GREENHECK
Building Value in Air.

Installation, Operation and Maintenance Manual

Please read and save these instructions for future reference. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with these instructions will result in voiding of the product warranty and may result in personal injury and/or property damage.

Product Specification

International Mechanical Code (IMC) compliant electrical package.

Provide Greenheck Fan Corporation temperature interlock electrical package as shown on plans and in accordance with the following specification:

The temperature interlock(s) consists of a temperature controller, temperature sensor (resistive temperature detector, or RTD), junction box, fire proof/leak proof fitting (Evergreen Quik-Seal® and/or Evergreen Compression Seal), and shall be a self-contained unit or as a part of another pre-engineered electrical control package.

The temperature interlock package shall engage a contact powering the fans when the sensor detects the temperature is above the set point plus hysteresis. The interlock shall hold the circuit closed upon fan switch being turned off until the sensor detects a temperature below the set point. Once the temperature is below the set point, the fans shall shut down.

The temperature interlock package shall be constructed by Greenheck Fan Corporation and operate in accordance with International Mechanical Code.

Due to continuous research, Greenheck Fan Corporation reserves the right to change specifications without notice.

General Safety Information

Only qualified personal should install this product. Personnel should have a clear understanding of these instructions and should be aware of general safety precautions. Improper installation can result in electric shock and other potential hazards.

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

2. Do not allow the electrical components of this product to come in contact with oil, grease, hot surfaces, water, or chemicals.

3. Verify the site can supply the necessary power for each fan and for the control panel.

WARNING
Electrical shock hazard. Can cause equipment damage, personal injury or death. Service must only be performed by personal that are knowledgeable in the operation of the equipment being controlled.
CAUTION
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 this sequence is required by the authority having jurisdiction.

Table of Contents

General Description

Description

The temperature interlock is designed to automatically start kitchen hood exhaust fans and keep them running while heat is being generated from the cooking appliances. Hood systems should always be manually started before equipment is turned on. If the operator fails to turn the fans on, the interlock will turn the fans on once enough heat is detected. The package consists of a temperature controller, temperature sensor (resistive temperature detector, or RTD), junction box, and a UL Listed, liquid-tight fitting. The temperature controller is contained in a stand alone box or can be added to a pre-engineered fan control center.

Purpose

To meet IMC, an interlock between exhaust fans and cooking equipment must be present for all Type I hood systems. This product will utilize a temperature sensor in the exhaust duct collar or in capture area of hood to detect heat generated from cooking operations and automatically activate the exhaust fans if not already turned on.

Product Application

The temperature interlock can be used with Type I and Type II hoods. It is not to be used in conjunction with exhaust fire dampers. Greenheck recommends using one interlock per hood system (activates all fans linked to system simultaneously).

Performance Goals

To meet IMC, the fans need to activate not more than 15 minutes after the first appliance served by that hood has been turned on. Ambient kitchen temperatures are not the same in all commercial kitchens. Therefore, set point adjustments may be necessary on the temperature controller to make sure the system meets this 15 minute requirement.

Receiving and Unpacking

Receiving

Upon receiving the product, check to make sure all items are accounted for by referencing the bill of lading or packing list to ensure all items were received. Notify the carrier if any damage is noticed. The carrier will make notification on the delivery receipt acknowledging any damage to the product. All damage should be noted on all of the copies of the bill of lading which is countersigned by the delivering carrier. If damaged upon arrival, file a claim with the carrier. Any physical damage to the unit after acceptance is not the responsibility of the manufacturer.

Unpacking

Verify that all required parts and the correct quantity of each item have been received. If any items are missing, report shortages to your local representative to arrange for obtaining missing parts.

Storage

If a temperature interlock must be stored prior to installation, it must be protected from dirt and moisture. Indoor storage is highly recommended.

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

Handling

Make sure the equipment does not suffer any heavy vibration or knocks.

Installation

Control Box Mounting

| NOTE |
| --- |
| Control box may be factory mounted. If so, continue to the next section. |

Locate an area with enough space to mount the control box and fasten to the wall. Avoid installing the control box in environments with high magnetic and/or radio frequency interference.

## Temperature Sensor(s) - Hood Mounting

NOTE
Temperature sensor(s) may be factory installed. If so, continue to the next section.

1. Locate flat area(s) at the top interior of the hood in front of the filters, towards the front of the hood.
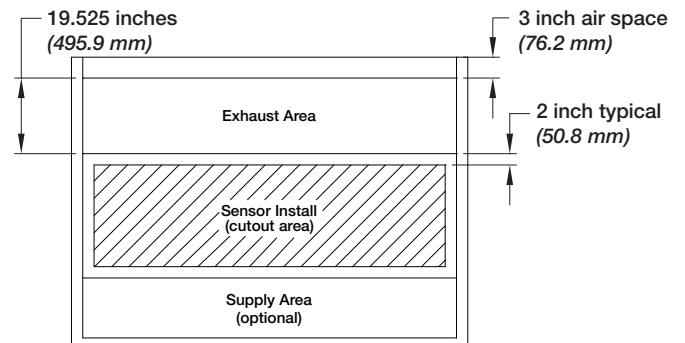

Top View of Exhaust Hood

2. Find a spot for the sensor in the flat space that will not interfere with the fire suppression nozzles and that is not within 12 inches (304.8 mm) of any light fixtures. Cut a 3/4 to 7/8-inch (19.0 to 22.2 mm) diameter hole in the flat spot of the capture tank.
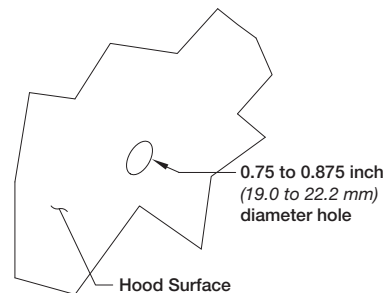
Installation - *continued*

3. Place the J-box plate inside of the octagon extension ring and place over the hole.

4. Disassemble the compression seal and place through hole and J-box plate as shown. Tighten the nut inside the octagon extension ring.
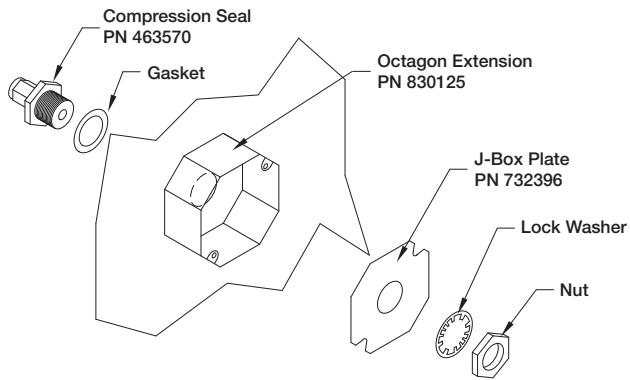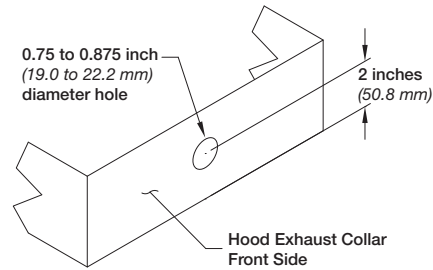

Compression Seal
PN 463570

Gasket

Octagon Extension
PN 830125

J-Box Plate
PN 732396

Lock Washer

Nut

5. Place the temperature sensor through the compression seal and tighten the compression fitting to 35 ft.-lbs. (47.5 Nm).

Temperature Sensor
PN 384925

Additional Octagon Extension
(Optional)
PN 830125

Octagon Cover
PN 380926
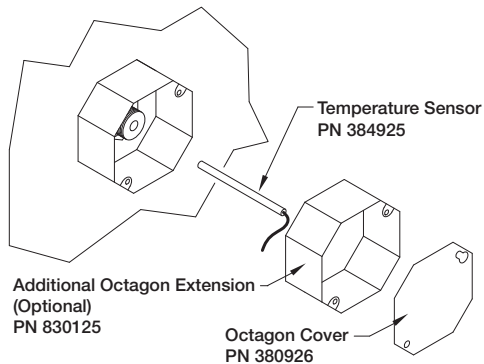
6. Wire the sensor. Refer to Electrical Connections section for instructions on wiring the temperature sensor.

7. Place octagon cover onto J-box and fasten it.

Temperature Sensor(s) - Duct Collar Mounting

1. Locate the exhaust duct on top of the hood. Find a spot to mount the sensor where it will not interfere with fire suppression nozzles or other items installed in the ducts. If an exhaust fire damper is present in the hood exhaust collar, it must be removed prior to temperature sensor installation. A 3/4 to 7/8-inch (19.0 to 22.2 mm) diameter hole must be cut into the duct 2 inches (50.8 mm) above the hood top.

0.75 to 0.875 inch *(19.0 to 22.2 mm)* diameter hole

2 inches *(50.8 mm)*

Hood Exhaust Collar Front Side

2. Place the J-box plate inside of the octagon extension ring and place over the hole in the exhaust collar.

3. Disassemble the compression seal and place through hole in duct collar and J-box plate as shown. Tighten the nut inside the octagon extension ring.

1/4-inch Compression Seal
PN 463570

Quik Seal Gasket

Octagon Extension
PN 830125

J-Box Plate
PN 732396

Lock Washer

Nut

4. Place the temperature sensor through the compression seal and tighten the compression fitting to 35 ft.-lbs. (47.5 Nm).

Octagon Cover
PN 380926

Additional Octagon Extension
(Optional)
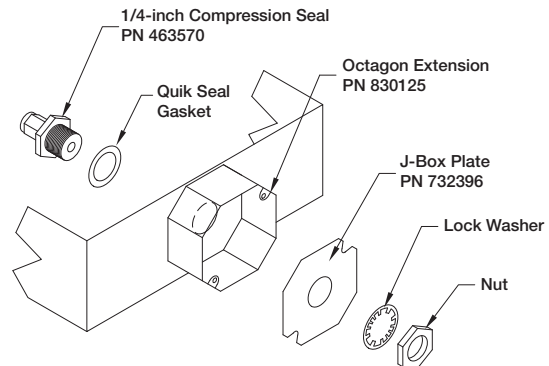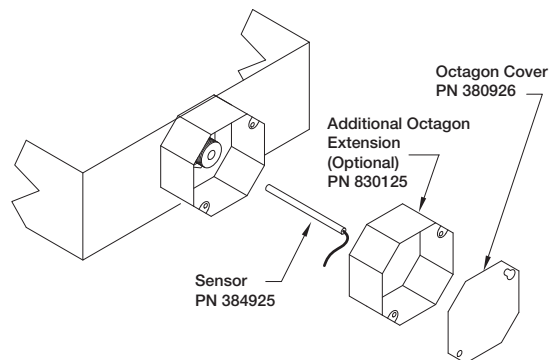PN 830125

Sensor
PN 384925

5. Wire the sensor. Refer to Electrical Connections section for instructions on wiring the temperature sensor.

6. Place octagon cover onto J-box and fasten it.

Electrical Connections

All Fan Starters Provided by Others

1. Wire 115 VAC power from non-shunted breaker to terminal blocks H1 (hot) and N1 (neutral) in temperature interlock panel.

2. Wire fan switch (either provided in field, shipped loose for remote install, or provided on hood/hood utility cabinet) to terminal blocks S1H and S1 in temperature interlock panel.

3. Wire AC voltage needed to activate fan starters (115 or 24 VAC) to terminal block CP1 (hot).

4. Wire one side of all exhaust fan starter coils to terminal block CP2 (switch leg).

5. If Type I hood, wire common (C) of dedicated fire system microswitch to terminal block CP2.

6. Wire normally open (NO) of fire system microswitch mentioned in item 5 above to terminal block CP1.

7. If Type I hood, wire normally closed (NC) of fire system microswitch mentioned in item 5 above to one side of all supply fan starter coils. If Type II hood, wire supply fan starter coils directly to terminal block CP2.

8. Wire the other side of all exhaust fan and supply fan starter coils back to neutral.

9. Wire low-voltage sensors in hoods back to temperature interlock panel (see Temperature Sensors section for details).
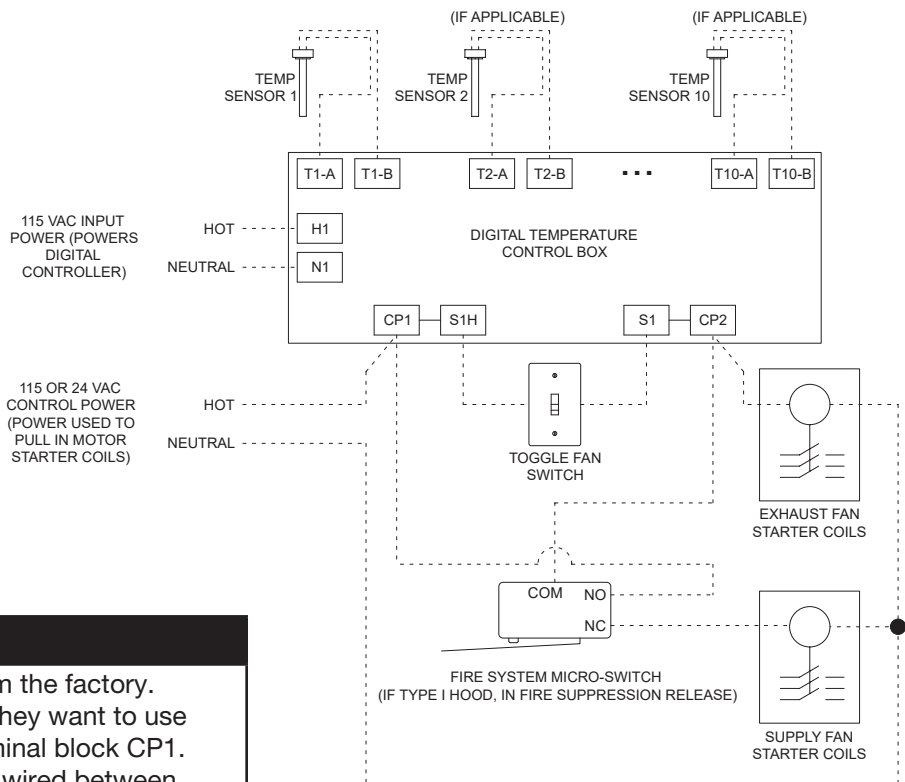
NOTE

CP1 and CP2 are dry contacts from the factory. The field needs to wire AC power they want to use to activate their fan starters to terminal block CP1. All exhaust fan starters need to be wired between CP2 and a neutral. **Contacts used to make this connection on the temperature controller are rated up to 240 VAC and 8 amps.** Make sure the control circuit does not exceed these ratings. If exceeded, this can damage the contacts in the temperature controller which will require replacement.

Electrical Connections - *continued*

All Exhaust/Supply Fan Starters Provided in Make-Up Air Unit

1. Wire 115 VAC power from non-shunted breaker to terminal blocks H1 (hot) and N1 (neutral) in temperature interlock panel.
2. Wire fan switch (either provided in field, shipped loose for remote install, or provided on hood/hood utility cabinet) to terminal blocks S1H and S1 in temperature interlock panel.
3. If Type I hood, wire common (C) of dedicated fire system microswitch to terminal block CP2.
4. If Type I hood, wire normally open (NO) of fire system microswitch mentioned in item 3 above to terminal block CP1.
5. Run three (3) low voltage wires (18 gauge) from MUA unit control center down to temperature interlock panel.
   a. Terminal block R in MUA connects to terminal block CP1 in temperature interlock panel.
   b. Terminal block H in MUA connects to terminal block CP2 in temperature interlock panel.
   c. If Type 1 hood, wire terminal block G in MUA to normally closed (NC) of fire microswitch mentioned in 3 above. If Type 2 hood, wire terminal block G in MUA to terminal block CP2 in temperature interlock panel.
6. Wire low-voltage sensors in hoods back to temperature interlock panel (see Temperature Sensors section for details).

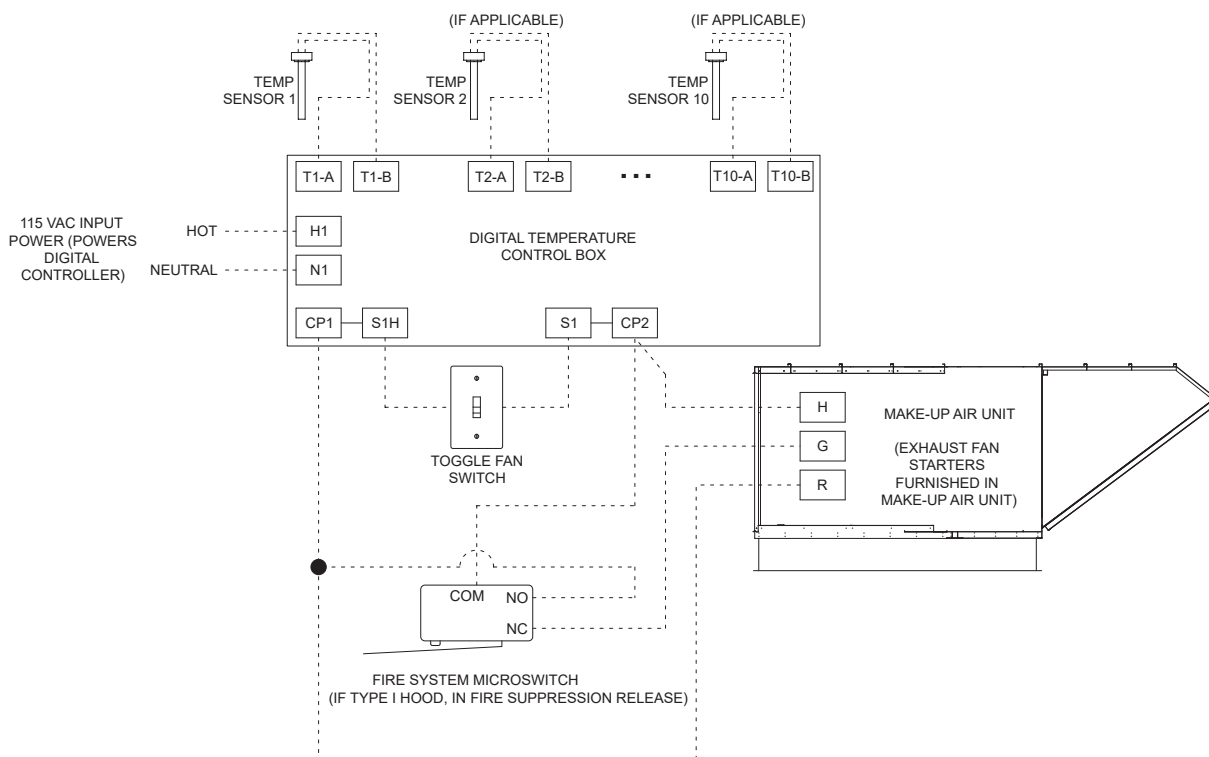# Electrical Connections - *continued*

Temperature Sensor(s)

Unless already done by the factory, wire the two leads of each sensor to the control panel as shown below using low voltage, 18 gauge stranded wire. The two wires of each sensor are not polarity sensitive.

| Sensor	Terminals
First Sensor	T1-A and T1-B
Others *(if applicable)*	T2-A and T2-B T3-A and T3-B T4-A and T4-B T5-A and T5-B T6-A and T6-B T7-A and T7-B T8-A and T8-B T9-A and T9-B T10-A and T10-B T11-A and T11-B T12-A and T12-B

CAUTION

Each sensor is a low voltage, PT1000 ohm resistive temperature detector. They are not a high voltage switch/thermostat. Do not connect temperature sensors in series/parallel with high voltage. This can result in damage to the temperature sensor and will require replacement.

Temperature Controller Programming and Calibration

Pre-programmed, digital temperature controller(s) will be provided to monitor temperatures detected by sensor(s) and engage fan(s).

The fan(s) will start running when a temperature exceeds the set point (defaulted at 90°F) plus differential (defaulted at 25°F). Once the temperature drops back below the set point AND the fan(s) have been running for a minimum run time (defaulted at 5 minutes), the fan(s) will shut off.
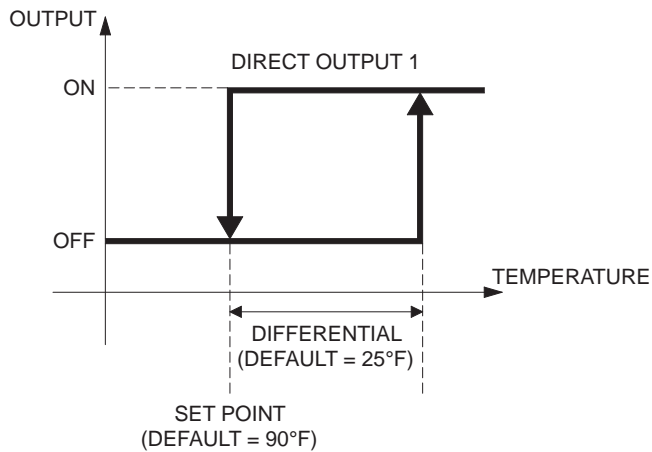
Calibration

Each controller is capable of monitoring up to three individual sensors. There will be an individual set point for each sensor input. The temperature set point may need to be adjusted slightly depending on both ambient and cooking conditions. To adjust the set points on the controller, follow these instructions:

1. Press Set button. 'St1" will appear.
2. Press △ or ▽ button to navigate to set point that you wish to adjust (St1, St2, or St3).
3. Press Set button to view current set point. Press △ or ▽ button to adjust and press Set button to store value.
4. Press Set + ▽ buttons together to exit set point menu or wait 1 minute.

Show Sensor Values

Press Set + △ buttons together to show sensor and value, and press these two buttons together again to see additional sensors connected. "Sd1" represents sensor input one, "Sd2" represents sensor input two, and "Sd3" represents sensor input three (respective to each controller). After 1 minute of no button presses, the controller will go back to displaying the first programmed input (see parameters P31, P32, P33).

Factory Parameters

NOTE
The controller is pre-programmed at the factory to operate based on how many sensors were selected. Adjustments (outside of the set point temperatures discussed in calibration section) should only be made under factory instruction. The list provided is for reference only.

To access/adjust all factory parameters, follow these instructions:

1. Press and hold [Set] button for 30 seconds or until '0' appears.

2. Press [Set] button to enter parameter list.
3. With [△] or [▽] button navigate to the desired parameter on the list of parameters.
4. Press [Set] button to see the current set value.
5. Press either [△] or [▽] button to set the desired new value.
6. Press [Set] button to confirm it and exit to the parameter list.
7. Press [Set] + [▽] buttons together to exit the programming menu or wait 1 minute (keypad timeout).

Temperature Controller Parameters					
	Description	Units	1 Sensor Program	2 Sensor Program	3 Sensor Program
St1	Setpoint Value Sensor 1	Degrees	90.0	90.0	90.0
St2	Setpoint Value Sensor 2	Degrees	3.0	90.0	90.0
St3	Setpoint Value Sensor 3	Degrees	3.0	3.0	90.0
r01	Differential Sensor 1	Degrees	25.0	25.0	25.0
r02	Differential Sensor 2	Degrees	1.0	25.0	25.0
r03	Differential Sensor 3	Degrees	1.0	1.0	25.0
r4	Minimum Setpoint Value	Degrees	-50.0	-50.0	-50.0
r5	Maximum Setpoint Value	Degrees	150.0	150.0	150.0
c01	Mode Sensor 1	Range	dir	dir	dir
c02	Mode Sensor 2	Range	inu	dir	dir
c03	Mode Sensor 3	Range	inu	inu	dir
c11	Minimum Output 1 Stop Time	Minutes	5.0	5.0	5.0
c12	Minimum Output 2 Stop Time	Minutes	0.0	5.0	5.0
c13	Minimum Output 3 Stop time	Minutes	0.0	0.0	5.0
c21	Minimum Output 1 On Time	Minutes	0.0	0.0	0.0
c22	Minimum Output 2 On Time	Minutes	0.0	0.0	0.0
c23	Minimum Output 3 On Time	Minutes	0.0	0.0	0.0
c31	On Time Fault Sensor 1 Cycle	Minutes	1.0	1.0	1.0
c32	On Time Fault Sensor 2 Cycle	Minutes	0.0	1.0	1.0
c33	On Time Fault Sensor 3 Cycle	Minutes	0.0	0.0	1.0
c41	Off Time Fault Sensor 1 Cycle	Minutes	0.0	0.0	0.0
c42	Off Time Fault Sensor 2 Cycle	Minutes	0.0	0.0	0.0
c43	Off Time Fault Sensor 3 Cycle	Minutes	0.0	0.0	0.0
P0	Temp Scale	Option	F	F	F
P11	Sensor 1 Calibration	Degrees	0.0	0.0	0.0
P12	Sensor 2 Calibration	Degrees	0.0	0.0	0.0
P13	Sensor 3 Calibration	Degrees	0.0	0.0	0.0
P2	Decimal Point	Option	YES	YES	YES
P31	Sensor 1 Present	Option	YES	YES	YES
P32	Sensor 2 Present	Option	NO	YES	YES
P33	Sensor 3 Present	Option	NO	NO	YES
H2	Keypad Protection	Option	NO	NO	NO
H4	Serial Communications Address	Range	0	0	0
H5	Keypad Code	Range	0	0	0
H6	Type of Sensor	Option	Pt1	Pt1	Pt1

Shaded values are changed by the factory

LED Indicators
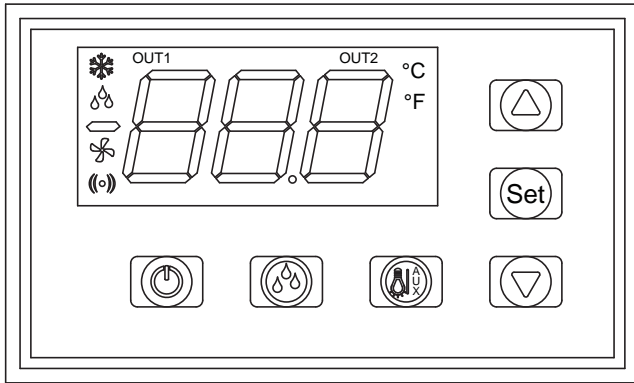
OUT1	Indicates that relay 1 is energized
OUT2	Indicates that relay 2 is energized
�	Indicates that relay 3 is energized
((∘))	Indicates an faulty temperature sensor or sensor connection

Display Messages

In normal operation the sensor temperature will be displayed. The following messages can also appear:

EP1, EP2, EP3	Sensor Error. Check wiring or replace temperature sensor.
ooo	Indicates an open sensor (infinite resistance)
- - -	Indicates shorted sensor (zero resistance)
Err	Memory Reading Error. Reset controller to factory defaults and program for 1, 2, or 3 sensors again. If problem persists, replace controller.

Reset to Factory Parameters

The factory parameters can be programmed to the factory default by turning off the controller and turning it on again while the △ + ▽ buttons are pressed. The PRO message will show after cycling power.

Control Circuit Diagram (Stand-Alone Package)

This is an example of a generic wiring diagram for standard control. This diagram has 12 sensors which provide temperature interlock function for two exhaust fans and one supply fan.
(All starters provided by others, external to this control box).

CONTROL INPUT: 115VAC, 15AMPS FROM BREAKER

LABEL	DESCRIPTION
EF	Exhaust Fan
SF	Supply Fan
ST	Starter
OL	Overload
C	Contactor
G	Ground
S	Switch
LT	Light
FS	Fire MicroSwitch
STB	Shunt Trip Breaker
N	Neutral
TS1-12	Temperature Sensor
TC1-4	Temperature Controller

——— FACTORY WIRING
- - - - FIELD WIRING

ALL WIRING 90°C 14 GA.
UNLESS SPECIFIED

WIRE COLOR
BK - black
BL - blue
BR - brown
OR - orange
PR - purple
RD - red
YW - yellow
WT - white

FIELD WIRING:
USE MINIMUM
60° Copper Wire

FIELD MOUNTED SWITCH
FIELD WIRING TO SWITCH REQUIRED

TYP. EXHAUST

TYP. EXHAUST

TYP. SUPPLY

FIELD WIRE FIRE SYSTEM
MICROSWITCH

CONTROL INPUT: 24/115 VAC, 15AMPS FROM BREAKER

Testing

1. Turn fan switch on, then off to ensure proper fan operation before cooking equipment is started. Once this is verified, testing can proceed.

2. With the fans turned off by the fan switch, turn on at least one piece of cooking equipment under the hood. The fans should automatically start within 5 to 10 minutes. If the fans take more than 15 minutes to start, decrease the temperature set point(s) on the temperature controller (see Calibration, page 8).

3. If an adjustment was made in Step 2, repeat now.

4. After verification of fan start-up, shut down cooking equipment. The fan switch should still be in the off position. Once cooking equipment has cooled below the set point, the fans will shut down.

CAUTION
The sensors should never be exposed to direct flame. The sensors are rated up to 250°F (121.1°C).
CAUTION
EXPOSING THE SENSOR TO DIRECT FLAME MAY RENDER THE SENSOR INOPERABLE AND WILL VOID THE WARRANTY.
NOTE
During testing, if fans do not start automatically in the first 15 minutes of cooking equipment activation, manually start fans to avoid accidental fire system dump due to heat build-up.

Operation

1. Turn fans on and off using the fan switch. It is normal for the fans to remain running after the switch is turned off. The exhaust temperature controller will shut down fans after heat is no longer present under the hood and the temperature is below the set point.

2. In the event that the cooking equipment is started without turning the fans on manually, the fans will turn on automatically and remain running with the presence of heat under the hood. Once the temperature is below the set point, the fans shall shut down.

Troubleshooting

1. **Controller(s) display EP1 or EP2 and/or EP3.**
   - EP1, EP2 and EP3 represent sensor errors
   - Disconnect the sensor from the system, and check resistance between the two wires on the sensor. At room temperature (77°F, or 25°C), the sensor should read 1097.4 ohms.
   - Check all wiring connections between the sensor and control cabinet

2. **Fans do not turn on automatically upon cooking equipment activation.**
   - Temperature set point too high, decrease set point
   - Multiple sensors must be wired separately
   - Check control circuit (fan starter) wiring

3. **Fans do not shut off.**
   - Check the controller to determine if there is a sensor error (EP1, EP2 or EP3). If yes, refer to the controller display error message, item 1 above.
   - Fan switch must be in the off position
   - Cooking equipment hot, wait for it to cool
   - Temperature set point too low, increase set point
   - Check control circuit (fan starter) wiring

4. **Fans do not turn on quick enough.**
   - Decrease temperature set point

Maintenance

Daily

Clean the temperature sensor with cloth and degreaser. Keep clean for best performance.

Weekly

Dependant on grease production and grease filter type, clean temperature sensor.

Seasonal

May have to change temperature setting on the temperature controller if ambient kitchen temperatures fluctuate between summer and winter seasons.

Whom to call

Contact your local Greenheck representative.

What to have ready for the call

Sales order, serial number and description of product.

Sales Order Number _____

Serial Number _____

Frequently Asked Questions

What temperature is the temperature controller set to from the factory?
95°F set point + 25°F hysteresis

Will the temperature interlock automatically start/ stop the fans?
When connected properly to fan starters the temperature interlock will automatically control the fans without input from the user. However, the intended use of the temperature interlock is as back-up to manual control.

May I connect the power going to my fan directly through the control box?
No, the control box should only use control voltage (24-115 VAC), and a separate 115 VAC power source is required to run the temperature interlock controls. Greenheck recommends the use of starters sized for each fan.

Can I use one control box for multiple hood systems?
This can be done, however, it is not recommended. Any one of the temperature controllers would turn on all hoods running on that control box. It is better to have one hood/fan per control box, plus a significant energy savings can be obtained if one or more of the hoods is not in operation.

Can I still turn my fan on and off?
Yes, the temperature interlock is designed to be operated with a typical on/off switch. The fan may not turn off directly after turning the fan switch off, it will sense when the cooking operations have cooled and then turn off.

Replacement Parts

Part Number	Description
384925	Temperature Sensor (RTD) Dwyer TE-IBN-E0448-00
880601	Temperature Controller (programmed for 1 sensor) Dwyer TSDIN-013-G
880602	Temperature Controller (programmed for 2 sensors) Dwyer TSDIN-013-G
880603	Temperature Controller (programmed for 3 sensors) Dwyer TSDIN-013-G
830125	Extension, Octagon (drilled) SC55151-1/2 (380928)
732396	J-Box Plate
380926	Cover, Octagon Box SC#54-C-1RACO 722
384905	Terminal Block, Single Pole, DIN-RAIL MT, ABB ZS6
384908	Jumper, DIN-RAIL Terminal Block Two Pole ABB JB6-2
463570	Evergreen Compression Seal 1/4-inch, #302

Codes and Standards Compliance

- UL 710
- National Fire Protection Association (NFPA 96)
- International Mechanical Code (IMC)

Maintenance Log

Date _____ Time _____ AM/PM
Notes:_____
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Our Commitment

AMCA Publication 410-96, Safety Practices for Users and Installers of Industrial and Commercial Fans, provides additional safety information. This publication can be obtained from AMCA International, Inc. at www.amca.org.

GREENHECK
Building Value in Air.