GE APPLIANCES

Service Manual

NF80D***T**R

80% Downflow Two-Stage
Constant Torque Gas Furnaces

Contact GE Appliances at:

Homeowner: **GEAppliances.com**
HVAC Pro: **GEAppliancesAirandWater.com**
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READ CAREFULLY.
KEEP THESE INSTRUCTIONS.

31-5001002 Rev. 0 09-25

General Information

NF80D*T**R** series units are 80% efficiency gas furnaces used for downflow applications only, manufactured with GE Appliances heat exchangers formed of aluminized steel. Units are available in heating inputs of 66,000 to 88,000 Btuh and cooling applications up to 4 tons.

Units are factory equipped for use with natural gas. Kits are available for conversion to LPG operation. **NF80D***T**R** model units are equipped with the integrated control. All units use a redundant gas valve to assure safety shut-off as required by CSA.

All specifications in this manual are subject to change. Procedures outlined in this manual are presented as a recommendation only and do not supersede or replace local or state codes. In the absence of local or state codes, the guidelines and procedures outlined in this manual (except where noted) are recommendations only and do not constitute code.

⚠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.
- 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.

⚠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.

Technical Specifications

Specifications

Model			-070	-090
Gas Heating Performance		[1] AFUE	80%	80%
	High Fire	Input - Btuh	66,000	88,000
		Output - Btuh	52,000	69,000
		Temperature rise range - °F	30 - 60	35 - 65
		Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0
	Low Fire	Input - Btuh		
		Output - Btuh		
		Temperature rise range - °F		
		Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane		
High static - in. w.g.		Heating	0.5	0.5
		Cooling	0.5	0.5
Connections		Flue connection - in. round	4	4
		Gas pipe size IPS	1/2	3/4
Indoor Blower		Wheel diameter x width - in.	10 x 8	10 x 10
		Motor output - hp	1/2	3/4
		Tons of add-on cooling	1.5 - 3.5	3 - 4
		Air Volume Range - cfm	400 - 1475	780 - 1700
Electrical Data		Voltage	120 volts - 60 hertz - 1 phase	
		Blower motor full load amps	6.1	8.2
		Maximum overcurrent protection	15	15
Shipping Data - lbs.		lbs. - 1 package	123	142

NOTE - Filters and provisions for mounting are not furnished and must be field provided.
[1] Annual Fuel Utilization Efficiency based on DOE test procedures and according to FTC labeling regulations. Isolated combustion system rating for non-weatherized furnaces.

Optional Accessories - Order Separately

	"A" Width Models	"B" Width Models
Cabinet		
Downflow Combustible Flooring Base	11M59	11M60
Controls		
Remote Outdoor Temperature Sensor	X2658	X2658
Transformer (75VA)	27J32	27J32
Refrigerant Detection Sensor		
Refrigerant Detection System (RDS) Coil Sensor Kit (for indoor coil)	27V53	

Blower Data

NF80D070T3AR PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1426	343	1298	265	1158	194	933	114	788	76
0.20	1406	353	1275	273	1132	201	904	119	751	81
0.30	1362	359	1251	282	1102	209	872	126	701	87
0.40	1347	366	1222	291	1076	216	814	132	673	91
0.50	1321	375	1193	300	1040	224	795	138	612	97
0.60	1295	384	1169	307	1013	231	756	143	531	103
0.70	1263	395	1142	315	983	239	715	149	492	107
0.80	1243	401	1117	323	942	248	660	155	439	111
0.90	1218	411	1088	331	909	255	619	161	397	116
1.00	1189	421	1055	341	897	258	582	165	333	121

NF80D090T4BR PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1734	421	1525	293	1405	237	1323	203	1198	158
0.20	1709	430	1498	302	1375	245	1288	209	1167	164
0.30	1669	444	1455	314	1344	253	1247	218	1116	172
0.40	1639	454	1428	323	1295	265	1218	224	1076	181
0.50	1608	464	1366	333	1267	271	1166	236	1031	188
0.60	1576	476	1349	340	1217	283	1133	243	995	195
0.70	1545	485	1316	350	1189	289	1095	250	936	204
0.80	1520	494	1282	359	1157	296	1044	260	923	208
0.90	1486	504	1256	366	1109	307	1017	265	843	216
1.00	1482	509	1223	374	1091	311	984	272	797	221

Service Information

PARTS IDENTIFICATION

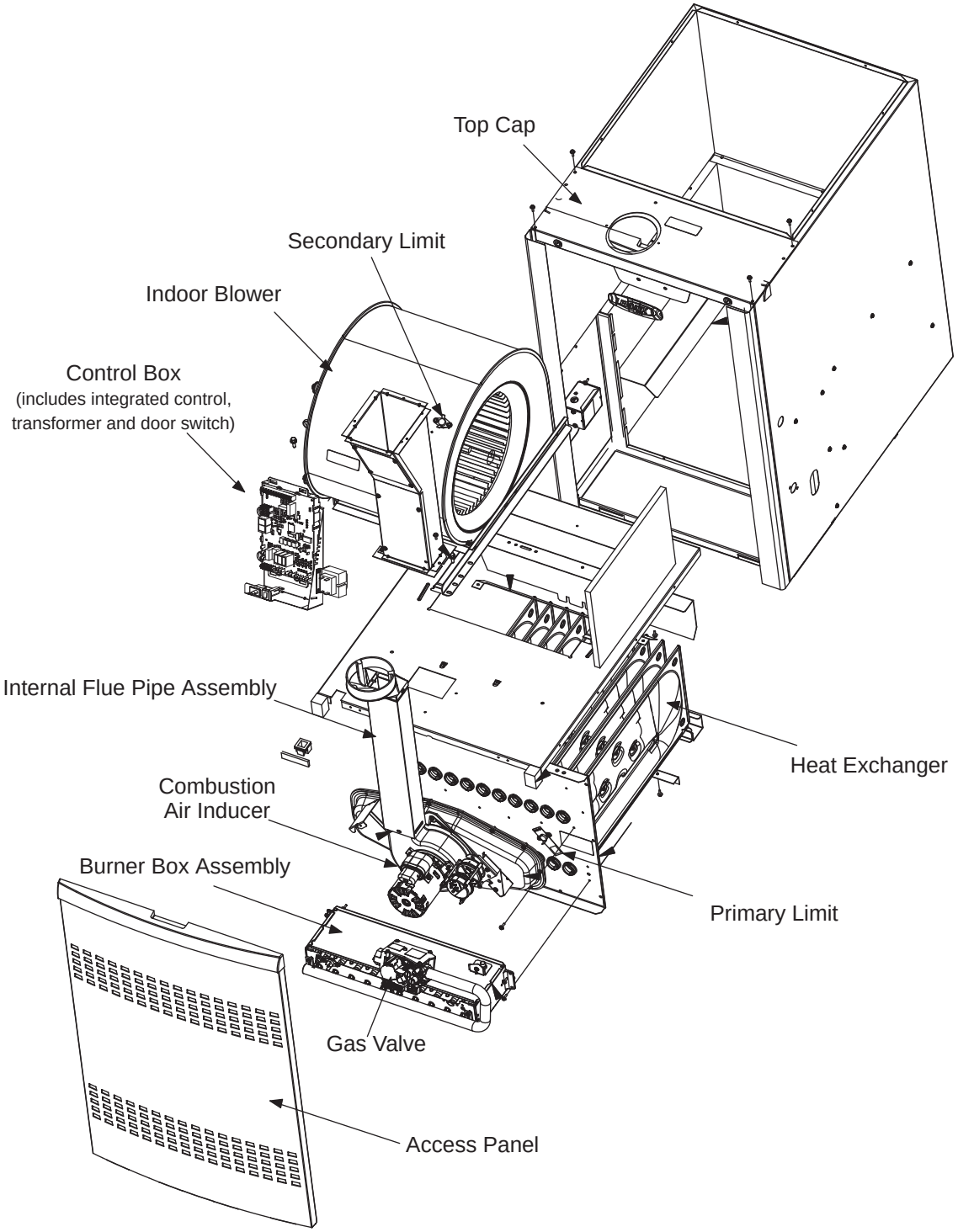


Figure 1.

Service Information

UNIT COMPONENTS

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

ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures

⚠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.

A- Control Box

1. Control Transformer (T1)

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

⚠IMPORTANT

- When matching this gas furnace with zoning, dual fuel or other 24V accessories, It is recommended to replace the factory installed transformer with kit 27J32.
- **Kit 27J32** contains a 75VA transformer, so you do not overload the original 40VA transformer.

2. Door Interlock Switch (S51)

A door interlock switch is wired in series with line voltage. When the inner blower access panel is removed the unit will shut down.

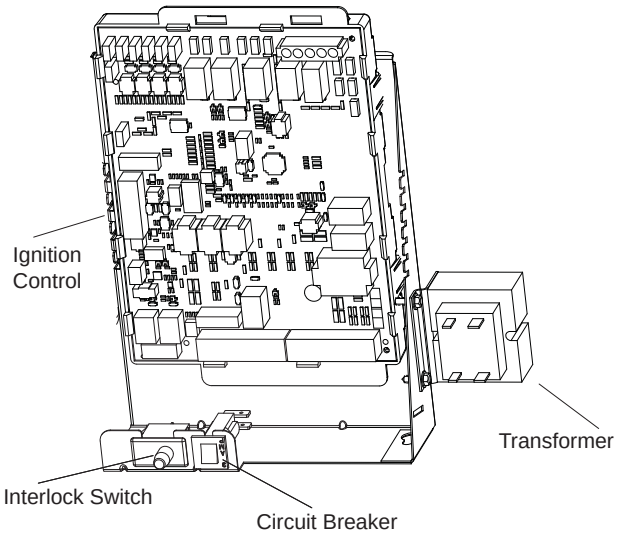


Figure 2.

3. 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 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. See **Figure 3**.

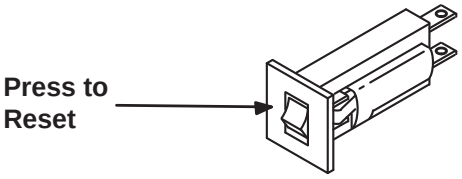


Figure 3.

⚠WARNING **Shock hazard**.

- Disconnect power before servicing. Integrated 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.

4. Ignition Control 107897-00

Units are equipped a two-stage, ignition control. The system consists of a ignition / blower control (**Figure 4**) with control pin designations in **Table 1, Table 2 , Table 3** and ignitor. The control and ignitor work in combination to ensure furnace ignition and ignitor durability. The control provides gas ignition, safety checks and indoor blower control with two-stage gas heating. The furnace combustion air inducer, gas valve and indoor blower are controlled in response to various system inputs such as thermostat signal, pressure and limit switch signal and flame signal. The control features a seven-segment LED display, indicating furnace status and error codes. The LED flashes in single digits. For example using **Table 4** under **LIMIT CODE**, an “E” followed by “2” followed by “5” followed by “0”, the limit switch circuit is open. The control also has two unpowered (dry) 1/4” contacts for a humidifier and a 120 volt accessory terminal. Both rated at (1) one amp each.

Service Information

Electronic Ignition

At the beginning of the heat cycle the integrated control monitors the first stage and second stage combustion air inducer pressure switch. The control will not begin the heating cycle if the first stage pressure switch is closed (bypassed). Likewise the integrated control will not begin the second stage heating cycle if the second stage pressure switch is closed, and will remain in first stage heat. However, if the second stage pressure switch closes during the first stage heat pre-purge, the control will allow second stage heat. Once the first stage pressure switch is determined to be open, the combustion air inducer is energized on low (first stage) heat speed.

When the differential in the pressure switch is great enough, the pressure switch closes and a 15-second pre-purge begins .

After the 15-second pre-purge period, the ignitor warms up for 20 seconds after which the gas valve opens for a 4-second trial for ignition. The ignitor remains energized during the trial until flame is sensed. If ignition is not proved during the 4-second period, the 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 control goes into Soft Lockout - Flame Failure mode. After a 60-minute reset period, the control will begin the ignition sequence again.

NOTE - During abnormal conditions such as low supply voltage or low outdoor temperatures and the low fire pressure switch does not close, the combustion air inducer will switch to high speed. After the low & high pressure switch close, the unit will proceed with a 15 sec pre-purge, followed by a 20 sec ignitor warm up, then ignition on highfire. After 10 to 20 seconds of high fire operation the unit will switch to low fire.

Two Stage Operation / Thermostat Selection DIP Switch

The control can be utilized in two modes: **SINGLE-STAGE** thermostat or **TWO-STAGE** thermostat. The thermostat selection is made using a DIP switch and must be positioned for the particular application. DIP switch 1, labeled **T"STAT HEAT STAGE** is factory-set in the **OFF** position for use with a two-stage thermostat. Move the DIP switch to **ON** for use with a single stage thermostat.

While in the single-stage thermostat mode, the burners will always fire on first-stage heat. The combustion air inducer will operate on low speed and indoor blower will operate on low heat speed.

The unit will switch to second stage heat after a "recognition period". DIP switch 2, labeled **SECOND STAGE DELAY**, is factory set in the **OFF** position for a 7 minute recognition period. The switch can be moved to the **ON** position for a 12 minute recognition period, after which time the unit will switch to second-stage heat. While in the two-stage thermostat mode, the burners will fire on first-stage heat. The combustion air inducer will operate on low speed and indoor blower will operate on low heat speed.

The unit will switch to second-stage heat on call from the indoor thermostat. If there is a simultaneous call for first and second stage heat, the unit will fire on first stage heat and switch to second stage heat after 30 seconds of operation. See **Sequence of Operation** flow charts in the back of this manual for more detail.

Table 1.

1/4" Quick Connect Terminals	
120V HUM	Power for Humidifier (120VAC)
LINE	Incoming Power Line (120VAC)
XFMR	Transformer Primary (120VAC)
CIRC	Indoor Blower Motor (120VAC)
ACC	Accessory (120VAC)
24V HUM	Humidifier (24VAC)
NEUTRALS	Neutral (5)
3/16" Quick Connect Terminals	
LO COOL	Cool Speed Tap from Indoor Blower Motor (24VAC)
HI COOL	Cool Speed Tap from Indoor Blower Motor (24VAC)
LO HEAT	Heat Speed Tap from Indoor Blower Motor (24 VAC)
HI HEAT	Heat Speed Tap from Indoor Blower Motor (24 VAC)
FAN	Continuous Fan Speed Tap From Indoor Blower Motor (24 VAC)
FLAME SENSE	Flame Sensor Electrode (120 VAC)
COMMON	Common (24VAC)
PARK	3 Terminals to Park Unused Motor Speed Taps

Service Information

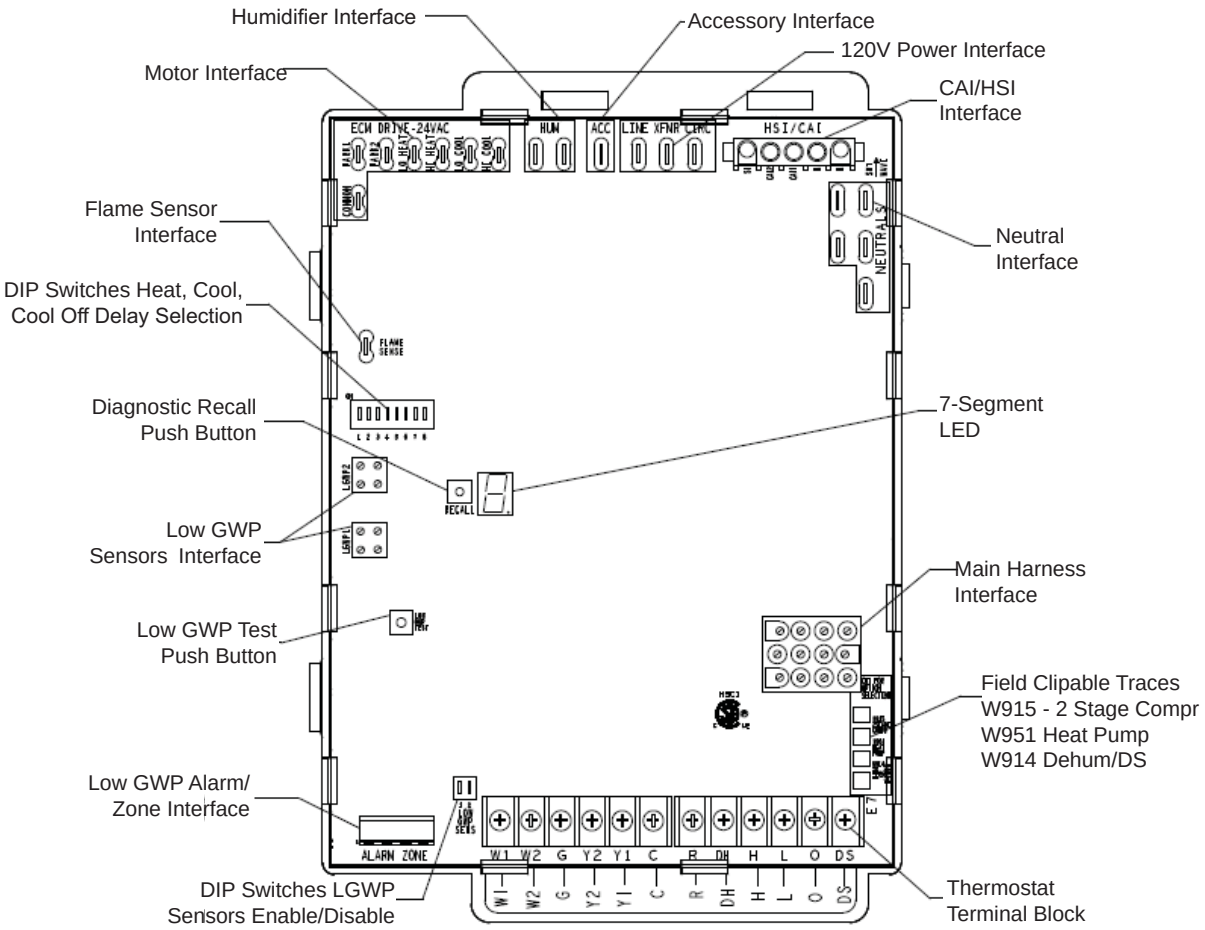


Figure 4.

Table 2.

Thermostat Input Terminals	
W1	Low Stage Heat
W2	High Stage Heat
G	Fan
Y1	Low Stage Cool (When W915 Is Clipped)
Y2	High Stage Cool
C	Thermostat Common / Ground
R	24VAC To The Thermostat
DH	Dehumidification (unused)
H	24VAC Humidifer (unused)
L	LSOM (unused)
O	Heat Pump Reversing Valve (when W951 is clipped)
DS	DEHUM / HARMONY (when W914 is clipped)

Table 3.

Low GWP Interface	
LGWP1	Low GWP Sensor #1 Interface
LGWP2	Low GWP Sensor # 2 Interface
ALARM	Interface To Low GWP Leak Audible Alarm (Dry Contact)
ZONE	Interface To Zoning Control (Dry Contact)
LGWP TEST	Push Button To Test Low GWP Functionality

Service Information

Table 4.

Diagnostic Codes / Status Of Furnace	Code
Idle Mode (Decimal blinks At 1 Hertz -- 0.5 Seconds On, 0.5 Seconds Off	.
Indoor Blower Operation: Continuous Fan Mode (Constant Torque Only), Indoor Blower Operation: Followed By Cfm Setting For Indoor Blower (1 Second On, 0.5 Second Off) / Cfm Setting For Mode Displayed (Variable Speed Only)	A
Cooling Stage (1 Second On, 0.5 Second Off) 1 Or 2 Displayed / Pause / Repeat Codes. Variable Speed Only	C
Gas Heat (1 Second On, 0.5 Second Off) Pause / Cfm Displayed / Pause / Repeat Codes Blinking - Ignition	H
Heat Pump Stage (1 Second On, 0.5 Second Off) 1 Or 2 Displayed / Pause / Cfm Setting Displayed / Pause / Repeat Codes	H
Defrost Mode	Df
Error/Fault Condition	Code
No Error In The Memory	E000
Electrical Faults (Wait For Recovery)	
Ac Line Voltage Low	E110
Twin Communication Fault (Constant Torque Only)	E106
Line Voltage Polarity Reversed	E111
Earth Ground Not Detected	E112
Ac Line Voltage High	E113
Line Voltage Frequency Out Of Range	E114
Low 24v - Control will Restart If The Error Recovers	E115
Hardware Fault (5 Minutes Lockout)	
Control Hardware (Include A/D Electronics And Flame Test) Failure	E125
Hard Lockout Fault	
Rollout Open Or Previously Opened	E200
Gas Valve/Pressure Switch/Limt Faults (Wait For Recovery)	
Gas Valve Relay (1st Or 2nd Stage) Problem	E204
Low Pressure Sw Failed To Close (Stuck Open)	E223
Low Pressure Sw Failed To Open (Stuck Closed)	E224
High Pressure Sw Failed To Close (Stuck Open)	E225
High Pressure Sw Failed To Open (Stuck Closed)	E226
Low Pressure Switch Opened In Run Or Tfi	E227
Flame Sense Out Of Sequence-Still Present	E241
Primary Limit Switch Opened	E250

Table 4 Cont

Diagnostic Codes / Status Of Furnace	Code
Soft Lockout Faults (60 Minutes)	
Gas Valve Relay (1st Or 2nd Stage) Contact Shorted	E205
Hot Surface Ignitor (Hsi) Sensed Open	E207
Soft Lockout-Flame Failure On Ignition, Ignition Retry>Max, Last Failed Retry Due To Flame Failure	E270
Soft Lockout-Pressure Switch Open, Ignition Retry>Max, Last Failed Retry Due To Lpsw Open	E271
Soft Lockout-Pressure Switch Open, In Run Mode Heating Recycles>Max, Last Failed Retry Due To Lpsw Open	E272
Soft Lockout-Flame Failure In Run Mode,Heating Recycles>Max, Last Failed Retry Due To Loss Of Flame	E273
Soft Lockout-Limit Open > 3 Minutes	E274
Soft Lockout-Flame Out Of Sequence And Is Gone	E275
Ignitor Circuit Fault-Failed Ignitor Or Triggering Circuitry	E290
Performance Warning	
Poor Ground Detected	E117
Igntion On High Fire	E229
Low Flame Current In Heating Mode	E240
Low Gwp Refrigerant Faults	
Refrigerant Leak Detected, Thermostat Lockout	E150
Refrigerant Leak Detector Sensor #1 Fault	E151
Refrigerant Leak Detector Sensor #2 Fault	E152
Refrigerant Leak Detector Sensor #1 Comm. Lost	E154
Refrigerant Leak Detector Sensor #2 Comm. Lost	E155
Refrigerant Leak Detector Sensor #1 Type Incorrect	E160
Refrigerant Leak Detector Sensor #2 Type Incorrect	E161
Refrigerant Leak Detector Control Failure	E163
Low Gwp Test	E164
Low Gwp Relay Stuck	E390

Service Information

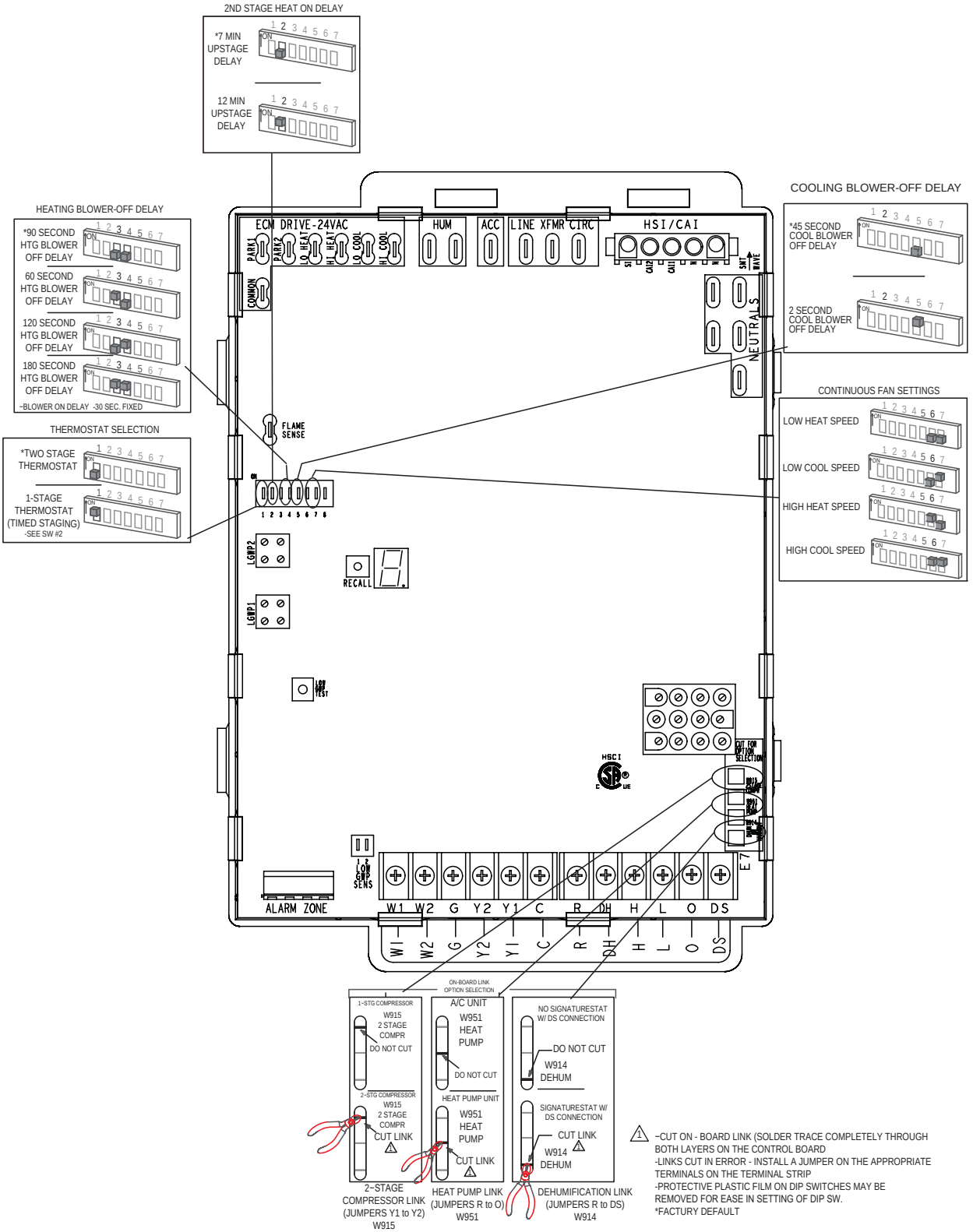


Figure 5. Integrated Control Configuration

Service Information

Integrated Control DIP Switches

Units are equipped with a two-stage integrated control. This control manages ignition timing, heating mode fan off delays and indoor blower speeds based on selections made using the control dip switches and jumpers. See **Figure 5** for an integrated control configuration.

The control includes an internal soft lockout feature which automatically resets the ignition control when it has been locked out. After one hour of continuous thermostat demand for heat, the soft lockout will break and remake thermostat demand to the furnace and automatically reset the control to relight the furnace.

Heating Operation DIP Switch Settings

Switch 1 -- Thermostat Selection -- This unit may be used with either a single-stage or two-stage thermostat. The thermostat selection is made using a DIP switch which must be properly positioned for the particular application. The DIP switch is factory-positioned for use with a two-stage thermostat. If a single-stage thermostat is to be used, the DIP switch must be repositioned.

a. Select **OFF** for two-stage heating operation controlled by a two-stage heating thermostat (factory setting);

b. Select **ON** for two-stage heating operation controlled by a single-stage heating thermostat. This setting provides a timed delay before second-stage heat is initiated.

Switch 2 a --- Second Stage Delay (Used with Single-Stage Thermostat Only) -- This switch is used to determine the second stage on delay when a single-stage thermostat is being used. The switch is factory-set in the **OFF** position, which provides a 7-minute delay before second-stage heat is initiated. If the switch is toggled to the **ON** position, it will provide a 12-minute delay before second-stage heat is initiated. This switch is only activated when the thermostat selector jumper is positioned for SINGLE-stage thermostat use.

Indoor Blower Operation DIP Switch Settings

Switches 3 and 4 -- Heating Mode Blower-Off Delay -- The blower-on delay of 30 seconds is not adjustable. The blower-off delay (time that the blower operates after the heating demand has been satisfied) can be adjusted by moving switches 3 and 4 on the integrated control. The unit is shipped from the factory with a blower-off delay of 90 seconds.

The blower off delay affects comfort and is adjustable to satisfy individual applications. Adjust the blower off delay to achieve a supply air temperature between 90° and 110°F at the exact moment that the blower is de-energized. Longer off delay settings provide lower supply air temperatures; shorter settings provide higher supply air temperatures. **Table 5** provides the blower off timings that will result from different switch settings.

Table 5. Blower Off Heating Mode Delay Switch Settings

Blower Off Delay Seconds	Switch 3	Switch 4
60	On	Off
90	Off	Off
120 (factory)	Off	On
180	On	On

Switch 5 -- Cooling Mode Blower-Off Delay -- The unit is shipped from the factory with the dip switch positioned **OFF** for a 45 second delay. **Table 6** provides the cooling mode off delay settings.

Table 6. Blower Off Cooling Mode Delay Switch Settings

Blower Off Delay Seconds	Switch 5
45 (factory)	Off
2	On

Switches 6 and 7 -- Continuous Fan Mode -- Continuous fan speed can be controlled by changing DIP switch positions. **Table 7** below provides DIP switch settings for continuous fan mode

Table 7. Continuous Fan Mode Settings

Continuous Fan Mode	Switch 6	Switch 7
Low Heat Speed (Factory Setting)	Off	Off

On-Board Link W914 Dehum

On-board link W914, is a clippable connection between terminals R and DS on the integrated control. W914 must be cut when the furnace is installed with a thermostat which features humidity control. If the link is not cut, terminal “DS” will remain energized not allowing the blower to reduce to low cool speed upon a call for dehumidification.

On-Board Link W951 Heat Pump (R to O)

On-board link W951 is a clippable connection between terminals **R** and **O** on the integrated control. W951 must be cut when the furnace is installed in applications which include a heat pump unit and a thermostat which features dual fuel use. If the link is left intact, terminal **O** will remain energized eliminating the **HEAT MODE** in the heat pump.

On-Board Link W915 2 Stage Compr (Y1 to Y2)

On-board link W915 is a clippable connection between terminals **Y1** and **Y2** on the integrated control. W915 must be cut if two-stage cooling will be used. If the **Y1** to **Y2** link is not cut the outdoor unit will operate in second-stage cooling only.

⚠IMPORTANT

If any onboard link is cut by mistake, install a jumper across the corresponding terminals on the low voltage terminal strip. Do not replace control.

Service Information

Indoor Blower Speeds

1 - When the thermostat is set to **FAN ON**, the indoor blower will run continuously on the low speed when there is no cooling or heating demand. See **Table 8** for allowable circulation speeds.

2 - 2 When the **NS80D***T**R** is operating in the high-fire or low-fire heating mode, the indoor blower will run on the corresponding heating speed. See **Table 9** for allowable heating speeds.

3 - When the **NS80D***T**R** is operating in the low cool or the high cool cooling mode, the indoor blower will run on the corresponding cooling speed.

Table 8.

Allowable Circulation Speeds					
Model Number	**Red**	**Yellow**	**Blue**	**Brown**	**Black**
-070	Factory Setting	Allowed	Not Allowed	Not Allowed	Not Allowed
-090	Factory Setting	Allowed	Not Allowed	Not Allowed	Not Allowed

Table 9.

Allowable Heating Speeds										
Model Number	**Low Fire Heating Speeds**					**High Fire Heating Speeds**				
	Red	**Yellow**	**Blue**	**Brown**	**Black**	**Red**	**Yellow**	**Blue**	**Brown**	**Black**
-070	Factory Setting	Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Factory Setting	Allowed	Allowed	Allowed
-090	Factory Setting	Allowed	Not Allowed	Not Allowed	Not Allowed	Not Allowed	Factory Setting	Allowed	Allowed	Allowed

Service Information

B-Indoor Blower

⚠IMPORTANT

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

NF80D*T**R** 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 connectors J48 and J49 from motor. See **Figure 8** 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 6**. When replacing the indoor blower motor the set screw must be aligned and tightened with the motor shaft as shown in **Figure 7**.

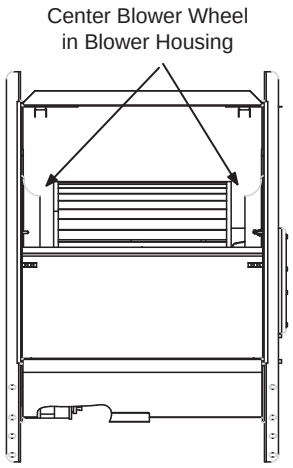


Figure 6. Blower Wheel Replacement

Align and Tighten Set Screw with Flat Side of Motor Shaft

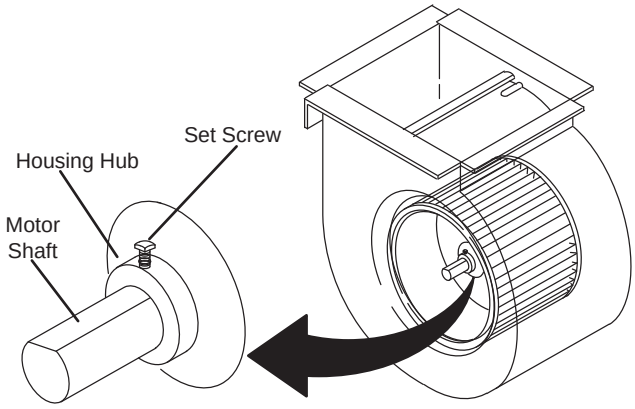
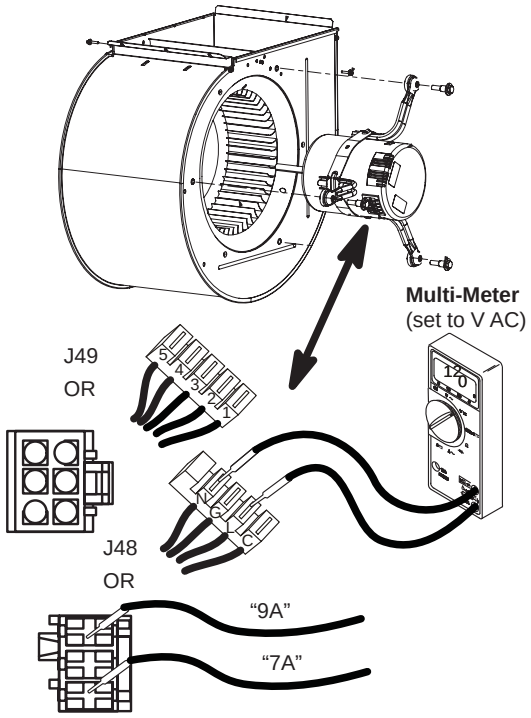
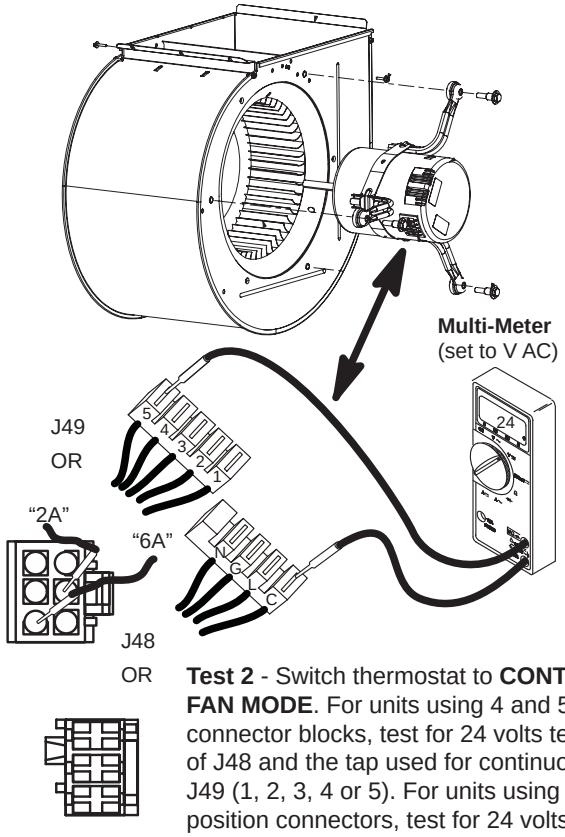


Figure 7.

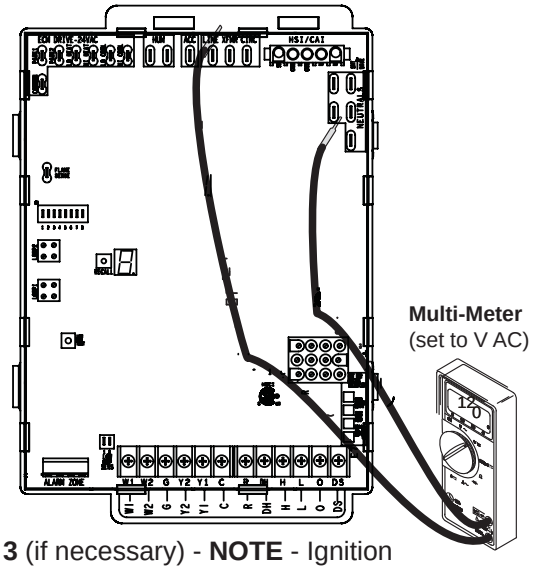
Service Information



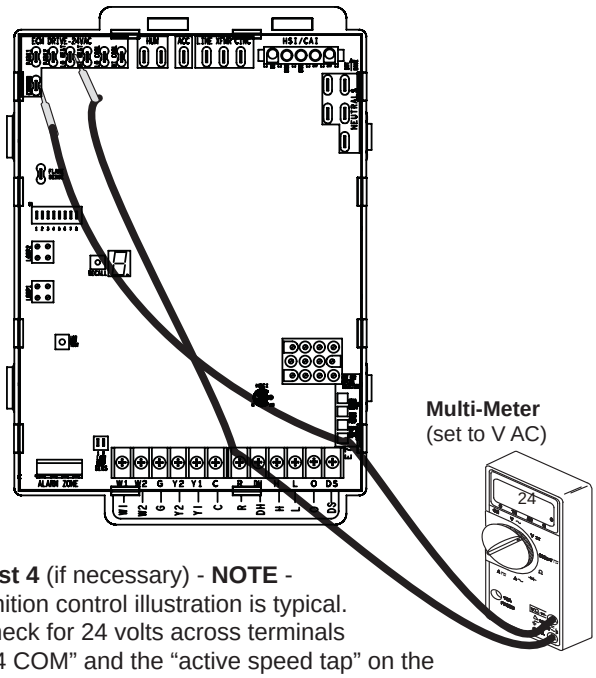
Test 1 - Turn power on to unit. Check for 120 volts across terminals "L" and "N" or terminals "7A" and "9A" of connector J48. If voltage is present continue to test 2. If voltage is not present, problem may be upstream of J48. Proceed to **Test 3**.



Test 2 - Switch thermostat to **CONTINUOUS FAN MODE**. For units using 4 and 5 position connector blocks, test for 24 volts terminal "C" of J48 and the tap used for continuous fan on J49 (1, 2, 3, 4 or 5). For units using 3 and 6 position connectors, test for 24 volts between pin "6A" and the pin used for continuous fan on connector J49 (1., 2, 3, 4 or 5).



Test 3 (if necessary) - **NOTE** - Ignition control illustration is typical. Check for 120 volts across terminals "L1" and "Neutrals" on the integrated control. If voltage is present, problem is with the harness. If voltage is not present problem may be may be with the integrated control.



Test 4 (if necessary) - **NOTE** - Ignition control illustration is typical. Check for 24 volts across terminals "24 COM" and the "active speed tap" on the integrated control. If voltage is present, problem is with the harness. If voltage is not present problem may be may be with the integrated control.

Figure 8.

Replacing the Motor Module

NOTE: Not all motors have field replaceable control modules. Only motors that utilize a 4 pin power connector and 5 pin signal connector as shown below may have replaceable controls. Motors that use a 3 pin power connector and 6 pin signal connector do not have field replaceable control modules. In the event of failure, the entire motor must be replaced.

1 - Disconnect electrical power to unit.

2 - Remove unit access panel.

3 - Unplug the two harnesses from the motor control module. See **Figure 9**.

4 - Remove the two hex head bolts securing the motor control module to the motor. See **Figure 10**.

5 - Slide the motor control module away from the motor to access and disconnect the internal three wire connector. It is not necessary to remove blower motor itself. Set both hex head bolts aside.

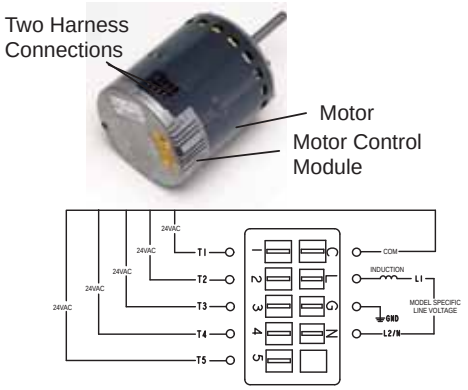


Figure 9. Unplug the Two Harness Connection

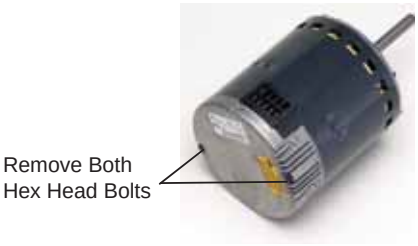


Figure 10. Remove the Hex Head Bolts

Testing the Motor (Figure 11)

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.

Motor Test

Figure 11.

Table 10.

Scale	Measurement range in words	ohms
2M	two megohm-two million ohms	0 - 2,000,000
200 K	two hundred kilo-ohm-two hundred thousand ohms	0 - 200,000
20 K	twenty kilo-ohm-twenty thousand ohms	0 - 20,000
2 K	two kilo-ohm 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 removed in **Figure 10**. Torque bolts to 22 inch pounds or 1/16th clock wise turn.

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 12**). This will directs moisture away from the motor and its electric connections on the motor.

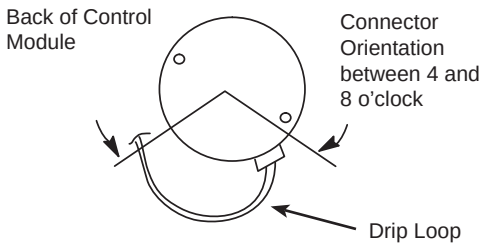


Figure 12. Drip Loop

Service Information

Heating Components

1. Ignitor
The ignitor is made of durable silicon nitride. Ignitor longevity is enhanced by controlling voltage to the ignitor. The integrated control provides a regulated 120 volts to the ignitor for a consistent ignition and long ignitor life.
Ohm value should be 39 to 70. See **Figure 14** for ignitor check out.

NOTE: The **NF80D***T**R** furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.

2. Flame Sensor
A flame sensor is located on the left side of the burner support. The sensor protrudes into the flame envelope of the left-most burner. The sensor can be removed for service without removing any part of the burners. During operation, flame is sensed by current passed through the flame and sensing electrode. The 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. See **Figure 15** for flame signal check and measurement.

3. Gas Valve
The two-stage gas valve is internally redundant to assure safety shut-off. If the gas valve must be replaced, the same type valve must be used.

24VAC terminals and ON/OFF switch are located on the valve. A wire harness connects the terminals from the gas valve to the electronic ignition 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 change over kits are available from GE Appliances. Kits include burner orifices.

4. Flame Rollout Switches (S47)
The **NF80D***T**R** unit is equipped with two rollout switches. The limits are a N.C. SPST manual-reset limit. When S47 senses rollout, the circuit breaks and the ignition control immediately stops ignition and closes the gas valve. Rollout can be caused by a blocked heat exchanger, flue or lack of combustion air. The switches are factory set to trip (open) at 210°F and cannot be adjusted.
To manually reset a tripped switch, push the reset button located on the control.

5. Burners
All units use inshot burners. Burners are factory set and require no adjustment. Always operate the unit with the burner box front panel in place. Each burner uses an orifice that is precisely matched to the burner input. Burners can be removed as a one piece assembly for service. If burner assembly has been removed, it is critical to align center of each burner to the center of the clamshell when re-installing.

6. Primary Limit Control (S10)
The primary limit (S10) is located in the heating vestibule panel. When excess heat is sensed in the heat exchanger, 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 switch must reset within three minutes or the control will go into soft lockout for one hour. The switch is factory set and cannot be adjusted. The switch may have a different set point for each unit model number.

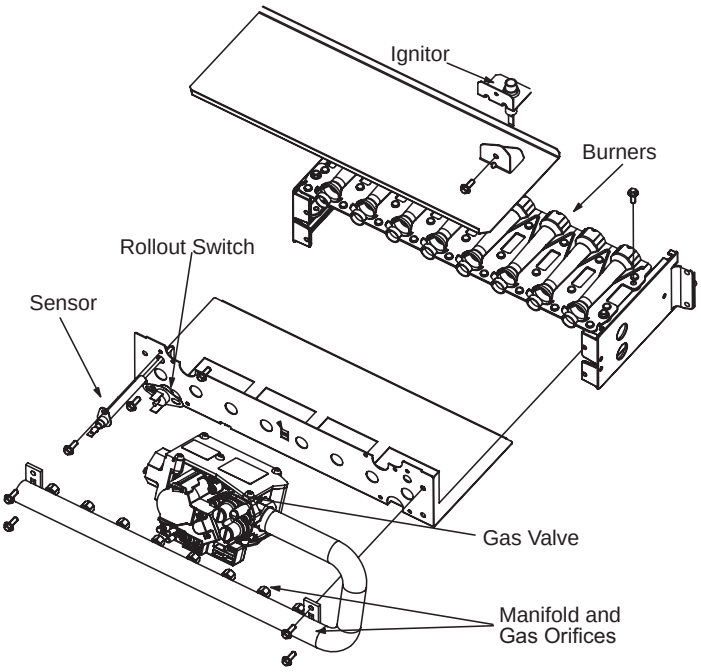


Figure 13. Heating Components

Service Information

Test 1 - Check ignitor circuit for correct resistance.
Remove HSI /CAI 4-pin plug from control. Check ohms reading across terminals 1 and 5. 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.

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.

Test 3 - Check ignitor for correct voltage.
Insert meter probes into terminals 1 and 5 (use small diameter probes in order not to damage plug). Check voltage during 20 second ignitor warm up period. Voltage should read 120 volts ± 10%. If voltage reads below these values, check for correct supply voltage to furnace.

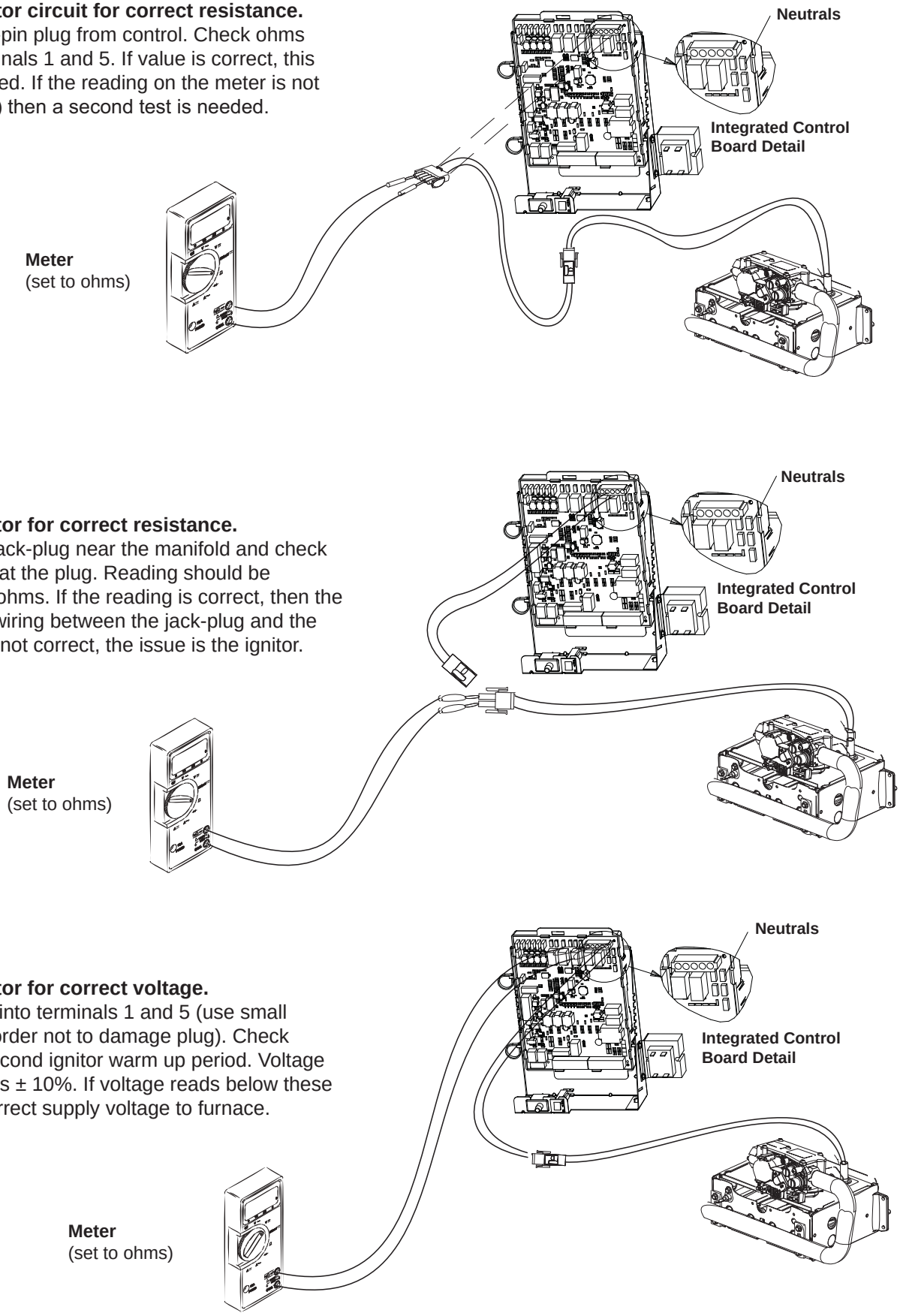


Figure 14. Ignitor Checks

Service Information

To Measure Flame Signal - Integrated Control:
Use a digital readout meter capable of reading DC microamps. See **Figure 15** and **Table 11** for flame signal check.

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

Table 11. Flame Signal in Microamps

Normal	Low	Drop Out
2.6 or greater	2.5 or less	0.6

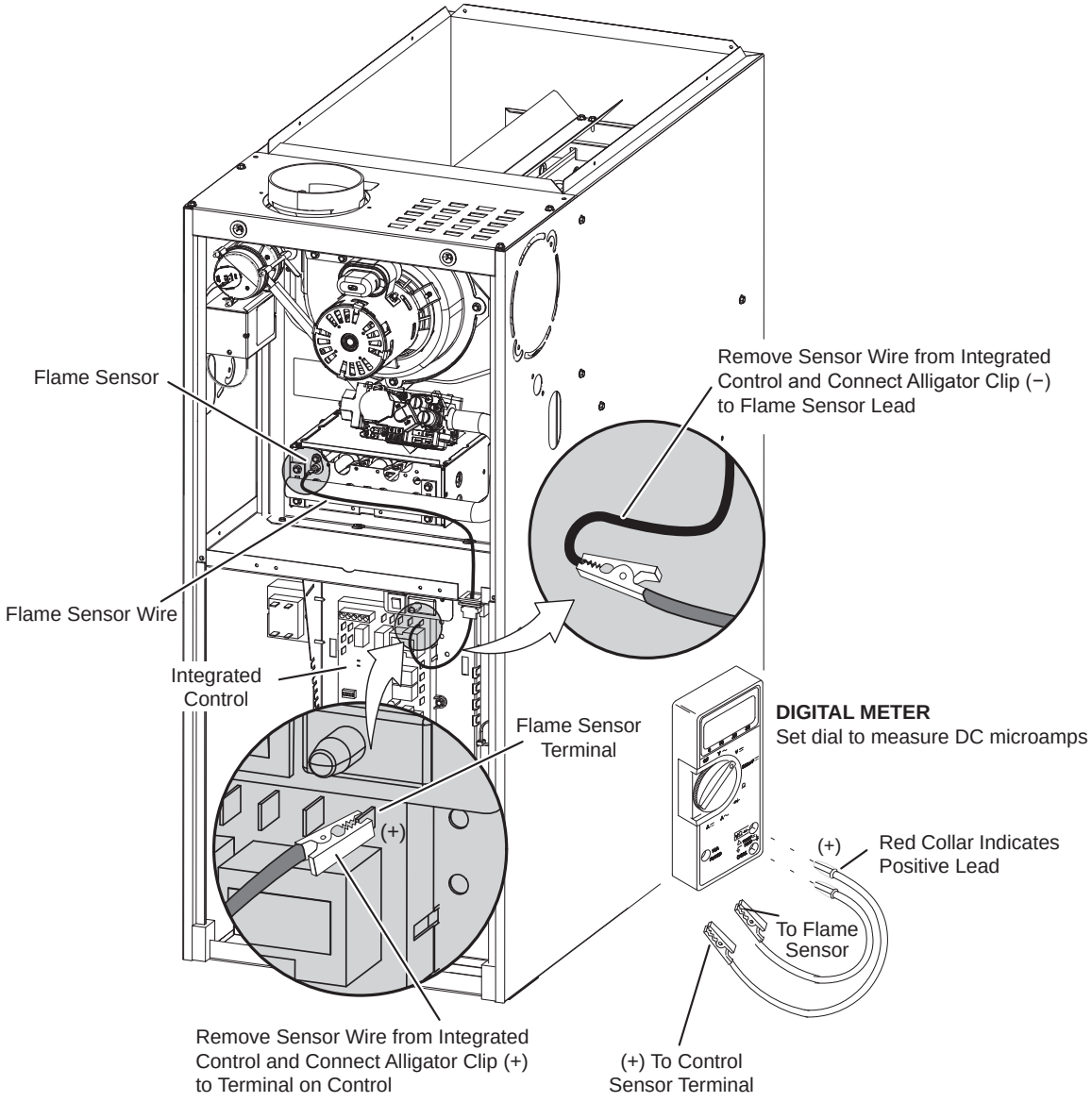


Figure 15. Measuring Flame Signal (Upflow Furnace shown)

7. Combustion Air Inducer (B6)

All units use a two-stage combustion air inducer to move airthrough 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 furnace / blower 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). The inducer operates on low speed during first-stage heat, then switches to high speed for second stage heat.

NOTE - Each furnace model uses a unique CAI. Refer to GE Appliances Repair Parts listing for correct inducer for replacement.

A pressure switch connected to the combustion air inducer orifice plate is used to prove inducer operation. The combustion air inducer orifice will be different for each model. See TABLE 12 for orifice sizes. 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 an obstruction) the proving switch opens. When the proving switch opens, the furnace control (A92) immediately closes the gas valve to prevent burner operation.

Table 12.

Unit	CAI Orifice Size
-070	1.406”
-090	1.690”

8. Combustion Air Inducer Pressure Switch (S18)

S18 is a dual combustion air pressure switch (first and second stage) 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 switches are 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 heat demand (first or second stage) the switch senses that the combustion air inducer is operating. It closes a circuit to the furnace control when pressure inside the combustion air inducer decreases to a certain set point.

Set points vary depending on unit size. See **Table 13**. 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 furnace 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.

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

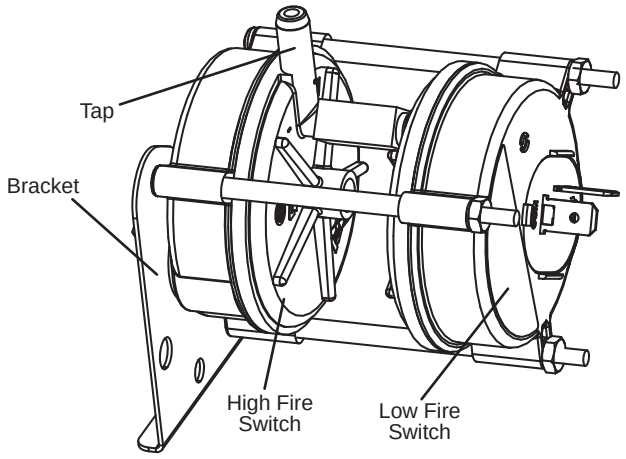


Figure 16. Combustion Air Pressure Switch

Table 13.

Unit	Set Point High Heat	Set Point Low Heat
-070	0.55”	0.25”
-090	0.55”	0.25”

PLACEMENT AND INSTALLATION

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

Service Information

START-UP

A - Preliminary and Seasonal Checks

1 - Inspect electrical wiring, both field and factory installed for loose connections. Tighten as required.

2 - Check voltage at disconnect switch. Voltage must be within range listed on the nameplate. If not, consult the power company and have voltage condition corrected before starting unit.

B - Heating Start-Up

⚠WARNING **Shock and burn hazard.**
NF80D*T**R units are equipped with a hot surface ignition system. Do not attempt to light manually.**

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 upper access panel.

6 - Turn switch on gas valve to **OFF**. Do not force. See **Figure 17**.

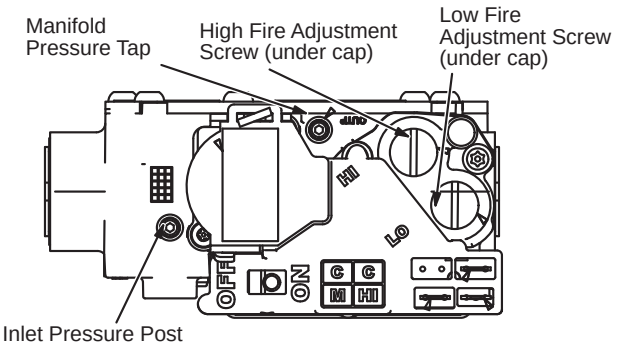


Figure 17. White Rodgers Gas Valve (Gas Valve Shown in ON Position

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 - Turn switch on gas valve to **ON**. Do not force. See .

9 - Replace the upper access panel.

10- Turn on all electrical power to 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.

Turning Off Gas To Unit

1 - Set thermostat to lowest setting.

2 - Turn off all electrical power to unit if service is to be performed.

3 - Remove access panel.

4 - Turn switch on gas valve to **OFF**. Do not force. See **Figure 17**.

5 - Replace access panel.

Failure To Operate

If the unit fails to operate, check the following:

1 - Is the thermostat calling for heat?

2 - Are access panels securely in place?

3 - Is the main disconnect switch closed?

4 - Is there a blown fuse or tripped circuit breaker?

5 - Is the filter dirty or plugged? Dirty or plugged filters will cause the limit control to shut the unit off.

6 - Is gas turned on at the meter?

7 - Is the manual main shut-off valve open?

8 - Is the internal manual shut-off valve open?

9 - Is the unit ignition system in lock out? If the unit locks out again, call the service technician to inspect the unit for blockages.

10 - Is pressure switch closed? Obstructed flue will cause unit to shut off at pressure switch. Check flue and outlet for blockages.

11 - Are flame rollout switches tripped? If flame rollout switches are tripped, call the service technician for inspection.

C-Safety or Emergency Shutdown

Turn off unit power. Close manual and main gas valves.

D-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 leak into combustion chamber. Turn off power to unit. All access panels and covers must be in place and secured.

HEATING SYSTEM SERVICE CHECKS

A- CSA Certification

All units are CSA design certified without modifications. Refer to the Installation Instruction.

B- Gas Piping

⚠WARNING

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

⚠IMPORTANT

- 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. The flexible connector can then be added between the black iron pipe and the gas supply line.

Gas supply piping should not allow more than 0.5"W.C. dropin pressure b tween 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.

C-Testing Gas Piping

⚠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.

When pressure testing gas lines, the gas valve must be disconnected and isolated. Gas valves can be damaged if subjected to more than 0.5 psig (14" W.C.). See FIGURE 18. If the pressure is equal to or less than 0.5psig (14"W.C.), use the manual shut-off valve before pressure testing to isolate furnace from gas supply.

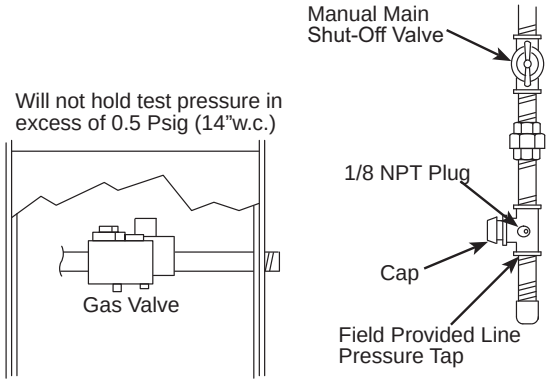


Figure 18. Gas Piping Test Procedure

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.

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

D-Testing Gas Supply Pressure

An inlet post located on the gas valve provides access to the supply pressure. See **Figure 17**. Back out the 3/32 hex screw one turn, connect a piece of 5/16 tubing and connect to a manometer to measure supply pressure. See **Table 16** for supply line pressure.

E-Check Manifold Pressure

After line pressure has been checked and adjusted, check manifold pressure. Move pressure gauge to outlet pressure tap located on unit gas valve (GV1). Checks of manifold pressure are made as verification of proper regulator adjustment. Manifold pressure can be measured at any time the gas valve is open and is supplying gas to the unit. See **Table 16** for normal operating manifold pressure.

⚠IMPORTANT

- For safety, connect a shut-off valve between the manometer and the gas tap to permit shut off of gas pressure to the manometer.

The gas valve is factory set and should not require adjustment. All gas valves are factory regulated.

Manifold Adjustment Procedure:

1 - Connect test gauge to manifold pressure tap (**Figure 17**) on gas valve.

2 - Ignite unit on low fire and let run for 5 minutes to allow for steady state conditions.

3 - After allowing unit to stabilize for 5 minutes, record manifold pressure and compare to value given in **Table 16**.

4 - If necessary, make adjustments. **Figure 17** shows location of high fire and low fire adjustment screw.

5 - Repeat steps 2, 3 and 4 on high fire.

6 - Shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to replace pressure tap plug.

7 - Start unit and perform leak check. Seal leaks if found.

F- Proper 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 14**. If manifold pressure matches **Table 16** and rate is incorrect, check gas orifices for proper size and restriction.

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

Service Information

Table 14. Gas Metering Clocking Chart

Unit	Natural 1000 btu/cu ft		LP 2500 btu/cu ft	
	Seconds For One Revolution			
	1 cu ft dial	2 cu ft dial	1 cu ft dial	2 cu ft dial
-070	55	110	136	272
-090	41	82	102	204

⚠DANGER

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

G - Proper Combustion

Furnace should operate minimum 15 minutes with correct manifold pressure and gas flow rate before checking combustion. See sections E- and F-. Take combustion sample beyond the flue outlet and compare to the table below. The maximum carbon monoxide reading should not exceed 100 ppm.

Table 15.

Firing Rate	CO_2% For Nat	CO_2% For L.P.
High Fire	6.8 - 7.4	7.5 - 9.0
Low Fire	4.2 - 5.7	5.0 - 6.0

H - High Altitude

The manifold pressure, gas orifice and pressure switch may require adjustment or replacement to ensure proper operation at higher altitudes. See **Table 16** for manifold pressures and **Table 17** for pressure switch kits and gas conversion kits.

Table 16. Manifold Pressure Settings at all Altitudes

Unit	Gas	Manifold Pressure in. wg. 0 - 4500 ft		Manifold Pressure in. wg. 4501 - 7500 ft		Manifold Pressure in. wg. 7501 - 10,000 ft[2]		Supply Line Pressure in. w.g.	
		Low Fire	High Fire	Low Fire	High Fire	Low Fire	High Fire	Min	Max
-070	Natural	1.7	3.5	1.5	3.2	1.7	3.5	4.5	13.0
	LP/propane [3]	4.5	10.0	4.5	10.0	4.5	10.0	11.0	13.0
-090	Natural	1.7	3.5	1.5	3.0	1.7	3.5	4.5	13.0
	LP/propane [3]	4.5	10.0	4.5	10.0	4.5	10.0	11.0	13.0

[1] This is the only permissible derate for these units.
[2] Natural gas high altitude orifice kit required.
[3] 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 - Units may be installed at altitudes up to 4500 ft. above sea level without modifications

Table 17. Pressure Switch and Gas Conversion Kits at all Altitudes

Unit	High Altitude Pressure Switch Kit			High Altitude Natural Gas Kit	LP/Propane Gas Kit		LP/Propane to Natural Kit
	0-4500 ft	4501- 7500 ft	7501-10,000 ft	7501-10,000 ft	0-7500 ft	7501-10,000 ft	0-7500 ft
-070	No Change	No Change	73W36	73W37	11K51	11K46	77W09
-090			73W36				

TYPICAL OPERATING CHARACTERISTICS

A-Blower Operation and Adjustment

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.

B-Temperature Rise (Figure 19)

Temperature rise for the unit 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.

TEMPERATURE RISE
Supply Duct Temperature _____
Return Duct Temperature – _____
Temperature Rise = _____

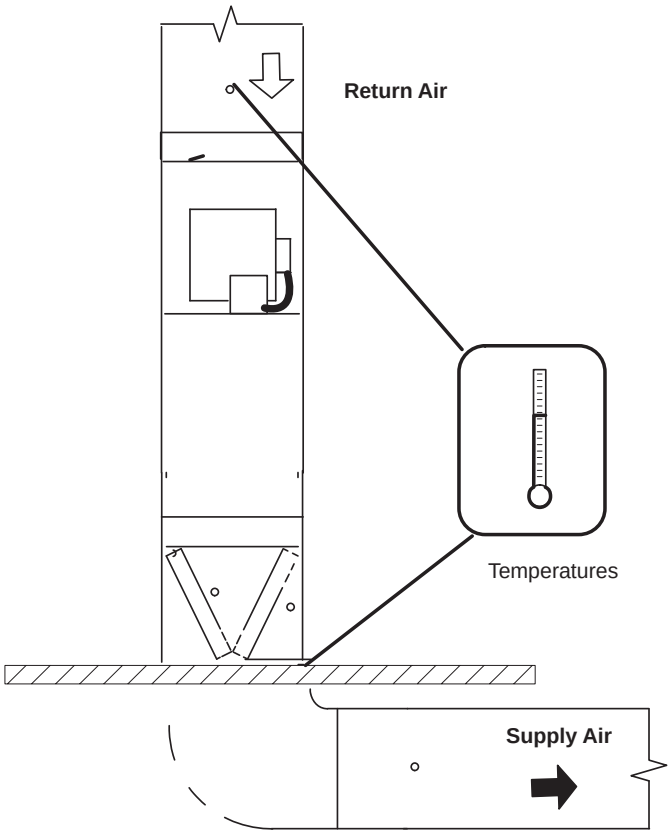


Figure 19.

C-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.

EXTERNAL STATIC PRESSURE
Supply Duct Static _____
Return Duct Static + _____
Total Duct Static = _____ (dry coil)

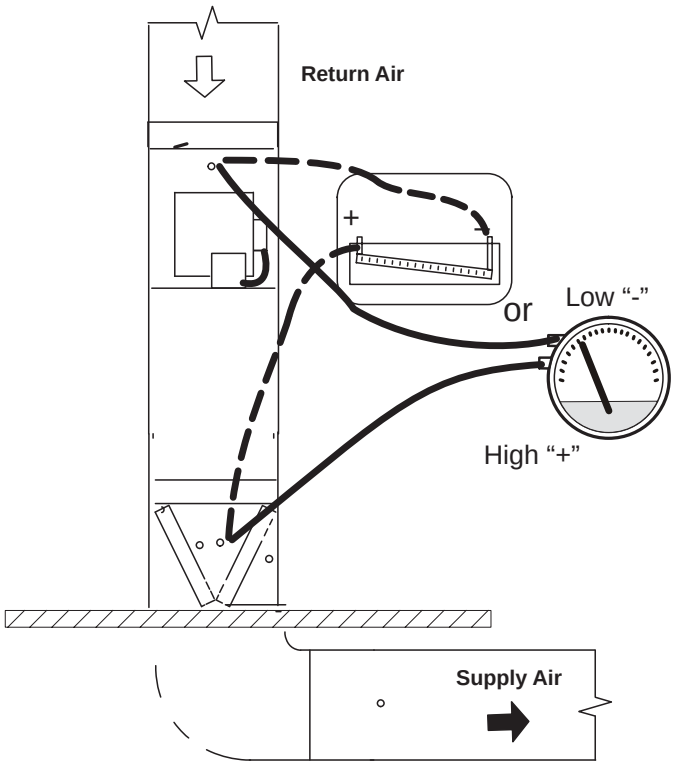


Figure 20.

Service Information

MAINTENANCE

Annual Furnace 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:

⚠WARNING

• Disconnect power before servicing unit.

⚠IMPORTANT

- Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.
- The inner blower access panel and vent pipe must be securely in place when the blower and burners are operating. Gas fumes, which could contain carbon monoxide, can be drawn into living space resulting in personal injury or death.

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.
15. Inspect the Low GWP sensor / sensors and rubber sleeve.

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.

MAINTENANCE (Cont.)

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, top cap, flue chase and internal flue pipe assembly 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 screw securing the burner box cover and remove cover. Remove the four screws securing the burner manifold assembly to the vestibule panel and remove the assembly from the unit.

7 - Remove screws securing burner box and remove burner box.

8 - Remove screws from both sides, top and bottom of vestibule panel.

9 - 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 22**..

10- Back wash using steam. Begin from the burner opening on each clam. Steam must not exceed 275°F.

11- 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.

12- 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.

13- Reinstall heat exchanger in vestibule. (Replace the five screws in the cabinet from step 10 if removed).

14- 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.

15- Reinstall burner box, manifold assembly and burner box cover.

16- Reconnect all wires.

17- Reconnect top cap and vent pipe to combustion air inducer outlet.

18- Reconnect gas supply piping.

19- Turn on power and gas supply to unit.

20- Set thermostat and check for proper operation.

21- Check all piping connections, factory and field, for gas leaks. Use a leak detecting solution or other preferred means.

⚠WARNING

- 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.

22- If a leak is detected, shut gas and electricity off and repair leak.

23- Repeat steps 21 and 23 until no leaks are detected.

24- Replace access panel.

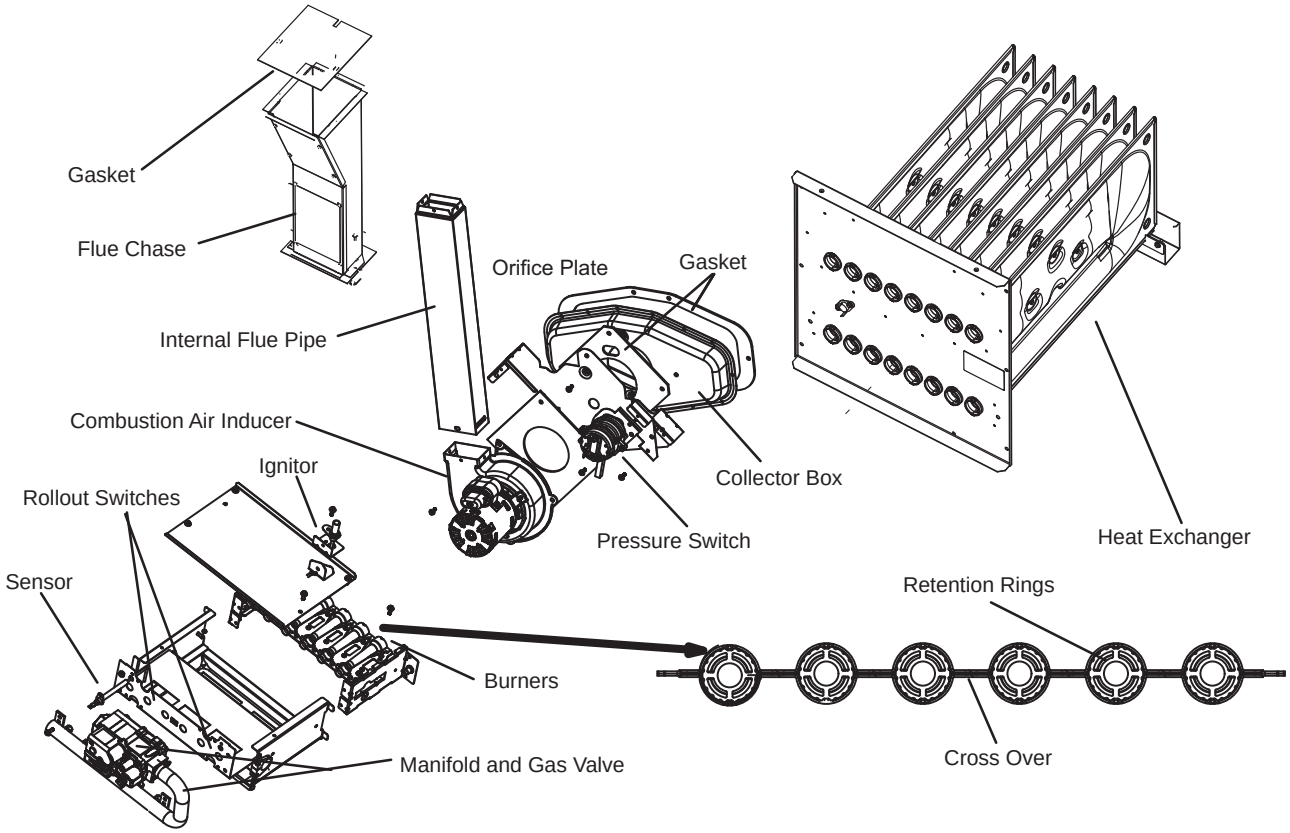


Figure 21. Burner, CAI Assembly & Heat Exchanger Removal

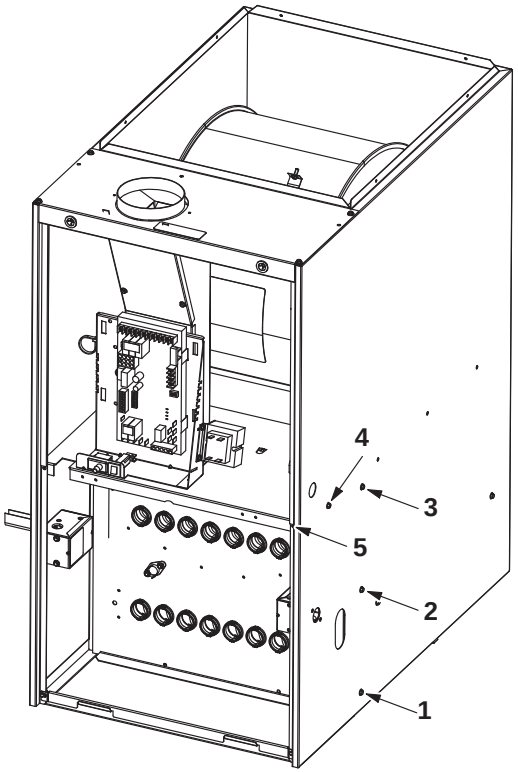


Figure 22. Remove five screws if necessary (either side of cabinet)

LOW GWP APPLICATION

⚠WARNING For use with GE Appliances approved evaporator coil and LGWP sensors only. Use original manufacturer recommended LGWP sensors if using non GE Appliances approved evaporator coil.

CONNECTING THE FURNACE CONTROL BOARD SENSOR.

See **Figure 25** and follow steps below:

1 - Route sensor wire #1 through provided grommet.

2 - Avoid sharp edges when routing sensor wire during installation.

3 - Sensor wire must not block view of 7 segment LED .

Ensure the cable is properly seated into the **SENSOR 1** plug (LGWP1). The Molex plug clip should lock into the Molex connection point for a secured connection, as shown below in **Figure 23**. Verify the connection is free of dust, debris, and moisture.

NOTE - In confined space applications, connect the second sensor to the **SENSOR 2** plug (LGWP2). Refer to evaporator coil installation instructions for more detail.

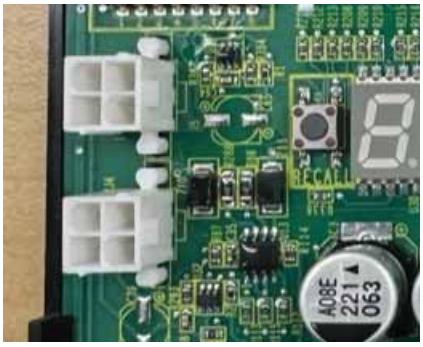


Figure 23. Two-Stage Constant Torque Control

LOW GWP DIP SWITCH SETTINGS

Adjust the DIP switch settings to the sensor configuration. Failure to do so will cause faults on power-up. See **Figure 24** and **Table 18**.

Figure 24.

Table 18. DIP Switch Settings

Configuration	Switch 1	Switch 2
One (1) sensor, connected to SENSOR 1 plug	OFF (enable)	ON (disable)
Two (2) sensors, connected to SENSOR 1 plug and SENSOR 2 plug	OFF (enable)	OFF (enable)

In single sensor configurations, the sensor must be connected to the **SENSOR 1** plug (LGWP1). Configurations other than the ones shown in **Table 18** will cause a servicing fault.

Each DIP switch corresponds to a sensor position (i.e., DIP switch 1 to sensor 1; DIP switch 2 to sensor 2). The default factory switch positions are set to **OFF (ENABLED)**

The furnace control board software reads the **OFF** position as an active sensor. A sensor should be present for the corresponding sensor connector. Setting the DIP switch to **ON** disables the sensor position.

SECONDARY SENSOR REQUIREMENTS

Additional Line Sets

If additional refrigerant line joints are present outside of the line set sleeve and a secondary refrigerant detection sensor is required, its installation must comply with the requirements listed in Refrigerant Detection Sensor Kit (27V53). See **Figure 25** for routing the secondary sensor cable through the furnace cabinet.

Non-Low GWP Applications

⚠WARNING For Furnace only applications or Furnace replacement in a Non-Low GWP applications, the LOW GWP sensors should be disabled, otherwise the blower will operate continuously. To do this, the Low GWP Dip switches setting for both – **SENSOR 1** and the **SENSOR 2** must be moved to the **ON** position.

FURNACE CONTROL BOARD LOW GWP MODES OF OPERATION

The modes of operation for the furnace control board are Initializing, Normal, Leak Detected, and Fault.

Initializing

The furnace control board is establishing connection with the refrigerant detection sensor and is completing an initial five-minute purge sequence.

Normal

The HVAC system is functioning normally. The furnace control board has not detected a refrigerant leak.

Leak Detected

When the furnace control board detects a refrigerant leak:

1. The furnace control board shuts off the (R) input (24VAC power) to the thermostat, which de-energizes the outdoor unit compressor and heat sources, such as gas and/or electric strip heat. No heating or cooling demands will be met.
2. The furnace control board activates the blower (high speed). The blower purges refrigerant from the cabinet, plenum, and ductwork.
3. After the furnace control board determines the refrigerant levels are below the safety threshold, the blower will continue to operate for the remainder of the seven (7) -minute cycle.
4. After the blower sequence is complete, the HVAC system resumes normal operation.

NOTE: The HVAC system may not maintain a cooling or heating setpoint if a significant leak exists. Any refrigerant leaks that remain unaddressed for an extended time may cause the HVAC system to shut down on a low refrigerant pressure limit condition.

Fault

When a Low GWP fault is detected by the furnace control board, the indoor unit blower engages and remains engaged at a constant air flow output until the fault is cleared.

NOTE: See **Table 4** for Low GWP diagnostic error codes.

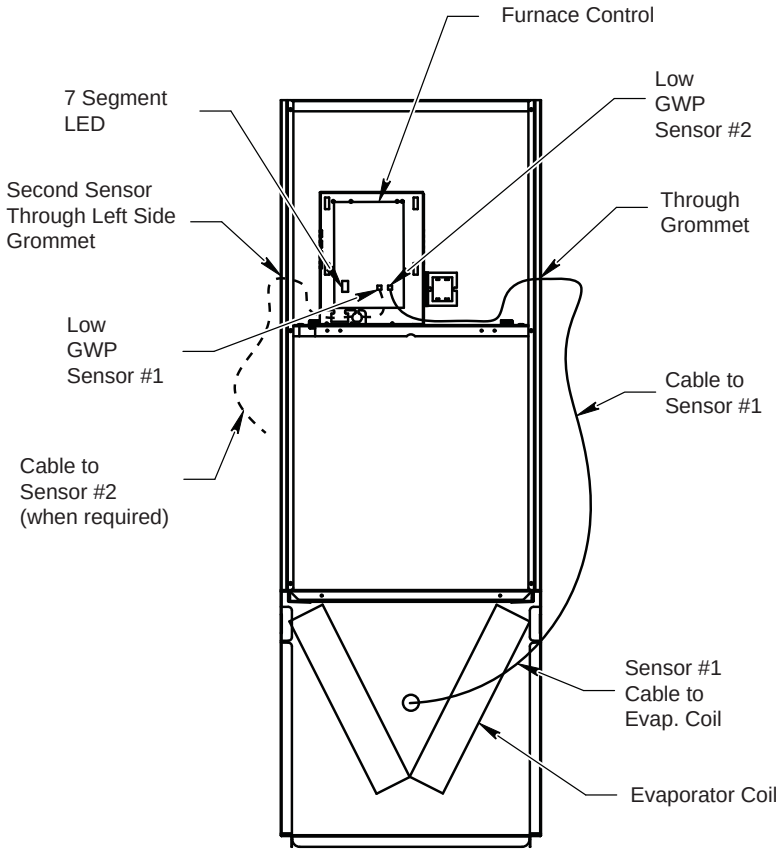


Figure 25.

LGWP TEST BUTTON FUNCTIONALITY

The furnace control board is equipped with a Test/Reset push button. The Test button can be used to perform several functions, depending on the mode of operation of the furnace control board.

Table 19 lists the functions of the Test button during each mode of operation.

Table 19. LGWP Test Button Function

Mode of Operation	Press the Test Button to:
Normal	Trigger a leak detection response. Verify all equipment is wired correctly into the furnace blower control board (after installation).
Leak Detected	Reset the furnace control board to a normal mode of operation after a previous leak has been detected and purged from the HVAC system
Fault	Reset the furnace control board after troubleshooting and resolving a fault condition. If the fault is not resolved, the furnace control board will enter the Fault mode again.

LGWP Test Button - Additional Functions

Table 20 lists the additional functions of the Test Button while the furnace control board is functioning within the states of Initializing, Monitoring, Leak Detection, Servicing and Fault.

Table 20. Additional Button Functions

State	Press	Action
Initializing	Short	Skips remaining pre-purge after sensors are recognized by the furnace control board
Initializing	Long	Reset control
Monitoring	Short	Clear purge-counter if prior mitigation has occurred; Test mitigation
Monitoring	Long	Reset control
Mitigating	Short	If testing mitigation, end test
Servicing	Short	Reevaluate fault condition - if cleared return to monitoring, otherwise update indicator
Servicing	Long	Reset control
Fault	Short	Reevaluate fault condition - if cleared return to monitoring, otherwise update indicator
Fault	Long	Reset control

External Alarm

(For applications with external alarms wired directly to the furnace control board)

The furnace control board triggers the external alarm system when it enters Leak Detected mode. For alarm notifications, the furnace control board provides a dry relay contact that is rated 3A at 30 VAC/DC.

THERMOSTAT COMPATIBILITY

Thermostats that preserve memory settings are compatible with the furnace control board. Examples include:

- Battery-powered thermostats
- Analog Thermostat
- Late-model programmable thermostats

NOTE: Early-generation digital and programmable thermostats may not retain the operation mode and temperature setpoints after a power outage.

The following scenarios are likely to occur when home occupants are not available to adjust the thermostat setpoints as the system is recovering from leak detection and resuming normal operation:

- Heating could be lost during a cold night
- Cooling could be lost during a hot day
- The thermostat could reset to an incorrect temperature setpoint.

START UP PROCEDURE

The furnace control board is equipped with a LGWP Test/Reset button, see **Test Button Functionality**. After the furnace control board has been mounted and wired, restore power to the HVAC system. The system will then run through a purge sequence for five minutes. After the purge sequence is complete, proceed to testing cooling demand and heating demand.

Cooling Demand

1. Prompt a cooling demand at the thermostat.
2. Press the **LGWP Test** button on the furnace control board. The system then executes a leak detection response.
3. Observe the following sequence:
   a. The LED indicator for leak detection. See **Table 5** for Low GWP diagnostic error codes.
   b. The blower powers up.
   c. The outdoor compressor powers down.
4. Press the **LGWP Test** button to terminate the simulated Leak Detected mode upon test completion.

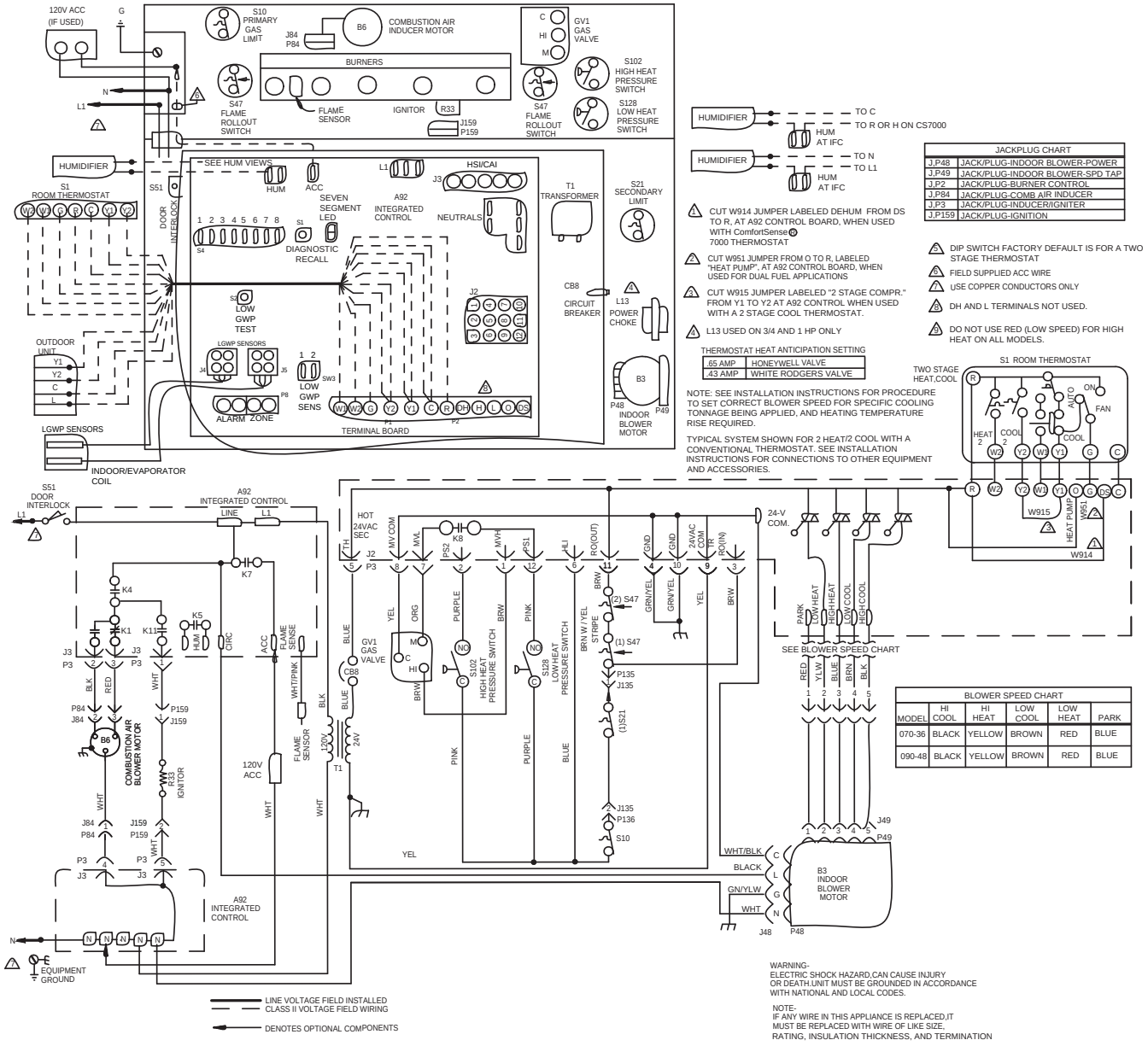
Heating Demand

1. Prompt a heating demand at the thermostat.
2. Press the **LGWP Test** button on the furnace control board. The system then executes a leak detection response.
3. Observe the following sequence:
   a. The LED indicator for leak detection. See **Table 5** for Low GWP diagnostic error codes.
   b. The blower powers up.
   c. The gas burners power down.
   d. The outdoor compressor powers down.
4. Press the **LGWP Test** button to terminate the simulated Leak Detected mode upon test completion.

The installation of the Refrigerant Detection System is complete after both sequences are successfully completed.

Service Information

WIRING AND SEQUENCE OF OPERATION



Service Information

Electronic Ignition

The two-stage integrated control used in the **NF80D***T**R units have an added feature of an internal soft lockout control. The feature serves as an automatic reset device for ignition control lockout caused by ignition failure. After one hour of continuous thermostat demand for heat, the soft lockout will break and remake thermostat demand to the furnace and automatically reset the control to begin the ignition sequence.

NOTE: The ignition control thermostat selection DIP switch is factory-set in the “TWO-STAGE” position.

Applications Using a Two-Stage Thermostat

See Figure 26 for ignition operation sequence.

A - Heating Sequence -- Integrated Control Thermostat Selection DIP Switch 1 OFF in “Two-Stage” Position (Factory Setting)

1. On a call for heat, thermostat first-stage contacts close sending a signal to the integrated control. The integrated control runs a self-diagnostic program and checks high temperature limit switches for normally closed contacts and pressure switches for normally open contacts. The combustion air inducer is energized at low speed.
2. Once the control receives a signal that the low pressure switch has closed, the combustion air inducer begins a 15-second pre-purge in low speed.

   NOTE: If the low fire pressure switch does not close the combustion air inducer will switch to high fire. After a 15 second pre-purge the high fire pressure switch will close and the unit will begin operation on high fire. After 10 to 20 seconds of high fire operation the unit will switch to low fire.
3. After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at low speed.
4. After the 20-second warm-up period has ended, the gas valve is energized on low fire (first stage) and ignition occurs. At the same time, the control module sends a signal to begin an indoor blower 30-second ON-delay. When the delay ends, the indoor blower motor is energized on the low fire heating speed, the HUM contacts close energizing the humidifier and 120V ACC terminal is energized. The furnace will continue this operation as long as the thermostat has a first-stage heating demand.

   NOTE: If the indoor thermostat is set on **CONTINUOUS FAN ON** mode, the furnace will light on high fire (second-stage) for 60 seconds to improve heat exchanger warm up. After 60 second warm-up period, furnace will switch to low fire (first-stage).
5. If second-stage heat is required, the thermostat second-stage heat contacts close and send a signal to the integrated control. The integrated control initiates a 30-second second-stage recognition delay.
6. At the end of the recognition delay, the integrated control energizes the combustion air inducer at high speed. The control also checks the high fire (second stage) pressure switch to make sure it is closed. The high fire (second stage) gas valve is energized and the indoor blower motor is energized for operation at the high fire heating speed.
7. When the demand for high fire (second stage) heat is satisfied, the combustion air inducer is switched to the low-fire heating speed and the high-fire (second stage) gas valve is de-energized. The low-fire (first stage) gas valve continues operation. The indoor blower motor is switched to the low-fire heating speed.
8. When the thermostat demand for low-fire (first stage) heat is satisfied, the gas valve is de-energized and the field-selected indoor blower off delay begins. The combustion air inducer begins a 5-second post-purge period.
9. When the combustion air post-purge period is complete, the inducer and the HUM contacts are de-energized. The indoor blower is de-energized at the end of the off delay as well a s the 120V ACC terminal.

Applications Using A Single-Stage Thermostat

See Figure 27 for ignition control sequence

B - Heating Sequence -- Integrated Control Thermostat Selection DIP Switch 1 ON in "Single-Stage" Position

NOTE - In these applications, two-stage heat will be initiated by the integrated control if heating demand has not been satisfied after the field adjustable period (7 or 12 minutes).

1. On a call for heat, thermostat first-stage contacts close sending a signal to the integrated control. The integrated control runs a self-diagnostic program and checks high temperature limit switches for normally closed contacts and pressure switches for normally open contacts. The combustion air inducer is energized at low speed.
2. Once the control receives a signal that the low pressure switch has closed, the combustion air inducer begins a 15-second pre-purge in low speed.

   NOTE: If the low fire pressure switch does not close the combustion air inducer will switch to high fire. After a 15 second pre-purge the high fire pressure switch will close and the unit will begin operation on high fire.
3. After 10 to 20 seconds of high fire operation the unit will switch to low fire. 3. After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at low speed.
4. After the 20-second warm-up period has ended, the gas valve is energized on low fire (first stage) and ignition occurs. At the same time, the control module sends a signal to begin an indoor blower 30-second ON-delay. When the delay ends, the indoor blower motor is energized on the low fire heating speed and the HUM contacts are energized. The integrated control also initiates a second-stage on delay (factory-set at 7 minutes; adjustable to 12 minutes).
5. If the heating demand continues beyond the secondstage on delay, the integrated control energizes the combustion air inducer at high speed. The control also checks the high fire (second stage) pressure switch to make sure it is closed. The high fire (second stage) gas valve is energized and the indoor blower motor is energized for operation at the high fire heating speed.
6. When the thermostat heating demand is satisfied, the combustion air inducer begins a 5-second low speed post-purge. The field-selected indoor blower off delay begins. The indoor blower operates at the low-fire heating speed.
7. When the combustion air post-purge period is complete, the inducer and the HUM contacts are de-energized. The indoor blower is de-energized at the end of the off delay as well as the 120V ACC terminal.

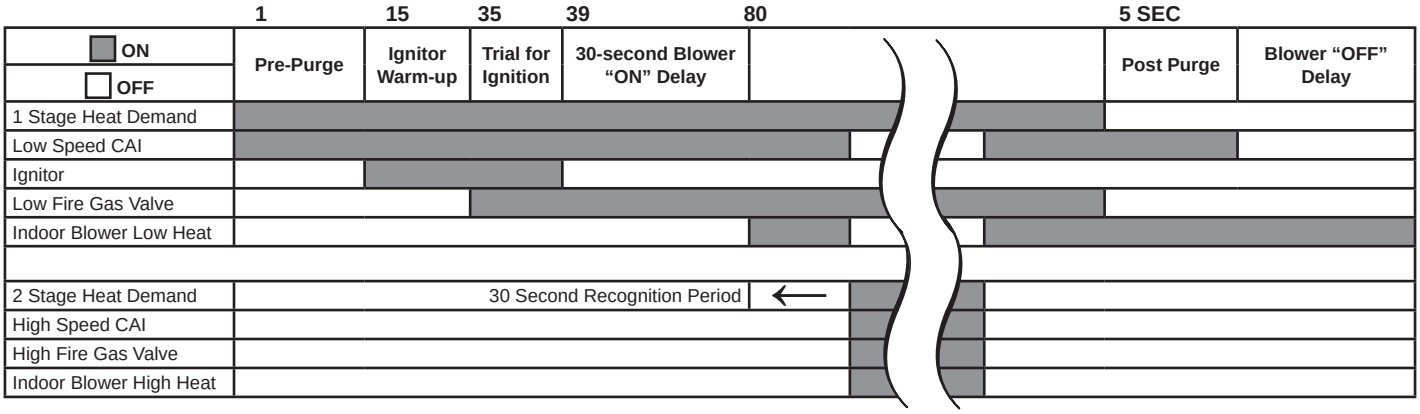


Figure 26.

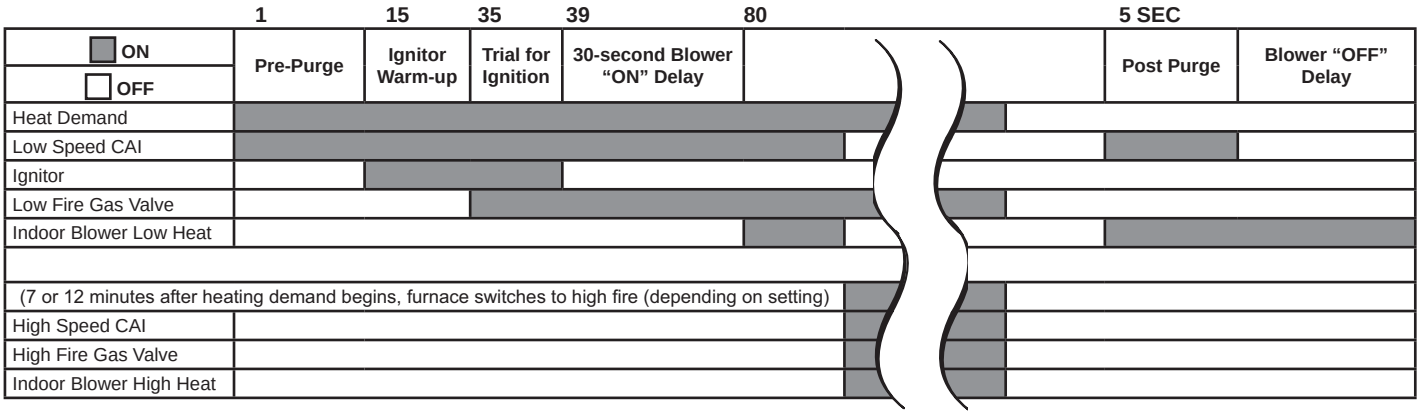
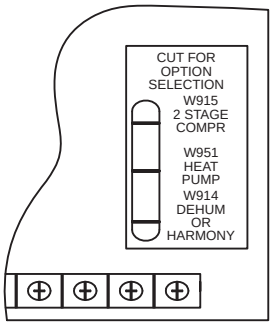
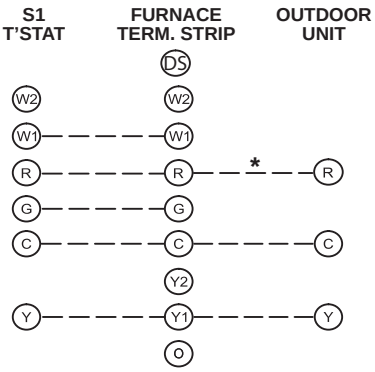
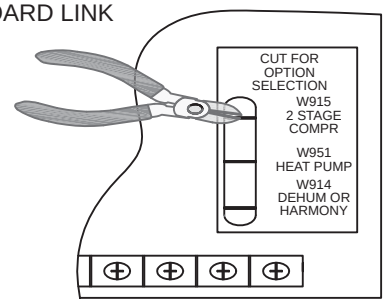
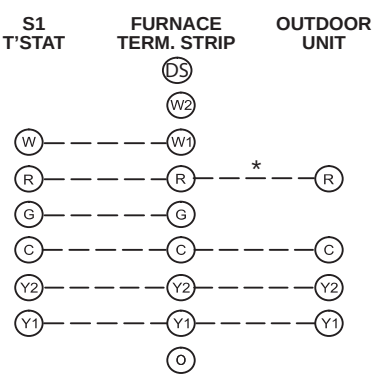
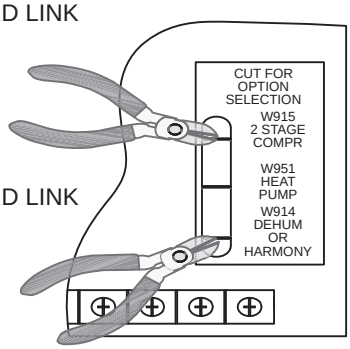
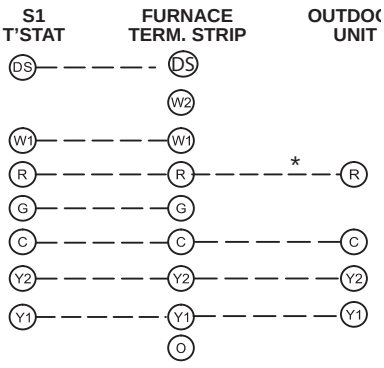


Figure 27.

Service Information

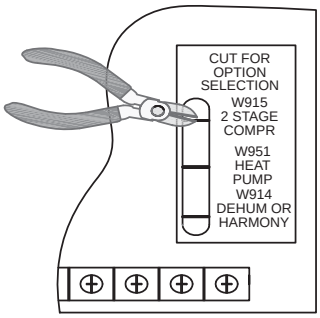
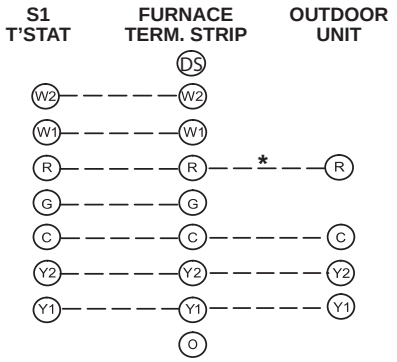
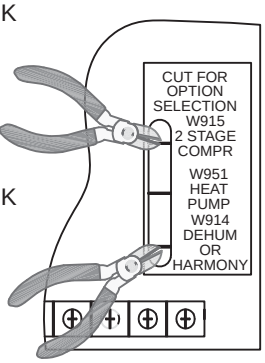
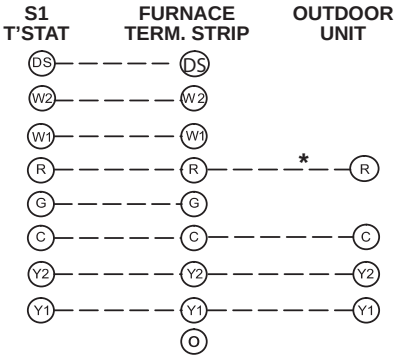
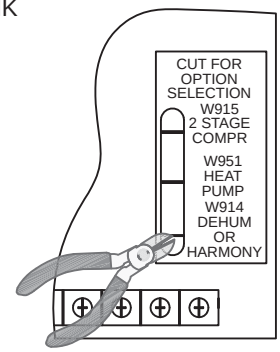
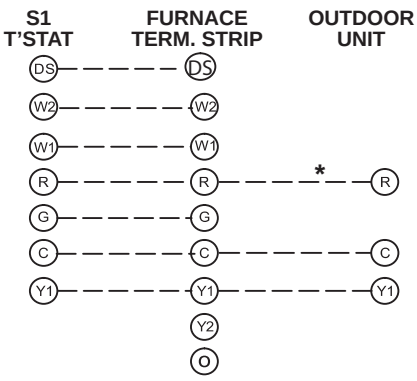
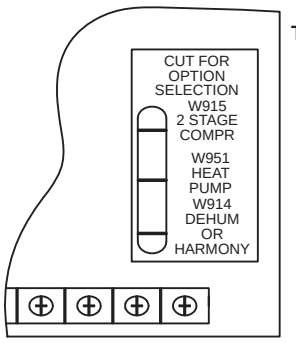
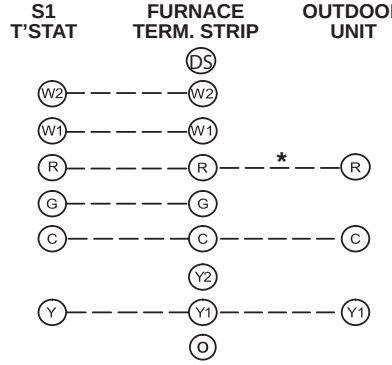
Field Wiring and DIP Switch Settings

Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options	
1 Heat / 1 Cool **NOTE:** Use DIP switch 2 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.	ON	DO NOT CUT ANY ON-BOARD LINKS 	
1 Heat / 2 Cool **NOTE:** Use DIP switch 2 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.	ON	CUT ON-BOARD LINK W915 2 STAGE COMPR 	
1 Heat / 2 Cool with t'stat with humidity control **NOTE:** Use DIP switch 2 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.	ON	CUT ON-BOARD LINK W915 2 STAGE COMPR CUT ON-BOARD LINK W914 DEHUM OR HARMONY 	

* Not required on all units.

Service Information

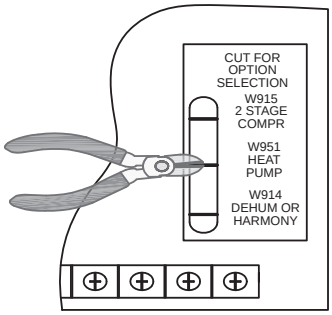
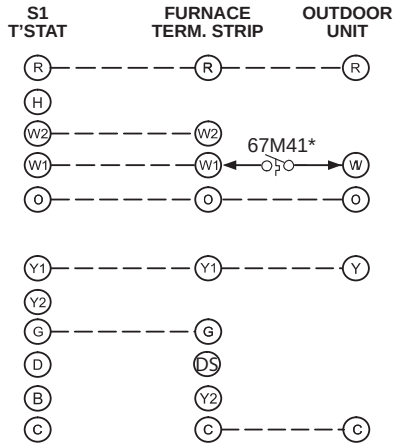
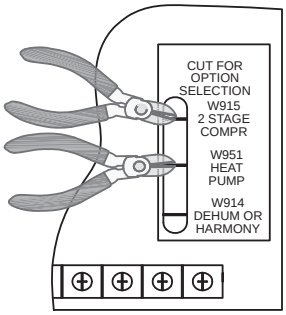
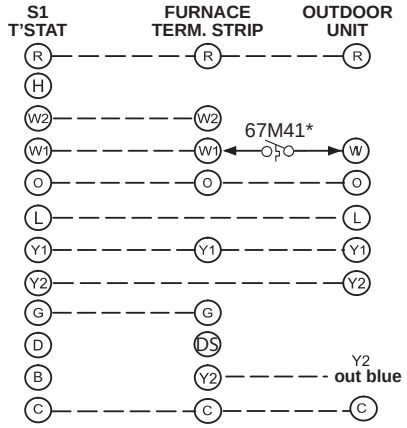
Field Wiring and DIP Switch Settings (Cont.)

Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options	
2 Heat / 2 Cool	OFF	CUT ON-BOARD LINK W915 2 STAGE COMPR 	
2 Heat / 2 Cool with t'stat with humidity control.	OFF	CUT ON-BOARD LINK W915 2 STAGE COMPR CUT ON-BOARD LINK W914 DEHUM OR HARMONY 	
2 Heat / 1 Cool with t'stat with humidity control.	OFF	CUT ON-BOARD LINK W914 DEHUM OR HARMONY 	
2 Heat / 1 Cool.	OFF	DO NOT CUT ANY ON-BOARD LINKS 	

* Not required on all units.

Service Information

Field Wiring and DIP Switch Settings (Cont.)

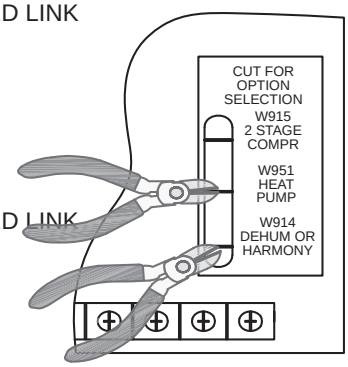
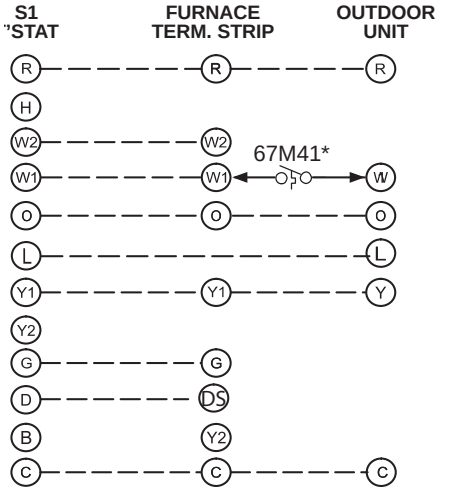
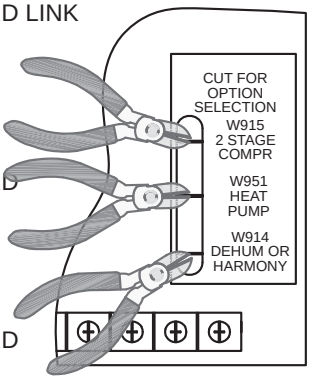
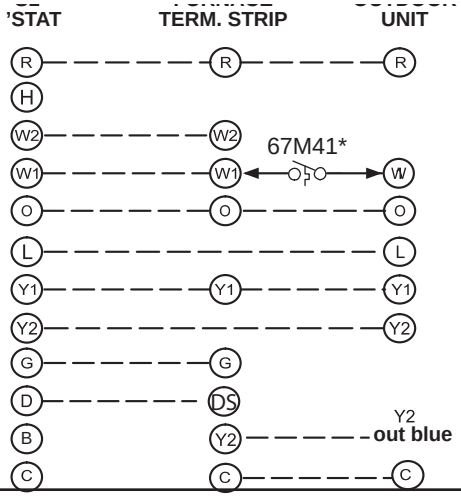
Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options	
Dual Fuel Single Stage Heat Pump thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control	OFF	CUT ON-BOARD LINK W951 HEAT PUMP 	
Dual Fuel Two Stage Heat Pump thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control	OFF	CUT ON-BOARD LINK W915 2 STAGE COMPR CUT ON-BOARD LINK W951 HEAT PUMP 	

* Connect W1 to W1 ONLY if using defrost tempering kit 67M41

NOTE: DO NOT make a wire connection between the room thermostat L terminal and the L terminal of the furnace integrated control.

Service Information

Field Wiring and DIP Switch Settings (Cont.)

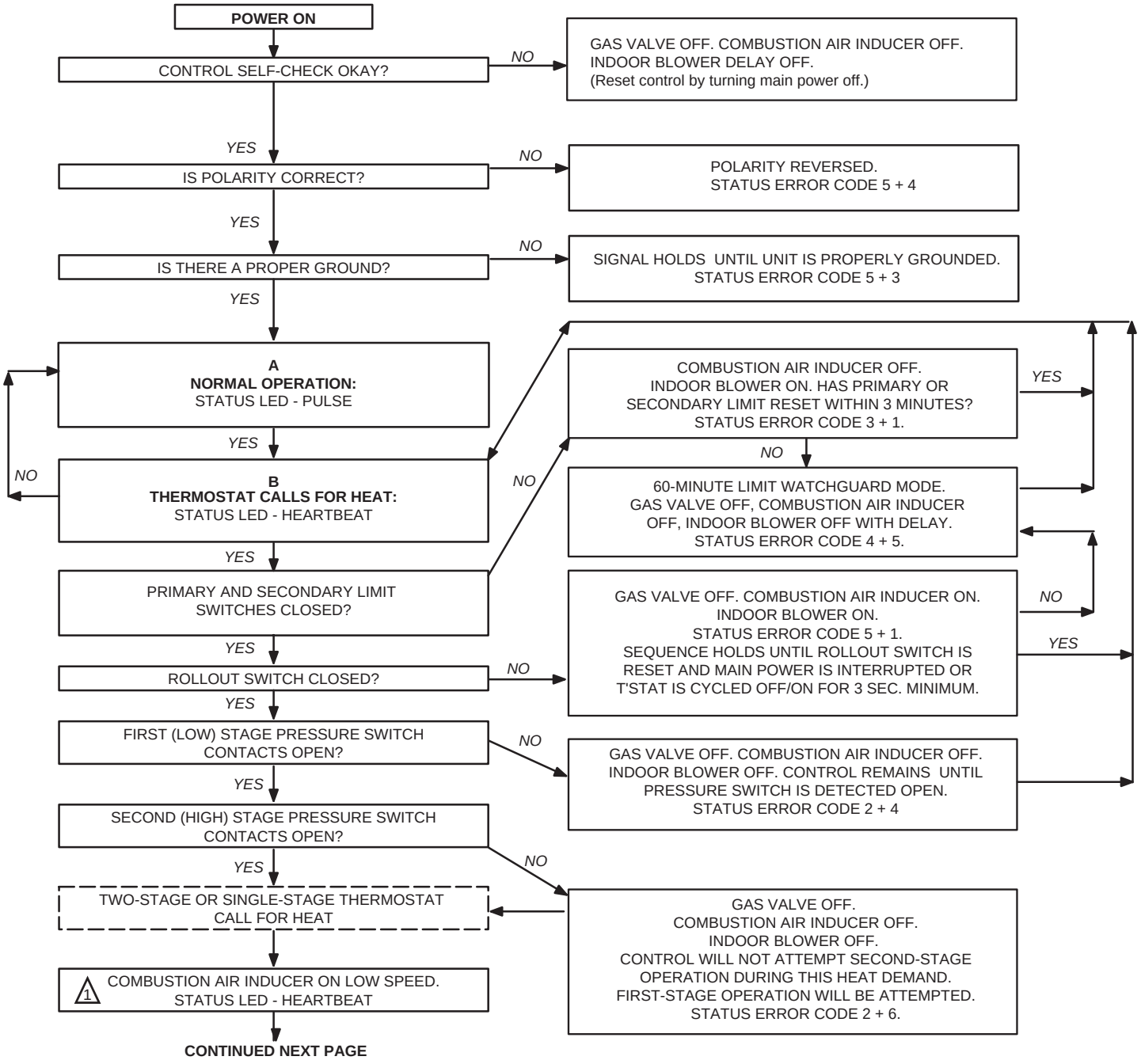
Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options	
Dual Fuel Single Stage Heat Pump thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control w/ dehumidification control	OFF	CUT ON-BOARD LINK W951 HEAT PUMP CUT ON-BOARD LINK W914 DEHUM OR HARMONY 	
Dual Fuel Two Stage Heat Pump thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control w/ dehumidification control	OFF	CUT ON-BOARD LINK W915 2 STAGE COMPR CUT ON-BOARD LINK W951 HEAT PUMP CUT ON-BOARD LINK W914 DEHUM OR HARMONY 	

* Connect W1 to W1 ONLY if using defrost tempering kit 67M41

NOTE: DO NOT make a wire connection between the room thermostat L terminal and the L terminal of the furnace integrated control.

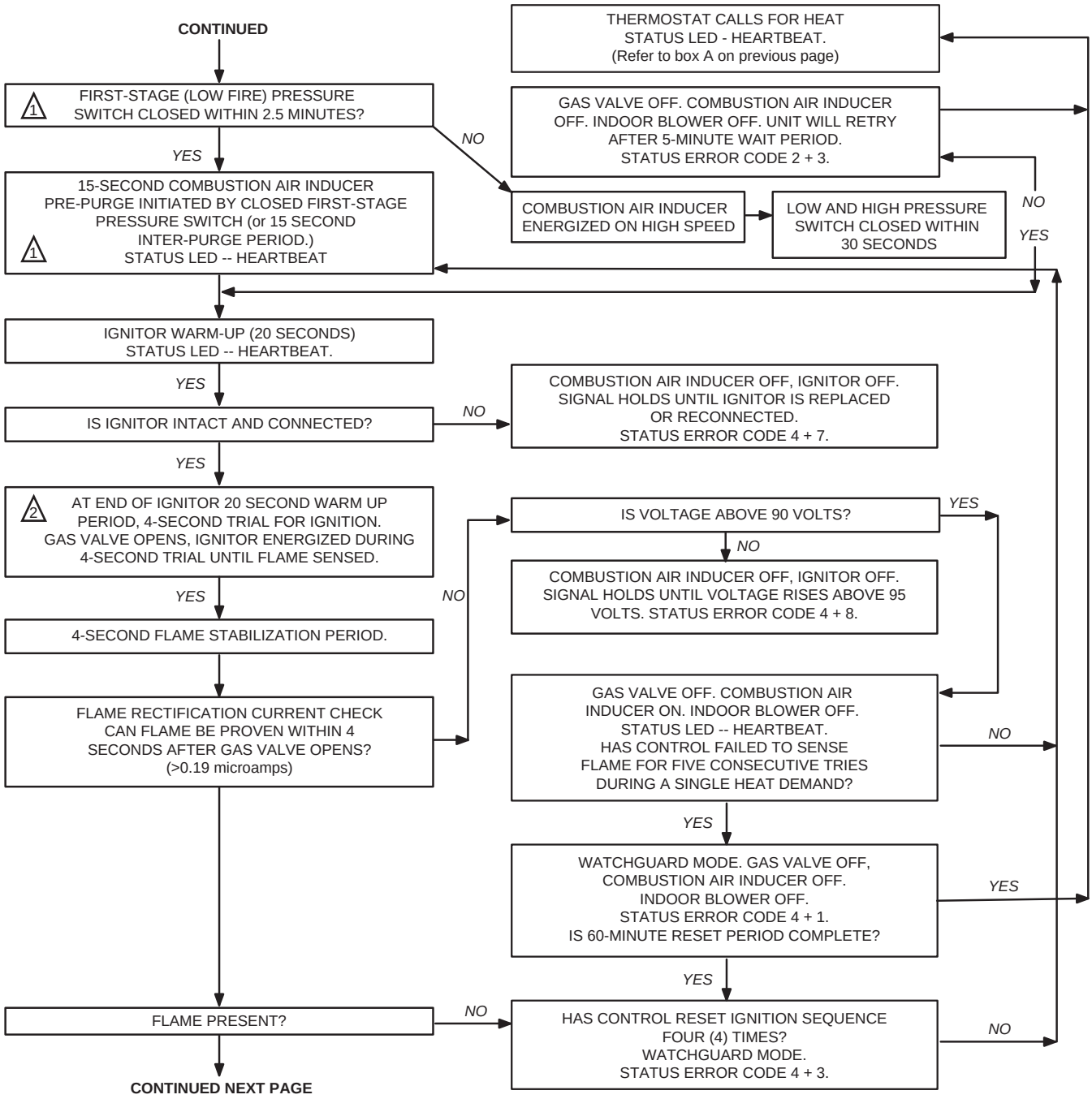
TROUBLESHOOTING

Heating Sequence of Operation - Normal and Abnormal Heating Mode



1 If the furnace is operating on continuous fan mode (terminals “R” and “G” are energized), the combustion air inducer will energize on high speed, the gas valve will energize on second-stage heat and the furnace will operate on high fire. Furnace will stay on high fire 60 seconds then switch to low fire.

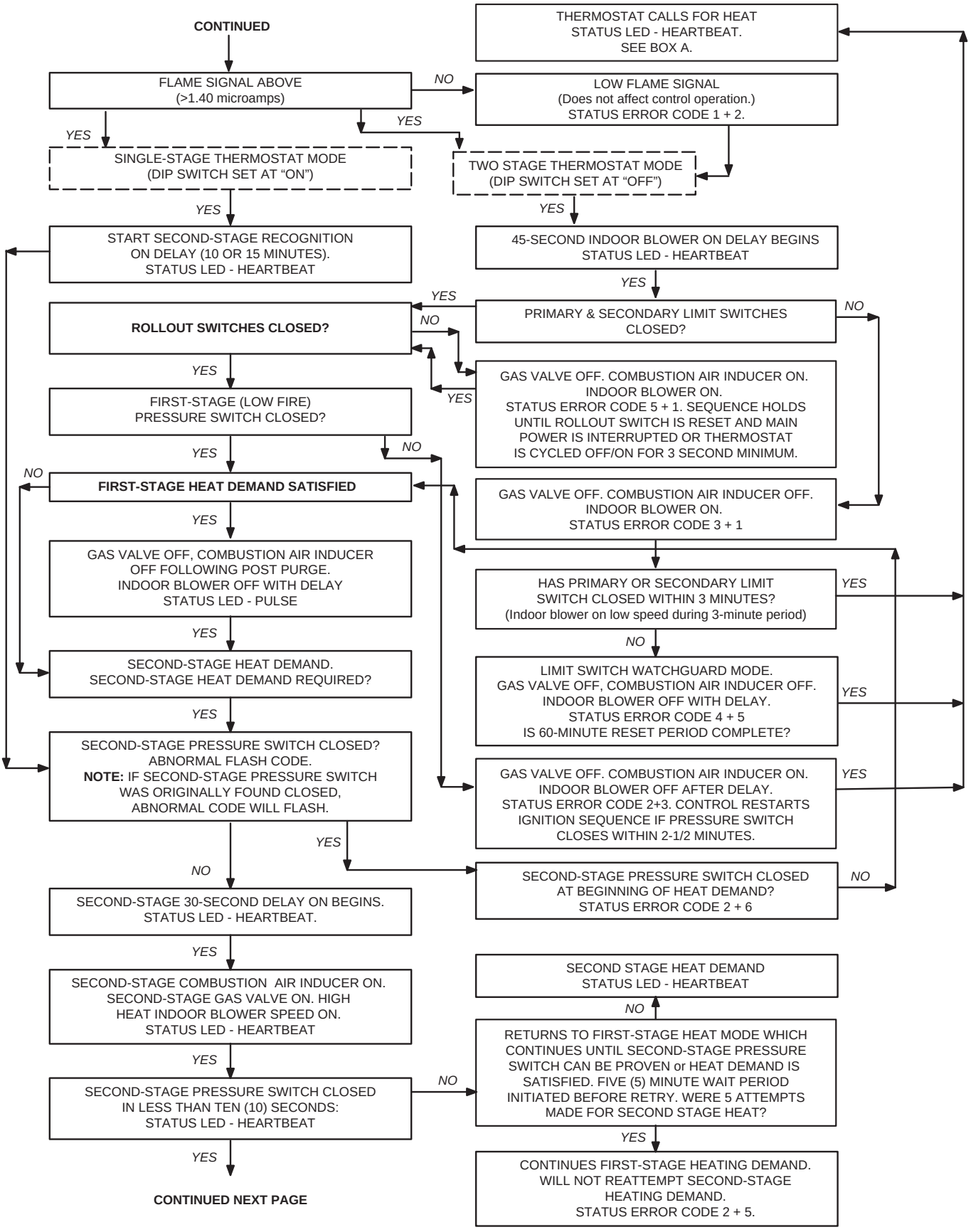
TROUBLESHOOTING - Heating Sequence of Operation (Cont)



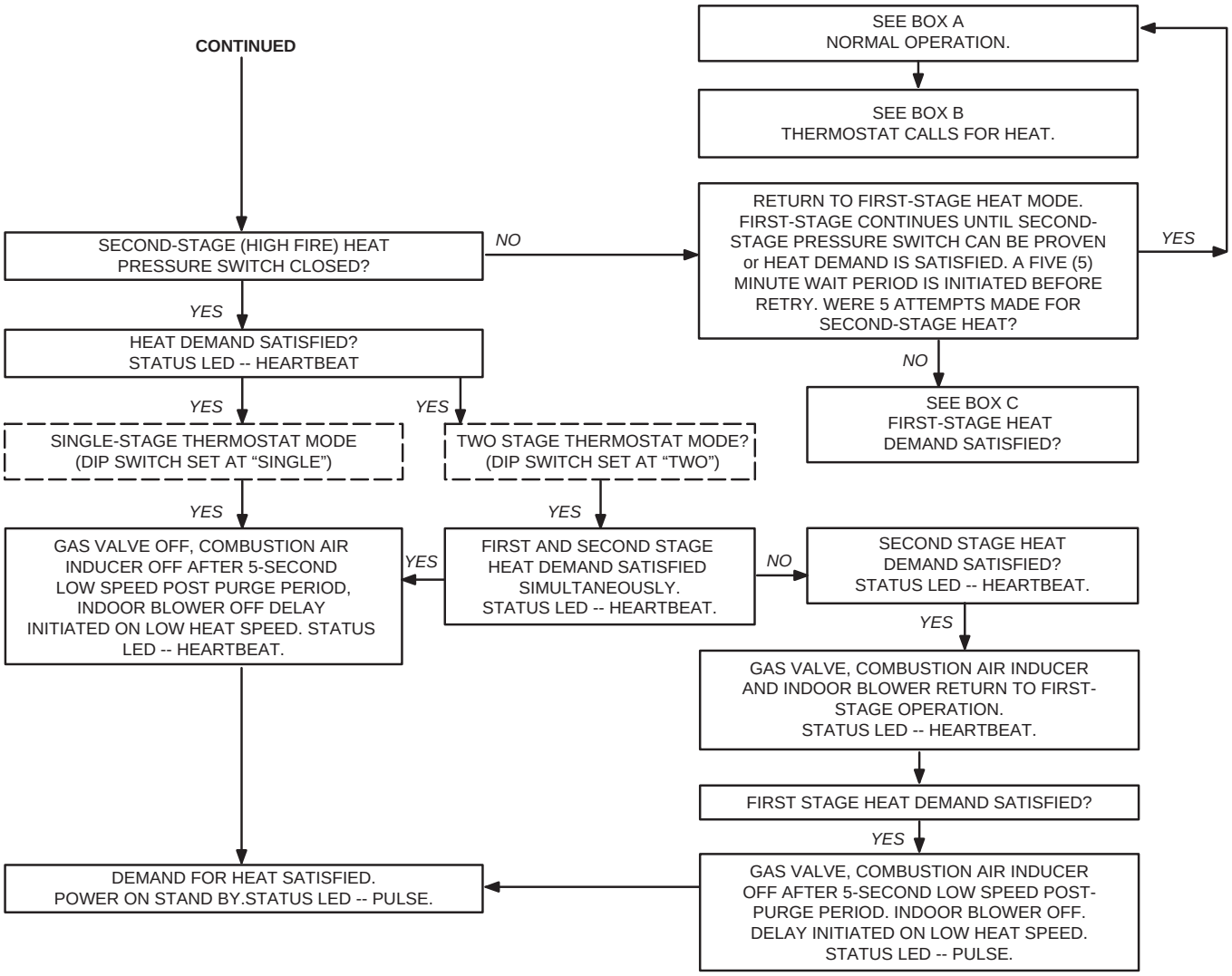
1 If the furnace is operating on continuous fan mode (terminals “R” and “G” are energized), the combustion air inducer will energize on high speed, the gas valve will energize on second-stage heat and the furnace will operate on high fire. Furnace will stay on high fire 60 seconds then switch to low fire.

2 If combustion air inducer is operating on high speed and gas valve is energized on second-stage heat, 20 seconds after flame is sensed furnace will switch to low fire.

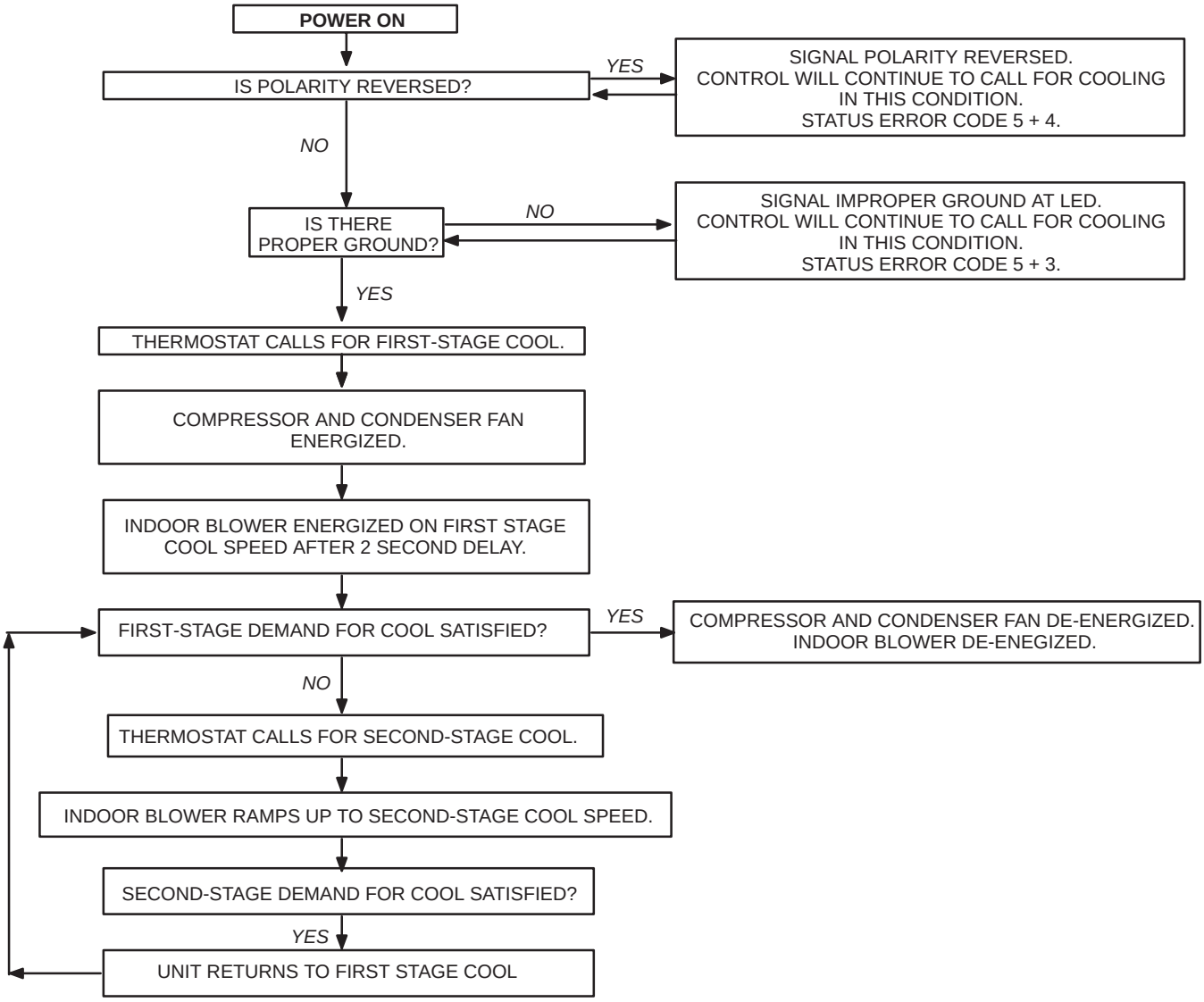
TROUBLESHOOTING - Heating Sequence of Operation (Cont)



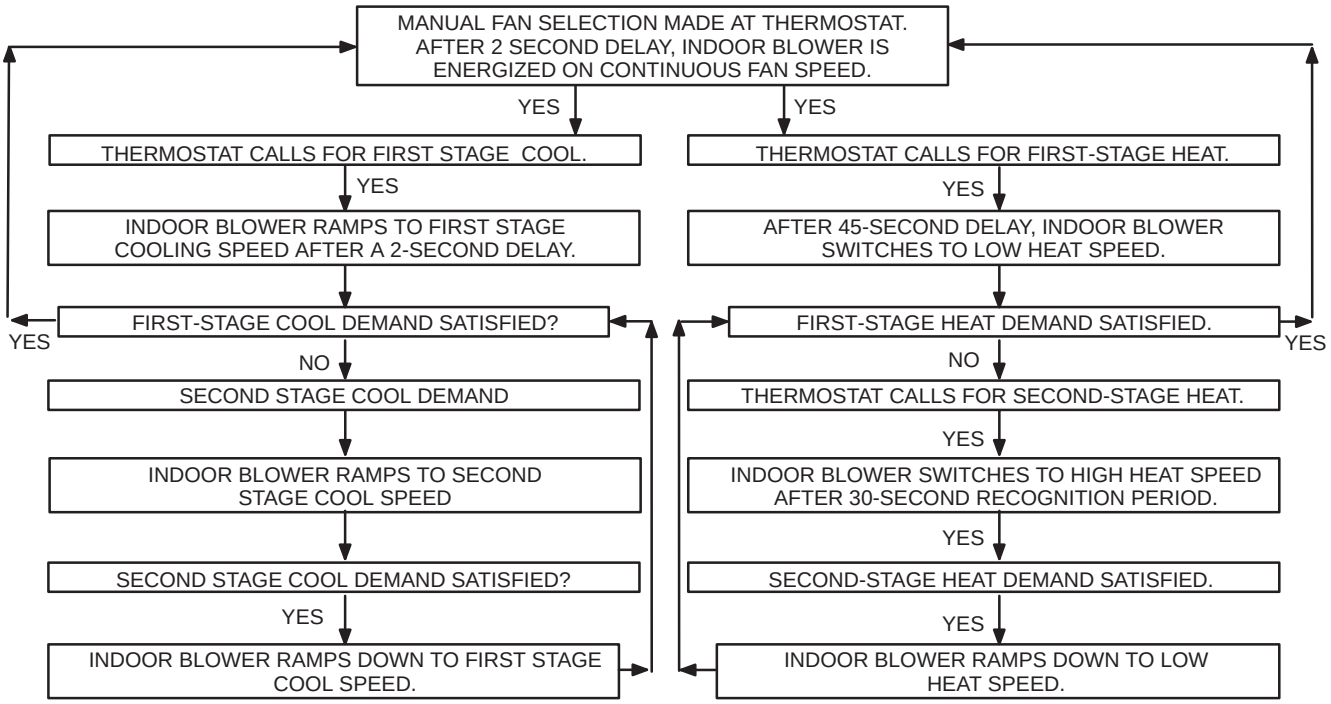
TROUBLESHOOTING - Heating Sequence of Operation (Cont)



TROUBLESHOOTING - Cooling Sequence of Operation



TROUBLESHOOTING - Continuous Low Speed Fan Sequence of Operation



GE APPLIANCES

All specifications and illustrations subject to change without notice and without incurring obligations.

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