

ML180UH(X) series units are mid-efficiency gas furnaces used for upflow or horizontal applications only, manufactured with Lennox Duralok Plus™ heat exchangers formed of aluminized steel. ML180UH(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. ML180UH(X) model units are equipped with a hot surface ignition system. The ML180UH(X) unit meets the California Nitrogen Oxides (NO_x) 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.

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⚠ IMPORTANT

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 qualified installer, service agency or the gas supplier.

⚠ WARNING



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

⚠ WARNING

Sharp edges. Be careful when servicing unit to avoid sharp edges which may result in personal injury.

SPECIFICATIONS

Gas Heating Performance	Model No. Model No. - Low Nox	ML180UH045P24A	ML180UH045P36A ML180UH045XP36A	ML180UH070P24A	ML180UH070P36A ML180UH070XP36A
	¹ AFUE	80%	80%	80%	80%
	Input - Btuh	44,000	44,000	66,000	66,000
	Output - Btuh	35,200	35,200	52,800	52,800
	Temperature rise range - °F	20 - 55	15 - 45	30 - 60	30 - 60
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0	3.5 / 10.0	3.5 / 10.0
High Static - in. w.g.		0.50	0.50	0.50	0.50
Connections in.	Flue connection - in. round	4	4	4	4
	Gas pipe size IPS	1/2	1/2	1/2	1/2
Indoor Blower	Wheel nom. dia. x width - in.	10 x 7	10 x 8	10 x 7	10 x 8
	Motor output - hp	1/5	1/3	1/5	1/3
	Tons of add-on cooling	2 - 3	2 - 3	1.5 - 2	2 - 3
	Air Volume Range - cfm	345 - 1130	650 - 1670	420 - 1160	785 - 1660
Electrical Data	Voltage	120 volts - 60 hertz - 1 phase			
	Blower motor full load amps	3.1	6.1	3.1	6.1
	Maximum overcurrent protection	15	15	15	15
Shipping Data	lbs. - 1 package	105	110	114	119

SPECIFICATIONS

Gas Heating Performance	Model No. Model No. - Low Nox	ML180UH090P36B	ML180UH090P48B ML180UH090XP48B	ML180UH110P48C
	¹ AFUE	80%	80%	80%
	Input - Btuh	88,000	88,000	110,000
	Output - Btuh	70,400	70,400	88,000
	Temperature rise range - °F	25 - 55	25 - 55	25 - 55
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0	3.5 / 10.0
High Static - in. w.g.		0.50	0.50	0.50
Connections in.	Flue connection - in. round	4	4	4
	Gas pipe size IPS	1/2	1/2	1/2
Indoor Blower	Wheel nom. dia. x width - in.	10 x 9	10 x 10	10 x 10
	Motor output - hp	1/3	1/2	1/2
	Tons of add-on cooling	2 - 3	3 - 4	3 - 4
	Air Volume Range - cfm	680 - 1795	920 - 2160	910 - 2170
Electrical Data	Voltage	120 volts - 60 hertz - 1 phase		
	Blower motor full load amps	6.1	8.2	8.2
	Maximum overcurrent protection	15	15	15
Shipping Data	lbs. - 1 package	131	183	151

SPECIFICATIONS

Gas Heating Performance	Model No. Model No. - Low Nox	ML180UH110P60C ML180UH110XP60C	ML180UH135P60D
	¹ AFUE	80%	80%
	Input - Btuh	110,000	132,000
	Output - Btuh	88,000	105,600
	Temperature rise range - °F	25 - 55	30 - 60
	Gas Manifold Pressure (in. w.g.) Nat. Gas / LPG/Propane	3.5 / 10.0	3.5 / 10.0
High Static - in. w.g.		0.50	0.50
Connections in.	Flue connection - in. round	4	4
	Gas pipe size IPS	1/2	1/2
Indoor Blower	Wheel nom. dia. x width - in.	11-1/2 x 10	11 x 11
	Motor output - hp	1	1
	Tons of add-on cooling	4 - 5	4 - 5
	Air Volume Range - cfm	1355 - 2715	1380 - 2810
Electrical Data	Voltage	120 volts - 60 hertz - 1 phase	
	Blower motor full load amps	10	11.5
	Maximum overcurrent protection	15	15
Shipping Data	lbs. - 1 package	161	174

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

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

BLOWER DATA

ML180UH045P24A PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds							
	High		Medium-High		Medium-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1130	453	900	328	750	261	680	237
0.10	1115	432	885	321	735	255	670	230
0.20	1100	413	870	315	720	249	655	223
0.30	1070	396	855	304	700	241	640	217
0.40	1030	375	830	294	685	234	620	209
0.50	990	356	800	283	655	223	590	200
0.60	930	335	750	261	610	207	535	186
0.70	870	315	705	245	540	193	490	175
0.80	785	285	615	223	455	175	405	158
0.90	615	247	485	196	375	157	345	143

ML180UH070P36A PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds							
	High		Medium-High		Medium-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1660	696	1370	604	1095	495	935	386
0.10	1620	658	1365	568	1115	468	945	374
0.20	1580	621	1355	535	1135	442	960	362
0.30	1520	595	1335	513	1130	423	955	350
0.40	1480	562	1300	478	1100	403	945	335
0.50	1400	520	1270	450	1080	382	925	320
0.60	1340	490	1205	420	1035	358	880	301
0.70	1245	458	1125	393	975	333	835	282
0.80	1160	434	1045	364	915	310	775	262
0.90	1045	393	940	334	830	283	785	268

ML180UH045P36A PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds							
	High		Medium-High		Medium-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1670	711	1335	614	1140	485	925	388
0.10	1620	663	1335	577	1130	470	940	376
0.20	1570	619	1330	543	1115	455	950	366
0.30	1525	598	1315	511	1140	432	950	349
0.40	1470	552	1275	491	1125	413	945	336
0.50	1400	525	1235	455	1085	384	925	317
0.60	1330	486	1185	422	1050	361	885	300
0.70	1225	450	1135	395	995	336	840	283
0.80	1135	418	1010	359	925	315	785	258
0.90	1020	388	930	329	820	278	650	227

ML180UH090P36B PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds							
	High		Medium-High		Medium-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1795	781	1450	606	1195	464	970	390
0.10	1760	730	1435	576	1185	452	970	378
0.20	1725	683	1420	547	1170	440	975	368
0.30	1685	656	1410	525	1170	420	980	356
0.40	1630	625	1370	501	1150	400	955	340
0.50	1535	569	1315	469	1125	391	925	326
0.60	1470	533	1275	440	1085	367	910	309
0.70	1365	490	1185	407	1020	344	840	290
0.80	1255	466	1105	380	935	314	785	266
0.90	1160	430	1000	352	815	285	680	258

ML180UH070P24A PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds					
	High		Medium		Low	
	cfm	Watts	cfm	Watts	cfm	Watts
0.00	1160	450	1005	380	865	309
0.10	1135	439	990	369	845	299
0.20	1115	429	975	358	820	289
0.30	1085	410	955	348	790	279
0.40	1045	389	925	335	775	270
0.50	1015	374	885	321	735	260
0.60	965	358	835	307	700	248
0.70	890	335	780	289	635	232
0.80	810	315	700	268	560	214
0.90	715	289	565	238	420	189

ML180UH090P48B PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds							
	High		Medium-High		Medium-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	2160	873	1825	775	1515	649	1260	544
0.10	2030	804	1780	719	1525	613	1280	518
0.20	1910	740	1740	666	1535	580	1305	493
0.30	1840	698	1705	643	1500	551	1305	474
0.40	1770	664	1635	594	1460	517	1280	445
0.50	1665	625	1560	567	1410	483	1225	420
0.60	1585	595	1470	523	1330	451	1190	391
0.70	1470	561	1365	483	1260	421	1115	368
0.80	1355	514	1230	433	1155	392	1020	338
0.90	1200	471	1120	399	1020	345	920	315

BLOWER DATA

ML180UH110P48C PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds							
	High		Medium-High		Medium-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	2170	980	1845	792	1565	678	1270	564
0.10	2125	919	1820	747	1555	648	1300	540
0.20	2080	862	1790	705	1540	619	1335	516
0.30	2015	807	1745	652	1545	587	1335	498
0.40	1940	748	1695	629	1505	552	1320	470
0.50	1850	716	1635	581	1470	523	1295	449
0.60	1775	679	1575	560	1395	484	1235	417
0.70	1680	637	1470	508	1320	450	1170	387
0.80	1560	592	1350	469	1205	404	1050	345
0.90	1425	546	1190	424	1060	362	910	307

ML180UH110P60C PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Different Blower Speeds															
	Bottom Return Air, Side Return Air with Optional Return Air Base, Return Air from Both Sides or Return Air from Bottom and One Side.								Single Side Return Air – Air volumes in bold require field fabricated transition to accommodate 20 x 25 x 1 in. air filter in order to maintain proper air velocity.							
	High		Medium-High		Medium-Low		Low		High		Medium-High		Medium-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	2575	1391	2270	1050	1845	860	1430	661	2715	1509	2175	1103	1695	858	1410	653
0.10	2520	1359	2250	1034	1860	841	1455	654	2605	1454	2160	1060	1740	848	1430	651
0.20	2465	1329	2230	1018	1870	823	1480	647	2505	1401	2150	1018	1785	838	1450	649
0.30	2385	1307	2180	981	1885	809	1540	646	2435	1349	2115	991	1795	818	1485	638
0.40	2295	1256	2105	942	1865	778	1570	638	2350	1308	2070	965	1805	801	1480	631
0.50	2200	1214	2055	909	1845	762	1570	619	2260	1274	2010	929	1785	775	1480	621
0.60	2130	1186	1985	882	1795	741	1550	604	2175	1228	1955	901	1755	752	1490	611
0.70	2015	1150	1890	848	1720	711	1505	580	2085	1186	1850	853	1710	722	1460	594
0.80	1905	1105	1810	815	1675	687	1470	565	1965	1147	1785	818	1640	689	1425	567
0.90	1795	1054	1710	779	1545	647	1375	533	1830	1094	1700	794	1555	662	1355	545

ML180UH135P60D PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Different Blower Speeds															
	Bottom Return Air, Side Return Air with Optional Return Air Base, Return Air from Both Sides or Return Air from Bottom and One Side.								Single Side Return Air – Air volumes in bold require field fabricated transition to accommodate 20 x 25 x 1 in. air filter in order to maintain proper air velocity.							
	High		Medium-High		Medium-Low		Low		High		Medium-High		Medium-Low		Low	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.00	2785	1492	2205	1083	1665	840	1345	632	2810	1528	2185	1100	1705	835	1260	622
0.10	2750	1441	2220	1056	1725	825	1395	625	2725	1463	2180	1075	1715	827	1320	624
0.20	2720	1392	2235	1029	1785	810	1445	618	2640	1400	2180	1051	1720	819	1380	626
0.30	2605	1362	2220	1002	1820	800	1460	623	2575	1374	2165	1005	1790	803	1420	622
0.40	2495	1312	2185	968	1845	779	1485	616	2495	1343	2145	988	1775	791	1450	617
0.50	2420	1275	2135	939	1825	767	1505	605	2405	1292	2105	948	1780	777	1470	610
0.60	2335	1234	2080	909	1825	753	1495	593	2305	1257	2045	914	1775	753	1480	593
0.70	2220	1190	1995	864	1760	716	1475	576	2215	1214	1970	884	1740	727	1455	583
0.80	2120	1157	1890	835	1680	686	1435	558	2110	1170	1890	851	1675	699	1430	565
0.90	1985	1102	1790	794	1605	656	1390	536	1985	1122	1790	811	1600	667	1380	543

ML180UH(X) PARTS ARRANGEMENT

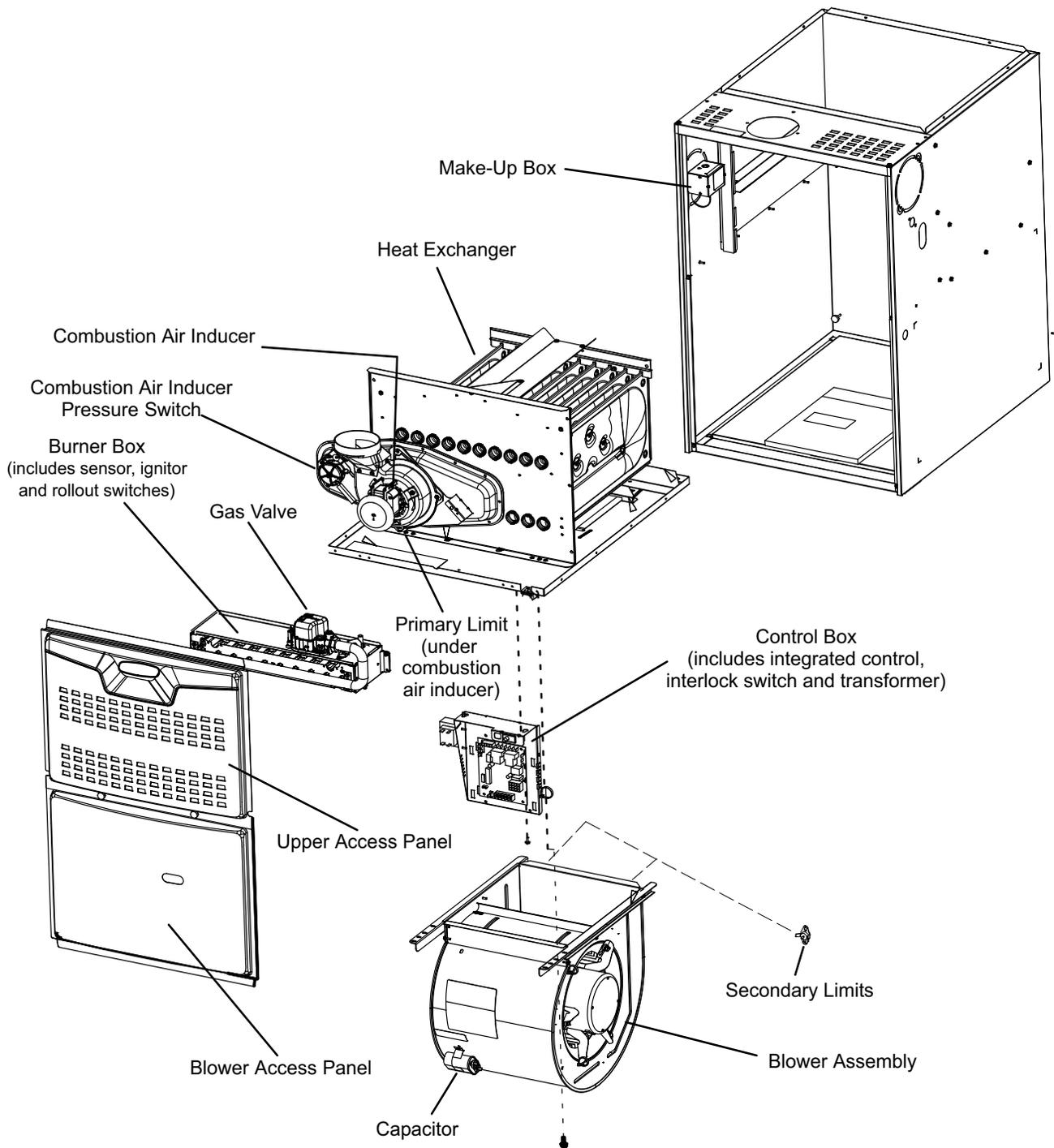


FIGURE 1

I-UNIT COMPONENTS

ML180UH(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.

⚠ CAUTION



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

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.

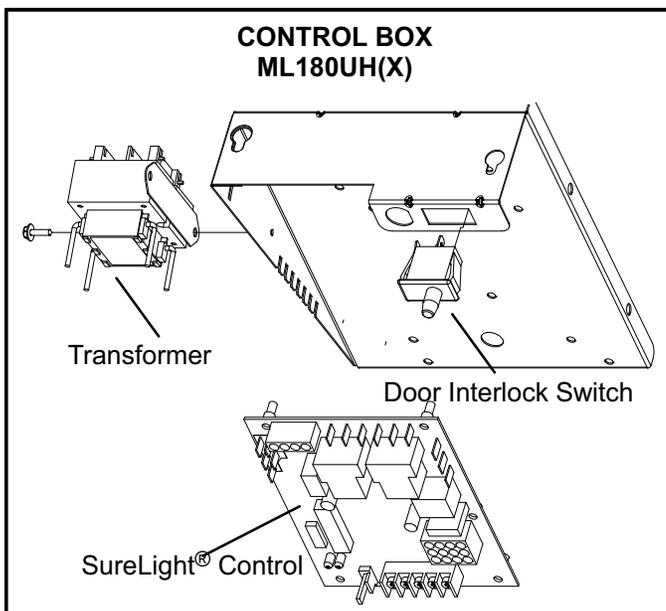


FIGURE 2

3. Integrated Control (A92)

⚠ WARNING

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.

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 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 two LED lights (AN1 red and AN2 green) for troubleshooting and two accessory terminals rated at (1) one amp. The integrated control also features a (3) amp fuse for overcurrent protection. 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. The integrated control continuously monitors line voltage and maintains the ignitor power at a consistent level to provide proper lighting and maximum ignitor life.

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	Not Used
3	24V Line
4	Not Used
5	Rollout Switch Out
6	24V Neutral
7	High Limit Input
8	Ground
9	Gas Valve Common
10	Prove Switch In
11	Rollout Switch In
12	Gas Valve Out

TABLE 3

TERMINAL DESIGNATIONS	
120 Volt Hot	
COOL	Cool Speed
HEAT	Heat Speed / Continuous Fan
PARK	Park
PARK	Park
EAC	Indoor Air Quality Accessories
XFMR	Transformer
LINE	Line
HUM	Humidifier
120 Volt Neutral	
CIRC	Blower
XMFR	Transformer
HUM	Humidifier
LINE	Line
Flame FS	Flame Signal

TABLE 4

The integrated control is equipped with two LED lights for troubleshooting. The diagnostic codes are listed below in table 4.

DIAGNOSTIC CODES		
Make sure to Identify LED'S Correctly.		
LED #1 (Red)	LED #2 (Green)	DESCRIPTION
SIMULTANEOUS SLOW FLASH	SIMULTANEOUS SLOW FLASH	Power on - Normal operation. Also signaled during cooling and continuous fan.
SIMULTANEOUS FAST FLASH	SIMULTANEOUS FAST FLASH	Normal operation - signaled when heating demand initiated at thermostat.
SLOW FLASH	ON	Primary or secondary limit switch open. Limit must close within 3 minutes or unit goes into 1 hour Watchguard.
OFF	SLOW FLASH	Pressure switch open. OR: Blocked exhaust vent; OR: Pressure switch closed prior to activation of combustion air inducer.
ALTERNATING SLOW FLASH	ALTERNATING SLOW FLASH	Watchguard 1 hour - burners failed to ignite or lost flame 5 times during single heating demand.
SLOW FLASH	OFF	Flame sensed without gas valve energized.
ON	SLOW FLASH	Rollout switch open. OR: 12-pin connector improperly attached.
ON ON OFF	ON OFF ON	Integrated control failure or control wired incorrectly.
FAST FLASH	SLOW FLASH	Main power polarity reversed. Switch line and neutral.
SLOW FLASH	FAST FLASH	Low flame signal. Measures below 1.5 microamps. Check voltage to sensor.
ALTERNATING FAST FLASH	ALTERNATING FAST FLASH	Improper main ground. OR: Line voltage below 90 volts.

NOTE - Slow flash rate equals 1 Hz (one flash per second). Fast flash rate equals 3 Hz (three flashes per second). Drop out flame signal = 0.4 amps..

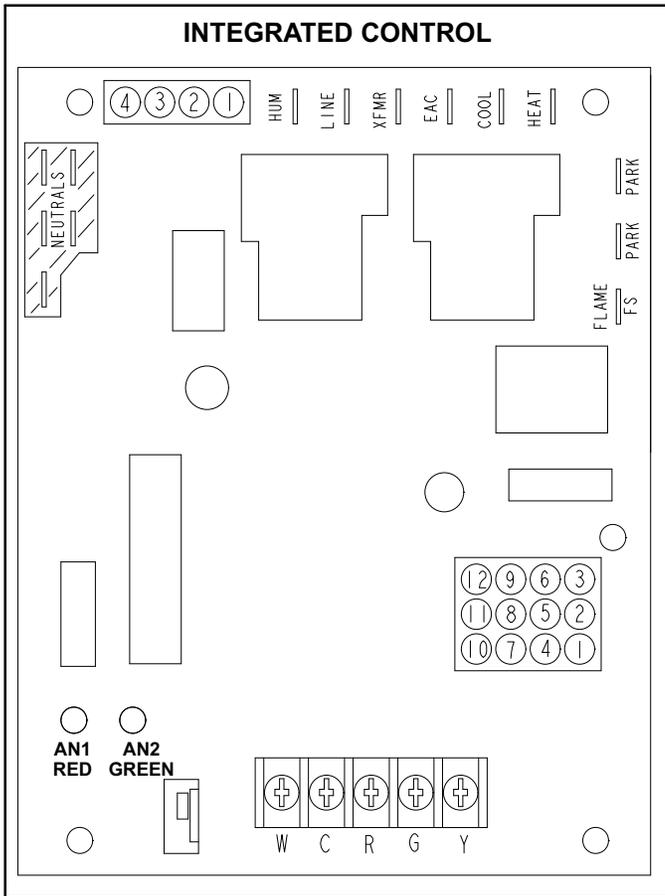


FIGURE 3

Electronic Ignition

On a call for heat the integrated control monitors the combustion air inducer pressure switch. The control board will not begin the heating cycle if the pressure switch is closed (by-passed). 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-

tal 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.

The integrated control has an added feature of ignitor power regulation to maintain consistent lighting and longer ignitor life under all line voltage conditions.

Fan Time Control

Heating Fan On Time

The fan on time of 45 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 4.

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.

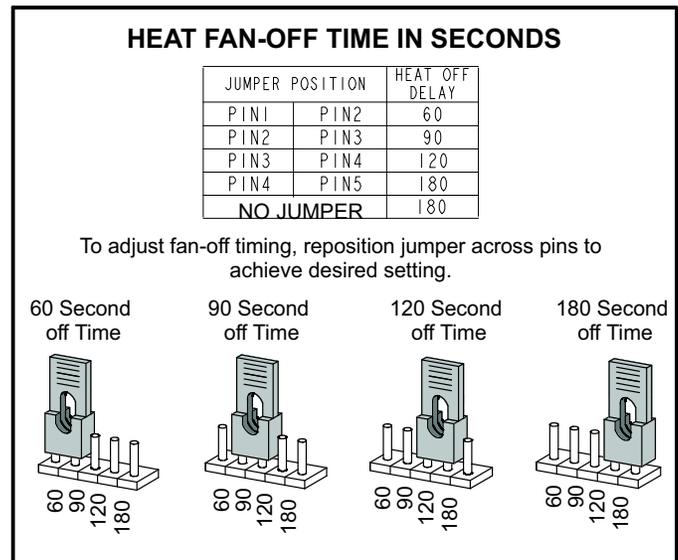


FIGURE 4

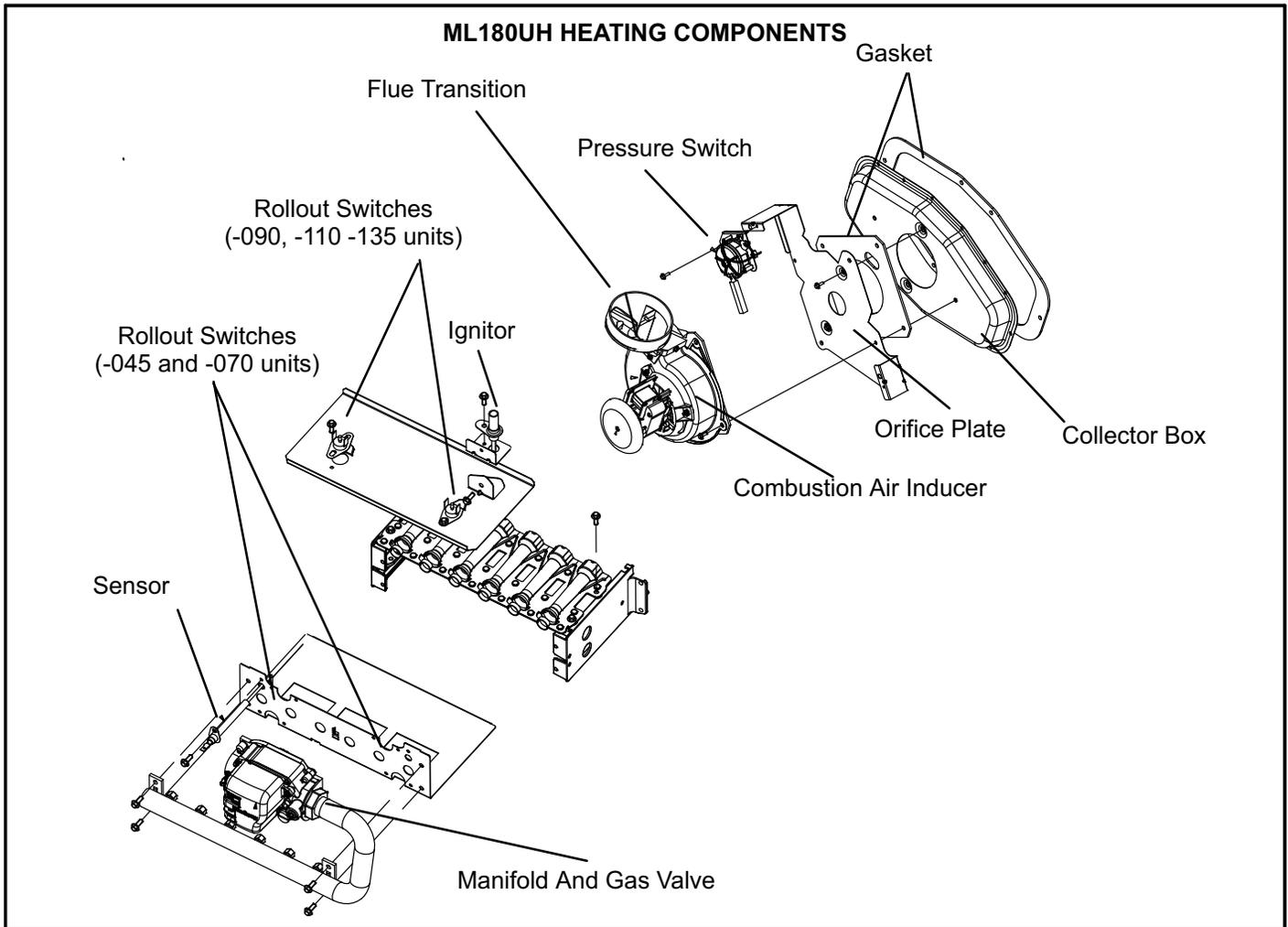


FIGURE 5

4. 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 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.

5. Flame Rollout Switches (Figure 5)

Flame rollout switch 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, 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 ML180UH(X) 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®.

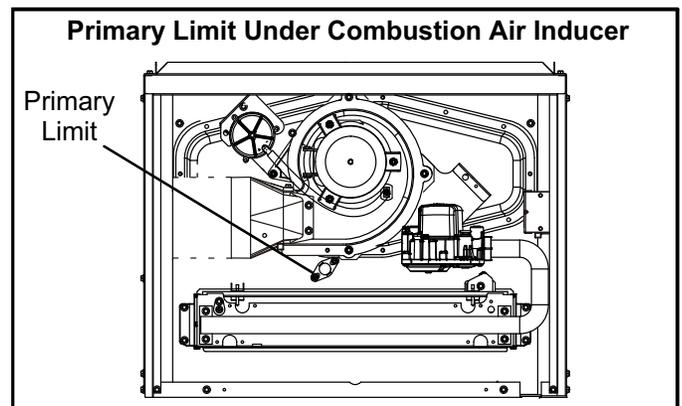


FIGURE 6

7. Ignitor (Figure 5)

The nitride ignitor used on ML180UH units is made from a proprietary ceramic material. Ignitor longevity is enhanced by controlling the voltage to the ignitor. To check ignitor, measure its resistance and voltage. A value of 25 to 47 ohms indicates a good ignitor. Voltage to the ignitor should be 95 VAC.

See figure 7 for resistance, and voltage check.

NOTE - The ML180UH(X) furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.

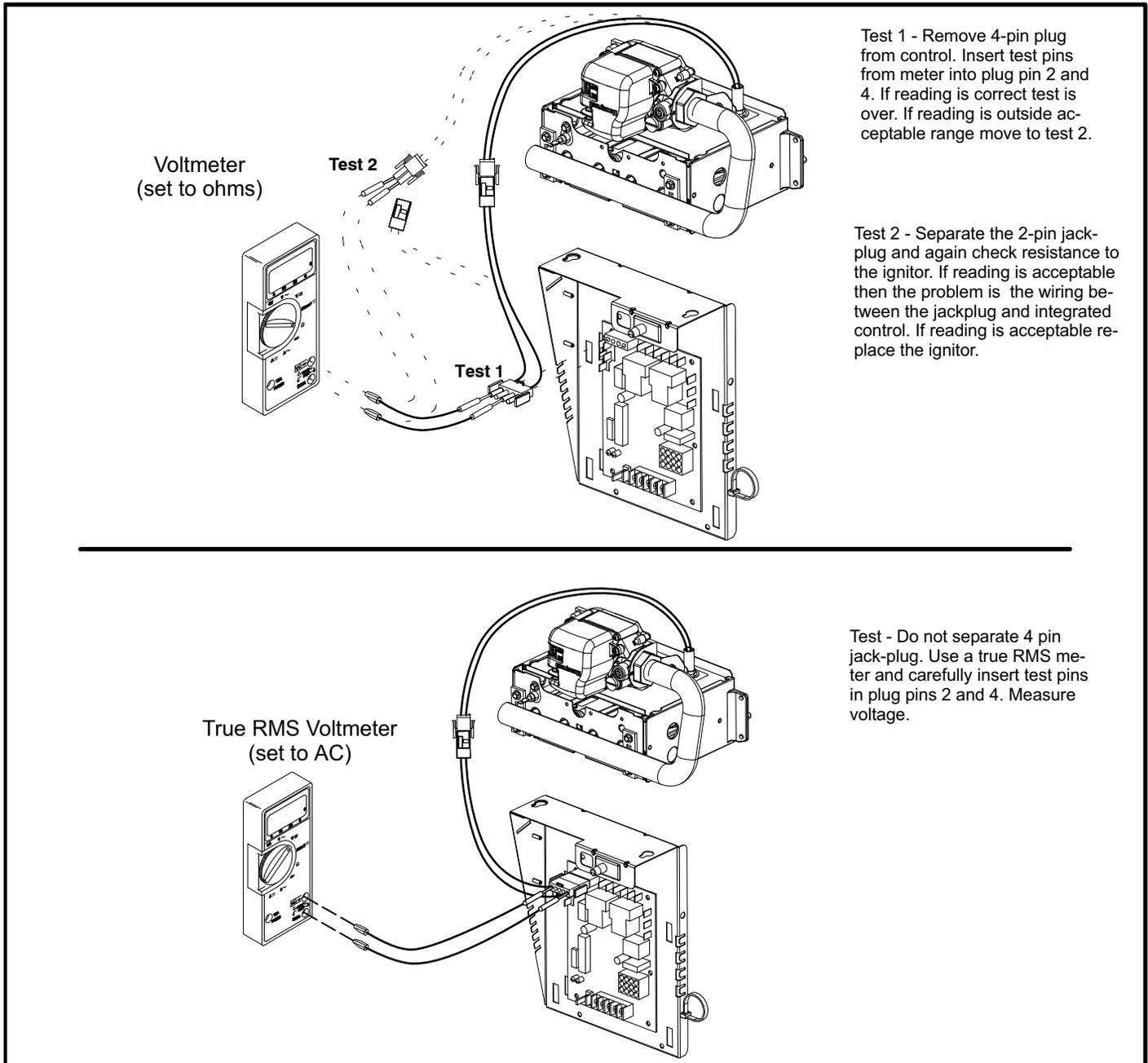


FIGURE 7

8. Gas Valve (Figure 5)

The ML180UH(X) uses 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 ML180UH(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 connected to the combustion air inducer orifice plate is used to prove inducer operation. The combustion air inducer orifice will be different for each model. See table 5 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 proving switch opens, the integrated control (A92) immediately de-energizes the gas valve to prevent burner operation.

TABLE 5

ML180UH(X) Unit	C.A.I. Orifice Size
045P24A, 045P36A	1.045"
070P24A, 070P36A	1.316"
090P36B, 090P48B	1.531"
110P48C, 110P60C	1.690"
135P60D	1.940"

10. Combustion Air Inducer Pressure Switch (S18)

ML180UH(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 6. 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 6

ML180UH(X)	Set Point
045P24A, 045P36A	-0.60
070P24A, 070P36A	-0.68
090P36B, 090P48B	-0.65
110P48C, 119P60C	-0.68
135P60D	-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 by-passed for any reason. If switch is closed or by-passed, the integrated control will not initiate ignition at start up.

Troubleshooting

See figure 8 for measuring operating pressures under various conditions and checking resistance in the pressure switch. Record pressures under various conditions in table 7.

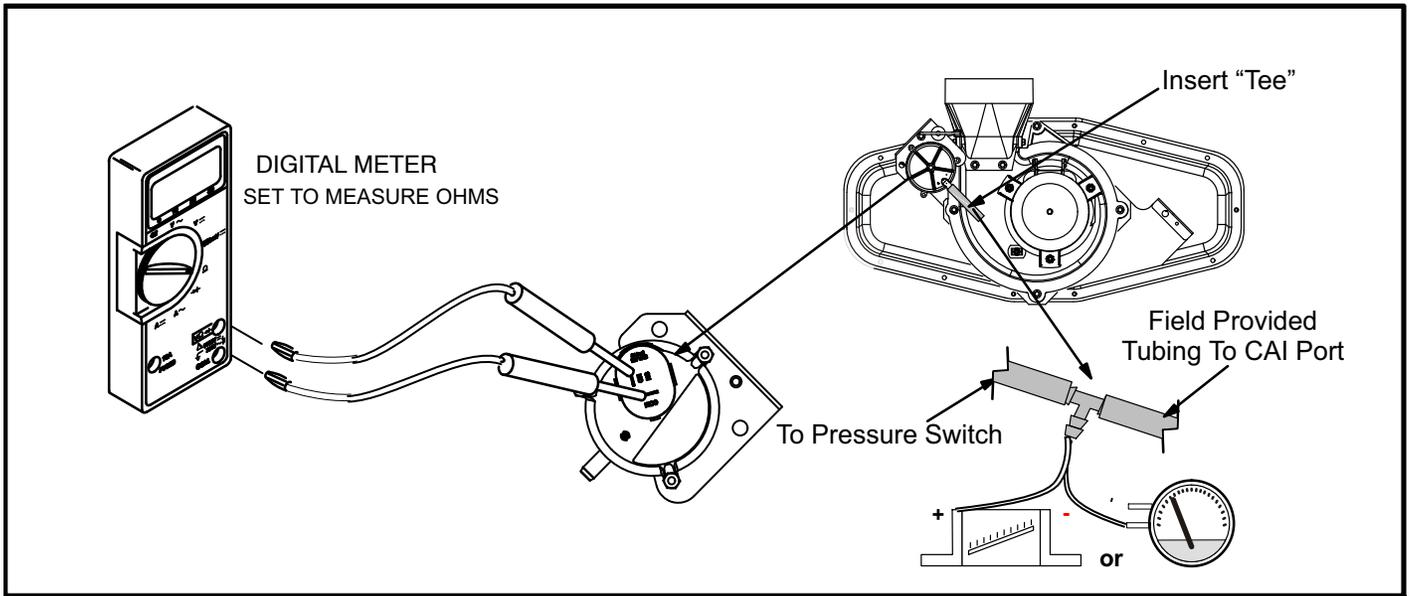


FIGURE 8

TABLE 7

Unit Input	CAI / Burner Condition									
	CAI Off	Burners Off	CAI On	Burners Off	CAI On	Burners On	CAI On	Burners Off	CAI Off	Burners Off
045										
070										
090										
110										
135										

Multiple Venting

The ML180UH(X) furnace can vent in multiple positions. See figure 9.

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.

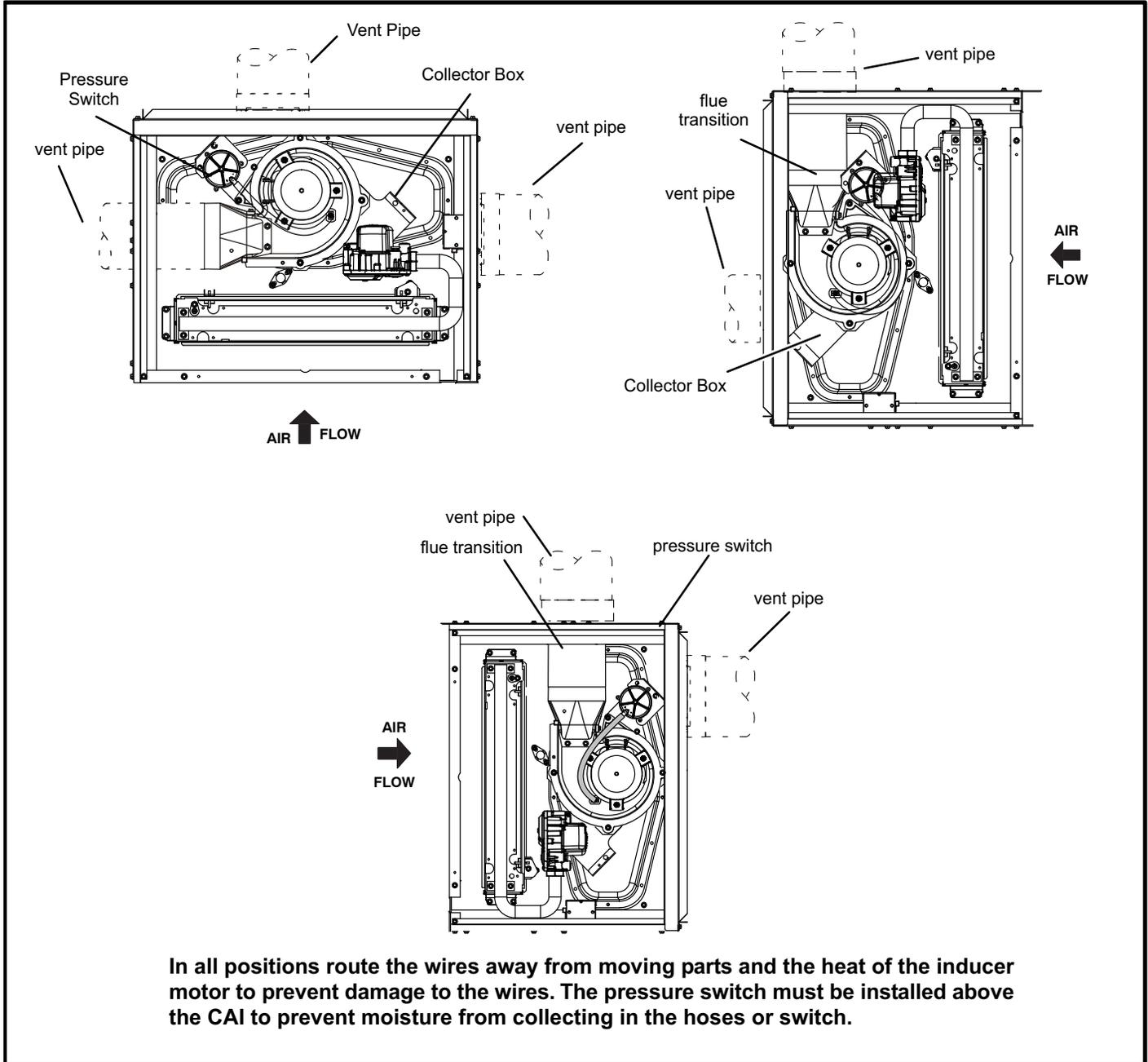


FIGURE 9

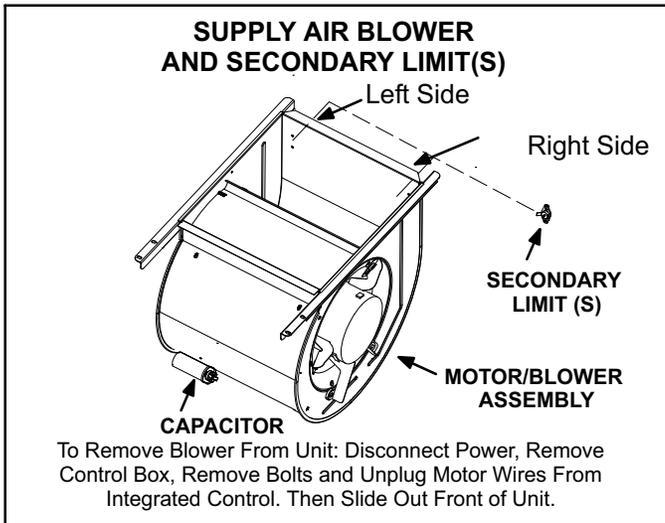


FIGURE 10

11. Blower Motors and Capacitors

All ML180UH(X) units use direct drive blower motors. All motors are 120V permanent split capacitor motors to ensure maximum efficiency. Ratings for capacitors will be on motor nameplate. 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 11. When replacing the indoor blower motor the set screw must be aligned and tightened with the motor shaft as shown in figure 12.

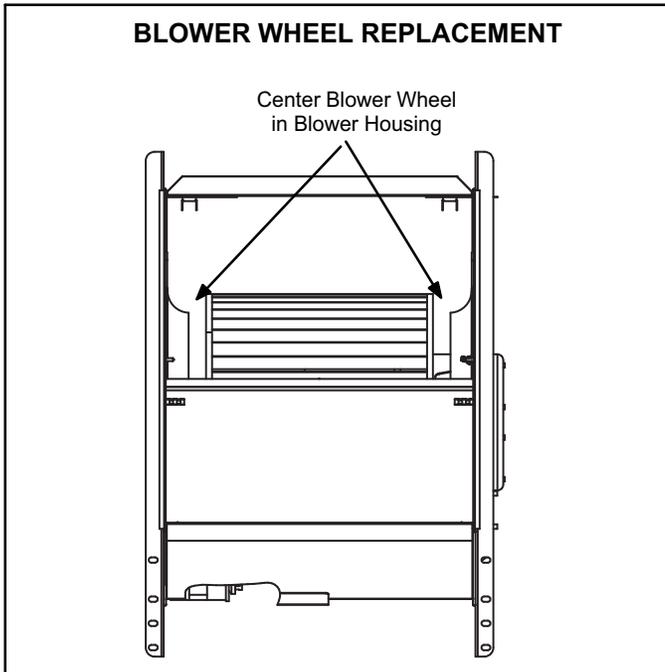


FIGURE 11

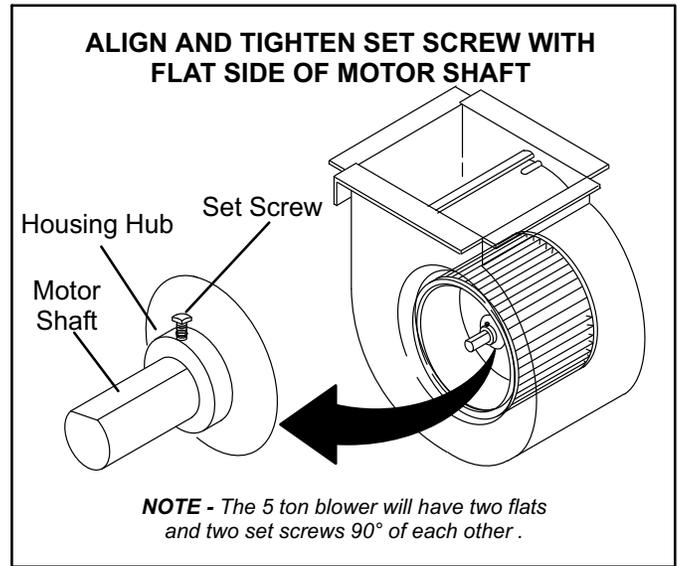


FIGURE 12

12. Secondary Limit Controls

The secondary limit is located in the blower compartment in the back side of the blower housing. See figure 10. When excess heat is sensed in the blower compartment, the limit will open. If the limit is open, the furnace control energizes the supply air blower and closes the gas valve. The limit automatically resets when unit temperature returns to normal. The secondary limit cannot be adjusted.

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.

ML180UH(X) units are equipped with a hot surface ignition system. Do not attempt to light manually.

Gas Valve Operation

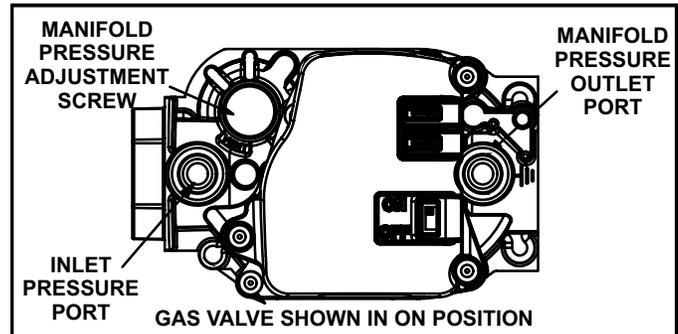


FIGURE 13

- 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 13.
- 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 13.
- 9 - Replace the upper access panel.
- 10- Turn on all electrical power to to the unit.
- 11- Set the thermostat to desired setting.

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

- 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 13.
- 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 leak into combustion chamber. Turn off power to unit. All access panels and covers must be in place and secured.

IV-HEATING SYSTEM SERVICE CHECKS

A- C.S.A. Certification

All units are C.S.A. design certified without modifications. Refer to the ML180UH(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 14. 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.

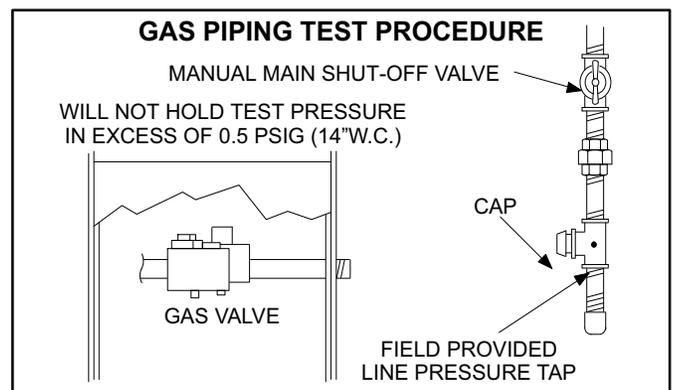


FIGURE 14

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 8

GAS METER CLOCKING CHART				
ML180UH Unit	Seconds for One Revolution			
	Natural		LP	
	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 8 below. If manifold pressure matches table 10 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- Static, Dynamic and Manifold Pressure Static and Dynamic Pressure Measurement

A threaded plug on the inlet side of the gas valve provides access to the line pressure tap. Remove the threaded plug, install a field-provided barbed fitting and connect a manometer to measure line pressure.

Static and Dynamic Pressure:

Take a reading without the unit operating and record below. This is the static pressure. Fire the unit and after stabilized, take a second reading. This is the dynamic pressure. See table 10 for proper line pressure. There should not be more than 0.5"W.C. between the readings. Replace the threaded plug after measurements have been taken.

Static pressure
(line pressure *without* unit operating) _____
Dynamic pressure
(line pressure *with* unit operating) - _____
Pressure difference
(must be less than 0.5" difference) _____

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 10.

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 50 ppm.

TABLE 9

ML180UH Unit	CO ₂ % For Nat	CO ₂ % For LP
045	7.2 - 7.8	7.5 - 9.0
070		
090		
110		
135		
The maximum carbon monoxide reading is 50 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 10 for manifold pressure and table 11 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 10
Manifold Pressure Settings at all Altitudes

Model Input Size	Gas	0-2000 ft	2105-4500 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	10.5	10.0	10.0	3.5	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	3.5	11.0	13.0
090	Nat	3.5	3.2	2.7	3.5	4.5	13.0
	LP/propane	10.0	10	9.6	3.5	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	3.5	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	3.5	11.0	13.0

TABLE 11
Pressure Switch and Gas Conversion Kits at all Altitudes

Model Input Size	High Altitude Pressure Switch Kit			High Altitude Natural Gas Burner Orifice Kit	Natural Gas to LP/Propane Burner Orifice Kit		LP/Propane to Natural Gas Burner 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	No Change	No Change	74W89	73W37	70W89	76W15	73W81
070		74W60	74W89				
090		74W60	74W89				
110		74W65	74W60				
135		74W60	74W89				

NOTE - A natural to LP./Propane gas changeover kit is necessary to convert this unit. Refer to the changeover kit installation instruction for the conversion procedure.

H- Flame Signal

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 15 and table 12 for flame signal check.

- 1 - Set the meter to the DC amps scale.
- 2 - Turn off supply voltage to control.

- 3 - Disconnect integrated control flame sensor wire from the flame sensor.
- 4 - Connect (-) lead to flame sensor.
- 5 - Connect (+) lead to the ignition control sensor wire.
- 6 - Turn supply voltage on and close thermostat contacts to cycle system.
- 7 - When main burners are in operation for two minutes, take reading.

TABLE 12

Flame Signal in Microamps		
Normal	Low	Drop Out
≥ 1.5	0.5 - 1.4	≤ 0.4

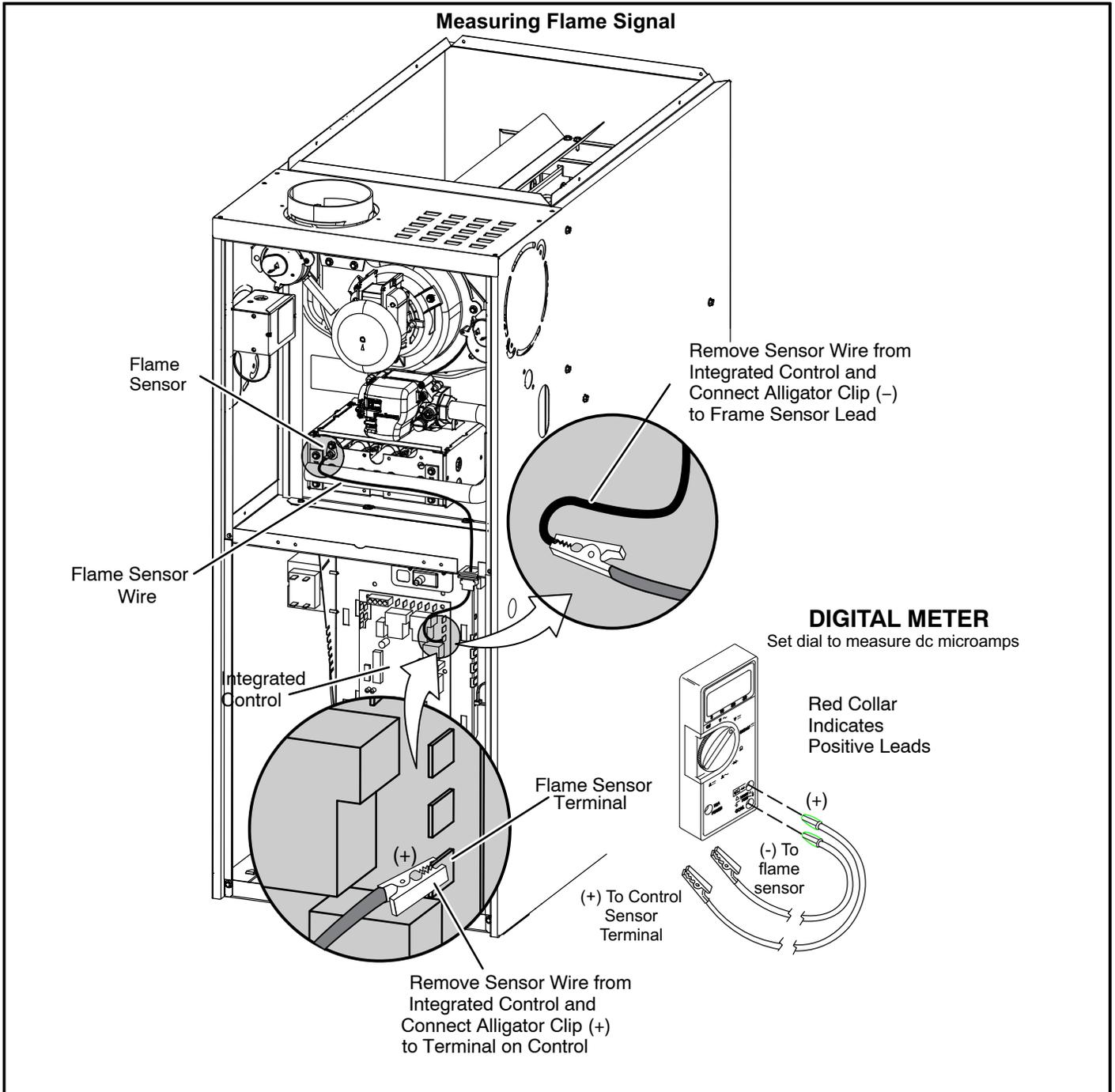


FIGURE 15

I- Proper Ground and Voltage

A poorly grounded furnace can contribute to premature ignitor failure. 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 16. 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 1, 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 17. This voltage should be in the range of 97 to 132 Vac

TABLE 13

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

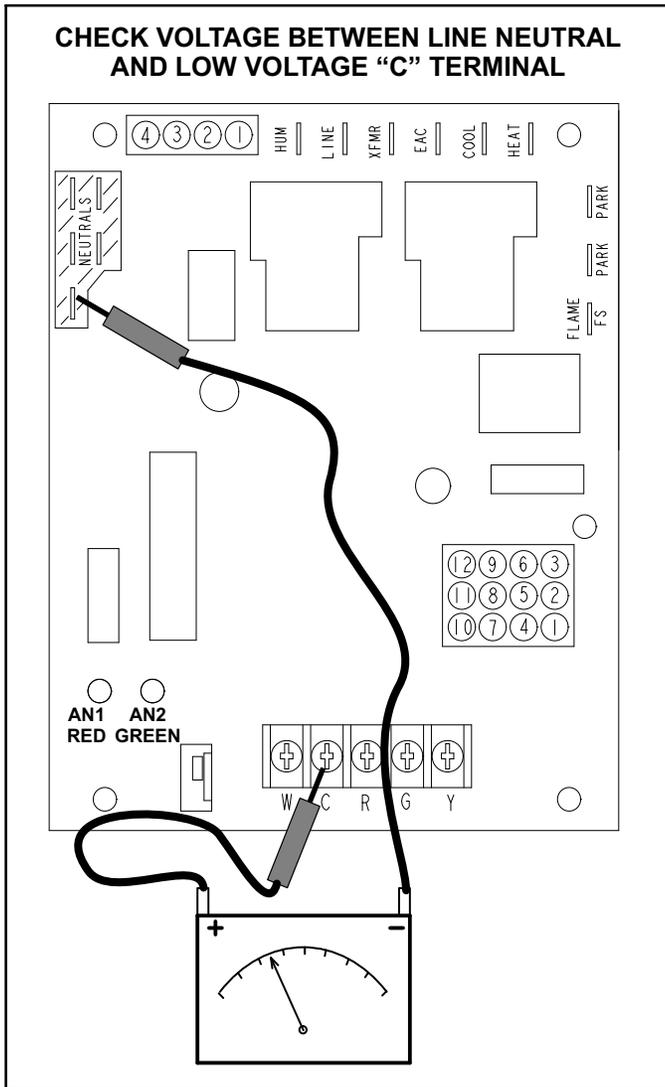


FIGURE 16

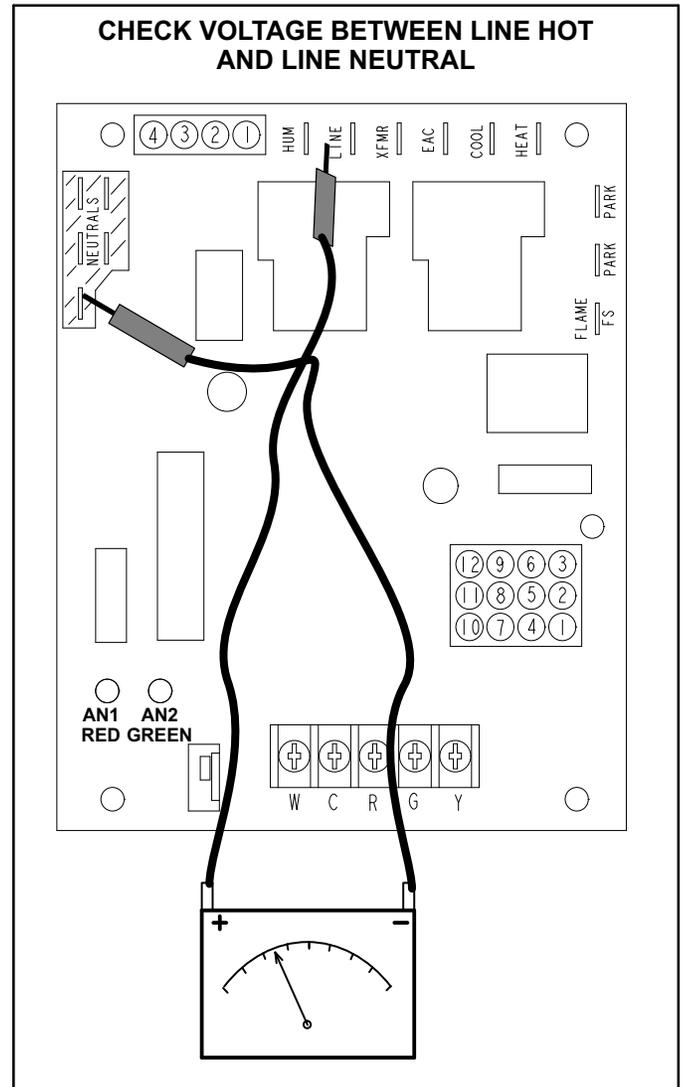


FIGURE 17

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 18)

Temperature rise for ML180UH(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.

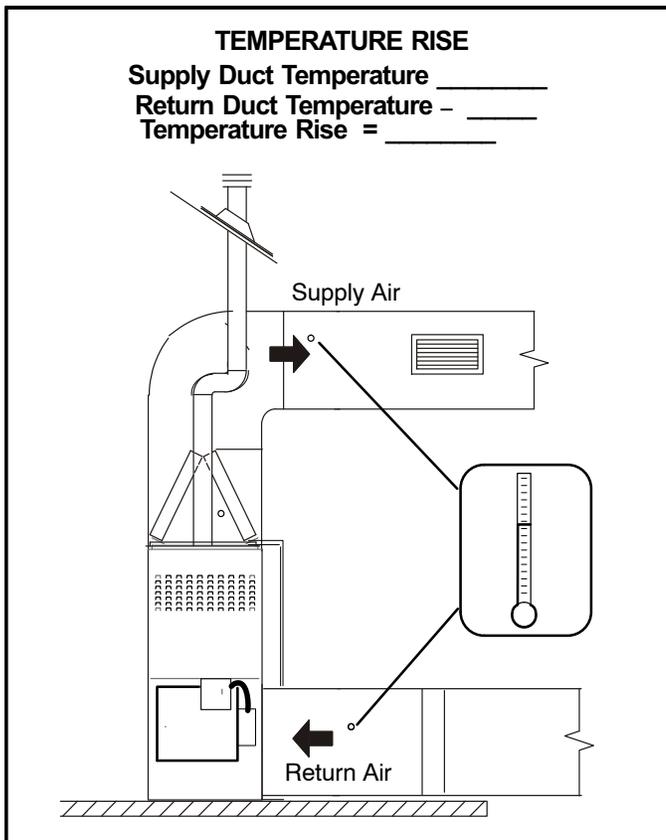


FIGURE 18

C-External Static Pressure

- 1 - Tap locations shown in figure 19.
- 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 perma-gum. 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.

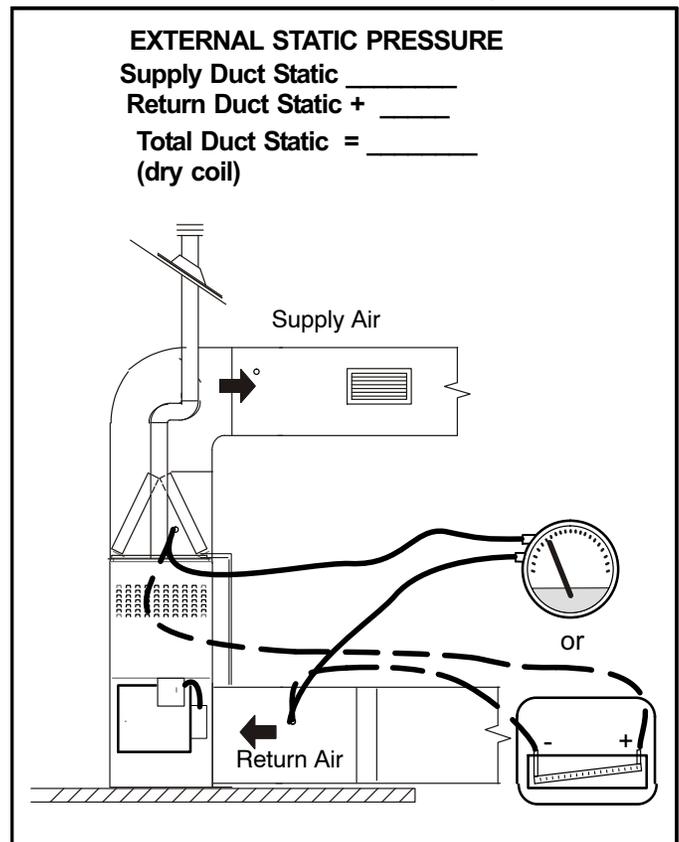


FIGURE 20

D-Blower Speed Taps

Blower speed tap changes are made on the integrated control. See figure 3. The heating tap is connected to the "HEAT" terminal and the cooling tap is connected to the "COOL" terminal. On all units the continuous blower tap is the same as the heating tap and unused taps must be secured on two dummy terminals labeled "PARK". To change out existing speed tap, turn off power and switch out speed tap with tap connected to "PARK". See blower speed tap table on unit diagram for motor tap colors for each speed.

VI-MAINTENANCE

A-Preliminary and Seasonal Checks

- 1 - Inspect electrical wiring, both field and factory installed for loose connections. Tighten as required.
- 2 - Check voltage at disconnect switch. Voltage must be within range listed on the nameplate. If not, consult the power company and have voltage condition corrected before starting unit.

At the beginning of each heating season, the system should be checked as follows:

B-Filters

Filters should be inspected monthly. Clean or replace the filters when necessary to ensure that the furnace operates properly. Replacement filters must be rated for high velocity airflow. See table 14.

TABLE 14

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)

Cleaning the Heat Exchanger and Burners

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

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

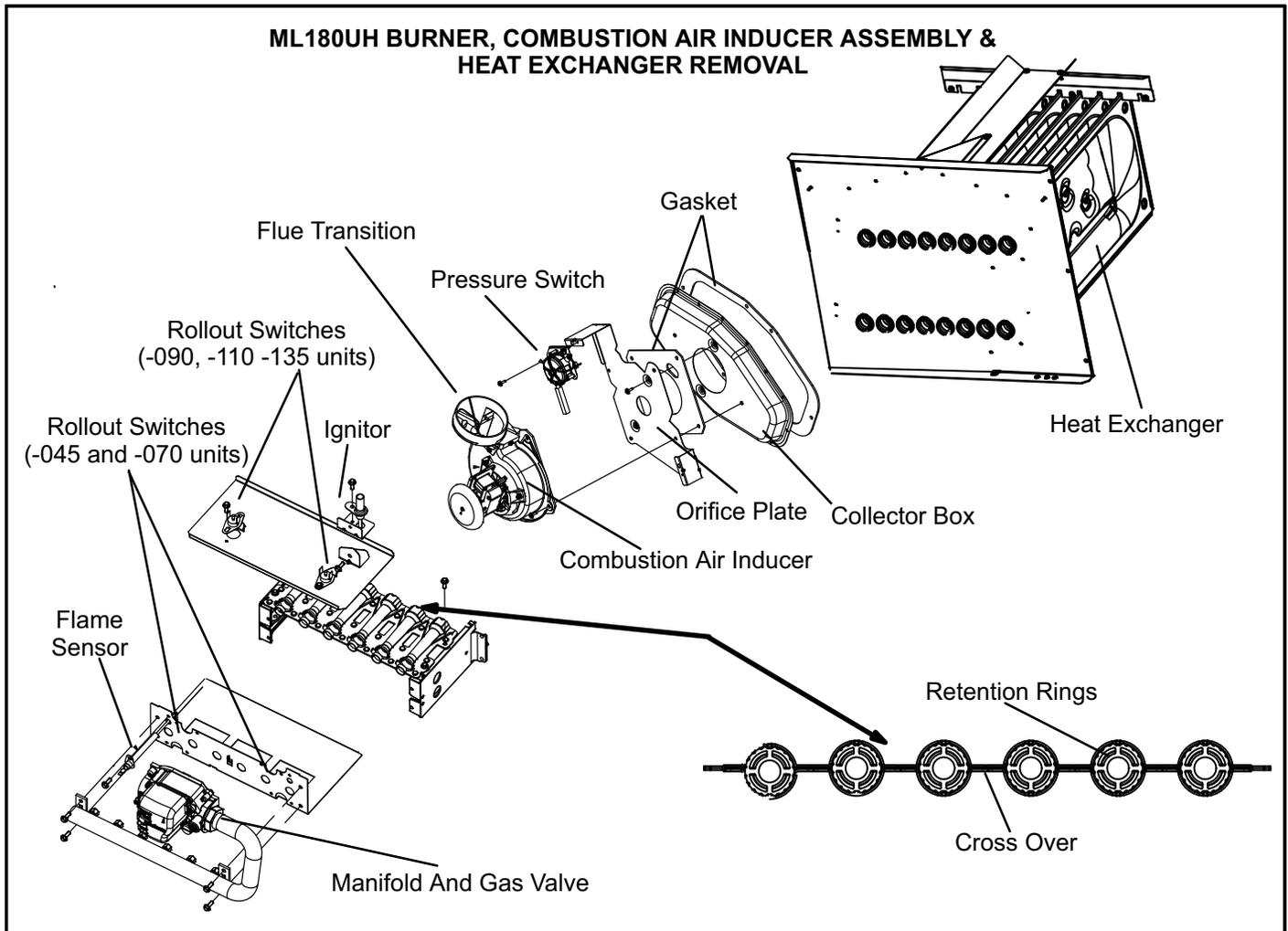


FIGURE 21

- 7 - Remove screws securing burner box and remove burner box.
- 8 - **NOx units only** - Remove screw securing NOx insert. Remove NOx insert. See figure 22.
- 9 - Remove screws from both sides, top and bottom of vestibule panel.
- 10 - Remove heat exchanger. It may be necessary to spread cabinet side to allow more room. If so, remove five screws from the left side or right side of cabinet. See figure 23.
- 11 - Backwash using steam. Begin from the burner opening on each clam. Steam must not exceed 275°F.
- 12 - To clean burners, run a vacuum cleaner with a soft brush attachment over the face of burners. Visually inspect inside the burners and crossovers for any blockage caused by foreign matter. Remove any blockage. Figure 21 shows burner detail.
- 13 - To clean the combustion air inducer visually inspect and using a wire brush clean where necessary. Use compressed air to clean off debris and any rust.
- 14 - Reinstall heat exchanger in vestibule. (Replace the five screws in the cabinet from step 10 if removed).
- 15 - **NOx units only** - Replace NOx inserts.
- 16 - Reinstall collector box and combustion air assembly. Reinstall all screws to the collector box and combustion air inducer. Failure to replace all screws may cause leaks. Inspect gaskets for any damage and replace if necessary.
- 17 - Reinstall burner box, manifold assembly and burner box cover.
- 18 - Reconnect all wires.
- 19 - Reconnect top cap and vent pipe to combustion air inducer outlet.
- 20 - Reconnect gas supply piping.
- 21 - Turn on power and gas supply to unit.
- 22 - Set thermostat and check for proper operation.
- 23 - Check all piping connections, factory and field, for gas leaks. Use a leak detecting solution or other preferred means.

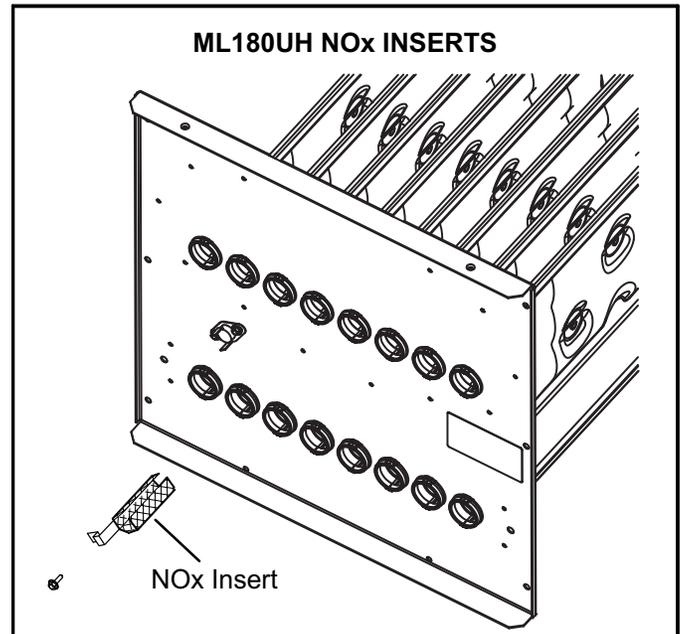


FIGURE 22

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

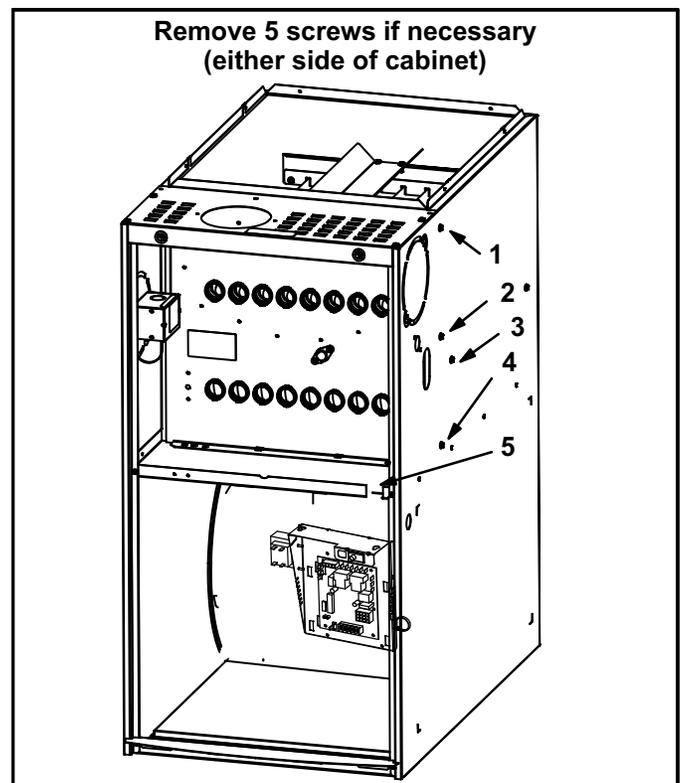


FIGURE 23

C-Supply Air Blower

- 1 - Check and clean blower wheel.
- 2 - Motors used on the Lennox ML180UH(X) series units are permanently lubricated and need no further lubrication.

D-Flue and Chimney

Flue must conform to local codes. In the absence of local codes, flue must meet the National Fuel Gas Code ANSI-Z223.1 venting requirements. Flue pipe deteriorates from the inside out and must be disconnected in order to check thoroughly. Check flue pipe, chimney and all connections for tightness and to make sure there is no blockage or leaks.

E-Electrical

- 1 - Check all wiring for loose connections.
- 2 - Check for the correct voltage at the furnace (furnace operating). Correct voltage is 120VAC \pm 10%

- 3 - Check amp-draw on the blower motor with inner blower access panel in place. See figure 24.
Motor Nameplate _____ Actual _____

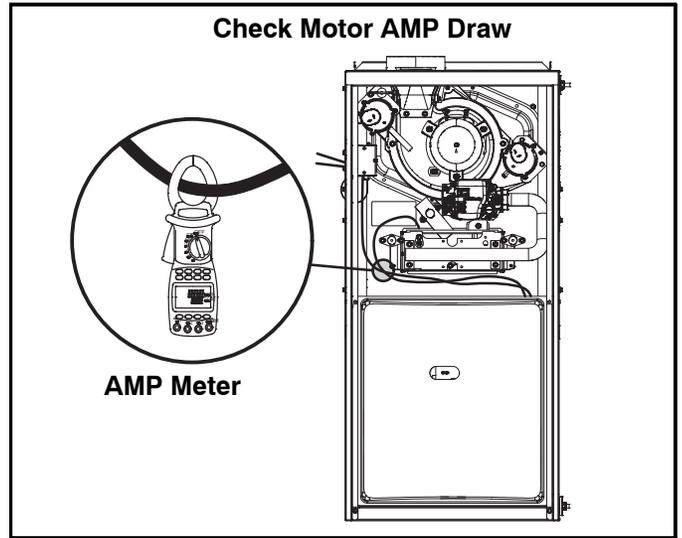
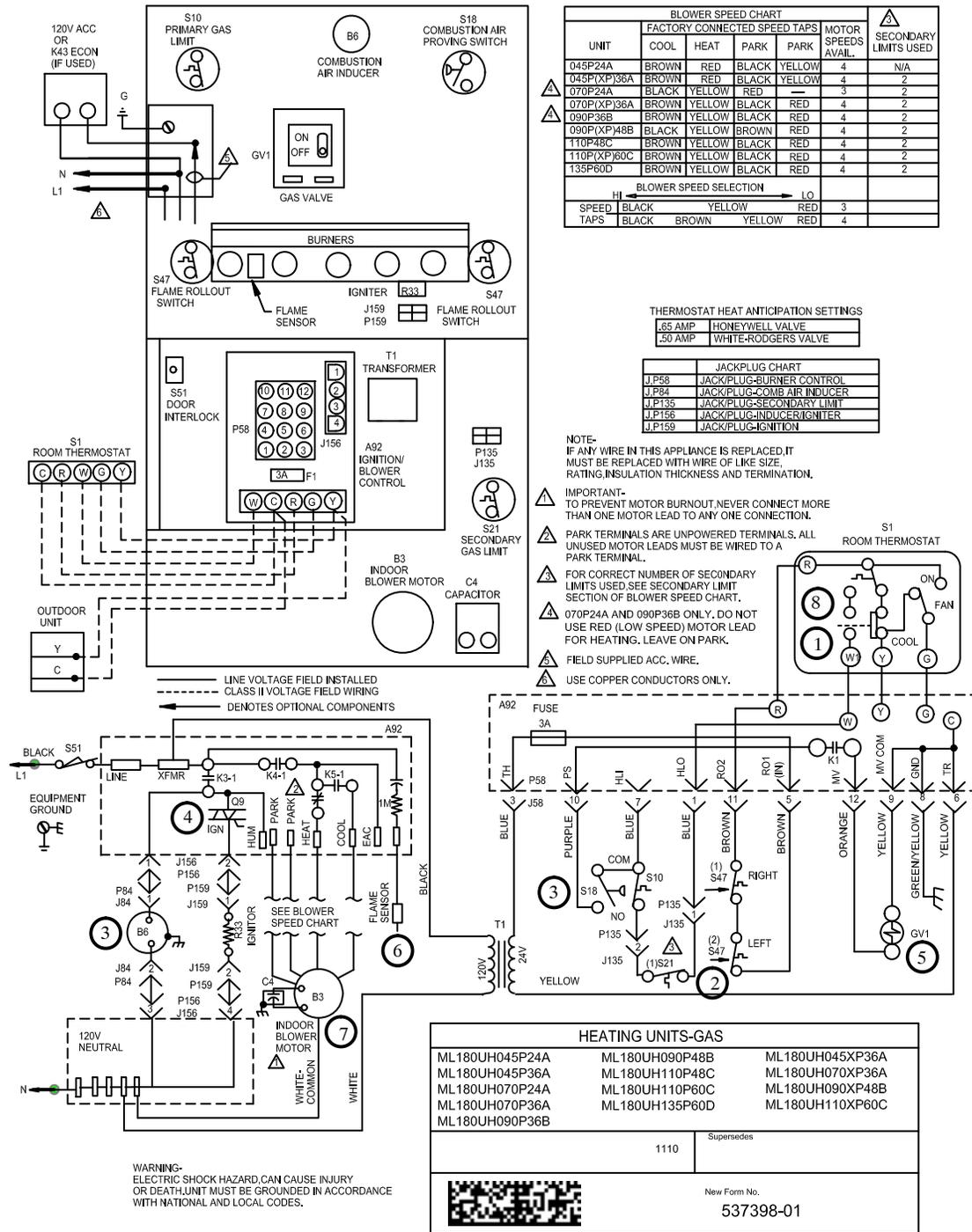


FIGURE 24

VII- Wiring and Sequence of Operation

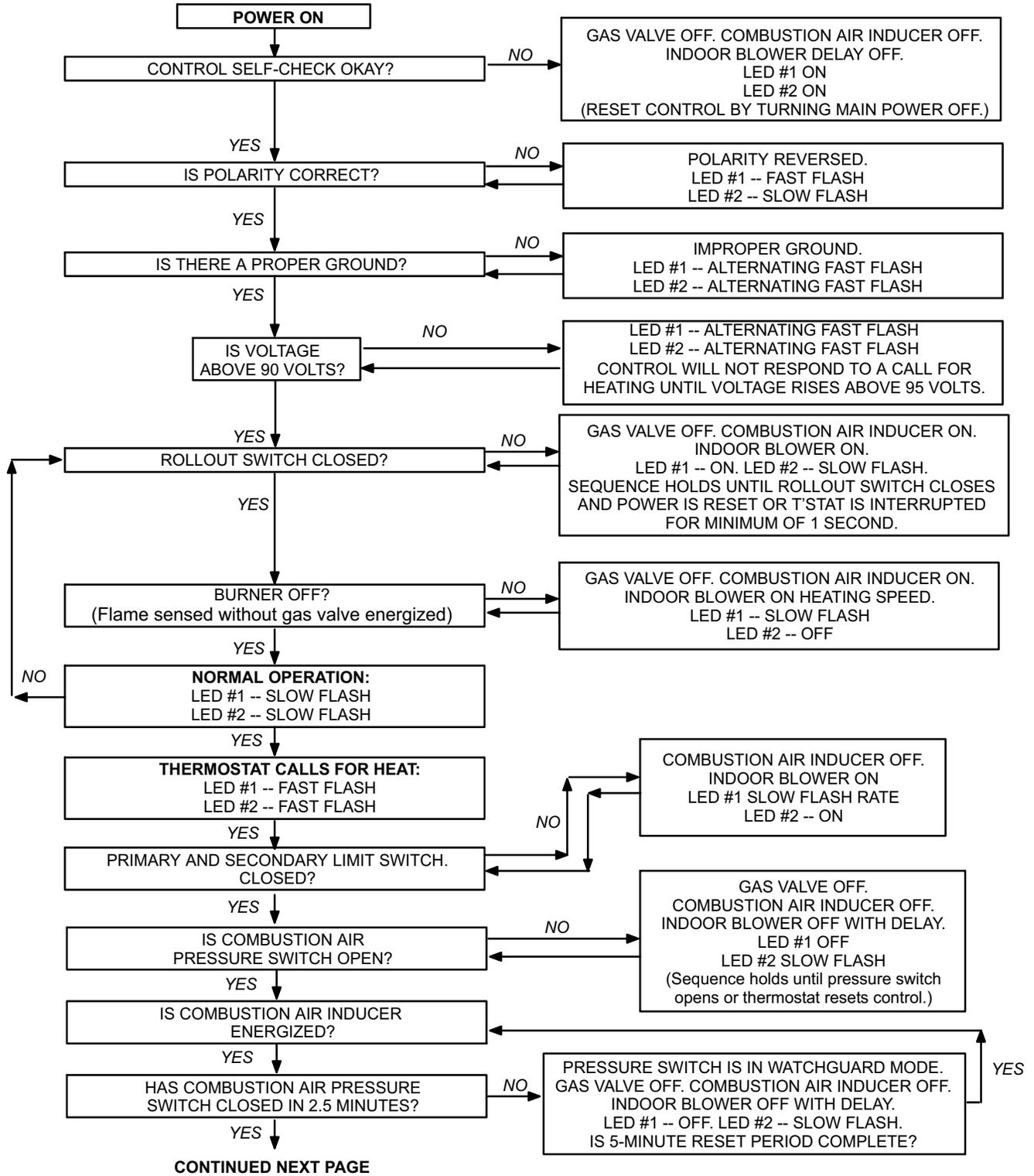


- When there is a call for heat, W1 of the thermostat energizes W of the furnace control with 24VAC.
- Integrated control runs a self-check. S10 primary limit, S47 rollout switch and S21 secondary limit contacts are found to be closed. Call for heat can continue.
- Integrated control (A92) energizes combustion air inducer B6. Combustion air inducer runs until S18 combustion air pressure switch closes. Once S18 closes, a 15-second pre-purge follows.
- Integrated control (A92) energizes igniter. A 20-second warm-up period begins.
- Gas valve opens for a 4-second trial for ignition
- Flame is sensed, gas valve remains open for the heat call.
- After 45-second delay, integrated control (A92) energizes indoor blower B3.
- When heat demand is satisfied, W1 of the indoor thermostat de-energizes W of the ignition control which de-energizes the gas valve. Combustion air inducer B6 continues a 5-second post-purge period, and indoor blower B3 completes a selected OFF time delay.

HEATING SEQUENCE OF OPERATION

NORMAL HEATING MODE

ABNORMAL HEATING MODE

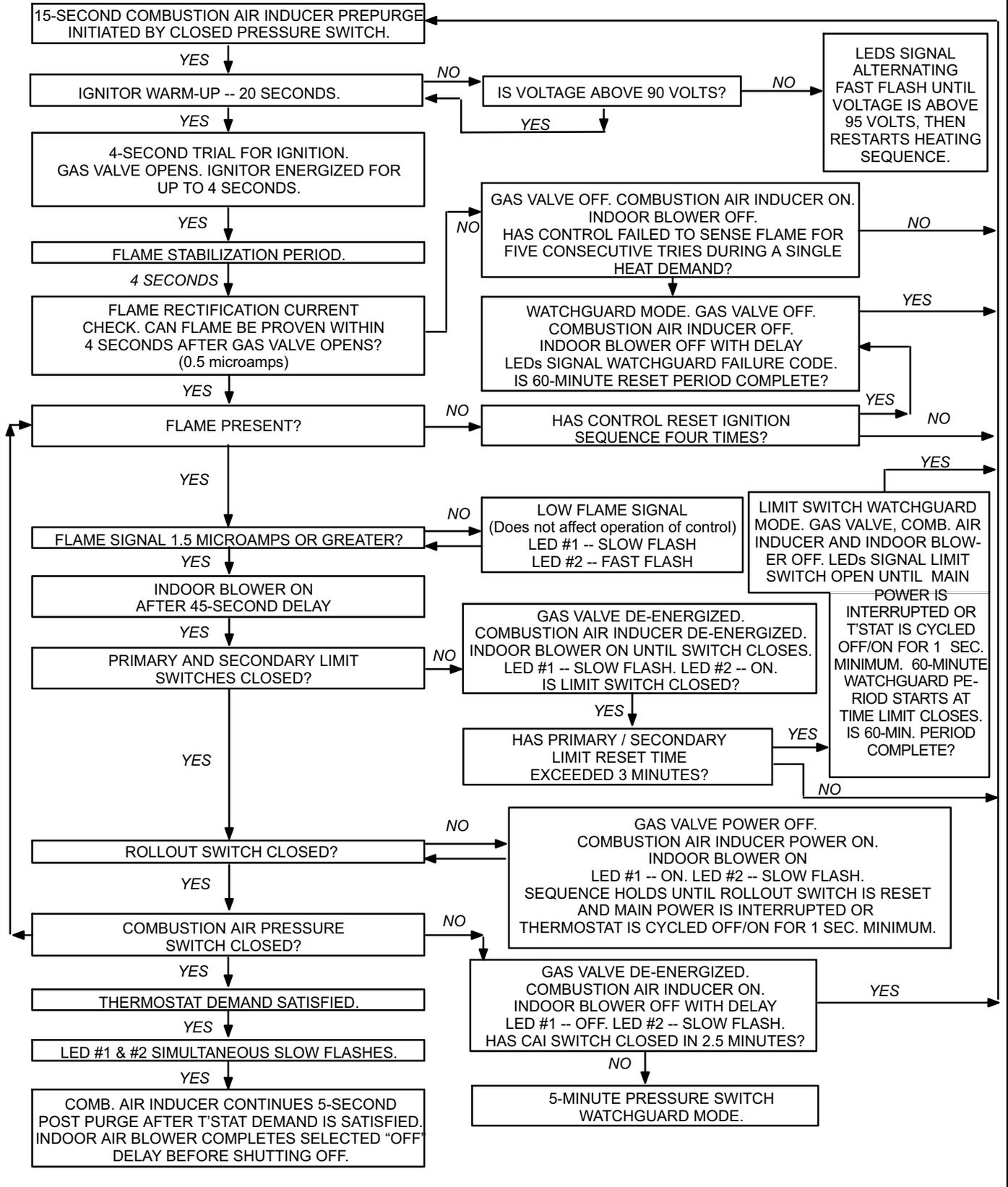


Troubleshooting: Heating Sequence of Operation (Continued)

HEATING SEQUENCE CONTINUED

NORMAL HEATING MODE

ABNORMAL HEATING MODE

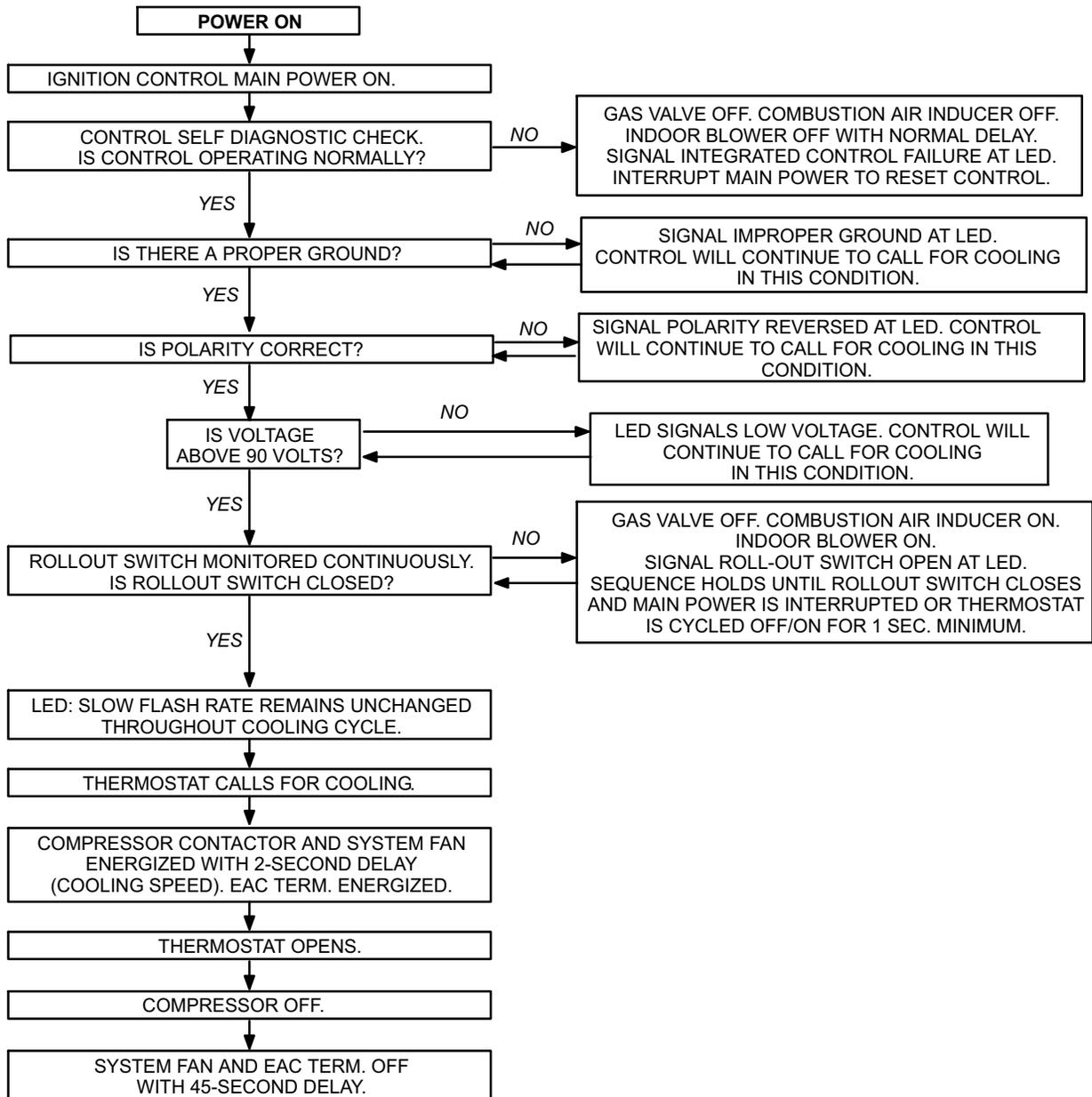


Troubleshooting: Cooling Sequence of Operation

COOLING SEQUENCE OF OPERATION

NORMAL COOLING MODE

ABNORMAL COOLING MODE



Troubleshooting: Continuous Fan Sequence of Operation

CONTINUOUS HEAT SPEED FAN SEQUENCE OF OPERATION

