

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.



TABLE OF CONTENTS

Specifications Page 2

Blower Performance Data Page 5

Parts Identification. Page 7

I Unit Components Page 8

II Installation Page 26

III Start Up Page 26

IV Heating System Service Checks Page 26

V Typical Operating Characteristics Page 30

VI Maintenance Page 31

VII Wiring and Sequence of Operation Page 34

VIII Field Wiring and DIP Switch Settings Page 38

IX Troubleshooting Flow Chart Page 42

⚠ 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
		¹ AFUE	80%	80%
High Fire	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
Low Fire	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
High static - in. w.g.	Heating		0.5	0.5
	Cooling		0.5	0.5
Connections in.	Flue connection - in. round		4	4
	Gas pipe size IPS		1/2	1/2
Indoor Blower	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
Electrical Data	Voltage		120 volts - 60 hertz - 1 phase	
	Blower motor full load amps		6.1	6.1
	Maximum overcurrent protection		15	15
Shipping Data	lbs. - 1 package		111	121

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

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

SPECIFICATIONS

Gas Heating Performance		Model No.	EL280UH090E36B	EL280UH090E48B
		Model No. - Low NOx	- - -	EL280UH090XE48B
		¹ AFUE	80%	80%
High Fire	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
Low Fire	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
High static - in. w.g.	Heating		0.5	0.5
	Cooling		0.5	0.5
Connections in.	Flue connection - in. round		4	4
	Gas pipe size IPS		1/2	1/2
Indoor Blower	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
Electrical Data	Voltage		120 volts - 60 hertz - 1 phase	
	Blower motor full load amps		6.1	8.2
	Maximum overcurrent protection		15	15
Shipping Data	lbs. - 1 package		136	140

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

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

SPECIFICATIONS

Gas	Model No.	EL280UH110E48C	EL280UH110E60C
Heating	Model No. - Low NOx	- - -	EL280UH110XE60C
Performance	¹ AFUE	80%	80%
High Fire	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.)	3.5 / 10.0	3.5 / 10.0
	Nat. Gas / LPG/Propane		
Low Fire	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.)	1.7 / 4.5	1.7 / 4.5
	Nat. Gas / LPG/Propane		
High static - in. w.g.	Heating	0.5	0.5
	Cooling	0.5	0.5
Connections in.	Flue connection – in. round	4	4
	Gas pipe size IPS	1/2	1/2
Indoor Blower	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
Electrical Data	Voltage	120 volts - 60 hertz - 1 phase	
	Blower motor full load amps	8.2	10
	Maximum overcurrent protection	15	15
Shipping Data	lbs. - 1 package	152	156

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

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

OPTIONAL ACCESSORIES - ORDER SEPARATELY

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

¹ 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	1441	306	1232	168	1056	107	1002	90	1036	103
0.10	1436	310	1199	175	1022	113	875	79	875	82
0.20	1431	315	1166	183	987	120	747	68	714	62
0.30	1413	324	1138	192	938	129	696	76	514	49
0.40	1378	337	1104	199	905	137	640	81	448	55
0.50	1350	345	1070	206	858	146	588	87	367	60
0.60	1321	357	1031	215	824	152	533	93	311	65
0.70	1292	366	993	226	773	159	488	98	272	69
0.80	1267	378	969	233	737	165	426	104	232	73
0.90	1239	385	926	243	691	173	382	108	-	-
1.00	1210	394	891	250	649	179	-	-	-	-

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	1458	302	1325	240	1200	165	966	97	877	78
0.10	1425	314	1300	247	1163	177	922	102	801	75
0.20	1391	326	1275	253	1126	189	877	108	725	71
0.30	1369	336	1245	266	1099	196	840	115	673	77
0.40	1335	348	1217	271	1059	205	796	122	625	85
0.50	1312	355	1183	284	1029	216	761	128	580	87
0.60	1282	366	1156	292	995	223	718	137	530	95
0.70	1255	378	1123	303	959	231	680	144	482	99
0.80	1227	386	1094	309	929	240	638	149	429	107
0.90	1196	397	1065	321	902	247	605	157	371	111
1.00	1170	405	1034	328	865	254	570	165	-	-

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	1768	372	1567	260	1460	199	1350	178	1265	128
0.10	1743	383	1538	269	1419	213	1321	187	1213	141
0.20	1718	395	1509	279	1379	228	1292	195	1161	155
0.30	1681	412	1466	293	1344	237	1245	207	1113	164
0.40	1661	423	1434	307	1298	247	1198	217	1059	172
0.50	1619	435	1396	317	1259	258	1155	227	1017	178
0.60	1592	449	1357	328	1210	270	1106	235	968	188
0.70	1554	460	1313	339	1176	279	1056	244	924	198
0.80	1520	472	1274	348	1131	289	1019	254	873	205
0.90	1457	477	1239	357	1097	295	977	263	821	214
1.00	1291	429	1195	369	1055	306	936	271	738	224

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	1552	289	1463	219	1299	153	1059	89	1169	104
0.10	1524	300	1418	231	1260	167	1012	95	973	86
0.20	1495	311	1374	243	1220	182	965	102	777	67
0.30	1460	322	1323	254	1183	188	908	110	709	73
0.40	1424	334	1297	263	1129	200	853	115	650	82
0.50	1390	343	1259	274	1100	205	802	128	575	87
0.60	1358	357	1227	283	1064	213	736	132	517	96
0.70	1329	364	1185	294	1013	223	684	138	437	100
0.80	1289	376	1144	305	968	232	639	147	380	105
0.90	1246	385	1108	311	929	238	572	152	344	108
1.00	1215	396	1059	323	881	250	510	158	-	-

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	1829	339	1628	240	1493	187	1418	150	1293	128
0.10	1788	355	1586	250	1450	199	1365	166	1241	134
0.20	1747	371	1543	259	1407	210	1313	182	1188	139
0.30	1714	384	1501	273	1369	219	1280	189	1141	149
0.40	1681	395	1458	286	1323	231	1229	197	1088	162
0.50	1638	409	1421	296	1271	240	1174	209	1032	172
0.60	1604	423	1379	308	1227	251	1131	218	981	178
0.70	1569	432	1328	316	1191	259	1083	229	926	189
0.80	1533	447	1285	326	1138	268	1040	236	871	197
0.90	1489	459	1245	338	1089	283	974	249	828	206
1.00	1455	472	1208	348	1045	294	934	255	763	215

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	2242	596	1989	413	1821	327	1713	271	1545	194	2201	590	1946	415	1806	322	1686	264	1523	190
0.10	2196	614	1954	430	1794	337	1674	282	1499	204	2164	611	1911	430	1762	336	1647	279	1473	201
0.20	2151	632	1919	446	1768	347	1634	292	1454	214	2126	631	1876	444	1718	350	1608	294	1424	212
0.30	2115	645	1879	461	1706	364	1592	303	1402	227	2092	646	1839	458	1673	361	1563	306	1373	226
0.40	2084	662	1845	477	1670	377	1555	318	1357	238	2055	662	1800	474	1638	374	1520	317	1324	237
0.50	2062	678	1799	491	1624	390	1507	328	1309	249	2016	678	1764	488	1594	388	1477	328	1275	247
0.60	2016	693	1763	502	1584	402	1464	342	1255	261	1986	691	1727	501	1556	401	1440	339	1230	259
0.70	1991	705	1728	519	1547	413	1428	355	1208	269	1967	705	1684	515	1521	411	1394	352	1172	270
0.80	1950	724	1684	531	1492	426	1374	366	1156	281	1916	720	1656	526	1480	425	1350	364	1141	278
0.90	1912	733	1651	543	1460	439	1322	376	1105	292	1895	734	1618	538	1440	437	1310	376	1092	290
1.00	1876	753	1605	557	1426	450	1291	389	1038	303	1845	752	1577	553	1396	450	1267	389	1046	301

EL280UHE(X) Parts Arrangement

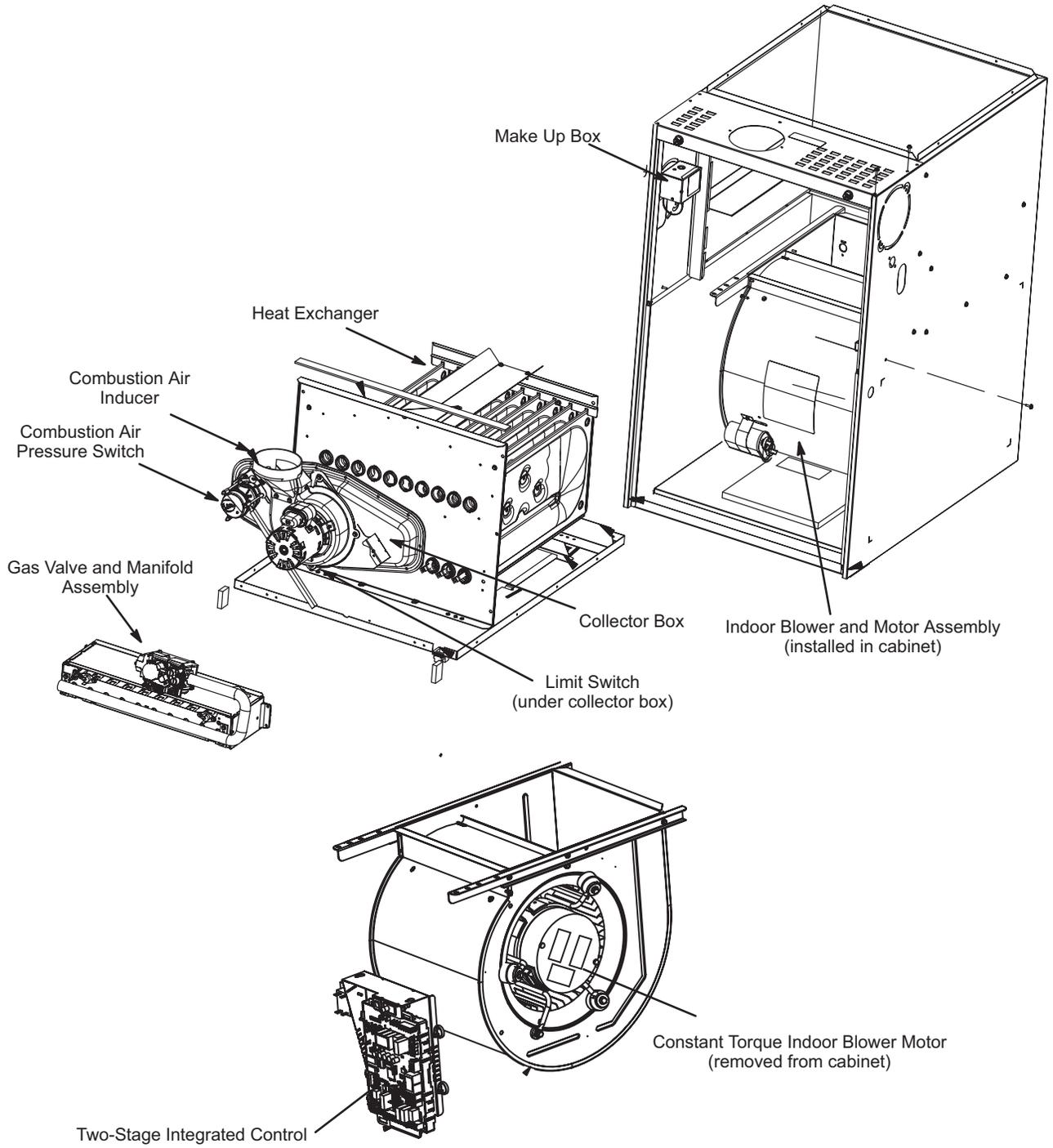


FIGURE 1

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 a Wiring Diagram 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.

ELECTROSTATIC DISCHARGE (ESD) Precautions and Procedures	
⚠ CAUTION	
	Electrostatic discharge can affect electronic components. Take precautions to neutralize electrostatic charge by touching your hand and tools to metal prior to handling the control.

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.

⚠ IMPORTANT
When matching this gas furnace with zoning, defrost tempering stat or other 24V accessories, It is recommended to replace the factory installed transformer with kit 27J32.
Kit 27J32 contains a 75VA transformer, so you do not overload the original 40VA transformer.

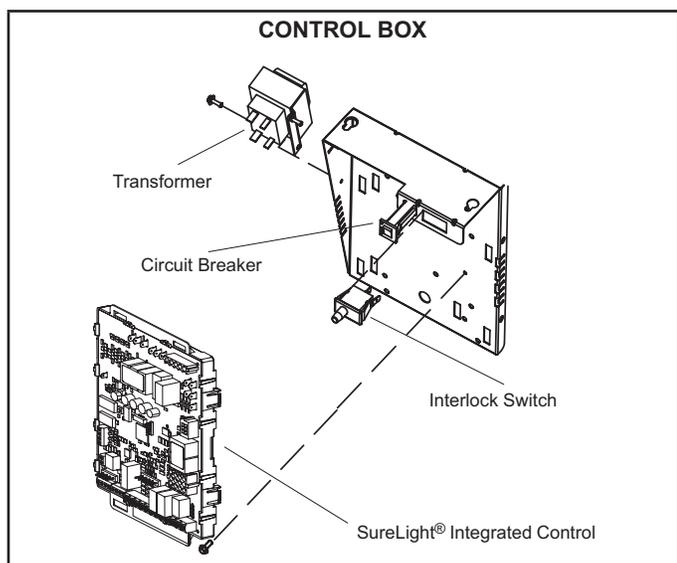


FIGURE 2

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.

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.

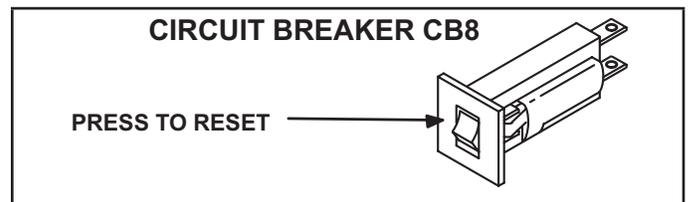


FIGURE 3

4. Integrated Control (A92)

103699 and 107048

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

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.

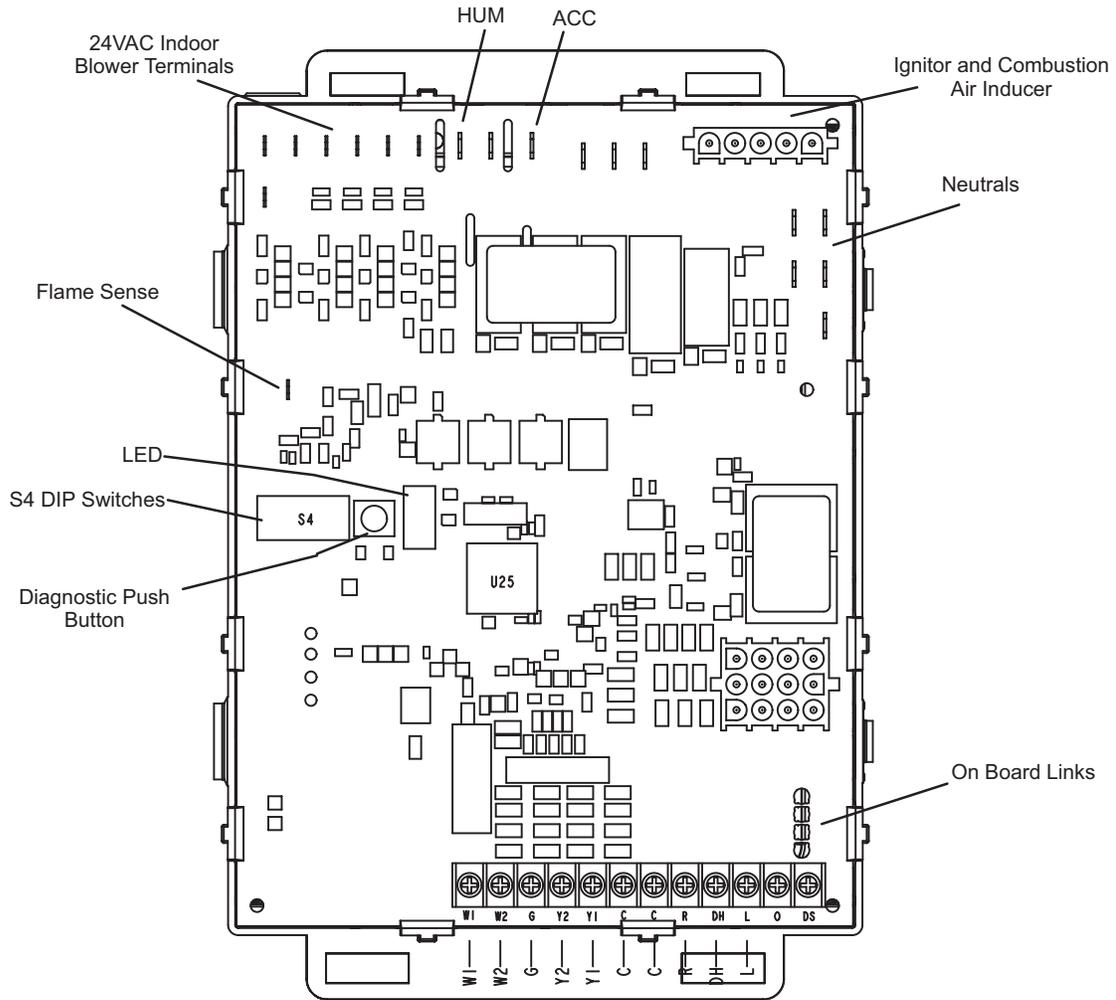
TABLE 1

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

TABLE 2

SureLight® Control 12 Pin Terminal Designation	
Pin #	Function
1	Gas Valve Second Stage
2	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

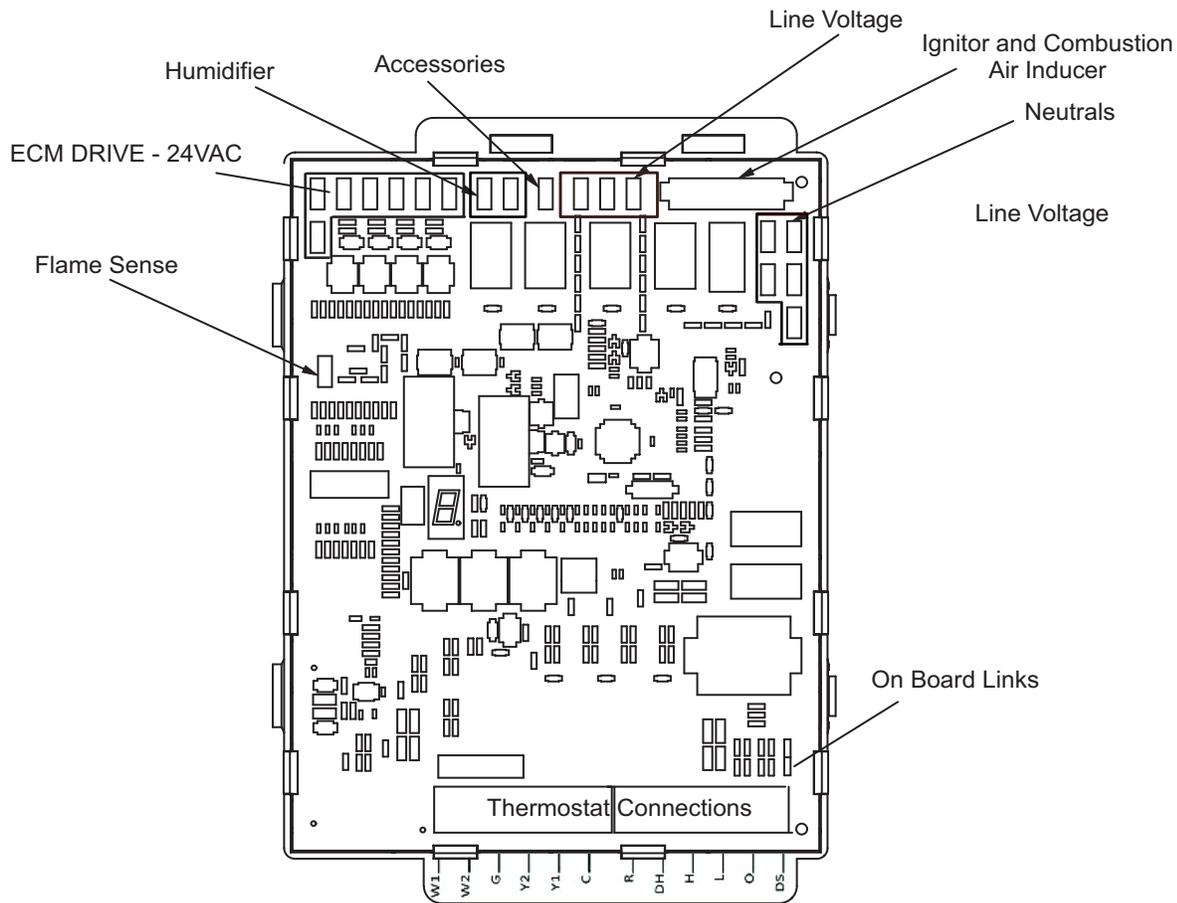
1/4" QUICK CONNECT TERMINALS

- 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



3/16" QUICK CONNECT TERMINALS

- HI COOL (24VAC)
- LO COOL (24VAC)
- HI HEAT (24VAC)
- LO HEAT (24VAC)
- PARK (two un-powered terminals for unused motor speed taps)
- FLAME SENSE

1/4" QUICK CONNECT TERMINALS

- HUM (two un-powered, normally open/dry contacts)
- ACC (120VAC output terminal for optional accessory)
- L1 (three 120VAC line terminals)

THERMOSTAT CONNECTIONS

- DS= Dehumidification signal
- W2= Heat demand from 2nd stage Tstat
- W1= Heat demand from 1st stage Tstat (white)
- R= Class 2 voltage to thermostat
- G= Manual fan from Tstat (green)
- C= Tstat signal ground connected to transformer Ground (TR) & Chasis ground (GRD)
- Y1= Tstat 1st stage cool signal
- Y2= Tstat 2nd stage cool signal
- DH= NOT USED
- H= NOT USED
- L= NOT USED
- O= NOT USED

FIGURE 5

INTEGRATED CONTROL CONFIGURATION GUIDE

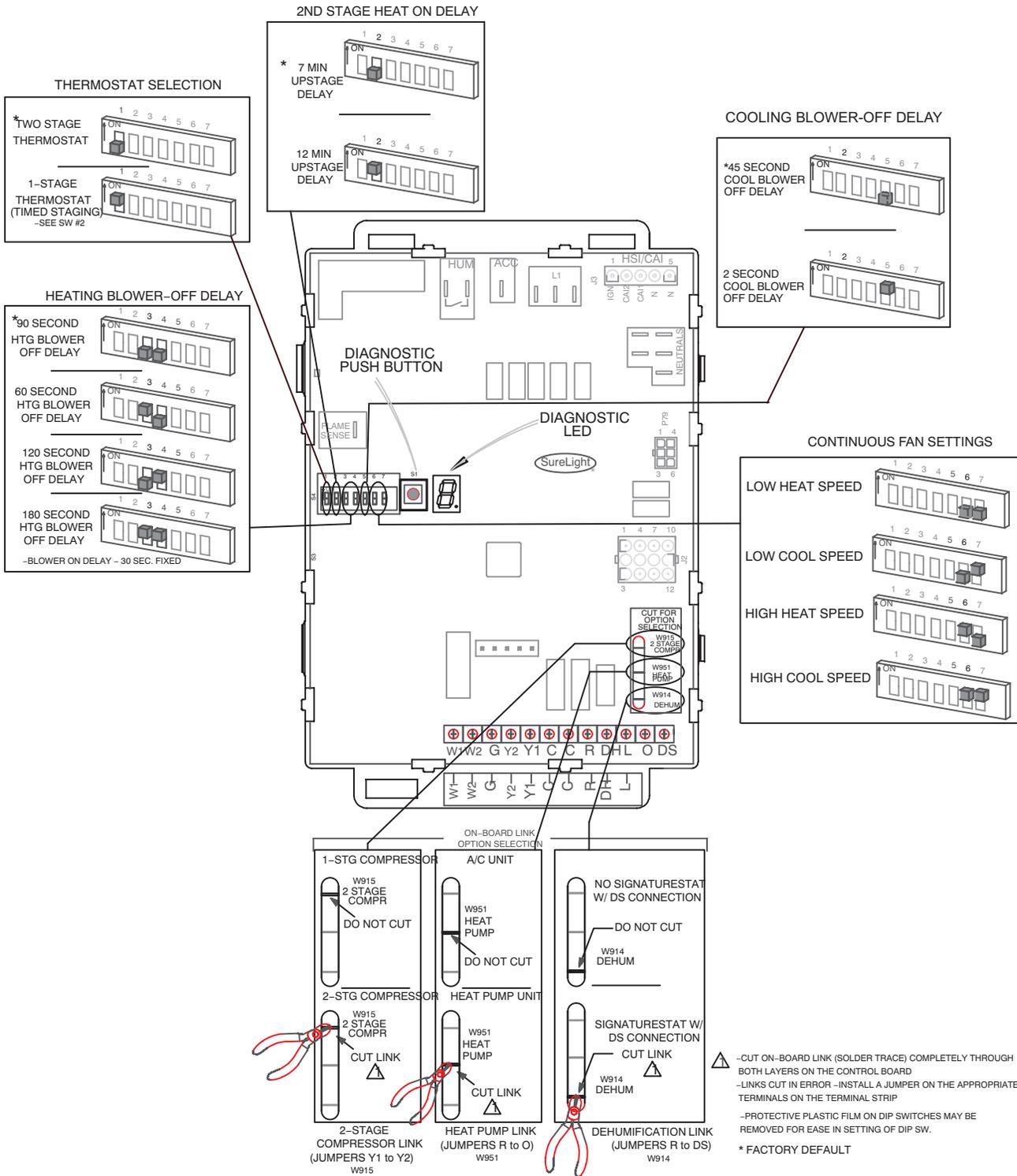


FIGURE 6

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

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E125	Control failed self-check, internal error, failed hardware. Will restart if error recovers. Integrated control not communicating. Covers hardware errors (flame sense circuit faults, pin shorts, etc.).	Hardware problem on the control. Cycle power on control. Replace if problem prevents service and is persistent. Critical alert. Cleared 300 seconds after fault recovered.
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

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
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 connectors J48 and J49 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.

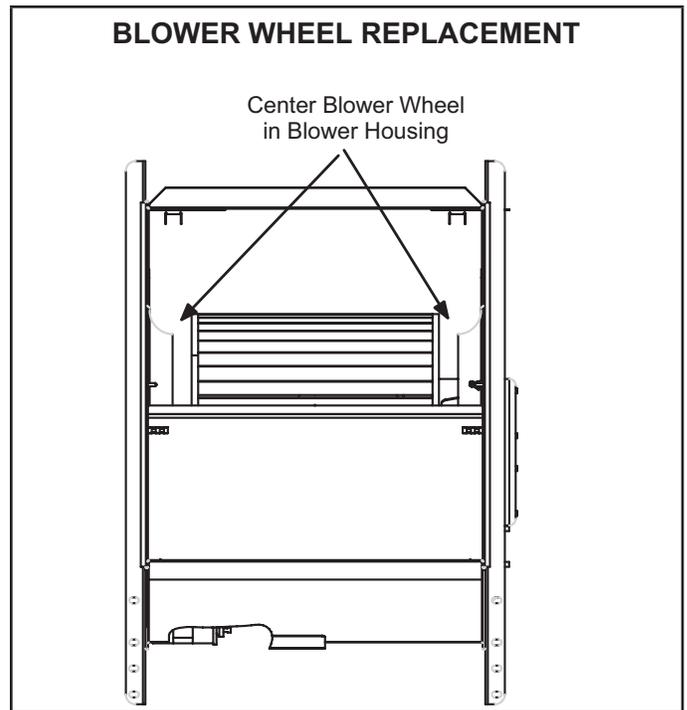


FIGURE 7

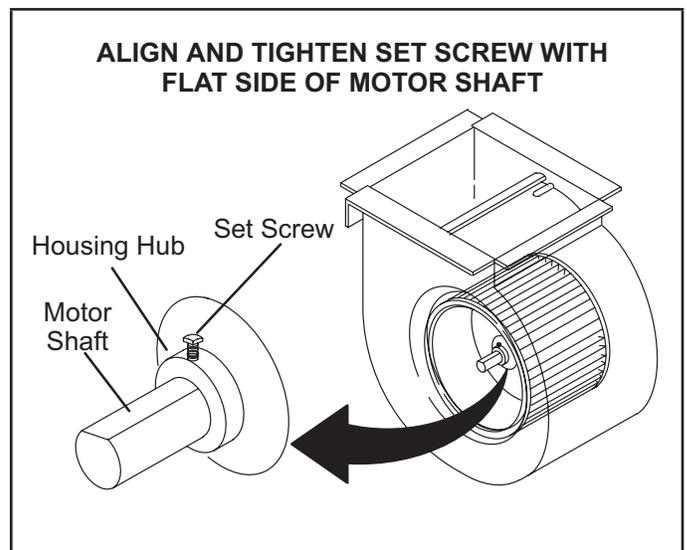
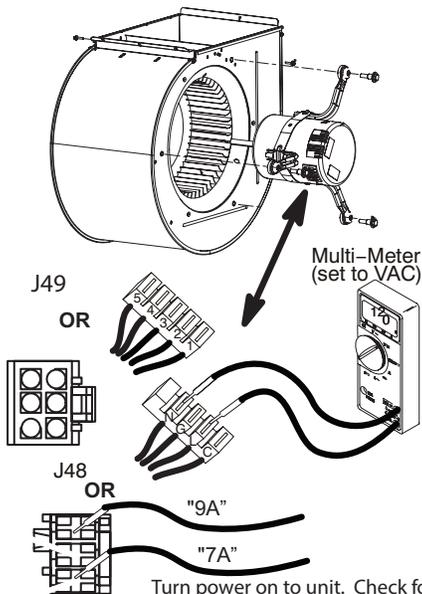
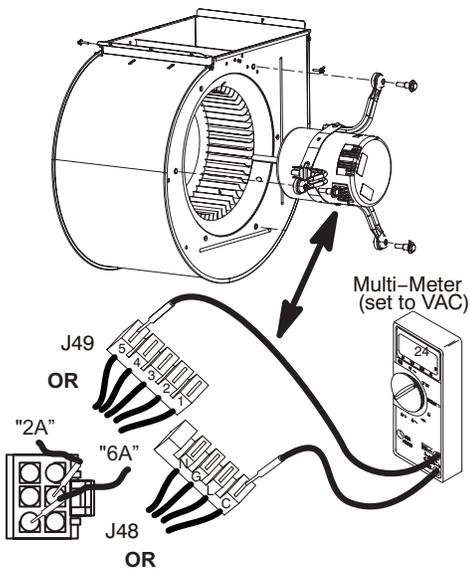


FIGURE 8



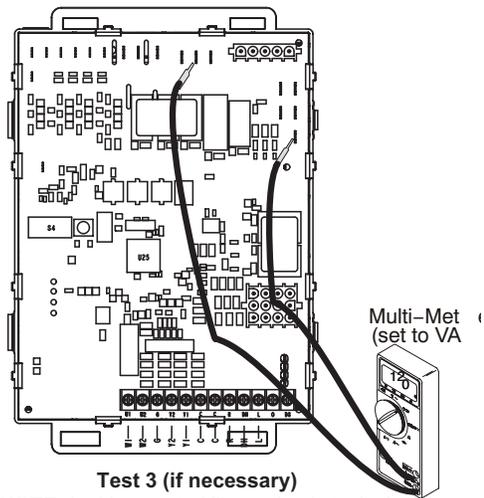
Test 1

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



Test 2

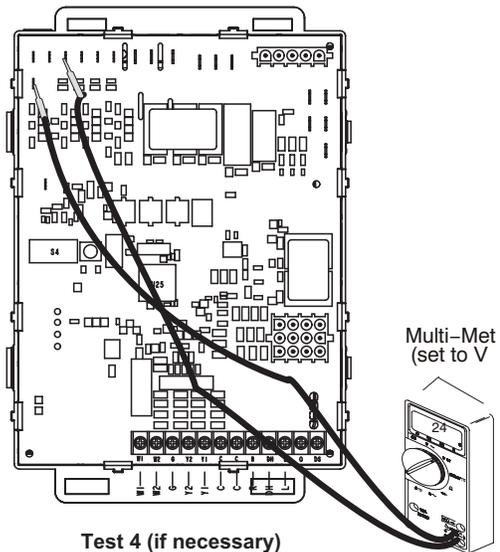
Switch thermostat to CONTINUOUS FAN MODE. For units using 4 and 5 position connector blocks, test for 24 volts terminal "C" of J48 and the tap used for continuous fan on J49 (1, 2, 3, 4 or 5). For units using 3 and 6 position connectors, test for 24 volts between pin "6A" and the pin used for continuous fan on connector J49 (1, 2, 3, 4 or 5).



Test 3 (if necessary)

NOTE- Ignition control illustration is typical

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



Test 4 (if necessary)

NOTE- Ignition control illustration is typical

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

FIGURE 9

Replacing the Motor Module

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

- 1 - Disconnect electrical power to unit.
- 2 - Remove unit access panel.
- 3 - Unplug the two harnesses from the motor control module. See FIGURE 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.

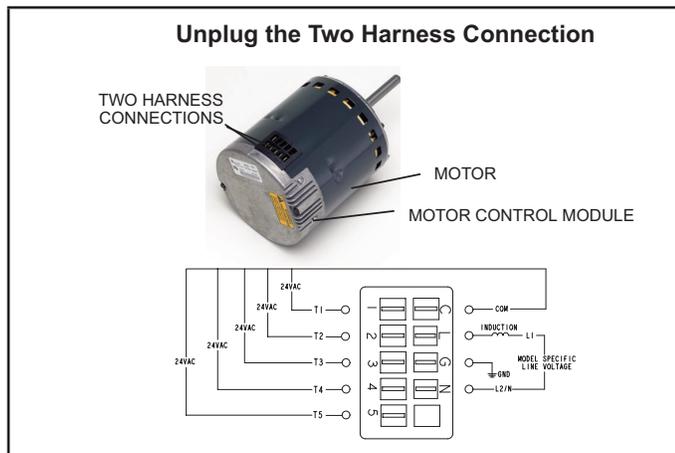


FIGURE 10



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

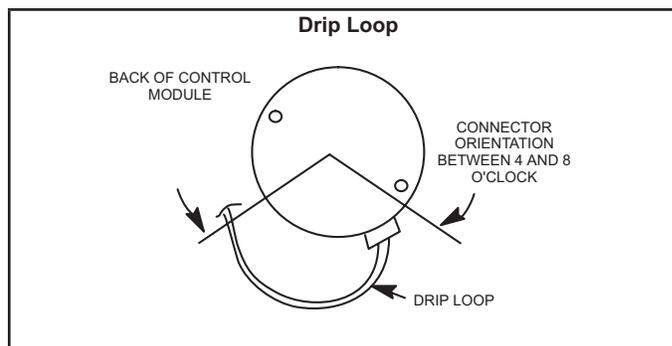


FIGURE 13

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

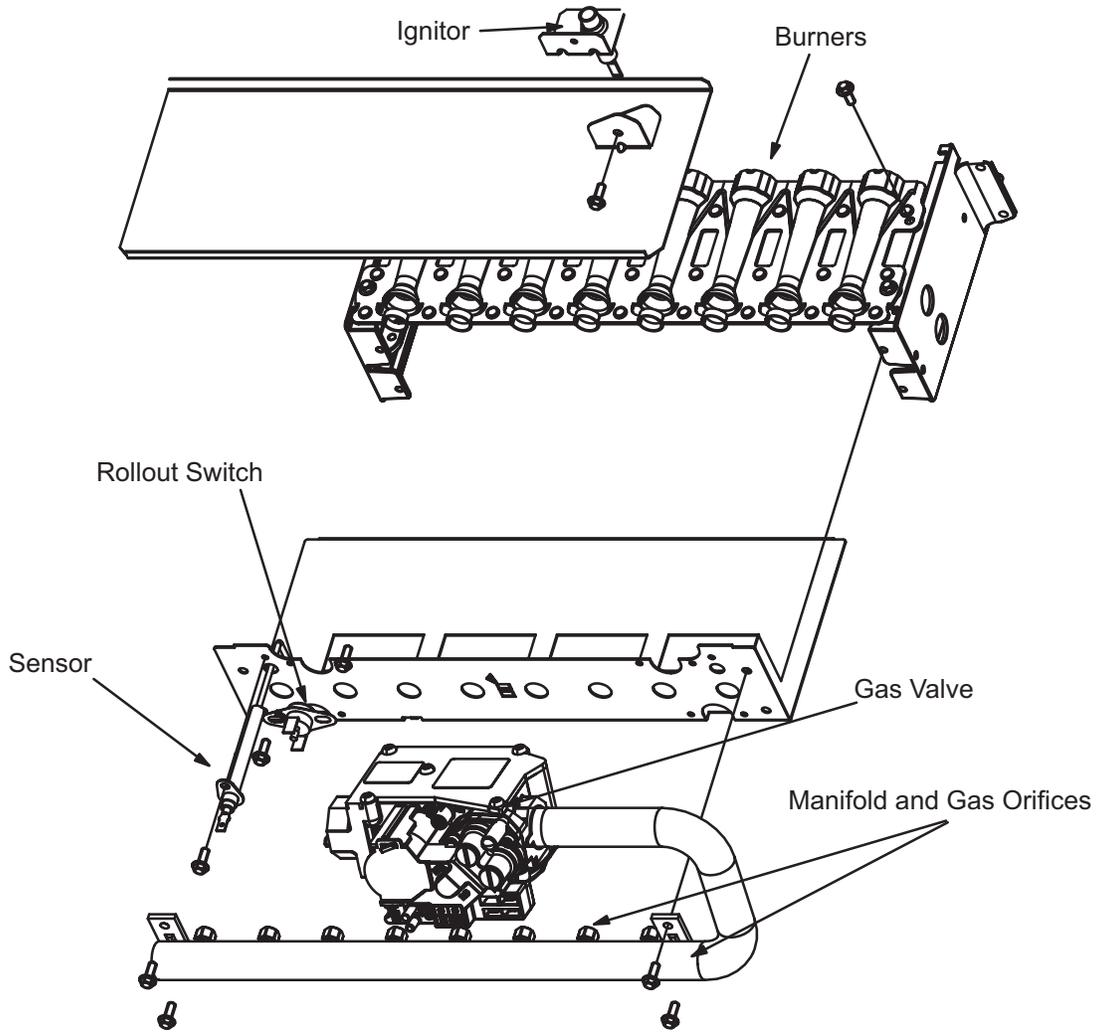


FIGURE 14

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

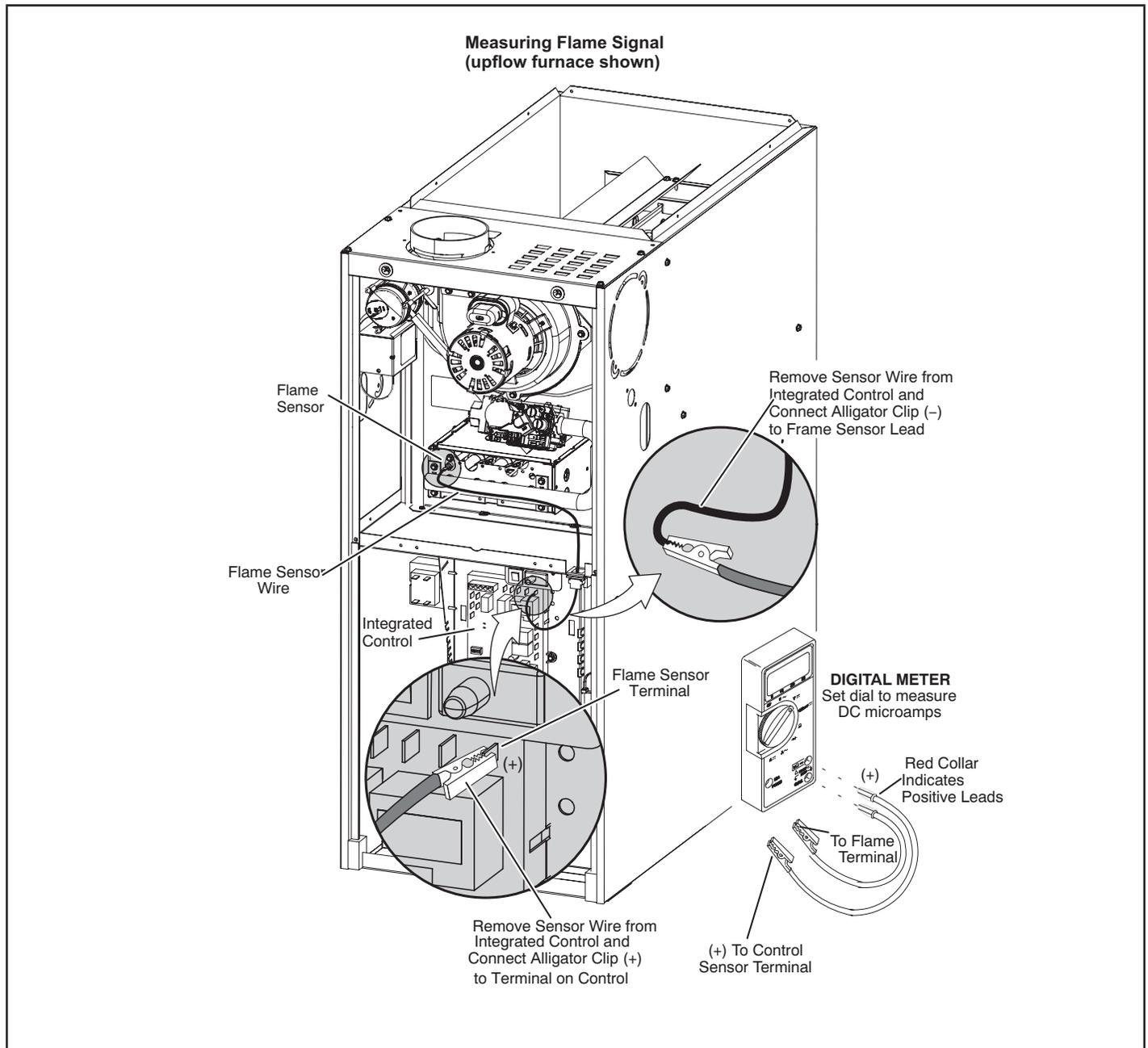
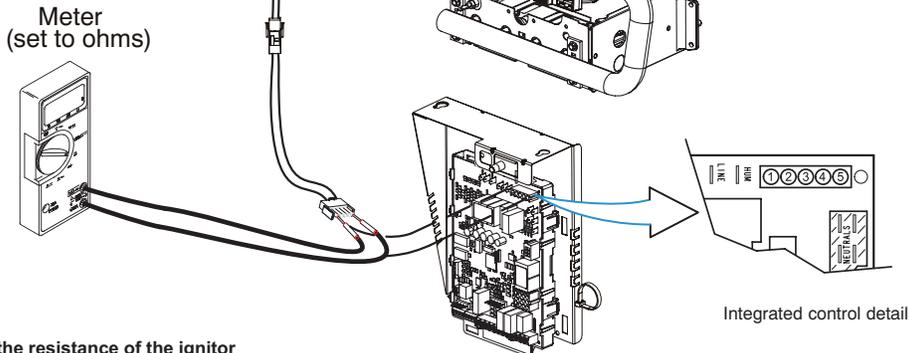


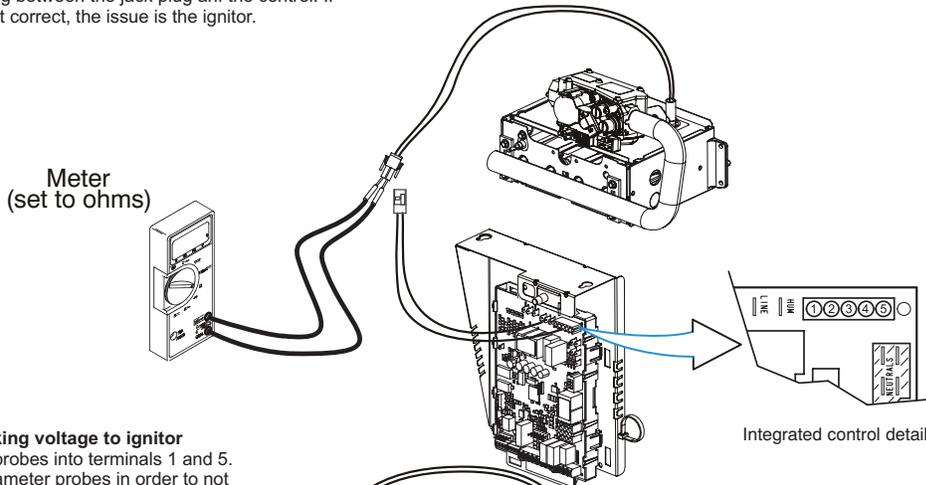
FIGURE 15

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.



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.



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.

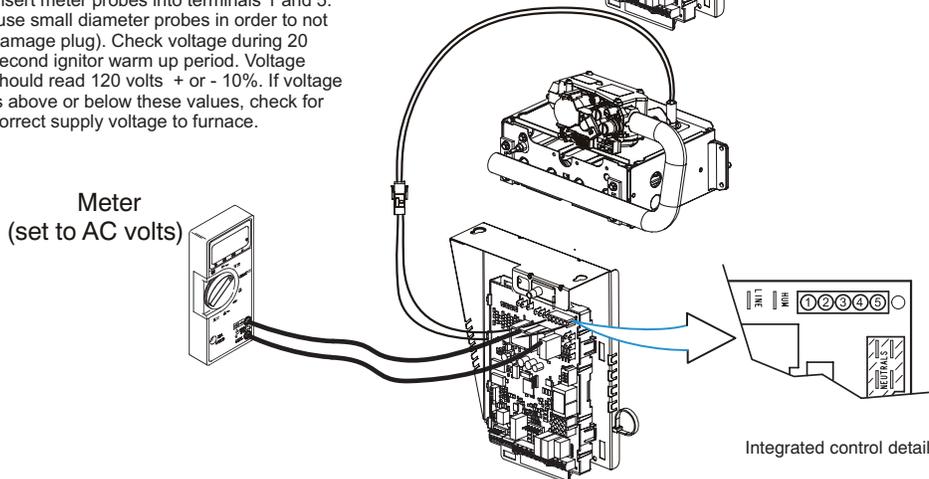


FIGURE 16

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.

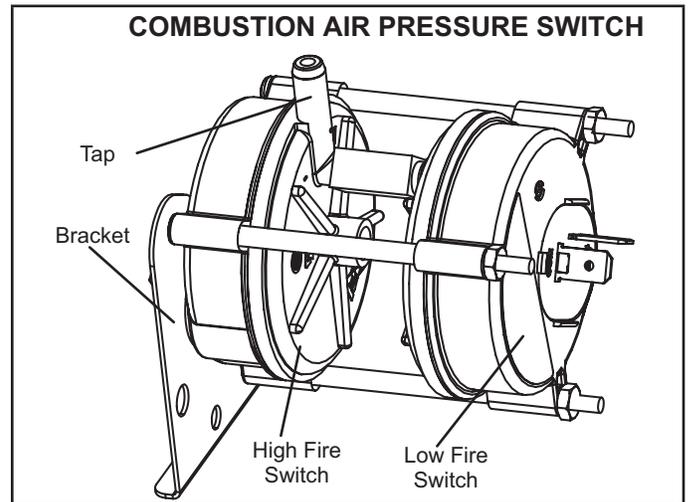


FIGURE 17

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.

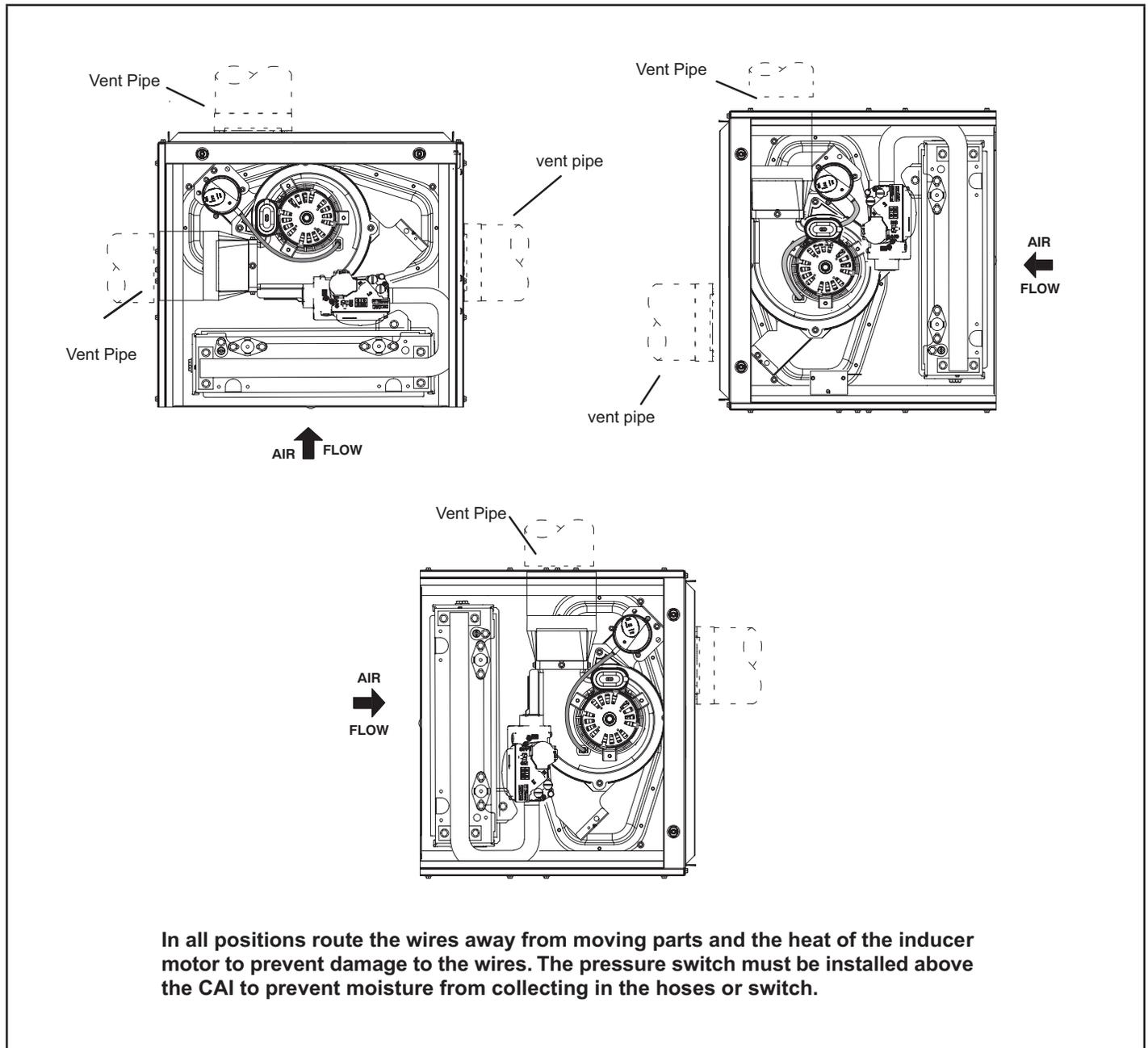


FIGURE 18

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.

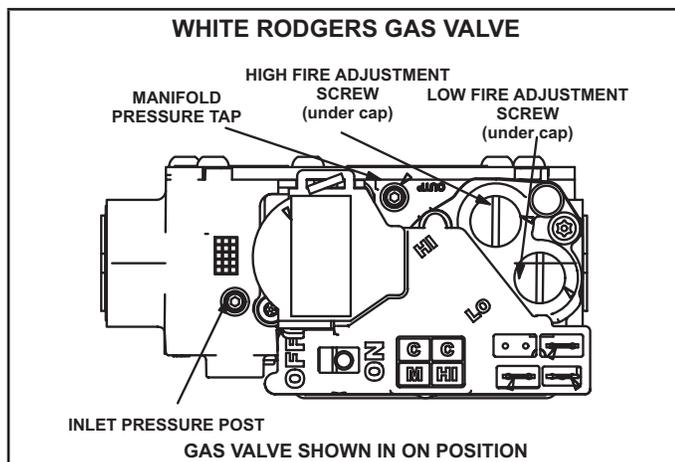


FIGURE 19

- 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.

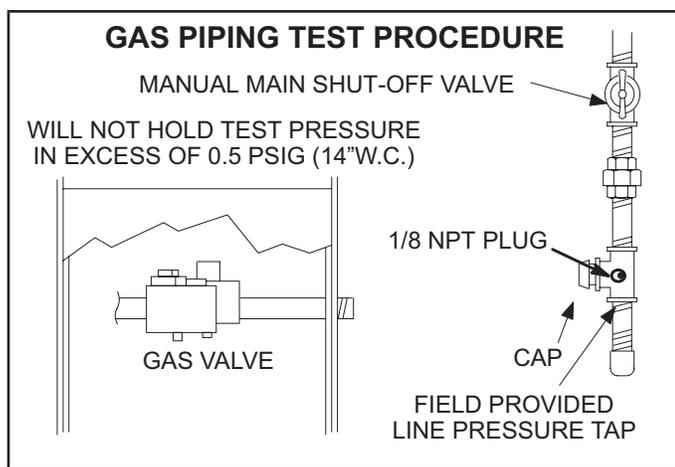


FIGURE 20

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 ₂ % Nat	CO ₂ % 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 ²		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 ³	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 ³	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 ³	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 ³	4.5	10.0	4.5	10.0	4.5	10.0	11.0	13.0

¹ This is the only permissible derate for these units.

² Natural gas high altitude orifice kit required.

³ 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

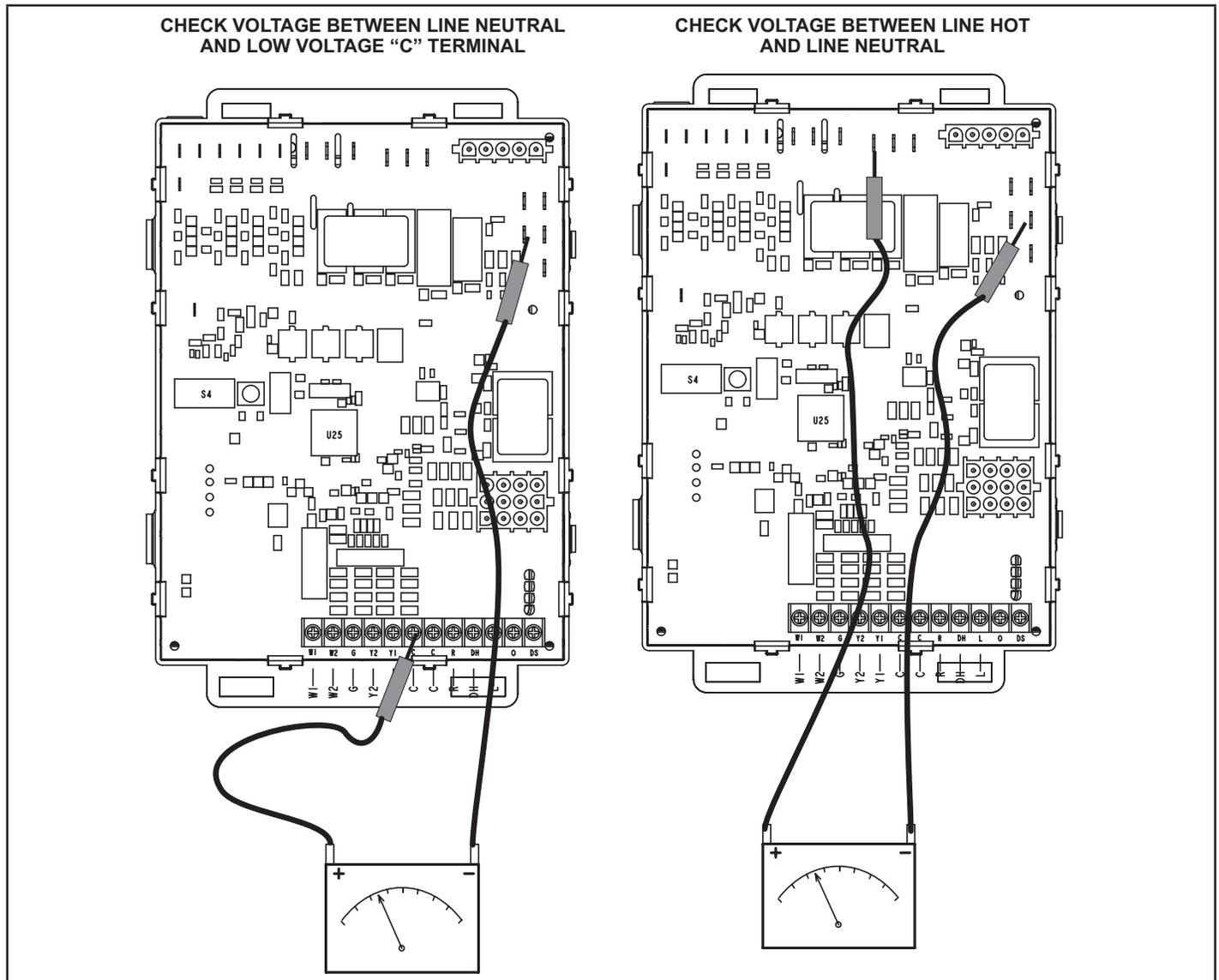


FIGURE 21

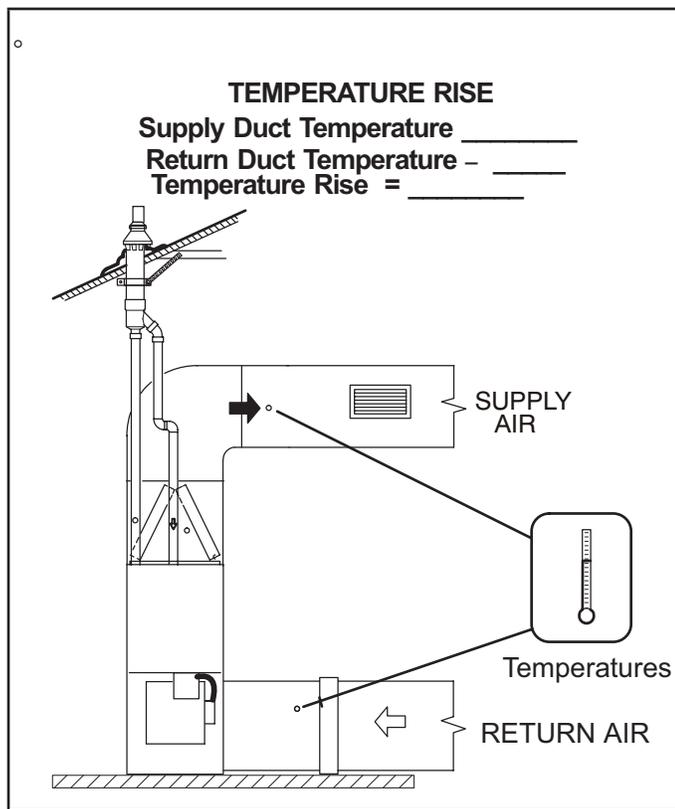
V-TYPICAL OPERATING CHARACTERISTICS

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.

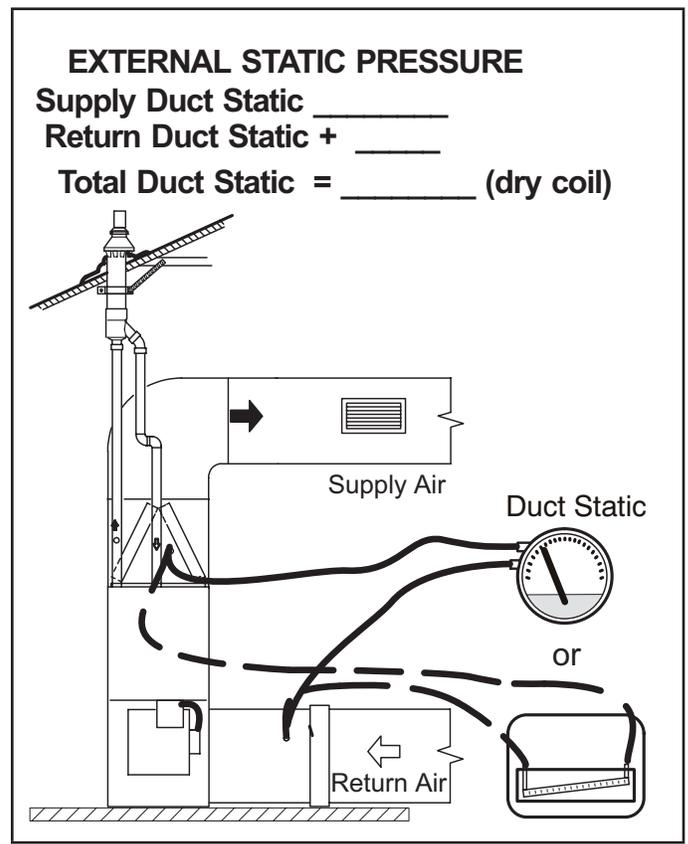
B-Temperature Rise (FIGURE 22)

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.



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.



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.

- 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.

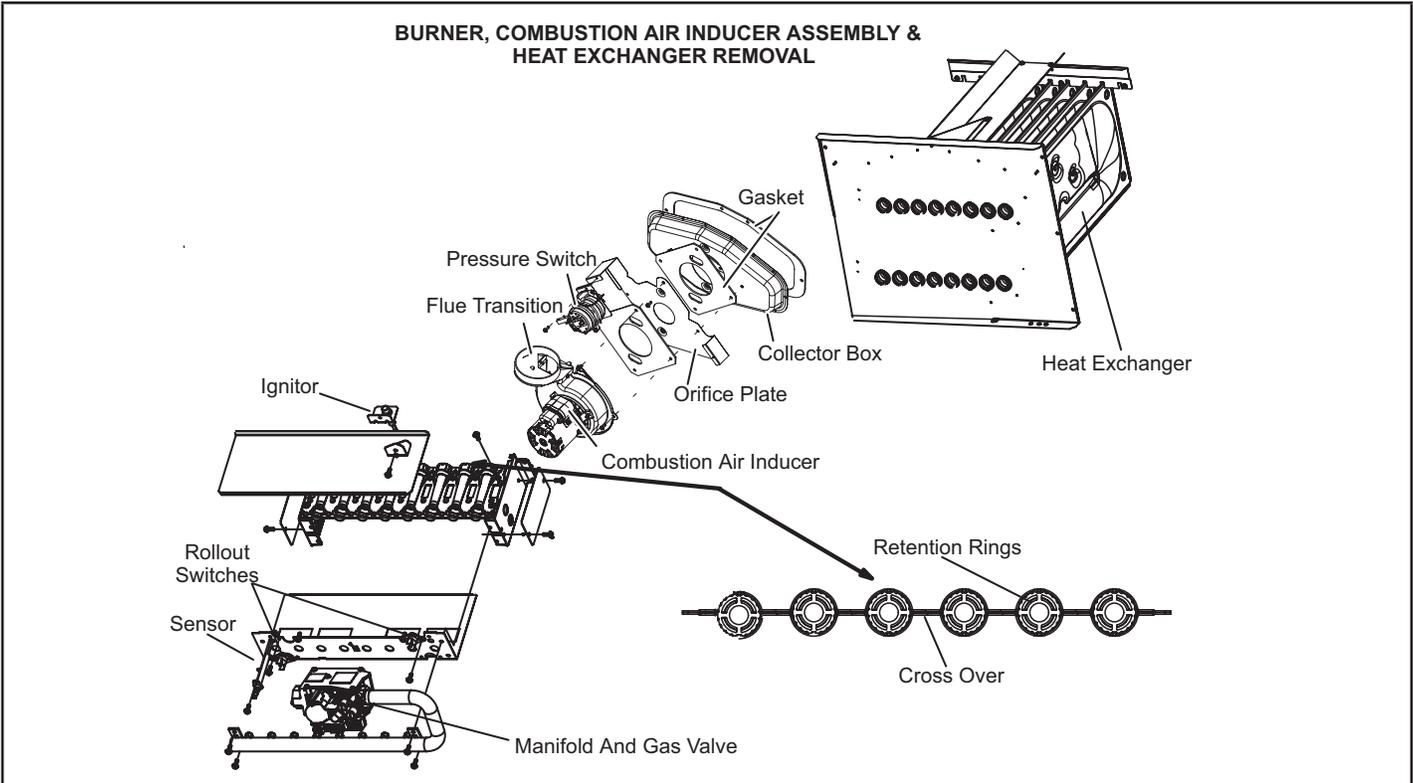


FIGURE 24

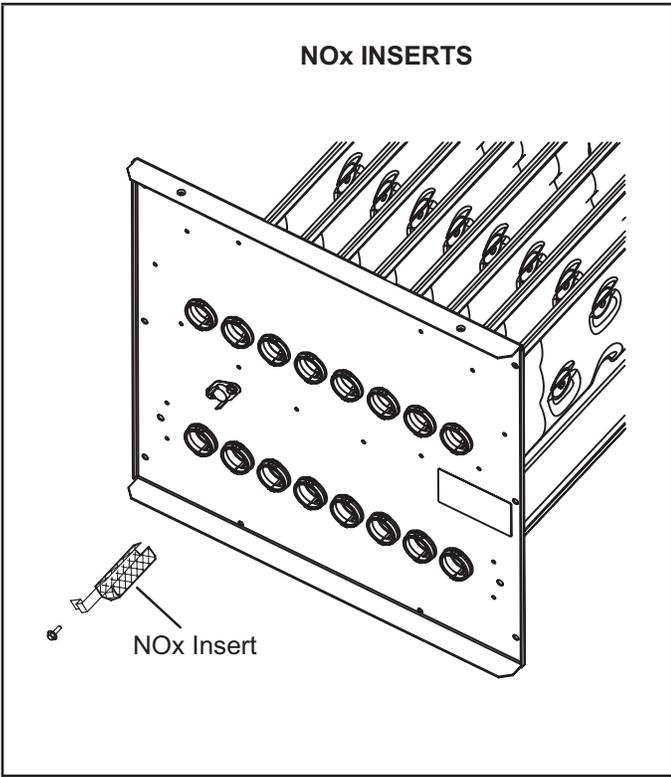


FIGURE 25

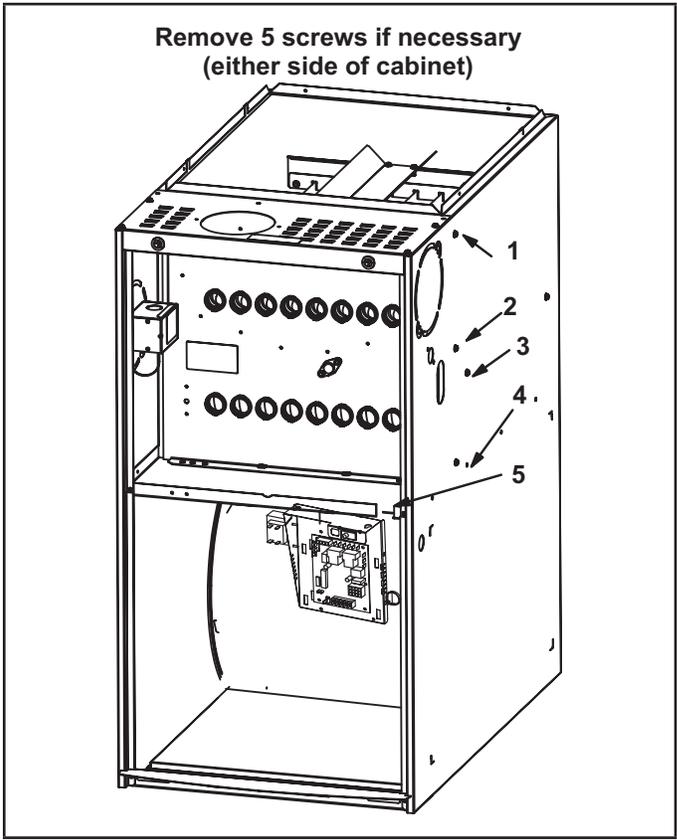
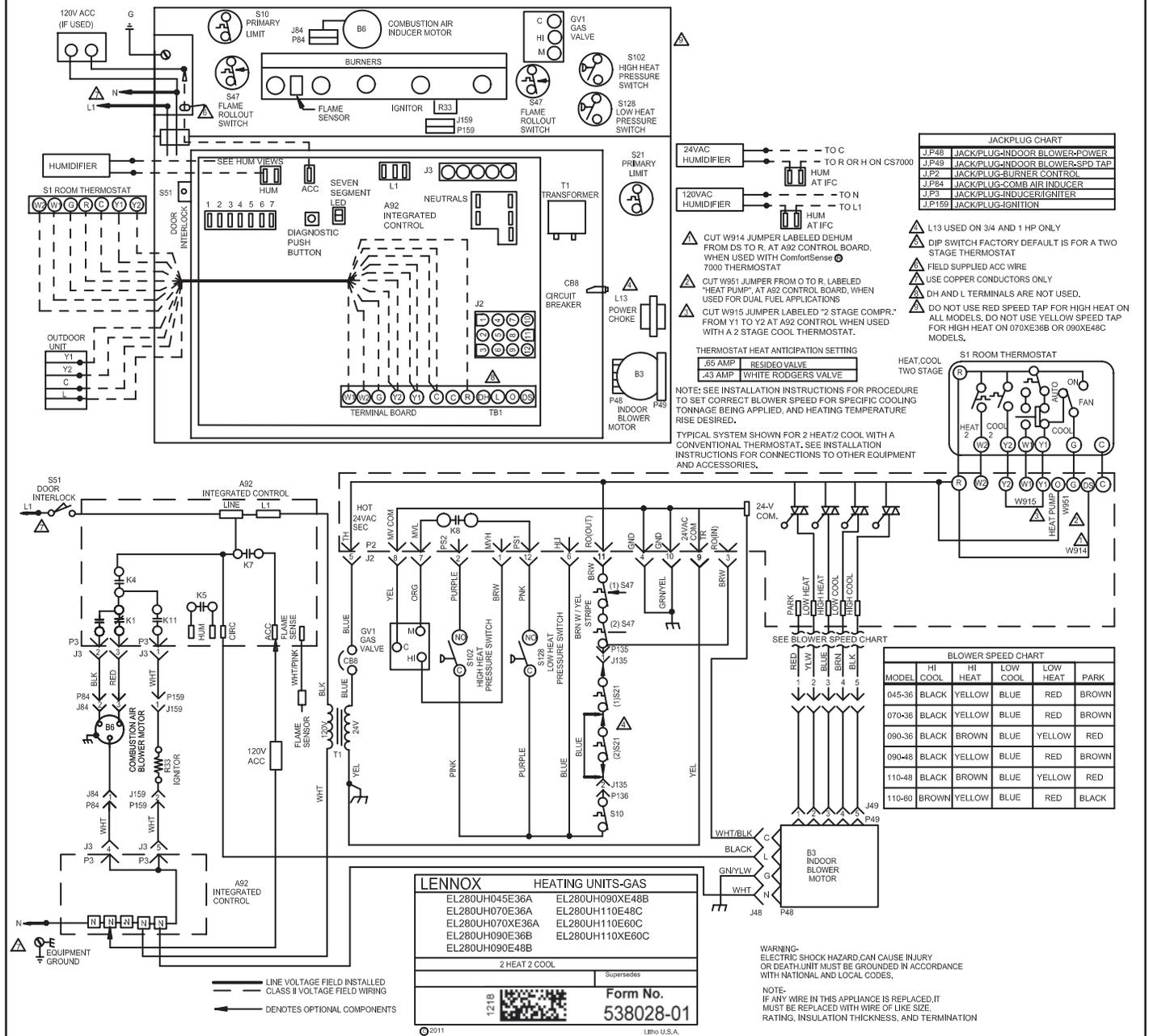


FIGURE 26

VII- Wiring and Sequence of Operation

Wiring Diagram With Integrated Control 103699

EL280UH(X)E Schematic Wiring Diagram



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.

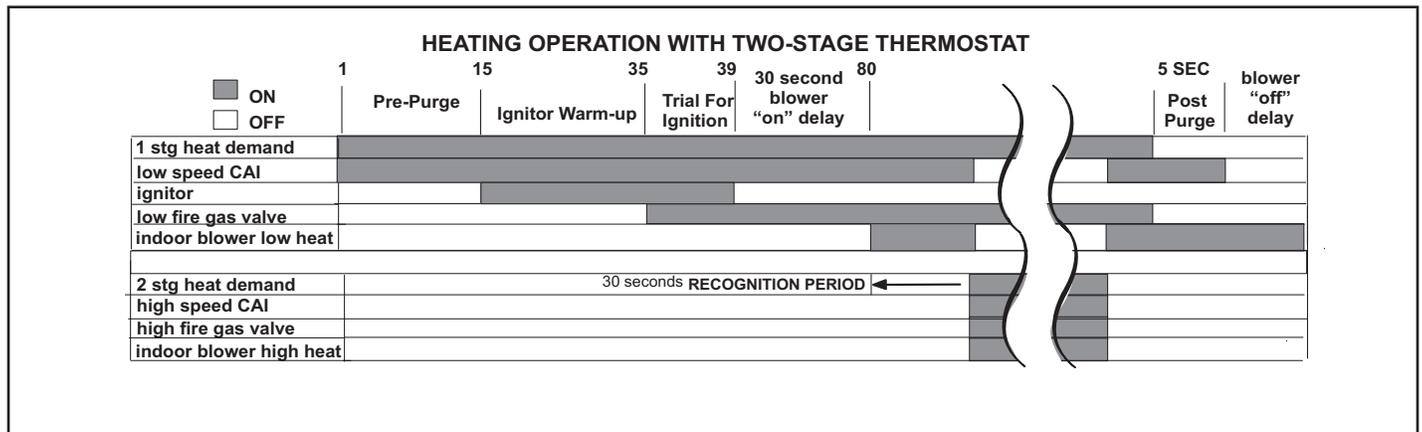


FIGURE 27

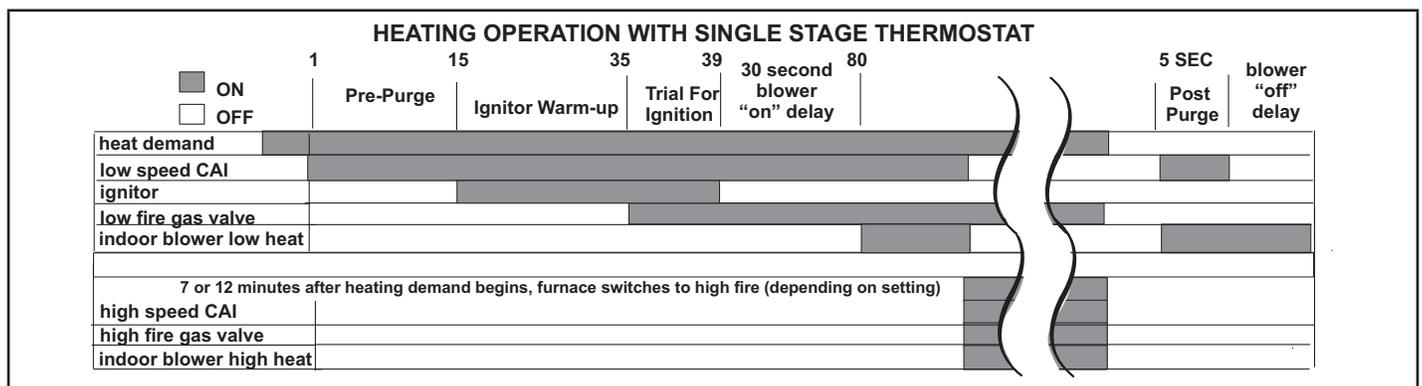


FIGURE 28

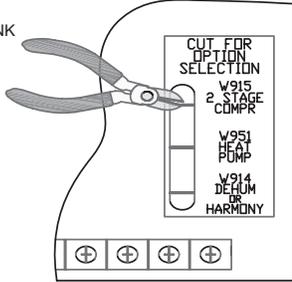
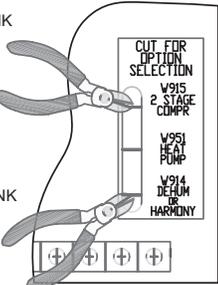
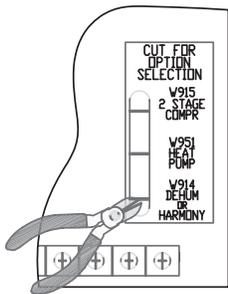
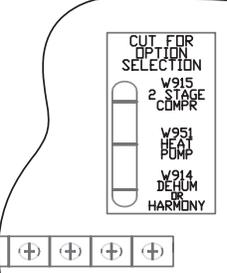
VIII- Field Wiring and DIP Switch Settings

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)	
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)																																
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)	
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)																																
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)	
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)																																

* 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																															
2 Heat / 2 Cool	OFF	<p>CUT ON-BOARD LINK W915 2 STAGE COMPR</p> 	<table border="0"> <thead> <tr> <th>S1 T'STAT</th> <th>FURNACE TERM. STRIP</th> <th>OUTDOOR UNIT</th> </tr> </thead> <tbody> <tr> <td>(DS)</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>(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> </tbody> </table>	S1 T'STAT	FURNACE TERM. STRIP	OUTDOOR UNIT	(DS)	(DS)		(W2)---	(W2)		(W1)---	(W1)		(R)---	(R)---	(R) *	(G)---	(G)		(C)---	(C)---	(C)	(Y2)---	(Y2)---	(Y2)	(Y1)---	(Y1)---	(Y1)		(O)	
S1 T'STAT	FURNACE TERM. STRIP	OUTDOOR UNIT																															
(DS)	(DS)																																
(W2)---	(W2)																																
(W1)---	(W1)																																
(R)---	(R)---	(R) *																															
(G)---	(G)																																
(C)---	(C)---	(C)																															
(Y2)---	(Y2)---	(Y2)																															
(Y1)---	(Y1)---	(Y1)																															
	(O)																																
2 Heat / 2 Cool with t'stat with humidity control	OFF	<p>CUT ON-BOARD LINK W915 2 STAGE COMPR</p>  <p>CUT ON-BOARD LINK W914 DEHUM OR HARMONY</p>	<table border="0"> <thead> <tr> <th>S1 T'STAT</th> <th>FURNACE TERM. STRIP</th> <th>OUTDOOR UNIT</th> </tr> </thead> <tbody> <tr> <td>(DS)---</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>(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> </tbody> </table>	S1 T'STAT	FURNACE TERM. STRIP	OUTDOOR UNIT	(DS)---	(DS)		(W2)---	(W2)		(W1)---	(W1)		(R)---	(R)---	(R) *	(G)---	(G)		(C)---	(C)---	(C)	(Y2)---	(Y2)---	(Y2)	(Y1)---	(Y1)---	(Y1)		(O)	
S1 T'STAT	FURNACE TERM. STRIP	OUTDOOR UNIT																															
(DS)---	(DS)																																
(W2)---	(W2)																																
(W1)---	(W1)																																
(R)---	(R)---	(R) *																															
(G)---	(G)																																
(C)---	(C)---	(C)																															
(Y2)---	(Y2)---	(Y2)																															
(Y1)---	(Y1)---	(Y1)																															
	(O)																																
2 Heat / 1 Cool with t'stat with humidity control	OFF	<p>CUT ON-BOARD LINK W914 DEHUM OR HARMONY</p> 	<table border="0"> <thead> <tr> <th>S1 T'STAT</th> <th>FURNACE TERM. STRIP</th> <th>OUTDOOR UNIT</th> </tr> </thead> <tbody> <tr> <td>(DS)---</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>(Y1)---</td> <td>(Y1)---</td> <td>(Y1)</td> </tr> <tr> <td></td> <td>(O)</td> <td></td> </tr> </tbody> </table>	S1 T'STAT	FURNACE TERM. STRIP	OUTDOOR UNIT	(DS)---	(DS)		(W2)---	(W2)		(W1)---	(W1)		(R)---	(R)---	(R) *	(G)---	(G)		(C)---	(C)---	(C)	(Y1)---	(Y1)---	(Y1)		(O)				
S1 T'STAT	FURNACE TERM. STRIP	OUTDOOR UNIT																															
(DS)---	(DS)																																
(W2)---	(W2)																																
(W1)---	(W1)																																
(R)---	(R)---	(R) *																															
(G)---	(G)																																
(C)---	(C)---	(C)																															
(Y1)---	(Y1)---	(Y1)																															
	(O)																																
2 Heat / 1 Cool	OFF	<p>DO NOT CUT ANY ON-BOARD LINKS</p> 	<table border="0"> <thead> <tr> <th>S1 T'STAT</th> <th>FURNACE TERM. STRIP</th> <th>OUTDOOR UNIT</th> </tr> </thead> <tbody> <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> </tbody> </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)	
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)																																

* Not required on all units.

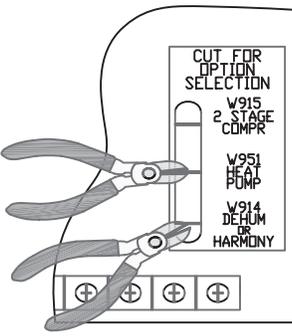
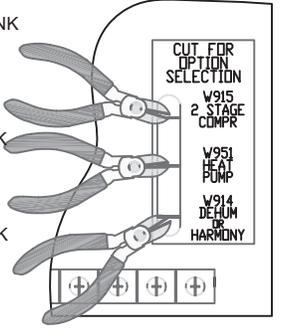
TABLE 17 Continued

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																																														
<p>Dual Fuel Single Stage Heat Pump</p> <p>ComfortSense thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control</p>	OFF	<p>CUT ON-BOARD LINK W951 HEAT PUMP</p> <p>CUT FOR OPTION SELECTION W915 2 STAGE COMPR W951 HEAT PUMP W914 DEF/UM OR HARMONY</p>	<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) ← 0-0 → (W1)</td> <td></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) ← 0-0 → (W1)		(O)-----	(O)-----	(O)	(L)-----		(L)	(Y1)-----	(Y1)-----	(Y)	(Y2)-----			(G)-----	(G)-----		(D)-----	(DS)		(B)-----	(Y2)		(C)-----	(C)-----	(C)	(T)-----		outdoor sensor	(T)-----		
T*STAT	FURNACE TERM. STRIP	HEAT PUMP																																														
(R)-----	(R)-----	(R)																																														
(H)-----																																																
(W2)-----	(W2) 67M41*																																															
(W1)-----	(W1) ← 0-0 → (W1)																																															
(O)-----	(O)-----	(O)																																														
(L)-----		(L)																																														
(Y1)-----	(Y1)-----	(Y)																																														
(Y2)-----																																																
(G)-----	(G)-----																																															
(D)-----	(DS)																																															
(B)-----	(Y2)																																															
(C)-----	(C)-----	(C)																																														
(T)-----		outdoor sensor																																														
(T)-----																																																
<p>Dual Fuel Two Stage Heat Pump</p> <p>ComfortSense thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control</p>	OFF	<p>CUT ON-BOARD LINK W915 2 STAGE COMPR</p> <p>CUT ON-BOARD LINK W951 HEAT PUMP</p> <p>CUT FOR OPTION SELECTION W915 2 STAGE COMPR W951 HEAT PUMP W914 DEF/UM OR HARMONY</p>	<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) ← 0-0 → (W1)</td> <td></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) ← 0-0 → (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)-----		
T*STAT	FURNACE TERM. STRIP	HEAT PUMP																																														
(R)-----	(R)-----	(R)																																														
(H)-----																																																
(W2)-----	(W2) 67M41*																																															
(W1)-----	(W1) ← 0-0 → (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)-----																																																

* 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

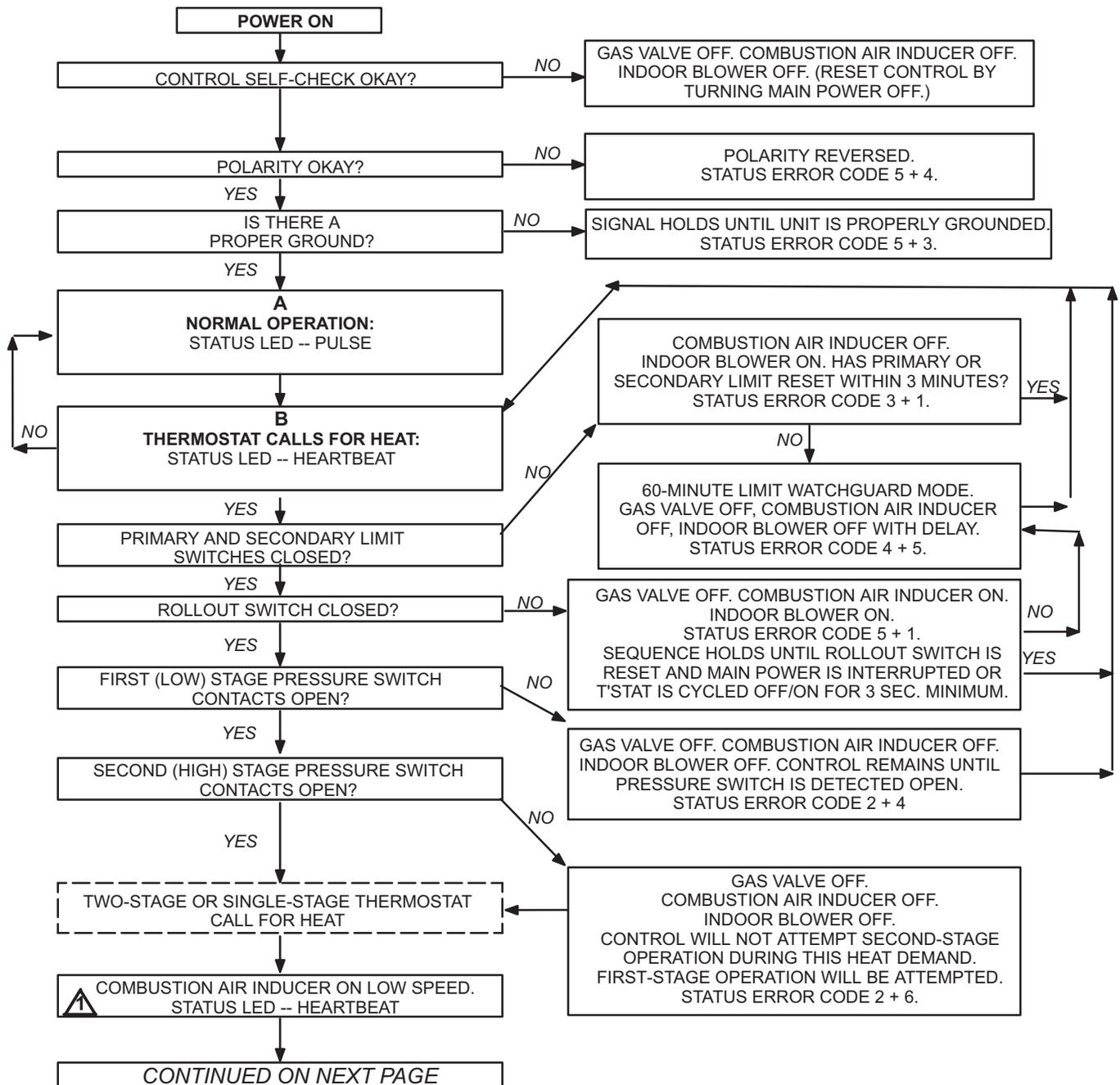
Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options	
<p>Dual Fuel Single Stage Heat Pump</p> <p>ComfortSense thermostat w/ dual fuel capa- bilities Capable of 2 stage gas heat control w/dehu- midification 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 HEAT PUMP TERM. STRIP</p> <p>(R) --- (R) --- (R)</p> <p>(H) --- (H) --- (H)</p> <p>(W2) --- (W2) 67M41*</p> <p>(W1) --- (W1) ← P → (W1)</p> <p>(O) --- (O) --- (O)</p> <p>(L) --- (L) --- (L)</p> <p>(Y1) --- (Y1) --- (Y)</p> <p>(Y2) --- (Y2) --- (Y2)</p> <p>(G) --- (G) --- (G)</p> <p>(D) --- (D) --- (DS)</p> <p>(B) --- (B) --- (Y2)</p> <p>(C) --- (C) --- (C)</p> <p>(T) --- (T) --- (T)</p> <p>(T) --- (T) --- [] outdoor sensor</p>
<p>Dual Fuel Two Stage Heat Pump</p> <p>ComfortSense thermostat w/ dual fuel capa- bilities Capable of 2 stage gas heat control w/dehu- midification</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 HEAT PUMP TERM. STRIP</p> <p>(R) --- (R) --- (R)</p> <p>(H) --- (H) --- (H)</p> <p>(W2) --- (W2) 67M41*</p> <p>(W1) --- (W1) ← P → (W1)</p> <p>(O) --- (O) --- (O)</p> <p>(L) --- (L) --- (L)</p> <p>(Y1) --- (Y1) --- (Y1)</p> <p>(Y2) --- (Y2) --- (Y2)</p> <p>(G) --- (G) --- (G)</p> <p>(D) --- (D) --- (DS)</p> <p>(B) --- (B) --- (Y2)</p> <p>(C) --- (C) --- (C)</p> <p>(T) --- (T) --- (T)</p> <p>(T) --- (T) --- [] outdoor sensor</p> <p>Y2 out blue</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.

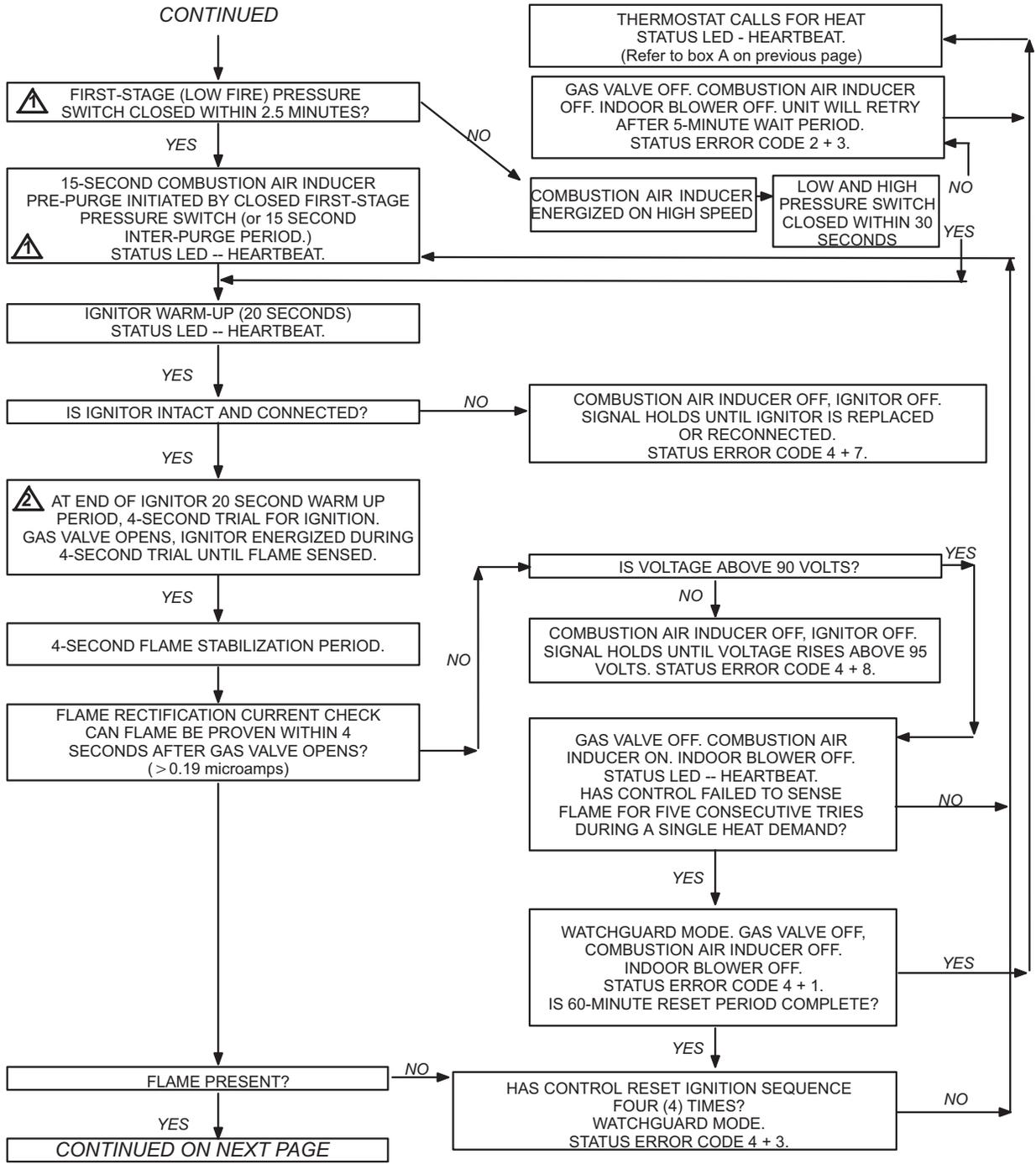
IX- Troubleshooting

**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.

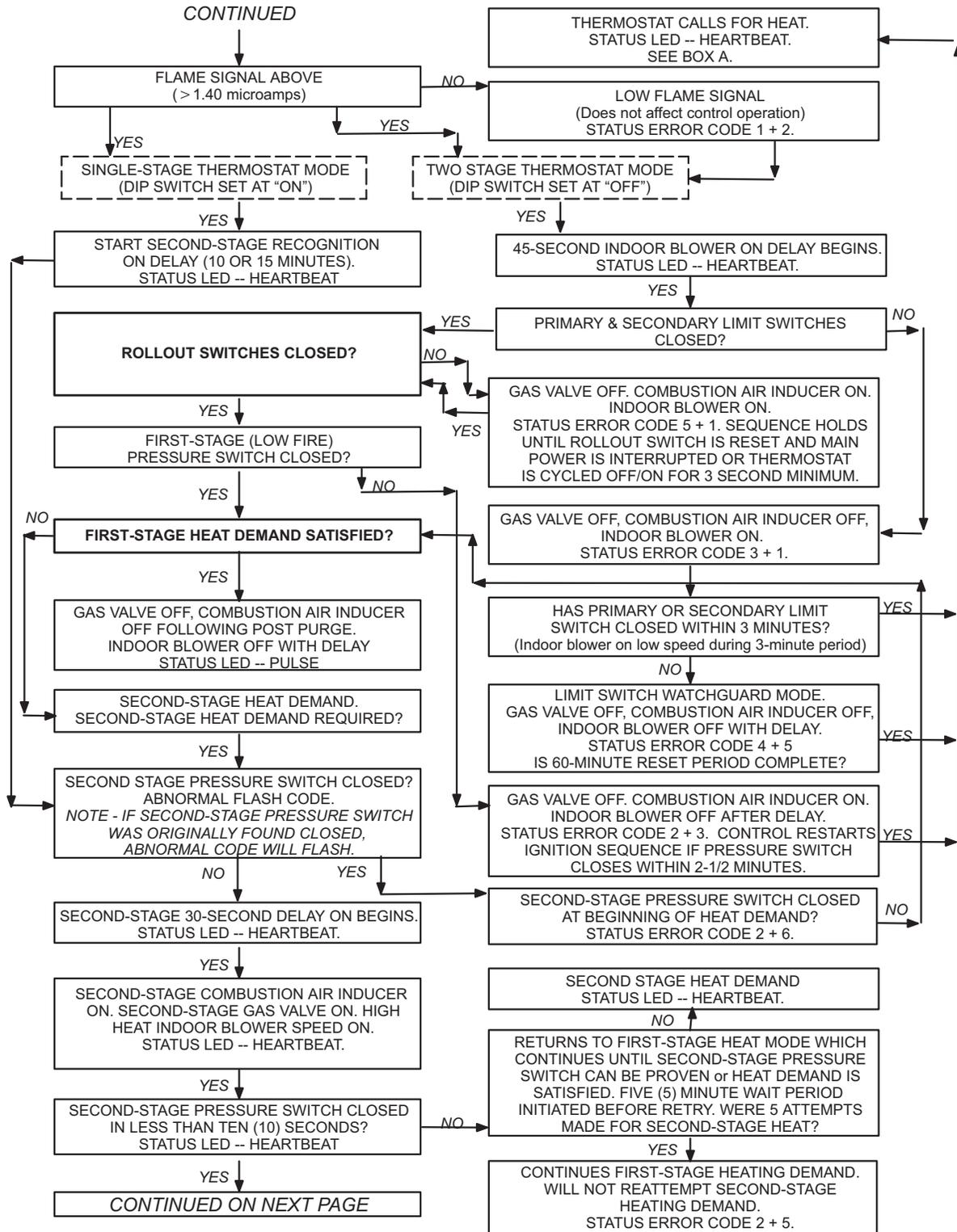
HEATING SEQUENCE OF OPERATION



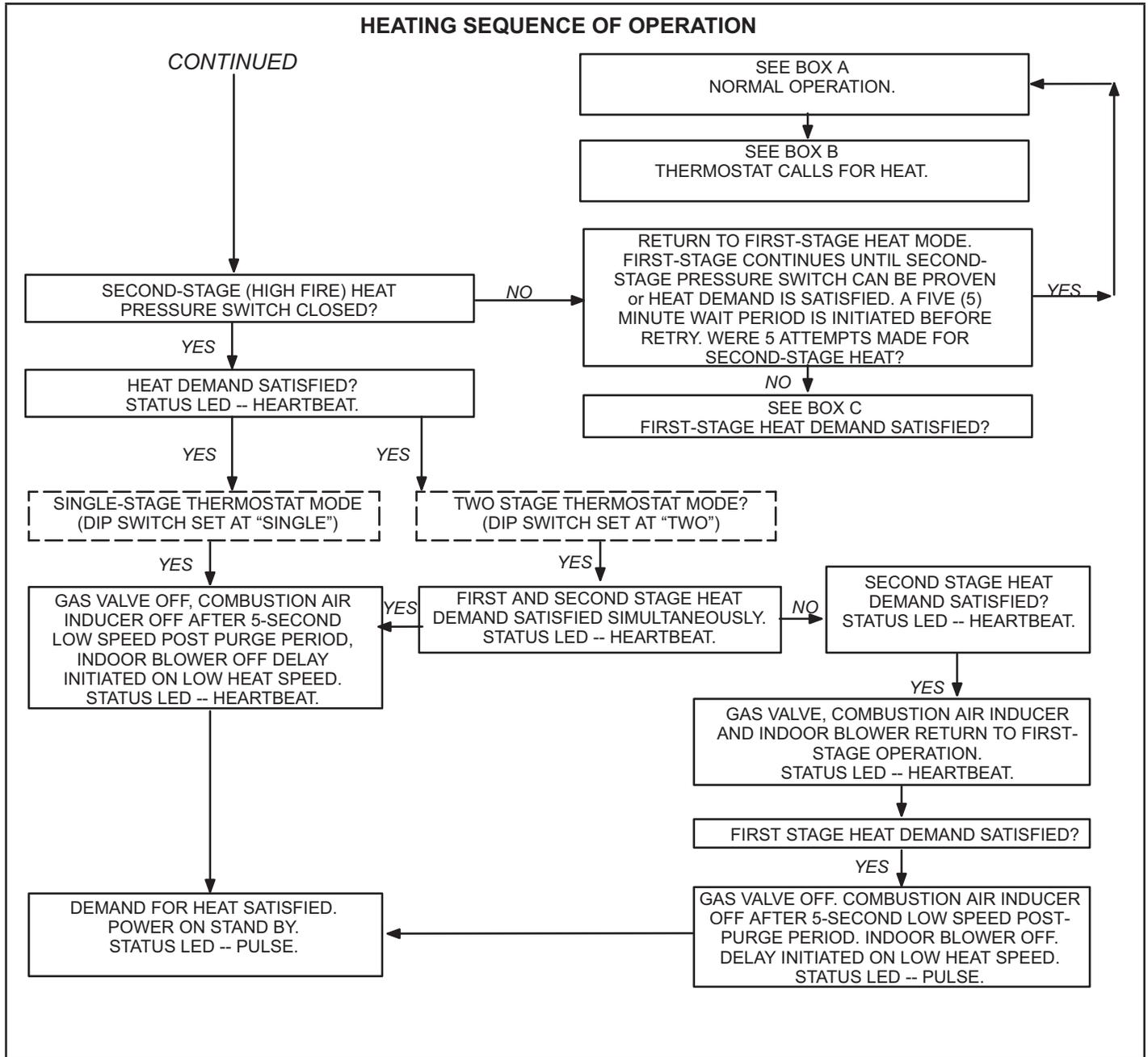
⚠ If the furnace is operating on continuous fan mode (terminals "R" and "G" are energized), the combustion air inducer will energize on high speed, the gas valve will energize on second-stage heat and the furnace will operate on high fire. Furnace will stay on high fire 60 seconds then switch to low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

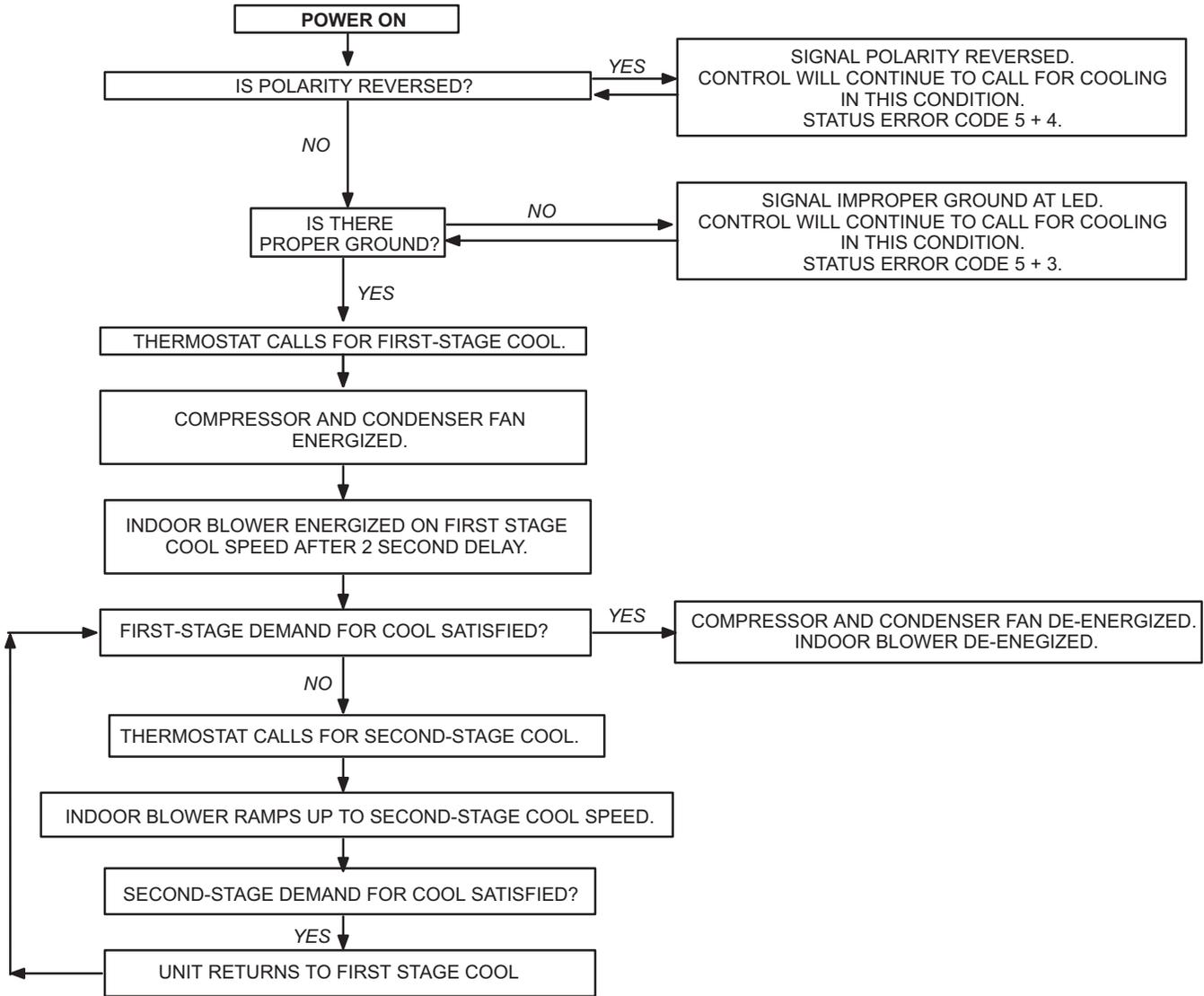
HEATING SEQUENCE OF OPERATION



HEATING SEQUENCE OF OPERATION



COOLING SEQUENCE OF OPERATION



CONTINUOUS LOW SPEED FAN SEQUENCE OF OPERATION

