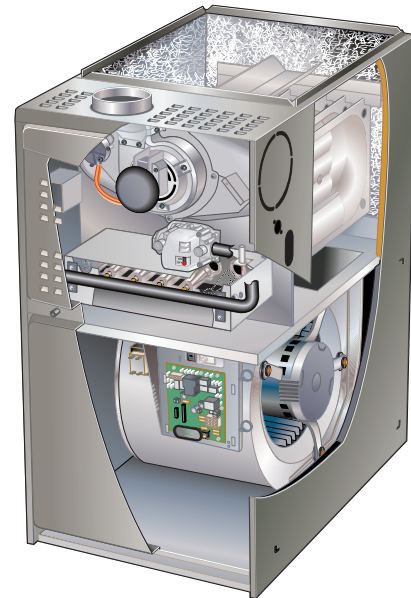


ML180UHV series units are mid-efficiency gas furnaces used for upflow or horizontal applications only, manufactured with Lennox Duralok heat exchangers formed of aluminized steel. ML180UHV units are available in heating capacities of 30,000 to 110,000 Btuh and cooling applications 1-1/2 to 5 tons. Refer to Engineering Handbook for proper sizing.

Units are factory equipped for use with natural gas. Kits are available for conversion to LP/Propane operation.

ML180UHV 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.

**⚠ 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.

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## SPECIFICATIONS

Gas Heating Performance	Model No.	ML180UH030V36A	ML180UH045V36A	ML180UH070V36A	ML180UH070V36B
	<sup>1</sup> AFUE	80%	80%	80%	80%
	Input - Btuh	30,000	44,000	66,000	66,000
	Output - Btuh	24,430	36,100	53,400	53,400
	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
<b>High Static - in. w.g.</b>		0.80	0.80	0.80	0.80
<b>Connections in.</b>	Flue connection - in. round	4	4	4	4
	Gas pipe size IPS	1/2	1/2	1/2	1/2
<b>Indoor Blower</b>	Wheel nom. dia. 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
<b>Electrical Data</b>	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
<b>Shipping Data</b>	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 No.	ML180UH070V48B	ML180UH090V48B	ML180UH110V60C
	<sup>1</sup> AFUE	80%	80%	80%
	Input - Btuh	66,000	88,000	110,000
	Output - Btuh	53,400	71,500	89,700
	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
<b>High Static - in. w.g.</b>		0.50	0.50	0.50
<b>Connections in.</b>	Flue connection - in. round	4	4	4
	Gas pipe size IPS	1/2	1/2	1/2
<b>Indoor Blower</b>	Wheel nom. dia. 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
<b>Electrical Data</b>	Voltage	120 volts - 60 hertz - 1 phase		
	Blower motor full load amps	8.5	8.5	11.5
	Maximum overcurrent protection	15	15	20
<b>Shipping Data</b>	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	
<b>CABINET ACCESSORIES</b>					
Horizontal Suspension Kit - Horizontal only		51W10	51W10	51W10	
Return Air Base - Upflow only		65W75	50W98	50W99	
High Performance Economizer (Commercial Only)		10U53	10U53	10U53	
<b>CONTROLS</b>					
iComfort® M30 Smart Wi-Fi Thermostat		15Z69	15Z69	15Z69	
Outdoor Temperature Sensor		X2658	X2658	X2658	
<b>FILTERS</b>					
¹ Air Filter and Rack Kit	Horizontal (end)	87L95	87L96	87L97	
	Size of filter - in.	14 x 25 x 1	18 x 25 x 1	20 x 25 x 1	
	Side Return	Single	44J22	44J22	44J22
		Ten Pack	66K63	66K63	66K63
	Size of filter - in.	16 x 25 x 1	16 x 25 x 1	16 x 25 x 1	
<b>NIGHT SERVICE KITS</b>					
Night Service Kit		19H89	19H89	19H89	
<b>VENTING</b>					
Vent Adaptor – 6 in. conn. size upflow applications only		18M79	18M79	18M79	

¹ Cleanable polyurethane, frame-type filter.

## BLOWER DATA

### ML180UH030V36A 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	¹ Med-Low	Med-Hi	High	Low	Med-Low	Med-Hi	¹ High	
+	630	665	715	775	645	840	1045	1320	
¹ 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	¹ High					
	+	450	580	690	860				
	¹ NORM	410	520	635	785				
—	380	480	590	705					

¹ 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 Harmony III™ Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH030V36A 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
+					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 Harmony III™ Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH045V36A 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
+					410	520	635	785
<sup>1</sup> NORM					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 Harmony III™ Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH045V36A 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 Harmony III™ Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH070V36A 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 Harmony III™ Zoning System Applications - Minimum blower speed is 350 cfm.

**BLOWER DATA****ML180UH070V36A 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 Harmony III™ Zoning System Applications - Minimum blower speed is 350 cfm.

**BLOWER DATA****ML180UH070V36B 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 Harmony III™ Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH070V36B 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 Harmony III™ Zoning System Applications - Minimum blower speed is 350 cfm.

## BLOWER DATA

### ML180UH070V48B 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 Harmony III™ Zoning System Applications - Minimum blower speed is 400 cfm.

## BLOWER DATA

### ML180UH070V48B 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
<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 Harmony III™ Zoning System Applications - Minimum blower speed is 400 cfm.

## BLOWER DATA

### ML180UH090V48B 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
<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 Harmony III™ Zoning System Applications - Minimum blower speed is 400 cfm.



## BLOWER DATA

ML180UH090V48B 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
+					725	845	970	1045
<sup>1</sup> NORM					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 Harmony III™ Zoning System Applications - Minimum blower speed is 400 cfm.

## BLOWER DATA

ML180UH090V48B 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
+					680	850	950	1060
<sup>1</sup> NORM					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 Harmony III™ Zoning System Applications - Minimum blower speed is 400 cfm.

## BLOWER DATA

### ML180UH110V60C 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
+	1530	1700	1850	2150	1560	1765	1980	2180
<sup>1</sup> NORM	1400	1560	1730	1960	1425	1620	1800	2000
—	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
					1125	1275	1420	1585
+					1030	1165	1290	1450
<sup>1</sup> NORM					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 Harmony III™ Zoning System Applications - Minimum blower speed is 550 cfm.

## BLOWER DATA

### ML180UH110V60C 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
+	1500	1635	1820	2085	1650	<b>1860</b>	<b>2080</b>	<b>2330</b>
<sup>1</sup> NORM	1370	1500	1665	1905	1500	1700	<b>1895</b>	<b>2080</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
					1200	1350	1500	1665
+					1090	1235	1375	1525
<sup>1</sup> NORM					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 Harmony III™ Zoning System Applications - Minimum blower speed is 550 cfm.

# PARTS ARRANGEMENT

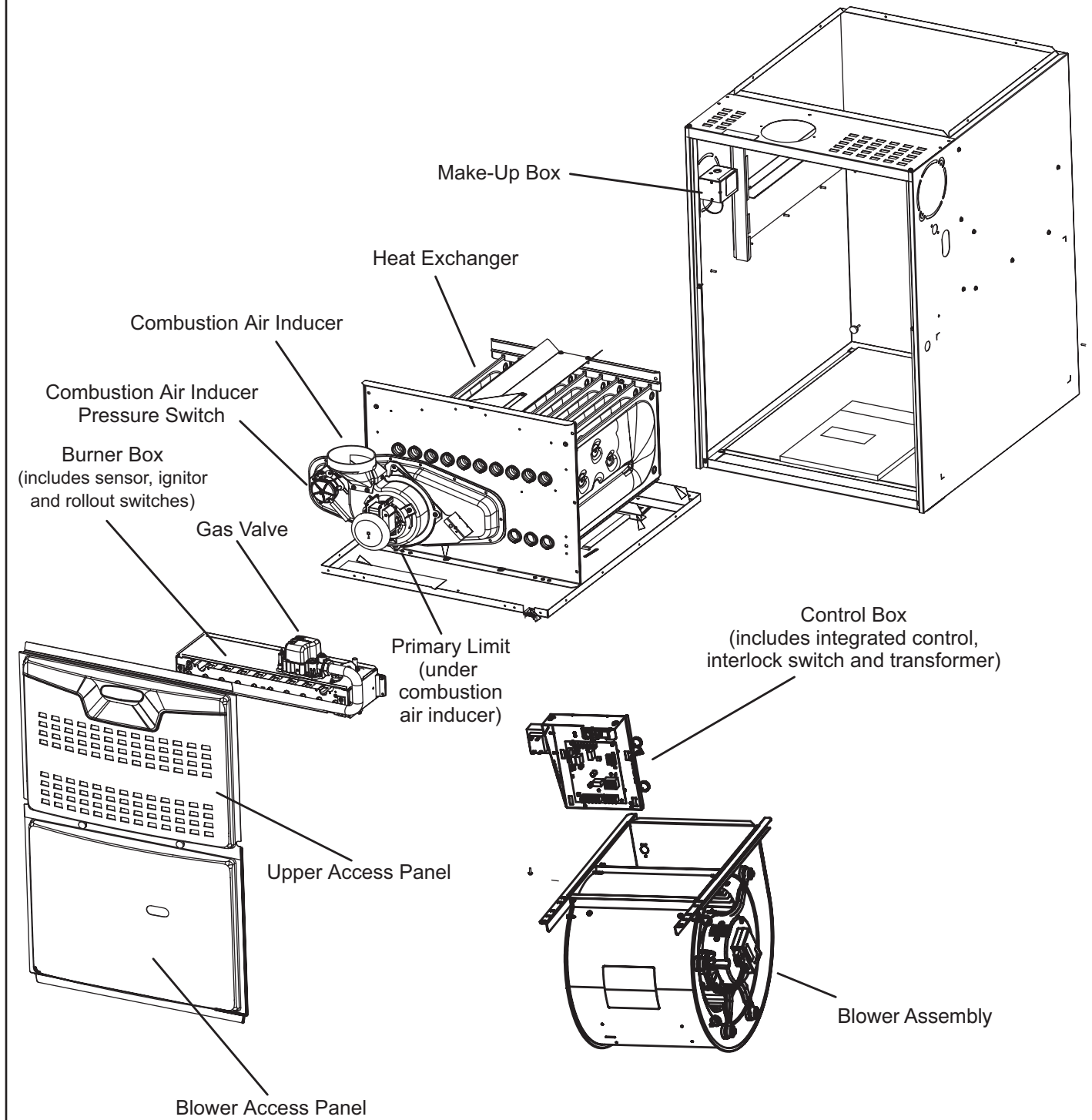
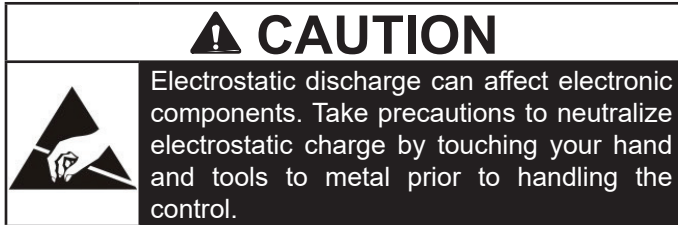


FIGURE 1

## I-UNIT COMPONENTS

ML180UHV 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



#### 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.

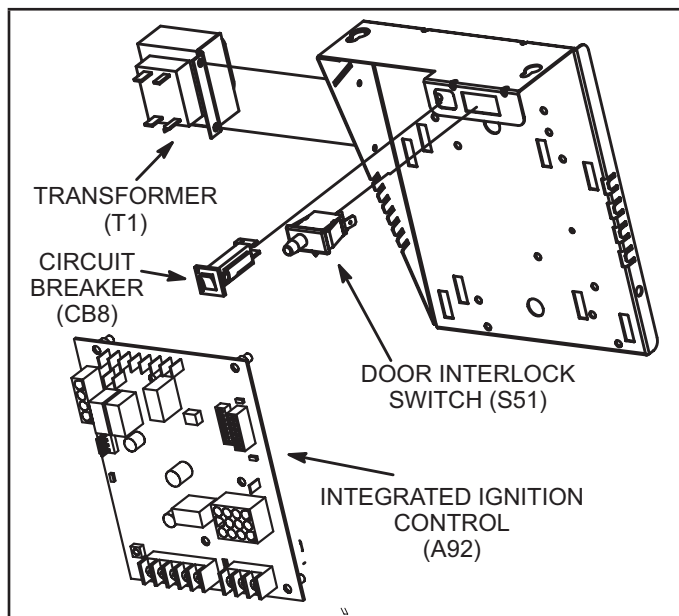


FIGURE 2

#### 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.

#### 4. Integrated Control (A92)

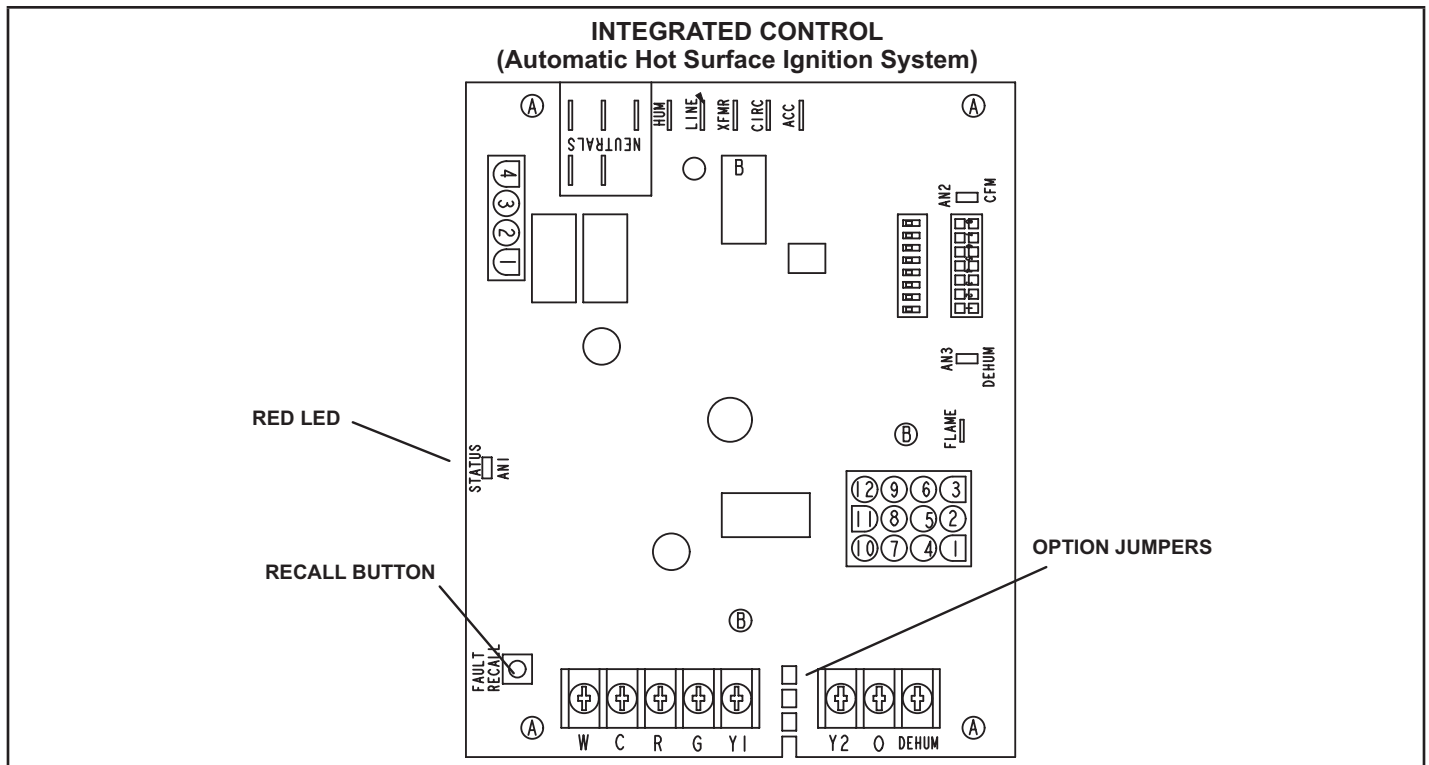


The hot surface ignition control system consisting of an integrated control (figure 2 with control terminal designations in tables 1, 2 and 3), sensor and ignitor (figure 5). The integrated control and ignitor work in combination to ensure furnace ignition and ignitor durability. The integrated control, 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.

#### Electronic Ignition (Figure 4)

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.



**FIGURE 3**

**TABLE 1**

<b>4-Pin Terminal Designations</b>	
PIN#	Function
1	Combustion Air Inducer Line
2	Ignitor Line
3	Combustion Air Inducer Neutral
4	Ignitor Neutral

**TABLE 2**

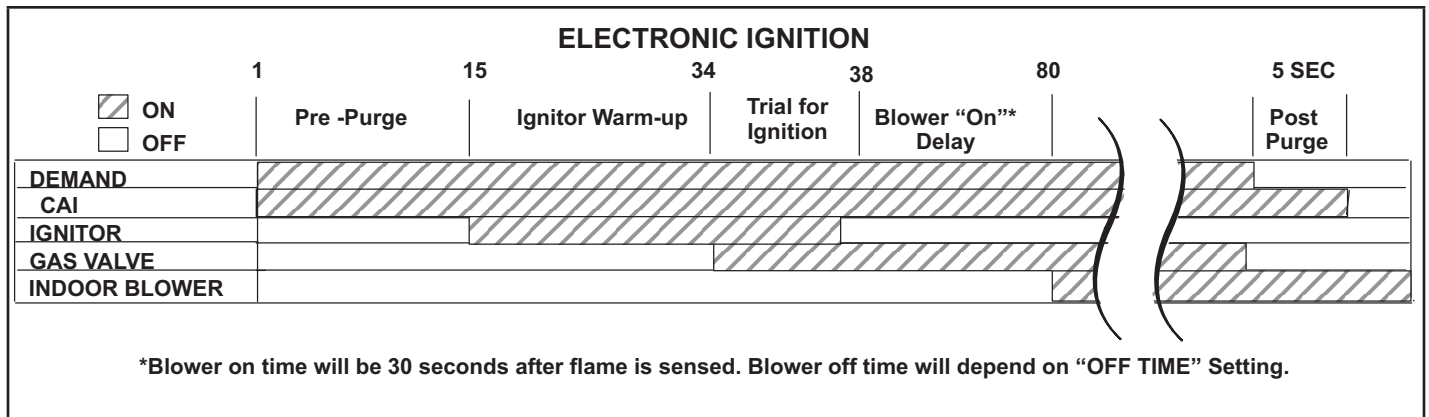
<b>12-Pin Terminal Designations</b>	
1	High Limit Output
2	Not Used
3	24V Line
4	Not Used
5	Rollout Switch Out
6	24V Neutral
7	High Limit Out
8	Ground
9	Gas Valve Common
10	Pressure Switch In
11	Rollout Switch In
12	Gas Valve Out

**TABLE 3**

<b>1/4" Quick Connections Terminals</b>	
HUM	Humidifier 120VAC
LINE	120VAC
XFMR	Transformer 120VAC
CIRC	Indoor Blower 120VAC
ACC	Inddor Air Quality Accessory 120VAC
NEUTRALS	Common 120VAC
<b>3/16" Quick Connections Terminals</b>	
Flame	Flame Sense

**TABLE 4**

RED LED Flash Code	Diagnostic Codes / Status of Furnace
Off	No power to control or board fault detected
On	Board fault detected,
Heartbeat <sup>1</sup>	Normal Operation - Idle, Continuous Fan, Cool
Continuous Rapid Flash <sup>2</sup>	Call For Heat / Burner Operation
1	Reverse Line Voltage Polarity
2	Improper Earth Ground
3	Burner failed to light, or lost flame during heat demand
4	Low Flame Signal - check flame sensor
5	Watchguard - burner failed to light, exceeded maximum number of retries or recycles.
6	Not Used
7	Primary or Secondary Limit Open or Watchguard Mode - Limit Switch Open longer than 3 minutes
8	Rollout Switch Open
9	Pressure Switch failed to close or opened during heat demand
10	Watchguard - Pressure Switch opened 5 times during one heat demand
11	Pressure Switch stuck closed prior to activation of combustion air inducer
12	Flame Sensed without gas valve energized
13	Low Line Voltage
Notes	
Note - 1	A "Heartbeat" is indicated by a "Slow Flash" - 1 sec on 1 sec off, repeating
Note - 2	A "Rapid Flash" is indicated by a 1/3 second on, 1/3 second off, repeating
Note	Error codes are indicated by a "rapid flash" - the LED flashes X times at 1/3 second on 1/3 second off, remains off for 3 seconds then repeats.
Note	Last 5 error codes are stored in memory including when power is shut off to the unit. - To recall, press and release button, most recent will be displayed first, LED off for 3 sec, then next error code is displayed, etc. To clear error codes, depress and hold button longer than 5 seconds.



**FIGURE 4**

**Fan Time Control**

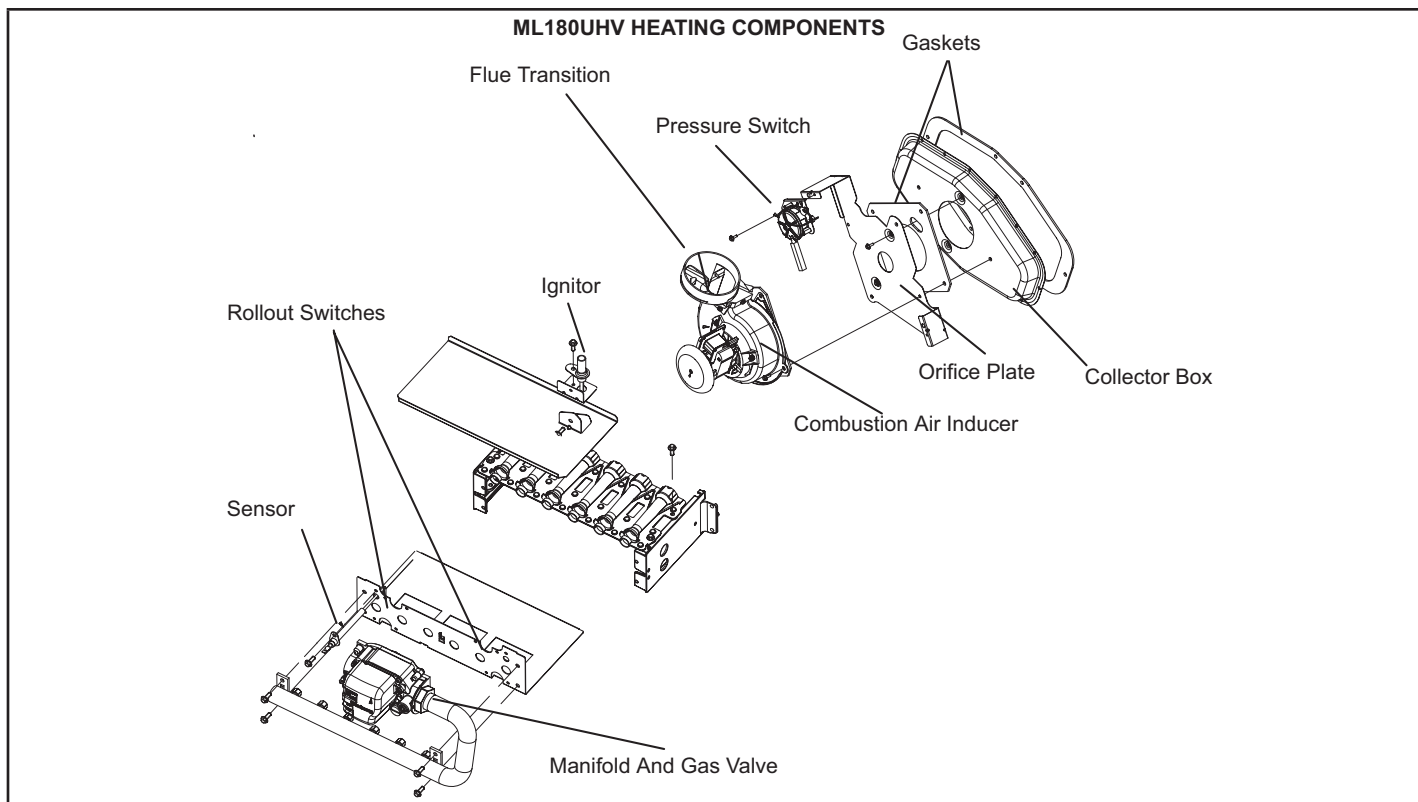
**Heating Fan On Time**

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 5). 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 5**

Heat Blower Off Delay Seconds	DIP 1	DIP 2
90	OFF	OFF
120	ON	OFF
180	ON	ON
210	OFF	ON



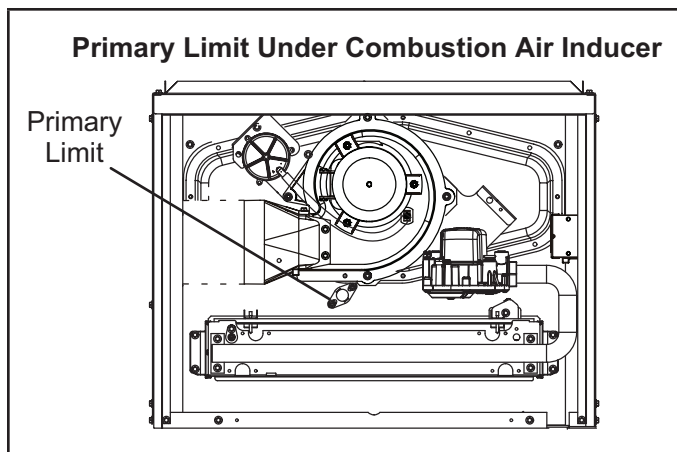
**FIGURE 5**

**5. Flame Rollout Switches (Figure 5)**

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.

**6. Primary Limit Control**

The primary limit on ML180UHV units is located in the heating vestibule panel under the combustion air inducer. See figure 6. 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 6**

**7. Flame Sensor (Figure 5)**

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.

A microamp DC meter is needed to check the flame signal on the integrated control.



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 7 and table 6 for flame signal check.

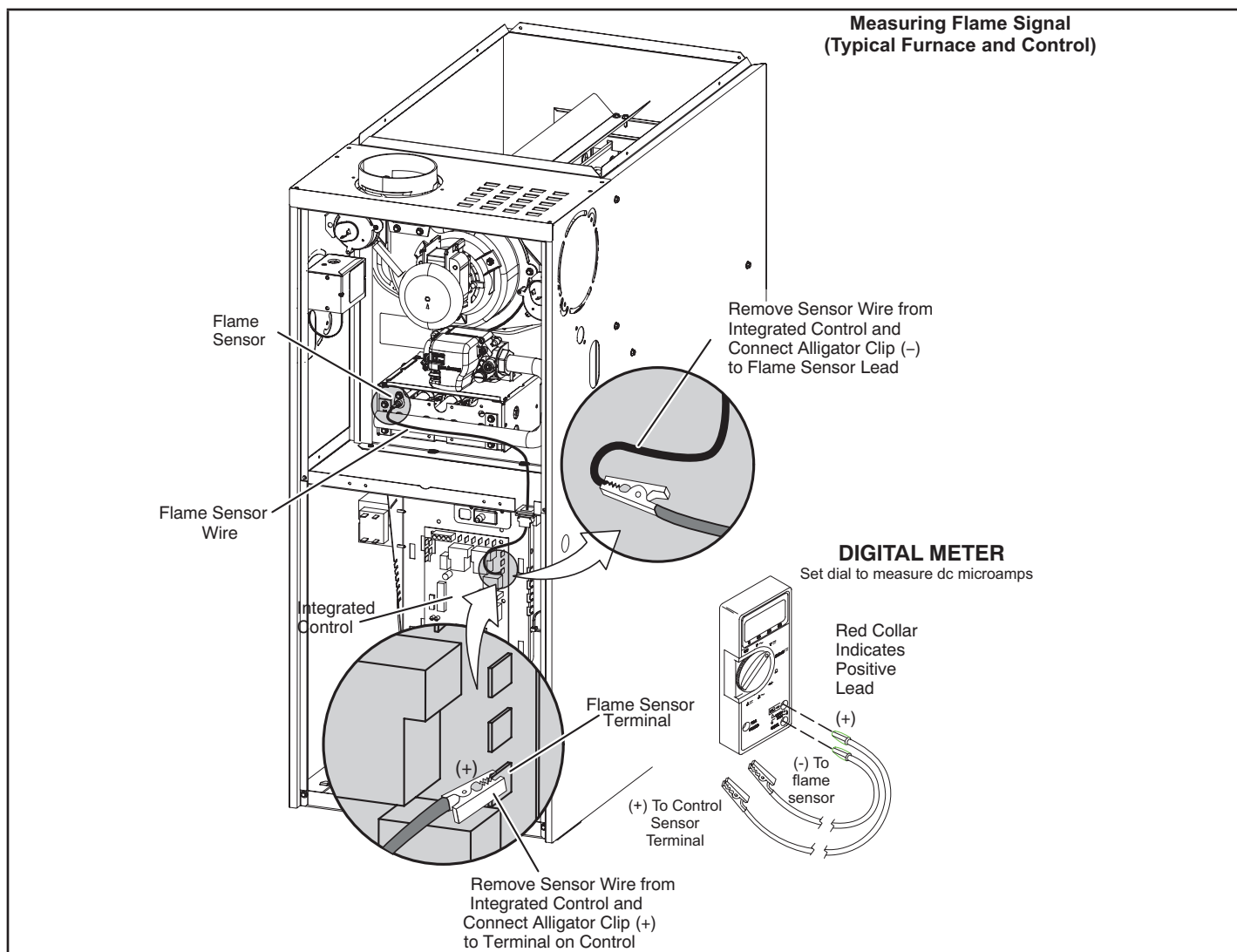
- 1 - Set the meter to the DC amps scale.
- 2 - Turn off supply voltage to control.
- 3 - Remove sensor wire from integrated control
- 4 - Connect (-) lead to flame sensor wire.

- 5 - Connect (+) lead to Terminal FS 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 6**

**Flame Signal in Microamps**

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



**FIGURE 7**

## 8. Gas Valve (Figure 5)

The ML180UHV 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.

## 9. Combustion Air Inducer (B6)

All ML180UHV 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 7 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 7**

ML180UHV 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"

## 10. Ignitor (Figure 5)

The nitride ignitor used on ML180UHV 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 8 for resistance, and voltage check.

**NOTE -** The ML180UHV furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.

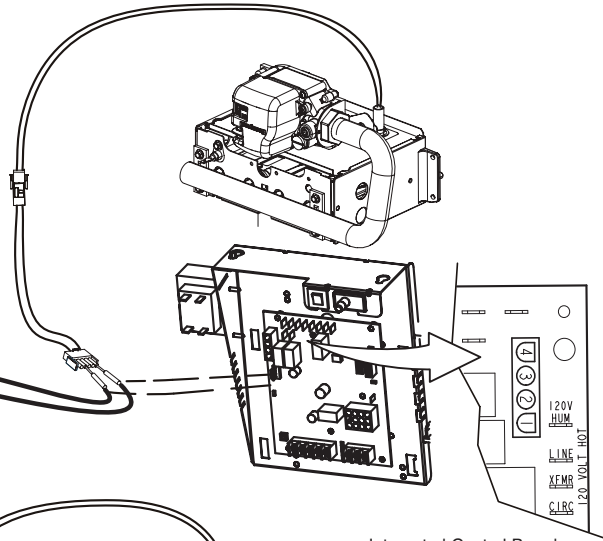
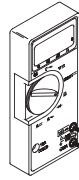
## IGNITOR CHECKS

### Test 1

#### Check ignitor circuit for correct resistance.

Remove 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)

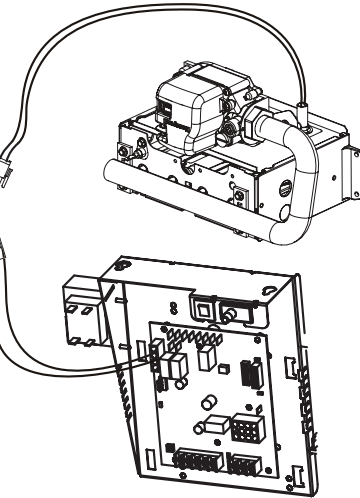
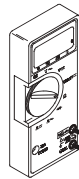


### Test 2

#### 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)



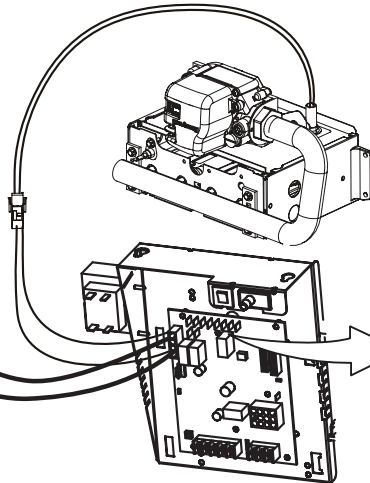
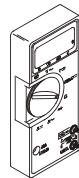
Integrated Control Board  
Detail

### 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)



Integrated Control Board  
Detail

FIGURE 8

## 11. Combustion Air Inducer

### Pressure Switch (S18)

ML180UHV 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 8. 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.

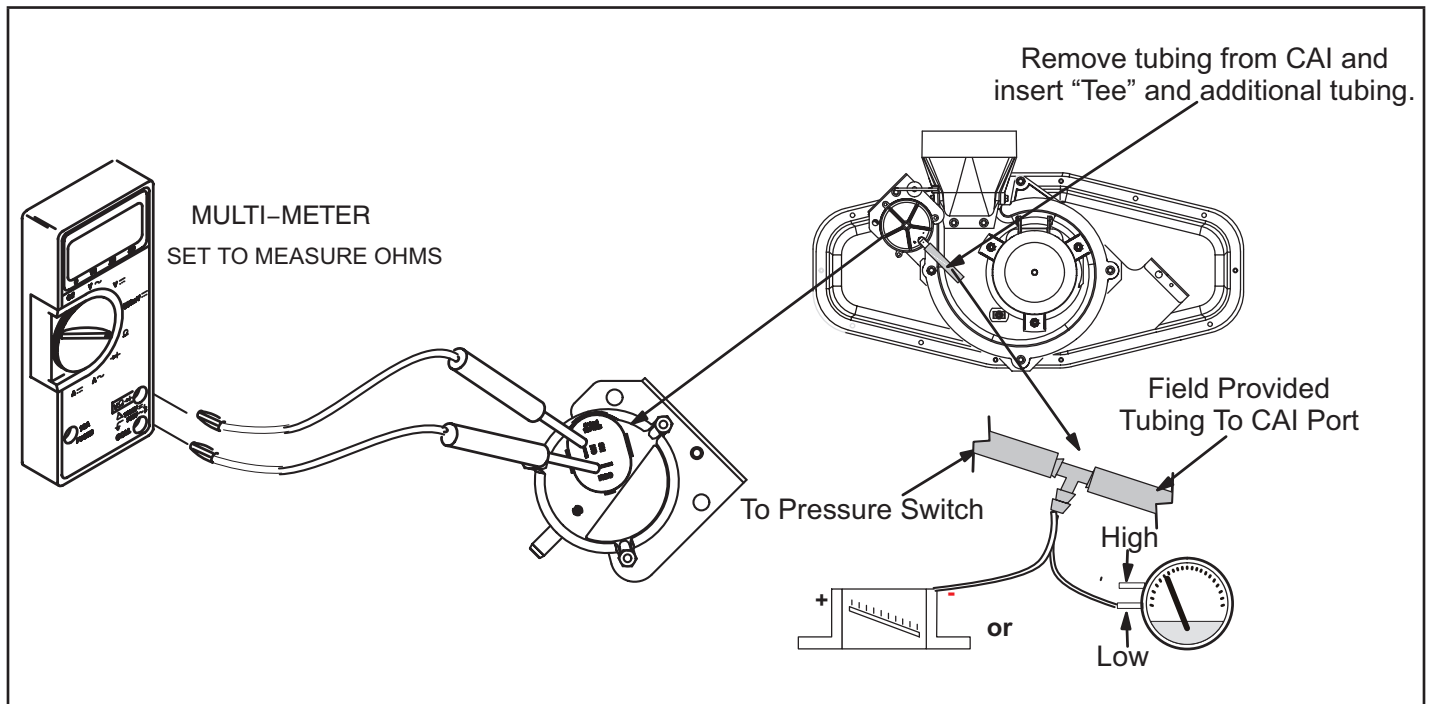
The switch is factory set and is not field adjustable. It is a safety shut-down control in the furnace and must not be bypassed for any reason. If switch is closed or by-passed, the integrated control will not initiate ignition at start up.

**TABLE 8**

ML180UHV	Set Point "
030V36A	-0.65
045V36A	
070V36A	-0.70
070V36B	
070V48B	
090V48B	
110V60C	

### Troubleshooting

See figure 9 for measuring operating pressure and check-  
ing resistance in the pressure switch.



**FIGURE 9**

## Multiple Venting

The ML180UHV furnace can vent in multiple positions. See figure 10.

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.

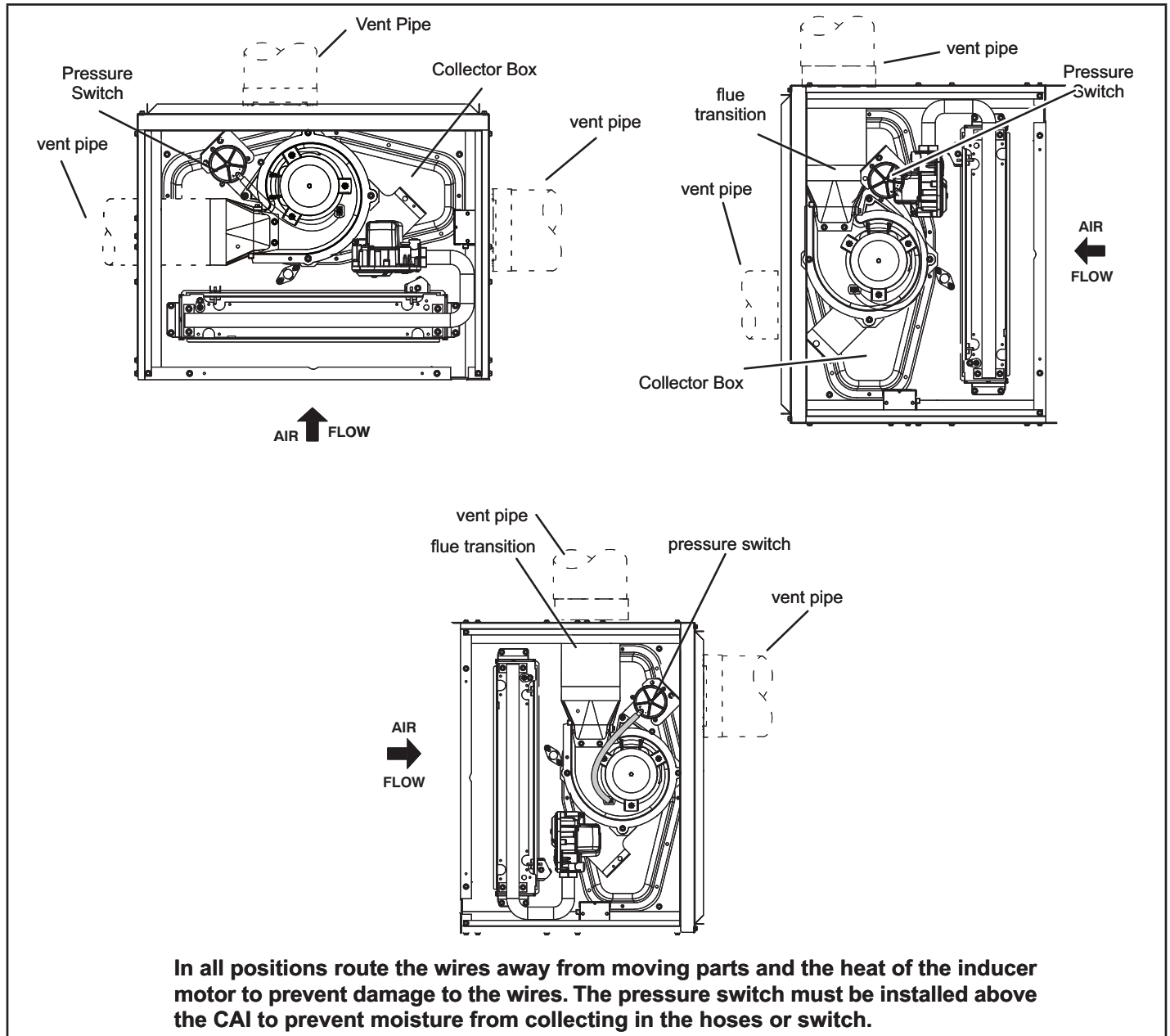
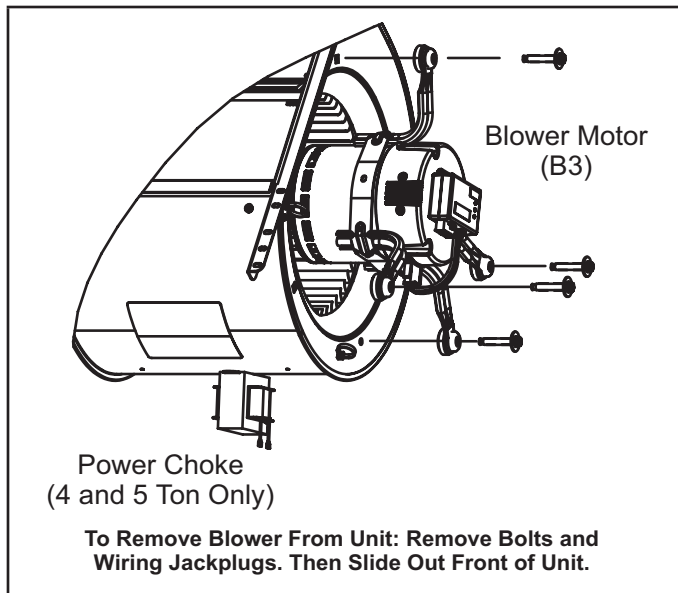


FIGURE 10

## 12. Blower Motor

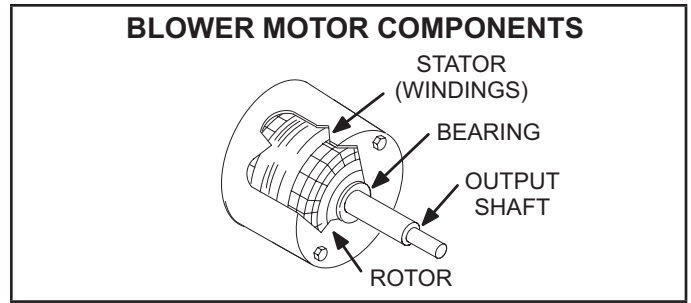


**FIGURE 11**

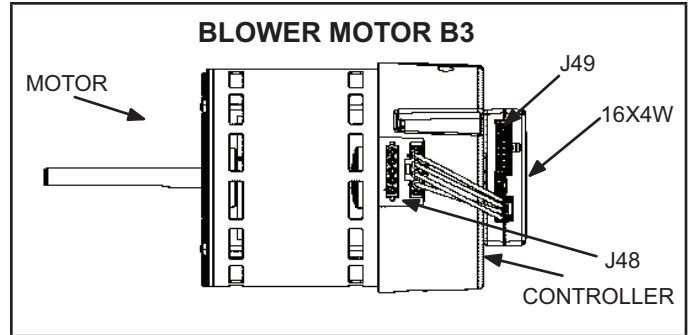
ML180V units use a three-phase, electronically controlled DC brushless motors (controller converts single-phase AC to three-phase DC), with a permanent magnet type rotor. Because this motor has a permanent magnet rotor it does not need brushes like conventional DC motors.

Internal components are shown in figure 12. 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 13 shows the location of the 16X4W and table 9 the LED codes.



**FIGURE 12**



**FIGURE 13**

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 12) 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 15), 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 9**

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 motormay 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.

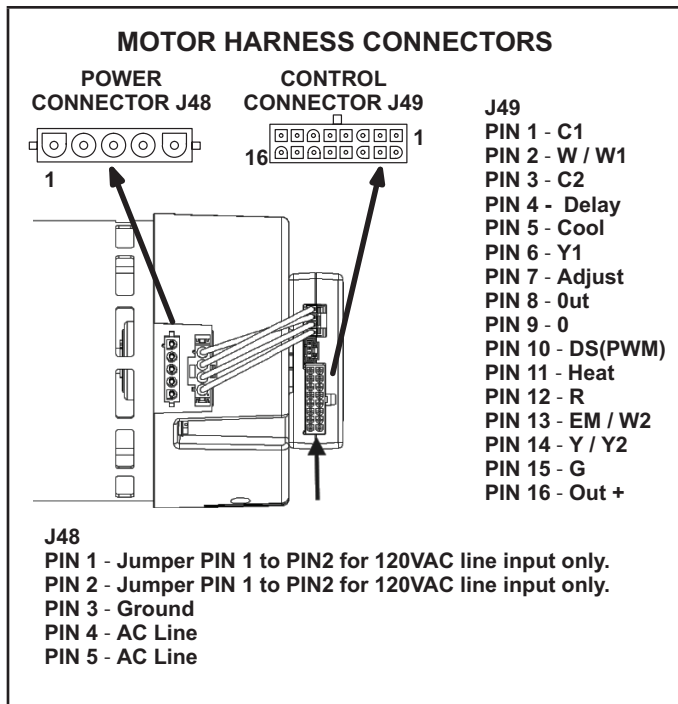
The DC filter capacitors inside the controller are connected electrically to the speed tap wires. The capacitors take approximately 5 minutes to discharge when the disconnect is opened. For this reason it is necessary to wait at least 5 minutes after turning off power to the unit before attempting to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

 <b>DANGER</b>
<b>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.</b>

**External Operation (Speed Tap Priority)**

Figures 14 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 14**

**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 ML180V 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 ML180V. Also make sure affected appliances are connected to a separate electrical circuit.



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

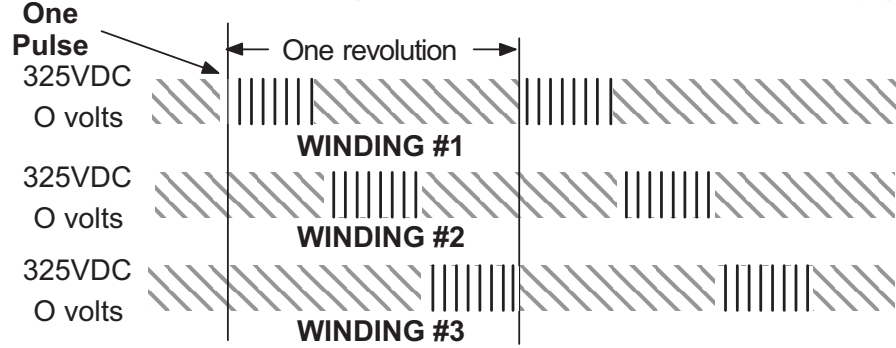
*Motor speed is determined by the size of the electrical pulse sent to the motor windings. The longer the pulse, the faster the motor.*

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

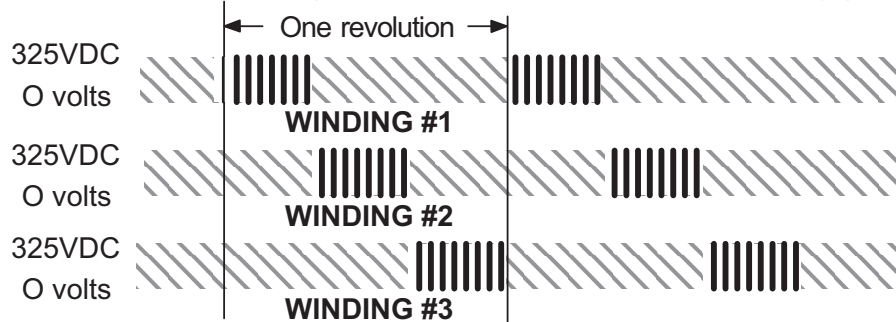
The frequency of the pulses to the windings is 20KHz.

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)**

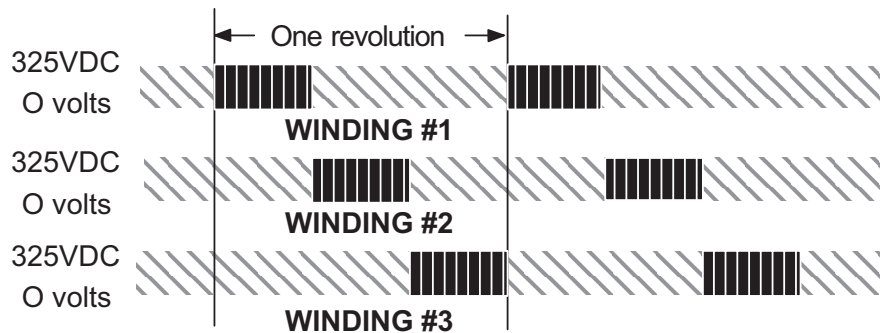


FIGURE 15

## 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.**

**ML180UHV units are equipped with a hot surface ignition system. Do not attempt to light manually.**

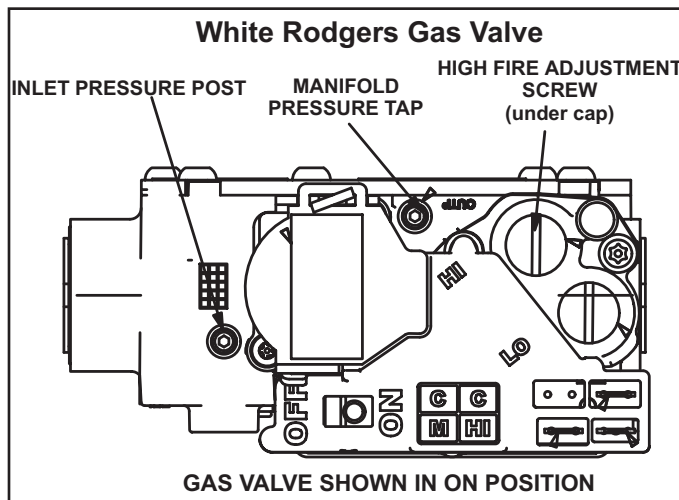


FIGURE 16

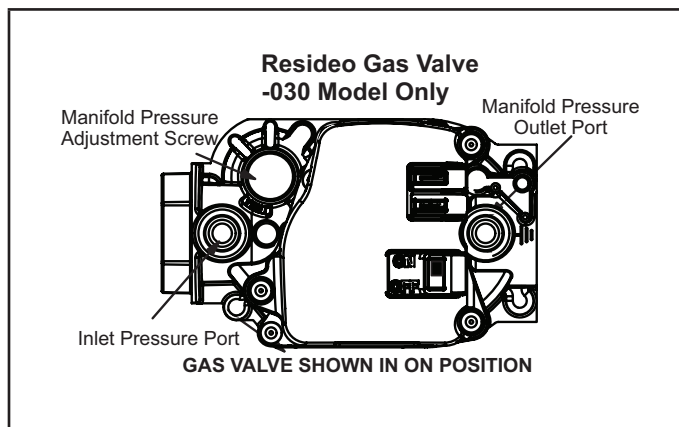


FIGURE 17

- 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 figures 16 and 17.

- 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 figures 16 and 17.
- 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 figures 16 and 17.
- 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 ML180UHV 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.**

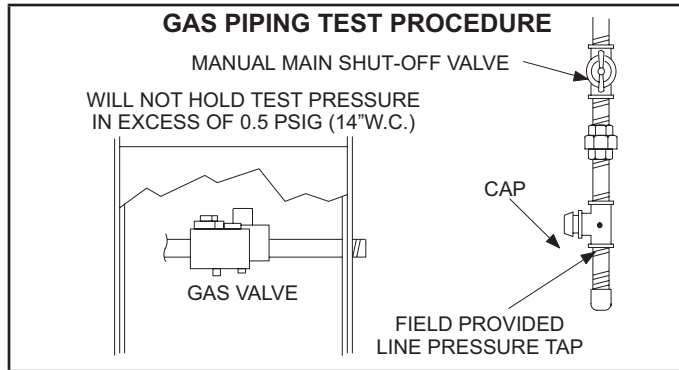
**⚠ IMPORTANT**

**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 18. 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 18**

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 10**

GAS METER CLOCKING CHART				
ML180UHV 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 10. If manifold pressure matches table 12 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 12 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 12.
- 4 - If necessary, make adjustments. Figures 16 and 17 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 tables below.

**TABLE 11**

ML180UHV	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 12 for manifold pressure and table 13 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 12**

## 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 13**

## 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	77W09
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.*

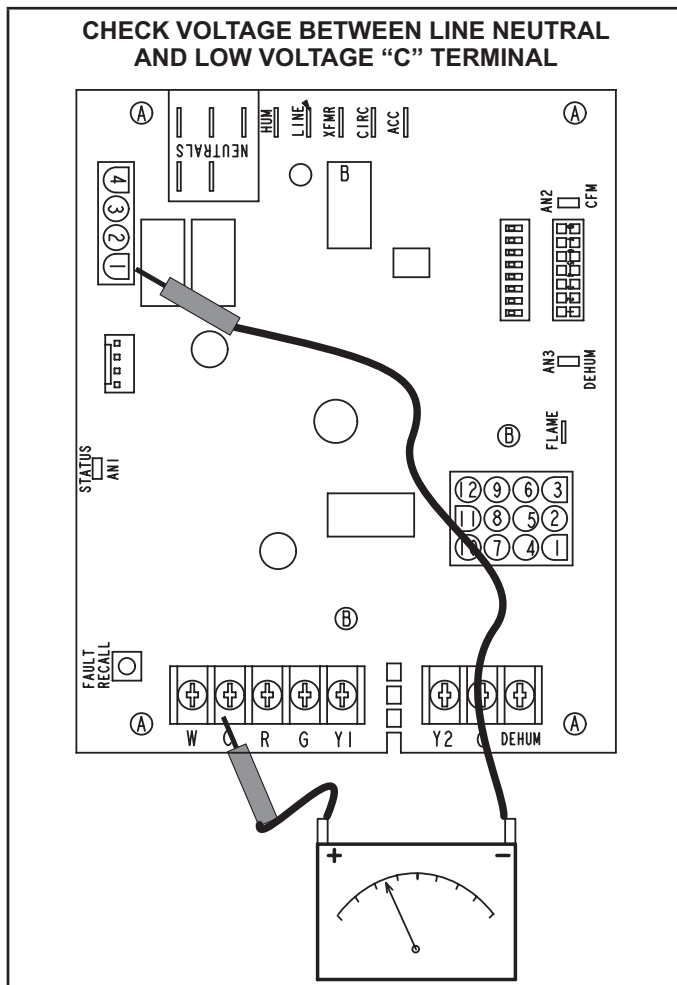
## H- Proper Ground and Voltage

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.

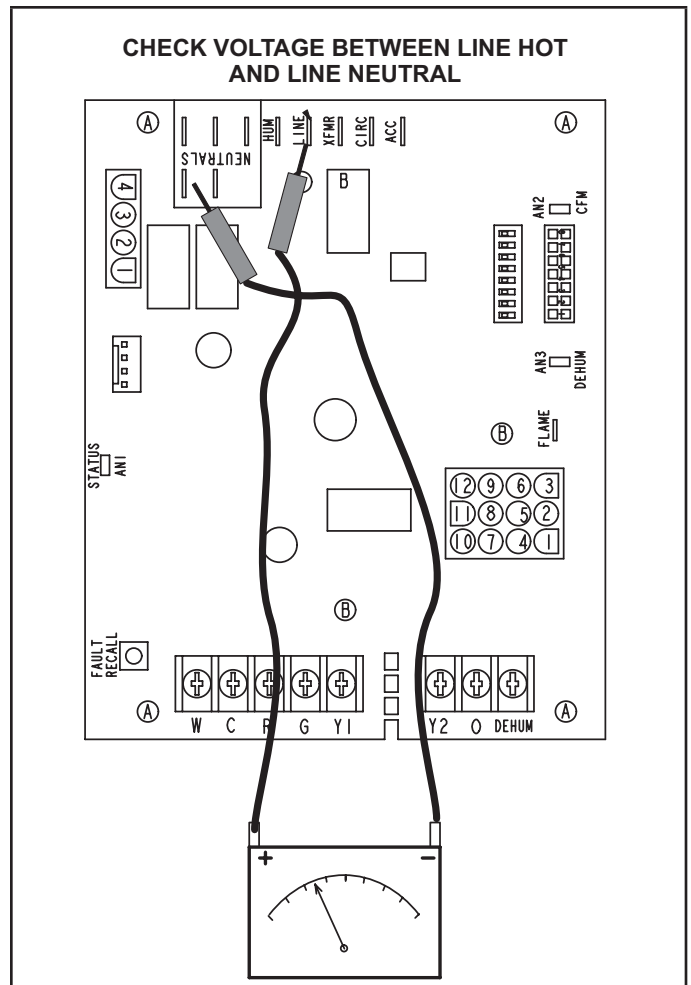
- 1 - Measure the AC voltage between Line Neutral (spade terminals) and "C" terminal (low voltage terminal block) on the integrated control. See figure 19. A wide variation in the voltage between Line Neutral and "C" as a function of load indicates a poor or partial ground. Compare the readings to the table below. If the readings exceed the maximum shown in table 14, make repairs before operating the furnace
- 2 - In addition, measure the AC voltage from Line Hot to Line Neutral (spade terminals) on the integrated control. See figure 20. This voltage should be in the range of 97 to 132 Vac.

**TABLE 14**  
**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 19**



**FIGURE 20**

## 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 21)

Temperature rise for ML180UHV units depends on unit input, blower speed, blower horsepower and static pressure as marked on the unit rating plate. The blower speed must be set for unit operation within the range of "TEMP. RISE °F" listed on the unit rating plate.

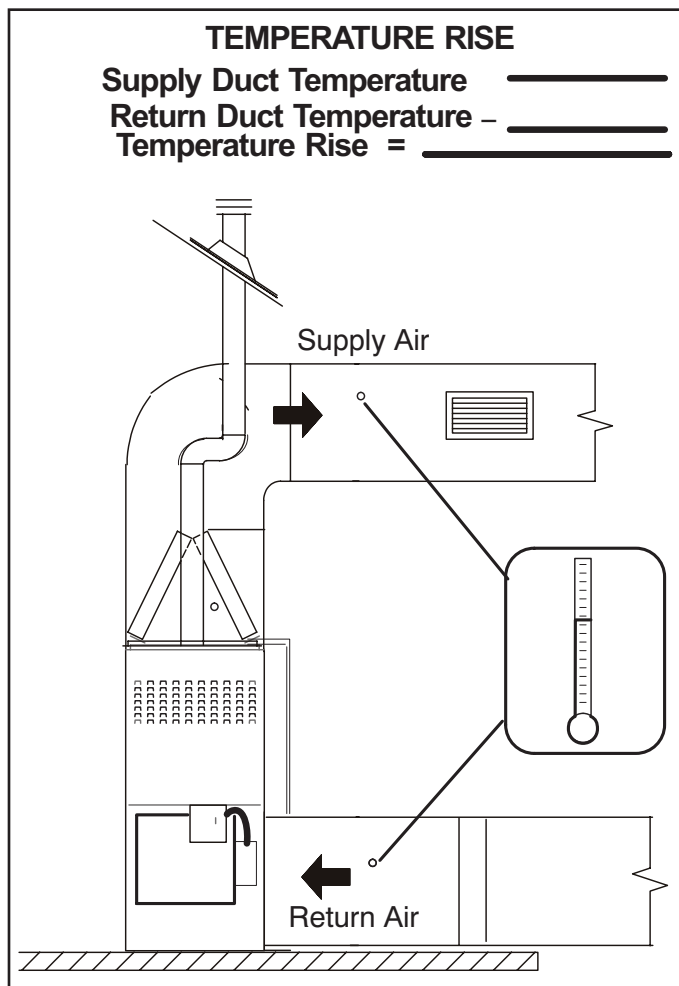


FIGURE 21

### C-External Static Pressure

- 1 - Tap locations shown in figure 22 .
- 2 - Punch a 1/4" diameter hole in supply and return air plenums. Insert 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.

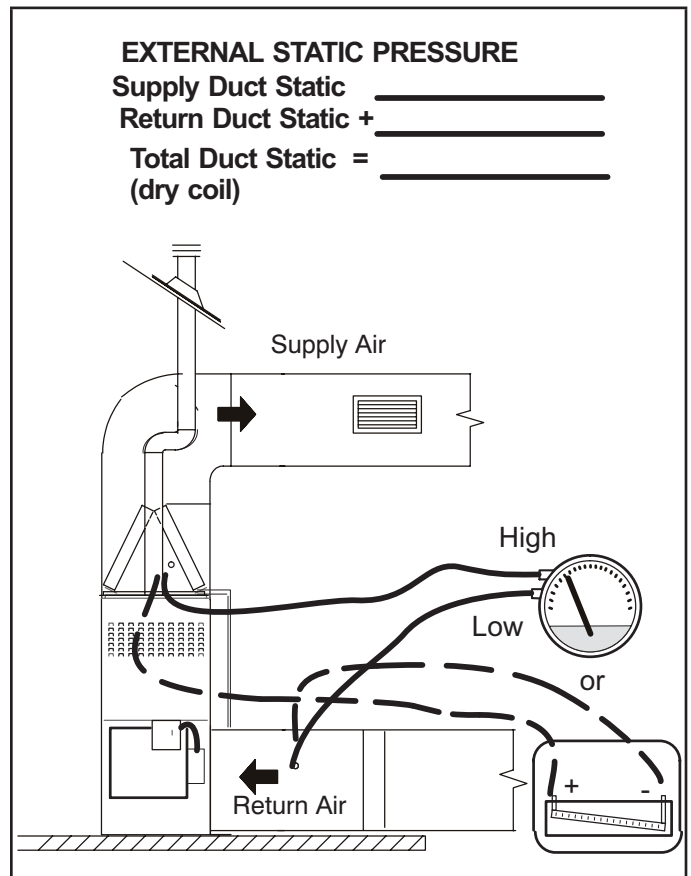


FIGURE 22

### 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).

**TABLE 15**  
**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. 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).

**TABLE 16**  
**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 from the NORM position to the (+) or (-) position. Changes to the ADJUST tap will affect both cooling and heating airflows. The TEST position on the ADJUST tap is not used.

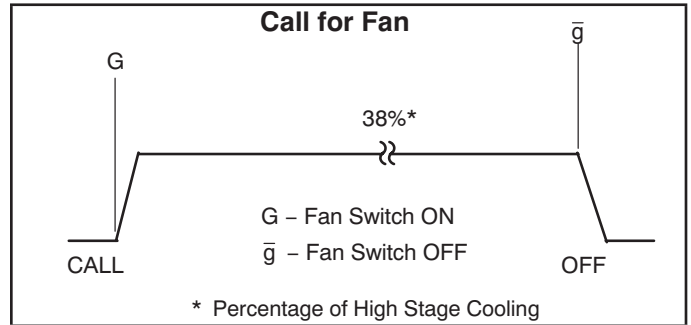
**TABLE 17**  
**Adjust Tap**

Adjust Tap	DIP7	DIP8
10%	OFF	ON
Normal	OFF	OFF
-10%	ON	OFF
Not Used	ON	ON

**Continuous Blower Operation Figure 23**

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.

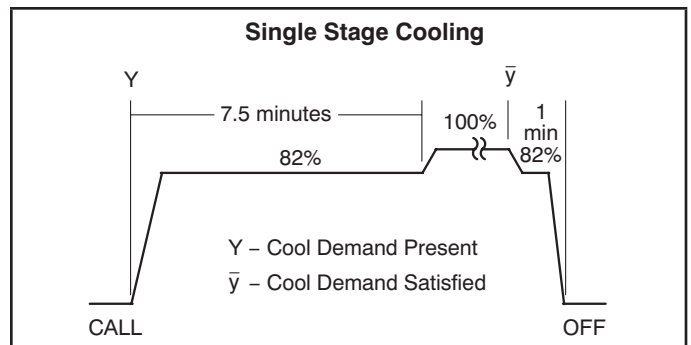
The control waits for a 1 second thermostat debounce delay before responding to the call for fan by ramping the circulating blower up to the cooling speed. When the call for continuous fan is satisfied, the control immediately ramps down the circulating blower



**FIGURE 23**

**Single Stage Cooling Figure 24**

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 ramps back down to 82% of the selected cooling airflow for 1 minute, then shuts off.

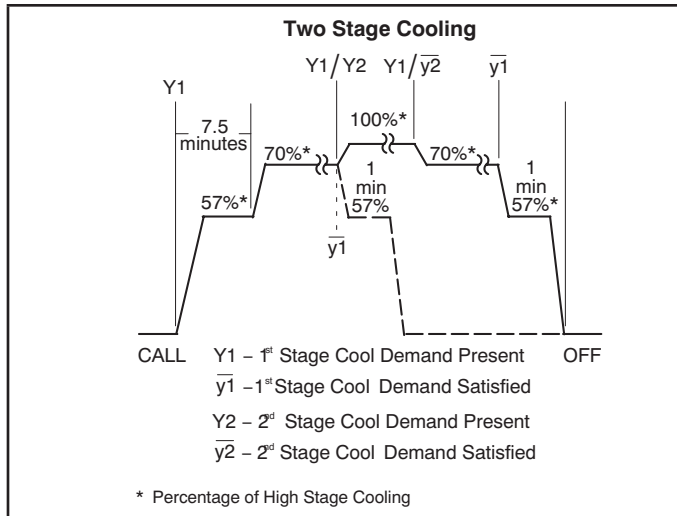


**FIGURE 24**

**Two Stage Cooling Figure 25**

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 ramps down to 57% for 1 minute, then turns off.



**FIGURE 25**

### 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.

### VI-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 18**

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- 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.

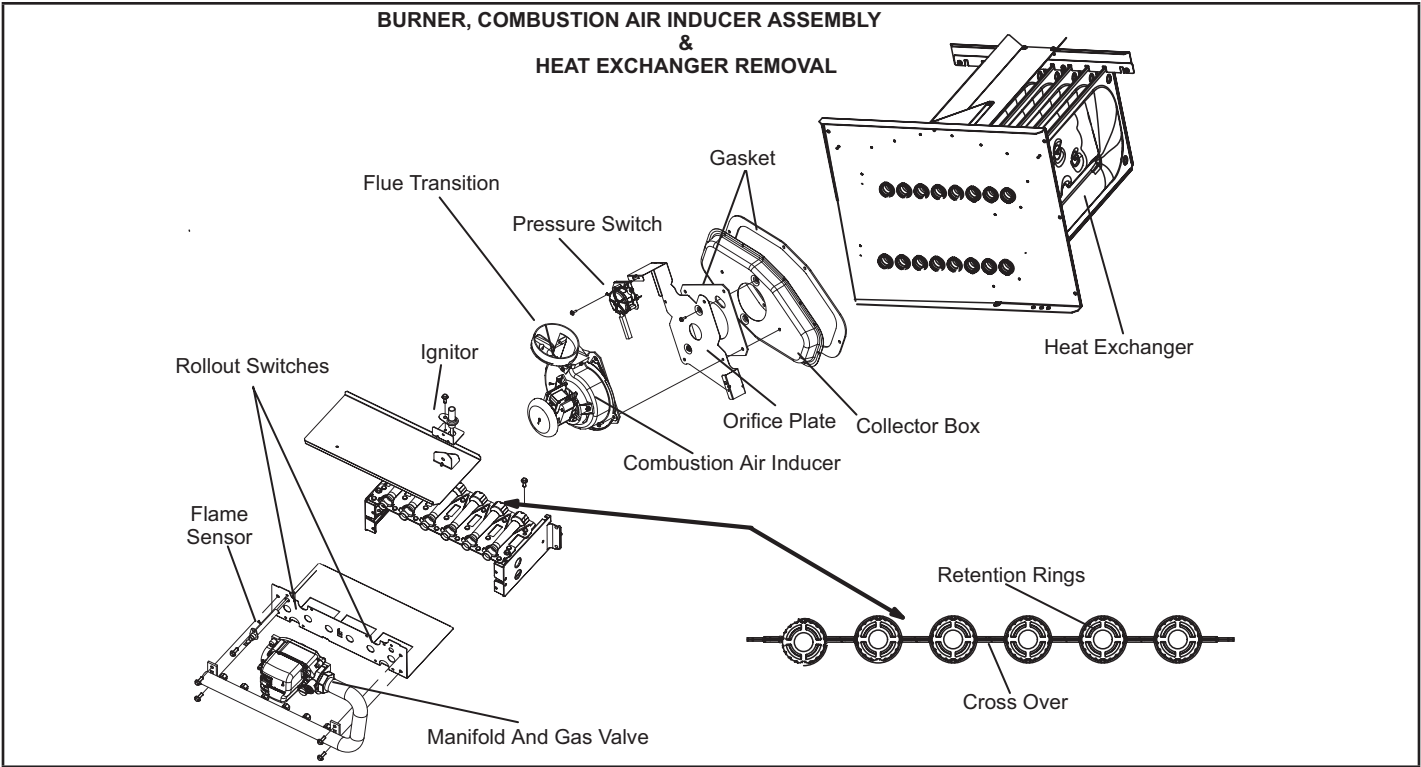
- 1 - Turn off both electrical and gas power supplies to furnace.
- 2 - Remove flue pipe and top cap (some applications top cap can remain) from the unit.
- 3 - Label the wires from gas valve, rollout switches, primary limit switch and make-up box then disconnect them.
- 4 - Remove the screws that secure 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 27.
- 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 26 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.

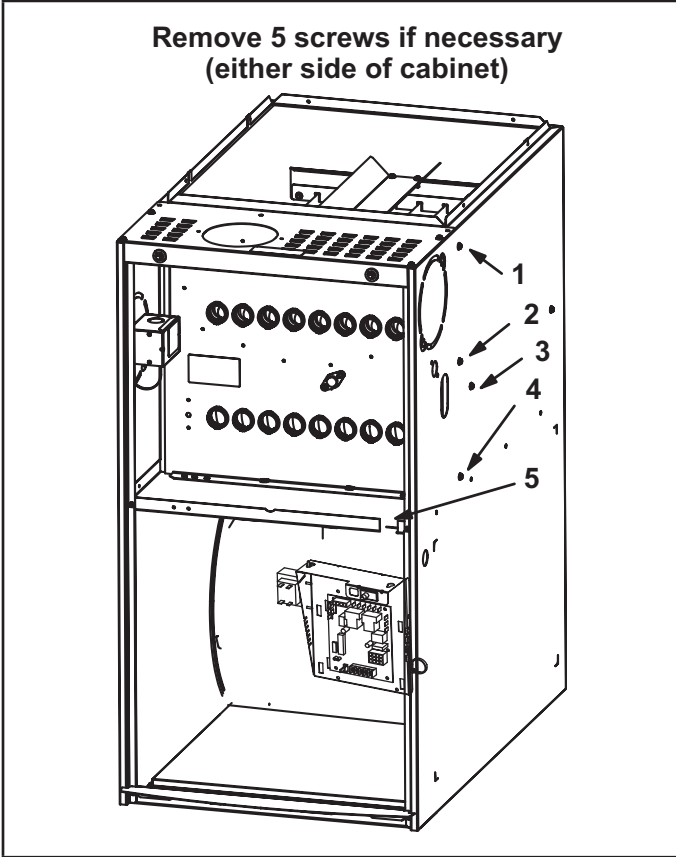
## **⚠ CAUTION**

**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.

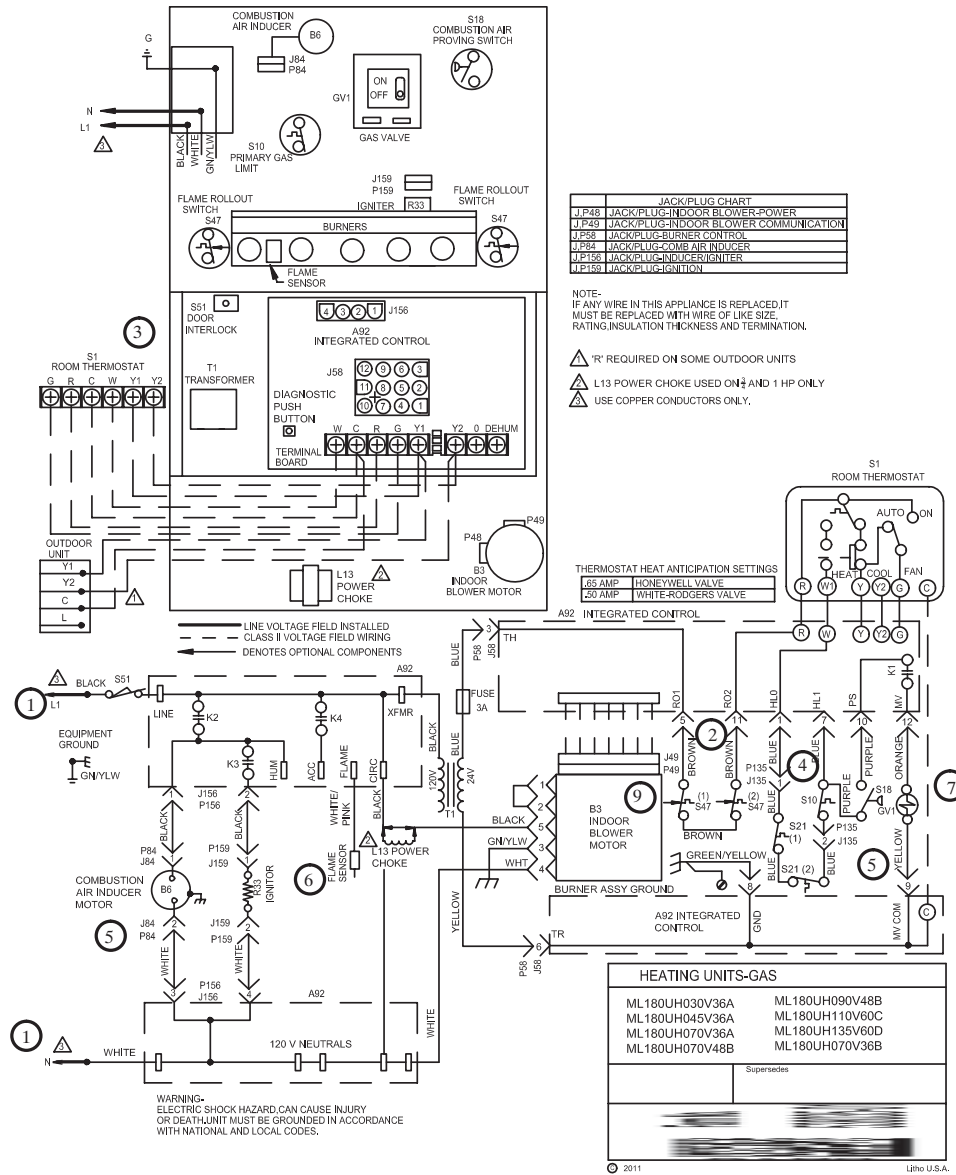


**FIGURE 26**



**FIGURE 27**

# ML180UHV Schematic Wiring Diagram and Sequence of Operation



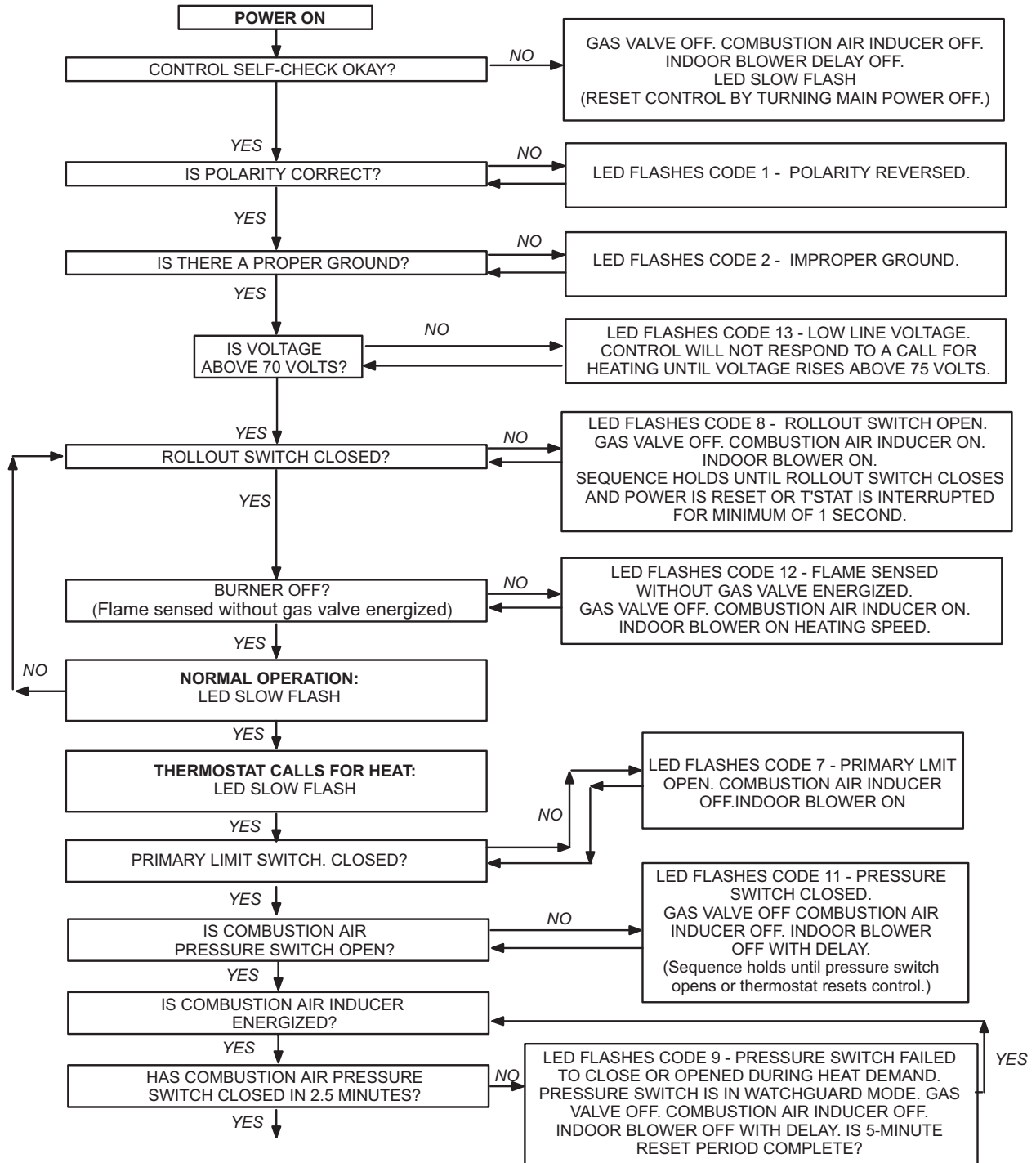
- Line voltage is applied to L1 and N. the T1 low voltage transformer is energized, and line voltage is applied to B3 indoor blower.
- S47 rollout switch(es) must be closed in order for 24V from transformer to be output on integrated control "R" to power thermostat.
- When there is a call for heat, W1 of the thermostat energizes W of the furnace control with 24VAC.
- 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.
- A92 integrated control energizes B6 combustion air inducer. S18 combustion air pressure switch closes. Once S18 closes, a 15-second pre-purge follows.
- A92 integrated control energizes R33 ignitor. A 20-second warm-up period begins.
- GV1 gas valve opens for a 4-second trial for ignition
- Flame is sensed, gas valve remains open for the heat call.
- After 30-second delay (from flame sensed), A92 integrated control applies 24VAC to Heat speed of B3 indoor blower.
- 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.

# Troubleshooting: Heating Sequence of Operation

## HEATING SEQUENCE OF OPERATION

### NORMAL HEATING MODE

### ABNORMAL HEATING MODE



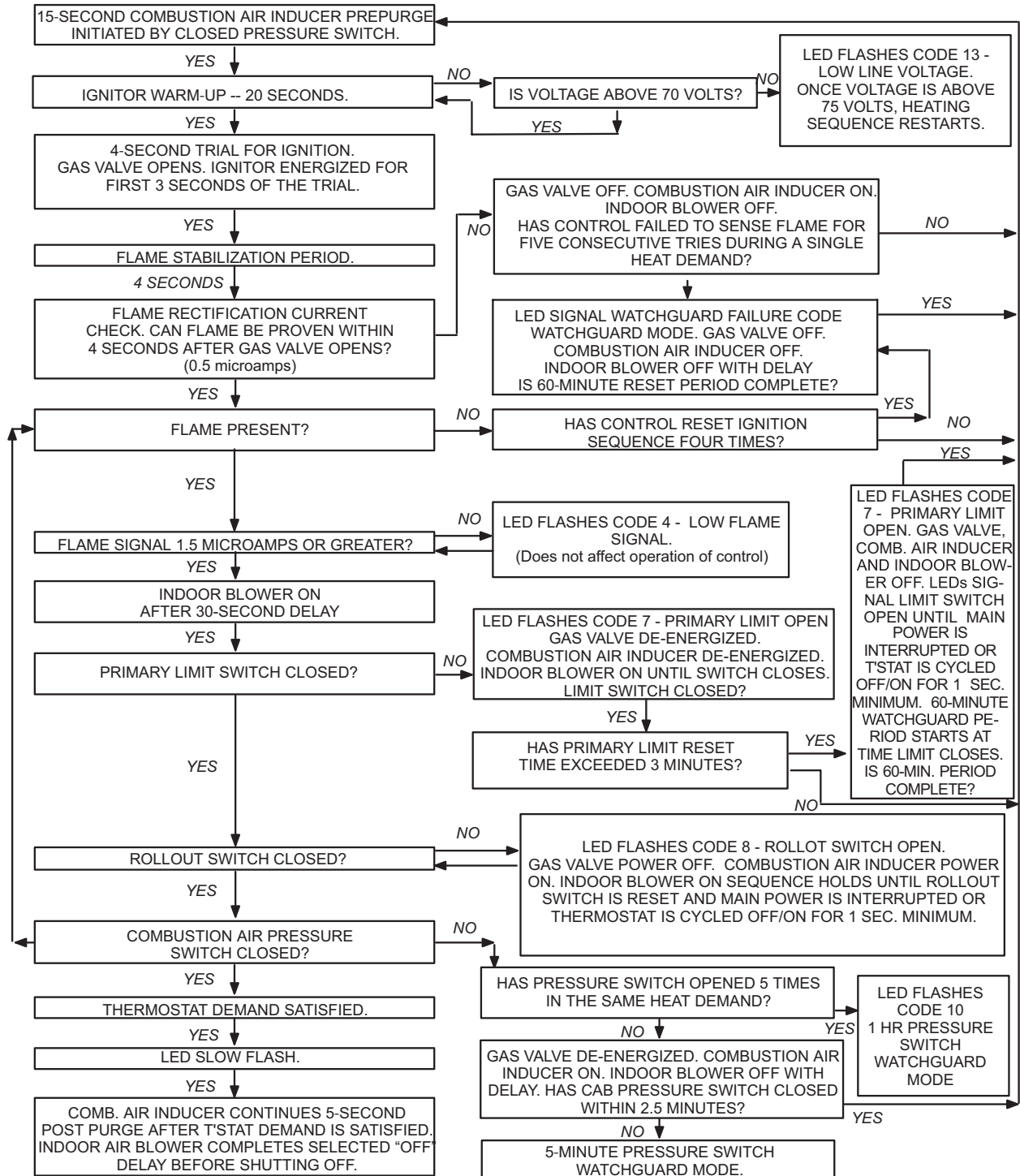
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# Troubleshooting: Heating Sequence of Operation (Continued)

## HEATING SEQUENCE CONTINUED

### NORMAL HEATING MODE

### ABNORMAL HEATING MODE

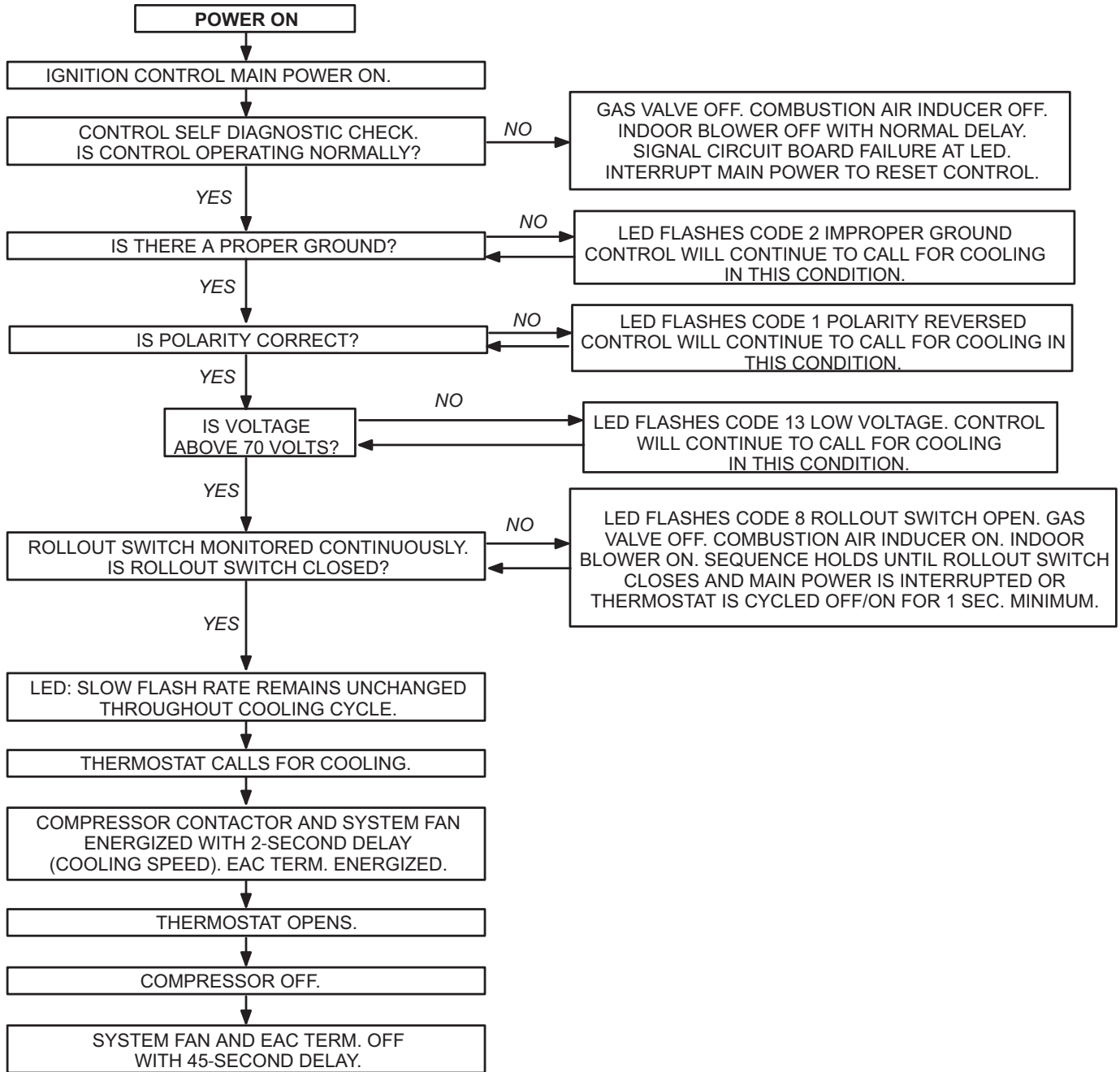


**Troubleshooting: Cooling Sequence of Operation**

**COOLING SEQUENCE OF OPERATION**

**NORMAL COOLING MODE**

**ABNORMAL COOLING MODE**



**Troubleshooting: Continuous Fan Sequence of Operation**

**CONTINUOUS FAN SEQUENCE OF OPERATION**

