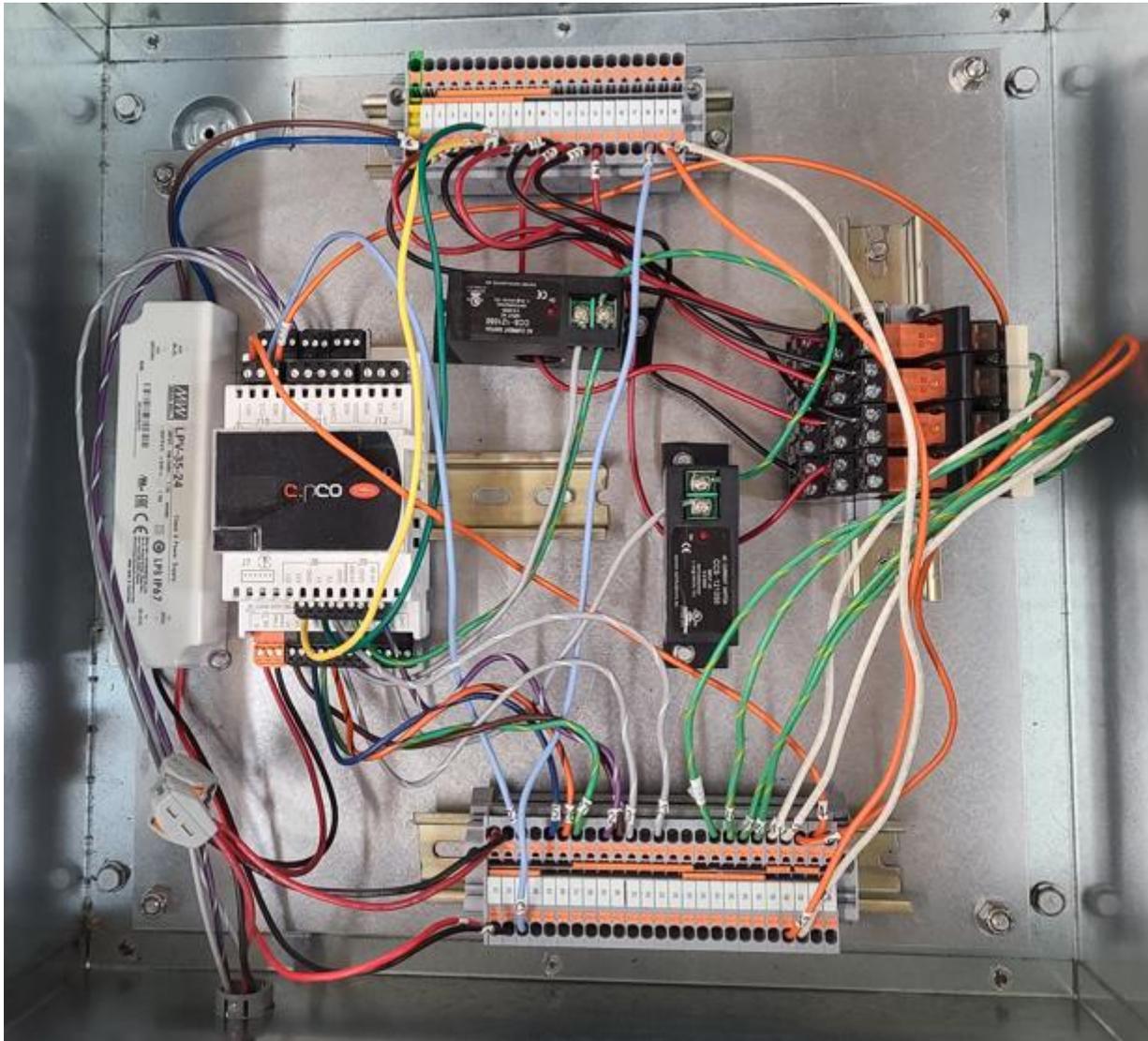


# Installation, Operation, and Maintenance Manual





## **RECEIVING AND INSPECTION**

Upon receiving your equipment, check for any interior or exterior damage. When the truck arrives at your location and the shipment is unloaded, it is **YOUR** responsibility to inspect each and every item for damage **BEFORE** signing the Driver's delivery receipt/Bill of Lading. **DO NOT SIGN until you have thoroughly looked over the equipment.** Once you sign the delivery receipt/Bill of Lading, you relieve the trucking company and North American Kitchen Solutions, Inc. of any and all claims for damaged and/or missing products.



**Please be sure to connect the minimum following items to ensure a successful start-up:**

- Main Control Panel Power
- Power in and out for ALL fans
- Speed Control Wiring for ALL fans
- Fire Micro-Switch
- Hood Thermostat(s)



**Save these instructions.** This document is the property of the owner of the equipment. Leave this document with the owner when installation or service is complete.

---

## **WARNING!!**

**Installation of this equipment should only be performed by a qualified professional.**

**Please read this manual thoroughly before installing or servicing this equipment.**

### **WARNING**

Electrical shock hazard. Can cause equipment damage, personal injury, or death. Service must only be performed by personnel that are knowledgeable in the operation of the equipment being controlled.

### **DANGER**

Always disconnect power before working on or near the product. Lock and tag the disconnect switch or breaker to prevent accidental power up.

### **CAUTION**

It is the responsibility of the installer to make sure both electrical and gas appliances shut down in the event of a fire or in the event of a power loss to the building when the sequence is required by the authority having jurisdiction.

## **INSTALLATION**

The equipment is required to be installed and operated as a pre-engineered product, using the equipment which is identified and explained within this manual. If there are any questions about any items, please call the service department at **1-800-715-1014** for warranty and technical support.

**WARNING: IMPROPER INSTALLATION, ADJUSTMENT, ALTERATION, SERVICE AND/OR MAINTENANCE CAN CAUSE PROPERTY DAMAGE, INJURY OR DEATH.**

**PLEASE READ THE INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS BEFORE INSTALLING OR SERVICING THIS EQUIPMENT.**

Once equipment is received, check for both obvious and hidden damage. If damage is found, record all necessary information on the bill of lading and file a claim with the final carrier. Check to be sure that all parts of the shipment, including accessories, are accounted for.

If a system must be stored prior to installation it must be protected. Indoor storage is recommended. For outdoor storage, cover the system and accessories with a tarp to keep them clean, dry, and protected from UV (Ultraviolet) radiation damage.

Improper storage which results in damage to the unit will void the warranty.

## **Site Preparation**

1. Make sure that clearance is provided around the installation site to connect Sensors both on the hood and in the room. Note Room Temp/Humidity Sensor to be no closer than 10'-0" to the hood system.
2. When possible, locate unit so that there is at least 24" of clearance in front of the touchscreen to allow adjustment.
3. Review the electrical and project plans and drawings for the job.
4. Determine the exact location of the hood – consult your project plans and drawings. The Hood Temperature Sensors should then be wired back to the Terminal Blocks and should be inspected to verify that there are no interferences which will prevent proper installation.

Follow all local electrical and safety codes, as well as the National Electrical Code (NEC) and the latest edition of the National Fire Protection Agency Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations (NFPA 96). If installing in Canada, follow the Canadian Electrical Code (CEC) and ULC-S650.

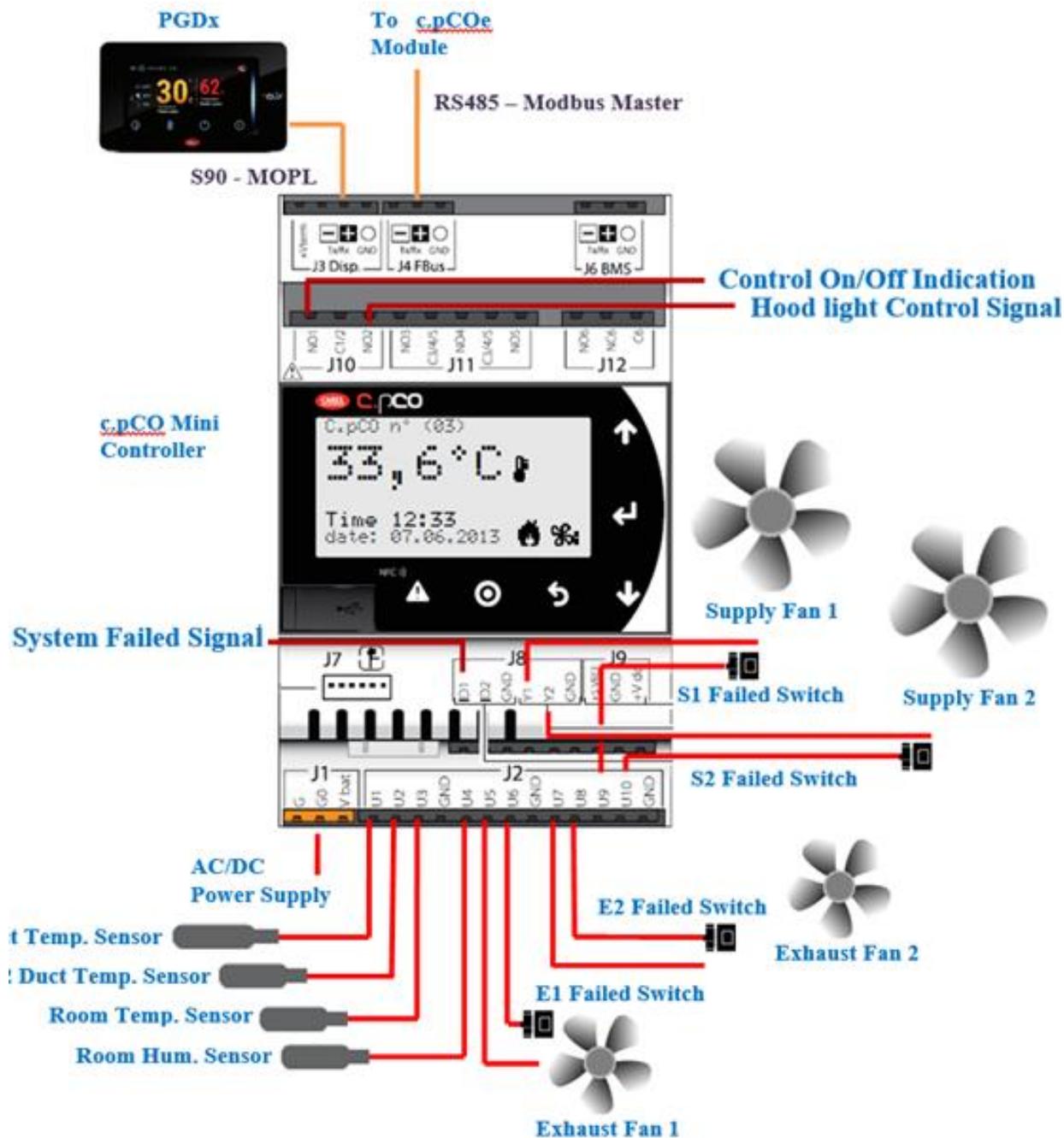


## **System Layout**

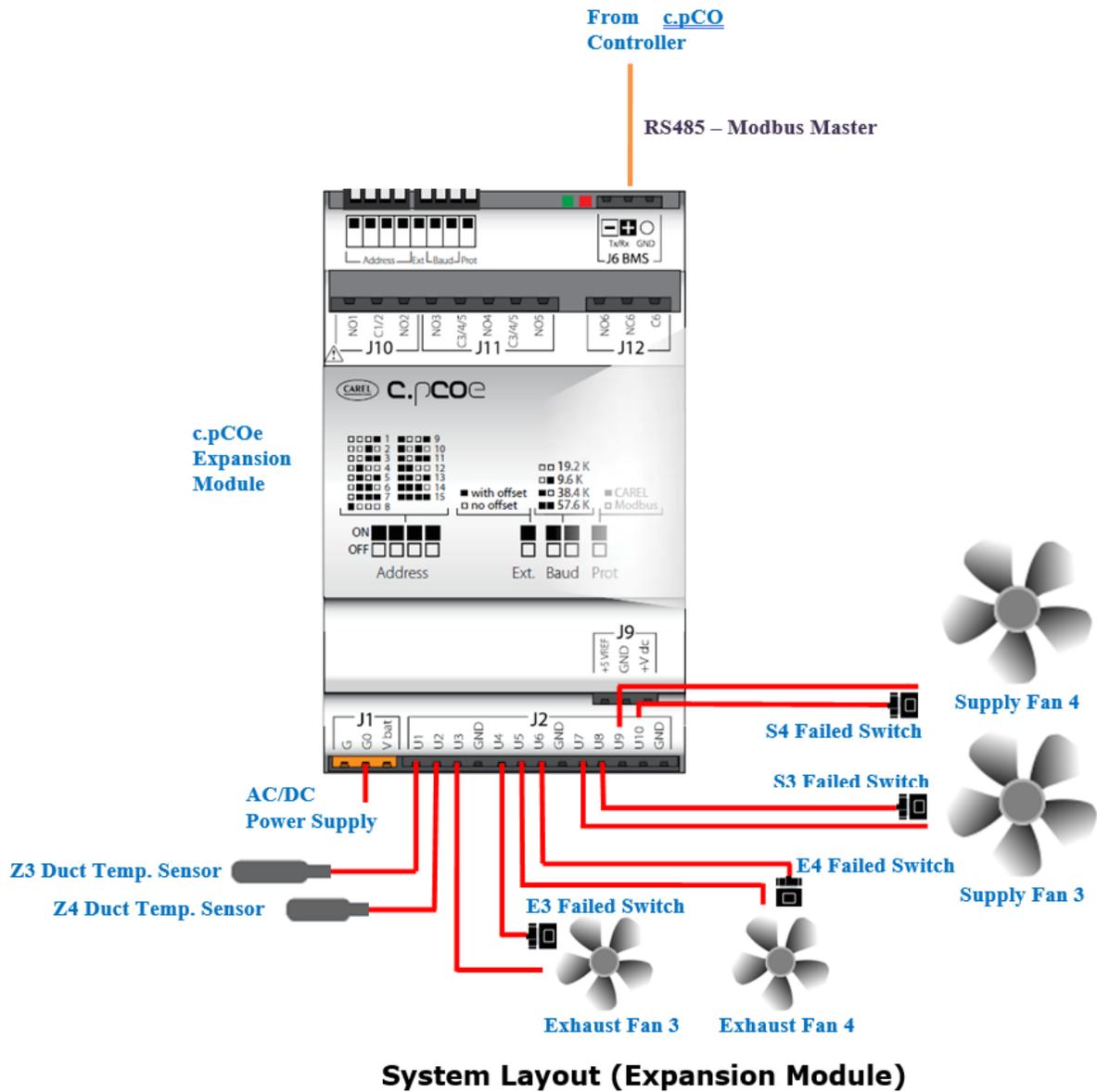
The picture on the following page shows how the Controller is connected to the PGDx, field sensors, and devices.

There will be ten (10) modeled selections to choose from to configure the system. The selection is based on the number of zones and the number of fans in each system.

Each zone has a Duct temperature sensor. Its signal is used to control the Exhaust and the Supply fan speed within that zone.



**System Layout Main Controller**



## Electrical Connections

Before connecting power to the control package, read and understand the entire section of this document. As-built wiring diagrams are furnished with each unit by the factory. They are attached to the control module's door or provided with paperwork packet, these are the latest documents and should be used to govern field installation of control panels

Electrical wiring and connections must be made in accordance with local ordinances and the National Electric Code, ANSI/NFPA 70. Verify the voltage and phase of the power supply, and the wire amperage capacity is in accordance with the unit nameplate. For additional safety information, refer to AMCA publication 410-96, Recommended Safety Practices for Users and Installers of Industrial and Commercial Fans.

- Always disconnect power before working on or near this equipment. Lock and tag the disconnect switch and/or breaker to prevent accidental power-up.
- Verify that the power source is compatible with the requirements of your equipment.
  - The nameplate identifies the proper phase and voltage of the equipment.
- Before connecting the unit to the building's power source, verify that the power source wiring is de-energized.
- Secure the power cable to prevent contact with sharp objects.
- Do not kink power cable and never allow the cable to encounter oil, grease, hot surfaces, or chemicals.
- Before powering up the unit, verify that the fan rotates freely.
  - Check the interior of the unit is free of loose debris or shipping materials.
- If any of the original wire supplied with the unit must be replaced, it must be replaced with type THHN wire or equivalent.

### Copper Wire Ampacity

Wire Size AWG	Maximum Amps	Wire Size AWG	Maximum Amps
14	15	4	85
12	20	3	100
10	30	2	115
8	50	1	130
6	65		

## High Voltage Wiring

- All high voltage wiring shall be connected to the Terminal Blocks mounted at the top of the control panel. The right side of the control panel should be used for creating access to utilized for high voltage connections.
- Variable Frequency Drives (VFD's) have screw connectors to the line and load power. The load wiring must not share conduit with other motor load wiring. Each motor must have its own conduit, or the warranty is void.
- There are multiple electrical power sources required for the control panel and hood control wiring. Refer to wiring diagram inside of the panel for details.
- The hood light wiring must have it's own power source and be wired to terminals, as indicated on the wiring diagram.
- If fire system is present, the fire system micro-switch will need to be wired to terminals as indicated on the installation diagram

## Low Voltage Wiring

- Low voltage wiring should be run through the left side of the panel. Do not route low voltage wires on the same side, nor inside of the same conduit as high voltage wiring. Low voltage wiring typically terminates directly on the c.pCO or components.
- Temperature Sensor(s) are thermostatically controlled temperature sensor(s) are supplied with wiring compatible for field installation. The temperature sensor(s) should be wired to terminal block inputs designated on the wiring diagram supplied inside the control panel
- Room Temperature/Humidity Sensor for all installations must be installed in a safe location. Locate the sensor so that it is free from external heat sources that may affect the sensor readings. 5-wire 18 AWG thermistor cable must be used.
- Display: The Display is connected to the c.pCO through a factory cable.

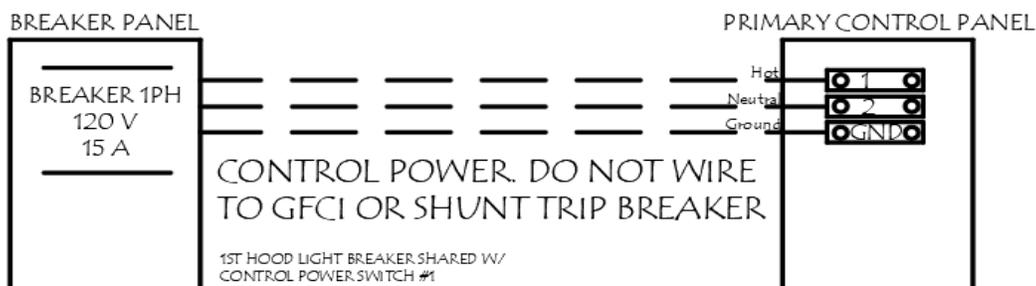
## Power for Controls

115 VAC, power to controls (Terminal 1, 2, and GND)

### BREAKER PANEL TO PRIMARY CONTROL PANEL

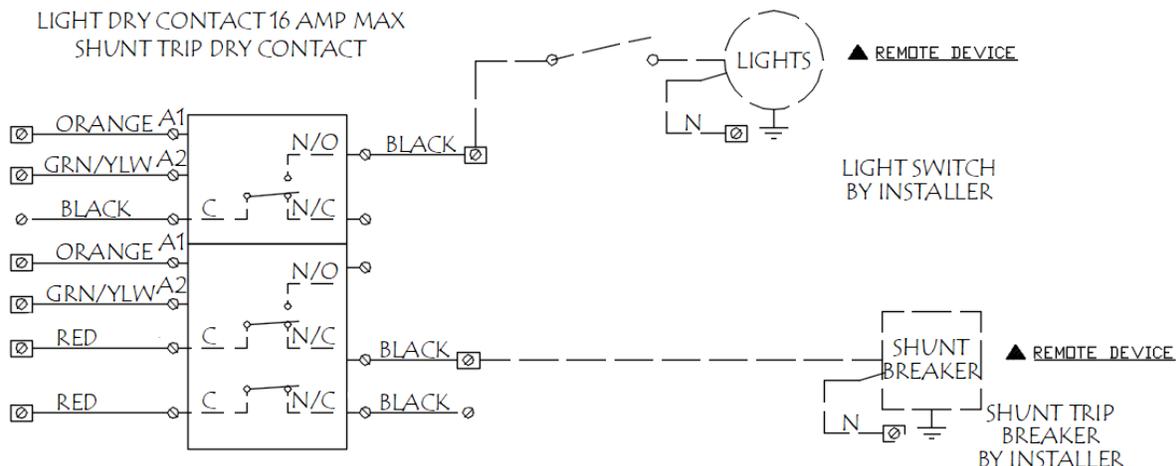
Responsibility: Electrician

BREAKER SIZE SHOWN IS THE MAXIMUM ALLOWED



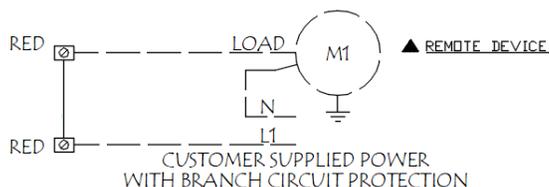
**Power for Lights**

115 VAC, power to controls power to lights and Shunt Trip Signal



**Connection for Fan Controls**

115 VAC, power to controls power to fan  
EXHAUST FAN



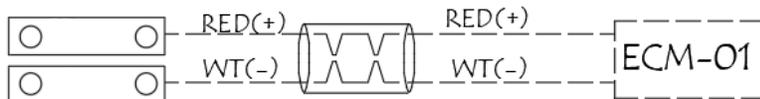
**Signal for Duct Thermostat**

Signal power from Duct Thermostat



**Fan 0-10 VDC Controls**

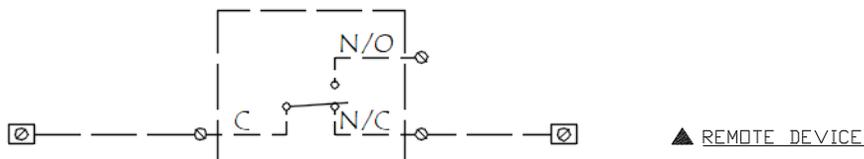
▲ REMOTE DEVICE



**Signal for Fire System**

Low Voltage 18/2 wire

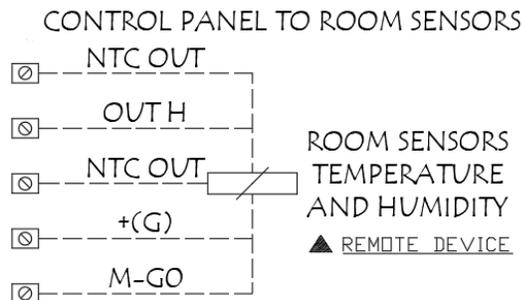
FIRE SYSTEM MICROSWITCH (CUSTOMER SUPPLIED)



### Connection for Room Temperature/Humidity Sensor

Low Voltage 18/5 wire

NOTE: WIRE TO CONTROL BOARD. INSTALL SENSOR IN ROOM AWAY FROM HEAT SOURCES. DO NOT INSTALL SENSOR ON CEILING GRID



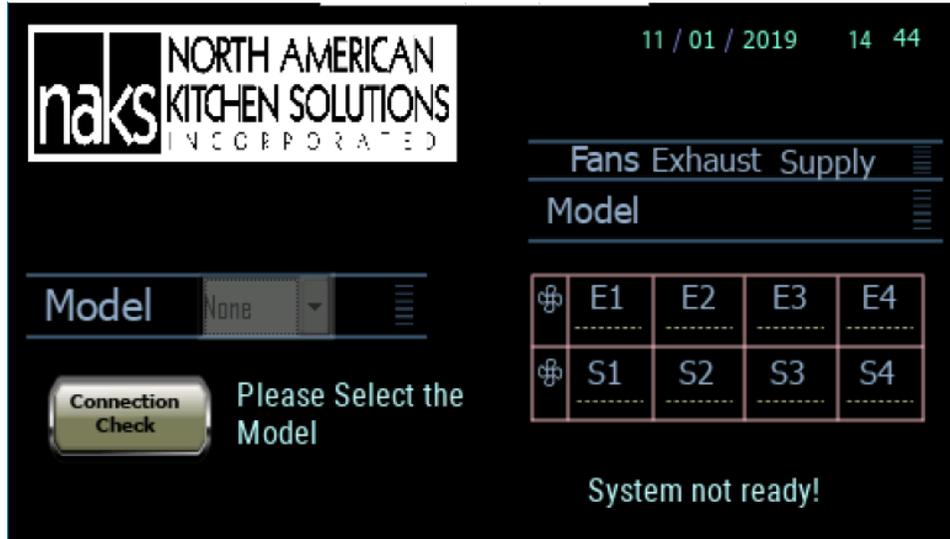
## Sequence of Operation

### First-time Startup Configuration

When the System is started for the first time, a configuration screen will be shown to allow the service personnel to select the system model. The table with the available Zones on the right will be shown based on the selected model.

The user can then press the connection check button, and a signal will be sent out to speed up the fans. The controller reads all of the current feedback sensors and updates the passed/failed results in the Table. During this testing process, a "Checking in Progress" message will be displayed.

The "System not ready!" will be changed to "System ready!" once all the tests have been passed. The user then can select the correct fan models for the system. The Enter button will also be shown to let the user go to the Homepage.



**System Configuration Page**

### Startup Mode

At startup, all the supply fans and exhaust fans will be set to 15% and run for 30 seconds. Once the timer expires, the fan speed of each zone is determined by the duct temperature of that zone with the minimum cutoff speed set to 10%.

The following Modes are applied to all the available zones of the system:

### Normal Mode

In the normal operation mode, all the exhaust fans are set to run from 10–100%. This is proportional to 95-140°F of duct temperature.

- The supply fan speed is set in percentage of the exhaust fan with the minimum of 10%. The supply fan will not start if the system detects there is an exhaust fan failure within that zone.
- When there is no demand, all fans will be at idle speed of 10%.
- When the controller is in the Off mode, the system continues to monitor the Duct temperature and will set the controller back to On if the temperature is equal to or greater than 150 °F.
- The Hood light can be controlled by either tapping the light switch from the HMI or by switching the controller On/Off.

### Demand Mode

When the Demand button is pressed, the exhaust fan will speed up to 100%, and the supply fan will default to 40%. The system will continue to run in this mode for 10 minutes and revert back to the Normal mode which is when the duct thermostat sets the fan speed.

### Warning and Alarm Mode

An LED Bar and Homepage displayed texts of the PGDx will provide insight about the Fan's speed in percentage range as follows:

- **Green**: Exhaust fan speed is below 30%.
- **Yellow**: Exhaust fan speed is from 30%-100%.
- **Red**: Exhaust fan failed to start, or the duct temperature reached 170°F, or the failed signal received from DI1. The system will activate the Buzzer in these situations. The Buzzer can be silenced by tapping Acknowledge the alarm on the screen.

## Components

### Temperature Sensor

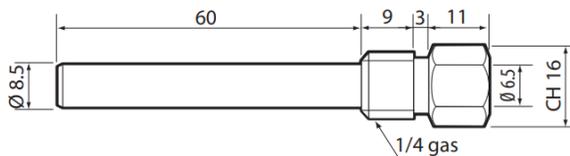
The temperature sensor is a 10K ohm thermistor. The sensor gives constant feedback to the control board. One sensor is installed in every exhaust riser for controls packages.

Only a maximum of 5 sensors can be connected to the Terminal Board, normally one room-temperature sensor and then other temperature sensors.



### Hood/Duct mounted Temperature Sensor Mounted inside of Nickel coated socket

- Socket: nickel-coated brass
  - Maximum operating pressure 35 bar
  - Temperature -20...95°C



**Table of temperature-resistance values for NTC sensor 10K@25°C B 3435**

Temp.	Resistance value		
	Max.	Typical	Min.
°C	KΩ	KΩ	KΩ
-50	344,60	329,50	314,90
-49	325,00	310,90	297,30
-48	306,60	293,50	280,90
-47	289,40	277,20	265,40
-46	273,40	262,00	251,00
-45	258,30	247,70	237,40
-44	244,20	234,30	224,70
-43	231,00	221,70	212,80
-42	218,60	209,90	201,60
-41	207,00	198,90	191,00
-40	196,00	188,50	181,10
-39	185,50	178,50	171,60
-38	175,60	169,00	162,60
-37	166,30	160,20	154,20
-36	157,60	151,90	146,30
-35	149,40	144,10	138,80
-34	141,70	136,70	131,80
-33	134,50	129,80	125,20
-32	127,70	123,30	119,00
-31	121,20	117,10	113,10
-30	115,20	111,30	107,50
-29	109,40	105,70	102,20
-28	103,90	100,50	97,20
-27	98,68	95,52	92,45
-26	93,80	90,84	87,97
-25	89,20	86,43	83,73
-24	84,85	82,26	79,74
-23	80,76	78,33	75,96
-22	76,89	74,61	72,39
-21	73,23	71,10	69,01
-20	69,77	67,77	65,82
-19	66,44	64,57	62,74
-18	63,30	61,54	59,83
-17	60,32	58,68	57,07
-16	57,51	55,97	54,46
-15	54,85	53,41	51,99
-14	52,33	50,98	49,65
-13	49,95	48,68	47,43
-12	47,69	46,50	45,32
-11	45,55	44,43	43,33
-10	43,52	42,47	41,43
-9	41,55	40,57	39,60
-8	39,69	38,77	37,86
-7	37,92	37,06	36,21
-6	36,25	35,44	34,64
-5	34,66	33,90	33,15
-4	33,15	32,44	31,73
-3	31,72	31,05	30,39
-2	30,36	29,73	29,11
-1	29,06	28,48	27,89
0	27,83	27,28	26,74

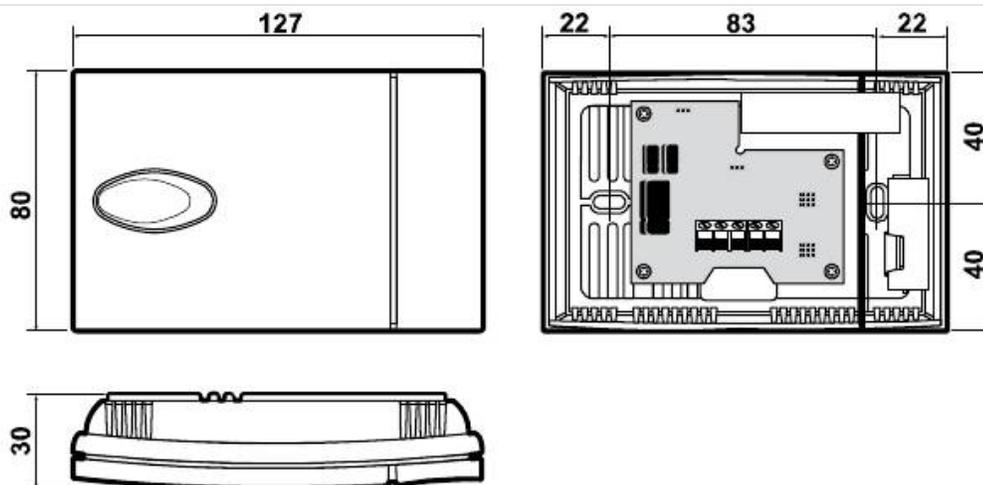
Temp.	Resistance value		
	Max.	Typical	Min.
°C	KΩ	KΩ	KΩ
1	26,65	26,13	25,62
2	25,52	25,03	24,55
3	24,44	23,99	23,54
4	23,42	23,00	22,57
5	22,45	22,05	21,66
6	21,53	21,15	20,78
7	20,64	20,30	19,95
8	19,81	19,48	19,15
9	19,01	18,70	18,39
10	18,25	17,96	17,67
11	17,51	17,24	16,97
12	16,81	16,56	16,30
13	16,14	15,90	15,67
14	15,50	15,28	15,06
15	14,89	14,69	14,48
16	14,31	14,12	13,92
17	13,75	13,58	13,39
18	13,22	13,06	12,89
19	12,72	12,56	12,40
20	12,24	12,09	11,94
21	11,77	11,63	11,50
22	11,32	11,20	11,07
23	10,90	10,78	10,66
24	10,49	10,38	10,27
25	10,10	10,00	9,90
26	9,73	9,63	9,53
27	9,38	9,28	9,18
28	9,04	8,94	8,84
29	8,72	8,62	8,52
30	8,41	8,31	8,21
31	8,11	8,01	7,92
32	7,83	7,73	7,63
33	7,55	7,45	7,36
34	7,29	7,19	7,10
35	7,04	6,94	6,85
36	6,79	6,70	6,61
37	6,56	6,47	6,37
38	6,34	6,25	6,15
39	6,12	6,03	5,94
40	5,92	5,83	5,74
41	5,72	5,63	5,54
42	5,53	5,44	5,35
43	5,34	5,26	5,17
44	5,17	5,08	4,99
45	5,00	4,91	4,83
46	4,83	4,75	4,67
47	4,68	4,59	4,51
48	4,52	4,44	4,36
49	4,38	4,30	4,22
50	4,24	4,16	4,08
51	4,10	4,03	3,95
52	3,97	3,90	3,82
53	3,85	3,77	3,70
54	3,73	3,65	3,58
55	3,61	3,54	3,46

Temp.	Resistance value		
	Max.	Typical	Min.
°C	KΩ	KΩ	KΩ
56	3,50	3,43	3,35
57	3,39	3,32	3,25
58	3,28	3,22	3,15
59	3,18	3,12	3,05
60	3,09	3,02	2,95
61	2,99	2,93	2,86
62	2,90	2,84	2,77
63	2,82	2,75	2,69
64	2,73	2,67	2,61
65	2,65	2,59	2,53
66	2,57	2,51	2,45
67	2,50	2,44	2,38
68	2,42	2,36	2,31
69	2,35	2,30	2,24
70	2,28	2,23	2,17
71	2,22	2,16	2,11
72	2,15	2,10	2,05
73	2,09	2,04	1,99
74	2,03	1,98	1,93
75	1,98	1,92	1,87
76	1,92	1,87	1,82
77	1,87	1,82	1,77
78	1,81	1,77	1,72
79	1,76	1,72	1,67
80	1,72	1,67	1,62
81	1,67	1,62	1,58
82	1,62	1,58	1,53
83	1,58	1,53	1,49
84	1,54	1,49	1,45
85	1,49	1,45	1,41
86	1,45	1,41	1,37
87	1,42	1,37	1,33
88	1,38	1,34	1,30
89	1,34	1,30	1,26
90	1,31	1,27	1,23
91	1,27	1,23	1,19
92	1,24	1,20	1,16
93	1,21	1,17	1,13
94	1,17	1,14	1,10
95	1,14	1,11	1,07
96	1,12	1,08	1,04
97	1,09	1,05	1,02
98	1,06	1,02	0,99
99	1,03	1,00	0,97
100	1,01	0,97	0,94
101	0,98	0,95	0,92
102	0,96	0,92	0,89
103	0,93	0,90	0,87
104	0,91	0,88	0,85
105	0,89	0,86	0,83
106	0,87	0,84	0,81
107	0,84	0,82	0,79
108	0,82	0,80	0,77
109	0,80	0,78	0,75
110	0,79	0,76	0,73

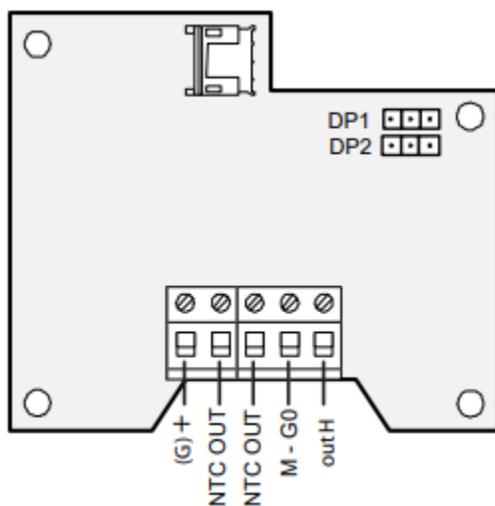
**Room Temperature/Humidity Sensor**

Best mounting locations for the sensor:

- On a wall near a return duct, if possible.
- A location that will provide an accurate representation of the average room temperature/relative humidity/barometric pressure.



**Out NTC Res. temperature**



DP1	<input type="checkbox"/>	ON	-0.5 to 1 V	R min. 1 kohm
DP2	<input type="checkbox"/>	OFF		
DP1	<input type="checkbox"/>	OFF	0 to 1 V	R max 100 kohm
DP2	<input type="checkbox"/>	OFF		
DP1	<input type="checkbox"/>	OFF	4 to 20 mA	
DP2	<input type="checkbox"/>	ON		

Jumpers for configuring the outputs:  
on models with two active outputs both  
are configured in the same way.

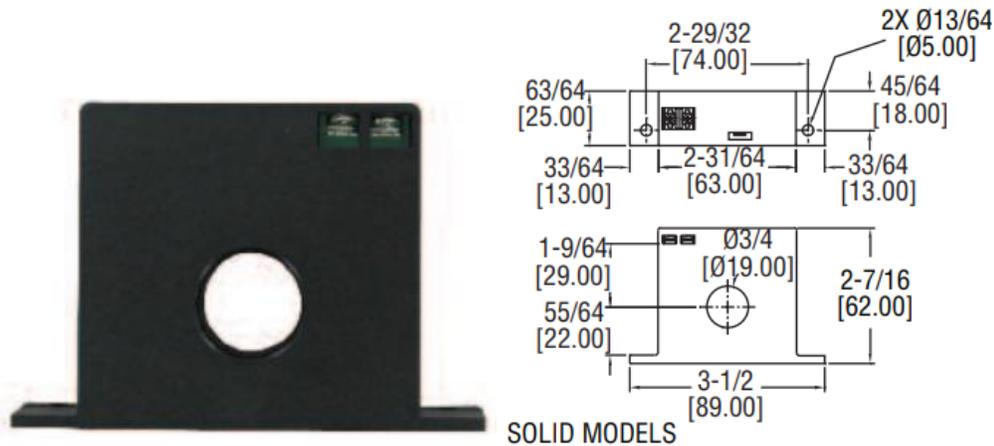
Temp.	Resistance value			Temp.	Resistance value			Temp.	Resistance value		
	Max.	Std	Min.		Max.	Std	Min.		Max.	Std	Min.
°C	KΩ	KΩ	KΩ	°C	KΩ	KΩ	KΩ	°C	KΩ	KΩ	KΩ
-50	344.40	329.20	314.70	1	26.64	26.13	25.52	56	3.49	3.42	3.35
-49	324.70	310.70	297.20	2	25.51	25.03	24.55	57	3.39	3.31	3.24
-48	306.40	293.30	280.70	3	24.24	23.99	23.54	58	3.28	3.21	3.14
-47	289.20	277.00	265.30	4	23.42	22.99	22.57	59	3.18	3.11	3.04
-46	273.20	261.80	250.60	5	22.45	22.05	21.66	60	3.09	3.02	2.95
-45	258.10	247.50	237.20	6	21.52	21.15	20.78	61	2.99	2.92	2.86
-44	244.00	234.10	244.60	7	20.64	20.29	19.95	62	2.90	2.83	2.77
-43	230.80	221.60	212.70	8	19.80	19.40	19.15	63	2.81	2.75	2.69
-42	218.50	209.80	201.50	9	19.00	18.70	18.40	64	2.73	2.66	2.60
-41	206.80	198.70	191.00	10	18.24	17.96	17.67	65	2.65	2.58	2.52
-40	195.90	188.40	181.10	11	17.51	17.24	16.97	66	2.57	2.51	2.45
-39	185.40	178.30	171.59	12	16.80	16.55	16.31	67	2.49	2.43	2.37
-38	175.50	168.90	162.00	13	16.13	15.90	15.87	68	2.42	2.36	2.30
-37	166.20	160.10	154.10	14	15.50	15.28	15.06	69	2.35	2.29	2.24
-36	157.50	151.80	140.20	15	14.89	14.68	14.48	70	2.28	2.22	2.17
-35	149.30	144.00	138.80	16	14.31	14.12	13.93	71	2.21	2.16	2.10
-34	141.60	136.60	131.80	17	13.75	13.57	13.40	72	2.15	2.10	2.04
-33	134.40	129.70	125.20	18	13.22	13.06	12.89	73	2.09	2.04	1.98
-32	127.60	123.20	118.90	19	12.72	12.56	12.41	74	2.03	1.98	1.93
-31	121.20	117.10	113.10	20	12.23	12.09	11.95	75	1.97	1.92	1.87
-30	115.10	111.30	107.50	21	11.77	11.63	11.57	76	1.92	1.87	1.82
-29	109.30	105.70	102.20	22	11.32	11.20	11.07	77	1.86	1.81	1.78
-28	103.80	100.40	97.16	23	10.90	10.78	10.60	78	1.81	1.76	1.71
-27	98.63	95.47	92.41	24	10.49	10.38	10.27	79	1.76	1.71	1.68
-26	93.75	90.80	87.93	<b>25</b>	<b>10.10</b>	<b>10.00</b>	<b>9.90</b>	80	1.71	1.66	1.62
-25	89.15	86.39	83.70	26	9.73	9.63	9.52	81	1.66	1.62	1.57
-24	84.82	82.22	79.71	27	9.38	9.28	9.18	82	1.62	1.57	1.53
-23	80.72	78.29	75.93	28	9.04	8.94	8.84	83	1.57	1.53	1.49
-22	76.85	74.58	72.36	29	8.72	8.62	8.52	84	1.53	1.49	1.44
-21	73.20	71.07	68.99	30	8.41	8.31	8.21	85	1.49	1.45	1.40
-20	69.74	67.74	65.80	31	8.11	8.01	7.91	86	1.45	1.41	1.37
-19	66.42	64.54	62.72	32	7.82	7.72	7.62	87	1.41	1.37	1.33
-18	63.27	61.52	59.81	33	7.55	7.45	7.35	88	1.37	1.33	1.29
-17	60.30	58.66	57.05	34	7.28	7.19	7.09	89	1.34	1.30	1.26
-16	57.49	55.95	54.44	35	7.03	6.94	6.84	90	1.30	1.26	1.22
-15	54.83	53.39	51.97	36	6.79	6.69	6.60	91	1.27	1.23	1.19
-14	52.31	50.96	49.83	37	6.56	6.46	6.37	92	1.23	1.20	1.16
-13	49.93	48.65	47.12	38	6.33	6.24	6.15	93	1.20	1.16	1.13
-12	47.67	46.48	45.31	39	6.12	6.03	5.94	94	1.17	1.13	1.10
-11	45.53	44.41	43.32	40	5.92	5.82	5.73	95	1.14	1.10	1.07
-10	43.50	42.25	41.43	41	5.72	5.63	5.54	96	1.11	1.08	1.04
-9	41.54	40.56	39.59	42	5.53	5.43	5.35	97	1.08	1.05	1.01
-8	39.68	38.76	37.85	43	5.34	5.25	5.17	98	1.05	1.02	0.99
-7	37.91	37.05	36.20	44	5.16	5.08	4.99	99	1.03	0.99	0.96
-6	36.24	35.43	34.02	45	4.99	4.91	4.82	100	1.00	0.97	0.94
-5	34.65	33.89	33.14	46	4.83	4.74	4.66	101	0.98	0.94	0.91
-4	33.14	32.43	31.73	47	4.67	4.59	4.51	102	0.95	0.92	0.89
-3	31.71	31.04	30.39	48	4.52	4.44	4.36	103	0.93	0.90	0.87
-2	30.35	29.72	29.11	49	4.38	4.30	4.22	104	0.91	0.87	0.84
-1	30.00	28.47	27.89	50	4.24	4.16	4.08	105	0.88	0.85	0.82
0	27.83	27.28	26.74	51	4.10	4.02	3.95	106	0.86	0.83	0.80
				52	3.97	3.90	3.82	107	0.84	0.81	0.78
				53	3.84	3.77	3.69	108	0.82	0.79	0.76
				54	3.72	3.65	3.57	109	0.80	0.77	0.74
				55	3.61	3.53	3.46	110	0.78	0.75	0.73

**Current Sensor**

These are pre-mounted in the control panel (or in the fan)

**LED INDICATOR**

- Red LED: indicates that the set point has been reached and the contacts are now closed.



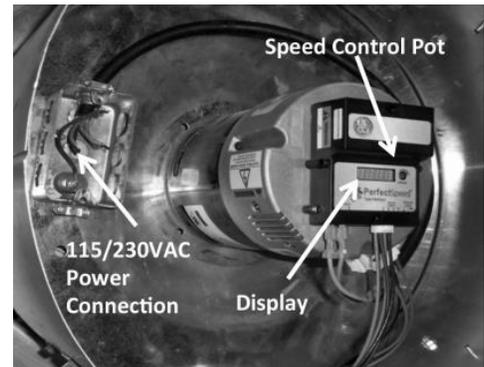
**EC (ELECTRONICALLY CONTROLLED) MOTOR**

**Perfect Speed Controller – Optional**

EC motors are equipped with a control module that allows for accurate manual adjustment of motor speed. Motor speed range is from 300 to 1800 rpm or maximum rpm for that model. The control module features a 4 digit LED display that indicates % demand of full speed and motor speed in rpm. The display also indicates an error code message for minor diagnostics if required.

**MESSAGE DISPLAYED...**

- Spd-** followed by the instantaneous speed in rpm
- dE-** followed by S + demand in %
- E1-** No communications
- E2-** Under Voltage

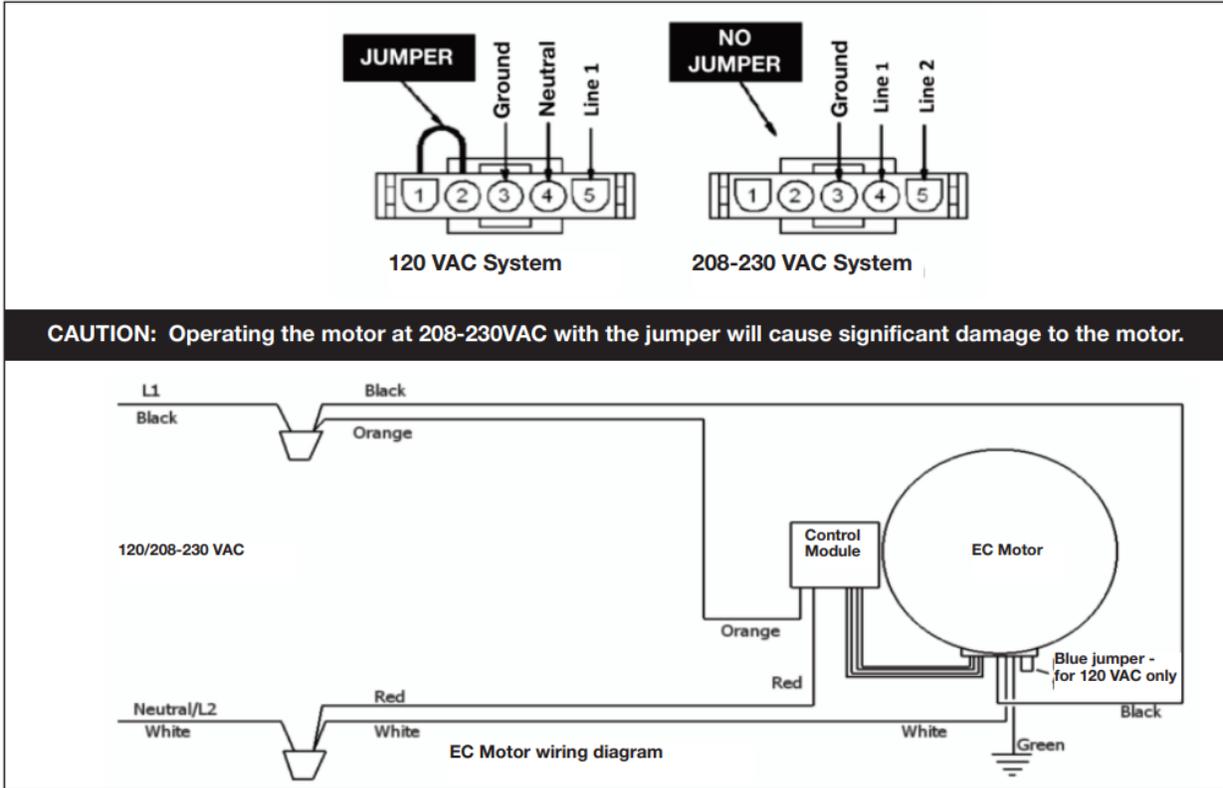


Motor speed can be changed by adjusting the speed control pot located on the control module. A small screwdriver can be used to make the speed adjustment.

**AC SUPPLY - 120/208-230VAC**

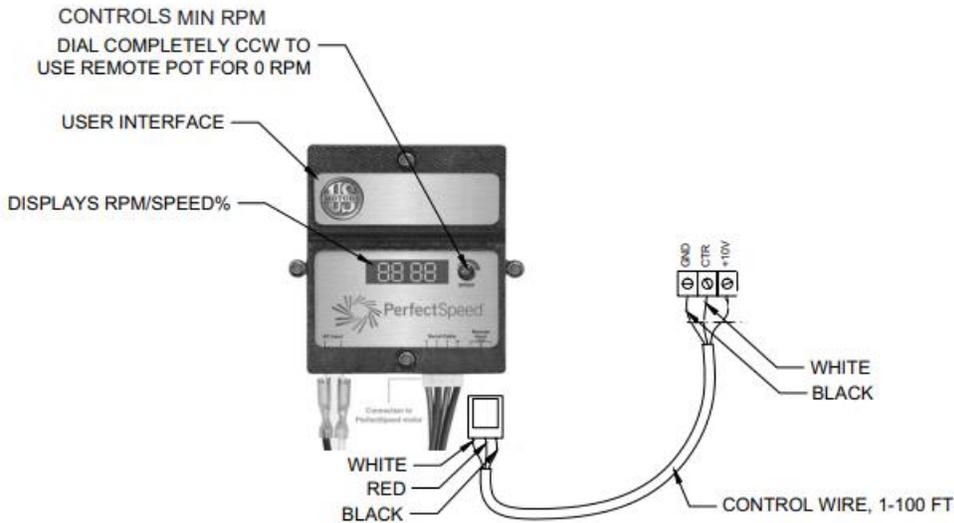
Power is connected to the motor and control module through the junction box and wiring harness provided.

**NOTE:** For 115VAC operation the blue jumper provided (taped to wire harness) must be inserted into motor power connector. See diagram.



**CAUTION:** Operating the motor at 208-230VAC with the jumper will cause significant damage to the motor.

**NOTE:** EC motors have a soft start feature. When the power is turned on the control module gathers information from the motor then begins the start up process. After a few seconds the motor will start to turn and reach full set speed in 10-30 seconds.



## RTC Controller – Optional

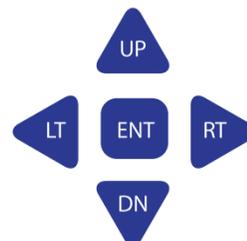
### Normal Operation

#### FSC Application

Every ten seconds the FSC-1 display will toggle between the current percent of run speed and the current RPMs. The percent of run speed can be changed by using the **UP** and **DN** keys followed by the **ENT** key to save your changes. If the remote function is enabled the speed is controlled through the 0-10V input. 0V being 0% and 10V being 100%, unless overridden by the low speed and high speed limits. You can access programming mode by holding the enter key for three seconds.

#### 0-10 Application

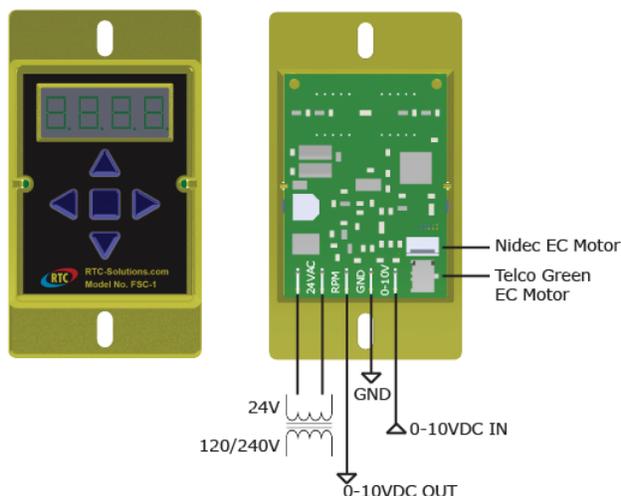
In the 0-10V application you are provided a programmable 0-10V reference. The display shows the selected voltage. The voltage is easily changed using the **UP** and **DN** keys followed by the **ENT** key to save your changes.



### Programming

Please refer to the “FSC-1 Menu Map” on page 3 for editing parameters within program mode. To enter program mode hold the **ENT** key for three seconds until “LSPD” is displayed. Use the **UP** and **DN** keys to navigate to the desired menu parameter shown in column 1 of the menu map on page 3. To edit a menu parameter press the **RT** key once on the desired parameter. The current value will be displayed in column 2 of the menu map on page 3. Also use the **UP** and **DN** keys to change values within a parameter. The parameter will blink until the user presses **ENT** to save the changes or the **LT** key to cancel without saving. If a key is not pressed for fifteen seconds, the control will return to normal operating mode. Different parameters are as follows:

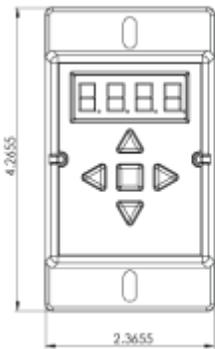
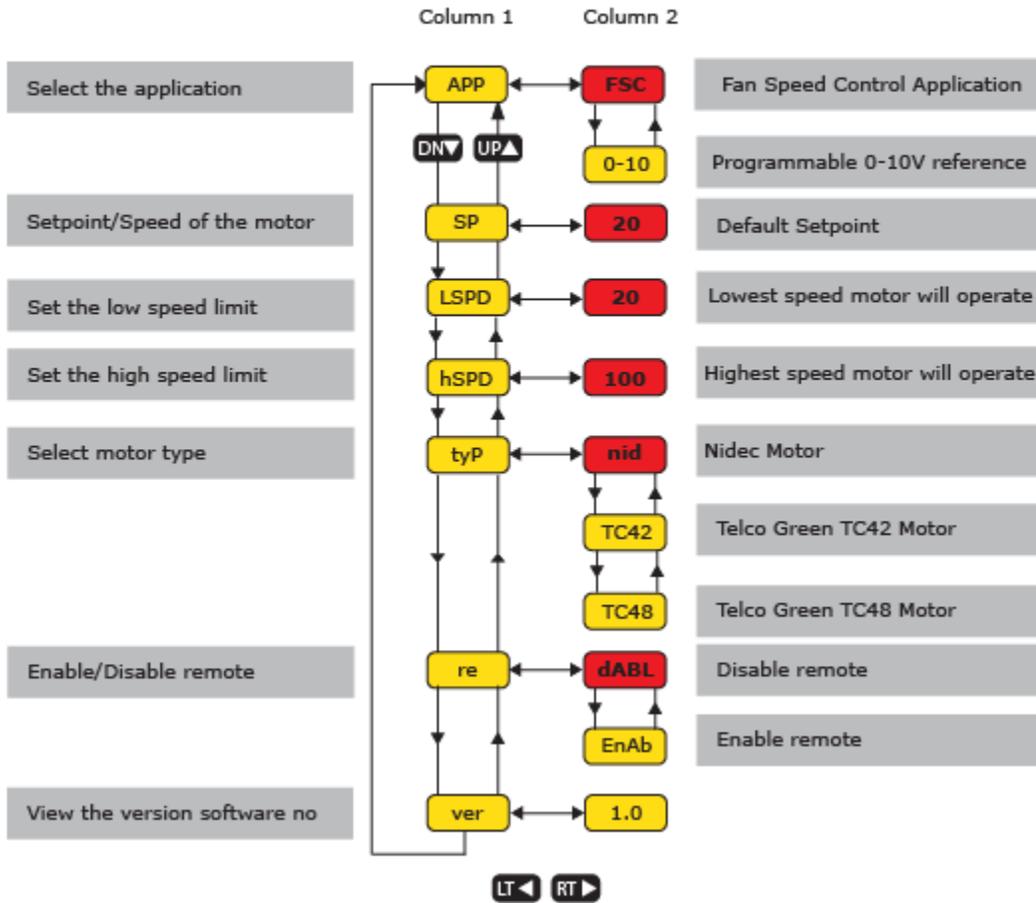
1. “APPS”: Prompts the user to select which application to utilize.
2. “SP”: Set the speed or the “Setpoint” of the motor.
3. “LSPD”: Sets the lowest possible speed the motor will operate at. If the **DN** button is pressed one more time passed the “LSPD” limit, the control will turn off.
4. “hSPD”: Sets the highest possible speed the motor can operate at.
5. “tyP”: Sets the type of motor the control is configured for. The FSC-1 is compatible with Telco Green and Nidec motors.
6. “re”: Allows the user to enable or disable the use of an external remote control.
7. “ver”: Allows the user to view the current version software number.



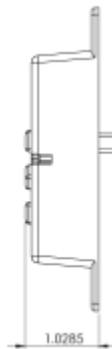
What you want to do

What you see

What it means

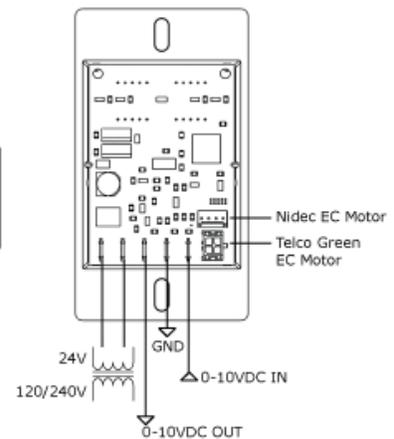


.128 lbs



Specifications

Power Requirements	24VAC @ 20VA
Ambient Operating Temperature	-40°F-140°F -40°C-60°C



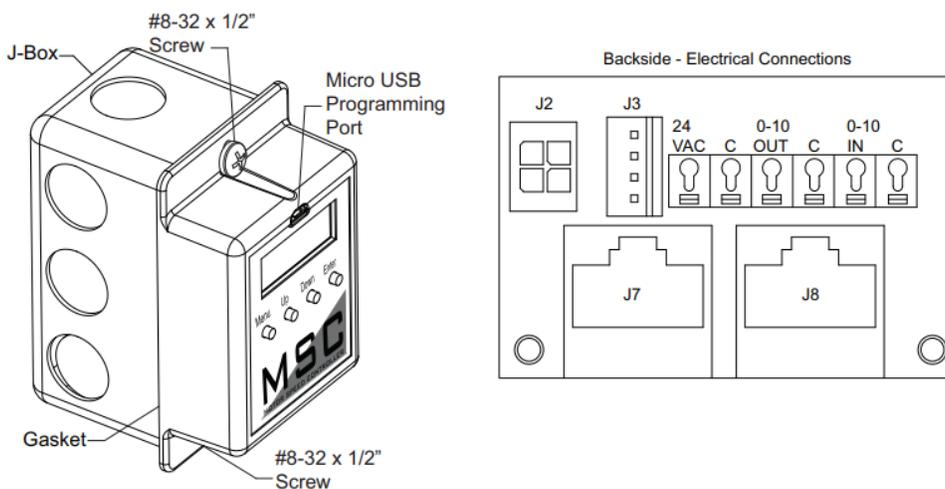
**Motor Speed Controller (MSC) – Optional**

The Motor Speed Controller (MSC) is a versatile device able to output various signal types to many different Electrically Commutated Motors (ECMs). The MSC signal output types can be selected under the ‘Motor Type’ section of the MSC menu. The MSC may be installed in a fan, remotely in a kitchen space, or in a mechanical room. While this device can be mounted remotely and powered using 24V, it may also be mounted with the fan where it will be exposed to higher voltages. If installed in the fan, the electrical installation must be carried out according to the appropriate regulations (e.g., cable cross-sections, circuit breaker, protective earth [PE] connection). National and local codes must be followed during the installation process.

The MSC board may be powered through a 120VAC/24VAC CLASS 2 transformer, 120V AC/24V DC CLASS 2 power supply.

The MSC contains static sensitive components. Therefore, you must handle with care to avoid damage to these components. All operations concerning installation, commissioning, and maintenance must be carried out by qualified, skilled personnel who are familiar with the installation, assembly, commissioning, and operation of the electronic board and the application for which it is being used.

Do not install the MSC where it is subjected to adverse environmental conditions such as combustibles, oils, hazardous vapors, corrosive chemicals, excessive dust, moisture, direct sunlight, or extreme temperatures. When removing or installing the MSC to the j-box, verify the gasket is present. All electrical connections for the MSC are located on the backside of the controller. Refer to Figure below for details on installation and electrical connections.



## Variable Frequency Drive (VFD) Installation

Variable Frequency Drives (VFDs) change the speed of 3-phase motors by varying the frequency signal which is sent to the motor. Factory wiring diagrams show which fans are controlled by VFDs.

The load wiring from variable frequency drives must be run in its own conduit. Each motor should not share load wiring conduit with any other motor covered by a variable frequency drive Input AC Power

- Circuit breakers feeding the VFDs are recommended to be thermal-magnetic and fast-acting.
- Every VFD should be powered by its own breaker. Do Not combine multiple VFDs are to be combined on the same breaker.
- Input AC line wires should be routed in conduit from the breaker panel to the drives. AC input power to multiple VFDs can be run in a single conduit if needed. Do not combine input and output power cables in the same conduit.
- The VFD should be grounded on the terminal marked PE.
- A separate insulated ground wire must be provided to each VFD from the electrical panel. This will reduce the noise being radiated in other equipment.

**ATTENTION: Do not connect incoming AC power to output terminals U, V, W. Severe damage to the drive will result. Input power must always be wired to the input L terminal connections (L1, L2, L3).**

### VFD Output Power

- Motor wires from each VFD MUST be routed in a separate steel conduit away from control wiring and incoming AC power wiring.
- An insulated ground must be run from each VFD to its respective motor.
- Do not install a contactor between the drive and the motor.
- When a disconnect switch is installed between the drive and motor, the disconnect should only be operated when the drive is in a STOP state.

**VFD – Lenze Americas Corporation controllers – Optional**

Basic Electrical Attachments (in additional to Line and Load):

- Ground signal to 2 on VFD
- 0-10VDC signal to 5 on VFD

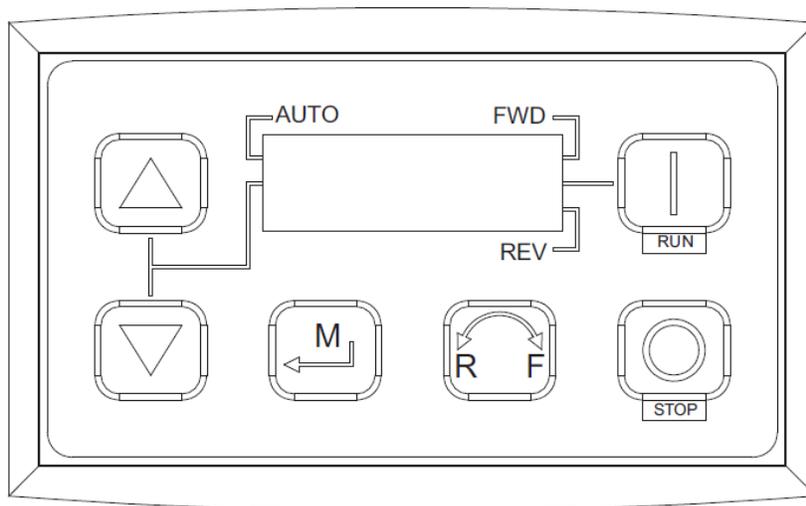
Basic Program Adjustments:

- P101 Change to “1” from “0”
- P160 Change to “30” from “0”
- P161 Change to “60” from “55”

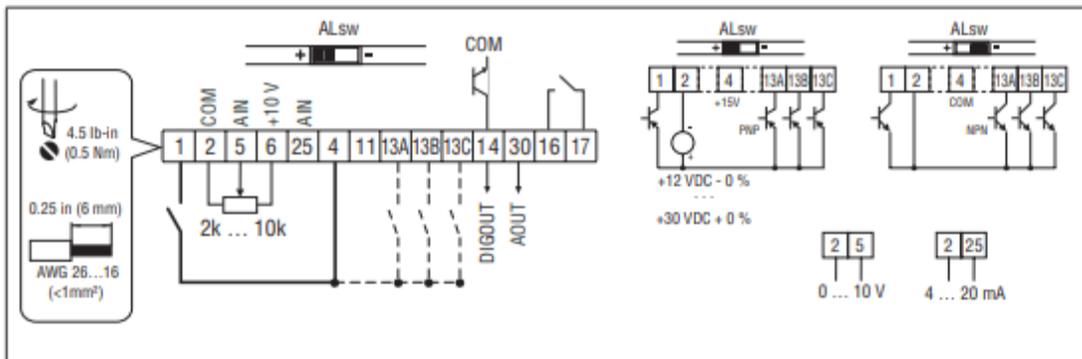
To enter the PROGRAM mode to access the parameters:

1. Press the **Mode (M)** button.
2. The display will read “P100”. If prompted for a password (PASS), use the **Up** and **Down** buttons to scroll to the password value (the factory default password is “0225”) and press the **Mode (M)** button. Once the correct password is entered, the display will read “P100”, which indicates that the PROGRAM mode has been accessed at the beginning of the parameter menu.
3. Use the **Down** buttons to scroll to P101
4. Press the **Mode (M)** button to display the present parameter setting. The parameter value will begin blinking, indicating that the present parameter setting is being displayed. The value of the parameter can be changed by using the **Up** to change to “1”
5. Pressing the **Mode (M)** button will store the new setting and exit the PROGRAM mode. If the **Mode (M)** button is pressed within 1 minute of exiting the PROGRAM mode, the password is not required to access the parameters. After one minute, the password must be re-entered to access the parameters again.

**VFD Controller Screen**



**Control Terminal Strip for 0.33 - 10 HP (0.25 - 7.5 kW):**



For further assistance, please visit our **SMV Support Portal**:  
<https://lenze.yonyx.com/y/portal/>

**Control Terminal Strip Descriptions**

Terminal	Description	Important
1	Digital Input: Start/Stop	input resistance = 4.3kΩ
2	Analog Common	
5	Analog Input: 0...10 VDC	input resistance: >50 kΩ
6	Internal DC supply for speed pot	+10 VDC, max. 10 mA
25	Analog Input: 4...20 mA	input resistance: 250Ω
4	Digital Reference/Common	+15 VDC / 0 VDC, depending on assertion level
11	Internal DC supply for external devices	+12 VDC, max. 50 mA
13A	Digital Input: Configurable with P121	input resistance = 4.3kΩ
13B	Digital Input: Configurable with P122	
13C	Digital Input: Configurable with P123	
13D*	Digital Input: Configurable with P124	
14	Digital Output: Configurable with P142, P144	DC 24 V / 50 mA; NPN
30	Analog Output: Configurable with P150...P155	0...10 VDC, max. 20 mA
2*	Analog Common	
TXA*	RS485 TxA	
TXB*	RS485 TxB	
16	Relay output: Configurable with P140, P144	AC 250 V / 3 A
17		DC 24 V / 2 A ... 240 V / 0.22 A, non-inductive

\* = Terminal is part of the terminal strip for the 15HP (11kW) and higher models only.

**Assertion level of digital inputs**

The digital inputs can be configured for active-high or active-low by setting the Assertion Level Switch (ALSw) and P120. If wiring to the drive inputs with dry contacts or with PNP solid state switches, set the switch and P120 to "High" (+). If using NPN devices for inputs, set both to "Low" (-). Active-high (+) is the default setting.

HIGH = +12 ... +30 V  
LOW = 0 ... +3 V



**NOTE**

An **F.AL** fault will occur if the Assertion Level switch (ALSw) position does not match the parameter P120 setting and P100 or any of the digital inputs (P121...P124) is set to a value other than 0.

**Fault Messages:**

Refer to VFD manufacturer manual for further details.

Fault Number	Description
0	No Fault
1	IGBT Temperature Fault
2	Output Fault
3	Ground Fault
4	Temperature Fault
5	Flying Start Fault
6	High DC BUS
7	Low DC BUS
8	Overload Fault
9	OEM Fault
10	Illegal Setup Fault
11	Dynamic Brake Fault
12	Phase Lost
13	External Fault
14	Control Fault
15	Start Fault
16	Incompatible Parameter Set
17	EPM Hardware Fault
18 - 27	Internal Fault
28	Remote Keypad Lost
29	Assertion Level Fault
30 - 33	Internal Fault
34	Comm. Module Failure
35 - 44	Network Fault

**Nidec (KB Electronics) VFD – Optional**

Basic Electrical Attachments (in additional to Line and Load):

- Ground signal to 1
- 0-10VDC signal to 2
- Jumper 9, 11, and 12

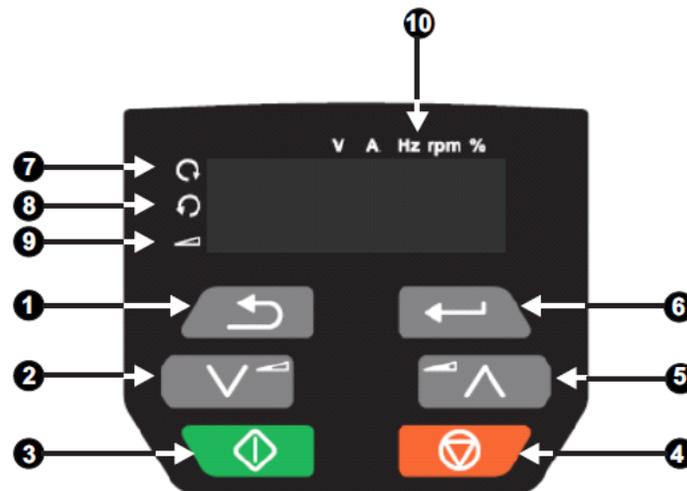
Basic Program Adjustments:

- Pr.0.005 = Drive Configuration – Change to “AV”
- Pr.0.006 = Motor Rated Amps (1.8, 2.8, 3.8, 6, etc.)
  - Note: If you are running more than one motor using this drive, then you are to add values of the motor rated currents (FLA) of each motor
- Pr.0.007 = Motor Rated Speed in RPMs (1500, 1600, 1800 RPM, etc.)
- Pr.0.008 = Motor Rated Voltage (208,230, 460, etc.)
- Pr.0.016 = Analog input mode – Change to “Volt”

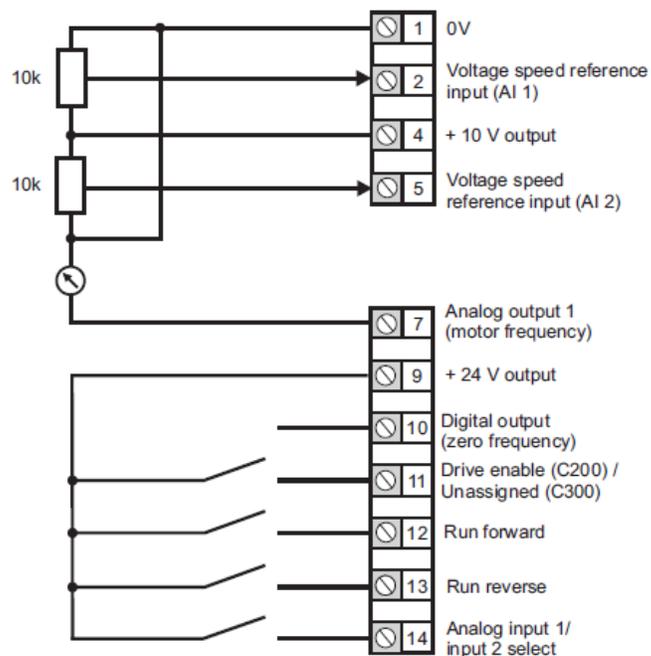
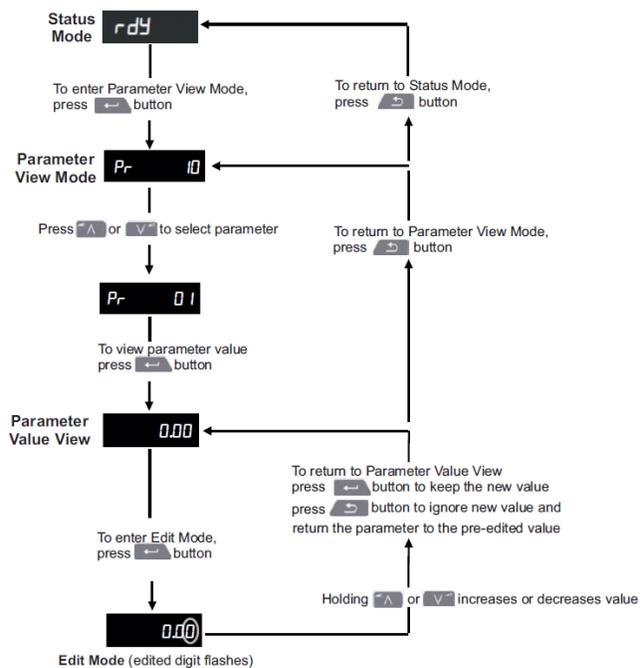
To enter the PROGRAM mode to access the parameters:

- Up and down button - Used to navigate the parameter structure and change parameter values.
- Enter button - Used to change between parameter edit and view mode, as well as entering data. This button can also be used to select between slot menu and parameter display.
- Escape button - Used to exit from parameter edit or view mode. In parameter edit mode, if parameter values are edited and the escape button pressed, the parameter value will be restored to the value it had on entry to edit mode.
- Start button - Used to provide a 'Run' command if keypad mode is selected.
- Stop / Reset button - Used to reset the drive. In keypad mode can be used for 'Stop'.

VFD Controller Screen



1. Escape button
2. Down button
3. Start button (green)
4. Stop / Reset button (red)
5. Up button
6. Enter button
7. Run forward indicator
8. Run reverse indicator
9. Keypad reference indicator
10. Unit indicators



### Alarms:

In any mode, an alarm is an indication given on the display by alternating the alarm string with the drive status string display. If an action is not taken to eliminate any alarm except "tuning", "LS" and "24.LoSt" the drive may eventually trip. Alarms are not displayed when a parameter is being edited.

Alarm string	Description
<b>br.res</b>	Brake resistor overload. <i>Braking Resistor Thermal Accumulator</i> (10.039) in the drive has reached 75.0 % of the value at which the drive will trip.
<b>OV.Ld</b>	<i>Motor Protection Accumulator</i> (04.019) in the drive has reached 75.0 % of the value at which the drive will trip and the load on the drive is >100 %.
<b>d.OV.Ld</b>	Drive over temperature. <i>Percentage Of Drive Thermal Trip Level</i> (07.036) in the drive is greater than 90 %.
<b>tuning</b>	The autotune procedure has been initialized and an autotune in progress.
<b>LS</b>	Limit switch active. Indicates that a limit switch is active and that is causing the motor to be stopped.
<b>Opt.AI</b>	Option slot alarm.
<b>Lo.AC</b>	Low voltage mode. See <i>Low AC Alarm</i> (10.107).
<b>I.AC.Lt</b>	Current limit active. See <i>Current Limit Active</i> (10.009).
<b>24.LoSt</b>	24V Backup not present. See <i>24V Alarm Loss Enable</i> (11.098).

### Status Indicators:

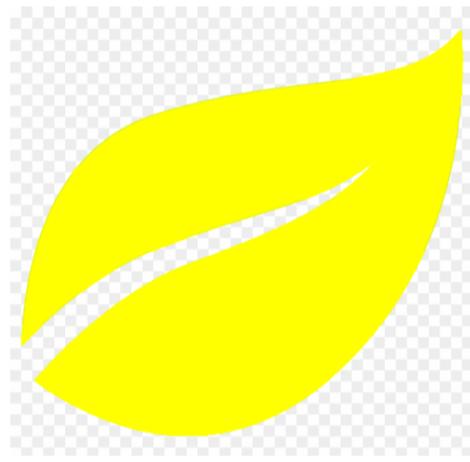
String	Description	Drive output stage
<b>inh</b>	The drive is inhibited and cannot be run. The Safe Torque Off signal is not applied to Safe Torque Off terminals or Pr 06.015 is set to 0.	Disabled
<b>rdy</b>	The drive is ready to run. The drive enable is active, but the drive inverter is not active because the final drive run is not active.	Disabled
<b>Stop</b>	The drive is stopped / holding zero speed.	Enabled
<b>S.Loss</b>	Supply loss condition has been detected.	Enabled
<b>dc.inj</b>	The drive is applying dc injection braking.	Enabled
<b>Er</b>	The drive has tripped and no longer controlling the motor. The trip code appears in the display.	Disabled
<b>UV</b>	The drive is in the under voltage state either in low voltage or high voltage mode.	Disabled
<b>HEAT</b>	The motor pre-heat function is active	Enabled

**Behavior when tripped:**

If the drive trips, the output of the drive is disabled so the load coasts to a stop. If any trip occurs, the following read only parameters are frozen until the trip is cleared. This is to help diagnose the cause of the trip

Parameter	Description
01.001	Frequency reference
01.002	Pre-skip filter reference
01.003	Pre-ramp reference
01.069	Reference in rpm
01.070	Clamped reference
02.001	Post-ramp reference
03.001	Final demand ref
03.002	Estimated frequency
03.003	Frequency error
03.004	Frequency controller output
03.045	Frequency reference
04.001	Current magnitude
04.002	Active current
04.017	Reactive current
05.001	Output frequency
05.002	Output voltage
05.003	Power
05.005	DC bus voltage
07.001	Analog input 1
07.002	Analog input 2

When the controller detects a period 30 seconds of inactivity, the system will activate the Screen Saver mode and display either a green or yellow image depending on the Exhaust Fan speed. The screen shows a green leaf when the fan speed is from 0% – 30% and a yellow leaf from 31% – 100%.



**Screen Saver Display Image**

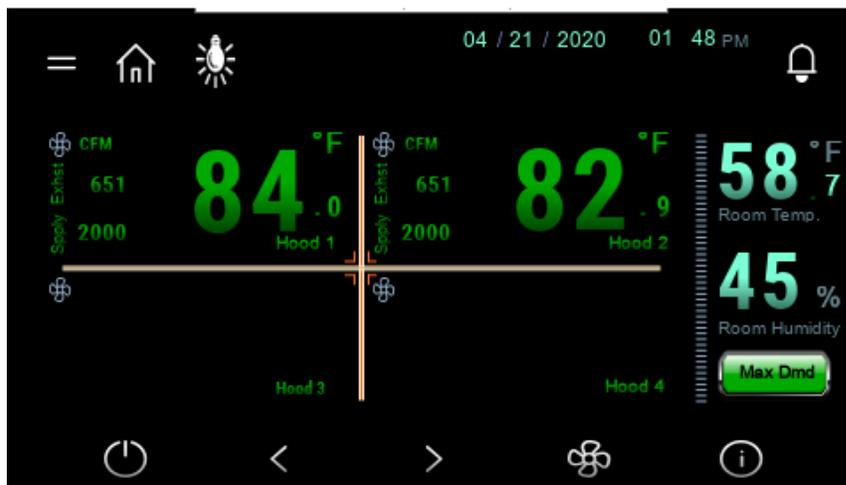
**Homepage Screen**

This screen will display the Zone temperatures, fan flow rate, room temperature, room humidity, and the Max Demand momentary Pushbutton.

It is depended on the selected Models that some Zones can be hidden on this screen.

The Room Temperature and Humidity are shown on the right side of the screen.

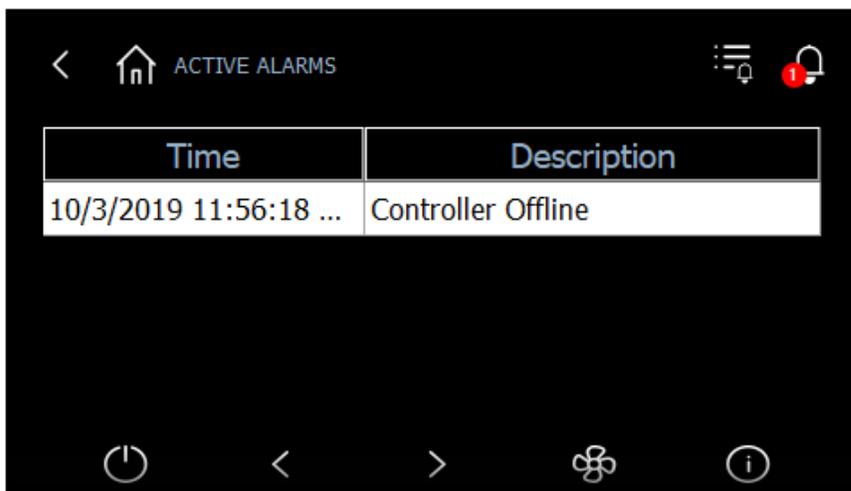
Notice that Icons layout at the top and bottom of Home screen will also show on all info pages.



**Homepage**

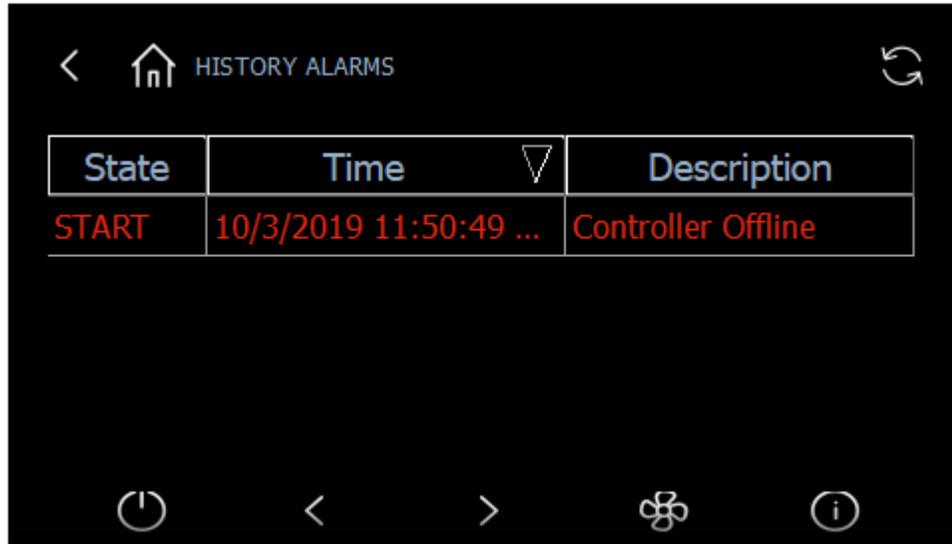
**Alarm and History Alarm Pages**

Users can access to the Alarm page any time by tapping the Bell Icon located on the upper right of the screen. A current active alarm page is shown below.



**Alarm Page**

To view the Alarm History page, a User can simply tap on the small bell Icon located to the right of the first one. A History Alarm page is shown below.



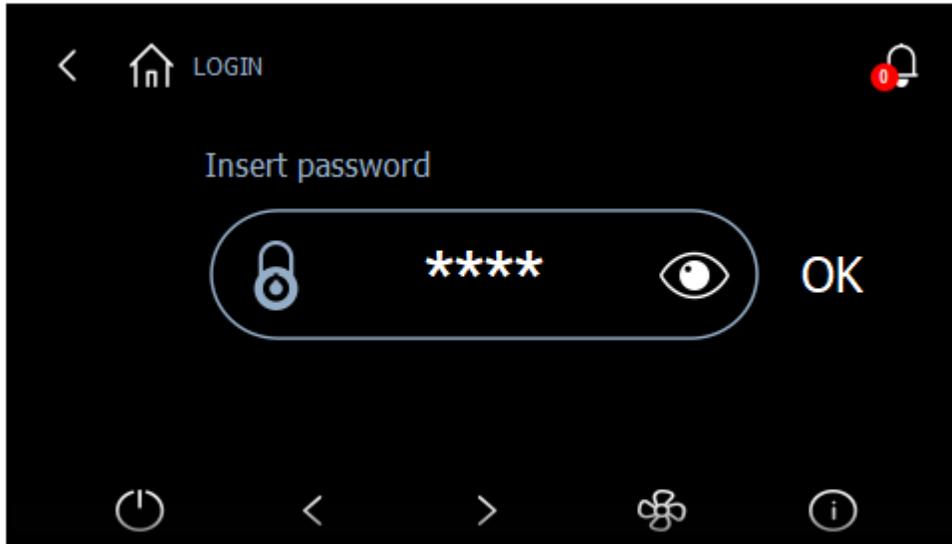
**History Alarm Page**

**Password Login Page**

To make any changes to a process Setpoint, a User must provide a correct password. A Login page is shown in the picture below. To get to this page, tap the “=” sign next to the Home icon.

End User Password – 1001

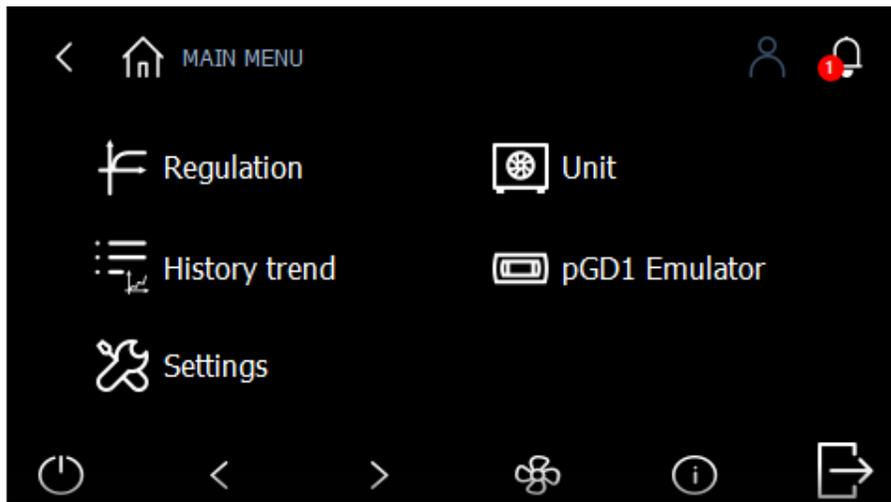
Service Password – 2002



**Login Page**

### Main Menu Page

Once a User has successfully logged in, they can now make changes to the Setpoint, Device's configuration, etc. The password type determines whether the system will allow a User to access certain areas of the Settings.

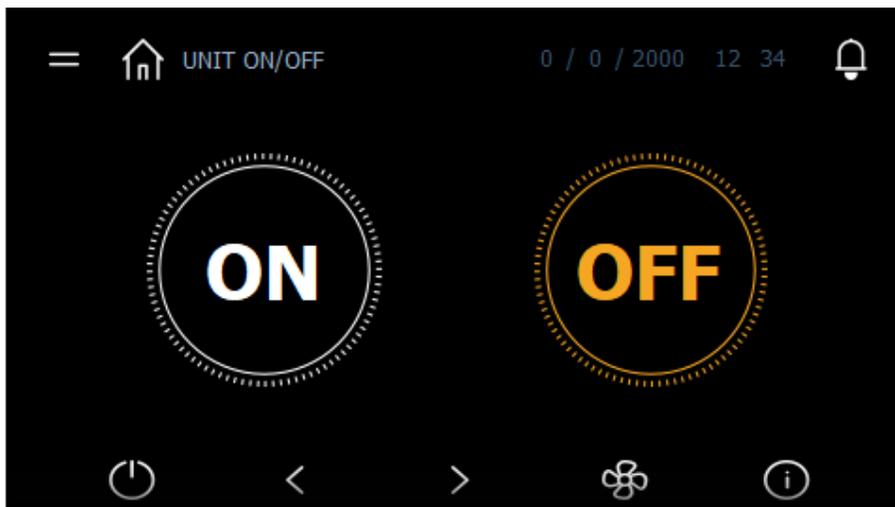


**Main Menu Page**

### ON/OFF Page

Tap on the Power Icon located at the bottom left to bring up the On/Off page.

The On/Off page allows the User to logically terminate the Controller’s process. By pressing the Off button, the Controller will be in Idle state and will not process anything until the On button is pressed. Get to this page by pressing the Power icon in the middle of the bottom page.



**Unit On/Off Page**

**Left and Right Arrow Buttons**

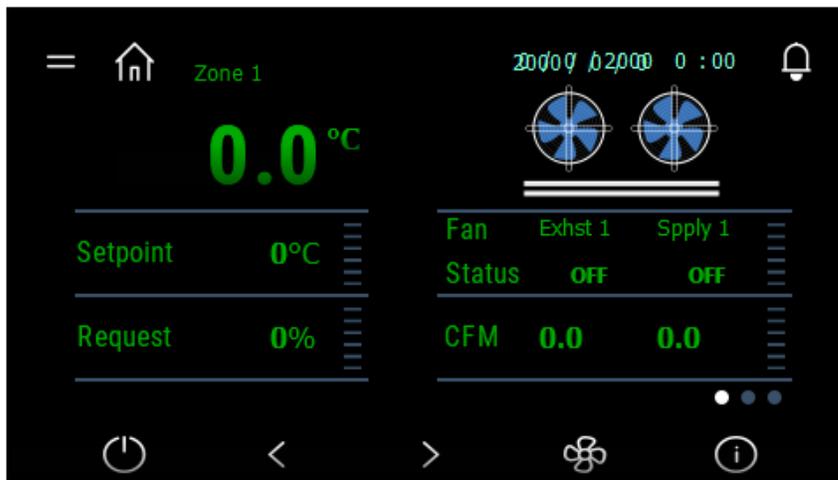
The Left and Right Arrow buttons are used to navigate back and forth from the current viewing page in the order shown in the picture below. *E.g.*, if a user is currently on Zone 4 page, pressing the Right arrow will load the Info02 page, and pressing the Left arrow will load the Zone 3 page.

- 1 : Logo
- 2 : FirstTime\_Cfg
- 3 : Homepage
- 4 : On Off
- 5 : Zone1
- 6 : Zone 2
- 7 : Zone 3
- 8 : Zone 4
- 9 : Info02
- 10 : Info03
- 11 : SetP
- 12 : Live Trend

**Info Page Structure**

**Zone Status Page**

Tapping on the Fan icon will take the user to the Zone 1 Info page. The Zone 1 info page is shown in the picture below. There will be one page for each enabled Zone. Depending on the system configuration, only zones that were configured to be used for that specific system will show on the status page.

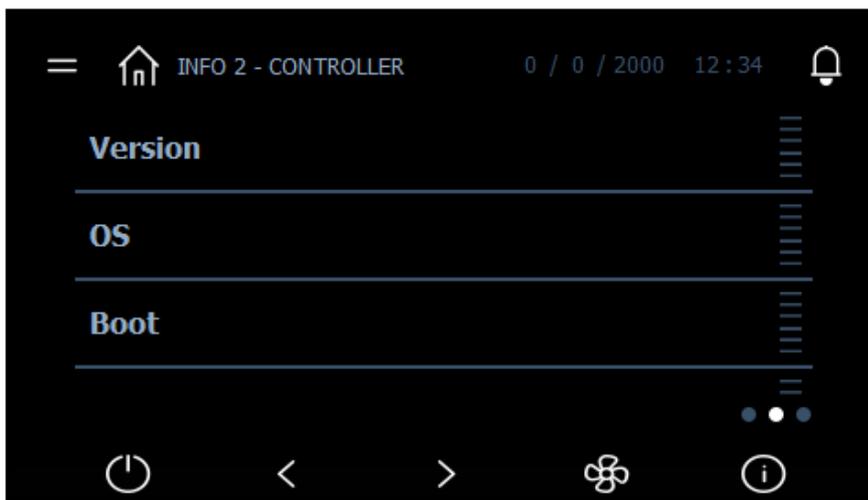


**Zone 1 Info Page**

### Controller's Info Page

By tapping on the "i" symbol Icon, the system will bring up the Controller's hardware information page.

The Controller's Info page shows the information about the Controller's OS version, processor type, etc. This screen is subsequent to the one above. Get to this page by tapping on the Right-Arrow located on the right side of the enabled Zone page.



**Controller's Info Page**

**Controller's Info Page**

Similar to the Controller page, a PGDx Info page is shown below. This screen contains all the information that relates to the PGDx. This screen is subsequent to the screen above.



**PGDx's Info Page**

**Setpoint Status Page**

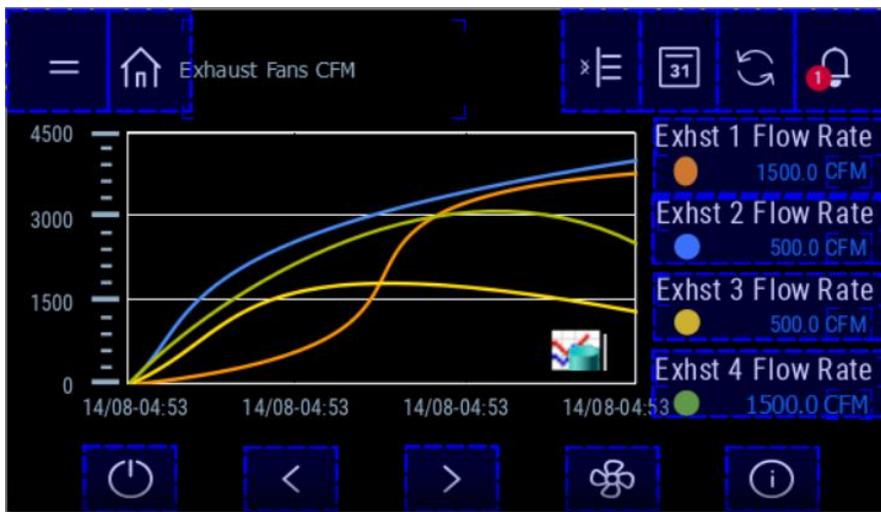
Tapping on the Temperature symbol button leads the User to the Setpoint Status page. Any other Setpoint screen will be subsequent to this one.

The Setpoint Status pages contain all the System's process Setpoints such as Zone temperatures, Exhaust and Supply fan speeds, etc.



### Live Trending Page

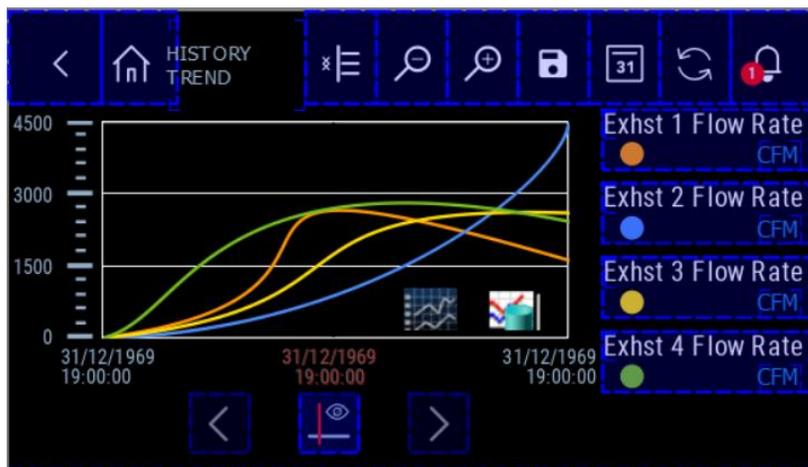
The Trending page displays all the Exhaust fan flow rates. Three buttons on the upper left window are used to configure the layout of the Trending window. Each button on the right window is used to control the show/hide of each cursor.



Fan Flow Rate Trending

### History Trending Page

The History Trending page shows the graphs of all the Exhaust fan flow rates. From this page, a user can also export the trending history into a log file which can be saved into a local PGDx drive or a usb stick.

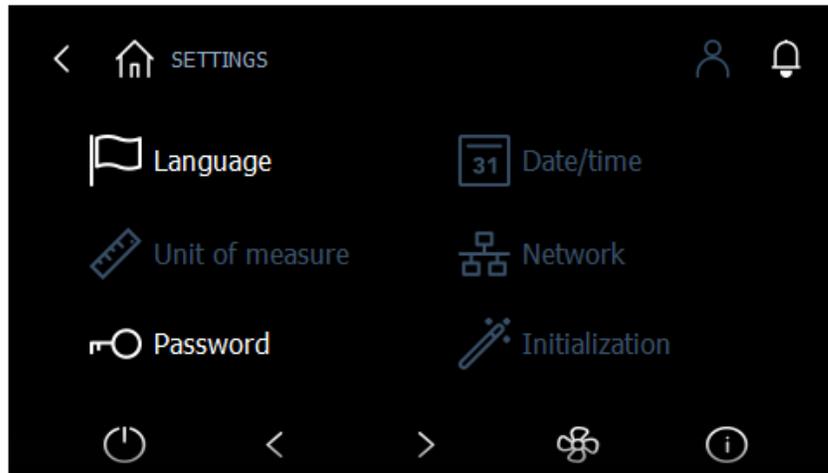


Fan Flow Rate History Trending

### Password Protected Page

As mentioned above, the system only allows the User to get to certain pages depending on the password types. An example is shown in a picture below. A setting page at the User level password type allows a User to change the System's display language, modify Date & Time, and change the new User password, but not the Unit of measurement, configure the serial port, or initialize the system.

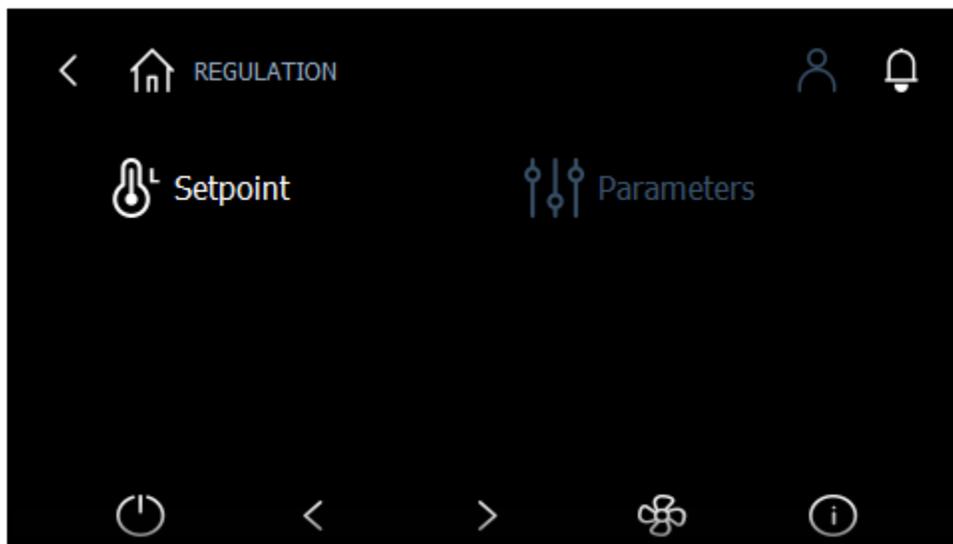
From the Main Menu page tap Settings to get to this system Settings page.



**User Level Password Setting Page**

### Regulation Page

The regulation page has two options, Setpoint and Parameters. To navigate to this page, a User can tap on Regulation from the Main Menu page.



**Regulation Page**

**Setpoint**

Zone Temperature Setpoint is shown in the picture below. From here, a User can set the temperatures for all the zones. The Max Temp. Setpoint allows a User to set the temperature at which the exhaust fan(s) speed will be at 100%.

To get to this page, just tap Setpoint from the Regulation page showed above.



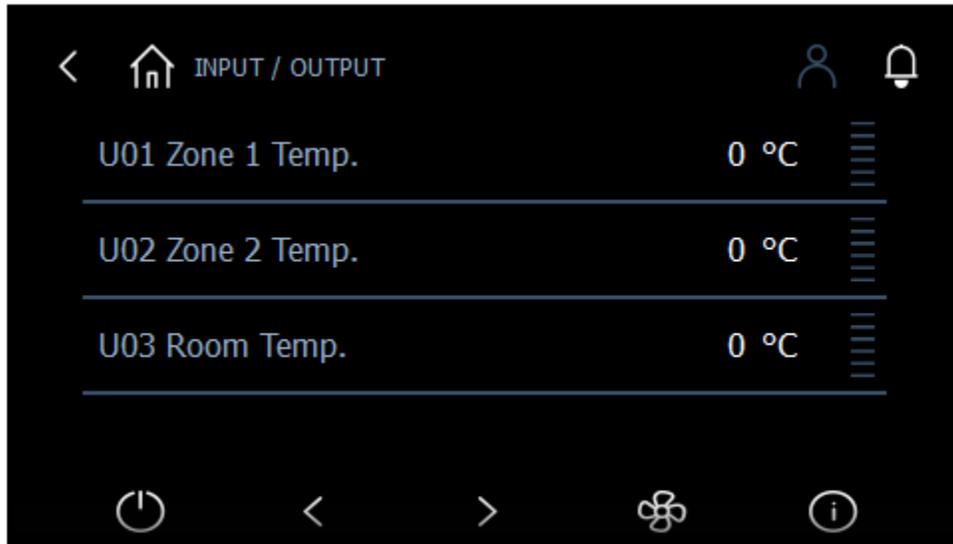
**Process Setpoint Page**

**Parameters**

The Parameter page is where a User can set the sensor types, Min and Max values, and an Offset value for each analog input channel. Tap Parameters from the Regulation page to get to this page.

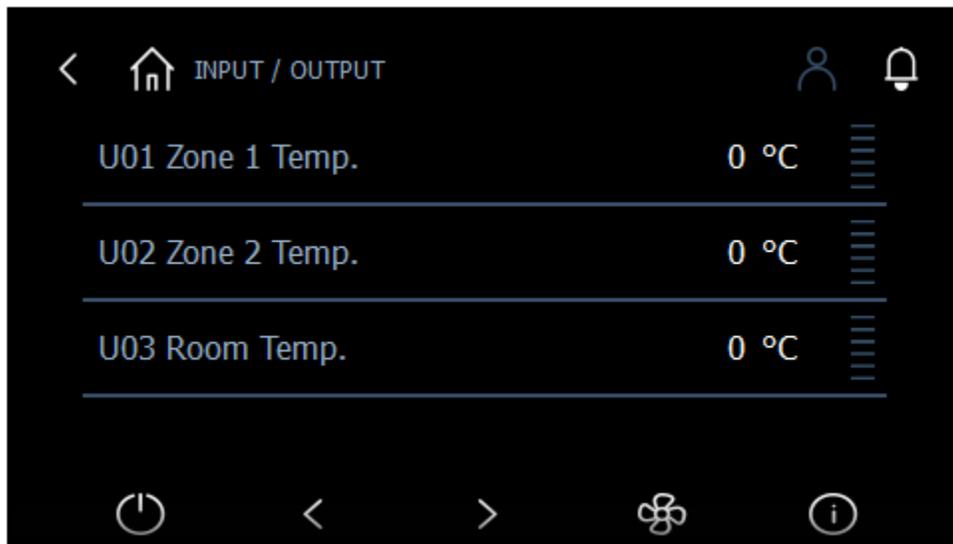


Unit Configuration



Unit Setting Page

The Unit Configuration page contains the IO Tab that will allow a User to set all the IO channel number by tapping Input/Output.



Input Output Page

System Date and Time

Finally, the last status page of the system that doesn't require a password to access is the Date & Time. Get to this page by pressing the bottom right Icon.



Date & Time Page

Alarm list is shown below:

Name
Al_cpCO_OffLine
Alam 1
Duct_HiTemp
Duct_Temp_Hw_Alm
Room_Temp_Hw_Alm
Room_Hum_Hw_Alm
Exhst1_Ch_Hw_Alm
Exhst2_Ch_Hw_Alm
Exhst3_Ch_Hw_Alm
Exhst4_Ch_Hw_Alm
Spply1_Ch_Hw_Alm
Spply3_Ch_Hw_Alm
Spply4_Ch_Hw_Alm
Spply2_Ch_Hw_Alm
Exhst1_Fail_Alarm
Exhst4_Fail_Alarm
Exhst3_Fail_Alarm
Exhst2_Fail_Alarm
Spply1_Fail_Alarm
Spply4_Fail_Alarm
Spply2_Fail_Alarm
Spply3_Fail_Alarm

Troubleshooting:

Problem	Items to Review	Solutions
Fan(s) rotating incorrect direction	3-Phase motors wired incorrect	Swap 2 of the 3-Phase wires at Load side of cable
		Jumper wires landed incorrectly on VFD
Fans operating constantly (including overnight)	Temperature set too low on set-up screen	Increase Temperature Set-point
Smoke spilling out of hoods at 100% operation	Maximum Exhaust fan speed has been scaled down from 100%	Increase exhaust fan maximum speed to 100%. Refer to information provided in manual for adjustment
	Supply fan percentage has been scaled up too far	Decrease Supply fan maximum percentage. Refer to information provided in manual for adjustment
Smoke spilling out of hood(s) at lowest speeds	Exhaust fan minimum speed is set too low	Increase exhaust fan minimum speed to 100%. Refer to information provided in manual for adjustment
	Supply fan percentage has been scaled up too far	Decrease Supply fan maximum percentage. Refer to information provided in manual for adjustment
Problem	Items to Review	Solutions
Exhaust Fan not coming on in Fire Mode	Fire microswitches not connected	Check connection to microswitch as per wiring diagram
	Speed control wiring not connected to EC or VFD	Check connection to fan as per the wiring diagram
	PLC to Display cable not connected	Check connection into both PLC (J6) and into Screen
	VFD not set-up	Review adjustments per manual
	Voltage not registering on voltage sensors	Check fan main power connections to terminal block as per wiring diagram
Supply Fan not shutting down in Fire Mode	Fire microswitches not connected	Check connection to microswitch as per wiring diagram
	Speed control wiring not connected to EC or VFD	Check connection to fan as per the wiring diagram
	PLC to Display cable not connected	Check connection into both PLC (J6) and into Screen
	VFD not set-up	Review adjustments per manual
	Voltage not registering on voltage sensors	Check fan main power connections to terminal block as per wiring diagram
Fans not adjusting based on heat	Heat sensors not connected	Check connection from heat sensor to terminals as per wiring diagram
	Voltage not registering on voltage sensors	Check fan main power connections to terminal block as per wiring diagram
Triangles on all display points	PLC to Display cable not connected	Check connection into both PLC (J6) and into Screen

Check Connection failed on initial screen	Voltage not registering on voltage sensors	Check hood/fan selection to ensure proper selection
		Check fan main power connections to terminal block as per wiring diagram
120V Shunt trip not powering during Fire Mode	Shunt wiring not connected to terminal block	Check connection to terminal block as per wiring diagram
	Fire microswitches not connected	Check connection to microswitch as per wiring diagram
Lights not coming on under hood system	Light power not connected to terminal block	Check connection to terminal block as per wiring diagram
	Fire microswitches not connected	Check connection to microswitch as per wiring diagram
Lights not turning off in fire mode on under hood system	Fire microswitches not connected	Check connection to microswitch as per wiring diagram

**Controller IO Table**

<b>CONTROLLER'S IO MAPPING</b>				
<b>Main Controller (c.pCO mini)</b>				
<b>Field Device</b>	<b>IO Type</b>	<b>Channel #</b>	<b>Signal Range</b>	<b>Process Range</b>
Z1 Duct Temp. Sens.	Analog Input	U1	NTC	95 - 140 °F
Z2 Duct Temp. Sens.	Analog Input	U2	NTC	95 - 140 °F
Room Temp. Sens.	Analog Input	U3	NTC	65 – 115 °F
Room Hum. Sens.	Analog Input	U4	0-1 Vdc	0 - 100 %
Exhaust 1	Analog Output	U5	0-10 Vdc	CFM
Exhaust 1 Failed Switch	Digital Input	U6	On/Off	True/False
Exhaust 2	Analog Output	U7	0-10 Vdc	CFM
Exhaust 2 Failed Switch	Digital Input	U8	On/Off	True/False
Supply 1	Analog Output	Y1	0-10 Vdc	10-100 % Exhst Fan
Supply 2	Analog Output	Y2	0-10 Vdc	10-100 % Exhst Fan
Supply 1 Failed Switch	Digital Input	U9	On/Off	True/False
Supply 2 Failed Switch	Digital Input	U10	On/Off	True/False
System Failed Signal	Digital Input	ID1	On/Off	True/False
System On/Off Signal	Digital Output	NO1	0/5 Vdc	Off/On
Hood Light Control	Digital Output	NO2	0/24 Vdc	Off/On
<b>Expansion Module (c.pCOe)</b>				
<b>Field Device</b>	<b>IO Type</b>	<b>Channel #</b>	<b>Signal Range</b>	<b>Process Range</b>
Z3 Duct Temp. Sens.	Analog Input	U1	NTC	95 - 140 °F
Z4 Duct Temp. Sens.	Analog Input	U2	NTC	95 - 140 °F
Exhaust 3	Analog Output	U3	0-10 Vdc	CFM
Exhaust 3 Failed Switch	Digital Input	U4	On/Off	True/False
Exhaust 4	Analog Output	U5	0-10 Vdc	CFM
Exhaust 4 Failed Switch	Digital Input	U6	On/Off	True/False
Supply 3	Analog Output	U7	0-10 Vdc	10-100 % Exhst Fan
Supply 3 Failed Switch	Digital Input	U8	On/Off	True/False
Supply 4	Analog Output	U9	0-10 Vdc	10-100 % Exhst Fan
Supply 4 Failed Switch	Digital Input	U10	On/Off	True/False



## Maintenance:

To ensure proper operation of the control panel, proper maintenance and service should be performed at recommended intervals

**WARNING:** Do not attempt maintenance on this control until the electrical supply has been completely disconnected.

## General Maintenance:

- Keep enclosure clean and free of debris
- All fittings and fasteners should be checked for tightness after maintenance and before start-up
- Control Panel enclosure door should be closed secure prior to energizing the control panel system

## Monthly Maintenance:

- Temperature Sensors mounted in hood system should be wiped-down to remove any grease or duct build-up with a damp cloth
- All fittings and fasteners should be checked for tightness after maintenance and before start-up



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8. **Safety.** The Products may be designed to serve multiple applications. NAKS offers a range of safety equipment, including guards and other devices, as may be required to meet customer specifications. Without exception, NAKS recommends that all orders include applicable safety devices. Use of Products ordered without applicable safety devices is your sole responsibility. You warrant that you have determined and acquired any and all safety devices required for the Products.

9. **Title.** Title and right of possession of Products remains with NAKS until all payments (including deferred payments whether evidenced by notes or otherwise) shall have been received to the satisfaction of NAKS and you agree to do all acts necessary to perfect and maintain such title and right in NAKS and not to subject any Products to any liens or encumbrances until such payment is made in full.

10. **Governing Law.** This Order shall be governed by and construed according to the laws of the State of Ohio (excluding the conflict of law provisions thereof). At NAKS' discretion, any action relating directly or indirectly to the Order shall be brought exclusively in the Common Pleas Court of Cuyahoga County, Ohio or the United States District Court for the Northern District of Ohio, Eastern Division, and you irrevocably waive any objection to the jurisdiction of, or venue in, either of these courts and agree that the acceptance of the Order constitutes doing business in the State of Ohio.

11. **Arbitration.** At NAKS' discretion, any dispute arising under or in connection with any Order may be submitted to binding arbitration administered by the American Arbitration Association under its Commercial Arbitration Rules, and judgment on the award rendered by the arbitrator may be entered in any court having jurisdiction thereof. The dispute shall be resolved by one neutral arbitrator who shall have no affiliation with either you as the buyer or with NAKS and shall be selected by the American Arbitration Association office, and held in, Cleveland, Ohio.

**WARNING.** NAKS' Products are designed and manufactured to provide reliable performance but they are not guaranteed to be 100% free of defects. Even reliable products will experience occasional failures and this possibility should be recognized by



the buyer and all end users. If Products are used in life support ventilation systems where failure could result in loss or injury, the buyer and all end users should provide adequate back-up ventilation, supplementary natural ventilation or failure alarm system, or acknowledge willingness to accept the risk of such loss or injury. **DO NOT USE IN HAZARDOUS ENVIRONMENTS** where fan's electrical system could provide ignition to combustible or flammable materials unless unit is specifically built for hazardous environments. Comply with all local and national safety codes including the National Electrical Code (NEC) and National Fire Protection Act (NFPA).

**DISCLAIMER.** NAKS has made a diligent effort to illustrate and describe the Products accurately in all materials; however, such illustrations and descriptions are for the sole purpose of identification and do not express or imply any warranty.

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**LIMITATION OF REMEDY AND DAMAGES.** All claims under this warranty must be made in writing and delivered by U.S. Mail to:

North American Kitchen Solutions, Inc.  
172 Reaser Court  
Elyria, OH 44035  
Attn: WARRANTY CLAIMS DEPARTMENT

All Product claims must be made within 15 days after discovery of the defect and prior to the expiration of two years from the date of shipment. Claims made beyond that period are barred. Within 30 days after receipt of a timely claim, NAKS shall have the option either to inspect the Product at its location or request its return to NAKS at your expense. NAKS shall replace, or at its option repair, free of charge, any Product it determines to be defective, and it shall ship the repaired or replacement product to you F.O.B. point of shipment; provided, however, if in NAKS' judgment circumstances are such to prohibit repair or replacement to remedy the warranted defects, your sole and exclusive remedy shall be a refund of any part of the invoice price, paid to NAKS, for the defective Product or part.



NAKS is not responsible for the cost of removal of the defective Product or part, damages due to removal, or any expenses incurred in shipping the Product, or the installation of the repaired or replaced Product or part.

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**REPLACEMENT PARTS.** If replacement parts are ordered, purchaser warrants that the original components in which these replacement parts will be placed are in satisfactory working condition, and when said replacement parts are installed, the resultant



installation will operate in a safe manner, at speeds and temperatures for which the original product was purchased.

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