icomfort® - ENABLED EL296DFV(X) SERIES UNITS

EL296DFV(X) series units are 90% efficiency gas furnaces used for upflow or horizontal applications only, manufactured with Lennox Duralok™ heat exchangers formed of aluminized steel. EL296DFV(X) units are available in heating capacities of 44,000 to 110,000 Btuh and cooling applications up to 5 tons. Refer to Engineering Handbook for proper sizing.

Units are factory equipped for use with natural gas. Kits are available for conversion to LPG operation. EL296DFV(X) model units are equipped with the icomfort® enabled SureLight® two-stage variable speed integrated control. EL296DFV(X) unit meets the California Nitrogen Oxides (NO_x) Standards and California Seasonal Efficiency requirements. All units use a redundant gas valve to assure safety shut-off as required by C.S.A.

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

TABLE OF CONTENTS

⚠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.

SPECIFICATIONS

Gas Heating Performance		Model No.	EL296DF045XV36B	EL296DF070XV48B	EL296DF090XV60C	EL296DF110XV60C
		[1] AFUE	96%	96%	96%	96%
	High Fire	Input - Btuh	44,000	66,000	88,000	110,000
		Output - Btuh	43,000	64,000	85,000	106,000
		Temperature rise range - °F	35-65	35-65	40-70	45-75
		Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0	3.5 / 10.0	3.5 / 10.0
	Low Fire	Input - Btuh	29,000	43,000	57,000	72,000
		Output - Btuh	28,000	42,000	56,000	70,000
		Temperature rise range - °F	20 - 50	25 - 55	30 - 60	35 - 65
		Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	1.7 / 4.9	1.7 / 4.9	1.7 / 4.9	1.7 / 4.9
High static - in. w.g.		Heating	0.8	0.8	0.8	0.8
		Cooling	1.0	1.0	1.0	1.0
Connections in.		Intake / Exhaust Pipe (PVC)	2 / 2	2 / 2	2 / 2	2 / 2
		Gas pipe size IPS	1/2	1/2	1/2	1/2
		Condensate Drain Trap (PVC pipe) - i.d.	1/2	1/2	1/2	1/2
		with furnished 90° street elbow	1/2 slip x 1/2 Mipt	1/2 slip x 1/2 Mipt	1/2 slip x 1/2 Mipt	1/2 slip x 1/2 Mipt
		with field supplied (PVC coupling) - o.d.	1/2 slip x 1/2 NPT	1/2 slip x 1/2 NPT	1/2 slip x 1/2 NPT	1/2 slip x 1/2 NPT
Indoor Blower		Wheel nom. diameter x width - in.	10 x 9	11 x 10	11 x 11	11 x 11
		Motor output - hp	1/2	3/4	1	1
		Tons of add-on cooling	2 - 3	2.5 - 4	3 - 5	3 - 5
		Air Volume Range - cfm	545 - 1360	575 - 1800	890 - 2130	860 - 2180
Electrical Data		Voltage	120 volts - 60 hertz - 1 phase			
		Blower motor full load amps	7.7	10.1	12.8	12.8
		Maximum overcurrent protection	15	20	20	20
Shipping Data		lbs. - 1 package	131	136	164	176

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.

INSTALLATION CLEARANCES

Sides	[1] 0 inches (0 mm)
Rear	0 inches (0 mm)
Top/Plenum	1 inch (25 mm)
Front	0 inches (0 mm)
Front (service/alcove)	24 inches (610 mm)
Floor	[2] Combustible

NOTE - Air for combustion must conform to the methods outlined in the National Fuel Gas Code (NFPA 54/ANSI-Z223.1) or the National Standard of Canada CAN/CSA-B149.1 “Natural Gas and Propane Installation Code”.

NOTE - In the U.S. flue sizing must conform to the methods outlined in the current National Fuel Gas Code (NFPA 54/ANSI-Z223.1) or applicable provisions of local building codes. In Canada flue sizing must conform to the methods outlined in National Standard of Canada CAN/CSA-B149.1.

[1] Allow proper clearances to accommodate condensate trap and vent pipe installation.

[2] Clearance for installation on combustible floor if Optional Downflow Combustible Flooring Base is installed between furnace and combustible floor. Not required in add-on cooling applications if installed in accordance with local codes or National Fuel Gas Code ANSI-Z223.1 or CAN/CGA-149.1,.2. Do not install the furnace directly on carpeting, tile, or other combustible materials other than wood flooring.

OPTIONAL ACCESSORIES - ORDER SEPARATELY

NOTE - FURNACES CANNOT BE TWINNED!

			"B" Width Models	"C" Width Models
CABINET ACCESSORIES				
Downflow Combustible Flooring Base			11M60	11M61
CONDENSATE DRAIN KITS				
Condensate Drain Heat Cable		6 ft.	26K68	26K68
		24 ft.	26K69	26K69
		50 ft.	26K70	26K70
Heat Cable Tape		Fiberglass - 1/2 in. x 66 ft.	36G53	36G53
		Aluminum foil - 2 in. x 60 ft.	16P89	16P89
Crawl Space Vent Drain Kit		US	51W18	51W18
		Canada	51W19	51W19
CONTROLS				
icomfort Touch® Communicating Thermostat			49W95	49W95
[1] Remote Outdoor Temperature Sensor (for dual fuel and Humiditrol®)			X2658	X2658
[2] Discharge Temperature Sensor			88K38	88K38
ComfortSense® 7000 Thermostat			Y2081	Y2081
[3] Remote Outdoor Temperature Sensor (for dual fuel and Humiditrol)			X2658	X2658
FILTERS				
[4] Downflow Filter Cabinet			51W07	51W08
		No. and Size of filter - in.	(2) 16 x 20 x 1	(2) 16 x 20 x 1
NIGHT SERVICE KITS				
Night Service Kit			14C99	14C99
Universal Service Kit - Switches			89W20	89W20
TERMINATION KITS				
See Installation Instructions for specific venting information.				
Termination Kits - Direct Vent Applications Only	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
Termination Kits - Direct or Non-Direct vent	Roof	2 in.	15F75	15F75
	Wall Ring Kit	2 in.	15F74	[6] 15F74
[5] Roof Termination Flashing Kit - Direct or Non-Direct Vent (2 flashings)		2 in.	44J41	44J41
VENTING				
[7] Left Side Vent Kit		2 or 3 in.	87W73	87W73

[1] Remote Outdoor Sensor may be used with an icomfort®-enabled outdoor unit for a secondary (alternate) sensor reading. Sensor may also be used with a conventional outdoor unit.

[2] Optional for service diagnostics.

[3] Remote Outdoor Temperature Sensor for ComfortSense 7000 Thermostat must be connected directly to the thermostat, Do not connect it directly to the icomfort® control.

[4] Cleanable polyurethane, frame-type filter.

[5] Kits contain enough parts for two, non-direct vent installations.

[6] Non-direct vent only.

NOTE - The curved exhaust pipe furnished with the Left Side Vent Kit counts as one additional 2 in. diameter 90° elbow. When using 3 in. diameter pipe, the furnished curved exhaust pipe and field provided fittings to transition from 2 in. to 3 in. count as 20 feet of equivalent pipe on all units.

NOTE - Termination Kits 44W92, 44W93, 30G28, 51W12, 51W19, 81J20 are certified to ULC S636 standard for use in Canada only.

EL296DFV PARTS IDENTIFICATION

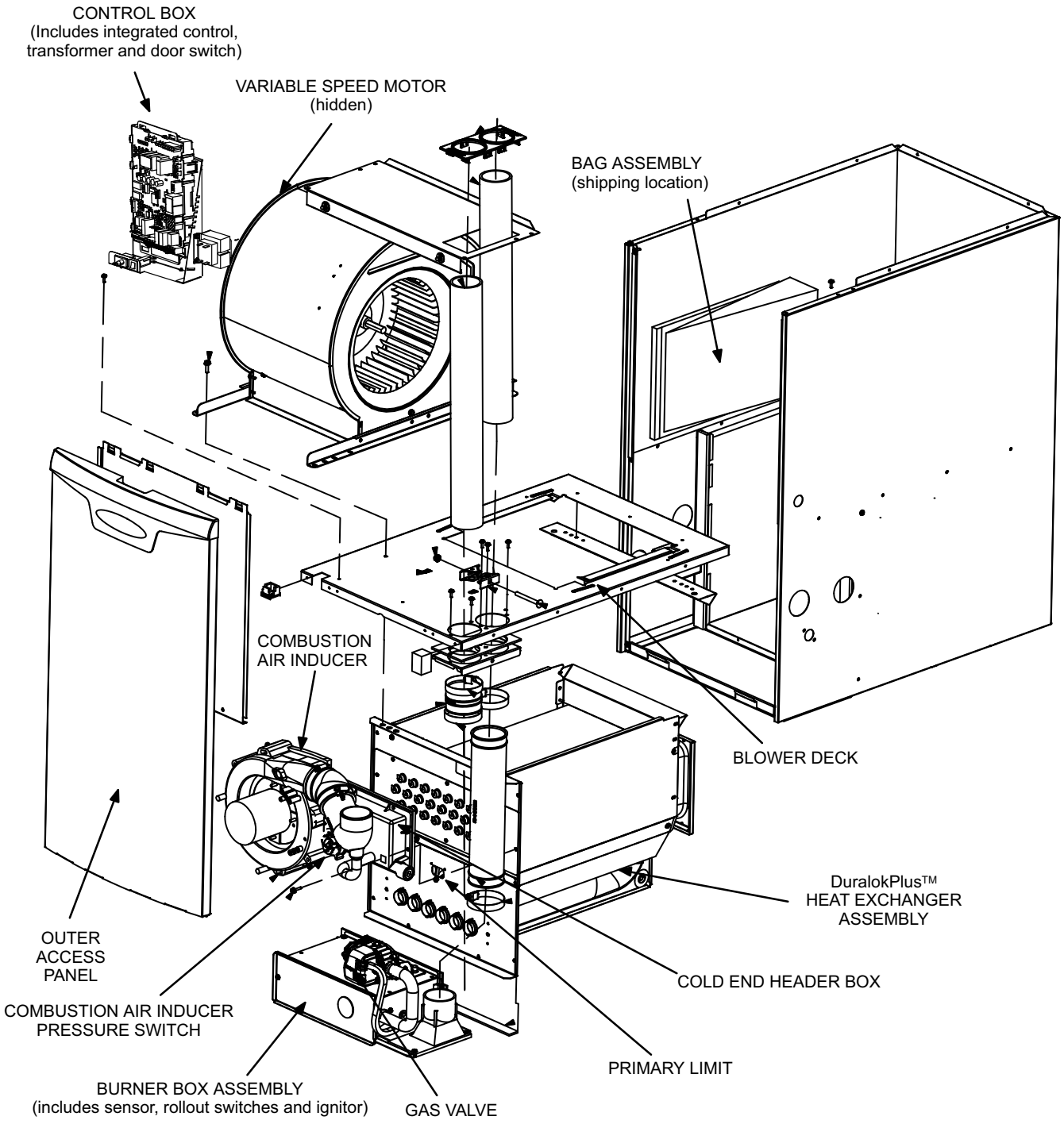


FIGURE 1

I-UNIT COMPONENTS

EL296DFV(X) unit components are shown in figure 1. The gas valve, combustion air inducer and burners can be accessed by removing the access panel. Electrical components are in the control box (figure 2) found in the blower section.

⚠ CAUTION

Electrostatic discharge can affect electronic components. Take precautions to neutralize electrostatic charge by touching your hand and tools to metal prior to handling the control.

A- Control Box

1. Control Transformer (T1)

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

2. Door Interlock Switch (S51)

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

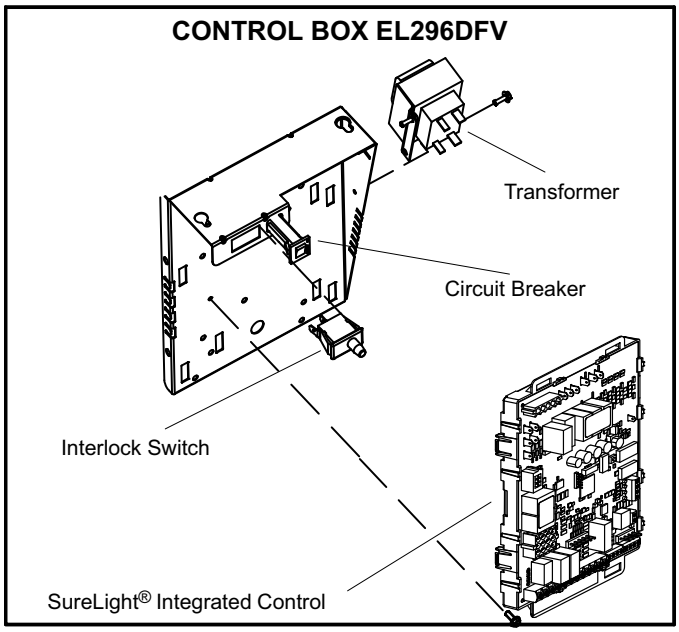


FIGURE 2

3. Circuit Breaker (CB8)

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

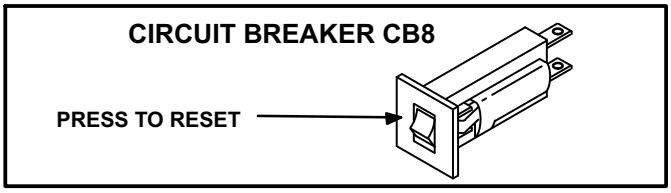


FIGURE 3

⚠ WARNING

Shock hazard.
Disconnect power before servicing. Integrated control is not field repairable. If control is inoperable, simply replace entire control.
Can cause injury or death. Unsafe operation will result if repair is attempted.

4. Integrated Control (A92)

Units are equipped with the icomfort® enabled SureLight® two-stage, variable speed integrated control. This control is used with the icomfort Touch® thermostat as part of a communicating comfort system. The control can also operate with a non-communicating conventional single or two-stage thermostat. The system consists of a ignition / blower control (figures 4 and 5) with control pin designations in tables 1, 2 and 3 and ignitor (figure 13). The control and ignitor work in combination to ensure furnace ignition and ignitor durability. The control provides gas ignition, safety checks and indoor blower control with two-stage gas heating. The furnace combustion air inducer, gas valve and indoor blower are controlled in response to various system inputs such as thermostat signal, pressure and limit switch signal and flame signal. The control features a seven-segment LED display, indicating furnace status (including indoor blower) and error codes. The LED flashes in single digits. For example using table 5 under LIMIT CODE, an “E” followed by “2” followed by “5” followed by “0”, the limit switch circuit is open. The control also has two unpowered (dry) 1/4” contacts for a humidifier and a 120 volt accessory terminal. Both rated at (1) one amp each.

Electronic Ignition

At the beginning of the heat cycle the integrated control monitors the first stage and second stage combustion air inducer prove switch. The control will not begin the heating cycle if the first stage prove switch is closed (by-passed). Likewise the integrated control will not begin the second stage heating cycle if the second stage prove switch is closed, and will remain in first stage heat. However, if the second stage prove switch closes during the first stage heat pre-purge, the control will allow second stage heat. Once the first stage prove switch is determined to be open, the combustion air inducer is energized on low (first stage) heat speed. When the differential in the prove switch is great enough, the prove switch closes and a 15-second pre-purge begins.

NOTE - *During abnormal conditions such as low supply voltage or low outdoor temperatures and the low fire pressure switch does not close, the combustion air inducer will switch to high fire. After a 15 second pre-purge the high fire pressure switch will close and the unit will begin operation on high fire. After 10 to 20 seconds of high fire operation the unit will switch to low fire*

After the 15-second pre-purge period, the SureLight ignitor warms up for 20 seconds after which the gas valve opens for a 4-second trial for ignition. The ignitor remains energized during the trial until flame is sensed. If ignition is not

proved during the 4-second period, the control will try four more times with an inter purge and warm-up time between trials of 35 seconds. After a total of five trials for ignition (including the initial trial), the control goes into Watchguard-Flame Failure mode. After a 60-minute reset period, the control will begin the ignition sequence again.

Two Stage Operation / Thermostat Selection DIP Switch

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

While in the single-stage thermostat mode, the burners will always fire on first-stage heat. The combustion air inducer will operate on low speed and indoor blower will operate on low heat speed. The unit will switch to second stage heat after a "recognition period". DIP switch 2, labeled SECOND STAGE DELAY, is factory set in the OFF position for a 7 minute recognition period. The switch can be moved to the ON position for a 12 minute recognition period, after which time the unit will switch to second-stage heat. While in the two-stage thermostat mode, the burners will fire on first-stage heat. The combustion air inducer will operate on low speed and indoor blower will operate on low heat speed. The unit will switch to second-stage heat on call from the indoor thermostat. If there is a simultaneous call for first and second stage heat, the unit will fire an first stage heat and switch to second stage heat after 30 seconds of operation. See Sequence of Operation flow charts in the back of this manual for more detail.

TABLE 1

SureLight® Control 5 Pin Terminal Designation	
PIN #	**Function**
1	Ignitor
2	Combustion Air Inducer High Speed
3	Combustion Air Inducer Low Speed
4	Combustion Air Inducer Neutral
5	Ignitor Neutral

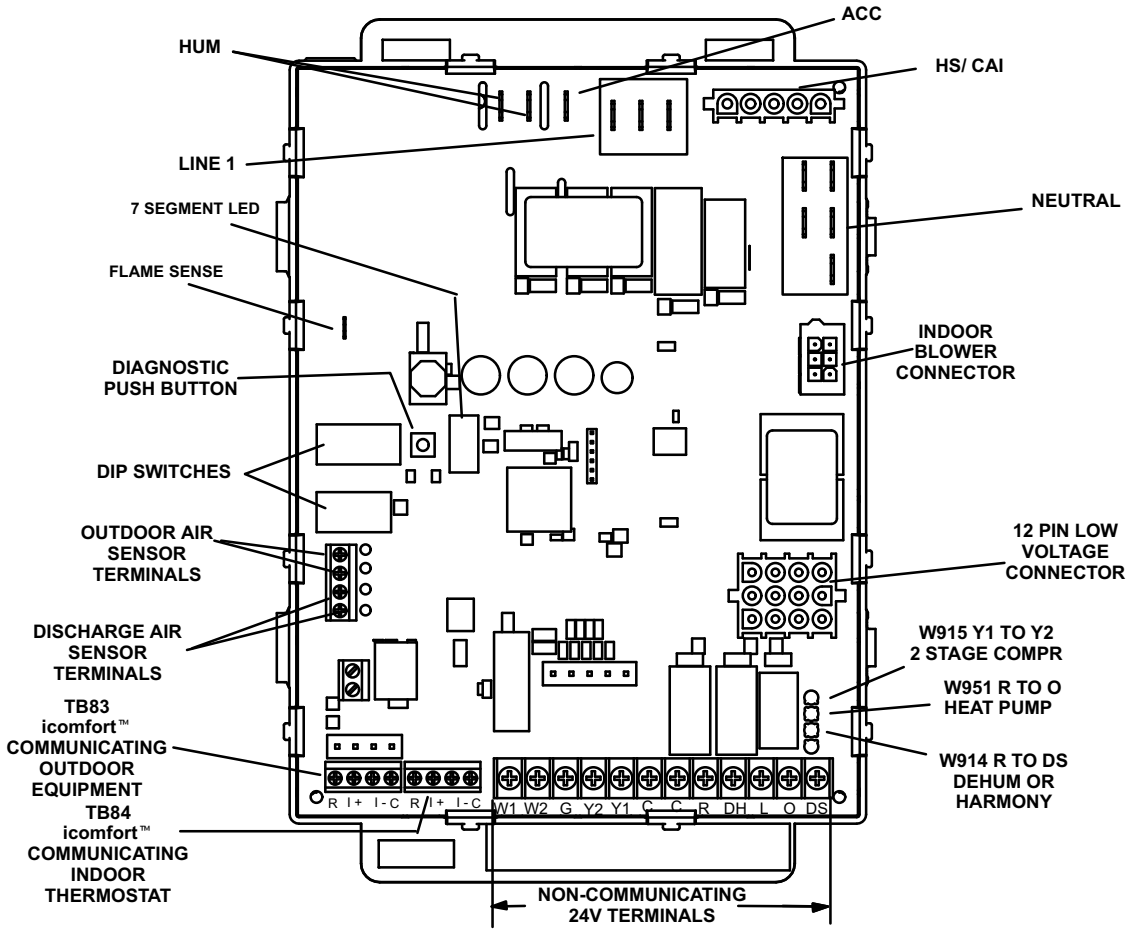
TABLE 2

SureLight® Control 12 Pin Terminal Designation	
PIN #	**Function**
1	Gas Valve Second Stage
2	Second Stage Prove Switch
3	Rollout Switch In
4	Ground
5	24V Hot
6	Primary Limit In
7	Gas Valve First Stage
8	Gas Valve Common
9	24V Neutral
10	Ground
11	Rollout Switch Out
12	First Stage Prove Switch

TABLE 3

SureLight® Control 6 Pin Terminal Designation	
PIN #	**Function**
1	Data Input From Motor
2	Common
3	Not Used
4	Data Output To Motor
5	5 Volt Bias Supply
6	Not Used

INTEGRATED CONTROL



TB83 icomfort™ Communicating Outdoor Equipment

R = 24VAC
I + = DATA HIGH CONNECTION
I - = DATA LOW CONNECTION
C = 24VAXC COMMON

TB84 icomfort™ Communicating Indoor Thermostat

R = 24VAC
I + = DATA HIGH CONNECTION
I - = DATA LOW CONNECTION
C = 24VAXC COMMON

1/4" QUICK CONNECT TERMINALS

HUM = UNPOWERED NORMALLY OPEN (DRY) CONTACTS

XMFR = 120 VAC OUTPUT TO TRANSFORMER

LI = 120 VAC INPUT TO CONTROL

ACC = 120 VAC OUTPUT TO OPTIONAL ACCESSORY

NEUTRALS = 120 VAC NEUTRAL

THERMOSTAT CONNECTIONS (TB1)

DS = DEHUMIDIFICATION SIGNAL

W2 = HEAT DEMAND FROM 2ND STAGE T/STAT

W1 = HEAT DEMAND FROM 1ST STAGE T/STAT

R = CLASS 2 VOLTAGE TO THERMOSTAT

G = MANUAL FAN FROM T'STAT

C = THERMOSTAT SIGNAL GROUND CONNECTED TO TRANSFORMER GRD (TR) & CHASIS GROUND (GRD)

Y1 = THERMOSTAT 1ST STAGE COOL SIGNAL

Y2 = THERMOSTAT 2ND STAGE COOL SIGNAL

O = THERMOSTAT SIGNAL TO HEAT PUMP REVERSING VALVE

DH = DEHUMIDIFICATION OUTPUT COMMUNICATING THERMOSTAT ONLY

L = USE ONLY WITH A COMMUNICATING THERMOSTAT AND A NON-COMMUNICATING OUTDOOR UNIT

FIGURE 4

INTEGRATED CONTROL CONFIGURATION GUIDE

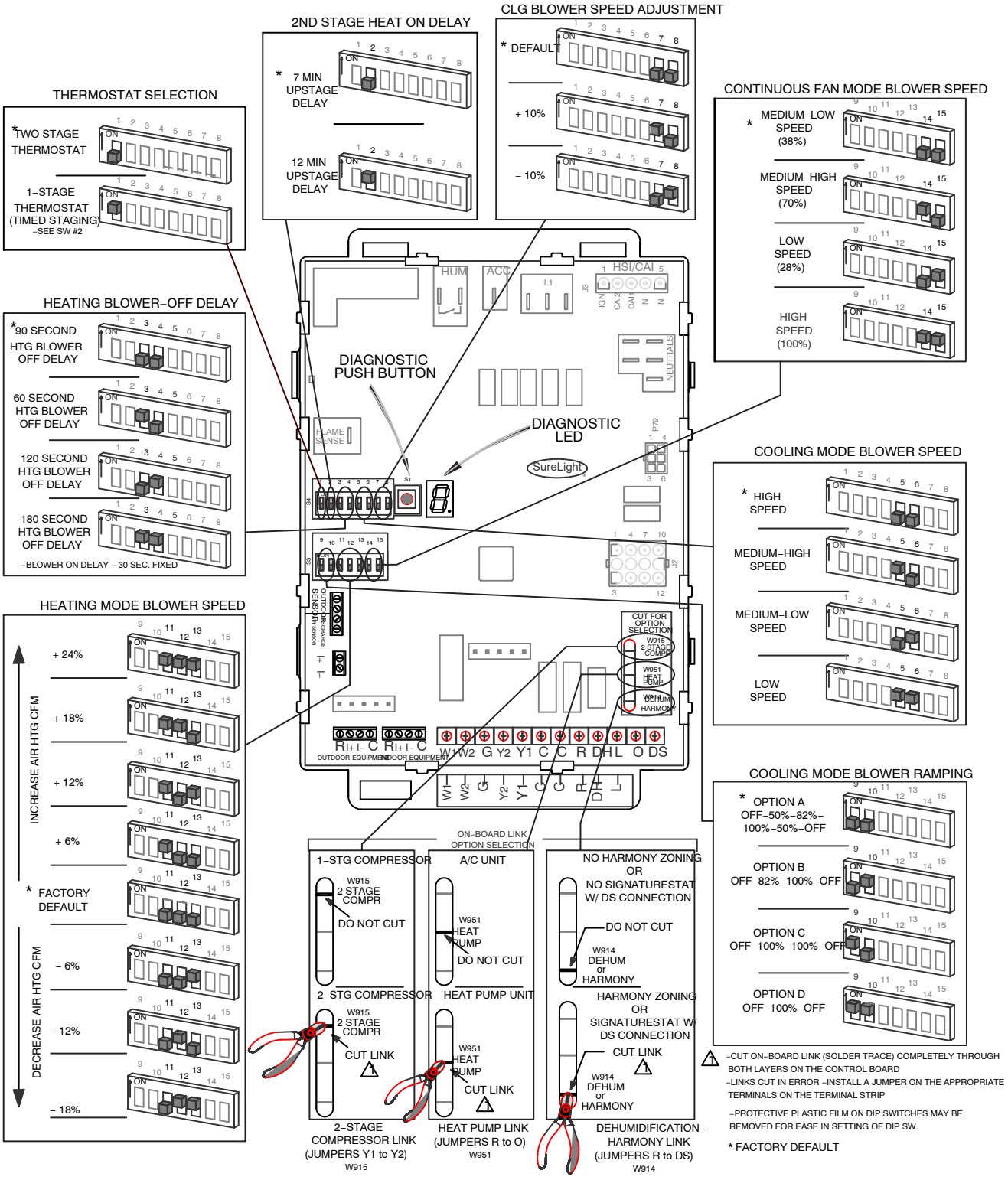


FIGURE 5

TABLE 4
Integrated Control Diagnostic Modes

Display	Action (when button released)
No change (idle)*	Remain in idle mode
Solid “E”	Enter diagnostic recall mode
Solid “F”	Enter flame signal mode
Solid “P” (variable speed only)	Program unit capacity/size (Unit Code)
Two horizontal bars ⎯⎯	Soft disable

* 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..)

Diagnostic LED (Figure 4)
The seven-segment diagnostic LED displays operating status, target airflow, error codes and other information. The table beginning on Page 10 lists diagnostic LED codes.

Diagnostic Push Button (Figure 4)
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, the Flame Signal “F” mode and “P” the Program Unit Capacity/Size mode. Press the button and hold it to cycle through a menu of options. Every five seconds a new menu item will be displayed. When the button is released, the displayed item will be selected. Once all items in the menu have been displayed, the menu resumes from the beginning until the button is released.

Error Code Recall Mode
Select ”E” from the menu to access the most recent 10 error codes. Select “c” from the Error Code Recall menu to clear all error codes. Button must be pressed a second time while “c” is flashing to confirm command to delete codes. Press the button until a solid “≡” is displayed to exit the Error Code Recall mode.

Flame Signal Mode
Select ”F” from the menu to access the flame signal mode. The integrated control will display the flame current on seven-segment LED in in micro amps (uA).

Flame signal mode is exited after any of the following:

- Power is reset
- Pressing and holding push button until 3 horizontal lines “≡” are displayed
- 10 minutes after entering the flame sense mode.

Program Unit Capacity/Size Mode
After the “P” is selected (by releasing the push button) the integrated control will start flashing the “P” on display for 90 seconds. If push button is pressed again and held during that time, the control will start to display characters corresponding to different variable speed furnace models for 3 seconds each. While the wanted character-model is displayed push button has to be released. Selected option will flash display for 10 seconds and during that time push button has to be pressed and held for 5 seconds. Once control accepts new setting it will store data in non-volatile memory and reset itself. If 10 seconds expires or push button is held less than 5 seconds, control will exit field test mode and go into idle without changing programming the unit size.

Soft Disable
Soft disabling is when thermostat finds a device on the BUS that it does not recognize and the thermostat sends a the device a message to be in soft disabling mode until properly configured. Two horizontal bars will display.

Steps to follow if the damper control module is displaying the soft disable code.

1- Confirm proper wiring between all devices (thermostat, damper control module, indoor and outdoor).

2- Cycle power to the control that is displaying the soft disable code.

3- Put the room thermostat through set up.

4- Go to **setup / system devices / thermostat / edit** / then push **reset.**

5- Go to **setup / system devices / thermostat / edit /** then push **resetAll**.

TABLE 5
Integrated Diagnostic Codes/Status of Equipment

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
.	Idle mode (Decimal blinks at 1 Hertz -- 0.5 second ON, 0.5 second OFF).	
A	Cubic feet per minute (cfm) setting for indoor blower (1 second ON, 0.5 second OFF) / cfm setting for current mode displayed.	
C	Cooling stage (1 second ON, 0.5 second OFF) / 1 or 2 displayed / Pause / cfm setting displayed / Pause / Repeat codes).	
d	Dehumidification mode (1 second ON) / 1 second OFF) / cfm setting displayed / Pause / Repeat Codes).	
h	Heat pump stage (1 second ON, 0.5 second OFF) / % of input rate displayed / Pause / cfm setting / Pause / Repeat codes.	
H	Gas Heat Stage (1 second ON, 0.5 second OFF) / 1 or 2 displayed / Pause / cfm setting displayed / Pause / Repeat codes. Blinking during ignition.	
dF	Defrost mode.	
U	Discharge Air Temperature	
E 105	Device communication problem - No other devices on RS BUS (Communication system).	Equipment is unable to communicate. Indicates numerous message errors. In most cases errors are related to electrical noise. Make sure high voltage power is separated from RSBus. Check for miswired and/or loose connections between the stat, indoor unit and outdoor unit. Check for a high voltage source of noise close to the system. Fault clears after communication is restored.
E 110	Low line voltage.	Line Voltage Low (Voltage lower than nameplate rating). Check power line voltage and correct. Alarm clears 5 seconds after fault recovered.
E 111	Line voltage polarity reversed.	Reverse line power voltage wiring. System resumes normal operation 5 seconds after fault recovered.
E 112	Ground not detected	System shuts down. Provide proper earth ground. System resumes normal operation 5 seconds after fault recovered.
E 113	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.
E 114	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.
E 115	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.
E 116	High 24V.	24 Volt Power High (Range is 18 to 30 volts). Check and correct voltage. Check for proper line voltage (120V, 240V, etc.) to equipment. Clears when control senses proper voltage.
E 117	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.
E 120	Unresponsive device. Communication only.	Usually caused by delay in outdoor unit responding to indoor unit poling. Recycle power. Check all wiring connections. Cleared after unresponsive device responds to any inquiry.

TABLE 5 Continued

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E 124	Active communicating thermostat signal missing for more than 3 minutes.	Equipment lost communication with the thermostat. Check four wiring connections, ohm wires and cycle power at the thermostat. Alert stops all services and waits for heartbeat message from thermostat (subnet controller). Cleared after valid thermostat (subnet controller) message is received.
E 125	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.
E 126	Control internal communication problem.	Hardware problem on the control. Cycle power on control. Replace if problem prevents service and is persistent. Cleared 300 seconds after fault recovered.
E 131	Corrupted control parameters (Verify configuration of system). Communicating only.	Reconfigure the system. Replace control if heating or cooling is not available. Only applicable in the communicating mode, not in startup. Exit from Commissioning and Execute 'Set Factory Default mode'. Control will still operate on default parameter settings.
E 180	Outdoor air temperature sensor failure. Only shown if shorted or out-of-range.	Compare outdoor sensor resistance to temperature/resistance charts in unit installation instructions. Replace sensor pack if necessary. At beginning of (any) configuration, furnace or air handler control will sense outdoor air and discharge air temperature sensor(s). If detected (reading in range), appropriate feature will be set as 'installed' and that could be seen in 'About' screen. In normal operation after control recognizes sensors, alarm will be sent if valid temperature reading is lost. To get rid of setting and alarm, redo configuration and make sure that temperature sensor is marked as 'not installed' in Indoor Unit 'About' screen. When Indoor unit control is replaced, thermostat will 'tell' new control if temperature sensor is in system or not. Clears 30 seconds after fault recovered.
E 200	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.
E 201	Indoor blower communication failure - Unable to communicate with blower motor.	Indoor blower communication failure (including power outage). Lost communication with indoor blower motor. Possible causes: motor not powered, loose wiring. Problem may be on control or motor side. Cleared after fault recovered.
E 202	Indoor blower motor mis-match - Indoor motor horsepower does not match unit capacity. See Page 71.	Incorrect appliance capacity code selected. Check for proper configuring under: Unit Size Codes for Furnace/Air Handler on configuration guide or in installation instructions. Cleared after the correct match is detected following a reset. (Remove thermostat from system while applying power and reprogramming.)
E 203	Appliance capacity / size is NOT programmed. Invalid unit codes refer to configuration flow chart. See Page 71.	No appliance capacity code selected. Check for proper configuring under: Unit Size Codes for Furnace on configuration guide or in installation instructions. Critical Alert. Cleared after valid unit code is read following a reset. (Remove thermostat from system while applying power and reprogramming.)
E 204	Gas valve mis-wired.	Check gas valve operation and wiring. Clears when repaired.
E 205	Gas valve control relay contact shorted.	Check wiring on control and gas valve. If wiring is correct, replace control.

TABLE 5 Continued

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E 206	Gas valve second-stage relay failure	Furnace will operate on 1st stage for remainder of the heating demand. Will clear after fault recovered. If unable to operate 2nd stage, replace control.
E 207	Hot surface ignitor sensed open - Refer to troubleshooting. See Page 72.	Measure resistance of hot surface ignitor. Replace if open or not within specified range found in IOM. Resumes normal operation after fault is cleared.
E 223	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
E 224	Low pressure switch failed closed - Refer to troubleshooting. See Page 72.	Check operation of low pressure switch to see if it is stuck closed on heat call longer than 150 seconds. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E 225	High pressure switch failed open - Refer to troubleshooting. See Page 72.	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. Resumes normal operation after fault is cleared.
E 226	High pressure switch failed closed - Refer to troubleshooting. See Page 72.	Check operation 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. Resumes normal operation after fault is cleared.
E 227	Low pressure switch open during trial for ignition or run mode. Refer to troubleshooting. See Page 72.	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.
E 228	Combustion air inducer calibration failure	Unable to perform pressure switch calibration. Check vent system and pressure switch wiring connections. Resumes normal operation after fault is cleared.
E 229	Ignition on High Fire - Information Only	Code is displayed if 1) low pressure switch fails to close, then furnace will switch to high speed inducer to close both low and high pressure switches, then furnace lights on high fire, or 2) if continuous fan is active, furnace lights on high fire for 60 seconds to improve heat exchanger warm up time.
E 240	Low flame current - Run mode - Refer to troubleshooting. See Page 72.	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.
E 241	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.
E 250	Limit switch circuit open - Refer to troubleshooting. See Page 72	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.
E 252	Discharge air temperature too high (gas heat only).	Check temperature rise, air flow and input rate. Cleared when heat call is finished.
E 270	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.

TABLE 5 Continued

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E 271	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.
E 272	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.
E 273	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.
E 274	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.
E 275	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.
E 276	Watchguard calibration failure.	Unable to perform pressure switch calibration. Check vent system and pressure switch wiring connections. 1-hour soft lockout. Clears when calibration has finished successfully.
E 290	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.
E 291	Heat air flow restricted below the minimum.	Check for dirty filter and air flow restriction. Check blower performance. 1-hour soft lockout. Cleared when heat call finishes successfully.
E 292	Indoor blower motor unable to start due to obstructed wheel, seized bearings.	Indoor blower motor unable to start (seized bearing, stuck wheel, etc.). Replace motor or wheel if assembly does not operate or meet performance standards. 1-hour soft lockout. Clears after circulator successfully starts.
E 294	Combustion air inducer over current.	Check combustion blower bearings, wiring and amps. Replace if does not operate or does not meet performance standards. Clears after inducer current is sensed to be in-range after the ignition following the soft lockout or reset.
E 295	Indoor blower motor temperature is too high.	Indoor blower motor over temperature (motor tripped on internal protector). Check motor bearings and amps. Replace if necessary. Cleared after blower demand is satisfied.
E 310	Discharge error temperature sensor failure. Only shown if shorted or out of range.	Compare outdoor sensor resistance to temperature/resistance charts in installation instructions. Replace sensor if necessary. Cleared in Communicating mode: 30 seconds after fault recovered. In Non-Communicating mode: Cleared after the current heat call is completed.
E 311	Heat rate reduced to match indoor blower air flow.	Warning Only. Furnace blower in cutback mode due to restricted airflow. Reduce firing rate every 60 seconds to match available CFM. Check filter and duct system. To clear, replace filter if needed or repair/add duct. 2-stage controls will reduce firing rate to 1st stage. Clears when heat call finishes successfully.

TABLE 5 Continued

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E 312	Restricted air flow in cooling or continuous fan mode is lower than cfm setting.	Warning Only. Restricted airflow - Indoor blower is running at a reduced CFM (Cutback Mode - The variable speed motor has pre-set speed and torque limiters to protect the motor from damage caused by operating outside of design parameters (0 to 0.8" W.C.. total external static pressure). Check filter and duct system. To clear, replace filter if needed or repair/add duct. Cleared after the current service demand is satisfied.
E 313	Indoor or outdoor unit capacity mismatch. Communication only.	Incorrect indoor/outdoor capacity code selected. Check for proper configuring in installation instructions. Alarm is just a warning. The system will operate, but might not meet efficiency and capacity parameters. Alarm will clear when commissioning is exited. Cleared after commissioning is complete.
E 331	Global network connection - Communication link problem.	For Future Use.
E 334	Relay "Y1" stuck on interated control.	Replace integrated control.
E 347	No 24 Volt output on Y1 of "integrated control" with non communicating outdoor unit.	Operation stopped. Y1 relay / Stage 1 failed. (Pilot relay contacts did not close or the relay coil did not energize; no input back to IFC chip). Critical Alert. Cleared after reset and Y1 input sensed.
E 348	No 24 Volt output on Y2 of "integrated control" with non?communicating outdoor unit.	Y2 relay / Stage 2 failed. (Pilot relay contacts did not close or the relay coil did not energize; no input back to IFC chip). Critical Alert. Cleared after reset and Y1 input sensed.
E 349	No 24 Volts between R & O on "integrated control" with non communicating outdoor unit (Dual fuel module required for heat pump application).	Configuration link R to O needs to be restored. Replace link or hard-wire. Applicable in non communicating mode. Critical Alert.
E 370	Interlock switch sensed open for 2 minutes.	Control sees the loss of 24VAC for 2 minutes .Terminate all services and wait for interlock switch to close. The alarm will clear when 24VAC is continuously sensed on DS terminal for a minimum of 10 seconds or on a power reset.
E 400	LSOM - Compressor internal overload tripped.	Thermostat demand Y1 is present; but, compressor is not running. Check power to outdoor unit. Clears the error after current is sensed in both RUN and START sensors for at least 2 seconds, or after service is removed, or after power reset.
E 401	LSOM Compressor long run cycle or low system pressure.	Compressor ran more than 18 hours to satisfy a single thermostat demand. Critical Alert. Clears the error after 30 consecutive normal run cycles or power reset. Also monitors low pressure switch trips.
E 402	LSOM - Outdoor unit system pressure trip.	Discharge or suction pressure out-of-limits, or compressor overloaded. Clears the error after 4 consecutive normal compressor run cycles.
E 403	LSOM - Compressor short-cycling. .(Running less than 4 minutes). Outdoor unit pressure trip	Compressor runs less than 3 minutes to satisfy a thermostat demand. Clears the error after 4 consecutive normal run cycles or power reset.
E 404	LSOM - Compressor rotor locked. Compressor short-cycling. (Running less than 4 minutes).	Compressor rotor locked up due to run capacitor short, bearings are seized, excessive liquid refrigerant, etc. Clears the error after 4 consecutive normal run cycles or after power reset.
E 405	LSOM - Compressor open circuit.	Compressor circuit open (due to power disconnection, open fuse, etc.) Clears the error after 1 normal compressor run cycle.

TABLE 5 Continued

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E 406	LSOM - Compressor open start circuit.	Required amount of current is not passing through Start current transformer. Clears the error after current is sensed in START sensor, or after power reset.
E 407	LSOM - Compressor open run circuit.	Required amount of current is not passing through Run current transformer. Clears the error after current is sensed in RUN sensor, or 1 normal compressor run cycle, or after power reset.
E 408	LSOM - Compressor contactor is welded.	Compressor runs continuously. Clears the error after 1 normal compressor run cycle or after power reset.
E 409	LSOM - Compressor low voltage.	Secondary voltage is below 18VAC. After 10 minutes, operation is discontinued. Clears the code after voltage is higher than 20 VAC for 2 seconds or after power reset.

DIP Switch Settings

NOTE - *All icomfort ™ settings are set at the icomfort Wi-Fi® thermostat. See icomfort ™ installation instruction. In icomfort ™ communication system all DIP switch and clippable link settings are ignored. For conventional thermostats proceed with DIP switch and clippable link settings as outlined in the following.*

Heating Operation DIP Switch Settings

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

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

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

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

Switches 3 and 4 -- Blower-Off Delay -- The blower-on delay of 30 seconds is not adjustable. The blower-off delay (time that the blower operates after the heating demand has been satisfied) can be adjusted by moving switches 3 and 4 on the integrated control. The unit is shipped from the factory with a blower-off delay of 90 seconds. The blower off delay affects comfort and is adjustable to satisfy individual applications. Adjust the blower off delay to achieve a supply air temperature between 90° and 110°F at the exact moment that the blower is de-energized. Longer off delay settings provide lower supply air temperatures; shorter settings provide higher supply air temperatures.Table 6 provides the blower off timings that will result from different switch settings.

TABLE 6
Blower Off Delay Switch Settings

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

Indoor Blower Operation DIP Switch Settings

Switches 5 and 6 -- Cooling Mode Blower Speed -- The unit is shipped from the factory with the dip switches positioned for high speed (4) indoor blower motor operation during the cooling mode. Table 7 provides the cooling mode blower speeds that will result from different switch settings. Switches 5 and 6 set the blower cfm for second-stage cool. The integrated control automatically ramps down to 70% of the second-stage cfm for first-stage cfm. Refer to tables for corresponding cfm values.

TABLE 7
Cooling Mode Blower Speeds

Speed	Switch 5	Switch 6
Low	On	On
Medium Low	Off	On
Medium High	On	Off
High (Factory)	Off	Off

Switches 7 and 8 -- Cooling Blower Speed Adjustment -- The unit is shipped from the factory with the dip switches positioned for NORMAL (no) adjustment. The dip switches may be positioned to adjust the blower speed by +10% or

-10% to better suit the application. Table 8 below provides blower speed adjustments that will result from different switch settings. Refer to tables for corresponding cfm values.

TABLE 8
Cooling Blower Speed Adjustment

Adjustment	Switch 7	Switch 8
+10% (approx.)	On	Off
Factory Default	Off	Off
-10% (approx.)	Off	On

Switches 9 and 10 -- Cooling Mode Blower Speed Ramping -- Blower speed ramping may be used to enhance dehumidification performance. The switches are factory set at option A which has the greatest effect on dehumidification performance. Table 9 provides the cooling mode blower speed ramping options that will result from different switch settings. The cooling mode blower speed ramping options are detailed below.

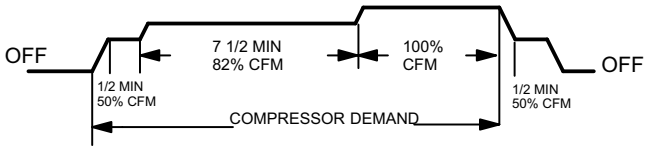
NOTE - *In heat pump mode blower operation defaults to option c.*

TABLE 9
Cooling Mode Blower Speed Ramping

Ramping Option	Switch 9	Switch 10
A (Factory)	Off	Off
B	Off	On
C	On	Off
D	On	On

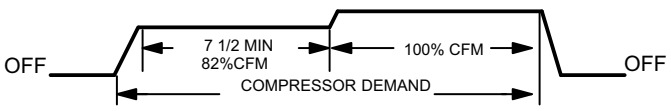
Ramping Option A (Factory Selection)

- Motor runs at 50% for 30 seconds.
- Motor then runs at 82% for approximately 7-1/2 minutes.
- If demand has not been satisfied after 7-1/2 minutes, motor runs at 100% until demand is satisfied.
- Once demand is met, motor runs at 50% for 30 seconds then ramps down to stop.



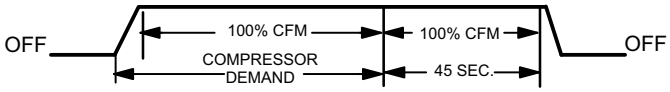
Ramping Option B

- Motor runs at 82% for approximately 7-1/2 minutes. If demand has not been satisfied after 7-1/2 minutes, motor runs at 100% until demand is satisfied.
- Once demand is met, motor ramps down to stop.



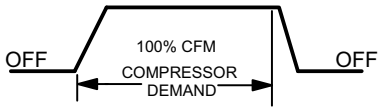
Ramping Option C

- Motor runs at 100% until demand is satisfied.
- Once demand is met, motor runs at 100% for 45 seconds then ramps down to stop.



Ramping Option D

- Motor runs at 100% until demand is satisfied.
- Once demand is met, motor ramps down to stop.



Switches 11, 12 and 13 -- Heating Mode Blower Speed -- The switches are factory set to the OFF position which provides factory default heat speed. Refer to table 10 for switches 11, 12 and 13 that provided the corresponding increases or decrease to both high and low heat demand.

TABLE 10
Heating Mode Blower Speeds

Heat Speed	Switch 11	Switch 12	Switch 13
Increase 24%	On	On	On
Increase 18%	On	On	Off
Increase 12%	On	Off	On
Increase 6%	On	Off	Off
Factory Default	Off	Off	Off
Decrease 6%	Off	Off	On
Decrease 12%	Off	On	Off
Decrease18%	Off	On	On

Switches 14 and 15 -- Continuous Blower Speed -- Table 11 provides continuous blower speed adjustments that will result from different switch settings.

TABLE 11
Continuous Blower Speed

Continuous Blower Speed	Switch 14	Switch 15
28% of High Cool Speed	Off	On
38% of High Cool Speed (Factory)	Off	Off
70% of High Cool Speed	On	Off
100% of High Cool Speed	On	On

BLOWER DATA

EL296DF045XV36B BLOWER PERFORMANCE (less filter)

BOTTOM RETURN AIR

0 through 0.8 in. w.g. (Heating) and 0 through 1.0 in. w.g. (Cooling) External Static Pressure Range

HEATING		
[1] Heating Speed DIP Switch Settings	First Stage Heating Speed - cfm	Second Stage Heating Speed - cfm
+24%	910	1150
+18%	855	1095
+12%	820	1040
+6%	770	990
Factory Default	745	935
–6%	700	880
–12%	665	820
–18%	635	755

COOLING								
[1] Cooling Speed DIP Switch Settings	First Stage Cooling Speed - cfm				Second Stage Cooling Speed - cfm			
	Low	Medium-Low	Medium-High	[2] High	Low	Medium-Low	Medium-High	[2] High
+	640	755	850	975	895	1050	1210	1360
Factory Default	580	695	780	880	805	965	1105	1250
–	545	645	720	795	735	865	1000	1130

[1] Cooling and heating speeds are based on a combination of DIP switch settings on the furnace control. Refer to Installation Instructions for specific DIP Switch Settings.

[2] Factory default setting.

NOTES -
- The effect of static pressure is included in air volumes shown.
- First stage HEAT is approximately 91% of the same second stage HEAT.
- First stage COOL (two-stage air conditioning units only) is approximately 70% of the same second stage COOL speed position.
- Continuous Fan Only speed is selectable at 28%, 38%, 70% and 100% of the selected second stage cooling speed - minimum 250 cfm.
- Lennox Harmony III™ Zone Control Applications - Minimum blower speed is 250 cfm.

EL296DF045XV36B BLOWER MOTOR WATTS (COOLING)

[1] Cooling Speed DIP Switch Settings		Motor Watts @ Various External Static Pressures - in. wg.																				
		First Stage									Second Stage											
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
+ Setting																						
Cooling Speed	Low	28	44	60	77	93	112	128	144	158	59	77	97	121	138	160	182	197	216	241	256	
	Med-low	47	67	88	105	121	138	161	179	201	131	154	177	202	228	250	277	299	320	344	370	
	Med-High	69	91	113	132	160	183	204	220	246	199	215	248	275	308	340	360	390	407	431	445	
	High	100	117	153	172	192	215	240	260	286	292	313	363	379	419	452	488	511	526	523	524	
Factory Default																						
Cooling Speed	Low	17	34	52	65	82	97	121	132	148	61	79	98	125	141	164	185	201	219	246	259	
	Med-low	35	50	70	85	105	125	140	155	175	99	115	148	167	188	211	236	256	279	303	317	
	Med-High	54	72	95	113	131	148	173	189	210	147	170	197	223	252	278	301	330	355	373	398	
	High	74	96	118	141	168	190	212	233	252	216	229	258	303	325	356	390	410	426	448	465	
– Setting																						
Cooling Speed	Low	17	31	49	61	75	91	107	123	136	46	64	82	101	115	134	155	174	196	205	221	
	Med-low	28	45	61	77	93	112	129	144	159	72	92	114	133	160	184	204	221	247	263	282	
	Med-High	40	57	77	93	112	130	148	165	186	112	130	161	183	205	226	252	272	294	319	341	
	High	57	76	97	119	136	156	179	195	214	155	174	207	235	265	292	311	343	370	386	414	

BLOWER DATA

EL296DF070XV48B BLOWER PERFORMANCE (less filter)

BOTTOM RETURN AIR

0 through 0.8 in. w.g. (Heating) and 0 through 1.0 in. w.g. (Cooling) External Static Pressure Range

HEATING		
[1] Heating Speed DIP Switch Settings	First Stage Heating Speed - cfm	Second Stage Heating Speed - cfm
+24%	1085	1635
+18%	1030	1525
+12%	950	1450
+6%	910	1365
Factory Default	850	1310
–6%	790	1225
–12%	740	1135
–18%	680	1060

COOLING								
[1] Cooling Speed DIP Switch Settings	First Stage Cooling Speed - cfm				Second Stage Cooling Speed - cfm			
	Low	Medium-Low	Medium-High	[2] High	Low	Medium-Low	Medium-High	[2] High
+	740	915	1055	1255	1110	1340	1575	1800
Factory Default	660	820	940	1120	995	1230	1420	1650
–	575	735	850	995	880	1085	1290	1460

[1] Cooling and heating speeds are based on a combination of DIP switch settings on the furnace control. Refer to Installation Instructions for specific DIP Switch Settings.

[2] Factory default setting.

NOTES -

The effect of static pressure is included in air volumes shown.
First stage HEAT is approximately 91% of the same second stage HEAT.
First stage COOL (two-stage air conditioning units only) is approximately 70% of the same second stage COOL speed position.
Continuous Fan Only speed is selectable at 28%, 38%, 70% and 100% of the selected second stage cooling speed - minimum 380 cfm.
Lennox Harmony III™ Zone Control Applications - Minimum blower speed is 380 cfm.

EL296DF070XV48B BLOWER MOTOR WATTS (COOLING)

[1] Cooling Speed DIP Switch Settings		Motor Watts @ Various External Static Pressures - in. wg.																			
		First Stage									Second Stage										
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
+ Setting																					
Cooling Speed	Low	68	88	109	132	154	178	199	213	238	144	169	208	244	270	310	343	378	401	432	457
	Med-low	93	120	147	172	198	220	254	274	304	257	276	326	370	398	437	470	492	531	558	598
	Med-High	120	152	180	220	254	281	318	344	380	390	428	472	526	574	611	659	706	745	788	820
	High	214	237	284	324	352	390	424	456	474	627	604	663	721	775	825	869	908	915	881	864
Factory Default																					
Cooling Speed	Low	35	54	74	92	109	129	147	163	191	104	137	162	189	219	254	278	312	341	369	400
	Med-low	75	100	115	140	165	190	210	230	255	188	203	250	297	327	374	399	432	454	486	513
	Med-High	99	129	159	179	209	236	270	293	329	304	340	376	418	450	495	533	567	613	637	674
	High	157	184	232	264	285	335	365	406	419	454	469	537	589	634	669	724	770	818	833	840
– Setting																					
Cooling Speed	Low	27	49	63	73	98	116	135	155	168	86	111	135	162	186	206	236	257	283	306	339
	Med-low	67	87	109	132	154	177	199	212	238	129	156	187	226	258	288	325	353	385	409	441
	Med-High	82	105	127	153	176	196	223	243	269	226	244	290	335	364	402	435	465	485	516	556
	High	107	141	164	195	224	263	282	321	347	329	375	403	444	481	526	570	612	656	680	718

BLOWER DATA

EL296DF090XV60C BLOWER PERFORMANCE (less filter)

BOTTOM RETURN AIR

0 through 0.8 in. w.g. (Heating) and 0 through 1.0 in. w.g. (Cooling) External Static Pressure Range

HEATING		
[1] Heating Speed DIP Switch Settings	First Stage Heating Speed - cfm	Second Stage Heating Speed - cfm
+24%	1425	1895
+18%	1355	1825
+12%	1280	1740
+6%	1215	1660
Factory Default	1160	1575
–6%	1055	1455
–12%	1010	1365
–18%	950	1265

COOLING								
[1] Cooling Speed DIP Switch Settings	First Stage Cooling Speed - cfm				Second Stage Cooling Speed - cfm			
	Low	Medium-Low	Medium-High	[2] High	Low	Medium-Low	Medium-High	[2] High
+	1115	1265	1400	1600	1600	1750	1970	2130
Factory Default	1005	1150	1275	1450	1450	1630	1810	1975
–	890	1065	1150	1270	1270	1450	1645	1810

[1] Cooling and heating speeds are based on a combination of DIP switch settings on the furnace control. Refer to Installation Instructions for specific DIP Switch Settings.

[2] Factory default setting.

NOTES -
- The effect of static pressure is included in air volumes shown.
- First stage HEAT is approximately 91% of the same second stage HEAT.
- First stage COOL (two-stage air conditioning units only) is approximately 70% of the same second stage COOL speed position.
- Continuous Fan Only speed is selectable at 28%, 38%, 70% and 100% of the selected second stage cooling speed - minimum 450 cfm.
- Lennox Harmony III™ Zone Control Applications - Minimum blower speed is 450 cfm.

EL296DF090XV60C BLOWER MOTOR WATTS (COOLING)

[1] Cooling Speed DIP Switch Settings		Motor Watts @ Various External Static Pressures - in. wg.																				
		First Stage									Second Stage											
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
+ Setting																						
Cooling Speed	Low	79	108	144	162	207	242	262	293	323	275	299	366	399	449	483	532	584	605	644	680	
	Med-low	120	156	187	233	261	279	329	368	401	387	409	471	521	562	606	650	688	716	762	800	
	Med-High	155	202	235	293	317	369	407	453	502	547	577	622	667	744	795	835	872	910	950	963	
	High	268	299	366	399	449	483	532	584	605	780	775	811	898	942	994	1048	1071	1082	1080	1073	
Factory Default																						
Cooling Speed	Low	56	86	111	140	170	200	232	259	282	186	219	270	308	361	390	431	489	517	555	590	
	Med-low	93	118	152	195	223	254	283	306	344	278	304	365	420	450	510	544	592	640	665	698	
	Med-High	123	161	201	228	260	310	341	381	416	446	475	528	582	616	662	686	747	780	823	855	
	High	182	219	270	308	361	390	431	489	517	576	603	654	704	756	809	871	902	939	972	975	
– Setting																						
Cooling Speed	Low	48	69	101	120	152	175	201	218	249	118	155	181	232	259	299	340	376	402	438	476	
	Med-low	65	94	123	150	185	220	250	278	296	177	205	267	304	353	390	430	486	515	563	587	
	Med-High	93	118	152	195	223	254	283	306	344	301	322	392	439	468	531	568	599	647	678	721	
	High	116	155	181	232	259	299	340	376	402	446	475	528	582	616	662	686	747	780	823	855	

BLOWER DATA

EL296DF110XV60C BLOWER PERFORMANCE (less filter)

BOTTOM RETURN AIR

0 through 0.8 in. w.g. (Heating) and 0 through 1.0 in. w.g. (Cooling) External Static Pressure Range

HEATING		
[1] Heating Speed DIP Switch Settings	First Stage Heating Speed - cfm	Second Stage Heating Speed - cfm
+24%	1535	2015
+18%	1445	1935
+12%	1370	1855
+6%	1300	1760
Factory Default	1220	1645
–6%	1135	1545
–12%	1070	1420
–18%	1000	1335

COOLING								
[1] Cooling Speed DIP Switch Settings	First Stage Cooling Speed - cfm				Second Stage Cooling Speed - cfm			
	Low	Medium-Low	Medium-High	[2] High	Low	Medium-Low	Medium-High	[2] High
+	1095	1265	1395	1585	1585	1790	1990	2180
Factory Default	965	1130	1285	1440	1440	1630	1845	2005
–	860	1035	1130	1275	1275	1475	1655	1845

[1] Cooling and heating speeds are based on a combination of DIP switch settings on the furnace control. Refer to Installation Instructions for specific DIP Switch Settings.

[2] Factory default setting.

NOTES -
- The effect of static pressure is included in air volumes shown.
- First stage HEAT is approximately 91% of the same second stage HEAT.
- First stage COOL (two-stage air conditioning units only) is approximately 70% of the same second stage COOL speed position.
- Continuous Fan Only speed is selectable at 28%, 38%, 70% and 100% of the selected second stage cooling speed - minimum 450 cfm.
- Lennox Harmony III™ Zone Control Applications - Minimum blower speed is 450 cfm.

EL296DF110XV60C BLOWER MOTOR WATTS (COOLING)

[1] Cooling Speed DIP Switch Settings		Motor Watts @ Various External Static Pressures - in. wg.																				
		First Stage									Second Stage											
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
+ Setting																						
Cooling Speed	Low	71	99	147	166	202	240	271	302	337	248	280	333	374	429	469	511	548	594	619	677
	Med-low	127	159	198	225	256	301	325	365	390	409	427	496	531	587	632	665	721	742	781	805
	Med-High	162	204	242	287	316	371	408	446	487	563	589	651	703	755	808	860	888	932	970	1007
	High	243	280	333	374	429	469	511	548	594	866	850	915	963	1020	1056	1091	1127	1141	1136	1131
Factory Default																						
Cooling Speed	Low	57	88	117	140	165	196	232	259	283	167	214	244	291	331	380	405	467	497	539	583
	Med-low	77	112	147	172	209	250	283	317	345	275	321	348	418	447	505	546	597	632	668	716
	Med-High	122	154	199	230	268	300	331	373	411	461	493	547	572	628	666	703	745	777	819	860
	High	167	214	244	291	331	380	405	467	497	601	626	688	730	787	823	880	924	963	994	1011
– Setting																						
Cooling Speed	Low	44	67	99	115	144	167	197	215	245	126	165	201	232	262	305	334	373	417	451	479
	Med-low	66	97	123	153	186	216	247	275	303	187	219	272	308	360	391	432	479	514	559	588
	Med-High	77	112	147	172	209	250	283	317	345	308	341	390	430	490	528	569	617	640	691	724
	High	127	165	201	232	262	305	334	373	417	461	493	547	572	628	666	703	745	777	819	860

On-Board Links

Note: *In icomfort ™ systems with a conventional outdoor unit (non-communicating), the on-board clippable links must be set to properly configure the system.*

⚠WARNING

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 W914 Dehum or Harmony (R to DS)

On-board link W914, is a clippable connection between terminals R and DS on the integrated control. W914 must be cut when the furnace is installed with either the Harmony III™ zone control or a thermostat which features humidity control. If the link is left intact the PMW signal from the Harmony III control will be blocked and also lead to control damage. Refer to table 12 for operation sequence in applications including EL296DFV, a thermostat which features humidity control and a single-speed outdoor unit. Table 13 gives the operation sequence in applications with a two-speed outdoor unit.

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

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

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

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

TABLE 12
OPERATING SEQUENCE
EL296DFV, Non-Communicating Thermostat with Humidity Control Feature and Single-Speed Outdoor Unit

OPERATING SEQUENCE		SYSTEM DEMAND							SYSTEM RESPONSE		
System Condition	Step	Thermostat Demand					Relative Humidity		Compressor	Blower CFM (COOL)	Comments
		Y1	O	G	W 1		Status	D			
NO CALL FOR DEHUMIDIFICATION											
Normal Operation	1	On	On	On			Acceptable	24 VAC	High	100%	Compressor and indoor blower follow thermostat demand
BASIC MODE (only active on a Y1 thermostat demand)											
Normal Operation	1	On	On	On			Acceptable	24 VAC	High	100%	ComfortSense® 7000 thermostat energizes Y1 and de-energizes D on a call for de-humidification
Dehumidification Call	2	On	On	On			Demand	0 VAC	High	70%*	
PRECISION MODE (operates independent of a Y1 thermostat demand)											
Normal Operation	1	On	On	On			Acceptable	24 VAC	High	100%	Dehumidification mode begins when humidity is greater than set point
Dehumidification call	2	On	On	On			Demand	0 VAC	High	70%*	
Dehumidification call ONLY	1	On	On	On			Demand	0 VAC	High	70%*	ComfortSense® 7000 thermostat will try to maintain room humidity setpoint by allowing the room space to maintain a cooler room thermostat setpoint**
	Jumpers at indoor unit with a single stage outdoor unit With Condensing unit - Cut W914 (R to DS) on SureLight® control With Heat Pump - Cut W914 (R to DS) & W951 (R to O) on SureLight® control										

Use Dave Lennox ComfortSense® 7000 thermostat Y2081 4 heat / 2 cool for this application

**Dehumidification blower speed is 70% of COOL speed for all units .*

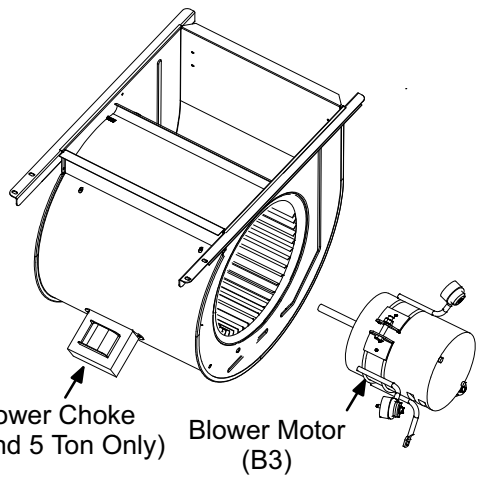
***In Precision mode, ComfortSense® 7000 thermostat will maintain room temperature up to 2 °F (1.2°C) cooler than room setting.*

TABLE 13
OPERATING SEQUENCE
EL296DFV, Non-Communicating Thermostat with Humidity Control Feature and Two-Speed Outdoor Unit

OPERATING SEQUENCE		SYSTEM DEMAND								SYSTEM RESPONSE		
System Condition	Step	Thermostat Demand						Relative Humidity		Compressor	Blower CFM (COOL)	Comments
		Y1	Y2	O	G	W1	W2	Status	D			
NO CALL FOR DEHUMIDIFICATION												
Normal Operation - Y1	1	On		On	On			Acceptable	24 VAC	Low	70%*	Compressor and indoor blower follow thermostat demand
Normal Operation - Y2	2	On	On	On	On			Acceptable	24 VAC	High	100%	
ROOM THERMOSTAT CALLS FOR FIRST STAGE COOLING												
BASIC MODE (only active on a Y1 thermostat demand)												
Normal Operation	1	On		On	On			Acceptable	24 VAC	Low	70%*	ComfortSense® 7000 thermostat energizes Y2 and de-energizes D on a call for de-humidification
Dehumidification Call	2	On	On	On	On			Demand	0 VAC	High	70%**	
PRECISION MODE (operates independent of a Y1 thermostat demand)												
Normal Operation	1	On		On	On			Acceptable	24 VAC	Low	70%*	Dehumidification mode begins when humidity is greater than set point
Dehumidification call	2	On	On	On	On			Demand	0 VAC	High	70%**	
Dehumidification call ONLY	1	On	On	On	On			Demand	0 VAC	High	70%**	ComfortSense® 7000 thermostat will try to maintain room humidity setpoint by allowing the room space to maintain a cooler room thermostat setpoint***
ROOM THERMOSTAT CALLS FOR FIRST AND SECOND STAGE COOLING												
BASIC MODE (only active on a Y1 thermostat demand)												
Normal Operation	1	On	On	On	On			Acceptable	24 VAC	High	100%	ComfortSense® 7000 thermostat energizes Y2 and de-energizes D on a call for de-humidification
Dehumidification Call	2	On	On	On	On			Demand	0 VAC	High	70%**	
PRECISION MODE (operates independent of a Y1 thermostat demand)												
Normal Operation	1	On		On	On			Acceptable	24 VAC	Low	70%*	Dehumidification mode begins when humidity is greater than set point
Dehumidification call	2	On	On	On	On			Demand	0 VAC	High	70%**	
Dehumidification call ONLY	1	On	On	On	On			Demand	0 VAC	High	70%**	ComfortSense® 7000 thermostat will try to maintain room humidity setpoint by allowing the room space to maintain a cooler room thermostat setpoint***
	Jumpers at indoor unit with a two stage outdoor unit Cut factory jumper from Y1 to Y2 or cut W915 (Y1 to Y2) With Condensing unit - Cut W914 (R to DS) on SureLight® control With Heat Pump - Cut W914 (R to DS) & W951 (R to O) on SureLight® control											

Use Dave Lennox ComfortSense® 7000 thermostat Y2081 4 heat / 2 cool for this application.
**Normal operation first stage cooling blower speed is 70% COOL speed.*
***Dehumidification blower speed is, reduced to 70% of COOL.*
****In Precision mode, ComfortSense® 7000 thermostat will maintain room temperature up to 2 °F (1.2°C) cooler than room setting.*

B- Indoor Blower Motor



To Remove Blower From Unit: Remove access panels, Control box, Bolts and Wiring Jackplugs. Then Slide Out Front of Unit.

FIGURE 6

⚠WARNING

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

The motor communicates with the integrated control via a 2-way serial connection. The motor receives all necessary functional parameters from the integrated control and does not rely on a factory program like traditional variable speed motors. EL296DFV units use a three-phase, electronically controlled D.C. brushless motor (controller converts single phase a.c. to three phase D.C.), with a permanent-magnet-type rotor (figure 7). Because this motor has a permanent magnet rotor it does not need brushes like conventional D.C. motors.

The stator windings are split into three poles which are electrically connected to the controller. This arrangement allows motor windings to turn on and off in sequence by the controller.

⚠ IMPORTANT

Earlier ECM motors used on other Lennox furnace models are not interchangeable with motors used on the EL296 furnace line.

A solid-state controller is permanently attached to the motor. The controller is primarily an A.C. to D.C. converter. Converted D.C. power is used to drive the motor. The controller contains a microprocessor which monitors varying conditions inside the motor (such as motor workload).

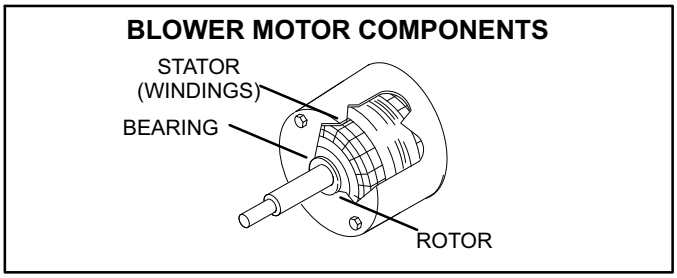


FIGURE 7

The controller uses sensing devices to sense what position the rotor is in at any given time. By sensing the position of the rotor and then switching the motor windings on and off in sequence, the rotor shaft turns the blower.

All EL296DFV blower motors use single phase power. An external run capacitor is not used. The motor uses permanently lubricated ball-type bearings.

Internal Operation

The motor is controlled via serial communication between the integrated control on the furnace and the controller attached to the motor shell. The messages sent back and forth between the two controls serve to communicate rotational direction, demand, motor size, current draw, torque, and rpm, among other variables.

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

Initial Power Up

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

Motor Start-Up

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

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

⚠ DANGER

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

Power Choke (L13)

A choke coil is used on EL296DFV 4 and 5 ton units equipped with 1 hp motors. The choke is located on the blower housing and is used to suppress transient current spikes.

Troubleshooting Motor Operation

To verify motor operation see steps below and figures 8 and 9.

1- Remove J48 (5 pin power plug) from P48 on the motor.

2- With the power on at the furnace and door switch depressed, use a test meter to verify 120V between pins 4 and 5 on J48.

3- Reconnect J48 to P48 on the motor.

4- Remove J49 (4 pin low voltage connector) from P49 on the motor.

5- Using test jumpers, apply 24V to pins 3 and 4 on P49 on the motor.

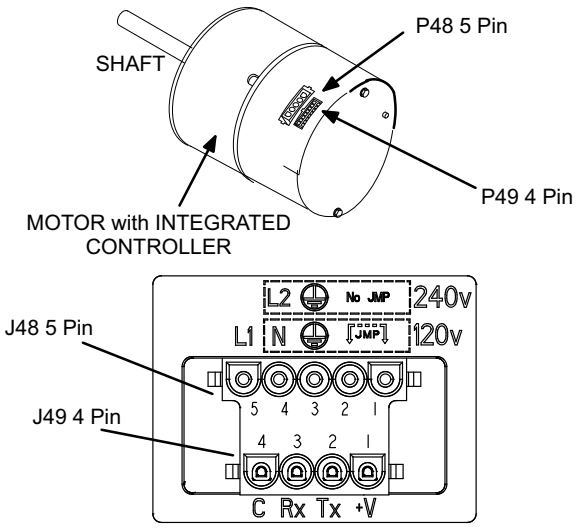
Note: *Do not apply 24V to pins 2 and 4 on P49. Doing so will cause permanent damage to the motor.*

6- Motor should run at 75%.

7- Test is complete. Remove jumpers and reconnect plugs.

Another option is to use the TECMate PRO motor tester with the 16 to 4 pin adaptor. The use of the TECMate PRO isolates the motor from the integrated control. Follow the instructions provided with the kit. If the motor runs do not replace.

BLOWER B3 HARNESS CONNECTORS



J49 4 Pin Control Connector	
PIN	DESCRIPTION
1	12V INPUT
2	SERIAL DATA OUTPUT
3	SERIAL DATA INPUT
4	COMMON

J48 5 Pin Line Voltage Connector	
PIN	DESCRIPTION
1	JUMPER PIN 1 TO PIN 2 FOR 120VAC LINE INPUT ONLY ***
2	
3	CHASSIS GROUND
4	AC LINE
5	AC LINE

FIGURE 8

BLOWER B3 HARNESS CONNECTORS

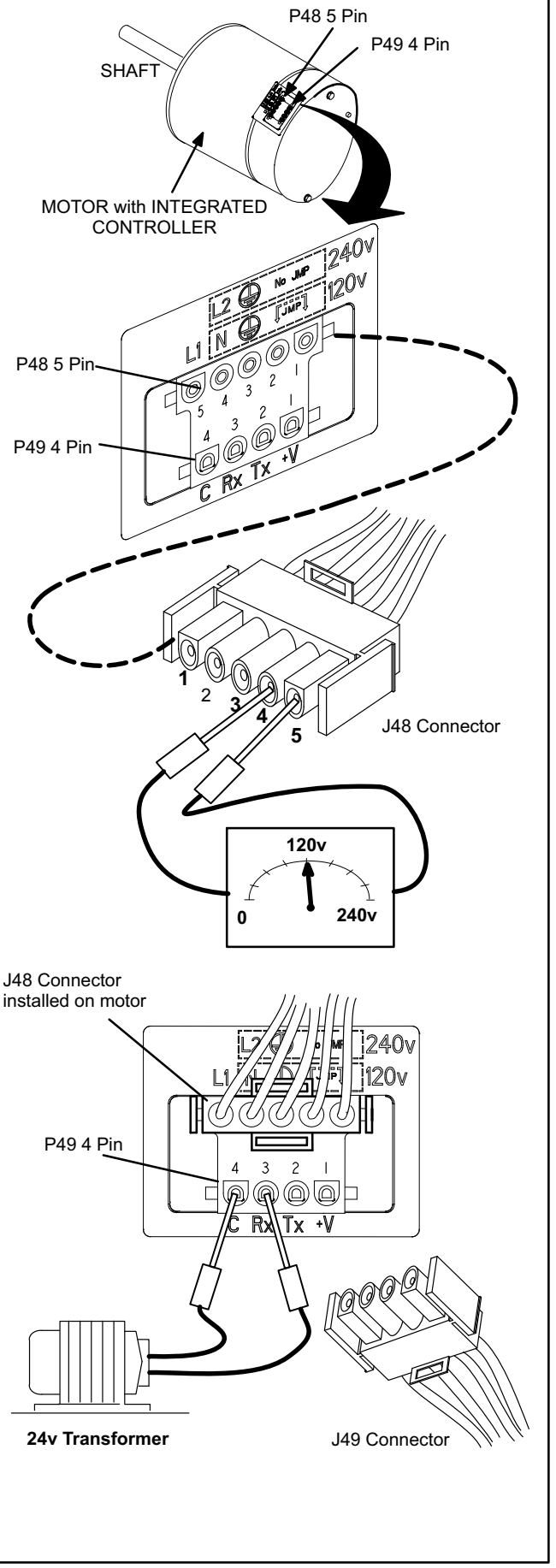


FIGURE 9

Troubleshooting Motor Windings

Ensure that motor windings are not damaged by performing the following tests:

NOTE *- If your ohm meter is not an auto-ranging type, set it to the highest ohm scale (100k ohms or greater) before performing tests.*

TABLE 14
Flame Signal in Microamps

Scale	Measurement Range	
	in words	ohms
2M	two megohm -- two million ohms	0-2,000,000
200k	two hundred kilohm -- two hundred thousand ohms	0-200,000
20k	twenty kilohm -- twenty thousand ohms	0-20,000
2k	two kilohm -- two thousand ohms	0-2,000
200	two hundred ohm	0-200

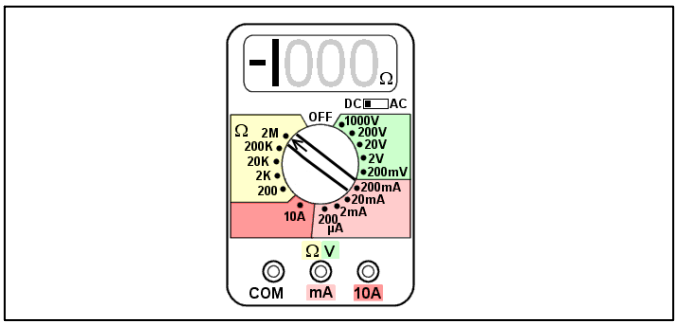


FIGURE 10

TEST A

Measure the resistance between each of the three motor leads (3-pin plug) and the unpainted part of the end shield.

If the winding resistance to ground is <100k ohms, replace the motor and control module. If the resistance to ground is >100k, the motor windings are fine. Proceed to Test B.

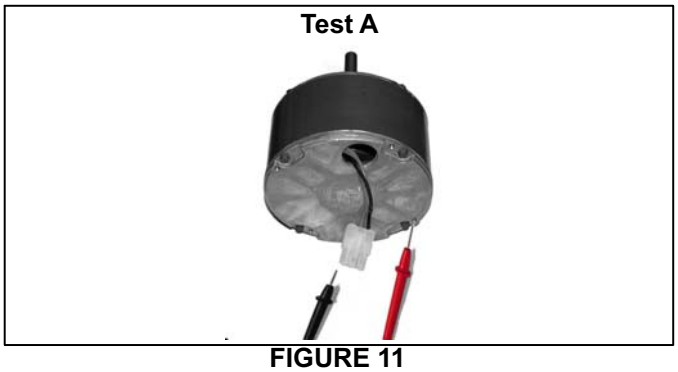


FIGURE 11

TEST B

Use an ohmmeter to measure the motor phase-to-phase resistance by checking these combinations of the the 3-pin motor plug. For the purpose of this test, start at either end of the connector as lead 1.

1 - The lead-to-lead resistance across any two leads should be less than 20 ohms.

2 - Each lead-to-lead resistance should be the same.

If the measured resistance is greater than 20 ohms, replace the motor and control module.

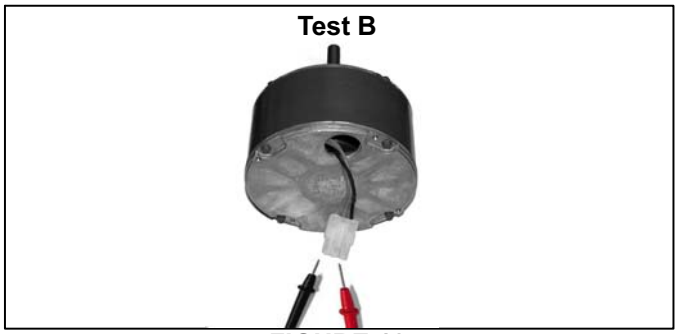


FIGURE 12

C- Heating Components

1. Ignitor

The SureLight® ignitor is made of durable silicon nitride. Ignitor longevity is enhanced by controlling voltage to the ignitor. The integrated control provides a regulated 120 volts to the ignitor for a consistent ignition and long ignitor life. Ohm value should be 39 to 70. See figure 13 for ignitor location and figure 14 for ignitor check out.

NOTE - *The EL296DFV(X) furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.*

2. Flame Sensor

A flame sensor is located on the left side of the burner support. See figure 13. The sensor tip protrudes into the flame envelope of the left-most burner. The sensor can be removed for service without removing any part of the burners. During operation, flame is sensed by current passed through the flame and sensing electrode. The SureLight control allows the gas valve to remain open as long as flame signal is sensed. To check flame sense signal use the push-button found on the integrated control and go to Field Test Mode. The menu will display the flame signal. See table 15 for flame signal.

TABLE 15
Flame Signal in Microamps

Normal	Low	Drop Out
2.6 or greater	2.5 or less	1.1

3. Gas Valve

The valve (figure 51) is internally redundant to assure safety shut-off. If the gas valve must be replaced, the same type valve must be used.

24VAC terminals and gas control knob are located on the valve. A wire harness connects the terminals from the gas valve to the electronic ignition control. 24V applied to the terminals energizes the valve.

Inlet and outlet pressure taps are located on the valve. A regulator adjustment screw is located on the valve.

LPG change over kits are available from Lennox. Kits include burner orifices and a gas valve.

4. Flame Rollout Switches (S47)

Flame rollout switch is a high temperature limit located on top of the burner box, one on each side.- See figure 13. The limit is a N.C. SPST manual-reset limit. When S47 senses rollout, the circuit breaks and the ignition control immediately stops ignition and closes the gas valve. Rollout can be caused by a blocked heat exchanger, flue or lack of combustion air. The switch is factory set to trip (open) at 210°F and cannot be adjusted. The switch can be manually reset. To manually reset a tripped switch, push the reset button located on the control.

5. Burners

All units use inshot burners. Burners are factory set and require no adjustment. Always operate the unit with the burner box front panel in place. Each burner uses an orifice (see table 28 for orifice size) that is precisely matched to the burner input. Burners can be removed as a one piece assembly for service. If burner assembly has been removed, it is critical to align center of each burner to the center of the clamshell when re-installing. See more detail in Section VI- MAINTENANCE.

6. Primary Limit Control (S10)

The primary limit (S10) is located in the heating vestibule panel. When excess heat is sensed in the heat exchanger, the limit will open. If the limit is open, the furnace control energizes the supply air blower and closes the gas valve. The limit automatically resets when unit temperature returns to normal. The switch must reset within three minutes or the 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,

EL296DFV HEATING COMPONENTS

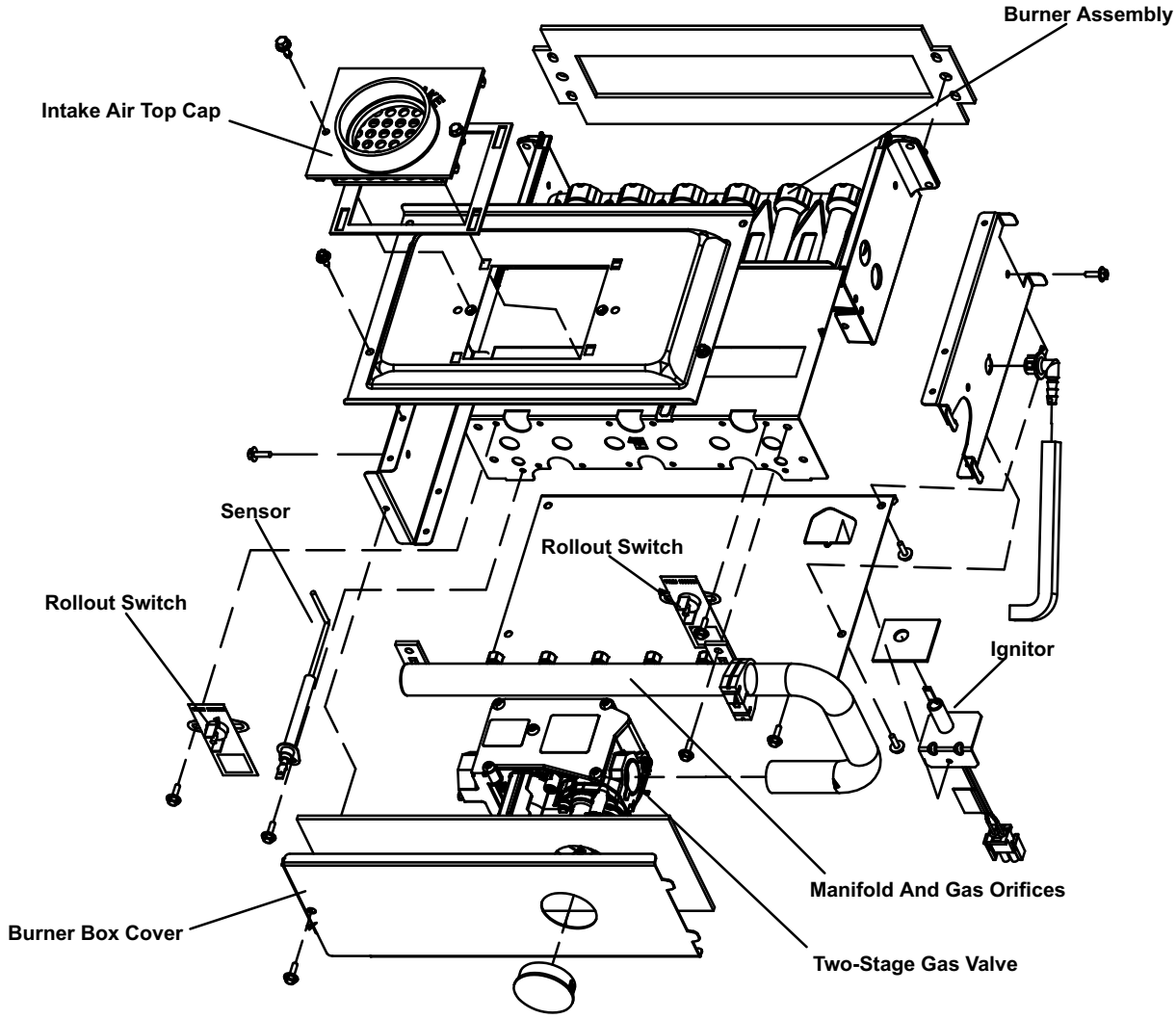
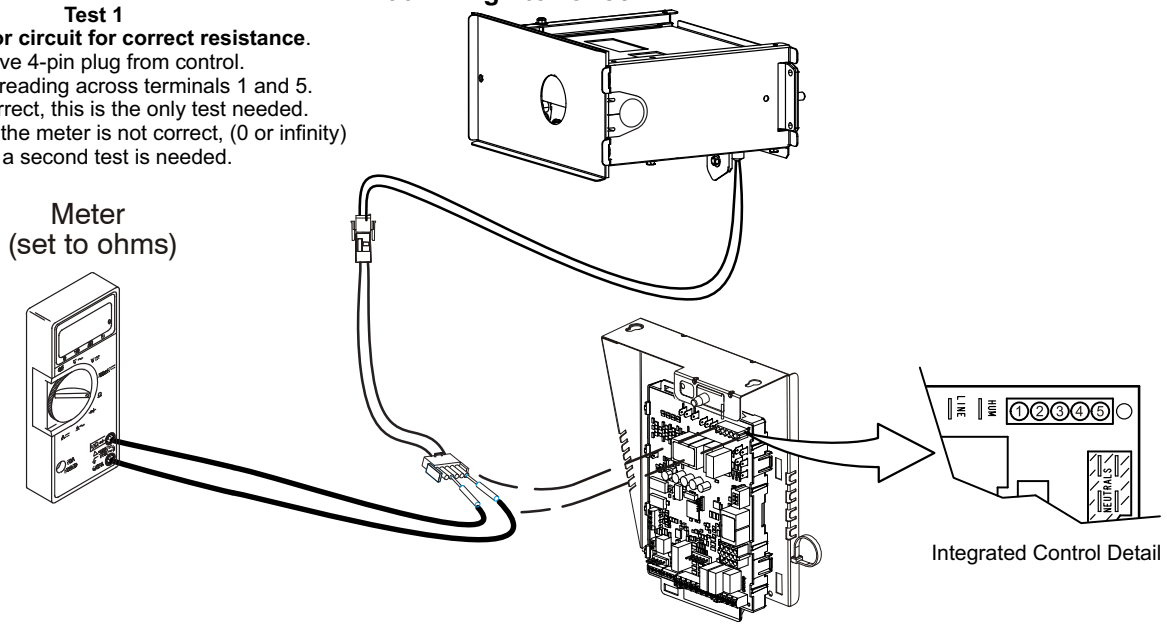


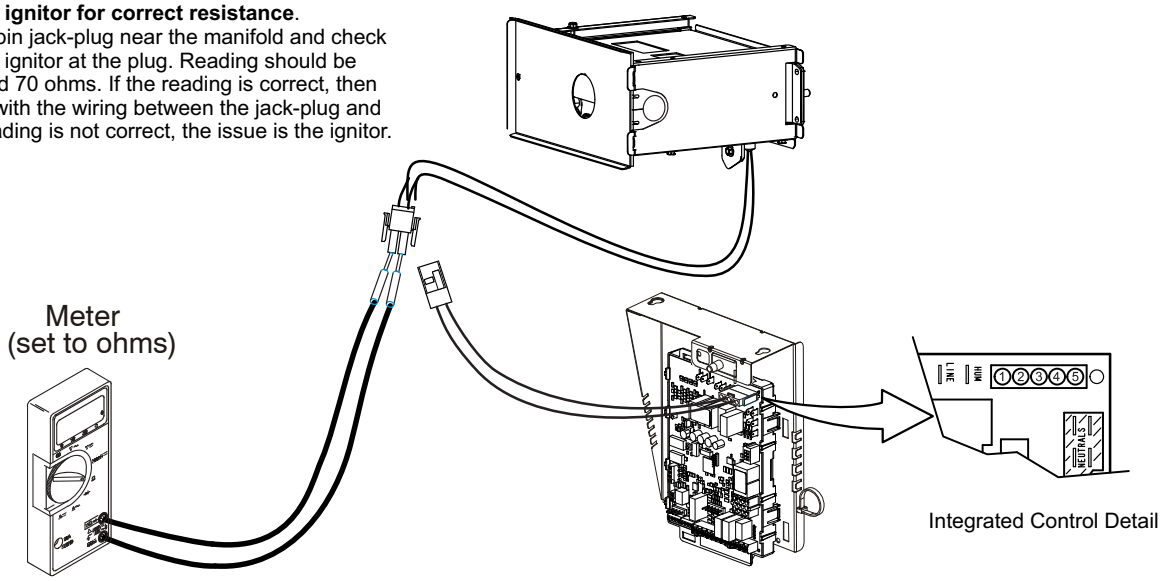
FIGURE 13

EL296DFV Ignitor Check

Test 1
Check ignitor circuit for correct resistance.
Remove 4-pin plug from control.
Check ohms reading across terminals 1 and 5.
If value is correct, this is the only test needed.
If the reading on the meter is not correct, (0 or infinity) then a second test is needed.



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



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

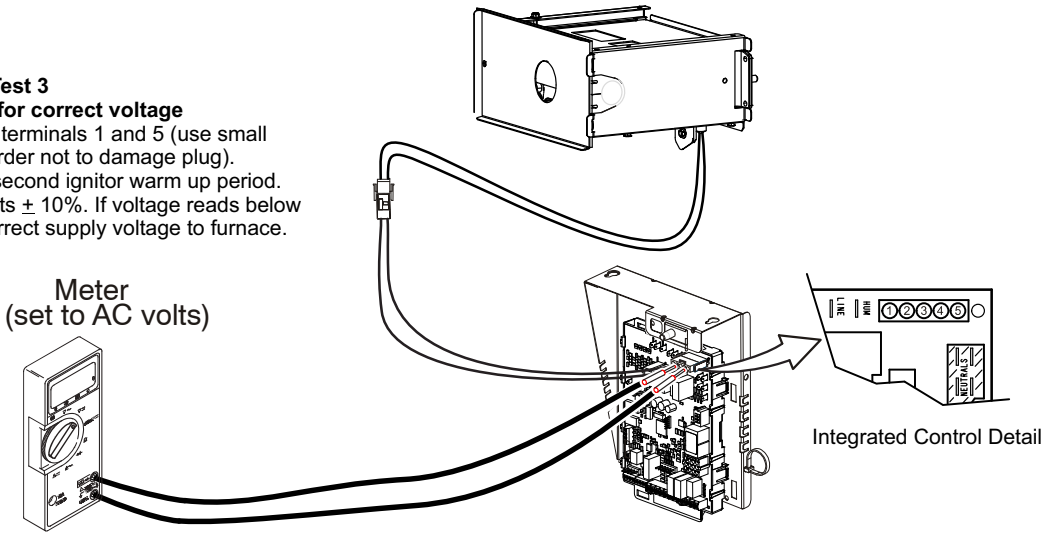


FIGURE 14

7. Combustion Air Inducer (B6) and Cold End Header Box

All EL296DFV(X) units use a two-stage combustion air inducer to move air through the burners and heat exchanger during heating operation. The blower uses a 120VAC motor. The motor operates during all heating operation and is controlled by integrated control control A92. The inducer also operates for 15 seconds before burner ignition (pre-purge) and for 5 seconds after the gas valve closes (post-purge). The inducer operates on low speed during first-stage heat, then switches to high speed for second stage heat.

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

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 differential 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.**

A proving switch connected to the combustion air inducer orifice plate is used to prove inducer operation. The combustion air inducer orifice will be different for each model. See table 16 for orifice sizes. The pressure switch measures the pressure differential across the combustion air inducer orifice. When the proving switch opens, the furnace control (A92) immediately closes the gas valve to prevent burner operation.

TABLE 16

EL296DFV(X) Unit	C.A.I. Orifice Size
-045	0.618
-070	0.810
-090	0.920
-110	1.040

8. Combustion Air Inducer Pressure Switch (S18)

EL296DFV(X) series units are equipped with a dual combustion air pressure switch (first and second stage) located on the combustion air inducer orifice bracket. See figure 15. The switch is connected to the combustion air inducer housing by means of a flexible silicone hose. It monitors negative air pressure in the combustion air inducer housing.

The switches are a single-pole single-throw proving switch electrically connected to the integrated control. The purpose of the switch is to prevent burner operation if the combustion air inducer is not operating or if the flue becomes obstructed.

On heat demand (first or second stage) the switch senses that the combustion air inducer is operating. It closes a circuit to the integrated control when pressure inside the combustion air inducer decreases to a certain set point.

Set points vary depending on unit size. See table 17. The pressure sensed by the switch is negative relative to atmospheric pressure. If the flue becomes obstructed during operation, the switch senses a loss of negative pressure (pressure becomes more equal with atmospheric pressure) and opens the circuit to the furnace control and gas valve. A bleed port on the switch allows relatively dry air in the vestibule to purge switch tubing, to prevent condensate build up.

COMBUSTION AIR PRESSURE SWITCH

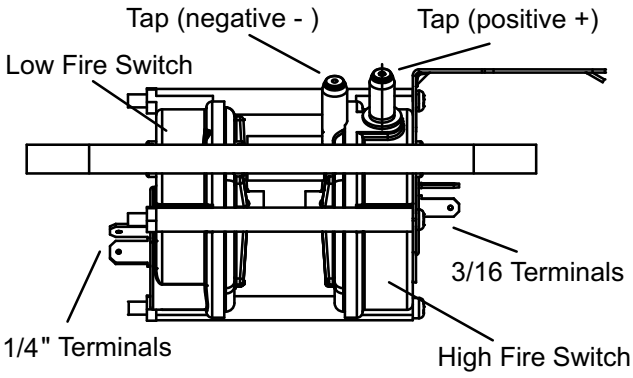


FIGURE 15

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

TABLE 17

EL296DFV(X) Unit	Set Point Low Heat	Set Point High Heat
-045	0.35	0.60
-070	0.45	0.90
-090	0.50	0.90
-110	0.45	0.90

Pressure Switch Check

To check pressure switch differential, refer to figure 16 and use the provided fittings and tubing to follow the steps below.

1 - Remove thermostat demand and allow unit to cycle off.

2 - Remove the tubing from the negative side (red and black or red) and positive side (black) of the pressure switch (leave both connected to cold end header box).

3 - Take the 2" length square tubing and connect to the positive (+) side of the pressure switch. Take the 10" length square tubing and tee into the tubing from the positive side of the cold end header box and the other side of the 2" square tubing. Connect the other end of the 10" square tubing the the positive (+) side of the measuring device.

4 - Take a second piece the 2" length square tubing and connect to the negative (-) side of the pressure switch. Take a second piece of 10" length square tubing and tee into the tubing from the negative (-) side of the cold end header box and the other side of the 2" square tubing. Connect the other end of the 10" square tubing the the negative (-) side of the measuring device.

5 - Operate unit and observe manometer reading. *Readings will change as heat exchanger warms.*
a. Take one reading immediately after start-up.
b. Take a second reading after unit has reached steady state (approximately 5 minutes). This will be the pressure differential.

The pressure differential should be at least 0.15" greater than those listed in the table 17. Readings in table are the *set points or "break points".*

6 - Remove thermostat demand and allow to cycle off.

7 - Replace original pressure switch tubing.

NOTE - Pressure differential values (set point) in table are the "break", or "open" specifications. "Make", or "close" pressure differentials are 0.15" greater than the set points listed in table.

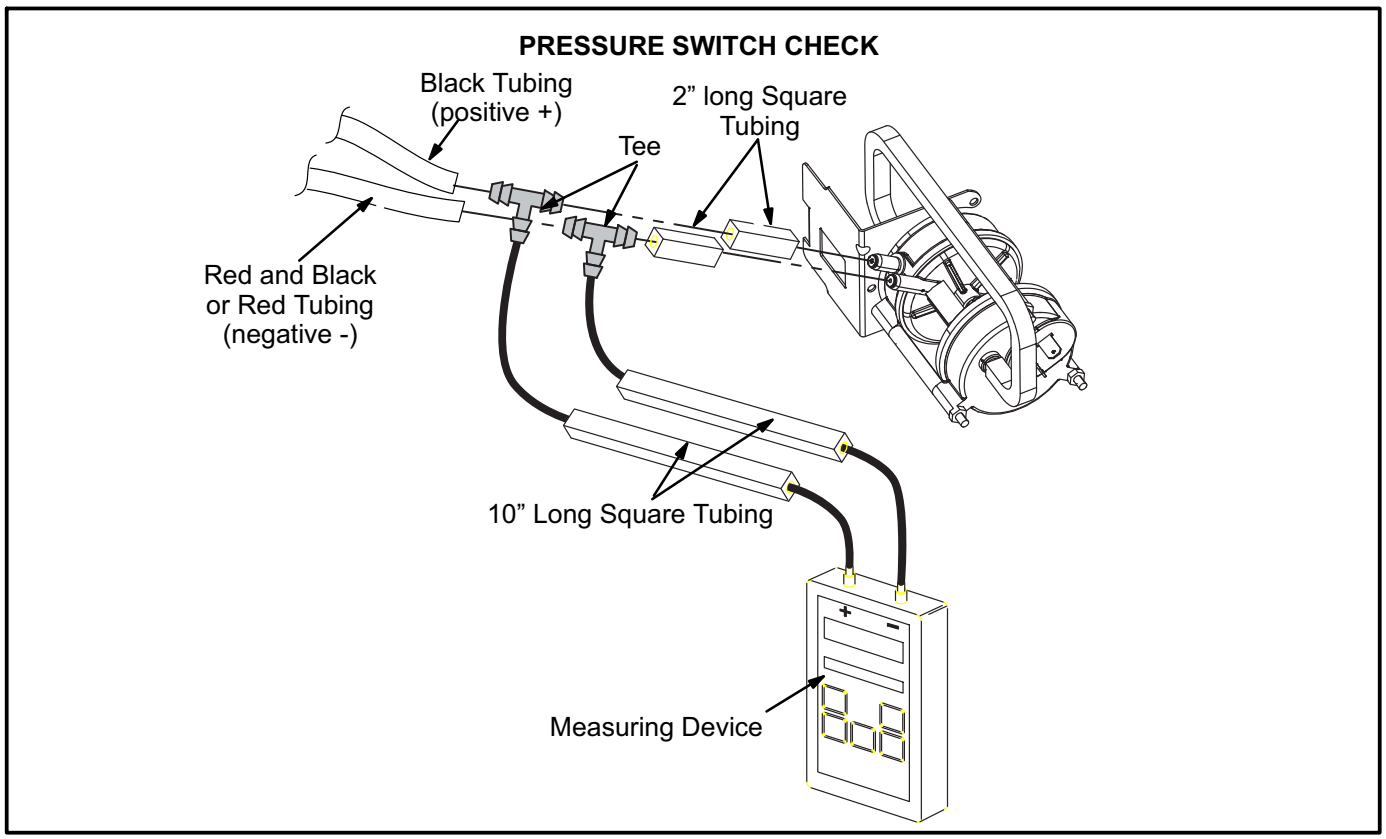


FIGURE 16

II-PLACEMENT AND INSTALLATION

Pipe & Fittings Specifications

All pipe, fittings, primer and solvent cement must conform with American National Standard Institute and the American Society for Testing and Materials (ANSI/ASTM) standards. The solvent shall be free flowing and contain no lumps, undissolved particles or any foreign matter that adversely affects the joint strength or chemical resistance of the cement. The cement shall show no gelation, stratification, or separation that cannot be removed by stirring. Refer to the table 18 below 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.

TABLE 18
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
CANADA PIPE & FITTING & SOLVENT CEMENT	**MARKING**
PVC & CPVC Pipe and Fittings	ULCS636
PVC & CPVC Solvent Cement	
ABS to PVC or CPVC Transition Cement	
POLYPROPYLENE VENTING SYSTEM	ULC-S636
PolyPro® by Duravent	ULC-S636
InnoFlue® by Centrotherm	ULC-S636

⚠ IMPORTANT

EL296DFV 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 18. 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.*

Venting Options

The EL296DFV is shipped with vent exhaust / air intake connection at the top cap. See figure 17. Using parts provided, the furnace may be field modified to have these connections on the right side of the furnace cabinet. See figure 19 and follow the steps below. For left side venting order kit 87W73.

1 - Remove inner blower door.

2 - Loosen hose clamps which attach rubber fittings to the white PVC pipes inside the vestibule area. See figure 17.

3 - Loosen the clamp which secures the pipes at the blower deck. See figure 17.

4 - Remove white PVC pipes, slide up and out thru the top cap.

5 - Remove the black plastic fitting in top cap which previously aligned the PVC pipes.

6 - Remove the remaining parts of the pipe clamp at the blower deck.

7 - Remove the sheet metal patch plate on the side of the cabinet which covers the openings for side venting option. Save screws for reuse.

8 - Re-use the patch plate to cover the hole in the top cap. See figure 18. Remove the 2 screws which secure the top cap to the furnace on the right side and re-install securing the right edge of the patch plate and the right side of the top cap to the furnace. Use 2 self-drilling sheet metal screws (provided) to finish securing the left edge of the patch plate on the left side.

9 - Use a utility knife to cut out the cabinet insulation for the right side vent / air intake.

10 - Install the two 90° street elbows (provided) through the side of the cabinet. The male side of each elbow should extend down through the blower deck and connect to the rubber fittings below. Once the elbows are properly positioned, tighten each clamp.

11 - Peel protective backing from side vent sealing gaskets (2) and apply to side vent sealing plates (2) as shown in figure 19.

12 - Install the side vent sealing plates and gaskets on the exterior of the cabinet as shown in figure 19. Secure with six mounting screws (four reused and two provided from bag assembly). Holes are pre-punched in the parts and cabinet, no drilling is required.

13 - Install sheet metal screws (provided) to seal extra two holes in cabinet not used with side vent clamps.

⚠ IMPORTANT

Side vent sealing plates and side vent sealing gaskets must be used when converting to right side venting. Failure to use gaskets and plates may lead to improper operation of unit.

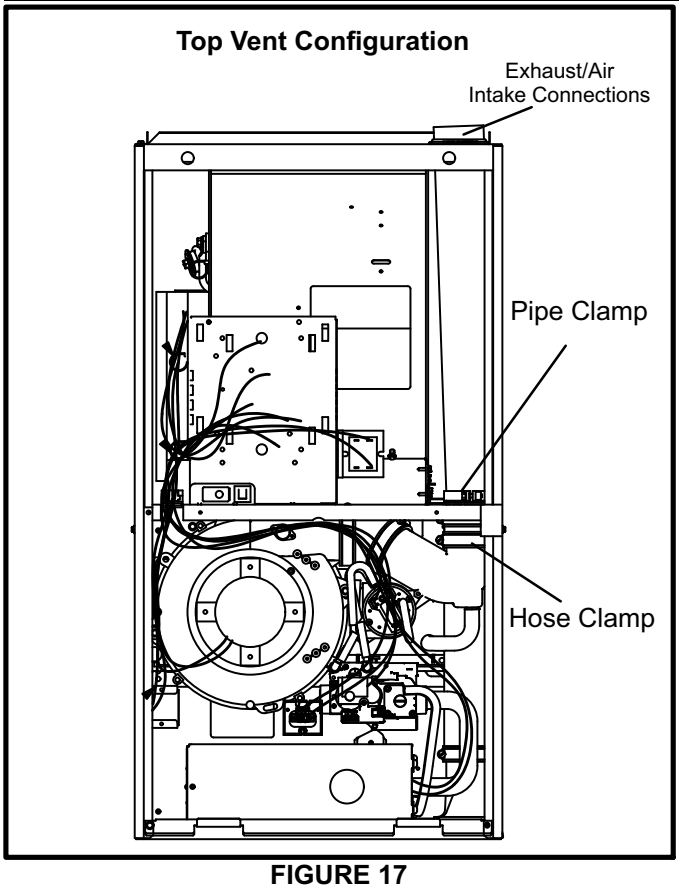


FIGURE 17

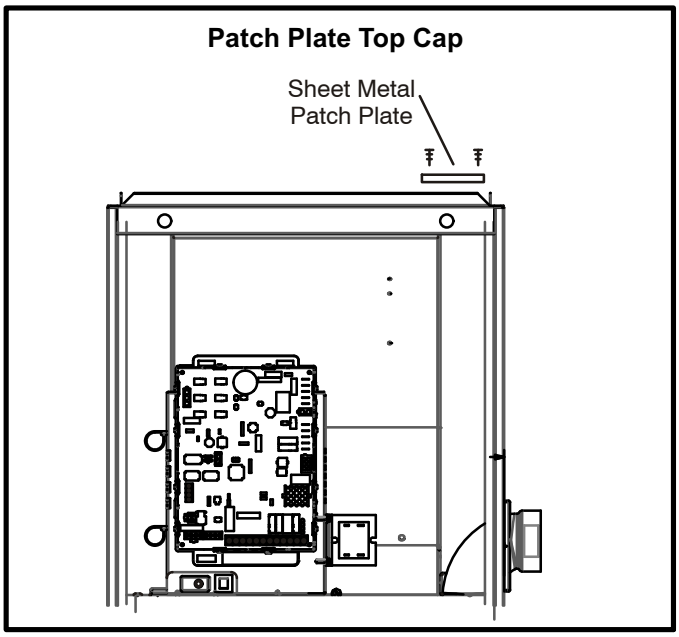


FIGURE 18

Right Side Vent Configuration

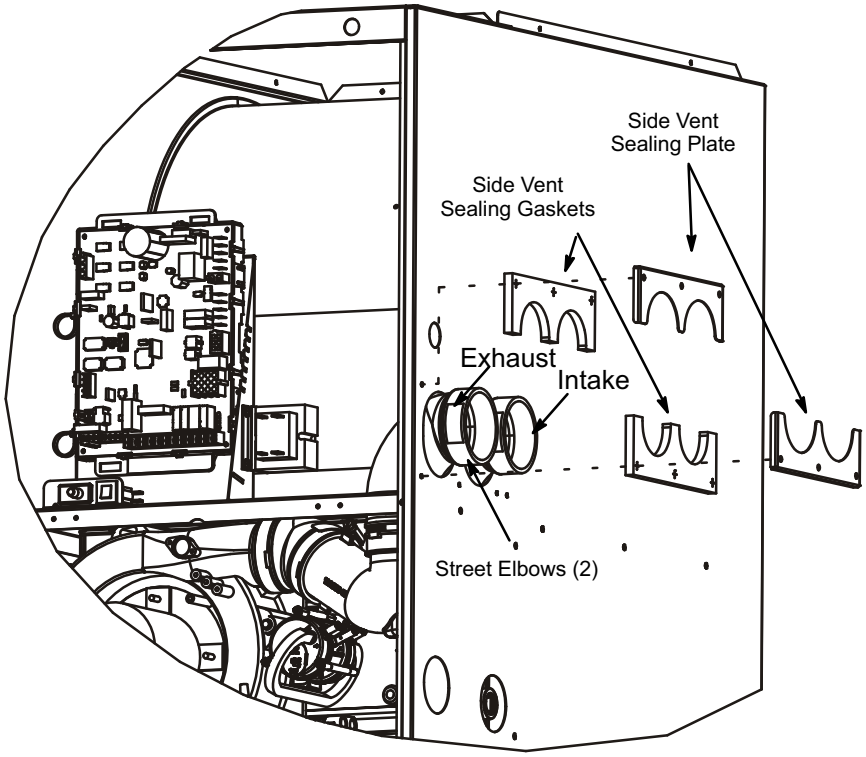


FIGURE 19

TABLE 19
OUTDOOR TERMINATION USAGE*

Input Size	Vent Pipe Dia. in.	STANDARD					CONCENTRIC		
		Flush-Mount Kit	Wall Kit		Wall Ring Kit	Field Fabricated	1-1/2 inch	2 inch	3 inch
			2 inch	3 inch	2 inch				
		51W11 (US) 51W12 (CA)	22G44 (US) [4]30G28 (CA)	44J40 (US) [4]81J20 (CA)	15F74		71M80 (US) [4]44W92 (CA)	69M29 (US) [4]44W92 (CA)	60L46 (US) [4]44W93 (CA)
045	[6]1-1/2	[3]YES	YES	[1]YES	[1]YES	[5]YES	[2]YES		
	2	[3]YES	YES	[1]YES	[1]YES	[5]YES	[2]YES		
	2-1/2	[3]YES	YES	[1]YES	[1]YES	[5]YES	[2]YES		
	3	[3]YES	YES	[1]YES	[1]YES	[5]YES	[2]YES		
070	2	[3]YES	YES	[1]YES	[1]YES	[5]YES	[2]YES		
	2-1/2	[3]YES	YES	[1]YES	[1]YES	[5]YES	[2]YES		
	3	[3]YES	YES	[1]YES	[1]YES	[5]YES	[2]YES		
090	2	[3]YES		YES	YES	[5]YES		YES	YES
	2-1/2	[3]YES		YES	YES	[5]YES		YES	YES
	3	[3]YES		YES	YES	[5]YES		YES	YES
110	2	YES		YES	YES	[5]YES		YES	YES
	2-1/2	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.*

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

[2]Concentric kits 71M80 and 44W92 include 1-1/2" outdoor accelerator, when used with 045 and 070 input models. 1-1/2 in pipe must transitioned to 2in pipe when used with a concentric kit.

[3]Flush mount kits 51W11 and 51W12 includes 1-1/2 in. outdoor exhaust accelerator, required when used with 045, 070 and 090 input models. 1-1/2 in pipe must transitioned to 2 in pipe when used with the flush mount kit

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

[5] See table 24 for vent accelerator requirements.

[6] 2 in. To 1-1/2 in. Reducer required, must be field provided

Joint Cementing Procedure

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

***NOTE** - A sheet metal screw may be used to secure the intake pipe to the connector, if desired. Use a drill or self tapping screw to make a pilot hole.*

⚠ 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.

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.

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

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.

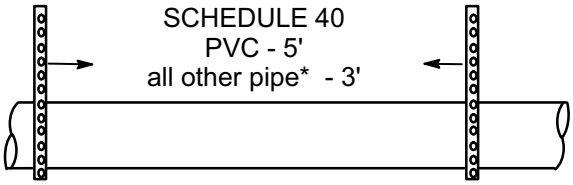
***NOTE** - Assembly should be completed within 20 seconds after last application of cement. Hammer blows should not be used when inserting pipe.*

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

Piping Suspension Guidelines



** See table 18 for allowable pipe.*

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

Wall Thickness Guidelines

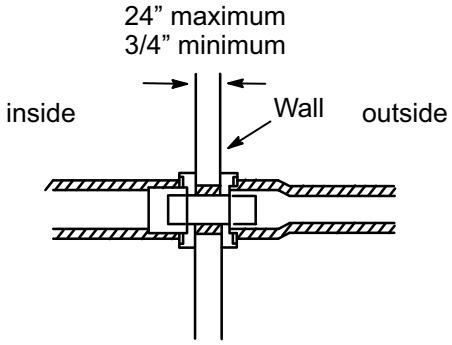
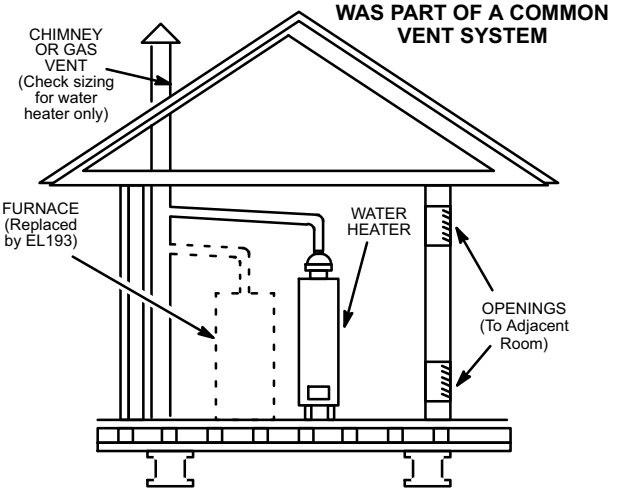


FIGURE 20



If an EL296DFV furnace replaces a furnace which was commonly vented with another gas appliance, the size of the existing vent pipe for that gas appliance must be checked. Without the heat of the original furnace flue products, the existing vent pipe is probably oversized for the single water heater or other appliance. The vent should be checked for proper draw with the remaining appliance.

FIGURE 21

9. 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.
10. 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.

Removal of the Furnace from Common Vent

In the event that an existing furnace is removed from a venting system commonly run with separate gas appliances, the venting system is likely to be too large to properly vent the remaining attached appliances.

Conduct the following test while each appliance is operating and the other appliances (which are not operating) remain connected to the common venting system. If the venting system has been installed improperly, you **must** correct the system as indicated in the general venting requirements section.

⚠ WARNING

CARBON MONOXIDE POISONING HAZARD

Failure to follow the steps outlined below for each appliance connected to the venting system being placed into operation could result in carbon monoxide poisoning or death.

The following steps shall be followed for each appliance connected to the venting system being placed into operation, while all other appliances connected to the venting system are not in operation:

1 - Seal any unused openings in the common venting system.

2 - Inspect the venting system for proper size and horizontal pitch. Determine that there is no blockage, restriction, leakage, corrosion, or other deficiencies which could cause an unsafe condition.

3 - Close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

4 - Follow the lighting instructions. Turn on the appliance that is being inspected. Adjust the thermostat so that the appliance operates continuously.

5 - After the main burner has operated for 5 minutes, test for leaks of flue gases at the draft hood relief opening. Use the flame of a match or candle.

6 - After determining that each appliance connected to the common venting system is venting properly, (step 3) return all doors, widows, exhaust fans, fireplace dampers, and any other gas-burning appliances to their previous mode of operation.

7 - If a venting problem is found during any of the preceding tests, the common venting system must be modified to correct the problem.

Resize the common venting system to the minimum vent pipe size determined by using the appropriate tables in Appendix G. (These are in the current standards of the National Fuel Gas Code ANSI Z223.1.

Exhaust Piping (Figures 23 and 24)

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.

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 22.*

The EL296DFV 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 or ventilated attic or crawlspace 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 tables 20 and 21. Count all elbows inside and outside the home. Table 20 lists the *minimum* vent pipe lengths permitted. Table 21 lists the *maximum* pipe lengths permitted.

TABLE 20
MINIMUM VENT PIPE LENGTHS

EL296DFV MODEL	MIN. VENT LENGTH*
045, 070, 090, 110	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.*

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 24.

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.

⚠ IMPORTANT

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

NOTE *- It is acceptable to use any pipe size which fits within the guidelines allowed in table 21.*

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 pipe MUST be glued to furnace exhaust fittings.*

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

NOTE - *If right side venting option is used, you must include the elbow at the furnace in the elbow count. If transitioning to 3" dia pipe, this elbow equates to 20' of equivalent vent length for all models.*

Use the following steps to correctly size vent pipe diameter.

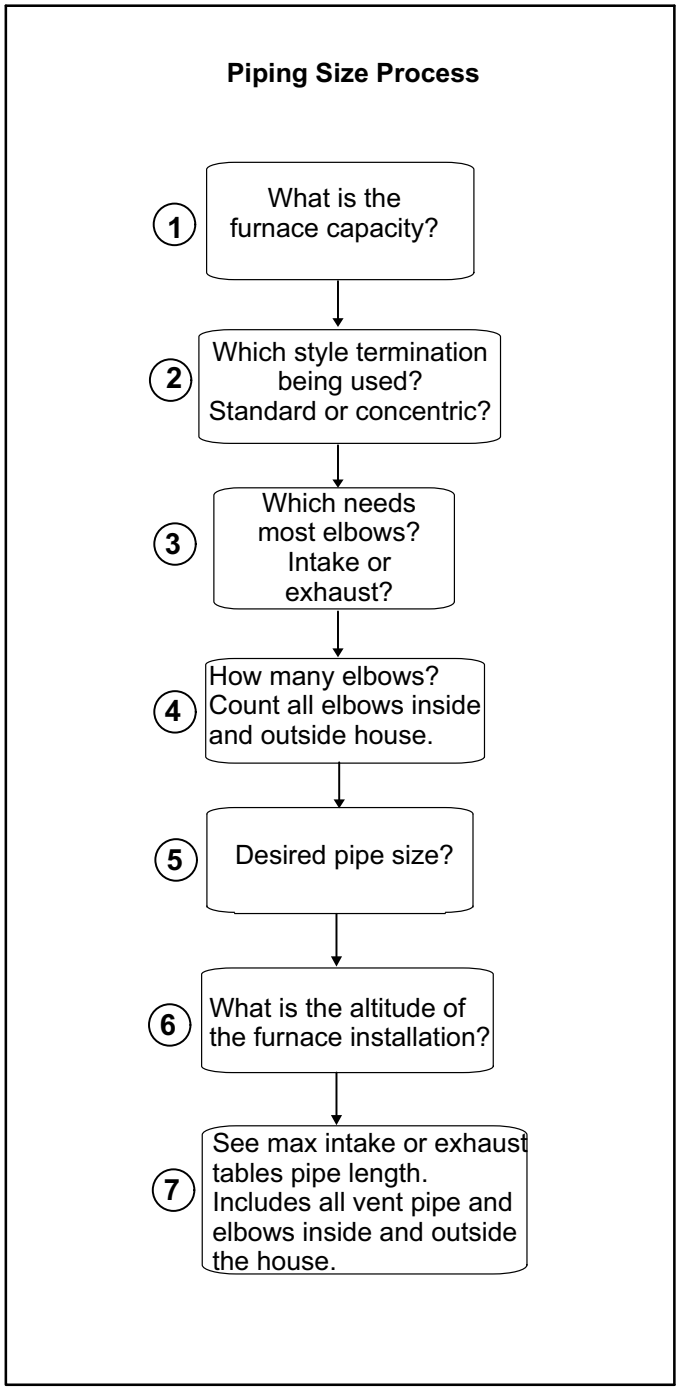


FIGURE 22

TABLE 21
Maximum Allowable Intake or Exhaust Vent Length

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 Used	1-1/2" Pipe				2" Pipe				2-1/2" Pipe				3" Pipe			
	Model				Model				Model				Model			
	045	070	090	110	045	070	090	110	045	070	090	110	045	070	090	110
1	20	15	n/a	n/a	71	56	34	14	105	105	83	48	128	127	108	108
2	15	10			66	51	29	9	100	100	78	43	123	122	103	103
3	10	n/a			61	46	24	4	95	95	73	38	118	117	98	98
4	n/a				56	41	19	n/a	90	90	68	33	113	112	93	93
5					51	36	14		85	85	63	28	108	107	88	88
6					46	31	9		80	80	58	23	101	102	83	83
7					41	26	4		75	75	53	18	98	97	78	78
8					36	21	n/a		70	70	48	13	93	92	73	73
9					31	16			65	65	43	8	88	87	68	68
10					26	11			60	60	38	3	83	82	63	63

Standard Termination Elevation 4500 - 10,000 ft

Number Of 90° Elbows Used	1-1/2" Pipe				2" Pipe				2-1/2" Pipe				3" Pipe			
	Model				Model				Model				Model			
	045	070	090	110	045	070	090	110	045	070	090	110	045	070	090	110
1	20	15	n/a	n/a	71	56	34	n/a	105	105	83	48	128	127	108	108
2	15	10			66	51	29		100	100	78	43	123	122	103	103
3	10	n/a			61	46	24		95	95	73	38	118	117	98	98
4	n/a				56	41	19		90	90	68	33	113	112	93	93
5					51	36	14		85	85	63	28	108	107	88	88
6					46	31	9		80	80	58	23	103	102	83	83
7					41	26	4		75	75	53	18	98	97	78	78
8					36	21	n/a		70	70	48	13	93	92	73	73
9					31	16	n/a		65	65	43	8	88	87	68	68
10					26	11	n/a		60	60	38	3	83	82	63	63

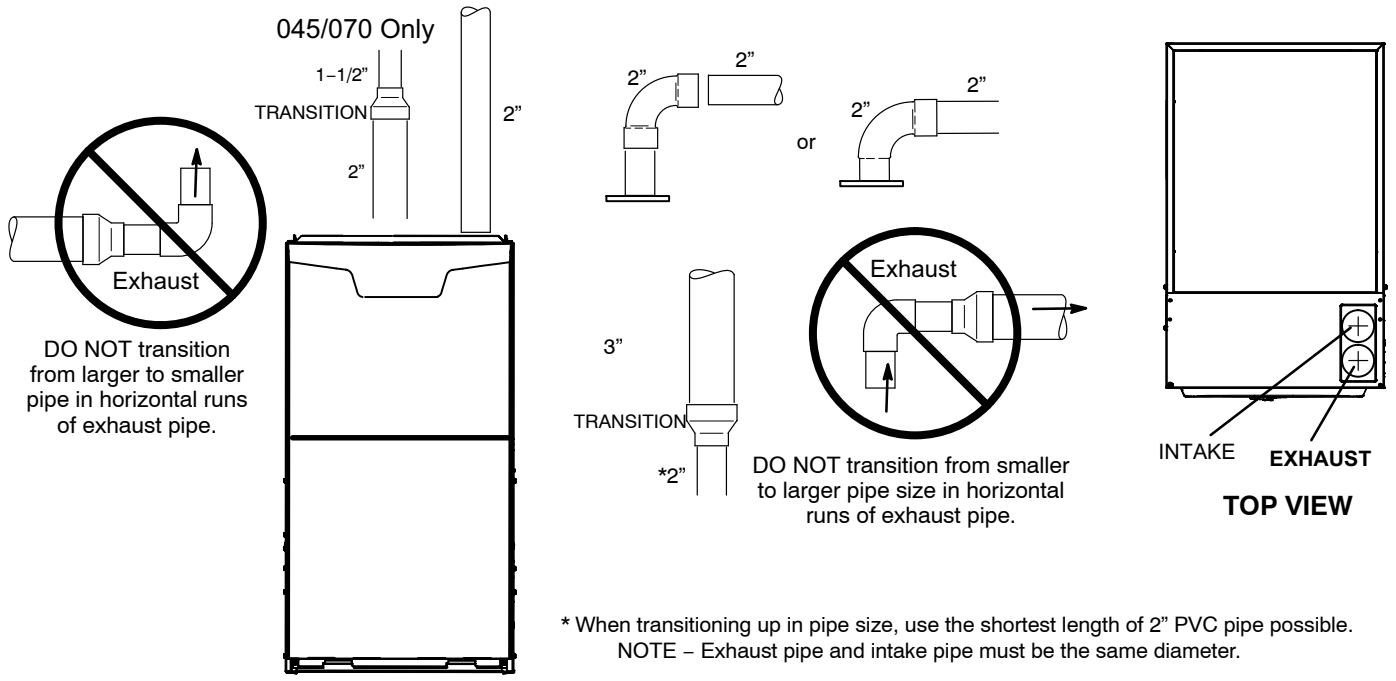
Concentric Termination at Elevation 0 - 4500 ft

Number Of 90° Elbows Used	1-1/2" Pipe				2" Pipe				2-1/2" Pipe				3" Pipe			
	Model				Model				Model				Model			
	045	070	090	110	045	070	090	110	045	070	090	110	045	070	090	110
1	15	10	n/a	n/a	63	48	32	12	95	95	79	44	111	111	104	104
2	10	n/a			58	43	27	7	90	90	74	39	106	106	99	99
3	n/a				53	38	22	2	85	85	69	34	101	91	94	94
4					48	33	17	n/a	80	80	64	29	96	96	89	89
5					43	28	12		75	75	59	24	91	91	84	84
6					38	23	7		70	70	54	19	96	86	79	79
7					33	18	2		65	65	49	14	81	81	74	74
8					28	13	n/a		60	60	44	9	76	76	69	69
9					23	8			55	55	39	4	71	71	64	64
10					18	3			50	50	34	n/a	66	66	59	59

Concentric Termination Elevation 4501 - 10,000 ft

Number Of 90° Elbows Used	1-1/2" Pipe				2" Pipe				2-1/2" Pipe				3" Pipe			
	Model				Model				Model				Model			
	045	070	090	110	045	070	090	110	045	070	090	110	045	070	090	110
1	15	10	n/a	n/a	63	48	32	n/a	95	95	79	44	111	111	104	94
2	10	n/a			58	43	27		90	90	74	39	106	106	99	99
3	n/a				53	38	22		85	85	69	34	101	101	94	94
4					48	33	17		80	80	64	29	96	96	89	89
5					43	28	12		75	75	59	24	91	91	84	84
6					38	23	7		70	70	54	19	86	86	79	79
7					33	18	2		65	65	49	14	81	81	74	74
8					28	13	n/a		60	60	44	9	76	76	69	69
9					23	8			55	55	39	4	71	71	64	64
10					18	3			50	50	34	n/a	66	66	59	59

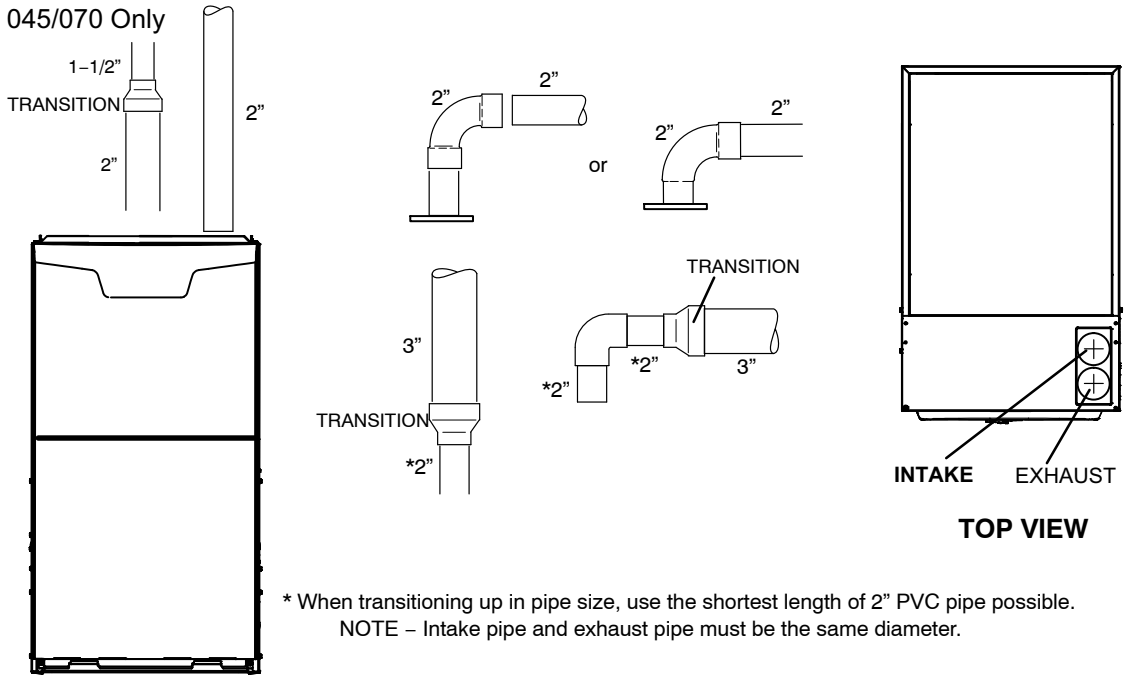
TYPICAL *EXHAUST* PIPE CONNECTIONS



***** When transitioning up in pipe size, use the shortest length of 2" PVC pipe possible.
NOTE – Exhaust pipe and intake pipe must be the same diameter.

FIGURE 23

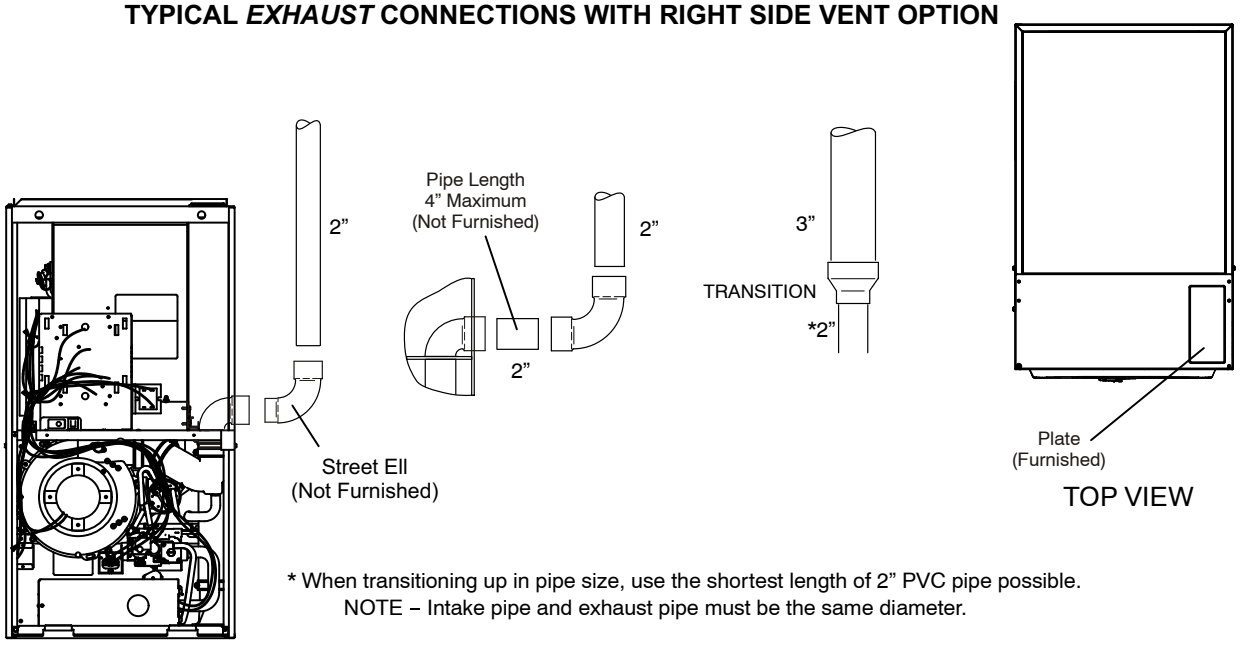
TYPICAL *INTAKE* PIPE CONNECTIONS



***** When transitioning up in pipe size, use the shortest length of 2" PVC pipe possible.
NOTE – Intake pipe and exhaust pipe must be the same diameter.

FIGURE 24

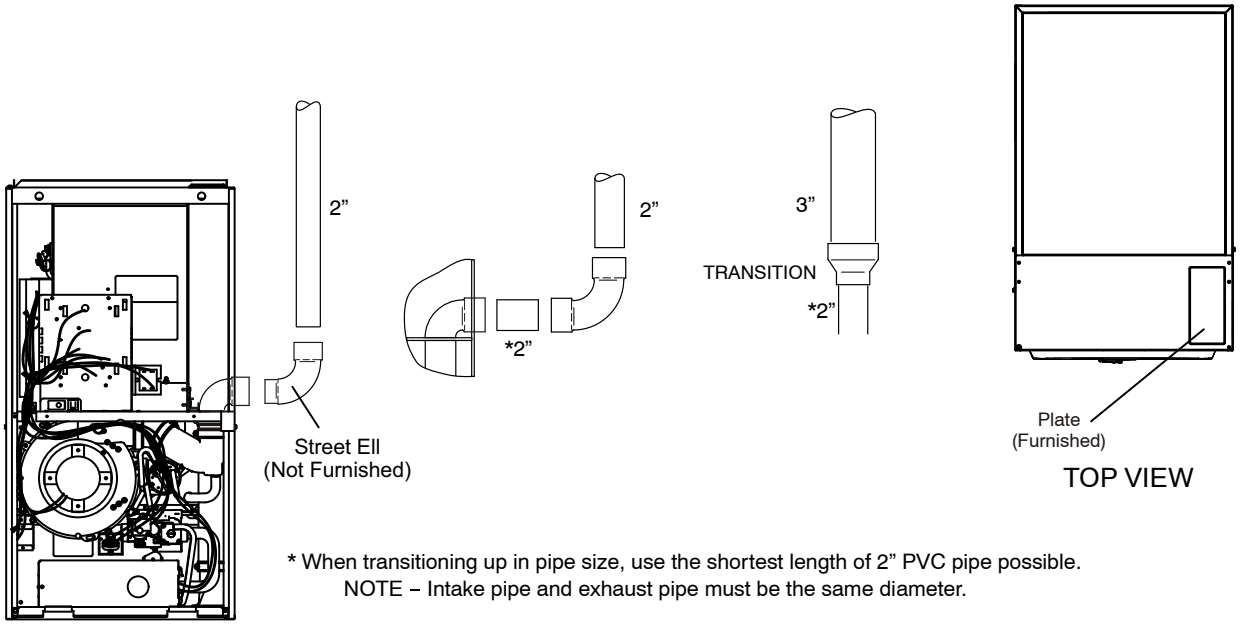
TYPICAL *EXHAUST* CONNECTIONS WITH RIGHT SIDE VENT OPTION



* When transitioning up in pipe size, use the shortest length of 2” PVC pipe possible.
NOTE – Intake pipe and exhaust pipe must be the same diameter.

FIGURE 25

TYPICAL *AIR INTAKE* PIPE CONNECTIONS WITH RIGHT SIDE VENT OPTION



* When transitioning up in pipe size, use the shortest length of 2” PVC pipe possible.
NOTE – Intake pipe and exhaust pipe must be the same diameter.

FIGURE 26

Intake Piping

The EL296DFV 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. 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 cement or a sheet metal screw to secure the intake pipe to the inlet air connector.

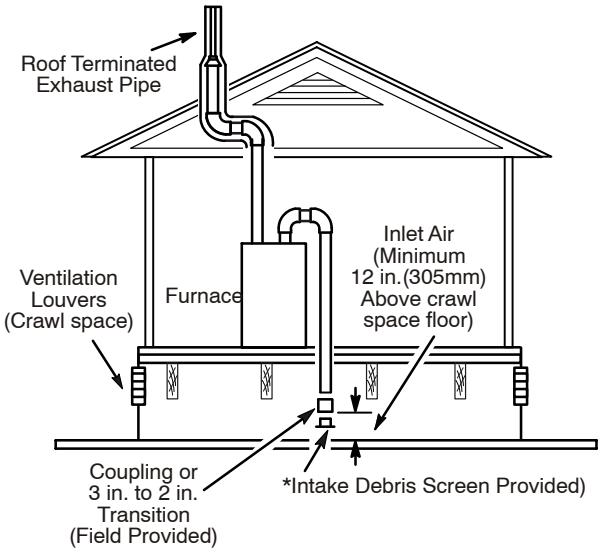
2 - If intake air is drawn from a ventilated crawlspace (figure 28) or ventilated attic (figure 27) the exhaust vent length must not exceed those listed in table 23. If 3" diameter pipe is used, reduce to 2" diameter pipe to accommodate the debris screen.

3 - Route piping to outside of structure. Continue with installation following instructions given in general guide lines for piping terminations and intake and exhaust piping terminations for direct vent sections. Refer to table 21 for pipe sizes.

⚠ 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 Crawlspace and Outlet Air to Outside)

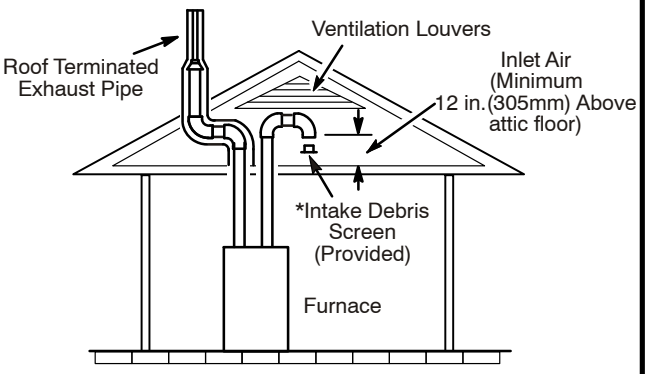


* See table 23 for maximum vent lengths

***NOTE**-The inlet and outlet air openings shall each have a free area of at least one square inch per 4,000 Btu (645mm² per 1.17kW) per hour of the total input rating of all equipment in the enclosure.*

FIGURE 27

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

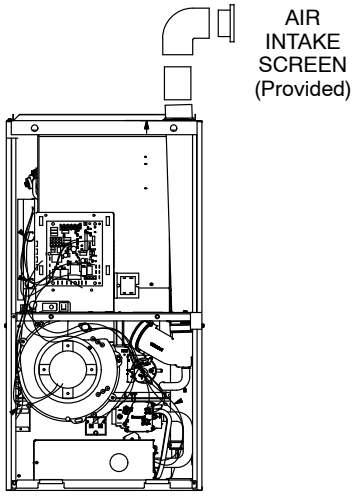


* See table 23 for maximum vent lengths

***NOTE**-The inlet and outlet air openings shall each have a free area of at least one square inch per 4,000 Btu (645mm² per 1.17kW) per hour of the total input rating of all equipment in the enclosure.*

FIGURE 28

TYPICAL AIR INTAKE PIPE CONNECTIONS
NON–DIRECT VENT APPLICATIONS



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

FIGURE 29

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 29. 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 sideways.

2 - Use cement to secure the intake pipe to the connector, if desired.

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 EL296DFV 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 EL296DFV 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 31 or 32. 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 an outdoor AC unit because the condensate can damage the painted coating.

***NOTE** - See table 22 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 enclosed areas that are not exposed to the outdoor ambient temperature and are above 32 degrees F (0°C) are to be considered conditioned spaces.*

⚠ IMPORTANT

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

⚠ IMPORTANT

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

TABLE 22
Maximum Allowable Exhaust Vent Pipe Length (in ft.[3]) Without Insulation In Unconditioned Space For Winter Design Temperatures Two - Stage High Efficiency Furnace

Winter Design Temperatures[1] °F (°C)	Vent Pipe Diameter	Unit Input Size							
		045		070		090		110	
		PVC	[2]PP	PVC	[2]PP	PVC	[2]PP	PVC	[2]PP
32 to 21 (0 to -6)	1-1/2 in.	22	N/A	20	N/A	N/A	N/A	N/A	N/A
	2 in.	21	18	33	30	46	42	30	30
	2-1/2 in.	16	N/A	26	N/A	37	N/A	36	N/A
	3 in.	12	12	21	21	30	30	29	29
20 to 1 (-7 to -17)	1-1/2 in.	12	N/A	20	N/A	N/A	N/A	N/A	N/A
	2 in	11	9	19	17	28	25	27	24
	2-1/2 in.	7	N/A	14	N/A	21	N/A	20	N/A
	3 in.	N/A	N/A	9	9	16	16	14	14
0 to -20 (-18 to -29)	1-1/2 in	8	N/A	13	N/A	N/A	N/A	N/A	N/A
	2 in.	6	4	12	10	19	16	18	15
	2-1/2 in.	N/A	N/A	7	N/A	13	N/A	12	N/A
	3 in.	N/A	N/A	N/A	N/A	8	8	7	7

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

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

[3] Vent length are equivalent length. Consider each elbow as 5ft of linear length.

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 21 or 23 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 figure30.

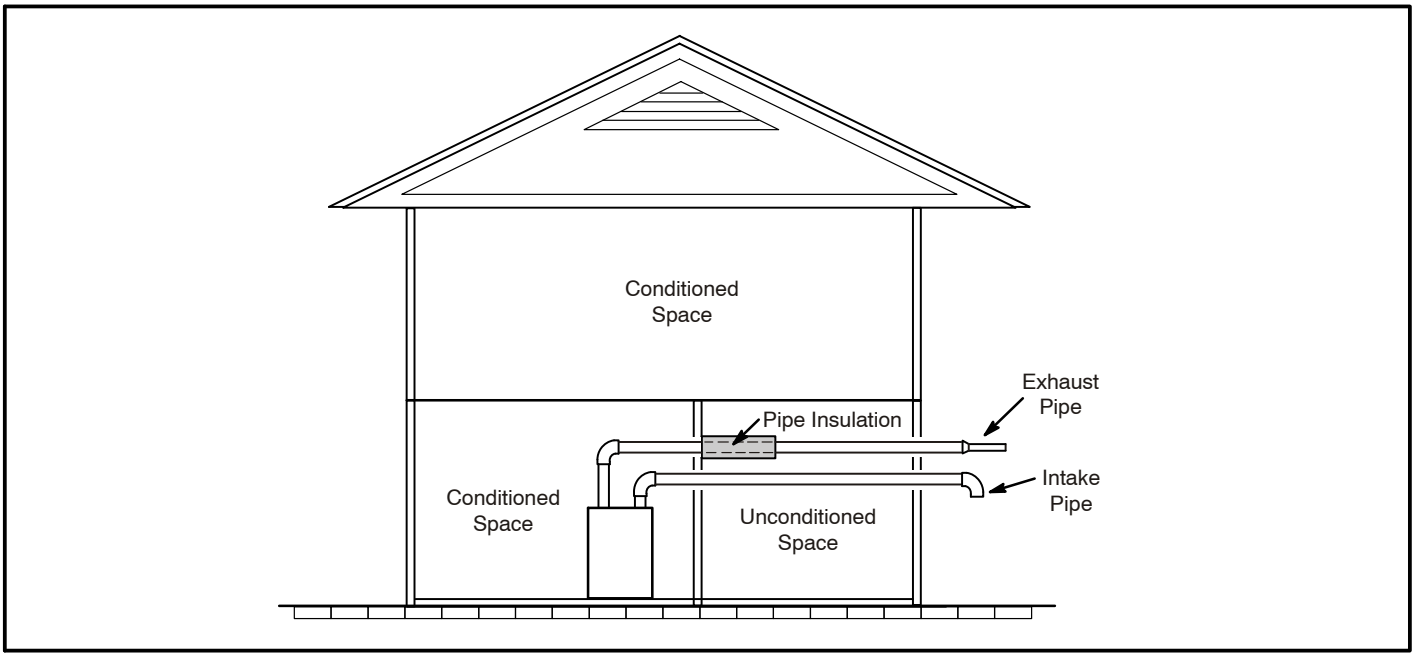


FIGURE 30

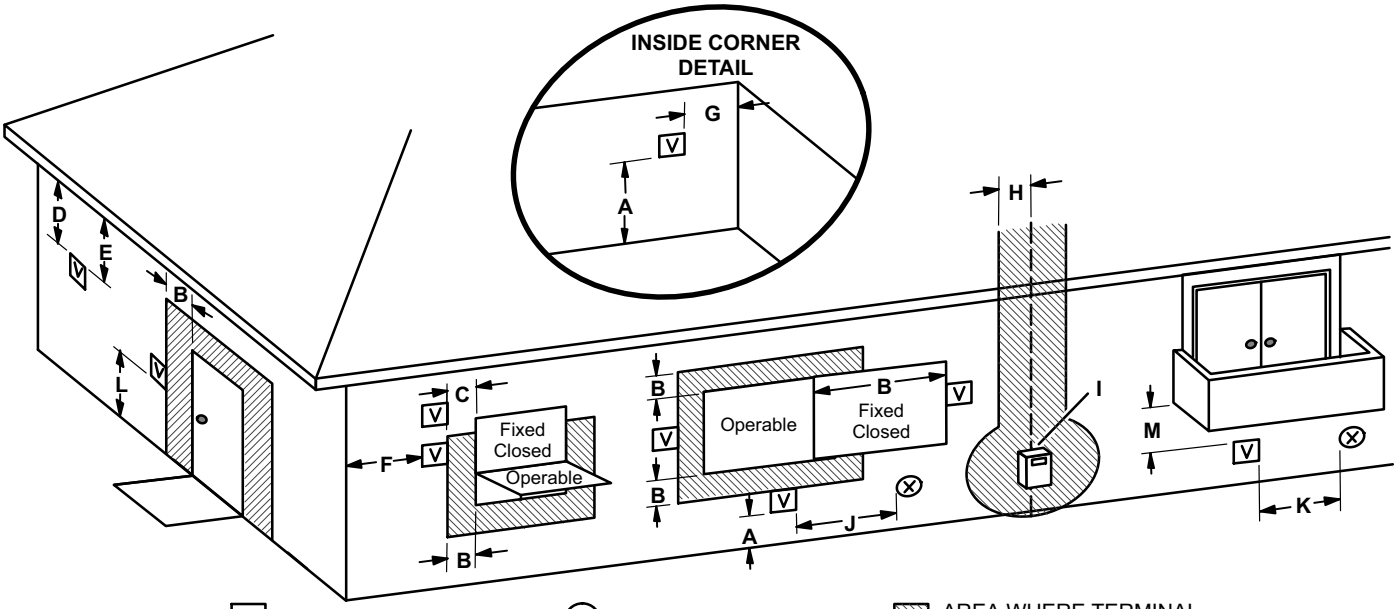
TABLE 23

Maximum Allowable Exhaust Vent Length 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 - 10,000 ft																
Number Of 90° Elbows Used	**1-1/2" Pipe**				**2" Pipe**				**2-1/2" Pipe**				**3" Pipe**			
	Model				**Model**				**Model**				**Model**			
	045	**070**	**090**	**110**	**045**	**070**	**090**	**110**	**045**	**070**	**090**	**110**	**045**	**070**	**090**	**110**
1	15	10	n/a	n/a	61	46	24	4	90	90	68	33	108	107	88	88
2	10	n/a			56	41	19	n/a	85	85	63	28	103	102	83	83
3	n/a				51	36	14		80	80	58	23	98	97	78	78
4					46	31	9		75	75	53	18	93	92	73	73
5					41	26	4		70	70	48	13	88	87	68	68
6					36	21	n/a		65	65	43	8	81	82	63	63
7					31	16			60	60	38	3	78	77	58	58
8					26	11			55	55	33	n/a	73	72	53	53
9					21	6			50	50	28	n/a	68	67	48	48
10					16	1			45	45	23	n/a	63	62	43	43

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

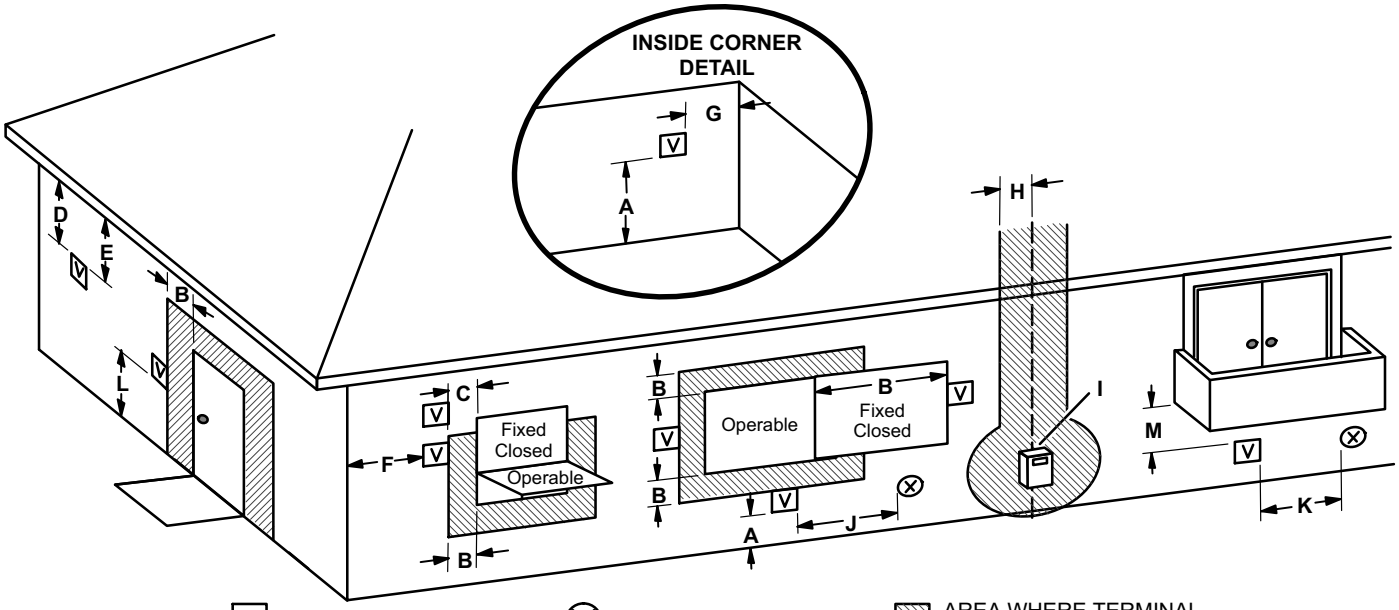
† A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single family dwellings and serves both dwellings.

‡ 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.”

FIGURE 31

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



		US Installations[1]	Canadian Installations[2]
A =	Clearance above grade, veranda, porch, deck or balcony	12 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.”

FIGURE 32

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 36.*

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. Figures 33 through 41 show typical terminations.

1. Vent 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 34). You may exit the exhaust out the roof and the intake out the side of the structure (figure 35).
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 (See figure 33).
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 24.

TABLE 24
EXHAUST PIPE TERMINATION SIZE REDUCTION

EL296 MODEL	Termination Pipe Size
*045 and *070	1-1/2" (38mm)
*090	2" (51mm)
110	2" (51mm)

**EL296DFV-045, -070 and -090 units with the flush-mount termination must use the 1-1/2"accelerator supplied with the kit.*

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 36.

   NOTE *- Care must be taken to avoid recirculation of exhaust back into intake pipe.*
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 36.

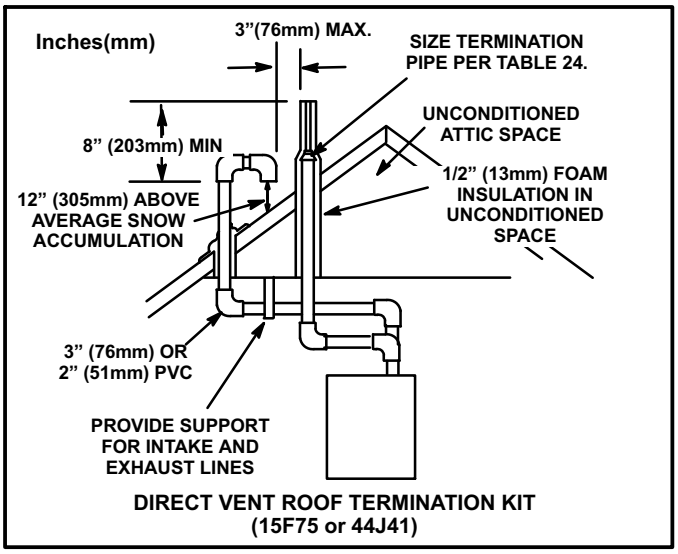


FIGURE 33

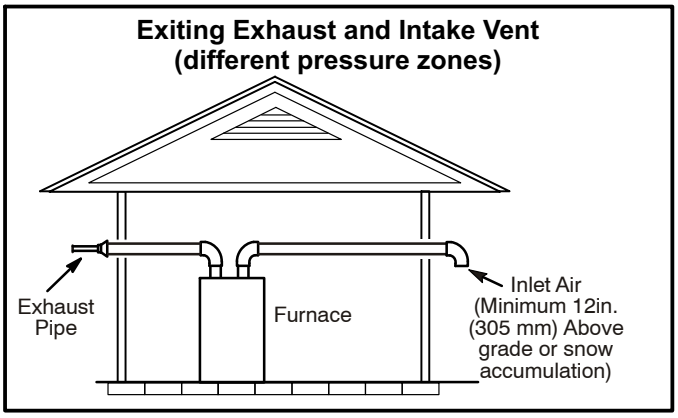


FIGURE 34

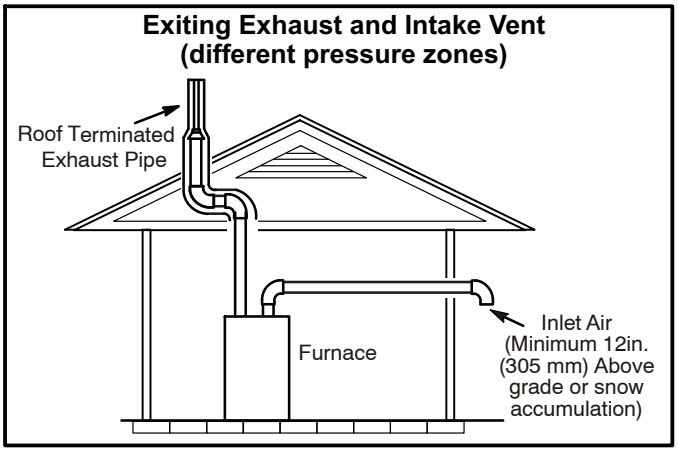
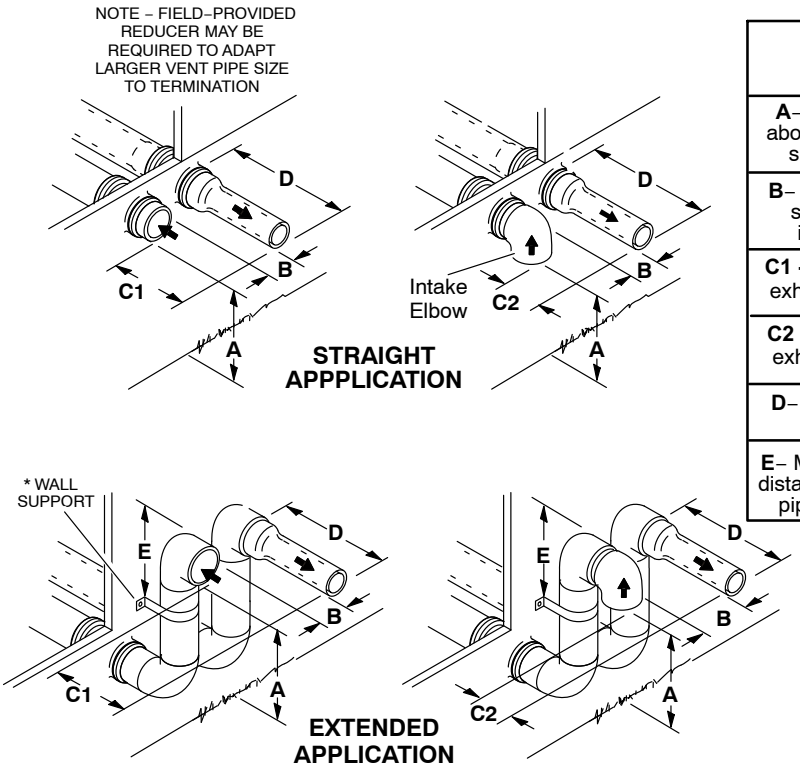


FIGURE 35

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 36, to prevent any movement in any direction. When exhaust and intake piping must be run up an outside wall, the exhaust piping must be terminated with pipe sized per table 24.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 39.

FIELD FABRICATED WALL TERMINATION



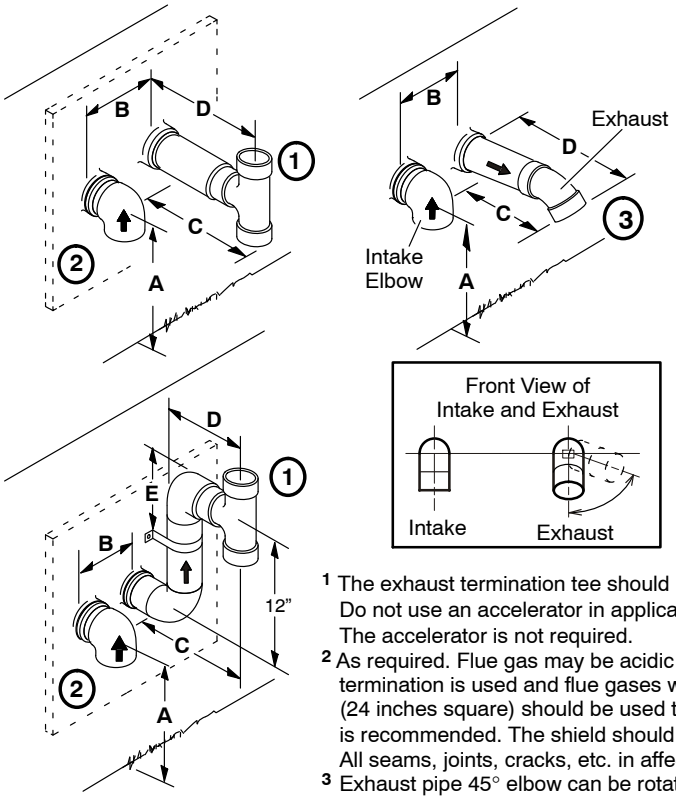
	2" (51mm) Vent Pipe	3" (76mm) Vent Pipe
A– Minimum clearance above grade or average snow accumulation	12" (305 mm)	12" (305 mm)
B– Maximum horizontal separation between intake and exhaust	6" (152 mm)	6" (152 mm)
C1 -Minimum from end of exhaust to inlet of intake	8" (203 mm)	8" (203 mm)
C2 -Minimum from 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 venting table 21 for maximum 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)



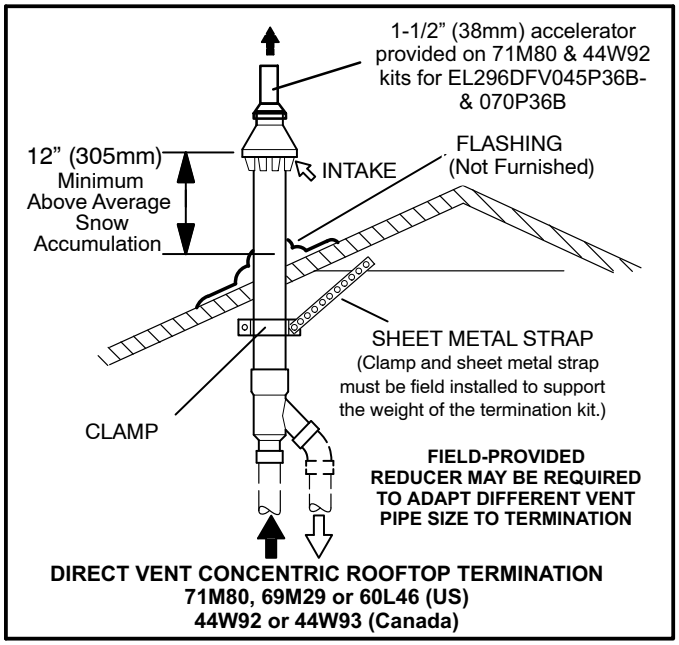
	2" (51MM) Vent Pipe	3" (76MM) Vent Pipe
A– Clearance above grade or average snow accumulation	12" (305 mm) Min.	12" (305 mm) Min.
B– Horizontal separation between intake and exhaust	6" (152 mm) Min. 24" (610 mm) Max.	6" (152 mm) Min. 24" (610 mm) Max.
C– Minimum from end of exhaust to inlet of intake	9" (227 mm) Min.	9" (227 mm) Min.
D– Exhaust pipe length	12" (305 mm) Min. 16" (405 mm) Max.	12" (305 mm) Min. 20" (508 mm) Max.
E– Wall support distance from top of each pipe (intake/exhaust)	6" (152 mm) Max.	6" (152 mm) Max.

[1] The exhaust termination tee should be connected to the 2" or 3" PVC flue pipe as shown in the illustration. Do not use an accelerator in applications that include an exhaust termination tee. The accelerator is not required.

[2] As required. Flue gas may be acidic and may adversely affect some building materials. If a side wall vent termination is used and flue gases will impinge on the building materials, a corrosion–resistant shield (24 inches square) should be used to protect the wall surface. If optional tee is used, the protective shield is recommended. The shield should be constructed using wood, sheet metal or other suitable material. All seams, joints, cracks, etc. in affected area, should be sealed using an appropriate sealant.

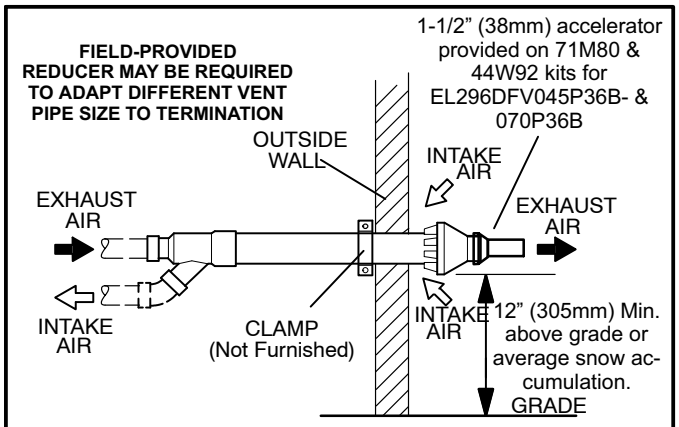
[3] Exhaust pipe 45° elbow can be rotated to the side away from the combustion air inlet to direct exhaust away from adjacent property. The exhaust must never be directed toward the combustion air inlet.

FIGURE 36



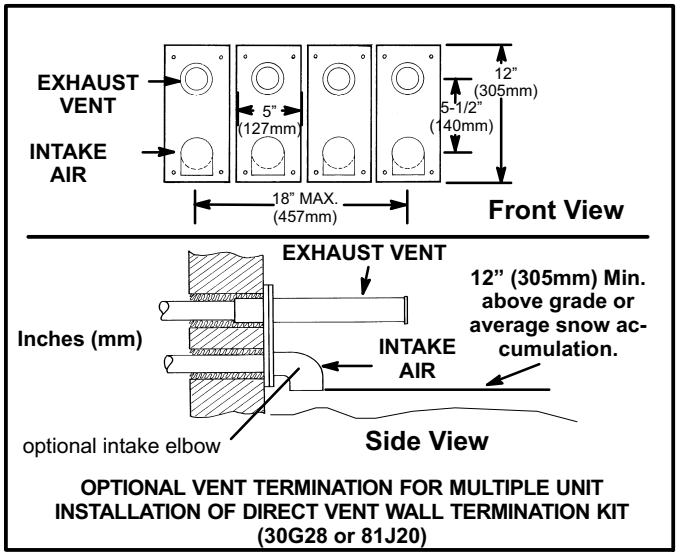
DIRECT VENT CONCENTRIC ROOFTOP TERMINATION
71M80, 69M29 or 60L46 (US)
44W92 or 44W93 (Canada)

FIGURE 37



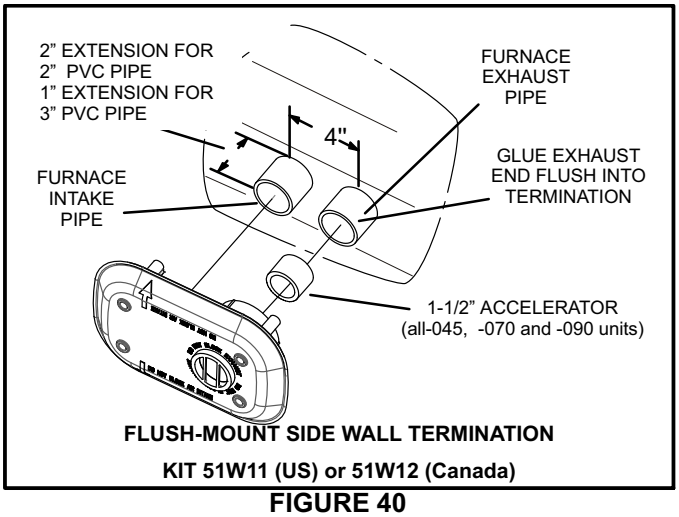
DIRECT VENT CONCENTRIC WALL TERMINATION
71M80, 69M29 or 60L46 (US)
44W92 or 44W93 (Canada)

FIGURE 38



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

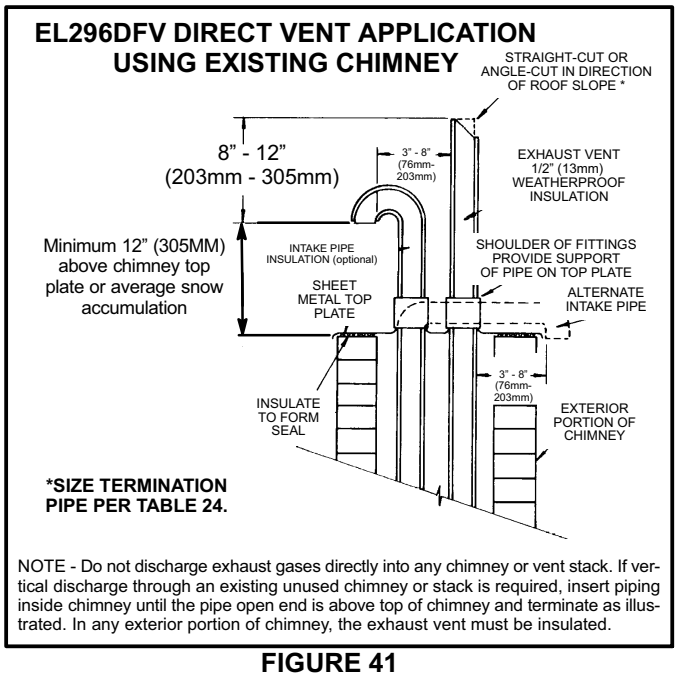
FIGURE 39



FLUSH-MOUNT SIDE WALL TERMINATION

KIT 51W11 (US) or 51W12 (Canada)

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

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. Figures 42 through 43 show typical terminations.

1. Exhaust piping must terminate straight out or up as shown. The termination pipe must be sized as listed in table 24.The specified pipe size ensures proper velocity required to move the exhaust gases away from the building.
2. On field supplied terminations for side wall exit, exhaust piping may extend a maximum of 12 inches (305mm) for 2" PVC and 20 inches (508mm) for 3" (76mm) PVC beyond the outside wall.

3. If exhaust piping must be run up a side wall to position above snow accumulation or other obstructions, piping must be supported every 24 inches (610mm). When exhaust piping must be run up an outside wall, any reduction in exhaust pipe size must be done after the final elbow.
4. Distance between exhaust pipe terminations on multiple furnaces must meet local codes.

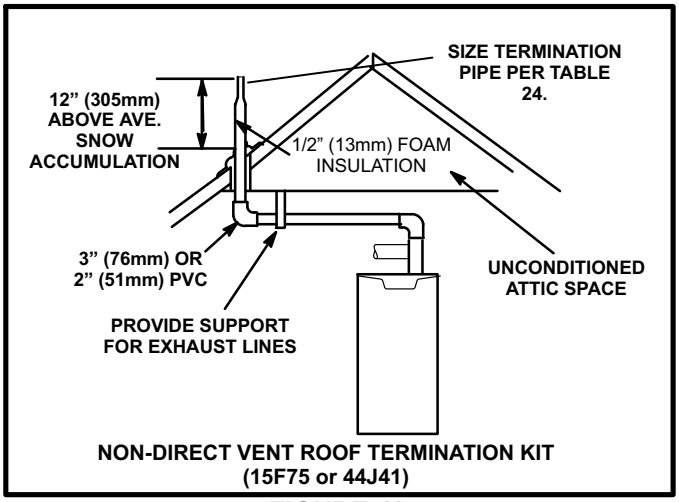


FIGURE 42

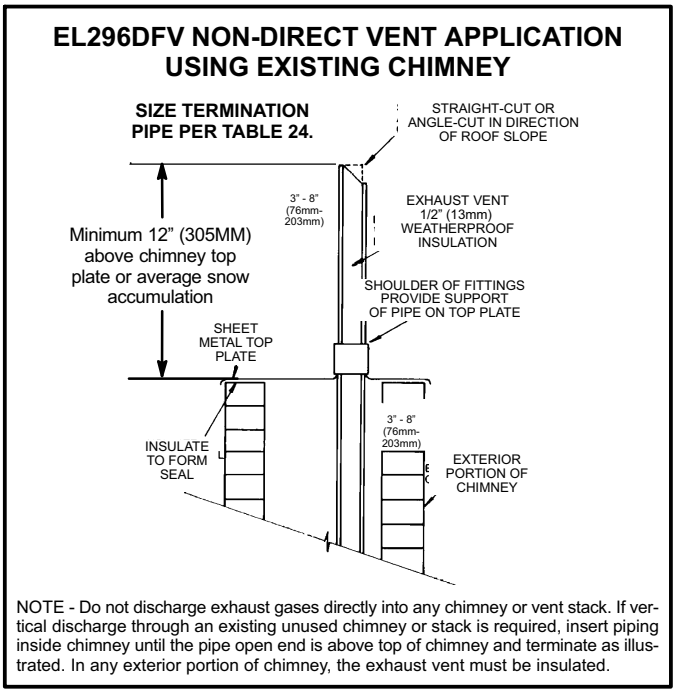


FIGURE 43

Condensate Piping

This unit is designed for either right- or left-side exit of condensate piping. Refer to figures 44 and 46 for condensate trap locations.

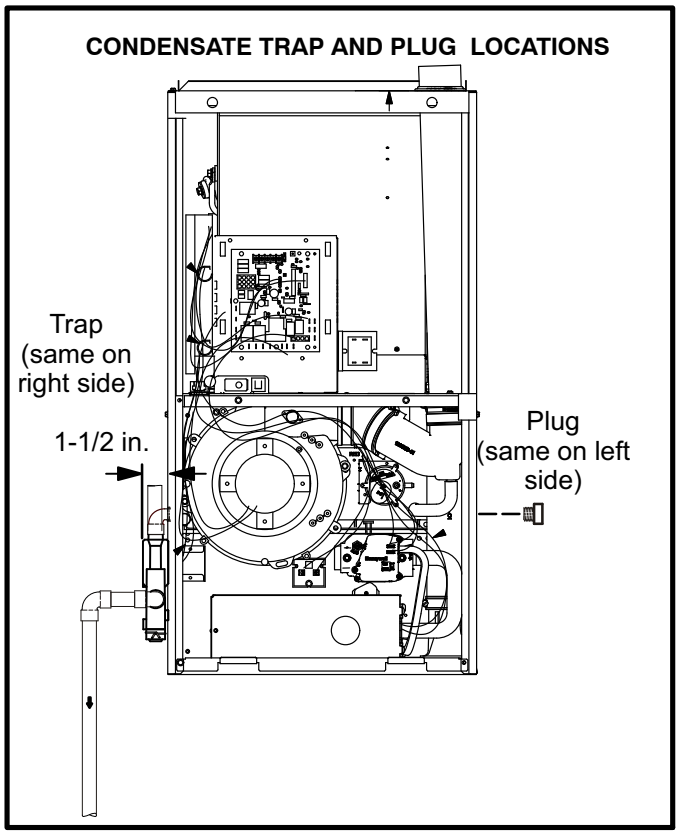


FIGURE 44

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 44) 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.

3 - Install the cap over the clean out opening at the base of the trap. Secure with clamp. See figure 49 (3/4" drain connection) or 50 (1/2" drain connection).

4 - Install drain trap using appropriate PVC fittings, glue all joints. Glue the provided drain trap as shown in figure 49 or 50. Route the condensate line to an open drain.

5 - Figure 47 shows the furnace and evaporator coil using a separate drain. If necessary, the condensate line from the furnace and evaporator coil can drain together. See figure 48. The field provided vent must be a minimum 1" to a maximum 2" length above the condensate drain outlet connection.

***NOTE** - If necessary the condensate trap may be installed up to 5 feet away from the furnace. Piping from furnace must slope down a minimum of 1/4" per ft. toward trap.*

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

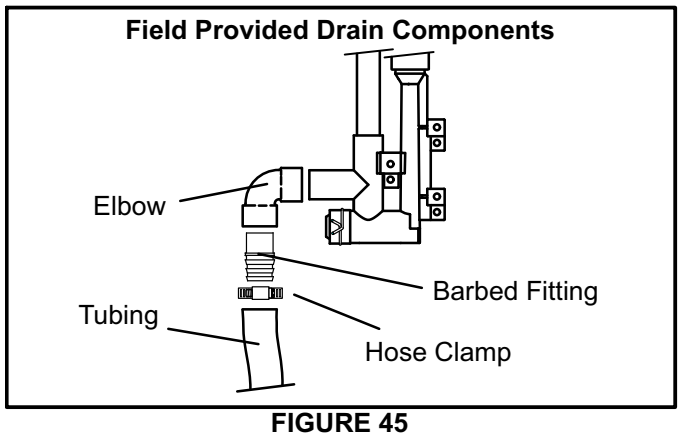


FIGURE 45

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. Heat cable kit is available from Lennox in various lengths; 6 ft. (1.8m) - kit no. 26K68; 24 ft. (7.3m) - kit no. 26K69; and 50 ft. (15.2m) - kit no. 26K70.

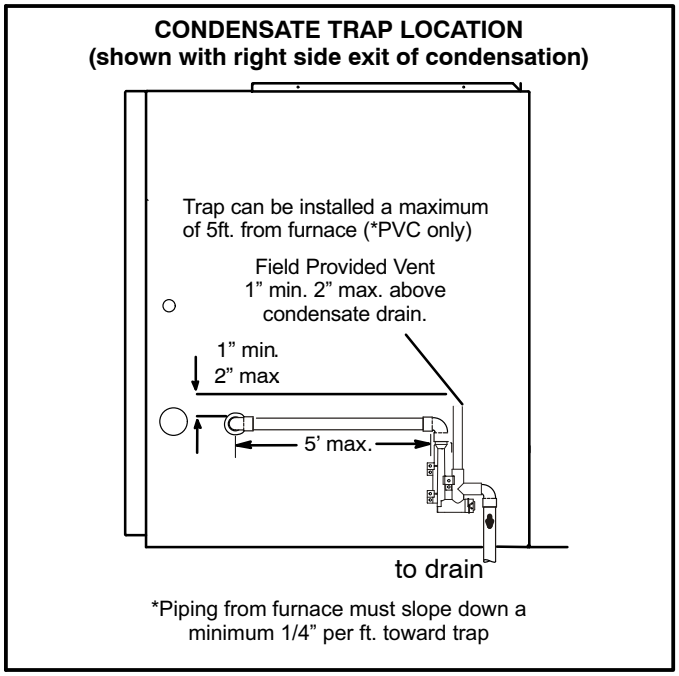


FIGURE 46

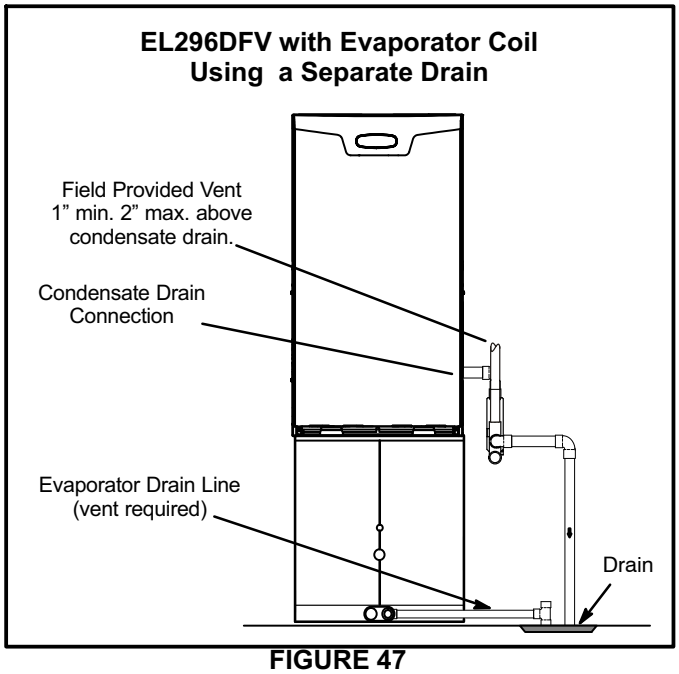


FIGURE 47

⚠ 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.

⚠ CAUTION

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

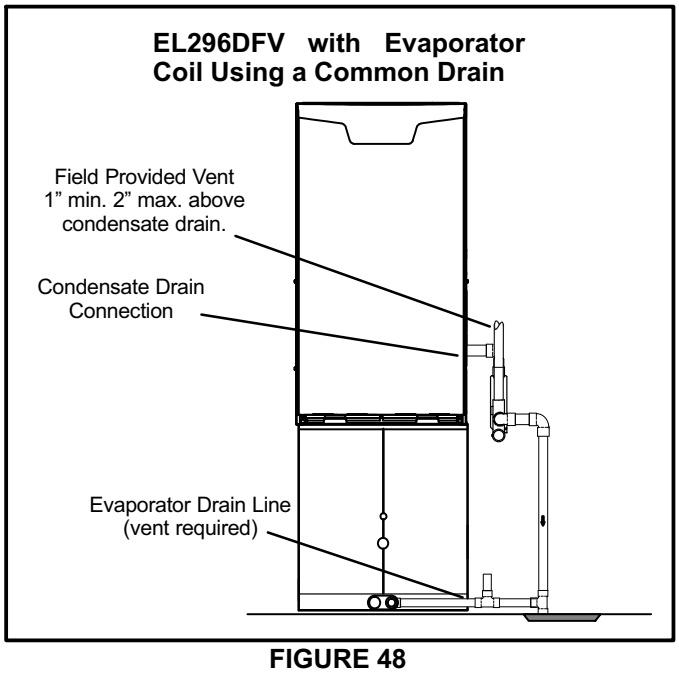


FIGURE 48

TRAP / DRAIN ASSEMBLY USING 1/2" PVC OR 3/4" PVC
COLD END HEADER BOX WITH 3/4" DRAIN CONNECTION

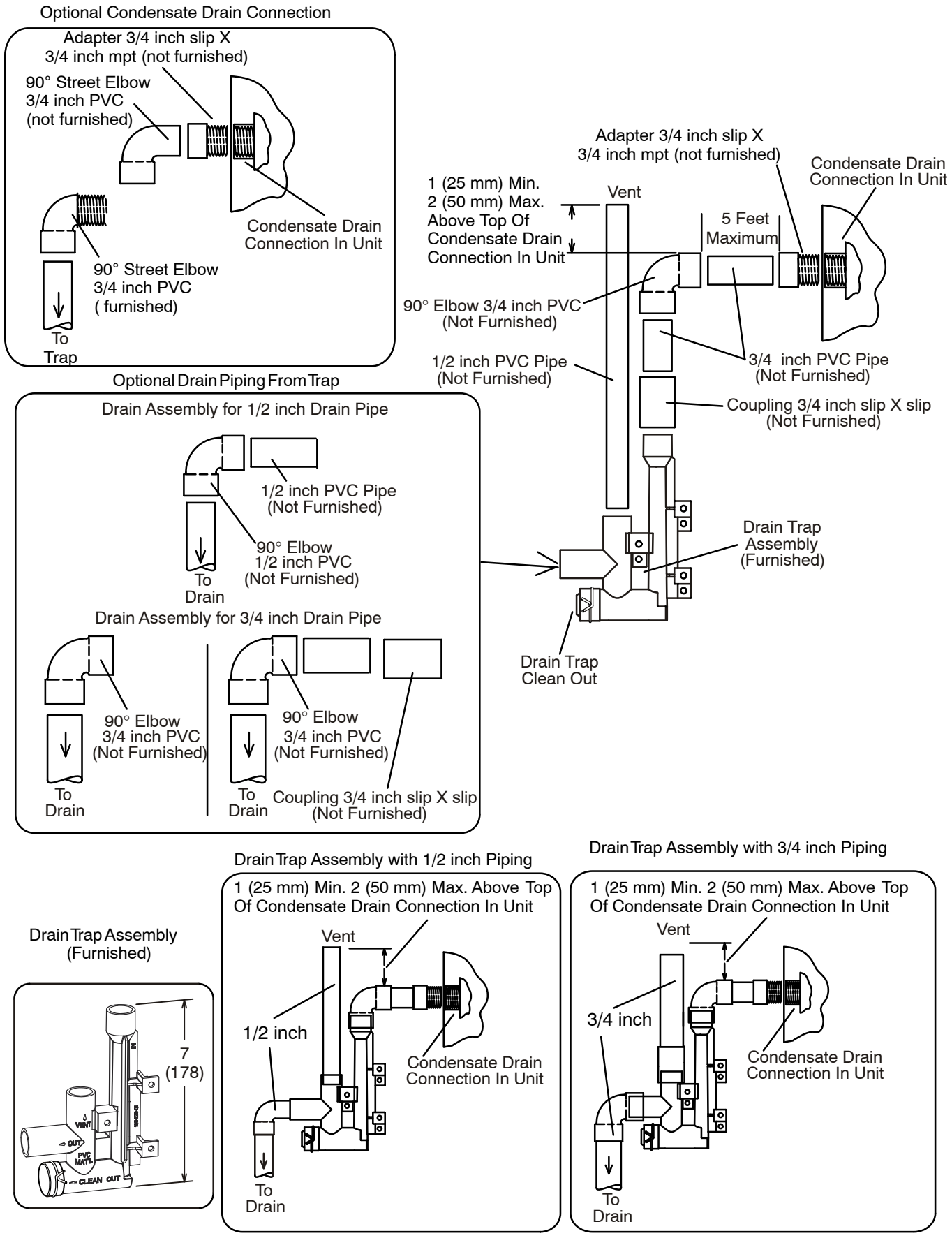


FIGURE 49

TRAP / DRAIN ASSEMBLY USING 1/2" PVC OR 3/4" PVC
COLD END HEADER BOX WITH 1/2" DRAIN CONNECTION

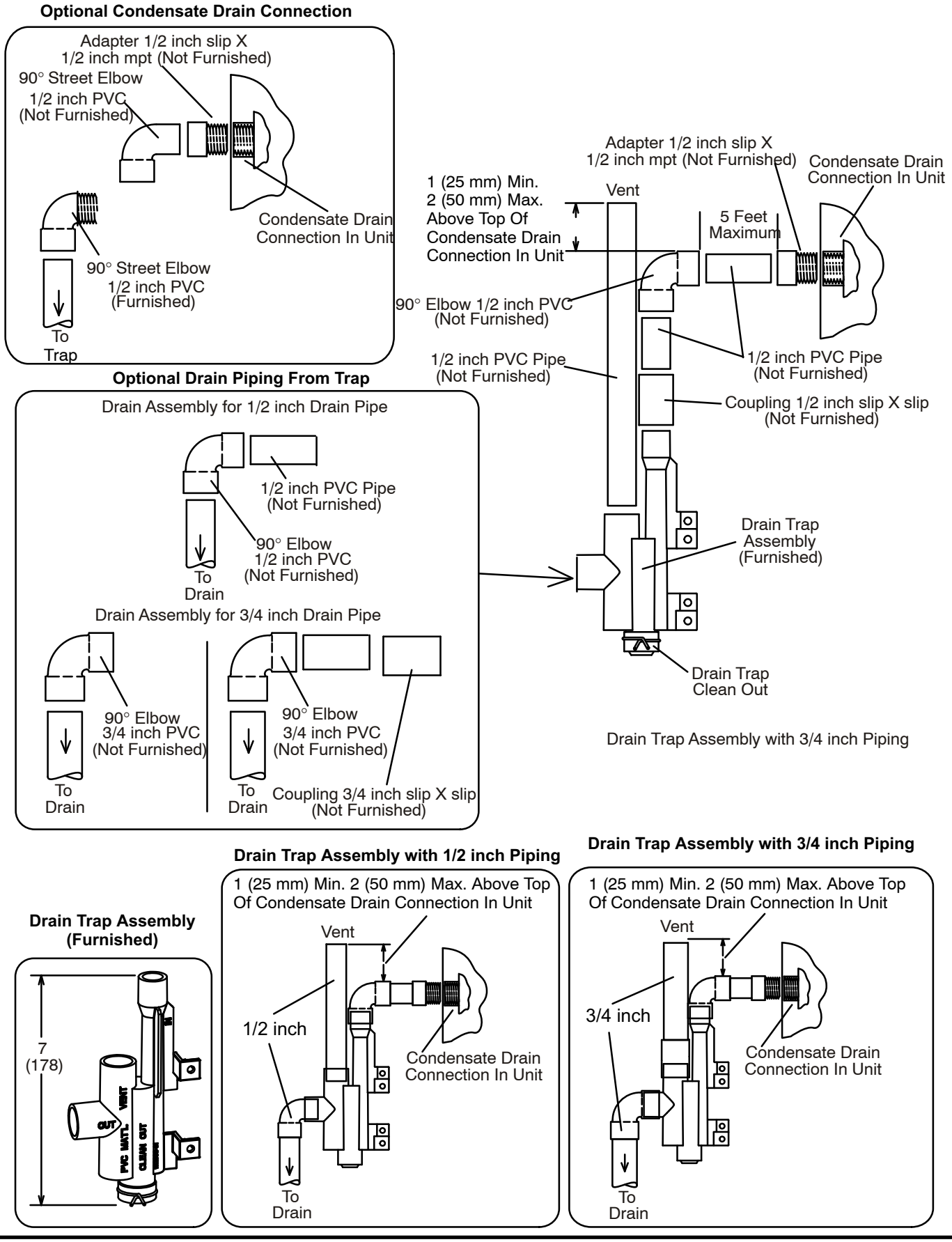


FIGURE 50

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 EL296DFV 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:

EL296DFV 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 51)

1 - **STOP**! Read the safety information at the beginning of this section.

2 - Set the thermostat to the lowest setting.

3 - Turn off all electrical power to the unit.

4 - This furnace is equipped with an ignition device which automatically lights the burners. Do **not** try to light the burners by hand.

5 - Remove the upper access panel.

6 - Move gas valve switch to **OFF.** See figure 51.

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 51.

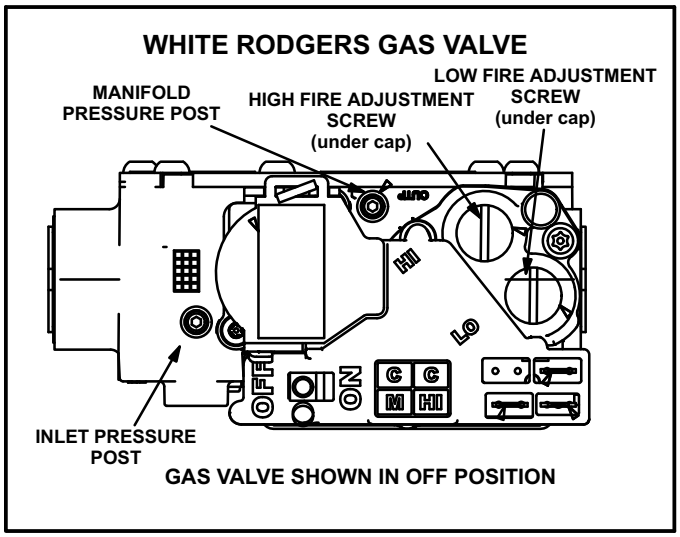


FIGURE 51

9 - Replace the upper access panel.

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

11- Set the thermostat to desired setting.

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

12- If the appliance will not operate, follow the instructions "Turning Off Gas to Unit" and call your service technician or gas supplier.

Turning Off Gas to Unit

1 - Set the thermostat to the lowest setting.

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

3 - Remove the upper access panel.

4 - Move gas valve switch to **OFF.**

5 - Replace the upper access panel.

Failure To Operate

If the unit fails to operate, check the following:

1 - Is the thermostat calling for heat?

2 - Are access panels securely in place?

3 - Is the main disconnect switch closed?

4 - Is there a blown fuse or tripped 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-CSA Certification

All units are CSA design certified without modifications. Refer to the EL296DFV(X) Installation Instruction.

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.

⚠ WARNING

Do not exceed 600 in-lbs (50 ft-lbs) torque 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 52. If the pressure is greater than 0.5psig (14"W.C.), use the manual shut-off valve before pressure testing to isolate furnace from gas supply.

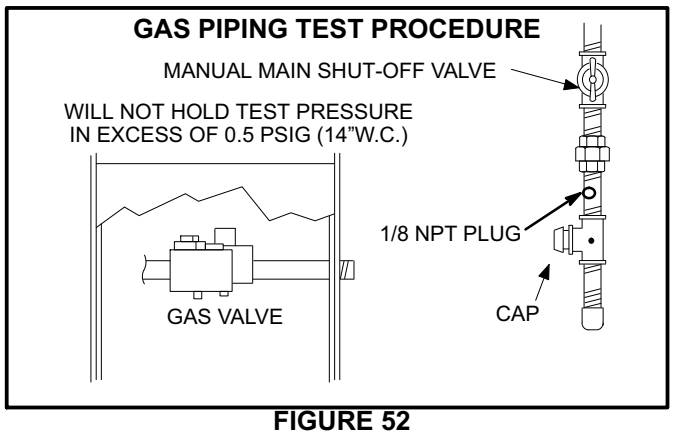


FIGURE 52

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.

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

D-Testing Gas Supply Pressure

An inlet pressure post located on the gas valve provides access to the supply pressure. See figure 51. Back out the 3/32 hex screw one turn, connect a piece of 5/16 tubing and connect to a manometer to measure supply pressure. See table 28 for supply line pressure.

E-Check Manifold Pressure

NOTE - Pressure test adapter kit (10L34) is available from Lennox to facilitate manifold pressure measurement.

A manifold pressure post located on the gas valve provides access to the manifold pressure. See figure 51. Back out the 3/32 hex screw one turn, connect a piece of 5/16 tubing and connect to a manometer to measure manifold pressure.

To correctly measure manifold pressure, the differential pressure between the positive gas manifold and the negative burner box must be considered.

⚠ IMPORTANT

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

1 - Connect the test gauge positive side "+" to manifold pressure tap on gas valve as noted above.

2 - Tee into the gas valve regulator vent hose and connect to test gauge negative "-".

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

4 - After allowing unit to stabilize for 5 minutes, record low fire manifold pressure and compare to value given in table 28. If necessary, make adjustment. Figure 51 shows location of low fire adjustment screw.

5 - Repeat on high fire and compare to value given in table 28. If necessary, make adjustment. Figure 51 shows location of high fire adjustment screw.

6 - Shut unit off and remove manometer as soon as an accurate reading has been obtained.

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

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

F- Proper Gas Flow (Approximate)

Furnace should operate at least 5 minutes before checking gas flow. Determine time in seconds for **two** revolutions of gas through the meter. (Two revolutions assures a more accurate time.) **Divide by two** and compare to time in table 25 below. If manifold pressure matches table 28 and rate is incorrect, check gas orifices for proper size and restriction.

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

TABLE 25

GAS METER CLOCKING CHART				
EL296 Unit	Seconds for One Revolution			
	Natural		LP	
	1 cu ft Dial	2 cu ft Dial	1 cu ft Dial	2 cu ft DIAL
-045	80	160	200	400
-70	55	110	136	272
-90	41	82	102	204
-110	33	66	82	164
-135	27	54	68	136
Natural-1000 btu/cu ft LP-2500 btu/cu ft				

⚠ IMPORTANT

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

G- Proper Combustion

Furnace should operate minimum 15 minutes with correct manifold pressure and gas flow rate before checking combustion. See sections E- and F-. Take combustion sample beyond the flue outlet. Table 26 shows acceptable combustions. The maximum carbon monoxide reading should not exceed 100 ppm.

TABLE 26

EL296 Unit	CO_2% For Nat		CO_2% For L.P	
	Low Fire	High Fire	Low Fire	High Fire
045	5.6 - 6.6	7.8 - 8.8	6.6 - 7.6	9.1 - 10.1
070	5.5 - 6.5	7.3 - 8.3	6.5 - 7.5	8.6 - 9.6
090	5.9 - 6.9	7.8 - 8.8	6.9 - 7.9	9.1 - 10.1
110	6.3 - 7.3	8.2 - 9.2	7.3 - 8.3	9.5 - 10.5
The maximum carbon monoxide reading should not exceed 100ppm.				

H- High Altitude

The manifold pressure, gas orifice and pressure switch may require adjustment or replacement to ensure proper operation at higher altitudes. See table 27 for gas conversion and pressure switch kits. See table 28 for manifold pressures

TABLE 27
LP/Propane Conversion Kit and Pressure Switch Requirements at Varying Altitudes

EL296 Unit	Natural to LP/Propane	High Altitude Natural Burner Orifice Kit	High Altitude LP/Propane Burner Orifice Kit	High Altitude Pressure Switch	
	0 - 7500 ft (0 - 2286m)	7501 - 10,000 ft (2286 - 3038m)	7501 - 10,000 ft (2286 - 3038m)	4501 - 7500 ft (1373 - 2286m)	7501 -10,000 ft (2286 - 3048m)
-045	*11K51	73W37	*11K46	14A57	14A50
-070				14A55	14A56
-090				14A54	14A53
-110				14A46	14A51

* Conversion requires installation of a gas valve manifold spring which is provided with the gas conversion kit.
Pressure switch is factory set. No adjustment necessary. All models use the factory-installed pressure switch from 0-4500 feet (0-1370 m).

TABLE 28
Manifold Pressure Settings

EL296 Unit	Gas	Manifold Pressure in.wg.		Supply Line Pressure in. w.g.	
		Low Fire	High Fire	Min	Max
All Sizes	Natural	1.7	3.5	4.5	10.5
	LP/propane	4.5	10.0	11.0	13.0

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.

I- Proper Ground and Voltage

A poorly grounded furnace can contribute to premature ignitor failure. Use the following procedure to check for ground and voltage to the integrated control.

1 - Measure the AC voltage between Line Neutral (spade terminals) and “C” terminal (low voltage terminal block) on the integrated control. See figure 53. 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 1, 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 53. This voltage should be in the range of 97 to 132 Vac

TABLE 29

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

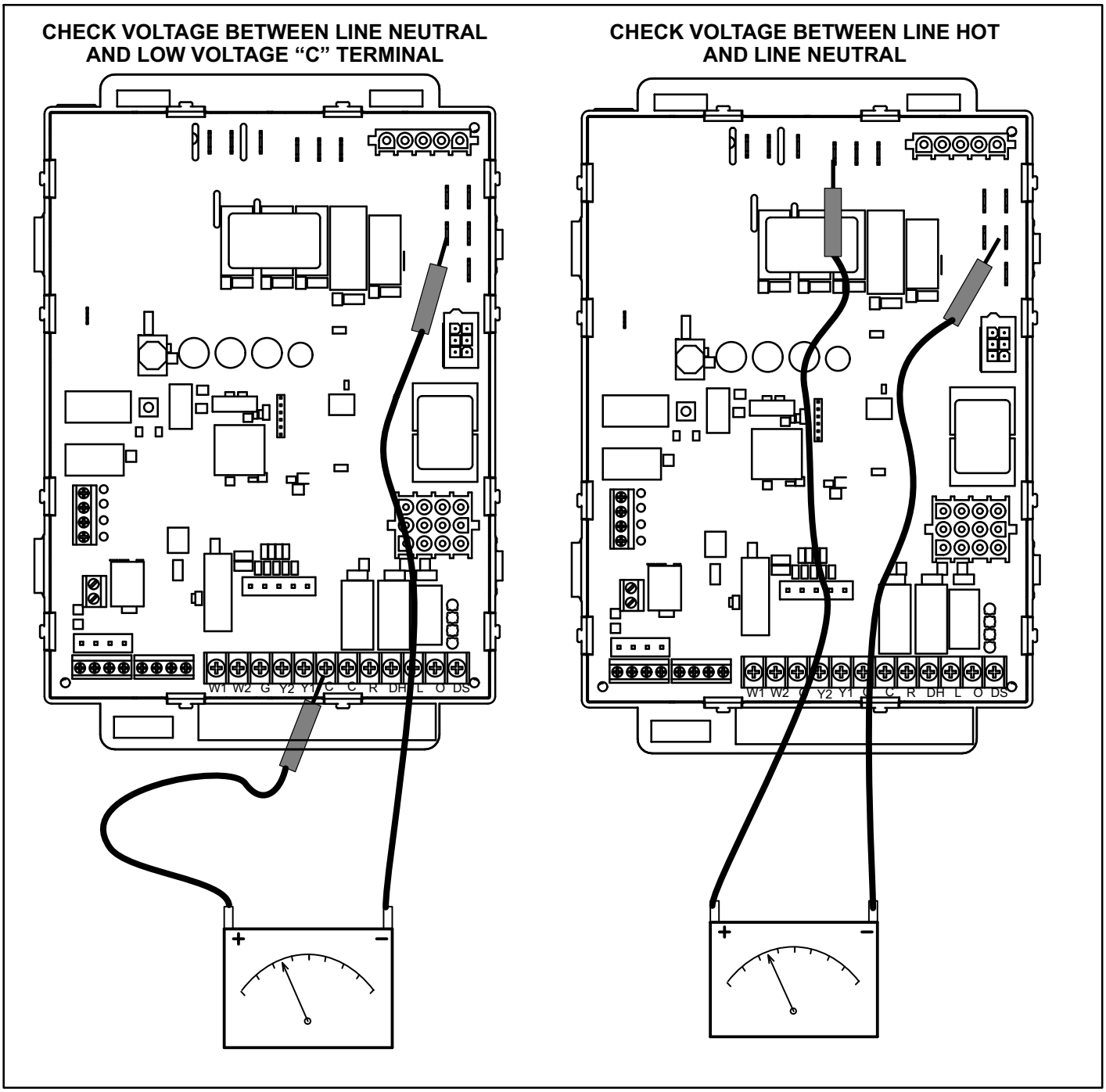


FIGURE 53

V-TYPICAL OPERATING CHARACTERISTICS

A-Blower Operation and Adjustment

1 - Blower operation is dependent on thermostat control system.

2 - Generally, blower operation is set at thermostat sub-base 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 54)

Temperature rise for EL296DFV 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.

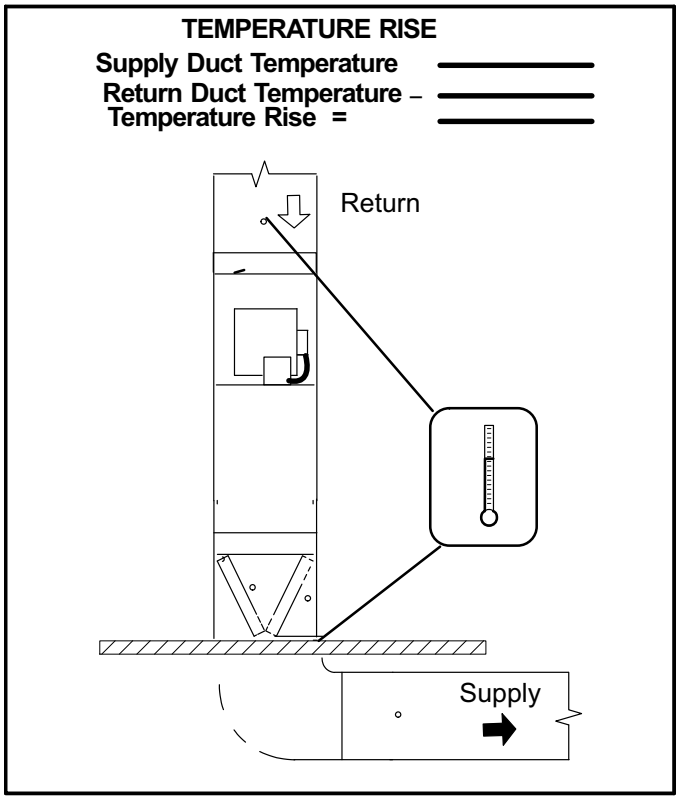


FIGURE 54

C-External Static Pressure

1 - Tap locations shown in figure 55.

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 (second stage heat speed) external static pressure drop must not be more than 0.8" W.C. For cooling speed (second stage cool speed) external static pressure drop must not be more than 1.0" W.C.

4 - Seal the hole when the check is complete.

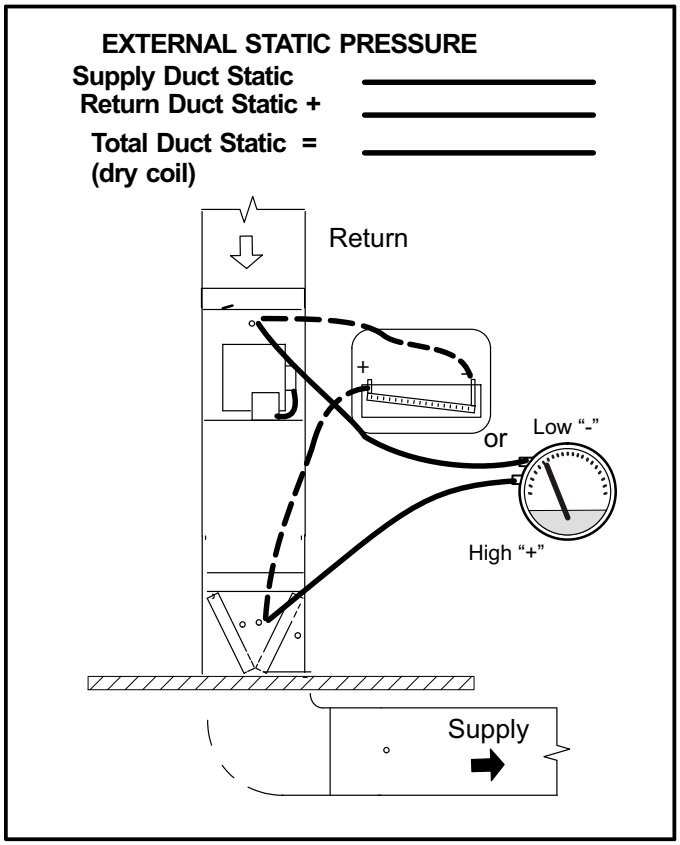


FIGURE 55

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.

At the beginning of each heating season, system should be checked as follows by a qualified service technician:

Blower

Check the blower wheel for debris and clean if necessary. The blower motors are prelubricated for extended bearing life. No further lubrication is needed.

⚠ 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.

Filters

All air filters are installed external to the unit. Filters should be inspected monthly. Clean or replace the filters when necessary to ensure proper furnace operation. Table 30 lists recommended filter sizes.

⚠ IMPORTANT

If a high-efficiency filter is being installed as part of this system to ensure better indoor air quality, the filter must be properly sized. High-efficiency filters have a higher static pressure drop than standard-efficiency glass/foam filters. If the pressure drop is too great, system capacity and performance may be reduced. The pressure drop may also cause the limit to trip more frequently during the winter and the indoor coil to freeze in the summer, resulting in an increase in the number of service calls.

Before using any filter with this system, check the specifications provided by the filter manufacturer against the data given in the appropriate Lennox Product Specifications bulletin. Additional information is provided in Service and Application Note ACC-00-2 (August 2000).

TABLE 30

Furnace Cabinet Width	Minimum Filter Size
17-1/2”	**16 x 25 x 1 (1)**
21”	

Exhaust and air intake pipes

Check the exhaust and air intake pipes and all connections for tightness and to make sure there is no blockage.

***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.*

Electrical

1 - Check all wiring for loose connections.

2 - Check for the correct voltage at the furnace (furnace operating).

3 - Check amp-draw on the blower motor.
Motor Nameplate_____Actual_____

Winterizing and Condensate Trap Care

1 - Turn off power to the furnace.

2 - Have a shallow pan ready to empty condensate water.

3 - Remove the clean out cap from the condensate trap and empty water. Inspect the trap then reinstall the clean out cap.

Condensate Hose Screen (Figure 56)
Check the condensate hose screen for blockage and clean if necessary.

1 - Turn off power to the unit.

2 - Remove hose from cold end header box. Twist and pull screen to remove.

3 - Inspect screen and rinse with tap water if needed.

4 - Reinstall screen and turn on power to unit.

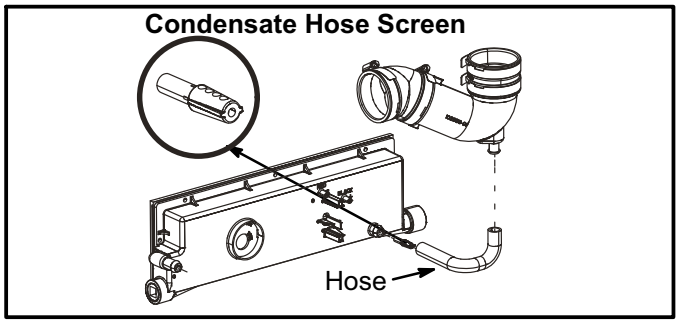


FIGURE 56

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

1 - Turn off electrical and gas supplies to the furnace.

2 - Remove the furnace access panels.

3 - Disconnect the wires from the gas valve.

4 - Remove gas supply line connected to gas valve. Remove the burner box cover (if equipped) and remove gas valve/manifold assembly.

5 - Remove sensor wire from sensor. Disconnect 2-pin plug from the ignitor.

6 - Disconnect wires from flame roll-out switches.

7 - Loosen clamps at vent elbow. Disconnect condensate drain tubing from flue collar. and remove the vent elbow.

8 - Loosen clamps and remove combustion air intake flexible connector if equipped.

9 - Remove four burner box screws at the vestibule panel and remove burner box. Set burner box assembly aside.
***NOTE** - If necessary, clean burners at this time. Follow procedures outlined in Burner Cleaning section.*

10 - Mark and disconnect all combustion air pressure tubing from cold end header collector box.

11 - Mark and remove wires from pressure switch assembly. Remove pressure switch assembly. Keep tubing attached to pressure switch assembly.

12 - Disconnect the plug from the combustion air inducer. Remove two screws which secure combustion air inducer to collector box. Remove combustion air inducer assembly. Remove ground wire from vest panel.

13 - Remove electrical junction box from the side of the furnace.

14 - Disconnect condensate line from cold end header box. Remove cold end header box.

15 - Loosen clamps on exhaust and air intake pipe seal plate. Slide exhaust and intake pipes up and out to clear blower deck. Remove exhaust and air intake pipe seal plate.

16 - Mark and disconnect any remaining wiring to heating compartment components. Disengage strain relief bushing and pull wiring and bushing through the hole in the blower deck.

17 - Remove the primary limit from the vestibule panel.

18 - Remove two screws from the front cabinet flange at the blower deck. Spread cabinet sides slightly to allow clearance for removal of heat exchanger.

19 - Remove screws along vestibule sides which secure vestibule panel and heat exchanger assembly to cabinet. Remove two screws from blower rail which secure top heat exchanger flange. Remove heat exchanger from furnace cabinet.

20 - Back wash heat exchanger with soapy water solution or steam. **If steam is used it must be below 275°F (135°C) .**

21 - Thoroughly rinse and drain the heat exchanger. Soap solutions can be corrosive. Take care to rinse entire assembly.

22 - Reinstall heat exchanger into cabinet making sure that the clamshells of the heat exchanger assembly are engaged properly into the support bracket on the blower deck. Remove the indoor blower to view this area through the blower opening.

23 - Re-secure the supporting screws along the vestibule sides and top to the cabinet.

24 - Reinstall cabinet screws on front flange at blower deck.

25 - Reinstall the primary limit on the vestibule panel.

26 - Route heating component wiring through hole in blower deck and reinsert strain relief bushing.

27 - Reinstall electrical junction box.

28 - Reinstall exhaust and air intake pipe seal plate. Reinstall exhaust and air intake pipes and tighten clamps on pipe seal plate.

29 - Reinstall the cold end header box.

30 - Reinstall the combustion air inducer. Reconnect the combustion air inducer to the wire harness.

31 - Reinstall pressure switch assembly and reconnect pressure switch wiring.

32 - Carefully connect combustion air pressure switch tubing from pressure switches to proper ports on cold end header collector box.

33 - Reinstall condensate trap.

34 - Secure burner box assembly to vestibule panel using four existing screws. **Make sure burners line up in center of burner ports.**

35 - Reconnect exhaust piping and exhaust drain tubing.

36 - Reconnect flame roll-out switch wires.

37 - Reconnect sensor wire and reconnect 2-pin plug from ignitor.

38 - Reinstall gas valve manifold assembly. Reconnect gas supply line to gas valve.

39 - Reinstall burner box cover if equipped.

40 - Reconnect plug to gas valve.

41 - Replace the blower compartment access panel.

42 - Follow lighting instructions on unit nameplate to light and operate furnace for 5 minutes to ensure the furnace is operating properly.

43- 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.

44 - Replace access panel.

Cleaning the Burner Assembly (if needed)

1 - Turn off electrical and gas power supplies to furnace. Remove upper and lower furnace access panels.

2 - Disconnect the 2-pin plug from the gas valve.

3 - Remove the burner box cover (if equipped).

4 - Disconnect the gas supply line from the gas valve. Remove gas valve/manifold assembly.

5 - -Loosen clamps and remove combustion air intake flexible connector (if equipped).

5 - Mark and disconnect sensor wire from the sensor. Disconnect plug from the ignitor at the burner box.

6 - Remove four screws which secure burner box assembly to vest panel. Remove burner box from the unit.

7 - Use the soft brush attachment on a vacuum cleaner to gently clean the face of the burners. Visually inspect the inside of the burners and crossovers for any blockage caused by foreign matter. Remove any blockage.

8 - Reinstall the burner box assembly using the existing four screws. Make sure that the burners line up in the center of the burner ports.

9 - Reconnect the sensor wire and reconnect the 2-pin plug to the ignitor wiring harness.

10 - Reinstall combustion air intake flexible connector (if equipped), secure using existing clamps.

11 - Reinstall the gas valve manifold assembly. Reconnect the gas supply line to the gas valve. Reinstall the burner box cover.

12 - Reconnect plug to gas valve.

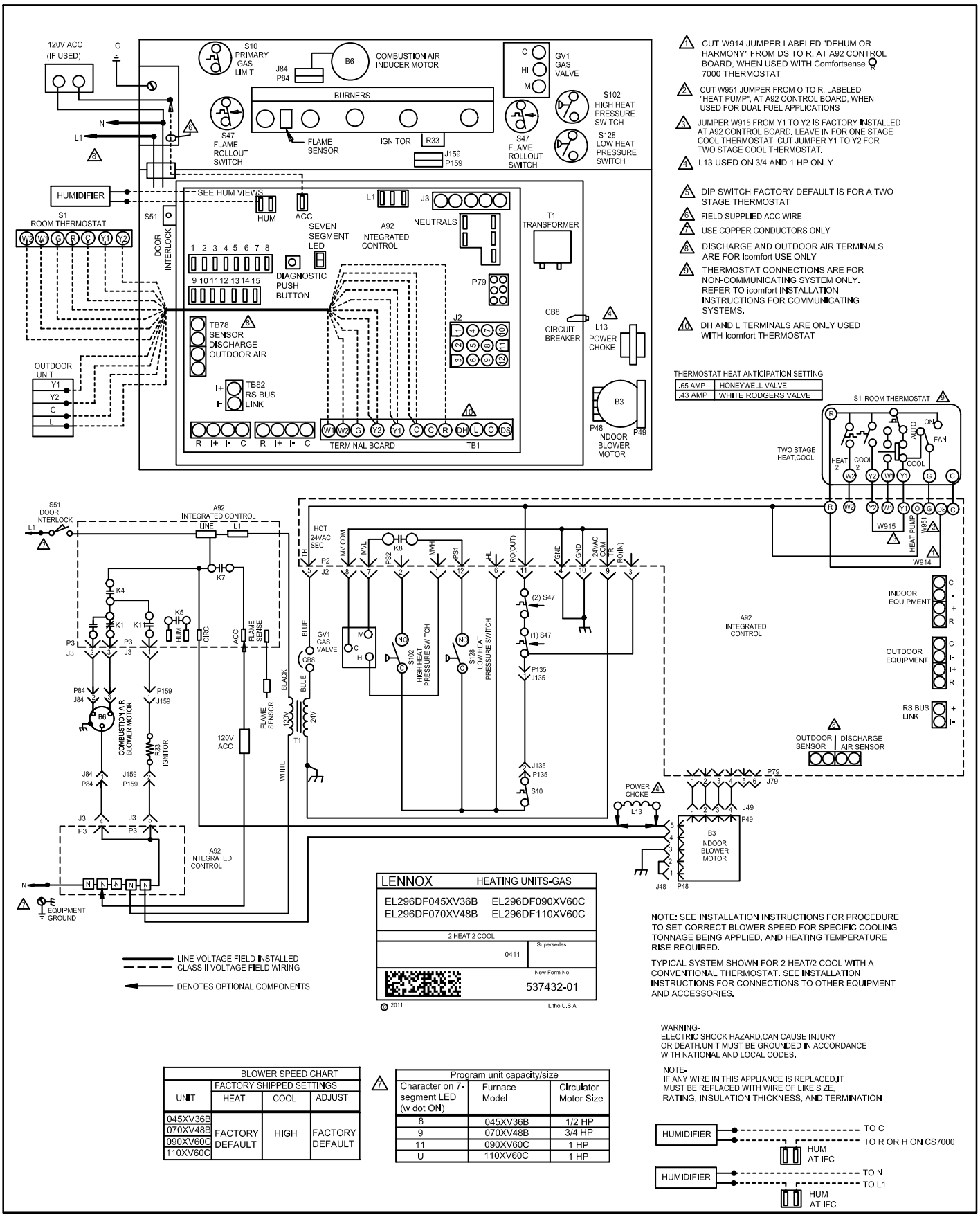
13 - Replace the blower compartment access panel.

14 - Refer to instruction on verifying gas and electrical connections when re-establishing supplies.

15 - Follow lighting instructions to light and operate furnace for 5 minutes to ensure that heat exchanger is clean and dry and that furnace is operating properly.

16 - Replace access panel.

VII- Wiring and Sequence of Operation



LENNOX	HEATING UNITS-GAS
EL296DF045XV36B	EL296DF090XV60C
EL296DF070XV48B	EL296DF110XV60C
2 HEAT 2 COOL	
0411	Supersedes
	New Form No. 537432-01

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NOTE: SEE INSTALLATION INSTRUCTIONS FOR PROCEDURE TO SET CORRECT BLOWER SPEED FOR SPECIFIC COOLING TONNAGE BEING APPLIED, AND HEATING TEMPERATURE RISE REQUIRED.

TYPICAL SYSTEM SHOWN FOR 2 HEAT/2 COOL WITH A CONVENTIONAL THERMOSTAT. SEE INSTALLATION INSTRUCTIONS FOR CONNECTIONS TO OTHER EQUIPMENT AND ACCESSORIES.

WARNING-
ELECTRIC SHOCK HAZARD,CAN CAUSE INJURY OR DEATH.UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES.

NOTE-
IF ANY WIRE IN THIS APPLIANCE IS REPLACED,IT MUST BE REPLACED WITH WIRE OF LIKE SIZE, RATING, INSULATION THICKNESS, AND TERMINATION

BLOWER SPEED CHART			
	FACTORY SHIPPED SETTINGS		
UNIT	HEAT	COOL	ADJUST
045XV36B 070XV48B 090XV60C 110XV60C	FACTORY DEFAULT	HIGH	FACTORY DEFAULT

7

Program unit capacity/size		
Character on 7-segment LED (w dot ON)	Furnace Model	Circulator Motor Size
8	045XV36B	1/2 HP
9	070XV48B	3/4 HP
11	090XV60C	1 HP
U	110XV60C	1 HP

⚠ WARNING

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

⚠ WARNING

Fire Hazard. Use of aluminum wire with this product may result in a fire, causing property damage, severe injury or death. Use copper wire only with this product.

⚠ CAUTION

Failure to use properly sized wiring and circuit breaker may result in property damage. Size wiring and circuit breaker(s) per Product Specifications bulletin (EHB) and unit rating plate.

Electronic Ignition

The two-stage, variable speed integrated control used in EL296DFV units has an added feature of an internal Watchguard control. The feature serves as an automatic reset device for ignition control lockout caused by ignition failure. After one hour of continuous thermostat demand for heat, the Watchguard will break and remake thermostat demand to the furnace and automatically reset the control to begin the ignition sequence.

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

Applications Using a Two-Stage Thermostat
See figure 57 for ignition control sequence

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

1. On a call for heat, thermostat first-stage contacts close sending a signal to the integrated control. The integrated control runs a self-diagnostic program and checks high temperature limit switches for normally closed contacts and pressure switches for normally open contacts. The combustion air inducer is energized at low speed.
2. Once the control receives a signal that the low pressure switch has closed, the combustion air inducer begins a 15-second pre-purge in low speed.
   NOTE - If the low fire pressure switch does not close the combustion air inducer will switch to high fire. After a 15 second pre-purge the high fire pressure switch will close and the unit will begin operation on high fire. After 10 to 20 seconds of high fire operation the unit will switch to low fire..
3. After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at low speed.

4 - After the 20-second warm-up period has ended, the gas valve is energized on low fire (first stage) and ignition occurs. At the same time, the control module sends a signal to begin an indoor blower 30-second ON-delay. When the delay ends, the indoor blower motor is energized on the low fire heating speed, the HUM contacts close energizing the humidifier and 120V ACC terminal is energized. The furnace will continue this operation as long as the thermostat has a first-stage heating demand.

5 - If second-stage heat is required, the thermostat second-stage heat contacts close and send a signal to the integrated control. The integrated control initiates a 30-second second-stage recognition delay.
   NOTE - *If the indoor thermostat is set on CONTINUOUS FAN ON mode, the furnace will light on high fire (second-stage) for 60 seconds to improve heat exchanger warm up. After 60 second warm-up period, furnace will switch to low fire (first-stage).*

6 - At the end of the recognition delay, the integrated control energizes the combustion air inducer at high speed. The control also checks the high fire (second stage) pressure switch to make sure it is closed. The high fire (second stage) gas valve is energized and the indoor blower motor is energized for operation at the high fire heating speed.

7 - When the demand for high fire (second stage) heat is satisfied, the combustion air inducer is switched to the low-fire heating speed and the high-fire (second stage) gas valve is de-energized. The low-fire (first stage) gas valve continues operation. The indoor blower motor is switched to the low-fire heating speed.

8 - When the thermostat demand for low-fire (first stage) heat is satisfied, the gas valve is de-energized and the field-selected indoor blower off delay begins. The combustion air inducer begins a 5-second post-purge period.

9 - When the combustion air post-purge period is complete, the inducer and the HUM contacts are de-energized. The indoor blower is de-energized at the end of the off delay as well as the 120V ACC terminal.

Applications Using A Single-Stage Thermostat
See figure 58 for ignition control sequence

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

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

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

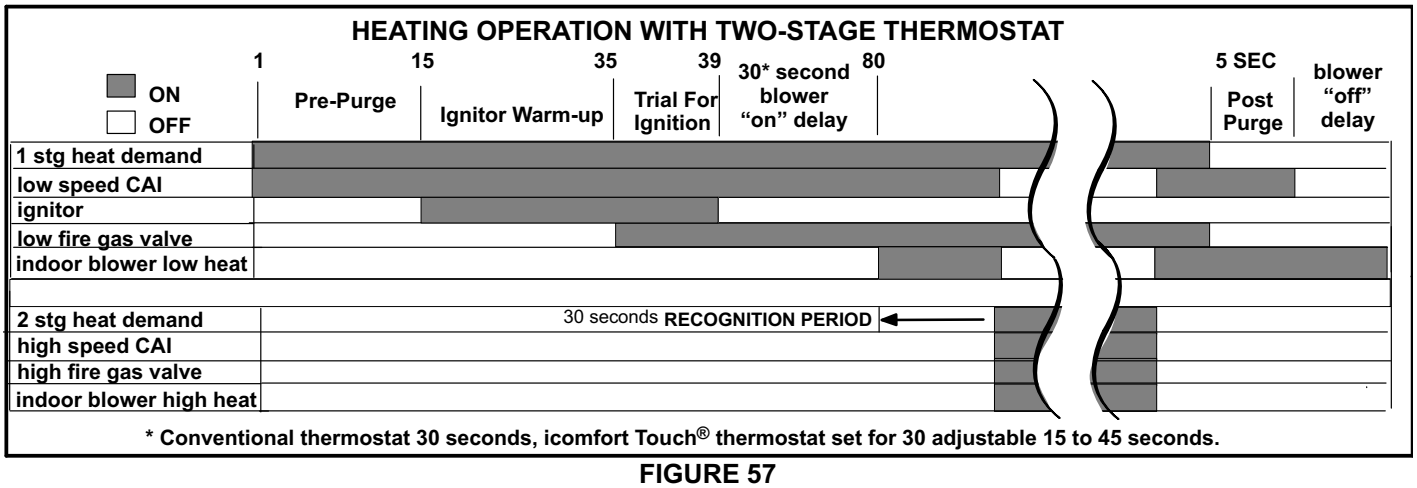


FIGURE 57

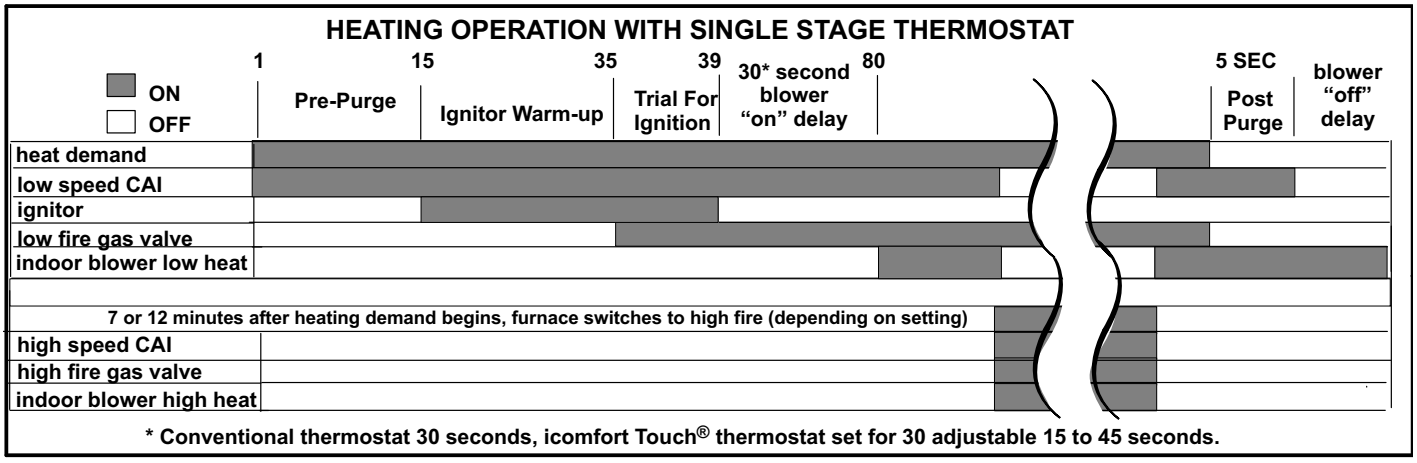
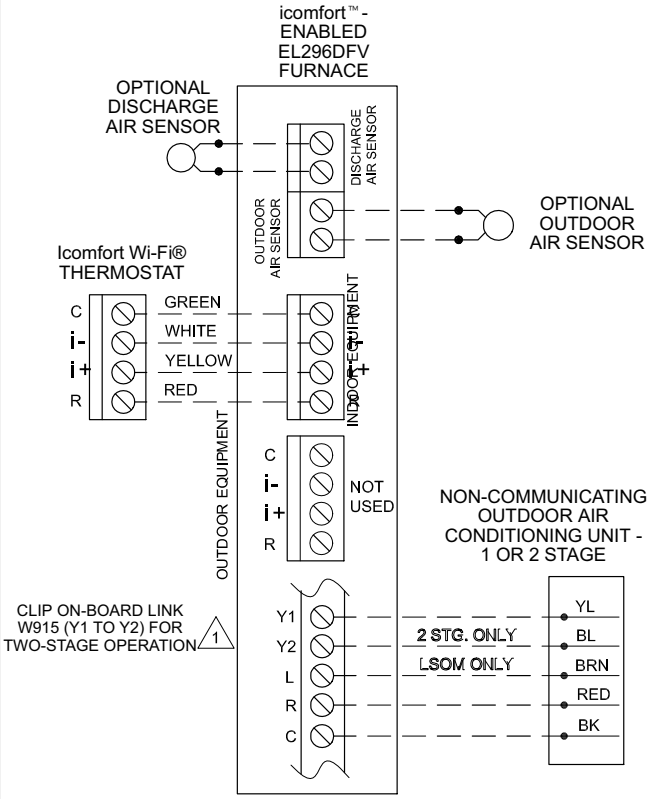


FIGURE 58

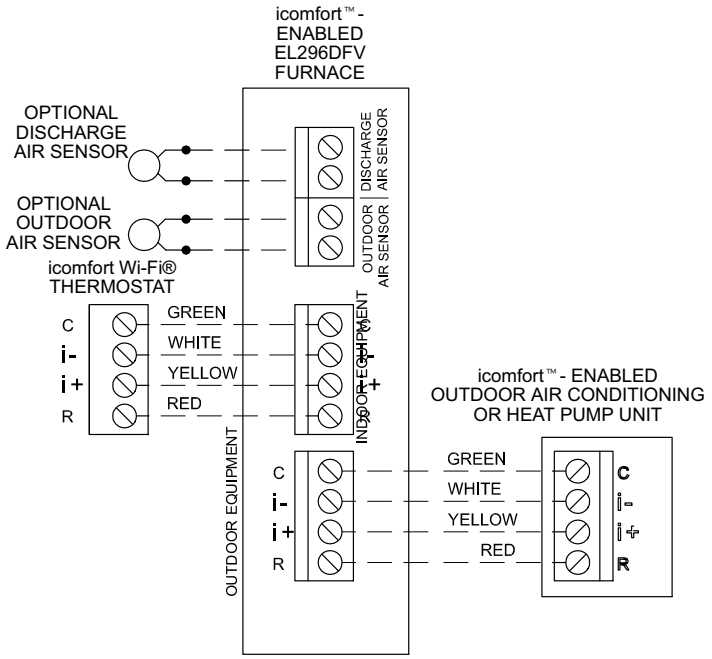
icomfort Wi-Fi® Thermostat with EL296DFV and Non-Communicating Outdoor Unit

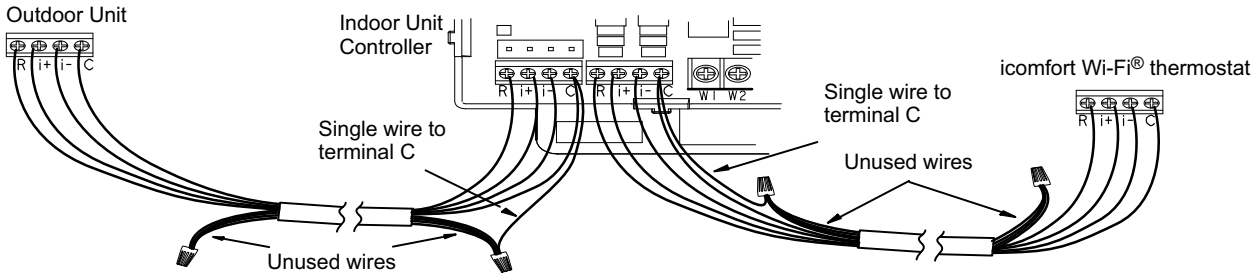
icomfort Wi-Fi® Thermostat
icomfort™ -Enabled EL296DFV Indoor Furnace
Non-Communicating Outdoor Air Conditioner



icomfort Wi-Fi® Thermostat with EL296DFV and icomfort™ -ENABLED Outdoor Unit

icomfort Wi-Fi® Thermostat
icomfort™ -Enabled EL296DFV Indoor Furnace
icomfort™ -Enabled Outdoor Air Conditioner or Heat Pump





Communicating systems using the icomfort Wi-Fi® thermostat require four thermostat wires between the thermostat and the furnace/air handler control and four wires between the outdoor unit and the furnace/air handler control. When a thermostat cable with more than four wires is used, the extra wires must be properly connected to avoid electrical noise. The wires must not be left disconnected.

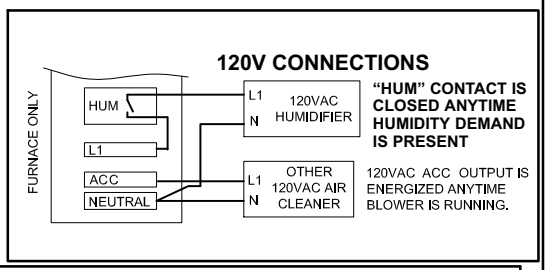
Use wire nuts to bundle the four unused wires at each end of the cable. A single wire should then be connected to the indoor unit end of the wire bundle and attached to the “C” terminals as shown above.

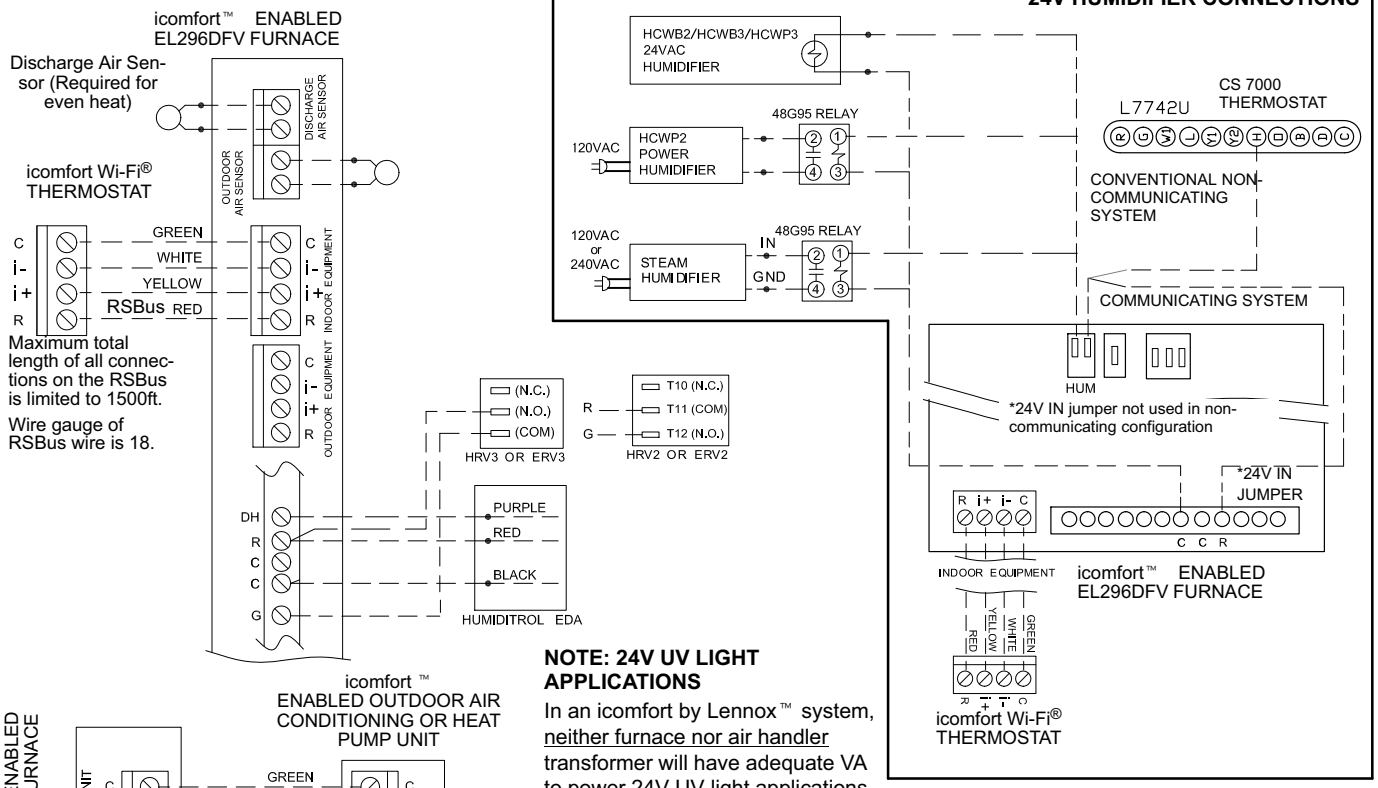
FIGURE 59

Optional Accessories for use with any icomfort Touch® System

NOTE: icomfort Wi-Fi® THERMOSTAT SENSES HUMIDITY & CONTROLS HUM CONTACTS TO CYCLE HUMIDIFIER BASED ON DEMAND. NO OTHER CONTROL OR HUMIDISTAT REQUIRED.

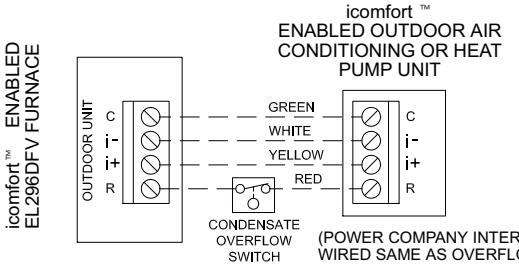
OPTIONAL OUTDOOR AIR SENSOR FOR USE WITH HUMIDIFIER (IF NOT ALREADY IN THE SYSTEM FOR OTHER FUNCTIONS. BUILT INTO ALL icomfort by Lennox™ OUTDOOR UNITS).

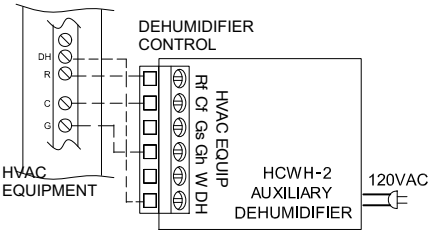




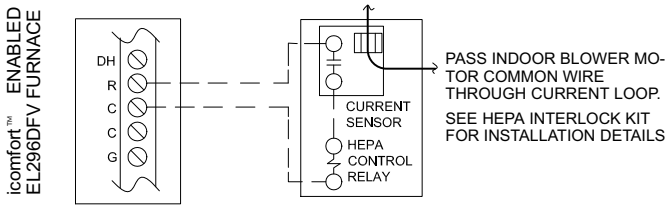
NOTE: 24V UV LIGHT APPLICATIONS

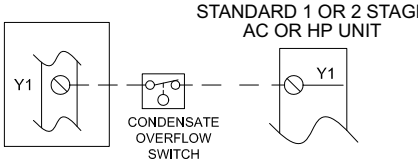
In an icomfort by Lennox™ system, neither furnace nor air handler transformer will have adequate VA to power 24V UV light applications. An additional transformer for UV light applications is required.





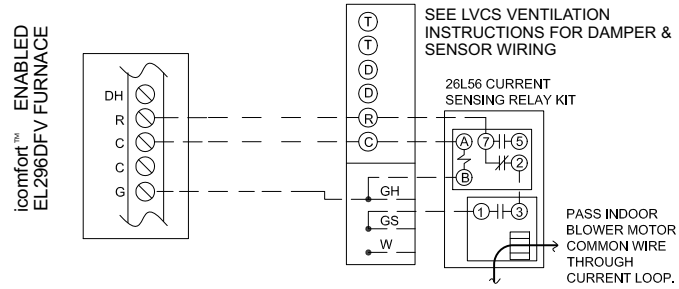
HEPA BYPASS FILTER X2680 HEPA INTERLOCK KIT

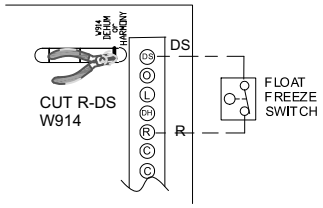




NON-COMMUNICATING SYSTEM WIRING

LVCS VENTILATION CONTROL SYSTEM





COMMUNICATING SYSTEM WIRING

VIII- EL296DFV Field Wiring Applications With Conventional Thermostat

TABLE 29

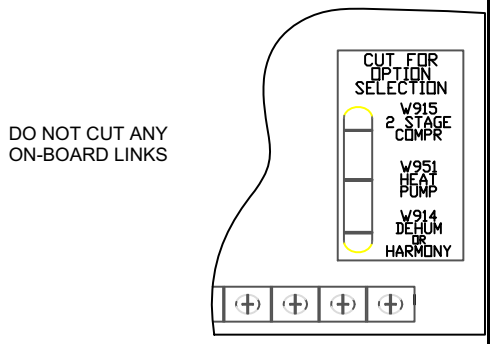
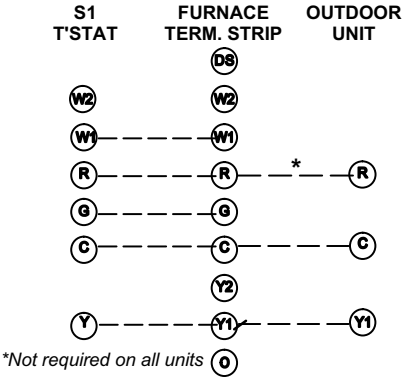
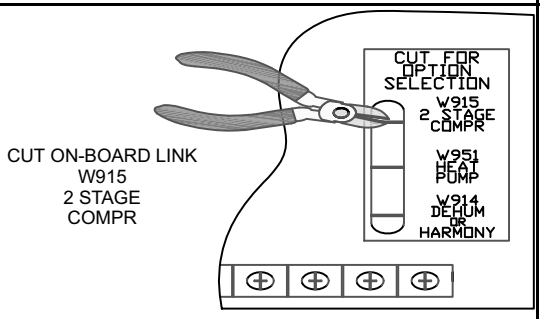
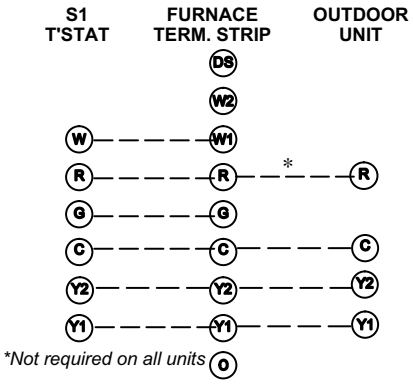
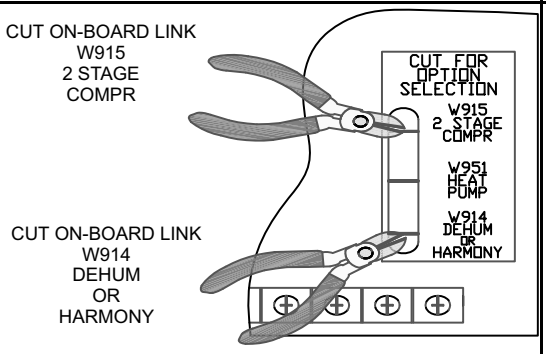
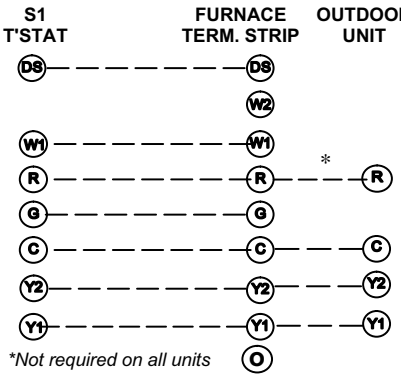
Thermostat	DIP Switch Settings and On-Board Links (See figure 4)		Wiring Connections
	DIP Switch 1 Thermostat Heating Stages	**On Board Links Must Be Cut To Select System Options**	
1 Heat / 1 Cool *NOTE - Use DIP switch 2 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.*	ON		
1 Heat / 2 Cool *NOTE - Use DIP switch 2 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.*	ON		
1 Heat / 2 Cool with t'stat with humidity control *NOTE - Use DIP switch 2 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.*	ON		

TABLE 29

EL296 Field Wiring Applications With Conventional Thermostat (Continued)

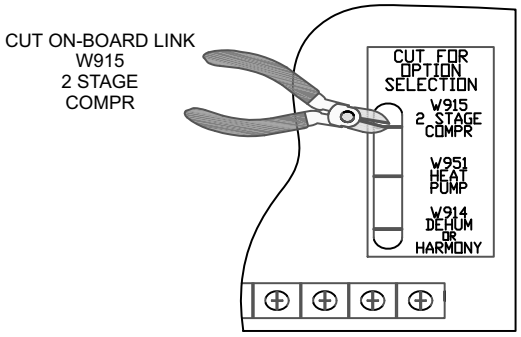
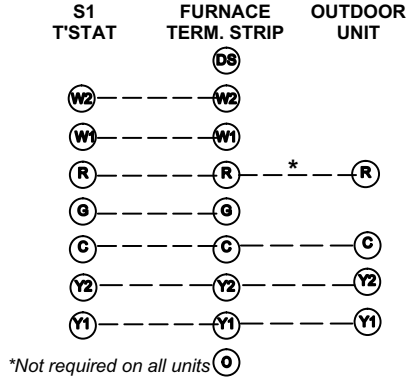
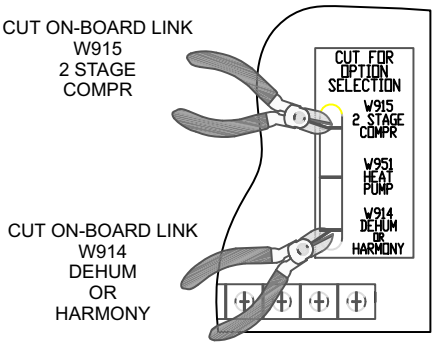
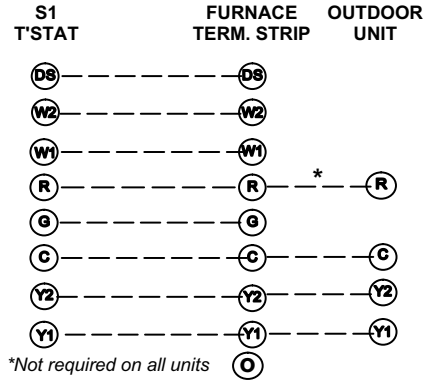
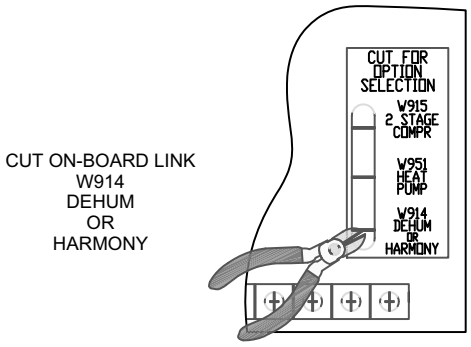
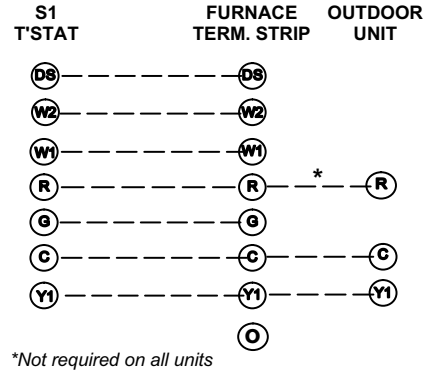
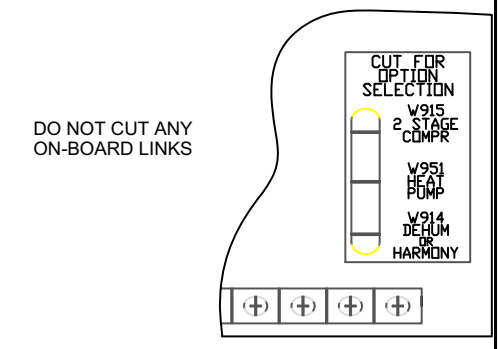
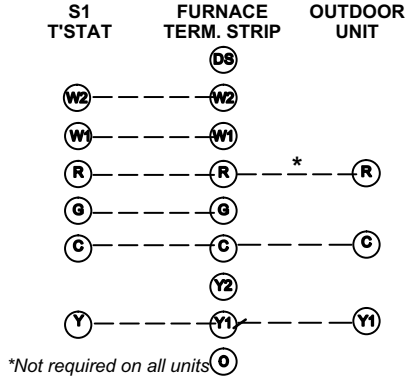
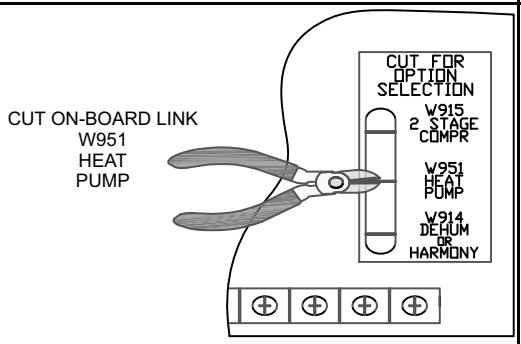
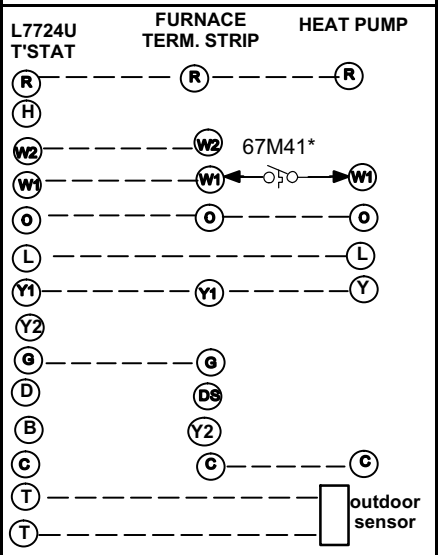
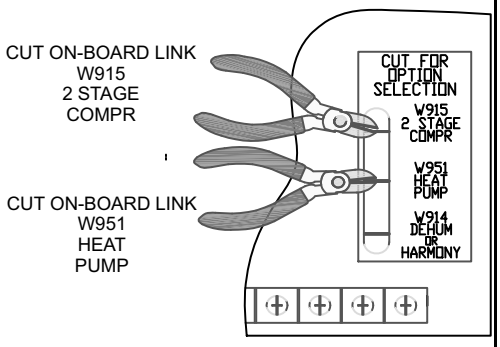
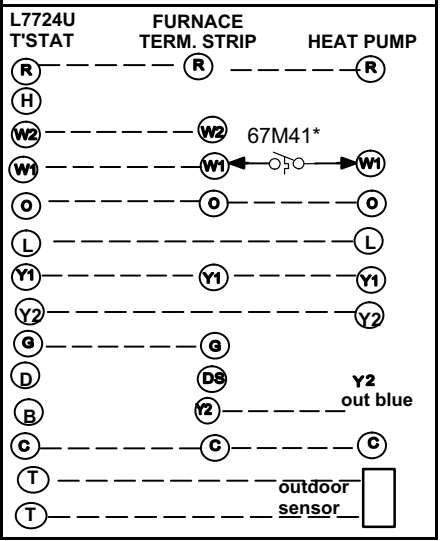
Thermostat	DIP Switch Settings and On-Board Links (See figure 4)		Wiring Connections
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options	
2 Heat / 2 Cool	OFF		
2 Heat / 2 Cool with t'stat with humidity control	OFF		
2 Heat / 1 Cool with t'stat with humidity control	OFF		
2 Heat / 1 Cool	OFF		

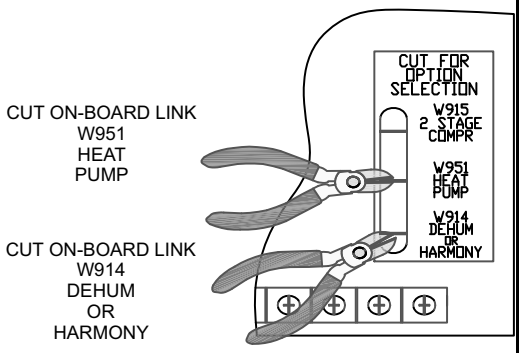
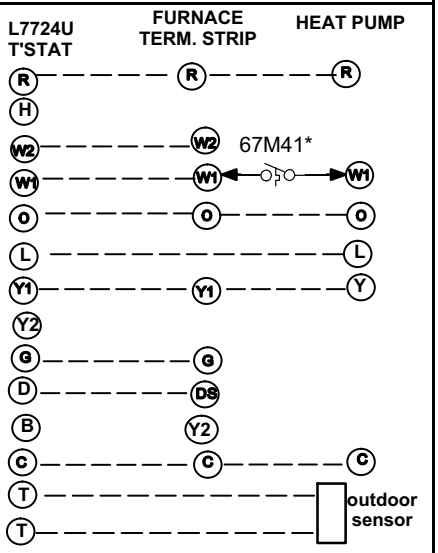
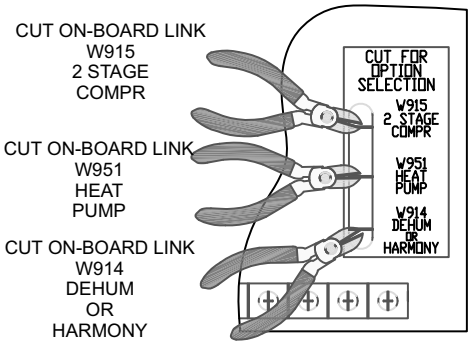
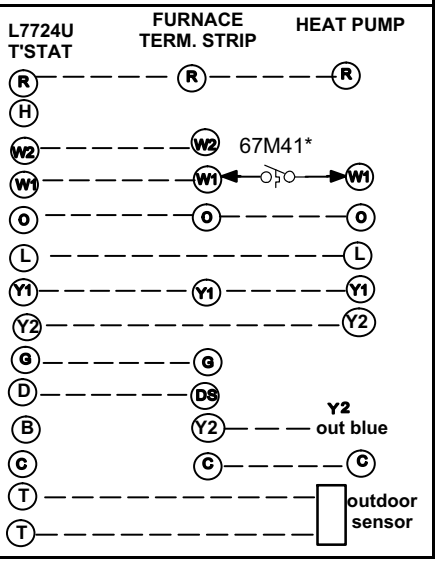
TABLE 29
EL296 Field Wiring Applications With Conventional Thermostat (Continued)

Thermostat	DIP Switch Settings and On-Board Links (figure 4)		Wiring Connections
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options	
Dual Fuel Single Stage Heat Pump ComfortSense 7000 L7724U thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control	OFF		
Dual Fuel Two Stage Heat Pump ComfortSense 7000 L7724U thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control	OFF		

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

*NOTE - **Do NOT** make a wire connection between the room thermostat L terminal and the L terminal of the EL296 integrated control.*

TABLE 29
EL296 Field Wiring Applications With Conventional Thermostat (Continued)

Thermostat	DIP Switch Settings and On-Board Links (figure 4)		Wiring Connections
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options	
Dual Fuel Single Stage Heat Pump ComfortSense 7000 L7724U thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control w/dehumidification control	OFF		
Dual Fuel Two Stage Heat Pump ComfortSense 7000 L7724U thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control w/dehumidification	OFF		

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

*NOTE - **Do NOT** make a wire connection between the room thermostat L terminal and the L terminal of the EL296 integrated control.*

IX- Program Unit Capacity Size Modes

Power-Up - Number displayed represents by integrated control unit size code (furnace model and capacity). If three horizontal bars are displayed followed by continuous E203, furnace control does not recognize **unit size code.** Configure per the following:

Furnace control in **IDLE** mode No heating, cooling or indoor fan operation)

Yes

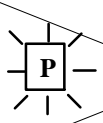
No

Turn room thermostat to **OFF**

To enter **Program Unit Capacity/Size:** push and hold button next to 7-segment LED display until **solid "P"** symbol appears. Release button.

***IMPORTANT**: Field replacement controls may need to be manually configured to validate furnace unit size code.*

Solid **P** starts blinking on 7-Segment LED



Push and hold button. Integrated control will display unit size code number for each furnace model for three seconds.

UNIT SIZE CODE	FURNACE MODEL
0	EL296UH045V36B
1	EL296UH070V36B
2	EL296UH090V36B
3	EL296UH09048C
4	EL296UH090V60C
5	EL296UH110V48C
6	EL296UH110V60C
7	EL296UH135V60D

UNIT SIZE CODE	FURNACE MODEL
8	EL296DF0450V36A
9	EL296DF070V48B
11	EL296DF090V60C
U	EL296DF110V60C

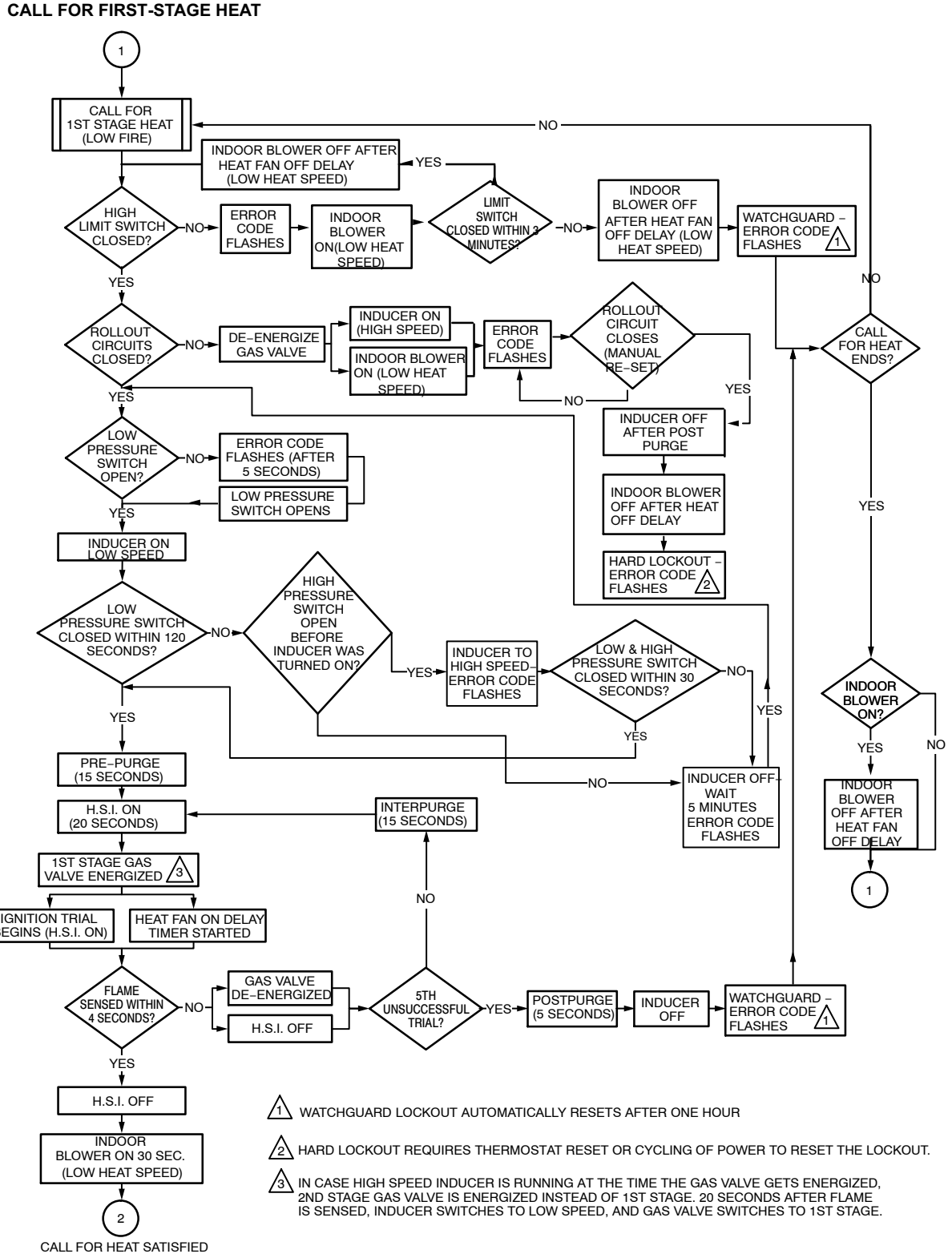
When the correct unit size code is displayed, release button. Selected code will flash for 10-second period. During that period, press and hold push button for 5 seconds. Integrated control will store code in memory and will automatically exit **Program Unit Capacity/Size Mode** and reset. (If second period expires or push button is held less than five seconds, control will automatically exit **Program Capacity/Size Mode** and go into **IDLE** mode without storing unit size code. If this happens, programming function must be repeated).

Verify that the selected unit size code is correct and stored in non-volatile memory by cycling the 24 volt power to the furnace control. (At 24 volt power-up of the furnace control, the 7-segment LED will display a unit size code. If three horizontal bars display, board does not recognize unit size code. Programming function must be repeated)

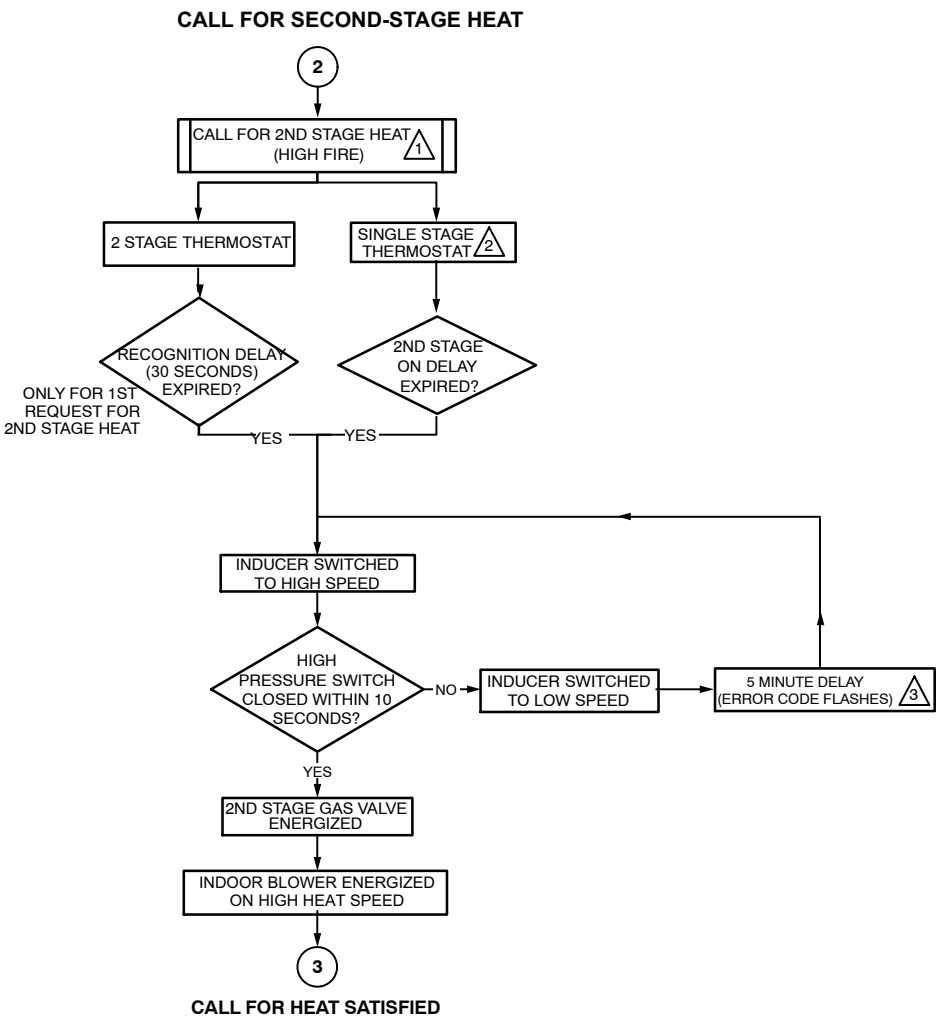
FINISHED

X- Troubleshooting

Troubleshooting: Heating Sequence of Operation



Troubleshooting: Heating Sequence of Operation (Continued)

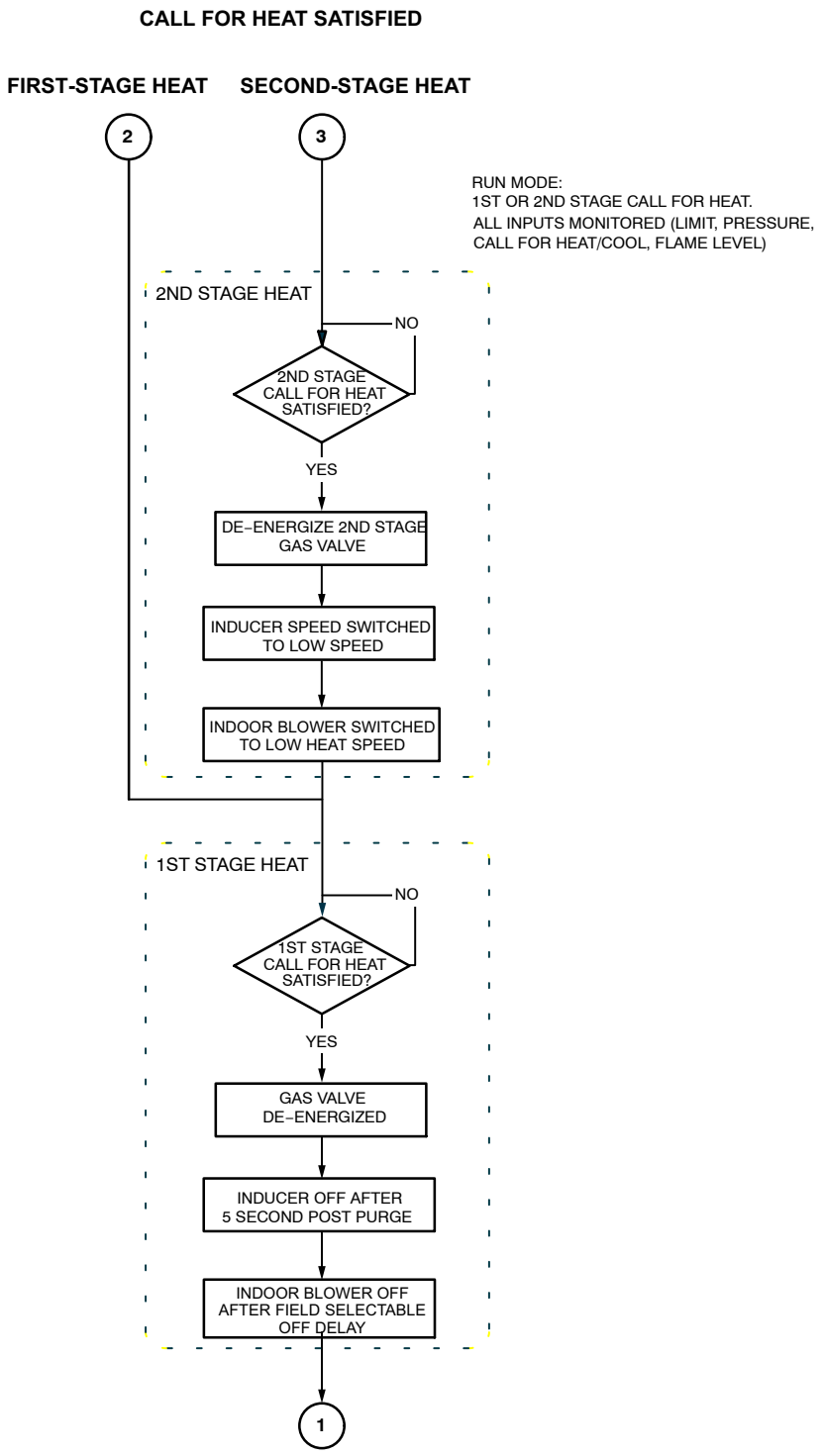


1 SYSTEM WILL ALWAYS LIGHT ON LOW FIIRE, EVEN IF 2ND STAGE HEAT IS IN PLACE.

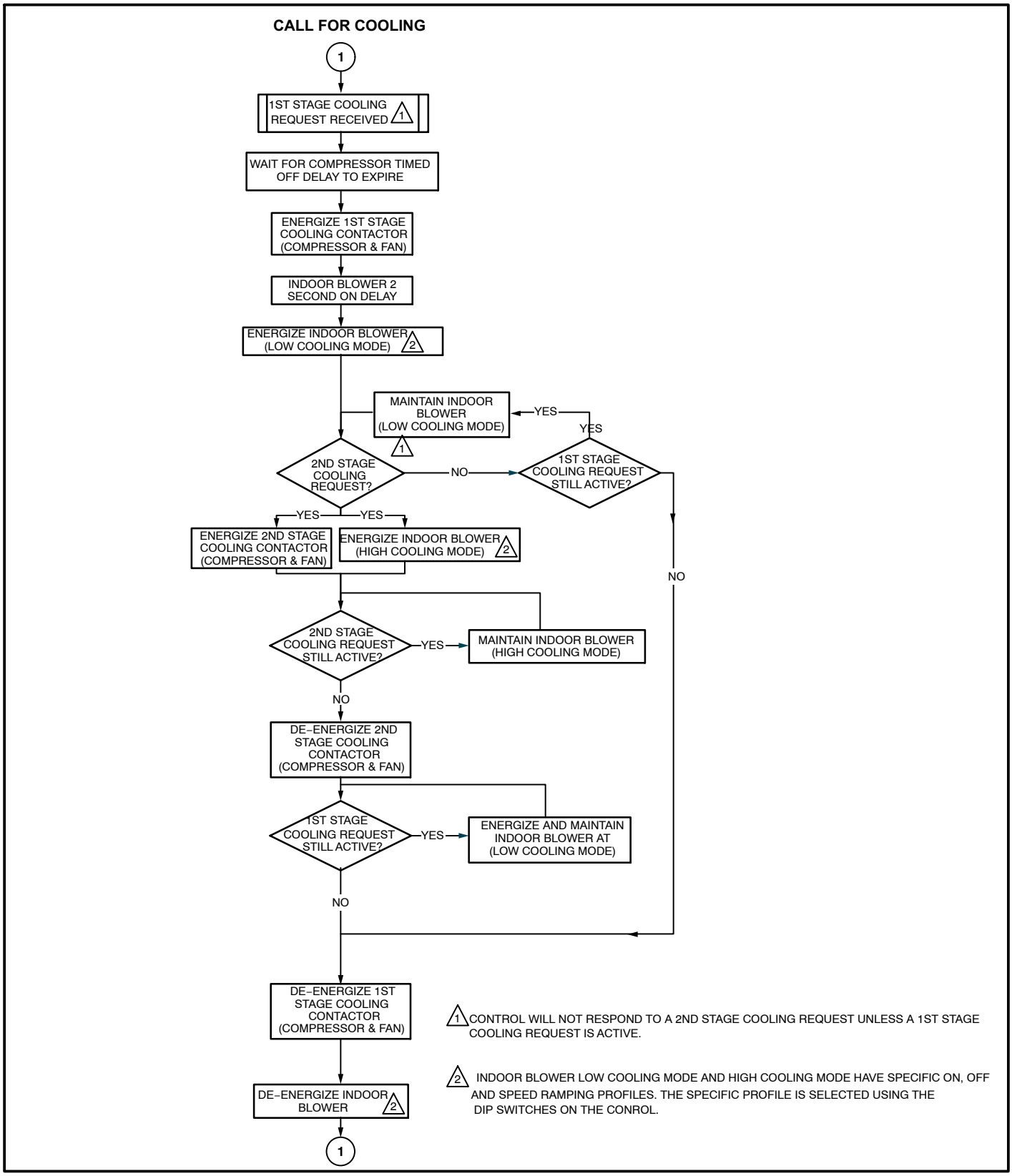
2 WHEN USED WITH A SINGLE STAGE THERMOSTAT, SET SW1 TO THE ON POSITION IN DIP SWITCH S4.

3 IF THE HIGH FIRE PRESSURE SWITCH DOES NOT CLOSE WITHIN 5 ATTEMPTS, THE SYSTEM WILL OPERATE AT LOW FIRE FOR THE REMAINDER OF THE CALL FOR HEAT REQUEST.

Troubleshooting: Heating Sequence of Operation (Continued)



Troubleshooting: Cooling Sequence of Operation (Continued)



Troubleshooting: Continuous Fan Sequence of Operation