Staged
Environment
Control

Easy

STAGES

1
2
3
4
5
Alarm

> **Program settings**
0 Operating program
1 Group set point
2 Stage 1 idle speed
3 Stage 1 idle range
4 Stage 1 set point
5 Stage 1 differential
6 Stage 2 idle speed
7 Stage 2 idle range
8 Stage 2 set point
9 Stage 2 differential
10 Stage 3 set point

11 Stage 4 set point
12 Stage 5 set point
13 Stage 5 P-band temperature
14 Stage 5 P-band interval
15 High temperature alarm
16 Low temperature alarm

> **Configuration**
17 Temperature unit
18 Frequency
19 Stage 1 configuration
20 Stage 2 configuration
21 Stage 3 configuration

22 Stage 4 configuration
23 Stage 5 configuration
24 Hysteresis
25 Settings save
26 Settings restore
27 Factory defaults
28 Firmware update
29 Version display

> **Alarm**
30 High temperature enable
31 Low temperature enable
32 Probe damage enable

33 Power fail enable

> **Test**
34 Stage override
35 Temperature override

> **Ventilation off**

> **Quick display**
⬆ Maximum temperature
⬇ Minimum temperature

Phason SEC-DC

CSA®

LR 61791

Table of contents

Chapter 1: Introducing the SEC-DC

Introducing the SEC-DC

The SEC-DC is a temperature-based control with two variable DC outputs and three relays. The primary purpose of the 0 to 10 V outputs is to control variable frequency drives (VFDs), but you can also use it to control modulating valves or other equipment requiring a 0 to 10 V input.

Easy to use and program

The SEC-DC comes with four factory-configured operating programs you can easily reconfigure for your ideal situation. The easy-to-use keypad and menu system make the SEC-DC one of the easiest controls to program. The SEC-DC's advanced and powerful features are never more than a few keystrokes away.

Versatility and peace of mind

The SEC-DC has a 30-foot temperature probe that monitors temperatures and a single zone. For more versatility, you can connect four temperature probes together and use four-zone averaging. Temperature probes are available in 1, 6, 30, 75, or 150-foot lengths; you can extend them up to 500 feet using extension cable.

The SEC-DC displays alert conditions such as high and low temperatures, power failure, and low line voltage, and can also connect to an alarm siren, alarm panel, or auto-dialer. Customizable alarm settings allow you to choose which alarm conditions you want to be notified about.

Features

- ◆ Automatic temperature-based control
- ◆ Seven configurable operating programs
- ◆ Two variable 0 to 10 V outputs
- ◆ Three general-purpose relays (heat, cool, or disconnect)
- ◆ One alarm relay (for external alarm system or siren)
- ◆ Four-character LED display and individual stage LEDs
- ◆ Minimum and maximum temperature logging
- ◆ Error code display
- ◆ Ventilation disable option
- ◆ Manual override/test mode
- ◆ Three-second full-power-turn-on for minimizing fan ice-up
- ◆ Power-failure settings protection
- ◆ One temperature probe input
- ◆ Thirty-foot temperature probe, extendable to 500 feet
- ◆ Rugged enclosure (corrosion resistant, water resistant, and fire retardant)
- ◆ CSA approval
- ◆ Limited warranty (two years)

Electrical ratings

◆ Input power   120/230 VAC, 50/60 Hz

◆ DC signal outputs   0 to 10 VDC, 2K Ω load

◆ Relay stages   6 A at 120/230 VAC, general-purpose (resistive)
                       1/3 HP at 120 VAC, 1/2 HP at 230 VAC
                       360 W tungsten at 120 VAC

◆ Fuses   12 A, 250 VAC ABC-type ceramic

◆ 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

Common applications

Livestock applications

Livestock applications include buildings housing calves, rabbits, goats, hogs, poultry, and turkey. Ventilation systems that use three-phase motors often use a variable frequency drive (VFD). These applications can use the SEC-DC to control the VFD with its 0 to 10 VDC output and temperature probe. In addition, it can use the three relay stages to control fans and heaters.

Greenhouse applications

Greenhouse applications include controlling ECM fan motors directly, or PSC fan motors through a triac-based slave with 0 to 10 VDC input, such as Phason's PLC-2SDC. The SEC-DC can regulate the temperature in the greenhouse by exhausting the heat using fans.

Business and light-industrial applications

Business and light-industrial applications include machine shops, garages, and utility sheds where customers use the SEC-DC to automatically regulate temperature. The SEC-DC controls DC controlled ECM fan motors to exhaust heat from a room. In addition, it can use its three relay stages to run fans and heaters. The SEC-DC can also be used with AC variable speed motors if used with a triac-based slave with 0-10 VDC input like the PLC-2SDC.

Becoming familiar with the SEC-DC

The SEC-DC has a four-character LED display, status LEDs for each variable stage and relay, and five buttons for programming and interacting with the control.

The four-character, seven-segment LED display shows ambient temperatures, alarm messages, and programming information. If there is a dot in the top left corner of the display, you are in an editable menu.

NOTE

If you leave the SEC-DC in a menu or display other than the main display, the control returns to the main display after five minutes without any key presses. The only exceptions are stage override mode and temperature override mode; the control remains in these modes until you manually exit them.

Menu layout

Main menu

Display	Description
A Pr-	Program A
b Pr-	Program B
C Pr-	Program C
d Pr-	Program D
E Pr-	Program E
F Pr-	Program F
G Pr-	Program G
COnF	Configuration
ALEn	Alarm enable
tESt	Test
uEnt	Ventilation ON/OFF

Program menu

Display*	Description
A 0	Operating program
A 1	Group set point
A 2	Stage 1 idle speed
A 3	Stage 1 idle range
A 4	Stage 1 set point
A 5	Stage 1 differential
A 6	Stage 2 idle speed
A 7	Stage 2 idle range
A 8	Stage 2 set point
A 9	Stage 2 differential
A 10	Stage 3 set point
A 11	Stage 4 set point
A 12	Stage 5 set point
A 13	Stage 5 P-band temperature
A 14	Stage 5 P-band interval
A 15	High temperature alarm
A 16	Low temperature alarm

Configuration menu

Display	Description
17	Temperature unit
18	Frequency
19	Variable 1 configuration
20	Variable 2 configuration
21	Stage 3 configuration
22	Stage 4 configuration
23	Stage 5 configuration
24	Hysteresis
25	Settings save
26	Settings restore
27	Factory defaults
28	Firmware update
29	Version display

Alarm menu

Display	Description
30	High alarm enable
31	Low alarm enable
32	Probe damage enable
33	Power fail enable

Test menu

Display	Description
34	Stage override menu
35	Temperature override

Ventilation off

Press **Program** to cycle through the menus.

Press **Up** or **Down** to cycle through the menu items.

* This is the display for program A. The display for programs B to G shows the appropriate letter first.

Chapter 2: Installing your SEC-DC

What you need to do before installing your SEC-DC

1. Read **Understanding power surges and surge suppression** on page 55.

   ⚠️ ◇ If you do not install external surge suppression devices, you risk damage to the electronics inside your SEC-DC, which may cause your SEC-DC to fail.

   ◇ Because it is not possible to completely protect this product internally from the effects of power surges and other transients, we highly recommend that you install external surge suppression devices. For specific recommendations, see your electrical contractor.

   ◇ If you do not take these precautions, you acknowledge your willingness to accept the risk of loss or injury.

2. Using **Appendix D: Installation worksheet** on page 51, list all the equipment you want to control using this SEC-DC. Install the equipment and make your electrical connections according to the sheet.

3. Using **Appendix E: Configuration worksheets** on page 52, decide which relays and variable stages you want to use for each piece of equipment, and how you want the equipment configured. You can connect more than one piece of equipment to a single relay or stage **as long as the total current draw does not exceed** the relay or stage's limit. For more information, read **Electrical ratings** on page 6.

SEC-DC layout

1	**Voltage selection switch**: set this switch to the correct voltage before installing your SEC-DC.
2	**Incoming power terminal**: connect the incoming power (120/230 VAC, 50/60 Hz).
3	**Temperature probe terminal**: connect the temperature probe.
4	**Alarm relay terminal**: connect an external alarm system or alarm siren to this terminal.
5	**Relay terminals** (STAGE 3 to STAGE 5): connect single stage (on/off) equipment, or connect variable frequency drives and use the relays as disconnects.
6	**Relay fuses** (F1 for STAGE 3, F4 for STAGE 4, and F5 for STAGE 5): 12 A, 250 VAC ABC-type ceramic.
7	**Display cable:** make sure the ribbon cable from the display is properly connected to the socket.
8	**Variable stage terminals** (V1, V2): connect variable frequency drives or other equipment that requires a 0 to 10 VDC input signal.
9	**Saver connector:** connect the optional SEC-DC Saver when saving or restoring settings, or the optional SEC-DC Updater when updating firmware.
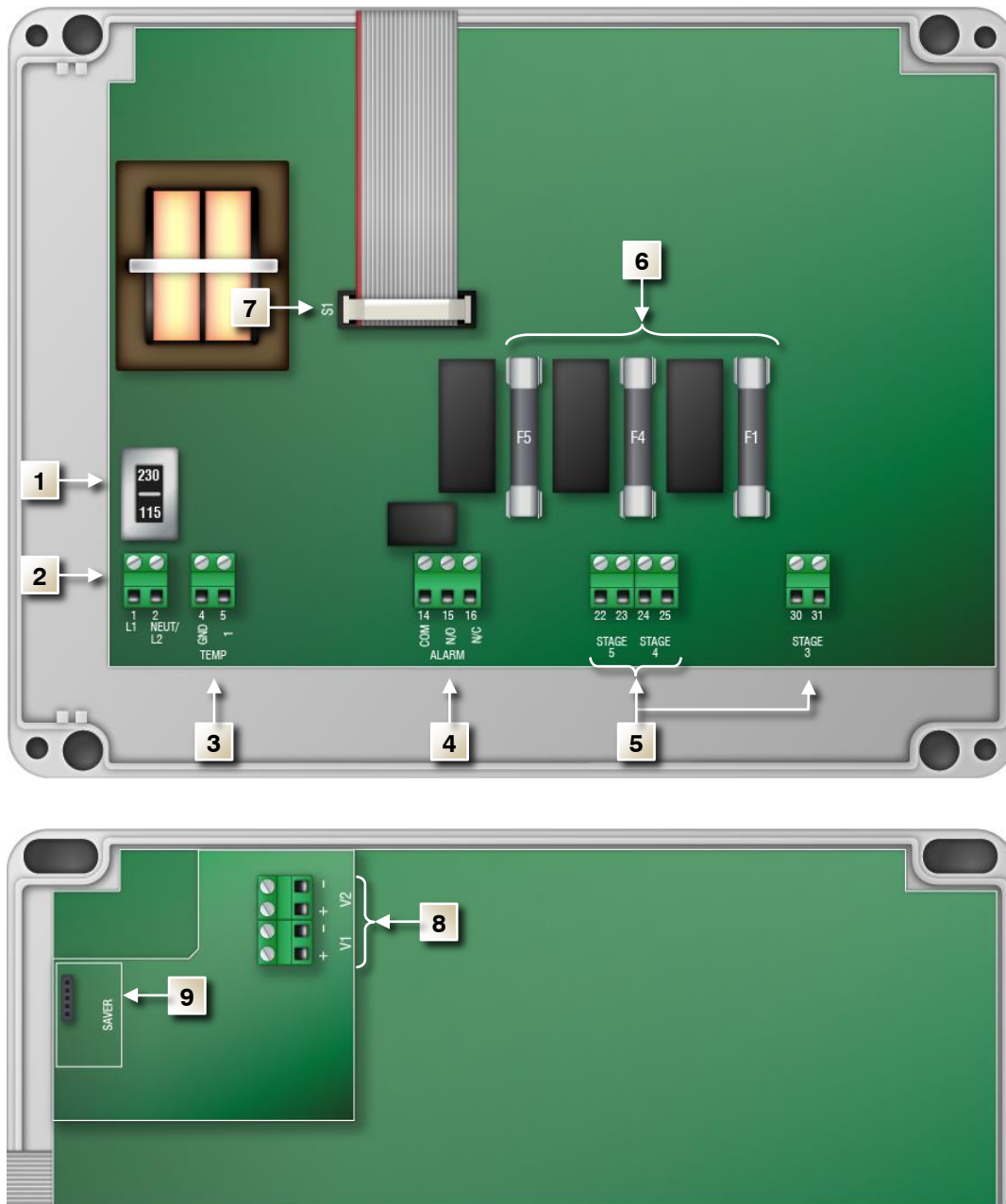
Mounting your SEC-DC

1. Select a location for your SEC-DC. Make sure you have enough cable and wire to reach all the equipment (fans, heaters, actuators, and so on) that you want to control.

2. Remove the screws from the front cover and then gently lift it off.

3. Mount the enclosure to a wall using the four screws provided with the control. Insert the screws into the large holes in each corner of the box and tighten.

Connecting equipment to your SEC-DC

Follow all instructions when installing your SEC-DC and connecting equipment to it.

> The SEC-DC's test modes are useful for testing equipment after installing and configuring it. For more information, read **Testing settings and equipment** on page 35.

> ⚠ Use the electrical knockouts for bringing wires or cables into or out of your SEC-DC enclosure. Do not make additional holes in the enclosure; this can damage the watertight seal or control components and void the warranty.

Connecting variable frequency drives

The SEC-DC has two 0 to 10 VDC signal outputs for controlling variable frequency drives, and three relays you can use as disconnects.

> ⚠ The ratings of the equipment must not exceed the ratings of the control.
>
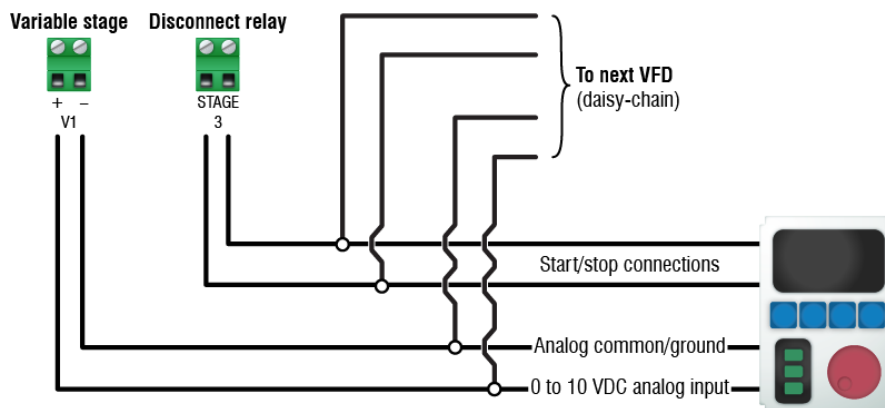> **DC signal outputs:** 0 to 10 VDC, 2K Ω load
>
> **Relay ratings:** 6 A at 120/230 VAC, general-purpose (resistive)
> 1/3 HP at 120 VAC, 1/2 HP at 230 VAC
> 360 W tungsten at 120 VAC
>
> **Relay fuses:** 12 A, 250 VAC ABC-type ceramic

To connect variable frequency drives

Connect variable frequency drives to your SEC-DC as shown in the following diagram. The example uses stage 3 as a disconnect relay.

Connecting equipment to the general-purpose relays

The SEC DC has three relays. Stages 3, 4, and 5 can be heat, cool, or disconnect relays. Relay 3 has the same options as 1 and 2, but can also be proportional heat or cool.

When you configure a relay as heat, cool, or proportional, you can connect equipment such as single-speed fans, electric heaters, and furnaces. When you configure a relay as disconnect, you can connect it to a variable frequency drive and use it as a start/stop relay.

Refer to **Appendix D: Installation worksheet** on page 51 and **Appendix E: Configuration worksheets** on page 52 when installing single-stage heating or cooling elements.

The ratings of the equipment must not exceed the ratings of the control.

Relay ratings: 6 A at 120/230 VAC, general-purpose (resistive)
1/3 HP at 120 VAC, 1/2 HP at 230 VAC
360 W tungsten at 120 VAC

Relay fuses: 12 A, 250 VAC ABC-type ceramic

To connect single-speed cooling or heating elements

Connect single-speed heating or cooling elements to the relay as shown in the following diagrams.

Gas-fired furnace or brooder   **Other single-speed cooling or heating elements**
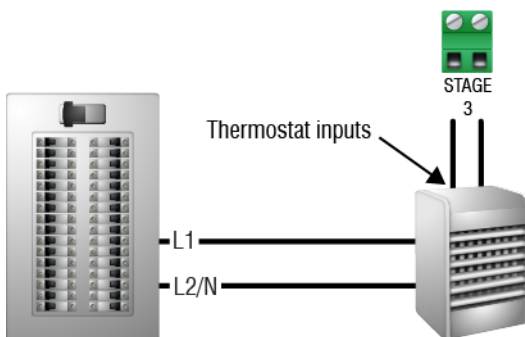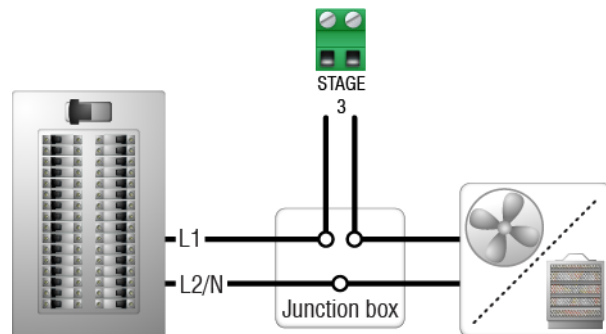
Gas furnaces using hot-surface ignition or glow plug can draw more current than indicated on their nameplate and require power contactors. For more information, contact your furnace dealer.

Connecting an alarm system

You can connect an alarm system to your SEC-DC's alarm terminal. An alarm system can be a siren, alarm panel, or auto-dialer. Read your system's installation guide for installation instructions and information about the type of system: **normally open** or **normally closed**.

◆ **COM**:   common connection

◆ **N/O**:   normally open; closes during alarm conditions

◆ **N/C**:   normally closed; opens during alarm conditions

For the alarm system to sound (or dial out) during an alarm condition, you must enable the alarms. For more information, read **Programming alarm settings** on page 30.

> ⚠️ The ratings of the alarm system must not exceed the ratings of the relay.
> **Alarm relay ratings**:   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

To connect an 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 **COM** connections together and all the **N/O** connections together. Your SEC-DC alarm relays must be in parallel with each other so any SEC-DC can trigger the alarm system when an alarm condition occurs.

◆ 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. Your SEC-DC alarm relays must be in series with each other so any SEC-DC can trigger the alarm system when an alarm condition occurs.

Normally open system (closed on alarm)   Normally closed system (open on alarm)
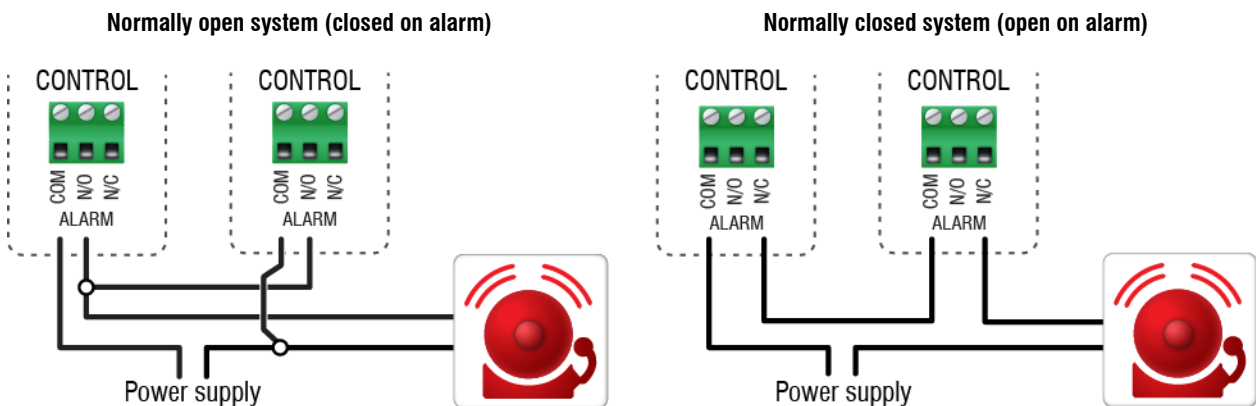
Connecting temperature probes

> ⚠️ Replace damaged probes as soon as possible. If there is no probe present or working properly, the SEC-DC shuts off stages 3, 4, and 5 and operates variable stages 1 and 2 at idle speed.

To connect a single 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.

To extend probe cable

You can extend Phason probe cables up to 500 feet. For more information, read the section in the **Control Fundamentals** guide that came with your control.

To use four-zone averaging

The SEC-DC can monitor the temperature in four different zones using four-zone averaging. The control takes an average of the temperatures measured by the four probes and then operates according to the average temperature.

Connect **four** temperature probes as shown in the following diagram. Follow the same guidelines as extending probe cables. Using two, three, or more than four probes measures the temperature incorrectly.
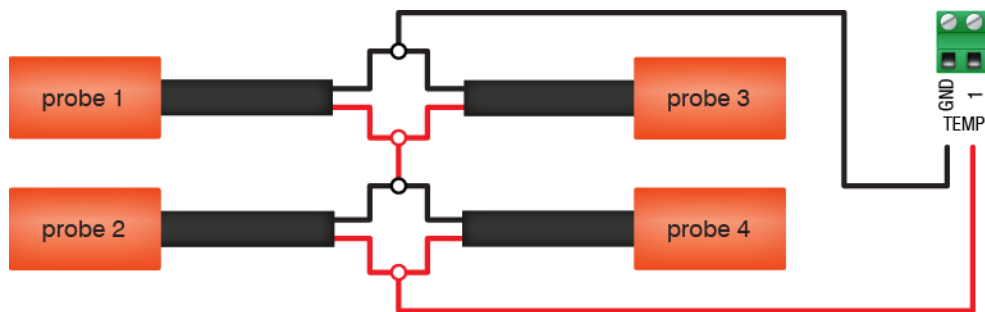
Connecting the power source

> ◇ Before connecting the power, set the voltage switch to the correct voltage, **120 or 230 VAC**.
> ◇ Before connecting the incoming power, switch OFF the power at the source.
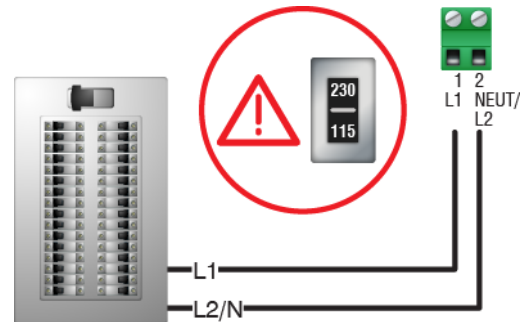> ◇ Do not switch ON the power until you have finished all wiring and verified all equipment is properly connected and free of obstructions.

To connect the incoming power source

Connect the incoming power source as shown in the following diagram.

Finishing the installation

After installing and connecting equipment, you are ready to finish the installation. Before you start configuring your SEC-DC, you need to verify the connections and fasten the cover to the SEC-DC.

Make sure the configuration worksheets in **Appendix E** correspond to how the equipment is connected to the control. The connections and the information in the worksheets must match, because the next step is to tell the control which equipment is connected to each terminal.

To finish the installation

1. Make sure all the wires are properly connected to the correct terminals.

2. Make sure the voltage selection switch is in the correct setting.

3. Make sure the display cable is properly connected. For more information, read **SEC-DC layout** on page 9.

4. Place the cover on the control.

5. Switch on the power to your SEC-DC.
    When you switch on the power to your SEC-DC, the display should show - - - - , followed by the temperature. If the power fail alarm is enabled, it will show the message *PF* .

    If the SEC-DC display does not come on, go back to step 1.

    If the display shows an alarm message and/or the LED for Alarm is lit, read **Programming alarm settings, parameters 15 and 16** on page 30.

6. Insert the four screws into the cover and then tighten them.

> ⚠ Do not over tighten the screws. Avoid using power screwdrivers or drills.

Chapter 3: Configuring your SEC-DC

Configuring your SEC-DC means telling it what equipment it will be controlling and how it will be controlling that equipment. For example, your SEC-DC has three relay stages. You need to tell the stages if they will be controlling heating or cooling elements.

Before you begin configuring your SEC-DC, make sure:

◆ It has power

◆ All equipment has been properly connected to the correct terminals.

◆ You know which equipment is connected to which relays and variable stages

---

NOTE   This chapter does not explain set points, idle speeds, or other settings. For information about those settings, read **Chapter 4: Programming the SEC-DC** on page 21.

◇ We recommend configuring *all* your control elements before programming the settings (temperature set points, idle speeds, and so on). Use the **Appendix E: Configuration worksheets** on page 52 to help you keep track of which equipment is connected to which relays and variable stages.

◇ If you receive an error message during configuration, look it up in **Appendix C: Error messages and troubleshooting** on page 47 and then follow the instructions for correcting the problem.

◇ Your SEC-DC's built-in diagnostic tests are useful for testing your equipment after installing and configuring it. For more information, read **Testing settings and equipment** on page 35.

Configuring the main control functions

Before configuring the variable and relay stages, configure the main control functions. Main control functions include:

◆ Temperature units (parameter 17)
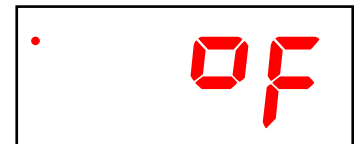
◆ Frequency (18)

◆ Hysteresis (24)

Selecting the temperature units, parameter 17

Your SEC-DC can display temperatures in either degrees Fahrenheit (°F) or degrees Celsius (°C), but not both at the same time.

Default: Fahrenheit

To select the temperature unit

1. Press **Program** until ⌐ONF displays and then press **Select**.
   The display shows 17, the first item in the Configuration menu.

2. Press **Select**.
   The display shows the current temperature unit.

3. Press **Up** or **Down** to toggle between °F and °C and then press **Select**.
   The control returns to the Configuration menu.

4. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

Selecting the operating frequency, parameter 18

In North America, utility companies supply power at 60 Hz. In some areas of the world, such as Europe, power is supplied 50 Hz.

Default: 60 Hz

To select the operating frequency

1. Press **Program** until ⌐ONF displays and then press **Select**.
   The display shows 17, the first item in the Configuration menu.

2. Press **Up** until 18 displays and then press **Select**.
   The display shows the current frequency.

3. Press **Up** or **Down** to toggle between 50 and 60 and then press **Select**.
   The control returns to the Configuration menu.

4. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

Configuring hysteresis, parameter 24

Hysteresis helps prevent damage to the relays, variable stages, and the equipment connected to them by preventing the stages from switching on and off rapidly when the temperature is hovering close to the set point.

Hysteresis is the number of degrees above the set point that a heating stage or relay switches off, and the number of degrees below the set point that a cooling stage or relay switches off. For example, a household thermostat might switch on a furnace at 68 °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.

Default: 0.5°F (0.3°C)   **Range**: 0.3 to 5.0°F (0.2 to 2.8°C)

To configure the hysteresis

1. Press **Program** until ⎓⎓⎓⎓ displays and then press **Select**.
   The display shows ⎓⎓, the first item in the Configuration menu.

2. Press **Up** or **Down** until ⎓⎓ displays and then press **Select**.
   The display shows the current configuration.

3. Press **Up** or **Down** to adjust the value and then press **Select**.
   The control returns to the Configuration menu.

4. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.
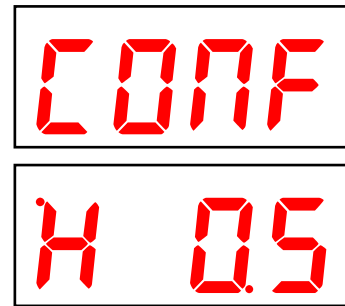
Configuring the stages

Your SEC-DC has two types of stages: two variable stages and three relay (ON/OFF) stages.

Configuring variable stages, parameters 19 and 20

Variable stages 1 and 2 control elements that operate with gradually changing voltage, such as variable speed fans. There are two configuration options.

◆ **Off** (⎓⎓⎓) – the stage is always off.

◆ **Cool** (⎓⎓⎓⎓) – the stage controls equipment used for cooling.

Default: cool
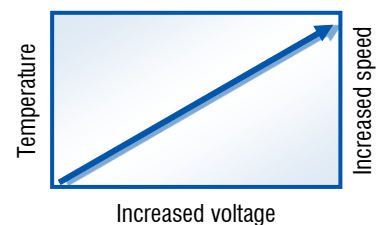
> ◇ Use the **Variable stage configuration worksheet** on page 52 when configuring variable stages.
>
> ◇ For more information about how variable stages work, read **Programming variable stages** on page 25.

To configure variable stages

1. Press **Program** until `CONF` displays and then press **Select**.
   The display shows `17`, the first item in the Configuration menu.

2. Press **Up** until `19` displays for variable 1 (or `20` for variable 2) and then press **Select**.
   The display shows the current configuration.

3. Press **Up** or **Down** until the configuration you want is displayed and then press **Select**.
   The control returns to the Configuration menu.

4. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

Configuring relay stages, parameters 21 to 23

The SEC-DC has three relay stages you can configure as one of the following options.

◆ **Off (`OFF`)**: The relay is always open (OFF).

◆ **On (`On`)**: The relay is always closed (ON). You can use this configuration as an override.

◆ **Cool (`Cool`)**: The relay controls a cooling element and is on when the temperature is above the set point.

◆ **Heat (`HEAt`)**: The relay controls a heating element and is on when the temperature is below the set point.

◆ **Variable 1 (`UAr 1`)**: The relay is a disconnect relay for variable stage 1. When configured as a disconnect relay, the relay switches off when the temperature drops below the variable stage's idle range.

◆ **Variable 2 (`UAr 2`)**: The relay is a disconnect relay for variable stage 2.

◆ **Proportional cool (`ProC`)**: This configuration is for stage 5 only. The relay controls a water pump or sprinkler solenoid and operates as a proportional cycle timer. The relay switches on for a portion of the cycle/interval and off for the remainder. The duration the relay is on depends on the temperature. Proportional control provides better control of temperature and is more efficient.

   Typical use for proportional cooling is soaking or direct evaporative cooling, which is often used in hog and dairy operations.

◆ **Proportional heat (*Pr o H*)**: This configuration is for stage 5 only. The relay controls a pump or valve and operates as a proportional cycle timer. Typical use for proportional heating is in-floor heating using water pipes, which is often in livestock buildings.

Defaults: stage 3 VAR1   stage 4 VAR2   stage 5 HEAT

To configure relay stages

1. Press **Program** until *CONF* displays and then press **Select**.
    The display shows *17*, the first item in the Configuration menu.

2. Press **Up** until *21* displays for stage 3 (*22* for stage 4, or *23* for stage 5) and then press **Select**.
    The display shows the current configuration.

3. Press **Up** or **Down** until you reach the option you want and then press **Select**.
    The control returns to the Configuration menu.

4. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

Testing the configuration

After configuring all the control elements (variable stages, relays, and so on), test your SEC-DC to make sure the configuration is correct. In other words, make sure what you think is connected to a particular relay or stage *is* actually connected to that relay or stage.

You can test the configuration using the SEC-DC's stage override mode. Stage override mode allows you to operate the equipment, regardless of temperature or time. As you operate each piece of equipment, visually check to see if that equipment is doing what you tell it.

For example, when you switch on stage 3 at the SEC-DC, does the equipment you think is connected to that relay switch on?

For more information about stage override mode, read **Testing settings and equipment** on page 35.

Chapter 4: Programming the SEC-DC

Programming the SEC-DC means telling the control what you want it to do with the equipment and when you want it done. For example, for a single-speed fan set for cooling, you might say "Switch ON when the temperature reaches 80°F."

Before you begin programming your SEC-DC, make sure:

◆   The control has power

◆   You know which equipment is connected to which stages

◆   You have **properly connected** all equipment to the **correct terminals**.

◆   You have properly configured and tested all equipment connected to the variable and relay stages. For more information, read **Chapter 3: Configuring your SEC-DC** on page 16.

Use **Appendix F: Settings worksheets** on page 53 when programming your SEC-DC.

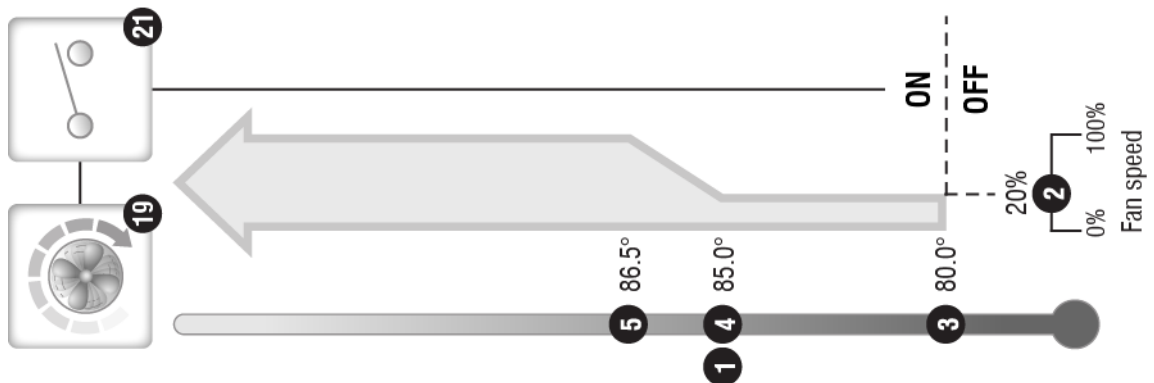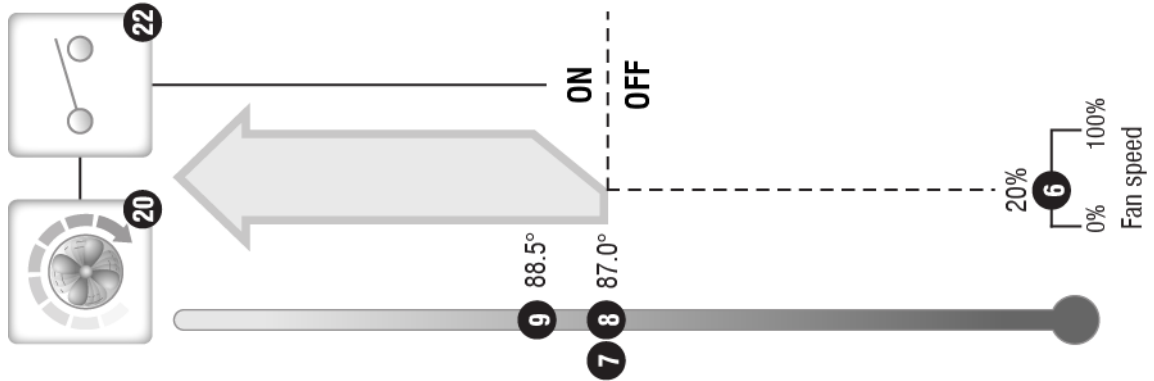## Understanding how the SEC-DC operates

Understanding how the SEC-DC operates can help you configure and program your control more efficiently, and control your environment more effectively. The following is just one example of the configuration for the variable and relay stages.

There are seven programs (A to G) you can use or customize to your needs. The configuration and settings for the following example are the factory defaults for program A.

● **Group set point** is the target temperature for the room.

● **Stage 1 idle speed** is the speed, in percentage of full power, at which the stage 1 fan operates for minimum ventilation.

● **Stage 1 idle range** is the temperature below which the stage 1 fan is off and the inlet is closed. When the temperature is between the **idle range** and **set point**, the fan operates at **idle speed**.

Parameter	Program A setting
1 Group set point (°F)	85.0
2 Stage 1 idle speed (%)	20
3 Stage 1 idle range (°F)	80.0
4 Stage 1 set point (°F)	85.0
5 Stage 1 differential (°F)	86.5
6 Stage 2 idle speed (%)	20
7 Stage 2 idle range (°F)	87.0
8 Stage 2 set point (°F)	87.0
9 Stage 2 differential (°F)	88.5
10 and 11 are not used in the example	
12 Stage 5 set point (°F)	84.0
13 and 14 are not used in the example	
15 High temperature alarm (°F)	95.0
16 Low temperature alarm (°F)	80.0
17 and 18 are not relevant in the example	
19 Stage 1 configuration	COOL
20 Stage 2 configuration	COOL
21 Stage 3 configuration	VAR1
22 Stage 4 configuration	VAR2
23 Stage 5 configuration	HEAT
24 to 29 are not relevant in the example	
30 High temperature enable	YES
31 Low temperature enable	YES

● **Stage 1 set point** is the temperature above which the stage 1 fan speed increases toward its maximum. You should set the stage 1 set point to the same temperature as the group set point.

● **Stage 1 differential** is the temperature at which the stage 1 fan reaches full speed.

● **Stage 2 idle speed** is the speed at which the stage 2 fan operates when the temperature is at the stage 2 idle range (number 7).

● **Stage 2 idle range** is the temperature above which the stage 2 fan operates at **idle speed.**

● **Stage 2 set point** is the temperature above which the stage 2 fan speed increases toward its maximum.

● **Stage 2 differential** is the temperature at which the stage 2 fan reaches full speed.

● **Stage 5 set point** is the temperature below which the stage 5 heater is on.

● **High temperature alarm** is the temperature equal to or above which the SEC-DC signals a high temperature alarm.

● **Low temperature alarm** is the temperature equal to or below which the SEC-DC signals a low temperature alarm.

● **Stage 1 configuration** in the example and factory defaults, stage 1 is configured as *cool*.

● **Stage 2 configuration** in the example and factory defaults, stage 2 is configured as *cool*.

● **Stage 3 configuration** in the example and factory defaults, stage 3 is configured as *variable 1 disconnect*.

● **Stage 4 configuration** in the example and factory defaults, stage 4 is configured as *variable 2 disconnect*.

● **Stage 5 configuration** in the example and factory defaults, stage 5 is configured as *heat*.

● **High temperature enable** in the example and factory defaults, the high temperature alarm is enabled.

● **Low temperature enable** in the example and factory defaults, the low temperature alarm is enabled.

95.0°

80.0°

84.0°

ON
OFF

100%
20%
0%
Fan speed

88.5°
87.0°

ON
OFF

100%
20%
0%
Fan speed

86.5°
85.0°
80.0°

Programming the parameters

Programming the parameters explains parameters 1 to 23 and how to program them. For information about parameter 0, read **Selecting the operating program** on page 33.

Programming the group set point, parameter 1

The group set point is the target or desired temperature for the zone. It is also the temperature tracked by the individual stages. The individual set points for each variable and relay stage will be adjusted relative to the group set point for that zone. For example, if you lower the group set point by 5 degrees, the set points for the variable and relay stages will also be lowered by 5 degrees.

Make sure you set the group set point before setting the individual set points.

For a more-detailed description of how all settings work together, read **Understanding how the SEC-DC operates** on page 21.

> Use **temperature override** to test your high and low temperature alarms instead of adjusting the group set point. In temperature override mode, the alarm relay and status LEDs both operate as if they were in a real alarm situation. For more information, read **Using temperature override mode** on page 36.

> NOTE
> The examples in the procedure below use program A, which displays as A Pr. Program B displays as b Pr, C displays as C Pr, and so on.

To program the group set point

1. Press **Program** until the program you want to adjust displays, for example A Pr for program A.

2. Press **Select**.
   The display shows A 0, the first item in the Program menu.

3. Press **Up** until A 1 displays and then press **Select**.
   The display shows the current setting.

4. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The control returns to the Program menu.

5. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

Programming variable stages, parameters 2 to 9

There are four settings to program for each variable stage. The following diagram explains how the settings work together. For a more-detailed description of how all settings work together, read **Understanding how the SEC-DC operates** on page 21.

When the temperature is below the **idle range**, the fan is off.

◆ When the temperature reaches the **idle range**, the fan runs at full speed for three seconds and then runs at the **idle speed**. The fan continues to run at the **idle speed** until the temperature rises to the **set point**.

◆ When the temperature is between the **set point** and **differential**, fan speed increases or decreases proportionally with the temperature.

◆ When the temperature is at or above the **differential**, the fan runs at full speed.

The fan runs at full speed.

5   **Differential temperature**

Fan speed increases as the temperature rises, or decreases as the temperature falls.

4   **Set point temperature**

The fan runs at **idle speed**. The temperature band between the **idle range** temperature and the **set point** is sometimes called the "idle band".

3   **Idle range temperature**

The fan is off when the temperature is below the **idle range** temperature.

Idle speed

2

0%   100%

Fan speed ⟶

Temperature

◇ If you are using a disconnect relay for the variable stage, it switches off when the temperature is below the idle range.

◇ Use the **Variable stage settings worksheet** on page 53 when programming variable stages.

To program variable stage settings

> NOTE
>
> The examples in the following procedure use program A and variable stage 1.
>
> ◇ Program A displays as *A Pr*. Program B displays as *b Pr*, C displays as *C Pr*, and so on.
>
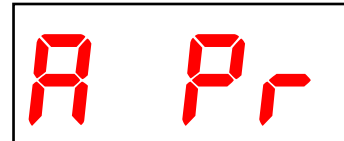> ◇ Variable stage 1 uses Program settings menu items 2, 3, 4, and 5. For variable stage 2, use menu items 6, 7, 8, and 9.

1. Press **Program** until the program you want to adjust displays, for example *A Pr* for program A.

2. Press **Select**.
    The display shows *A 0*, the first item in the Program menu.

3. Press **Up** until the setting you want to adjust displays, for example *A 2* for **Stage 1 idle speed** and then press **Select**.
    The display shows the current setting.

4. Press **Up** or **Down** to adjust the setting and then press **Select**.
    The control returns to the Program menu.

5. Repeat steps 3 to 4 for each setting you want to adjust.

6. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

Programming relay stages, parameters 10 to 14

There are three types of relay stage setups: **heat/cool**, **disconnect**, and **proportional**. Normal and disconnect are available for stages 3, 4, and 5. Proportional is available only for stage 5.

For a more-detailed description of how all settings work together, read **Understanding how the SEC-DC operates** on page 21.

How disconnect relays work

When configured as a disconnect relay, there is no setting to program. The relay switches off when the temperature drops below the variable stage's **idle range** setting, and on when it rises above the setting.

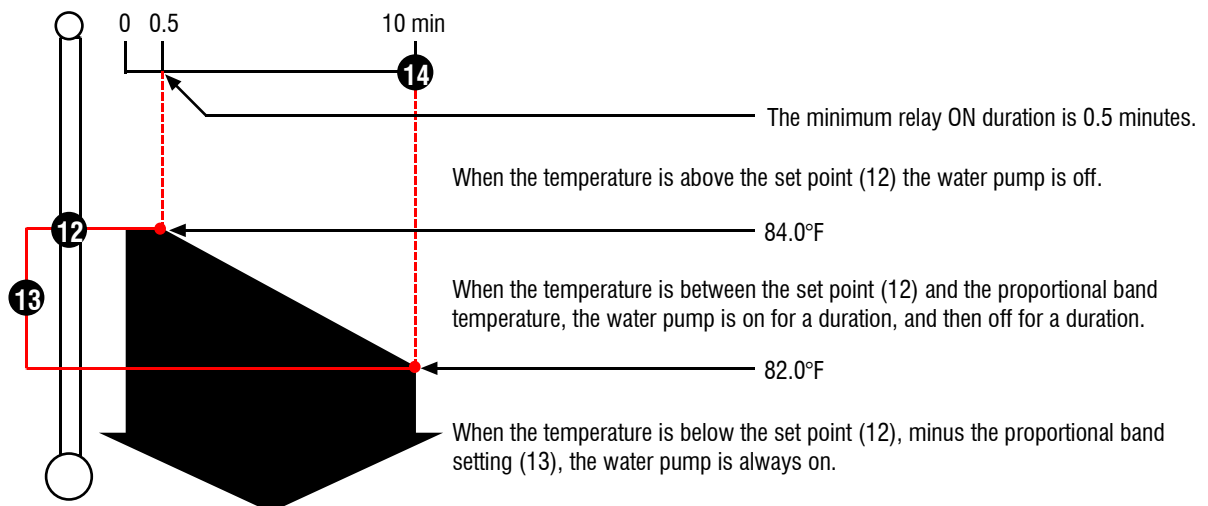### How proportional control works (stage 5 only)

Proportional heating

When configured for proportional heating, the relay controls a pump or valve and operates as a proportional cycle timer. Typical use for proportional heating is in-floor heating using water pipes, which is often in livestock buildings.

The following example uses the default settings for program A.

- Parameter 12, **Stage 5 set point** = 84.0°F

- Parameter 13, **Stage 5 P-band temperature** = 2.0°F

- Parameter 14, **Stage 5 P-band interval** = 10 minutes

10 minutes ÷ 2.0 = 5 minutes change per degree, therefore:

- At 84.0:   0.5 min on (this is the minimum time regardless of interval parameter), 9.5 min off

- At 83.5:   2.5 min on, 7.5 min off

- At 83.0:   5 min on, 5 min off

- At 82.5:   7.5 min on, 2.5 min off

- At 82.0:   10 min on, 0 min off (always on)

The minimum relay ON duration is 0.5 minutes.

When the temperature is above the set point (12) the water pump is off.

84.0°F

When the temperature is between the set point (12) and the proportional band temperature, the water pump is on for a duration, and then off for a duration.

82.0°F

When the temperature is below the set point (12), minus the proportional band setting (13), the water pump is always on.

Proportional cooling

When configured for proportional cooling, the relay controls a water pump or sprinkler solenoid and operates as a proportional cycle timer. The relay switches on for a portion of the cycle/interval and off for the remainder. The duration the relay is on depends on the temperature. Proportional cooling allows you to control temperatures more effectively and efficiently.
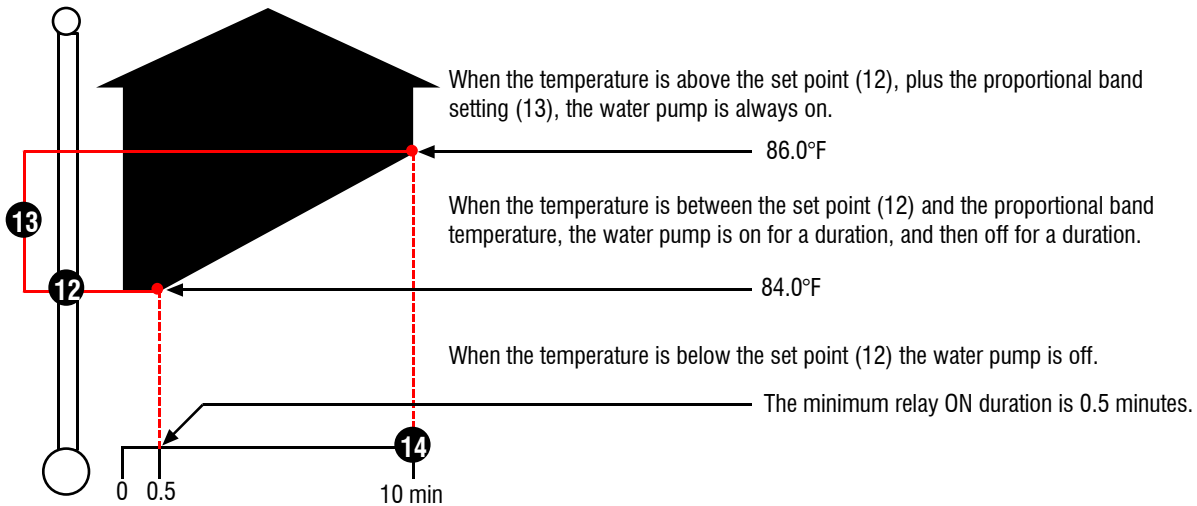
Typical use for proportional cooling is soaking or direct evaporative cooling, which is often used in hog and dairy operations.

The following example uses the default settings for program A.

◆ Parameter 12, **Stage 5 set point** = 84.0°F

◆ Parameter 13, **Stage 5 P-band temperature** = 2.0°F

◆ Parameter 14, **Stage 5 P-band interval** = 10 minutes

10 minutes ÷ 2.0 = 5 minutes change per degree, therefore:

◆ At 84.0:   0.5 min on (this is the minimum time regardless of interval parameter), 9.5 min off

◆ At 84.5:   2.5 min on, 7.5 min off

◆ At 85.0:   5 min on, 5 min off

◆ At 85.5:   7.5 min on, 2.5 min off

◆ At 86.0:   10 min on, 0 min off (always on)


When the temperature is above the set point (12), plus the proportional band setting (13), the water pump is always on.

86.0°F

When the temperature is between the set point (12) and the proportional band temperature, the water pump is on for a duration, and then off for a duration.

84.0°F

When the temperature is below the set point (12) the water pump is off.

The minimum relay ON duration is 0.5 minutes.

0 0.5   10 min

To program proportional band settings

> **NOTE**
> The examples in the procedure below use program A, which displays as $R\ Pr$.
> Program B displays as $b\ Pr$, C displays as $\complement\ Pr$, and so on.

1. Press **Program** until the program you want to adjust displays, for example $R\ Pr$ for program A.

2. Press **Select**.
   The display shows $R\quad \complement$, the first item in the Program menu.

3. Press **Up** or **Down** until the setting you want to adjust displays, for example $R\quad l2$ for **Stage 5 set point** and then press **Select**.
   The display shows the current setting.

4. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The control returns to the Program menu.

5. Repeat steps 3 to 4 for each setting you want to adjust.

6. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.
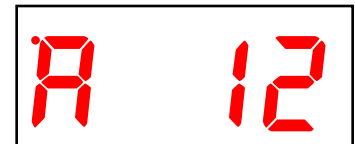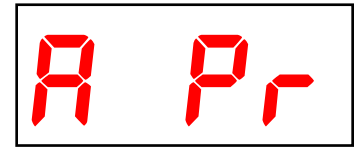
To program stage settings (no proportional band)

> **NOTE**
> The examples in the following procedure use program A and stage 3.
> ◇ Program A displays as $R\ Pr$. Program B displays as $b\ Pr$, C displays as $\complement\ Pr$, and so on.
> ◇ Stage 3 uses Program settings menu item 10. For stage 4, use menu item 11. For stage 5, use menu item 12.

1. Press **Program** until the program you want to adjust displays, for example $R\ Pr$ for program A.

2. Press **Select**.
   The display shows $R\quad \complement$, the first item in the Program menu.

3. Press **Up** or **Down** until the setting you want to adjust displays, for example $R\quad l\complement$ for **Stage 3 set point** and then press **Select**.
   The display shows the current setting.

4. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The control returns to the Program menu.

5. Repeat steps 3 to 4 for each setting you want to adjust.

6. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

Programming alarm settings, parameters 15 and 16

There are four alarms.

◆   High temperature

◆   Low temperature

◆   Probe damage

◆   Power fail

The alarm settings for your SEC-DC determine which alarm conditions are enabled, which are disabled, and their settings. All these work together to determine how and when the alarm relay activates (in other words, signals an alarm condition).

The alarm relay activates if an enabled alarm condition is present for longer than the minimum duration of one minute. The one-minute minimum duration prevents alarms from occurring when the temperature rises or drops for just a few seconds.

For example, the high temperature alarm setting is 85.0°F. If the temperature rises to 86 degrees, but drops below 85 degrees 30 seconds later, the alarm relay does not activate. If the temperature rises to 86 degrees and stays there for more than 1 minute, the alarm relay activates. The alarm relay remains activated until the temperature drops below the alarm setting.

The exception to the one-minute minimum is the power fail alarm. The power fail alarm automatically triggers the relay on a loss of power.

◇   When an alarm occurs, the **Alarm** LED switches on and the alarm message displays. For more information about acknowledging and responding to alarms, read **Acknowledging alarms** on page 34.

◇   Use temperature override to test your high and low temperature alarms instead of adjusting the group set point. In temperature override mode, the alarm relay and status LEDs both operate as if they were in a real alarm situation. For more information, read **Using temperature override mode** on page 36.

◇   Use the **Alarm settings worksheet** on page 54 when programming alarms.

To program high and low temperature alarm settings

> NOTE
> The examples in the following procedure use program A. Program A displays as *A Pr*. Program B displays as *b Pr*, C displays as *C Pr*, and so on.

1. Press **Program** until the program you want to adjust displays, for example *A Pr* for program A.

2. Press **Select**.
   The display shows *A 0*, the first item in the Program menu.

3. Press **Down** until the setting you want to adjust displays, for example *A 15* for **High temperature alarm**, and then press **Select**.
   The display shows the current setting.

4. Press **Up** or **Down** to adjust the setting and then press **Select**.
   The control returns to the Program menu.

5. Repeat steps 3 to 4 for each setting you want to adjust.

6. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

To enable or disable alarms

> NOTE
> When you enable or disable an alarm, you do it for all programs and stages.

1. Press **Program** until *ALEn* displays and then press **Select**.
   The display shows *30*, the first item in the Alarm enable menu.

2. To enable or disable the **High temperature alarm**, press **Select**.
   The display shows the current configuration.

   a) Press **Up** or **Down** to toggle between *no* (not enabled) and *YES* (enabled) and then press **Select**.
      The control returns to the Alarm enable menu.

3. To enable or disable the **Low temperature alarm**, press **Up** or **Down** until *31* displays and then press **Select**.
   The display shows the current configuration.

   a) Press **Up** or **Down** to toggle between *no* and *YES* and then press **Select**.
      The control returns to the Alarm enable menu.

4. To enable or disable the **Probe damage alarm**, press **Up** or **Down** until *32* displays and then press **Select**.
   The display shows the current configuration.

    a) Press **Up** or **Down** to toggle between no and YES and then press **Select**.
       The control returns to the Alarm enable menu.

5. To enable or disable the **Power fail alarm**, press **Up** or **Down** until 33 displays and then press **Select**.
   The display shows the current configuration.

    a) Press **Up** or **Down** to toggle between no and YES and then press **Select**.
       The control returns to the Alarm enable menu.

6. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

Chapter 5: Monitoring and maintaining your SEC-DC

Monitoring your SEC-DC

Your SEC-DC displays temperature, alarm, and status information. Monitoring the control regularly gives you a better idea of what is going on in your facility. When in normal operation, the display shows the ambient temperature.

Displaying the minimum and maximum temperatures

The SEC-DC logs minimum and maximum temperatures. You can view and reset the temperatures.

To view the minimum temperature

At the main display, press **Down**.
The display shows the lowest temperature since being reset.

To view the maximum temperature

At the main display, press **Up**.
The display shows the highest temperature since being reset.

To reset the minimum and maximum temperatures

At the main display, press **Program** and **Down**.
The control resets the minimum and maximum temperatures.

Selecting the operating program

The SEC-DC has seven configurable programs: **A**, **B**, **C**, **D**, **E**, **F**, and **G**. If you are running a livestock or poultry operation, you might use different programs for different stages of development. Another option is to use different programs for different seasons.

The default operating program is program **A**. Any of the programs can be the operating program. For a list of the factory defaults for the programs, see the table starting on page 46.

To select the operating program

1. Press **Program** until one of the four Program settings menus displays, for example $A\ Pr$ for program A. At this point, it does not matter which program menu you select.

2. Press **Select**.
   The display shows $A\quad\ 0$, the first item in the Program menu.

3. Press **Select**.
   The display shows the current operating program.

4. Press **Up** or **Down** to change the operating program and then press **Select**.
   The control returns to the Program menu.

5. To return to the Main menu, press **Back** once. To return to the Main display, press **Back** twice.

Acknowledging alarms

The alarm relay activates if an enabled alarm condition is present for longer than the minimum duration of one minute. The one-minute minimum duration prevents alarms from occurring when the temperature rises or drops for just a few seconds.

The exception to the one-minute minimum is the **power fail alarm**. The power fail alarm automatically triggers the relay on a loss of power.

When an alarm occurs, the alarm relay activates, the LED for **ALARM** switches on, and the alarm message displays. If there is more than one message, after acknowledging the first alarm, the next one displays.

For example, if you have a high temperature and probe damage alarm, the display shows $H\text{-}AL$. After acknowledging the high temperature alarm, the display shows $PbAd$. When all alarms have been acknowledged, the display shows the temperature.

To acknowledge alarms

Press **Select**.
If there was only one alarm message, the SEC-DC clears the message and returns to the main display. If there are additional alarm messages, the SEC-DC displays the next message.

> For a list of alarm messages, their descriptions, and possible resolutions, read **Alarm and error messages** on page 47.

> ◇ Acknowledging alarms clears the alarm message; it does not deactivate the alarm relay or LED. To deactivate the alarm relay, resolve the problem causing the alarm condition.
>
> NOTE ◇ If you acknowledge the alarm, but do not resolve the problem causing the alarm condition, the alarm message displays again after five minutes without any key presses.
>
> ◇ If the condition causing the alarm returns to normal (for example, the temperature drops below the high alarm setting), the alarm relay and LED deactivate, but the alarm message remains.

Testing settings and equipment

The SEC-DC has two test utilities: **stage override mode** and **temperature override mode**.

Using stage override mode

Stage override mode is for individually testing the installation and equipment connected to the SEC-DC. When you enter stage override mode, all stages switch off. You can then change the output of the stages: 0 to 100% for variable stages, OFF or ON for relay stages and the alarm relay.

All equipment remains at the state you set it until you leave stage override mode, then it returns to normal, programmed operation. For example, if stage 3 is a cooling stage and you switch it ON, it remains on until you leave stage override mode.

> ◇ When the SEC-DC is in stage override mode, it does not operate the equipment according to the measured temperature.
>
> NOTE ◇ The SEC-DC does not exit test mode on its own. When you are finished testing, press **Back** until the control exits test mode.

To use stage override mode

1. Press **Program** until tESt displays and then press **Select**.
   The display shows 34, the first item in the Test menu.

2. Press **Select**.
   The display shows St91, the first item in the Stage override submenu.

3. Press **Up** or **Down** until the stage you want to test displays, for example ALA for the alarm relay and then press **Select**.
   The display shows the current setting.

tESt

34

St91

4. Press **Up** or **Down** to adjust the setting and then press **Select**.
    The control returns to the Stage override menu.

5. Repeat steps 3 to 4 for each stage you want to test.

6. To return to the Main menu, press **Back** twice. To return to the Main display, press **Back** three times.

Using temperature override mode

Temperature override mode is for testing the SEC-DC configuration and settings. It allows you to test the settings by simulating the temperature. Instead of adjusting the output of a variable stage or state of a relay, you adjust the "test temperature".

As you increase or decrease the test temperature, all stages and relays operate according to their programmed settings and the test temperature, giving you an idea of how your system performs over a full range of temperatures.

> NOTE
>
> ◇ When the SEC-DC is in temperature override mode, it operates according to the test temperature, not according to the temperature measured by the probe.
> ◇ The SEC-DC does not exit test mode automatically. When you are finished testing, press **Back** until the control exits test mode.

To use temperature override mode

1. Press **Program** until t E 5 t displays and then press **Select**.
    The display shows 3 4, the first item in the Test menu.

2. Press **Up** or **Down** until 3 5 displays and then press **Select**.
    The display shows the current temperature, which is now the test temperature.

3. Press **Up** or **Down** to adjust the test temperature
    The control responds to the changes in the test temperature.

4. To return to the Main menu, press **Back** twice. To return to the Main display, press **Back** three times.

Servicing and maintaining your SEC-DC

Enabling and disabling ventilation

Normally, ventilation is enabled and the variable and relay stages function according to the program settings. This is the default setting and we refer to it as **normal operation**.

Occasionally, you might want to disable the ventilation. For example, if a room is vacant, you might want to disable ventilation to conserve energy.

When ventilation is disabled:

◆   Variable stages are off

◆   Cooling stages (relay) are off

◆   Heating stages function normally

◆   The display alternates between the current temperature and $UoFF$

◆   Alarms do not display

⚠   DO NOT use the disable ventilation function to shut down fans while working on wiring. When working on any wiring, switch OFF the power at the source.

To enable or disable ventilation

1.   Press **Program** until $UEnt$ displays and then press **Select**.
     The display shows the current setting.

2.   Press **Up** or **Down** to toggle between OFF and On and then press **Select**.
     The control returns to the Main menu.

3.   To return to the Main display, press **Back**.

Restoring the factory defaults, parameter 27

When your SEC-DC leaves the factory, it comes with default settings and configuration. When you program your SEC-DC, you change its configuration and settings. Resetting your SEC-DC erases all the configuration and settings you programmed and restores them to what they were when the control left the factory.

For a list of the factory defaults, read **Appendix B: Factory defaults** on page 46.

⚠   ◇ **Restore the factory defaults only as a last resort. It erases ALL your configuration and settings and you will have to reconfigure the control.**

◇ If you restore your SEC-DC to its factory defaults, disconnect the power to all loads and then reconfigure the control before restoring power to the loads.
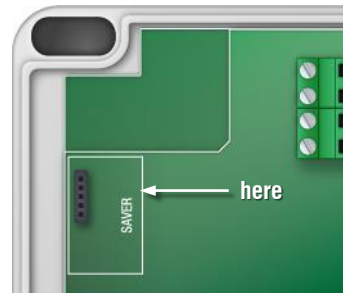
To restore the factory defaults

1. Press **Program** until *CONF* displays and then press **Select**.
   The display shows *17*, the first item in the Configuration menu.

2. Press **Down** until *27* displays and then press **Select**.

3. Press **Up** or **Down** to change the *no* to *YES* and then press **Select**.
   The control restores the factory defaults. When complete, the display shows *donE*.

4. To return to the Configuration menu, press **Back** once. To return to the Main menu, press **Back** twice. To return to the Main display, press **Back** three times.
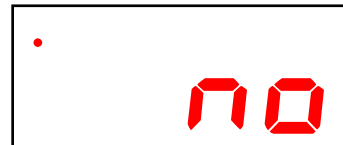
Saving and restoring settings, parameters 25 and 26

The SEC-DC Saver is an innovative and easy-to-use product that allows you to store your SEC-DC configuration and settings.

The SEC-DC Saver stores a complete copy of all a SEC-DC's configuration and settings. You can restore the configuration and settings any time, or even use them to set up new SEC-DCs in seconds!
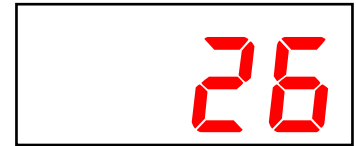

To save your settings

1. Loosen the four screws in the SEC-DC enclosure and then gently remove the cover. Make sure not to disconnect the ribbon cable.

2. Insert the SEC-DC Saver into the connector marked SAVER on the inside top-left of the cover.

3. Press **Program** until *CONF* displays and then press **Select**.
   The display shows *17*, the first item in the Configuration menu.

4. Press **Down** until *25* displays and then press **Select**.

5. Press **Up** or **Down** to change the *no* to *YES* and then press **Select**.
   The control saves the information to the SEC-DC Saver. When complete, the display shows *donE*.

6. To return to the Configuration menu, press **Back** once. To return to the Main menu, press **Back** twice. To return to the Main display, press **Back** three times.

7. Remove the SEC-DC Saver.

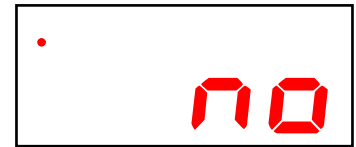8. Replace the cover and then tighten the four screws.
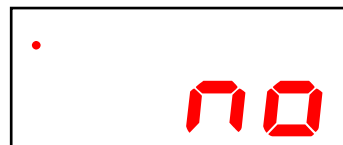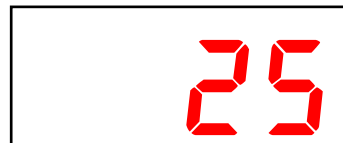
To restore your settings

1. Loosen the four screws in the SEC-DC enclosure and then gently remove the cover. Make sure not to disconnect the ribbon cable.

2. Insert the SEC-DC Saver into the connector marked SAVER on the inside top-left of the cover.

3. Press **Program** until ⊏⊡∏⊏ displays and then press **Select**. The display shows 17, the first item in the Configuration menu.

4. Press **Down** until 26 displays and then press **Select**.

5. Press **Up** or **Down** to change the no to YES and then press **Select**. The control reads the information from the SEC-DC Saver. When complete, the display shows donE.

6. To return to the Configuration menu, press **Back** once. To return to the Main menu, press **Back** twice. To return to the Main display, press **Back** three times.

7. Remove the SEC-DC Saver.

8. Replace the cover and then tighten the four screws.

Displaying the firmware version, parameter 29

Firmware is similar to operating system software for a computer. Firmware contains instructions that tell the SEC-DC how it operates. Just like computer operating systems (such as Windows™ 7) have version numbers, the firmware has a version number.
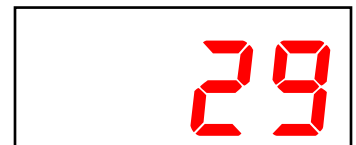
If you need to contact Phason Customer Support about your SEC-DC, you might need to provide them with the firmware version of your control. For more information about technical support, read **Service and technical support** on the last page of the manual.

The SEC-DC displays the firmware version as a number in the format #.##.

To display the firmware version

1. Press **Program** until ⊏⊡∏⊏ displays and then press **Select**. The display shows 24, the first item in the Configuration menu.

2. Press **Down** until 29 displays and then press **Select**. The display shows the firmware version.

3. To return to the Configuration menu, press **Back** once. To return to the Main menu, press **Back** twice. To return to the Main display, press **Back** three times.

Updating the firmware, parameter 28

The optional SEC-DC Updater is an innovative and easy-to-use product that allows you to upgrade your SEC-DC's firmware. Phason constantly improves and adds new features to their products. With the SEC-DC Updater, you can upgrade the firmware in your SEC-DC as these features become available. The SEC-DC Updater takes only seconds to use and can upgrade all the SEC-DC controls at your site.

There are two methods for updating the SEC-DC firmware.

◆ **Power on**: the power on method allows you to update the SEC-DC firmware using the menu system, without having to switch the incoming power off and then on. If the power on method fails, use the power off method.

◆ **Power off**: the power off method allows you to update the SEC-DC firmware by switching the incoming power off and then on. Use the power off method if the power on method fails.
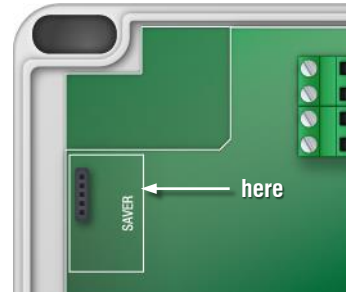
The inside of the SEC-DC cover is where you connect the SEC-DC Updater. The cover label must face the right when you plug the updater into the socket.

To update the firmware using the "power on" method

1. Loosen the four screws in the SEC-DC enclosure and then gently remove the cover. Make sure not to disconnect the ribbon cable.

2. Insert the SEC-DC Updater into the connector marked **SAVER** on the inside top-left of the cover.

3. Press **Program** until `CONF` displays and then press **Select**. The display shows `17`, the first item in the Configuration menu.

4. Press **Down** until `28` displays and then press **Select**.

5. Press **Up** or **Down** to change the `no` to `YES` and then press **Select**. The SEC-DC updates its firmware. During the update, the display is blank and the control beeps.

    When the update is complete, the display shows `----` for a couple seconds and then shows the ambient temperature.

6. Remove the SEC-DC Updater.

7. Verify that the control functions properly.

8. Replace the cover and then tighten the four screws.
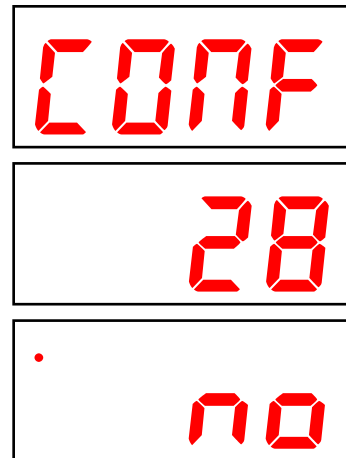
To update the firmware using the "power off" method

1. Loosen the four screws in the SEC-DC enclosure and then gently remove the cover. Make sure not to disconnect the ribbon cable.

2. Insert the SEC-DC Updater into the connector marked **SAVER** on the inside top-left of the cover.

3. Switch off the power to the SEC-DC for at least five seconds.

4. Switch on the power to the SEC-DC.
   The SEC-DC updates its firmware. During the update, the display is blank and the control beeps.

   When the update is complete, the display shows - - - - for a couple seconds and then shows the ambient temperature.

5. Remove the SEC-DC Updater.

6. Verify that the control functions properly.

7. Replace the cover and then tighten the four screws.

Repair kits and optional accessories

Parts and kits

If your SEC-DC's bottom circuit board or display fails, you can replace it with a kit.

◆ The control kit (bottom circuit board) part number is **K330001**.

◆ The display kit part number is **K330003**.

Power contactors

Phason's 240-volt power contactors are heavy-duty relays that increase the load handling capability of control relays. Power contactors are ideal for secondary ventilation fans and electric heaters.

◆ **Power contactor relay** (PC-240): includes power contactor relay and mounting hardware for easy mounting in an enclosure.

◆ **Power contactor kit** (122-1): includes power contactor relay, on-off-auto switch and label, snubber filter (reduces electrical noise), and mounting hardware for easy mounting in an enclosure.

◆ **Power contactor unit** (129-0): includes two power contactor relays, two on-off-auto switches, and two snubber filters, mounted in a large enclosure. The enclosure has room for two additional contactor relays or kits.

SEC-DC Saver

The SEC-DC Saver is an innovative and easy-to-use product that stores a complete copy of a SEC-DC's configuration and settings. You can restore the configuration and settings any time, or even use them to set up new SEC-DCs in seconds!

Features

◆ Quick and easy to use

◆ Portable, reliable, and safe storage of configuration and settings

◆ Transferable to any SEC-DC that has the same firmware version

◆ Compact design, fits in a pocket

◆ Limited warranty (90 days)

SEC-DC Updater

The SEC-DC Updater is an innovative and easy-to-use product that updates a SEC-DC's firmware. Phason constantly improves and adds new features to their products. With the SEC-DC Updater, you can update the firmware in your SEC-DC as these features become available. The SEC-DC Updater takes only seconds to use and can upgrade all the SEC-DC controls at your site.

Features

◆ Quick and easy to use

◆ Compact design, fits in a pocket

◆ Limited warranty (90 days)

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)

Appendixes

This section contains reference information that is useful when installing, configuring, setting up, or troubleshooting your SEC-DC.

◆ **Appendix A: Glossary** below

◆ **Appendix B: Factory defaults** on page 46

◆ **Appendix C: Error** messages and troubleshooting on page 47

◆ **Appendix D: Installation worksheet** on page 51

◆ **Appendix E: Configuration worksheets** on page 52

◆ **Appendix F: Settings worksheets** on page 53

Appendix A: Glossary

differential	The temperature setting above which a variable stage's fan runs at full speed.
	For more information, read **Programming variable stages, parameters 2 to 9** on page 25.
firmware	The internal program instructions of your SEC-DC. You can update the firmware version of your SEC-DC to the latest version using a SEC-DC Updater.
	For more information, read **Updating the firmware** on page 40.
group set point	The desired temperature for the room.
	For more information, read **Programming the group set point, parameter 1** on page 24.
hysteresis	The number of degrees above the set point that a heating stage or relay switches off, and the number of degrees below the set point that a cooling stage or relay switches off.
	For example, a household thermostat might switch on a furnace at 68 °F when the house is cooling down, but switch it off at 72 °F when the house is warming up. The difference between these two values is the hysteresis.
	For more information, read **Configuring hysteresis, parameter** on page 18.

idle range	The temperature setting below which a variable stage's fan is off and the inlet is closed. When the temperature is between the idle range and set point, the fan operates at idle speed and the inlet is open the corresponding amount.
	For more information, read **Programming variable stages, parameters 2 to 9** on page 25.
idle speed	The percentage of full power at which a variable speed fan operates for minimum ventilation.
	For more information, read **Programming variable stages, parameters 2 to 9** on page 25.
minimum duration	The minimum amount of time an alarm condition must be present before the SEC-DC signals an alarm. The minimum duration (one minute) prevents alarms from activating when the temperature rises or drops for just a few seconds.
	For more information, read **Programming alarm settings, parameters 15 and** on page 30.
minimum idle	See idle speed.
set point	For variable stages, the temperature above which fan speed increases toward its maximum and the inlet opens proportionally. For more information, read **Programming variable stages, parameters 2 to 9** on page 25.
	For relay stages, the temperature at which the stage switches between the OFF and ON state. For more information, read **Programming relay stages, parameters 10 to 14** on page 19.
terminal block	The part of your SEC-DC where you connect the wires for incoming power, control elements, and so on.
	For more information, read **SEC-DC layout** on page 9.

Appendix B: Factory defaults

When your SEC-DC leaves the factory, it comes with default settings and configuration. Configuring and programming your SEC-DC changes the factory defaults.

Resetting your SEC-DC erases all the configuration and settings you programmed and then restores the defaults. For more information, read **Restoring the factory defaults, parameter 27** on page 37.

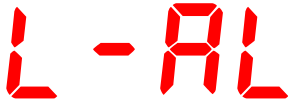The following table lists all the factory defaults and ranges.

Parameter		Default							Range/options
0	Operating program	A	B	C	D	E	F	G	
1	Group set point (°F/°C)	85.0	80.0	75.0	70.0	65.0	65.0	65.0	-13.0 to 125 °F (-25 to 51.7°C)
2	Stage 1 idle speed (%)	20	20	30	30	20	20	20	0 to 100 %
3	Stage 1 idle range (°F/°C)	80.0	75.0	70.0	65.0	60.0	60.0	60.0	-13.0 to 125 °F (-25 to 51.7°C)
4	Stage 1 set point (°F/°C)	85.0	80.0	75.0	70.0	65.0	65.0	65.0	-13.0 to 125 °F (-25 to 51.7°C)
5	Stage 1 differential (°F/°C)	86.5	82.0	77.0	73.0	68.0	68.0	68.0	-13.0 to 125 °F (-25 to 51.7°C)
6	Stage 2 idle speed (%)	20	20	30	30	20	20	20	0 to 100 %
7	Stage 2 idle range (°F/°C)	87.0	82.0	77.5	73.0	68.0	68.0	68.0	-13.0 to 125 °F (-25 to 51.7°C)
8	Stage 2 set point (°F/°C)	87.0	82.0	77.5	73.0	68.0	68.0	68.0	-13.0 to 125 °F (-25 to 51.7°C)
9	Stage 2 differential (°F/°C)	88.5	84.0	79.5	76.0	71.0	71.0	71.0	-13.0 to 125 °F (-25 to 51.7°C)
10	Stage 3 set point (°F/°C)	89.0	85.0	80.0	77.0	72.0	72.0	72.0	-13.0 to 125 °F (-25 to 51.7°C)
11	Stage 4 set point (°F/°C)	91.0	87.0	82.0	79.0	74.0	74.0	74.0	-13.0 to 125 °F (-25 to 51.7°C)
12	Stage 5 set point (°F/°C)	84.0	79.0	74.0	69.0	64.0	64.0	64.0	-13.0 to 125 °F (-25 to 51.7°C)
13	Stage 5 P-band temperature (°F/°C)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1 to 16.0°F (0.6 to 8.9°C)
14	Stage 5 P-band interval (minutes)	10	10	10	10	10	10	10	5 to 25 minutes
15	High temperature alarm (°F/°C)	95.0	90.0	90.0	85.0	80.0	80.0	80.0	-13.0 to 125 °F (-25 to 51.7°C)
16	Low temperature alarm (°F/°C)	80.0	75.0	70.0	65.0	60.0	60.0	60.0	-13.0 to 125 °F (-25 to 51.7°C)
17	Temperature unit	°F							°F/°C
18	Frequency	60							50/60 Hz
19	Stage 1 configuration	COOL							OFF/COOL
20	Stage 2 configuration	COOL							OFF/COOL
21	Stage 3 configuration	VAR1							OFF/ON/COOL/ HEAT/VAR1-2
22	Stage 4 configuration	VAR2							OFF/ON/COOL/ HEAT/ VAR1-2
23	Stage 5 configuration	HEAT							OFF/ON/COOL/HEAT/P-COOL/ P-HEAT
24	Hysteresis (°F/°C)	0.5							0.3 to 5.0°F (0.2 to 2.8°C)
30	High temperature enable	YES							NO/YES
31	Low temperature enable	YES							NO/YES
32	Probe damage enable	YES							NO/YES
33	Actuator jam enable	YES							NO/YES

Appendix C: Error messages and troubleshooting

◆ If you see an alarm message and are not sure what it means, look it up in the **Alarm and error messages** table below and then follow the instructions for resolving the alarm condition.

◆ If you are having a problem using your SEC-DC, see if the problem is described in the **Troubleshooting** table on page 48 and then follow the directions for correcting the problem.

Alarm and error messages

The following table lists the alarm and error messages, the possible causes, and their possible solutions. If you see a message and are not sure what it means, look it up in the table and then follow the instructions for resolving the condition.

Alarm message	Possible cause	Possible solution
H - AL High temperature alarm	The temperature has gone above the high temperature alarm point.	◇ Try to lower the temperature by turning heaters down or off, or by increasing or turning on cooling elements (such as fans or misters), or by a combination of both. ◇ Check the temperature probes. ◇ Check to see if a fan has failed. ◇ Check the alarm settings. For more information, read **Programming alarm settings** on page 30.
L - AL Low temperature alarm	The temperature has gone below the low temperature alarm point.	◇ Try to raise the temperature by turning heaters up or on, or by decreasing or turning off cooling elements (such as fans or misters), or by a combination of both. ◇ Check the temperature probes. ◇ Check to see if a heater has failed. ◇ Check the alarm settings. For more information, read **Programming alarm settings** on page 30.
PbAd Probe damage alarm	A temperature probe is damaged or disconnected.	◇ Check the wire between the control and the probe. Any wire damage can cause the alarm. ◇ Replace or reconnect the temperature probe. The control should recover automatically.
PF Power fail alarm	There has been a power failure.	◇ Check to see why the power failed and then fix the problem.

Alarm message	Possible cause	Possible solution
Err 1 Error 1 - SAVER error	The SEC-DC Saver is not in place when trying to save or restore settings.	◇ Make sure the SEC-DC Saver is inserted correctly and then try again.
	The Saver inserted is not an SEC-DC Saver.	◇ Remove the Saver and then insert an SEC-DC Saver.
	The Saver inserted has invalid settings on it.	◇ Resave the settings from the SEC-DC to the SEC-DC Saver.

Troubleshooting

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

Problem	Possible cause	Possible solution
Power supply components blown out Burn marks on boards and components Motors and fans slow down or stop	Power surge, brownout, or power outage	◇ Avoid the problem in future by providing proper voltage and protection for the control.
No power and/or display	A circuit breaker at service panel is off or tripped.	◇ Reset the circuit breaker.
	Incorrect incoming power wiring	◇ Correct the wiring.
	The display board connect cable is not plugged into the control board properly.	◇ Plug in the display board cable. For more information, read **SEC-DC layout** on page 9.
	The 115/230 VAC switch is in the wrong position	◇ Switch off the power, set the switch to the correct setting, and then switch on the power. For more information, read **SEC-DC layout** on page 9.
Temperature does not change	The control is in temperature override mode.	◇ Exit test mode. For more information, see **Using temperature override mode** on page 36.
Display showing 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.
	Damaged probe	◇ Replace the temperature probe.

Problem	Possible cause	Possible solution
Variable fan runs at maximum	Incorrect wiring	◇ Correct the wiring. For more information, read **Connecting** on page 11.
	The *idle speed* is too high.	◇ Decrease the *idle speed* setting. For more information, read **Programming variable stages** on page 25.
	The *differential* setting is the same as the *set point*.	◇ Adjust the *set point* to the desired temperature. For more information, read **Programming variable stages** on page 25.
	Incorrect motor curve	◇ Configure the stage to use the other motor curve. For more information, read **Configuring the stages** on page 18.
Variable fan not running	Incorrect wiring	◇ Correct the wiring. For more information, read **Connecting** on page 11.
	The fuse is open or blown.	◇ Check why the fuse was blown and repair any problems. Replace the fuse.
	The variable stage is configured as OFF	◇ Configure the variable stage for cooling. For more information, read **Configuring the stages** on page 18.
	The *idle speed* setting is too low.	◇ Increase the *idle speed* setting. For more information, read **Programming variable stages** on page 25.
	The *idle range* temperature setting is too high.	◇ Decrease the *idle range* temperature setting. For more information, read **Programming variable stages** on page 25.
	The temperature *set point* is above room temperature.	◇ Adjust the *set point* to the desired temperature. For more information, read **Programming variable stages** on page 25.
	There is no power to the fan.	◇ Switch on the power.
	Faulty fan/heater	◇ Replace the equipment.
	Circuit breaker open	◇ Reset the breaker.
Variable speed fan responds to only a small portion of the 0 to 100% range	Incorrect motor curve	◇ Configure the stage to use the other motor curve. For more information, read **Configuring the stages** on page 18.
Variable speed fan comes on, runs at full speed, and then turns off, keeps cycling.	The hysteresis is not high enough. The outside temperature is rising and falling quickly. This happens most often in the spring and fall.	◇ Adjust the hysteresis setting.
Relay does not switch ON the load	Incorrect wiring	◇ Correct the wiring. For more information, read the appropriate installation section.
	The stage is configured as OFF, as cool for a heater, or as heat for a fan.	◇ Configure the relay properly. For more information, read **Configuring relay stages, parameters 21 to 23** on page 19.

Problem	Possible cause	Possible solution
	The set point is incorrect	◇ Adjust the setting. For more information, read the appropriate programming section.
	No power to the load	◇ Switch on the power.
	Faulty equipment	◇ Replace the equipment.
	Circuit breaker open	◇ Reset the breaker.
	Blown relay	◇ Solve the problem that caused the relay to blow and then replace the circuit board or use a different relay.
Relay does not switch OFF the load	The stage is configured as ON.	◇ Configure the relay properly. For more information, read **Configuring relay stages, parameters** on page 19.
Alarm relay not operating alarm system	Incorrect wiring	◇ Correct the wiring. For more information, read **Connecting an alarm system** on page 13.
Staged element cycles on and off	The set points are too close together with variable speed fans.	◇ Adjust the hysteresis setting. ◇ Move the temperature probe closer to the heater. ◇ Widen the set points.
	The heater is too large for the room.	◇ Replace the heater with a smaller output unit.
	The stage is set up as proportional control.	◇ Change the configuration from proportional control.

Appendix D: Installation worksheet

Use the following worksheet to list all the equipment (fans, heaters, and so on that you want your SEC-DC to control. We recommend you make a copy of the worksheet before filling it in because you need more than one sheet or you make a mistake.

> Use the **Installation worksheet** when you fill in the **Configuration worksheets** (starting on page 52).

Stage	Equipment to connect and notes
Example: *VAR 1*	*36-inch variable speed fan, 2.5 FLA, 3/4 HP*
VAR 1	
VAR 2	
STAGE 3	
STAGE 4	
STAGE 5	
ALARM	

Appendix E: Configuration worksheets

> Use the **Installation Worksheet** on page 51 when completing the configuration worksheets.

Main control function worksheet

For each item, circle or write in the configuration.

Item	Description	Configuration
Units	The unit of measure for temperature.	°C °F
Frequency	The line frequency of the incoming power.	50 Hz 60 Hz
Hysteresis	The number of degrees above the set point that a heating stage or relay switches off, and the number of degrees below the set point that a cooling stage or relay switches off.	_____ degrees *Range: 0.3 to 5.0°F (0.2 to 2.8°C)*

Variable stage configuration worksheet

For each variable stage, enter a description (for reference only) and put a check mark in the appropriate column. The first two lines are an example.

Stage	Description	Off	Cool 1	Cool 2
1	*Stage 1 fan*		✓	
2	*Unused*	✓		
1				
2				

Relay configuration worksheet

For each stage, enter a description (for reference only) and put a check mark in the appropriate column. The first table is an example.

Stage	Description	Off	Variable 1	Variable 2	On	Heat	Cool	Proportional heat	Proportional cool
3 *4* *5*	*36-inch fan* *24-inch fans* *Gas furnace*		✔	✔		✔			
3								░░	░░
4								░░	░░
5									

Appendix F: Settings worksheets

Appendix F contains worksheets for you to use when programming your SEC-DC settings. Each worksheet contains a brief explanation of the information required. For more information about programming your SEC-DC, see **Chapter 4: Programming the SEC-DC** on page 21.

Variable stage settings worksheet

Parameter	Stage 1	Stage 2	Range/options
Group set point①			-13.0 to 125 °F (-25 to 51.7°C)
Stage # idle speed			0 to 100 %
Stage # idle range			-13.0 to 125 °F (-25 to 51.7°C)
Stage # set point①			-13.0 to 125 °F (-25 to 51.7°C)
Stage # differential			-13.0 to 125 °F (-25 to 51.7°C)
① Recommend these be set to the same value.			

Relay stages worksheet

Parameter	Setting②	Range/options
Stage 3 set point		-13.0 to 125 °F (-25 to 51.7℃)
Stage 4 set point		-13.0 to 125 °F (-25 to 51.7℃)
Stage 5 set point		-13.0 to 125 °F (-25 to 51.7℃)
Stage 5 P-band temperature①		1 to 16.0°F (0.6 to 8.9℃)
Stage 5 P-band interval①		5 to 25 minutes
① Required only if stage 5 is configured as proportional heat or proportional cool. ② Relays configured as disconnect relays for variable 1 or variable 2 do not have a setting; they use the **idle range** setting for the variable stage.		

Alarm settings worksheet

The alarm settings for your SEC-DC determine which alarm conditions are enabled, which are disabled, and their settings. All these work together to determine how and when the alarm relay activates (in other words, signals an alarm condition).

The alarm relay activates if an enabled alarm condition is present for longer than the minimum duration of one minute. The minimum duration prevents alarms from occurring when the temperature rises or drops for just a few seconds. The exception to the one-minute minimum is the *power fail* alarm. The power fail alarm automatically triggers the relay on a loss of power.

For more information, read **Programming alarm settings** on page 30.

Alarm	Configuration		Setting	Description
High temperature① H-AL	ON	OFF		The highest temperature to which you can safely allow your facility to rise; this cannot be lower than low temperature alarm.
Low temperature① L-AL	ON	OFF		The lowest temperature to which you can safely allow your facility to fall; this cannot be higher than high temperature alarm.
Probe damage PbAd	ON	OFF		Damaged or disconnected temperature probe
Power fail PF	ON	OFF		Incoming power interruption
① Temperature in °F/℃, *range: -13.0 to 125 °F (-25 to 51.7℃)*				

Appendix G: Surge suppression and electrical noise

Understanding power surges and surge suppression

Power surges can be caused by external influences (for example, lightning or utility distribution problems) or they can be caused internally (for example, starting and stopping inductive loads such as motors).

One of the most common causes of power surges is lightning. When lightning strikes the ground, it produces an enormously powerful electromagnetic field. This field affects nearby power lines, which transmit a surge to any device connected to it, such as lights, computers, or environmental controls like your Heat Mat Control. Lightning does not have to strike a power line to transmit a surge.

Surge suppression devices offer some protection from power surges. Because it is not possible to internally protect this product completely from the effects of power surges and other transients, Phason *highly recommend* that you install external surge suppression devices. For specific recommendations, see your electrical contractor. If you do not take these precautions, you acknowledge your willingness to accept the risk of loss or injury.

Reducing electrical noise using filters

Electrical noise is caused by high voltage transients created when inductive loads, such as power contactors, are switched on or off. The strength of the transients can be over 1000 volts and can vary with the type of equipment and wiring, as well as several other factors.

Visible symptoms of electrical noise include erratic control operation, cycling inlets, communication problems, and more. However, the effects of electrical noise are *not always visible*. Over time, electrical noise can cause electronic circuits, relay contacts, and power contactors to deteriorate.

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Limited warranty

This warranty applies only to the Phason Staged Environment Control (SEC-DC). If you need warranty service, return the product and original proof of purchase to your dealer.

Phason Inc. (Phason) warrants the SEC-DC subject to the following terms and conditions.

This warranty is valid only to the original purchaser of the product, for two years from the manufacturing date. The manufacturing date is stated in the first eight digits of the serial number in the form year-month-day.

Phason hereby warrants that should the SEC-DC fail because of improper workmanship, Phason will repair the unit, effecting all necessary parts replacements without charge for either parts or labor.

Conditions

◆ Installation must be done according to our enclosed installation instructions.

◆ The product must not have been previously altered, modified, or repaired by anyone other than Phason.

◆ The product must not have been involved in an accident, misused, abused, or operated or installed contrary to the instructions in our user and/or installation manuals. Phason's opinion about these items is final.

◆ The person requesting warranty service must be the original purchaser of the unit, and provide proof of purchase upon request.

◆ All transportation charges for products submitted for warranty must be paid by the purchaser.

Except to the extent prohibited by applicable law, no other warranties, whether expressed or implied, including warranties of merchantability and fitness for a particular purpose, shall apply to the SEC-DC. Any implied warranties are excluded.

Phason is not liable for consequential damages caused by the SEC-DC.

Phason does not assume or authorize any representatives, or other people, to assume any obligations or liabilities, other than those specifically stated in this warranty.

Phason reserves the right to improve or alter the SEC-DC without notice.

Service and technical support

Phason will be happy to answer all technical questions that will help you use your SEC-DC. Before contacting Phason, check the following:

- Read this manual for information about the feature with which you are having trouble.

- If you see an alarm message and are not sure what it means, look it up in the **Alarm and error messages** table on page 47 and then follow the instructions for resolving the alarm condition.

- If you are having a problem using your SEC-DC, look in the **Troubleshooting** table on page 48 and then follow the directions for correcting the problem.

- If you still have a problem with your SEC-DC, collect the following information:

    - The serial number

    - Any messages displayed by your SEC-DC

    - A description of the problem

    - A description of what you were doing before the problem occurred

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◇ Phason controls are designed and manufactured to provide reliable performance, but they are not guaranteed to be 100 percent free of defects. Even reliable products can experience occasional failures and the user should recognize this possibility.

◇ If Phason products are used in a life-support ventilation system where failure could result in loss or injury, the user should provide adequate back up ventilation, supplementary natural ventilation, or an independent failure-alarm system. The user's lack of such precautions acknowledges their willingness to accept the risk of such loss or injury.