

**EL280UHE(X) SERIES UNITS**

EL280UHE(X) series units are 80% efficiency gas furnaces used for upflow or horizontal applications only, manufactured with Lennox Duralok heat exchangers formed of aluminized steel. Units are available in heating capacities of 44,000 to 110,000 Btuh and cooling applications up to 5 tons. Refer to Engineering Handbook for proper sizing.

Units are factory equipped for use with natural gas. Kits are available for conversion to LPG operation. EL280UHE(X) model units are equipped with the SureLight® two-stage integrated control. EL280UHE(X) unit meets the California Nitrogen Oxides (NOx) Standards and California Seasonal Efficiency requirements. All units use a redundant gas valve to assure safety shut-off as required by C.S.A.

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



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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.

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

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

## SPECIFICATIONS

Gas Heating Performance		Model No.	EL280UH045E36A	EL280UH070E36A
		Model No. - Low NOx	- - -	EL280UH070XE36A
		<sup>1</sup> AFUE	80%	80%
<b>High Fire</b>	Input - Btuh		44,000	66,000
	Output - Btuh		35,000	53,000
		Temperature rise range - °F	30 - 60	30 - 60
		Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0
<b>Low Fire</b>	Input - Btuh		29,000	43,000
	Output - Btuh		23,000	35,000
		Temperature rise range - °F	20 - 50	20 - 50
		Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	1.7 / 4.5	1.7 / 4.5
<b>High static - in. w.g.</b>	Heating		0.5	0.5
	Cooling		0.5	0.5
<b>Connections in.</b>	Flue connection - in. round		4	4
	Gas pipe size IPS		1/2	1/2
<b>Indoor Blower</b>	Wheel nominal diameter x width - in.		10 x 8	10 x 8
	Motor output - hp		1/2	1/2
	Tons of add-on cooling		1.5 - 3.5	2 - 3.5
	Air Volume Range - cfm		250 - 1500	350 - 1375
<b>Electrical Data</b>	Voltage		120 volts - 60 hertz - 1 phase	
	Blower motor full load amps		6.1	6.1
	Maximum overcurrent protection		15	15
<b>Shipping Data</b>	lbs. - 1 package		111	121

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.

## SPECIFICATIONS

Gas Heating Performance		Model No.	EL280UH090E36B	EL280UH090E48B
		Model No. - Low NOx	- - -	EL280UH090XE48B
		<sup>1</sup> AFUE	80%	80%
<b>High Fire</b>	Input - Btuh		88,000	88,000
	Output - Btuh		70,000	69,000
		Temperature rise range - °F	35 - 65	30 - 60
		Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0
<b>Low Fire</b>	Input - Btuh		57,000	57,000
	Output - Btuh		46,000	46,000
		Temperature rise range - °F	25 - 55	20 - 50
		Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	1.7 / 4.5	1.7 / 4.5
<b>High static - in. w.g.</b>	Heating		0.5	0.5
	Cooling		0.5	0.5
<b>Connections in.</b>	Flue connection - in. round		4	4
	Gas pipe size IPS		1/2	1/2
<b>Indoor Blower</b>	Wheel nominal diameter x width - in.		10 x 9	10 x 10
	Motor output - hp		1/2	3/4
	Tons of add-on cooling		2 - 3.5	3 - 4
	Air Volume Range - cfm		350 - 1600	765 - 1800
<b>Electrical Data</b>	Voltage		120 volts - 60 hertz - 1 phase	
	Blower motor full load amps		6.1	8.2
	Maximum overcurrent protection		15	15
<b>Shipping Data</b>	lbs. - 1 package		136	140

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.

## SPECIFICATIONS

<b>Gas</b>	<b>Model No.</b>	<b>EL280UH110E48C</b>	<b>EL280UH110E60C</b>
<b>Heating Performance</b>	<b>Model No. - Low NOx</b>	<b>- - -</b>	<b>EL280UH110XE60C</b>
	<sup>1</sup> AFUE	80%	80%
<b>High Fire</b>	Input - Btuh	110,000	110,000
	Output - Btuh	86,000	87,000
	Temperature rise range - °F	35 - 65	30 - 60
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0
<b>Low Fire</b>	Input - Btuh	72,000	72,000
	Output - Btuh	58,000	58,000
	Temperature rise range - °F	25 - 55	20 - 50
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	1.7 / 4.5	1.7 / 4.5
<b>High static - in. w.g.</b>	Heating	0.5	0.5
	Cooling	0.5	0.5
<b>Connections in.</b>	Flue connection – in. round	4	4
	Gas pipe size IPS	1/2	1/2
<b>Indoor Blower</b>	Wheel nominal diameter x width - in.	10 x 10	11-1/2 x 10
	Motor output - hp	3/4	1
	Tons of add-on cooling	3 - 4	4 - 5
	Air Volume Range - cfm	865 - 1780	1100 - 2200
<b>Electrical Data</b>	Voltage	120 volts - 60 hertz - 1 phase	
	Blower motor full load amps	8.2	10
	Maximum overcurrent protection	15	15
<b>Shipping Data</b>	lbs. - 1 package	152	156

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.

**OPTIONAL ACCESSORIES - ORDER SEPARATELY**

		<b>“A” Width Models</b>	<b>“B” Width Models</b>	<b>“C” Width Models</b>	
<b>CABINET</b>					
<b>Horizontal Suspension Kit - Horizontal only</b>		<b>51W10</b>	<b>51W10</b>	<b>51W10</b>	
<b>Return Air Base - Upflow only</b>		<b>65W75</b>	<b>50W98</b>	<b>50W99</b>	
<b>High Performance Economizer (Commercial only)</b>		<b>10U53</b>	<b>10U53</b>	<b>10U53</b>	
<b>CONTROLS</b>					
<b>iComfort® E30 Smart Wi-Fi Thermostat</b>		<b>20A65</b>	<b>20A65</b>	<b>20A65</b>	
<b>Remote Outdoor Temperature Sensor</b>		<b>X2658</b>	<b>X2658</b>	<b>X2658</b>	
<b>Furnace Twinning Kit</b>		<b>16W72</b>	<b>16W72</b>	<b>16W72</b>	
<b>FILTERS</b>					
<b><sup>1</sup> Air Filter and Rack Kit</b>	Horizontal (end)		<b>87L95</b>	<b>87L96</b>	<b>87L97</b>
		Size of filter - in.	14 x 25 x 1	18 x 25 x 1	20 x 25 x 1
	Side Return	Single	<b>44J22</b>	<b>44J22</b>	<b>44J22</b>
		Ten Pack	<b>66K63</b>	<b>66K63</b>	<b>66K63</b>
		Size of filter - in.	16 x 25 x 1	16 x 25 x 1	16 x 25 x 1
<b>NIGHT SERVICE KIT</b>					
<b>Night Service Kit</b>		<b>17B59</b>	<b>17B59</b>	<b>17B59</b>	
<b>VENTING</b>					
<b>Vent Adaptor – 6 in. conn. size upflow applications only</b>		<b>18M79</b>	<b>18M79</b>	<b>18M79</b>	

<sup>1</sup> Cleanable polyurethane, frame-type filter.

**EL280UH045E36A PERFORMANCE (Less Filter)**

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1500	300	1220	175	1050	114	850	65	800	48
0.10	1485	311	1200	179	1025	118	810	68	790	50
0.20	1460	323	1170	188	980	125	725	73	580	53
0.30	1420	334	1140	195	930	133	670	76	455	54
0.40	1395	343	1095	203	890	138	600	86	375	60
0.50	1355	355	1050	212	840	149	550	93	325	64
0.60	1325	368	1020	222	790	158	495	96	275	67
0.70	1290	369	980	228	745	164	420	103	238	69
0.80	1260	381	945	238	700	172	380	107	---	---

**EL280UH070E36A PERFORMANCE (Less Filter)**

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1375	340	1350	240	1110	190	970	93	780	50
0.10	1350	346	1325	254	1100	194	940	104	725	57
0.20	1330	346	1310	264	1080	200	895	113	680	64
0.30	1315	353	1280	272	1060	204	860	118	610	70
0.40	1300	368	1250	283	1040	212	810	125	550	76
0.50	1285	369	1220	293	1010	222	765	132	510	78
0.60	1260	384	1190	301	975	227	725	140	460	83
0.70	1240	391	1150	314	950	236	680	147	400	89
0.80	1210	399	1120	319	915	244	640	152	355	95

**EL280UH090E36B PERFORMANCE (Less Filter)**

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1605	313	1475	240	1320	173	1,050	99	865	60
0.10	1565	323	1430	251	1270	185	995	108	800	68
0.20	1515	334	1380	264	1225	196	935	115	730	76
0.30	1475	347	1340	275	1170	207	870	124	645	83
0.40	1435	360	1300	285	1120	215	805	133	550	91
0.50	1395	369	1250	295	1065	225	715	140	470	98
0.60	1355	378	1205	307	1010	235	655	147	395	101
0.70	1305	391	1160	318	935	246	560	156	345	107
0.80	1265	404	1105	329	875	254	510	162	300	112

**EL280UH090E48B PERFORMANCE (Less Filter)**

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1800	370	1555	260	1425	207	1370	172	1240	131
0.10	1765	381	1525	272	1390	218	1320	184	1190	144
0.20	1725	397	1485	283	1350	229	1255	195	1130	157
0.30	1685	416	1450	296	1310	241	1205	206	1075	165
0.40	1635	425	1390	312	1260	250	1165	217	1015	174
0.50	1600	438	1350	322	1205	263	1100	230	955	185
0.60	1560	453	1300	332	1140	270	1050	239	905	193
0.70	1520	467	1255	344	1110	284	1000	249	840	202
0.80	1470	474	1215	352	1050	294	935	258	765	211

**EL280UH110E48C PERFORMANCE (Less Filter)**

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1780	349	1570	248	1465	190	1370	169	1250	131
0.10	1750	365	1540	260	1420	205	1330	177	1205	140
0.20	1720	382	1500	271	1365	220	1280	187	1155	150
0.30	1675	397	1460	279	1330	228	1250	197	1110	159
0.40	1645	407	1415	291	1290	241	1200	211	1070	166
0.50	1605	424	1395	307	1250	249	1165	219	1015	177
0.60	1580	432	1345	316	1205	258	1105	228	960	186
0.70	1565	448	1300	328	1165	271	1060	237	915	194
0.80	1525	449	1270	339	1125	283	1025	246	865	203

**EL280UH110E60C PERFORMANCE (Less Filter)**

External Static Pressure in. w.g.	Air Volume / Watts at Different Blower Speeds																			
	Bottom Return Air, Side Return Air from Both Sides or Return Air from Bottom and One Side.										Single Side Return Air - Air volumes in bold (over 1800 cfm) require Optional Return Air Base and field fabricated transition to accommodate 20 x 25 x 1 in. air filter in order to maintain proper air velocity.									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)		High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	2175	590	2050	410	1850	310	1695	275	1510	195	<b>2175</b>	<b>605</b>	<b>1930</b>	<b>420</b>	1785	320	1675	260	1500	195
0.10	2158	607	1943	421	1778	328	1650	283	1461	205	<b>2129</b>	<b>628</b>	<b>1892</b>	<b>441</b>	1733	345	1627	288	1458	209
0.20	2131	620	1897	436	1719	345	1591	299	1405	215	<b>2091</b>	<b>649</b>	<b>1838</b>	<b>458</b>	1691	360	1586	297	1407	220
0.30	2085	639	1847	456	1678	354	1563	308	1351	228	<b>2072</b>	<b>660</b>	<b>1806</b>	<b>471</b>	1631	371	1529	313	1353	232
0.40	2055	652	1806	466	1641	371	1499	317	1297	238	<b>2014</b>	<b>677</b>	1772	485	1591	385	1485	327	1302	243
0.50	2030	668	1767	476	1588	387	1462	333	1256	254	<b>1977</b>	<b>690</b>	1742	498	1554	395	1444	337	1252	256
0.60	1976	686	1724	495	1550	399	1419	348	1215	265	<b>1960</b>	<b>707</b>	1696	511	1511	410	1412	348	1204	265
0.70	1949	700	1685	510	1512	408	1371	357	1168	271	<b>1913</b>	<b>720</b>	1661	525	1480	424	1351	359	1149	274
0.80	1896	716	1649	527	1473	419	1332	372	1121	287	<b>1873</b>	<b>738</b>	1617	538	1440	437	1313	371	1117	285

# EL280UHE(X) Parts Arrangement

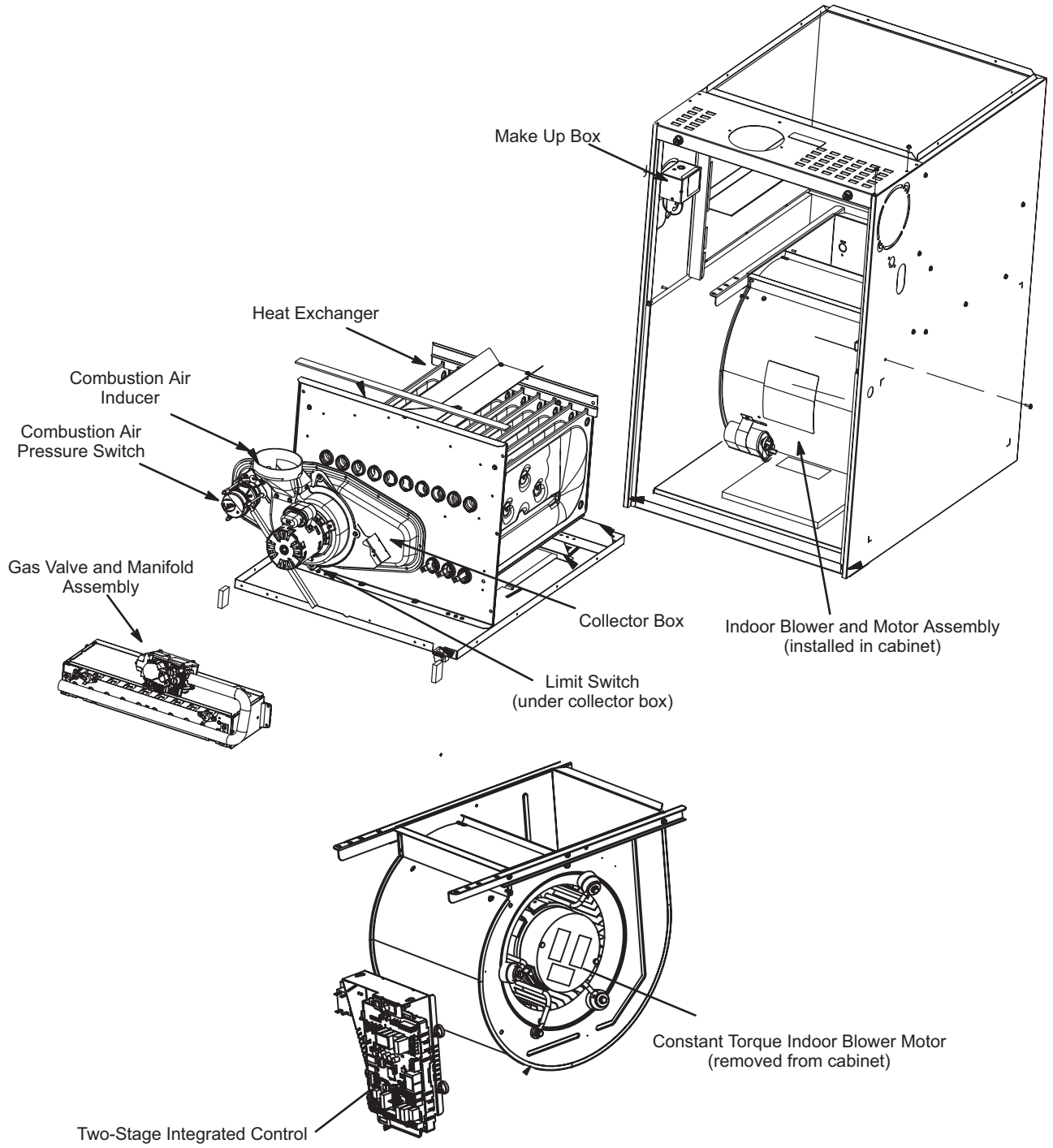


FIGURE 1



## I-UNIT COMPONENTS

EL280UHE(X) unit components are shown in FIGURE 1. The gas valve, combustion air inducer and burners can be accessed by removing the access panel. Electrical components are in the control box (FIGURE 2) found in the blower section.

EL280UHE(X) units are factory equipped with Integrated Control 107048d 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.

<b>ELECTROSTATIC DISCHARGE (ESD)</b> 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.

#### 2. Door Interlock Switch (S51)

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

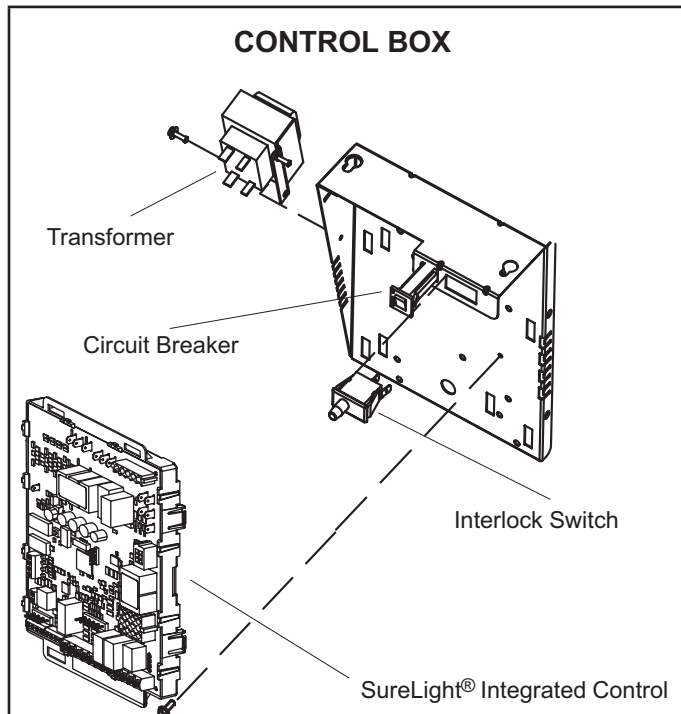


FIGURE 2

#### 3. Circuit Breaker (CB8)

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

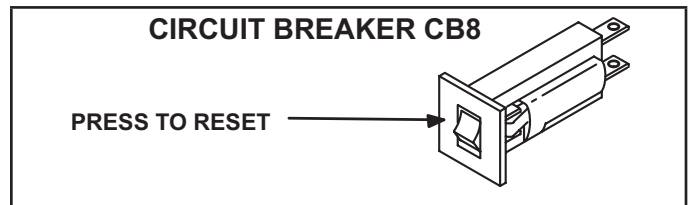


FIGURE 3

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

#### 4. Integrated Control (A92)

##### 103699 and 107048

Units are equipped with the SureLight® two-stage, integrated control. The system consists of a ignition / blower control (FIGURE 4 and FIGURE 6) with control pin designations in TABLE 1 and TABLE 2 and ignitor. The control and ignitor work in combination to ensure furnace ignition and ignitor durability. The control provides gas ignition, safety checks and indoor blower control with two-stage gas heating. The furnace combustion air inducer, gas valve and indoor blower are controlled in response to various system inputs such as thermostat signal, pressure and limit switch signal and flame signal. The control features a seven-segment LED display, indicating furnace status and error codes. The LED flashes in single digits. For example using table 4 under LIMIT CODE, an "E" followed by "2" followed by "5" followed by "0", the limit switch circuit is open. The control also has two unpowered (dry) 1/4" contacts for a humidifier and a 120 volt accessory terminal. Both rated at (1) one amp each.

##### Electronic Ignition

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



When the differential in the pressure switch is great enough, the pressure switch closes and a 15-second pre-purge begins .

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

**NOTE** - During abnormal conditions such as low supply voltage or low outdoor temperatures and the low fire pressure switch does not close, the combustion air inducer will switch to high speed. After the low & high pressure switch close, the unit will proceed with a 15 sec pre-purge, followed by a 20 sec ignitor warm up, then ignition on high-fire. After 10 to 20 seconds of high fire operation the unit will switch to low fire.

**Two Stage Operation / Thermostat Selection DIP Switch**

The control can be utilized in two modes: SINGLE-STAGE thermostat or TWO-STAGE thermostat. The thermostat selection is made using a DIP switch and must be positioned for the particular application. DIP switch 1, labeled T\*STAT HEAT STAGE is factory-set in the OFF position for use with a two-stage thermostat. Move the DIP switch to ON for use with a single stage thermostat. While in the single-stage thermostat mode, the burners will always fire on first-stage heat. The combustion air inducer will operate on low speed and indoor blower will operate on low heat speed.

The unit will switch to second stage heat after a “recognition period”. DIP switch 2, labeled SECOND STAGE DELAY, is factory set in the OFF position for a 7 minute recognition period. The switch can be moved to the ON position for a 12 minute recognition period, after which time the unit will switch to second-stage heat. While in the two-stage thermostat mode, the burners will fire on first-stage heat. The combustion air inducer will operate on low speed and indoor blower will operate on low heat speed.

The unit will switch to second-stage heat on call from the indoor thermostat. If there is a simultaneous call for first and second stage heat, the unit will fire on first stage heat and switch to second stage heat after 30 seconds of operation. See Sequence of Operation flow charts in the back of this manual for more detail.

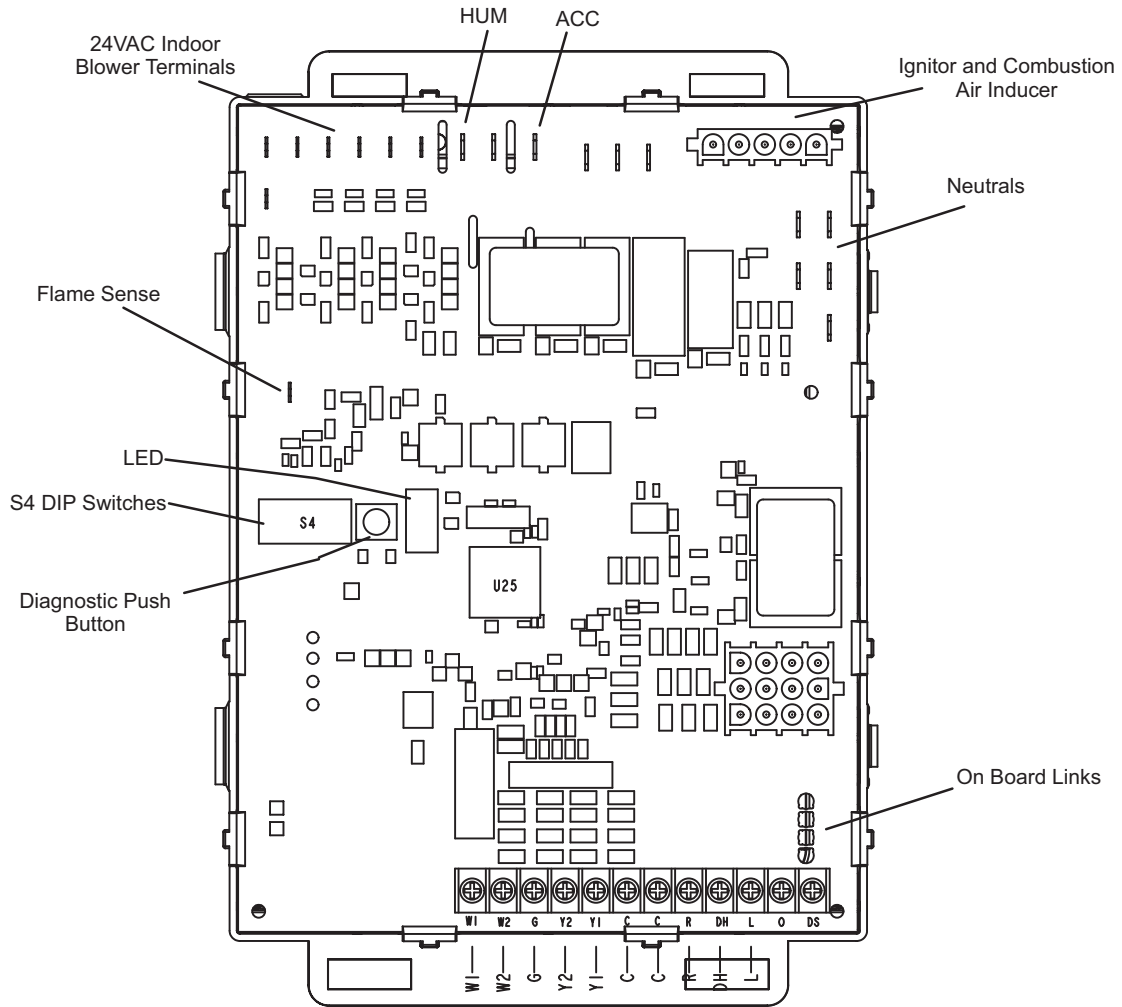
**TABLE 1**

<b>SureLight® Control 5 Pin Terminal Designation</b>	
<b>Pin #</b>	<b>Function</b>
1	Ignitor
2	Combustion Air Inducer High Speed
3	Combustion Air Inducer Low Speed
4	Combustion Air Inducer Neutral
5	Ignitor Neutral

**TABLE 2**

<b>SureLight® Control 12 Pin Terminal Designation</b>	
<b>Pin #</b>	<b>Function</b>
1	Gas Valve Second Stage
2	Pressure Switch Second Stage
3	Rolout Switch
4	Ground
5	24V Hot
6	Primary Limit In
7	Gas Valve First Stage
8	Gas Valve Common
9	24V Neutral
10	Ground
11	Primary Limit Out
12	Pressure Switch First Stage

**INTEGRATED CONTROL**



**3/16" QUICK CONNECT TERMINALS**

- FLAME SENSE SIGNAL
- HI COOL 24VAC
- HI HEAT 24VAC
- LO COOL 24VAC
- LO HEAT 24VAC
- PARK
- PARK
- COMMON 24VAC

**1/4" QUICK CONNECT TERMINALS**

- NEUTRALS = 120 VAC NEUTRAL
- HUM = UNPOWERED NORMALLY OPEN (DRY) CONTACTS
- LI = 120 VAC INPUT TO CONTROL
- ACC = 120 VAC OUTPUT TO OPTIONAL ACCESSORY

**THERMOSTAT CONNECTIONS (TB1)**

- DS = DEHUMIDIFICATION SIGNAL
- W2 = HEAT DEMAND FROM 2ND STAGE T/STAT
- W1 = HEAT DEMAND FROM 1ST STAGE T/STAT
- R = CLASS 2 VOLTAGE TO THERMOSTAT
- G = MANUAL FAN FROM T'STAT
- C = THERMOSTAT SIGNAL GROUND CONNECTED TO TRANSFORMER GRD (TR) & CHASIS GROUND (GRD)
- Y1 = THERMOSTAT 1ST STAGE COOL SIGNAL
- Y2 = THERMOSTAT 2ND STAGE COOL SIGNAL
- O = THERMOSTAT SIGNAL TO HEAT PUMP REVERSING VALVE
- DH = NOT USED
- L = NOT USED

**FIGURE 4**

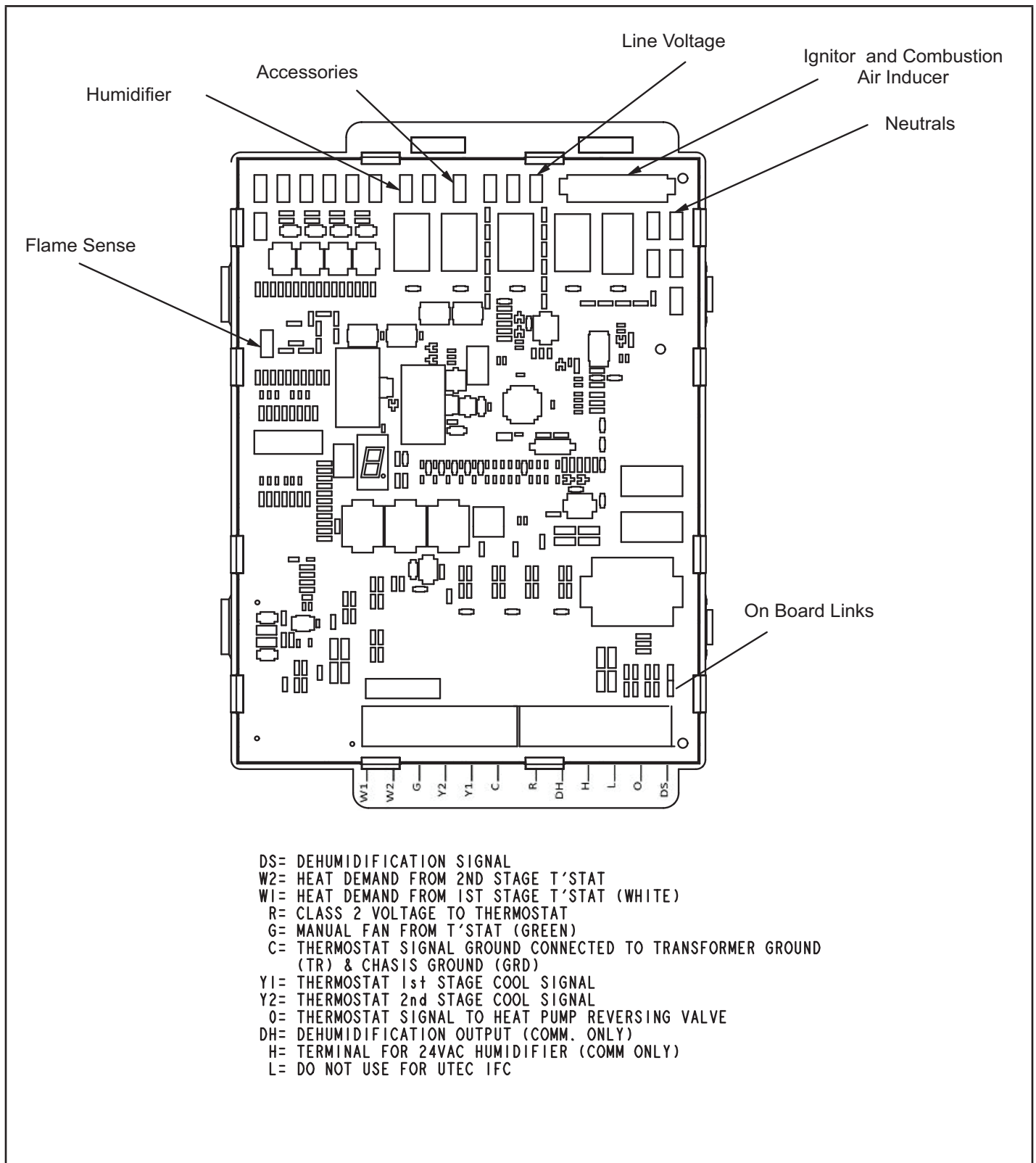


FIGURE 5

# INTEGRATED CONTROL CONFIGURATION GUIDE

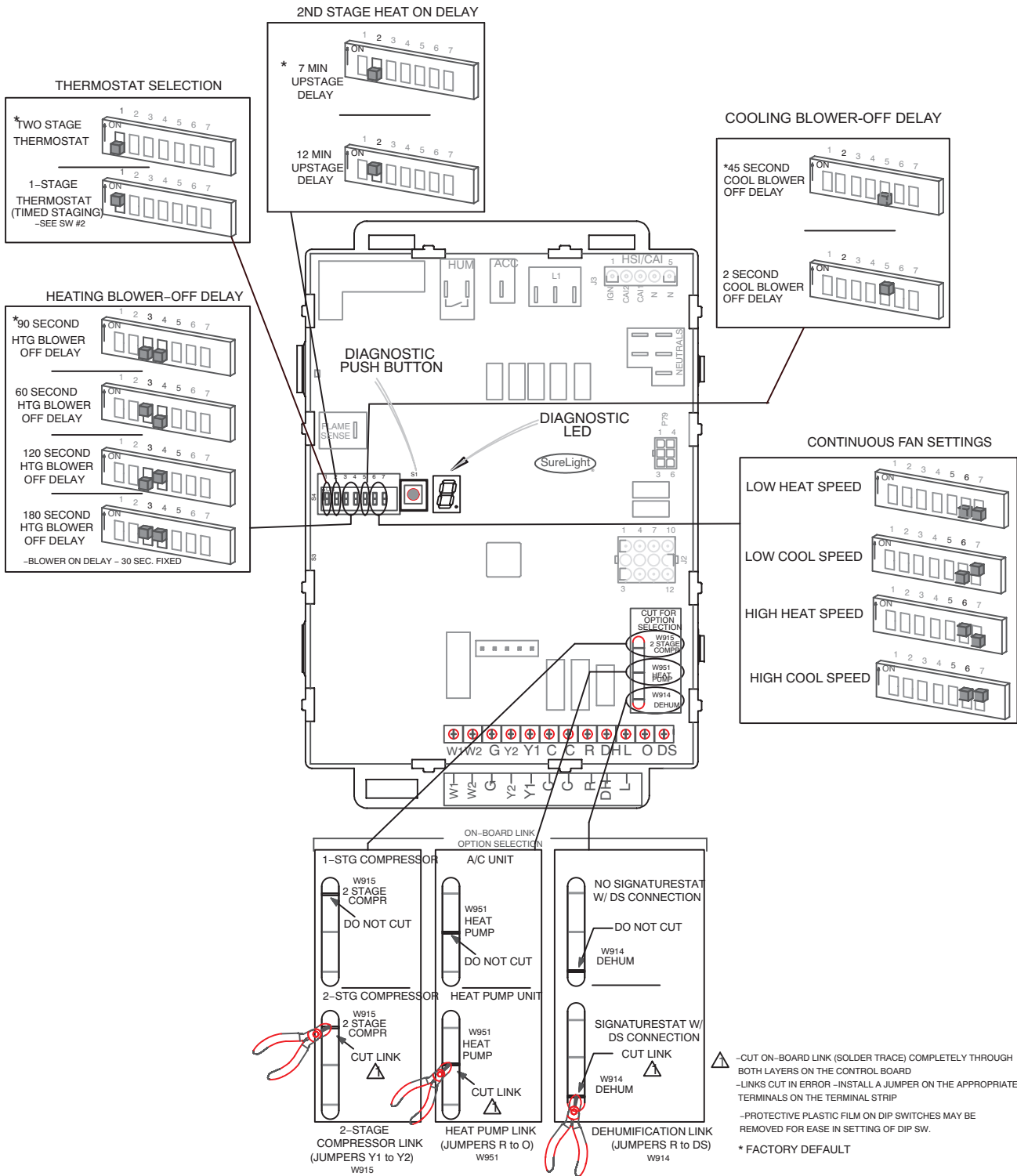


FIGURE 6

**TABLE 3**  
**Integrated Control Diagnostic Modes**

Display	Action (when button released)
No Change	Remain in idle mode
Solid "E"	Enter diagnostic recall mode
Solid "F"	Enter flame signal mode

**TABLE 4**  
**Integrated Diagnostic Codes/Status of Equipment**

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
.	Idle mode (Decimal blinks at 1 Hertz -- 0.5 second ON, 0.5 second OFF).	
C	Cooling stage (1 second ON, 0.5 second OFF) 1 or 2 displayed / Pause / Repeat codes.	
d	Dehumidification mode (1 second ON, 1 second OFF) / Pause / Repeat Codes).	
H	Gas Heat Stage (1 second ON, 0.5 second OFF) 1 or 2 displayed / Pause / Repeat codes. Blinking during ignition.	
h	Heat pump stage.	
E110	Low line voltage.	Line Voltage Low (Voltage lower than nameplate rating). Check power line voltage and correct. Alarm clears 5 seconds after fault recovered.
E111	Line voltage polarity reversed.	Reverse line power voltage wiring. System resumes normal operation 5 seconds after fault recovered.
E112	Ground not detected.	System shuts down. Provide proper earth ground. System resumes normal operation 5 seconds after fault recovered.
E113	High line voltage.	Line Voltage High (Voltage higher than nameplate rating). Provide power voltage within proper range. System resumes normal operation 5 seconds after fault recovered.
E114	Line voltage frequency out-of-range.	No 60 Hertz Power. Check voltage and line power frequency. Correct voltage and frequency problems. System resumes normal operation 5 seconds after fault recovered.
E115	Low 24V - Control will restart if the error recovers.	24-Volt Power Low (Range is 18 to 30 volts). Check and correct voltage. Check for additional power-robbing equipment connected to system. May require installation of larger VA transformer to be installed in furnace / air handler. Clears after fault recovered.
E117	Poor ground detected (Warning only).	Provide proper grounding for unit. Check for proper earth ground to the system. Warning only will clear 30 seconds after fault recovered.

\* No change implies the display will continue to show whatever is currently being displayed for normal operation (blinking decimal, active error code, heat state, etc.)

### Diagnostic LED

The seven-segment diagnostic LED displays operating status, error codes and other information. Table be4 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 "E" mode and the Flame Signal "F" mode. Press the button and hold it to cycle through a menu of options. Every five seconds a new menu item will be displayed. When the button is released, the displayed item will be selected. Once all items in the menu have been displayed, the menu resumes from the beginning until the button is released.

### Error Code Recall Mode

Select "E" from the menu to access the most recent 10 error codes. Select "c" from the Error Code Recall menu to clear all error codes. Button must be pressed a second time while "c" is flashing to confirm command to delete codes.

Press the button until a solid "≡" is displayed to exit the Error Code Recall mode.

### Flame Signal Mode

Select "F" from the menu to access the flame signal mode. The integrated control will display the flame current on seven-segment LED in in micro amps (uA). Flame signal mode is exited after any of the following:

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

**TABLE 4 Continued**

<b>Code</b>	<b>Diagnostic Codes/Status of Equipment</b>	<b>Action Required to Clear and Recover</b>
E125	Control failed self-check, internal error, failed hardware. Will restart if error recovers. Integrated control not communicating. Covers hardware errors (flame sense circuit faults, pin shorts, etc.).	Hardware problem on the control. Cycle power on control. Replace if problem prevents service and is persistent. Critical alert. Cleared 300 seconds after fault recovered.
E200	Hard lockout - Rollout circuit open or previously open.	Correct cause of rollout trip, or replace flame rollout switch. Test furnace operation. Cleared after fault recovered.
E204	Gas valve mis-wired.	Check gas valve operation and wiring. Clears when repaired.
E205	Gas valve control relay contact shorted.	Check wiring on control and gas valve. If wiring is correct, replace control.
E206	Gas valve second-stage relay failure.	Furnace will operate on 1st stage for remainder of the heating demand. Will clear after fault recovered. If unable to operate 2nd stage, replace control.
E207	Hot surface ignitor sensed open.	Measure resistance of hot surface ignitor. Replace if open or not within specified range found in IOM. Resumes normal operation after fault is cleared.
E223	Low pressure switch failed open.	Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E224	Low pressure switch failed closed.	Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E225	High pressure switch failed open.	Check pressure (inches w.c.) of high pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E226	High pressure switch failed closed.	Check operation of high pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E227	Low pressure switch open during trial for ignition or run mode.	Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E229	Ignition on High Fire - Information Only.	Code is displayed if 1) low pressure switch fails to close, then furnace will switch to high speed inducer to close both low and high pressure switches, then furnace lights on high fire, or 2) if continuous fan is active, furnace lights on high fire for 60 seconds to improve heat exchanger warm up time.
E240	Low flame current - Run mode.	Check micro-amperes of flame sensor using control diagnostics or field-installed mode. Clean or replace sensor. Measure voltage of neutral to ground to ensure good unit ground. Alert clears after current heat call has been completed.
E241	Flame sensed out of sequence - Flame still present.	Shut off gas. Check for gas valve leak. Replace, if necessary. Alert clears when fault is recovered.
E250	Limit switch circuit open.	Check for proper firing rate on furnace. Ensure there is no blockage in heater. Check for proper air flow. If limit not closed within 3 minutes, unit will go into 1-hour soft lockout. Resumes normal operation after fault is cleared.

**TABLE 4 Continued**

<b>Code</b>	<b>Diagnostic Codes/Status of Equipment</b>	<b>Action Required to Clear and Recover</b>
E270	Soft lockout - Exceeded maximum number of retries. No flame current sensed.	Check for proper gas flow. Ensure that ignitor is lighting burner. Check flame sensor current. Clears when heat call finishes successfully.
E271	Soft lockout - Exceeded maximum number of retries. Last retry failed due to the pressure switch opening.	Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Clears when heat call finishes successfully.
E272	Soft lockout - Exceeded maximum number of recycles. Last recycle due to the pressure switch opening.	Check operation of low pressure switch to see if it is stuck closed on heat call. Check pressure (inches w.c.) of high pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Clears when heat call finishes successfully.
E273	Soft lockout - Exceeded maximum number of recycles. Last recycle due to flame failure.	Check micro-amperes of flame sensor using control diagnostics or field-installed mode. Clean or replace sensor. Measure voltage of neutral to ground to ensure good unit ground. Clears when heat call finishes successfully.
E274	Soft lockout - Exceeded maximum number of recycles. Last recycle failed due to the limit circuit opening or limit remained open longer than 3 minutes.	Shut down system. 1-hour soft lockout. Check firing rate and air flow. Check for blockage. Clears when heat call finishes successfully.
E275	Soft lockout - Flame sensed out of sequence. Flame signal is gone.	Shut off gas. Check for gas valve leak. 1-hour soft lockout. Clears when flame has been proven stable.
E290	Ignitor circuit fault - Failed ignitor or triggering circuitry.	Measure resistance of hot surface ignitor. Replace if open or not within specifications. 1-hour soft lockout. Clears when flame has been proven stable.



## Integrated Control DIP Switches

EL280UHE(X) units are equipped with a two-stage integrated control. This control manages ignition timing, heating mode fan off delays and indoor blower speeds based on selections made using the control dip switches and jumpers.

The control includes an internal watchguard feature which automatically resets the ignition control when it has been locked out. After one hour of continuous thermostat demand for heat, the watchguard will break and remake thermostat demand to the furnace and automatically reset the control to relight the furnace.

### Heating Operation DIP Switch Settings

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

- Select "OFF" for two-stage heating operation controlled by a two-stage heating thermostat (factory setting);
- Select "ON" for two-stage heating operation controlled by a single-stage heating thermostat. This setting provides a timed delay before second-stage heat is initiated.

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

### Indoor Blower Operation DIP Switch Settings

#### Switches 3 and 4 -- Heating Mode Blower-Off Delay --

The blower-on delay of 30 seconds is not adjustable. The blower-off delay (time that the blower operates after the heating demand has been satisfied) can be adjusted by moving switches 3 and 4 on the integrated control. The unit is shipped from the factory with a blower-off delay of 90 seconds.

The blower off delay affects comfort and is adjustable to satisfy individual applications. Adjust the blower off delay to achieve a supply air temperature between 90° and 110°F at the exact moment that the blower is de-energized. Longer off delay settings provide lower supply air temperatures; shorter settings provide higher supply air temperatures. TABLE 5 provides the blower off timings that will result from different switch settings.

**TABLE 5**

**Blower Off Heating Mode Delay Switch Settings**

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

**Switch 5 -- Cooling Mode Blower-Off Delay--** The unit is shipped from the factory with the dip switch positioned OFF for a 45 second delay. TABLE 6 provides the cooling mode off delay settings.

**TABLE 6**

**Blower Off Cooling Mode Delay Switch Settings**

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

**Switches 6 and 7 -- Continuous Fan Mode --** Continuous fan speed can be controlled by changing DIP switch positions. TABLE 7 below provides DIP switch settings for continuous fan mode.

**TABLE 7**

**Continuous Fan Mode Settings**

Continuous Fan Mode	Switch 6	Switch 7
Low Heat Speed (Factory Setting)	Off	Off

#### On-Board Link W914 Dehum

On-board link W914, is a clippable connection between terminals R and DS on the integrated control. W914 must be cut when the furnace is installed with a thermostat which features humidity control. If the link is not cut, terminal "DS" will remain energized not allowing the blower to reduce to low cool speed upon a call for dehumidification.

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

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

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

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

## IMPORTANT

**If any onboard link is cut by mistake, install a jumper across the corresponding terminals on the low voltage terminal strip. Do not replace control.**

## B- Indoor Blower

### **⚠ IMPORTANT**

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

EL280UHE(X) units are equipped with a constant torque ECM motor. It has a DC motor coupled to an electronic control module both contained in the same motor housing. The motor is programmed to provide constant torque at each of the five selectable speed taps. Each tap requires 24 volts to energize.

#### **Input Voltage Requirements**

The circuit is designed to be operated with AC voltage. To enable a tap requires 12 to 33VAC. Expected current draw will be less than 20mA.

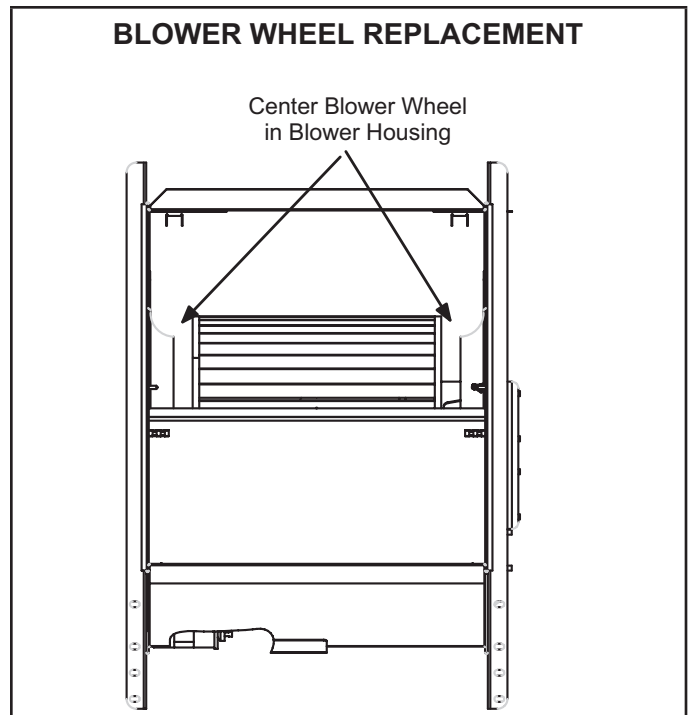
#### **Troubleshooting the Motor**

Troubleshooting the motor is an easy process. Follow steps below.

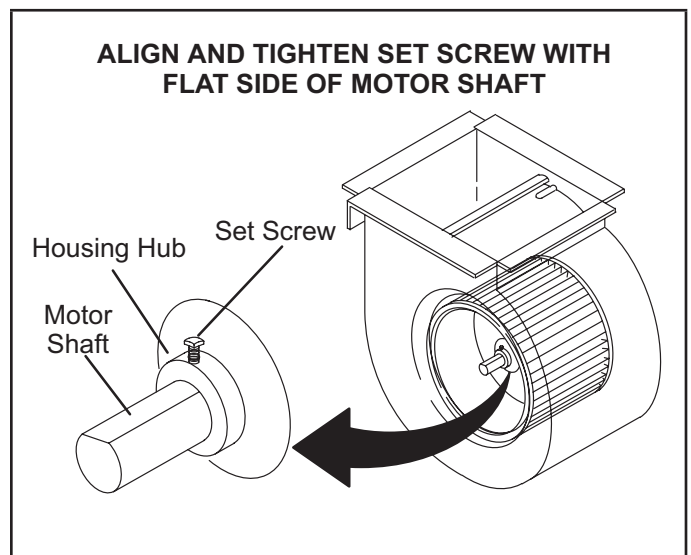
- 1 - Shut off power to unit.
- 2 - Remove input plugs P48 and P49 from motor. See FIGURE 9 for troubleshooting procedure.

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

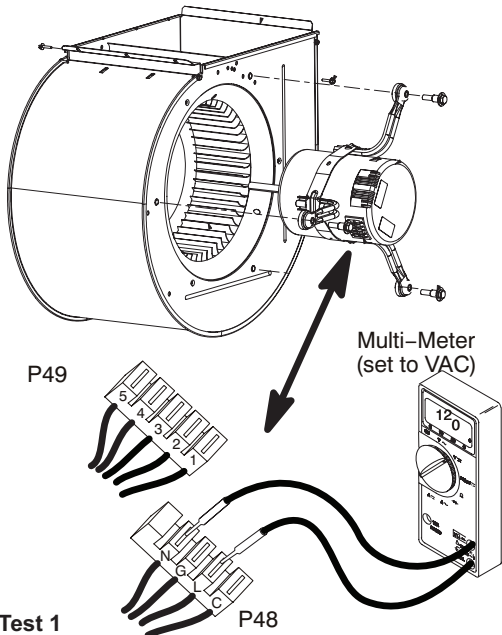
If replacing the indoor blower motor or blower wheel is necessary, placement is critical. The blower wheel must be centered in the blower housing as shown in FIGURE 7. When replacing the indoor blower motor the set screw must be aligned and tightened with the motor shaft as shown in FIGURE 8.



**FIGURE 7**

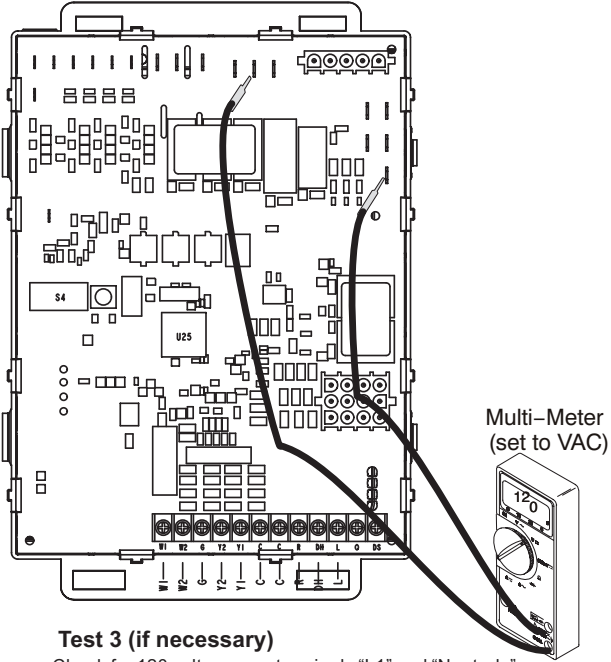


**FIGURE 8**



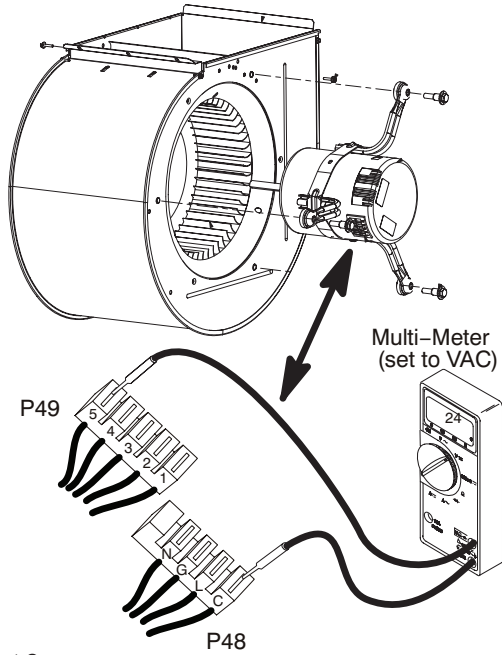
**Test 1**

Turn on power to unit. Check for 120 volts across terminals "L" and "N" on input plug P48. If voltage is present continue to test 2. If voltage is not present problem may be may be up-stream of plug P48 and proceed to test 3.



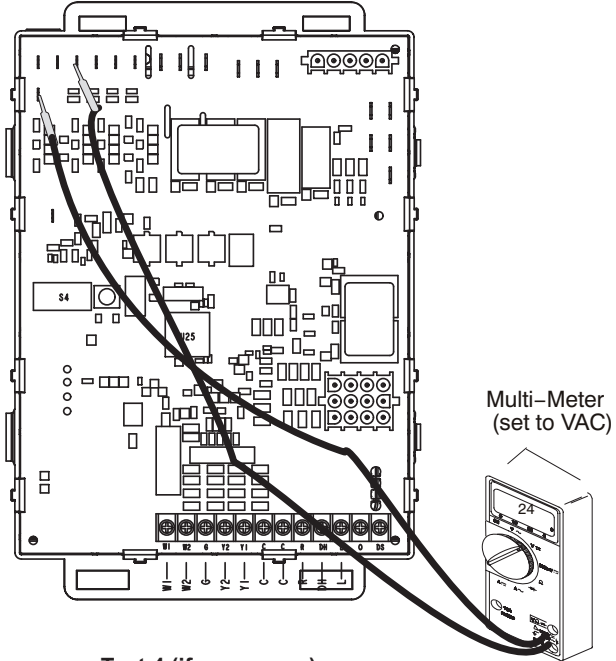
**Test 3 (if necessary)**

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



**Test 2**

Switch thermostat to CONTINUOUS FAN MODE. Check for 24 volts across terminal "C" on input plug P48 and speed tap used for continuous fan. (1, 2, 3, 4 or 5) on input plug P49. If 24 volts is not present problem may be up stream of plug P49. Proceed to test 4.



**Test 4 (if necessary)**

Check for 24 volts across terminals "24 COM" and the "active speed tap" on the integrated control. If voltage is present, problem is with the harness. If voltage is not present problem may be may be with the integrated control

**FIGURE 9**

## Replacing the Motor Module

- 1 - Disconnect electrical power to unit.
- 2 - Remove unit access panel.
- 3 - Unplug the two harnesses from the motor control module. See FIGURE 10.
- 4 - Remove the two hex head bolts securing the motor control module to the motor (FIGURE 11).
- 5 - Slide the motor control module away from the motor to access and disconnect the internal three wire connector. It is not necessary to remove blower motor itself. Set both hex head bolts aside.

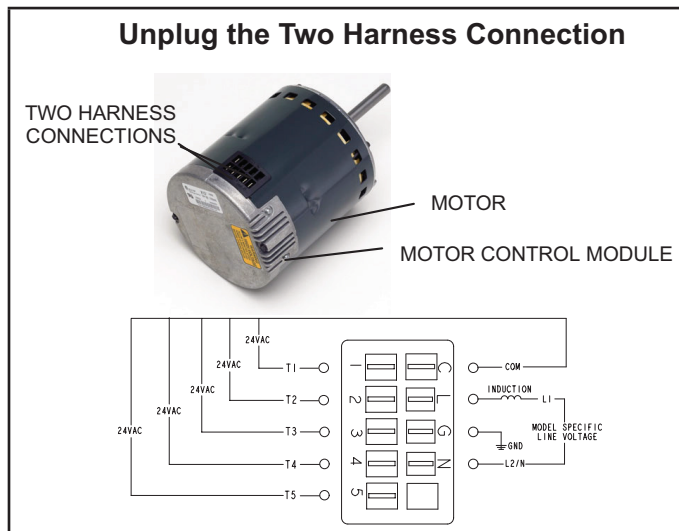


FIGURE 10

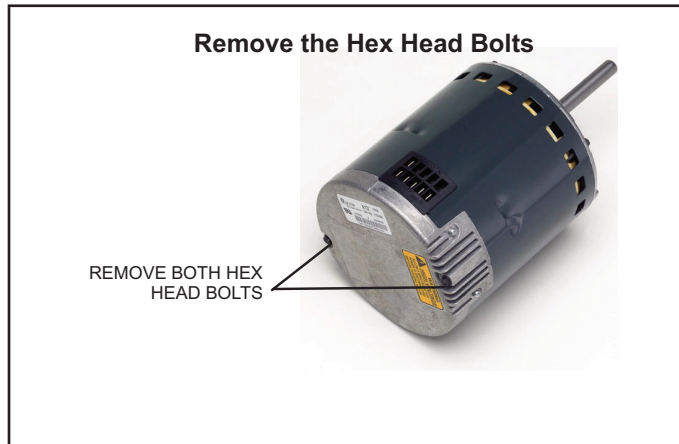


FIGURE 11

## Testing the Motor (FIGURE 12)

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

- 1 - Using an ohmmeter check the resistance from any one of the motor connector pins to the aluminum end plate of the motor. This resistance should be greater than 100k ohms.
- 2 - Check the resistances between each of the three motor connector pins. These should all read approximately the same resistance within an ohm.
- 3 - Check to see if the blower wheel spins freely.

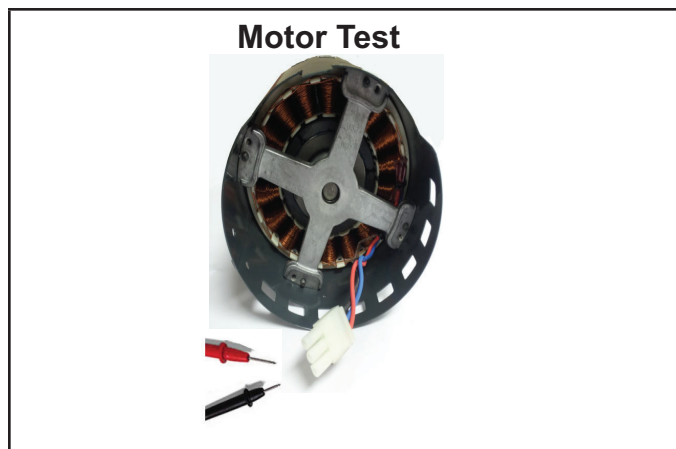


FIGURE 12

## Motor Module Installation

All replacement motor control modules look similar; however, each module is designed for a specific motor size. It is very important to make sure that you are using the correct replacement motor control module. **USE OF THE WRONG MOTOR CONTROL MODULE MAY RESULT IN UNEXPECTED UNIT OPERATION.**

- 1 - Verify electrical power to unit is disconnected.
- 2 - Connect three-wire harness from motor to control module.
- 3 - Mount new motor control module to motor using two hex head bolts removed in FIGURE 11. Torque bolts to 22 inch pounds or 1/16th clock wise turn.
- 4 - Reconnect the two harnesses to the motor control module.
- 5 - The electrical connectors of the motor should be facing down to form a drip loop (FIGURE 13). This will direct moisture away from the motor and its electric connections on the motor.

TABLE 8

Scale	Measurement range in words	ohms
2 M	two megohm-two million ohms	0 - 2,000,000
200 K	two hundred kilo-ohm-two hundred thousand ohms	0 - 200,000
20 K	twenty kilo-ohm-twenty thousand ohms	0 - 20,000
2 K	two kilo-ohm two-thousand ohms	0 - 2,000
200	two hundred ohms	0 - 200

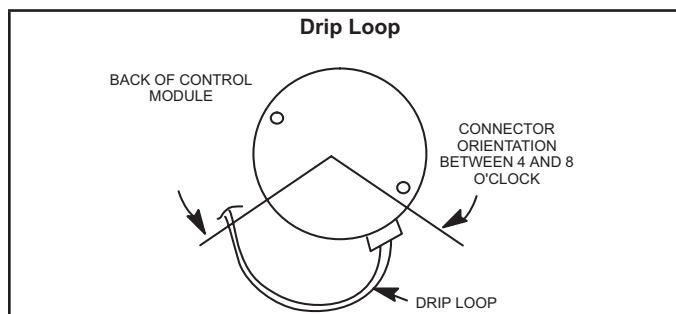


FIGURE 13

## C- Heating Components

### 1. Ignitor

The SureLight® ignitor is made of durable silicon nitride. Ignitor longevity is enhanced by controlling voltage to the ignitor. The integrated control provides a regulated 120 volts to the ignitor for a consistent ignition and long ignitor life. Ohm value should be 39 to 70. See FIGURE 14 for ignitor location and FIGURE 16 for ignitor check out.

**NOTE** - *The EL280UHE(X) furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.*

### 2. Flame Sensor

A flame sensor is located on the left side of the burner support. See FIGURE 14. The sensor 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. A microamp DC meter is needed to check the flame signal on the integrated control. See FIGURE 15 and TABLE 9 for flame signal check and measurement.

### 3. Gas Valve

The two-stage gas valve (FIGURE 19) is internally redundant to assure safety shut-off. If the gas valve must be replaced, the same type valve must be used. 24VAC terminals and ON/OFF switch are located on the valve. A wire harness connects the terminals from the gas valve to the electronic ignition control. 24V applied to the terminals energizes the valve.

Inlet and outlet pressure taps are located on the valve. A regulator adjustment screw is located on the valve. LPG change over kits are available from Lennox. Kits include burner orifices.

### 4. Flame Rollout Switches (S47)

The EL280UHE(X) is equipped with two rollout switches. See FIGURE 14 for location. The limits are a N.C. SPST manual-reset limit. When S47 senses rollout, the circuit breaks and the ignition control immediately stops ignition and closes the gas valve. Rollout can be caused by a blocked heat exchanger, flue or lack of combustion air. The switches are factory set to trip (open) at 210°F and cannot be adjusted. To manually reset a tripped switch, push the reset button located on the control.

### 5. Burners

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

### 6. Primary Limit Control (S10)

The primary limit (S10) is located in the heating vestibule panel. When excess heat is sensed in the heat exchanger, the limit will open. If the limit is open, the furnace control energizes the supply air blower and closes the gas valve. The limit automatically resets when unit temperature returns to normal. The switch must reset within three minutes or the SureLight control will go into Watchguard for one hour. The switch is factory set and cannot be adjusted. The switch may have a different set point for each unit model number. See Lennox Repair Parts Handbook if limit switch must be replaced.

# HEATING COMPONENTS

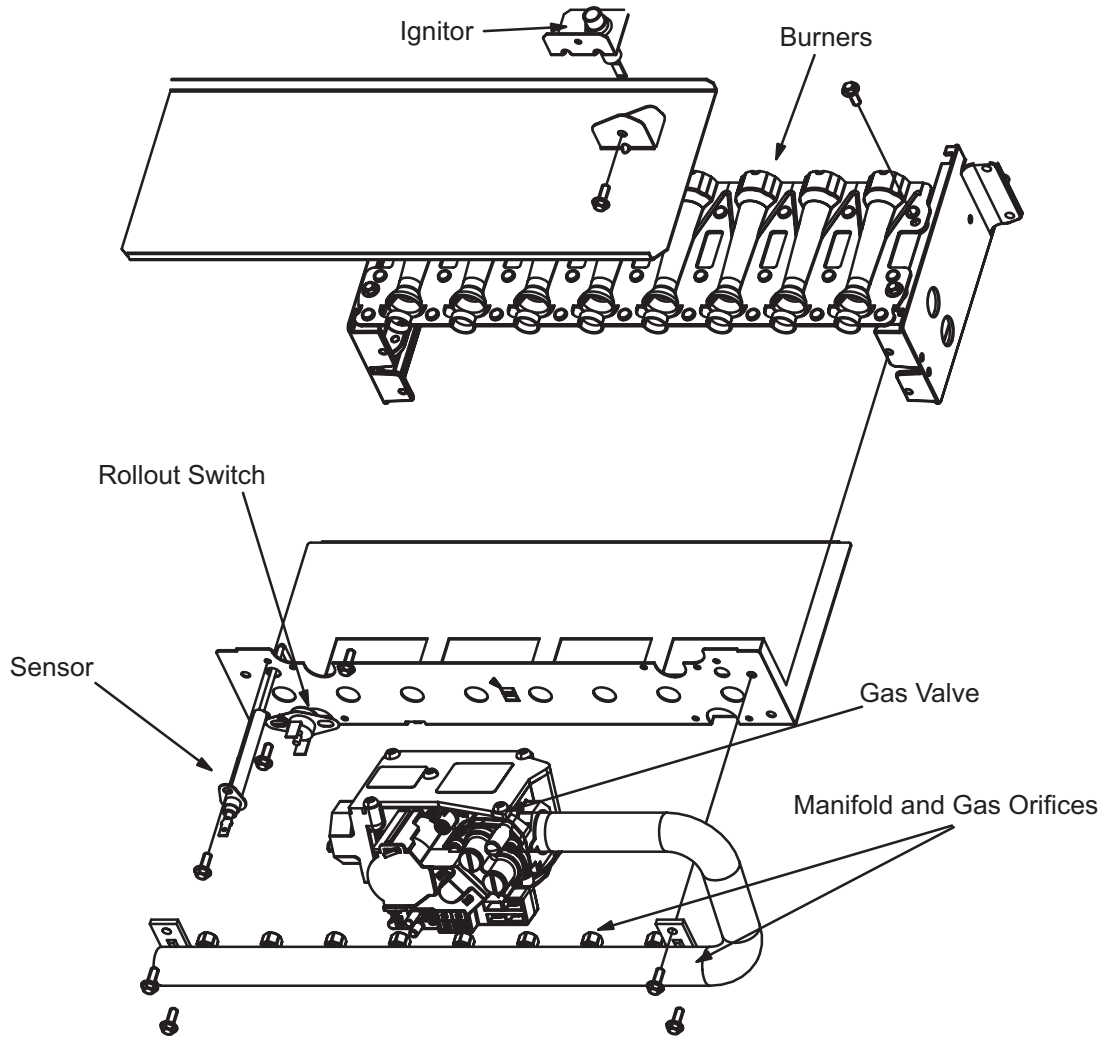


FIGURE 14



**To Measure Flame Signal - Integrated Control:**

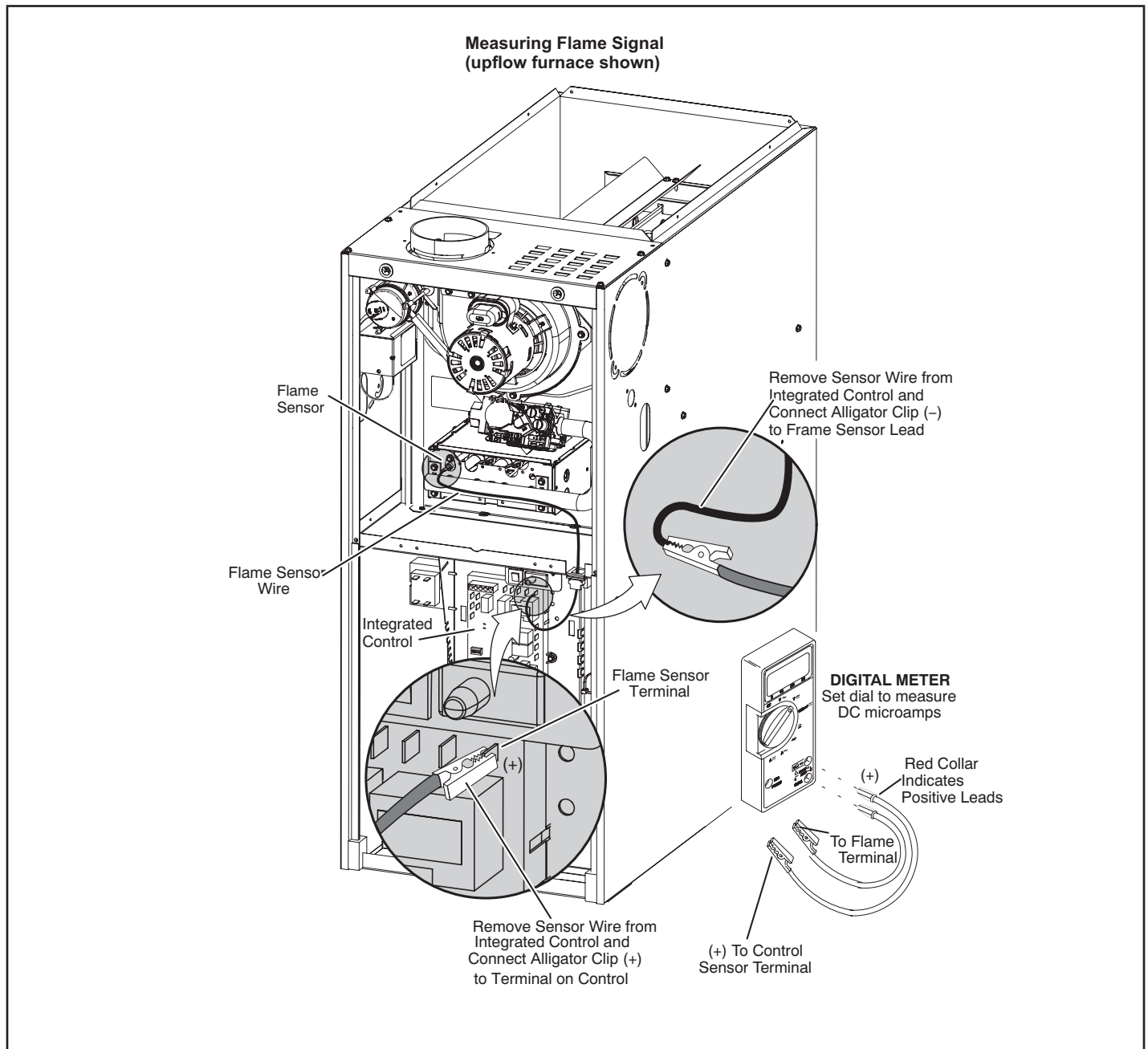
Use a digital readout meter capable of reading DC microamps. See FIGURE 15 and TABLE 9 for flame signal check.

- 1 - Set the meter to the DC amps scale.
- 2 - Turn off supply voltage to control.
- 3 - Disconnect integrated control flame sensor wire from the flame sensor.
- 4 - Connect (-) lead to flame sensor.
- 5 - Connect (+) lead to the ignition control sensor wire

- 6 - Turn supply voltage on and close thermostat contacts to cycle system.
- 7 - When main burners are in operation for two minutes, take reading.

**TABLE 9**  
**Flame Signal in Microamps**

Normal	Low	Drop Out
2.6 or greater	2.5 or less	.06



**FIGURE 15**

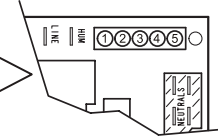
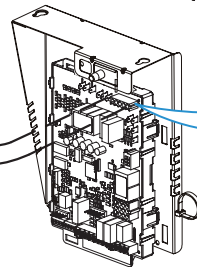
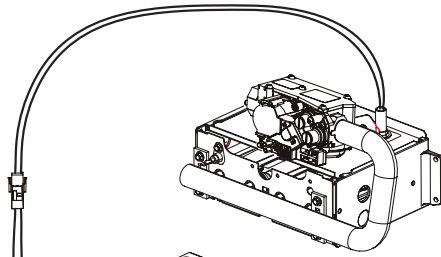
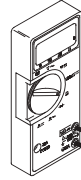


## EL280UHE(X) Ignitor Check Out

### Test 1 Checking resistance of ignitor circuit

Remove 5-pin plug from integrated control.  
Check Ohms reading across terminal 1 and 5.  
Reading should be between 39 and 70 ohms. If value is correct, this is the only test needed. If the meter reading is not correct ("0" or infinity), then a second test is needed.

Meter  
(set to ohms)

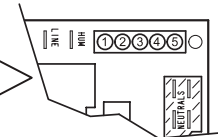
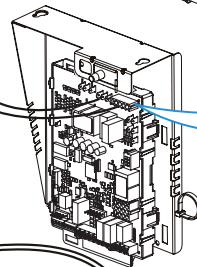
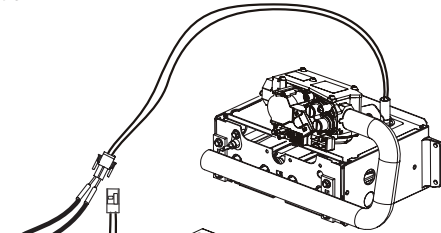
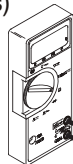


Integrated control detail

### Test 2 Checking the resistance of the ignitor

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

Meter  
(set to ohms)

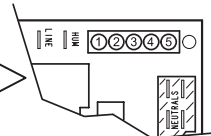
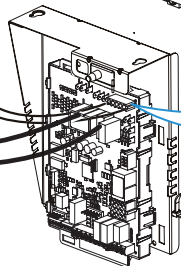
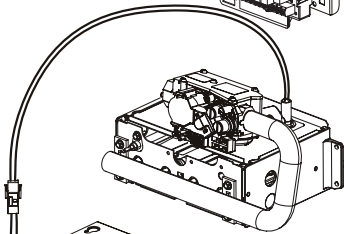
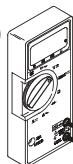


Integrated control detail

### Test 3 Checking voltage to ignitor

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

Meter  
(set to AC volts)



Integrated control detail

FIGURE 16

## 7. Combustion Air Inducer (B6)

All EL280UHE(X) units use a two-stage combustion air inducer to move air through the burners and heat exchanger during heating operation. The blower uses a 120VAC motor. The motor operates during all heating operation and is controlled by integrated control A92. The inducer also operates for 15 seconds before burner ignition (pre-purge) and for 5 seconds after the gas valve closes (post-purge). The inducer operates on low speed during first-stage heat, then switches to high speed for second stage heat.

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

A pressure switch connected to the combustion air inducer orifice plate is used to prove inducer operation. The combustion air inducer orifice will be different for each model. See TABLE 10 for orifice sizes. The switch monitors air pressure in the inducer housing. During normal operation, the pressure in the housing is negative. If pressure becomes less negative (signifying an obstruction in the flue) the proving switch opens. When the proving switch opens, the furnace control (A92) immediately closes the gas valve to prevent burner operation.

**TABLE 10**

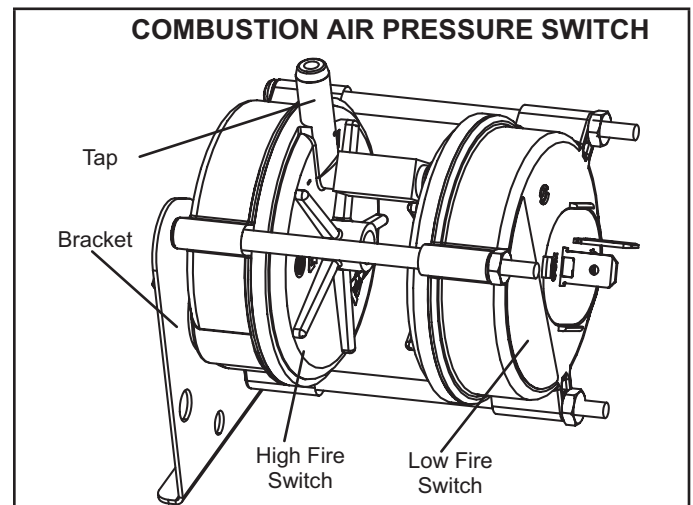
EL280UHE(X) Unit	C.A.I. Orifice Size (in)
-045E36A	1.063
-070E36A	1.375
-090E36B	1.625
-090E48B	1.690
-110E48C	1.875
-110E60C	1.875

## 8. Combustion Air Inducer pressure Switch (S18)

EL280UHE(X) series units are equipped with a dual combustion air pressure switch (first and second stage) located on the combustion air inducer orifice bracket. See FIGURE 17. The switch is connected to the combustion air inducer housing by means of a flexible silicone hose. It monitors negative air pressure in the combustion air inducer housing.

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

On heat demand (first or second stage) the switch senses that the combustion air inducer is operating. It closes a circuit to the integrated control when pressure inside the combustion air inducer decreases to a certain set point. Set points vary depending on unit size. See TABLE 11. The pressure sensed by the switch is negative relative to atmospheric pressure. If the flue becomes obstructed during operation, the switch senses a loss of negative pressure (pressure becomes more equal with atmospheric pressure) and opens the circuit to the furnace control and gas valve. A bleed port on the switch allows relatively dry air in the vestibule to purge switch tubing, to prevent condensate build up.



**FIGURE 17**

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

**TABLE 11**

**0 - 4500 FT**

EL280UHE(X) Unit	Set Point Low Heat (in w.c.)	Set Point High Heat (in w.c.)
-045E36A	0.30	0.68
-070E36A	0.35	
-090E36B	0.30	
-090E48B		
-110E48C		
-110E60C		

**NOTE** - See table 15 for high altitude pressure switch kits.

## Multiple Venting

The EL280UHE(X) furnace can vent in multiple positions. See FIGURE 18.

The make up box may be removed and the combustion air inducer may be rotated clockwise or counterclockwise 90° to allow for vertical or horizontal vent discharge in a vertical or horizontal cabinet position. Remove the four mounting

screws, rotate the combustion air inducer and gasket (pressure switch should be above the combustion air inducer in all positions), then reinstall the mounting screws. See unit Installation Instructions for more detail.

### **! IMPORTANT**

**The combustion air pressure switch must be moved for horizontal discharge air left position.**

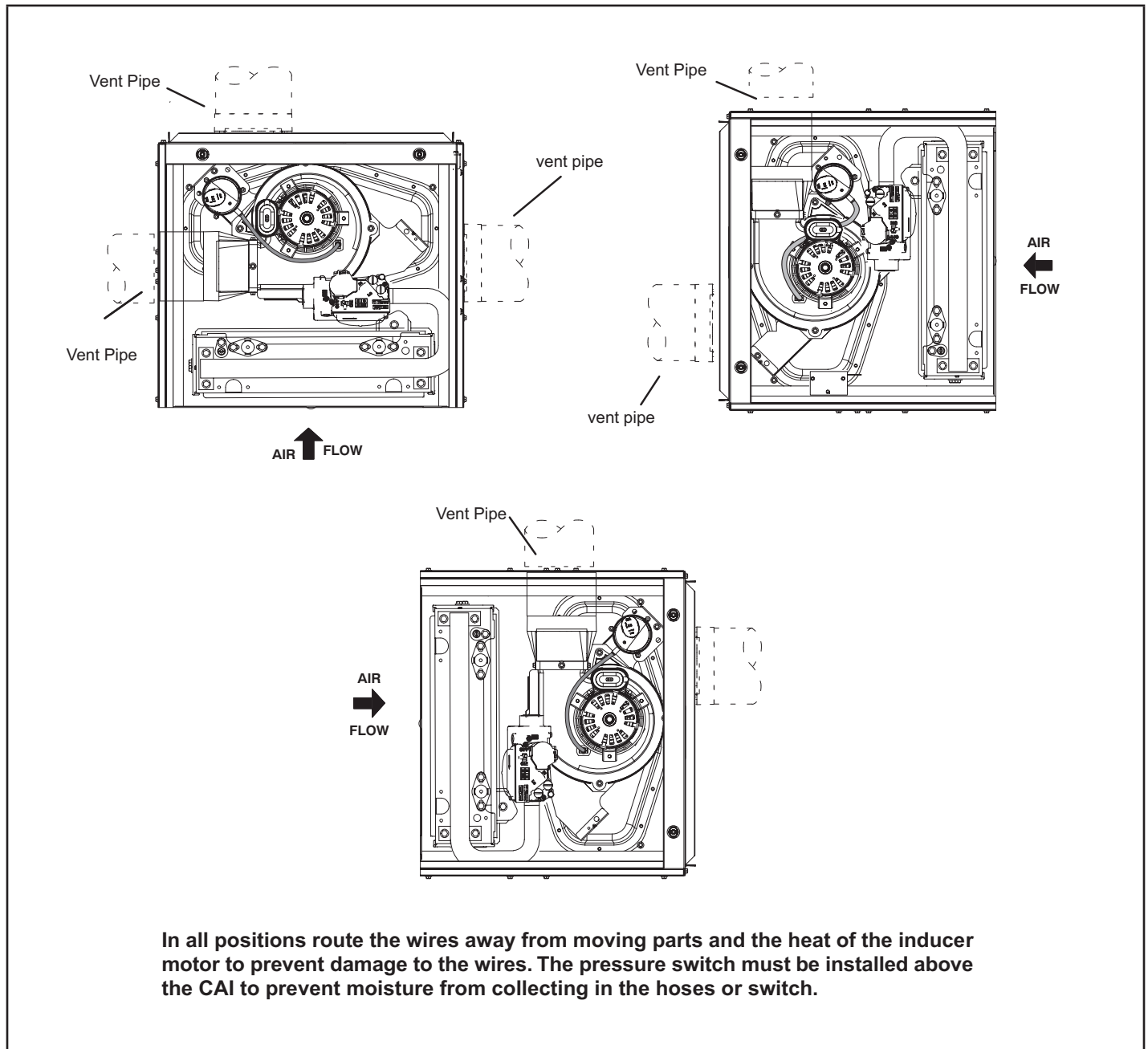


FIGURE 18

## II-PLACEMENT AND INSTALLATION

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

## III-START-UP

### A-Preliminary and Seasonal Checks

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

### B-Heating Start-Up

## ⚠ WARNING

Shock and burn hazard.

**EL280UHE(X) units are equipped with a hot surface ignition system. Do not attempt to light manually.**

- 1 - **STOP!** Read the safety information at the beginning of this section.
- 2 - Set the thermostat to the lowest setting.
- 3 - Turn off all electrical power to the unit.
- 4 - This furnace is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.
- 5 - Remove the access panel.
- 6 - Turn switch on gas valve to OFF. Do not force. See FIGURE 19.
- 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.

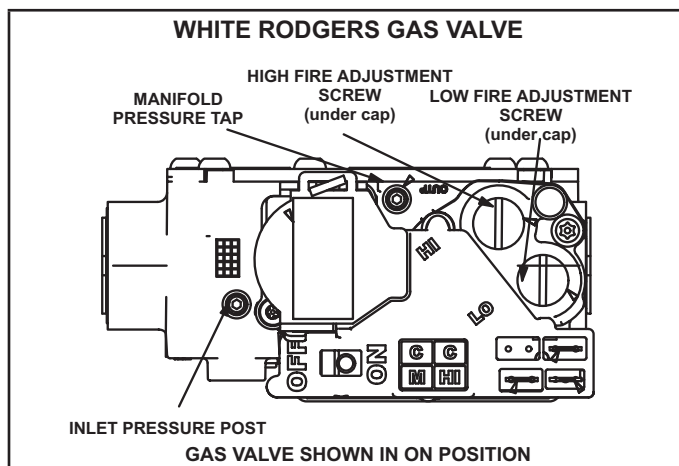


FIGURE 19

- 8 - Move switch on gas valve to ON. Do not force. See FIGURE 19.
- 9 - Replace the access panel.
- 10 - Turn on all electrical power to the unit.
- 11 - Set the thermostat to desired setting.

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

### Turning Off Gas To Unit

- 1 - Set thermostat to lowest setting.
- 2 - Turn off all electrical power to unit if service is to be performed.
- 3 - Remove access panel.
- 4 - Move switch on valve to OFF. Do not force.
- 5 - Replace access panel.

### Failure To Operate

If the unit fails to operate, check the following:

- 1 - Is the thermostat calling for heat?
- 2 - Are access panels securely in place?
- 3 - Is the main disconnect switch closed?
- 4 - Is there a blown fuse or tripped circuit breaker?
- 5 - Is the filter dirty or plugged? Dirty or plugged filters will cause the limit control to shut the unit off.
- 6 - Is gas turned on at the meter?
- 7 - Is the manual main shut-off valve open?
- 8 - Is the gas valve ON/OFF switch in the ON position?
- 9 - Is the unit ignition system in lock out? If the unit locks out again, call the service technician to inspect the unit for blockages.
- 10 - Is pressure switch closed? Obstructed flue will cause unit to shut off at pressure switch. Check flue and outlet for blockages.
- 11 - Are flame rollout switches tripped? If flame rollout switches are tripped, call the service technician for inspection.

### 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.

## IV-HEATING SYSTEM SERVICE CHECKS

### A-CSA Certification

All units are CSA design certified without modifications. Refer to the EL280UHE(X) Installation Instruction.

### B-Gas Piping

## ⚠ WARNING

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

## ⚠ WARNING

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.

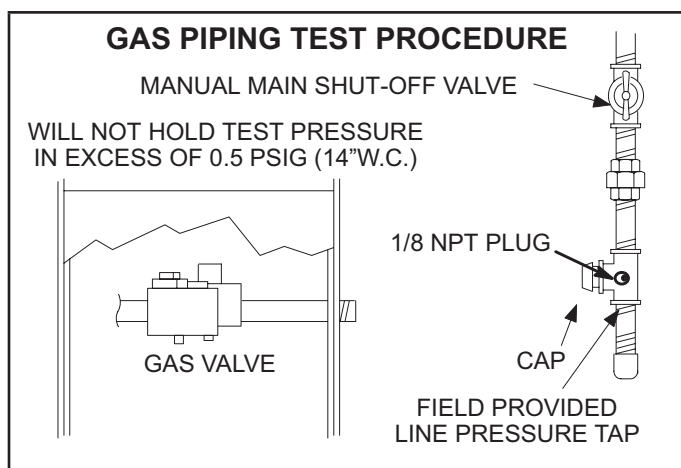
Gas supply piping should not allow more than 0.5"W.C. drop in pressure between gas meter and unit. Supply gas pipe must not be smaller than unit gas connection. Compounds used on gas piping threaded joints should be resistant to action of liquefied petroleum gases.

### C-Testing Gas Piping

**⚠ WARNING**

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

When pressure testing gas lines, the gas valve must be disconnected and isolated. Gas valves can be damaged if subjected to more than 0.5 psig (14" W.C.). See FIGURE 20. If the pressure is greater than 0.5psig (14"W.C.), use the manual shut-off valve before pressure testing to isolate furnace from gas supply.



**FIGURE 20**

When checking piping connections for gas leaks, use preferred means. Kitchen detergents can cause harmful corrosion on various metals used in gas piping. Use of a specialty Gas Leak Detector is strongly recommended. It is available through Lennox under part number 31B2001. See Corp. 8411-L10, for further details.

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

### D-Testing Gas Supply Pressure

A threaded plug on the inlet side of the gas valve provides access to the supply pressure tap. Remove the threaded plug, install a field-provided barbed fitting and connect a manometer to measure supply pressure. See table 14 for supply line pressure. Replace the threaded plug after measurements have been taken.

### E-Check Manifold Pressure

After line pressure has been checked and adjusted, check manifold pressure. Checks of manifold pressure are made as verification of proper regulator adjustment. Manifold pressure for the EL280UHE(X) can be measured at any time the gas valve is open and is supplying gas to the unit.

**⚠ IMPORTANT**

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

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

### Manifold Adjustment Procedure:

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

- 1 - Connect test gauge to manifold pressure post (FIGURE 19) on gas valve.
- 2 - Ignite unit on low fire and let run for 5 minutes to allow for steady state conditions.
- 3 - After allowing unit to stabilize for 5 minutes, record manifold pressure and compare to value given in table 14.
- 4 - If necessary, make adjustments. Figure 18 show location of high fire and low fire adjustment screw.
- 5 - Repeat steps 2, 3 and 4 on high fire.
- 6 - Shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to replace pressure tap plug.
- 7 - Start unit and perform leak check. Seal leaks if found.

### F- Proper Gas Flow (Approximate)

Furnace should operate at least 5 minutes before checking gas flow. Determine time in seconds for two revolutions of gas through the meter. (Two revolutions assures a more accurate time.) Divide by two and compare to time in TABLE 12 below. If manifold pressure matches TABLE 14 and rate is incorrect, check gas orifices for proper size and restriction.

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

**TABLE 12**

GAS METERING CLOCKING CHART				
Input	Natural 1000 btu/ cu ft		LP 2500 btu/cu ft	
	Seconds For One Revolution			
	1 cu ft dial	2 cu fr dial	1 cu ft Dial	2 cu ft Dial
-045	80	160	200	400
-070	55	110	136	272
-090	41	82	102	204
-110	33	66	82	164

**⚠ IMPORTANT**

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



## G- Proper Combustion

Furnace should operate minimum 15 minutes with correct manifold pressure and gas flow rate before checking combustion. See sections E- and F-. Take combustion sample beyond the flue outlet. TABLE 13 shows acceptable combustion for ALL EL280UHE(X) models. The maximum carbon monoxide reading should not exceed 100 ppm.

Firing Rate	CO <sub>2</sub> % Nat	CO <sub>2</sub> % LP
High Fire	6.0 - 7.5	7.0 - 8.5
Low Fire	5.0 - 6.5	5.8 - 7.3

## H- High Altitude

The manifold pressure may require adjustment and combustion air pressure switch may need replacing to ensure proper combustion at higher altitudes. Refer to TABLE 14 for manifold pressure and TABLE 15 for pressure switch change and gas conversion kits.

**TABLE 14**  
Manifold Pressure Settings

Unit Input	Gas	Manifold Pressure in. wg. 0 - 4500 ft		Manifold Pressure in. wg. 4500 - 7500 ft		Manifold Pressure in. wg. 7500 - 10,000 ft <sup>2</sup>		Supply Line Pressure in. w.g.	
		Low Firer	High Fire	Low Fire	High Fire	Low Fire	High Fire	Min	Max
045	Natural	1.7	3.5	1.5	3.2	1.7	3.5	4.5	13.0
	LP/propane <sup>3</sup>	4.5	10.0	4.5	10.0	4.5	10.0	11.0	13.0
070	Natural	1.7	3.5	1.6	3.4	1.7	3.5	4.5	13.0
	LP/propane <sup>3</sup>	4.5	10.0	4.5	10.0	4.5	10.5	11.0	13.0
090	Natural	1.7	3.5	1.5	3.2	1.7	3.5	4.5	13.0
	LP/propane <sup>3</sup>	4.5	10.0	4.5	10.0	4.5	10.0	11.0	13.0
110	Natural	1.7	3.5	1.5	2.8	1.7	3.5	4.5	13.0
	LP/propane <sup>3</sup>	4.5	10.0	4.5	10.0	4.5	10.0	11.0	13.0

<sup>1</sup> This is the only permissible derate for these units.

<sup>2</sup> Natural gas high altitude orifice kit required.

<sup>3</sup> A natural to L.P. propane gas changeover kit is necessary to convert this unit. Refer to the changeover kit installation instruction for the conversion procedure.

NOTE - Units may be installed at altitudes up to 4500 ft. above sea level without modifications.

**TABLE 15**  
Pressure Switch and Gas Conversion Kits at all Altitudes

Unit Input	High Altitude Pressure Switch Kit			High Altitude Natural Gas Kit	LP/Propane Gas Kit		LP/Propane to Natural Kit
	0-4500 ft	4501- 7500 ft	7501-10,000 ft	7501-10,000 ft	0-7500 ft	7501 - 10,000 ft	0 -7500 ft
045	No Change	91W53	73W35	73W37	11K51	11K46	77W09
070		91W53	73W35				
090		91W53	73W35				
110		91W53	73W35				

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

## I- Proper Ground and Voltage

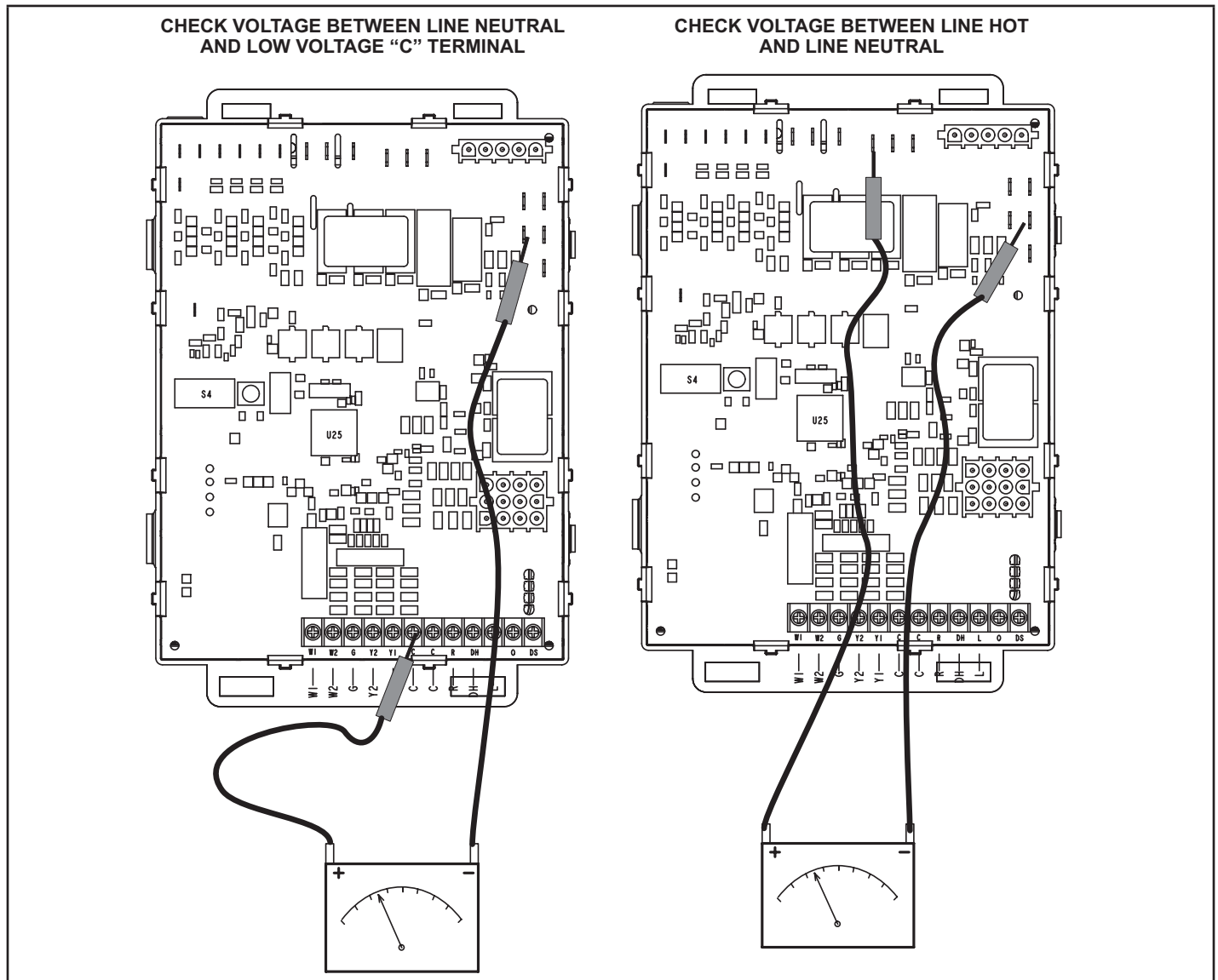
Furnace must be properly grounded for proper performance. Use the following procedure to check for ground and voltage to the integrated control.

- 1 - Measure the AC voltage between Line Neutral (spade terminals) and "C" terminal (low voltage terminal block) on the integrated control. See FIGURE 21. 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 16, 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 21. This voltage should be in the range of 97 to 132 Vac.

**TABLE 16**

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



**FIGURE 21**



## V-TYPICAL OPERATING CHARACTERISTICS

### A-Blower Operation and Adjustment

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

### B-Temperature Rise (FIGURE 22)

Temperature rise for EL280UHE(X) units depends on unit input, blower speed, blower horsepower and static pressure as marked on the unit rating plate. The blower speed must be set for unit operation within the range of "TEMP. RISE °F" listed on the unit rating plate.

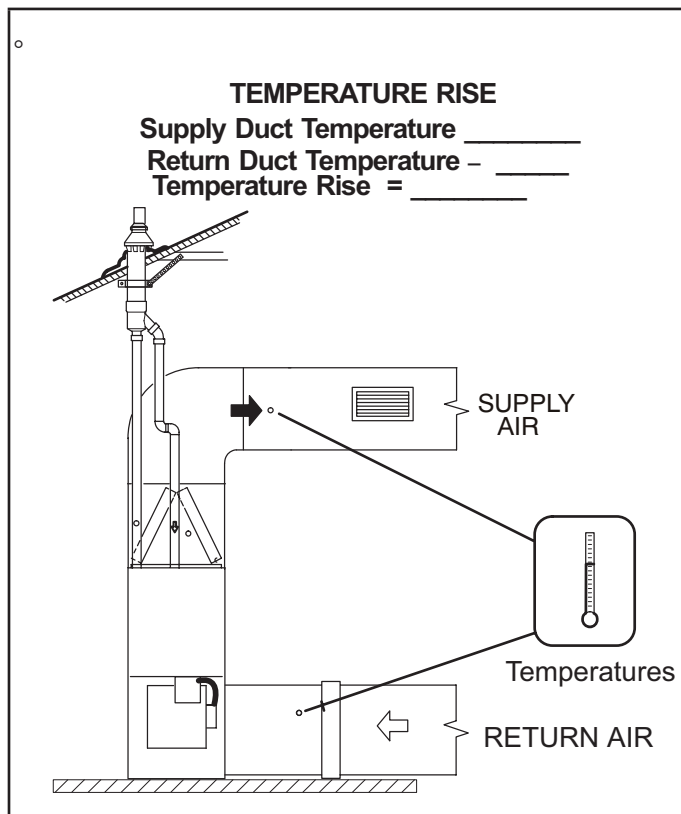


FIGURE 22

### C-External Static Pressure

- 1 - Tap locations shown in FIGURE 23.
- 2 - Punch a 1/4" diameter hole in supply and return air plenums. Insert manometer hose flush with inside edge of hole or insulation. Seal around the hose with permagum. Connect the zero end of the manometer to the discharge (supply) side of the system. On ducted systems, connect the other end of manometer to the return duct as above.
- 3 - With only the blower motor running and the evaporator coil dry, observe the manometer reading. Adjust blower motor speed to deliver the air desired according to the job requirements. For heating speed external static pressure drop must not be more than 0.5" W.C. For cooling speed external static pressure drop must not be more than 0.8" W.C.
- 4 - Seal the hole when the check is complete.

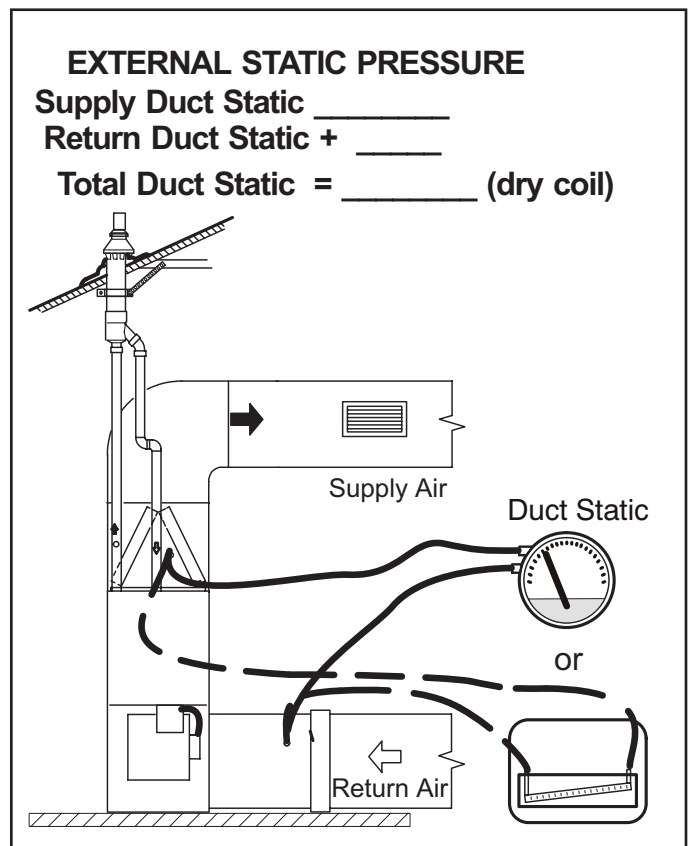


FIGURE 23

## VI-MAINTENANCE

### Annual Furnace Maintenance

At the beginning of each heating season, and to comply with the Lennox Limited Warranty, your system should be checked by a licensed professional technician (or equivalent) as follows:

#### **WARNING**

**Disconnect power before servicing unit.**

#### **IMPORTANT**

**Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.**

#### **WARNING**

**The blower access panel must be securely in place when the blower and burners are operating. Gas fumes, which could contain carbon monoxide, can be drawn into living space resulting in personal injury or death.**

- 1 - Check wiring for loose connections, voltage at indoor unit and amperage of indoor motor.
- 2 - Check the condition of the belt and shaft bearings if applicable.
- 3 - Inspect all gas pipe and connections for leaks.
- 4 - Check the cleanliness of filters and change if necessary (monthly).
- 5 - Check the condition and cleanliness of burners and heat exchanger and clean if necessary.
- 6 - Check the cleanliness of blower assembly and clean the housing, blower wheel and blower motor if necessary. The blower motors are prelubricated for extended bearing life. No further lubrication is needed.
- 7 - Inspect the combustion air inducer and clean if necessary.
- 8 - Evaluate the heat exchanger integrity by inspecting the heat exchanger per the AHRI heat exchanger inspection procedure. This procedure can be viewed at [www.ahrinet.org](http://www.ahrinet.org).

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

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

- 1 - Check the operation of the ignition system, inspect and clean flame sensor. Check microamps before and after. Check controls and safety devices (gas valve, flame sensor, temperature limits). Consult Service Manual for proper operating range. Thermal Limits should be checked by restricting airflow and not disconnecting the indoor blower. For additional details, please see Service and Application Note H049.
- 2 - Verify that system total static pressure and airflow settings are within specific operating parameters.
- 3 - Clock gas meter to ensure that the unit is operating at the specified firing rate. Check the supply pressure and the manifold pressure. On two-stage gas furnaces check the manifold pressure on high fire and low fire. If manifold pressure adjustment is necessary, consult the Service Literature for unit specific information on adjusting gas pressure. Not all gas valves are adjustable. Verify correct temperature rise.

## Cleaning the Heat Exchanger and Burners

**NOTE** - Use papers or protective covering in front of the furnace during cleaning.

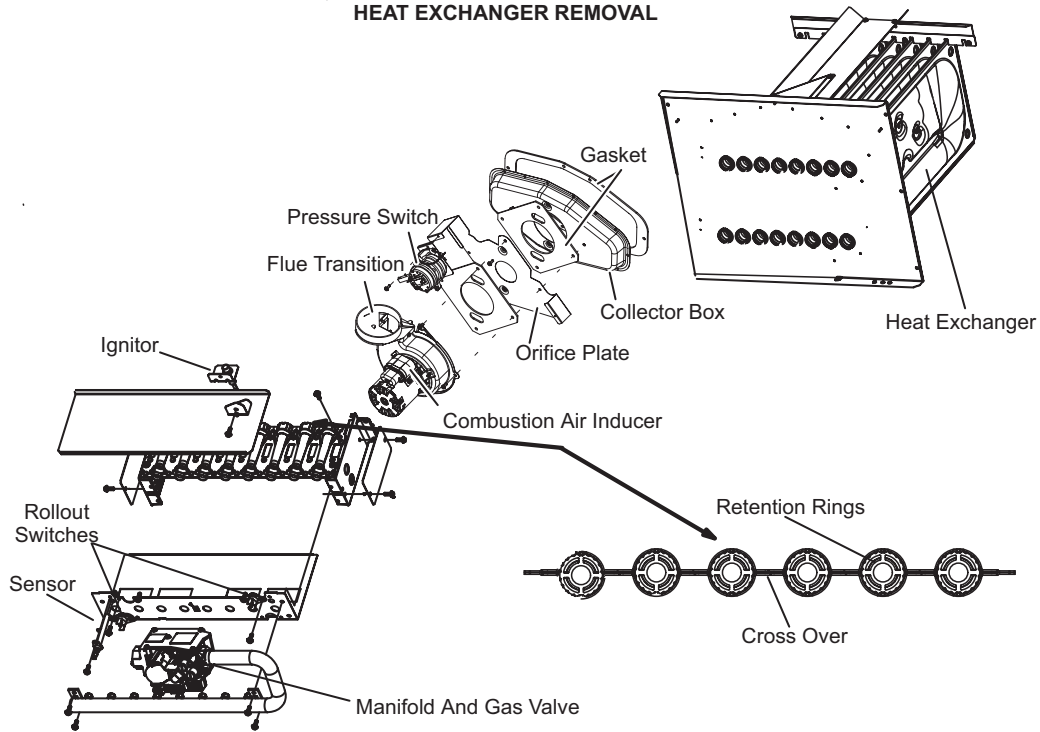
- 1 - Turn off both electrical and gas power supplies to furnace.
- 2 - Remove flue pipe and top cap (some applications top cap can remain) from the unit.
- 3 - Label the wires from gas valve, rollout switches, primary limit switch and make-up box then disconnect them.
- 4 - Remove the screws that secure the combustion air inducer/ pressure switch assembly to the collector box. Carefully remove the combustion air inducer to avoid damaging blower gasket. If gasket is damaged, it must be replaced to prevent leakage.
- 5 - Remove the collector box located behind the combustion air inducer. Be careful with the collector box gasket. If the gasket is damaged, it must be replaced to prevent leakage.
- 6 - Disconnect gas supply piping. Remove the screw securing the burner box cover and remove cover. Remove the four screws securing the burner manifold assembly to the vestibule panel and remove the assembly from the unit.
- 7 - Remove screws securing burner box and remove burner box.
- 8 - **NOx units only** - Remove screw securing NOX insert. Remove NOX insert. FIGURE 25.
- 9 - Remove screws from both sides, top and bottom of vestibule panel.
- 10 - Remove heat exchanger. It may be necessary to spread cabinet side to allow more room. If so, remove five screws from the left side or right side of cabinet. See FIGURE 26.
- 11 - Backwash using steam. Begin from the burner opening on each clam. Steam must not exceed 275°F.
- 12 - To clean burners, run a vacuum cleaner with a soft brush attachment over the face of burners. Visually inspect inside the burners and crossovers for any blockage caused by foreign matter. Remove any blockage. FIGURE 24 shows burner detail.
- 13 - To clean the combustion air inducer visually inspect and using a wire brush clean where necessary. Use compressed air to clean off debris and any rust.
- 14 - Reinstall heat exchanger in vestibule. (Replace the five screws in the cabinet from step 10 if removed).
- 15 - **NOx units only** - Replace NOx inserts.
- 16 - Reinstall collector box and combustion air assembly. Reinstall all screws to the collector box and combustion air inducer. Failure to replace all screws may cause leaks. Inspect gaskets for any damage and replace ifw necessary.
- 17 - Reinstall burner box, manifold assembly and burner box cover.
- 18 - Reconnect all wires.
- 19 - Reconnect top cap and vent pipe to combustion air inducer outlet.
- 20 - Reconnect gas supply piping.
- 21 - Turn on power and gas supply to unit.
- 22 - Set thermostat and check for proper operation.
- 23 - Check all piping connections, factory and field, for gas leaks. Use a leak detecting solution or other preferred means.

### **WARNING**

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

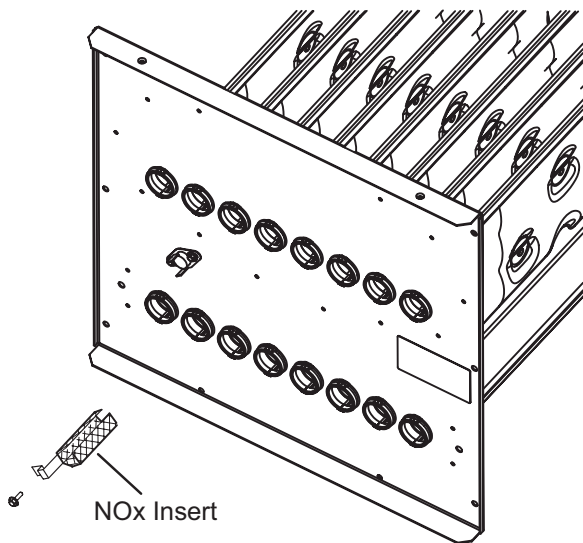
- 24 - If a leak is detected, shut gas and electricity off and repair leak.
- 25 - Repeat steps 24 and 26 until no leaks are detected.
- 26 - 26 -Replace access panel.

**BURNER, COMBUSTION AIR INDUCER ASSEMBLY & HEAT EXCHANGER REMOVAL**



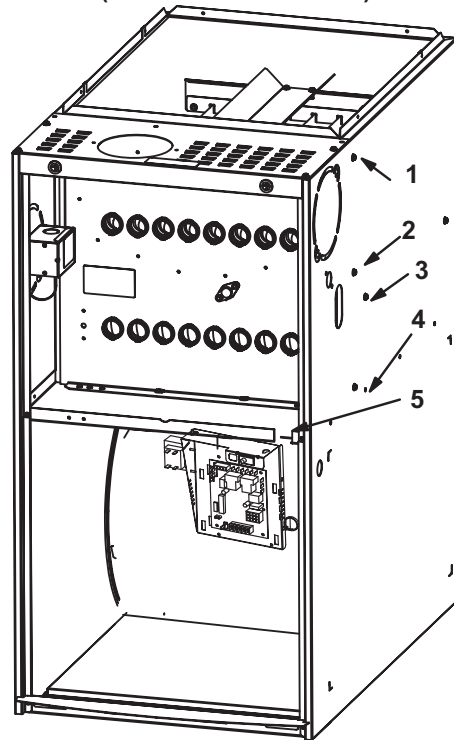
**FIGURE 24**

**EL280UHE(X) NOx INSERTS**



**FIGURE 25**

**Remove 5 screws if necessary  
(either side of cabinet)**

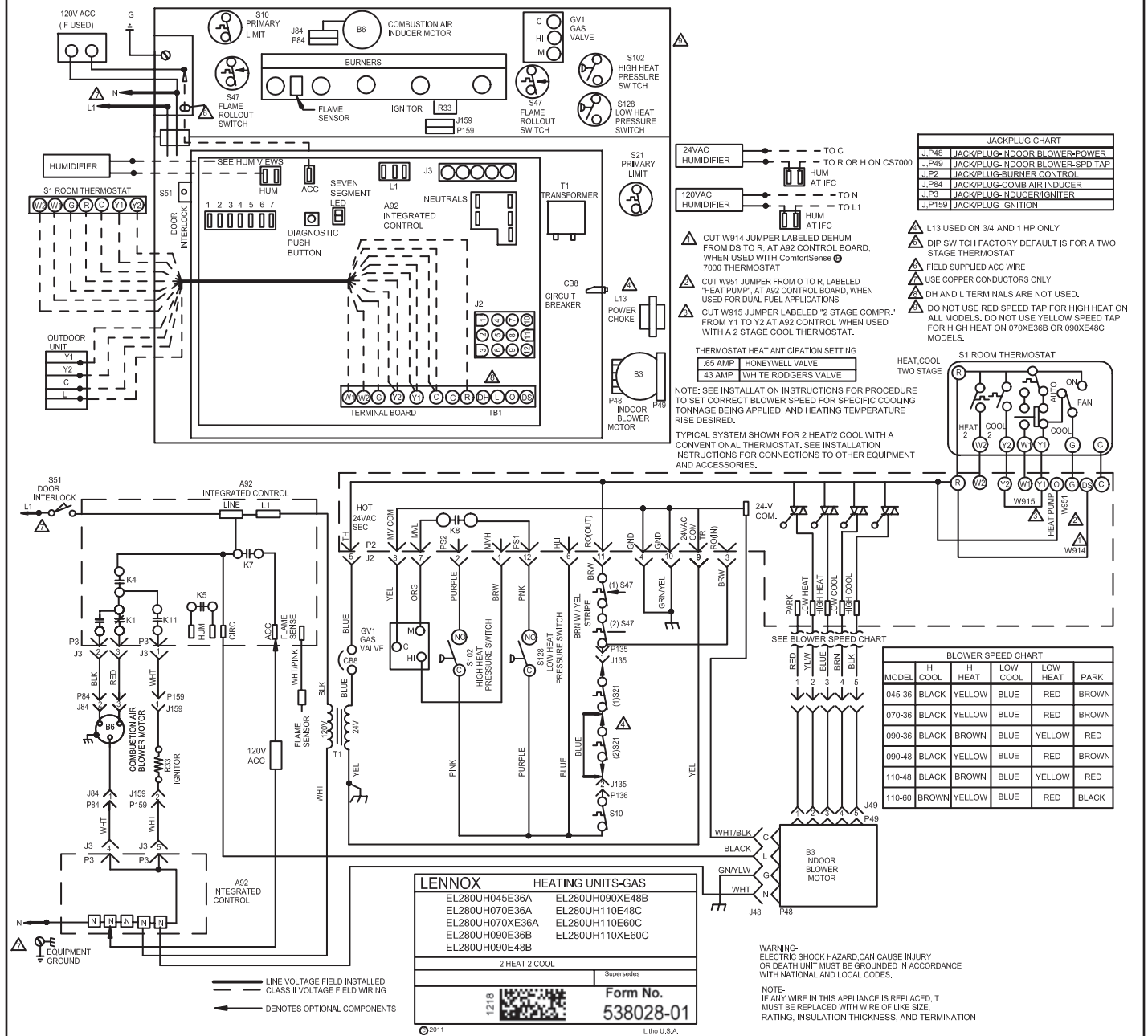


**FIGURE 26**

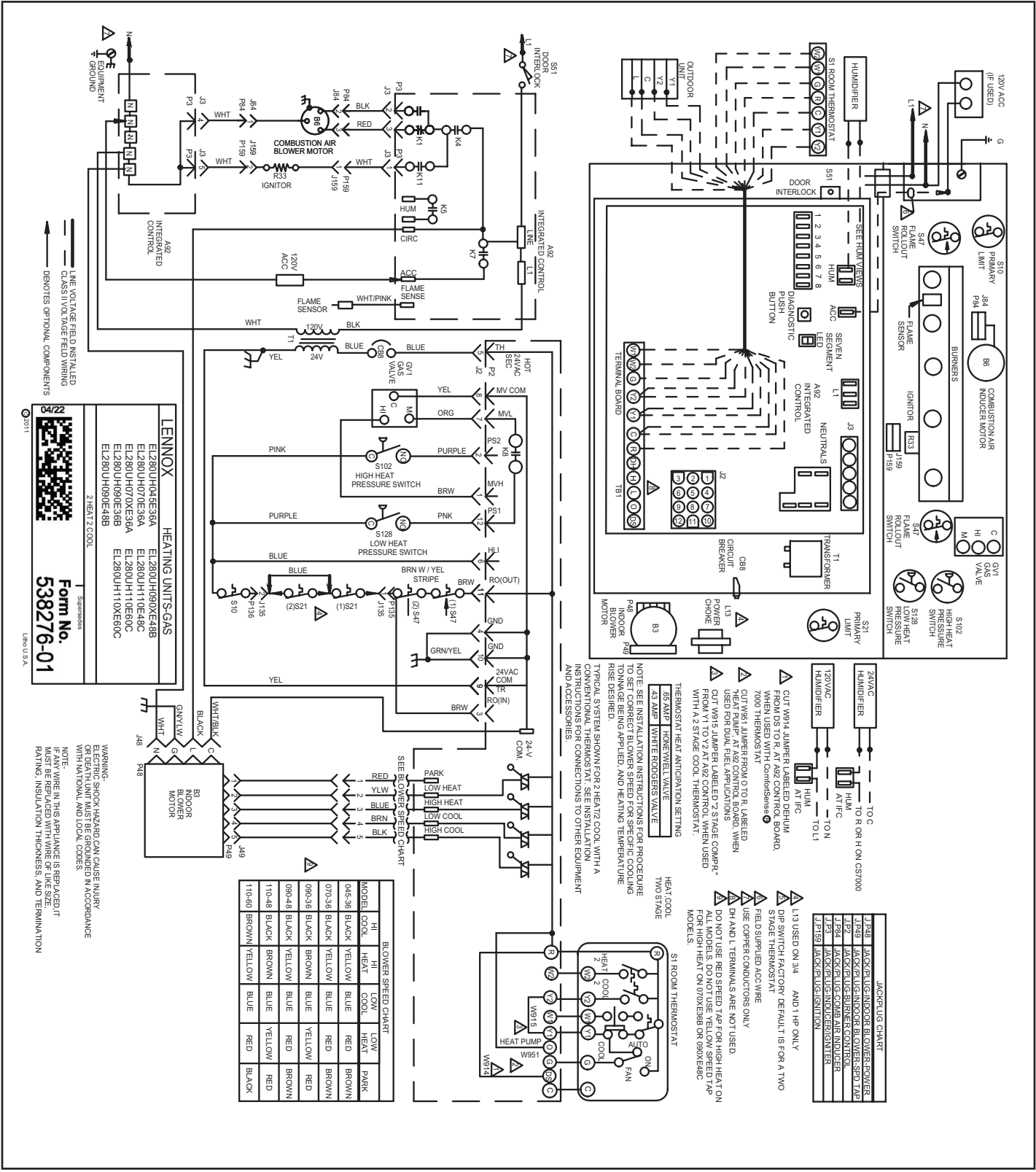
# VII- Wiring and Sequence of Operation

## Wiring Diagram With Integrated Control 103699

### EL280UH(X)E Schematic Wiring Diagram



# Wiring Diagram With Integrated Control 107048



- 24VAC HUMIDIFIER
- 120VAC HUMIDIFIER
- CUT W/4.1 JUMPER LABEL AT R, FROM DS TO R, AT A92 CONTROL BOARD, WHEN USED WITH Combestone® 7000 THERMOSTAT
- CUT W/5.1 JUMPER FROM O TO R, LABELED "HEAT PUMP" AT A92 CONTROL BOARD, WHEN USED FOR DUAL FUEL APPLICATIONS
- CUT W/19. JUMPER LABELLED "STAGE COMP" FROM DS TO R, AT A92 CONTROL BOARD, WHEN USED WITH A 2 STAGE COOL THERMOSTAT.

- TERMOSTAT HEAT ANTICIPATION SETTING
- 43 AMP WHITE RODGERS VALVE
  - 65 AMP HENWELL VALVE
- NOTE: SEE INSTALLATION INSTRUCTIONS FOR PROCEDURE TO SET CORRECT BLOWER SPEED FOR SPECIFIC COOLING TONNAGE BEING APPLIED, AND HEATING TEMPERATURE RISE DESIRED.
- TYPICAL SYSTEM SHOWN FOR 2 HEATZ COOL WITH A THERMOSTAT. SEE INSTALLATION INSTRUCTIONS FOR CONNECTIONS TO OTHER EQUIPMENT AND ACCESSORIES.



**HEATING UNITS-GAS**

LENNOX

EL280UH045E38A	EL280UH090X44B
EL280UH070E38A	EL280UH110E48C
EL280UH070X38A	EL280UH110E60C
EL280UH090E38B	EL280UH110XE60C
EL280UH090E48B	

2 HEATZ COOL

Form No. 538276-01

WARNING: ELECTRICAL SHOCK HAZARD CAN CAUSE INJURY OR DEATH. DISCONNECT POWER TO THE APPLIANCE BEFORE WORKING ON IT. ALWAYS USE PROPER SAFETY PRACTICES IN ACCORDANCE WITH NATIONAL AND LOCAL CODES.

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

SEE BLOWER SPEED CHART

MODEL	HI	HI	LOW	HEAT	HEAT	PARK
045-36	BLACK	YELLOW	BLUE	RED	BROWN	BROWN
070-36	BLACK	YELLOW	BLUE	RED	BROWN	BROWN
090-36	BLACK	BROWN	BLUE	YELLOW	RED	BROWN
090-48	BLACK	YELLOW	BLUE	RED	BROWN	BROWN
110-48	BLACK	BROWN	BLUE	YELLOW	RED	BROWN
110-60	BROWN	YELLOW	BLUE	RED	BLACK	BLACK

LINE VOLTAGE FIELD INSTALLED CLASS II VOLTAGE DERATED WIRING DENOTES OPTIONAL COMPONENTS



## Electronic Ignition

The two-stage integrated control used in EL280UHE(X) units has an added feature of an internal Watchguard control. The feature serves as an automatic reset device for ignition control lockout caused by ignition failure. After one hour of continuous thermostat demand for heat, the Watchguard will break and remake thermostat demand to the furnace and automatically reset the control to begin the ignition sequence.

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

**Applications Using a Two-Stage Thermostat**  
See FIGURE 27 for ignition control sequence

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

- 1 - On a call for heat, thermostat first-stage contacts close sending a signal to the integrated control. The integrated control runs a self-diagnostic program and checks high temperature limit switches for normally closed contacts and pressure switches for normally open contacts. The combustion air inducer is energized at low speed.
- 2 - Once the control receives a signal that the low pressure switch has closed, the combustion air inducer begins a 15-second pre-purge in low speed.  
**NOTE** - If the low fire pressure switch does not close the combustion air inducer will switch to high fire. After a 15 second pre-purge the high fire pressure switch will close and the unit will begin operation on high fire. After 10 to 20 seconds of high fire operation the unit will switch to low fire..
- 3 - After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at low speed.
- 4 - After the 20-second warm-up period has ended, the gas valve is energized on low fire (first stage) and ignition occurs. At the same time, the control module sends a signal to begin an indoor blower 30-second ON-delay.

When the delay ends, the indoor blower motor is energized on the low fire heating speed, the HUM contacts close energizing the humidifier and 120V ACC terminal is energized. The furnace will continue this operation as long as the thermostat has a first-stage heating demand.

**NOTE** - If the indoor thermostat is set on CONTINUOUS FAN ON mode, the furnace will light on high fire (second-stage) for 60 seconds to improve heat exchanger warm up. After 60 second warm-up period, furnace will switch to low fire (first-stage).

- 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, the integrated control energizes the combustion air inducer at high speed. The control also checks the high fire (second stage) pressure switch to make sure it is closed. The high fire (second stage) gas valve is energized and the indoor blower motor is energized for operation at the high fire heating speed.
- 7 - When the demand for high fire (second stage) heat is satisfied, the combustion air inducer is switched to the low-fire heating speed and the high-fire (second stage) gas valve is de-energized. The low-fire (first stage) gas valve continues operation. The indoor blower motor is switched to the low-fire heating speed.
- 8 - When the thermostat demand for low-fire (first stage) heat is satisfied, the gas valve is de-energized and the field-selected indoor blower off delay begins. The combustion air inducer begins a 5-second post-purge period.
- 9 - When the combustion air post-purge period is complete, the inducer and the HUM contacts are de-energized. The indoor blower is de-energized at the end of the off delay as well as the 120V ACC terminal.



## Applications Using A Single-Stage Thermostat

See FIGURE 28 for ignition control sequence

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

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

1 - On a call for heat, thermostat first-stage contacts close sending a signal to the integrated control. The integrated control runs a self-diagnostic program and checks high temperature limit switches for normally closed contacts and pressure switches for normally open contacts. The combustion air inducer is energized at low speed.

2 - Once the control receives a signal that the low pressure switch has closed, the combustion air inducer begins a 15-second pre-purge in low speed.

**NOTE** - If the low fire pressure switch does not close the combustion air inducer will switch to high fire. After a 15 second pre-purge the high fire pressure switch will close and the unit will begin operation on high fire.

3 - After 10 to 20 seconds of high fire operation the unit will switch to low fire. 3. After the pre-purge is complete, a 20-second initial ignitor warm-up period begins. The combustion air inducer continues to operate at low speed.

4 - After the 20-second warm-up period has ended, the gas valve is energized on low fire (first stage) and ignition occurs. At the same time, the control module sends a signal to begin an indoor blower 30-second ON-delay. When the delay ends, the indoor blower motor is energized on the low fire heating speed and the HUM contacts are energized. The integrated control also initiates a second-stage on delay (factory-set at 7 minutes; adjustable to 12 minutes).

5 - If the heating demand continues beyond the secondstage on delay, the integrated control energizes the combustion air inducer at high speed. The control also checks the high fire (second stage) pressure switch to make sure it is closed. The high fire (second stage) gas valve is energized and the indoor blower motor is energized for operation at the high fire heating speed.

6 - When the thermostat heating demand is satisfied, the combustion air inducer begins a 5-second low speed post-purge. The field-selected indoor blower off delay begins. The indoor blower operates at the low-fire heating speed.

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

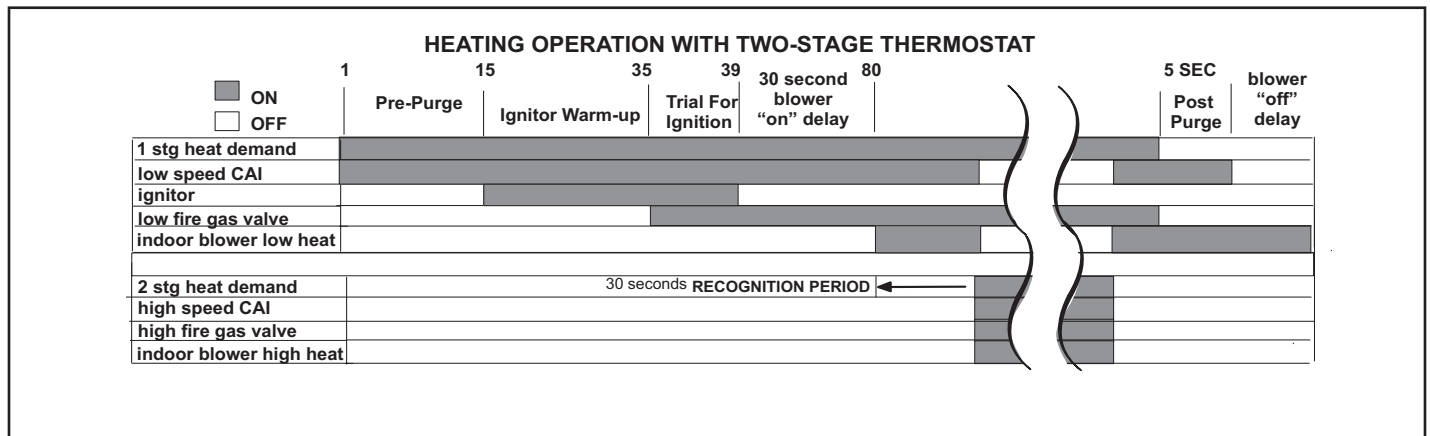


FIGURE 27

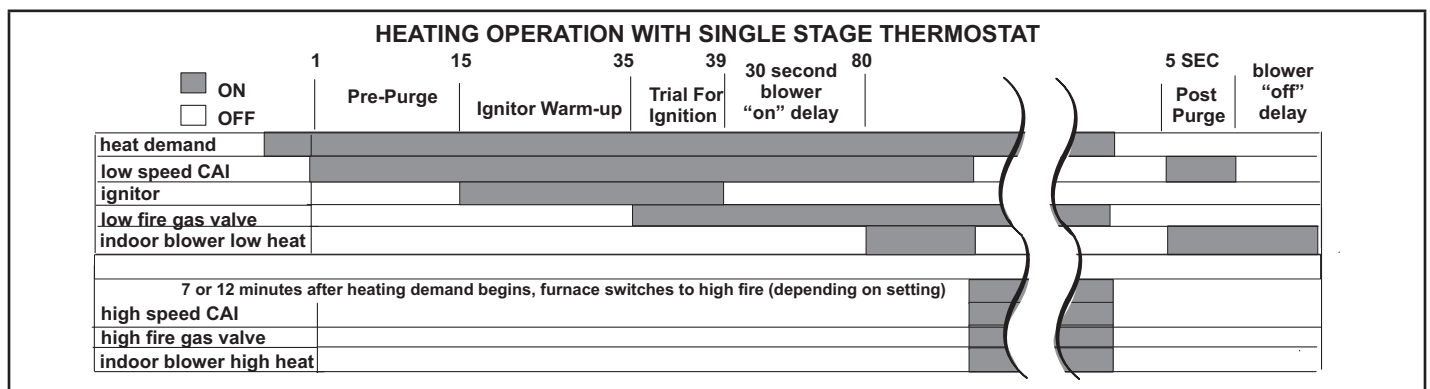


FIGURE 28

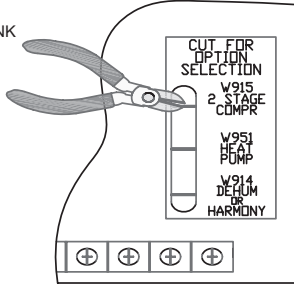
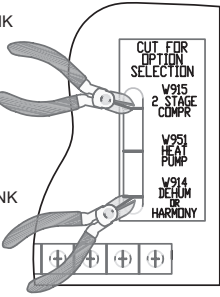
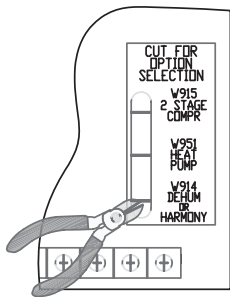
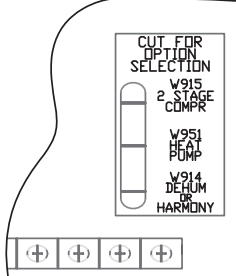
VIII- Field Wiring and DIP Switch Settings

TABLE 17

Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections																														
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options																															
1 Heat / 1 Cool <i>NOTE - Use DIP switch 2 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.</i>	ON	DO NOT CUT ANY ON-BOARD LINKS 	<table border="0"> <tr> <td>S1 T'STAT</td> <td>FURNACE TERM. STRIP</td> <td>OUTDOOR UNIT</td> </tr> <tr> <td></td> <td>(DS)</td> <td></td> </tr> <tr> <td>(W2)</td> <td>(W2)</td> <td></td> </tr> <tr> <td>(W1)-----</td> <td>(W1)</td> <td></td> </tr> <tr> <td>(R)-----</td> <td>(R)</td> <td>*----- (R)</td> </tr> <tr> <td>(G)-----</td> <td>(G)</td> <td></td> </tr> <tr> <td>(C)-----</td> <td>(C)</td> <td>----- (C)</td> </tr> <tr> <td></td> <td>(Y2)</td> <td></td> </tr> <tr> <td>(Y)-----</td> <td>(Y1)</td> <td>----- (Y1)</td> </tr> <tr> <td></td> <td>(O)</td> <td></td> </tr> </table>	S1 T'STAT	FURNACE TERM. STRIP	OUTDOOR UNIT		(DS)		(W2)	(W2)		(W1)-----	(W1)		(R)-----	(R)	*----- (R)	(G)-----	(G)		(C)-----	(C)	----- (C)		(Y2)		(Y)-----	(Y1)	----- (Y1)		(O)	
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1 Heat / 2 Cool <i>NOTE - Use DIP switch 2 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.</i>	ON	CUT ON-BOARD LINK W915 2 STAGE COMPR 	<table border="0"> <tr> <td>S1 T'STAT</td> <td>FURNACE TERM. STRIP</td> <td>OUTDOOR UNIT</td> </tr> <tr> <td></td> <td>(DS)</td> <td></td> </tr> <tr> <td></td> <td>(W2)</td> <td></td> </tr> <tr> <td>(W)-----</td> <td>(W1)</td> <td></td> </tr> <tr> <td>(R)-----</td> <td>(R)</td> <td>*----- (R)</td> </tr> <tr> <td>(G)-----</td> <td>(G)</td> <td></td> </tr> <tr> <td>(C)-----</td> <td>(C)</td> <td>----- (C)</td> </tr> <tr> <td>(Y2)-----</td> <td>(Y2)</td> <td>----- (Y2)</td> </tr> <tr> <td>(Y1)-----</td> <td>(Y1)</td> <td>----- (Y1)</td> </tr> <tr> <td></td> <td>(O)</td> <td></td> </tr> </table>	S1 T'STAT	FURNACE TERM. STRIP	OUTDOOR UNIT		(DS)			(W2)		(W)-----	(W1)		(R)-----	(R)	*----- (R)	(G)-----	(G)		(C)-----	(C)	----- (C)	(Y2)-----	(Y2)	----- (Y2)	(Y1)-----	(Y1)	----- (Y1)		(O)	
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1 Heat / 2 Cool with t'stat with humidity control <i>NOTE - Use DIP switch 2 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.</i>	ON	CUT ON-BOARD LINK W915 2 STAGE COMPR  CUT ON-BOARD LINK W914 DEHUM OR HARMONY 	<table border="0"> <tr> <td>S1 T'STAT</td> <td>FURNACE TERM. STRIP</td> <td>OUTDOOR UNIT</td> </tr> <tr> <td>(DS)-----</td> <td>(DS)</td> <td></td> </tr> <tr> <td></td> <td>(W2)</td> <td></td> </tr> <tr> <td>(W1)-----</td> <td>(W1)</td> <td></td> </tr> <tr> <td>(R)-----</td> <td>(R)</td> <td>*----- (R)</td> </tr> <tr> <td>(G)-----</td> <td>(G)</td> <td></td> </tr> <tr> <td>(C)-----</td> <td>(C)</td> <td>----- (C)</td> </tr> <tr> <td>(Y2)-----</td> <td>(Y2)</td> <td>----- (Y2)</td> </tr> <tr> <td>(Y1)-----</td> <td>(Y1)</td> <td>----- (Y1)</td> </tr> <tr> <td></td> <td>(O)</td> <td></td> </tr> </table>	S1 T'STAT	FURNACE TERM. STRIP	OUTDOOR UNIT	(DS)-----	(DS)			(W2)		(W1)-----	(W1)		(R)-----	(R)	*----- (R)	(G)-----	(G)		(C)-----	(C)	----- (C)	(Y2)-----	(Y2)	----- (Y2)	(Y1)-----	(Y1)	----- (Y1)		(O)	
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\* Not required on all units.

TABLE 17 Continued

Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections																														
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options																															
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TABLE 17 Continued

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	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options																																														
<p>Dual Fuel Single Stage Heat Pump</p> <p>ComfortSense thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control</p>	OFF		<table border="0"> <tr> <td>T*STAT</td> <td>FURNACE TERM. STRIP</td> <td>HEAT PUMP</td> </tr> <tr> <td>(R)-----</td> <td>(R)-----</td> <td>(R)</td> </tr> <tr> <td>(H)-----</td> <td></td> <td></td> </tr> <tr> <td>(W2)-----</td> <td>(W2) 67M41*</td> <td></td> </tr> <tr> <td>(W1)-----</td> <td>(W1) ← 67M41* →</td> <td>(W1)</td> </tr> <tr> <td>(O)-----</td> <td>(O)-----</td> <td>(O)</td> </tr> <tr> <td>(L)-----</td> <td></td> <td>(L)</td> </tr> <tr> <td>(Y1)-----</td> <td>(Y1)-----</td> <td>(Y)</td> </tr> <tr> <td>(Y2)-----</td> <td></td> <td></td> </tr> <tr> <td>(G)-----</td> <td>(G)-----</td> <td></td> </tr> <tr> <td>(D)-----</td> <td>(DS)</td> <td></td> </tr> <tr> <td>(B)-----</td> <td>(Y2)</td> <td></td> </tr> <tr> <td>(C)-----</td> <td>(C)-----</td> <td>(C)</td> </tr> <tr> <td>(T)-----</td> <td></td> <td>outdoor sensor</td> </tr> <tr> <td>(T)-----</td> <td></td> <td></td> </tr> </table>	T*STAT	FURNACE TERM. STRIP	HEAT PUMP	(R)-----	(R)-----	(R)	(H)-----			(W2)-----	(W2) 67M41*		(W1)-----	(W1) ← 67M41* →	(W1)	(O)-----	(O)-----	(O)	(L)-----		(L)	(Y1)-----	(Y1)-----	(Y)	(Y2)-----			(G)-----	(G)-----		(D)-----	(DS)		(B)-----	(Y2)		(C)-----	(C)-----	(C)	(T)-----		outdoor sensor	(T)-----		
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<p>Dual Fuel Two Stage Heat Pump</p> <p>ComfortSense thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control</p>	OFF		<table border="0"> <tr> <td>T*STAT</td> <td>FURNACE TERM. STRIP</td> <td>HEAT PUMP</td> </tr> <tr> <td>(R)-----</td> <td>(R)-----</td> <td>(R)</td> </tr> <tr> <td>(H)-----</td> <td></td> <td></td> </tr> <tr> <td>(W2)-----</td> <td>(W2) 67M41*</td> <td></td> </tr> <tr> <td>(W1)-----</td> <td>(W1) ← 67M41* →</td> <td>(W1)</td> </tr> <tr> <td>(O)-----</td> <td>(O)-----</td> <td>(O)</td> </tr> <tr> <td>(L)-----</td> <td></td> <td>(L)</td> </tr> <tr> <td>(Y1)-----</td> <td>(Y1)-----</td> <td>(Y1)</td> </tr> <tr> <td>(Y2)-----</td> <td></td> <td>(Y2)</td> </tr> <tr> <td>(G)-----</td> <td>(G)-----</td> <td></td> </tr> <tr> <td>(D)-----</td> <td>(DS)</td> <td></td> </tr> <tr> <td>(B)-----</td> <td>(Y2)</td> <td>Y2 out blue</td> </tr> <tr> <td>(C)-----</td> <td>(C)-----</td> <td>(C)</td> </tr> <tr> <td>(T)-----</td> <td></td> <td>outdoor sensor</td> </tr> <tr> <td>(T)-----</td> <td></td> <td></td> </tr> </table>	T*STAT	FURNACE TERM. STRIP	HEAT PUMP	(R)-----	(R)-----	(R)	(H)-----			(W2)-----	(W2) 67M41*		(W1)-----	(W1) ← 67M41* →	(W1)	(O)-----	(O)-----	(O)	(L)-----		(L)	(Y1)-----	(Y1)-----	(Y1)	(Y2)-----		(Y2)	(G)-----	(G)-----		(D)-----	(DS)		(B)-----	(Y2)	Y2 out blue	(C)-----	(C)-----	(C)	(T)-----		outdoor sensor	(T)-----		
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\* Connect W1 to W1 ONLY if using defrost tempering kit 67M41

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

TABLE 17 Continued

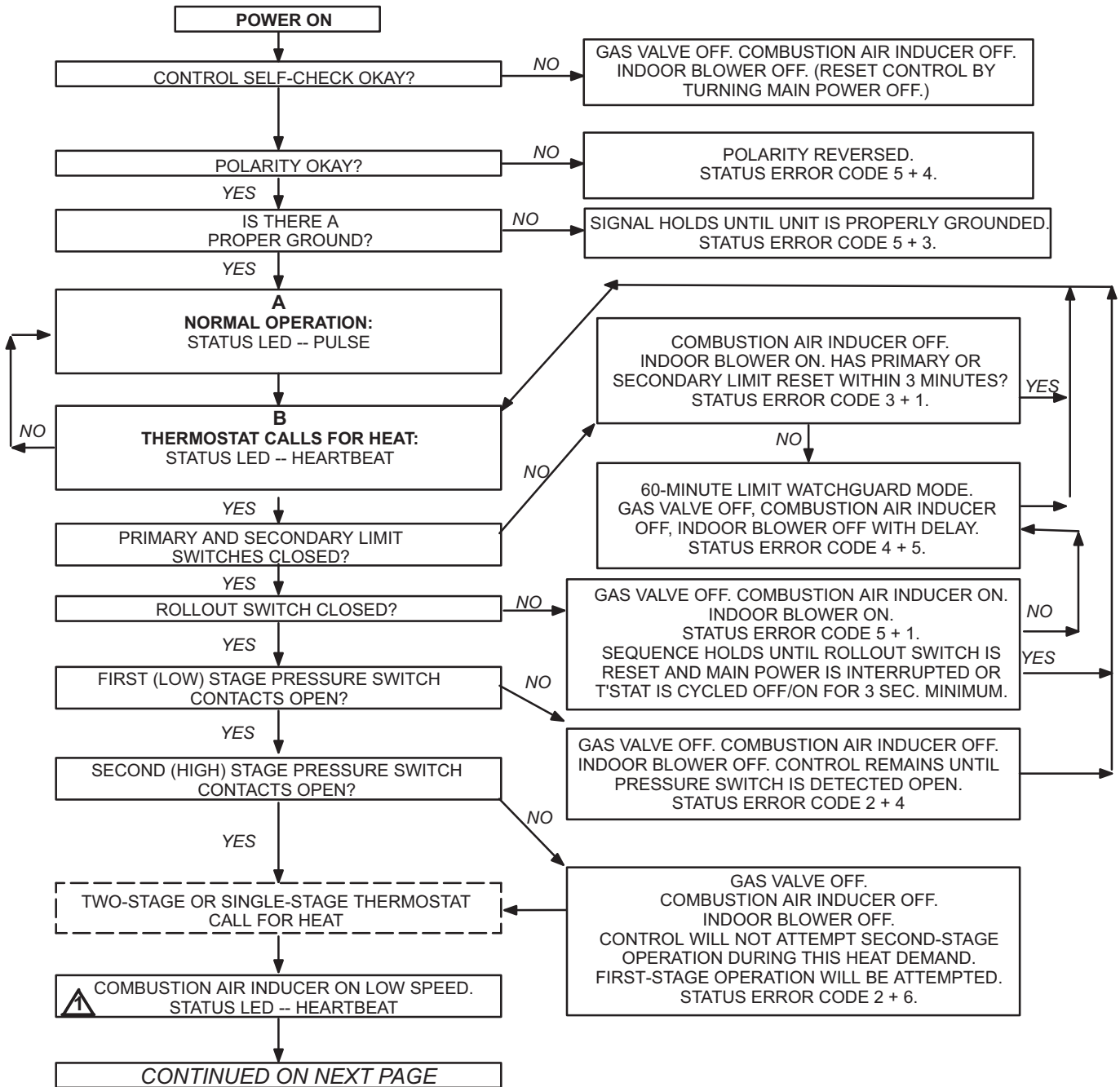
Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options	
<p>Dual Fuel Single Stage Heat Pump</p> <p>ComfortSense thermostat w/ dual fuel capabilities</p> <p>Capable of 2 stage gas heat control w/dehumidification control</p>	OFF	<p>CUT ON-BOARD LINK W951 HEAT PUMP</p> <p>CUT ON-BOARD LINK W914 DEHUM OR HARMONY</p>	<p>T*STAT FURNACE TERM. STRIP HEAT PUMP</p> <p>R --- R --- R</p> <p>H --- W2 67M41* --- W1</p> <p>W1 --- W1</p> <p>O --- O --- O</p> <p>L --- L --- L</p> <p>Y1 --- Y1 --- Y</p> <p>Y2 --- Y2</p> <p>G --- G</p> <p>D --- DS</p> <p>B --- Y2</p> <p>C --- C --- C</p> <p>T --- T</p> <p>T --- outdoor sensor</p>
<p>Dual Fuel Two Stage Heat Pump</p> <p>ComfortSense thermostat w/ dual fuel capabilities</p> <p>Capable of 2 stage gas heat control w/dehumidification</p>	OFF	<p>CUT ON-BOARD LINK W915 2 STAGE COMPR</p> <p>CUT ON-BOARD LINK W951 HEAT PUMP</p> <p>CUT ON-BOARD LINK W914 DEHUM OR HARMONY</p>	<p>T*STAT FURNACE TERM. STRIP HEAT PUMP</p> <p>R --- R --- R</p> <p>H --- W2 67M41* --- W1</p> <p>W1 --- W1</p> <p>O --- O --- O</p> <p>L --- L --- L</p> <p>Y1 --- Y1 --- Y1</p> <p>Y2 --- Y2</p> <p>G --- G</p> <p>D --- DS</p> <p>B --- Y2 --- Y2 out blue</p> <p>C --- C --- C</p> <p>T --- T</p> <p>T --- outdoor sensor</p>

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

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

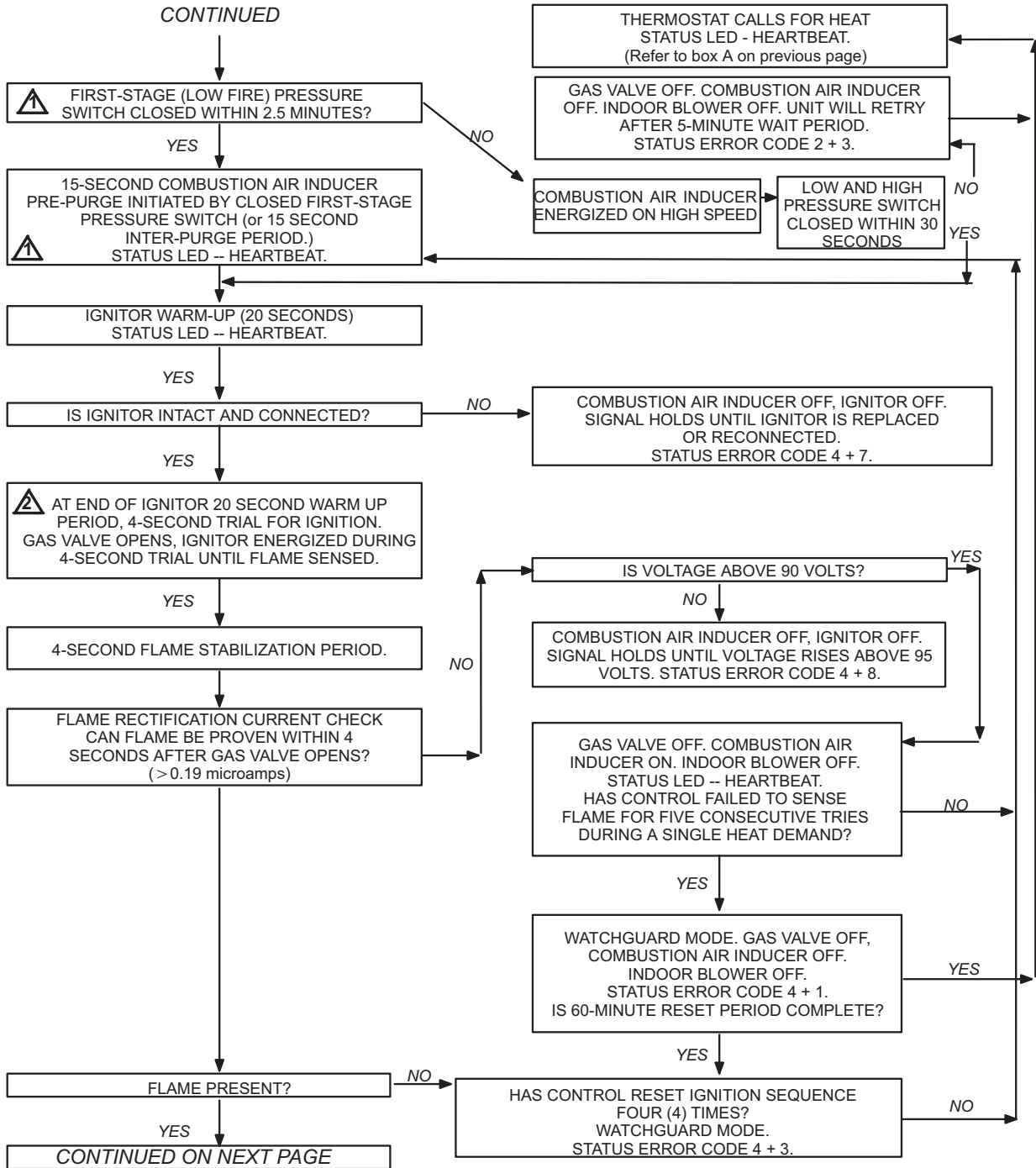
**IX- Troubleshooting**

**HEATING SEQUENCE OF OPERATION  
NORMAL AND ABNORMAL HEATING MODE**



**⚠** If the furnace is operating on continuous fan mode (terminals "R" and "G" are energized), the combustion air inducer will energize on high speed, the gas valve will energize on second-stage heat and the furnace will operate on high fire 60 seconds then switch to low fire.

## HEATING SEQUENCE OF OPERATION

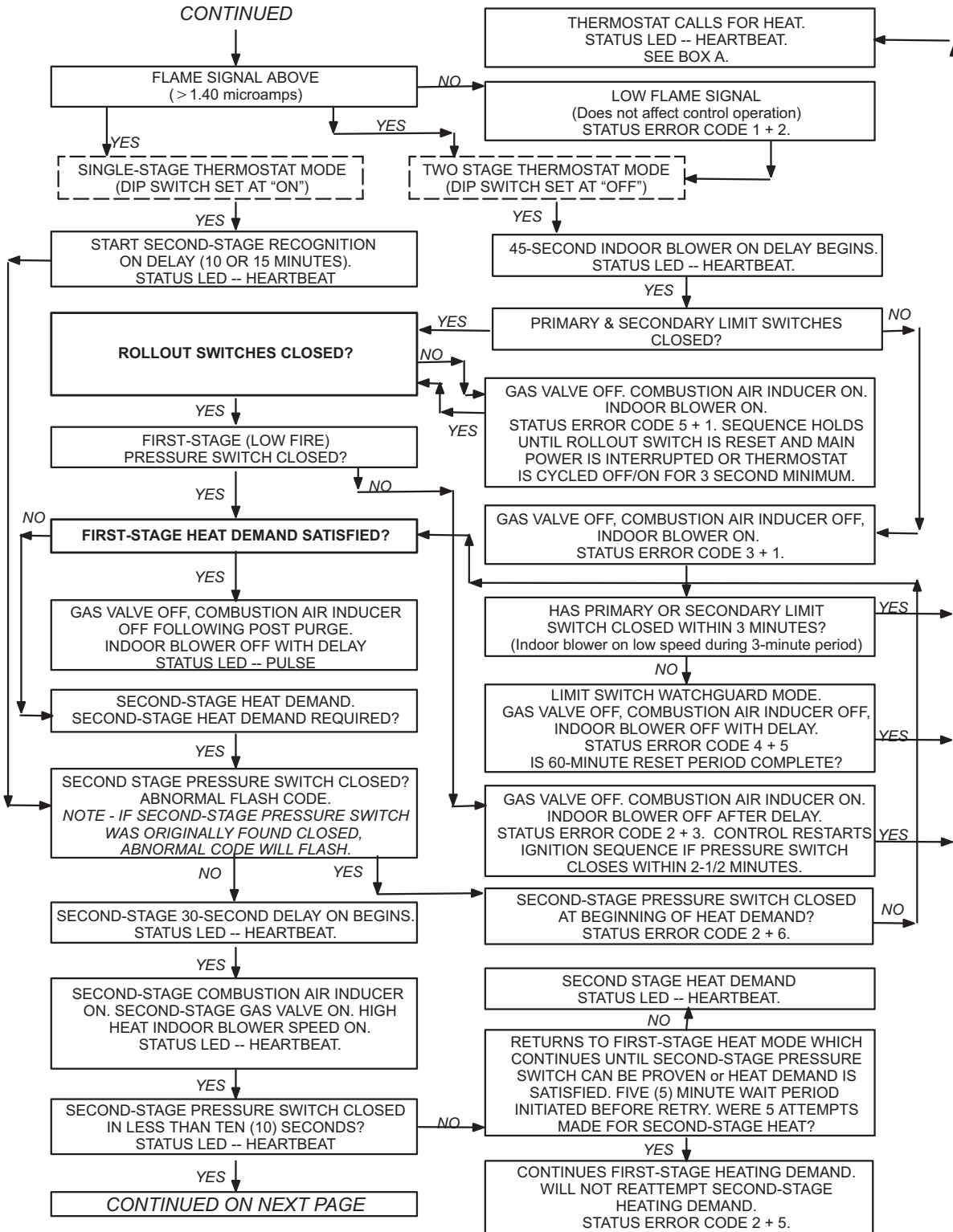


**⚠** If the furnace is operating on continuous fan mode (terminals "R" and "G" are energized), the combustion air inducer will energize on high speed, the gas valve will energize on second-stage heat and the furnace will operate on high fire. Furnace will stay on high fire 60 seconds then switch to low fire.

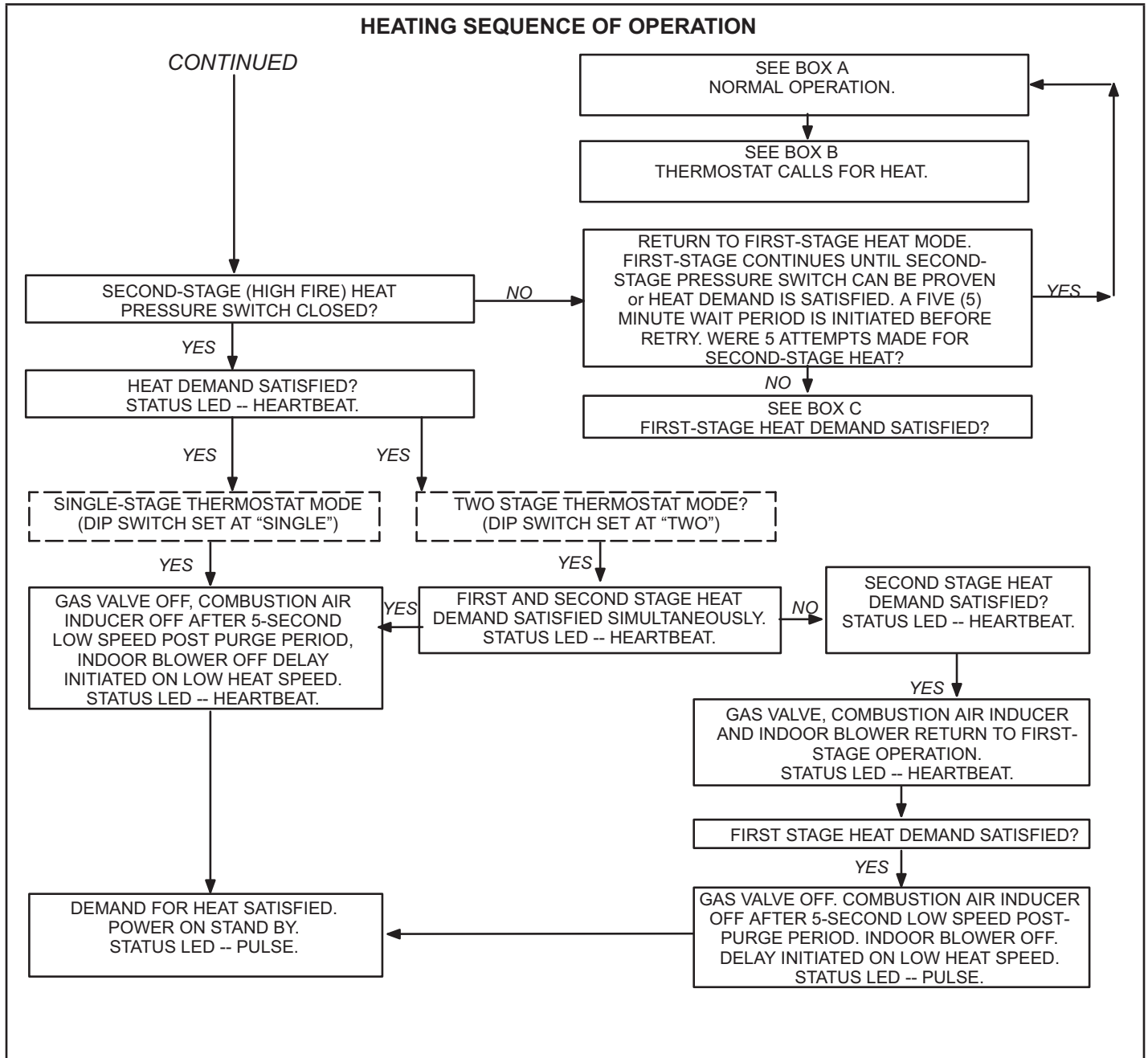
**⚠** If combustion air inducer is operating on high speed and gas valve is energized on second-stage heat, 20 seconds after flame is sensed furnace will switch to low fire.



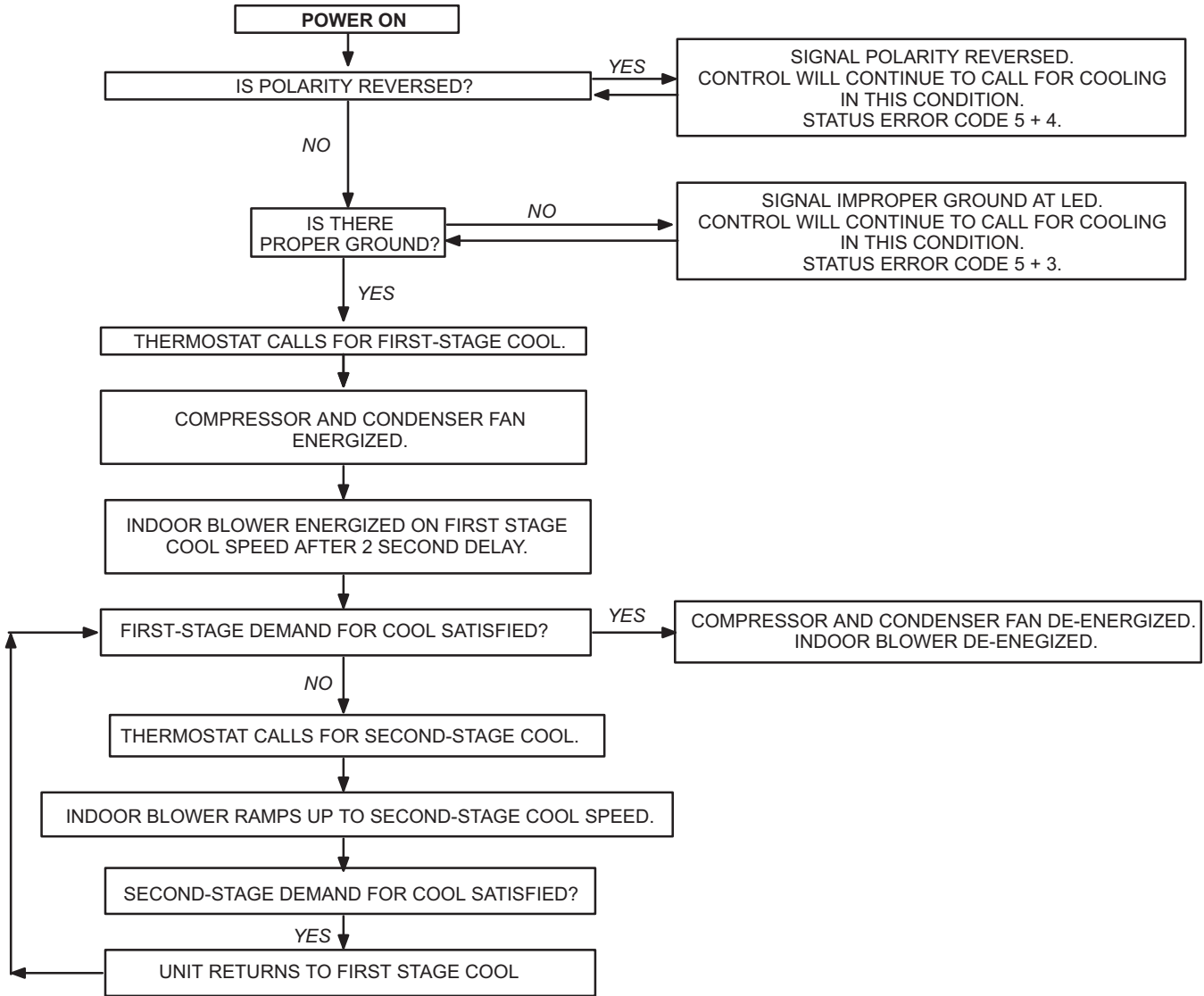
## HEATING SEQUENCE OF OPERATION



## HEATING SEQUENCE OF OPERATION



## COOLING SEQUENCE OF OPERATION



### CONTINUOUS LOW SPEED FAN SEQUENCE OF OPERATION

