JDN5-PLUS

Specifications

Size of enclosure	7” x 10” x 6”
Input voltage	120VAC
Output	10 Normally open relays
Temperature sensor	The 3’ cord can be extended to 100’
Warranty	1 year

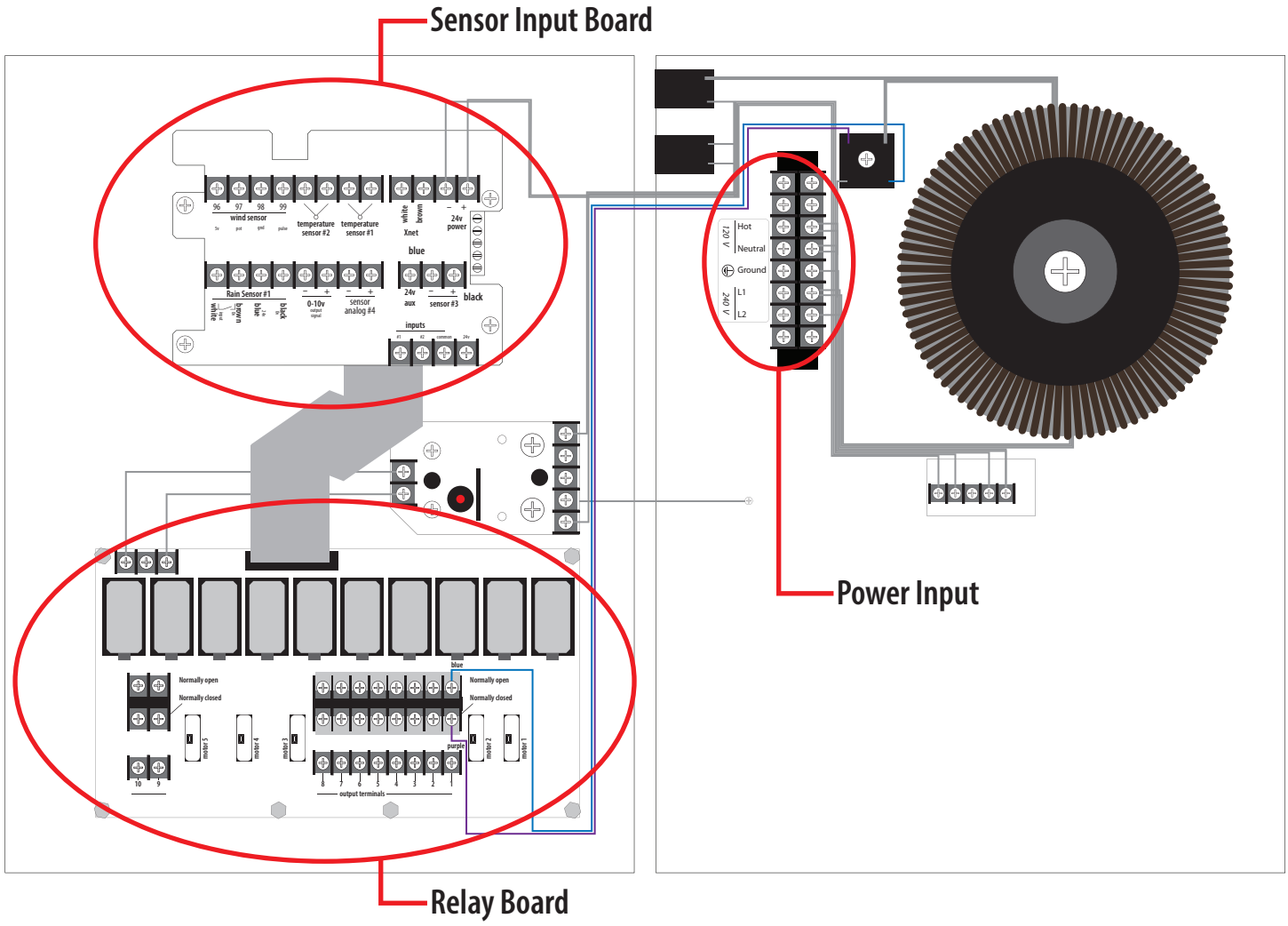
Electrician's Guide for JDN5-PLUS System

Thank you for purchasing the JDN5-PLUS System.
It is designed for easy installation and operation.
The system is designed to control curtains, heaters, and fans.

Main Features

The JDN5-PLUS System is designed for the unique challenges of dairy and animal facilities.

- Temperature sensor
- Wind speed sensor option
- Humidity option
- Battery backed clock
- 10 relay outputs
- Adjustable temperature settings
- Touch screen display
- Manual overrides



Installing the JDN5-PLUS

Consider the following before installing the JDN5-PLUS:

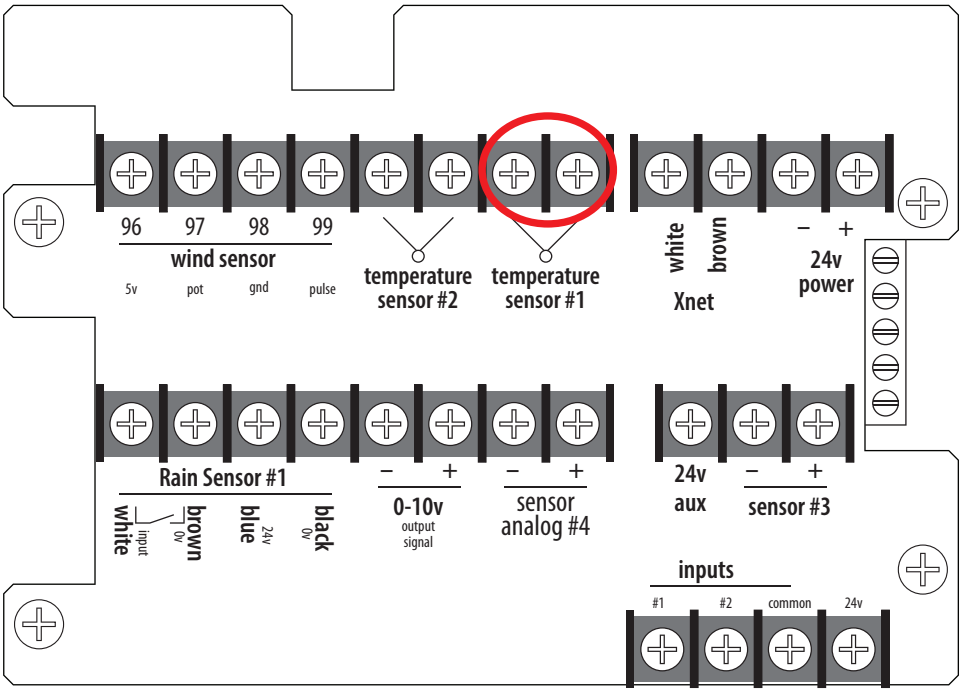
- Protect the enclosure from moisture—mount it in a secure and dry place.
- Important: Only drill holes in the bottom of the enclosures.
- Condensation runs downhill. Drilling holes into the top or upper sides of the enclosure voids the warranty.

Wiring the Temperature Sensor

Place the temperature sensor in the middle of the building or in a location that represents the building's average temperature.

>> It is important to not allow sensors to come into contact with direct sunlight.

Connect the temperature sensor to temperature sensor #1 terminals. Polarity is not important.



Extending the temperature sensor:

1. Run 18-22 AWG wire (twisted or shielded wire if possible) from the sensor to the JDN5-PLUS. Keep the sensor wire away from high voltage wire by at least 1 foot. Specifically, keep it away from the VFD output wires.
2. Solder or use gel-filled crimps to connect your wires to the temperature sensor.

Connecting Wind Meter

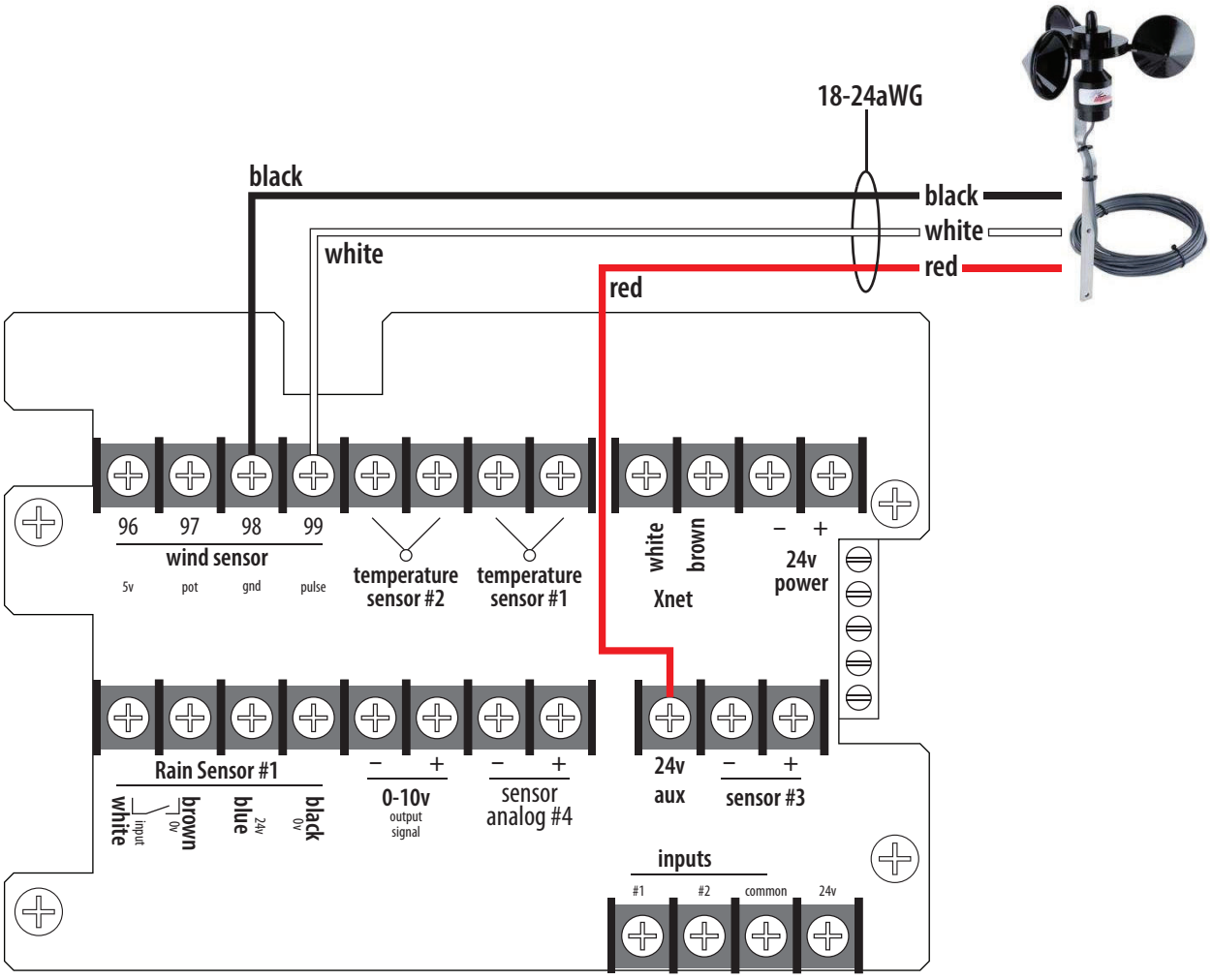
The wind meter is used to close curtains or shut off fans in high wind conditions. JDN5-PLUS series controls don't sense wind direction, so it responds no matter which direction the wind comes from.

Connections:

The black wire connects to 98 (gnd)

The white wire connects to 99 (pulse)

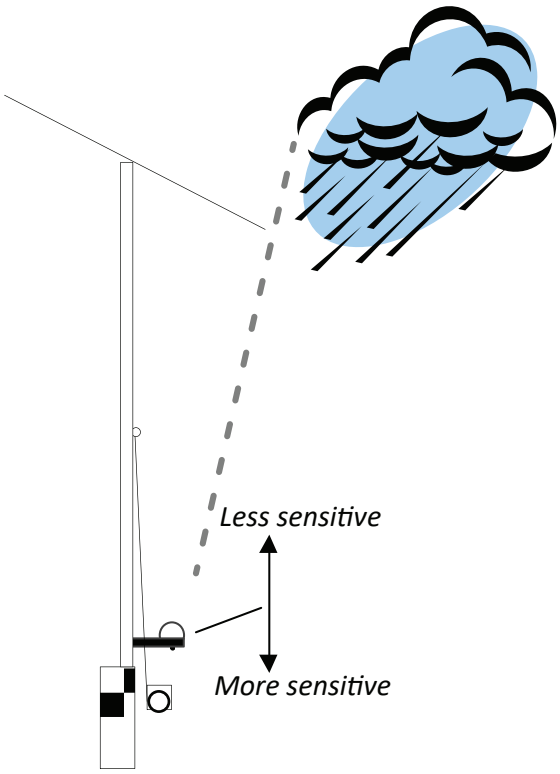
The red wire connects to 24v aux



Connecting Rain Sensors

You can connect a rain sensor to the system. The rain sensor closes select vent motors when it's raining. The system supports up to 3 rain sensors.

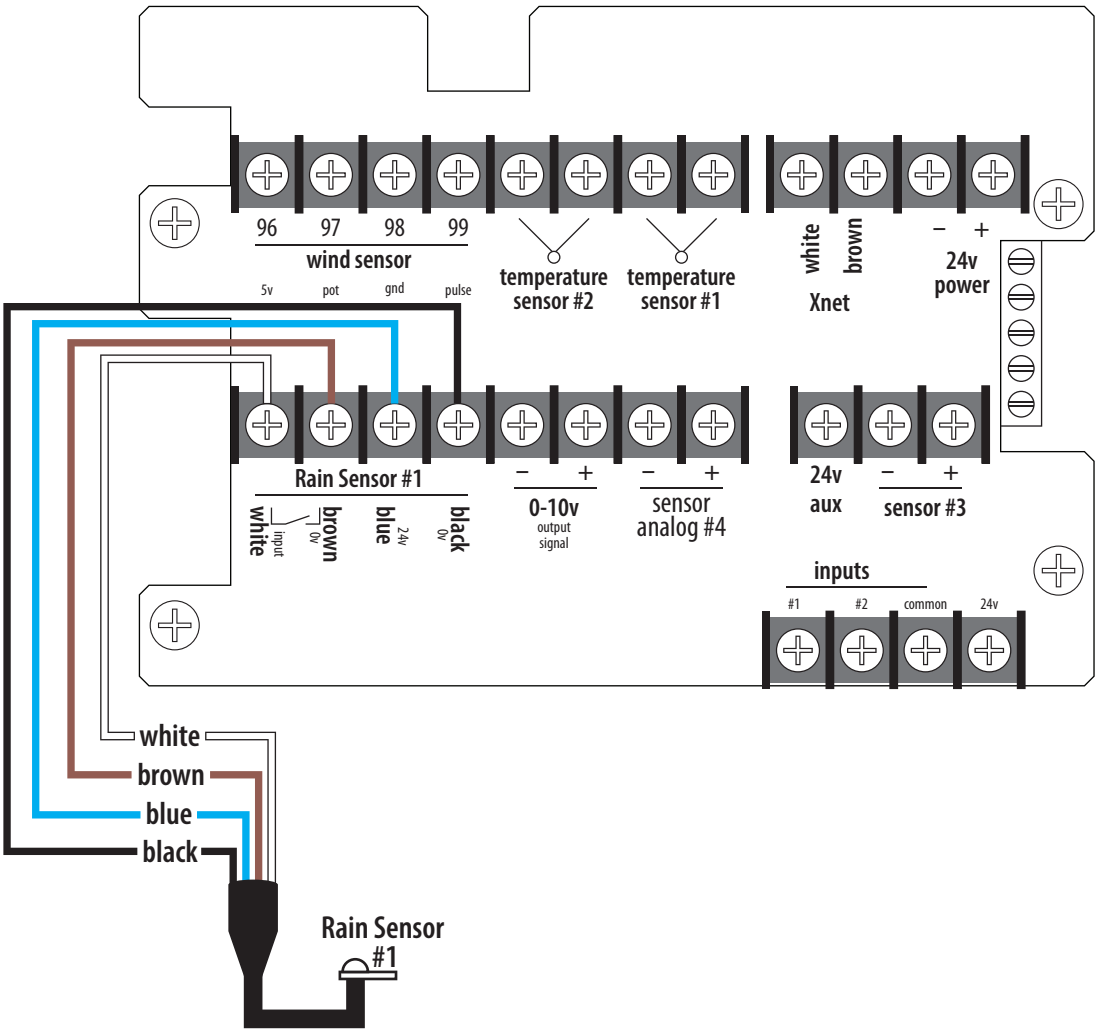
If you connect a rain sensor, the controller needs to know it. Setup parameters P41 through P45 assign the sensor to the vent motors.



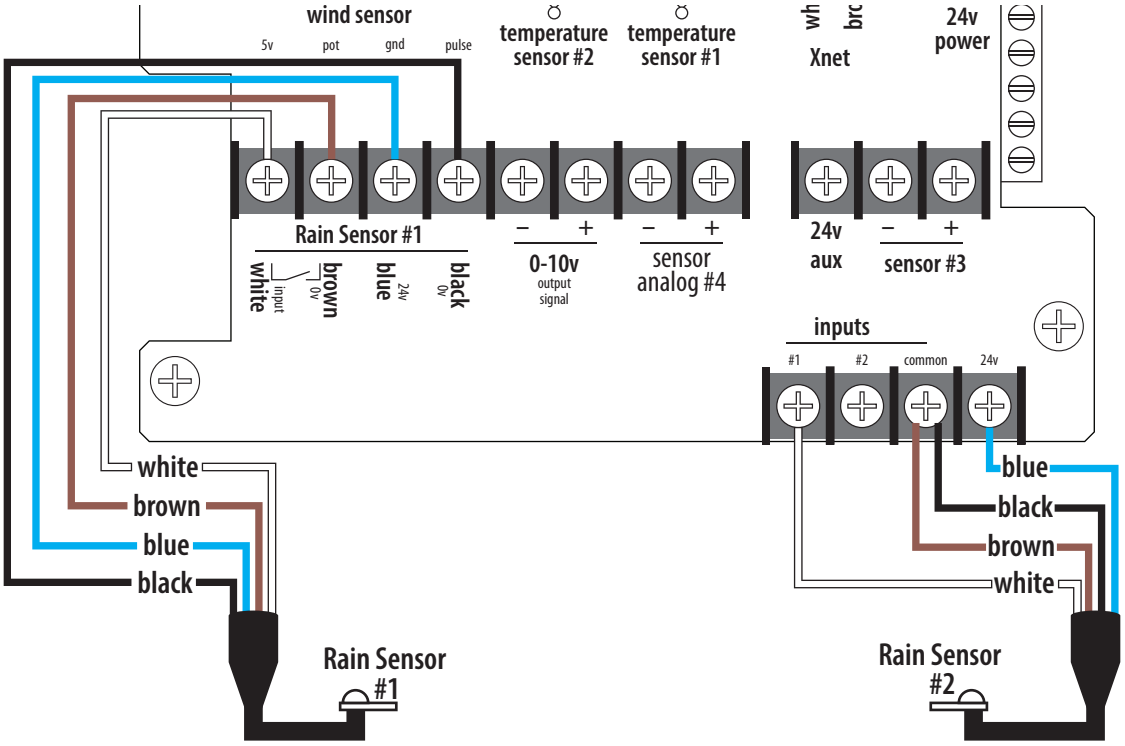
Installing the rain sensor

- Route rain sensor cord 6 inches away from high voltage wires.
- Signal is activated when the sensor becomes wet. The position of the sensor versus the sky dictates the response. (see illustration)

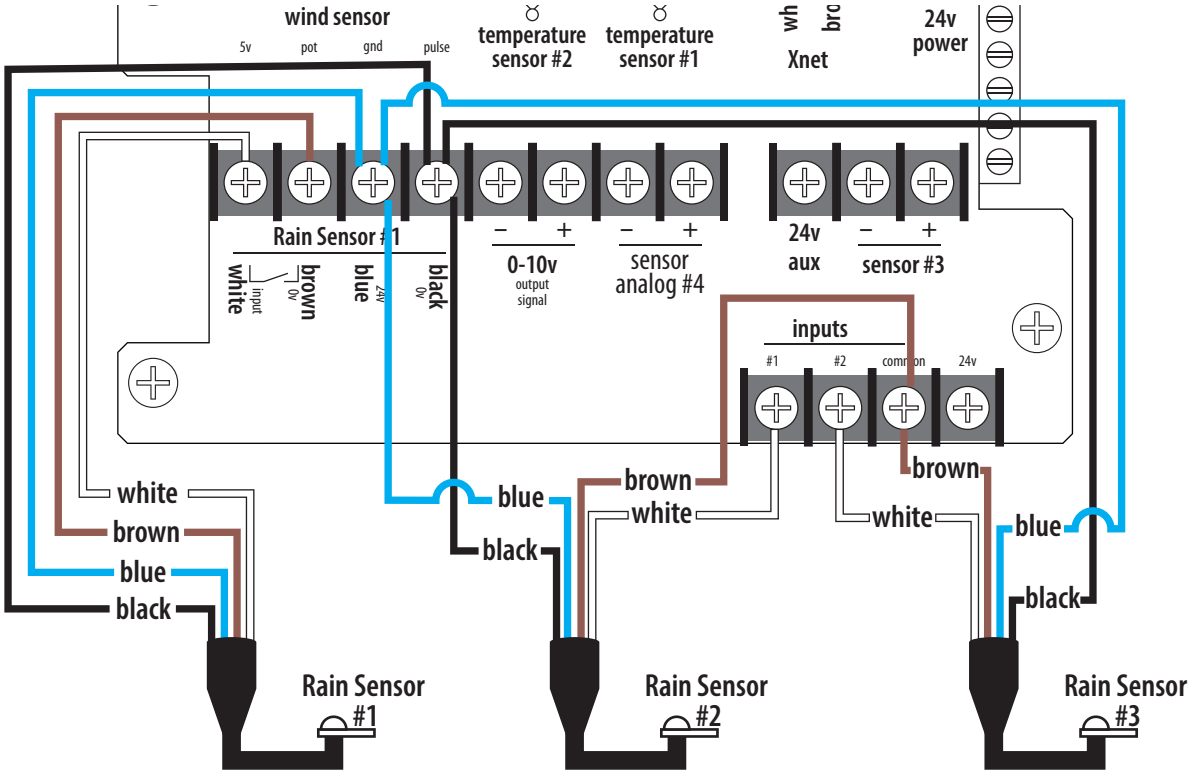
Rain Sensor #1



Rain Sensor #1 and Rain Sensor #2



Rain Sensor #1, Rain Sensor #2 and Rain Sensor #3



Connecting a Humidity Sensor

The humidity sensor allows you to monitor and control the humidity.
If humidity is too high a vent can open or a fan can start.

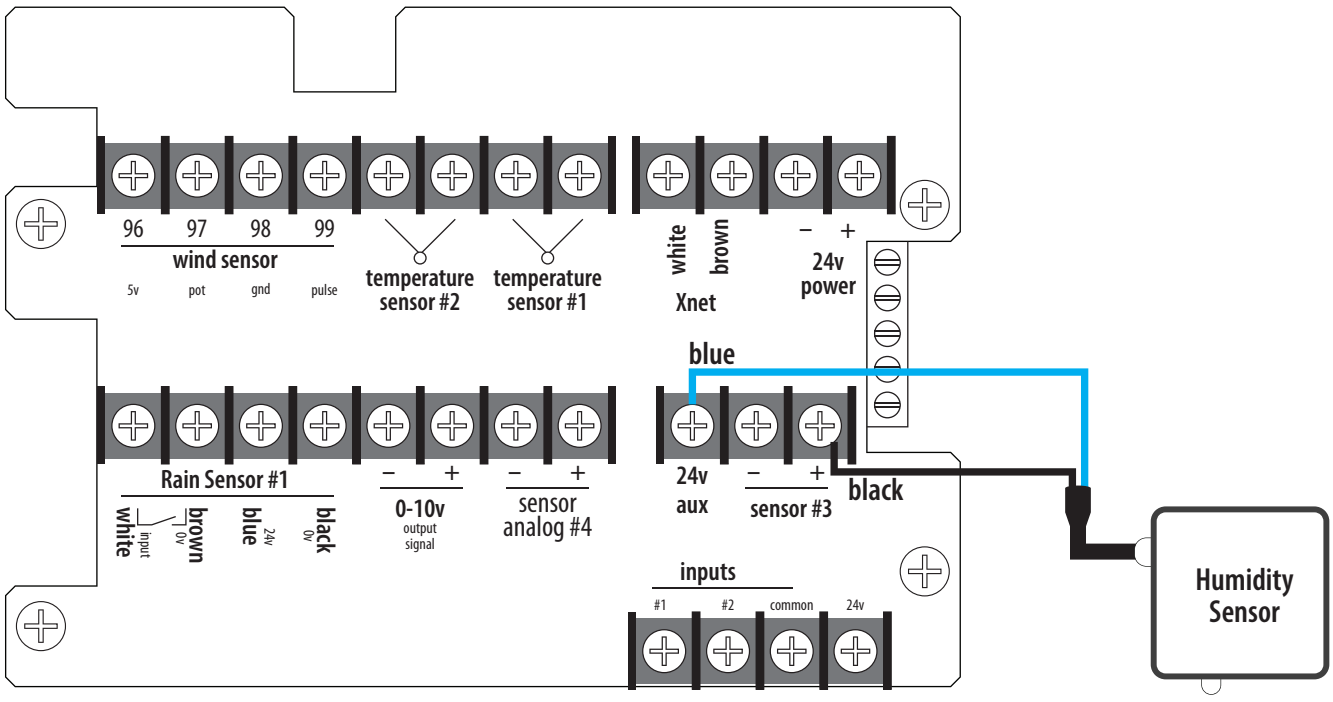
If you connect a humidity sensor, it needs to be activated.
Activate it by selecting humidity for Setup parameter P10.

Installing the humidity sensor

- Mount in a central location.
- Keep the sensor away from heaters or you will get a low reading when the heater is running.
- Route humidity sensor wires 6 inches away from high voltage wires.

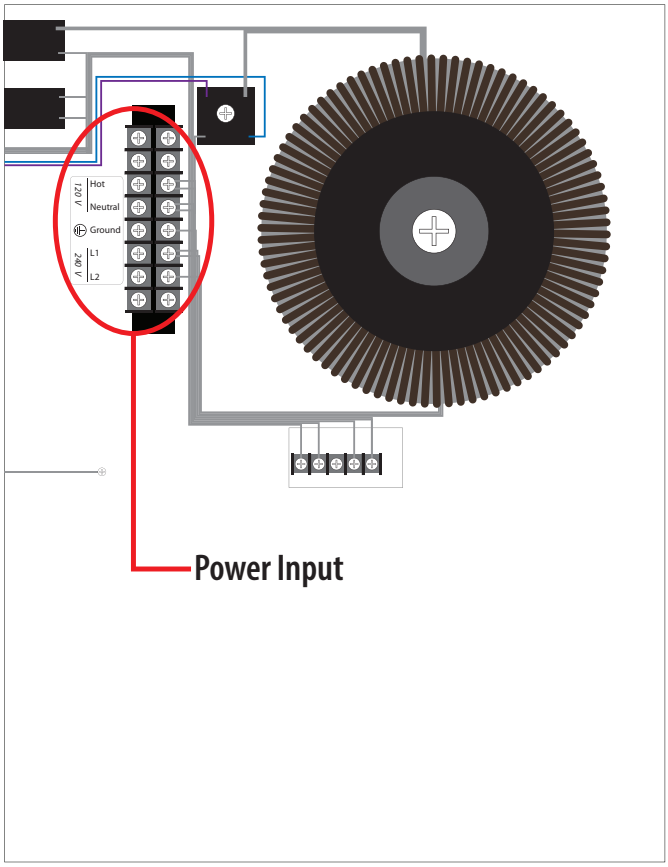
To use a humidity sensor:

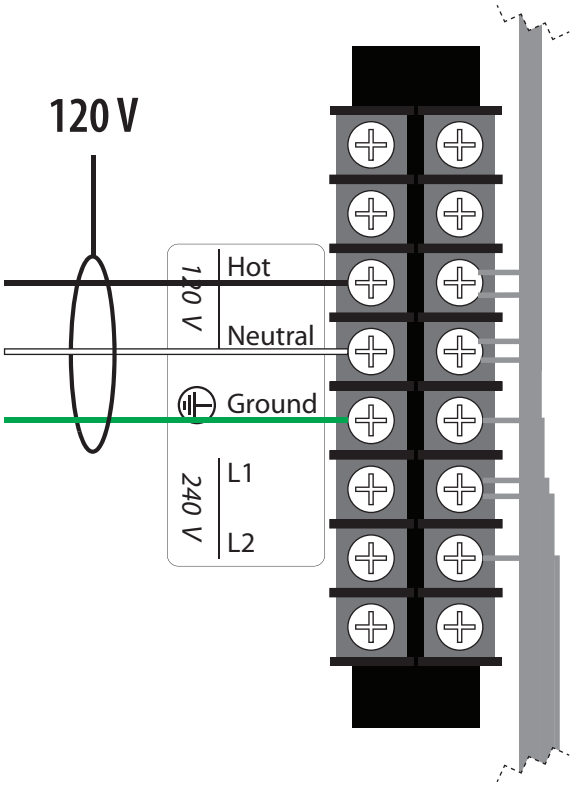
Connections:
J&D Manufacturing humidity sensor, JDRPH-050
Connect the blue wire to Power 24v+
Connect the black wire connects to Sensor #3 +

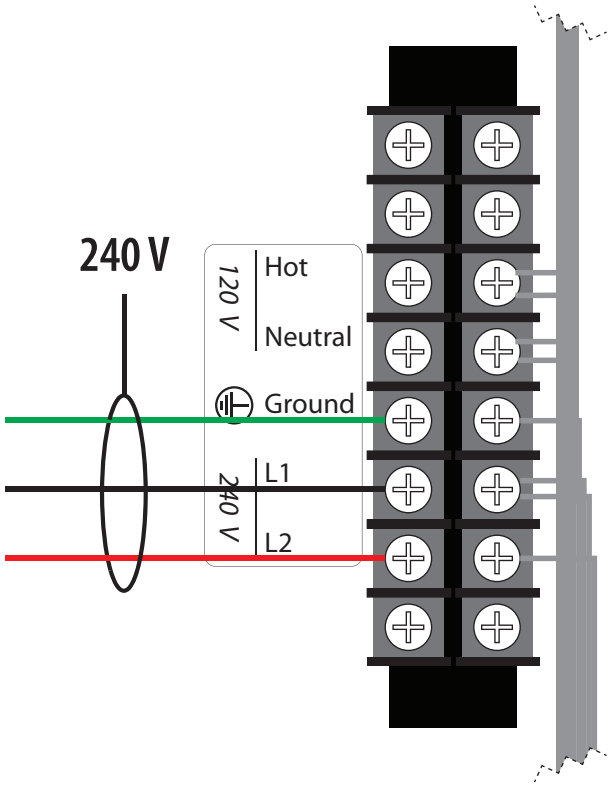


Powering the JDN5-PLUS

Requires 120 V or 240 V.
- For 120 V load is 5 amps
- For 240 V load is 2.5 amps

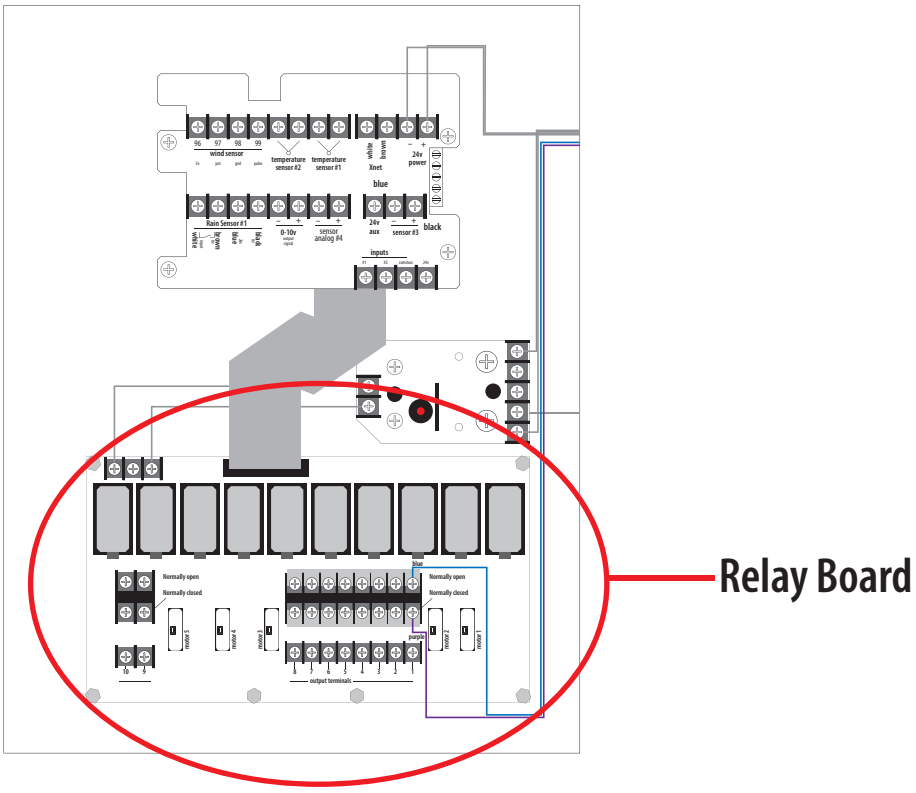


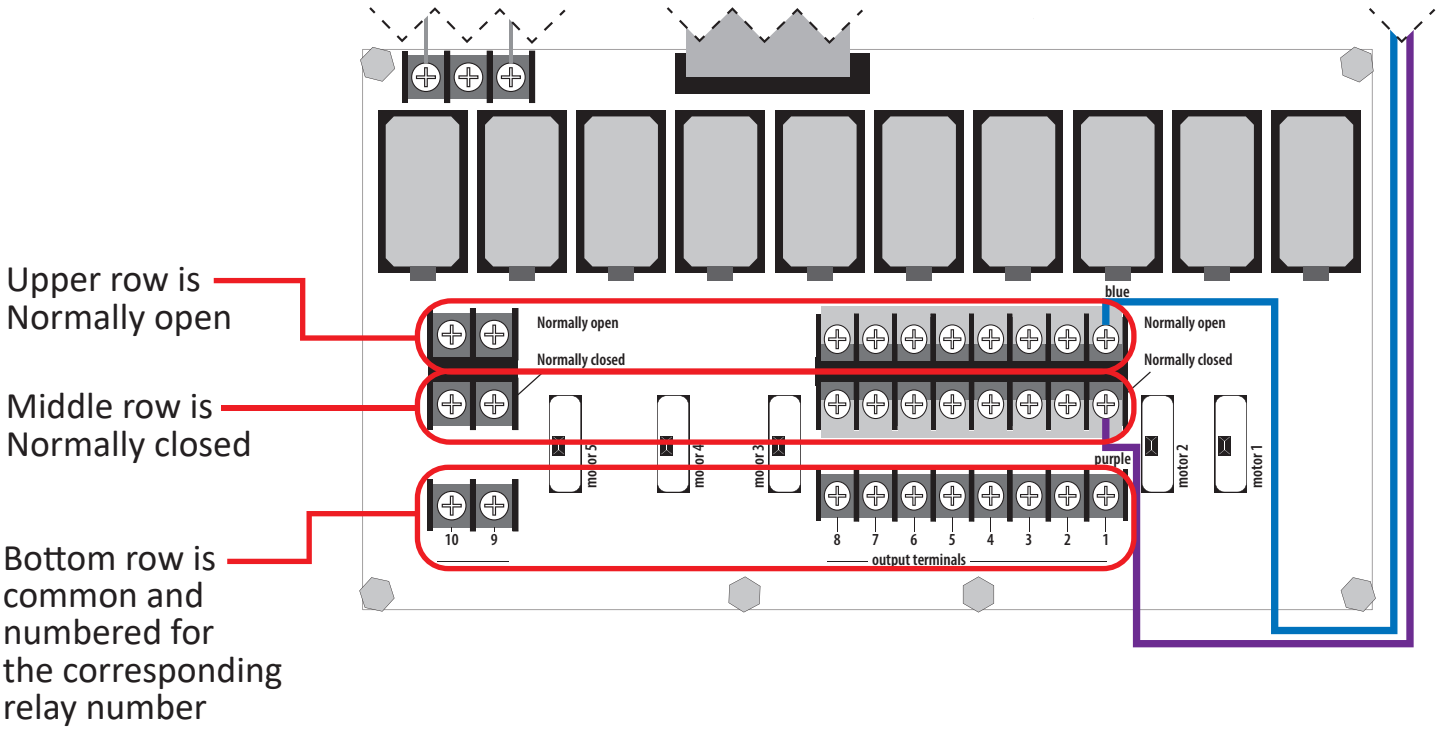




Connecting to Ventilation Equipment

The relay board has 3 rows of terminals where you connect ventilation equipment.



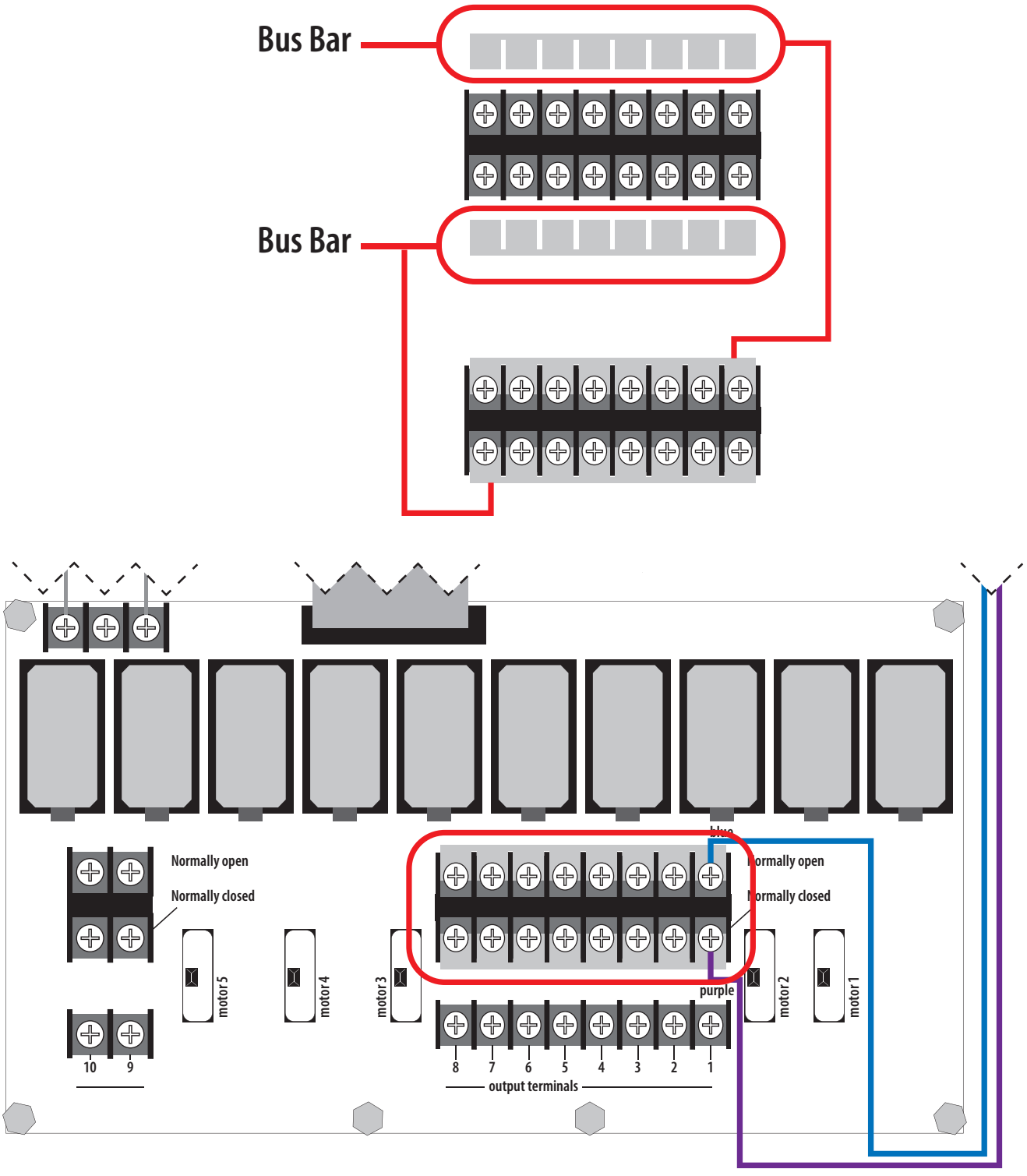


24v Motor Connector Bus Bars

The bus bars are aluminum strips that are intended to make it easy for low voltage vent motor installation.

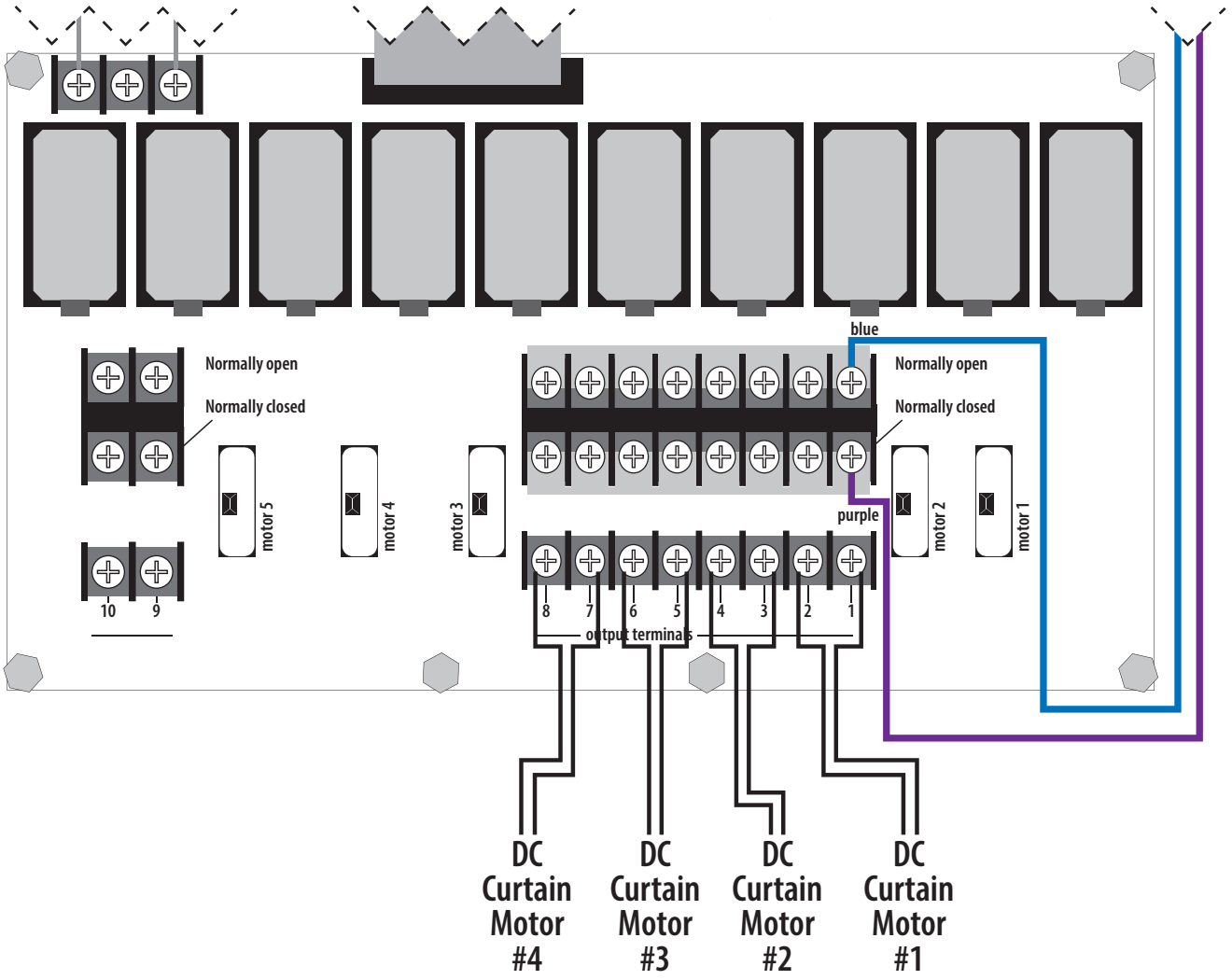
They can be shortened or removed to allow fans, heaters, or lights to be connected instead of vent motors.

To shorten them, remove the connector completely and use pliers to bend it repeatedly to break it apart.



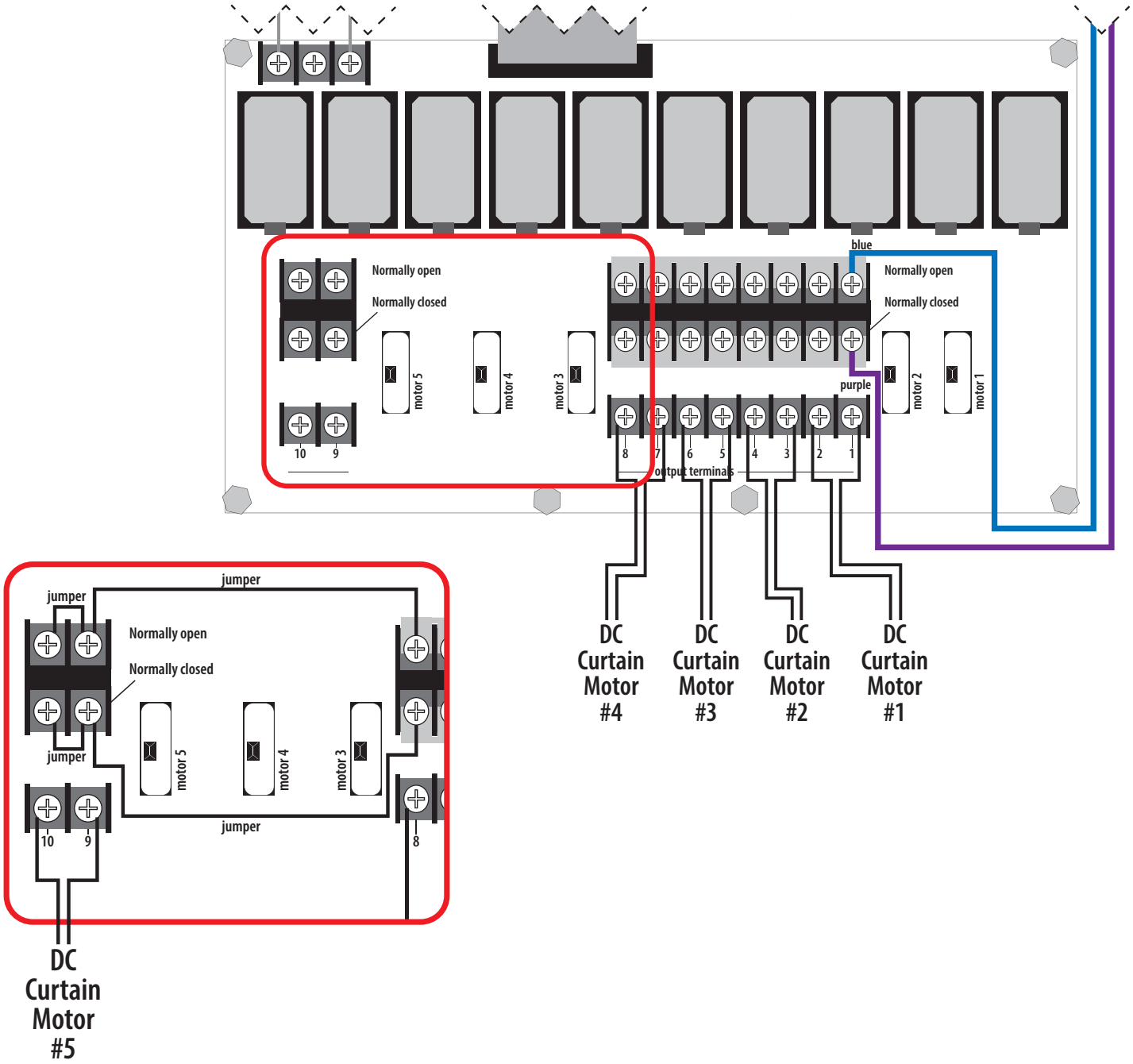
Connecting 4 DC Motors

The JDN5-PLUS includes a 20-amp 24v motor supply.
It is prewired to run several DC curtain motors.
Each has a circuit breaker to protect the motors.
Connect motors directly to the board as shown.
(Full bus bars installed)



Connecting the 5th DC Motor

The JDN5-PLUS includes a 20-amp 24v motor supply.
It is prewired to run several DC curtain motors.
Each has a circuit breaker to protect the motors.
Connect motors directly to the board as shown.
(Full bus bars installed)

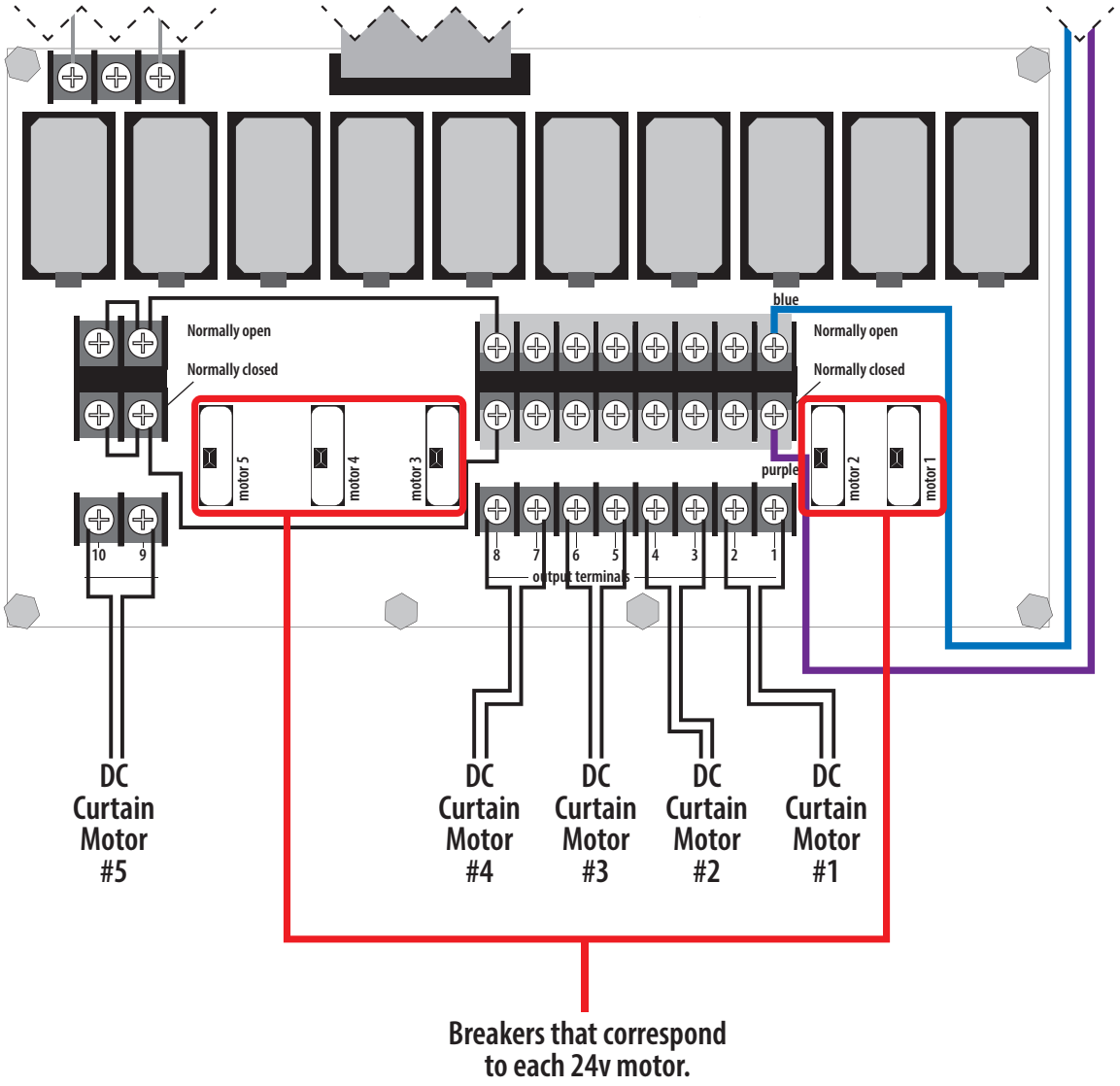


Curtain Motor Circuit Breakers

The JDN5-PLUS come with (5) 5 amp breakers preinstalled. There is a corresponding breaker for each 24v motor.

If a motor's amps go too high, the center tab trips out. Inspect the motor and curtain system to ensure nothing is interfering with normal usage, reset breaker by pressing reset tab on breaker.

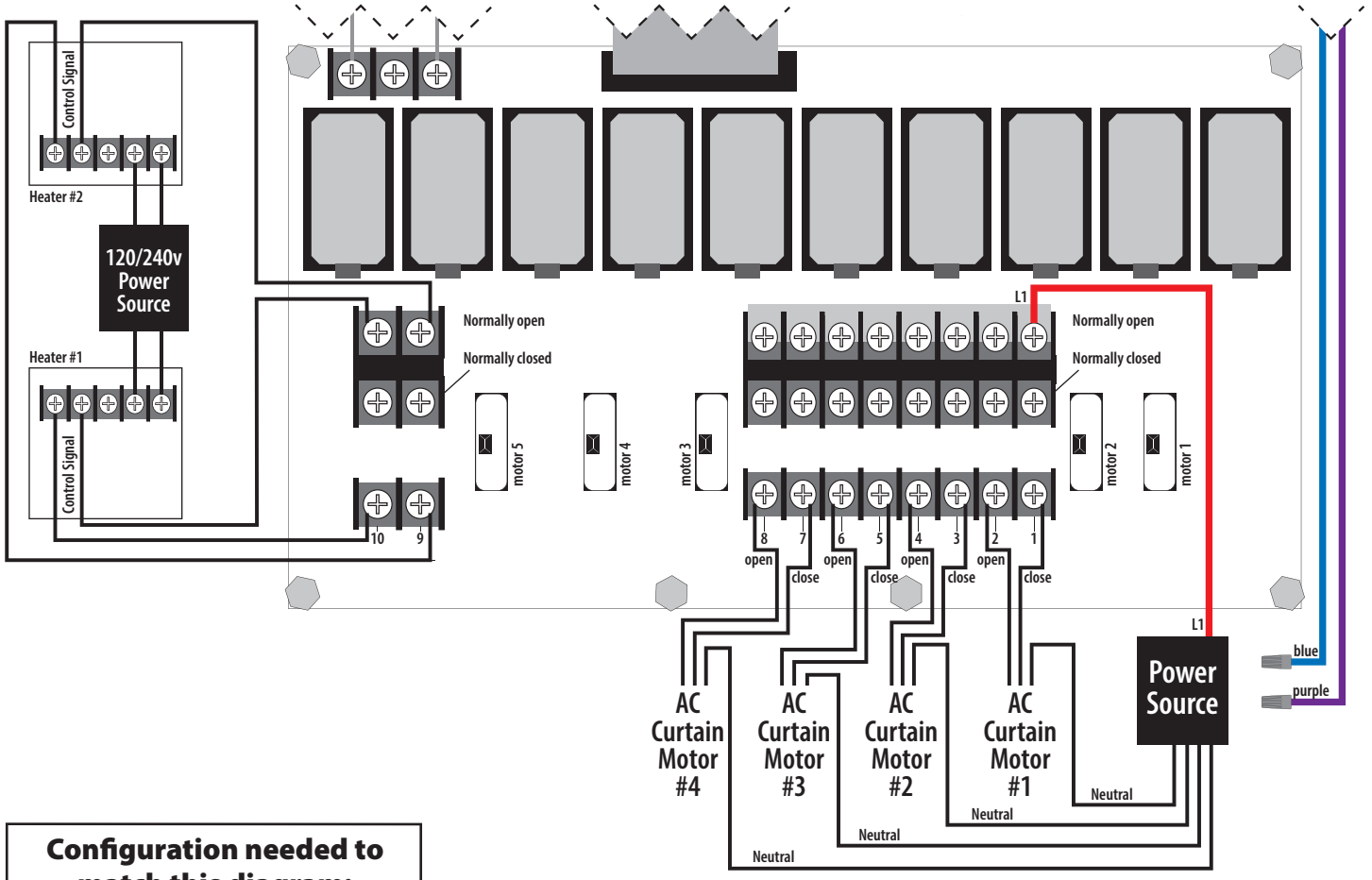
If tripping continues to occur with normal usage you may want to increase your breaker size. Included in the control box are additional 7.5 and 10 amp breakers. For the best curtain material protection and site safety, use the smallest amp that doesn't nuisance trip.



Connecting AC Vent Motors

Small 120v AC vent motors can be run directly from the board as long as they are 1/4 hp or less.

Disconnect the DC motor power supply by insulating the ***blue*** and ***purple*** wires feeding the circuit board.



Configuration needed to match this diagram:

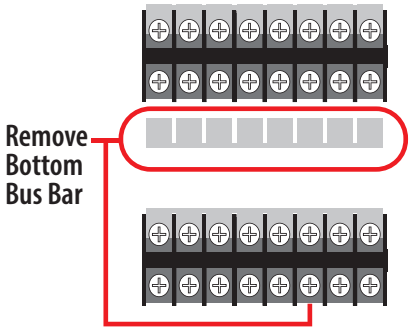
P0 - Number of curtains = 4
P1 - Curtain starting relay = 1
P2 - Number of fans = 0

P4 - Number of heaters = 2
P5 - Heater starting relay = 9
P6 - Number of lights = 0

P8 - Number of soakers = 0

P17 - 0-10v enabled = 0

Important:
For this configuration remove the bottom aluminum bus bar.



Relay#1 = Curtain 1 close signal
Relay#2 = Curtain 1 open signal

Relay#3 = Curtain 2 close signal
Relay#4 = Curtain 2 open signal

Relay#5 = Curtain 3 close signal
Relay#6 = Curtain 3 open signal

Relay#7 = Curtain 4 close signal
Relay#8 = Curtain 4 open signal

Connecting AC Fans

Always use contactors to run fans. The controller will switch fan contactors on and off.

In most installations, many fan contactors can be connected to a single relay

Do not try powering a fan motor directly through a relay. It will burn out.

Configuration needed to match this diagram:

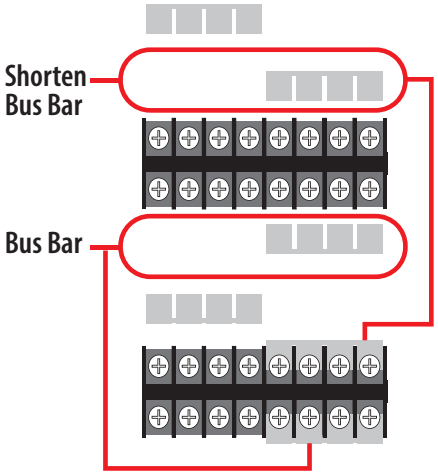
P0 - Number of curtains = 2
P1 - Curtain starting relay = 1
P2 - Number of fans = 3
P3 - Fan starting relay = 8
P4 - Number of heaters = 0

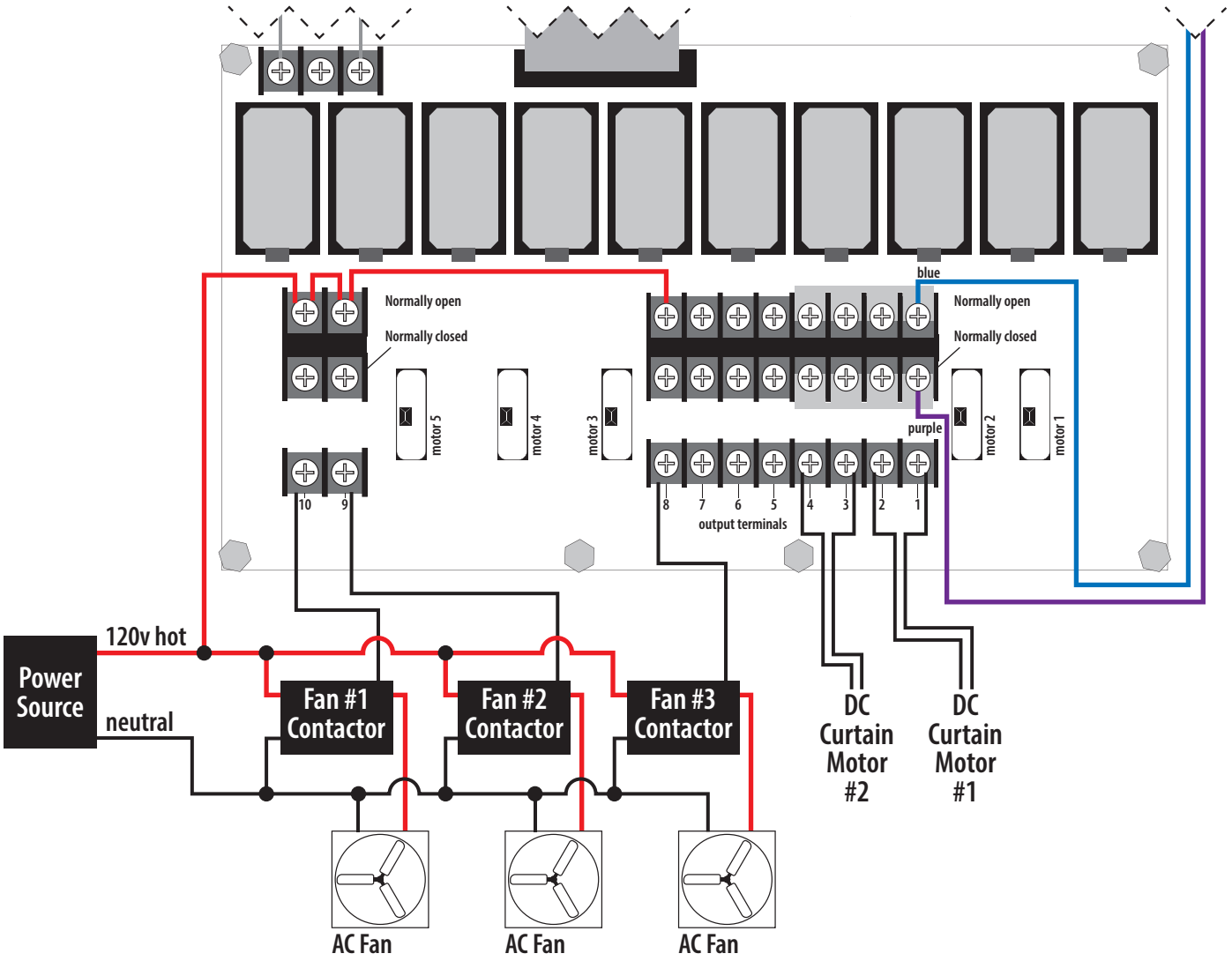
P6 - Number of lights = 0

P8 - Number of soakers = 0

P17 - 0-10v enabled = 0

Important:
Remove the aluminum bus bars from relays 5-8 for this configuration.





Connecting Variable Speed Fans

0-10v VFDs can be connected and their speed controlled automatically by temperature. VFDs use 2 signals, a speed signal and a start signal. Wiring consists of both these signals which always takes at least 4 conductors.

The speed signal is DC voltage which varies between 0-10v. 10v is 100% speed, 0 = stopped (but still energized).

The start signal is a Normally Open switch to tell the VFD when to energize the motor.

Multiple VFDs can be connected. (Maximum 10 VFDs)

Configuration needed to match this diagram:

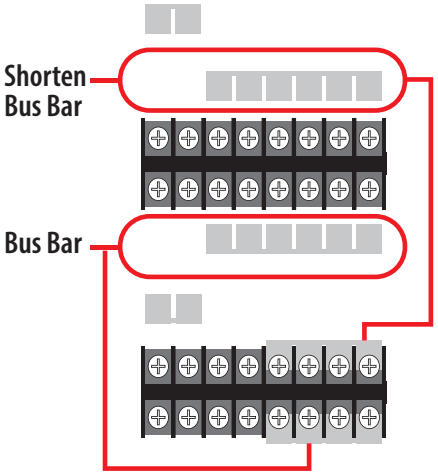
P0 - Number of curtains = 3
P1 - Curtain starting relay = 1
P2 - Number of fans = 1
P3 - Fan starting relay = 7
P4 - Number of heaters = 0

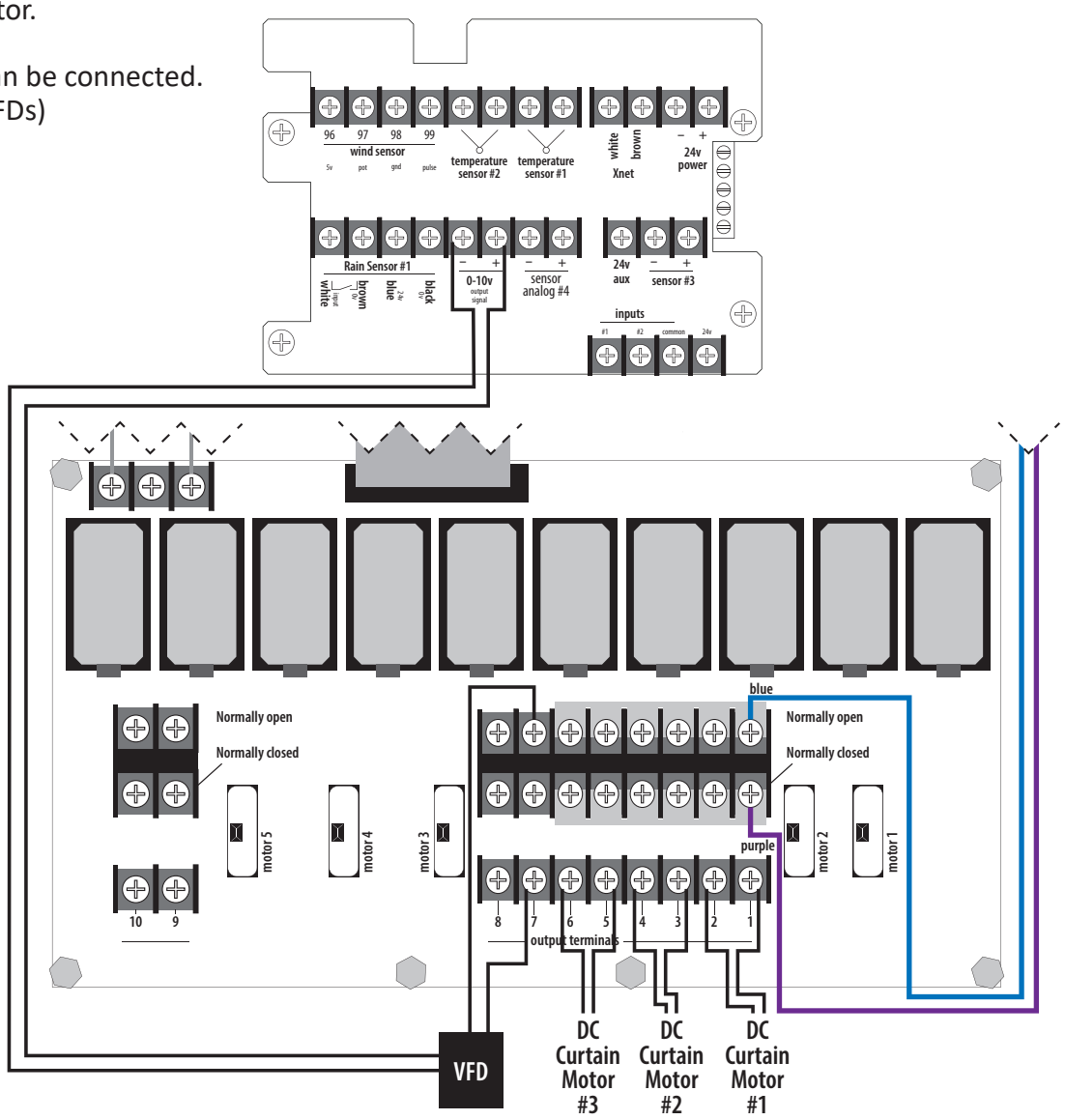
P6 - Number of lights = 0

P8 - Number of soakers = 0

P17 - 0-10v enabled = 1

Important:
Remove the aluminum bus bars from relays 7 & 8 for this configuration.





Reconfigurable

Fans, heaters, lights, and curtain motors can be mapped to any relay. The only limitation is multiples of an equipment type use consecutive relays.

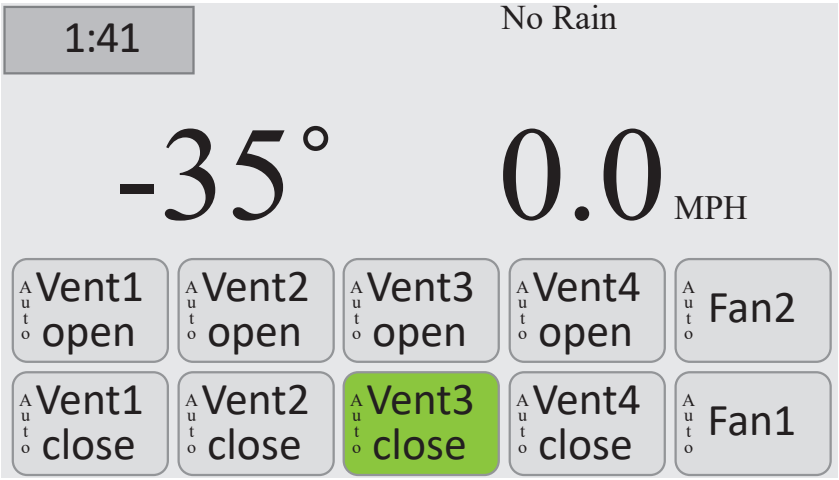
Example:
If there are 4 fans (as per parameter P2) and fan's start relay is 1 (parameter P3) relays 1 through 4 will be the fan circuits.

Overview of the Controller Screen

The screen shows you what is happening. You can see the temperature and the status of the relays.

Press on the temperature to go to your settings

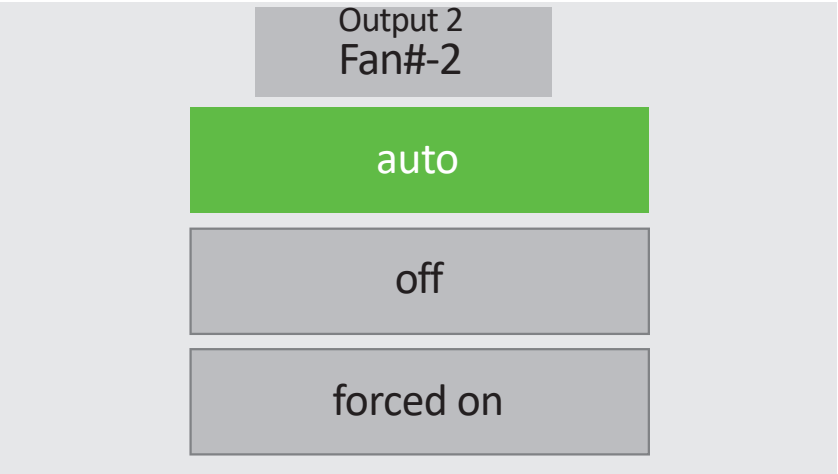
Press the bottom row of buttons to manually overrides



Overrides

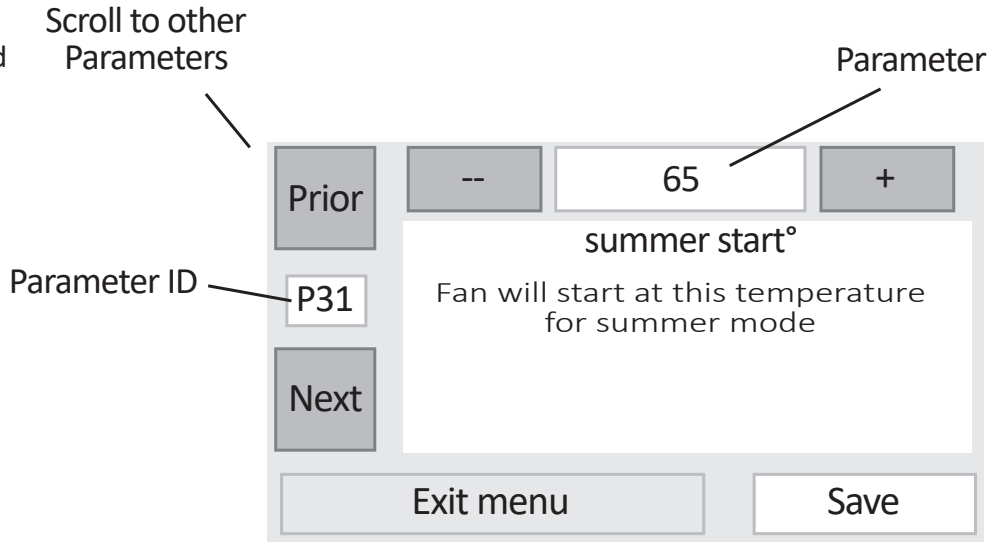
Select the relay status you want.

- In "auto", it will operate automatically.
- Selecting "off" or "forced on" allows you to avoid the control system.
- To exit press the blank space on the sides.



Parameters

There are parameters that you can change. The parameters are labeled P1, P2 …. These parameters are the temperature setpoints and values you can adjust.



ID	Description	Default	Min	Max
P101-P103	Open temperature for Curtains#1 – Curtain#10	60°	1°	99°
P131-P133	Curtain#1 – Curtain#3's run seconds. (Number of seconds the curtain runs per interval.)	15		
P141-P143	Curtain#1 – Curtain#3's, pause minutes. (The time the curtain waits between intervals.)	50		
P151-P153	Curtain#1 – Curtain#3's ventilation temperature gap. (The difference between open and shut temperature.)	50		
P170	Curtain Motor's max humidity. (Humidity at which the curtain will open to dry things.)	95		
P171	Seconds the curtain will open for the humidity event.	10		
P172	Humidity limits temperature. (Humidity will be disregarded if it's too cold.)	32		
P181-P190	Curtain#1 – Curtain#10 sequence. If vent should wait on another curtain to close first from rain or high wind.	0		
P191-P200	Curtain#1 – Curtain#10 How long it takes a curtain to shut. Closing seconds for rain or high wind events.	100		
P201	High wind Vents (Which vents should shut when wind is high.)	0		
P202	High wind MPH	53		
P203	Wind override clear MPH	50		

Fan Temperature Parameters

The temperature parameters control the starting temperature.
The fans are used for cooling. They will turn on above the temperature setpoint.

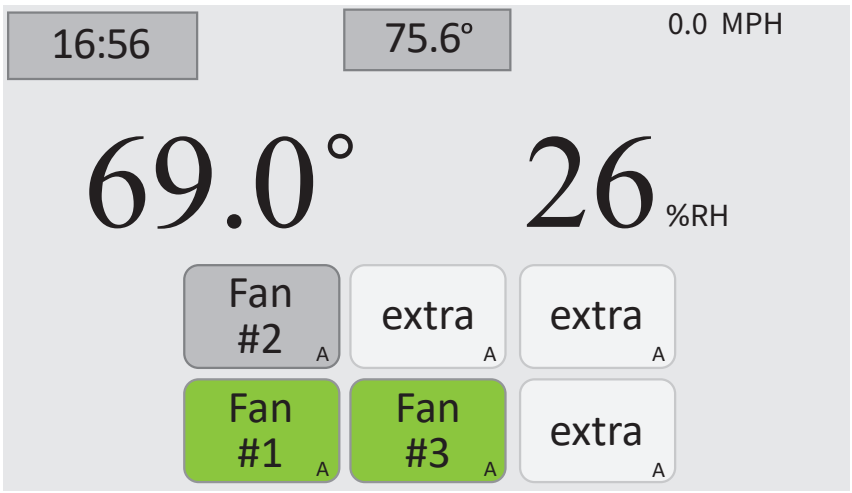
If humidity is connected, fan # 1 can be set to clear out the high humidity.

ID	Description	Default	Min	Max
P301-P306	Fan#1 – Fan#6's start temperature	0°	1°	99°
P331	Fan temperature Gap (Difference between on and off.)	0.3		
P341	Fan Max MPH (If wind sensor is connected, MPH at which fans will stop.)	0		
P342	MPH deadspan	0		
P350	Fan #1 Max humidity (If humidity sensor is installed, when fan #1 will start to dry out the building. Set at 101%, to disable humidity function.)	99%RH		
P351	Fan humidity hysteresis	5%		101
P352	Fan humidity (Low temperature limit.)	32°		
P361-P366	Fan#1 – Fan#6's high temperature limit	0		

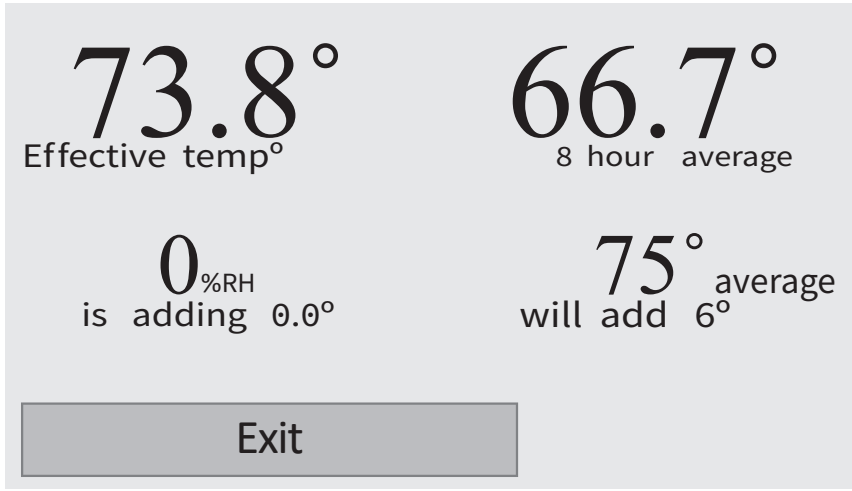
THI (Temperature Humidity Index)

The THI uses the average temperature and the humidity to turn the fans on sooner.

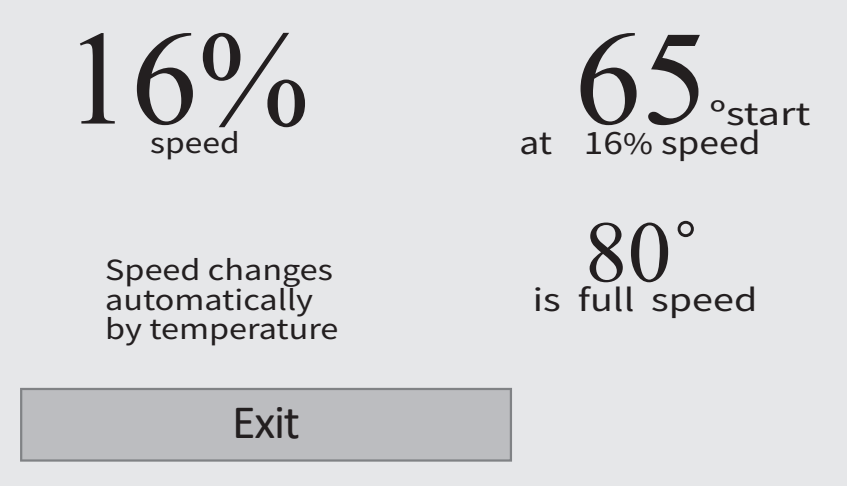
This allows the controller to think more like a cow. You can adjust how much humidity and high temperatures affect the index.



ID	Description	Default	Min	Max
P391	Enabling THI 0 = no/off 1 = temperature based only 2 = humidity and temperature based	0	0	2
P392	Hot Temperature trigger (Average degrees heat, temperature trigger.)	75°	1°	99°
P393	Number of degrees that are added to the effective temperature when it's hot.	6°	1°	20°
P394	Number of hours that are included in the rolling temperature average.	8	1	24
P395	Optional – Percentage of Relative Humidity (Set for amount of humidity that starts affecting the effective temperature.)	60%RH	10%	95%
P396	At 99% humidity – How much of the index is influenced by the humidity. (Example: By default, 6° will be added to the THI when its 99%RH. This influence scales down as the humidity drops. This effect tapers to zero at P395 humidity.	6°	0	20



Variable Fan Parameters



Controlling the Speed Signal

The VFD will run at the minimum speed when the temperature reaches the “start temperature”.
As the temperature continues to rise the VFD will run faster until it reaches 100% speed.
The VFD is at 100% speed when the temperature reaches “Max speed”.

You can add 2 additional 0-10v zones with a JDEX02 expansion module.
P17 sets the number of zones you wish to use.

ID	Description	Default	Min	Max
P401	Low-speed temperature for variable fans	50°	1°	99°
P402	High-speed temperature for variable fans	85°		
P403	Low speed for variable fans	20		
P404	Manual speed for variable fans	11	1	99°
P405	Fan speed if humidity is high	98		
P410	Optional Zone 2 Low-speed temperature for variable fans	50°	1°	99°
P411	Optional Zone 2 High-speed temperature for variable fans	85°		
P412	Optional Zone 2 Low speed for variable fans	20		
P413	Optional Zone 2 Manual speed for variable fans	11	1	99°
P405	Optional Zone 2 Fan speed if humidity is high	98		
P420	Optional Zone 3 Low-speed temperature for variable fans	50°	1°	99°
P421	Optional Zone 3 High-speed temperature for variable fans	85°		
P422	Optional Zone 3 Low speed for variable fans	20		
P423	Optional Zone 3 Manual speed for variable fans	11	1	99°
P425	Optional Zone 3 Fan speed if humidity is high	98		

Light Timer

The lights are a simple time clock that goes on and off based on the time you enter.
It is based on 24hr time in 6-minute intervals.

ID	Description	Default	Min	Max
P560	Time on for lights. Period A	0.00	0:04	24:00
P561	Time off for lights Period A	0.00	0:04	24:00
P562	Time on for lights Period B	0.00	0:04	24:00
P563	Time off for lights Period B	0.00	0:04	24:00

Heater Parameters

The parameters control the starting temperature.

ID	Description	Default	Min	Max
P601-P610	Heater 1 – Heater 10's setpoint in degrees	60°	1°	100°
P631	Heater Hysteresis	2.0°		

Duty Cycle Fan

The duty cycle fan was intended to control a fan to provide a variable amount of air by stopping and starting it. You can set how long the cycle is to keep it from cycling too often. Cycling too often will prematurely wear the contacts and your motors.

Note: To keep it from short cycling, when set above 95%, the fan will always be on.

ID	Description	Default	Min	Max
P850	Start temperature. (0 means it's on always to maintain minimum ventilation)	40°	1°	100°
P851	Begin accelerating temperature	60°	1°	100°
P852	Always on temperature. (The duty cycle is at 100% and the fan will not turn off)	80	1	120°
P853	Minimum %. (The least amount the duty cycle fan will be on)	10%	5%	100%
P854	Cycle minutes. How long an on/off cycle will be.	3	1	20

Soakers

The soakers function by turning a valve on and off. The Spray and dry-off times ramp between setpoints to give you an infinitely adjusted water output. For reduced water demand, each zone takes turns spraying. It controls up to 6 individual soakers.

The amount of water used and how often it sprays is controlled by the temperature or temperature index.

Sprinkler Temperature Settings

The spray time ramps between Low and High spray seconds with the barn temperature. The first zone has its own spray seconds. The remaining zones share spray settings.

The dry off/interval time ramps between Low and High dry off minutes with the barn temperature. All zones share the dry-off minutes. The interval time is the amount of time each zone waits between sprinkles.

In the eastern USA, it's typical to spray for about 30-60 seconds. This varies with the spray tip size. The goal is to get the cow wet but not running onto her udder. When the side of the leg is wet, it's time to stop.

The dry-off time usually is 15 minutes at 70° and 5 minutes at 90°.

Application Note:

A 1,000lb cow, laying in a freestall, will overheat within 90 minutes at 5MPH @ 90° @70%RH.
Getting a cow's body temperature down from 102 ° to 100° takes 5 cycles.
This means a theoretical 25 minutes at 90°.
If the cow is drying off before 5 minutes in very hot weather, a 3-minute high dry-off time gets her cooled down in 15 minutes.

ID	Description	Default	Min	Max
P800	Soaker start temperature	75°	1°	99°
P801	Soaker High temperature	95°	1°	99°
P802	Soaker dry-off minutes when the temperature is at the start temperature.	15	1	25
P803	Soaker dry-off minutes when the temperature is at the high temperature.	5	1	25
P804	Spray seconds at low for zone #1	30	1	250
P805	Spray seconds at high for zone #1	30	1	250
P806	Spray seconds at low for zone #2-6	30	1	250
P807	Spray seconds at high for zone #2-6	30	1	250

Setup Configurations

ID	Description	Default	Min	Max
P0	Number of curtains	2	0	3
P1	Curtain Starting Relay	1	0	1
P2	Number of fans in the system	1	0	6
P3	Fan Starting Relay	5	0	6
P4	Number of heaters	2		6
P5	Heater Starting Relay	8		6
P6	Number of Grow lights	0	1	1
P7	Grow lights Starting Relay	1		6
P8	Number of sprinkler circuits	0	0	6
P9	Starting relay for the sprinklers	1	1	6
P12	Duty Cycle fan enabled (0=no, 1=yes)	0		1
P13	Duty cycle fan relay	0		6
P16	If 0-10v zone 1 should use humidity instead of temperature (0=No 1=Yes)	0	0	1
P17	Number of 0-10v zones in system	0	1	3
P18	0-10v Low-temperature volts. (Normally this is zero unless you want 10v to shut the fan off.)	0	0	10
P19	0-10v High-temperature volts. (Volts at high temperature.)	10	0	10
P20	Is 2nd Temperature sensor enabled	0		
P21	Is Humidity sensor enabled	0		
P22	Temperature probe 1 offset	0.0	-10.0	+10.0
P24	Fahrenheit or Celsius	F		
P27	Wind response time minutes	3		
P28	Anemometer calibration	25		2
P29	Windmeter enabled	0		
P30	Revert controller to defaults	3	1	5
P41- P49	Curtain #1 – Curtain #3 rain sensor uses input # (Select which input a curtains rain sensor is connected to)	0		
P60	Fan high-temperature shutoff enabled (0=no, 1=yes)	0=no		1=yes
P61- P70	Turn fan 1 – fan 10 input off	0		
P71	How many curtains use 2nd temperature sensor	0		
P72	How many heaters use 2nd temperature sensor	0		
P73	How many fans use 2nd temperature sensor	0		