



GE APPLIANCES
a Haier company

Service Manual

NF80US

80% Upflow/Horizontal Single
Stage Constant Torque Gas
Furnace



**READ CAREFULLY.
KEEP THESE INSTRUCTIONS.**

SERVICE MANUAL

NF80US



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.

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



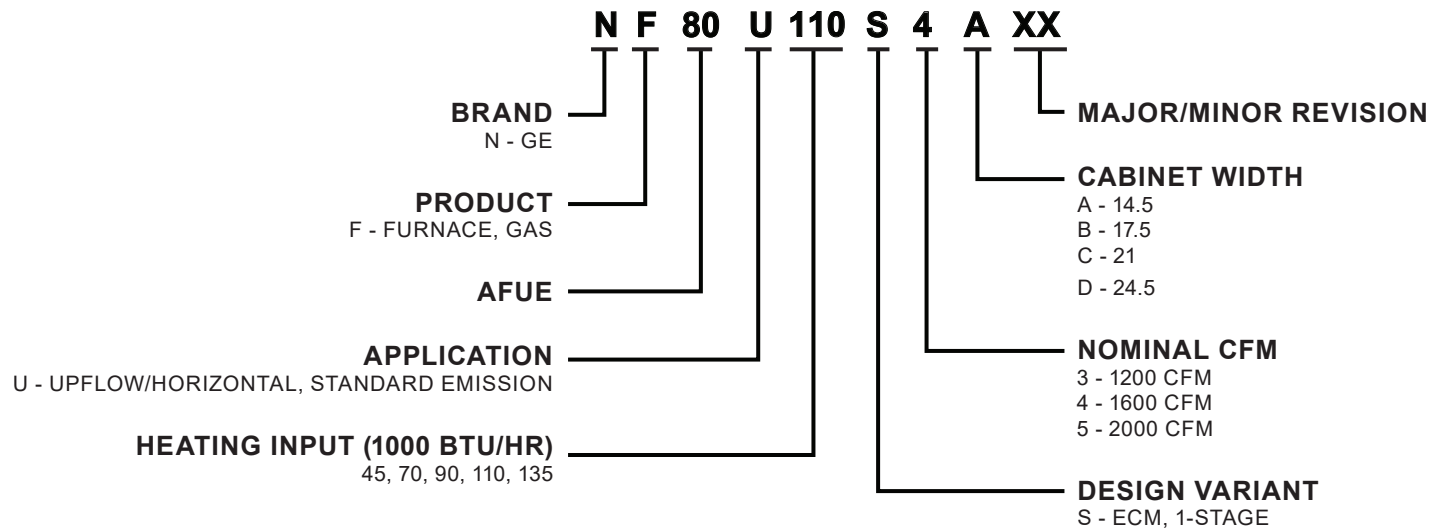
Electric shock hazard.
Can cause injury or death. Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch(es). Unit may have multiple power supplies.

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Technical Specifications

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.)
Upflow / Horizontal	NF80U045S3A	44,000	36,000	80.00%	1-1/2 — 3	1/2	120-60-1	15	6.8	40	111
	NF80U070S3A	66,000	53,000	80.00%	1-1/2 — 3	1/2	120-60-1	15	6.8	40	111
	NF80U070S3B	66,000	53,000	80.00%	1-1/2 — 3	1/2	120-60-1	15	6.8	40	127
	NF80U090S4B	88,000	72,000	80.00%	2-1/2 — 4	1/2	120-60-1	15	8.4	40	142
	NF80U090S5C	88,000	72,000	80.00%	3 — 5	1/2	120-60-1	15	10.9	40	152
	NF80U110S5C	110,000	90,000	80.00%	4 — 5	1/2	120-60-1	15	10.9	40	160
	NF80U135S5D	132,000	107,000	80.00%	4 — 5	1/2	120-60-1	15	10.9	40	178

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

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
Upflow / Horizontal	NF80U045S3A	1/2	10 x 8	15 - 45	High	1320	1290	1265	1230	1190	1165	1130
					Med/High	1080	1055	1010	990	945	915	880
					Med	900	875	825	790	750	705	670
					Med/Low	805	750	710	660	630	570	535
					Low	700	640	595	535	500	435	380
	NF80U070S3A	1/2	10 x 10	40 - 70	High	1400	1365	1335	1310	1285	1250	1220
					Med/High	1170	1145	1105	1075	1040	1010	975
					Med	1090	1055	1015	980	950	905	860
					Med/Low	1050	1025	985	945	905	870	830
					Low	880	845	795	760	705	665	625
	NF80U070S3B	1/2	10 x 10	40 - 70	High	1355	1330	1290	1245	1225	1190	1160
					Med/High	1225	1190	1155	1115	1045	1000	925
					Med	1110	1060	1015	980	920	855	790
					Med/Low	1080	1035	970	930	865	790	735
					Low	885	825	770	695	625	540	445
	NF80U090S4B	3/4	10 x 10	35 - 65	High	1730	1690	1645	1615	1590	1545	N/A
					Med/High	1505	1460	1435	1395	1350	1300	1270
					Med	1380	1345	1310	1265	1210	1175	1140
					Med/Low	1310	1275	1240	1180	1150	1095	1040
					Low	1110	1065	1010	955	915	860	820
	NF80U090S5C	1	11-1/2 x 10	30 - 60	High	2150	2125	2090	2060	2020	1980	1935
					Med/High	1865	1835	1800	1760	1725	1680	1635
					Med	1655	1635	1585	1545	1515	1465	1420
					Med/Low	1490	1450	1405	1370	1320	1265	1225
					Low	1340	1285	1235	1200	1145	1105	1055
	NF80U110S5C	1	11-1/2 x 10	35 - 65	High	2135	2090	2050	2025	2010	1965	1905
					Med/High	1865	1830	1785	1740	1710	1670	1635
					Med	1630	1595	1550	1500	1470	1420	1380
					Med/Low	1470	1440	1385	1340	1305	1255	1215
					Low	1280	1235	1175	1130	1080	1015	975
	NF80U135S5D	1	11 x 11	30 - 60	High	2390	2360	2285	2240	2225	2160	2105
					Med/High	2175	2140	2125	2060	2015	1955	1925
					Med	1935	1895	1850	1815	1785	1755	1715
					Med/Low	1735	1720	1660	1610	1535	1500	1435
					Low	1550	1485	1455	1415	1330	1265	1215

ACCESSORIES

System Accessory	Kit Number	Description
Natural to LP Kit	11K50	Single Stage
	11K45	High Altitude
Return Air Base	68W61	14.5" A Width
	68W62	17.5" B Width
	68W63	21.0" C Width
	68W64	24.5" D Width
Twinning Kit	16W72	Constant Torque Gas Furnace Twinning Kit

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

Parts Arrangement

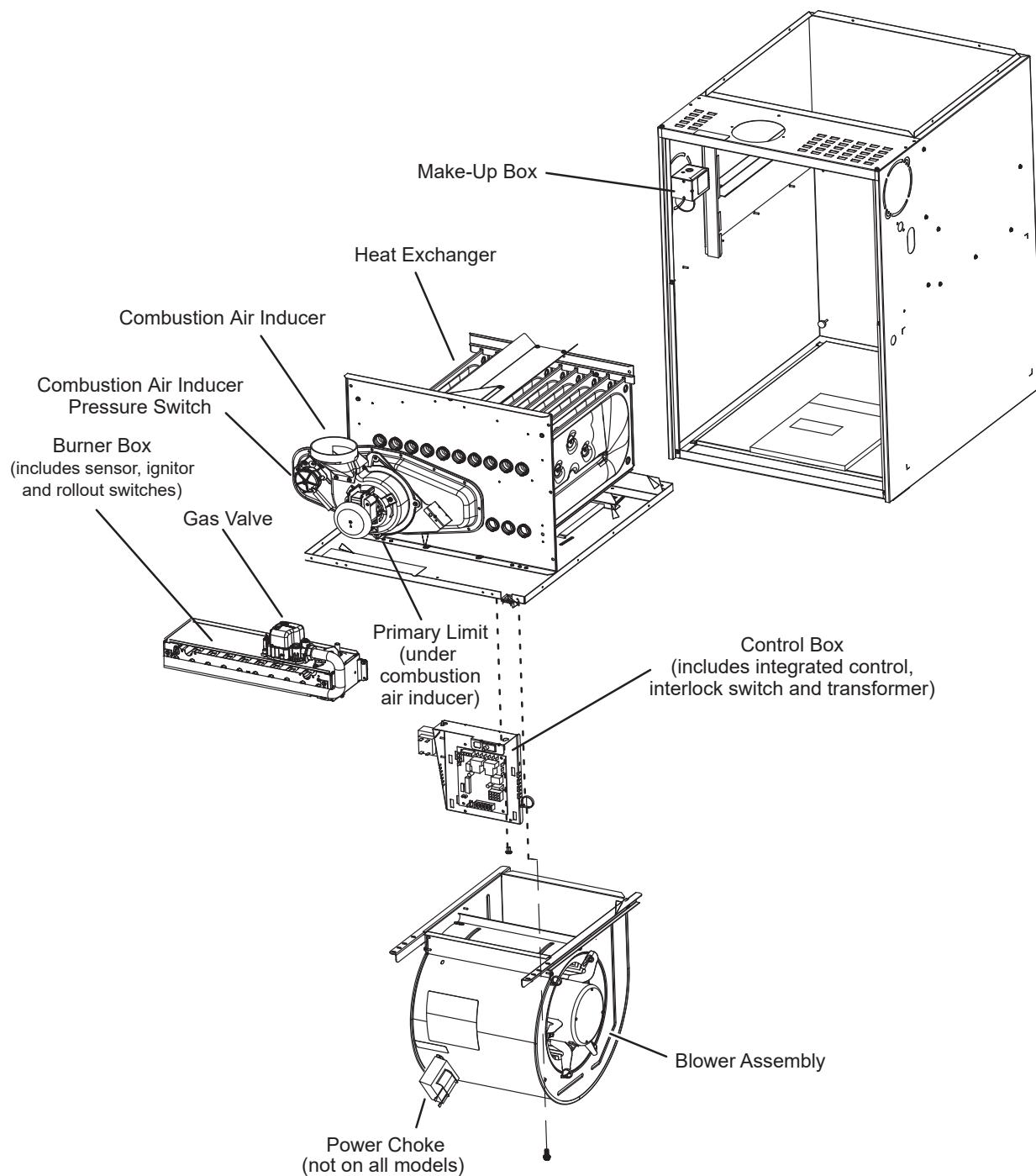


Figure 1.

Unit Components

NF80US 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.

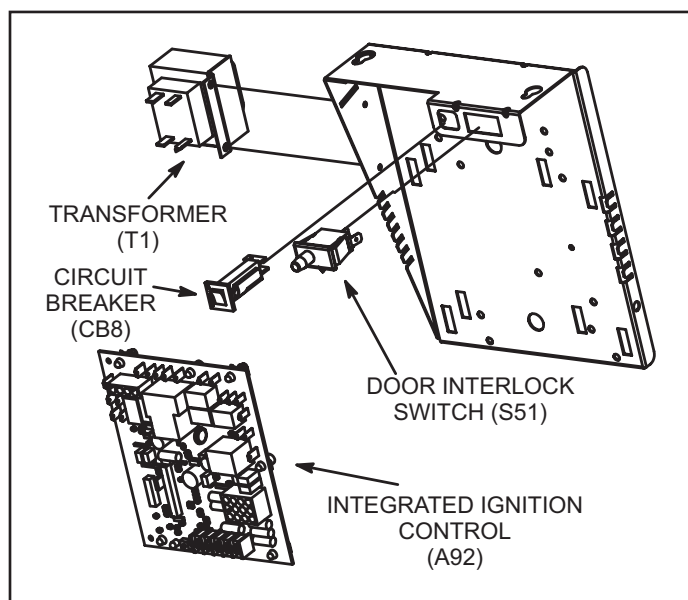


Figure 2. Control Box

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 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

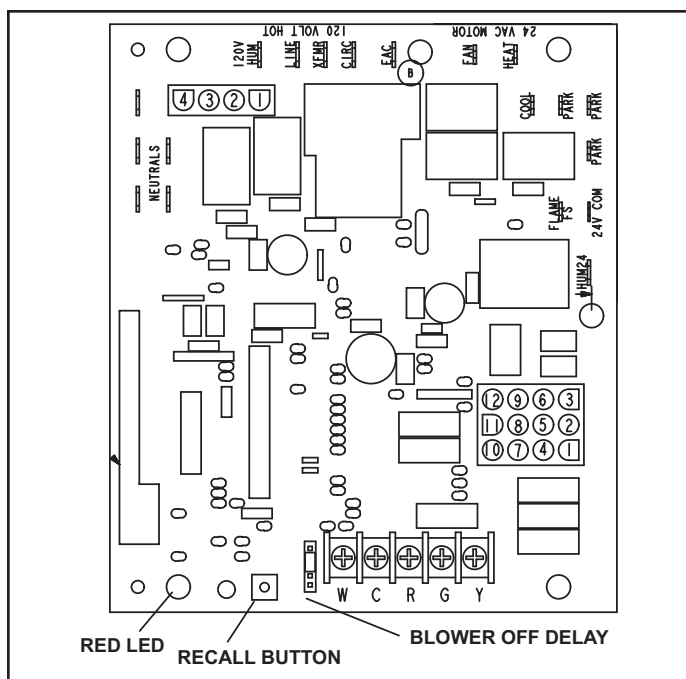
1/4" Quick Connect Terminals	
120HUM	Humidifier 120VAC
LINE	120VAC
XFMR	Transformer 120VAC
CIRC	Indoor Blower 120VAC
EAC	Indoor Air Quality Accessory 120VAC
NEUTRALS	Common 120VAC
HUM24	Humidifier 24VAC
3/16" Quick Connect Terminals	
COOL	Cooling Tap 24VAC
HEAT	Heating Tap 24VAC
FAN	Continuous Blower 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.

Red LED Flash Code ²	Diagnostic Codes / Status of Furnace
Off	No power to control or board fault detected
Heartbeat ¹	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	Soft lockout - burner failed to light, exceeded maximum number of retries or recycles
6	Not Used
7	Primary or Secondary Limit Open or Soft Lockout Mode - Limit Switch Open longer than 3 minutes
8	Rollout Switch Open
9	Pressure Switch failed to close or opened during heat demand
10	Soft lockout - 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
1 A "Heartbeat" is indicated by a "Slow Flash" - 1 sec on 1 sec off, repeating 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 NOTE: 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.	

Table 4. -02 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 Soft Lockout-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 proved 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 Soft Lockout-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

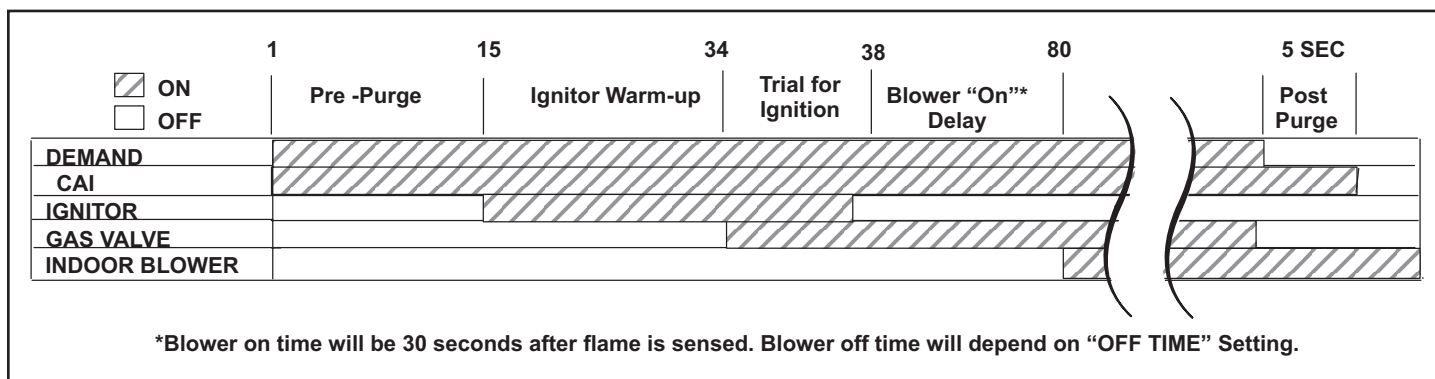
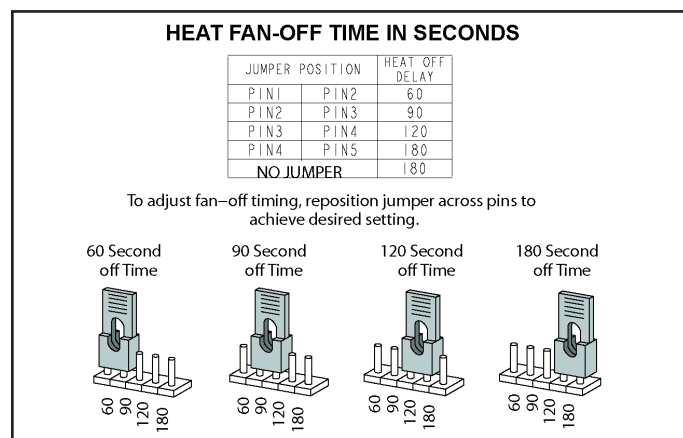
The fan on time of 30 seconds is not adjustable.

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.



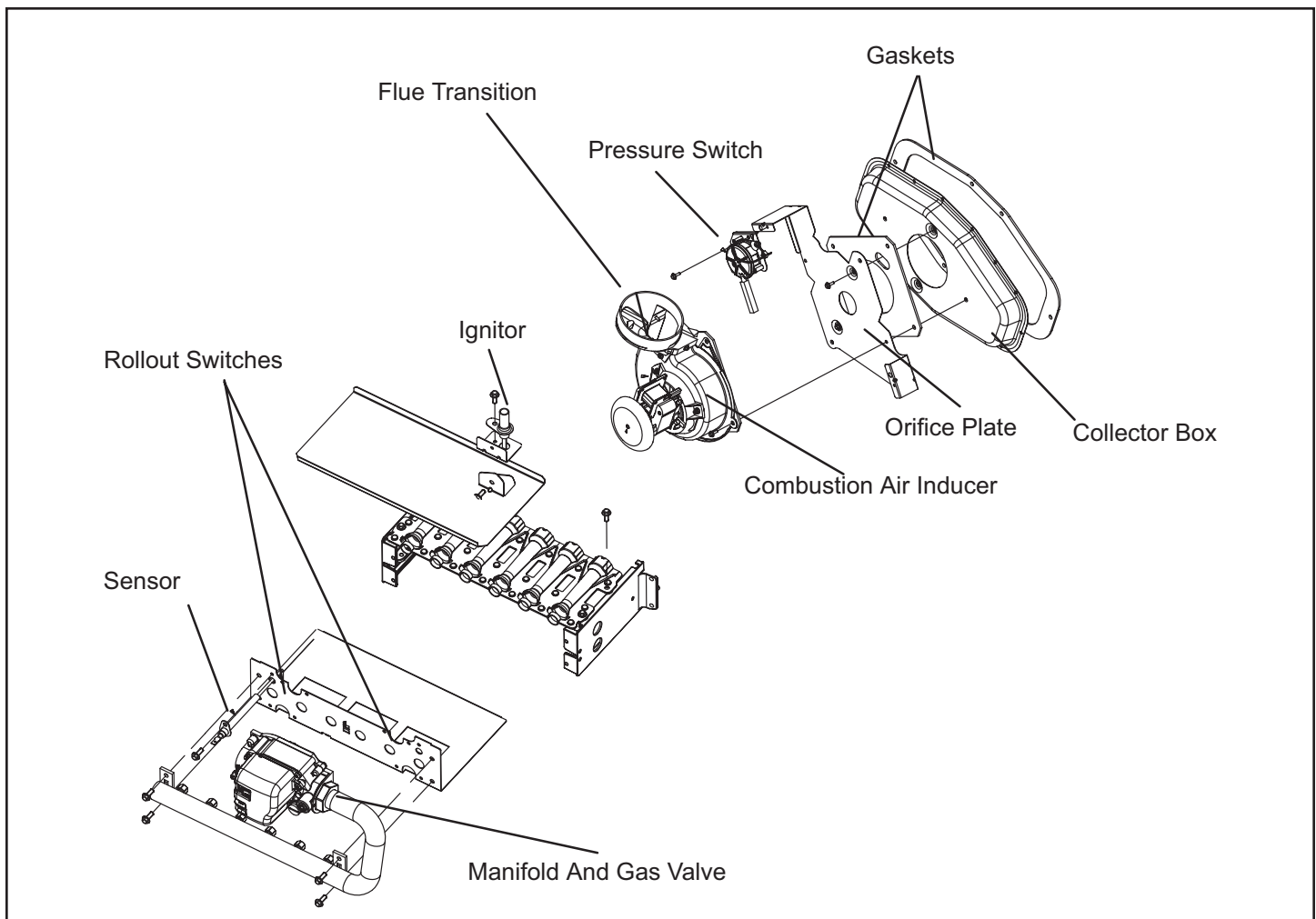


Figure 6. Heating Components

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)

NF80US 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 9 for resistance and voltage checks.

NOTE: The NF80US 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 (Figure 7)

The primary limit on NF80US units is located in the heating vestibule panel under the combustion air inducer. See Figure 7. 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 control will go into soft lockout for one hour. The switch is factory set and cannot be adjusted. The switch may have a different setpoint for each unit model number.

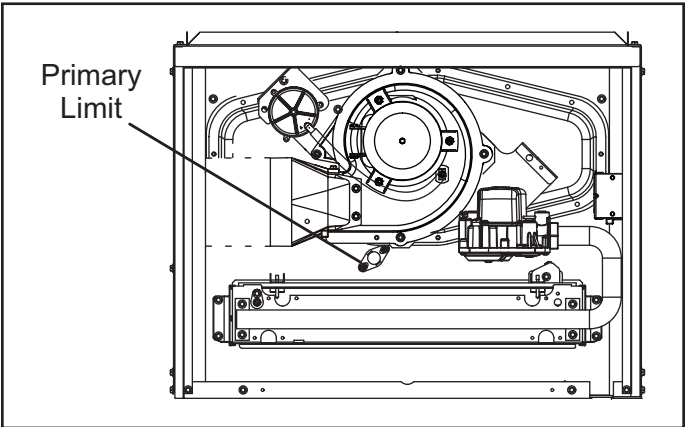


Figure 7. Primary Limit Under Combustion Air Inducer

Gas Valve (Figure 6)

The NF80US 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 GE Appliances. 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 8 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.

Flame Signal in Microamps		
Normal	Low	Drop Out
≥ 1.5	0.5 - 1.4	≤ 0.4

Table 5.

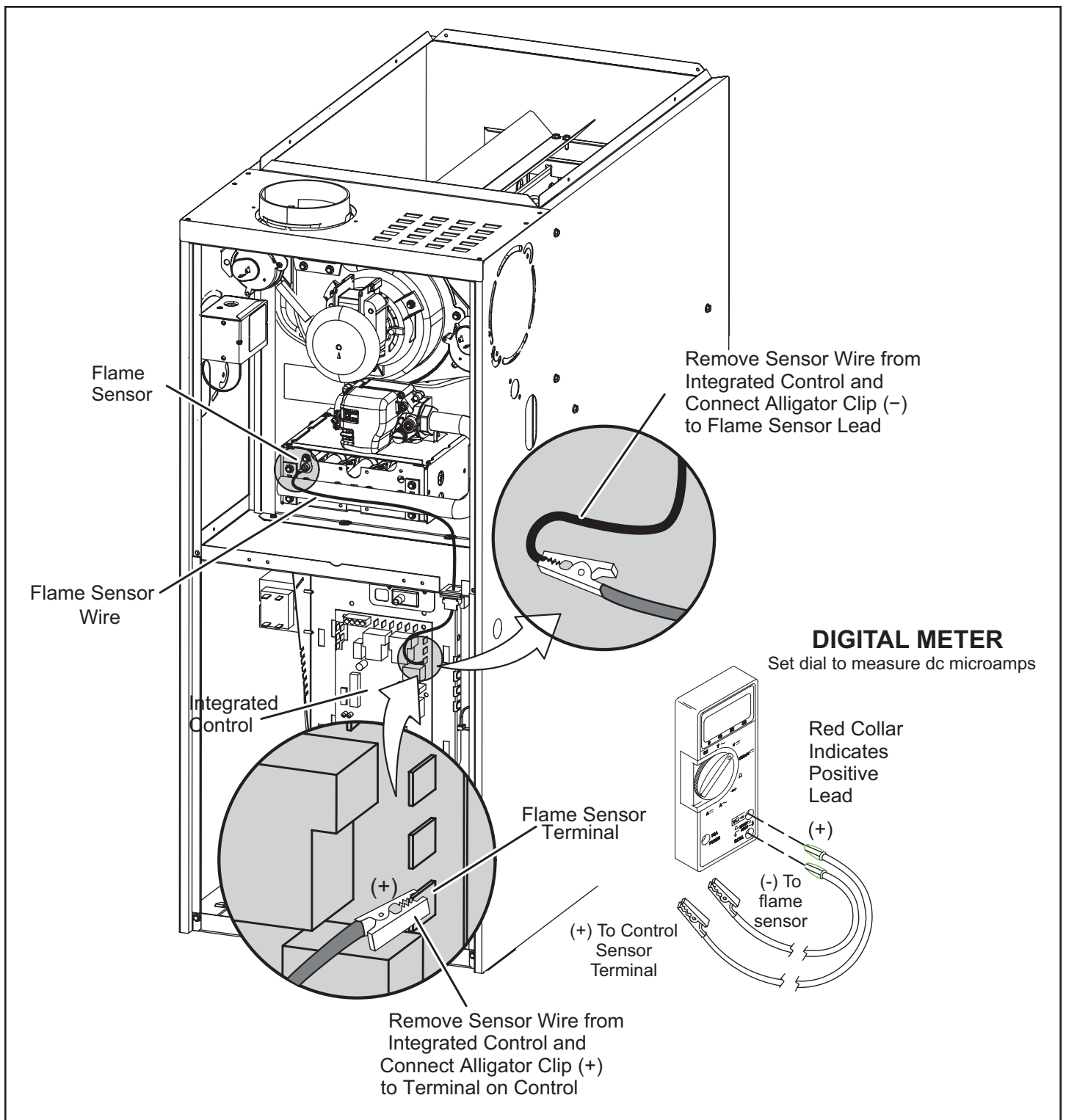


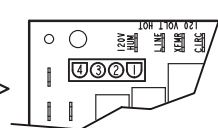
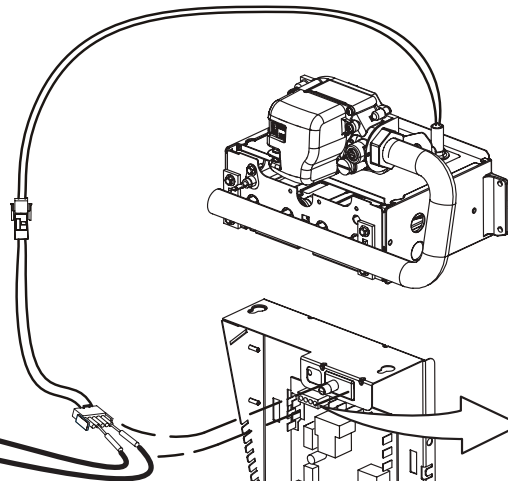
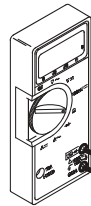
Figure 8. Measuring Flame Signal

Test 1

Check ignitor circuit for correct resistance.

Remove 4-pin plug from control.
Check ohms reading across terminals 2 and 4.
The reading should be between 39 and 70 ohms. If value is correct, this is the only test needed.
If the reading on the meter is not correct, (0 or infinity) then a second test is needed.

Meter
(set to ohms)

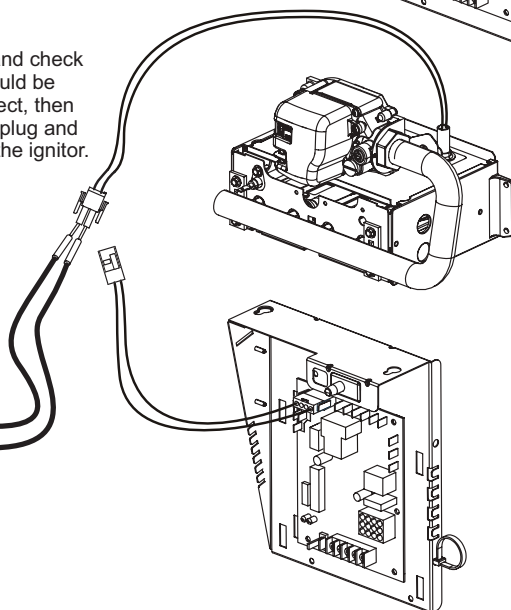
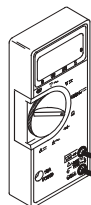


Test 2

Check ignitor for correct resistance.

Separate the 2-pin jack-plug near the manifold and check resistance of ignitor at the plug. Reading should be between 39 and 70 ohms. If the reading is correct, then the problem is with the wiring between the jack-plug and the control. If reading is not correct, the issue is the ignitor.

Meter
(set to ohms)

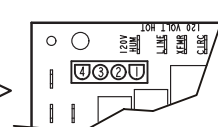
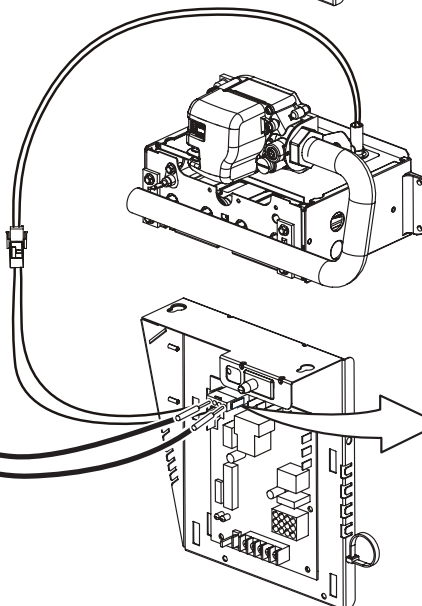
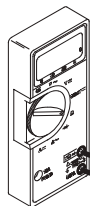


Test 3

Check ignitor for correct voltage

Insert meter probes into terminals 2 and 4 (use small diameter probes in order not to damage plug).
Check voltage during 20 second ignitor warm up period.
Voltage should read 120 volts $\pm$ 10%. If voltage reads below these values, check for correct supply voltage to furnace.

Meter
(set to ohms)



Integrated Control Board
Detail

Figure 9. Check Ignitor

Combustion Air Inducer (B6)

All NF80US 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)

NF80US 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 6. 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 ± 0.05 (in. w.c.)
045	-0.65
070	-0.68
090	-0.65
110	-0.70
135	-0.65

Table 6.

Troubleshooting

See Figure 10 for measuring operating pressure and checking resistance in the pressure switch.

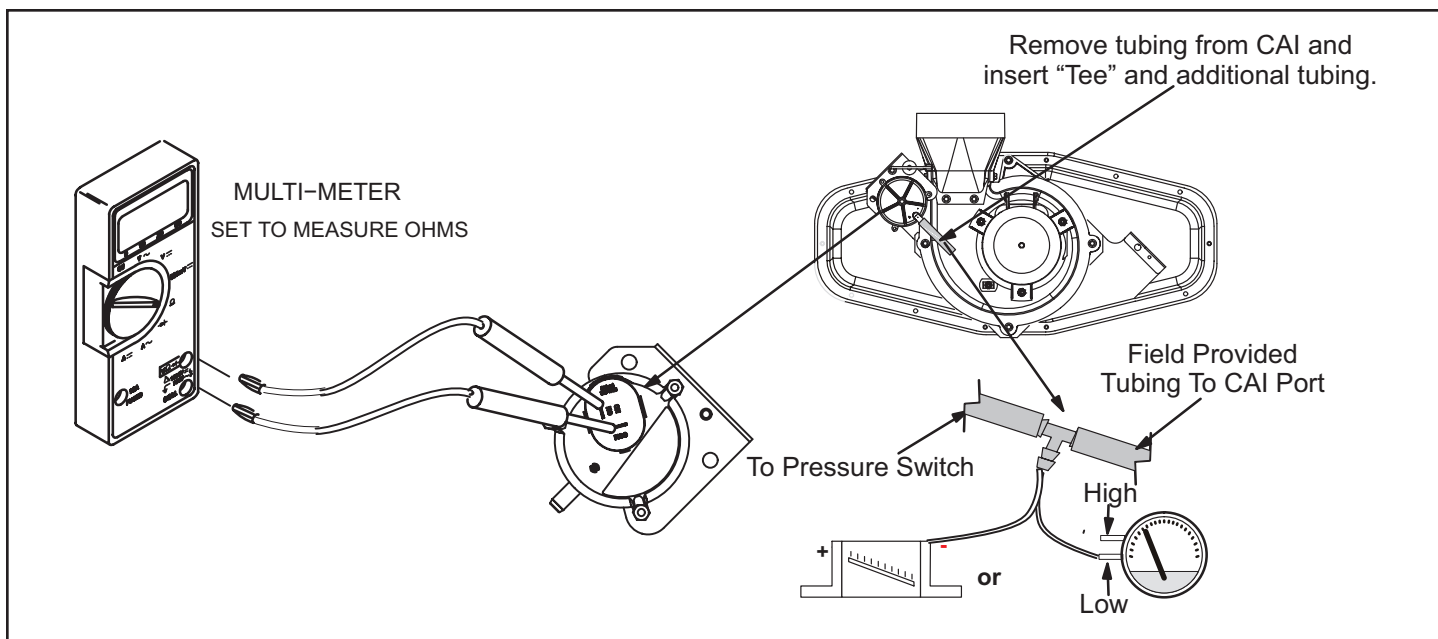


Figure 10.

Multiple Venting

The NF80US furnace can vent in multiple positions. See Figure 11.

The make up box may be removed and the combustion air inducer may be rotated clockwise or counterclockwise 90° to allow for vertical or horizontal vent discharge in a vertical or horizontal cabinet position. Remove the four mounting screws, rotate the assembly (assembly consists of orifice plate, proving switch, gasket and combustion air inducer), then reinstall the mounting screws. See unit Installation Instructions for more detail.

! IMPORTANT

The combustion air pressure switch must be moved for horizontal discharge air left position.

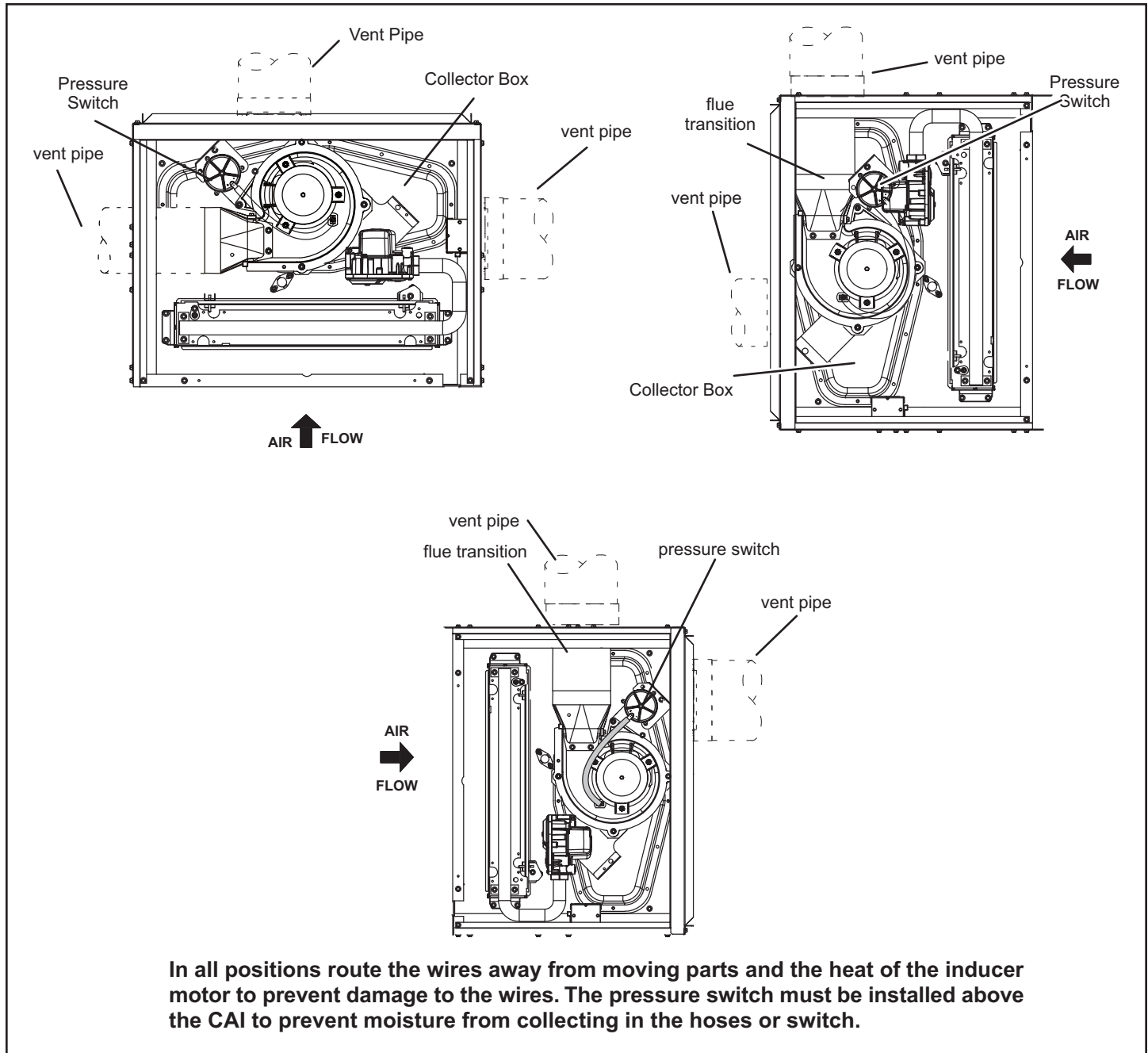


Figure 11.

Blower Compartment

IMPORTANT

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

NF80US 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 14 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 12. When replacing the indoor blower motor the set screw must be aligned and tightened with the motor shaft as shown in Figure 13.

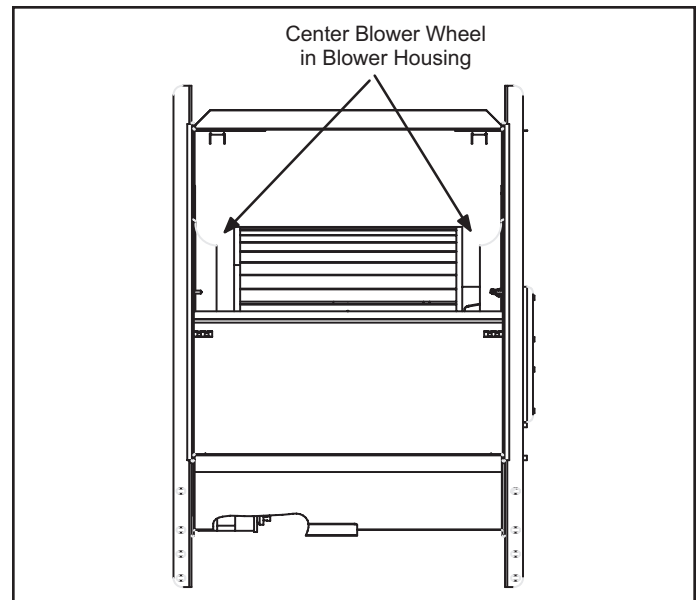


Figure 12. Blower Wheel Replacement

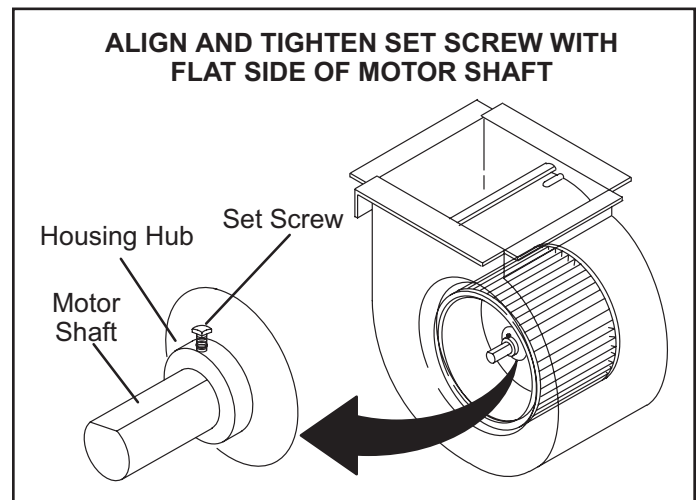
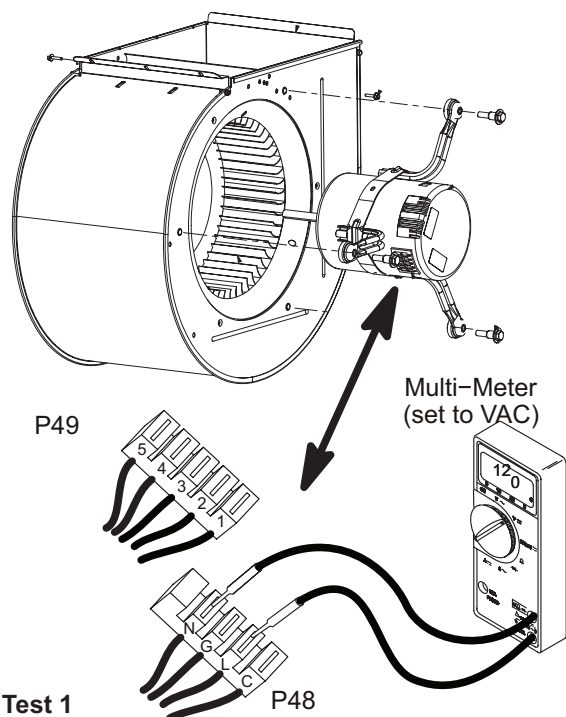
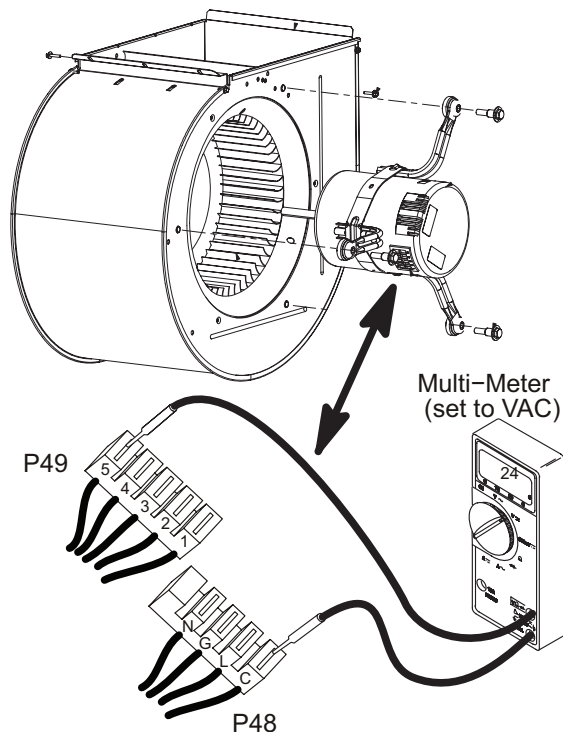


Figure 13.



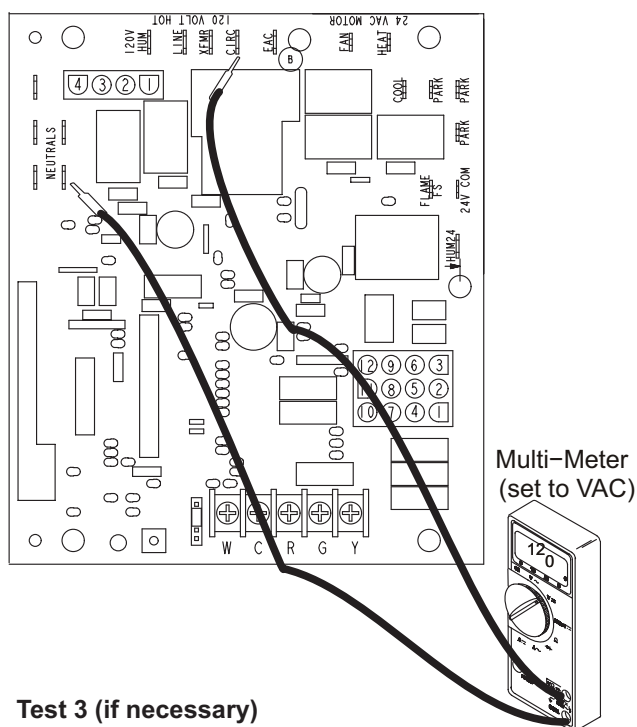
Test 1

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.



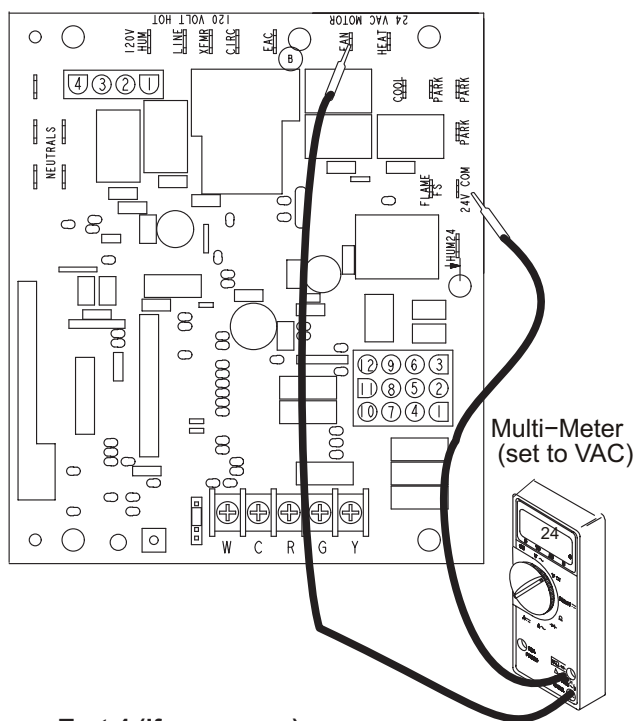
Test 2

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 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 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 14.

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.

NF80US units are equipped with a hot surface ignition system. Do not attempt to light manually.

Gas Valve Operation (Figure 15)

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 15.
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 15.

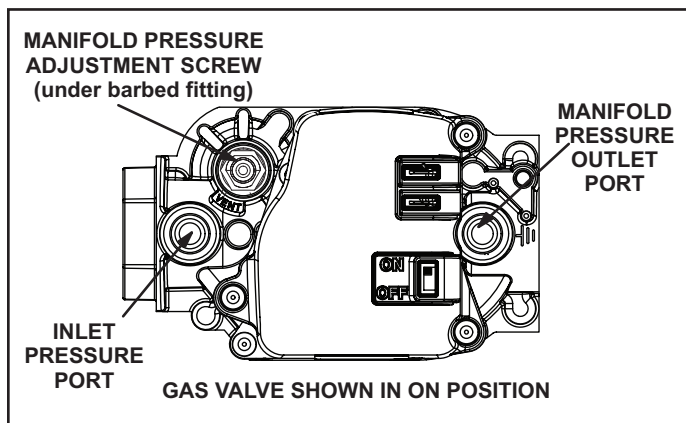


Figure 15. Gas Valve

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 15.
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 NF80US 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 16. 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.

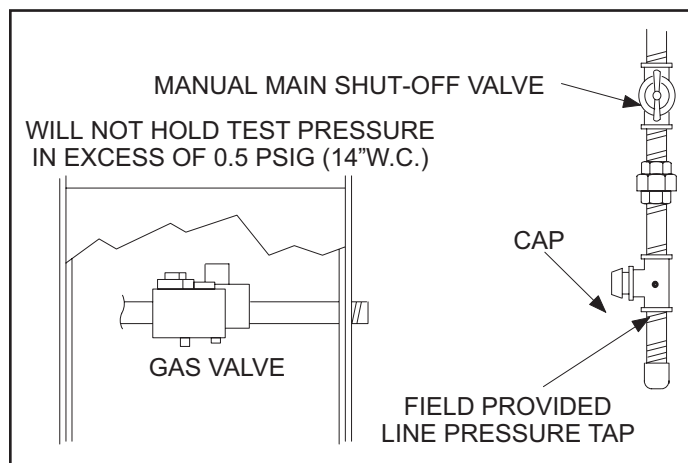


Figure 16. Gas Piping Test Procedure

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 7. If manifold pressure matches Table 9 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
-135	27	54	68	136
Natural-1000 btu/cu ft LP-2500 btu/cu ft				

Table 7. 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 9.

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 9.

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 minimum 15 minutes with correct manifold pressure and gas flow rate before checking combustion. Take combustion sample beyond the flue outlet and compare to Table 8.

Capacity	CO ₂ % for Nat	CO ₂ % for L.P.
All	7.2 - 7.8	7.5 - 9.0
The maximum carbon monoxide reading should not exceed 100 ppm.		

Table 8.

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 9 for manifold pressure and Table 10 for pressure switch change and gas conversion kits.

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.

Capacity	Gas	Manifold Pressure in. w.g.				Supply Line Pressure in. w.g.	
		0-2,000 ft.	2,001-4,500 ft.	4,501-7,500 ft.	7,501-10,000 ft.	Min.	Max
045	Natural	3.5	3.2	3.0	3.5	4.5	13.0
	LP / Propane	10.5	10.0	10.0	10.0	11.0	
070	Natural	3.5	3.2	2.8	3.5	4.5	
	LP / Propane	10.0	10.0	10.0	10.0	11.0	
090	Natural	3.5	3.2	2.7	3.5	4.5	
	LP / Propane	10.0	10.0	9.6	10.0	11.0	
110	Natural	3.5	3.5	3.0	3.5	4.5	
	LP / Propane	10.0	10.0	9.6	10.0	11.0	
135	Natural	3.5	3.5	2.9	3.5	4.5	
	LP / Propane	10.0	10.0	9.6	10.0	11.0	
NOTE: A natural to LP propane gas changeover kit is necessary to convert this unit. Refer to the changeover kit installation instruction for the conversion procedure.							

Table 9. Manifold and Supply Line Pressure 0-10,000 ft.

Capacity	0-4,600 ft		4,601 - 7,600 ft		7,601 - 10,000 ft	
	Pressure ¹ Switch Kit	Natural to LP/ Propane Orifice Kit	Pressure ¹ Switch Kit	Natural to LP/ Propane Orifice Kit	Pressure ¹ Switch Kit	LP/Propane to Natural Orifice Kit
045	As Shipped (-0.65" w.c.)	11K50 ² (0.034")	80W52 (-0.60" w.c.)	11K50 ² (0.034")	80W51 (-0.55" w.c.)	11K45 ² (0.032")
070	As Shipped (-0.68" w.c.)					
090	As Shipped (-0.65" w.c.)		80W57 (-0.65" w.c.)		80W52 (-0.60" w.c.)	
110	As Shipped (-0.68" w.c.)					
135	As Shipped (-0.65" w.c.)		80W52 (-0.60" w.c.)		80W51 (-0.55" w.c.)	
1 Minimum allowable set points for this altitude range. Application of a Pressure Switch with lower set point (less negative / closer to zero) is not permitted.						
2 Kit contains burner orifices and gas valve regulator spring(s).						

Table 10. Burner Orifice Conversion Kits at Varying Altitudes

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 17. 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 17. 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.

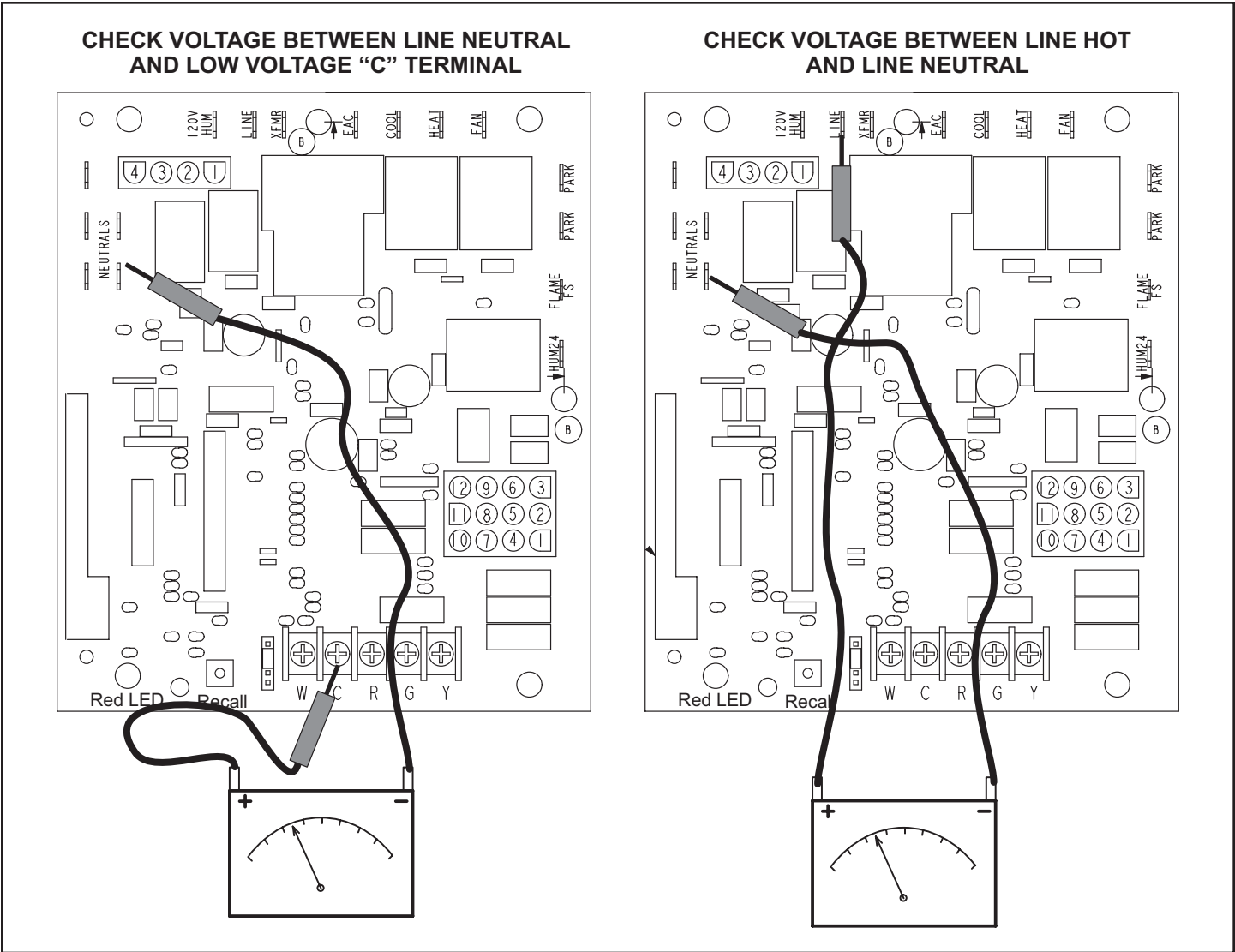


Figure 17.

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 18)

Temperature rise for NF80US 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.

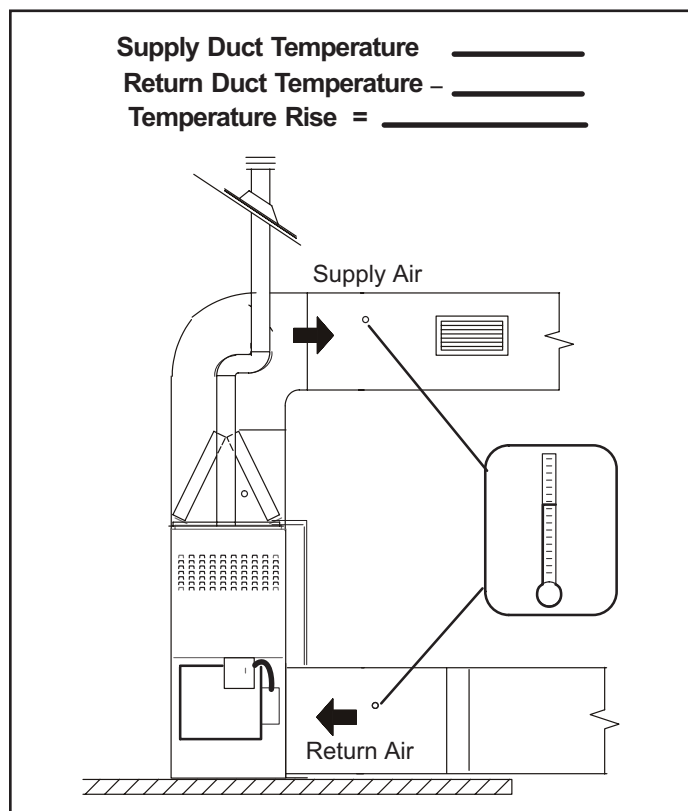


Figure 18. Temperature Rise

External Static Pressure

1. Tap locations shown in Figure 19.
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.

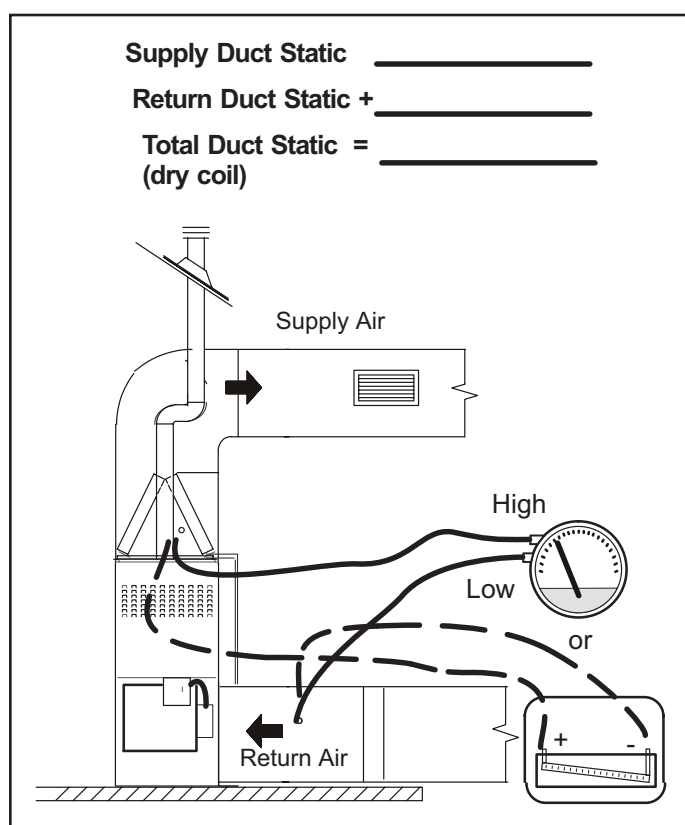


Figure 19. External Static Pressure

Blower Speed Taps

Blower speed tap changes are made on the integrated control. See Figure 3. 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 GE Appliances 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	
	Side Return	Bottom Return
A - 14-1/2	16 x 25 x 1 (1)	14 x 25 x 1
B - 17-1/2"		16 x 25 x 1 (1)
C - 21"		20 x 25 x 1 (1)
D - 24-1/2"	16 x 25 x 1 (2)	24 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
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.
2. Verify that system total static pressure and airflow settings are within specific operating parameters.

3. 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.

1. Turn off both electrical and gas power supplies to furnace.
2. Remove flue pipe and top cap (some applications top cap can remain) from the unit.
3. Label the wires from gas valve, rollout switches, primary limit switch and make-up box then disconnect them.
4. 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.
5. 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.
6. Disconnect gas supply piping. Remove the four screws securing the burner manifold assembly to the vestibule panel and remove the assembly from the unit.
7. Remove screws from both sides, top and bottom of vestibule panel.
8. 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 20.
9. Backwash using steam. Begin from the burner opening on each clam. Steam must not exceed 275°F.
10. 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 21 shows burner detail.
11. 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.
12. Reinstall heat exchanger in vestibule. (Replace the five screws in the cabinet from step 10 if removed).
13. Reinstall collector box and combustion air assembly. 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.
14. Reinstall burner box and manifold assembly.
15. Reconnect all wires.
16. Reconnect top cap and vent pipe to combustion air inducer outlet.
17. Reconnect gas supply piping.
18. Turn on power and gas supply to unit.
19. Set thermostat and check for proper operation.
20. Check all piping connections, factory and field, for gas leaks. Use a leak detecting solution or other preferred means.
21. Repeat step 20 until no leaks are detected.
22. 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.

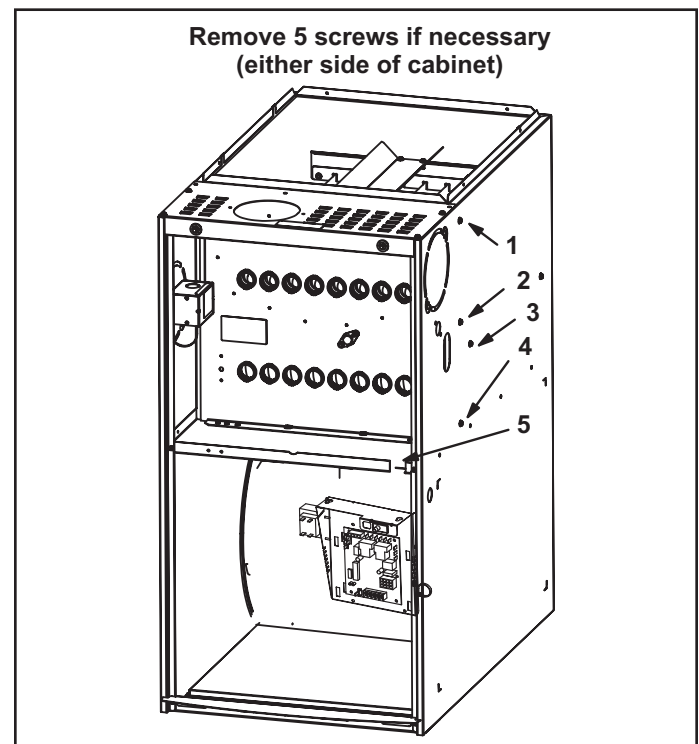


Figure 20.

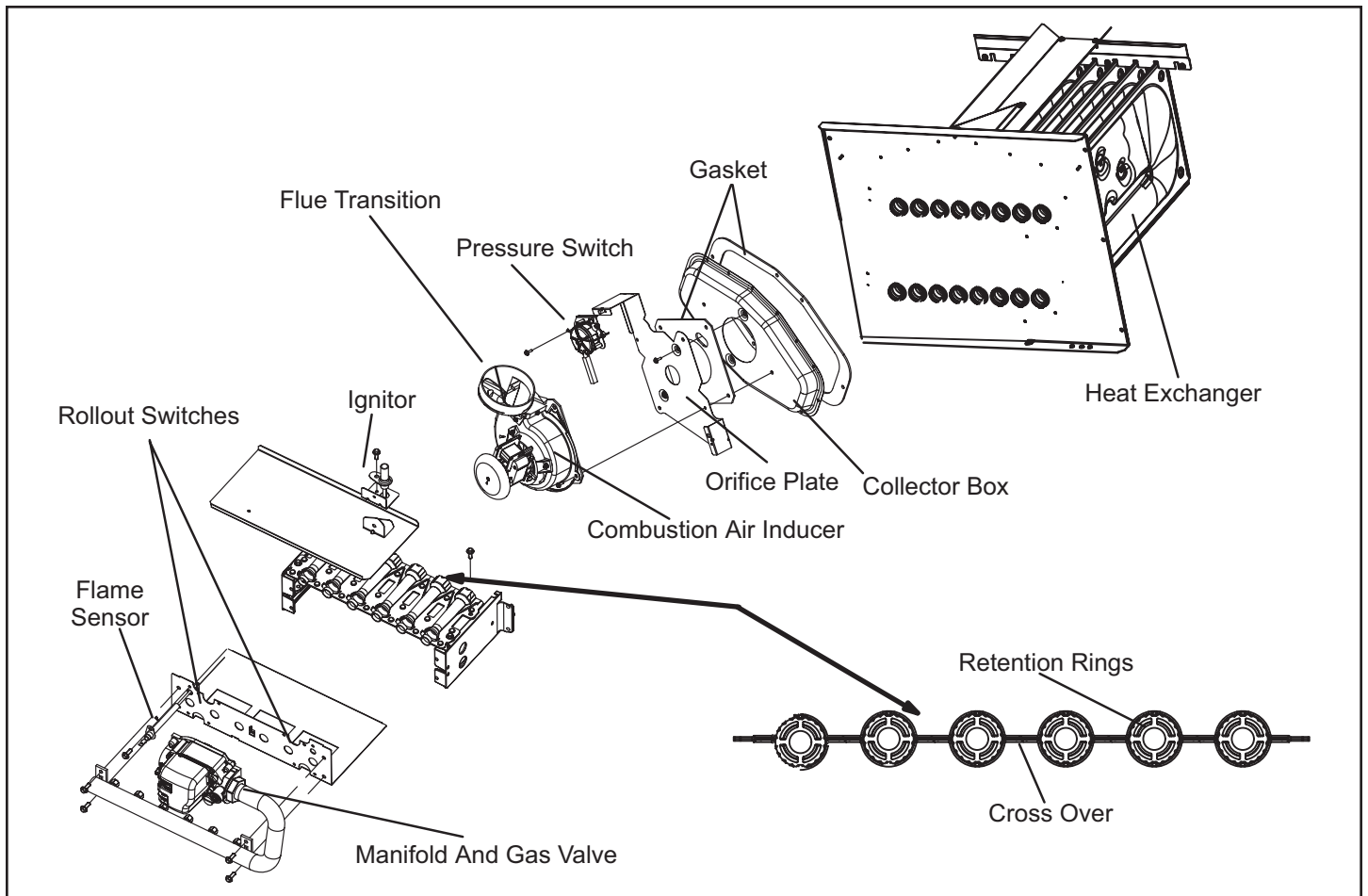


Figure 21. Burner, Combustion Air Inducer Assembly & Heat Exchanger Removal

Wiring Diagram

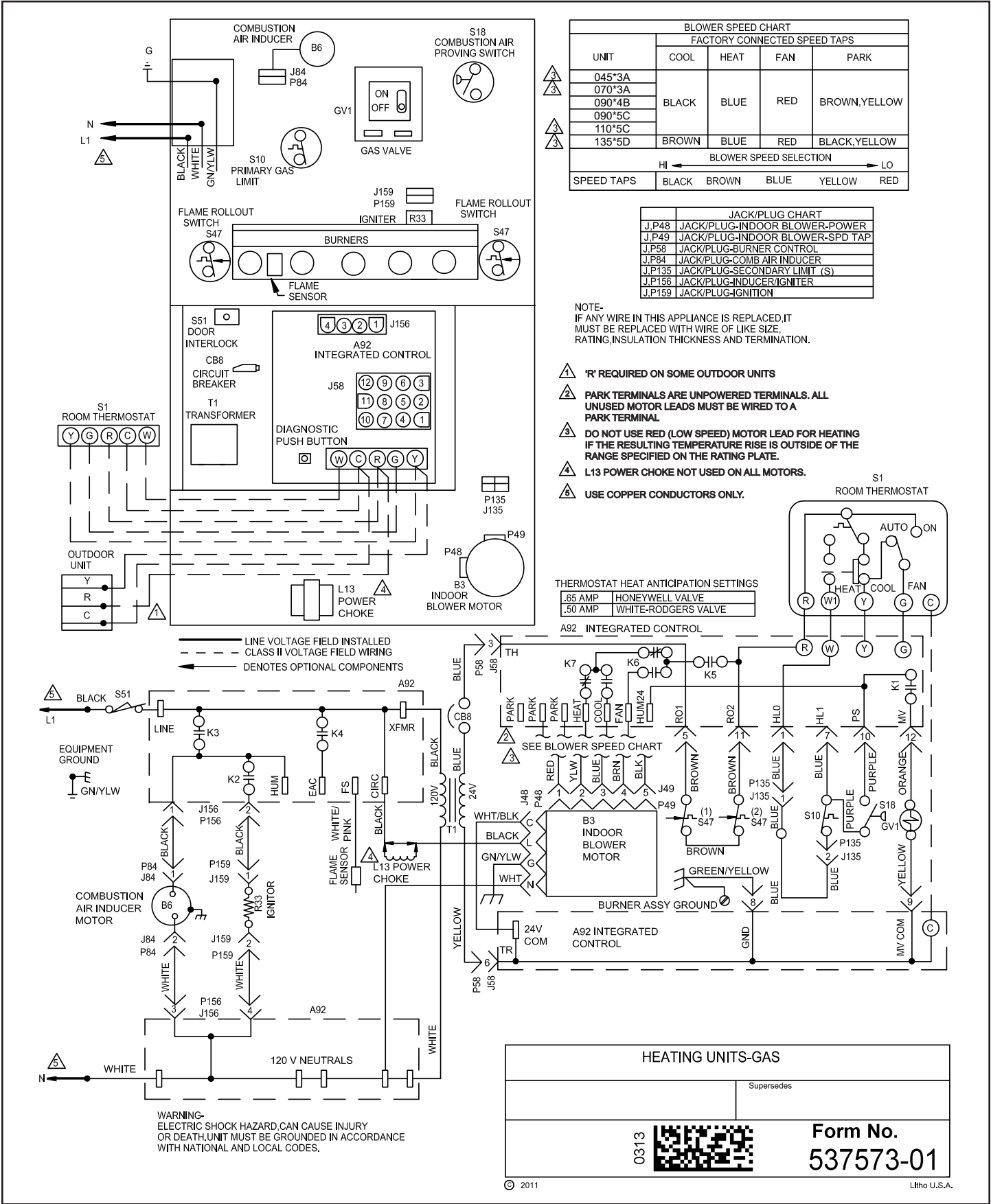
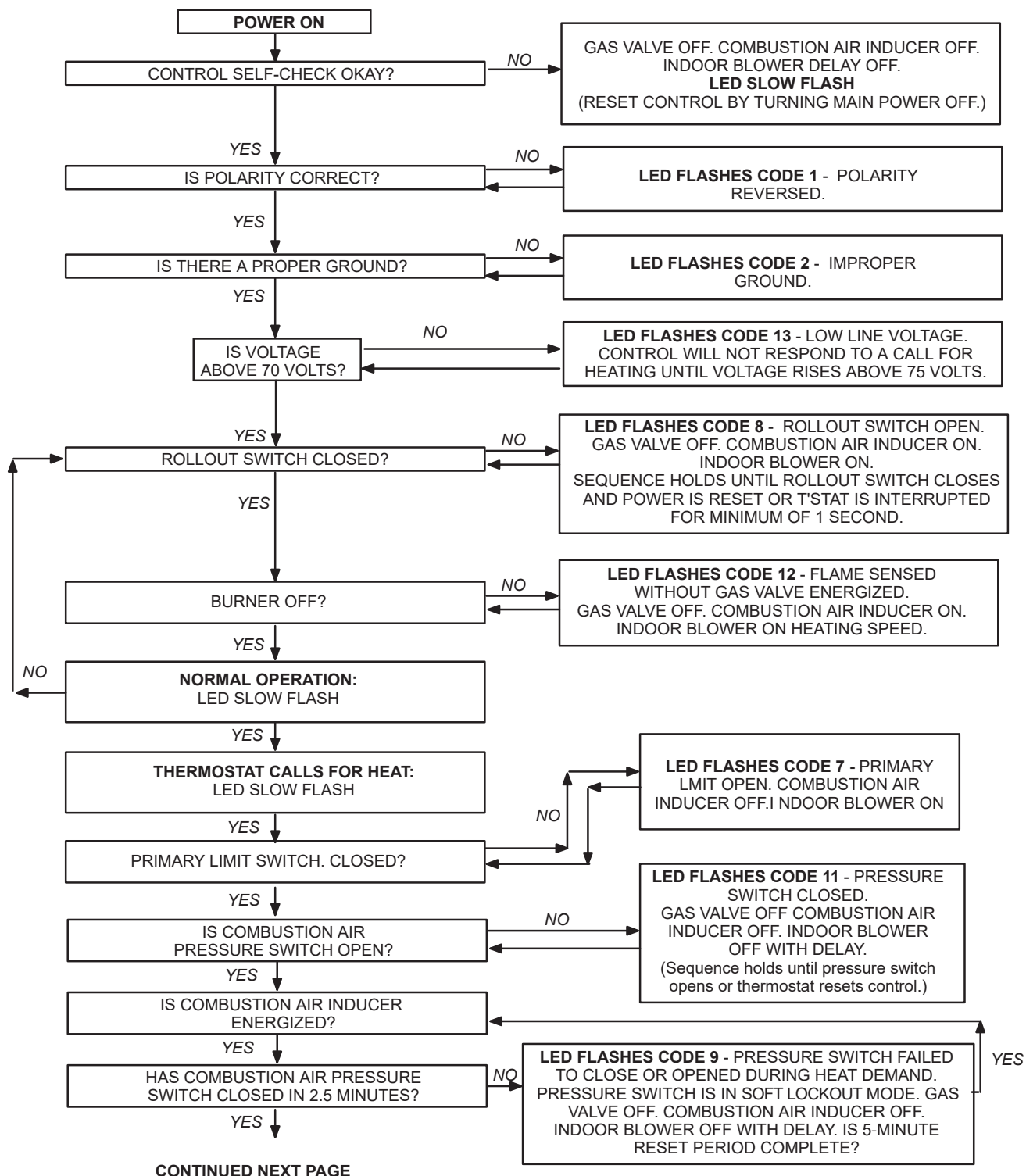


Figure 22. Wiring Diagram

HEATING SEQUENCE OF OPERATION

NORMAL HEATING MODE

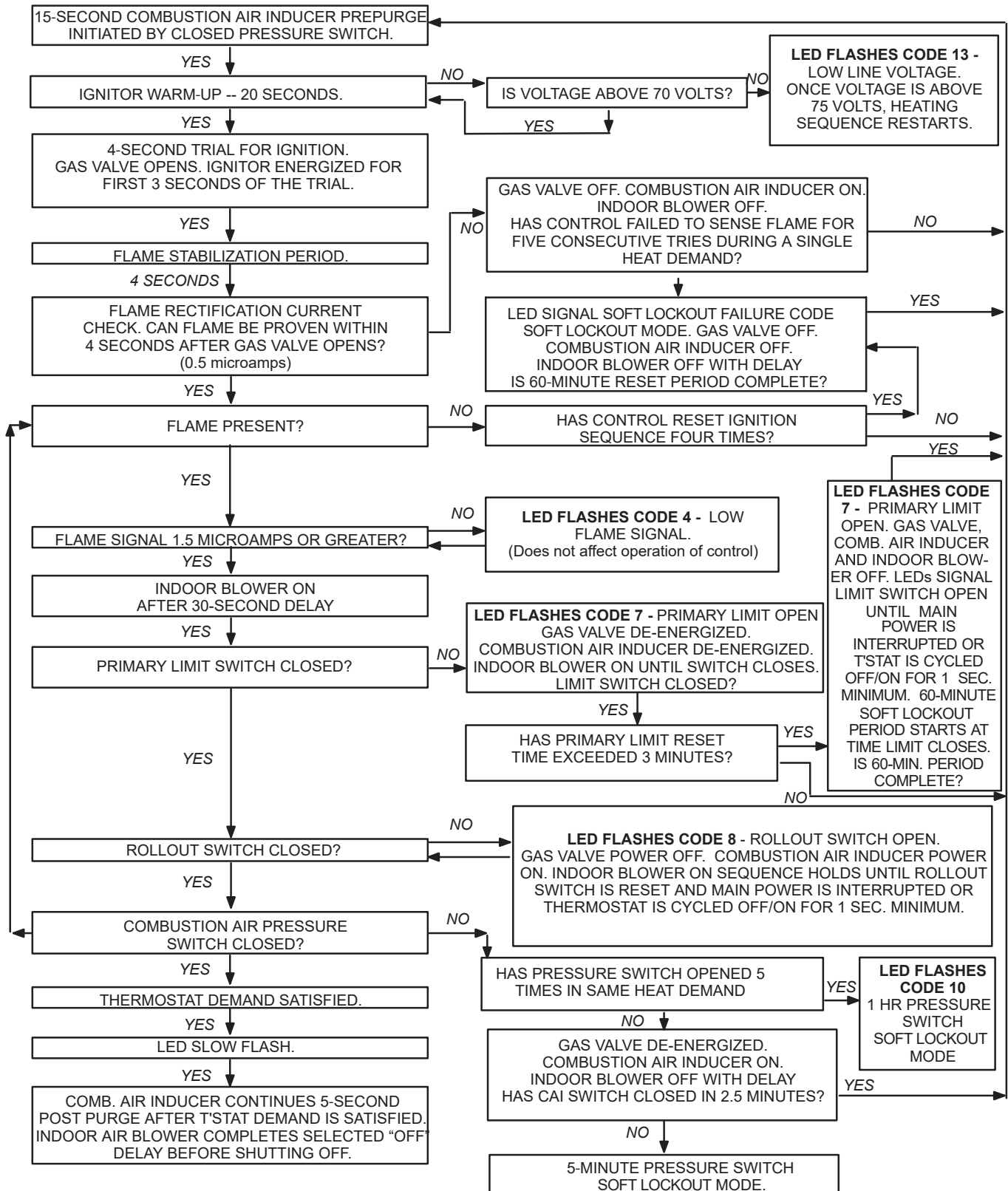
ABNORMAL HEATING MODE



HEATING SEQUENCE CONTINUED

NORMAL HEATING MODE

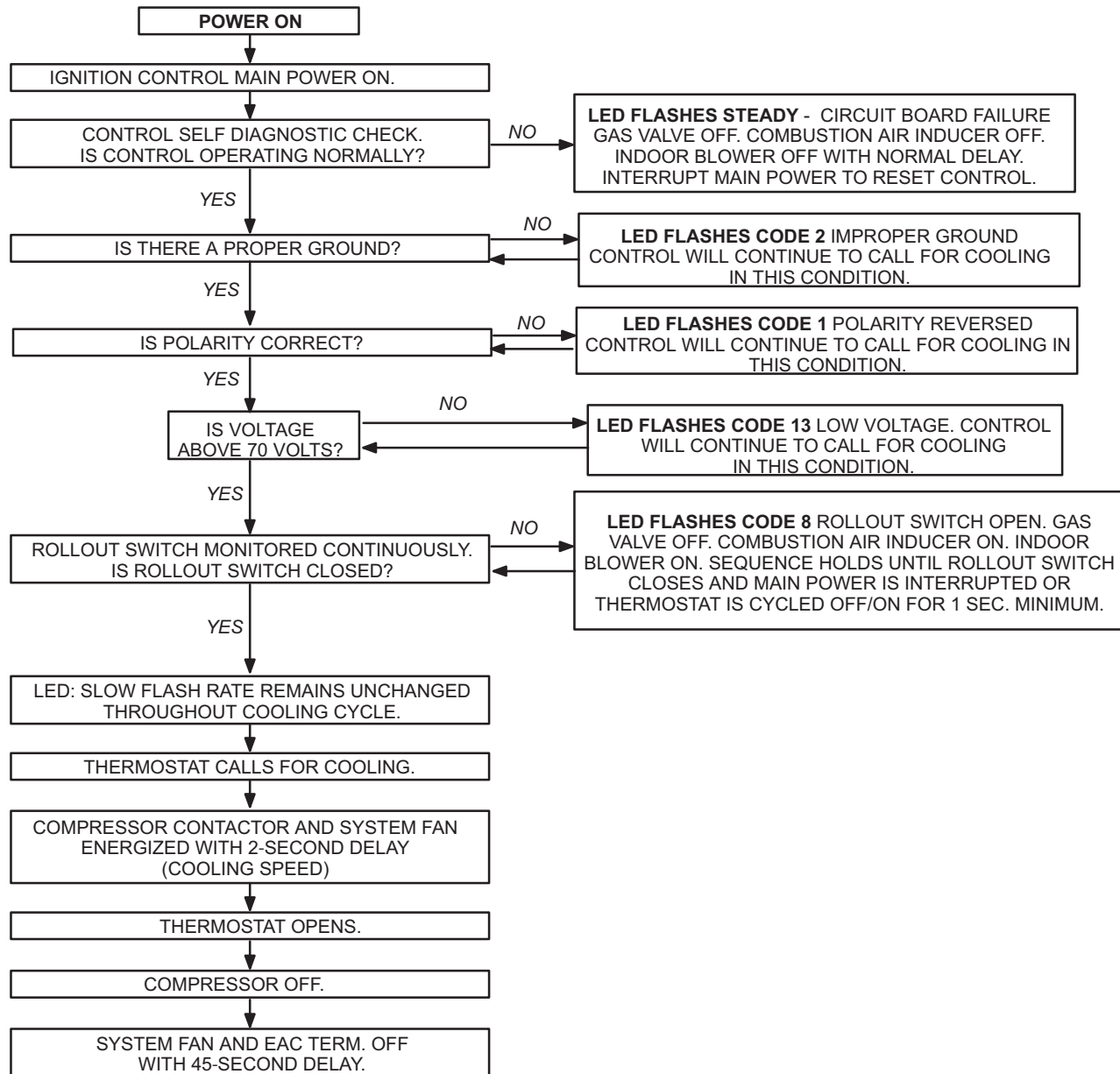
ABNORMAL HEATING MODE



COOLING SEQUENCE OF OPERATION

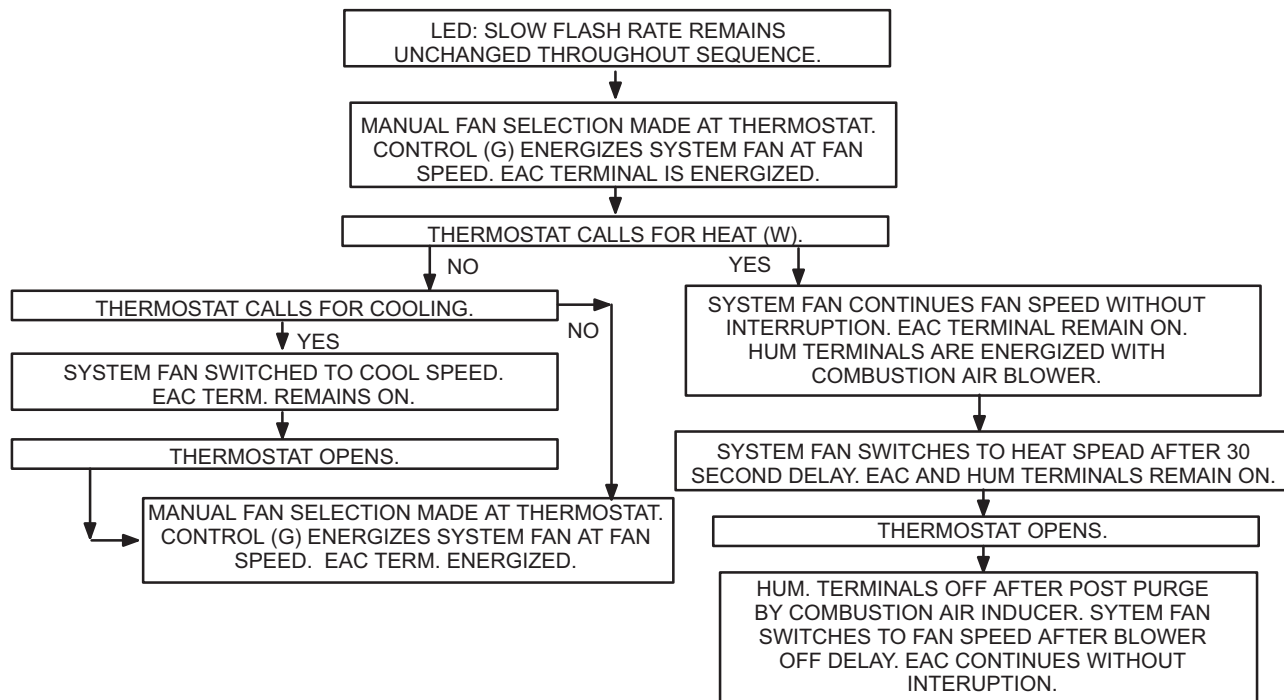
NORMAL COOLING MODE

ABNORMAL COOLING MODE



Troubleshooting: Continuous Fan / Accessories Sequence of Operation

CONTINUOUS FAN / ACCESSORIES SEQUENCE OF OPERATION





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