

## OPERATIONAL CHECKS & SAFETY CIRCUIT DESCRIPTION

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- Integrated control module performs internal checks.
- Integrated control module displays 88 on dual 7-segment display LED's.
- Integrated control module monitors safety circuits continuously.
- Furnace awaits call from thermostat. Dual 7-segment LED's display 0P while awaiting call from thermostat.

### HEATING MODE

The normal operational sequence in heating mode is as follows:

- R and W1 (or R and W1/W2) thermostat contacts close, initiating a call for heat.
- Integrated control module performs safety circuit checks.
- Induced draft blower is energized on high speed for a 15-second prepurge. Humidifier terminal is energized with induced draft blower.
- Induced draft blower steps to low speed following prepurge. Low stage pressure switch contacts are closed.
- Igniter warm up begins upon step to low speed and presence of closed low stage pressure switch contacts.
- Gas valve opens at end of igniter warm up period, delivering gas to burners and establishing flame.
- Integrated control module monitors flame presence. Gas valve will remain open only if flame is detected.
- If the thermostat call is for low heat, gas valve and induced draft blower will continue on low stage. If the call is for high heat, the gas valve and induced draft blower will change to high stage.
- Circulator blower is energized on heat speed following a thirty (30) second blower on delay. The circulator blower requires thirty seconds to ramp up to full speed. Electronic air cleaner terminal is energized with circulator blower.
- Furnace is now operating on the specified stage called for by the two-stage thermostat.
- Furnace runs, integrated control module monitors safety circuits continuously.
- If the two-stage thermostat changes the call from low heat to high heat, the integrated control module will immediately switch the induced draft blower, gas valve, and circulator blower to their high stage settings.
- If the two-stage thermostat changes the call from high heat to low heat, the control will immediately switch the induced draft blower and gas valve to their low stage settings. The circulator blower will remain on high heating speed for thirty (30) seconds before switching to the low heat circulating speed.
- R and W1 (or R and W1/W2) thermostat contacts open, completing the call for heat.
- Gas valve closes, extinguishing flame.

- Induced draft blower is de-energized following a fifteen second post purge. Humidifier terminals are de-energized.
- Circulator blower continues running for the selected heat off delay period (90, 120, 150 or 180 seconds). The speed run during this period depends on the last heat call provided by the thermostat.

If the last call for heat was a call for low heat, the air circulator motor will run on low heat speed for the duration of the heat off delay period (90, 120, 150 or 180 seconds).

If the last call for heat was a call for high heat, the air circulating motor will run on the high heating speed for thirty (30) seconds and then switch to the low heating speed for the **balance** of the heat off delay period (60, 90, 120 or 150 seconds).

- Circulator blower and electronic air cleaner terminal is de-energized.
- Circulator blower ramps down to OFF during the 30 seconds following the heat off delay period.
- Furnace awaits next call from thermostat.

### COOLING MODE

The normal operational sequence in cooling mode is as follows:

- R and Y1/G or Y2/G thermostat contacts close, initiating a call for cool.
- Integrated control module performs safety circuit checks.
- Outdoor fan and compressor are energized to their appropriate speed.
- Circulator blower is energized on the appropriate cool speed at the level and time determined by the selected ramping profile. Electronic air cleaner terminal is energized with circulator blower.
- Furnace circulator blower and outdoor cooling unit run their appropriate speeds, integrated control module monitors safety circuits continuously.
- R and Y1/G or Y2/G thermostat contacts open, completing the call for cool.
- Outdoor fan and compressor are de-energized.
- Circulator blower continues running during a cool off delay period. The OFF delay time and airflow level are determined by the selected ramping profile.
- Electronic air cleaner terminal and circulator blower are de-energized.
- Furnace awaits next call from thermostat.

### FAN ONLY MODE

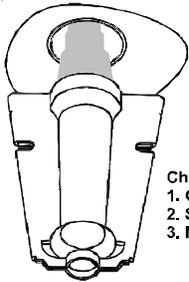
The normal operational sequence in fan only mode is as follows:

- R and G thermostat contacts close, initiating a call for fan.
- Integrated control module performs safety circuit checks.

- Circulator blower is energized on continuous fan speed (30% of the furnace's maximum airflow capability) following a five (5) second delay. Electronic air cleaner terminal is energized.
- Circulator blower runs, integrated control module monitors safety circuits continuously.
- R and G thermostat contacts open, completing the call for fan.
- Circulator blower is de-energized. Electronic air cleaner terminal is de-energized.
- Furnace awaits next call from thermostat.

### OPERATIONAL CHECKS

The burner flames should be inspected with the burner compartment door installed. Flames should be stable, quiet, soft, and blue (dust may cause orange tips but they must not be yellow). Flames should extend directly outward from the burners without curling, floating, or lifting off. Flames must not impinge on the sides of the heat exchanger firing tubes.



- Check the burner flames for:
1. Good adjustment
  2. Stable, soft and blue
  3. Not curling, floating, or lifting off.

Burner Flame

### SAFETY CIRCUIT DESCRIPTION

A number of safety circuits are employed to ensure safe and proper furnace operation. These circuits serve to control any potential safety hazards and serve as inputs in the monitoring and diagnosis of abnormal function. These circuits are continuously monitored during furnace operation by the integrated control module.

#### INTEGRATED CONTROL MODULE

The integrated control module is an electronic device which, if a potential safety concern is detected, will take the necessary precautions and provide diagnostic information through an LED.

#### PRIMARY LIMIT

The primary limit control is located on the partition panel and monitors heat exchanger compartment temperatures. It is a normally-closed (electrically), automatic reset, temperature-activated sensor. The limit guards against overheating as a result of insufficient conditioned air passing over the heat exchanger.

#### AUXILIARY LIMIT

The auxiliary limit controls are located on or near the circulator blower and monitors blower compartment temperatures. They are a normally-closed (electrically), manual-reset sensors. These limits guard against overheating as a result of insufficient conditioned air passing over the heat exchanger.

#### ROLLOUT LIMIT

The rollout limit controls are mounted on the burner/manifold assembly and monitor the burner flame. They are normally-closed (electrically), manual-reset sensors. These limits guard against burner flames not being properly drawn into the heat exchanger.

#### PRESSURE SWITCHES

The pressure switches are normally-open (closed during operation) negative air pressure-activated switches. They monitor the airflow (combustion air and flue products) through the heat exchanger via pressure taps located on the induced draft blower and the coil front cover. These switches guard against insufficient airflow (combustion air and flue products) through the heat exchanger and/or blocked condensate drain conditions.

#### FLAME SENSOR

The flame sensor is a probe mounted to the burner/manifold assembly which uses the principle of flame rectification to determine the presence or absence of flame.

### TROUBLESHOOTING

#### ELECTROSTATIC DISCHARGE (ESD) PRECAUTIONS

**NOTE:** Discharge body's static electricity before touching unit. An electrostatic discharge can adversely affect electrical components.

Use the following precautions during furnace installation and servicing to protect the integrated control module from damage. By putting the furnace, the control, and the person at the same electrostatic potential, these steps will help avoid exposing the integrated control module to electrostatic discharge. This procedure is applicable to both installed and uninstalled (ungrounded) furnaces.

1. Disconnect all power to the furnace. Do not touch the integrated control module or any wire connected to the control prior to discharging your body's electrostatic charge to ground.
2. Firmly touch a clean, unpainted, metal surface of the furnace away from the control. Any tools held in a person's hand during grounding will be discharged.
3. Service integrated control module or connecting wiring following the discharge process in step 2. Use caution not to recharge your body with static electricity; (i.e., do not move or shuffle your feet, do not touch ungrounded objects, etc.). If you come in contact with an ungrounded object, repeat step 2 before touching control or wires.
4. Discharge your body to ground before removing a new control from its container. Follow steps 1 through 3 if installing the control on a furnace. Return any old or new controls to their containers before touching any ungrounded object.

# TROUBLESHOOTING & MAINTENANCE

## DIAGNOSTIC CHART

 **WARNING**

**HIGH VOLTAGE !**

TO AVOID PERSONAL INJURY OR DEATH DUE TO ELECTRICAL SHOCK, DISCONNECT ELECTRICAL POWER BEFORE PERFORMING ANY SERVICE OR MAINTENANCE.



Refer to the *Troubleshooting Chart* in the Appendix for assistance in determining the source of unit operational problems. The dual 7-segment LED display will display an error code that may contain a letter and number. The error code may be used to assist in troubleshooting the unit.

## RESETTING FROM LOCKOUT

Furnace lockout results when a furnace is unable to achieve ignition after three attempts during a single call for heat. It is characterized by a non-functioning furnace and a **E0** code displayed on the dual 7-segment display. If the furnace is in "lockout", it will (or can be) reset in any of the following ways.

1. Automatic reset. The integrated control module will automatically reset itself and attempt to resume normal operations following a one hour lockout period.
2. Manual power interruption. Interrupt 115 volt power to the furnace.
3. Manual thermostat cycle. Lower the thermostat so that there is no longer a call for heat for 1 -20 seconds then reset to previous setting.

**NOTE:** If the condition which originally caused the lockout still exists, the control will return to lockout. Refer to the *Troubleshooting Chart* for aid in determining the cause.

## MAINTENANCE

 **WARNING**

TO AVOID ELECTRICAL SHOCK, INJURY OR DEATH, DISCONNECT ELECTRICAL POWER BEFORE PERFORMING ANY MAINTENANCE. IF YOU MUST HANDLE THE IGNITER, HANDLE WITH CARE. TOUCHING THE IGNITER ELEMENT WITH BARE FINGERS, ROUGH HANDLING OR VIBRATION COULD DAMAGE THE IGNITER RESULTING IN PREMATURE FAILURE. ONLY A QUALIFIED SERVICER SHOULD EVER HANDLE THE IGNITER.



## ANNUAL INSPECTION

The furnace should be inspected by a qualified installer, or service agency at least once per year. This check should be performed at the beginning of the heating season. This will ensure that all furnace components are in proper working order and that the heating system functions appropriately. Pay particular attention to the following items. Repair or service as necessary.

- Flue pipe system. Check for blockage and/or leakage. Check the outside termination and the connections at and internal to the furnace.
- Heat exchanger. Check for corrosion and/or buildup within the heat exchanger passageways.
- Burners. Check for proper ignition, burner flame, and flame sense.
- Drainage system. Check for blockage and/or leakage. Check hose connections at and internal to furnace.
- Wiring. Check electrical connections for tightness and/or corrosion. Check wires for damage.
- Filters.

## FILTERS

 **CAUTION**

TO ENSURE PROPER UNIT PERFORMANCE, ADHERE TO THE FILTER SIZES GIVEN IN THE RECOMMENDED MINIMUM FILTER SIZE TABLE OR SPECIFICATION SHEET APPLICABLE TO YOUR MODEL.

### FILTER MAINTENANCE

Improper filter maintenance is the most common cause of inadequate heating or cooling performance. Filters should be cleaned (permanent) or replaced (disposable) every two months or as required. When replacing a filter, it must be replaced with a filter of the same type and size.

### FILTER REMOVAL

Depending on the installation, differing filter arrangements can be applied. Filters can be installed in either the central return register or a side panel external filter rack (upflow only). A media air filter or electronic air cleaner can be used as an alternate filter. Follow the filter sizes given in the Recommended Minimum Filter size table to ensure proper unit performance.

To remove filters from an external filter rack in an upright upflow installation, follow the directions provided with external filter rack kit.

### HORIZONTAL UNIT FILTER REMOVAL

Filters in horizontal installations are located in the central return register or the ductwork near the furnace.

To remove:

1. Turn OFF electrical power to furnace.
2. Remove filter(s) from the central return register or ductwork.
3. Replace filter(s) by reversing the procedure for removal.
4. Turn ON electrical power to furnace.

### MEDIA AIR FILTER OR ELECTRONIC AIR CLEANER REMOVAL

Follow the manufacturer's directions for service.

**BURNERS**

Visually inspect the burner flames periodically during the heating season. Turn on the furnace at the thermostat and allow several minutes for flames to stabilize, since any dislodged dust will alter the flames normal appearance. Flames should be stable, quiet, soft, and blue (dust may cause orange tips but they must not be yellow). They should extend directly outward from the burners without curling, floating, or lifting off. Flames must not impinge on the sides of the heat exchanger firing tubes.

**INDUCED DRAFT AND CIRCULATOR BLOWERS**

The bearings in the induced draft blower and circulator blower motors are permanently lubricated by the manufacturer. No further lubrication is required. Check motor windings for accumulation of dust which may cause overheating. Clean as necessary.

**CONDENSATE TRAP AND DRAIN SYSTEM (QUALIFIED SERVICER ONLY)**

Annually inspect the drain tubes, drain trap, and field-supplied drain line for proper condensate drainage. Check drain system for hose connection tightness, blockage, and leaks. Clean or repair as necessary.

**FLAME SENSOR (QUALIFIED SERVICER ONLY)**

Under some conditions, the fuel or air supply can create a nearly invisible coating on the flame sensor. This coating acts as an insulator causing a drop in the flame sense signal. If the flame sense signal drops too low the furnace will not sense flame and will lock out. The flame sensor should be carefully cleaned by a qualified servicer using emery cloth or steel wool. Following cleaning, the flame sense signal should be as indicated in the Specifications Sheet.

**FLUE PASSAGES (QUALIFIED SERVICER ONLY)**

The heat exchanger flue passageways should be inspected at the beginning of each heating season. If necessary, clean the passageways as outlined below.

1. Turn OFF the electrical power and gas supply to the furnace.
2. Disconnect the gas line and remove the burner/ manifold assembly by removing the screws securing the assembly to the partition panel.
3. Disconnect the flue pipe system from the induced draft blower.
4. Remove the induced draft blower, drain and pressure tap hoses from the recuperator coil front cover.
5. Remove the recuperator coil front cover to expose the coil tubes and turbulators.
6. Remove the recuperator coil turbulators individually by slowly pulling each turbulator forward firmly.
7. Clean the recuperator coil tubes using a long handle wire brush, such as a gun cleaning brush.
8. Clean the primary heat exchanger tubes using a wire brush attached to a length of high grade stainless steel cable, such as drain cleanout cable. Attach a variable speed reversible drill to the other end of the cable. Slowly rotate

the cable with the drill and insert it into one of the heat exchanger tubes. While reversing the drill, work the cable in and out several times to obtain sufficient cleaning. Repeat for each tube.

9. Clean residue from furnace using a vacuum cleaner.
10. Replace the parts removed in the previous steps in reverse order.
11. Turn on electrical power and gas to furnace. Check for leaks and proper unit operation.
12. Severe heat exchanger fouling is an indication of an operational problem. Perform the checks listed in *Startup Procedure and Adjustments* to reduce the chances of repeated fouling.

**BEFORE LEAVING AN INSTALLATION**

- Cycle the furnace with the thermostat at least three times. Verify cooling and fan only operation.
- Review the Owner's Manual with the homeowner and discuss proper furnace operation and maintenance.
- Leave literature packet near furnace.

**REPAIR AND REPLACEMENT PARTS**

- When ordering any of the listed functional parts, be sure to provide the furnace model, manufacturing, and serial numbers with the order.
- Although only functional parts are shown in the parts list, all sheet metal parts, doors, etc. may be ordered by description.
- Parts are available from your distributor.

Functional Parts List-

Gas Valve	Blower Motor
Gas Manifold	Blower Wheel
Natural Gas Orifice	Blower Mounting Bracket
Propane Gas Orifice	Blower Cutoff
Igniter	Blower Housing
Flame Sensor	Inductor
Rollout Limit Switch	Heat Exchanger with
Primary Limit Switch	Recuperator Coil
Auxiliary Limit Switch	Coil Front Cover
Pressure Switch	Integrated Control Module
Induced Draft Blower	Transformer
Door Switch	

# DIP SWITCHES

Switch Bank	Purpose	Function	DIP Switch No.										
			1	2	3	4	5	6	7	8	9	10	
S1	Heat OFF Delay	90 seconds	OFF	OFF	---	---	---	---	---	---	---	---	---
		120 seconds	ON	OFF	---	---	---	---	---	---	---	---	---
		150 seconds*	OFF	ON	---	---	---	---	---	---	---	---	---
		180 seconds	ON	ON	---	---	---	---	---	---	---	---	---
	Thermostat Setup	1-Stage T-stat	---	---	OFF	---	---	---	---	---	---	---	---
		2-Stage T-Stat	---	---	ON	---	---	---	---	---	---	---	---
		5-Min Delay	---	---	---	OFF	---	---	---	---	---	---	---
	Auto Delay	---	---	---	ON	---	---	---	---	---	---	---	
S2	Bus BIAS	BIAS	ON*	ON*	---	---	---	---	---	---	---	---	
	TERM	Bus Termination	---	---	ON*	---	---	---	---	---	---	---	
S3	Cooling Speed Tap	A	OFF	OFF	---	---	---	---	---	---	---	---	
		B	ON	OFF	---	---	---	---	---	---	---	---	
		C	OFF	ON	---	---	---	---	---	---	---	---	
		D*	ON	ON	---	---	---	---	---	---	---	---	
	Adjust Taps	Normal*	---	---	OFF	OFF	---	---	---	---	---	---	
		10%	---	---	ON	OFF	---	---	---	---	---	---	
		-10%	---	---	OFF	ON	---	---	---	---	---	---	
	Normal	---	---	ON	ON	---	---	---	---	---	---		
S4	Ramping Profiles	A*	---	---	---	---	OFF	OFF	---	---	---	---	
		B	---	---	---	---	ON	OFF	---	---	---	---	
		C	---	---	---	---	OFF	ON	---	---	---	---	
		D	---	---	---	---	ON	ON	---	---	---	---	
	Heating Speed Tap	A	---	---	---	---	---	---	OFF	OFF	---	---	
		B*	---	---	---	---	---	---	ON	OFF	---	---	
		C	---	---	---	---	---	---	OFF	ON	---	---	
	D	---	---	---	---	---	---	ON	ON	---	---		
S5	DEHUM	Disabled*	---	---	---	---	---	---	---	---	OFF	Unused	
		Enabled	---	---	---	---	---	---	---	---	ON	Unused	
(*Indicates factory setting)													
---	Not applicable												

Symptoms of Abnormal Operation (Legacy & ComfortNet™ Thermostat)		Diagnostic/Status LED Codes		Fault Description		ComfortNet™ Thermostat Only Message Code		Possible Causes		Corrective Actions		Notes & Cautions	
<ul style="list-style-type: none"> <li>Furnace fails to operate</li> <li>Integrated control module LED display provides no signal.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message</li> </ul>	None	<ul style="list-style-type: none"> <li>No 115 power to furnace or no 24 volt power to integrated control module</li> <li>Blown fuse or circuit breaker</li> <li>Integrated control module has an internal fault</li> </ul>	INTERNAL FAULT	EE	<ul style="list-style-type: none"> <li>Manual disconnect switch OFF, door switch open or 24 volt wire improperly connected or loose</li> <li>Blown fuse or circuit breaker</li> <li>Integrated control module has an internal fault</li> </ul>	<ul style="list-style-type: none"> <li>Assure 115 and 24 volt power to furnace and integrated control module.</li> <li>Check integrated control module fuse (3A). Replace if necessary.</li> <li>Check for possible shorts in 115 and 24 volt circuits. Repair as necessary.</li> <li>Replace bad integrated control module.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> <li>Replace integrated control module fuse with 3A automotive fuse.</li> <li>Read precautions in "Electrostatic Discharge" section of manual.</li> <li>Replace integrated control module with current replacement parts.</li> <li>Normal operation</li> </ul>						
<ul style="list-style-type: none"> <li>LED display indicates <b>OP</b></li> </ul>	<b>OP</b>	<ul style="list-style-type: none"> <li>Normal operation</li> </ul>	None	None	<ul style="list-style-type: none"> <li>Normal operation</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>Normal operation</li> </ul>						
<ul style="list-style-type: none"> <li>Furnace fails to operate</li> <li>Integrated control module LED display provides <b>E0</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>E0</b>	<ul style="list-style-type: none"> <li>Furnace lockout due to an excessive number of ignition "retries" (3 total)</li> </ul>	LOCKOUT	E0	<ul style="list-style-type: none"> <li>Failure to establish flame. Cause may be no gas to burners, front cover pressure switch stuck open, bad igniter or igniter alignment, improper orifices, or coated/oxidized or improperly connected flame sensor.</li> <li>Loss of flame after establishment. Cause may be interrupted gas supply, lazy burner flames (improper gas pressure or restriction in flue and/or combustion air piping), front cover pressure switch opening, or improper induced draft blower performance.</li> </ul>	<ul style="list-style-type: none"> <li>Locate and correct gas interruption.</li> <li>Check front cover pressure switch operation (hose, wiring, contact operation). Correct if necessary.</li> <li>Replace or realign igniter.</li> <li>Check flame sense signal. Sand sensor if coated and/or oxidized.</li> <li>Check flue piping for blockage, proper length, elbows, and termination.</li> <li>Verify proper induced draft blower performance.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> <li>Igniter is fragile, handle with care.</li> <li>Sand flame sensor with emery cloth.</li> <li>See "Vent/Flue Pipe" section for piping details.</li> </ul>						
<ul style="list-style-type: none"> <li>Furnace fails to operate.</li> <li>Integrated control module LED display provides <b>E1</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>E1</b>	<ul style="list-style-type: none"> <li>Low stage pressure switch circuit is closed at start of heating cycle.</li> </ul>	PSI CLOSED	E1	<ul style="list-style-type: none"> <li>Low stage pressure switch contacts sticking.</li> <li>Shorts in pressure switch circuit wiring.</li> </ul>	<ul style="list-style-type: none"> <li>Replace low stage pressure switch.</li> <li>Repair short in wiring.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> <li>Replace pressure switch with correct replacement part.</li> </ul>						
<ul style="list-style-type: none"> <li>Induced draft blower runs continuously with no further furnace operation.</li> <li>Integrated control module LED display provides <b>E2</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>E2</b>	<ul style="list-style-type: none"> <li>Low stage pressure switch circuit is not closed.</li> </ul>	PSI OPEN	E2	<ul style="list-style-type: none"> <li>Pressure switch hose blocked pinched, or connected improperly.</li> <li>Blocked flue and/or inlet air pipe, blocked drain system or weak induced draft blower.</li> <li>Incorrect pressure switch set point or malfunctioning switch contacts.</li> <li>Loose or improperly connected wiring.</li> </ul>	<ul style="list-style-type: none"> <li>Inspect pressure switch hose. Repair/replace if necessary.</li> <li>Inspect flue and/or inlet air piping for blockage, proper length, elbows, and termination.</li> <li>Check drain system. Correct as necessary.</li> <li>Check induced draft blower performance. Correct as necessary.</li> <li>Correct pressure switch set point or contact motion.</li> <li>Tighten or correct wiring connection.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> <li>Replace pressure switch with correct replacement part.</li> <li>Replace induced draft blower with correct replacement part.</li> </ul>						

Symptoms of Abnormal Operation (Legacy & ComfortNet™ Thermostat)	Diagnostic/Status LED Codes	Fault Description	ComfortNet™ Thermostat Only Message	Code	Possible Causes	Corrective Actions	Notes & Cautions
<ul style="list-style-type: none"> <li>Circulator blower runs continuously. No furnace operation.</li> <li>Integrated control module LED display provides <b>E3</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>E3</b>	<ul style="list-style-type: none"> <li>Primary limit or auxiliary limit circuit is open.</li> <li>Rollout limit circuit is open.</li> </ul>	<i>HIGH LIMIT OPEN</i>	<i>E3</i>	<ul style="list-style-type: none"> <li>Insufficient conditioned air over the heat exchanger. Blocked filters, restrictive ductwork, improper circulator blower speed, or failed circulator blower motor.</li> <li>Flame rollout.</li> <li>Misaligned burners, blocked flue and/or air inlet pipe, or failed induced draft blower.</li> <li>Loose or improperly connected wiring.</li> </ul>	<ul style="list-style-type: none"> <li>Check filters and ductwork for blockage. Clean filters or remove obstruction.</li> <li>Check circulator blower speed and performance. Correct speed or replace blower motor if necessary.</li> <li>Check burners for proper alignment.</li> <li>Check flue and air inlet piping for blockage, proper length, elbows, and termination. Correct as necessary.</li> <li>Check induced draft blower for proper performance. Replace if necessary.</li> <li>Tighten or correct wiring connection.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> <li>See Specification Sheet applicable to your model for allowable rise range and proper circulator speed.</li> <li>See "Vent/Flue Pipe" section for piping details.</li> </ul>
<ul style="list-style-type: none"> <li>Induced draft blower and circulator blower runs continuously. No furnace operation.</li> <li>Integrated control module LED display provides <b>E4</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>E4</b>	<ul style="list-style-type: none"> <li>Flame sensed with no call for heat.</li> </ul>	<i>IMPROPER FLAME</i>	<i>E4</i>	<ul style="list-style-type: none"> <li>Short to ground in flame sense circuit.</li> <li>Lingering burner flame.</li> <li>Slow closing gas valve.</li> </ul>	<ul style="list-style-type: none"> <li>Correct short at flame sensor or in flame sensor wiring.</li> <li>Check for lingering flame.</li> <li>Verify proper operation of gas valve.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> </ul>
<ul style="list-style-type: none"> <li>No furnace operation.</li> <li>Integrated control module LED display provides <b>E5</b> error code.</li> <li>ComfortNet™ thermostat displays "Battery Power".</li> </ul>	<b>E5</b>	<ul style="list-style-type: none"> <li>Open Fuse</li> </ul>	Not Displayed	Not Displayed	<ul style="list-style-type: none"> <li>Short in low voltage wiring</li> </ul>	<ul style="list-style-type: none"> <li>Locate and correct short in low voltage wiring</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> <li>Replace fuse with 3-amp automotive type</li> </ul>
<ul style="list-style-type: none"> <li>Normal furnace operation.</li> <li>Integrated control module LED display provides <b>E6</b> error code.</li> </ul>	<b>E6</b>	<ul style="list-style-type: none"> <li>Flame sense micro amp signal is low</li> </ul>	<i>WEAK FLAME</i>	<i>E6</i>	<ul style="list-style-type: none"> <li>Flame sensor is coated/oxidized.</li> <li>Flame sensor incorrectly positioned in burner flame.</li> <li>Lazy burner flame due to improper gas pressure or combustion air.</li> </ul>	<ul style="list-style-type: none"> <li>Sand flame sensor if coated/oxidized.</li> <li>Inspect for proper sensor alignment.</li> <li>Check inlet air piping for blockage, proper length, elbows, and termination.</li> <li>Compare current gas pressure to rating plate. Adjust as needed.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> <li>Sand flame sensor with emery cloth.</li> <li>See "Vent/Flue Pipe" section for piping details.</li> <li>See rating plate for proper gas pressure.</li> </ul>
<ul style="list-style-type: none"> <li>Furnace fails to operate.</li> <li>Integrated control module LED display provides <b>E7</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>E7</b>	<ul style="list-style-type: none"> <li>Problem with igniter circuit.</li> </ul>	<i>IGNITER FAULT</i>	<i>E7</i>	<ul style="list-style-type: none"> <li>Improperly connected igniter.</li> <li>Shorted igniter.</li> <li>Poor unit ground.</li> <li>Igniter relay fault on integrated control module.</li> </ul>	<ul style="list-style-type: none"> <li>Check and correct wiring from integrated control module to igniter.</li> <li>Replace shorted igniter.</li> <li>Check and correct unit ground wiring.</li> <li>Check igniter output from control. Replace if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> <li>Replace igniter with correct replacement part.</li> <li>Replace control with correct replacement part.</li> </ul>

Symptoms of Abnormal Operation (Legacy & ComfortNet™ Thermostat)		Diagnostic/Status LED Codes		Fault Description		ComfortNet™ Thermostat Only Message Code		Possible Causes		Corrective Actions		Notes & Cautions	
<ul style="list-style-type: none"> <li>Furnace fails to operate on high stage; furnace operates normally on low stage.</li> <li>Integrated control module LED display provides <b>E8</b> error code.</li> </ul>	<b>E8</b>	<ul style="list-style-type: none"> <li>High stage pressure switch circuit is closed at start of heating cycle.</li> <li>Induced draft blower is operating.</li> <li>Furnace is operating on low stage only</li> </ul>	<p><i>PS2 CLOSED</i></p> <p><i>E8</i></p>	<ul style="list-style-type: none"> <li>High stage pressure switch contacts sticking.</li> <li>Shorts in pressure switch circuit wiring.</li> </ul>	<ul style="list-style-type: none"> <li>Replace high stage pressure switch.</li> <li>Repair short in wiring</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> <li>Replace pressure switch with correct replacement part.</li> </ul>							
<ul style="list-style-type: none"> <li>Furnace fails to operate on high stage; furnace operates normally on low stage.</li> <li>Integrated control module LED display provides <b>E9</b> error code.</li> </ul>	<b>E9</b>	<ul style="list-style-type: none"> <li>High stage pressure switch circuit is not closed.</li> <li>Induced draft blower is operating.</li> <li>Furnace is operating on low stage only</li> </ul>	<p><i>PS2 OPEN</i></p> <p><i>E9</i></p>	<ul style="list-style-type: none"> <li>Pressure switch hose blocked pinched, or connected improperly.</li> <li>Blocked flue and/or inlet air pipe, blocked drain system or weak induced draft blower.</li> <li>Incorrect pressure switch set point or malfunctioning switch contacts.</li> <li>Loose or improperly connected wiring.</li> </ul>	<ul style="list-style-type: none"> <li>Inspect pressure switch hose. Repair/replace if necessary.</li> <li>Inspect flue and/or inlet air piping for blockage, proper length, elbows, and termination. Check drain system. Correct as necessary.</li> <li>Check induced draft blower performance. Correct as necessary.</li> <li>Correct pressure switch set point or contact motion.</li> <li>Tighten or correct wiring connection.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> <li>Replace pressure switch with correct replacement part.</li> <li>Replace induced draft blower with correct replacement part.</li> </ul>							
<ul style="list-style-type: none"> <li>Furnace fails to operate.</li> <li>Integrated control module LED display provides <b>EA</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>EA</b>	<ul style="list-style-type: none"> <li>Polarity of 115 volt AC is reversed</li> </ul>	<p><i>REVERSED PLTY</i></p> <p><i>EA</i></p>	<ul style="list-style-type: none"> <li>Polarity of 115 volt AC power to furnace or integrated module is reversed.</li> <li>Poor unit ground</li> </ul>	<ul style="list-style-type: none"> <li>Review wiring diagram to correct polarity.</li> <li>Verify proper ground. Correct if necessary.</li> <li>Check and correct wiring.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> </ul>							
<ul style="list-style-type: none"> <li>Furnace fails to operate.</li> <li>Integrated control module LED display provides <b>d0</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>d0</b>	<ul style="list-style-type: none"> <li>Data not yet on network.</li> </ul>	<p><i>NO NET DATA</i></p> <p><i>d0</i></p>	<ul style="list-style-type: none"> <li>Furnace does not contain any shared data.</li> </ul>	<ul style="list-style-type: none"> <li>Populate shared data set using memory card.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair</li> <li>Use memory card for the specific model.</li> <li>Insert memory card BEFORE turning power ON. Memory card may be removed after data is loaded.</li> <li>Turn power OFF before removing memory card.</li> <li>Error code will be cleared once data is loaded.</li> </ul>							

Symptoms of Abnormal Operation (Legacy & ComfortNet™ Thermostat)	Diagnostic/Status LED Codes	Fault Description	ComfortNet™ Thermostat Only Message Code	Possible Causes	Corrective Actions	Notes & Cautions
<ul style="list-style-type: none"> <li>Operation different than expected or no operation.</li> <li>Integrated control module LED display provides <b>d4</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>d4</b>	<ul style="list-style-type: none"> <li>Invalid memory card data.</li> </ul>	<p><i>INVALID MC DATA</i></p> <p><i>d4</i></p>	<ul style="list-style-type: none"> <li>Shared data set on memory card has been rejected by integrated control module</li> </ul>	<ul style="list-style-type: none"> <li>Verify shared data set is correct for the specific model. Repopulate data using correct memory card if required.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair</li> <li>Use memory card for the specific model.</li> <li>Insert memory card BEFORE turning power ON. Memory card may be removed after data is loaded.</li> <li>Turn power OFF before removing memory card.</li> <li>Error code will be cleared once data is loaded.</li> </ul>
<ul style="list-style-type: none"> <li>Furnace fails to operate.</li> <li>Integrated control module LED display provides <b>b0</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>b0</b>	<ul style="list-style-type: none"> <li>Circulator blower motor is not running when it should be running.</li> </ul>	<p><i>MOTOR NOT RUN</i></p> <p><i>b0</i></p>	<ul style="list-style-type: none"> <li>Loose wiring connection at circulator motor power leads or circulator motor power leads disconnected.</li> <li>Open circuit in inductor or loose wiring connection at inductor (3/4 Hp and 1 Hp models only).</li> <li>Failed circulator blower motor.</li> </ul>	<ul style="list-style-type: none"> <li>Tighten or correct wiring connection.</li> <li>Verify continuous circuit through inductor. Replace if open or short circuit.</li> <li>Check circulator blower motor. Replace if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair</li> <li>Replace inductor with correct replacement part.</li> <li>Replace circulator motor with correct replacement part.</li> </ul>
<ul style="list-style-type: none"> <li>Furnace fails to operate.</li> <li>Integrated control module LED display provides <b>b1</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>b1</b>	<ul style="list-style-type: none"> <li>Integrated control module has lost communications with circulator blower motor.</li> </ul>	<p><i>MOTOR COMM</i></p> <p><i>b1</i></p>	<ul style="list-style-type: none"> <li>Loose wiring connection at circulator motor control leads.</li> <li>Failed circulator blower motor.</li> <li>Failed integrated control module.</li> </ul>	<ul style="list-style-type: none"> <li>Tighten or correct wiring connection.</li> <li>Check circulator blower motor. Replace if necessary.</li> <li>Check integrated control module. Replace if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair</li> <li>Replace circulator motor with correct replacement part.</li> <li>Replace integrated control module with correct replacement part.</li> </ul>
<ul style="list-style-type: none"> <li>Furnace fails to operate.</li> <li>Integrated control module LED display provides <b>b2</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>b2</b>	<ul style="list-style-type: none"> <li>Circulator blower motor horse power in shared data set does not match circulator blower motor horse power.</li> </ul>	<p><i>MOTOR MISMATCH</i></p> <p><i>b2</i></p>	<ul style="list-style-type: none"> <li>Incorrect circulator blower motor in furnace.</li> <li>Incorrect shared data set in integrated control module.</li> </ul>	<ul style="list-style-type: none"> <li>Verify circulator blower motor horse power is the same specified for the specific furnace model. Replace if necessary.</li> <li>Verify shared data set is correct for the specific model. Repopulate data using correct memory card if required.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair</li> <li>Replace motor with correct replacement part.</li> <li>Use memory card for the specific model</li> <li>Insert memory card BEFORE turning power ON. Memory card may be removed after data is loaded.</li> </ul>
<ul style="list-style-type: none"> <li>Furnace operates at reduced performance.</li> <li>Airflow delivered is less than expected.</li> <li>Integrated control module LED display provides <b>b3</b> error code.</li> </ul>	<b>b3</b>	<ul style="list-style-type: none"> <li>Circulator blower motor is operating in a power, temperature, or speed limiting condition.</li> </ul>	<p><i>MOTOR LIMITS</i></p> <p><i>b3</i></p>	<ul style="list-style-type: none"> <li>Blocked filters.</li> <li>Restrictive ductwork.</li> <li>Undersized ductwork.</li> <li>High ambient temperatures.</li> </ul>	<ul style="list-style-type: none"> <li>Check filters for blockage. Clean filters or remove obstruction.</li> <li>Check ductwork for blockage. Remove obstruction. Verify all registers are fully open.</li> <li>Verify ductwork is appropriately sized for system. Resize/replace ductwork if necessary.</li> <li>See "Product Description" and "Location Requirements &amp; Considerations" for furnace installation requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> </ul>

Symptoms of Abnormal Operation (Legacy & ComfortNet™ Thermostat)		Diagnostic/Status LED Codes		Fault Description		ComfortNet™ Thermostat Only Message Code		Possible Causes		Corrective Actions		Notes & Cautions	
<ul style="list-style-type: none"> <li>Furnace fails to operate.</li> <li>Integrated control module LED display provides <b>b4</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>b4</b>	<ul style="list-style-type: none"> <li>Circulator blower motor senses a loss of rotor control.</li> <li>Circulator blower motor senses high current.</li> </ul>	<i>MOTOR TRIPS</i>	<i>b4</i>	<ul style="list-style-type: none"> <li>Abnormal motor loadings, sudden change in speed or torque, sudden blockage of furnace air inlet or outlet.</li> <li>High loading conditions, blocked filters, very restrictive ductwork, blockage of furnace air inlet or outlet.</li> </ul>	<ul style="list-style-type: none"> <li>Check filters, filter grills/registers, duct system, and furnace air inlet/outlet for blockages.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> </ul>						
<ul style="list-style-type: none"> <li>Furnace fails to operate.</li> <li>Integrated control module LED display provides <b>b5</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>b5</b>	<ul style="list-style-type: none"> <li>Circulator blower motor fails to start 10 consecutive times.</li> </ul>	<i>MTR LCKD ROTOR</i>	<i>b5</i>	<ul style="list-style-type: none"> <li>Obstruction in circulator blower housing.</li> <li>Seized circulator blower motor bearings.</li> <li>Failed circulator blower motor.</li> </ul>	<ul style="list-style-type: none"> <li>Check circulator blower for obstructions. Remove and repair/replace wheel/motor if necessary.</li> <li>Check circulator blower motor shaft rotation and motor. Replace motor if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> <li>Replace motor with correct replacement part.</li> <li>Replace wheel with correct replacement part.</li> </ul>						
<ul style="list-style-type: none"> <li>Furnace fails to operate.</li> <li>Integrated control module LED display provides <b>b6</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>b6</b>	<ul style="list-style-type: none"> <li>Circulator blower motor shuts down for over or under voltage condition.</li> <li>Circulator blower motor shuts down due to over temperature condition on power module.</li> </ul>	<i>MOTOR VOLTS</i>	<i>b6</i>	<ul style="list-style-type: none"> <li>High AC line voltage to furnace.</li> <li>Low AC line voltage to furnace.</li> <li>High ambient temperatures.</li> </ul>	<ul style="list-style-type: none"> <li>Check power to furnace. Verify line voltage to furnace is within the range specified on the furnace rating plate.</li> <li>See "Product Description" and "Location Requirements &amp; Considerations" for furnace installation requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> </ul>						
<ul style="list-style-type: none"> <li>Furnace fails to operate.</li> <li>Integrated control module LED display provides <b>b7</b> error code.</li> <li>ComfortNet™ thermostat "Call for Service" icon illuminated.</li> <li>ComfortNet™ thermostat scrolls "Check Furnace" message.</li> </ul>	<b>b7</b>	<ul style="list-style-type: none"> <li>Circulator blower motor does not have enough information to operate properly.</li> <li>Motor fails to start 40 consecutive times.</li> </ul>	<i>MOTOR PARAMS</i>	<i>b7</i>	<ul style="list-style-type: none"> <li>Error with integrated control module.</li> <li>Motor has a locked rotor condition.</li> </ul>	<ul style="list-style-type: none"> <li>Check integrated control module. Verify control is populated with correct shared data set. See data errors above for details.</li> <li>Check for locked rotor condition (see error code above for details).</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> <li>Replace with correct replacement part(s).</li> <li>Use memory card for the specific model.</li> </ul>						
<ul style="list-style-type: none"> <li>Furnace operates at reduced performance or operates on low stage when high stage is expected.</li> <li>Integrated control module LED display provides <b>b9</b> error code.</li> </ul>	<b>b9</b>	<ul style="list-style-type: none"> <li>Airflow is lower than demanded.</li> </ul>	<i>LOW ID AIRFLOW</i>	<i>b9</i>	<ul style="list-style-type: none"> <li>Blocked filters.</li> <li>Restrictive ductwork.</li> <li>Undersized ductwork.</li> </ul>	<ul style="list-style-type: none"> <li>Check filters for blockage. Clean filters or remove obstruction.</li> <li>Check ductwork for blockage. Remove obstruction. Verify all registers are fully open.</li> <li>Verify ductwork is appropriately sized for system. Resize/replace ductwork if necessary.</li> </ul>	<ul style="list-style-type: none"> <li>Turn power OFF prior to repair.</li> </ul>						

□	□	INTERNAL CONTROL FAULT/NO POWER
O	P	NORMAL OPERATION
E	0	LOCKOUT DUE TO EXCESSIVE RETRIES
E	1	LOW STAGE PRESSURE SWITCH STUCK CLOSED AT START OF HEATING CYCLE
E	2	LOW STAGE PRESSURE SWITCH STUCK OPEN
E	3	OPEN HIGH LIMIT SWITCH
E	4	FLAME DETECTED WHEN NO FLAME SHOULD BE PRESENT
E	5	OPEN FUSE
E	6	LOW FLAME SIGNAL
E	7	IGNITER FAULT OR IMPROPER GROUNDING
E	8	HIGH STAGE PRESSURE SWITCH STUCK CLOSED AT START OF HEATING CYCLE
E	9	HIGH STAGE PRESSURE SWITCH STUCK OPEN
E	A	REVERSED 115 VAC POLARITY
d	0	DATA NOT YET ON NETWORK
d	4	INVALID MEMORY CARD DATA
b	0	BLOWER MOTOR NOT RUNNING
b	1	BLOWER COMMUNICATION ERROR
b	2	BLOWER HP MIS-MATCH
b	3	BLOWER MOTOR OPERATING IN POWER, TEMPERATURE, OR SPEED LIMIT
b	4	BLOWER MOTOR CURRENT TRIP OR LOST ROTOR
b	5	BLOWER MOTOR LOCKED ROTOR
b	6	OVER/UNDER VOLTAGE TRIP OR OVER TEMPERATURE TRIP
b	7	INCOMPLETE PARAMETERS SENT TO MOTOR
b	9	LOW INDOOR AIRFLOW
C	1	LOW STAGE COOL
C	2	HIGH STAGE COOL
L	0	LOW STAGE HEAT
H	1	HIGH STAGE HEAT
□	F	CONTINUOUS FAN
1	2	CFM/100; ALTERNATES WITH C 1, C 2, L 0, H 1, □ F