

ML180UHT 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. ML180UHT units are available in heating capacities of 69.6 to 139.3 MJ/h Btuh and cooling applications 3 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. ML180UHT model units are equipped with a hot surface ignition system. All units use a redundant gas valve to assure safety shut-off as required.

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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⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Installation and service must be performed by a licensed professional HVAC installer (or equivalent), service agency or the gas supplier.

⚠ WARNING



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

⚠ WARNING

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

SPECIFICATIONS

Gas Heating		Model Number	ML180UH070TP36A	ML180UH090TP48B	ML180UH110TP36C
		Input - kW	19.3	25.8	32.2
		Output - kW	15.5	20.6	25.8
		Temperature rise range - °C	14 - 31	14 - 31	19 - 36
		Gas Manifold Pressure (kPa) Natural Gas / Propane	0.87/2.49	0.87/2.49	0.87/2.49
High Static - Pa			125	125	125
		Flue connection - mm round	102	102	102
		Gas pipe size IPS	1/2 in.	1/2 in.	1/2 in.
Indoor Blower	Wheel nom. diameter x width - mm		254 x 203	254 x 254	254 x 254
	Motor output - W		248	373	373
	Add-on cooling - kW		7 - 10.6	7 - 14.1	7 - 14.1
	Air Volume Range - L/s		282 - 716	229 - 890	239 - 827
Electrical Data	Voltage	220/240 volts - 50 hertz - 1 phase (less than 10 amps)			
Shipping Data	kg - 1 package		54	63	70

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

SPECIFICATIONS

Gas Heating		Model Number	ML180UH110TP60C	ML180UH135TP60D
		Input - kW	32.2	38.7
		Output - kW	25.8	31.0
		Temperature rise range - °C	17 - 33	17 - 33
		Gas Manifold Pressure (kPa) Natural Gas / Propane	0.87/2.49	0.87/2.49
High Static - Pa			125	125
		Flue connection - mm round	102	102
		Gas pipe size IPS	1/2 in.	1/2 in.
Indoor Blower	Wheel nom. diameter x width - mm		292 x 254	279 x 279
	Motor output - W		746	746
	Add-on cooling - kW		14.1 - 17.6	14.1 - 17.6
	Air Volume Range - L/s		665 - 1165	627 - 1153
Electrical Data	Voltage	220/240 volts - 50 hertz - 1 phase (less than 10 amps)		
Shipping Data	kg - 1 package		71	79

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

OPTIONAL ACCESSORIES - ORDER SEPARATELY

		"A" Width Models	"B" Width Models	"C" Width Models	"D" Width Models
CABINET ACCESSORIES					
Horizontal Suspension Kit - Horizontal only		51W10	51W10	51W10	51W10
Return Air Base - Upflow only		65W75	50W98	50W99	51W00
FILTERS					
¹ Air Filter and Rack Kit	Horizontal (end)	87L95	87L96	87L97	87L98
	Size of filter - mm	356 x 635 x 25	457 x 635 x 25	508 x 635 x 25	635 x 635 x 25
	Side Return	44J22	44J22	44J22	44J22
	Ten Pack	66K63	66K63	66K63	66K63
	Size of filter - mm	406 x 635 x 25	406 x 635 x 25	406 x 635 x 25	406 x 635 x 25

¹ Cleanable polyurethane, frame-type filter.

BLOWER DATA

ML180UH070TP36A PERFORMANCE (Less Filter)

External Static Pressure Pa	Air Volume at Various Blower Speeds					
	High		Medium		Low	
	L/s	Watts	L/s	Watts	L/s	Watts
0	716	771	589	615	469	468
25	687	752	564	597	435	448
50	675	724	554	583	430	441
75	662	708	547	569	421	430
100	649	691	530	554	408	417
125	633	672	517	541	393	405
150	616	650	503	524	372	387
175	595	624	488	514	359	375
200	573	608	472	494	324	363
225	551	590	447	477	307	346
250	523	561	424	454	282	331

ML180UH090TP48B PERFORMANCE (Less Filter)

External Static Pressure Pa	Air Volume at Various Blower Speeds							
	High		Medium-High		Medium-Low		Low	
	L/s	Watts	L/s	Watts	L/s	Watts	L/s	Watts
0	890	1085	715	892	497	598	423	493
25	849	1050	679	855	463	577	386	481
50	849	1016	679	831	460	565	384	464
75	831	967	676	807	456	546	369	447
100	827	937	667	773	452	526	364	434
125	816	906	660	747	439	509	349	421
150	799	872	647	718	426	494	331	408
175	784	845	629	691	411	477	308	394
200	754	808	601	642	394	460	290	383
225	722	765	577	622	359	435	256	363
250	674	713	555	593	332	421	229	348

ML180UH110TP36C PERFORMANCE (Less Filter)

External Static Pressure Pa	Air Volume at Various Blower Speeds							
	High		Medium-High		Medium-Low		Low	
	L/s	Watts	L/s	Watts	L/s	Watts	L/s	Watts
0	827	1106	660	884	460	574	404	478
25	800	1063	630	850	434	558	378	463
50	801	1043	631	819	432	541	369	451
75	779	984	631	807	434	527	359	438
100	773	962	624	777	422	512	352	422
125	773	938	620	758	408	490	335	411
150	761	907	609	725	382	472	331	396
175	741	854	593	695	383	460	319	386
200	722	832	580	659	366	441	299	372
225	699	777	554	638	351	432	263	354
250	677	741	527	600	331	411	239	340

BLOWER DATA

ML180UH110TP60C PERFORMANCE (Less Filter)

External Static Pressure Pa	Air Volume 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 508 x 635 x 25 mm air filter in order to maintain proper air velocity.					
	High		Medium		Low		High		Medium		Low	
	L/s	Watts	L/s	Watts	L/s	Watts	L/s	Watts	L/s	Watts	L/s	Watts
0	1138	1496	956	1202	793	983	1109	1469	937	1197	772	980
25	1106	1460	930	1180	770	963	1088	1441	912	1184	746	960
50	1092	1441	920	1162	761	944	1061	1405	896	1140	743	937
75	1087	1412	899	1115	745	919	1044	1382	893	1119	735	920
100	1055	1382	884	1100	740	901	1031	1352	868	1091	727	897
125	1042	1361	871	1077	730	882	1019	1325	853	1076	714	877
150	1017	1315	856	1060	714	866	994	1295	844	1054	703	865
175	1003	1294	836	1034	701	848	973	1269	824	1032	685	839
200	974	1270	816	1011	676	819	942	1233	803	1002	668	816
225	951	1236	792	987	661	805	925	1209	779	983	647	798
250	922	1207	764	948	636	776	903	1173	758	948	633	773

ML180UH135TP60D PERFORMANCE (Less Filter)

External Static Pressure Pa	Air Volume 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 508 x 635 x 25 mm air filter in order to maintain proper air velocity.					
	High		Medium		Low		High		Medium		Low	
	L/s	Watts	L/s	Watts	L/s	Watts	L/s	Watts	L/s	Watts	L/s	Watts
0	1159	1503	955	1153	791	914	1141	1506	936	1155	782	908
25	1135	1456	924	1120	767	895	1113	1483	909	1130	754	887
50	1113	1430	916	1114	753	876	1099	1449	899	1105	744	871
75	1096	1390	898	1076	739	851	1092	1412	888	1089	732	852
100	1080	1374	893	1057	723	834	1073	1364	869	1067	720	839
125	1072	1340	872	1033	711	814	1052	1341	858	1038	702	824
150	1053	1304	856	1019	693	793	1033	1301	841	1017	695	802
175	1022	1261	838	994	675	777	1015	1295	830	1001	668	782
200	997	1219	809	964	657	758	995	1256	809	980	643	761
225	977	1181	792	937	632	738	971	1225	777	949	628	742
250	951	1143	761	905	610	712	949	1191	755	920	602	730

ML180UHT PARTS ARRANGEMENT

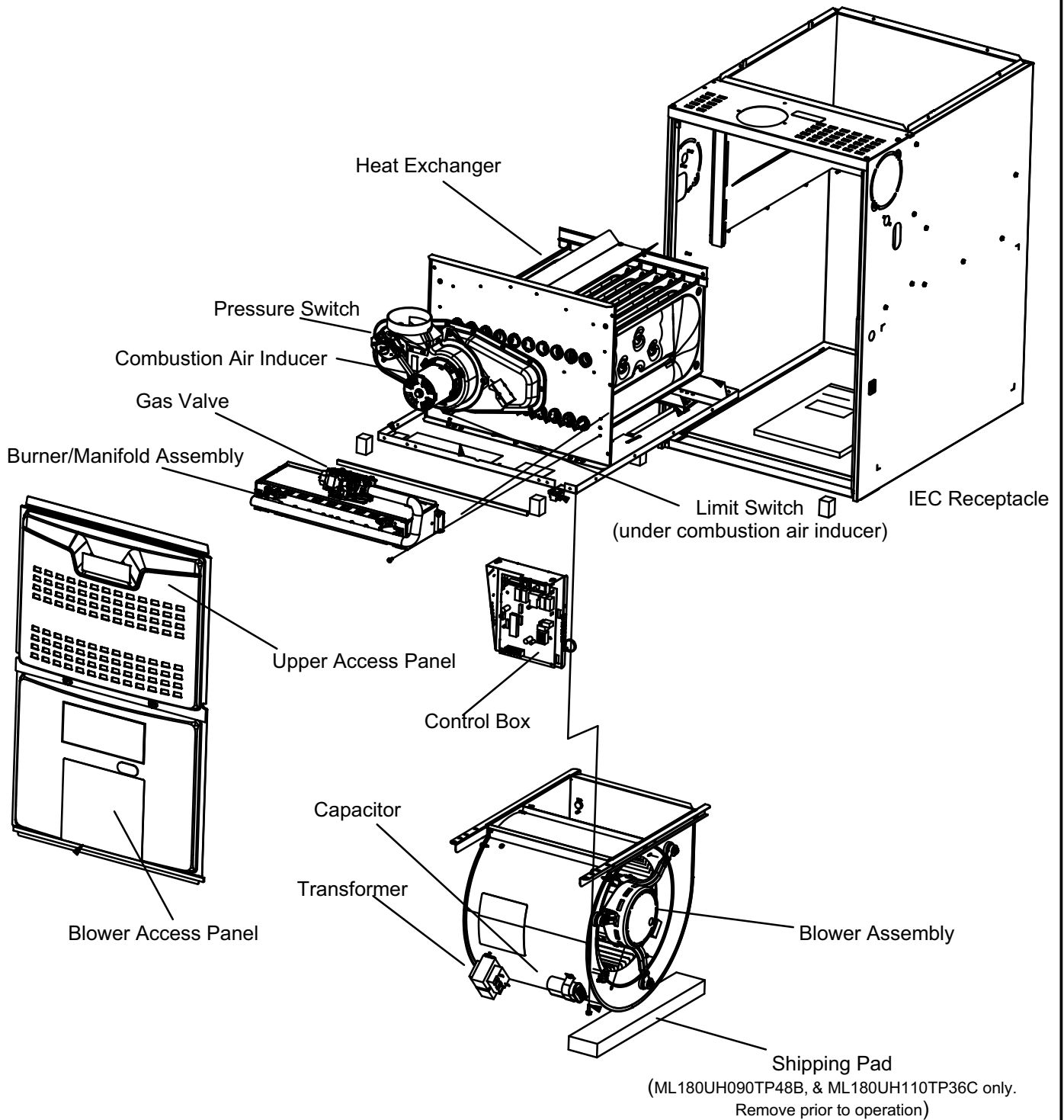


FIGURE 1

I-UNIT COMPONENTS

ML180UHT 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 230V primary and a 24V secondary.

2. Door Interlock Switch (S51)

A door interlock switch rated 14A at 230VAC is wired in series with line voltage. When the blower door is removed the unit will shut down.

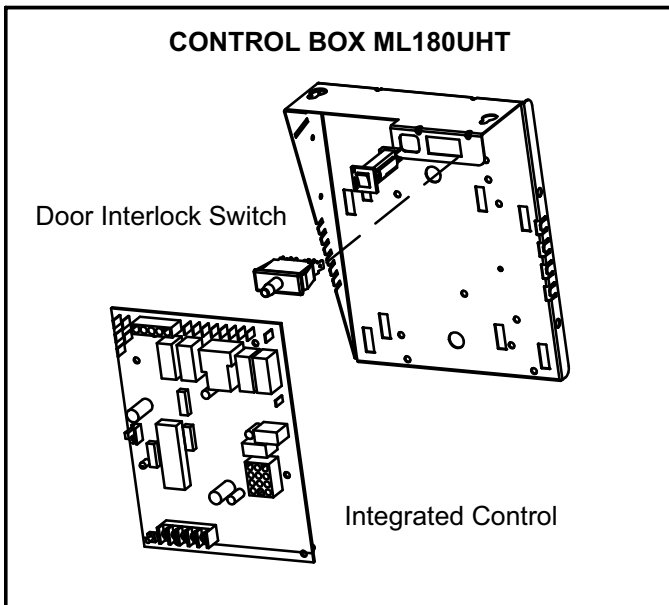


FIGURE 2

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 3A at 32V. If the current exceeds this limit the breaker will trip and all unit operation will shut-down. The breaker can be manually reset by pressing the button on the face. See figure 3.

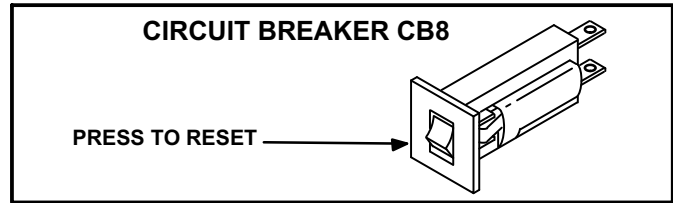


FIGURE 3

4. 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 4 with control terminal designations in tables 1 and 2.) 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 one LED light (AN1 red) 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 3 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.

INTEGRATED CONTROL

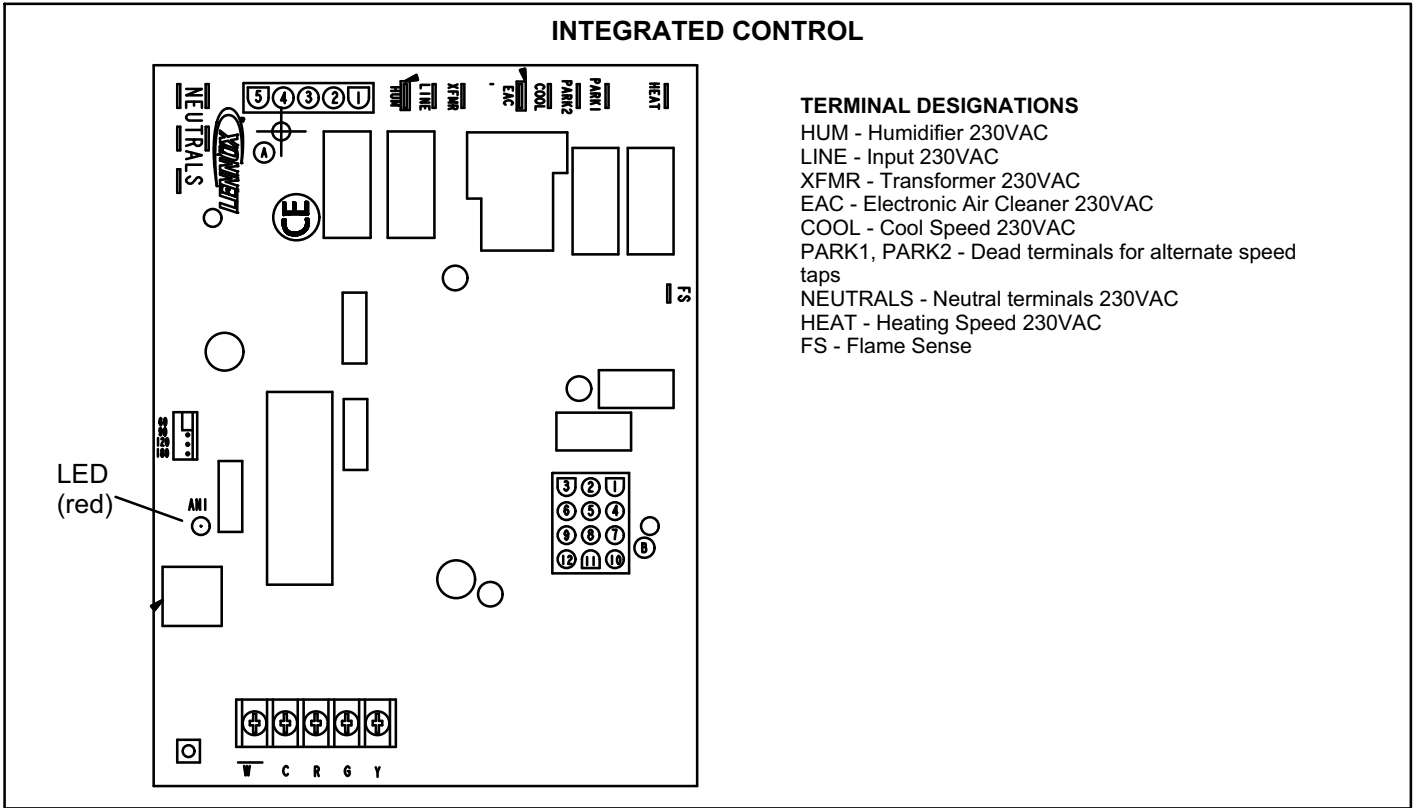


FIGURE 4

TABLE 1

5-Pin Terminal Designation	
PIN #	FUNCTION
1	Ignitor Line
2	Not Used
3	Combustion Air Inducer Low
4	Combustion Air Inducer Neutral
5	Ignitor Neutral

TABLE 2

12-Pin Terminal Designations	
PIN #	FUNCTION
1	Not Used
2	Not Used
3	Rollout Switch Input
4	Ground
5	TH 24V Hot
6	High Limit Input
7	Gas Valve Line
8	Gas Valve Common
9	TR 24V Return
10	Ground
11	Rollout Switch Output
12	Pressure Switch

TABLE 3

FLASH CODE (X + Y)	STATUS / ERROR DESCRIPTION
FLASH CODE DESCRIPTIONS	
Pulse	A 1/4 second flash followed by four seconds of off time.
Heartbeat	Constant 1/2 second bright and 1/2 second dim cycles.
X + Y	LED flashes X times at 2Hz, remains off for two seconds, flashes Y times at 2Hz, remains off for four seconds, then repeats.
Pulse	Power on - Standby.
Heartbeat	Normal operation - signaled when heating demand initiated at thermostat.
FLAME CODES	
1 + 2	Low flame current -- check flame sensor.
1 + 3	Flame sensed out of sequence -- flame still present. Flame sensed without gas valve energized.
PRESSURE SWITCH CODES	
2 + 3	Low pressure switch failed open. Check blocked inlet/exhaust .
2 + 4	Low pressure switch failed closed. Pressure switch closed prior to activation of combustion air inducer.
LIMIT CODE	
3 + 1	Limit switch open.
WATCHGUARD CODES	
4 + 1	Watchguard -- Exceeded maximum number of retries. Burners failed to light.
4 + 2	Watchguard -- Exceeded maximum number of retries or last retry was due to pressure switch opening.
4 + 3	Watchguard -- Exceeded maximum number of retries or last retry was due to flame failure.
4 + 5	Watchguard -- Limit remained open longer than three minutes.
4 + 6	Watchguard -- Flame sensed out of sequence; flame signal gone.
4 + 8	Low line voltage.
HARD LOCKOUT CODES	
5 + 1	Hard lockout -- Rollout circuit open or previously opened.
5 + 4	Reversed line voltage polarity (control will restart if the error recovers). And or no Earth gas valve fault
5 + 5	Gas valve fault (sensed open when should be closed, or sensed closed when should be open).
5 + 6	Program memory fault (internal microprocessor memory fault)
5 + 7	Flame sense circuit fault. (flame sense circuit or bad flame probe fault).
5 + 8	No communication packet fault (loss of communications between redundant microprocessor fault).
5 + 9	Bad communication packet fault. (corrupted communications between redundant microprocessor fault).
5 + 10	Redundant variable fault. (internal microprocessor memory retention fault).

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 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.

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 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 fac-

tory fan off setting of 60 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 32° C - 43° C (90° F - 110° F) 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.

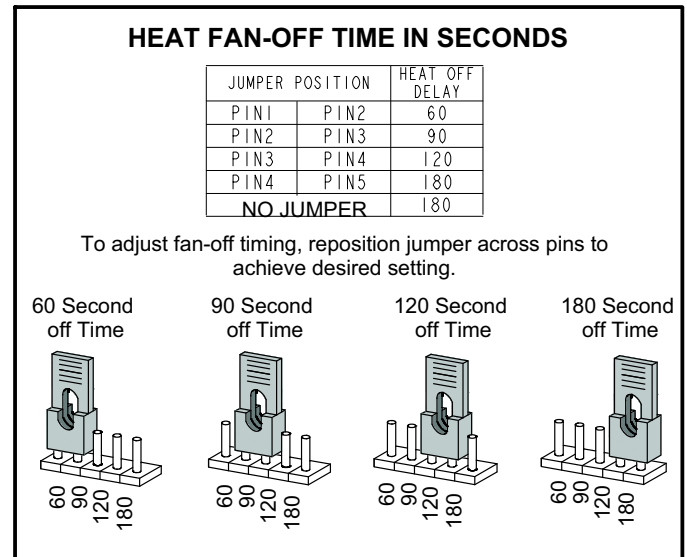


FIGURE 5

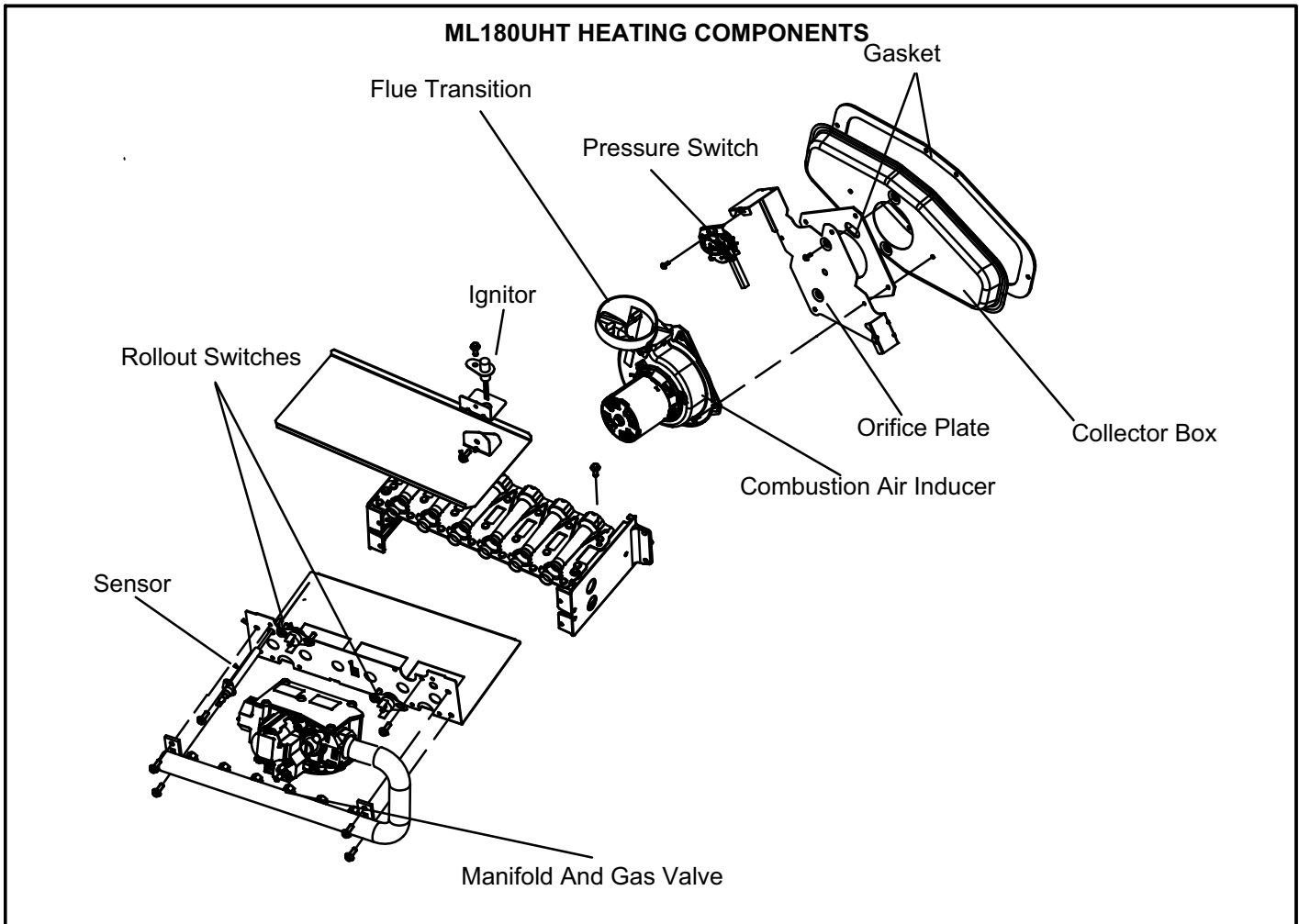


FIGURE 6

5. 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 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.

6. Flame Rollout Switches (Figure 6) (S47)

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 320°C (210°F) and cannot be adjusted. To manually reset a tripped switch, push the reset button located on the control.

7. Primary Limit Control (S10)

The primary limit on ML180UHT units is located in the heating vestibule panel under the combustion air inducer. See figure 1. 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®.

8. Ignitor (Figure 6)

The nitride ignitor used on ML180UHT 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 300 to 1300 ohms indicates a good ignitor. Voltage to the ignitor should be 150VAC.

See figure 7 for resistance, and voltage check.

NOTE - The ML180UHT furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.

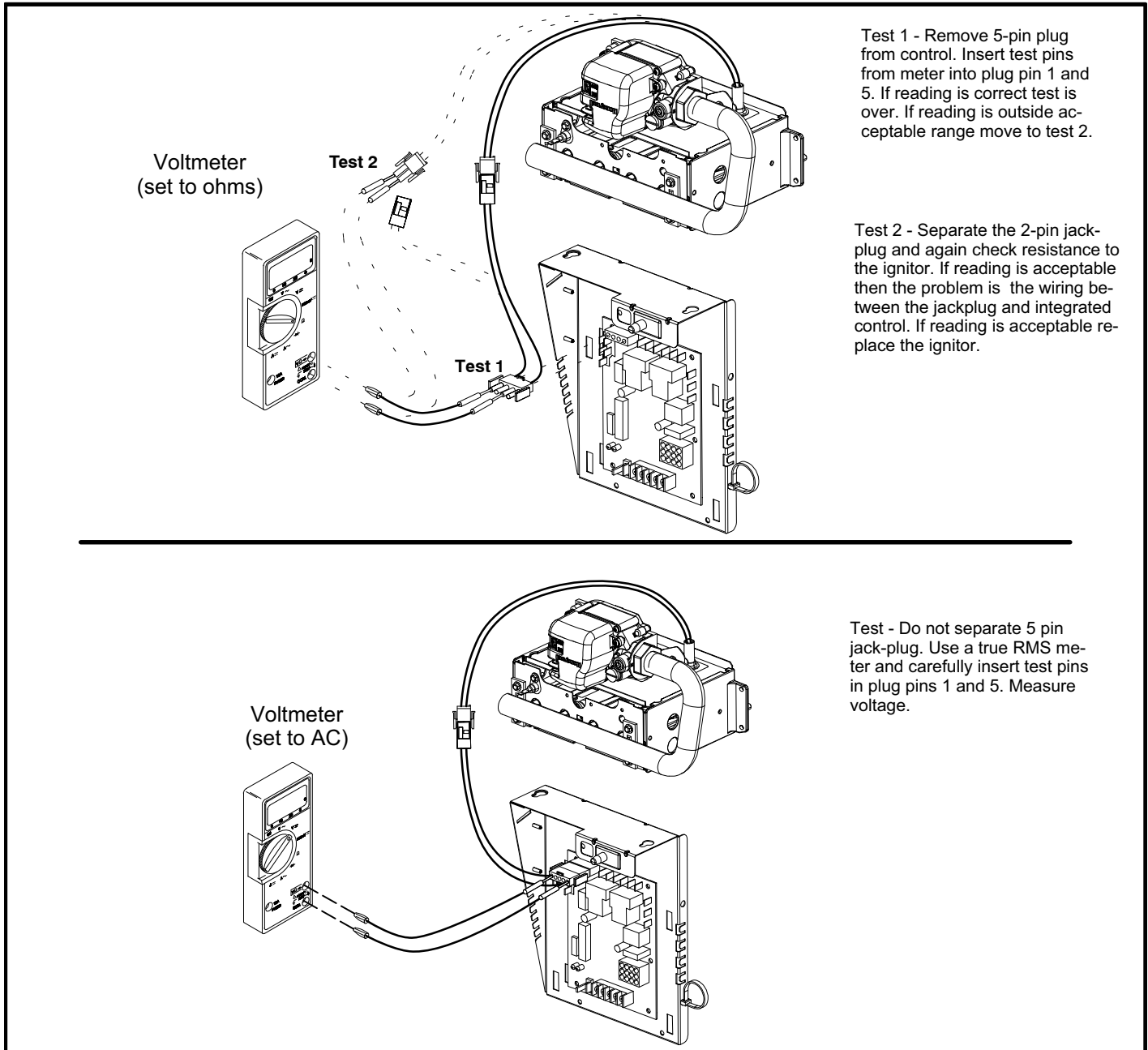


FIGURE 7

9. Gas Valve (Figure 6)

The ML180UHT 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.

10. Combustion Air Inducer (B6)

All ML180UHT units use a combustion air inducer to move air through the burners and heat exchanger during heating operation. The blower uses a 230VAC 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 4 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 4

ML180UHT Unit	C.A.I. Orifice Size mm (in)
070TP36A	35.7 (1.406)
090TP48B	42.2 (1.660)
110T36C, 110TP60C	47.6 (1.875)
135TP60D	55.6 (2.188)

11. Combustion Air Inducer Pressure Switch (S18)

ML180UHT 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 5. 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 5

ML180UHT	Set Point Pa (in)
070T36A	150 (.60)
090T48B	150 (.60)
110TP36C, 110TP60C	150 (.60)
135TP60D	150 (.60)

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.

Multiple Venting

The ML180UHT furnace can vent in multiple positions. See figure 8.

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.

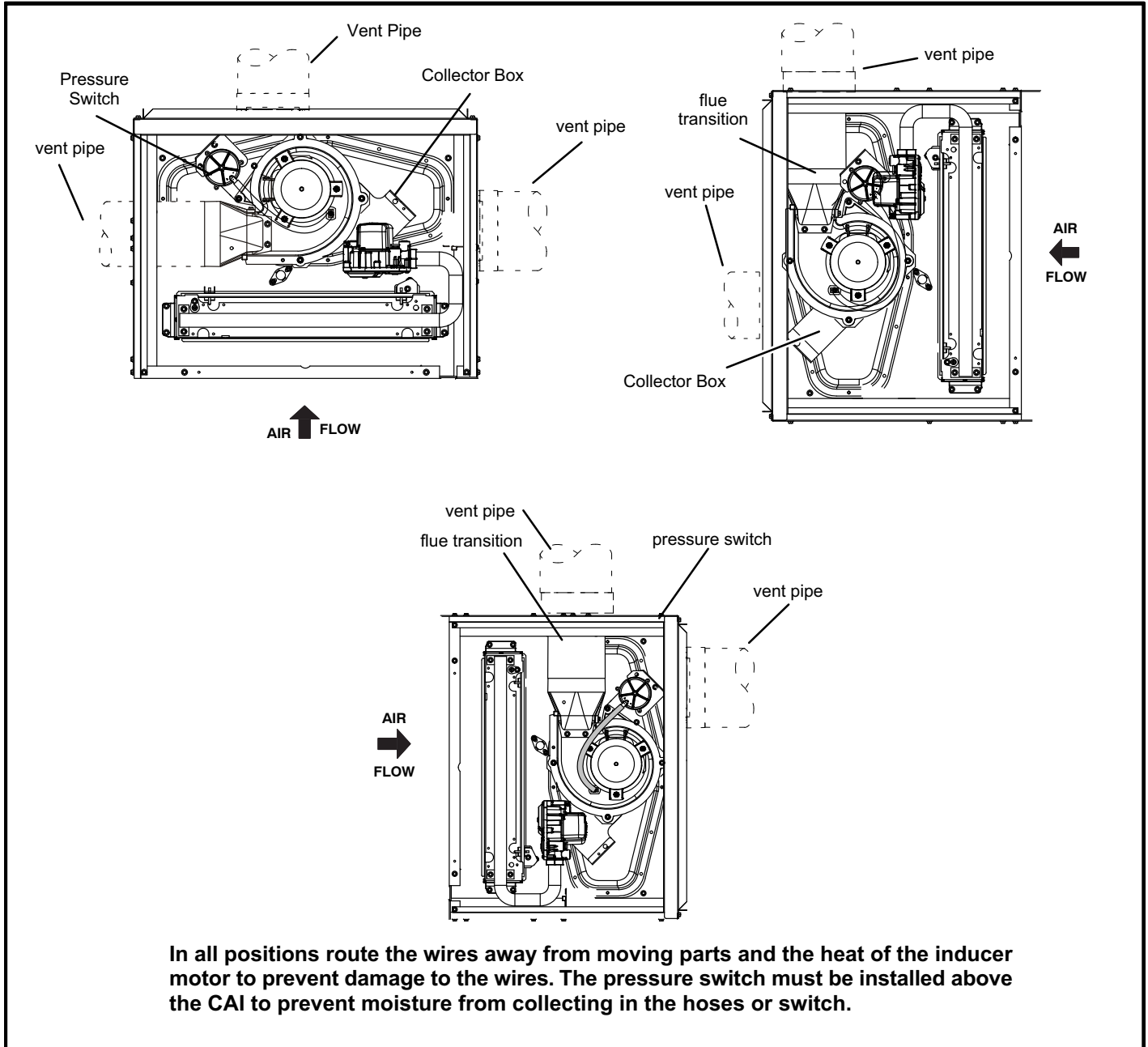


FIGURE 8

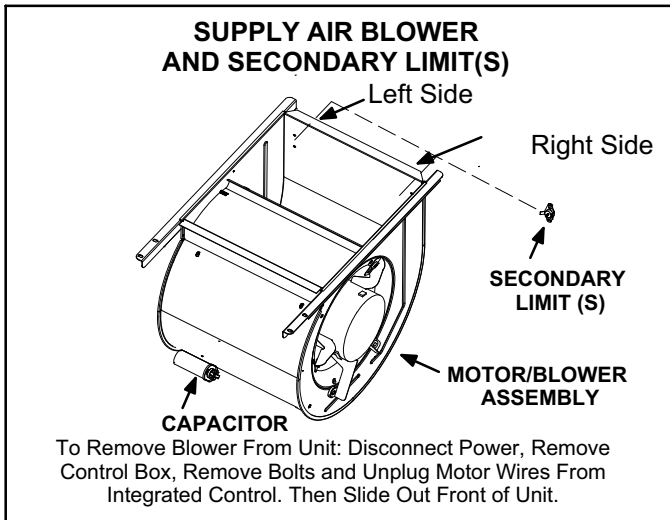


FIGURE 9

12. Blower Motors and Capacitors

All ML180UHT units use direct drive blower motors. All motors are 230V 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 10. When replacing the indoor blower motor the set screw must be aligned and tightened with the motor shaft as shown in figure 11.

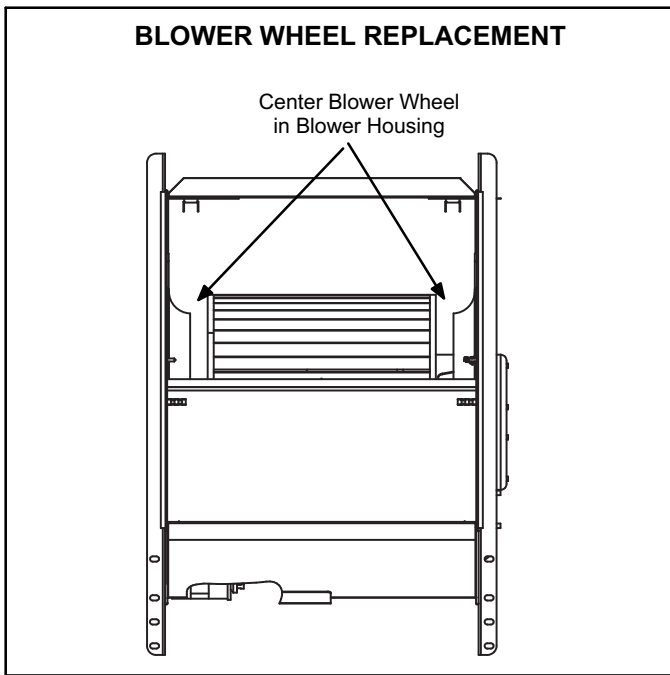


FIGURE 10

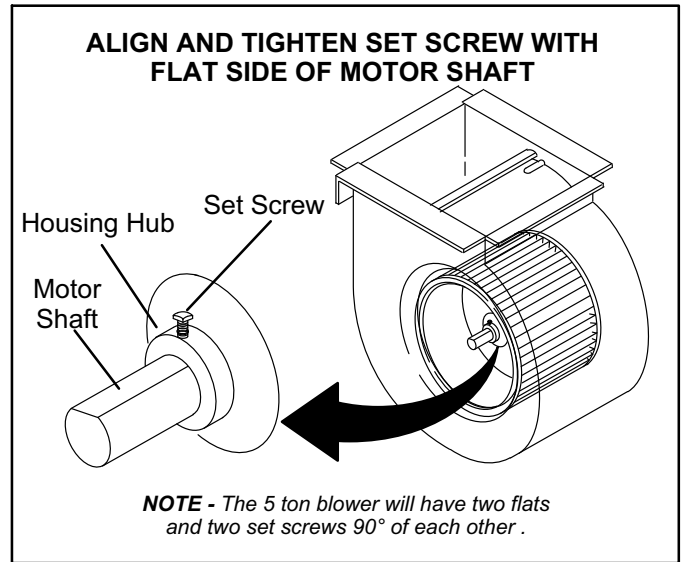


FIGURE 11

13. Secondary Limit Controls

The secondary limit is located in the blower compartment in the back side of the blower housing. See figure 9. 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



Gas Valve Operation

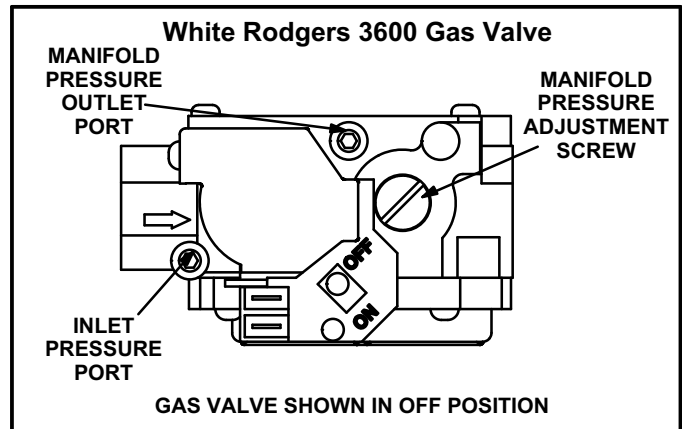


FIGURE 12

- 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 lever to **OFF position**. Do not force. See figure 12.
- 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 lever to **ON position**. Do not force. See figure 12.
- 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 lever to **OFF position**. Do not force. See figure 12.
- 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- Gas Piping

Gas supply piping should not allow more than 13 mm W.C. (0.5") 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.

B- 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 (355 mm W.C) See figure 13. If the pressure is equal to or less than 0.5psig (355 mm W.C), close the manual shut-off valve before pressure testing to isolate furnace from gas supply.

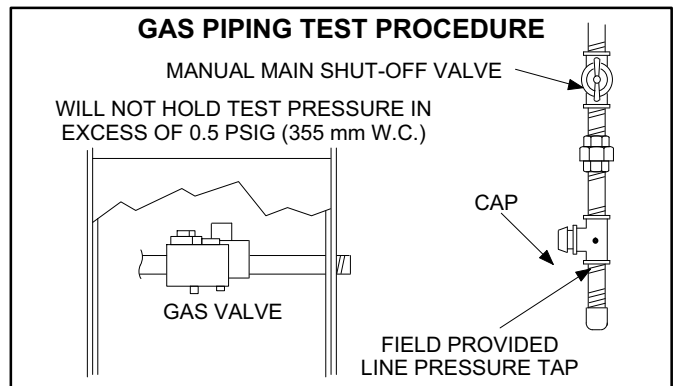


FIGURE 13

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.

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 6

GAS METER CLOCKING CHART				
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 6 below. If manifold pressure matches table 8 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.

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 8.

5 - Shut unit off and remove manometer as soon as an accurate reading has been obtained. Take care to replace pressure tap plug.

6 - Start unit and perform leak check. Seal leaks if found.

E- 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 7

ML180UHT Unit	CO ₂ % For Nat	CO ₂ % For L.P.
-070	6.3 - 7.8	7.0 - 9.0
-090		
-110		
-135		

F- 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 8 for manifold pressure and table 9 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 8

Manifold Pressure Settings at all Altitudes

Model Input Size	Gas	0-610 m* (0-2000 ft)	611-914 m* (2001-3000 ft.)	915-1219 m* (3001-4000 ft)	1220-1524 m* (4001-5000 ft.)	1525-1981 m* (5001-6500 ft)	Line Pressure kPa	
							Min	Max
All Models	Nat	0.87	0.72	0.67	0.62	0.87	1.12	3.20
	LP/propane	2.49	2.27	2.19	2.12	2.49	2.74	3.20

* See table 9 for proper high altitude gas conversion kit.

TABLE 9

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 Change Over Kit		LP/Propane to Natural Gas Change Over Kit
	0-610 m (0-2000 ft)	611-1219 m (2001-4000 ft)	1220-1981 m (4001-6500 ft)	1525-1981 m (5001-6500 ft)	0-1524 m (0-5000 ft)	1525-1981 m (5001-6500 ft)	1-1524 m (1 5000 ft)
070	No Change	80W51	80W56	73W37	11K15	97W04	96W95
090		80W51	80W56				
110		80W51	80W56				
135		No Change	80W51				

G- 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 14 and table 10 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 10

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

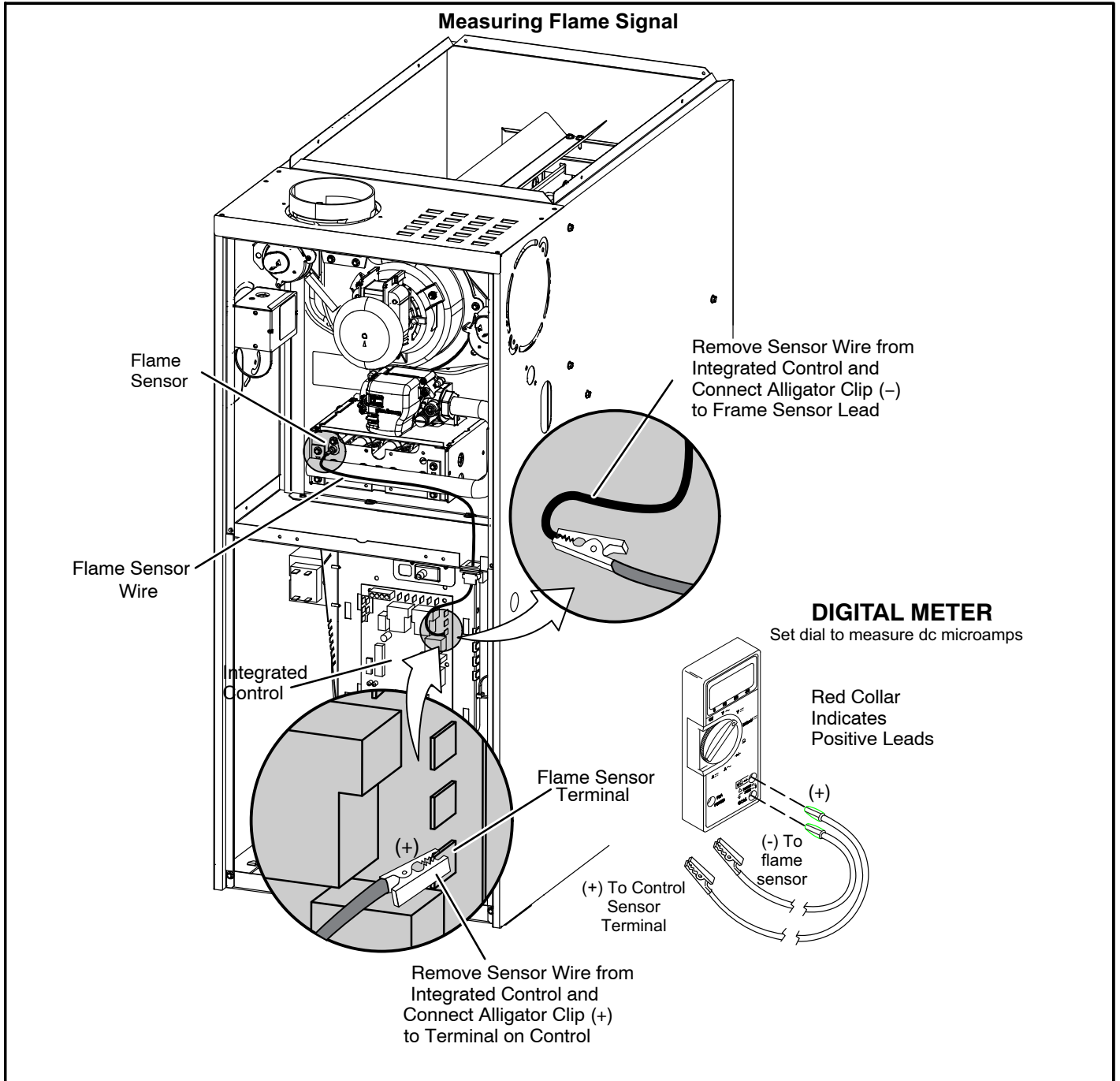


FIGURE 14

H- 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 15. 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 11, 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 16. This voltage should be in the range of 196 to 253VAC.

TABLE 11

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

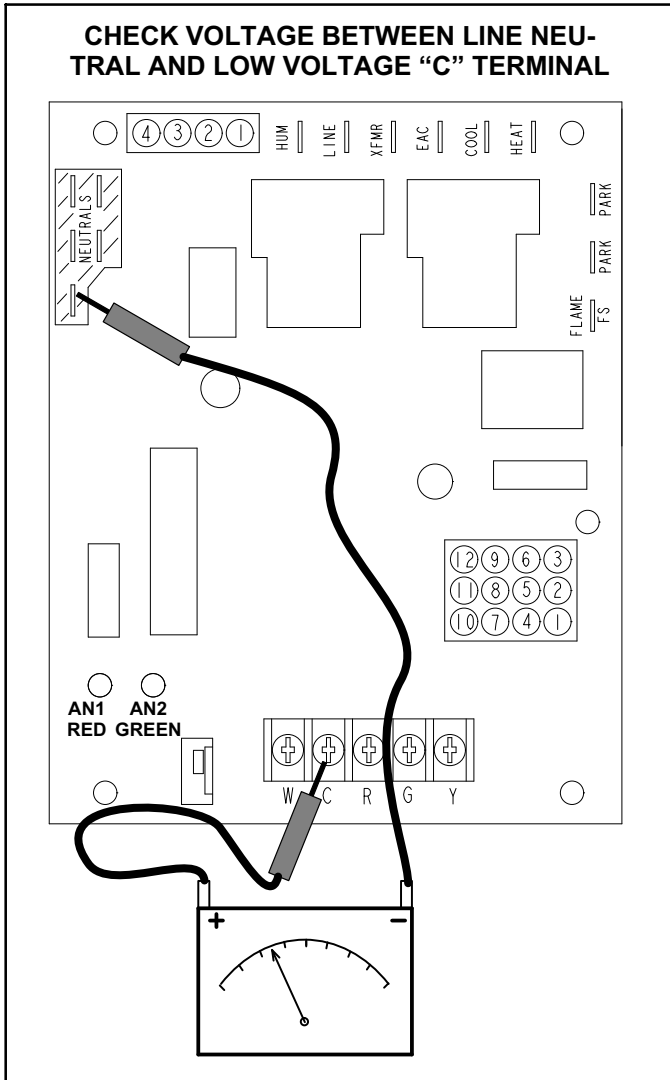


FIGURE 15

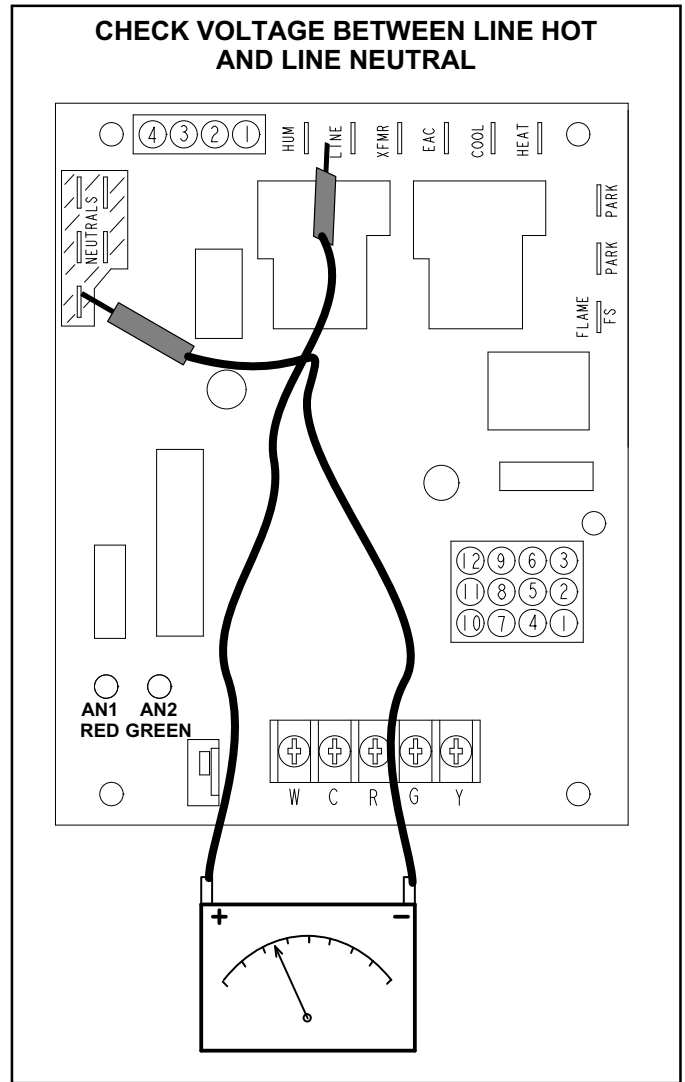


FIGURE 16

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 17)

Temperature rise for ML180UHT 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 °C" listed on the unit rating plate.

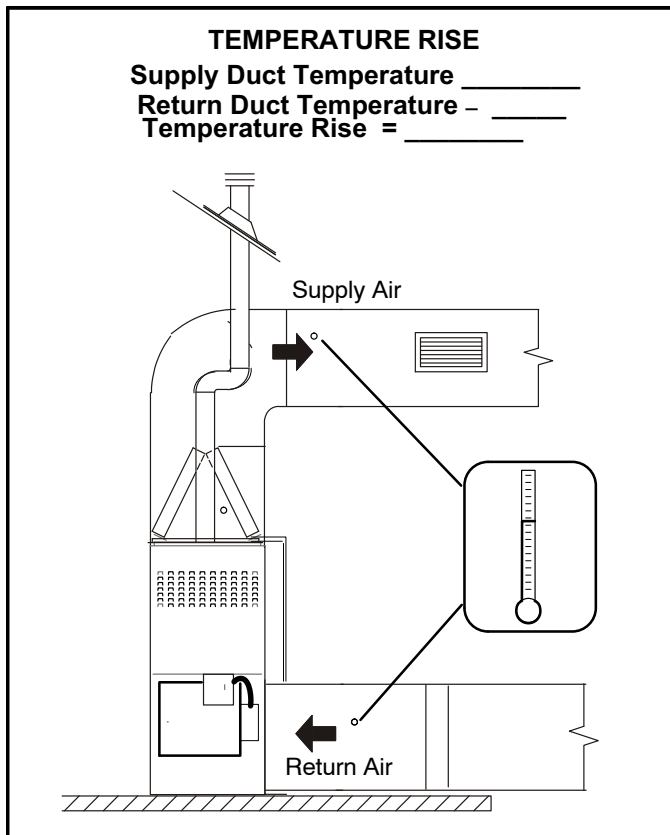


FIGURE 17

C-External Static Pressure

- 1 - Tap locations shown in figure 18 .
- 2 - Punch a 6.3 mm (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 13 mm W.C (0.5"). For cooling speed external static pressure drop must not be more than 20 mm W.C (0.8")
- 4 - Seal the hole when the check is complete.

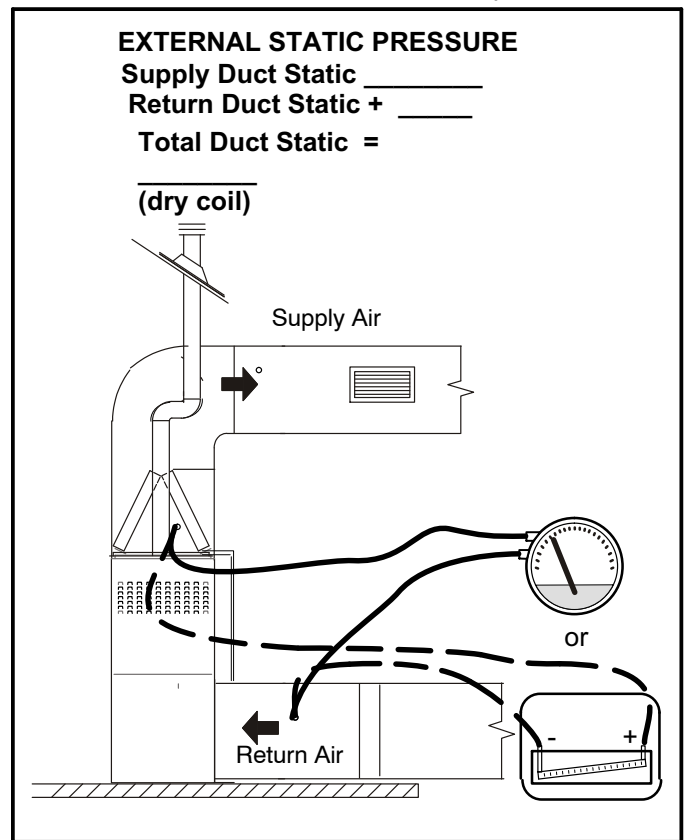


FIGURE 18

D-Blower Speed Taps

Blower speed tap changes are made on the integrated control. See figure 4. 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

Annual Furnace Maintenance

At the beginning of each heating season, and to comply with the **Lennox Limited Warranty**, your system should be checked by a licensed professional technician (or equivalent) as follows:

- 1- Check wiring for loose connections, voltage at indoor unit and amperage of indoor motor.
- 2- Check the condition of the belt and shaft bearings if applicable.
- 3- Inspect all gas pipe and connections for leaks.
- 4- Check the cleanliness of filters and change if necessary (monthly).
- 5- Check the condition and cleanliness of burners and heat exchanger and clean if necessary.
- 6- Check the cleanliness of blower assembly and clean the housing, blower wheel and blower motor if necessary. The blower motors are prelubricated for extended bearing life. No further lubrication is needed.
- 7- Inspect the combustion air inducer and clean if necessary.
- 8- Evaluate the heat exchanger integrity by inspecting the heat exchanger per the AHRI heat exchanger inspection procedure. This procedure can be viewed at www.ahrinet.org
- 9- Ensure sufficient combustion air is available to the furnace. Fresh air grilles and louvers (on the unit and in the room where the furnace is installed) must be properly sized, open and unobstructed to provide combustion air.
- 10 Inspect the furnace venting system to make sure it is in place, structurally sound, and without holes, corrosion,

or blockage. Vent system must be free and clear of obstructions and must slope upward away from the furnace. Vent system should be installed per the National Fuel Gas Code

- 11 Inspect the furnace return air duct connection to ensure the duct is sealed to the furnace. Check for air leaks on supply and return ducts and seal where necessary.
- 12 Check the condition of the furnace cabinet insulation and repair if necessary.
- 13 Perform a complete combustion analysis during the furnace inspection to ensure proper combustion and operation. Consult Service Literature for proper combustion values.
- 14 Verify operation of CO detectors and replace batteries as required.

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

- 1 - Check the operation of the ignition system, inspect and clean flame sensor. Check microamps before and after. Check controls and safety devices (gas valve, flame sensor, temperature limits). Consult Service Manual for proper operating range. Thermal Limits should be checked by restricting airflow and not disconnecting the indoor blower. For additional details, please see Service and Application Note H-04-9.
- 2 - Verify that system total static pressure and airflow settings are within specific operating parameters.
- 3 - Clock gas meter to ensure that the unit is operating at the specified firing rate. Check the supply pressure and the manifold pressure. On two-stage gas furnaces check the manifold pressure on high fire and low fire. If manifold pressure adjustment is necessary, consult the Service Literature for unit specific information on adjusting gas pressure. Not all gas valves are adjustable. Verify correct temperature rise.

Cleaning the Heat Exchanger and Burners

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

- 1 - Turn off both electrical and gas power supplies to furnace.
- 2 - Remove flue pipe and top cap (*some applications top cap can remain*) from the unit.
- 3 - Label the wires from gas valve, rollout switches, primary limit switch and make-up box then disconnect them.
- 4 - Remove the screws that secure the combustion air inducer/pressure switch assembly to the collector box. Carefully remove the combustion air inducer to avoid damaging blower gasket. If gasket is damaged, it must be replaced to prevent leakage.
- 5 - Remove the collector box located behind the combustion air inducer. Be careful with the collector box gasket. If the gasket is damaged, it must be replaced to prevent leakage.
- 6 - Disconnect gas supply piping. Remove the screw securing the burner box cover and remove cover. Remove the four screws securing the burner manifold assembly to the vestibule panel and remove the assembly from the unit.
- 7 - Remove screws securing burner box and remove burner box.
- 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 19.
- 11 - Backwash using steam. Begin from the burner opening on each clam. Steam must not exceed 135°C (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.
- 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 - 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, manifold assembly and burner box cover.
- 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.

⚠ 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.

- 23 - If a leak is detected, shut gas and electricity off and repair leak.
- 24 - Repeat steps 23 and 25 until no leaks are detected.
- 25 - Replace access panel.

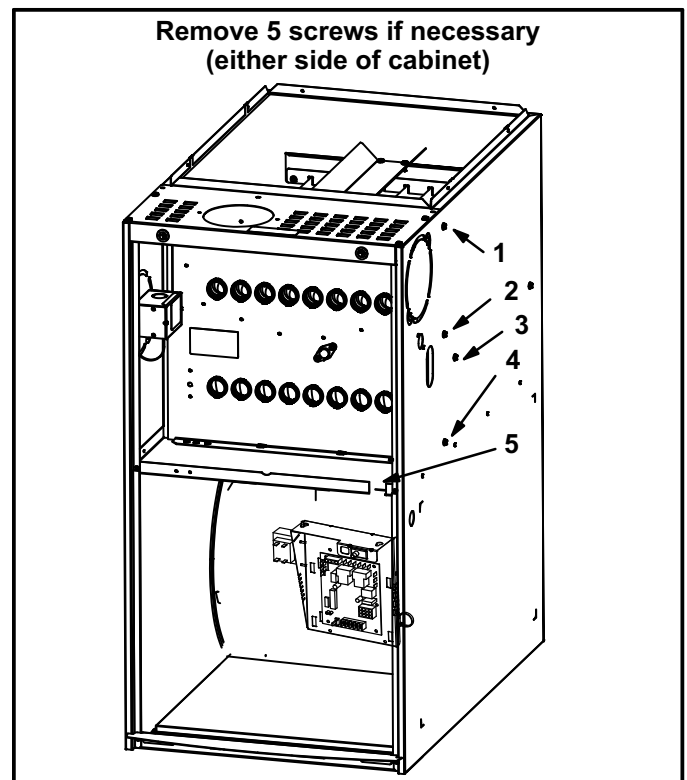


FIGURE 19

A-Supply Air Blower

- 1 - Check and clean blower wheel.
- 2 - Motors used on the Lennox ML180UHT series units are permanently lubricated and need no further lubrication.

B-Flue and Chimney

Flue must conform to local codes. 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.

C-Electrical

- 1 - Check all wiring for loose connections.
- 2 - Check for the correct voltage at the furnace (furnace operating). Correct voltage is 230VAC \pm 10%
- 3 - Check amp-draw on the blower motor with inner blower access panel in place. See figure 20.
Motor Nameplate _____ Actual _____

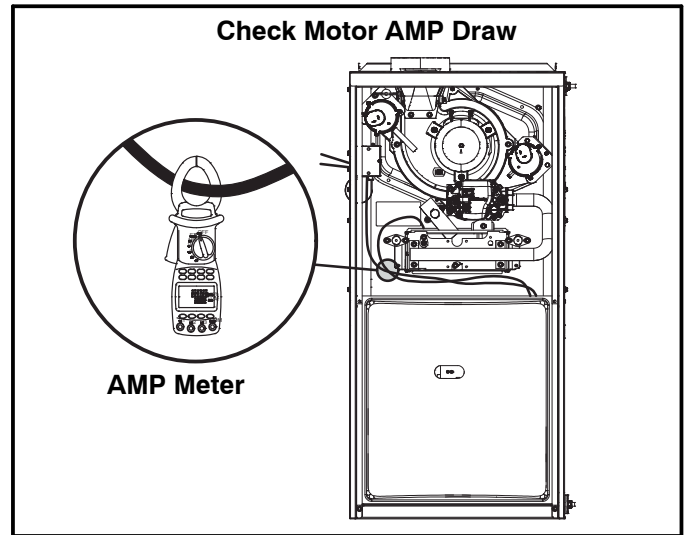
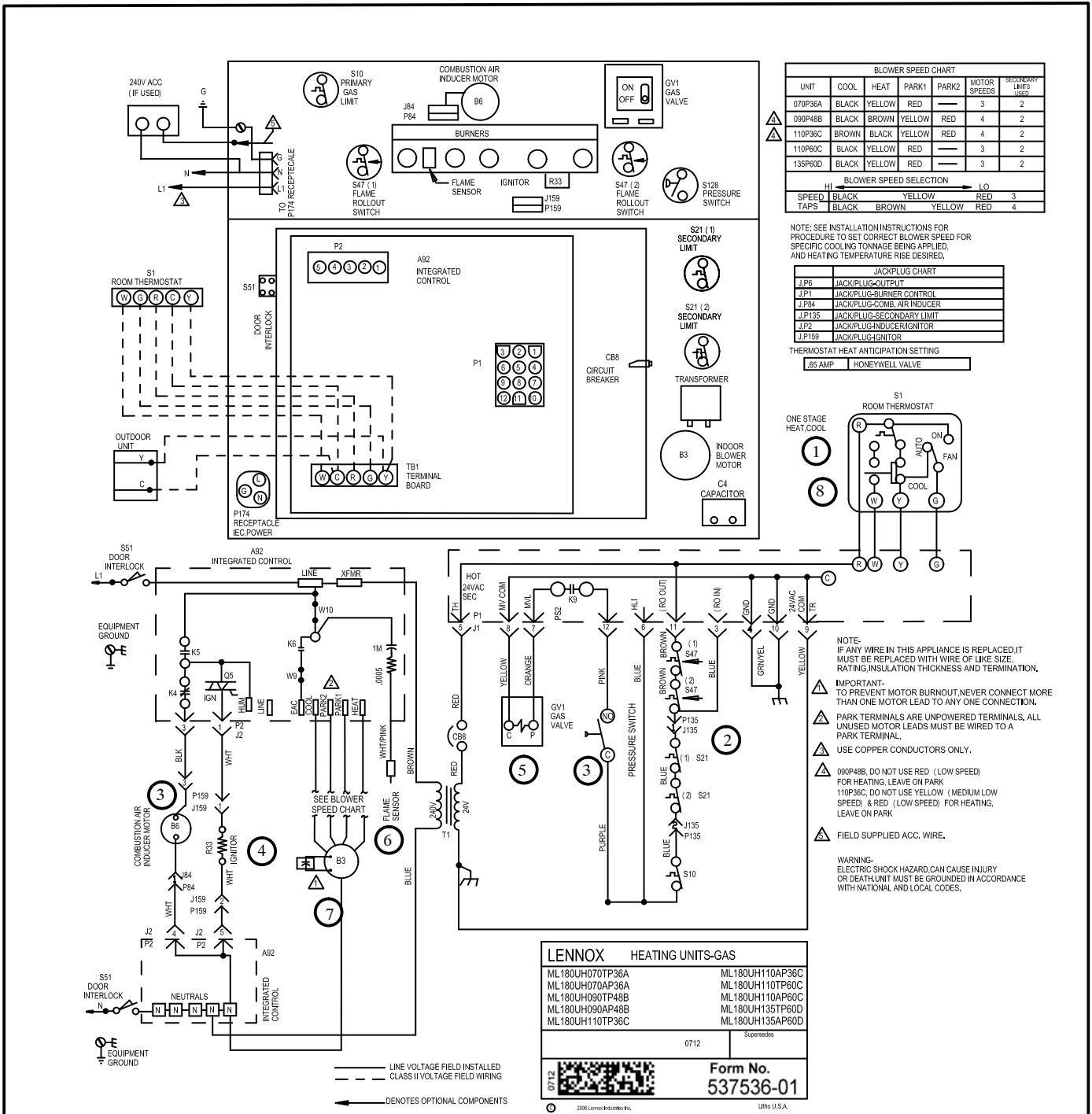


FIGURE 20

VII- Wiring and Sequence of Operation



BLOWER SPEED CHART						
UNIT	COOL	HEAT	PARK1	PARK2	MOTOR SPEEDS	SECONDARY LIMITS USED
070P36A	BLACK	YELLOW	RED	---	3	2
090P48B	BLACK	BROWN	YELLOW	RED	4	2
110P36C	BROWN	BLACK	YELLOW	RED	4	2
110P60C	BLACK	YELLOW	RED	---	3	2
135P60D	BLACK	YELLOW	RED	---	3	2

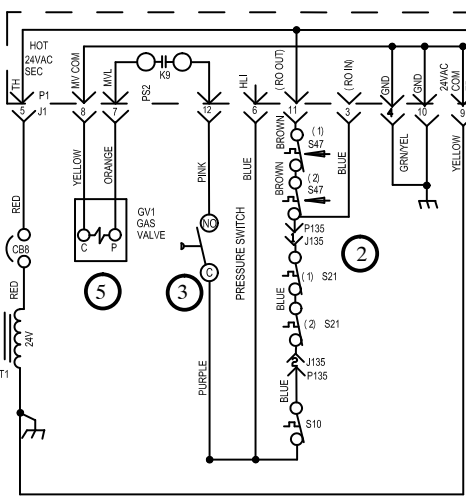
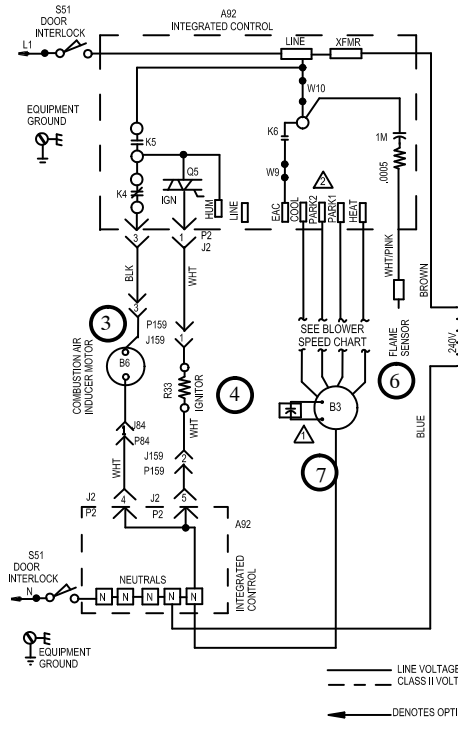
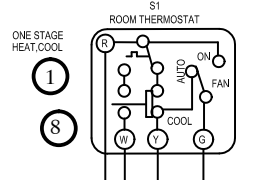
BLOWER SPEED SELECTION			
SPEED	HI	LO	---
TAPS	BLACK	YELLOW	RED
	BLACK	BROWN	YELLOW

NOTE: SEE INSTALLATION INSTRUCTIONS FOR PROCEDURE TO SET CORRECT BLOWER SPEED FOR SPECIFIC COOLING TONNAGE BEING APPLIED, AND HEATING TEMPERATURE RISE DESIRED.

JACKPLUG CHART	
JP8	JACKPLUG-OUTLET
JP1	JACKPLUG-BURNER CONTROL
JP84	JACKPLUG-COMB. AIR INDUCER
JP135	JACKPLUG-SECONDARY LIMIT
JP2	JACKPLUG-IGNITOR
JP159	JACKPLUG-IGNITOR

THERMOSTAT HEAT ANTICIPATION SETTING

0.5 AMP HONEYWELL VALVE



NOTE: IF ANY WIRE IN THIS APPLIANCE IS REPLACED IT MUST BE REPLACED WITH WIRE OF LIKE SIZE, RATING, INSULATION THICKNESS AND TERMINATION.

IMPORTANT: TO PREVENT MOTOR BURNOUT, NEVER CONNECT MORE THAN ONE MOTOR LEAD TO ANY ONE CONNECTION.

PARK TERMINALS ARE UNPOWERED TERMINALS. ALL UNUSED MOTOR LEADS MUST BE WIRED TO A PARK TERMINAL.

USE COPPER CONDUCTORS ONLY.

090P48B, DO NOT USE RED (LOW SPEED) FOR HEATING, LEAVE ON PARK

110P36C, DO NOT USE YELLOW (MEDIUM LOW SPEED) & RED (LOW SPEED) FOR HEATING, LEAVE ON PARK

FIELD SUPPLIED ACC. WIRE.

WARNING- ELECTRIC SHOCK HAZARD, CAN CAUSE INJURY OR DEATH. UNIT MUST BE GROUNDED IN ACCORDANCE WITH NATIONAL AND LOCAL CODES.

LENNOX HEATING UNITS-GAS

ML180UH070TP36A	ML180UH110AP36C
ML180UH070AP36A	ML180UH110TP60C
ML180UH090TP48B	ML180UH110AP60C
ML180UH090AP48B	ML180UH135TP60D
ML180UH110TP36C	ML180UH135AP60D

0712 Supersedes

Form No. 537536-01

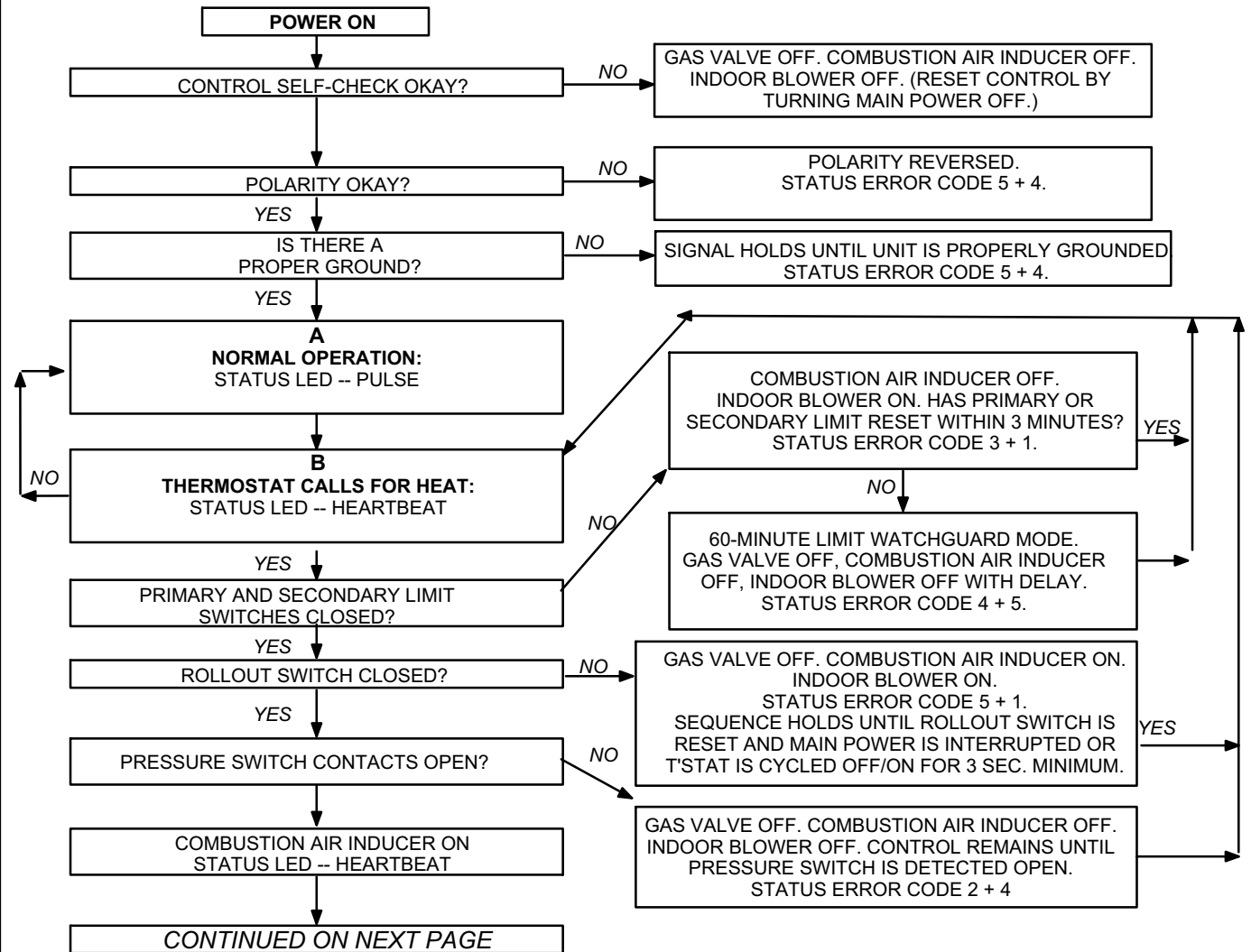
0712

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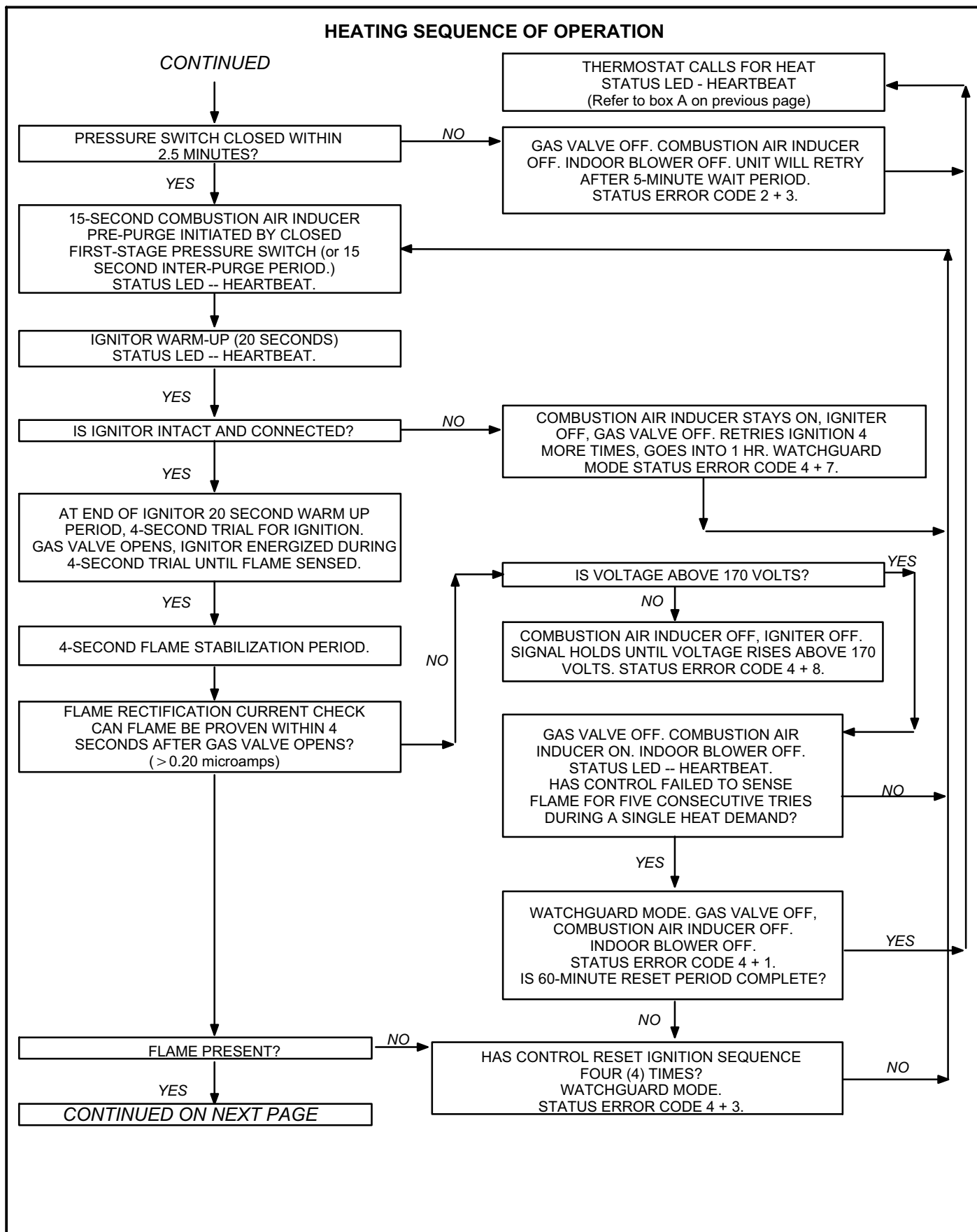
- When there is a call for heat, W1 of the thermostat energizes W of the furnace control with 24VAC.
- Integrated control runs a self-check. S10 primary limit, S47 rollout switch and S21 secondary limit contacts are found to be closed. Call for heat can continue.
- Integrated control (A92) energizes combustion air inducer B6. Combustion air inducer runs until combustion air pressure switch closes. Once it closes, a 15-second pre-purge follows.
- Integrated control (A92) energizes ignitor. 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.

Troubleshooting: Heating Sequence of Operation

HEATING SEQUENCE OF OPERATION NORMAL AND ABNORMAL HEATING MODE

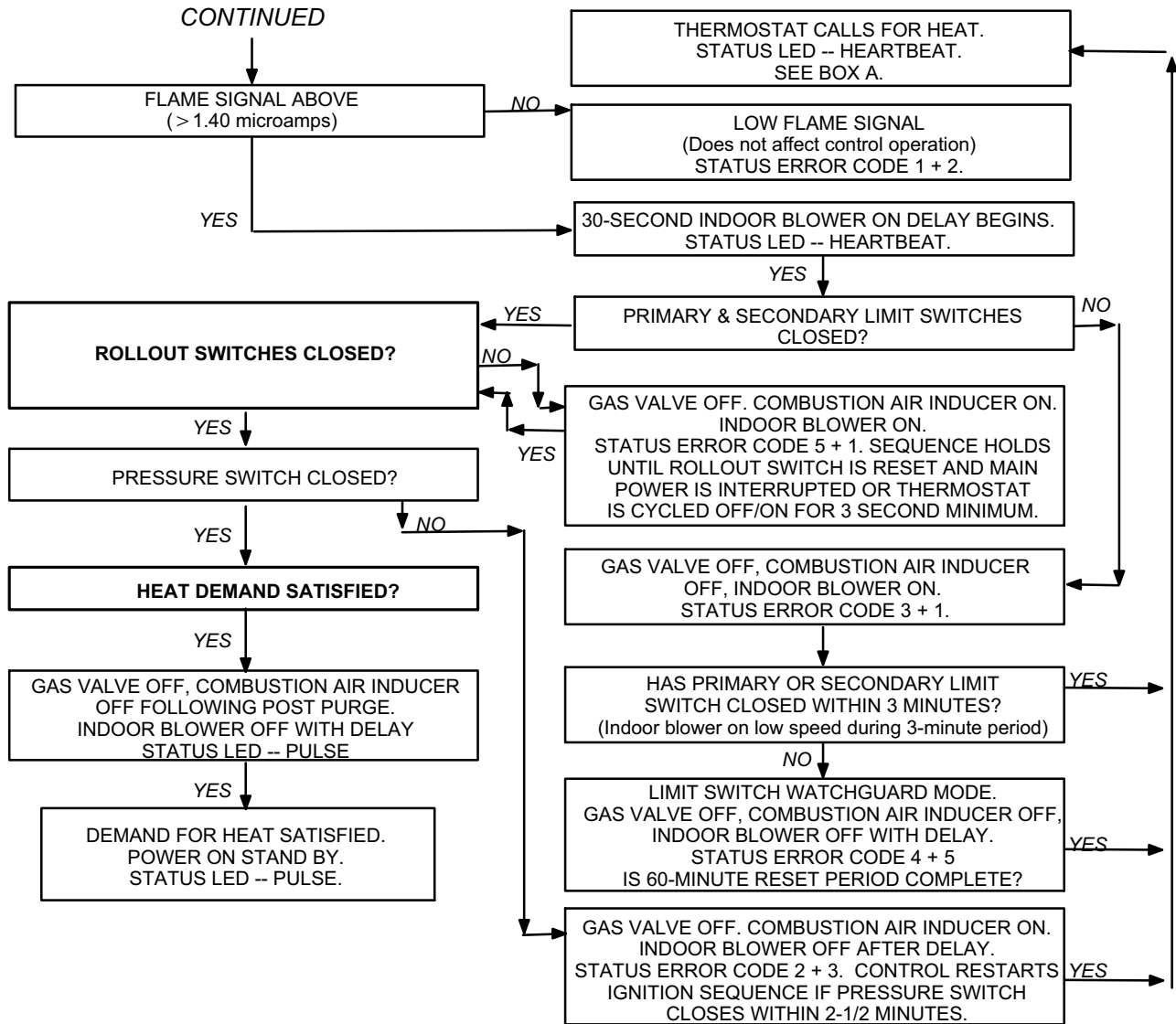


Troubleshooting: Heating Sequence of Operation (Continued)



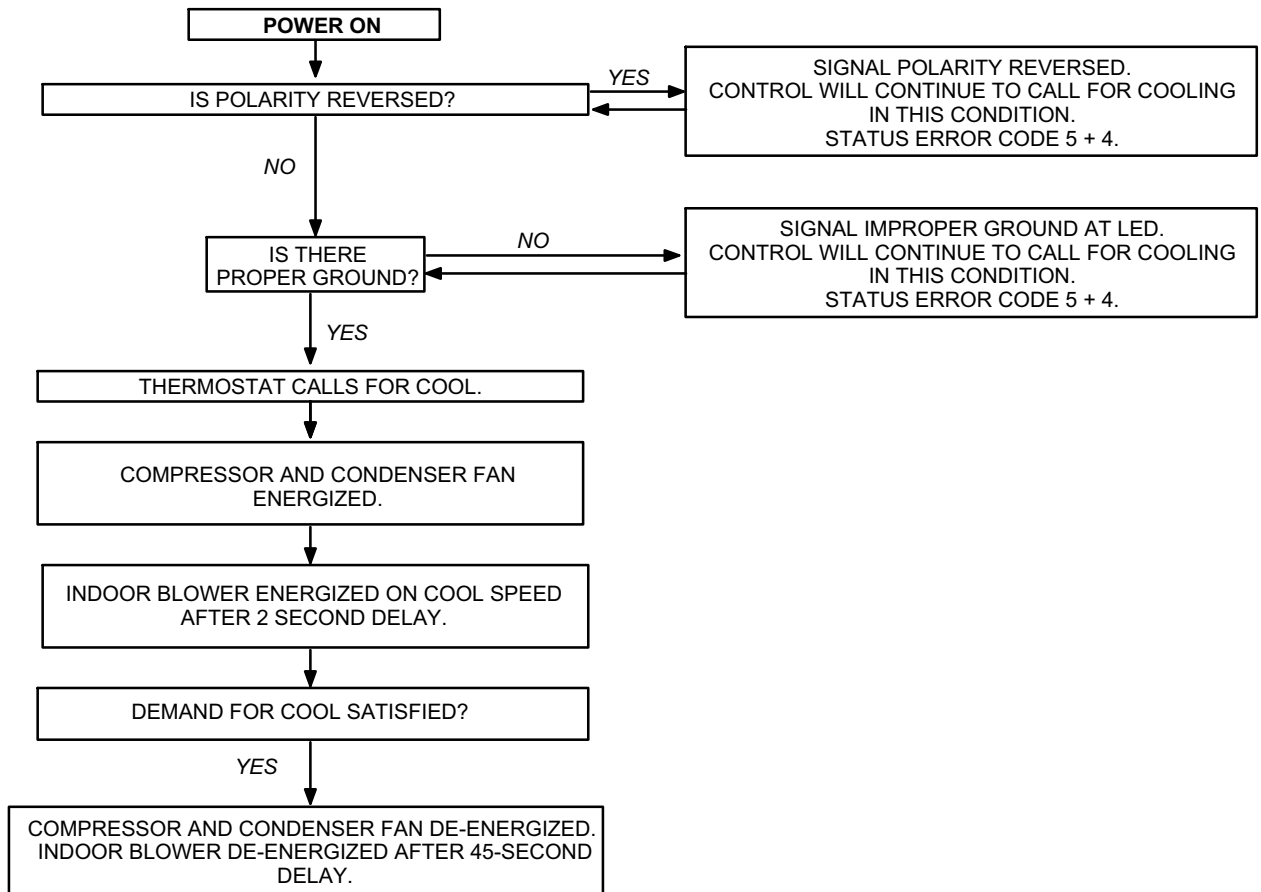
Troubleshooting: Heating Sequence of Operation (Continued)

HEATING SEQUENCE OF OPERATION



Troubleshooting: Cooling Sequence of Operation

COOLING SEQUENCE OF OPERATION



Troubleshooting: Continuous Fan Sequence of Operation

