FHC-1D Fan and Heater Control user manual

The Fan and Heater Control (FHC-1D) automatically controls the temperature in a room by adjusting the speed of variable speed fans and controlling a heater interlock.

When the temperature is at the temperature set point, the FHC-1D operates the fans at the idle speed setting and the heater is off. When the temperature exceeds the set point, the FHC-1D increases the speed of the fans. When the temperature drops below the set point, the FHC-1D shuts off the fans (in shut-off mode) or operates the fans at idle speed (idle mode) and switches on the heater or heat lamps.

The FHC-1D is ideal for poultry, livestock, greenhouse, or light-industrial buildings.

Features

- One variable speed output
- One heater interlock output
- Automatic shut-off and idle modes
- Adjustable temperature set point
- Adjustable idle speed for idle mode (0 to 99%)
- Adjustable temperature differential (1 to 20°F)
- Adjustable off set-back for shut-off mode (0 to 16°F)
- Three-second full-power-turn-on to minimize fan ice-up
- Two-digit LED display
- Fahrenheit and Celsius display
- Error code display for troubleshooting
- Overload protection fuse
- Six-foot temperature probe, extendable to 500 feet
- Rugged enclosure (corrosion resistant, water resistant, and fire retardant)
- CSA approval
- Two-year limited warranty

Installing the FHC-1D

The FHC-1D must be installed by a qualified electrician.

Before installing or servicing the FHC-1D, switch OFF the power at the source.

Install the FHC-1D according to local electrical codes.

Electrical ratings

- 115/230 VAC, 60 Hz
- 10 FLA
- 360 W tungsten
- Fuse: 15 A, 250 VAC ceramic

Variable speed fan motors draw more current at reduced speeds than maximum speed. Fan motor specifications show current draw at maximum speed. Current over 10 A will cause overheating and eventual failure of the FHC-1D control. Check current requirements for the fan motor by either measuring current draw at all speeds or consulting the dealer for information about that fan.

For controlling shaded-pole, permanent-split-capacitor, or universal motors only.

When connecting electric heaters or brooder lamps and a furnace to the FHC-1D, remember that operation voltages might be different. This could damage the equipment.

Fill out the information below to help configure your control and verify that you do not exceed the electrical ratings of the FHC-1D.

Fans	**A** **Maximum current draw per fan**	**B** **Number of fans**	**A × B** **Total current draw**
Make			
Model			
Voltage rating			
Power factor			
Heater or furnace	**Maximum current draw**	**Voltage rating**	
Make			
Model			

Mounting the FHC-1D

When selecting a mounting location, follow the guidelines below.

- Select a location that is away from sources of heat.
- Mount the control on a solid, vertical surface.
- Mount the control with the electrical knockouts facing down.

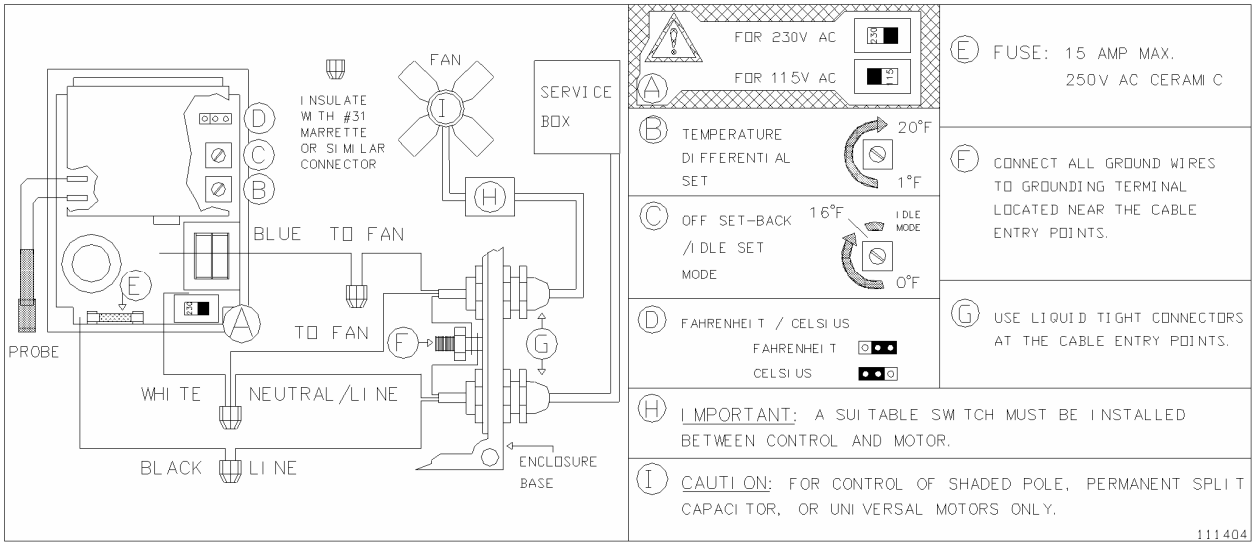
Failure to follow the mounting guidelines can allow moisture into the control and will void the warranty.

To mount the FHC-1D

1. Remove the cover from the enclosure.
2. Attach the FHC-1D to the mounting surface using the fours screws provided.

Wiring the FHC-1D

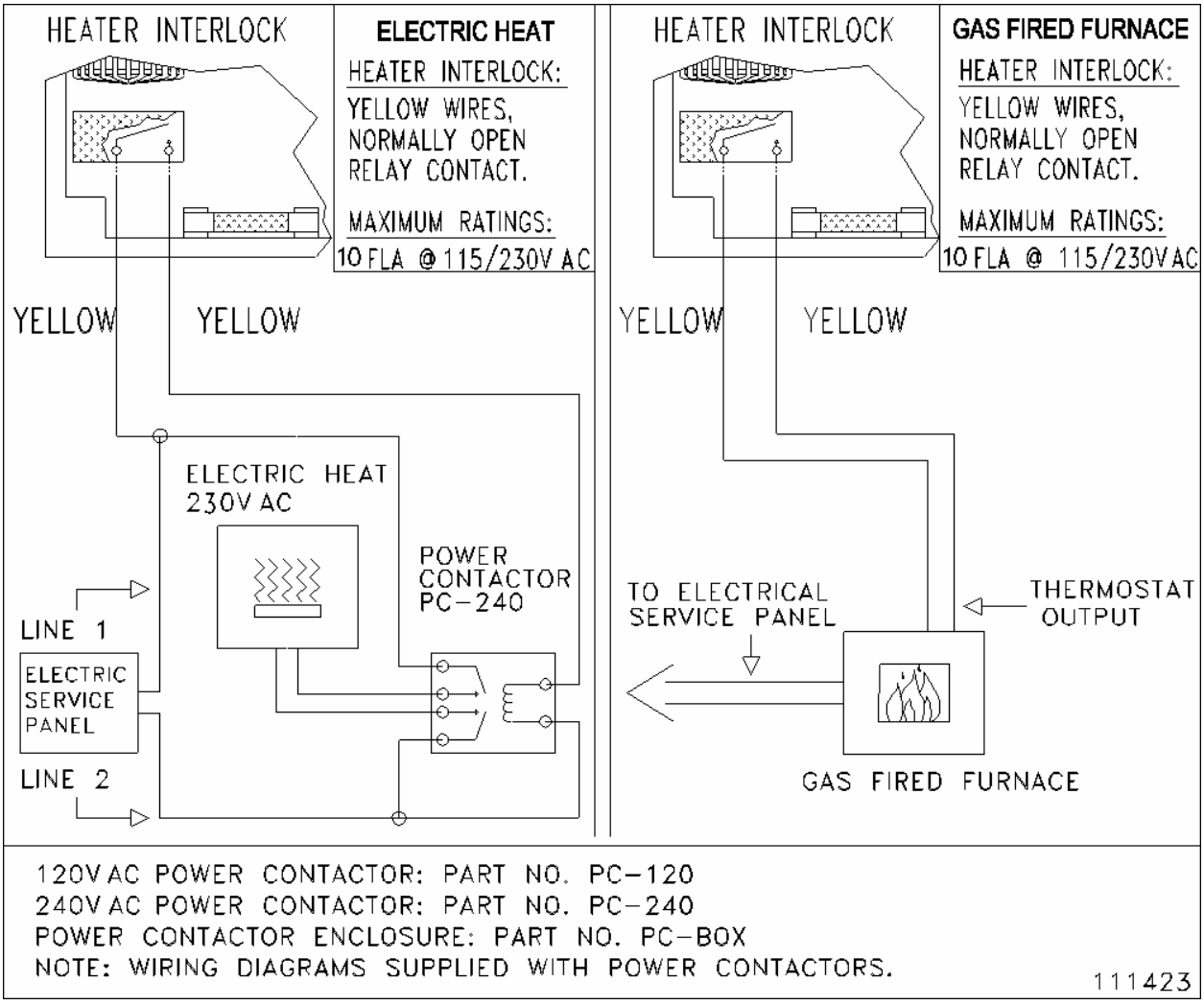
1. Before wiring the control, set the voltage switch to the correct line voltage used (115 or 230 VAC).
2. Before removing electrical knockouts, remove the cover to prevent damaging the control.
3. Connect the wires as shown below.



Connecting equipment to the heater interlock

The heater interlock output is a normally-open relay contact that switches a heater or furnace ON or OFF. The relay contacts close when the temperature is 2°F below the TEMP SET.

Connect the wires as shown below. Use power contactors (not supplied) for electric heat or heat lamps. Connect directly for most gas furnaces.



Connecting temperature probes

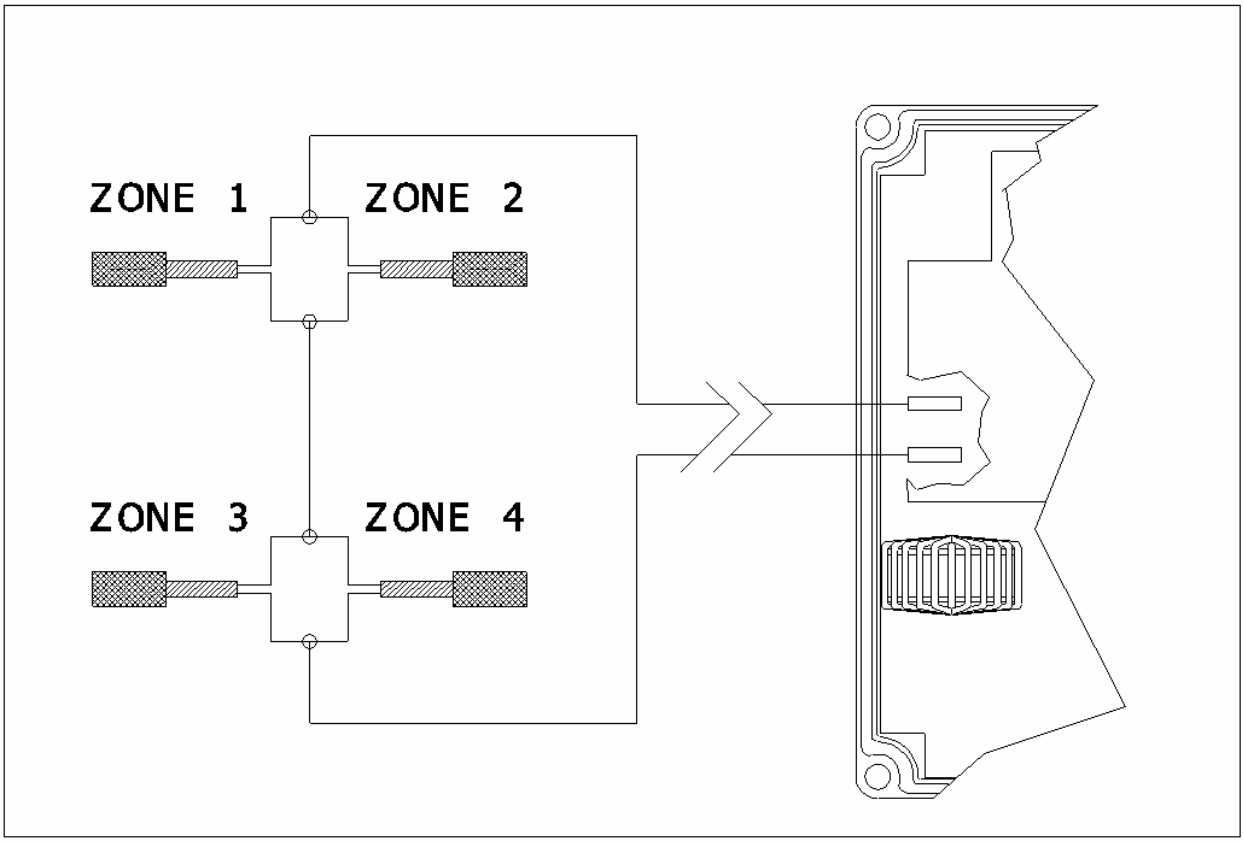
Follow these guidelines and connect the temperature probe as shown below.

- Do not run the probe cable in the same conduit as AC power cables
- Do not run the sensor cable beside AC power cables or near electrical equipment.
- When crossing other cables or power lines, cross them at a 90 degree angle.

Using four-zone averaging

The FHC-1D can monitor the temperature in four different zones. The control takes an average of the four temperatures and operates according to the average temperature.

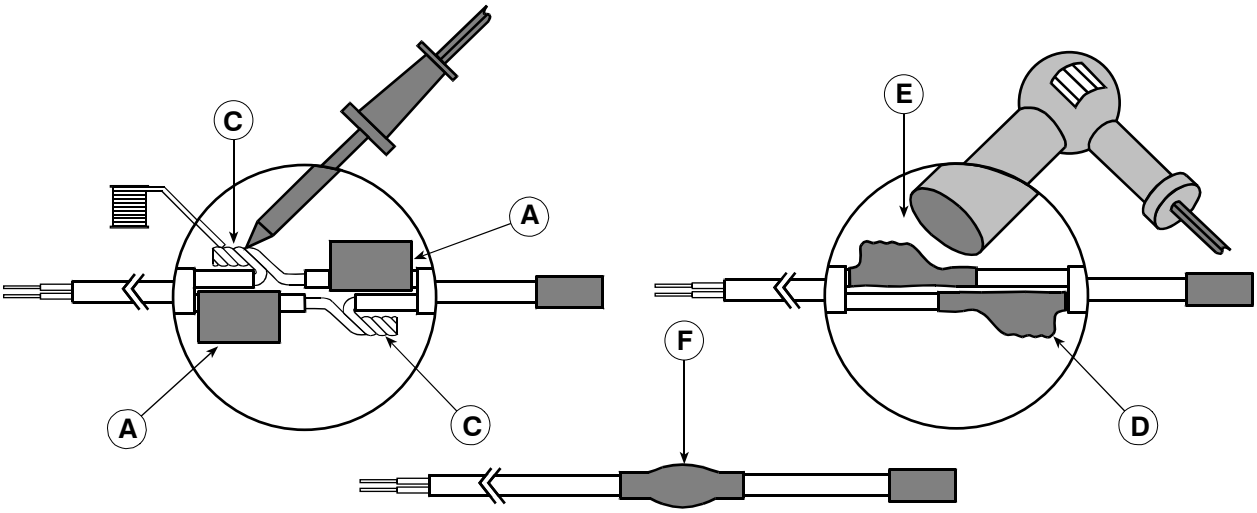
To use four-zone averaging, you must connect four temperature sensors to the unit. Connect the probes as shown below.



Extending temperature probe cables

You can extend temperature probe cables to lengths of up to 500 feet. Follow the guidelines below and on page 5 when extending cables.

- Use two-wire 18 AWG jacketed cable. Phason recommends Belden # 9408, Alpha # 5052, or an equivalent. Extension cable is also available from Phason. For more information, contact your dealer or Phason.
- Join the extension cable to the temperature probe cable as shown on the next page.
- If the unit operates erratically with the extended probe, run the cable along a different path or shorten it.



A Slide three pieces of heat shrink tubing over the wires: one for the red wire, one for the black wire, and one for both.

B Strip the ends of the wires and then twist them together.

C Solder the wires together using rosin-core flux solder—DO NOT use acid core solder.

D Slide the heat shrink tubing over the solder joints.

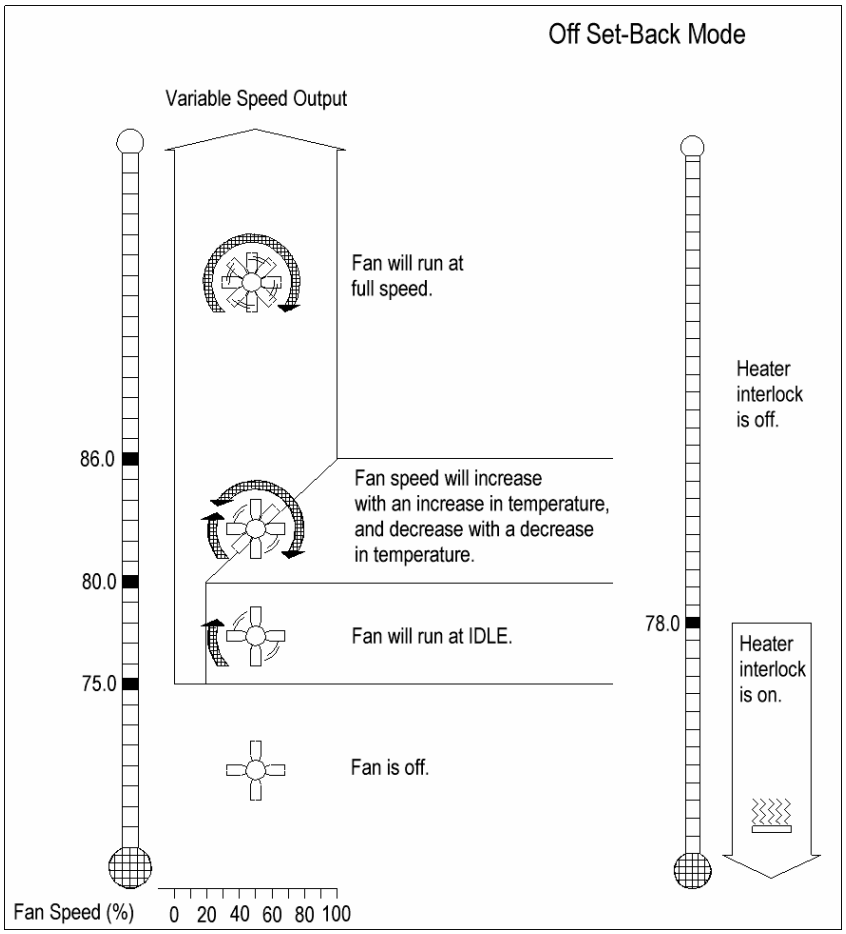
E Shrink the tubing using a heat gun.

F Your connection should look like this.

Operation description

Example 1, operation in off set-back (OSB) mode

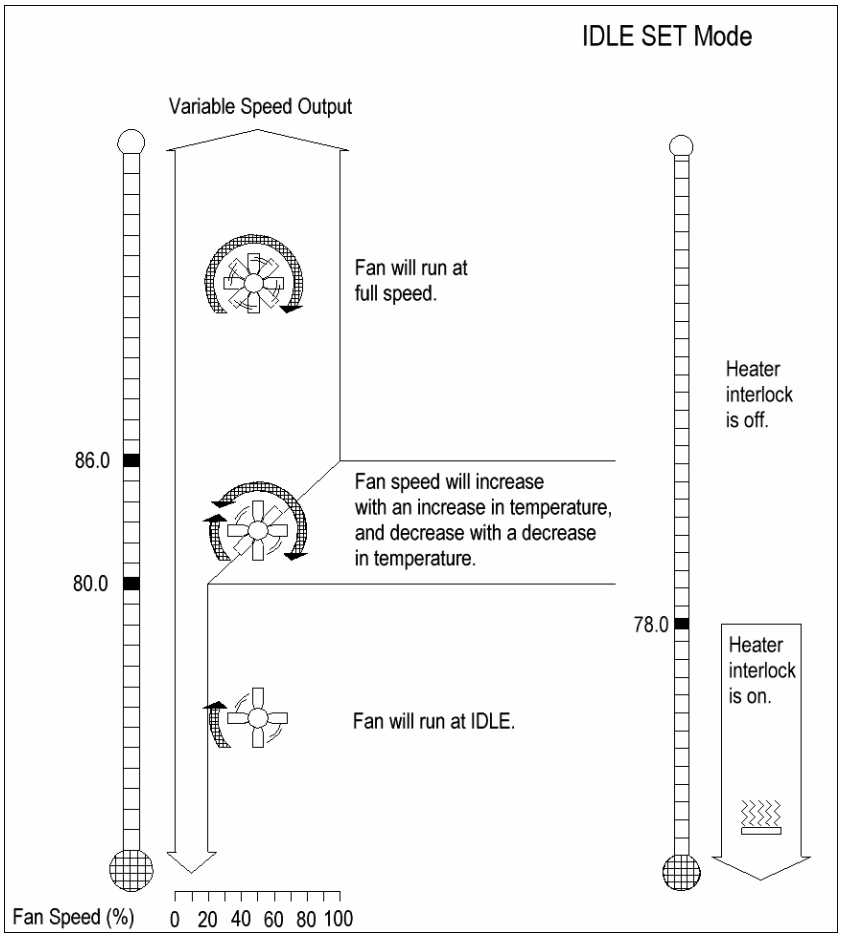
TEMP SET	DIFF	OSB	IDLE
80°F	6°F	5°F	20% of max. ventilation



1. The fan will be off and the heater interlock will be on when the temperature is below 75°F.
2. When the temperature increases to 75°F (OSB) the fan operates at full speed for three seconds, then IDLE (minimum ventilation of 20%). The fan will continue to IDLE between 75°F and 80°F.
3. At 78°F the heater interlock shuts off.
4. Between 80°F and 86°F (DIFF) the fan speed changes proportionally with the temperature. If the temperature increases, fan speed increases. If the temperature decreases, fan speed decreases.
5. The fan operates at maximum speed when the temperature is at or above 86°F (maximum ventilation).
6. When the temperature drops, the reverse happens.

Example 2, control operation in IDLE SET mode

TEMP SET	DIFF	OSB	IDLE
80°F	6°F	OFF	20% of max. ventilation



Description of operation

1. Below 78°F the heater interlock will be on.
2. The fan operates at IDLE (20% of maximum ventilation) when the temperature is below 80°F.
3. Between 80°F and 86°F (DIFF) the fan speed changes proportionally with the temperature. If the temperature increases, fan speed increases. If the temperature decreases, fan speed decreases.
4. The fan operates at maximum speed when the temperature is at or above 86°F (maximum ventilation).
5. When the temperature drops, the reverse happens.

Getting started

When power is applied to the FHC-1D, the following will be displayed:

1. **88** will be displayed for approximately 0.25 seconds (start-up).
2. **00** will be displayed for approximately one second (self-test).
3. **60** will be displayed for approximately one second. **60** indicates that the power system is 60Hz.
4. The display will alternately flash between the temperature and **PF**. This indicates a power interruption or start-up has occurred.
5. To clear the **PF**, click the switch to the right.
   The control is now in 'normal' mode.

If **Pd** or **P5** is displayed, the probe is not connected properly. For more information, see **Error codes** on page 13.

Changing the temperature display units

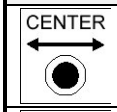
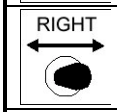
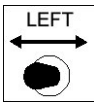
The °F/°C jumper lets you select whether the FHC-1D displays temperatures in degrees Fahrenheit or Celsius. To change the setting, position the jumper as shown in section D on page 3.

About the hysteresis

The FHC-1D has a 1°F (0.5°C) hysteresis. This means the fan will turn off 1°F below the point it turned on.

For example, if TEMP SET is 75°F, the fan will turn on at 75°F, off at 74°F. This prevents the fan from flickering on and off at the TEMP SET.

Displaying and adjusting parameters

Switch position	Function
	Displays the temperature of the air surrounding the temperature probe
	Allows viewing and adjustment of the TEMP SET Clears alerts
	Allows viewing and adjustment of the temperature differential (**d 1**), off set-back (**oS**), and idle speed (**Id**). Each time the switch is clicked and held in this position, the next parameter is displayed. The display alternately flashes the parameter code (two letters) and its setting (two digits). You can then adjust the parameter. The cycle starts over after the last parameter. To restart at the beginning of the cycle, click the switch to the right

Parameter	Code	Range	Factory setting	Location
Temperature set point	N/A	32 to 99°F (0 to 38°C)	N/A	External knob
Idle speed	**Id**	0 - 99%	N/A	External knob
Temperature differential	**d 1**	1 to 20°F (0.6 to 12°C)	6 °F	Internal trimmer
Off set-back	**oS**	0 to 16°F (0 to 9°C)	5 °F	Internal trimmer
°F or °C	**°F** / **°C**	-22 to 99°F (-30 to 38°C)	°F	Internal jumper

Adjusting the temperature set point (TEMP SET)

TEMP SET is the desired temperature. It is also the reference for the off set-back (OSB) and temperature differential (DIFF) settings.

To display and adjust TEMP SET

1. Hold the switch in the set (right) position.
2. Adjust the **Temperature** knob to the desired setting.

You must hold the switch in the set position while turning the **Temperature** knob. If this is not done correctly, the display will flash between **tS** and the temperature display, indicating the knob has accidentally been turned. The control will not accept the new setting until the switch is clicked to the right.

Adjusting the temperature differential (DIFF):

DIFF is the number of degrees Celsius or Fahrenheit above the TEMP SET that the fan reaches maximum speed. For example, if the TEMP SET is 80°F and the DIFF is 6°F, the fan will increase from IDLE at 80°F to maximum speed at 86°F. See Figures 4 and 5 for examples.

To display and adjust DIFF

1. Click the switch to the right to start at the beginning of the parameter list.
2. Click the switch to the left once and then hold.
   The display flashes between **d I** and the setting.
3. Use a small flat screwdriver to adjust the internal trimmer. See section B of the diagram on page 3 for trimmer location.

NOTE

The difference in motor power factors can cause the actual differential to be less than the displayed value. If the power factor of the motor is available, use the correction numbers and formula below to calculate the correct DIFF setting.

Power Factor	1.0	0.9	0.8	0.7	0.6	0.5
Correction (°F)	1.00	1.05	1.10	1.25	1.33	1.60

actual DIFF = desired DIFF X correction

Example 1: To have an actual differential of 6°F with a motor that has a power factor of 0.7, set the DIFF to 7.5°F. [6°F x 1.25 = 7.5°F]
Example 2: To have an actual differential of 5°F with a motor that has a power factor of 0.5, set the DIFF to 8.0°F. [5°F x 1.6 = 8.0°F]

If you do not know the power factor, measure the correction as follows:

1. Ensure the IDLE is set properly (See **Adjusting minimum ventilation in IDLE SET mode** on page 13).
2. Set the DIFF to 10°F with the internal trimmer. Note the temperature in the digital display.
3. Hold the switch to the right and adjust the TEMP SET to equal the temperature. The fan operates just above minimum idle speed.
4. Slowly decrease the TEMP SET and listen to the fan increase in speed.
5. When the motor reaches full speed, record the TEMP SET (FULL SPEED TEMP SET).
6. Calculate the correction using the formula on the below.

correction = 10°F ÷ (FULL SPEED TEMP SET – TEMPERATURE)

Example 3: For a TEMPERATURE of 75°F and a FULL SPEED TEMP SET of 82°F, the correction would be 1.43. [10°F ÷ (82°F-75°F) = 1.43]
If the desired differential is 5°F, the actual differential can be calculated as follows: 5°F x 1.43 = 7.15°F.
Set the DIFF to 7°F for an actual differential of 5°F.

Off set-back/IDLE SET Mode (OSB)

OSB is the number of degrees Celsius or Fahrenheit below the TEMP SET that the fan will switch between OFF and IDLE. IDLE mode provides minimum ventilation at temperatures below the TEMP SET. For more information, see **Example 1, operation in off set-back (OSB) mode** on page 7.

To display and adjust OSB

1. Click the switch to the right to start at the beginning of the parameter list.
2. Click the switch to the left two times and then hold. The display flashes between **oS** and the setting. If **Id** is displayed, the control is in IDLE SET mode.
3. Use a small flat screwdriver to adjust the internal trimmer to the desired OSB or turn the trimmer fully clockwise to put the control into IDLE SET mode. See section C of the diagram on page 3 for trimmer location.

Adjusting minimum ventilation in OSB mode

There must be a temperature probe connected before adjusting the minimum ventilation.

1. Turn the **Idle Speed** knob fully counter-clockwise and then back ¼-turn clockwise.
2. Click the front cover switch to the right and hold while turning the **Temperature** knob fully clockwise and then release the switch. The fan should not be running
3. Click the front cover switch to the right and hold while slowly turning the **Temperature** knob counter-clockwise. When the fan runs full speed, release the front cover switch and the **Temperature** knob.
   The fan runs at maximum speed for approximately three seconds, and then at IDLE. The **Temperature** knob should be approximately one °F higher than the temperature.
4. Slowly adjust the **Idle Speed** knob until a satisfactory IDLE has been reached. A voltmeter is helpful for determining the voltage. If you are unsure, see your fan dealer for the minimum idle voltage for your fan motor.
5. Click the front cover switch to the right and adjust the **Temperature** knob to the desired temperature.
6. Release the switch.

Adjusting minimum ventilation in IDLE SET mode

1. Turn the **Idle Speed** knob fully counter-clockwise.
2. Click the front cover switch to the right and hold while turning the **Temperature** knob fully clockwise and then release the switch. The fan should be running at IDLE.
3. Slowly adjust the **Idle Speed** knob until a satisfactory IDLE has been reached. A voltmeter is helpful for determining the voltage. If you are unsure, see your fan dealer for the minimum idle voltage for your fan motor.
4. Hold the front cover switch to the right and then adjust the **Temperature** knob to the desired temperature.
5. Release the switch.

Adjusting the idle speed (IDLE)

The IDLE is the speed of the fan in IDLE SET mode. In other words, minimum ventilation. IDLE is displayed as a percentage of maximum speed. For more information, see **Operation description** on page 7.

To display and adjust IDLE

1. Click the switch to the right to start at the beginning of the parameter list.
2. Click the switch to the left four times and hold.
   The display alternately flashes between Id and the setting.
3. Adjust the **Idle Speed** knob on the front cover to the desired fan speed.
4. Release the switch

Error codes

The FHC-1D has several error codes:

Display	Description
PS	The temperature probe or sensor cable has short circuited.
Pd	The temperature probe is damaged or the connecting wire is broken.
tS	The Temperature knob has accidentally been turned. The display will alternately flash tS and the temperature. The control will not accept the new setting until the switch is clicked to the set position. See the Temperature Display section on page 5 for more details.
PF	The power has been interrupted. The display will flash between PF and the temperature. To clear the alarm, click the switch to the right. The control will function normally.

Maintaining the FHC-1D

Proper care and maintenance will help your FHC-1D last longer. To prevent damage to the control, perform the following steps after the first two weeks of operation, and once a year after that.

1. Switch off the power to the control.
2. Remove the cover and check inside for moisture. If there is any moisture, wipe it away using a dry cloth.
3. Check all cable entry points to make sure they are properly sealed. If they are not properly sealed, apply silicone sealant around the entry points.

If you need to seal the enclosure, use a sealant that is labelled as 'non-corrosive', 'electronics grade', or 'neutral cure', such as GE Silicone RTV6780B, RTV 142, or RTV 162.

Do not use a sealant that is labelled as 'acetic acid cure' or 'acetoxy cure'. These sealants release acetic acid while curing, which can damage the control and will void the warranty.

4. Check all wires to make sure they are properly connected and that they are in good condition.
5. Fasten the cover to the enclosure and then switch on the power to the control.

Cleaning the FHC-1D

To clean the FHC-1D, wipe the surface with a damp cloth.

Be careful when washing the room using a high-pressure washer. DO NOT spray the control using a high-pressure washer, this can damage the control and will void the warranty.

Evidence of moisture damage inside the control will void the warranty.

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

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

Limited warranty

This warranty applies only to the Phason Inc. (Phason) FHC-1D. If you need warranty service, return the product and original proof of purchase to your dealer.

Phason warrants the FHC-1D subject to the following terms and conditions.

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

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

Conditions

- Installation must be done according to Phason's enclosed installation instructions.
- The product must not have been previously altered, modified, or repaired by anyone other than Phason.
- The product must not have been involved in an accident, misused, abused, or operated or installed contrary to the instructions in our user and/or installation manuals. Phason's opinion about these items is final.
- The person requesting warranty service must be the original purchaser of the unit, and provide proof of purchase upon request.
- All transportation charges for products submitted for warranty must be paid by the purchaser.

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

Phason is not liable for consequential damages caused by this product.

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

Phason reserves the right to improve or alter the FHC-1D without notice.

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