



GE APPLIANCES
a Haier company

Service Manual

NF95XS

95% Upflow/Horizontal Single
Stage Constant Torque Ultra Low
NO_x (<14 Ng/J) Gas Furnace



**READ CAREFULLY.
KEEP THESE INSTRUCTIONS.**

SERVICE MANUAL

NF95XS Gas Furnace



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

NF95XS series units are high-efficiency gas furnaces available in heating input capacities of 40,000 to 100,000 Btuh and cooling applications from 2 through 5 tons. Refer to Engineering Handbook for proper sizing.

Units are factory equipped for use with natural gas. All NF95XS units are equipped with a hot surface ignition system. The gas valve is redundant to assure safety shut-off as required by C.S.A.

The heat exchanger, burners and manifold assembly can be removed for inspection and service. The maintenance section gives a detailed description on how this is done.

All specifications 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.

Table of Contents

Technical Specifications	3
Blower Performance	4
Blower Performance	5
Parts Arrangement.....	6
Unit Components.....	7
Placement and Installation	16
Joint Cementing Procedure	17
Venting Practices.....	17
Vent Piping Guidelines	18
Start-Up	38
Heating System Service Checks	39
Typical Operating Characteristics.....	42
Maintenance	43
Wiring Diagram and Sequence of Operation.....	46
Notes	51

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.

WARNING



Electric shock hazard.

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

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

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 Full Load Amps	Trans (VA)	Approx Shipping Weight (lbs)
NF95X040S3B	40,000	39,000	95%	3 Ton	1/2	120-60-1	15	6.8	40	122
NF95X060S3B	60,000	58,000	95%	3 Ton	1/2	120-60-1	15	6.8	40	128
NF95X080S4C	80,000	78,000	95%	4 Ton	1/2	120-60-1	15	8.4	40	148
NF95X100S5C	100,000	97,000	95%	5 Ton	1/2	120-60-1	15	10.9	40	157

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

Accessory List

Catalog Number	Description
Return Air Base	
68W62	17.5" B Width
68W63	21.0" C Width
Flush Mount Termination (90% Furnaces only) US Only	
51W11	2" & 3" Vent Version
Concentric Vent Kit (90% Furnaces only) US Only	
71M80	1-1/2" Vent Version
69M29	2" Vent Version
60L46	3" Vent Version
Twinning Kit	
16W72	Constant Torque Gas Furnace Twinning Kit

Note: LP Conversion is not available on these models

Blower Performance

NF95X040S3B Performance (Less Filter)

External Static Pressure in. w.c.	Air Volume / Watts at Various Blower Speeds									
	High		Medium-High		Medium		Medium-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1450	350	1280	247	1190	200	966	112	902	89
0.10	1429	360	1268	257	1171	207	939	119	875	99
0.20	1400	371	1248	267	1139	212	894	124	850	110
0.30	1377	381	1222	279	1112	223	872	131	800	114
0.40	1350	391	1195	286	1084	235	829	138	778	122
0.50	1317	401	1156	298	1043	240	794	147	724	129
0.60	1285	408	1127	308	1019	252	754	151	690	142
0.70	1233	390	1107	316	987	259	708	161	633	144
0.80	1160	370	1077	322	955	270	661	167	607	149

NF95X060S3B Performance (Less Filter)

External Static Pressure in. w.c.	Air Volume / Watts at Various Blower Speeds									
	High		Medium-High		Medium		Medium-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1477	338	1289	240	1189	188	940	99	905	88
0.10	1431	353	1262	254	1160	200	918	109	873	97
0.20	1401	360	1244	263	1135	209	894	121	839	108
0.30	1372	374	1215	270	1110	221	852	126	798	113
0.40	1352	387	1189	282	1074	226	821	136	772	123
0.50	1324	391	1165	292	1050	241	786	146	728	130
0.60	1296	403	1130	302	1011	252	741	150	691	140
0.70	1255	406	1102	313	988	258	703	161	641	144
0.80	1190	386	1073	326	962	267	664	167	606	153

NF95X080S4C Performance (Less Filter)

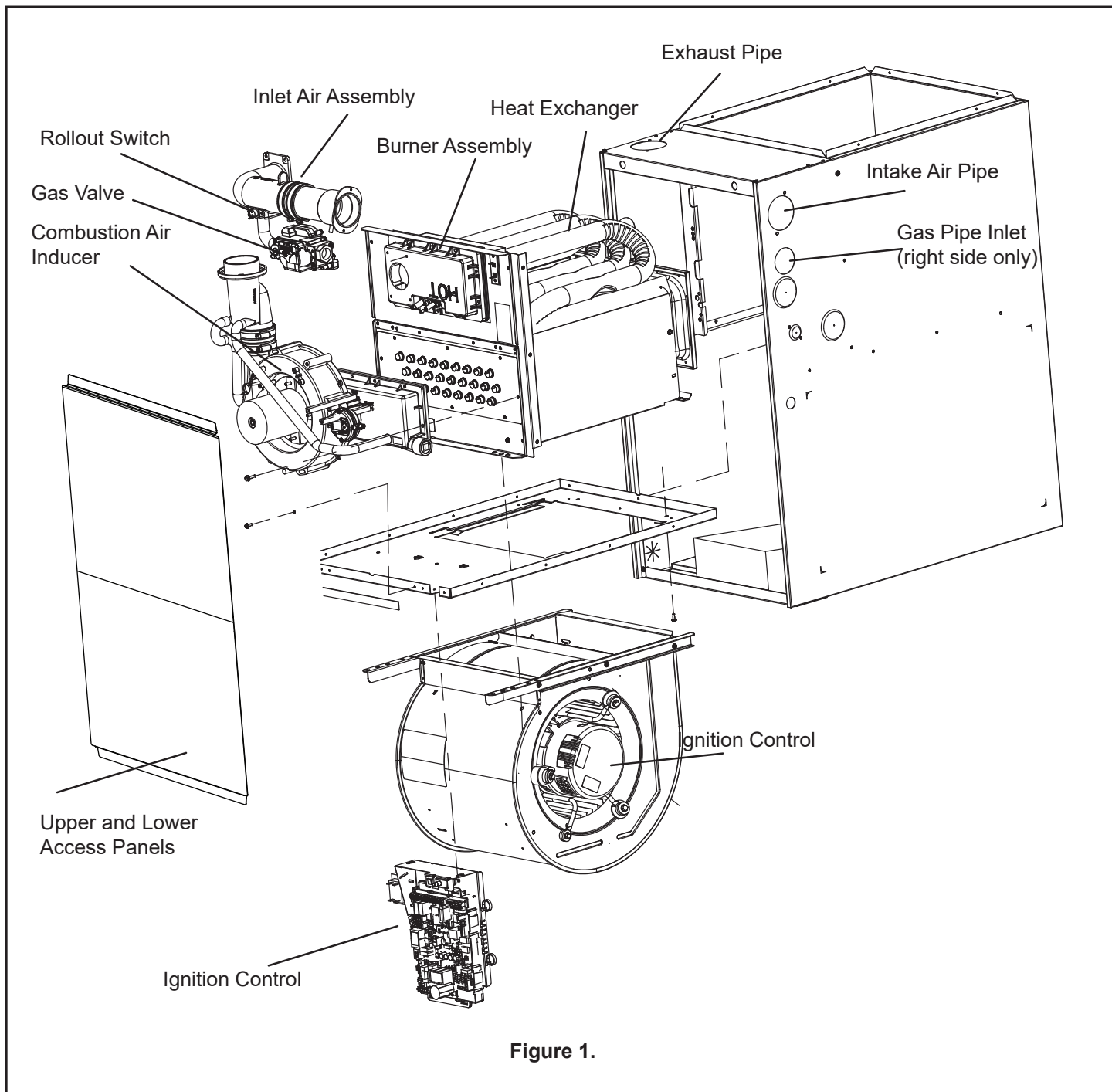
External Static Pressure in. w.c.	Air Volume / Watts at Various Blower Speeds									
	High		Medium-High		Medium		Medium-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1702	381	1502	270	1375	195	1298	169	1189	132
0.10	1688	418	1479	287	1349	220	1258	187	1136	144
0.20	1660	443	1450	304	1321	242	1215	203	1084	158
0.30	1627	458	1403	321	1282	255	1172	215	1030	172
0.40	1577	475	1370	337	1234	272	1131	231	990	188
0.50	1540	483	1329	352	1191	288	1085	245	933	195
0.60	1441	457	1291	369	1146	301	1045	259	883	203
0.70	1293	402	1249	380	1102	315	992	271	830	216
0.80	1144	365	1122	351	1053	326	951	285	809	219

Blower Performance

NF95X100S5C Performance (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Different Blower Speeds																			
	Bottom Return Air, Side Return Air with Optional Return Air Base, Return Air from Both Sides or Return Air from Bottom and One Side.										Single Side Return Air – Air volumes in bold require field fabricated transition to accommodate 20 x 25 x 1 in. air filter in order to maintain proper air velocity.									
	High		Med-High		Medium		Med-Low		Low		High		Med-High		Medium		Med-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	2156	722	1922	497	1723	370	1589	215	1420	211	2102	118	1833	489	1688	170	1590	300	1375	209
0.10	2112	738	1851	511	1681	388	1552	326	1380	227	2064	730	1809	504	1658	384	1540	314	1347	224
0.20	2076	748	1808	533	1636	403	1525	334	1340	244	2038	749	1789	514	1623	402	1507	331	1325	242
0.30	2035	768	1782	542	1604	425	1488	349	1290	259	2011	760	1761	531	1594	413	1472	348	1266	246
0.40	2009	772	1749	558	1572	433	1441	362	1248	266	1968	770	1726	549	1561	431	1435	355	1247	264
0.50	1942	776	1715	580	1533	452	1424	374	1213	281	1920	776	1685	560	1527	443	1394	374	1199	278
0.60	1881	746	1681	584	1512	468	1357	382	1157	293	1849	741	1660	578	1489	455	1356	379	1154	286
0.70	1790	715	1634	599	1459	474	1319	401	1136	306	1777	723	1622	593	1439	473	1317	395	1124	301
0.80	1702	679	1582	613	1432	491	1300	418	1084	312	1682	681	1588	602	1407	488	1288	408	1067	308

Parts Arrangement



Unit Components

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.

NF95XS unit components are shown in Figure 1. The combustion air inducer, gas valve and burners can be accessed by removing the outer access panel. The blower and control box can be accessed by removing the blower access panel.

Control Box Components

Unit transformer (T1) and integrated ignition control (A92) are located in the control box. In addition, a door interlock switch (S51) is located in the control box See Figure 2.

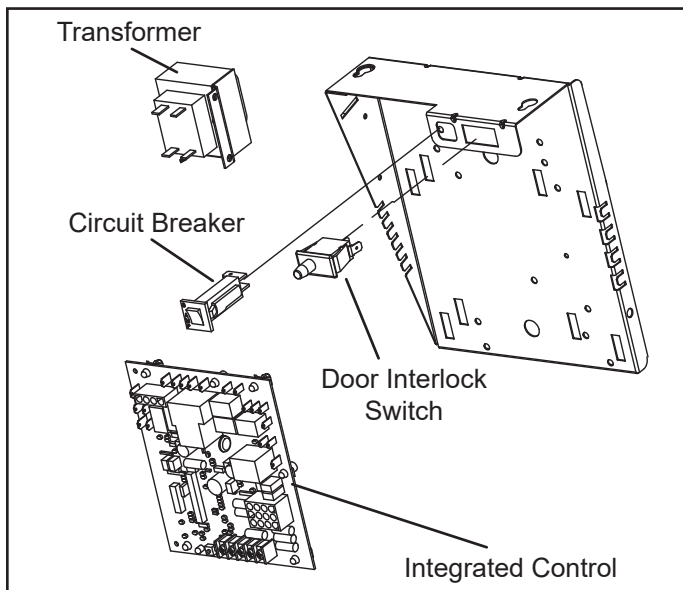


Figure 2. Control Box

Transformer (T1)

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

Door Interlock Switch (S51)

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

Circuit Breaker (CB8)

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

Integrated Ignition Control (A92)

⚠ WARNING

Shock hazard.

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

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

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

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

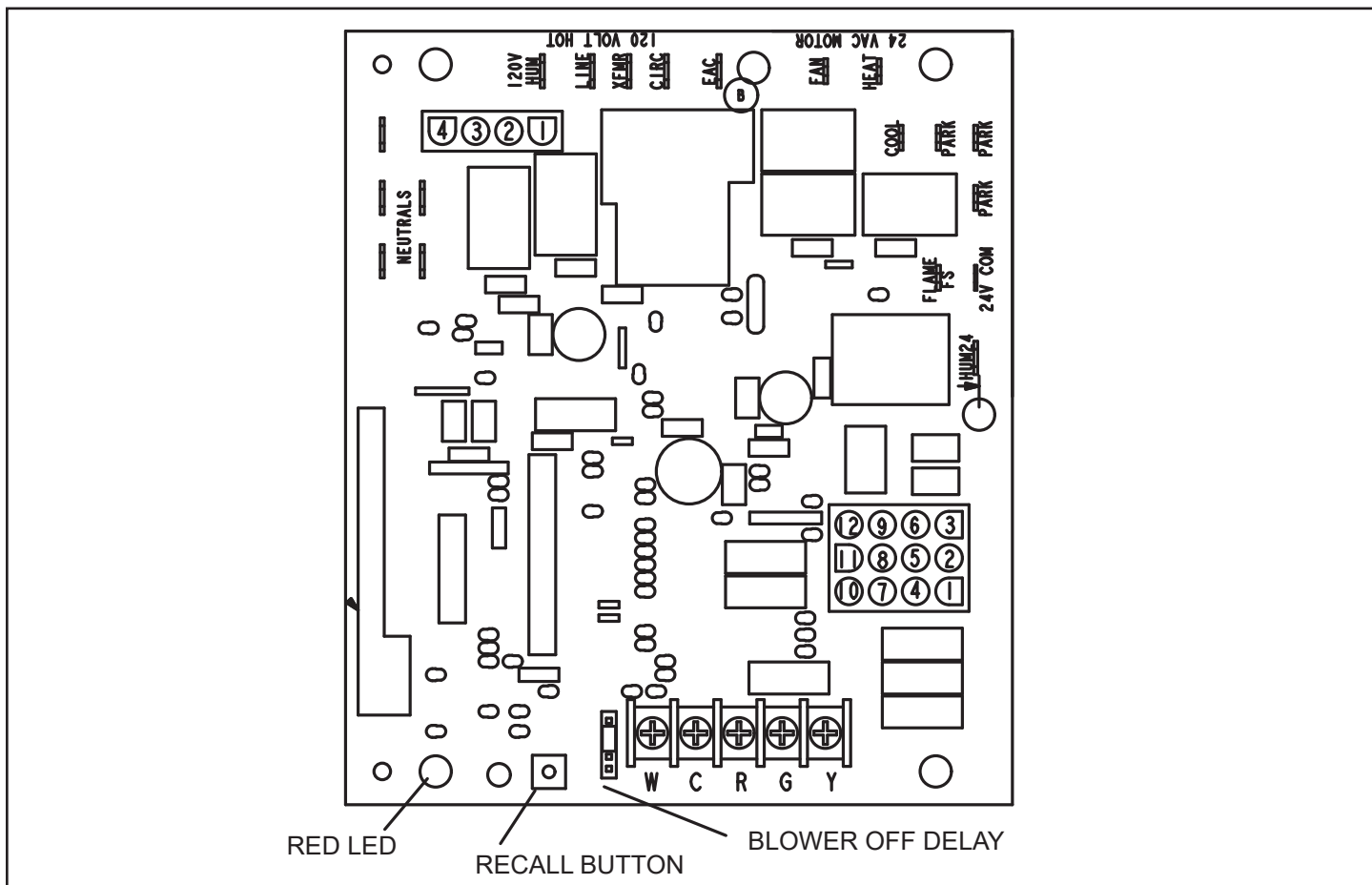
Table 1. 4-Pin Terminal Designation

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

Table 2. 12-Pin Terminal Designations

1/4" Quick Connect Terminals	
120HUM	Humidifier 120VAC
LINE	120VAC
XFMR	Transformer 120VAC
CIRC	Indoor blower 120VAC
EAC	Indoor air quality accessory 120VAC
NEUTRALS	Common 120VAC
HUM24	Humidifier 24VAC
3/16" Quick Connect Terminals	
COOL	Cooling tap 24VAC
HEAT	Heating tap 24VAC
FAN	Continuous blower 24VAC
PARK (no power)	Park terminal for speed taps
FS	Flame sense
24 COM	Common 24VAC

Table 3.



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

Red LED Flash Code ²	Diagnostic Codes / Status of Furnace
Off	No power to control or board fault detected
On	Board fault detected
Heartbeat¹	Control powered - displayed during all modes of operation if no errors are detected
1 flash	Reverse line voltage polarity
2 flashes	Improper earth ground
3 flashes	Burner failed to light, or lost flame during heating demand
4 flashes	Low flame signal - check flame sensor
5 flashes	Soft lockout - burner failed to light, exceeded maximum number of retries or recycles
6 flashes	Not used
7 flashes	Primary or secondary limit open or soft lockout mode - limit switch open longer than 3 minutes
8 flashes	Rollout switch open
9 flashes	Pressure switch failed to close or opened during heat demand
10 flashes	Soft lockout - pressure switch opened 5 times during one heat demand
11 flashes	Pressure switch stuck closed prior to activation or combustion air inducer
12 flashes	Flame sensed without gas valve energized
13 flashes	Low line voltage

¹ A "Heartbeat" is indicated by a "Slow Flash" - 1 sec on 1 sec off, repeating

² Error codes are indicated by a "rapid flash" - the LED flashes X times at ½ second on ½ second off, remains off for 3 seconds then repeats.

Last 10 error codes are stored in memory including when power is shut off to the unit. - To recall, press and release button, most recent will be displayed first, LED off for 3 sec, then next error code is displayed, etc. To clear error codes, depress and hold button longer than 5 seconds.

Table 4. Diagnostic Codes

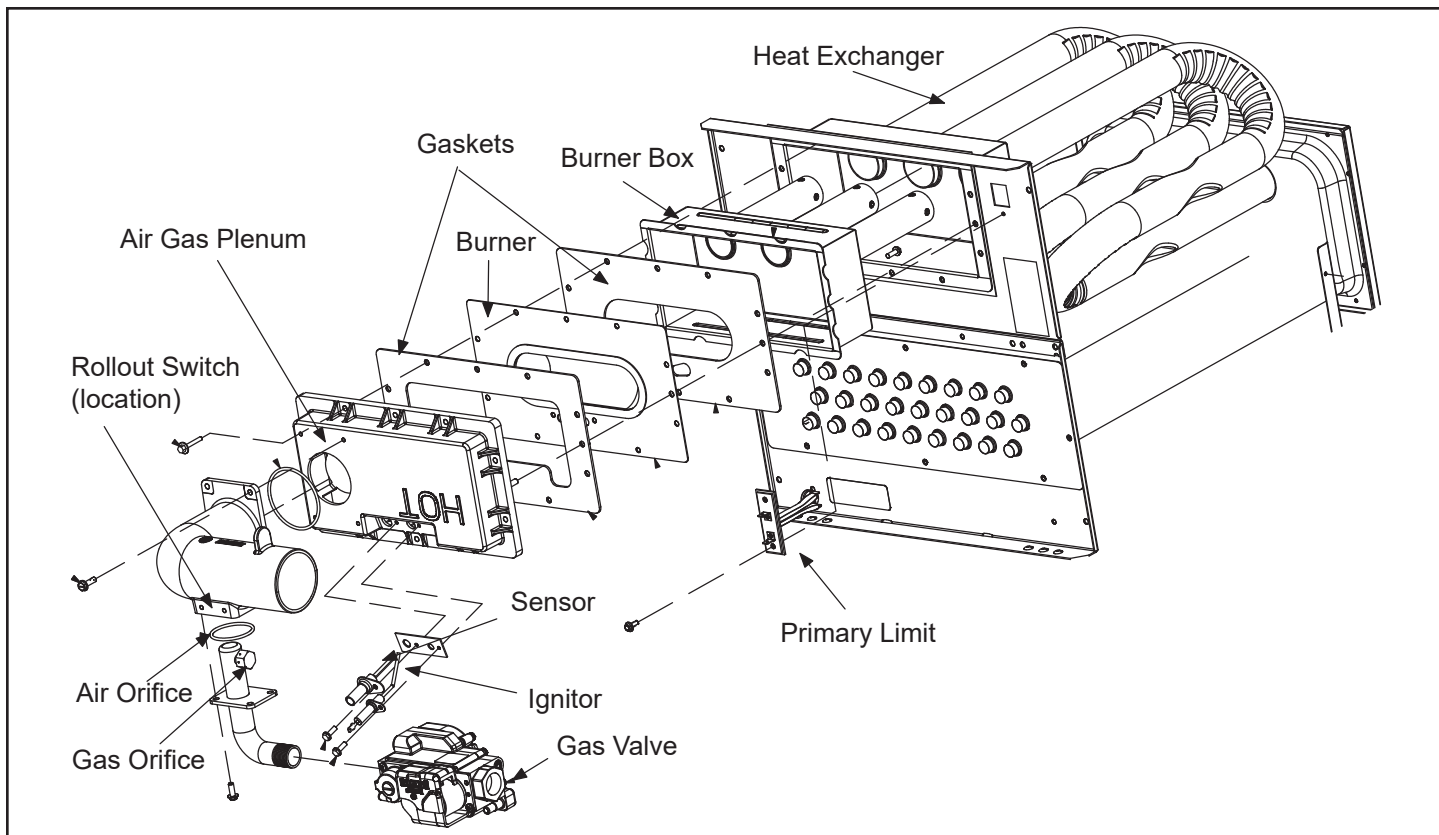


Figure 4. Heating Components

Electronic Ignition

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

After the 15-second pre-purge period, the ignitor warms up for 20 seconds during which the gas valve opens at 19 seconds for a 4-second trial for ignition. The ignitor remains energized for the first 3 seconds during the 4 second trial. If ignition is not proved during the 4-second period, the integrated control will try four more times with an inter purge and warm-up time between trials of 35 seconds. After a total of five trials for ignition (including the initial trial), the integrated control goes into Soft Lockout-Flame Failure mode. After a 60-minute reset period, the integrated control will begin the ignition sequence again.

Fan Time Control

Heating Fan On Time

The fan on time of 30 seconds is not adjustable.

Heating Fan Off Time

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

Adjust the fan-off delay to achieve a supply air temperature between 90° - 110° at the instant the blower is de-energized. (Longer delay times allow for lower air temperature, shorter delay times allow for higher air temperature). See Figure 5.

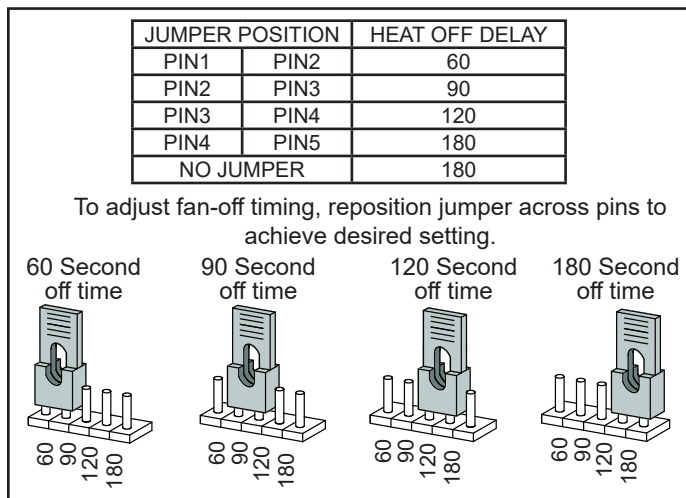


Figure 5. Heat Fan-Off Time in Seconds

Cooling Fan On Time

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

Cooling Fan Off Time

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

Heating Components

Combustion air inducer (B6), primary limit control (S10), ignitor, burner, flame rollout switch (S47), gas valve (GV1), combustion air pressure switch (S18), and heat exchangers are located in the heating compartment. The heating compartment can be accessed by removing the outer access panel.

Thermal Switch

The auto-reset switch is located on the front of the air gas intake. The switch will safely shut the unit down if excessive temperatures are detected. When the switch senses excessive temperature, the circuit breaks and the ignition control immediately stops ignition and closes the gas valve. See Figure 4.

Burner and Orifice

Burners are factory set and require no adjustment. Always operate the unit with air gas plenum in place. The burner has one orifice located between the gas valve and the air intake assembly (Figure 4). To check or replace the orifice remove the black iron inlet pipe from the gas valve then remove the four screws securing the gas valve to the intake air pipe. The orifice is located in the orifice housing. The burner uses an orifice (see Table 5) that is precisely matched to the burner input. The burner can be removed for service. If burner has been removed, it is critical to replace all gaskets.

Unit Input	Orifice Size
040	0.0472
060	0.0595
080	0.0689
100	0.0810

Table 5. Gas Orifice

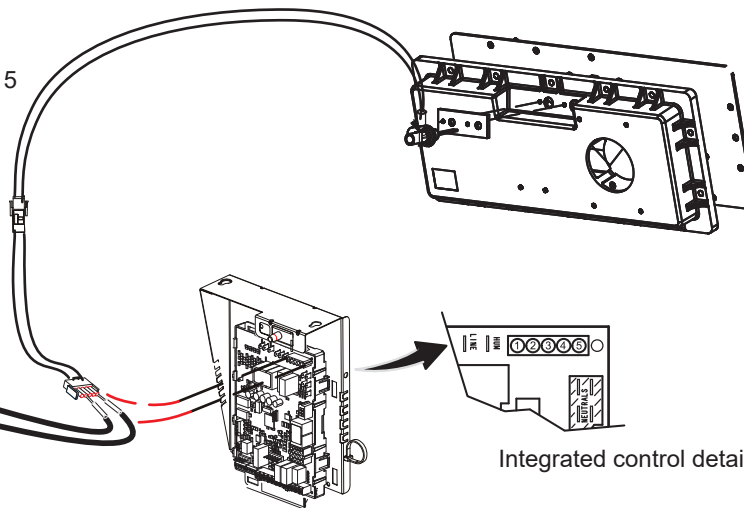
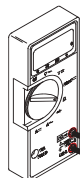
Primary Limit Control

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.

Test 1

Remove 5-pin plug from control
Check ohms reading across terminals 1 and 5
Ohm value should be between 39-70.

Meter
(set to ohms)

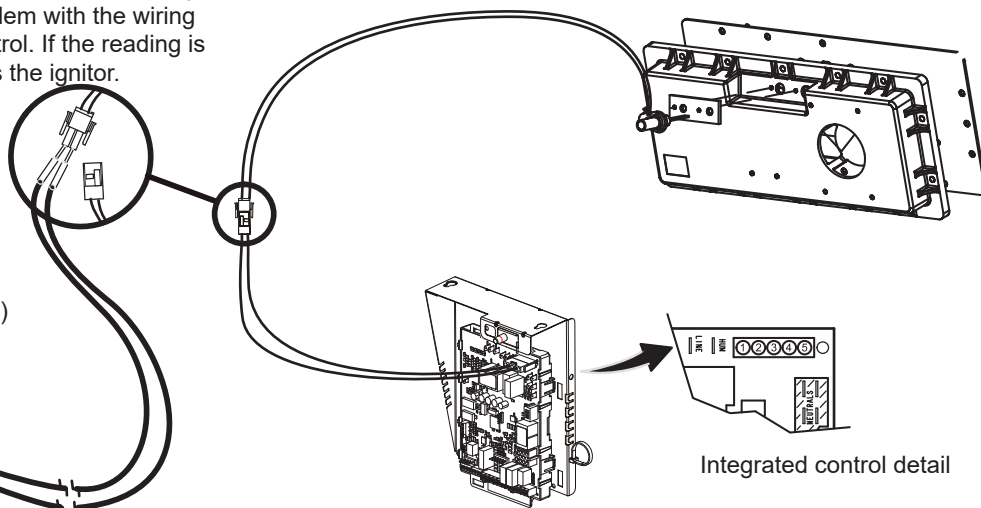
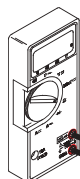


Integrated control detail

Test 2

Separate the 2-pin jack plug near the manifold and check resistance of the ignitor. If the reading is correct, then there is a problem with the wiring between the jack plug and control. If the reading is not correct, the issue is the ignitor.

Meter
(set to ohms)

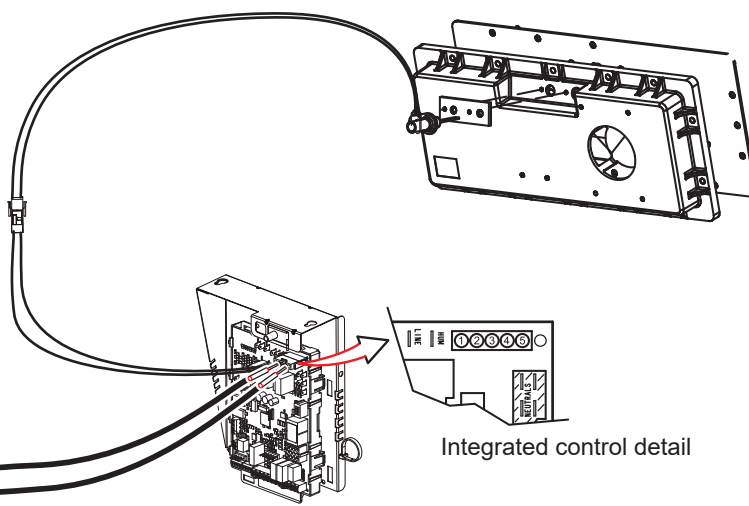
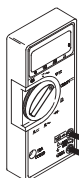


Integrated control detail

Test 3

Insert meter probes into the terminals 1 and 5.
(Use small diameter probes in order to not damage plug). Check voltage during 20 second warm up period. Voltage should read 120 volts + 10%. If voltage is above these values, check for correct supply voltage to furnace.

Meter
(set to AC volts)



Integrated control detail

Figure 6. Ignitor Check Out
(exploded view for clarity)

Gas Valve

The NF95XS uses an internally redundant valve to assure safety shut-off. If the gas valve must be replaced, the same type valve must be used. See Figure 7.

24VAC terminals and gas control switch are located on top of the valve. All terminals on the gas valve are connected to wires from the ignition control. 24V applied to the terminals opens the valve.

Inlet and outlet pressure taps are located on the valve. A manifold adjustment screw is also located on the valve. An LP/Propane changeover kit is available.

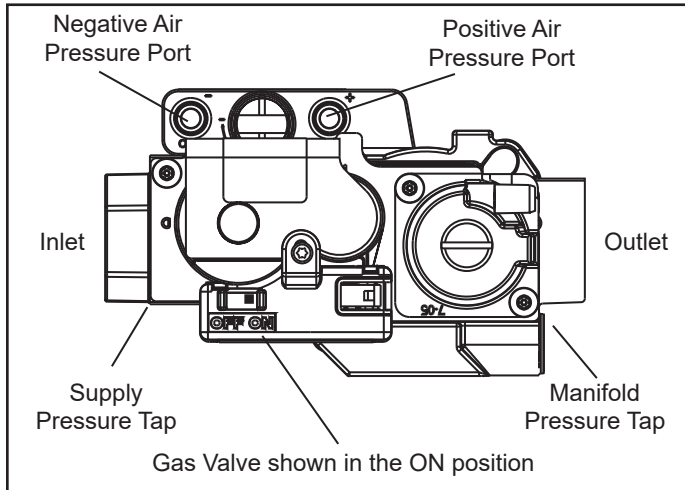


Figure 7. Gas Valve

Flame Sensor

A flame sensor is located on the top of the air gas plenum. The sensor can be removed for service without removing the burner. During operation, flame is sensed by current passed through the flame and sensing electrode. The SureLight control allows the gas valve to remain open as long as flame signal is sensed. To check flame sense signal use the push-button found on the integrated control and go to Field Test Mode. The menu will display the flame signal. See Table 6 for flame signal. See Figure 4.

Flame Signal in Microamps		
Normal	Low	Drop Out
2.6 or greater	2.5 or less	1.1

Table 6.

Ignitor

NF95XS units use a nitride ignitor made from a proprietary ceramic material. To check ignitor, measure its resistance and voltage. A value of 39 to 70 ohms indicates a good ignitor. Voltage to the ignitor should be 102 - 132VAC. See Figure 6 for resistance and voltage checks. See Figure 4.

Combustion Air Inducer (B6) & Cold End Header Box

All NF95XS units use a combustion air inducer to move air through the burners and heat exchanger during heating operation (see Figure 8). The blower uses a shaded pole 120VAC motor. The motor operates during all heating operation and is controlled by integrated control A92. Blower operates continuously while there is a call for heat. The integrated control will not proceed with the ignition sequence until combustion air inducer operation is sensed by the proving switches.

The combustion air inducer is installed on the cold end header box. The cold end header box is a single piece made of hard plastic. The box has an internal channel where the combustion air inducer creates negative pressure at unit start up. The channel contains an orifice used to regulate flow created by the combustion air inducer. The box has pressure taps for the combustion air inducer pressure switch hoses. The pressure switch measures the pressure across the combustion air inducer orifice or difference in the channel and the box. If replacement is necessary the gaskets used to seal the box to the vestibule panel and the combustion air inducer to the box, must also be replaced.

Combustion Air Prove Switch

NF95XS series units are equipped with a differential pressure switch located on the cold end header box. The switch monitors across the combustion air inducer orifice to insure proper flow through the heat exchanger. See Figure 8 and Figure 9.

The switch is a SPST N.O. pressure switch electrically connected to the integrated control. The purpose of the switch is to prevent burner operation if the combustion air inducer is not moving enough air for proper combustion.

On start-up, the switch monitors whether the combustion air inducer is operating. It closes a circuit to the integrated control when the difference in pressure across the combustion air inducer orifice exceeds a non-adjustable factory setting. If the switch does not successfully sense the required differential, the switch cannot close and the furnace cannot operate. If the flue or air inlet become obstructed during operation, the switch senses a loss of pressure differential and opens the circuit to the integrated control. If the condensate line is blocked, water will back up into the header box and reduce the pressure differential across the switch. The pressure switch opens if the differential drops below the set point. See Table 7.

Unit Input	Orifice Size
040	0.50"
060	
080	
100	

Table 7.

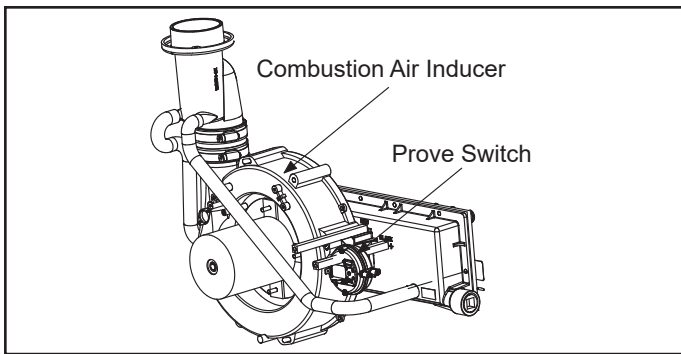


Figure 8. Combustion Air Inducer and Prove Switch

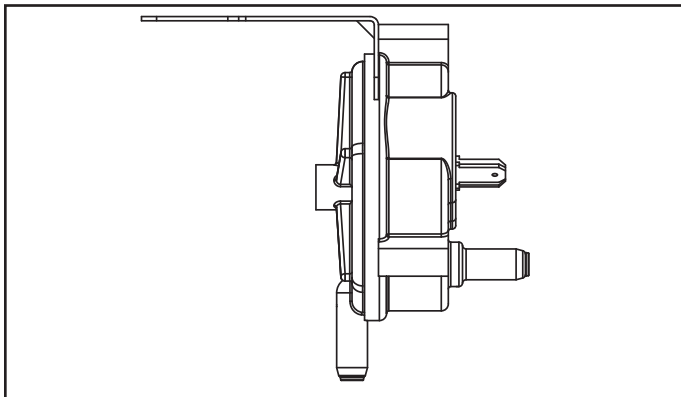


Figure 17. Pressure Switch

Blower Compartment

⚠ IMPORTANT

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

NF95XS 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 17 for troubleshooting procedure.

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

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

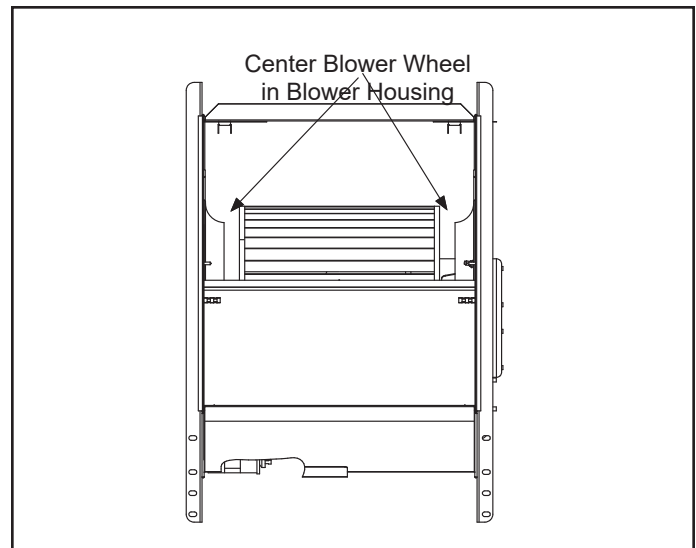


Figure 9. Blower Wheel Replacement

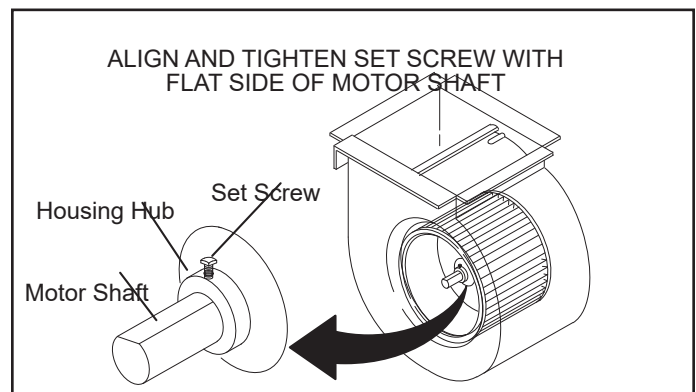


Figure 10.

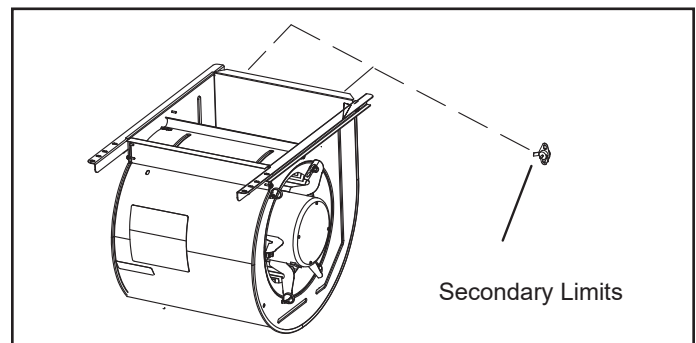


Figure 11. Secondary Limit Control

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 (see Figure 13) 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 13.

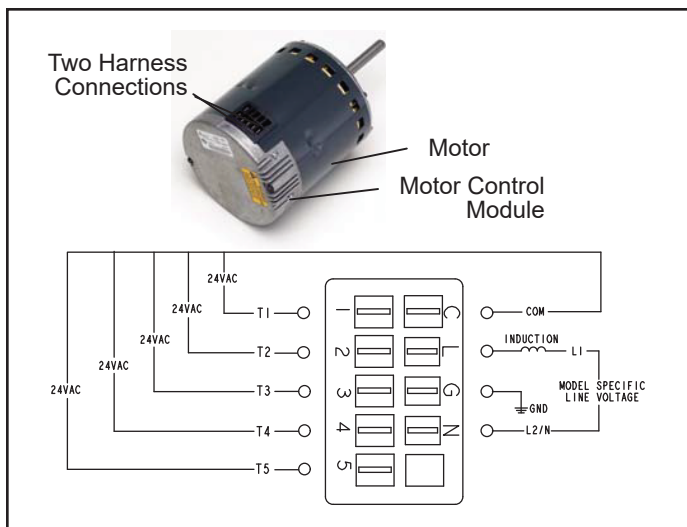


Figure 12. Unplug the Two Harness Connection

4. Remove the two hex head bolts securing the motor control module to the motor (see Figure 14).



Figure 13. Remove the Hex Head Bolts

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.

Testing the Motor

See Figure 15.

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.



Figure 14. Motor Test

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.

Scale	Measurement Range	
	in Words	in ohms
2 M	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

Table 8. Ohm Meter Range

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 14. Torque bolts to 22 inch pounds or 1/16th clock turn as exemplified to the right.
4. Reconnect the two harnesses to the motor control module.
5. The electrical connectors of the motor should be facing down to form a drip loop (Figure 16). This will direct moisture away from the motor and its electric connections on the motor.

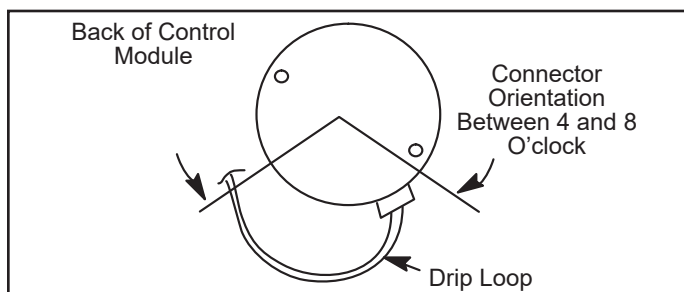
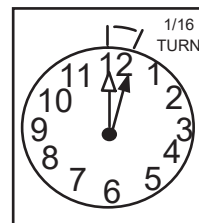
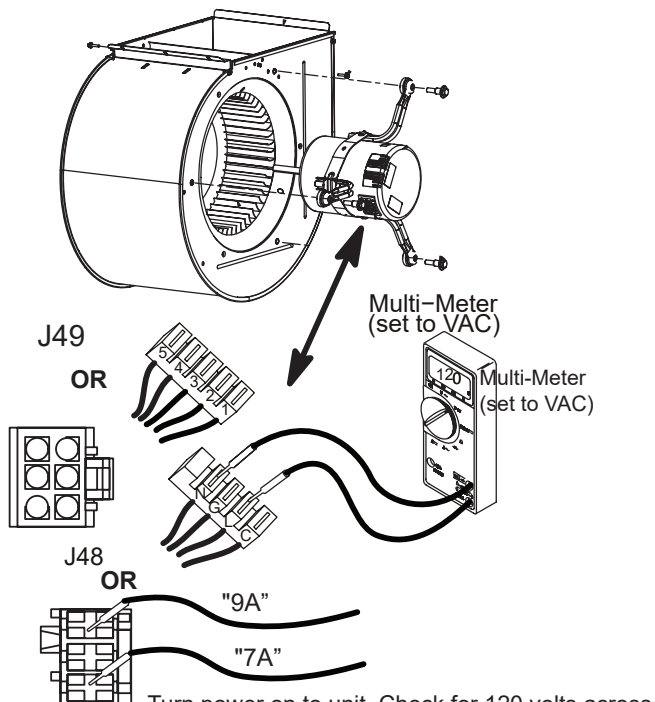
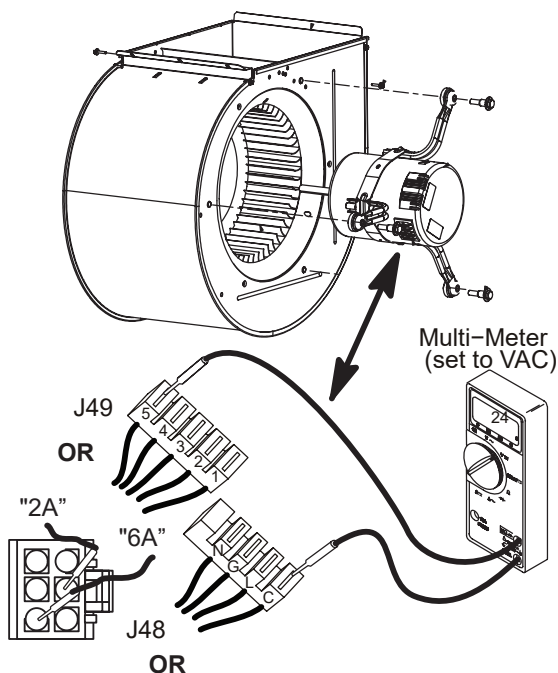


Figure 15. Drip Loop



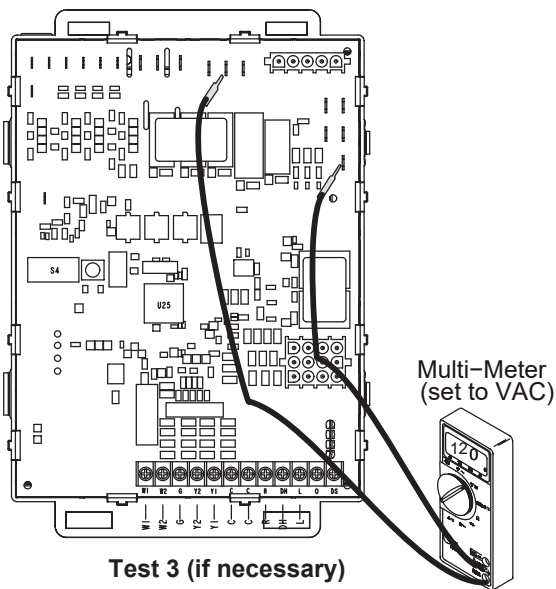
Test 1

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

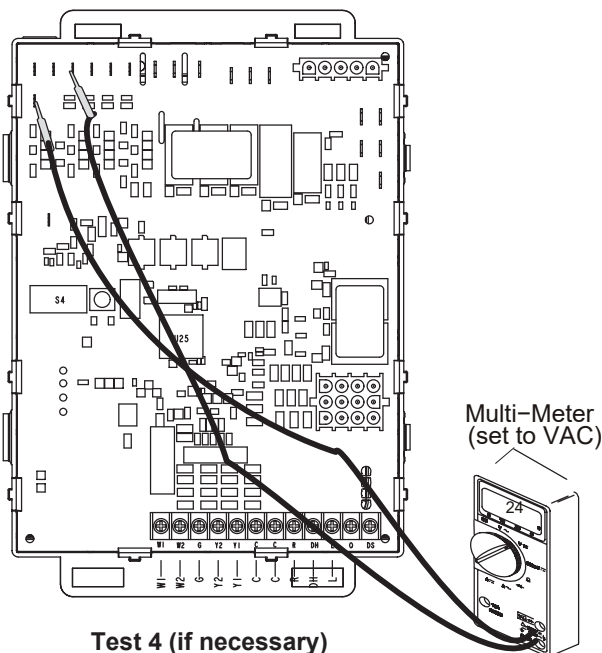
Switch thermostat to CONTINUOUS FAN MODE. For units using 4 and 5 position connector blocks, test for 24 volts terminal "C" of J48 and the tap used for continuous fan on J49 (1, 2, 3, 4 or 5). For units using 3 and 6 position connectors, test for 24 volts between pin "6A" and the pin used for continuous 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 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 the voltage is not present, problem may be with the integrated control.

Figure 16.

Placement and Installation

Pipe & Fittings Specifications

All pipe, fittings, primer and solvent cement must conform with American National Standard Institute and the American Society for Testing and Materials (ANSI/ASTM) standards. The solvent shall be free flowing and contain no lumps, undissolved particles or any foreign matter that adversely affects the joint strength or chemical resistance of the cement. The cement shall show no gelation, stratification, or separation that cannot be removed by stirring. Refer to Table 9 for approved piping and fitting materials.

Schedule 40 PVC (Pipe)	D1785
Schedule 40 PVC (Cellular Core Pipe)	F891
Schedule 40 PVC (Fittings)	D2466
Schedule 40 CPVC (Pipe)	F441
Schedule 40 CPVC (Fittings)	F438
SDR-21 PVC or SDR-26 PVC (Pipe)	D2241
SDR-21 CPVC or SDR-26 CPVC (Pipe)	F442
Schedule 40 ABS Cellular Core DWV (Pipe)	F628
Schedule 40 ABS (Pipe)	D1527
Schedule 40 ABS (Fittings)	D2468
ABS-DWV (Drain Waste & Vent) (Pipe & Fittings)	D2661
PVC-DWV (Drain Waste & Vent) (Pipe & Fittings)	D2665
PRIMER & SOLVENT CEMENT	ASTM SPECIFICATION
PVC & CPVC Primer	F656
PVC Solvent Cement	D2564
CPVC Solvent Cement	F493
ABS Solvent Cement	D2235
PVC/CPVC/ABS All Purpose Cement For Fittings & Pipe of the same material	D2564, D2235, F493
ABS to PVC or CPVC Transition Solvent Cement	D3138
CANADA PIPE & FITTING & SOLVENT CEMENT	MARKING
PVC & CPVC Pipe and Fittings	ULCS636
PVC & CPVC Solvent Cement	
ABS to PVC or CPVC Transition Cement	
POLYPROPYLENE VENTING SYSTEM	ULC-S636
PolyPro® by Duravent	
InnoFlue® by Centrotherm	
ECCO Polypropylene Vent™	

Table 9. Piping and Fittings Specifications

CAUTION

Solvent cements for plastic pipe are flammable liquids and should be kept away from all sources of ignition. Do not use excessive amounts of solvent cement when making joints. Good ventilation should be maintained to reduce fire hazard and to minimize breathing of solvent vapors. Avoid contact of cement with skin and eyes.

IMPORTANT

NF95XS exhaust and intake connections are made of PVC. Use PVC primer and solvent cement when using PVC vent pipe. When using ABS vent pipe, use transitional solvent cement to make connections to the PVC fittings in the unit.

Use PVC primer and solvent cement or ABS solvent cement meeting ASTM specifications, refer to Table 9. As an alternate, use all purpose cement, to bond ABS, PVC, or CPVC pipe when using fittings and pipe made of the same materials. Use transition solvent cement when bonding ABS to either PVC or CPVC.

Low temperature solvent cement is recommended during cooler weather. Metal or plastic strapping may be used for vent pipe hangers. Uniformly apply a liberal coat of PVC primer for PVC or use a clean dry cloth for ABS to clean inside socket surface of fitting and male end of pipe to depth of fitting socket.

Canadian Applications Only - Pipe, fittings, primer and solvent cement used to vent (exhaust) this appliance must be certified to ULC S636 and supplied by a single manufacturer as part of an approved vent (exhaust) system. In addition, the first three feet of vent pipe from the furnace flue collar must be accessible for inspection.

NOTE: *The intake coupling on the furnace is ABS material. Use transitional solvent to make connections to PVC pipe.*

NOTE: *Exhaust coupling must be installed with provided appliance adapter. See Figure 20.*

Joint Cementing Procedure

All cementing of joints should be done according to the specifications outlined in ASTM D 2855.



DANGER

DANGER OF EXPLOSION!

Fumes from PVC glue may ignite during system check. Allow fumes to dissipate for at least 5 minutes before placing unit into operation.

1. Measure and cut vent pipe to desired length.
2. Debur and chamfer end of pipe, removing any ridges or rough edges. If end is not chamfered, edge of pipe may remove cement from fitting socket and result in a leaking joint.

NOTE: Check the inside of vent pipe thoroughly for any obstruction that may alter furnace operation.

3. Clean and dry surfaces to be joined.
4. Test fit joint and mark depth of fitting on outside of pipe.
5. Uniformly apply a liberal coat of PVC primer for PVC or use a clean dry cloth for ABS to clean inside socket surface of fitting and male end of pipe to depth of fitting socket.

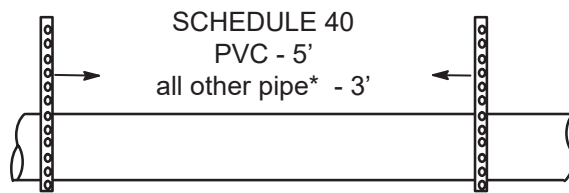
NOTE: Time is critical at this stage. Do not allow primer to dry before applying cement.

6. Promptly apply solvent cement to end of pipe and inside socket surface of fitting. Cement should be applied lightly but uniformly to inside of socket. Take care to keep excess cement out of socket. Apply second coat to end of pipe.
7. Immediately after applying last coat of cement to pipe, and while both inside socket surface and end of pipe are wet with cement, forcefully insert end of pipe into socket until it bottoms out. Turn PVC pipe 1/4 turn during assembly (but not after pipe is fully inserted) to distribute cement evenly. DO NOT turn ABS or cellular core pipe.

NOTE: Assembly should be completed within 20 seconds after last application of cement. Hammer blows should not be used when inserting pipe.

8. After assembly, wipe excess cement from pipe at end of fitting socket. A properly made joint will show a bead around its entire perimeter. Any gaps may indicate an improper assembly due to insufficient solvent.
9. Handle joints carefully until completely set.

Venting Practices



* See table 9 for allowable pipe.

NOTE: - Isolate piping at the point where it exits the outside wall or roof in order to prevent transmission of vibration to the structure.

NOTE: All horizontal runs of exhaust pipe must slope back toward ward unit a minimum of 1/4" (6mm) drop for each 12" (305mm).

Wall Thickness Guidelines

24" maximum
3/4" minimum

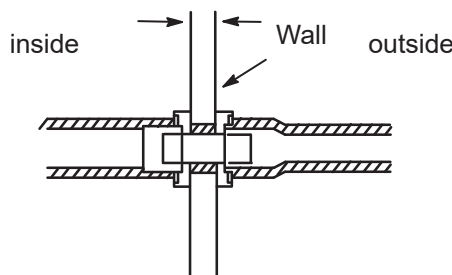


Figure 18. Piping Suspension Guidelines

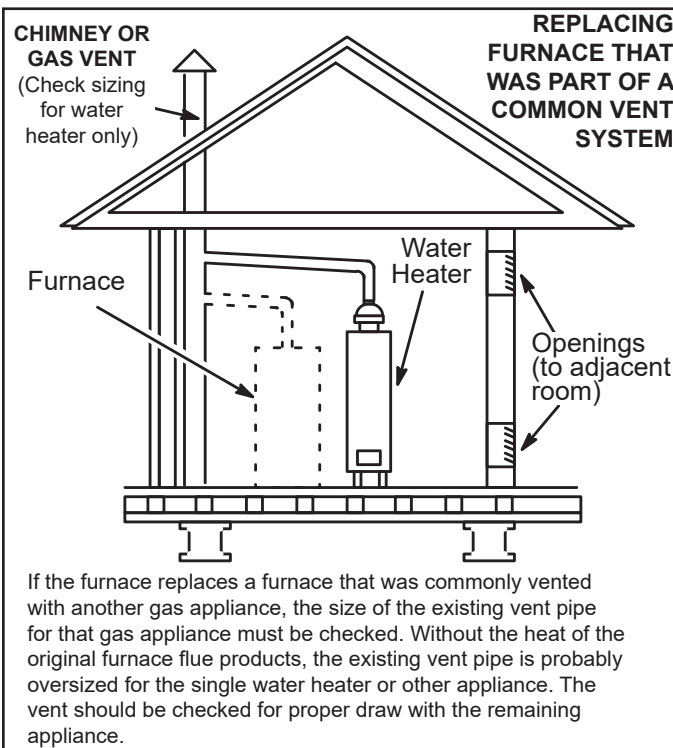


Figure 19.

1. In areas where piping penetrates joists or interior walls, hole must be large enough to allow clearance on all sides of pipe through center of hole using a hanger.
2. When furnace is installed in a residence where unit is shut down for an extended period of time, such as a vacation home, make provisions for draining condensate collection trap and lines.

Vent Adaptor

See Figure 20.

The vent adaptor must be attached to the exhaust coupling on the furnace top panel. Use the provided bands. See steps below.

1. Remove the caution sticker from vent adaptor.
2. Fully insert vent adaptor with both bands loosely attached on the furnace exhaust coupling.
3. Insert PVC exhaust pipe through vent adapter. Ensure vent pipe is fully seated into exhaust coupling.
4. Tighten both top and bottom bands to 40 in-lbs. See Figure 20.
5. Tighten top band.

Route piping to outside of structure. Continue with installation following instructions given in piping termination section.

CAUTION

Do not discharge exhaust into an existing stack or stack that also serves another gas appliance. If vertical discharge through an existing unused stack is required, insert PVC pipe inside the stack until the end is even with the top or outlet end of the metal stack.

CAUTION

The exhaust vent pipe operates under positive pressure and must be completely sealed to prevent leakage of combustion products into the living space.

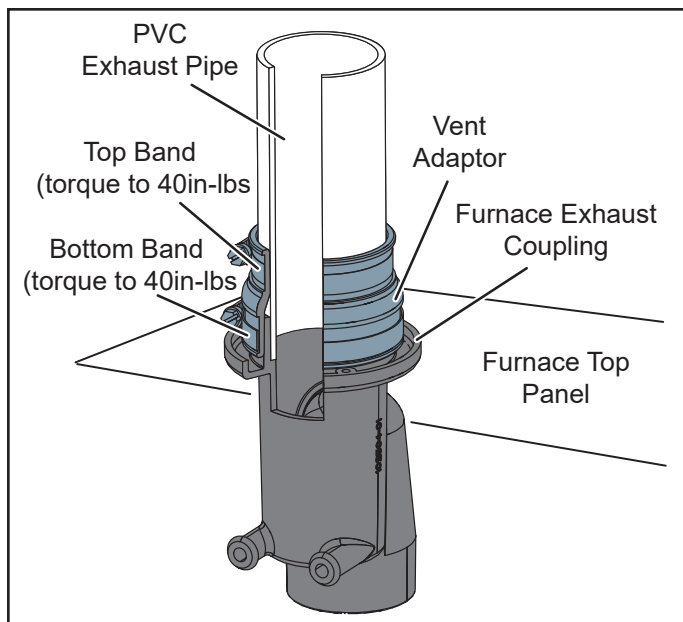


Figure 20. Vent Adaptor to Exhaust Coupling

Vent Piping Guidelines

NOTE: GE Appliances has approved the use of DuraVent® and Centrotherm manufactured vent pipe and terminations as an option to PVC. When using the PolyPro® by DuraVent or InnoFlue® by Centrotherm venting system the vent pipe requirements stated in the unit installation instruction – minimum & maximum vent lengths, termination clearances, etc. – apply and must be followed. Follow the instructions provided with PolyPro by DuraVent and InnoFlue by Centrotherm venting system for assembly or if requirements are more restrictive. The PolyPro by DuraVent and InnoFlue by Centrotherm venting system must also follow the uninsulated and unconditioned space criteria listed in Table 14.

The NF95XS can be installed as either a Non-Direct Vent or a Direct Vent gas central furnace.

NOTE: In Non-Direct Vent installations, combustion air is taken from indoors and flue gases are discharged outdoors. In Direct Vent installations, combustion air is taken from outdoors and flue gases are discharged outdoors.

Intake and exhaust pipe sizing -- Size pipe according to Table 10 and Table 12A through Table 12B. Count all elbows in side and outside the home. Table 10 lists the minimum vent pipe lengths permitted. Table 12A through Table 12B lists the maximum pipe lengths permitted. Regardless of the diameter of pipe used, the standard roof and wall terminations described in section Exhaust Piping Terminations should be used. Exhaust vent termination pipe is sized to optimize the velocity of the exhaust gas as it exits the termination. Refer to Table 15.

In some applications which permit the use of several different sizes of vent pipe, a combination vent pipe may be used. Contact GE Appliances Technical Service for assistance in sizing vent pipe in these applications.

NOTE: The exhaust collar on all models is sized to accommodate 2" Schedule 40 vent pipe. In horizontal applications, any transition to exhaust pipe larger than 2" must be made in vertical runs of the pipe. Therefore a 2" elbow must be added before the pipe is transitioned to any size larger than 2". This elbow must be added to the elbow count used to determine acceptable vent lengths. Contact the Application Department for more information concerning sizing of vent systems which include multiple pipe sizes.

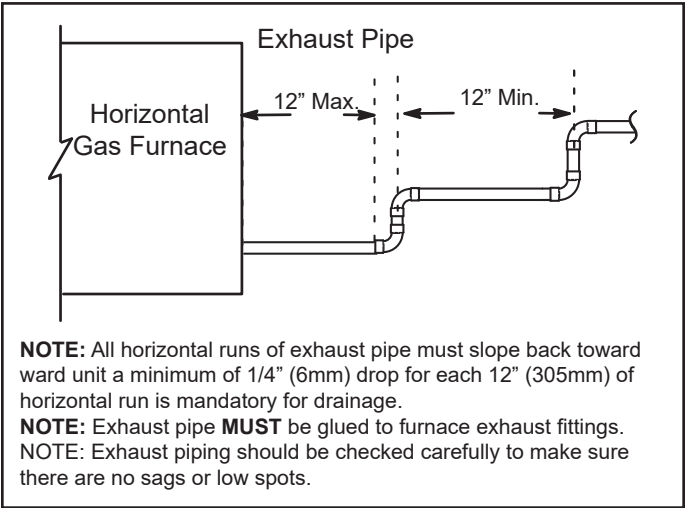


Figure 21. Horizontal Installation Offset Requirements

Model	Min. Vent Length*
040, 060, 080, 100	15 ft. or 5 ft. plus 2 elbows or 10 ft. plus 1 elbow
*Any approved termination may be added to the minimum length listed.	

Table 10. Minimum Vent Pipe Lengths

Use the following steps to correctly size vent pipe diameter.

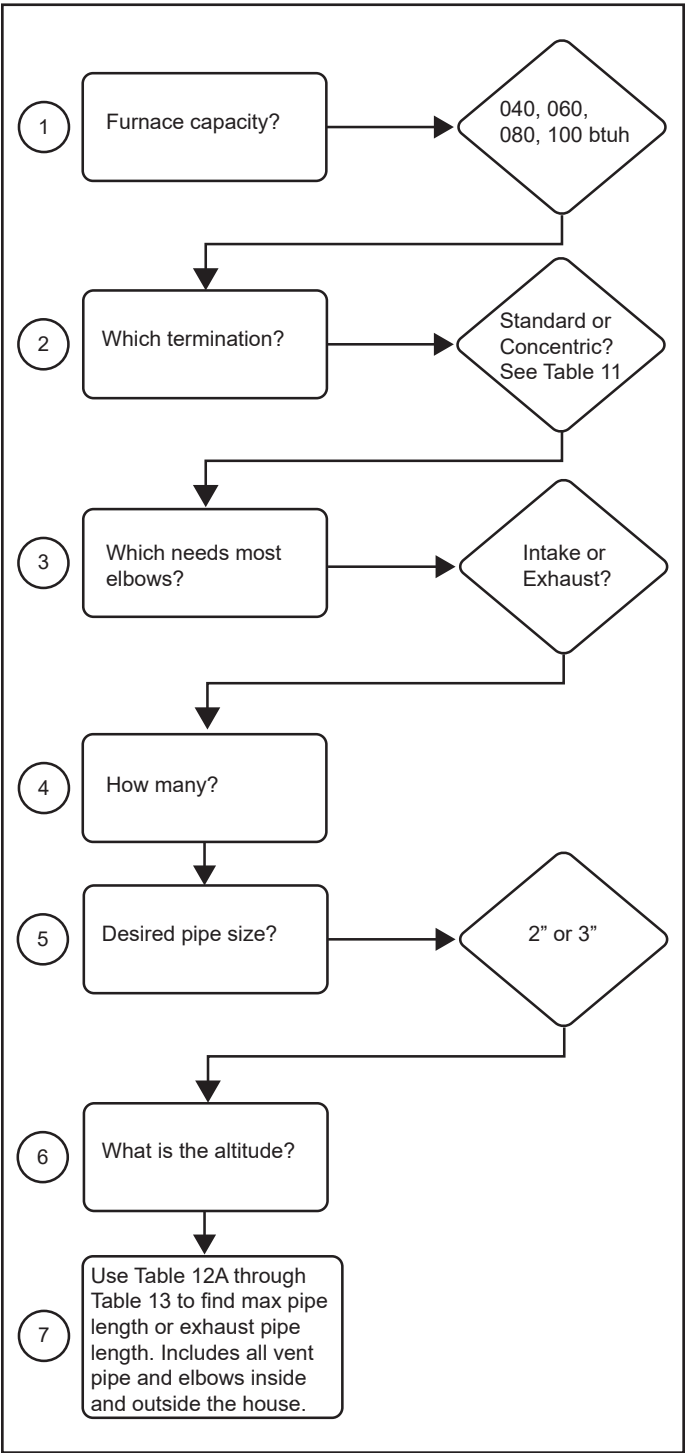


Figure 22.


IMPORTANT

Do not use screens or perforated metal in exhaust or intake terminations. Doing so will cause freeze-ups and may block the terminations.

Input Size	Vent Pipe Dia. (in.)	STANDARD		CONCENTRIC		
		Flush-Mount Kit	Field Fabricated	1-1/2 in.	2 in.	3 in.
		51W11 (US)		71M80 (US) 44W92 (CA)	69M29 (US) 44W92 (CA)	60L46 (US) 44W93 (CA)
040	2	³ YES	⁵ YES	² YES		
	3	³ YES	⁵ YES	² YES		
060	2	³ YES	⁵ YES	² YES		
	3	³ YES	⁵ YES	² YES		
080	2	³ YES	⁵ YES		YES	YES
	3	³ YES	⁵ YES		YES	YES
100	2	³ YES	⁵ YES		YES	YES
	3	³ YES	⁵ YES		YES	YES

NOTE - Standard Terminations do not include any vent pipe or elbows external to the structure. Any vent pipe or elbows external to the structure must be included in total vent length calculations. See vent length tables.

* Kits must be properly installed according to kit instructions.

¹ Requires field-provided outdoor 1-1/2" exhaust accelerator.

² Concentric kits 71M80 and 44W92 include 1-1/2" outdoor accelerator, when used with 040 and 060 input models.

³ Flush mount kits 51W11 includes 1-1/2 in. outdoor exhaust accelerator, required when used with 040, 060 and 080 input models.

⁴ Termination kits 44W92 and 44W93 are certified to ULC S636 for use in Canada only.

⁵ See Table 15 for vent accelerator requirements.

Table 11. Outdoor Termination Kits

Maximum Allowable Intake or Exhaust Vent Length in Feet

Standard Termination at Elevation 0 - 4500 ft									
Number of 90° Elbows Used	2" Pipe				3" Pipe				
	Model				Model				
	040	060	080	100	040	060	080	100	
1	81	66	44	24	138	137	118	118	
2	76	61	39	19	133	132	113	113	
3	71	56	34	14	128	127	108	108	
4	66	51	29	n/a	123	122	103	103	
5	61	46	24		118	117	98	98	
6	56	41	19		113	112	93	93	
7	51	36	14		108	107	88	88	
8	46	31	n/a		103	102	83	83	
9	41	26			98	97	78	78	
10	36	21			93	92	73	73	
Standard Termination at Elevation 4501 - 7500 ft									
Number of 90° Elbows Used	2" Pipe				3" Pipe				
	Model				Model				
	040	060	080	100	040	060	080	100	
1	81	41	34	9	138	105	100	65	
2	76	36	29	n/a	133	100	95	60	
3	71	31	24		128	95	90	55	
4	66	26	19		123	90	85	50	
5	61	21	14		118	85	80	45	
6	56	16	9		113	80	75	40	
7	51	11	n/a		108	75	70	35	
8	46	n/a			103	70	65	30	
9	41				98	65	60	25	
10	36				93	60	55	20	
NOTE - Size intake and exhaust pipe length separately. Values in table are for Intake OR Exhaust, not combined total. Both Intake and Exhaust must be same pipe size.									
NOTE - Additional vent pipe and elbows used to terminate the vent pipe outside the structure must be included in the total vent length calculation.									

Table 12A.

Maximum Allowable Intake or Exhaust Vent Length in Feet

Concentric Termination at Elevation 0 - 4500 ft									
Number of 90° Elbows Used	2" Pipe				3" Pipe				
	Model				Model				
	040	060	080	100	040	060	080	100	
1	73	58	42	22	121	121	114	114	
2	68	53	37	17	116	116	109	109	
3	63	48	32	12	111	111	104	104	
4	58	43	27	n/a	106	106	99	99	
5	53	38	22		101	101	94	94	
6	48	33	17		96	96	89	89	
7	43	28	12		91	91	84	84	
8	38	23	n/a		86	86	79	79	
9	33	18			81	81	74	74	
10	28	13			76	76	69	69	
Concentric Termination at Elevation 4501 - 7500 ft									
Number of 90° Elbows Used	2" Pipe				3" Pipe				
	Model				Model				
	040	060	080	100	040	060	080	100	
1	73	33	32	n/a	121	89	89	61	
2	68	28	27		116	84	84	56	
3	63	23	22		111	79	79	51	
4	58	18	17		106	74	74	46	
5	53	13	12		101	69	69	41	
6	48	n/a	n/a		96	64	64	36	
7	43				91	59	59	31	
8	38				86	54	54	26	
9	33				81	49	49	21	
10	28				76	44	44	16	
NOTE - Size intake and exhaust pipe length separately. Values in table are for Intake OR Exhaust, not combined total. Both Intake and Exhaust must be same pipe size.									
NOTE - Additional vent pipe and elbows used to terminate the vent pipe outside the structure must be included in the total vent length calculation.									

Table 12B.

Maximum Allowable Exhaust Vent Lengths With Furnace Installed in a Closet or Basement Using Ventilated Attic or Crawl Space For Intake Air in Feet

Standard Termination at Elevation 0 - 4500 ft									
Number of 90° Elbows Used	2" Pipe				3" Pipe				
	Model				Model				
	040	060	080	100	040	060	080	100	
1	71	56	34	14	118	117	98	98	
2	66	51	29	9	113	112	93	93	
3	61	46	24	4	108	107	88	88	
4	56	41	19	n/a	103	102	83	83	
5	51	36	14		98	97	78	78	
6	46	31	9		93	92	73	73	
7	41	26	4		88	87	68	68	
8	36	21	n/a		83	82	63	63	
9	31	16			78	77	58	58	
10	26	11			73	72	53	53	
Standard Termination at Elevation 4501 - 7500 ft									
Number of 90° Elbows Used	2" Pipe				3" Pipe				
	Model				Model				
	040	060	080	100	040	060	080	100	
1	71	31	24	n/a	118	85	80	45	
2	66	26	19		113	80	75	40	
3	61	21	14		108	75	70	35	
4	56	16	9		103	70	65	30	
5	51	11	n/a		98	65	60	25	
6	46	n/a			93	60	55	20	
7	41				88	55	50	15	
8	36				83	50	45	10	
9	31				78	45	40	n/a	
10	26				73	40	35		
NOTE - Additional vent pipe and elbows used to terminate the vent pipe outside the structure must be included in the total vent length calculation.									

Table 13.

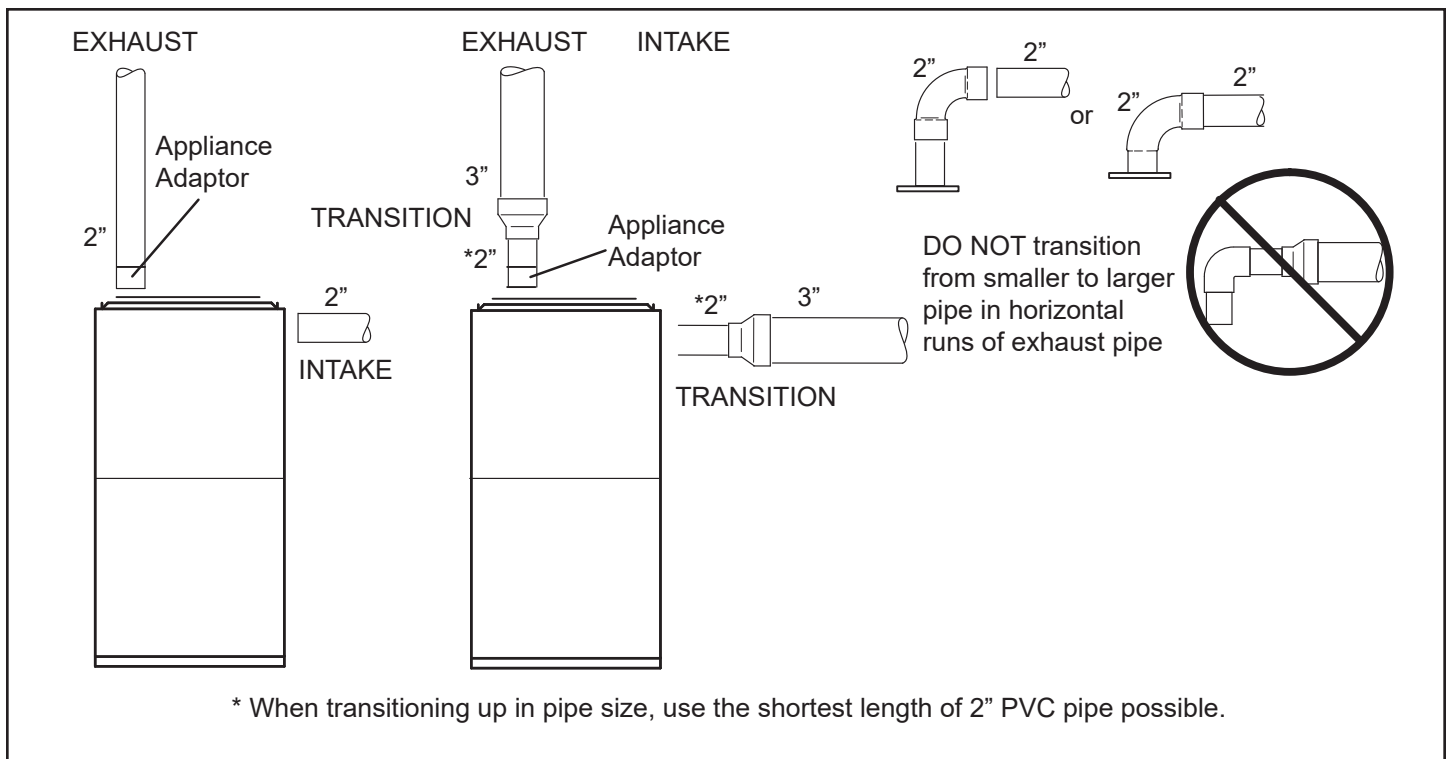


Figure 23. Typical Exhaust and Intake Pipe Connections in Upflow Direct Vent Applications

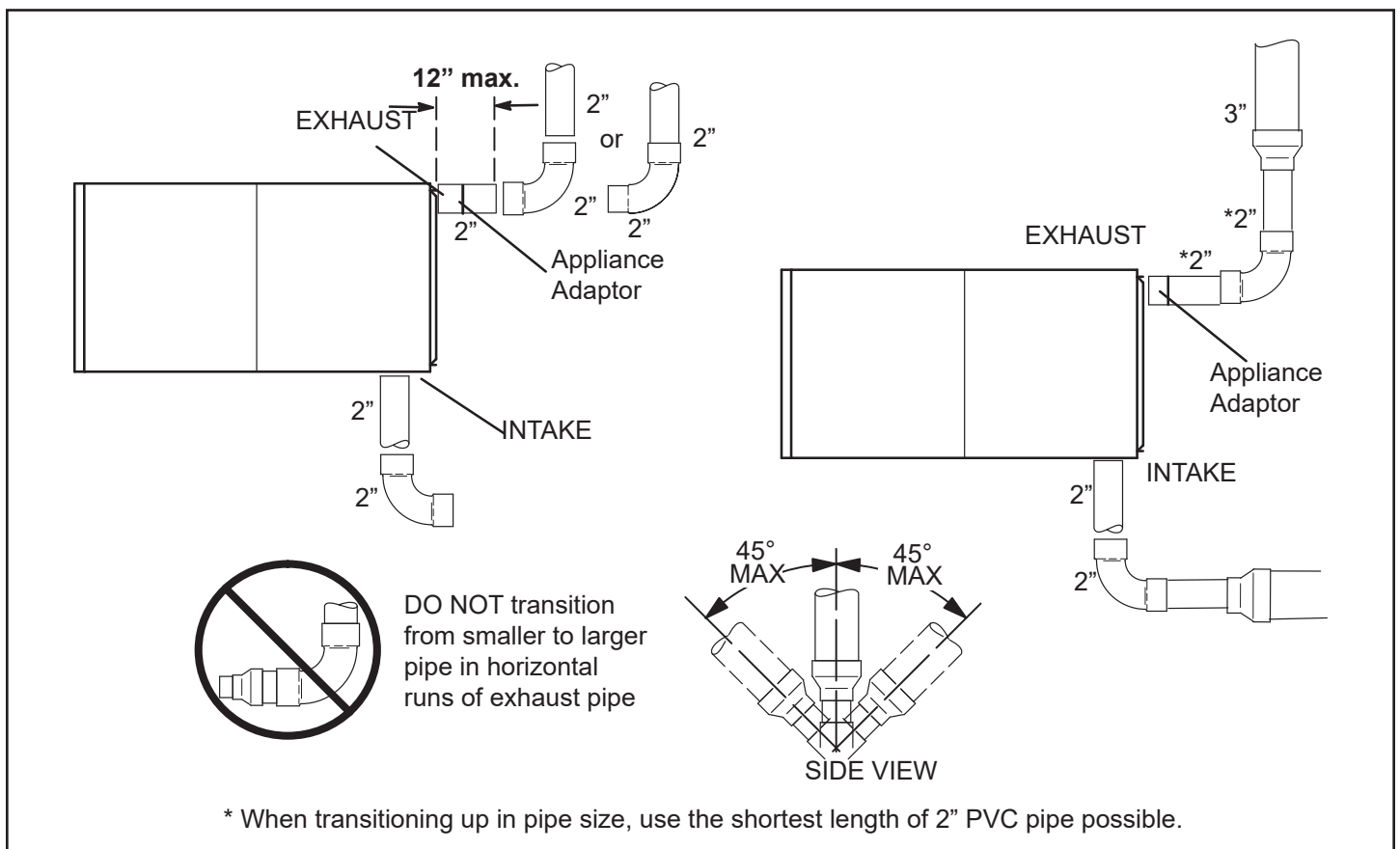


Figure 24. Typical Exhaust and Intake Pipe Connections in Horizontal Direct Vent Applications (Right Hand Discharge Shown)

Intake Piping

The NF95XS furnace may be installed in either direct vent or non-direct vent applications. In non-direct vent applications, when intake air will be drawn into the furnace from the surrounding space, the indoor air quality must be considered and guidelines listed in Combustion, Dilution and Ventilation Air section must be followed.

Follow the next two steps when installing the unit in Direct Vent applications, where combustion air is taken from outdoors and flue gases are discharged outdoors. **The provided air intake screen must not be used in direct vent applications (outdoors).**

1. Use transition solvent cement or a sheet metal screw to secure the intake pipe to the inlet air connector.
2. Route piping to outside of structure. Continue with installation following instructions given in general guidelines for piping terminations and intake and exhaust piping terminations for direct vent sections. Refer to Table 12A through Table 12B for pipe sizes.

Follow the next two steps when installing the unit in Non-Direct Vent applications where combustion air is taken from indoors and flue gases are discharged outdoors.

1. Use field-provided materials and the factory-provided air intake screen to route the intake piping as shown in Figure 25 or Figure 26. Maintain a minimum clearance of 3" (76mm) around the air intake opening. The air intake opening (with the protective screen) should always be directed forward or to either side in the upflow position, and either straight out or downward in the horizontal position.

The air intake piping must not terminate too close to the flooring or a platform. Ensure that the intake air inlet will not be obstructed by loose insulation or other items that may clog the debris screen.

2. If intake air is drawn from a ventilated attic (Figure 27) or ventilated crawlspace (Figure 28) the exhaust vent length must not exceed those listed in Table 13. If 3" diameter pipe is used, reduce to 2" diameter pipe at the termination point to accommodate the debris screen.
3. Use a sheet metal screw to secure the intake pipe to the connector, if desired.

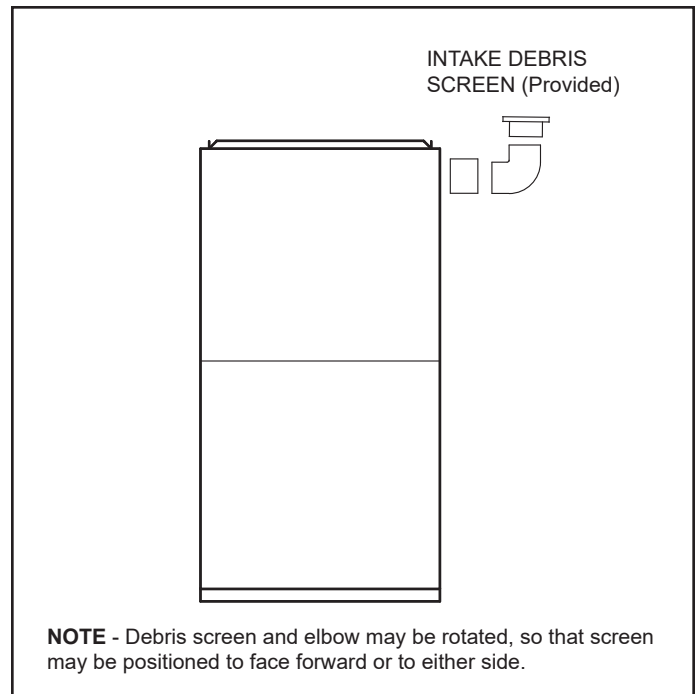


Figure 25. Typical Air Intake Pipe Connections Upflow Non-Direct Vent Applications

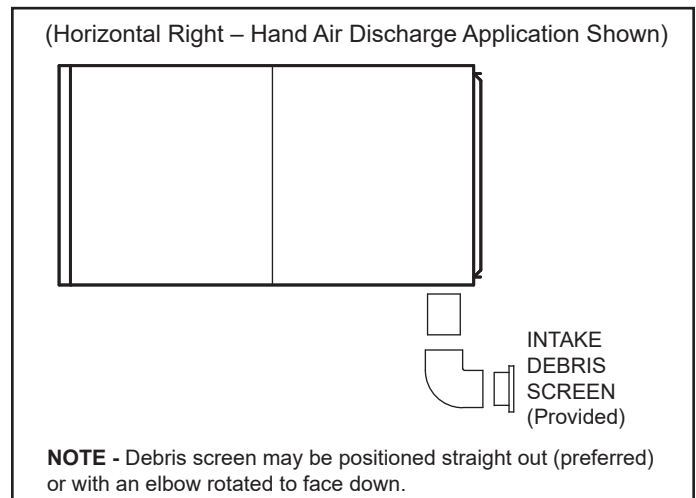
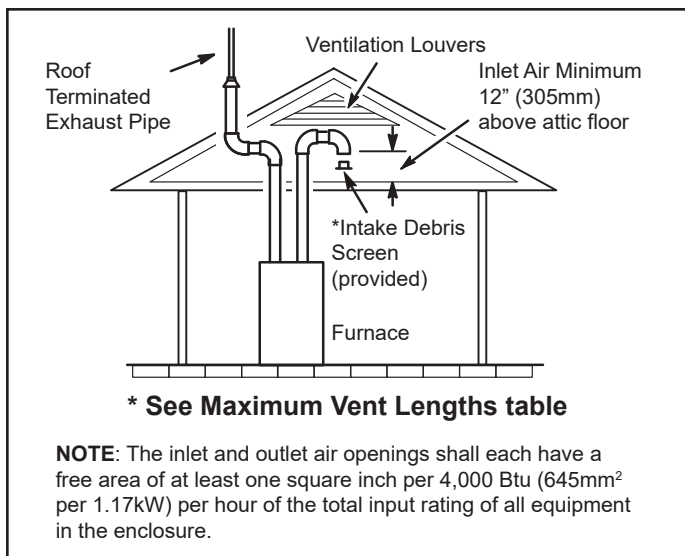


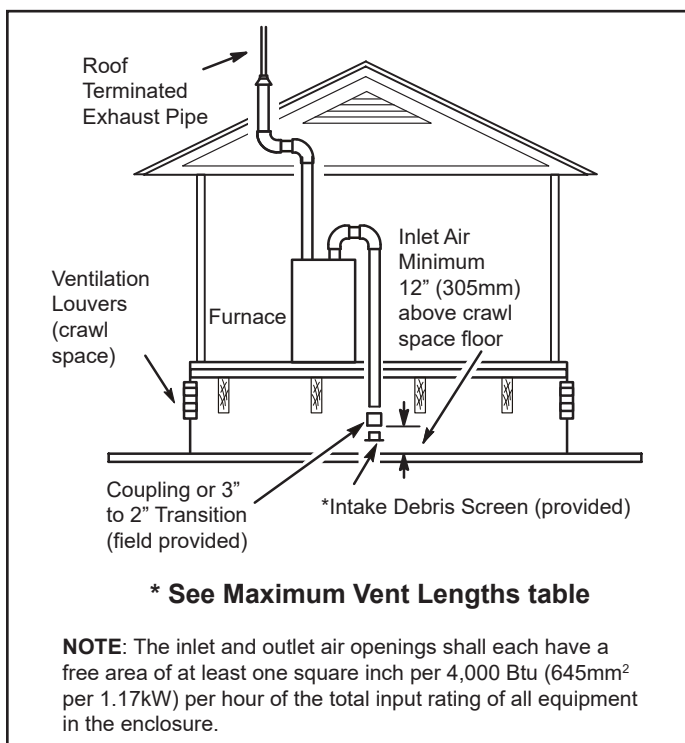
Figure 26. Typical Air Intake Pipe Connections Horizontal Non-Direct Vent Applications

CAUTION

If this unit is being installed in an application with combustion air coming in from a space serviced by an exhaust fan, power exhaust fan, or other device which may create a negative pressure in the space, take care when sizing the inlet air opening. The inlet air opening must be sized to accommodate the maximum volume of exhausted air as well as the maximum volume of combustion air required for all gas appliances serviced by this space.



**Figure 27. Equipment in Confined Space
(Inlet Air from Ventilated Attic and Outlet Air to Outside)**



**Figure 28. Equipment in Confined Space
(Inlet Air from Ventilated Crawlspace and Outlet Air to Outside)**

General Guidelines for Vent Terminations

In Non-Direct Vent applications, combustion air is taken from indoors and the flue gases are discharged to the outdoors. The NF95XS is then classified as a non-direct vent, Category IV gas furnace.

In Direct Vent applications, combustion air is taken from outdoors and the flue gases are discharged to the outdoors. The NF95XS is then classified as a direct vent, Category IV gas furnace.

In both Non-Direct Vent and Direct Vent applications, the vent termination is limited by local building codes. In the absence of local codes, refer to the current National Fuel Gas Code ANSI Z223-1/NFPA 54 in U.S.A., and current CSA-B149 Natural Gas and Propane Installation Codes in Canada for details.

Position termination according to location given in Figure 30 or Figure 40. In addition, position termination so it is free from any obstructions and 12" above the average snow accumulation.

At vent termination, care must be taken to maintain protective coatings over building materials (prolonged exposure to exhaust condensate can destroy protective coatings). It is recommended that the exhaust outlet not be located within 6 feet (1.8m) of a condensing unit because the condensate can damage the painted coating.

NOTE: See Table 14 for maximum allowed exhaust pipe length without insulation in unconditioned space during winter design temperatures below 32°F (0°C). If required exhaust pipe should be insulated with 1/2" (13mm) Armaflex or equivalent. In extreme cold climate areas, 3/4" (19mm) Armaflex or equivalent may be necessary. Insulation must be protected from deterioration. Armaflex with UV protection is permissible. Basements or other enclosed areas that are not exposed to the outdoor ambient temperature and are above 32 degrees F (0°C) are to be considered conditioned spaces.

IMPORTANT

Do not use screens or perforated metal in exhaust terminations. Doing so will cause freeze-ups and may block the terminations.

IMPORTANT

For Canadian Installations Only:

In accordance to CSA International B149 installation codes, the minimum allowed distance between the combustion air intake inlet and the exhaust outlet of other appliances shall not be less than 12 inches (305mm).

Maximum Allowable Exhaust Vent Pipe Length (in ft.) without Insulation in Unconditioned Space for Winter Design Temperatures									
Winter Design Temperatures ¹ °F (°C)	Vent Pipe Diameter	Unit Input Size							
		040		060		080		100	
		PVC	PP ²	PVC	PP ²	PVC	PP ²	PVC	PP ²
32 to 21 (0 to -6)	2 in.	18	16	31	28	50	48	30	30
	3 in.	9	9	18	18	35	35	47	47
20 to 1 (-7 to -17)	2 in.	9	8	18	16	32	29	30	30
	3 in.	N/A	N/A	8	8	19	19	26	26
0 to -20 (-18 to -29)	2 in.	5	N/A	12	10	22	19	30	27
	3 in.	N/A	N/A	N/A	N/A	10	10	16	16

¹ Refer to 99% Minimum Design Temperature table provided in the current edition of the ASHRAE Fundamentals Handbook.

² Poly-Propylene vent pipe (PP) by Duravent and Centrotherm

NOTE - Concentric terminations are the equivalent of 5' and should be considered when measuring pipe length.

NOTE- Maximum uninsulated vent lengths listed may include the termination (vent pipe exterior to the structure) and cannot exceed 5 linear feet or the maximum allowable intake or exhaust vent length listed in Table 12A through Table 12B or Table 13, whichever is less.

NOTE - If insulation is required in an unconditioned space, it must be located on the pipe closest to the furnace. See Figure 29.

Table 14.

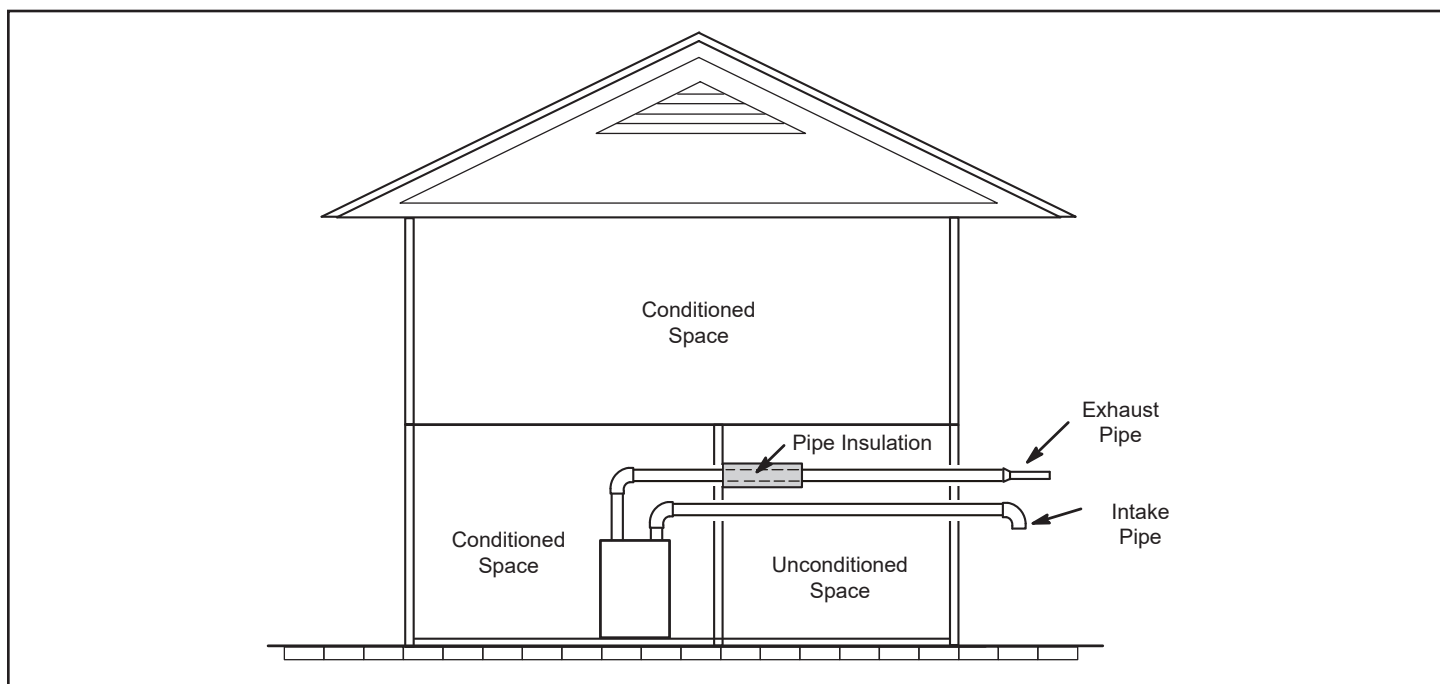
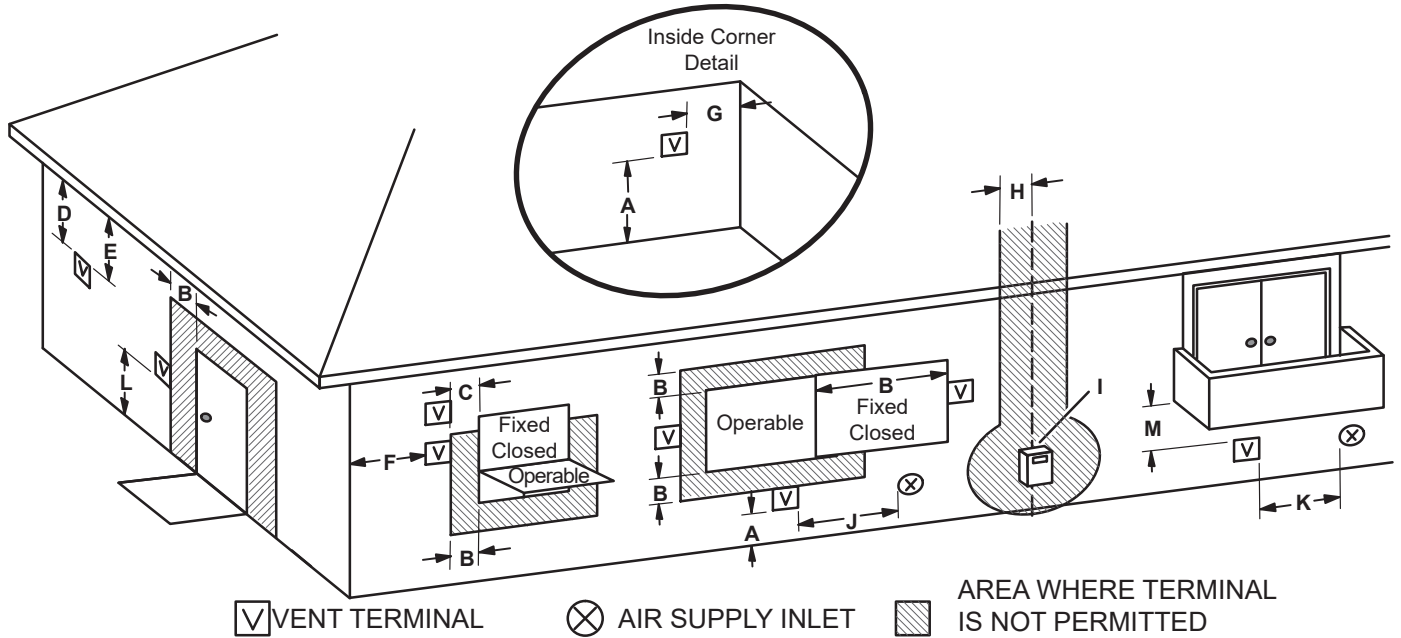


Figure 29. Insulating Exhaust Pipe in an Unconditioned Space

VENT TERMINATION CLEARANCES FOR DIRECT VENT INSTALLATIONS IN THE USA AND CANADA



		US Installations ¹	Canadian Installations ²
A	Clearance above grade, veranda, porch, deck or balcony	12" (305mm) or 12" (305mm) above average snow accumulation	
B	Clearance to window or door that may be opened	6" (152mm) for appliances <10,000 Btuh (3kw), 9" (228mm) for appliances > 10,000 Btuh (3kw) and <50,000 Btuh (15kw), 12" (305mm) for appliances > 50,000 Btuh (15kw)	6" (152mm) for appliances <10,000 Btuh (3kw), 12" (305mm) for appliances > 10,000 Btuh (3kw) and <100,000 Btuh (30kw), 36" (.9m) for appliances > 100,000 Btuh (30kw)
C	Clearance to permanently closed window	* 12"	
D	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (610mm) from the center line of the terminal	* Equal to or greater than soffit depth	
E	Clearance to unventilated soffit	* Equal to or greater than soffit depth	
F	Clearance to outside corner	* No minimum to outside corner	
G	Clearance to inside corner	*	
H	Clearance to each side of center line extended above meter / regulator assembly	3 feet (.9m) within a height 15 feet (4.5m) above the meter / regulator assembly	
I	Clearance to service regulator vent outlet	* 3 feet (.9m)	
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	6" (152mm) for appliances <10,000 Btuh (3kw), 9" (228mm) for appliances > 10,000 Btuh (3kw) and <50,000 Btuh (15kw), 12" (305mm) for appliances > 50,000 Btuh (15kw)	6" (152mm) for appliances <10,000 Btuh (3kw), 12" (305mm) for appliances > 10,000 Btuh (3kw) and <100,000 Btuh (30kw), 36" (.9m) for appliances > 100,000 Btuh (30kw)
K	Clearance to mechanical air supply inlet	3 feet (.9m) above if within 10 feet (3m) horizontally	6 feet (1.8m)
L	Clearance above paved sidewalk or paved driveway located on public property	* 7 feet (2.1m)	
M	Clearance under veranda, porch, deck or balcony	*12 inches (305mm)†	
¹ In accordance with the current ANSI Z223.1/NFPA 54 Natural Fuel Gas Code ² In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code † A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings. ‡ Permitted only if veranda, porch, deck or balcony is fully open on a minimum of two sides beneath the floor. Avoiding this location is recommended if possible.		* For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearance will be in accordance with local installation codes and the requirements of the gas supplier and these installation instructions.	

Figure 30. Vent Termination Clearances Direct Vent Installations

Details of Intake and Exhaust Piping Terminations for Direct Vent Installations

NOTE: In Direct Vent installations, combustion air is taken from outdoors and flue gases are discharged to outdoors.

NOTE: Flue gas may be slightly acidic and may adversely affect some building materials. If any vent termination is used and the flue gasses may impinge on the building material, a corrosion-resistant shield (minimum 24 inches square) should be used to protect the wall surface. If the optional tee is used, the protective shield is recommended. The shield should be constructed using wood, plastic, sheet metal or other suitable material. All seams, joints, cracks, etc. in the affected area should be sealed using an appropriate sealant. See Figure 39.

Intake and exhaust pipes may be routed either horizontally through an outside wall or vertically through the roof. In attic or closet installations, vertical termination through the roof is preferred. Figure 31 through Figure 38 show typical terminations.

1. Intake and exhaust terminations are not required to be in the same pressure zone. You may exit the intake on one side of the structure and the exhaust on another side (Figure 32). You may exit the exhaust out the roof and the intake out the side of the structure (Figure 33).
2. Intake and exhaust pipes should be placed as close together as possible at termination end (refer to illustrations). Maximum separation is 3" (76mm) on roof terminations and 6" (152mm) on side wall terminations.

NOTE: When venting in different pressure zones, the maximum separation requirement of intake and exhaust pipe DOES NOT apply.

3. On roof terminations, the intake piping should terminate straight down using two 90° elbows (Figure 31).
4. Exhaust piping must terminate straight out or up as shown. A reducer may be required on the exhaust piping at the point where it exits the structure to improve the velocity of exhaust away from the intake piping. See Table 15.

Model	Exhaust Pipe Size	Termination Pipe Size
*040 and 060	2" (51mm), 2-1/2" (64mm), 3" (76mm)	1-1/2" (38 mm)
*080		2" (51 mm)
100		
* -040, -060 and -080 units with the flush mount termination must use the 1-1/2" accelerator supplied with the kit.		
NOTE - Care must be taken to avoid recirculation of exhaust back into intake pipe.		

Table 15. Exhaust Pipe Termination Size Reduction

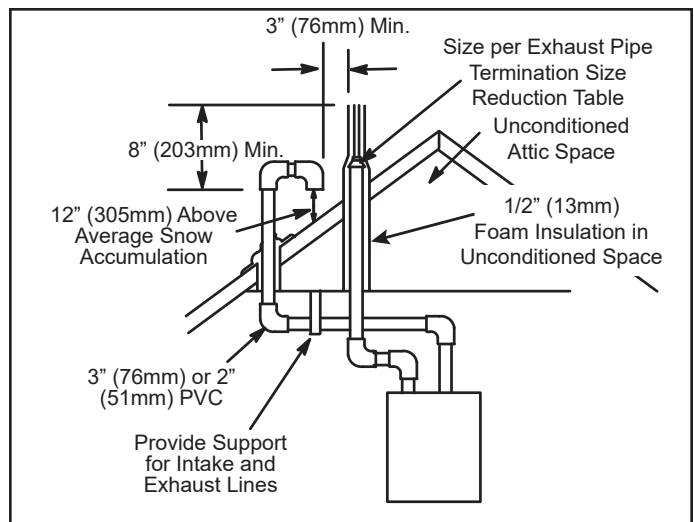


Figure 31. Direct Vent Roof Termination

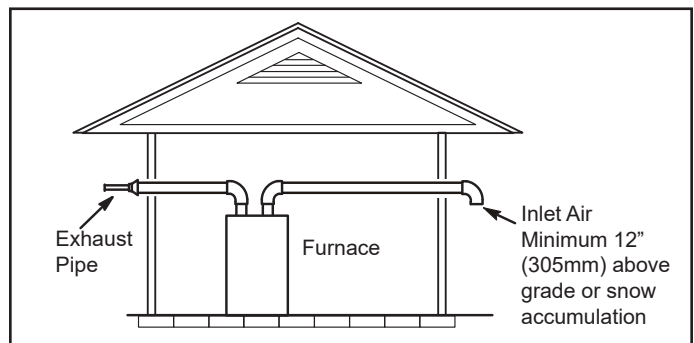


Figure 32. Exiting Exhaust and Intake Vent (no common pressure zone)

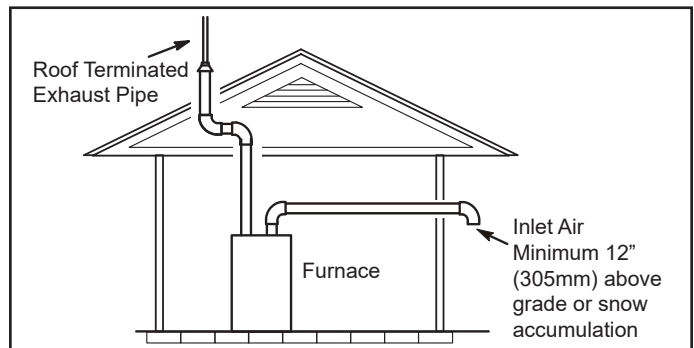


Figure 33. Exiting Exhaust and Intake Vent (no common pressure zone)

5. On field-supplied terminations for side wall exit, exhaust piping may extend a maximum of 12 inches (305mm) for 2" PVC and 20 inches (508mm) for 3" (76mm) PVC beyond the outside wall. Intake piping should be as short as possible. See Figure 39.
6. On field-supplied terminations, a minimum distance between the end of the exhaust pipe and the end of the intake pipe without a termination elbow is 8" and a minimum distance of 6" with a termination elbow. See Figure 39.

7. If intake and exhaust piping must be run up a side wall to position above snow accumulation or other obstructions, piping must be supported. At least one bracket must be used within 6" from the top of the elbow and then every 24" (610mm) as shown in Figure 39, to prevent any movement in any direction. When exhaust and intake piping must be run up an outside wall, the exhaust piping must be terminated with pipe sized per Table 15. The intake piping may be equipped with a 90° elbow turndown. Using turndown will add 5 feet (1.5m) to the equivalent length of the pipe.
8. A multiple furnace installation may use a group of up to four terminations assembled together horizontally, as shown in Figure 38.

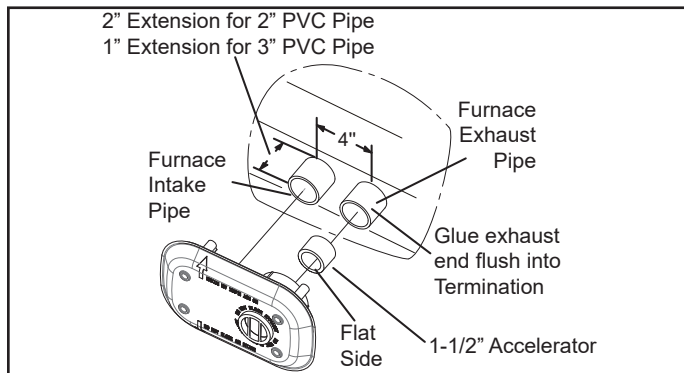


Figure 34. Flush-Mount Side Wall Termination 51W11

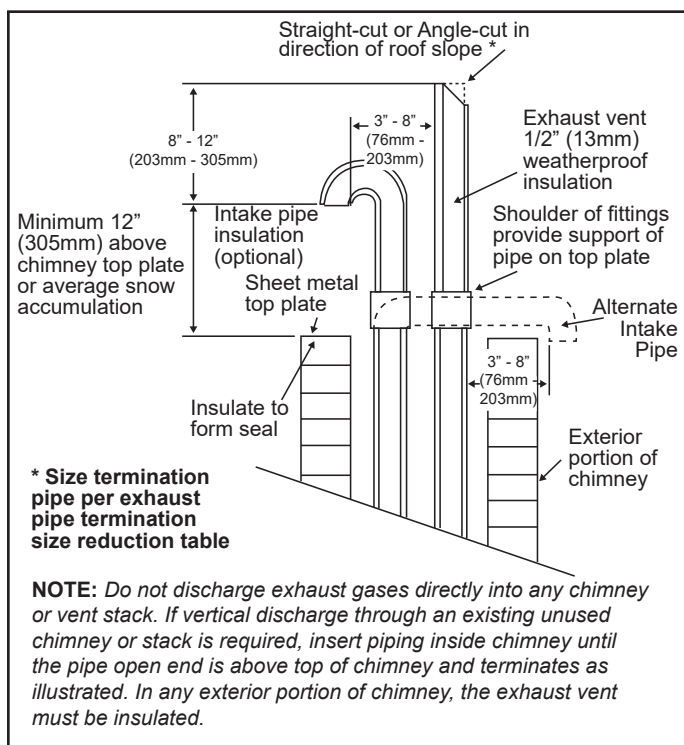


Figure 35. Direct Vent Application Using Existing Chimney

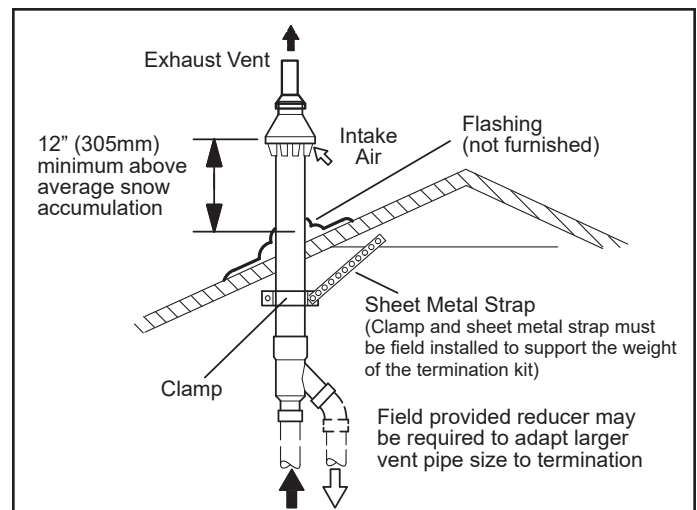


Figure 36. Direct Vent Concentric Rooftop Termination
71M80, 69M29 or 60L46 (US)
44W92 or 44W93 (Canada)

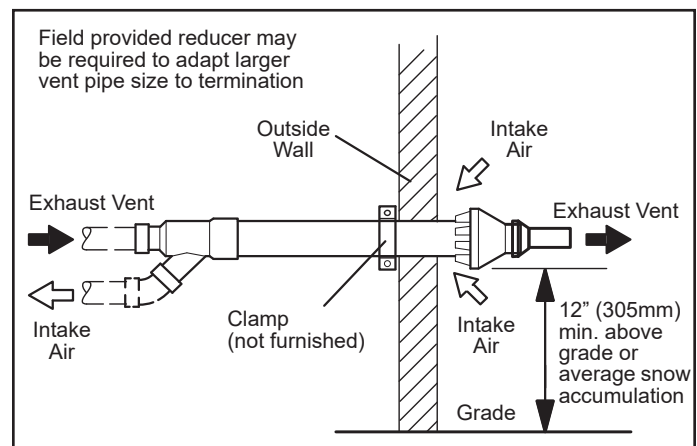


Figure 37. Direct Vent Concentric Wall Termination
71M80, 69M29 or 60L46 (US)
44W92 or 44W93 (Canada)

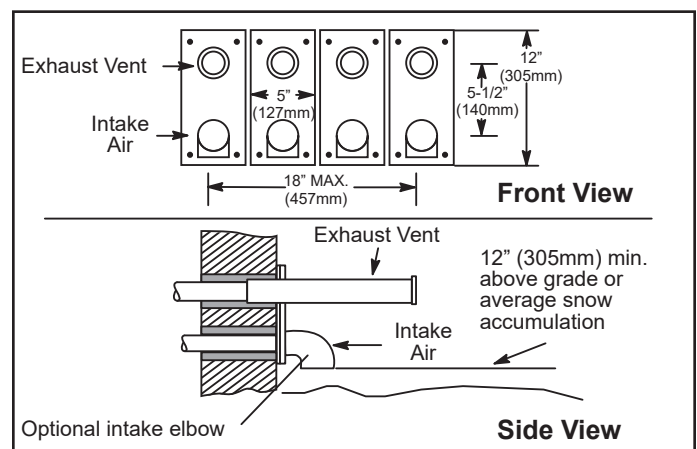
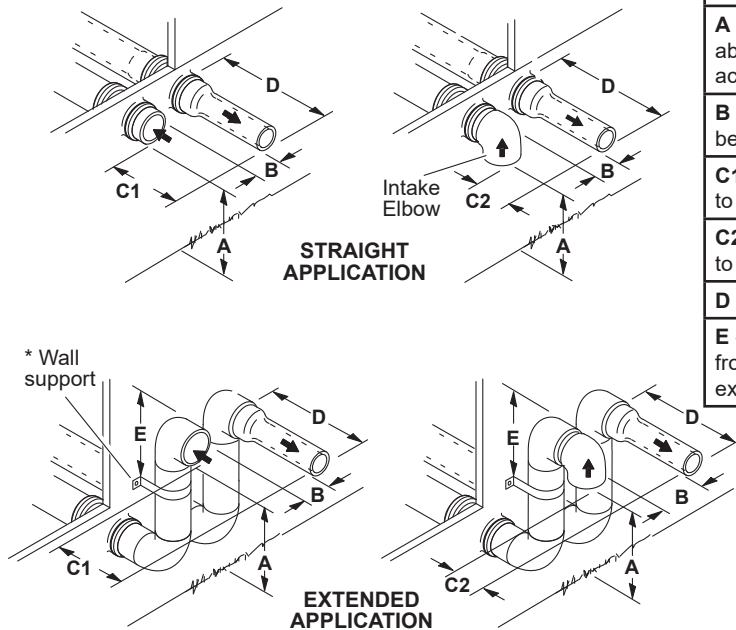


Figure 38. Optional Vent Termination for Multiple Unit Installation of Direct Vent Wall Termination

FIELD FABRICATED WALL TERMINATION

NOTE: Field provided reducer may be required to adapt larger vent pipe size to termination

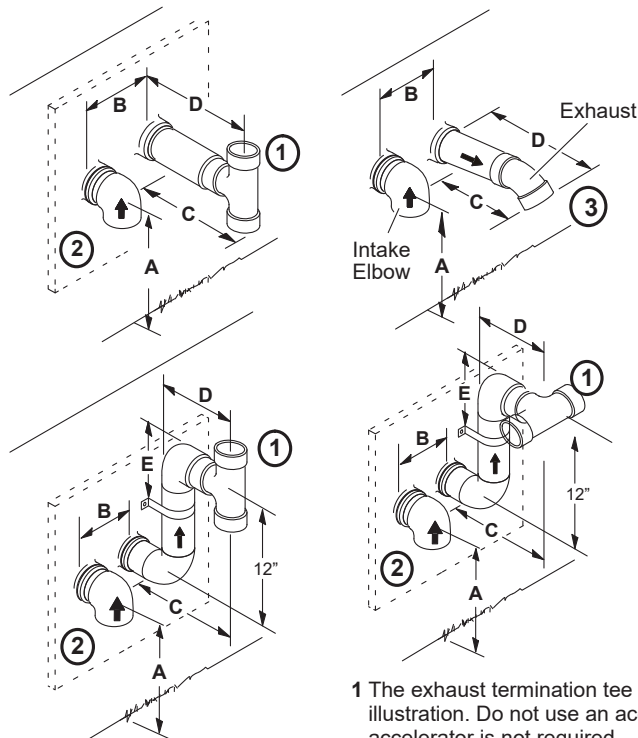


	2" (51mm) Vent Pipe	3" (76mm) Vent Pipe
A - minimum clearance above grade or average snow accumulation	12" (305mm)	
B - maximum horizontal separation between intake and exhaust	6" (152mm)	
C1 - minimum from end of exhaust to inlet of intake	8" (203mm)	
C2 - minimum from end of exhaust to inlet of intake	6" (152mm)	
D - maximum exhaust pipe length	12" (305mm)	20" (508mm)
E - maximum wall support distance from top of each pipe (intake/exhaust)	6" (152mm)	

* Use wall support every 24" (610 mm). Use two wall supports if extension is greater than 24" (610 mm) but less than 48" (1219 mm).

NOTE: One wall support must be within 6" (152 mm) from top of each pipe (intake and exhaust) to prevent movement in any direction.

ALTERNATE TERMINATIONS (TEE & FORTY-FIVE DEGREE ELBOWS ONLY)

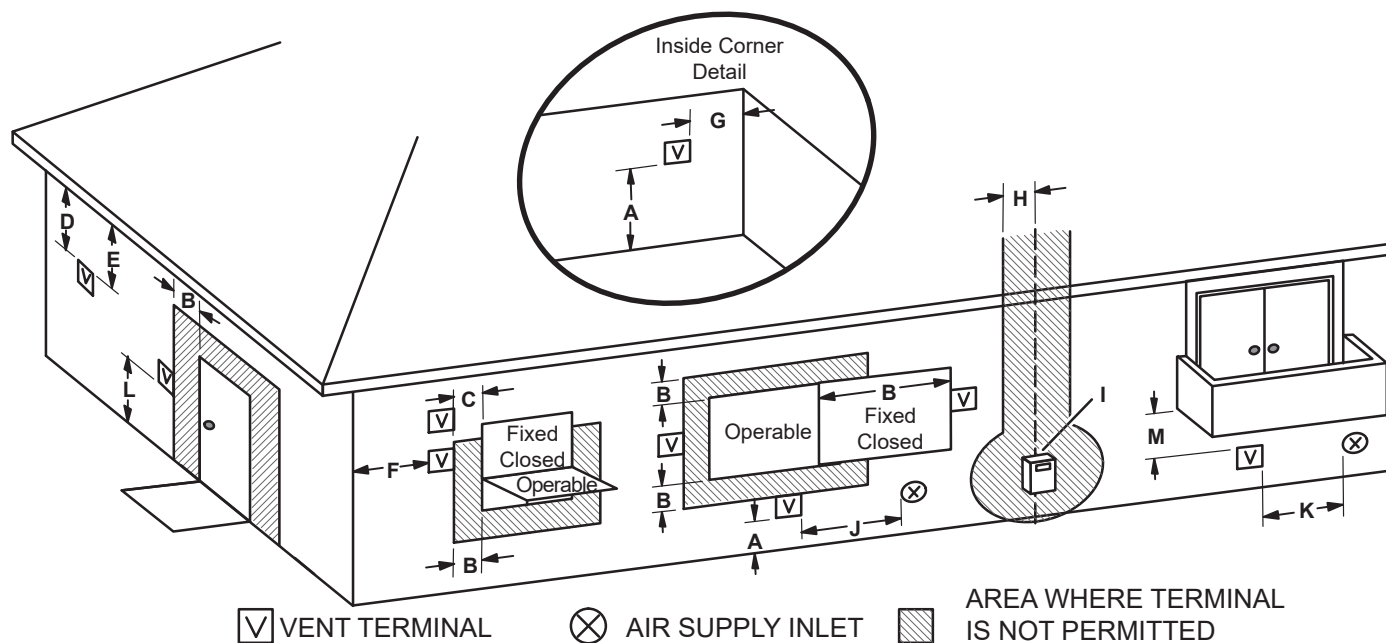


	2" (51mm) Vent Pipe	3" (76mm) Vent Pipe
A - clearance above grade or average snow accumulation	12" (305mm) min.	
B - horizontal separation between intake and exhaust	6" (152mm) min. 24" (610mm) max.	
C - minimum from end of exhaust to inlet of intake	9" (227mm) min.	
D - exhaust pipe length	12" (305mm) min. 16" (405mm) max.	12" (305mm) min. 20" (508mm) max.
E - wall support distance from top of each pipe (intake/exhaust)	6" (152mm)	

- 1 The exhaust termination tee should be connected to the 2" or 3" PVC flue pipe as shown in the illustration. Do not use an accelerator in applications that include an exhaust termination tee. The accelerator is not required.
- 2 As required. Flue gas may be acidic and may adversely affect some building materials. If a side wall vent termination is used and flue gases will impinge on the building materials, a corrosion-resistant shield (24 inches square) should be used to protect the wall surface. If optional tee is used, the protective shield is recommended. The shield should be constructed using wood, sheet metal or other suitable material. All seams, joints, cracks, etc. in affected area, should be sealed using an appropriate sealant.
- 3 Exhaust pipe 45° elbow can be rotated to the side away from the combustion air inlet to direct exhaust away from adjacent property. The exhaust must never be directed toward the combustion air inlet.

Figure 39. Field Fabricated Wall Termination

VENT TERMINATION CLEARANCES FOR NON-DIRECT VENT INSTALLATIONS IN THE USA AND CANADA



		US Installations ¹	Canadian Installations ²
A	Clearance above grade, veranda, porch, deck or balcony	12" (305mm) or 12" (305mm) above average snow accumulation	
B	Clearance to window or door that may be opened	4 feet (1.2m) below or to side of opening; 1 foot (30cm) above opening	6" (152mm) for appliances <10,000 Btuh (3kw), 12" (305mm) for appliances > 10,000 Btuh (3kw) and <100,000 Btuh (30kw), 36" (.9m) for appliances > 100,000 Btuh (30kw)
C	Clearance to permanently closed window	* 12"	
D	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (610mm) from the center line of the terminal	* Equal to or greater than soffit depth	
E	Clearance to unventilated soffit	* Equal to or greater than soffit depth	
F	Clearance to outside corner	* No minimum to outside corner	
G	Clearance to inside corner	*	
H	Clearance to each side of center line extended above meter / regulator assembly	3 feet (.9m) within a height 15 feet (4.5m) above the meter / regulator assembly	
I	Clearance to service regulator vent outlet	* 3 feet (.9m)	
J	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	4 feet (1.2m) below or to side of opening; 1 foot (30cm) above opening	6" (152mm) for appliances <10,000 Btuh (3kw), 12" (305mm) for appliances > 10,000 Btuh (3kw) and <100,000 Btuh (30kw), 36" (.9m) for appliances > 100,000 Btuh (30kw)
K	Clearance to mechanical air supply inlet	3 feet (.9m) above if within 10 feet (3m) horizontally	6 feet (1.8m)
L	Clearance above paved sidewalk or paved driveway located on public property	* 7 feet (2.1m)	
M	Clearance under veranda, porch, deck or balcony	*12 inches (305mm)†	
¹ In accordance with the current ANSI Z223.1/NFPA 54 Natural Fuel Gas Code ² In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code † A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings. ‡ Permitted only if veranda, porch, deck or balcony is fully open on a minimum of two sides beneath the floor. Avoiding this location is recommended if possible.		* For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearance will be in accordance with local installation codes and the requirements of the gas supplier and these installation instructions.	

**Figure 40. Vent Termination Clearances
Non-Direct Vent Installations**

Details of Exhaust Piping Terminations for Non-Direct Vent Applications

Exhaust pipes may be routed either horizontally through an outside wall or vertically through the roof. In attic or closet installations, vertical termination through the roof is preferred. Figure 41 through Figure 42 show typical terminations.

1. Exhaust piping must terminate straight out or up as shown. The termination pipe must be sized as listed in Table 15. The specified pipe size ensures proper velocity required to move the exhaust gases away from the building.
2. On field supplied terminations for side wall exit, exhaust piping may extend a maximum of 12 inches (305mm) for 2" PVC and 20 inches (508mm) for 3" (76mm) PVC beyond the outside wall.
3. If exhaust piping must be run up a side wall to position above snow accumulation or other obstructions, piping must be supported every 24 inches (610mm). When exhaust piping must be run up an outside wall, any reduction in exhaust pipe size must be done after the final elbow.
4. Distance between exhaust pipe terminations on multiple furnaces must meet local codes.

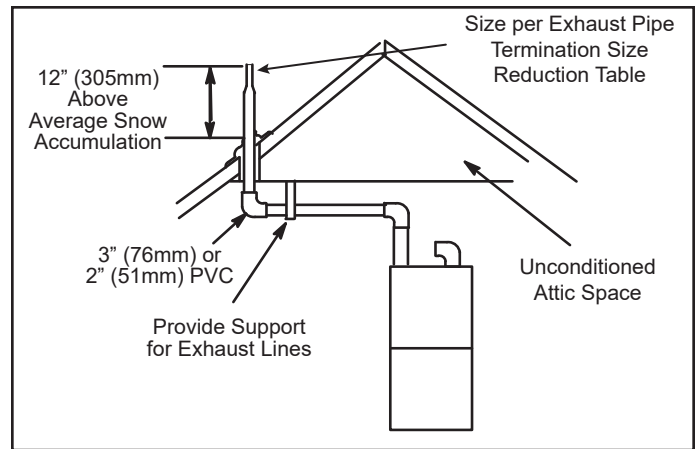


Figure 41. Non-Direct Vent Roof Termination

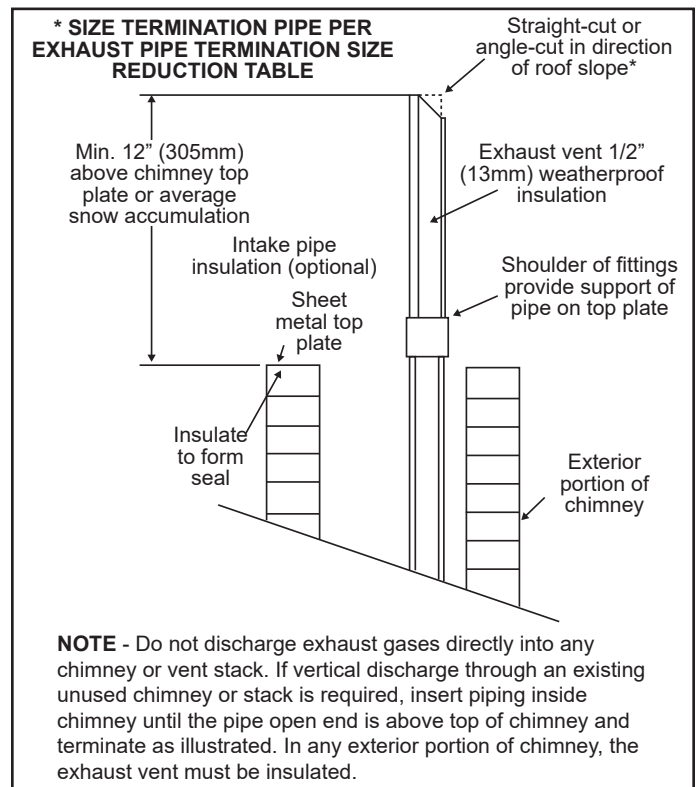


Figure 42. Non-Direct Vent Application Using Existing Chimney

Condensate Piping

This unit is designed for either right- or left-side exit of condensate piping in upflow applications. In horizontal applications, the condensate trap must extend below the unit. An 8" service clearance is required for the condensate trap. Refer to Figure 43 and Figure 44 for condensate trap locations. Figure 51 show trap assembly using 1/2" PVC or 3/4" PVC.

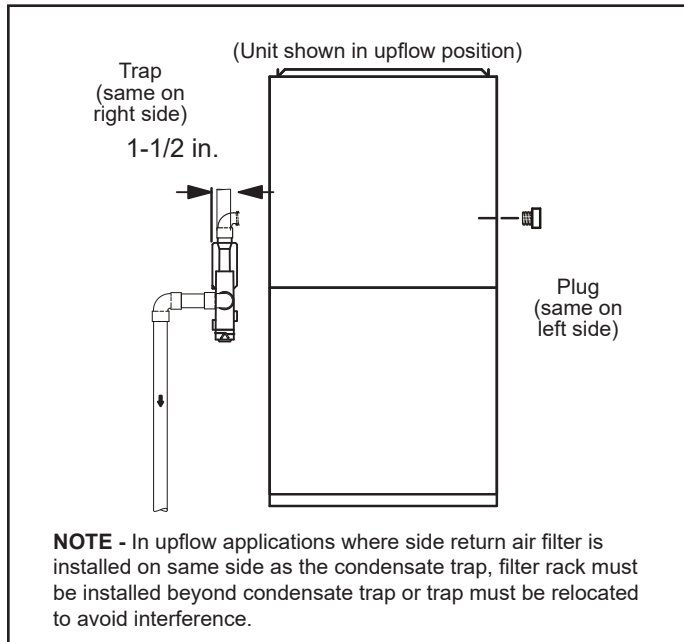


Figure 43. Condensate Trap and Plug Locations

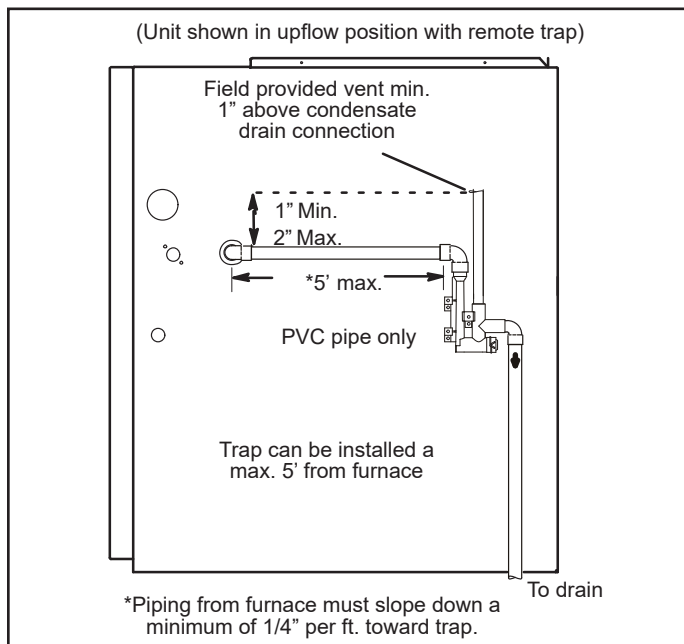


Figure 44. Condensate Trap Locations

NOTE: If necessary the condensate trap may be installed up to 5' away from the furnace. Use PVC pipe to connect trap to furnace condensate outlet. Piping from furnace must slope down a minimum of 1/4" per ft. toward trap.

1. Determine which side condensate piping will exit the unit, location of trap, field-provided fittings and length of PVC pipe required to reach available drain.
2. For furnaces with a 1/2" drain connection use a 3/8 allen wrench and remove plug (Figure 43) from the cold end header box at the appropriate location on the side of the unit. Install field-provided 1/2 NPT male fitting into cold end header box. For furnaces with a 3/4" drain connection use a large flat head screw driver or a 1/2" drive socket extension and remove plug. Install provided 3/4 NPT street elbow fitting into cold end header box. Use Teflon tape or appropriate pipe dope.

NOTE: Cold end header box drain plugs are factory installed. Check the unused plug for tightness to prevent leakage.

3. Install the cap over the clean out opening at the base of the trap. Secure with clamp. See Figure 51.
4. Install drain trap using appropriate PVC fittings, glue all joints. Glue the provided drain trap as shown in Figure 51. Route the condensate line to an open drain. Condensate line must maintain a 1/4" downward slope from the furnace to the drain.
5. Figure 46 and Figure 47 show the furnace and evaporator coil using a separate drain. If necessary the condensate line from the furnace and evaporator coil can drain together. See Figure 48 and Figure 50.

Upflow furnace (Figure 46 and 48) - In upflow furnace applications the field provided vent must be a minimum 1" to a maximum 2" length above the condensate drain outlet connection. Any length above 2" may result in a flooded heat exchanger if the combined primary drain line were to become restricted.

Horizontal furnace (Figure 47 and 50) - In horizontal furnace applications the field provided vent must be a minimum 4" to a maximum 5" length above the condensate drain outlet connection. Any length above 5" may result in a flooded heat exchanger if the combined primary drain line were to become restricted.

NOTE: In horizontal applications it is recommended to install a secondary drain pan underneath the unit and trap assembly.

NOTE: Appropriately sized tubing and barbed fitting may be used for condensate drain. Attach to the drain on the trap using a hose clamp. See Figure 45.

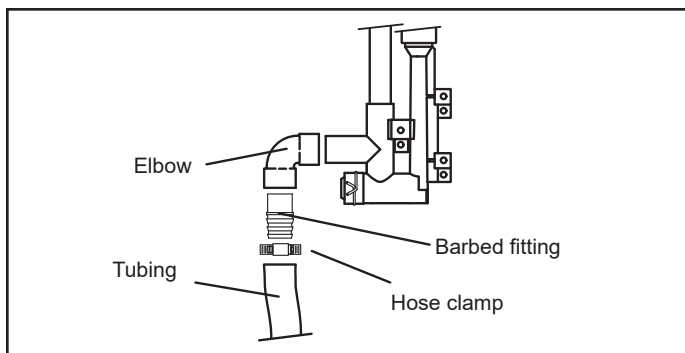


Figure 45. Field-Provided Drain Components

! CAUTION

Do not use copper tubing or existing copper condensate lines for drain line.

6. If unit will be started immediately upon completion of installation, prime trap per procedure outlined in Unit Start-Up section.

Condensate line must slope downward away from the trap to drain. If drain level is above condensate trap, condensate pump must be used. Condensate drain

line should be routed within the conditioned space to avoid freezing of condensate and blockage of drain line. If this is not possible, a heat cable kit may be used on the condensate trap and line.

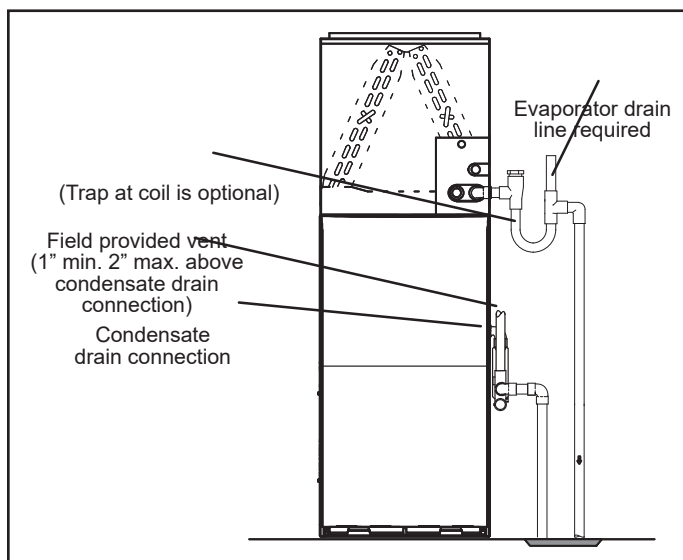


Figure 46. Furnace with Evaporator Coil Using a Separate Drain

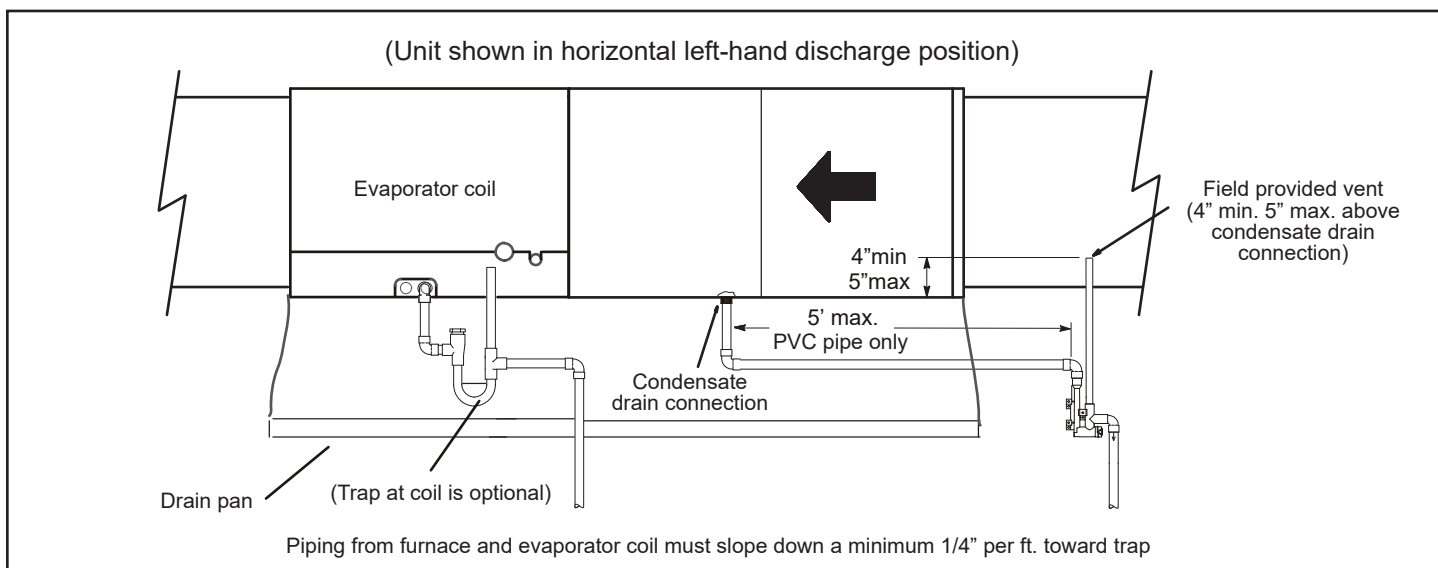


Figure 47. Furnace with Evaporator Coil Using a Separate Drain

⚠ IMPORTANT

When combining the furnace and evaporator coil drains together, the A/C condensate drain outlet must be vented to relieve pressure in order for the furnace pressure switch to operate properly.

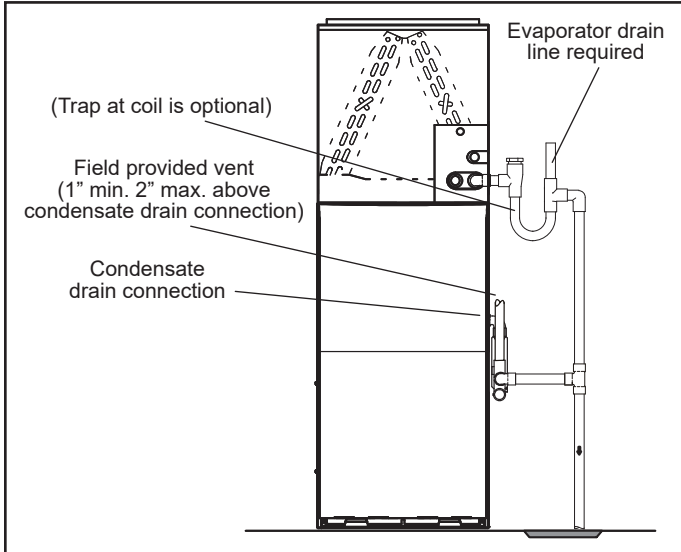


Figure 48. Furnace with Evaporator Coil Using a Common Drain

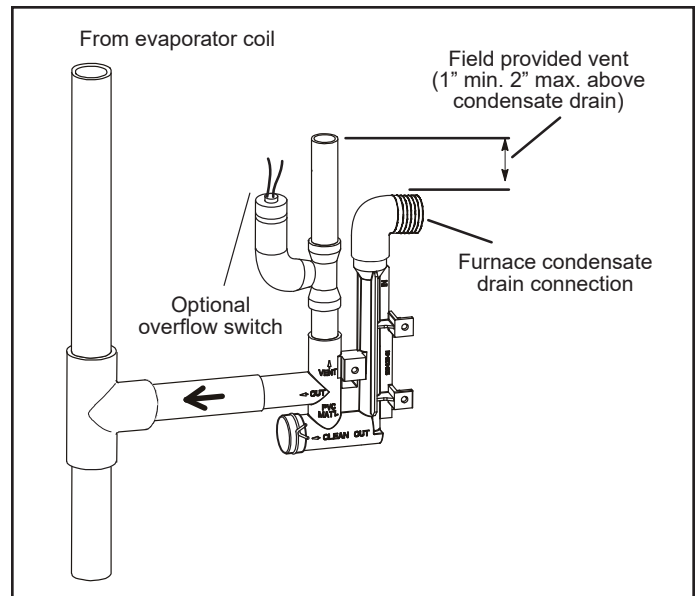


Figure 49. Condensate Trap With Optional Overflow Switch

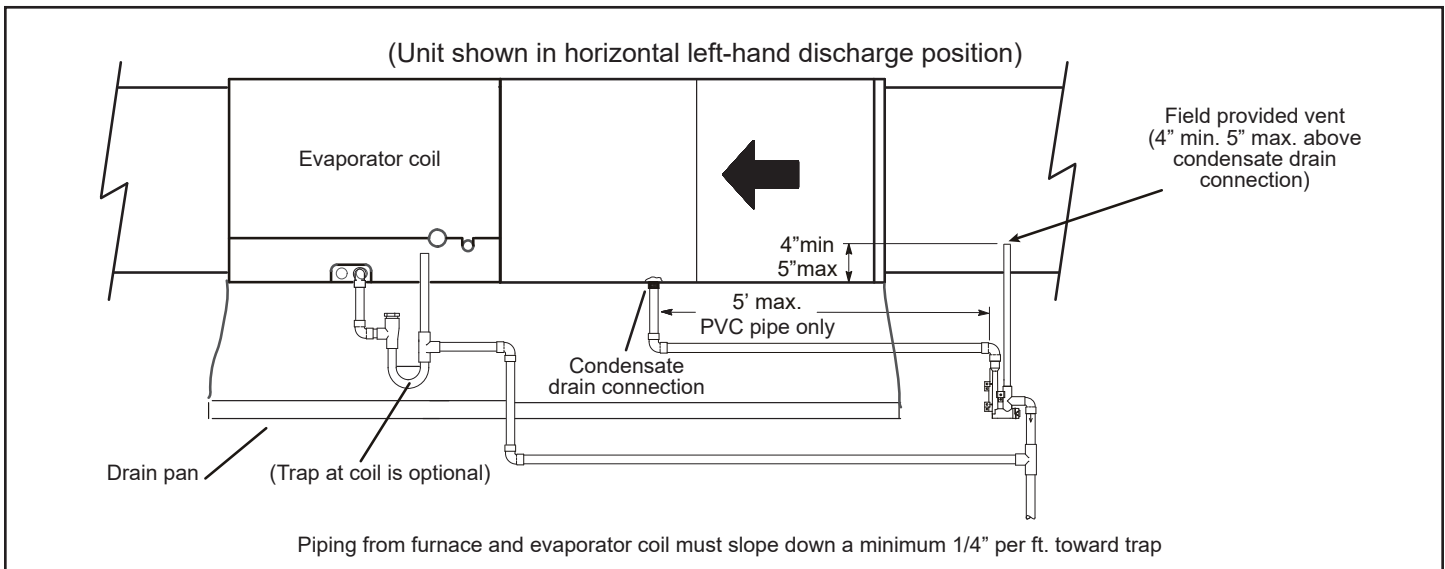
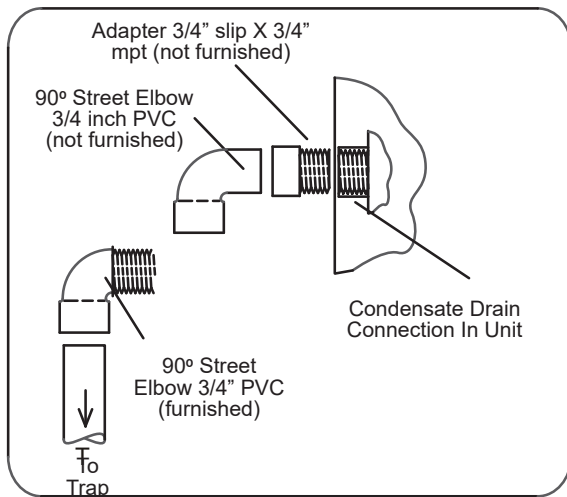
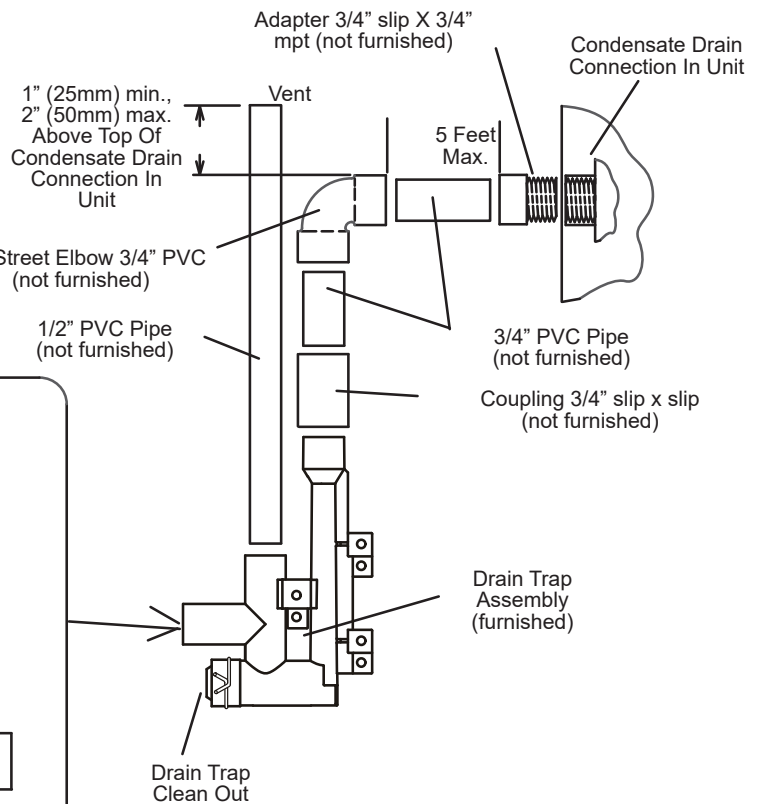
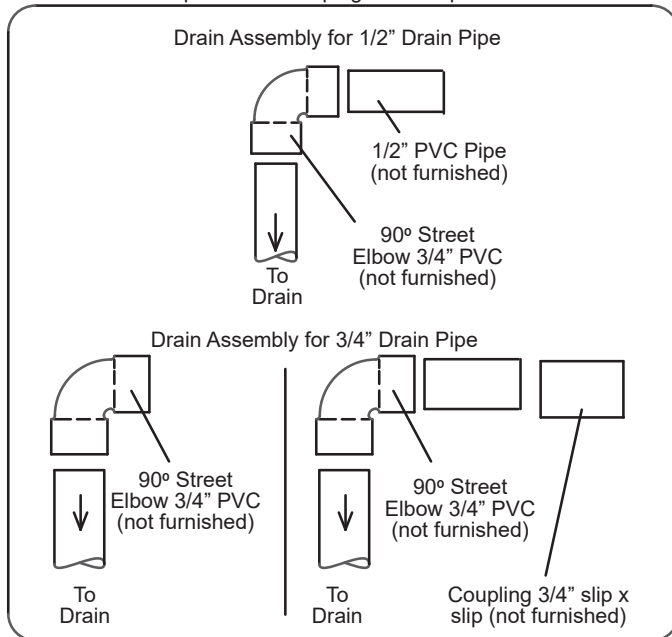


Figure 50. Furnace with Evaporator Coil Using a Common Drain

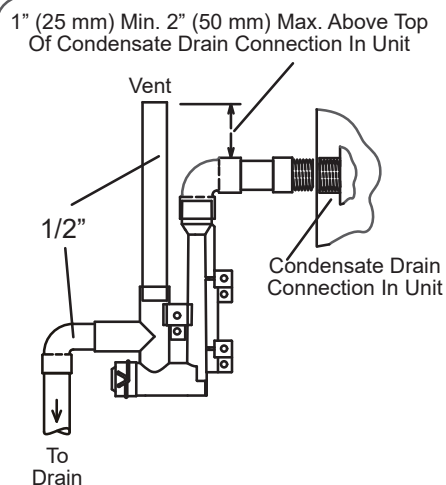
Optional Condensate Drain Connection



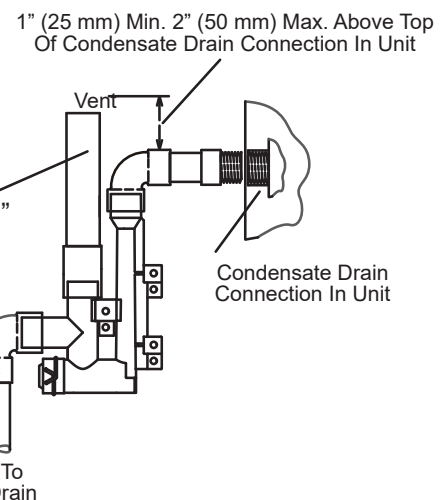
Optional DrainPiping From Trap



Drain Trap Assembly with 1/2" Piping



Drain Trap Assembly with 3/4" Piping



DrainTrap Assembly (furnished)

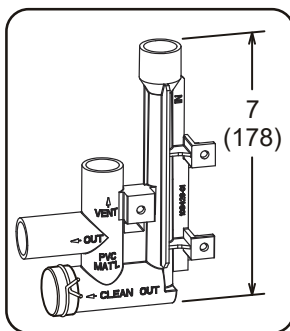


Figure 51. Trap / Drain Assembly Using 1/2" PVC or 3/4" PVC

Start-Up

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.
3. Inspect condition of condensate traps and drain assembly. Disassemble and clean seasonally.

Heating Start-Up

BEFORE LIGHTING the unit, smell all around the furnace 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 the NF95XS is equipped with a gas control switch. Use only your hand to move the switch. Never use tools. If the the switch will not move by hand, replace the valve. Do not try to repair it. Force or attempted repair may result in a fire or explosion.

Placing the Furnace into Operation

NF95XS units are equipped with a SureLight ignition system. Do not attempt to manually light burners on this furnace. 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 SureLight ignition system.

Priming Condensate Trap

The condensate trap should be primed with water prior to start-up to ensure proper condensate drainage. Either pour 10 fl. oz. (300 ml) of water into the trap, or follow these steps to prime the trap:

1. Follow the lighting instructions to place the unit into operation.
2. Set the thermostat to initiate a heating demand.
3. Allow the burners to fire for approximately 3 minutes.
4. Adjust the thermostat to deactivate the heating demand.
5. Wait for the combustion air inducer to stop. Set the thermostat to initiate a heating demand and again allow the burners to fire for approximately 3 minutes.
6. Adjust the thermostat to deactivate the heating demand and again wait for the combustion air inducer to stop. At this point, the trap should be primed with sufficient water to ensure proper condensate drain operation.

WARNING

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

Gas Valve Operation

1. **STOP!** Read the safety information at the beginning of this section.
2. Set the thermostat to the lowest setting.
3. Turn off all electrical power to the unit.
4. This furnace is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.
5. Remove the access panel.
6. Move gas valve switch to OFF. See Figure 52.
7. Wait five minutes to clear out any gas. If you then smell gas, **STOP!** Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas go to next step.
8. Move gas valve switch to ON. See Figure 52.

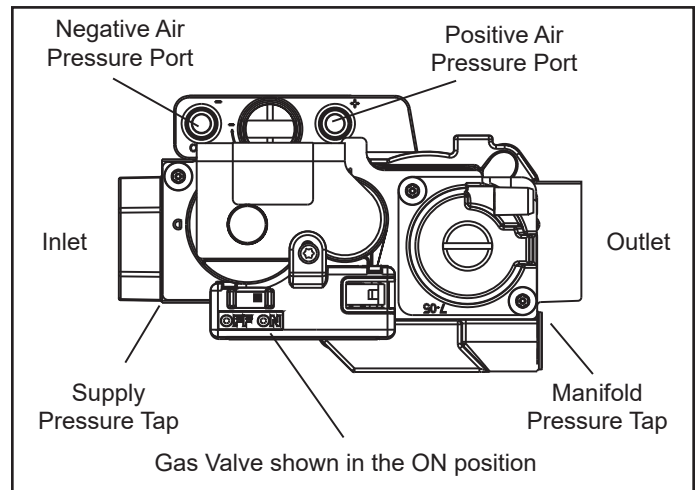


Figure 52. Gas Valve

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

Turning Off Gas to Unit

1. Set the thermostat to the lowest setting.
2. Turn off all electrical power to the unit if service is to be performed.
3. Remove the access panel.
4. Move gas valve switch to OFF.
5. Replace the 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 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 lockout? If the unit locks out again, inspect the unit for blockages.

Heating System Service Checks

C.S.A. Certification

All units are C.S.A. design certified without modifications. Refer to the NF95XS Operation and Installation Instruction Manual Information.

Gas Piping

⚠ CAUTION

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

⚠ WARNING

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

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

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

Testing Gas Piping

⚠ 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 53.

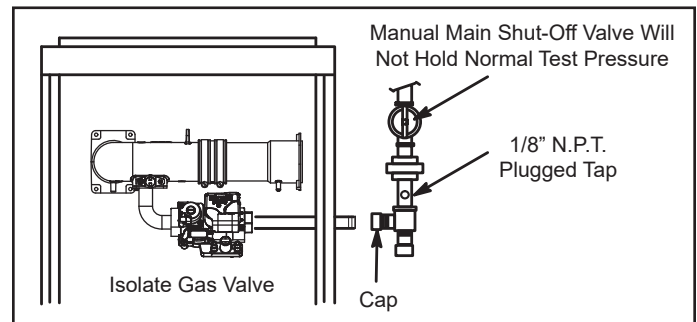


Figure 53.

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

⚠ WARNING

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

Testing Gas Supply Pressure Gas Flow (Approximate)

Model	Seconds for One Revolution	
	Natural	
	1 cu ft Dial	2 cu ft Dial
-040	90	180
-060	60	120
-080	45	90
-100	36	72
Natural - 1000 btu/cu ft		

Table 16. Gas Meter Clocking Chart

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 16. If manifold pressure matches Table 17 and rate is incorrect, check gas orifices for proper size and restriction. Remove temporary gas meter if installed.

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

Supply Pressure Measurement

A threaded plug on the inlet side of the gas valve provides access to the supply pressure tap. Remove the threaded plug, install a field-provided barbed fitting and connect a manometer to measure supply pressure. Replace the threaded plug after measurements have been taken. See Table 17 for supply line pressure.

On multiple unit installations, each unit should be checked separately, with and without units operating.

Manifold Pressure Measurement

To correctly measure manifold pressure, follow the steps below:

1. Remove the threaded plug from the outlet side of the gas valve and install a field-provided barbed fitting. Connect measuring device "+" connection to barbed fitting to measure manifold pressure.
2. Start unit on low heat and allow 15 minutes for unit to reach steady state.
3. After allowing unit to stabilize for 15 minutes, record manifold pressure and compare to value given in Table 17.
4. Shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to remove barbed fitting and replace threaded plug.
5. Start unit and perform leak check. Seal leaks if found.

Altitude	Unit	Natural	
		Manifold	Supply
0 - 4,500 ft.	040	3.5	4.5 - 10.5
	060		
	080		
	100		
4,501 - 7,500 ft.	040	3.2	4.5 - 10.5
	060	2.3	
	080	2.4	
	100	2.3	

**Table 17. Supply Line and Manifold Pressure
(inches w.c.)**

Proper Combustion

Furnace should operate minimum 15 minutes with correct manifold pressure and gas flow rate before checking combustion. Take combustion sample beyond the flue outlet and compare to Table 18.

Model	CO ₂ % for Nat
-040	6.3 - 7.8
-060	6.5 - 8.2
-080	7.2 - 8.4
-100	7.3 - 8.5
The maximum carbon monoxide reading should not exceed 100 ppm.	

Table 18.

High Altitude

Units may be installed at altitudes up to 7,500 ft. above sea level. See Table 17 for de-rate manifold values.

Proper Ground and Voltage



! WARNING

Electric Shock Hazard. Can cause injury or death. Unit must be properly grounded in accordance with national and local codes.

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 54. 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 19. If the readings exceed the maximum shown, 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 54. 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 19.

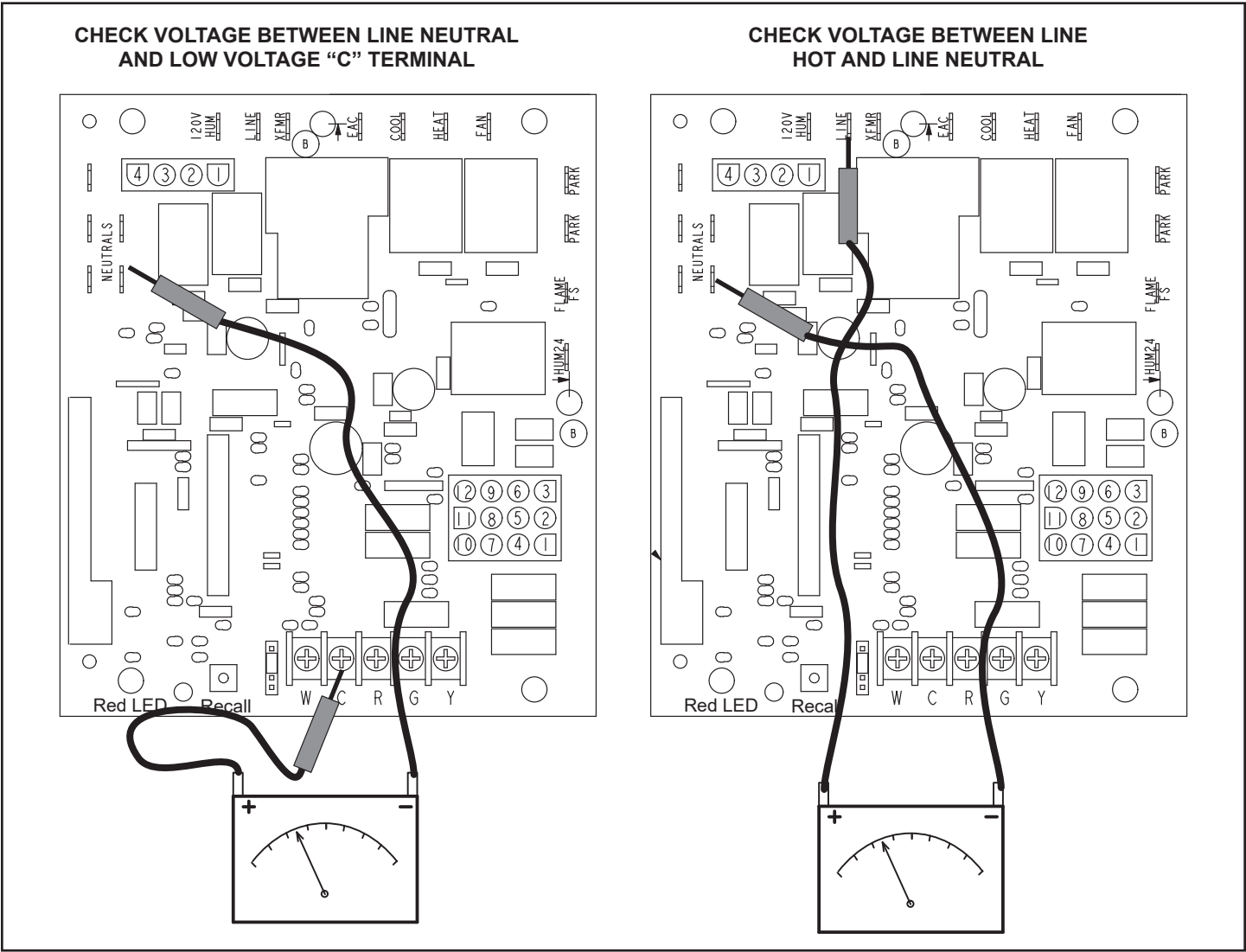


Figure 54.

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 NF95XS 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. See Figure 55.

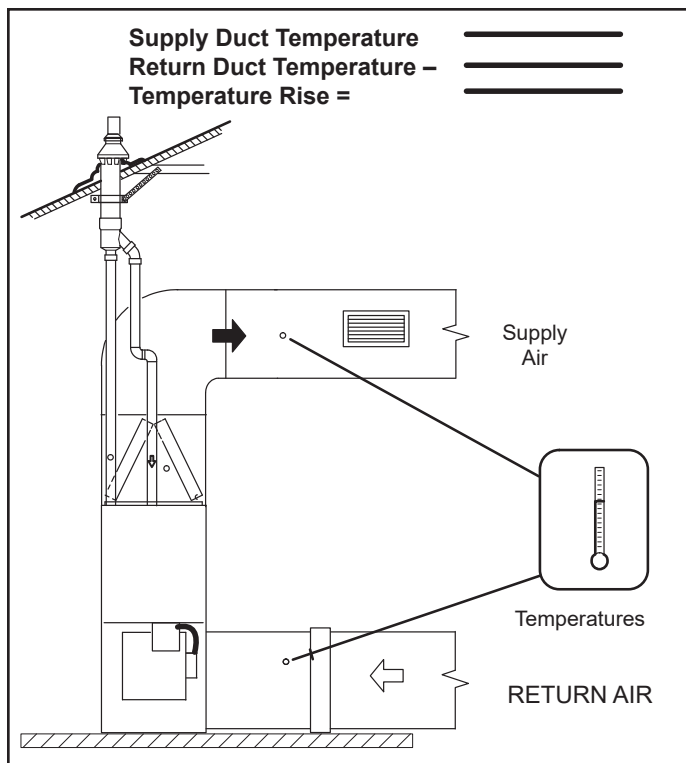


Figure 55. Temperature Rise

External Static Pressure

1. Tap locations shown in Figure 56.
2. Punch a 1/4" diameter hole in supply and return air plenums. Insert manometer hose flush with inside edge of hole or insulation. Seal around the hose with permagum. Connect the zero end of the manometer to the discharge (supply) side of the system. On ducted systems, connect the other end of manometer to the return duct as above.
3. With only the blower motor running and the evaporator coil dry, observe the manometer reading. Adjust blower motor speed to deliver the air desired according to the job requirements. For heating speed external static pressure drop must not be more than 0.5" W.C. For cooling speed external static pressure drop must not be more than 0.8" W.C.
4. Seal the hole when the check is complete.

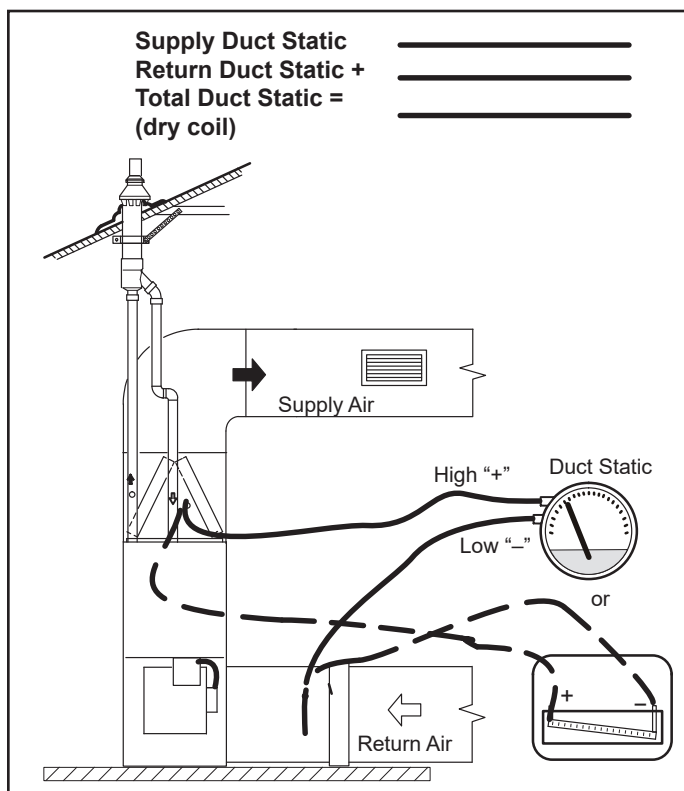


Figure 56. External Static Pressure

Blower Speed Taps

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

Maintenance



WARNING

ELECTRICAL SHOCK, FIRE, OR EXPLOSION HAZARD.

Failure to follow safety warnings exactly could result in dangerous operation, serious injury, death or property damage.

Improper servicing could result in dangerous operation, serious injury, death, or property damage. Before servicing, disconnect all electrical power to furnace.

When servicing controls, label all wires prior to disconnecting. Take care to reconnect wires correctly. Verify proper operation after servicing.



WARNING

The blower access panel 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.

Annual Furnace Maintenance

At the beginning of each heating season, and to comply with the GE Appliances Limited Warranty, your system should be checked as follows:

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 cleanliness of blower assembly and clean the housing, blower wheel and blower motor if necessary.
6. Inspect the condensate drain and trap for leaks and cracks. The drain and trap must also be cleaned and the trap must be primed with water. Inspect the rubber hoses connected to the pressure switches for cracks or loose connections, replace as necessary. Remove the rubber hoses from the cold end header box and inspect for any blockage, clean as needed. If strainers are installed in the hoses remember to remove and clean before reinstalling the hoses.
7. 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.

8. 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.
9. On condensing furnaces, inspect the furnace intake and exhaust pipes to make sure they are in place, structurally sound, without holes, blockage or leakage and the exhaust pipe is sloped toward the furnace. Inspect terminations to ensure they are free of obstructions and are structurally sound. 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.
10. 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.
11. Check the condition of the furnace cabinet insulation and repair if necessary.
12. Perform a complete combustion analysis during the furnace inspection to ensure proper combustion and operation. Consult Service Literature for proper combustion values.
13. Verify operation of CO detectors and replace batteries as required.

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

1. Check the operation of the ignition system, inspect and clean flame sensor. Check microamps before and after. Check controls and safety devices (gas valve, flame sensor, temperature limits). Consult Service Manual for proper operating range. Thermal Limits should be checked by restricting airflow and not disconnecting the indoor blower.
2. Verify that system total static pressure and airflow settings are within specific operating parameters.
3. Clock gas meter to ensure that the unit is operating at the specified firing rate for each stage of operation. 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.

NOTE: After any heavy snow, ice or frozen fog event the furnace vent pipes may become restricted. Always check the vent system and remove any snow or ice that may be obstructing the plastic intake or exhaust pipes.

Winterizing and Condensate Trap Care

1. Turn off power to the unit.
2. Have a shallow pan ready to empty condensate water.
3. Remove the drain plug from the condensate trap and empty water. Inspect the trap then reinstall the drain plug and refill trap with water.

Condensate Hose Screens

Check the condensate hose screens for blockage and clean if necessary. See Figure 57.

1. Turn off power to the unit.
2. Remove hoses from cold end header box. Twist and pull screens to remove.
3. Inspect screens and rinse with tap water if needed.
4. Reinstall screens, reconnect hoses and turn on power to unit.

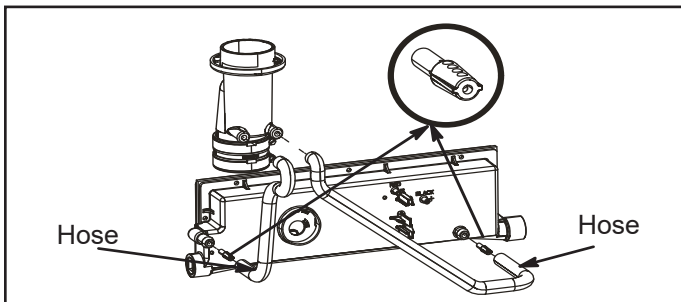


Figure 57. Condensate Hose Screens

Heat Exchanger and Burners

If cleaning the heat exchanger becomes necessary, follow the below procedures and refer to Figure 1 and Figure 58 when disassembling unit. Use papers or protective covering in front of furnace while removing heat exchanger assembly.

1. Turn off both electrical and gas power supplies to furnace.
2. Remove exhaust pipe from appliance adaptor but leave adaptor connected to exhaust coupling. Remove top cap and intake air pipe from side of unit.
3. Label the wires from gas valve, thermal switch, primary limit switch and make-up box then disconnect them.
4. Label then disconnect the wires from gas valve, thermal switch, primary limit switch and make-up box.

5. Disconnect gas supply piping. Remove the screw securing the air fuel plenum and remove along with the air intake assembly as one component.
6. Remove screws from both sides, top and bottom of vestibule panel.
7. Remove heat exchanger. It may be necessary to spread cabinet side to allow more room.
8. Back wash using steam. Begin from the burner opening on each tube. Steam must not exceed 275°F.
9. Run a vacuum cleaner over the face of burner. Visually inspect inside the burner. Remove any blockage. Replace gasket between burner plate and air fuel plenum then re-install burner plate.
10. 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.
11. Reinstall heat exchanger in vestibule.
12. Reinstall the air fuel plenum and air intake assembly.
13. Re-install the combustion air inducer assembly. Make note to re-install all screws. Failure to replace all screws may cause leaks. Reconnect all wires.
14. Reconnect top cap and exhaust pipe to combustion air inducer outlet. Reconnect intake air pipe.
15. Reconnect gas supply piping.
16. Turn on power and gas supply to unit.
17. Set thermostat and check for proper operation.
18. Check all piping connections, factory and field, for gas leaks. Use a leak detecting solution or other preferred means.

CAUTION

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

19. If a leak is detected, shut gas and electricity off and repair leak.
20. Repeat steps 18 and 19 until no leaks are detected.
21. Replace access panel.

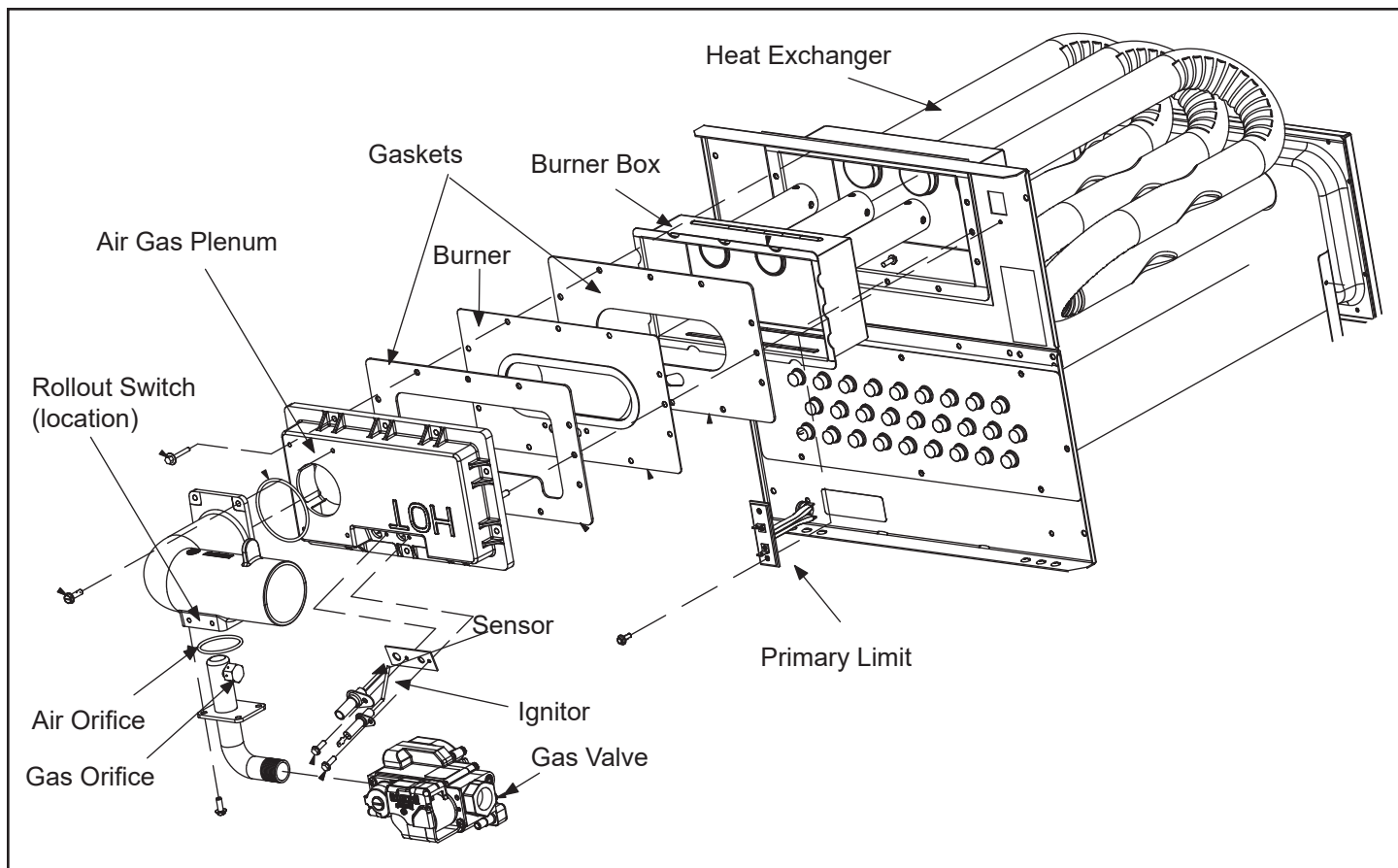


Figure 58. Burner, CAI Assembly & Heat Exchanger Removal

Wiring Diagram and Sequence of Operation

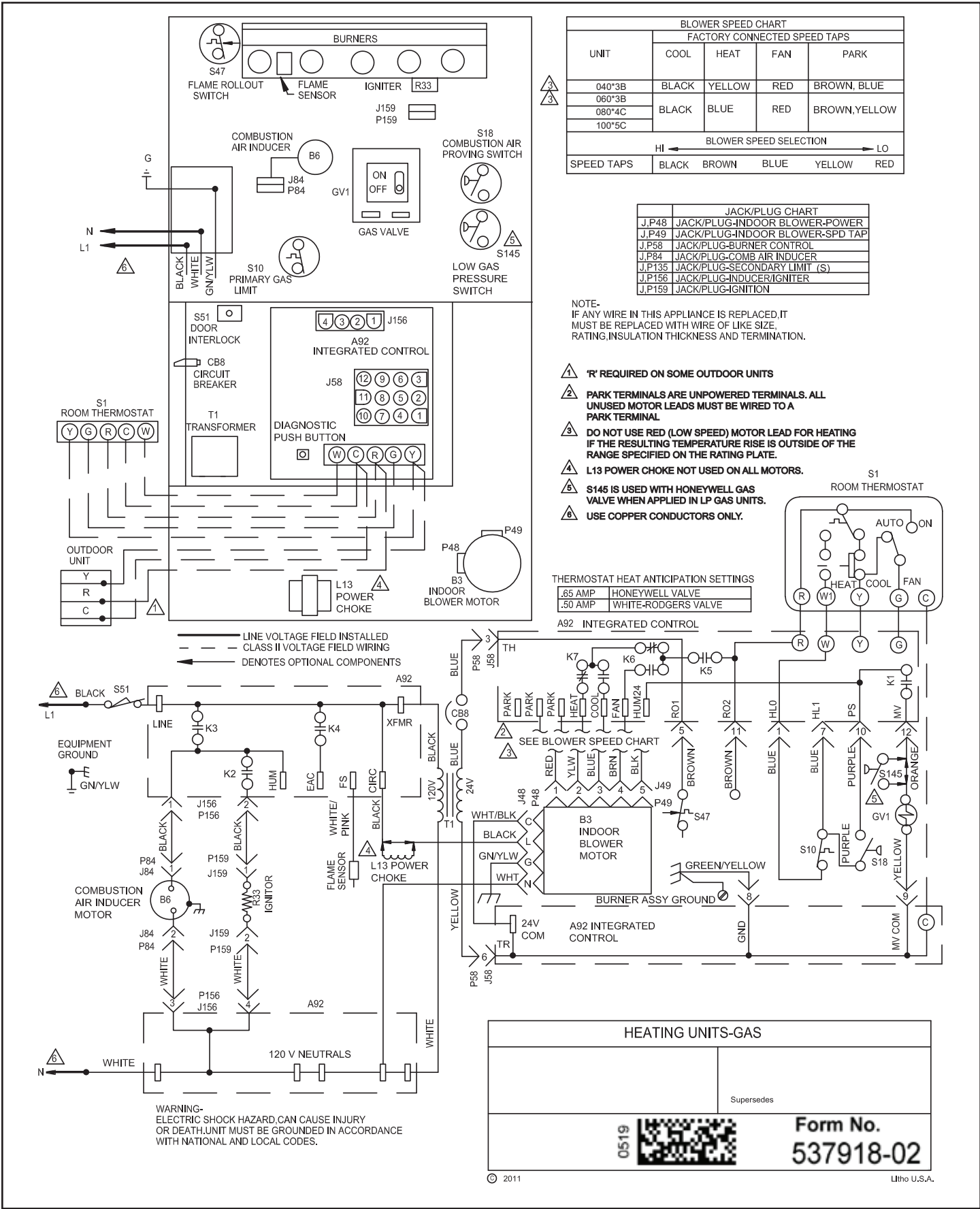
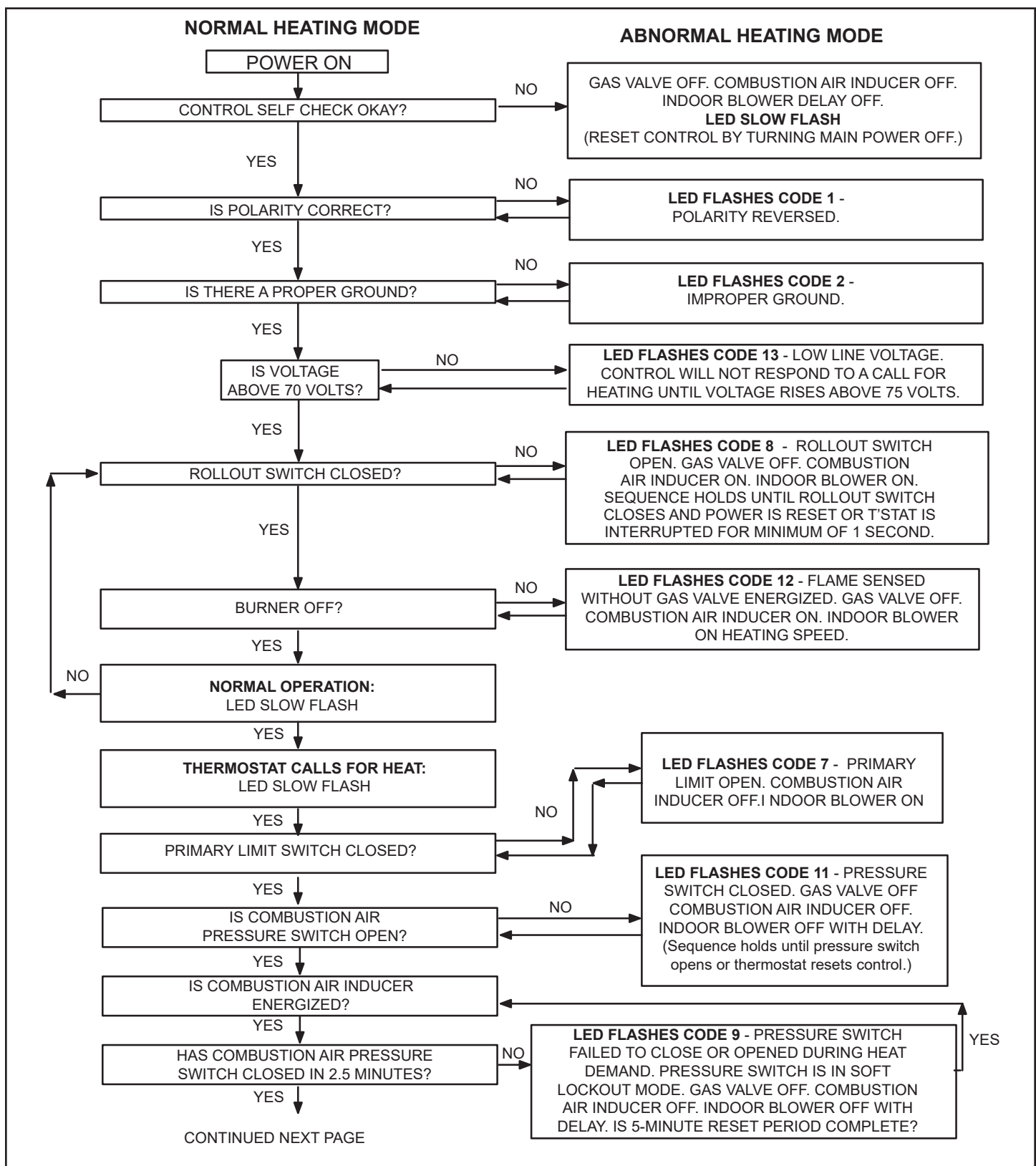
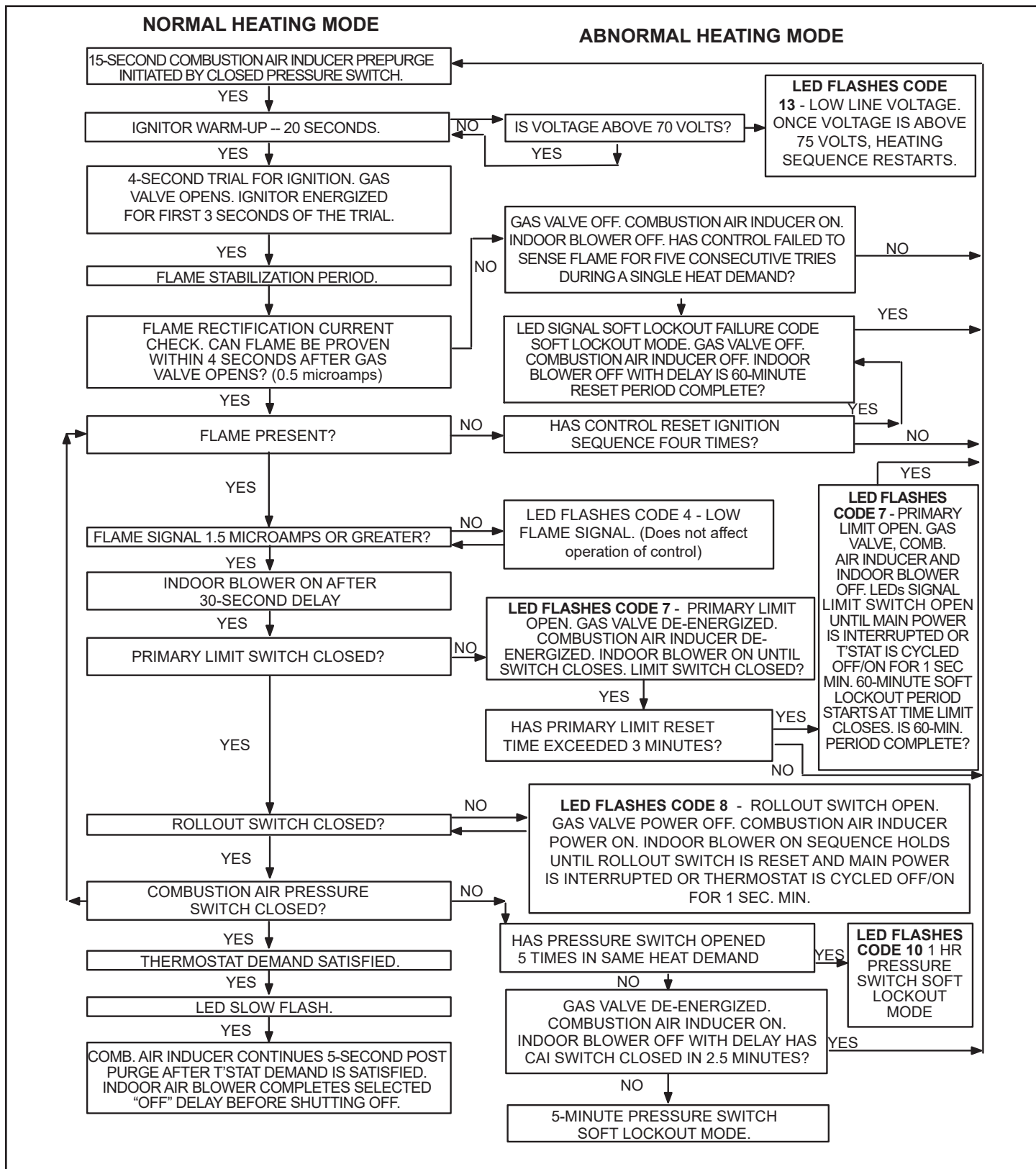


Figure 59.

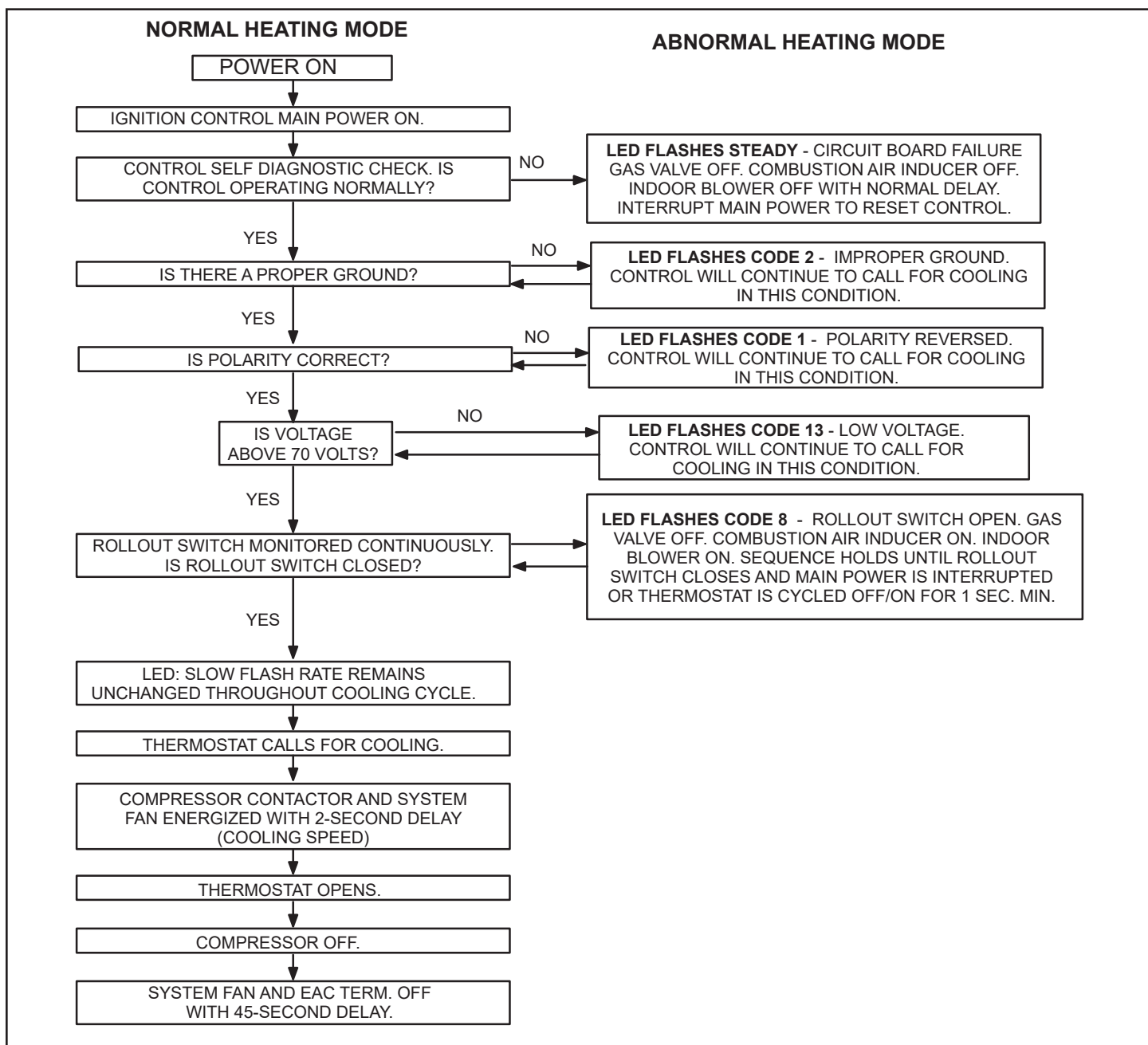
Troubleshooting: Heating Sequence of Operation



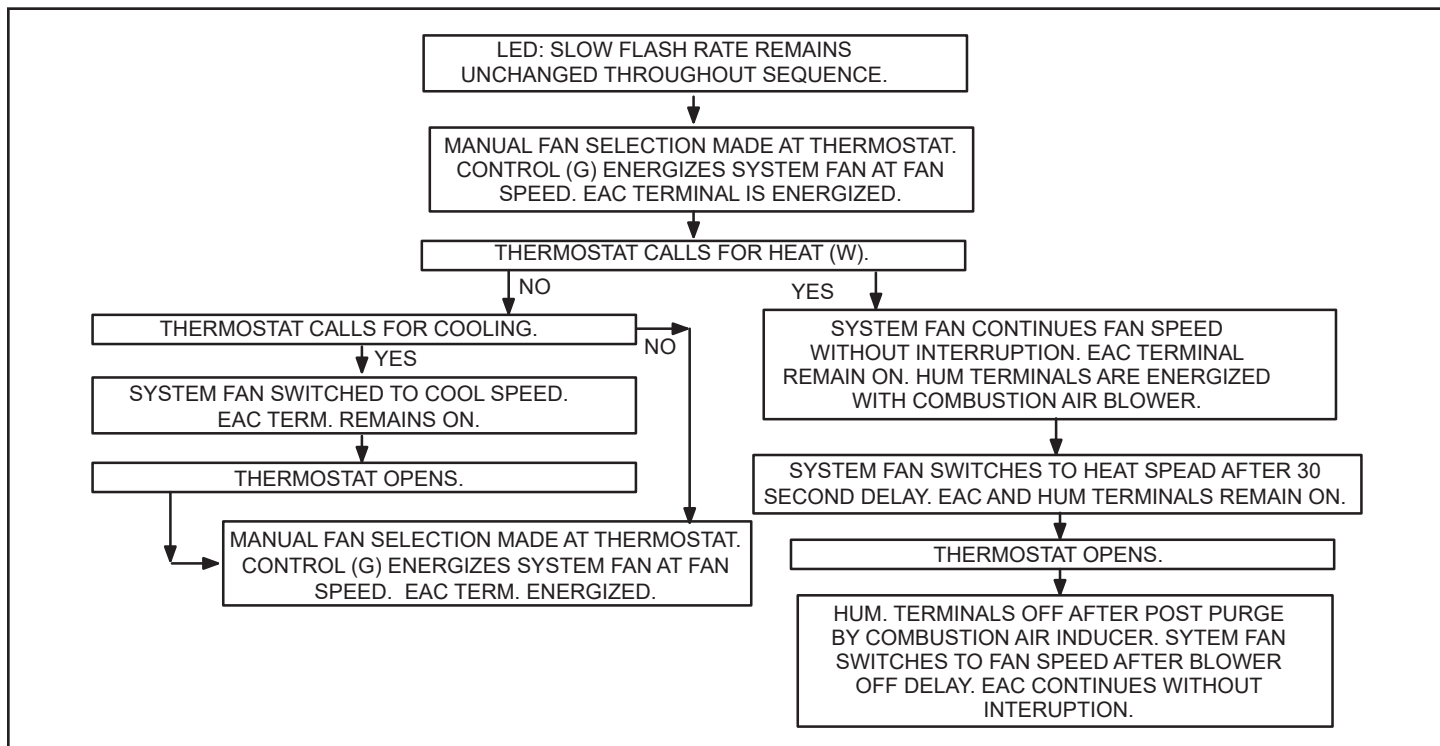
Troubleshooting: Heating Sequence of Operation (Continued)



Troubleshooting: Cooling Sequence of Operation



Troubleshooting: Continuous Fan / Accessories Sequence of Operation





GE APPLIANCES
a Haier company

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

Printed in the U.S.A.