LENNOX

Service Literature

UNIT INFORMATION

100158

EL195UHNEK

EL195UHNEK SERIES UNITS With R454B

EL195UHEK 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 EL195UHNEK 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.

⚠ WARNING

This furnace is equipped with an ignition control factory enabled for use with Lennox A2L refrigerant systems. Disabling the refrigerant detection functionality on A2L system is prohibited by safety codes. Refer to furnace installation instructions for refrigerant system setup.

⚠ 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.

⚠ WARNING

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

⚠ CAUTION

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

Table of Contents

SPECIFICATIONS

	Model	EL195UH040NE36BK	EL195UH060NE36BK
Gas Heating Performance	[1] AFUE	95%	95%
	Input - Btuh	40,000	60,000
	Output - Btuh	39,000	58,000
	Temperature rise range - °F	30 - 60	35 - 65
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / N/A	3.5 / 4.0
	High static - in. w.g.	0.5	0.5
Connections	Intake / Exhaust Pipe (PVC)	2 / 2	2 / 2
	Gas pipe size IPS	1/2	1/2
	Condensate Drain Trap (PVC pipe) - i.d.	3/4	3/4
	with furnished 90° street elbow	3/4 slip x 3/4 MIPT	3/4 slip x 3/4 MIPT
	with field supplied (PVC coupling) - o.d.	3/4 slip x 3/4 MPT	3/4 slip x 3/4 MPT
Indoor Blower	Wheel diameter x width - in.	10 x 8	10 x 8
	Motor Type	DC Brushless	DC Brushless
	Motor output - hp	1/2	1/2
	Tons of add-on cooling	1 - 2	1.5 - 3
	Air Volume Range - cfm	260 - 990	550 - 1380
Electrical Data	Voltage	120 volts - 60 hertz - 1 phase	
	Blower motor full load amps	6.8	6.8
	Maximum overcurrent protection	15	15
Shipping Data	lbs. - 1 package	122	128

NOTE - Filters and provisions for mounting are not furnished and must be field provided.

[1] Annual Fuel Utilization Efficiency based on DOE test procedures and according to FTC labeling regulations. Isolated combustion system rating for non-weatherized furnaces.

SPECIFICATIONS

	Model	EL195UH080NE48CK	EL195UH100NE60CK
Gas Heating Performance	[1] AFUE	95%	95%
	Input - Btuh	80,000	100,000
	Output - Btuh	78,000	97,000
	Temperature rise range - °F	40 - 70	45 - 75
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 4.0	3.5 / N/A
	High static - in. w.g.	0.5	0.5
Connections	Intake / Exhaust Pipe (PVC)	2 / 2	2 / 2
	Gas pipe size IPS	1/2	1/2
	Condensate Drain Trap (PVC pipe) - i.d.	3/4	3/4
	with furnished 90° street elbow	3/4 slip x 3/4 MIPT	3/4 slip x 3/4 MIPT
	with field supplied (PVC coupling) - o.d.	3/4 slip x 3/4 MPT	3/4 slip x 3/4 MPT
Indoor Blower	Wheel diameter x width - in.	10 x 10	11-1/2 x 10
	Motor Type	DC Brushless	DC Brushless
	Motor output - hp	3/4	1
	Tons of add-on cooling	2.5 - 4	3.5 - 5
	Air Volume Range - cfm	760 - 1740	1260 - 2405
Electrical Data	Voltage	120 volts - 60 hertz - 1 phase	
	Blower motor full load amps	8.4	10.9
	Maximum overcurrent protection	15	15
Shipping Data	lbs. - 1 package	148	157

NOTE - Filters and provisions for mounting are not furnished and must be field provided.

[1] Annual Fuel Utilization Efficiency based on DOE test procedures and according to FTC labeling regulations. Isolated combustion system rating for non-weatherized furnaces.

OPTIONAL ACCESSORIES - ORDER SEPARATELY

				"B" Width Models	"C" Width Models
CABINET ACCESSORIES					
Horizontal Suspension Kit - Horizontal only				**51W10**	**51W10**
Return Air Base - Upflow only				**50W98**	**50W99**
High Performance Economizer (Commercial Only)				**10U53**	**10U53**
CONDENSATE DRAIN KITS					
Condensate Drain Heat Cable			6 ft.	**26K68**	**26K68**
			24 ft.	**26K69**	**26K69**
Crawl Space Vent Drain Kit			US	**51W18**	**51W18**
			Canada	**15Z70**	**15Z70**
CONTROLS					
Blower Relay Kit (for two-stage outdoor units)				**85W66**	**85W66**
Transformer (75VA)				**27J32**	**27J32**
E30 Smart Wi-Fi Thermostat				**20A65**	**20A65**
Remote Outdoor Temperature Sensor				**X2658**	**X2658**
REFRIGERANT DETECTION SENSOR					
Refrigerant Detection System (RDS) Coil Sensor Kit (for indoor coil)				**27V53**	**27V53**
FILTER KITS					
[1] **Air Filter and Rack Kit**	Horizontal (end)			**87L96**	**87L97**
			Size of filter - in.	18 x 25 x 1	20 x 25 x 1
	Side Return		Single	**44J22**	**44J22**
			Ten Pack	**66K63**	**66K63**
			Size of filter - in.	16 x 25 x 1	16 x 25 x 1
TERMINATION KITS					
See Installation Instructions for specific venting information.					
Direct Vent	Concentric		US - 2 in.	**71M80**	**69M29**
			3 in.	**- - -**	**60L46**
			Canada - 2 in.	**44W92**	**44W92**
			3 in.	**- - -**	**44W93**
	Flush-Mount		US - 2, 2-1/2 or 3 in.	**51W11**	**51W11**
			Canada - 2, 2-1/2 or 3 in.	**51W12**	**51W12**
	Wall - Close Couple		US - 2 in.	**22G44**	**- - -**
			3 in.	**44J40**	**44J40**
	Wall - Close Couple WTK		Canada - 2 in.	**30G28**	**- - -**
			3 in.	**81J20**	**81J20**
	Roof Termination Flashing Kit (no vent pipe - 2 flashings)		2 in.	**15F75**	**15F75**
			3 in.	**44J41**	**44J41**
VENTING					
Flue Coupling			2 in.	**17H92**	**17H92**

[1] Cleanable polyurethane frame type filter.

NOTE - Termination Kits (**44W92**, **44W93**, **30G28**, **51W12**, **81J20**) and Crawl Space Vent Drain Kit (**15Z70**) are certified to ULC S636 standard for use in Canada only.

BLOWER DATA

EL195UH040NE36BK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1413	358	1257	255	1155	202	914	114	871	97
0.20	1385	366	1231	267	1124	214	875	120	820	106
0.30	1354	383	1199	277	1091	223	832	130	776	114
0.40	1336	396	1171	289	1062	232	791	137	740	124
0.50	1280	392	1140	301	1019	244	751	148	684	131
0.60	1211	375	1111	307	985	254	702	158	642	140
0.70	1129	351	1071	323	959	263	658	163	589	147
0.80	1009	319	996	309	917	275	613	172	555	151
0.90	846	273	858	273	812	259	575	178	509	158
1.00	730	246	719	245	702	236	530	185	466	166

EL195UH060NE36BK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1416	339	1253	249	1145	194	904	109	856	96
0.20	1395	351	1223	258	1118	205	865	118	812	103
0.30	1369	364	1198	270	1083	212	830	127	777	111
0.40	1342	377	1169	279	1055	222	793	134	744	117
0.50	1321	384	1141	289	1024	230	756	143	698	126
0.60	1292	396	1117	300	996	242	718	151	664	133
0.70	1246	395	1091	307	965	251	673	157	615	142
0.80	1179	376	1065	316	934	262	635	164	576	147
0.90	1082	349	1020	323	906	267	594	171	533	155
1.00	975	318	927	300	875	275	565	177	504	161

EL195UH080NE48CK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1651	400	1441	286	1314	225	1236	189	1114	151
0.20	1622	414	1419	303	1286	241	1201	204	1077	160
0.30	1603	433	1386	316	1253	254	1163	217	1038	174
0.40	1581	452	1355	331	1222	265	1122	229	996	184
0.50	1548	467	1322	347	1182	278	1094	240	948	193
0.60	1522	479	1293	358	1157	290	1053	252	908	203
0.70	1441	465	1258	371	1104	304	1011	264	876	212
0.80	1341	435	1211	382	1083	312	984	271	827	222
0.90	1228	403	1159	372	1037	324	938	281	799	230
1.00	1132	377	1034	342	987	323	913	291	769	239

EL195UH100NE60CK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Different Blower Speeds																			
	Bottom Return Air, Side Return Air with Return Air from Both Sides or Return Air from Bottom and One Side.										Single Side Return Air − Air volumes in bold (over 1800 cfm) require Optional Return Air Base and field fabricated transition to accommodate 20 x 25 x 1 in. air filter in order to maintain proper air velocity.									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)		High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	2064	683	1822	466	1662	363	1559	306	1387	222	**2045**	**678**	**1837**	**466**	1648	366	1527	300	1358	218
0.20	2034	700	1793	480	1621	379	1520	318	1337	233	**2009**	**698**	1765	482	1611	377	1489	315	1313	228
0.30	1997	715	1750	497	1587	390	1479	330	1297	244	**1981**	**713**	1737	497	1574	391	1448	327	1270	240
0.40	1967	730	1719	513	1548	402	1447	341	1254	254	**1954**	**729**	1701	508	1535	402	1419	337	1224	251
0.50	1940	739	1682	525	1514	415	1400	354	1205	266	**1915**	**740**	1663	522	1501	414	1378	349	1186	261
0.60	1867	729	1649	537	1469	428	1362	364	1162	275	**1859**	**731**	1625	538	1457	428	1338	360	1139	273
0.70	1794	701	1615	552	1441	436	1326	375	1125	285	1787	706	1596	550	1418	438	1298	367	1090	284
0.80	1706	668	1581	567	1399	451	1280	387	1077	295	1697	674	1553	565	1383	452	1262	383	1065	288
0.90	1596	624	1532	574	1366	463	1249	397	1039	301	1604	635	1524	572	1344	463	1223	395	1017	302
1.00	1490	584	1455	554	1329	474	1210	407	993	312	1482	586	1444	552	1318	475	1183	406	973	310

Twinning

The control board in this furnace is equipped with a provision to ”twin” (interconnect) two(2) adjacent furnaces with a common plenum such that they operate as one (1) large unit.

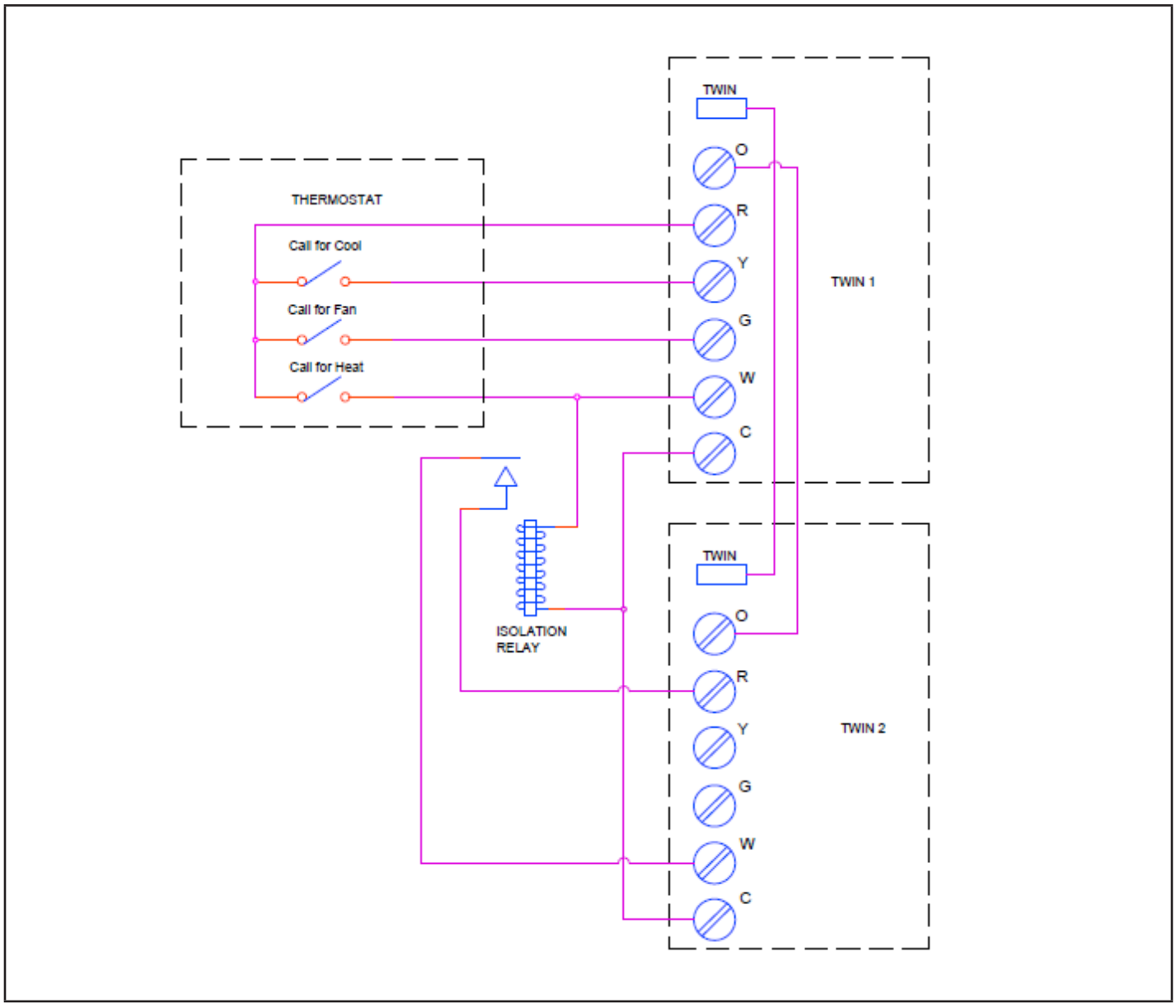
When twinned, the circulating blower speeds are synchronized between the furnaces. If either furnace has a need to run the blower, both furnaces will run the blower on the same speed. The cooling speed has highest priority, followed by heating speed and fan speed.

Field installation of twinning consists of connecting wires between the “C”, ”O” and ”Twin” terminals of the two controls.

The 24 VAC secondary of the two systems must be in phase. All thermostat connections are made to one control only. See diagram below.

The twinned furnace without thermostat connections is to have the call for heat supplied by an external 24VAC isolation relay* to prevent its rollout switch from being bypassed by the other twinned furnace. The coil of the isolation relay connects from the thermostat ”W” to 24 VAC common. The contacts of the relay connect ”R” to ”W” on the non-thermostat twin.

*Wiring and quick connects will be field provided .



PARTS IDENTIFICATION

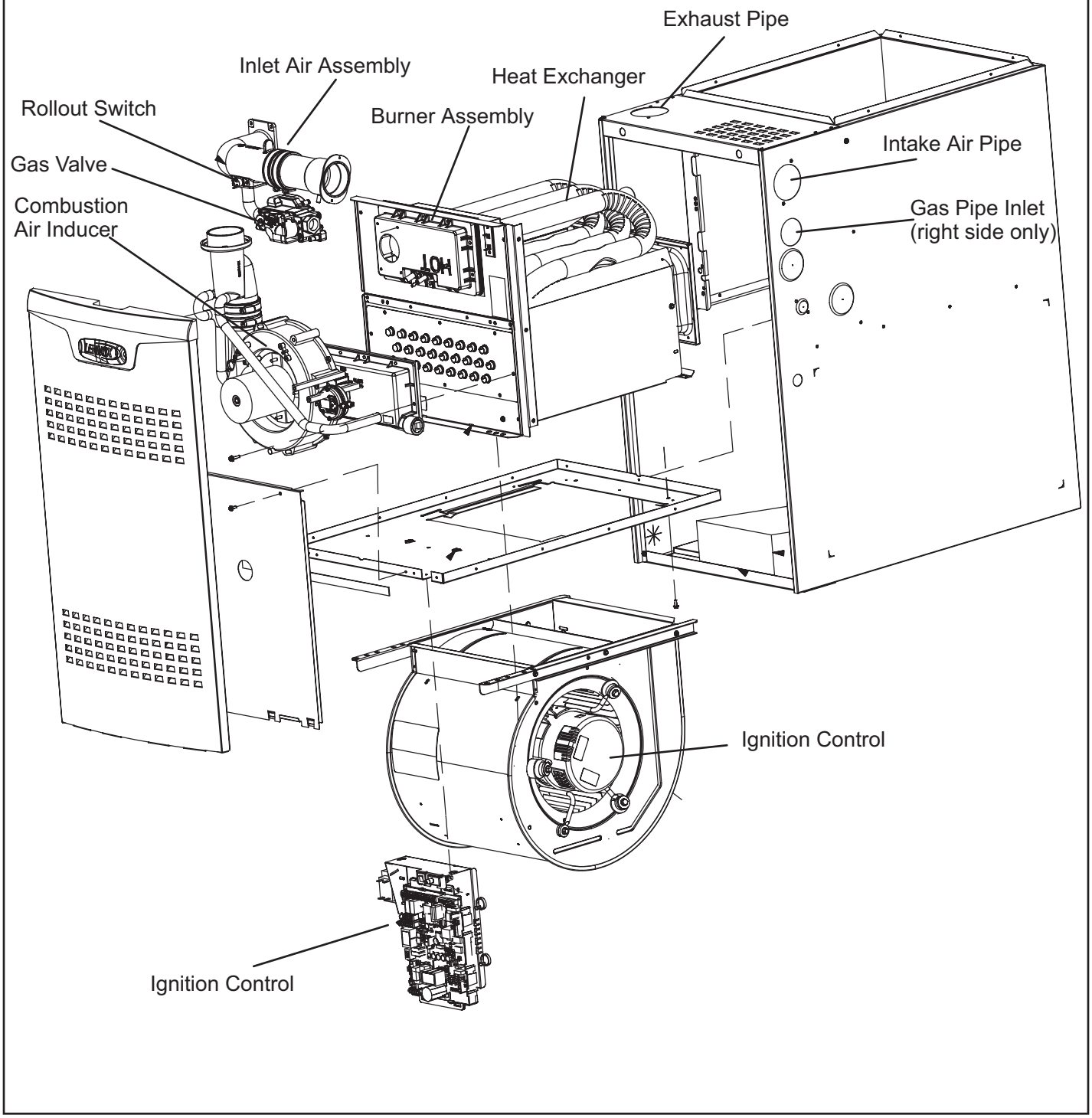


FIGURE 1

I-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.

EL195UHNEK 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.

A-Control Box Components (FIGURE 2)

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

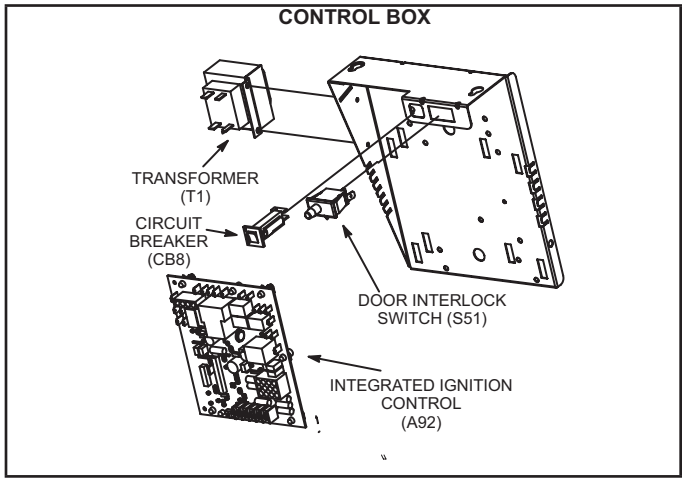


FIGURE 2

1. 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.

⚠ IMPORTANT

When matching this gas furnace with zoning, dual fuel or other 24V accessories, It is recommended to replace the factory installed transformer with kit 27J32.

Kit 27J32 contains a 75VA transformer, so you do not overload the original 40VA transformer.

2. Door Interlock Switch (S51)

A door interlock switch rated 14A at 120VAC is located on the control box. The switch is wir ored in series with line voltage. When the blower door is removed the unit will shut down.**3.**

3-Circuit Breaker (CB8)

A 24V circuit breaker is also located in the control box. The switch provides overcurrent protection to the transformer (T1). The breaker is rated 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.

4. Ignition Control (A92) 107792-XX FIGURE 3

⚠ 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.

Integrated Control DIP Switch Settings

Units are equipped with a single-stage integrated control. This control manages ignition timing, heating mode fan off delays and indoor blower speeds based on selections made using the control dip switches and jumpers. For LGWP DIP switch settings see section VII Low GWP Application. The control includes an internal watchguard feature which automatically resets the ignition control when it has been locked out. After one hour of continuous thermostat demand for heat, the watchguard will break and remake thermostat demand to the furnace and automatically reset the control to relight the furnace.

Accessory Terminals FIGURE 3

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

One line voltage “HUM” 1/4” spade terminal is provided on the furnace integrated control. This terminal is energized in the heating mode when the combustion air inducer is operating. Any humidifier rated up to one amp can be connected to this terminal with the neutral leg of the circuit being connected to one of the provided neutral terminals. If a humidifier rated at greater than one amp is connected to this terminal, it is necessary to use an external relay.

One 24V ”H” 1/4” spade terminal is provided on the furnace integrated control. The terminal is energized in the heating mode when the combustion air inducer is operating and the pressure switch is closed. Any humidifier rated up to 0.5 amp can be connected to this terminal with the ground leg of the circuit connected to ground or the ”C” terminal.

Indoor Blower Operation DIP Switch Settings

The heat fan-on time of 30 seconds is not adjustable The heat fan-off delay (amount of time that the blower operates after the heat demand has been satisfied) may be adjusted by changing the two position dip switch on the integrated control, to one of four selections. Blower off delay is factory set at 120 seconds. For other blower off delay settings, please refer to the following chart:

Blower Delay Select		
	SW1-1	SW1-2
90	OFF	ON
120	OFF	OFF
180	ON	OFF
210	ON	ON
Factory Setting is 120		

ON BOARD LINKS (FIGURE 4 and FIGURE 5) DIAGNOSTIC PUSH BUTTON (FIGURE 3)

⚠ IMPORTANT

Carefully review all configuration information provided. Failure to properly set DIP switches, jumpers and on-board links can result in improper operation!

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

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

Diagnostic Push Button

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

The hot surface ignition control system consisting of an integrated control (FIGURE 3 with control terminal designations in TABLE 1, TABLE 2 and TABLE 3), sensor and ignitor (FIGURE 7). 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.

TABLE 1

1/4” QUICK CONNECT TERMINALS	
120V HUM	POWER FOR HUMIDIFIER (120 VAC
LINE	INCOMING POWER LINE (120 VAC)
XFMR	TRANSFORMER PRIMARY (120 VAC)
CIRC	INDOOR BLOWER MOTOR (120 VAC)
ACC	ACCESSORY(120 VAC)
24V HUM	HUMIDIFIER (24 VAC)
NEUTRALS	NEUTRAL (5)
3/16” QUICK CONNECT TERMINALS	
COOL	COOL SPEED TAP FROM INDOOR BLOWER MOTOR (24 VAC)
HEAT	HEAT SPEED TAP FROM INDOOR BLOWER MOTOR (24 VAC)
FAN	CONTINUOUS FAN SPEED TAP FROM INDOOR BLOWER MOTOR (24 VAC)
FLAME SENSE	FLAME SENSOR ELECTRODE (120 VAC)
COMMON	COMMON (24 VAC)
TWIN	24V TWINNING COMMUNICATION
PARK	3 TERMINALS TO PARK UNUSED MOTOR SPEED TAPS

TABLE 2

THERMOSTAT INPUT TERMINALS	
W	HEAT
C	COMMON GROUND
R	24V AC
G	FAN
Y	COOL
O	REVERSING VALVE (when W951 is clipped)

TABLE 3

LOW GWP INTERFACE	
LGWP1	LOW GWP SENSOR #1 INTERFACE
LGWP2	LOW GWP SENSOR # 2 INTERFACE
ALARM	INTERFACE TO LOW GWP LEAK AUDIBLE ALARM (DRY CONTACT)
ZONE	INTERFACE TO ZONING CONTROL (DRY CONTACT)
LGWP TEST	PUSH BUTTON TO TEST LOW GWP FUNCTIONALITY

Single Stage, Constant, Torque, Non-Communicating
107792-XX

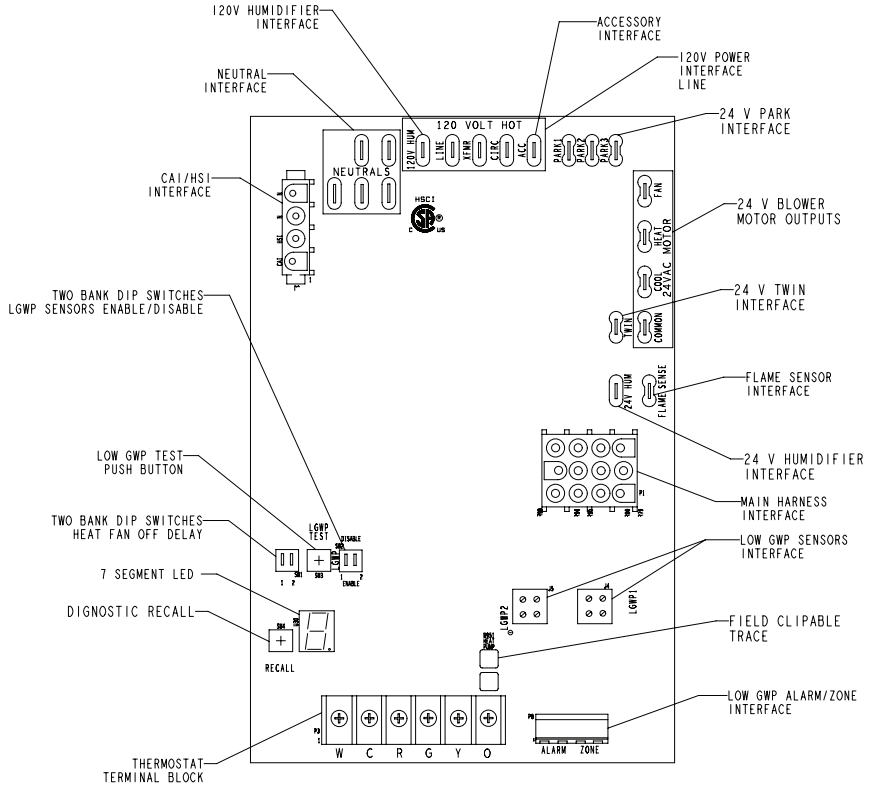


FIGURE 3

Indoor Blower Speeds

1 - When the thermostat is set to “FAN ON,” the indoor blower will run continuously on the fan speed when there is no cooling or heating demand. See table below for Allowable Circulation Speeds.

2 - When the EL195UHNEK is running in the heating mode, the indoor blower will run on the heating speed. See table below for Allowable Heating Hpeeds.

3 - When there is a cooling demand, the indoor blower will run on the cooling speed.

Allowable Circulation Speeds					
Model Number	**Red**	**Yellow**	**Blue**	**Brown**	**Black**
All Models	Factory Setting	Not Allowed	Not Allowed	Not Allowed	Not Allowed

Allowable Heating Speeds					
EL195UHNEK Model Number	**Red**	**Yellow**	**Blue**	**Brown**	**Black**
040NE36BK	Allowed	Factory Setting	Allowed	Not Allowed	Not Allowed
060NE36BK		Allowed	Factory Setting	Allowed	
080NE60CK					
100NE60CK				Not Allowed	

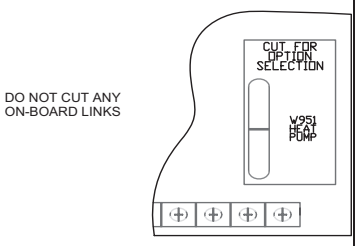
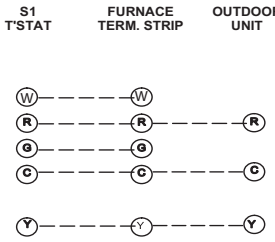
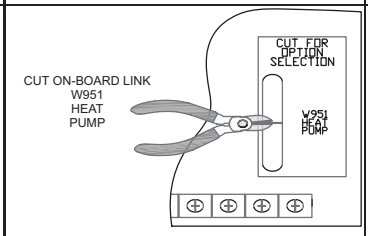
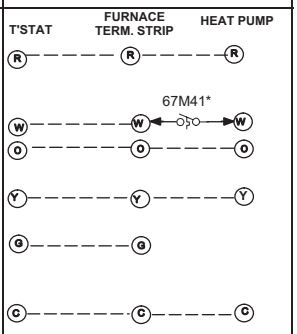
Thermostat	On Board Links Must NOT Be Cut To Select AC ON System Options	Wiring Connections
Heat / Cool .		

FIGURE 4

Thermostat	On Board Links Must Be Cut To Select Heat Pump Options	Wiring Connections
Dual Fuel Single Stage Heat Pump ComfortSense thermostat w/ dual fuel capabilities		

Connect W to W ONLY if using defrost tempering kit 67M41

FIGURE 5

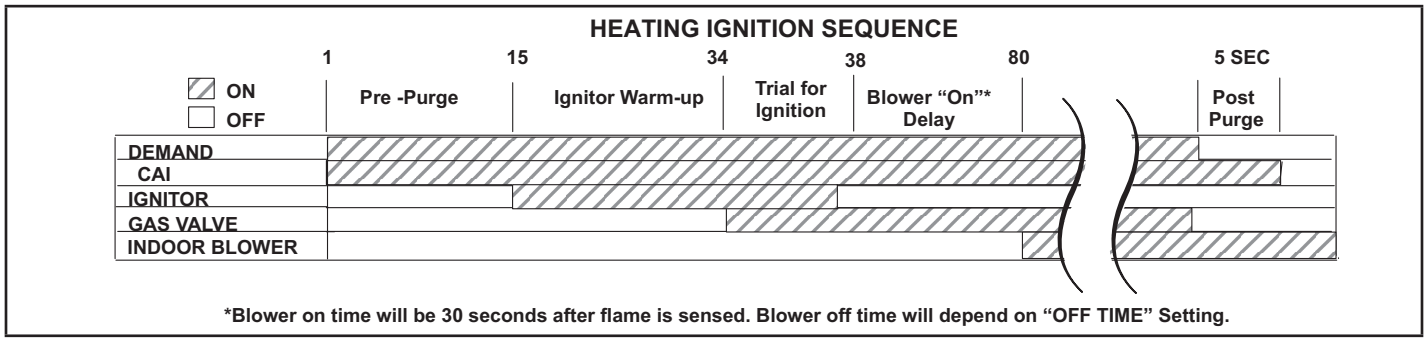


FIGURE 6

Heating Ignition Sequence FIGURE 6

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

After the 15-second pre-purge period, the ignitor warms up for 20 seconds during which the gas valve opens at 19 seconds for a 4-second trial for ignition. The ignitor remains energized for the first 3 seconds during the 4 second trial. If ignition is not 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 Watchguard-Flame Failure mode. After a 60-minute reset period, the integrated control will begin the ignition sequence again

TABLE 4

Integrated Diagnostic Codes/Status of Equipment

Code	Diagnostic Codes/Status of Equipment
A	Indoor Blower Operation: Continuous Fan only mode
dF	Defrost mode
.	Idle mode (Decimal blinks at 1 Hertz -- 0.5 second ON, 0.5 second OFF).
C	Cooling stage (1 second ON, 0.5 second OFF) 1 or 2 displayed / Pause / Repeat codes.
d	Dehumidification mode (1 second ON, 1 second OFF) / Pause / Repeat Codes).
H	Gas Heat Stage (1 second ON, 0.5 second OFF) 1 or 2 displayed / Pause / Repeat codes. Blinking during ignition.
h	Heat pump stage.
* No change implies the display will continue to show whatever is currently being displayed for normal operation (blinking decimal, active error code, heat state, etc.)	

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E000	No error in memory	No active fault exists, or all faults have been cleared
E106	Twin Communication Fault	This may indicate: 1) The power is removed from one furnace and not the other or/and 2) The 24 VAC supply to the twins are not in phase
E110	Low line voltage.	Line Voltage Low (Voltage lower than nameplate rating). Check power line voltage and correct. Alarm clears 5 seconds after fault recovered.
E111	Line voltage polarity reversed.	Reverse line power voltage wiring. System resumes normal operation 5 seconds after fault recovered.
E112	Ground not detected.	System shuts down. Provide proper earth ground. System resumes normal operation 5 seconds after fault recovered.
E113	High line voltage.	Line Voltage High (Voltage higher than nameplate rating). Provide power voltage within proper range. System resumes normal operation 5 seconds after fault recovered.
E114	Line voltage frequency out-of-range.	No 60 Hertz Power. Check voltage and line power frequency. Correct voltage and frequency problems. System resumes normal operation 5 seconds after fault recovered.
E115	Low 24V - Control will restart if the error recovers.	24-Volt Power Low (Range is 18 to 30 volts). Check and correct voltage. Check for additional power-robbing equipment connected to system. May require installation of larger VA transformer to be installed in furnace / air handler. Clears after fault recovered.
E117	Poor ground detected (Warning only).	Provide proper grounding for unit. Check for proper earth ground to the system. Warning only will clear 30 seconds after fault recovered.

TABLE 4 Continued

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E125	Control failed self-check, internal error, failed hardware. Will restart if error recovers. Integrated control not communicating. Covers hardware errors (flame sense circuit faults, pin shorts, etc.).	Hardware problem on the control. Cycle power on control. Replace if problem prevents service and is persistent. Critical alert. Cleared 300 seconds after fault recovered.
E150	Refrigerant Leak detected	This may indicate the presence of a leak at or in the indoor unit coil of the equipment, that will need to be repaired for proper and safe system operation. Additionally, it may indicate that proper refrigerant charge will need to be verified. This fault cannot be cleared while the refrigerant detection system sensor is reporting the presence of a leak
E151	Refrigerant Leak Detector Sensor #1 fault	The refrigerant detection sensor #1 in the unit is reporting an issue that prevents it from functioning properly, and replacement of the sensor may be necessary. This fault clears when the sensor no longer reports the presence of a fault condition.
E152	Refrigerant Leak Detector Sensor #2 fault	The refrigerant detection sensor #2 in the unit is reporting an issue that prevents it from functioning properly, and replacement of the sensor may be necessary. This fault clears when the sensor no longer reports the presence of a fault condition.
E154	Refrigerant Leak Detector Sensor #1 Communication lost or invalid sensor dip switch configuration (ON/OFF)	There may be an issue with the wiring harness connecting the sensor #1 to the furnace control board, either with the wiring itself or with the connector. Check the wiring and the connector for damage or improper connectivity. Check the sensor for damage or obstruction on the harness plug. This fault clears when communications with the sensor has been reestablished, but blower latches for a minimum of 5 minutes. Retest of the presence of fault can be effected by pressing the Low GWP test button on the furnace unit control board. This may also indicate incorrect Low GWP dip switch settings. Please refer to installation instructions.
E155	Refrigerant Leak Detector Sensor #2 Communication lost	There may be an issue with the wiring harness connecting the sensor #2 to the furnace control board, either with the wiring itself or with the connector. Check the wiring and the connector for damage or improper connectivity. Check the sensor for damage or obstruction on the harness plug. This fault clears when communications with the sensor has been reestablished, but blower latches for a minimum of 5 minutes. Retest of the presence of fault can be effected by pressing the Low GWP test button on the furnace unit control board
E160	Refrigerant Leak Detector Sensor #1 type incorrect	The sensor #1 is of a type not suitable for use in the application. Replace the sensor with a Lennox approved replacement part. This fault clears when a sensor suitable for the application is detected by the furnace control board, but blower will latch for a minimum of 5 minutes. Retest of the presence of the fault can be effected by pressing the Low GWP test button on the furnace unit control board.
E161	Refrigerant Leak Detector Sensor #2 type incorrect	The sensor #2 is of a type not suitable for use in the application. Replace the sensor with a Lennox approved replacement part. This fault clears when a sensor suitable for the application is detected by the furnace control board, but blower will latch for a minimum of 5 minutes. Retest of the presence of the fault can be effected by pressing the Low GWP test button on the furnace unit control board.
E163	Furnace Control Board Failure	There is an issue with the furnace control board, preventing the furnace from operating properly. This may require the replacement of the indoor unit control board. This fault clears when the furnace controller operates normally.

TABLE 4 Continued

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E164	Low GWP Test	Low GWP Test mode activates by manually engaging Low GWP test button. Normal operations resumes and code clears automatically after 1-minute
E200	Hard lockout - Rollout circuit open or previously open.	Correct cause of rollout trip, or replace flame rollout switch. Test furnace operation. Cleared after fault recovered.
E204	Gas valve mis-wired.	Check gas valve operation and wiring. Clears when repaired.
E223	Low pressure switch failed open.	Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E224	Low pressure switch failed closed.	Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E227	Low pressure switch open during trial for ignition or run mode.	Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E240	Low flame current - Run mode.	Check micro-amperes of flame sensor using control diagnostics or field-installed mode. Clean or replace sensor. Measure voltage of neutral to ground to ensure good unit ground. Alert clears after current heat call has been completed.
E241	Flame sensed out of sequence - Flame still present.	Shut off gas. Check for gas valve leak. Replace, if necessary. Alert clears when fault is recovered.
E250	Limit switch circuit open.	Check for proper firing rate on furnace. Ensure there is no blockage in heater. Check for proper air flow. If limit not closed within 3 minutes, unit will go into 1-hour soft lockout. Resumes normal operation after fault is cleared.
E270	Soft lockout - Exceeded maximum number of retries. No flame current sensed.	Check for proper gas flow. Ensure that ignitor is lighting burner. Check flame sensor current. Clears when heat call finishes successfully.
E271	Soft lockout - Exceeded maximum number of retries. Last retry failed due to the pressure switch opening.	Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Clears when heat call finishes successfully.
E272	Soft lockout - Exceeded maximum number of recycles. Last recycle due to the pressure switch opening.	Check operation of low pressure switch to see if it is stuck closed on heat call. Check pressure (inches w.c.) of high pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Clears when heat call finishes successfully.
E273	Soft lockout - Exceeded maximum number of recycles. Last recycle due to flame failure.	Check micro-amperes of flame sensor using control diagnostics or field-installed mode. Clean or replace sensor. Measure voltage of neutral to ground to ensure good unit ground. Clears when heat call finishes successfully.
E274	Soft lockout - Exceeded maximum number of recycles. Last recycle failed due to the limit circuit opening or limit remained open longer than 3 minutes.	Shut down system. 1-hour soft lockout. Check firing rate and air flow. Check for blockage. Clears when heat call finishes successfully.
E275	Soft lockout - Flame sensed out of sequence. Flame signal is gone.	Shut off gas. Check for gas valve leak. 1-hour soft lockout. Clears when flame has been proven stable.
E290	Ignitor circuit fault - Failed ignitor or triggering circuitry.	Measure resistance of hot surface ignitor. Replace if open or not within specifications. 1-hour soft lockout. Clears when flame has been proven stable.
E390	Low GWP Relay Stuck	This indicates an issue with the Low GWP relay in the furnace control. This may require the replacement of the indoor unit control board. This fault clears when the relay operates normally.

B-Heating Components (FIGURE 7)

Combustion air inducer (B6), primary limit control (S10), ignitor, burners, 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.

1. 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.

2. Primary Limit Control (S10)

The primary limit (S10) is located in the heating vestibule panel. When excess heat is sensed in the heat exchanger, the limit will open. If the limit is open, the furnace control energizes the supply air blower and closes the gas valve. The limit automatically resets when unit temperature returns to normal. The switch must reset within three minutes or the SureLight control will go into Watch guard 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. See Lennox Repair Parts Handbook if limit switch must be replaced.

3. 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. 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 (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.

TABLE 5

Orifice Size

Unit Input	Nat Orifice Size (0 - 7500 ft)
040	0.0472
060	0.0595
080	0.0689
100	0.0810

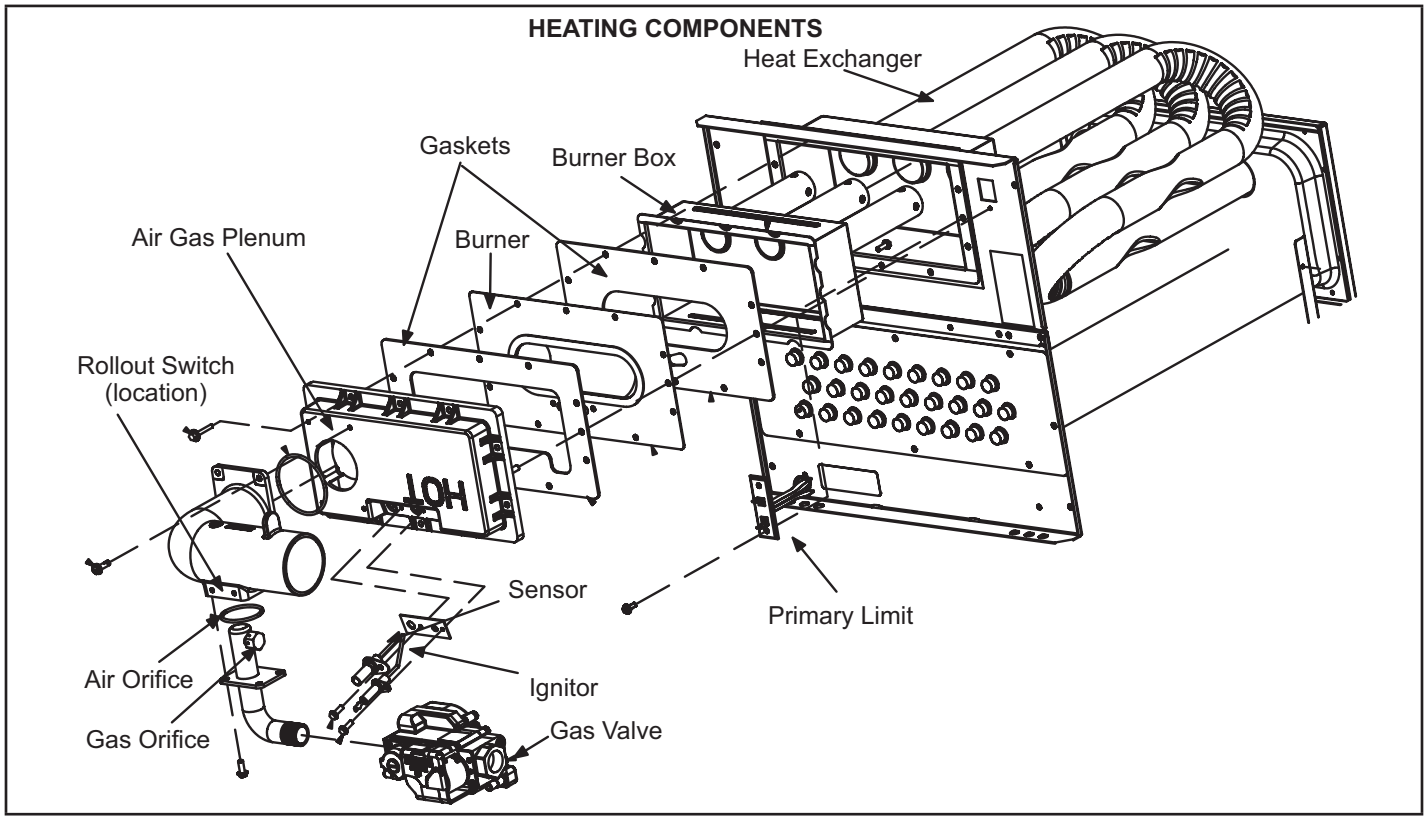


FIGURE 7

4. Gas Valve (FIGURE 8)

The EL195UHNEK uses an internally redundant valve to assure safety shut-off. If the gas valve must be replaced, the same type valve must be used.

24VAC terminals and 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.

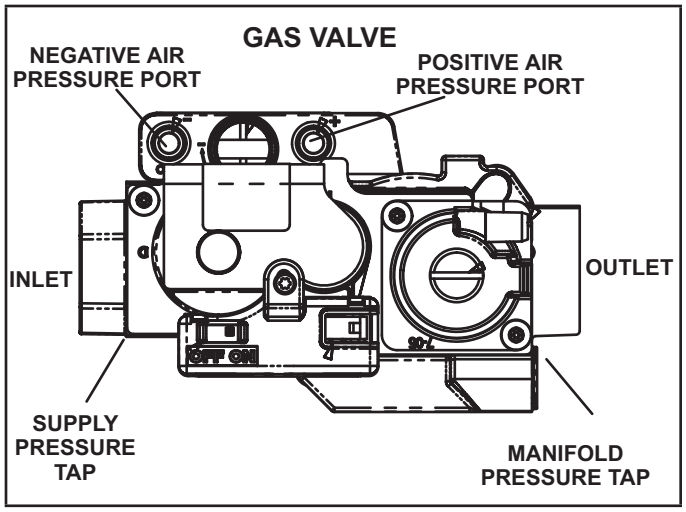


FIGURE 8

5. 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 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 TABLE 6 and the recall button found on the integrated control.

TABLE 6

Flame Signal in Microamps

Normal	Low	Drop Out
2.6 or greater	2.5 or less	1.1

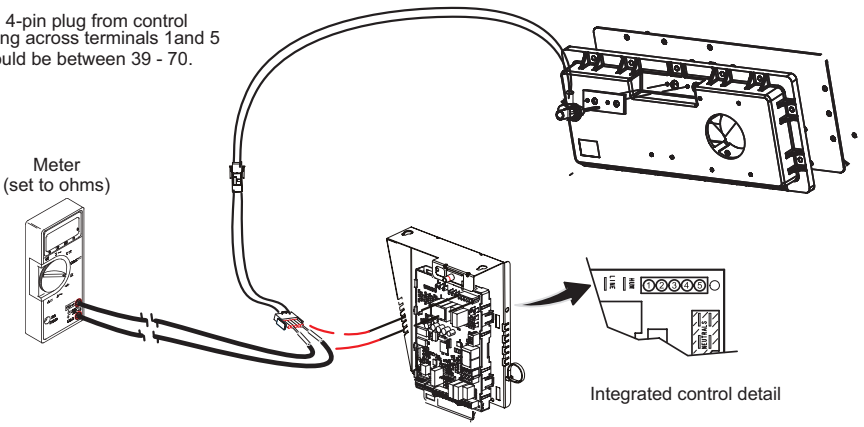
6. Ignitor

EL195UHNEK units use a nitride ignitor made from a proprietary ceramic material. To check ignitor, measure its resistance and voltage. A value of 39 to 70 ohms indicates a good ignitor. Voltage to the ignitor should be 102 - 132VAC. See FIGURE 9 for resistance and voltage checks.

Ignitor Check Out
(exploded view for clarity)

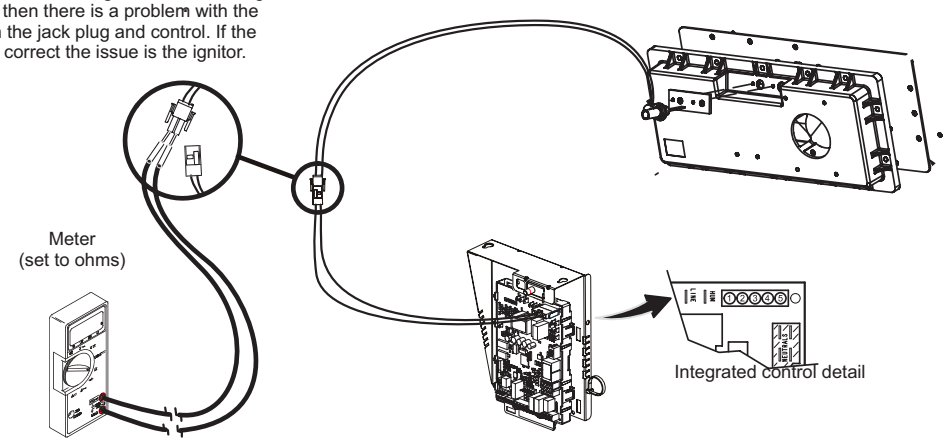
Test 1

Remove HSI/CAI 4-pin plug from control
Check ohms reading across terminals 1and 5
Ohm value should be between 39 - 70.



Test 2

Seperate the 2-pin jack plug near the manifold and check resistance of the ignitor. If the reading is correct, then 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.



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.

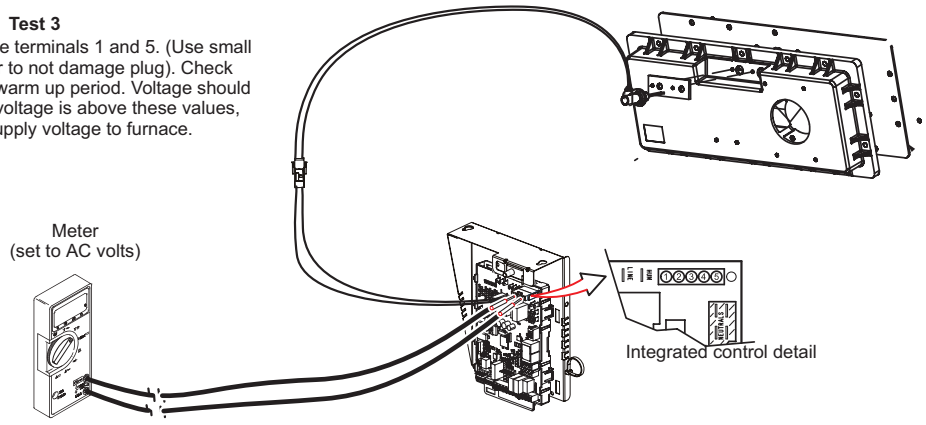


FIGURE 9

7. Combustion Air Inducer (B6) & Cold End Header Box (FIGURE 10)

All EL195UHNEK units use a combustion air inducer to move air through the burners and heat exchanger during heating operation. 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.

8. Combustion Air Prove Switch (FIGURE 10 and FIGURE 11)

EL195UHNEK 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.

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.

COMBUSTION AIR INDUCER AND PROVE SWITCH

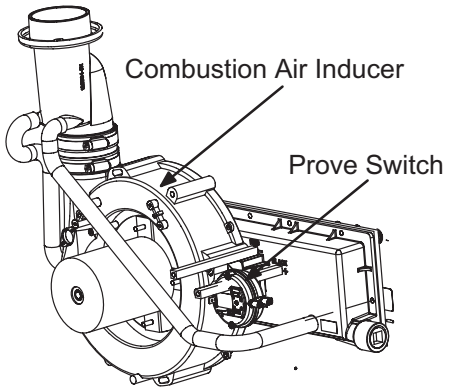


FIGURE 10

Pressure Switch

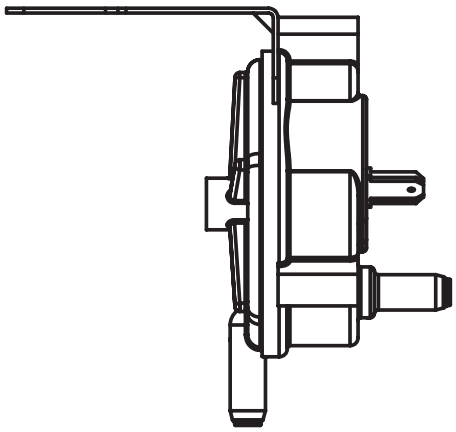


FIGURE 11

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.

TABLE 7

Unit	Setpoint
040	0.50”
060	
080	
100	

C- Blower Compartment

⚠ IMPORTANT

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

EL195UHEK 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 motor. See FIGURE 15 for troubleshooting procedure.

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

If replacing the indoor blower motor or blower wheel is necessary, placement is critical. The blower wheel must be centered in the blower housing as shown in FIGURE 12. When replacing the indoor blower motor the set screw must be aligned and tightened with the motor shaft as shown in FIGURE 13.

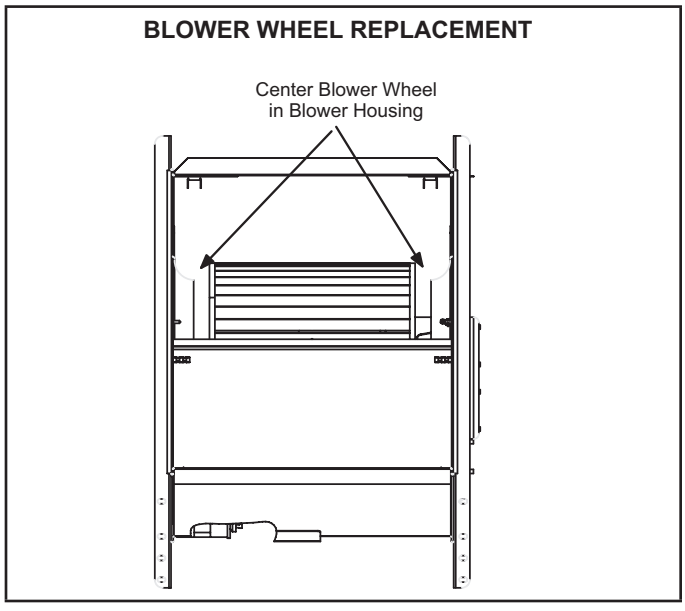


FIGURE 12

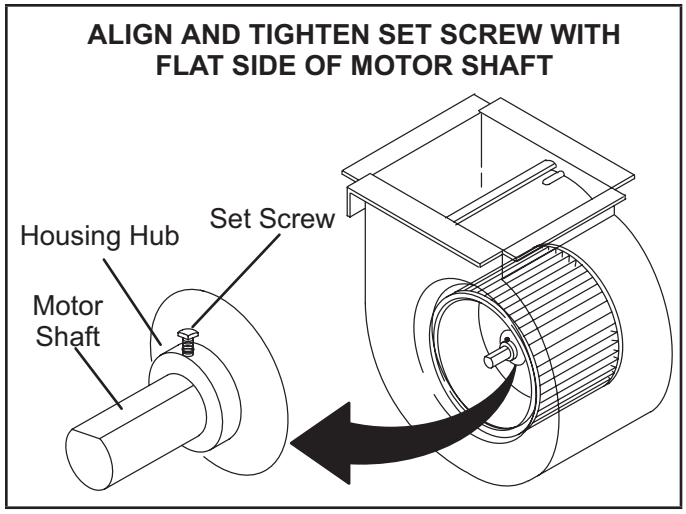


FIGURE 13

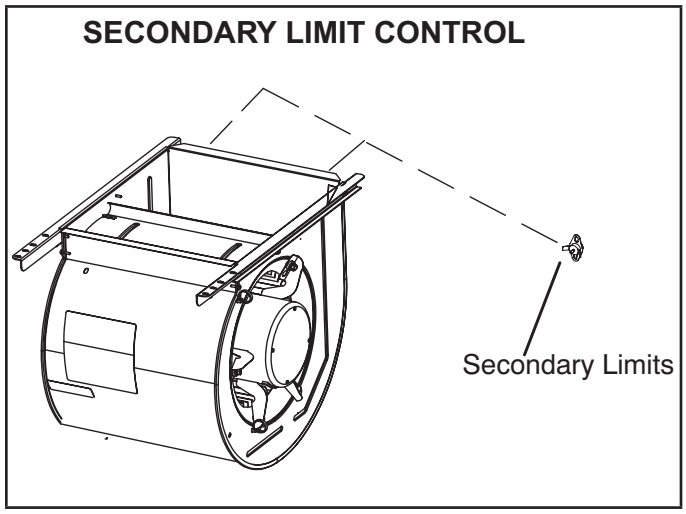
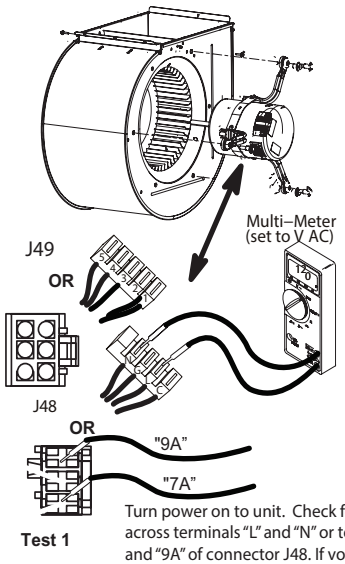
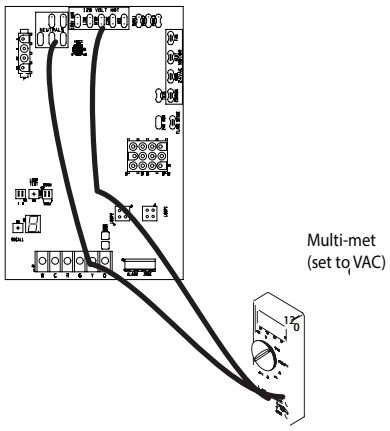


FIGURE 14



Test 1

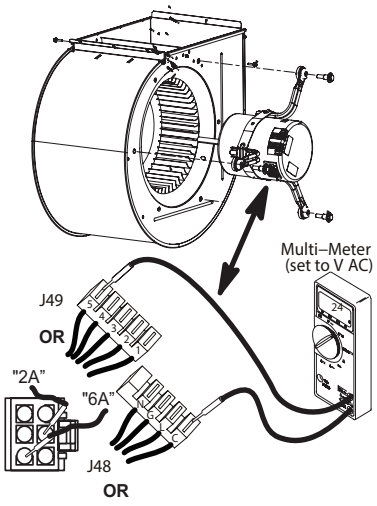
Turn power on to unit. Check for 120 volts across terminals "L" and "N" or terminals "7A" and "9A" of connector J48. If voltage is present continue to test 2. If voltage is not present problem may be upstream of J48. Proceed to test3.



Test 3 (if necessary)

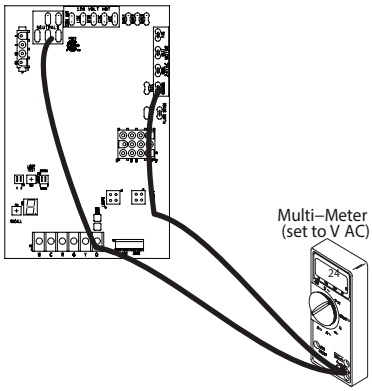
NOTE- *Ignition control illustration is typical*

Check for 120 volts across terminals "L1" and "Neutrals" on the integrated control. If voltage is present, problem is with the har ness. If voltage is not present problem may be may be with the integrated control.



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 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, prob lem is with the harness. If voltage is not present problem may be may be with the integrated control

FIGURE 15

Replacing the Motor Module

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

1 - Disconnect electrical power to unit.

2 - Remove unit access panel.

3 - Unplug the two harnesses from the motor control module. See FIGURE 16.

4 - Remove the two hex head bolts securing the motor control module to the motor See FIGURE 17.

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

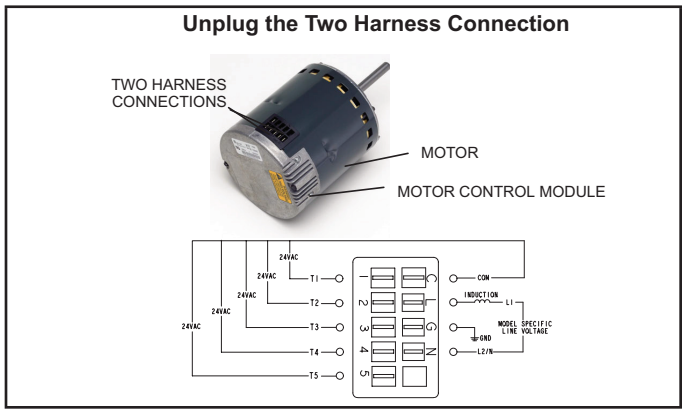


FIGURE 16

FIGURE 17

Testing the Motor (FIGURE 18)

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

The new control can fail if placed on a defective motor.

1 - Using an ohmmeter check the resistance from any one of the motor connector pins to the aluminum end plate of the motor. This resistance should be greater than 100k ohms.

2 - Check the resistances between each of the three motor connector pins. These should all read approximately the same resistance within an ohm.

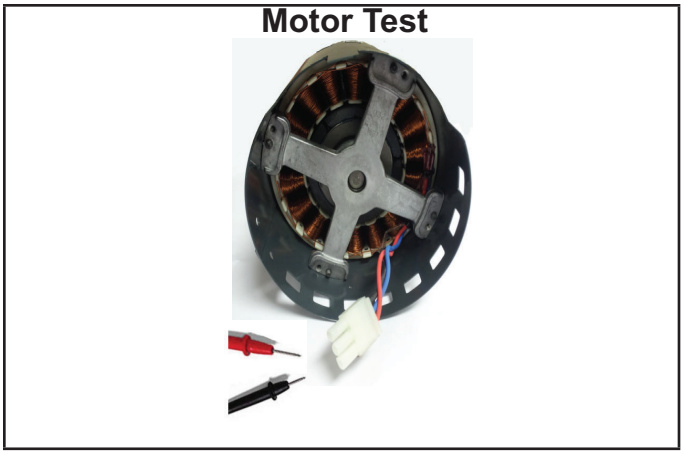


FIGURE 18

TABLE 8

Scale	Measurement range inwords	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

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.

Mount new motor control module to motor using two hex head bolts removed in FIGURE 17. Torque bolts to 22 inch pounds or 1/16th clock turn as exampled to the right.

3 - Reconnect the two harnesses to the motor control module.

4 - The electrical connectors of the motor should be facing down to form a drip loop (FIGURE 19). This will directs moisture away from the motor and its electric connections on the motor.

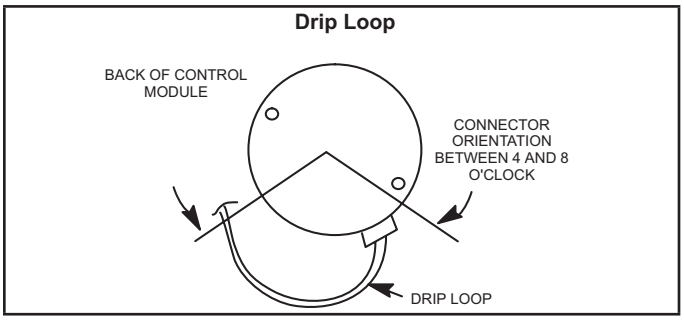


FIGURE 19

NOTE - *For any Low GWP refrigerant systems with exposed line set joints installed in the same space, each non-direct vent furnace system must have a refrigerant detection sensor installed below the level of the burners Any direct vent furnace system is not subject to this requirement.*

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.

⚠ 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

EL195UHNEK 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 22.*

TABLE 9

PIPING AND FITTINGS SPECIFICATIONS

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
PVC & ABS & NORYL Transition Solvent Cement WELD-ON 4052	
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	
PolyPro® by Duravent	
InnoFlue® by Centrotherm	
UL 1738 CERTIFIED GAS VENTING SYSTEM	
IPEX System1738 Schedule 40 PVC Pipes and Fittings	UL1738
IPEX System1738 PVC FGV Cement & Primer	

* Not approved as of 12-1-2022

TABLE 10

OUTDOOR TERMINATION USAGE*

Input Size	Vent Pipe Dia. in.	STANDARD				CONCENTRIC		
		Flush Mount Kit	Wall Kit		Field Fabricated	1-1.2 inch	2 inch	3 inch
			2 inch	3 inch				
		51W11 (US) 51W12 (CA)	22G44 (US) [4]30G28 (CA)	44J40 (US) [4]81J20 (CA)		71M80 (US) [4]44W92 (CA)	69M29 (US) [4]44W92 (CA)	60L46 (US) [4]44W93 (CA)
040	2	[3]YES	YES	[1]YES	[5]YES	[2]YES		
	3	[3]YES	YES	[1]YES	[5]YES	[2]YES		
060	2	[3]YES	YES	[1]YES	[5]YES	[2]YES		
	3	[3]YES	YES	[1]YES	[5]YES	[2]YES		
080	2	[3]YES		YES	[5]YES		YES	YES
	3	[3]YES		YES	[5]YES		YES	YES
100	2	YES		YES	[5]YES		YES	YES
	3	YES		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.

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

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

3 Flush mount kits 51W11 and 51W12 includes 1-1/2 in. outdoor exhaust accelerator, required when used with 040, 060 and 080 input models.

4 Termination kits 30G28, 44W92, 4493 and 81J20 are certified to ULC S636 for use in Canada only.

5 See TABLE 15 for vent accelerator requirements.

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

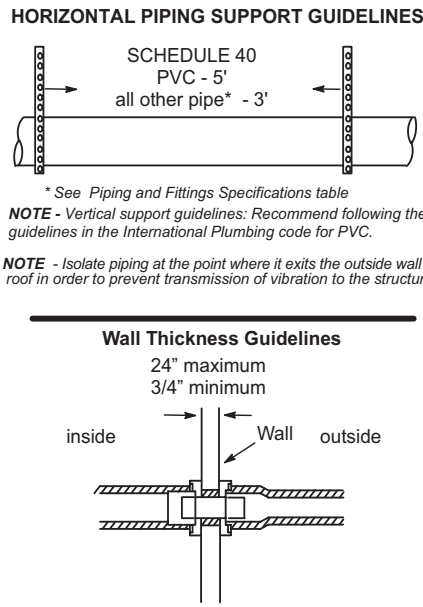


FIGURE 20

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.

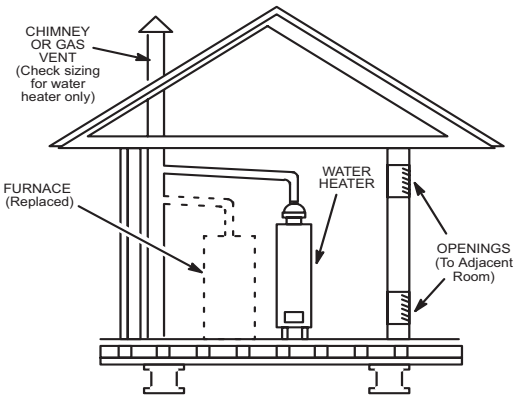


FIGURE 21

Exhaust Piping (FIGURE 22, FIGURE 25 and FIGURE 26)

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

1 - Remove the caution tag from vent adapter.

2 - Fully insert vent adapter 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 40in-lbs.

NOTE - *PVC / ABS / NORYL transition solvent cement WELD-ON 4052 (or equivalent) must be used for connecting PVC exhaust pipe to NORYL furnace exhaust coupling.*

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.

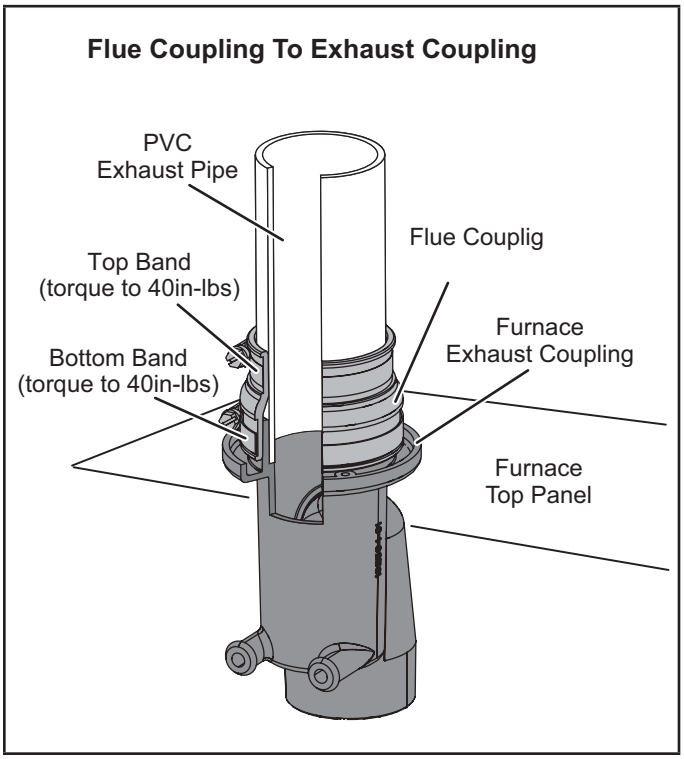


FIGURE 22

Vent Piping Guidelines

NOTE - *Lennox 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 PoyPro 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 EL195UHNEK can be installed as either a Non-Direct Vent or a Direct Vent gas central furnace.

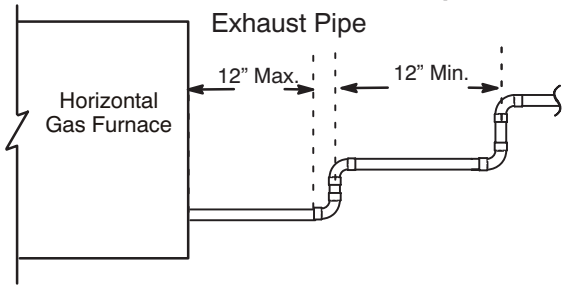
NOTE - *In Non-Direct Vent installations, combustion air is taken from indoors and flue gases are discharged outdoors. In Direct Vent installations, combustion air is taken from outdoors and flue gases are discharged outdoors.*

Intake and exhaust pipe sizing -- Size pipe according to TABLE 11 (min lengths) and TABLE 12 (max lengths). Count all elbows in side and outside the home. 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 Lennox' Application Department 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.*

Horizontal Installation Offset Requirements



NOTE - *All horizontal runs of exhaust pipe must slope back toward unit. A minimum of 1/4" (6mm) drop for each 12" (305mm) of horizontal run is mandatory for drainage.*

NOTE *- Exhaust piping should be checked carefully to make sure there are no sags or low spots.*

FIGURE 23

TABLE 11

MINIMUM VENT PIPE LENGTHS

EL195UHNEK 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. Two 45 degree elbows are equivalent to one 90 degree elbow.

Piping Size Process

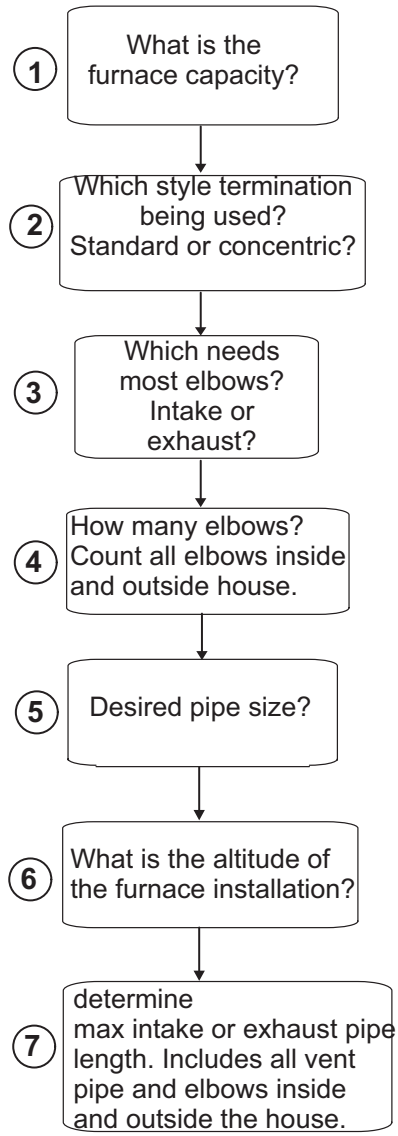


FIGURE 24

⚠ IMPORTANT

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

TABLE 12

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.

Standard Termination at Elevation 0 - 4500 ft								
Number Of 90° Elbows	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

NOTE - Additional vent pipe and elbows used to terminate the vent pipe outside the structure must be included in the total vent length calculation.

Standard Termination at Elevation 4501 - 7500 ft								
Number Of 90° Elbows	2" Pipe				3" Pipe			
	Model				Model			
	040	060	080	100	040	060	080	100
1	81	41	34	n/a	138	105	100	65
2	76	36	29		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

TABLE 12 Continued

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.

Concentric Termination at Elevation 0 - 4500 ft								
Number Of 90° Elbows	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	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

TABLE 13

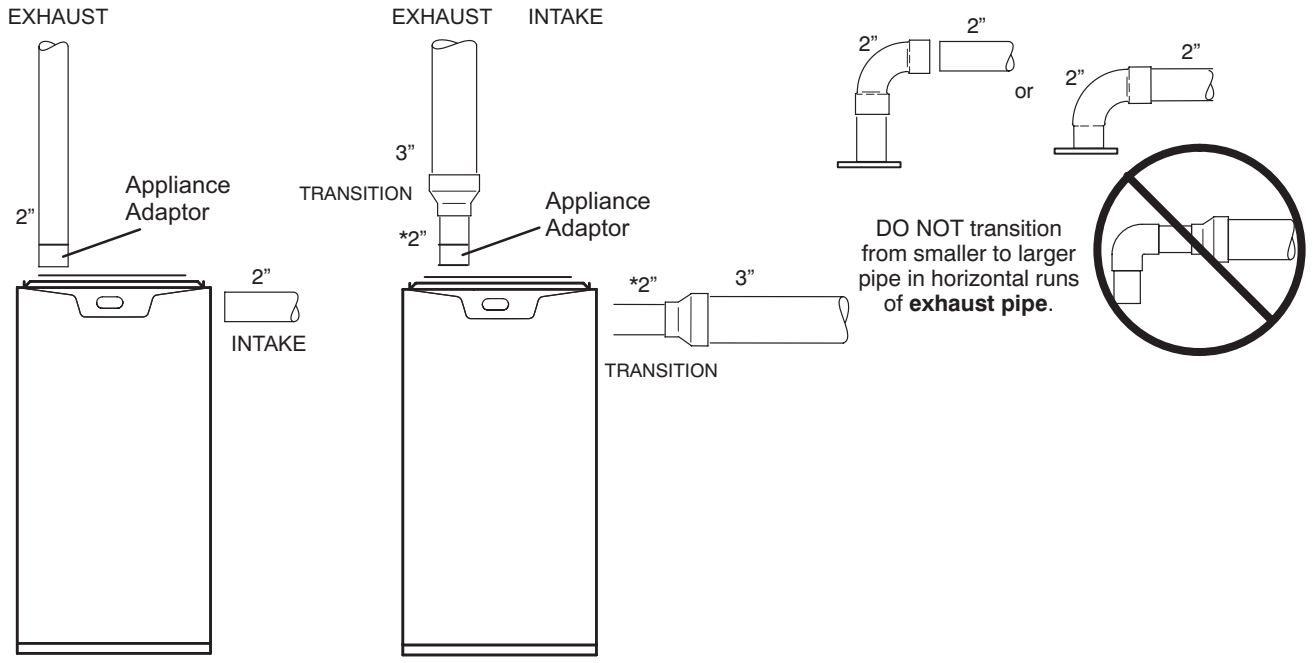
Maximum Allowable Exhaust Vent Lengths With Furnace Installed in a Closet or Basement Using Ventilated Attic or Crawl Space For Intake Air in Feet

NOTE - Additional vent pipe and elbows used to terminate the vent pipe outside the structure must be included in the total vent length calculation.

Standard Termination at Elevation 0 - 4500 ft								
Number Of 90° Elbows	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	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	

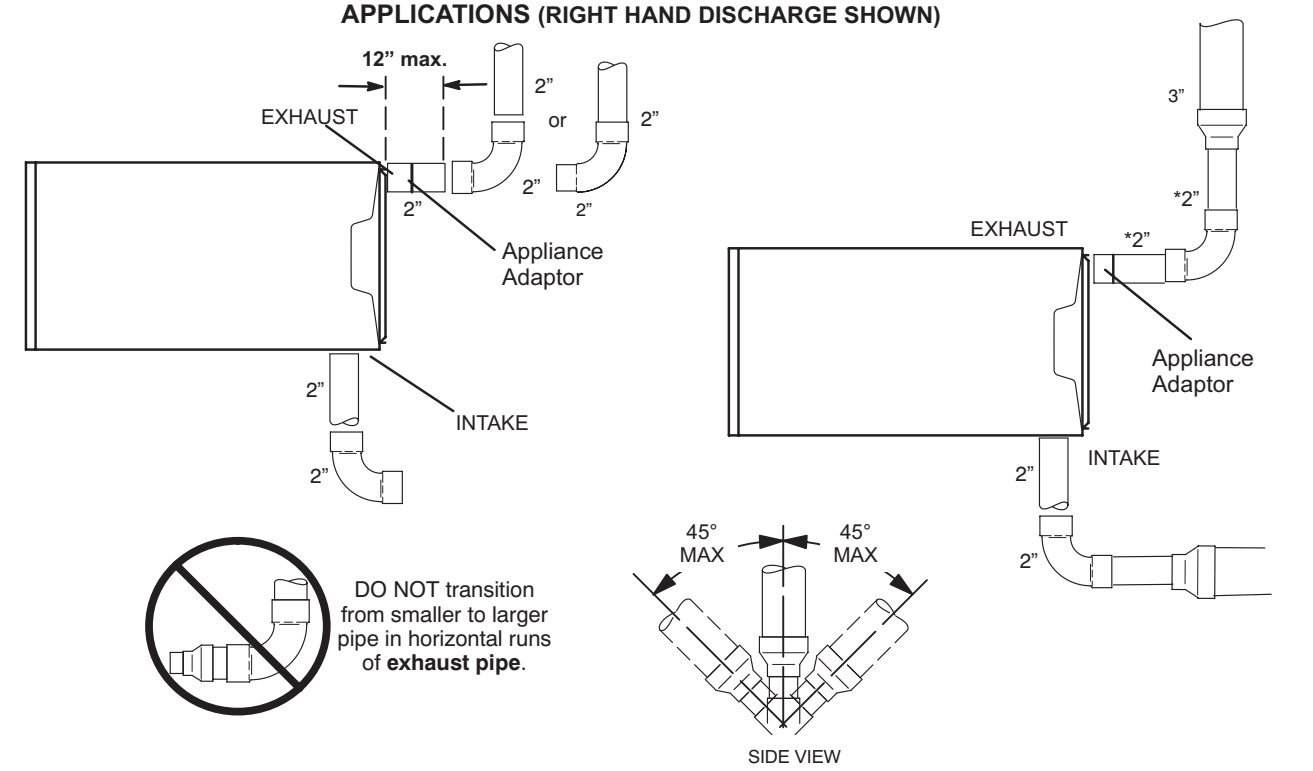
TYPICAL EXHAUST AND INTAKE PIPE CONNECTIONS IN UPFLOW DIRECT OR NON-DIRECT VENT APPLICATIONS



* When transitioning up in pipe size, use the shortest length of 2" PVC pipe possible.

FIGURE 25

TYPICAL EXHAUST AND INTAKE PIPE CONNECTIONS IN HORIZONTAL DIRECT OR NON-DIRECT VENT APPLICATIONS (RIGHT HAND DISCHARGE SHOWN)



* When transitioning up in pipe size, use the shortest length of 2" PVC pipe possible.

FIGURE 26

Intake Piping

The EL195UHNEK 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 12 for pipe sizes.

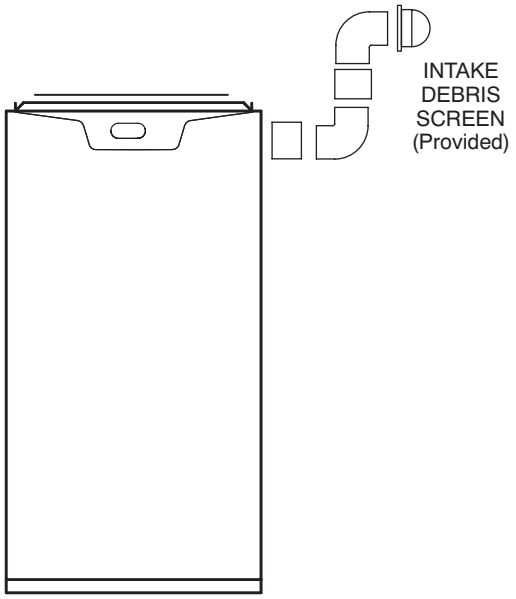
Follow the next two steps when installing the unit in Non-Direct Vent applications where combustion air is taken from indoors and flue gases are discharged outdoors.

1 - Use field-provided materials and the factory-provided air intake screen to route the intake piping as shown in FIGURE 27 or FIGURE 28. 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 29) or ventilated crawlspace (FIGURE 30) 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.

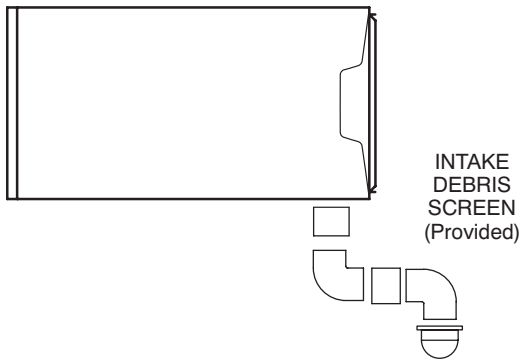
TYPICAL AIR INTAKE PIPE CONNECTIONS
UPFLOW NON–DIRECT
VENT APPLICATIONS



***NOTE** - Debris screen and elbow may be rotated, so that screen may be positioned to face forward or to either side.*

FIGURE 27

TYPICAL AIR INTAKE PIPE CONNECTIONS
HORIZONTAL NON–DIRECT VENT APPLICATIONS
(Horizontal Right–Hand Air Discharge Application Shown)



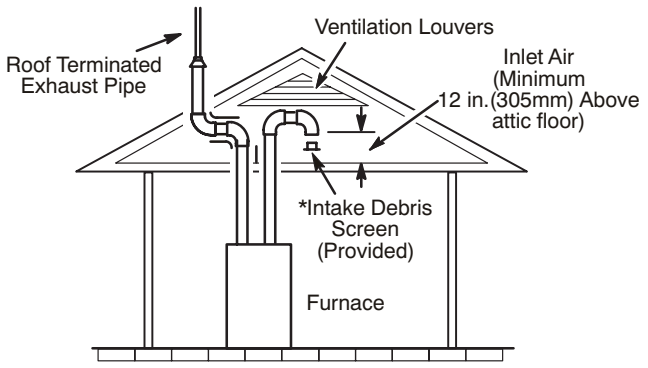
***NOTE** - Debris screen may be positioned with elbow rotated to face down or face up.*

FIGURE 28

⚠ 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.

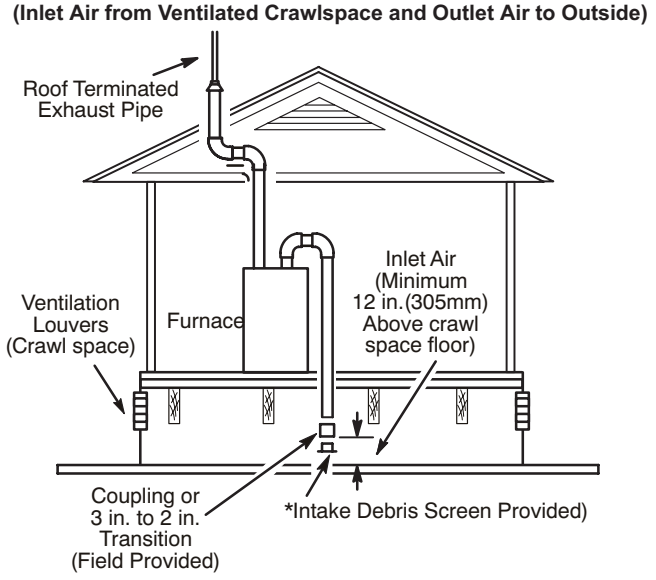
EQUIPMENT IN CONFINED SPACE
(Inlet Air from Ventilated Attic and Outlet Air to Outside)



***NOTE**-The inlet and outlet air openings shall each have a free area of at least one square inch per 4,000 Btu (645mm^2 per 1.17kW) per hour of the total input rating of all equipment in the enclosure.*

FIGURE 29

EQUIPMENT IN CONFINED SPACE
(Inlet Air from Ventilated Crawlspace and Outlet Air to Outside)



***NOTE**-The inlet and outlet air openings shall each have a free area of at least one square inch per 4,000 Btu (645mm^2 per 1.17kW) per hour of the total input rating of all equipment in the enclosure.*

FIGURE 30

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 EL195UHNEK 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 EL195UHNEK 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 32 or FIGURE 33. 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 permissable. Basements or other enlosed 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).

TABLE 14

Maximum Allowable Exhaust Vent Pipe Length (in ft.) Without Insulation In Unconditioned Space For Winter Design Temperatures Single - Stage High Efficiency Furnace

Winter Design Temp[1] °F (°C)	Vent Pipe Diam	Unit Input Size							
		040		060		080		100	
		PVC	[2]PP	PVC	[2]PP	PVC	[2]PP	PVC	[2]PP
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		8	8	19	19	26	26
0 to -20 (-18 to -29)	2 in	5		12	10	22	19	30	27
	3 in	N/A		N/A	N/A	10	10	16	16

1Refer 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 12 or TABLE 14 which ever is less.

NOTE - - If insulation is required in an unconditioned space, it must be located on the pipe closest to the furnace. See FIGURE 31.

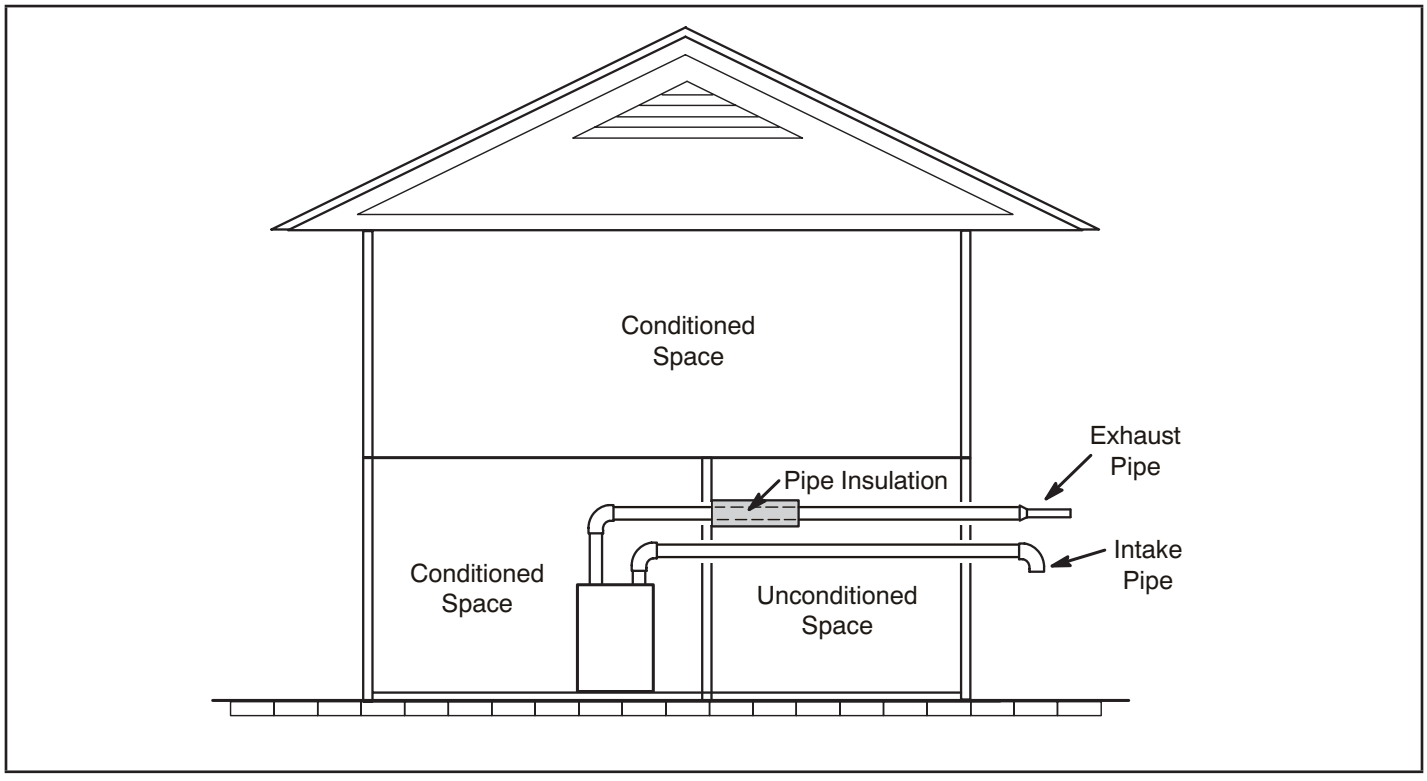
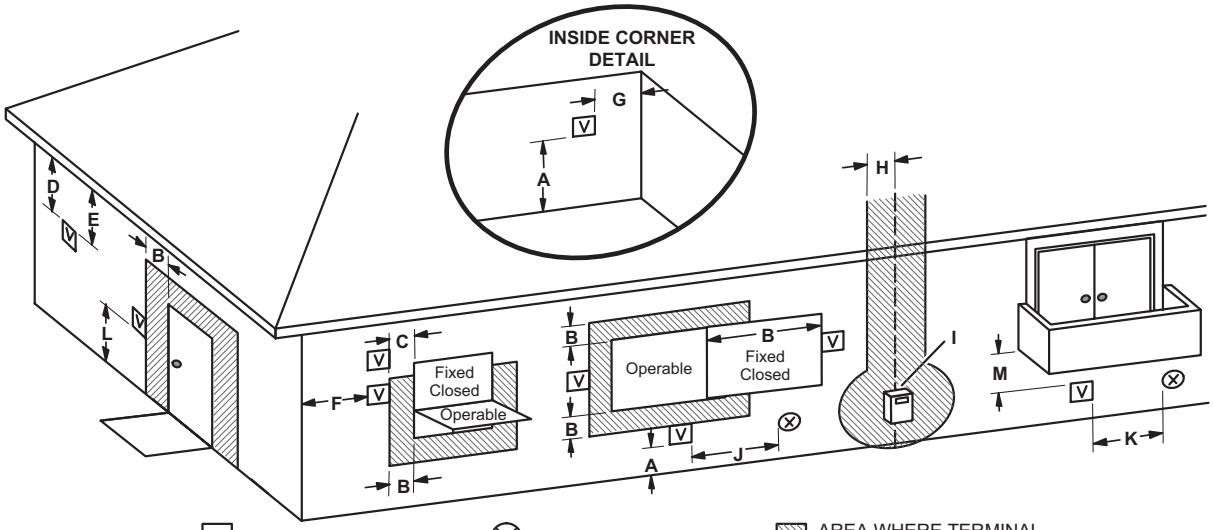


FIGURE 31

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 inches (305mm) or 12 in. (305mm) above average snow accumulation.	12 inches (305mm) or 12 in. (305mm) above average snow accumulation.
B =	Clearance to window or door that may be opened	4 feet (1.2 m) below or to side of opening; 1 foot (30cm) above opening	6 inches (152mm) for appliances <10,000 Btuh (3kw), 12 inches (305mm) for appliances > 10,000 Btuh (3kw) and <100,000 Btuh (30kw), 36 inches (.9m) for appliances > 100,000 Btuh (30kw)
C =	Clearance to permanently closed window	* 12”	* 12”
D =	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (610 mm) from the center line of the terminal	* Equal to or greater than soffit depth.	* Equal to or greater than soffit depth.
E =	Clearance to unventilated soffit	* Equal to or greater than soffit depth.	* Equal to or greater than soffit depth.
F =	Clearance to outside corner	* No minimum 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	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)	3 feet (.9m)
J =	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	4 feet (1.2 m) below or to side of opening; 1 foot (30 cm) above opening	6 inches (152mm) for appliances <10,000 Btuh (3kw), 12 inches (305mm) for appliances > 10,000 Btuh (3kw) and <100,000 Btuh (30kw), 36 inches (.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)†	7 feet (2.1m)†
M =	Clearance under veranda, porch, deck or balcony	*12 inches (305mm)‡	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.

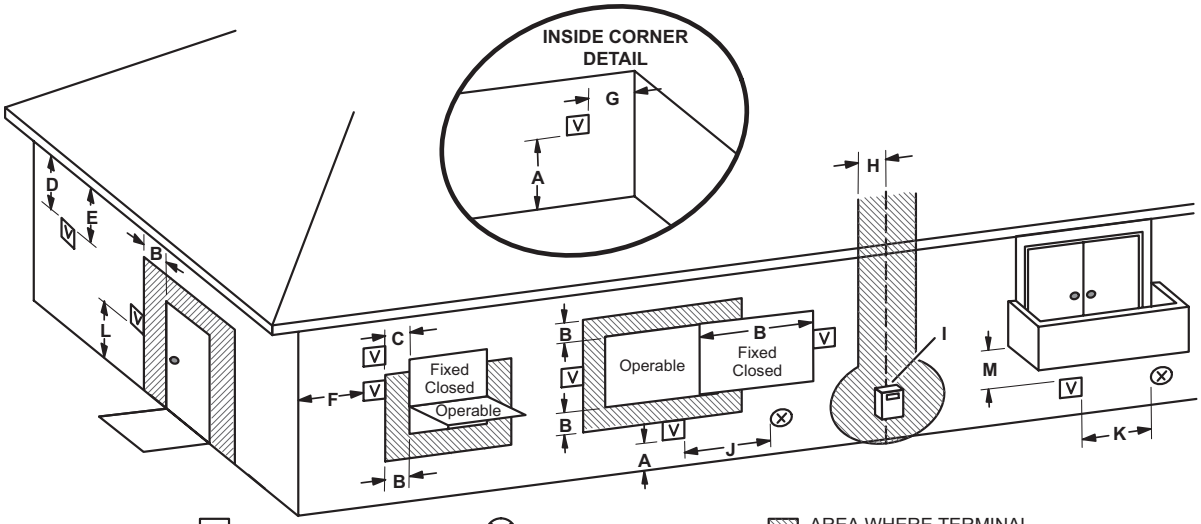
‡ Permitted only if veranda, porch, deck or balcony is fully open on a minimum of two sides beneath the floor. Lennox recommends avoiding this location if possible.

*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.”

NOTE - *This figure is intended to illustrate clearance requirement and does not serve as a substitute for locally adopted installation codes.*

FIGURE 32

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



V VENT TERMINAL ⊗ AIR SUPPLY INLET AREA WHERE TERMINAL IS NOT PERMITTED

		US Installations[1]	Canadian Installations[2]
A =	Clearance above grade, veranda, porch, deck or balcony	12 inches (305mm) or 12 in. (305mm) above average snow accumulation.	12 inches (305mm) or 12 in. (305mm) above average snow accumulation.
B =	Clearance to window or door that may be opened	6 inches (152mm) for appliances <10,000 Btuh (3kw), 9 inches (228mm) for appliances > 10,000 Btuh (3kw) and <50,000 Btuh (15 kw), 12 inches (305mm) for appliances > 50,000 Btuh (15kw)	6 inches (152mm) for appliances <10,000 Btuh (3kw), 12 inches (305mm) for appliances > 10,000 Btuh (3kw) and <100,000 Btuh (30kw), 36 inches (.9m) for appliances > 100,000 Btuh (30kw)
C =	Clearance to permanently closed window	* 12”	* 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	* Equal to or greater than soffit depth
E =	Clearance to unventilated soffit	* Equal to or greater than soffit depth	* Equal to or greater than soffit depth
F =	Clearance to outside corner	* No minimum 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	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)	3 feet (.9m)
J =	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	6 inches (152mm) for appliances <10,000 Btuh (3kw), 9 inches (228mm) for appliances > 10,000 Btuh (3kw) and <50,000 Btuh (15 kw), 12 inches (305mm) for appliances > 50,000 Btuh (15kw)	6 inches (152mm) for appliances <10,000 Btuh (3kw), 12 inches (305mm) for appliances > 10,000 Btuh (3kw) and <100,000 Btuh (30kw), 36 inches (.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)	7 feet (2.1m)†
M =	Clearance under veranda, porch, deck or balcony	*12 inches (305mm)‡	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. Lennox recommends avoiding this location 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.”

NOTE - *This figure is intended to illustrate clearance requirements and does not serve as a substitute for locally adopted installation codes.*

FIGURE 33

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 42.*

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 34 through FIGURE 42 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 35). You may exit the exhaust out the roof and the intake out the side of the structure (FIGURE 36).

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 34).

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.

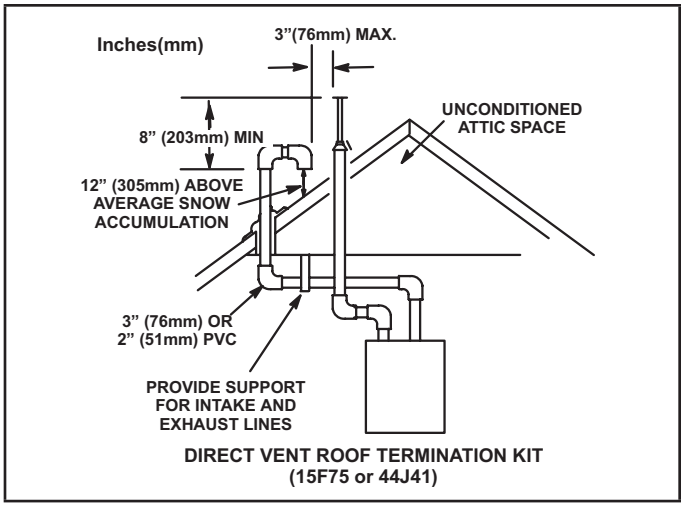


FIGURE 34

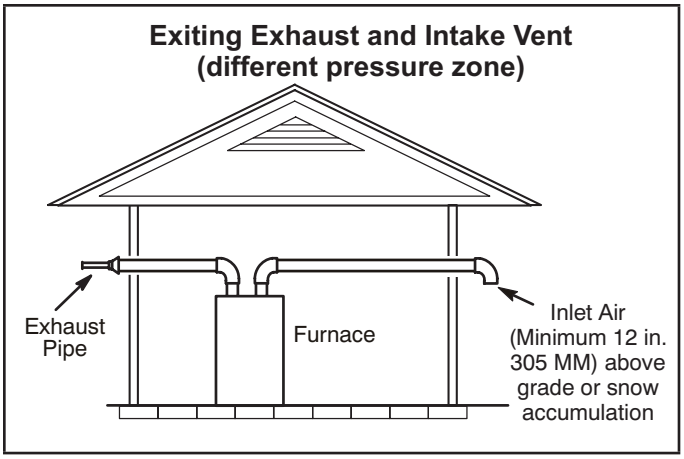


FIGURE 35

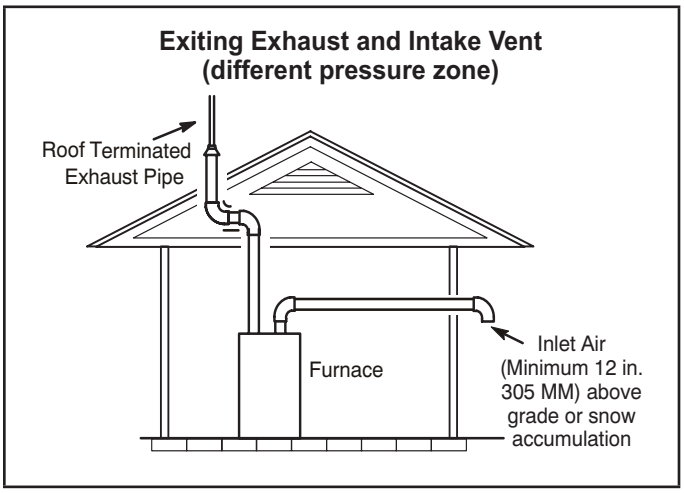


FIGURE 36

TABLE 15

EXHAUST PIPE TERMINATION SIZE REDUCTION

EL195UHNEK Model	Termination Pipe Size
*040, *060	1-1/2” (38mm)
*080	2” (51mm)
100	

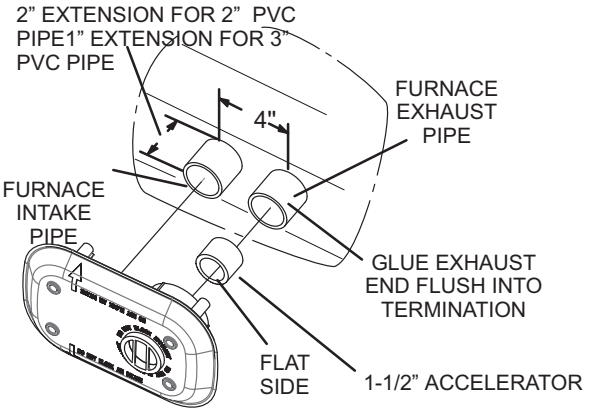
*Use the provided 1-1/2” accelerator if matched with the flushmount termination.

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 42.

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 42.

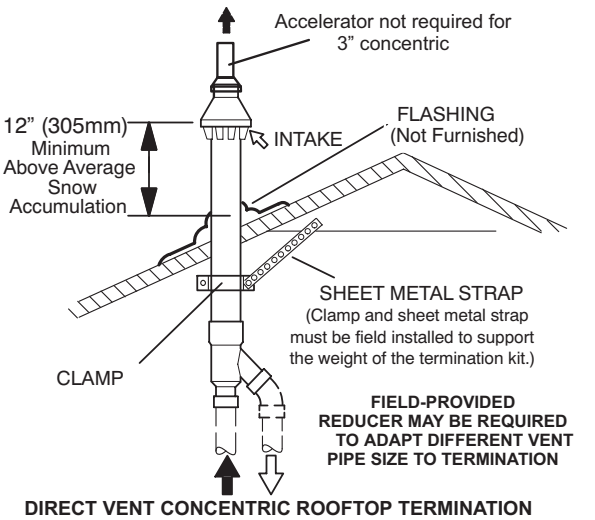
7 - If intake and exhaust piping must be run up a side wall to position above snow accumulation or other obstructions, piping must be supported. At least one bracket must be used within 6” from the top of the elbow and then every 24” (610mm) as shown in FIGURE 42, to prevent any movement in any direction. When exhaust and intake piping must be run up an outsidewall, 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 40.



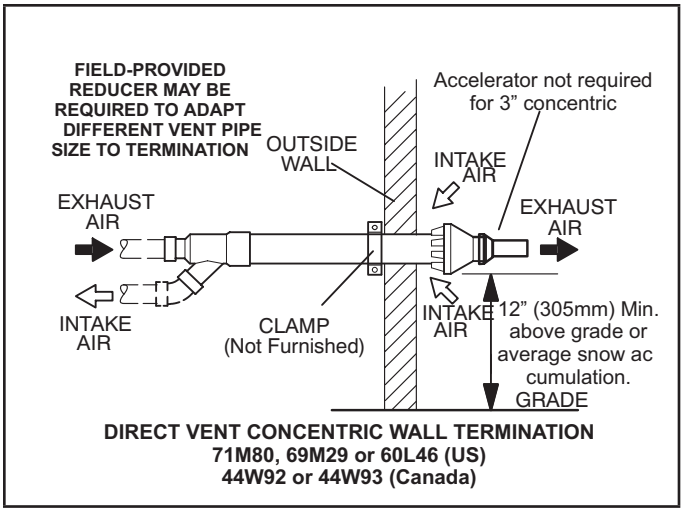
FLUSH-MOUNT SIDE WALL TERMINATION KIT
51W11 (US) or 51W12 (Canada)

FIGURE 37



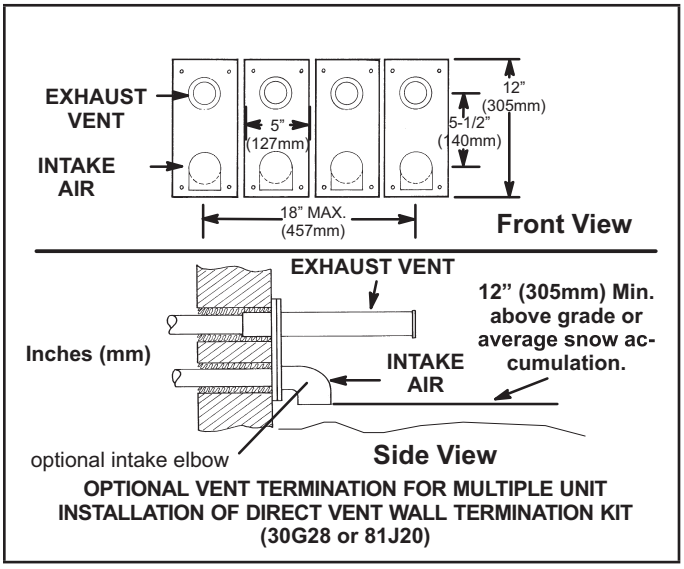
DIRECT VENT CONCENTRIC ROOFTOP TERMINATION
71M80, 69M29 or 60L46 (US)
44W92 or 44W93 (Canada)

FIGURE 38



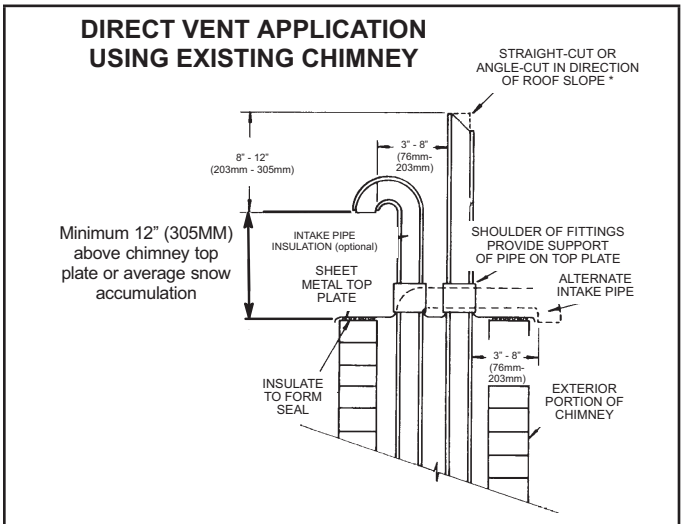
DIRECT VENT CONCENTRIC WALL TERMINATION
71M80, 69M29 or 60L46 (US)
44W92 or 44W93 (Canada)

FIGURE 39



OPTIONAL VENT TERMINATION FOR MULTIPLE UNIT INSTALLATION OF DIRECT VENT WALL TERMINATION KIT
(30G28 or 81J20)

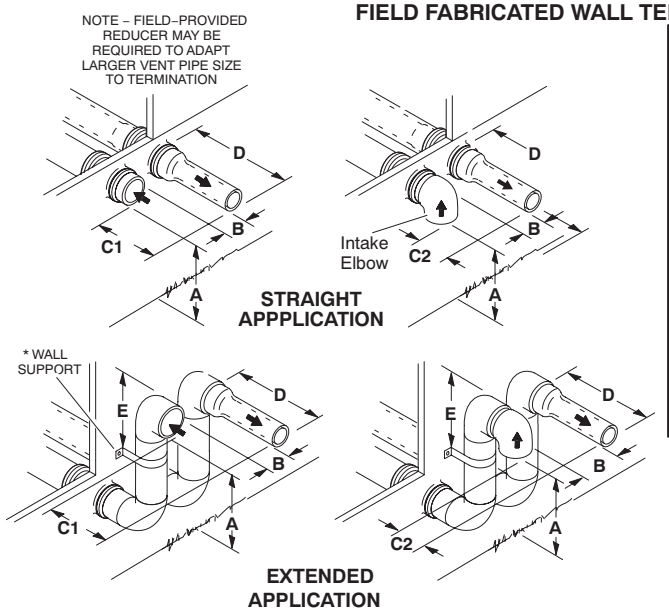
FIGURE 40



NOTE - Do not discharge exhaust gases directly into any chimney or vent stack. If vertical discharge through an existing unused chimney or stack is required, insert piping inside chimney until the pipe open end is above top of chimney and terminate as illustrated. In any exterior portion of chimney, the exhaust vent must be insulated.

FIGURE 41

FIELD FABRICATED WALL TERMINATION



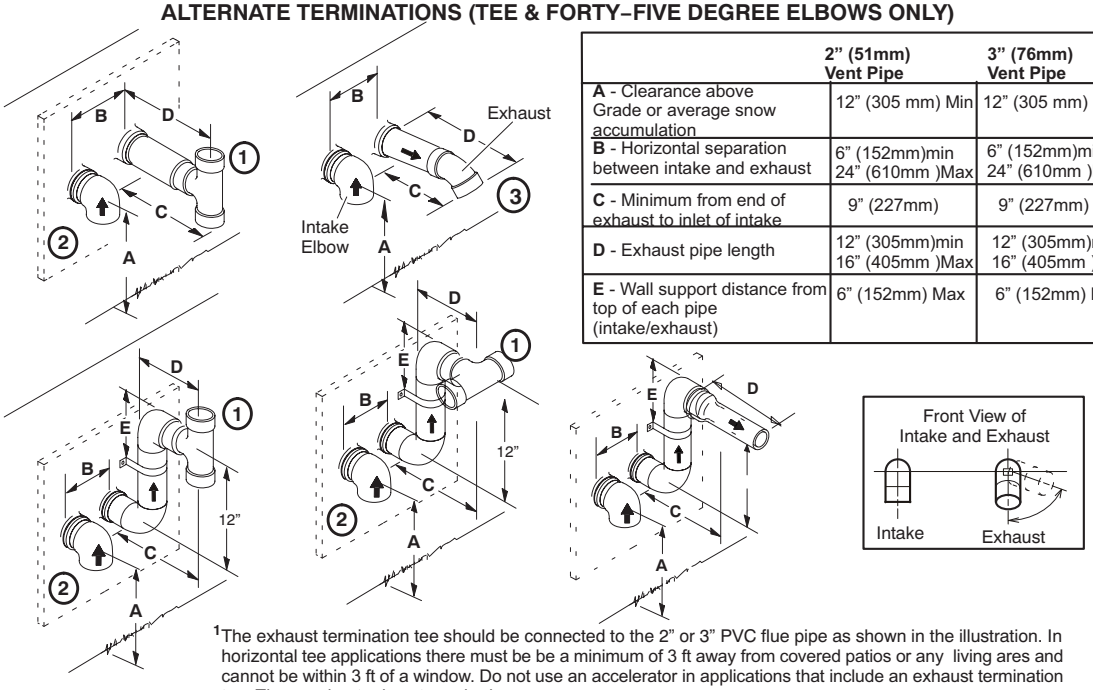
	2" (51mm) Vent Pipe	3" (76mm) Vent Pipe
A– Minimum clearance above grade or average snow accumulation	12" (305 mm)	12" (305 mm)
B– Maximum horizontal separation between intake and exhaust	6" (152 mm)	6" (152 mm)
C1 -Minimum from end of exhaust to inlet of intake	8" (203 mm)	8" (203 mm)
C2 -Minimum from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

See maximum allowable venting tables for venting lengths with this arrangement.

* 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" (305 mm) Min	12" (305 mm) Min
B - Horizontal separation between intake and exhaust	6" (152mm)min 24" (610mm)Max	6" (152mm)min 24" (610mm)Max
C - Minimum from end of exhaust to inlet of intake	9" (227mm)	9" (227mm)
D - Exhaust pipe length	12" (305mm)min 16" (405mm)Max	12" (305mm)min 16" (405mm)Max
E - Wall support distance from top of each pipe (intake/exhaust)	6" (152mm) Max	6" (152mm) Max

[1] The exhaust termination tee should be connected to the 2" or 3" PVC flue pipe as shown in the illustration. In horizontal tee applications there must be be a minimum of 3 ft away from covered patios or any living ares and cannot be within 3 ft of a window. 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 42

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 43 and FIGURE 44 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.

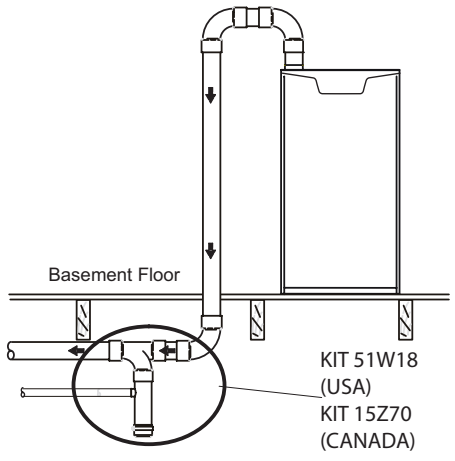
3 - If exhaust piping must be run up a side wall to position above snow accumulation or other obstructions, piping must be supported every 24 inches (610mm). When exhaust piping must be run up an outside wall, any reduction in exhaust pipe size must be done after the final elbow.

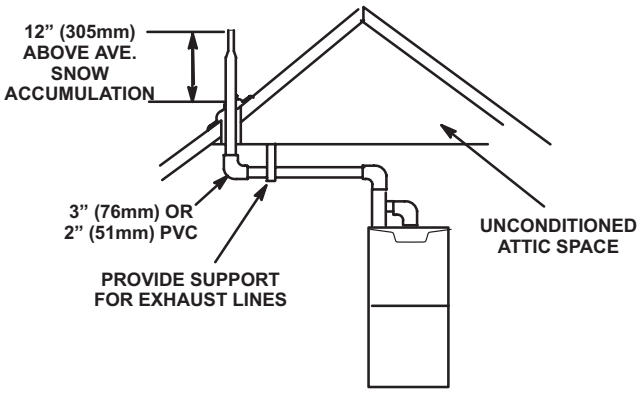
4 - Distance between exhaust pipe terminations on multiple furnaces must meet local codes.

Crawl Space and Extended Horizontal Venting

Lennox provides kit 51W18 (USA) kit 15Z70 (Canada) to install 2” or 3” PVC exhaust piping through the floor joists and into the crawl space. See figure below. This kit can also be used as a supplemental drain for installations with condensate run back in the vent pipe (ie. long horizontal runs, unconditioned spaces, etc.)

Venting In A Crawl Space

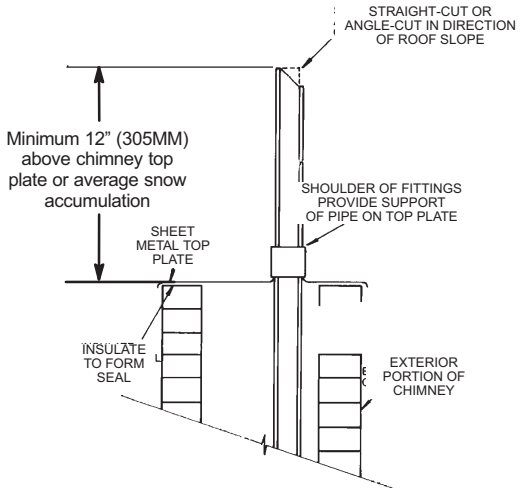




NON-DIRECT VENT ROOF TERMINATION KIT (15F75 or 44J41)

FIGURE 43

NON-DIRECT VENT APPLICATION USING EXISTING CHIMNEY



NOTE - Do not discharge exhaust gases directly into any chimney or vent stack. If vertical discharge through an existing unused chimney or stack is required, insert piping inside chimney until the pipe open end is above top of chimney and terminate as illustrated. In any exterior portion of chimney, the exhaust vent must be insulated.

FIGURE 44

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 45 and FIGURE 47 for condensate trap locations. FIGURE 53 (3/4” drain connection) shows a trap assembly using 1/2” PVC or 3/4” PVC.

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.

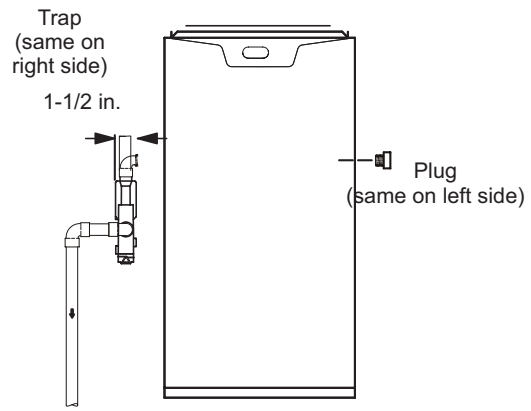
2 - For furnaces with a 1/2” drain connection use a 3/8 allen wrench and remove plug (FIGURE 45) from the cold end header box at the appropriate location on the side of the unit. Install field-provided 1/2 NPT

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 53.

4 - Install drain trap using appropriate PVC fittings, glue all joints. Glue the provided drain trap as shown in FIGURE 53. Route the condensate line to an open drain. Condensate line must maintain a 1/4" downward slope from the furnace to the drain.



NOTE - In upflow applications where side return air filter is installed on same side as the condensate trap, filter rack must be installed beyond condensate trap or trap must be re-located to avoid interference.

FIGURE 45

5 - FIGURE 48 and FIGURE 50 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 51 and FIGURE 52. *Upflow furnace (FIGURE 51)* - 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 52)* - 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 46.*

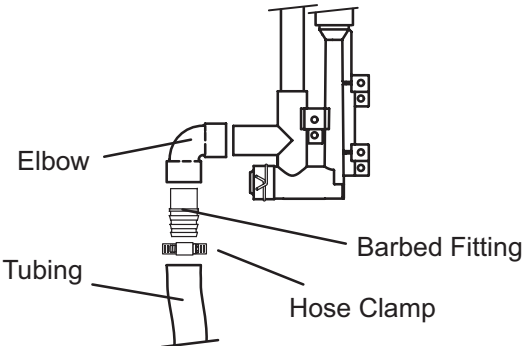


FIGURE 46

⚠ IMPORTANT

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. Heating cable kit is available from Lennox in various lengths; 6 ft. (1.8m) - kit no. 26K68 and 24 ft. (7.3m) - kit no. 26K69.

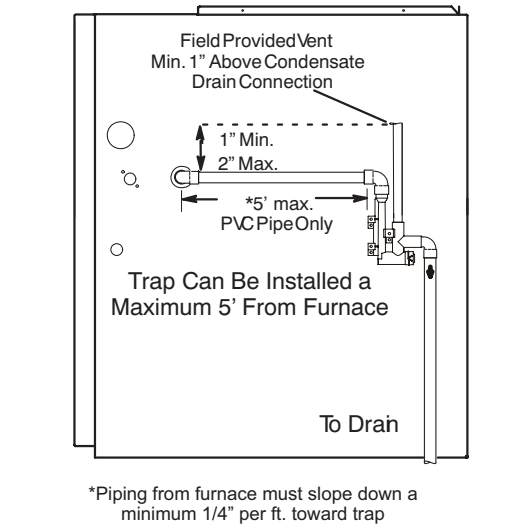


FIGURE 47

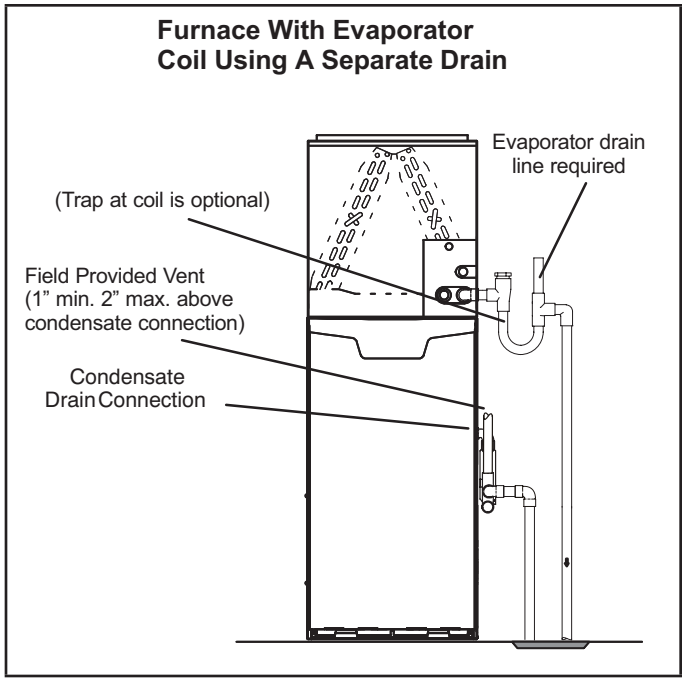


FIGURE 48

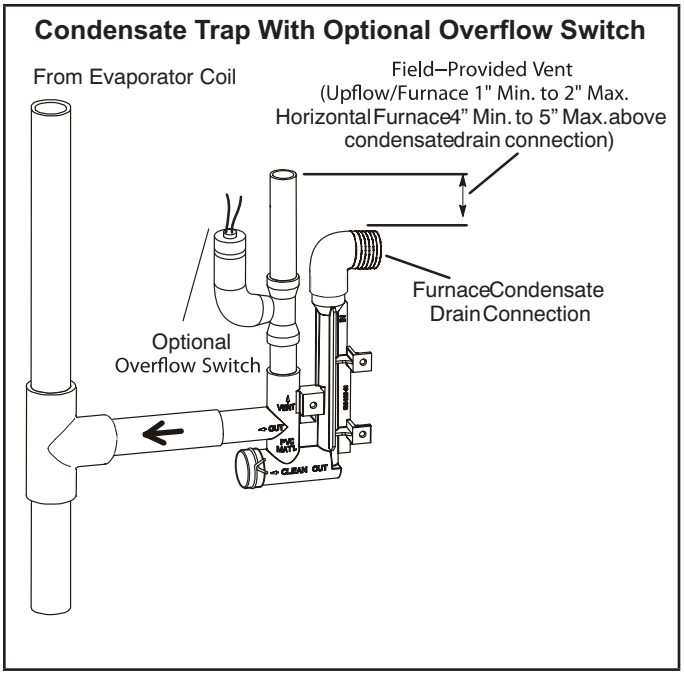


FIGURE 49

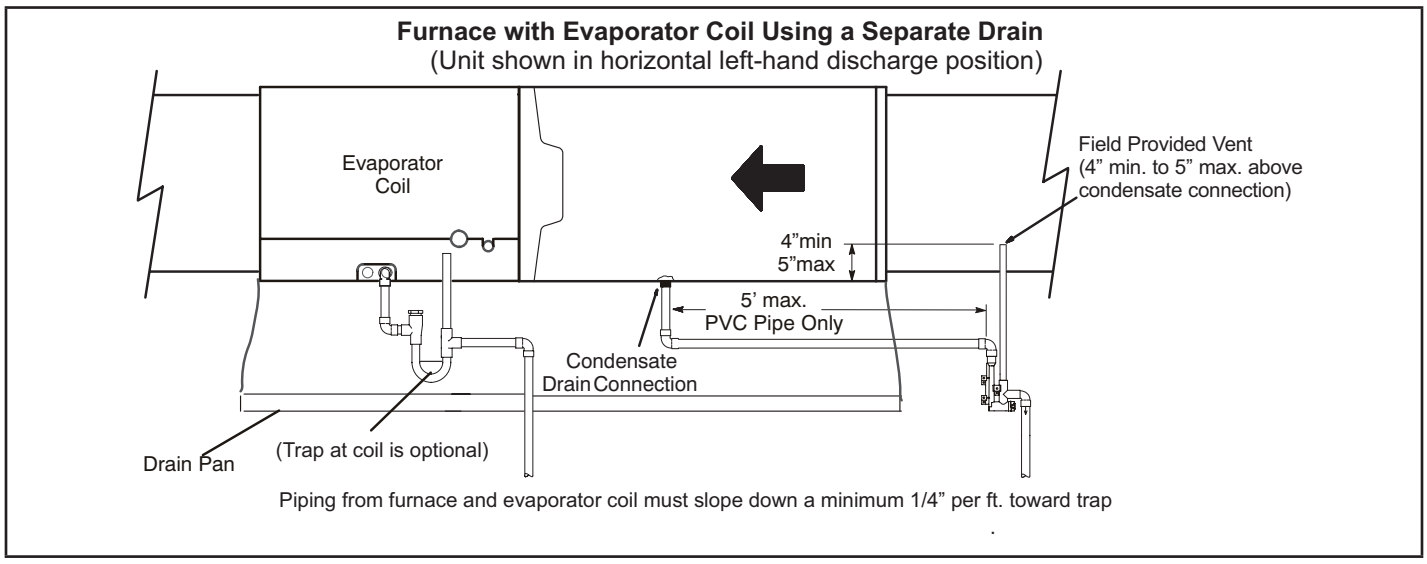


FIGURE 50

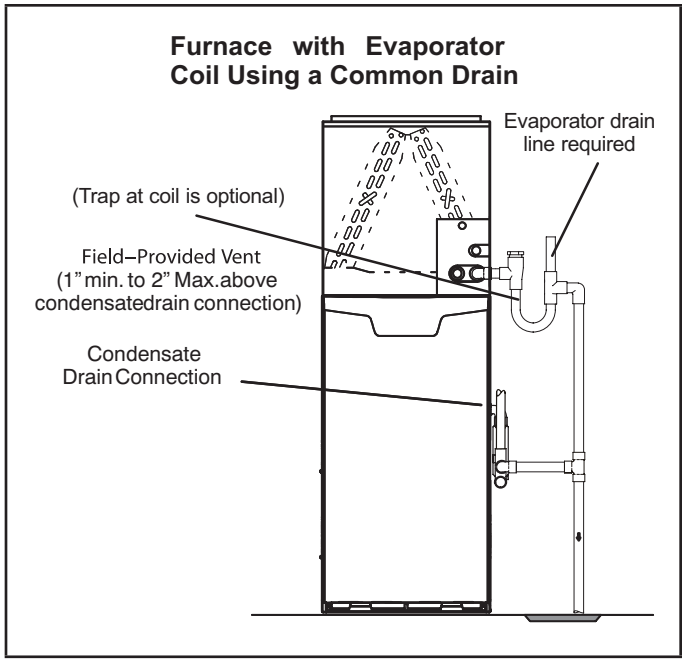


FIGURE 51

⚠ 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.

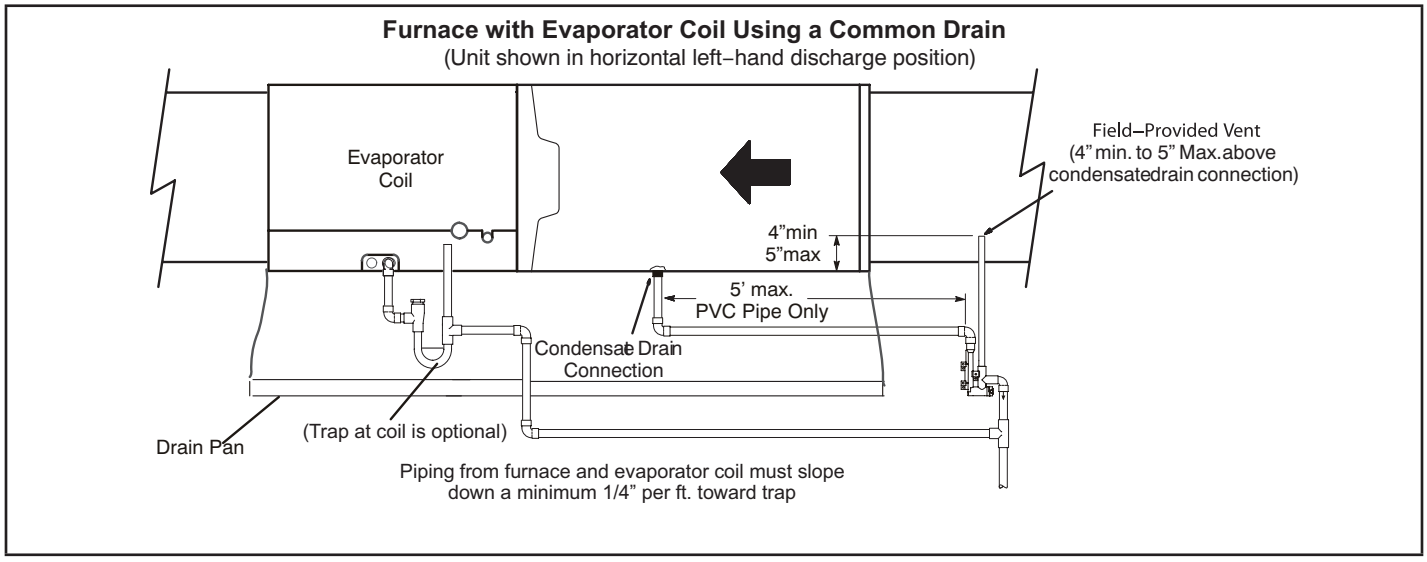


FIGURE 52

TRAP / DRAIN ASSEMBLY USING 1/2" PVC OR 3/4" PVC

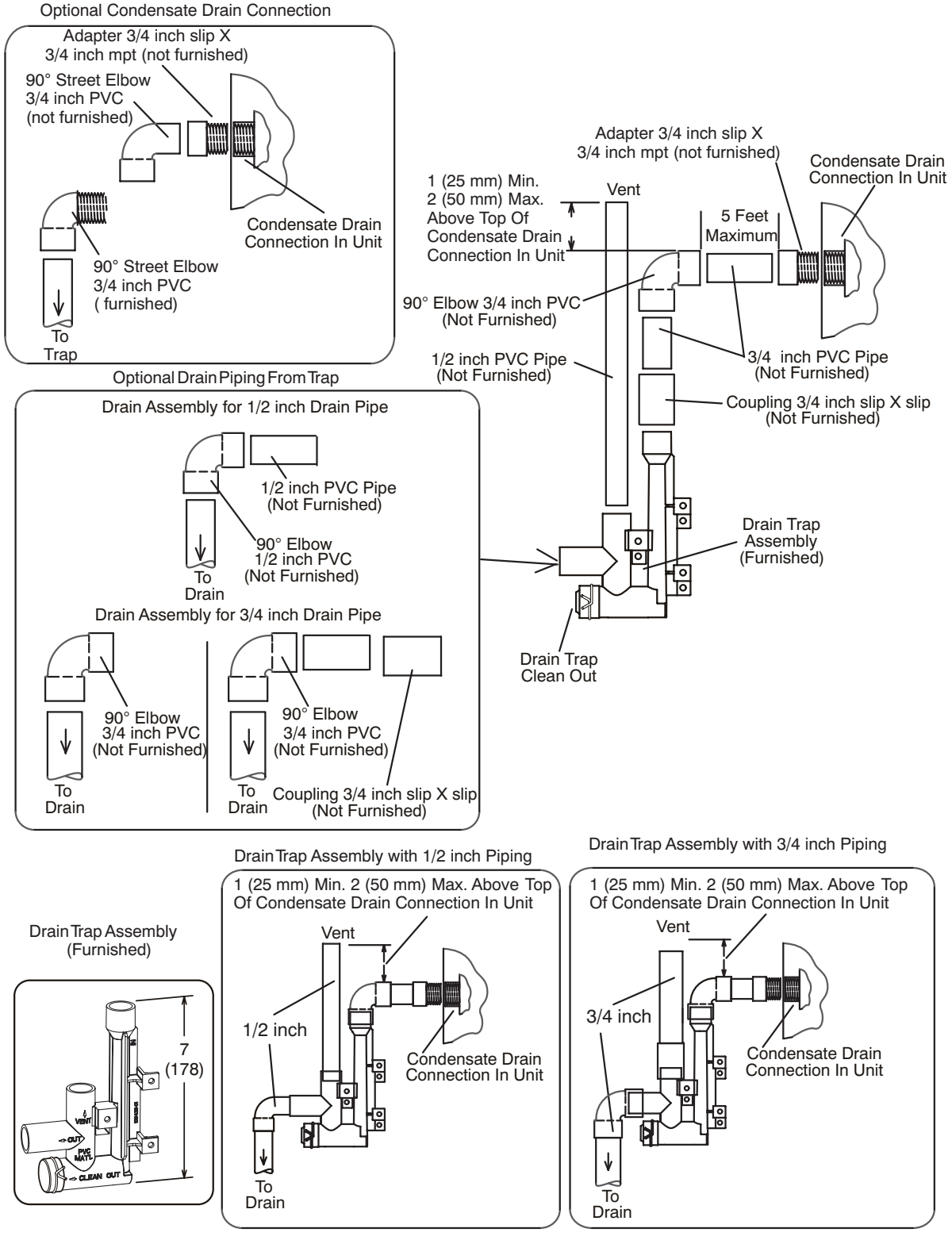


FIGURE 53

III-START-UP

A-Preliminary and Seasonal Checks

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

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

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

B-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 EL195UHNEK 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:

EL195UHNEK 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 (FIGURE 54)

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 54.

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 54.

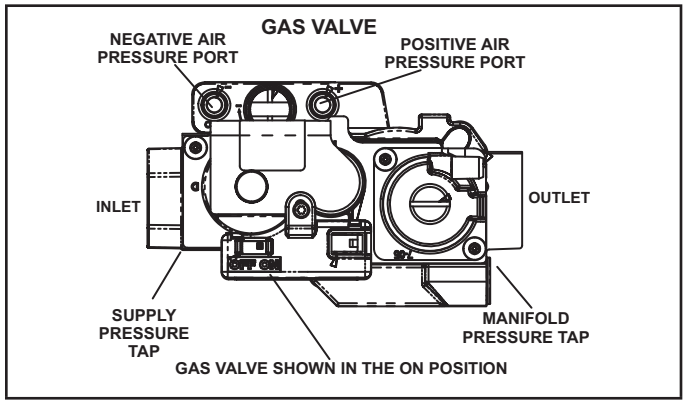


FIGURE 54

9 - Replace the access panel.

10 - Turn on all electrical power to to the unit.

11 - Set the thermostat to desired setting.

NOTE - *When unit is initially started, steps 1 through 11 may need to be repeated to purge air from gas line.*

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.

IV-HEATING SYSTEM SERVICE CHECKS

A-C.S.A. Certification

All units are C.S.A. design certified without modifications. Refer to the EL195UHNEK Operation and Installation Instruction Manual Information.

B-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.

C-Testing Gas Piping

⚠ IMPORTANT

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

When pressure testing gas lines, the gas valve must be disconnected and isolated. Gas valves can be damaged if subjected to more than 0.5 psig (14" W.C.). See FIGURE 55.

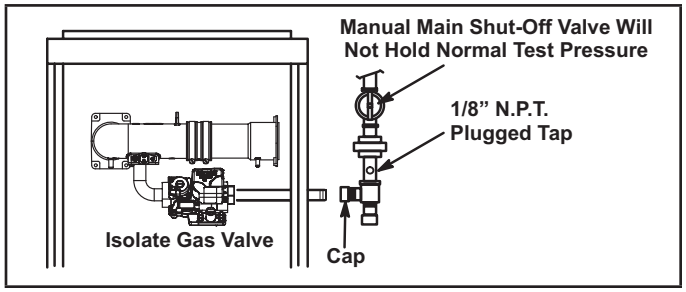


FIGURE 55

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. It is available through Lennox under part number 31B2001. See Corp. 8411-L10, for further details.

⚠ WARNING

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

D-Gas Supply, Manifold and Signal Pressure

Gas Flow (Approximate)

TABLE 16

GAS METER CLOCKING CHART				
EL195E Model	Seconds For One Revolution			
	Natural		LP/Propanae	
	1 cu ft Dial	2 cu ft Dial	1 cu ft Dial	2 cu ft Dial
-040	90	180	n/a	n/a
-060	60	120	150	300
-080	45	90	112	224
-100	36	72	n/a	n/a
Natural-1000 btu/cu ft / Propane 2500 btu/cu ft				

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 18 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.

TABLE 17

Supply Line

Unit	Fuel	Supply Line WC"	Propane Kit 0-7500ft (0-1372m)
All	Nat	4.5 - 10.5	
-040	LP/Propane	N/A	N/A
-060		11.0 - 13.0	19K05
-080		11.0 - 13.0	19K06
-110		N/A	N/A

NOTE - A natural to L.P. propane gas changeover kit is necessary to convert this unit. Refer to the changeover kit installation instruction for the conversion procedure and manifold pressure measure procedure.

E- High Altitude

Units may be installed at altitudes up to 7,500 ft. above sea level. See TABLE 18 for de-rate manifold values.

Manifold and Signal Pressure Measurement

To correctly measure manifold and signal pressure, follow the steps below:

1 - Turn off the electrical power and gas supply to the furnace.

2 - Remove the threaded plug from the outlet side of the gas valve and install a field-provided barbed fitting. Connect measuring device positive "+" to barbed fitting to measure manifold pressure. See FIGURE 54 for manifold location.

3 - Install hoses and meter as shown in FIGURE 58 for signal pressure measurement.

4 - After allowing unit to stabilize for 8 minutes, record manifold pressure and compare to value in TABLE 18. If manifold pressure is within range, rate check is complete move to step 6. If manifold pressure is not within range continue. Valve is not adjustable. Do not adjust manifold pressure.

5 - Record signal pressure and compare to value in table 18. If signal pressure is within range continue. If the signal is not within range go to "Troubleshooting".

6 - Shut off unit and remove manometer and signal meter after accurate readings has been obtained.

7 - Restart unit and check for gas leaks. Seal any leaks found.

If the unit has difficulty igniting or ignites with loud resonance the air orifice must be checked and replaced if necessary.

TABLE 18

Manifold and Signal Pressure (inches w.c.)

Altitude	Unit	Natural Manifold	Propane Manifold	Signal
0 - 4500 ft	-040	3.2 - 3.8	n/a	0.80-0.93
	-060		3.6	0.69-0.93
	-080			0.73-0.93
	-100		n/a	0.75-0.82
4501 - 7500 ft	-040	3.2	n/a	0.78-0.82
	-060	2.3	2.5	0.55-0.62
	-080	2.4	2.8	0.58-0.62
	-100	2.3	n/a	0.55-0.60

Air Orifice Replacement

Do not replace the air orifice until the problem has been determined. If the unit has difficulty igniting the orifice is oversized and brings in too much air. If the unit ignites but with loud resonance the orifice is too small and needs more air. The air orifice is located inside the gray coupling between the clamps. FIGURE 57 show corresponding steps with the steps below.

1 - Turn off the electrical power and gas supply to the furnace.

2 - Remove the black air pressure tube on the air intake coupling.

3 - Use a 5/16" nut driver to loosen the clamps on the gray coupling.

4 - Remove the two screws attaching the air intake coupling to the furnace cabinet.

5 - Remove the air intake coupling. If the air intake coupling is still too difficult to remove, then remove the two screws from the right side of the top cap and one from the far right side of the blower deck that attaches to the cabinet. See FIGURE 56. Carefully pull cabinet side away from air intake coupling, then remove the air intake coupling. Note: Be careful not to bend the cabinet side.

6 - Remove the air orifice. Check the "Part" number stamped on the air orifice. See TABLE 19. If the part number is incorrect, then replace it with the proper air orifice. Repeat manifold check. If air orifice is correct diameter, then it must be replaced to resolve ignition or resonance issue. See TABLE 19 for replacement.

7 - Reinstall the air orifice on the left side of the coupling and push firmly into place.

8 - Reinstall air intake coupling making sure it is fully seated in the gray coupling. Re-install the two screws attaching the air intake coupling to the furnace cabinet. Tighten clamps to secure the coupling. Re-install the two screws on the right side of the top cap and the one screw that attaches the blower deck to the cabinet.

9 - Reconnect the black air pressure tube.

10 - Repeat manifold and signal pressure check. If unit ignites and manifold and signal pressure are correct, move on to combustion check. If unit still does not ignite or ignites with loud resonance go to Troubleshooting FIGURE 59.

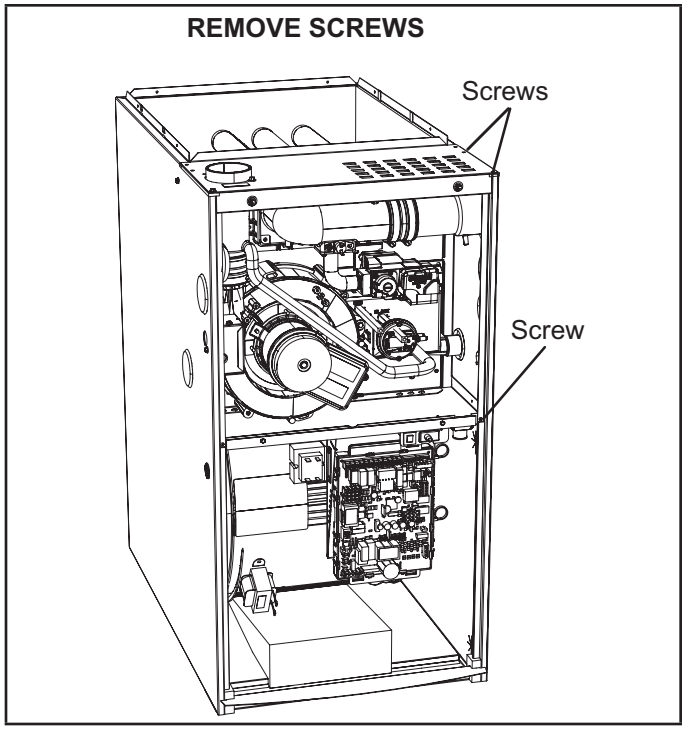


FIGURE 56

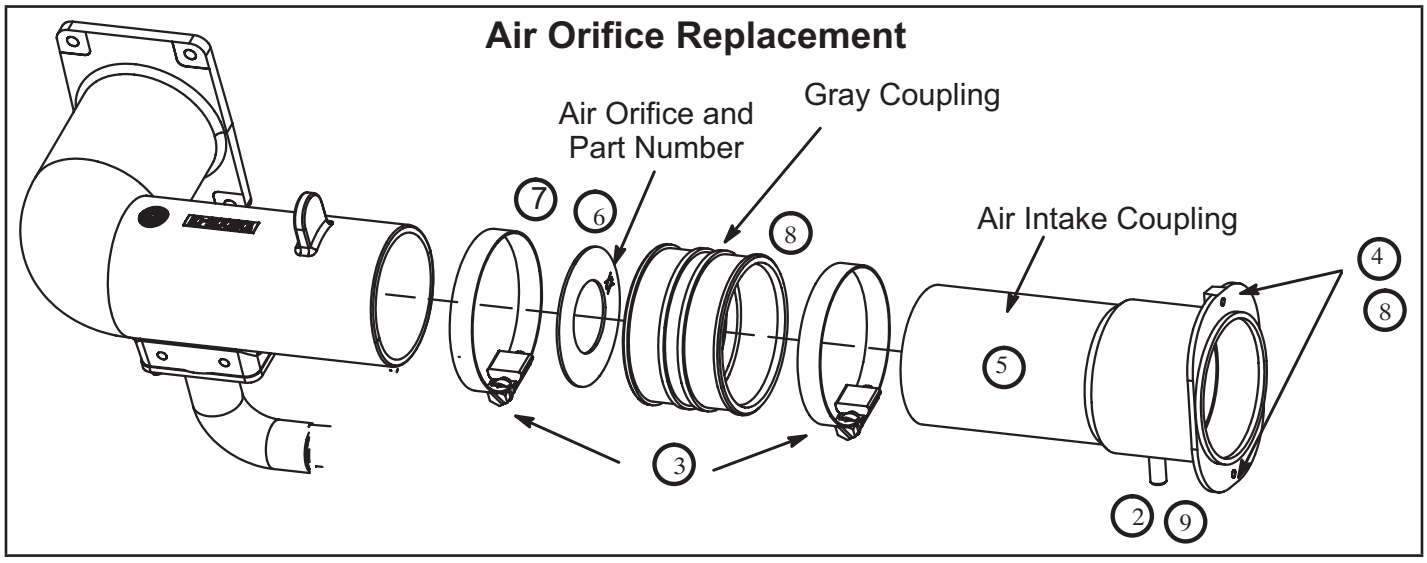


FIGURE 57

Operating Signal Pressure Measurement

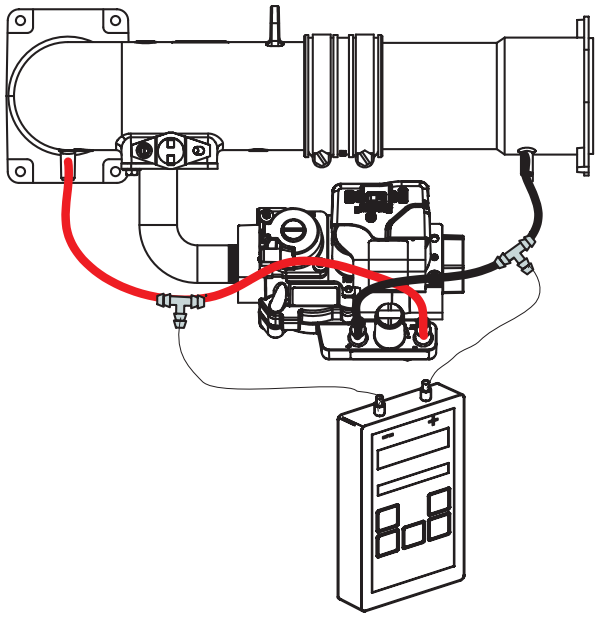


FIGURE 58

TABLE 19

Single-Stage	Production	Resonance (more air)		Difficulty Igniting (less air)	
	Orifice Size (Part No)	Orifice Size	Cat No	Orifice Size	Cat No
-040	0.800 (16)	0.812 (01)	21U23	0.787 (20)	21U01
-060	0.995 (14)	1.010 (21)	21U02	0.980 (13)	21U25
-080	1.105 (12)	1.125 (03)	19X31	1.085 (22)	21U03
-100	1.250 (06)	1.281 (19)	19X39	1.219 (04)	19X32

Troubleshooting Poor Ignition or Combustion Resonance Issues

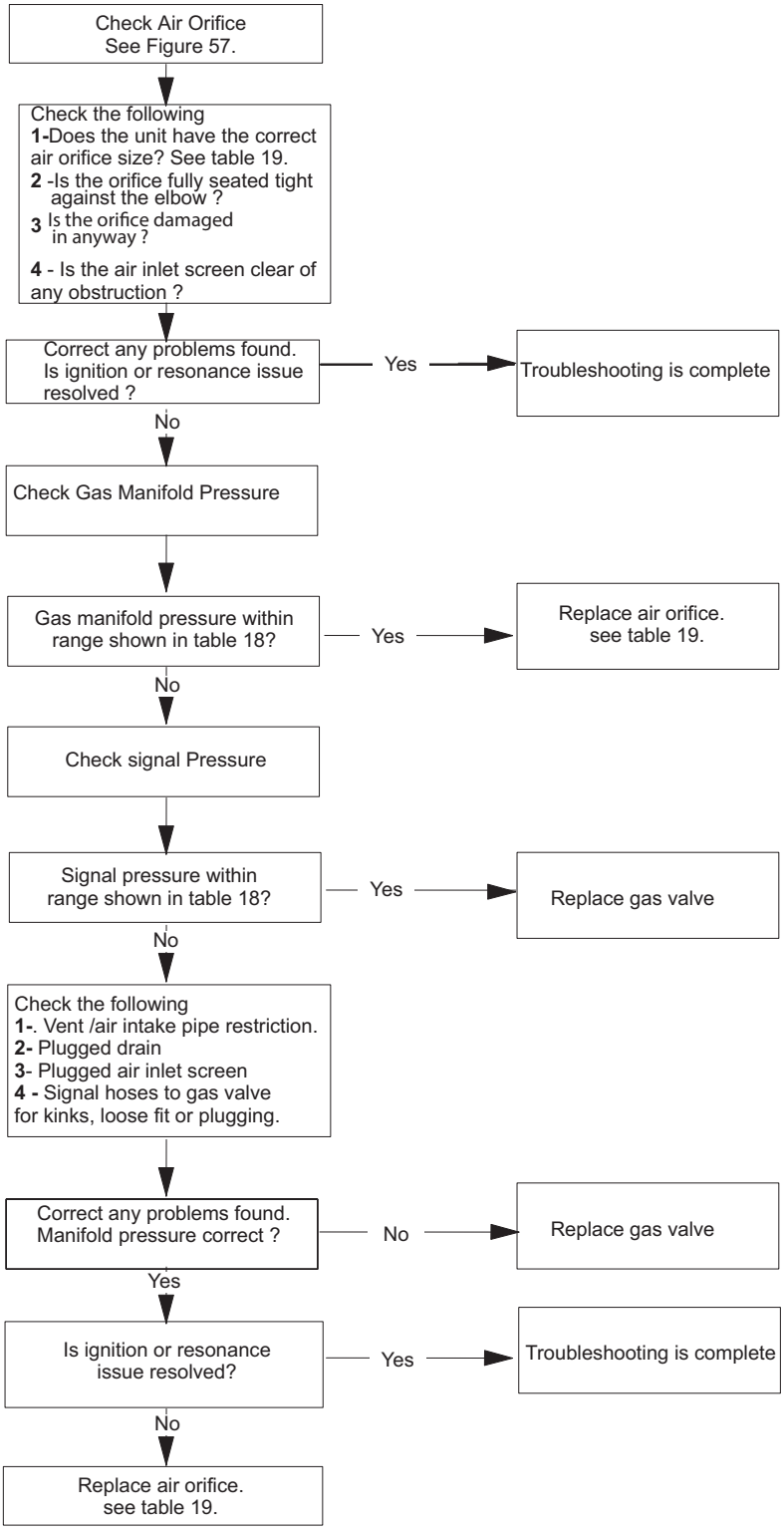


FIGURE 59

E-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 the table below.

TABLE 20

EL195K Model	CO_2% For Nat	CO_2% For LP
040	6.3 - 7.8	n/a
060	6.5 - 8.2	8.4 - 9.9
080	7.2 - 8.4	9.0 - 10.4
100	7.3 - 8.5	n/a
The maximum carbon monoxide reading should not exceed 100ppm.		

F- 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.

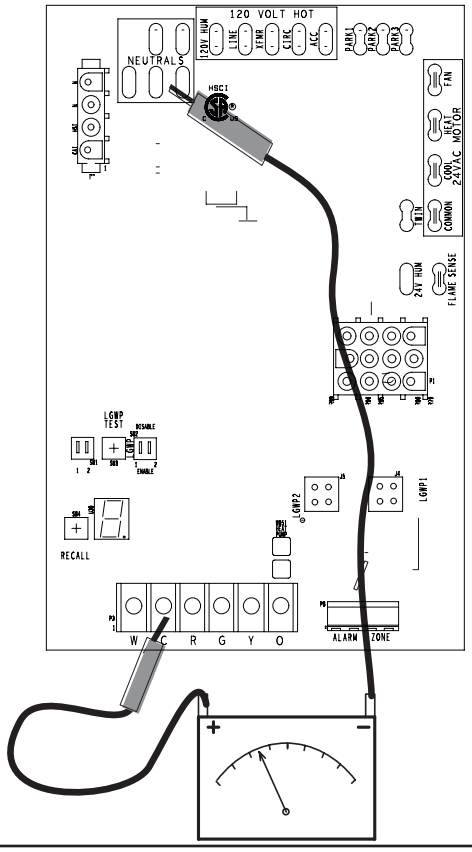
1 - Measure the AC voltage between Line Neutral (spade terminals) and “C” terminal (low voltage terminal block) on the integrated control. See FIGURE 60. A wide variation in the voltage between Line Neutral and “C” as a function of load indicates a poor or partial ground. Compare the readings to the table below. If the readings exceed the maximum shown in TABLE 21, 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 60. This voltage should be in the range of 97 to 132 Vac.

TABLE 21

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

CHECK VOLTAGE BETWEEN LINE NEUTRAL AND LOW VOLTAGE “C” TERMINAL



CHECK VOLTAGE BETWEEN LINE HOT AND LINE NEUTRAL

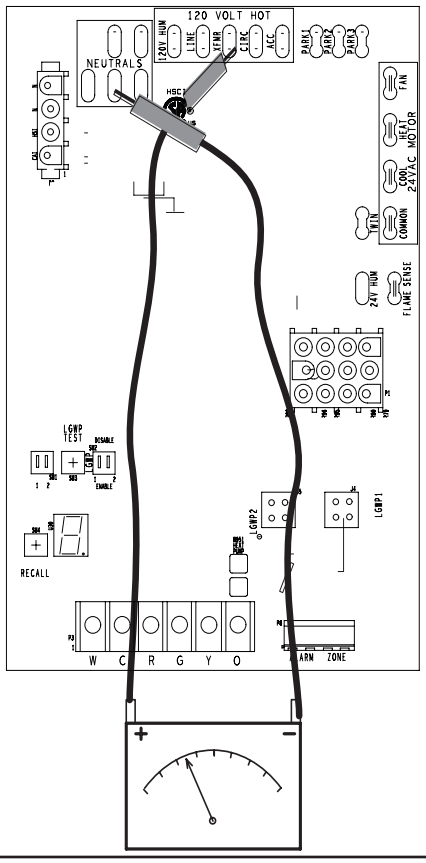


FIGURE 60

V-TYPICAL OPERATING CHARACTERISTICS

A-Blower Operation and Adjustment1

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.

B-Temperature Rise (FIGURE 61)

Temperature rise for EL195UHNEK units depends on unit input, blower speed, blower horsepower and static pressure as marked on the unit rating plate. The blower speed must be set for unit operation within the range of “TEMP. RISE °F” listed on the unit rating plate.

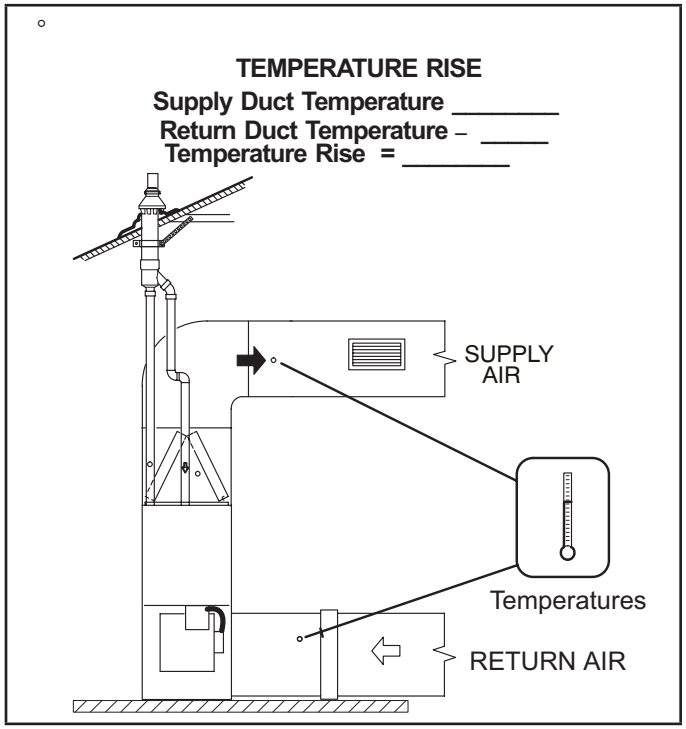


FIGURE 61

C-External Static Pressure

1 - Tap locations shown in FIGURE 62.

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.

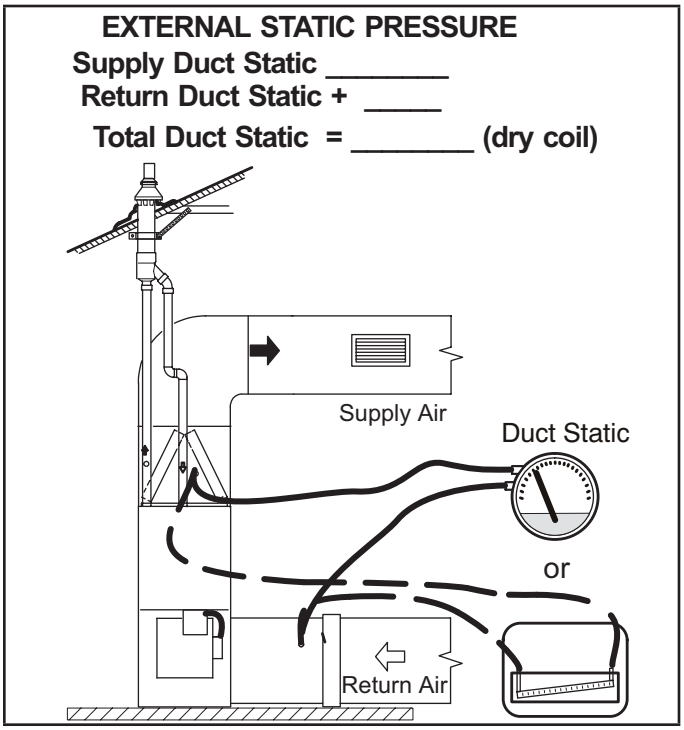


FIGURE 62

D-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.

VI-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 Lennox 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.

14 - Inspect the Low GWP sensor / sensors and rubber sleeve.

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

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

2 - Verify that system total static pressure and airflow settings are within specific operating parameters.

3 - Clock gas meter to ensure that the unit is operating at the specified firing rate for each stage of operation. Check supply, manifold and signal pressures at 35, 70 and 100% capacity as outlined in the unit Service Literature. 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 (FIGURE 63)

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

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.

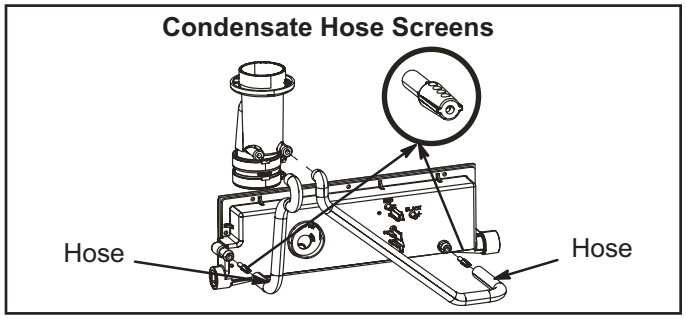


FIGURE 63

Heat Exchanger and Burners

If cleaning the heat exchanger becomes necessary, follow the below procedures and refer to FIGURE 64 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 inake 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 - 1Reinstall 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.

BURNER, C.A.I ASSEMBLY &
HEAT EXCHANGER REMOVAL

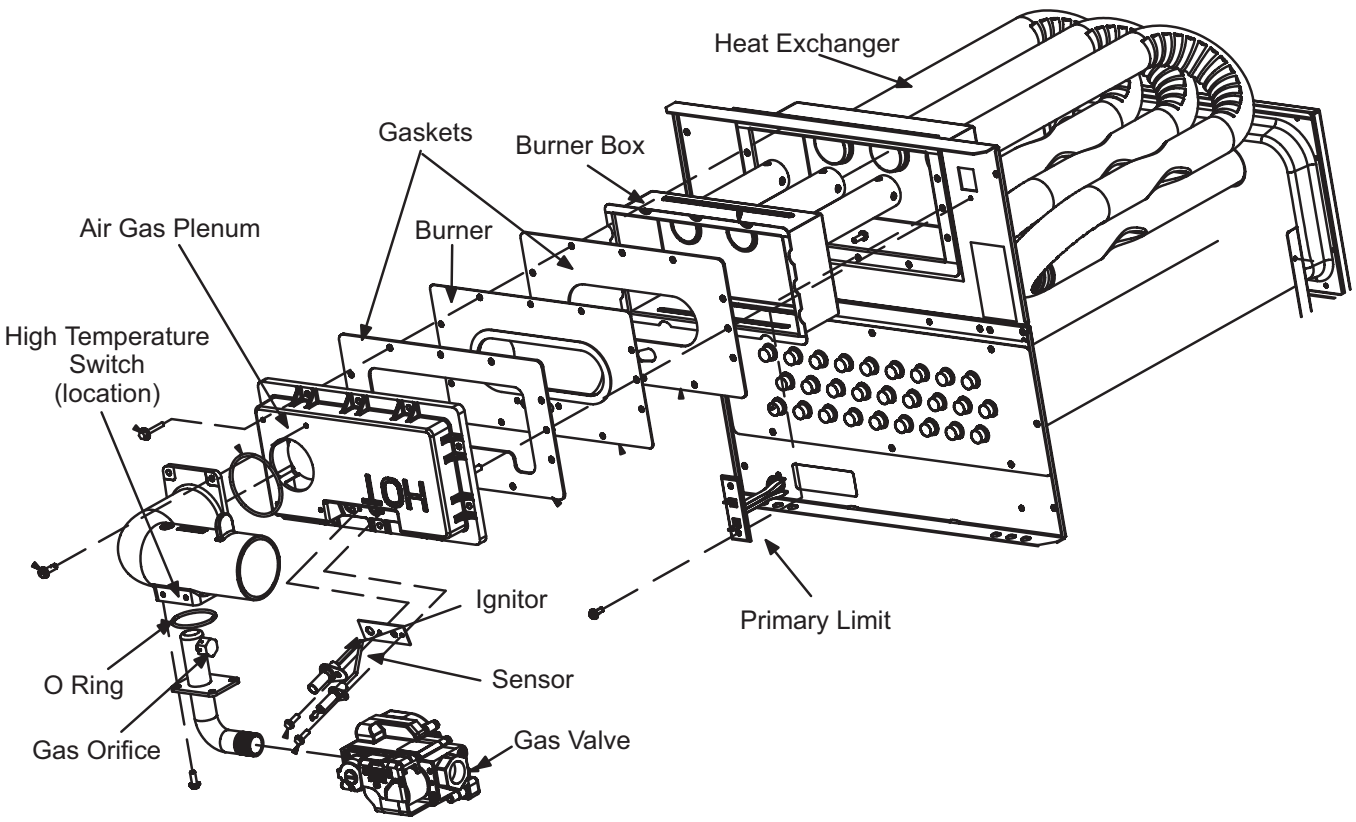


FIGURE 64

VII- Low GWP Application

⚠ WARNING

For use with Lennox approved evaporator coil and LGWP sensors only. Use original manufacturer recommended LGWP sensors if using non Lennox approved evaporator coil.

CONNECTING THE FURNACE CONTROL BOARD SENSOR.

See FIGURE 67 and follow steps below:

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

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

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

Ensure the cable is properly seated into the SENSOR 1 plug (LGWP1). The Molex plug clip should lock into the Molex connection point for a secured connection, as shown below in FIGURE 65. Verify the connection is free of dust, debris, and moisture.

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

Single Stage Constant Torque Control

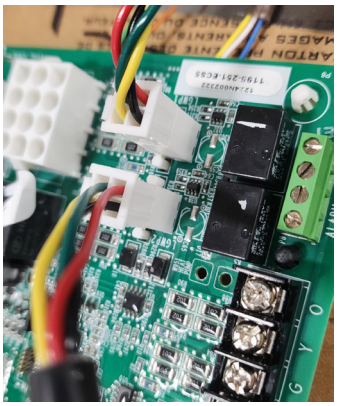


FIGURE 65

LOW GWP DIP SWITCH SETTINGS

Adjust the DIP switch settings to the sensor configuration. Failure to do so will cause faults on power-up. See FIGURE 66 and TABLE 22.

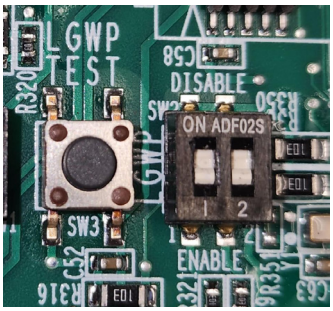


FIGURE 66

TABLE 22

DIP Switch Settings

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

In single sensor configurations, the sensor must be connected to the SENSOR 1 plug (LGWP1). Configurations other than the ones shown in TABLE 22 will cause a servicing fault.

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

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

SECONDARY SENSOR REQUIREMENTS

Additional Line Sets

If additional refrigerant line joints are present outside of the line set sleeve and a secondary refrigerant detection sensor is required, its installation must comply with the requirements listed in Refrigerant Detection Sensor Kit (27V53). See FIGURE 67 for routing the secondary sensor cable through the furnace cabinet.

Non-Low GWP Applications

⚠ WARNING

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

FURNACE CONTROL BOARD LOW GWP MODES OF OPERATION

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

Initializing

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

Normal

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

Leak Detected

When the furnace control board detects a refrigerant leak:

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

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

Fault

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

NOTE - *See TABLE 4 "Ignition control diagnostic codes"*

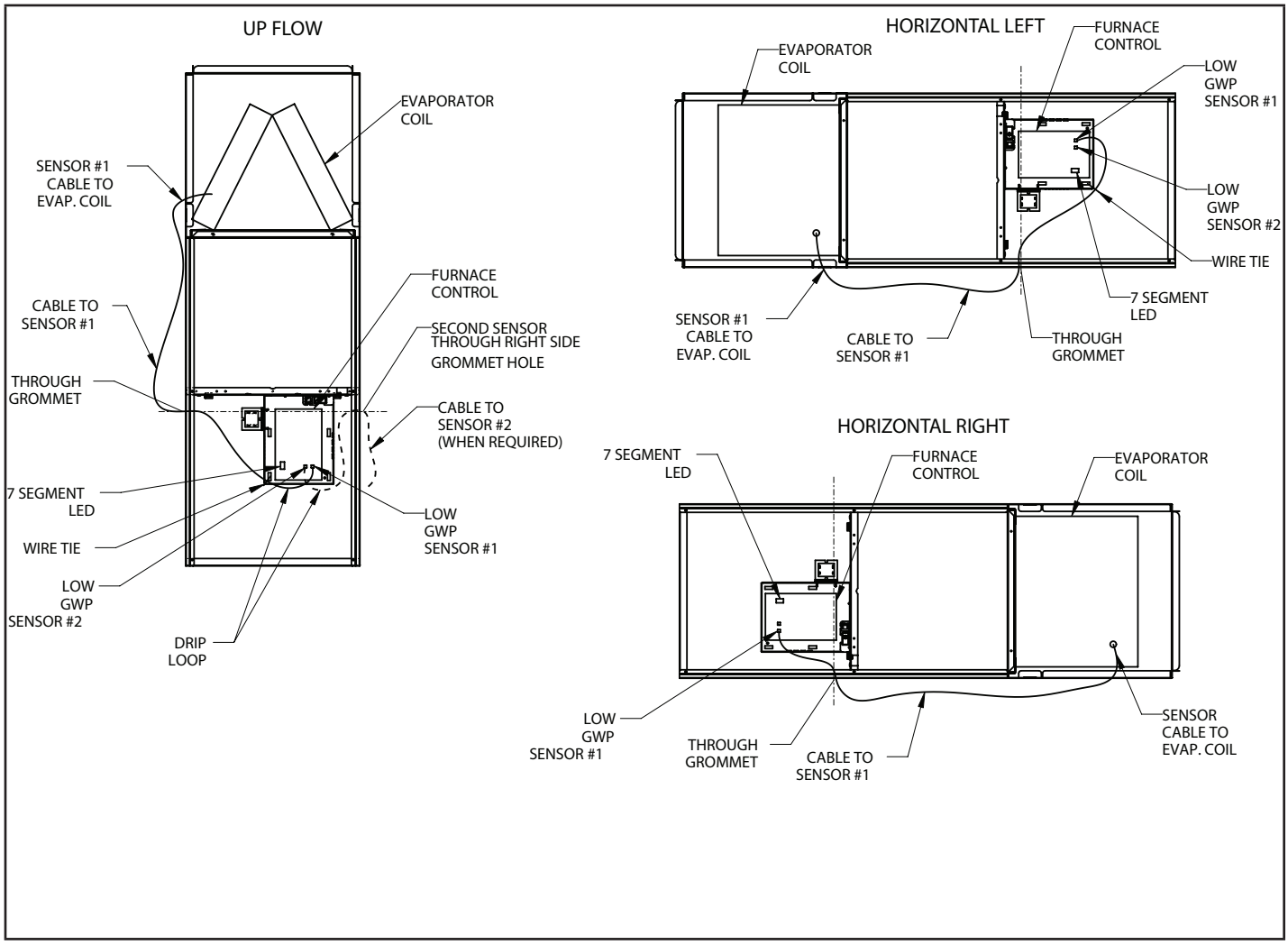


FIGURE 67

LGWP TEST BUTTON FUNCTIONALITY

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

TABLE 23 lists the functions of the Test button during each mode of operation.

TABLE 23

LGWP Test Button Function

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

LGWP Test Button - Additional Functions

TABLE 24 lists the additional functions of the Test Button while the furnace control board is functioning within the states of Initializing, Monitoring, Leak Detection, Servicing and Fault.

TABLE 24

Additional Button Functions

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

External Alarm

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

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

THERMOSTAT COMPATIBILITY

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

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

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

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

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

START UP PROCEDURE

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

Cooling Demand

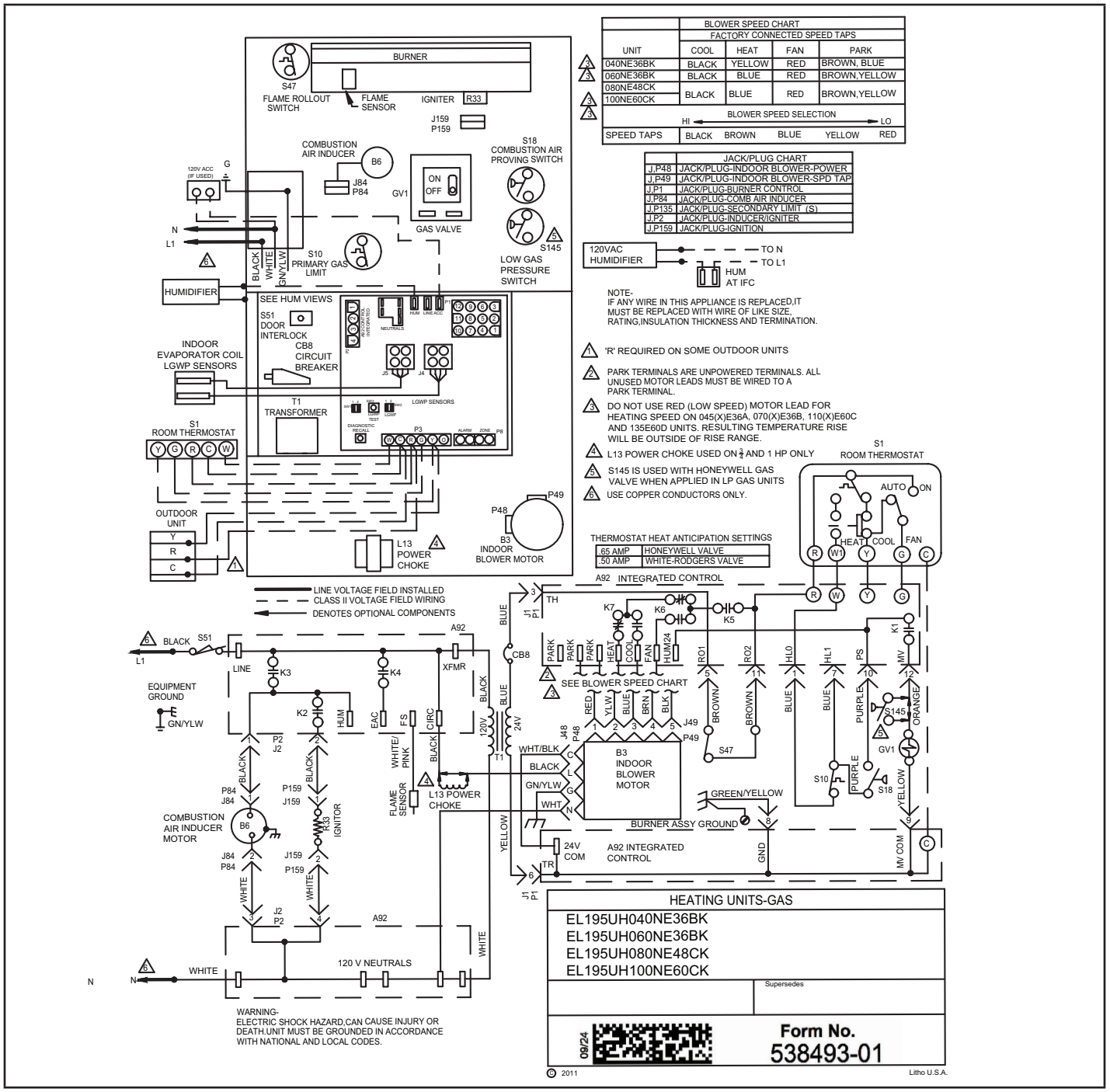
1. Prompt a cooling demand at the thermostat.
2. Press the LGWP Test button on the furnace control board.

   The system then executes a leak detection response.
3. Observe the following sequence:
   a. The LED indicator for leak detection. See TABLE 4 ”Igntion control diagnostic codes”
   b. The blower powers up.
   c. The outdoor compressor powers down.
4. Press the LGWP Test button to terminate the simulated Leak Detected mode upon test completion
5. ***Heating Demand***

1. Prompt a heating demand at the thermostat.
2. Observe the following sequence:
   a. The LED indicator for leak detection. See TABLE 4 “Ignition control diagnostoc codes”.
   b. The blower powers up.
   c. The gas burners power down.
   d. The outdoor compressor powers down.
3. Press the LGWP Test button to terminate the simulated Leak Detected mode upon test completion.

The installation of the furnace control board is complete after both sequences are successfully completed.

VIII-WIRING DIAGRAM AND SEQUENCE OF OPERATION



1 - Line voltage is applied to L1 and N. the T1 low voltage transformer is energized, and line voltage is applied to B3 indoor blower.

2 - S47 rollout switch(es) must be closed in order for 24V from transformer to be output on integrated control ”R” to power thermostat.

3 - When there is a call for heat, W1 of the thermostat energizes W of the furnace control with 24VAC.

4 - A92 integrated control runs a self-check. S10 primary limit and S21 secondary limit contacts are found to be closed. Call for heat can continue.

5 - A92 integrated control energizes B6 combustion air inducer. S18 combustion air pressure switch closes . Once S18 closes, a 15-second pre-purge follows.

6 - A92 integrated control energizes R33 ignitor. A 20-second warm-up period begins.

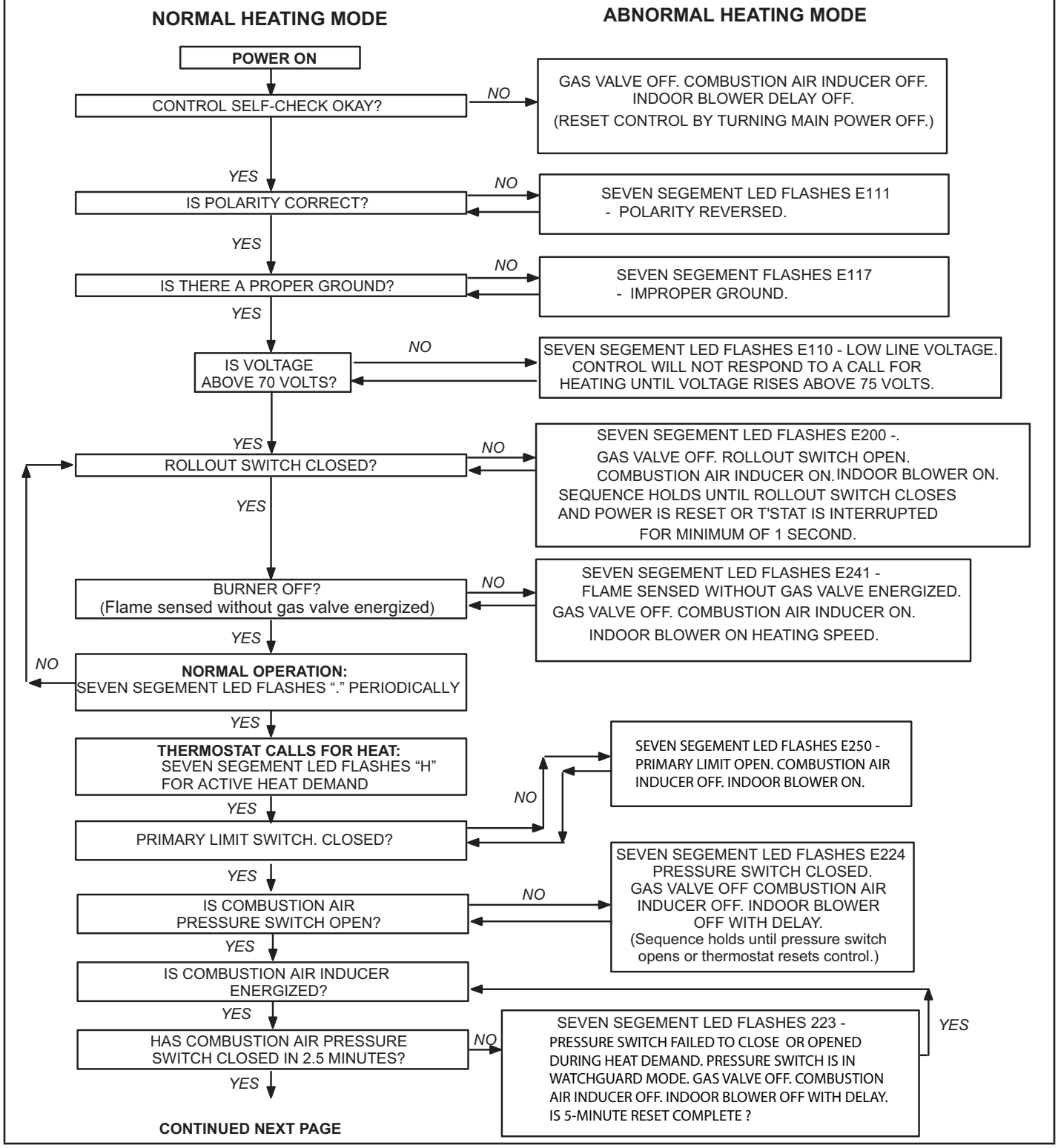
7 - GV1 gas valve opens for a 4-second trial for ignition

8 - Flame is sensed, gas valve remains open for the heat call.

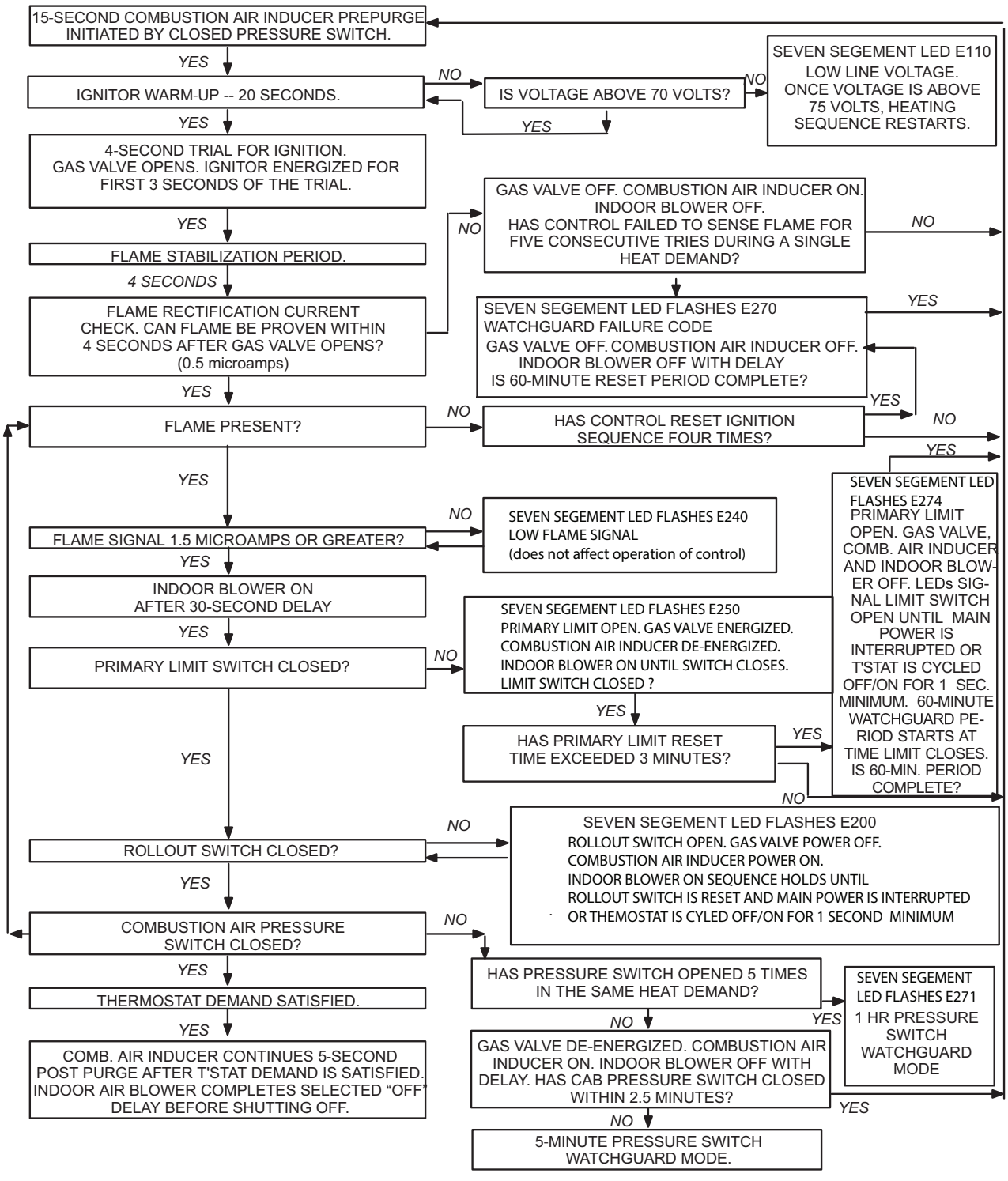
9 - After 30-second delay (from flame sensed), A92 integrated control applies 24VAC to Heat speed of B3 indoor blower.

10 - When heat demand is satisfied, W1 of the indoor thermostat de-energizes W of A92integrated control which de-energizes GV1 gas valve. B6 combustion air inducer continues a 5-second post-purge period, and B3 indoor blower completes a selected OFF time delay

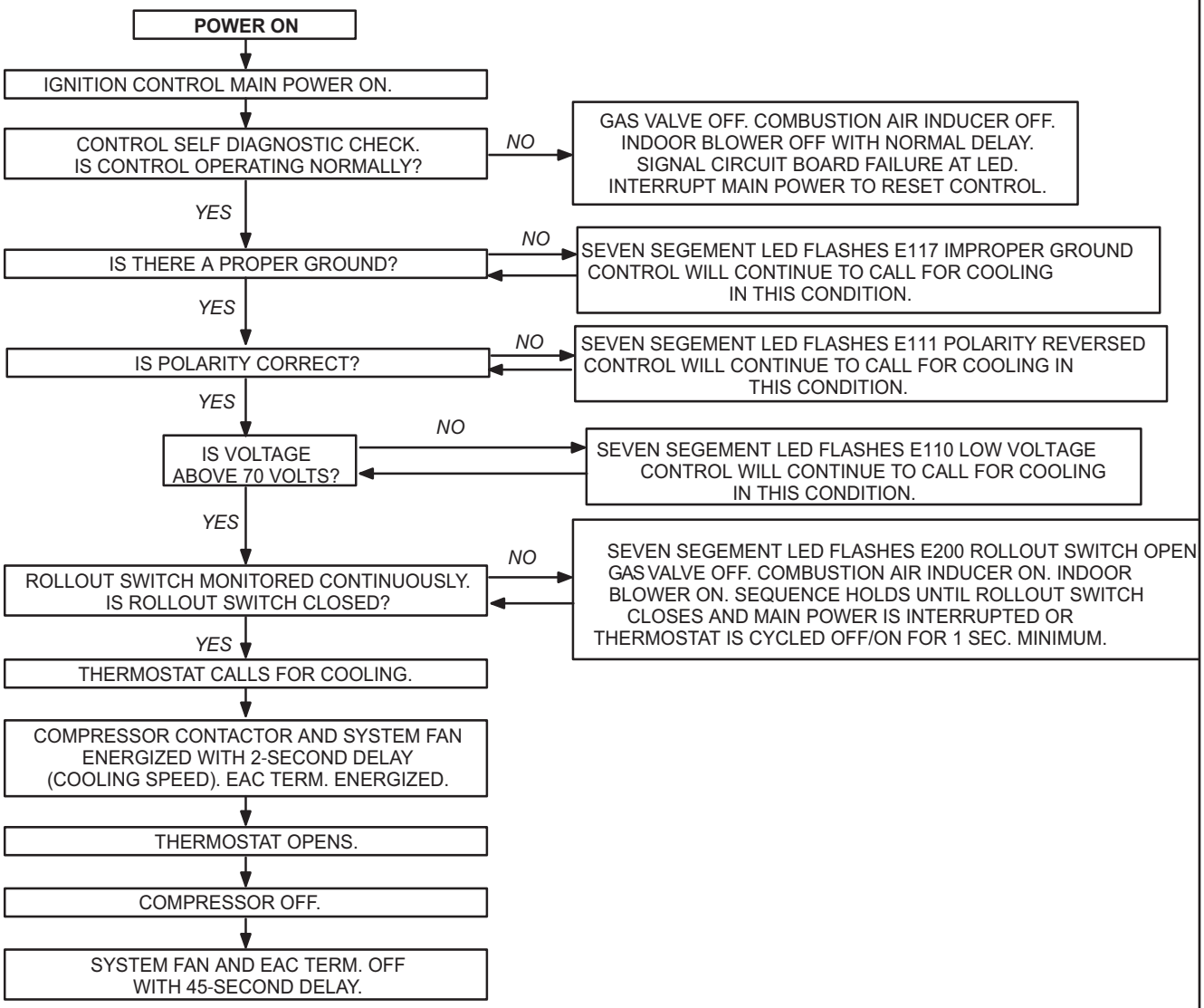
HEATING SEQUENCE OF OPERATION



HEATING SEQUENCE CONTINUED



COOLING SEQUENCE OF OPERATION



CONTINUOUS FAN SEQUENCE OF OPERATION