

**ML180UHE(X) SERIES UNITS**

ML180UHE(X) series units are mid-efficiency gas furnaces used for upflow or horizontal applications only, manufactured with Lennox Duralok heat exchangers formed of aluminized steel. ML180UHE(X) units are available in heating capacities of 44,000 to 132,000 Btuh and cooling applications 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. ML180UHE(X) model units are equipped with a hot surface ignition system. The ML180UHE(X) unit meets the California Nitrogen Oxides (NOx) Standards and California Seasonal Efficiency requirements.

All units use a redundant gas valve to assure safety shut-off as required by C.S.A. All specifications in this manual are subject to change. Procedures outlined in this manual are presented as a recommendation only and do not supersede or replace local or state codes. In the absence of local or state codes, the guidelines and procedures outlined in this manual (except where noted) are 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 HVAC installer (or equivalent), service agency or the gas supplier.

**⚠ WARNING**  
Electric Shock Hazard. Can cause injury or death. Unit must be properly grounded in accordance with national and local codes.  
Line voltage is present at all components when unit is not in operation on units with single-pole contactors. Disconnect all remote electric power supplies before opening access panel. Unit may have multiple power supplies.



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

## SPECIFICATIONS

Gas Heating Performance	Model No.	ML180UH045E36A	ML180UH070E36A	ML180UH070E36B	ML180UH090E48B
	Model No. - Low Nox	ML180UH045XE36A	ML180UH070XE36A	ML180UH070XE36B	ML180UH090XE48B
	<sup>1</sup> AFUE	80%	80%	80%	80%
	Input - Btuh	44,000	66,000	66,000	88,000
	Output - Btuh	36,000	53,000	53,000	72,000
	Temperature rise range - °F	15 - 45	40 - 70	40 - 70	35 - 65
	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>		0.50	0.50	0.50	0.50
<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 8	10 x 10	10 x 10	10 x 10
	Motor Type	DC Brushless	DC Brushless	DC Brushless	DC Brushless
	Motor output - hp	1/2	1/2	1/2	3/4
	Tons of add-on cooling	1.5 - 3	1.5 - 3	1.5 - 3	2.5 - 4
	Air Volume Range - cfm	350 - 1380	625 - 1435	395 - 1415	750 - 1785
<b>Electrical Data</b>	Voltage	120 volts - 60 hertz - 1 phase			
	Blower motor full load amps	6.8	6.8	6.8	8.4
	Maximum overcurrent protection	15	15	15	15
<b>Shipping Data</b>	lbs. - 1 package	111	111	127	142

## SPECIFICATIONS

Gas Heating Performance	Model No.	ML180UH090E60C	ML180UH110E60C	ML180UH135E60D
	Model No. - Low Nox	---	ML180UH110XE60C	---
	<sup>1</sup> AFUE	80%	80%	80%
	Input - Btuh	88,000	110,000	132,000
	Output - Btuh	72,000	90,000	107,000
	Temperature rise range - °F	30 - 60	35 - 65	30 - 60
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0	3.5 / 10.0
<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 10	11-1/2 x 10	11 x 11
	Motor Type	DC Brushless	DC Brushless	DC Brushless
	Motor output - hp	1	1	1
	Tons of add-on cooling	3 - 5	3 - 5	3.5 - 5
	Air Volume Range - cfm	990 - 2290	920 - 2315	1140 - 2495
<b>Electrical Data</b>	Voltage	120 volts - 60 hertz - 1 phase		
	Blower motor full load amps	10.9	10.9	10.9
	Maximum overcurrent protection	15	15	15
<b>Shipping Data</b>	lbs. - 1 package	152	160	178

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	"D" Width Models	
<b>CABINET ACCESSORIES</b>						
Horizontal Suspension Kit - Horizontal only		51W10	51W10	51W10	51W10	
Return Air Base - Upflow only		65W75	50W98	50W99	51W00	
High Performance Economizer (Commercial Only)		10U53	10U53	10U53	10U53	
<b>CONTROLS</b>						
iComfort® M30 Smart Wi-Fi Thermostat		15Z69	15Z69	15Z69	15Z69	
Remote Outdoor Air Temperature Sensor		X2658	X2658	X2658	X2658	
Blower Relay Kit (for two-stage outdoor units)		85W66	85W66	85W66	85W66	
Furnace Twinning Kit		16W72	16W72	16W72	16W72	
<b>FILTERS</b>						
¹ Air Filter and Rack Kit	Horizontal (end)	87L95	87L96	87L97	87L98	
	Size of filter - in.	14 x 25 x 1	18 x 25 x 1	20 x 25 x 1	25 x 25 x 1	
	Side Return	Single	44J22	44J22	44J22	44J22
		Ten Pack	66K63	66K63	66K63	66K63
	Size of filter - in.	16 x 25 x 1				
<b>NIGHT SERVICE KIT</b>						
Night Service Kit		84W47	84W47	84W47	84W47	
<b>VENTING</b>						
Vent Adaptor – 6 in. conn. size upflow applications only		18M79	18M79	18M79	18M79	

¹ Cleanable polyurethane, frame-type filter.

## GAS HEAT ACCESSORIES

Input	High Altitude Pressure Switch Kit			Natural Gas to LPG/Propane Kit		LPG/Propane to Natural Gas Kit	Natural Gas High Altitude Orifice Kit
	0 - 4500 ft.	4501 - 7500 ft.	7501 - 10,000 ft.	0 - 7500 ft.	7501 - 10,000 ft.	0 - 7500 ft.	7501 - 10,000 ft.
045	No Change	80W52	80W51	11K49	11K44	73W81	73W37
070	No Change	80W52	80W51	11K49	11K44	73W81	73W37
090	No Change	80W52	80W51	11K49	11K44	73W81	73W37
110	No Change	80W52	80W52	11K49	11K44	73W81	73W37
135	No Change	80W52	80W51	11K49	11K44	73W81	73W37

## HIGH ALTITUDE

NOTE - Units may be installed at altitudes up to 2000 ft. above sea level without any modifications.

At altitudes above 2000 ft. units must be derated to match information in the shaded areas shown below.

NOTE - This is the only permissible derate for these units.

Input	Gas Manifold Pressure (Outlet) in. w.g.								Line Pressure - in. w.g.		
	0 - 2000 Feet		2001 - 4500 Feet		4501 - 7500 Feet		7501 - 10,000 ft.		Minimum		Maximum
	Natural Gas	LPG/Propane	Natural Gas	LPG/Propane	Natural Gas	LPG/Propane	¹ Natural Gas	LPG/Propane	Natural Gas	LPG/Propane	
045	3.5	10	3.2	10	3	10	3.5	10	4.5	11	13
070	3.5	10	3.2	10	2.8	10	3.5	10	4.5	11	13
090	3.5	10	3.2	10	2.7	9.6	3.5	10	4.5	11	13
110	3.5	10	3.5	10	3	9.6	3.5	10	4.5	11	13
135	3.5	10	3.5	10	2.9	9.6	3.5	10	4.5	11	13

¹ Natural Gas High Altitude Orifice Kit required.

**BLOWER-DATA****ML180UH045E36A PERFORMANCE (Less Filter)**

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1420	227	1226	147	1039	98	1086	112	1154	118
0.10	1383	239	1179	156	991	106	970	102	959	98
0.20	1346	251	1132	165	943	114	854	92	764	78
0.30	1308	263	1083	174	896	122	797	99	668	78
0.40	1268	272	1057	185	864	130	748	106	612	85
0.50	1257	286	1013	193	818	139	697	114	562	92
0.60	1211	297	985	203	775	147	651	121	508	98
0.70	1185	307	937	212	728	155	605	129	456	104
0.80	1140	318	902	221	688	163	554	136	385	111
0.90	1115	328	866	231	641	171	512	143	---	---
1.00	1074	335	823	241	598	178	446	151	---	---

**ML180UH070E36A PERFORMANCE (Less Filter)**

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1436	244	1236	155	1139	127	1130	121	1038	103
0.10	1393	256	1193	166	1092	137	1071	130	946	100
0.20	1350	268	1150	177	1045	147	1012	139	854	97
0.30	1312	279	1099	187	1003	156	970	147	798	105
0.40	1278	289	1069	196	961	164	928	155	758	112
0.50	1251	300	1016	204	916	174	889	163	708	119
0.60	1212	310	982	214	881	180	852	171	660	127
0.70	1176	320	939	223	841	190	803	179	614	134
0.80	1158	335	903	231	802	198	769	188	573	141
0.90	1109	344	867	240	769	207	730	196	521	148
1.00	1036	338	837	250	734	215	689	204	472	155

**ML180UH070E36B PERFORMANCE (Less Filter)**

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1553	257	1291	162	1216	135	1200	125	1053	94
0.10	1493	267	1256	173	1166	145	1139	132	978	96
0.20	1433	277	1221	184	1116	155	1078	139	903	98
0.30	1395	288	1151	193	1067	163	1027	148	849	107
0.40	1353	296	1094	199	1008	171	975	155	786	113
0.50	1312	308	1047	209	951	179	923	164	726	120
0.60	1270	318	995	219	901	187	875	172	667	127
0.70	1232	328	943	228	856	194	824	181	604	134
0.80	1187	338	895	236	804	202	774	188	543	142
0.90	1144	348	858	244	754	209	720	196	492	147
1.00	1067	339	809	252	703	217	669	204	447	152

**ML180UH090E48B PERFORMANCE (Less Filter)**

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1783	314	1577	221	1448	183	1394	161	1263	120
0.10	1740	329	1528	233	1404	193	1348	173	1205	130
0.20	1697	344	1479	245	1360	203	1302	185	1147	140
0.30	1655	355	1437	260	1329	219	1262	194	1097	151
0.40	1624	373	1405	274	1268	225	1215	204	1043	161
0.50	1581	382	1376	287	1234	238	1175	216	996	171
0.60	1545	400	1319	299	1197	249	1119	227	944	182
0.70	1513	414	1277	308	1150	260	1069	238	889	190
0.80	1472	426	1246	321	1097	270	1025	251	845	199
0.90	1421	431	1197	333	1051	283	983	261	781	211
1.00	1296	404	1153	344	1010	292	935	270	723	221

**ML180UH090E60C PERFORMANCE (Less Filter)**

External Static Pressure in. w.g.	Air Volume / Watts at Different Blower Speeds																			
	Bottom Return Air, Side Return Air from Both Sides or Return Air from Bottom and One Side.										Single Side Return Air – Air volumes in <b>bold</b> (over 1800 cfm) require Optional Return Air Base and field fabricated transition to accommodate 20 x 25 x 1 in. air filter in order to maintain proper air velocity.									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)		High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	2202	591	1912	408	1764	308	1548	228	1469	188	<b>2173</b>	<b>580</b>	<b>1955</b>	<b>400</b>	1735	293	1603	224	1431	174
0.10	2142	600	1883	412	1712	310	1534	238	1421	191	<b>2148</b>	<b>593</b>	<b>1889</b>	<b>403</b>	1707	305	1553	234	1404	185
0.20	2082	609	1854	416	1660	312	1520	248	1373	194	<b>2123</b>	<b>606</b>	<b>1823</b>	<b>406</b>	1679	317	1503	244	1377	196
0.30	2101	617	1818	424	1639	326	1492	258	1320	203	<b>2069</b>	<b>613</b>	<b>1814</b>	<b>422</b>	1638	327	1464	255	1328	207
0.40	2066	630	1794	434	1605	334	1437	267	1283	214	<b>2065</b>	<b>634</b>	1791	435	1593	337	1414	264	1268	216
0.50	2024	642	1757	445	1570	348	1388	275	1229	223	<b>2030</b>	<b>645</b>	1734	445	1548	348	1366	276	1224	228
0.60	2006	659	1729	459	1518	358	1346	288	1172	236	<b>2000</b>	<b>663</b>	1705	461	1503	360	1329	291	1156	235
0.70	1977	677	1683	470	1472	369	1304	300	1123	246	<b>1954</b>	<b>681</b>	1663	474	1461	374	1278	303	1106	245
0.80	1946	690	1653	487	1430	387	1244	314	1054	258	<b>1928</b>	<b>694</b>	1624	488	1411	385	1227	313	1045	257
0.90	1916	706	1601	499	1390	401	1190	325	996	269	<b>1890</b>	<b>712</b>	1576	502	1361	397	1175	324	989	268
1.00	1882	720	1551	511	1325	408	1134	337	901	281	<b>1853</b>	<b>728</b>	1541	517	1315	412	1122	335	912	282

**ML180UH110E60C PERFORMANCE (Less Filter)**

External Static Pressure in. w.g.	Air Volume / Watts at Different Blower Speeds																			
	Bottom Return Air, Side Return Air with Return Air from Both Sides or Return Air from Bottom and One Side.										Single Side Return Air – Air volumes in <b>bold</b> (over 1800 cfm) require Optional Return Air Base and field fabricated transition to accommodate 20 x 25 x 1 in. air filter in order to maintain proper air velocity.									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)		High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	2166	579	1977	416	1762	292	1600	231	1425	167	<b>2202</b>	<b>605</b>	<b>1950</b>	<b>413</b>	1732	288	1591	236	1399	168
0.10	2147	601	1917	421	1697	300	1550	240	1367	175	<b>2160</b>	<b>623</b>	<b>1902</b>	<b>427</b>	1679	303	1538	244	1354	179
0.20	2129	622	1857	427	1632	308	1501	249	1309	184	<b>2117</b>	<b>642</b>	<b>1854</b>	<b>440</b>	1626	318	1486	252	1309	189
0.30	2087	632	1822	441	1594	320	1436	256	1263	193	<b>2066</b>	<b>653</b>	<b>1805</b>	<b>453</b>	1579	326	1445	265	1265	198
0.40	2065	652	1787	454	1542	329	1401	270	1203	203	<b>2038</b>	<b>670</b>	1764	467	1541	336	1400	276	1210	208
0.50	2013	661	1743	464	1498	339	1343	278	1150	214	<b>2004</b>	<b>686</b>	1740	481	1493	347	1360	290	1155	219
0.60	1995	683	1701	477	1452	356	1294	291	1088	224	<b>1965</b>	<b>698</b>	1697	494	1450	360	1307	299	1097	228
0.70	1942	691	1651	492	1409	369	1243	305	1039	235	<b>1936</b>	<b>717</b>	1648	505	1409	369	1260	310	1038	235
0.80	1913	710	1617	507	1358	380	1193	313	974	245	<b>1906</b>	<b>731</b>	1605	518	1353	381	1206	315	986	246
0.90	1877	726	1570	521	1304	392	1158	328	---	---	<b>1842</b>	<b>724</b>	1566	534	1324	395	1160	328	929	256
1.00	1797	719	1545	539	1263	403	1090	339	---	---	1742	696	1529	546	1264	403	1112	339	873	267

**ML180UH135E60D PERFORMANCE (Less Filter)**

External Static Pressure in. w.g.	Air Volume / Watts at Different Blower Speeds																			
	Bottom Return Air, Side Return Air with Return Air from Both Sides or Return Air from Bottom and One Side.										Single Side Return Air – Air volumes in <b>bold</b> (over 1800 cfm) require Optional Return Air Base and field fabricated transition to accommodate 20 x 25 x 1 in. air filter in order to maintain proper air velocity.									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)		High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	2498	674	2297	519	2095	377	1913	291	1726	213	<b>2466</b>	<b>673</b>	<b>2266</b>	<b>527</b>	<b>2070</b>	<b>393</b>	1878	291	1674	214
0.10	2441	700	2249	547	2036	403	1826	305	1647	231	<b>2388</b>	<b>698</b>	<b>2205</b>	<b>546</b>	<b>2005</b>	<b>411</b>	1808	309	1604	231
0.20	2384	726	2200	576	1978	428	1739	319	1569	249	<b>2309</b>	<b>722</b>	<b>2145</b>	<b>565</b>	<b>1939</b>	<b>429</b>	1738	327	1535	248
0.30	2336	760	2137	595	1895	442	1662	340	1507	265	<b>2275</b>	<b>749</b>	<b>2091</b>	<b>594</b>	<b>1866</b>	<b>447</b>	1675	344	1461	263
0.40	2269	784	2069	621	1837	472	1585	360	1430	281	<b>2208</b>	<b>773</b>	<b>2049</b>	<b>619</b>	<b>1812</b>	<b>469</b>	1606	363	1396	281
0.50	2211	799	2021	651	1771	487	1517	376	1346	294	<b>2193</b>	<b>802</b>	<b>1987</b>	<b>640</b>	1745	487	1534	381	1324	297
0.60	2186	836	1966	671	1710	508	1437	391	1271	311	<b>2138</b>	<b>827</b>	<b>1945</b>	<b>669</b>	1676	507	1481	400	1262	314
0.70	2107	835	1881	682	1633	525	1429	415	1201	328	<b>2071</b>	<b>833</b>	<b>1884</b>	<b>687</b>	1630	529	1411	417	1192	329
0.80	1979	802	1826	706	1598	550	1355	432	1091	348	<b>1948</b>	<b>798</b>	<b>1835</b>	<b>710</b>	1604	560	1344	433	1117	345
0.90	1817	742	1735	700	1512	567	1224	448	1000	361	1775	740	1709	689	1519	569	1282	451	876	361
1.00	1576	644	1525	634	1401	569	1124	467	927	376	1535	639	1514	619	1426	574	1220	469	786	377

# PARTS ARRANGEMENT

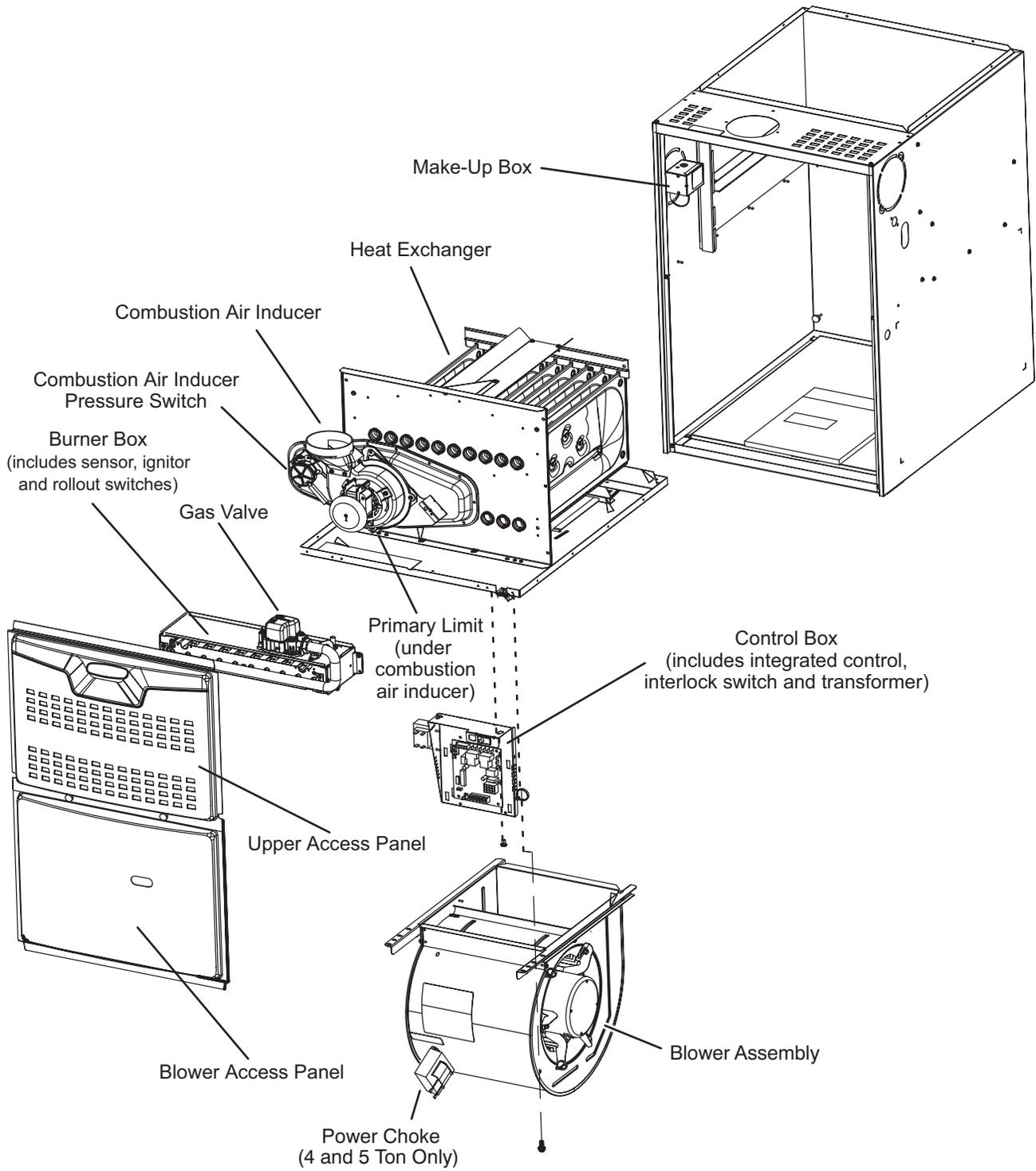


FIGURE 1

## I-UNIT COMPONENTS

ML180UHE(X) 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

<b>⚠ CAUTION</b>	
	<b>Electrostatic discharge can affect electronic components. Take precautions to neutralize electrostatic charge by touching your hand and tools to metal prior to handling the control.</b>

#### 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.

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

#### 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.

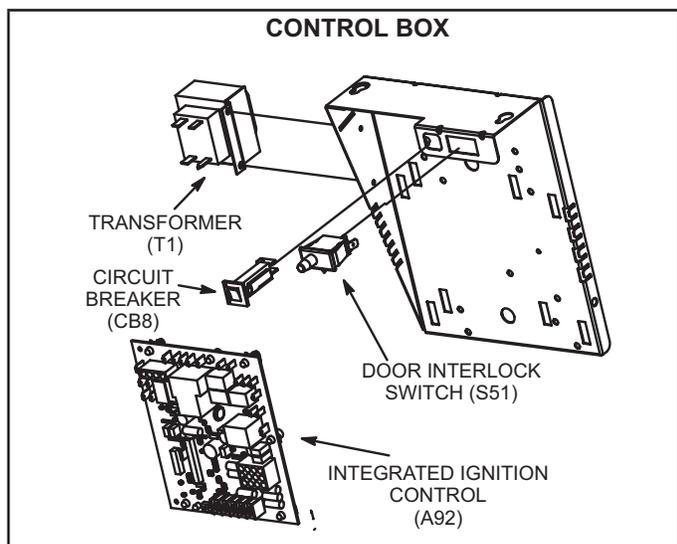


FIGURE 2

#### 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)

103217-03 & 107163-01

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

The hot surface ignition control system consisting of an integrated control (figure 3 with control terminal designations in tables 1, 2 and 3), sensor and ignitor (figure 6). 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 or 5. 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 for 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.

**TABLE 1**

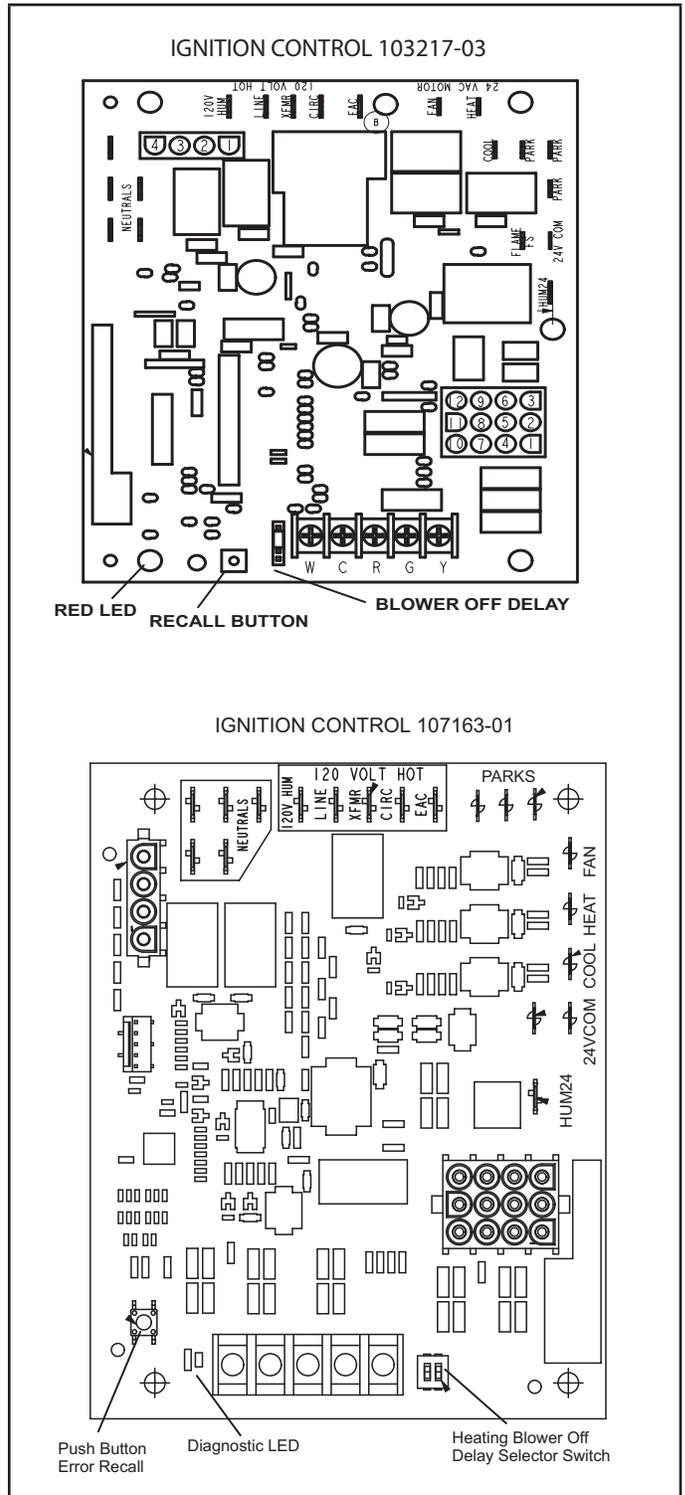
4-Pin Terminal Designation	
PIN #	FUNCTION
1	Combustion Air Inducer Line
2	Ignitor Line
3	Combustion Air Inducer Neutral
4	Ignitor Neutral

**TABLE 2**

12-Pin Terminal Designations	
PIN #	FUNCTION
1	High Limit Output
2	IFC 103217-03 Not Used IFC 107163-01 Flame Sense
3	24V Line
4	Not Used
5	Rollout Switch Out
6	24V Neutral
7	High Limit Input
8	Ground
9	Gas Valve Common
10	Pressure Switch In
11	Rollout Switch In
12	Gas Valve Out

**TABLE 3**

1/4" Quick Connect Terminals	
120HUM	Humidifier 120VAC
LINE	120VAC
XFMR	Transformer 120VAC
CIRC	Indoor blower 120VAC
EAC	Indoor air quality accessory 120VAC
NEUTRALS	Common 120VAC
HUM24	Humidifier 24VAC
3/16" Quick Connect Terminals	
COOL	Cooling tap 24VAC
HEAT	Heating tap 24VAC
FAN	Continuous blower 24 VAC
PARK (no power)	Park terminal for speed taps
FS	Flame sense
24 COM	Common 24VAC



**FIGURE 3**

**TABLE 4**  
**Ignition Control 103217-02**

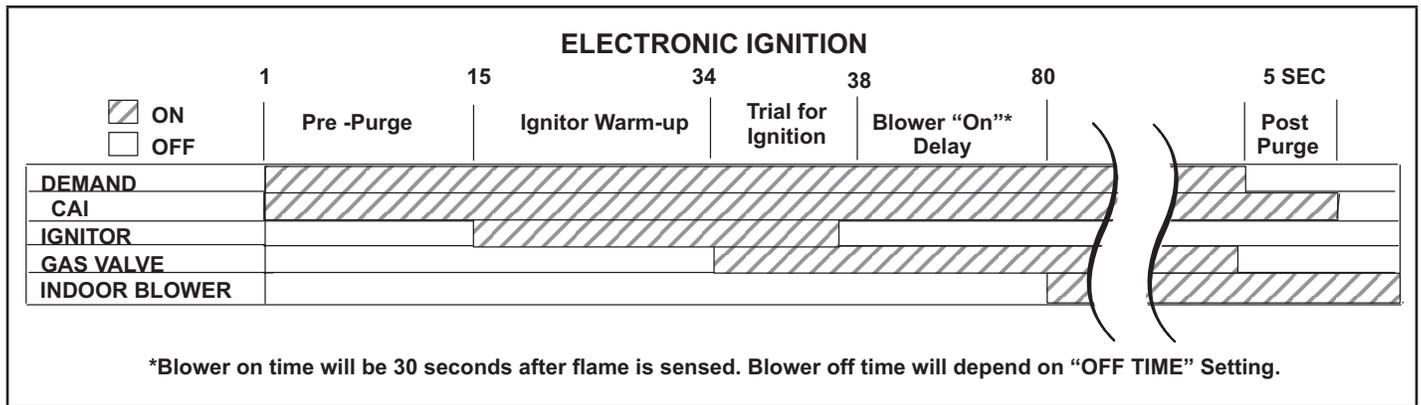
<b>RED LED Flash Code<sup>2</sup></b>	<b>Diagnostic Codes / Status of Furnace</b>
Off	No power to control or board fault detected
Heartbeat <sup>1</sup>	Normal Operation - Idle, Continuous Fan, Cool
1	Reverse Line Voltage Polarity
2	Improper Earth Ground
3	Burner failed to light, or lost flame during heat demand
4	Low Flame Signal - check flame sensor
5	Watchguard - burner failed to light, exceeded maximum number of retries or recycles.
6	Ignitor Circuit Failure - not available on this control
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
<b>Notes</b>	
Note 1	A "Heartbeat" is indicated by a "Slow Flash" - 1 sec on 1 sec off, repeating
Note 2	Error codes are indicated by a "rapid flash" - the LED flashes X times at 1/2 second on 1/2 second off, remains off for 3 seconds then repeats.
Note3	Last 10 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.

**TABLE 5**  
**Ignition Control 103217-03**

RED LED Flash Code <sup>2</sup>	Diagnostic Codes / Status of Furnace
Off	No power to control or board fault detected
Heartbeat <sup>1</sup>	Normal Operation - Idle, Continuous Fan, Cool
Continuous Rapid Flash	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	Error codes are indicated by a "rapid flash" - the LED flashes X times at ½ second on ½ second off, remains off for 3 seconds then repeats.
Note - 3	Last 10 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.

**Ignition Control 107163-01**

<b>RED LED Flash Code</b>	<b>Diagnostic Codes / Status of Furnace</b>
Off	No Power to Control or Board Fault Detected
On	Board Fault Detected
Fast Heartbeat <sup>3</sup>	Call for Heat / Burner Operation
Slow Heartbeat <sup>1</sup>	Normal Operation – Idle, Continuous Fan, or Cool
1 Flash <sup>2</sup>	Reverse Line Voltage Polarity or Phasing of 120V power
2 Flashes <sup>2</sup>	Improper earth ground
3 Flashes <sup>2</sup>	Burner failed to light, or lost flame during heat demand
4 Flashes <sup>2</sup>	Low flame signal – check flame sensor
5 Flashes <sup>2</sup>	Watchguard – burner failed to light, exceeded maximum number of retries/ recycles, 1 hour lockout
6 Flashes <sup>2</sup>	Not used
7 Flashes <sup>2</sup>	Primary or Secondary limit switch open or Watchguard mode – Limit Switch open longer than 3 minutes
8 Flashes <sup>2</sup>	Roll-out Switch Open
9 Flashes <sup>2</sup>	Pressure Switch failed to close or opened during heat demand, inducer on
10 Flashes <sup>2</sup>	Watchguard - Pressure switch opened 5 times during a single heating demand
11 Flashes <sup>2</sup>	Pressure switch stuck closed prior to activation of Combustion Air Inducer
12 Flashes <sup>2</sup>	Flame sensed without gas valve energized
13 Flashes <sup>2</sup>	Low line voltage
<b>Notes</b>	
Note - 1	A slow heartbeat is indicated by 1s on / 1s off. It is used for idle, continuous fan and cool modes.
Note - 2	Error codes are indicated by a “rapid flash” - the LED flashes X times at ½ second on ½ second off, remains off for 3 seconds then repeats.
Note - 3	A fast heartbeat is indicated by 0.5s on / 0.5s off. It is only used during a heat call.
Note - 4	Last 10 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**

**Ignition Control 103217-03**

**Heating Fan On Time**

The fan on time of 30 seconds is not adjustable.

**Heating Fan Off Time**

Fan off time (time that the blower operates after the heat demand has been satisfied) can be adjusted by moving the jumper to a different setting. The unit is shipped with a factory fan off setting of 90 seconds. For customized comfort, monitor the supply air temperature once the heat demand is satisfied. Note the supply air temperature at the instant the blower is de-energized.

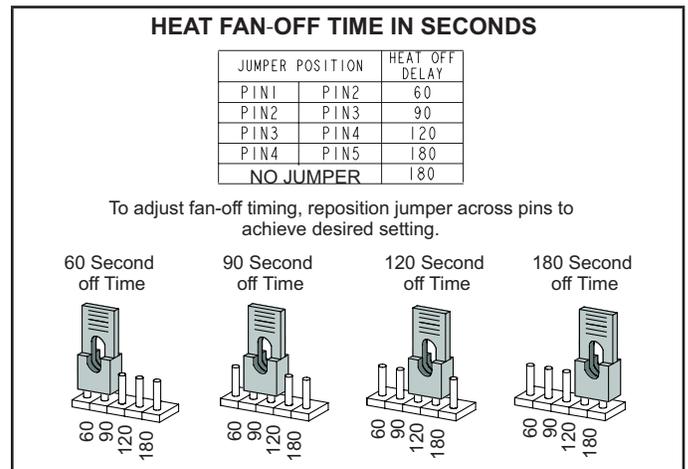
Adjust the fan-off delay to achieve a supply air temperature between 90° - 110° at the instant the blower is de-energized. (Longer delay times allow for lower air temperature, shorter delay times allow for higher air temperature). See figure 5.

**Cooling Fan On Time**

The fan on time is 2 seconds and is not adjustable.

**Cooling Fan Off Time**

The control has a 45 second fan off delay after cooling demand has been met. This delay is factory set and not adjustable.

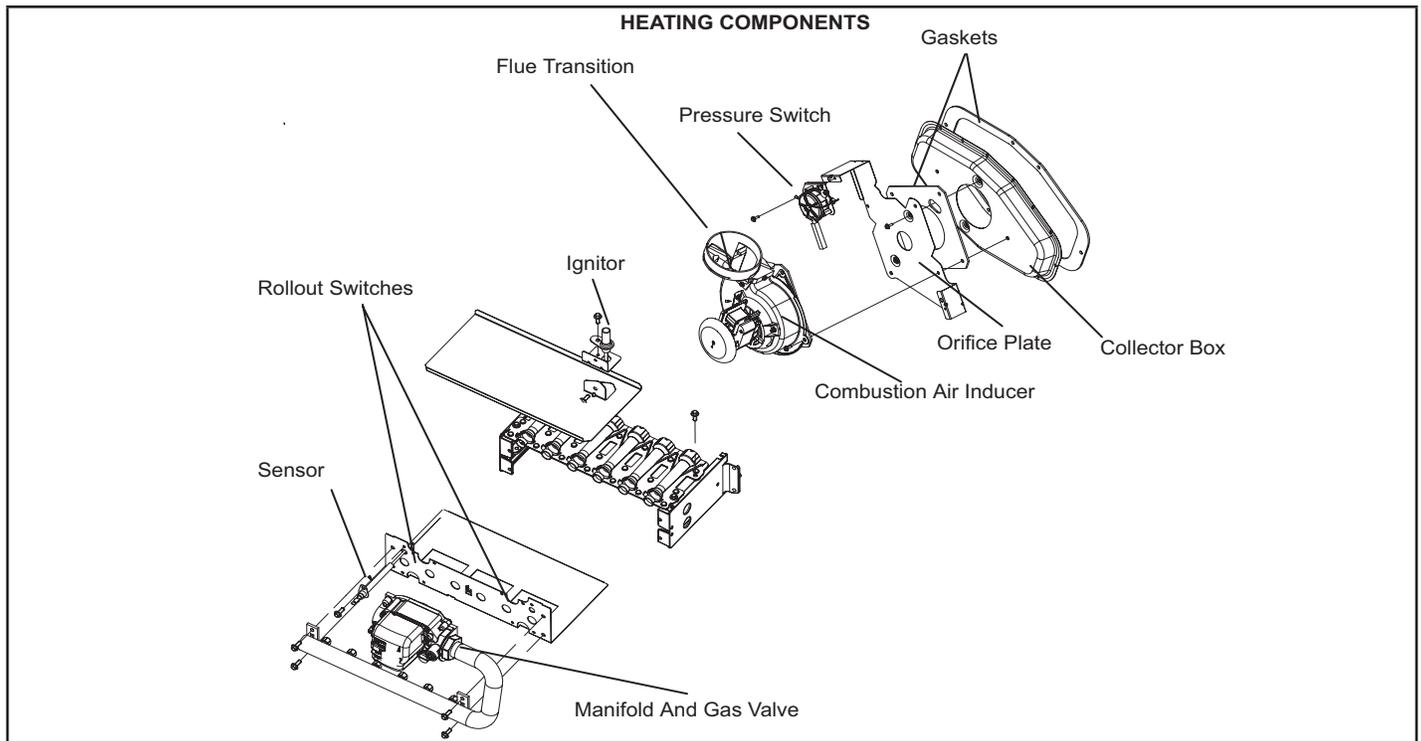


**FIGURE 5**

**Ignition Control 107163-01**

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 changing the two position dip switch on the integrated control, to one of four selections. Blower off delay is factory set at 90 seconds. For other blower off delay settings, please refer to the following chart:

Blower Delay Select		
	SW2-1	SW2-2
60	OFF	ON
90	OFF	OFF
120	ON	OFF
180	ON	ON
Factory Setting is 90		



**FIGURE 6**

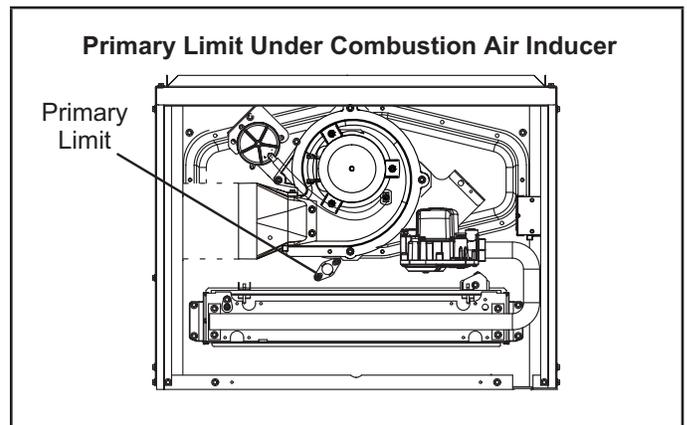
**5. Flame Rollout Switches (Figure 6)**

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 ML180UHE(X) units is located in the heating vestibule panel under the combustion air inducer. See figure 7. 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.



**FIGURE 7**

**7. Flame Sensor (Figure 6)**

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.

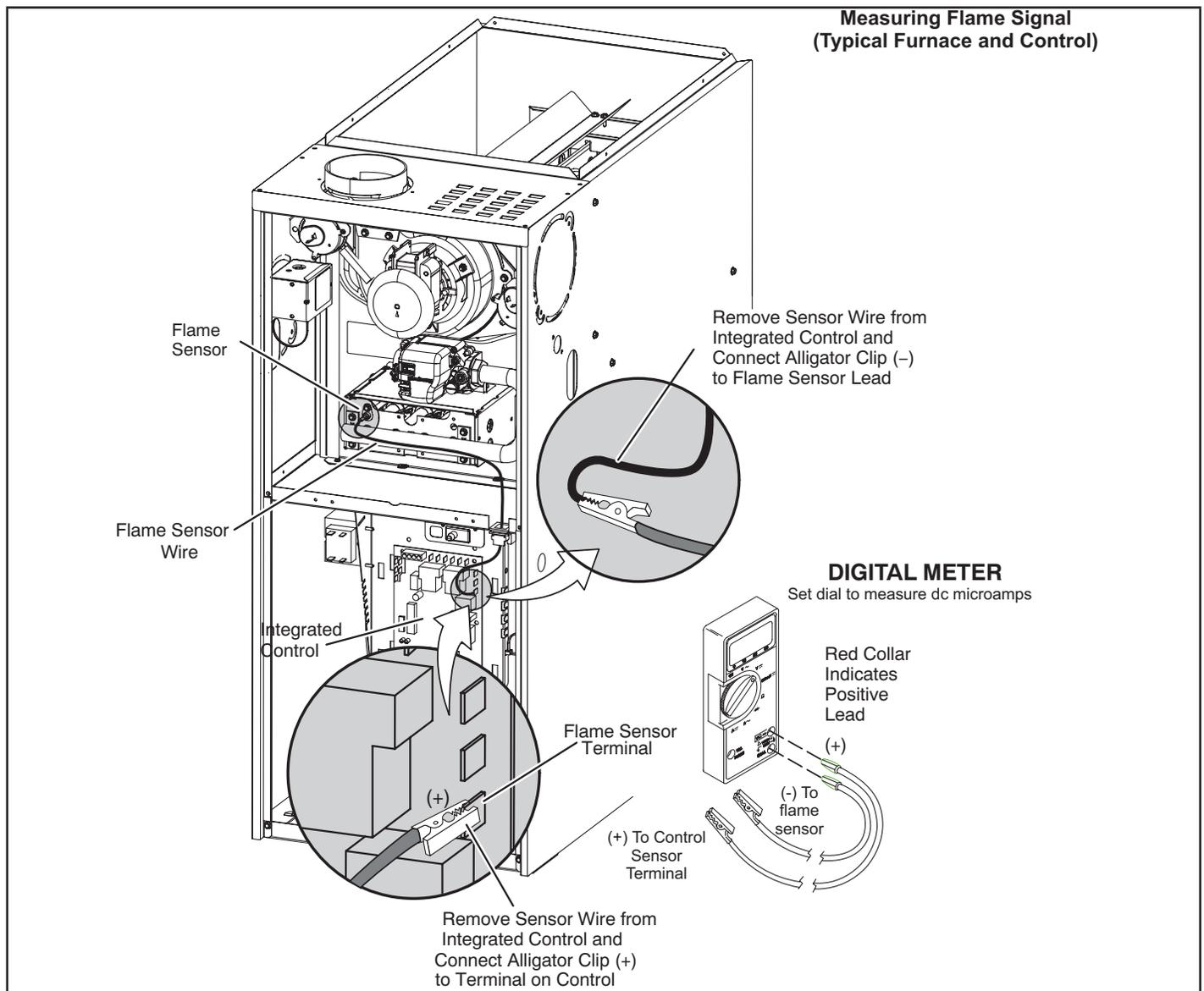
See figure 8 and table 6 for flame signal check.

- 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
1.5 or greater	0.5 - 1.4	0.4 or less



**FIGURE 8**

## 8. Gas Valve (Figure 6)

The ML180UHE(X) 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 ML180UHE(X) 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

Model	C.A.I. Orifice Size
045E36A	1.063"
070E36B	1.316"
090E48B, 090E60C	1.531"
110E60C	1.690"
135E60D	1.940"

## 10. Ignitor (Figure 6)

The nitride ignitor used on ML180UHE 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 9 for resistance, and voltage check.

**NOTE** - The ML180UHE(X) furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.

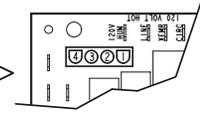
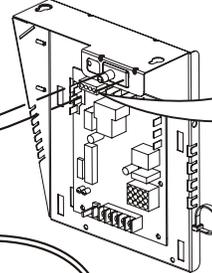
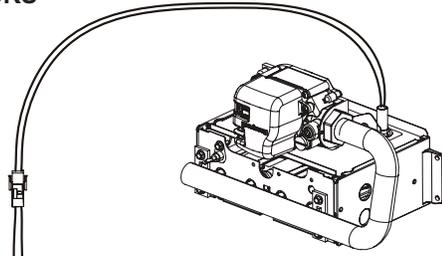
## IGNITOR CHECKS

### 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)

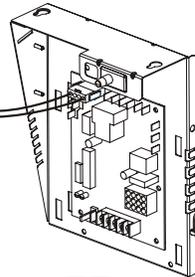
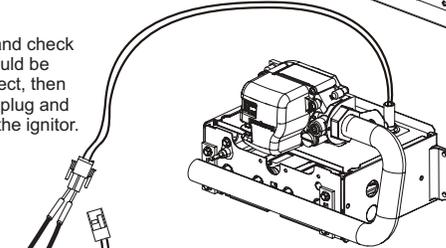


### Test 2

#### 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)

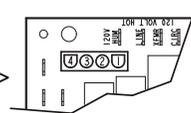
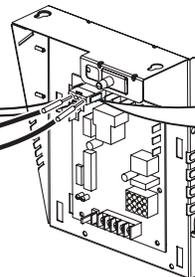
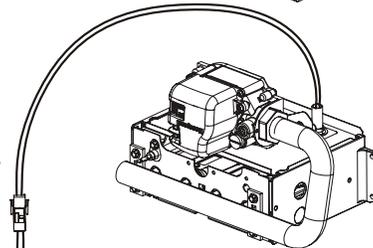


### Test 3

#### 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 9

## 11. Combustion Air Inducer Pressure Switch (S18)

ML180UHE(X) 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.

TABLE 8

Unit	inches wc	
	Make	Break $\pm$ 0.05
045E36A-1, -2, -54	-0.75	-0.65
070E36B-1, -2	-0.83	-0.68
070E36B-54	-0.85	-0.70
090E48B, 090E60C-1, -2	-0.80	-0.65
090E48B-54	-0.85	-0.70
110E60C-1, -2	-0.83	-0.68
110E60C-54	-0.85	-0.70
135E60D-1, -2, -54	-0.80	-0.65

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.

### Troubleshooting

See figure 10 for measuring operating pressure and checking resistance in the pressure switch.

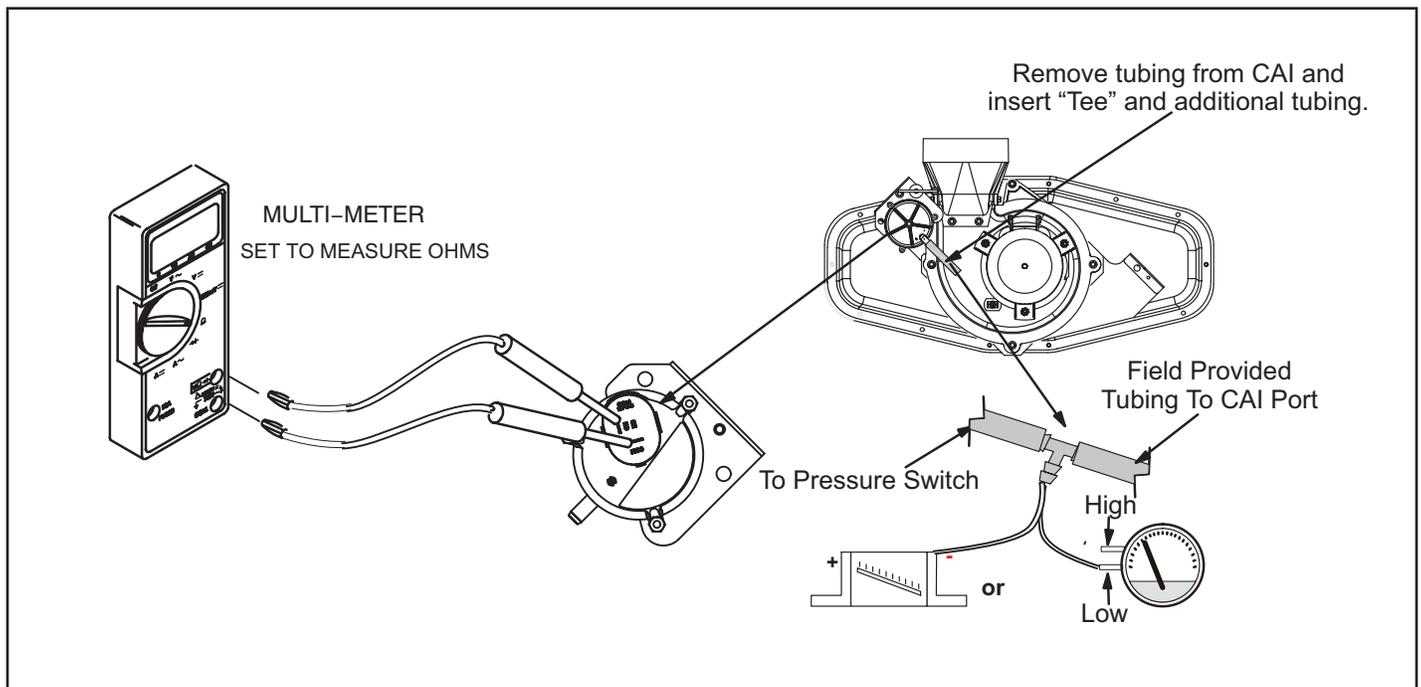


FIGURE 10

## Multiple Venting

The ML180UHE(X) furnace can vent in multiple positions. See figure 11. 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.**

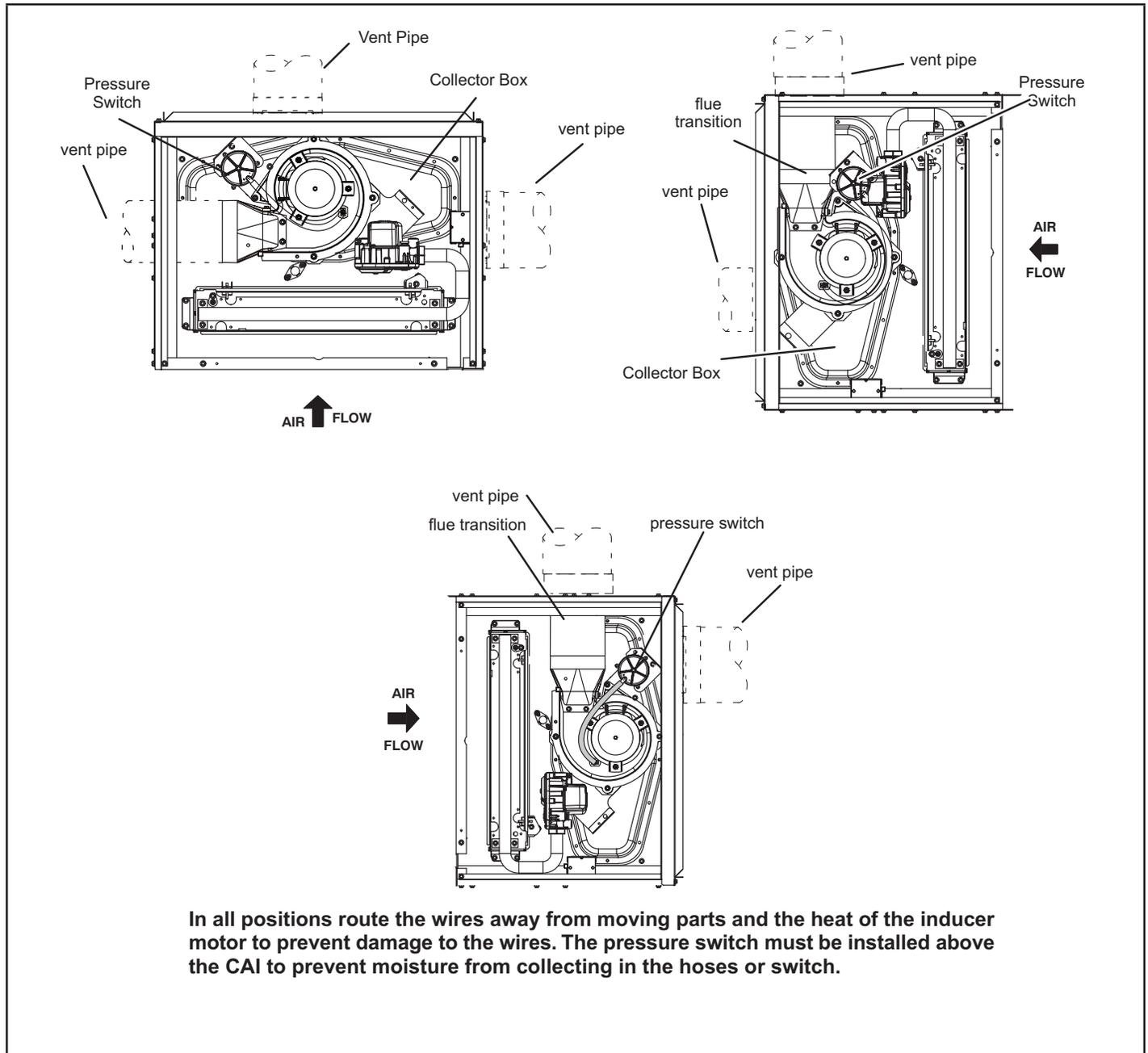


FIGURE 11

## 12. Blower Motor

### **! IMPORTANT**

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

ML180UHE units are equipped with a constant torque ECM motor. It has a DC motor coupled to an electronic control module both contained in the same motor housing. The motor is programmed to provide constant torque at each of the five selectable speed taps. Each tap requires 24 volts to energize.

#### **Input Voltage Requirements**

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

#### **Troubleshooting**

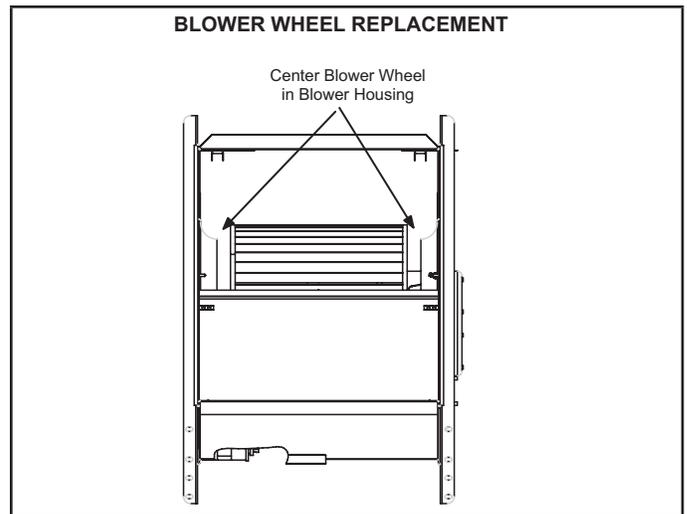
Troubleshooting the motor is an easy process. Follow steps below.

- 1 - Shut off power to unit.
- 2 - Remove input connectors J48 and J49 from motor. See figure 14 for troubleshooting procedure.

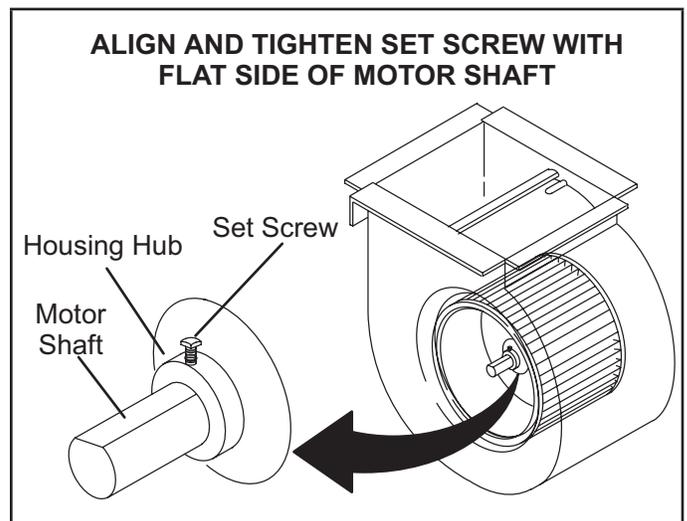
**NOTE** - Figure 14 is typical ignition control illustration.

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

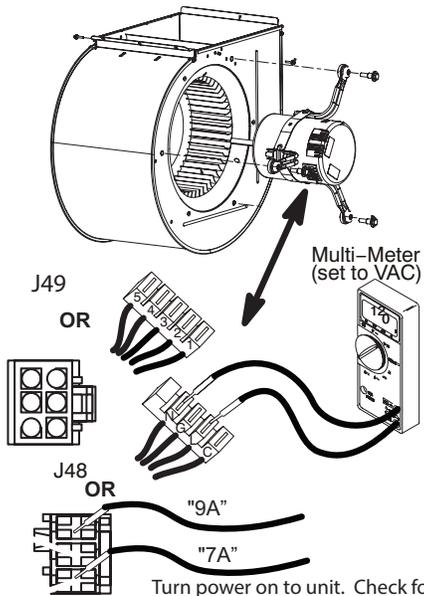
If replacing the indoor blower motor or blower wheel is necessary, placement is critical. The blower wheel must be centered in the blower housing as shown in figure 12. When replacing the indoor blower motor the set screw must be aligned and tightened with the motor shaft as shown in figure 13.



**FIGURE 12**

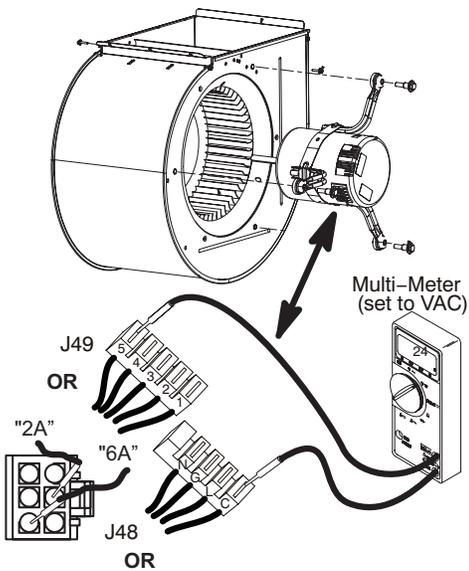


**FIGURE 13**



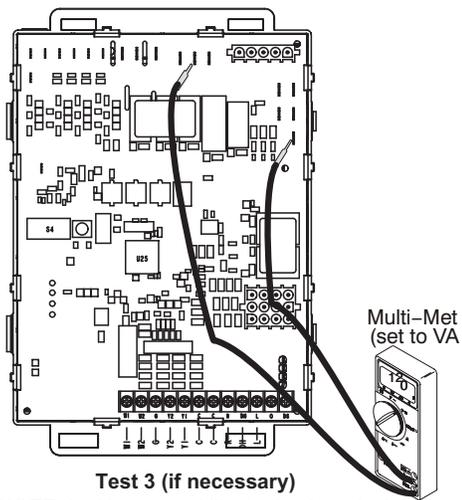
**Test 1**

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



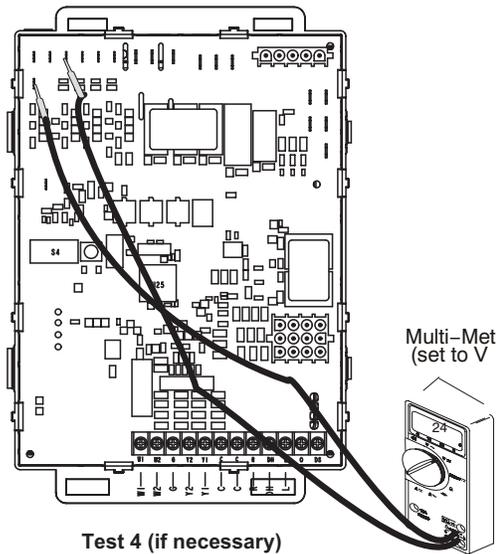
**Test 2**

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



**Test 3 (if necessary)**

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



**Test 4 (if necessary)**

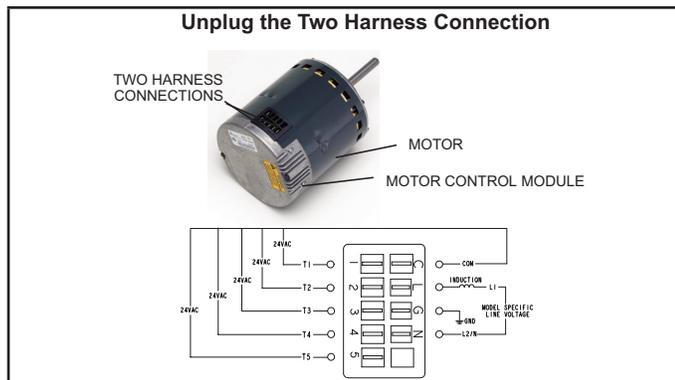
**NOTE- Ignition control illustration is typical**  
Check for 24 volts across terminals "24 COM" and the "active speed tap" on the integrated control. If voltage is present, problem is with the harness. If voltage is not present problem may be may be with the integrated control

**FIGURE 14**

## Replacing the Motor Module

- 1 - Disconnect electrical power to unit.
- 2 - Remove unit access panel.
- 3 - Unplug the two harnesses from the motor control module. See figure 15.

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



**FIGURE 15**

- 4 - Remove the two hex head bolts securing the motor control module to the motor (see figure 16).



**FIGURE 16**

- 5 - Slide the motor control module away from the motor to access and disconnect the internal three wire connector. It is not necessary to remove blower motor itself. Set both hex head bolts aside.

## Testing the Motor (Figure 17)

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

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



**FIGURE 17**

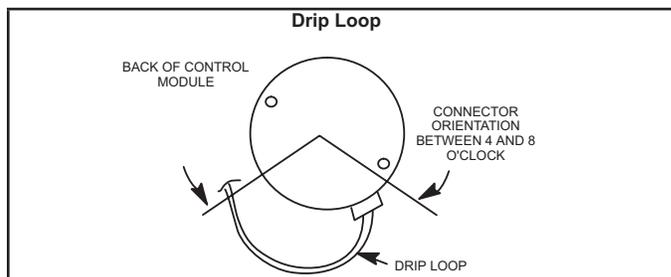
**TABLE 9**

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

## Motor Module Installation

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

- 1 - Verify electrical power to unit is disconnected.
- 2 - Connect three-wire harness from motor to control module.
- 3 - Mount new motor control module to motor using two hex head bolts removed in figure 10. Torque bolts to 22 inch pounds or 1/16th clock wise turn.
- 4 - Reconnect the two harnesses to the motor control module.
- 5 - The electrical connectors of the motor should be facing down to form a drip loop (figure 12). This will direct moisture away from the motor and its electric connections on the motor



**FIGURE 18**

## 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.**  
**ML180UHE(X) units are equipped with a hot surface ignition system. Do not attempt to light manually.**

### Gas Valve Operation

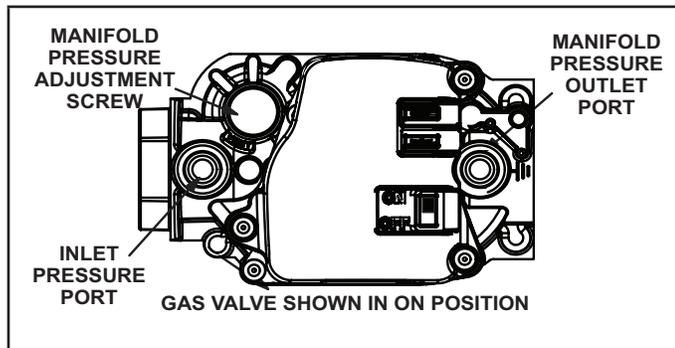


FIGURE 19

- 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 19.
- 7 - Wait five minutes to clear out any gas. If you then smell gas, STOP! Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas go to next step.
- 8 - Move gas valve switch to ON position. Do not force. See figure 19.
- 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 19.
- 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 ML180UHE(X) 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

**⚠ CAUTION**

**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.**

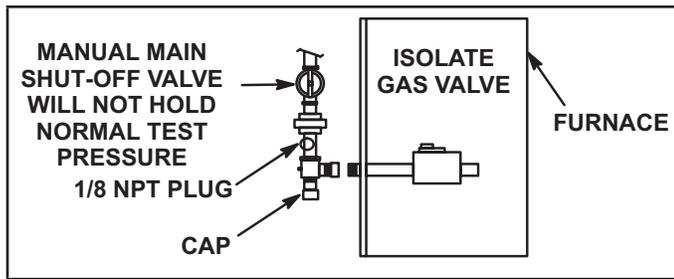
**⚠ IMPORTANT**

**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 exceed 600 in-lbs (50 ft-lbs) torque 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 20. 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 20**

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

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

**D- Gas Pressure Adjustment**

**Gas Flow (Approximate)**

**TABLE 10**

GAS METER CLOCKING CHART				
ML180UHE Unit	Seconds For One Revolution			
	Natural		LP/Propane	
	1 cu ft Dial	2 cu ft Dial	1 cu ft Dial	2 cu ft Dial
-045	80	160	200	400
-070	55	110	136	272
-090	41	82	102	204
-110	33	66	82	164
-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**

- 1 - Remove the threaded plug from the inlet side of the gas valve and install a field-provided barbed fitting. Connect to a test gauge to measure supply pressure.

- 2 - Start unit and allow 5 minutes for unit to reach steady state.
- 3 - After allowing unit to stabilize for 5 minutes, record supply pressure and compare to value given in table 12.

**Manifold Pressure Measurement**

- 1 - Remove the threaded plug from the outlet side of the gas valve and install a field-provided barbed fitting. Connect to a test gauge to measure manifold pressure.
- 2 - Start unit and allow 5 minutes for unit to reach steady state.
- 3 - While waiting for the unit to stabilize, observe the flame. Flame should be stable and should not lift from burner. Natural gas should burn blue.
- 4 - After allowing unit to stabilize for 5 minutes, record manifold pressure and compare to value given in table 12.

**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. **The maximum carbon monoxide reading should not exceed 100 ppm.**

**TABLE 11**

ML180UHE Unit	CO <sub>2</sub> % Nat	CO <sub>2</sub> % LP
-045	7.2 - 7.8	7.5 - 9.0
-070		
-090		
-110		
-135		

**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**

## 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
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
135	Nat	3.5	3.5	2.9	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
045							
070	No Change	80W52	80W51	73W37	11K49	11K44	73W81
110		80W52	80W51				
090		80W52	80W51				
110		80W57	80W52				
135		80W52	80W51				

**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 21. A wide variation in the voltage between Line Neutral and "C" as a function of load indicates a poor or partial ground. Compare the readings to the table below. If the readings exceed the maximum shown in table 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 22. This voltage should be in the range of 97 to 132 Vac.

**NOTE** - Figures 21 and 22 are typical ignition control illustrations.

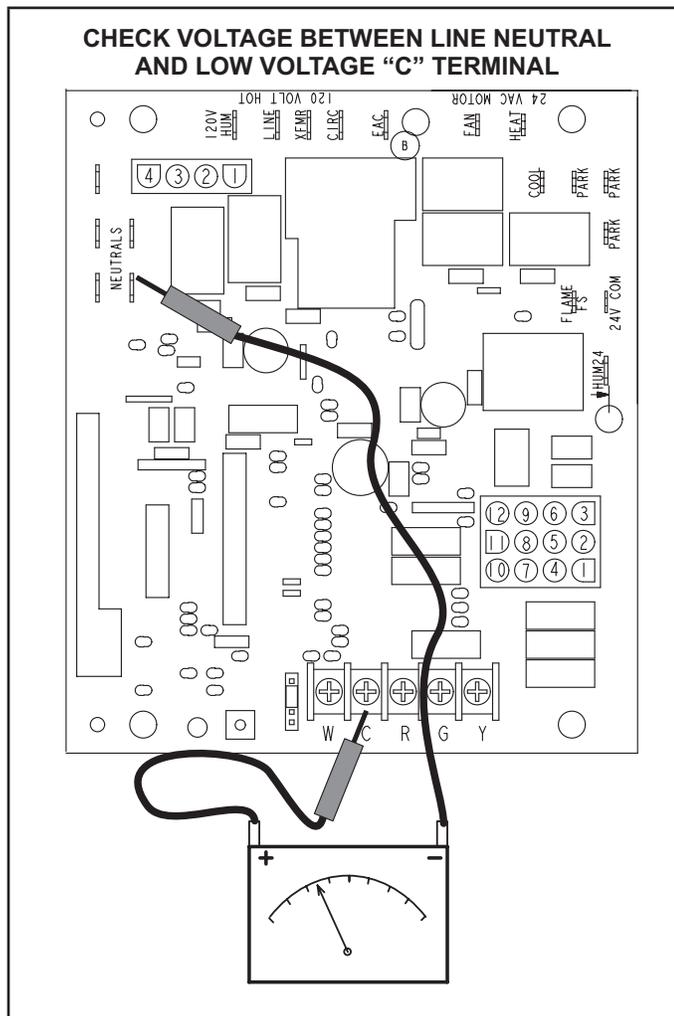


FIGURE 21

TABLE 14

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

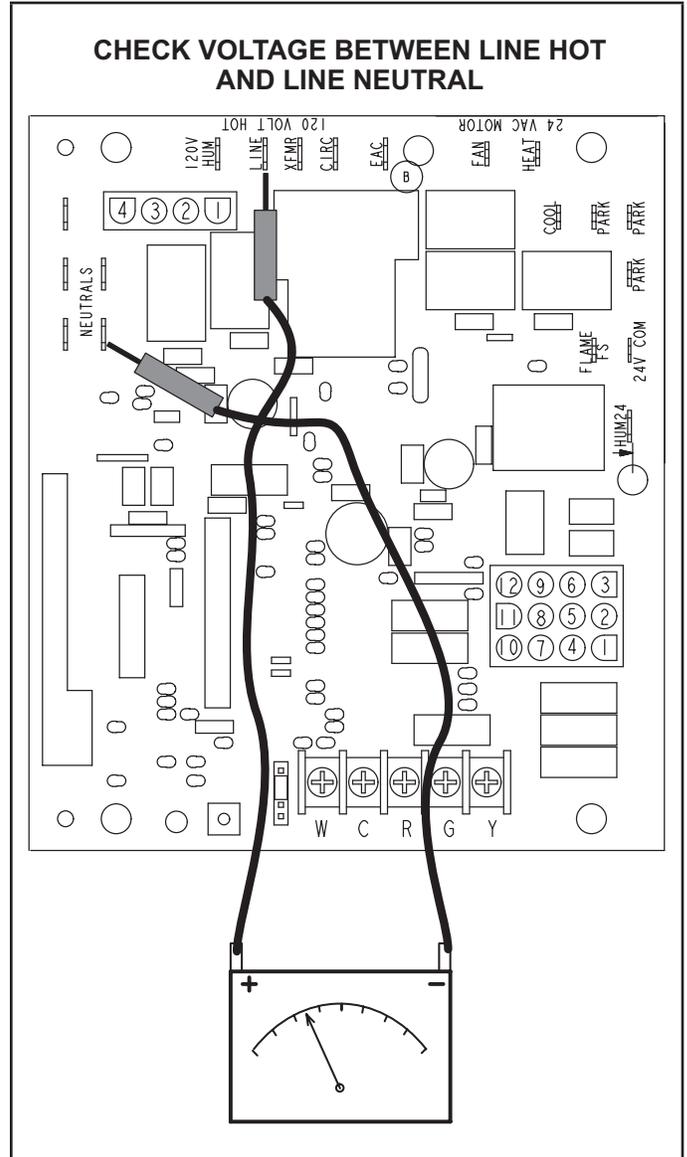


FIGURE 22

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

### B-Temperature Rise (Figure 23)

Temperature rise for ML180UHE(X) units depends on unit input, blower speed, blower horsepower and static pressure as marked on the unit rating plate. The blower speed must be set for unit operation within the range of "TEMP. RISE °F" listed on the unit rating plate.

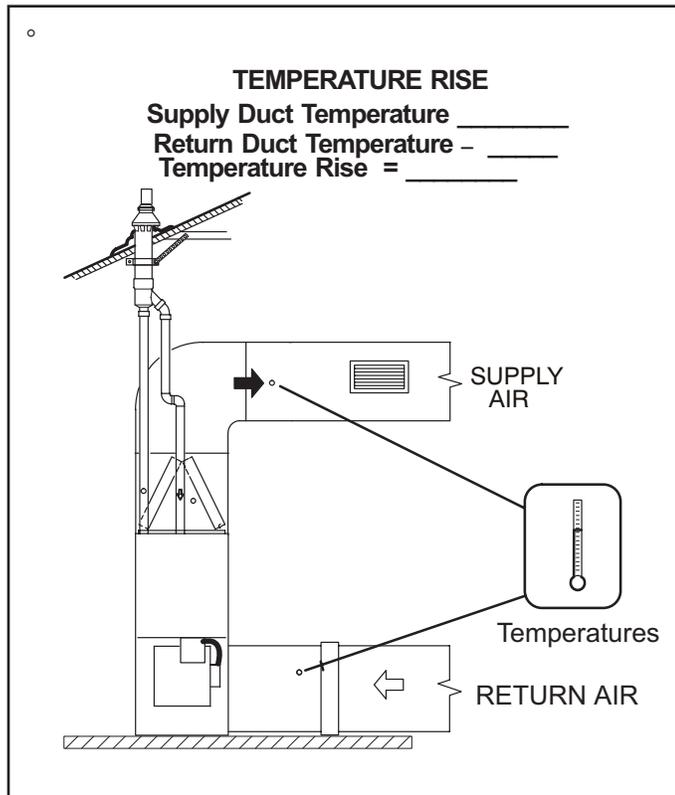


FIGURE 23

### C-External Static Pressure

- 1 - Tap locations shown in figure 24 .
- 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.

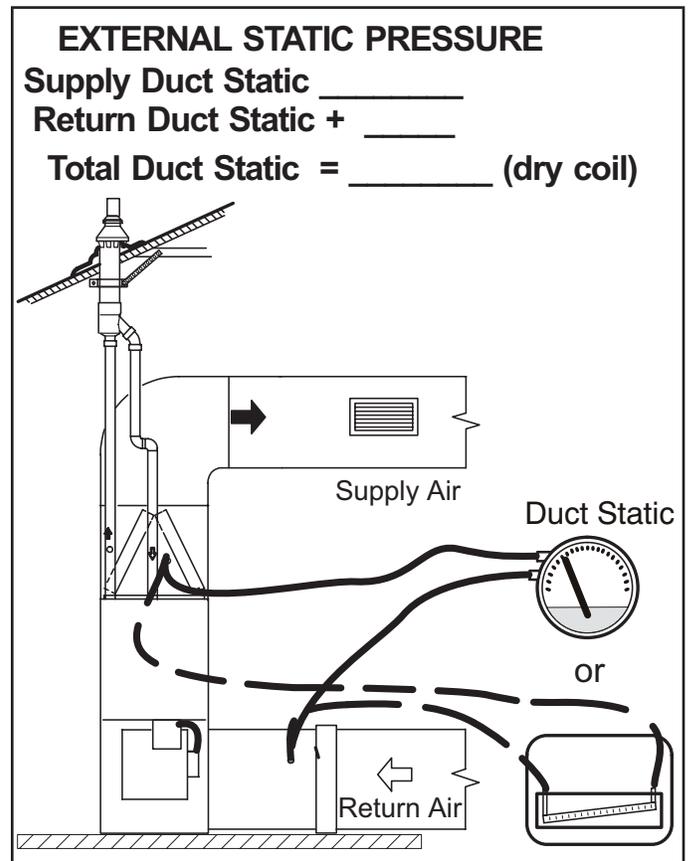


FIGURE 24

## 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.

### WARNING

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 15**

Furnace Cabinet Width	Filter Size	
	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)	16 X 25 X 1 (1)
C - 21"	16 X 25 X 1 (1)	20 x 25 x 1 (1)
D - 24-1/2"	16 X 25 X 1 (2)	24 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-of 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.

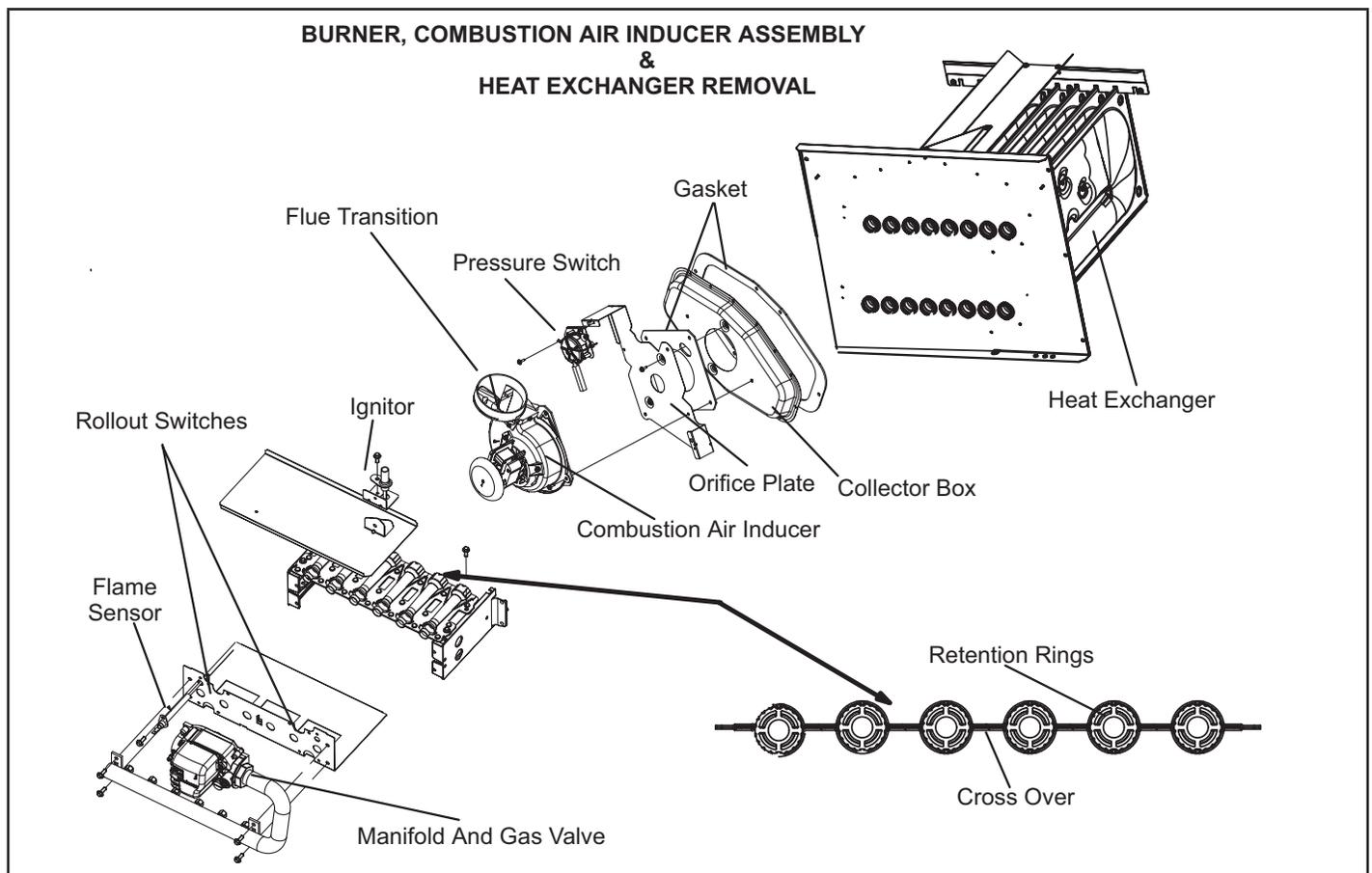
- 3 - Clock gas meter to ensure that the unit is operating at the specified firing rate. Check the supply pressure and the manifold pressure. On two-stage gas furnaces check the manifold pressure on high fire and low fire. If manifold pressure adjustment is necessary, consult the Service Literature for 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.



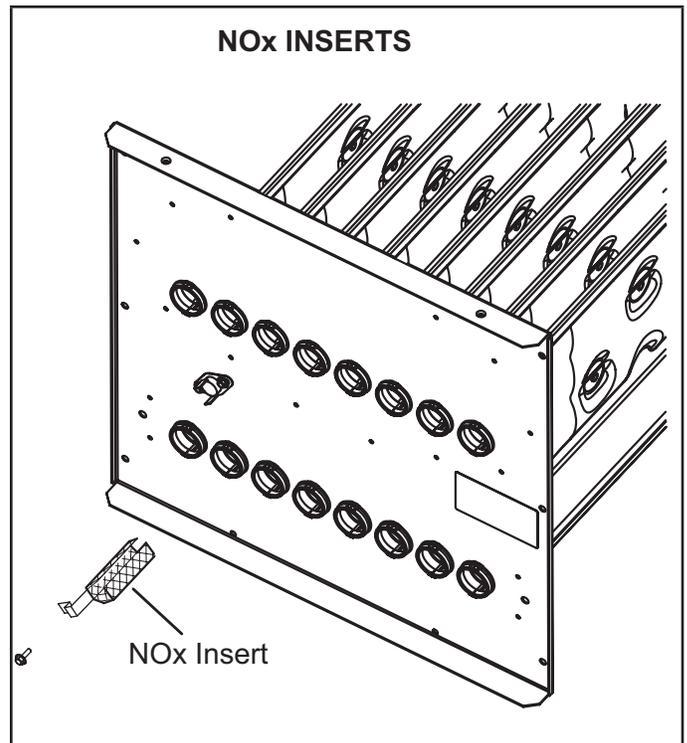
**FIGURE 25**

- 7 - **NOx units only** - Remove screw securing NOx insert. Remove NOx insert. See figure 26.
- 8 - Remove screws from both sides, top and bottom of vestibule panel.
- 9 - 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.
- 10 - Backwash using steam. Begin from the burner opening on each clam. Steam must not exceed 275°F.
- 11 - 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 25 shows burner detail.
- 12 - 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.
- 13 - Reinstall heat exchanger in vestibule. (Replace the five screws in the cabinet from step 10 if removed).
- 14 - NOx units only - Replace NOx inserts.
- 15 - 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.
- 16 - Reinstall burner box and manifold assembly.
- 17 - Reconnect all wires.
- 18 - Reconnect top cap and vent pipe to combustion air inducer outlet.
- 19 - Reconnect gas supply piping.
- 20 - Turn on power and gas supply to unit.
- 21 - Set thermostat and check for proper operation.
- 22 - Check all piping connections, factory and field, for gas leaks. Use a leak detecting solution or other preferred means.
- 23 - If a leak is detected, shut gas and electricity off and repair leak.

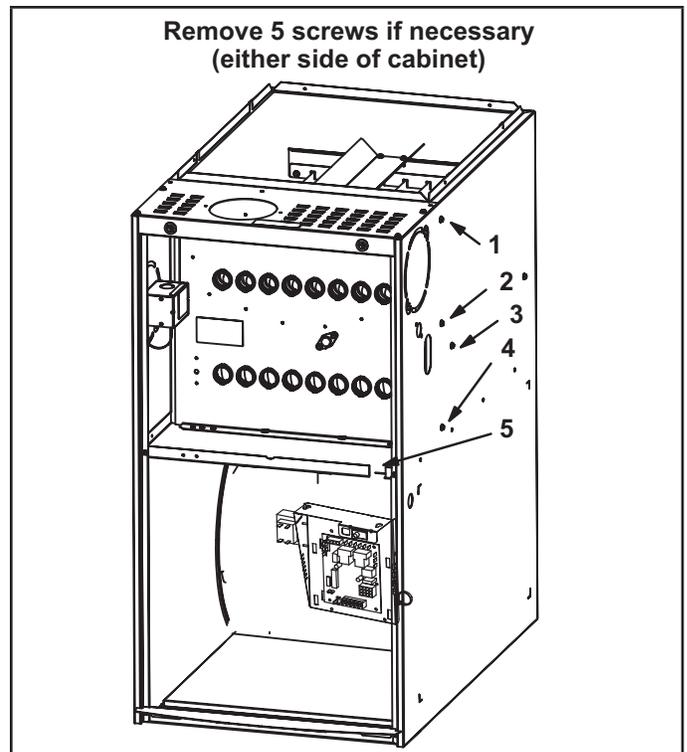
## ⚠ CAUTION

**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.**

- 24 - Repeat steps 24 and 26 until no leaks are detected.
- 25 - Replace access panel.



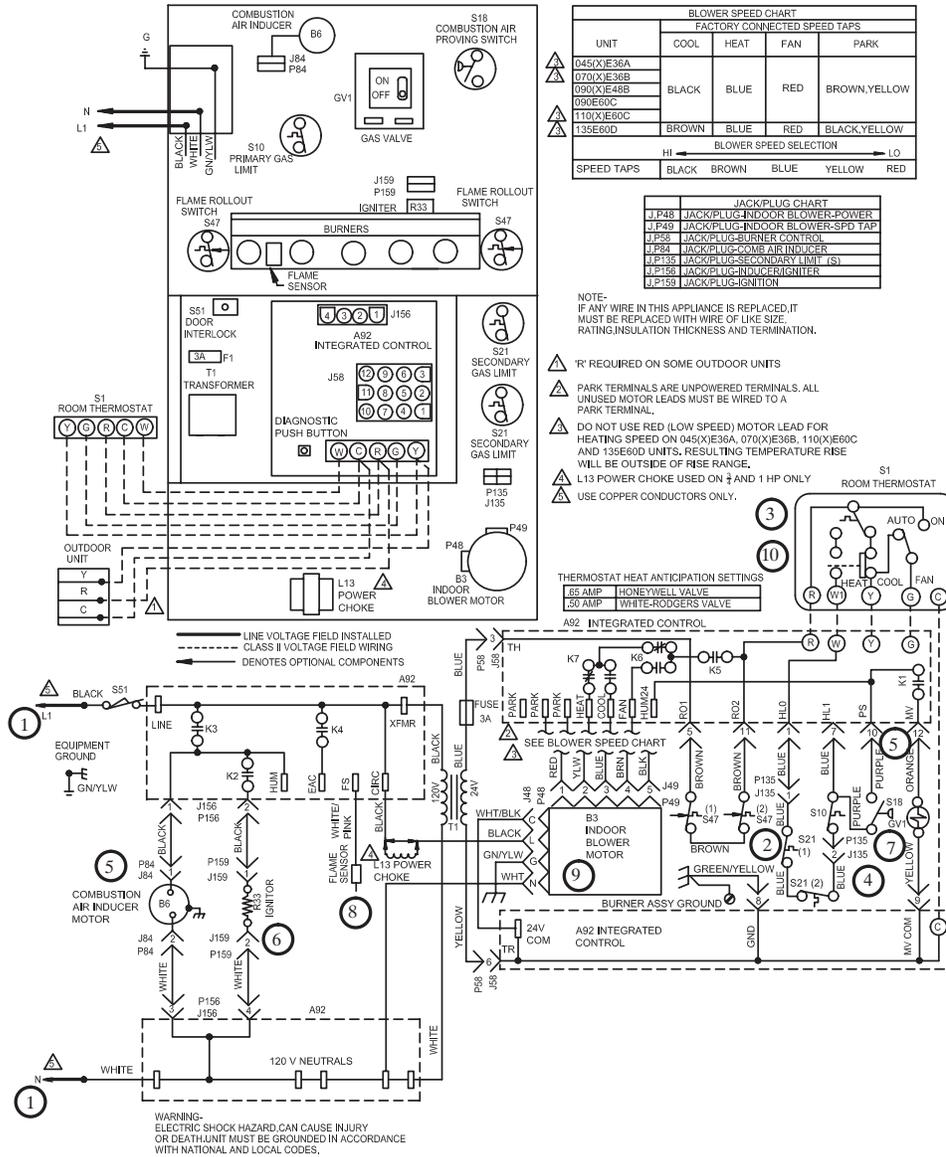
**FIGURE 26**



**FIGURE 27**

## VII- Wiring and Sequence of Operation

### Schematic Wiring Diagram and Sequence of Operation

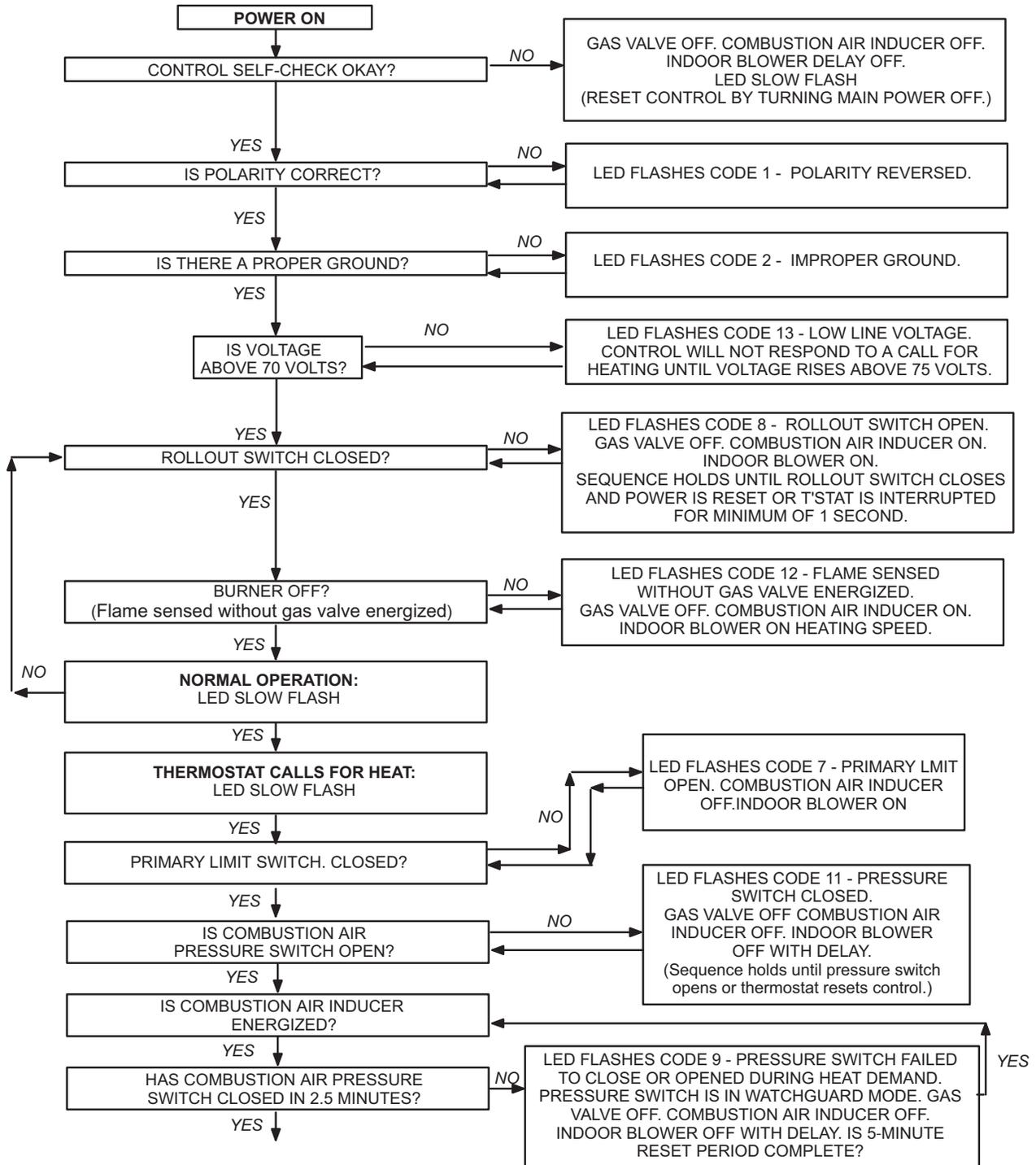


- Line voltage is applied to L1 and N. the T1 low voltage transformer is energized, and line voltage is applied to B3 indoor blower.
- S47 rollout switch(es) must be closed in order for 24V from transformer to be output on integrated control "R" to power thermostat.
- When there is a call for heat, W1 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 24vVAC 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.

## HEATING SEQUENCE OF OPERATION

### NORMAL HEATING MODE

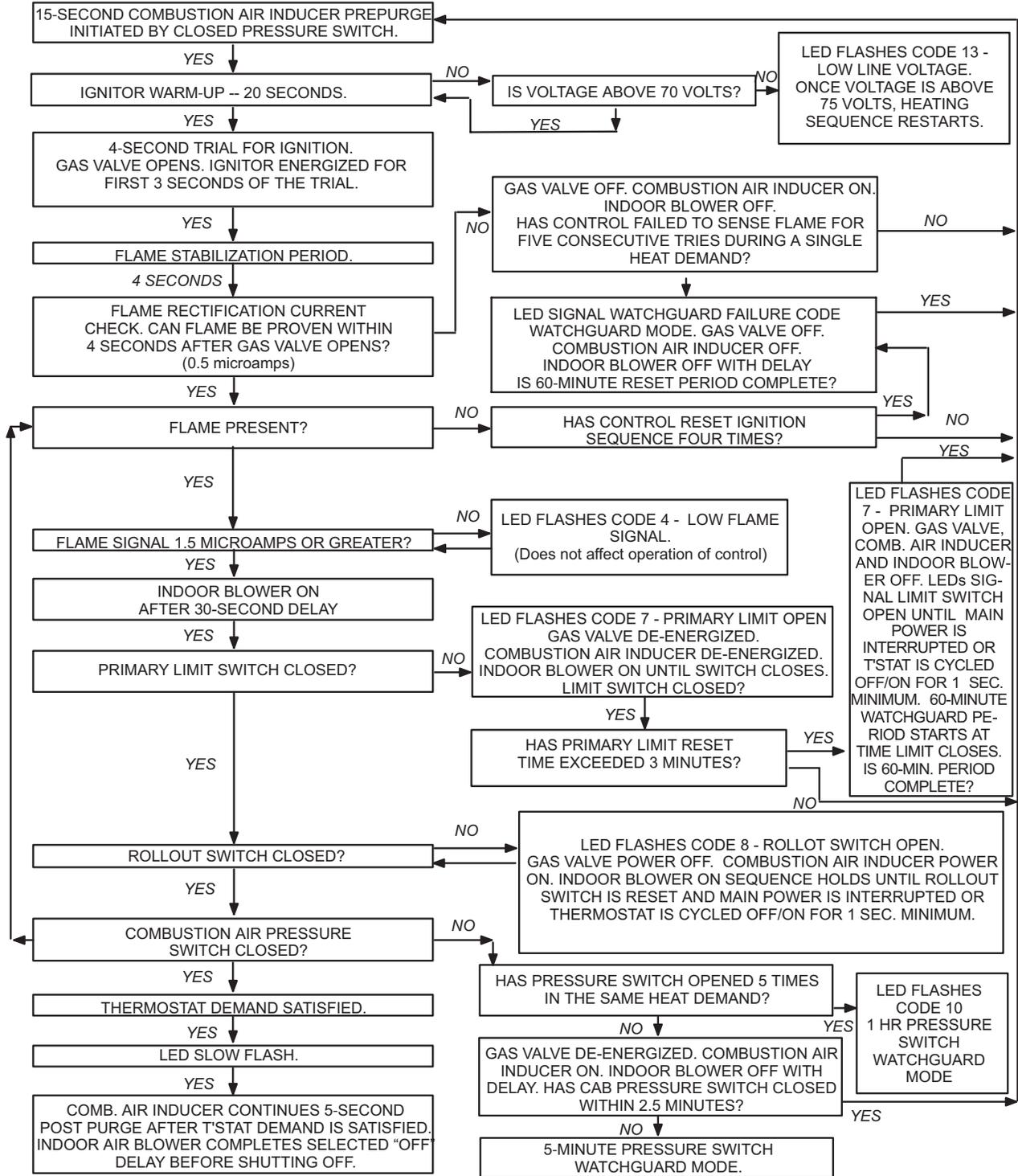
### ABNORMAL HEATING MODE



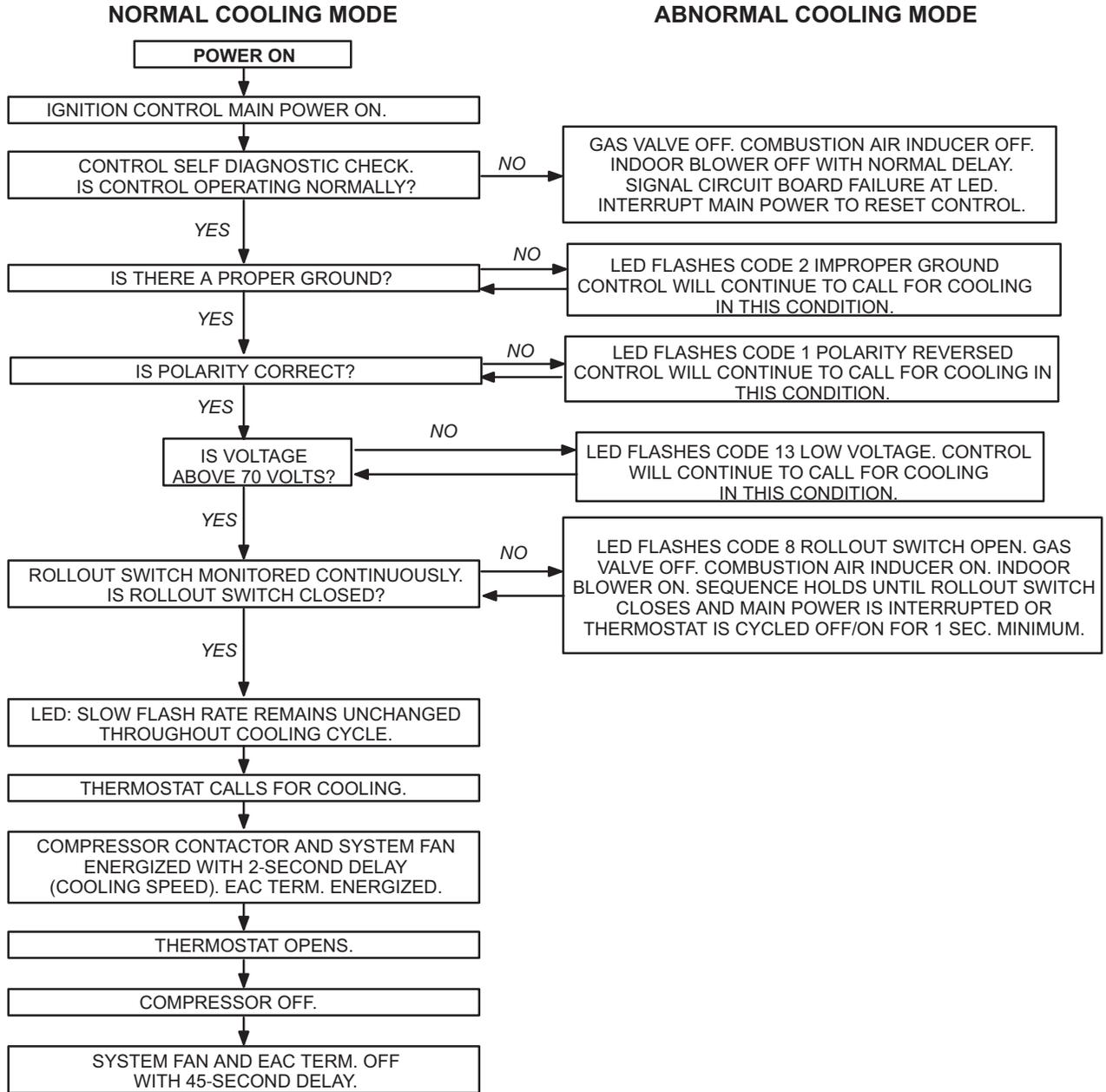
## HEATING SEQUENCE CONTINUED

### NORMAL HEATING MODE

### ABNORMAL HEATING MODE



## COOLING SEQUENCE OF OPERATION



### CONTINUOUS FAN SEQUENCE OF OPERATION

