GE APPLIANCES

Service Manual

NF80U***V**R

80% Upflow/Horizontal Two Stage
Variable Speed Gas Furnace

Contact GE Appliances at:

Homeowner: **GEAppliances.com**
HVAC Pro: **GEAppliancesAirandWater.com**
or
866.814.3633

Split System USAC and USHP matches:
AHRIDirectory.org

READ CAREFULLY.
KEEP THESE INSTRUCTIONS.

31-5001000 Rev. 0 09-25

General Information

NF80U*V**R** series units are 80% efficiency gas furnaces used for upflow and horizontal applications only, manufactured with GE Appliances heat exchangers formed of aluminized steel. Units are available in heating inputs of 66,000 to 110,000 Btuh and cooling applications up to 5 tons.

Units are factory equipped for use with natural gas. Kits are available for conversion to LPG operation. **NF80U***V**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

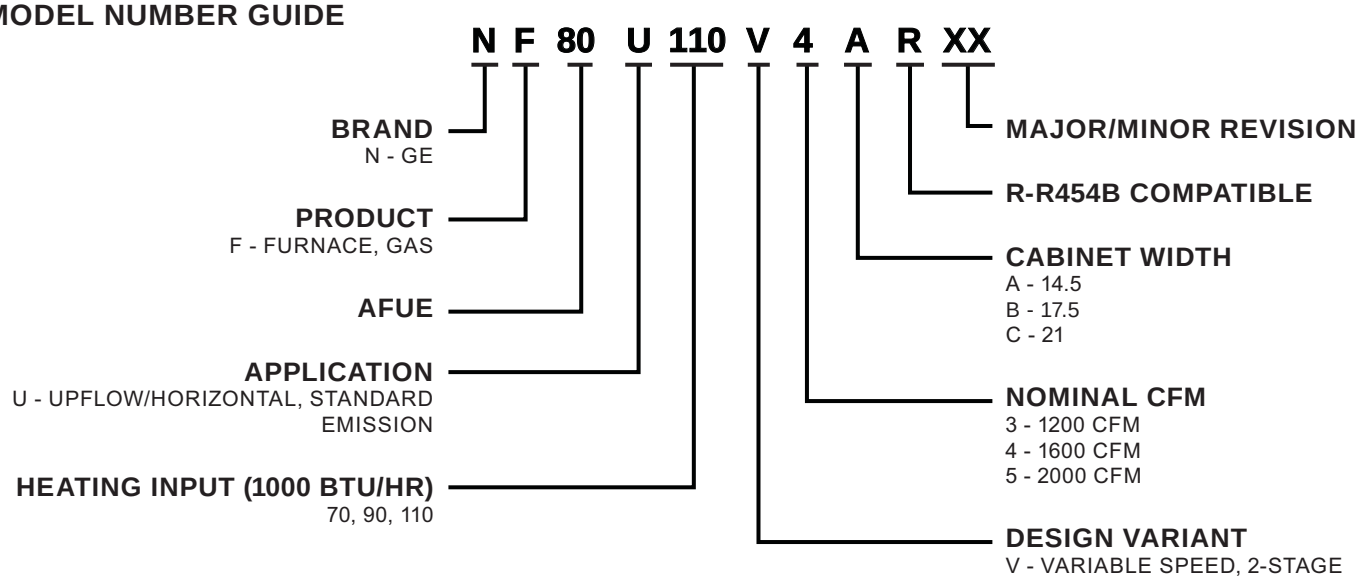
- Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional HVAC installer or equivalent, service agency, or the gas supplier.
- **Electric shock hazard.** Can 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.
- This furnace is equipped with an ignition control factory enabled for use with A2L refrigerant systems. Disabling the refrigerant detection functionality on A2L system is prohibited by safety codes. Refer to furnace installation instructions for non-A2L refrigerant system setup.

⚠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

MODEL NUMBER GUIDE



PHYSICAL AND ELECTRICAL DATA

	Model	Input (Btuh)	Output* (Btuh)	AFUE (ICS)	Nominal 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	NF80U070V3AR	66,000	52,000	80.0%	3 tons	1/2	120-60-1	15	7.7	40	128
	NF80U090V4BR	88,000	70,000	80.0%	4 tons	1/2	120-60-1	20	12.8	40	154
	NF80U110V5CR	110,000	87,000	80.0%	5 tons	1/2	120-60-1	20	12.8	40	181

Note: For vent length and clearances to combustibles, please reference installation instructions.
** Outputs shown are High Fire, 100% rate, Low Fire is 67% of shown output.*

Blower Data

				Bottom Return Air							
				Heating CFM @ 0 through 0.8” w.c.				Cooling CFM @ 0 through 1.0” w.c.			
Model	Motor Hp	Stage	Speed Adjustment*	Heat Setting D	Heat Setting C	Heat Setting B	Heat Setting A	Cool Setting D	Cool Setting C	Cool Setting B	Cool Setting A
NF80U070V3AR	1/2	2nd	Norm	715	900	934	1026	920	985	1105	1225
		1st	Norm	679	754	842	937	690	735	795	885
NF80U090V4BR	1	2nd	Norm	1013	1079	1130	1390	940	1200	1405	1600
		1st	Norm	926	996	1033	1271	600	810	960	1090
* Speed Adjustment (+) or (-) 10% by moving jumper from NORM.											

				Bottom Return Air, Return Air from Both Sides or Return Air from Bottom and One Side							
				Heating CFM @ 0 through 0.8” w.c.				Cooling CFM @ 0 through 1.0” w.c.			
Model	Motor Hp	Stage	Speed Adjustment*	Heat Setting D	Heat Setting C	Heat Setting B	Heat Setting A	Cool Setting D	Cool Setting C	Cool Setting B	Cool Setting A
NF80U110V5CR	1/2	2nd	Norm	1288	1405	1489	1543	1401	1564	1714	1877
		1st	Norm	1178	1301	1361	1410	969	1075	1181	1336
* Speed Adjustment (+) or (-) 10% by moving jumper from NORM.											

				Single Side Return Air							
				Heating CFM @ 0 through 0.8” w.c.				Cooling CFM @ 0 through 1.0” w.c.			
Model	Motor Hp	Stage	Speed Adjustment*	Heat Setting D	Heat Setting C	Heat Setting B	Heat Setting A	Cool Setting D	Cool Setting C	Cool Setting B	Cool Setting A
NF80U070V3AR	1/2	2nd	Norm	707	890	925	1013	926	1003	1104	1213
		1st	Norm	673	750	864	949	689	726	795	859
NF80U090V4BR	1	2nd	Norm	1013	1075	1130	1394	897	1158	1346	1499
		1st	Norm	926	996	1033	1271	571	778	930	1040
NF80U110V5CR	1	2nd	Norm	1277	1368	1447	1501	1375	1526	1687	1843
		1st	Norm	1169	1250	1323	1382	942	1048	1154	1277
* Speed Adjustment (+) or (-) 10% by moving jumper from NORM.											

				Side Return with Optional Return Air Base							
				Heating CFM @ 0 through 0.8” w.c.				Cooling CFM @ 0 through 1.0” w.c.			
Model	Motor Hp	Stage	Speed Adjustment*	Heat Setting D	Heat Setting C	Heat Setting B	Heat Setting A	Cool Setting D	Cool Setting C	Cool Setting B	Cool Setting A
NF80U070V3AR	1/2	2nd	Norm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
		1st	Norm	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
NF80U090V4BR	1	2nd	Norm	1017	1079	1140	1390	904	1126	1347	1525
		1st	Norm	930	981	1045	1277	599	762	928	1045
NF80U110V5CR	1	2nd	Norm	1280	1367	1431	1505	1469	1536	1654	1813
		1st	Norm	1174	1252	1318	1385	1008	1038	1159	1307
* Speed Adjustment (+) or (-) 10% by moving jumper from NORM.											

Accessory List

ACCESSORY LIST

CATALOG NUMBER	DESCRIPTION
Return Air Base	
68W61	14.5", A Width
68W62	17.5”, B Width
68W63	21.0”, C Width

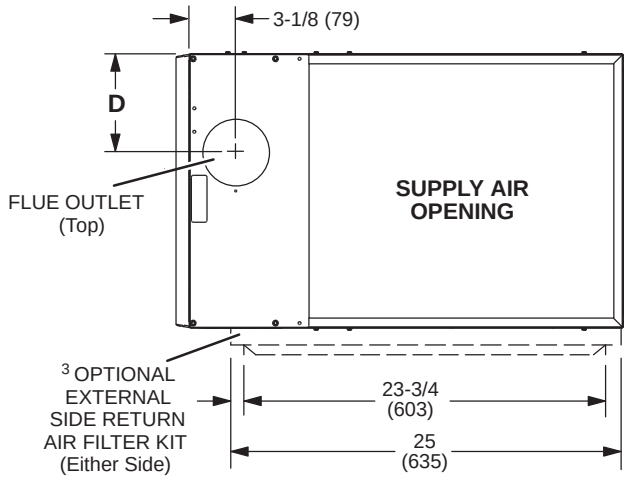
Note: For vent length and clearances to combustibles, please reference installation instructions.

		Natural Gas High Altitude Conversion Kit			Pressure Switch			LP High Alt. Conversion Kit		
MODEL NUMBER	**Description**	**0-4500**	**4500-7500**	**7500-10,000**	**0-4500**	**4500-7500**	**7500-10,000**	**0-4500**	**4500-7500**	**7500-10,000**
NF80U070V3AR	80% Upflow 2-Stage Variable Speed	Not Required		51W01	Not Required	NR	73W35	11K48		11K47
NF80U090V4BR						69W56				
NF080U110V5CR										

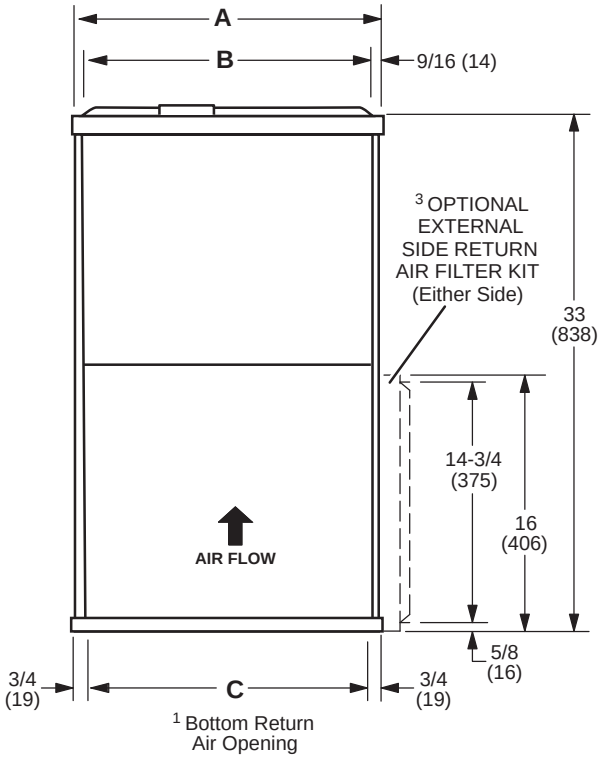
Refrigerant Detection System (Rds) Components

Description	Order No.
Refrigerant Detection System (RDS) Coil Sensor Kit	27V53

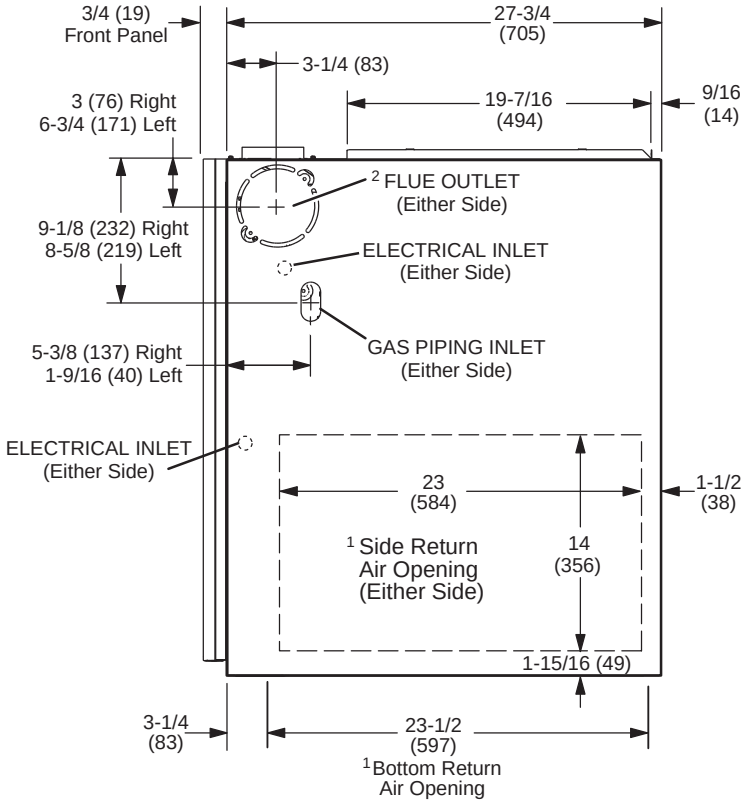
Unit Dimensions



TOP VIEW



FRONT VIEW



SIDE VIEW

Capacity	A		B		C		D	
	in.	mm	in.	mm	in.	mm	in.	mm
070-3AR	14-1/2	368	13-3/8	340	13	330	4-3/4	121
090-4BR	17-1/2	446	16-3/8	416	16	406	6-1/4	159
110-5CR	21	533	19-7/8	504	19-1/2	495	8	203

Parts Arrangement

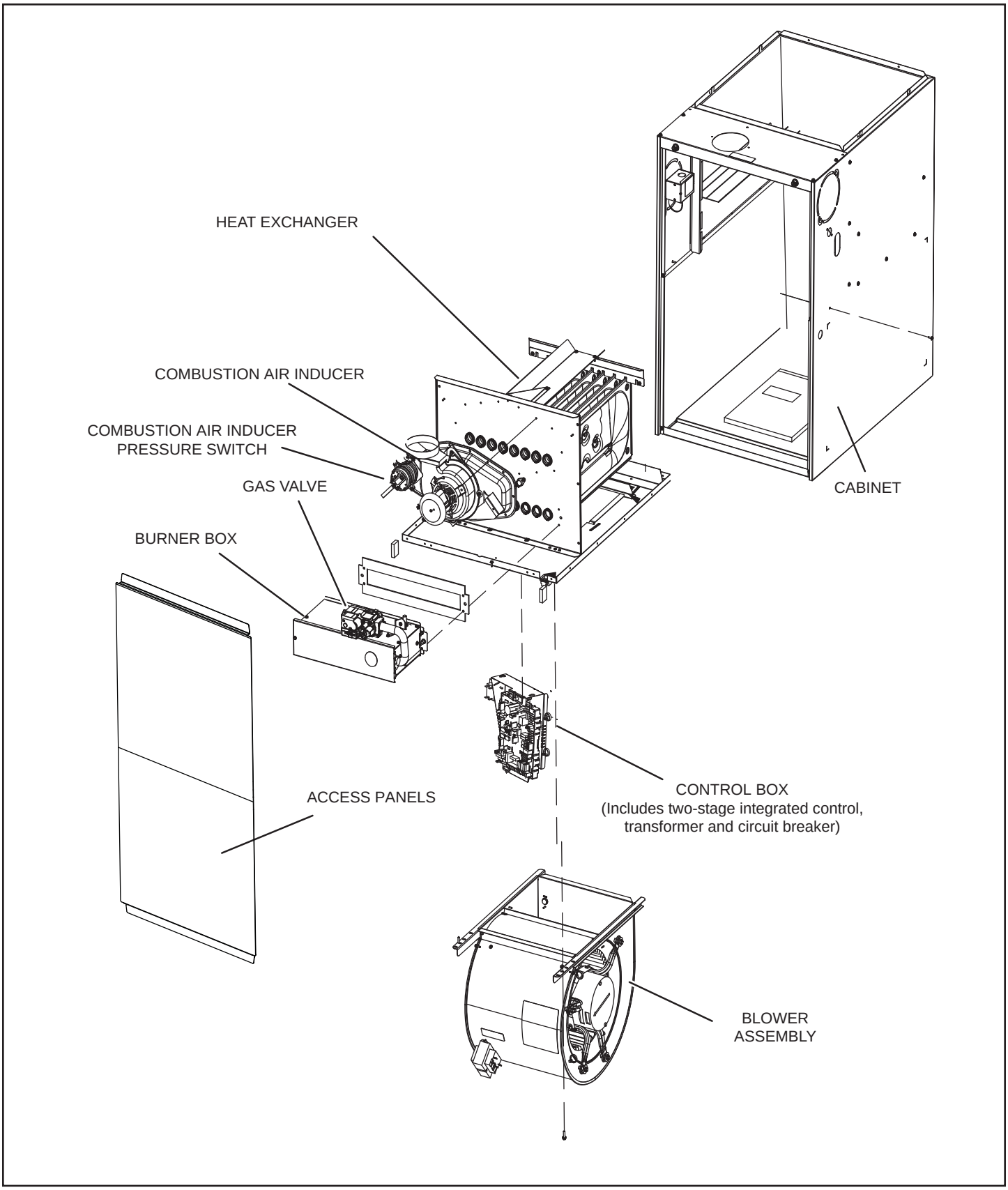


Figure 1. Expanded View

Service Information

UNIT COMPONENTS

NF80U*V** 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.

⚠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

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.

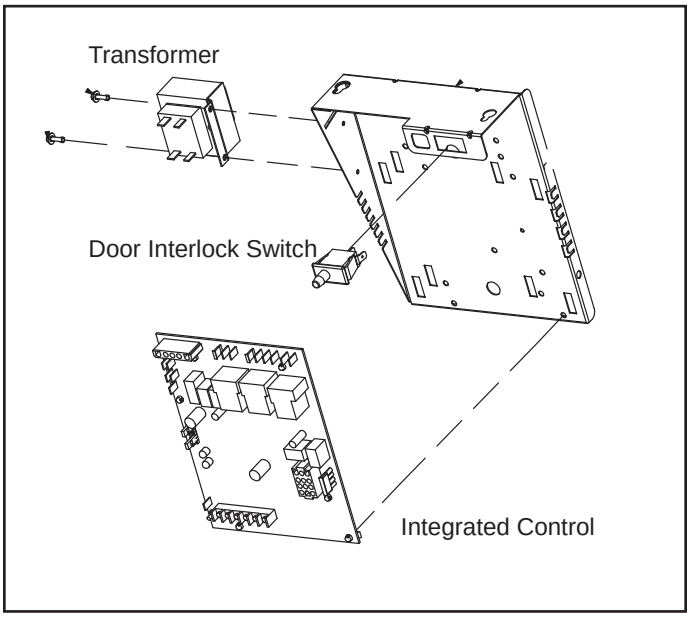


Figure 2. Control Box

Door Interlock Switch (S51)

A door interlock switch rated 14A at 125VAC is wired in series with line voltage. When the inner blower access panel is removed the unit will shut down.

⚠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.

IGNITION CONTROL

Integrated Control DIP Switch Settings Conventional Thermostat

NF80U*V** units are equipped with a two-stage, variable speed 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. 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.

Bank Of Four DIP Switches SW1 - 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 twostage 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 - Second Stage Heat 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.

Switches 3 and 4 - Heat Indoor 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 1** provides the blower off timings that will result from different switch settings.

Service Information

Table 1. Blower Off Delay Switch Settings

Blower Off Delay Seconds	Switch 3	Switch 4
90	Off	On
120 (default)	Off	Off
180	On	Off
210	On	On

Bank Of Eight DIP Switches SW2

Switches 1 and 2 - Cooling Mode Blower Speed - The unit is shipped from the factory with the dip switches positioned for high speed (4) indoor blower motor operation during the cooling mode. **Table 2** provides the cooling mode blower speeds that will result from different switch settings. Switches 1 and 2 set the blower cfm for second stage cool. The integrated control automatically ramps down to 70% of the second-stage cfm for first-stage cfm. Refer to tables for corresponding cfm values. See Product Specifications for more detailed blower cfm tables.

Table 2. Cooling Mode Blower Speeds

Speed	Switch 1	Switch 2
Low	On	On
Medium Low	On	Off
Medium High	Off	On
High (default)	Off	Off

Switches 3 and 4 - Blower Speed Adjustment

The unit is shipped from the factory with the dip switches positioned for **NORMAL** (no) adjustment. The dip switches may be positioned to adjust the blower speed by +10% or -10% to better suit the application. **Table 3** below provides blower speed adjustments that will result from different switch settings. Refer to tables for corresponding cfm values. See **Product Specifications** for more detailed blower cfm tables.

Table 3. Blower Speed Adjustment

Adjustment	Switch 3	Switch 4
+10 %(approx)	On	Off
Normal (default)	Off	Off
-10 % (approx)	Off	On
Field Test (do not use)	On	On

Switch 5 - Cooling / Heat Pump Blower Off Delay

The unit is shipped from the factory with DIP switch positioned **OFF** for a 45 second delay. **Table 4** provides the cooling mode off settings.

Table 4. Blower Off Cooling Mode Delay Switch Setting

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

Switch 6 Not Used

Switches 7 and 8 - Heating Mode Blower Speeds

These switches are factory set to the **OFF** position which provides factory default heat speed. See **Table 5** for switch setting.

Table 5.

Heat Speed	DIP Switch 7	DIP Switch 8
Medium High	Off	Off
High	Off	On
Medium Low	On	Off
Low	On	On

Service Information

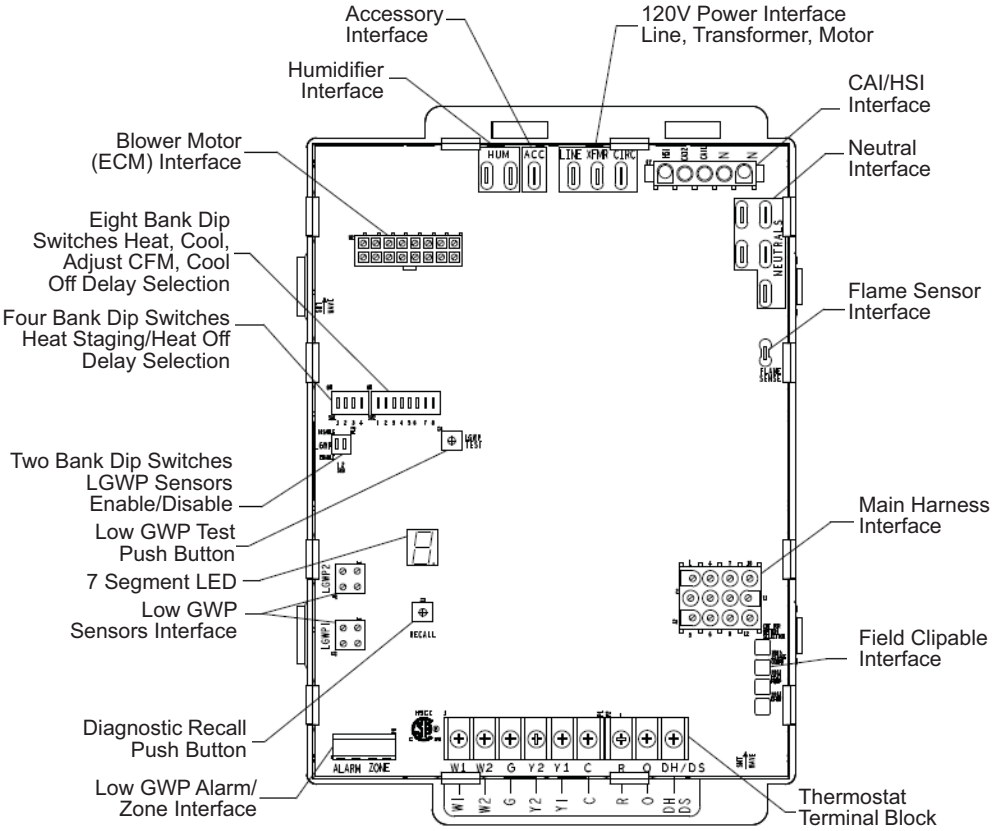


Figure 3. Two Stage, Variable Speed, Non-Communicating - 107629-XX

Table 6. Quick Connect Terminals

1/4 in. Quick Connect Terminals	
LINE	120VAC Input to the Control
XFMR	120VAC Output to the Transformer
CIRC	120VAC Output to the Indoor Blower
HUM	Unpowered Normally Open (Dry) Contacts
ACC	120VAC Output To The Optional Accessory
NEUTRALS	120VAC Neutrals (5)
3/16 in. Quick Connect Terminals	
FLAME SENSE	Flame Senses Or Interface

Table 7. 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 (When W915 is Clipped)
C	Thermostat Common / Ground
R	24VAC Power to the Thermostat
O	Heat Pump Reversing Valve (When W951 is Clipped)
DH/DS	DEHUM (when W914 is clipped)

Table 8. 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 for Low GWP Applications
LGWP TEST	Push Button to Test Low GWP Functionality

Service Information

IGNITION CONTROL DIAGNOSTIC CODES

CODE	DIAGNOSTIC CODES/STATUS OF FURNACE
	Idle mode (Decimal blinks at 1 Hertz -- 0.5 second ON, 0.5 second OFF).
A	Cubic feet per minute(cfm) setting for indoor blower (1 second ON, 0.5 second OFF)/ cfm setting for current mode displayed.
C	Cooling stage (1 sec. ON, 0.5 sec. OFF) 1 or 2 displayed / Pause/ cfm setting displayed / Pause/ Repeat codes.
d	Dehumidification mode (1 second ON, 1 second OFF) CFM setting displayed / Pause/ Repeat Codes.
H	Gas Heat Stage (1 sec. ON, 0.5 sec. OFF) 1 or 2 displayed / Pause/ cfm displayed / Pause / Repeat codes. Blinking - Ignition.
h	Heat Pump Stage. (1 second ON, 0.5 sec OFF) 1 or 2 displayed/ Pause/ cfm setting displayed /Pause/ Repeat codes)
dF	Defrost mode.
E 000	No error in memory
E 110	Low line voltage.
E 111	Line voltage polarity reversed
E 112	Ground not detected
E 113	High line voltage.
E 117	Poor ground detected (Warning only).
E 125	"Control failed self-check, internal error, failed hardware. Will restart if error recovers. Covers hardware errors (flame sense circuit faults, pin shorts) etc."
E 150	Refrigerant leak detected
E 151	Refrigerant Leak Detector Sensor #1 Fault
E 152	Refrigerant Leak Detector Sensor #2 Fault
E 154	Refrigerant Leak Detector Sensor #1 Comm. Lost or invalid sensor dip switch configuration (ON/OFF)
E 155	Refrigerant Leak Detector Sensor #2 Comm. Lost
E 160	Refrigerant Leak Detector Sensor #1 Type Incorrect
E 161	Refrigerant Leak Detector Sensor #2 Type Incorrect
E 163	Refrigerant Leak Detector Control Failure
E164	Low GWP Test
E 200	Hard lockout - Rollout circuit open or previously open.
E 204	Gas valve mis-wired.
E 205	Control gas valve relay contact shorted.
E 207	Hot surface ignitor sensed open - Refer to troubleshooting in installation instruction.
E 223	Low pressure switch failed open - Refer to troubleshooting in installation instruction.
E 224	Low pressure switch failed closed - Refer to troubleshooting in installation instruction.
E 225	High pressure switch failed open - Refer to troubleshooting in installation instruction.
E 226	High pressure switch failed closed - Refer to troubleshooting in installation instruction.
E 227	Low pressure switch opened during trial for ignition or run mode - Refer to troubleshooting in installation instruction.
E 229	Ignition on high fire
E 240	Low flame current - Run mode - Refer to troubleshooting in installation instruction.
E 241	Flame sensed out of sequence - Flame still present.
E 250	Limit switch circuit open - Refer to troubleshooting in installation instruction.
E 270	Soft lockout - Exceeded maximum number of retries. No flame current sensed.
E 271	Soft lockout - Exceeded maximum number of retries. Last retry failed due to pressure switch opening.
E 272	Soft lockout - Exceeded maximum number of recycles. Last recycle failed due to pressure switch opening.
E 273	Soft lockout - Exceeded maximum number of recycles. Last recycle failed due to a flame failure.
E 274	Soft lockout - Exceeded maximum number of recycles. Last recycle failed due to the limit circuit opening or the limit remained open longer than 3 minutes.
E 275	Soft lockout - Flame sensed out of sequence fr.om code 241 fault. Flame signal is gone.
E 292	Indoor blower motor unable to start or unable to communicate with the control.
E 311	Heat rate reduced to match indoor blower air flow. Replace filter or repair duct restriction.
E 390	Low GWP Relay Stuck

ON-BOARD LINKS

⚠WARNING Carefully review all configuration information provided. Failure to properly set DIP switches, jumpers and onboard links can result in improper operation!

On-Board Link W914 Dehum (R to DS)
On-Board Link W914 Dehum (R to DS) Onboard 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. See active Dehumidification section for more detail.

On-Board Link W951 Heat Pump (R to O)
On-board link W951 is a clippable connection between erminals 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.

Diagnostic Push Button
The diagnostic push button is located adjacent to the sevensegment diagnostic LED. This button is used to enable the Error Code Recall “E” mode and the Flame Signal “F” mode. Press the button and hold it to cycle through a menu of options. Every five seconds a new menu item will be displayed. When the button is released, the displayed item will be selected. Once all items in the menu have been displayed, the menu resumes from the beginning until the button is released.

Humidifier
An unpowered, normally open (dry) set of contacts with a 1/4 in. spade terminal “HUM” are provided for humidifier connections and may be connected to 24V or 120V. Any humidifier rated up to one amp can be connected to these terminals. In 120V humidifier applications the neutral leg of the circuit can be connected to one of the provided neutral terminals. This terminal is energized in the heating mode.

Accessory Terminals
One line voltage “ACC” 1/4 in. spade terminal is provided on the furnace integrated control. Refer to **Figure 59** for integrated control configuration. This terminal is energized when the indoor blower is operating. Any accessory rated up to one amp can be connected to this terminal with the neutral leg of the circuit being connected to one of the provided neutral terminals. If an accessory rated at greater than one amp is connected to this terminal, it is necessary to use an external relay.

Variable Speed Features
This furnace is equipped with a variable speed circulation air blower motor that will deliver a constant airflow within a wide range of external static pressures. Other features of this variable speed motor include:

Soft Start
The variable speed motor will slowly ramp up to normal operating speed. This minimizes noise and increases comfort by eliminating the initial blasts of air encountered with standard motors.

Soft Stop
At the end of a cooling or heating cycle, the variable speed\ motor will slowly ramp down after a short blower “off” delay. If continuous blower operation has been selected, the variable speed motor will slowly ramp down until it reaches the airflow for that mode.

Passive and Active Dehumidification
Both the passive and active dehumidification methods described below can be utilized on the same furnace.

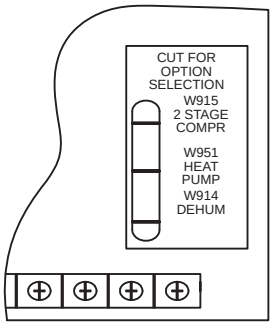
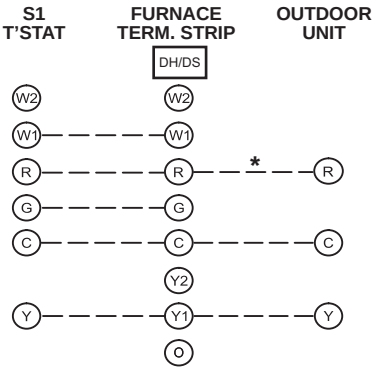
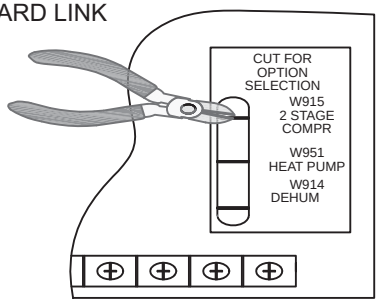
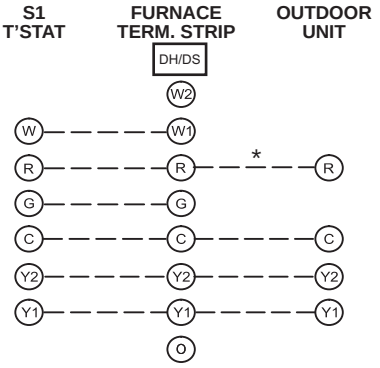
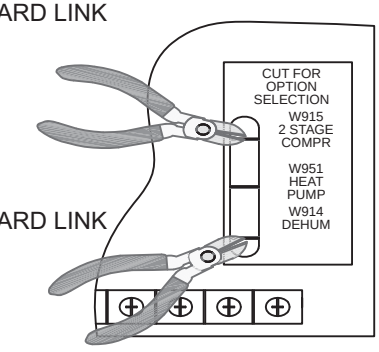
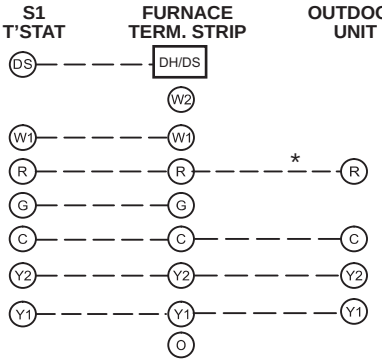
Passive Dehumidification
For situations where humidity control is a problem, a dehumidification feature has been built into the variable speed motor. At the start of each cooling cycle, the variable speed motor will run at 82% of the rated airflow for 7.5 minutes. After 7.5 minutes has elapsed, the motor will increase to 100% of the rated airflow.

Active Dehumidification
To achieve additional dehumidification, clip the R to DH/ DS on the integrated ignition/ blower control board and connect a humidity control that opens on humidity rise to the DEHUM and R terminals. The DEHUM terminal on the control board must be connected to the normally closed contact of the humidity control so that the board senses an open circuit on high humidity. In this setup, the variable speed motor will operate at a 30% reduction in the normal cooling airflow rate when there is a call for dehumidification.

Continuous Blower Operation
The comfort level of the living space can be enhanced when using this feature by allowing continuous circulation of air between calls for cooling or heating. The circulation of air occurs at the full cooling airflow rate. To engage the continuous blower operation, place the fan switch on the thermostat into the ON position. A call for fan from the thermostat closes R to G on the ignition control board. The control waits for a 1 second thermostat delay before responding to the call for fan by ramping the circulating blower at to 38% of the cooling speed. When the call for continuous fan is satisfied, the control immediately ramps down the circulating blower.

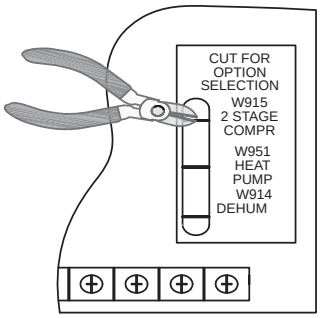
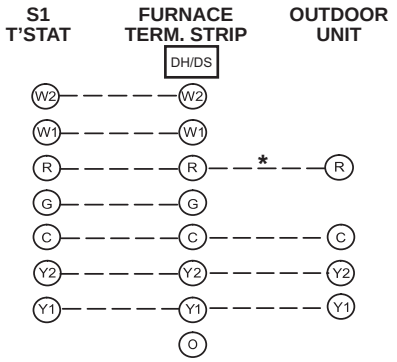
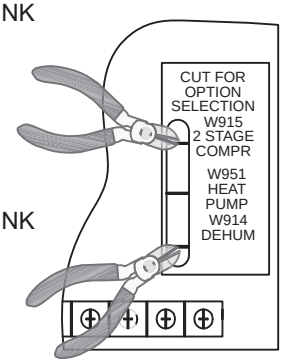
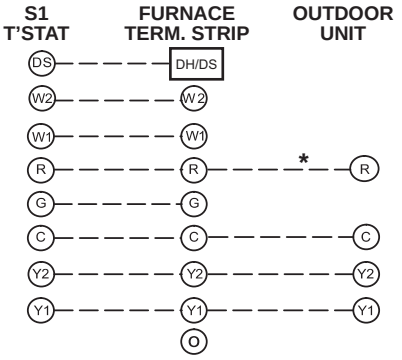
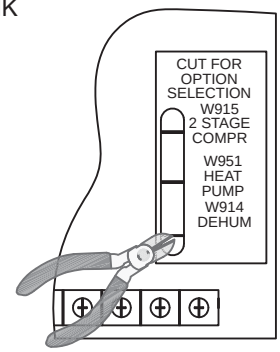
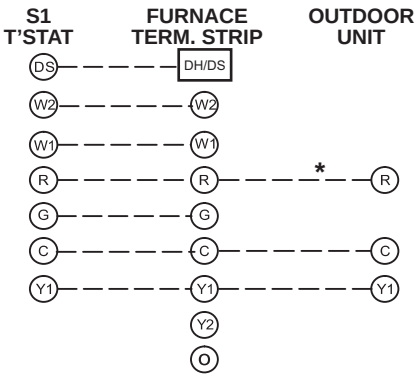
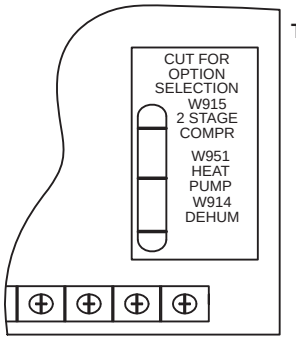
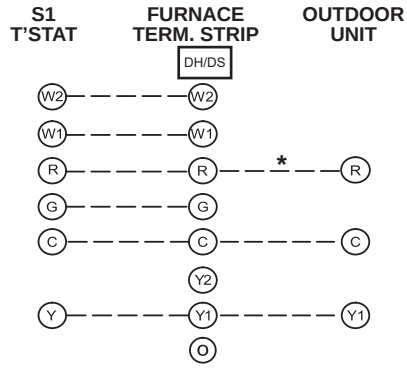
Service Information

FIELD WIRING APPLICATIONS WITH CONVENTIONAL THERMOSTAT (SEE IGNITION CONTROL SECTION FOR 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	

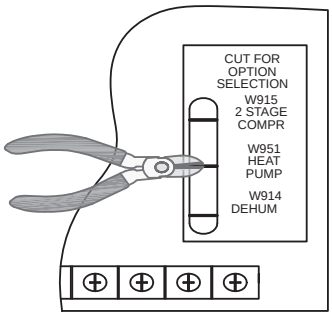
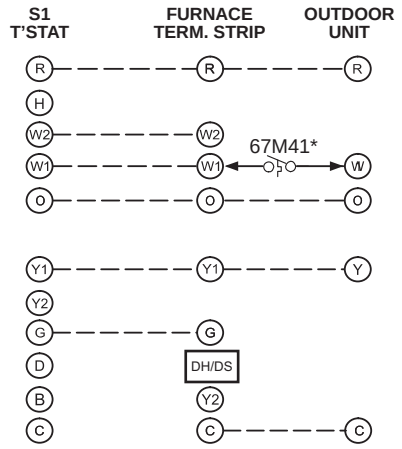
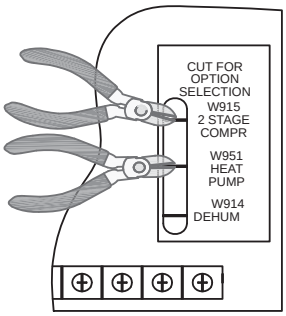
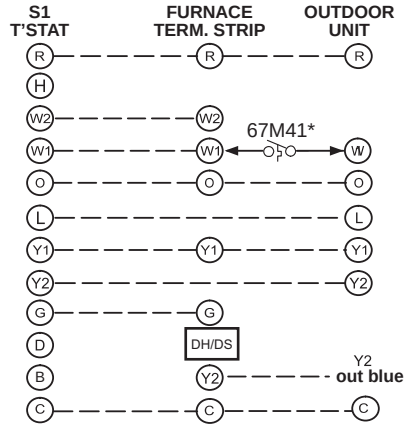
* Not required on all units.

FIELD WIRING APPLICATIONS WITH CONVENTIONAL THERMOSTAT (SEE IGNITION CONTROL SECTION FOR DIP SWITCH SETTINGS) Cont.

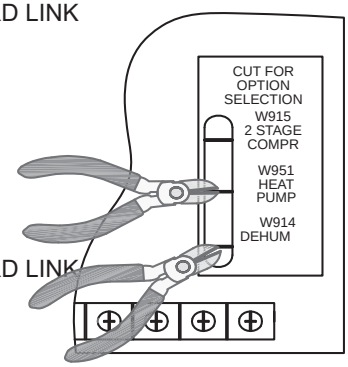
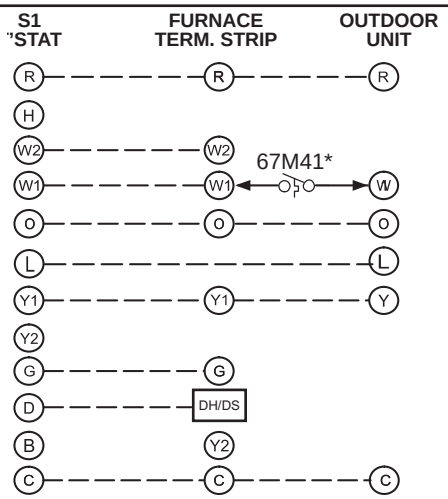
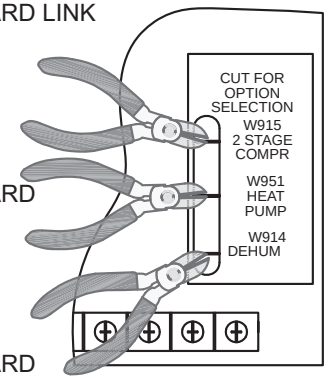
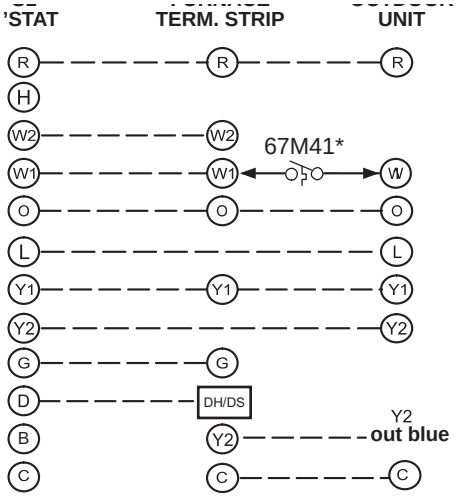
Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options	
2 Heat / 2 Cool	OFF	CUT ON-BOARD LINK W915 2 STAGE COMPR 	
2 Heat / 2 Cool with t'stat with humidity control.	OFF	CUT ON-BOARD LINK W915 2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

Service Information

FIELD WIRING APPLICATIONS WITH CONVENTIONAL THERMOSTAT (SEE IGNITION CONTROL SECTION FOR 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 	

FIELD WIRING APPLICATIONS WITH CONVENTIONAL THERMOSTAT (SEE IGNITION CONTROL SECTION FOR 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 	
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 	

* 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.

INDOOR BLOWER MOTOR

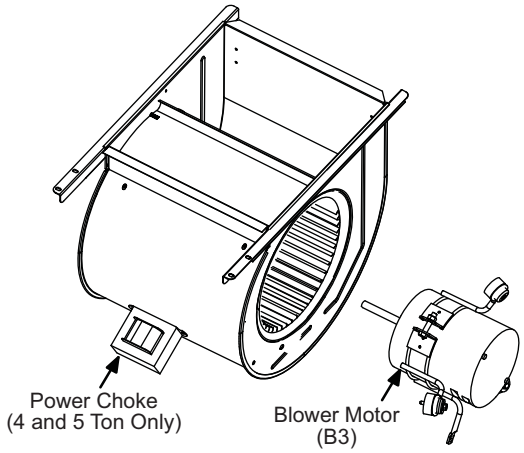


Figure 4.

⚠WARNING During blower operation, the ECM motor emits energy that may interfere with pacemaker operation. Interference is reduced by both the sheet metal cabinet and distance.

The motor communicates with the integrated control via a 2-way serial connection. The motor receives all necessary functional parameters from the integrated control and does not rely on a factory program like traditional variable speed motors. **NF80U**V**R** units use a three-phase, electronically controlled D.C. brushless motor (controller converts single phase a.c. to three phase D.C.), with a permanent-magnet type rotor (**Figure 6**). Because this motor has a permanent magnet rotor it does not need brushes like conventional D.C. motors.

All **NF80U**V**R** blower motors use single phase power. An external run capacitor is not used. The motor uses permanently lubricated ball-type bearings.

Blower motor controller
A solid-state controller is permanently attached to the motor. The controller is primarily an A.C. to D.C. converter. Converted D.C. power is used to drive the motor.

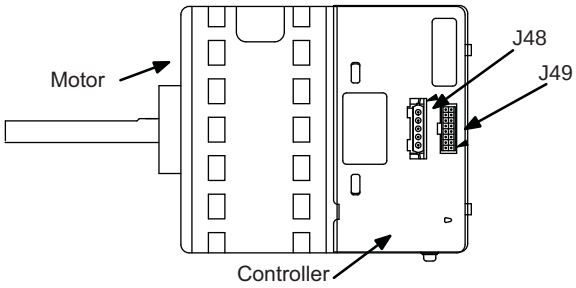


Figure 5. GenTeq Blower Motor B3

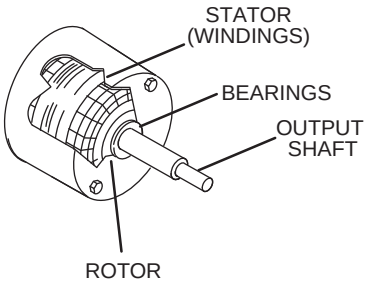


Figure 6. Blower Motor Components

Internal Operation

The controller monitors the static workload on the motor and varies motor rpm in order to maintain constant airflow (cfm).

The motor controller is driven by the Two-stage Variable Speed Integrated control board.

Motor rpm is continually adjusted internally to maintain constant static pressure against the blower wheel. The controller monitors the static work load on the motor and motor amp-draw to determine the amount of rpm adjustment. Blower rpm may be adjusted any amount in order to maintain a constant cfm as shown in blower tables. The cfm remains relatively stable over a broad range of static pressure. Since the blower constantly adjusts rpm to maintain a specified cfm, motor rpm is not rated. Hence, the terms “cool speed”, “heat speed” or “speed tap” in this manual, on the unit wiring diagram and on blower B3, refer to blower cfm regardless of motor rpm.

The unit control indicates the desired cfm. The blower will maintain the desired cfm as long as external static pressure does not exceed 0.8”. If the system exceeds this amount, the blower may enter a “cut back”, mode wherein it then slows down to protect itself from electrical damage. During this “cut back” mode the unit control will still indicate the same desired cfm regardless of actual motor rpm.

Initial Power Up

When line voltage is applied to B3, there will be a large inrush of power lasting less than 1/4 second. This inrush charges a bank of DC filter capacitors inside the controller. If the disconnect switch is bounced when the disconnect is closed, the disconnect contacts may become welded. Try not to bounce the disconnect switch when applying power to the unit.

Motor Start-Up

When B3 begins start-up, the motor gently vibrates back and forth for a moment. This is normal. During this time the electronic controller is determining the exact position of the rotor. Once the motor begins turning, the controller slowly eases the motor up to speed (this is called “soft-start”). The motor may take as long as 10-15 seconds to reach full speed. If the motor does not reach 200 rpm within 13 seconds, the motor shuts down. Then the motor will immediately attempt a restart. The shutdown feature provides protection in case of a frozen bearing or blocked blower wheel. The motor may attempt to start eight times. If the motor does not start after the eighth try, the controller locks out. Reset controller by momentarily turning off power to unit.

The DC filter capacitors inside the controller are connected electrically to the motor supply wires. The capacitors take approximately 5 minutes to discharge when the disconnect is opened. For this reason it is necessary to wait at least 5 minutes after turning off power to the unit before attempting to change speed taps.

⚠DANGER Disconnect power from unit and wait at least five minutes to allow capacitors to discharge before attempting to service motor. Failure to wait may cause personal injury or death.

Figure 7 shows the two quick-connect jacks (J48 and J49) which connect the motor to the **NF80U**V**R**. Jack J48 is the power plug and jack J49 connects the unit controls to the motor.

Jack J48 is the power plug. Line voltage must be applied to J48 pins 4 and 5 in order for the motor to operate. When using 120VAC pins 1 and 2 must be jumpered.

Jack J49 connects the unit controls to the motor. The motor assigns priority to J49 pin 2 so that if a call for cooling and a call for heating are concurrent, heating call overrides and the blower operates on high speed heating tap.

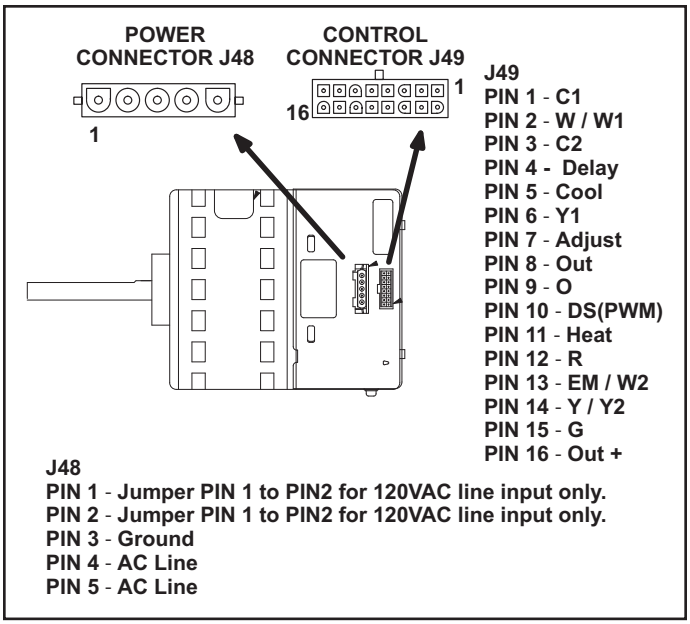


Figure 7. GenTeq Harness Connectors

Power Choke (L13)

A choke coil is used on **NF80U**V**R** 4 and 5 ton units equipped with 1 hp motors. The choke is located on the blower housing and is used to suppress transient current spikes.

Remove Blower from Unit

1. Remove unit access panels, control box, bolts and wiring jackplugs.
2. Slide blower out front of unit.

Precautions

If the furnace or its electronically controlled blower motor is improperly or inadequately grounded, it may cause television interference (commonly known as RFI or radio frequency interference).

This interference is caused by internal switching frequencies of the motor controller. TV interference may show up as small specks or lines which randomly appear on the TV screen accompanied by pops or clicks in the sound. Before attempting any service, make sure the indoor unit is causing the interference. To check, disconnect power to indoor unit then check TV for continued signs of interference.

TV interference may be stopped by making sure the motor is solidly grounded to the cabinet (metal to metal) and by making sure the cabinet is solidly grounded. If TV interference persists, make sure the television (and all affected RF appliances) are moved away from the furnace. Also make sure affected appliances are connected to a separate electrical circuit.

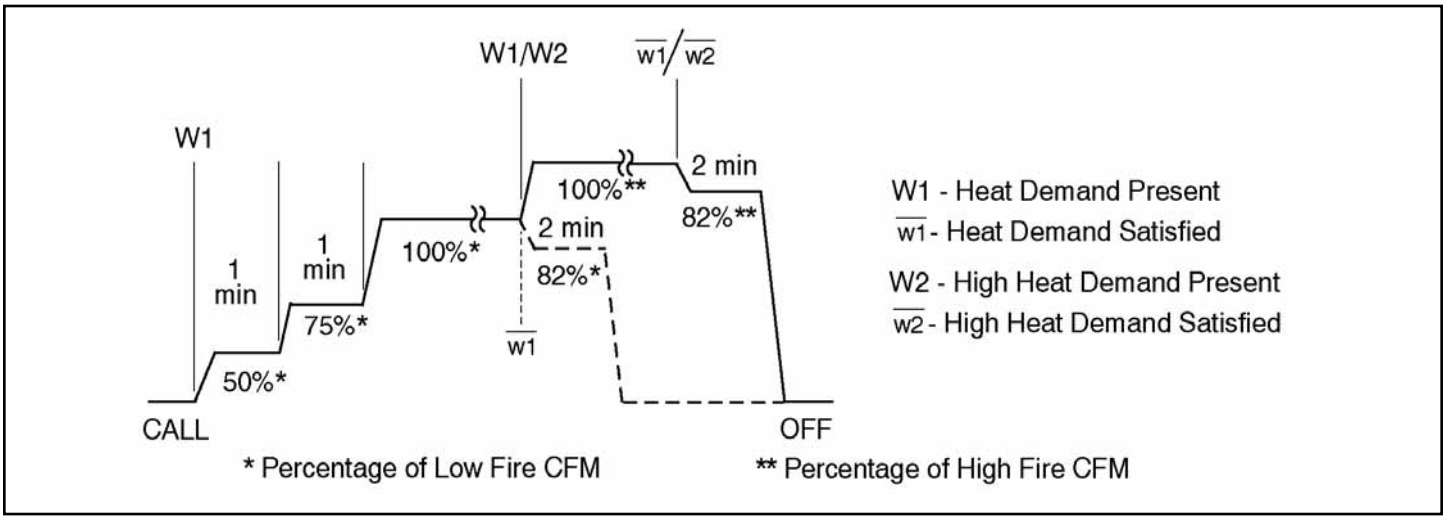


Figure 8. Indoor Blower Operation - 1st Stage-2nd Stage (W1/W2) Heat Call

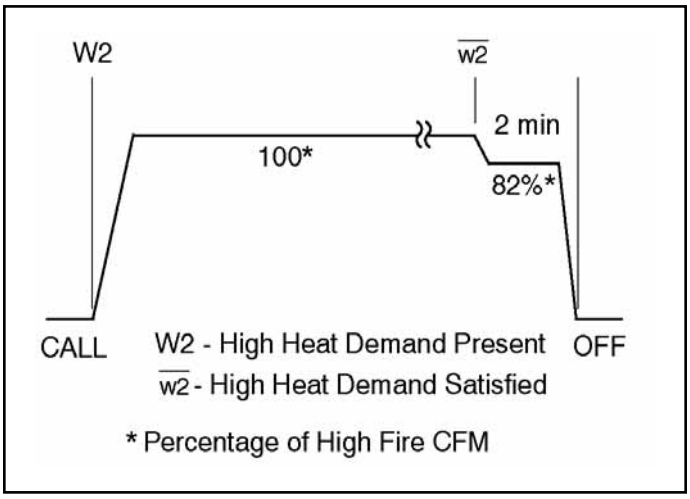


Figure 9. Indoor Blower Operation - High Heat (W2) Call

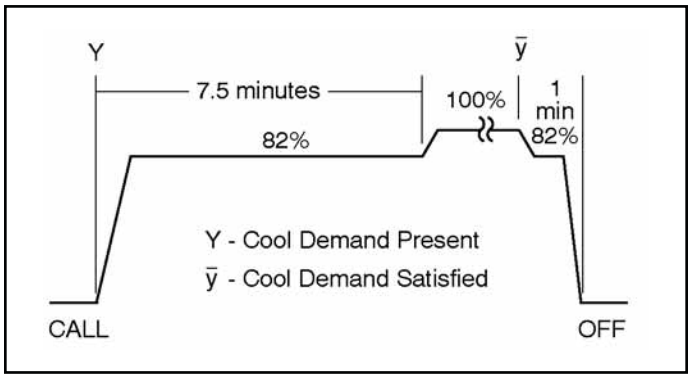


Figure 11. Indoor Blower Operation - Single Stage Cooling

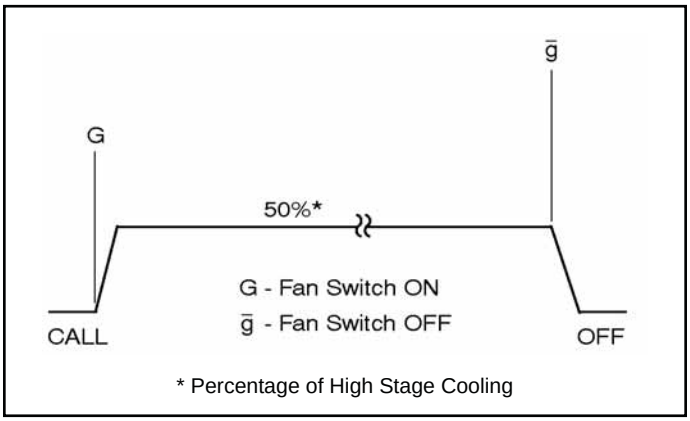


Figure 10. Indoor Blower Operation - Call for Fan

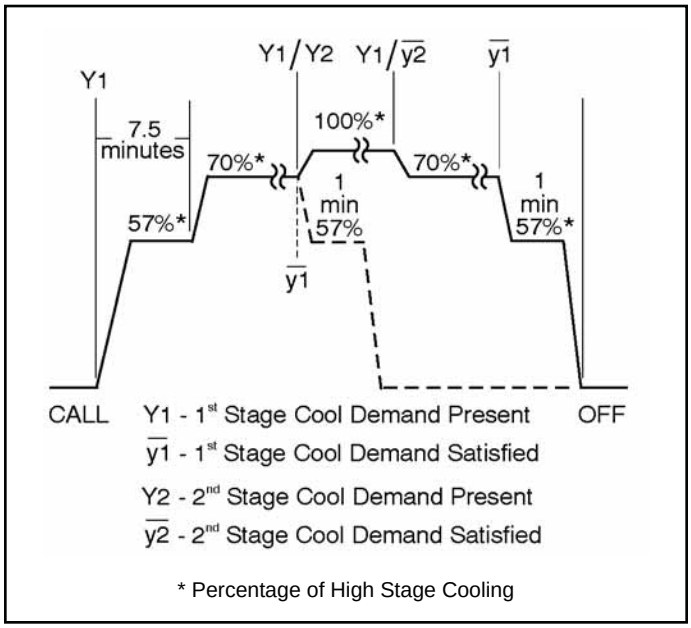


Figure 12. Indoor Blower Operation - Two Stage Cooling

HEATING COMPONENTS

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 13** for ignitor location and Figure 99 for ignitor check out.

NOTE: The **NF80U**V**R** furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.

Flame Sensor
A flame sensor is located on the left side of the burner support. See **Figure 13**. The sensor tip 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. See **Table 9** for flame signal.

Normal	Low	Drop Out
1.5 or greater	1.0 or less	0.5

Table 9. Flame Signal in Microamps

Gas Valve
The valve (**Figure 18**) 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 gas control knob 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 and a gas valve.

Flame Rollout Switches (S47)
Flame rollout switch is a high temperature limit located on top of the burner box, one on each side.- See Figure 8. The limit is 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 switch is factory set to trip (open) at 210°F and cannot be adjusted. The switch can be manually reset. To manually reset a tripped switch, push the reset button located on the control.

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. See more detail in Maintenance section.

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.

Combustion Air Inducer (B6) and Cold End Header Box
All units use a two-stage 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 control A92. The inducer also operates for 15 seconds before burner ignition (prepurge) and for 5 seconds after the gas valve closes (postpurge). The inducer operates on low speed during first-stage heat, then switches to high speed for second stage heat.

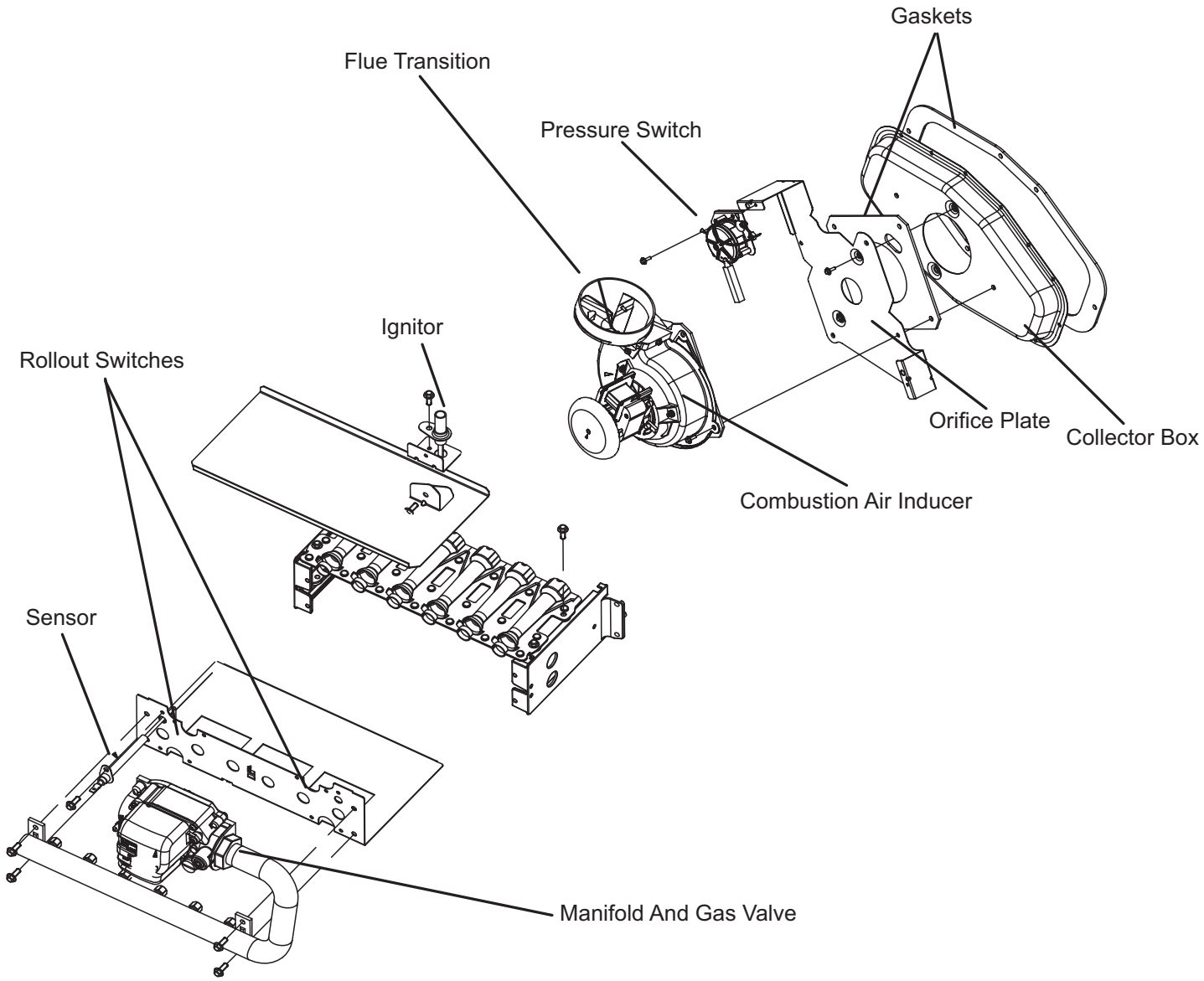


Figure 13. Heating Components

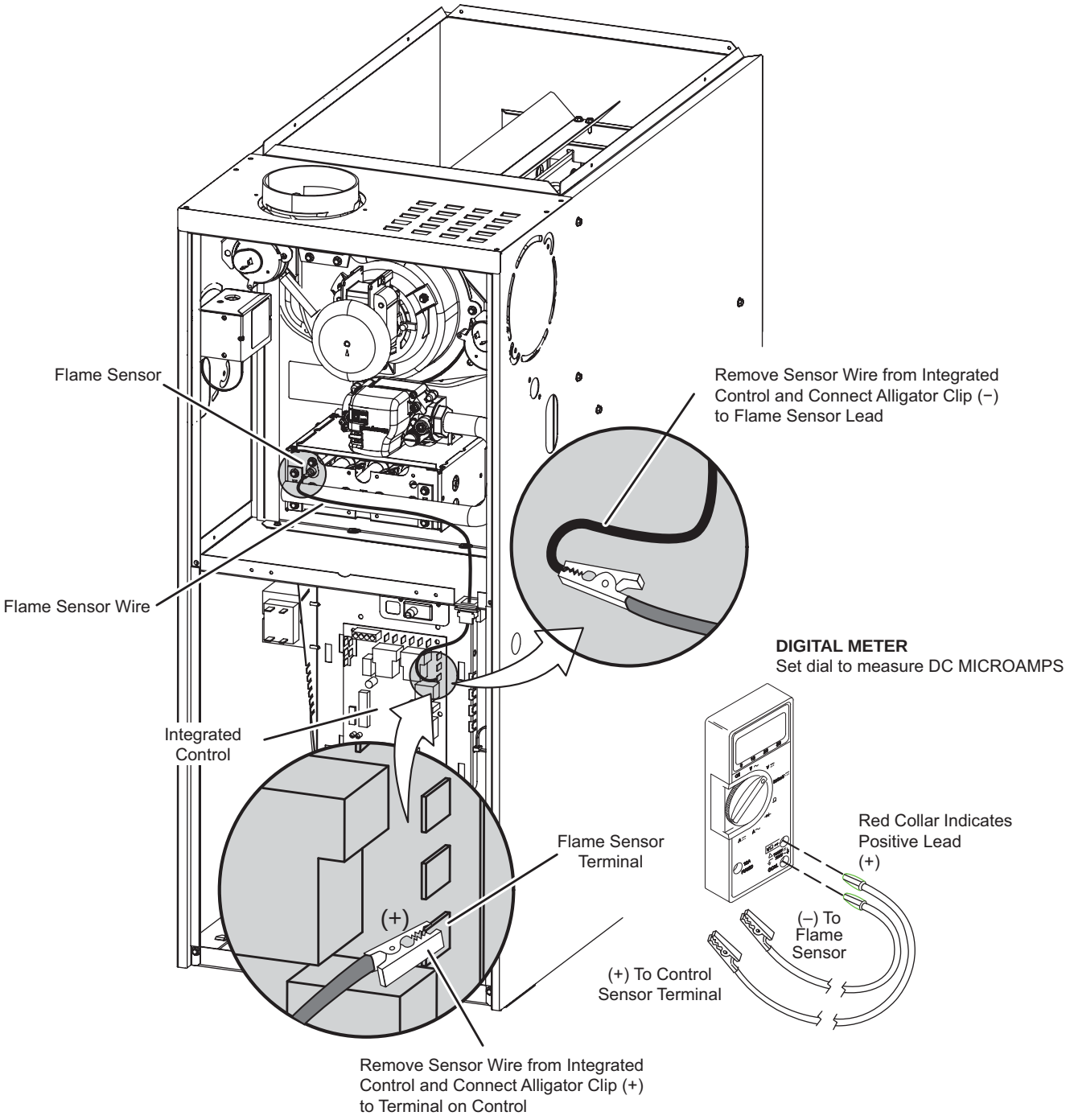


Figure 14. Measuring Flame Signal

Service Information

Test 1

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

Test 2

Check ignitor for correct resistance. Seperate 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.

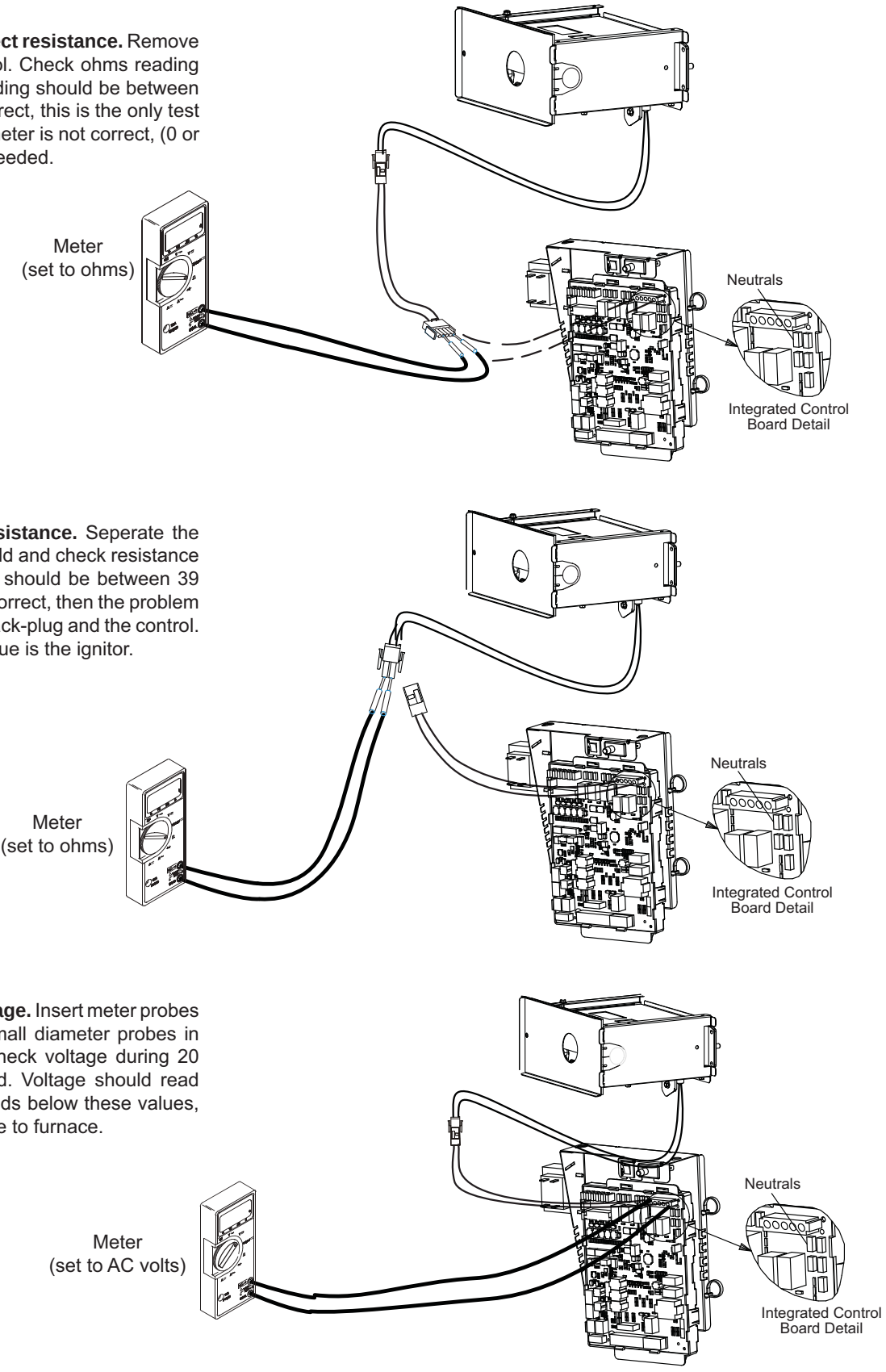


Figure 15. Ignitor Check

Service Information

Combustion Air Inducer Pressure Switch (S18)

80G2UHVK series units are equipped with 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 integrated 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 integrated control when pressure inside the combustion air inducer decreases to a certain set point.

Set points vary depending on unit size. See **Table 10.** 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.

Unit	Set Point Low Heat	Set Point High Heat
-070	0.25	0.60
-090	0.35	0.68
-110	0.30	0.68

Table 10. Pressure Switch Setting 0 - 4500'

Troubleshooting

See **Figure 16** for measuring operating pressure and checking resistance in the pressure switch.

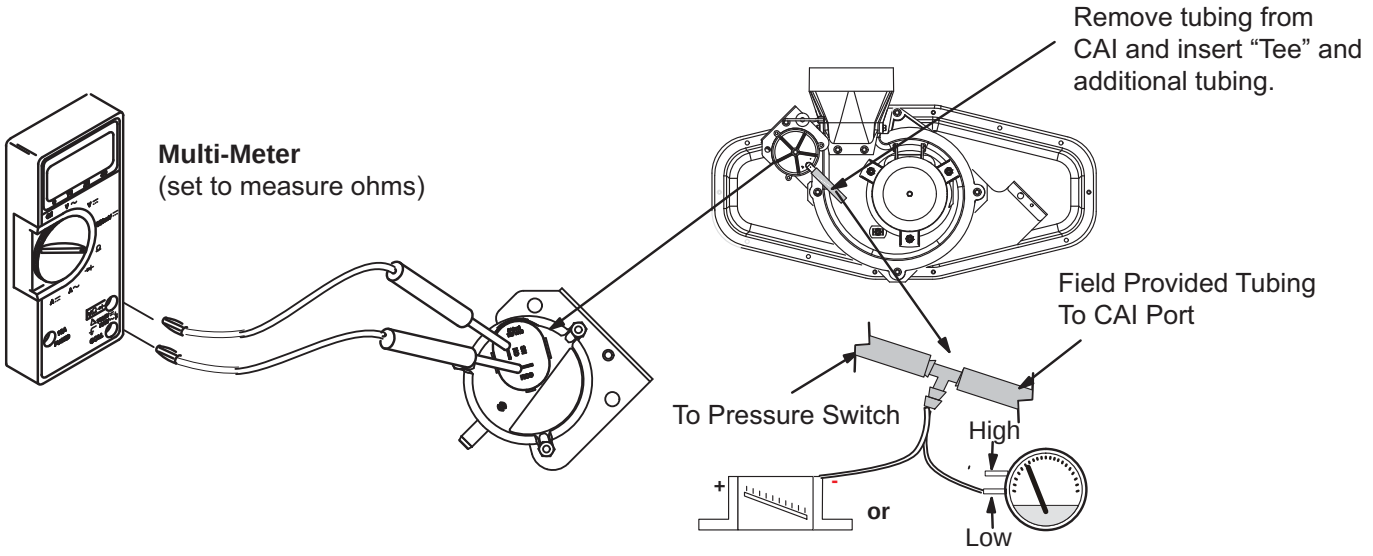


Figure 16.

Service Information

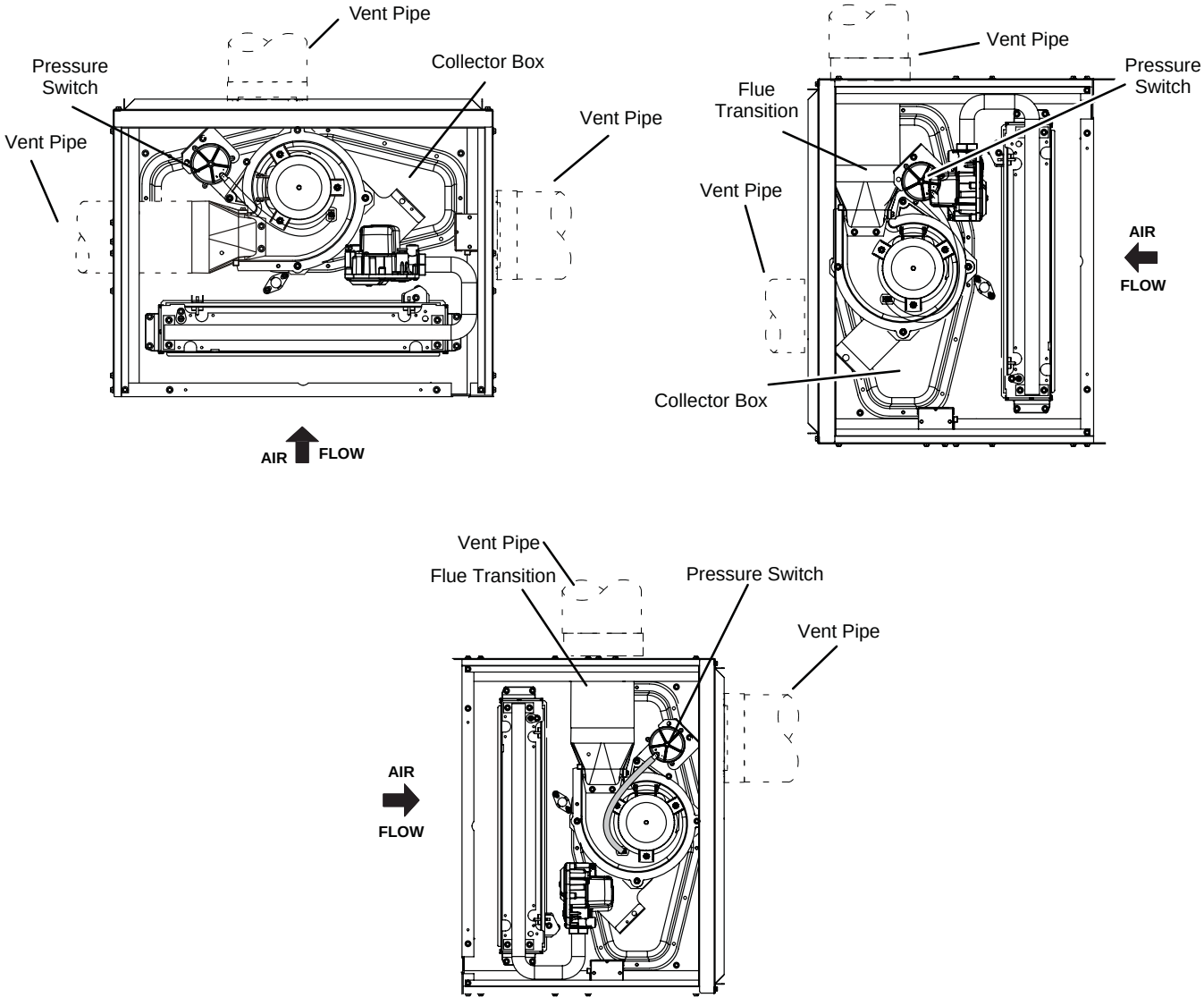
Multiple Venting

The furnace can vent in multiple positions. See **Figure 17**.

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 combustion air inducer and gasket (pressure switch should be above the combustion air inducer in all positions), 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.



In all positions route the wires away from moving parts and the heat of the inducer motor to prevent damage to the wires. The pressure switch must be installed above the CAI to prevent moisture from collecting in the hoses or switch.

Figure 17.

Service Information

PLACEMENT AND INSTALLATION

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

START-UP

For Your Safety, Read Before Operating

⚠WARNING

- Do not use this furnace if any part has been under water. Immediately call a licensed professional service technician (or equivalent) to inspect the furnace and to replace any part of the control system and any gas control which has been under water.
- If overheating occurs or if gas supply fails to shut off, shut off the manual gas valve to the appliance before shutting off electrical supply.
- During blower operation, the ECM motor emits energy that may interfere with pacemaker operation. Interference is reduced by both the sheet metal cabinet and distance.

⚠CAUTION

- Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch.

BEFORE LIGHTING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

The gas valve on this unit is equipped with a gas control switch. Use only your hand to move the switch. Never use tools. If the switch will not turn or if the control switch will not move by hand, do not try to repair it.

Placing the Furnace into Operation

These units are equipped with an automatic ignition system. Do not attempt to manually light burners on these furnaces. Each time the thermostat calls for heat, the burners will automatically light. The ignitor does not get hot when there is no call for heat on units with an automatic ignition system.

⚠WARNING

- If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury, or loss of life.

Gas Valve Operation

See **Figure 18** and **Figure 19.**

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 heating compartment access panel.
6. Move gas valve switch to **OFF** position. Do not force. See **Figure 18** and **Figure 19**.
7. Wait five (5) 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.

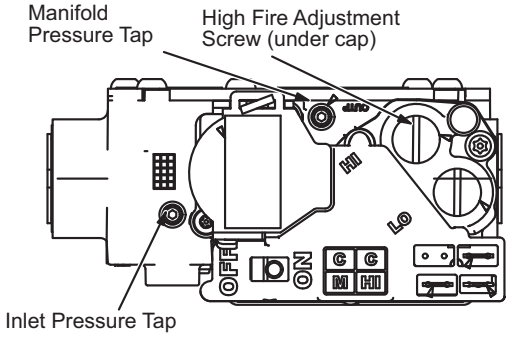


Figure 18. White Rodgers Gas Valve

Service Information

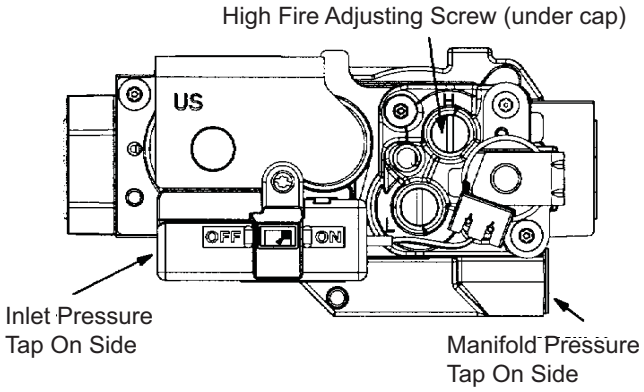


Figure 19. Honeywell Gas Valve

8. Move gas valve switch to ON position. Do not force. See **Figure 18** and **Figure 19**.
9. Replace the heating compartment 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 heating compartment access panel.
4. Move gas valve switch to OFF position. Do not force. See **Figure 18** and **Figure 19**.
5. Replace the upper 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.

Gas Pressure Adjustment

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 11**. If manifold pressure matches **Table 13** and rate is incorrect, check gas orifices for proper size and restriction. Remove temporary gas meter if installed.

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

Capacity	Seconds for One Revolution			
	Natural		LP	
	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
-110	33	66	82	164
	Natural - 1000 btu/cu ft		LP - 2500 btu/cu ft	

Table 11. Gas Meter Clocking Chart

Supply Line Pressure

A threaded plug on the inlet side of the gas valve provides access to the supply pressure tap.

Honeywell Valve

1. Remove the threaded plug.
2. Install a field provided barbed fitting.
3. Connect a manometer.

White Rodgers Valve

1. Loosen threaded plug (removal not required).
2. Connect a manometer.

See **Table 13** for supply line pressure. Replace or tighten the threaded plug after measurements have been taken.

Service Information

Manifold Pressure

NOTE: A pressure test adapter kit is available to facilitate manifold pressure measurement.

1. Connect test gauge to manifold pressure tap (**Figure 18** and **Figure 19**) on gas valve.
2. Ignite unit on high 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 13**.
4. If necessary, make adjustments. **Figure 18** and **Figure 19** show the location of high fire adjustment screw.
5. If an adjustment is made on high fire, re-check manifold pressure on low fire. Do not adjust low fire manifold pressure. If the low fire manifold pressure is more than 1/2" above or below value specified in **Table 13** , replace the valve.

Proper Combustion

Furnace should operate a minimum 15 minutes with correct manifold pressure and gas flow rate before checking combustion. Take combustion sample beyond the flue out let and compare to **Table 12**. The maximum carbon monoxide reading should not exceed 100 ppm.

Firing Rate	CO2% for Nat	CO2% for LP
High Fire	6.8 - 7.4	7.5 - 9.0
Low Fire	4.2 - 5.7	5.0 - 6.0

Table 12.

High Altitude

The manifold pressure, gas orifice and pressure switch may require adjustment or replacement to ensure proper operation at higher altitudes. See Table 13 for manifold pressures and Table 14 for pressure switch and gas conversion kits.

Capacity	Gas	Orifice Size 0 - 7500 ft.[1]	Orifice Size 7501 - 10000 ft	Manifold Pressure in. w.g. 0 - 4500 ft		Manifold Pressure in. w.g. 4501 - 7500 ft		Manifold Pressure in. w.g. 7501 - 10000 ft[2]		Supply Line Pressure in. w.g.	
				Low Fire	High Fire	Low Fire	High Fire	Low Fire	High Fire	Min	Max
070	Natural	0.063	0.055	1.7	3.5	1.6	3.4	1.7	3.5	4.5	13.0
	LP / propane[3]	0.034	0.032	4.5	10.0	4.5	10.0	4.5	10.0	11.0	13.0
090	Natural	0.063	0.055	1.7	3.5	1.5	3.2	1.7	3.5	4.5	13.0
	LP / propane[3]	0.034	0.032	4.5	10.0	4.5	10.0	4.5	10.0	11.0	13.0
110	Natural	0.063	0.055	1.7	3.5	1.5	3.2	1.7	3.5	4.5	13.0
	LP / propane[3]	0.034	0.032	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 13. Manifold and Supply Line Pressure 0 - 10,000 ft.

Capacity	High Altitude Pressure Switch Kit			High Altitude Natural Gas Orifice Kit	Natural Gas to LP / Propane Kit	
	0 - 4500 ft	4501 - 7500 ft	7501 - 10000 ft	7501 - 10000 ft	0 - 7500 ft.	7501 - 10000 ft
070	No Change	No Change	73W35	51W01	11K48	11K47
090	No Change	69W56	73W35	51W01	11K48	11K47
110	No Change	69W56	73W35	51W01	11K48	11K47

Table 14. High Altitude Pressure Switch and Gas Conversion Kits

Service Information

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 20**. 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 15**. If the readings exceed the maximum shown in **Table 15**, 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 20**. 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 15.

Check Voltage Between Line Neutral and Low Voltage “C” Terminal

Check Voltage Between Line Hot and Line Neutral

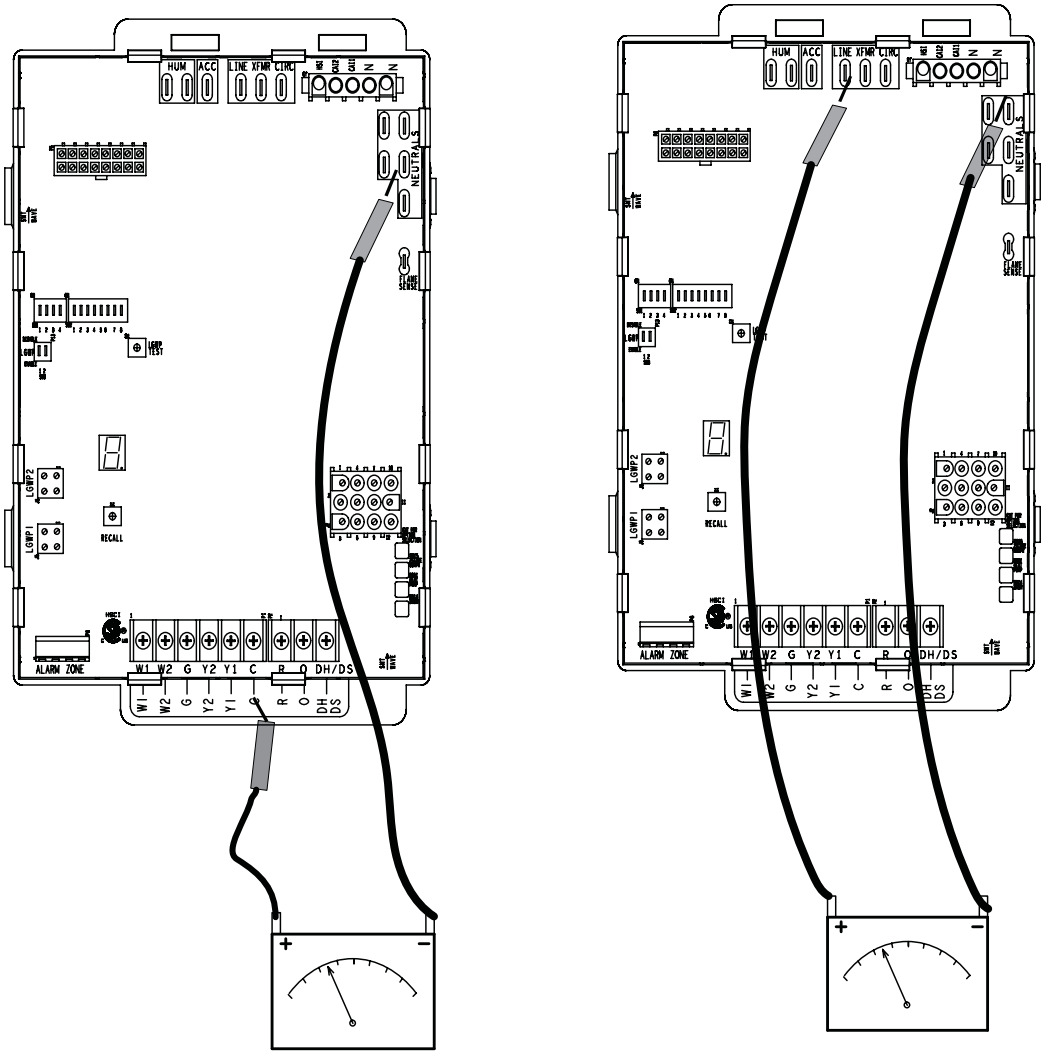


Figure 20.

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

Temperature rise for **NF80U***V**R** 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.

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

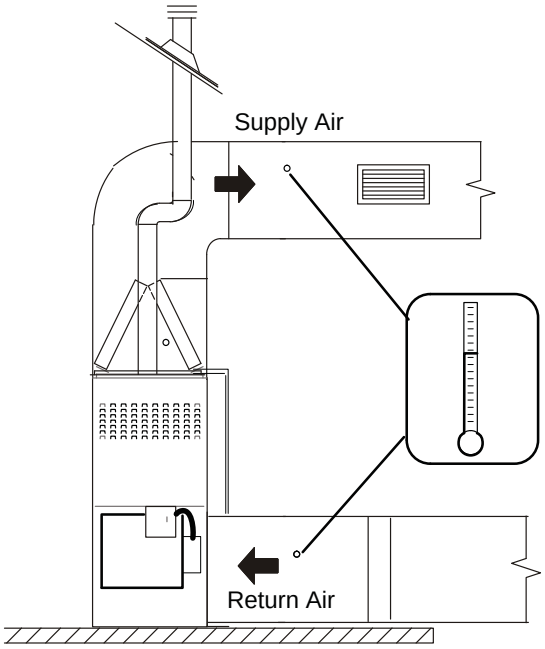


Figure 21. Temperature Rise

External Static Pressure

1. Tap locations shown in **Figure 22**.
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)

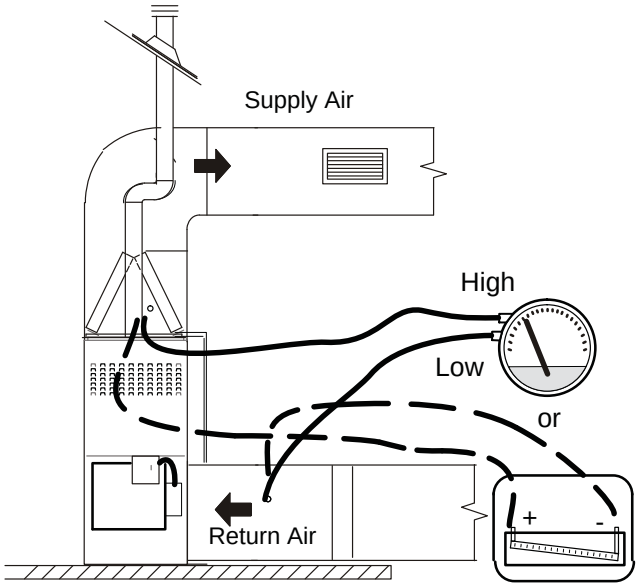


Figure 22. External Static Pressure

Service Information

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 Fire Hazard.

- Disconnect power before servicing unit.
- 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.
- Failure to use properly sized wiring and circuit breaker may result in property damage. Size wiring and circuit breaker(s) per Technical Specifications and unit rating plate.

⚠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 against the data given in the appropriate Product Specifications.

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).

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

Table 16.

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 **AHRInet.org.**
9. Ensure sufficient combustion air is available to the furnace. Fresh air grilles and louvers (on the unit and in the room where the furnace is installed) must be properly sized, open and unobstructed to provide combustion air.
10. Inspect the furnace venting system to make sure it is in place, structurally sound, and without holes, corrosion, or blockage. Vent system must be free and clear of obstructions and must slope upward away from the furnace . Vent system should be installed per the National Fuel Gas Code.
11. Inspect the furnace return air duct connection to ensure the duct is sealed to the furnace. Check for air leaks on supply and return ducts and seal where necessary.
12. Check the condition of the furnace cabinet insulation and repair if necessary.
13. Perform a complete combustion analysis during the furnace inspection to ensure proper combustion and operation. Consult Service Literature for proper combustion values.
14. Verify operation of CO detectors and replace batteries as required.

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

1. Check the operation of the ignition system, inspect and clean flame sensor. Check microamps before and after. Check controls and safety devices (gas valve, flame sensor, temperature limits). Consult Service Manual for proper operating range. Thermal Limits should be checked by restricting airflow and not disconnecting the indoor blower. For additional details, please see Service and Application Note H049.
2. Verify that system total static pressure and airflow settings are within specific operating parameters.
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 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 23**.
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 24** 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 8** 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.

⚠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.

21. If a leak is detected, shut gas and electricity off and repair leak.
22. Repeat **Steps 19 and 20** until no leaks are detected.
23. Replace access panel.

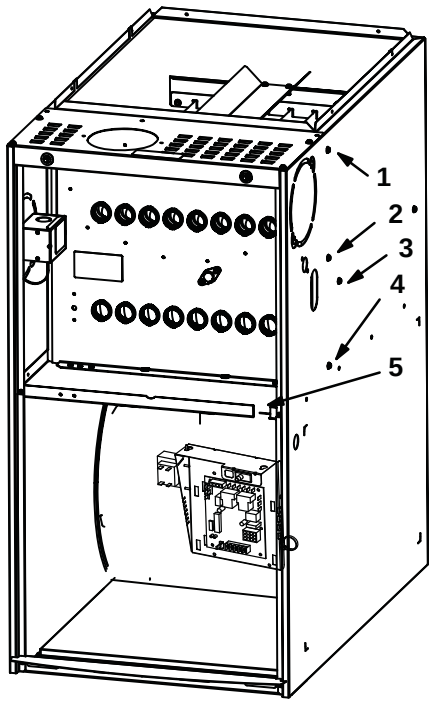


Figure 23. Remove 5 screws if necessary (either side of cabinet)

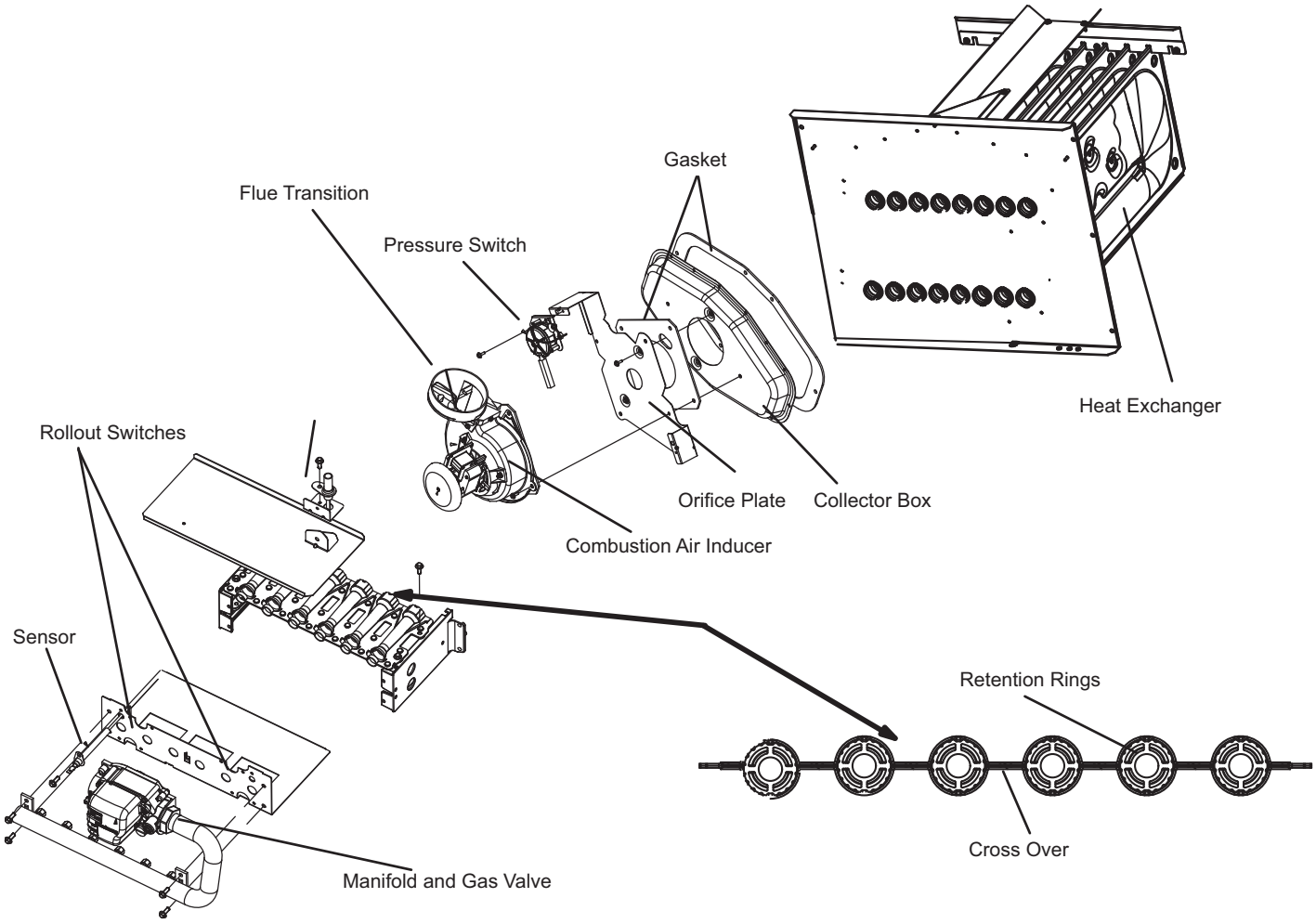


Figure 24. Burner, Combustion Air Inducer Assembly, and Heat Exchanger Removal

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 27** and follow steps below:

1 - Route sensor wire #1 through provided grommet. Form a drip loop below the control board on upflow installations to prevent condensate dripping on the control board.

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 25**. 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.

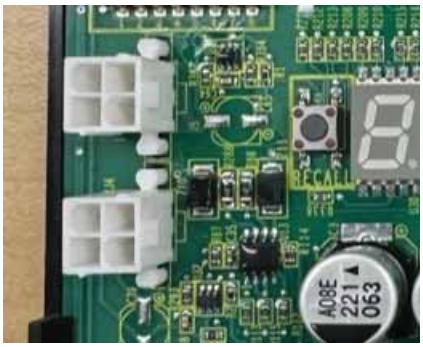


Figure 25. Two-Stage Constant Torque Control

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 26** and **Table 17**.

Figure 26.

Table 17. 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 17** 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 27** 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 **IGNITION CONTROL DIAGNOSTIC CODES** on **Page 11** for Low GWP diagnostic error codes..

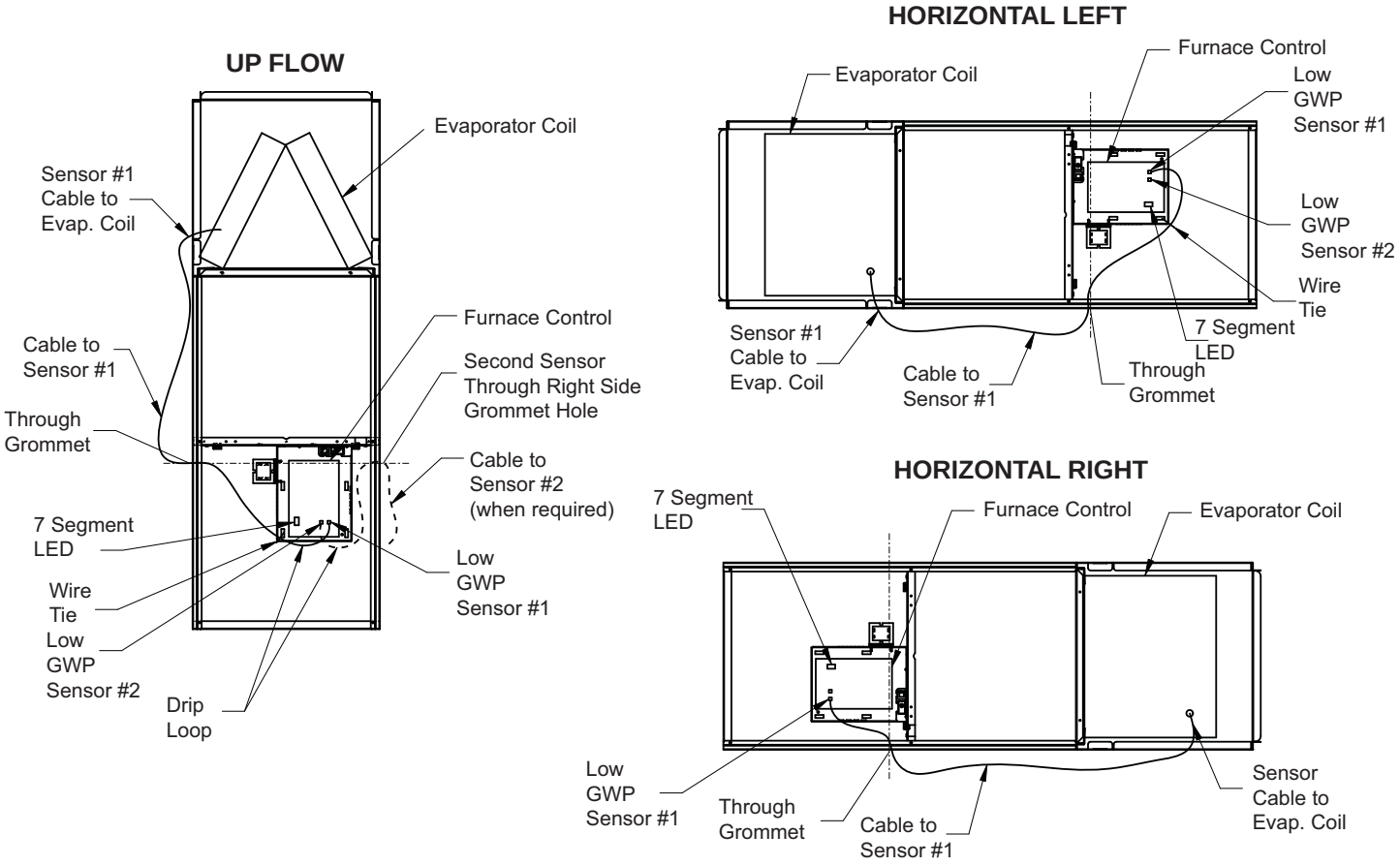


Figure 27.

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 18 lists the functions of the Test button during each mode of operation.

Table 18. 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 19 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 19. 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 Reset control
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 4 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 4 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.

DIAGRAM,SEQUENCE OF OPERATION AND DIP SWITCH SETTINGS

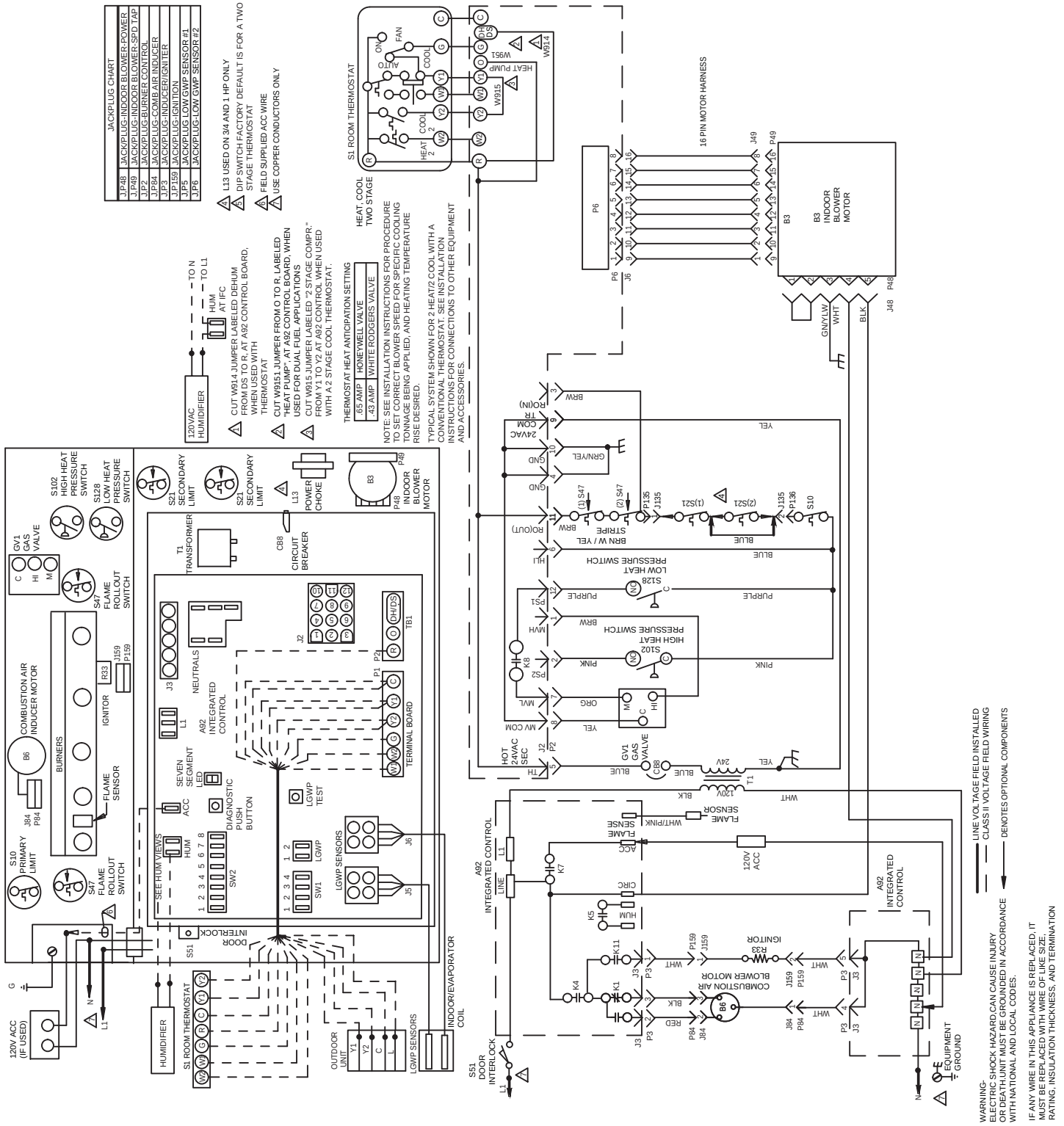


Figure 28. Wiring Diagram

Service Information

Sequence of Operation

On a call for heat from the room thermostat, the control board performs a 1 second self check. Upon confirmation that the pressure switch contacts are in an open position, the control energizes the combustion blower on high speed. The control then checks for adequate combustion air by making sure the low-fire pressure switch contacts are closed.

The igniter energizes and is allowed to warm up for 20 seconds before the gas valve energizes on 1st stage and burners ignite. 45 seconds after the control confirms ignition has occurred, the control drops the combustion blower to low speed.

The circulating blower ramps up to 50% of 1st stage heat speed and operates at that speed for one minute (including ramp up time), then at 75% of 1st stage heat speed for an additional minute. After that, the circulating blower operates at full 1st stage heat speed until either the heat call is satisfied or the thermostat initiates a call for 2nd stage heat. On a call for 2nd stage heat, the control energizes the circulating air blower on full CFM 2nd stage heat.

If the automatic heat staging option is being used the furnace does not switch to 2nd stage heat in response to a call from the thermostat but instead operates at 1st stage heat for the duration of the selected time before automatically switching to 2nd stage heat.

When the call for heat is satisfied, the gas valve and combustion air blower shut down. The control board shuts off the gas valve and runs the combustion blower for an additional 15 seconds. The circulating air blower continues to run for 2 minutes at 82% of the selected heating speed (low fire or high fire) before ramping down.

In the event the unit loses ignition, the control will attempt to recycle up to five times before it goes into a 1 hour lockout. Lockout may be manually reset by removing power from the control for more than 1 second or removing the thermostat call for heat for more than 3 seconds.

If during a heating cycle the limit control senses an abnormally high temperature and opens, the control board deenergizes the gas valve and the combustion blower while the circulating blower ramps up to 2nd stage heat speed. The circulating blower remains energized until the limits are closed.

Fan On

When the thermostat is set for continuous fan operation and there is no demand for heating or cooling, a call for fan closes the R to G circuit and the circulating blower motor runs at 50% of the selected cooling CFM until switched off. When the call for fan is turned off, the control de-energizes the circulating blower.

Cooling

The unit is set up at the factory for single stage cooling. For two stage cooling operation, clip the jumper wire located between the Y to Y2 terminals on the integrated ignition/blower control board. If the active dehumidification feature is enabled, the circulating blower runs at 70% of the selected cooling speed as long as there is a call for dehumidification.

⚠WARNING

- The system must not be in either the passive or active dehumidification mode when charging a cooling system.

Single Stage Cooling

A call for cooling from the thermostat closes the R to Y circuit on the integrated ignition/blower control board. The control waits for a 1-second delay before energizing the circulating blower to 82% of the selected cooling CFM (passive dehumidification mode). After 7.5 minutes, the circulating blower automatically ramps up to 100% of the selected cooling airflow. When the call for cooling is satisfied, the circulating blower ramps back down to 82% of the selected cooling airflow for 1 minute, then shuts off.

Two-Stage Cooling

A call for 1st stage cooling from the thermostat closes the R to Y circuit on the control board. The control waits for a 1-second delay before energizing the circulating blower. The blower motor runs at 57% of the selected air flow for the first 7.5 minutes of the 1st stage cooling demand (passive dehumidification mode). After 7.5 minutes, the blower motor runs at 70% of the selected cooling air flow until 1st stage cooling demand is satisfied.

A call for 2nd stage cooling from the thermostat closes the R to Y2 circuit on the control board. The blower motor ramps up to 100% of the selected cooling air flow. When the demand for cooling is met, the blower ramps down to Y1 until satisfied, then ramps down to 57% for 1 minute, then turns off.

Heat Pump

For heat pump operation, clip the jumper wire located bellow the O terminal on the integrated ignition/blower control board. In heat pump mode, a call for heat will result in the circulating air blower operating at the selected cooling airflow after a brief ramp-up period.

GE APPLIANCES

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

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