

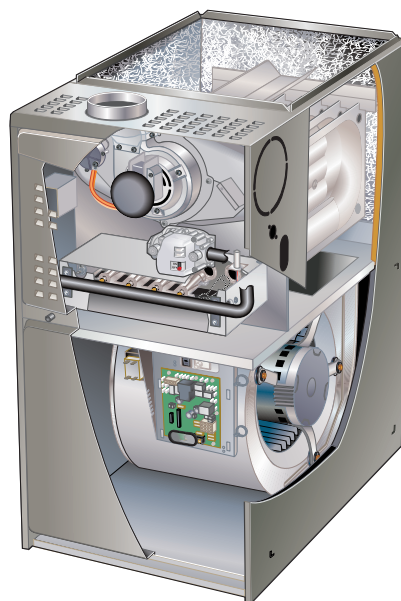
**ML180UHVK With R-454B Series Units**

ML180UHVK series units are mid-efficiency gas furnaces used for upflow or horizontal applications only, manufactured with Lennox Duralok heat exchangers formed of aluminized steel. ML180UHVK units are available in heating capacities of 30,000 to 110,000 Btuh and cooling applications 1-1/2 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 LP/Propane operation.

ML180UHVK model units are equipped with a hot surface ignition system. 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 recommended only and do not constitute code.



**⚠ 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 installer (or equivalent), service agency or the gas supplier.

**TABLE OF CONTENTS**

Specifications . . . . .	Page 2
Blower Data . . . . .	Page 4
Parts Identification . . . . .	Page 11
I-Unit Components . . . . .	Page 12
II- Installation . . . . .	Page 34
III- Start Up . . . . .	Page 30
IV- Heating System Service Checks . . . . .	Page 34
V- Typical Operating Characteristics . . . . .	Page 34
VI- Low GWP Application. . . . .	Page 39
VII- Maintenance . . . . .	Page 42
VIII-Diagram and Sequence of Operation. . . . .	Page 45
IX- Troubleshooting Flow Chart . . . . .	Page 49

**⚠ CAUTION**

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

**⚠ WARNING**

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

**⚠ WARNING**

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

## SPECIFICATIONS

Gas Heating Performance	Model	ML180UH 030V36AK	ML180UH 045V36AK	ML180UH 070V36AK	ML180UH 070V36BK
	<sup>1</sup> AFUE	80%	80%	80%	80%
	Input - Btuh	30,000	44,000	66,000	66,000
	Output - Btuh	24,000	36,000	53,000	53,000
	Temperature rise range - °F	25 - 55	15 - 45	30 - 60	30 - 60
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0	3.5 / 10.0	3.5 / 10.0
High Static - in. w.g.		0.80	0.80	0.80	0.80
Connections	Flue connection - in. round	4	4	4	4
	Gas pipe size IPS	1/2	1/2	1/2	1/2
Indoor Blower	Wheel diameter x width - in.	10 x 7	10 x 7	10 x 7	10 x 8
	Motor output - hp	1/2	1/2	1/2	1/2
	Tons of add-on cooling	1.5 - 3	1.5 - 3	1.5 - 3	1.5 - 3
	Air Volume Range - cfm	380 - 1320	380 - 1320	400 - 1345	370 - 1290
Electrical Data	Voltage	120 volts - 60 hertz - 1 phase			
	Blower motor full load amps	7.7	7.7	7.7	7.7
	Maximum overcurrent protection	15	15	15	15
Shipping Data	lbs. - 1 package	111	111	126	127

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

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

## SPECIFICATIONS

Gas Heating Performance	Model	ML180UH 070V48BK	ML180UH 090V48BK	ML180UH 110V60CK
	<sup>1</sup> AFUE	80%	80%	80%
	Input - Btuh	66,000	88,000	110,000
	Output - Btuh	53,000	72,000	90,000
	Temperature rise range - °F	30 - 60	35 - 65	35 - 65
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0	3.5 / 10.0
High Static - in. w.g.		0.50	0.50	0.50
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.	11-1/2 x 9	11-1/2 x 9	11-1/2 x 10
	Motor output - hp	3/4	3/4	1
	Tons of add-on cooling	2.5 - 4	2.5 - 4	3 - 5
	Air Volume Range - cfm	430 - 1850	650 - 1740	930 - 2180
Electrical Data	Voltage	120 volts - 60 hertz - 1 phase		
	Blower motor full load amps	8.5	8.5	11.5
	Maximum overcurrent protection	15	15	20
Shipping Data	lbs. - 1 package	129	141	160

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

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

## OPTIONAL ACCESSORIES - ORDER SEPARATELY

		“A” Width Models	“B” Width Models	“C” Width Models
CABINET ACCESSORIES				
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				
M30 Smart Wi-Fi Thermostat		15Z69	15Z69	15Z69
Outdoor Temperature Sensor		X2658	X2658	X2658
Transformer (75VA)		27J32	27J32	27J32
REFRIGERANT DETECTION SENSOR				
Refrigerant Detection System (RDS) Coil Sensor Kit (for indoor coil)		27V53	27V53	27V53
FILTERS				
<sup>1</sup> 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	44J22	44J22	44J22
	Single	66K63	66K63	66K63
	Ten Pack	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

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

## BLOWER DATA

ML180UH030V36AK BLOWER PERFORMANCE (less filter)

BOTTOM RETURN AIR

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

"ADJUST" Switch Positions	Speed Switch Positions							
	"HEAT" Speed - cfm				Second Stage "COOL" Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
+	630	665	715	775	645	840	1045	1320
<sup>1</sup> NORM	580	615	665	715	590	765	950	1200
—	335	560	615	645	540	700	850	1070
"ADJUST" Switch Positions					First Stage "COOL" Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
					450	580	690	860
					410	520	635	785
+					380	480	590	705
<sup>1</sup> NORM								
—								

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 350 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH030V36AK BLOWER PERFORMANCE (less filter)

#### SINGLE SIDE RETURN AIR

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
+	615	650	700	760	635	830	1025	1285
<sup>1</sup> NORM	570	600	650	700	585	755	925	1170
—	525	550	600	630	540	690	845	1050
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
+					440	570	670	850
<sup>1</sup> NORM					415	530	610	765
—					380	485	575	695

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 350 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH045V36AK BLOWER PERFORMANCE (less filter)

#### BOTTOM RETURN AIR

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
+	900	1005	1100	1260	645	840	1045	1320
<sup>1</sup> NORM	825	915	1005	1135	590	765	950	1200
—	750	830	910	1020	540	700	850	1070
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
+					450	580	690	860
<sup>1</sup> NORM					410	520	635	785
—					380	480	590	705

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 350 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH045V36AK BLOWER PERFORMANCE (less filter)

#### SINGLE SIDE RETURN AIR

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
+	880	980	1080	1225	635	830	1025	1285
<sup>1</sup> NORM	810	900	985	1105	585	755	925	1170
—	740	815	890	1005	540	690	845	1050
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
					440	570	670	850
+					415	530	610	765
<sup>1</sup> NORM					380	485	575	695
—								

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 350 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH070V36AK BLOWER PERFORMANCE (less filter)

#### BOTTOM RETURN AIR

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
+	890	1035	1150	1300	660	880	1110	1345
<sup>1</sup> NORM	810	940	1045	1180	600	800	1000	1215
—	730	845	940	1060	540	720	900	1095
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
					470	630	765	930
+					440	565	700	835
<sup>1</sup> NORM					395	510	630	750
—								

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 350 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH070V36AK BLOWER PERFORMANCE (less filter)

#### SINGLE SIDE RETURN AIR

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
+	890	1035	1150	1300	650	850	1070	1300
<sup>1</sup> NORM	810	940	1045	1180	600	770	975	1180
—	730	845	940	1060	540	695	875	1060
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
+					460	600	740	890
<sup>1</sup> NORM					440	560	670	800
—					395	505	605	720

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 350 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH070V36BK BLOWER PERFORMANCE (less filter)

#### BOTTOM RETURN AIR

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
+	875	970	1075	1225	640	820	1020	1290
<sup>1</sup> NORM	800	890	975	1100	600	755	935	1170
—	725	810	885	995	540	685	835	1050
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
+					440	570	675	845
<sup>1</sup> NORM					400	530	620	770
—					370	480	570	695

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 350 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH070V36BK BLOWER PERFORMANCE (less filter)

#### SINGLE SIDE RETURN AIR

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
+	850	950	1055	1190	625	805	995	1275
<sup>1</sup> NORM	775	875	960	1080	570	730	910	1150
—	710	795	865	980	525	660	825	1025
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
					435	560	665	825
+					400	515	605	745
<sup>1</sup> NORM					365	470	555	680
—								

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 350 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH070V48BK BLOWER PERFORMANCE (less filter)

#### BOTTOM RETURN AIR

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
+	1410	1550	1750	1930	1045	1375	1640	1850
<sup>1</sup> NORM	1285	1410	1615	1770	940	1250	1500	1700
—	1155	1270	1445	1620	850	1115	1365	1540
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
					615	870	1065	1240
+					525	780	960	1130
<sup>1</sup> NORM					430	685	870	990
—								

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 400 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 400 cfm.

## BLOWER DATA

### ML180UH070V48BK BLOWER PERFORMANCE (less filter)

#### SINGLE SIDE RETURN AIR

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
+	1335	1475	1650	1840	980	1290	1550	1760
<sup>1</sup> NORM	1225	1355	1520	1690	900	1175	1415	1610
—	1090	1215	1375	1500	810	1060	1280	1450
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
+					605	820	1000	1155
<sup>1</sup> NORM					520	780	920	1060
—					420	670	810	935

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 400 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 400 cfm.

## BLOWER DATA

### ML180UH090V48BK BLOWER PERFORMANCE (less filter)

#### BOTTOM RETURN AIR

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
+	1315	1445	1575	1775	1070	1300	1550	1740
<sup>1</sup> NORM	1195	1315	1430	1615	1000	1210	1410	1600
—	1075	1180	1285	1450	880	1115	1295	1465
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
+					750	910	1050	1180
<sup>1</sup> NORM					730	875	990	1120
—					650	800	940	1010

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 400 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 400 cfm.



## BLOWER DATA

### ML180UH090V48BK BLOWER PERFORMANCE (less filter)

#### SINGLE SIDE RETURN AIR

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
+	1315	1445	1575	1775	1035	1285	1500	1690
<sup>1</sup> NORM	1195	1315	1430	1615	975	1175	1385	1560
—	1075	1180	1285	1450	895	1080	1255	1410
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
+					765	900	1025	1145
<sup>1</sup> NORM					725	845	970	1045
—					650	760	870	945

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 400 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 400 cfm.

## BLOWER DATA

### ML180UH090V48BK BLOWER PERFORMANCE (less filter)

#### SINGLE SIDE RETURN AIR WITH OPTIONAL RETURN AIR BASE

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
+	1315	1445	1575	1775	985	1250	1480	1670
<sup>1</sup> NORM	1195	1315	1430	1615	925	1150	1350	1525
—	1075	1180	1285	1450	840	1060	1235	1380
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
+					740	900	1030	1150
<sup>1</sup> NORM					680	850	950	1060
—					650	750	870	980

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 400 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 400 cfm.

## BLOWER DATA

### ML180UH110V60CK BLOWER PERFORMANCE (less filter)

**BOTTOM RETURN AIR, RETURN AIR FROM BOTH SIDES OR RETURN AIR FROM BOTTOM AND ONE SIDE**

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
<b>+</b>	1530	1700	1850	2150	1560	1765	1980	2180
<b><sup>1</sup> NORM</b>	1400	1560	1730	1960	1425	1620	1800	2000
<b>—</b>	1260	1400	1560	1764	1280	1460	1620	1800
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
<b>+</b>					1125	1275	1420	1585
<b><sup>1</sup> NORM</b>					1030	1165	1290	1450
<b>—</b>					930	1050	1160	1305

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 550 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 550 cfm.

## BLOWER DATA

### ML180UH110V60CK BLOWER PERFORMANCE (less filter)

**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.

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

“ADJUST” Switch Positions	Speed Switch Positions							
	“HEAT” Speed - cfm				Second Stage “COOL” Speed - cfm			
	Low	<sup>1</sup> Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	<sup>1</sup> High
<b>+</b>	1500	1635	1820	2085	1650	<b>1860</b>	<b>2080</b>	<b>2330</b>
<b><sup>1</sup> NORM</b>	1370	1500	1665	1905	1500	1700	<b>1895</b>	<b>2080</b>
<b>—</b>	1235	1350	1500	1715	1350	1530	1705	1870
“ADJUST” Switch Positions					First Stage “COOL” Speed - cfm			
					Low	Med-Low	Med-Hi	<sup>1</sup> High
<b>+</b>					1200	1350	1500	1665
<b><sup>1</sup> NORM</b>					1090	1235	1375	1525
<b>—</b>					980	1110	1235	1370

<sup>1</sup> Factory default DIP switch setting.

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

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

Continuous Fan Only speed is approximately **38%** of the same second stage COOL speed position - minimum 550 cfm.

Lennox® LZSV Variable Zoning System Applications - Minimum blower speed is 550 cfm.

## PARTS ARRANGEMENT

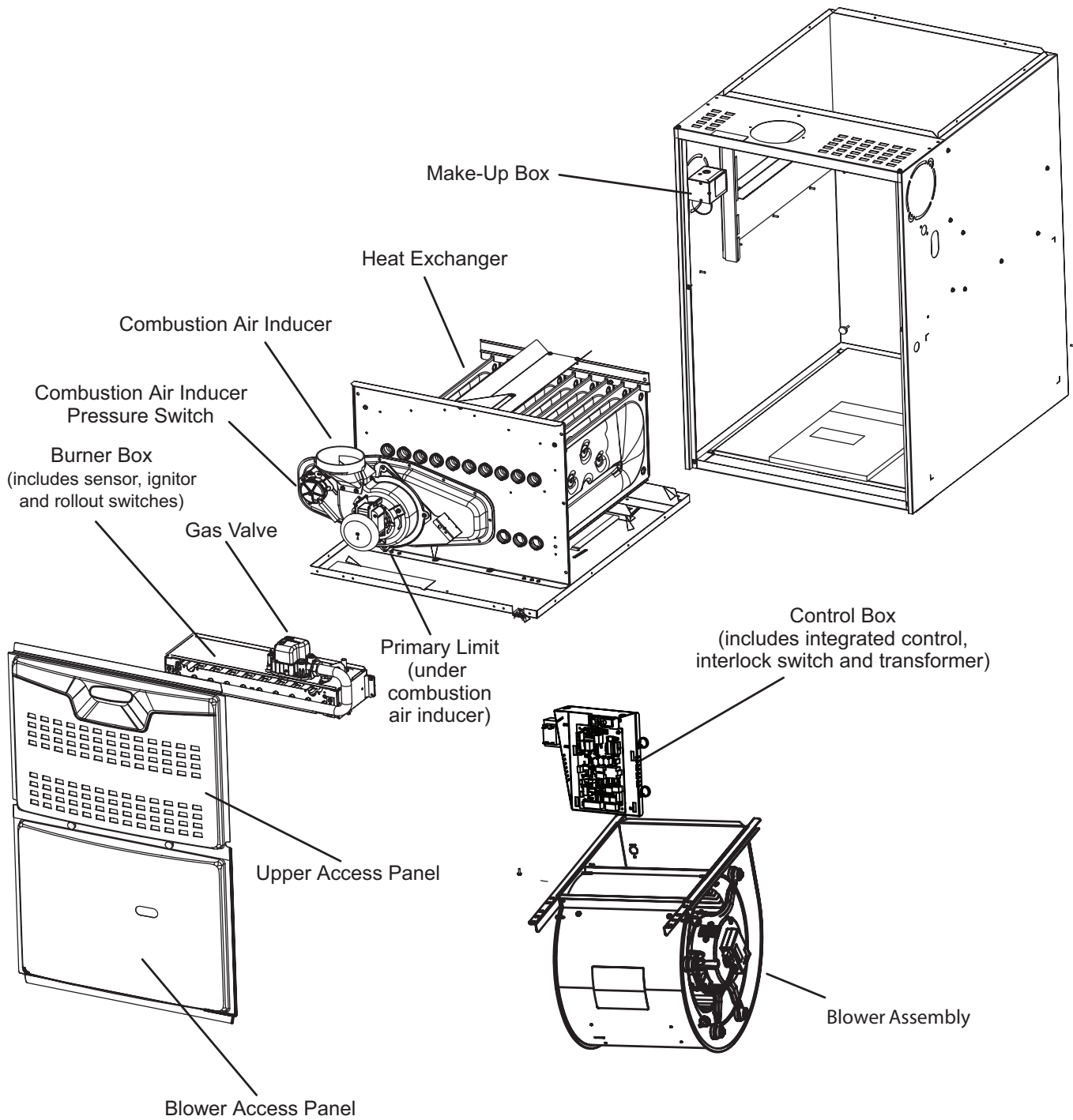
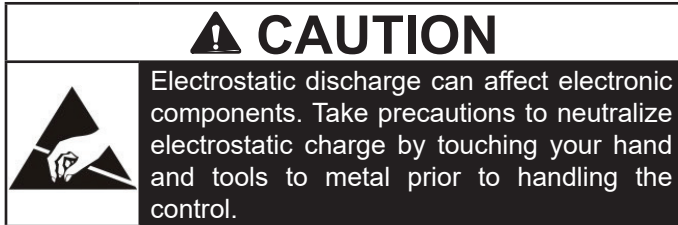


FIGURE 1

## I-UNIT COMPONENTS

ML180UHVK unit components are shown in FIGURE 1. The gas valve, combustion air inducer and burners can be accessed by removing the upper access panel. Electrical components are in the control box (FIGURE 2) found in the blower section.

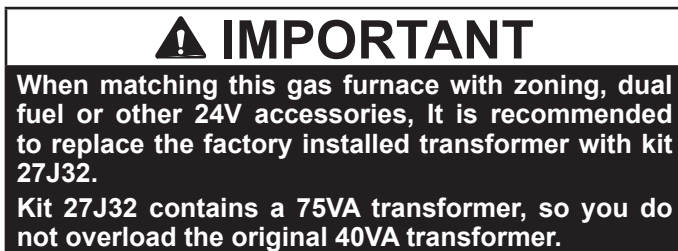
### ELECTROSTATIC DISCHARGE (ESD) Precautions and Procedures



#### A - Control Box

##### 1. Control Transformer (T1)

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



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

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

**NOTE** - The door interlock switch is a safety switch. Do not by-pass or jumper switch.

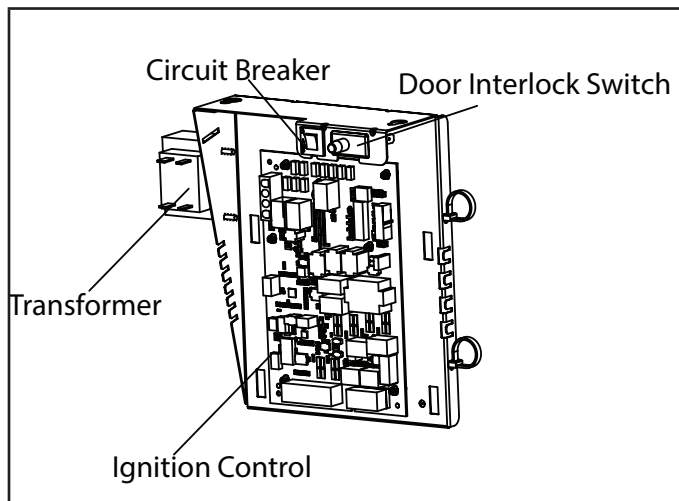


FIGURE 2

##### 3. Circuit Breaker (CB8)

A 24V circuit breaker is also located in the control box. The switch provides overcurrent protection to the transformer (T1). The breaker is rated at 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.

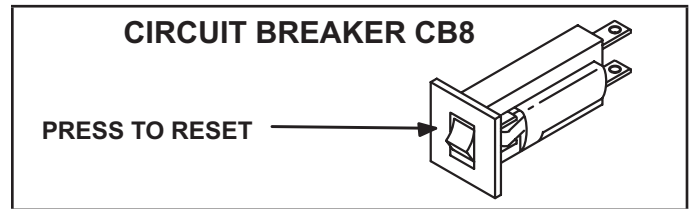
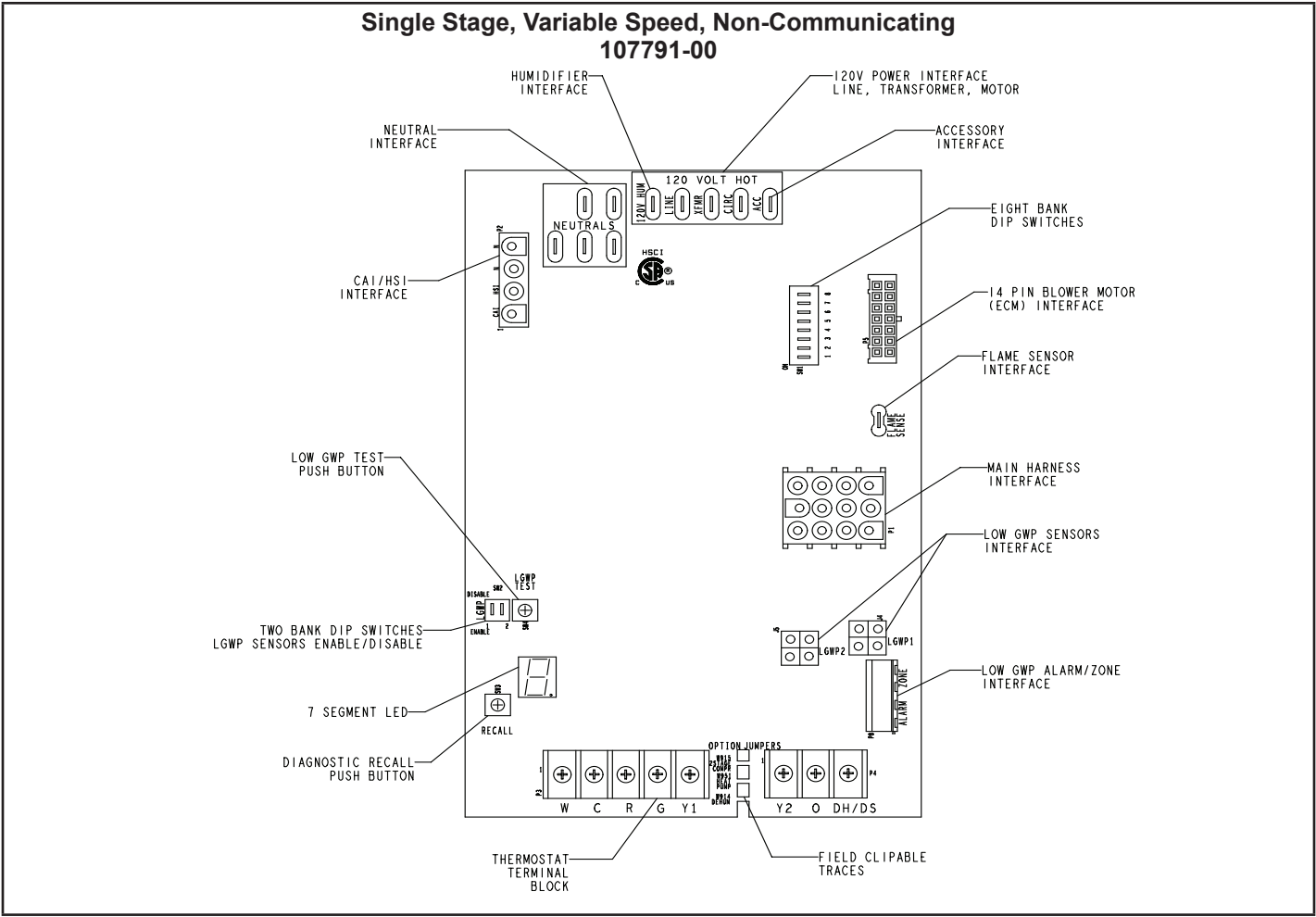


FIGURE 3

##### 4. Integrated Control (A92)



The hot surface ignition control system consisting of an integrated control (FIGURE 4) with control terminal designations in TABLE 1, TABLE 2 and TABLE 3, sensor and ignitor (FIGURE 9). The integrated control and ignitor work in combination to ensure furnace ignition and ignitor durability. The integrated control, controls all major furnace operations. The integrated control also features a RED LED for troubleshooting and two accessory terminals rated at (1) one amp. See TABLE 4 for troubleshooting diagnostic codes. The nitride ignitor is made from a non-porous, high strength proprietary ceramic material that provides long life and trouble free maintenance.



**FIGURE 4**

**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)
NEUTRALS	NEUTRAL (5)

**TABLE 2**

THERMOSTAT INPUT TERMINALS	
W	HEAT
C	COMMON GROUND
R	24V AC
G	FAN
Y1	LOW STAGE COOL (when W915 is clipped)
O	REVERSING VALVE (when W951 is clipped)
Y2	HIGH STAGE COOL (when W915 is clipped)
DH/DS	DEHUMIDIFICATION/HARMONY III (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

## Diagnostic LED (FIGURE 4)

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

## Diagnostic Push Button (FIGURE 4)

The diagnostic push button is located adjacent to the seven- segment diagnostic LED. This button is used to enable the Error Code Recall “E” mode and the Flame Signal “F” mode. Press the button and hold it to cycle through a menu of options. Every five seconds a new menu item will be displayed. When the button is released, the displayed item will be selected. Once all items in the menu have been displayed, the menu resumes from the beginning until the button is released

### Error Code Recall Mode

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

### Flame Signal Mode

Select “F” from the menu to access the flame signal mode. The integrated control will display the flame current on 7 segment LED in in micro amps (uA).

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

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 (VARIABLE 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 CONDITON	CODE
NO ERROR IN THE MEMORY	E000
ELECTRICAL FAULTS (WAIT FOR RECOVERY)	
AC LINE VOLTAGE LOW	E110
LINE VOLTAGE POLARITY REVERSED	E111
AC LINE VOLTAGE HIGH	E113
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/LIMIT FAULTS (wait for recovery)	
GAS VALVE RELAY (1ST OR 2ND STAGE) PROBLEM	E204
PRESSURE SW FAILED TO CLOSE (STUCK OPEN)	E223
PRESSURE SW FAILED TO OPEN (STUCK CLOSED)	E224
PRESSURE SWITCH OPENED IN RUN OR TFI	E227
FLAME SENSE OUT OF SEQUENCE-STILL PRESENT	E241
PRIMARY LIMIT SWITCH OPENED	E250

**TABLE 4 Continued**

<b>SOFT LOCKOUT FAULTS (60 MINUTES)</b>	
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
<b>PERFORMANCE WARNING</b>	
POOR GROUND DETECTED	E117
LOW FLAME CURRENT IN HEATING MODE	E240
IGNITOR CIRCUIT FAULT-FAILED IGNITOR OR TRIGGERING CIRCUITRY.	E290
INDOOR BLOWER UNABLE TO START (VARIABLE SPEED ONLY)	E292
<b>LOW GWP REFRIGERANT FAULTS</b>	
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

**TABLE 5**  
**Integrated Diagnostic Codes/Status of Equipment**

Code	Diagnostic Codes/Status of Equipment	
A	Indoor Blower Operation: Continuous Fan only mode	
dF	Defrost mode	
.	Idle mode (Decimal blinks at 1 Hertz -- 0.5 second ON, 0.5 second OFF).	
C	Cooling stage (1 second ON, 0.5 second OFF) 1 or 2 displayed / Pause / Repeat codes.	
d	Dehumidification mode (1 second ON, 1 second OFF) / Pause / Repeat Codes).	
H	Gas Heat Stage (1 second ON, 0.5 second OFF) 1 or 2 displayed / Pause / Repeat codes. Blinking during ignition.	
h	Heat pump stage.	
* No change implies the display will continue to show whatever is currently being displayed for normal operation (blinking decimal, active error code, heat state, etc.)		
Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E000	No error in memory	No active fault exists, or all faults have been cleared
E106	Twin Communication Fault	This may indicate: 1) The power is removed from one furnace and not the other or/and 2) The 24 VAC supply to the twins are not in phase
E110	Low line voltage.	Line Voltage Low (Voltage lower than nameplate rating). Check power line voltage and correct. Alarm clears 5 seconds after fault recovered.
E111	Line voltage polarity reversed.	Reverse line power voltage wiring. System resumes normal operation 5 seconds after fault recovered.
E112	Ground not detected.	System shuts down. Provide proper earth ground. System resumes normal operation 5 seconds after fault recovered.
E113	High line voltage.	Line Voltage High (Voltage higher than nameplate rating). Provide power voltage within proper range. System resumes normal operation 5 seconds after fault recovered.
E114	Line voltage frequency out-of-range.	No 60 Hertz Power. Check voltage and line power frequency. Correct voltage and frequency problems. System resumes normal operation 5 seconds after fault recovered.
E115	Low 24V - Control will restart if the error recovers.	24-Volt Power Low (Range is 18 to 30 volts). Check and correct voltage. Check for additional power-robbing equipment connected to system. May require installation of larger VA transformer to be installed in furnace / air handler. Clears after fault recovered.
E117	Poor ground detected (Warning only).	Provide proper grounding for unit. Check for proper earth ground to the system. Warning only will clear 30 seconds after fault recovered.
E125	Control failed self-check, internal error, failed hardware. Will restart if error recovers. Integrated control not communicating. Covers hardware errors (flame sense circuit faults, pin shorts, etc.).	Hardware problem on the control. Cycle power on control. Replace if problem prevents service and is persistent. Critical alert. Cleared 300 seconds after fault recovered.
E150	Refrigerant Leak detected	This may indicate the presence of a leak at or in the indoor unit coil of the equipment, that will need to be repaired for proper and safe system operation. Additionally, it may indicate that proper refrigerant charge will need to be verified. This fault cannot be cleared while the refrigerant detection system sensor is reporting the presence of a leak

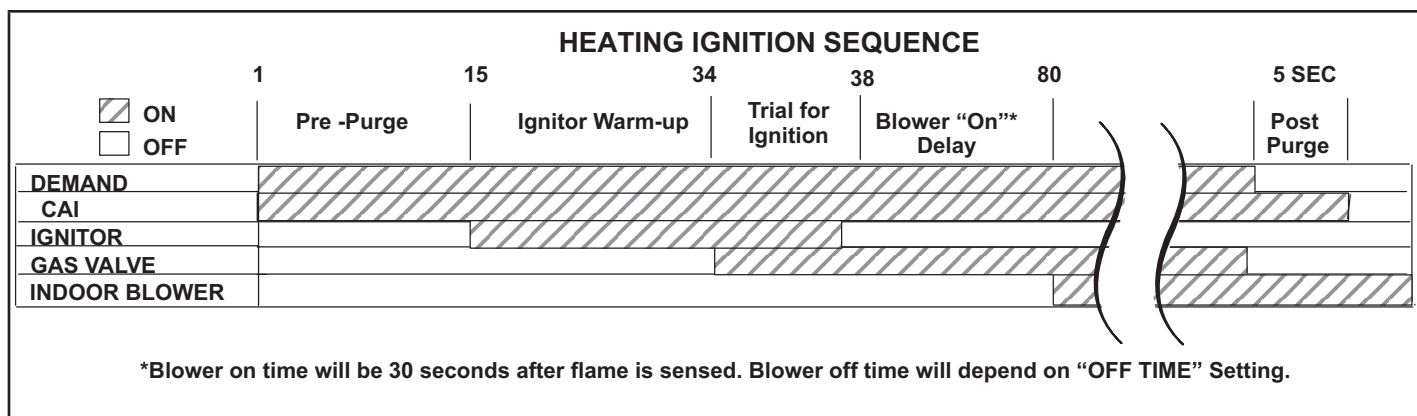


**TABLE 5 Continued**

<b>Code</b>	<b>Diagnostic Codes/Status of Equipment</b>	<b>Action Required to Clear and Recover</b>
E151	Refrigerant Leak Detector Sensor #1 fault	The refrigerant detection sensor #1 in the unit is reporting an issue that prevents it from functioning properly, and replacement of the sensor may be necessary. This fault clears when the sensor no longer reports the presence of a fault condition.
E152	Refrigerant Leak Detector Sensor #2 fault	The refrigerant detection sensor #2 in the unit is reporting an issue that prevents it from functioning properly, and replacement of the sensor may be necessary. This fault clears when the sensor no longer reports the presence of a fault condition.
E154	Refrigerant Leak Detector Sensor #1 Communication lost or invalid sensor dip switch configuration (Disable/Enable)	There may be an issue with the wiring harness connecting the sensor #1 to the furnace control board, either with the wiring itself or with the connector. Check the wiring and the connector for damage or improper connectivity. Check the sensor for damage or obstruction on the harness plug. This fault clears when communications with the sensor has been reestablished, but blower latches for a minimum of 5 minutes. Retest of the presence of fault can be effected by pressing the Low GWP test button on the furnace unit control board.  This may also indicate incorrect Low GWP dip switch settings. Please refer to installation instructions.
E155	Refrigerant Leak Detector Sensor #2 Communication lost	There may be an issue with the wiring harness connecting the sensor #2 to the furnace control board, either with the wiring itself or with the connector. Check the wiring and the connector for damage or improper connectivity. Check the sensor for damage or obstruction on the harness plug. This fault clears when communications with the sensor has been reestablished, but blower latches for a minimum of 5 minutes. Retest of the presence of fault can be effected by pressing the Low GWP test button on the furnace unit control board
E160	Refrigerant Leak Detector Sensor #1 type incorrect	The sensor #1 is of a type not suitable for use in the application. Replace the sensor with a Lennox approved replacement part. This fault clears when a sensor suitable for the application is detected by the furnace control board, but blower will latch for a minimum of 5 minutes. Retest of the presence of the fault can be effected by pressing the Low GWP test button on the furnace unit control board.
E161	Refrigerant Leak Detector Sensor #2 type incorrect	The sensor #2 is of a type not suitable for use in the application. Replace the sensor with a Lennox approved replacement part. This fault clears when a sensor suitable for the application is detected by the furnace control board, but blower will latch for a minimum of 5 minutes. Retest of the presence of the fault can be effected by pressing the Low GWP test button on the furnace unit control board.
E163	Furnace Control Board Failure	There is an issue with the furnace control board, preventing the furnace from operating properly. This may require the replacement of the indoor unit control board. This fault clears when the furnace controller operates normally.
E164	Low GWP Test	Low GWP Test mode activates by manually engaging Low GWP test button. Normal operations resumes and code clears automatically after 1-minute
E200	Hard lockout - Rollout circuit open or previously open.	Correct cause of rollout trip, or replace flame rollout switch. Test furnace operation. Cleared after fault recovered.
E204	Gas valve mis-wired.	Check gas valve operation and wiring. Clears when repaired.

**TABLE 5 Continued**

<b>Code</b>	<b>Diagnostic Codes/Status of Equipment</b>	<b>Action Required to Clear and Recover</b>
E223	Pressure switch failed open.	Check pressure (inches w.c.) of pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E224	Pressure switch failed closed.	Check pressure (inches w.c.) of pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E227	Pressure switch open during trial for ignition or run mode.	Check pressure (inches w.c.) of pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E240	Low flame current - Run mode.	Check micro-amperes of flame sensor using control diagnostics or field-installed mode. Clean or replace sensor. Measure voltage of neutral to ground to ensure good unit ground. Alert clears after current heat call has been completed. See TABLE 12 for flame signal.
E241	Flame sensed out of sequence - Flame still present.	Shut off gas. Check for gas valve leak. Replace, if necessary. Alert clears when fault is recovered.
E250	Limit switch circuit open.	Check for proper firing rate on furnace. Ensure there is no blockage in heater. Check for proper air flow. If limit not closed within 3 minutes, unit will go into 1-hour soft lockout. Resumes normal operation after fault is cleared.
E270	Soft lockout - Exceeded maximum number of retries. No flame current sensed.	Check for proper gas flow. Ensure that ignitor is lighting burner. Check flame sensor current. Clears when heat call finishes successfully.
E271	Soft lockout - Exceeded maximum number of retries. Last retry failed due to the pressure switch opening.	Check pressure (inches w.c.) of pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Clears when heat call finishes successfully.
E272	Soft lockout - Exceeded maximum number of recycles. Last recycle due to the pressure switch opening.	Check operation of pressure switch to see if it is stuck closed on heat call. Check pressure (inches w.c.) of pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Clears when heat call finishes successfully.
E273	Soft lockout - Exceeded maximum number of recycles. Last recycle due to flame failure.	Check micro-amperes of flame sensor using control diagnostics or field-installed mode. Clean or replace sensor. Measure voltage of neutral to ground to ensure good unit ground. Clears when heat call finishes successfully.
E274	Soft lockout - Exceeded maximum number of recycles. Last recycle failed due to the limit circuit opening or limit remained open longer than 3 minutes.	Shut down system. 1-hour soft lockout. Check firing rate and air flow. Check for blockage. Clears when heat call finishes successfully.
E275	Soft lockout - Flame sensed out of sequence. Flame signal is gone.	Shut off gas. Check for gas valve leak. 1-hour soft lockout. Clears when flame has been proven stable.
E290	Ignitor circuit fault - Failed ignitor or triggering circuitry.	Measure resistance of hot surface ignitor. Replace if open or not within specifications. 1-hour soft lockout. Clears when flame has been proven stable.
E292	Indoor blower motor unable to start due to obstructed wheel, seized bearings.	Indoor blower motor unable to start (seized bearing, stuck wheel, etc.). Replace motor or wheel if assembly does not operate or meet performance standards. 1-hour soft lockout. Clears after circulator successfully starts
E390	Low GWP Relay Stuck	This indicates an issue with the Low GWP relay in the furnace control. This may require the replacement of the indoor unit control board. This fault clears when the relay operates normally.



**FIGURE 5**

### Heating Ignition Sequence (FIGURE 5)

On a call for heat the integrated control monitors the combustion air inducer pressure switch. The control will not begin the heating cycle if the pressure switch is closed (bypassed). Once the pressure switch is determined to be open, the combustion air inducer is energized. When the differential in the pressure switch is great enough, the pressure switch closes and a 15-second pre-purge begins. If the pressure switch is not proven within 2-1/2 minutes, the integrated control goes into Watchguard-Pressure Switch mode for a 5-minute re-set period.

After the 15-second pre-purge period, the ignitor warms up for 20 seconds during which the gas valve opens at 19 seconds or a 4-second trial for ignition. The ignitor remains energized for the first 3 seconds during the 4 second trial. If ignition is not proved during the 4-second period, the integrated 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 integrated control goes into Watchguard-Flame Failure mode. After a 60-minute reset period, the integrated control will begin the ignition sequence again.

### Fan Control

The heat fan-on time of 30 seconds is not adjustable. The heat fan-off delay (amount of time that the blower operates after the heat demand has been satisfied) may be adjusted by repositioning DIP switches 1 and 2 (TABLE 6) The unit is shipped with a factory fan-off delay setting of 90 seconds The fan-off delay affects comfort and is adjustable to satisfy individual applications. Adjust the fan-off delay to achieve a supply air temperature between 90° and 110°F at the moment that the blower is de-energized. Longer off delay settings provide lower return air temperatures; shorter settings provide higher return air temperatures.

**TABLE 6**

Heat Blower Off Delay Seconds	DIP1	DIP2
90	OFF	OFF
120	ON	OFF
180	ON	ON
210	OFF	ON

## Variable Speed Ignition Control Features

### Accessory Terminals

One line voltage “ACC” 1/4” spade terminal is provided on the furnace integrated control. See FIGURE 4 for integrated control configuration. This terminal is energized when the indoor blower is operating. Any accessory rated up to one amp can be connected to this terminal with the neutral leg of the circuit being connected to one of the provided neutral terminals. If an accessory rated at greater than one amp is connected to this terminal, it is necessary to use an external relay.

One line voltage “HUM” 1/4” spade terminal is provided on the furnace integrated control. See FIGURE 4 for integrated control configuration. This terminal is energized in the heating mode when the combustion air inducer is operating. Any humidifier rated up to one amp can be connected to this terminal with the neutral leg of the circuit being connected to one of the provided neutral terminals. If a humidifier rated at greater than one amp is connected to this terminal, it is necessary to use an external relay.

This furnace is equipped with a variable speed circulation air blower motor that will deliver a constant airflow within a wide range of external static pressures. Other features of this variable speed motor include:

- **Soft Start** - The variable speed motor will slowly ramp up to normal operating speed. This minimizes noise and increases comfort by eliminating the initial blasts of air encountered with standard motors.
- **Soft Stop** - At the end of a cooling or heating cycle, the variable speed motor will slowly ramp down after a short blower “off” delay. If continuous blower operation has been selected, the variable speed motor will slowly ramp down until it reaches the airflow for that mode.
- **Passive Dehumidification** - For situations where humidity control is a problem, a dehumidification feature has been built into the variable speed motor. At the start of each cooling cycle, the variable speed motor will run at 82% of the rated airflow for 7.5 minutes. After 7.5 minutes has elapsed, the motor will increase to 100% of the rated airflow.

- **Active Dehumidification** - To achieve additional dehumidification, clip the DEHUM (W914) trace on the integrated ignition/ blower control board and connect a humidity control that opens on humidity rise to the DEHUM and DH/DS) terminals. The DEHUM terminal on the control board must be connected to the normally closed contact of the humidity control so that the board senses an open circuit on high humidity. In this setup, the variable speed motor will operate at a 30% reduction in the normal cooling airflow rate when there is a call for dehumidification.

Both the passive and active dehumidification methods described above can be utilized on the same furnace.

### Circulating Airflow Adjustments

**Heating Mode** - These units are factory set to run at the middle of the heating rise range as shown on the unit rating plate. If higher or lower rise is desired, reposition DIP switches 3 and 4.

See TABLE 10 for allowable heating speeds.

**TABLE 7**  
**Heating Mode**

Heat Air Flow	DIP3	DIP4
High	OFF	ON
Med-High	ON	OFF
Med-Low	OFF	OFF
Low	ON	ON

**Cooling Mode** - The units are factory set for the highest airflow for each model. Adjustments can be made to the cooling airflow by repositioning DIP switches 5 and 6.

**TABLE 8**  
**Cooling Mode**

Cool Air Flow	DIP5	DIP6
High	OFF	OFF
Med-High	OFF	ON
Med-Low	ON	OFF
Low	ON	ON

**Adjust Tap** - Airflow amounts may be increased or decreased by 10% by moving the ADJUST DIP switches 7 and 8. Changes to the ADJUST tap will affect both cooling and heating airflows. The TEST position (DIP7 and DIP8 both ON) shall not be used for normal furnace operation.

**TABLE 9**  
**Adjust Tap**

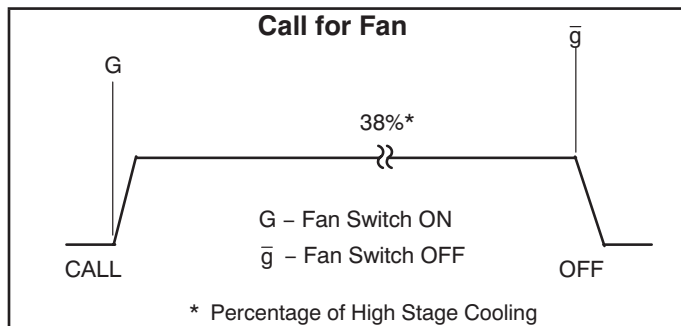
Adjust Tap	DIP7	DIP8
10%	ON	OFF
Normal	OFF	OFF
-10%	OFF	ON
Do Not Use <sup>1</sup>	ON	ON

<sup>1</sup> When DIP7 and DIP8 are both on, the blower will not run

### Continuous Blower Operation FIGURE 6

The comfort level of the living space can be enhanced when using this feature by allowing continuous circulation of air between calls for cooling or heating. The circulation of air occurs at 38% the full cooling airflow rate.

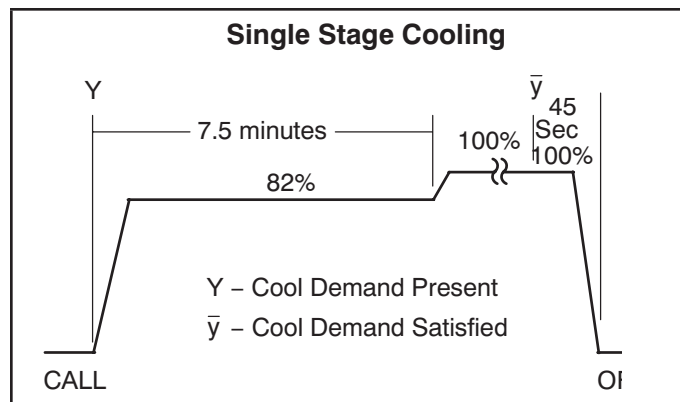
To engage the continuous blower operation, place the fan switch on the thermostat into the ON position. A call for fan from the thermostat closes R to G on the ignition control board. The control waits for a 1 second thermostat debounce delay before responding to the call for fan by ramping the circulating blower up to the cooling speed. When the call for continuous fan is satisfied, the control immediately ramps down the circulating blower. See TABLE 11 for allowable circulaiton speeds.



**FIGURE 6**

### Single Stage Cooling FIGURE 7

A call for cooling from the thermostat closes the R to Y circuit on the integrated ignition/blower control board. The control waits for a 1-second delay before energizing the circulating blower to 82% of the selected cooling CFM (passive dehumidification mode). After 7.5 minutes, the circulating blower automatically ramps up to 100% of the selected cooling airflow. When the call for cooling is satisfied, the circulating blower continues to run at the cooling airflow for 45 seconds, then shuts off.

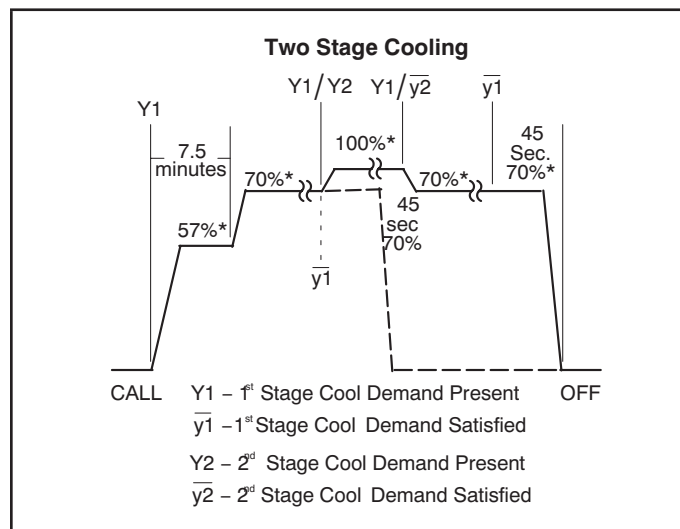


**FIGURE 7**

### Two Stage Cooling FIGURE 8

A call for 1st stage cooling from the thermostat closes the R to Y circuit on the control board. The control waits for a 1- second delay before energizing the circulating blower. The blower motor runs at 57% of the selected air flow for the first 7.5 minutes of the 1st stage cooling demand (passive dehumidification mode). After 7.5 minutes, the blower motor runs at 70% of the selected cooling air flow until 1st stage cooling demand is satisfied.

A call for 2nd stage cooling from the thermostat closes the R to Y2 circuit on the control board. The blower motor ramps up to 100% of the selected cooling air flow. When the demand for cooling is met, the blower ramps down to Y1 until satisfied, then continues to run at first stage cool speed for 45 seconds, then turns off.



**FIGURE 8**

### Heat Pump

For heat pump operation, clip the R-O link located next to the terminal block at the bottom of the furnace control. In heat pump mode, a call for heat will result in the circulating air blower operating at the selected cooling airflow after a brief ramp-up period.

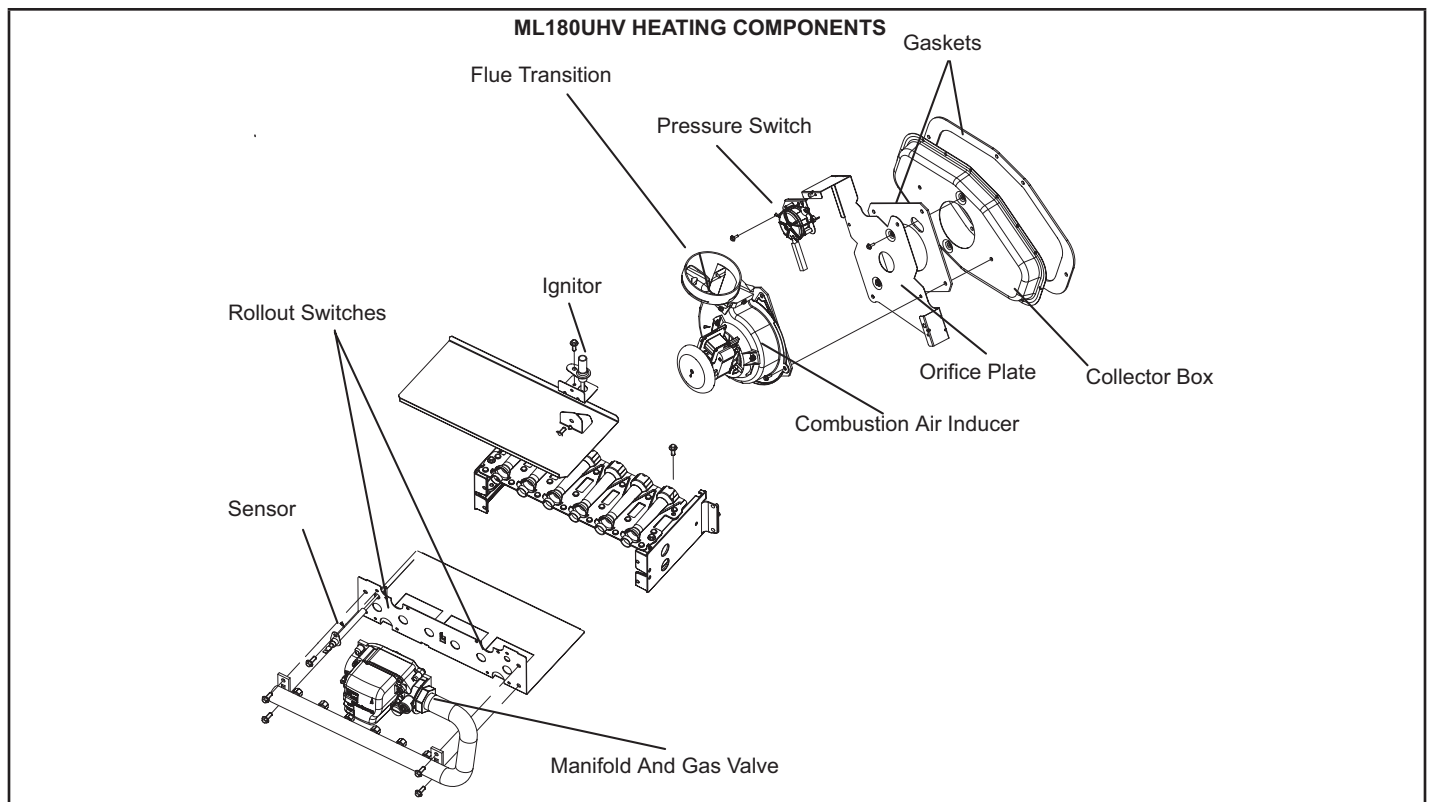
**TABLE 10**  
**Allowable Heating Speeds**

ML180V Model	Speed Adjust	LOW	MED LOW	MED HIGH	HIGH
030V36A	+10%	Allowed	Allowed	Allowed	Allowed
	Norm		Factory Setting		
	-10%		Allowed		
045V36A	+10%		Allowed		Not Allowed
	Norm		Factory Setting		
	-10%		Allowed		
070V36A	+10%		Allowed		
	Norm		Factory Setting		
	-10%		Allowed		
070V36B	+10%		Allowed		Allowed
	Norm		Factory Setting		
	-10%		Allowed		
070V48B	+10%		Allowed		
	Norm		Factory Setting		
	-10%		Allowed		
090V48B	+10%		Allowed		
	Norm		Factory Setting		
	-10%		Allowed		
110V60C	+10%		Allowed		
	Norm		Factory Setting		
	-10%		Allowed		

**TABLE 11**  
**Allowable Circulation Speeds**

Model Number	38% of Second Stage Cooling
All Models	Factory Setting





**FIGURE 9**

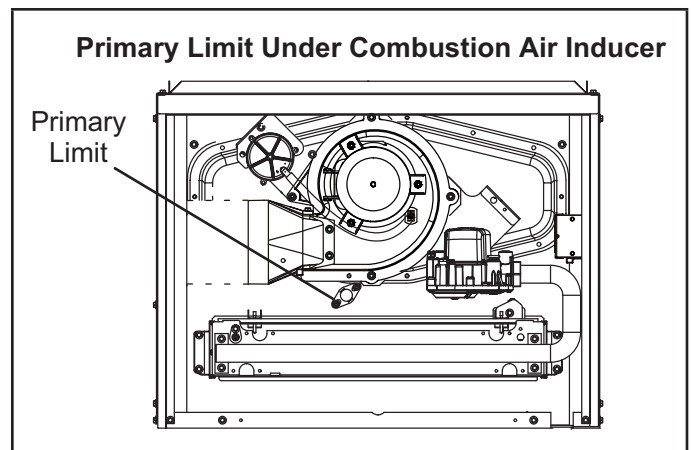
## **B - Heating Components (FIGURE 9)**

### **1. Flame Rollout Switches**

Flame rollout switch (S47) is a high temperature limit. Each furnace is equipped with two identical switches. The limit is a N.C. SPST manual-reset limit connected in series with the integrated control A92. When S47 senses rollout, the integrated control immediately stops ignition and closes the gas valve. If unit is running and flame rollout is detected, the gas valve will close and integrated control will be disabled. Rollout can be caused by a blocked heat exchanger, blocked flue or lack of combustion air. The switch has a factory setpoint of 210°F and cannot be adjusted. To manually reset a tripped switch, push the reset button located on the control.

### **2. Primary Limit Control**

The primary limit on ML180UHV units is located in the heating vestibule panel under the combustion air inducer. See FIGURE 10. When excess heat is sensed in the heat exchanger, the limit will open. If the limit is open, the integrated 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 SureLight® control will go into Watchguard for one hour. The switch is factory set and cannot be adjusted. The switch may have a different setpoint for each unit model number. If limit switch must be replaced, refer to Lennox ProductZone repair parts list on Lennox DaveNet®.



**FIGURE 10**

### **3. Flame Sensor**

A flame sensor is located on the left side of the burner support. The sensor is mounted on the flame rollout plate and the tip protrudes into the flame envelope of the left-most burner. The sensor can be removed for service (clean with steel wool) without removing any part of the burners. During operation, flame is sensed by current passed through the flame and sensing electrode. The integrated control allows the gas valve to remain open as long as flame signal is sensed.

Flame (microamp) signal is an electrical current which passes from the integrated control to the sensor during unit operation. Current passes from the sensor through the flame to ground to complete a safety circuit.

### To Measure Flame Signal - Integrated Control:

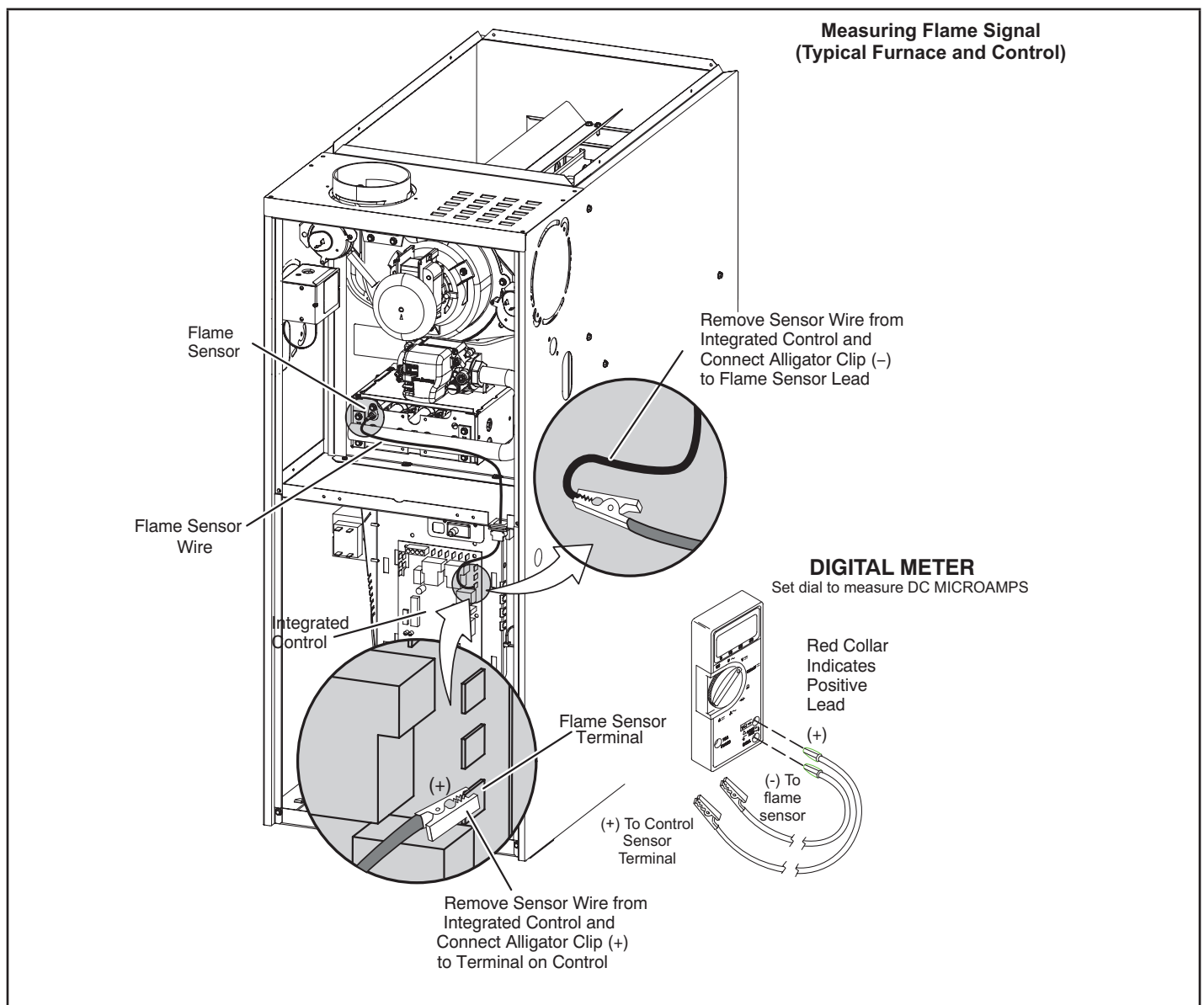
Use a digital readout meter capable of reading DC microamps. See FIGURE 11 and TABLE 12 for flame signal check.

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

- 5 - Connect (+) lead to Terminal "Flame Sense" on integrated control.
- 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 12**  
**Flame Signal in Microamps**

Normal	Low	Drop Out
$\geq 1.5$	0.5 - 1.4	$\leq 0.4$



**FIGURE 11**



#### 4. Gas Valve

The ML180UHVK uses an internally redundant gas valve to assure safety shut-off. If the gas valve must be replaced, the same type valve must be used. 24VAC terminals and valve switch are located on the valve. All terminals on the gas valve are connected to wires from the integrated 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 changeover kits are available from Lennox. Kits include burner orifices and a gas valve regulator spring.

#### 5. Combustion Air Inducer (B6)

All ML180UHVK units use a 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).

A pressure switch mounted on 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 13 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 any obstruction in the flue) the pressure switch opens. When the pressure switch opens, the integrated control (A92) immediately de-energizes the gas valve to prevent burner operation.

**TABLE 13**

ML180UHVK Unit	C.A.I. Orifice Size
030V36A	0.812"
045V36A	1.063"
070V36A	1.316"
070V36B	1.316"
070V48B	1.316"
090V48B	1.531"
110V60C	1.690"

#### 6. Ignitor

The nitride ignitor used on ML180UHVK units is made from a proprietary ceramic material. To check ignitor, measure its resistance and voltage. A value of 39 to 70 ohms indicates a good ignitor. Voltage to the ignitor should be 120VAC. See FIGURE 12 for resistance, and voltage check.

**NOTE** - The ML180UHVK furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.

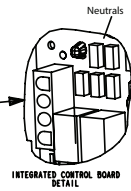
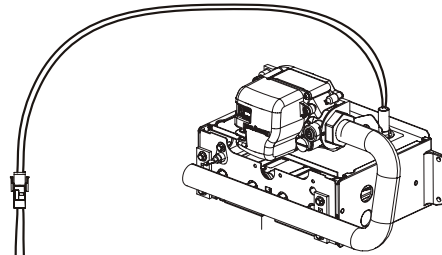
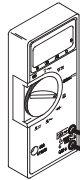
## IGNITOR CHECKS

### Test 1

#### Check ignitor circuit for correct resistance.

Remove HSI/CAI 4-pin plug from control.  
Check ohms reading across terminals 2 and 4.  
The reading should be between 39 and 70 ohms. If value is correct, this is the only test needed.  
If the reading on the meter is not correct, (0 or infinity) then a second test is needed.

Meter  
(set to ohms)

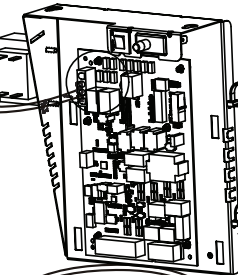
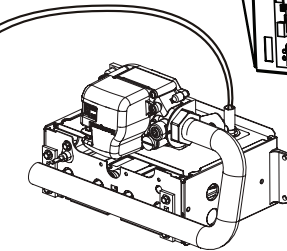
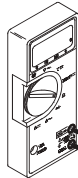


### Test 2

#### Check ignitor for correct resistance.

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

Meter  
(set to ohms)



### Test 3

#### Check ignitor for correct voltage

Insert meter probes into terminals 2 and 4 (use small diameter probes in order not to damage plug).  
Check voltage during 20 second ignitor warm up period.  
Voltage should read 120 volts  $\pm$  10%. If voltage reads below these values, check for correct supply voltage to furnace.

Meter  
(set to ohms)

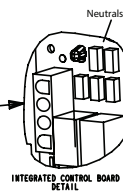
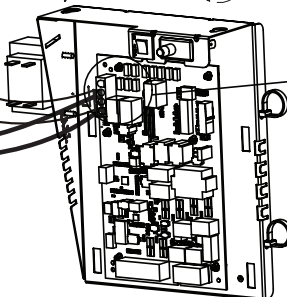
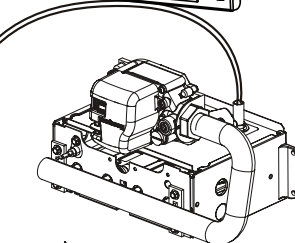
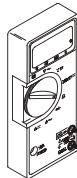


FIGURE 12

## 7. Combustion Air Inducer

### Pressure Switch (S18)

ML180UHVK series units are equipped with a combustion air pressure switch located on the combustion air inducer orifice bracket. 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 switch is a single-pole single-throw proving switch electrically connected to the furnace 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 start-up, 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 14. 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 integrated 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.

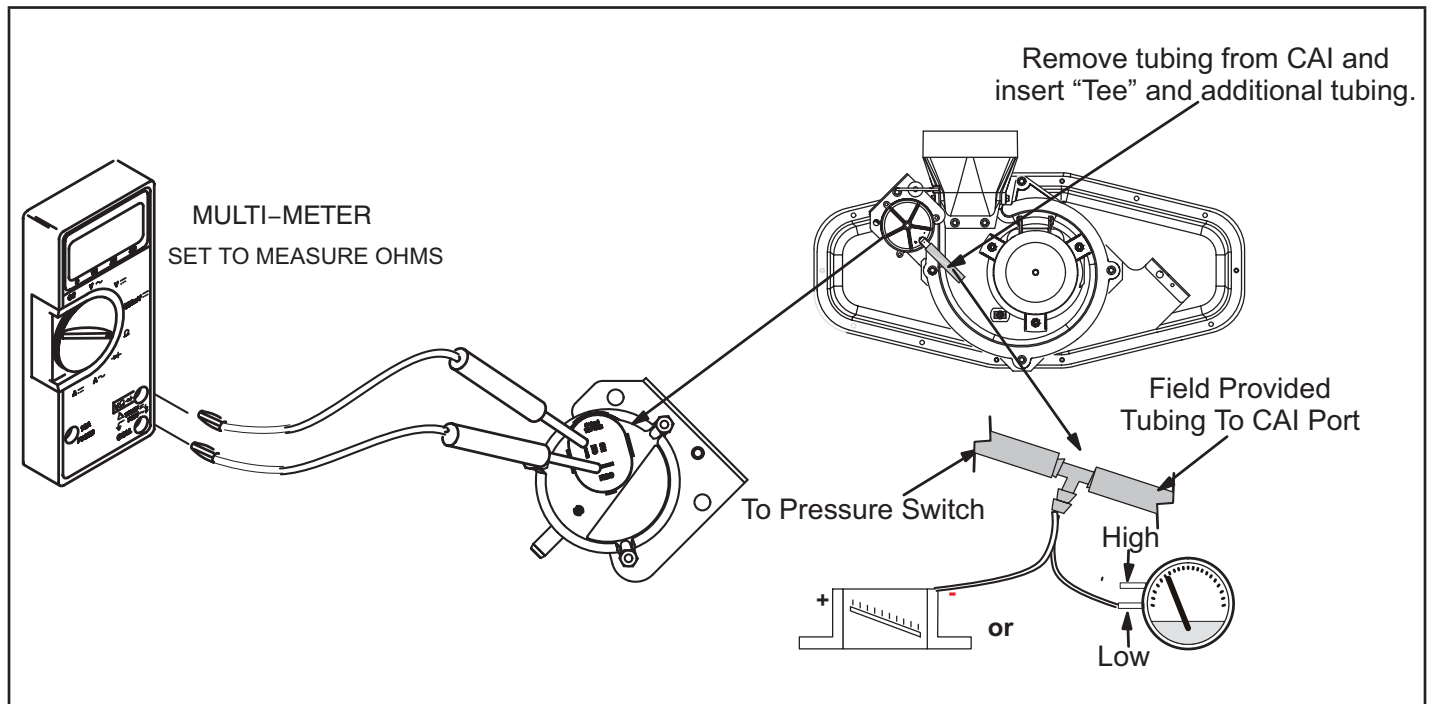
The switch is factory set and is not field adjustable. It is a safety shut-down control in the furnace and must not be bypassed for any reason. If switch is closed or by-passed, the integrated control will not initiate ignition at start up.

**TABLE 14**

ML180UHVK	Set Point “
030V36A	-0.65
045V36A	
070V36A	-0.70
070V36B	
070V48B	
090V48B	
110V60C	

### Troubleshooting

See FIGURE 13 for measuring operating pressure and checking resistance in the pressure switch.



**FIGURE 13**

## Multiple Venting

The ML180UHVK furnace can vent in multiple positions. See FIGURE 14.

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 assembly (assembly consists of orifice plate, proving switch, gasket and combustion air inducer), then reinstall the mounting screws. See unit Installation Instructions for more detail.

### **IMPORTANT**

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

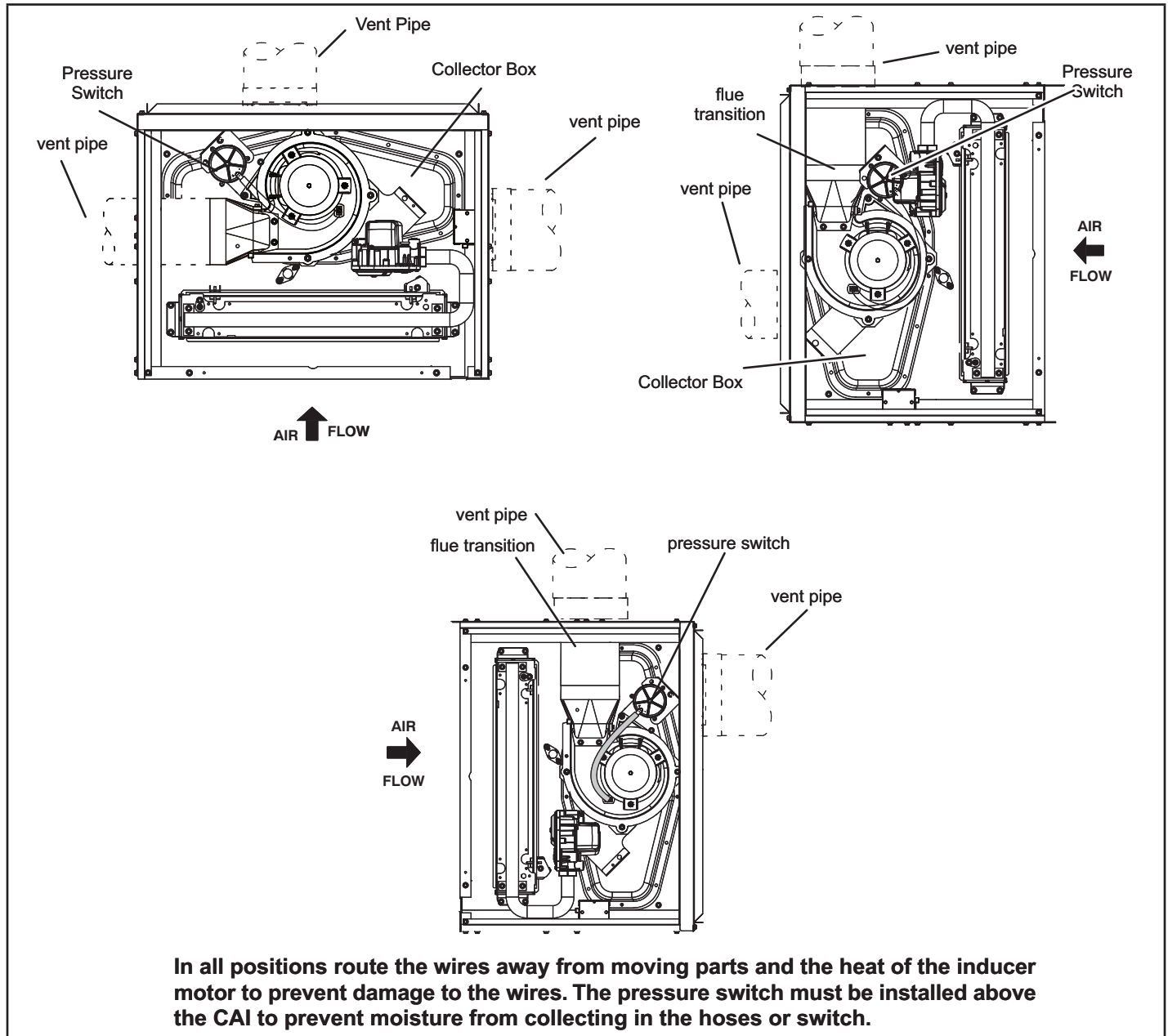


FIGURE 14

## C - Blower Compartment

### 1 - Blower Motor

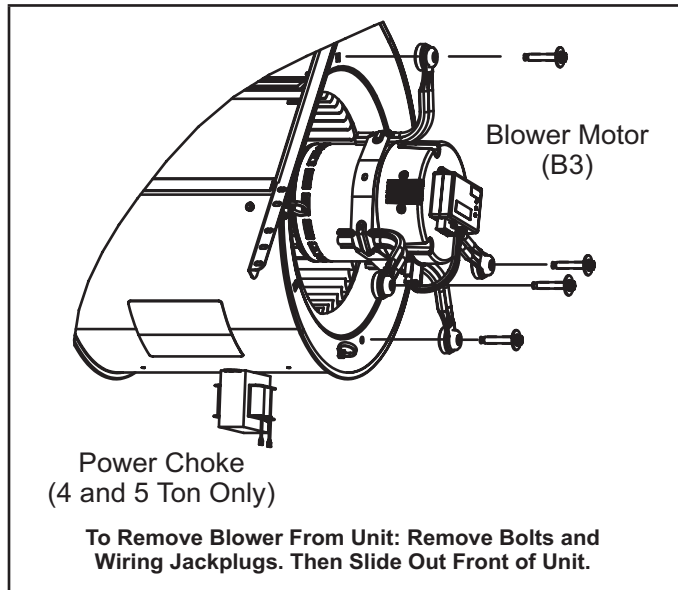


FIGURE 15

ML180UHVK units use a three-phase, electronically controlled DC brushless motors (controller converts single-phase AC to three-phase DC), with a permanent magnet type rotor. Because this motor has a permanent magnet rotor it does not need brushes like conventional DC motors.

Internal components are shown in FIGURE 16. The stator windings are split into three poles which are electrically connected to the controller. This arrangement allows motor windings to turn on and off in sequence by the controller.

A solid-state controller is attached to the motor. The controller is primarily an AC to DC converter. Converted DC power is used to drive the motor. The controller contains a microprocessor which monitors varying conditions inside the motor (such as motor workload). It includes the 16X4W control with three LED's PW, RX and TX located on the face for troubleshooting. FIGURE 17 shows the location of the 16X4W and TABLE 15 the LED codes.

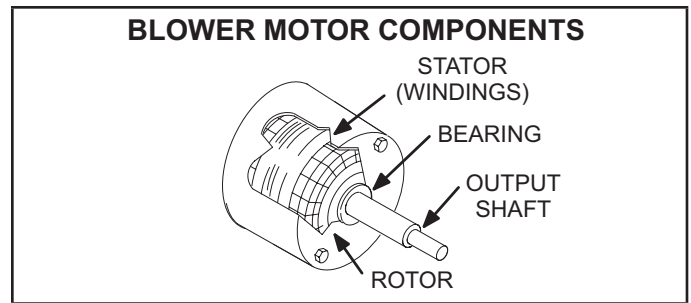


FIGURE 16

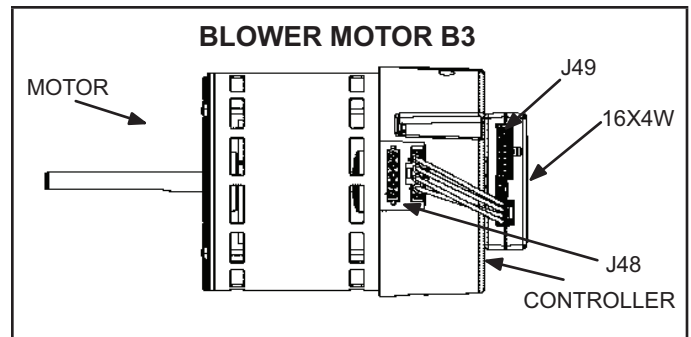


FIGURE 17

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

ML180V blower motors use single phase power. An external run capacitor is not used. The motor uses permanently lubricated ball-type bearings.

#### Internal Operation

Each time the controller switches a stator winding (FIGURE 16) on and off, it is called a "pulse." The length of time each pulse stays on is called the "pulse width." By varying the pulse width (FIGURE 21), the controller varies motor speed (called "pulse-width modulation"). This allows for precise control of motor speed and allows the motor to compensate for varying load conditions as sensed by the controller. In this case, the controller monitors the static workload on the motor and varies motor rpm in order to maintain constant airflow (cfm).

The motor controller is driven by the Variable Speed Integrated control board. The board receives its demand (PWM signal or fixed 24 VAC or VDC signal) from optional controls such as the Harmony III zoning system, SignatureStat, Efficiency Plus Humidity Control (CCB1) or a conventional thermostat.

TABLE 15

PW LED	RX LED	TX LED	Motor Blower	Action
Off	Blink	Blink	Not Rotating	Normal
Blink	Blink	Blink	Rotating	Normal. PW blink is 100cfm/blink
Blink	Off	Blink	Not Rotating	Verify 16X4W and motor control hp match. Verify power to motor control. Turn off power for 1 minute then restart. If motor still does not rotate replace the controller.
Off	Off	Off	Not Rotating	Verify power to the 16X4W. Turn off power then restart. If LED's are still out, replace controller.

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

The unit control indicates the desired cfm. The blower will maintain the desired cfm as long as external static pressure does not exceed 0.8". If the system exceeds this amount, the blower may enter a “cut back”, mode wherein it then slows down to protect itself from electrical damage. During this “cut back” mode the unit control will still indicate the same desired cfm regardless of actual motor rpm. When Harmony is used, speed taps are overridden and a PWM signal generated by the Harmony controller continuously varies motor speed based upon zone demands.

#### Initial Power Up

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

#### Motor Start-Up

When B3 begins start-up, the motor gently vibrates back and forth for a moment. This is normal. During this time the electronic controller is determining the exact position of the rotor. Once the motor begins turning, the controller slowly eases the motor up to speed (this is called “soft-start”).

The motor may take as long as 10-15 seconds to reach full speed. If the motor does not reach 200rpm within 13 seconds, the motor shuts down. Then the motor will immediately attempt a restart. The shutdown feature provides protection in case of a frozen bearing or blocked blower wheel. The motor may attempt to start eight times. If the motor does not start after the eighth try, the controller locks out. Reset controller by momentarily turning off power to unit.

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

### DANGER

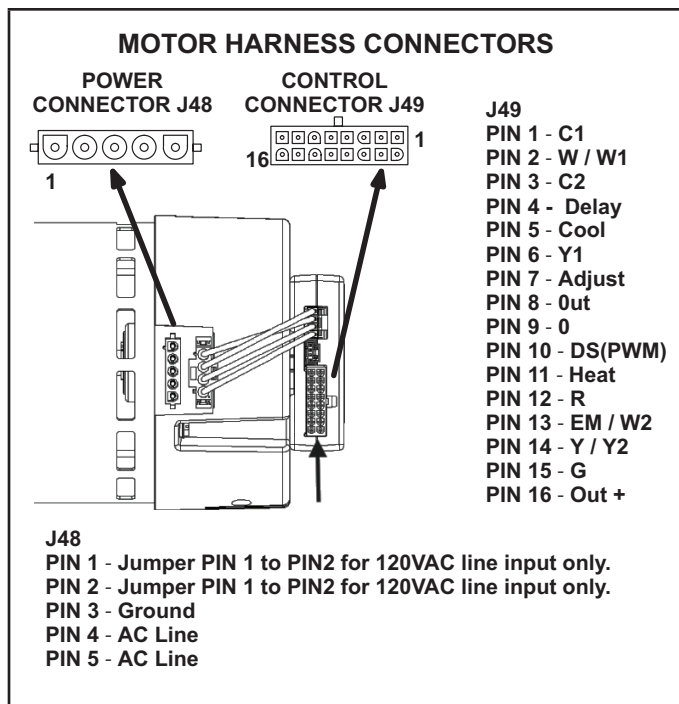
**Disconnect power from unit and wait at least five minutes to allow capacitors to discharge before attempting to adjust motor speed tap settings. Failure to wait may cause personal injury or death.**

#### External Operation (Speed Tap Priority)

FIGURE 18 shows the two quick-connect jacks (J48 and J49) which connect the motor to the ML180V. Jack J48 is the power plug and jack J49 connects the unit controls to the motor.

Jack J48 is the power plug. Line voltage must be applied to J48 pins 4 and 5 in order for the motor to operate. When using 120VAC pins 1 and 2 must be jumpered. Jack J49 connects the unit controls to the motor. The motor assigns priority to J49 pin 2 so that if a call for cooling and a call for heating are concurrent, heating call overrides and the blower operates on high speed heating tap.





**FIGURE 18**

### Power Choke (L13)

A choke coil is used on the 4 and 5 ton units. The choke is located on the blower housing and is used to suppress transient current spikes.

**Precautions**  
 If the ML180UHVK or its electronically controlled blower motor is improperly or inadequately grounded, it may cause television interference (commonly known as RFI or radio frequency interference).

This interference is caused by internal switching frequencies of the motor controller. TV interference may show up as small specks or lines which randomly appear on the TV screen accompanied by pops or clicks in the sound. Before attempting any service, make sure the indoor unit is causing the interference. To check, disconnect power to indoor unit then check TV for continued signs of interference.

TV interference may be stopped by making sure the motor is solidly grounded to the cabinet (metal to metal) and by making sure the cabinet is solidly grounded. If TV interference persists, make sure the television (and all affected RF appliances) are moved away from the ML180VK. Also make sure affected appliances are connected to a separate electrical circuit.

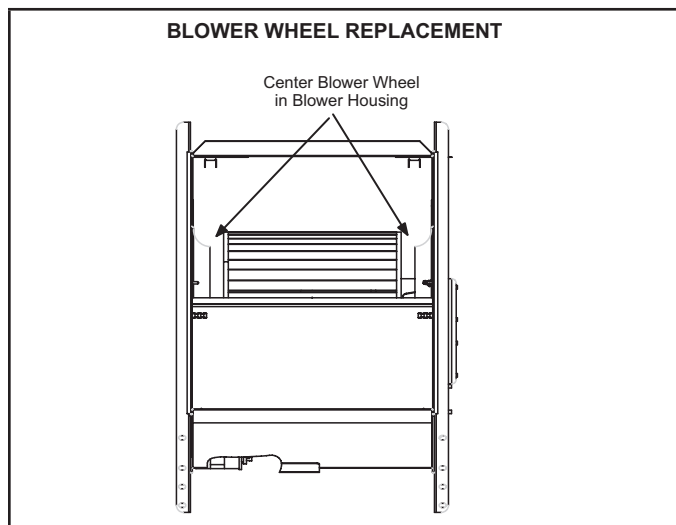
### Troubleshooting the Motor

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

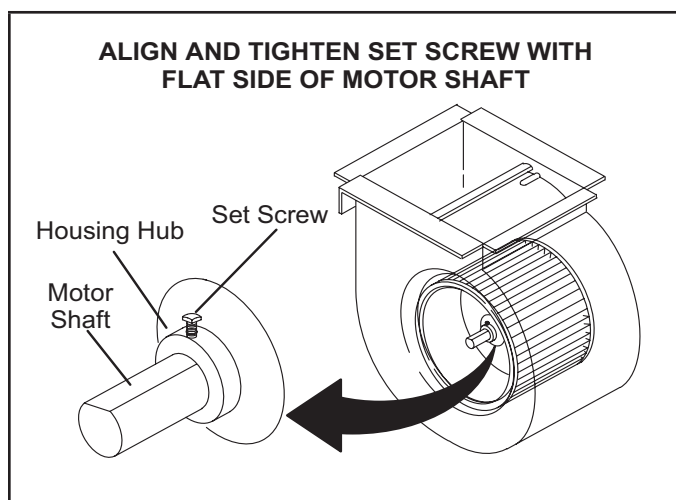
- 1 - Shut off power to unit.
- 2 - Remove input connectors J48 and J49 motor. See FIGURE 22 for troubleshooting procedure.

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 19. When replacing the indoor blower motor the set screw must be aligned and tightened with the motor shaft as shown in FIGURE 20.






**FIGURE 19**



**FIGURE 20**

## MOTOR SPEED CONTROL WITH D.C. PULSE-WIDTH MODULATION

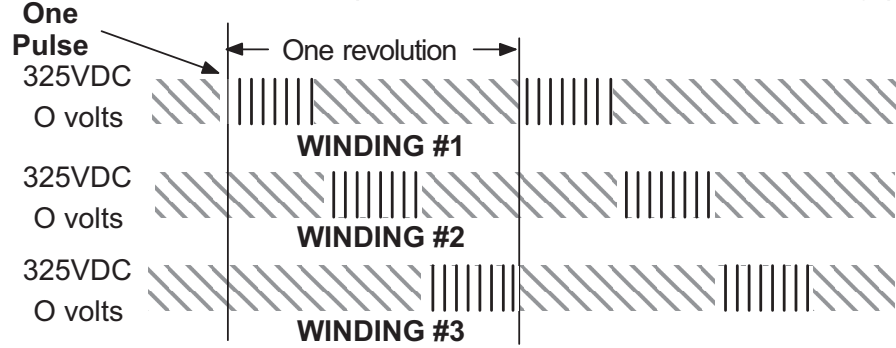
*Motor speed is determined by the size of the electrical pulse sent to the motor windings. The longer the pulse, the faster the motor.*

OUTPUT FROM CONTROLLER TO MOTOR WINDINGS	
WINDINGS TURNED OFF	WINDINGS TURNED ON
	 ON PULSE  OFF PULSE

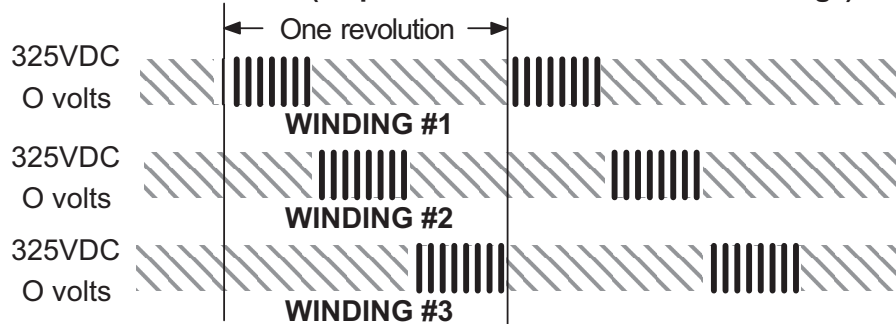
The frequency of the pulses to the windings is 20KHz.

DO NOT ATTEMPT TO MEASURE THESE VOLTAGES.

**LOW SPEED HEAT/COOL (output from controller to motor windings)**



**HIGH SPEED HEAT (output from controller to motor windings)**



**HIGH SPEED COOL (output from controller to motor windings)**

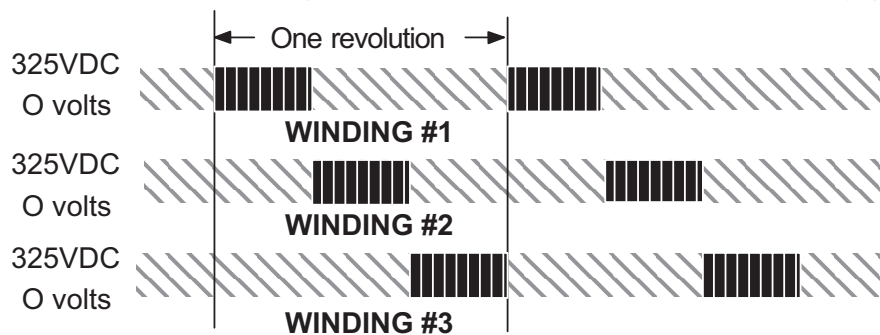
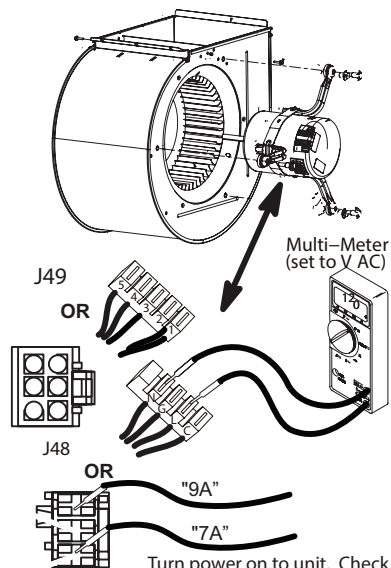
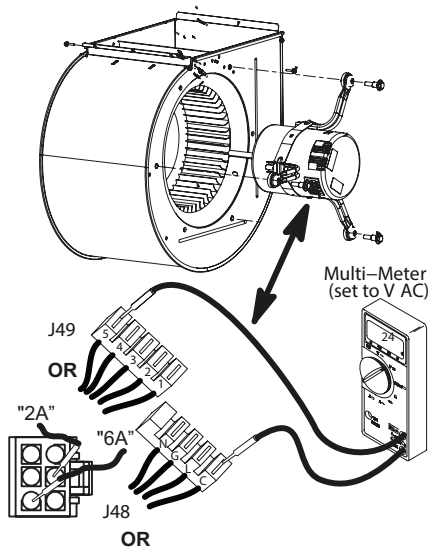


FIGURE 21

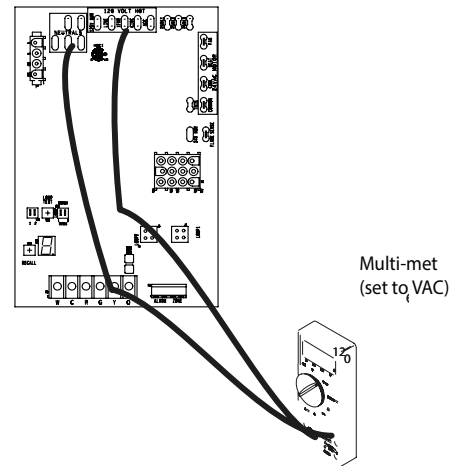




**Test 1**  
Turn power on to unit. Check for 120 volts across terminals "L" and "N" or terminals "7A" and "9A" of connector J48. If voltage is present continue to test 2. If voltage is not present problem may be upstream of J48. Proceed to test 3.

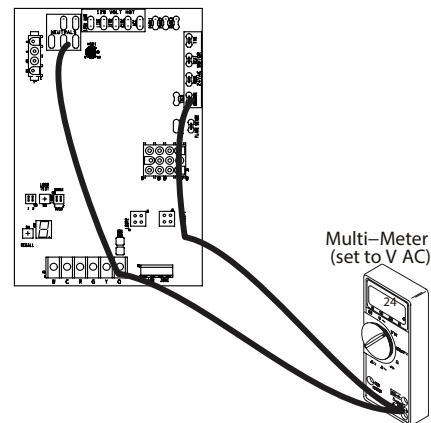


**Test 2**  
Switch thermostat to CONTINUOUS FAN MODE. For units using 4 and 5 position connector blocks, test for 24 volts terminal "C" of J48 and the tap used for continuous fan on J49 (1, 2, 3, 4 or 5). For units using 3 and 6 position connectors, test for 24 volts between pin



#### Test 3 (if necessary)

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



#### Test 4 (if necessary)

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

**FIGURE 22**

## II- PLACEMENT AND INSTALLATION

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

### III- START-UP

#### A- Heating Start-Up

## ⚠ WARNING

**Shock and burn hazard.**

**ML180UHVK units are equipped with a hot surface ignition system. Do not attempt to light manually.**

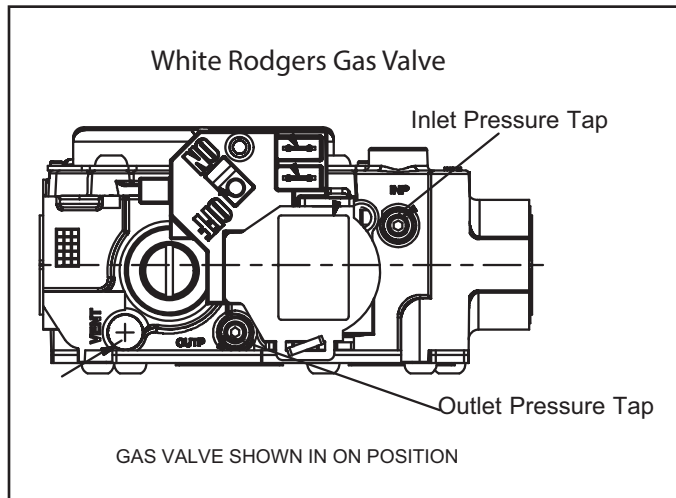


FIGURE 23

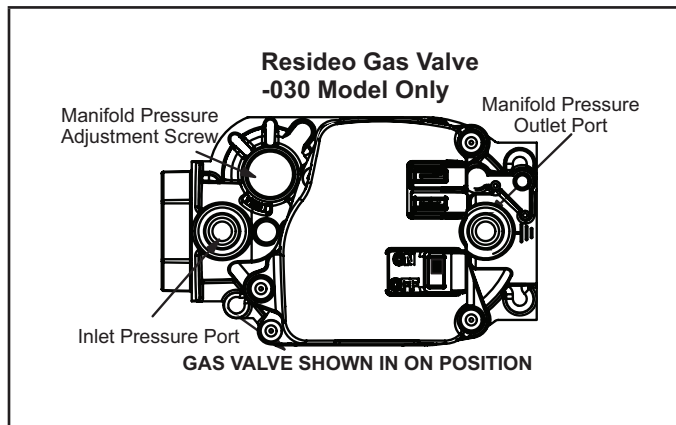


FIGURE 24

- 1 - **STOP!** Read the safety information at the beginning of this section.
- 2 - Set the thermostat to the lowest setting.
- 3 - Turn off all electrical power to the unit.
- 4 - This furnace is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.
- 5 - Remove the upper access panel.
- 6 - Move gas valve switch to OFF position. Do not force. See FIGURE 23 and FIGURE 24.

- 7 - Wait five minutes to clear out any gas. If you then smell gas, STOP! Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas go to next step.
- 8 - Move gas valve switch to ON position. Do not force. See FIGURE 23 and FIGURE 24.
- 9 - Replace the upper access panel.
- 10 - Turn on all electrical power to the unit.
- 11 - Set the thermostat to desired setting.

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

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

#### Turning Off Gas to Unit

- 1 - Set the thermostat to the lowest setting.
- 2 - Turn off all electrical power to the unit if service is to be performed.
- 3 - Remove the upper access panel.
- 4 - Move gas valve switch to OFF position. Do not force. See FIGURE 23 and FIGURE 24.
- 5 - Replace the upper access panel.

#### B- Safety or Emergency Shutdown

Disconnect main power to unit. Close manual and main gas valves.

#### C- 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 leaks 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- C.S.A. Certification

All units are C.S.A. design certified without modifications. Refer to the ML180UHVK Installation Instruction.

#### B- Gas Piping

Gas supply piping should not allow more than 0.5"W.C. drop in pressure between gas meter and unit. Supply gas pipe must not be smaller than unit gas connection.

Compounds used on gas piping threaded joints should be resistant to action of liquefied petroleum gases.

#### C- Testing Gas Piping

## ⚠ IMPORTANT

**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.**

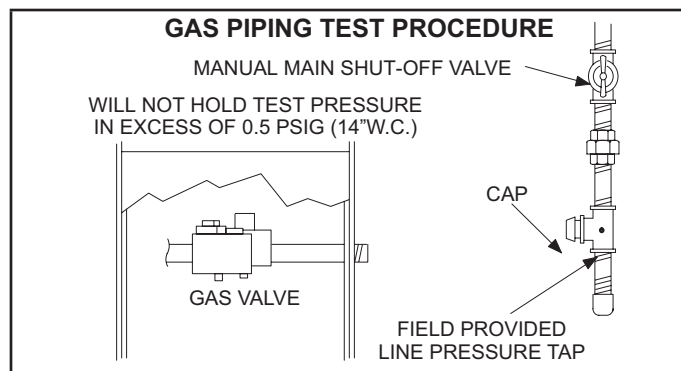
## ⚠ IMPORTANT

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

## ⚠ WARNING

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

When pressure testing gas lines, the gas valve must be disconnected and isolated. Gas valves can be damaged if subjected to more than 0.5psig (14" W.C.). See FIGURE 25. If the pressure is equal to or less than 0.5psig (14"W.C.), close the manual shut-off valve before pressure testing to isolate furnace from gas supply.



**FIGURE 25**

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- Gas Pressure Adjustment

#### Gas Flow (Approximate)

**TABLE 16**

GAS METER CLOCKING CHART				
ML180UHVK Unit	Seconds For One Revolution			
	Natural		LP/Propane	
	1 cu ft Dial	2 cu ft Dial	1 cu ft Dial	2 cu ft Dial
-030	120	240	300	600
-045	80	160	200	400
-070	55	110	136	272
-090	41	82	102	204
-110	33	66	82	164
-135	27	54	68	136
Natural-1000 btu/cu ft LP-2500 btu/cu ft				

Furnace should operate at least 5 minutes before checking gas flow. Determine time in seconds for two revolutions of gas through the meter. (Two revolutions assures a more accurate time.) Divide by two and compare to time in TABLE 16. If manifold pressure matches TABLE 18 and rate is incorrect, check gas orifices for proper size and restriction. Remove temporary gas meter if installed.

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

### E- Supply and Manifold Pressure

#### Supply Pressure Measurement

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 18 for proper line pressure. Replace the threaded plug after measurements have been taken.

#### Manifold Pressure Measurement

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

- 1 - Connect test gauge to manifold pressure post on gas valve.
- 2 - Fire the unit on 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 18.
- 4 - If necessary, make adjustments. FIGURE 23 and FIGURE 24 show location of adjustment screw.
- 5 - Shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to replace pressure tap plug if removed.
- 6 - Start unit and perform leak check. Seal leaks if found.

**NOTE** - Shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to remove barbed fitting and replace threaded plug.

### F- Proper Combustion

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

**TABLE 17**

ML180UHVK	CO <sub>2</sub> For Nat	CO <sub>2</sub> For LP
All Models	6.8 - 7.4	7.5 - 9.0
The maximum carbon monoxide reading is 100 ppm.		

### G- 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 18 for manifold pressure and TABLE 19 for pressure switch change and gas conversion kits.

## ⚠ 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.**

**TABLE 18**

Supply Line and Manifold Pressure Settings at all Altitudes

Model Input Size	Gas	0 - 2000 ft.	2001 -4500 ft .	4501 - 7500 ft.	7501 - 10,000 ft	Line Pressure in. wg.	
						Min	Max
030	Nat	3.5	3.2	3.0	3.5	4.5	13.0
	LP/Propane	10.0	10.0	10.0	10.0	11.0	13.0
045	Nat	3.5	3.2	3.0	3.5	4.5	13.0
	LP/Propane	10.0	10.0	10.0	10.0	11.0	13.0
070	Nat	3.5	3.2	2.8	3.5	4.5	13.0
	LP/Propane	10.0	10.0	10.0	10.0	11.0	13.0
090	Nat	3.5	3.2	2.7	3.5	4.5	13.0
	LP/Propane	10.0	10.0	9.6	10.0	11.0	13.0
110	Nat	3.5	3.5	3.0	3.5	4.5	13.0
	LP/Propane	10.0	10.0	9.6	10.0	11.0	13.0

**TABLE 19**

Pressure Switch and Gas Conversion Kits at all Altitudes

Model Input Size	High Altitude Pressure Switch Kit			High Altitude Natural Gas Orifice Kit	LP/Propane Orifice Kit		Natural Gas Orifice 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
030	No Change	80W52	80W51	14C90	19D59	19H30	N/A
045		80W52	80W51	73W37	19D58	19H29	77WO9
070		80W52	80W51				
110		80W52	80W51				
090		80W52	80W51				
110		80W57	80W52				

**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.**

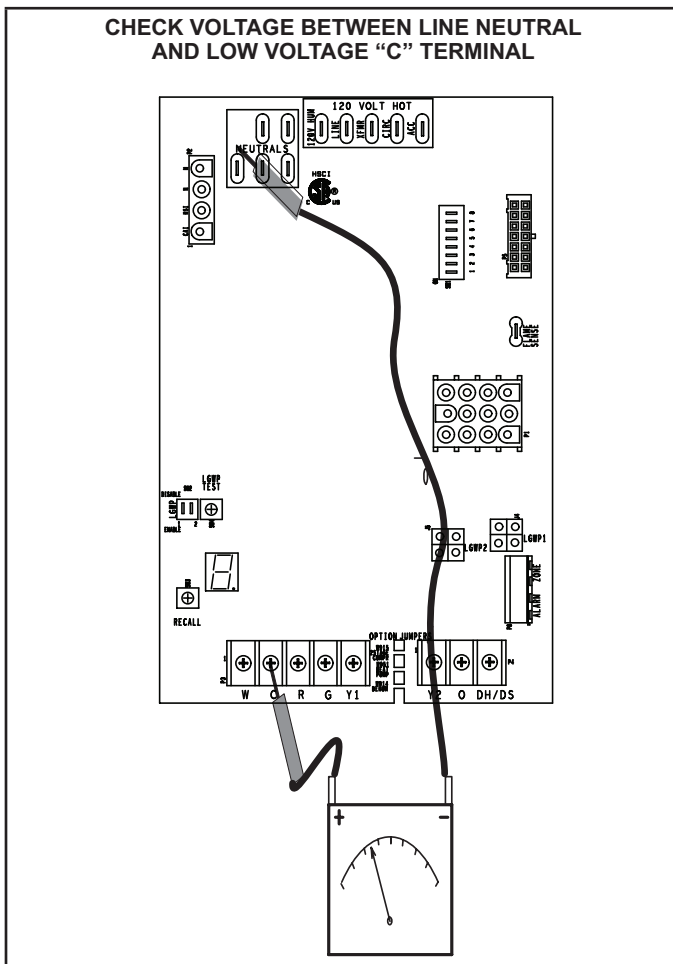
## H- Proper Ground and Voltage

A poorly grounded furnace can contribute to poor flame sense signal. Use the following procedure to check for ground and voltage to the integrated control.

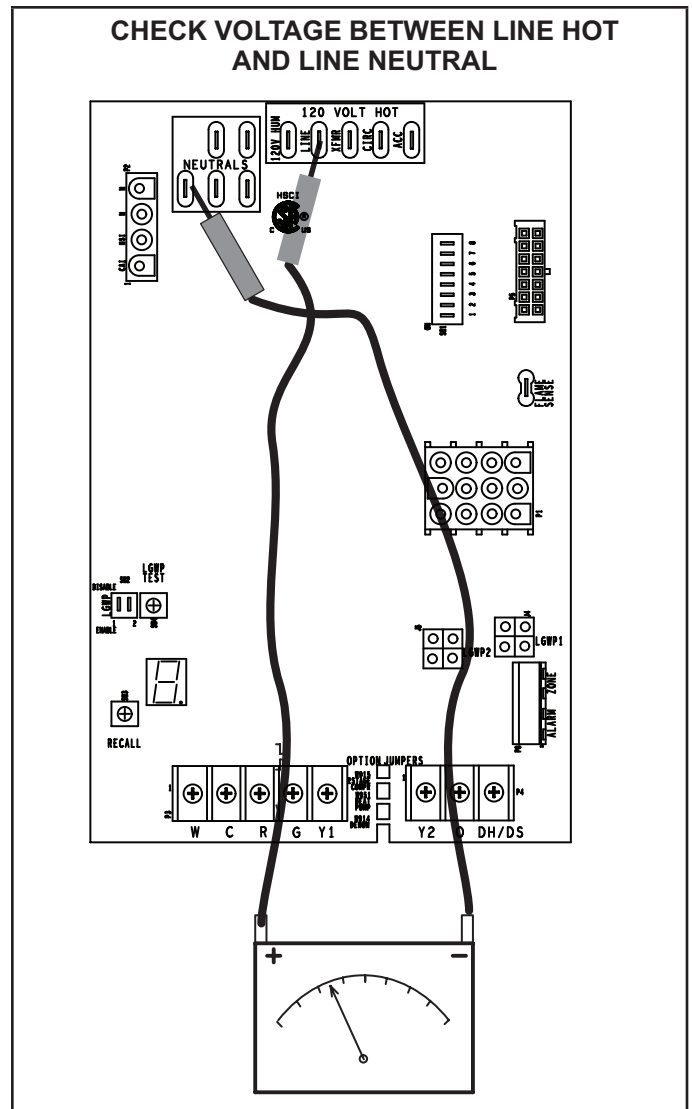
- 1 - Measure the AC voltage between Line Neutral (spade terminals) and "C" terminal (low voltage terminal block) on the integrated control. See FIGURE 26. A wide variation in the voltage between Line Neutral and "C" as a function of load indicates a poor or partial ground. Compare the readings to the table below. If the readings exceed the maximum shown in TABLE 20, 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 27. This voltage should be in the range of 97 to 132 Vac.

**TABLE 20**  
**Measurement VAC**

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



**FIGURE 26**



**FIGURE 27**

## V-TYPICAL OPERATING CHARACTERISTICS

### A-Blower Operation and Adjustment

**NOTE-** The following is a generalized procedure and does not apply to all thermostat controls.

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

### B-Temperature Rise (FIGURE 28)

Temperature rise for ML180UHVK 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.

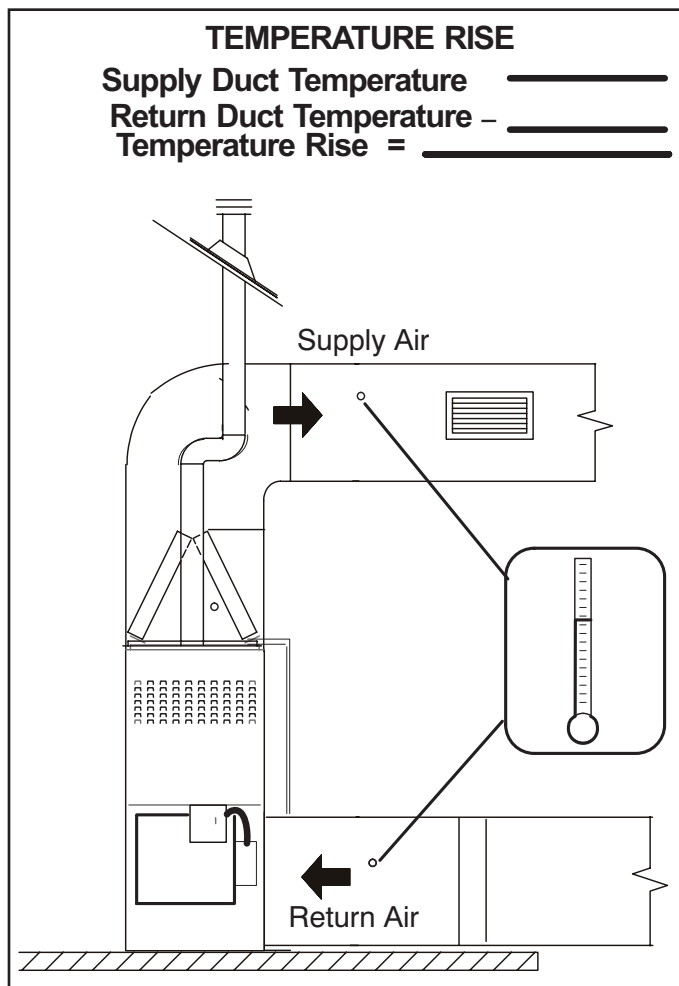


FIGURE 28

### C-External Static Pressure

- 1 - Tap locations shown in FIGURE 29.
- 2 - Punch a 1/4" diameter hole in supply and return air plenums. Insert manometer hose flush with inside edge of hole or insulation. Seal around the hose with permagum. Connect the zero end of the manometer to the discharge (supply) side of the system. On ducted systems, connect the other end of manometer to the return duct as above.
- 3 - With only the blower motor running and the evaporator coil dry, observe the manometer reading. Adjust blower motor speed to deliver the air desired according to the job requirements. For heating speed external static pressure drop must not be more than 0.5" W.C. For cooling speed external static pressure drop must not be more than 0.8" W.C.
- 4 - Seal the hole when the check is complete.

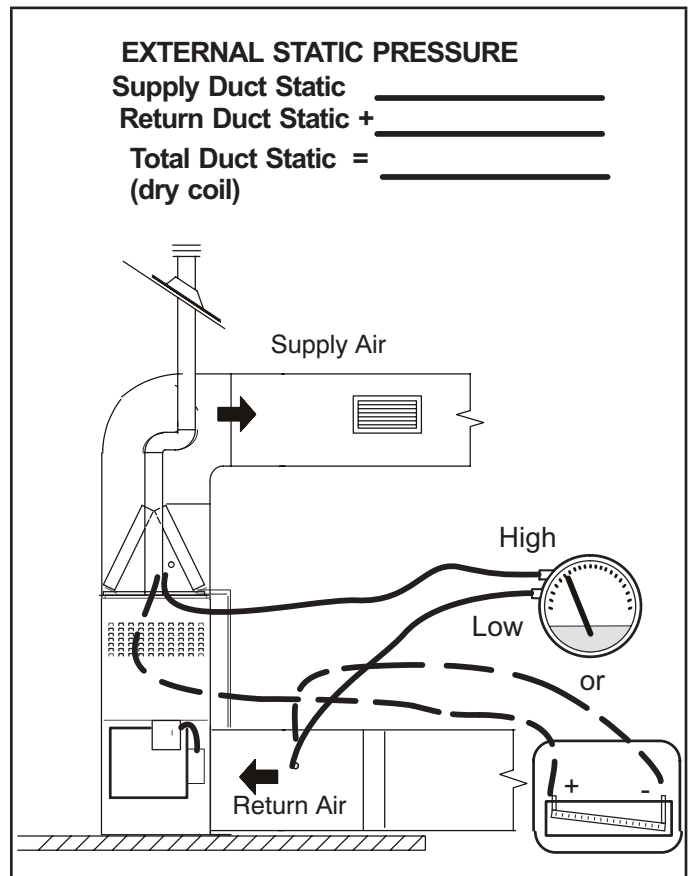


FIGURE 29

### D - Circulating Airflow Adjustments

**Heating Mode** - These units are factory set to run at the middle of the heating rise range as shown on the unit rating plate. If higher or lower rise is desired, reposition DIP switches 3 and 4. To determine what CFM the motor is delivering at any time, count the number of times the green LED on the control board flashes. Each flash signifies 100 CFM; count the flashes and multiply by 100 to determine the actual CFM delivered (for example: 10 flashes x 100 = 1000 CFM).



## VI- Low GWP Application

### **⚠ WARNING**

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

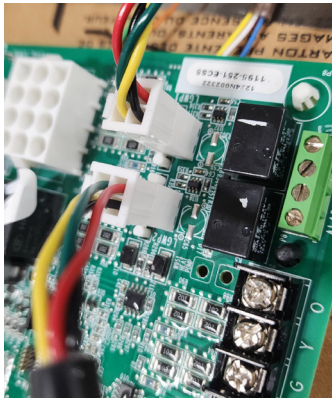
### CONNECTING THE FURNACE CONTROL BOARD SENSOR.

See **FIGURE 32** 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 30** . Verify the connection is free of dust, debris, and moisture.

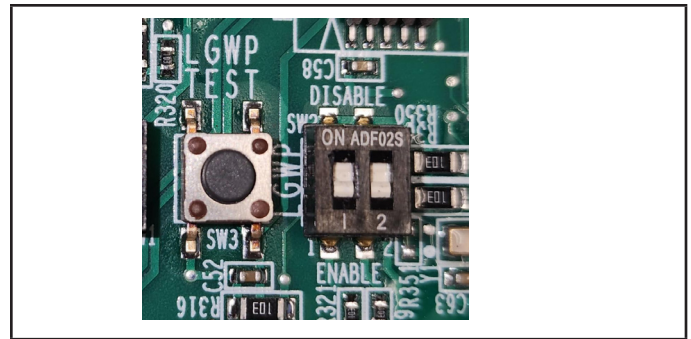
**NOTE** - In confined space applications, connect the second sensor to the LGWP2 sensor plug. Refer to evaporator coil installation instructions for more detail.



**FIGURE 30**

### 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 31** and **TABLE 21**.



**FIGURE 31**

**TABLE 21**

DIP Switch Settings

Configuration	LGWP1	LGWP2
One (1) sensor, connected to SENSOR 1 plug	Enable	Disable
Two (2) sensors, connected to SENSOR 1 plug and SENSOR 2 plug	Enable	Enable
No sensor R410A or heat only applications	Disable	Disable
Invalid Configuration	Disable	Enable

In single sensor configurations, the sensor must be connected to the SENSOR 1 plug (LGWP1). Configurations other than the ones shown in **TABLE 21** 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 **ENABLED**.

The furnace control board software reads the **ENABLE** position as an active sensor. A sensor should be present for the corresponding sensor connector. Setting the DIP switch to **DISABLE** 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 32** 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 **DISABLE** position.

## FURNACE CONTROL BOARD LOW GWP MODES OF OPERATION

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

### Initializing

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

### Normal

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

### Leak Detected

When the furnace control board detects a refrigerant leak:

1. The furnace control board shuts off the (R) input (24VAC power) to the thermostat, which de-energizes the outdoor unit compressor and heat sources, such as gas and/or electric strip heat. No heating or cooling demands will be met. The furnace control board activates the blower (high speed). The blower purges refrigerant from the cabinet, plenum, and ductwork.

2. 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.
3. 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 diagnostic codes

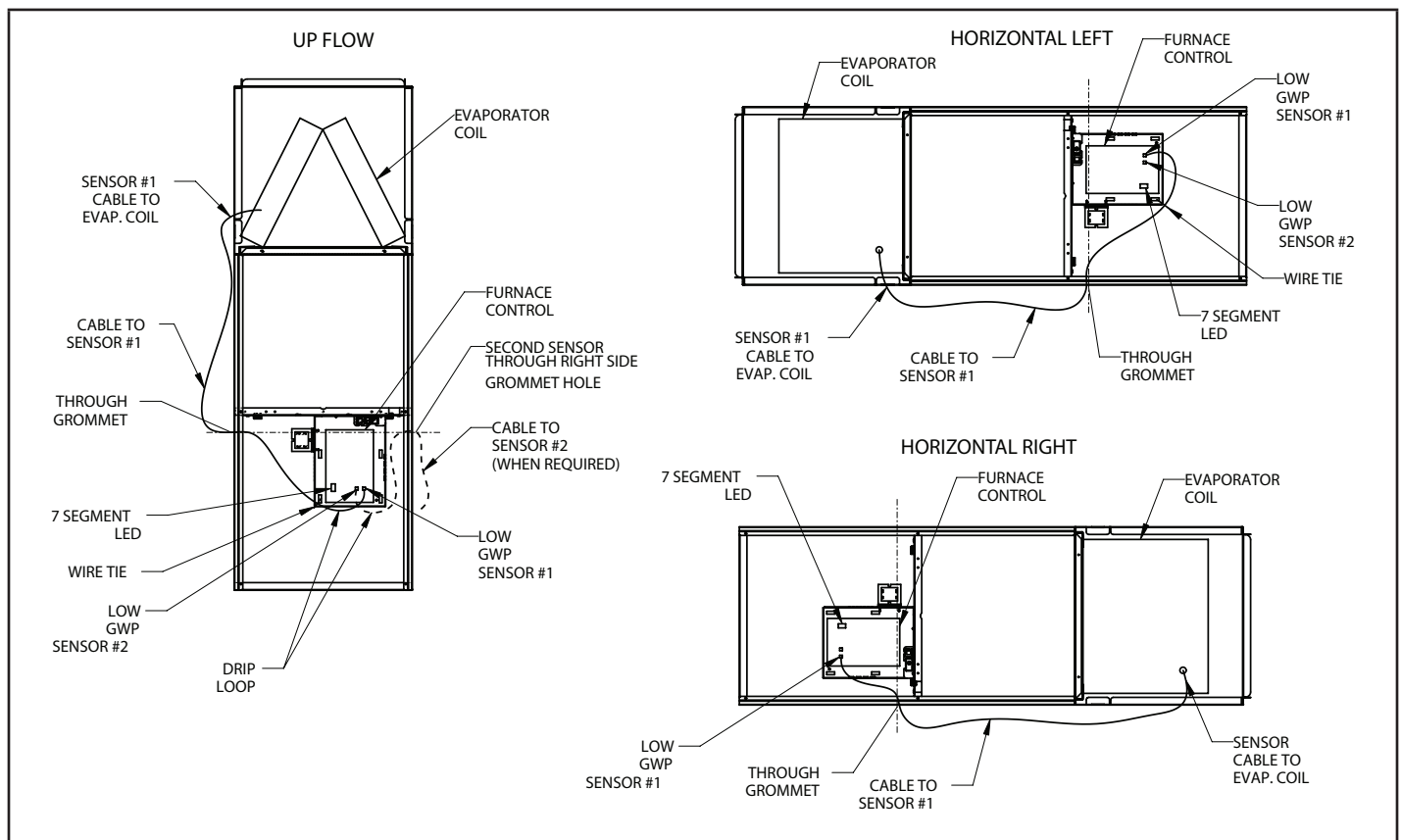


FIGURE 32



## 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 22 lists the functions of the Test button during each mode of operation.

**TABLE 22**  
**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 23 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 23**  
**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. See TABLE 4 diagnostic codes..  
The system then executes a leak detection response.
3. Observe the following sequence:
  - a. The LED indicator for leak detection. See TABLE 4. Diagnostic codes.
  - b. The blower powers up.
  - c. The outdoor compressor powers down.
4. Press the LGWP Test button to terminate the simulated Leak Detected mode upon test completion

#### Heating Demand

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

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

## VII-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:

### **IMPORTANT**

If a highefficiency filter is being installed as part of this system to ensure better indoor air quality, the filter must be properly sized. Highefficiency filters have a higher static pressure drop than standardefficiency glass/foam filters. If the pressure drop is too great, system capacity and performance may be reduced.

The pressure drop may also cause the limit to trip more frequently during the winter and the indoor coil to freeze in the summer, resulting in an increase in the number of service calls.

Before using any filter with this system, check the specifications provided by the filter manufacturer against the data given in the appropriate Lennox Product Specifications bulletin. Additional information is provided in Service and Application Note ACC002 (August 2000).

### **WARNING**

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

### **CAUTION**

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

- 1- Check 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).

**TABLE 24**

Furnace Cabinet Width “	Filter	
	Side Return “	Bottom Return “
A - 14-1/2	16 X 25 X 1 (1)	14 X 25 X 1 (1)
B - 17-1/2		16 X 25 X 1 (1)
C - 21		20 X 25 X 1 (1)

- 5- Check the condition and cleanliness of burners and heat exchanger and clean if necessary.
- 6- Check the cleanliness of blower assembly and clean the housing, blower wheel and blower motor if necessary . The blower motors are prelubricated for extended bearing life. No further lubrication is needed.
- 7- Inspect the combustion air inducer and clean if necessary.
- 8- Evaluate the heat exchanger integrity by inspecting the heat exchanger per the AHRI heat exchanger inspection procedure. This procedure can be viewed at [www.ahrinet.org](http://www.ahrinet.org)
- 9- Ensure sufficient combustion air is available to the furnace. Fresh air grilles and louvers (on the unit and in the room where the furnace is installed) must be properly sized, open and unobstructed to provide combustion air.
- 10- Inspect the furnace venting system to make sure it is in place, structurally sound, and without holes, corrosion, or blockage. Vent system must be free and clear of obstructions and must slope upward away from the furnace. Vent system should be installed per the National Fuel Gas Code
- 11- Inspect the furnace return air duct connection to ensure the duct is sealed to the furnace. Check for air leaks on supply and return ducts and seal where necessary.
- 12 - Inspect the Low GWP sensor / sensors and rubber sleeve.

- 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 values.
- 14- Verify operation of CO detectors and replace batteries as required.

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

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

### **Cleaning the Heat Exchanger and Burners**

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

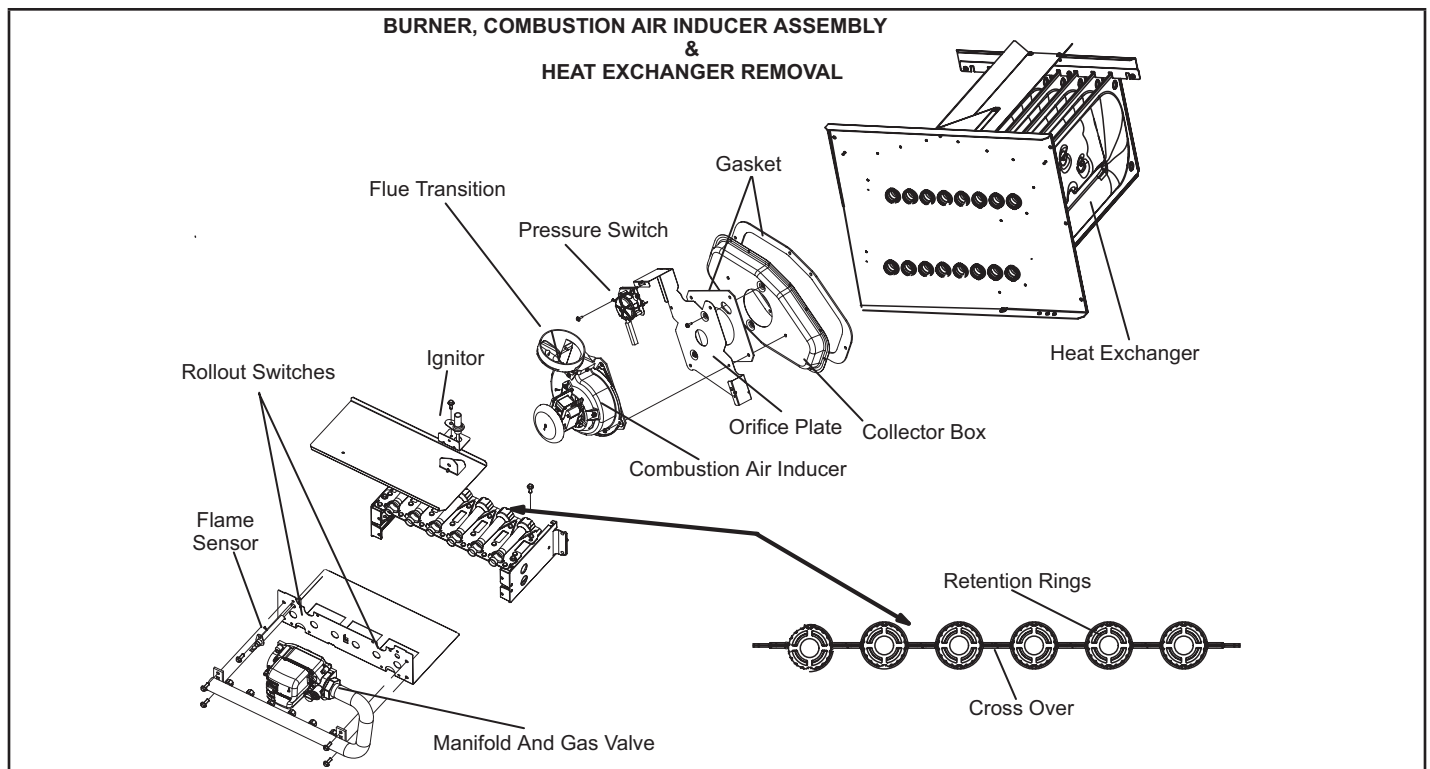
- 1 - Turn off both electrical and gas power supplies to furnace.
- 2 - Remove flue pipe and top cap (some applications top cap can remain) from the unit.
- 3 - Label the wires from gas valve, rollout switches, primary limit switch and make-up box then disconnect them.
- 4 - Remove the screws that secure the combustion air inducer/ pressure switch assembly to the collector box. Carefully remove the combustion air inducer to avoid damaging blower gasket. If gasket is damaged, it must be replaced to prevent leakage.
- 5 - Remove the collector box located behind the combustion air inducer. Be careful with the collector box gasket. If the gasket is damaged, it must be replaced to prevent leakage.
- 6 - Disconnect gas supply piping. Remove the four screws securing the burner manifold assembly to the vestibule panel and remove the assembly from the unit.

- 7 - Remove screws from both sides, top and bottom of vestibule panel.
- 8 - 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 34.
- 9 - Backwash using steam. Begin from the burner opening on each clam. Steam must not exceed 275°F.
- 10 -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 33 shows burner detail.
- 11 - 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.
- 12 -Reinstall heat exchanger in vestibule. (Replace the five screws in the cabinet from step 10 if removed).
- 13 -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 if necessary.
- 14 -Reinstall burner box and manifold assembly.
- 15 -Reconnect all wires.
- 16 -Reconnect top cap and vent pipe to combustion air inducer outlet.
- 17 -Reconnect gas supply piping.
- 18 -Turn on power and gas supply to unit.
- 19 -Set thermostat and check for proper operation.
- 20 -Check all piping connections, factory and field, for gas leaks. Use a leak detecting solution or other preferred means.

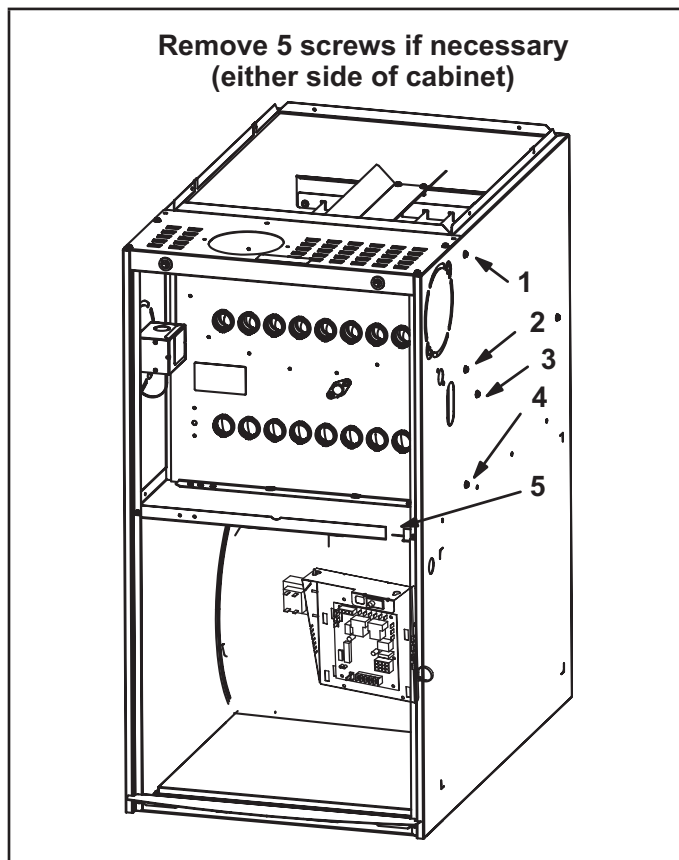
## **⚠ CAUTION**

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

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

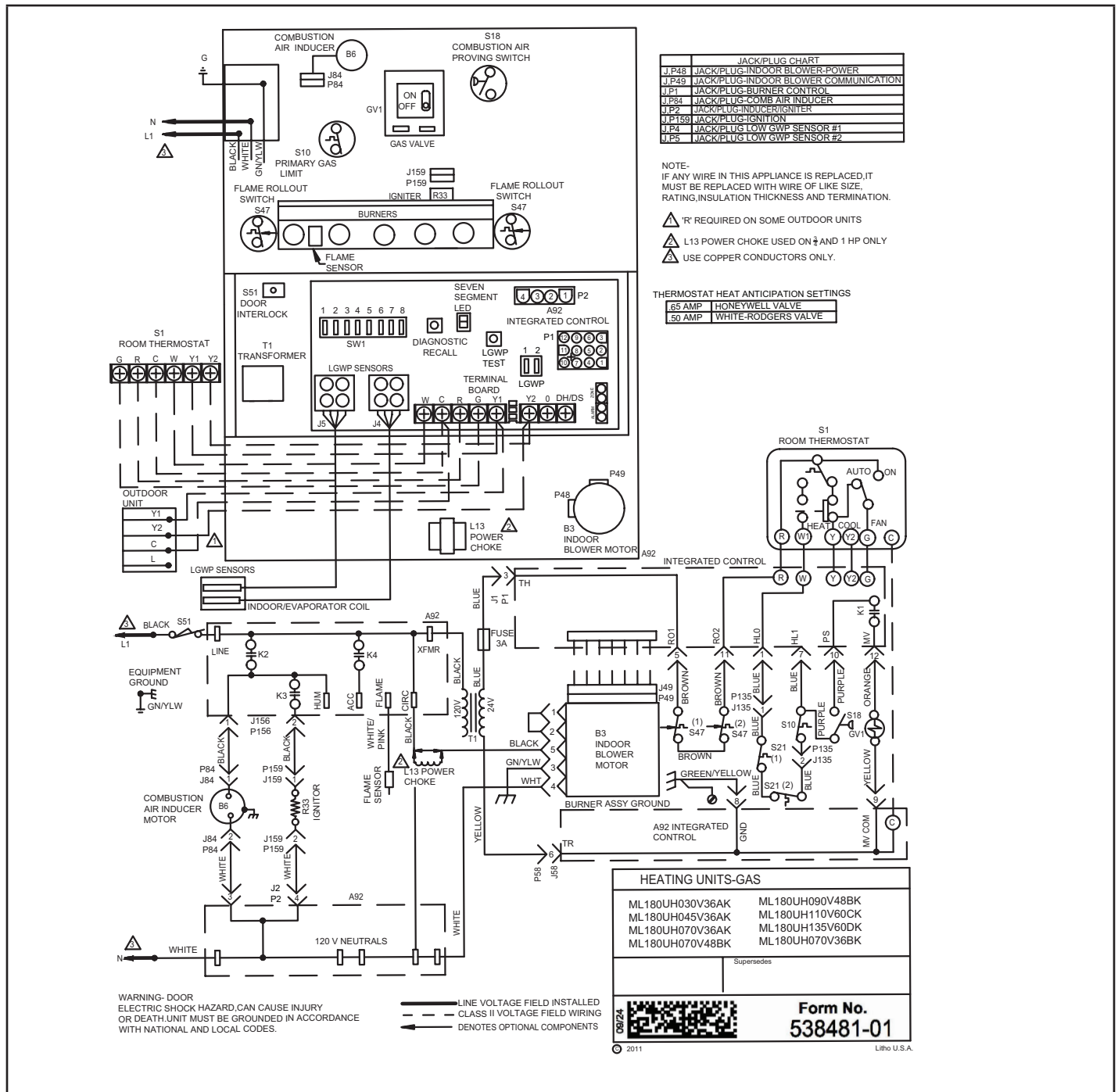


**FIGURE 33**

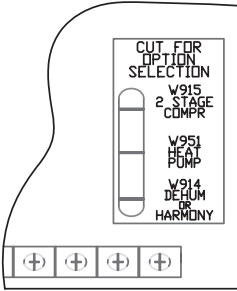
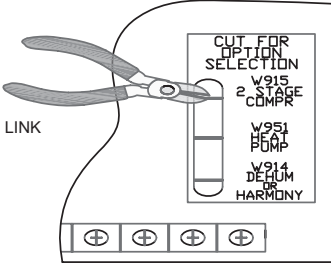
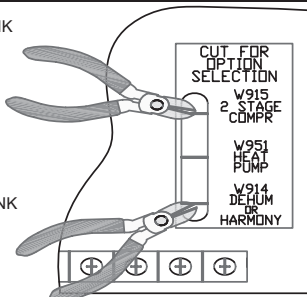


**FIGURE 34**

## VIII- Wirng Diagram, Sequence of Operation



- 1 - Line voltage is applied to L1 and N. the T1 low voltage transformer is energized, and line voltage is applied to B3 indoor blower.
- 2 - S47 rollout switch(es) must be closed in order for 24V from transformer to be output on integrated control "R" to power thermostat.
- 3 - When there is a call for heat, W1 of the thermostat energizes W of the furnace control with 24VAC.
- 4 - A92 integrated control runs a self-check. S10 primary limit and S21 secondary limit contacts are found to be closed. Call for heat can continue.
- 5 - A92 integrated control energizes B6 combustion air inducer. S18 combustion air pressure switch closes. Once S18 closes, a 15-second pre-purge follows.
- 6 - A92 integrated control energizes R33 ignitor. A 20-second warm-up period begins.
- 7 - GV1 gas valve opens for a 4-second trial for ignition
- 8 - Flame is sensed, gas valve remains open for the heat call.
- 9 - After 30-second delay (from flame sensed), A92 integrated control applies 24vVAC to Heat speed of B3 indoor blower.
- 10 - When heat demand is satisfied, W1 of the indoor thermostat de-energizes W of A92 ignition control which de-energizes GV1 gas valve. B6 combustion air inducer continues a 5-second post-purge period, and B3 indoor blower completes a selected OFF time delay.

Thermostat	On-Board Links		Wiring Connections
		On Board Links Must Be Cut To Select System Options	
1 Heat / 1 Cool		<p>DO NOT CUT ANY ON-BOARD LINKS</p> 	<p>S1 T'STAT      FURNACE TERM. STRIP      OUTDOOR UNIT</p> <p>(DH/DS)</p> <p>W ——— W      * ——— R</p> <p>R ——— R      G ——— G</p> <p>G ——— G      C ——— C</p> <p>C ——— C      Y2      Y</p> <p>Y ——— Y1      O</p>
1 Heat / 2 Cool		<p>CUT ON-BOARD LINK W915 2 STAGE COMPR</p> 	<p>S1 T'STAT      FURNACE TERM. STRIP      OUTDOOR UNIT</p> <p>(DH/DS)</p> <p>W ——— W      * ——— R</p> <p>R ——— R      G ——— G</p> <p>G ——— G      C ——— C</p> <p>C ——— C      Y2      Y2</p> <p>Y2 ——— Y2      Y1      Y1</p> <p>Y1 ——— Y1      O</p>
1 Heat / 2 Cool with t'stat with humidity control		<p>CUT ON-BOARD LINK W915 2 STAGE COMPR</p> <p>CUT ON-BOARD LINK W914 DEHUM OR HARMONY</p> 	<p>S1 T'STAT      FURNACE TERM. STRIP      OUTDOOR UNIT</p> <p>(DS) ——— (DH/DS)</p> <p>W ——— W      * ——— R</p> <p>R ——— R      G ——— G</p> <p>G ——— G      C ——— C</p> <p>C ——— C      Y2      Y2</p> <p>Y2 ——— Y2      Y1      Y1</p> <p>Y1 ——— Y1      O</p>

\* Not required on all units.



Thermostat	On-Board Links		Wiring Connections
		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		<div><div>CUT ON-BOARD LINK W951 HEAT PUMP</div><div></div></div>	<div><div>T'STAT</div><div>FURNACE TERM. STRIP</div><div>HEAT PUMP</div><div><div><div>(R)-----</div><div>(H)</div><div>(W1)-----</div><div>(O)-----</div><div>(Y1)-----</div><div>(Y2)</div><div>(G)-----</div><div>(D)</div><div>(B)</div><div>(C)-----</div></div><div><div>(R)-----</div><div></div><div>(W)-----</div><div>(O)-----</div><div>(Y1)-----</div><div>(Y2)</div><div>(G)</div><div>(DH/DS)</div><div></div><div>(C)-----</div></div><div><div>(R)</div><div></div><div>(W)-----</div><div>(O)</div><div>(Y)</div><div></div><div></div><div></div><div>(C)</div></div></div><div><div>67M41*</div><div><div></div><div></div><div></div></div></div></div>
Dual Fuel Two Stage Heat Pump  (M30 T-stat) thermostat w/ dual fuel capa- bilities Capable of 2 stage gas heat control		<div><div>CUT ON-BOARD LINK W915 2 STAGE COMPR</div><div>CUT ON-BOARD LINK W951 HEAT PUMP</div><div></div></div>	<div><div>T'STAT</div><div>FURNACE TERM. STRIP</div><div>HEAT PUMP</div><div><div><div>(R)-----</div><div>(H)</div><div>(W2)-----</div><div>(W1)-----</div><div>(O)-----</div><div>(L)-----</div><div>(Y1)-----</div><div>(Y2)-----</div><div>(G)-----</div><div>(D)</div><div>(B)</div><div>(C)-----</div></div><div><div>(R)-----</div><div></div><div>(W1)-----</div><div>(O)-----</div><div></div><div>(Y1)-----</div><div>(Y2)-----</div><div>(G)</div><div>(DH/DS)</div><div></div><div>(C)-----</div></div><div><div>(R)</div><div></div><div>(W)-----</div><div>(O)</div><div>(Y1)</div><div>(Y2)</div><div></div><div></div><div></div><div>(C)</div></div></div><div><div>67M41*</div><div><div></div><div></div><div></div></div></div></div>

\* 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	On-Board Links		Wiring Connections																																							
		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		<div>CUT ON-BOARD LINK W951 HEAT PUMP</div> <div>CUT ON-BOARD LINK W914 DEHUM OR HARMONY</div> <div></div>	<table><thead><tr><th>T'STAT</th><th>FURNACE TERM. STRIP</th><th>HEAT PUMP</th></tr></thead><tbody><tr><td>(R) ---</td><td>(R) ---</td><td>(R)</td></tr><tr><td>(H)</td><td></td><td></td></tr><tr><td>(W2)</td><td></td><td></td></tr><tr><td>(W1) ---</td><td>(W) ← 67M41* →</td><td>(W)</td></tr><tr><td>(O) ---</td><td>(O) ---</td><td>(O)</td></tr><tr><td>(L) ---</td><td></td><td>(L)</td></tr><tr><td>(Y1) ---</td><td>(Y1) ---</td><td>(Y)</td></tr><tr><td>(Y2) ---</td><td>(Y2) ---</td><td></td></tr><tr><td>(G) ---</td><td>(G) ---</td><td></td></tr><tr><td>(D) ---</td><td>(DH/DS)</td><td></td></tr><tr><td>(B)</td><td></td><td></td></tr><tr><td>(C) ---</td><td>(C) ---</td><td>(C)</td></tr></tbody></table>	T'STAT	FURNACE TERM. STRIP	HEAT PUMP	(R) ---	(R) ---	(R)	(H)			(W2)			(W1) ---	(W) ← 67M41* →	(W)	(O) ---	(O) ---	(O)	(L) ---		(L)	(Y1) ---	(Y1) ---	(Y)	(Y2) ---	(Y2) ---		(G) ---	(G) ---		(D) ---	(DH/DS)		(B)			(C) ---	(C) ---	(C)
T'STAT	FURNACE TERM. STRIP	HEAT PUMP																																								
(R) ---	(R) ---	(R)																																								
(H)																																										
(W2)																																										
(W1) ---	(W) ← 67M41* →	(W)																																								
(O) ---	(O) ---	(O)																																								
(L) ---		(L)																																								
(Y1) ---	(Y1) ---	(Y)																																								
(Y2) ---	(Y2) ---																																									
(G) ---	(G) ---																																									
(D) ---	(DH/DS)																																									
(B)																																										
(C) ---	(C) ---	(C)																																								
Dual Fuel Two Stage Heat Pump  (M30 T-stat) thermostat w/ dual fuel capabilities Capable of 2 stage gas heat control w/dehumidification		<div>CUT ON-BOARD LINK W915 2 STAGE COMPR</div> <div>CUT ON-BOARD LINK W951 HEAT PUMP</div> <div>CUT ON-BOARD LINK W914 DEHUM OR HARMONY</div> <div></div>	<table><thead><tr><th>T'STAT</th><th>FURNACE TERM. STRIP</th><th>HEAT PUMP</th></tr></thead><tbody><tr><td>(R) ---</td><td>(R) ---</td><td>(R)</td></tr><tr><td>(H)</td><td></td><td></td></tr><tr><td>(W2)</td><td></td><td></td></tr><tr><td>(W1) ---</td><td>(W) ← 67M41* →</td><td>(W)</td></tr><tr><td>(O) ---</td><td>(O) ---</td><td>(O)</td></tr><tr><td>(L) ---</td><td></td><td>(L)</td></tr><tr><td>(Y1) ---</td><td>(Y1) ---</td><td>(Y1)</td></tr><tr><td>(Y2) ---</td><td>(Y2) ---</td><td>(Y2)</td></tr><tr><td>(G) ---</td><td>(G) ---</td><td></td></tr><tr><td>(D) ---</td><td>(DH/DS)</td><td></td></tr><tr><td>(B)</td><td></td><td></td></tr><tr><td>(C) ---</td><td>(C) ---</td><td>(C)</td></tr></tbody></table>	T'STAT	FURNACE TERM. STRIP	HEAT PUMP	(R) ---	(R) ---	(R)	(H)			(W2)			(W1) ---	(W) ← 67M41* →	(W)	(O) ---	(O) ---	(O)	(L) ---		(L)	(Y1) ---	(Y1) ---	(Y1)	(Y2) ---	(Y2) ---	(Y2)	(G) ---	(G) ---		(D) ---	(DH/DS)		(B)			(C) ---	(C) ---	(C)
T'STAT	FURNACE TERM. STRIP	HEAT PUMP																																								
(R) ---	(R) ---	(R)																																								
(H)																																										
(W2)																																										
(W1) ---	(W) ← 67M41* →	(W)																																								
(O) ---	(O) ---	(O)																																								
(L) ---		(L)																																								
(Y1) ---	(Y1) ---	(Y1)																																								
(Y2) ---	(Y2) ---	(Y2)																																								
(G) ---	(G) ---																																									
(D) ---	(DH/DS)																																									
(B)																																										
(C) ---	(C) ---	(C)																																								

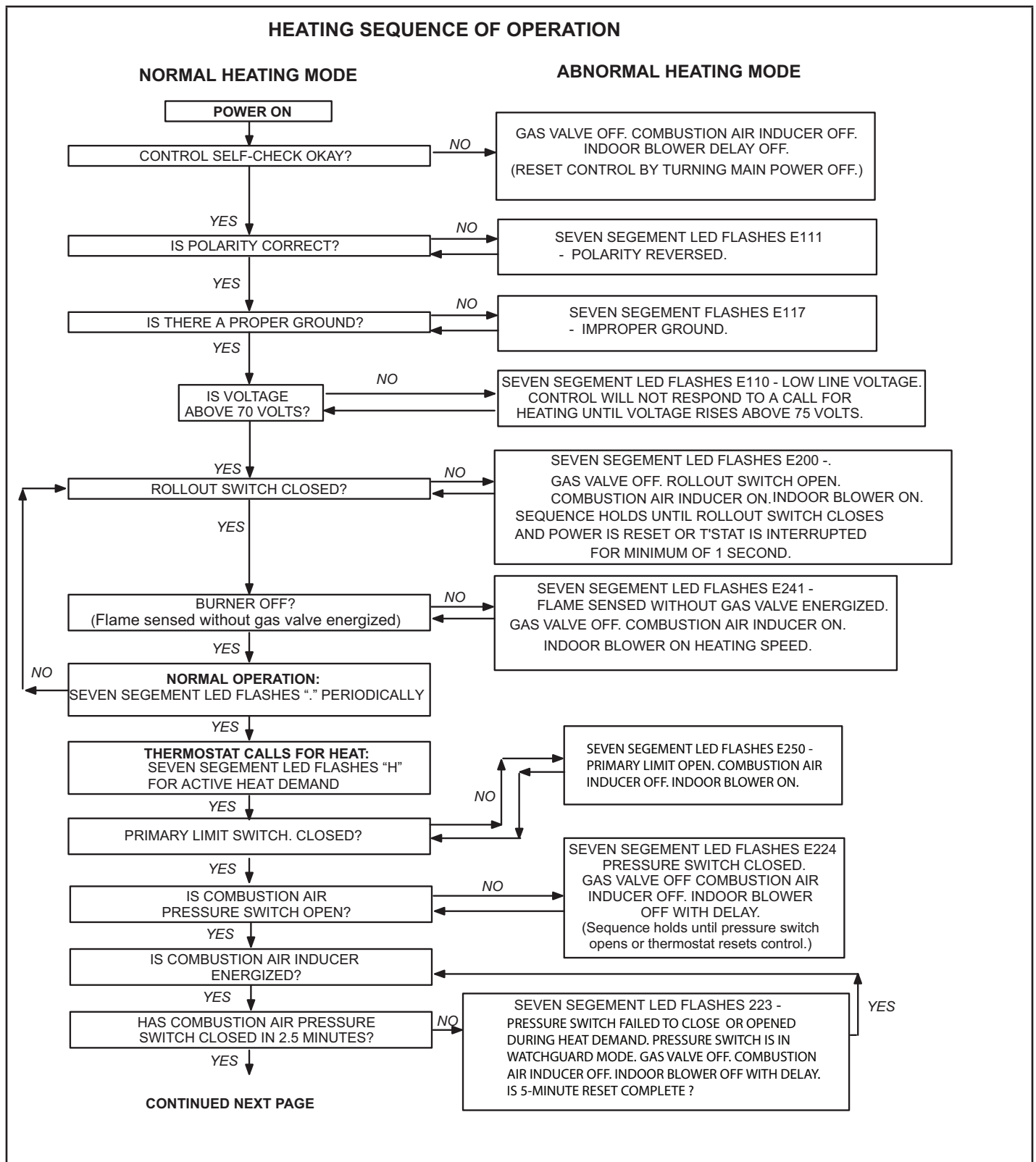
\* Connect W1 to W1 ONLY if using defrost tempering kit 67M41

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

\* 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.

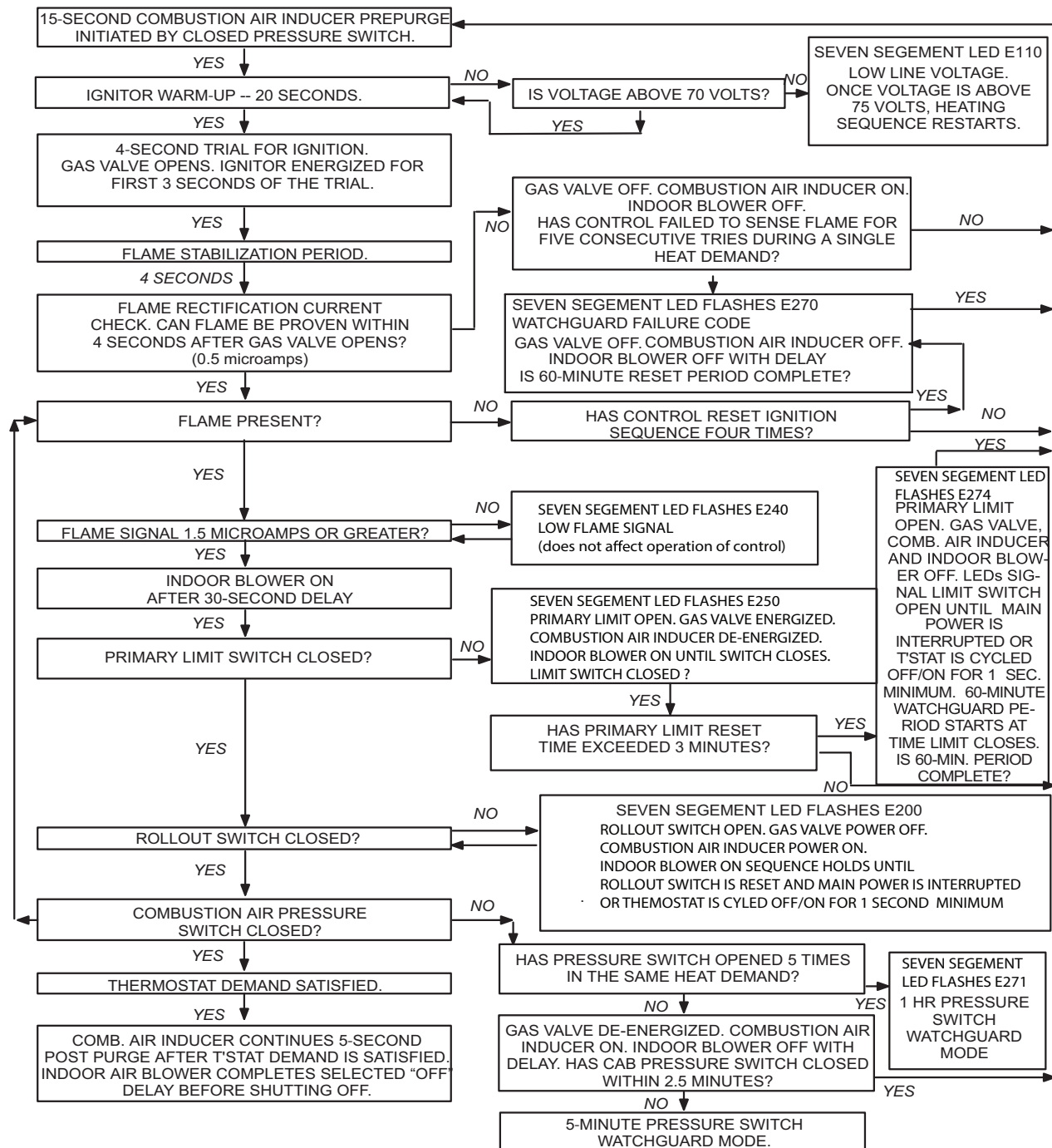
## IX-Troubleshooting Flow Chart



## HEATING SEQUENCE CONTINUED

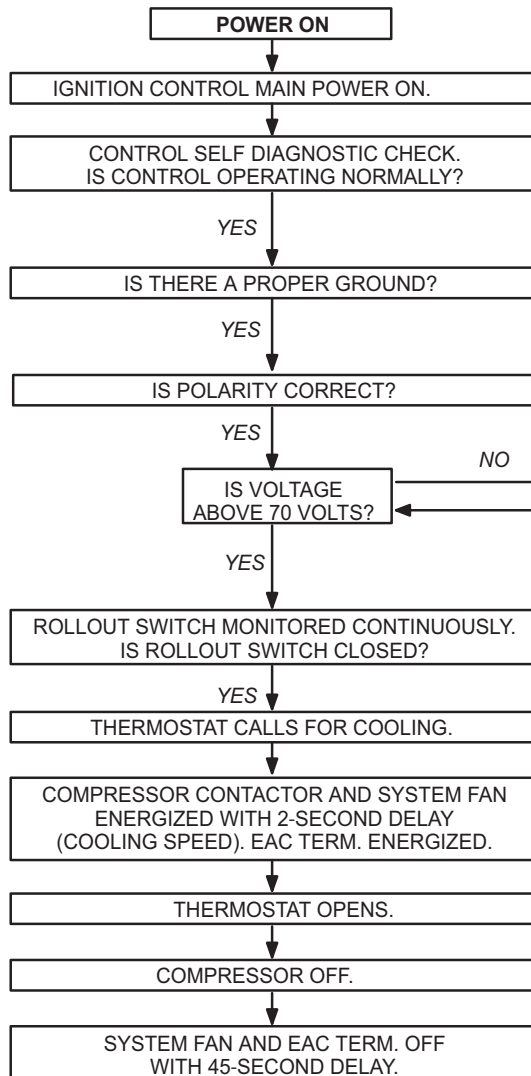
### NORMAL HEATING MODE

### ABNORMAL HEATING MODE



## COOLING SEQUENCE OF OPERATION

### NORMAL COOLING MODE



### ABNORMAL COOLING MODE

GAS VALVE OFF. COMBUSTION AIR INDUCER OFF.  
INDOOR BLOWER OFF WITH NORMAL DELAY.  
SIGNAL CIRCUIT BOARD FAILURE AT LED.  
INTERRUPT MAIN POWER TO RESET CONTROL.

SEVEN SEGEMENT LED FLASHES E117 IMPROPER GROUND  
CONTROL WILL CONTINUE TO CALL FOR COOLING  
IN THIS CONDITION.

SEVEN SEGEMENT LED FLASHES E111 POLARITY REVERSED  
CONTROL WILL CONTINUE TO CALL FOR COOLING IN  
THIS CONDITION.

SEVEN SEGEMENT LED FLASHES E110 LOW VOLTAGE  
CONTROL WILL CONTINUE TO CALL FOR COOLING  
IN THIS CONDITION.

SEVEN SEGEMENT LED FLASHES E200 ROLLOUT SWITCH OPEN.  
GAS VALVE OFF. COMBUSTION AIR INDUCER ON. INDOOR  
BLOWER ON. SEQUENCE HOLDS UNTIL ROLLOUT SWITCH  
CLOSES AND MAIN POWER IS INTERRUPTED OR  
THERMOSTAT IS CYCLED OFF/ON FOR 1 SEC. MINIMUM.

## CONTINUOUS FAN SEQUENCE OF OPERATION

