other so any control can trigger the alarm system when an alarm condition occurs.



To connect a normally closed alarm system

If you are connecting the alarm system to a network of controls and your system uses a **normally closed** connection (opens on alarm), connect the system as shown in the normally closed diagram.

Join the alarm relays in a continuous loop. The alarm relays must be in series with each other so any control can trigger the alarm system when an alarm condition occurs.



Finishing the installation

After you have finished connecting all equipment:

1. Make sure you have properly connected all wires to the correct terminals.
2. Place the cover on the control.
3. Switch on the power to the controller; it should display 8888 for three seconds, the version (for example, u 100) for three seconds, and then the temperature.
   - If the display does not light up, go back to step 1.
   - If the display shows an alarm message, or the LED for Alarm is flashing, press **Select** to acknowledge the alarm. For a list of alarm messages and error codes, read **Alarm messages** on page 15.
4. Test the equipment. For more information, read **Testing and maintaining the controller** on page 17
5. Fasten the cover to the base.

Programming

Before programming the controller, make sure the control has power and you have properly connected all equipment to the correct terminals.

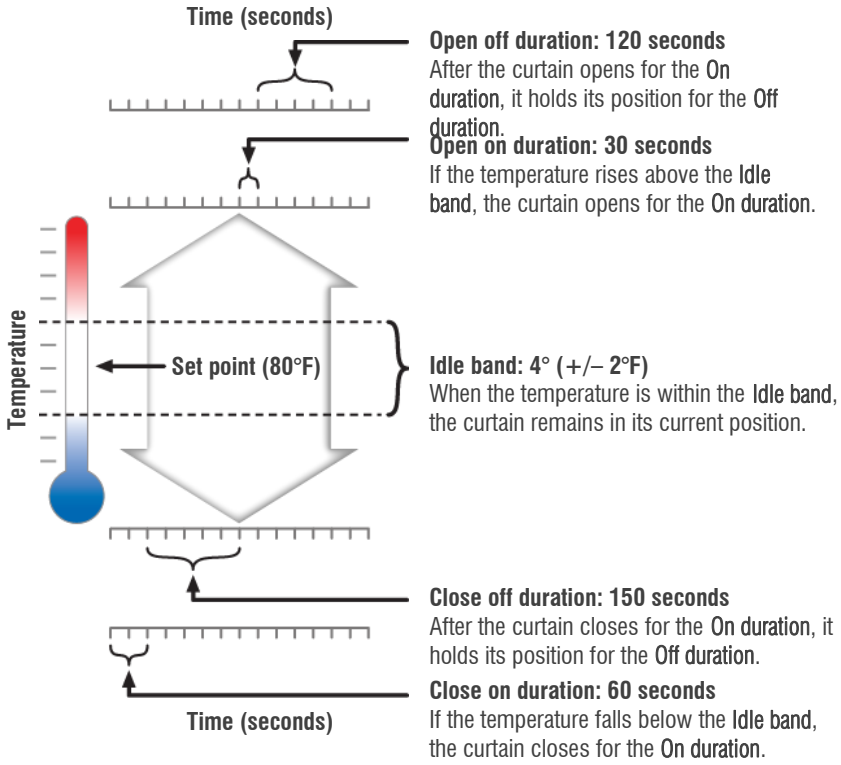
How the curtain settings work

- **Set point** (or growth curve set point) – the temperature at which the curtain holds its position.
- **Idle band** – the buffer around the set point within which the curtain holds its position.
- **Open on duration** – the duration the curtain opens during the open cycle
- **Close on duration** – the duration the curtain closes during the close cycle
- **Open off duration** – the duration the curtain holds its position during the open cycle
- **Close off duration** – the duration the curtain holds its position during the close cycle

Curtains hold their position while the temperature is within the **Idle band** of the **Set point**. For example, if the **Set point** is 80°F and the **Idle band** is 4°F (+/- 2°), the curtain holds its position when the temperature is between 78°F and 82°F.

If the temperature rises above the **Idle band** (above 82°F in our example), the curtain opens for the **Open on duration**. After opening, the curtain holds its position for the **Open off duration**. If the temperature is still above the **Idle band**, the curtain again opens for the **Open on duration,** and the process repeats.

If the temperature drops below the **Idle band** (below 78°F in our example), the curtain closes for the **Close on duration**. After closing, the curtain holds its position for the **Close off duration**. If the temperature is still below the **Idle band**, the curtain again closes for the **Close on duration,** and the process repeats.



To program the set point

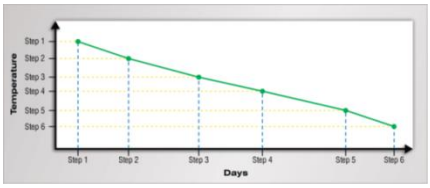
Default: 70.0°F *Range*: -13 to 125 (-25 to 51.7°C)

1. Press **Down** until the display shows SEPt.
2. Press **Select**.
   The current setting (in degrees) displays and the **Set point** LED flashes.
3. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The change is saved and the display shows SEPt.
4. Press **Down** to move to the **Open on duration**, or **Back** to cancel and return to the main display.

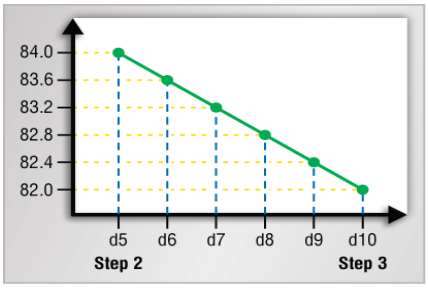
You cannot adjust the set point if you have the growth curve enabled.

Programming the growth curve

The growth curve automatically adjusts temperature set points over time, up to a maximum of 365 days. There are 6 steps in the growth curve; each step has a start day and a temperature. The control calculates the set points for the days between the steps, and then adjusts them each day at midnight.



Example



- Step 2 starts on day 5 and has a temperature of 84.0°F. Step 3 starts on day 10 and has a temperature of 82.0°F.
- The difference between the step 2 and step 3 set points is 2.0°F: (84.0 – 82.0 = 2.0). There are 5 days in step 2: (10 – 5 = 5).
- The controller divides the temperature difference by the number of days, 2.0 ÷ 5 = 0.4, and then automatically adjusts the set point by 0.4°F each day for 5 days.

To set the clock

The controller has a 24-hour clock it uses to calculate settings for the growth curve. If you will be using the growth curve, you need to set the clock to the correct time. If you are not using the growth curve, you do not need to set the clock.

1. Press **Up** or **Down** until the Set point LED is lit and then press **Select**.
2. Press **Up** or **Down** until CLoc displays and then press **Select**.
   The Set point LED flashes and the display shows the current time.
3. Press **Up** or **Down** to adjust the hour and then press **Select**.
4. Press **Up** or **Down** to adjust the minute and then press **Select**.
   The display shows Curd and the current day changes.

To start or stop the growth curve

When the growth curve is not running, the controller uses the main set point instead of the growth curve set points; the current day does not advance and the control does not automatically adjust the temperature set points. You can adjust the growth curve steps while the growth curve is not running, but you must start it before the control will advance the days and automatically adjust the temperatures.

When you start the growth curve, it starts at the day you left off. For example, if you stop the curve at day 50, it will continue at day 50 when you start it again. If you want to restart the curve, adjust the current day to 1.

1. Press **Up** or **Down** until the Set point LED is lit and then press **Select**.
2. Press **Down** until GC displays, and then press **Select**.
   The display shows EnbL, the first item on the growth curve menu.
3. Press **Select**.
   The Set point LED flashes in the display shows the current status.
4. Press **Up** or **Down** to change to the state you want, and then press **Select**.
   The display shows EnbL.

To adjust the current day

When the growth curve is running, the controller automatically advances the current day and adjusts the set points each day at midnight. However, there may be times when you want to move forward or backward in the curve, or restart the curve at day 1. You can do that by changing the current day of the curve.

- ◇ You can adjust the current day while the growth curve is not running, but the controller will not count the days until you start the curve.
- ◇ You cannot adjust the current day to be more than the **step 6 day**.

1. Press **Up** or **Down** until the **Set point** LED is lit and then press **Select**.
2. Press **Down** until GC displays, and then press **Select**.
   The display shows EnbL, the first item on the growth curve menu.
3. Press **Up** or **Down** until Curd displays and then press **Select**.
   The **Set point** LED flashes and the display shows the current day.
4. Press **Up** or **Down** until you reach the day you want and then press **Select**.
   The display shows Curd and the current day changes.

To adjust the growth curve steps

The growth curve can have up to 6 steps. Each step has a start day and a temperature. Temperatures can increase or decrease as the curve progresses. The maximum length for the growth curve is 365 days.

- ◇ You can adjust the growth curve steps while the growth curve is not running, but you must start it before the control will advance the days and automatically adjust the temperatures.
- ◇ Step 1 day is always 1.

1. Press **Up** or **Down** until the **Set point** LED is lit and then press **Select**.
2. Press **Down** until GC displays, and then press **Select**.
   The display shows EnbL, the first item on the growth curve menu.
3. Press **Up** or **Down** until St 1t (step 1 temperature) or the setting you want displays and then press **Select**.
   The **Set point** LED flashes and the display shows the current setting.
4. Press **Up** or **Down** to adjust the setting and then press **Select**.
5. Repeat steps 3 and 4 for each setting you need to adjust.

Programming curtain settings

To program the open on duration

Default: 20 seconds *Range*: 1 to 900 (up to 15 minutes)

1. Press **Up** or **Down** until the display shows `0 on`.
2. Press **Select**.
   The current setting (in seconds) displays and the **On duration** LED flashes.
3. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The change is saved and the display shows `0 on`.
4. Press **Down** to move to the **Open off duration**, or **Back** to cancel and return to the main display.

To program the open off duration

Default: 180 seconds *Range*: 1 to 900 (up to 15 minutes)

1. Press **Up** or **Down** until the display shows `0oFF`.
2. Press **Select**.
   The current setting (in seconds) displays and the **Off duration** LED flashes.
3. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The change is saved and the display shows `0oFF`.
4. Press **Down** to move to the **Close on duration**, or **Back** to cancel and return to the main display.

To program the close on duration

Default: 30 seconds *Range*: 1 to 900 (up to 15 minutes)

1. Press **Up** or **Down** until the display shows `C on`.
2. Press **Select**.
   The current setting (in seconds) displays and the **On duration** LED flashes.
3. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The change is saved and the display shows `C on`.
4. Press **Down** to move to the **Close off duration**, or **Back** to cancel and return to the main display.

To program the close off duration

Default: 120 seconds *Range*: 1 to 900 (up to 15 minutes)

1. Press **Up** or **Down** until the display shows `CoFF`.
2. Press **Select**.
   The current setting (in seconds) displays and the **Off duration** LED flashes.
3. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The change is saved and the display shows `CoFF`.
4. Press **Down** to move to the **Idle band**, or **Back** to cancel and return to the main display.

To program the idle band

Default: 2.0°F *Range*: 1.0 to 10.0°F (0.6 to 5.5°C)

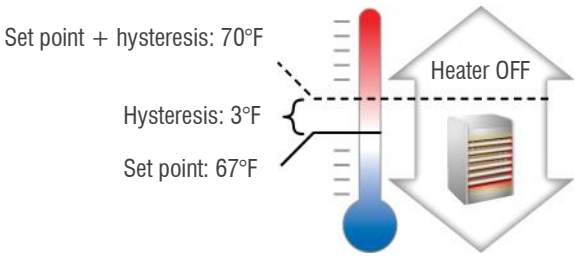
1. Press **Up** or **Down** until the display shows bAnd.
2. Press **Select**.
   The current setting (in degrees) displays and the **Idle band** LED flashes.
3. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The change is saved and the display shows bAnd.
4. Press **Down** to move to the **Heat set point**, or **Back** to cancel and return to the main display.

Programming heater settings

When the temperature is below the **heat set point**, the controller switches the heater on. When the temperature is above the **heat set point** plus the **hysteresis**, the controller switches the heater off.

Hysteresis is the number of degrees above the set point that a heating stage or relay switches off.

For example, a household thermostat might switch on a furnace at 67°F when the house is cooling down, but switch it off at 70°F when the house is warming up. The difference between these two values is the hysteresis.



To program the heat set point

Default: 65.0°F *Range*: -13 to 124°F (-25 to 51.1°C)

1. Press **Up** or **Down** until the display shows HEAt.
2. Press **Select**.
   The current setting (in degrees) displays and the **Heat set point** LED flashes.
3. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The change is saved and the display shows HEAt.
4. Press **Down** to move to the **High alarm**, or **Back** to cancel and return to the main display.

To program the hysteresis

Default: 2.0°F *Range*: 0.5 to 5°F (0.3 to 2.8°C)

1. Press **Up** or **Down** until the display shows HYSt.
2. Press **Select**.
   The current setting (in degrees) displays and the **Hysteresis** LED flashes.
3. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The change is saved and the display shows HYSt.
4. Press **Down** to move to **Units**, or **Back** to cancel and return to the main display.

Programming alarm settings

When there is an alarm condition, the alarm relay activates and the Alarm LED flashes. The display alternates between the ambient temperature and the alarm message.

When the condition goes away, the alarm relay deactivates and the Alarm LED switches off. The display continues to alternate between the temperature and alarm message until you acknowledge the alarm. To acknowledge an alarm, press **Select**.

There are four alarm conditions.

- **High temperature:** is when the temperature is above the high temperature alarm setting. You can adjust the high temperature alarm from the **low alarm** value to 125°F (51.7°C).
- **Low temperature:** is when the temperature is below the low temperature alarm setting. You can adjust the low temperature alarm from -13°F (-25°C) to the **high alarm** value.
- **Probe short:** is when the temperature probe is shorted (the temperature circuit is closed).
- **Probe damage:** is when the temperature probe is missing or broken (the temperature circuit is open).

When there is a probe damage or probe short condition, the control switches all relays off.

Alarm messages

Message and description	Possible causes	Possible solutions
High temperature alarm	The ambient temperature is too high. The high temperature alarm setting is too low.	◇ Increase ventilation/cooling. ◇ Increase the high temperature alarm setting. For more information, read ◇ **To program the high** alarm on page 16.
Low temperature alarm	The ambient temperature is too low. The low temperature alarm setting is too high.	◇ Decrease ventilation/cooling, increase heating. ◇ Decrease the low temperature alarm setting. For more information, read **To program the low alarm** on page 16.
Probe damage alarm	The temperature probe is damaged, missing, or the connecting wire is broken. The temperature probe circuit is open.	◇ Check the wire between the control and the probe. Wire damage can cause the alarm. ◇ Replace or reconnect the temperature probe. The control should recover automatically.
Probe short alarm	The temperature probe is damaged. The temperature probe circuit is closed.	◇ Check the wire between the control and the probe. Wire damage can cause the alarm. ◇ Replace the temperature probe. The control should recover automatically.

To program the high alarm

Default: 95.0°F *Range*: from **low alarm** to 125°F (51.7°C), or OFF

1. Press **Up** or **Down** until the display shows HI AL.
2. Press **Select**.
   The current setting (in degrees) displays and the **High alarm** LED flashes.
3. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The change is saved and the display shows HI AL.
4. Press **Down** to move to the **Low alarm**, or Back to cancel and return to the main display.

To program the low alarm

Default: 50.0°F *Range*: -13°F (-25°C) to **high alarm**, or OFF

1. Press **Up** or **Down** until the display shows LoAL.
2. Press **Select**.
   The current setting (in degrees) displays and the **Low alarm** LED flashes.
3. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The change is saved and the display shows LoAL.
4. Press **Down** to move to the **Hysteresis**, or **Back** to cancel and return to the main display.

Changing temperature units

The controller can display temperatures in Fahrenheit or Celsius.

To change the units

Default: Fahrenheit

1. Press **Up** or **Down** until the display shows Unit.
2. Press **Select**.
   The current setting displays and the **Units** LED flashes.
3. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The change is saved and the display shows Unit.
4. Press **Down** to move to **Sensor**, or **Back** to cancel and return to the main display.

Enabling the optional rain sensor

With the optional Phason Rain Sensor installed, the controller automatically the closes curtain, bypassing the on and off durations, when the sensor detects rainfall. After 15 minutes with no new rainfall, the controller returns to normal operation. For more information, read **Phason Rain Sensor** on page 23.

To enable the sensor

Default: not enabled

1. Press **Up** or **Down** until the display shows SEnS and the Sensor LED is lit.
2. Press **Select**.
   The current setting (on or off) displays and the Sensor LED flashes.
3. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The change is saved and the display shows SEnS.
4. Press **Back** to return to the main display.

Testing and maintaining the controller

Using temperature test mode

Temperature test mode allows you to test your equipment and settings by simulating the temperature. In temperature test mode, you adjust the “test temperature”.

As you increase or decrease the test temperature, the relays operate according to their settings and the test temperature. This gives you an idea of how your system performs over a full range of temperatures. The relays remain operating according to the test temperature until you exit test mode.

- ◇ When the controller is in temperature test mode, it operates the equipment according to the test temperature, not according to the measured temperature.
- ◇ The controller does not exit test mode automatically. When you are finished testing, press **Back** or **Select** to exit test mode.

To use temperature test mode

1. Press **Up** or **Down** until the display shows tESt.
2. Press **Select**.
   The display shows tEnP.
3. Press **Select**.
   The Test LED flashes and the display shows the test temperature. The controller is now in temperature test mode.
4. Press **Up** or **Down** to adjust the test temperature.
   The controller operates the equipment according to the test temperature.
5. When finished, press **Back** to return the control to automatic mode. Press **Back** again to return to the main display.

Testing the alarm

You can manually switch the alarm relay on and off so that you can test your alarm system.

To test the alarm

1. Press **Up** or **Down** until the display shows ALAr.
2. Press **Select**.
   The display shows oFF and the **Alarm** LED flashes.
3. Press **Up** or **Down** to change the relay state.
4. When finished, press **Back** to return to the main menu. Press **Back** again to return to the main display.

Using manual override mode

Manual override mode allows you to override the automatic settings and manually control the curtain and/or heater. You can open, close, or pause the curtain, and switch the heater on or off. Manual mode is also useful for testing equipment.

When the main display is showing and the curtain or heater is in override mode:

- **For the curtain**, the **Open** and **Close** LEDs will blink three times and then stay off for one second.
- **For the heater**, if the heater is ON, the **Heat** LED will blink three times and then stay ON for one second; if the heater is OFF, the LED will blink three times and then stay OFF for one second.

To override the curtain

1. Press **Up** or **Down** until the display shows Curt.
2. Press **Select**.
   The **Open** and **Close** LEDs blink rapidly.
   - If you are in automatic mode, the display shows Auto.
   - If you are in override mode, the display shows Ourd.
3. Press **Up** or **Down** until Ourd (override) displays.
4. Press **Select**.
   The display shows , dLE.
5. Press **Down** to switch between idle/stop and oPEn, or press **Up** to switch between idle and cLoS (close). Each time you press the button the curtain starts or stops moving.
6. Press **Select**.
   The control returns to the main menu and the display shows Curt.
7. Press **Up** or **Down** to select a different menu item, or press **Back** to return the main display.

- ◇ There is a three-second delay when switching between Open and Close. This is to allow the motor to stop before switching directions.
- ◇ The controller remains in override mode until you exit; it does not timeout or exit automatically.

To exit manual mode

1. Press **Up** or **Down** until the display shows the item you wan.
2. Press **Select**.
   The relay LED(s) blink rapidly and the display shows Ourd.
3. Press **Up** or **Down** until the display shows Auto.
4. Press **Select**.
   The display shows Curt or HEAt, depending which item you chose in step 1.
5. Press **Up** or **Down** to select a different menu item, or press **Back** to return the main display.

To override the heater

1. Press **Up** or **Down** until the display shows HEAt.
2. Press **Select**.
   The Heat LED blinks rapidly.
   - If you are in automatic mode, the display shows Auto.
   - If you are in override mode, the display shows Ourd.
3. Press **Up** or **Down** until the display shows Ourd.
4. Press **Select**.
   The display shows on (on).
5. Press **Up** or **Down** to switch between on and oFF (off).
6. Press **Select**.
   The control returns to the main menu and the display shows Curt.
7. Press **Up** or **Down** to select a different menu item, or press **Back** to return the main display.

Restoring the factory defaults

Setting	Default	Range/options
Set point	70.0	-13 to 125°F (-25 to 51.7°C)
Open ON duration	20	1 to 900 seconds
Open OFF duration	180	1 to 900 seconds
Close ON duration	30	1 to 900 seconds
Close OFF duration	120	1 to 900 seconds
Idle band	2.0	1.0 to 10.0°F (0.6 to 5.5°C)
Heat set point	75.0	-13 to 125°F (-25 to 51.7°C)
Low alarm	50.0	-13°F (-25°C) to High alarm
High alarm	95.0	Low alarm to 125°F (51.7°C)
Hysteresis	2.0	0.5 to 5°F (0.3 to 2.8°C)
Units	°F	°F/°C
Sensor	Off	Off/On

You can restore the default settings using one of two methods: the **power on method** or the **power off method**. The power on method is the easiest way to restore the factory defaults. If the power on method does not work, use the power off method.

To restore the factory defaults using the POWER ON method

1. Press **Up** or **Down** until the display shows tESt.
2. Press **Select**.
   The display shows tEnP.
3. Press **Up** or **Down** until the display shows FACt.
4. Press **Select**.
   The **Test** LED flashes and the display shows no.
5. Press **Up** or **Down** to until the display shows YES.
6. Press **Select** to restore the factory defaults.
   The control resets, displays the version for a few seconds, and then displays the temperature.

To restore the factory defaults using the POWER OFF method

We recommend having someone assist you if using the power off method.

1. Switch off the power to the control.
2. Switch on the power to the control while holding the **Up** and **Down** buttons. Keep holding the buttons until dEF displays.
3. Release the buttons.
   The control resets, displays the version for a few seconds, and then displays the temperature.

Displaying the firmware version

Firmware is the internal programming instructions of the controller. It is much like an operating system or software on a computer. Just like an operating system, the firmware has a version. If you call technical support, the support agent might ask you for the firmware version.

To display the firmware version

1. Press **Up** or **Down** until the display shows UEr.
2. Press **Select**.
   The display shows diSP.
3. Press **Select**.
   The display shows the firmware version and the **Version** LED flashes.
4. Press **Back** twice to return to the main display.

Updating the firmware

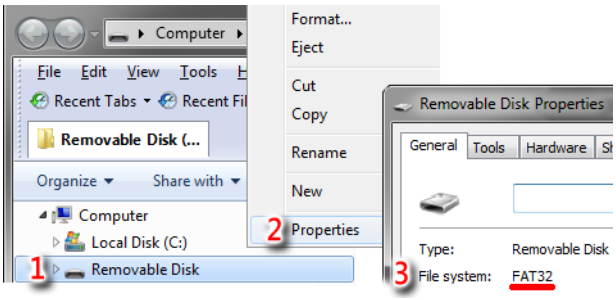
At Phason, we constantly improve and add new features to our products. You can the firmware in your controller as these improvements become available; all you need is a USB memory stick and a firmware update file.

You can update the firmware using one of two methods: the power on method or the power off method. The power on method is the easiest way to update the firmware. If, for some reason, the power on method does not work, use the power off method.

To prepare the firmware update file

You can download the firmware update file from the Phason website at **www.phasoncontrols.com**; just go to the product page. Copy the file to a USB memory stick. The USB stick that is formatted as a **FAT32 file system**. To check if the USB drive is the correct format, insert it into your computer and then open Windows Explorer.

1. Right-click the USB drive.
2. Click **Properties**.
3. Make sure the file system is FAT32.
   If the file system is not correct, you will need to format the drive as FAT32, or use a different drive that is the correct format.
4. Copy the update file to the root of the USB drive.
   The *root* means *not in a folder*.



To update the firmware using the POWER ON method

1. Loosen the four cover screws and gently remove the cover from the control. Make sure not to disconnect the ribbon cable from the base; it must stay properly connected.
2. Insert the USB drive into the connector on the back of the cover.
3. Press **Up** or **Down** until the display shows UEr.
4. Press **Select**.
   The display shows di SP.
5. Press **Up** or **Down** until the display shows UPdt.
6. Press **Select**.
   The display shows no and the **Version** LED blinks.
7. Press **Up** or **Down** until the display shows YES.
8. Press and hold **Select** until the **Test** LED blinks rapidly.

9. Release the button.
   - While the **Test** LED is blinking rapidly, the firmware is updating. Updating can take up to 2 minutes.
   - After updating, the display shows 8888 for a few seconds, followed by the version number, and then the main temperature display.
10. When finished, remove the USB drive, verify the ribbon cable is properly connected, and then fasten the cover to the base.

To update the firmware using the POWER OFF method

We recommend having someone assist you if using the power off method.

1. Switch off the power to the control.
2. Loosen the four cover screws and gently remove the cover from the control. Make sure not to disconnect the ribbon cable from the base; it must stay properly connected.
3. Insert the USB drive into the connector on the back of the cover.
4. Switch on the power to the control while holding the **Select** button. Keep holding the button until the **Test** LED blinks rapidly.
5. Release the button.
   - While the **Test** LED is blinking rapidly, the firmware is updating. Updating can take up to 2 minutes.
   - After updating, the display shows 8888 for a few seconds, followed by the version number, and then the main temperature display.
6. When finished, remove the USB drive, verify the ribbon cable is properly connected, and then fasten the cover to the base.

Troubleshooting

If you see an error code and are not sure what it means, look it up in **Alarm messages** on page 15 and then follow the instructions to resolve the condition.

The following table lists some problems, possible causes, and possible solutions. If you are having a problem using the controller, see if the problem is in the following table and then follow the directions for correcting the problem.

Problem	Possible cause	Possible solution
The power supply components are blown, or there are burn marks on boards and components. Motors and fans slow down or stop.	There has been a power surge, brownout, or power outage.	◇ Avoid the problem in future by providing proper voltage and protection for the control.
There is no power/display.	A circuit breaker at service panel is off or tripped.	◇ Reset the circuit breaker.
	The incoming power wiring is incorrect.	◇ Correct the wiring.
The display shows unusually high or low temperature.	The probe is not a Phason probe.	◇ Remove the probe and then install a Phason probe.
	The extension cable connected to the temperature probe is providing a poor connection	◇ Check the extension cable connection and re-solder it if necessary.
	The temperature probe is damaged.	◇ Replace the probe.
The curtain opens when it should close, or closes when it should open	The wiring is incorrect; the close and open wires are reversed.	◇ Correct the wiring. For more information, read **Connecting a curtain machine** on page 7.
The alarm relay is not operating the alarm system.	The alarm wiring is incorrect.	◇ Correct the wiring. For more information, read **Connecting an alarm system** on page 7.

Optional accessories and kits

Phason Rain Sensor

The Phason Rain Sensor (model PRS) connects to the Natural Ventilation Controller and allows it to close the curtain when rainfall is detected.

When the sensor detects rain, it sends a signal to the controller. When the controller receives the signal, it completely closes the curtain, bypassing the on and off durations. After 15 minutes with no rain, the control returns to normal operation.

The advanced optical sensor uses infrared light to detect water hitting its surface. This method of detection is more sensitive and reliable than other methods, is nearly immune to false detection, and is not affected by movement and most environmental conditions.

The Phason Rain Sensor's durable and rugged enclosure is completely sealed, so there are no electronics to corrode, and no openings for debris to collect.

Power contactors

The Manual Override Box (model MOB-4) increases the load handling capability of relays and provides an external disconnect.

The MOB-4 includes four 240 V power contactor relays with AUTO-OFF-MANUAL switches and snubber filters. If you need to override an actuator or curtain machine, an actuator override kit is available.

- Heavy-duty 240 V power contactor relays
- AUTO-OFF-MANUAL switches
- NEMA 4X enclosure (Corrosion-resistant, water-resistant, and fire-retardant)
- CSA approval
- Limited warranty

Temperature probes and extension cable

Temperature probes monitor temperatures ranging from –49 to 122°F (-45 to 50°C). The probes are available in 1, 6, 30, 75, or 150-foot cable lengths and can extended up to 500 feet using extension cable. Extension cable is available in 500-foot lengths.

Features

- Easy installation
- Rugged and durable design
- Weather and UV-resistant cable
- Limited warranty (90 days)

Parts and kits

If the display fails, you can replace it with a display kit. After replacing the display, you will need to program the control. If the bottom circuit board fails, you can replace it with a control kit.

Model NVC-2-12

Display kit: **KNVC2-DISPLAY**

Control kit: **KNVC12-CONTROL**

Model NVC-2-24

Display kit: **KNVC24-DISPLAY**

Control kit: **KNVC24-CONTROL**