



96% AFUE Gas Furnace

Troubleshooting Guide

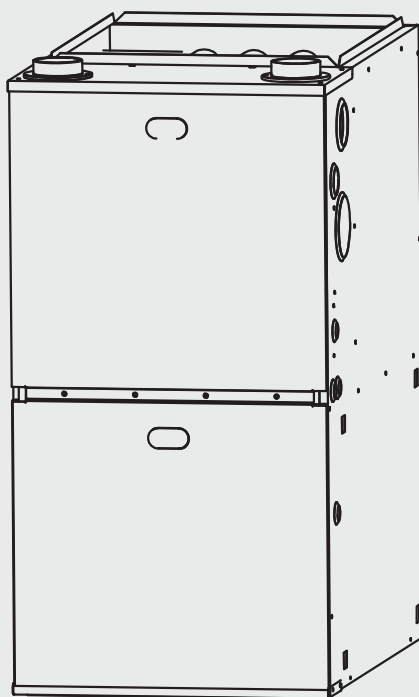


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1 Key to Symbols and Safety Instructions

1.1 Key to Symbols

Warnings



Warnings in this document are identified by a warning triangle printed against a grey background.

Keywords at the start of a warning indicate the type and seriousness of the ensuing risk if measures to prevent the risk are not taken.

The following keywords are defined and can be used in this document:

- ▶ **DANGER** indicates a hazardous situation which, if not avoided, will result in death or serious injury.
- ▶ **WARNING** indicates a hazardous situation which, if not avoided, could result in death or serious injury.
- ▶ **CAUTION** indicates a hazardous situation which, if not avoided, could result in minor to moderate injury.
- ▶ **NOTICE** is used to address practices not related to personal injury.

Important information



This symbol indicates important information where there is no risk to people or property.

1.2 Safety

Please read all instruction in the manual and retain all manuals for future reference.



WARNING:

- ▶ Untrained personnel (homeowners) may only clean and replace filters and replace fuses as required by basic maintenance. **All other operations, including installation, repair, and service must be performed by a qualified installer, service agency, or the gas supplier.**



WARNING: FIRE OR EXPLOSION HAZARD

- ▶ Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- ▶ **WHAT TO DO IF YOU SMELL GAS:**
 - Do not try to light any appliance.
 - Do not touch any electrical switch; do not use any phone in your building.
 - Leave the building immediately.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department.
- ▶ Installation and service must be performed by a qualified installer, service agency, or the gas supplier.



WARNING:

- ▶ Do not use this furnace if any part has been under water. A flood-damaged furnace is extremely dangerous. Attempts to use the furnace can result in fire or explosion. A qualified service agent must inspect the furnace and replace all gas controls, control system parts, and electrical parts that have been wet, or the furnace if deemed necessary.



WARNING: FIRE OR EXPLOSION HAZARD

- ▶ The furnace is designed and approved for use with Natural Gas and Propane (LP) Gas ONLY.
- ▶ **DO NOT BURN ANY LIQUID FUEL OR SOLID FUEL IN THIS FURNACE.**
- ▶ Burning any unapproved fuel will result in damage to the furnace's heat exchanger, which could result in Fire, Personal Injury, and/or Property Damage.



WARNING: FOLLOW ALL SAFETY CODES

- ▶ Wear safety glasses, protective clothing, and work gloves. Have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit. Consult local building codes as well as the current editions of the National Fuel Gas Code (NFGC) NFPA 54/ANSI Z223.1 and the National Electrical Code (NEC) NFPA 70.



WARNING: FIRE, EXPLOSION

- ▶ Check entire gas assembly for leaks after lighting this appliance.
- ▶ Never test for gas leaks with an open flame. Use a commercially available soap solution made specifically for the detection of leaks to check all connections, as specified in the Installation, Operation, and Maintenance Manual.



WARNING: FIRE, EXPLOSION, ELECTRICAL SHOCK, AND CARBON MONOXIDE POISONING HAZARD

- ▶ Failure to follow this warning could result in dangerous operation, serious injury, death, or property damage. Improper installation, adjustment, alteration, maintenance, or use could cause carbon monoxide poisoning, explosion, fire, electrical shock, or other conditions which may cause personal injury or property damage. Consult a qualified service agency, local gas supplier, or your distributor for information or assistance.



WARNING: FIRE, EXPLOSION

- ▶ See instructions for lighting/shutdown operation (as shown on a sticker directly on the inside of the furnace panel). Should the gas supply fail to shut off or if overheating occurs, shut off the gas valve to the furnace before shutting off the electrical supply.



WARNING: FIRE HAZARD

- ▶ The furnaces must be kept free and clear of insulating materials. Inspect surrounding area to ensure insulation material is at a safe distance when installing furnaces or adding insulation materials. Insulation materials may be combustible.
Maintain a 1 in. clearance from combustible materials to supply air ductwork for a distance of 36 in. horizontally from the furnace. See NFPA 90B or local code for further requirements.
- ▶ These furnaces SHALL NOT be installed directly on carpeting, tile, or any other combustible material other than wood flooring. In downflow installations, field supplied floor base MUST be used when installed on combustible materials and wood flooring. Special base is not required when this furnace is installed on industry standard Coil Assembly matching correct furnace width.



WARNING:

- ▶ This product can expose you to chemicals including Lead and Lead components, which are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.



CAUTION: CUT HAZARD

- ▶ Failure to follow this caution may result in personal injury. Sheet metal parts may have sharp edges or burrs. Use care and wear appropriate protective clothing, safety glasses and gloves when handling parts and servicing furnaces.

2 Troubleshooting



WARNING: FIRE, EXPLOSION AND ASPHYXIATION HAZARD

- Installation and service must be performed by a qualified service agency or the gas supplier.

Refer to the troubleshooting charts and associated figures on the following pages for assistance in determining the source of unit operational problems. The diagnostic LED blinks to assist in troubleshooting the unit. The number of blinks refers to a specific code.

2.1 Electrostatic Discharge (ESD) Precautions

NOTICE:

- Discharge body's static electricity before touching unit. An electrostatic discharge can adversely affect electrical components.

Use the following precautions during furnace installation and servicing to protect the integrated control module from damage. By putting the furnace control and the person at the same electrostatic potential these steps will help avoid exposing the integrated control module to electrostatic discharge. This procedure is applicable to both installed and uninstalled (ungrounded) furnaces.

1. Disconnect all power to the furnace. Do not touch the integrated control module or any wire connected to the control prior to discharging your body's electrostatic charge to ground.
2. Firmly touch a clean unpainted metal surface of the furnace away from the control. Any tools held in a person's hand during grounding will be discharged.
3. Service integrated control module or connecting wiring following the discharge process in step 2. Use caution not to recharge your body with static electricity; (i.e. do not move or shuffle your feet, do not touch ungrounded objects, etc.). If you come in contact with an ungrounded object, repeat step 2 before touching control or wires.
4. Discharge your body to ground before removing a new control from its container. Follow steps 1 through 3 if installing the control on a furnace. Return any old or new controls to their containers before touching any ungrounded object.

2.2 Resetting From Lockout

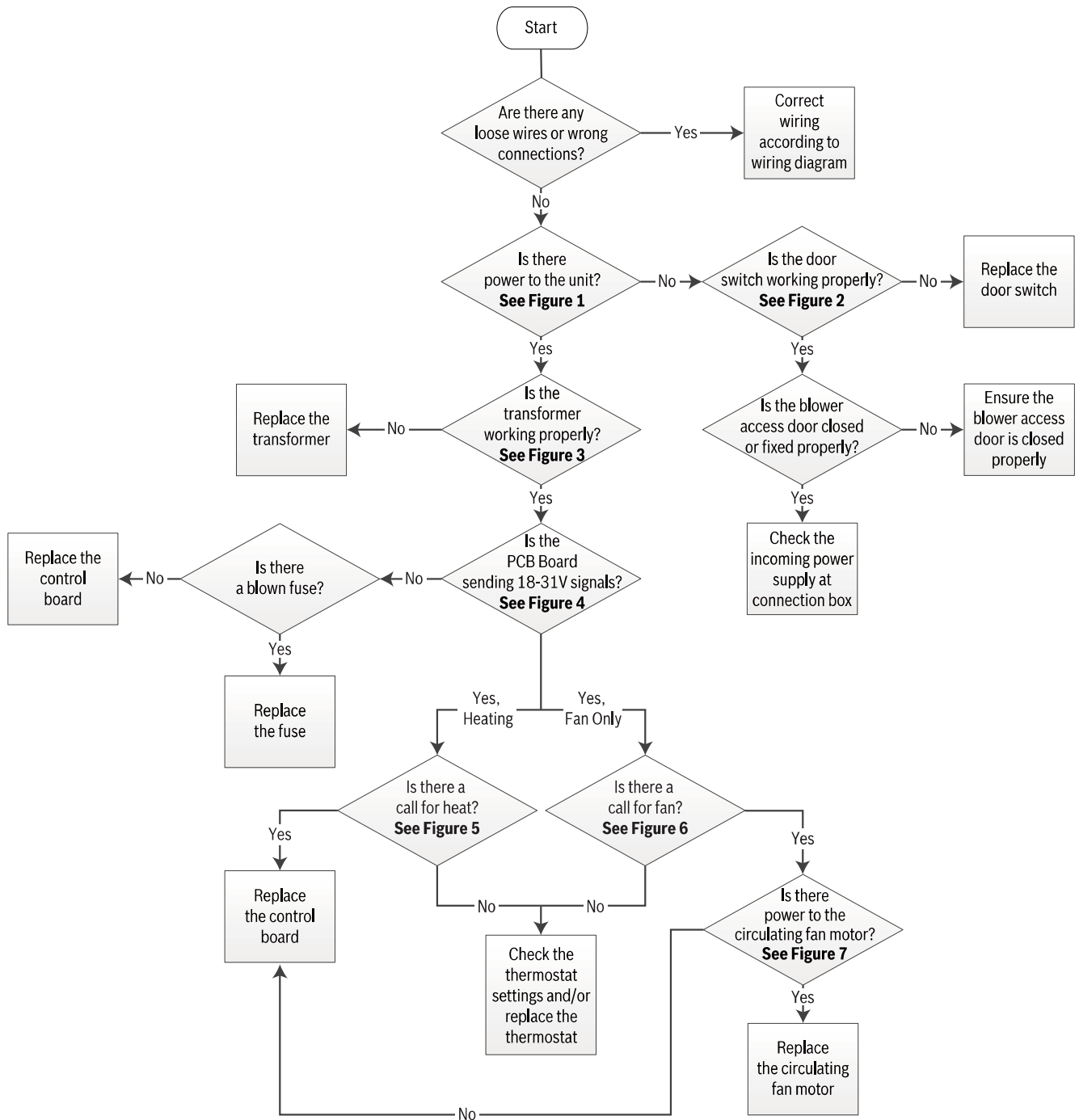
Furnace lockout results when a furnace is unable to achieve ignition after three attempts. Refer to the troubleshooting chart on the following pages for assistance in determining the source of unit operational problems. The red diagnostic LED blinks to assist in troubleshooting the unit. If the furnace is in "lockout" it will (or can be) reset in any of the following ways.

1. Automatic reset. The integrated control module will automatically reset itself and attempt to resume normal operations following a one hour lockout period.
2. Manual power interruption. Interrupt 115 volt power to the furnace for 1 - 20 seconds.
3. Manual thermostat cycle. Lower the thermostat so that there is no longer a call for heat for 1 - 20 sec.

3 Error Flash Codes

3.1 No Light and No Fan (System Does Not Start Normally)

Troubleshooting Chart



Leave "Park" terminal unused.

No Light and No Fan (System Does Not Start Normally)

Figures & Tables

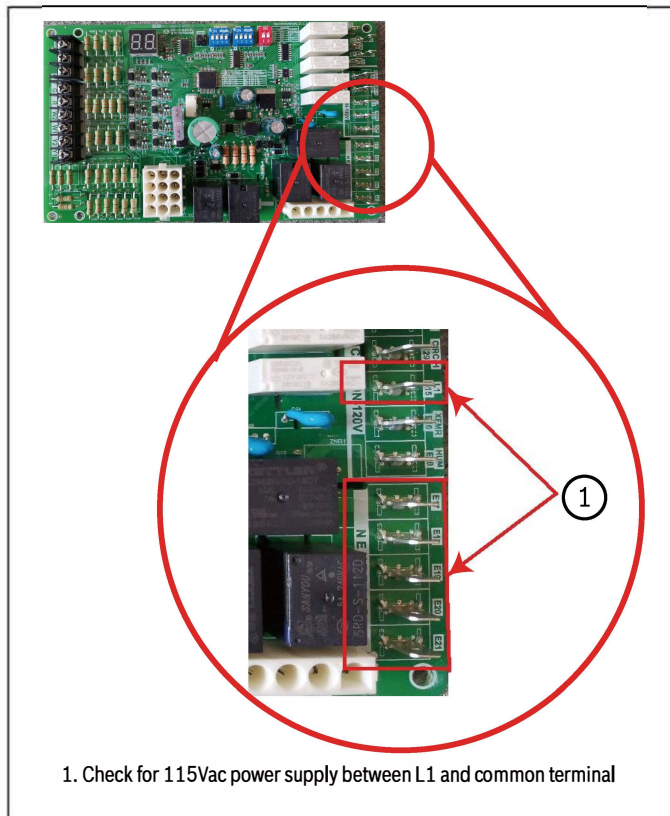


Figure 1

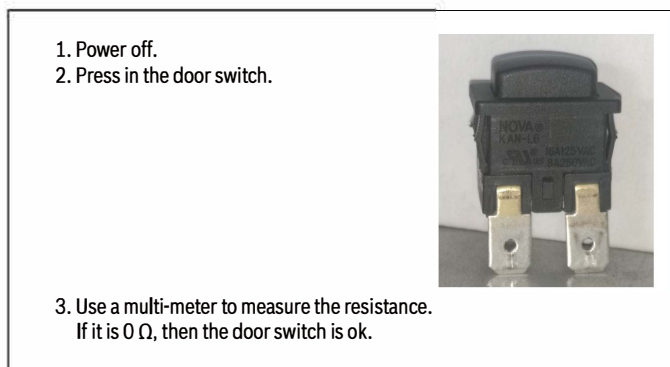


Figure 2

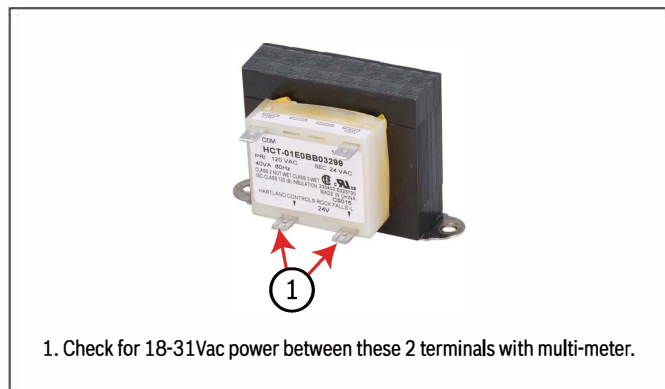


Figure 3

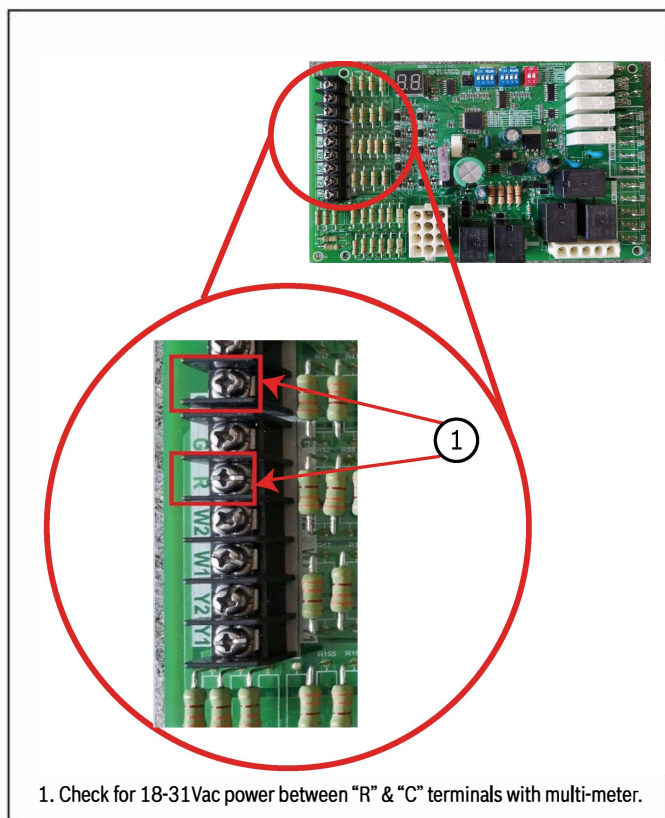


Figure 4

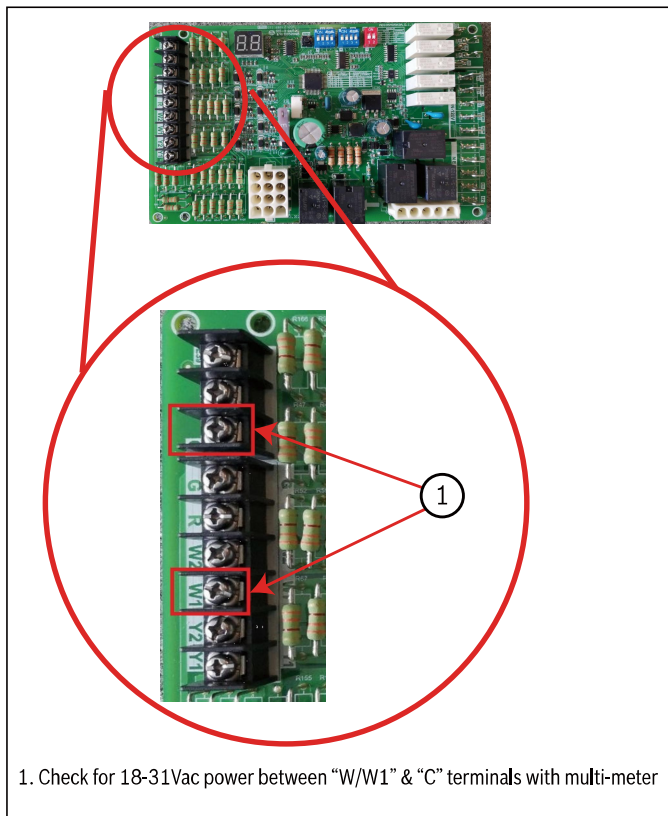


Figure 5

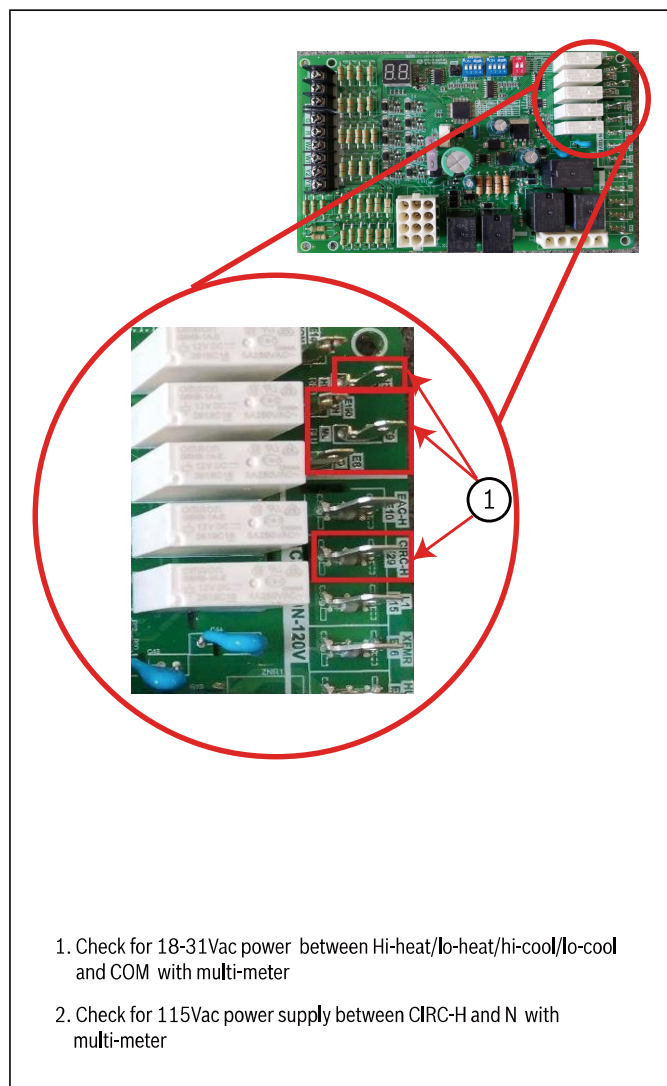


Figure 7

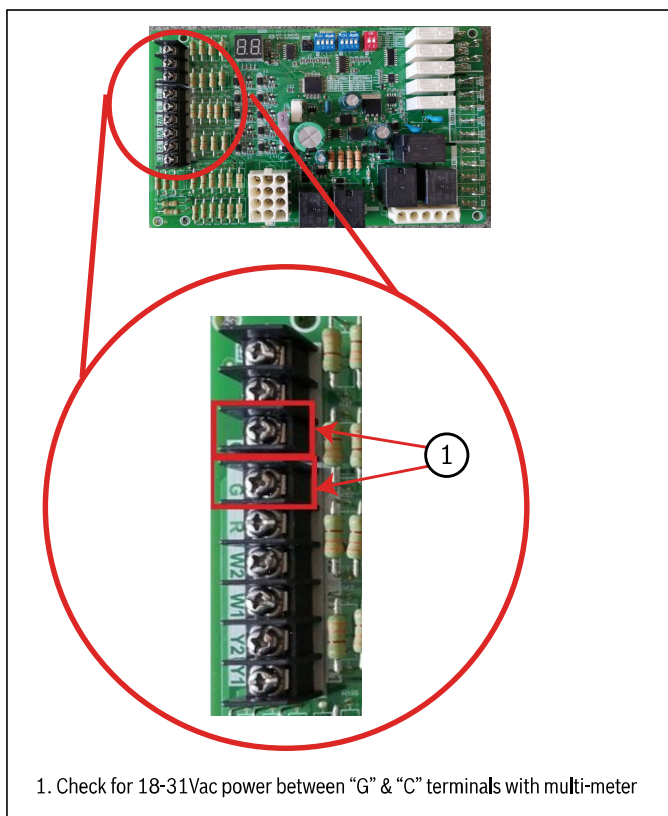
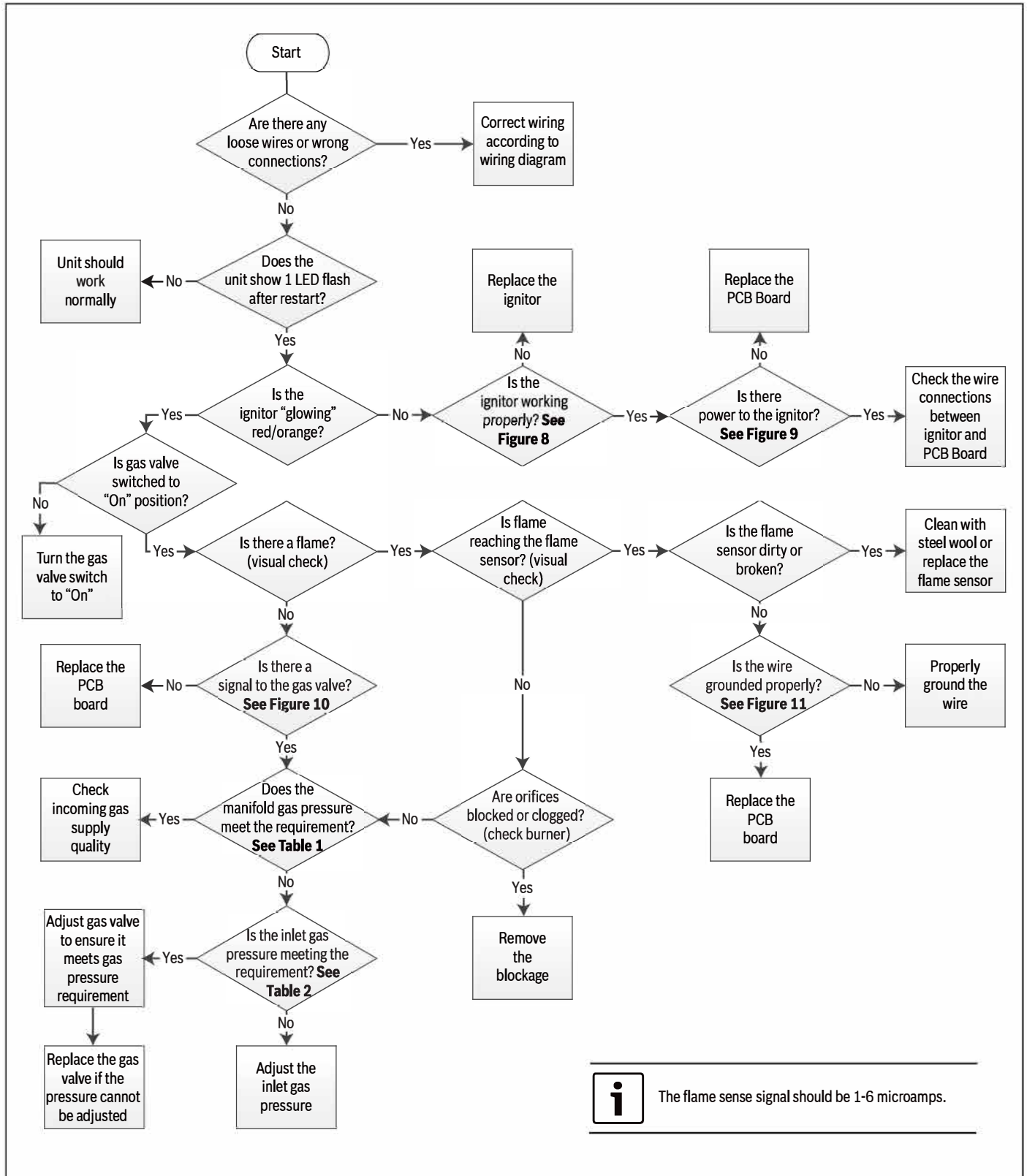


Figure 6

3.2 E7 (System Lock-Out due to Failed Ignition) E8 (System Lock-Out due to too Many Flame Dropouts)

Troubleshooting Chart



E7 (System Lock-Out due to Failed Ignition)
E8 (System Lock-Out due to too Many Flame Dropouts)

Figures & Tables

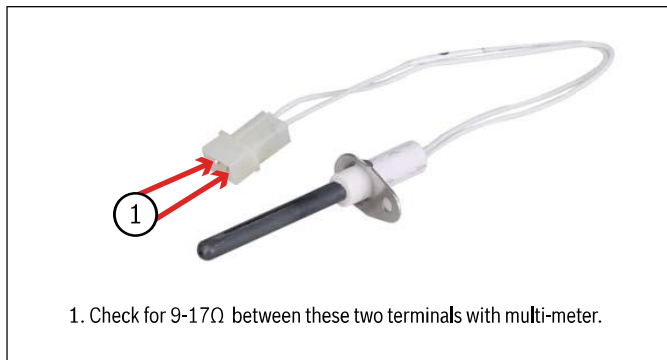


Figure 8

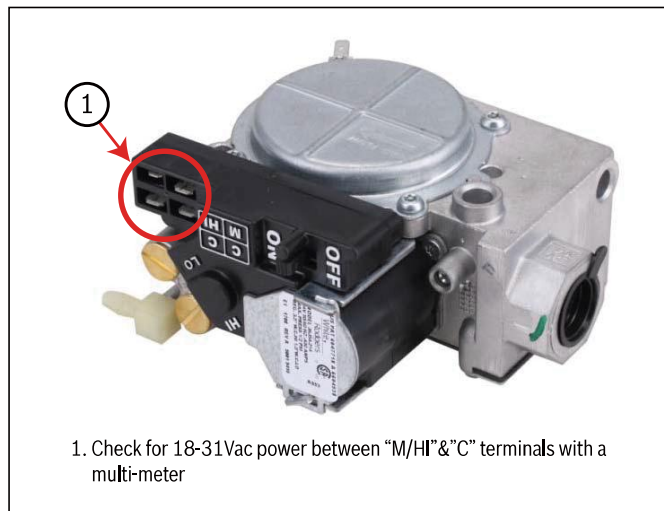


Figure 10

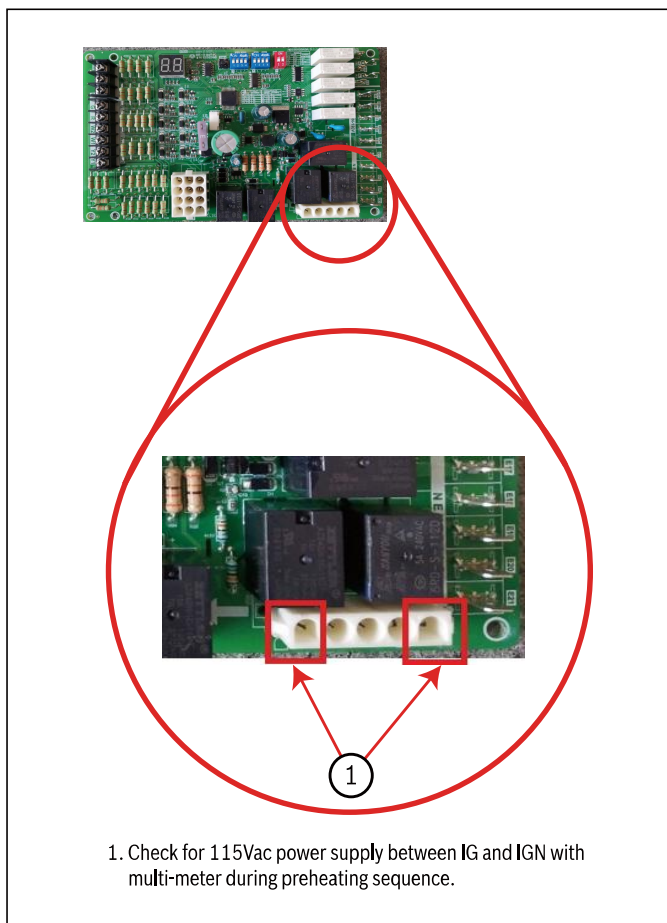


Figure 9

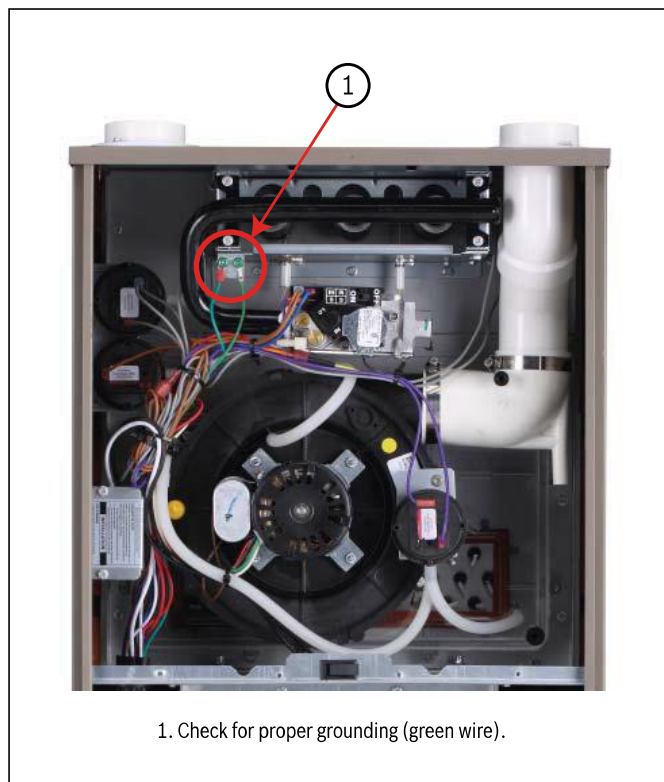


Figure 11

	Manifold Gas Pressure
Natural Gas	3.5 in. W.C.
Propane Gas	10 in. W.C.

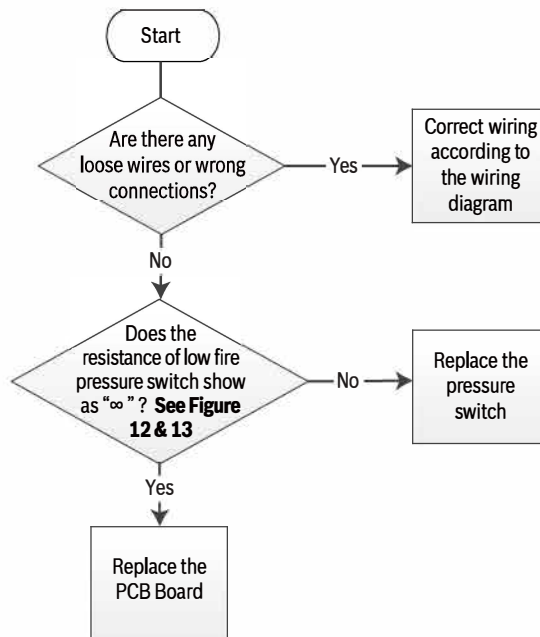
Table 1 Manifold Gas Pressure

	Inlet Gas Supply Pressure	
Natural Gas	Minimum: 4.5 in. W.C.	Maximum: 10.5 in. W.C.
Propane Gas	Minimum: 11.0 in. W.C.	Maximum: 13.0 in. W.C.

Table 2 Inlet Gas Supply Pressure

3.3 E1 (Low Fire Pressure Switch Stuck Closed)

Troubleshooting Chart



This error could also be caused by a blocked vent. Check vent for obstructions. If a vent is blocked, unit's safety protection logic will turn off unit.

E1 (Low Fire Pressure Switch Stuck Closed)

Figures

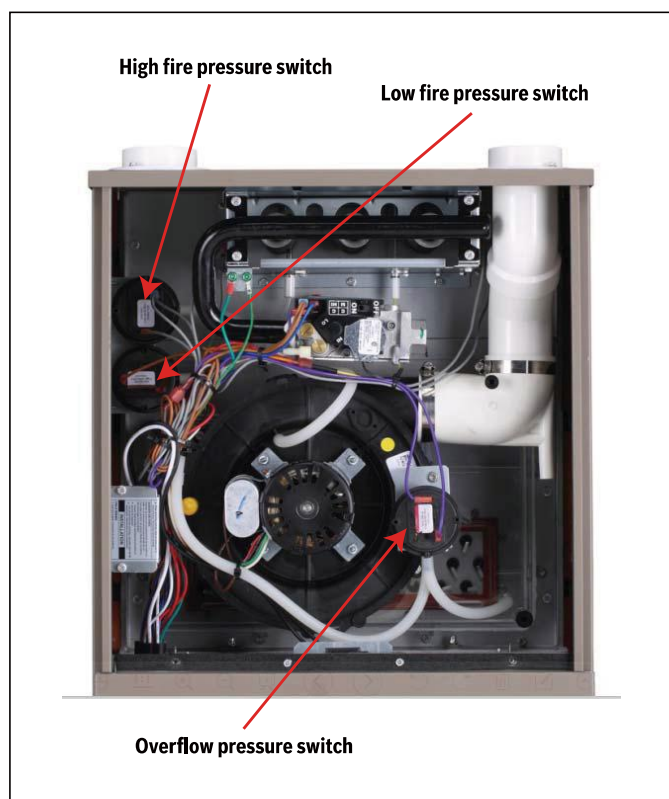


Figure 12

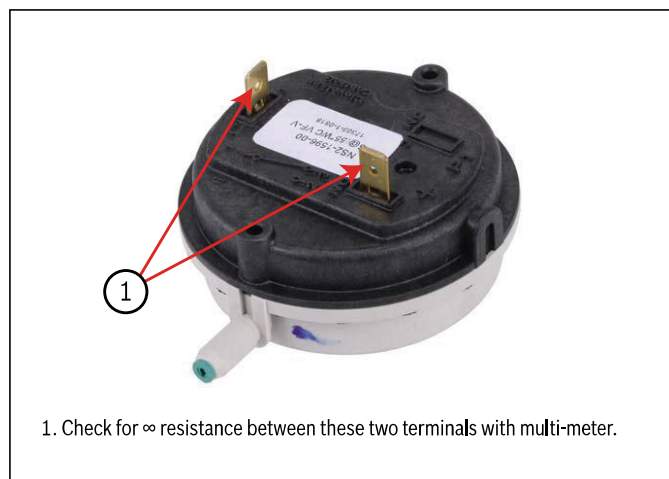
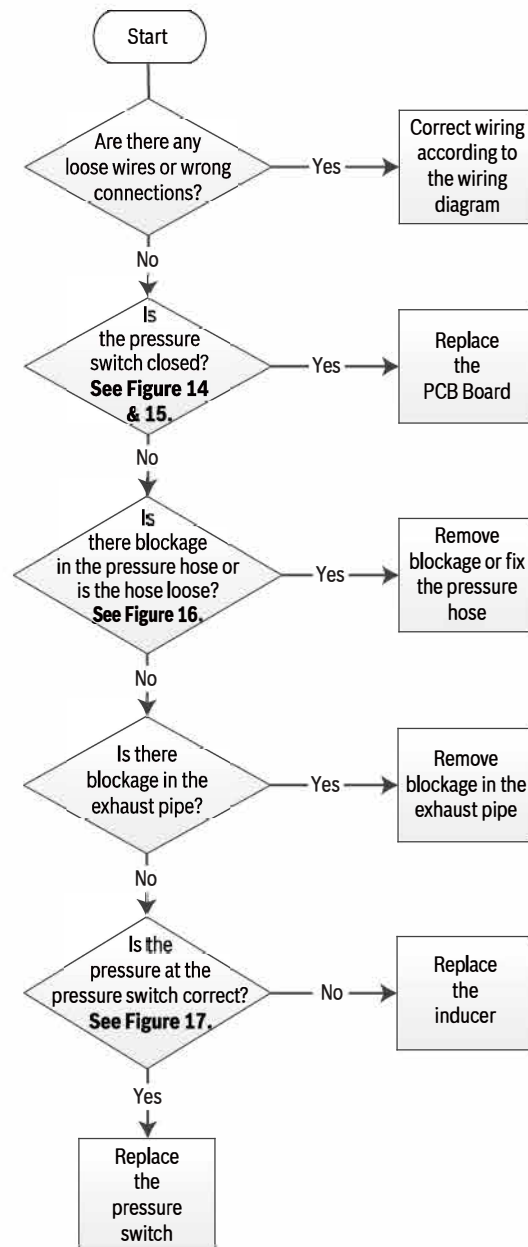


Figure 13

**3.4 E2 (Low Pressure Switch Stuck Open)
E4 (Pressure Switch Cycle Lockout)
E3 (High Pressure Switch Stuck Open)**

Troubleshooting Chart



E2 (Low Pressure Switch Stuck Open)
E4 (Pressure Switch Cycle Lockout)
E3 (High Pressure Switch Stuck Open)

Figures



The pressure switch that you are checking in this step depends on the number of LED flashes. Refer to the specific flashes and their descriptions above.

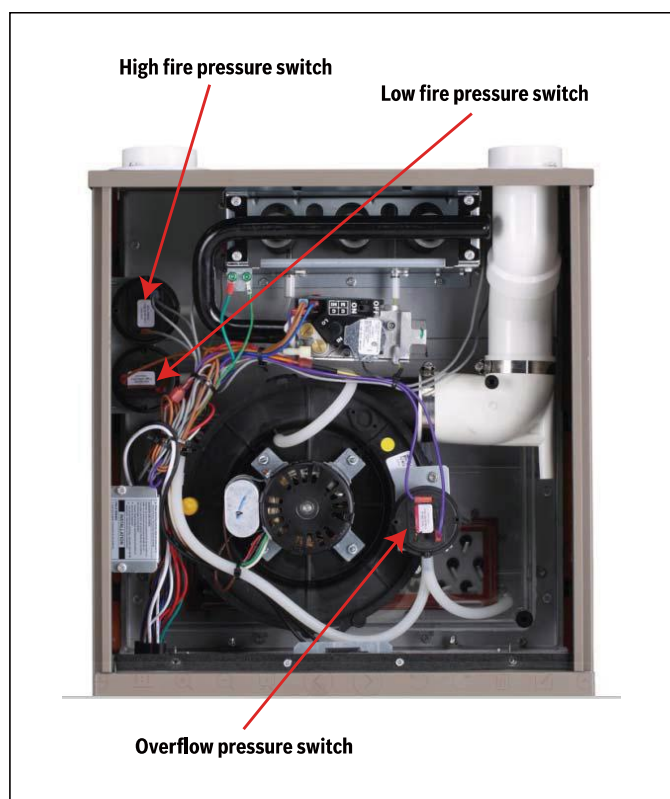


Figure 14

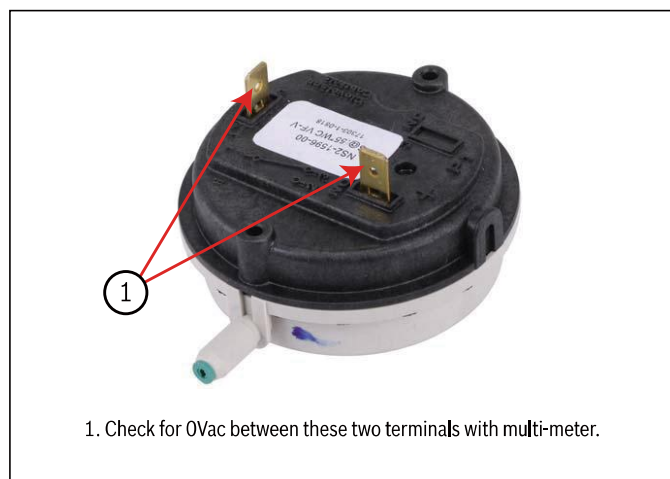


Figure 15

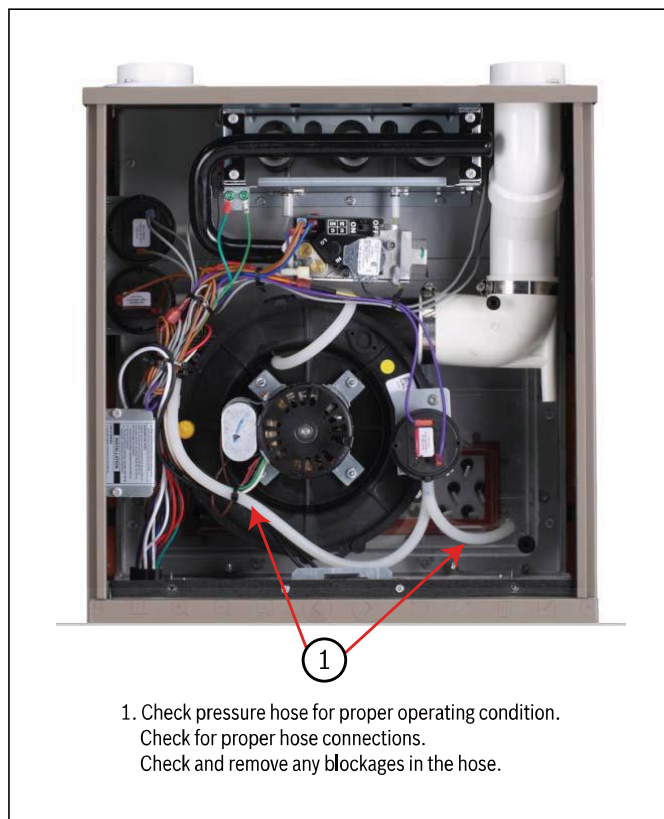


Figure 16

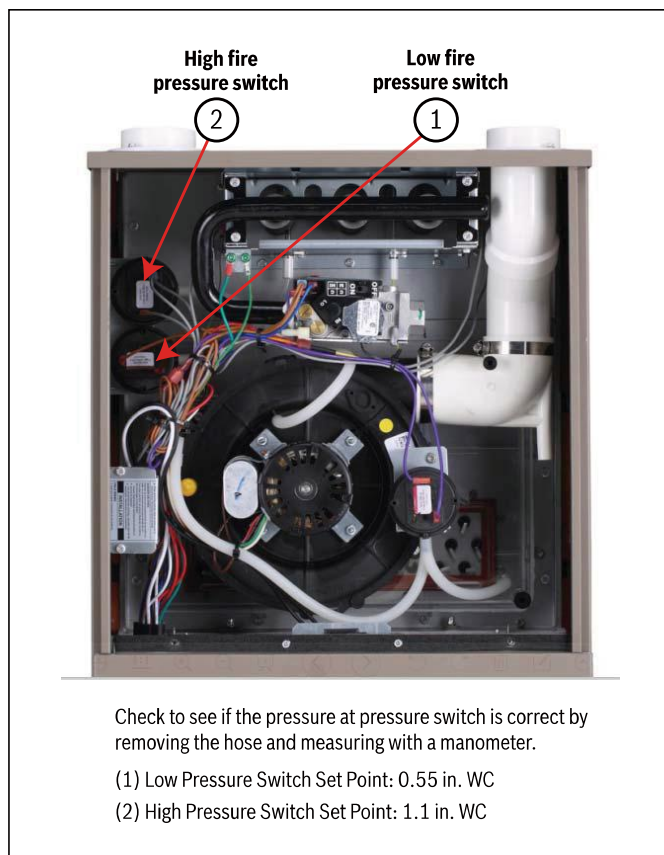
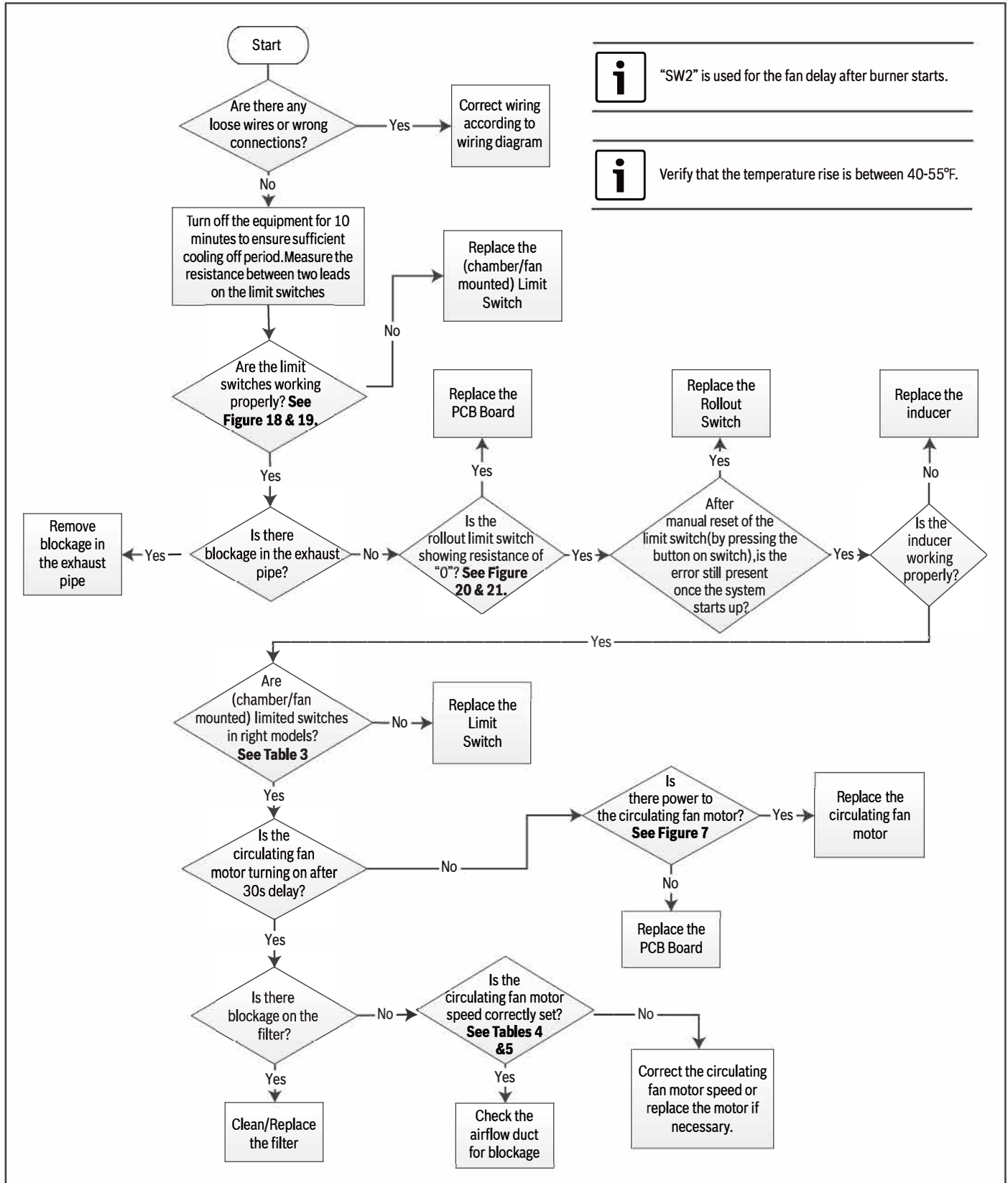


Figure 17

3.5 E5 (Limit/Rollout Switch Open Less than 5 Mins) E6 (Limit/Rollout Switch Open More than 5 Mins)

Troubleshooting Chart



E5 (Limit/Rollout Switch Open Less than 5 Mins)
E6 (Limit/Rollout Switch Open More than 5 Mins)

Figures & Tables

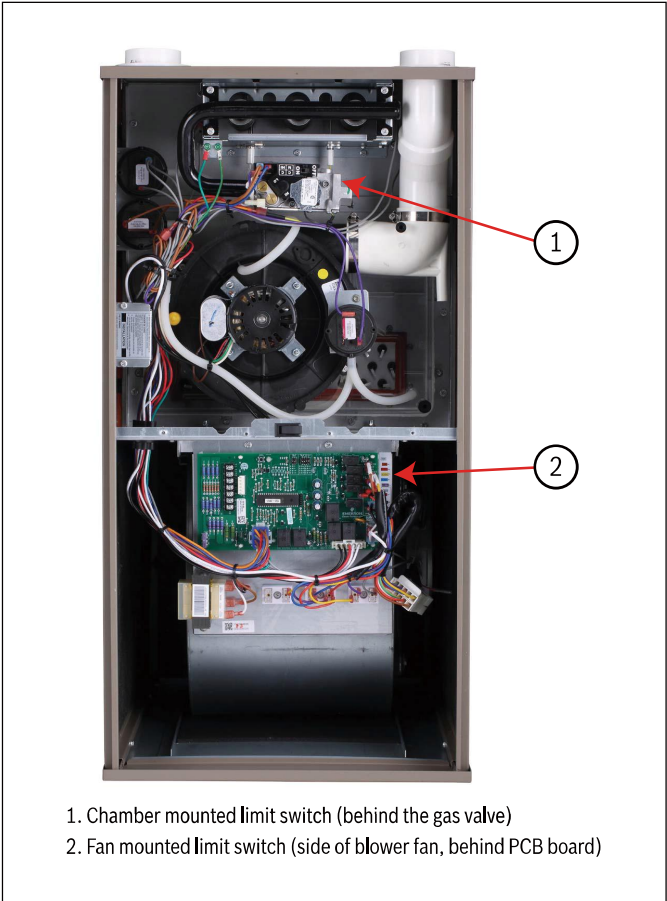


Figure 18

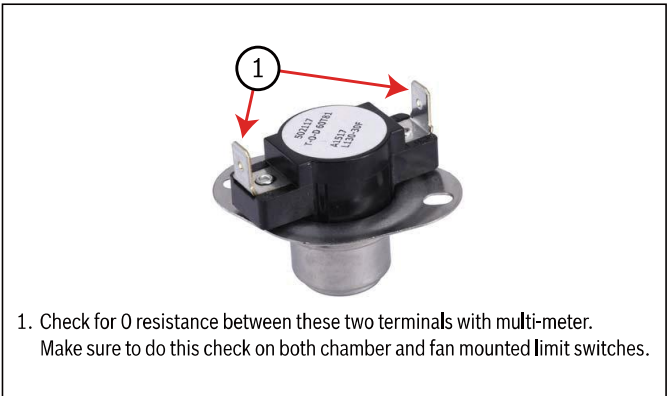


Figure 19

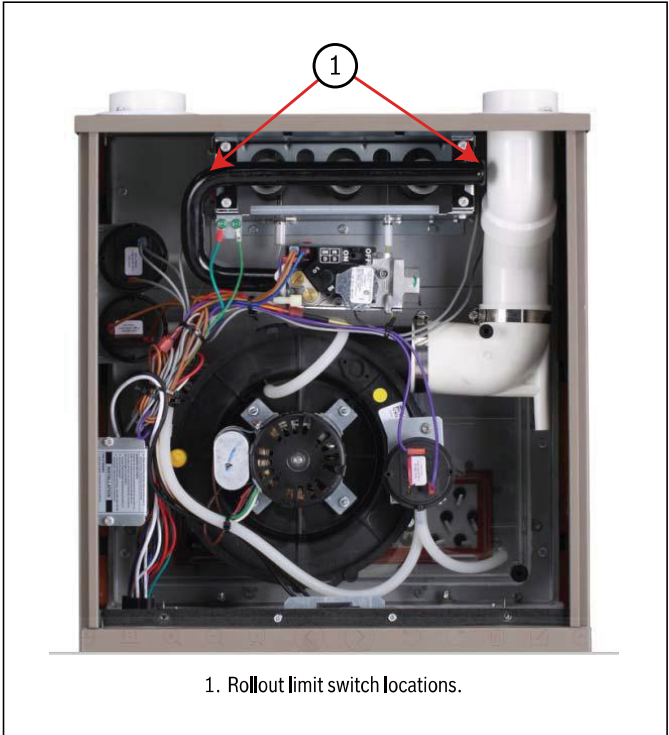


Figure 20

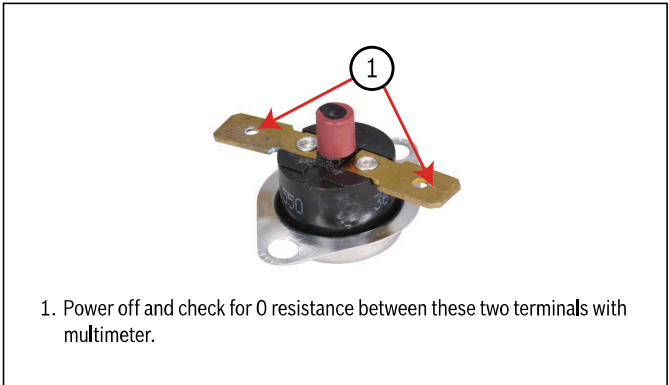


Figure 21

Bosch Model			96M060B3B	96M080B3B	96M080C4B	96M100C5B	96M100D5B	96M120D5B
Rollout switch - resettable	—	°F	300					
Inlet High Temperature Limit switch - fixed	Off/On	°F	150/120	150/120	150/120	150/120	150/120	150/120

Table 3

Furnace size	Return-air inlet	Speed		External static pressure (in. WC)									
				0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
60B	Bottom or Sides	H	CFM	1430	1390	1350	1320	1280	1240	1200	1160	1110	1065
			Temp Rise-1st stage °F	--	--	--	--	--	--	--	30.7	32.2	33.6
			Temp Rise-2nd stage °F	37	37.4	38.6	39.3	40.7	41.7	43.4	45.1	47.1	49.1
		Mid-H	CFM	1245	1205	1165	1130	1100	1050	1010	960	920	865
			Temp Rise-1st stage °F	--	--	30	31.1	32.1	33.2	35.1	37	38.7	40.4
			Temp Rise-2nd stage °F	42.7	43.4	45	46.5	48.3	50.1	52.6	55.1	58	--
		Mid	CFM	1075	1035	1000	955	910	860	820	780	730	685
			Temp Rise-1st stage °F	32.1	33.4	35.5	37.6	39.3	41	43.1	45.1	48.2	51.3
			Temp Rise-2nd stage °F	49.4	52.9	55.4	58	--	--	--	--	--	--
		Mid-L	CFM	885	830	780	735	690	650	590	550	520	470
			Temp Rise-1st stage °F	39.1	41.7	44.9	48	51.2	54.5	59.1	--	--	--
			Temp Rise-2nd stage °F	--	--	--	--	--	--	--	--	--	--
		Low	CFM	780	707	640	579	500	466	403	356	320	253
			Temp Rise-1st stage °F	48.3	52.8	58	--	--	--	--	--	--	--
			Temp Rise-2nd stage °F	--	--	--	--	--	--	--	--	--	--
80B	Bottom or Sides	H	CFM	1411	1374	1339	1303	1271	1233	1190	1148	1102	1054
			Temp Rise-1st stage °F	--	--	--	35.5	36.4	37.5	38.8	40.3	41.9	43.8
			Temp Rise-2nd stage °F	50.5	51.8	53.2	54.6	56.0	57.8	59.8	62.0	64.6	--
		Mid-H	CFM	1215	1178	1144	1108	1071	1029	985	945	898	854
			Temp Rise-1st stage °F	38.0	39.2	40.4	41.7	43.2	44.9	46.9	48.9	51.5	54.2
			Temp Rise-2nd stage °F	56.6	58.4	60.2	62.3	64	--	--	--	--	--
		Mid	CFM	1044	1002	968	931	886	841	805	767	718	677
			Temp Rise-1st stage °F	40.8	43.4	45.8	50.5	50.9	54.0	57.6	60.8	64.4	--
			Temp Rise-2nd stage °F	--	--	--	--	--	--	--	--	--	--
		Mid-L	CFM	825	790	743	698	649	608	457	527	491	463
			Temp Rise-1st stage °F	50.5	53.7	58.4	62.9	--	--	--	--	--	--
			Temp Rise-2nd stage °F	--	--	--	--	--	--	--	--	--	--
		Low	CFM	786	720	645	598	539	503	436	385	348	302
			Temp Rise-1st stage °F	56.8	62.2	--	--	--	--	--	--	--	--
			Temp Rise-2nd stage °F	--	--	--	--	--	--	--	--	--	--
80C	Bottom or Sides	H	CFM	1516	1467	1418	1367	1312	1261	1201	1144	1086	1029
			Temp Rise-1st stage °F	--	--	--	--	35.1	36.2	38	39.8	41.6	43.3
			Temp Rise-2nd stage °F	46.7	47.4	48.8	50.1	52.5	54.8	57.4	59.9	62.7	--
		Mid-H	CFM	1316	1259	1203	1149	1092	1031	976	909	855	791
			Temp Rise-1st stage °F	35	37	38.2	39.4	41.1	42.7	45.2	47.7	50.9	54
			Temp Rise-2nd stage °F	53.8	53.2	55.8	58.4	62	--	--	--	--	--
		Mid	CFM	1142	1076	1014	960	894	823	765	702	651	597
			Temp Rise-1st stage °F	40.3	43.1	45.4	47.7	51.2	54.6	58.2	61.8	--	--
			Temp Rise-2nd stage °F	60	61.1	--	--	--	--	--	--	--	--
		Mid-L	CFM	901	829	767	692	625	562	506	463	409	345
			Temp Rise-1st stage °F	49	49.9	55.7	61.5	--	--	--	--	--	--
			Temp Rise-2nd stage °F	--	--	--	--	--	--	--	--	--	--
		Low	CFM	800	674	618	498	455	400	360	300	240	--
			Temp Rise-1st stage °F	57	--	--	--	--	--	--	--	--	--
			Temp Rise-2nd stage °F	--	--	--	--	--	--	--	--	--	--

Table 4 Air Delivery – CFM (Without Filter) * **

* A filter is required for each return air inlet. This table shows the airflow performance without a filter. To determine airflow performance with a filter, if a 3/4 inch (19 mm) washable media filter is used, assume an additional 0.1 in. WC available external static pressure.

** The manufacturer default fan settings are based on model, refer to Table 24.

Furnace size	Return-air inlet	Speed		External static pressure (in. WC)									
				0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
100C	Bottom or Sides	H	CFM	2195	2158	2116	2072	2031	1985	1940	1896	1852	1862
			Temp Rise-1st stage °F	--	--	--	--	--	--	--	--	--	--
			Temp Rise-2nd stage °F	40.3	41.0	41.8	42.7	43.6	44.6	45.6	46.7	47.8	47.5
		Mid-H	CFM	2008	1963	1924	1882	1836	1791	1744	1697	1648	1603
			Temp Rise-1st stage °F	--	--	--	--	--	--	--	--	--	--
			Temp Rise-2nd stage °F	44.1	45.1	46.0	47.0	48.2	49.4	50.8	52.2	53.7	55.2
		Mid	CFM	1753	1709	1666	1627	1573	1530	1487	1444	1395	1347
			Temp Rise-1st stage °F	--	--	--	35.4	36.6	37.6	38.7	39.9	41.3	42.7
			Temp Rise-2nd stage °F	50.5	51.8	53.1	54.4	56.3	57.9	59.5	61.3	63.5	65.8
		Mid-L	CFM	1447	1388	1338	1286	1241	1186	1137	1083	1029	983
			Temp Rise-1st stage °F	39.8	41.5	43.0	44.7	46.4	48.5	50.6	53.2	55.9	58.5
			Temp Rise-2nd stage °F	61.2	63.8	--	--	--	--	--	--	--	--
		Low	CFM	1089	1021	946	883	820	751	685	625	565	520
			Temp Rise-1st stage °F	52.8	56.4	60.8	--	--	--	--	--	--	--
			Temp Rise-2nd stage °F	--	--	--	--	--	--	--	--	--	--
100D	Bottom or Sides	H	CFM	2283	2239	2193	2143	2095	2049	1998	1947	1897	1847
			Temp Rise-1st stage °F	--	--	--	--	--	--	--	--	--	--
			Temp Rise-2nd stage °F	38.8	39.5	40.4	41.3	42.3	43.2	44.3	45.5	46.7	48.0
		Mid-H	CFM	2086	2038	1988	1942	1889	1841	1792	1745	1695	1637
			Temp Rise-1st stage °F	--	--	--	--	--	--	--	--	--	--
			Temp Rise-2nd stage °F	42.4	43.5	44.5	45.6	46.9	48.1	49.4	50.7	52.3	54.1
		Mid	CFM	1813	1760	1711	1657	1609	1560	1506	1453	1402	1350
			Temp Rise-1st stage °F	--	--	--	--	35.8	36.9	38.2	39.6	41.0	42.6
			Temp Rise-2nd stage °F	48.8	50.3	51.8	53.4	55.0	56.8	58.8	60.9	63.1	--
		Mid-L	CFM	1487	1417	1360	1296	1241	1183	1123	1064	1005	941
			Temp Rise-1st stage °F	38.7	40.6	42.3	44.4	46.4	48.7	51.3	54.1	57.2	61.1
			Temp Rise-2nd stage °F	59.5	62.5	--	--	--	--	--	--	--	--
		Low	CFM	1122	1036	977	889	802	731	646	586	532	485
			Temp Rise-1st stage °F	55.6	58.9	64.7	--	--	--	--	--	--	--
			Temp Rise-2nd stage °F	--	--	--	--	--	--	--	--	--	--
120D	Bottom or Sides	H	CFM	2290	2253	2213	2170	2127	2080	2031	1985	1937	1888
			Temp Rise-1st stage °F	--	--	--	--	--	--	--	--	--	--
			Temp Rise-2nd stage °F	46.4	47.2	48.0	49.0	50.0	51.1	52.3	53.5	54.9	56.3
		Mid-H	CFM	2079	2037	1993	1950	1907	1856	1813	1767	1726	1675
			Temp Rise-1st stage °F	--	--	--	--	--	--	--	--	40.0	41.2
			Temp Rise-2nd stage °F	51.1	52.2	53.3	54.5	55.7	57.3	58.6	60.1	61.6	63.4
		Mid	CFM	1809	1764	1719	1668	1620	1572	1528	1487	1432	1364
			Temp Rise-1st stage °F	--	--	40.2	41.4	42.6	43.9	45.2	46.5	48.2	50.6
			Temp Rise-2nd stage °F	58.7	60.2	61.8	63.7	65.6	67.6	69.6	--	--	--
		Mid-L	CFM	1489	1429	1373	1311	1265	1208	1137	1083	1032	972
			Temp Rise-1st stage °F	46.4	48.3	50.3	52.7	54.6	57.2	60.7	63.8	66.9	--
			Temp Rise-2nd stage °F	--	--	--	--	--	--	--	--	--	--
		Low	CFM	1123	1051	1352	899	814	741	688	605	551	507
			Temp Rise-1st stage °F	61.5	65.7	--	--	--	--	--	--	--	--
			Temp Rise-2nd stage °F	--	--	--	--	--	--	--	--	--	--

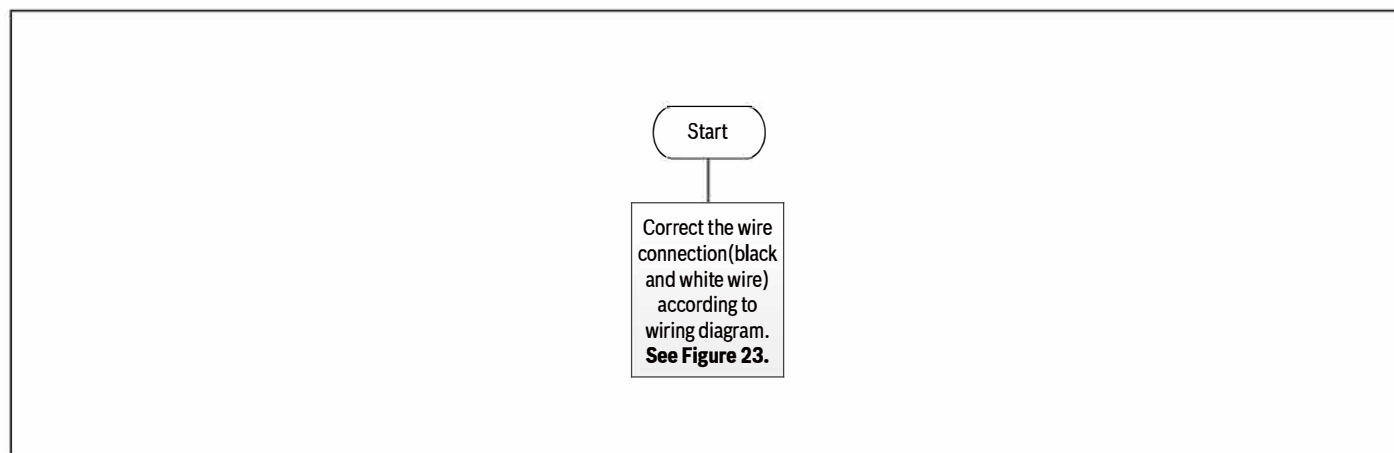
Table 5 Air Delivery – CFM (Without Filter) * **

* A filter is required for each return air inlet. This table shows the airflow performance without a filter. To determine airflow performance with a filter, if a 3/4 inch (19 mm) washable media filter is used, assume an additional 0.1 in. WC available external static pressure.

** The manufacturer default fan settings are based on model, refer to Table 24.

3.6 Pr (Incorrect Polarity of L1/L2)

Troubleshooting Chart



Figures

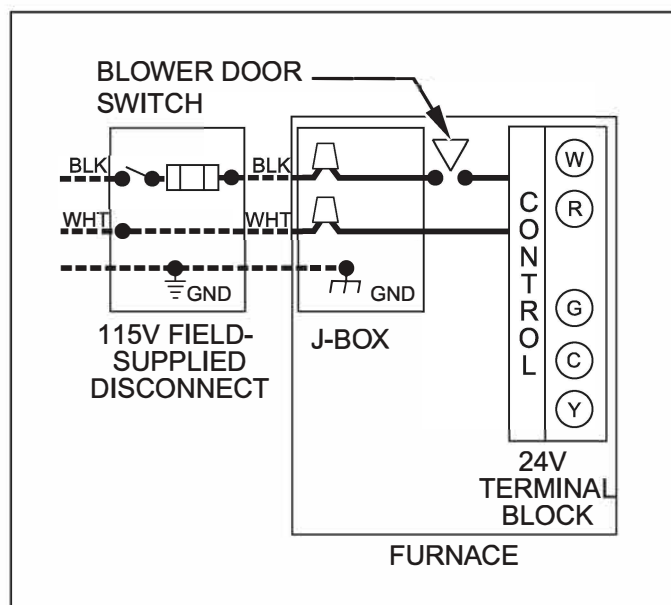
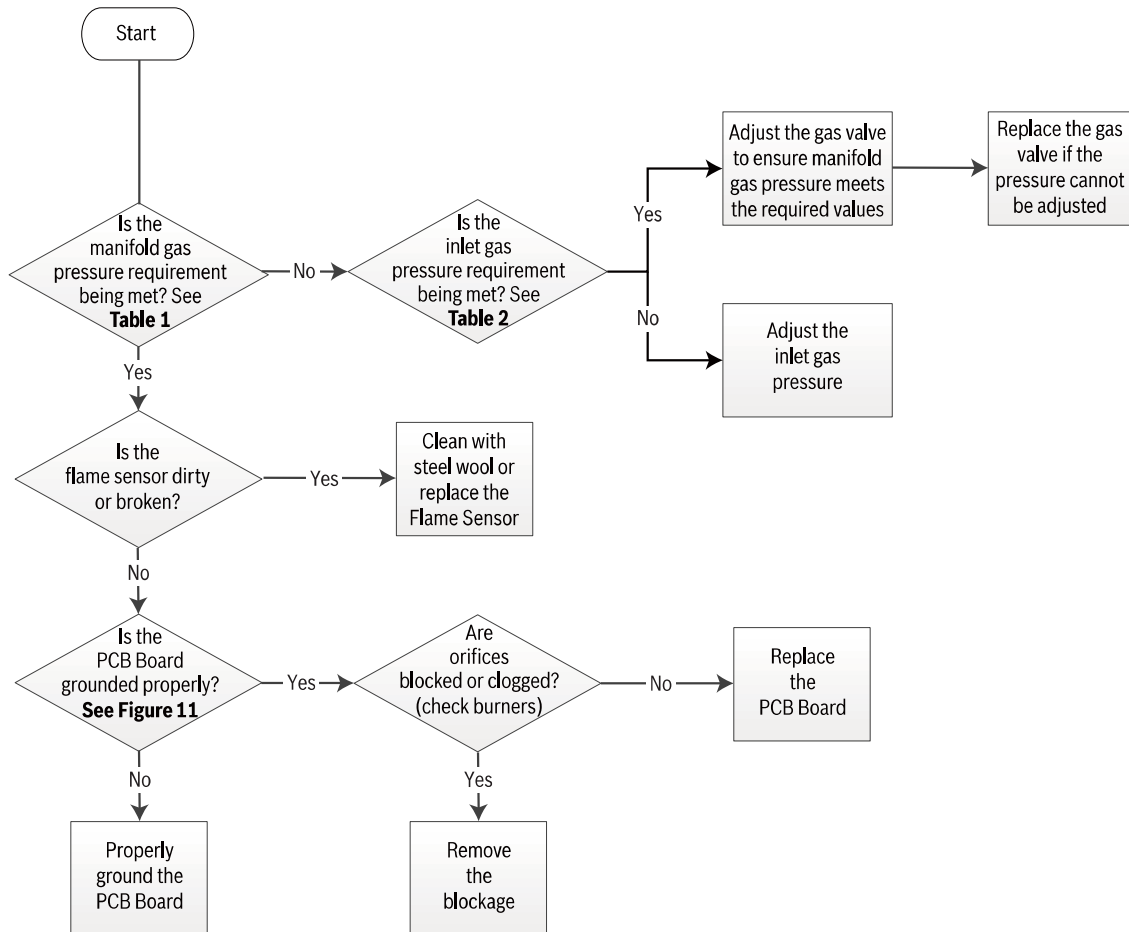


Figure 23

3.7 FL (Low Flame)

Troubleshooting Chart



Appendix A - Sequence of Operation

Two Stage Controller Logic

A1. There are two heating modes:

A1.1 Low Fire Heating Mode: Only W1 signal

A1.2 High Fire Heating Mode: Both W1 and W2 signal



If you are using a single stage thermostat, only a W1 signal will be sent. In this scenario, the furnace will upstage from low to high fire via a timing sequence. The time delay is set via the S1-1 & S1-2 dip switches on the control board.

A2. If the furnace fails to ignite, there is a separate logic for the re-ignition sequence.

A1 Heating Modes

A1.1 Low Fire Heating Mode Logic (only W1 signal):

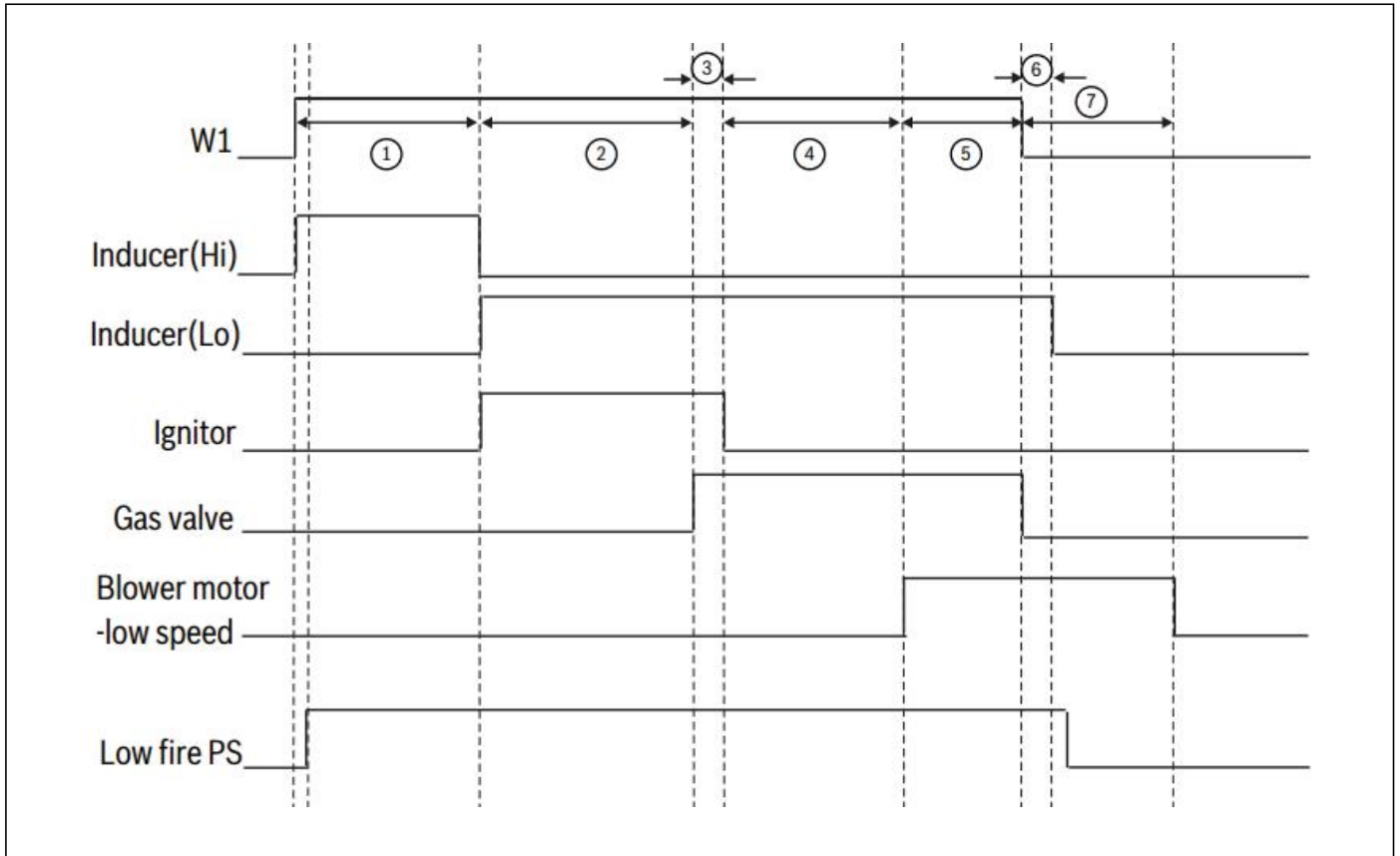


Figure 24

- ① When there is a call for heat (W1), the inducer will start on HIGH speed and the low pressure switch closes. This will last for **15s**.
- ② Inducer will turn to low speed and ignitor will energize. This preheating sequence lasts for **17s**.
- ③ After preheating, gas valve opens and the burners light. The ignitor will turn off after **3s**.
- ④ There is 30s time delay before blower motor starts.
- ⑤ The system is working properly.
- ⑥ When there is no call for heat (no W1 call) and no flame is sensed, post-purge begins. This will last for **15s**.
- ⑦ There is a fan delay to dissipate heat in the system. This time depends on the dip switch S1-3 & S1-4. The default time is **180s**.

A1.2 High Fire Heating Mode Logic (W1+W2 Signal):

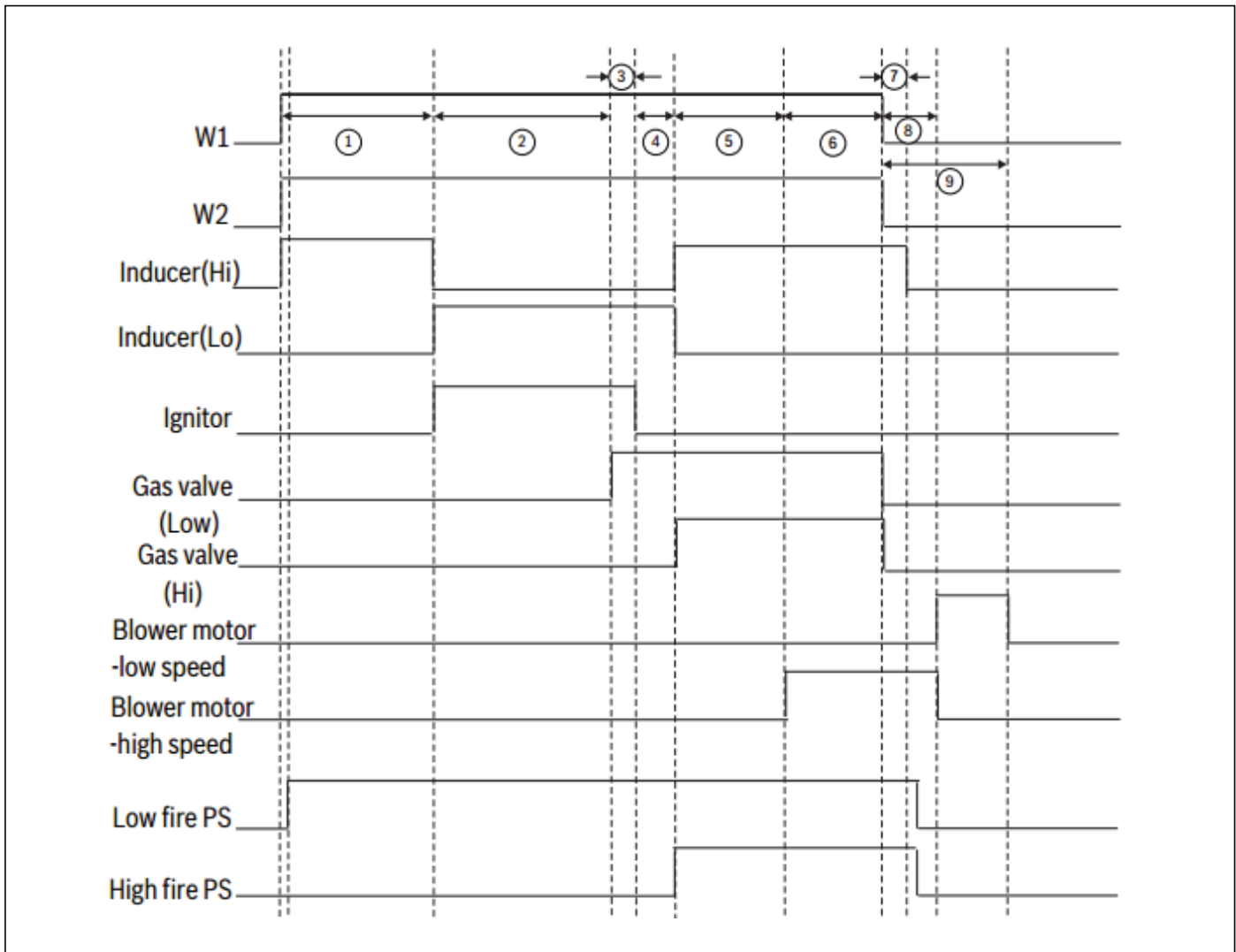


Figure 25

- ① When there is a call for heat (W1), the inducer will start on HIGH speed and the low pressure switch closes. This will last for **15s**.
- ② Inducer will turn to low speed and ignitor will energize. This preheating sequence lasts for **17s**.
- ③ After preheating, gas valve opens and the burners light. The ignitor will turn off after **3s**.
- ④ Before gas valve, inducer, pressure switch turn to high stage, there is a **5s** delay.
- ④ + ⑤ There is a time delay of **30s** before blower motor starts.
- ⑥ The system is working properly in high stage.
- ⑦ When there is no call for heat, there is a time delay before inducer shuts down. This will last for **15s**.
- ⑧ The blower motor will run at high speed for **30s** for fan delay.
- ⑨ There is a fan delay to dissipate heat in the system. This time depends on the dip switch S1-3 & S1-4. The default time is **180s**.

A2 Ignition Failure and Reignition Sequence

If the furnace fails to ignite, there is a separate logic for the re-ignition sequence:

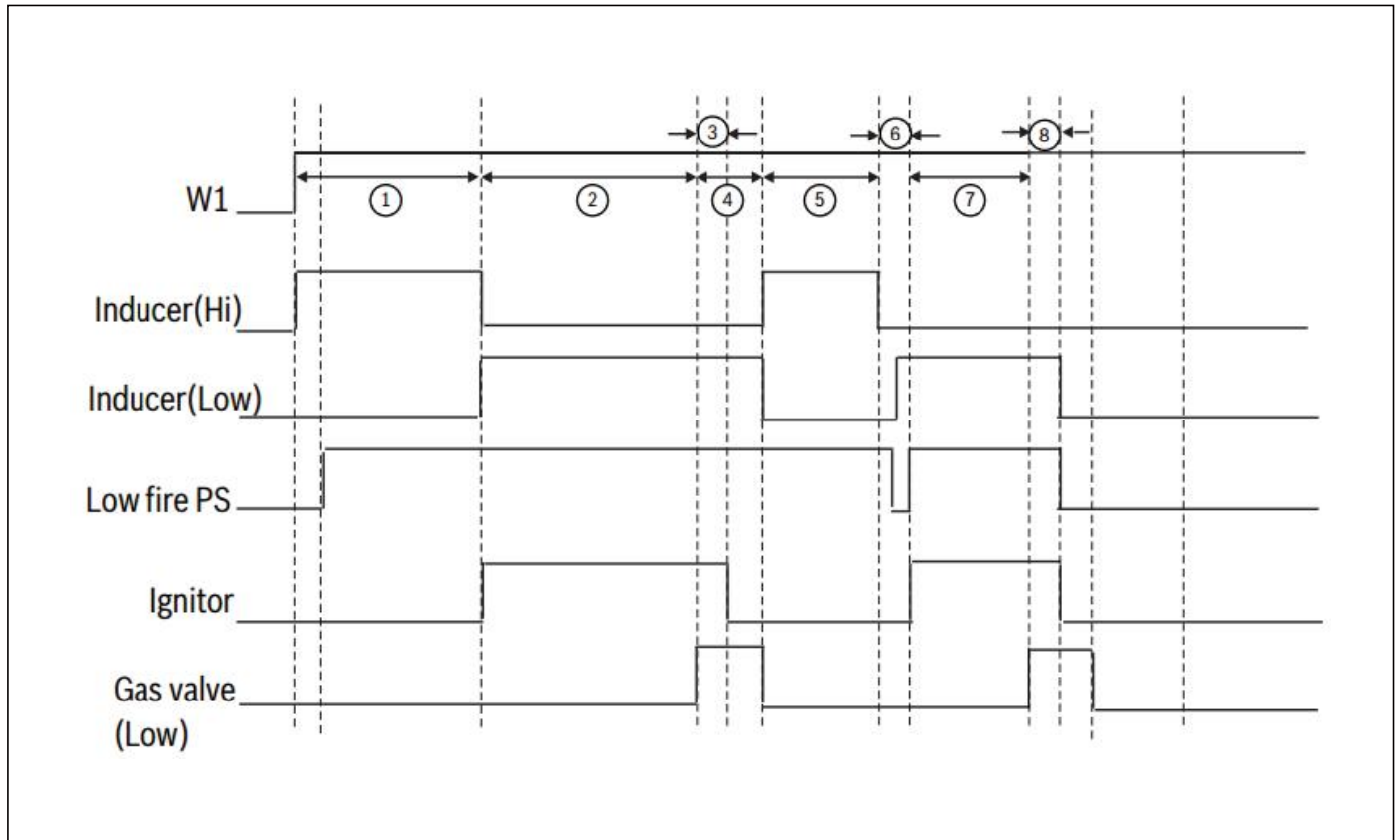


Figure 26

- ① When there is a call for heat (W1), the inducer will start on HIGH speed and the low pressure switch closes. This will last for **15s**.
- ② Inducer will turn to low speed and ignitor will energize. This preheating sequence lasts for **17s**.
- ③ After preheating, gas valve opens and the burners light. The ignitor will turn off after **3s**.
- ④ The gas valve will open for **4s** if there is no flame.
- ⑤ The inducer will run at high speed for **60s**.
- ⑥ Test of low pressure switch.
- ⑦ Preheating occurs for **27s**.
- ⑧ After preheating, gas valve opens. The ignitor will turn off after **3s**. After two failed ignition attempts, system will lock out.