EL280UHEK(X) With R-454B SERIES UNITS

EL280UHEK 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. EL280UHEK 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.

⚠ WARNING

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

⚠ 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.

TABLE OF CONTENTS

SPECIFICATIONS

Gas Heating Performance		**Model**	**EL280UH045E36AK**	**EL280UH070E36AK**	**EL280UH090E36BK**
		Model No. - Low NOx	**- - -**	**EL280UH070XE36AK**	**- - -**
		[1] AFUE	80%	80%	80%
	High Fire	Input - Btuh	44,000	66,000	88,000
		Output - Btuh	35,000	54,000	71,000
		Temperature rise range - °F	30 - 60	30 - 60	35 - 65
		Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0	3.5 / 10.0
	Low Fire	Input - Btuh	29,000	43,000	57,000
		Output - Btuh	23,000	35,000	47,000
		Temperature rise range - °F	20 - 50	20 - 50	25 - 55
		Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	1.7 / 4.5	1.7 / 4.5	1.7 / 4.5
High static - in. w.g.		Heating	0.5	0.5	0.5
		Cooling	0.5	0.5	0.5
Connections		Flue connection − in. round	4	4	4
		Gas pipe size IPS	1/2	1/2	1/2
Indoor Blower		Wheel diameter x width - in.	10 x 8	10 x 8	10 x 9
		Motor output - hp	1/2	1/2	1/2
		Tons of add-on cooling	1.5 - 3.5	2 - 3.5	2 - 3.5
		Air Volume Range - cfm	250 - 1500	350 - 1375	350 - 1600
Electrical Data		Voltage	120 volts - 60 hertz - 1 phase		
		Blower motor full load amps	6.1	6.1	6.1
		Maximum overcurrent protection	15	15	15
Shipping Data		lbs. - 1 package	111	121	136

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**	**EL280UH090E48BK**	**EL280UH110E48C**	**EL280UH110E60C**
		Model No. - Low NOx	**EL280UH090XE48BK**	**- - -**	**EL280UH110XE60C**
		[1] AFUE	80%	80%	80%
	High Fire	Input - Btuh	88,000	110,000	110,000
		Output - Btuh	72,000	89,000	88,000
		Temperature rise range - °F	30 - 60	35 - 65	30 - 60
		Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0	3.5 / 10.0
	Low Fire	Input - Btuh	57,000	72,000	72,000
		Output - Btuh	46,000	58,000	59,000
		Temperature rise range - °F	20 - 50	25 - 55	20 - 50
		Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	1.7 / 4.5	1.7 / 4.5	1.7 / 4.5
High static - in. w.g.		Heating	0.5	0.5	0.5
		Cooling	0.5	0.5	0.5
Connections		Flue connection − in. round	4	4	4
		Gas pipe size IPS	1/2	1/2	1/2
Indoor Blower		Wheel diameter x width - in.	10 x 10	10 x 10	11-1/2 x 10
		Motor output - hp	3/4	3/4	1
		Tons of add-on cooling	3 - 4	3 - 4	4 - 5
		Air Volume Range - cfm	765 - 1800	865 - 1780	1100 - 2200
Electrical Data		Voltage	120 volts - 60 hertz - 1 phase		
		Blower motor full load amps	8.5	8.2	10
		Maximum overcurrent protection	15	15	15
Shipping Data		lbs. - 1 package	140	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					
E30 Smart Wi-Fi Thermostat			**20A65**	**20A65**	**20A65**
Remote Outdoor Temperature Sensor			**X2658**	**X2658**	**X2658**
Furnace Twinning Panel			**Y3653**	**Y3653**	**Y3653**
Furnace Twinning Kit			**16W72**	**16W72**	**16W72**
Transformer (75VA)			**27J32**	**27J32**	**27J32**
REFRIGERANT DETECTION SENSOR					
Refrierant Detection System (RDS) Coil Sensor Kit (for indoor coil)			**27AV53**	**27V53**	**27V52**
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
VENTING					
Vent Adaptor − 6 in. conn. size upflow applications only			**18M79**	**18M79**	**18M79**

[1] Cleanable polyurethane, frame-type filter.

BLOWER DATA

EL280UH045E36AK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	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	-	-	-	-

EL280UH070E36AK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1449	325	1328	256	1183	189	946	111	782	75
0.20	1419	335	1297	266	1148	197	904	118	736	81
0.30	1391	345	1267	276	1114	206	862	124	689	87
0.40	1363	356	1236	285	1081	214	822	131	639	93
0.50	1334	366	1206	294	1047	223	780	138	594	98
0.60	1307	376	1177	304	1013	231	740	145	548	104
0.70	1279	386	1146	313	981	239	700	151	506	109
0.80	1250	397	1115	322	946	246	661	158	451	115
0.90	1222	406	1084	331	913	254	624	163	399	120
1.00	1193	415	1054	339	881	262	588	169	357	125

EL280UH090E36BK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	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	-	-

BLOWER DATA

EL280UH090E48BK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1724	384	1514	271	1392	218	1308	189	1182	148
0.20	1691	399	1477	284	1354	230	1268	200	1139	158
0.30	1659	412	1442	295	1317	242	1229	211	1097	168
0.40	1629	427	1408	308	1280	253	1189	221	1048	177
0.50	1599	440	1372	320	1239	264	1145	231	999	187
0.60	1569	453	1336	332	1195	274	1097	240	955	195
0.70	1536	466	1298	343	1153	285	1050	249	908	203
0.80	1503	479	1256	353	1111	295	1008	258	864	211
0.90	1469	491	1218	364	1070	304	970	266	819	218
1.00	1432	503	1181	374	1031	313	931	275	784	226

EL280UH110E48CK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1785	355	1565	251	1438	204	1351	177	1217	139
0.20	1749	369	1524	264	1396	216	1307	188	1170	148
0.30	1714	383	1486	276	1355	226	1264	198	1122	158
0.40	1679	397	1447	288	1315	238	1220	208	1076	168
0.50	1644	411	1408	300	1272	249	1176	218	1023	177
0.60	1610	425	1369	312	1229	259	1129	228	972	186
0.70	1576	437	1328	323	1186	270	1080	238	922	196
0.80	1538	448	1287	335	1139	280	1034	248	871	203
0.90	1500	461	1246	346	1096	290	988	257	824	212
1.00	1464	474	1206	357	1053	300	943	266	780	218

EL280UH110E60CK 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
0.10	2173	601	1934	431	1772	335	1654	281	1468	206	**2164**	**611**	**1911**	**430**	1762	336	1647	279	1473	201
0.20	2147	613	1900	444	1736	346	1626	290	1445	214	**2126**	**631**	**1876**	**444**	1718	350	1608	294	1424	212
0.30	2109	630	1873	456	1701	356	1585	303	1361	227	**2092**	**646**	**1839**	**458**	1673	361	1563	306	1373	226
0.40	2085	643	1833	471	1657	369	1547	314	1343	235	**2055**	**662**	1800	474	1638	374	1520	317	1324	237
0.50	2050	658	1800	485	1626	379	1503	327	1298	246	**2016**	**678**	1764	488	1594	388	1477	328	1275	247
0.60	2019	672	1771	495	1579	393	1480	338	1256	256	**1986**	**691**	1727	501	1556	401	1440	339	1230	259
0.70	1983	689	1734	509	1543	404	1401	348	1211	265	**1967**	**705**	1684	515	1521	411	1394	352	1172	270
0.80	1953	703	1693	524	1502	416	1381	361	1176	277	**1916**	**720**	1656	526	1480	425	1350	364	1141	278
0.90	1925	715	1663	535	1470	426	1343	372	1118	289	**1895**	**734**	1618	538	1440	437	1310	376	1092	290
1.00	1898	728	1643	544	1441	434	1304	383	1078	297	**1845**	**752**	1577	553	1396	450	1267	389	1046	301

PARTS ARRANGEMENT

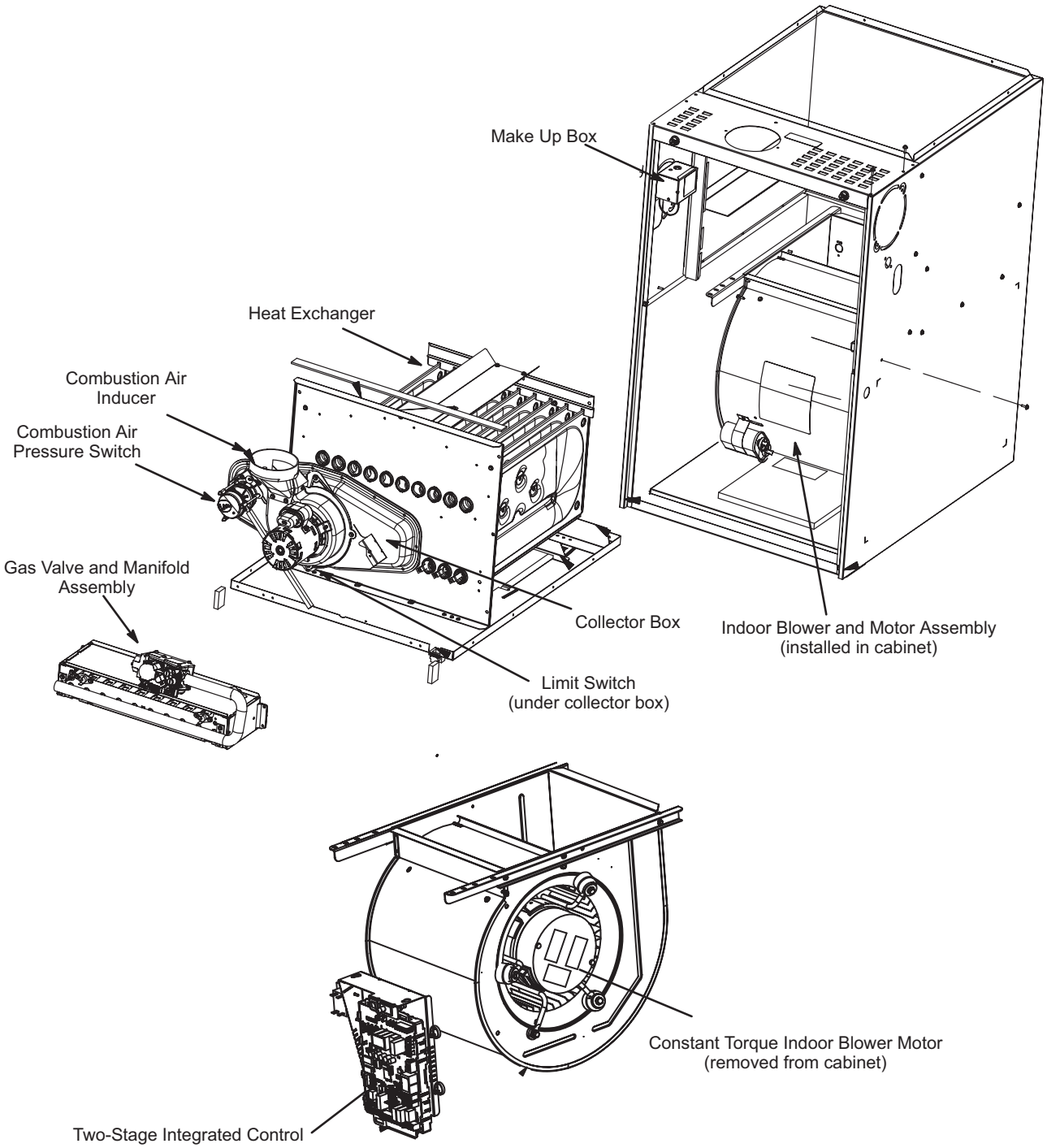


FIGURE 1

I-UNIT COMPONENTS

EL280UHEK 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.

EL280UHEK units are factory equipped with a bottom return air panel in place. The panel is designed to be field removed as required for bottom air return. Markings are provided for side return air and may be cut out in the field.

ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures

⚠ 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.

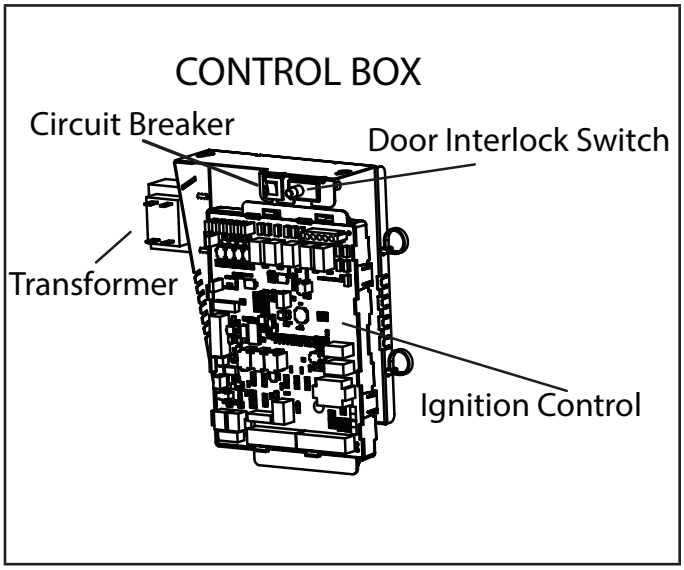


FIGURE 2

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.

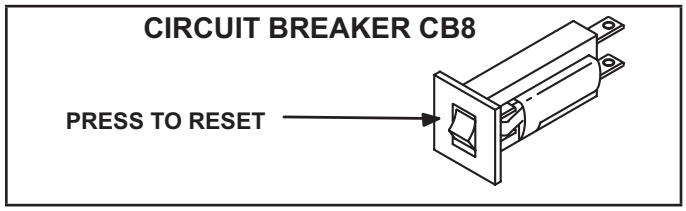


FIGURE 3

4. Ignition Control - 107897-00

⚠ 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 a two-stage, ignition control. The system consists of a ignition / blower control (FIGURE 4) with control pin designations in TABLE 1, TABLE 2, TABLE 3 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 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

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

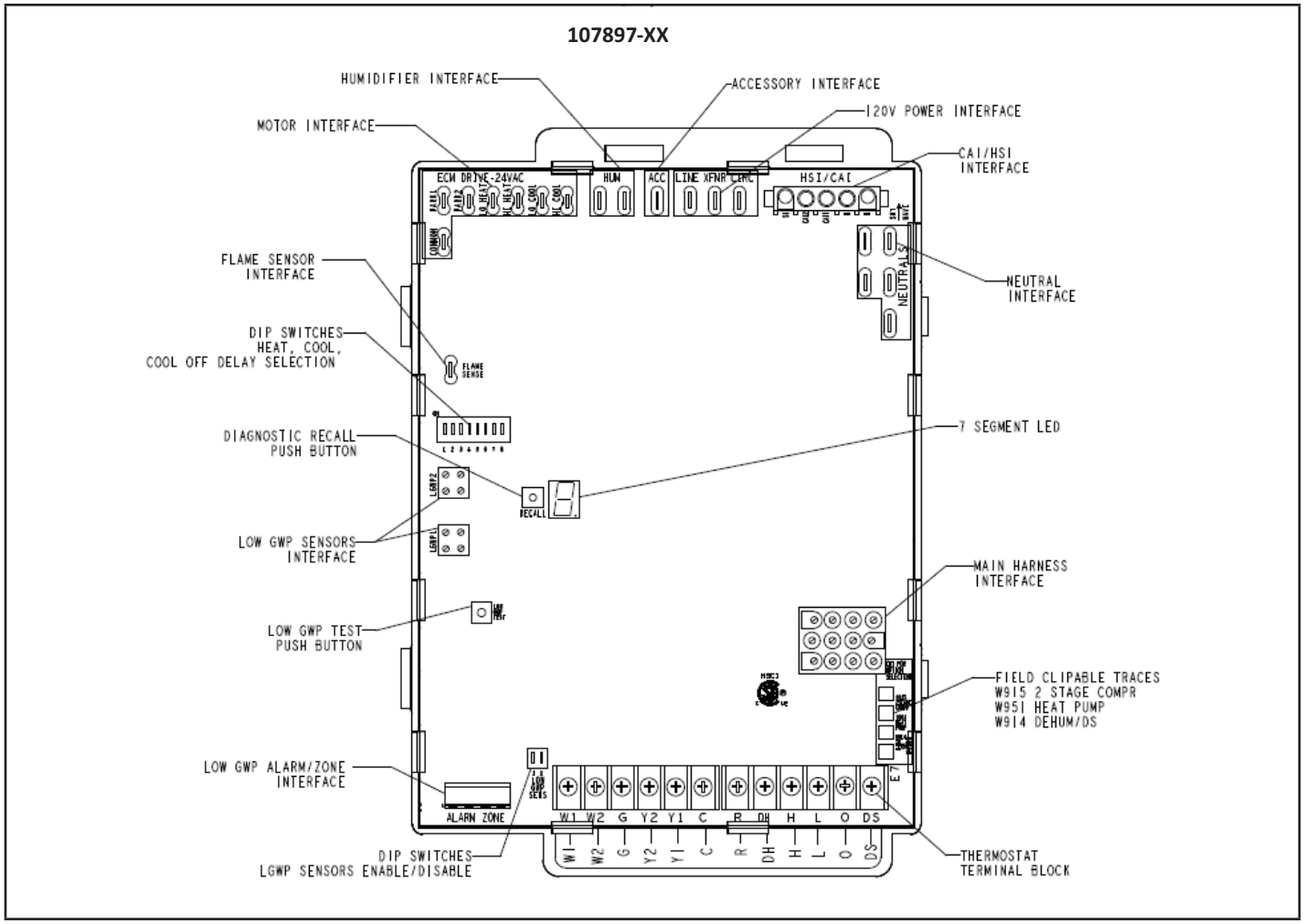


FIGURE 4

TABLE 2

THERMOSTAT INPUT TERMINALS	
W1	LOW STAGE HEAT
W2	HIGH STAGE HEAT
G	FAN
Y1	LOW STAGE COOL (when W915 is clipped)
Y2	HIGH STAGE COOL
C	THERMOSTAT COMMON / GROUND
R	24VAC TO THE THERMOSTAT
DH	DEHUMIDIFICATION (UNUSED)
H	24VAC HUMIDIFER (UNUSED)
L	LSOM (UNUSED)
O	HEAT PUMP REVERSING VALVE (when W951 is clipped)
DS	DEHUM / HARMONY (when W914 is clipped)

TABLE 3

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

TABLE 4

DIAGNOSTIC CODES / STATUS OF FURNACE	CODE
IDLE MODE (DECIMALBLINKS AT 1 HERTZ -- 0.5 SECONDS ON, 0.5 SECONDS OFF	.
INDOOR BLOWER OPERATION: CONTINUOUS FAN MODE (COSTANT TORQUE ONLY) INDOOR BLOWER OPERATION: FOLLOWED BY CFM SETTING FOR INDOOR BLOWER (1 SECOND ON, 0.5 SECOND OFF) / CFM SETTING FOR MODE DISPLAYED (VARIALBE SPEED ONLY)	A
COOLING STAGE (1 SECOND ON, 0.5 SECOND OFF) 1 OR 2 DISPLAYED / PAUSE / REPEAT CODES. VARIABLE SPEED ONLY	C
GAS HEAT (1 SECOND ON, 0.5 SECOND OFF) PAUSE / CFM DISPLAYED / PAUSE / REPEAT CODES BLINKING - IGNITION	H
HEAT PUMP STAGE (1 SECOND ON, 0.5 SECOND OFF) 1 OR 2 DISPLAYED / PAUSE / CFM SETTING DISPLAYED / PAUSE / REPEAT CODES	h
DEFROST MODE	dF
ERROR/FAULT CONDTION	**CODE**
NO ERROR IN THE MEMORY	E000
ELECTRICAL FAULTS (WAIT FOR RECOVERY)	
AC LINE VOLTAGE LOW	E110
TWIN COMMUNICATION FAULT (CONSTANT TORQUE ONLY)	E106
LINE VOLTAGE POLARITY REVERSED	E111
EARTH GROUND NOT DETECTED	E112
AC LINE VOLTAGE HIGH	E113
LINE VOLTAGE FREQUENCY UOT OF RANGE	E114
LOW 24V - CONTROLWILL RESTART IF THE ERROR RECOVERS	E115
HARDWARE FAULT (5 MINUTES LOCKOUT)	
CONTROL HARDWARE (INCLUDE A/D ELECTRONICS AND FLAME TEST) FAILURE	E125
HARD LOCKOUT FAULT	
ROLLOUT OPEN OR PREVIOUSLY OPENED	E200
GAS VALVE/PRESSURE SWITCH/LIMT FAULTS (wait for recovery)	
GAS VALVE RELAY (1ST OR 2ND STAGE) PROBLEM	E204
LOW PRESSURE SW FAILED TO CLOSE (STUCK OPEN)	E223
LOW PRESSURE SW FAILED TO OPEN (STUCK CLOSED)	E224
HIGH PRESSURE SW FAILED TO CLOSE (STUCK OPEN)	E225
HIGH PRESSURE SW FAILED TO OPEN (STUCK CLOSED)	E226
LOW PRESSURE SWITCH OPENED IN RUN OR TFI	E227
FLAME SENSE OUT OF SEQUENCE-STILL PRESENT	E241
PRIMARY LIMIT SWITCH OPENED	E250

TABLE 4 Continued

SOFT LOCKOUT FAULTS (60 MINUTES)	
GAS VALVE RELAY (1ST OR 2ND STAGE) CONTACT SHORTED	E205
HOT SURFACE IGNITOR (HSI) SENSED OPEN	E207
SOFT LOCKOUT-FLAME FAILURE ON IGNITION, IGNITION RETRY>MAX, LAST FAILED RETRY DUE TO FLAME FAILURE	E270
SOFT LOCKOUT-PRESSURE SWITCH OPEN, IGNITION RETRY>MAX, LAST FAILED RETRY DUE TO LPSW OPEN	E271
SOFT LOCKOUT-PRESSURE SWITCH OPEN, IN RUN MODE HEATING RECYCLES>MAX, LAST FAILED RETRY DUE TO LPSW OPEN	E272
SOFT LOCKOUT-FLAME FAILURE IN RUN MODE,HEATING RECYCLES>MAX, LAST FAILED RETRY DUE TO LOSS OF FLAME	E273
SOFT LOCKOUT-LIMIT OPEN > 3 MINUTES	E274
SOFT LOCKOUT-FLAME OUT OF SEQUENCE AND IS GONE	E275
IGNITOR CIRCUIT FAULT-FAILED IGNITOR OR TRIGGERING CIRCUITRY.	E290
PERFORMANCE WARNING	
POOR GROUND DETECTED	E117
IGNTION ON HIGH FIRE	E229
LOW FLAME CURRENT IN HEATING MODE	E240
LOW GWP REFRIGERANT FAULTS	
REFRIGERANT LEAK DETECTED, THERMOSTAT LOCKOUT	E150
REFRIGERANT LEAK DETECTOR SENSOR #1 FAULT	E151
REFRIGERANT LEAK DETECTOR SENSOR #2 FAULT	E152
REFRIGERANT LEAK DETECTOR SENSOR #1 COMM. LOST	E154
REFRIGERANT LEAK DETECTOR SENSOR #2 COMM. LOST	E155
REFRIGERANT LEAK DETECTOR SENSOR #1 TYPE INCORRECT	E160
REFRIGERANT LEAK DETECTOR SENSOR #2 TYPE INCORRECT	E161
REFRIGERANT LEAK DETECTOR CONTROL FAILURE	E163
LOW GWP TEST	E164
LOW GWP RELAY STUCK	E390

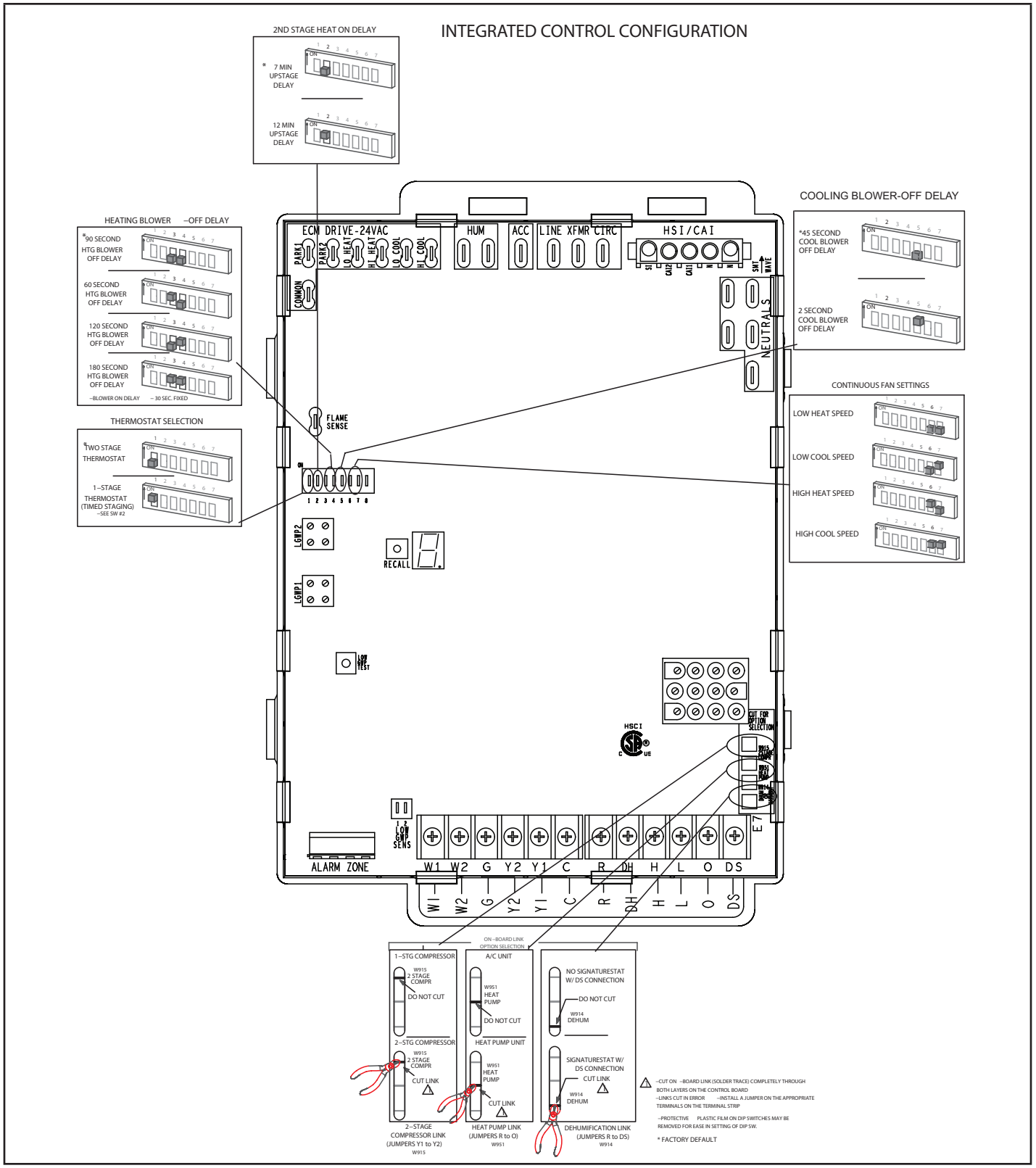

INTEGRATED CONTROL CONFIGURATION
2ND STAGE HEAT ON DELAY
* 7 MIN UPSTAGE DELAY
12 MIN UPSTAGE DELAY
HEATING BLOWER –OFF DELAY
*90 SECOND HTG BLOWER OFF DELAY
60 SECOND HTG BLOWER OFF DELAY
120 SECOND HTG BLOWER OFF DELAY
180 SECOND HTG BLOWER OFF DELAY
–BLOWER ON DELAY
– 30 SEC. FIXED
THERMOSTAT SELECTION
*TWO STAGE THERMOSTAT
1–STAGE THERMOSTAT (TIMED STAGING) –SEE SW #2
COOLING BLOWER-OFF DELAY
*45 SECOND COOL BLOWER OFF DELAY
2 SECOND COOL BLOWER OFF DELAY
CONTINUOUS FAN SETTINGS
LOW HEAT SPEED
LOW COOL SPEED
HIGH HEAT SPEED
HIGH COOL SPEED
ECM DRIVE-24VAC
PARK1
PARK2
LO HEAT
HI HEAT
LO COOL
HI COOL
COMMON
HUM
ACC
LINE XFMR CIRC
HSI/CAI
NEUTRALS
FLAME SENSE
LGWP2
LGWP1
RECALL
LOW GHP TEST
HSCI
CUT FOR OPTION SELECTION
LOW GHP SENS
ALARM ZONE
W1 W2 G Y2 Y1 C R DH H L O DS
ON–BOARD LINK OPTION SELECTION
1–STG COMPRESSOR
W915 2 STAGE COMPR
DO NOT CUT
2–STG COMPRESSOR
CUT LINK
2–STAGE COMPRESSOR LINK (JUMPERS Y1 to Y2)
W915
A/C UNIT
W951 HEAT PUMP
HEAT PUMP UNIT
HEAT PUMP LINK (JUMPERS R to O)
W951
NO SIGNATURESTAT W/ DS CONNECTION
W914 DEHUM
SIGNATURESTAT W/ DS CONNECTION
DEHUMIFICATION LINK (JUMPERS R to DS)
W914
–CUT ON –BOARD LINK (SOLDER TRACE) COMPLETELY THROUGH BOTH LAYERS ON THE CONTROL BOARD
–LINKS CUT IN ERROR –INSTALL A JUMPER ON THE APPROPRIATE TERMINALS ON THE TERMINAL STRIP
–PROTECTIVE PLASTIC FILM ON DIP SWITCHES MAY BE REMOVED FOR EASE IN SETTING OF DIP SW.
* FACTORY DEFAULT

FIGURE 5

Integrated Control DIP Switches

EL280UHEK 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. See FIGURE 5 for an integrated control configuration.

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 twostage thermostat. If a single-stage thermostat is to be used, the DIP switch must be repositioned.

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

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

Switch 2 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	Off	Off
120 (factory)	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.

Indoor Blower Speeds

1 - When the thermostat is set to “FAN ON,” the indoor blower will run continuously on the low speed when there is no cooling or heating demand. See TABLE 8 for allowable circulation speeds.

2 - 2When the EL280UH(X)EK is operating in the high-fire or low-fire heating mode, the indoor blower will run on the corresponding heating speed. See TABLE 9 for allowable heating speeds.

3 - When the EL280UH(X)EK is operating in the low cool or the high cool cooling mode, the indoor blower will run on the corresponding cooling speed.

TABLE 8

Allowable Circulation Speeds					
EL280UH Model Number	**Red**	**Yellow**	**Blue**	**Brown**	**Black**
045E36AK	Factory Setting	Allowed	Not Allowed	Not Allowed	Not Allowed
070E36AK					
090E36BK	Allowed	Factory Setting			
090E48BK	Factory Setting	Allowed			
110E48CK	Allowed	Factory Setting			
110E60CK	Factory Setting	Allowed			

TABLE 9

Allowable Heating Speeds										
EL280UH Model Number	**Low Fire Heating Speeds**					**High Fire Heating Speeds**				
	Red	**Yellow**	**Blue**	**Brown**	**Black**	**Red**	**Yellow**	**Blue**	**Brown**	**Black**
045E36AK	Factory Setting	Allowed	Allowed	Allowed	Not Allowed	Not Allowed	Factory Setting	Allowed	Allowed	Allowed
070E36AK	Factory Setting			Not Allowed						
090E36BK	Allowed	Factory Setting					Allowed		Factory Setting	
090E48BK	Factory Setting	Allowed					Factory Setting		Allowed	
110E48CK	Allowed	Factory Setting					Allowed		Factory Setting	
110E60CK	Factory Setting	Allowed	Not Allowed				Factory Setting		Allowed	

B- Indoor Blower

⚠ IMPORTANT

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

EL280UHEK units are equipped with a constant torque ECM motor. It has a DC motor coupled to an electronicco-ntrol 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 8 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 6. When replacing the indoor blower motor the set screw must be aligned and tightened with the motor shaft as shown in FIGURE 7.

BLOWER WHEEL REPLACEMENT

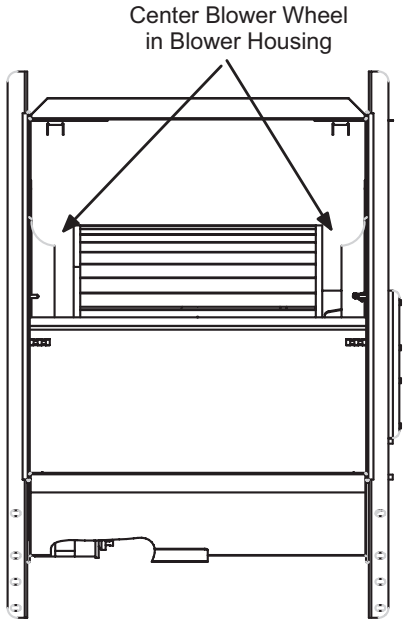


FIGURE 6

ALIGN AND TIGHTEN SET SCREW WITH FLAT SIDE OF MOTOR SHAFT

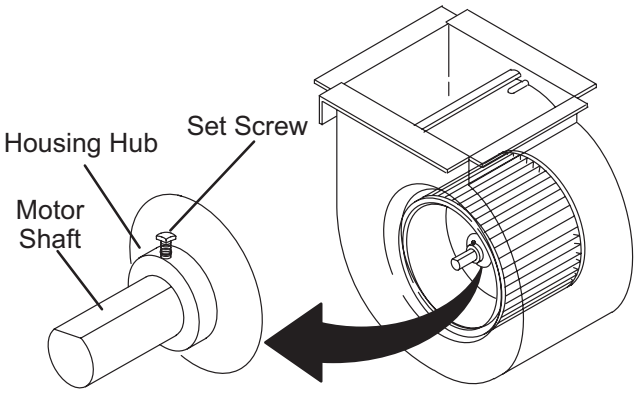
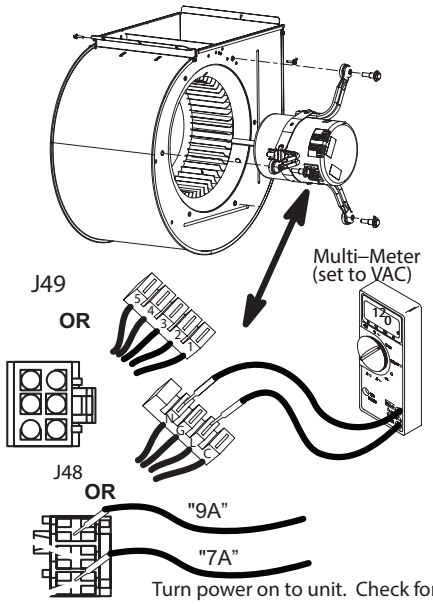
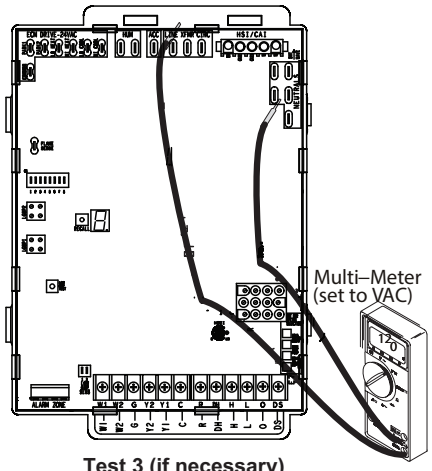


FIGURE 7



Test 1

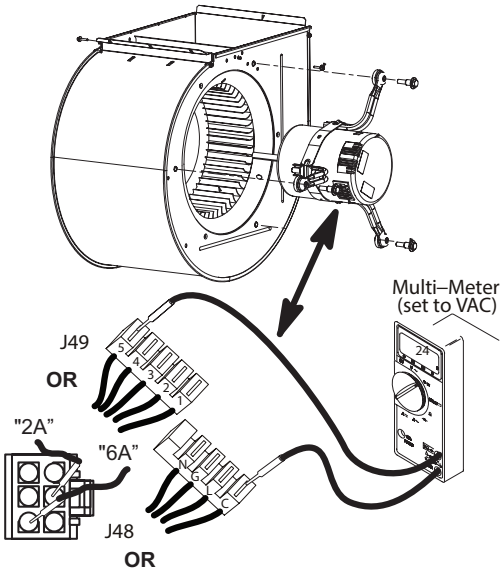
Turn power on to unit. Check for 120 volts across terminals "L" and "N" or terminals "7A" and "9A" of connector J48. If voltage is present continue to test 2. If voltage is not present problem may be upstream of J48. Proceed to test3.



Test 3 (if necessary)

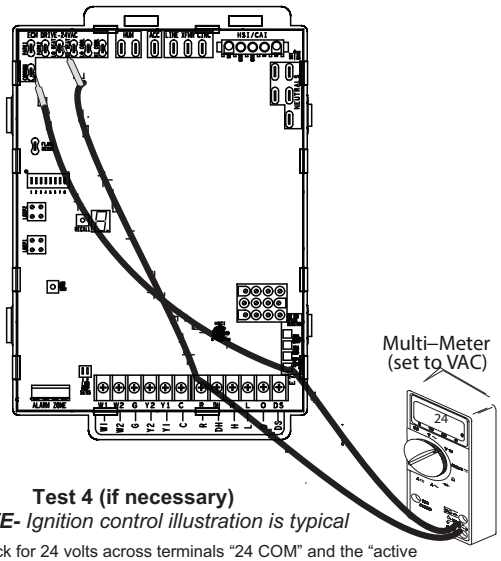
NOTE- *Ignition control illustration is typical*

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



Test 2

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



Test 4 (if necessary)

NOTE- *Ignition control illustration is typical*

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

FIGURE 8

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 9.

4 - Remove the two hex head bolts securing the motor control module to the motor (FIGURE 10).

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.

Unplug the Two Harness Connection

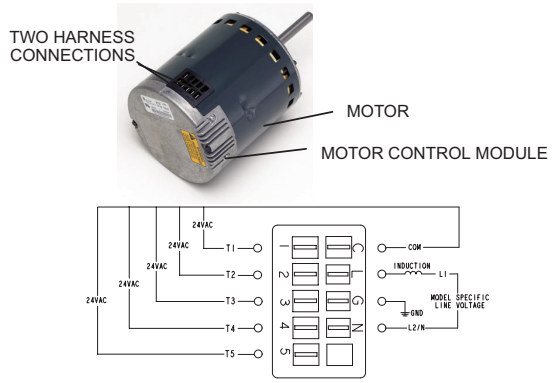


FIGURE 9

Remove the Hex Head Bolts

FIGURE 10

Testing the Motor (FIGURE 11)

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.

Motor Test

FIGURE 11

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 10. 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 12). This will directs moisture away from the motor and its electric connections on the motor.

TABLE 10

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

Drip Loop

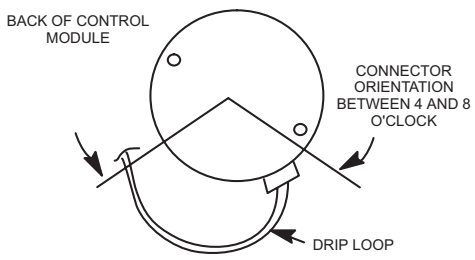


FIGURE 12

C- Heating Components

1. Ignitor

The SureLight® ignitor is made of durable silicon nitride. Ignitor longevity is enhanced by controlling voltage to the ignitor. The integrated control provides a regulated 120 volts to the ignitor for a consistent ignition and long ignitor life. Ohm value should be 39 to 70. See FIGURE 13 for ignitor location and FIGURE 15 for ignitor check out.

NOTE - *The EL280UHEK furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.*

2. Flame Sensor

A flame sensor is located on the left side of the burner support. See FIGURE 13. The sensor 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 14 and TABLE 11 for flame signal check and measurement.

3. Gas Valve

The two-stage gas valve (FIGURE 18) 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 EL280UHEK is equipped with two rollout switches. See FIGURE 13 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

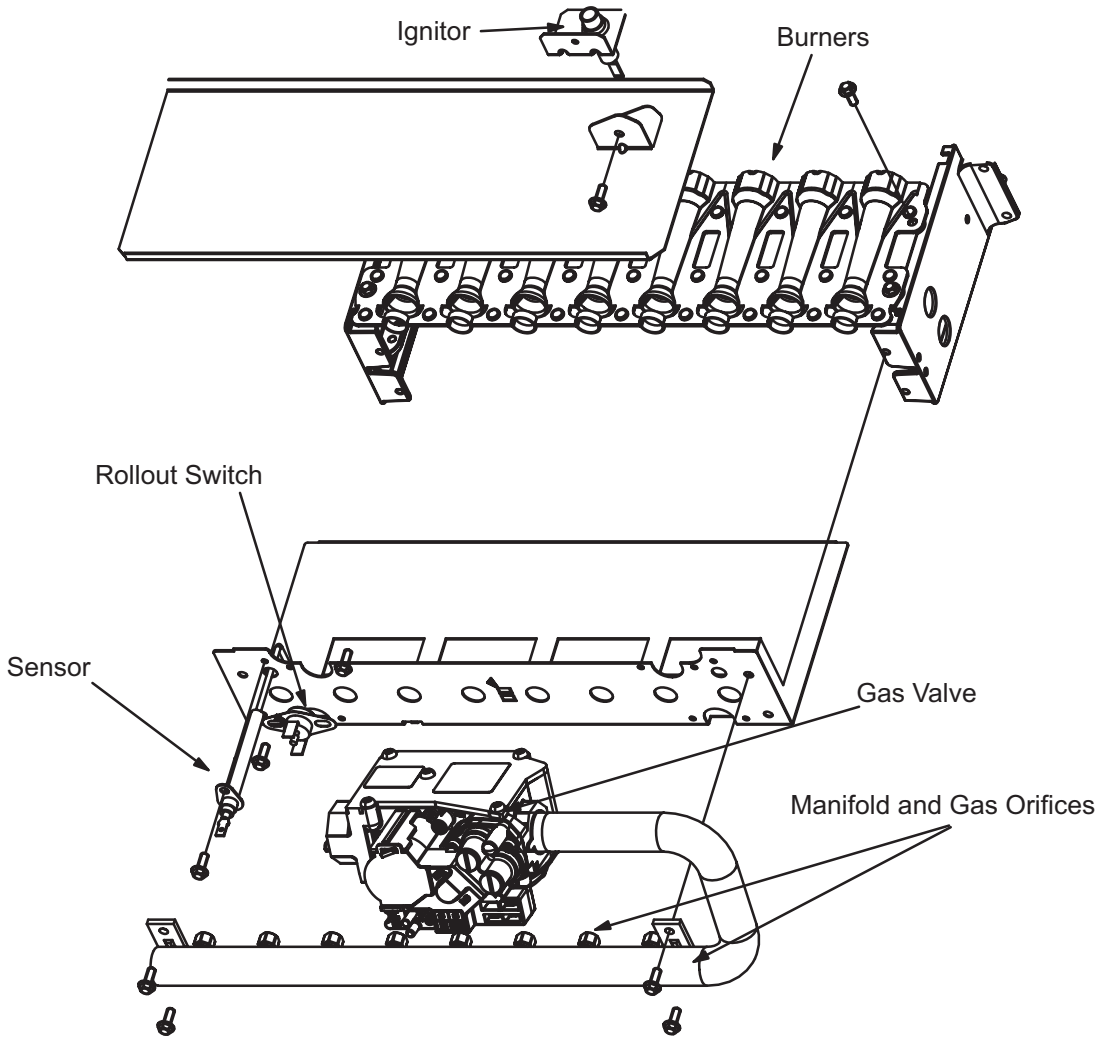


FIGURE 13

To Measure Flame Signal - Integrated Control:

Use a digital readout meter capable of reading DC microamps. See FIGURE 14 and TABLE 11 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 11

Flame Signal in Microamps

Normal	Low	Drop Out
2.6 or greater	2.5 or less	0.6

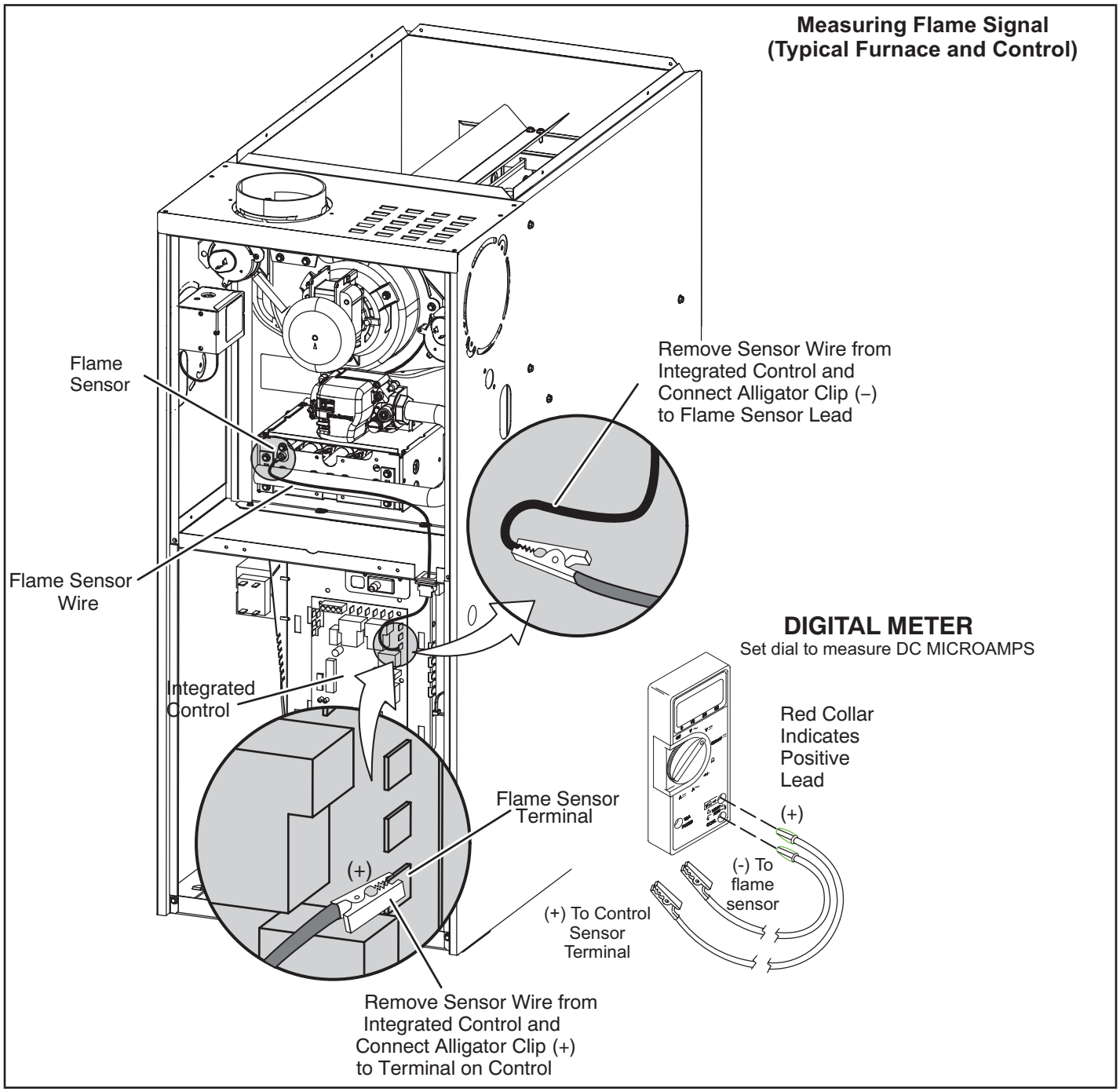
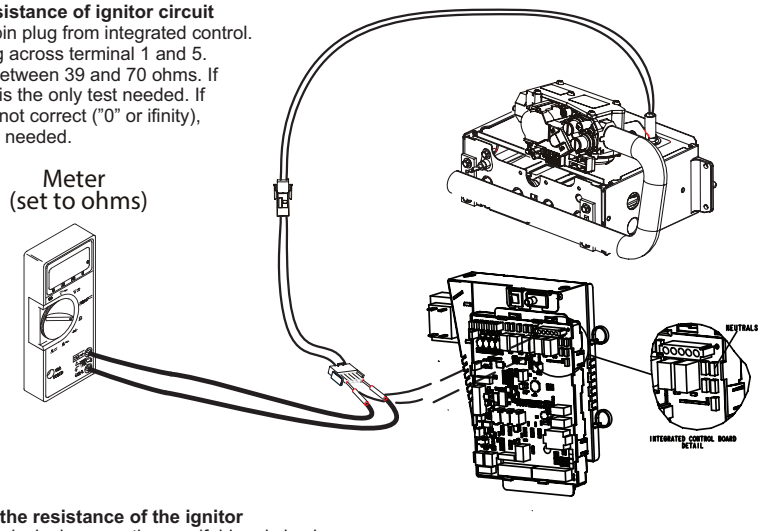


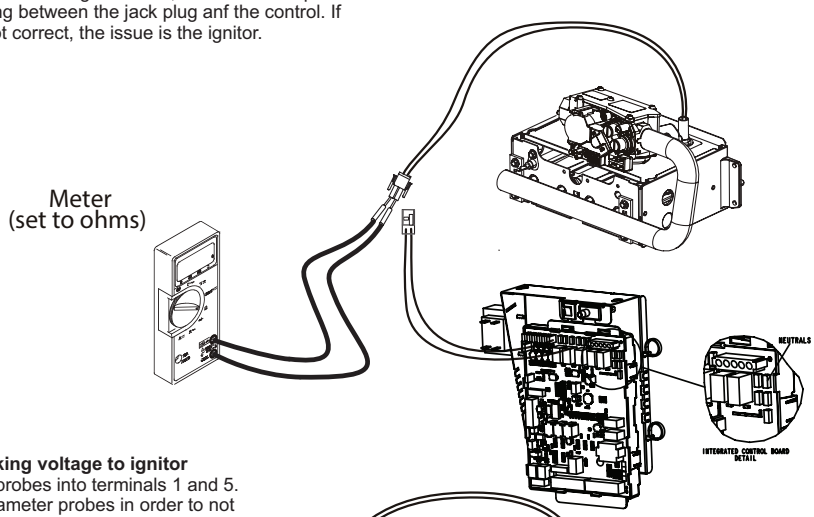
FIGURE 14

Ignitor Check Out

Test 1 Checking resistance of ignitor circuit
Remove HSI/CAI 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 ifinity), then a second test is needed.



Test 2 Checking the resistance of the ignitor
Seperate the 2-pin jack plug near the manifold and check resistance of the ignitor. Reading should be betwenn 39 and 70 ohms. If reading is correct, then there is a problem with the wiring between the jack plug anf 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.

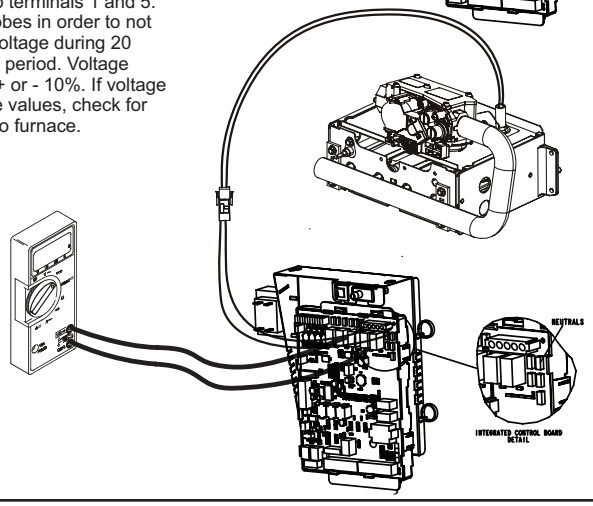


FIGURE 15

7. Combustion Air Inducer (B6)

All EL280UHEK 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 12 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 12

EL280UHEK 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)

EL280UHEK 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 16. 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 13. 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.

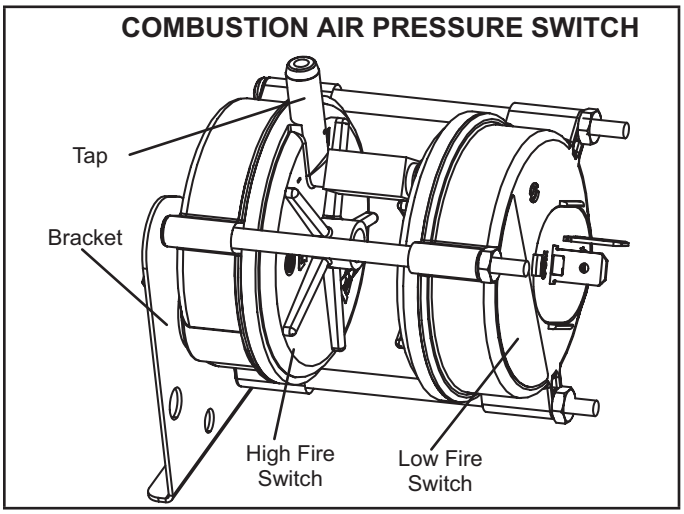


FIGURE 16

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 13

0 - 4500 FT

EL280UHEK 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.*

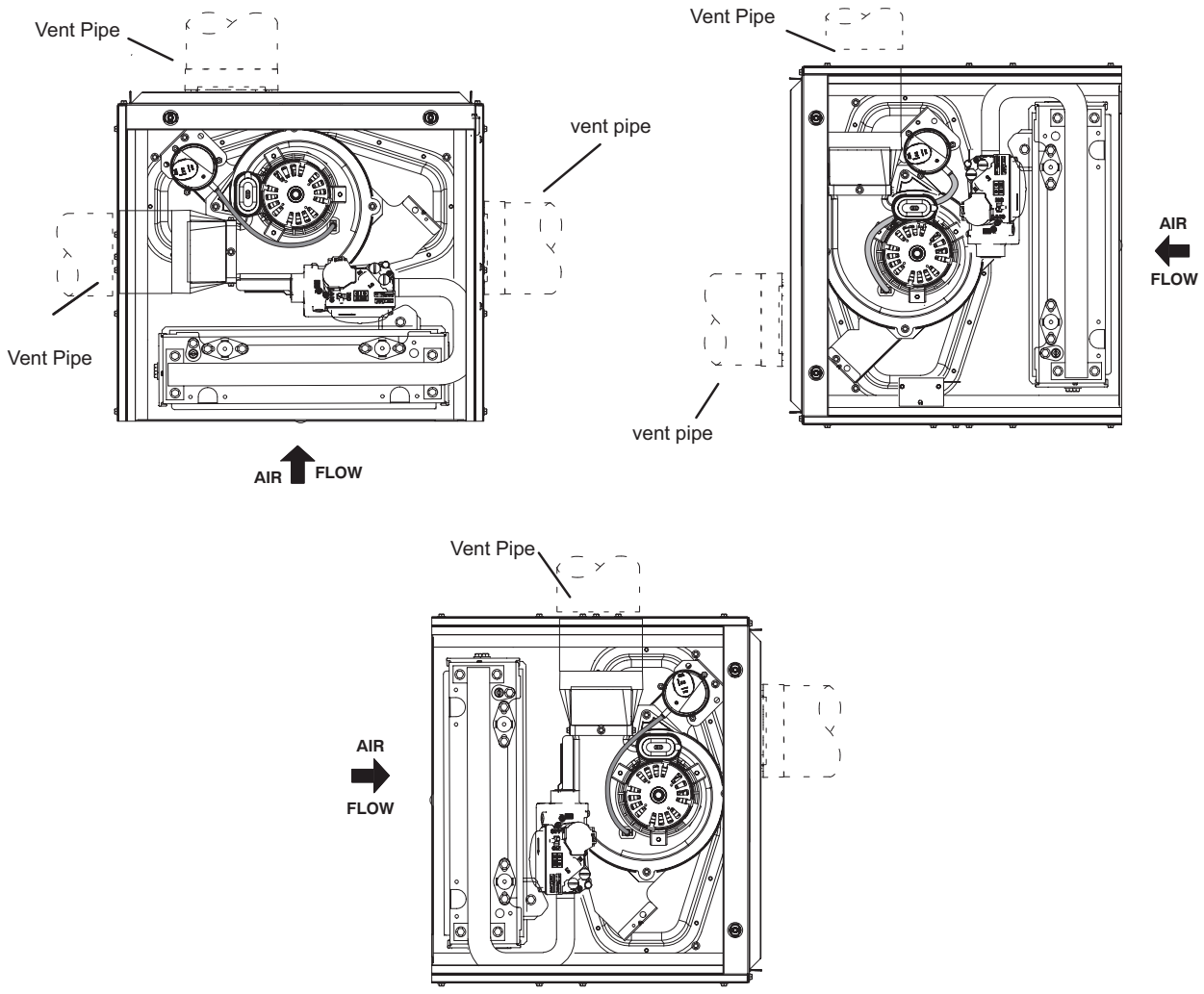
Multiple Venting

The EL280UHEK furnace can vent in multiple positions. See FIGURE 17.

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.



In all positions route the wires away from moving parts and the heat of the inducer motor to prevent damage to the wires. The pressure switch must be installed above the CAI to prevent moisture from collecting in the hoses or switch.

FIGURE 17

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.

EL280UHEK 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 18.

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.

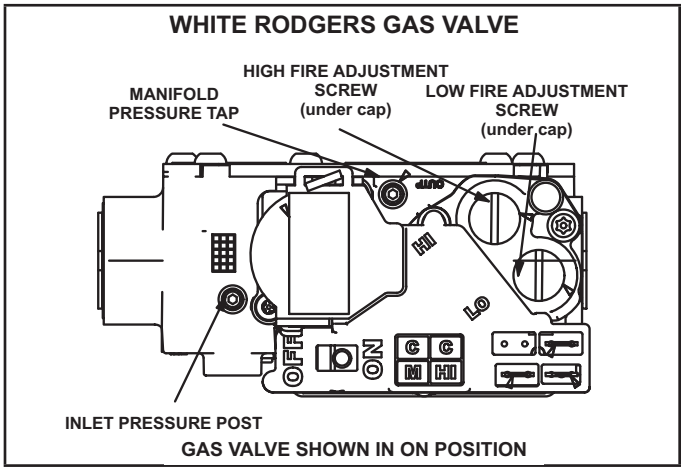


FIGURE 18

8 - Move switch on gas valve to ON. Do not force. See FIGURE 18.

9 - Replace the access panel.

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

11 - Set the thermostat to desired setting.

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

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 willcause 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 EL280UHEK 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 19. 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.

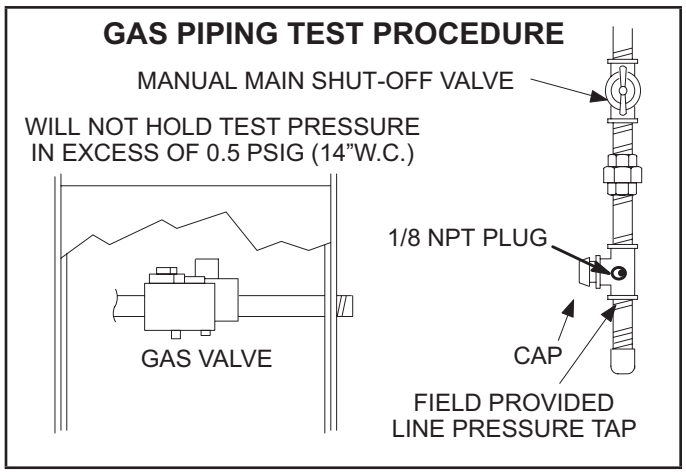


FIGURE 19

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 EL280UHEK 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 18) 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 14 below. If manifold pressure matches TABLE 16 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 14

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 15 shows acceptable combustion for ALL EL280UHEK models. The maximum carbon monoxide reading should not exceed 100 ppm.

TABLE 15

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 16 for manifold pressure and TABLE 17 for pressure switch change and gas conversion kits.

TABLE 16

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	Natuarl	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 17

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.

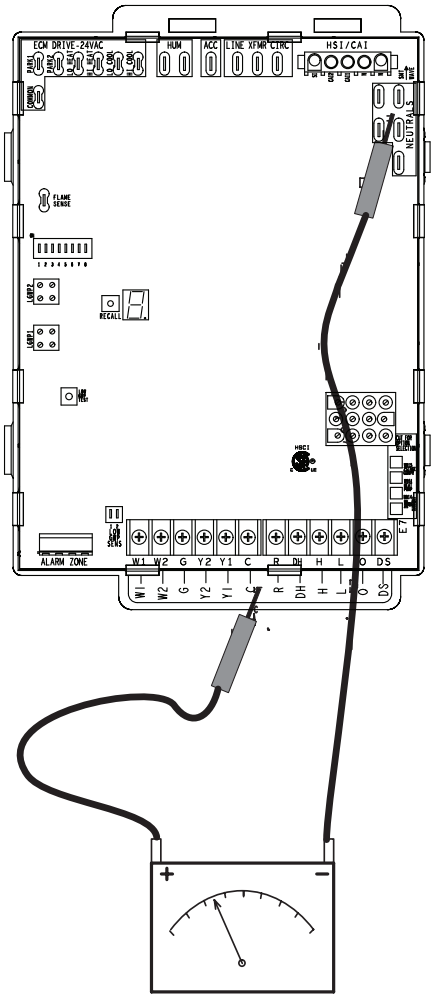
1 - Measure the AC voltage between Line Neutral (spade terminals) and “C” terminal (low voltage terminal block) on the integrated control. See FIGURE 20. A wide variation in the voltage between Line Neutral and “C” as a function of load indicates a poor or partial ground. Compare the readings to the table below. If the readings exceed the maximum shown in TABLE 18, 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 20. This voltage should be in the range of 97 to 132 Vac.

TABLE 18

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

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



CHECK VOLTAGE BETWEEN LINE NEUTRAL AND LINE HOT

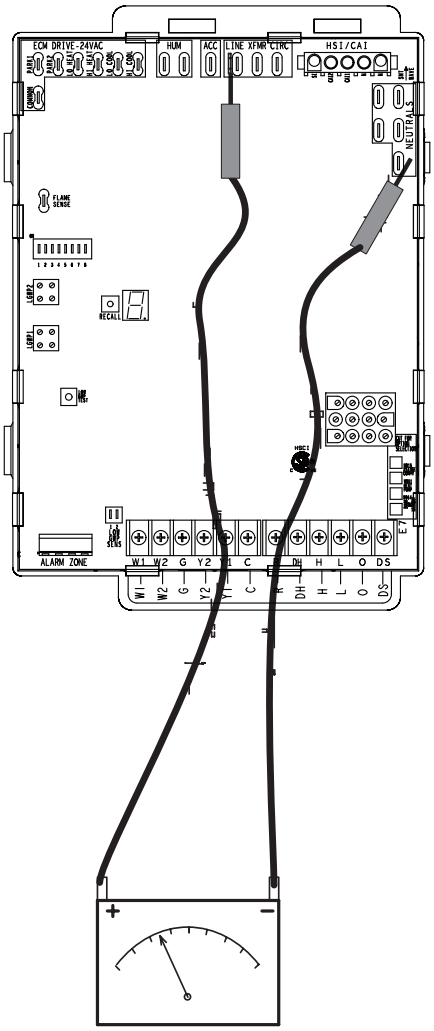


FIGURE 20

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 21)

Temperature rise for EL280UHEK units depends on unit input, blower speed, blower horsepower and static pressure as marked on the unit rating plate. The blower speed must be set for unit operation within the range of “TEMP. RISE °F” listed on the unit rating plate.

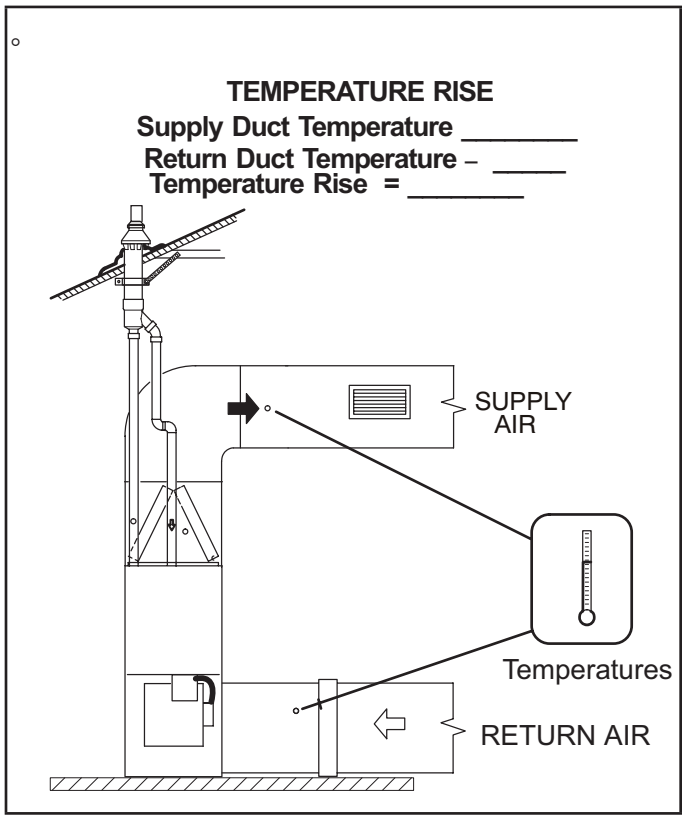


FIGURE 21

C-External Static Pressure

1 - Tap locations shown in FIGURE 22.

2 - Punch a 1/4” diameter hole in supply and return air plenums. Insert manomter hose flush with inside edge of hole or insulation. Seal around the hose with permagum. Connect the zero end of the manometer to the discharge (supply) side of the system. On ducted systems, connect the other end of manometer to the return duct as above.

3 - With only the blower motor running and the evaporator coil dry, observe the manometer reading. Adjust blower motor speed to deliver the air desired according to the job requirements. For heating speed external static pressure drop must not be more than 0.5” W.C. For cooling speed external static pressure drop must not be more than 0.8” W.C.

4 - Seal the hole when the check is complete.

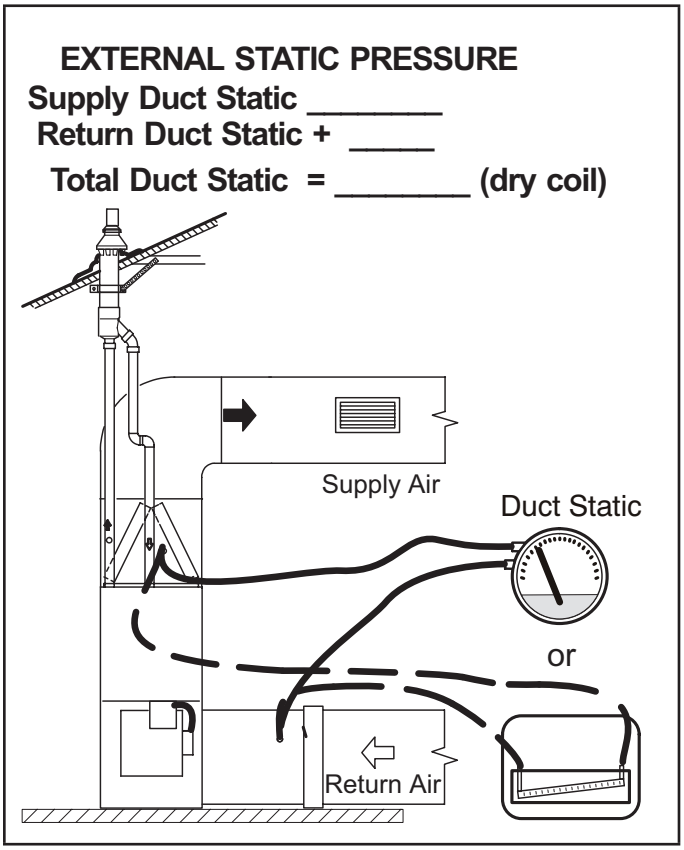


FIGURE 22

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.

15 - Inspect the Low GWP sensor(s) and rubber sleeve.

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

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

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

3 - Clock gas meter to ensure that the unit is operating at the specified firing rate. 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 24.

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 25.

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 23 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.

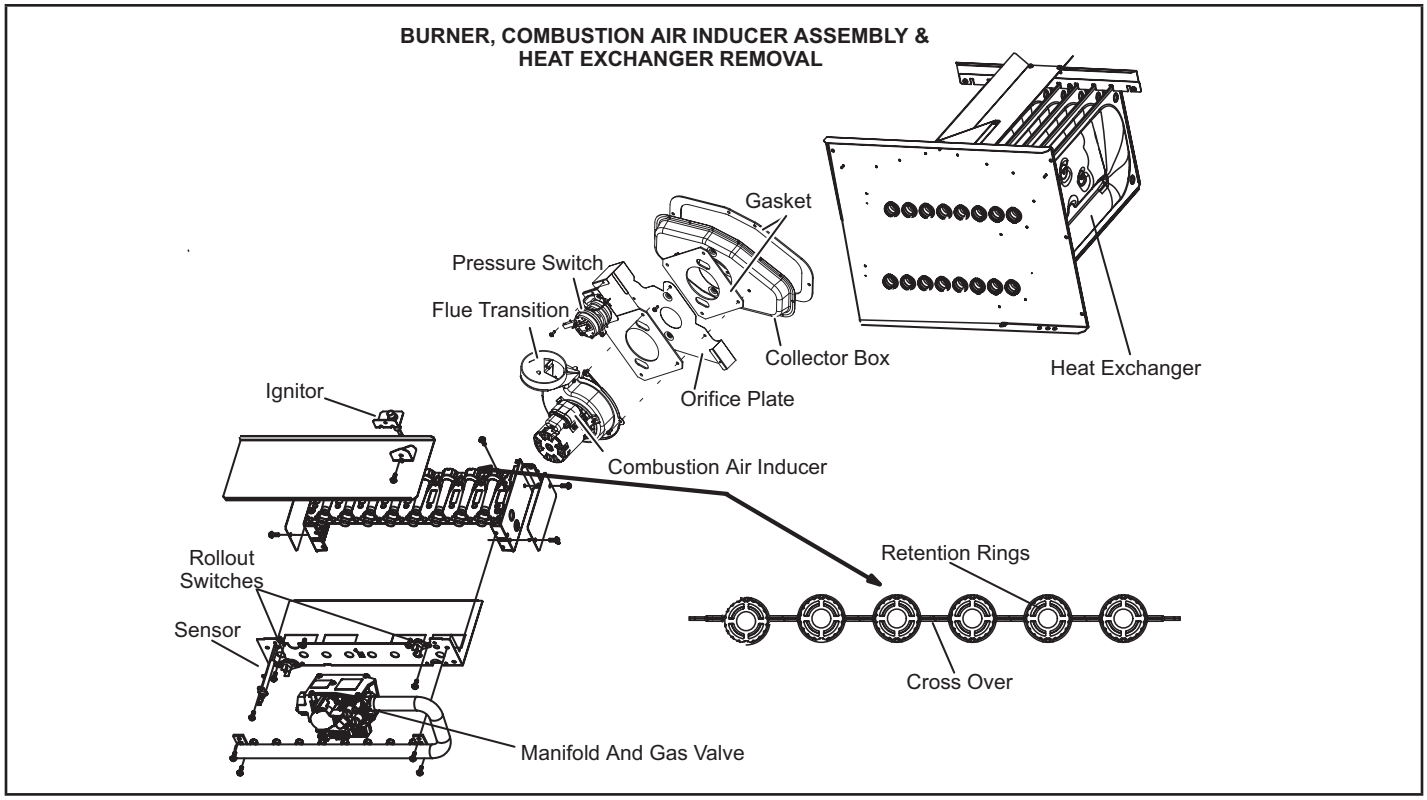


FIGURE 23

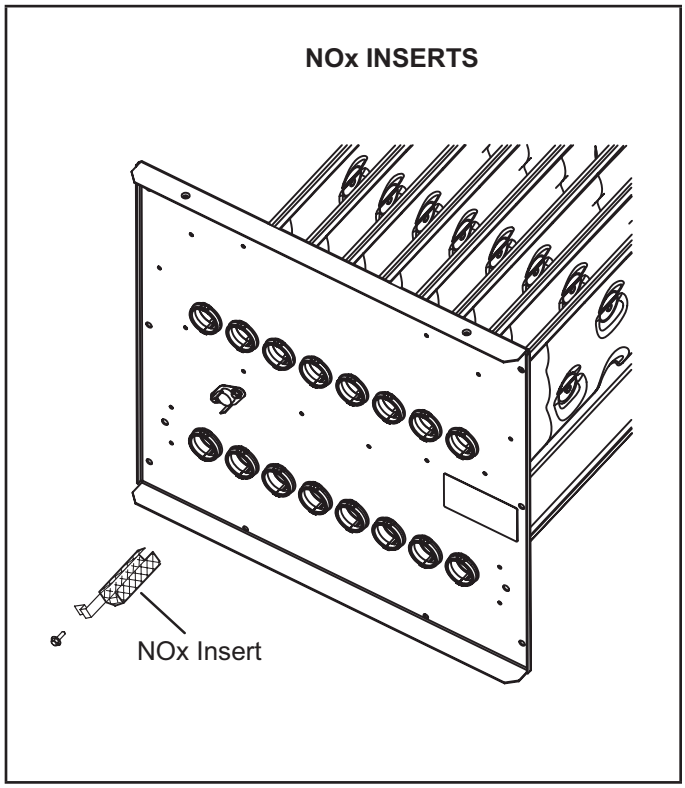


FIGURE 24

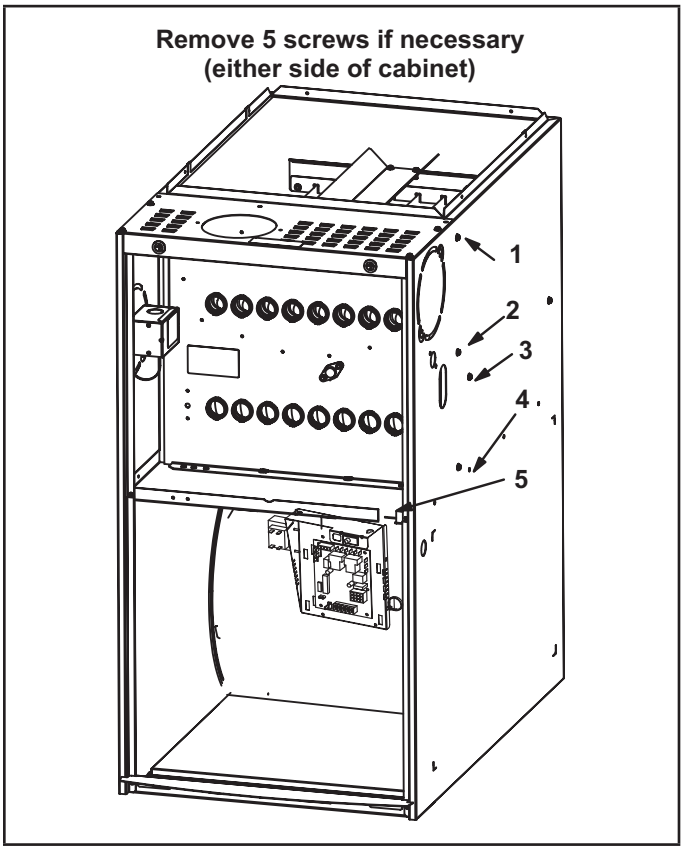


FIGURE 25

VII-Low GWP Applications

⚠ WARNING

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

CONNECTING THE FURNACE CONTROL BOARD SENSOR.

See FIGURE 34 and follow steps below:

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

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

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

Ensure the cable is properly seated into the SENSOR 1 plug (LGWP1). The Molex plug clip should lock into the Molex connection point for a secured connection, as shown below in FIGURE 26. Verify the connection is free of dust, debris, and moisture.

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

TwoStage Constant Torque Control

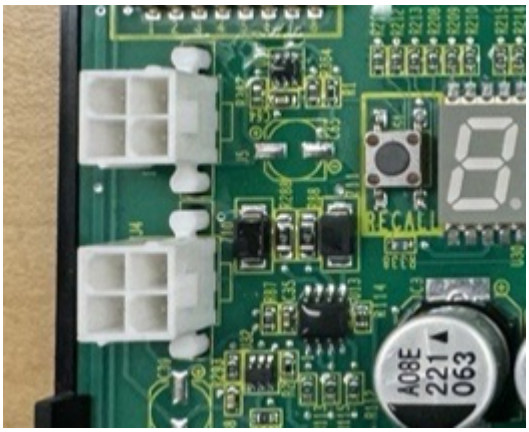


FIGURE 26

LOW GWP DIP SWITCH SETTINGS

Adjust the DIP switch settings to the sensor configuration. Failure to do so will cause faults on power-up. See FIGURE 27 and TABLE 19.

FIGURE 27

TABLE 19

DIP Switch Settings

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

In single sensor configurations, the sensor must be connected to the SENSOR 1 plug (LGWP1). Configurations other than the ones shown in TABLE 19 will cause a servicing fault.

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

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

SECONDARY SENSOR REQUIREMENTS

Additional Line Sets

If additional refrigerant line joints are present outside of the line set sleeve and a secondary refrigerant detection sensor is required, its installation must comply with the requirements listed in Refrigerant Detection Sensor Kit (27V53). See FIGURE 34 for routing the secondary sensor cable through the furnace cabinet.

Non-Low GWP Applications

⚠ WARNING

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

FURNACE CONTROL BOARD LOW GWP MODES OF OPERATION

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

Initializing

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

Normal

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

Leak Detected

When the furnace control board detects a refrigerant leak:

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

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

Fault

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

NOTE - *See TABLE 4 for Low GWP diagnostic error codes.*

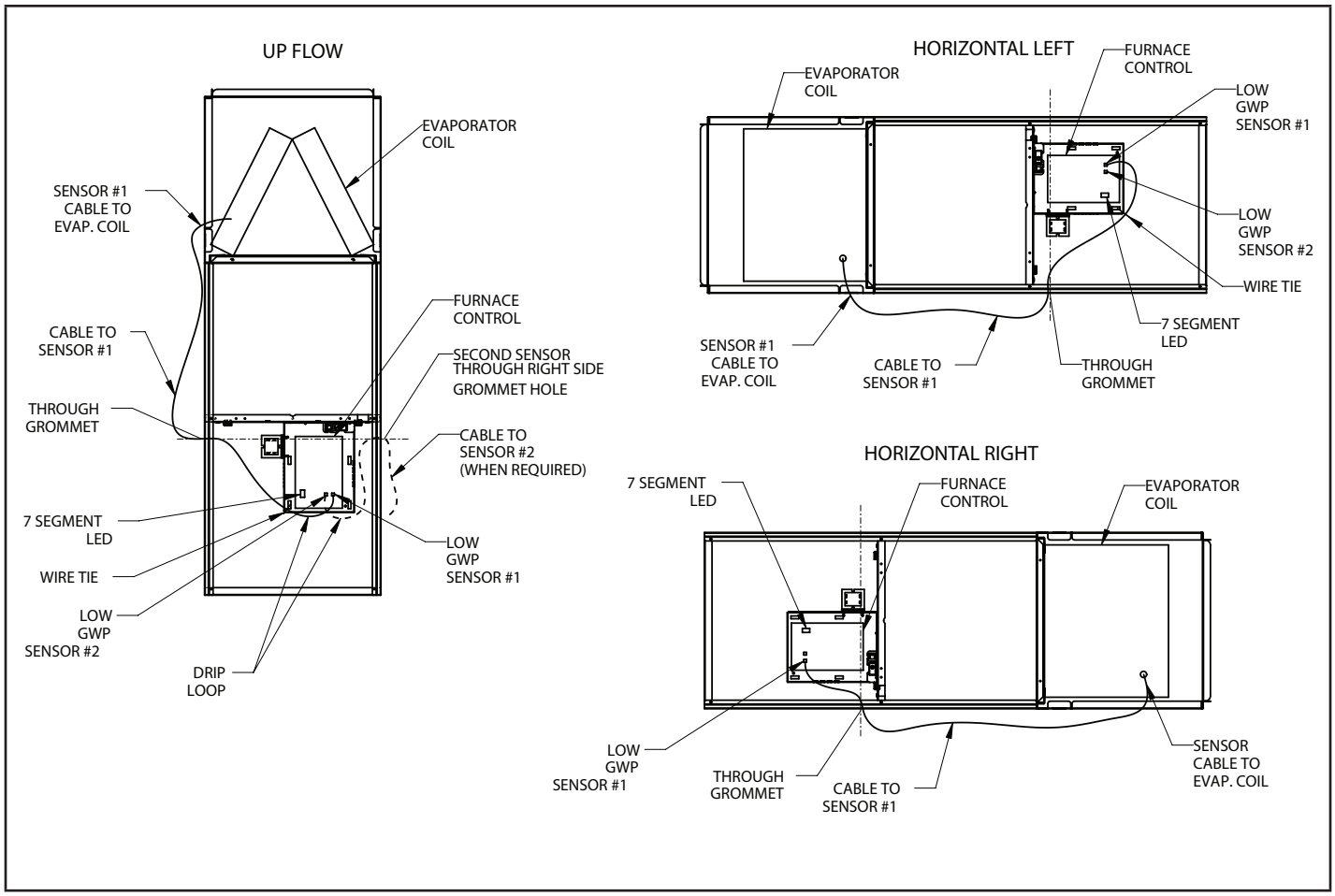


FIGURE 28

LGWP TEST BUTTON FUNCTIONALITY

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

TABLE 20 lists the functions of the Test button during each mode of operation.

TABLE 20

LGWP Test Button Function

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

LGWP Test Button - Additional Functions

TABLE 21 lists the additional functions of the Test Button while the furnace control board is functioning within the states of Initializing, Monitoring, Leak Detection, Servicing and Fault.

TABLE 21

Additional Button Functions

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

External Alarm

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

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

THERMOSTAT COMPATIBILITY

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

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

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

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

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

START UP PROCEDURE

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

Cooling Demand

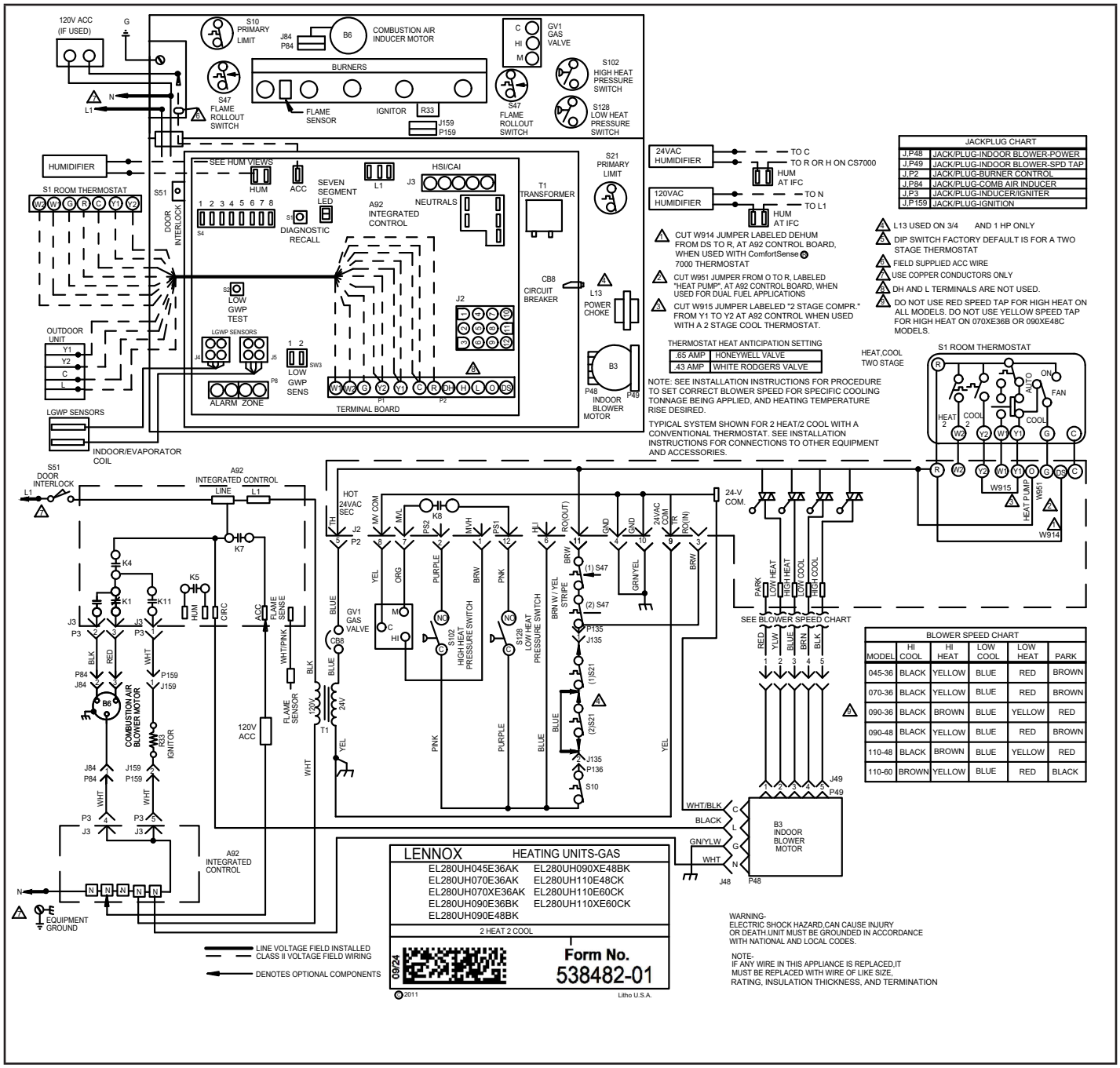
1. Prompt a cooling demand at the thermostat.
2. Press the LGWP Test button on the furnace control board.

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

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

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

VIII- Diagram,Sequence of Operation and DIP Switch Settings



Electronic Ignition

The two-stage integrated control used in EL280UHEK 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 29 for heating operation 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 a s the 120V ACC terminal.

Applications Using A Single-Stage Thermostat

See FIGURE 30 for heating operation

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.

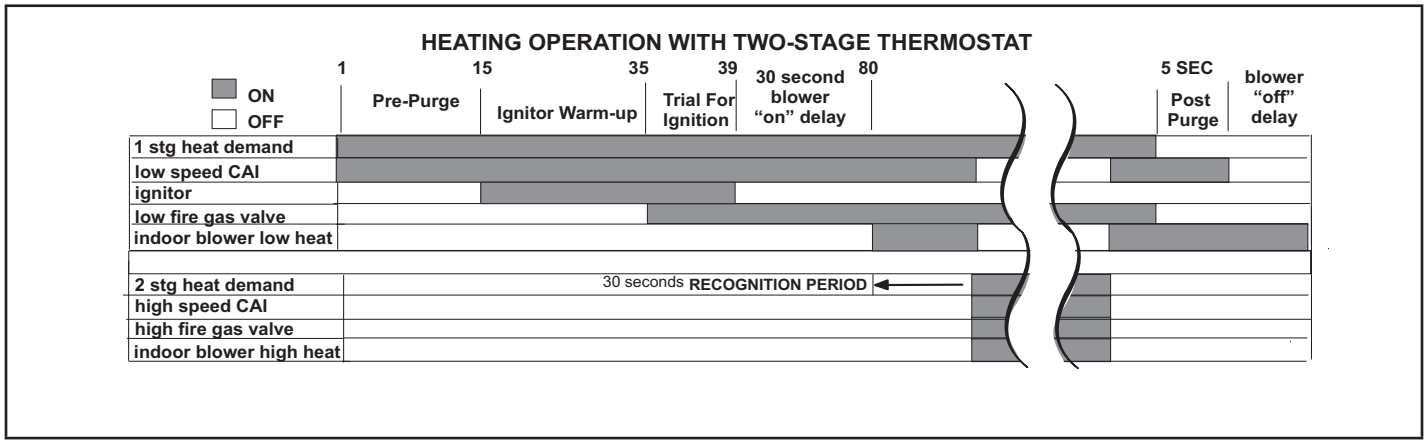


FIGURE 29

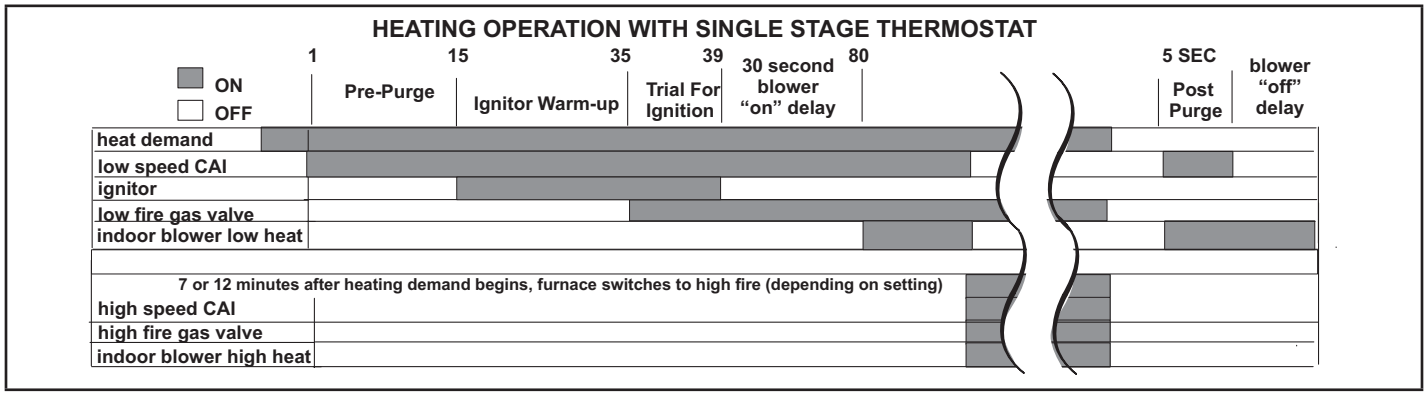
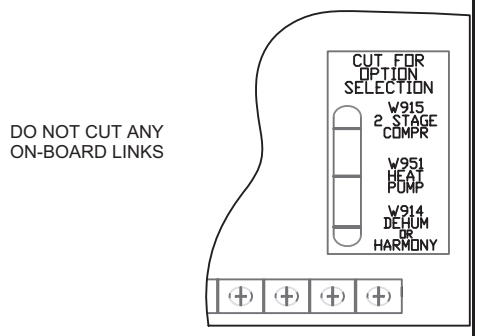
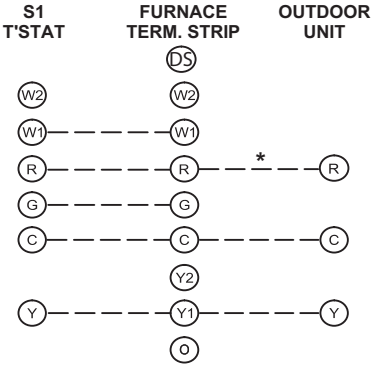
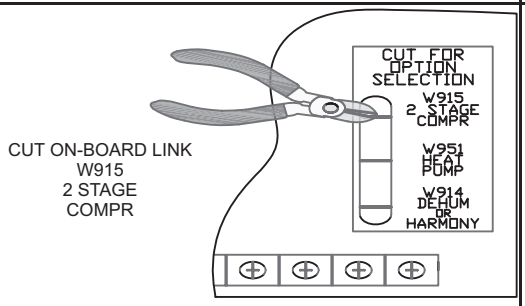
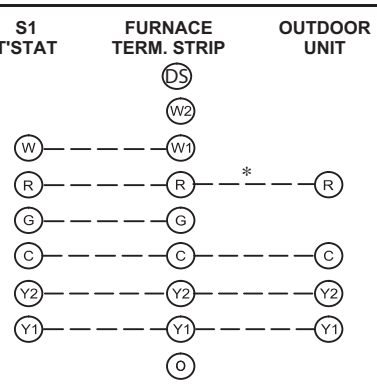
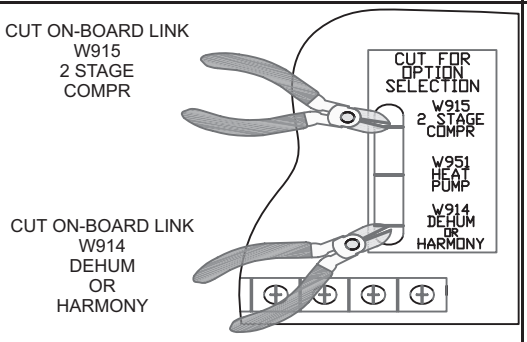
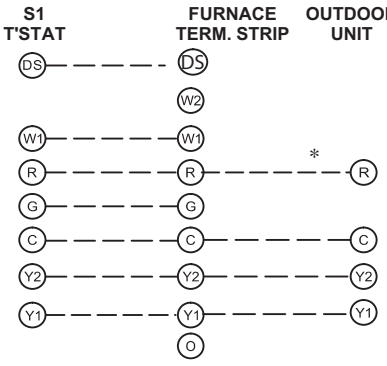
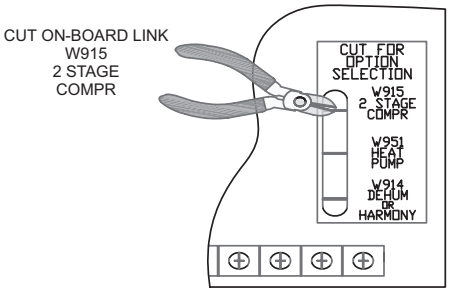
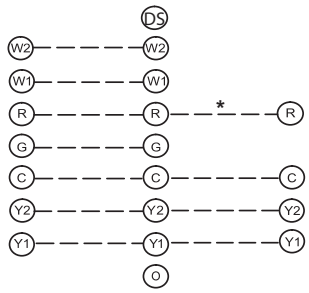
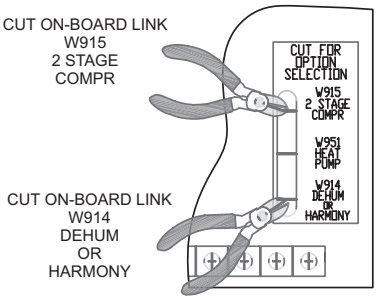
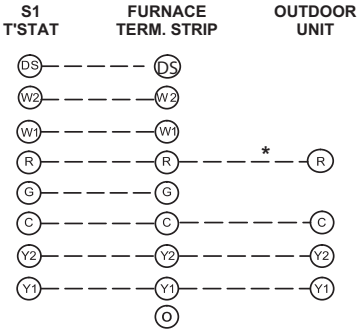
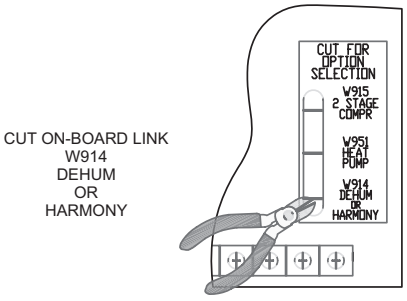
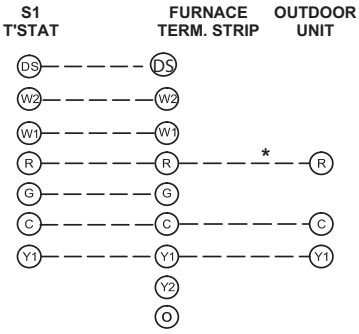
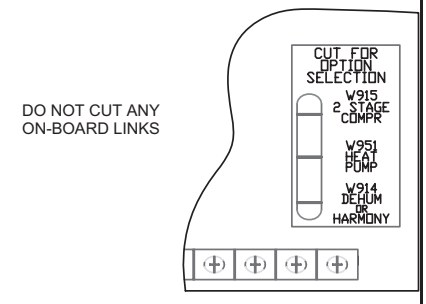
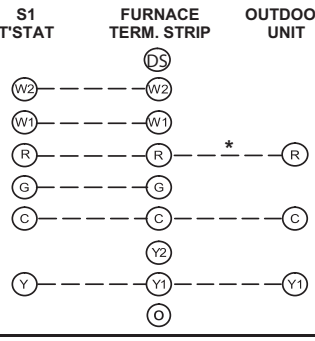


FIGURE 30

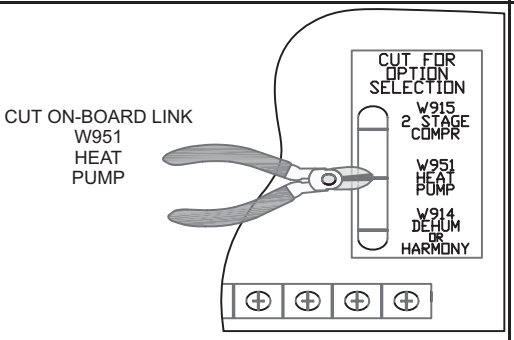
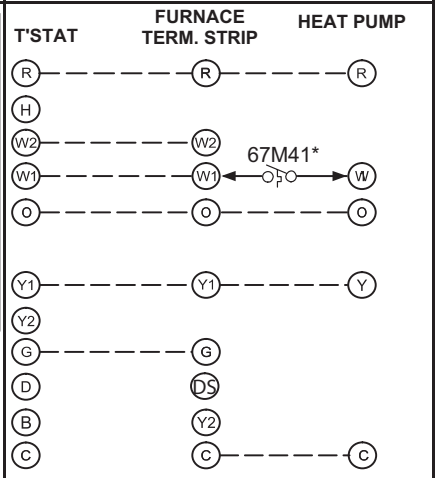
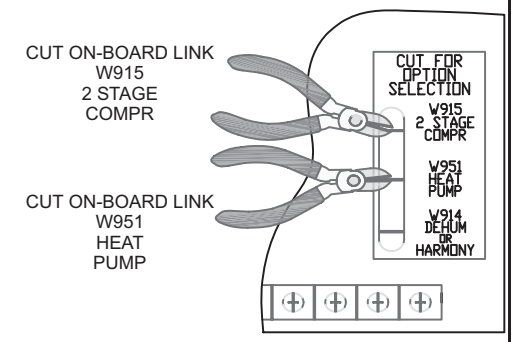
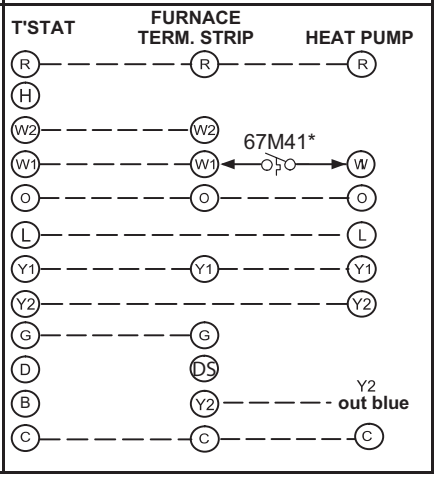
Field Wiring and DIP Switch Settings

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 *NOTE - Use DIP switch 2 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.* (L40 T-stat)	ON		
1 Heat / 2 Cool *NOTE - Use DIP switch 2 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.* (M30 T-stat)	ON		
1 Heat / 2 Cool with t'stat with humidity control *NOTE - Use DIP switch 2 to set second-stage heat ON delay. OFF-7 minutes. ON-12 minutes.* (M30 T-stat)	ON		

** Not required on all units.*

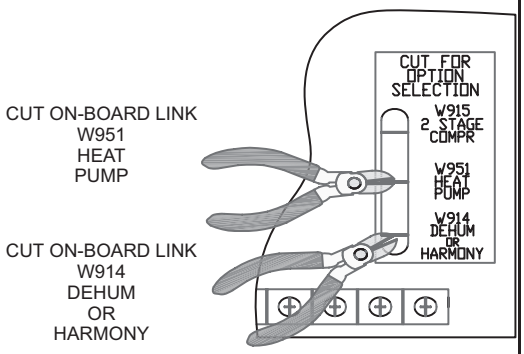
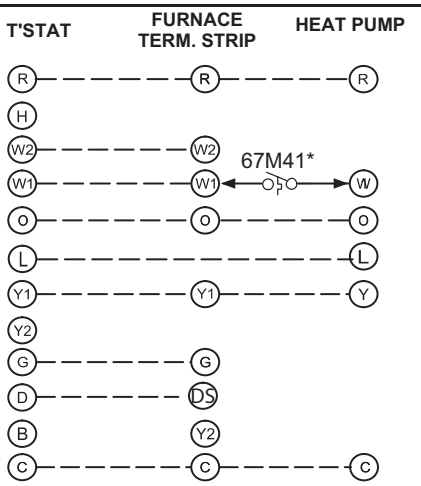
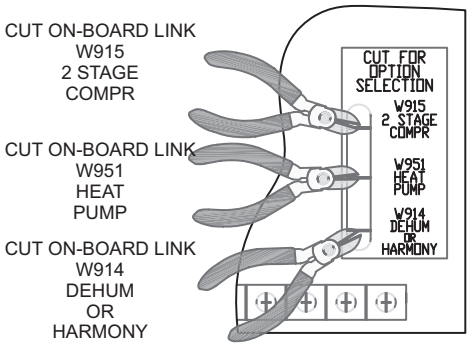
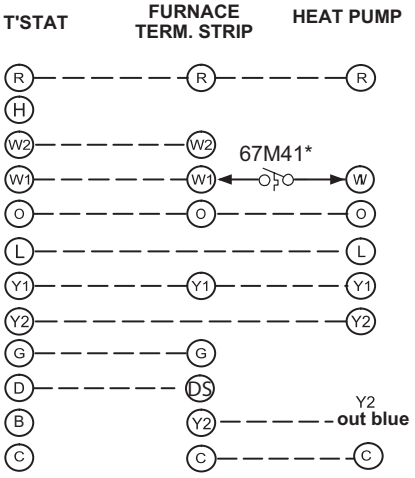
Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options	
2 Heat / 2 Cool (M30 T-stat)	OFF		
2 Heat / 2 Cool with t'stat with humidity control (M30 T-stat)	OFF		
2 Heat / 1 Cool with t'stat with humidity control (M30 T-stat)	OFF		
2 Heat / 1 Cool (M30 T-stat)	OFF		

** Not required on all units.*

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	
Dual Fuel Single Stage Heat Pump (M30 T-stat) thermostat w/ dual fuel capa-bilities Capable of 2 stage gas heat control	OFF		
Dual Fuel Two Stage Heat Pump (M30 T-stat) thermostat w/ dual fuel capa-bilities Capable of 2 stage gas heat control	OFF		

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

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

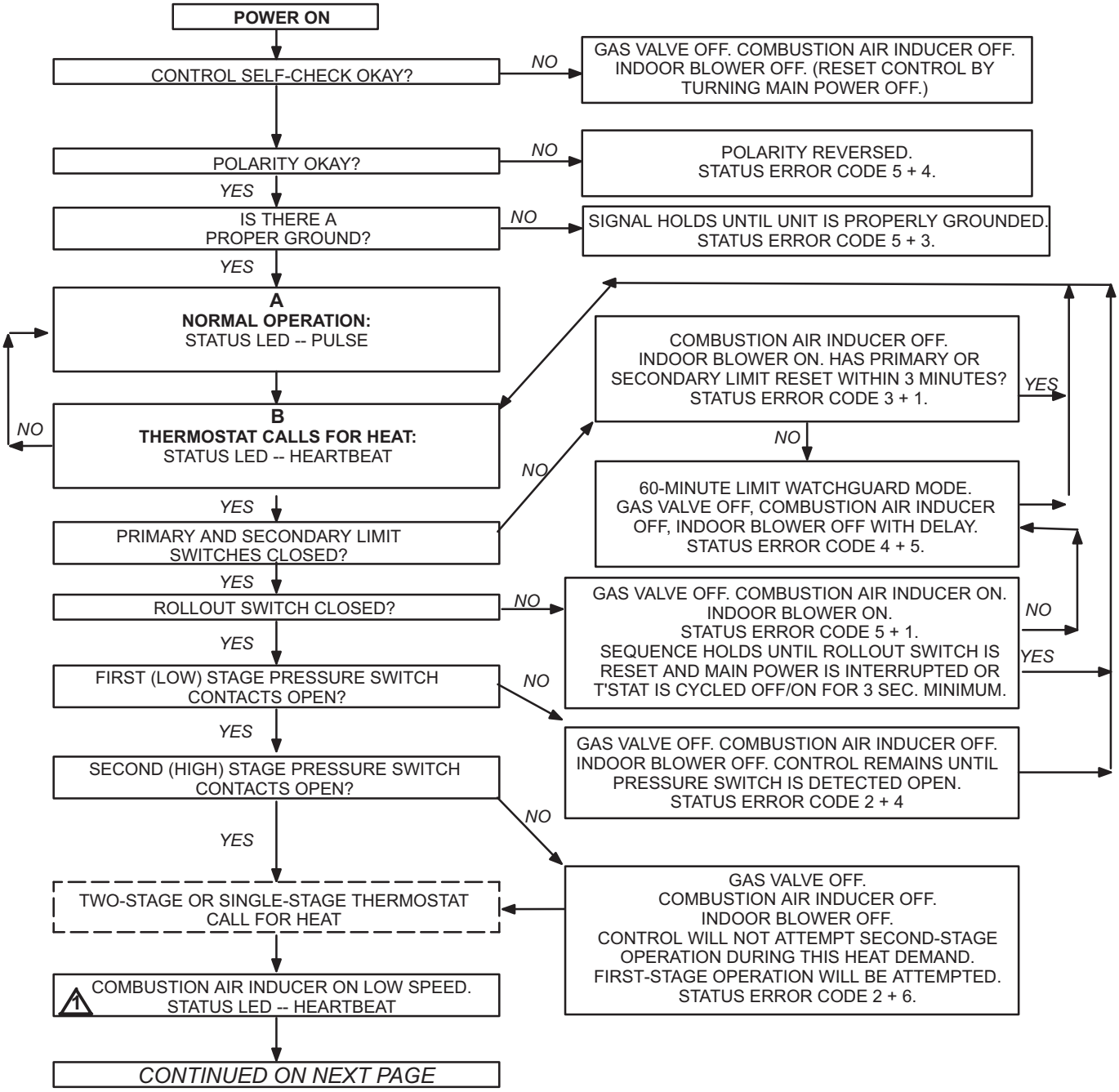
Thermostat	DIP Switch Settings and On-Board Links		Wiring Connections
	DIP Switch 1 Thermostat Heating Stages	On Board Links Must Be Cut To Select System Options	
Dual Fuel Single Stage Heat Pump (M30 T-stat) thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control w/dehumidification control	OFF		
Dual Fuel Two Stage Heat Pump (M30 T-stat) thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control w/dehumidification	OFF		

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

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

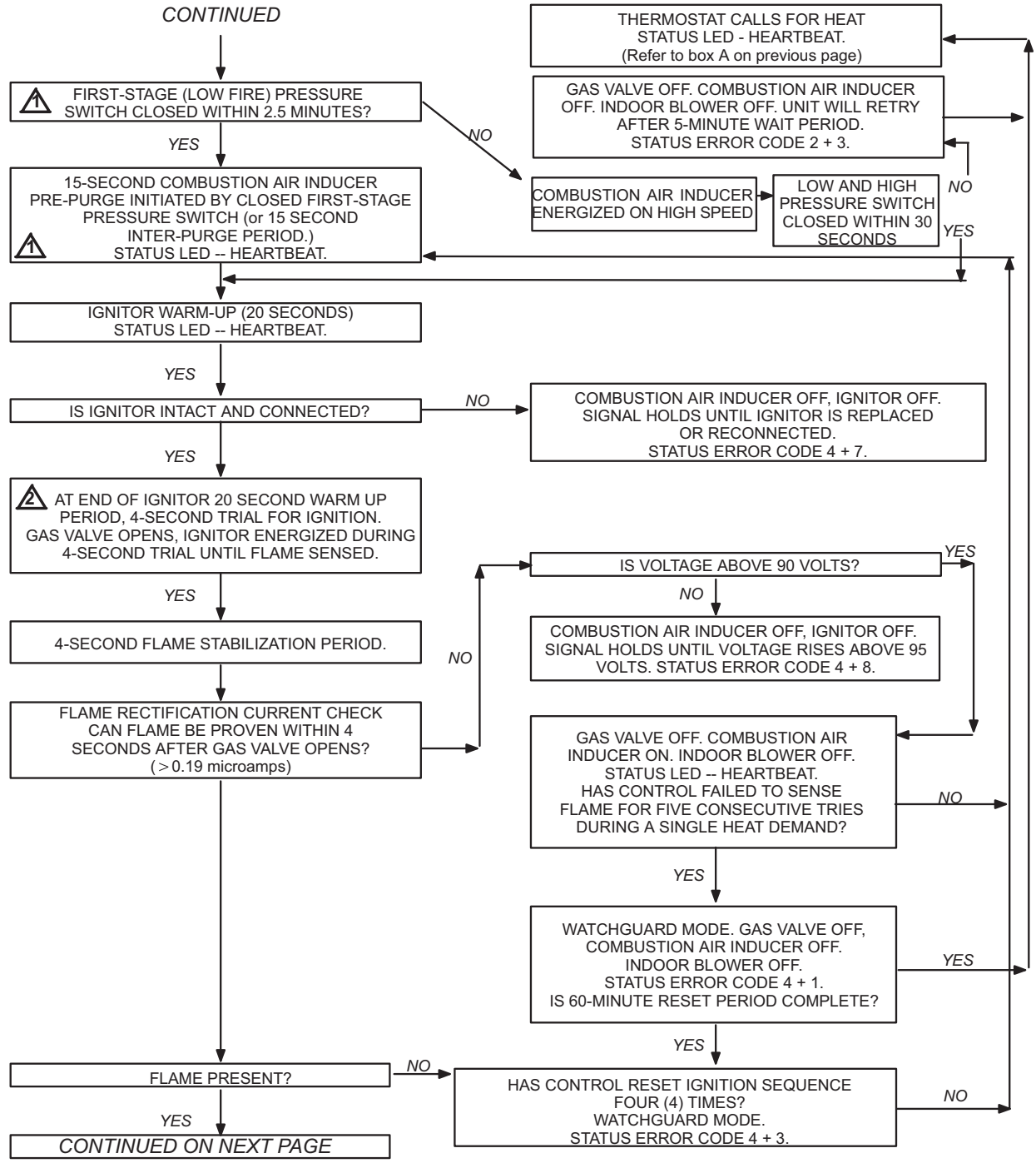
IX- Troubleshooting

HEATING SEQUENCE OF OPERATION
NORMAL AND ABNORMAL HEATING MODE



1 *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.*

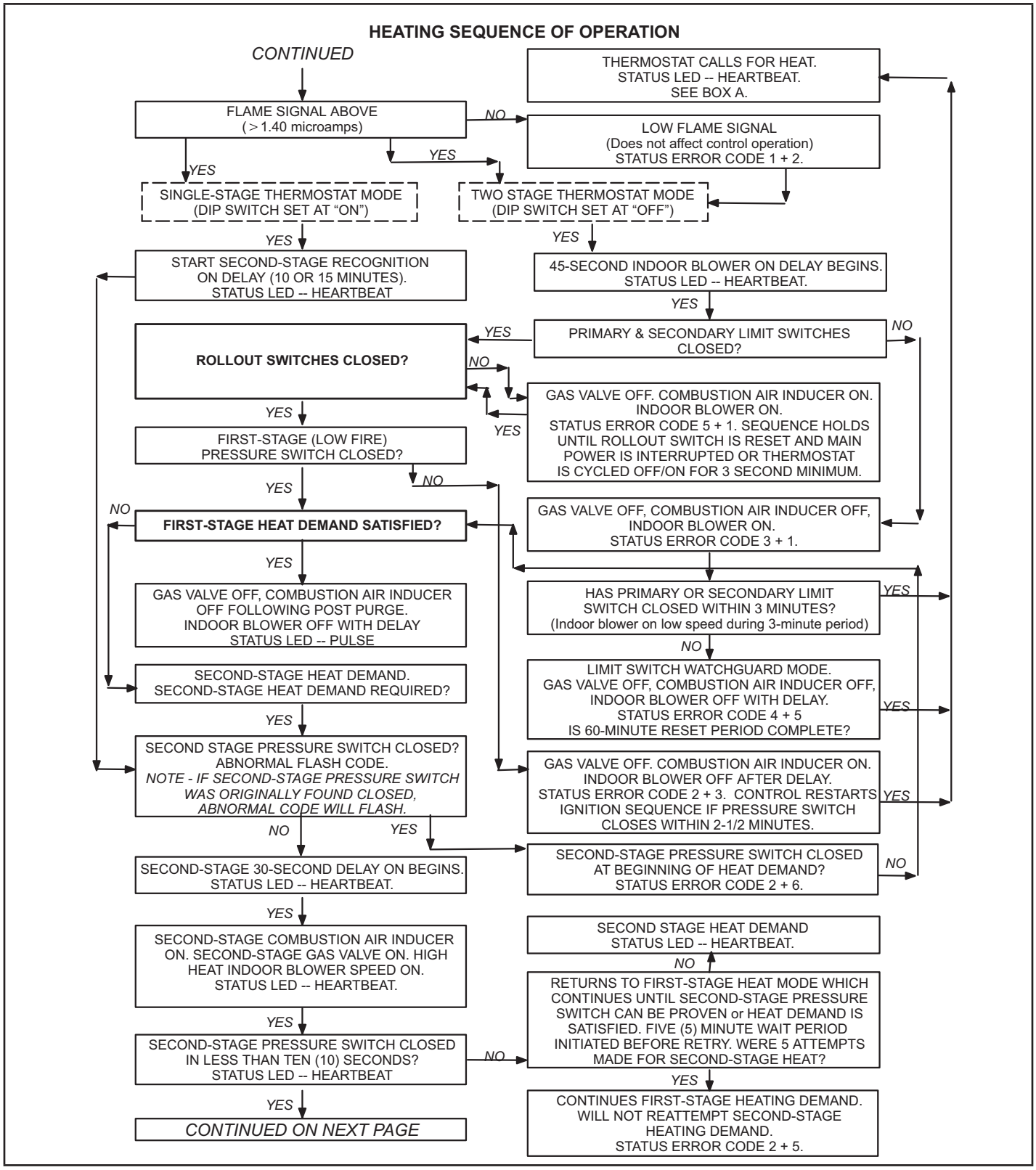
HEATING SEQUENCE OF OPERATION



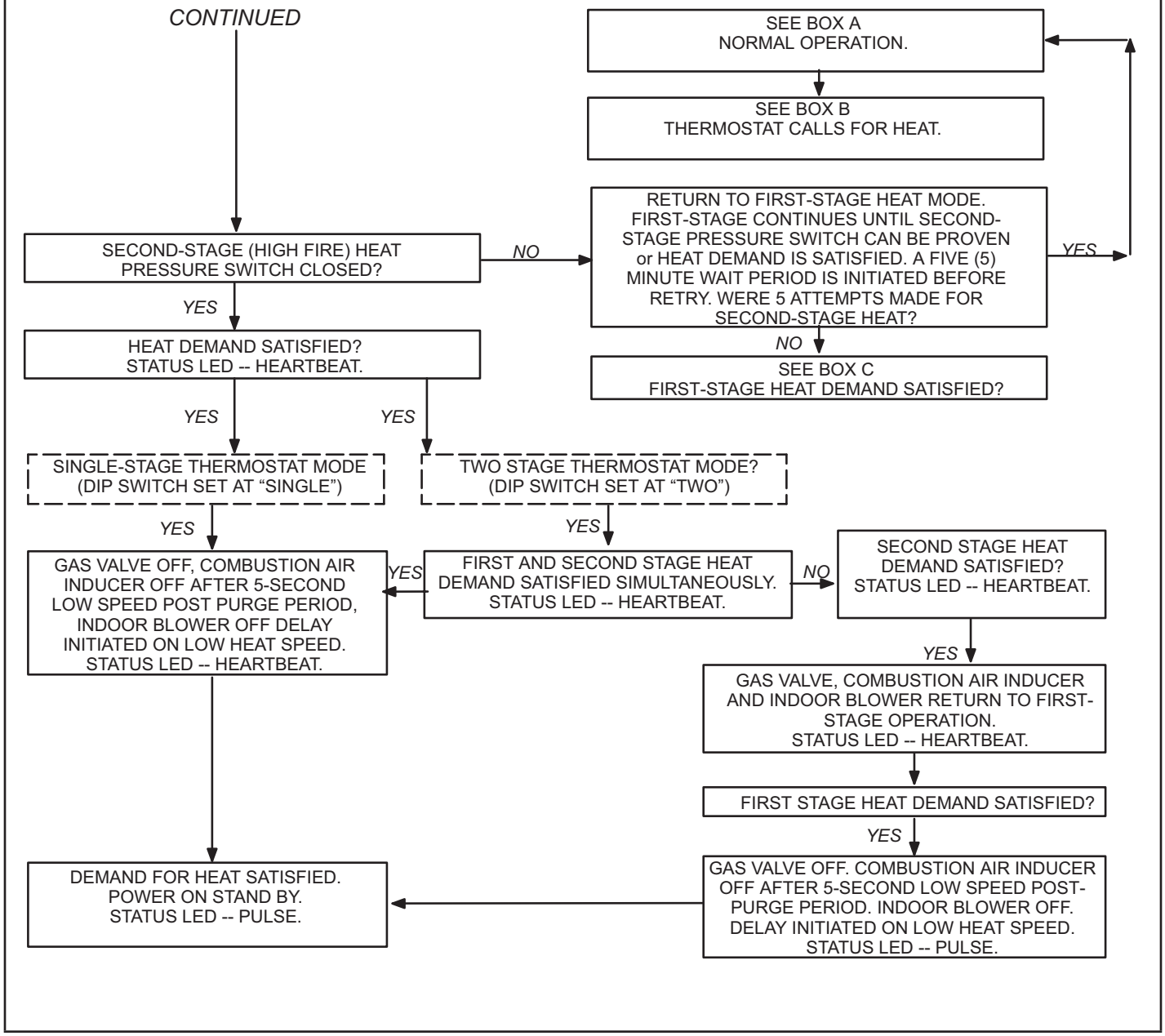
1 *If the furnace is operating on continuous fan mode (terminals "R" and "G" are energized), the combustion air inducer will energize on high speed, the gas valve will energize on second-stage heat and the furnace will operate on high fire. Furnace will stay on high fire 60 seconds then switch to low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

2 *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.*

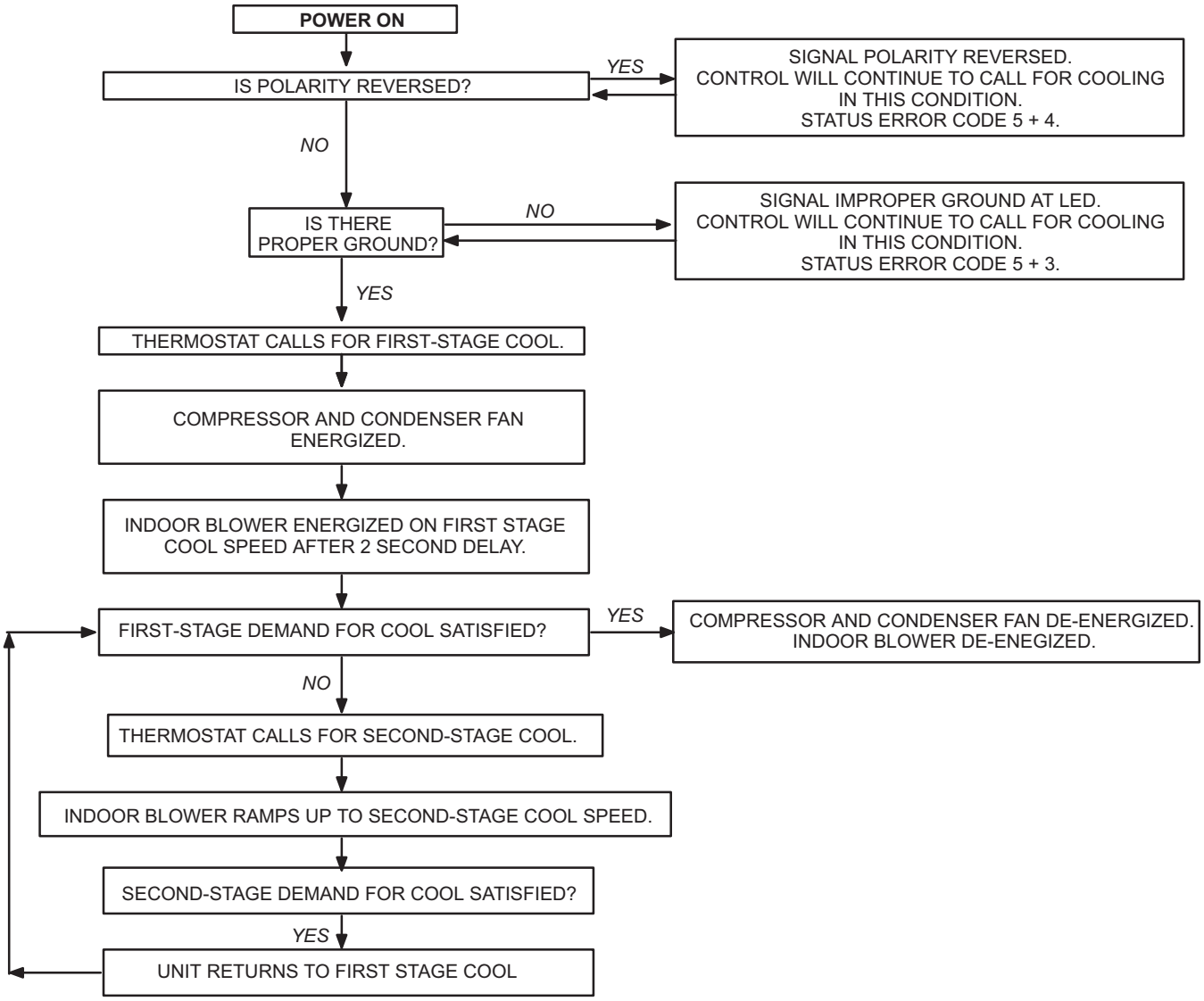
HEATING SEQUENCE OF OPERATION



HEATING SEQUENCE OF OPERATION



COOLING SEQUENCE OF OPERATION



CONTINUOUS LOW SPEED FAN SEQUENCE OF OPERATION