LENNOX®
Service Literature

UNIT INFORMATION
Corp. 9814-L8
Revised 08-2001

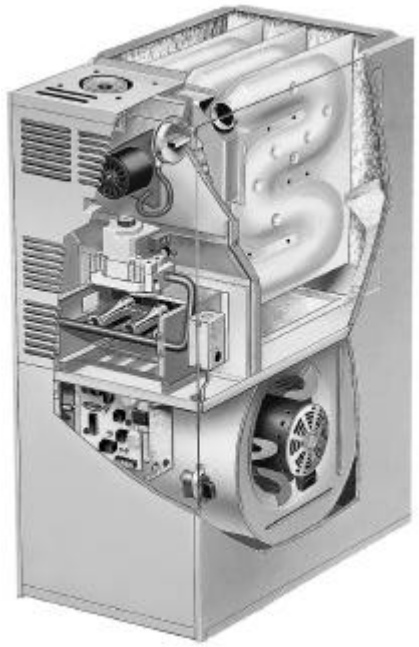
G23(X)

G23(X) SERIES UNITS

G23(X) series units are mid-efficiency upflow gas furnaces manufactured with Duralok™ aluminized steel clamshell type heat exchangers. G23(X) units are available in heating capacities of 50,000 to 150,000 Btuh and cooling applications up to 6 tons. Refer to Engineering Handbook for proper sizing.

Units are factory equipped for use with natural gas. A kit is available for conversion to LPG operation. G23(X)-1, -2, -3 and -4 model units use electronic (intermittent pilot) ignition. G23(X)-5 and -6 model units feature the Lennox SureLight™ silicon nitride ignition system. All units meet the California Nitrogen Oxides (NO_x) Standards and California Seasonal Efficiency requirements with the installation of flame baffles. All units use a redundant gas valve to assure safety shut-off as required by A.G.A. or C.G.A.

Information contained in this manual is intended for use by qualified service technicians only. All specifications 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.



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SPECIFICATIONS

Model No.		G23Q2(X)-50	G23Q3(X)-50	G23Q2/3(X)-75	G23Q4/5(X)-75	G23Q3(X)-100
Input Btuh (kW)		50,000 (14.7)		75,000 (22.0)		100,000 (29.3)
Output Btuh (kW)		40,000 (11.7)		61,000 (17.8)		80,000 (23.4)
☆A.F.U.E.		80.7%	80.8%	80.4%		80.1%
California Seasonal Efficiency		75.5%	75.6%	76.9%	74.2%	76.6%
Flue size connection diameter— in. (mm) round		3 (76)		4 (102)		
Temperature rise range — °F (°C)		30-60 (17-33)		35-65 (19-36)	20-50 (11-28)	45-75 (25-42)
High static certified by A.G.A. — in wg. (Pa)		.50 (125)				
Gas Piping Size I.P.S. Natural or LPG/propane	in.	1/2				
	mm	12.7				
Blower wheel nominal diameter x width	in.	10 x 7	10 x 8		11-1/2 x 9	10 x 8
	mm	254 x 178	254 x 203		292 x 229	254 x 203
Blower motor output — hp (W)		1/5 (149)	1/3 (249)		3/4 (560)	1/3 (249)
Nominal cooling that can be added	Tons	1 to 2	1 to 3		3-1/2 to 5	1 to 3
	kW	3.5 to 7.0	3.5 to 10.6		12.3 to 17.6	3.5 to 10.6
Shipping weight — lbs. (kg) 1 package		135 (61)	140 (64)	146 (66)	186 (84)	159 (72)
Electrical characteristics		120 volts — 60 hertz — 1 phase (all models) (less than 12 amps)				

☆Annual Fuel Utilization Efficiency based on U.S. DOE test procedures and FTC labeling regulations. Isolated combustion system rating for non-weatherized furnaces.
‡Cleanable polyurethane frame type filter.

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SPECIFICATIONS

Model No.		G23Q3/4(X)-100	G23Q4/5(X)-100	G23Q3/4(X)-125	G23Q5/6(X)-125	G23Q5/6(X)-150
Input Btuh (kW)		100,000 (29.3)		125,000 (36.6)		150,000 (44.0)
Output Btuh (kW)		80,000 (23.4)	81,000 (23.7)	100,000 (29.3)		120,000 (35.2)
☆A.F.U.E.		80.7%	80.1%	80.0%	80.4%	80.0%
California Seasonal Efficiency		77.3%	75.9%	76.3%	76.8%	76.8%
Flue size connection diameter— in. (mm) round		4 (102)		5 (127)		
Temperature rise range — °F (°C)		40-70 (22-39)	30-60 (17-33)	45-75 (25-42)	35-65 (19-36)	40-70 (22-39)
High static certified by A.G.A. — in wg. (Pa)		.50 (125)				
Gas Piping Size I.P.S. Natural or LPG/propane	in.	1/2				
	mm	12.7				
Blower wheel nominal diameter x width	in.	10 x 8	11-1/2 x 9	10 x 10	12 x 12	
	mm	254 x 203	292 x 229	254 x 254	305 x 305	
Blower motor output — hp (W)		1/2 (373)	3/4 (560)	1/2 (373)	3/4 (560)	
Nominal cooling that can be added	Tons	2 to 4	3-1/2 to 5	2 to 4	5 and 6	
	kW	7.0 to 14.1	12.3 to 17.6	7.0 to 14.1	17.6 and 21.1	
Shipping weight — lbs. (kg) 1 package		143 (65)	167 (76)	195 (88)	218 (99)	223 (101)
Electrical characteristics		120 volts — 60 hertz — 1 phase (all models) (less than 12 amps)				

☆Annual Fuel Utilization Efficiency based on U.S. DOE test procedures and FTC labeling regulations. Isolated combustion system rating for non-weatherized furnaces.
‡Cleanable polyurethane frame type filter.

G23Q2(X)-50 BLOWER PERFORMANCE

External Static Pressure		Air Volume and Motor Watts at Specific Blower Taps								
		High			Medium			Low		
in. w.g.	Pa	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts
0	0	1225	580	530	950	450	375	785	370	295
.10	25	1215	575	520	945	445	375	770	365	290
.20	50	1190	560	505	925	435	360	745	350	280
.30	75	1150	545	485	895	420	350	720	340	275
.40	100	1090	515	460	865	410	335	690	325	265
.50	125	1030	485	440	820	385	320	645	305	250
.60	150	960	455	415	760	360	300	595	280	235
.70	175	865	410	390	690	325	285	535	250	225
.80	200	760	360	365	600	285	260	445	210	200
.90	225	630	295	340	520	245	240	- - - -	- - - -	- - - -

NOTE — All air data is measured external to unit with 1 in. (25 mm) cleanable foam filter (not furnished) in place. Also see Filter Air Resistance table.

G23Q3(X)-50 BLOWER PERFORMANCE

External Static Pressure		Air Volume and Motor Watts at Specific Blower Taps											
		High			Medium-High			Medium-Low			Low		
in. w.g.	Pa	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts
0	0	1620	765	630	1380	650	510	1110	525	405	875	415	310
.10	25	1575	745	605	1350	635	490	1090	515	390	870	410	305
.20	50	1520	715	580	1315	620	465	1080	510	375	860	405	295
.30	75	1455	685	550	1275	600	445	1050	495	355	840	395	285
.40	100	1390	655	525	1230	580	425	1015	480	340	815	385	275
.50	125	1320	625	505	1165	550	400	975	460	325	775	365	265
.60	150	1240	585	480	1100	520	375	920	435	310	715	335	245
.70	175	1160	545	460	1030	485	360	830	390	280	620	295	220
.80	200	1075	505	440	900	425	320	700	330	250	535	250	205
.90	225	900	425	395	720	340	285	600	285	230	- - - -	- - - -	- - - -

NOTE — All air data is measured external to unit with 1 in. (25 mm) cleanable foam filter (not furnished) in place. Also see Filter Air Resistance table.

G23Q2/3(X)-75 BLOWER PERFORMANCE

External Static Pressure		Air Volume and Motor Watts at Specific Blower Taps											
		High			Medium-High			Medium-Low			Low		
in. w.g.	Pa	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts
0	0	1600	755	620	1355	640	510	1080	510	395	865	410	310
.10	25	1545	730	595	1320	625	485	1060	500	385	855	405	305
.20	50	1490	705	570	1275	600	465	1035	490	370	830	390	295
.30	75	1425	670	550	1240	585	445	1010	475	360	810	380	285
.40	100	1370	645	530	1185	560	425	975	460	345	780	370	275
.50	125	1300	615	500	1135	535	405	940	445	330	735	345	260
.60	150	1240	585	485	1075	505	380	890	420	310	700	330	250
.70	175	1155	545	465	1000	470	360	830	390	290	625	295	230
.80	200	1045	495	430	905	425	330	720	340	265	555	260	215
.90	225	930	440	405	810	380	305	640	300	245	- - - -	- - - -	- - - -

NOTE — All air data is measured external to unit with 1 in. (25 mm) cleanable foam filter (not furnished) in place. Also see Filter Air Resistance table.

G23Q4/5(X)-75 BLOWER PERFORMANCE

External Static Pressure		Air Volume and Motor Watts at Specific Blower Taps														
		High			Medium-High			Medium			Medium-Low			Low		
in. w.g.	Pa	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts
0	0	2365	1115	1360	2130	1005	1180	1850	875	995	1600	755	840	1360	640	710
.10	25	2360	1115	1355	2105	995	1175	1830	865	995	1575	745	835	1350	635	710
.20	50	2290	1080	1325	2055	970	1155	1800	850	985	1560	735	830	1325	625	705
.30	75	2235	1055	1310	2010	950	1135	1780	840	970	1530	720	820	1310	620	700
.40	100	2175	1025	1275	1970	930	1115	1735	820	945	1500	710	910	1290	610	690
.50	125	2110	995	1250	1910	900	1085	1700	800	930	1480	700	800	1265	610	685
.60	150	2030	960	1215	1855	875	1060	1650	780	910	1450	685	790	1250	590	675
.70	175	1955	925	1185	1765	835	1030	1610	760	895	1410	665	775	1220	575	670
.80	200	1890	890	1165	1695	800	1005	1550	730	875	1370	645	760	1190	560	655
.90	225	1800	850	1145	1600	755	980	1490	705	850	1340	630	730	1160	545	625

NOTE — All air data is measured external to unit with 1 in. (25 mm) cleanable foam filter (not furnished) in place. Also see Filter Air Resistance table.

G23Q3(X)-100 BLOWER PERFORMANCE

External Static Pressure		Air Volume and Motor Watts at Specific Blower Taps								
		High			Medium			Low		
in. w.g.	Pa	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts
0	0	1615	760	630	1300	615	500	1030	485	400
.10	25	1585	750	615	1290	610	490	1015	480	395
.20	50	1530	720	595	1255	590	475	1000	470	380
.30	75	1470	695	570	1220	575	455	975	460	365
.40	100	1400	660	545	1175	555	435	950	450	350
.50	125	1330	630	510	1125	530	415	910	430	340
.60	150	1250	590	485	1065	505	390	870	410	320
.70	175	1155	545	455	995	470	365	810	380	300
.80	200	1055	500	425	915	430	345	735	345	275
.90	225	950	450	400	820	385	320	650	305	250

NOTE — All air data is measured external to unit with 1 in. (25 mm) cleanable foam filter (not furnished) in place. Also see Filter Air Resistance table.

G23Q3/4(X)-100 BLOWER PERFORMANCE

External Static Pressure		Air Volume and Motor Watts at Specific Blower Taps											
		High			Medium-High			Medium-Low			Low		
in. w.g.	Pa	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts
0	0	1970	930	925	1675	790	750	1500	710	655	1180	555	505
.10	25	1895	895	880	1635	770	710	1480	700	635	1175	555	495
.20	50	1850	875	855	1600	755	680	1450	685	605	1170	550	485
.30	75	1790	845	825	1560	735	655	1420	670	580	1155	545	465
.40	100	1710	805	790	1515	715	630	1370	645	550	1130	535	450
.50	125	1635	770	760	1460	690	600	1315	620	520	1100	520	425
.60	150	1555	735	725	1390	655	565	1270	600	495	1060	500	410
.70	175	1470	695	690	1300	615	525	1195	565	470	1015	480	385
.80	200	1370	645	660	1225	580	500	1110	525	435	970	460	370
.90	225	1265	595	625	1115	525	455	1025	485	400	895	420	340

NOTE — All air data is measured external to unit with 1 in. (25 mm) cleanable foam filter (not furnished) in place. Also see Filter Air Resistance table.

G23Q4/5(X)-100 BLOWER PERFORMANCE

External Static Pressure		Air Volume and Motor Watts at Specific Blower Taps														
		High			Medium-High			Medium			Medium-Low			Low		
in. w.g.	Pa	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts
0	0	2465	1165	1305	2230	1050	1115	1985	935	940	1735	820	770	1530	720	650
.10	25	2425	1145	1295	2170	1025	1085	1950	920	930	1700	800	765	1500	710	645
.20	50	2375	1120	1265	2130	1005	1065	1920	905	915	1670	790	750	1470	695	635
.30	75	2315	1090	1235	2090	985	1050	1880	885	895	1645	775	745	1440	680	630
.40	100	2255	1065	1210	2045	965	1040	1840	870	890	1610	760	735	1420	670	625
.50	125	2195	1035	1185	1995	940	1010	1815	855	880	1575	745	725	1390	655	615
.60	150	2135	1010	1155	1950	920	1000	1770	835	870	1530	720	715	1350	635	600
.70	175	2075	980	1145	1890	890	985	1710	805	850	1490	705	700	1295	610	595
.80	200	1985	935	1105	1825	860	960	1650	780	830	1435	675	690	1245	590	585
.90	225	1895	895	1080	1745	825	925	1585	750	810	1365	645	675	1170	550	570

NOTE — All air data is measured external to unit with 1 in. (25 mm) cleanable foam filter (not furnished) in place. Also see Filter Air Resistance table.

G23Q3/4(X)-125 BLOWER PERFORMANCE

External Static Pressure		Air Volume and Motor Watts at Specific Blower Taps											
		High			Medium-High			Medium-Low			Low		
in. w.g.	Pa	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts
0	0	1980	935	800	1690	800	700	1470	695	610	1165	550	465
.10	25	1905	900	770	1670	790	680	1465	690	595	1160	545	455
.20	50	1850	875	740	1630	770	650	1430	675	570	1125	530	445
.30	75	1780	840	705	1580	745	620	1410	665	545	1120	530	430
.40	100	1695	800	670	1530	720	590	1375	650	520	1095	515	410
.50	125	1605	755	640	1455	685	550	1310	620	485	1065	505	390
.60	150	1525	720	605	1380	650	520	1245	590	455	1015	480	370
.70	175	1405	665	565	1280	605	485	1165	550	425	950	450	345
.80	200	1275	600	525	1160	545	440	1030	485	385	860	405	315
.90	225	1120	530	480	1000	470	390	915	430	355	780	370	295

NOTE — All air data is measured external to unit with 1 in. (25 mm) cleanable foam filter (not furnished) in place. Also see Filter Air Resistance table.

G23Q5/6(X)-125 BLOWER PERFORMANCE

External Static Pressure		Air Volume and Motor Watts at Specific Blower Taps														
		High			Medium-High			Medium			Medium-Low			Low		
in. w.g.	Pa	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts
0	0	2460	1160	1295	2220	1050	1050	2000	945	900	1775	840	755	1595	755	645
.10	25	2455	1160	1285	2210	1045	1050	1990	940	900	1755	830	760	1570	740	645
.20	50	2450	1155	1280	2180	1030	1040	1965	925	895	1720	810	755	1535	725	645
.30	75	2445	1155	1270	2155	1015	1035	1930	910	885	1690	800	745	1500	710	645
.40	100	2440	1150	1265	2125	1005	1025	1890	890	875	1660	785	750	1470	695	640
.50	125	2430	1145	1255	2090	985	1020	1860	880	870	1620	765	745	1435	675	635
.60	150	2350	1110	1235	2040	965	1000	1810	855	855	1585	750	735	1395	660	635
.70	175	2300	1085	1210	1990	940	990	1770	835	845	1540	725	725	1345	635	620
.80	200	2220	1050	1185	1925	910	970	1715	810	830	1490	705	715	1270	600	605
.90	225	2120	1000	1140	1850	875	950	1640	775	800	1420	670	690	1200	565	590

NOTE — All air data is measured external to unit with 1 in. (25 mm) cleanable foam filter (not furnished) in place. Also see Filter Air Resistance table.

G23Q5/6(X)-150 BLOWER PERFORMANCE

External Static Pressure		Air Volume and Motor Watts at Specific Blower Taps														
		High			Medium-High			Medium			Medium-Low			Low		
in. w.g.	Pa	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts	cfm	L/s	Watts
0	0	2565	1210	1430	2300	1085	1160	2055	970	970	1840	870	825	1620	765	680
.10	25	2560	1210	1420	2265	1070	1155	2020	955	960	1810	855	825	1590	750	680
.20	50	2555	1205	1410	2225	1050	1140	1980	935	955	1770	835	810	1555	735	680
.30	75	2550	1205	1400	2185	1030	1130	1935	915	945	1740	820	805	1515	715	675
.40	100	2500	1180	1380	2150	1015	1115	1900	440	935	1700	800	800	1470	695	670
.50	125	2440	1150	1365	2100	990	1105	1860	435	925	1645	775	790	1430	675	665
.60	150	2370	1120	1335	2045	965	1085	1790	430	910	1585	750	780	1380	650	660
.70	175	2300	1085	1310	1960	925	1055	1730	815	895	1530	720	770	1315	620	645
.80	200	2210	1045	1270	1920	905	1035	1640	415	875	1470	695	755	1210	570	635
.90	225	2110	995	1240	1855	875	1030	1550	730	855	1345	635	725	1100	520	625

NOTE — All air data is measured external to unit with 1 in. (25 mm) cleanable foam filter (not furnished) in place. Also see Filter Air Resistance table.

FILTER AIR RESISTANCE

CFM (L/S)	in. w.g. (Pa)
0 (0)	0.00 (0)
200 (95)	0.01 (0)
400 (190)	0.03 (5)
600 (285)	0.04 (10)
800 (380)	0.06 (15)
1000 (470)	0.09 (20)
1200 (565)	0.12 (30)
1400 (660)	0.15 (35)
1600 (755)	0.19 (45)
1800 (850)	0.23 (55)
2000 (945)	0.27 (65)
2200 (1040)	0.33 (80)
2400 (1130)	0.38 (95)
2600 (1225)	0.44 (110)

OPTIONAL ACCESSORIES (Must be Ordered Extra)

Model No.		G23Q3/4(X)-100	G23Q4/5(X)-100	G23Q3/4(X)-125	G23Q5/6(X)-125	G23Q5/6(X)-150
LPG/Propane kit	Standard models	71K82				
	"X" models	15K03		15K04		15K05
Filter and Filter Rack Kits ‡No. & size of filters - in. (mm)		Single **(44J21)** Ten Pack **(66K62)** (1) 20 x 25 x 1 (508 x 635 x 25)				
Horizontal Power Venter Kit		**79J15** (all models)				
Twinning Kits	Non-continuous low speed	**64H88** (all models)				
	Continuous low speed	**35J93** (all models)				
Continuous Low Speed Blower Switch (optional)		**44J06** (all models) Not used with Twinning Kits				

OPTIONAL ACCESSORIES (Must be Ordered Extra)

Model No.		G23Q2(X)-50	G23Q3(X)-50	G23Q2/3(X)-75	G23Q4/5(X)-75	G23Q3(X)-100
LPG/Propane kit	Standard models	71K82				
	"X" models	15K01		15K02		15K03
Filter and Filter Rack Kits ‡No. & size of filters - in. (mm)		Single **(44J20)** Ten Pack **(66K61)** (1) 14 x 25 x 1 (356 x 635 x 25)			Single **(44J21)** Ten Pack **(66K62)** (1) 20 x 25 x 1 (508 x 635 x 25)	Single **(44J22)** Ten Pack **(66K63)** (1) 16 x 25 x 1 (406 x 635 x 25)
Horizontal Power Venter Kit		**79J15** (all models)				
Twinning Kits	Non-continuous low speed	**64H88** (all models)				
	Continuous low speed	**35J93** (all models)				
Continuous Low Speed Blower Switch		**44J06** (all models) Not used with Twinning Kits				

HIGH ALTITUDE

Pressure regulator adjustment may be required depending on altitude. See table below for proper pressure regulator setting.

Manifold Absolute Pressure (Outlet) in. w.g. (kPa)

FUEL	ALTITUDE ft. (m)			
	0-4500 (0-1372)	4501-5500 (1373-1676)	5501-6500 (1677-1981)	6501-7500 (1982-2286)
Natural Gas	3.5 (.87)	3.3 (.82)	3.1 (.77)	3.0 (.75)
LPG/Propane	10.0 (2.49)			

Pressure switch is factory set. No adjustment necessary. G23(X)-50/75 units use the factory pressure switch from 0-7500 feet (0-2286 m). G23(X)-100/125 and G23(X)-150 units require a High Altitude Pressure Switch for units installed above 5000 feet (1524 m). Order (**97J50**) for G23(X)-100/125 and (**18J35**) for G23(X)-150.

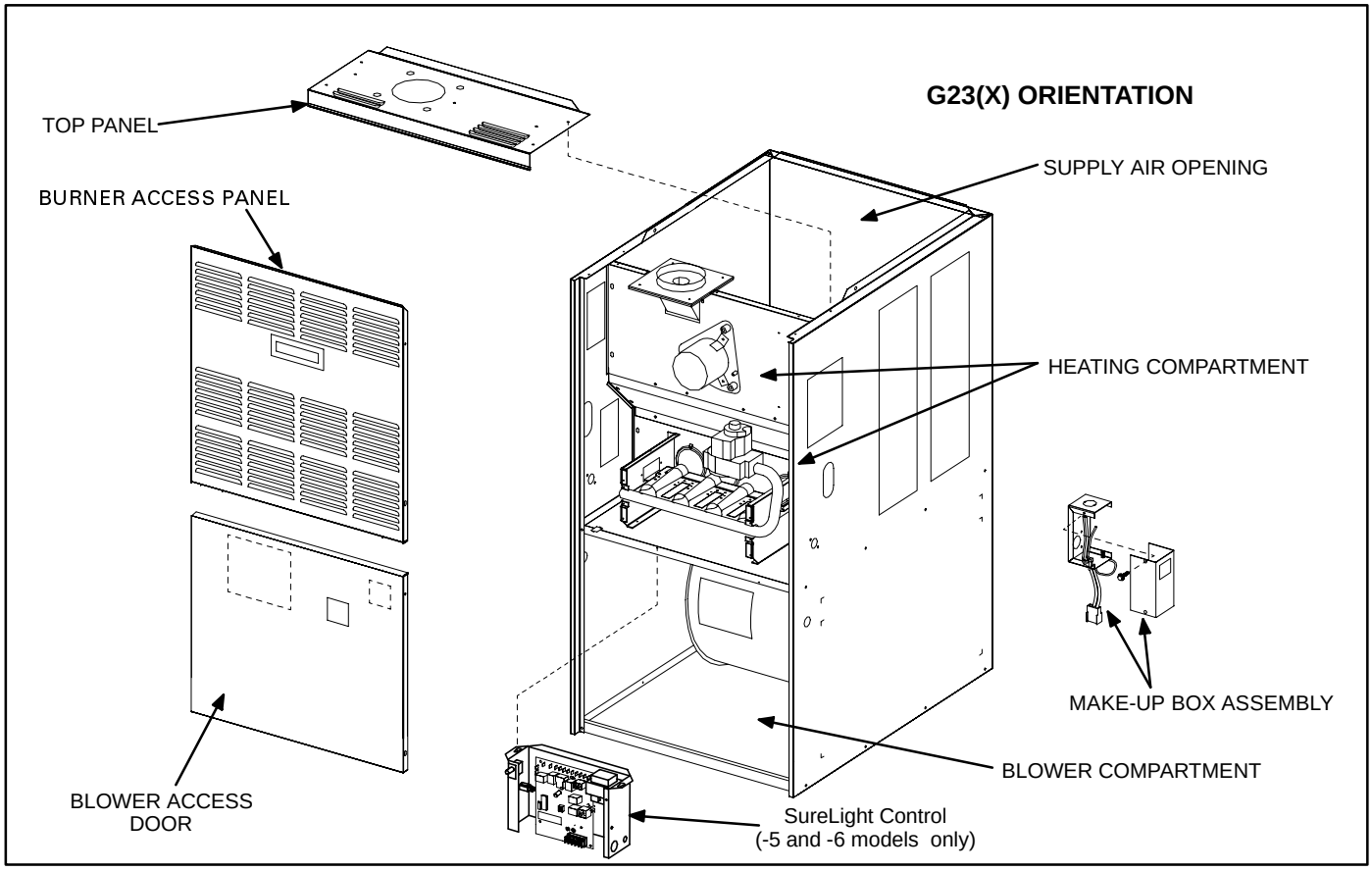

FIGURE 1

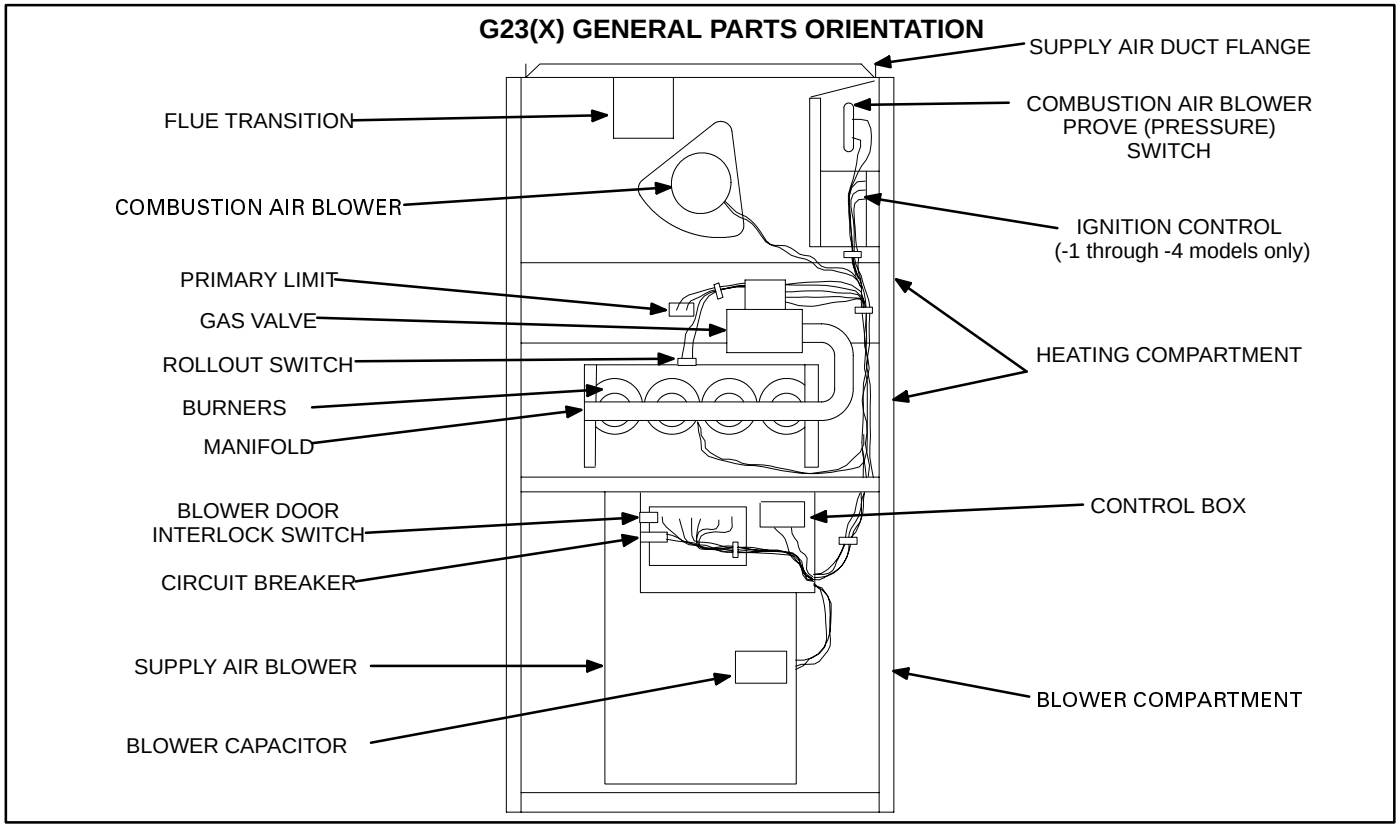

FIGURE 2

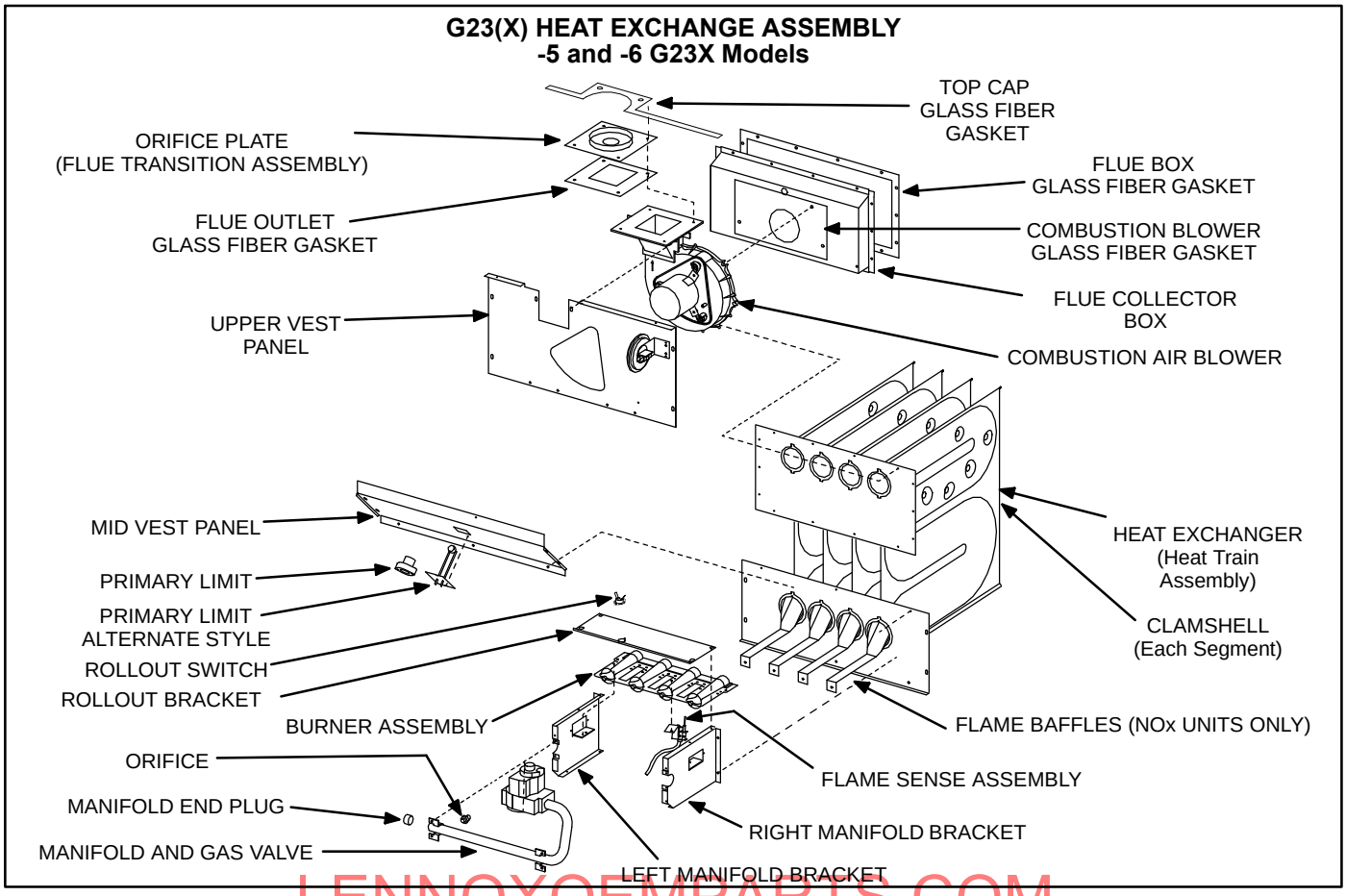

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FIGURE 3

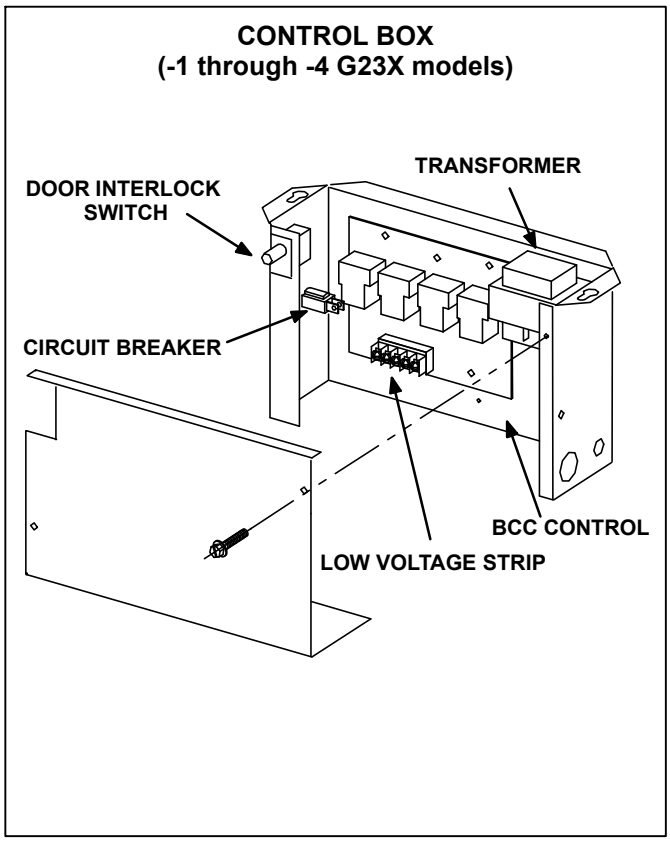


FIGURE 4

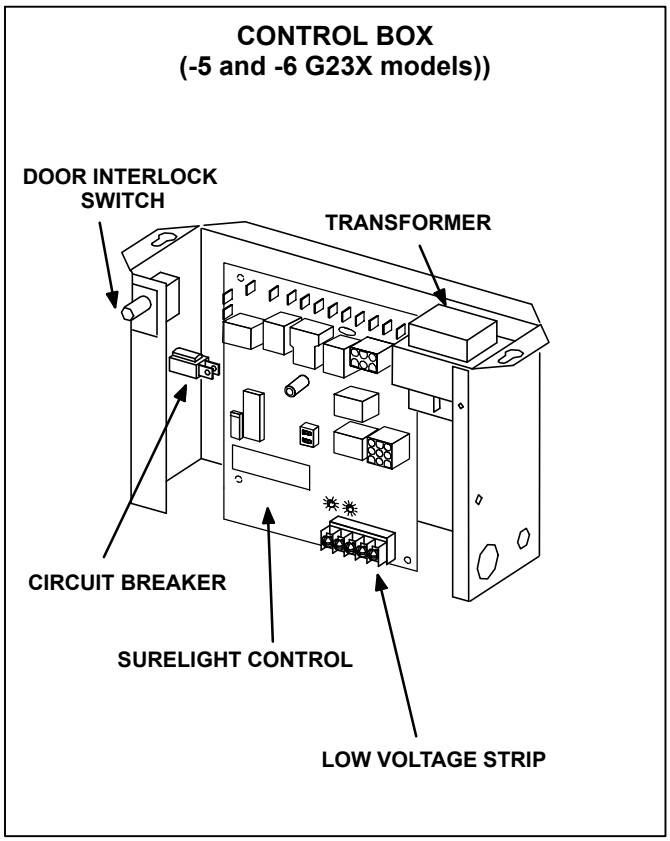


FIGURE 5

I-UNIT COMPONENTS (Figures 1 and 2)

G23(X) unit components are shown in figures 1 and 2. The gas valve, ignition control and burners can be accessed by removing the burner access panel. The blower, blower control and SureLight control can be accessed by removing the blower access door.

G23(X) units are factory equipped with bottom and side return air panels in place. The panels are designed to be field removed as required for bottom air return or side air return.

A-Make-Up Box (Figure 6)

The line voltage make-up box is shown in figure 6. The box may be installed inside or outside the unit and may be installed on the unit left or right side (figure 8).

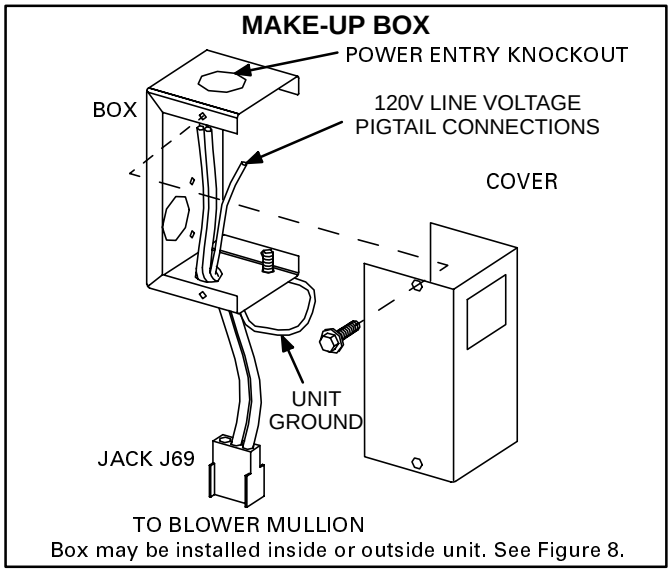


FIGURE 6

B-Control Box Components (Figures 4 & 5)

SureLight control (A3), Electrical blower control components (A15), unit transformer (T1) and 24V circuit breaker (CB8) are located in the control box. In addition, a door interlock switch (S51) is located in the control box. Jackplugs allow the control box to be easily removed for blower service.

1. Control Transformer (T1)

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

2. 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 shutdown. The breaker can be manually reset by pressing the button on the face. See figure 7.

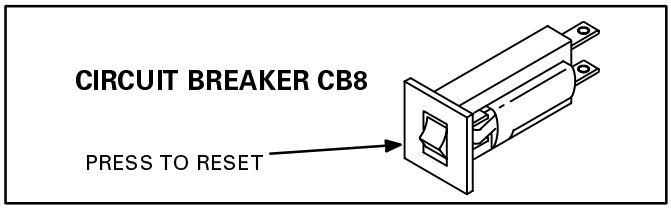


FIGURE 7

3.Door Interlock Switch (S51)

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

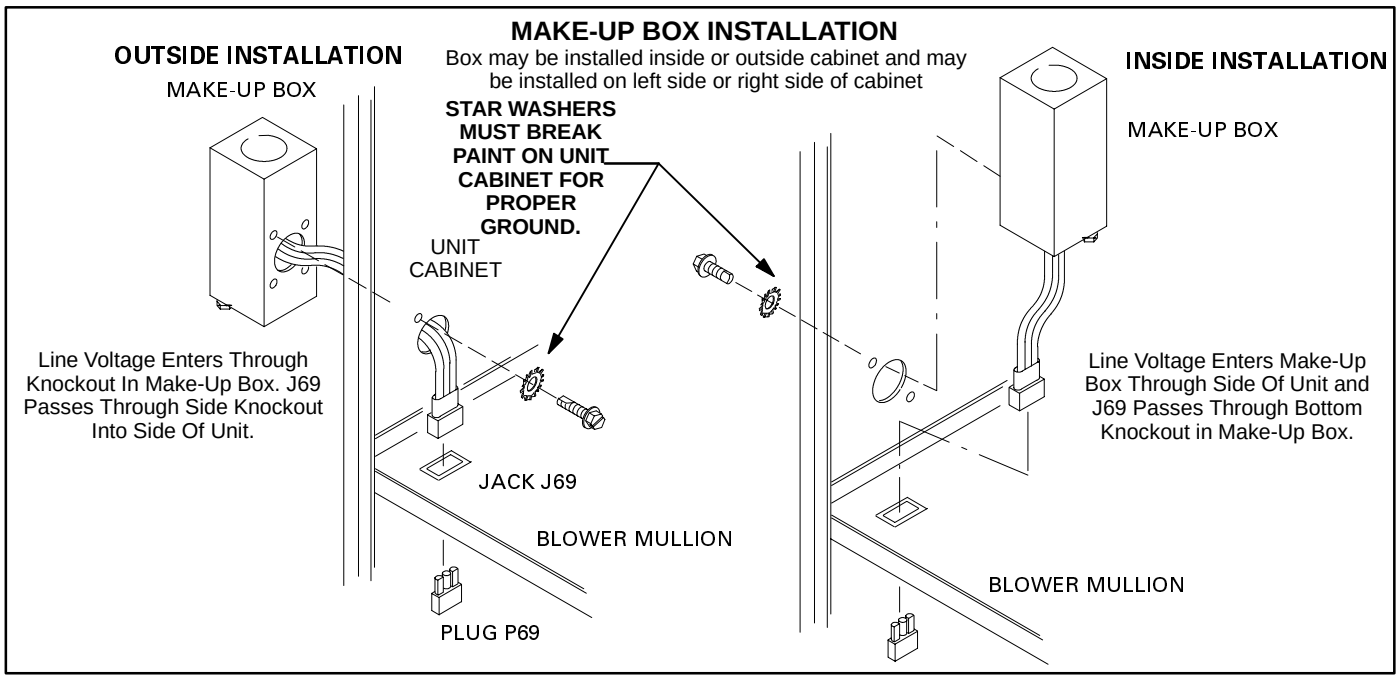


FIGURE 8

4. BCC Blower Control (A15)
-1 Through -4 Models

G23(X)-1, -2, -3 and -4 model units utilize the BCC blower control manufactured by Heatcraft. See figure 10. The BCC is a printed circuit board which controls the supply air blower and monitors primary limit and gas valve operation. The BCC is equipped with a jumper for electronic (isolation relay) or electro-mechanical thermostat selection.The control has a non-adjustable, factory preset fan "on" timing. Fan "off" timing is adjustable. The board is divided into two sections, 120 and 24VAC. Line voltage comes into the board on the 120VAC side. See table 1 for terminal designations.

Fan Timings

Fan "off" timing (time that the blower operates after the heat demand has been satisfied) is determined by the arrangement of a jumper across pins on the BCC blower control board. See figure 9. To adjust fan "off " timing, gently disconnect jumper and reposition across pins corresponding with new timing. Fan "on" time is factory set at 45 seconds and is not adjustable.

NOTE—If fan "off" time is set too low, residual heat in heat exchanger may cause primary limit S10 to trip resulting in frequent cycling of blower. If this occurs, adjust blower to longer time setting.

Figure 9 shows the various fan "off" timings and how jumper should be positioned. Unit is shipped with a factory fan "off" setting of 90 seconds. Fan "off" time will affect comfort and efficiency and is adjustable to satisfy individual applications. The fan "off" timing is initiated after a heating demand but not after a blower or cooling demand (that is, when indoor thermostat switch is changed from ON to AUTO and heating/ cooling demand is not present, the blower stops immediately).

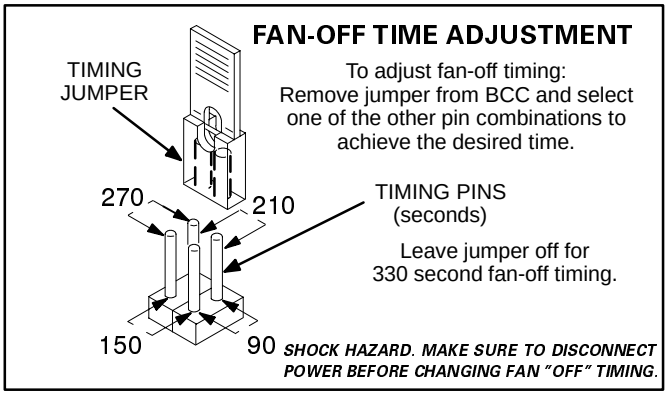


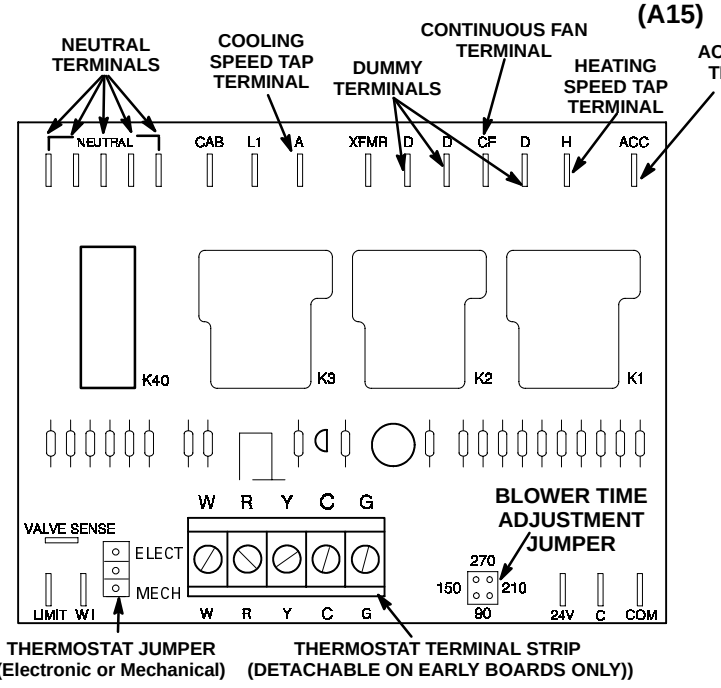
FIGURE 9

ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures

⚠ CAUTION

Electrostatic discharge can affect electronic components. Take precautions during furnace installation and service to protect the furnace's electronic controls. Precautions will help to avoid control exposure to electrostatic discharge by putting the furnace, the control and the technician at the same electrostatic potential. Neutralize electrostatic charge by touching hand and all tools on an unpainted unit surface, such as the gas valve or blower deck, before performing any service procedure.

G23(X)-1, -2 ,-3 and -4 MODELS
BLOWER CONTROL - BCC
(A15)



Heat Anticipator Settings
Beginning with the BCC3-2 series, a 3 pin jumper has been installed on the board next to the removable 24V terminal strip to account for both programmable and electromechanical thermostat usage in the field. For electromechanical thermostat, position the jumper over the middle and bottom pin labeled "MECH." Set the heat anticipator setting to 0.65 amps for Honeywell valves or 0.50 amps for White Rodgers valves. For programmable (electronic) thermostats, position the jumper over the middle and top pin labeled "ELECT." Set the heat anticipator setting to 0.1 amps.

FIGURE 10

TABLE 1

BLOWER CONTROL A15 TERMINAL DESIGNATIONS		
Terminal (Designation on Wiring Diagram)	**Type**	**Function**
Y	Detachable or Screw Strip	Cooling Demand
G	Detachable or Screw Strip	Blower Demand
R	Detachable or Screw Strip	24VAC to Thermostat
W	Detachable or Screw Strip	Heating Demand
T	Detachable or Screw Strip	24VAC Common To Indoor Thermostat
IBN (N)	1/4" Spade	120VAC Indoor Blower Common
N1 (N)	1/4" Spade	120VAC Neutral (L2 Line Voltage Neutral)
CABN (N)	1/4" Spade	120VAC Combustion Air Blower Common
XFMRN (N)	1/4" Spade	120VAC Transformer Common
HSIN (N)	1/4" Spade	120VAC Hot Surface Ignition Common (Not Used)
CAB	1/4" Spade	Switched 120VAC to Combustion Air Blower
L1	1/4" Spade	120VAC Line Voltage In
A	1/4" Spade	Switched 120VAC to Blower Cooling Tap
XFMR	1/4" Spade	24VAC In From Transformer
D	1/4" Spade	Dummy Connection for Unused Blower Leads
CF	1/4" Spade	Switched 120VAC to Continuous Blower Tap
H	1/4" Spade	Switched 120VAC to Blower Heating Tap
ACC	1/4" Spade	Switched 120VAC to Accessory (Electronic Air Cleaner, Humidifier, Etc.)
24V (24)	3/16" or 1/4" Spade	24VAC Input From Transformer
LIMIT (L)	1/4" Spade	24VAC In From Primary Limit. Limit Open: Closes Gas Valve and Turns On Blower Limit Closed: Allows Ignition
W	1/4" Spade	24VAC Thermostat Demand Output Through Rollout and Prove Switch to "TH" Terminal of Ignition Control
VALVE SENSE (V)	3/16" or 1/4" Spade	24VAC Input From Gas Valve
T	1/4" Spade	24VAC Common From Ignition Control and Gas Valve
COM (C)	1/4" Spade	24VAC Common To Transformer

C-Ignition Control (-1 Through -4 Models)

G23(X) -1, -2, -3 and -4 model units use an intermittent pilot ignition control manufactured by Johnson Controls. The ignition control is located on a bracket on the upper vest panel.

Unit Operation

When there is a call for heat, the control is prevented from beginning an ignition sequence until the pressure switch proves combustion air blower operation. When the pressure switch closes, the control generates a spark and opens the pilot valve to ignite the pilot. When flame is sensed, the control opens the main gas valve and the pilot ignites the main burners. The indoor blower starts after a 45 second delay. Gas valve remains open and combustion air blower continues to run until demand stops, flame sensor senses loss of flame, a limit opens or the prove switch opens. If any of these events occur during a thermostat demand, the gas valve closes.

The control will attempt ignition for 85 seconds. If ignition is not successful, the control will lockout (indicated by flashing LED). Within one hour the control will momentarily remove then reapply the thermostat signal and the ignition sequence will begin again (Watchguard circuit). If pilot ignition is successful, but flame is lost when the main valve opens, the ignition sequence will retry up to 15 more times. If ignition is not successful after the 16th try, the control will shut-down and must be reset manually. Manual reset is accomplished by removing then reapplying thermostat demand for at least 30 seconds.

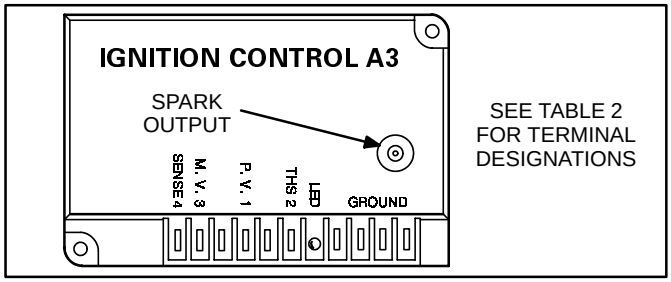


FIGURE 11

⚠ DANGER

Shock hazard.

Spark related components contain high voltage. 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.

TABLE 2

IGNITION CONTROL A3 TERMINAL DESIGNATIONS		
Terminal	**Type**	**Function**
GROUND	1/4" Spade	Cabinet Ground
THS 2	1/4" Spade	Safety Limit 24VAC Input From Rollout and Prove Switch
P.V.1	1/4" or 3/16"Spade	24VAC Output to Pilot Operator of Gas Valve
M.V.3	1/4" or 3/16" Spade	24VAC Output to Main Operator of Gas Valve
SENSE 4	1/4" Spade	Microamp Flame Sensing Input
Unmarked	Pin Type Bare Wire	High Voltage Spark Output

Diagnostic LED

The furnace ignition control is equipped with a diagnostic LED used for troubleshooting the unit and the control. LED functions are shown in table 3.

TABLE 3

Furnace Control A3 Diagnostic LED		
LED State	**Meaning**	**Remedy**
Steady On	Normal Operation	- - - -
Slow Flash (1 sec. on/ 5 sec. off)	Control Retry Period	Failed to Sense Flame. Ignition Control Will Retry Before Locking Out.
Off	Control Failure or Power Failure or Hard Lockout	If Power and Gas Supply are OK, Try Removing T'stat Demand For At Least 30 Seconds. If LED Remains Off When Demand Is Returned, Replace Control.

Johnson G776 Ignition Control Operation

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On a call for heat from the indoor thermostat, the ignition control energizes and the ignition control LED lights (steady on). The combustion air blower is energized. After a 15 second pre-purge period, the control simultaneously opens the pilot valve and sends spark to the pilot electrode.

If the pilot ignites within 85 seconds, the flame sensor detects pilot flame and signals the ignition control to to energize the main valve. The main valve cannot be energized until the sensor detects pilot flame. Spark continues until pilot flame is sensed or 85 seconds has elapsed, whichever happens first.

When pilot flame is sensed, the main valve is energized and the spark turns off. The ignition control remains in "run" mode until the indoor thermostat is satisfied or flame is lost.

If pilot flame is not sensed before the end of the 85 second trial for ignition, the control enters the 100% shutoff mode. The spark circuit and pilot valve de-energize and the ignition control automatically begins the 60 minute retry delay period. During the 60 minute delay the diagnostic LED continually flashes on for one second and off for five seconds. After the delay period, another trial for ignition sequence starts, beginning with pre-purge.

If pilot flame goes out while the indoor thermostat is calling for heat, both main and pilot valves de-energize within 0.8 seconds and remain de-energized for five seconds. After this delay, the spark and pilot valve energize until flame is sensed or the 85 second trial for ignition period ends. If this "flameout" cycle repeats 16 times (pilot flame is established and then lost), the control locks out and the LED goes off. A new trial for ignition sequence begins after the thermostat contacts are opened for 30 seconds and then closed.

If flame is detected when the thermostat calls for heat, it must extinguish within 30 seconds for normal operation. If flame is still present after 30 seconds, the control goes into lockout and the LED goes off.

D-Combustion Air Blower (B6)

All G23(X) units use a combustion air blower to move air through the burners and heat exchanger during heating operation. The blower uses a shaded pole 120VAC motor. Shaded pole motors do not use run capacitors. The motor operates during all heating operation and is controlled by blower control A15. The blower operates continuously while there is a call for heat. The ignition control is prevented from proceeding through the ignition sequence until combustion air blower operation is sensed by the prove switch.

The pressure switch connected to the upper vest panel is used to prove combustion air blower operation. The switch monitors air pressure in the blower housing. During normal operation, the pressure in the housing is negative. If the pressure drops (becomes more positive), the pressure switch opens. When the pressure switch opens, the ignition control (A3) immediately closes the gas valve to prevent burner operation.

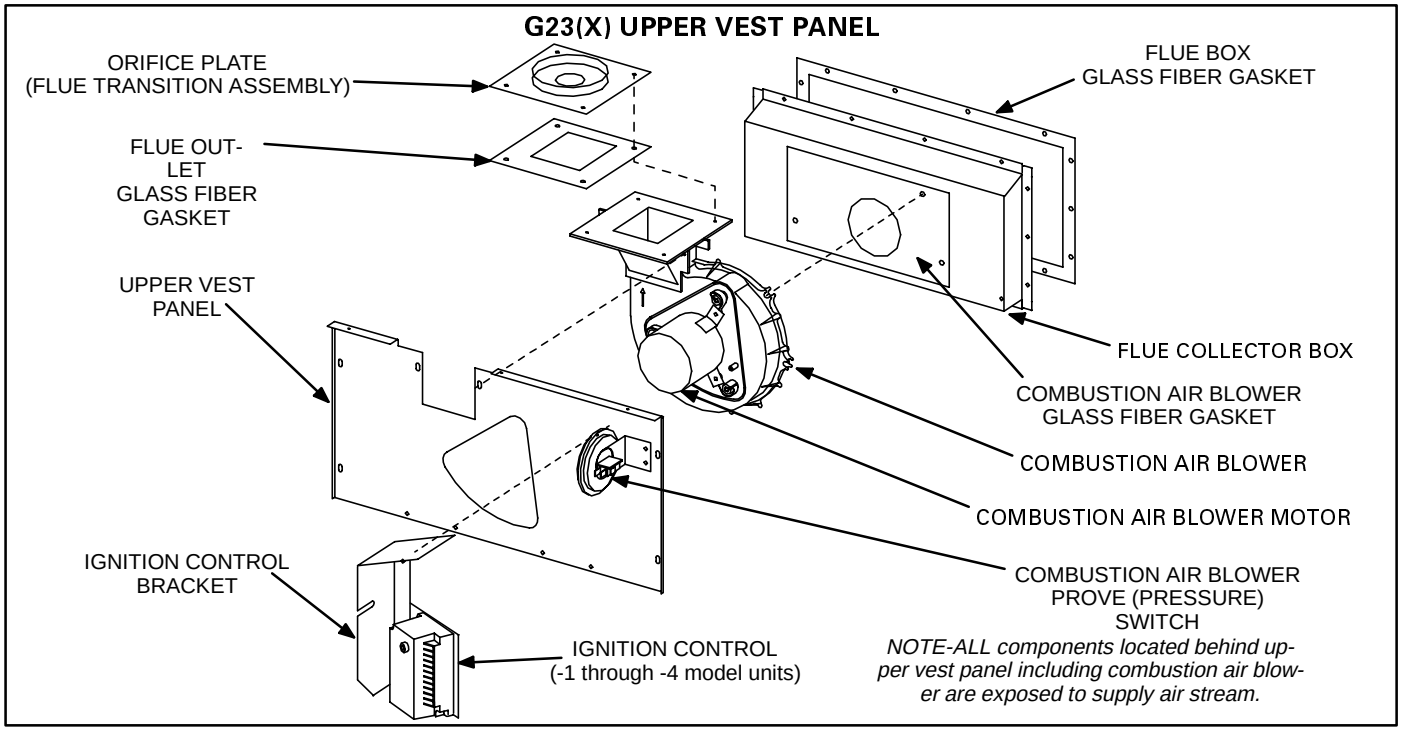

FIGURE 12

E-Blower Motors and Capacitors

All G23(X) units use direct drive blower motors. All motors used are 120V permanent split capacitor motors to ensure maximum efficiency. See table 4 for ratings.

TABLE 4

G23(X) BLOWER RATINGS 120V 1PH		
BLOWER MOTOR	HP	CAP
G23Q2(X)	1/5	5MFD 370V
G23Q2/3(X)	1/3	5MFD 370V
G23Q3(X)	1/3	5MFD 370V
G23Q3/4(X)	1/2	7MF 370V
G23Q4/5(X)	3/4	40MFD 370V
G23Q5/6(X)	3/4	40MFD 370V

F-Flame Rollout Switch (S47)

Flame rollout switch is a high temperature limit located on rollout switch bracket (over burner assembly). The limit is a N.C. SPST manual-reset limit connected in series with the ignition control (A3). When S47 senses rollout, the ignition control immediately stops ignition and closes the gas valve. If unit is running and flame rollout is detected, the gas valve will close and ignition control will be disabled. Rollout can be caused by a reverse draft, blocked flue or lack of combustion air. The switch is factory set and cannot be adjusted. The switch may have different setpoints for each unit model number. However, the setpoint will be printed on the side of the limit. The switch can be manually reset. To manually reset a tripped switch, push the reset button located on the control (see figure 13).

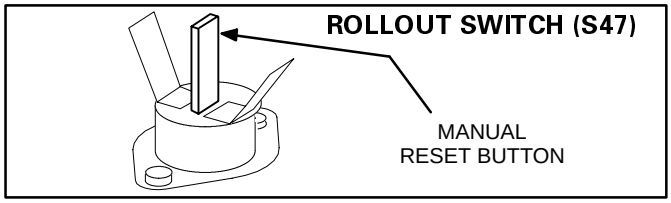

FIGURE 13

G-Primary Limit Control (S10)

Primary limit (S10) on G23(X) units is located in the middle of the vestibule panel. When excess heat is sensed in the heat exchanger, the limit will open. If the limit is tripped, the furnace control energizes the supply air blower and closes the gas valve. The limit automatically resets when temperature returns to normal. The switch is factory set and cannot be adjusted. The switch may have different setpoints for each unit model number. However, the setpoint will be printed on the side of the limit.

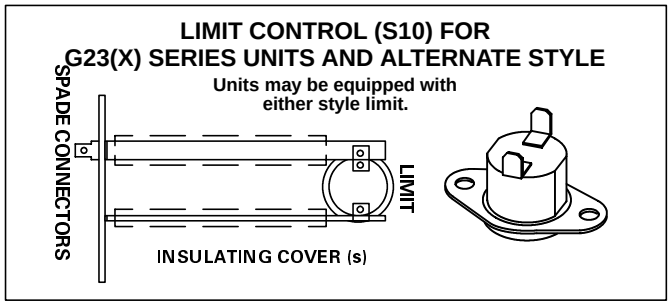

FIGURE 14

Units may be equipped with either flush style or extended (masted) limit (figure14). Masted limits may be installed with limit facing blower or away from blower. This orientation cannot be changed. When removing limit from unit, pay careful attention to its orientation and make sure limit is re-installed facing same direction.

H-Pilot, Spark Electrode, Flame Sensor and Burners (-1 Through -4 Models)

Figure 17 shows the arrangement of pilot, flame sensor, spark electrode and burners. The ignition control uses direct spark to ignite the pilot. The pilot ignites the burners and the burners cross-light. The flame sensor uses flame rectification to sense ignition. The ignition control requires that pilot flame must be sensed before the main gas valve is allowed to open. Typically, a 2 to 4 second delay occurs between the pilot ignition and the main valve opening.

Figure 16 shows the gap between tip of the electrodes and the burner surface. It is important that the gap be maintained for consistent ignition of pilot flame.

A flame retention ring in the end of each burner is used to maintain correct flame length and shape and to keep the flame from lifting off the burner head. In addition, the burner entrance to each clamshell (Figure 3) is fitted with a flame baffle or corbel to enhance the combustion process.

TYPICAL BURNER ASSEMBLY

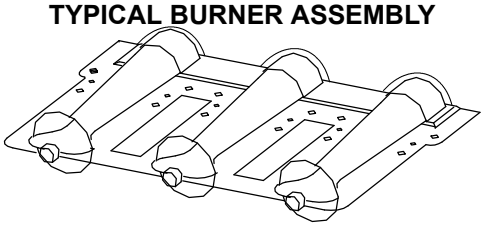

FIGURE 15

PILOT, SPARK ELECTRODE AND FLAME SENSOR

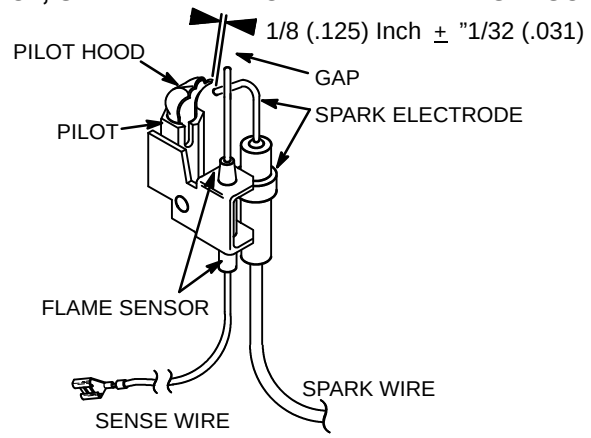

FIGURE 16

G23(X)-1, -2, -3 AND -4 MODELS BURNER PILOT/ELECTRODE ORIENTATION
view looking at side of burners

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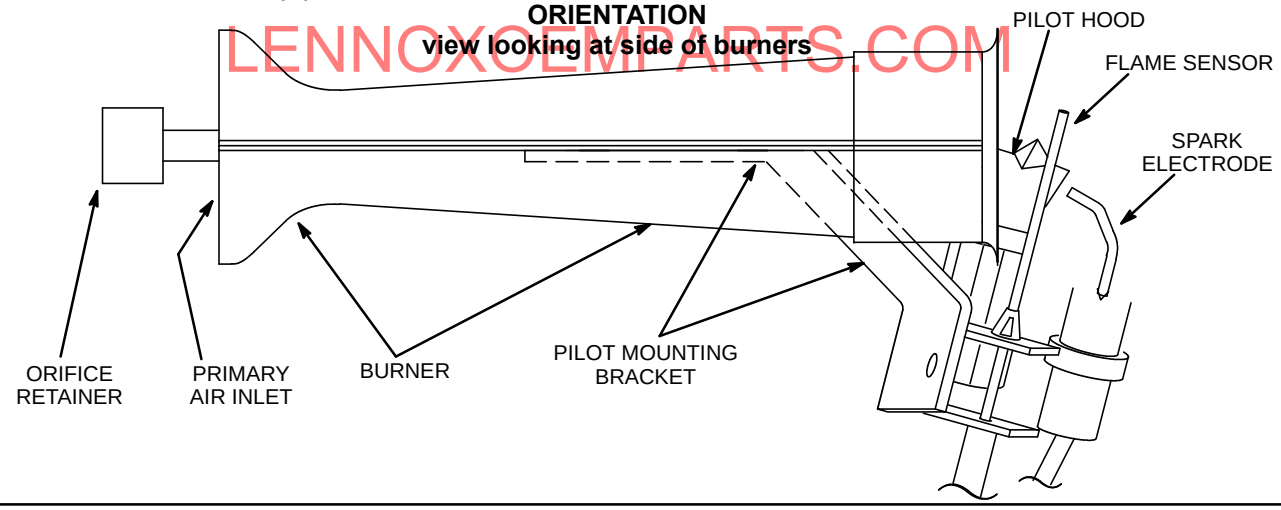

FIGURE 17

NOTE - - The G23(X) furnace contains electronic components that are polarity sensitive. Make sure that the furnace is wired correctly and is properly grounded.

⚠ DANGER

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.

I- SureLight Ignition System A3 (-5 and -6 models)

All G23(X)-5 and -6 model units are equipped with the Lennox SureLight ignition system. The system consists of ignition control board (figure 21 with control terminal designations in table 5) and ignitor (figures 18, 19 and 20. The board and ignitor work in combination to ensure furnace ignition and ignitor durability. The SureLight integrated board controls all major furnace operations. The board also features two LED lights for troubleshooting and two accessory terminals rated at (4) four amps. See table 6 for troubleshooting diagnostic codes. Table 7 and 8 show jack plug terminal designations. Units equipped with the SureLight board can be used with either electronic or electro-mechanical thermostats without modification. The SureLight ignitor is made of durable silicon-nitride. Ignitor longevity is also enhanced by voltage ramping by the control board. The board finds the lowest ignitor temperature which will successfully light the burner, thus increasing the life of the ignitor.

Flame Sensor

A flame sensor is located on the left side of the burner support. See figures 18, 19 and 20. The sensor is mounted on a bracket in the burner support and the tip protrudes into the flame envelope of the left-most burner. The sensor is fastened to burner supports and 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 SureLight control allows the gas valve to remain open as long as flame signal is sensed.

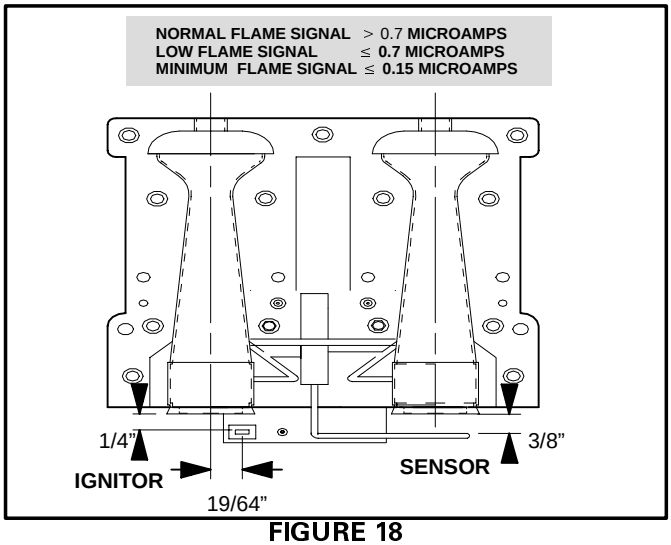

FIGURE 18

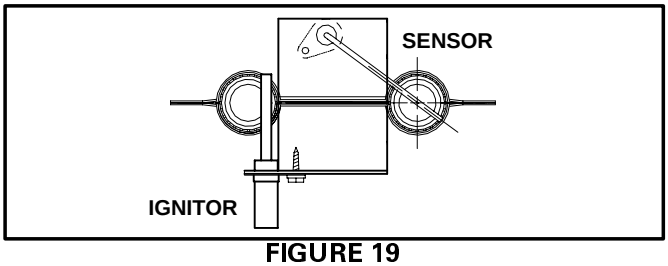

FIGURE 19

NOTE - Do not remove blower access panel to read SureLight LED lights. A sight glass is provided on the access panel for viewing.

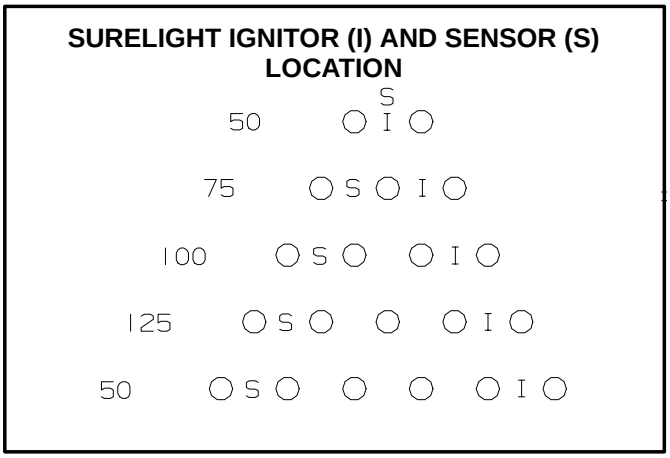

FIGURE 20

SURELIGHT CONTROL BOARD

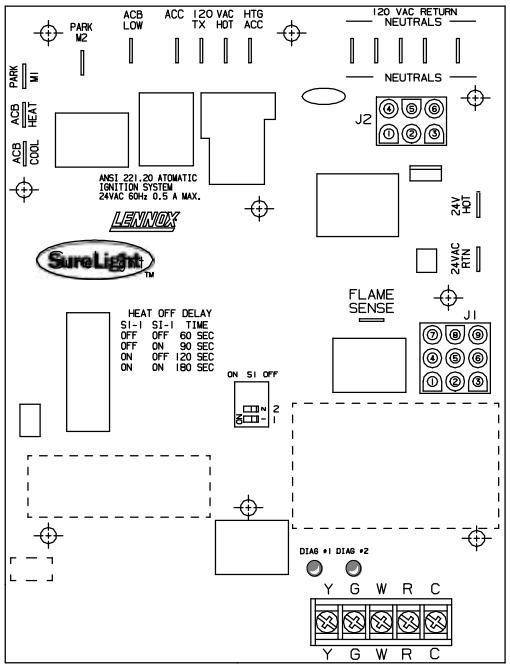

FIGURE 21

TABLE 5

SURELIGHT CONTROL TERMINAL DESIGNATIONS	
ACB COOL	Blower - Cooling Speed (Line Volt)
ACB HEAT	Blower - Heating Speed (Line Volt)
PARK	Alternate Blower Speeds (Dead)
ACB LOW	Continuous Low Speed Blower
ACC	Accessory Terminal (Line Volt)
TX	120VAC Hot to Transformer
HOT	120VAC Hot Input
HTG ACC	Heat Only Accessory (Line Volt)
NEUTRALS	120VAC Neutrals
24VAC HOT	24VAC Hot from Transformer
24VAC RTN	24VAC Return from Transformer
FLAME SENSE	Flame Sense Terminal

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TABLE 6

DIAGNOSTIC CODES MAKE SURE TO ID LED'S CORRECTLY: REFER TO INSTALLATION INSTRUCTIONS FOR CONTROL BOARD LAYOUT.		
LED #1	**LED #2**	**DESCRIPTION**
SIMULTANEOUS SLOW FLASH	SIMULTANEOUS SLOW FLASH	Power - Normal operation Also signaled during cooling and continues fan.
SIMULTANEOUS FAST FLASH	SIMULTANEOUS FAST FLASH	Normal operation - signaled when heating demand initiated at thermostat.
SLOW FLASH	ON	Primary or Secondary limit open. Units with board 63K8901 or 24L85: Limit must close within 5 trials for ignition or board goes into one hour limit Watchguard. Units with board 56L83 or 97L48: Limit must close within 3 minutes or board goes into one hour limit Watchguard.
OFF	SLOW FLASH	Pressure switch open or has opened 5 times during a single call for heat; OR: Blocked inlet/exhaust vent; OR: Condensate line blocked; OR: Pressure switch closed prior to activation of combustion air blower.
ALTERNATING SLOW FLASH	ALTERNATING SLOW FLASH	Watchguard - burners fail to ignite.
SLOW FLASH	OFF	Flame sensed without gas valve energized.
ON	SLOW FLASH	Rollout switch open. OR: 9 pin connector improperly attached.
ON ON OFF	ON OFF ON	Circuit board failure or control wired incorrectly.
FAST FLASH	SLOW FLASH	Main power polarity reversed. Switch line and neutral.
SLOW FLASH	FAST FLASH	Low flame signal. Measures below .7 microAmps. Replace flame sense rod.
ALTERNATING FAST FLASH	ALTERNATING FAST FLASH	Improper main ground or line voltage below 75 volts; OR: Broken ignitor; OR: Open ignitor circuit.

NOTE - Slow flash equals 1 Hz (one flash per second). Fast flash equals 3 Hz (three flashes per second). Drop out flame sense current < 0.15 microAmps

TABLE 7

SureLight BOARD J156 (J2) TERMINAL DESIGNATIONS	
PIN #	**FUNCTION**
1	Ignitor
2	Not Used
3	Ignitor Neutral
4	Combustion Air Blower Line Voltage
5	Not Used
6	Combustion Air Blower Neutral

TABLE 8

SureLight BOARD J58 (J1) TERMINAL DESIGNATIONS	
PIN #	**FUNCTION**
1	Primary Limit In
2	Gas Valve Common
3	Roll Out Switch Out
4	Gas Valve 24V
5	Pressure Switch In
6	Pressure Switch and Primary Limit Out
7	Not Used
8	Roll Out Switch In
9	Ground

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ELECTROSTATIC DISCHARGE (ESD)
Precautions and Procedures

⚠ CAUTION

Electrostatic discharge can affect electronic components. Take precautions during furnace installation and service to protect the furnace's electronic controls. Precautions will help to avoid control exposure to electrostatic discharge by putting the furnace, the control and the technician at the same electrostatic potential. Neutralize electrostatic charge by touching hand and all tools on an unpainted unit surface, such as the gas valve or blower deck, before performing any service procedure.

a-Electronic Ignition

On a call for heat the SureLight control monitors the combustion air blower 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 blower 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 control goes into Watchguard-Pressure Switch mode for a 5-minute re-set period.

After the 15-second pre-purge period, the SureLight ignitor warms up for 20 seconds after which the gas valve opens for a 4-second trial for ignition. G23X units equipped with board 24L85, 56L83 or 63K89: the ignitor stays energized for the first second of the 4-second trial. Units equipped with board 97L48: ignitor stays energized during the trial until flame is sensed. If ignition is not proved during the 4-second period, the 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 control goes into Watchguard-Flame Failure mode. After a 60-minute reset period, the control will begin the ignition sequence again.

The SureLight control board has an added feature that prolongs the life of the ignitor. After a successful ignition, the SureLight control utilizes less power to energize the ignitor on successive calls for heat. The control continues to ramp down the voltage to the ignitor until it finds the lowest amount of power that will provide a successful ignition. It finds this by ramping down until the ignitor will not light, then steps up the amount of power by three times. This amount of power is used for 255 cycles. On the 256th call for heat, the control will again ramp down until the lowest power is determined and the cycle begins again.

b-Fan Time Control

The fan on time of 45 seconds is not adjustable. Fan off time (time that the blower operates after the heat demand has been satisfied) can be adjusted by flipping the dip switches located on the SureLight integrated control. The unit is shipped with a factory fan off setting of 90 seconds. Fan off time will affect comfort and is adjustable to satisfy individual applications. See figure 22.

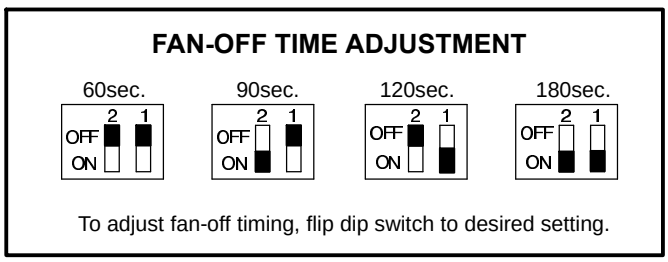


FIGURE 22

J-Gas Valve

The G23(X) uses a gas valve manufactured by Honeywell or White Rodgers. See figure 23. The valve is internally redundant to assure safety shut-off. If the gas valve must be replaced, the same type valve must be used.

24VAC terminals and gas control knob are located on top of the valve. All terminals on the gas valve are connected to wires from the ignition control. 24V applied to the "PV" terminals opens the pilot (-1 through -4 models) and 24V applied to the "MV" terminals opens the valve on G23X. Inlet and outlet pressure taps are located on the valve. A regulator adjustment screw (figure 24) is located on the valve.

An LPG changeover kit is available from Lennox. The kit includes main and pilot burner orifices, burner corbel plate (Nox only), and regulator conversion kit.

K-Combustion Air Blower Prove (Pressure) Switch (S64)

G23(X) series units are equipped with a combustion air (pressure) switch located on the vestibule panel. The switch is connected to the combustion air blower housing by means of a flexible silicon hose. It monitors air pressure in the combustion air blower housing. The other side of the pressure switch is open to atmosphere.

The switch is a single-pole single-throw pressure switch electrically connected in series with the ignition control. The purpose of the switch is to prevent burner operation if the combustion air blower is not operating.

On start-up, the switch senses that the combustion air blower is operating. It closes a circuit to the ignition control when pressure inside the combustion air blower increases above the setpoint. The setpoint is measured in negative inches water gauge. The pressure sensed by the switch is relative to atmospheric pressure. If the flue becomes obstructed during operation, the switch senses a loss of negative pressure (drops below setpoint) and opens the circuit to the ignition control.

The switch setpoint varies with unit model number. Look for the setpoint printed on the side of the switch.

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.

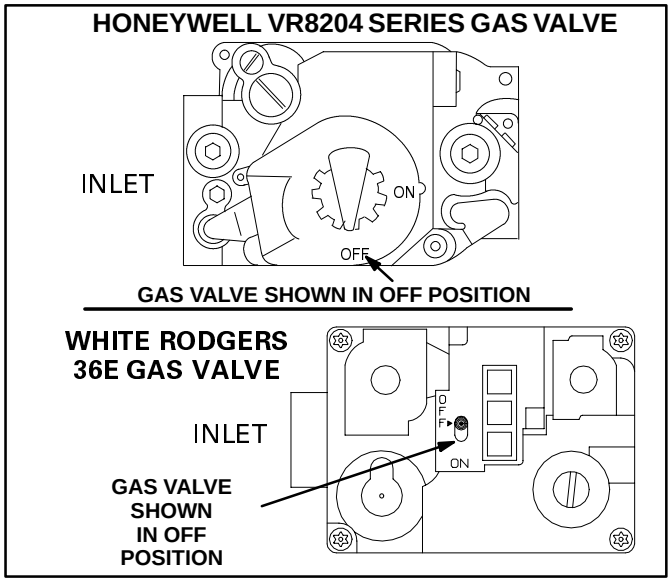


FIGURE 23

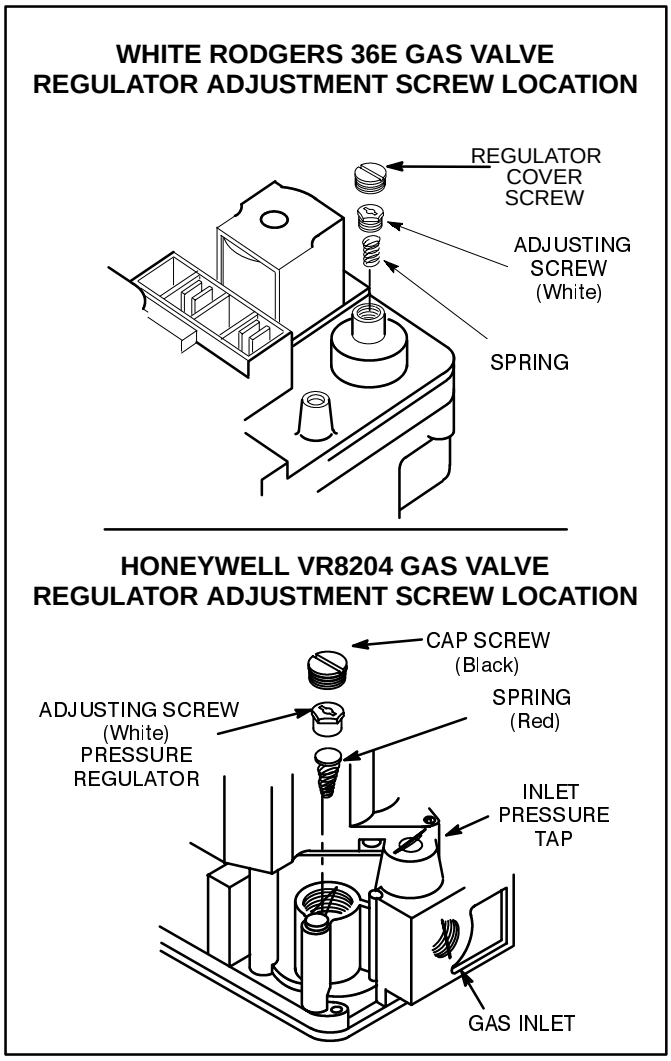


FIGURE 24

II-PLACEMENT AND INSTALLATION

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

A-Fresh Air Requirements

Until recently, there was no problem in bringing in sufficient amounts of outdoor air for combustion -- infiltration provided all the air that was needed and then some. In today's homes built with energy conservation in mind, tight construction practices make it necessary to bring in air from outside for combustion. Consideration must also be given to the use of exhaust fans, appliance vents, chimneys and fireplaces because they draw additional air that could be used for combustion out of the house. Unless outside air is brought into the home for combustion, negative pressure (pressure outside is greater than inside pressure) will build to the point that a down draft can occur in the furnace vent pipe or chimney. Combustion gases can enter the living space creating a potentially dangerous situation.

The importance of the previous paragraph cannot be overstated. Users may inadvertently block fresh air intakes after installation.

In the absence of local codes concerning air for combustion and ventilation, the following section outlines guidelines and recommends procedures for operating G23(X) furnaces in a manner that ensures efficient and safe operation. Special consideration must be given to combustion air needs as well as requirements for exhaust vents and gas piping. A portion of this information has been reprinted with permission from the National Fuel Gas Code (ANSI-Z223.1). This reprinted material is not the complete and official position of the ANSI on the referenced subject, which is represented only by the standard in its entirety.

In Canada, refer to the standard CAN/CGA-B149.1 and -B149.2 installation codes.

Combustion Air Requirements

⚠ CAUTION

Insufficient combustion air can cause headaches, nausea, dizziness or asphyxiation. Excessive exposure to contaminated combustion air will result in safety and performance related problems. Avoid exposure to the following substances in the combustion air supply:
Permanent wave solutions;
Chlorinated waxes and cleaners;
Chlorine base swimming pool chemicals;
Water softening chemicals;
De-icing salts or chemicals;
Carbon tetrachloride;
Halogen type refrigerants;
Cleaning solvents (such as perchloroethylene);
Printing inks, paint removers, varnishes, etc.;
Hydrochloric acid;
Cements and glues;
Antistatic fabric softeners for clothes dryers; and
Masonry acid washing materials.

All gas-fired appliances require air to be used for the combustion process. If sufficient amounts of combustion air are not available, the furnace or other appliance will operate in an inefficient and unsafe manner. Enough air must be provided to meet the needs of all fuel-burning appliances, as well as appliances such as exhaust fans which force air out of the home. When fireplaces, exhaust fans, or clothes dryers are used at the same time as the furnace, much more air is required to ensure proper combustion and to prevent a down-draft situation. Insufficient amounts of air also cause incomplete combustion which can result in carbon monoxide. The requirements for providing air for combustion and ventilation depend largely on whether the furnace is installed in an unconfined or confined space.

Unconfined Space

An unconfined space is an area such as a basement or large equipment room with a volume greater than 50 cubic feet per 1,000 Btu per hour of the combined input rating of all appliances installed in that space. This space also includes adjacent rooms which are not separated by a door. Though an area may appear to be unconfined, it might be necessary to bring in outdoor air for combustion if the structure does not provide enough air by infiltration. If the furnace is located in a building of tight construction with weather stripping and caulking around the windows and doors, follow the procedures outlined for using air from the outside for combustion and ventilation.

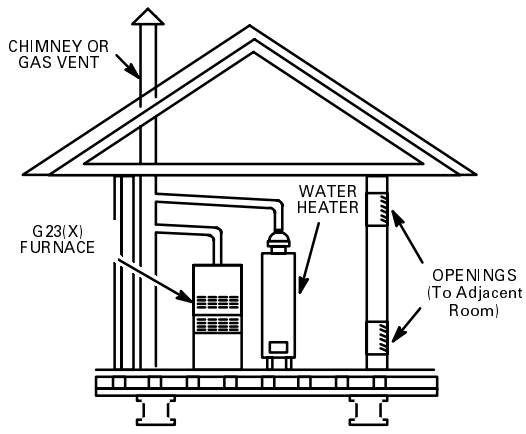
Confined Space

A confined space is an area with volume less than 50 cubic feet per 1,000 Btu per hour of the combined input rating of all appliances installed in that space. This definition includes furnace closets or small equipment rooms.

When the furnace is installed so that supply ducts carry air circulated by the furnace to areas outside the space containing the furnace, the return air must be handled by ducts which are sealed to the furnace casing and which terminate outside the space containing the furnace. This is especially important when the furnace is mounted on a platform in a confined space such as a closet or small equipment room. Even a small leak around the base of the unit at the platform or at the return air duct connection can cause a potentially dangerous negative pressure condition. Air for combustion and ventilation can be brought into the confined space either from inside the building or from outside.

Air from Inside

If the confined space housing the furnace adjoins space categorized as unconfined, air can be brought in by providing two permanent openings between the two spaces. Each opening must have a minimum free area of 1 square inch per 1,000 Btu per hour of the total input rating of all gas-fired equipment in the confined space. Each opening must be at least 100 square inches. One opening shall be within 12 inches of the top of the enclosure and one opening within 12 inches of the bottom (See figure 25).

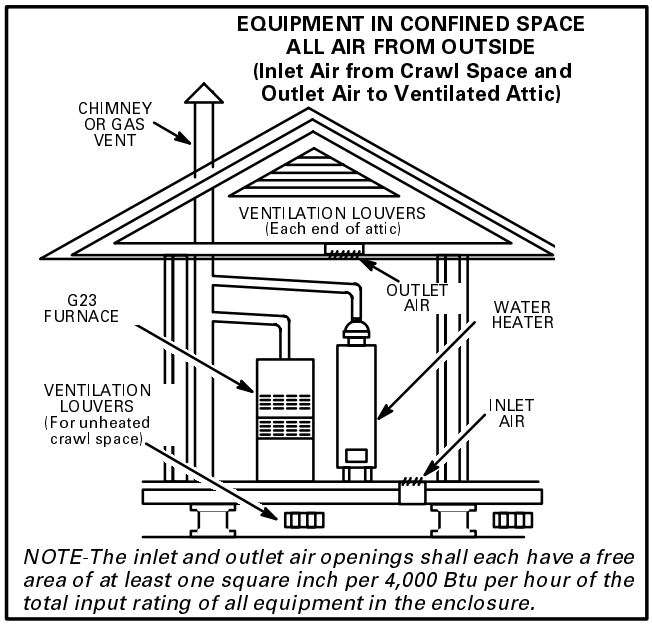


NOTE-Each opening shall have a free area of at least one square inch per 1,000 Btu per hour of the total input rating of all equipment in the enclosure, but not less than 100 square inches.

FIGURE 25

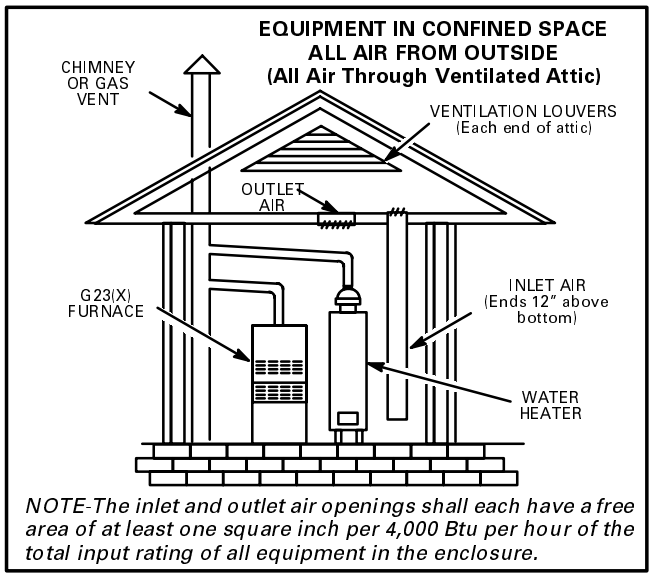
Air from Outside

If air from outside is brought in for combustion and ventilation, the confined space shall be provided with two permanent openings. One opening shall be within 12 inches of the top of the enclosure and one within 12 inches of the bottom. These openings must communicate directly or by ducts with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors or indirectly through vertical ducts. Each opening shall have a minimum free area of 1 square inch per 4,000 Btu per hour of total input rating of all equipment in the enclosure (See figures 26 and 27). When communicating with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 square inch per 2,000 Btu per total input rating of all equipment in the enclosure (See figure 28).



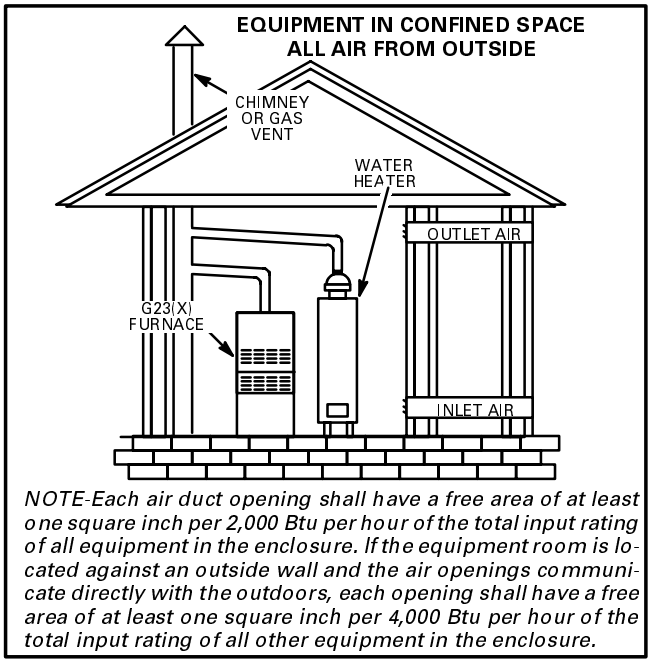
NOTE-The inlet and outlet air openings shall each have a free area of at least one square inch per 4,000 Btu per hour of the total input rating of all equipment in the enclosure.

FIGURE 26



NOTE-The inlet and outlet air openings shall each have a free area of at least one square inch per 4,000 Btu per hour of the total input rating of all equipment in the enclosure.

FIGURE 27



NOTE-Each air duct opening shall have a free area of at least one square inch per 2,000 Btu per hour of the total input rating of all equipment in the enclosure. If the equipment room is located against an outside wall and the air openings communicate directly with the outdoors, each opening shall have a free area of at least one square inch per 4,000 Btu per hour of the total input rating of all other equipment in the enclosure.

FIGURE 28

When ducts are used, they shall be of the same cross-sectional area as the free area of the openings to which they connect. The minimum dimension of rectangular air ducts shall be no less than 3 inches. In calculating free area, the blocking effect of louvers, grilles, or screens must be considered. If the design and free area of protective covering is not known for calculating the size opening required, it may be assumed that wood louvers will have 20 to 25 percent free area and metal louvers and grilles will have 60 to 75 percent free area. Louvers and grilles must be fixed in the open position or interlocked with the equipment so that they are opened automatically during equipment operation.

B-Flue Venting Requirements

G23(X) series furnaces must be vented in compliance with all local codes, the venting tables provided in this manual and these instructions.

The G23(X) series units have been classified as fan assisted Category I type furnaces when vertically vented in accordance with the latest edition of ANSI Z21.47 Central Furnace Standard. The definition of a fan assisted Category I type furnace is an appliance equipped with an integral mechanical means to either draw or force products of combustion through the combustion chamber and/or heat exchanger.

The vent sizing tables in this manual have been extracted from the National Fuel Gas Code (NFPA 54 / ANSI Z223.1) and are provided for convenience to serve as a guideline for proper vent installation. Proper application, termination, construction and location of vents must conform to local codes having jurisdiction. In the absence of local codes, the NFGC serves as the defining document.

Refer to the tables and the venting information contained in these instructions for proper sizing and installation of the venting system.

The G23(X) series units have the following flue collar sizes: -50 unit, 3” diameter; -75 and -100 units, 4” diameter; and -125 & -150 units, 5” diameter. Use this information in conjunction with the provided venting tables to properly size the vent or vent connector that attaches to the furnace flue collar.

Venting Using a Masonry Chimney

The following additional requirements apply when a lined masonry chimney is being used to vent a G23(X) furnace:

A Category I appliance must never be connected to a chimney that is servicing a solid fuel appliance. If a fireplace chimney flue is used to vent this appliance, the fireplace opening must be permanently sealed.

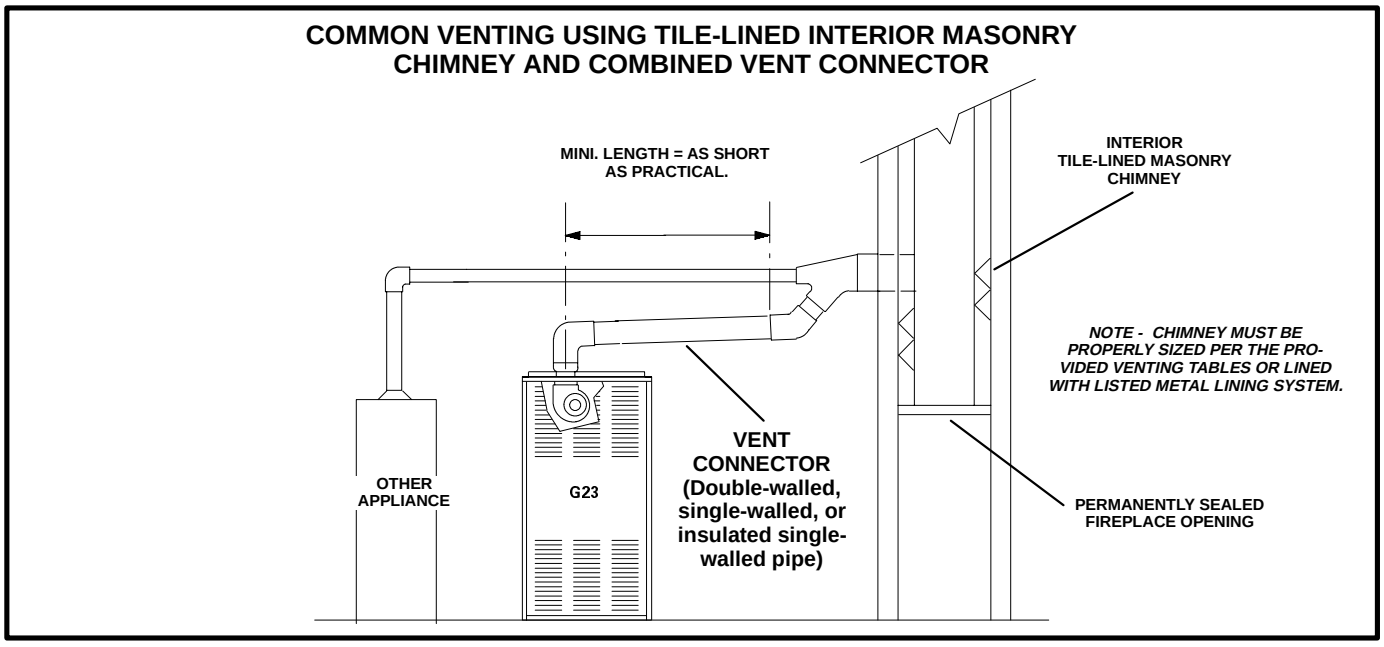


FIGURE 29

A chimney with one or more sides exposed to the outside of the structure is considered to be an exterior chimney. A Type B or listed chimney lining system passing through an unused masonry chimney flue is not considered to be exposed to the outdoors.

Masonry chimneys used to vent Category I central furnaces must be either tile-lined or lined with a listed metal lining system or dedicated gas vent. Unlined masonry chimneys are prohibited.

A fan assisted furnace may be commonly vented into an existing lined internal masonry chimney provided:

1 - The chimney is currently serving at least one draft-hood equipped appliance.
2 - The vent connectors and chimney are sized in accordance with the provided venting tables.

SINGLE APPLIANCE VENTING OF A FAN ASSISTED FURNACE INTO A TILE-LINED MASONRY CHIMNEY (INTERIOR OR OUTSIDE WALL) IS **PROHIBITED**. THE CHIMNEY MUST FIRST BE LINED WITH EITHER TYPE "B" VENT OR AN INSULATED SINGLE WALL FLEXIBLE VENT LINING SYSTEM, SIZED IN ACCORDANCE WITH THE PROVIDED VENTING TABLES.

See figures 29 and 30 for common venting.

A Type "B" vent or masonry chimney liner shall terminate above the roof surface with a listed cap or a listed roof assembly in accordance with the terms of their respective listings and the vent manufacturer's instructions.

Do not install a manual damper, barometric draft regulator, or flue restrictor between the furnace and the chimney.

If type "B" double-wall vent is used inside a chimney, no other appliance can be vented into the chimney. Outer wall of type "B" vent pipe must not be exposed to flue products.

Insulation for the flexible vent pipe must be an encapsulated fiberglass sleeve recommended by the flexible vent pipe manufacturer. See figure 30.

The space between liner and chimney wall should NOT be insulated with puffed mica or any other loose granular insulating material.

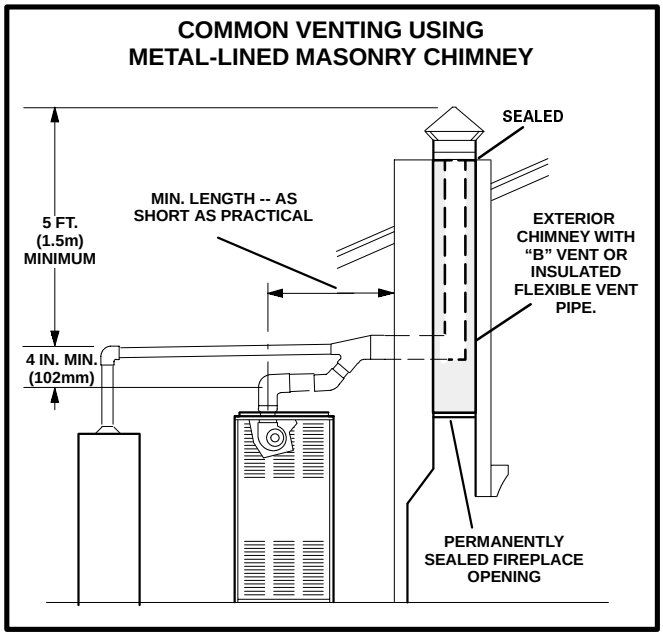


FIGURE 30

If “B” vent or an insulated flexible vent pipe cannot be used as liners, the chimney must be rebuilt to accommodate one of these methods or some alternate approved method must be found to vent the appliance.

When inspection reveals that an existing chimney is not safe for the intended purpose, it shall be rebuilt to conform to nationally recognized standards, lined or relined with suitable materials or replaced with a gas vent or chimney suitable for venting G23(X) series units. The chimney passageway must be checked periodically to ensure that it is clear and free of obstructions.

General Venting Requirements

All G23(X) furnaces must be vented in accordance with the methods outlined in these instructions.

1 - Vent diameter recommendations and maximum runs allowed are found in the provided venting tables.

2 - In no case should the vent or vent connector diameter be less than the diameter specified in the provided venting tables.

3 - *For single appliance vents:* If the vertical vent or tile-lined chimney has a larger diameter or flow area than the vent connector, use the ***vertical vent diameter*** to determine the ***minimum vent capacity*** and the **vent connector diameter** to determine the **maximum vent capacity**. The flow area of the vertical vent, however, shall not exceed 7 times the flow area of the listed appliance categorized vent area, drafthood outlet area or flue collar area unless designed in accordance with approved engineering methods.

4 - *For multiple appliance vents:* The flow area of the largest section of vertical vent or chimney shall not exceed 7 times the smallest listed appliance categorized vent area, flue collar area or drafthood outlet area unless designed in accordance with approved engineering methods.

5 - The entire length of single wall metal vent connector shall be readily accessible for inspection, cleaning, and replacement.

6 - Single appliance venting configurations with zero lateral lengths, see tables 9 and 10, are assumed to have no elbows in the vent system. For all other vent configurations, the vent system is assumed to have two 90° elbows. For each additional 90° elbow or equivalent (for example two 45° elbows equal one 90° elbow) beyond two, the maximum capacity listed in the venting table should be reduced by 10 percent (0.90 x maximum listed capacity).

7 - The common venting tables 11, 12, 13, and 14 were generated using a maximum horizontal vent connector length of 1-1/2 feet (18 inches) for each inch of connector diameter as follows:

CONNECTOR DIAMETER (INCHES)	MAXIMUM HORIZONTAL CONNECTOR LENGTH (FEET)
3	4-1/2
4	6
5	7-1/2
6	9
7	10-1/2

8 - If the common vertical vent is offset, the maximum common vent capacity listed in the common venting tables should be reduced by 20%, the equivalent of two 90° elbows (0.80 x maximum common vent capacity). The horizontal length of the offset shall not exceed 1-1/2 feet for each inch of common vent diameter.

9 - The vent pipe should be as short as possible with the least number of elbows and angles to do the job. The vent connector should be routed to the vent utilizing the shortest possible route.

10- A vent connector shall be supported without any dips or sags and shall slope a minimum of 1/4” per linear foot of connector, back towards the appliance.

11- Vent connectors shall be firmly attached to furnace flue collars by sheet metal screws or other approved means, except vent connectors of listed Type “B” vent material which shall be assembled in accordance with the manufacturer’s instructions. Joints between sections of single wall connector piping shall be fastened by sheet metal screws or other approved means.

12- When the vent connector used for Category I appliances must be located in or pass through a crawl space or other areas which may be cold, that portion of the vent connector shall be listed double-wall Type B vent material or material having equivalent insulation qualities.

13- All venting pipe passing through floors, walls, and ceilings must be installed with the listed clearance to combustible materials and be fire stopped according to local codes. In absence of local codes, refer to NFGC (Z223.1).

14- No portion of the venting system can extend into, or pass through any circulation air duct or plenum.

15- Vent connectors serving Category I appliances shall not be connected to any portion of mechanical draft systems operation under positive pressure such as Category III or IV venting systems.

16- If vent connectors are combined prior to entering the common vent, the maximum common vent capacity listed in the common venting tables must be reduced by 10%, the equivalent of one 90° elbow (0.90 x maximum common vent capacity).

17- Common vent diameter must always be at least as large as the largest vent connector diameter.

18- In no case, shall the vent connector be upsized more than two consecutive table size diameters over the size of the drafthood outlet or flue collar outlet.

19- A manual damper, barometric draft regulator or flue restrictor must not be installed between furnace and any chimney.

20- When connecting this appliance to an existing dedicated or common venting system, the venting system, must be inspected for signs of corrosion, and general condition. The sizing of the vent system must be reviewed and conform to these instructions and the provided venting tables. If the existing system is in conflict with these requirements, the venting system must be resized.

TABLE 9

CAPACITY OF TYPE B DOUBLE-WALL VENTS WITH TYPE B DOUBLE-WALL CONNECTORS SERVING A SINGLE CATEGORY I APPLIANCE

Height H (feet)	Lateral L (feet)	Vent and Connector Diameter - D (inches)							
		3 Inch		4 Inch		5 Inch		6 Inch	
		Appliance Input Rating in Thousands of Btu Per Hour							
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
6	0	0	78	0	152	0	251	0	375
	2	13	51	18	97	27	157	32	232
	4	21	49	30	94	39	153	50	227
	6	25	46	36	91	47	149	59	223
8	0	0	84	0	165	0	276	0	415
	2	12	57	16	109	25	178	28	263
	5	23	53	32	103	42	171	53	255
	8	28	49	39	98	51	164	64	247
10	0	0	88	0	175	0	295	0	447
	2	12	61	17	118	23	194	26	289
	5	23	57	32	113	41	187	52	280
	10	30	51	41	104	54	176	67	267
15	0	0	94	0	191	0	327	0	502
	2	11	69	15	136	20	226	22	339
	5	22	65	30	130	39	219	49	330
	10	29	59	40	121	51	206	64	315
	15	35	53	48	112	61	195	76	301
20	0	0	97	0	202	0	349	0	540
	2	10	75	14	149	18	250	20	377
	5	21	71	29	143	38	242	47	367
	10	28	64	38	133	50	229	62	351
	15	34	58	46	124	59	217	73	337
	20	48	52	55	116	69	206	84	322
30	0	0	100	0	213	0	374	0	587
	2	9	81	13	166	14	283	18	432
	5	21	77	28	160	36	275	45	421
	10	27	70	37	150	48	262	59	405
	15	33	64	44	141	57	249	70	389
	20	56	58	53	132	66	237	80	374
	30	NR	NR	73	113	88	214	104	346

NOTE: Single appliance venting configurations with zero lateral lengths are assumed to have no elbows in the vent system. For all other vent configurations, the vent system is assumed to have two 90° elbows. For each additional 90° elbow or equivalent (for example two 45° elbows equal one 90° elbow) beyond two, the maximum capacity listed in the venting table should be reduced by 10 percent (0.90 x maximum listed capacity).

TABLE 10
CAPACITY OF TYPE B DOUBLE-WALL VENTS WITH SINGLE-WALL METAL CONNECTORS SERVING A SINGLE CATEGORY I APPLIANCE

Height H (feet)	Lateral L (feet)	Vent and Connector Diameter - D (inches)							
		3 Inch		4 Inch		5 Inch		6 Inch	
		Appliance Input Rating in Thousands of Btu Per Hour							
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
6	0	38	77	59	151	85	249	126	373
	2	39	51	60	96	85	156	123	231
	4	NR	NR	74	92	102	152	146	225
	6	NR	NR	83	89	114	147	163	220
8	0	37	83	58	164	83	273	123	412
	2	39	56	59	108	83	176	121	261
	5	NR	NR	77	102	107	168	151	252
	8	NR	NR	90	95	122	161	175	243
10	0	37	87	57	174	82	293	120	444
	2	39	61	59	117	82	193	119	287
	5	52	56	76	111	105	185	148	277
	10	NR	NR	97	100	132	171	188	261
15	0	36	93	56	190	80	325	116	499
	2	38	69	57	136	80	225	115	337
	5	51	63	75	128	102	216	144	326
	10	NR	NR	95	116	128	201	182	308
	15	NR	NR	NR	NR	158	186	220	290
20	0	35	96	54	200	78	346	114	537
	2	37	74	56	148	78	248	113	375
	5	50	68	73	140	100	239	141	363
	10	NR	NR	93	129	125	223	177	344
	15	NR	NR	NR	NR	155	208	216	325
	20	NR	NR	NR	NR	186	192	254	306
30	0	34	99	53	211	76	372	110	584
	2	37	80	55	164	76	281	109	429
	5	49	74	72	157	98	271	136	417
	10	NR	NR	91	144	122	255	171	397
	15	NR	NR	115	131	151	239	208	377
	20	NR	NR	NR	NR	181	223	246	357
	30	NR	NR	NR	NR	NR	NR	NR	NR

NOTE: Single appliance venting configurations with zero lateral lengths are assumed to have no elbows in the vent system. For all other vent configurations, the vent system is assumed to have two 90° elbows. For each additional 90° elbow or equivalent (for example two 45° elbows equal one 90° elbow) beyond two, the maximum capacity listed in the venting table should be reduced by 10 percent (0.90 x maximum listed capacity).

TABLE 11
CAPACITY OF TYPE B DOUBLE-WALL VENTS WITH TYPE B DOUBLE-WALL CONNECTORS SERVING TWO OR MORE CATEGORY I APPLIANCES
VENT CONNECTOR CAPACITY

Vent Height H (feet)	Connector Rise R (feet)	Vent and Connector Diameter - D (inches)							
		3 Inch		4 Inch		5 Inch		6 Inch	
		Appliance Input Rating in Thousands of Btu Per Hour							
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
6	1	22	37	35	66	46	106	58	164
	2	23	41	37	75	48	121	60	183
	3	24	44	38	81	49	132	62	199
8	1	22	40	35	72	49	114	64	176
	2	23	44	36	80	51	128	66	195
	3	24	47	37	87	53	139	67	210
10	1	22	43	34	78	49	123	65	189
	2	23	47	36	86	51	136	67	206
	3	24	50	37	92	52	146	69	220
15	1	21	50	33	89	47	142	64	220
	2	22	53	35	96	49	153	66	235
	3	24	55	36	102	51	163	68	248
20	1	21	54	33	99	46	157	62	246
	2	22	57	34	105	48	167	64	259
	3	23	60	35	110	50	176	66	271
30	1	20	62	31	113	45	181	60	288
	2	21	64	33	118	47	190	62	299
	3	22	66	34	123	48	198	64	309

TABLE 12
CAPACITY OF TYPE B DOUBLE-WALL VENTS WITH TYPE B DOUBLE-WALL CONNECTORS SERVING TWO OR MORE CATEGORY I APPLIANCES
COMMON VENT CAPACITY

Vent Height H (feet)	Common Vent Diameter - D (inches)							
	4 Inch		5 Inch		6 Inch		7 Inch	
	Appliance Input Rating in Thousands of Btu Per Hour							
	FAN + FAN	FAN + NAT	FAN + FAN	FAN + NAT	FAN + FAN	FAN + NAT	FAN + FAN	FAN + NAT
6	92	81	140	116	204	161	309	248
8	101	90	155	129	224	178	339	275
10	110	97	169	141	243	194	367	299
15	125	112	195	164	283	228	427	352
20	136	123	215	183	314	255	475	394
30	152	138	244	210	361	297	547	459

TABLE 13
CAPACITY OF TYPE B DOUBLE-WALL VENT WITH SINGLE-WALL METAL CONNECTORS SERVING TWO OR MORE CATEGORY I APPLIANCES
VENT CONNECTOR CAPACITY

Vent Height H (feet)	Connector Rise R (feet)	Vent and Connector Diameter - D (inches)							
		3 Inch		4 Inch		5 Inch		6 Inch	
		Appliance Input Rating in Thousands of Btu Per Hour							
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
6	1	NR	NR	NR	NR	NR	NR	NR	NR
	2	NR	NR	NR	NR	NR	NR	168	182
	3	NR	NR	NR	NR	121	131	174	198
15	1	NR	NR	79	87	116	138	177	214
	2	NR	NR	83	94	121	150	185	230
	3	NR	NR	87	100	127	160	193	243
30	1	47	60	77	110	113	175	169	278
	2	50	62	81	115	117	185	177	290
	3	54	64	85	119	122	193	185	300

TABLE 14
CAPACITY OF TYPE B DOUBLE-WALL VENTS WITH SINGLE-WALL METAL CONNECTORS SERVING TWO OR MORE CATEGORY I APPLIANCES
COMMON VENT CAPACITY

Vent Height H (feet)	Common Vent Diameter - D (inches)							
	4 Inch		5 Inch		6 Inch		7 Inch	
	Appliance Input Rating in Thousands of Btu Per Hour							
	FAN + FAN	FAN + NAT	FAN + FAN	FAN + NAT	FAN + FAN	FAN + NAT	FAN + FAN	FAN + NAT
6	89	78	136	113	200	158	304	244
8	98	87	151	126	218	173	331	269
10	106	94	163	137	237	189	357	292
15	121	108	189	159	275	221	416	343
20	131	118	208	177	305	247	463	383
30	145	132	236	202	350	286	533	446

Removal of Unit from Common Venting System

In the event that an existing furnace is removed from a venting system commonly run with separate gas appliances, the venting system is likely to be too large to properly vent the remaining attached appliances. The following test should be conducted while each appliance is in operation and the other appliances not in operation remain connected to the common venting system. If the venting system has been installed improperly, the system must be corrected as outlined in the previous section.

1 - Seal any unused openings in the common venting system.

2 - Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion and other deficiencies which could cause an unsafe condition.

3 - Insofar as is practical, close all building doors and windows and all doors between the space in which the appliances remaining connected to the common venting system are located and other spaces of the building. Turn on clothes dryers and any appliances not connected to the common venting system. Turn on any exhaust fans, such as range hoods and bathroom exhausts, so they will operate at maximum speed. Do not operate a summer exhaust fan. Close fireplace dampers.

4 - Following the lighting instruction, place the appliance being inspected in operation. Adjust thermostat so appliance will operate continuously.

5 - Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Use the flame of a match or candle, or smoke from a cigarette, cigar or pipe.

6 - After it has been determined that each appliance remaining connected to the common venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers and any other gas burning appliance to their previous condition of use.

7 - If improper venting is observed during any of the above tests, the common venting system must be corrected. The common venting system should be resized to approach the minimum size as determined by using the appropriate tables in appendix G in the current standards of the National Fuel Gas Code ANSI Z223-1.

Horizontal Venting

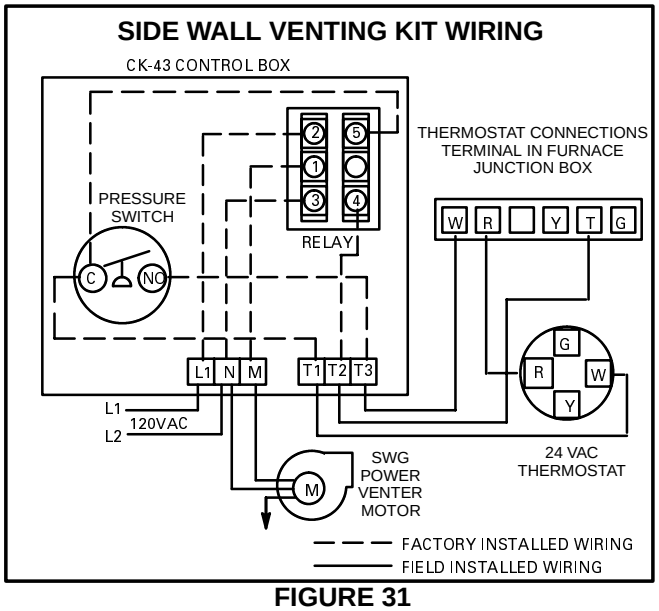


FIGURE 31

This furnace is design certified by the American Gas Association for horizontal venting through an outside wall only with the use of a Field Controls Company Model SWG-4L side wall venting kit available from Lennox Dealer Service Center. No other Field brand venting kit or any other manufacturer's venting kit is acceptable. Horizontal venting of this furnace without the use of the above stated kit is prohibited. See figure 31 for field wiring of side wall horizontal venting kit.

When horizontally vented, minimum clearance for termination from electric meters, gas meters, regulators and relief equipment is 4 ft. (1.2m).

III-START-UP

A-Preliminary and Seasonal Checks

1 - Inspect electrical wiring, both field and factory installed for loose connections. Tighten as required.

2 - Check voltage at disconnect switch. Voltage must be within range listed on the nameplate. If not, consult the power company and have voltage condition corrected before starting unit.

B-Heating Start-Up

FOR YOUR SAFETY READ BEFORE LIGHTING

⚠ WARNING

Shock and burn hazard.

G23(X)-1 through -4 model units are equipped with an electronic spark ignition system. Do not attempt to light manually.

⚠ WARNING

Shock and burn hazard.

G23(X)-5 and -6 model units are equipped with the SureLight ignition system. Do not attempt to light manually..

⚠ WARNING

Do not use this furnace if any part has been underwater. Inspect the furnace and replace any part of the control system and any gas control which has been under water.

⚠ CAUTION

Before attempting to perform any service or maintenance, turn the electrical power to unit OFF at disconnect switch.

⚠ WARNING

If overheating occurs or if gas supply fails to shut off, shut off the manual gas valve to the appliance before shutting off electrical supply.

BEFORE LIGHTING smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, do not try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.

G23(X) -1 through -4 model units are equipped with an intermittent pilot ignition system. Do <u>not</u> attempt to manually light pilot on these furnaces. Each time thermostat calls for heat, the pilot will be automatically lit. The pilot does not burn when there is no call for heat.

How To Operate Gas Valve (Figure 33)

⚠ WARNING

If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

Gas Valve Operation (Figure 33)

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

2 - Set thermostat to lowest setting. See figure 32.

3 - Turn off all electrical power to appliance.

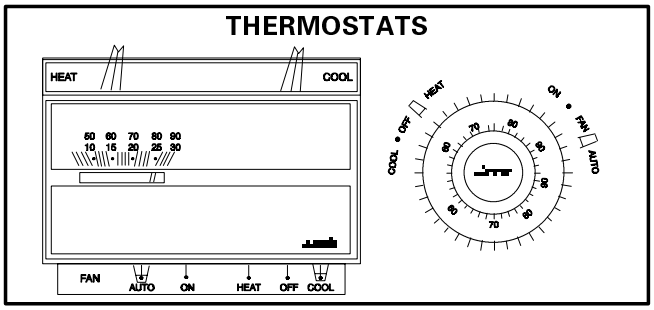


FIGURE 32

4 - This appliance is equipped with an ignition device which automatically lights the furnace. Do not try to light the furnace by hand.
5 - Remove upper access panel.
6 - On Honeywell VR8204 gas valves, turn knob on gas valve clockwise to **OFF**. For White Rodgers 36E gas valves, move switch to **OFF**. Do not force. See figure 33.

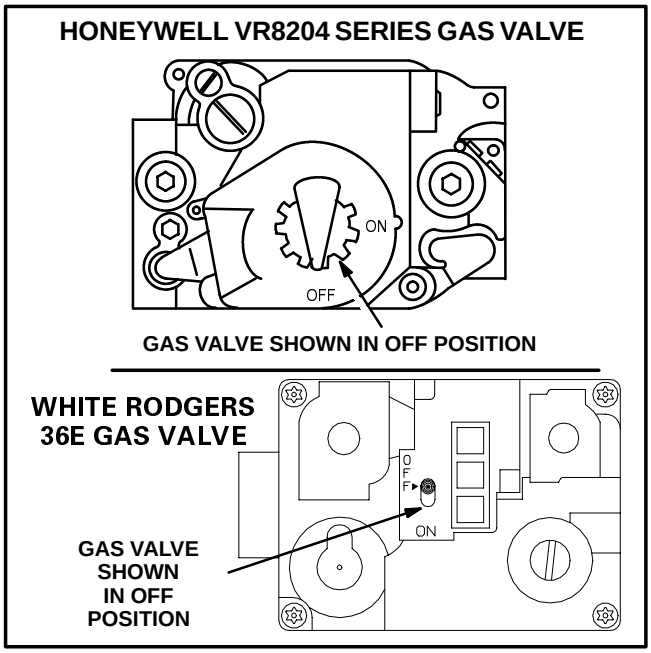


FIGURE 33

7 - Wait five (5) 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 - For Honeywell VR8204 gas valves, turn knob on gas valve counterclockwise to **ON**. For White Rodgers 36E gas valves, move switch to **ON**.
9 - Replace upper access panel.
10- Turn on all electrical power to unit.
11- Set thermostat to desired setting.

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

12- If the appliance still will not operate, follow the instructions "To Turn Off Gas To Unit" and call your service technician or gas supplier.

To Turn Off Gas To Unit

1 - Set thermostat to lowest setting.
2 - Turn off all electrical power to unit if service is to be performed.
3 - Remove upper access panel.
4 - On Honeywell VR8204 gas valves, turn knob on gas valve clockwise to **OFF**. For White Rodgers 36E gas valves, move switch to **OFF**. Do not force.
5 - Replace upper access panel.

C-Safety or Emergency Shutdown

Turn off unit power. Close manual and main gas valves.

D-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, covers and vent caps must be in place and secured.

IV-HEATING SYSTEM SERVICE CHECKS

A-A.G.A Certification

All units are A.G.A. design certified without modifications. Refer to the G23(X) Operation and Installation Instruction Manual Information.

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. See table 16 for gas pipe capacity.

Compounds used on gas piping threaded joints should be resistant to action of liquefied petroleum gases.

C-Testing Gas Piping

⚠ 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.

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 34. If the pressure is equal to or less than 0.5psig (14"W.C.), use the manual shut-off valve before pressure testing to isolate furnace from gas supply.

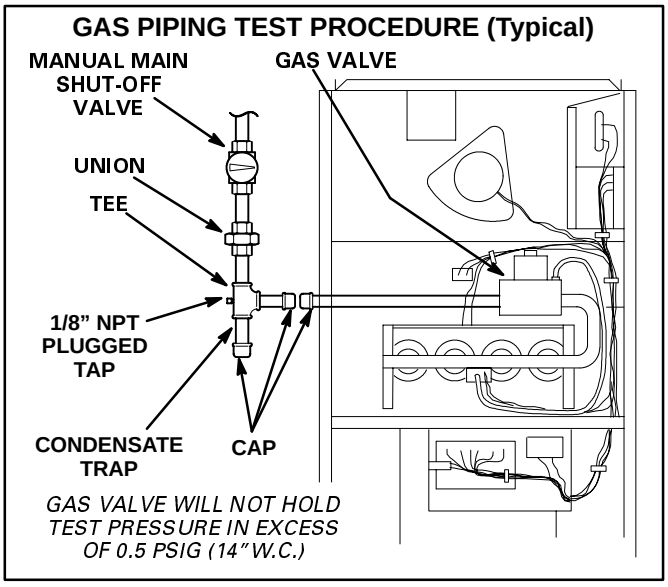


FIGURE 34

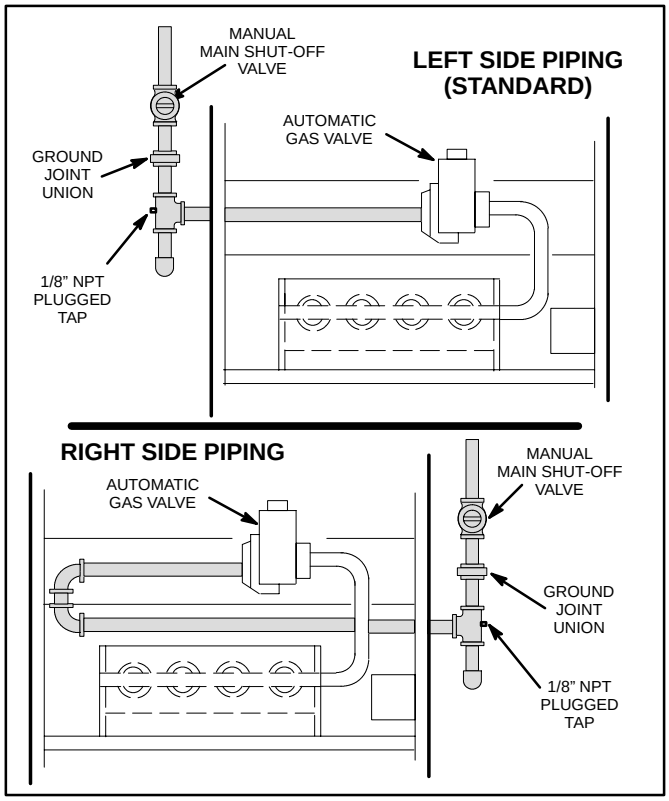


FIGURE 35

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-Check Manifold Pressure

After line pressure has been checked and adjusted, check manifold pressure. Move pressure gauge to outlet pressure tap located on unit gas valve (GV1). Checks of manifold pressure are made as verification of proper regulator adjustment. Manifold pressure for the G23(X) can be measured at any time the gas valve is open and is supplying gas to the unit. Normal manifold pressure for natural gas units is 3.5 in. w.c. For LP gas the correct manifold pressure is 10.0 in. w.c.

⚠ IMPORTANT

For safety, connect a shut-off valve between the manometer and the gas tap to permit shut off of gas pressure to the manometer.

TABLE 15

GAS VALVE REGULATION	
Unit (Fuel)	**Operating Pressure (outlet) in. W.C.**
Natural	3.5 ± 0.3
L.P.	10.0 ± 0.5

The gas valve is factory set and should not require adjustment. See table 15.

Manifold Adjustment Procedure:

1 - Connect a test gauge to outlet pressure tap on gas valve. Start unit and allow 5 minutes for unit to reach steady state.

2 - While waiting for the unit to stabilize, notice the flame. Flame should be stable and should not lift from burner. Natural gas should burn blue. L.P. gas should burn mostly blue with some orange streaks.

3 - After allowing unit to stabilize for 5 minutes, record manifold pressure and compare to values given in table 15.

⚠ 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.

E-Testing Gas Supply Pressure

When testing supply gas pressure, connect test gauge to inlet pressure tap (field provided). See figure 35. Check gas line pressure with unit firing at maximum rate. Low pressure may result in erratic operation or underfire. High pressure can result in permanent damage to gas valve or overfire. For natural gas units, operating pressure at unit gas connection must be between 4.5" W.C. and 13.0" W.C. For L.P. gas units, operating pressure at unit gas connection must be between 10.5" W.C. and 13.0" W.C.

On multiple unit installations, each unit should be checked separately, with and without units operating. Supply pressure must fall within range listed in previous paragraph.

TABLE 16
GAS PIPE CAPACITY - FT³/HR (kL/HR)

Nominal Iron Pipe Size -Inches(mm)	Internal Diameter -Inches(mm)	Length of Pipe-Feet(m)									
		10 (3.048)	20 (6.096)	30 (9.144)	40 (12.192)	50 (15.240)	60 (18.288)	70 (21.336)	80 (24.384)	90 (27.432)	100 (30.480)
1/4 (6.35)	.364 (9.246)	43 (1.13)	29 (.82)	24 (.68)	20 (.57)	18 (.51)	16 (.45)	15 (.42)	14 (.40)	13 (.37)	12 (.34)
3/8 (9.53)	.493 (12.522)	95 (2.69)	65 (1.84)	52 (1.47)	45 (1.27)	40 (1.13)	36 (1.02)	33 (.73)	31 (.88)	29 (.82)	27 (.76)
1/2 (12.7)	.622 (17.799)	175 (4.96)	120 (3.40)	97 (2.75)	82 (2.32)	73 (2.07)	66 (1.87)	61 (1.73)	57 (1.61)	53 (1.50)	50 (1.42)
3/4 (19.05)	.824 (20.930)	360 (10.19)	250 (7.08)	200 (5.66)	170 (4.81)	151 (4.28)	138 (3.91)	125 (3.54)	118 (3.34)	110 (3.11)	103 (2.92)
1 (25.4)	1.049 (26.645)	680 919.25)	465 (13.17)	375 (10.62)	320 (9.06)	285 (8.07)	260 (7.36)	240 (6.80)	220 (6.23)	205 (5.80)	195 (5.52)
1-1/4 (31.75)	1.380 (35.052)	1400 (39.64)	950 (26.90)	770 (21.80)	660 (18.69)	580 (16.42)	530 (15.01)	490 (13.87)	460 (13.03)	430 (12.18)	400 (11.33)
1-1/2 (38.1)	1.610 (40.894)	2100 (59.46)	460 (41.34)	1180 (33.41)	990 (28.03)	900 (25.48)	810 (22.94)	750 (21.24)	690 (19.54)	650 (18.41)	620 (17.56)
2 (50.8)	2.067 (52.502)	3950 (111.85)	2750 (77.87)	2200 (62.30)	1900 (53.80)	1680 (47.57)	1520 (43.04)	1400 (39.64)	1300 (36.81)	1220 (34.55)	1150 (32.56)
2-1/2 (63.5)	2.469 (67.713)	6300 (178.39)	4350 (123.17)	3520 (99.67)	3000 (84.95	2650 (75.04)	2400 (67.96)	2250 (63.71)	2050 (58.05)	1950 (55.22)	1850 (52.38)
3 (76.2)	3.068 (77.927)	11000 (311.48)	7700 (218.03)	6250 (176.98)	5300 (150.07)	4750 (134.50)	4300 (121.76)	3900 (110.43)	3700 (104.77)	3450 (97.69)	3250 (92.03)
4 (101.6)	4.026 (102.260)	23000 (651.27)	15800 (447.39)	12800 (362.44)	10900 (308.64)	9700 (274.67)	8800 (249.18)	8100 (229.36)	7500 (212.37)	7200 (203.88)	6700 (189.72)

NOTE-Capacity given in cubic feet of gas per hour (kilo liters of gas per hour) and based on 0.60 specific gravity gas.

F- Proper Gas Flow (Approximate)

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 17 below. Adjust manifold pressure on gas valve to match time needed.

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

TABLE 17

GAS METER CLOCKING CHART				
G23(X) Unit	Seconds for One Revolution			
	Natural		LP	
	1 cu ft Dial	2 cu ft Dial	1 cu ft Dial	2 cu ft DIAL
-50	72	144	180	360
-75	48	96	120	240
-100	36	72	90	180
-125	29	58	72	144
-150	24	48	60	120
Natural-1000 btu/cu ft LP-2500 btu/cu ft				

G-High Altitude Derate

Pressure regulator may need to be adjusted, depending on altitude. See table 18 for proper pressure regulator setting.

TABLE 18
Manifold Absolute Pressure (Outlet) in. w.c.

FUEL	ALTITUDE			
	0 - 4500	4501 - 5500	5501 - 6500	6501 - 7500
NAT. GAS	3.5	3.3	3.1	3.0
L.P. GAS	10.0	10.0	10.0	10.0

LENNOXOEMPARTS.COM

A natural to LP/propane gas changeover kit is required to convert unit. Refer to the installation instructions supplied with the changeover kit for conversion procedure.

The pressure switch is factory set. No adjustment is necessary. The G23-50/75 units use the factory pressure switch from 0 to 7500 feet. G23-100/125 and G23-150 units require a high altitude pressure switch for units installed above 5000 feet. Order Lennox part number 97J50 for G23-100/125 and 18J35 for G23-150.

H-Flame Signal

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

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

To Measure Flame Signal-G776 Ignition Control:

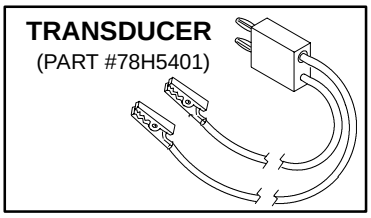


FIGURE 36

A transducer (Part #78H5401 available from Lennox Repair Parts) is required to measure flame signal. See figure 36. The transducer converts microamps to volts on a 1:1 conversion. If the flame signal should read 0.15-0.25 microamps, a reading of 0.15-0.25 volts should be read on the meter. See table 19 for correct microamp reading.

A digital readout meter must be used. The transducer plugs into most meters.

TABLE 19

FLAME SIGNAL MICROAMPS		
G23(X) -1, -2, -3 and -4 models	Normal	0.25
	Minimum	0.15
G23(X) -5 and -6 models	Normal	> 0.7
	Low	≤ 0.7
	Minimum	0.15

1 - Set the volt meter to the DC voltage scale. Insert transducer into the VDC and common inputs. Observe correct polarities. Failure to do so results in negative (-) values.
2 - Turn off supply voltage to control.
3 - Disconnect flame sensor lead from terminal of ignition control.
4 - Connect (+) lead of transducer to ignition control sensor connection.
5 - Connect (-) lead of the transducer to sensor wire.
6 - Turn supply voltage on and close thermostat contacts to cycle system.
7 - When unit lights read voltage on meter display. Remember 1 DC volt = 1 DC microamp. See table 19 for correct microamp reading.

⚠ WARNING

Fire and explosion hazard.
These instructions MUST be followed exactly.
Can cause a fire or explosion resulting in property damage, personal injury or loss of life.

Flame signal may rise above 0.5 microamps for the first few seconds after ignition and then level off within the range.

V-TYPICAL OPERATING CHARACTERISTICS

A-Blower Operation and Adjustment

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

1 - Blower operation is dependent on thermostat control system.
2 - Generally, blower operation is set at thermostat subbase fan switch. With fan switch in ON position, blower operates continuously. With fan switch in AUTO position, blower cycles with demand or runs continuously while heating or cooling circuit cycles.
3 - In all cases, blower and entire unit will be off when the system switch is in OFF position.

B-Temperature Rise

Temperature rise for G23(X) units depends on unit input, blower speed, blower horsepower and static pressure as marked on the unit rating plate. The blower speed must be set for unit operation within the range of "AIR TEMP. RISE °F" listed on the unit rating plate.

To Measure Temperature Rise:

1 - Place plenum thermometers in the supply and return air plenums. Locate supply air thermometer in the first horizontal run of the plenum where it will not pick up radiant heat from the heat exchanger.
2 - Set thermostat to highest setting. After furnace reaches equilibrium, (approximately 15 minutes) check firing rate.
3 - After plenum thermometers have reached their highest and steadiest readings, subtract the two readings. The difference should be in the range listed on the unit rating plate. If the temperature is too low, decrease blower speed. If temperature is too high, increase blower speed to reduce temperature. To change blower speed taps see the Blower Speed Taps section in this manual.

C-External Static Pressure

1 - Measure tap locations as shown in figure 37.

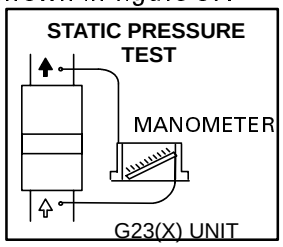


FIGURE 37

2 - Punch a 1/4" diameter hole in supply (between furnace and coil) and return (between furnace and any add on such as electronic air cleaner) 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. For systems with non-ducted returns, leave the other end of the manometer open to the atmosphere.
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.
4 - External static pressure drop must not be more than 0.5" W.C.
5 - Seal around the hole when the check is complete.

G23(X) BLOWER REMOVAL

To Remove Blower:

1. Turn off line voltage power. Unplug J69 from P69 located on blower deck.
2. Disconnect thermostat wiring connections by removing low voltage terminal strip.
3. Disconnect J20/P20 located on blower deck.
4. Disconnect J43/P43 from blower motor.
5. Loosen screws (2) and remove control box from unit. Holes are slotted so screws do not need to be removed.
6. Remove screws (2) and remove blower from unit.

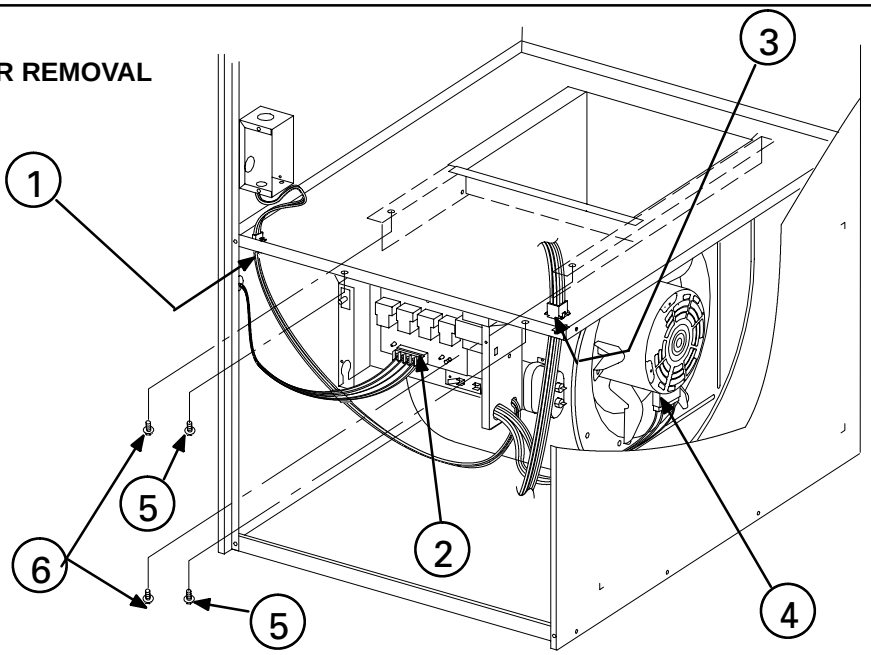


FIGURE 38

D-Blower Speed Taps Leadless Motors (-1, -2, -3 and -4 Models)

Blower speed tap selection is accomplished by changing the taps at the blower motor harness connector. Disconnect harness connector from motor to expose speed selectors. Blower speed selections are listed in table 20.

To Change Blower Speed:

1 - Turn off electric power to furnace.
2 - Remove blower access door. See figure 1.
3 - Disconnect blower motor harness from motor.
4 - Pull harness connector and wires through blower access panel opening.
5 - Select desired speeds for heating and cooling. (Red = heating, Black = cooling, White = common). See table 20.
6 - Depress harness connector tab to release wire terminal. Select connector location for new speed (refer to unit wiring diagram). Insert wire terminal until it is securely in place. See figure 39.
7 - Replace harness connector to motor .

TABLE 20

BLOWER SPEED CHART			
UNIT	FACTORY CONNECTED SPEED TAPS		MOTOR SPEEDS AVAILABLE
	COOL	HEAT	
Q2-50,Q3-100	2	3	3
Q2/3-75,Q3-50		4	4
Q3/4-100,125		4	4
Q4/5-75		6	5
Q4/5-100		5	5
Q5/6-125,150		4	5
BLOWER SPEED SELECTION HI ◄——► LO			
SPEED TAPS: 2 3 4			3
SPEED TAPS: 2 3 4 5			4
SPEED TAPS: 2 3 4 5 6			5

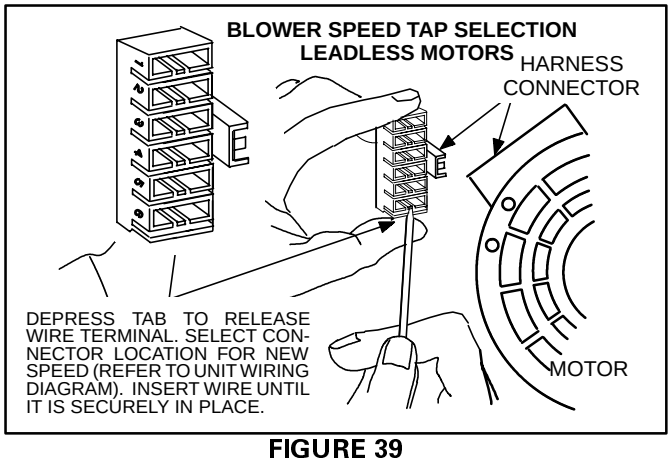


FIGURE 39

**NOTE-Q3(X)-100 furnaces use a 4 tap motor with low speed permanently blocked off so it cannot be used. Do not attempt to operate unit on low speed tap.*

E-Blower Speed Taps Leaded Motors -5 and -6 Models

Blower speed tap changes are made on the SureLight control board. See figure 21. Unused taps must be secured on dummy terminals "PARK M1" and or "PARK M2" on the SureLight board. The heating tap is connected to the "ACB HEAT " terminal and the cooling tap is connected to the "ACB COOL" terminal. The continuous blower tap is connected to the "ACB LOW" terminal.

To change existing heat tap, turn off power then switch out speed tap on "ACB HEAT" with tap connected to "PARK M1" or "PARK M2". See table 21 for blower motor tap colors for each speed.

TABLE 21

BLOWER SPEED CHART						
UNIT	FACTORY CONNECTED SPEED TAPS					MOTOR SPEEDS AVAILABLE
	COOL	HEAT	ACB LOW	MI	M2	
Q2-50,Q3-100	BLACK	YELLOW	RED	----	----	3
Q2/3-75,Q3-50		YELLOW		----	BROWN	4
Q3/4-100,125		YELLOW		----	BROWN	4
Q4/5-75		RED	YELLOW	BLUE	BROWN	5
Q4/5-100		YELLOW	RED	BLUE	BROWN	5
Q5/6-125,150		BLUE		YELLOW	BROWN	5
BLOWER SPEED SELECTION HI ◄ ► LO						
SPEED TAPS	BLACK YELLOW RED					3
	BLACK BROWN YELLOW RED					4
	BLACK BROWN BLUE YELLOW RED					5

VI-MAINTENANCE

A-Filters

Retainers for optional return air filter are shown in figure 40.

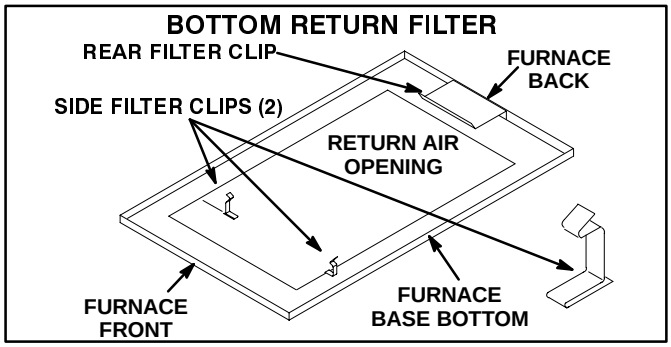


FIGURE 40

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

1. Filters should be inspected monthly and must be cleaned or replaced when dirty to assure proper furnace operation.
2. Optional foam filters available for the G23(X) can be washed with water and mild detergent. When dry, they should be sprayed with filter handicoater prior to reinstallation. Filter handicoater is RP Products coating no. 418 and is available as Lennox part no. P-8-5069.
3. If replacement is necessary, order Lennox part no. 31J8101 for 14 X 25 inch filter for G23(X)-50, and 75 units, P-8-7822 for 16 X 25 inch filter for Q3(X)-100 units, and P-8-7831 for 20" x 25 " filters used on Q3/4(X)-100, Q3/4(X)-125, Q4/5(X)-75, Q4/5(X)-100, Q5/6(X)-125 and Q5/6(X)-150 units.

B-Cleaning Heat Exchanger and Burners

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

Cleaning the heat exchanger requires a steel spring "snake," a reversible drill and a vacuum cleaner. The steel spring snake may be constructed by purchasing a 4 ft. long by 1/4" diameter steel wire cable and a 1/4" diameter wire brush. These items are available at a hardware store. Insert wire end of brush into the open end of the spring cable. Crimp the cable around the brush so that the brush is secured and will not come off during cleaning. Attach the other end of the cable to the reversible drill to complete the tool for cleaning the heat exchanger. See figure 3 for parts arrangement when disassembling furnace.

1 - Turn off both electrical and gas power supplies to furnace.
2 - Remove flue pipe and top cap from unit. Mark and disconnect wiring from pressure switch and ignition control (-1 through -4 model units). Remove ignition control and pressure switch from upper vestibule panel.
3 - Remove upper vestibule panel to expose the combustion air blower.

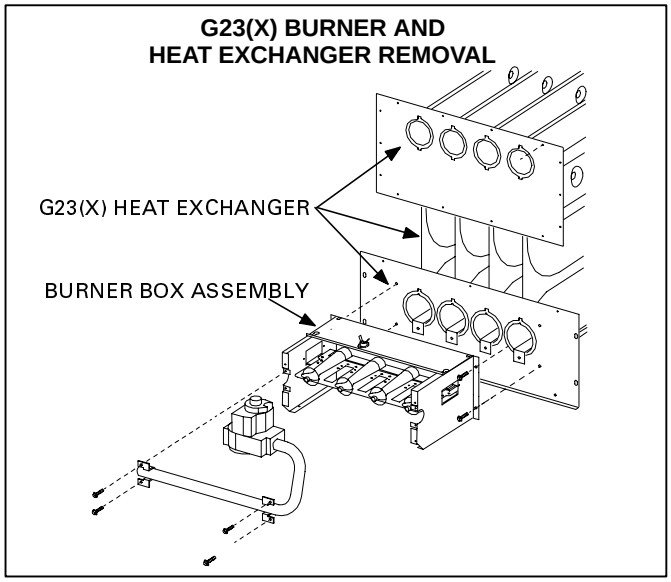


FIGURE 41

4 - Remove three screws securing the combustion air blower. Carefully remove the combustion air blower to avoid damaging blower gasket. If gasket is damaged, it must be replaced to prevent leakage.
5 - Remove collector box located behind combustion air blower. Care must be taken to avoid damaging the collector box gasket. If the gasket is damaged it must be replaced to prevent leakage.
6 - Mark then disconnect wires from gas valve and rollout switch.
7 - Disconnect gas supply piping. Remove four screws securing the burner manifold assembly to the lower vestibule panel and remove the assembly from the unit.
8 - For NOx units only, remove the screws holding the flame baffles in the heat exchanger clam shells. Carefully remove each baffle from each heat exchanger section. To avoid damaging baffles, turn baffles 90° before pulling out through heat exchanger outlet.

⚠ IMPORTANT

Mark each baffle so that they are returned to the proper heat exchanger section.

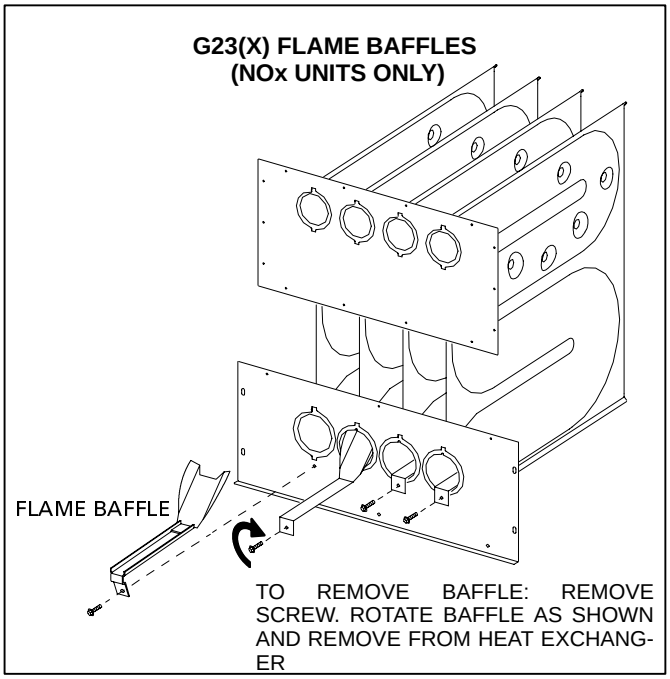


FIGURE 42

9 - Insert brush end of cable snake into top of one of the heat exchanger openings. DO NOT FORCE CABLE INTO HEAT EXCHANGER. Once the cable has been inserted, operate drill on slow speed. Move the cable in and out of the heat exchanger section three or four times or until sufficient cleaning is accomplished. Reverse drill and slowly work cable out of opening.

10- Repeat procedure for each heat exchanger section.

11- When the top heat exchanger sections are complete, place brush end of cable snake into the bottom openings of each of the heat exchanger sections. Clean the bottom opening as described in step 9.

12- Remove cable from heat exchanger. Use a vacuum to remove debris knocked loose during cleaning from each heat exchanger section.

13- Attach the exhaust end (positive pressure) of the vacuum to the top of the heat exchanger sections. Any loose debris will be forced to the bottom of the heat exchanger section. Vacuum debris from bottom openings.

14- Replace collector box and combustion air blower. Check gaskets for damage. Damaged seals must be replaced to avoid heat exchanger leaks. Replace all screws to the collector box and combustion air blower. Leaving off screws may cause leaks.

15- Replace upper vestibule panel, top cap, pressure switch and ignition control.

16- Clean burner by running a vacuum with a soft brush attachment over face of burners. Visually inspect inside of burners and crossovers for any blockage caused by foreign matter. Remove any blockage.

17- For NOX units, replace flame baffles in each heat exchanger section. DO NOT BEND baffles. Baffles should sit on the bottom of each heat exchanger section.

18- Replace burner / manifold assembly onto lower vestibule panel.

19- Reconnect wires to ignition control (-1 through -4 model units), pressure switch, roll-out switch, gas valve and combustion air blower. Refer to unit wiring diagram.

20- Reconnect vent pipe to combustion blower outlet.

21- Reconnect gas supply piping.

22- Turn on power and gas supply to unit.

23- Set thermostat and check for proper operation.

24- 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.

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

26- Repeat steps 23 and 24 until no leaks are detected.

27- Replace front access panel.

C-Supply Air Blower

1 - Check and clean blower wheel.

2 - Motors used on the Lennox G23(X) series units are permanently lubricated and need no further lubrication.

D-Flue and Chimney

Flue must conform to all AGA/GAMA venting requirements. Flue pipe deteriorates from the inside out and must be disconnected in order to check thoroughly. Check flue pipe, chimney and all connections for tightness and to make sure there is no blockage or leaks.

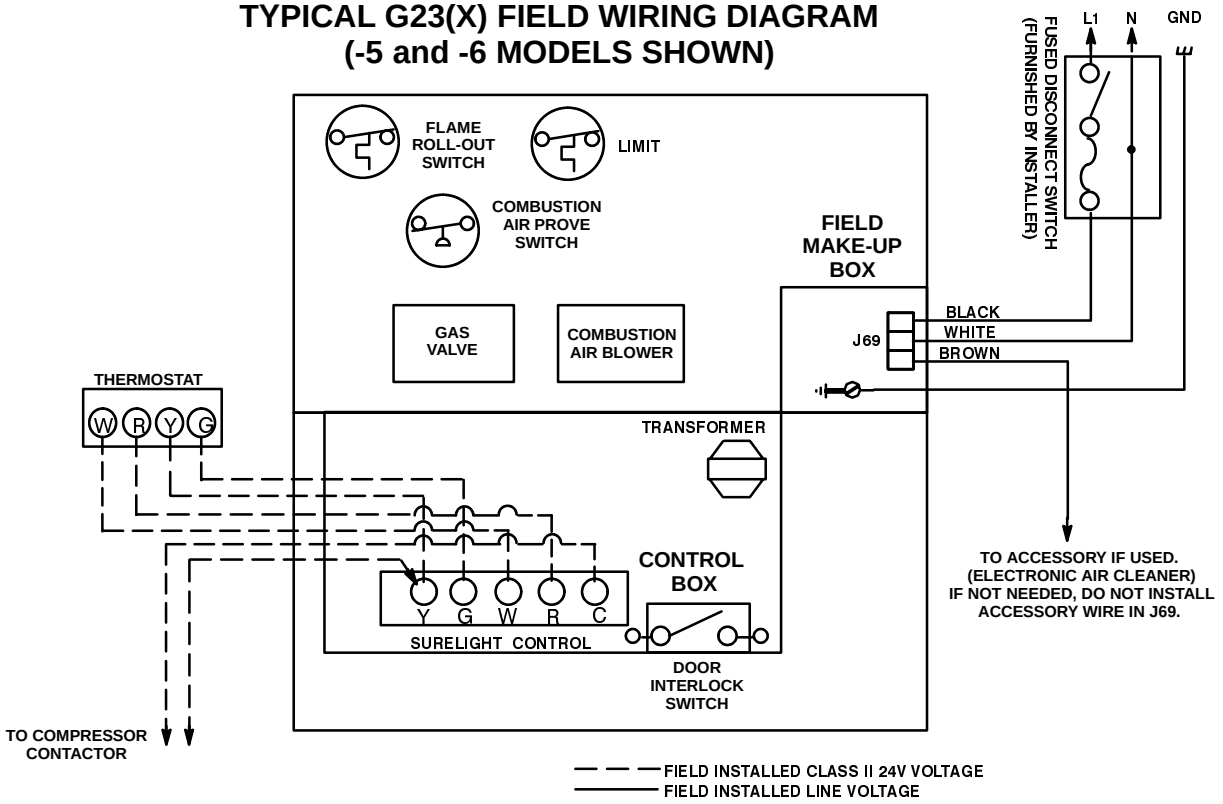
E-Electrical

1 - Check all wiring for loose connections.

2 - Check for correct voltage.

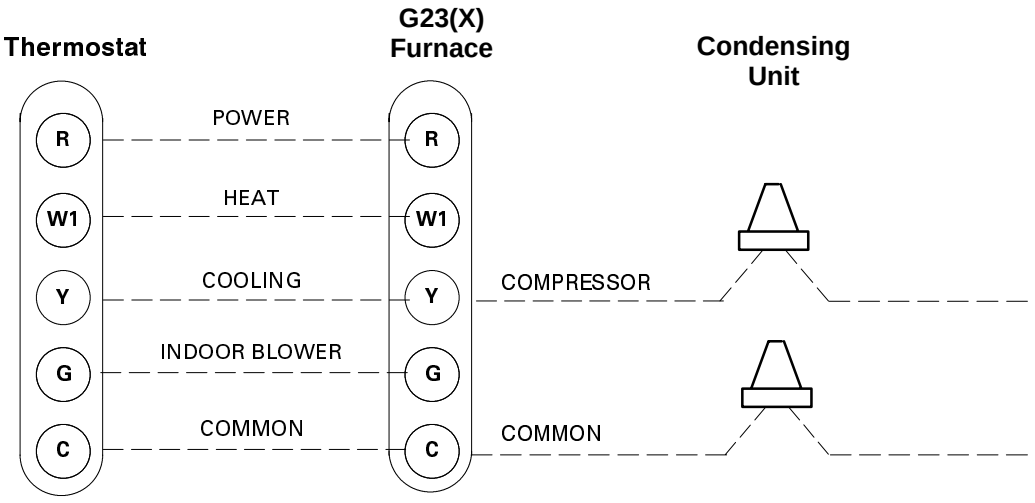
3 - Check amp-draw on blower motor.

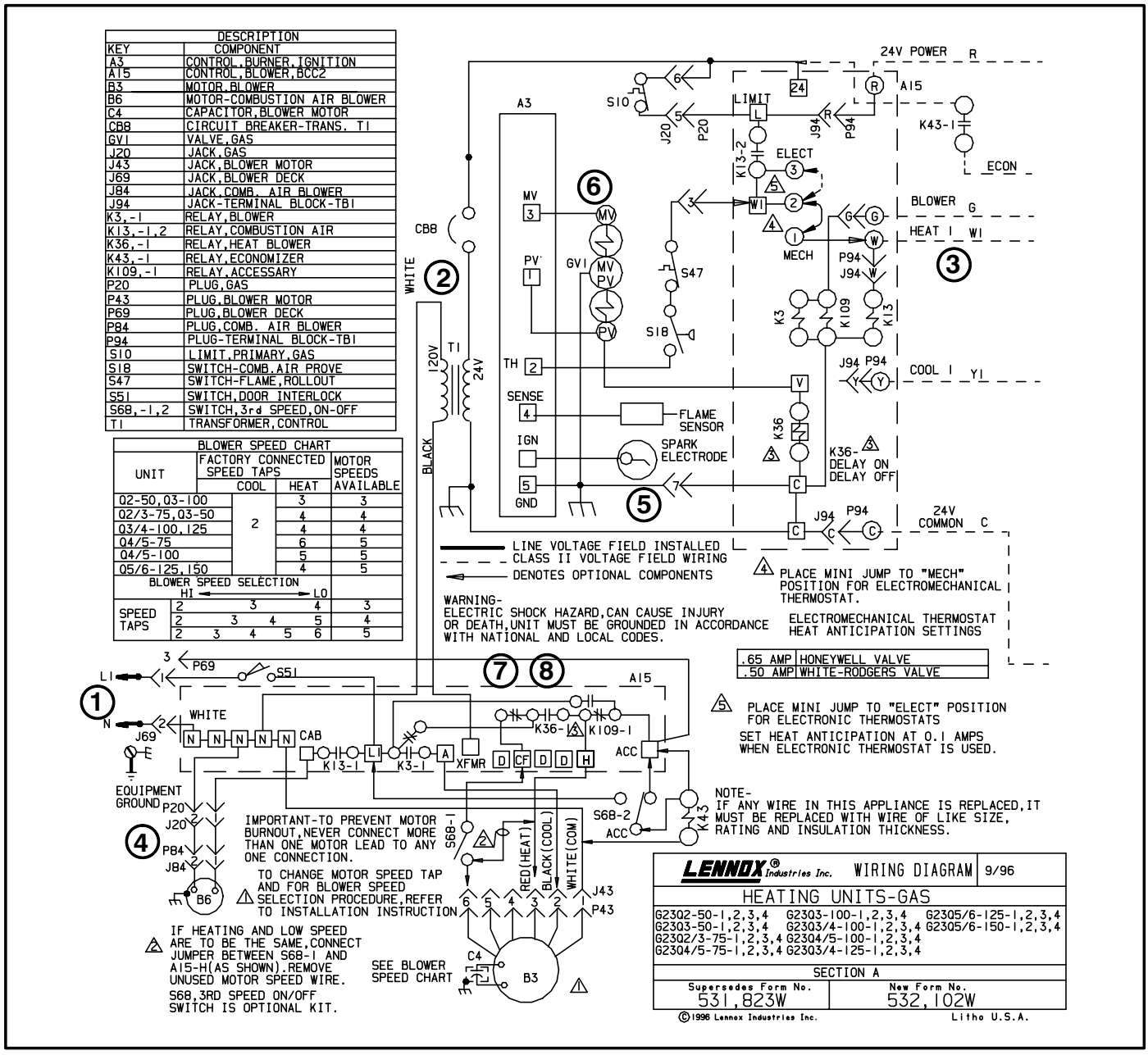
TYPICAL G23(X) FIELD WIRING DIAGRAM
(-5 and -6 MODELS SHOWN)



G23(X) and CONDENSING UNIT THERMOSTAT DESIGNATIONS

(Refer to specific thermostat and outdoor unit.)





OPERATION SEQUENCE-G23(X) -1, -2, -3 and -4 MODELS

1 - When disconnect is closed, 120V is routed through door interlock switch (S51) to feed the line voltage side of the blower control (A3) and transformer T1 primary. Door interlock switch must be closed for A3 and T1 to receive voltage.

2 - T1 supplies 24VAC to terminal "24VAC" on A3. In turn, terminal "R" of A3 supplies 24VAC to terminal "RC" of the indoor thermostat (not shown).

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

4 - CAB of the blower control energizes the combustion air blower (B6). When the combustion air blower nears full speed, combustion air prove switch (S18) closes.

5 - When S18 closes, assuming the flame rollout switch (S47) primary limit (S10) and secondary limits (S21) are closed, the ignition control opens the pilot valve and begins spark.

6 - When flame is sensed, spark stops and main valve opens to light main burners.

7 - After 45 seconds, blower control (A3) energizes the indoor blower.

8 - When heat demand is satisfied, W1 of the thermostat de-energizes W of the furnace control and the furnace control immediately de-energizes the gas valve. The combustion air blower immediately stops. Also, the indoor blower runs for a designated period (90-330 seconds) as set by jumper on blower control.

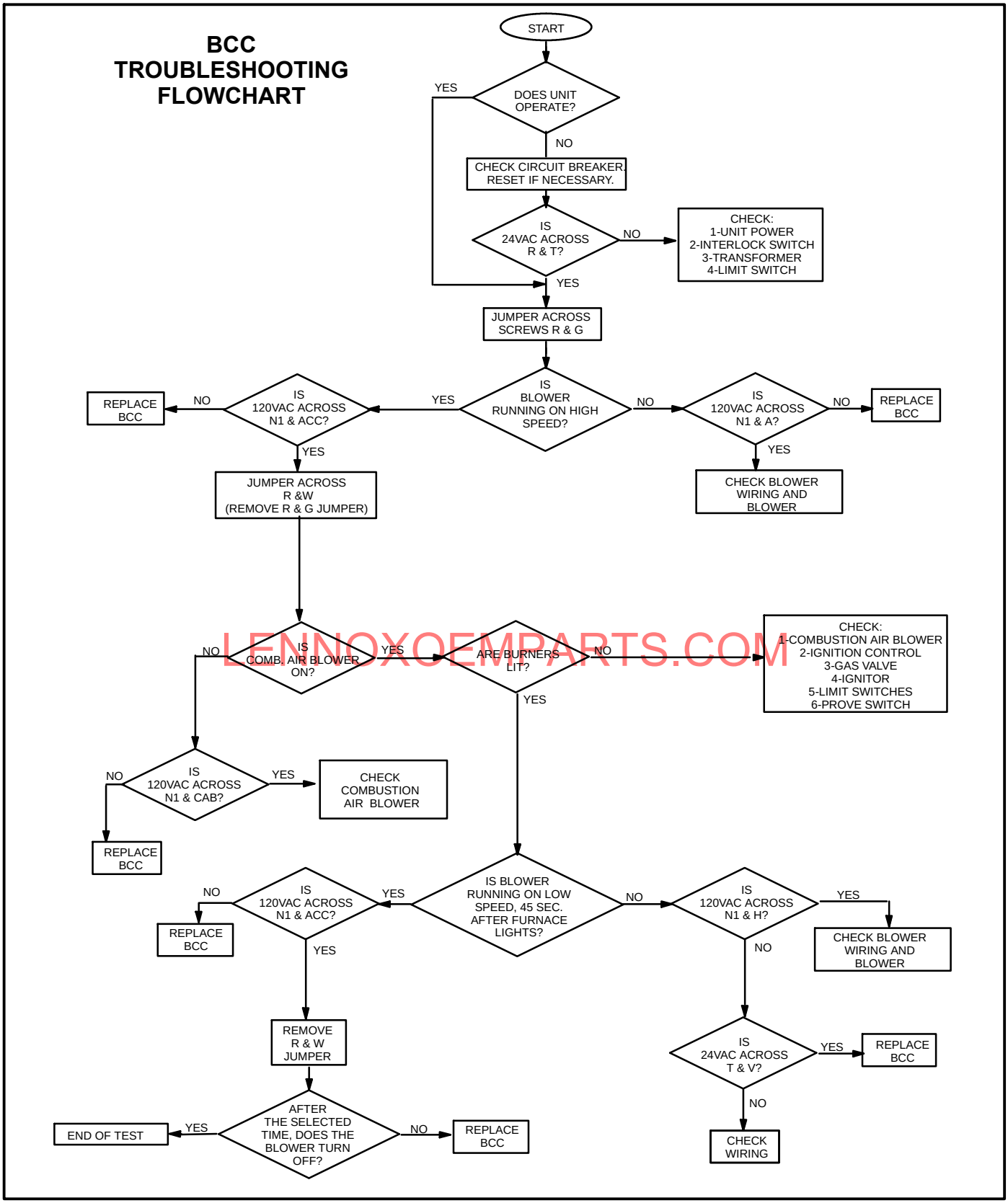


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FIGURE 43

G776 IGNITION CONTROL TROUBLESHOOTING

Spark is present but pilot will not light

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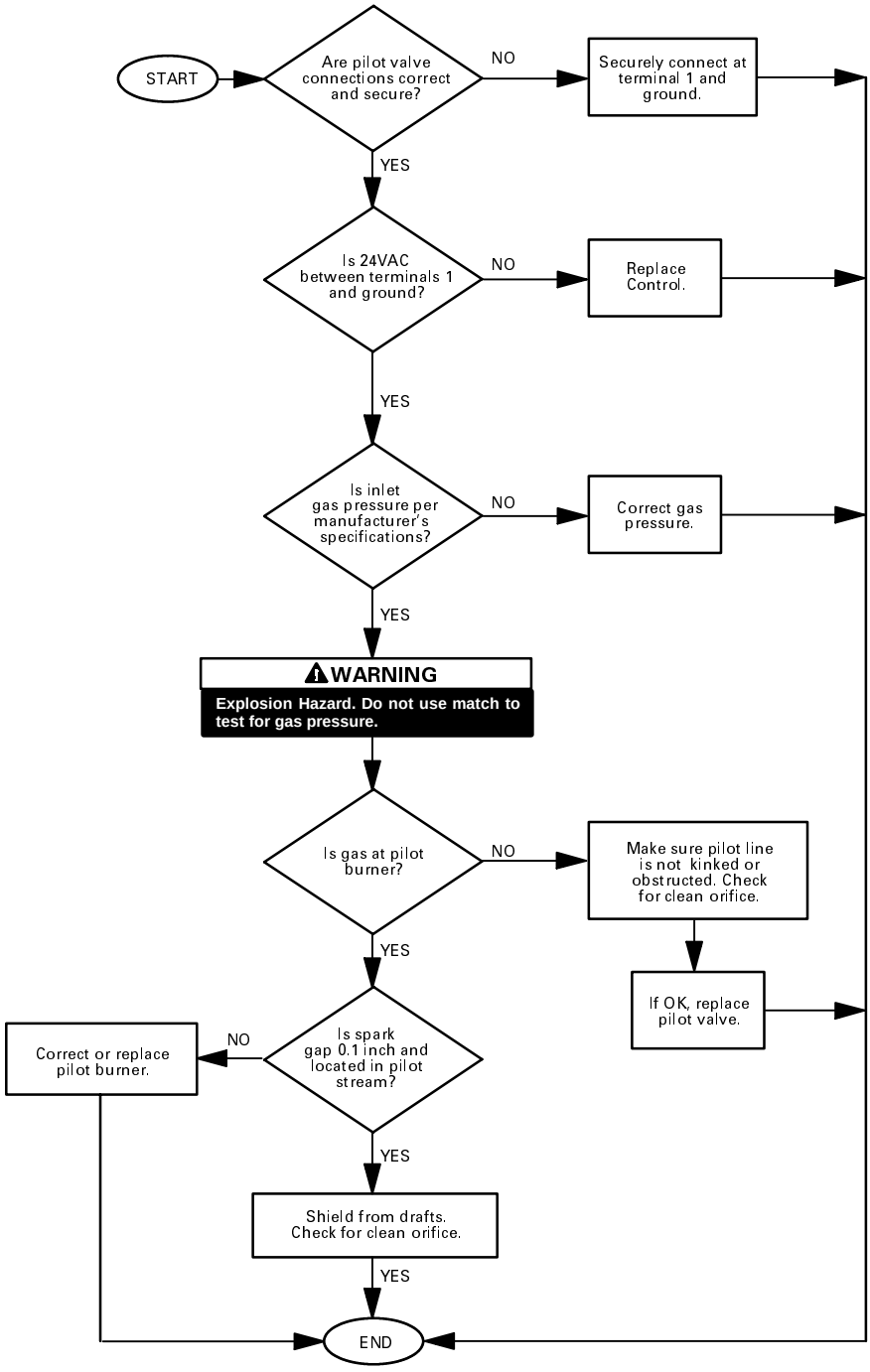

FIGURE 44

G776 IGNITION CONTROL TROUBLESHOOTING

No spark and system will not work

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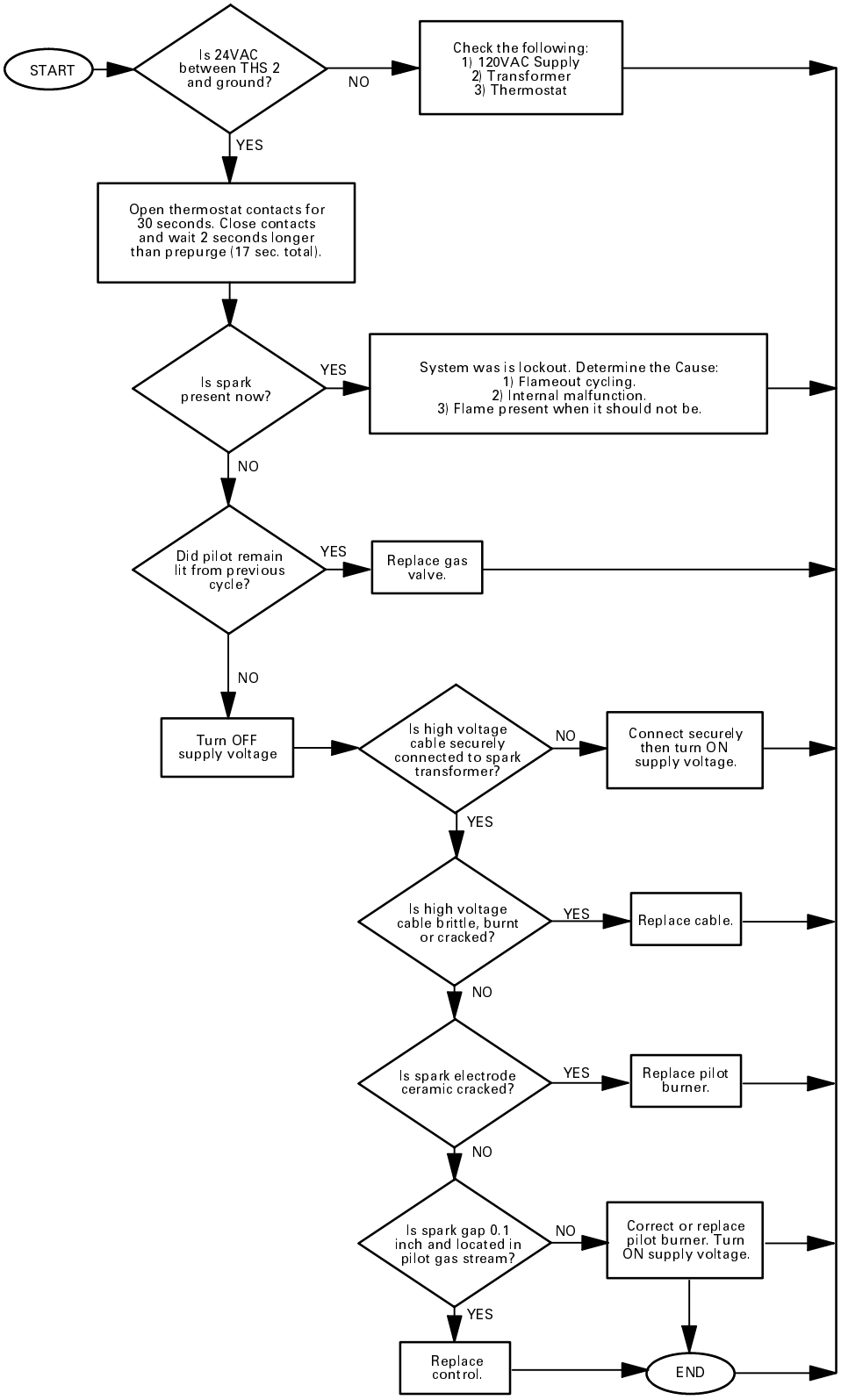

FIGURE 45

G776 IGNITION CONTROL TROUBLESHOOTING

Pilot lights but main valve will not come on

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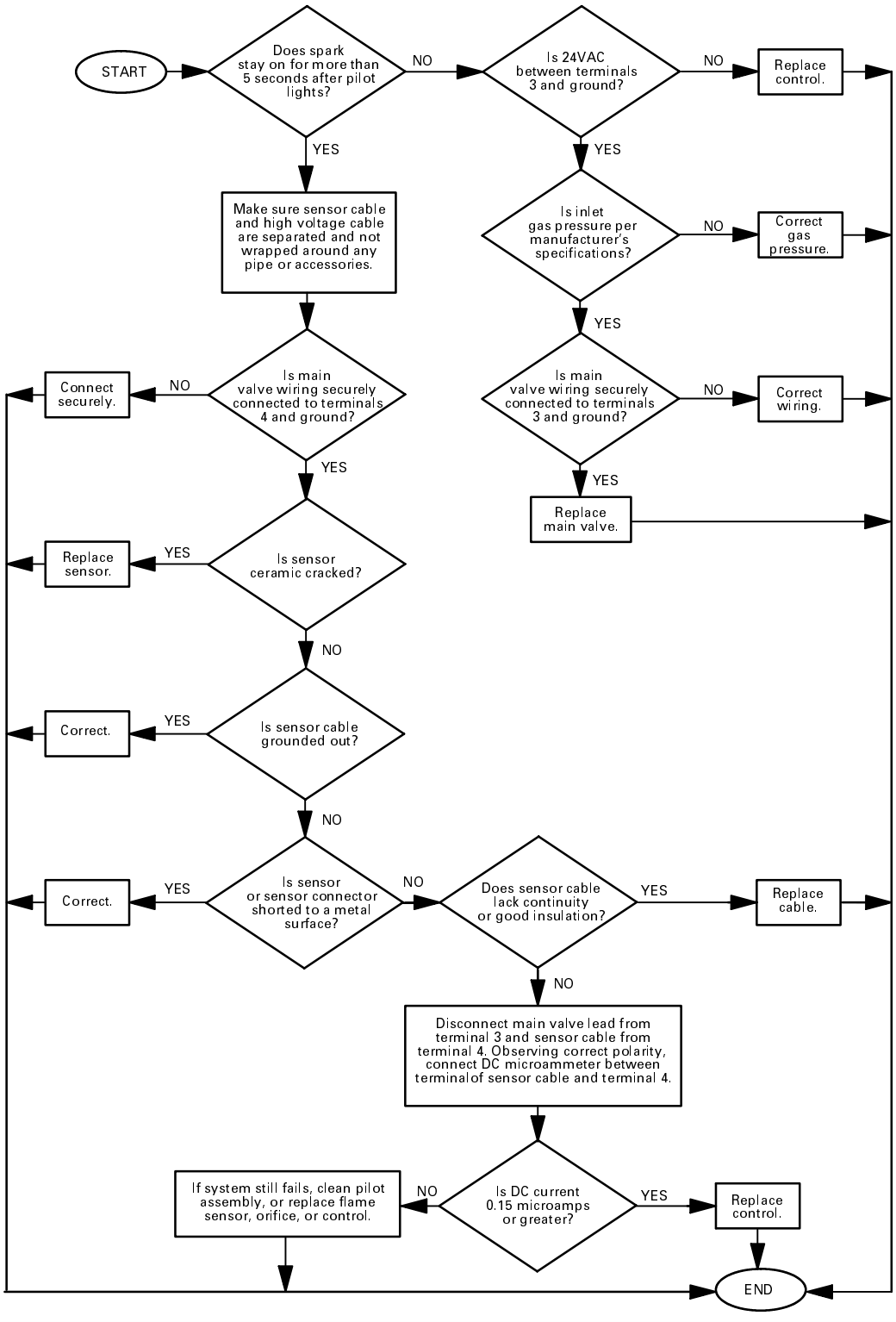
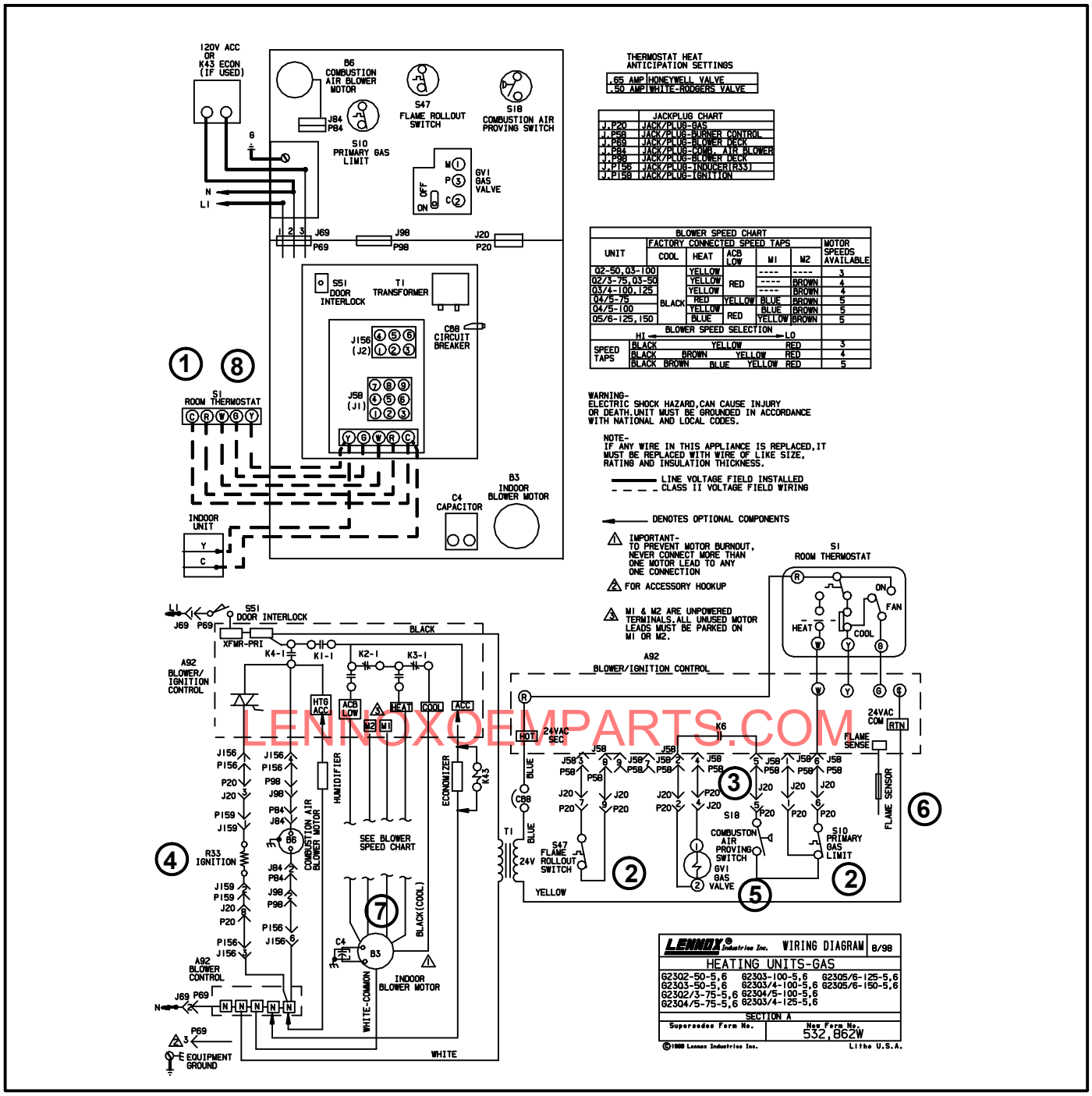


FIGURE 46



OPERATION SEQUENCE-G23(X) -5 and -6 MODELS WITH SURELIGHT CONTROL

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

2 - S10 primary limit switch and S47 rollout switch are closed. Call for heat can continue.

3 - Surelight control energizes combustion air blower B6. Combustion air blower runs until S18 combustion air prove switch closes (switch must close within 2-1/2 minutes or control goes into 5 minute Watchguard Pressure Switch delay). Once S18 closes, a 15-second pre-purge follows.

4 - Surelight control energizes ignitor. A 20-second warm-up period begins.

5 - Gas valve opens for a 4-second trial for ignition.

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

7 - After 45-second delay, Surelight control energizes indoor blower B3.

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

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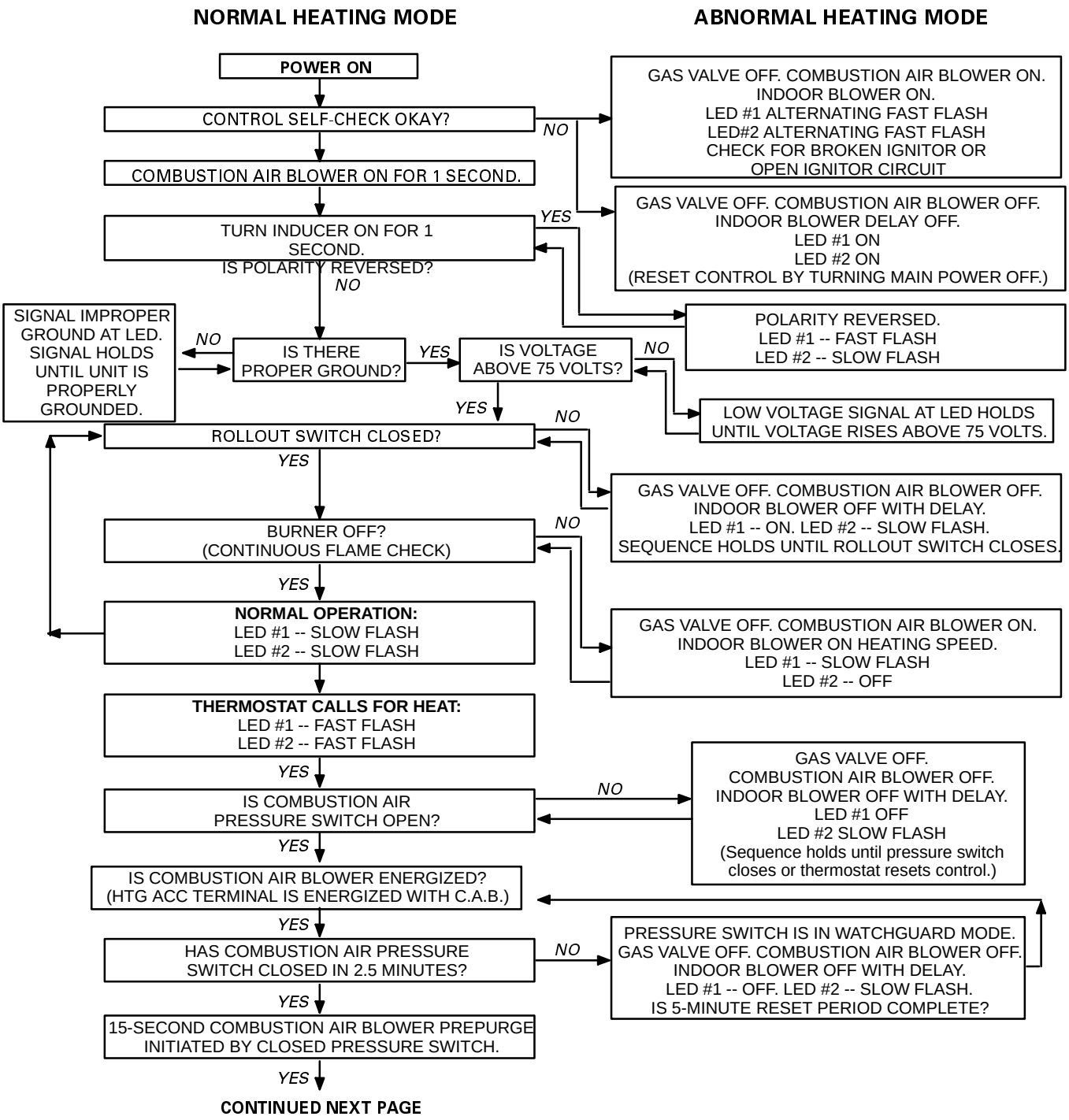
SURELIGHT CONTROL HEATING SEQUENCE OF OPERATION



HEATING SEQUENCE CONTINUED

NORMAL HEATING MODE

15-SECOND COMBUSTION AIR BLOWER PREPURGE INITIATED BY CLOSED PRESSURE SWITCH.

YES

IGNITOR WARM-UP -- 20 SECONDS.

YES

4-SECOND TRIAL FOR IGNITION.
GAS VALVE OPENS. BOARD 24L85, 56L83, 63K8901: IGNITOR ENERGIZED FOR 1 SECOND AFTER VALVE OPENS. BOARD 97L48: IGNITOR ENERGIZES THROUGH OUT 4 SECOND TRIAL.

YES

FLAME STABILIZATION PERIOD.

4 SECONDS

FLAME RECTIFICATION CURRENT CHECK
CAN FLAME BE PROVEN WITHIN 4 SECONDS AFTER GAS VALVE OPENS?
(0.15 microamps)

NO

FLAME PRESENT?

YES

FLAME SIGNAL ABOVE 0.7 MICROAMPS?

YES

INDOOR BLOWER ON DELAY BEGINS. AFTER 45 SECOND DELAY, ACB HEAT SPEED TERMINAL IS ENERGIZED. ACC. TERMINAL IS ENERGIZED.

YES

PRIMARY AND SECONDARY LIMIT SWITCHES CLOSED?

YES

ROLLOUT SWITCH CLOSED?

YES

COMBUSTION AIR PRESSURE SWITCH CLOSED?

YES

THERMOSTAT DEMAND SATISFIED.

YES

LED #1 & #2 SIMULTANEOUS SLOW FLASHES.

YES

COMB. AIR BLOWER CONTINUES 5-SECOND POST PURGE AFTER T'STAT DEMAND IS SATISFIED. HTG ACC. TERM. IS DE-ENERGIZED. INDOOR AIR BLOWER COMPLETES SELECTED "OFF" DELAY BEFORE SHUTTING OFF. ACC. TERM. DE-ENERGIZED.

ABNORMAL HEATING MODE

NO (from FLAME RECTIFICATION CURRENT CHECK)

GAS VALVE OFF. COMBUSTION AIR BLOWER ON. INDOOR BLOWER OFF.
HAS CONTROL FAILED TO SENSE FLAME FOR FIVE CONSECUTIVE TRIES DURING A SINGLE HEAT DEMAND?

NO → (to 15-SECOND COMBUSTION AIR BLOWER PREPURGE)

YES

WATCHGUARD MODE. GAS VALVE OFF. COMBUSTION AIR BLOWER OFF. INDOOR BLOWER OFF WITH DELAY LEDs SIGNAL WATCHGUARD FAILURE CODE.
IS 60-MINUTE RESET PERIOD COMPLETE?

YES → (to 15-SECOND COMBUSTION AIR BLOWER PREPURGE)

NO (from FLAME PRESENT?)

HAS CONTROL RESET IGNITION SEQUENCE FOUR TIMES?

YES → (to WATCHGUARD MODE)

NO → (to 15-SECOND COMBUSTION AIR BLOWER PREPURGE)

NO (from FLAME SIGNAL ABOVE 0.7 MICROAMPS?)

LOW FLAME SIGNAL
(Does not affect operation of control)
LED #1 -- SLOW FLASH
LED #2 -- FAST FLASH

NO (from PRIMARY AND SECONDARY LIMIT SWITCHES CLOSED?)

GAS VALVE DE-ENERGIZED. COMBUSTION AIR BLOWER DE-ENERGIZED. INDOOR BLOWER ON UNTIL SWITCH CLOSES. LED #1 -- SLOW FLASH. LED #2 -- ON.
IS LIMIT SWITCH CLOSED?

YES

HAS PRIMARY LIMIT RESET?
(See table 6 DIAGNOSTIC CODES for limit reset operation).

NO → (to WATCHGUARD MODE)

YES → (to 15-SECOND COMBUSTION AIR BLOWER PREPURGE)

NO (from ROLLOUT SWITCH CLOSED?)

GAS VALVE OFF. COMBUSTION AIR BLOWER OFF. INDOOR BLOWER OFF WITH DELAY. LED #1 -- ON. LED #2 -- SLOW FLASH. SEQUENCE HOLDS UNTIL ROLLOUT SWITCH CLOSES.

NO (from COMBUSTION AIR PRESSURE SWITCH CLOSED?)

GAS VALVE DE-ENERGIZED. COMBUSTION AIR BLOWER ON. INDOOR BLOWER OFF WITH DELAY LED #1 -- OFF. LED #2 -- SLOW FLASH.
HAS CAB SWITCH CLOSED IN 2.5 MINUTES?

YES → (to 15-SECOND COMBUSTION AIR BLOWER PREPURGE)

NO

5-MINUTE PRESSURE SWITCH WATCHGUARD MODE.

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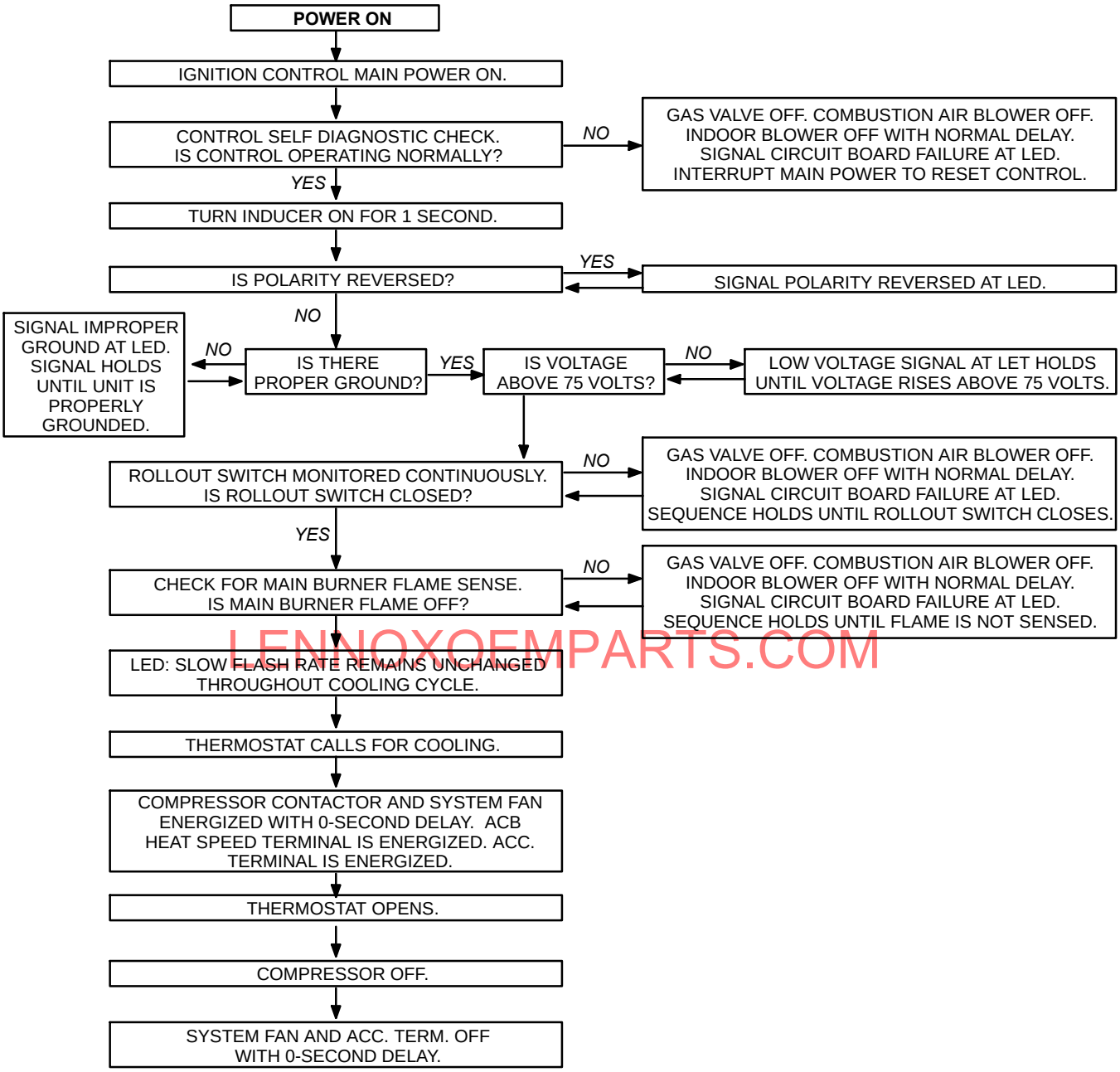
SURELIGHT CONTROL
COOLING SEQUENCE OF OPERATION



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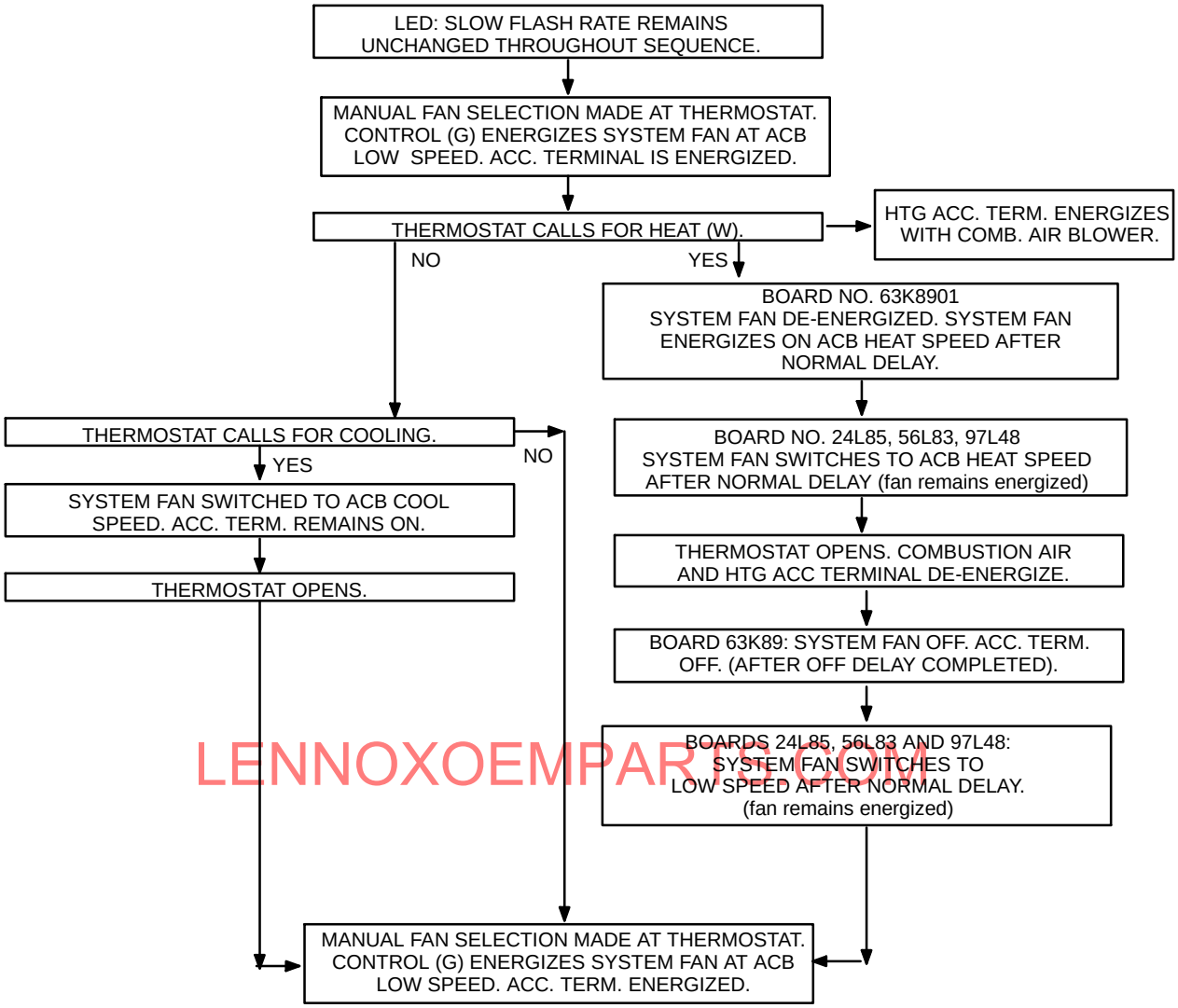
CONTINUOUS LOW SPEED FAN SEQUENCE OF OPERATION



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SURELIGHT – TROUBLE SHOOTING GUIDE

UPON INITIAL POWER UP, REMOVE ALL THERMOSTAT DEMANDS TO THE UNIT

PROBLEM: 1 UNIT FAILS TO OPERATE IN THE COOLING, HEATING, OR CONTINUOUS FAN MODE		
Condition	**Possible Cause**	**Corrective Action / Comments**
1.1 - Both diagnostic lights fail to light up. LED#1-Off LED#2-Off	**1.1.1** Main voltage 120V not supplied to unit.	**ACTION 1 -** Check 120V main voltage. Determine cause of main power failure.
	1.1.2 Miswiring of furnace or improper connections.	**ACTION 1 -** Check for correct wiring of 120V to power make up box and transformer. **ACTION 2** - Check 24V wiring to control board.
	1.1.3 Circuit breaker tripped or fails to close.	**ACTION 1 -** Replace circuit breaker if it is re-set but does not have continuity. **ACTION 2 -** If circuit breaker still trips, check for short.
	1.1.4 Door interlock switch failure.	**ACTION 1 -** Check that door switch is activated when door is closed. **ACTION 2 -** Check wire connections to switch, replace loose connectors. **ACTION 3 -** Check continuity of switch in closed position. Replace if defective.
	1.1.5 Transformer Failure.	**ACTION 1 -** Check that transformer output is 24V. Replace if defective.
	1.1.6 Failed control board.	**ACTION 1 -** If all the above items have been checked, replace board.
1.2 - Diagnostic lights flash the roll-out code. LED#1-On, LED#2-Slow Flash	**1.2.1** Roll-out switch open.	**ACTION 1 -** Manually reset the roll-out switch by pushing the top button. **ACTION 2 -** Determine the cause of the roll-out switch activation before leaving furnace.
	1.2.2 Roll-out switch failure.	**ACTION 1 -** Check continuity across roll-out switch. Replace roll-out switch if switch is reset but does not have continuity.
	1.2.3 Miswiring or improper connections at roll-out switch.	**ACTION 1 -** Check wiring connections to switch.
	1.2.4 Nine pin connector failure	**ACTION 1 -** Check 9-pin connector for proper connection to control board. **ACTION 2 -** Check continuity of the multi plug pin.
1.3 - On initial power-up the comb. air blower does not energize. - Diagnostic lights flash the reverse polarity code. LED#1-Fast Flash, LED#2-Slow Flash.	**1.3.1** 120V main power polarity reversed.	**ACTION 1 -** Check the 120V has line and neutral correctly input into control. **ACTION 2 -** Reverse the line and neutral at the 120V field connection.
1.4 - On initial power up the combustion air blower does not energize. - Diagnostic lights flash normal power on operation. LED#1-Slow Flash LED#2-Slow Flash	**1.4.1** Open combustion air blower motor circuit.	**ACTION 1 -** Check for 120V to combustion air blower. If no power, check wire and connections.
	1.4.2 Failed combustion air blower motor.	**ACTION 1 -** If power is present at blower, replace blower.

PROBLEM 1: UNIT FAILS TO OPERATE IN THE COOLING, HEATING, OR CONTINUOUS FAN MODE		
Condition	**Possible Cause**	**Corrective Action / Comments**
1.5 - On initial power-up the combustion air blower remains energized. - Diagnostic lights flash the improper main ground. LED#1-Alternating Fast Flash LED#2-Alternating Fast Flash	**1.5.1** Improper ground to the unit.	**ACTION 1 -** Check that the unit is properly ground. **ACTION 2 -** Install a proper main ground to the unit
	1.5.2 6-Pin connector is improperly attached to the circuit board.	**ACTION 1 -** Check 6-pin connector for proper installation. Correctly insert connector into control.
	1.5.3 Line voltage is below 75V.	**ACTION 1 -** Check that the line voltage is above 75V. Determine cause of voltage drop and supply correct voltage to the control.
PROBLEM 2: UNIT FAILS TO OPERATE IN THE COOLING OR HEATING MODE, BUT COMBUSTION AIR BLOWER OPERATES CONTINUOUS. UNITS WITH CONTROL BOARDS DATE CODED AFTER NOV. 1 1997, WILL OPERATE IN COOLING BUT NOT IN THE HEATING MODE, WITH COMBUSTION AIR BLOWER CYCLING 5 SECONDS ON 55 SECONDS OFF.		
Condition	**Possible Cause**	**Corrective Action / Comments**
2.1 - On initial power-up the combustion air blower remains energized. - Diagnostic lights flash the improper main ground. - Units with control boards date coded after Nov.1 1997; combustion air blower will cycle 5 seconds on 55 seconds off. LED#1-Alternating Fast Flash LED#2-Alternating Fast Flash	**2.1.1** Open ignitor circuit.	**ACTION 1 -** Check for correct wiring and loose connections in the ignitor circuit. Check multplug connections for correct installation.
	2.1.2 Broken or failed ignitor.	**ACTION 1 -** Unplug ignitor and read resistance across ignitor. If resistance does not read between 10.9 and 19.7 ohms, replace the ignitor.
PROBLEM 3: UNIT FAILS TO FIRE IN THE HEATING MODE, COMBUSTION AIR BLOWER DOES NOT ENERGIZE		
Condition	**Possible Cause**	**Corrective Action / Comments**
3.1 - Unit operates with a cooling or continuous fan demand. - Combustion air blower will not start with a Heating demand. - Diagnostic lights flash the limit failure mode. LED#1-Slow Flash, LED#2-On	**3.1.1** Primary or secondary (if equipped) limit open.	**ACTION 1 -** Check continuity across switch(es). Switches reset automatically upon cool down. **ACTION 2 -** Check for restrictions on blower inlet air (including filter) and outlet air. Determine cause for limit activation before placing unit back in operation.
	3.1.2 Miswiring of furnace or improper connections at limit switch(es).	**ACTION 1 -** Check for correct wiring and loose connections. Correct wiring and/or replace any loose connections.
3.2 - Unit operates with a cooling and continuous fan demand. - Combustion air blower will not start with a Heating demand. - Diagnostic lights flash the pressure switch failure code. LED#1-Off, LED#2-Slow Flash	**3.2.1** Miswiring of furnace or improper connections to combustion air blower.	**ACTION 1 -** Check for correct wiring and loose connections. Correct wiring and/or replace any loose connections.
	3.2.2 Pressure switch stuck closed.	**ACTION 1 -** Check that the pressure switch is open without the combustion air blower operating. Replace if defective.

PROBLEM 3: UNIT FAILS TO FIRE IN THE HEATING MODE, COMBUSTION AIR BLOWER DOES NOT ENERGIZE (CONT.).		
Condition	**Possible Cause**	**Corrective Action/Comments**
3.3 - Unit operates with a cooling and continuous fan demand. - Combustion air blower will not start with a Heating demand. - Diagnostic lights flash the pressure switch failure code 2.5 minutes after heating demand. LED#1-Off, LED#2-Slow Flash	**3.3.1** Miswiring of furnace or improper connections to combustion air blower.	**ACTION 1 -** Check for correct wiring and loose connections. Correct wiring and/or replace any loose connections.
	3.3.2 Combustion air blower failure.	**ACTION 1 -** If there is 120V to combustion air blower and it does not operate, replace combustion air blower.

PROBLEM 4: UNIT FAILS TO FIRE IN THE HEATING MODE, COMBUSTION AIR BLOWER ENERGIZES, IGNITOR IS NOT ENERGIZED.		
Condition	**Possible Cause**	**Corrective Action/Comments**
4.1 - Unit operates with a cooling and continuous fan demand. - Combustion air blower energizes with a heating demand. - Diagnostic lights flash the pressure switch failure code 2.5 minutes after heating demand. LED#1-Off LED#2-Slow Flash	**4.1.1** Pressure switch does not close due to incorrect routing of the pressure switch lines.	**ACTION 1 -** Check that the pressure switch lines are correctly routed. Correctly route pressure switch lines.
	4.1.2 Pressure switch does not close due to obstructions in the pressure lines.	**ACTION 1 -** Remove any obstructions from the the pressure lines and/or taps.
	4.1.3 Pressure switch lines damaged	**ACTION 1 -** Check pressure switch lines for leaks. Replace any broken lines.
	4.1.4 Condensate in pressure switch line.	**ACTION 1 -** Check pressure switch lines for condensate. Remove condensate from lines. Check that the condensate lines are located correctly.
	4.1.5 Pressure switch does not close due to a low differential pressure across the pressure switch.	**ACTION 1 -** Check the differential pressure across the pressure switch. This pressure should exceed the set point listed on the switch. **ACTION 2 -** Check for restricted inlet and exhaust vent. Remove all blockage. **ACTION 3 -** Check for proper vent sizing and run length. See installation instructions.
	4.1.6 Wrong pressure switch installed in the unit, or pressure switch is out of calibration.	**ACTION 1 -** Check that the proper pressure switch is installed in the unit. Replace pressure switch if necessary.
	4.1.7 Miswiring of furnace or improper connections at pressure switch.	**ACTION 1 -** Check for correct wiring and loose connections. Correct wiring and/or replace any loose connections.
	4.1.8 Pressure switch failure.	**ACTION 1 -** If all the above modes of failure have been checked, the pressure switch may have failed. Replace pressure switch and determine if unit will operate.

PROBLEM 5: UNIT FAILS TO FIRE IN THE HEATING MODE, COMBUSTION AIR BLOWER ENERGIZES, IGNITOR IS ENERGIZED.		
Condition	**Possible Cause**	**Corrective Action/Comments**
5.1 - Unit operates with a cooling and continuous fan demand. - Combustion air blower energizes with Heating demand. - Ignitor is energized but unit fails to light. LED#1-Alternating Slow Flash LED#2-Alternating Slow Flash	**5.1.1** Check that gas is being supplied to the unit.	**ACTION 1 -** Check line pressure at the gas valve. Pressure should not exceed 13" WC for both natural and propane. Line pressure should read a minimum 4.5" WC for natural and 8.0"WC for propane.
	5.1.2 Miswiring of gas valve or loose connections at multi-pin control amp plugs or valve.	**ACTION 1 -** Check for correct wiring and loose connections. Correct wiring and/or replace any loose connections.
	5.1.3 Defective gas valve or ignition control.	**ACTION 1 -** Check that 24V is supplied to the gas valve approximately 35 seconds after heat demand is initiated. **ACTION 2 -** Replace the valve if 24V is supplied but valve does not open. **ACTION 3 -** Replace the control board if 24V is not supplied to valve.
PROBLEM 6: BURNERS LIGHT WITH A HEATING DEMAND BUT UNIT SHUTS DOWN PREMATURELY		
Condition	**Possible Cause**	**Corrective Action/Comments**
6.1 - Burners fire with a heating demand. - Burners light but unit shuts off prior to satisfying T-stat demand. - Diagnostic lights flash the pressure switch code. LED#1-Off LED#2-Slow Flash	**6.1.1** Wrong concentric vent kit used for terminating the unit.	**ACTION 1 -** Check vent termination kit installed. 1-1/2" dia. concentric vent (kit60G77) for 50 and 75 inputs and 2" dia. concentric vent (kit 33K97) for 100 &125 inputs.
	6.1.2 Condensate drain line is not draining properly.	**ACTION 1 -** Check condensate line for proper vent slope, and any blockage. Condensate should flow freely during operation of furnace. Repair or replace any improperly installed condensate lines.
	6.1.3 Low pressure differential at the pressure switch.	**ACTION 1 -** Check for restricted vent inlet or exhaust. Remove all blockage. **ACTION 2**: Check for proper vent sizing. See installation instructions.
6.2 - Combustion air blower energizes with a heating demand. - Burners light but fail to stay lit. - After 5 tries the control diagnostics flash the watchguard burners failed to ignite code. LED#1-Alternating Slow Flash LED#2-Alternating Slow Flash	**6.2.1** Sensor or sense wire is improperly installed.	**ACTION 1 -** Check that sensor is properly located and that the sense wire is properly attached to both the sensor and the control.
	6.2.2 Sensor or sense wire is broken.	**ACTION 1 -** Check for a broken sensor. **ACTION 2 -** Test continuity across the sense wire. If wire or sensor are damaged replace the component.
	6.2.3 Sensor or sensor wire is grounded to the unit.	**ACTION 1 -** Check for resistance between the sensor rod and the unit ground. **ACTION 2 -** Check for resistance between the sensor wire and the unit ground. **ACTION 3 -** Correct any shorts found in circuit.
	6.2.4 Control does not sense flame.	**ACTION 1 -** Check the microamp signal from the burner flame. If the microamp signal is below 0.70 microamps, check the sense rod for proper location or contamination. **ACTION 2 -** Replace, clean, or relocate flame sense rod. If rod is to be cleaned, use steel wool or replace sensor. DO NOT CLEAN ROD WITH SAND PAPER. SAND PAPER WILL CONTRIBUTE TO THE CONTAMINATION PROBLEM. **NOTE**: Do not attempt to bend sense rod.

PROBLEM 6: BURNERS LIGHT WITH HEATING DEMAND BUT UNIT SHUTS DOWN PREMATURELY (CONT.)		
Condition	**Possible Cause**	**Corrective Action/Comments**
6.3 - Combustion air blower energizes with a heating demand. - Burners light. - Roll-out switch trips during the heating demand. - Diagnostic lights flash roll-out failure. LED#1-On LED#2-Slow Flash	**6.3.1** Unit is firing above 100% of the nameplate input.	**ACTION 1 -** Check that the manifold pressure matches value listed on nameplate. See installation instructions for proper procedure. **ACTION 2 -** Verify that the installed orifice size match the size listed on the nameplate or installation instructions. **ACTION 3 -** Check gas valve sensing hose to insure no leaks are present. **ACTION 4 -** Check the input rate to verify rate matches value listed on nameplate.
	6.3.2 Gas orifices leak at the manifold connection.	**ACTION 1 -** Tighten orifice until leak is sealed. **NOTE**: Be careful not to strip orifice threads. **ACTION 2 -** Check for gas leakage at the threaded orifice connection. Use approved method for leak detection (see unit instructions).
	6.3.3 Air leakage at the connections between the primary heat exchanger, secondary heat exchanger, and combustion air blower.	**ACTION 1 -** Check for air leakage at all joints in the heat exchanger assembly. Condition will cause high CO2 with high CO. **ACTION 2 -** Seal leakage if possible, replace heat exchanger if necessary, tag and return heat exchanger to proper Lennox personnel.
	6.3.4 Insufficient flow through the heat exchanger caused by a sooted or restricted heat exchanger.	ACTION 1 - Check for sooting deposits or other restrictions in the heat exchanger assembly. Clean assembly as outlined in instruction manual. ACTION 2 - Check for proper combustion. CO2 should measure 6.5%-8.5%. CO should measure below .04% (400PPM) in an air-free sample of flue gases for either NG or LP.
	6.3.5 Burners are not properly located in the burner box.	**ACTION 1 -** Check that the burners are firing into the center of the heat exchanger openings. Correct the location of the burners if necessary.
6.4 - Combustion air blower energizes with a heating demand. - Burners light roughly and the unit fails to stay lit. - Diagnostic lights flash watchguard flame failure. LED#1-Alternating Slow Flash LED#2-Alternating Slow Flash	**6.4.1** Recirculation of flue gases. This condition causes rough ignitions and operation. Problem is characterized by nuisance flame failures.	**ACTION 1 -** Check for proper flow of exhaust gases away from intake vent. Remove any obstacles in front of the intake and exhaust vent which would cause recirculation. **ACTION 2 -** Check for correct intake and exhaust vent installation. See instructions
	6.4.2 Improper burner cross-overs	**ACTION 1 -** Remove burner and inspect the cross-overs for burrs, or any restriction or if crossover is warped. Remove restriction or replace burners.

PROBLEM 6: BURNERS LIGHT WITH HEATING DEMAND BUT UNIT SHUTS DOWN PREMATURELY (CONT.)		
6.5 - Combustion air blower energizes with a heating demand. - Burners light. - Diagnostic lights flash watch guard flame failure. - NOTE" Unit might go into 60 minute Watchguard mode depending on intermittent nature of sensor signal. LED#1-Alternating Slow Flash LED#2-Alternating Slow Flash	**6.5.1** Loose sensor wire connection causes intermittent loss of flame signal.	**ACTION 1 -** Check that the sensor is properly located. **ACTION 2 -** Check that the sense wire is properly attached to both the sensor and the control. Pay extra attention to the pin connectors.
PROBLEM 7: CONTROL SIGNALS LOW FLAME SENSE DURING HEATING MODE		
Condition	**Possible Cause**	**Corrective Action/Comments**
7.0 - Unit operates correctly but the diagnostic lights flash low flame sense code. LED#1-Slow Flash LED#2-Fast Flash	**7.1.1** Sense rod is improperly located on the burner.	**ACTION 1 -** Check the sense rod for proper location on the burner. Properly locate the sense rod or replace if rod cannot be located correctly.
	7.1.2 Sense rod is contaminated.	**ACTION 1 -** Check sense rod for contamination or coated surface. Clean the sense rod with steel wool or replace sensor. DO NOT USE SAND PAPER TO CLEAN ROD. SAND PAPER WILL CONTRIBUTE TO THE CONTAMINATION PROBLEM.
PROBLEM 8: INDOOR BLOWER FAILS TO OPERATE IN COOLING, HEATING, OR CONTINUOUS FAN MODE		
Condition	**Possible Cause**	**Corrective Action/Comments**
8.0 - Indoor blower fails to operate in continuous fan, cooling, or heating mode.	**8.1.1** Miswiring of furnace or improper connections at control or indoor blower motor.	**ACTION 1-** Correct wiring and/or replace any loose connections. Check for correct wiring and loose connections.
	8.1.2 120V is not being supplied to the indoor air blower or blower motor failure.	**ACTION 1 -** Check for 120V at the various calls for indoor blower by energizing "Y", "G", and "W" individually on the low voltage terminal strip. Note that when "W' is energized, the blower is delayed 45 seconds. If there is 120V to each motor tap but the blower does not operate, replace the motor.
	8.1.3 Defective control board	**ACTION 1 -** If there is not 120V when "Y", "G", or "W" is energized, replace the control.
PROBLEM 9: RF STATIC DURING TIME FOR IGNITION		
Condition	**Possible Cause**	**Corrective Action/Comments**
9.0 - AM radio interference.	**9.1.2** Ignitor operation	**ACTION 1 -** Call Technical Support, Dallas.