

## SLP99DFVK With R454B SERIES UNITS

SLP99DFVK series units are high-efficiency downflow gas furnaces equipped with variable capacity gas valve, variable speed combustion air inducer and variable speed indoor blower motor. All models are designed for direct vent (dual pipe) venting system only. SLP99DFVK units are available in heating capacities from 66,000 to 132,000 Btuh (19.3 to 38.6 kW) and cooling applications from 2 to 5 tons (7.0 kW to 17.5 kW). Refer to Engineering Handbook for proper sizing.

Units are factory-equipped for use with natural gas. Kits are available for conversion to LP operation. SLP99DFVK models include a SureLight® variable integrated control that can be used with a communication thermostat as part of a communicating comfort system. All SLP99DFVK units meet the California Nitrogen Oxides (NOx) Standards and California Seasonal Efficiency requirements.

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



### WARNING

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

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### 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.

### WARNING



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

## SPECIFICATIONS

Gas Heating Performance	Model	SLP99DF070XV36BK	SLP99DF090XV36CK	SLP99DF090XV48CK
	<sup>1</sup> AFUE	97.5%	97.5%	97.5%
Maximum	Input - Btuh	66,000	88,000	88,000
	Output - Btuh	64,000	84,000	85,000
	Temperature rise range - °F	50 - 80	60 - 90	50 - 80
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0	3.5 / 10.0
	Input - Btuh	23,000	31,000	31,000
	Output - Btuh	22,000	30,000	30,000
	Temperature rise range - °F	35 - 65	35 - 65	35 - 65
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	0.5 / 1.5	0.5 / 1.5	0.5 / 1.5
	High static - in. w.g.	0.8	0.8	0.8
	Intake / <sup>2</sup> Exhaust Pipe (PVC)	2 / 2	2 / 2	2 / 2
Connections	Gas pipe size IPS	1/2	1/2	1/2
	Condensate Drain Trap (PVC pipe) - i.d.	3/4	3/4	3/4
	with furnished 90° street elbow	3/4 slip x 3/4 MIPT	3/4 slip x 3/4 MIPT	3/4 slip x 3/4 MIPT
	with field supplied (PVC coupling) - o.d.	3/4 slip x 3/4 MPT	3/4 slip x 3/4 MPT	3/4 slip x 3/4 MPT
Indoor Blower	Wheel diameter x width - in.	10 x 9	10 x 9	11 x 11
	Motor output - hp	1/2	1/2	3/4
	Tons of add-on cooling	2 - 3	2 - 3	3 - 4
	Air Volume Range - cfm	410 - 1365	465 - 1385	545 - 1745
	Electrical Data	120 volts - 60 Hertz - 1 phase		
Electrical Data	Voltage (Maximum Amps)			
	Blower motor full load amps	7.7	7.7	10.1
	Maximum overcurrent protection	15	15	15
Shipping Data	lbs. - 1 package	141	156	166

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

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

<sup>2</sup> 2 in. Rubber Flue Coupling is furnished for exhaust pipe connection to unit.

## SPECIFICATIONS

Gas Heating Performance	Model	SLP99DF090XV60CK	SLP99DF110XV60CK
	<sup>1</sup> AFUE	97.5%	97.5%
Maximum	Input - Btuh	88,000	110,000
	Output - Btuh	85,000	107,000
	Temperature rise range - °F	50 - 80	50 - 80
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0
	Input - Btuh	31,000	39,000
	Output - Btuh	30,000	38,000
	Temperature rise range - °F	35 - 65	35 - 65
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	0.5 / 1.5	0.5 / 1.5
	High static - in. w.g.	0.8	0.8
	Intake / <sup>2</sup> Exhaust Pipe (PVC)	2 / 2	2 / 2
Connections	Gas pipe size IPS	1/2	1/2
	Condensate Drain Trap (PVC pipe) - i.d.	3/4	3/4
	with furnished 90° street elbow	3/4 slip x 3/4 MIPT	3/4 slip x 3/4 MIPT
	with field supplied (PVC coupling) - o.d.	3/4 slip x 3/4 MPT	3/4 slip x 3/4 MPT
Indoor Blower	Wheel diameter x width - in.	11 x 11	11 x 11
	Motor output - hp	1	1
	Tons of add-on cooling	3.5 - 5	3.5 - 5
	Air Volume Range - cfm	467 - 2130	575 - 2180
	Electrical Data	120 volts - 60 Hertz - 1 phase	
Electrical Data	Voltage (Maximum Amps)		
	Blower motor full load amps	12.8	12.8
	Maximum overcurrent protection	20	20
Shipping Data	lbs. - 1 package	166	175

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

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

<sup>2</sup> 2 in. Rubber Flue Coupling is furnished for exhaust pipe connection to unit.

## OPTIONAL ACCESSORIES - ORDER SEPARATELY

NOTE - FURNACES CANNOT BE TWINNED!

		"B" Width Models	"C" Width Models	
CABINET ACCESSORIES				
Downflow Combustible Flooring Base		11M60	11M61	
High Performance Economizer (Commercial Only)		10U53	10U53	
CONDENSATE DRAIN KITS				
Condensate Drain Heat Cable	6 ft.	26K68	26K68	
	24 ft.	26K69	26K69	
Crawl Space Vent Drain Kit	US	51W18	51W18	
	Canada	15Z70	15Z70	
CONTROLS				
S40 Smart Wi-Fi Thermostat		22V24	22V24	
¹ Remote Outdoor Temperature Sensor		X2658	X2658	
Transformer (75VA)		27J32	27J32	
REFRIGERANT DETECTION SENSOR				
Refrigerant Detection System (RDS) Coil Sensor Kit (for indoor coil)		27V53	27V53	
DOWNFLOW FILTER KITS				
Downflow Air Filter and Rack Kit		51W07	51W08	
	No. and Size of filter - in.	(2) 16 x 20 x 1	(2) 16 x 20 x 1	
TERMINATION KITS				
Direct Vent Applications Only. See Installation Instructions for specific venting information.				
Direct Vent	Concentric	US - 2 in.	71M80	69M29
		3 in.	- - -	60L46
		Canada - 2 in.	44W92	44W92
		3 in.	- - -	44W93
	Flush-Mount	US - 2, 2-1/2 or 3 in.	51W11	51W11
		Canada - 2, 2-1/2 or 3 in.	51W12	51W12
	Wall - Close Couple	US - 2 in.	22G44	- - -
		3 in.	44J40	44J40
	Wall - Close Couple WTK	Canada - 2 in.	30G28	- - -
		3 in.	81J20	81J20
	Roof Termination Flashing Kit (no vent pipe - 2 flashings)	2 in.	15F75	15F75
		3 in.	44J41	44J41
VENTING				
² Left Side Vent Kit		2 or 3 in.	87W73	87W73

<sup>1</sup> Remote Outdoor Temperature Sensor is used with conventional (non-Lennox® Communicating) outdoor units (sensor is furnished with Lennox® Communicating outdoor units). Allows the thermostat to display outdoor temperature. Required in dual-fuel and EDA applications.

<sup>2</sup> 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, 81J20) and Crawl Space Vent Drain Kit (15Z70) are certified to ULC S636 standard for use in Canada only.

## BLOWER DATA

### SLP99DF070XV36BK BLOWER PERFORMANCE (less filter)

#### HEATING BLOWER PERFORMANCE - 0 through 0.8 in. w.g. External Static Pressure Range

Heating Adjust CFM Selections	Heating Input Range and Blower Volume - CFM							
	35%	40%	50%	60%	70%	80%	90%	100%
Increase (+15%) Heat CFM	495	543	639	735	830	926	1022	1118
Increase (+7.5%) Heat CFM	473	516	604	691	778	866	953	1041
Default Heat CFM	450	489	568	647	726	805	884	963
Decrease (-7.5%) Heat CFM	430	467	540	614	687	761	834	908
Decrease (-15%) Heat CFM	410	444	512	580	649	717	785	853

#### COOLING BLOWER PERFORMANCE - 0 through 1.0 in. w.g. External Static Pressure Range

Cooling Adjust CFM Selections	Blower Speed Selections							
	First Stage Cool Speed - cfm				Second Stage Cool Speed - cfm			
	Low	Medium-Low	Medium High	High (Default)	Low	Medium-Low	Medium High	High (Default)
Increase (+10%) Cool CFM	625	785	890	995	910	1075	1230	1365
Default Cool CFM	575	710	830	890	845	960	1125	1265
Decrease (-10%) Cool CFM	520	615	710	820	755	885	985	1150

## BLOWER DATA

### SLP99DF090XV36CK BLOWER PERFORMANCE (less filter)

#### HEATING BLOWER PERFORMANCE - 0 through 0.8 in. w.g. External Static Pressure Range

Heating Adjust CFM Selections	Heating Input Range and Blower Volume - CFM							
	35%	40%	50%	60%	70%	80%	90%	100%
Increase (+15%) Heat CFM	710	756	848	940	1033	1125	1217	1309
Increase (+7.5%) Heat CFM	670	713	799	885	971	1057	1143	1230
Default Heat CFM	629	669	749	829	910	990	1070	1150
Decrease (-7.5%) Heat CFM	559	599	681	763	845	927	1009	1091
Decrease (-15%) Heat CFM	488	530	614	697	781	865	948	1032

#### COOLING BLOWER PERFORMANCE - 0 through 1.0 in. w.g. External Static Pressure Range

Cooling Adjust CFM Selections	Blower Speed Selections							
	First Stage Cool Speed - cfm				Second Stage Cool Speed - cfm			
	Low	Medium-Low	Medium High	High (Default)	Low	Medium-Low	Medium High	High (Default)
Increase (+10%) Cool CFM	610	770	900	1035	920	1080	1215	1385
Default Cool CFM	545	690	805	920	835	1000	1135	1255
Decrease (-10%) Cool CFM	465	620	720	810	750	890	1025	1145

The effect of static pressure is included in air volumes shown.

The following control configurations are available. See Installation Instructions for details and DIP switch settings.

#### Heat Modes Available (Heating Blower Performance Table):

Single-stage thermostat:

- 35%, 70%, 100% input (three-stage) with time delays in-between

Two-stage thermostat:

- Variable Rate Capacity Mode - furnace automatically adjusts firing rate based on first- and second-stage cycle times.

- W1 demand at 70% input, W2 demand at 100% input. No delay between stages.

#### Cool Mode Available (Cooling Blower Performance Table):

First stage COOL (two-stage air conditioning units only) is approximately 70% of the same second stage COOL speed position.

Continuous Fan speeds are approximately 28% and 38% (DIP switch selectable) of the same second-stage COOL speed position minimum 250 cfm.

Lennox® Smart Zoning System Applications - Minimum blower speed is 250 cfm.



## BLOWER DATA

### SLP99DF090XV48CK BLOWER PERFORMANCE (less filter)

#### HEATING BLOWER PERFORMANCE - 0 through 0.8 in. w.g. External Static Pressure Range

Heating Adjust CFM Selections	Heating Input Range and Blower Volume - CFM							
	35%	40%	50%	60%	70%	80%	90%	100%
Increase (+15%) Heat CFM	723	790	925	1060	1195	1329	1464	1599
Increase (+7.5%) Heat CFM	690	752	878	1004	1129	1255	1381	1507
Default Heat CFM	656	714	831	948	1064	1181	1297	1414
Decrease (-7.5%) Heat CFM	601	654	761	867	974	1081	1188	1295
Decrease (-15%) Heat CFM	545	593	690	787	884	981	1078	1175

#### COOLING BLOWER PERFORMANCE - 0 through 1.0 in. w.g. External Static Pressure Range

Cooling Adjust CFM Selections	Blower Speed Selections							
	First Stage Cool Speed - cfm				Second Stage Cool Speed - cfm			
	Low	Medium-Low	Medium High	High (Default)	Low	Medium-Low	Medium High	High (Default)
Increase (+10%) Cool CFM	775	940	1100	1255	1120	1340	1535	1745
Default Cool CFM	690	875	975	1135	1000	1220	1425	1625
Decrease (-10%) Cool CFM	635	755	915	1025	920	1100	1270	1470

The effect of static pressure is included in air volumes shown.

The following control configurations are available. See Installation Instructions for details and DIP switch settings.

#### Heat Modes Available (Heating Blower Performance Table):

Single-stage thermostat:

- 35%, 70%, 100% input (three-stage) with time delays in-between

Two-stage thermostat:

- Variable Rate Capacity Mode - furnace automatically adjusts firing rate based on first- and second-stage cycle times.

- W1 demand at 70% input, W2 demand at 100% input. No delay between stages.

#### Cool Mode Available (Cooling Blower Performance Table):

First stage COOL (two-stage air conditioning units only) is approximately 70% of the same second stage COOL speed position.

Continuous Fan speeds are approximately 28% and 38% (DIP switch selectable) of the same second-stage COOL speed position minimum 250 cfm.

Lennox® Smart Zoning System Applications - Minimum blower speed is 380 cfm.

## BLOWER DATA

### SLP99DF090XV60CK BLOWER PERFORMANCE (less filter)

#### HEATING BLOWER PERFORMANCE - 0 through 0.8 in. w.g. External Static Pressure Range

Heating Adjust CFM Selections	Heating Input Range and Blower Volume - CFM							
	35%	40%	50%	60%	70%	80%	90%	100%
Increase (+15%) Heat CFM	653	728	877	1027	1176	1326	1475	1625
Increase (+7.5%) Heat CFM	603	673	813	953	1092	1232	1372	1512
Default Heat CFM	553	618	748	878	1009	1139	1269	1399
Decrease (-7.5%) Heat CFM	510	570	690	811	931	1051	1171	1292
Decrease (-15%) Heat CFM	467	522	632	743	853	963	1074	1184

#### COOLING BLOWER PERFORMANCE - 0 through 1.0 in. w.g. External Static Pressure Range

Cooling Adjust CFM Selections	Blower Speed Selections							
	First Stage Cool Speed - cfm				Second Stage Cool Speed - cfm			
	Low	Medium-Low	Medium High	High (Default)	Low	Medium-Low	Medium High	High (Default)
Increase (+10%) Cool CFM	1110	1265	1395	1600	1600	1750	1965	2130
Default Cool CFM	1000	1145	1275	1445	1445	1625	1805	1975
Decrease (-10%) Cool CFM	885	1060	1145	1265	1265	1445	1645	1805

## BLOWER DATA

### SLP99DF110XV60CK BLOWER PERFORMANCE (less filter)

#### HEATING BLOWER PERFORMANCE - 0 through 0.8 in. w.g. External Static Pressure Range

Heating Adjust CFM Selections	Heating Input Range and Blower Volume - CFM							
	35%	40%	50%	60%	70%	80%	90%	100%
Increase (+15%) Heat CFM	811	906	1096	1286	1475	1665	1855	2045
Increase (+7.5%) Heat CFM	744	835	1017	1199	1380	1562	1744	1926
Default Heat CFM	677	764	938	1112	1285	1459	1633	1807
Decrease (-7.5%) Heat CFM	626	707	869	1031	1193	1355	1517	1679
Decrease (-15%) Heat CFM	575	650	800	950	1101	1251	1401	1551

#### COOLING BLOWER PERFORMANCE - 0 through 1.0 in. w.g. External Static Pressure Range

Cooling Adjust CFM Selections	Blower Speed Selections							
	First Stage Cool Speed - cfm				Second Stage Cool Speed - cfm			
	Low	Medium-Low	Medium High	High (Default)	Low	Medium-Low	Medium High	High (Default)
Increase (+10%) Cool CFM	1090	1260	1395	1580	1580	1790	1990	2180
Default Cool CFM	965	1125	1285	1440	1440	1625	1845	2000
Decrease (-10%) Cool CFM	860	1030	1125	1270	1270	1470	1655	1845

The effect of static pressure is included in air volumes shown.

The following control configurations are available. See Installation Instructions for details and DIP switch settings.

#### Heat Modes Available (Heating Blower Performance Table):

Single-stage thermostat:

- 35%, 70%, 100% input (three-stage) with time delays in-between

Two-stage thermostat:

- Variable Rate Capacity Mode - furnace automatically adjusts firing rate based on first- and second-stage cycle times.

- W1 demand at 70% input, W2 demand at 100% input. No delay between stages.

#### Cool Mode Available (Cooling Blower Performance Table):

First stage COOL (two-stage air conditioning units only) is approximately 70% of the same second stage COOL speed position.

Continuous Fan speeds are approximately 28% and 38% (DIP switch selectable) of the same second-stage COOL speed position minimum 250 cfm.

Lennox® Smart Zoning System Applications - Minimum blower speed is 450 cfm.

## Parts Arrangement

CONTROL BOX  
(includes variable capacity  
integrated control,  
transformer, circuit breaker  
and door switch)

BLOWER ASSEMBLY  
(Variable Speed Blower  
Motor Is Hidden)

BAG ASSEMBLY

SIDE VENT  
PATCH PLATE

BLOWER  
ACCESS  
PANEL

ACCESS PANEL

COMBUSTION AIR INDUCER

GAS VALVE

PRIMARY LIMIT

BURNER BOX ASSEMBLY

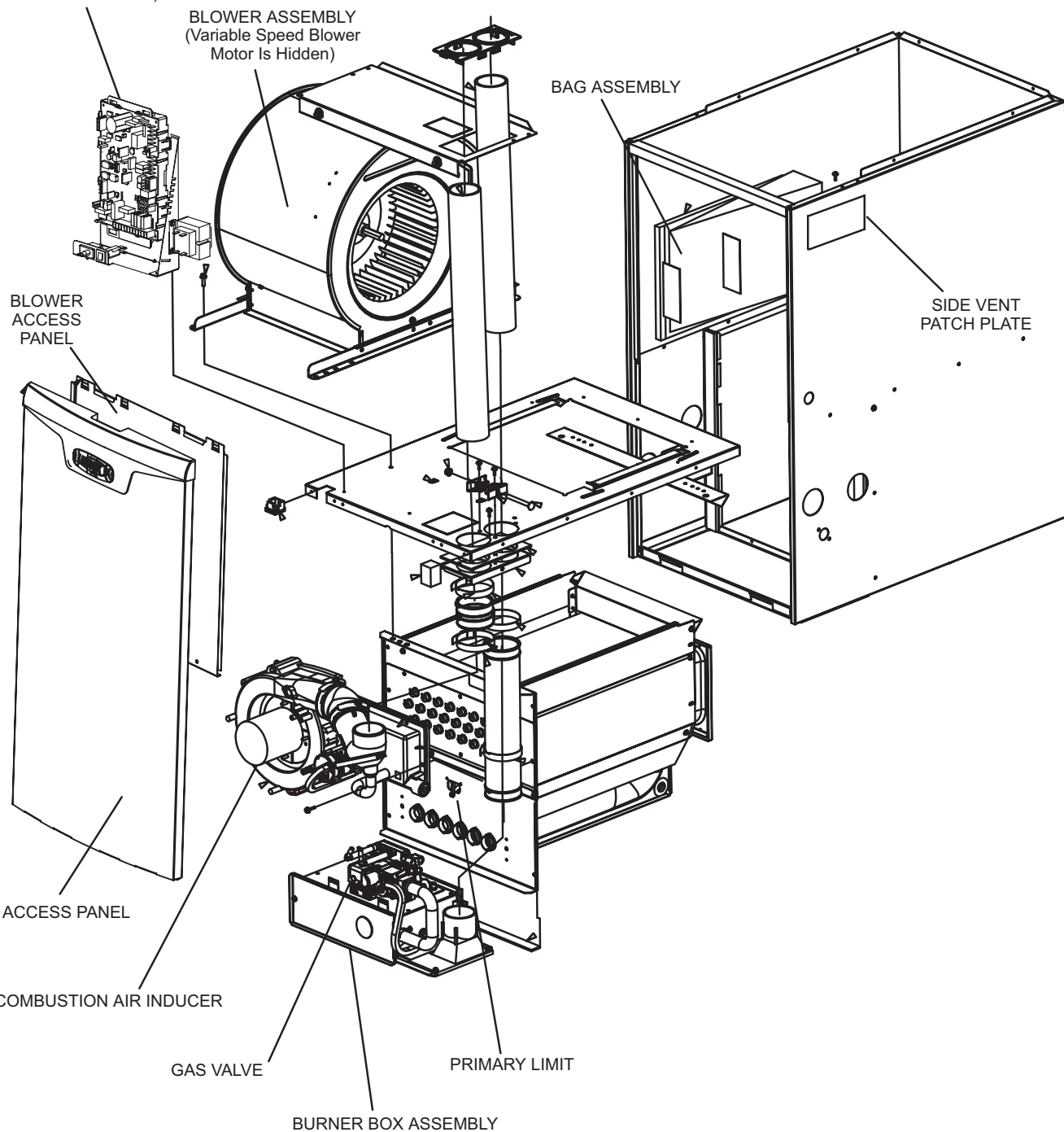


FIGURE 1

## I-UNIT COMPONENTS

SLP99DFVK 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 compartment. SLP99DFVK units are factory-equipped with a bottom return air panel in place. The panel is designed to be field removed as required for bottom air return. Markings are provided for side return air and may be cut out in the field.

ELECTROSTATIC DISCHARGE (ESD) Precautions and Procedures	
<b>⚠ CAUTION</b>	
	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.

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

#### 2. Interlock Switch (S51)

An 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.

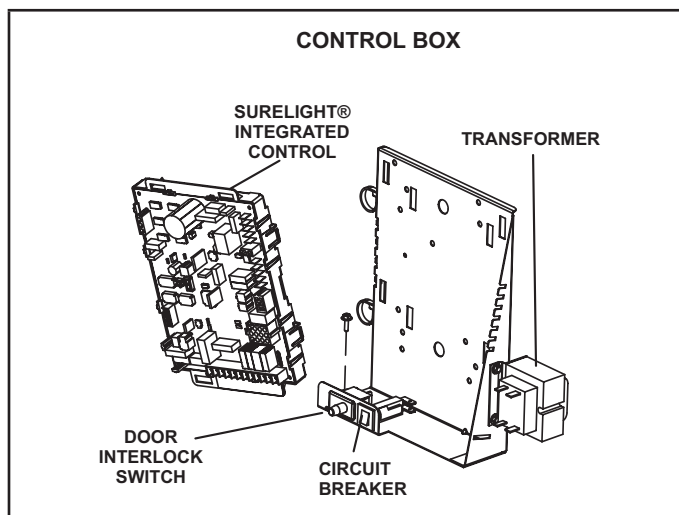


FIGURE 2

#### 2. Interlock Switch (S51)

An 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.

#### 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 shut down. The breaker can be manually reset by pressing the button on the face. See FIGURE 3.

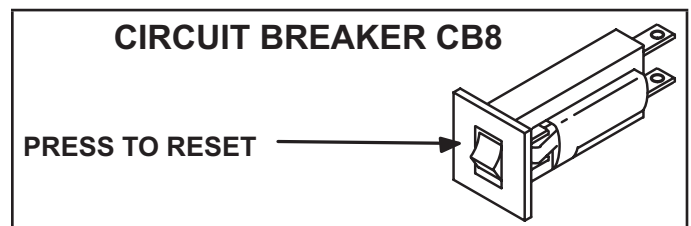


FIGURE 3

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

#### 4. Ignition Control (A92)

SLP99DFVK units are equipped with a variable-capacity integrated control. This control can be used with the icomfort Wi-Fi® thermostat as part of a communicating comfort system. The control can also operate with a conventional single or two-stage thermostat. The system consists of an ignition / blower control (FIGURE 4 and FIGURE 5) with control pin designations in TABLE 1, TABLE 2, TABLE 3, TABLE 4 and ignitor.

The control provides gas ignition, safety checks and indoor blower control with variable capacity rate 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 (TABLE 5). The LED flashes in single digits. For example using table 14 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 120 volt accessory terminals (used for a humidifier and electronic air cleaner) rated at (1) one amp each.

## Electronic Ignition

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

When the differential in the pressure switch is great enough, the pressure switch closes and a 15-second pre-purge begins. If the switch is not proven within 2-1/2 minutes, the inducer is de-energized and the control will initiate vent calibration. If the vent calibration is unsuccessful the control goes into a 5 minute delay. The control will attempt vent calibration 3 more times before going into a 1 hour soft lockout.

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

### Thermostat Selection Modes

The control can be made to operate in three modes: variable capacity, three-stage timed or two-stage. The variable capacity and two-stage modes are only operational with a two-stage thermostat. The thermostat selection is made using dip switches one and / or two (FIGURE 4) and must be positioned for the particular application.

## Variable Capacity

Using a two-stage thermostat the system will operate in a variable capacity sequence mode. In this mode, the control will vary the firing rate anywhere between 35% and 100% of full capacity. The indoor blower will be automatically adjusted accordingly to provide the appropriate air-flow at any rate. On the initial call for low fire, the furnace will operate at 35% and will remain there until the heat call is satisfied or a call for high fire is initiated. If there is a call for high fire the rate will increase by 10% if the current rate is above 60%. However, if the current rate is below 60% the rate will increase to 70%. After this initial rate increase to 70% capacity, the furnace will increase rate by 10% every 5 minutes while a high fire heat call is present. If the high fire heat call is satisfied but the low fire heat call is still present, the furnace will remain at the current firing rate until the demand is satisfied or another call for high fire is initiated.

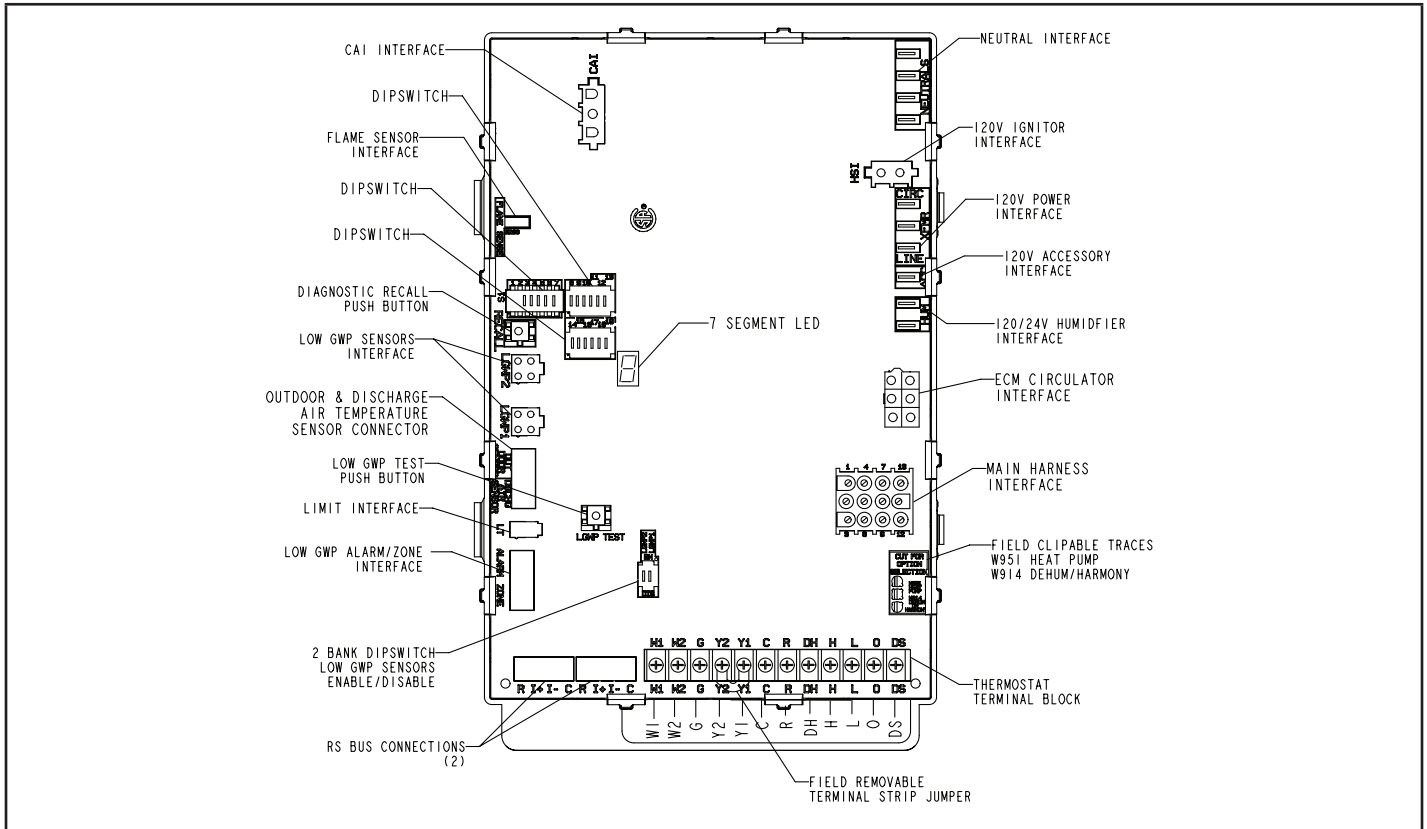
### Three-Stage Timed Operation

Using a single-stage thermostat the system will operate in a three stage timed mode. Upon a call for heat and a successful ignition, the combustion air inducer will operate at 35% and the indoor blower will adjust to the appropriate cfm. After a field selectable 7 or 12 minute delay period, the inducer RPM will increase and the unit will operate at 70%. The indoor blower will adjust to the appropriate cfm. After a factory set non-adjustable 10 minute delay expires the furnace will increase rate to 100%. The indoor blower will adjust to the appropriate cfm.

### Two-Stage Operation

The system will also operate in conventional two-stage mode. While in two-stage mode, the furnace will fire on low fire (70% rate). The combustion air inducer will operate at 70% and the indoor blower will adjust to the appropriate cfm. The unit will switch to high fire on a W2 call from the thermostat. After a 30 second recognition period (during which the integrated control will receive a continuous W2 call) expires the furnace will increase to 100% rate. The inducer will increase to 100% speed and the indoor blower will adjust to appropriate cfm. If there is a simultaneous call for first and second stage heat, the unit will fire on first stage heat and switch to second stage heat after 30 seconds of operation.

# Modulating, Variable Speed and Communicating 107901-XX



**FIGURE 4**

**TABLE 1**

THERMOSTAT INPUT TERMINALS	
W1	LOW STAGE HEAT
W2	HIGH STAGE HEAT
G	FAN
Y1	LOW STAGE COOL
Y2	HIGH STAGE COOL24
C	THERMOSTAT COMMON / GROUND
R	24VAC POWER TO THE THERMOSTAT
DH	DEHUMIDIFICATION (COMM ONLY)
H	24V HUMIDIFIER OUTPUT
L	LSOM (COMM ONLY)
O	HEAT PUMP REVERSING VALVE
DS	DEHUMIDIFICATION (NON-COMM ONLY)

**TABLE 2**

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

**TABLE 3**

1/4"QUICK CONNECT TERMINALS	
HUM	120 VAC OUTPUT TO HUMIDIFIER
XMFR	120 VAC OUTPUT TO TRANSFORMER
L1	120 VAC INPUT TO CONTROL
CIRC	120 VAC OUTPUT TO CIRCULATING BLOWER
EAC	120 VAC TO ELECTRICAL AIR CLEANER
NEUTRALS	120 VAC NEUTRAL

**TABLE 4**

RS - BUS OUTDOOR	
R	24VAC
i+	DATA HIGH CONNECTION
i-	DATA LOW CONNECTION
C	24VAXC COMMON
RS - BUS INDOOR	
R	24VAC
i+	DATA HIGH CONNECTION
i-	DATA LOW CONNECTION
C	24VAC COMMON



# INTEGRATED CONTROL CONFIGURATION GUIDE

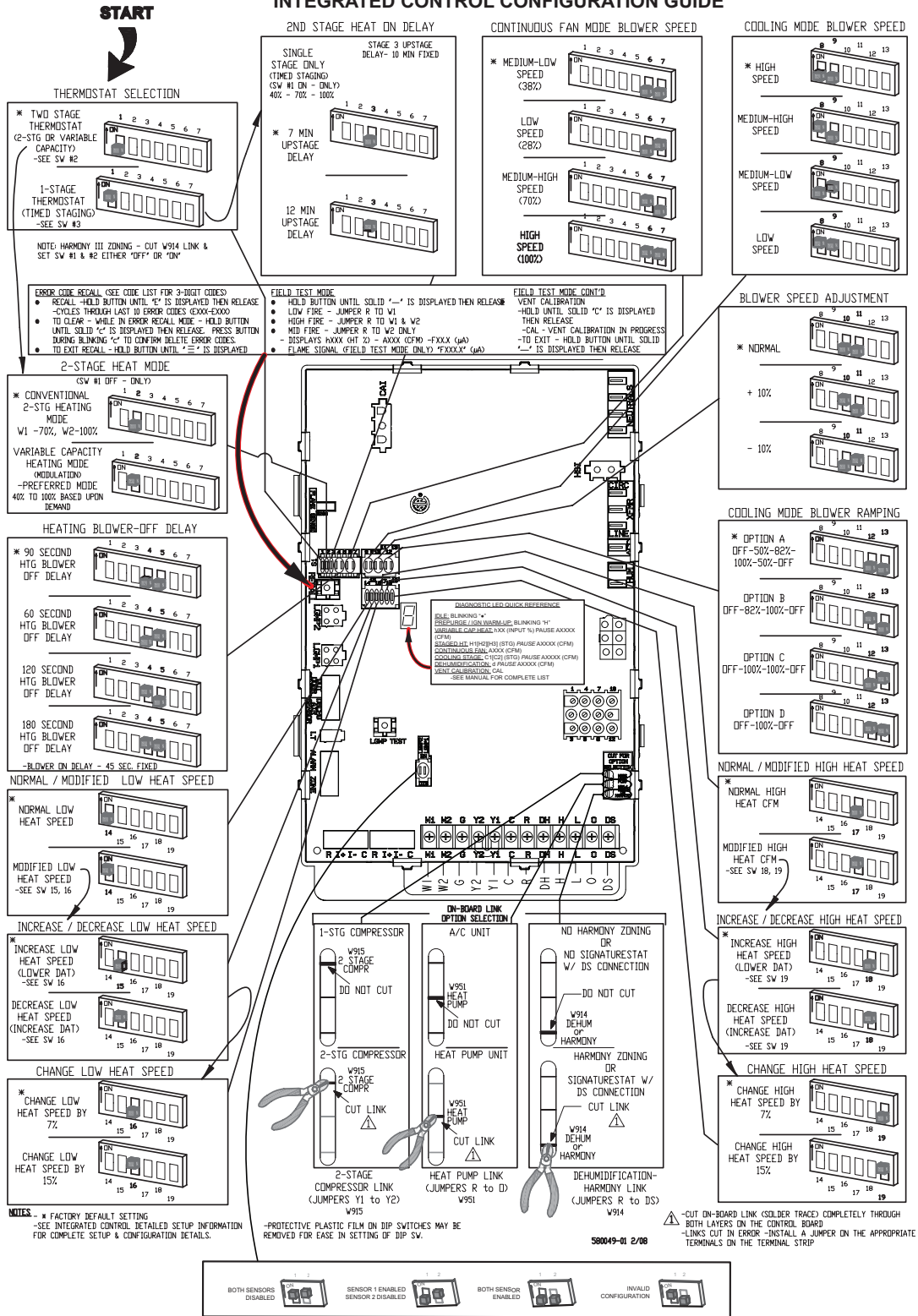


FIGURE 5

TABLE 5

**CODE DIAGNOSTIC CODES/STATUS OF FURNACE**

.	Idle mode (Decimal blinks at 1 Hertz -- 0.5 second ON, 0.5 second OFF).
A	Cubic feet per minute(cfm) setting for indoor blower (1 second ON, 0.5 second OFF) / cfm setting for current mode displayed.
C	Cooling stage (1 sec. ON, 0.5 sec. OFF) 1 or 2 displayed / Pause / cfm setting displayed / Pause / Repeat codes.
d	Dehumidification mode ( 1 second ON, 1 second OFF) CFM setting displayed / Pause/ Repeat Codes.
h	Variable Capacity Heat ( 1 second ON, 0.5 second OFF) % of input rate / Pause / CFM / Pause / Repeat codes.
H	Heat Stage ( 1 second ON, 0.5 second OFF) 1 or 2 displayed / Pause/ cfm setting displayed / Pause / Repeat codes.
dF	Defrost mode.
E 105	Device communication problem - No other devices on BUS (Communication system).
E 110	Low line voltage.
E111	Line voltage polarity reversed
E113	High line voltage
E 114	Line voltage frequency out-of-range.
E 115	Low 24V - Control will restart if the error recovers.
E 120	Unresponsive Device.
E 124	Active communicating thermostat signal missing for more than 3 minutes.
E 125	Control failed self-check, internal error, failed hardware. Will restart if error recovers. Integrated Furnace Control not communicating. Covers hardware errors like flame sense circuit faults, pin shorts, etc.
E 126	Failed internal control communication between microcontrollers.
E 131	Corrupted control parameters (Verify configuration of system).
E 150	Refrigerant leak detected
E 151	Refrigerant Leak Detector Sensor #1 Fault
E 152	Refrigerant Leak Detector Sensor #2 Fault
E 154	Refrigerant Leak Detector Sensor #1 Comm. Lost or invalid sensor dip switch configuration (ON/OFF)
E 155	Refrigerant Leak Detector Sensor #2 Comm. Lost
E 160	Refrigerant Leak Detector Sensor #1 Type Incorrect
E 161	Refrigerant Leak Detector Sensor #2 Type Incorrect
E 163	Refrigerant Leak Detector Control Failure
E164	Low GWP test
E 180	Outdoor air sensor failure - NO error if disconnected. Only shown if shorted or out-of-range.
E 200	Hard lockout - Rollout circuit open or previously open.
E 201	Indoor blower communication failure - Unable to communicate with blower motor.
E 202	Indoor blower motor mis-match - Indoor motor horsepower does not match unit capacity.
E 203	Appliance capacity / size is NOT programed. Invalid unit codes Refer to configuration flow chart installation instructions.
E 204	Gas valve mis-wired.
E 205	Control gas valve relay contact shorted.
E 207	Hot surface ignitor sensed open - Refer to troubleshooting in installation instruction.
E 223	Low pressure switch failed open - Refer to troubleshooting in installation instruction.
E 224	Low pressure switch failed closed - Refer to troubleshooting in installation instruction.
E 225	High pressure switch failed open - Refer to troubleshooting in installation instruction.
E 226	High pressure switch failed closed - Refer to troubleshooting in installation instruction.
E 227	Low pressure switch opened during trial for ignition or run mode - Refer to troubleshooting in installation instruction.
E 228	Unable to perform successful pressure switch calibration.
E 240	Low flame current - Run mode - Refer to troubleshooting in installation instruction.
E 241	Flame sensed out of sequence - Flame still present.
E 250	Limit switch circuit open - Refer to troubleshooting in installation instruction.
E 252	Discharge air temperature too high (gas heat only).
E 270	Soft lockout - Exceeded maximum number of retries. No flame current sensed.
E 271	Soft lockout - Exceeded maximum number of retries. Last retry failed due to pressure switch opening.
E 272	Soft lockout - Exceeded maximum number of recycles. Last recycle failed due to pressure switch opening.
E 273	Soft lockout - Exceeded maximum number of recycles. Last recycle failed due to a flame failure.
E 274	Soft lockout - Exceeded maximum number of recycles. Last recycle failed due to the limit circuit opening or the limit remained open longer than 3 minutes.
E 275	Soft lockout - Flame sensed out of sequence from code 241 fault. Flame signal is gone.
E 276	Soft lockout - Exceeded maximum number of calibration retries.
E 290	Ignitor circuit fault - Failed ignitor or triggering circuitry.
E 291	Restricted air flow - Cubic feet per minute is lower than what is needed for minimum firing rate.
E 292	Indoor blower motor unable to start - Seized bearings, stuck wheel, etc.
E 294	Combustion air inducer motor amp draw too high.
E 295	Indoor blower motor temperature is too high.
E 310	Discharge error sensor failure - No error if disconnected. Only shown if shorted or out of range.
E 311	Heat rate reduced to match indoor blower air flow. Replace filter or repair duct restriction.
E 312	Restricted air flow in cooling or continuous fan mode is lower than air flow settings.
E 313	Indoor or outdoor unit capacity mis-match.
E 331	Global network connection - Communication link problem.
E 347	No 24 Volt output on Y1 to C with non-communicating outdoor unit.
E 348	No 24 Volt output on Y2 to C with non-communicating outdoor unit.
E 349	No 24 Volts between R & O with non-communicating outdoor unit (Dual fuel module required for heat pump application).
E 370	Interlock Switch Sensed Open
E 390	Low GWP Relay Stuck

## LED Segment Status / Error Code

Press the diagnostic push button and hold it to cycle through a menu of options. Every five seconds a new menu item will be displayed.

Release the button when the desired mode is displayed.

When a solid "P" is displayed, the furnace capacity/ size is programmed.

When the solid "E" is displayed, the control enters the Error Code Recall mode. Error Code Recall mode menu options: No change (displaying error history) remains in Error Code Recall mode; solid "b" exits Error Code Recall mode; and solid "c" clears the error history. Must press button while flashing "c" is displayed to clear error codes.

When the solid "-" is displayed, the control enters the Field Test mode. Field Test mode menu options: Solid "C" starts pressure switch calibration; blinking "-" exits Field Test mode.

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	Cooling stage (1 second ON, 0.5 second OFF) / 1 or 2 displayed / Pause / cfm setting displayed / Pause / Repeat codes).	
h	Variable Capacity Heat (1 second ON, 0.5 second OFF) / % of input rate displayed / Pause/ cfm setting / Pause/ Repeat codes.	
H	Heat Stage (1 second ON, 0.5 second OFF) / 1 or 2 displayed / Pause / cfm setting displayed / Pause / Repeat codes.	
df	Defrost mode.	
U	Discharge air temperature	
-	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.	<p>Steps to follow if the damper control module is displaying the soft disable code.</p> <p>Confirm proper wiring between all devices (thermostat, damper control module, indoor and outdoor).</p> <p>Cycle power to the control that is displaying the soft disable code.</p> <p>Put the room thermostat through set up.</p> <p>Go to setup / system devices / thermostat / edit / then push reset.</p> <p>Go to setup / system devices / thermostat / edit / then push resetAll.</p>
E105	Device communication problem - No other devices on BUS (Communication system).	Equipment is unable to communicate. Check for mis wire and loose connections and check for a high voltage source of noise close to the system. (welder etc.).
E110	Low line voltage.	Line Voltage low (Voltage lower than nameplate rating) Check voltage.
E113	High line voltage.	Line Voltage High (Voltage higher than nameplate rating) Check voltage.
E114	Line voltage frequency out-of-range.	No 60 hertz power (Check voltage and frequency).
E115	Low 24V - Control will restart if the error recovers.	24 voltage low (Range is 18 to 30 volts) Check voltage.
E120	Unresponsive device.	Usually caused by delay in outdoor unit responding to indoor unit poling recycle power, check wiring.
E124	Active communicating thermostat signal missing for more than 3 minutes.	Equipment lost communication with the thermostat. Check connections and cycle power on the thermostat.
E125	Control failed self-check, internal error, failed hardware. Will restart if error recovers. Integrated furnace control not communicating. Covers hardware errors (flame sense circuit faults, pin shorts, etc.).	Hardware problem on the control board. Cycle power on control. Replace if problem prevents service and is persistent.
E126	Failed internal control communication between microcontrollers.	Hardware problem on the control board. Cycle power on control. Replace if problem prevents service and is persistent.
E180	Outdoor air sensor failure - NO error if disconnected. Only shown if shorted or out-of-range.	

## Integrated Control Diagnostic Codes (Continued)

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E200	Hard lockout - Rollout circuit open or previously open.	Correct unit cause of rollout trip or replace flame rollout switch and test furnace operation.
E201	Indoor blower communication failure - Unable to communicate with blower motor.	Indoor blower communication failure including power outage.
E202	Indoor blower motor mis-match - Indoor motor horsepower does not match unit capacity.	Incorrect furnace size code selected. Check unit size codes on configuration guide or in installation instructions.
E203	Appliance capacity / size is NOT programmed. Invalid unit codes refer to configuration flow chart in installation instructions.	No furnace size code selected. Check unit size codes on configuration guide or in installation instructions.
E204	Gas valve mis-wired.	Check operation of gas valve.
E205	Gas valve control relay contact shorted.	Check operation of gas valve.
E207	Hot surface ignitor sensed open - Refer to troubleshooting in installation instruction.	Measure resistance of Hot Surface Ignitor, replace if open or not within specification.
E223	Low pressure switch failed open - Refer to troubleshooting in installation instruction.	Check inches of water column pressure during operation of low pressure switch on heat call, measure inches of water column of operating pressure, inspect vent and combustion air inducer for correct operation and restriction.
E224	Low pressure switch failed closed - Refer to troubleshooting in installation instruction.	Check low pressure switch for closed contacts, measure inches of water column of operating pressure, inspect vent and combustion air inducer for correct operation and restriction.
E225	High pressure switch failed open - Refer to troubleshooting in installation instruction.	Check inches of water column pressure of high pressure switch on heat call, measure inches of water column of operating pressure, inspect vent and combustion air inducer for correct operation and restriction.
E226	High pressure switch failed closed - Refer to troubleshooting in installation instruction.	Check high pressure switch for closed contacts, measure inches of water column of operating pressure, inspect vent and combustion air inducer for correct operation and restriction.
E227	Low pressure switch open during trial for ignition or run mode. Refer to troubleshooting in installation instruction.	Check inches of water column pressure during operation of low pressure switch on heat call, measure inches of water column of operating pressure, inspect vent and combustion air inducer for correct operation and restriction.
E228	Unable to perform successful pressure switch calibration.	Retry after 300 seconds. Error counter cleared when exiting lockout, unable to perform pressure switch calibration. Check vent system and pressure switch wiring connections.
E240	Low flame current - Run mode - Refer to troubleshooting in installation instruction.	Check micro amperes of flame sensor, clean or replace sensor. Measure voltage of neutral to ground for good unit ground.
E241	Flame sensed out of sequence - Flame still present.	Shut off gas, check for gas valve leak.
E250	Limit switch circuit open - Refer to troubleshooting in installation instruction.	Check why limit is tripping, overfired, low air flow.
E252	Discharge air temperature too high (gas heat only).	Check temperature rise, air flow and input rate.
E270	Soft lockout - Exceeded maximum number of retries. No flame current sensed.	Check for gas flow, ignitor lighting burner, flame sensor current.
E271	Soft lockout - Exceeded maximum number of retries. Last retry failed due to the pressure switch opening.	See E 223.
E272	Soft lockout - Exceeded maximum number of recycles. Last recycle due to the pressure switch opening.	See E 223 and E 225.
E273	Soft lockout - Exceeded maximum number of recycles. Last recycle due to flame failure.	See E 240.

## Integrated Control Diagnostic Codes (Continued)

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E274	Soft lockout - Exceeded maximum number of recycles. Last recycle failed due to the limit circuit opening or limit remained open longer than 3 minutes.	See E 250.
E275	Soft lockout - Flame sensed out of sequence from code 241 fault. Flame signal is gone.	See E 241.
E276	Soft lockout - Exceeded maximum number of calibration retries.	See E 228.
E290	Ignitor circuit fault - Failed ignitor or triggering circuitry.	See E 207.
E291	Restricted air flow - Cubic feet per minute is lower than what is needed for minimum firing rate.	Check for dirty filter, unit air flow restriction, blower performance.
E292	Indoor blower motor unable to start - Seized bearings, stuck wheel, etc.	Indoor blower motor unable to start (seized bearing, stuck wheel, etc), replace motor or wheel if assembly does not operate or meet performance.
E294	Combustion air inducer motor amp draw is too high.	Check combustion blower bearings, wiring , amperes, replace if it does not operate or meet performance.
E295	Indoor blower motor temperature is too high.	Indoor blower motor over temperature (motor tripped on internal protector), Check motor bearings, amperes. Replace if necessary.
E310	Discharge error sensor failure - No error if disconnected. Only shown if shorted or out-of-range.	Discharge air temperature(DATS) out of range, code is activated during "Field test mode".
E311	Heat rate reduced to match indoor blower air flow. Replace filter or repair duct restriction.	Furnace blower in cutback mode due to restricted airflow. Check filter and ductwork. To clear replace filter if needed or repair/ add ductwork.
E312	Restricted air flow in cooling or continuous fan mode is lower than cfm setting.	Restricted airflow - Indoor blower is running at a reduced cubic feet per minute (Cutback Mode) - The variable speed motor has pre-set speed and torque limiters to protect the motor from damage caused by operating out of its designed parameters (0 to 0.8 inches water column total external static pressure). Check filter and ductwork. To clear replace filter if needed or repair/ add ductwork.
E313	Indoor or outdoor unit capacity mismatch.	Incorrect Indoor /outdoor capacity code selected. Check for proper configuration in installation instructions. Alarm is just a warning. The system operation is not impacted at all and alarm would clear when Commissioning is exited.
E331	Global network connection - Communication link problem.	For Future Use.
E347	No 24 Volt output on Y1 to C with non-communicating outdoor unit.	Y1 relay / Stage 1 failed (Pilot relay contacts did not close or the relay coil did not energize).
E348	No 24 Volt output on Y2 to C with non-communicating outdoor unit.	Y2 relay / Stage 2 failed (Pilot relay contacts did not close or the relay coil did not energize).
E349	No 24 Volts between R & O with non-communicating outdoor unit (Dual fuel module required for heat pump application).	Only applicable in non-communicating mode. The O to R link on the furnace has been cut and could possibly cause a brown out. Might also result in low voltage to which would generate alert code as well. Configuration link R to O needs to be restored. Will need to restore link by hard-wiring the R to O terminals on the terminal strip.

## Integrated Control Diagnostic Codes LOW GWP

Code	Diagnostic Codes / Status of Equipment	Action Required to Clear and Recover
E150	Refrigerant Leak detected	This may indicate the presence of a leak at or in the indoor unit coil of the equipment, that will need to be repaired for proper and safe system operation. Additionally, it may indicate that proper refrigerant charge will need to be verified. This fault cannot be cleared while the refrigerant detection system sensor is reporting the presence of a leak
E151	Refrigerant Leak Detector Sensor #1 fault	The refrigerant detection sensor #1 in the unit is reporting an issue that prevents it from functioning properly, and replacement of the sensor may be necessary. This fault clears when the sensor no longer reports the presence of a fault condition.
E152	Refrigerant Leak Detector Sensor #2 fault	The refrigerant detection sensor #2 in the unit is reporting an issue that prevents it from functioning properly, and replacement of the sensor may be necessary. This fault clears when the sensor no longer reports the presence of a fault condition.
E154	Refrigerant Leak Detector Sensor #1 Communication lost or invalid sensor dip switch configuration (ON/OFF)	There may be an issue with the wiring harness connecting the sensor #1 to the furnace control board, either with the wiring itself or with the connector. Check the wiring and the connector for damage or improper connectivity. Check the sensor for damage or obstruction on the harness plug. This fault clears when communications with the sensor has been reestablished, but blower latches for a minimum of 5 minutes. Retest of the presence of fault can be effected by pressing the Low GWP test button on the furnace unit control board.  This may also indicate incorrect Low GWP dip switch settings. Please refer to installation instructions.
E155	Refrigerant Leak Detector Sensor #2 Communication lost	There may be an issue with the wiring harness connecting the sensor #2 to the furnace control board, either with the wiring itself or with the connector. Check the wiring and the connector for damage or improper connectivity. Check the sensor for damage or obstruction on the harness plug. This fault clears when communications with the sensor has been reestablished, but blower latches for a minimum of 5 minutes. Retest of the presence of fault can be effected by pressing the Low GWP test button on the furnace unit control board
E160	Refrigerant Leak Detector Sensor #1 type incorrect	The sensor #1 is of a type not suitable for use in the application. Replace the sensor with a Lennox approved replacement part. This fault clears when a sensor suitable for the application is detected by the furnace control board, but blower will latch for a minimum of 5 minutes. Retest of the presence of the fault can be effected by pressing the Low GWP test button on the furnace unit control board.
E161	Refrigerant Leak Detector Sensor #2 type incorrect	The sensor #2 is of a type not suitable for use in the application. Replace the sensor with a Lennox approved replacement part. This fault clears when a sensor suitable for the application is detected by the furnace control board, but blower will latch for a minimum of 5 minutes. Retest of the presence of the fault can be effected by pressing the Low GWP test button on the furnace unit control board.
E163	Furnace Control Board Failure	There is an issue with the furnace control board, preventing the furnace from operating properly. This may require the replacement of the indoor unit control board. This fault clears when the furnace controller operates normally.
E164	Low GWP Test	Low GWP Test mode activates by manually engaging Low GWP test button. Normal operations resumes and code clears automatically after 1-minute
E390	Low GWP Relay Stuck	This indicates an issue with the Low GWP relay in the furnace control. This may require the replacement of the indoor unit control board. This fault clears when the relay operates normally.



**TABLE 6****Thermostat Selection Switch Settings**

Operation	Thermostat	Switch 1	Switch 2	Switch 3
Variable Capacity Heat (35% to 100%)	Two-Stage	Off	On	Off
Three-Stage Heat (35%, 70%, 100%)	Single-Stage	On	Off	2nd stage delay OFF = 7 minutes ON = 12 minutes 3rd stage delay 10 minutes fixed
Two-Stage Heat (W1 70%, W2 100%)	Two-Stage	Off	Off	Off

**NOTE** - When the SLP99DFKV is used with a communicating thermostat, all indoor blower speed selections and DIP switch settings are made by the thermostat.

**NOTE** - All DIP switches are factory shipped in the "OFF" position.

**Heating Operation DIP Switch Settings -- Figure 4 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. See TABLE 6.

**Switch 2 -- Operating Mode with Two-Stage Thermostat** -- If a two-stage thermostat is used, the furnace can operate in either variable-capacity or conventional two-stage mode. When variable-capacity mode is selected, the firing rate of the unit is varied to maximize comfort. Conventional two-stage mode is the factory default setting. See TABLE 6.

**Switch 3 -- Second-Stage Heat On Delay** -- If a single-stage thermostat is used, the integrated control can be used to energize second-stage heat after either 7 minutes or 12 minutes of first-stage heat operation. See TABLE 6.

**Switches 4 and 5 -- Blower-Off Delay** -- The blower-on delay of 45 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 4 and 5 on the integrated control. The unit is shipped from the factory with a blower-off delay of 120 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 7 provides the blower-off timings that will result from different switch settings.

**TABLE 7****Blower-Off Delay Switch Settings**

Blower-Off Delay (Seconds)	Switch 4	Switch 5
90	Off	On
120 (factory)	Off	Off
180	On	Off
210	On	On

**Indoor Blower Operation DIP Switch Settings**

**Switches 6 and 7 -- Continuous Indoor Fan Operation Blower Speed** -- The unit is shipped from the factory with the DIP switches positioned for medium low (2) speed during continuous indoor blower operation. TABLE 8 provides the continuous blower speeds that will result from different switch settings. Refer to blower tables at the front of this manual for corresponding cfm values.

**TABLE 8****Continuous Indoor Blower Operation -- Blower Speeds**

Speed	Switch 6	Switch 7
1 - Low (28%)*	Off	On
2 - Medium Low (38%)* Factory	Off	Off

See TABLE 15 for allowable circulation speeds.

**Switches 8 and 9 -- Cooling Mode Blower Speed --**

Switches 8 and 9 are used to select cooling blower motor 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 9 provides the cooling mode blower speeds that will result from different switch settings. Refer to blower tables at the front of this manual for corresponding cfm values.

**TABLE 9****Cooling Mode Blower Speeds**

Speed	Switch 8	Switch 9
1 - Low	On	On
2 - Medium Low	Off	On
3 - Medium High	On	Off
4 - High Factory	Off	Off

**Switches 10 and 11 -- Cooling Mode Blower Speed Adjustment** -- Switches 10 and 11 are used to select blower speed adjustment settings. 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 10 provides blower speed adjustments that will result from different switch settings. Refer to blower tables at the front of this manual for corresponding cfm values. With switches 10 and 11 set to ON, motor will bypass ramping profiles and all delays and immediately upon a call for cool, run at COOLING speed selected. LED will continue to operate as normal. This mode is used to check motor operation.

**TABLE 10**  
**Cooling Mode Blower Speed Adjustment**

Adjustment	Switch 10	Switch 11
+10% (approx.)	On	Off
Default Cool CFM	Off	Off
- 10% (approx.)	Off	On
Motor Test	On	On

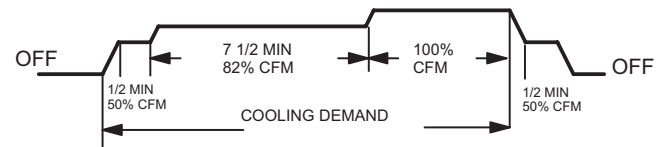
**Switches 12 and 13 -- Cooling Mode Blower Speed Ramping** - Switches 12 and 13 are used to select cooling mode blower speed ramping options. Blower speed ramping may be used to enhance dehumidification performance. The switches are factory set at option A which has the greatest effect on blower motor performance. TABLE 11 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.

**TABLE 11**  
**Cooling Mode Blower Speed Ramping**

Ramping Option	Switch 12	Switch 13
A (factory)	Off	Off
B	On	Off
C	Off	On
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.



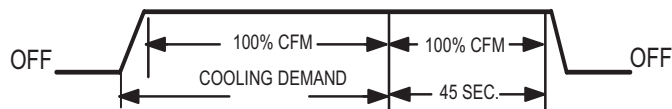
### Ramping Option B

- 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.



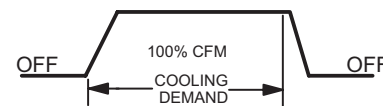
### Ramping Option C

- 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.



**TABLE 12**

**Low Heat Blower Speeds**

Thermostat Demand	Blower Speed Adjustments	DIP Switch Settings		
		14	15	16
Low Heat (R to W1)	+ 15%	On	Off	On
	+ 7.5%	On	Off	Off
	Normal	Off	Off	Off
	- 7.5%	On	On	Off
	- 15%	On	On	On

**TABLE 13**

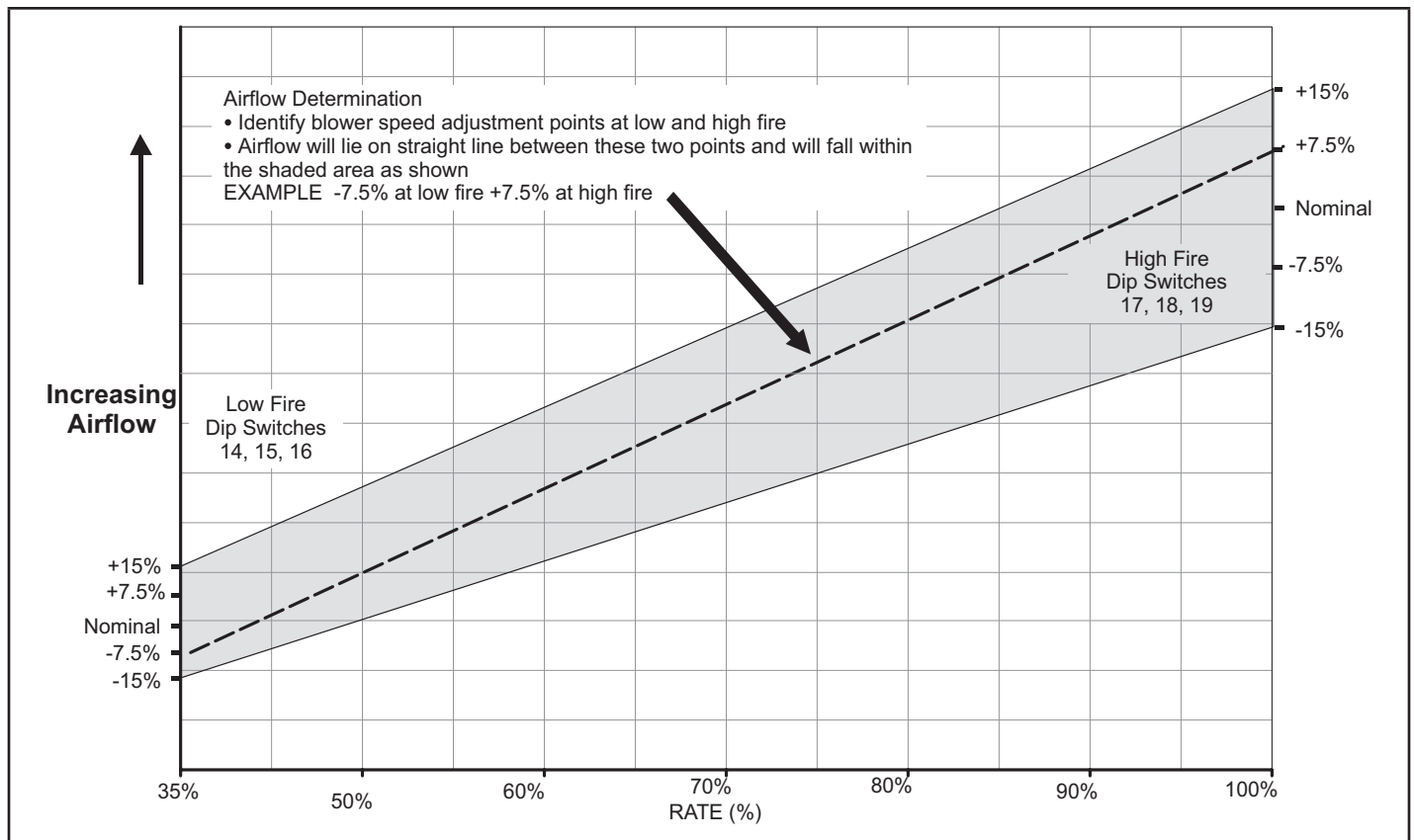
**High Heat Blower Speeds**

Thermostat Demand	Blower Speed Adjustments	DIP Switch Settings		
		17	18	19
High Heat (R to W1 & W2)	+ 15%	On	Off	On
	+ 7.5%	On	Off	Off
	Normal	Off	Off	Off
	- 7.5%	On	On	Off
	- 15%	On	On	On

**Switches 14 through 19 -- Heating Mode Blower Speed**

-- Switches 14 through 19 are used to select heating mode blower motor speeds. These switches are factory set at the OFF position which provides 100 % of normal speed during HIGH HEAT demand, 70% of normal speed during MIDRANGE HEAT demand and 40% of normal speed during LOW HEAT demand. Switches 14, 15 and 16 are used to adjust the LOW FIRE blower motor speed. Switches 17, 18 and 19 are used to adjust the HIGH FIRE blower motor speed. TABLE 12 and TABLE 13 provides the heating mode blower speeds that will result from different switch settings. FIGURE 6 indicates the effect the DIP switch settings have upon the heating airflow at various furnace firing rates. Refer to blower tables at the front of this manual for corresponding cfm values.

See TABLE 14 allowable heating speeds.



**FIGURE 6**

**TABLE 14**  
**Allowable Heating Speeds**

SLP99DF Model	-15%	-7.5%	Default	+7.5%	+15%
All Models	Allowed	Allowed	Factory	Allowed	Allowed

**TABLE 15**  
**Allowable Circulation Speeds**

SLP99DF Model	28% (Second Stage Cool)	38% (second stage cool)
All Models	Allowed	Factory Setting

**TABLE 16**  
**COOLING OPERATING SEQUENCE**  
**SLP99DFVK and Single-Stage Outdoor Unit**

OPERATING SEQUENCE		SYSTEM DEMAND			SYSTEM RESPONSE				
System Condition	Step	Thermostat Demand			Relative Humidity		Compressor	Blower CFM (cool)	Comments
		1st stage	O	G	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%	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 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%	Thermostat will keep outdoor unit energized after cooling temperature setpoint has been reached in order to maintain room humidity setpoint.
On-board links 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.									
*ComfortSense® 7500 thermostat only									

**TABLE 17**  
**OPERATING SEQUENCE**  
**SLP99DFVK and Two-Speed Outdoor Unit**

OPERATING SEQUENCE		SYSTEM DEMAND				SYSTEM RESPONSE				
System Condition	Step	Thermostat Demand				Relative Humidity		Compressor	Blower CFM (cool)	Comments
		1 s t stage	2nd stage	O	G	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%	Thermostat energizes 2nd stage and de-energizes D on a call for dehumidification
Dehumidification call	2	On	On	On	On	Demand	0 VAC	High	70%	
PRECISION MODE (operates independent of a Y1 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%	Thermostat will keep outdoor unit energized after cooling temperature setpoint has been reached in order to maintain room humidity 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%	Thermostat energizes 2nd stage and de-energizes D on a call for dehumidification
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%	Thermostat will keep outdoor unit energized after cooling temperature set-point has been reached in order to maintain room humidity set-point.
On-board links at indoor unit with a two-stage outdoor unit: Cut factory link from Y1 to Y2 or cut W915 (Y1 to Y2) on SureLight® integrated control. With Condensing unit - Cut W914 (R to DS) on SureLight® integrated control; With Heat Pump - Cut W914 (R to DS) & W951 (R to O) on SureLight® integrated control. *ComfortSense® 7500 thermostat only										

## On-Board Link W914 DS to R

### (FIGURE 4 and FIGURE 5)

On-board link W914, is a clippable connection between terminals DS and R 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 PWM signal from the Harmony III control will be blocked and also lead to control damage. Refer to FIGURE 16 for operation sequence in applications including SLP99DFVK, a thermostat which features humidity control and a single-speed outdoor unit. TABLE 17 gives the operation sequence in applications with a twospeed outdoor unit.

## On-Board Link W951 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 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 link is not cut the outdoor unit will operate in second-stage cooling only.

## Diagnostic LED

The seven-segment diagnostic LED displays operating status, target airflow, error codes and other information. Table 14 lists diagnostic LED codes.

## Diagnostic Push Button

The diagnostic push button is located adjacent to the seven-segment diagnostic LED. This button is used to enable the Error Code Recall mode and the Field Test 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.

## Field Test Mode

Use the diagnostic push button to scroll through the menu as described above. Release the button when the LED flashes "-" to select the Field Test mode.

While in the Field Test mode the technician can:

- Initiate furnace ignition and move to and hold low-fire rate by applying a R to W1 jumper.
- Initiate furnace ignition sequence and move to and hold high-fire rate by applying a jumper from R to W1 and W2.
- Initiate furnace ignition sequence and move to and hold mid-fire rate by applying a jumper to R and W2.
- Apply then remove the jumper from R to W1 and W2 to change the firing rate from low fire to mid fire and high fire.
- A vent calibration sequence can be initiated even if a thermostat signal is not present. Press and hold the push button until a solid "C" is displayed. Release the button and calibration will begin. The furnace will perform the high-fire and low-fire pressure switch calibrations and display "CAL". After calibration, the LED will return to the flashing "-" display.

During Field Test mode operation, all safety switches are still in the circuit (they are not by-passed) and indoor blower performance and timings will match DIP switch selections. Current furnace firing rate, indoor blower CFM and flame signal will be displayed. To exit the Field Test mode, press and hold the button. The menu will resume from the beginning. Also, cycle the main power to exit the Field Test mode. The integrated control will automatically exit the Field Test mode after 45 minutes of operation.

## 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 18****Idle Menu Options**

These options are displayed on the menu when the button is pressed during normal operation

DISPLAY	ACTION (when button released)
No change (idle)	remain in idle mode
Solid "E"	enter diagnostic mode
Solid "-"	enter field test mode

*NOTE - No change implies the display will continue to show whatever is currently being displayed for normal operation*

**TABLE 19****Idle Menu Options**

These options are displayed on the menu when the button is pressed during normal operation

DISPLAY	ACTION (when button released)
No change (blinking "-")	remain in field test mode
Solid "-"	exit field test mode
Solid "c"	start pressure switch calibration

**TABLE 20****Idle Menu Options**

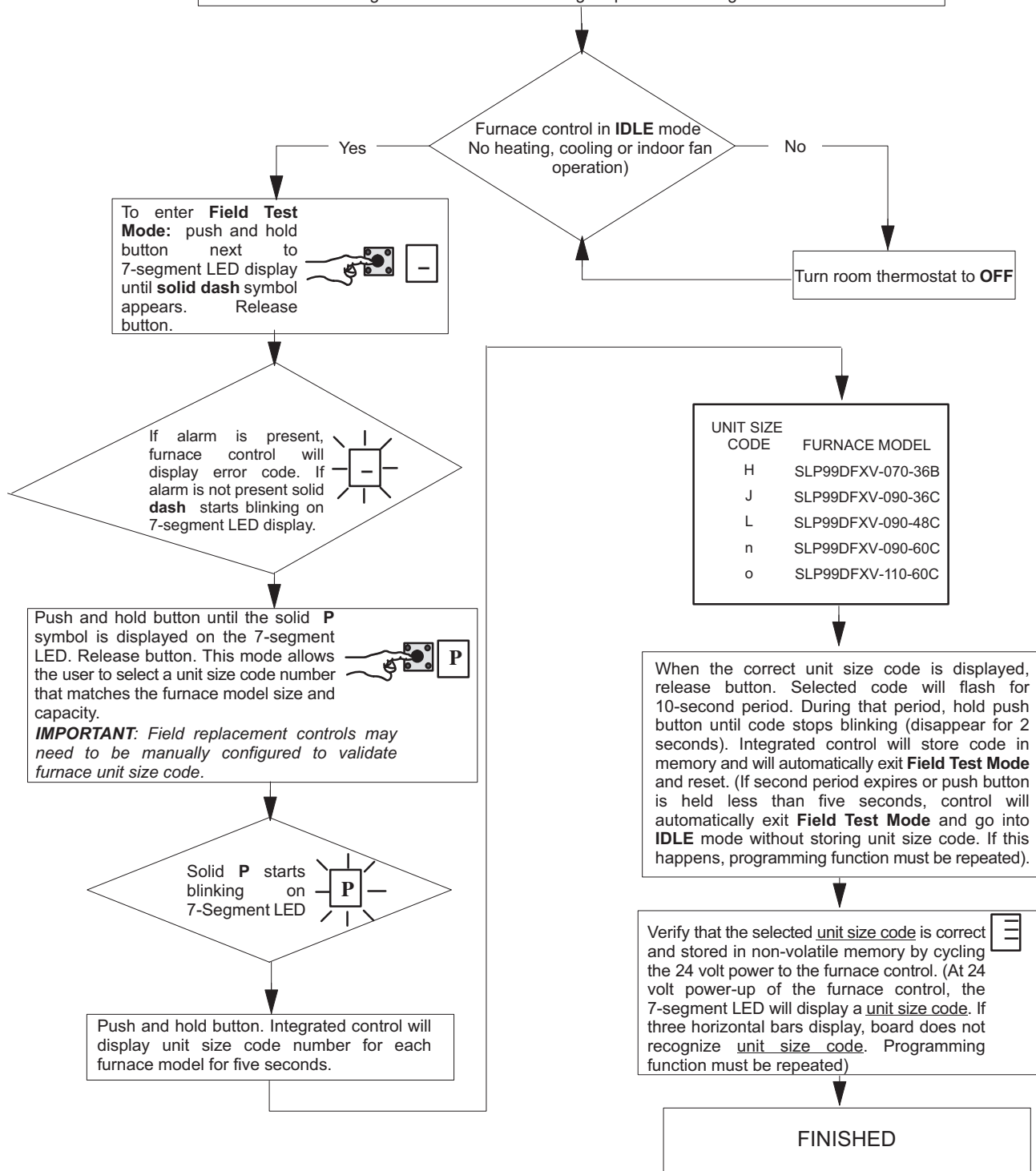
These options are displayed on the menu when the button is pressed during normal operation

DISPLAY	ACTION (when button released)
No change (displaying error history)	remain in diagnostic recall mode
Solid (3 horizontal bars)	exit diagnostic recall mode
Solid "c"	clear error history

Once the button is released to clear the error history a blinking "c" will be shown on the display for up to 10 seconds. During this time the user must press and release the button one additional time to confirm the action of deleting the error history. Once the error history is deleted it cannot be recovered.

## Configuring Unit Size Codes

**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:



## B-Blower Compartment (FIGURE 7)

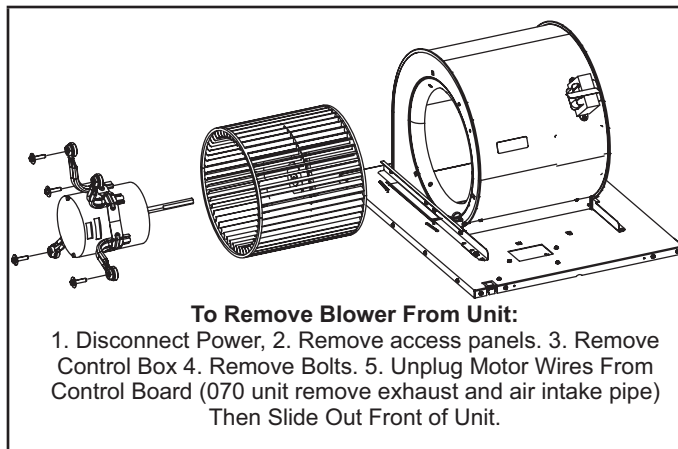


FIGURE 7

### 1. Blower Motor (B3)

#### **! 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 SLP99DFVK line uses three different motor sizes; 1/2 hp, 3/4 hp and 1hp. 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. SLP99DFVK 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 8). Because this motor has a permanent magnet rotor it does not need brushes like conventional D.C. motors.

Internal components are shown in FIGURE 8. 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.

#### **! IMPORANT**

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.

## BLOWER MOTOR COMPONENTS

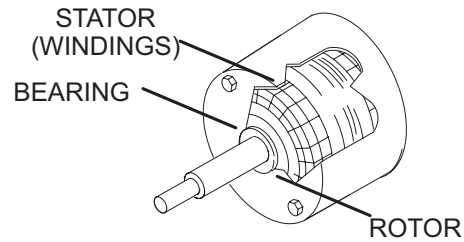


FIGURE 8

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).

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 SLP99DFVK 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.

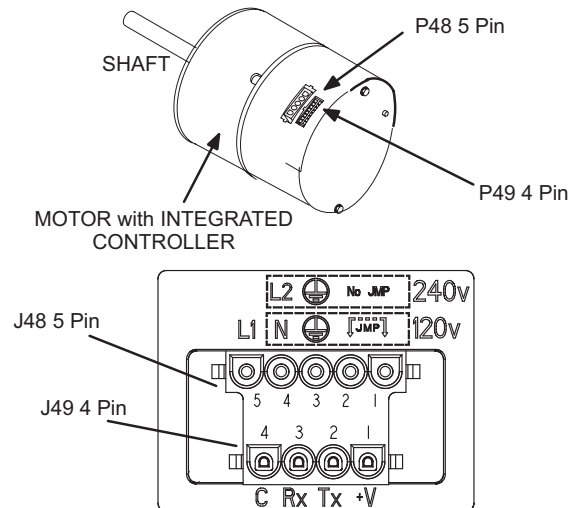
⚠ DANGER

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 5 ton 3/4hp and 1hp units. The choke is located on the blower housing and is used to suppress transient current spikes.

### 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 9**

## Troubleshooting Motor Operation (FIGURE 10)

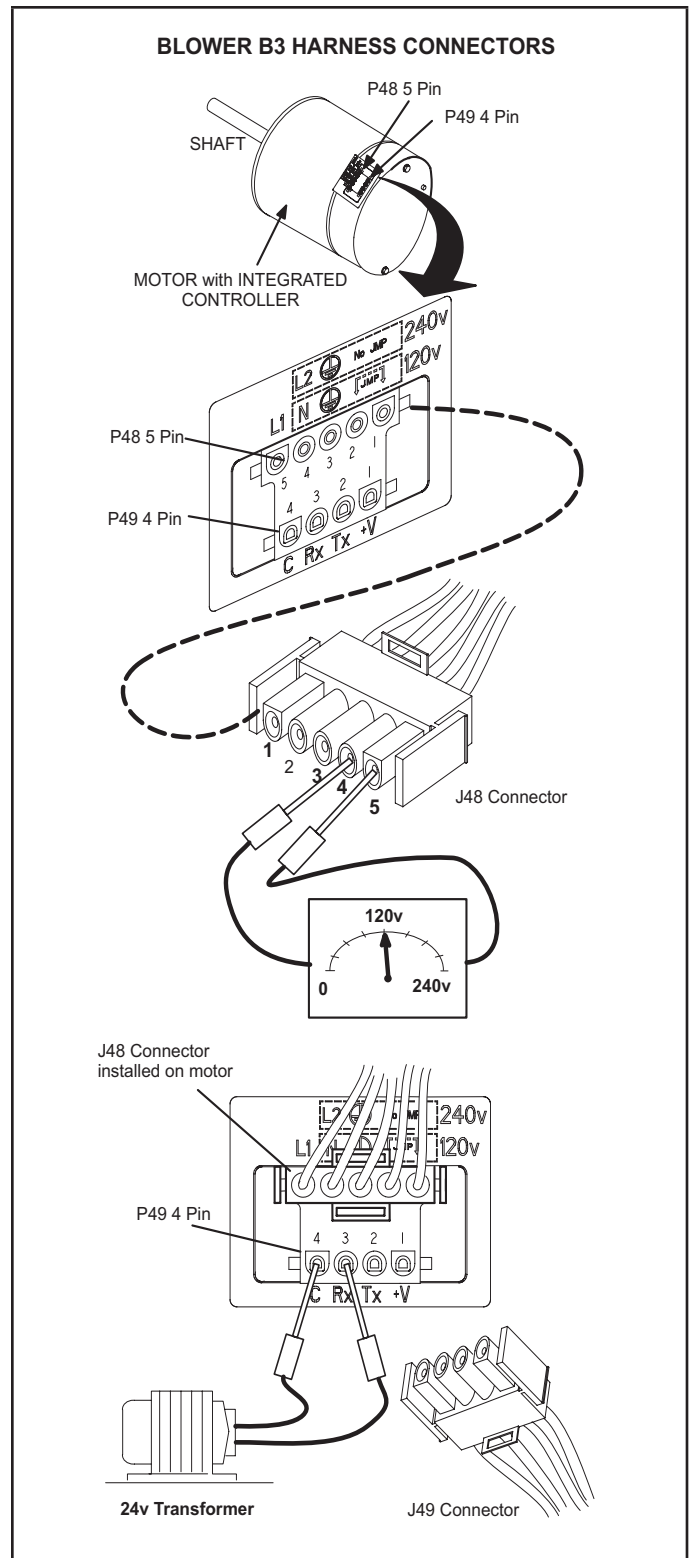
To verify motor operation see steps below:

- 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.



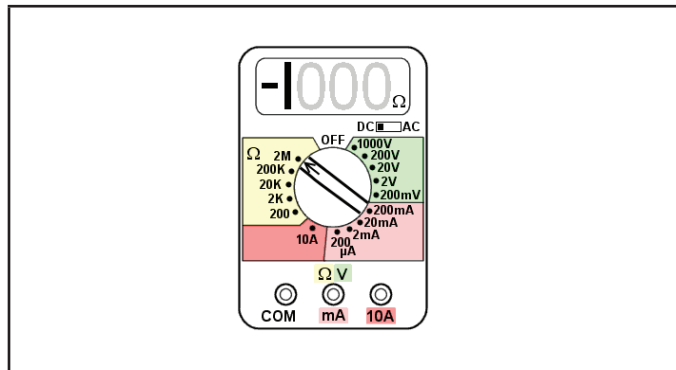
## Troubleshooting Motor Windings

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 21**

Ohm Meter Range		
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

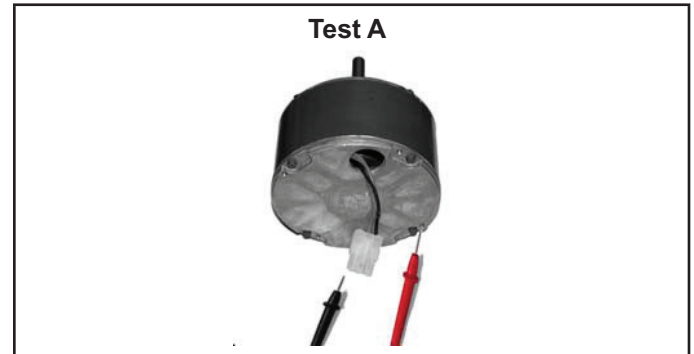


**FIGURE 11**

## 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.**

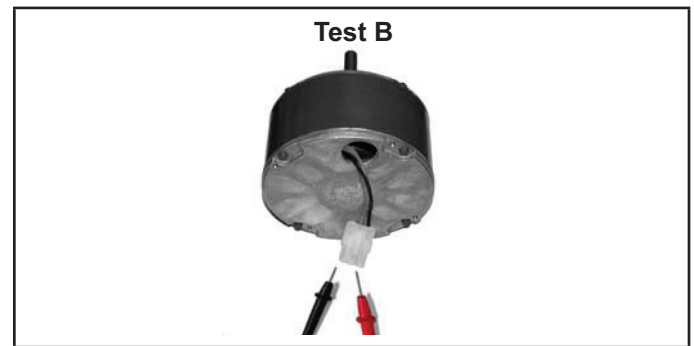


**FIGURE 12**

## 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 13**



## C-Heating Components (FIGURE 14)

### 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. Due to this feature of the control, voltage measured with a digital meter will be slightly lower. To measure correct voltage use a true RMS meter or ignitor can be ohmed. Ohm value should be 39 to 70.

### 2. Flame Sensor

A flame sensor is located on the left side of the burner support. The sensor is mounted on the flame rollout plate and the 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. TABLE 22 shows the flame signal for the SLP99DFVK unit.

**TABLE 22**  
**Flame Signal in Microamps**

Normal	Low	Drop Out
2.6 or greater	2.5 or less	1.1

NOTE - A much higher than normal micro amp reading (15 for example) may appear when checking flame signal.

### 3. Flame Rollout Switches

Flame rollout switch S47 is a high temperature limit located inside the burner box. Each furnace is equipped with two identical switches. The limit is a N.C. SPST manual-reset limit connected in series with the primary limit S10.

When S47 senses rollout, the circuit breaks and the integrated control immediately stops ignition and closes the gas valve. If unit is running and flame rollout is detected, the gas valve will close and integrated control will be disabled. 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 center of the switch.

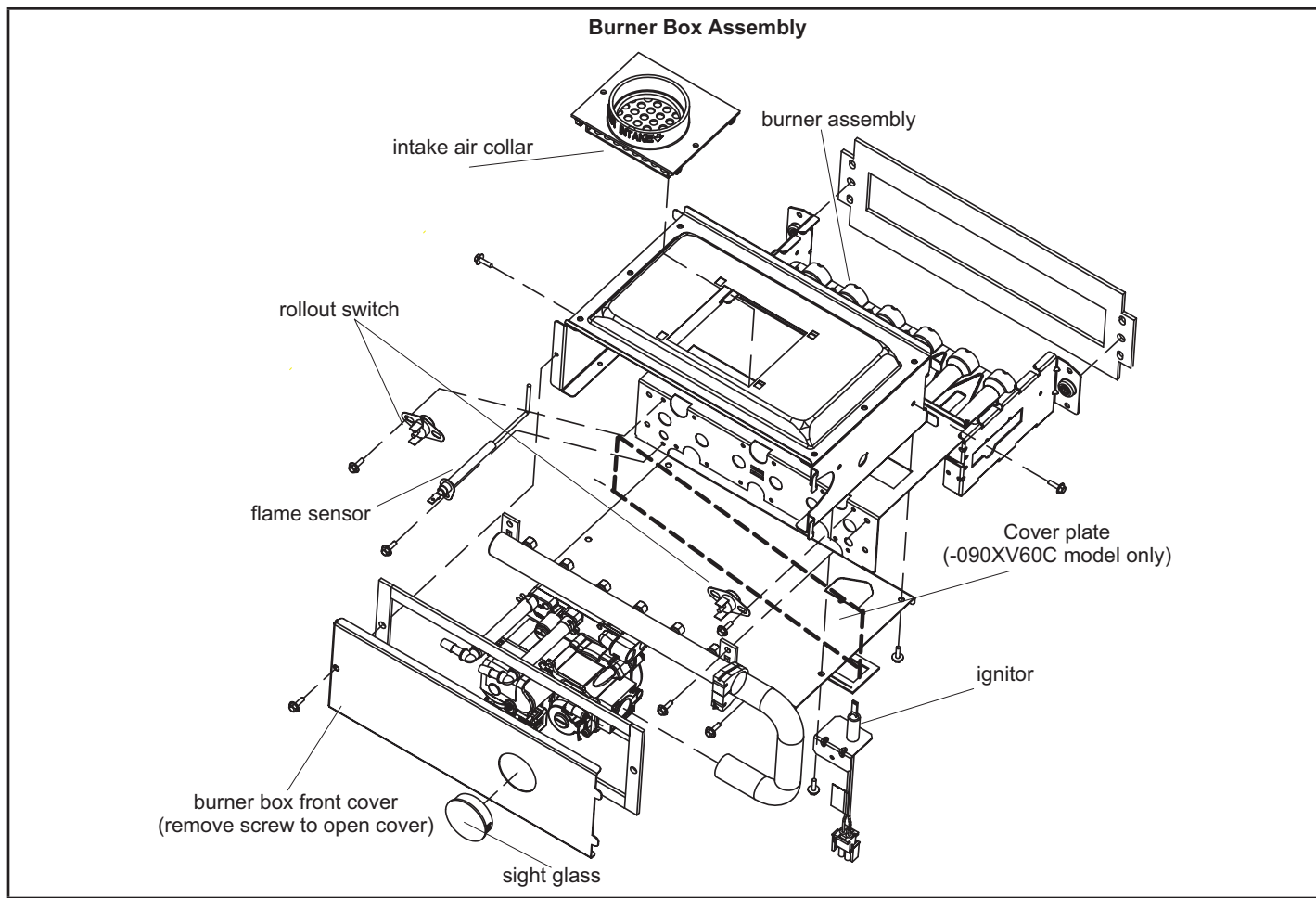
### 4. Burners

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

### 5. Duralock Plus Heat Exchanger ()

Units use an aluminized steel primary and stainless steel secondary heat exchanger assembly. Heat is transferred to the air stream from all surfaces of the heat exchanger. The shape of the heat exchanger ensures maximum efficiency.

The combustion air inducer pulls fresh air through the burner box. This air is mixed with gas in the burners. The gas / air mixture is then burned at the entrance of each clamshell. Combustion gases are then pulled through the primary and secondary heat exchangers and exhausted out the exhaust vent pipe.



**FIGURE 14**

## 6. Primary Limit Control (S10)

FIGURE 15 shows the primary limit (S10) used on SLP99DFVK units located in the heating vestibule panel. When excess heat is sensed in the heat exchanger, the limit will open. Once the limit opens, the furnace control energizes the supply air blower and de-energizes the gas valve. The limit automatically resets when unit temperature returns to normal. The switch is factory set and cannot be adjusted. In the event of restricted air flow, the integrated control will reduce firing rate and indoor blower airflow in 10% increments until a sustainable air flow is reached. If the furnace reaches 35% firing rate, and adequate air flow is not available, the furnace will shutdown and enter one hour watchguard. For limit replacement remove wires from limit terminals and rotate limit switch 90 degrees. Slowly remove from the vestibule panel.

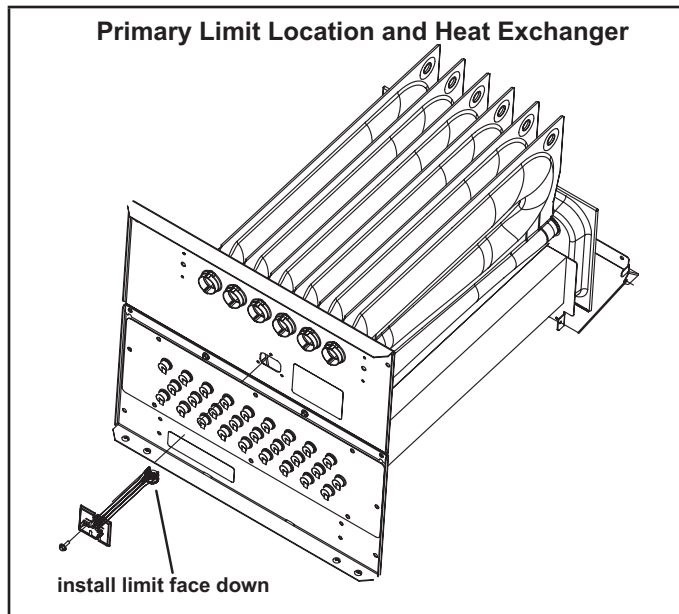


FIGURE 15

## 7. Gas Valve (GV1)

Units use a variable capacity gas valve (FIGURE 16) and is applicable for two-stage or variable capacity settings. See "Thermostat selection modes" in the integrated control section (section A- subsection 4.) for more details. The valve is internally redundant to assure safety shut-off. If the gas valve must be replaced, the same type valve must be used.

A 24VAC 2-pin plug and gas control switch are located on the valve. 24V applied to the pins enables valve operation. Inlet and outlet pressure taps are located on the valve. LPG change over kits are available from Lennox. Kits include burner orifices and an LP gas valve.

## **⚠ DANGER**

**Danger of explosion.**

**There are circumstances in which odorant used with LP/propane gas can lose its scent. In case of a leak, LP/propane gas will settle close to the floor and may be difficult to smell. An LP/propane leak detector should be installed in all LP applications.**

The burner box is sealed and operates under a negative pressure. A pressure hose is connected from the burner box to the gas valve. The gas valve senses the pressure in the burner box and uses that to set the maximum manifold pressure while the pressure switch with pressure conditioning device adjusts the gas flow. This will compensate for different vent configurations which can greatly affect the rate of the unit.

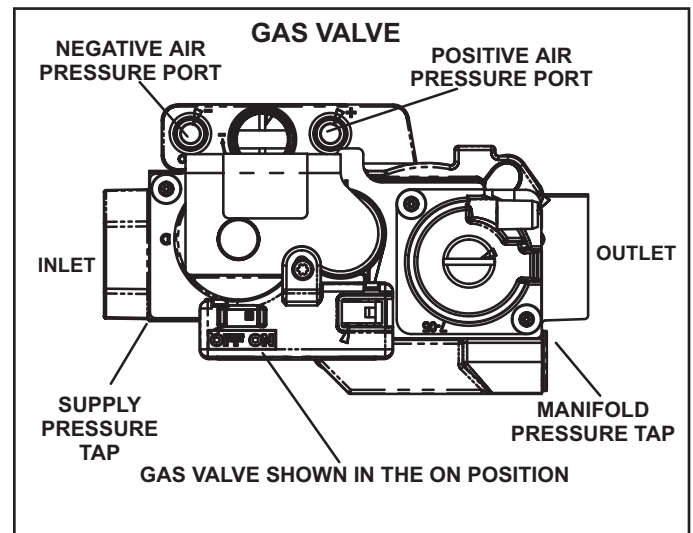


FIGURE 16

## 8. Combustion Air Inducer (B6) & Pressure Switch (S18)

All SLP99DFVK units are equipped with a combustion air inducer (B6) and dual pressure switch assembly (high fire and low fire). The pressure switch (FIGURE 17) serves four functions. First it establishes calibration points for the vent calibration routine. The combustion air inducer's speed at a given firing rate is a function of the vent system resistance. The calibration routine establishes the inducer speed required to make low and high fire switches for a given vent pipe installation and interpolates the speeds required to achieve all intermediate rates between these two points. The setting for low fire switch on the assembly is such that it does not normally enter into the vent calibration routine.

Second, the switch proves combustion air inducer operation by sensing a vacuum energizing the control circuit and allowing ignition. The low fire pressure switch provides this function.

Third, the switch interrupts the combustion process in the event vent outlet or combustion air intake blockage. Finally, the switch interrupts the combustion process if the condensate drainage system becomes blocked to the point the condensate level builds up in the cold end header box/secondary coil or vent system.

If the switch assembly is to be replaced, replace the entire assembly. Individual switch components cannot be replaced.

### Combustion Air Inducer Specifications

- Three phase AC induction motor
- Sealed ball bearings
- VFD controlled by the furnace control board
- Operates at 60 to 180Hz
- Voltage range 33 - 110 VAC
- Amp draw 0.75 - 1.0
- Windings resistance 16.74 / 14.26
- Speed range 1000 - 5400 RPM

### Combustion Air Inducer Troubleshooting

- Is the CAI mounted correctly?
- Any air or condensate leaks?
- Does the motor and wheel turn freely?
- Any missing or broken mounting screws?
- Perform a visual inspection
- Clean as needed
- Measure the resistance between each of the windings. All readings should read 16.74 / 14.26 and be approximately 10% of each other.
- Check each winding to ground to confirm there is no continuity / not grounded

## WARNING

The pressure switch is a safety shut-down control in the furnace and must not be jumpered for any reason other than troubleshooting.

### Pressure Switch Troubleshooting

To troubleshoot the pressure switch, add a temporary jumper. The unit will not fire with the switch jumpered. Therefore, the pressure switch must be bypassed after the combustion air inducer is activated. This will determine if the pressure switch and furnace are operating properly. However, this may not indicate if the sealed combustion system is operating properly.

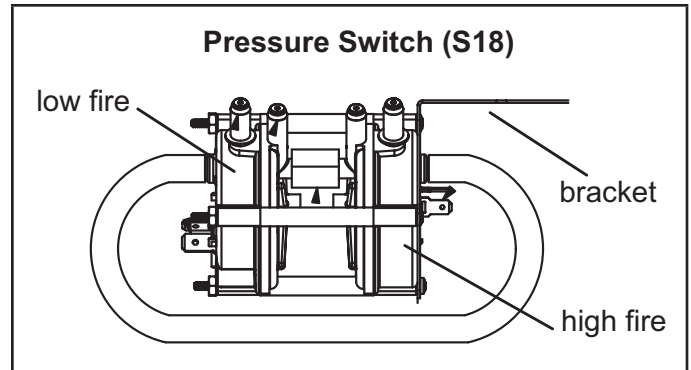


FIGURE 17

### Vent Calibration

The vent calibration sequence establishes furnace operating parameters in a specific installation. The integrated control runs the calibration and may be repeated as necessary to maintain proper furnace operation. Prior to calibration, all duct work (and returns) vent pipe and condensate trap (primed) must be connected.

If calibration is successful the data is stored in memory and will be used to determine furnace operation and maintain parameters during heat call. If calibration is not successful, the integrated control will proceed to a 5 minute delay and signal the appropriate code. After the 5 minute delay the calibration will be repeated 4 more times with a 5 minute delay in between. If still unsuccessful after the 4 trials (total 5) the integrated control will go into a 1 hour soft lockout.

Calibration may be initiated by:

- Initial call for heat
- Cycling main power off / on and then call for heat
- Venting conditions change (affecting high and low pressure switch operation)
- Ramp down low fire switch check failed (calibration will follow next call for heat)
- The service technician (by pressing the push button found on the integrated control until the control cycles through to "Field Test Mode")

The integrated control will do the following during calibration:

- 1 - Verify both low pressure switch and high pressure switch are open. If either are closed log error and end calibration.
- 2 - Start inducer at a predetermined low RPM (1600). Wait 7.5 seconds.
- 3 - Check low pressure switch, if open, increase RPM by 250, wait 5 seconds. Repeat this step until low pressure switch is closed.
- 4 - Decrease RPM by 50, wait 5 seconds and look for the low pressure switch to open. Repeat this step until it is open.
- 5 - Keep this RPM as RPM1.
- 6 - Increase RPM by 1250. Wait 5 seconds.
- 7 - Check high pressure switch, if open, increase RPM by 250, wait 5 seconds. Repeat this step until high pressure switch is closed.
- 8 - Decrease RPM by 50, check after 5 seconds. Repeat this step until switch is open.
- 9 - Keep this RPM as RPM2.
- 10 - Calibration complete.

**NOTE** - If after a successful calibration and a heat call is present the integrated control will by-pass the prepurge state and go straight into ignitor warm up

After calibration, the integrated control stores the RPM1 and RPM2 values. The low fire (35%) and high fire (100%) RPM points are calculated by adding margin values to the RPM1 and RPM2 values.

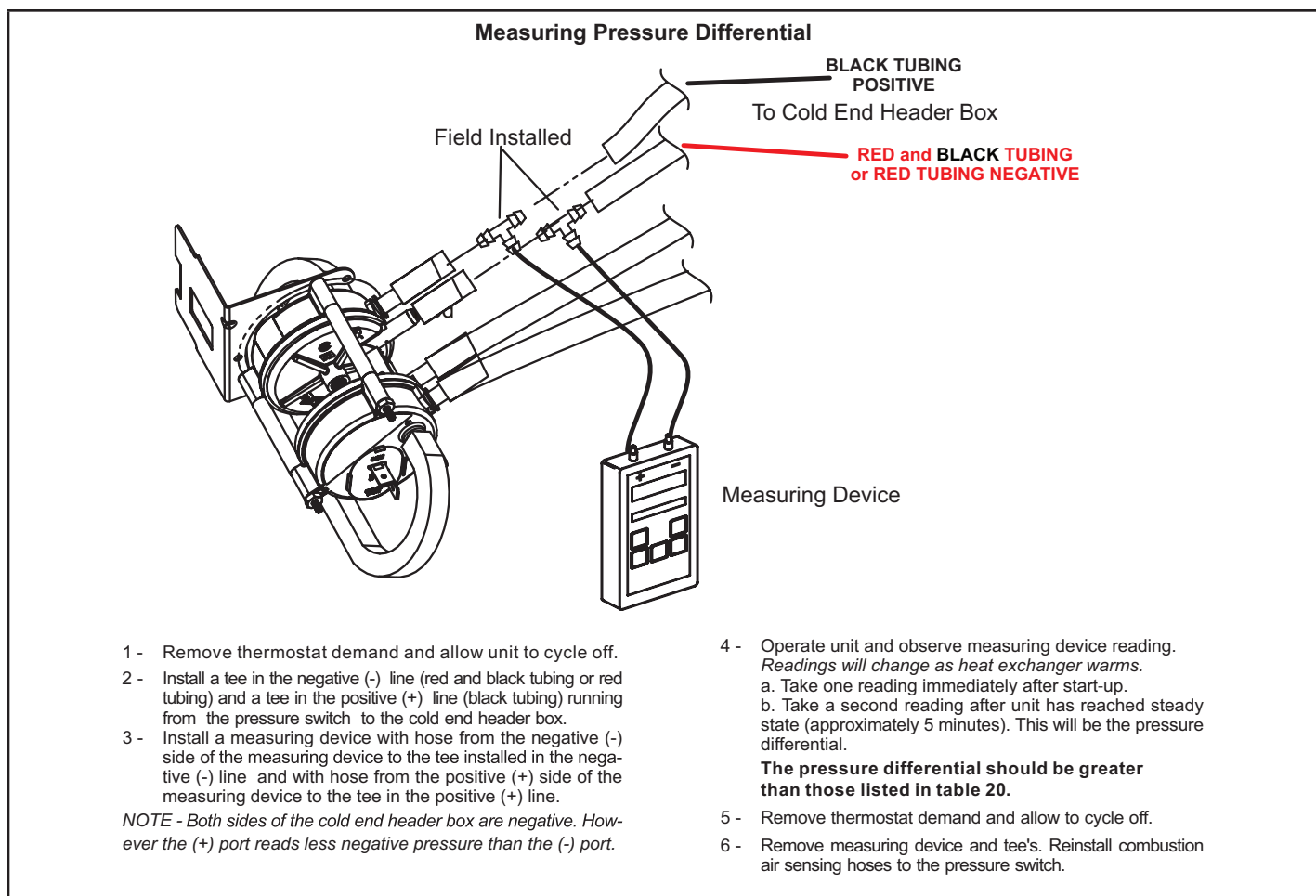
The integrated control also initiates a low fire switch check at the end of a normal heating cycle described below. If this check fails the pressure switch calibration will follow on the next call for heat.

- 1 - The inducer runs 15 seconds at the last firing rate before the heat call ended.
- 2 - Inducer runs at 35% firing rate RPM ( $RPM1 + \text{low pressure switch open RPM margin value}$ ).
- 3 - If low pressure switch is open, set flag for calibration on next call for heat. Turn inducer off until next call for heat.
- 4 - If low pressure switch is closed move inducer speed to RPM1. Allow 5 seconds for stabilization.
- 5 - If low pressure switch opens turn off inducer. No further action.
- 6 - If low pressure switch is still closed, decrease inducer speed 1/2 of the low pressure switch open RPM margin. Allow 5 seconds to stabilize.
- 7 - If low pressure switch is open turn off inducer. No further action.
- 8 - If low pressure switch is still closed, set flag for calibration on next call for heat and turn off inducer.

#### **Measuring pressure differential FIGURE 18**

Checks of pressure differential can aid in troubleshooting. Lennox provides a kit (10L34) if necessary. When measuring the pressure differential, readings should be taken at the pressure switch. Lack of differential usually indicates problems in the intake or exhaust piping, but may indicate problems in the heat exchanger, condensing coil, header boxes, combustion inducer or other components.

The differential pressure is the difference in pressure measured across the cold end header box orifice



**FIGURE 18**

The CAI 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 CAI. The box has pressure taps for the CAI pressure switch hoses.

The pressure switch measures the pressure differential across the CAI orifice (difference in the channel and cold end header box). See TABLE 23 for orifice size per unit. **If replacement is necessary the gaskets used to seal the box to the vestibule panel and the CAI to the box, must also be replaced.**

**TABLE 23**

Unit	C.A.I Orifice
-070	0.775
-090	0.890
-110	1.000

**TABLE 24**

**Pressure Switch 0' to 7500'**

Unit	Set Point High Fire	Set Point Low Fire
-070	1.00 ± 0.05	0.25 ± 0.05
-090		
-110		

*\*Units over 7500 ft will require a conversion kit. See table 34.*



# Combustion Air Inducer / Cold End Header Box / Vent Pipe Assembly

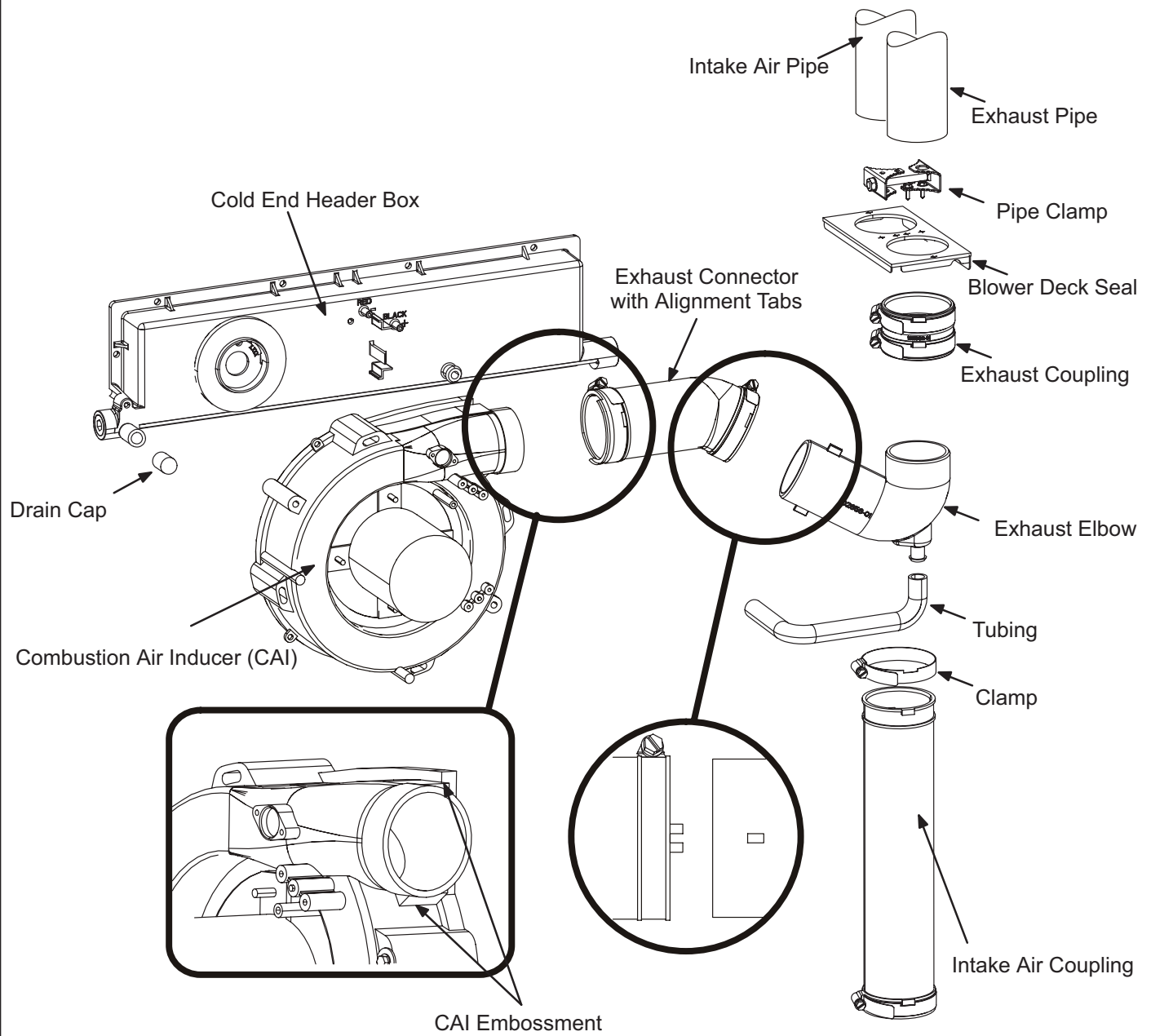


FIGURE 19

## II-Communicating Thermostat (if applicable)

In communicating applications a communicating thermostat must be used. In these applications the thermostat overrides the DIP switch settings on the integrated control. Refer to the illustrations provided with the thermostat for installation, set-up and operation. See FIGURE 20, FIGURE 21 and FIGURE 22 for thermostat wiring in communicating applications.

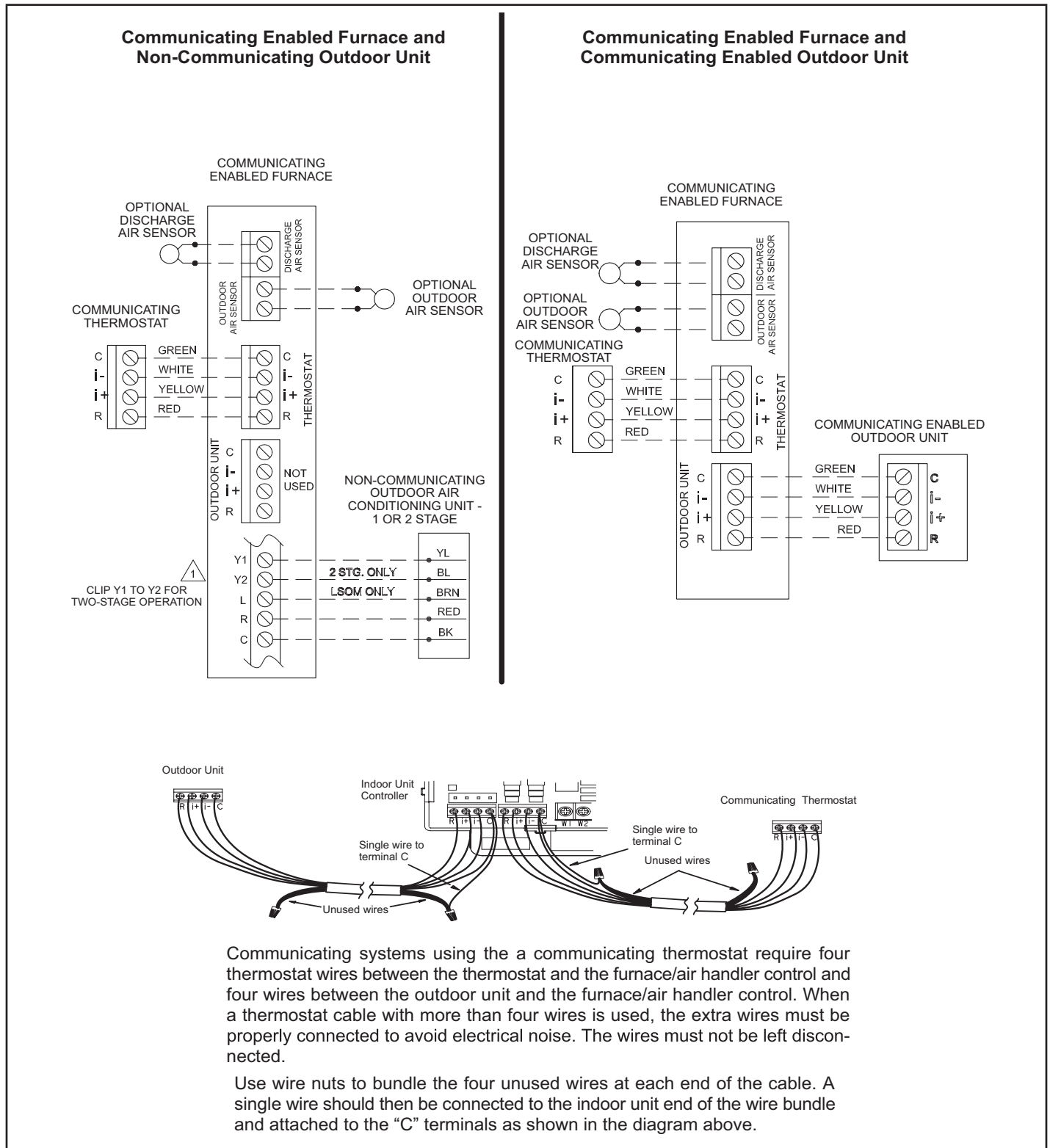


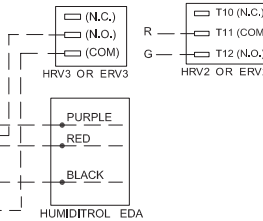
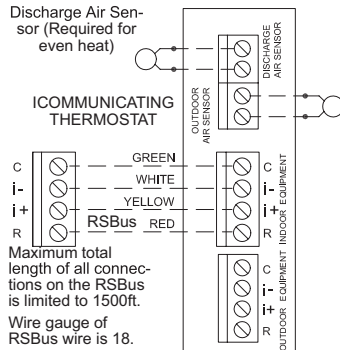
FIGURE 20

## Optional Accessories for use with any Communicating System

NOTE: iCOMMUNICATING 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 COMMUNICATING ENABLED OUTDOOR UNITS).

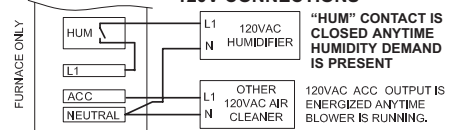
### COMMUNICATING ENABLED FURNACE



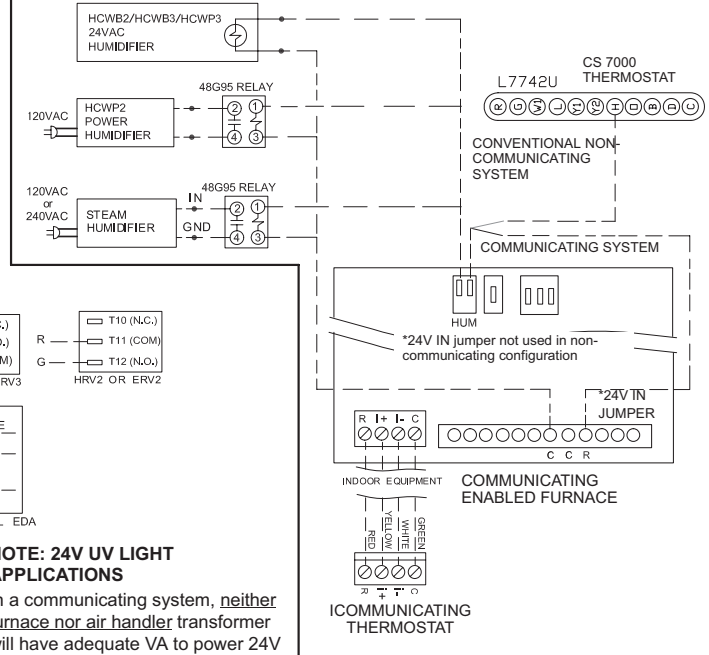
### NOTE: 24V UV LIGHT APPLICATIONS

In a communicating 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.

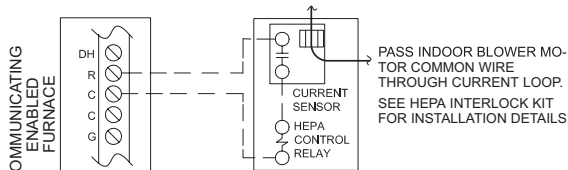
### 120V CONNECTIONS



### 24V HUMIDIFIER CONNECTIONS



### HEPA BYPASS FILTER X2680 HEPA INTERLOCK KIT



### LVCS VENTILATION CONTROL SYSTEM

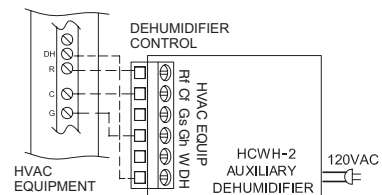
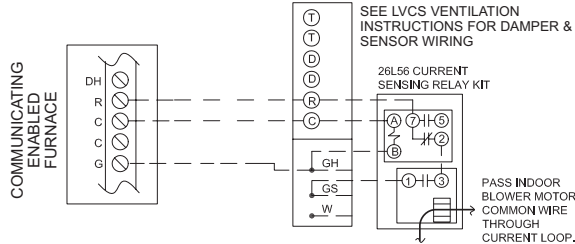
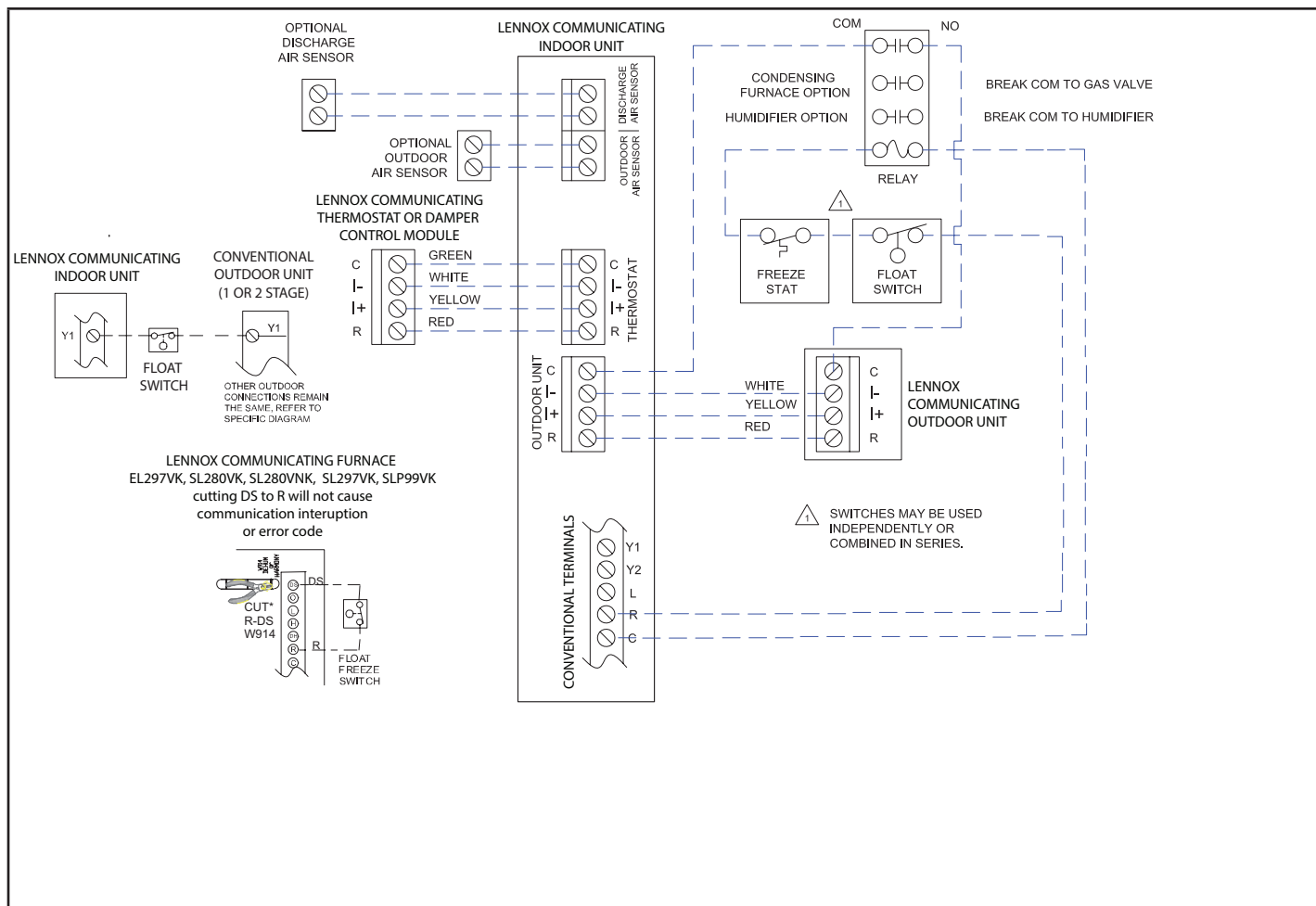


FIGURE 21



**FIGURE 22**

### III-PLACEMENT AND INSTALLATION

All pipe, fittings, primer and solvent cement must conform with American National Standard Institute and the American Society for Testing and Materials (ANSI/ASTM) standards. The solvent shall be free-flowing and contain no lumps, undissolved particles or any foreign matter that adversely affects the joint strength or chemical resistance of the cement. The cement shall show no gelation, stratification, or separation that cannot be removed by stirring. Refer to TABLE 25 for approved piping and fitting materials.

**TABLE 25**  
**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
<b>PRIMER &amp; SOLVENT CEMENT</b>	<b>ASTM SPECIFICATION</b>
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
<b>CANADA PIPE &amp; FITTING &amp; SOLVENT CEMENT</b>	<b>MARKING</b>
PVC & CPVC Pipe and Fittings	ULCS636
PVC & CPVC Solvent Cement	
ABS to PVC or CPVC Transition Cement	
<b>POLYPROPYLENE VENTING SYSTEM</b>	
PolyPro® by Duravent	
InnoFlue® by Centrotherm	
<b>UL 1738 CERTIFIED GAS VENTING SYSTEM</b>	
IPEX System1738 Schedule 40 PVC Pipes and Fittings	UL1738
IPEX System1738 PVC FGV Cement & Primer	

\* Not approved as of 12-1-2022

### 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.

### 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.

### IMPORTANT

SLP99UHV 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 25. 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. Metal or plastic strapping may be used for vent pipe hangers. Uniformly apply a liberal coat of PVC primer for PVC.

**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. TABLE 22 lists the available exhaust termination kits.

**TABLE 26**  
**OUTDOOR TERMINATION USAGE\***

Input Size	Vent Pipe Dia. in.	STANDARD				CONCENTRIC		
		Flush Mount Kit	Wall Kit		Field Fabricated	1-1.2 inch	2 inch	3 inch
			2 inch	3 inch		71M80 (US) 44W92 (CA)	69M29 (US) 44W92 (CA)	60L46 (US) 44W93 (CA)
		51W11 (US) 51W12 (CA)	22G44 (US) 30G28 (CA)	44J40 (US) 81J20 (CA)				
070	<sup>6</sup> 1-1/2	<sup>3</sup> YES	YES	<sup>1</sup> YES	<sup>5</sup> YES	<sup>2</sup> YES		
	2	<sup>3</sup> YES	YES	<sup>1</sup> YES	<sup>5</sup> YES	<sup>2</sup> YES		
	2-1/2	<sup>3</sup> YES	YES	<sup>1</sup> YES	<sup>5</sup> YES	<sup>2</sup> YES		
	3	<sup>3</sup> YES	YES	<sup>1</sup> YES	<sup>5</sup> YES	<sup>2</sup> YES		
090	2	<sup>3</sup> YES		YES	<sup>5</sup> YES		YES	YES
	2-1/2	<sup>3</sup> YES		YES	<sup>5</sup> YES		YES	YES
	3	<sup>3</sup> YES		YES	<sup>5</sup> YES		YES	YES
110	2	YES		YES	<sup>5</sup> YES		YES	YES
	2-1/2	YES		YES	<sup>5</sup> YES		YES	YES
	3	YES		YES	<sup>5</sup> 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 in. outdoor accelerator, when used with 070 input models. When 1-1/2 in. pipe is used it must transition to 2 in. pipe with the concentric kit.

3 Flush mount kits 51W11 and 51W12 includes 1-1/2 in. outdoor exhaust accelerator, required when used with 070 and 090 input models. When 1-1/2 in. pipe is used it must transition to 2 in. pipe 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 30 for vent accelerator requirements.

6 2 in. to 1-1/2 in. **field provided** reducer required.

### 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.

- 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.

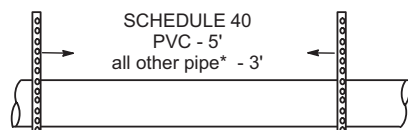
**NOTE** - Assembly should be completed within 20 seconds after last application of cement. Hammer blows should not be used when inserting pipe.

- 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 a defective assembly due to insufficient solvent.
- 9 - Handle joints carefully until completely set.



## Venting Practices

### HORIZONTAL PIPING SUPPORT GUIDELINES



\* See Piping and Fittings Specifications table

**NOTE** - Vertical support guidelines: Recommend following the guidelines in the International Plumbing code for PVC.

**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

24" maximum  
3/4" minimum

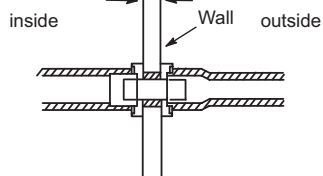
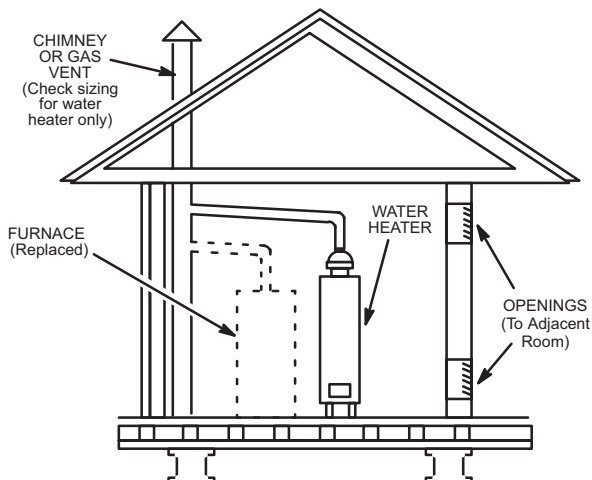


FIGURE 23

### REPLACING FURNACE THAT WAS PART OF A COMMON VENT SYSTEM



If replacing 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 24

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

### Exhaust Piping (FIGURE 25 and FIGURE 27)

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 PolyPro by DuraVent and InnoFlue® by Centrotherm venting system for assembly or if requirements are more restrictive. The PolyPro by DuraVent and InnoFlue by Centrotherm venting system must also follow the uninsulated and unconditioned space criteria listed in TABLE 26.

The SLP99DFV is installed only as a Direct Vent gas central furnace.

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

Intake and exhaust pipe sizing -- Size pipe according to TABLE 27 (minimum length permitted) and TABLE 28 (maximum length permitted). Count all elbows inside and outside the home.

Regardless of the diameter of pipe used, the standard roof and wall terminations described in section Exhaust Piping Terminations should be used. Exhaust vent termination pipe is sized to optimize the velocity of the exhaust gas as it exits the termination. Refer to TABLE 30

**TABLE 27**  
**MINIMUM VENT PIPE LENGTHS**

SLP99UHV MODEL	MIN.EQUIV. VENT LENGTH	EXAMPLE
070	15 ft*	5 ft. plus 2 elbows of 1-1/2", 2", 2-1/2" or 3" diameter pipe
090, 110		5 ft. plus 2 elbows of 2", 2-1/2" or 3" diameter pipe

\*Any approved termination may be added to the minimum equivalent length listed. Two 45 degree elbows are the equivalent to one 90 degree elbow.

**NOTE** - It is acceptable to use any pipe size which fits within the guidelines allowed in TABLE 28.

**NOTE** - The exhaust collar on all models is sized to accommodate 2" Schedule 40 vent pipe. Contact the Application Department for more information concerning sizing of vent systems which include multiple pipe sizes.

**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.

Use the following steps to correctly size vent pipe diameter.

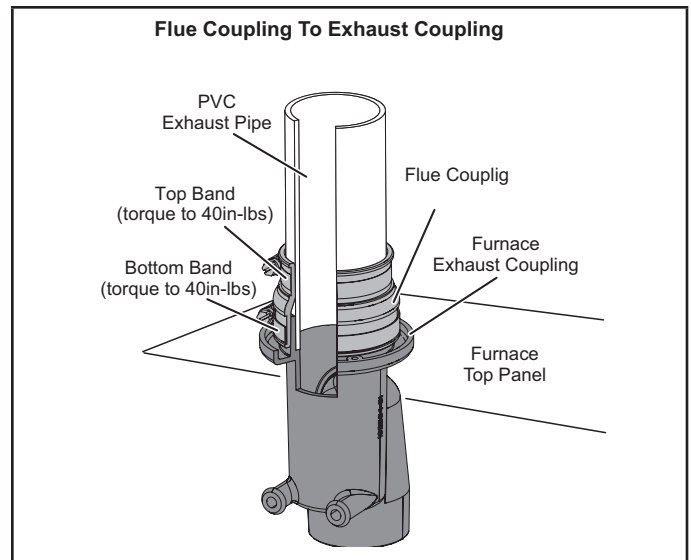
## **IMPORTANT**

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

### Flue Coupling

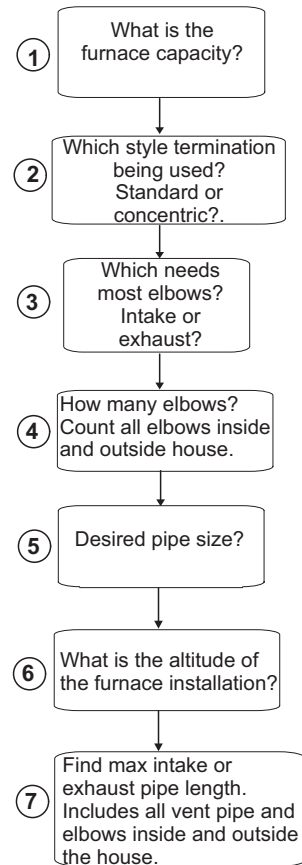
The provided flue coupling must be attached to the exhaust coupling on the furnace top panel. Use provided bands. See steps below and FIGURE 25.

- 1 - Remove the caution sticker from flue coupling .
- 2 - Fully insert flue coupling with both bands loosely attached on the furnace exhaust coupling.
- 3 - Insert PVC exhaust pipe through flue coupling. Ensure vent pipe is fully seated into exhaust coupling. Tighten both top and bottom bands to 40 in lbs. See FIGURE 25. **Do not use glue flue.**



**FIGURE 25**

### Piping Size Process



**FIGURE 26**

**TABLE 28**

**Maximum Allowable Intake or Exhaust Vent Length in Feet**

\*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.

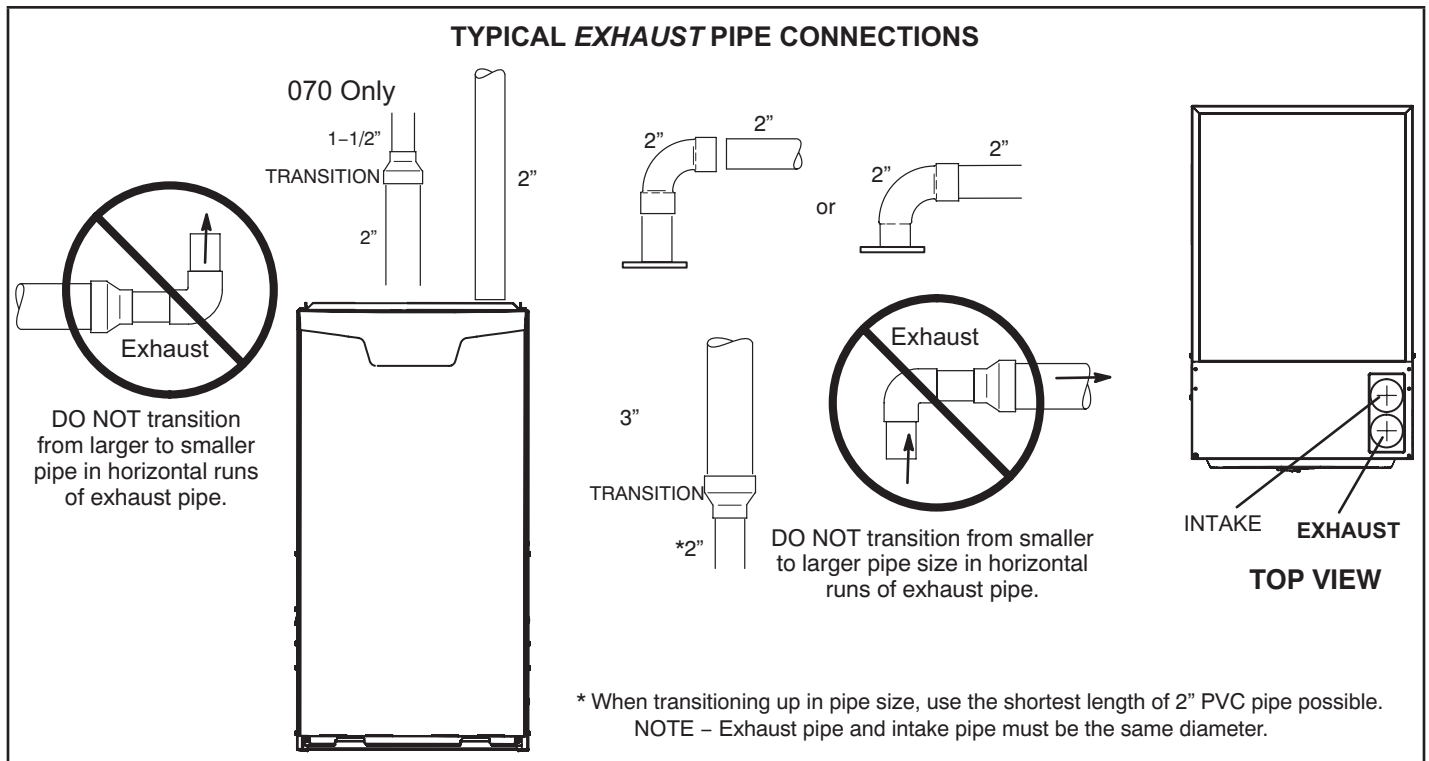
Standard Termination at Elevation 0 - 4500'													
Number Of 90° Elbows Used	1-1/2" Pipe			2" Pipe			2-1/2" Pipe			3" Pipe			
	Model			Model			Model			Model			
	070	090	110	070	090	110	070	090	110	070	090	110	
1	15	N/A	N/A	91	69	14	140	93	43	162	143	118	
2	10			86	64	9	135	88	38	157	138	113	
3	N/A			81	59	N/A	130	83	33	152	133	108	
4				76	54		125	78	28	147	128	103	
5				71	49		120	73	23	142	123	98	
6				66	44		115	68	18	137	118	93	
7				61	39		110	63	13	132	113	88	
8				56	34		105	58	N/A	127	108	83	
9				51	29		100	53		122	103	78	
10				46	24		95	48		117	98	73	
Standard Termination at Elevation 4501' - 7500'													
Number of 90° Elbows Used	1-1/2" Pipe			2" Pipe			2-1/2" Pipe			3" Pipe			
	Model			Model			Model			Model			
	070	090	110	070	090	110	070	090	110	070	090	110	
1	13	N/A	N/A	66	69	14	115	93	43	137	143	118	
2	8			61	64	9	110	88	38	132	138	113	
3	N/A			56	59	N/A	105	83	33	127	133	108	
4				51	54		100	78	28	122	128	103	
5				46	49		95	73	23	117	123	98	
6				41	44		90	68	18	112	118	93	
7				36	39		85	63	13	107	113	88	
8				31	34		80	58		102	108	83	
9				26	29		75	53		97	103	78	
10				21	24		70	48		92	98	73	
Standard Termination 7501' - 10,000"													
Number of 90° Elbows Used	1-1/2 Pipe			2" Pipe			2-1/2" Pipe			3" Pipe			
	Model			Model			Model			Model			
	070	090	110	070	090	110	070	090	110	070	090	110	
1	N/A	N/A	N/A	41	44	N/A	90	68	N/A	112	118	93	
2				36	39		85	63		107	113	88	
3				31	34		80	58		102	108	83	
4				26	29		75	53		97	103	78	
5				21	24		70	48		92	98	73	
6				16	19		65	43		87	93	68	
7				11	14		60	38		82	88	63	
8				N/A	N/A		55	33		77	83	58	
50							28	72		78	53		
45							23	67		73	48		

**TABLE 28 Cont.**

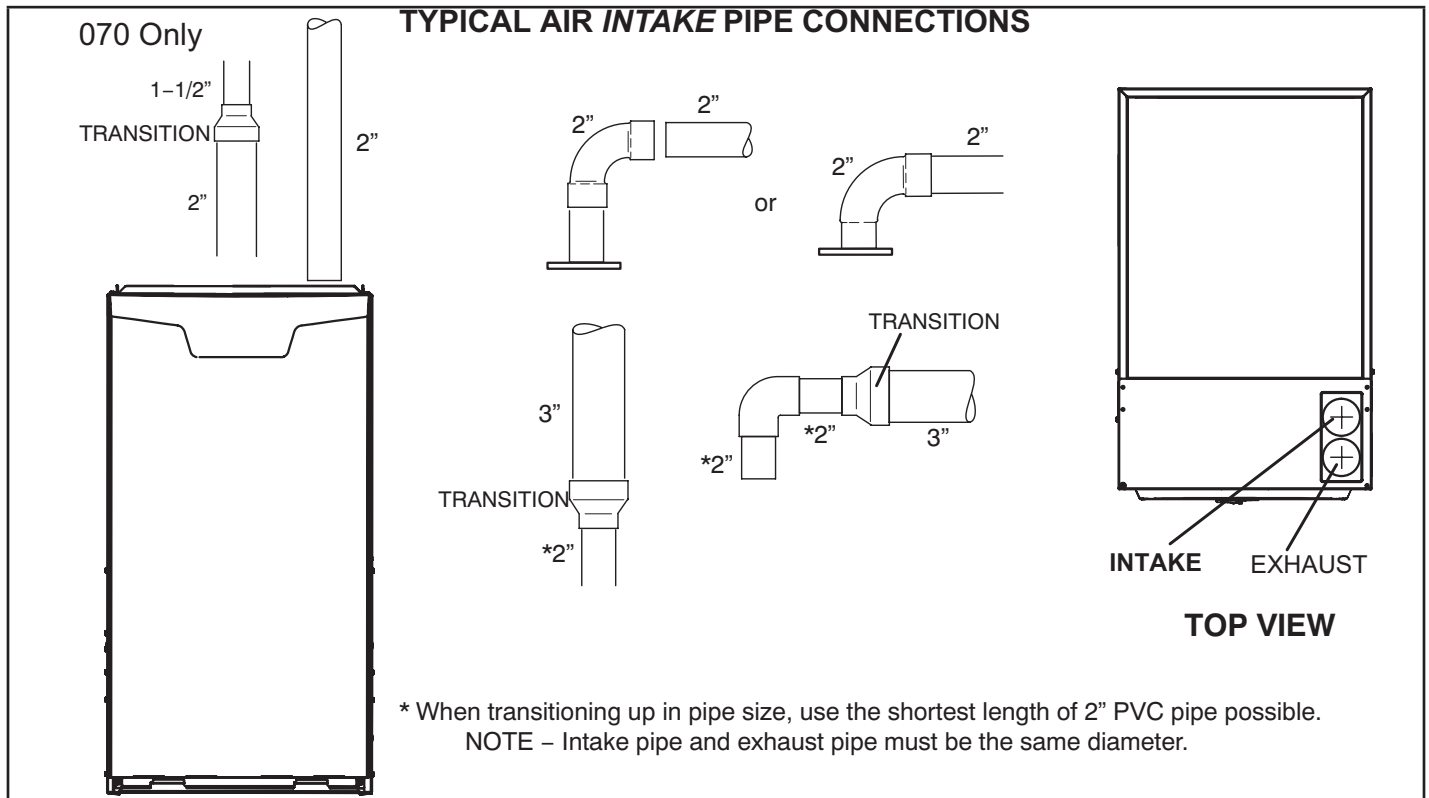
**Maximum Allowable Intake or Exhaust Vent Length in Feet**

\*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.

Concentric Termination at Elevation 0 - 4500'														
Number Of 90° Elbows Used	1-1/2" Pipe			2" Pipe			2-1/2" Pipe			3" Pipe				
	Model			Model			Model			Model				
	070	090	110	070	090	110	070	090	110	070	090	110		
1	10	N/A	N/A	83	67	12	130	89	39	146	139	114		
2	N/A			78	62	7	125	84	34	141	134	109		
3				73	57	N/A	120	79	29	136	129	104		
4				68	52		115	74	24	131	124	99		
5				63	47		110	69	19	126	119	94		
6				58	42		105	64	14	121	114	89		
7				53	37		100	59	N/A	116	109	84		
8				48	32		95	54		111	104	79		
9				43	27		90	49		106	99	74		
10				38	22		85	44		101	94	69		
Concentric Termination at Elevation 4501' - 7500'														
Number of 90° Elbows Used	1-1/2" Pipe			2" Pipe			2-1/2" Pipe			3" Pipe				
	Model			Model			Model			Model				
	070	090	110	070	090	110	070	090	110	070	090	110		
1	N/A	N/A	N/A	58	67	12	105	89	39	121	114	114		
2				53	62	7	100	84	34	116	109	109		
3				48	57	N/A	95	79	29	111	104	104		
4				43	52		90	74	24	106	99	99		
5				38	47		85	69	19	101	94	94		
6				33	42		80	64	14	96	89	89		
7				28	37		75	59	N/A	91	84	84		
8				23	32		70	54		86	79	79		
9				18	27		65	49		81	74	74		
10				13	22		60	44		76	69	69		
Concentric Termination 7501' - 10,000"														
Number of 90° Elbows Used	1-1/2" Pipe			2" Pipe			2-1/2" Pipe			3" Pipe				
	Model			Model			Model			Model				
	070	090	110	070	090	110	070	090	110	070	090	110		
1	N/A	N/A	N/A	33	42	N/A	80	64	N/A	96	114	89		
2				28	37		75	59		91	109	84		
3				23	32		70	54		86	104	79		
4				18	27		65	49		81	99	74		
5				13	22		60	44		76	94	69		
6				N/A	17		N/A	55		39	71	89	64	
7					12			50		34	66	84	59	
8					N/A			N/A		45	29	61	79	54
9										40	24	56	74	49
10						35				19	51	69	44	

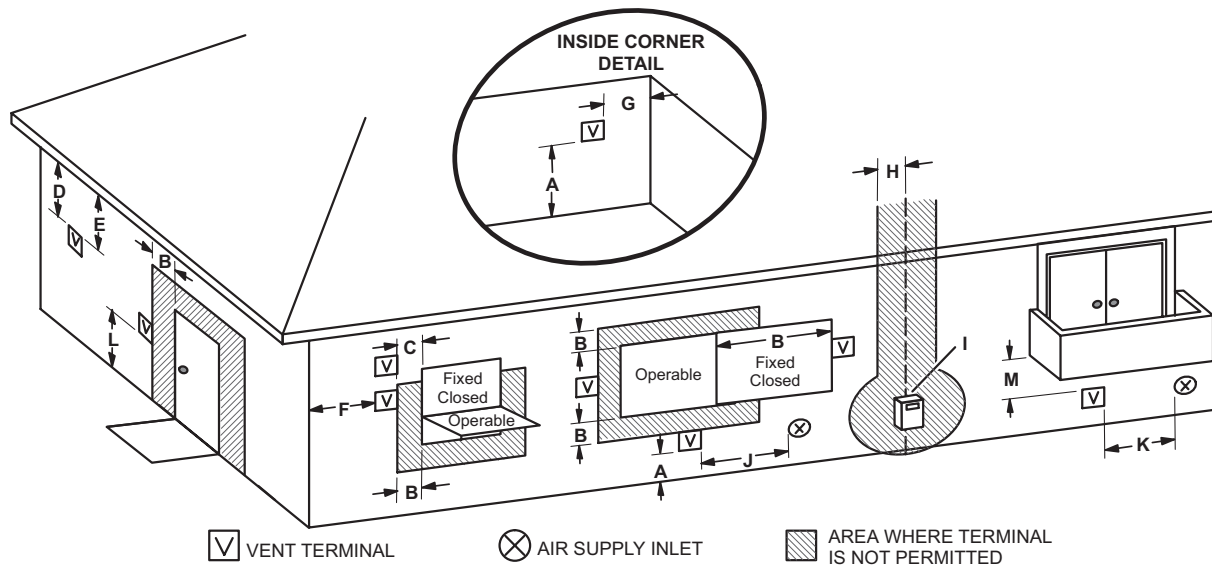


**FIGURE 27**



**FIGURE 28**

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



		US Installations <sup>1</sup>	Canadian Installations <sup>2</sup>
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)‡

<sup>1</sup> In accordance with the current ANSI Z223.1/NFPA 54 Natural Fuel Gas Code

<sup>2</sup> In accordance with the current CSA B149.1, Natural Gas and Propane Installation Code

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

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

\*For clearances not specified in ANSI Z223.1/NFPA 54 or CSA B149.1, clearance will be in accordance with local installation codes and the requirements of the gas supplier and these installation instructions."

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

**FIGURE 29**



## General Guidelines for Vent Terminations

In Direct Vent applications, combustion air is taken from outdoors and the flue gases are discharged to the outdoors. The SLP99DFVK is classified as a direct vent, Category IV gas furnace.

In 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 29. In addition, position termination so it is free from any obstructions and 12" above the average snow accumulation.

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

**NOTE** - See TABLE 29 for maximum allowed exhaust pipe length without insulation in unconditioned space during winter design temperatures below 32°F (0°C). If required exhaust pipe should be insulated with 1/2" (13mm) Armaflex or equivalent. In extreme cold climate areas, 3/4" (19mm) Armaflex or equivalent may be necessary. Insulation must be protected from deterioration. Armaflex with UV protection is permissible. Basements or other enclosed areas that are not exposed to the outdoor ambient temperature and are above 32 degrees F (0°C) are to be considered conditioned spaces.



### IMPORTANT

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



### IMPORTANT

**For Canadian Installations Only:**

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

**TABLE 29**

**Maximum Allowable Vent Pipe Length (in ft.)<sup>3</sup> Without Insulation In Unconditioned Space  
For Winter Design Temperatures Modulating High Efficiency Furnace**

Winter Design Temperatures <sup>1</sup> °F (°C)	Vent Pipe Diameter	Unit Input Size					
		070		090		110	
32 to 21 (0 to -6)		PVC	<sup>2</sup> PP	PVC	<sup>2</sup> PP	PVC	<sup>2</sup> PP
	1-1/2 in.	N/A	N/A	N/A	N/A	N/A	N/A
	2 in.	11	9	14	12	18	15
	2-1/2 in.	7	N/A	10	N/A	12	N/A
	3 in.	2	2	6	6	8	8
20 to 1 (-7 to -17)	1-1/2 in.	N/A	N/A	N/A	N/A	N/A	N/A
	2 in.	3	1	6	4	8	6
	2-1/2 in.	1	N/A	1	N/A	3	N/A
	3 in.	1	1	1	1	1	1
0 to -20 (-18 to -29)	1-1/2 in.	N/A	N/A	N/A	N/A	N/A	N/A
	2 in.	1	1	1	1	2	1
	2-1/2 in.	1	N/A	1	N/A	1	N/A
	3 in.	1	1	1	1	N/A	N/A

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

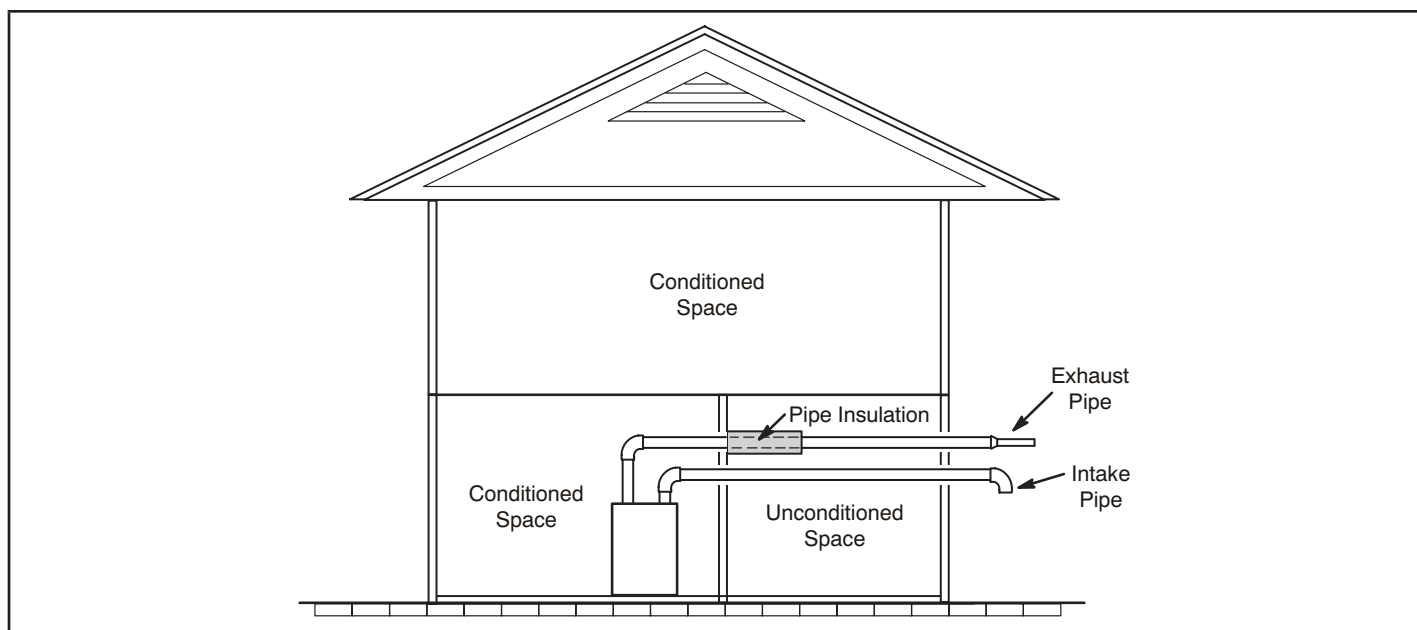
<sup>2</sup> Poly-Propylene vent pipe (PP) by Duravent and Centrotherm.

<sup>3</sup>Vent lengths in table 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 28 or TABLE 29 which ever is less.

NOTE - If insulation is required in an unconditioned space, it must be located on the pipe closest to the furnace. See FIGURE 30.



**FIGURE 30**

### 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 34.

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

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

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

- 3 - On roof terminations, the intake piping should terminate straight down using two 90° elbows (FIGURE 31).
- 4 - Exhaust piping must terminate straight out or up as shown. A reducer may be required on the exhaust piping at the point where it exits the structure to improve the velocity of exhaust away from the intake piping. See TABLE 30.

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

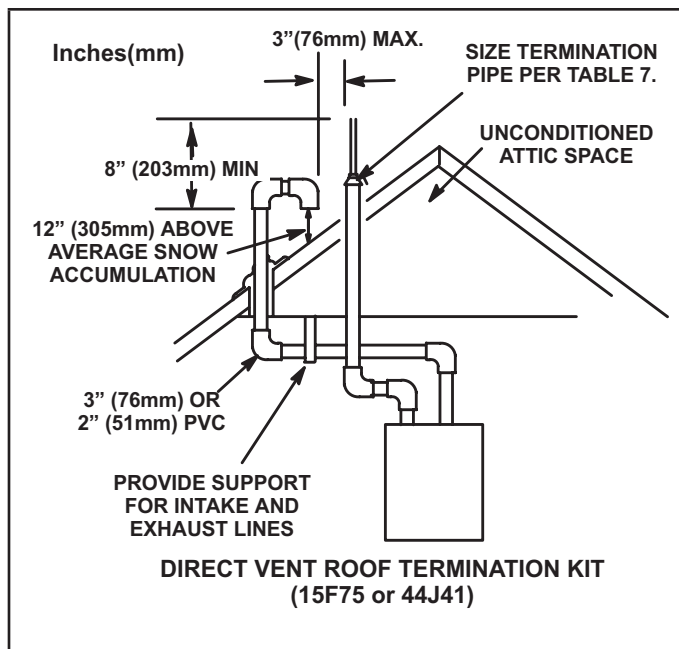
**TABLE 30**

#### EXHAUST PIPE TERMINATION SIZE REDUCTION

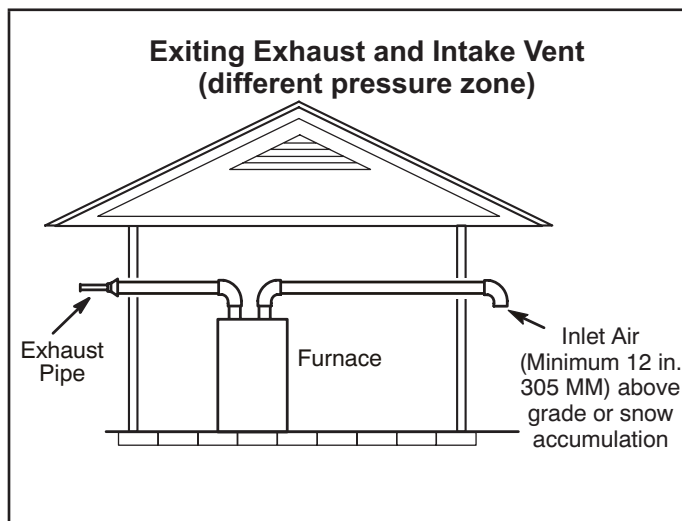
SLP99DFVK Model	Termination Pipe Size
*070	1-1/2"
*090	2"
110	2"

\*SLP99DF -070 and -090 units with the flush-mount termination must use the 1-1/2" accelerator supplied with the kit.

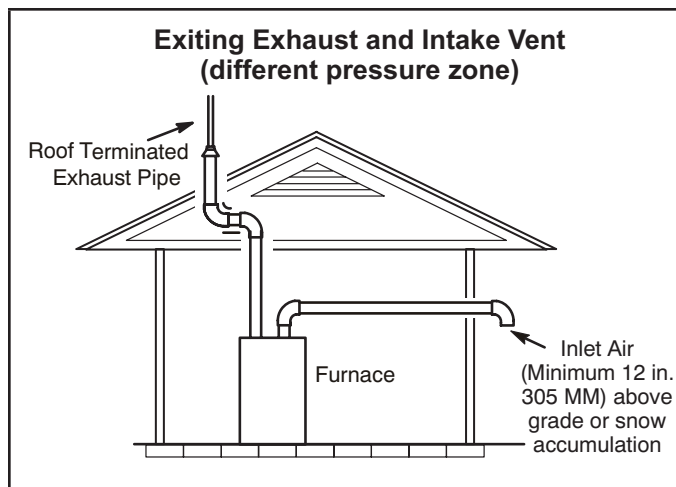
- 5 - On field-supplied terminations for side wall exit, exhaust piping may extend a maximum of 12 inches (305mm) for 2" PVC and 20 inches (508mm) for 3" (76mm) PVC beyond the outside wall. Intake piping should be as short as possible. See FIGURE 34.
- 6 - On field-supplied terminations, a minimum distance 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 34.



**FIGURE 31**

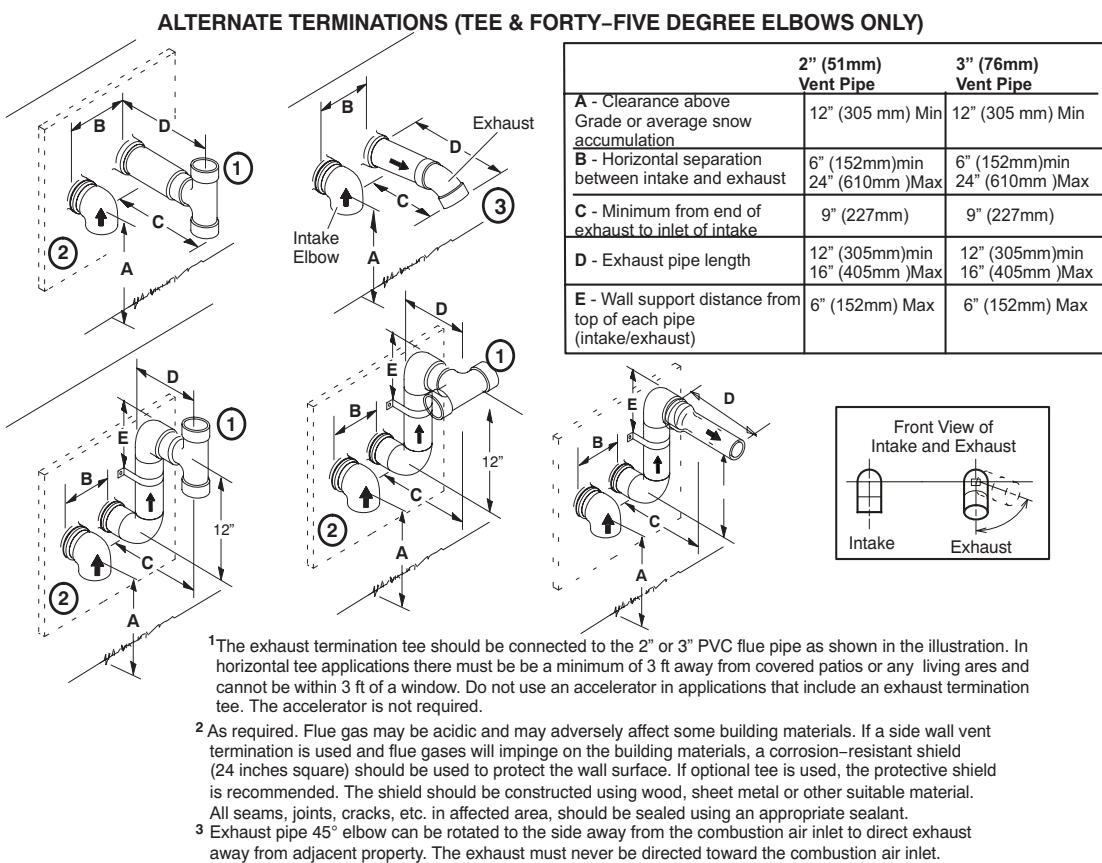
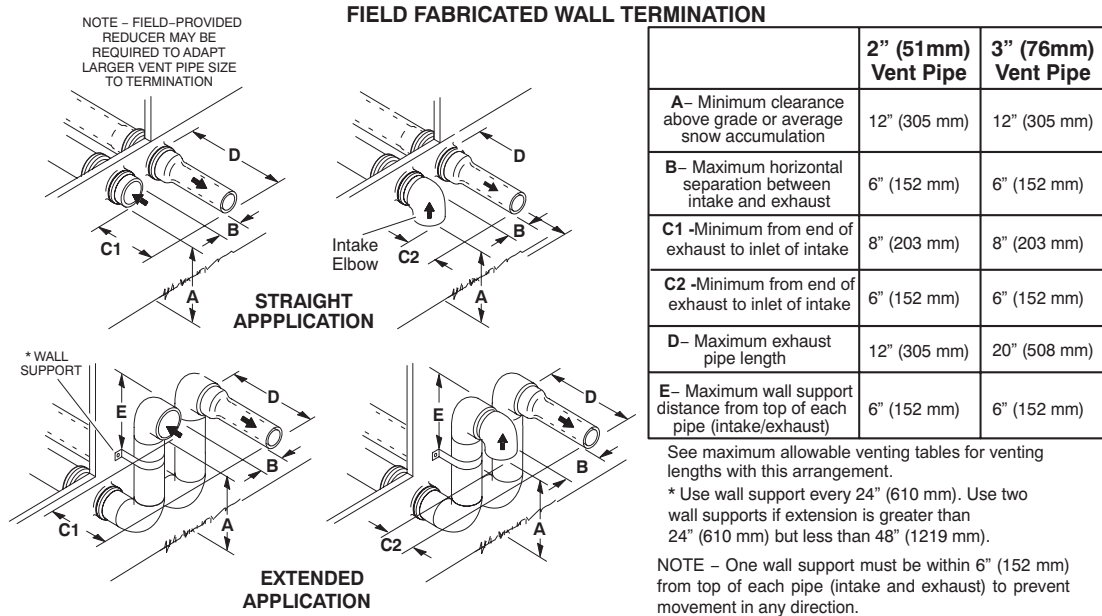


**FIGURE 32**

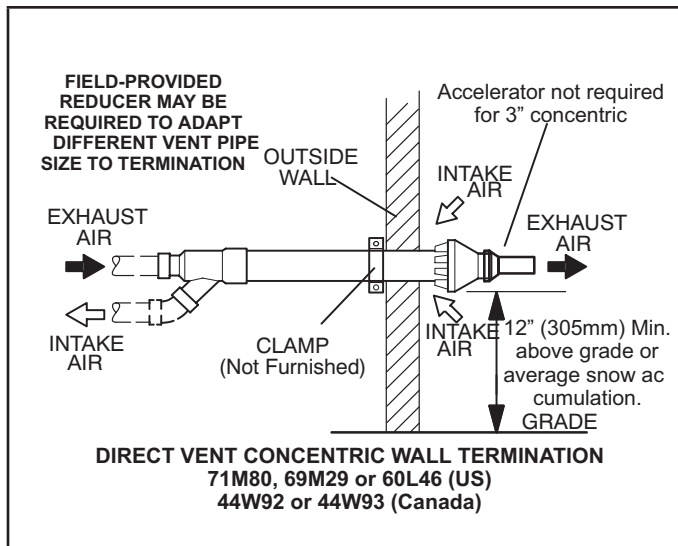


**FIGURE 33**

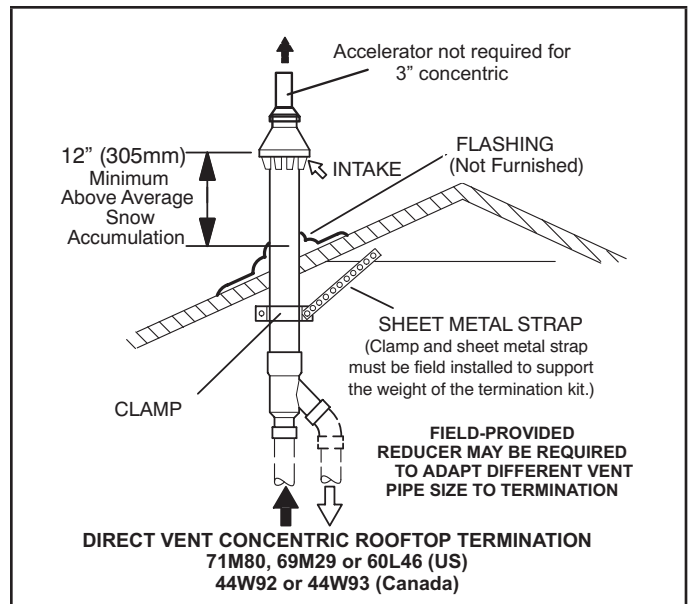
- 7 - If intake and exhaust piping must be run up a side wall to position above snow accumulation or other obstructions, piping must be supported. At least one bracket must be used within 6" from the top of the elbow and then every 24" (610mm) as shown in FIGURE 34, to prevent any movement in any direction. When exhaust and intake piping must be run up an outside wall, the exhaust piping must be terminated with pipe sized per TABLE 27. 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 - Based on the recommendation of the manufacturer, a multiple-furnace installation may use a group of up to four terminations assembled together horizontally, as shown in FIGURE 36.



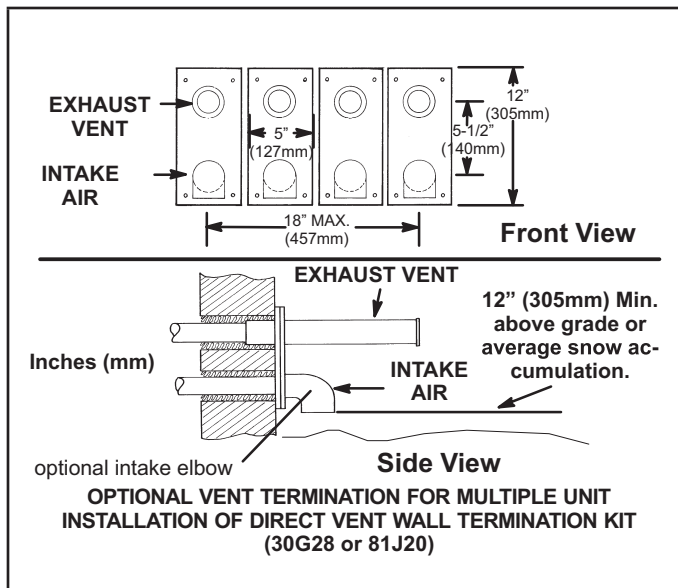
**FIGURE 34**



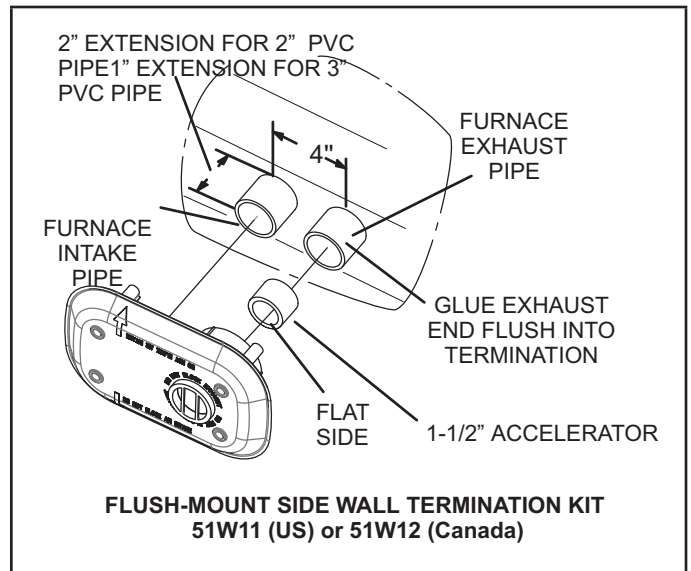
**FIGURE 35**



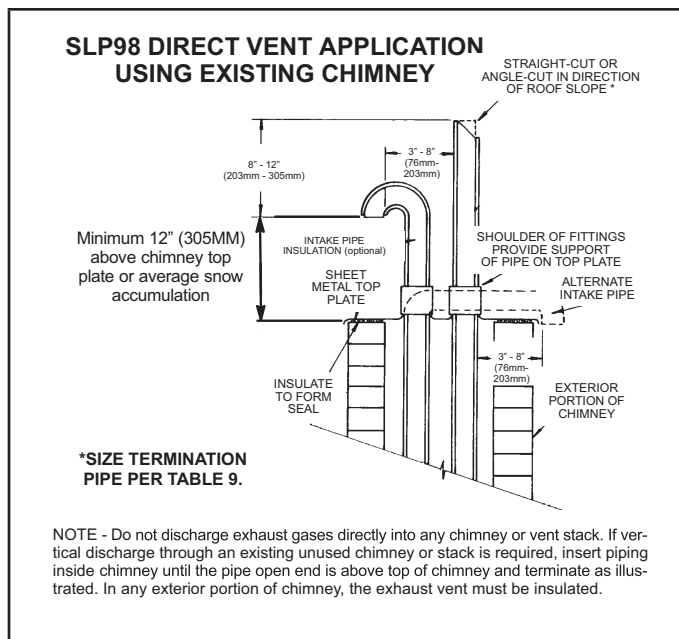
**FIGURE 37**



**FIGURE 36**



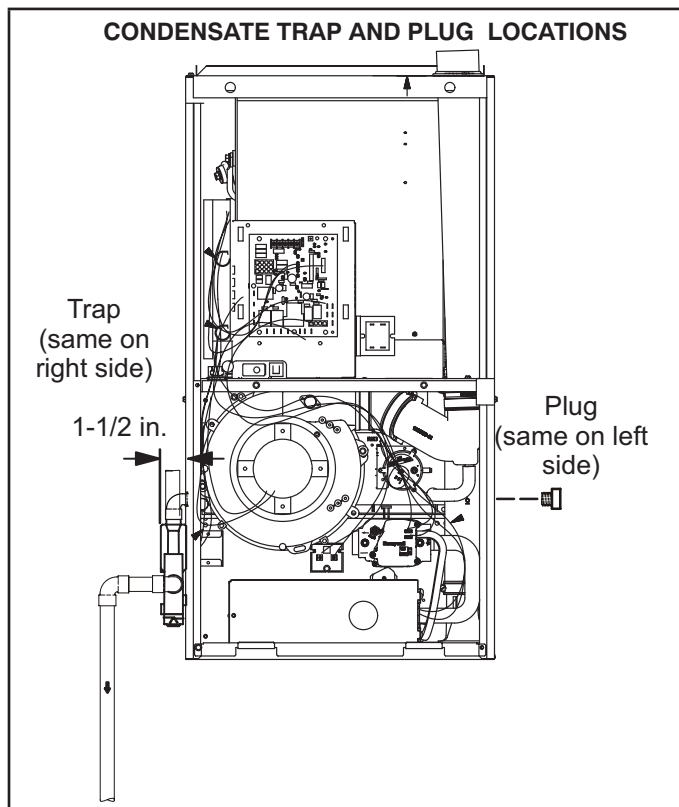
**FIGURE 38**



**FIGURE 39**

### Condensate Piping

This unit is designed for either right- or left-side exit of condensate piping. Refer to FIGURE 40 and FIGURE 42 for condensate trap locations.



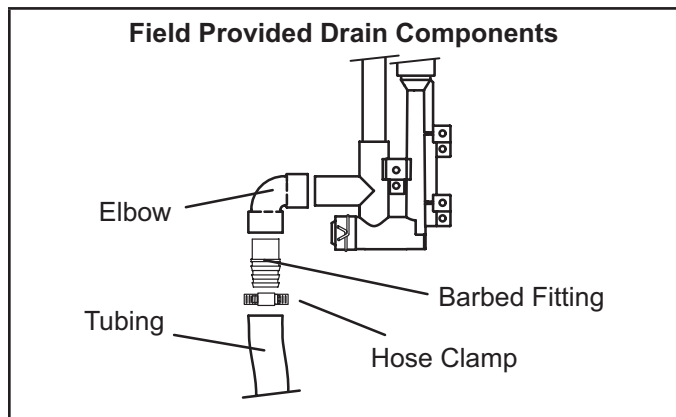
**FIGURE 40**

- 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 40) 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 46.
- 4 - Install drain trap using appropriate PVC fittings, glue all joints. Glue the provided drain trap as shown in FIGURE 46. Route the condensate line to an open drain.
- 5 - FIGURE 43 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 44 and FIGURE 45. 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 41.

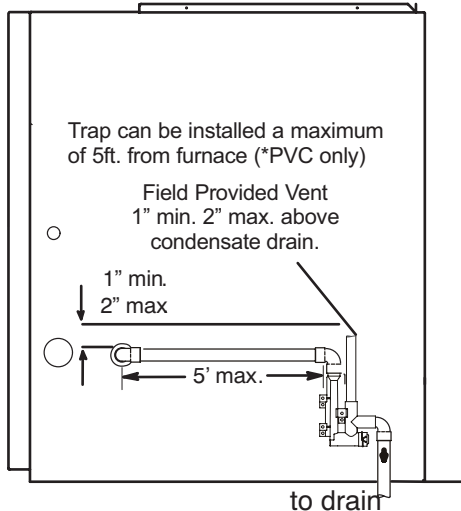


**FIGURE 41**

- 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 and 24 ft. (7.3m) - kit no. 26K69.



### CONDENSATE TRAP LOCATION (shown with right side exit of condensation)



\*Piping from furnace must slope down a minimum 1/4" per ft. toward trap

FIGURE 42

### Furnace with Evaporator Coil Using a Common Drain

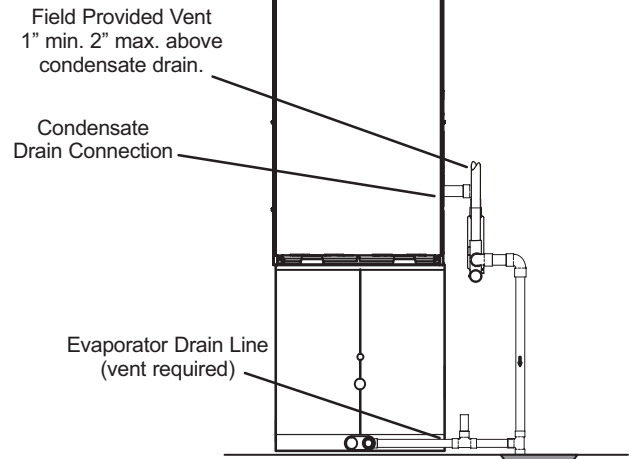


FIGURE 44

### Furnace with Evaporator Coil Using a Separate Drain

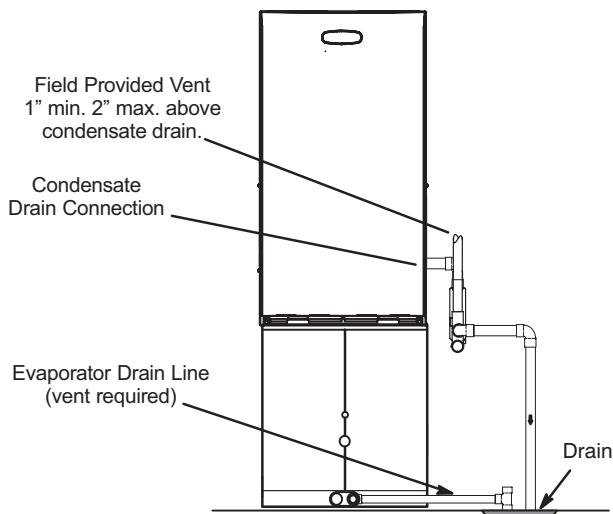


FIGURE 43

### Condensate Trap With Optional Overflow Switch

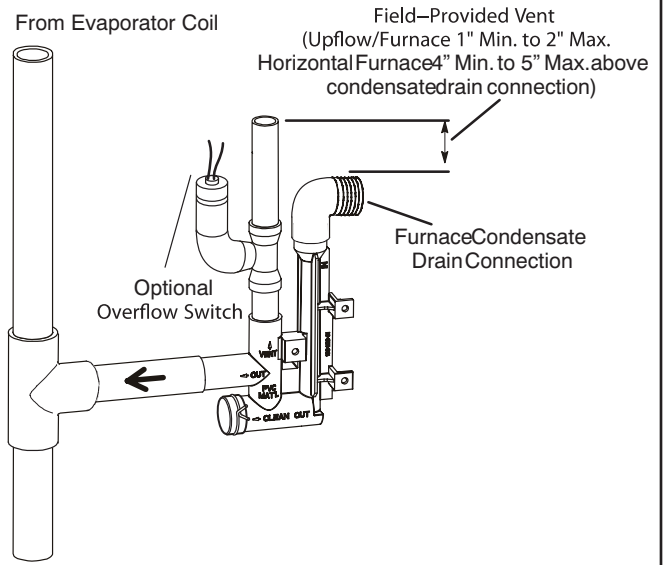


FIGURE 45

### ⚠ IMPORTANT

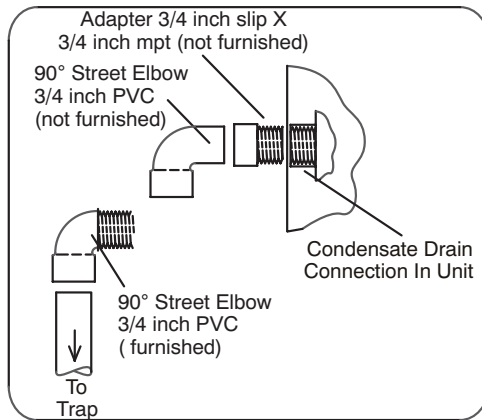
When combining the furnace and evaporator coil drains together, the A/C condensate drain outlet must be vented to relieve pressure in order for the furnace pressure switch to operate properly.

### ⚠ CAUTION

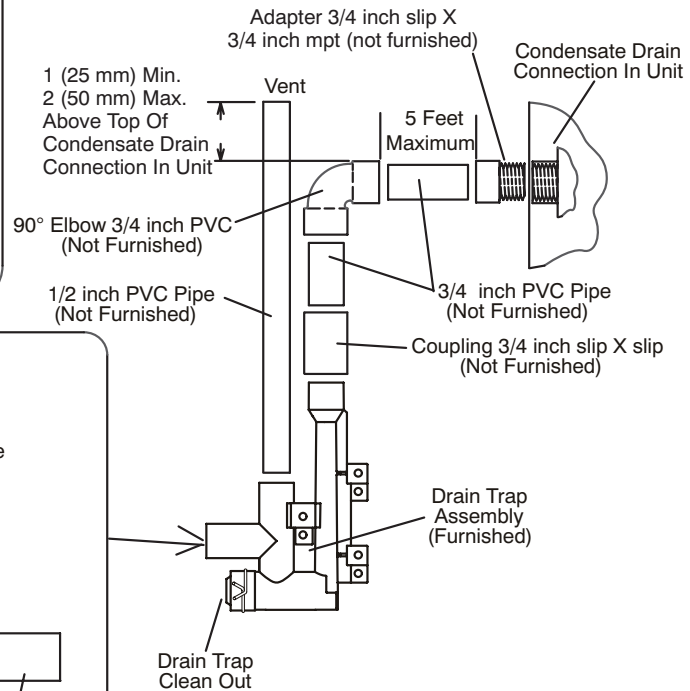
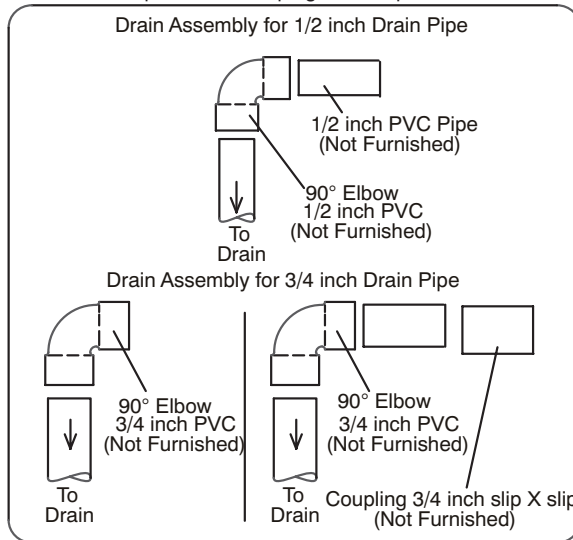
Do not use copper tubing or existing copper condensate lines for drain line.

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

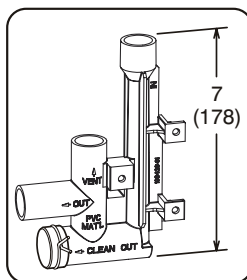
## **Optional Condensate Drain Connection**



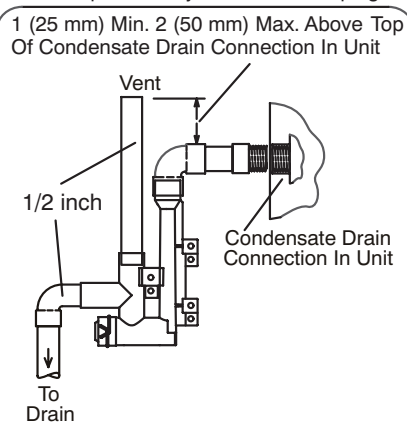
## **Optional Drain Piping From Trap**



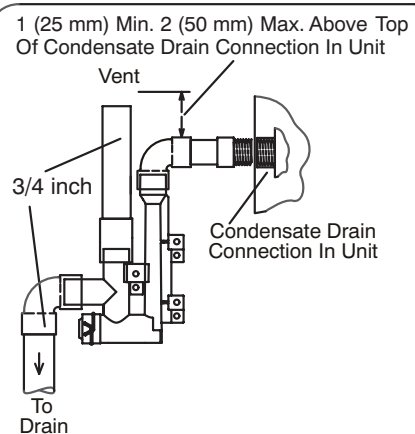
## **Drain Trap Assembly (Furnished)**



## **Drain Trap Assembly with 1/2 inch Piping**



## **Drain Trap Assembly with 3/4 inch Piping**



**FIGURE 46**

## IV-START-UP

### A-Preliminary and Seasonal Checks

- 1 - Inspect electrical wiring, both field and factory installed for loose connections. Tighten as required.
- 2 - Check voltage at disconnect switch. Voltage must be within range listed on the nameplate. If not, consult the power company and have voltage condition corrected before starting unit.

### B-Heating Start-Up

#### FOR YOUR SAFETY READ BEFORE OPERATING

### WARNING

Do not use this furnace if any part has been underwater. A flood-damaged furnace is extremely dangerous. Attempts to use the furnace can result in fire or explosion. Immediately call a qualified service technician to inspect the furnace and to replace all gas controls, control system parts, and electrical parts that have been wet or to replace the furnace, if deemed necessary.

### WARNING



Danger of explosion. Can cause injury or product or property damage. Do not use matches, candles, flame or other sources of ignition to check for leaks.

### CAUTION

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

### 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.

**BEFORE PLACING THE UNIT INTO OPERATION**, 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 SLP99DFVK is equipped with a gascontrol switch. Use only your hand to move the control switch. Never use tools. If the switch will not move by hand, do not try to repair it. Force or attempted repair may result in a fire or explosion.

### Placing the furnace into operation:

SLP99DFVK units are equipped with an automatic 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 this ignition.

### 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 47)

- 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 the gas valve switch to the OFF position. See FIGURE 47.
- 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 the ON position. See FIGURE 47. Do not force.
- 9 - Replace the upper access panel.

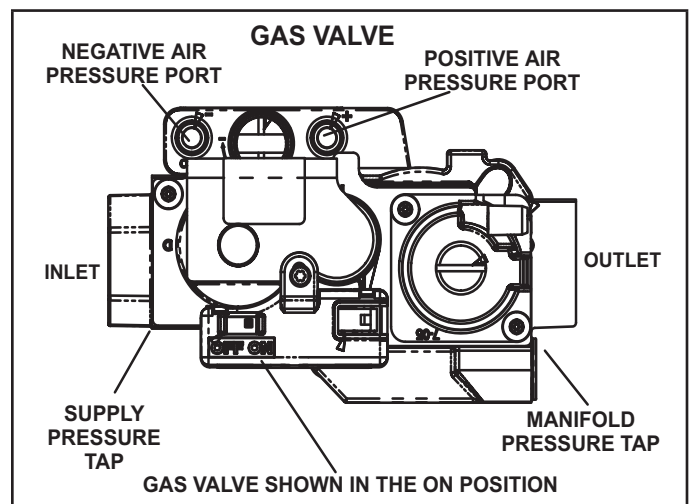


FIGURE 47

- 10 - Turn on all electrical power to the unit.
- 11 - Set the thermostat to desired setting.

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

- 12 - If the appliance will not operate, follow the instructions
- 13 - "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 the gas valve switch to the OFF position.
- 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 - 3 - Is the main disconnect switch closed?
- 4 - Is there a blown fuse?
- 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 gas valve turned on?
- 9 - Is the unit ignition system in lock out? If the unit locks out again, inspect the unit for blockages.
- 10 - Is blower harness connected to integrated control? Furnace will not operate unless harness is connected.

#### C-Safety or Emergency Shutdown

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

#### D-Extended Period Shutdown

Turn off thermostat or set to "UNOCCUPIED" mode. Close all gas valves (both internal and external to unit) to guarantee no gas leak into combustion chamber. Turn off power to unit. All access panels and covers must be in place and secured.

#### V-HEATING SYSTEM SERVICE CHECKS

##### A-CSA Certification

All units are CSA design certified without modifications. Refer to the SLP99DFVK Installation Instruction.

##### B-Gas Piping

## ! WARNING

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

## ! CAUTION

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

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 0.5psig (14" W.C.). See FIGURE 48.

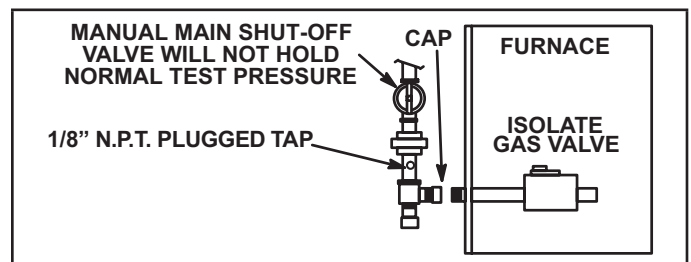


FIGURE 48

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- Proper Gas Flow (Approximate)

TABLE 31				
GAS METER CLOCKING CHART				
SLP99K Unit	Seconds for One Revolution			
	Natural		LP	
	1 cu ft Dial	2 cu ft Dial	1 cu ft Dial	2 cu ft Dial
-070	55	110	136	272
-090	41	82	102	204
-110	33	66	82	164
-135	27	54	68	136
Natural-1000 btu/cu ft LP-2500 btu/cu ft				

Furnace should operate at least 5 minutes before checking gas flow. Determine time in seconds for two revolutions of gas through the meter. (Two revolutions assures a more accurate time.) Divide by two and compare to time in TABLE 28. If manifold pressure matches TABLE 31 and rate is incorrect, check gas orifices for proper size and restriction. Remove temporary gas meter if installed.

### E-Testing Gas Supply Pressure

When testing supply gas pressure, connect test gauge to supply pressure tap on the gas valve. See FIGURE 47. Check gas line pressure with unit firing at maximum rate. Low pressure may result in erratic operation or underfire. High pressure can result in permanent damage to gas valve or overfire. See TABLE 32 for operating pressure at unit gas connection (line).

On multiple unit installations, each unit should be checked separately, with and without units operating. Supply pressure must fall within range listed in TABLE 32.

**TABLE 32**

All Units	Natural	LP/Propane
Line Pressure WC"	4.5 - 10.5	11.0 - 13.0

### Manifold Pressure Measurement (FIGURE 49)

To correctly measure manifold pressure, the differential pressure between the positive gas manifold and the negative burner box must be considered. Use pressure test adapter kit (available as Lennox part 10L34) to assist in measurement.

- 1 - Remove the threaded plug from the outlet side of the gas valve and install a field-provided barbed fitting. Connect measuring device "+" connection to barbed fitting to measure manifold pressure.
- 2 - Tee into the gas valve regulator vent hose and connect measuring device "-" connection.
- 3 - Start unit on low heat (35% rate) and allow 5 minutes for unit to reach steady state.

- 4 - While waiting for the unit to stabilize, notice the flame. Flame should be stable and should not lift from burner. Natural gas should burn blue.
- 5 - After allowing unit to stabilize for 5 minutes, record manifold pressure and compare to value given in TABLE 36.
- 6 - Repeat steps 3, 4 and 5 on high heat.
- 7 - Shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to remove barbed fitting and replace threaded plug.
- 8 - Start unit and perform leak check. Seal leaks if found.

### Operating Pressure Signal (Delta P) Measurement (FIGURE 50)

Operating pressure signal can be taken while the manifold pressure check is taken (using two measuring devices). Or, taken after the manifold pressure measurement is complete.

- 1 - Tee into the negative line between the gas valve and pressure switch and connect to measuring device negative "-".
- 2 - Tee into the positive line between the gas valve and pressure switch and connect to measuring device positive "+".
- 3 - Start unit on low heat (35% rate) and allow 5 minutes for unit to reach steady state.
- 4 - After allowing unit to stabilize for 5 minutes, record operating pressure signal and compare to value given in TABLE 36.
- 5 - Repeat steps 3 on 4 high heat.

## CAUTION

**Do not attempt to make adjustments to the gas valve.**

## MANIFOLD PRESSURE MEASUREMENT

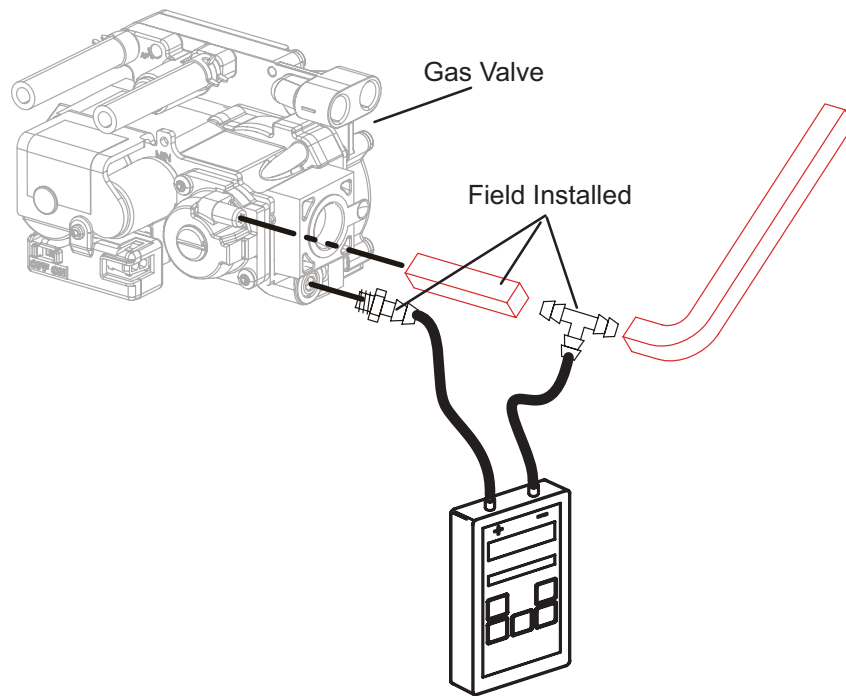


FIGURE 49

## Operating Signal (Delta P) Measurement

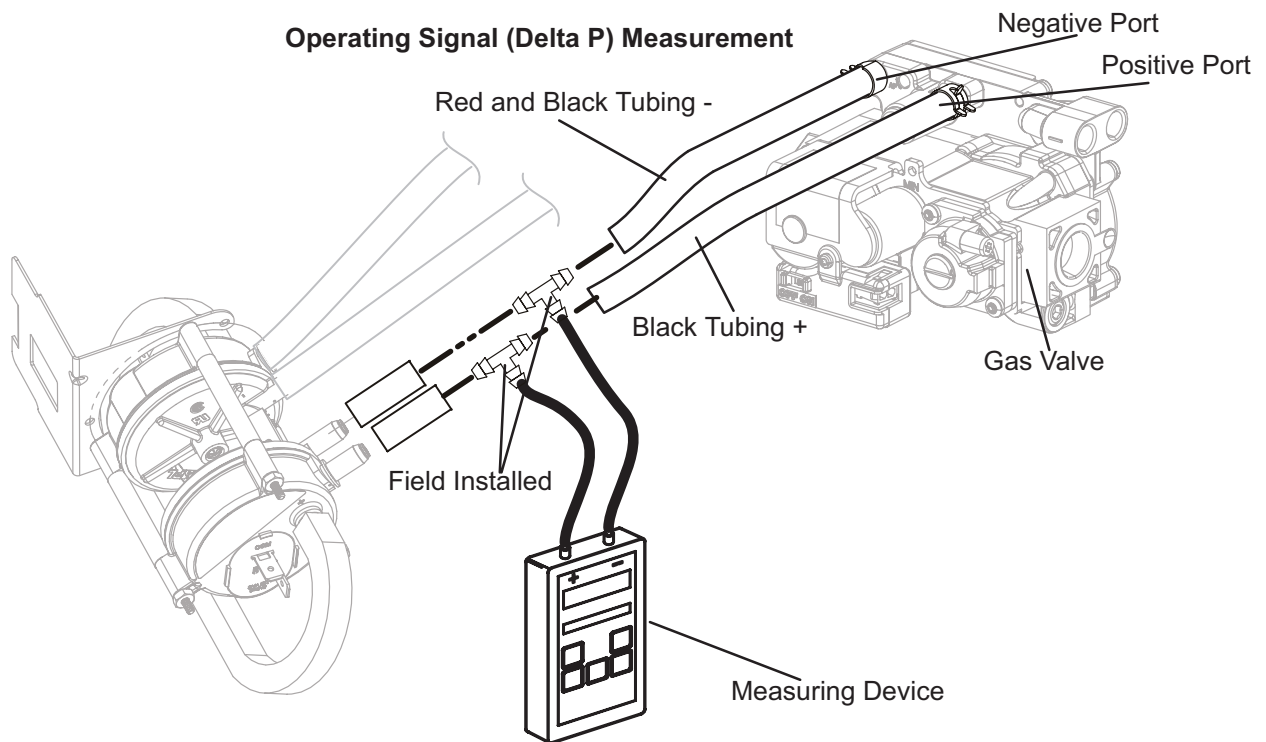


FIGURE 50



## G- Proper Combustion

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

**TABLE 33**

### High Fire

SLP99DFVK Unit	CO <sub>2</sub> % Nat	CO <sub>2</sub> L.P.
070	6.5 - 9.0	7.7 - 10.2
090		
110		

The maximum carbon monoxide reading should not exceed 100 ppm.

**TABLE 34**

### Low Fire

SLP99DFVK Unit	CO <sub>2</sub> % Nat	CO <sub>2</sub> % LP
070	4.7 - 7.2	5.7 - 8.2
090		
110		

The maximum carbon monoxide reading should not exceed 100 ppm.

## H- High Altitude

**NOTE** - In Canada, certification for installations at elevations over 4500 feet (1372 m) is the jurisdiction of local authorities.

Units require no manifold pressure adjustment nor a gas orifice change for operation at altitudes up to 10,000 feet (3048m) above sea level. Units installed at altitude of 7,501 to 10,000 feet (2287 to 3048m) require a pressure switch change per TABLE 35. TABLE 35 also lists gas conversion kit requirements at all altitudes.

The combustion air pressure switch is factory-set and requires no adjustment.

**TABLE 35**

### Conversion Kit Requirements

Model Input Size	LP/Propane	High Altitude Pressure Switch	
	0 - 10,000 ft (0 - 3048m)	0 - 7500 ft (0 - 2286m)	7501 ft - 10,000 ft (287 - 3048m)
070	65W77	Not Required	14T67
090			
110			

**TABLE 36**

Manifold and Operating Signal Pressures in inches 0 - 7500 ft (0 - 2286 m)

SLP99DFVK Firing Rate	Manifold Pressure Natural Gas		Manifold Pressure LP/Propane		Operating Pressure Signal (Delta P)	
	Min	Max	Min	Max	Min	Max
Low	0.4	0.95	1.2	2.8	0.20	0.40
High	3.0	3.8	9.1	10.5	0.95	1.25

**NOTE** - A natural to LP/propane gas changeover kit is necessary to convert this unit. Refer to the changeover kit installation instruction for the conversion procedure.

**NOTE** - The values given in table are measurements only. The gas valve should NOT be adjusted.

## 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.

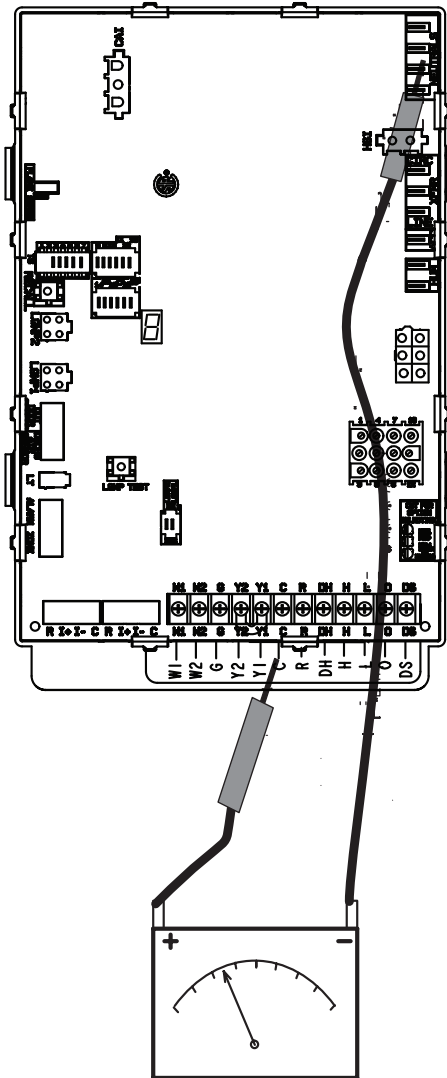
- 1 - Measure the AC voltage between Line Neutral (spade terminals) and "C" terminal (low voltage terminal block) on the integrated control. See FIGURE 51. A wide variation in the voltage between Line Neutral and "C" as a function of load indicates a poor or partial ground. Compare the readings to the table below. If the readings exceed the maximum shown in TABLE 37, 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 51. This voltage should be in the range of 97 to 132 Vac.

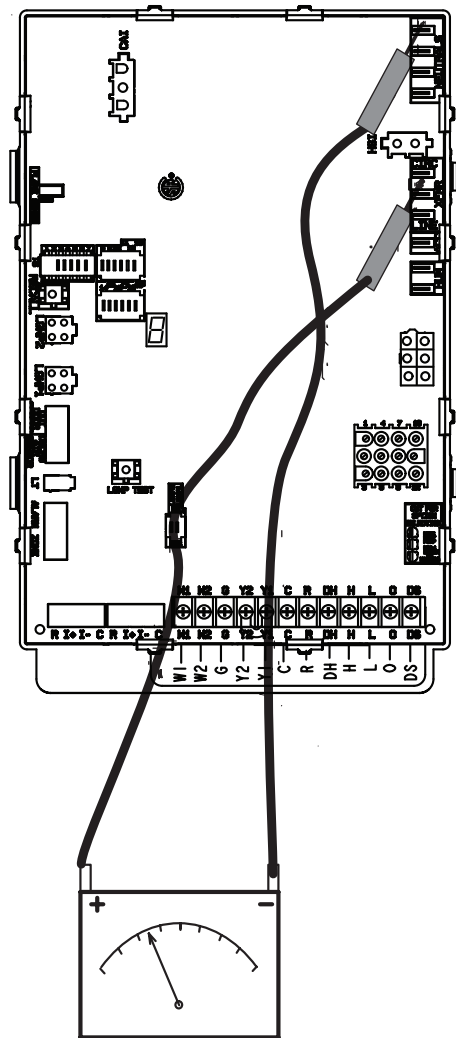
**TABLE 37**

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

**CHECK VOLTAGE BETWEEN LINE NEUTRAL AND LOW VOLTAGE "C" TERMINAL**



**CHECK VOLTAGE BETWEEN LINE HOT AND LINE NEUTRAL**



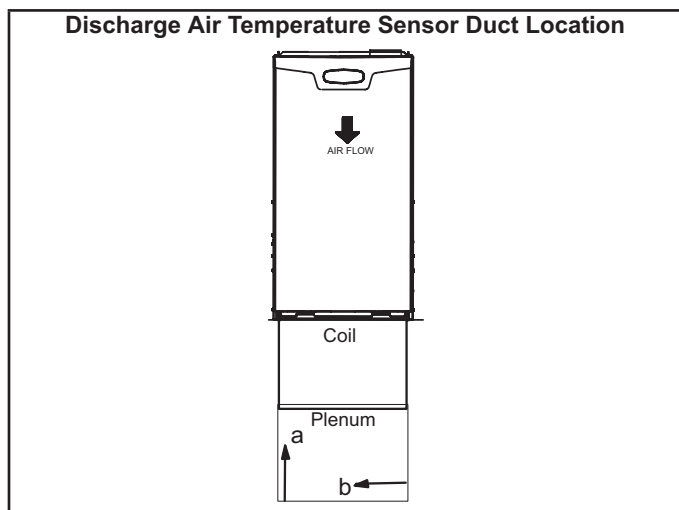
**FIGURE 51**

## J-Discharge Air Temperature Sensor (DATS)

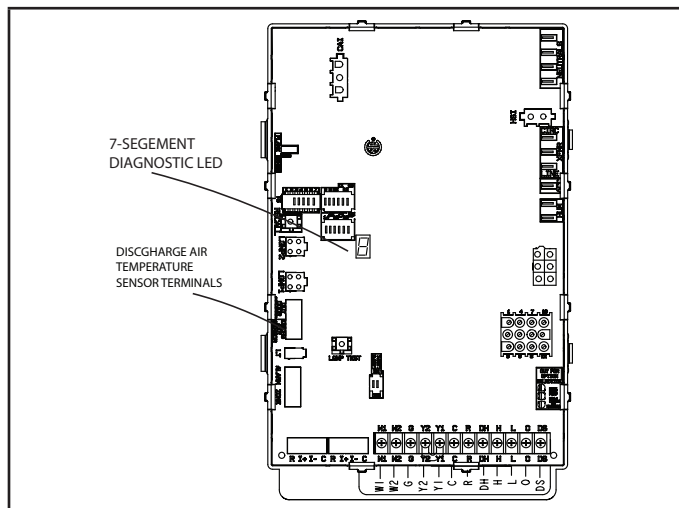
Units may have a discharge air temperature sensor located in the supply duct. If the sensor is suspect, check the location using TABLE 38 and FIGURE 52. See FIGURE 53 for field wiring to the furnace control. If the location and wiring are correct, but the sensor is not working properly, replace the sensor. Follow the DATS instructions found in the kit for replacing the sensor.

**TABLE 38**

Unit	"a"	"b"
070V36B	6"	center
090V36C		
090V48C		
090V60C		
110V60C		



**FIGURE 52**



**FIGURE 53**

## VI-TYPICAL OPERATING CHARACTERISTICS

### A-Blower Operation and Adjustment

- 1 - Blower operation is dependent on thermostat control system.
- 2 - Generally, blower operation is set at thermostat subbase fan switch. With fan switch in ON position, blower operates continuously. With fan switch in AUTO position, blower cycles with demand or runs continuously while heating or cooling circuit cycles.
- 3 - Depending on the type of indoor thermostat, blower and entire unit will be off when the system switch is in OFF position.

### B-Temperature Rise

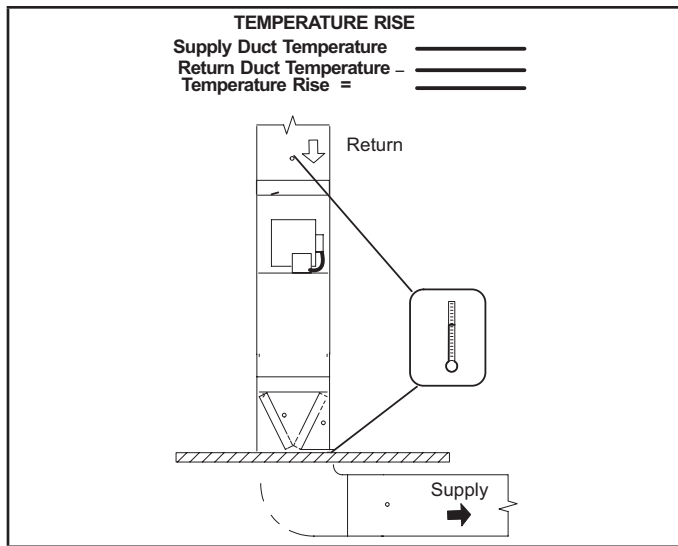
Temperature rise for SLP99DFVK units depends on unit input, blower speed, blower horsepower and static pressure as marked on the unit rating plate. The blower speed must be set for unit operation within the range of "TEMP. RISE °F" listed on the unit rating plate.

#### To Measure Temperature Rise:

- 1 - Place plenum thermometers in the supply and return air plenums. Locate supply air thermometer in the first horizontal run of the plenum where it will not pick up radiant heat from the heat exchanger.
- 2 - Set thermostat for heat call. Unit must operate on second- stage heat. *If using a single-stage thermostat furnace must fire at least 10 minutes before switching to second-stage heat.*
- 3 - After plenum thermometers have reached their highest and steadiest readings, subtract the two readings. The difference should be in the range listed on the unit rating plate. If the temperature is too low, decrease blower speed. If temperature is too high, first check the firing rate. Provided the firing rate is acceptable, increase blower speed to reduce temperature.

### C-External Static Pressure

- 1 - Tap locations shown in FIGURE 54.
- 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.
- 4 - External static pressure drop must not be more than 0.8" W.C. in the heating mode and must not exceed 1.0" W.C in the cooling mode.
- 5 - Seal the hole when the check is complete.



**FIGURE 54**

## VII-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 SLP99DFVK filters are installed external to the unit. Filters should be inspected monthly. Clean or replace the filters when necessary to ensure proper furnace operation. All units use a 16 x 25 x 1 filter.

#### **Low GWP Sensor**

Inspect sensors and rubber sleeve.

### **⚠ IMPORTANT**

If a highefficiency filter is being installed as part of this system to ensure better indoor air quality, the filter must be properly sized. Highefficiency filters have a higher static pressure drop than standardefficiency 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 ACC002 (August 2000).

#### **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**

### **⚠ 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.

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

## Condensate Hose Screen (FIGURE 55)

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.

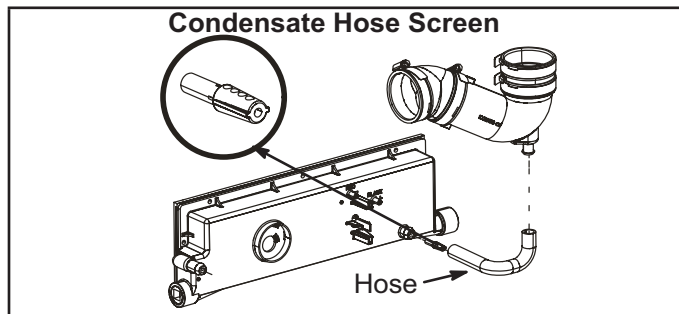


FIGURE 55

## 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 2-pin plug from the gas valve.
  - 4 - Remove gas supply line connected to gas valve. Remove the burner box cover 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 - 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.
- 8 - Loosen the clamps to the flexible exhaust coupling.
  - 9 - Disconnect condensate drain line from the cold end header box.
  - 10 - Disconnect condensate drain tubing from flue collar. Remove screws that secures the flue collar into place. Remove flue collar. It may be necessary to cut the exiting exhaust pipe for removal of the fitting.

- 11 - Mark and disconnect all combustion air pressure tubing from cold end header collector box.
- 12 - Mark and remove wires from pressure switches. Remove pressure switches. Keep tubing attached to pressure switches.
- 13 - Disconnect the 4-pin 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.
- 14 - Remove electrical junction box from the side of the furnace.
- 15 - Remove cold end header box.
- 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 and bottom which secure vestibule panel and heat exchanger assembly to cabinet. Remove two screws from blower rail which secure bottom 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 resting on the support located at the rear of the cabinet. Remove the indoor blower to view this area through the blower opening.
- 23 - Re-secure the supporting screws along the vestibule sides and bottom 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 the cold end header box.
- 29 - Reinstall the combustion air inducer. Reconnect the 4-pin plug to the wire harness.
- 30 - Reinstall pressure switches and reconnect pressure switch wiring
- 31 - Carefully connect combustion air pressure switch hosing from pressure switches to proper stubs on cold end header collector box.
- 32 - Reinstall condensate trap.
- 33 - Use securing screws to reinstall flue collar to the top cap on the furnace. Reconnect exhaust piping and exhaust drain tubing.
- 34 - Replace flexible exhaust adapter tee on combustion air inducer and flue collar. Secure using two existing hose clamps.
- 35 - Reinstall burner box assembly in vestibule area.

- 36 - Reconnect flame roll-out switch wires.
- 37 - Reconnect sensor wire and reconnect 2-pin plug from ignitor.
- 38 - Secure burner box assembly to vestibule panel using four existing screws. Make sure burners line up in center of burner ports.
- 39 - Reinstall gas valve manifold assembly. Reconnect gas supply line to gas valve.
- 40 - Reinstall burner box cover.
- 41 - Reconnect 2-pin plug to gas valve.
- 42 - Replace the blower compartment access panel.
- 43 - Refer to instruction on verifying gas and electrical connections when re-establishing supplies.
- 44 - 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.
- 45 - Replace heating compartment access panel.

### **Cleaning the Burner Assembly**

- 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.
- 4 - Disconnect the gas supply line from the gas valve. Remove gas valve/manifold assembly.
- 5 - Mark and disconnect sensor wire from the sensor. Disconnect 2-pin 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 - Reconnect the sensor wire and reconnect the 2-pin plug to the ignitor wiring harness.
- 9 - Reinstall the burner box assembly using the existing four screws. Make sure that the burners line up in the center of the burner ports.
- 10 - Reinstall the gas valve manifold assembly. Reconnect the gas supply line to the gas valve. Reinstall the burner box cover.
- 11 - Reconnect 2-pin plug to gas valve.
- 12 - Replace the blower compartment access panel.
- 13 - Refer to instruction on verifying gas and electrical connections when re-establishing supplies.
- 14 - 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.
- 15 - Replace heating compartment access panel.



VIII-Low GWP Application



**WARNING**

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

CONNECTING THE FURNACE CONTROL BOARD SENSOR.

See FIGURE 56 and follow steps below:

- 1 - Route sensor wire #1 through provided grommet.
- 2 - Avoid sharp edges when routing sensor wire during installation.
- 3 - Sensor wire must not block view of 7 segment LED .

Ensure the cable is properly seated into the SENSOR 1 plug (LGWP1). The Molex plug clip should lock into the Molex connection point for a secured connection, as shown below in FIGURE 56. Verify the connection is free of dust, debris, and moisture.

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

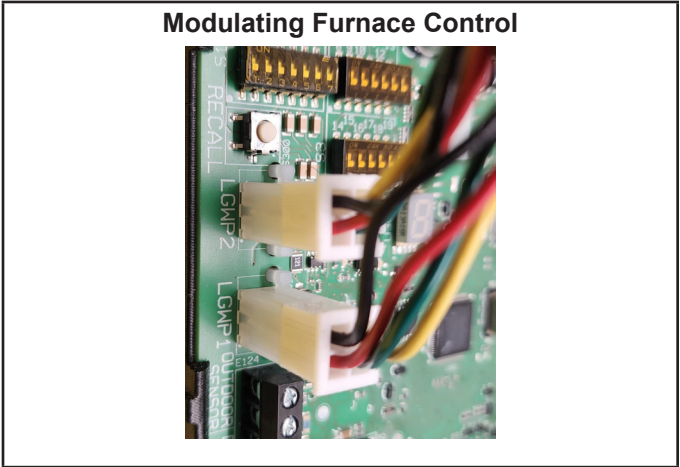


FIGURE 56

LOW GWP DIP SWITCH SETTINGS

Adjust the DIP switch settings to the sensor configuration. Failure to do so will cause faults on power-up. See FIGURE 57 and TABLE 39.

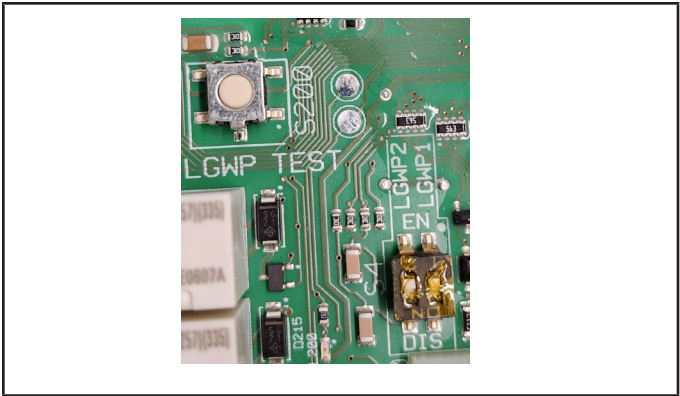


FIGURE 57

TABLE 39

DIP Switch Settings

Configuration	Switch 1	Switch 2
One (1) sensor, connected to SENSOR 1 plug	OFF (enable)	ON (disable)
Two (2) sensors, connected to SENSOR 1 plug and SENSOR 2 plug	OFF (enable)	OFF (enable)
No sensor R410A or heat only applications	ON (Disabled)	ON (Disabled)

In single sensor configurations, the sensor must be connected to the SENSOR 1 plug (LGWP1). Configurations other than the ones shown in TABLE 39 will cause a servicing fault.

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


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

SECONDARY SENSOR REQUIREMENTS

Additional Line Sets

If additional refrigerant line joints are present outside of the line set sleeve and a secondary refrigerant detection sensor is required, its installation must comply with the requirement listed in Refrigeration Detection Sensor kit (27V53). See FIGURE 58 for routing the secondary sensor cable through the furnace cabinet.

Non-Low GWP Applications



**WARNING**

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

## FURNACE CONTROL BOARD LOW GWP MODES OF OPERATION

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

### Initializing

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

### Normal

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

### Leak Detected

When the furnace control board detects a refrigerant leak:

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

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

### Fault

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

**NOTE** - See TABLE 5 for diagnostic codes.

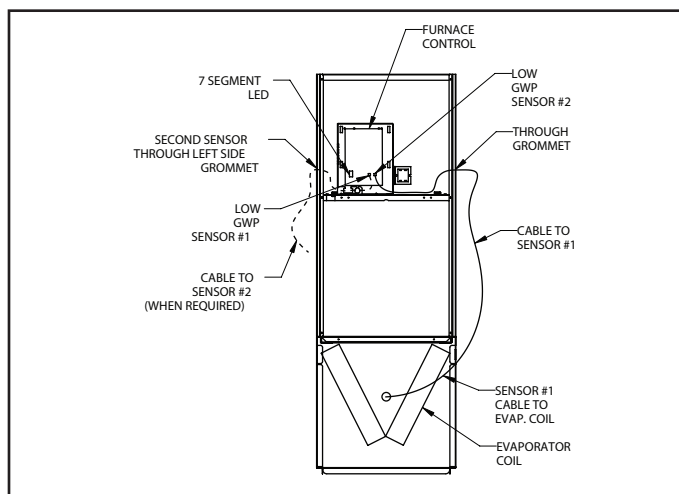


FIGURE 58

TABLE 40  
LGWP Test Button Function

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

### LGWP Test Button - Additional Functions

TABLE 41 lists the additional functions of the Test Button while the furnace control board is functioning within the states of Initializing, Monitoring, Leak Detection, Servicing and Fault.

TABLE 41  
Additional Button Functions

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

### **External Alarm**

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

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

### **THERMOSTAT COMPATIBILITY**

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

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

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

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

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

### **START UP PROCEDURE**

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

#### **Cooling Demand**

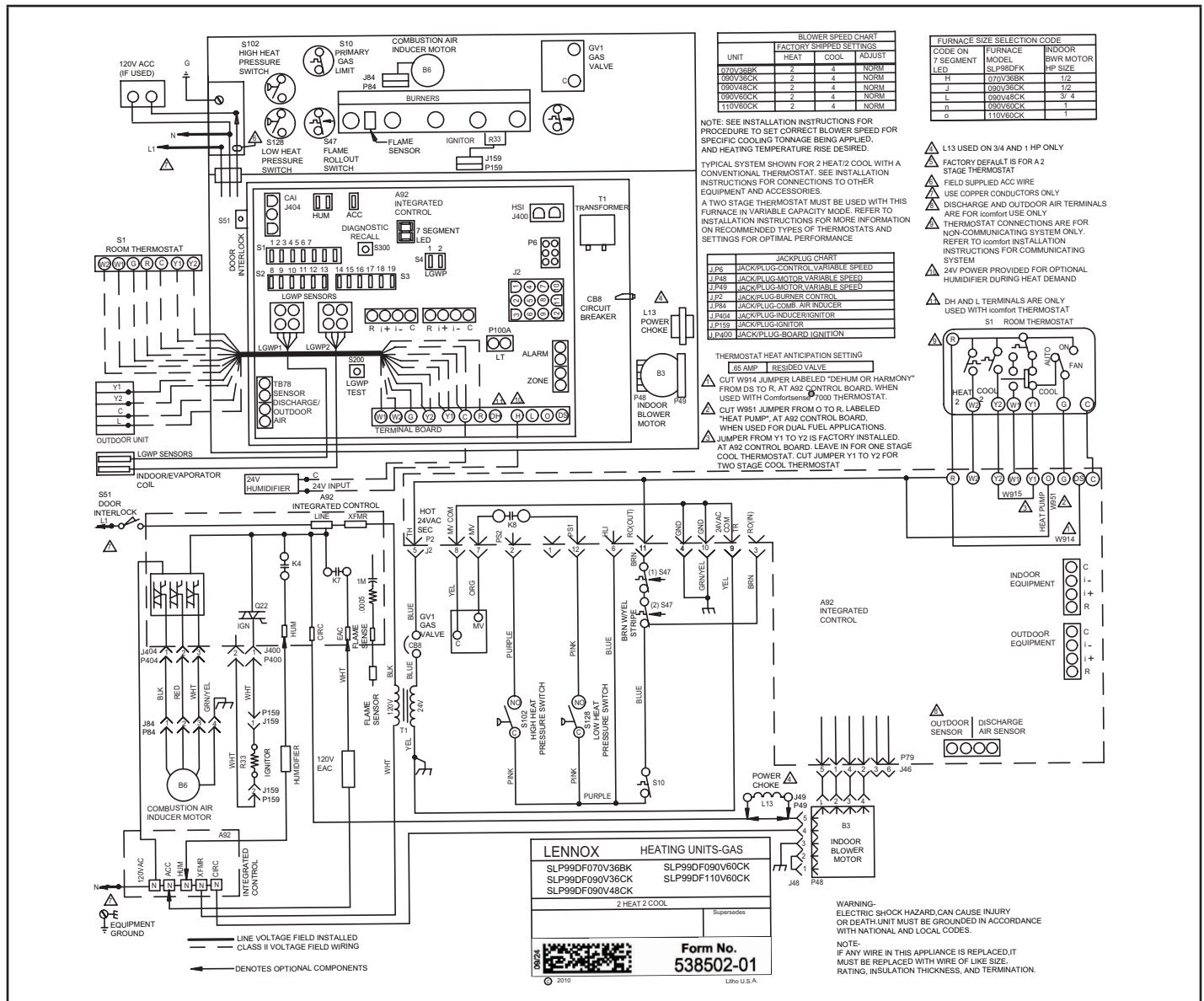
1. Prompt a cooling demand at the thermostat.
2. Press the LGWP Test button on the furnace control board.  
The system then executes a leak detection response.
3. Observe the following sequence:
  - a. The LED indicator for leak detection. See TABLE 5 for diagnostic codes.
  - b. The blower powers up.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

#### **Heating Demand**

1. Prompt a heating demand at the thermostat.
2. Observe the following sequence:
  - a. The LED indicator for leak detection. See TABLE 5 for diagnostic codes.
  - b. The blower powers up.
  - c. The gas burners power down.
  - d. The outdoor compressor powers down.
3. Press the LGWP Test button to terminate the simulated Leak Detected mode upon test completion.

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

## IX- Wiring and Sequence of Operation



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

Applications Using a Two-Stage Thermostat

### A - Heating Sequence -- Control Thermostat Selection DIP switch in "Variable Capacity" Position

- 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 ignition speed, which is approximately the same as the inducer speed at 70 percent firing rate.
- 2 - Once the control receives a signal that the low-fire pressure switch has closed, the combustion air inducer begins a 15-second pre-purge in ignition speed.

- 3 - After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at the ignition speed.
- 4 - After the 20-second warm-up period has ended, the gas valve is energized and ignition occurs. At the same time, the control module begins an indoor blower 45-second ON-delay. When the delay ends, the indoor blower motor is energized at a speed that matches the firing rate. After the 10-second ignition stabilization delay expires, the inducer speed is adjusted to the appropriate target rate. If the furnace is operating in the initial heating cycle after power-up, the initial firing rate will be approximately 35 percent. The firing rate on subsequent cycles will be automatically adjusted by the integrated control based on thermostat cycles. The firing rate will vary and will range from 40 percent to 90 percent. 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 either increases the firing rate to 70 percent (if the current rate is at or below 60 percent) or increases the firing rate by 10 percent (if the current rate is above 60 percent). If the call for heat continues 5 minutes beyond this initial upstage, the rate will be increased by 10 percent every 5 minutes until the call for heat is satisfied or the furnace reaches 100 percent rate. As the firing rate increases, the indoor blower motor is adjusted to a speed which is appropriate for the target rate.
- 6 - If second-stage heat demand is satisfied, but first stage is still present, the furnace will continue to operate at the present firing rate until the heat cycle ends.
- 7 - When the demand for first- and second-stage heat is satisfied, the gas valve is de-energized and the fieldselected indoor blower off delay begins. The combustion air inducer begins a 20-second post-purge period.
- 8 - When the combustion air post-purge period is complete, the inducer is de-energized. The indoor blower is de-energized at the end of the off delay.

#### **Applications Using A Single-Stage Thermostat**

##### **B - Heating Sequence -- Control Thermostat Selection DIP switch in "Single-Stage" Position**

- 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 the ignition speed, which is approximately the same as the inducer speed at 70 percent firing rate.
- 2 - Once the control receives a signal that the low-fire pressure switch has closed, the combustion air inducer begins a 15-second pre-purge at the ignition speed.
- 3 - After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at the ignition speed.
- 4 - After the 20-second warm-up period has ended, the gas valve is energized and ignition occurs, which initiates a 10-second ignition stabilization delay. At the same time, the control module sends a signal to begin an indoor blower 45-second ON-delay. When the delay ends, the indoor blower motor is energized at a speed which is appropriate for the firing rate. After the 10-second ignition stabilization delay expires, the inducer speed is adjusted to 40 percent speed. The integrated control also initiates a second-stage on delay (factory-set at 7 minutes; adjustable to 12 minutes).
- 5 - If the heating demand continues beyond the secondstage on delay, the integrated control energizes the combustion air inducer at 70 percent speed. The indoor blower motor is adjusted to a speed which matches the target rate. A fixed, 10-minute third-stage on delay is initiated.
- 6 - If the heating demand continues beyond the thirdstage on delay, the integrated control energizes the inducer at high speed. The indoor blower motor

is adjusted to a speed which is appropriate for the target rate.

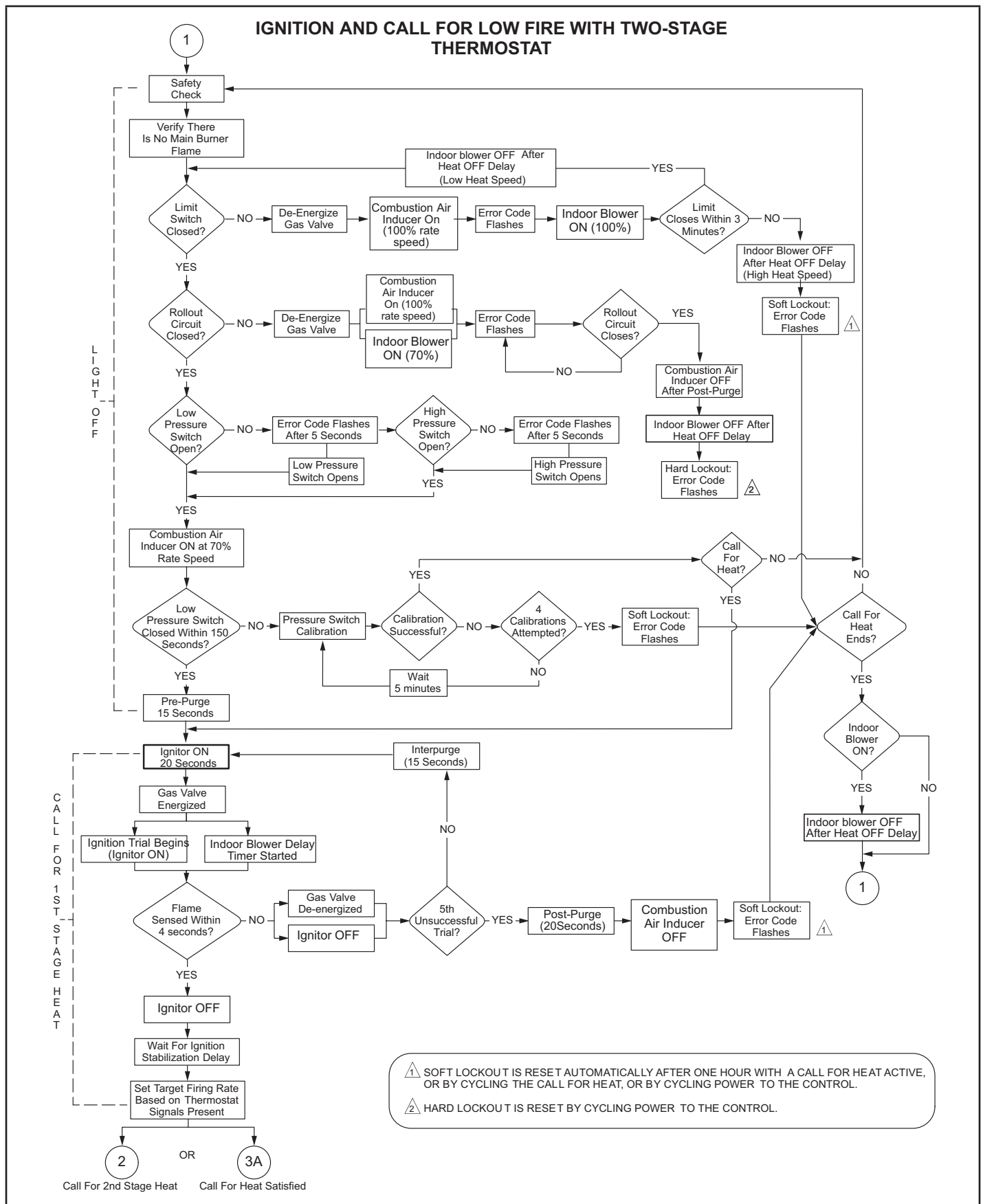
- 7 - When the thermostat heating demand is satisfied, the gas valve is de-energized and the combustion air inducer begins a 20-second post-purge. The field-selected indoor blower off delay begins.
- 8 - When the combustion air post-purge period is complete, the inducer is de-energized. The indoor blower is de-energized at the end of the off delay.

#### **Applications Using a Two-Stage Thermostat**

##### **C - Heating Sequence -- Control Thermostat Selection DIP switch in "Two-Stage" Position (Factory Setting)**

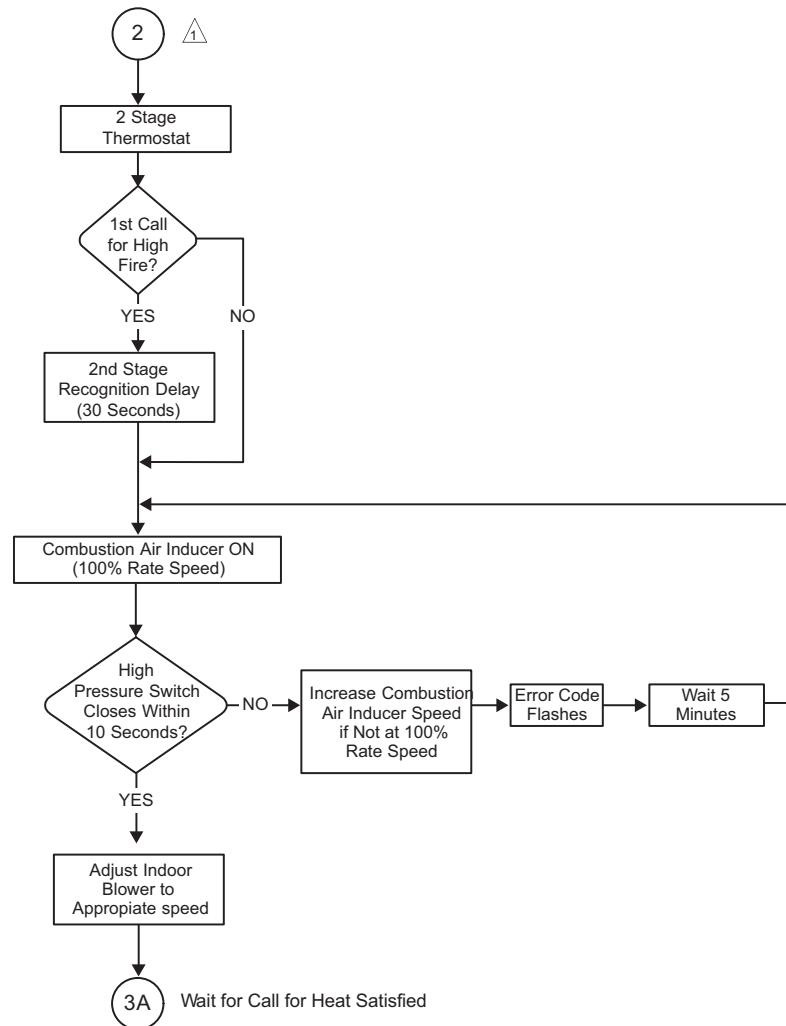
- 1 - On a call for heat, thermostat first-stage contacts close sending a signal to the integrated control. The integrated control runs a self-diagnostic program and checks high temperature limit switches for normally closed contacts and pressure switches for normally open contacts. The combustion air inducer is energized at ignition speed, which is approximately the same as the inducer speed at 70 percent firing rate.
- 2 - Once the control receives a signal that the low-fire pressure switch has closed, the combustion air inducer begins a 15-second pre-purge at the ignition speed.
- 3 - After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at the ignition speed.
- 4 - After the 20-second warm-up period has ended, the gas valve is energized and ignition occurs. At the same time, the control module sends a signal to begin an indoor blower 45-second ON-delay. When the delay ends, the indoor blower motor is energized at a speed that matches the firing rate. After the 10-second ignition stabilization delay expires, the inducer speed is adjusted to the appropriate target rate. The inducer will remain at the 70 percent speed 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.
- 6 - At the end of the recognition delay and on all subsequent calls for heat in the same heating cycle, the integrated control energizes the combustion air inducer at high speed. The control also checks the high-fire pressure switch to make sure it is closed. As the inducer speed is increased to high, the indoor blower motor is adjusted to a speed which is appropriate for the target rate.
- 7 - When the demand for high-fire (second stage) heat is satisfied, the gas valve is de-energized and the fieldselected indoor blower off delay begins. The combustion air inducer begins a 20-second post-purge period.
- 8 - When the combustion air post-purge period is complete, the inducer is de-energized. The indoor blower is de-energized at the end of the off delay.

## Sequence of Operation and Troubleshooting Flow Chart





## CALL FOR HIGH FIRE WITH TWO-STAGE THERMOSTAT



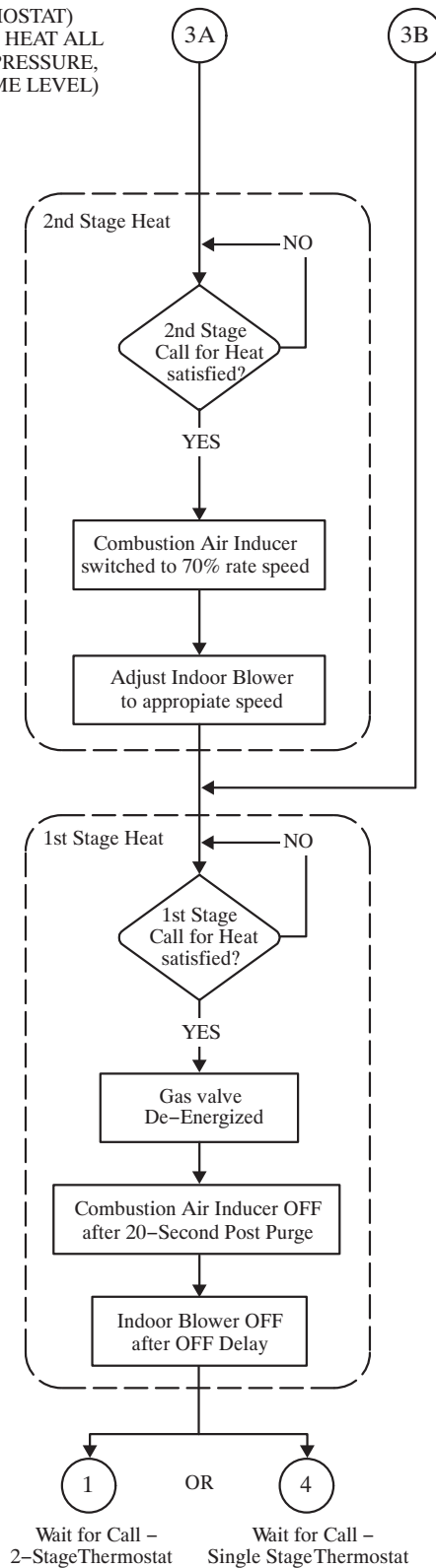
⚠️ System will always light at 70% even if 2nd stage call for heat is in place

⚠️ If the high pressure switch does not close within 5 attempts, the system will operate at low fire for the remainder of the call for heat at request

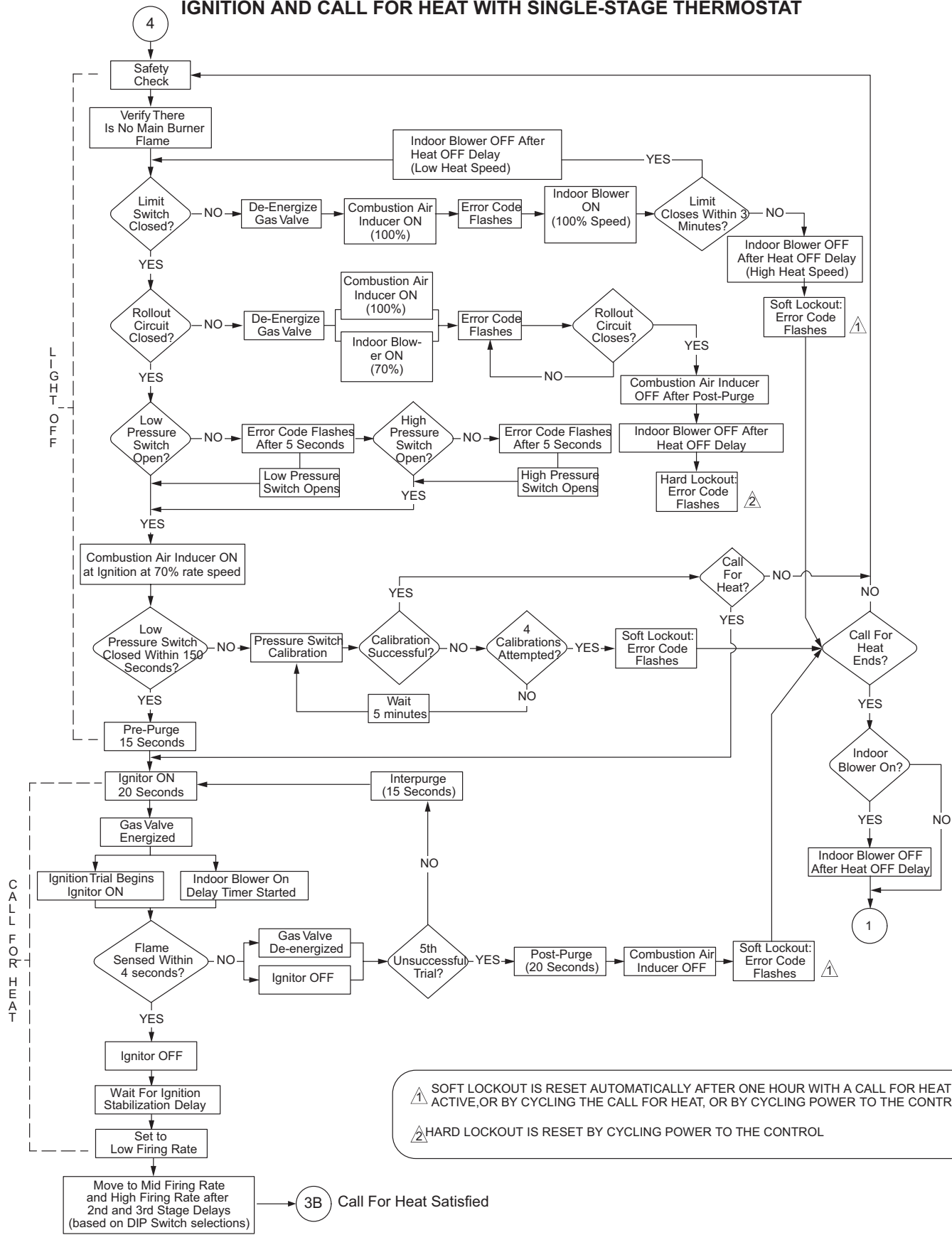
## CALL FOR HEAT SATISFIED

RUN MODE (2 STAGE THERMOSTAT)  
1ST OR 2ND STAGE CALL FOR HEAT ALL  
INPUTS MONITORED (LIMIT, PRESSURE,  
CALL FOR HEAT / COOL, FLAME LEVEL)

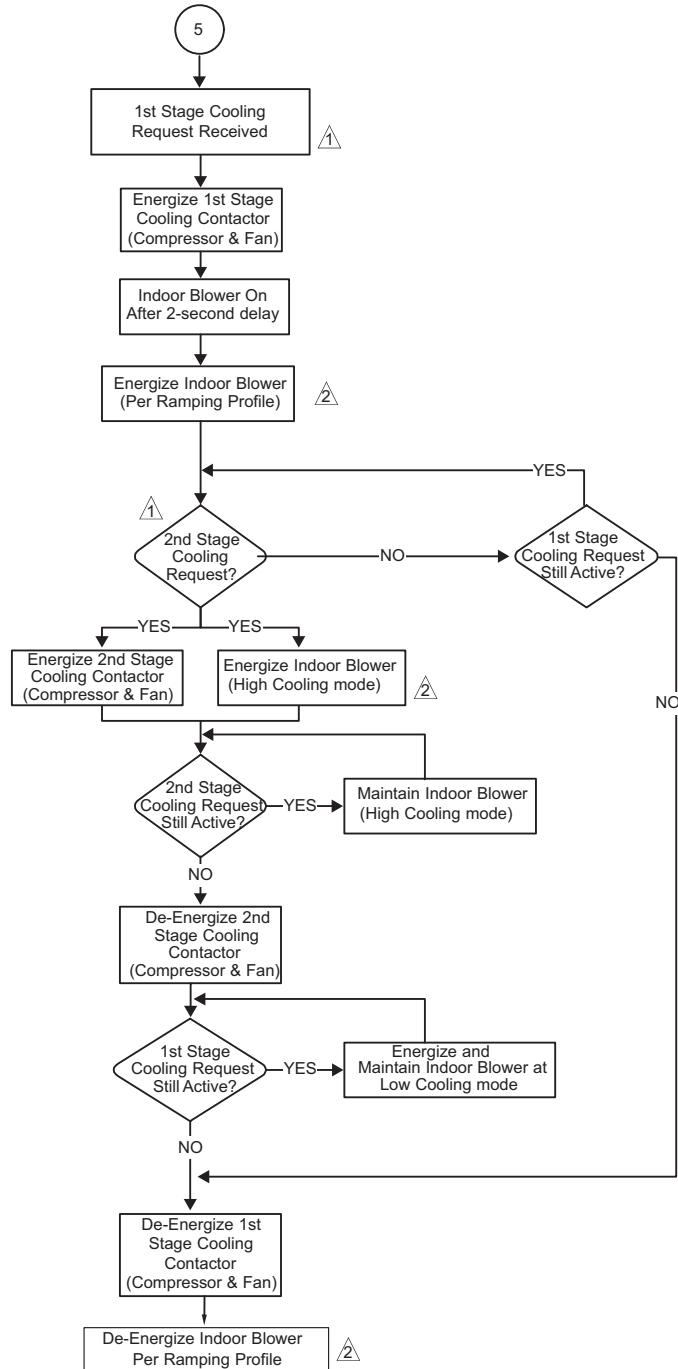
RUN MODE (SINGLE STAGE THERMOSTAT)  
ALL INPUTS MONITORED (LIMIT, PRESSURE,  
CALL FOR HEAT / COOL, FLAME LEVEL)



# IGNITION AND CALL FOR HEAT WITH SINGLE-STAGE THERMOSTAT



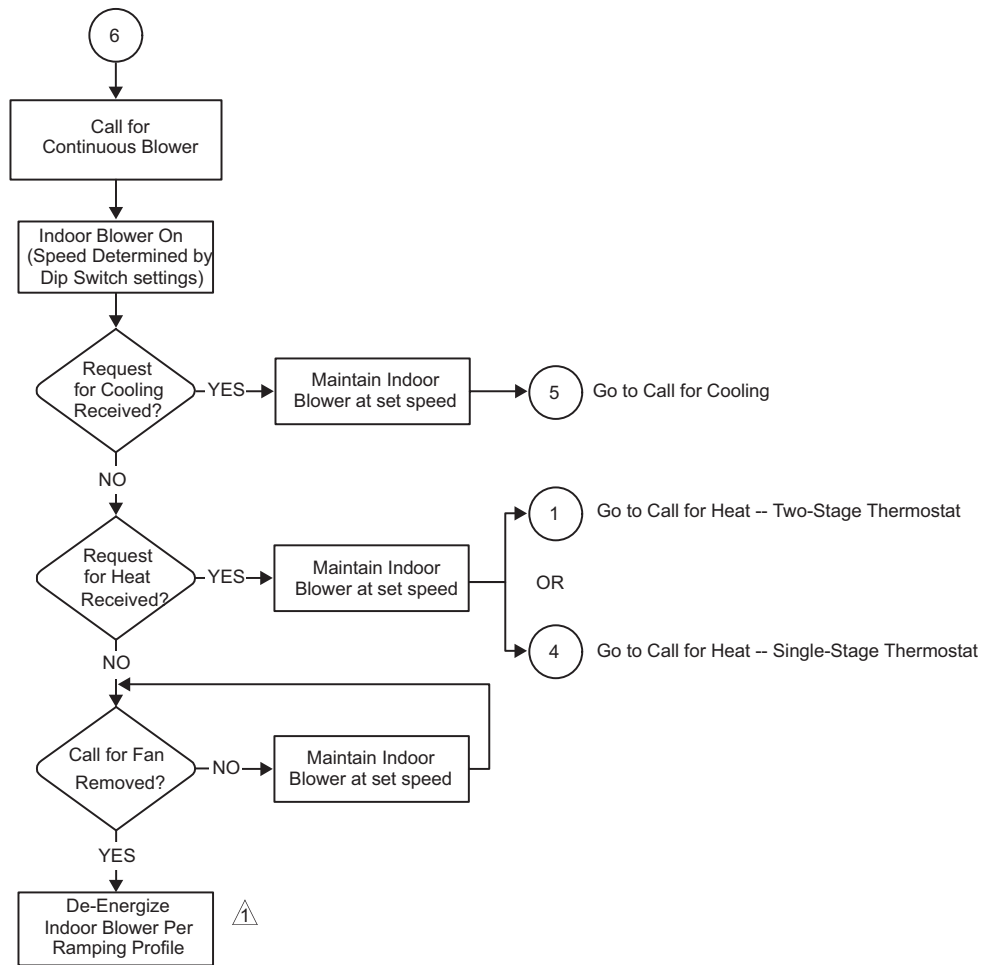
## CALL FOR COOLING



1 2nd stage cooling operation requires a 2-stage thermostat, a 2-stage cooling system and on-board link W915 must be cut. The control will not respond to a 2nd stage cooling request unless a 1st stage cooling request is active

2 Indoor blower cooling mode and high cooling mode have a specific ON, OFF and speed ramping profiles. The specific profile is selected using the DIP switches on the control.

## CONTINUOUS LOW SPEED INDOOR BLOWER SEQUENCE OF OPERATION



⚠ Indoor blower low cooling mode and high cooling mode, have specific ON - OFF and speed ramping profiles. The specific profile is selected using the dip switches on the control.

## X- Field Wiring For Non-Communicating Thermostats

Thermostat	DIP Switch Settings and On-Board Links				Wiring Connections
	DIP Switch 1	W915 (Y1 to Y2) Two-Stage Cooling	W914 (DS to R) Dehumidifi- cation or Harmony III™	W951 (O to R) Heat Pumps	
1Heat / 1 Cool <i>NOTE - Use DIP switch 3 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.</i>	ON	Intact	Intact	Intact	<div> <div>S1 T'STAT</div> <div>CONTROL TERM. STRIP</div> <div>OUTDOOR UNIT</div> <div> <div>DS</div> <div>W2</div> <div>W1</div> <div>R</div> <div>G</div> <div>C</div> <div>Y2</div> <div>Y1</div> <div>O</div> </div> <div> <div>W</div> <div>R</div> <div>G</div> <div>C</div> <div>Y</div> </div> <div> <div>*</div> <div>R</div> <div>C</div> <div>Y</div> </div> </div>
1 Heat / 2 Cool <i>NOTE - Use DIP switch 3 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.</i>	ON	Cut	Intact	Intact	<div> <div>S1 T'STAT</div> <div>CONTROL TERM. STRIP</div> <div>OUTDOOR UNIT</div> <div> <div>DS</div> <div>W2</div> <div>W1</div> <div>R</div> <div>G</div> <div>C</div> <div>Y2</div> <div>Y1</div> <div>O</div> </div> <div> <div>W</div> <div>R</div> <div>G</div> <div>C</div> <div>Y2</div> <div>Y1</div> </div> <div> <div>*</div> <div>R</div> <div>C</div> <div>Y2</div> <div>Y1</div> </div> </div>
1 Heat / 2 Cool with t'stat with dehumidification mode <i>NOTE - Use DIP switch 3 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.</i>	ON	Cut	Cut	Intact	<div> <div>S1 T'STAT</div> <div>CONTROL TERM. STRIP</div> <div>OUTDOOR UNIT</div> <div> <div>DS</div> <div>W2</div> <div>W1</div> <div>R</div> <div>G</div> <div>C</div> <div>Y2</div> <div>Y1</div> <div>O</div> </div> <div> <div>D</div> <div>W1</div> <div>R</div> <div>G</div> <div>C</div> <div>Y2</div> <div>Y1</div> </div> <div> <div>*</div> <div>R</div> <div>C</div> <div>Y2</div> <div>Y1</div> </div> </div>

\* "R" required on some units.



Thermostat	DIP Switch Settings and On-Board Links				Wiring Connections
	DIP Switch 1	W915 (Y1 to Y2) Two-Stage Cooling	W914 (DS to R) Dehumidifi- cation or Harmony III™	W951 (O to R) Heat Pumps	
2 Heat / 2 Cool	OFF	Cut	Intact	Intact	<div> <div>S1 T'STAT</div> <div>CONTROL TERM. STRIP</div> <div>OUTDOOR UNIT</div> <div> <div>DS</div> <div>W2</div> <div>W1</div> <div>R</div> <div>G</div> <div>C</div> <div>Y2</div> <div>Y1</div> <div>O</div> </div> <div> <div>W2</div> <div>W1</div> <div>R</div> <div>G</div> <div>C</div> <div>Y2</div> <div>Y1</div> </div> <div> <div>*</div> <div>R</div> <div>C</div> <div>Y2</div> <div>Y1</div> </div> </div>
2 Heat / 2 Cool with t'stat with dehumidifica- tion mode	OFF	Cut	Cut	Intact	<div> <div>S1 T'STAT</div> <div>CONTROL TERM. STRIP</div> <div>OUTDOOR UNIT</div> <div> <div>D</div> <div>W2</div> <div>W1</div> <div>R</div> <div>G</div> <div>C</div> <div>Y2</div> <div>Y1</div> </div> <div> <div>DS</div> <div>W2</div> <div>W1</div> <div>R</div> <div>G</div> <div>C</div> <div>Y2</div> <div>Y1</div> </div> <div> <div>*</div> <div>R</div> <div>C</div> <div>Y2</div> <div>Y1</div> </div> </div>
2 Heat / 1 Cool	OFF	Intact	Intact	Intact	<div> <div>S1 T'STAT</div> <div>CONTROL TERM. STRIP</div> <div>OUTDOOR UNIT</div> <div> <div>DS</div> <div>W2</div> <div>W1</div> <div>R</div> <div>G</div> <div>C</div> <div>Y2</div> <div>Y1</div> <div>O</div> </div> <div> <div>W2</div> <div>W1</div> <div>R</div> <div>G</div> <div>C</div> <div>Y2</div> <div>Y1</div> </div> <div> <div>*</div> <div>R</div> <div>C</div> <div>Y1</div> </div> </div>

\* "R" required on some units.

Thermostat	DIP Switch Settings and On-Board Links				Wiring Connections
	DIP Switch	W915 (Y1 to Y2) Two-Stage Cooling	W914 (DS to R) Dehumidifi- cation or Harmony III™	W951 (O to R) Heat Pumps	
Dual Fuel Single-Stage Heat Pump  ComfortSense® 7000 L7742U thermostat w/ dual fuel capa- bilities Capable of 2-stage gas heat control	DIP Switch 1 OFF	Intact	Intact	Cut	
Dual Fuel Two Stage Heat Pump  ComfortSense® 7000 L7742U thermostat w/ dual fuel capa- bilities Capable of 2-stage gas heat control	DIP Switch 1 OFF	Cut	Intact	Cut	

\* 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 integrated control.