



Farm Hand SC-5v2

5 Stage Environmental Controller with Variable Speed Stages

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1. Ratings and specifications

Part Number:	6607-1605	6607-1606
Model:	FH-SC5v2-0-2	FH-SC5v2-S-2
Rating:	120/240 VAC 50/60 Hz 1 Phase	120/240 VAC 50/60 Hz 1 Phase
Curtain Output:	½ hp @ 120vac	½ hp @ 120vac
Stage Output:	1 hp @ 240vac	1 hp @ 240vac
Sensors:	Temperature Sensor Assembly NOT INCLUDED	Three Temperature Sensor Assemblies INCLUDED

2. Warnings

Warning!

Only a certified electrician should install or maintain electrical connections.

Warning!

Do not install or maintain equipment during a lightning storm.

Warning!

Before connecting power to the machine, be sure to check the position of the voltage selector switch located next to the transformer on the relay board. Improper positioning of this switch will cause system failure.

Warning!

Operating temperature of the controller is 0° C to +50° C (32° F to 122° F).

Warning!

When this controller is used in a life support heating and ventilation system where failure could result in loss or injury, the user should provide adequate back-up, or accept the risk of such loss or injury!

3. Limited Warranty - Protein Products

The GSI Group, LLC. ("GSI") warrants products which it manufactures, to be free of defects in materials and workmanship under normal usage and conditions for a period of 12 months from the date of purchase (or, if shipped by vessel, 14 months from the date of arrival at the port of discharge). If, in GSI's sole judgment, a product is found to have a defect in materials and/or workmanship, GSI will, at its own option and expense, repair or replace the product or refund the purchase price. This Limited Warranty is subject to extension and other terms as set forth below.

Warranty Enhancements: The warranty period for the following products is enhanced as shown below and is in lieu of (and not in addition to) the above stated warranty period.

	Product	Warranty Period
AP® Fans	Performer Series Direct Drive Fan Motor	3 Years
AP® and Cumberland®	Flex-Flo/Pan Feeding System Motors	2 Years
Electronic Controls	All Protein controls manufactured by GSI	24 Months from date code on part
Cumberland® Feeding and Watering Systems	Feeder System Pan Assemblies	5 Years, prorated **
	Feed Tubes (1.75" and 2.00")	10 Years, prorated *
	Centerless Augers	10 Years, prorated *
	Watering Nipples	10 Years, prorated *

* Warranty prorated from material list price:
 0 to 3 years - no material cost to end user
 3 to 5 years - end user pays 25%
 5 to 7 years - end user pays 50%
 7 to 10 years - end user pays 75%
 ** Warranty prorated from material list price:
 0 to 3 years - no material cost to end user
 3 to 5 years - end user pays 75%

Conditions and Limitations:

THERE ARE NO WARRANTIES THAT EXTEND BEYOND THE LIMITED WARRANTY DESCRIPTION SET FORTH HEREIN; SPECIFICALLY, GSI DISCLAIMS ANY AND ALL OTHER WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR USE IN CONNECTION WITH: (I) ANY PRODUCT MANUFACTURED OR SOLD BY GSI, OR (II) ANY ADVICE, INSTRUCTION, RECOMMENDATION OR SUGGESTION PROVIDED BY AN AGENT, REPRESENTATIVE OR EMPLOYEE OF GSI REGARDING OR RELATED TO THE CONFIGURATION, INSTALLATION, LAYOUT, SUITABILITY FOR A PARTICULAR PURPOSE, OR DESIGN OF SUCH PRODUCTS.

The sole and exclusive remedy for any claimant is set forth in this Limited Warranty and shall not exceed the amount paid for the product purchased. This Warranty only covers the value of the warranted parts and equipment, and does not cover labor charges for removing or installing defective parts, shipping charges with respect to such parts, any applicable sales or other taxes, or any other charges or expenses not specified in this Warranty. GSI shall not be liable for any other direct, indirect, incidental or consequential damages, including, without limitation, loss of anticipated profits or benefits. Expenses incurred by or on behalf of a claimant without prior written authorization from the GSI warranty department shall not be reimbursed. This warranty is not transferable and applies only to the original end user. GSI shall have no obligation or responsibility for any representations or warranties made by or on behalf of any dealer, agent or distributor. Prior to installation, the end user bears all responsibility to comply with federal, state and local codes which apply to the location and installation of the products.

This Limited Warranty extends solely to products sold by GSI and does not cover any parts, components or materials used in conjunction with the product, that are not sold by GSI. GSI assumes no responsibility for claims resulting from construction defects, unauthorized modifications, corrosion or other cosmetic issues caused by storage, application or environmental conditions. Modifications to products not specifically delineated in the manual accompanying the product at initial sale will void all warranties. This Limited Warranty shall not extend to products or parts which have been damaged by negligent use, misuse, alteration, accident or which have been improperly/inadequately maintained.

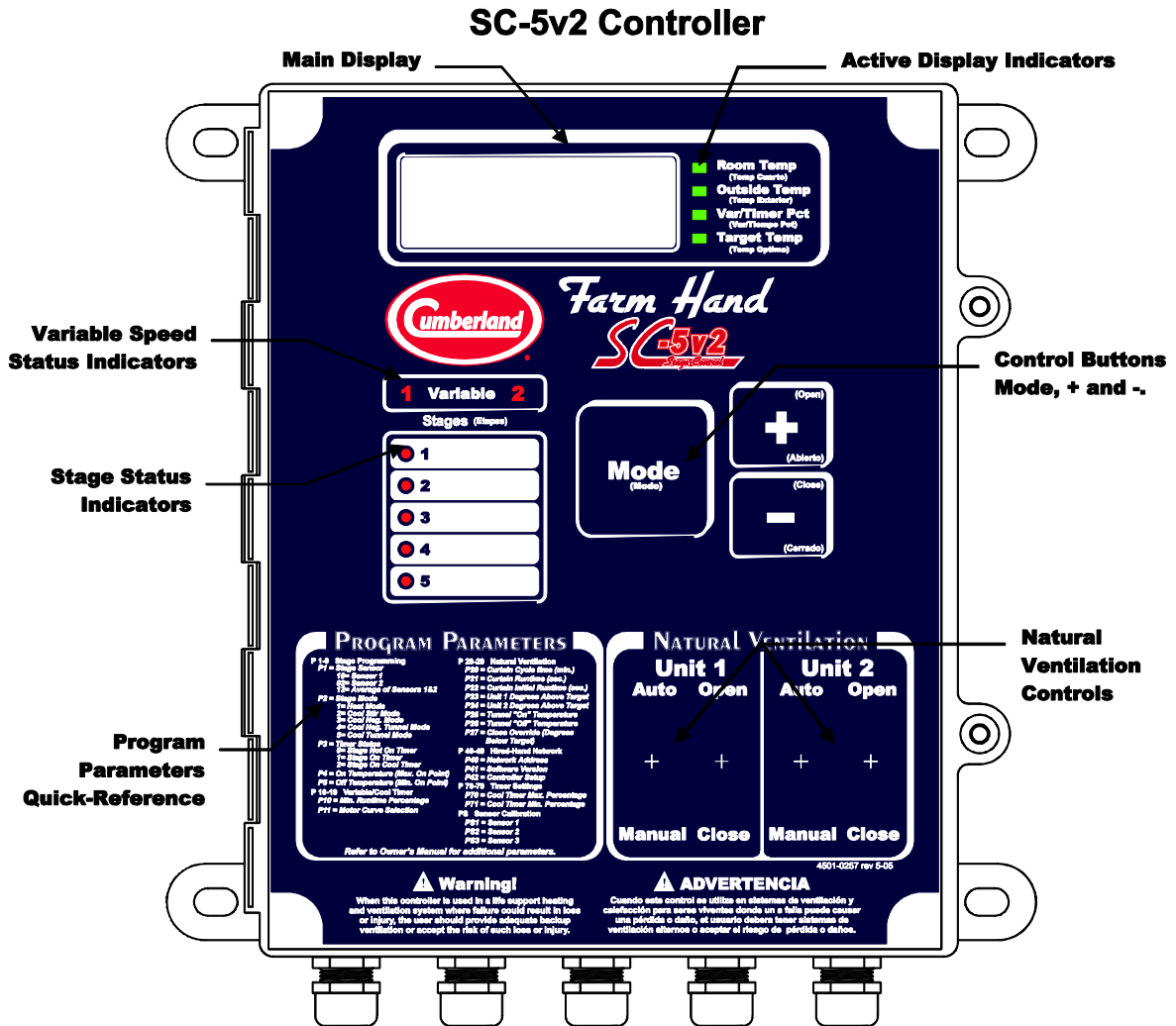
Service Parts:

GSI warrants, subject to all other conditions described in this Warranty, Service Parts which it manufactures for a period of 12 months from the date of purchase, unless specified in Enhancements above. Parts not manufactured by GSI will carry the Manufacturer's Warranty.

(Protein Limited Warranty_REV01_06 November 2018)

4. Introduction

The SC-5v2 includes a larger enclosure for easier installation/maintenance, upgraded HHnet protection circuits, manual natural ventilation controls, and Programming Parameters are included on the front cover for user friendly reference. The SC-5v2 is designed to be one of the simplest controllers on the market to operate, but to also be one of the most powerful.



The SC-5v2 has six main regions on the facepad which should be reviewed.

- Main Display and Active Display Indicators**
 This section includes the Main Display and four Active Display Indicators which tell what the display is indicating. If the green light beside “Room Temperature” is lit, then the display is showing the average inside temperature of your building. Later in this manual you will learn about the other three parameters.
- Variable Speed Status Indicators**
 Above the stage status indicators, you will notice either one or two variable speed stage status indicators. These will flash whenever the variable speed stages are on.
- Stage Status Indicators**
 On the left hand side of the controller face you will see the five stage status indicators (a small red LED on the left side of this white region). This light will be lit if the stage is on, and will flash on and

off if it is running because it is on a timer. The blank white region is for you to label your equipment such as (front heat, back heat, sidewall fans, etc.).

- **Control Buttons (Mode, +, & -)**
Just below the main display on the right hand side of the controller is the control button region. This region has three buttons, Mode, +, and -. You will learn the use of these three buttons later in the manual.
- **Program Parameters**
Just below the Stage Status Indicators on the left hand side of the controller is the Program Parameters Quick-Reference information. This information provides a helpful quick-reference to the various programming options.
- **Manual Switch Override**
Just below the control buttons on the right hand side of the controller is the Natural Ventilation Controls section for two separate curtain machines (Unit 1 and Unit 2). This section contains toggle switches to provide curtain machine manual switch override capability. The Auto/Manual toggle switches determine if the curtain machines are in automatic or manual override operation mode. When the Auto/Manual switch is in the Manual position, the Open/Off/Close 3-position toggle switch allows the user to manually turn the curtain machine to Open, Off, or Close for each machine.

5. Day to Day Operating Instructions

This section of the manual will give you all you need to know about the day to day operation of your controller.

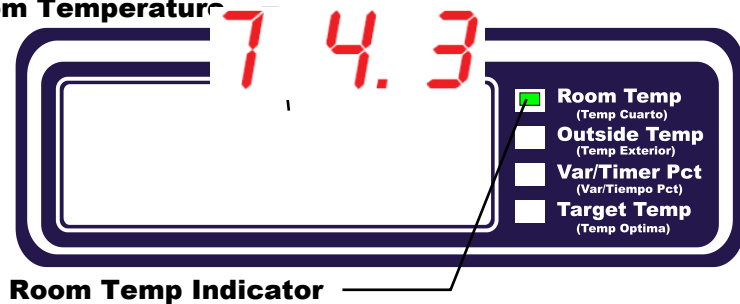
5.1 Checking/Adjusting Temperatures and Timer Percentages

At any time you want to see the average temperature of your house, just look at the display. When no one has pressed a button for over one minute, the display will automatically show “Room Temperature”. To see the outside temperature, press the button labeled “Mode”. This button is located in the center of the controller facepad. When you press the button, watch the green indicator beside the main display. Whichever indicator is lit is the parameter you are viewing. You can easily see “Outside Temperature”, “Var/Timer Percentage”, and “Target Temperature”.

5.1.1 Room Temperature

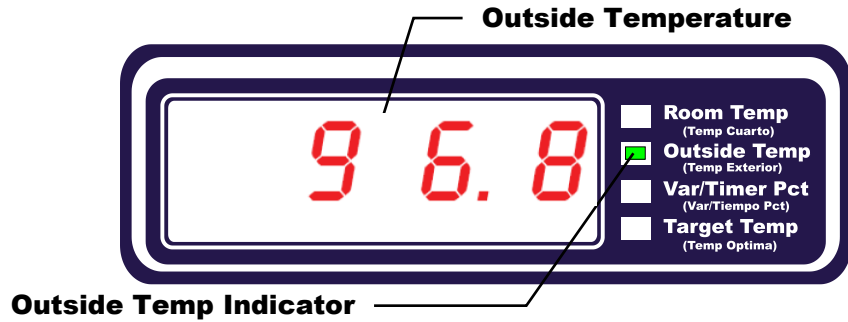
The average of the sensors located inside the house.

Average Room Temperature



5.1.2 Outside Temperature

The temperature read by the sensor located outside the house. (Sensor 3)



5.1.3 Var/Timer Percentage

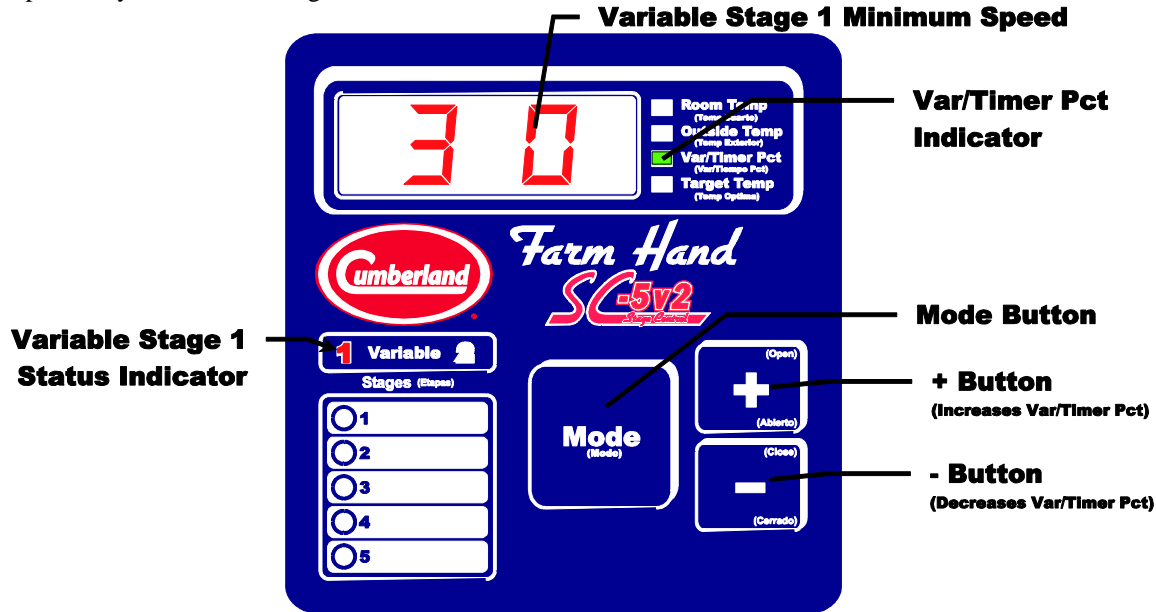
This is the percentage of the timer cycle that a stage on a timer will run. If this is set for 30, and your timer period is set to 10 Minutes, the timed stages will run for 3 minutes out of every ten minutes. This setting will also show minimum speed settings for variable speed fans on controllers with that option.

When you are stepping through the main display parameters and you get to this option, be sure to notice the stage status indicators. This parameter may be different for each variable speed/Cool Timer stage. As you press the Mode button, the Var/Timer Percentage display will show each of the settings. If the Var/Timer Percentage LED on the main display is lit, and the stage status indicator beside Variable Speed Stage 1 is lit, any adjustment to the setting will only affect that particular stage.

Refer to **Section 6.2 "Variable/Cool Timer"** for programming information.

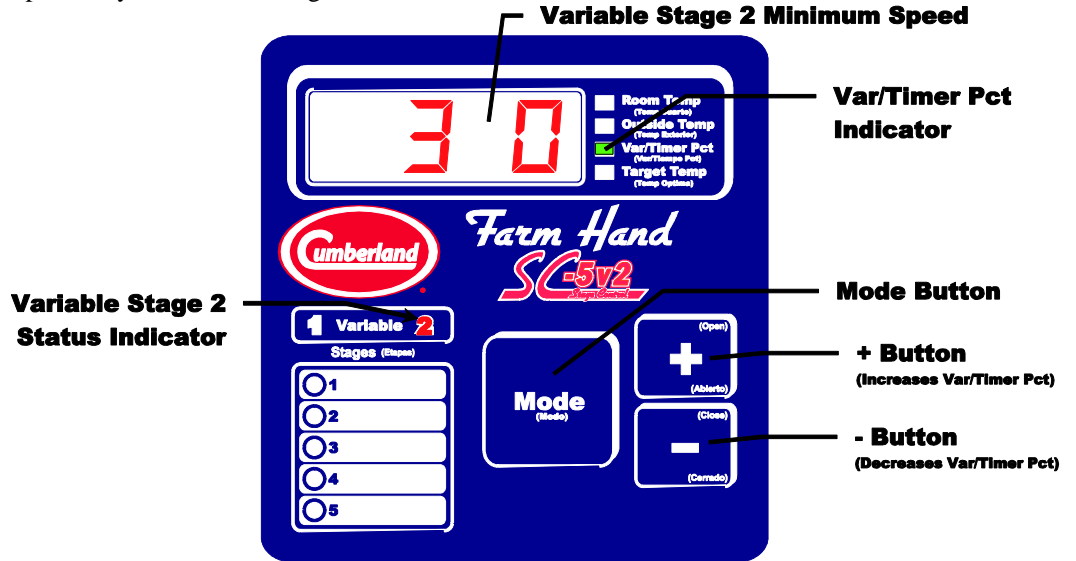
- **Minimum Speed for Variable Stage 1**

To view or change the Minimum Speed for Variable Stage 1, press the Mode button until the Var/Timer Pct Indicator initially turns ON. At this point, the Green Var/Timer Pct Indicator will be ON and the **Variable** Stage "1" Red Indicator will be ON solid (not flashing) and the current Minimum Speed for Variable Stage 1 will be shown in the Display. The "+" button will increase or the "-" button will decrease the Minimum Speed only for Variable Stage 1.



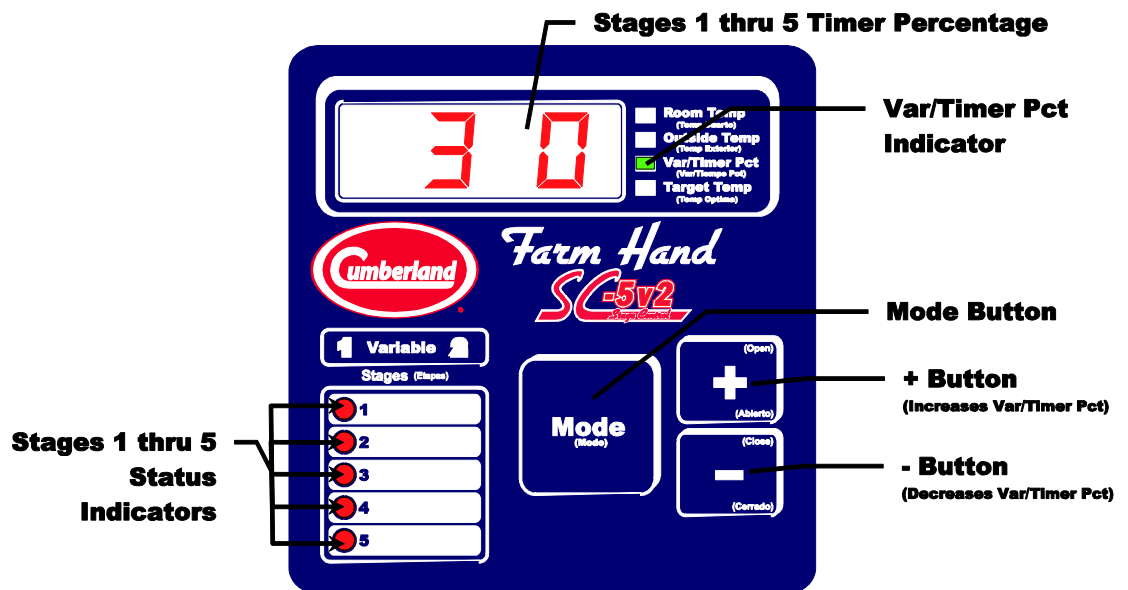
- **Minimum Speed for Variable Stage 2**

To view or change the Minimum Speed for Variable Stage 2, press the Mode button one additional time from the previous Variable Stage 1 mode until the **Variable Stage “2”** Red Indicator turns ON solid (not flashing). At this point, the Green Var/Timer Pct Indicator will be ON and the Red **Variable Stage “2”** Indicator will be ON solid (not flashing) and the current Minimum Speed for Variable Stage 2 will be shown in the Display. The “+” button will increase or the “-“ button will decrease the Minimum Speed only for Variable Stage 2.



- **Timer Percentage for Stages 1 thru 5**

To view or change the Timer Percentage for Stages 1 thru 5, press the Mode button one additional time from the previous Variable Stage 2 mode until the Stages 1 thru 5 Red Indicators turn ON solid (not flashing). At this point, the Green Var/Timer Pct Indicator will be ON and Stages 1 thru 5 Red Indicators will all be ON solid (not flashing) and the current Timer Percentage for Stages 1 thru 5 will be shown in the Display. The “+” button will increase or the “-“ button will decrease the Timer Percentage for all Stages 1 thru 5 (Variable Stages 1 and 2 excluded).



5.1.4 Target Temperature

The Target Temperature is the temperature which the system tries to maintain.



To adjust these settings, press the mode button until you see the setting you want to adjust. Then, use the + button to raise the value and the - button to lower the value. When you are finished setting a new value, either press the mode button again, or do nothing, and the system will return to normal operation within a few seconds.

5.2 Running Natural Ventilation Curtain Machines

Under normal circumstances the natural ventilation curtain machines should be controlled automatically (Manual/Auto switches set to “Auto”). When controlled automatically, if the controller needs to open the curtains, the curtains will automatically open. If it is necessary to manually open or close the curtains for any reason do the following:



Using The Manual Switches:

1. Find the switches for the machine you want to run and check that the Open/Off/Close switch is in the off position. This makes sure that the machine does not run until required.
2. Place the Automatic/Manual switch for that machine in the “Manual” position.
3. To open the machine place the Open/Off/Close switch to the position marked “Open”.
4. To close the machine place the Open/Off/Close switch to the position marked “Close”.
5. Finally when you are finished positioning the machine, place the switch back into the “Off” position. Note: "Off" position is between "Open" and "Close".
6. When you are ready for the controller to take over control of the curtain, place the Automatic/Manual switch in the automatic position.

6. Program Mode

Settings that are usually set up once per growout, or maybe even just for summer or winter are referred to as program parameters and are accessed by taking the controller to program mode. Some examples of these settings are Curtain Runtime, Stages on Timers, and Sensor Calibration.

To get to program mode, press and hold the “Mode” button for five seconds. When the controller has entered program mode, the main display will flash between “P1” and the value of this parameter.

The “P1” is known as a parameter number. All of the program items for the controller have a parameter number assigned to them. The product label located on the front cover includes the Program Parameters

quick reference shown on the next page. Each of the numbers are also listed in the section called “Program Reference” in the back of this manual with a short description of each parameter.

PROGRAM PARAMETERS

<p>P 1-9 Stage Programming P1 = Stage Sensor 10= Sensor 1 02= Sensor 2 12= Average of Sensors 1&2 P2 = Stage Mode 1= Heat Mode 2= Cool Stir Mode 3= Cool Neg. Mode 4= Cool Neg. Tunnel Mode 5= Cool Tunnel Mode P3 = Timer Status 0= Stage Not On Timer 1= Stage On Timer 2= Stage On Cool Timer P4 = On Temperature (Max. On Point) P5 = Off Temperature (Min. On Point) P 10-19 Variable/Cool Timer P10 = Min. Runtime Percentage P11 = Motor Curve Selection</p>	<p>P 20-29 Natural Ventilation P20 = Curtain Cycle time (min.) P21 = Curtain Runtime (sec.) P22 = Curtain Initial Runtime (sec.) P23 = Unit 1 Degrees Above Target P24 = Unit 2 Degrees Above Target P25 = Tunnel "On" Temperature P26 = Tunnel "Off" Temperature P27 = Close Override (Degrees Below Target)</p> <p>P 40-49 Hired-Hand Network P40 = Network Address P41 = Software Version P42 = Controller Setup</p> <p>P 70-79 Timer Settings P70 = Cool Timer Max. Percentage P71 = Cool Timer Min. Percentage</p> <p>PS Sensor Calibration PS1 = Sensor 1 PS2 = Sensor 2 PS3 = Sensor 3</p>
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Refer to Owner's Manual for additional parameters.

When in program mode, you change the current parameter by using the + and - buttons as needed. When you have finished with the current setting, press the “Mode” button to move to the next parameter. Look at the stage status indicators. If the light for stage 1 is lit, the parameter you are programming is for stage 1. To go to stage 2, continue to press the mode button until the stage 2 stage indicator light is lit.

6.1 Stage Programming

The following parameters are used to program each stage on the Farm Hand SC-5v2. Through these parameters, the user has complete control over the operation of each stage. The following sections explain each parameter in detail.

- P1 = Stage Sensor**
- P2 = Stage Mode**
- P3 = Timer Status**
- P4 = Stage ON Temperature**
- P5 = Stage OFF Temperature**

6.1.1 Stage Sensor (P1)

The SC-5v2 triggers stage operations from temperature sensors. The stage sensor parameter (P1) sets which sensor(s) the controller uses to regulate stage operation.

P1 options are as follows:

- 10 = Sensor 1**
Sensor 1 is used. The controller will ignore sensor 2.
- 02 = Sensor 2**
Sensor 2 is used. The controller will ignore sensor 1.
- 12 = Average of Sensors 1 & 2**
The average temperature of sensor 1 and sensor 2 is used.

6.1.2 Stage Mode (P2)

The Farm Hand SC-5v2 is a very intelligent controller, therefore, it needs to not only know whether this is a heating or cooling stage but also what type of cooling stage. The Farm Hand SC-5v2 reacts not only to temperature but also curtain position. This feature allows the grower to program the cooling stages to work exactly like he wants them to without the expense of hard wiring through relays and limit switches. This feature allows the Farm Hand SC-5v2 to better react to the environment. Any Stage can be programmed to be one of the following:

Important: In the following descriptions, many references are made to the Main Curtain (Unit 1). If you do not have a Main Curtain or do not wish to use the auxiliary connection as shown in **Section 11.4 Natural Ventilation Curtain Machine Wiring**, you must place a jumper across the signal terminals for Unit 1. This manipulates the controller into thinking the main curtain is closed. In turn, this allows the heat and negative stages to operate.

01 = Heat Mode

This mode allows the equipment to operate when room temperature is below the ON Point for the stage, and the curtains are closed.

02 = Cool Stir Mode

This mode setting allows the cool stage to run whether the main curtain is open or closed. The only time that this mode will not run is during tunnel mode.

03 = Cool Negative Mode

This mode setting only allows the cooling stage to run if the main curtain is closed, hence the name Negative. This stage will not run if the controller is in tunnel mode.

04 = Cool Negative Tunnel Mode

This mode setting works exactly like the Cool Negative setting except it will run if the controller goes into tunnel mode. This stage is sometimes referred to as a transitional stage. In other words, it operates before it goes into tunnel and also during tunnel.

05 = Cool Tunnel Mode

This mode setting only works when the controller is in tunnel mode.

6.1.3 Timer Status (P3)

The Farm Hand SC-5v2 is equipped to satisfy any of your minimum ventilation needs for regular runtime timers and to cool timers.

00 = Stage Not On Timer

Select 0 for the timer setting if you do not want the stage to be on a timer.

01 = Stage On Timer

Any one of the On/Off stages can be placed on the system timer by placing a "1" in parameter 3 (**P3**) of the stage. By doing this the stage will operate off of the system timer while the temperature is below the stage's OnPoint. Once the temperature reaches the stage OnPoint, the stage will come on full time.

02 = Stage On Cool Timer

ON/Off Stages

Any one of the On/Off Stages can be placed on a cool timer. By doing this the stage will operate off the system timer only while the temperature is above the stage OffPoint (**OFF**). Refer to **Section 9.3 Cool Timer Stage Operation** for proper setup.

Variable Stages

Any of the variable stages can be placed on a cool timer. By doing this the stage will be placed on the system timer all the time. It will run full speed for a certain percentage of time which is set in Var Timer/PCT. This percentage will progressively increase as the temperature rises above the minimum OnPoint setting (**OFF**). Refer to **Section 9.5 Variable Speed Fan Control** for proper setup.

6.1.4 Stage On Temperature (P4)

The OnPoint (Max. On Point) setting is the temperature at which a stage turns on. (i.e. the temperature at which a start signal is transmitted by the controller). The OnPoint setting of a 'cool' stage will always be greater than the target temperature. The OnPoint setting of a 'heat' stage will always be less than the target temperature. The temperature controller will automatically limit settings accordingly.

6.1.5 Stage Off Temperature (P5)

The OffPoint (Min. On Point) setting is the temperature at which a stage turns off.

6.2 Variable/Cool Timer

The following parameters are used to program only the variable stages on the Farm Hand SC-5v2. The following sections explain each parameter in detail.

P10 = Min. Runtime Percentage

P11 = Motor Curve Selection

6.2.1 Minimum Runtime Percentage (P10) (Variable Stages Only)

This setting is the percentage of the system timer that the variable stage will run at minimum speed if the stage sensor's temperature is below the Minimum OnPoint (**OFF**) for the stage.

6.2.2 Motor Curve Selection (P11) (Variable Stages Only)

The controller is programmed to operate single phase or three phase fan motors at their optimum performance levels. Select the correct motor curve parameter (**P11**) for your particular application from the following table.

Curve	Conditions
0	This curve is optimized for use with Cumberland's line of Funnel Flow Fans that are 24" or less. Also, line voltage must be Single Phase.
1	This curve lends itself better to operation of 36" fans. The power distributed at each percentage is somewhat greater than that of curve 0. Therefore, the speed will be a little greater than that of curve 0.
2	This curve is for 3-Phase systems. Its purpose is to shift the voltage curve to give a much higher power from the varied phase. Conditions that would warrant the use of this curve is a variable speed fan that varies a great deal from 100% speed to 95% speed.
3	This curve is for 3-Phase systems. Its purpose is to shift the voltage curve to give much less power from the varied phase. Conditions that would warrant the use of this curve is a variable speed fan that varies very little from 100% speed to 5% speed.
4	This curve is for use with Cumberland's newest Emerson fan motor. These motors are typically used on fans that are 24" or smaller.

6.3 Natural Ventilation

This controller runs 1 or 2 curtain machines independently. No additional resources – including external timers – are necessary. The curtain machines run off a common cycle timer and run timer, however they can use separate sensors. The sensor selection is made via a switch located on the inside of the front cover of the machine. This switch causes the machines to either operate together or independently. If they are operating independently, unit 1 always uses sensor 1 and unit 2 uses sensor 2.

A brief overview of the programmable parameters for the curtain machines follows:

NOTE: Parameters P20-P24 are only used when using the main curtain to naturally ventilate the building.

P20 – Curtain Cycle Time (min.)

The controller looks at all parameters and decides whether or not to move the curtains occasionally. This parameter determines how often this occurs. Valid settings are 1 to 10 minutes.

P21 – Curtain Run Time (sec.)

When the controller determines that curtains need to run open or close, this setting determines how long they run. Valid settings are 1 to 240 seconds.

P22 – Curtain Initial Run Time (sec.)

When the controller determines that the curtains should run open and senses that they are closed, it uses this parameter for the ‘first’ run. This setting is used to allow the curtains to open enough on the first run to guarantee adequate ventilation. Valid settings are 1 to 240 seconds.

P23 – Unit 1 Degrees above target

Generally a grower would like to give his variable speed and/or first stage fans an opportunity to ventilate the building before starting curtains open. Thus, when the curtains do come down, they will most likely stay down for a fair period of time. This setting allows the user to do that. Valid settings are: 0 - 25.

P24 – Unit 2 Degrees above target

Occasionally, a grower may want one curtain sidewall to drop before the other to try to avoid large temperature swings. This setting allows for this to happen.

Note: If you would like both curtain units to always react together, you must set P23 = P24.

P25 – Tunnel “On” Temperature

This is the sensor 3 temperature at which the controller will enter tunnel mode. Only applicable when tunneling on outside temperature.

P26 – Tunnel “Off” Temperature

This is the sensor 3 temperature at which the controller will exit tunnel mode. Only applicable when tunneling on outside temperature.

P27 – Close Override (Degrees Below Target)

This setting provides the grower a temperature at which to override the curtains closed. The setting represents degrees below target at which time the curtains will begin closing regardless of the cycle. The setting allows the user to anticipate quick temperature drops to help maintain a stable inside temperature. Valid settings are 1-25.

6.4 PC Compatible Cumberland Network Parameters

This option requires Cumberland’s Farm Manager Software. The controller has 3 functions which are used to set it up on the Cumberland PC compatible inter-controller network (HHNet). These are:

P40 - HHNet Address

HHNet allows you to connect up to 32 controllers on a single communications port of your personal computer (PC). In order for the computer to recognize the communications from the controllers, each controller must have a unique address. For example, if you have two *SC-5v2s*, and two *Power Vents* you would need to set the first *SC-5v2* to be address 1, the second *Swine Finisher* to address 2, the first *Power Vent* to address 3, and the second *Power Vent* to address 4. Valid settings are: 1 - 32. (You do not have to address the controllers in any particular order.)

P41 -- Version Number

This is not settable. It is the version of controller software.

P42 -- Controller Type

This is not settable. It is a unique number that allows the network software (Farm Manager) to know what type controller it is.

6.5 Cool Timer Settings

The following two settings allow the user to set the Runtime range for their cool timer stages.

P70 = Cool Timer Maximum Percentage

This sets the maximum Runtime percentage that a cool timer stage can operate.

P71 = Cool Timer Minimum Percentage

This sets the minimum Runtime percentage that a cool timer stage can operate.

6.6 Sensor Calibration

The SC-5v2 has 3 sensors that may be calibrated. The parameter(s) for calibration are PSx with x being the sensor number. The sensor temperature reading is alternately displayed along with the parameter number.

You should never attempt to calibrate a sensor more than 8 degrees. If you have a setting that far out of range, it indicates that there is a problem that should be corrected.

PS1 - Calibrate Sensor 1

This reading can be changed by pressing the + or - button until the desired reading is displayed.

PS2 - Calibrate Sensor 2

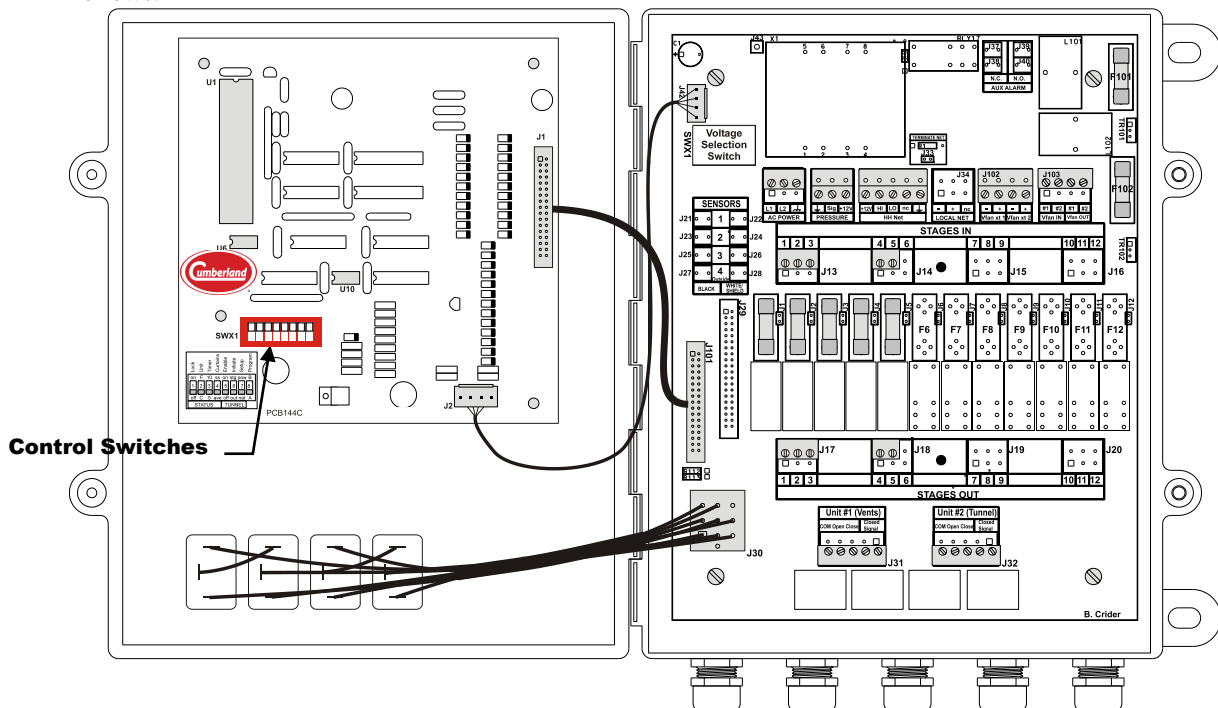
This reading can be changed by pressing the + or - button until the desired reading is displayed.

PS3 - Calibrate Sensor 3

This reading can be changed by pressing the + or - button until the desired reading is displayed.

7. Rarely Changed Settings

Settings which are rarely or never changed are found on a bank of switches located inside the front panel of the controller. The upper position is ON, the lower position is OFF. The functions of the switches are as follows:

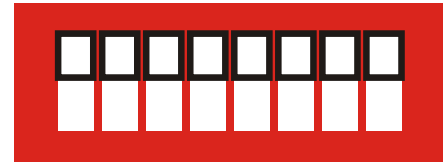


7.1 Switch Settings

SWX 1 - Lock

This switch is used to lock the controller. When it is on, the user may change settings such as target temperature and minimum speed/timer percentages but they can not change the settings in program mode. If the switch is set to ON the program settings are locked.

SWX1



SWX 2 - Fahrenheit/Celsius

This switch toggles between Fahrenheit and Celsius operation. If the switch is set to ON, the controller will read the sensors as Fahrenheit. (Note: If you change this switch, you will have to reset your tunnel on points and off points and your Target Temperature.)

Lock	Unit	Timer	Curtains	Enable	Initiate	Setup	Program
on	F	10	ss	on	stg	pow	B
1	2	3	4	5	6	7	8
off	C	5	ave	off	out	nat	A
STATUS				TUNNEL			

SWX 3 - 5/10 minute timer

This switch selects between a 5 and 10 minute system timer. If the switch is ON, the timer is 10 minutes.

SWX 4 - Curtains independent

This switch is used to choose whether the curtain machines operate off the same sensor or if they operate independently. If the switch is ON, the curtains are independent with curtain 1 running on sensor 1, and curtain 2 running on sensor 2.

SWX 5 - Tunnel On/Off

This switch is used to enable or disable the tunnel mode of the controller. When this switch is in the OFF position, the controller will not go into tunnel for any reason.

SWX 6 - Tunnel On Stage

This switch tells the controller whether it is tunneling off of the lowest programmed tunnel stage or if it is tunneling off of outside temperature. If this switch is set to the ON position, the controller will switch to tunnel mode whenever the first programmed tunnel stage comes on. If this switch is OFF, the controller will use the "Tunnel On Point" setting for entry into tunnel.

SWX 7 - Power Ventilate

This switch indicates whether this is a power ventilated house or a natural ventilated house. If it is a power ventilated house the controller will leave the inlet curtain closed until tunnel mode is entered. This switch must be set to ON if you have a Power Ventilated house.

SWX 8 - Program 'A' or 'B'

This switch is used to toggle between 2 preset programs. This could be used to store separate summer/winter programs for instance. The ON position is for Program A, and the OFF position is for Program B.

8. Controller Installation and Setup

8.1 Installation

8.1.1 Tools Required

Mini Screwdriver	Standard Screwdriver
Wire Strippers	

8.1.2 Installation Instructions

1. Unpack system, and check that all components are present.
 - 1 Farm Hand SC-5v2
 - 1 Installation Kit
 - 1 Fuse Kit
 - 3 Sensors
 - 1 Manual
2. Hang Farm Hand SC-5v2 with four screws and the plastic mounting brackets included.
3. Make sure all power supplies are disconnected before breaking any wires, or reaching into the enclosure.
4. Open SC-5v2 and find all connections. Refer to wiring diagrams in back of this manual.
5. Run sensors out to locations inside the house. (Sensor 3 should be installed outside the house.) Be sure that the sensors are in a safe location, free from any temperature influences (direct sunlight, water, etc.) Use care when securing sensor wires so that you do not cut the wire, any short, or break in the wire will cause improper sensor operation.
6. Connect each sensor to its appropriate terminals inside the enclosure. (See wiring diagrams in the back of this manual.)
7. Connect wires from stage terminals to the contactor panel, or relay box. See wiring diagrams for locations of terminals.
8. Hookup three wire connections from SC-5v2 PCB164 circuit board to curtain machines. See wiring diagrams for locations of terminals.
9. **CHECK THE POSITION OF THE VOLTAGE SELECTOR SWITCH.** Connect the wires for 120/240V power to the terminals specified in the wiring diagram.

9. Programming Examples

When following these examples, you will need to refer to the Program Reference section to see which options are available for each of the parameters (P1, P24, etc.).

9.1 Setting up a Stage

There are five parameters used in programming any stage. They are P1-P5. The following is an overview of how to program a stage:

1. Enter *Program Mode* by pressing and holding the *Mode* button for 5 seconds until **P1** is displayed, and the variable speed stage 1 light comes on. This parameter selects the sensor(s) that this stage watches for on/off operation.
2. Press the + or - button until the desired sensor is displayed. 1= sensor 1; 2 = sensor 2, and 3 = an average of sensors 1 and 2.
3. Press the *Mode* button again and **P2** is shown. This parameter selects what mode the stage operates as.

4. Press the + or - button until the desired mode is displayed.
5. Press the *Mode* button until **P3** is displayed. This parameter allows you to put a stage on the system timer (5 or 10 minutes).
6. Press the + or - button until the desired setting is displayed. (0 = Not on a timer, 1 = On the timer, 2 = Cool timer (Variable Speed and Stage 5 Only.))
7. Press the *Mode* button until **P4** is displayed. This parameter sets the stage On Point.
8. Press the + or - button until the desired setting is displayed.
9. Press the *Mode* button until **P5** is displayed. This parameter sets the stage Off Point.
10. Press the + or - button until the desired setting is displayed.
11. Exit Program Mode by pressing the *Mode* button until after **PS3** has been displayed or wait 1 minute.

9.2 Setting Up Tunnel Control

Note: If you do not want the controller to ever enter tunnel mode just make sure that the Tunnel On/Off switch is in the off position and you can ignore this section.

The SC-5v2 is a very versatile tunnel controller. It provides the grower with many different ways to tunnel based on the layout of the house. It also provides two different ways of initiating tunnel mode. The following are some tips and examples of setting up this controller to tunnel your house appropriately.

1. The first step in setting up your tunnel house is to configure the stages that you want as your **cool tunnel stages**. If some stages need to operate in tunnel mode and in normal mode, then program these stages to be **cool negative tunnel stages**. See the Program Reference section in the back of this manual for more information on the operation of various stage modes.
2. The next step in setting up your tunnel house is determining how your controller should operate while out of tunnel mode. In other words, does your house always power ventilate or does it naturally ventilate using curtain sidewalls? If it is a power ventilated house you must set the **Power Ventilate** switch (SWX-7) in the on position.
3. The last step in setting up your tunnel house is determining how you would like to initiate tunnel mode. You can initiate tunnel mode by outside temperature or by your lowest programmed **cool tunnel** stage. The lowest programmed cool tunnel stage is determined by the lowest onpoint. If you would like to tunnel based on outside temperature you must set the **Tunnel On Stage** (SWX-6) switch to off. You can then set the temperature at which you would like to enter tunnel mode at **P24** and the temperature at which you would like to exit tunnel mode at **P25**. Otherwise, set the **Tunnel On Stage** (SWX-6) to on.

The following is a brief description of how the tunnel would work in each of the situations.

Tunneling on outside temperature in a naturally ventilated building

When the outside temperature rises above the Tunnel OnPoint (P24), the controller will shut down all stages and begin to close the main curtain and open the inlet curtain. After 6 minutes have passed, the controller makes sure that the inlet is open. If there is no error condition, the controller will begin waiting for the main curtain to close. If the controller does not see the main curtain closed after 7 more minutes, it will abort tunneling, and sound the alarm. Once the controller recognizes that the main curtain is closed, it will then allow the other cool tunnel and cool negative tunnel stages to come on. Once the temperature drops below the Tunnel OffPoint (P25), the controller will open both the inlet and the main curtain fully and return the stages to normal operation immediately.

Tunneling on outside temperature in a power ventilated building

The controller reacts in the same way as in the naturally ventilated building. For proper operation in a house without a curtain sidewall, you must jumper the curtain closed switches on the main curtain together.

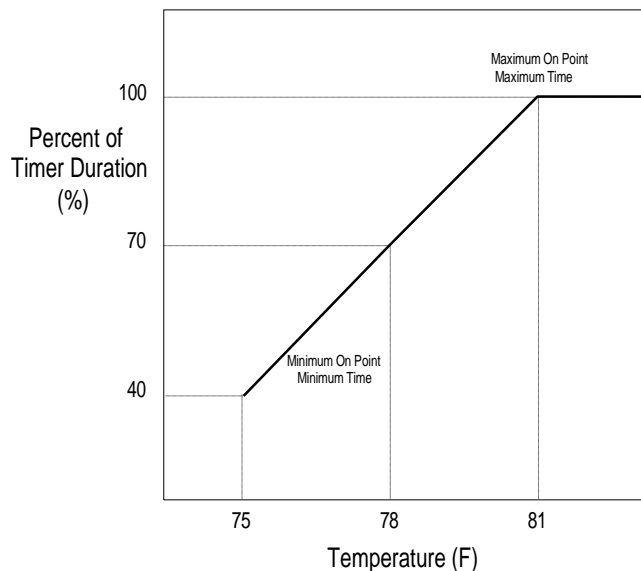
Tunneling on a stage in a power ventilated building

As soon as the lowest programmed Cool Tunnel stage comes on, the controller opens the inlet curtain and leaves all Cool Negative Tunnel and Cool Tunnel stages on. When the temperature begins to fall and the lowest programmed Cool Tunnel stage turns off, the controller will close the inlet fully and return the stages to normal operation immediately.

Note: If you are using a main sidewall curtain, it must run at a speed where it can go from fully open to fully closed in less than 13 minutes. Otherwise, the controller will not operate tunnel properly.

9.3 Cool Timer Stage Operation

All stages of the SC-5v2 can be programmed as cool timer stages. A cool timer stage will come on and run at the timer percentage whenever temperature is above its off point, and its timer percentage will increase as temperature rises. The following graph shows how you can vary this percentage.



The above graph shows how the timer percentage of the fan will increase with the following settings:

Setting	Parameter	Setpoint
Sensors	P1 - Stage Sensors	Any Combination
Timer Setting	P3 - Timer Selection	2 - Cool Timer
Maximum On Point	P4 - On Point	81 °F
Minimum On Point	P5 - Off Point	75 °F
Minimum Percentage	Minimum Runtime Percent	40%

From the graph, you can see that at 78°F, the cool timer stage will run at 70% of the timer duration. Below 75°F the stage will never run. Above 81°F the cool timer stage will run at 100% continuously.

The minimum Runtime Percentage may be set when going through the main display indicators.

9.4 Setting up a Cool Timer Stage

There are two unique parameters used in programming a Cool Timer stage in addition to the other 5 stage parameters. They are P10-P11. The following is an overview of how to program a cool timer stage:

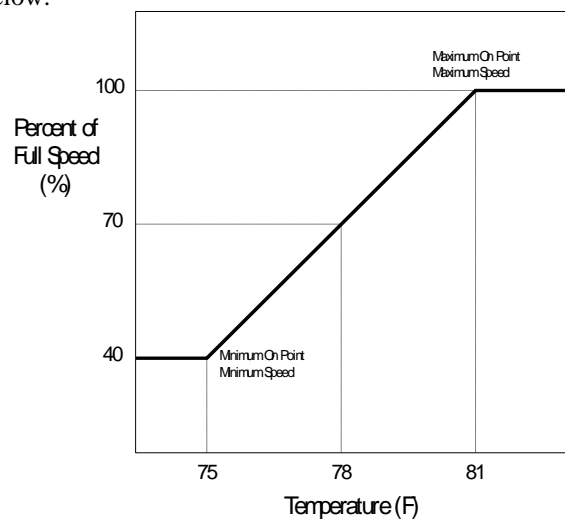
1. Enter *Program Mode* by pressing and holding the *Mode* button for 5 seconds until **P1** is displayed and the red light next to the stage you want to program is lit. This parameter selects the sensor(s) that this stage watches for on/off operation.
2. Press the + or - button until the desired sensor is displayed. 1 = sensor 1; 2 = sensor 2, and 3 = an average of sensors 1 and 2.
3. Press the *Mode* button again and **P2** is shown. This parameter selects what mode the stage operates as.
4. Press the + or - button until the desired mode is displayed.
5. Press the *Mode* button until **P3** is displayed. This parameter allows you to put a stage on the system timer (5 or 10 minutes).
6. Press the + or - button until a **2** is displayed.
7. Press the *Mode* button again and **P4** is displayed. This parameter sets the Onpoint temperature for this stage. Press the + or - button until the desired full runtime temperature is displayed.
8. Press the *Mode* button again and **P5** is displayed. This parameter sets the Offpoint temperature for this stage. Press the + or - button until the desired minimum runtime temperature is displayed.

Note: The following two steps only apply to variable speed stages being used as cool timers.

9. Press the *Mode* button again and **P10** is displayed. This is where you set the timer percentage for the times when the temperature is below the offpoint of the stage. If you want this to be a strictly cool timer set this to "0".
10. Press the *Mode* button again. **P11** is now displayed. This can be ignored because the stage will no longer vary the speed.
11. Exit program mode by pressing the *Mode* button until **PS3** has been displayed or by waiting 1 minute.
12. Now press the *Mode* button until the green light next to *Var/Timer Pct* is lit and the stage status indicator for the stage you are programming to be the cool timer is lit. Press the + or - button until the desired minimum fan runtime % is displayed.

9.5 Variable Speed Fan Control

The SC-5v2 can accommodate 1 or 2 Variable Speed Fan Stages. These stages can be programmed to either be a variable speed fan or a cool timer. The operation of the variable speed option is explained below.



The graph shows how the speed of the fan will increase with the following settings:

Setting	Parameter	Setpoint
Sensors	P1 - Stage Sensors	Any Combination
Timer Setting	P3 - Timer Selection	0 - Not on Timer
Maximum On Point	P4 - On Point	81 °F
Minimum On Point	P5 - Off Point	75 °F

From the graph, you can see that at 78°F, the variable speed fan will run at 70% of maximum speed. Below 75°F the variable speed fan will run at its minimum speed, for the minimum timer percentage (P-10). Above 81°F the variable speed fan will run at 100% continuously. If you want to use the cool timer option for these two stages, refer to the section “Setting up a Cool Timer Stage”.

9.6 Setting Up a Variable Speed Fan

There are two unique Parameters used in programming a variable speed fan, in addition to the other five stage programming parameters. They are P10-P11. The following is an overview of how to program a variable speed fan:

1. Enter *Program Mode* by pressing and holding the *Mode* button for 5 seconds until **P1** is displayed if the red light next to the stage you want to program is not lit, press the mode button repeatedly until that light is lit. This parameter selects the sensor(s) that this stage watches for on/off operation.
2. Press the + or - button until the desired sensor is displayed. 1= sensor 1; 2 = sensor 2, and 3 = an average of sensors 1 and 2.
3. Press the *Mode* button again and **P2** is shown. This parameter selects what mode the stage operates as.
4. Press the + or - button until the desired mode is displayed.
5. Press the *Mode* button until **P3** is displayed. This parameter allows you to put a stage on the system timer (5 or 10 minutes).
6. Press the + or - button until a **0** is displayed.
7. Press the *Mode* button again and **P4** is displayed. This parameter sets the OnPoint temperature for this stage (The temperature the stage will run at full speed continuously). Press the + or - button until the desired on temperature is displayed.
8. Press the *Mode* button again and **P5** is displayed. This parameter sets the OffPoint temperature for this stage (The temperature the stage will run continuously at its minimum speed). Press the + or - button until the desired on temperature is displayed.

Note: The speed of the fan will vary between the On Point and the Off Point.

9. Press the *Mode* button again. **P10** is now displayed. This is where you set the minimum runtime percentage. In other words this is the percentage of 5 or 10 minutes that you want your fan to run while the temperature is below the OffPoint of the stage.
10. Press the *Mode* button again and **P11** is displayed. This is the motor curve for the fan.
11. Exit program mode by pressing the *Mode* button until **PS3** has been displayed or by waiting 1 minute.
12. Now press the *Mode* button until the green light next to *Var/Timer Pct* is lit and the stage status indicator for the variable speed stage you are programming is lit. Press the + or - button until the desired minimum fan speed (in %) is displayed.

10. Maintenance

Check the calibration of your sensors at least once per quarter. To do this, you will need to have two persons. One person should be at the sensor with a trusted thermometer, and another person at the controller to set the sensor to the proper setting.

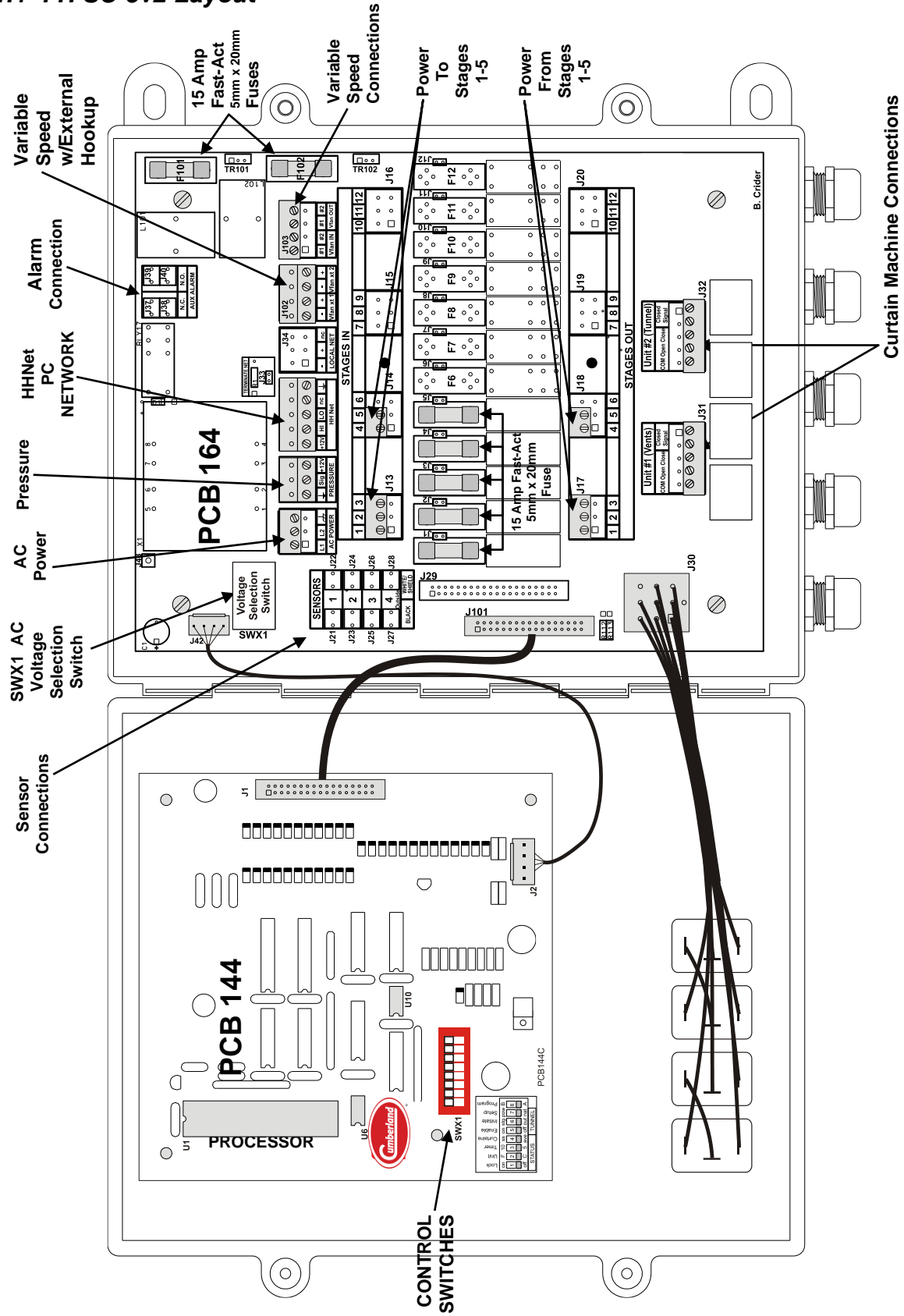
11. Wiring Diagrams

All wiring connections for stages, curtain machines, variable speed fans, and curtain sensors inside the controller are provided with removable terminal blocks to attach to the end of the wire. To make the connection, strip about ¼” of the insulation off the wire, remove terminal block from PCB 164, insert wires into appropriate terminal block slots, and tighten the set-screws securely by hand.

Warning!

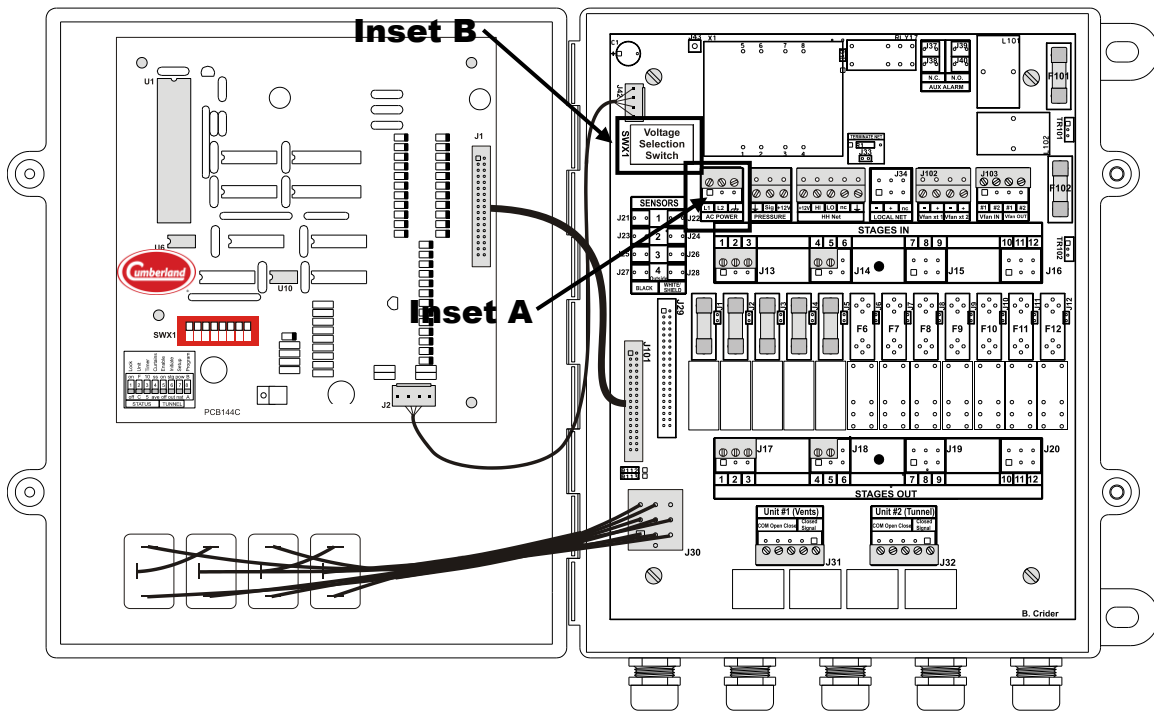
Do not connect more than twelve (12) amps of load to any one stage.

11.1 FH SC-5v2 Layout



11.2 Connecting AC Power to the SC-5v2

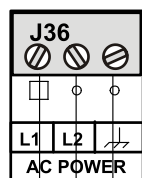
SC-5v2 – Right & Left Side Compartments



WARNING:

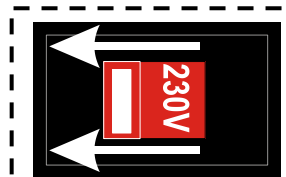
DO NOT Turn The Power ON Until All Connections Are Completed And The Voltage Selection Switch (SWX1) Setting And AC Power Connections (J36) Are Verified To Be Correct. SWX1 Is Preset At The Factory For 230 VAC. To Prevent Equipment Damage And Possible Injury, The Switch Setting Must Be Set To The Specific Voltage Required.

Inset A



To Breaker

Inset B

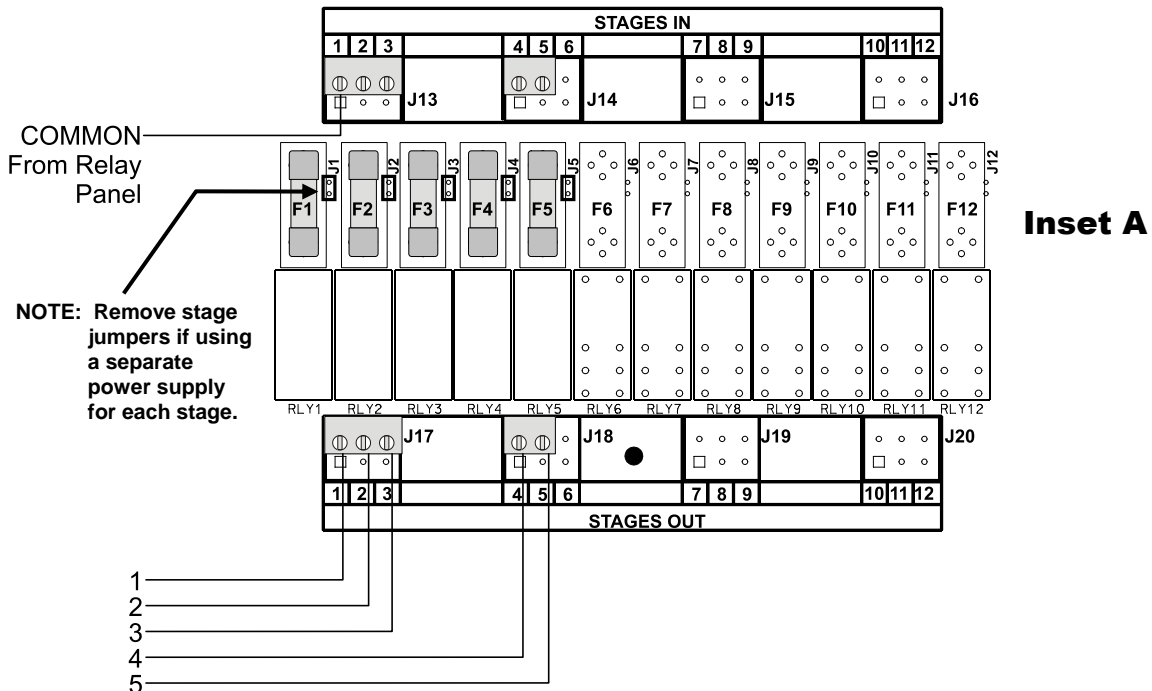
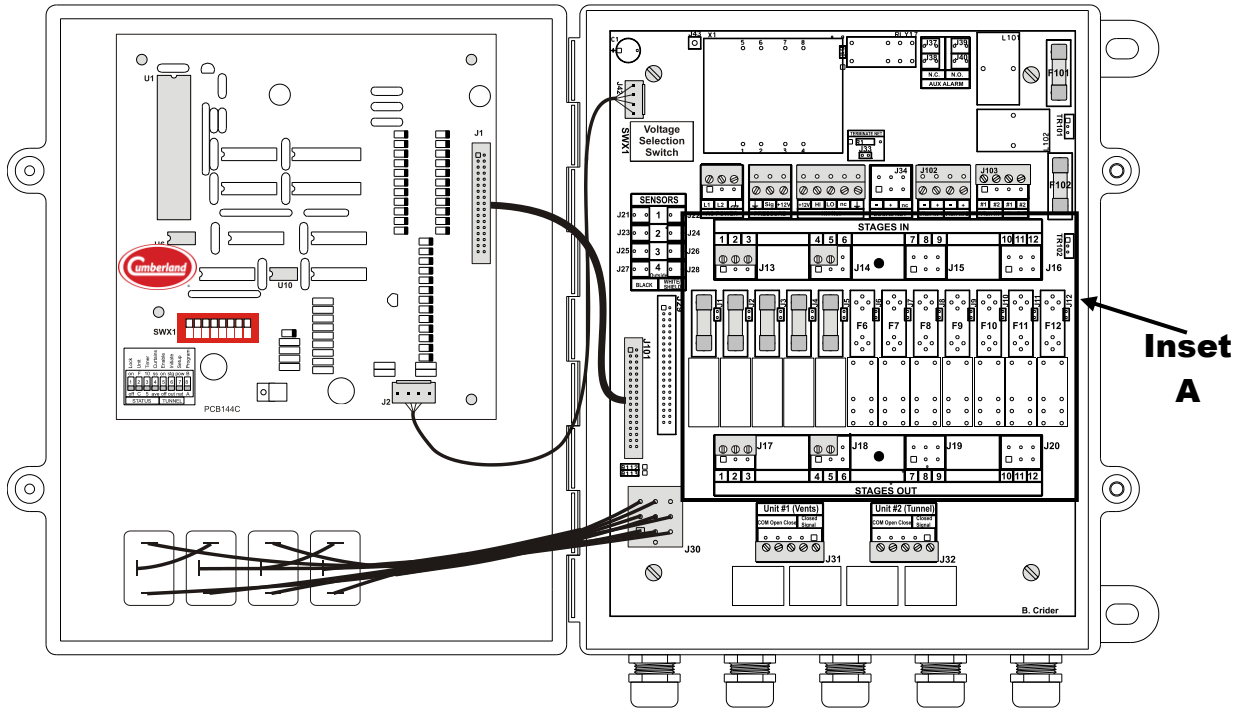


OR



11.3 Connecting On/Off Stages to a Relay Panel

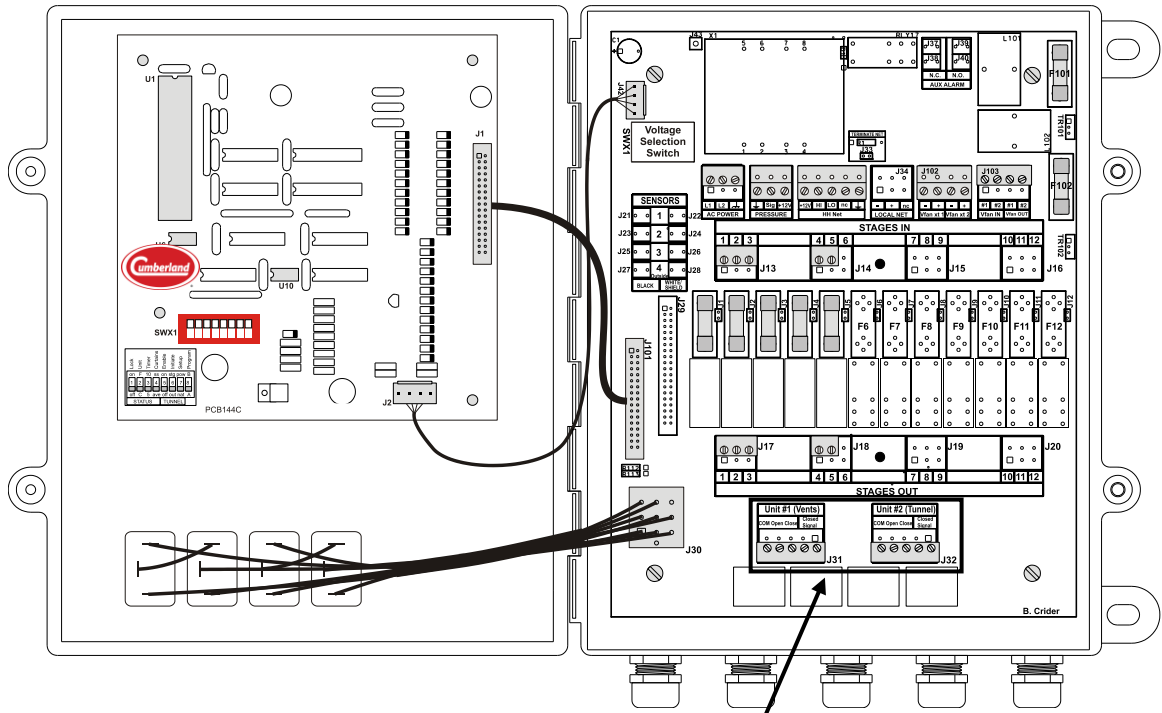
SC-5v2 – Right & Left Side Compartments



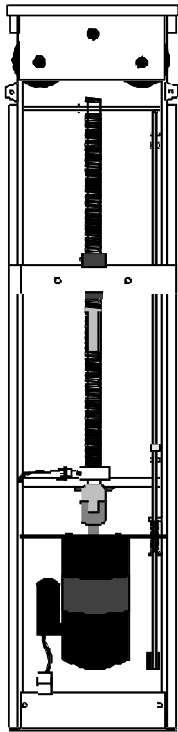
Warning: Check that the stage jumpers are removed when connecting a load directly to the controller.

11.4 Natural Ventilation Curtain Machine Wiring

SC-5v2 – Right & Left Side Compartments

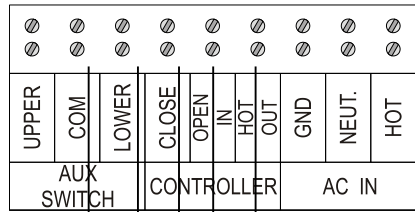


Inset A

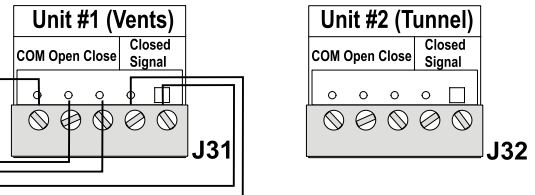


PowerTrak

PowerTrak



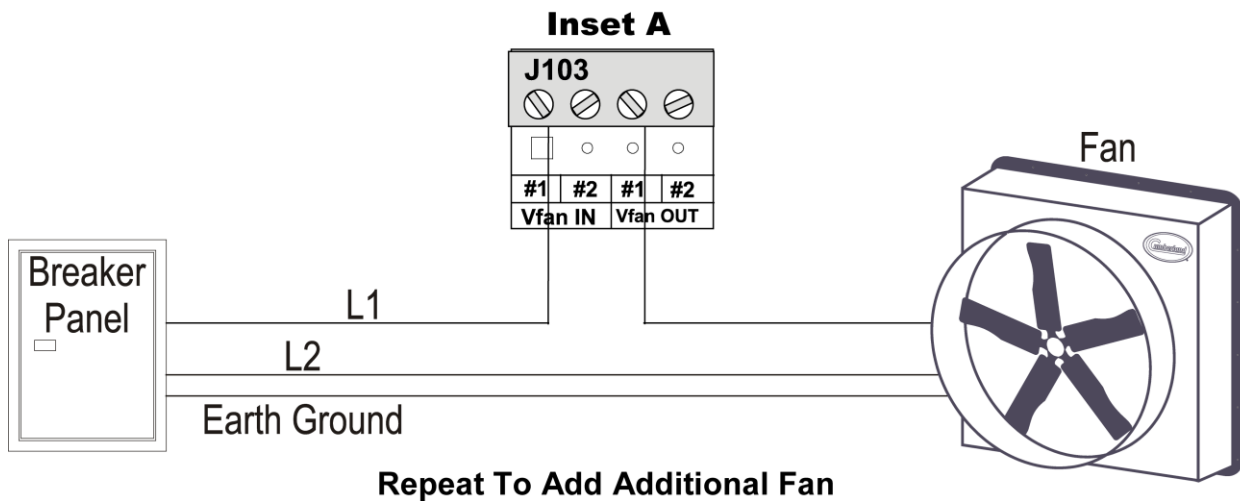
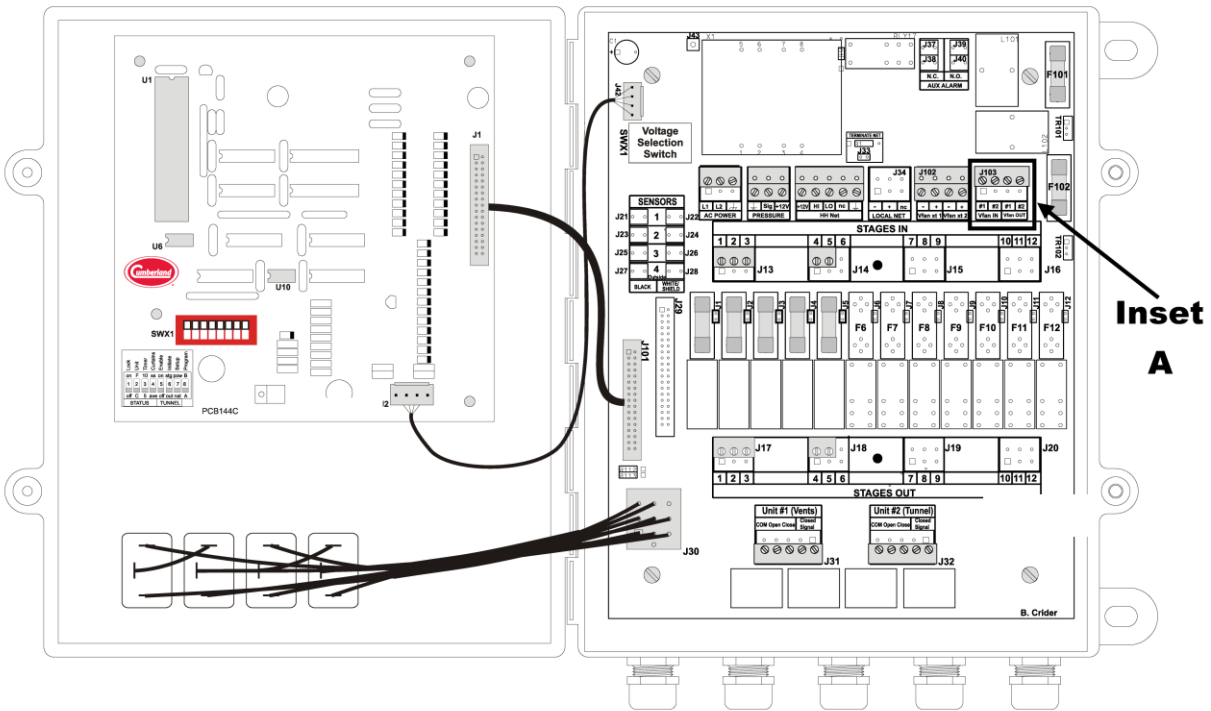
Inset A



Note: If you are tunneling with this controller, the inlet machine must be connected to "Curtain 2". Your main curtain should be connected to "Curtain 1"

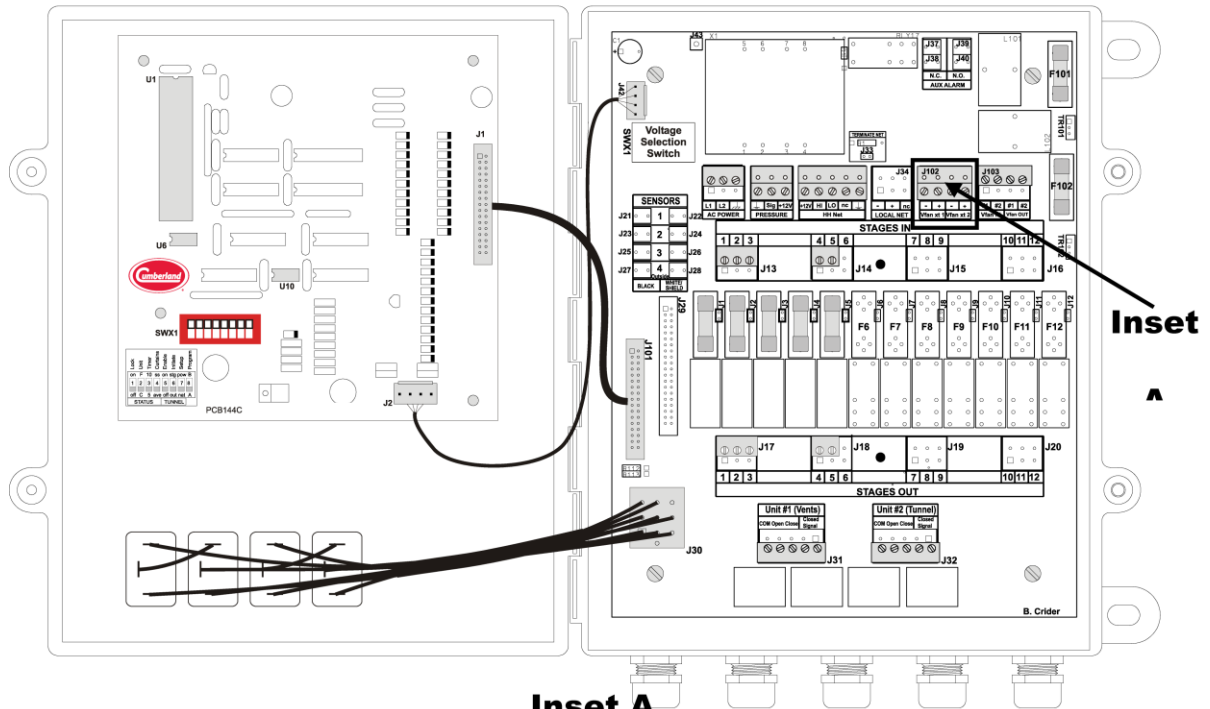
11.5 Variable Speed Fan Wiring

SC-5v2 – Right & Left Side Compartments

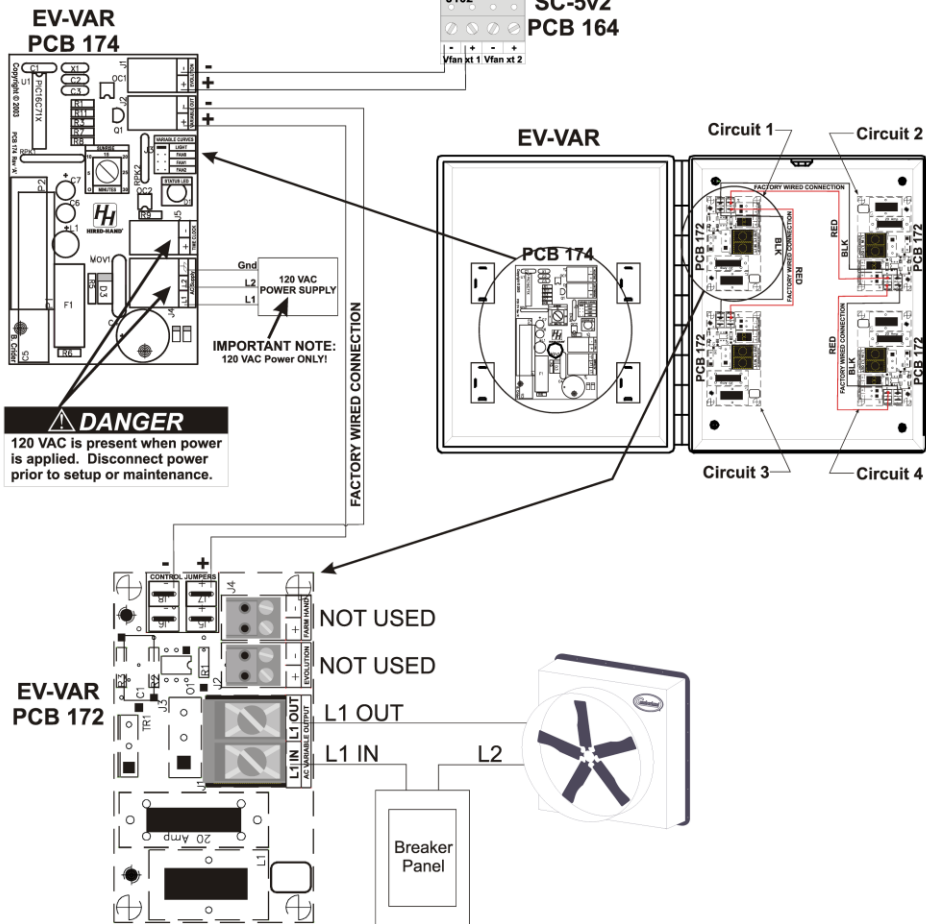


11.6 Variable Speed Fan Wiring with External Hookup

SC-5v2 – Right & Left Side Compartments

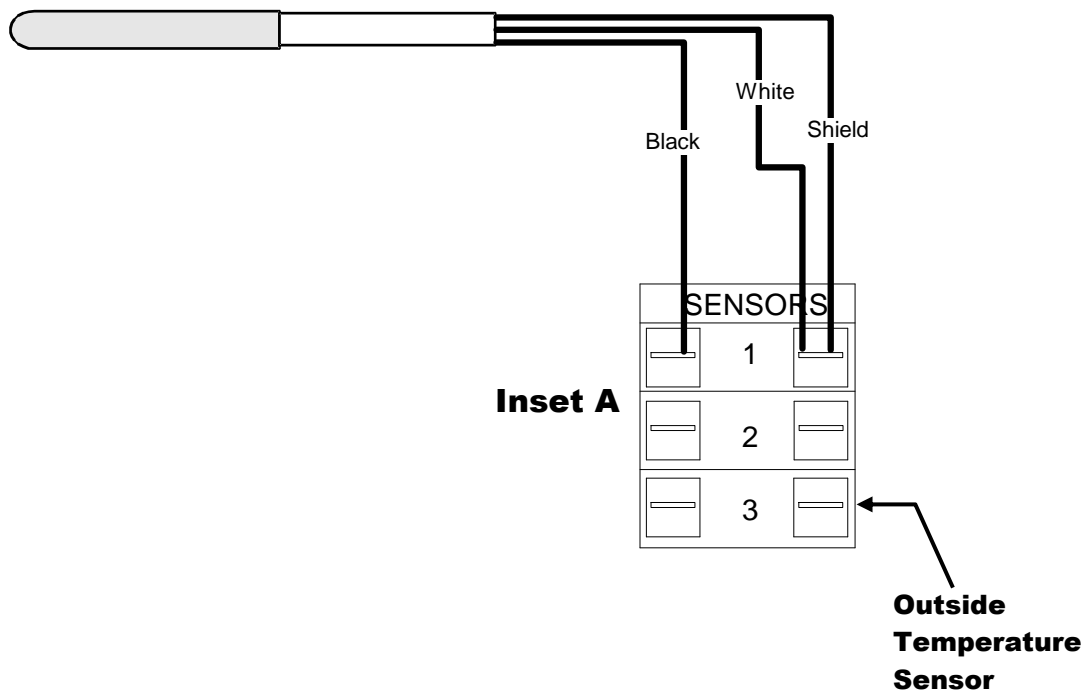
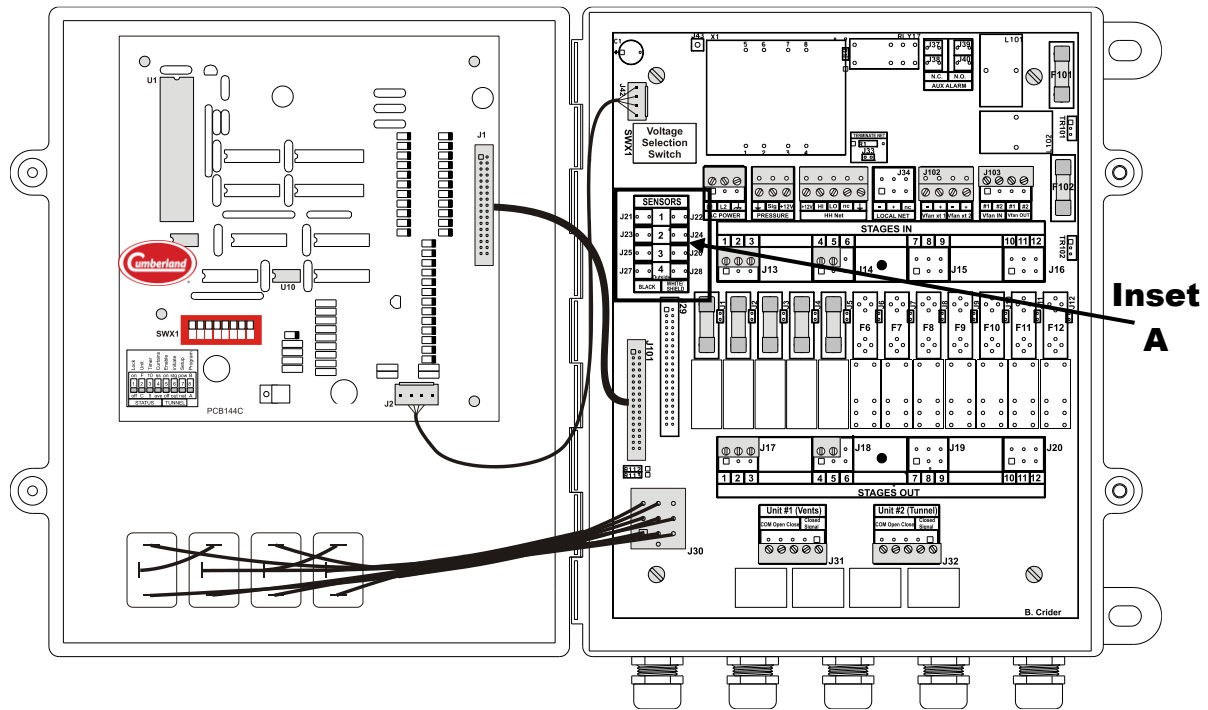


Inset A



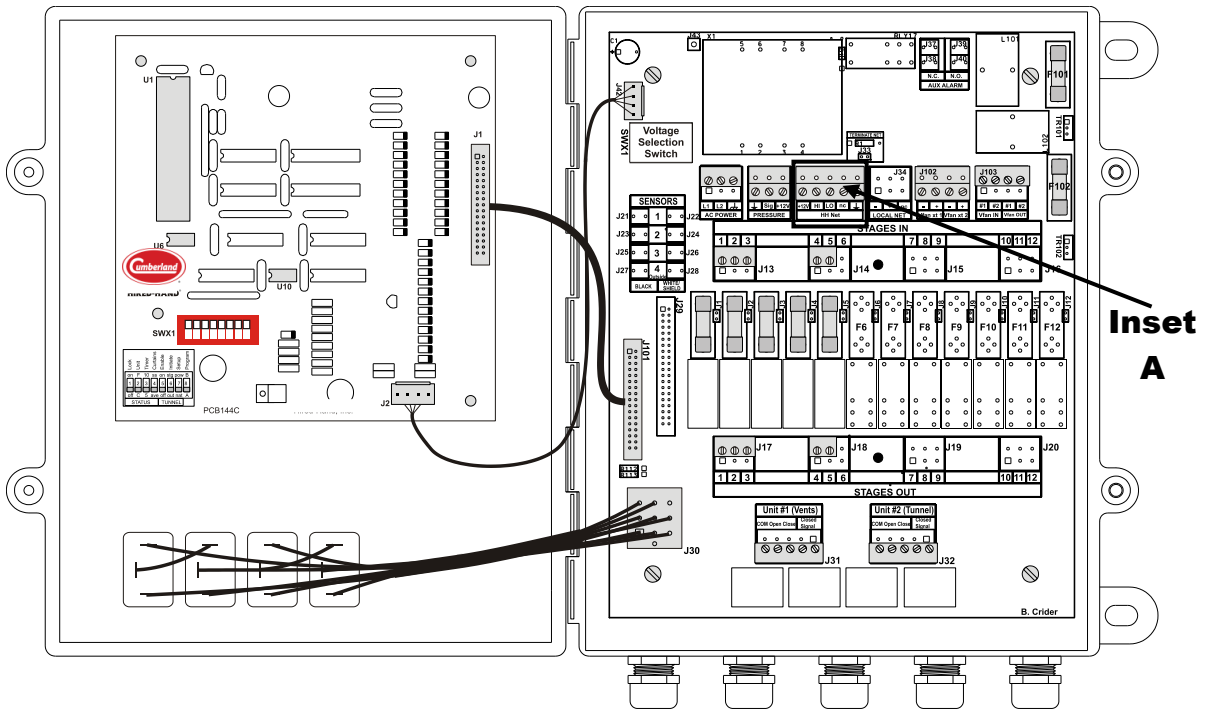
11.7 Sensor Wiring

SC-5v2 - Right & Left Side Compartments

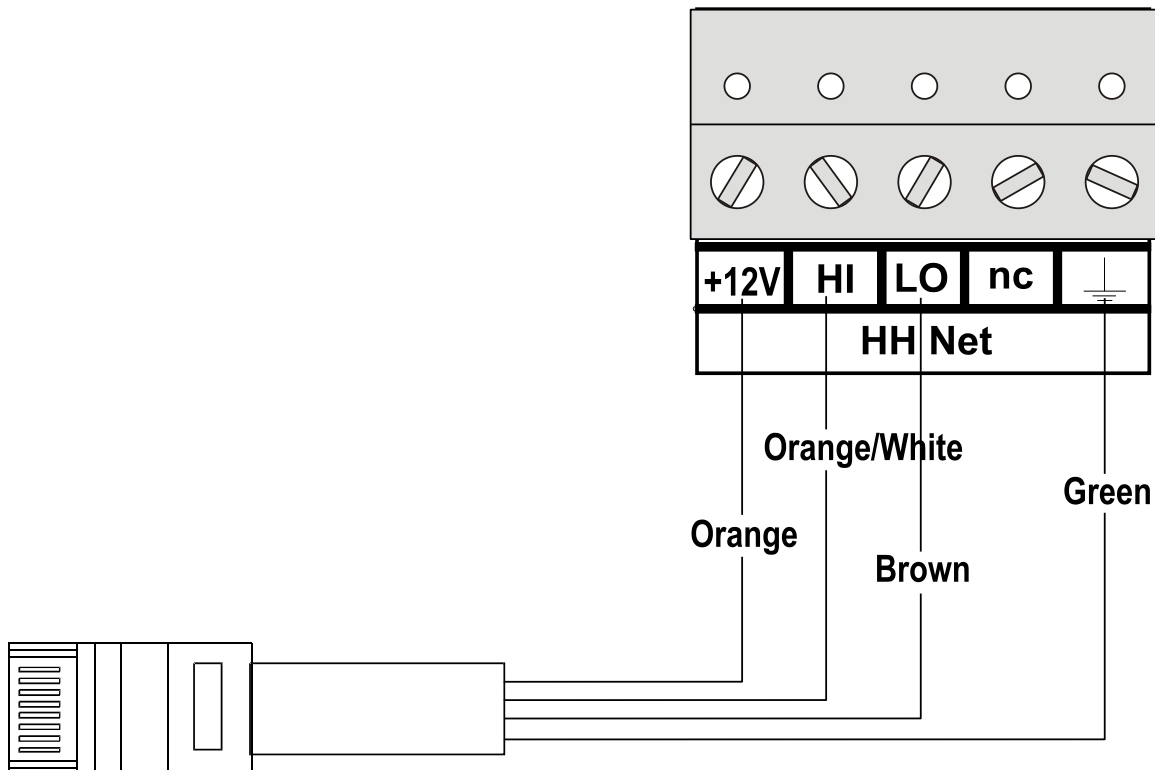


11.8 Connecting the SC-5v2 to a Data Shuttle

SC-5v2 – Right & Left Side Compartments

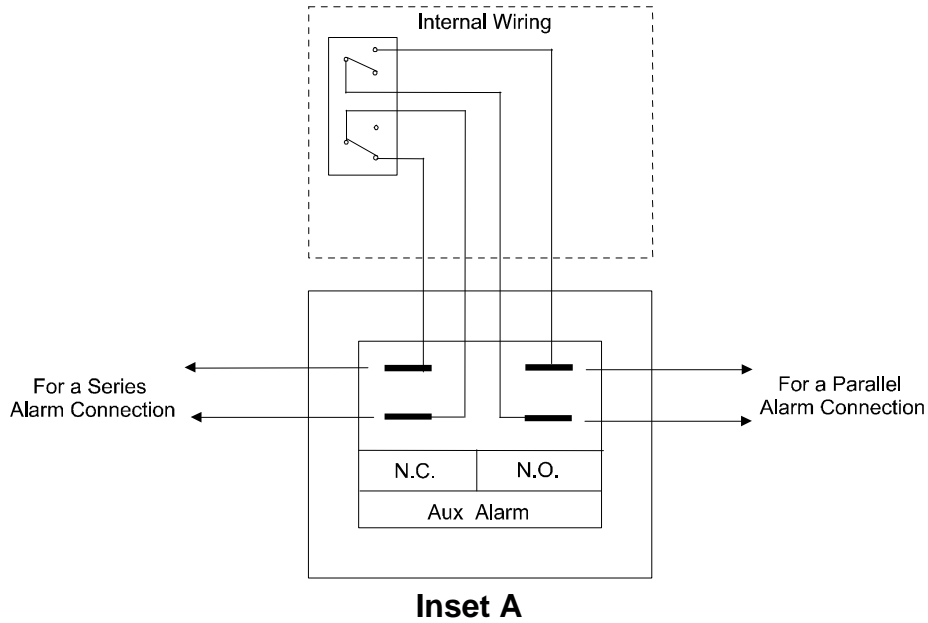
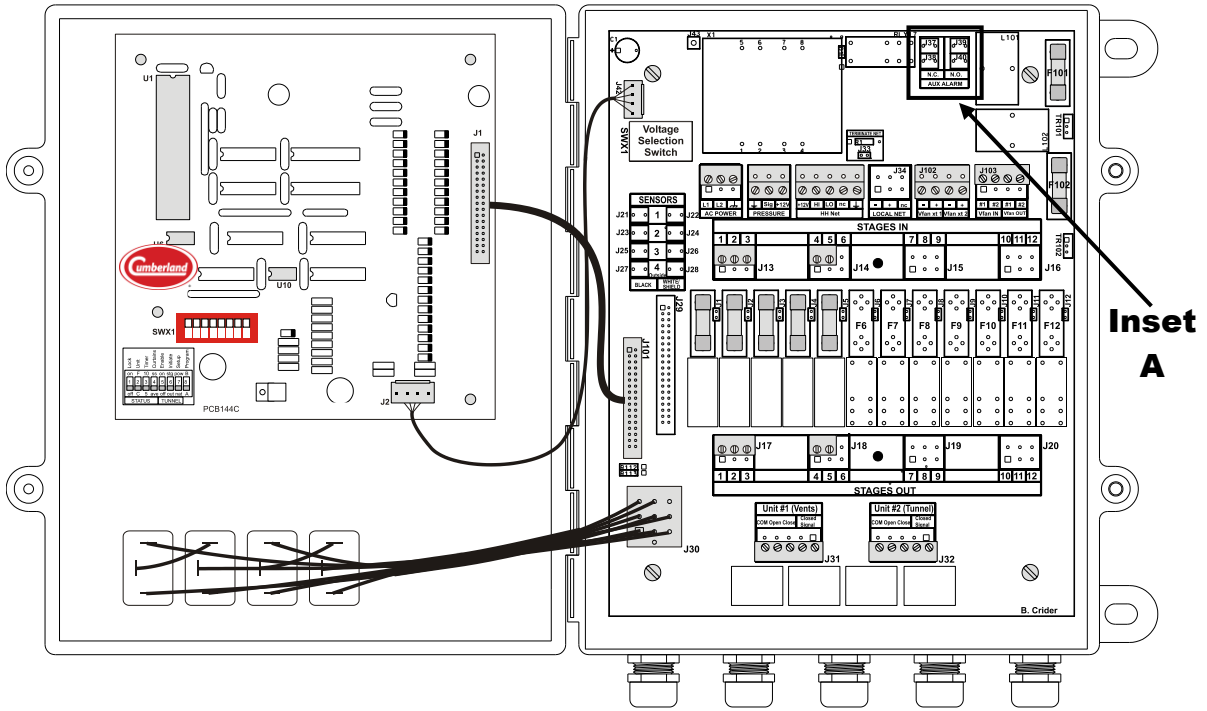


Inset A



11.9 Connecting the SC-5v2 to a Series or Parallel Alarm

SC-5v2 – Right & Left Side Compartments



Note: The internal wiring shows the condition of the alarm relay during normal conditions (no alarm present). During an alarm condition, the contact positions will be reversed.

12. References

12.1 Temperature vs. Sensor Resistance Table

The following chart gives the resistance when measured between the white and black sensor wires at a given temperature. To check a sensor, first know the temperature in the area, then, use a multi-meter to check the resistance.

Resistance Kohms	Temp (F)	Temp (C)	Resistance Kohms	Temp (F)	Temp (C)	Resistance Kohms	Temp (F)	Temp (C)
32.654	32	0	15.714	59	15	8.59	83.3	28.5
32.158	32.5	0.3	15.568	59.4	15.2	8.517	83.7	28.7
31.671	33.1	0.6	15.353	59.9	15.5	8.408	84	28.9
31.191	33.6	0.9	15.211	60.3	15.7	8.336	84.6	29.2
30.72	34.2	1.2	15.001	60.8	16	8.23	85.1	29.5
30.257	34.7	1.5	14.863	61.2	16.2	8.125	85.6	29.8
29.802	35.2	1.8	14.658	61.7	16.5	8.056	86	30
29.355	35.8	2.1	14.457	62.2	16.8	7.954	86.5	30.3
28.915	36.3	2.4	14.325	62.6	17	7.853	87.1	30.6
28.482	36.9	2.7	14.128	63.1	17.3	7.787	87.4	30.8
28.057	37.4	3	13.999	63.5	17.5	7.689	88	31.1
27.777	37.8	3.2	13.808	64	17.8	7.592	88.5	31.4
27.363	38.3	3.5	13.682	64.4	18	7.496	89.1	31.7
26.957	38.8	3.8	13.496	64.9	18.3	7.433	89.4	31.9
26.557	39.4	4.1	13.373	65.3	18.5	7.34	90	32.2
26.164	39.9	4.4	13.192	65.8	18.8	7.248	90.5	32.5
25.777	40.5	4.7	13.073	66.2	19	7.157	91	32.8
25.523	40.8	4.9	12.896	66.7	19.3	7.098	91.4	33
25.147	41.4	5.2	12.779	67.1	19.5	7.009	91.9	33.3
24.777	41.9	5.5	12.607	67.6	19.8	6.922	92.5	33.6
24.413	42.4	5.8	12.493	68	20	6.836	93	33.9
24.055	43	6.1	12.325	68.5	20.3	6.779	93.4	34.1
23.82	43.3	6.3	12.215	68.9	20.5	6.695	93.9	34.4
23.472	43.9	6.6	12.051	69.4	20.8	6.612	94.5	34.7
23.13	44.4	6.9	11.943	69.8	21	6.531	95	35
22.793	45	7.2	11.783	70.3	21.3	6.45	95.5	35.3
22.572	45.3	7.4	11.678	70.7	21.5	6.371	96.1	35.6
22.244	45.9	7.7	11.522	71.2	21.8	6.319	96.4	35.8
21.922	46.4	8	11.42	71.6	22	6.241	97	36.1
21.71	46.8	8.2	11.268	72.1	22.3	6.165	97.5	36.4
21.397	47.3	8.5	11.168	72.5	22.5	6.089	98.1	36.7
21.088	47.8	8.8	11.02	73	22.8	6.015	98.6	37
20.886	48.2	9	10.874	73.6	23.1	5.941	99.1	37.3
20.586	48.7	9.3	10.778	73.9	23.3	5.869	99.7	37.6
20.29	49.3	9.6	10.636	74.5	23.6	5.798	100.2	37.9
20.096	49.6	9.8	10.542	74.8	23.8	5.728	100.8	38.2
19.809	50.2	10.1	10.404	75.4	24.1	5.658	101.3	38.5
19.526	50.7	10.4	10.312	75.7	24.3	5.59	101.8	38.8
19.34	51.1	10.6	10.177	76.3	24.6	5.522	102.4	39.1
19.065	51.6	10.9	10.088	76.6	24.8	5.456	102.9	39.4
18.884	52	11.1	9.956	77.2	25.1	5.39	103.4	39.7
18.616	52.5	11.4	9.869	77.5	25.3	5.326	104	40
18.352	53.1	11.7	9.741	78.1	25.6	5.262	104.5	40.3
18.179	53.4	11.9	9.614	78.6	25.9	5.199	105.1	40.6
17.503	54.9	12.7	9.53	79	26.1	5.137	105.6	40.9
17.339	55.2	12.9	9.407	79.5	26.4	5.076	106.2	41.2
17.095	55.8	13.2	9.325	79.9	26.6	4.995	106.9	41.6
16.856	56.3	13.5	9.205	80.4	26.9	4.936	107.4	41.9
16.698	56.7	13.7	9.086	81	27.2	4.877	108	42.2
16.465	57.2	14	9.007	81.3	27.4	4.82	108.5	42.5
16.312	57.6	14.2	8.891	81.9	27.7	4.763	109	42.8
16.085	58.1	14.5	8.815	82.2	27.9	4.688	109.8	43.2
15.935	58.5	14.7	8.702	82.8	28.2			

12.2 Replacement and Accessory Parts List

	Description	Notes
Control		
6607-1605	FH-SC5v2-0-2	w/o Temp. Sensors
6607-1606	FH-SC5v2-S-2	w/ Temp. Sensors
Replacement Parts		
Circuit Boards		
6407-0619	/DOOR ASSY SC-5v2	(incl. PCB144, Switches & 9 pin Cable Assy)
6407-1567	/PCB164 SC-5v2 w/QA	
Terminal Blocks		
3006-5077	CONN Terminal Block 3 pos	* Black
3006-5078	CONN Terminal Block 4 pos	* Black
3006-5079	CONN Terminal Block 5 pos	* Black
3006-5082	CONN TBLK 3pos Magnum	* Green
3006-5084	CONN TBLK 4pos Magnum	* Green
3006-5086	CONN TBLK 5pos Magnum	* Green
3006-5107	CONN TBLK 2pos Magnum	* Green
Fuses		
3010-0102	FUSE 15 AMP 5mm X 20mm fast-action	F1 thru F5, F101, F102
Chips		
3701-6023	PIC FH-S5-2 (Processor)	
3701-6029	EEPROM FH-S5-2	
3540-0149	DIGITAL_IC LTC1483CN8 (Network Chip)	
Sensors and Wire Assemblies		
1503-2427	CBL SJT 18-2 Yellow (sensor)	
6407-2593	/Temperature sensor asy 15'	
1902-2974	CBLA FHSC-5v2 Ribbon34cond 11"	
1902-2877	CBLA FH-SM 8 & 12 Power (4 conductor)	
1902-2881	CBLASY Data shuttle-Contl 2'	
Misc		
3001-2863	SWTCH SPDT toggle tab	*Auto-Manual Switch
3001-2864	SWTCH SPDT togle cen off tab	* Open/Off/Close Switch
3006-0137	CONB IDC Scotch lock 19-24g	
3006-2984	CONN IDC 2 pin MINI JUMPERS	

12.3 Program Reference

Program Parameters

P1 -- Stage Sensor	The combination of sensors used to determine whether that stage should be on or off. 1 = Stage uses sensor 1 2 = Stage uses sensor 2 3 = Stage uses an average of both sensors 1 & 2
P2 -- Stage Mode	Heat, Cool Negative, etc. This setting determines when the stage is allowed to run, and how the stage will run. 1 = Heat Mode 2 = Cool Stir Mode 3 = Cool Negative Mode 4 = Cool Negative Tunnel Mode 5 = Cool Tunnel Mode
P3 -- Stage on Timer	Any cool stage can be placed on the system timer. This timer is settable to 5 or 10 minutes. Any stage on a timer will run for the system runtime percentage. (Example: 30% runtime of 10 minutes = 3 minutes out of each ten.) 0 = No Timer 1 = Standard Timer 2 = Cool Timer (Stage 5 and variable speed stages only.)
P4 -- Onpoint	The temperature at which a stage will turn on.
P5 -- Offpoint	The temperature at which a stage will turn off.
Maximum On Point	The temperature at which a variable speed fan stage will run at full speed. This is set as the stage On Point (P4).
Minimum On Point	The temperature at which a variable speed fan will run continuously at its minimum speed. Any temperature increase from that point will cause the speed to increase. This is set as the stage Off Point (P5).
P10 -- Minimum Runtime Percentage	If temperature is below the OffPoint, the percent of the system timer that the fan will run at its minimum speed.
P11 -- Motor Curve	Different manufacturers' motors speeds vary at different rates. For this reason, it is necessary to make calculations based on the fan manufacturer. 0 = Cumberland's 24" size fan or less. Single Phase 1 = Cumberland's 36" size fan or less. 2 = Three Phase, Variable-Speed fan with wide variance from 100% speed to 95% speed. 3 = Three Phase, Variable-Speed fan with very little variance from 100% speed to 5% speed. 4 = Cumberland's 24" or smaller fan with Emerson fan motors.
P20 -- Cycle Time	The length of time in minutes between the start of one curtain position adjustment, and the start of the next curtain position adjustment. (Cycle time of 3 means that the curtain will move up or down (or remain stationary) depending upon temperature for its runtime once every 3 minutes.)
P21 -- Run Time	The number of seconds that the curtain machine will run opening or closing at the beginning of each curtain cycle (See Cycle Time).

P22 -- Initial Run Time	Number of seconds to run on the first drop from closed. This is to be sure that you have cleared the top of the opening. This setting only applies when the controller senses that the curtain is closed when it begins its run.
P23 -- Degrees above target (Unit 1)	Many times it is more cost effective to bring a slightly high temperature back into range with a fan. This setting allows you to specify a number of degrees above the target temperature that the curtain will allow before trying to open.
P24 -- Degrees above target (Unit 2)	Occasionally, a grower may want one curtain sidewall to drop before the other to try to avoid large temperature swings. This setting allows for this to happen. Note: If you would like both curtain units to always react together, you must set P23=P24.
P25 -- Tunnel Onpoint	This is the sensor 3 temperature at which the controller will enter tunnel mode. Only applicable when tunneling on outside temperature.
P26 -- Tunnel Offpoint	This is the sensor 3 temperature at which the controller will enter tunnel mode. Only applicable when tunneling on outside temperature.
P27 -- Close Override	The degrees below target at which time the curtains will override to close.
P40 - HHNet Address	Unique setting for controllers along a single network wire pair. Only used with the PC compatibility feature using Cumberland's Farm Manager software.
P41 -- Version Number	This is the version of the software for the controller. This value is not settable.
P42 -- Controller Type	This is a number that identifies the type of controller (Swine Finisher) to the Farm Manager Software (PC compatible)
PS1 - Calibrate Sensor 1	The temperature the controller reads from Sensor 1. This setting is used only when calibrating sensors. Press the + and/or - buttons until the correct reading is seen in the main display. (See Sensor Calibration)
PS2 - Calibrate Sensor 2	The temperature the controller reads from Sensor 2. This setting is used only when calibrating sensors. Press the + and/or - buttons until the correct reading is seen in the main display. (See Sensor Calibration)
PS3 - Calibrate Sensor 3	The temperature the controller reads from Sensor 3. This setting is used only when calibrating sensors. Press the + and/or - buttons until the correct reading is seen in the main display. (See Sensor Calibration)

12.4 Status Switches Reference

Status Switches (Located inside the Controller Door)

SWX 1 - Lock	Locks the front panel to protect your settings from accidental change. If the switch is set to ON the program settings are locked.
SWX 2 - Fahrenheit or Celsius	Switches the temperature readings from Fahrenheit to Celsius. If the switch is set to ON the controller will read the sensors as Fahrenheit. (Note: If you change this switch, you will have to reset your tunnel on points and off points and your Target Temperature.)
SWX 3 - 5/10 minute timer	This switch selects between a 5 and 10 minute system timer. If the switch is on, the timer is 10 minutes.
SWX 4 - Curtains On Separate Sensor	This switch is used to choose whether the curtain machines operate off the same sensor or if they operate independently. If the switch is on, the curtains are independent with curtain 1 running on sensor 1, and curtain 2 running on sensor 2.
SWX 5 - Tunnel On/Off	Enables/Disables tunnel mode When this switch is in the off position, the controller will not go into tunnel for any reason.
SWX 6 - Tunnel On Stage	Option to have the controller go into tunnel whenever the first tunnel stage turns on. If this switch is off, the controller will use the "Tunnel On Point" setting for entry into tunnel.
SWX 7 - Power Ventilate	If you have a power ventilated house the controller will leave the inlet curtain closed until tunnel mode is entered. This switch must be set to "on" if you have a Power Ventilated house.
SWX 8 - Program 'A' or 'B'	This switch is used to toggle between 2 preset programs. This could be used to store separate summer/winter programs for instance. The ON position is for Program A, and the OFF position is for Program B.

12.5 Error Codes

12.5.1 Descriptions

If your controller is displaying an “E1”, or “E2”, etc. the controller has recorded an error. The controller records errors from sensor readings, and tunnel related problems. To diagnose your controller problem, look up the error on the table (under “Error Codes”) and look across the table to find the components that have failed. (Items with an “x” have failed according to the controller.)

Error Code	Description	Sensor 1 Error	Sensor 2 Error	Sensor 3 Error	Tunnel Error
E1	Sensor 1 Error	X			
E2	Sensor 2 Error		X		
E3	Sensor 1 & 2 Error	X	X		
E4	Sensor 3 Error			X	
E5	Sensor 1 & 3 Error	X		X	
E6	Sensor 2 & 3 Error		X	X	
E7	Sensor 1,2 & 3 Error	X	X	X	
E16	Tunnel Error				X
E17	Tunnel and Sensor 1 Error	X			X
E18	Tunnel and Sensor 2 Error		X		X
E19	Tunnel and Sensor 1 & 2 Error	X	X		X
E20	Tunnel and Sensor 3 Error			X	X
E21	Tunnel and Sensor 1 & 3 Error	X		X	X
E22	Tunnel and Sensor 2 & 3 Error		X	X	X
E23	Tunnel and Sensor 1,2 & 3 Error	X	X	X	X

12.5.2 Possible Solutions

Sensor Error

If any of the sensors are bad try the following:

- Reset the controller by taking power away at the breaker, or unplugging it.
- Determine which sensor is bad, and then check the connection inside the controller door.
- Determine which sensor is bad, and then check the sensor that is hanging in the house to make sure that it has not been damaged.
- Check the wire going to the sensor(s) to be sure there are no staples through the wires.
- Replace the bad sensor.

Tunnel Error

The controller will error if it can not open the inlet curtain or if you are using a main curtain, it will error if it can not close the main curtain.

Note: If not using a main curtain, you must put a jumper wire across the main curtain closed signal inside the control box.

If you see a tunnel error, check the following:

- Make sure that the inlet is operating correctly.
- If applicable, make sure the main curtain is operating correctly.
- Make sure that the curtain closed signals inside the control box are wired to the auxiliary switches inside the PowerTrak.

12.6 Curtain Movement Time (sec.) Vs. Distance (inches/cm.)

To find the distance moved, select the chart corresponding to a specific Motor Speed and Cabling Ratio.

NOTE: Cabling Ratio = First number is PT and second number is load.

Motor RPM	Cabling Ratio	Seconds	Inches	Centimeters
15	1 to 1	5	0.25	0.635
		10	0.50	1.27
		15	0.75	1.905
		30	1.5	3.81
		45	2.25	5.715
		60	3	7.652
	1 to 2	5	0.5	1.27
		10	1.0	2.54
		15	1.5	3.81
		30	3.0	7.62
		45	4.5	11.43
		60	6.0	15.24
	2 to 1	5	0.125	0.3175
		10	0.25	0.635
		15	0.375	0.9525
		30	0.75	1.905
		45	1.125	2.875
		60	1.5	3.81
30	1 to 1	5	0.5	1.27
		10	1.0	2.54
		15	1.5	3.81
		30	3.0	7.62
		45	45.5	11.43
		60	6.0	15.24
	1 to 2	5	1	2.54
		10	2	5.08
		15	3	7.62
		30	6	15.24
		45	9	22.86
		60	12	30.48
	2 to 1	5	0.25	0.635
		10	0.50	1.27
		15	0.75	1.905
		30	1.5	3.81
		45	2.25	5.715
		60	3	7.652
60	1 to 1	5	1	2.54
		10	2	5.08
		15	3	7.62
		30	6	15.24
		45	9	22.86
		60	12	30.48
	1 to 2	5	2	5.08
		10	4	10.16
		15	6	15.24
		30	12	30.48
		45	18	45.72
		60	24	60.96
	2 to 1	5	0.5	1.27
		10	1.0	2.54
		15	1.5	3.81
		30	3.0	7.62
		45	45.5	11.43
		60	6.0	15.24

13. Program Data Sheet

Use this Data Sheet to record your personal settings for the SC-5v2. Copy this form as needed.

Farm Hand SC-5v2

Target	
V1 Min. Speed	
V2 Min. Speed	
Timer %	

Control Switches	
Swx 1 Lock	On/Off
Swx 2 Unit	On-Far./Off Cel.
Swx3 Timer	On-10/Off-5
Swx 4 Curtain	On-SS/Off-Avg.
Swx 5 Tunnel On	On/Off
Swx 6 Initiate	On-Stage/Off-Outside
Swx 7 House Style	On-Power/Off-Natural
Swx 8 Program	On-B/Off-A

Stages	Equipment	P4 OnPoint	P5 OffPoint	P1 Sensors	P2 Mode	P3 Timer	P10 Runtime %	P11 Motor Curve
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

P20 Curtain Cycle Time	Min.
P21 Curtain Runtime	Sec.
P22 Curtain Initial Runtime	Sec.
P23 Unit 1 DAT	
P24 Unit 2 DAT	
P25 Tunnel "On" Temp	
P26 Tunnel "Off" Temp	
P27 Close Override	

Network Address	P40	
Software Version	P41	
Controller Setup	P42	
Cool Timer Max. %	P70	
Cool Time Min. %	P71	

P1 Sensors

10=Sensor 1
02=Sensor 2
12=Avg. Sen 1&2

P2 Mode

1=Heat
2=Cool Stir
3=Cool Neg
4=Cool Neg Tunnel
5=Cool Tunnel

P3 Timer

0=Off Timer
1=On Normal Timer
2=On Cool Timer

(Version 15 or above)

