

## SERVICE MANUAL

## GDD80C



This is a safety alert symbol and should never be ignored. When you see this symbol on labels or in manuals, be alert to the potential for personal injury or death.



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### WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional HVAC installer (or equivalent), service agency or the gas supplier.

### CAUTION

As with any mechanical equipment, contact with sharp sheet metal edges can result in personal injury. Take care while handling this equipment and wear gloves and protective clothing.

### WARNING



Electric shock hazard.

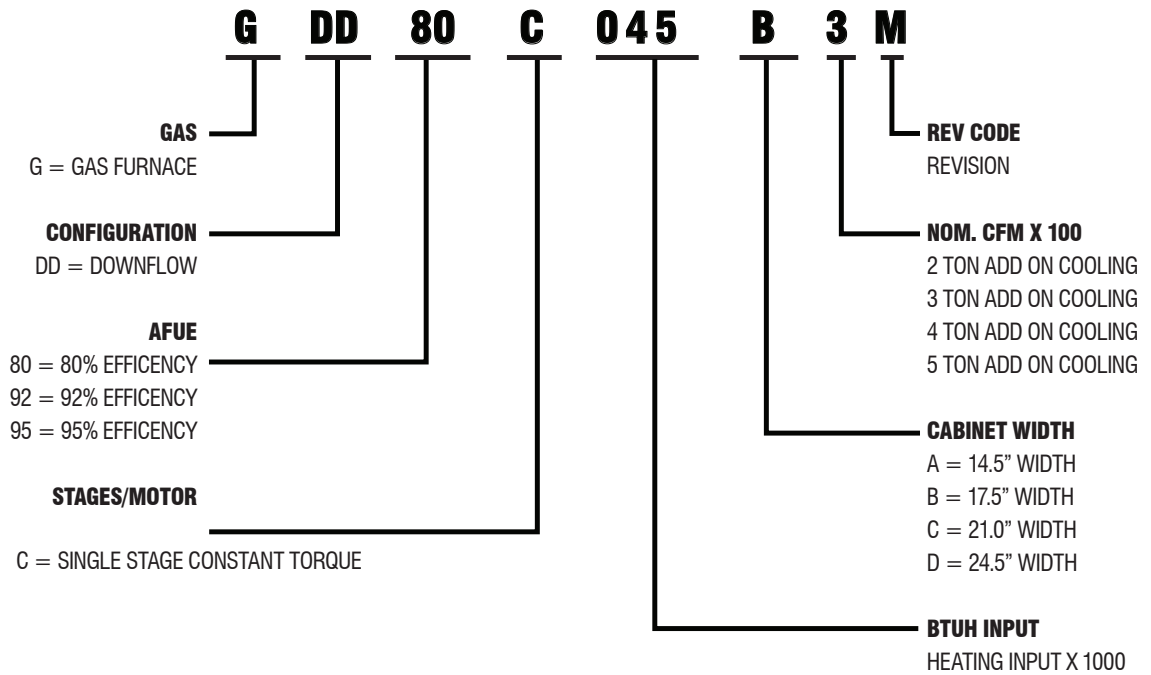
Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.



(P) 508142-01

# Technical Specifications - GDD80C

## MODEL NUMBER GUIDE



## PHYSICAL AND ELECTRICAL DATA

	Model	Input (Btuh)	Output (Btuh)	AFUE (ICS)	Nom. Cooling Capacity	Gas Inlet (in.)	Volts/ Hz/ Phase	Max. Time Delay Breaker or Fuse	Nominal F.L.A.	Trans. (V.A.)	Approx. Shipping Weight (lbs.)
<b>DOWNFLOW</b>	GDD80C045A3M	44,000	35,200	80.0%	2 — 3	1/2	120-60-1	15	6.8	40	113
	GDD80C070B3M	66,000	52,800	80.0%	2 — 3	1/2	120-60-1	15	6.8	40	128
	GDD80C090B4M	88,000	70,400	80.0%	3 — 4	1/2	120-60-1	15	8.4	40	140
	GDD80C110C5M	110,000	88,000	80.0%	4 — 5	1/2	120-60-1	15	10.9	40	160

**BLOWER PERFORMANCE DATA**

	Model	Motor Size (hp)	Blower Size	Temp Rise (°F)	Blower Speed	CFM @ External Static Pressure - " w.c.						
						0.20	0.30	0.40	0.50	0.60	0.70	0.80
<b>DOWNFLOW</b>	GDD80C045A3M	1/2	10 x 8	15 - 45	High	1375	1335	1320	1275	1245	1215	1175
					Med/High	1145	1120	1075	1045	1000	970	925
					Med	950	915	870	835	785	745	695
					Med/Low	840	790	745	715	655	605	555
					Low	725	665	625	565	520	455	400
	GDD80C070B3M	1/2	10 x 10	30 - 60	High	1400	1360	1310	1280	1250	1220	1165
					Med/High	1230	1205	1155	1110	1060	1000	935
					Med	1125	1085	1050	985	935	865	795
					Med/Low	1110	1055	1000	950	865	815	750
					Low	900	845	790	705	645	590	480
	GDD80C090B4M	3/4	10 x 10	30 - 60	High	1695	1660	1615	1570	1545	N/A	N/A
					Med/High	1470	1425	1395	1360	1295	1265	1215
					Med	1340	1290	1250	1210	1165	1120	1080
					Med/Low	1280	1225	1185	1145	1085	1040	1000
					Low	1105	1040	1005	945	865	810	755
	GDD80C110C5M	1	11-1/2 x 10	30 - 60	High	2325	2280	2235	2165	2125	2090	2035
					Med/High	2010	1940	1895	1845	1800	1755	1700
					Med	1760	1705	1635	1595	1545	1510	1460
					Med/Low	1570	1500	1440	1380	1320	1285	1255
					Low	1375	1320	1265	1200	1170	1100	1030

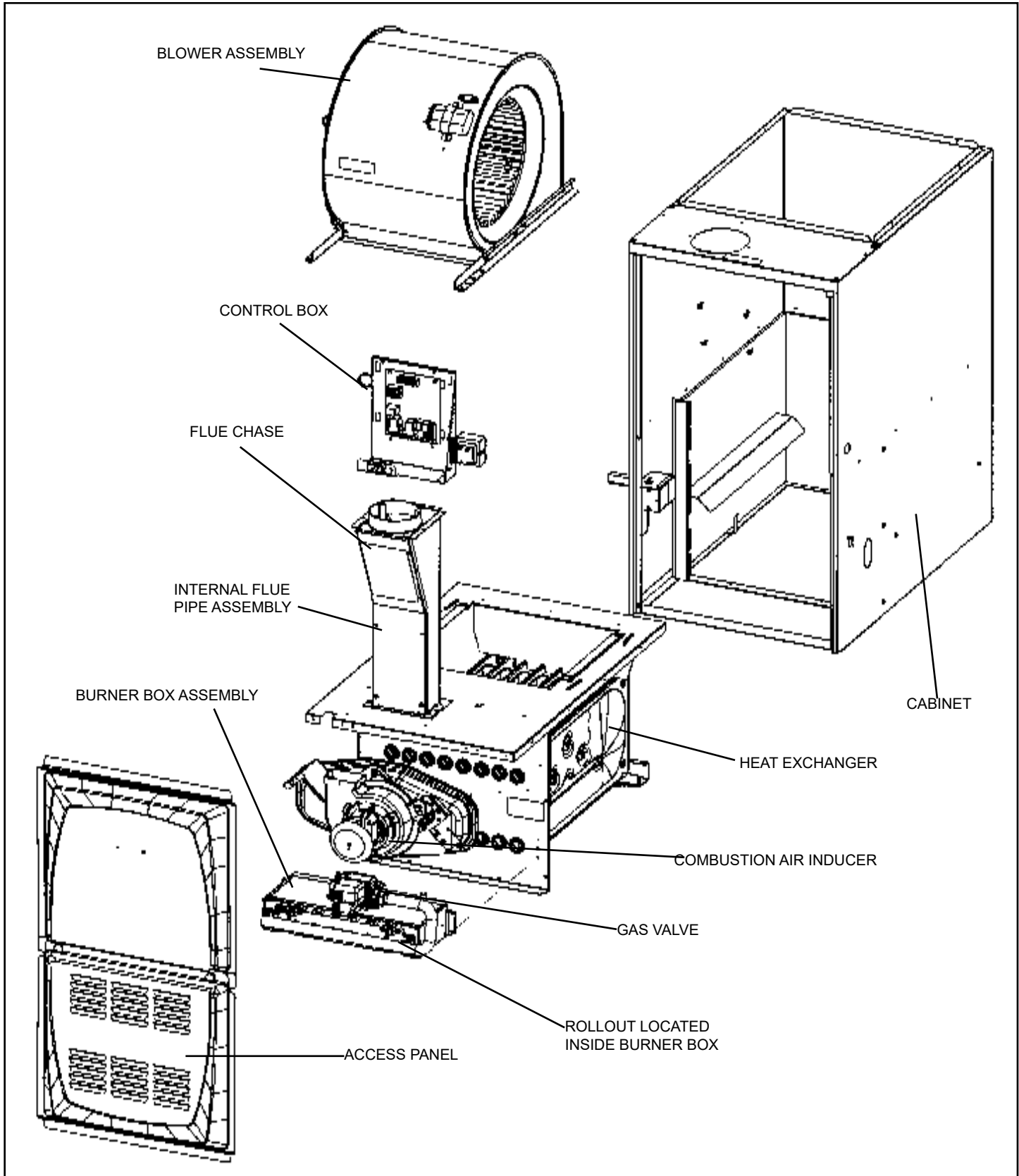
## ACCESSORY LIST

Catalog Number	Description
<b>External Filter Rack kits</b>	
1.841018	1 Pack (16x25)
1.841039	10 Pack (16x25)
<b>Natural to LP Kits</b>	
11K50	1-Stage - 80
11K45	High Altitude 1-Stage ( <4500ft. )
<b>Return Air Base</b>	
68W61	14.5", A Width
68W62	17.5", B Width
68W63	21.0", C Width
86W57	24.5", D Width
<b>Downflow Combustible Flooring Base</b>	
11M59	14.5", A Width
11M60	17.5", B Width
11M61	21.0", C Width
<b>Night Service Kits</b>	
86W57	Single Stage
<b>Horizontal Suspension Kits</b>	
51W10	80 & 90% Kit
<b>2-Stage Compressor Relay Kit</b>	
85W66	Blower Relay Kit
<b>Twinning kit</b>	
16W72	Constant Torque Gas Furnace Twinning Kit

*Note: For vent sizing and clearances to combustibles, please reference installation instructions.*

*2-Stage Compressor Relay Kit 2-Stage Compressor Relay Kit*

**Parts Arrangement**



**Figure 1.**

## Unit Components

GDD80C unit components are shown in Figure 1. The gas valve, combustion air inducer and burners can be accessed by removing the upper access panel. Electrical components are in the control box (Figure 2) found in the blower section.

### CAUTION



Electrostatic discharge can affect electronic components. Take precautions to neutralize electrostatic charge by touching your hand and tools to metal prior to handling the control.

### Control Box Components (Figure 2)

Unit transformer (T1) and integrated ignition control (A92) are located in the control box. In addition, a door interlock switch (S51) is located in the control box.

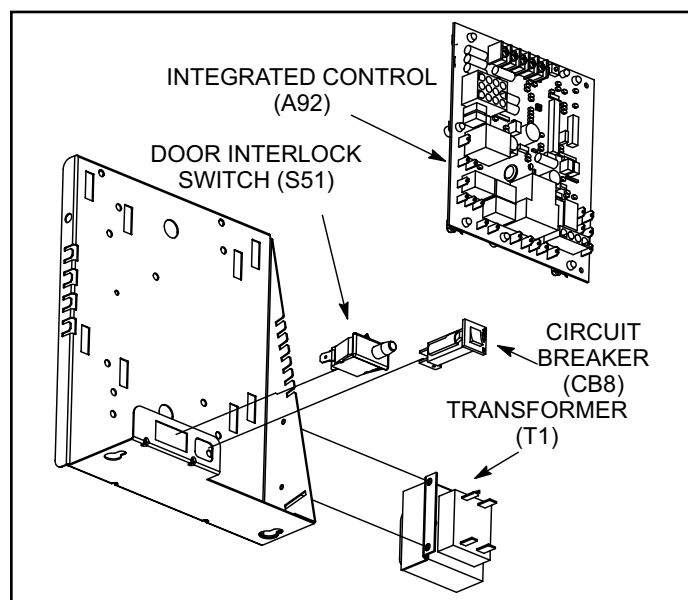


Figure 2. Control Box

#### Transformer (T1)

A transformer located in the control box provides power to the low voltage section of the unit. The transformers on all models are rated at 40VA with a 120V primary and 24V secondary.

#### Door Interlock Switch (S51)

A door interlock switch rated 14A at 120VAC is located on the control box. The switch is wired in series with line voltage. When the blower door is removed the unit will shut down.

**NOTE:** The door interlock switch is a safety switch. Do not by-pass or jumper switch.

#### Circuit Breaker (CB8)

A 24V circuit breaker is also located in the control box. The switch provides overcurrent protection to the transformer (T1). The breaker is rated at 3A at 32V. If the current exceeds this limit the breaker will trip and all unit operation will shutdown. The breaker can be manually reset by pressing the button on the face.

#### Integrated Ignition Control

### WARNING



Shock hazard.

Disconnect power before servicing. Control is not field repairable. If control is inoperable, simply replace entire control.

Can cause injury or death. Unsafe operation will result if repair is attempted.

The hot surface ignition control system consisting of an integrated control (Figure 3 with control terminal designations in Table 1 through Table 3), sensor and ignitor (Figure 6). The integrated control and ignitor work in combination to ensure furnace ignition and ignitor durability. The integrated control, controls all major furnace operations. The integrated control also features a RED LED for troubleshooting and two accessory terminals rated at (1) one amp. See Table 4 or Table 5 for troubleshooting diagnostic codes. The nitride ignitor is made from a non-porous, high strength proprietary ceramic material that provides long life and trouble free maintenance.

Pin #	Function
1	Combustion Air Inducer Line
2	Ignitor Line
3	Combustion Air Inducer Neutral
4	Ignitor Neutral

Table 1. 4-Pin Terminal Designations

Pin #	Function
1	High Limit Output
2	Not Used
3	24V Line
4	Not Used
5	Rollout Switch Out
6	24V Neutral
7	High Limit Input
8	Ground
9	Gas Valve Common
10	Pressure Switch In
11	Rollout Switch In
12	Gas Valve Out

Table 2. 12-Pin Terminal Designations

1/4" Quick Connect Terminals	
120HUM	Humidifier 120VAC
LINE	120VAC
XFMR	Transformer 120VAC
CIRC	Indoor Blower 120VAC
EAC	Indoor Air Quality Accessory 120VAC
NEUTRALS	Common 120VAC
HUM24	Humidifier 24VAC
3/16" Quick Connect Terminals	
COOL	Cooling Tap 24VAC
HEAT	Heating Tap 24VAC
FAN	Continuous Blower 24VAC
PARK (no power)	Park terminal for unused speed taps
FS	Flame Sense
24 COM	Common 24VAC

**Table 3.**

The integrated control is equipped with an LED light for troubleshooting. The diagnostic codes are listed in Table 4 or Table 5.

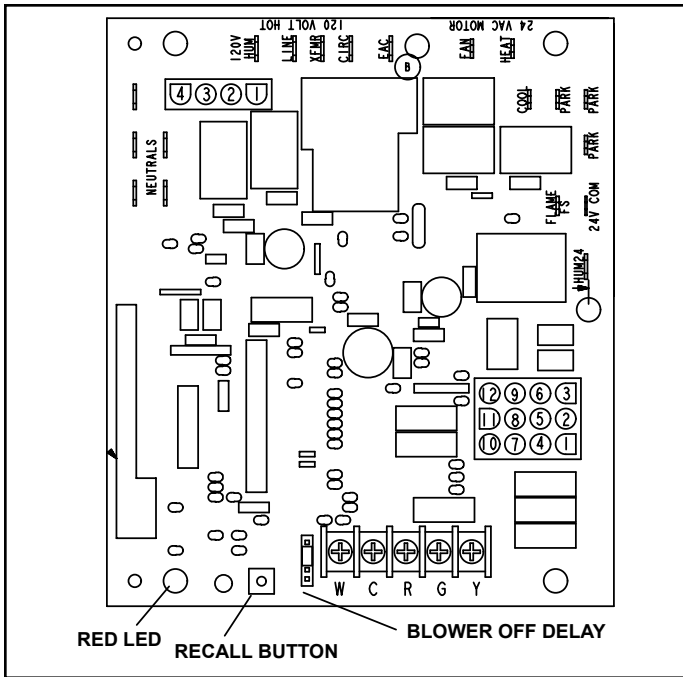
Red LED Flash Code <sup>2</sup>	Diagnostic Codes / Status of Furnace
Off	No power to control or board fault detected
Heartbeat <sup>1</sup>	Control powered - displayed during all modes of operation if no errors are detected
1	Reverse Line Voltage Polarity
2	Improper Earth Ground
3	Burner failed to light, or lost flame during heat demand
4	Low Flame Signal - check flame sensor
5	Watchguard - burner failed to light, exceeded maximum number of retries or recycles
6	Not Used
7	Primary or Secondary Limit Open or Watchguard Mode - Limit Switch Open longer than 3 minutes
8	Rollout Switch Open
9	Pressure Switch failed to close or opened during heat demand
10	Watchguard - Pressure Switch opened 5 times during one heat demand
11	Pressure Switch stuck closed prior to activation of combustion air inducer
12	Flame Sensed without gas valve energized
13	Low Line Voltage
<p>1 A "Heartbeat" is indicated by a "Slow Flash" - 1 sec on 1 sec off, repeating</p> <p>2 Error codes are indicated by a "Rapid Flash" - the LED flashes X times at 1/2 sec on 1/2 sec off, remains off for 3 sec, then repeats</p> <p><b>NOTE:</b> Last 10 error codes are stored in memory including when power is shut off to the unit. - To recall, press and release button, most recent will be displayed first, LED off for 3 sec, then next error code is displayed, etc. To clear error codes, depress and hold button longer than 5 seconds.</p>	

**Table 4. -02 Control Diagnostic Codes**

Red LED Flash Code <sup>2</sup>	Diagnostic Codes / Status of Furnace
Off	No power to control or board fault detected
Heartbeat <sup>1</sup>	Normal Operation - Idle, Continuous Fan, Cool
Continuous Rapid Flash	Call for Heat / Burner Operation
1	Reverse Line Voltage Polarity
2	Improper Earth Ground
3	Burner failed to light, or lost flame during heat demand
4	Low Flame Signal - check flame sensor
5	Watchguard - burner failed to light, exceeded maximum number of retries or recycles
6	Not Used
7	Primary or Secondary Limit Open or Watchguard Mode - Limit Switch Open longer than 3 minutes
8	Rollout Switch Open
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**Table 5. -03 Control Diagnostic Codes**





**Figure 3. Integrated Control  
(Automatic Hot Surface Ignition System)**

**Electronic Ignition**

On a call for heat the integrated control monitors the combustion air inducer pressure switch. The control board will not begin the heating cycle if the pressure switch is closed (by-passed). Once the pressure switch is determined to be open, the combustion air inducer is energized. When the differential in the pressure switch is great enough, the pressure switch closes and a 15-second pre-purge begins. If the pressure switch is not proven within 2-1/2 minutes, the integrated control goes into Watchguard-Pressure Switch mode for a 5-minute re-set period.

After the 15-second pre-purge period, the ignitor warms up for 20 seconds during which the gas valve opens at 19 seconds for a 4-second trial for ignition. The ignitor remains energized for the first 3 seconds during the 4 second trial. If ignition is not proven during the 4-second period, the integrated control will try four more times with

an inter purge and warm-up time between trials of 35 seconds. After a total of five trials for ignition (including the initial trial), the integrated control goes into Watchguard-Flame Failure mode. After a 60-minute reset period, the integrated control will begin the ignition sequence again.

**Fan Time Control**

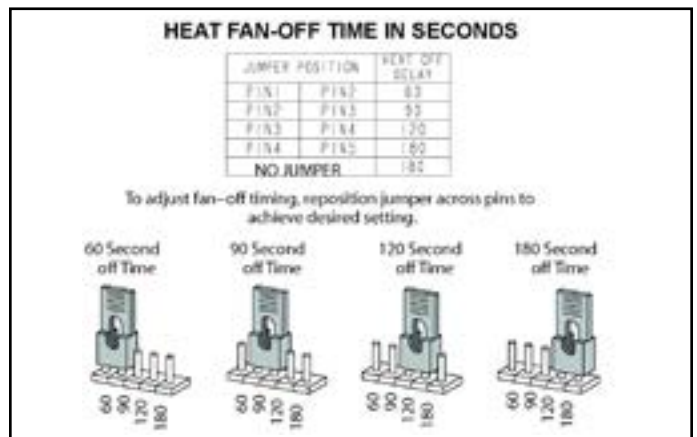
**Heating Fan On Time**

The fan on time of 30 seconds is not adjustable.

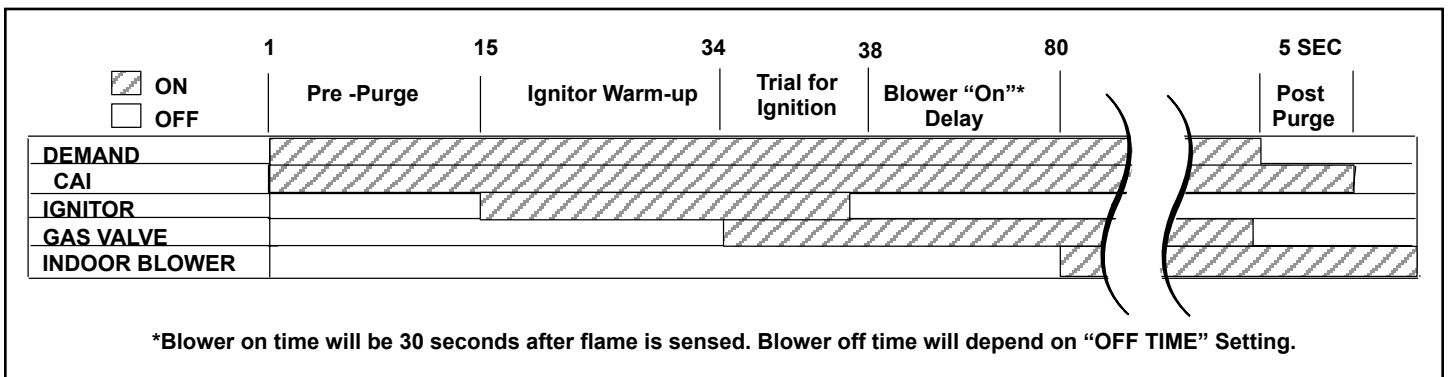
**Heating Fan Off Time**

Fan off time (time that the blower operates after the heat demand has been satisfied) can be adjusted by moving the jumper to a different setting. The unit is shipped with a factory fan off setting of 90 seconds. For customized comfort, monitor the supply air temperature once the heat demand is satisfied. Note the supply air temperature at the instant the blower is de-energized.

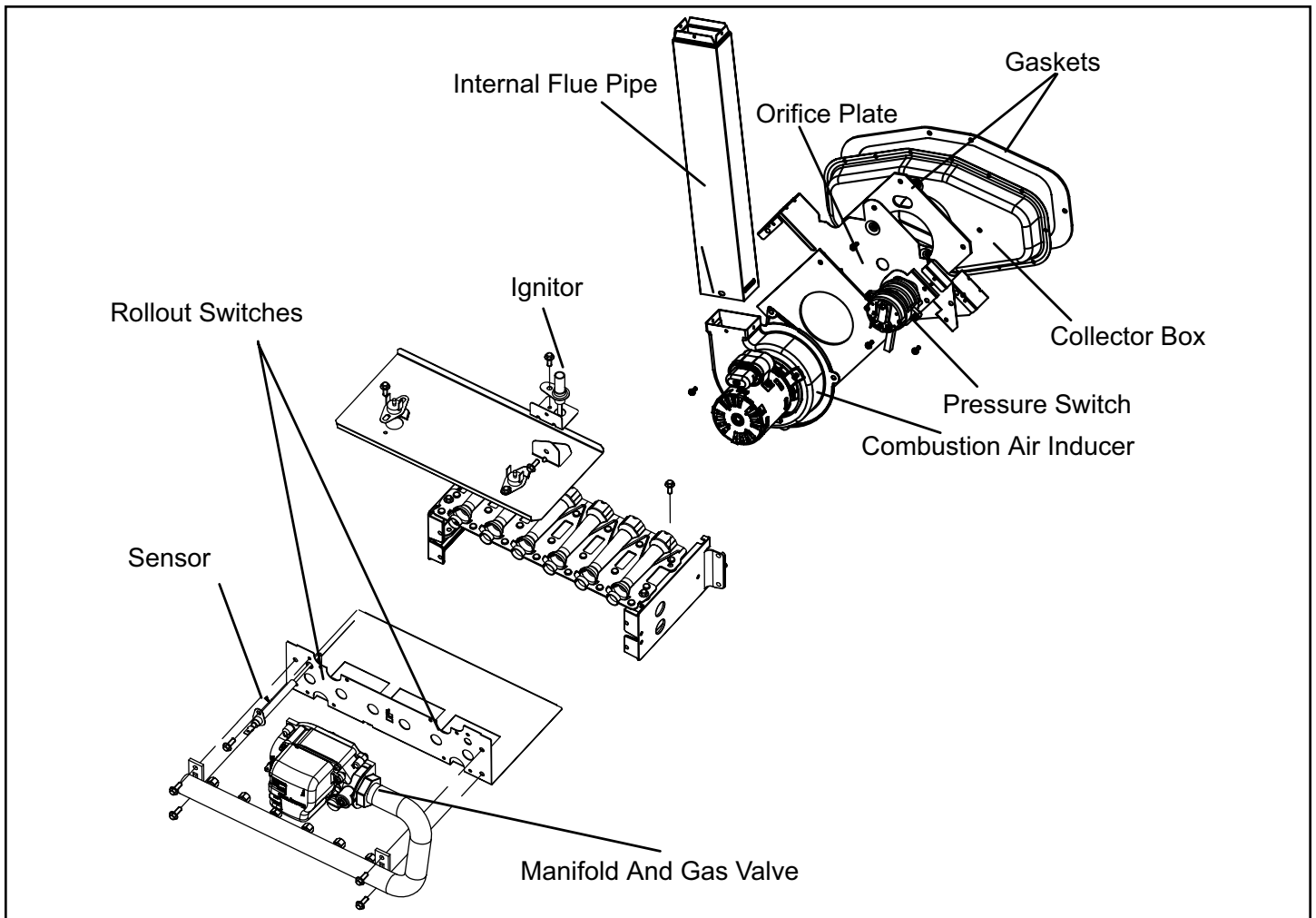
Adjust the fan-off delay to achieve a supply air temperature between 90° - 110° at the instant the blower is de-energized. (Longer delay times allow for lower air temperature, shorter delay times allow for higher air temperature). See Figure 4.



**Figure 4.**



**Figure 5. Electronic Ignition**



**Figure 6. Heating Components**

### Cooling Fan On Time

The fan on time is 2 seconds and is not adjustable.

### Cooling Fan Off Time

The control has a 45 second fan off delay after cooling demand has been met. This delay is factory set and not adjustable.

### Ignitor (Figure 6)

GDD80C units use a nitride ignitor made from a proprietary ceramic material. To check ignitor, measure its resistance and voltage. A value of 39 to 70 ohms indicates a good ignitor. Voltage to the ignitor should be 102 - 132VAC. See Figure 8 for resistance and voltage checks.

**NOTE:** *The GDD80C furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.*

### Flame Rollout Switches (Figure 6)

Flame rollout switch (S47) is a high temperature limit. Each furnace is equipped with two identical switches. The limit is a N.C. SPST manual-reset limit connected in series with the integrated control A92. When S47 senses rollout, the integrated control immediately stops ignition and closes the gas valve. If unit is running and flame rollout is detected, the gas valve will close and integrated control will be disabled. Rollout can be caused by a blocked heat exchanger, blocked flue or lack of combustion air. The switch has a factory setpoint of 210°F and cannot be adjusted. To manually reset a tripped switch, push the reset button located on the control.

### Flame Sensor (Figure 6)

A flame sensor is located on the left side of the burner support. The sensor is mounted on the flame rollout plate and the tip protrudes into the flame envelope of the left-most burner. The sensor can be removed for service (clean with steel wool) without removing any part of the burners. During operation, flame is sensed by current passed through the flame and sensing electrode. The integrated control allows the gas valve to remain open as long as flame signal is sensed.

A microamp DC meter is needed to check the flame signal on the integrated control.

Flame (microamp) signal is an electrical current which passes from the integrated control to the sensor during unit operation. Current passes from the sensor through the flame to ground to complete a safety circuit.

### **Primary Limit Control**

The primary limit on GDD80C units is located in the heating vestibule panel under the combustion air inducer. See Figure 1. When excess heat is sensed in the heat exchanger, the limit will open. If the limit is open, the integrated control energizes the supply air blower and closes the gas valve. The limit automatically resets when unit temperature returns to normal. The switch must reset within three minutes or SureLight® control will go into Watchguard for one hour. The switch is factory set and cannot be adjusted. The switch may have a different setpoint for each unit model number.

### **Gas Valve (Figure 6)**

The GDD80C uses an internally redundant valve to assure safety shut-off. If the gas valve must be replaced, the same type valve must be used.

24VAC terminals and valve switch are located on the valve. All terminals on the gas valve are connected to wires from the integrated control. 24V applied to the terminals energizes the valve.

Inlet and outlet pressure taps are located on the valve. A regulator adjustment screw is located on the valve.

LPG changeover kits are available from Comfort-Aire/Century. Kits include burner orifices and a gas valve regulator spring.

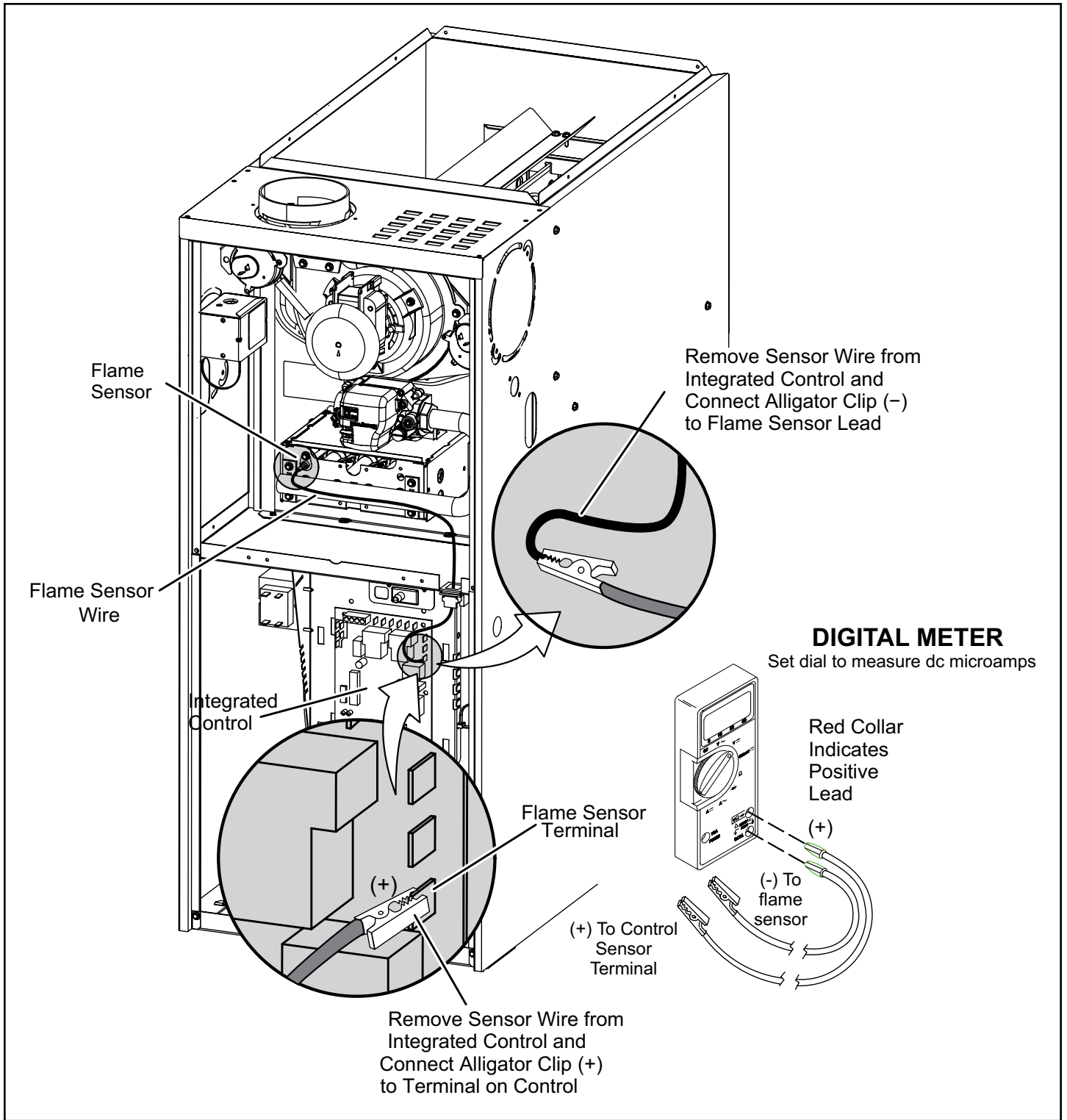
### **To Measure Flame Signal - Integrated Control:**

Use a digital readout meter capable of reading DC microamps. See Figure 7 for flame signal check.

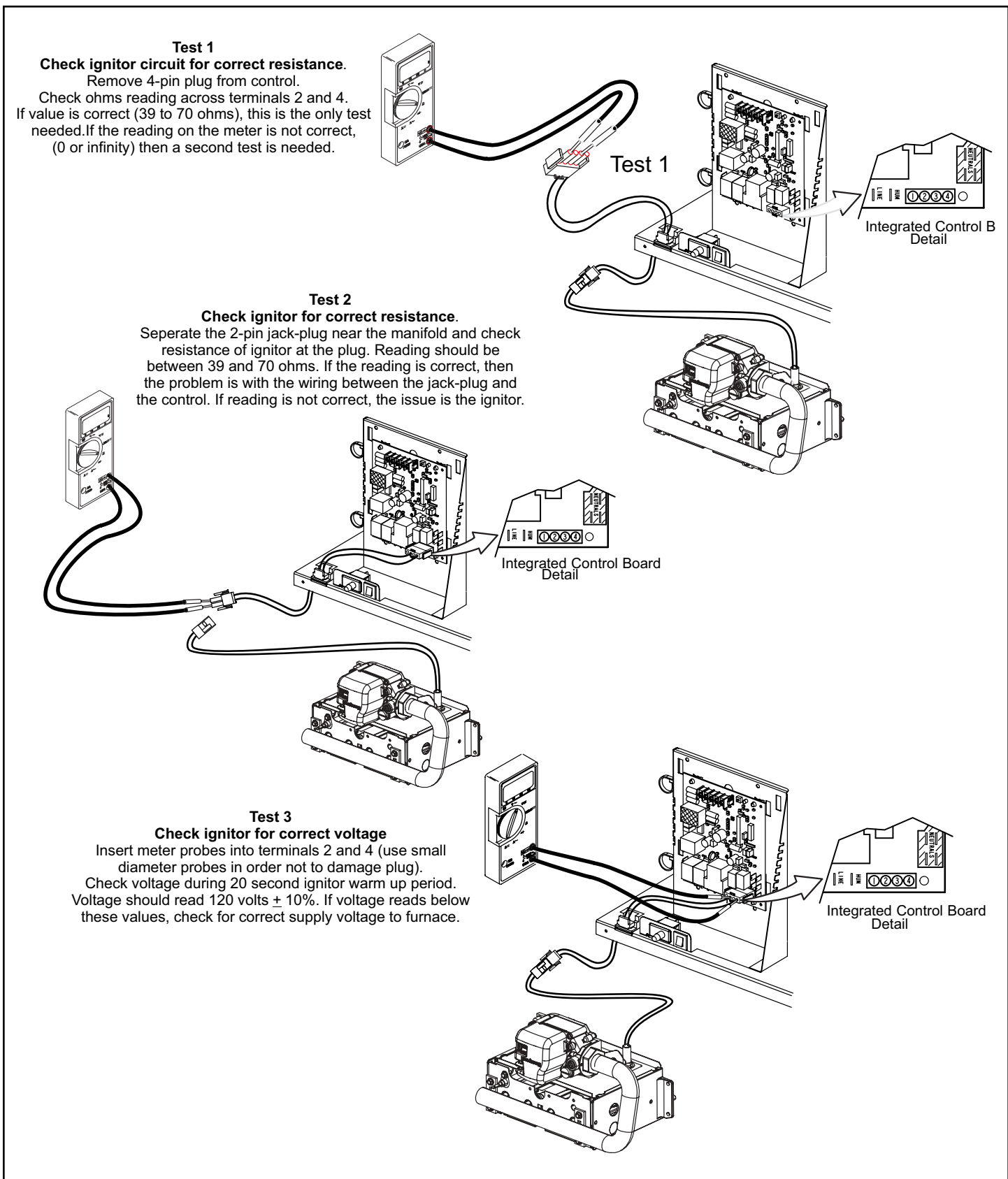
1. Set the meter to the DC amps scale.
2. Turn off supply voltage to control.
3. Remove sensor wire from integrated control.
4. Connect (-) lead to flame sensor wire.
5. Connect (+) lead to Terminal FS on integrated control.
6. Turn supply voltage on and close thermostat contacts to cycle system.
7. When main burners are in operation for two minutes, take reading.

<b>Flame Signal in Microamps</b>		
<b>Normal</b>	<b>Low</b>	<b>Drop Out</b>
≥ 1.5	0.5 - 1.4	≤ 0.4

**Table 6.**



**Figure 7. Measuring Flame Signal**



**Figure 8. Check Ignitor**

### Combustion Air Inducer (B6)

All GDD80 units use a combustion air inducer to move air through the burners and heat exchanger during heating operation. The blower uses a 120VAC motor. The motor operates during all heating operation and is controlled by integrated control A92. The inducer also operates for 15 seconds before burner ignition (pre-purge) and for 5 seconds after the gas valve closes (post-purge).

A pressure switch mounted on the combustion air inducer orifice plate is used to prove inducer operation. The combustion air inducer orifice will be different for each model. The switch monitors air pressure in the inducer housing. During normal operation, the pressure in the housing is negative. If pressure becomes less negative (signifying any obstruction in the flue) the pressure switch opens. When the pressure switch opens, the integrated control (A92) immediately de-energizes the gas valve to prevent burner operation.

### Combustion Air Inducer Pressure Switch (S18)

GDD80C series units are equipped with a combustion air pressure switch located on the combustion air inducer orifice bracket. The switch is connected to the combustion air inducer housing by means of a flexible silicone hose. It monitors negative air pressure in the combustion air inducer housing.

The switch is a single-pole single-throw proving switch electrically connected to the furnace control. The purpose of the switch is to prevent burner operation if the combustion air inducer is not operating or if the flue becomes obstructed.

On start-up, the switch senses that the combustion air inducer is operating. It closes a circuit to the integrated control when pressure inside the combustion air inducer decreases to a certain set point. Set points vary depending on unit size. See Table 7. The pressure sensed by the switch is negative relative to atmospheric pressure. If the flue becomes obstructed during operation, the switch senses a loss of negative pressure (pressure becomes more equal with atmospheric pressure) and opens the circuit to the integrated control and gas valve. A bleed port on the switch allows relatively dry air in the vestibule to purge switch tubing, to prevent condensate build up.

The switch is factory set and is not field adjustable. It is a safety shut-down control in the furnace and must not be bypassed for any reason. If switch is closed or by-passed, the integrated control will not initiate ignition at start up.

Unit	Break $\pm 0.05$ (in. w.c.)
045	-0.60
070	-0.65
090	-0.60
110	-0.65

Table 7.

### Troubleshooting

See Figure 9 for measuring operating pressure and checking resistance in the pressure switch.

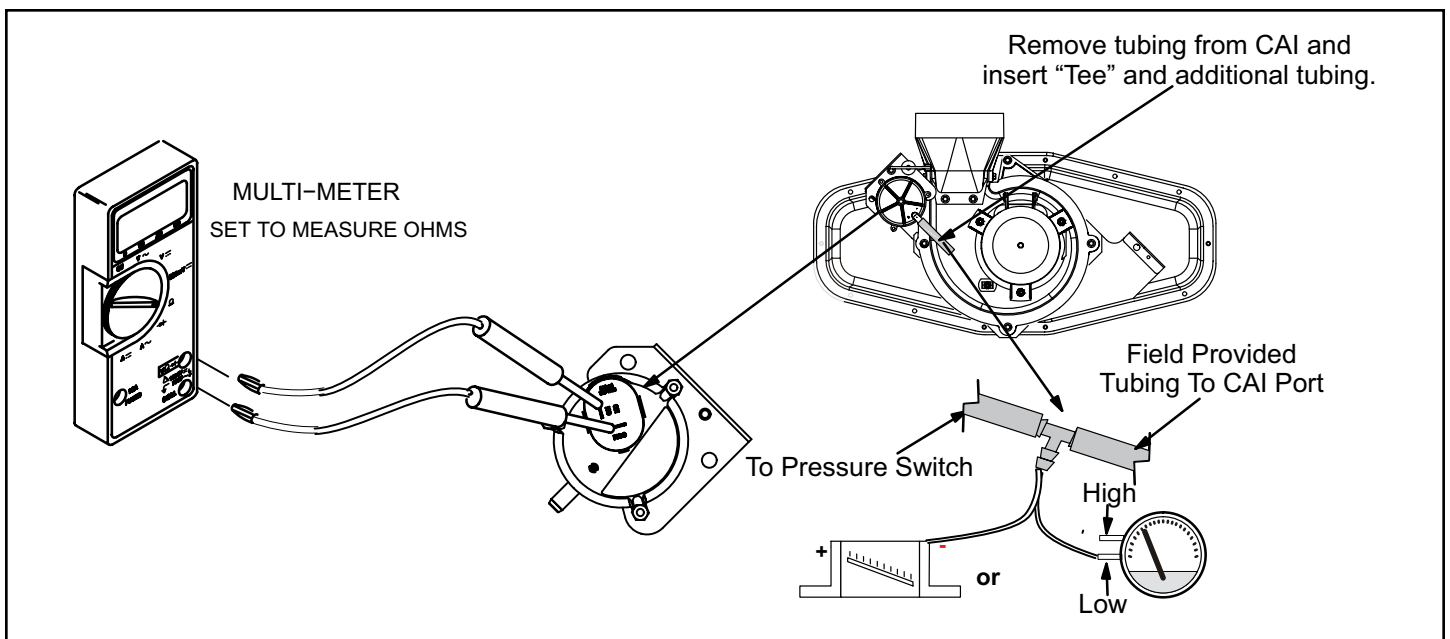


Figure 9.

## Blower Compartment

### **⚠ IMPORTANT**

Each blower is statically and dynamically balanced as an assembly before installation in the unit.

GDD80C units are equipped with a constant torque ECM motor. It has a DC motor coupled to an electronic control module both contained in the same motor housing. The motor is programmed to provide constant torque at each of the five selectable speed taps. Each tap requires 24 volts to energize.

### **Input Voltage Requirements**

The circuit is designed to be operated with AC voltage. To enable a tap requires 12 to 33VAC. Expected current draw will be less than 20mA.

### **Troubleshooting the Motor**

Troubleshooting the motor is an easy process. Follow steps below.

1. Shut off power to unit.
2. Remove input plugs P48 and P49 from motor. See Figure 13 for troubleshooting procedure.

If correct voltage is present in tests 1 and 2 and motor is not operating properly, replace motor. The motor is not field repairable.

If replacing the indoor blower motor or blower wheel is necessary, placement is critical. The blower wheel must be centered in the blower housing as shown in Figure 10. When replacing the indoor blower motor the set screw must be aligned and tightened with the motor shaft as shown in Figure 11.

### **Secondary Limit Controls**

The secondary limit is located in the blower compartment on the back side of the blower housing. See Figure 12. When excess heat is sensed in the blower compartment, the limit will open. If the limit is open, the furnace control energizes the supply air blower and closes the gas valve. The limit automatically resets when unit temperature returns to normal. The secondary limit cannot be adjusted.

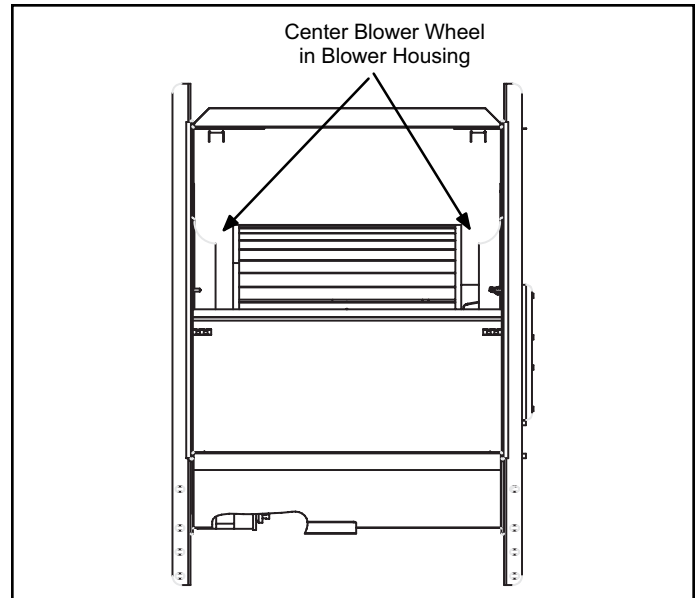


Figure 10. Blower Wheel Replacement

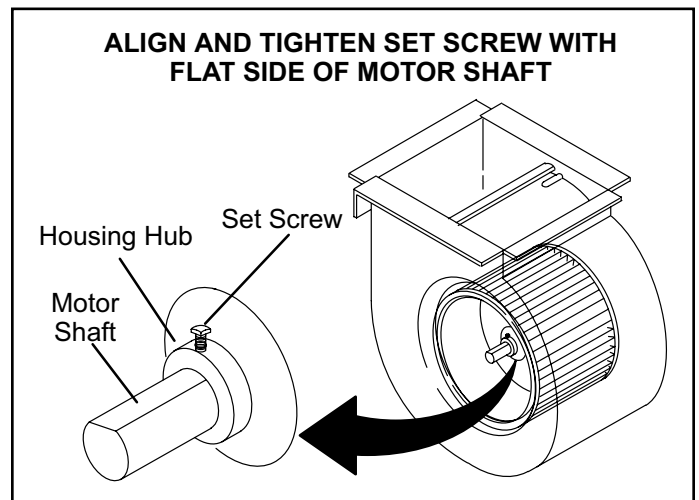


Figure 11.

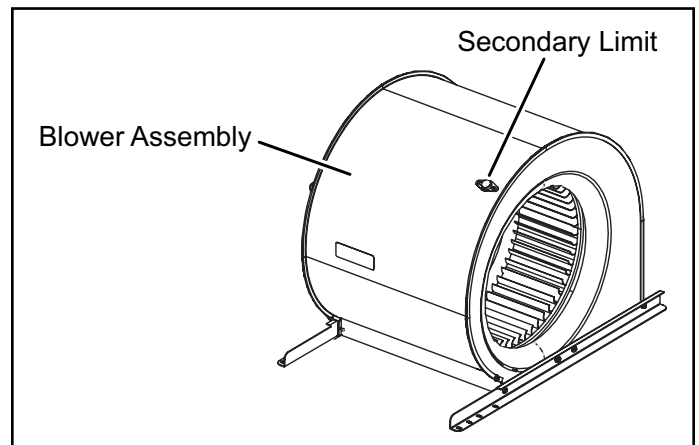
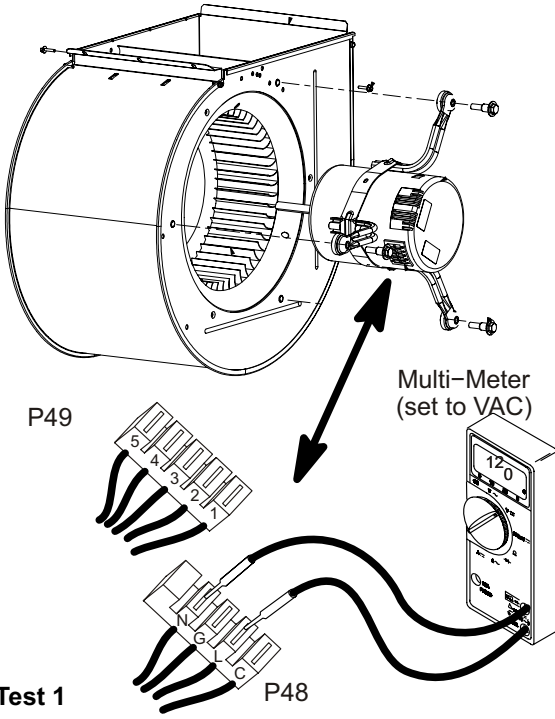
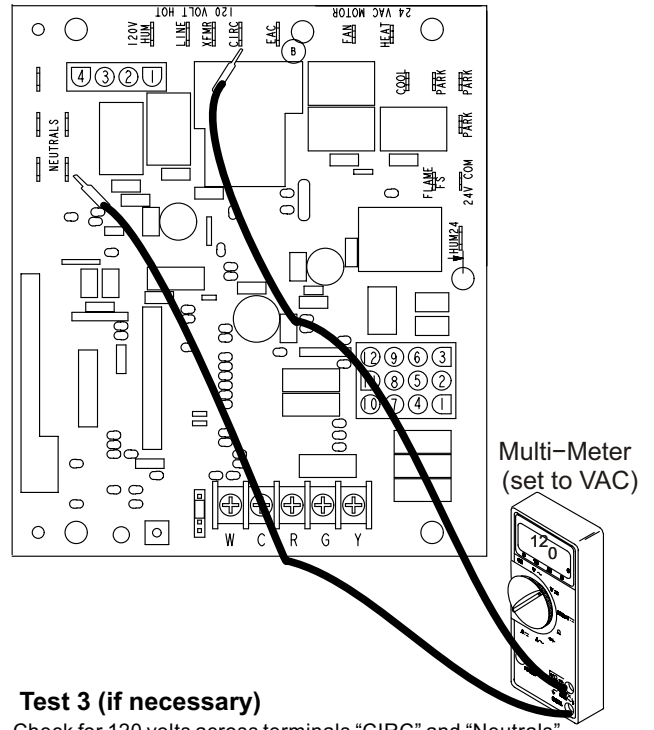


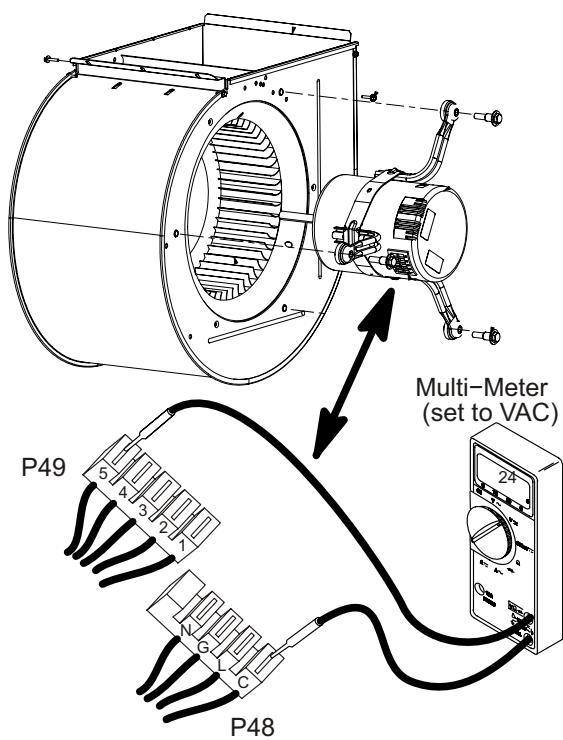
Figure 12. Secondary Limit Control



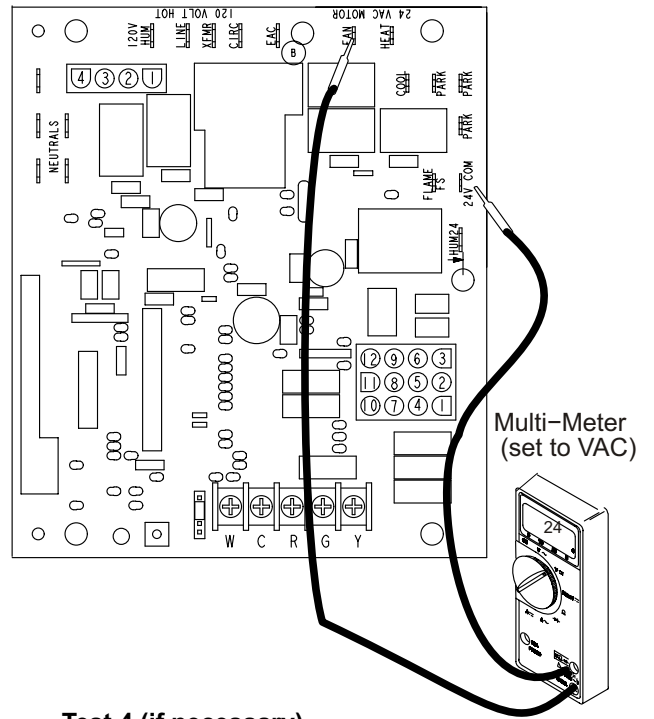
**Test 1**  
 Turn on power to unit. Check for 120 volts across terminals "L" and "N" on input plug P48. If voltage is present continue to test 2. If voltage is not present, problem may be upstream of plug P48. Proceed to test 3.



**Test 3 (if necessary)**  
 Check for 120 volts across terminals "CIRC" and "Neutrals" on the integrated control. If voltage is present, problem is with the harness. If voltage is not present problem may be with the integrated control.



**Test 2**  
 Switch thermostat to CONTINUOUS FAN MODE. Check for 24 volts across terminal "C" on input plug P48 and speed tap used for continuous fan. (1, 2, 3, 4 or 5) on input plug P49. If 24 volts is not present problem may be up stream of plug P49. Proceed to test 4.



**Test 4 (if necessary)**  
 Check for 24 volts across terminals "24 COM" and "FAN" terminals on the integrated control. If voltage is present, problem is with the harness. If voltage is not present, problem may be with the integrated control.

Figure 13.



### Testing the Motor (Figure 14)

If any motor fails the below tests, do not install the new control module. The motor is defective and it also must be replaced. The new control can fail if placed on a defective motor.

1. Using an ohmmeter check the resistance from any one of the motor connector pins to the aluminum end plate of the motor. This resistance should be greater than 100k ohms.
2. Check the resistances between each of the three motor connector pins. These should all read approximately the same resistance within an ohm.
3. Check to see if the blower wheel spins freely.



Figure 14. Motor Test

Scale	Measurement Range in Words	ohms
2 M	two megohms - two million ohms	0 - 2,000,000
200 K	two hundred kil-ohms - two hundred thousand ohms	0 - 200,000
20 K	twenty kilo-ohms - twenty thousand ohms	0 - 20,000
2 K	two kilo-ohms - two-thousand ohms	0 - 2,000
200	two hundred ohms	0 - 200

### Motor Module Installation

All replacement motor control modules look similar; however, each module is designed for a specific motor size. It is very important to make sure that you are using the correct replacement motor control module. **USE OF THE WRONG MOTOR CONTROL MODULE MAY RESULT IN UNEXPECTED UNIT OPERATION.**

1. Verify electrical power to unit is disconnected.
2. Connect three-wire harness from motor to control module.
3. Mount new motor control module to motor using two hex head bolts. Torque bolts to 22 inch pounds or 1/16th clock turn as exemplified to the right.
4. Reconnect the two harnesses to the motor control module.
5. The electrical connectors of the motor should be facing down to form a drip loop (Figure 15). This will direct moisture away from the motor and its electric connections on the motor.

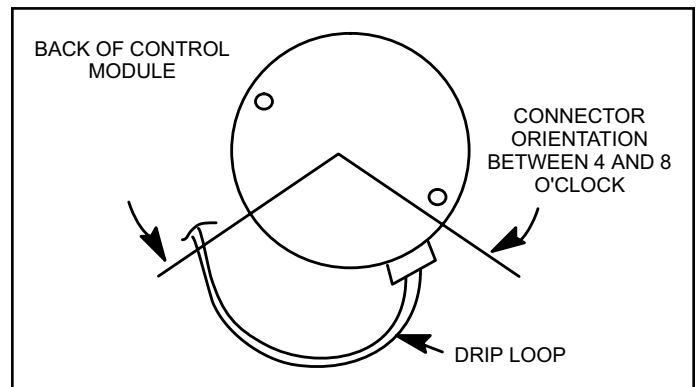
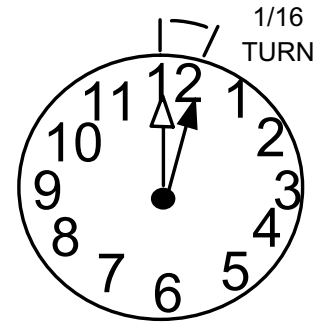


Figure 15. Drip Loop

### Placement & Installation

Make sure unit is installed in accordance with installation instructions and applicable codes.

### Start-Up

#### Heating Start-Up

#### **⚠ WARNING**

Shock and burn hazard.

GDD80C units are equipped with a hot surface ignition system. Do not attempt to light manually.

## Gas Valve Operation (Figure 16)

1. **STOP!** Read the safety information at the beginning of this section.
2. Set the thermostat to the lowest setting.
3. Turn off all electrical power to the unit.
4. This furnace is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.
5. Remove the access panel.
6. Move gas valve switch to OFF. See Figure 16.
7. Wait five minutes to clear out any gas. If you then smell gas, **STOP!** Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas go to next step.
8. Move gas valve switch to ON. See Figure 16.

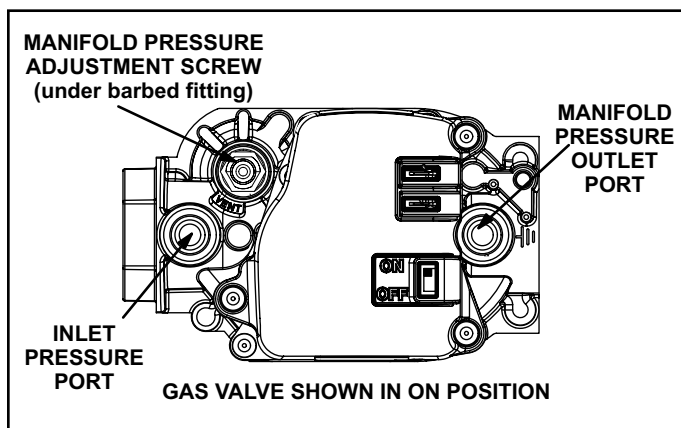


Figure 16. Gas Valve

9. Replace the access panel.
10. Turn on all electrical power to the unit.
11. Set the thermostat to desired setting.  
**NOTE:** When unit is initially started, steps 1 through 11 may need to be repeated to purge air from gas line.
12. If the appliance will not operate, follow the instructions "Turning Off Gas to Unit" and call your service technician or gas supplier.

## Turning Off Gas to Unit

1. Set the thermostat to the lowest setting.
2. Turn off all electrical power to the unit if service is to be performed.
3. Remove the upper access panel.
4. Move gas valve switch to OFF position. Do not force. See Figure 16.
5. Replace the upper access panel.

## Safety or Emergency Shutdown

Disconnect main power to unit. Close manual and main gas valves.

## Extended Period Shutdown

Turn off thermostat or set to "UNOCCUPIED" mode. Close all gas valves (both internal and external to unit) to guarantee no gas leaks into combustion chamber. Turn off power to unit. All access panels and covers must be in place and secured.

## Heating System Service Checks

### C.S.A. Certification

All units are C.S.A. design certified without modifications.

Refer to the GDD80C Operation and Installation Instruction.

### Gas Piping

Gas supply piping should not allow more than 0.5" W.C. drop in pressure between gas meter and unit. Supply gas pipe must not be smaller than unit gas connection.

Compounds used on gas piping threaded joints should be resistant to action of liquefied petroleum gases.

Testing Gas Piping

### CAUTION

If a flexible gas connector is required or allowed by the authority that has jurisdiction, black iron pipe shall be installed at the gas valve and extend outside the furnace cabinet.

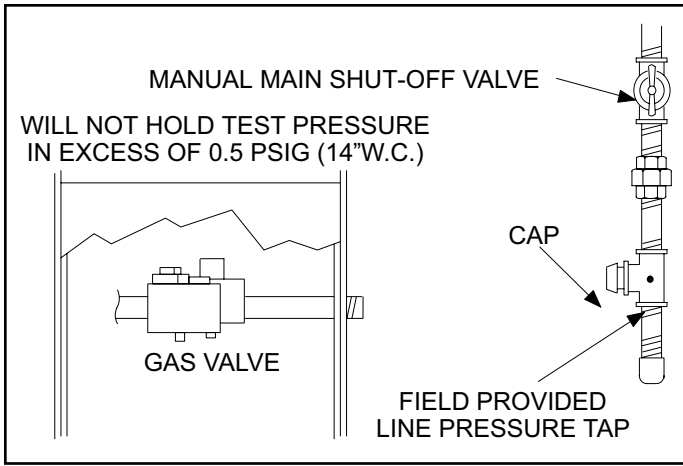
### IMPORTANT

In case emergency shutdown is required, turn off the main shut-off valve and disconnect the main power to unit. These controls should be properly labeled by the installer.

### WARNING

Do not over torque (800 in-lbs) or under torque (350 in-lbs) when attaching the gas piping to the gas valve.

When pressure testing gas lines, the gas valve must be disconnected and isolated. Gas valves can be damaged if subjected to more than 0.5psig (14" W.C.). See Figure 17. If the pressure is equal to or less than 0.5psig (14"W.C.), close the manual shut-off valve before pressure testing to isolate furnace from gas supply.



**Figure 17. Gas Piping Test Procedure**

When checking piping connections for gas leaks, use preferred means. Kitchen detergents can cause harmful corrosion on various metals used in gas piping. Use of a specialty Gas Leak Detector is strongly recommended.

**⚠ WARNING**

Do not use matches, candles, flame or any other source of ignition to check for gas leaks.

## Gas Pressure Adjustment

### Gas Flow (Approximate)

Furnace should operate at least 5 minutes before checking gas flow. Determine time in seconds for two revolutions of gas through the meter. (Two revolutions assures a more accurate time.) Divide by two and compare to time in Table 8. If manifold pressure matches Table 10 and rate is incorrect, check gas orifices for proper size and restriction. Remove temporary gas meter if installed.

**NOTE:** To obtain accurate reading, shut off all other gas appliances connected to meter.

Capacity	Seconds for One Revolution			
	Natural		LP	
	1 cu ft Dial	2 cu ft Dial	1 cu ft Dial	2 cu ft Dial
-45	80	160	200	400
-70	55	110	136	272
-90	41	82	102	204
-110	33	66	82	164

Natural-1000 btu/cu ft LP-2500 btu/cu ft

**Table 8. Gas Meter Clocking Chart**

## Supply and Manifold Pressure

### Supply Pressure Measurement

1. Remove the threaded plug from the inlet side of the

gas valve and install a field-provided barbed fitting. Connect to a test gauge to measure supply pressure.

2. Start unit and allow 5 minutes for unit to reach steady state.
3. After allowing unit to stabilize for 5 minutes, record supply pressure and compare to value given in Table 10.

### Manifold Pressure Measurement

1. Remove the threaded plug from the outlet side of the gas valve and install a field-provided barbed fitting. Connect to a test gauge to measure manifold pressure.
2. Start unit and allow 5 minutes for unit to reach steady state.
3. While waiting for the unit to stabilize, observe the flame. Flame should be stable and should not lift from burner. Natural gas should burn blue.
4. After allowing unit to stabilize for 5 minutes, record manifold pressure and compare to value given in Table 10.

**NOTE:** Shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to remove barbed fitting and replace threaded plug.

## Proper Combustion

Furnace should operate a minimum 15 minutes with correct manifold pressure and gas flow rate before checking combustion. Take combustion sample beyond the flue out let and compare to Table 9. The maximum carbon monoxide reading should not exceed 100 ppm.

Capacity	CO <sup>2</sup> % For Nat	CO <sup>2</sup> % For LP
-045	7.2 - 7.8	7.5 - 9.0
-070		
-090		
-110		

**Table 9.**

## High Altitude

The manifold pressure may require adjustment and combustion air pressure switch may need replacing to ensure proper combustion at higher altitudes. Refer to Table 10 for manifold pressure and pressure switch change.

**⚠ IMPORTANT**

For safety, shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to replace pressure tap plug.

Input Size	Gas	Line Pressure (in. w.c.)		0 - 2,000 ft.			2,000 - 4,500 ft.			4,501 - 7,500 ft.			7,501 - 10,000 ft.		
		Min.	Max.	Orifice Size (in)	Manifold Pressure (in w.c.)	Pressure Switch	Orifice Size (in)	Manifold Pressure (in w.c.)	Pressure Switch	Orifice Size (in)	Manifold Pressure (in w.c.)	Pressure Switch	Orifice Size (in)	Manifold Pressure (in w.c.)	Pressure Switch
045	Nat	4.5	10.0	No Change 0.0625"	3.5		No Change 0.0625"	3.5		No Change 0.0625"	3.5	51W01 0.0550"	3.5		
	LP/Propane	11.0	13.0	11K50 0.034"	10.0		11K50 0.034"	10.0		11K45 0.032"	10.0				
070	Nat	4.5	10.0	No Change 0.0625"	3.5	No Change	No Change 0.0625"	3.5		No Change 0.0625"	3.3	51W01 0.0550"	3.5	74W89 -0.55" w.c.	
	LP/Propane	11.0	13.0	11K50 0.034"	10.0		11K50 0.034"	10.0		11K45 0.032"	10.0				
090	Nat	4.5	10.0	No Change 0.0625"	3.5		No Change 0.0625"	3.5	Change	No Change 0.0625"	3.3	51W01 0.0550"	3.5		
	LP/Propane	11.0	13.0	11K50 0.034"	10.0		11K50 0.034"	10.0		11K45 0.032"	10.0				
110	Nat	4.5	10.0	No Change 0.0625"	3.5		No Change 0.0625"	3.5		No Change 0.0625"	3.3	74W60 -0.60" w.c.	3.5		
	LP/Propane	11.0	13.0	11K50 0.034"	10.0		11K50 0.034"	10.0		11K45 0.032"	10.0				

**NOTE:** A natural to L.P. propane gas changeover kit is necessary to convert this unit. Refer to the changeover kit installation instruction for the conversion procedure.

**NOTE:** For Altitudes of 7501' - 10,000' call Comfort-Aire/Century Technical Support.

**Table 10. Manifold Pressure Settings and Pressure Switch**

## Proper Ground and Voltage

A poorly grounded furnace can contribute to premature ignitor failure. Use the following procedure to check for ground and voltage to the integrated control.

1. Measure the AC voltage between Line Neutral (spade terminals) and "C" terminal (low voltage terminal block) on the integrated control. See Figure 18. A wide variation in the voltage between Line Neutral and "C" as a function of load indicates a poor or partial ground. Compare the readings to Table 11. If the readings exceed the maximum shown in Table 11, make repairs before operating the furnace.

2. In addition, measure the AC voltage from Line Hot to Line Neutral (spade terminals) on the integrated control. See Figure 18. This voltage should be in the range of 97 to 132 VAC

Furnace Status	Measurement VAC	
	Expected	Maximum
Power On Furnace Idle	0.3	2
CAI / Ignitor Energized	0.75	5
Indoor Blower Energized	Less than 2	10

Table 11.

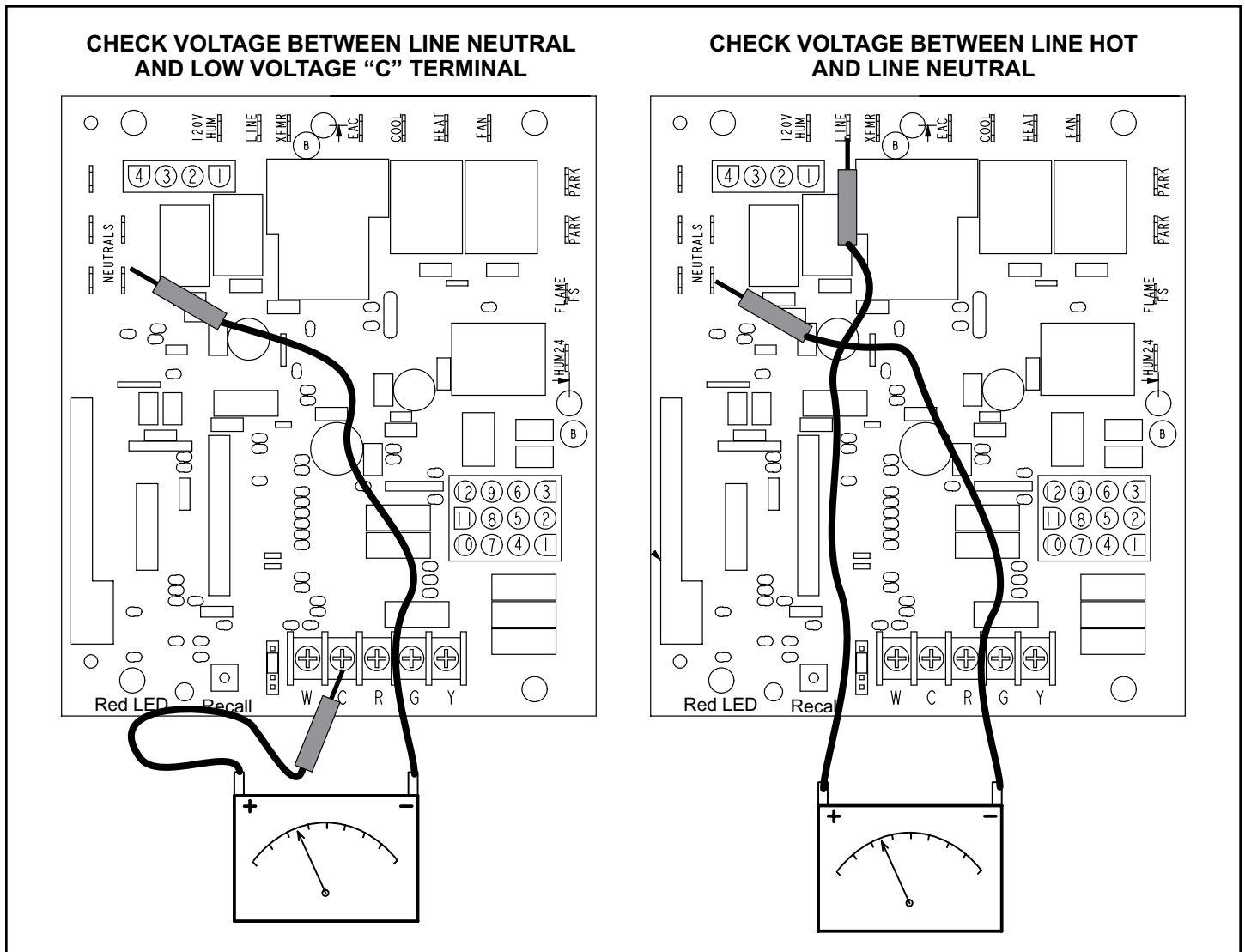


Figure 18.

## Typical Operating Characteristics

### Blower Operation and Adjustment

**NOTE:** The following is a generalized procedure and does not apply to all thermostat controls.

1. Blower operation is dependent on thermostat control system.
2. Generally, blower operation is set at thermostat subbase fan switch. With fan switch in ON position, blower operates continuously. With fan switch in AUTO position, blower cycles with demand or runs continuously while heating or cooling circuit cycles.
3. Depending on the type of indoor thermostat, blower and entire unit will be off when the system switch is in OFF position.

### Temperature Rise (Figure 19)

Temperature rise for GDD80C units depends on unit input, blower speed, blower horsepower and static pressure as marked on the unit rating plate. The blower speed must be set for unit operation within the range of "TEMP. RISE °F" listed on the unit rating plate.

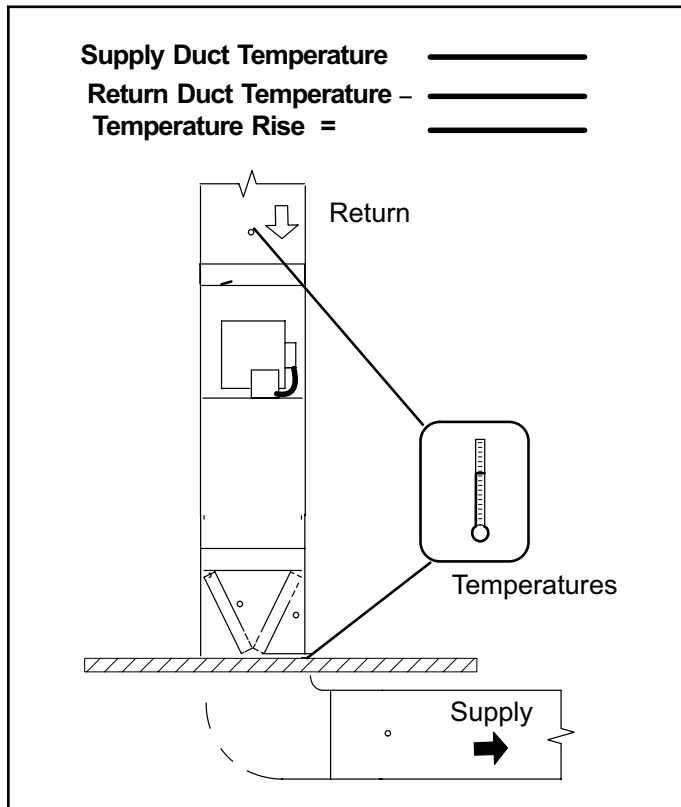


Figure 19. Temperature Rise

### External Static Pressure

1. Tap locations shown in Figure 20.
2. Punch a 1/4" diameter hole in supply and return air plenums. Insert manometer hose flush with inside edge of hole or insulation. Seal around the hose with permagum. Connect the zero end of the manometer to the discharge (supply) side of the system. On ducted systems, connect the other end of manometer to the return duct as above.
3. With only the blower motor running and the evaporator coil dry, observe the manometer reading. Adjust blower motor speed to deliver the air desired according to the job requirements. For heating speed external static pressure drop must not be more than 0.5" W.C. For cooling speed external static pressure drop must not be more than 0.8" W.C.
4. Seal the hole when the check is complete.

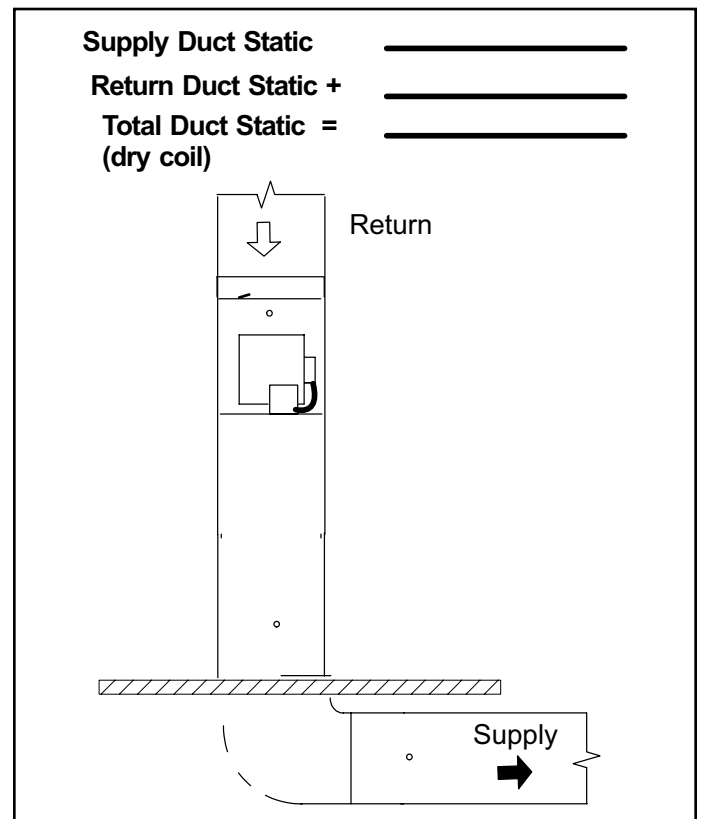


Figure 20. External Static Pressure

### Blower Speed Taps

Blower speed tap changes are made on the integrated control. See Figure 3 or Figure 18. The heating tap is connected to the "HEAT" terminal and the cooling tap is connected to the "COOL" terminal. On all units the continuous blower tap is connected to the "FAN" terminal. Unused taps must be secured on two dummy terminals labeled "PARK". To change out existing speed tap, turn off power and switch out speed tap with tap connected to "PARK". See blower speed tap table on unit diagram for motor tap colors for each speed.

## Maintenance

At the beginning of each heating season, and to comply with the Comfort-Aire/Century Limited Warranty, your system should be checked by a licensed professional technician (or equivalent) as follows:

### IMPORTANT

If a high-efficiency filter is being installed as part of this system to ensure better indoor air quality, the filter must be properly sized. High-efficiency filters have a higher static pressure drop than standard-efficiency glass/foam filters. If the pressure drop is too great, system capacity and performance may be reduced. The pressure drop may also cause the limit to trip more frequently during the winter and the indoor coil to freeze in the summer, resulting in an increase in the number of service calls.

Before using any filter with this system, check the specifications provided by the filter manufacturer

### WARNING

Fire Hazard. Use of aluminum wire with this product may result in a fire, causing property damage, severe injury or death. Use copper wire only with this product.

### CAUTION

Failure to use properly sized wiring and circuit breaker may result in property damage. Size wiring and circuit breaker(s) per Product Specifications and unit rating plate.

## Filters

All air filters are installed external to the unit. Filters should be inspected monthly. Clean or replace the filters when necessary to ensure proper furnace operation. Table 12 lists recommended filter sizes.

Cabinet Width	Filter Size
	Bottom Return
14-1/2"	14 x 25 x 1 (1)
17-1/2"	16 x 25 x 1 (1)
21"	20 x 25 x 1 (1)

Table 12.

1. Check wiring for loose connections, voltage at indoor unit and amperage of indoor motor.
2. Check the condition of the belt and shaft bearings if applicable.

3. Inspect all gas pipe and connections for leaks.
4. Check the cleanliness of filters and change if necessary (monthly).
5. Check the condition and cleanliness of burners and heat exchanger and clean if necessary.
6. Check the cleanliness of blower assembly and clean the housing, blower wheel and blower motor if necessary. The blower motors are prelubricated for extended bearing life. No further lubrication is needed.
7. Inspect the combustion air inducer and clean if necessary.
8. Evaluate the heat exchanger integrity by inspecting the heat exchanger per the AHRI heat exchanger inspection procedure. This procedure can be viewed at [www.ahrinet.org](http://www.ahrinet.org)
9. Ensure sufficient combustion air is available to the furnace. Fresh air grilles and louvers (on the unit and in the room where the furnace is installed) must be properly sized, open and unobstructed to provide combustion air.
10. Inspect the furnace venting system to make sure it is in place, structurally sound, and without holes, corrosion, or blockage. Vent system must be free and clear of obstructions and must slope upward away from the furnace. Vent system should be installed per the National Fuel Gas Code.
11. Inspect the furnace return air duct connection to ensure the duct is sealed to the furnace. Check for air leaks on supply and return ducts and seal where necessary.
12. Check the condition of the furnace cabinet insulation and repair if necessary.
13. Perform a complete combustion analysis during the furnace inspection to ensure proper combustion and operation. Consult Service Literature for proper combustion values.
14. Verify operation of CO detectors and replace batteries as required.

Perform a general system test. Turn on the furnace to check operating functions such as the start-up and shut-off operation.

1. Check the operation of the ignition system, inspect and clean flame sensor. Check microamps before and after. Check controls and safety devices (gas valve, flame sensor, temperature limits). Consult Service Manual for proper operating range. Thermal Limits should be checked by restricting airflow and not disconnecting the indoor blower. For additional details, please see Service and Application Note H049.
2. Verify that system total static pressure and airflow settings are within specific operating parameters.

- Clock gas meter to ensure that the unit is operating at the specified firing rate. Check the supply pressure and the manifold pressure. On two-stage gas furnaces check the manifold pressure on high fire and low fire. If manifold pressure adjustment is necessary, consult the Service Literature for unit specific information on adjusting gas pressure. Not all gas valves are adjustable. Verify correct temperature rise.

### Cleaning the Heat Exchanger and Burners

**NOTE:** Use papers or protective covering in front of the furnace during cleaning.

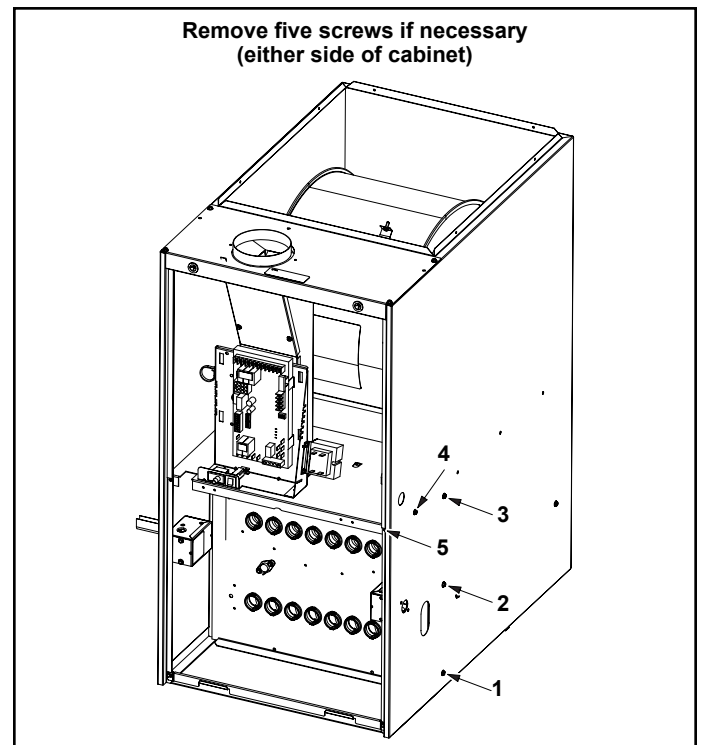
- Turn off both electrical and gas power supplies to furnace.
- Remove flue pipe, top cap, flue chase and internal flue pipe assembly from the unit.
- Label the wires from gas valve, rollout switches, primary limit switch and make-up box then disconnect them.
- Remove the screws that secure the combustion air inducer/pressure switch assembly to the collector box. Carefully remove the combustion air inducer to avoid damaging blower gasket. If gasket is damaged, it must be replaced to prevent leakage.
- Remove the collector box located behind the combustion air inducer. Be careful with the collector box gasket. If the gasket is damaged, it must be replaced to prevent leakage.
- Disconnect gas supply piping. Remove the four screws securing the burner manifold assembly to the vestibule panel and remove the assembly from the unit.
- Remove screws from both sides, top and bottom of vestibule panel.
- Remove heat exchanger. It may be necessary to spread cabinet side to allow more room. If so, remove five screws from the left side or right side of cabinet. See Figure 21.
- Back wash using steam. Begin from the burner opening on each clam. Steam must not exceed 275°F.
- To clean burners, run a vacuum cleaner with a soft brush attachment over the face of burners. Visually inspect inside the burners and crossovers for any blockage caused by foreign matter. Remove any blockage. Figure 22 shows burner detail.
- To clean the combustion air inducer visually inspect and using a wire brush clean where necessary. Use compressed air to clean off debris and any rust.
- Reinstall heat exchanger in vestibule. (Replace the five screws in the cabinet from step 10 if removed).
- Reinstall collector box, combustion air assembly, internal flue pipe and flue chase. Seal with high temperature RTV. Reinstall all screws to the collector box and combustion air inducer. Failure to replace all screws may cause leaks. Inspect gaskets for any

damage and replace if necessary.

- Reinstall burner box, manifold assembly and burner box cover.
- Reconnect all wires.
- Reconnect top cap and vent pipe to combustion air inducer outlet.
- Reconnect gas supply piping.
- Turn on power and gas supply to unit.
- Set thermostat and check for proper operation.
- Check all piping connections, factory and field, for gas leaks. Use a leak detecting solution or other preferred means.
- If a leak is detected, shut gas and electricity off and repair leak.
- Repeat steps 21 and 23 until no leaks are detected.
- Replace access panel.

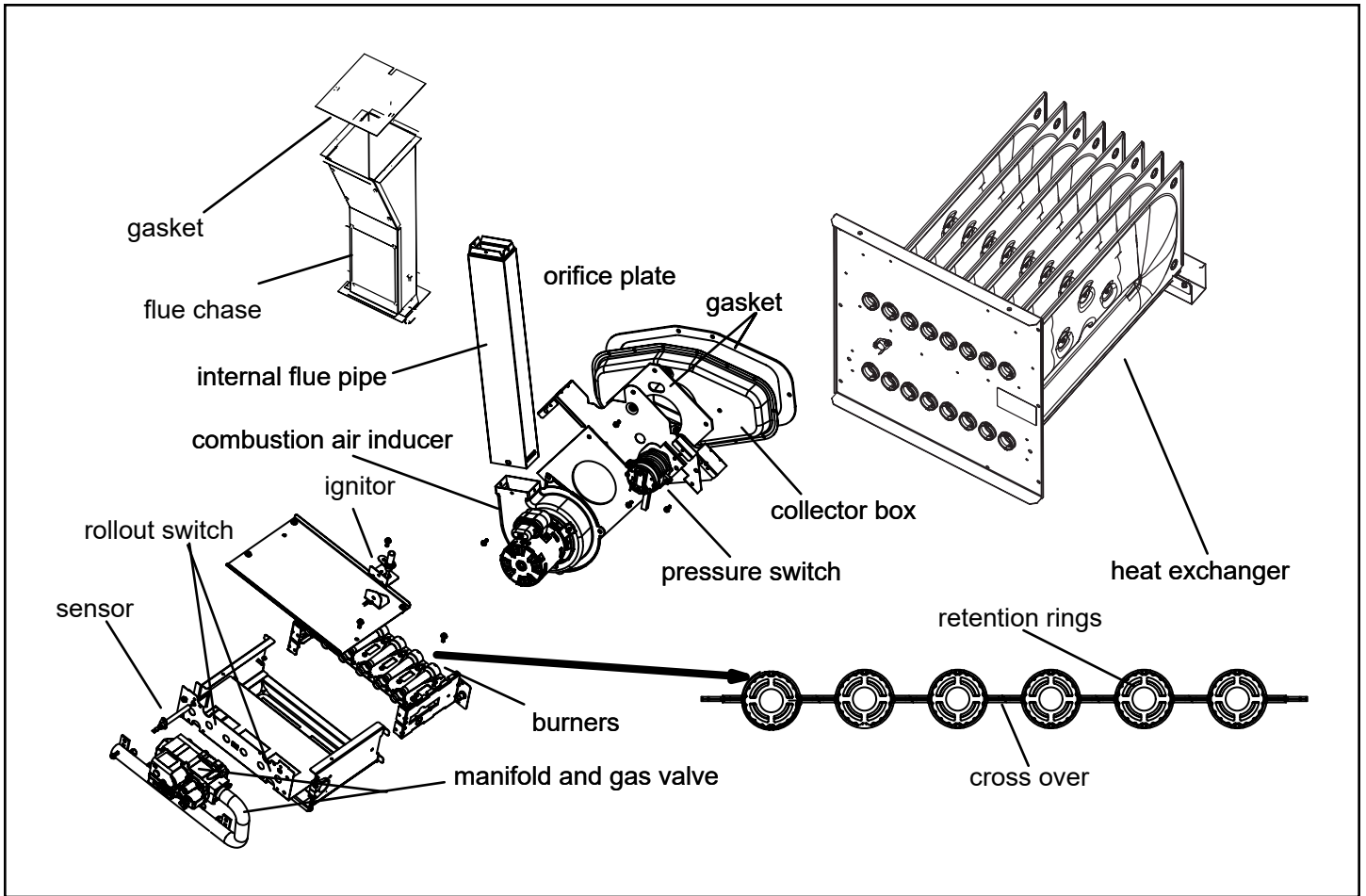
### **⚠ CAUTION**

Some soaps used for leak detection are corrosive to certain metals. Carefully rinse piping thoroughly after leak test has been completed. Do not use matches, candles, flame or other sources of ignition to check for gas leaks.



**Figure 21.**





**Figure 22. Burner, Combustion Air Inducer Assembly & Heat Exchanger Removal**

# Wiring Diagram

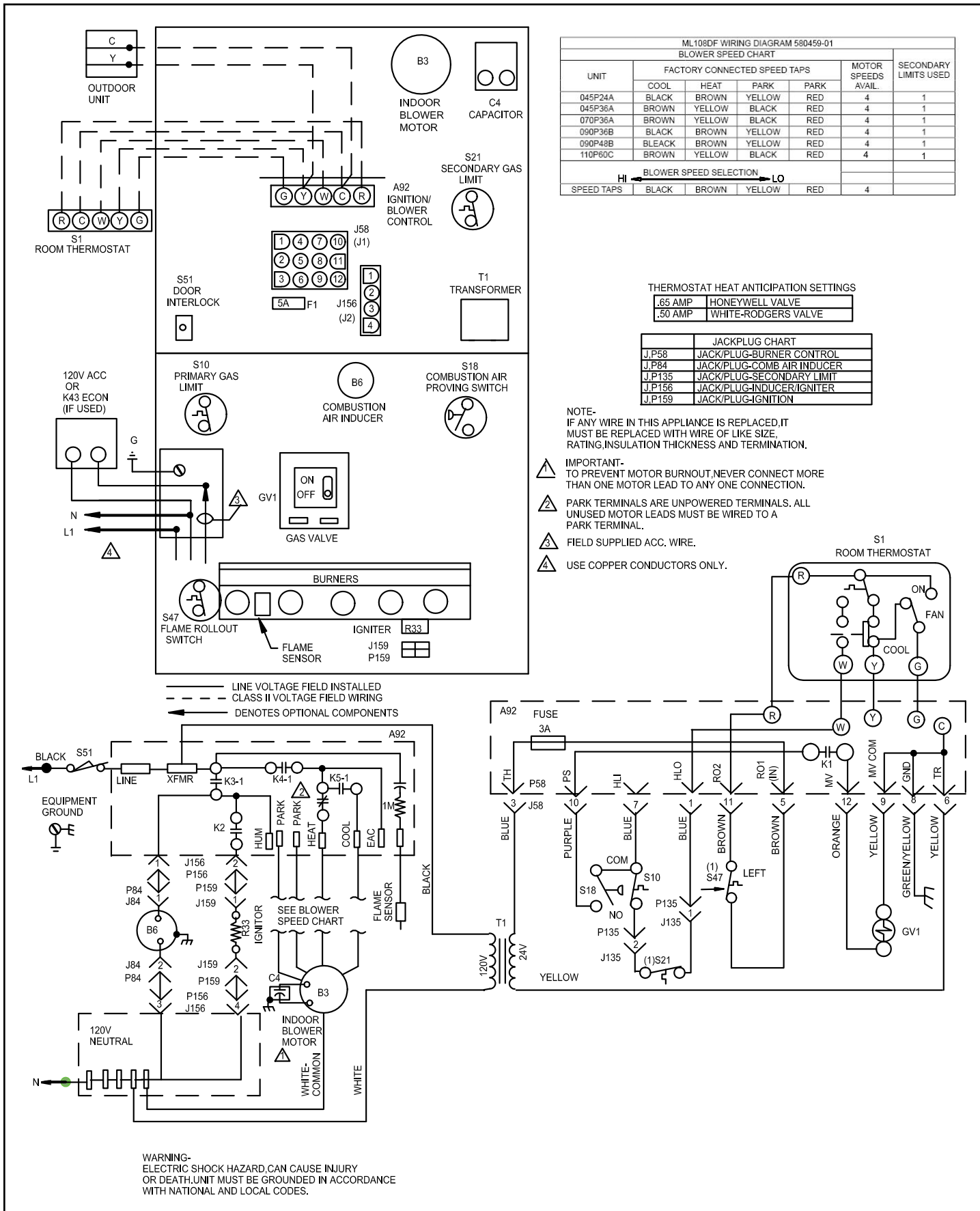
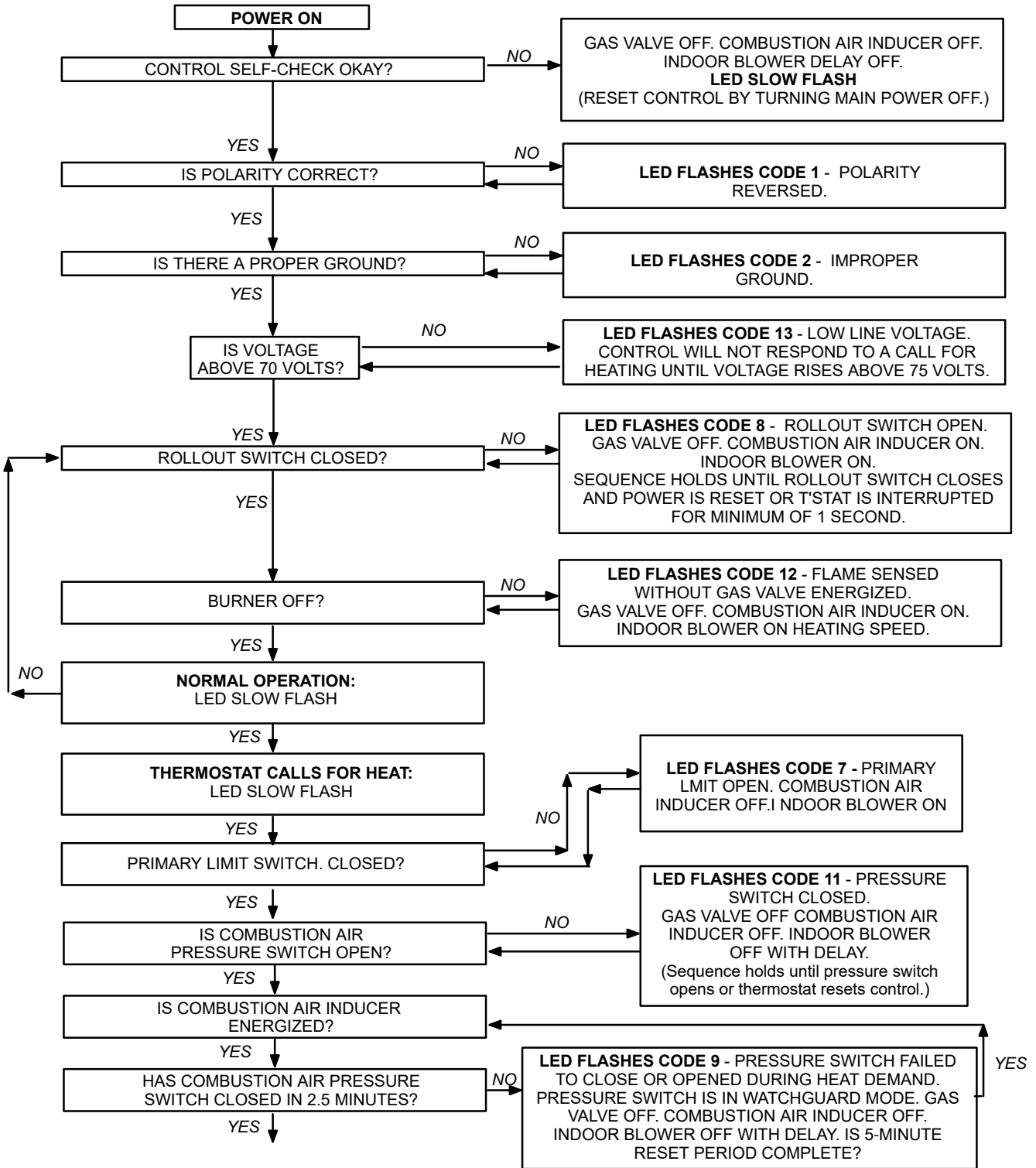


Figure 23.

**HEATING SEQUENCE OF OPERATION**

**NORMAL HEATING MODE**

**ABNORMAL HEATING MODE**



**CONTINUED NEXT PAGE**

# Troubleshooting: Heating Sequence of Operation (Continued)

## HEATING SEQUENCE CONTINUED

### NORMAL HEATING MODE

### ABNORMAL HEATING MODE

15-SECOND COMBUSTION AIR INDUCER PREPURGE INITIATED BY CLOSED PRESSURE SWITCH.

YES

IGNITOR WARM-UP -- 20 SECONDS.

YES

4-SECOND TRIAL FOR IGNITION. GAS VALVE OPENS. IGNITOR ENERGIZED FOR FIRST 3 SECONDS OF THE TRIAL.

YES

FLAME STABILIZATION PERIOD.

4 SECONDS

FLAME RECTIFICATION CURRENT CHECK. CAN FLAME BE PROVEN WITHIN 4 SECONDS AFTER GAS VALVE OPENS? (0.5 microamps)

YES

FLAME PRESENT?

YES

FLAME SIGNAL 1.5 MICROAMPS OR GREATER?

YES

INDOOR BLOWER ON AFTER 30-SECOND DELAY

YES

PRIMARY LIMIT SWITCH CLOSED?

YES

ROLLOUT SWITCH CLOSED?

YES

COMBUSTION AIR PRESSURE SWITCH CLOSED?

YES

THERMOSTAT DEMAND SATISFIED.

YES

LED SLOW FLASH.

YES

COMB. AIR INDUCER CONTINUES 5-SECOND POST PURGE AFTER T'STAT DEMAND IS SATISFIED. INDOOR AIR BLOWER COMPLETES SELECTED "OFF" DELAY BEFORE SHUTTING OFF.

NO

IS VOLTAGE ABOVE 70 VOLTS?

YES

**LED FLASHES CODE 13 -** LOW LINE VOLTAGE. ONCE VOLTAGE IS ABOVE 75 VOLTS, HEATING SEQUENCE RESTARTS.

NO

GAS VALVE OFF. COMBUSTION AIR INDUCER ON. INDOOR BLOWER OFF. HAS CONTROL FAILED TO SENSE FLAME FOR FIVE CONSECUTIVE TRIES DURING A SINGLE HEAT DEMAND?

NO

NO

LED SIGNAL WATCHGUARD FAILURE CODE WATCHGUARD MODE. GAS VALVE OFF. COMBUSTION AIR INDUCER OFF. INDOOR BLOWER OFF WITH DELAY IS 60-MINUTE RESET PERIOD COMPLETE?

YES

NO

HAS CONTROL RESET IGNITION SEQUENCE FOUR TIMES?

NO

YES

NO

**LED FLASHES CODE 4 -** LOW FLAME SIGNAL. (Does not affect operation of control)

NO

**LED FLASHES CODE 7 -** PRIMARY LIMIT OPEN GAS VALVE DE-ENERGIZED. COMBUSTION AIR INDUCER DE-ENERGIZED. INDOOR BLOWER ON UNTIL SWITCH CLOSSES. LIMIT SWITCH CLOSED?

YES

HAS PRIMARY LIMIT RESET TIME EXCEEDED 3 MINUTES?

YES

NO

**LED FLASHES CODE 7 -** PRIMARY LIMIT OPEN. GAS VALVE, COMB. AIR INDUCER AND INDOOR BLOWER OFF. LEDs SIGNAL LIMIT SWITCH OPEN UNTIL MAIN POWER IS INTERRUPTED OR T'STAT IS CYCLED OFF/ON FOR 1 SEC. MINIMUM. 60-MINUTE WATCHGUARD PERIOD STARTS AT TIME LIMIT CLOSSES. IS 60-MIN. PERIOD COMPLETE?

NO

**LED FLASHES CODE 8 -** ROLLOUT SWITCH OPEN. GAS VALVE POWER OFF. COMBUSTION AIR INDUCER POWER ON. INDOOR BLOWER ON SEQUENCE HOLDS UNTIL ROLLOUT SWITCH IS RESET AND MAIN POWER IS INTERRUPTED OR THERMOSTAT IS CYCLED OFF/ON FOR 1 SEC. MINIMUM.

NO

COMBUSTION AIR PRESSURE SWITCH CLOSED?

NO

HAS PRESSURE SWITCH OPENED 5 TIMES IN SAME HEAT DEMAND

YES

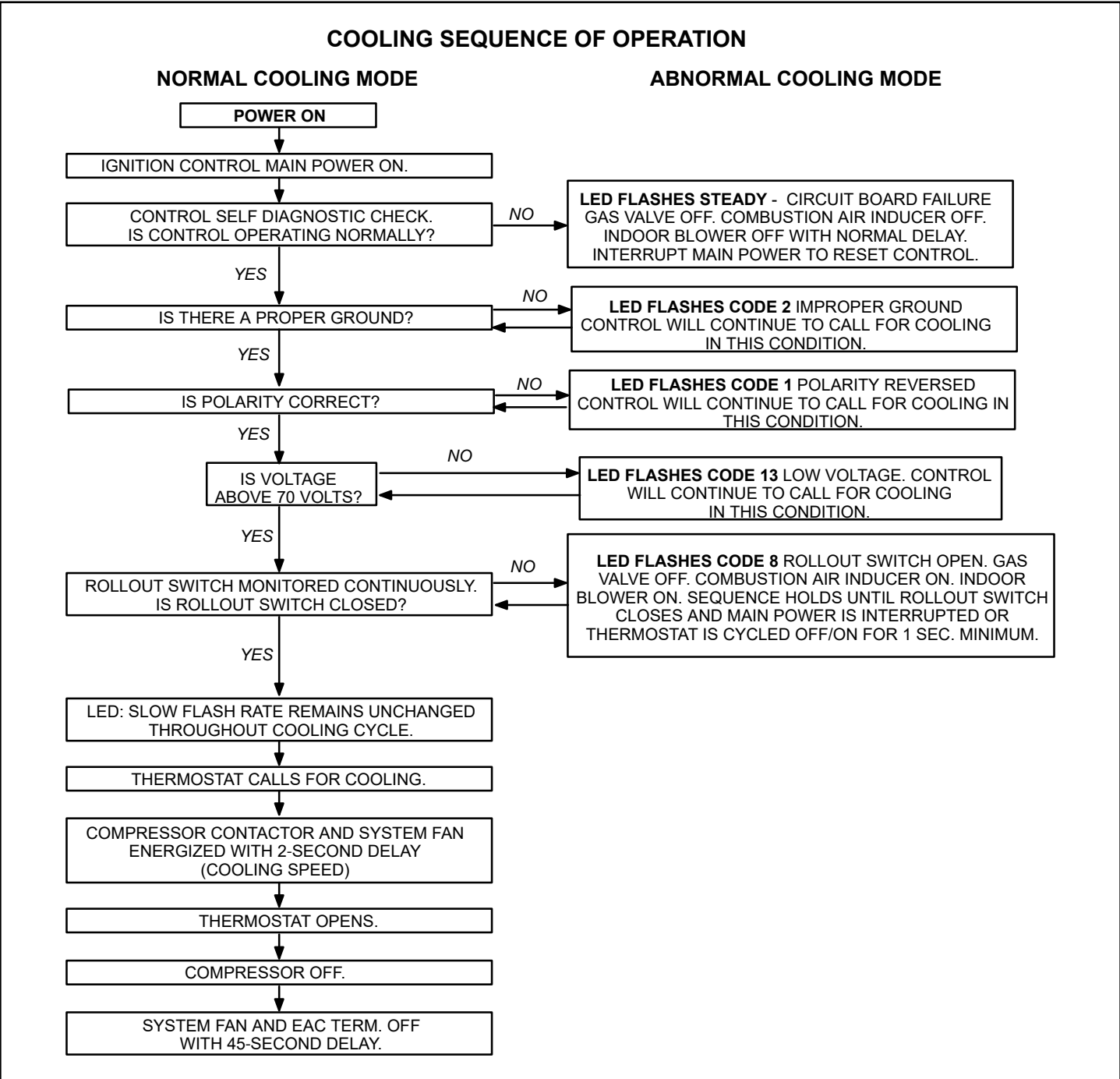
**LED FLASHES CODE 10** 1 HR PRESSURE SWITCH WATCHGUARD MODE

GAS VALVE DE-ENERGIZED. COMBUSTION AIR INDUCER ON. INDOOR BLOWER OFF WITH DELAY HAS CAI SWITCH CLOSED IN 2.5 MINUTES?

YES

5-MINUTE PRESSURE SWITCH WATCHGUARD MODE.

**Troubleshooting: Cooling Sequence of Operation**



## Troubleshooting: Continuous Fan / Accessories Sequence of Operation

### CONTINUOUS FAN / ACCESSORIES SEQUENCE OF OPERATION

