UNIT INFORMATION

100160

ML180DFEK

ML180DFEK SERIES UNITS WITH R-454B

ML180DFEK series units are mid-efficiency gas furnaces used for downflow applications only, manufactured with Lennox Duralok heat exchangers formed of aluminized steel. ML180DFEK units are available in heating capacities of 44,000 to 110,000 Btuh and cooling applications 1.5 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. ML180DFEK model units are equipped with a hot surface ignition system and a constant torque ECM motor. The motor is programmed to provide constant torque at each of the five selectable speed taps. All units use a redundant gas valve to assure safety shut-off as required by C.S.A.

All specifications in this manual are subject to change. Procedures outlined in this manual are presented as a recommendation only and do not supersede or replace local or state codes. In the absence of local or state codes, the guidelines and procedures outlined in this manual (except where noted) are recommended only and do not constitute code.

⚠ WARNING

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

⚠ 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

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.

⚠ CAUTION

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

TABLE OF CONTENTS

SPECIFICATIONS

	Model	ML180DF045E36AK	ML180DF070E36AK	ML180DF070E36BK
Gas Heating Performance	[1] AFUE	80%	80%	80%
	Input - Btuh	44,000	66,000	66,000
	Output - Btuh	36,000	53,000	54,000
	Temperature rise range - °F	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
High Static - in. w.g.		0.50	0.50	0.50
Connections	Flue connection - in. round	4	4	4
	Gas pipe size IPS	1/2	1/2	1/2
Indoor Blower	Wheel diameter x width - in.	10 x 8	10 x 10	10 x 10
	Motor Type	DC Brushless	DC Brushless	DC Brushless
	Motor output - hp	1/2	1/2	1/2
	Tons of add-on cooling	1.5 - 3	1.5 - 3	1.5 - 3
	Air Volume Range - cfm	355 - 1430	675 - 1460	430 - 1475
Electrical Data	Voltage	120 volts - 60 hertz - 1 phase		
	Blower motor full load amps	6.8	6.8	6.8
	Maximum overcurrent protection	15	15	15
Shipping Data	lbs. - 1 package	113	119	128

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.

SPECIFICATIONS

	Model	ML180DF090E48BK	ML180DF110E60CK
Gas Heating Performance	[1] AFUE	80%	80%
	Input - Btuh	88,000	110,000
	Output - Btuh	72,000	90,000
	Temperature rise range - °F	30 - 60	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	Flue connection - in. round	4	4
	Gas pipe size IPS	1/2	1/2
Indoor Blower	Wheel diameter x width - in.	10 x 10	11-1/2 x 10
	Motor Type	DC Brushless	DC Brushless
	Motor output - hp	3/4	1
	Tons of add-on cooling	2.5 - 4	3 - 5
	Air Volume Range - cfm	680 - 1750	990 - 2410
Electrical Data	Voltage	120 volts - 60 hertz - 1 phase	
	Blower motor full load amps	8.4	10.9
	Maximum overcurrent protection	15	15
Shipping Data	lbs. - 1 package	140	160

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.

OPTIONAL ACCESSORIES - ORDER SEPARATELY

	"A" Width Models	"B" Width Models	"C" Width Models
CABINET ACCESSORIES			
Downflow Combustible Flooring Base	**11M59**	**11M60**	**11M61**
CONTROLS			
M30 Smart Wi-Fi Thermostat	**15Z69**	**15Z69**	**15Z69**
Remote Outdoor Air Temperature Sensor	**X2658**	**X2658**	**X2658**
Blower Relay Kit (for two-stage outdoor units)	**85W66**	**85W66**	**85W66**
Transformer (75VA)	**27J32**	**27J32**	**27J32**
REFRIGERANT DETECTION SENSOR			
Refrigerant Detection System (RDS) Coil Sensor Kit (for indoor coil)	**27V53**	**27V53**	**27V53**
FILTERS			
[1] **Downflow Filter Cabinet**	**51W06**	**51W07**	**51W08**
No. and Size of filter - in.	(1) 20 x 20 x 1	(2) 20 x 16 x 1	(2) 20 x 16 x 1

[1] Cleanable polyurethane, frame-type filter.

BLOWER DATA

ML180DF045E36AK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1347	278	1137	179	947	120	880	94	787	76
0.20	1310	288	1110	188	924	129	818	102	707	77
0.30	1278	301	1066	198	878	135	771	109	645	84
0.40	1259	312	1027	204	831	143	713	115	587	89
0.50	1210	323	995	214	785	149	669	121	530	95
0.60	1183	330	941	220	742	156	615	127	478	100
0.70	1155	338	902	228	702	164	570	134	430	105
0.80	1085	333	873	236	654	170	522	139	384	110
0.90	992	313	831	244	615	176	478	145	-	-
1.00	879	286	796	250	574	182	437	150	-	-

ML180DF070E36AK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1444	316	1262	219	1162	176	1144	169	986	119
0.20	1403	327	1227	228	1121	185	1112	179	939	127
0.30	1373	337	1186	236	1078	194	1064	187	894	132
0.40	1350	348	1151	244	1045	202	1034	196	861	143
0.50	1321	361	1117	255	1012	212	992	205	816	150
0.60	1279	371	1082	263	969	219	948	212	773	157
0.70	1250	382	1049	272	937	230	914	222	730	165
0.80	1214	384	1018	283	898	238	872	229	682	172
0.90	1131	370	966	291	862	247	840	238	639	179
1.00	1029	343	930	300	825	255	798	247	595	186

ML180DF070E36BK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1526	302	1291	192	1202	158	1166	146	1003	97
0.20	1480	314	1241	202	1156	166	1117	154	928	109
0.30	1434	327	1194	212	1089	178	1059	164	860	116
0.40	1388	338	1163	219	1040	187	1003	174	804	125
0.50	1353	350	1095	231	986	195	951	183	736	133
0.60	1309	360	1046	244	928	205	900	189	642	137
0.70	1237	355	1000	251	878	213	842	202	567	149
0.80	1123	330	947	262	816	223	750	209	488	154
0.90	969	298	888	268	723	231	673	219	444	161
1.00	753	264	700	251	635	236	609	226	-	-

ML180DF090E48BK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	1711	333	1499	237	1372	192	1328	175	1183	131
0.20	1668	347	1451	247	1336	204	1281	186	1132	142
0.30	1643	362	1421	262	1307	214	1240	196	1077	148
0.40	1601	371	1389	273	1261	227	1198	206	1036	160
0.50	1559	390	1352	287	1215	235	1152	219	984	170
0.60	1527	401	1312	297	1181	249	1113	228	934	181
0.70	1486	414	1265	309	1139	262	1062	239	887	191
0.80	1456	428	1236	321	1096	273	1024	251	843	201
0.90	1407	432	1195	335	1055	284	982	264	778	212
1.00	1277	403	1152	348	1005	294	940	273	716	222

ML180DF110E60CK PERFORMANCE (Less Filter)

External Static Pressure in. w.g.	Air Volume / Watts at Various Blower Speeds									
	High (Black)		Medium-High (Brown)		Medium (Blue)		Medium-Low (Yellow)		Low (Red)	
	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts	cfm	Watts
0.10	2335	581	2049	400	1798	283	1664	228	1476	169
0.20	2276	602	2007	416	1767	296	1603	241	1410	176
0.30	2243	613	1971	428	1709	308	1563	253	1347	188
0.40	2183	632	1917	441	1654	322	1500	263	1280	198
0.50	2164	645	1864	458	1598	331	1439	275	1222	207
0.60	2120	670	1818	474	1561	347	1391	286	1153	217
0.70	2083	682	1777	485	1496	355	1333	296	1100	228
0.80	2032	693	1728	499	1450	369	1272	305	1022	239
0.90	2008	712	1690	513	1395	380	1211	320	928	250
1.00	1962	730	1634	520	1345	393	1150	330	863	260

Twinning

The control board in this furnace is equipped with a provision to ”twin” (interconnect) two(2) adjacent furnaces with a common plenum such that they operate as one (1) large unit.

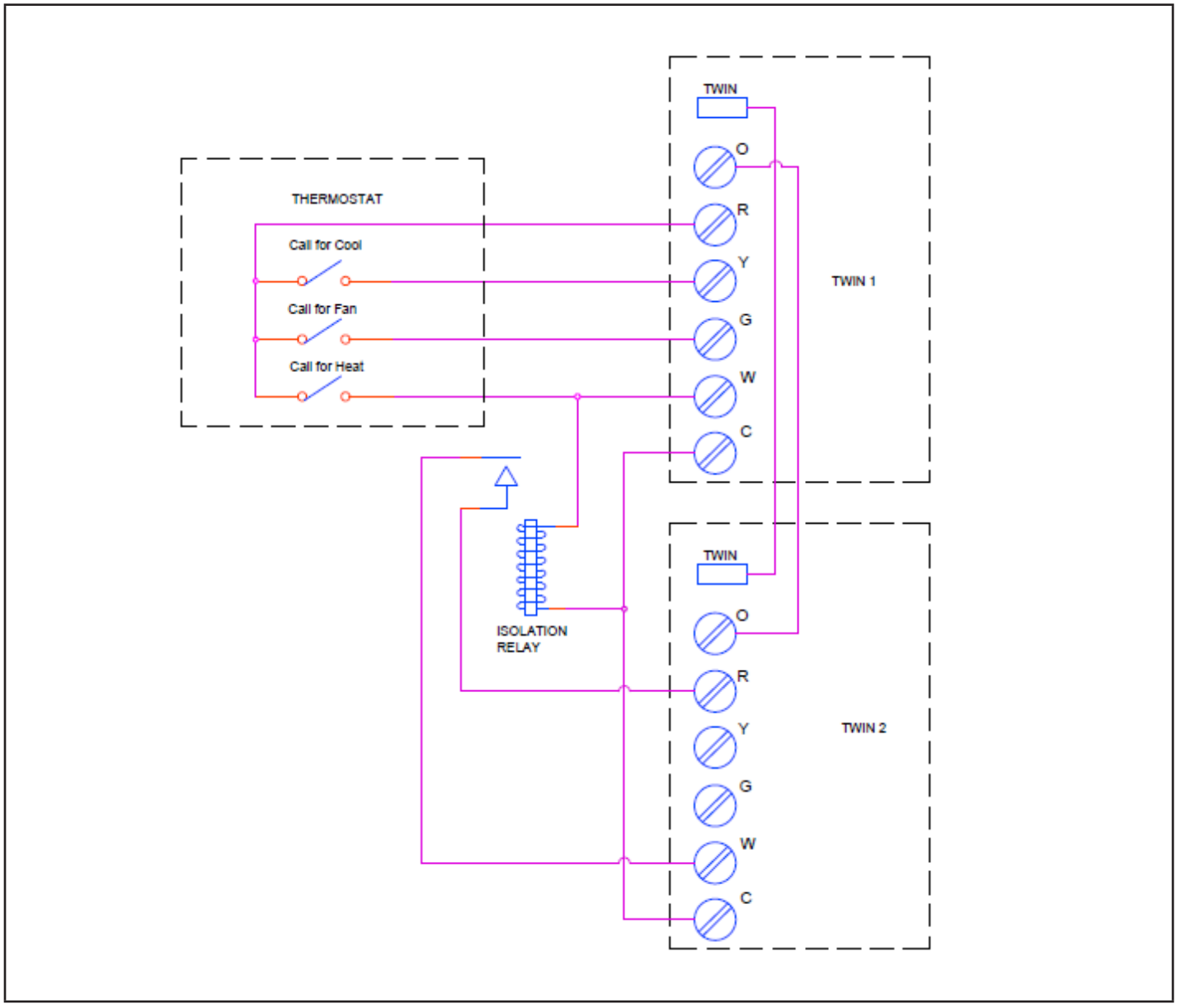
When twinned, the circulating blower speeds are synchronized between the furnaces. If either furnace has a need to run the blower, both furnaces will run the blower on the same speed. The cooling speed has highest priority, followed by heating speed and fan speed.

Field installation of twinning consists of connecting wires between the “C”, ”O” and ”Twin” terminals of the two controls.

The 24 VAC secondary of the two systems must be in phase. All thermostat connections are made to one control only. See diagram below.

The twinned furnace without thermostat connections is to have the call for heat supplied by an external 24VAC isolation relay* to prevent its rollout switch from being bypassed by the other twinned furnace. The coil of the isolation relay connects from the thermostat ”W” to 24 VAC common. The contacts of the relay connect ”R” to ”W” on the non-thermostat twin.

*Wiring and quick connects will be field provided.



PARTS ARRANGEMENT

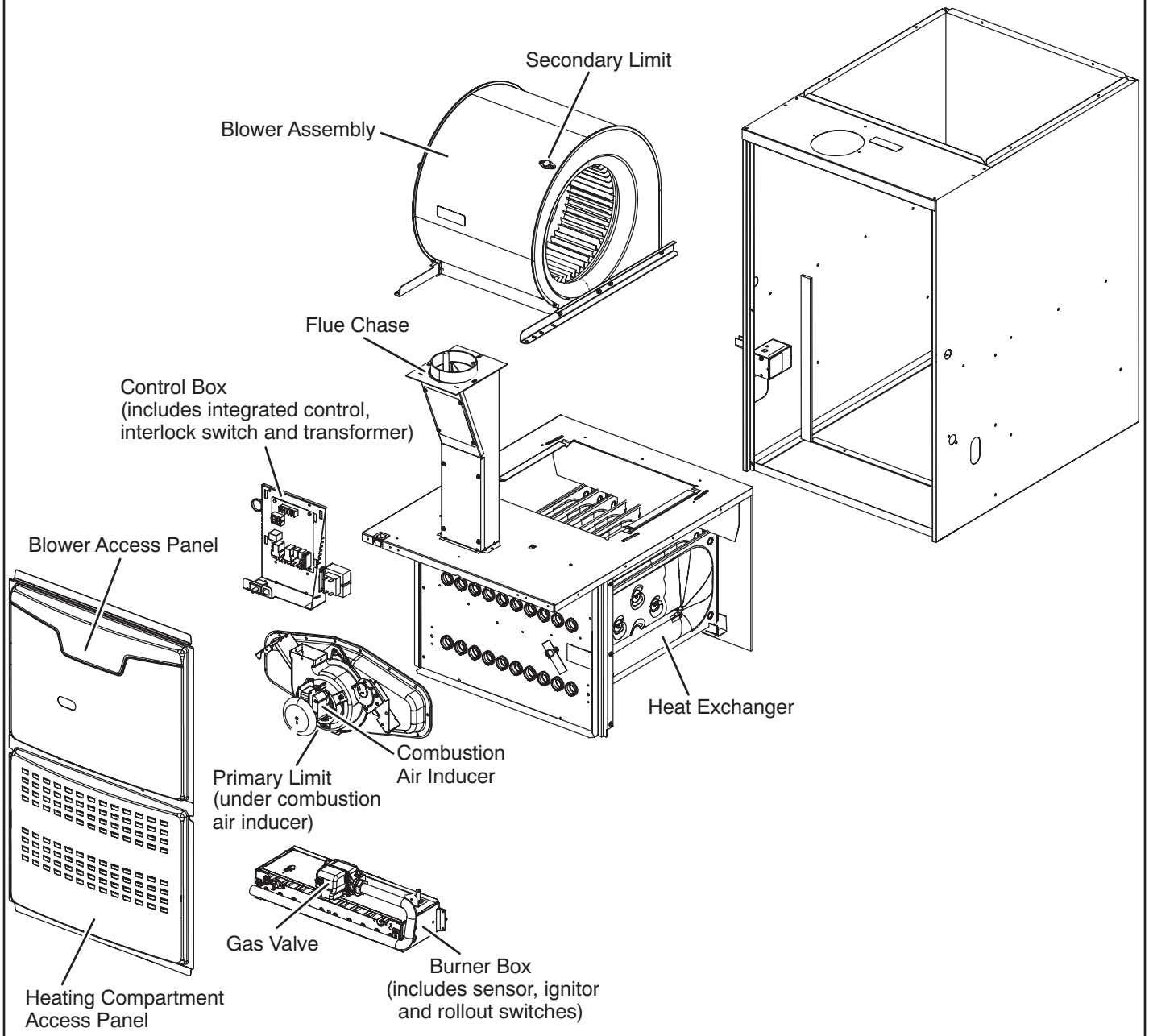


FIGURE 1

I-UNIT COMPONENTS

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

ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures

⚠ 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.

A - Control Box

1. Control Transformer (T1)

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

⚠ IMPORTANT

When matching this gas furnace with zoning, dual fuel or other 24V accessories, It is recommended to replace the factory installed transformer with kit 27J32.

Kit 27J32 contains a 75VA transformer, so you do not overload the original 40VA transformer.

2. Door Interlock Switch (S51)

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

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

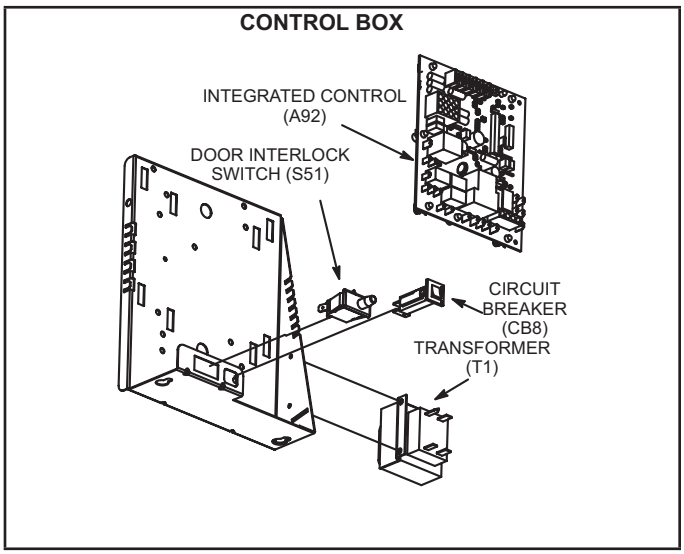


FIGURE 2

3. Circuit Breaker (CB8)

A 24V circuit breaker is also located in the control box. The switch provides overcurrent protection to the transformer (T1). The breaker is rated at 3A at 32V. If the current exceeds this limit the breaker will trip and all unit operation will shutdown. The breaker can be manually reset by pressing the button on the face.

4. Ignition Control 107792-XX (FIGURE 3)

⚠ 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.

Integrated Control DIP Switch Settings

Units are equipped with a single-stage integrated control. This control manages ignition timing, heating mode fan off delays and indoor blower speeds based on selections made using the control dip switches and jumpers. See section VII for Low GWP DIP switch settings. The control includes an internal watchguard feature which automatically resets the ignition control when it has been locked out. After one hour of continuous thermostat demand for heat, the watchguard will break and remake thermostat demand to the furnace and automatically reset the control to relight the furnace.

Accessory Terminals

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

One line voltage “HUM” 1/4” spade terminal is provided on the furnace integrated control. See FIGURE 3 for integrated control configuration. This terminal is energized in the heating mode when the combustion air inducer is operating. Any humidifier rated up to one amp can be connected to this terminal with the neutral leg of the circuit being connected to one of the provided neutral terminals. If a humidifier rated at greater than one amp is connected to this terminal, it is necessary to use an external relay.

One 24V ”H” 1/4” spade terminal is provided on the furnace integrated control. The terminal is energized in the heating mode when the combustion air inducer is operating and the pressure switch is closed. Any humidifier rated up to 0.5 amp can be connected to this terminal with the ground leg of the circuit connected to ground or the ”C” terminal.

Indoor Blower Operation DIP Switch Settings

The heat fan-on time of 30 seconds is not adjustable The heat fan-off delay (amount of time that the blower operates after the heat demand has been satisfied) may be adjusted by changing the two position dip switch on the integrated control, to one of four selections. Blower off delay is factory set at 120 seconds. For other blower off delay settings, please refer to the following chart:

Blower Delay Select		
	SW1-1	SW1-2
90	OFF	ON
120	OFF	OFF
180	ON	OFF
210	ON	ON
Factory Setting is 120		

ON BOARD LINKS (FIGURE 4 and FIGURE 5) and DIAGNOSTIC PUSH BUTTON (FIGURE 3)

⚠ IMPORTANT

Carefully review all configuration information provided. Failure to properly set DIP switches, jumpers and on-board links can result in improper operation!

On-Board Link W951 Heat Pump (R to O)

On-board link W951 is a clippable connection between terminals R and O on the integrated control. W951 must be cut when the furnace is installed in applications which include a heat pump unit and a thermostat which features dual fuel use. If the link is left intact, terminal “O” will remain energized eliminating the HEAT MODE in the heat pump.

Diagnostic Push Button

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

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

TABLE 1

1/4” QUICK CONNECT TERMINALS	
120V HUM	POWER FOR HUMIDIFIER (120 VAC
LINE	INCOMING POWER LINE (120 VAC)
XFMR	TRANSFORMER PRIMARY (120 VAC)
CIRC	INDOOR BLOWER MOTOR (120 VAC)
ACC	ACCESSORY(120 VAC)
24V HUM	HUMIDIFIER (24 VAC)
NEUTRALS	NEUTRAL (5)
3/16” QUICK CONNECT TERMINALS	
COOL	COOL SPEED TAP FROM INDOOR BLOWER MOTOR (24 VAC)
HEAT	HEAT SPEED TAP FROM INDOOR BLOWER MOTOR (24 VAC)
FAN	CONTINUOUS FAN SPEED TAP FROM INDOOR BLOWER MOTOR (24 VAC)
FLAME SENSE	FLAME SENSOR ELECTRODE (120 VAC)
COMMON	COMMON (24 VAC)
TWIN	24V TWINNING COMMUNICATION
PARK	3 TERMINALS TO PARK UNUSED MOTOR SPEED TAPS

TABLE 2

THERMOSTAT INPUT TERMINALS	
W	HEAT
C	COMMON GROUND
R	24V AC
G	FAN
Y	COOL
O	REVERSING VALVE (when W951 is clipped)

TABLE 3

LOW GWP INTERFACE	
LGWP1	LOW GWP SENSOR #1 INTERFACE
LGWP2	LOW GWP SENSOR # 2 INTERFACE
ALARM	INTERFACE TO LOW GWP LEAK AUDIBLE ALARM (DRY CONTACT)
ZONE	INTERFACE TO ZONING CONTROL (DRY CONTACT)
LGWP TEST	PUSH BUTTON TO TEST LOW GWP FUNCTIONALITY

Single Stage, Constant, Torque, Non-Communicating
107792-XX

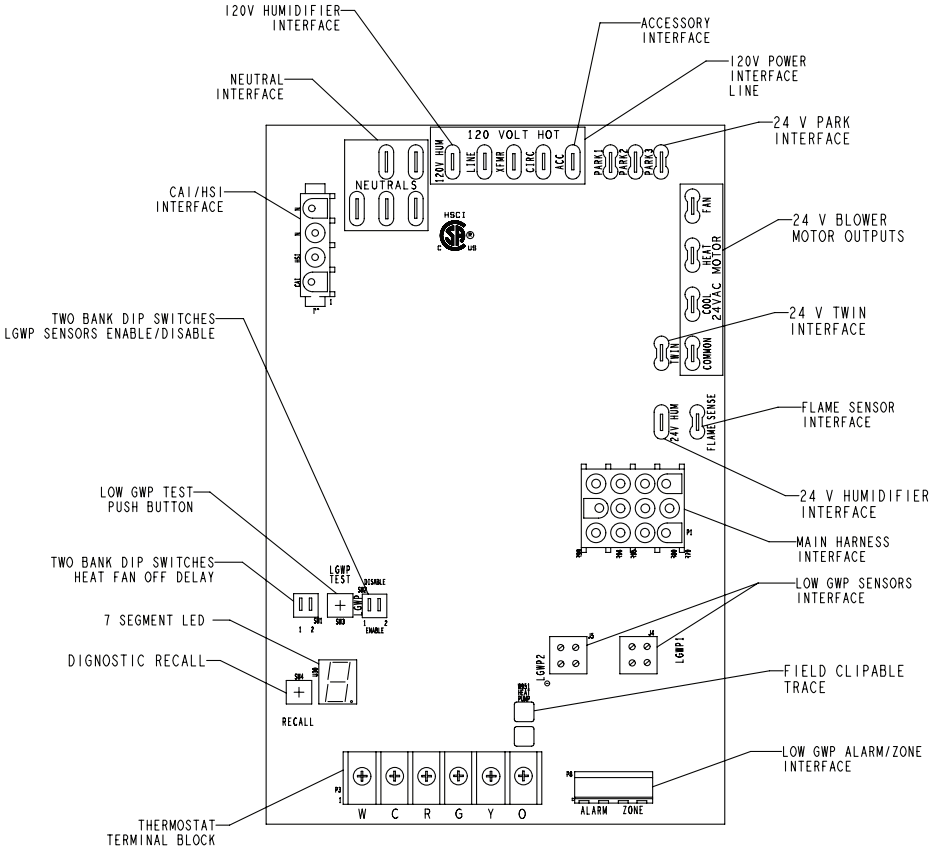


FIGURE 3

Indoor Blower Speeds

1 - When the thermostat is set to “FAN ON,” the indoor blower will run continuously on the fan speed when there is no cooling or heating demand. See table below for “Allowable circulation speeds”

2 - When the unit is running in the heating mode, the indoor blower will run on the heating speed. See table below for “Allowable heating speeds”.

3 - When there is a cooling demand, the indoor blower will run on the cooling speed

Allowable Heating Speeds					
Model Number	**Red**	**Yellow**	**Blue**	**Brown**	**Black**
ML180DF045E36A	Not Allowed	Allowed	Factory Setting	Allowed	Not Allowed
ML180DF070E36B	Not Allowed				
ML180DF090E48B	Allowed				
ML180DF110E60C	Not Allowed				

Allowable Circulation Speeds					
Model Number-ww	**Red**	**Yellow**	**Blue**	**Brown**	**Black**
All Models	Factory Setting	Not Allowed	Not Allowed	Not Allowed	Not Allowed

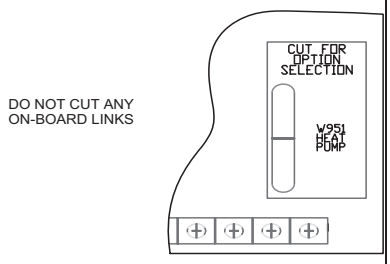
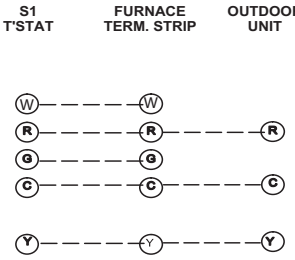
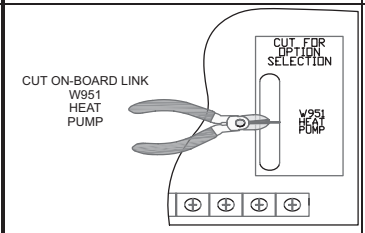
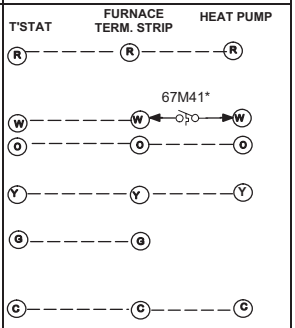
Thermostat	On Board Links Must NOT Be Cut To Select AC ON System Options	Wiring Connections
Heat / Cool		

FIGURE 4

Thermostat	On Board Links Must Be Cut To Select Heat Pump Options	Wiring Connections
Dual Fuel Single Stage Heat Pump ComfortSense thermostat w/ dual fuel capabilities		

Connect W to W ONLY if using defrost tempering kit 67M41

FIGURE 5

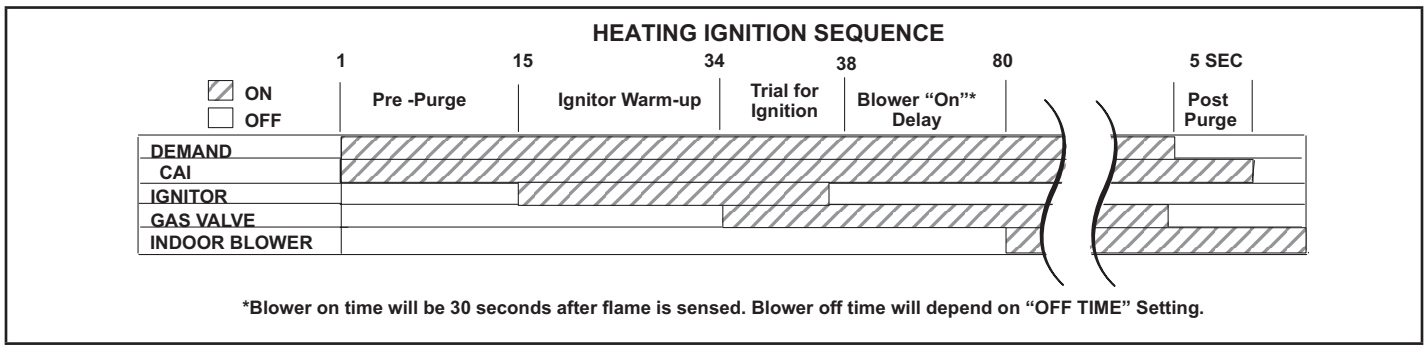


FIGURE 6

Heating Ignition Sequence FIGURE

On a call for heat the integrated control monitors the combustion air inducer pressure switch. The control will not begin the heating cycle if the pressure switch is closed (bypassed). Once the pressure switch is determined to be open, the combustion air inducer is energized. When the differential in the pressure switch is great enough, the pressure switch closes and a 15-second pre-purge begins. After 5-minute wait period expires, the control shall start the Ignition Sequence from the beginning if the call for heat is still present.

After the 15-second pre-purge period, the ignitor warms up for 20 seconds during which the gas valve opens at 19 seconds for a 4-second trial for ignition. The ignitor remains energized for the first 3 seconds during the 4 second trial. If ignition is not proved during the 4-second period, the integrated control will try four more times with an inter purge and warm-up time between trials of 35 seconds. After a total of five trials for ignition (including the initial trial), the integrated control goes into Watchguard-Flame Failure mode. After a 60-minute reset period, the integrated control will begin the ignition sequence again.

TABLE 4

Integrated Diagnostic Codes/Status of Equipment

Code	Diagnostic Codes/Status of Equipment
A	Indoor Blower Operation: Continuous Fan only mode
dF	Defrost mode
.	Idle mode (Decimal blinks at 1 Hertz -- 0.5 second ON, 0.5 second OFF).
C	Cooling stage (1 second ON, 0.5 second OFF) 1 or 2 displayed / Pause / Repeat codes.
d	Dehumidification mode (1 second ON, 1 second OFF) / Pause / Repeat Codes).
H	Gas Heat Stage (1 second ON, 0.5 second OFF) 1 or 2 displayed / Pause / Repeat codes. Blinking during ignition.
h	Heat pump stage.

* No change implies the display will continue to show whatever is currently being displayed for normal operation (blinking decimal, active error code, heat state, etc.)

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E000	No error in memory	No active fault exists, or all faults have been cleared
E106	Twin Communication Fault	This may indicate: 1) The power is removed from one furnace and not the other or/and 2) The 24 VAC supply to the twins are not in phase
E110	Low line voltage.	Line Voltage Low (Voltage lower than nameplate rating). Check power line voltage and correct. Alarm clears 5 seconds after fault recovered.
E111	Line voltage polarity reversed.	Reverse line power voltage wiring. System resumes normal operation 5 seconds after fault recovered.
E112	Ground not detected.	System shuts down. Provide proper earth ground. System resumes normal operation 5 seconds after fault recovered.
E113	High line voltage.	Line Voltage High (Voltage higher than nameplate rating). Provide power voltage within proper range. System resumes normal operation 5 seconds after fault recovered.
E114	Line voltage frequency out-of-range.	No 60 Hertz Power. Check voltage and line power frequency. Correct voltage and frequency problems. System resumes normal operation 5 seconds after fault recovered.
E115	Low 24V - Control will restart if the error recovers.	24-Volt Power Low (Range is 18 to 30 volts). Check and correct voltage. Check for additional power-robbing equipment connected to system. May require installation of larger VA transformer to be installed in furnace / air handler. Clears after fault recovered.
E117	Poor ground detected (Warning only).	Provide proper grounding for unit. Check for proper earth ground to the system. Warning only will clear 30 seconds after fault recovered.

TABLE 4 Continued

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E125	Control failed self-check, internal error, failed hardware. Will restart if error recovers. Integrated control not communicating. Covers hardware errors (flame sense circuit faults, pin shorts, etc.).	Hardware problem on the control. Cycle power on control. Replace if problem prevents service and is persistent. Critical alert. Cleared 300 seconds after fault recovered.
E150	Refrigerant Leak detected	This may indicate the presence of a leak at or in the indoor unit coil of the equipment, that will need to be repaired for proper and safe system operation. Additionally, it may indicate that proper refrigerant charge will need to be verified. This fault cannot be cleared while the refrigerant detection system sensor is reporting the presence of a leak
E151	Refrigerant Leak Detector Sensor #1 fault	The refrigerant detection sensor #1 in the unit is reporting an issue that prevents it from functioning properly, and replacement of the sensor may be necessary. This fault clears when the sensor no longer reports the presence of a fault condition.
E152	Refrigerant Leak Detector Sensor #2 fault	The refrigerant detection sensor #2 in the unit is reporting an issue that prevents it from functioning properly, and replacement of the sensor may be necessary. This fault clears when the sensor no longer reports the presence of a fault condition.
E154	Refrigerant Leak Detector Sensor #1 Communication lost or invalid sensor dip switch configuration (ON/OFF)	There may be an issue with the wiring harness connecting the sensor #1 to the furnace control board, either with the wiring itself or with the connector. Check the wiring and the connector for damage or improper connectivity. Check the sensor for damage or obstruction on the harness plug. This fault clears when communications with the sensor has been reestablished, but blower latches for a minimum of 5 minutes. Retest of the presence of fault can be effected by pressing the Low GWP test button on the furnace unit control board. This may also indicate incorrect Low GWP dip switch settings. Please refer to installation instructions.
E155	Refrigerant Leak Detector Sensor #2 Communication lost	There may be an issue with the wiring harness connecting the sensor #2 to the furnace control board, either with the wiring itself or with the connector. Check the wiring and the connector for damage or improper connectivity. Check the sensor for damage or obstruction on the harness plug. This fault clears when communications with the sensor has been reestablished, but blower latches for a minimum of 5 minutes. Retest of the presence of fault can be effected by pressing the Low GWP test button on the furnace unit control board
E160	Refrigerant Leak Detector Sensor #1 type incorrect	The sensor #1 is of a type not suitable for use in the application. Replace the sensor with a Lennox approved replacement part. This fault clears when a sensor suitable for the application is detected by the furnace control board, but blower will latch for a minimum of 5 minutes. Retest of the presence of the fault can be effected by pressing the Low GWP test button on the furnace unit control board.
E161	Refrigerant Leak Detector Sensor #2 type incorrect	The sensor #2 is of a type not suitable for use in the application. Replace the sensor with a Lennox approved replacement part. This fault clears when a sensor suitable for the application is detected by the furnace control board, but blower will latch for a minimum of 5 minutes. Retest of the presence of the fault can be effected by pressing the Low GWP test button on the furnace unit control board.
E163	Furnace Control Board Failure	There is an issue with the furnace control board, preventing the furnace from operating properly. This may require the replacement of the indoor unit control board. This fault clears when the furnace controller operates normally.

TABLE 4 Continued

Code	Diagnostic Codes/Status of Equipment	Action Required to Clear and Recover
E164	Low GWP Test	Low GWP Test mode activates by manually engaging Low GWP test button. Normal operations resumes and code clears automatically after 1-minute
E200	Hard lockout - Rollout circuit open or previously open.	Correct cause of rollout trip, or replace flame rollout switch. Test furnace operation. Cleared after fault recovered.
E204	Gas valve mis-wired.	Check gas valve operation and wiring. Clears when repaired.
E223	Low pressure switch failed open.	Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E224	Low pressure switch failed closed.	Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E227	Low pressure switch open during trial for ignition or run mode.	Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Resumes normal operation after fault is cleared.
E240	Low flame current - Run mode.	Check micro-amperes of flame sensor using control diagnostics or field-installed mode. Clean or replace sensor. Measure voltage of neutral to ground to ensure good unit ground. Alert clears after current heat call has been completed.
E241	Flame sensed out of sequence - Flame still present.	Shut off gas. Check for gas valve leak. Replace, if necessary. Alert clears when fault is recovered.
E250	Limit switch circuit open.	Check for proper firing rate on furnace. Ensure there is no blockage in heater. Check for proper air flow. If limit not closed within 3 minutes, unit will go into 1-hour soft lockout. Resumes normal operation after fault is cleared.
E270	Soft lockout - Exceeded maximum number of retries. No flame current sensed.	Check for proper gas flow. Ensure that ignitor is lighting burner. Check flame sensor current. Clears when heat call finishes successfully.
E271	Soft lockout - Exceeded maximum number of retries. Last retry failed due to the pressure switch opening.	Check pressure (inches w.c.) of low pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Clears when heat call finishes successfully.
E272	Soft lockout - Exceeded maximum number of recycles. Last recycle due to the pressure switch opening.	Check operation of low pressure switch to see if it is stuck closed on heat call. Check pressure (inches w.c.) of high pressure switch closing on heat call. Measure operating pressure (inches w.c.). Inspect vent and combustion air inducer for correct operation and restriction. Clears when heat call finishes successfully.
E273	Soft lockout - Exceeded maximum number of recycles. Last recycle due to flame failure.	Check micro-amperes of flame sensor using control diagnostics or field-installed mode. Clean or replace sensor. Measure voltage of neutral to ground to ensure good unit ground. Clears when heat call finishes successfully.
E274	Soft lockout - Exceeded maximum number of recycles. Last recycle failed due to the limit circuit opening or limit remained open longer than 3 minutes.	Shut down system. 1-hour soft lockout. Check firing rate and air flow. Check for blockage. Clears when heat call finishes successfully.
E275	Soft lockout - Flame sensed out of sequence. Flame signal is gone.	Shut off gas. Check for gas valve leak. 1-hour soft lockout. Clears when flame has been proven stable.
E290	Ignitor circuit fault - Failed ignitor or triggering circuitry.	Measure resistance of hot surface ignitor. Replace if open or not within specifications. 1-hour soft lockout. Clears when flame has been proven stable.
E390	Low GWP Relay Stuck	This indicates an issue with the Low GWP relay in the furnace control. This may require the replacement of the indoor unit control board. This fault clears when the relay operates normally.

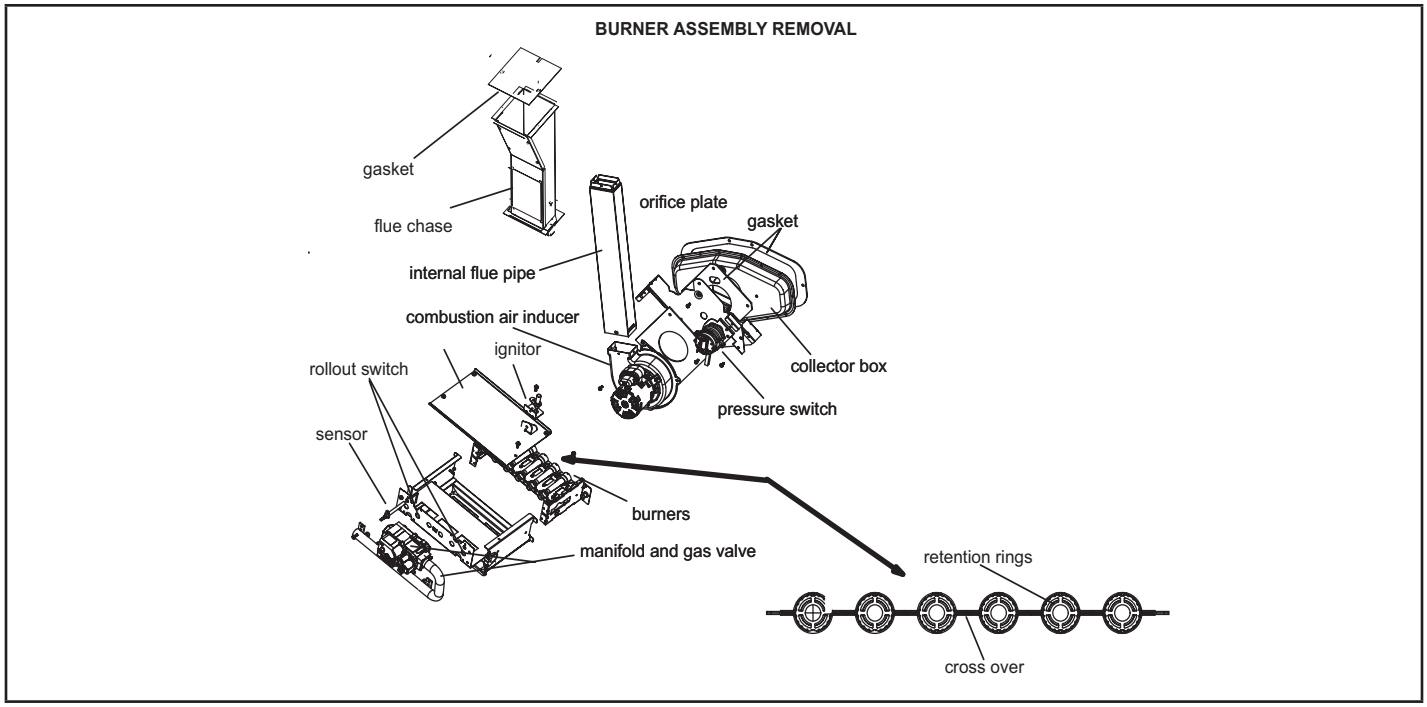


FIGURE 7

B - Heating Components (FIGURE 7)

1. Flame Rollout Switches

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

2. Primary Limit Control

The primary limit on 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.

3. Flame Sensor

A flame sensor is located on the left side of the burner support. The sensor is mounted on the flame rollout plate and the tip protrudes into the flame envelope of the left-most burner. The sensor can be removed for service (clean with steel wool) without removing any part of the burners.

During operation, flame is sensed by current passed through the flame and sensing electrode. The integrated control allows the gas valve to remain open as long as flame signal is sensed.

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

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

To Measure Flame Signal - Integrated Control:

Use a digital readout meter capable of reading DC microamps. See FIGURE 8 and TABLE 5 for flame signal check.

4 - Set the meter to the DC amps scale.

5 - Turn off supply voltage to control.

6 - 3 - Remove sensor wire from integrated control.

7 - Connect (-) lead to flame sensor wire.

8 - Connect (+) lead to Terminal “Flame Sense” on integrated control.

9 - Turn supply voltage on and close thermostat contacts to cycle system.

10 - When main burners are in operation for two minutes, take reading.

TABLE 5

Flame Signal in Microamps		
Normal	Low	Drop Out
1.5 or greater	0.5 - 1.4	0.4 or less

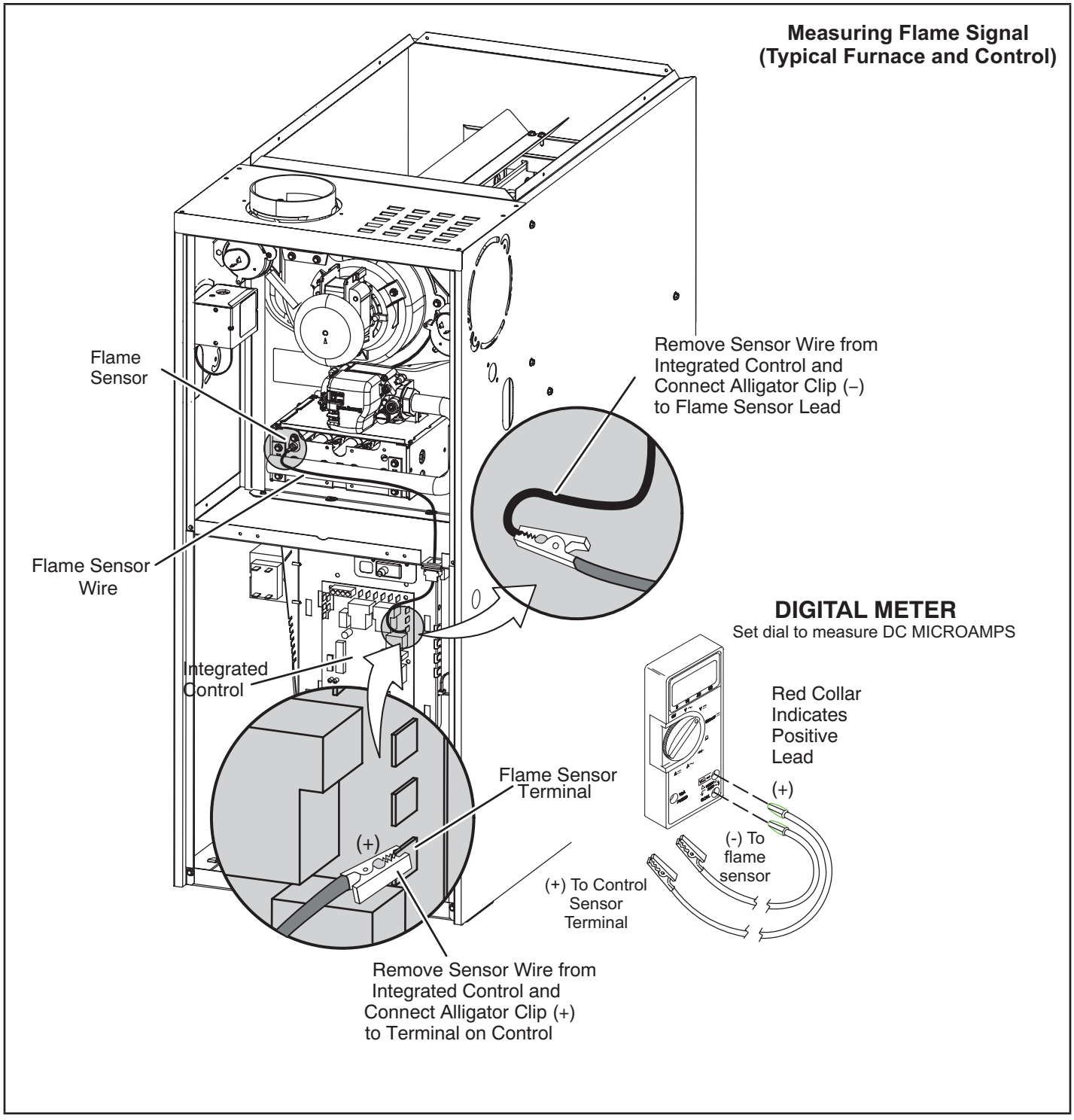

Measuring Flame Signal
(Typical Furnace and Control)
Flame
Sensor
Flame Sensor
Wire
Remove Sensor Wire from
Integrated Control and
Connect Alligator Clip (–)
to Flame Sensor Lead
DIGITAL METER
Set dial to measure DC MICROAMPS
Integrated
Control
Red Collar
Indicates
Positive
Lead
(+)
Flame Sensor
Terminal
(+)
(-) To
flame
sensor
(+) To Control
Sensor
Terminal
Remove Sensor Wire from
Integrated Control and
Connect Alligator Clip (+)
to Terminal on Control

FIGURE 8

4. Ignitor

The nitride ignitor used units is made from a proprietary ceramic material. To check ignitor, measure its resistance and voltage. A value of 39 to 70 ohms indicates a good ignitor. Voltage to the ignitor should be 120VAC. See FIGURE 9 for resistance, and voltage check.

NOTE - *The ML180UDFEK furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.*

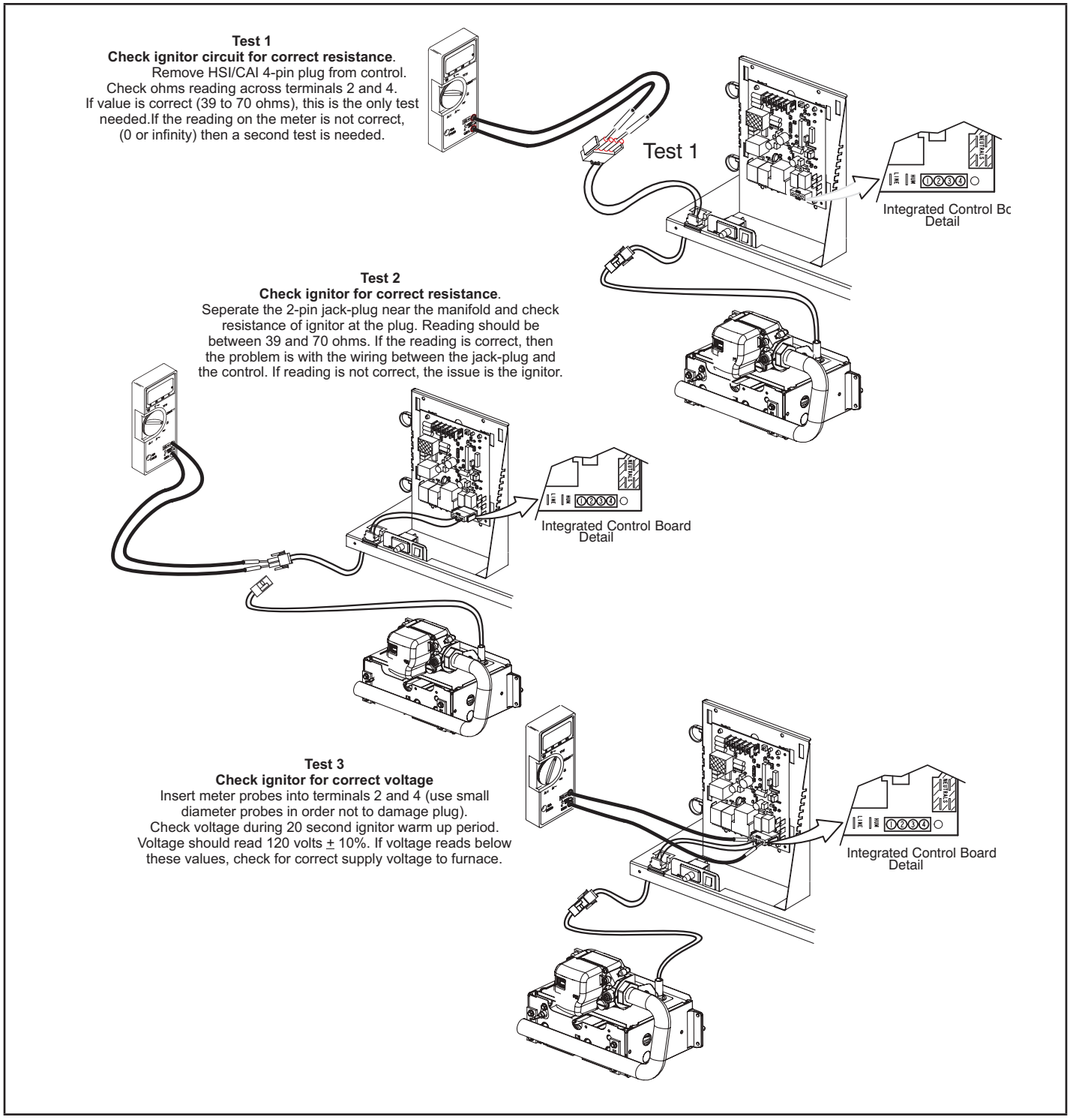


FIGURE 9

5. Gas Valve

The ML180DFEK uses an internally redundant gas valve to assure safety shut-off. If the gas valve must be replaced, the same type valve must be used. 24VAC terminals and valve switch are located on the valve. All terminals on the gas valve are connected to wires from the integrated control. 24V applied to the terminals energizes the valve.

Inlet and outlet pressure taps are located on the valve. A regulator adjustment screw is located on the valve. LPG changeover kits are available from Lennox. Kits include burner orifices and a gas valve regulator spring.

6. Combustion Air Inducer (B6)

All units use a combustion air inducer to move air through the burners and heat exchanger during heating operation. The blower uses a 120VAC motor. The motor operates during all heating operation and is controlled by integrated control A92. The inducer also operates for 15 seconds before burner ignition (pre-purge) and for 5 seconds after the gas valve closes (post-purge).

A pressure switch mounted on the combustion air inducer orifice plate is used to prove inducer operation. The combustion air inducer orifice will be different for each model.

See TABLE 6 for orifice sizes. The switch monitors air pressure in the inducer housing. During normal operation, the pressure in the housing is negative. If pressure becomes less negative (signifying any obstruction in the flue) the pressure switch opens. When the pressure switch opens, the integrated control (A92) immediately de-energizes the gas valve to prevent burner operation.

TABLE 6

Model	C.A.I. Orifice Size
045E36A	1.045”
070E36B	1.316”
090E48B	1.531”
110E60C	1.690”

7. Combustion Air Inducer Pressure Switch (S18)

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 7. 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 7

Unit	inches wc	
	Make	Break ± 0.05
045E36A	-0.75	-0.60
07036EB	-0.80	-0.65
090E48B	-0.75	-0.60
110E60C	-0.80	-0.65

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

Troubleshooting

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

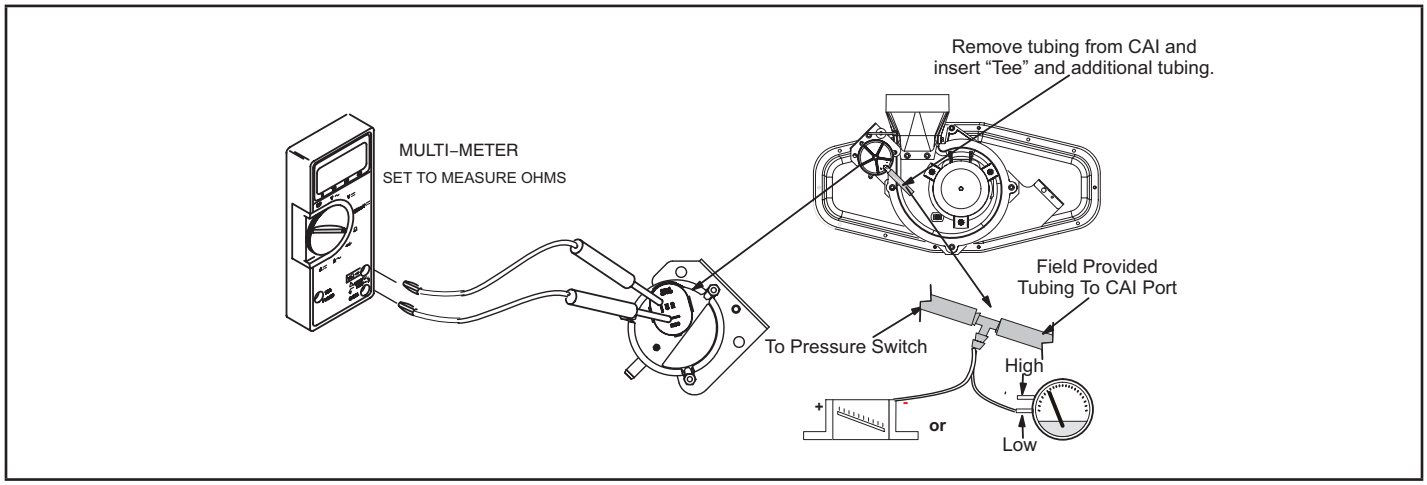


FIGURE 10

C - Blower Compartment

1. Blower Motor

⚠ IMPORTANT

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

ML180DFEK units are equipped with a constant torque ECM motor. It has a DC motor coupled to an electronic control module both contained in the same motor housing. The motor is programmed to provide constant torque at each of the five selectable speed taps. Each tap requires 24 volts to energize.

Input Voltage Requirements

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

Troubleshooting

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

1 - Shut off power to unit.

2 - Remove input connectors J48 and J49 from motor. See FIGURE 14 for troubleshooting procedure.

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

If replacing the indoor blower motor or blower wheel is necessary, placement is critical. The blower wheel must be centered in the blower housing as shown in FIGURE 11. When replacing the indoor blower motor the set screw must be aligned and tightened with the motor shaft as shown in FIGURE 12.

2. Secondary Limit Controls

The secondary limit is located in the blower compartment on the back side of the blower housing. See FIGURE 13. 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.

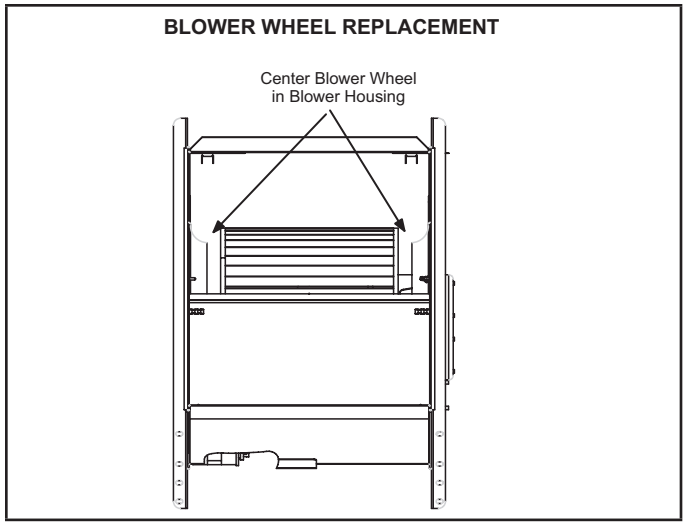


FIGURE 11

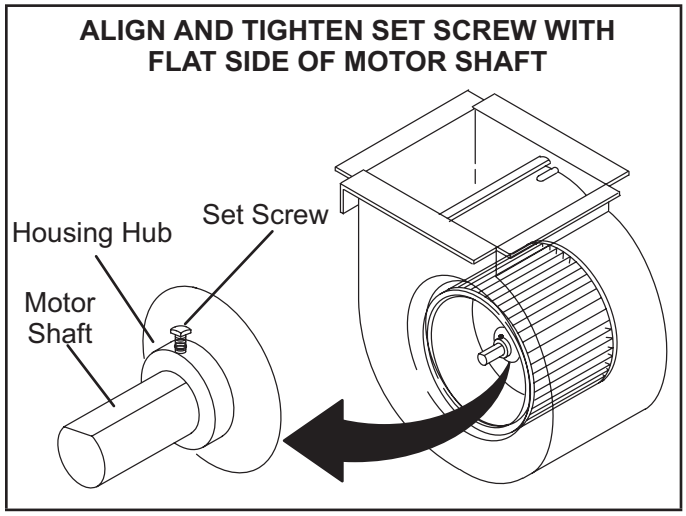


FIGURE 12

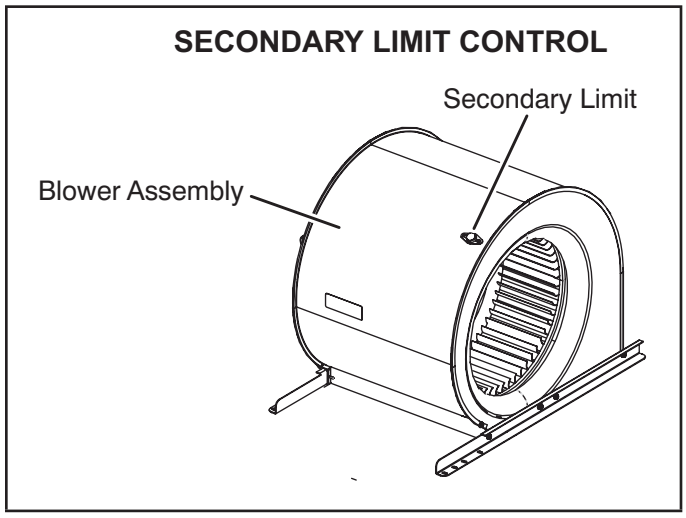
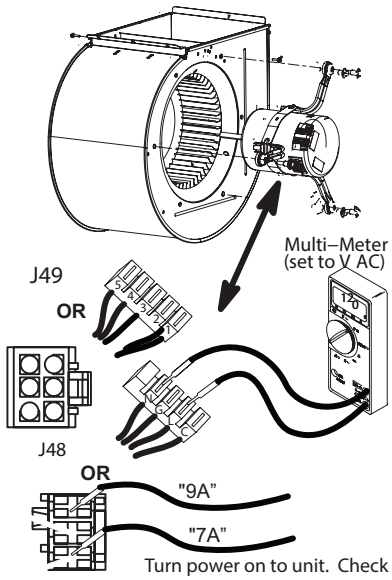
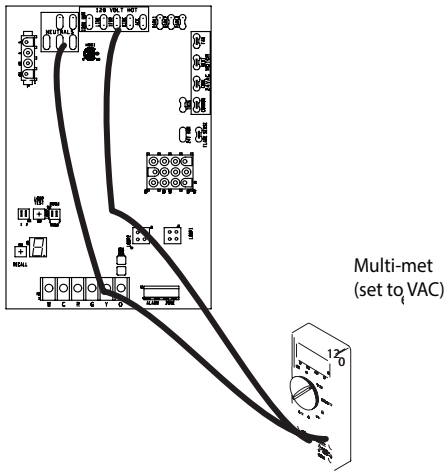


FIGURE 13



Test 1

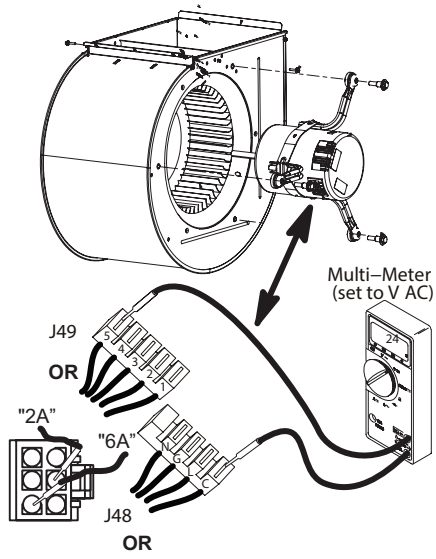
Turn power on to unit. Check for 120 volts across terminals "L" and "N" or terminals "7A" and "9A" of connector J48. If voltage is present continue to test 2. If voltage is not present problem may be upstream of J48. Proceed to test3.



Test 3 (if necessary)

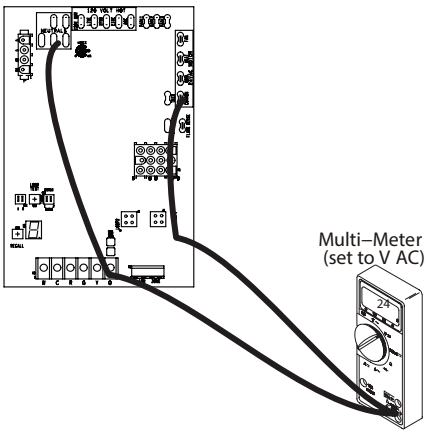
NOTE- *Ignition control illustration is typical*

Check for 120 volts across terminals "L1" and "Neutrals" on the integrated control. If voltage is present, problem is with the har ness. If voltage is not present problem may be may be with the integrated control.



Test 2

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



Test 4 (if necessary)

NOTE- *Ignition control illustration is typical*

Check for 24 volts across terminals "24 COM" and the "active speed tap" on the integrated control. If voltage is present, prob lem is with the harness. If voltage is not present problem may be may be with the integrated control

FIGURE 14

Replacing the Motor Module

1 - Disconnect electrical power to unit.

2 - Remove unit access panel.

3 - Unplug the two harnesses from the motor control module. See FIGURE 15.

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

Unplug the Two Harness Connection

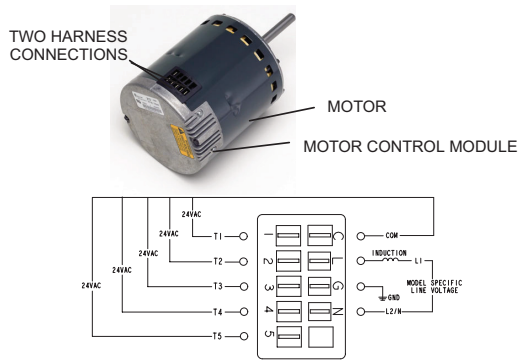


FIGURE 15

4 - Remove the two hex head bolts securing the motor control module to the motor. See FIGURE 16.

Remove the Hex Head Bolts

FIGURE 16

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

Testing the Motor (FIGURE 17)

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

1 - Using an ohmmeter check the resistance from any one of the motor connector pins to the aluminum end plate of the motor. This resistance should be greater than 100k ohms.

2 - Check the resistances between each of the three motor connector pins. These should all read approximately the same resistance within an ohm.

3 - Check to see if the blower wheel spins freely.

Motor Test

FIGURE 17

TABLE 8

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

Motor Module Installation

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

1 - Verify electrical power to unit is disconnected.

2 - Connect three-wire harness from motor to control module.

3 - Mount new motor control module to motor using two hex head bolts removed in FIGURE 16. Torque bolts to 22 inch pounds or 1/16th clock wise turn.

4 - Reconnect the two harnesses to the motor control module.

5 - The electrical connectors of the motor should be facing down to form a drip loop (FIGURE 18). This will directs moisture away from the motor and its electric connections on the motor.

Drip Loop

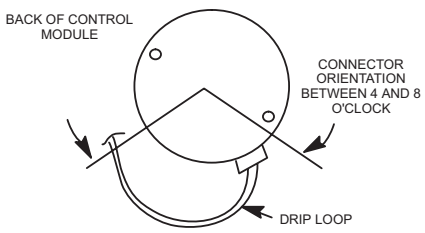


FIGURE 18

II- PLACEMENT AND INSTALLATION

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

III- START-UP

A- Heating Start-Up

⚠ WARNING

Shock and burn hazard.

ML180UDFE units are equipped with a hot surface ignition system. Do not attempt to light manually.

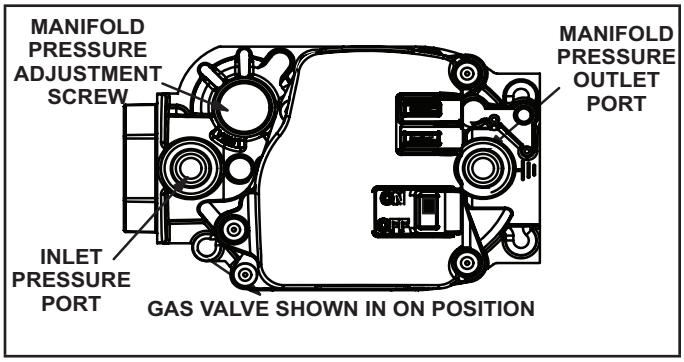


FIGURE 19

1 - **STOP!** Read the safety information at the beginning of this section.

2 - Set the thermostat to the lowest setting.

3 - Turn off all electrical power to the unit.

4 - This furnace is equipped with an ignition device which automatically lights the burners. Do not try to light the burners by hand.

5 - Remove the upper access panel.

6 - Move gas valve switch to OFF position. Do not force. See FIGURE 19.

7 - Wait five minutes to clear out any gas. If you then smell gas, STOP! Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions. If you do not smell gas go to next step.

8 - Move gas valve switch to ON position. Do not force. See FIGURE 19.

9 - Replace the upper access panel.

10 - Turn on all electrical power to 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 18.

5 - Replace the upper access panel.

B- Safety or Emergency Shutdown

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

C- Extended Period Shutdown

Turn off thermostat or set to "UNOCCUPIED" mode. Close all gas valves (both internal and external to unit) to guarantee no gas leaks into combustion chamber. Turn off power to unit. All access panels and covers must be in place and secured.

IV-HEATING SYSTEM SERVICE CHECKS

A- C.S.A. Certification

All units are C.S.A. design certified without modifications. Refer to the ML180DFEK Installation Instruction.

B- Gas Piping

Gas supply piping should not allow more than 0.5"W.C. drop in pressure between gas meter and unit. Supply gas pipe must not be smaller than unit gas connection. Compounds used on gas piping threaded joints should be resistant to action of liquefied petroleum gases.

C- Testing Gas Piping

⚠ CAUTION

If a flexible gas connector is required or allowed by the authority that has jurisdiction, black iron pipe shall be installed at the gas valve and extend outside the furnace cabinet.

⚠ IMPORTANT

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

⚠ WARNING

Do not exceed 600 in-lbs (50 ft-lbs) torque when attaching the gas piping to the gas valve.

When pressure testing gas lines, the gas valve must be disconnected and isolated. Gas valves can be damaged if subjected to more than 0.5psig (14" W.C.). See FIGURE 20. If the pressure is equal to or less than 0.5psig (14"W.C.), close the manual shut-off valve before pressure testing to isolate furnace from gas supply.

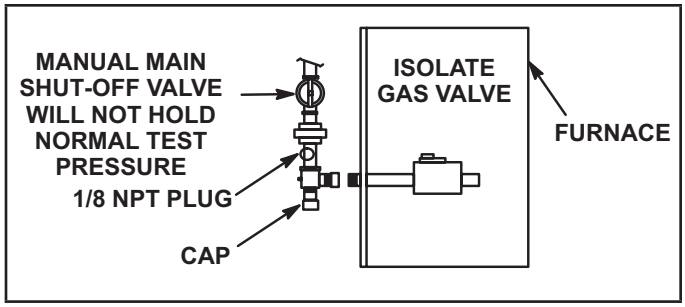


FIGURE 20

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

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

D- Gas Pressure Adjustment

Gas Flow (Approximate)

TABLE 9

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

Furnace should operate at least 5 minutes before checking gas flow. Determine time in seconds for two revolutions of gas through the meter. (Two revolutions assures a more accurate time.) Divide by two and compare to time in TABLE 9. If manifold pressure matches TABLE 11 and rate is incorrect, check gas orifices for proper size and restriction. Remove temporary gas meter if installed.

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

E- Supply and Manifold Pressure

Supply Pressure Measurement

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

2 - Start unit and allow 5 minutes for unit to reach steady state.

3 - After allowing unit to stabilize for 5 minutes, record supply pressure and compare to value given in TABLE 11.

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 11.

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

F- Proper Combustion

Furnace should operate a minimum 15 minutes with correct manifold pressure and gas flow rate before checking combustion. Take combustion sample beyond the flue outlet and compare to the table below. **The maximum carbon monoxide reading should not exceed 100 ppm.**

TABLE 10

ML180DFE Unit	CO_2% Nat	CO_2% LP
-045	6.8 - 7.4	7.5 - 9.0
-070		
-090		
-110		

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 11 for manifold pressure and TABLE 12 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 11

Manifold Pressure Settings at all Altitudes

Model Input Size	Gas	0 - 4500 ft.	4501 - 7500 ft .	7501 - 10,000 ft.	Line Pressure in. wg.	
					Min	Max
045	Nat	3.5	3.5	3.5	4.5	13.0
	LP/Propane	10.0	10.0	10.0	11.0	13.0
070	Nat	3.5	3.3	3.5	4.5	13.0
	LP/Propane	10.0	10.0	10.0	11.0	13.0
090	Nat	3.5	3.3	3.5	4.5	13.0
	LP/Propane	10.0	10.0	10.0	11.0	13.0
110	Nat	3.5	3.3	3.5	4.5	13.0
	LP/Propane	10.0	10.0	10.0	11.0	13.0

TABLE 12

Pressure Switch and Gas Conversion Kits at all Altitudes

Model Input Size	High Altitude Pressure Switch Kit			High Altitude Natuarl Gas Orifice Kit	LP/Propane Oricifice Kit		Natuarl Gas Orifice Kit
	0-4500 ft	4501-7500 ft	7501-10,000 ft	7501-10,000 ft	0-7500 ft	7501-10,000 ft	0-7500 ft
045	No Change	No Change	80W51	73W37	11K49	11K44	73W81
070		80W52					
090		No Change					
110		80W52					

NOTE - A natural to L.P. propane gas changeover kit is necessary to convert this unit. Refer to the changeover kit installation instruction for the conversion procedure.

H- Proper Ground and Voltage

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

1 - Measure the AC voltage between Line Neutral (spade terminals) and “C” terminal (low voltage terminal block) on the integrated control. See FIGURE 21. A wide variation in the voltage between Line Neutral and “C” as a function of load indicates a poor or partial ground. Compare the readings to the table below. If the readings exceed the maximum shown in TABLE 13, make repairs before operating the furnace.

2 - In addition, measure the AC voltage from Line Hot to Line Neutral (spade terminals) on the integrated control. See FIGURE 22. This voltage should be in the range of 97 to 132 Vac.

CHECK VOLTAGE BETWEEN LINE NEUTRAL AND LOW VOLTAGE “C” TERMINAL

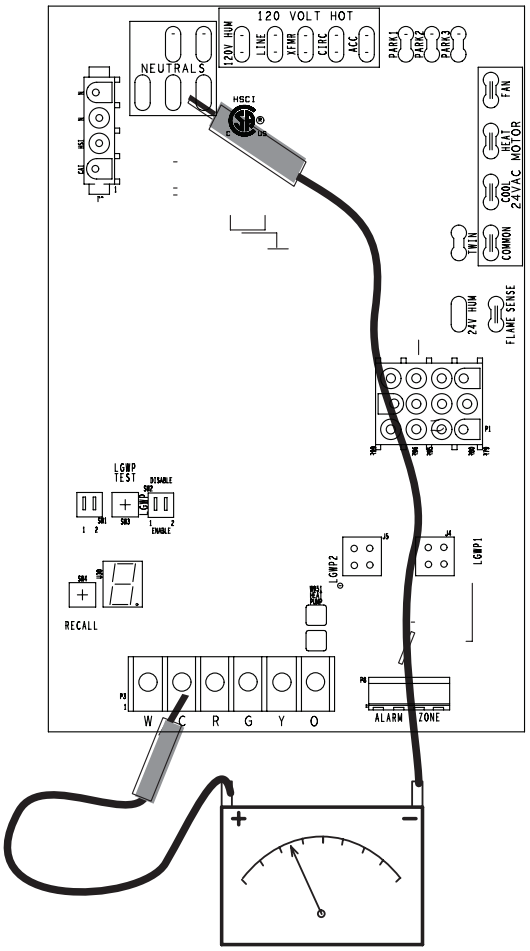


FIGURE 21

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

CHECK VOLTAGE BETWEEN LINE HOT AND LINE NEUTRAL

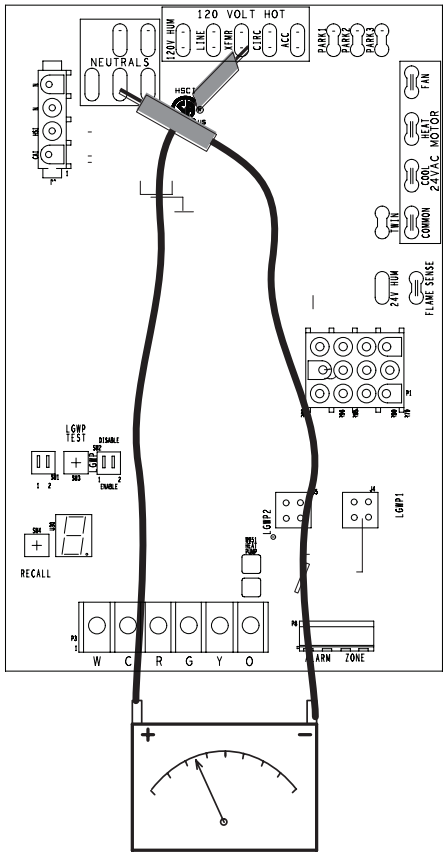


FIGURE 22

V-TYPICAL OPERATING CHARACTERISTICS

A-Blower Operation and Adjustment

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

1 - Blower operation is dependent on thermostat control system.

2 - Generally, blower operation is set at thermostat subbase fan switch. wWith fan switch in ON position, blower operates continuously. With fan switch in AUTO position, blower cycles with demand or runs continuously while heating or cooling circuit cycles.

3 - Depending on the type of indoor thermostat, blower and entire unit will be off when the system switch is in OFF position.

B-Temperature Rise (FIGURE 23)

Temperature rise for ML180DFEK units depends on unit input, blower speed, blower horsepower and static pressure as marked on the unit rating plate. The blower speed must be set for unit operation within the range of “TEMP. RISE °F” listed on the unit rating plate.

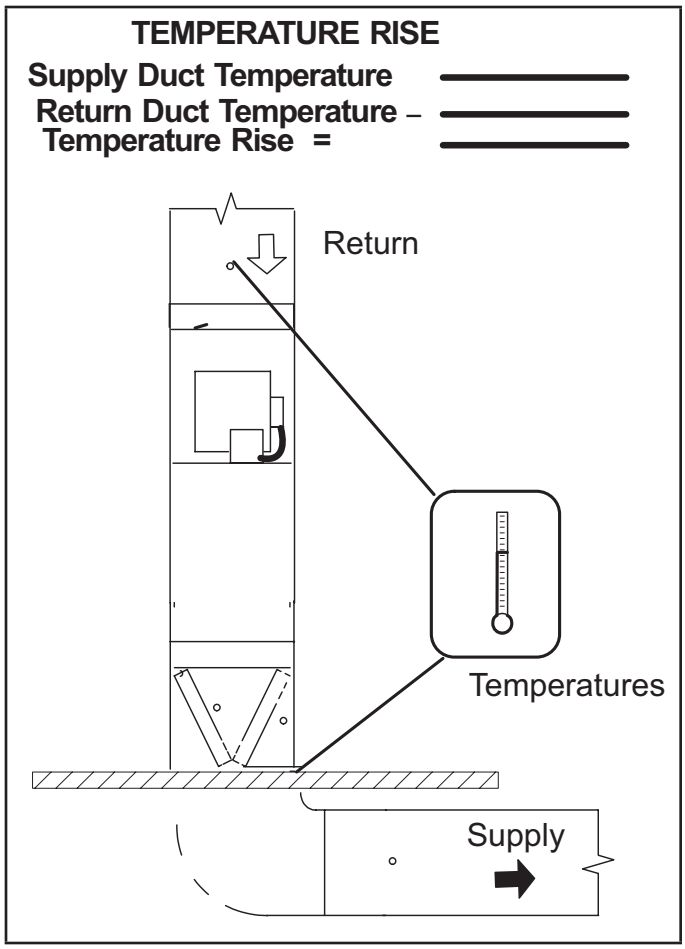


FIGURE 23

C-External Static Pressur

1 - Tap locations shown in FIGURE 24 .

2 - Punch a 1/4” diameter hole in supply and return air plenums. Insert manometer hose flush with inside edge of hole or insulation. Seal around the hose with permagum. Connect the zero end of the manometer to the discharge (supply) side of the system. On ducted systems, connect the other end of manometer to the return duct as above.

3 - With only the blower motor running and the evaporator coil dry, observe the manometer reading. Adjust blower motor speed to deliver the air desired according to the job requirements. For heating speed external static pressure drop must not be more than 0.5” W.C. For cooling speed external static pressure drop must not be more than 0.8” W.C.

4 - Seal the hole when the check is complete.

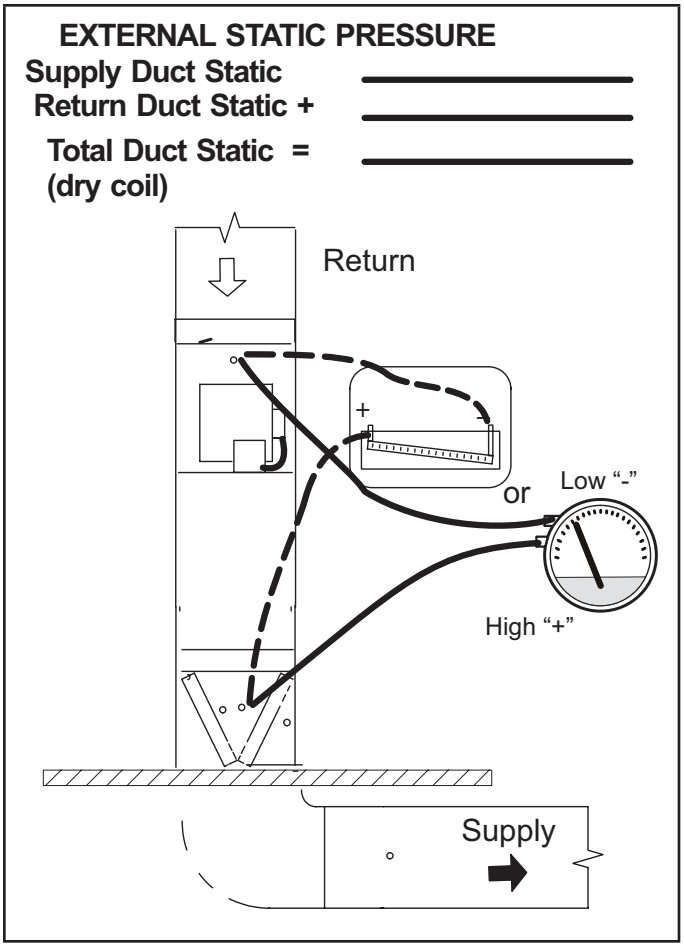


FIGURE 24

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. The continuous blower tap is connected to the “FAN” terminal. Unused taps must be secured on 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). See TABLE 14.

⚠ IMPORTANT

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

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

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

TABLE 14

Furnace Cabinet Width	Filter Size (inches)
A - 14-1/2”	14 X 25 X 1 (1)
B - 17-1/2”	16 X 25 X 1 (1)
C - 21”	20 x 25 x 1 (1)

5 - Check the condition and cleanliness of burners and heat exchanger and clean if necessary.

6 - Check the cleanliness of blower assembly and clean the housing, blower wheel and blower motor if necessary. The blower motors are prelubricated for extended bearing life. No further lubrication is needed.

7 - Inspect the combustion air inducer and clean if necessary.

8 - Evaluate the heat exchanger integrity by inspecting the heat exchanger per the AHRI heat exchanger inspection procedure. This procedure can be viewed at www.ahrinet.org

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.

15 - Inspect the Low GWP sensor / sensors and rubber sleeve.

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

1 - Check the operation of the ignition system, inspect and clean flame sensor. Check microamps before and after. Check controls and safety devices (gas valve, flame sensor, temperature limits). Consult Service Manual for proper operating range. Thermal Limits should be checked by restricting airflow and not disconnecting the indoor blower. For additional details, please see Service and Application Note H049.

2 - Verify that system total static pressure and airflow settings are within specific operating parameters.

3 - Clock gas meter to ensure that the unit is operating at the specified firing rate. Check the supply pressure and the manifold pressure. On two-stage gas furnaces check the manifold pressure on high fire and low fire. If manifold pressure adjustment is necessary, consult the Service Literature for unit specific information on adjusting gas pressure. Not all gas valves are adjustable. Verify correct temperature rise.

Cleaning the Heat Exchanger and Burners

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

1 - Turn off both electrical and gas power supplies to furnace.

2 - Remove flue pipe, top cap, flue chase and internal flue pipe assembly from the unit.

3 - Label the wires from gas valve, rollout switches, primary limit switch and make-up box then disconnect them.

4 - Remove the screws that secure the combustion air inducer/ pressure switch assembly to the collector box. Carefully remove the combustion air inducer to avoid damaging blower gasket. If gasket is damaged, it must be replaced to prevent leakage.

5 - Remove the collector box located behind the combustion air inducer. Be careful with the collector box gasket. If the gasket is damaged, it must be replaced to prevent leakage.

6 - Disconnect gas supply piping. Remove the four screws securing the burner manifold assembly to the vestibule panel and remove the assembly from the unit.

7 - Remove screws from both sides, top and bottom of vestibule panel.

8 - Remove heat exchanger. It may be necessary to spread cabinet side to allow more room. If so, remove five screws from the left side or right side of cabinet. See FIGURE 26.

9 - Back wash using steam. Begin from the burner opening on each clam. Steam must not exceed 275°F.

10 - To clean burners, run a vacuum cleaner with a soft brush attachment over the face of burners. Visually inspect insid he burners and crossovers for any blockage caused by foreign matter. Remove any blockage. FIGURE 25 shows burner detail.

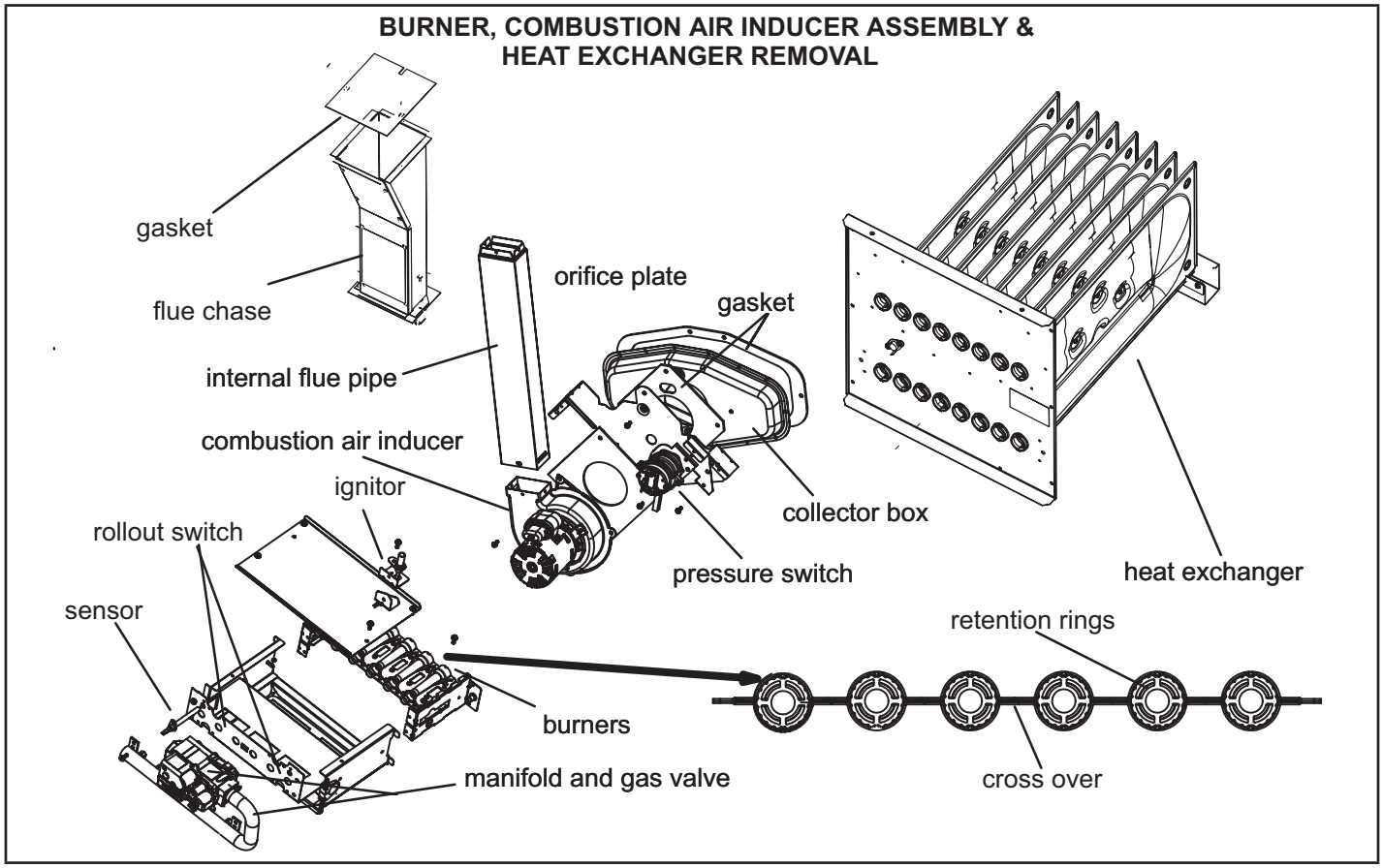


FIGURE 25

11 - To clean the combustion air inducer visually inspect and using a wire brush clean where necessary. Use compressed air to clean off debris and any rust.

12 - Reinstall heat exchanger in vestibule. (Replace the five screws in the cabinet from step 10 if removed).

13 - Reinstall collector box, combustion air assembly, internal flue pipe and flue chase. Seal with high temperature RTV. Reinstall all screws to the collector box and combustion air inducer. Failure to replace all screws may cause leaks. Inspect gaskets for any damage and replace if necessary.

14 - Reinstall burner box, manifold assembly and burner box cover.

15 - Reconnect all wires.

16 - Reconnect top cap and vent pipe to combustion air inducer outlet.

17 - Reconnect gas supply piping.

18 - Turn on power and gas supply to unit.

19 - Set thermostat and check for proper operation.

20 - Check all piping connections, factory and field, for gas leaks. Use a leak detecting solution or other preferred means.

21 - If a leak is detected, shut gas and electricity off and repair leak.

⚠ CAUTION

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

22 - Repeat steps 21 and 23 until no leaks are detected.

23 - Replace access panel.

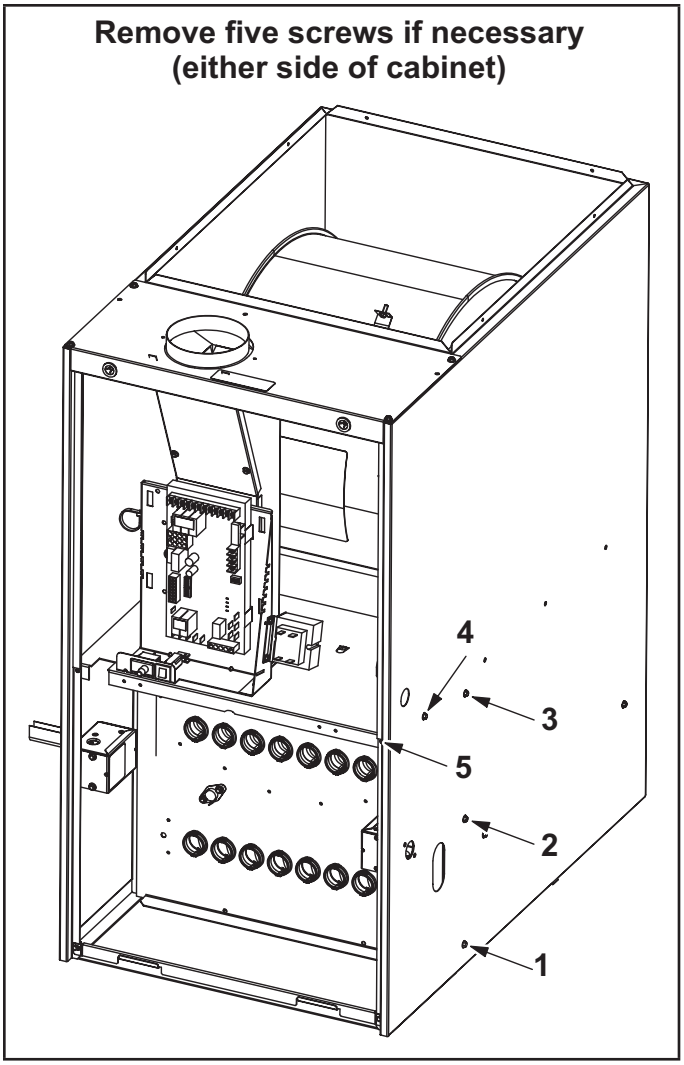


FIGURE 26

VII- Low GWP Application

⚠ WARNING

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

CONNECTING THE FURNACE CONTROL BOARD SENSOR.

See FIGURE 29 and follow steps below:

1 - Route sensor wire #1 through provided grommet. Form a drip loop below the control board on upflow installations to prevent condensate dripping on the control board.

2 - Avoid sharp edges when routing sensor wire during installation.

3 - Sensor wire must not block view of 7 segment LED .

Ensure the cable is properly seated into the SENSOR 1 plug (LGWP1). The Molex plug clip should lock into the Molex connection point for a secured connection, as shown below in FIGURE 27 Verify the connection is free of dust, debris, and moisture.

NOTE - *In confined space applications, connect the second sensor to the SENSOR 2 plug (LGWP2). Refer to evaporator coil installation instructions for more detail.*

Single Stage Constant Torque Control

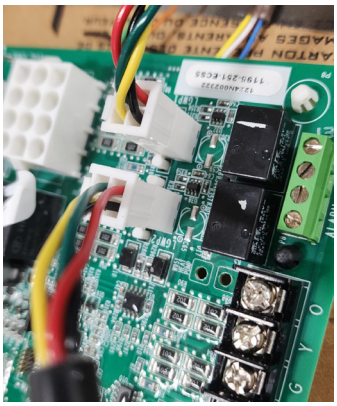


FIGURE 27

LOW GWP DIP SWITCH SETTINGS

Adjust the DIP switch settings to the sensor configuration. Failure to do so will cause faults on power-up. See FIGURE 28 and TABLE 15.

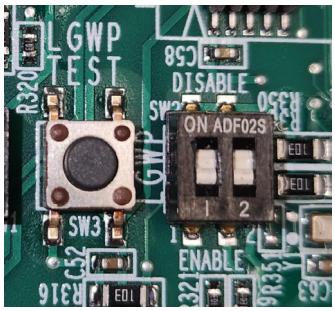


FIGURE 28

TABLE 15

DIP Switch Settings

Configuration	Switch 1	Switch 2
One (1) sensor, connected to SENSOR 1 plug	OFF (enable)	ON (disable)
Two (2) sensors, connected to SENSOR 1 plug and SENSOR 2 plug	OFF (enable)	OFF (enable)

In single sensor configurations, the sensor must be connected to the SENSOR 1 plug (LGWP1). Configurations other than the ones shown in TABLE 15 will cause a servicing fault.

Each DIP switch corresponds to a sensor position (i.e., DIP switch 1 to sensor 1; DIP switch 2 to sensor 2). The default factory switch positions are set to OFF (ENABLED)

The furnace control board software reads the OFF position as an active sensor. A sensor should be present for the corresponding sensor connector. Setting the DIP switch to ON disables the sensor position.

SECONDARY SENSOR REQUIREMENTS

Additional Line Sets

If additional refrigerant line joints are present outside of the line set sleeve and a secondary refrigerant detection sensor is required, its installation must comply with the requirements listed in Refrigerant Detection Sensor Kit (27V53). See FIGURE 29 for routing the secondary sensor cable through the furnace cabinet

Non-Low GWP Applications

⚠ WARNING

For Furnace only applications or Furnace replacement in a Non-Low GWP applications, the LOW GWP sensors should be disabled, otherwise the blower will operate continuously. To do this, the Low GWP Dip switches setting for both – Sensor 1 and the Sensor 2 must be moved to the ON position.

FURNACE CONTROL BOARD LOW GWP MODES OF OPERATION

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

Initializing

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

Normal

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

Leak Detected

When the furnace control board detects a refrigerant leak:

1. The furnace control board shuts off the (R) input (24VAC power) to the thermostat, which de-energizes the outdoor unit compressor and heat sources, such as gas and/or electric strip heat. No heating or cooling demands will be met.
2. The furnace control board activates the blower (high speed). The blower purges refrigerant from the cabinet, plenum, and ductwork.
3. After the furnace control board determines the refrigerant levels are below the safety threshold, the blower will continue to operate for the remainder of the seven (7) -minute cycle.
4. After the blower sequence is complete, the HVAC system resumes normal operation.

NOTE - *The HVAC system may not maintain a cooling or heating setpoint if a significant leak exists. Any refrigerant leaks that remain unaddressed for an extended time may cause the HVAC system to shut down on a low refrigerant pressure limit condition.*

Fault

When a Low GWP fault is detected by the furnace control board, the indoor unit blower engages and remains engaged at a constant air flow output until the fault is cleared.

NOTE - See TABLE 4 “Ignition control diagnostoc codes”..

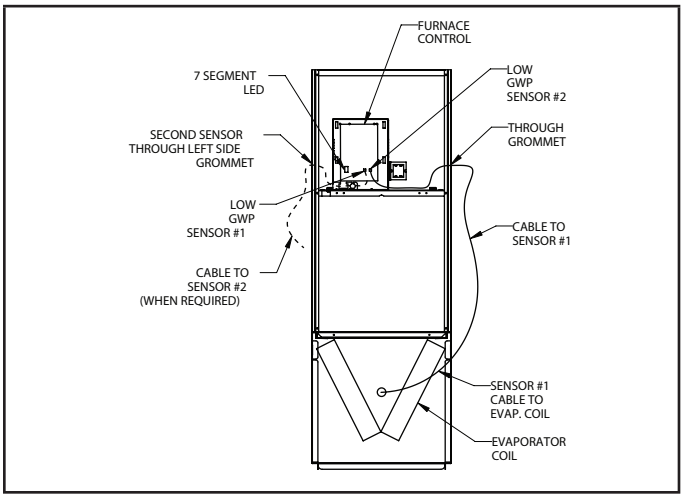


FIGURE 29

LGWP TEST BUTTON FUNCTIONALITY

The furnace control board is equipped with a Test/Reset push button. The Test button can be used to perform several functions, depending on the mode of operation of the furnace control board.

TABLE 16 lists the functions of the Test button during each mode of operation.

TABLE 16

LGWP Test Button Function

Mode of Operation	Press the Test Button to:
Normal	Trigger a leak detection response. Verify all equipment is wired correctly into the furnace blower control board (after installation).
Leak Detected	Reset the furnace control board to a normal mode of operation after a previous leak has been detected and purged from the HVAC system
Fault	Reset the furnace control board after troubleshooting and resolving a fault condition. If the fault is not resolved, the furnace control board will enter the Fault mode again.

LGWP Test Button - Additional Functions

TABLE 17 lists the additional functions of the Test Button while the furnace control board is functioning within the states of Initializing, Monitoring, Leak Detection, Servicing and Fault.

TABLE 17

Additional Button Functions

State	Press	Action
Initializing	Short	Skips remaining pre-purge after sensors are recognized by the furnace control board
Initializing	Long	Reset control
Monitoring	Short	Clear purge-counter if prior mitigation has occurred; Test mitigation
Monitoring	Long	Reset control
Mitigating	Short	If testing mitigation, end test
Servicing	Short	Reevaluate fault condition - if cleared return to monitoring, otherwise update indicator
Servicing	Long	Reset control
Fault	Short	Reevaluate fault condition - if cleared return to monitoring, otherwise update indicator
Fault	Long	Reset control

External Alarm

(*For applications with external alarms wired directly to the furnace control board*)

The furnace control board triggers the external alarm system when it enters Leak Detected mode. For alarm notifications, the furnace control board provides a dry relay contact that is rated 3A at 30 VAC/DC.

THERMOSTAT COMPATIBILITY

Thermostats that preserve memory settings are compatible with the furnace control board. Examples include:

- Battery-powered thermostats
- Analog Thermostat
- Late-model programmable thermostats

NOTE - *Early-generation digital and programmable thermostats may not retain the operation mode and temperature setpoints after a power outage.*

The following scenarios are likely to occur when home occupants are not available to adjust the thermostat setpoints as the system is recovering from leak detection and resuming normal operation:

- Heating could be lost during a cold night
- Cooling could be lost during a hot day
- The thermostat could reset to an incorrect temperature setpoint

START UP PROCEDURE

The furnace control board is equipped with a LGWP Test/Reset button, see Test Button Functionality. After the furnace control board has been mounted and wired, restore power to the HVAC system. The system will then run through a purge sequence for five minutes. After the purge sequence is complete, proceed to testing cooling demand and heating demand.

Cooling Demand

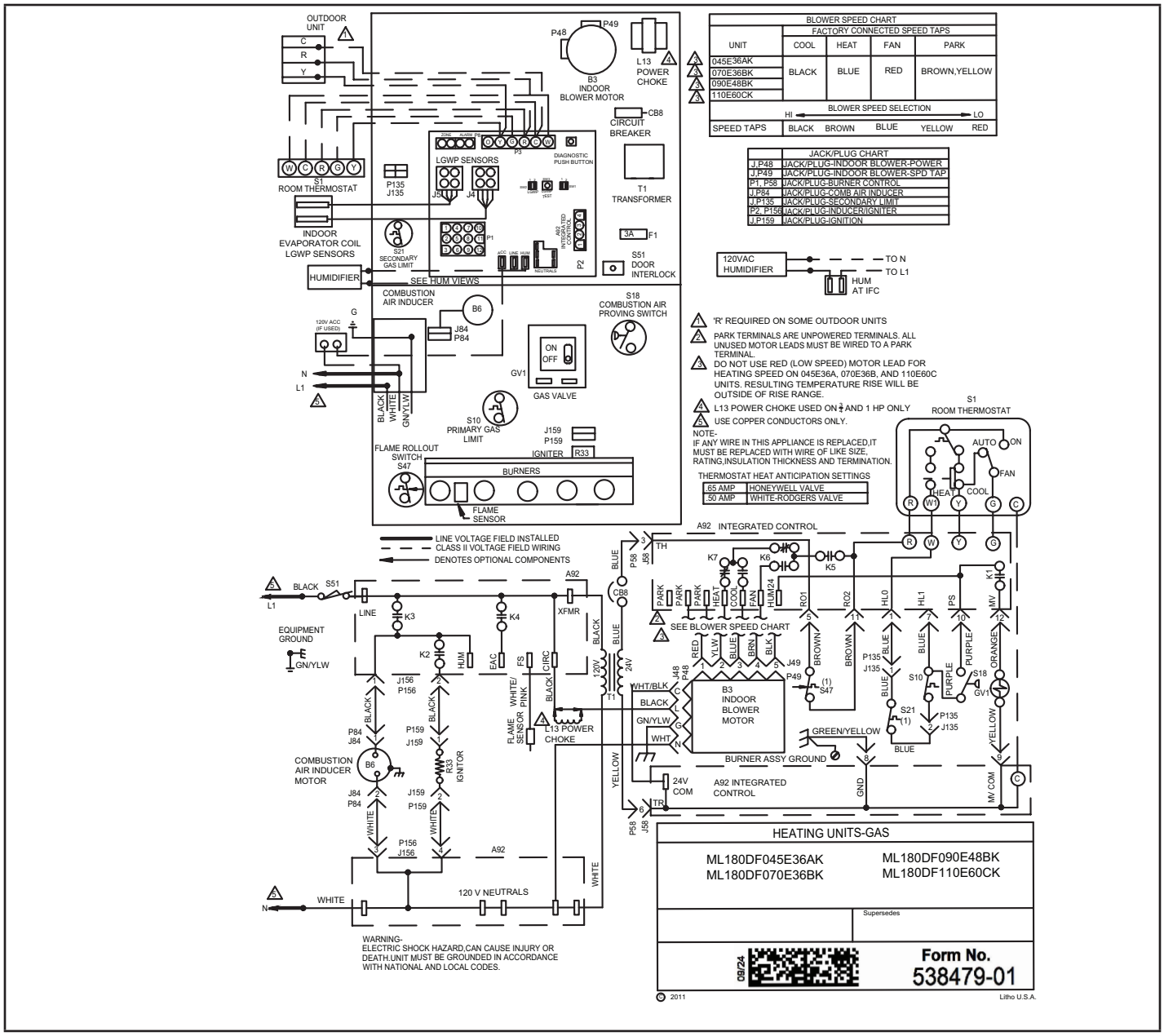
1. Prompt a cooling demand at the thermostat.
2. Press the LGWP Test button on the furnace control board.

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

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

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

VIII- Wiring and Sequence of Operation



1-Line voltage is applied to L1 and N. the T1 low voltage transformer is energized, and line voltage is applied to B3 indoor blower.

2 -S47 rollout switch(es) must be closed in order for 24V from transformer to be output on integrated control ”R” to power thermostat.

3 -When there is a call for heat, W1 of the thermostat energizes W of the furnace control with 24VAC.

4 -A92 integrated control runs a self-check. S10 primary limit and S21 secondary limit contacts are found to be closed. Call for heat can continue.

5 -A92 integrated control energizes B6 combustion air inducer. S18 combustion air pressure switch closes . Once S18 closes, a 15-secondpre-purge follows.

6 -A92 integrated control energizes R33 ignitor. A 20-second warm-up period begins.

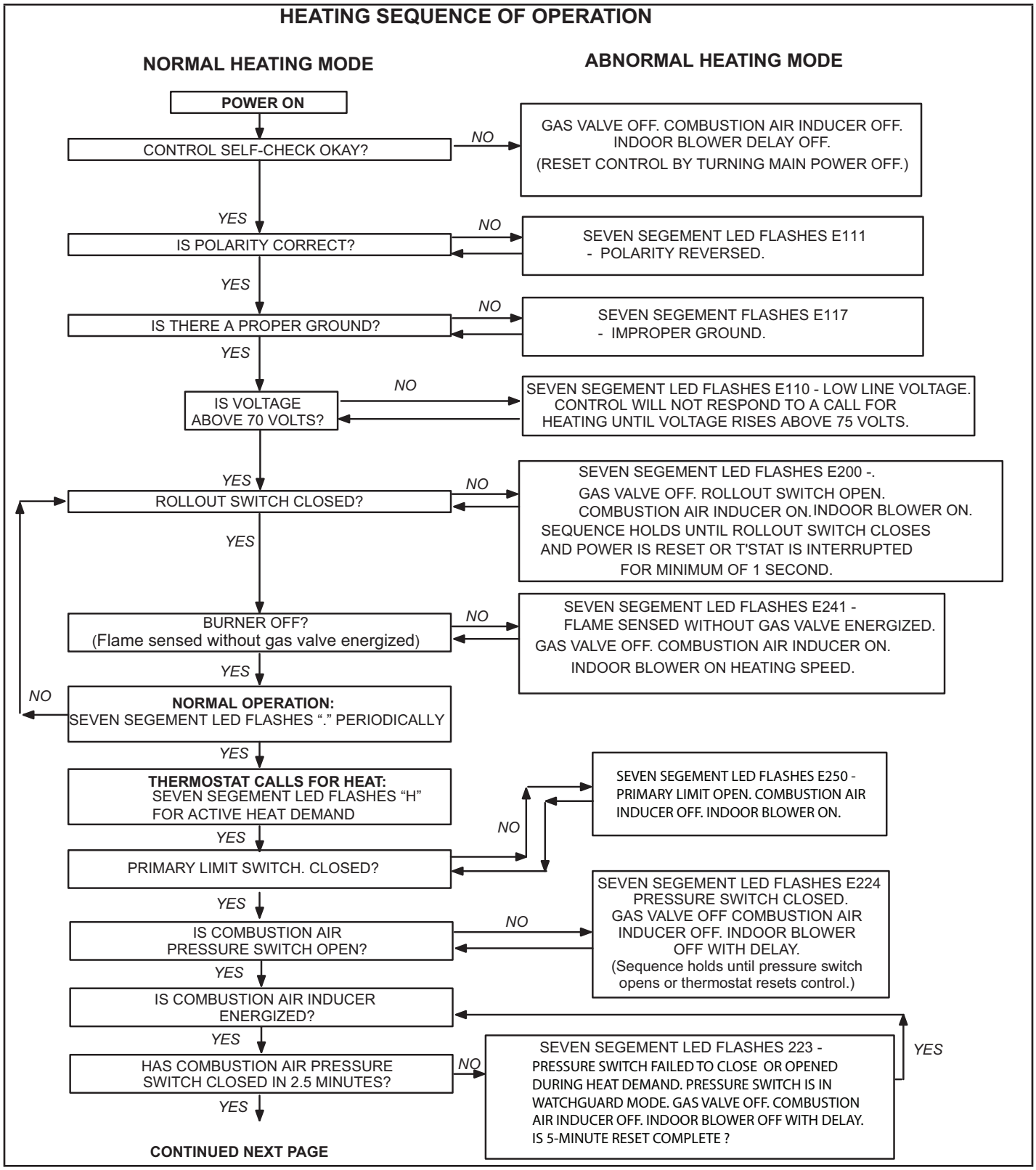
7 -GV1 gas valve opens for a 4-second trial for ignition

8 -Flame is sensed, gas valve remains open for the heat call.

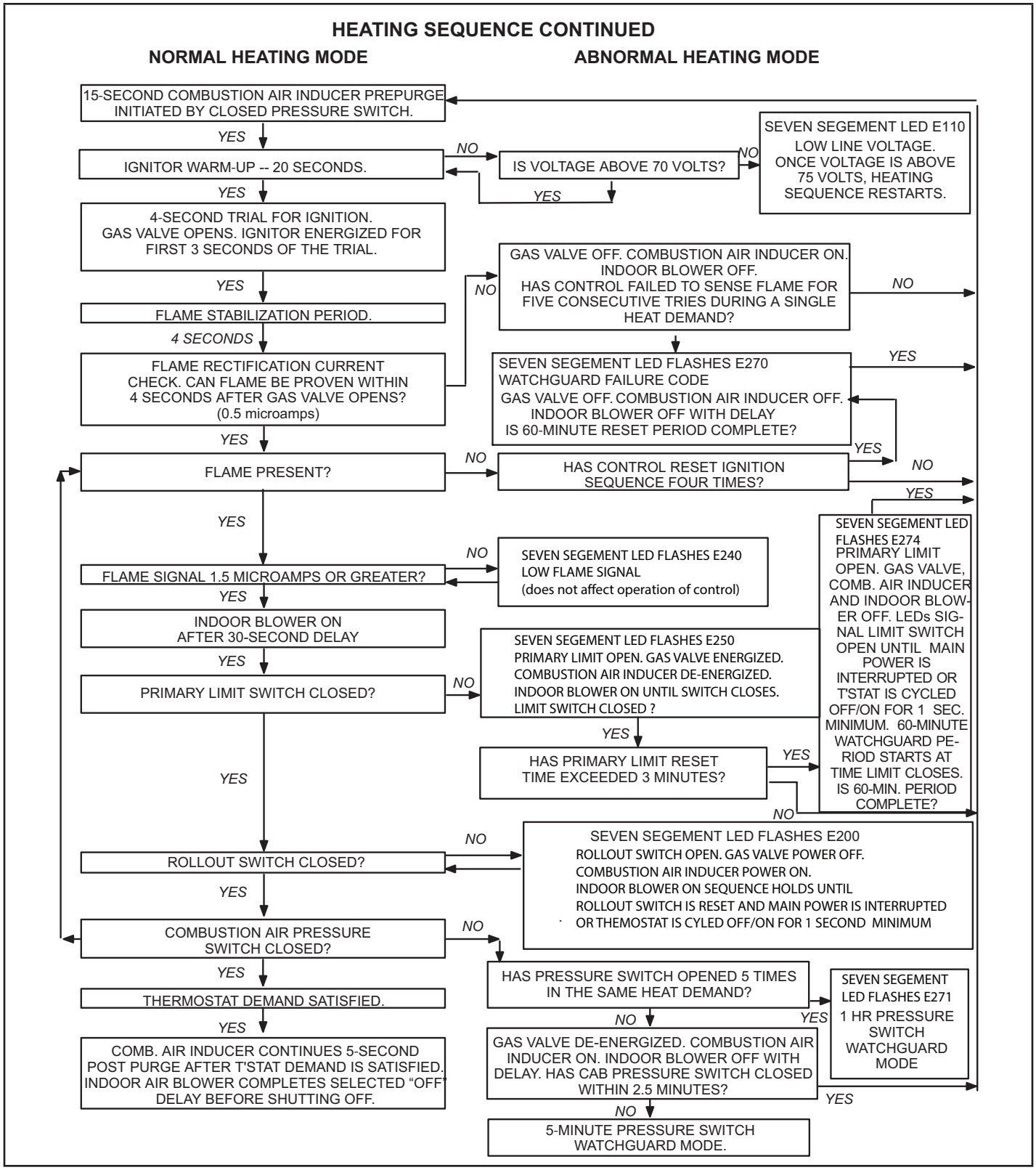
9 -After 30-second delay (from flame sensed), A92 integrated control applies 24vVAC to Heat speed of B3 indoor blower.

10 -When heat demand is satisfied, W1 of the indoor thermostat de-energizes W of A92ignition control which de-energizes GV1 gas valve.B6 combustion air inducer continues a 5-second post-purge period, and B3 indoor blower completes a selected OFF time delay.

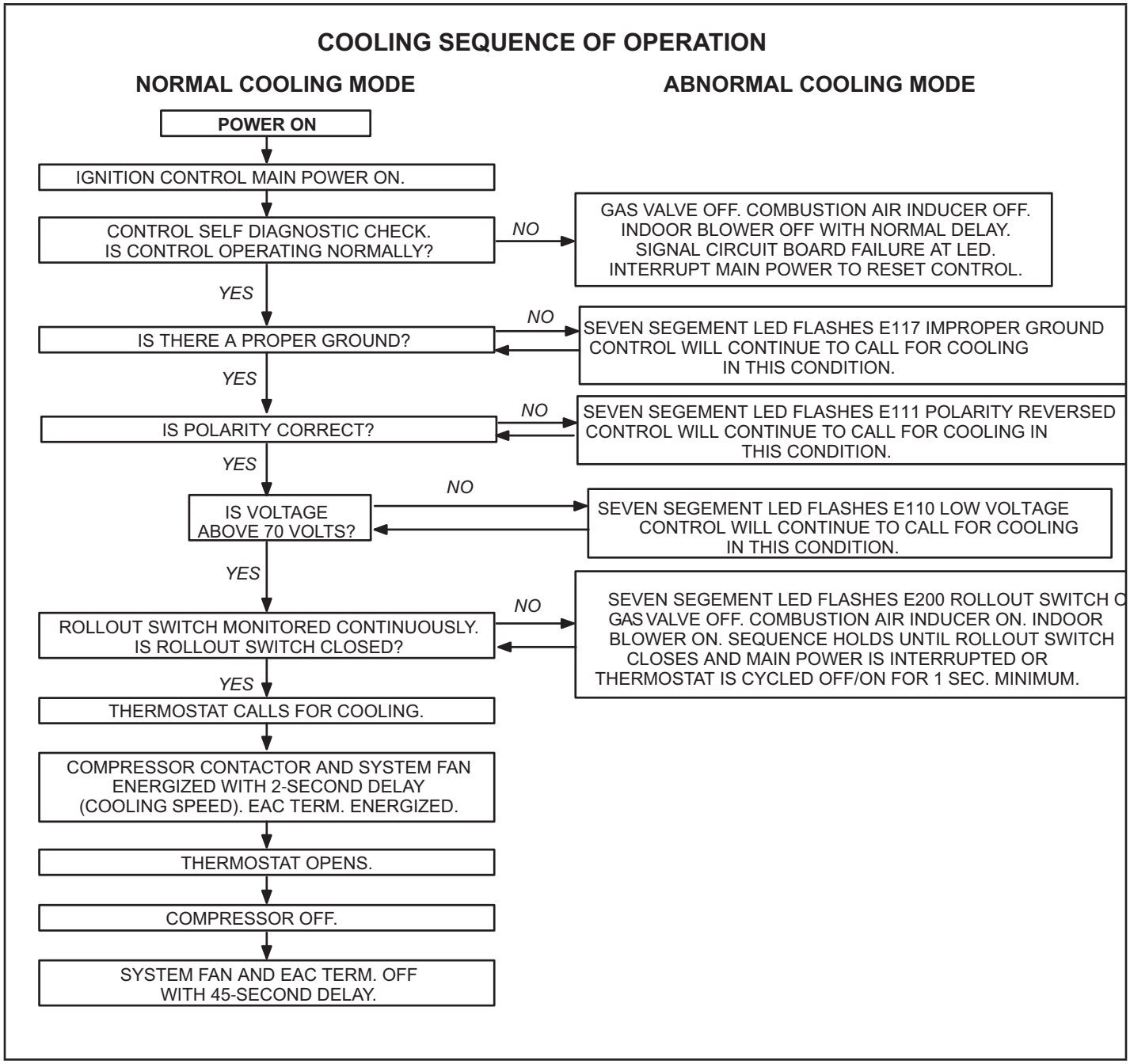
IX - Troubleshooting



HEATING SEQUENCE CONTINUED



COOLING SEQUENCE OF OPERATION



CONTINUOUS FAN SEQUENCE OF OPERATION