

Installation, Operation and Maintenance Instructions for

SUMMIT

**Condensing Modulating Boiler
Models SMB-200, SMB-250**

**Condensing Modulating Water Heater
Models SMW-200, SMW-250**

FOR YOUR SAFETY: This product must be installed and serviced by a professional service technician, qualified in hot water boiler and heater installation and maintenance. Improper installation and/or operation could create carbon monoxide gas in flue gases which could cause serious injury, property damage, or death. Improper installation and/or operation will void the warranty.

⚠ WARNING

If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

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.
- Immediately call your gas supplier from a nearby 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 gas supplier.

To the Installer: After installation these instructions must be given to the homeowner or left on or near the appliance.

To the User: This booklet contains important information that will help you in maintaining and operating this heater. Please retain it for future reference.

⚠ AVERTISSEMENT

Assurez-vous de bien suivre les instructions données dans cette notice pour réduire au minimum le risque d'incendie ou d'explosion ou pour éviter tout dommage matériel, toute blessure ou la mort.

Ne pas entreposer ni utiliser d'essence ni d'autres vapeurs ou liquides inflammables dans le voisinage de cet appareil ou de tout autre appareil.

QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:

- Ne pas tenter d'allumer d'appareils.
- Ne touchez à aucun interrupteur. Ne pas vous servir des téléphones dans le bâtiment où vous trouvez.
- Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur.
- Si vous ne pouvez rejoindre le fournisseur de gaz, appelez le service des incendies.

L'installation et l'entretien doivent être assurés par un installateur ou un service d'entretien qualifié ou par le fournisseur de gaz.

À l'installateur : Après l'installation, ces instructions doivent être remises au propriétaire de la maison ou demeurer près de l'appareil.

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SECTION 1. General Information

USING THIS MANUAL – Because the SUMMIT SMB-200/250 Boilers and SMW-200/250 Water Heaters are identical appliances, with the exception of materials of manufacture, labels and ultimate use application, this manual provides information for the proper installation, operation and maintenance of both products. Where differences exist between the application of the appliances and their operation, the sections pertinent to only one appliance or the other will be so identified.

⚠ WARNING

The SUMMIT hydronic, condensing, boiler or water heater **must** be installed in accordance with the procedures detailed in this manual, or the Laars Heating Systems warranty will be voided. The installation must conform to the requirements of the local jurisdiction having authority, and, in the United States, to the latest edition of the National Fuel Gas Code, ANSI Z223.1. In Canada, the installation must conform to the latest edition of CAN/CGA-B149.1 Natural Gas Installation Code or CAN/CGA-B149.2 Propane Gas Installation Code, and/or local codes. Any modifications to the boiler, its gas controls, or wiring may void the warranty. If field conditions require modifications, consult the factory representative before initiating such modifications.

1.1 Introduction

This manual provides information necessary for the installation, operation, and maintenance of Laars Heating Systems SUMMIT copper tube, condensing, appliances. Read it carefully before installation.

All application and installation procedures should be reviewed completely before proceeding with the installation. Consult the Laars Heating Systems factory, or local factory representative, with any problems or questions regarding this equipment. Experience has shown that most operating problems are caused by improper installation.

Direct vent-sealed combustion:

The SUMMIT appliance does not and should not get combustion air from inside the building. All combustion air is drawn in from outdoors through a 3-inch or 4-inch diameter plastic pipe. PVC, ABS or CPVC pipe is used for air intake. **EXHAUST VENTING** may only be done in **CPVC or AL29-4C Stainless Steel Venting Systems that comply with UL Standard 1738.**

No chimney....flue....or draft inducer required. Because this is a sealed combustion, forced draft appliance, it does not require, and must not be connected to a chimney, existing venting system, or draft inducer.

⚠ Caution

Connection of this vent to a chimney, existing venting system, or draft inducer will result in poor and possibly dangerous operation.

The supplied vent terminations are designed to be installed through the nearest outside wall.

The SUMMIT appliance is protected against over pressurization. A pressure relief valve is fitted to all appliances. It is installed in the dedicated fitting on the top of the appliance.

IMPORTANT: The inlet gas pressure to the appliance must not exceed 13" WC.

A high quality circulator is built into the SUMMIT appliance and will provide sufficient head pressure and volume to circulate water to the heating system or storage tank(s) (see Table 3).

All installations must be made in accordance with the 1). American National Standard Z223.1-Latest Edition "National Fuel Gas Code" or 2). CAN/CGA 1-B149 "Installation Codes for Gas Burning Appliances and Equipment" and with the requirement of the local utility or other authorities having jurisdiction. Such applicable requirements take precedence over the general instructions contained herein.

All electrical wiring is to be done in accordance with the local codes, or in the absence of local codes, with: 1). The National Electrical Code ANSI/NFPA No. 70-latest Edition, or 2). CSA STD. C22.1 "Canadian Electrical Code - Part 1". This appliance must be electrically grounded in accordance with these codes.

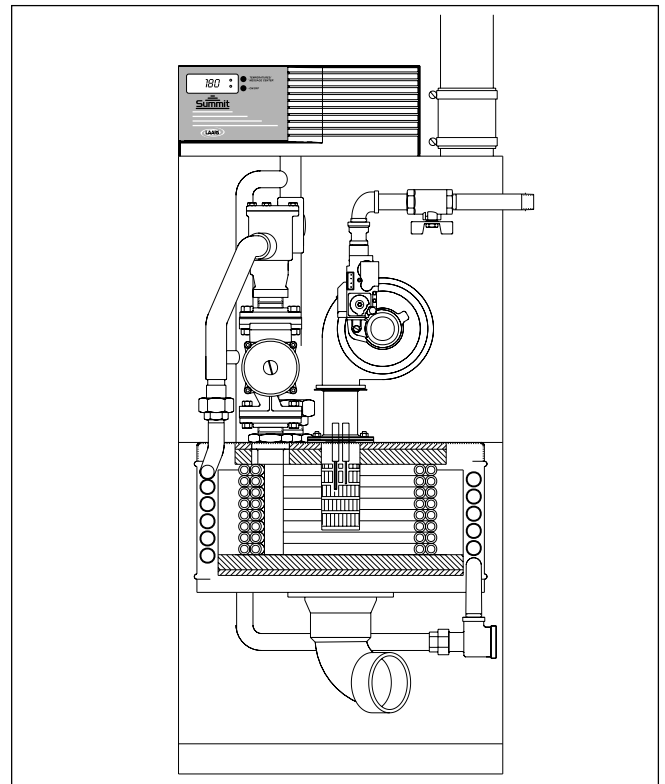


Figure 1. Assembly View of the Unit.

1.2 Warranty

Laars Heating Systems SUMMIT appliances are covered by a limited warranty. The owner should fill out the warranty registration card and return it to Laars Heating Systems.

All warranty claims must be made to an authorized Laars Heating Systems representative or directly to the factory. Claims must include the serial number and model (this information can be found on the rating plate), installation date, and name of the installer. Shipping costs are not included in the warranty coverage.

Some accessory items are shipped in separate packages. Verify receipt of all packages listed on the packing slip. Inspect everything for damage immediately upon delivery, and advise the carrier of any shortages or damage. Any such claims should be filed with the carrier. The carrier, not the shipper, is responsible for shortages and damage to the shipment whether visible or concealed.

1.3 Materials Installer Must Provide

1. Total combined feet allowed for intake and exhaust vent pipe per instructions. The following charts show acceptable materials for intake and exhaust pipes:

Acceptable Intake Pipe Material	
Model 200	Model 250
3-inch or 4-inch PVC schedule 40 pipe per ASTM D-1785 std.	3-inch or 4-inch PVC schedule 40 pipe per ASTM D-1785 std.
3-inch or 4-inch PVC DWV pipe per ASTM D-2665 std.	3-inch or 4-inch PVC DWV pipe per ASTM D-2665 std.
3-inch or 4-inch ABS-DWV pipe per ASTM D2661 std. or ASTM F-628 std.	3-inch or 4-inch ABS-DWV pipe per ASTM D2661 std. or ASTM F-628 std.
3-inch or 4-inch CPVC schedule 40 or 80 pipe per ASTM F441 std.	3-inch or 4-inch CPVC schedule 40 or 80 pipe per ASTM F441 std.
3-inch or 4-inch AL29-4C stainless steel complying with UL Std. 1738	3-inch or 4-inch AL29-4C stainless steel complying with UL Std. 1738
Acceptable Exhaust Vent Material	
Model 200	Model 250
3-inch or 4-inch PVC schedule 40 pipe per ASTM D-1785 std.	3-inch or 4-inch CPVC schedule 40 or 80 pipe per ASTM F441 std.
3-inch or 4-inch PVC DWV pipe per ASTM D-2665 std.	3-inch or 4-inch AL29-4C stainless steel complying with UL Std. 1738
3-inch or 4-inch ABS-DWV pipe per ASTM D2661 std. or ASTM F-628 std.	
3-inch or 4-inch CPVC schedule 40 or 80 pipe per ASTM F441 std.	
3-inch or 4-inch AL29-4C stainless steel complying with UL Std. 1738	

The solvent cement for pipe joints must comply with the following standards:

- i. PVC pipe D2564 / ABS pipe D2235, or CPVC pipe F493
 - ii. CSA listed solvent cement for the PVC, ABS or CPVC pipe used.
2. Electrical connection to a 120VAC/15Amp service.
 3. Gas connection that will provide 250 cubic feet/hour at 4 to 13 inch w.c.
 4. Condensate drainage: a floor drain is preferred, and a condensate pump can be used if required. Check local codes for information about proper disposal of condensate in your area.
 5. Miscellaneous copper fittings and bronze valves will be required to complete the piping system. Use only plastic fittings (except Nylon®) for condensate drain lines.

1.4 Unpacking

The SUMMIT appliance is shipped in a single crate with the following standard components on top of the appliance.

1. Exhaust terminal
2. Intake terminal
3. Backing plates (4)
4. Hubless couplings (2)
5. Terminal Screens, 4" (2)

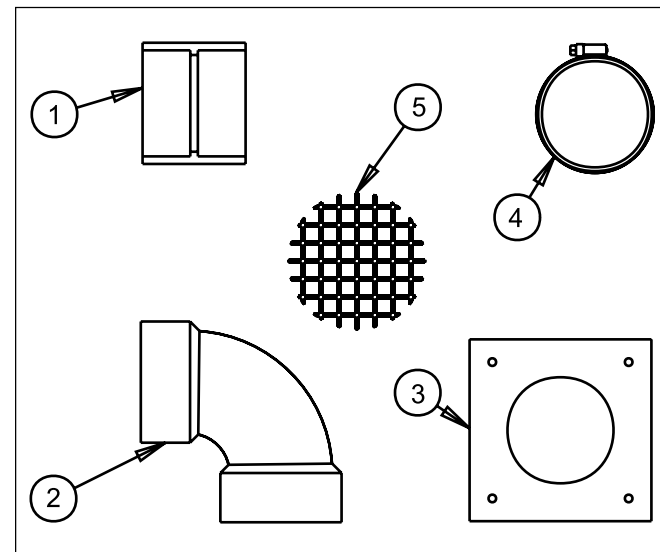


Figure 2. Contents of shipping package.

1. Remove all packing and tie-down materials.
2. Check contents of the carton against items shown above.

1.5 Locating the SUMMIT Appliance

The appliance should be located to provide clearances on all sides for maintenance and inspection. It should not be located in an area where leakage of any connections will result in damage to the area adjacent to the appliance or to lower floors of the structure.

When such a location is not available, it is recommended that a suitable drain pan, adequately drained, be installed under the appliance.

The appliance shall be installed so that the gas ignition system components are protected from water (dripping, spraying, rain, etc.) during appliance operation or service (circulator replacement, control replacement, etc.).

The appliance is design certified by CSA-International (AGA / CGA) for installation on combustible flooring; in basements; in closets, utility rooms or alcoves. **SUMMIT Boilers or Water Heaters must never be installed on carpeting.**

The location for the appliance should be chosen with regard to the vent pipe lengths and external plumbing. If there is potential for snow accumulation in the local area, both vent terminals should be installed at an appropriate level above grade.

The following dimensions and requirements should be met when choosing the locations for the appliance:

Appliance Surface	Clearance from Combustible Material		Service Access Clearance	
	U. S./Canada		U. S.	Canada
Left Side	1" 2.5cm	6" 15cm	24" 61cm	
Right Side	1" 2.5cm	12" 30cm	24" 61cm	
Top	1" 2.5cm	14" 36cm	24" 61cm	
Back	1" 2.5cm	9" 23cm	24" 61cm	
Front	1" 2.5cm	24" 61cm	24" 61cm	
Vent	0"			

Table 1. Clearances.

NOTE: Roof terminations for air intake terminal must prevent entry of rain water.

1.6 Locating Appliance for Correct Vent Distance From Outside Wall or Roof Termination

The forced draft combustion air blower in the SUMMIT appliance has sufficient power to vent properly when the following guidelines are followed.

Intake	Exhaust
Maximum run: 3" pipe size 55 equivalent feet 4" pipe size 105 equivalent feet	Maximum run: 3" pipe size 55 equivalent feet 4" pipe size 105 equivalent feet
Minimum run: 11½ equivalent feet	Minimum run: 21 equivalent feet
Intake Terminal is P/N 2400-102	Exhaust Terminal is P/N 2400-104

Equivalent feet is determined by adding 10 linear feet for each 90° elbow and 5 linear feet for each 45° elbow to the actual linear feet of pipe required to be installed.

Example: 8' of pipe, 2 x 45° elbows and a 90° elbow.

Equivalent Feet: 8' + (2 x 5') + (1 x 10') = 28.

If a 4" pipe size is used to permit longer vent runs the installer must supply 4" hubless couplings (2) and 3 x 4 bushings (2) to adapt to the appliance fittings. The supplied vent terminals may be used with 3" diameter pipes through the outside wall. Reducing couplings should be located inside the outside wall to increase to the 4" pipe size. A reducing coupling and 1' of 3" pipe must be considered as 5 equivalent feet.

NOTE: It is required that a minimum horizontal separation of 18" be maintained between the intake and exhaust terminals and that both terminals be installed on the same wall of the building. The intake terminal must be installed at an elevation 6" below the exhaust terminal to prevent exhaust gases from entering the intake.

1.7 Locating Appliance for Proper Vent Height

The vent locations you select must permit direct pipe runs to the terminal from the appliance. Since the SUMMIT appliance is designed to drain any water that collects in the vent, it is important that you do not build any traps or low points into the vent where water could collect and restrict the vent. It is recommended that a pitch of ¼" per foot of vent be built into the vent system to direct any water in the vent back toward the appliance. Note that standard DWV elbows have a built in allowance for the required ¼" per foot pitch.

1.8 Locating Appliance with Respect to Ventilation

While the SUMMIT appliance requires no indoor air for combustion, adequate airflow around the appliance must be provided for proper cooling of electrical components.

1.9 Locating Appliance with Respect to Storage Tank(s) SMW-200/250 Water Heater

For best results the SMW-200/250 water heater should be located within 10 feet of the storage tank(s).

If the appliance must be installed with longer piping runs, then larger diameter pipe or tubing must be used. Calculate the necessary pipe diameter for the installation using Table 3.

1.10 Locating Appliance with Respect to Return/Supply Header SMB-200/250 Boiler

For the best results the SUMMIT SMB-200/250 Boiler should be located within 10 feet of the supply and return headers.

If the appliance must be installed with longer piping runs, then the larger diameter tubing must be used. Calculate the necessary pipe diameter for the installation using Table 3.

SECTION 2. Venting

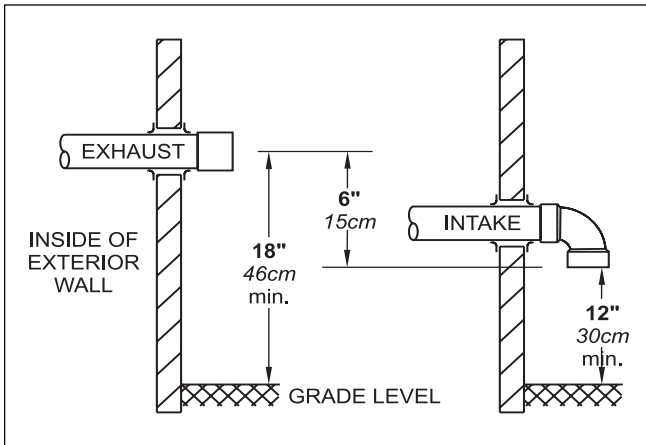


Figure 3. Suggested Vent Terminal Installations.

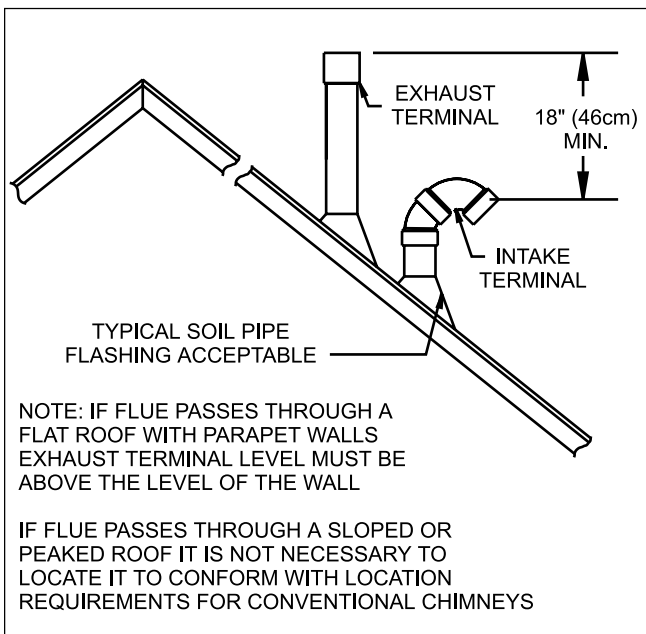


Figure 4. Alternate Vent Terminal Installations.

2.1 Locating Vent Openings On Outside Wall

2.1.1 Exhaust Terminal Location

The exhaust pipe and terminal fitting require a 4" diameter hole through the outside wall. The centerline of this opening must be at least 18" above grade and at least 14" (3' in Canada) from any other building opening such as doors, windows, etc.

Vent opening should be well away from shrubbery or other obstructions that would block or restrict the exhaust.

Whenever possible, locations under windows or near doors should be avoided. Because the SUMMIT is a condensing appliance, steaming at the flue terminal is a normal occurrence and it should be considered when deciding flue terminal location.

2.1.2 Intake Terminal Location

The intake pipe and terminal require a separate 4" diameter hole to install the intake fitting. The centerline of the hole should be at least 16½" above grade outdoors and 18" away horizontally from the exhaust outlet. The intake should never be located above the exhaust terminal.

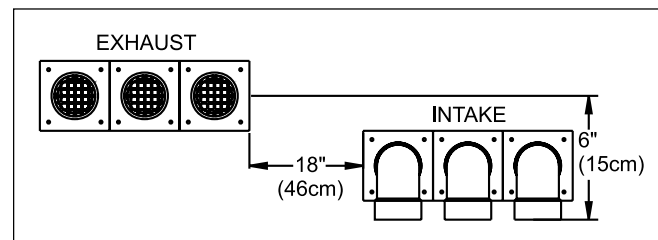


Figure 5. Multiple Units Minimum Vent Terminal Separation.

2.2 Installing Vent Piping / Terminals

The appliance is provided with intake and exhaust terminals for use with 3" diameter plastic pipe. If AL29-4C stainless steel venting materials that comply with UL 1738 Standard are used, the terminals for that system shall be used and supplied by the installer.

The installer is responsible for obtaining the vent pipe and fittings. The maximum combined length of the intake and exhaust pipe and maximum number of elbows are determined by using the guidelines in Section 1.6.

The following steps are recommended for vent installation of **Approved** plastic venting: For installation of approved stainless steel venting systems, follow the venting system suppliers instructions.

1. Obtain the necessary 3" or 4" diameter plastic piping and fittings as determined beforehand.
2. Position appliance at previously selected location.
3. Unpack vent terminals and vent terminal backing plates located in the box on top of appliance.
4. Cut holes in outside wall for vent terminals in previously selected locations.
5. Mount the vent terminals backing plates.
6. Fit all of the vent pipes together without cementing. Make sure that there are no water traps and that any pitch is inclined back towards the appliance.
7. Make sure that the flexible vent connections at the appliance fit properly.

8. Begin cementing the intake and exhaust pipes, start at the vent terminals and work back towards the appliance. **Note: The intake terminal is the 90° elbow fitting that is designed to be installed facing down.**
9. Support both horizontal vent pipes with pipe hangers every 5'. The weight of venting must not be supported by appliance connectors.
10. Tighten the flexible couplings to connect the appliance to the vent. **DO NOT CEMENT VENT PIPES TO APPLIANCE — USE COUPLINGS PROVIDED.**

SECTION 3.

Gas Connections

3.1 Gas Supply and Piping

Gas piping should be supported by suitable hangers or floor stands, not the appliance.

Review the following instructions before proceeding with the installation.

1. Verify that the appliance is fitted for the proper type of gas by checking the rating plate. Laars Heating Systems appliances are normally equipped to operate at elevations up to 2000 feet. However, the SUMMIT appliance will function properly without the use of high altitude modification at elevations up to 4500 feet (1372 m). Appliances equipped to operate at higher altitudes have appropriate stickers or tags attached (next to the rating plate).
2. Referring to Table 2, size supply piping to keep flow capacity to the appliance above 250 cubic feet per hour (CFH) per installed appliance.
3. Run gas supply line in accordance with all applicable codes.
4. Locate and install manual shutoff valves in accordance with state and local requirements.
5. Install drip leg and ground joint union (Figure 6).
6. All threaded joints should be coated with piping compound resistant to action of liquefied petroleum gas.
7. The SUMMIT appliance and its individual shutoff valve must be disconnected from the gas supply piping during any pressure testing of that system at test pressures in excess of 1/2 PSIG (3.45kpa).
It must be isolated from the gas supply system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 PSIG (3.45kpa).
8. The SUMMIT appliance and its gas connection must be leak tested before placing it in operation.

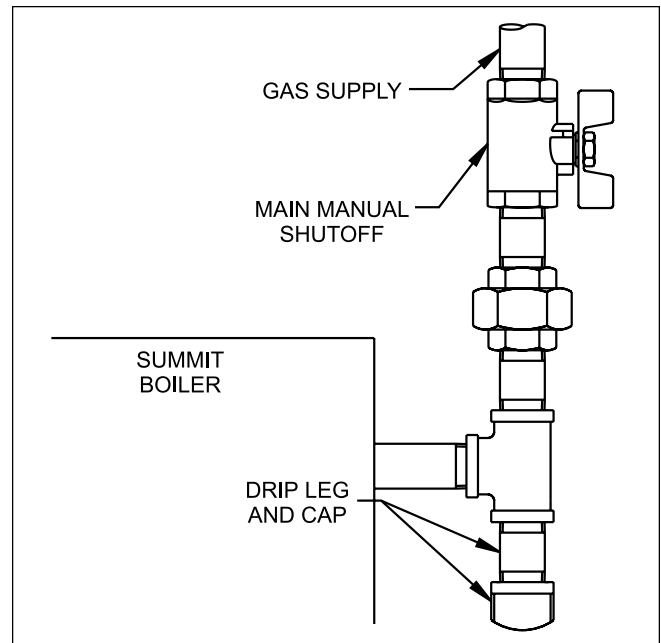


Figure 6. Gas Supply Piping.

Length of Pipe	Capacity of Pipe in MBTU/HR (.6 Specific Gravity)		
	¾"	1"	1½"
10' (3m)	278	520	1,050
20' (6m)	190	350	730
30' (9m)	152	285	590
40' (12m)	130	245	500
50' (15m)	115	215	440
75' (23m)	93	175	360
100' (30m)	79	150	305
150' (46m)	64	120	250
Additional length to be added for each tee or bend	1.7' (0.5m)	2.2' (0.7m)	2.7' (0.8m)

Table 2. Gas Supply Piping.

9. Purge all air from gas lines.

⚠ Caution:

Do not use open flame to check for leaks.

NOTE: The SUMMIT appliance and all other gas appliances sharing the gas supply line must be firing at maximum capacity to properly measure the inlet supply pressure. The pressure can be measured at the supply pressure port on the gas valve (Figure 20). Low gas pressure could be an indication of an undersized gas meter, undersized gas supply lines and/or an obstructed gas supply line.

10. The correct burner manifold gas pressure (offset) is pre-set at the factory, and normally requires no further adjustment. See Section 7.2.2.1 Offset

and Throttle Adjustment for the proper method of verification.

11. Before operating the appliance, the complete gas supply system and all connections must be tested for leaks using a soap solution.

SECTION 4A.

Water Connections

SMB-200/250 Boiler

4A.1 Heating System Piping: Hot Supply Connections

NOTE: This appliance must be installed in a closed pressure system with a minimum of 10 psi static pressure.

Hot water piping should be supported by suitable hangers or floor stands, NOT by the appliance. Due to expansion and contraction of copper pipe, consideration should be given to the type of hangers used. Rigid hangers may transmit noise through the system resulting from the piping sliding in the hangers. It is recommended that padding be used when rigid hangers are installed.

SUMMIT boilers must not be direct connected to a heating system utilizing oxygen permeable tubing, (see warranty). Provide a water to water heat exchanger between systems to prevent corrosion of internal pump, pump flanges, buffer tank (if installed) or other components.

THE SUMMIT BOILER MUST BE CONNECTED IN A PRIMARY/SECONDARY TYPE SYSTEM OR WITH A FULL SIZED BYPASS.

1. Connect the 1¼" supply connection on the appliance to the system bypass. Size the combined length of supply and return to the loop using Table 3.

Copper tube or pipe size	Maximum allowable tubing length	Amount deducted for each additional 90° elbow	Amount deducted for each additional 45° elbow
1¼"	40' (12m)	2' (0.6m)	1½' (0.5m)
1½"	120' (37m)	2' (0.6m)	1½' (0.5m)
2"	270' (82m)	2' (0.6m)	1½' (0.5m)

Table 3. Water Pipe and Tube Sizing.

2. Pipe the discharge of the relief valve, full size, to a drain or in a manner to prevent injury in the event of pressure relief.
3. Install an air purger, an air vent, a diaphragm type expansion tank, and a hydronic flow check in the system supply loop. Minimum fill pressure must be 12psig.
4. Install shutoff valves where required.

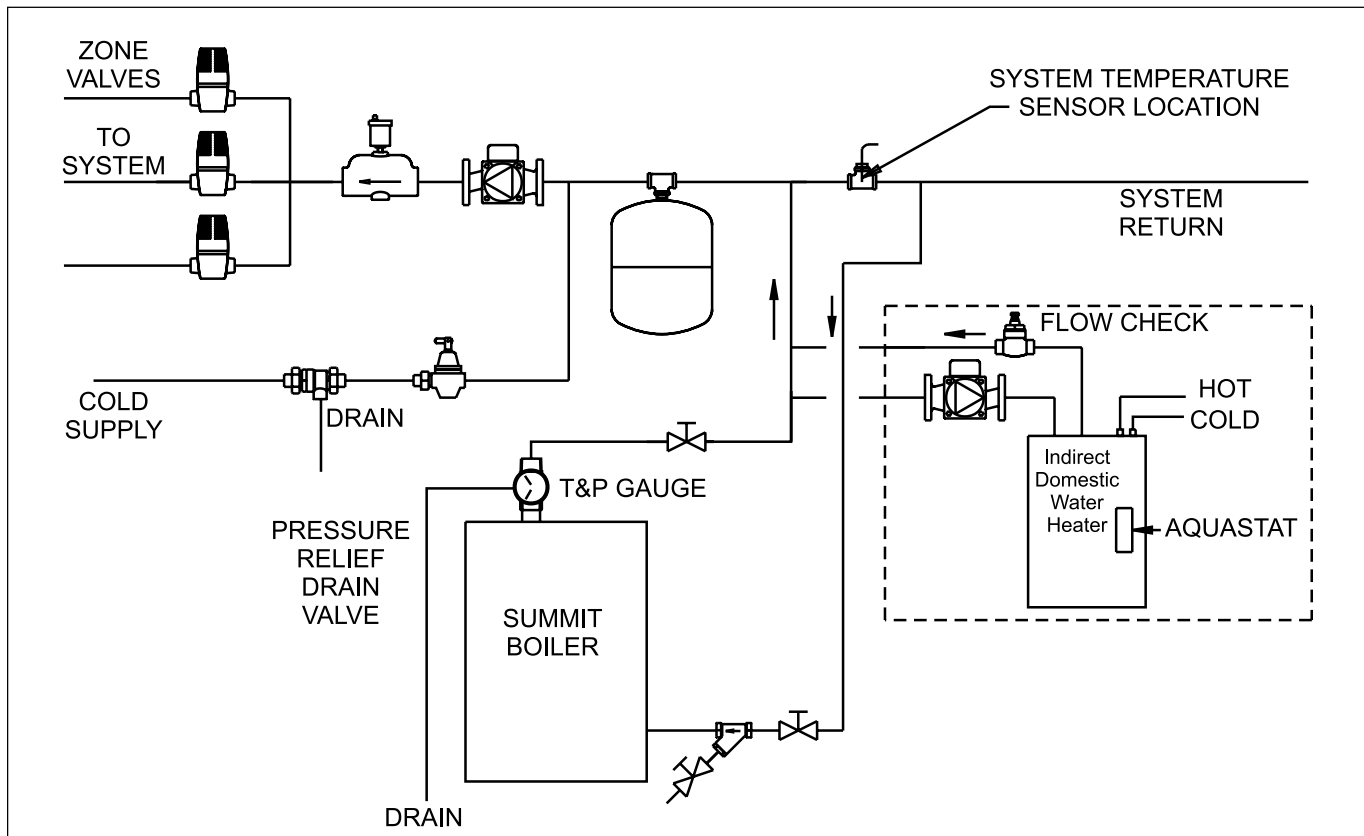


Figure 7. Piping for Heating and Optional Domestic Hot Water.

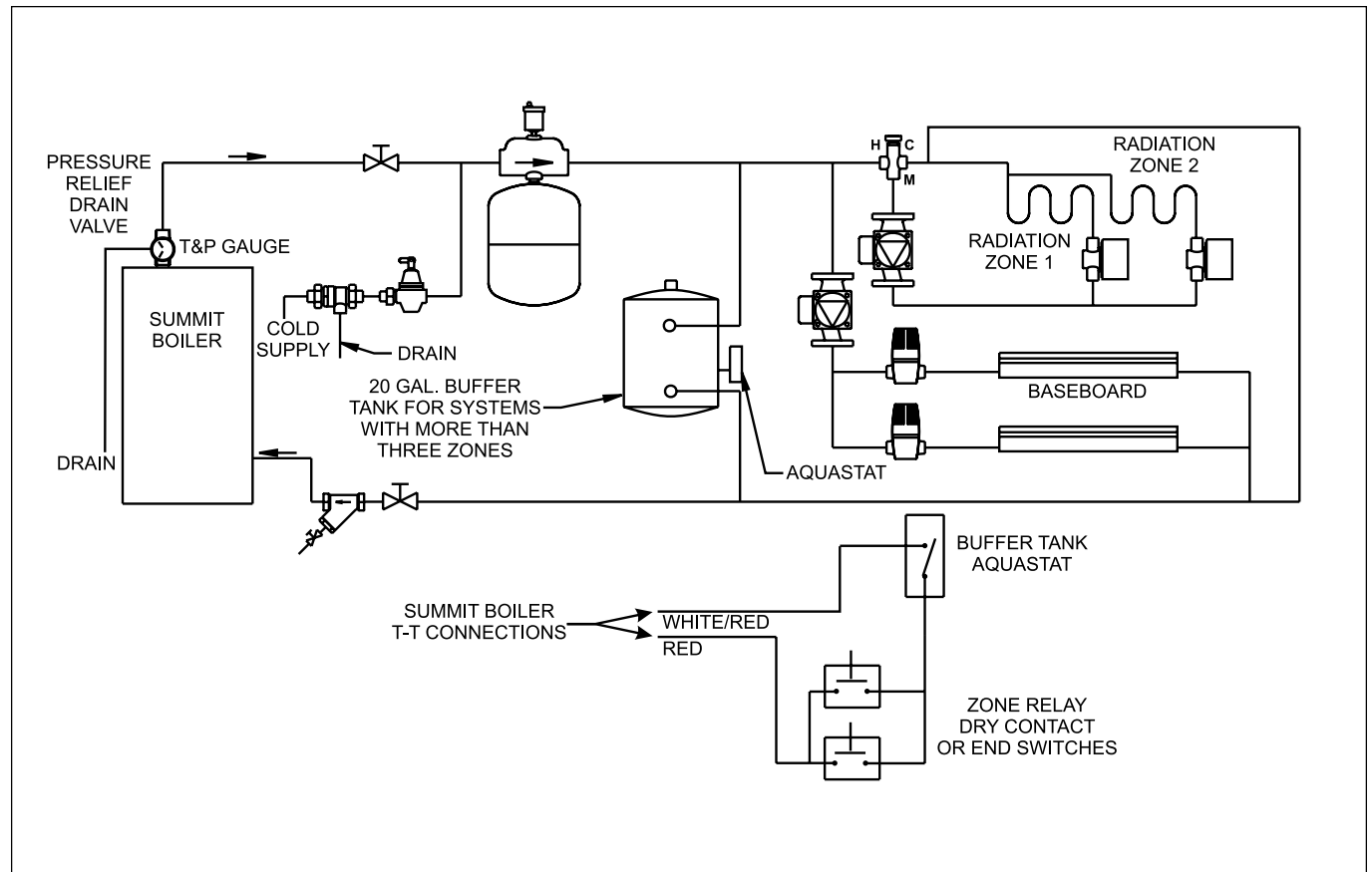


Figure 8. Radiant and Baseboard Heat with More Than Three Zones.

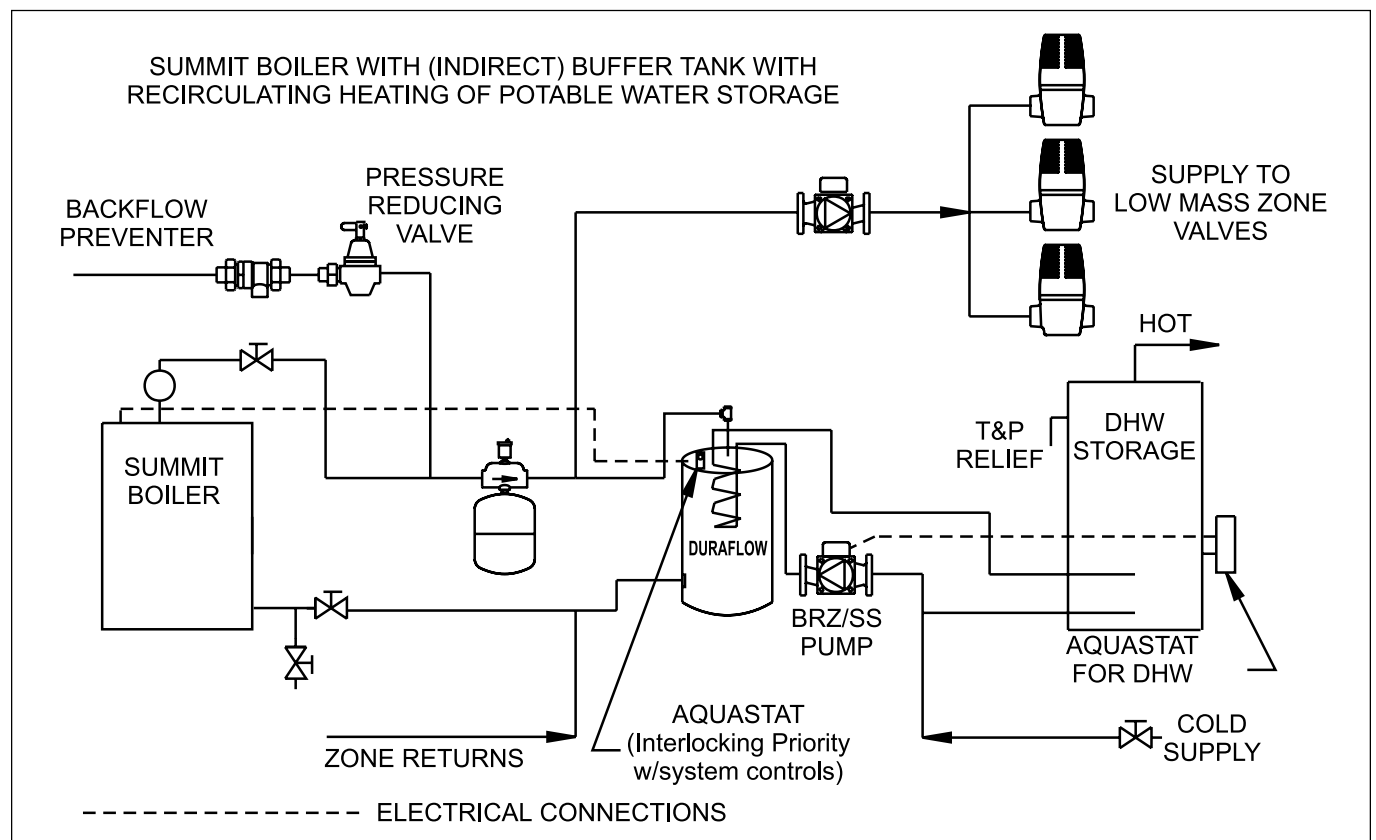


Figure 9. Indirect Tank as Buffer with Potable Water Storage Tank.

4A.2 Return Connections

1. Install a strainer between the SUMMIT boiler and the system.
2. Connect the 1¼" return connection on the appliance to the return side of the system circulating loop.
3. Install a check valve (multiple appliances only), a shutoff valve and a drain valve near the appliance in the return line.
4. Install a properly sized circulator in the system loop.

4A.3 Cold Water Make-Up

1. Connect the cold water supply to the inlet connection of an automatic fill valve.
2. Install a suitable back flow preventer between the automatic fill valve and the cold water supply.
3. Install shut off valves where required.

NOTE: The boiler, when used in connection with a refrigeration system, must be installed so the

chilled medium is piped in parallel with the boiler with appropriate valves to prevent the chilled medium from entering the boiler.

The boiler piping system of a hot water heating boiler connected to heating coils located in air handling appliances where they may be exposed to refrigerated air circulation must be equipped with flow control valves or other automatic means to prevent gravity circulation of the boiler water during the cooling cycle.

The boiler when installed above the radiation level must be provided with a low water cutoff device at the time of boiler installation.

SECTION 4B.

Water Connections

SMW-200/250 Water Heater

4B.1 Water System Piping, Fittings and Accessories

Hot water piping should be supported by suitable hangers or floor stands, NOT by the appliance. Due to expansion and contraction of copper pipe, consideration should be given to the type of hangers used. Rigid hangers may transmit noise through the

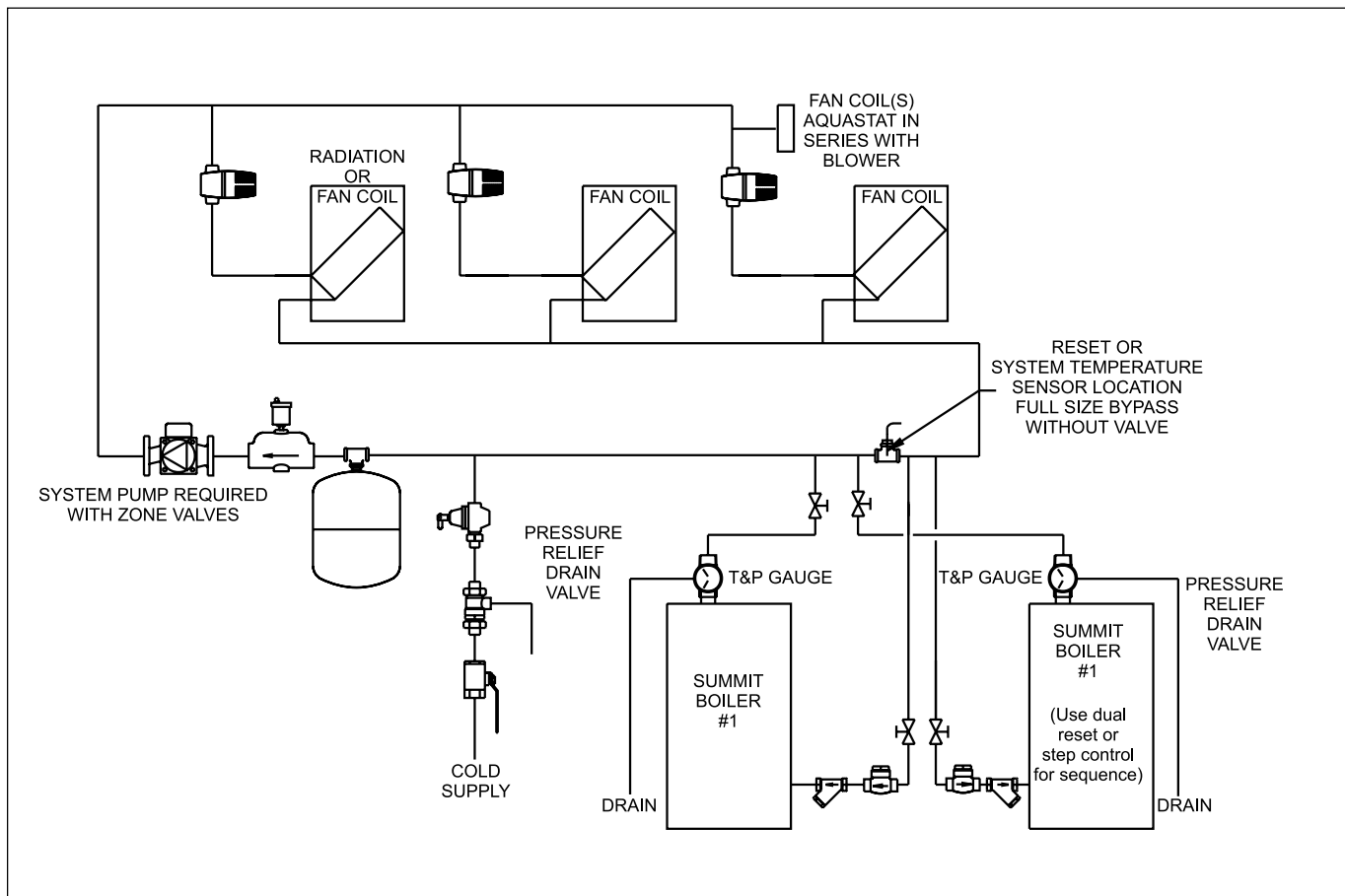


Figure 10. Piping Diagram for Modular Units and/or Hydro Air Systems.

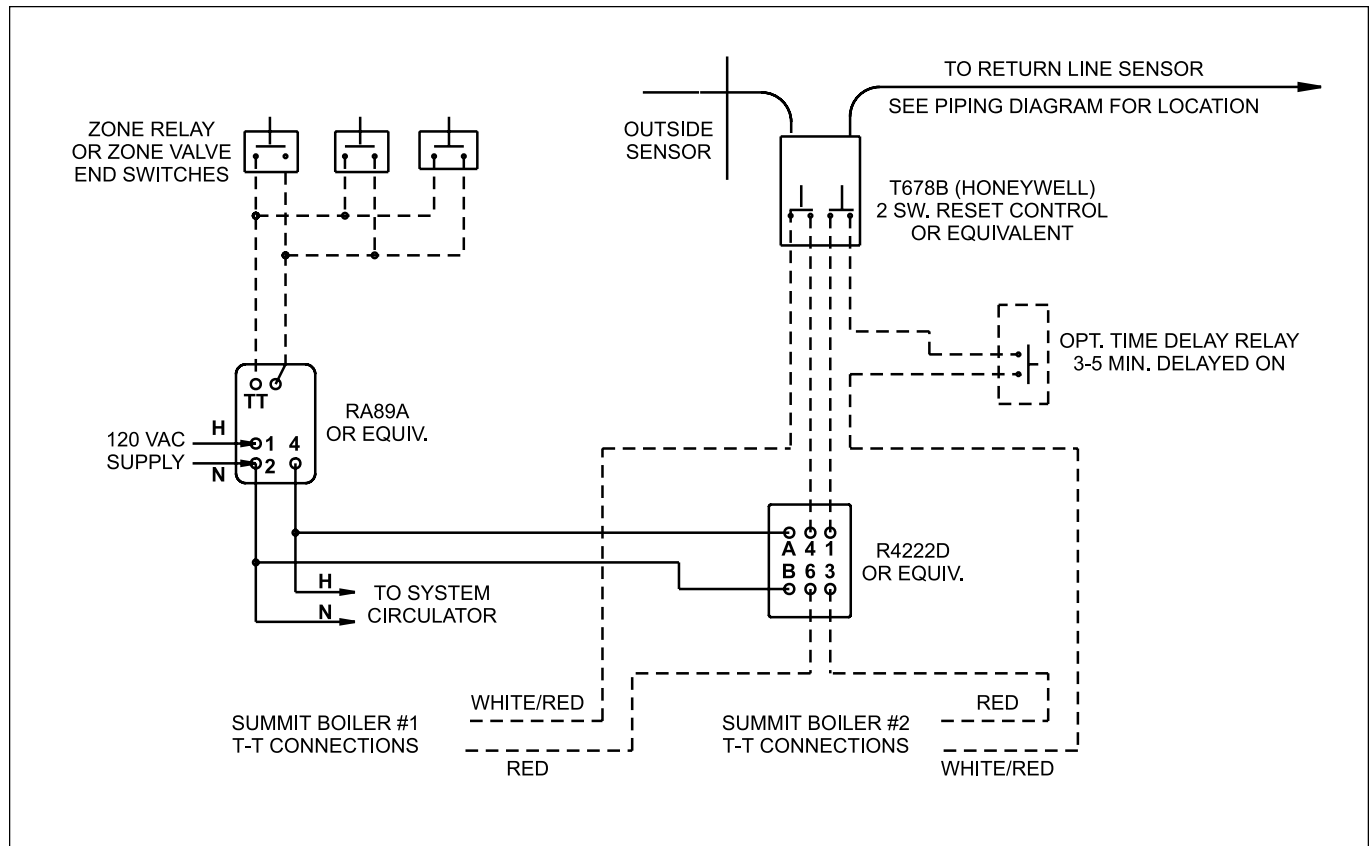


Figure 11. Wiring Diagram.

system resulting from the piping sliding in the hangers. It is recommended that padding be used when rigid hangers are installed.

Installing Tank & Piping

The SMW-200/250 can be used with several different types of readily available storage tanks. A bronze circulating pump is built into the water heater. The pump draws water from the storage tank and pumps the water through the heater and back into the tank.

Position the Storage Tank(s)

At the previously selected locations, position the storage tank(s). Use Table 3 to determine the pipe size necessary to provide adequate flow between the SMW-200/250 and the tank(s).

Hot Water Outlet Piping, Fittings, and Accessories

1. Begin piping to the tank from the hot water outlet at the top of the SMW-200/250 cabinet.
2. Pipe the outlet from the relief valve (located on top of the appliance) such that any discharge

from the relief valve will be conducted to a suitable place for disposal when relief occurs. Do not reduce line size or install any valves in this line. The line must be installed to allow complete drainage of both the valve and the line.

3. Install a shut off valve in the piping between the thermometer fitting and the tank.

Cold Water Supply Piping, Fittings and Accessories

1. Install a strainer between the SMW 200/250 and the system. For proper pipe size and distance limitations, refer to Table 3.
2. Connect a drain valve and a shut off valve to the SMW-200/250 cold inlet. On multiple appliances install a check valve at each appliance's cold water inlet.
3. Where check valves have been installed on cold water inlet piping, check to be sure system has an adequately sized expansion tank to allow thermal expansion to occur.

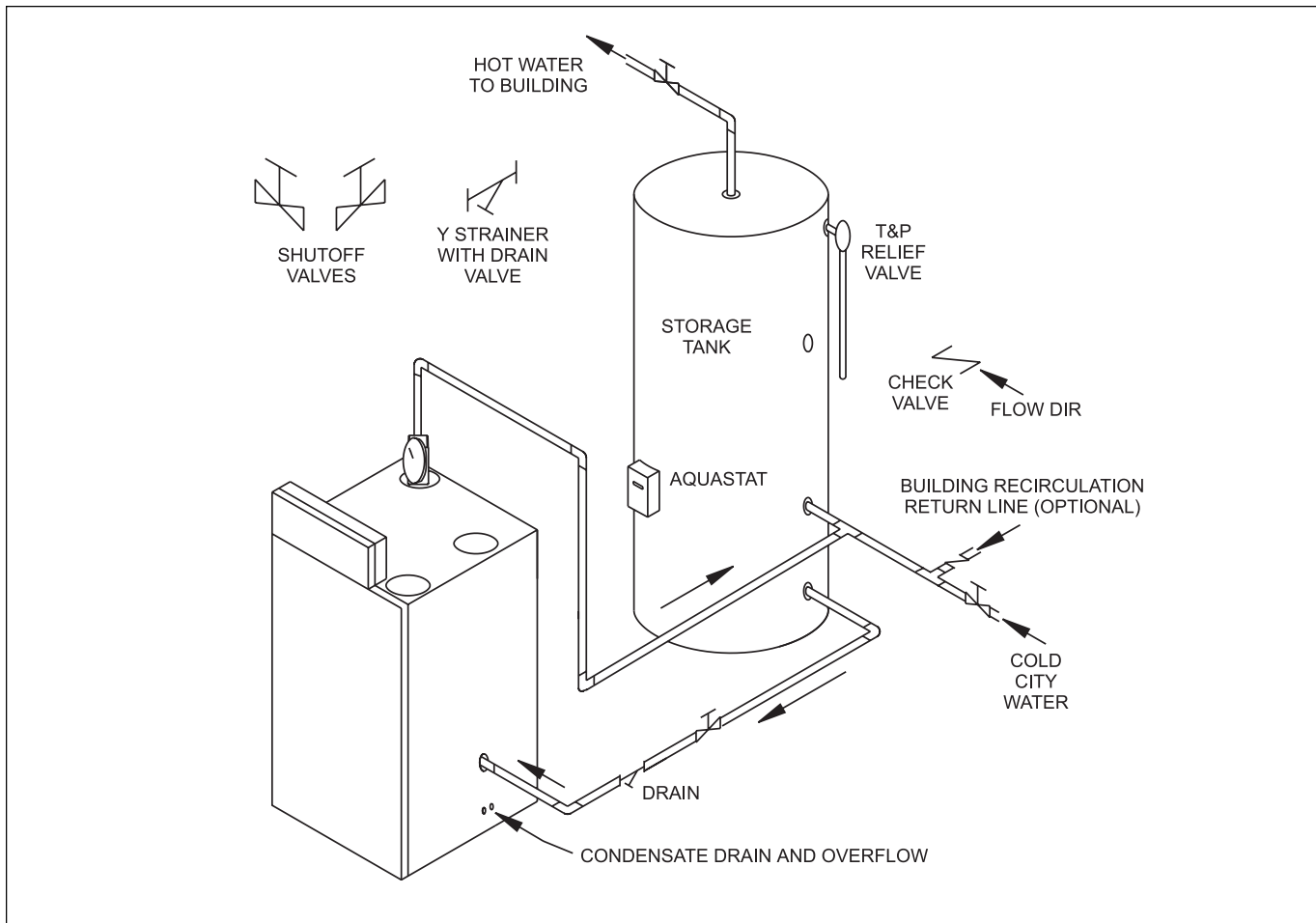


Figure 12. Single Summit Water Heater and Storage Tank.

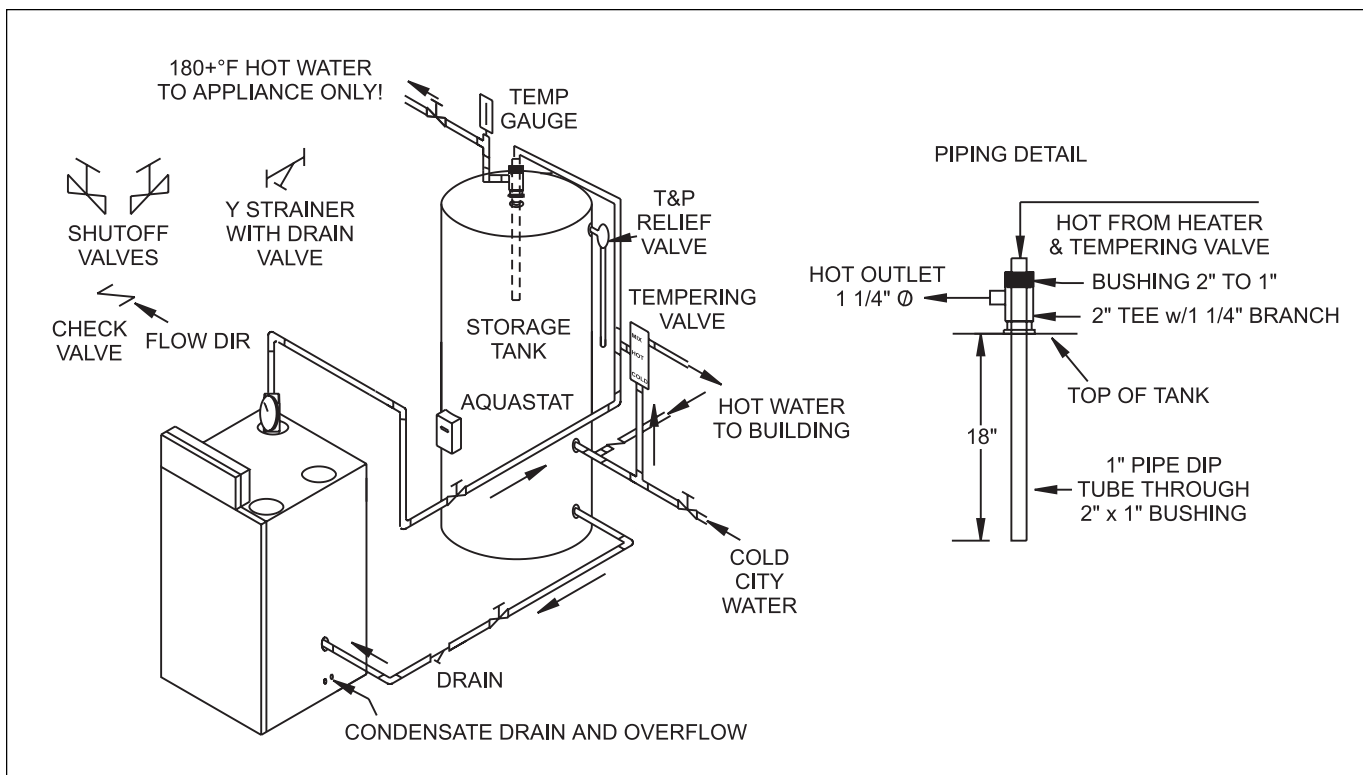


Figure 13. Two Temperature System.

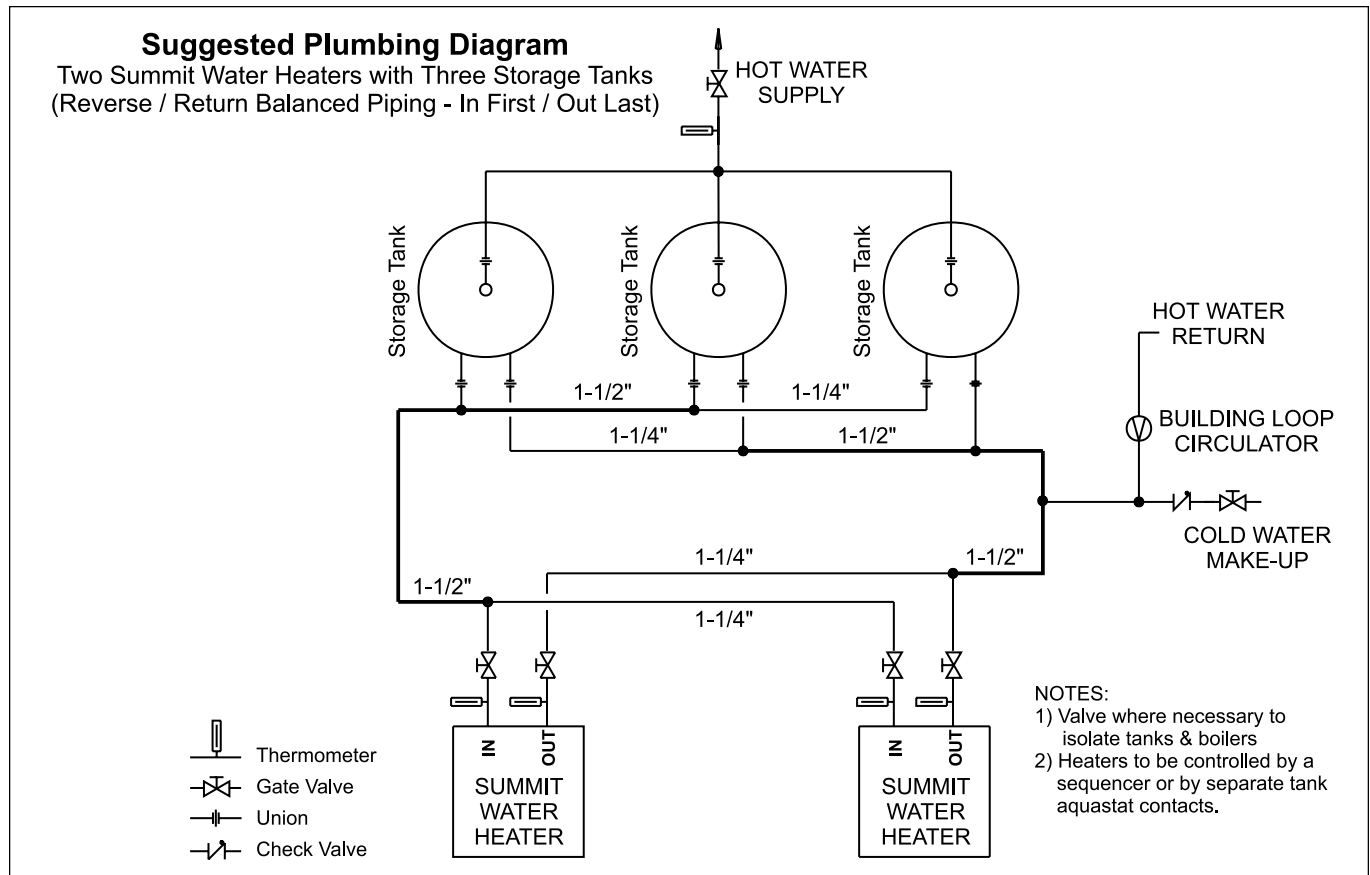


Figure 14. Multiple Summit Water Heaters and Storage Tanks.

Hot Water Supply Piping

Follow the tank manufacturer's guidelines for completion of the hot water system connections.

NOTE: A listed temperature and pressure relief valve listed as complying with the Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems, 1). ANSI Z21.22 latest edition, or 2). CAN / CGA 1 - 4.4, of suitable discharge capacity must be installed in the separate storage tank system.

4B.2 Combined Water (potable) Heating and Space Heating SMW-200/250 Water Heater

Piping and components connected to this water heater for the space heating application shall be suitable for use with potable water.

Toxic chemicals, such as used for boiler treatment, shall not be introduced into the potable water used for space heating.

This water heater when used to supply potable water shall not be connected to any heating system or component(s) previously used with a non-potable water heating appliance.

When the system requires water for heating at temperatures higher than required for other uses, an anti-scald mixing or tempering valve shall be installed to temper the water for those uses in order to reduce scald hazard potential.

SECTION 4C. Condensate Drain Connection

NOTE: Connecting tubing must run DOWNWARDS from the level of the fitting (see Figure 16).

1. Connect a plastic tube between the plastic fitting closer to the front of the appliance and a floor drain (or optional condensate pump if a floor drain is not accessible).
2. Connect another plastic tube between the other plastic fitting and a drain pan.
3. **The plastic tubes must not be connected together** because the second tube is a condensate relief tube that will function to drain condensate if the first or primary condensate drain tube becomes blocked.

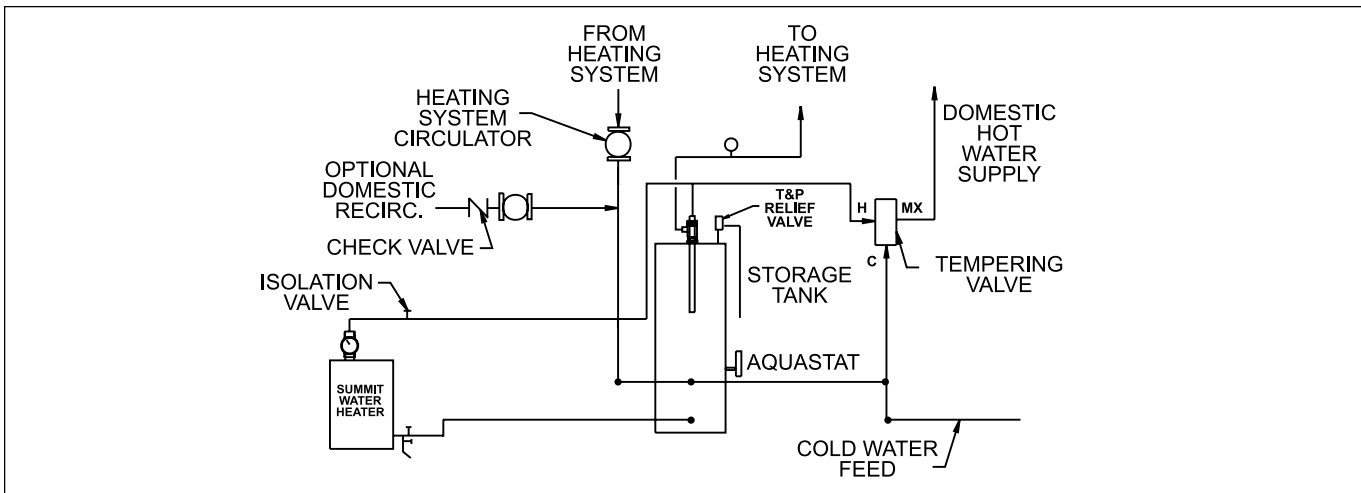


Figure 15. Typical Installation.

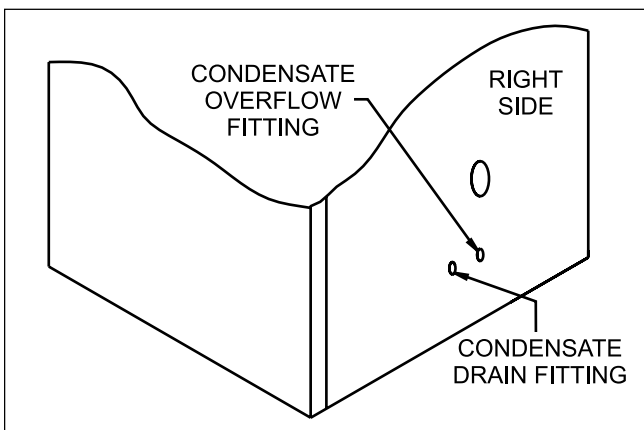


Figure 16. Condensate Drain Tube Outlet.

SECTION 5. Electrical Connections

⚠ WARNING

The appliance must be electrically grounded in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the latest edition of the National Electrical Code, ANSI/NFPA 70, in the U.S. and with latest edition of CSA C22.1 Canadian Electrical Code, Part 1, in Canada. Do not rely on the gas or water piping to ground the metal parts of the boiler. Plastic pipe or dielectric unions may isolate the boiler electrically. Service and maintenance personnel, who work on or around the boiler, may be standing on wet floors and could be electrocuted by an ungrounded boiler.

Single pole switches, including those of safety controls and protective devices must not be wired in a grounded line.

All electrical connections are made in the field wiring box that is located on the left side of the appliance.

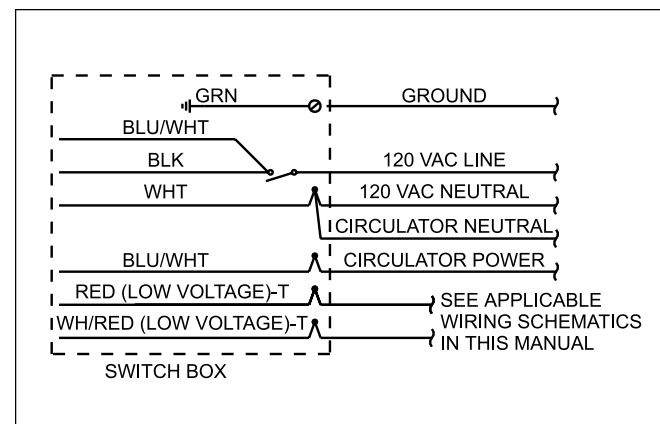


Figure 17. Field Wiring.

NOTE: All internal electrical components have been prewired. No attempt should be made to connect electrical wires to any other location except the wiring box designated above.

Wiring connections are indicated on Figure 17.

5.1 Main Power

Connect a 15 amp. fused, 120-volt supply to the main power switch (hot leg is connected directly to switch). Neutral leg is connected directly to the white wire. Ground wire can be connected to the grounding screw in the box or on the switch.

5.2 Temperature Control

SMB-200/250 Boiler

NOTE: Connect boiler T-T wires to isolated contacts on zone valves, circulator relays, sequencing controls (multiple appliance applications) or other temperature controlled devices. **DO NOT JUMPER.** If connected to a room thermostat set heat anticipator at 0.9 amps.

5.3 Temperature Control

SMW-200/250 Water Heater

5.3.1 Water Heater Temperature Control

Connect water heater T-T wires to isolated aquastat contacts, sequencing controls (multiple appliance applications) or other temperature controlled devices. **DO NOT JUMPER.**

5.3.2 Tank Temperature Control

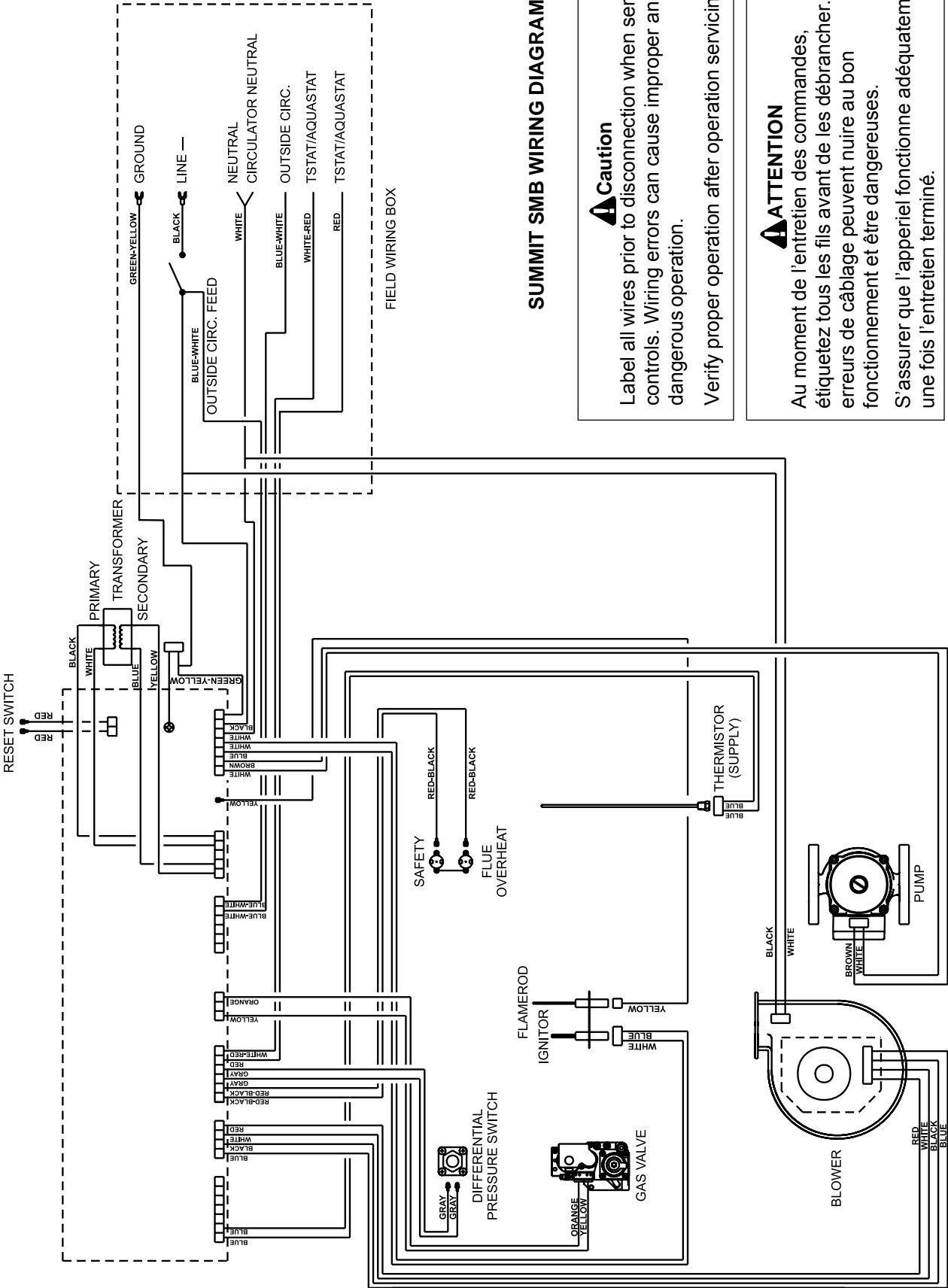
The SMW-200/250 is turned on and off by a remote tank aquastat. Locate the aquastat above the cold water inlet fitting in the separate storage tank. The SMW-200/250 draws water off the bottom of the tank and pumps hot water back into the tank. When the hot water level reaches the level of the aquastat, the aquastat contacts will open and switch off the SMW-200/250.

Please contact your factory representative if you have any questions about storage tank application.

5.4 Wiring Diagram

Caution

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing



SUMMIT SMB WIRING DIAGRAM

⚠ Caution
Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.
Verify proper operation after operation servicing.

⚠ ATTENTION
Au moment de l'entretien des commandes, étiquetez tous les fils avant de les débrancher. Les erreurs de câblage peuvent nuire au bon fonctionnement et être dangereuses.
S'assurer que l'appareil fonctionne adéquatement une fois l'entretien terminé.

H2210300A

Figure 18. Wiring Diagram.

SECTION 6. Operating Instructions

FOR YOUR SAFETY READ BEFORE OPERATING

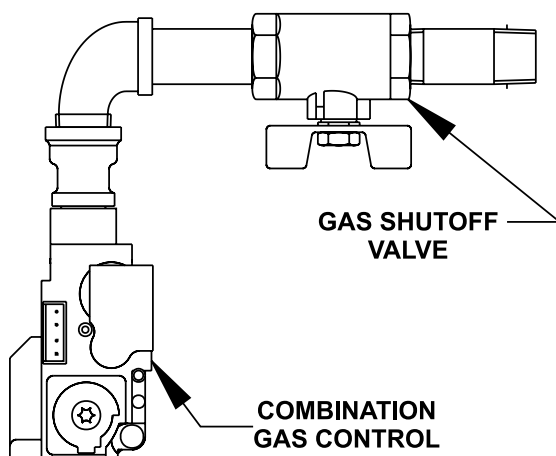
⚠ WARNING

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

- A. This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
- B. BEFORE OPERATING 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.
WHAT TO DO IF YOU SMELL GAS
 - Do not try to light any appliance.
 - Do not touch any electric switch; do not use any phone in your building.
 - 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.
- C. Turn off gas shutoff valve (located above the combination gas control) so that the handle is aligned across the gas pipe. If the handle will not turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- D. Do not use this appliance if any part may have been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which may have been under water.

OPERATING INSTRUCTIONS

1. STOP! Read the safety information above on this label.
2. Set the thermostat to lowest setting.
3. Turn off all electric power to the appliance.
4. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.
5. Remove front cover.
6. Turn gas shutoff valve to "off". Handle will be aligned across gas pipe. Do not force.
7. Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow "B" in the safety information above on this label. If you don't smell gas, go to next step.
8. Turn gas shutoff valve to "on". Handle will be aligned along gas pipe.
9. Turn on all electric power to appliance, depress on/off button on control panel, depress black button on top of control panel.
10. Replace front cover.
11. Set thermostat to desired setting.
12. If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.



TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electric power to the appliance if service is to be performed.
3. Remove front cover.
4. Turn gas shutoff valve "off". Handle will be aligned across gas pipe. Do not force.
5. Replace front cover.

Section 6. Notice d'utilisation

PAR MESURE DE PRUDENCE, LISEZ CE QUI SUIT AVANT DE FAIRE FONCTIONNER L'APPAREIL

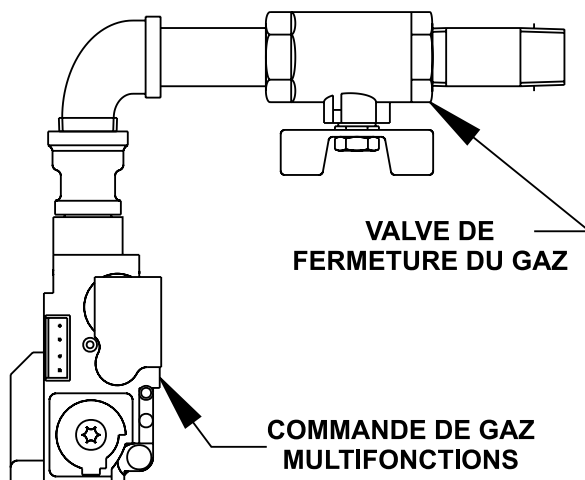
⚠ AVERTISSEMENT

Si vous ne suivez pas ces instructions à la lettre, un incendie ou une explosion pourrait se produire et causer des dommages matériels, des blessures personnelles ou même la mort.

- A. Cet appareil n'est pas doté d'une veilleuse. Il est équipé d'un dispositif d'allumage qui allume automatiquement le brûleur. Ne tentez pas d'allumer le brûleur manuellement.
- B. **AVANT D'UTILISER**, vérifiez s'il n'y a pas d'odeur de gaz autour de l'appareil. Vérifiez s'il n'y a pas d'odeur de gaz près du plancher, car le gaz est plus lourd que l'air et peut se déposer sur le plancher.
QUE FAIRE EN CAS D'ODEUR DE GAZ
 - N'essayez pas d'allumer n'importe quel appareil que ce soit.
 - Ne touchez pas à un commutateur électrique. N'utilisez pas le téléphone de votre résidence.
 - Appelez immédiatement votre fournisseur de gaz en utilisant le téléphone de votre voisin. Suivez les instructions de votre fournisseur de gaz.
- Si vous ne pouvez joindre votre fournisseur de gaz, appelez le service des incendies.
- C. Fermez la soupape d'arrêt de gaz (située au-dessus de la commande de gaz multifonctions) de sorte que la poignée soit perpendiculaire au tuyau de gaz. Si vous ne pouvez tourner la poignée à la main, n'essayez pas de la réparer. Communiquez avec un technicien de service qualifié. Le fait de forcer ou de tenter de réparer la poignée pourrait causer un incendie ou une explosion.
- D. N'utilisez pas cet appareil si l'une des pièces a été submergée sous l'eau. Communiquez immédiatement avec un technicien de service qualifié afin qu'il inspecte l'appareil et remplace toute pièce du système de commande et toute commande de gaz qui aurait été submergée sous l'eau.

NOTICE D'UTILISATION

1. **ARRÊTEZ !** Lisez l'information de sécurité ci-dessus, sur cette étiquette.
2. Réglez le thermostat au réglage le plus bas.
3. Coupez l'alimentation électrique à l'appareil.



4. Cet appareil est doté d'un dispositif d'allumage qui allumera automatiquement le brûleur. Ne tentez pas d'allumer le brûleur manuellement.
5. Retirez le couvercle avant.
6. Mettez la soupape d'arrêt de gaz à «off». La poignée se trouvera perpendiculaire au tuyau de gaz. N'employez pas de force.
7. Attendez cinq (5) minutes afin que le gaz se dissipe. Si vous croyez sentir une odeur de gaz, **ARRÊTEZ !** Reportez-vous aux instructions du paragraphe B ci-dessus, sur cette étiquette. S'il n'y a pas d'odeur de gaz, passez à la prochaine étape.
8. Mettez la soupape d'arrêt de gaz à «on». La poignée sera parallèle au tuyau de gaz.
9. Rétablissez l'alimentation électrique à l'appareil, appuyez sur le bouton «on/off» qui se trouve sur le panneau de commande, appuyez sur le bouton noir qui se trouve sur le panneau de commande.
10. Remplacez le couvercle avant.
11. Réglez le thermostat à la température désirée.
12. Si l'appareil ne fonctionne pas, suivez les directives relatives à la fermeture de l'alimentation en gaz et communiquez avec votre technicien de service ou le fournisseur de gaz.

FERMETURE DE L'ALIMENTATION EN GAZ À L'APPAREIL

1. Réglez le thermostat au réglage le plus bas.
2. Coupez toute alimentation électrique à l'appareil si celui-ci doit faire l'objet d'un entretien.
3. Retirez le couvercle avant.
4. Mettez la soupape d'arrêt de gaz à «off». La poignée se trouvera perpendiculaire au tuyau de gaz. N'employez pas de force.
5. Remplacez le couvercle avant.

6.1 Anti Freeze

SMB-200/250 Boilers

Proper precautions for freeze protection are recommended for boiler installations in areas where the danger of freezing exists.

6.1.1 Summit Boiler Low Temperature Feature

Summit boilers are equipped with a Low Temperature control feature that recognizes when the water temperature at the outlet of the boiler has fallen below 39°F (4°C). If this condition is recognized, the Summit pump will run for 5 minutes, or until the boiler outlet temperature reaches 45°F (7°C). If the boiler outlet temperature remains below 45°F (7°C) for 5 minutes, the appliance will start its ignition sequence, in hopes of firing the boiler and heating the water. The display will show [ICE] during this time.

This feature is intended to assist in protecting the boiler from freezing conditions, and does not help to protect any other part of the heating system. This feature will only help when there is power to the boiler and when the internal water flow components in the Summit are working properly. This feature will not be able to prevent freezing if the low temperature water condition persists. See section 6.1.2 for information concerning further freeze protection for the Summit.

6.1.2 Anti-Freeze Boiler Additives

Power outage, interruption of gas supply, failure of system components, activation of safety devices, etc., may prevent a boiler from firing. **Any time a boiler is subjected to freezing conditions, and the boiler is not able to fire, and/or the water is not able to circulate, there is a risk of freezing in the boiler or in the pipes in the system.** When water freezes, it expands. This can result in bursting of pipes in the system, or damage to the boiler, which could result in leaking or flooding conditions.

Do not use automotive anti-freeze. Maintaining a mixture of minimum 65% water and maximum 35% properly inhibited HVAC glycol, which contains an anti-foamant, is the preferred method of freeze protection for Summit boilers. **Percentage of glycol used in the Summit boiler must not exceed 35%.** Typically, this mixture will serve as freeze protection for temperatures down to approximately 0°F (-18°C), and will serve as burst protection for temperatures down to approximately -35°F (-30°C).

IMPORTANT NOTES: Different glycol products may provide varying degrees of protection. Glycol products must be maintained properly in a heating system, or they may become ineffective. Consult the glycol specifications, or the glycol manufacturer, for information about specific products, maintenance of solutions, and set up according to your particular conditions.

6.2 Anti-Freeze SMW-200/250 Water Heater

Summit water heaters are equipped with a Low Temperature control feature that recognizes when the water temperature at the outlet of the heater has fallen below 39°F (4°C). If this condition is recognized, the Summit pump will run for 5 minutes, or until the heater outlet temperature reaches 45°F (7°C). If the heater outlet temperature remains below 45°F (7°C) for 5 minutes, the appliance will start its ignition sequence, in hopes of firing the heater and heating the water. The display will show [ICE] during this time.

This feature is intended to assist in protecting the heater from freezing conditions, and does not help to protect any other part of the water heater system. This feature will only help when there is power to the heater and when the internal water flow components in the Summit are working properly. This feature will not be able to prevent freezing if the low temperature water condition persists.

Power outage, interruption of gas supply, failure of system components, activation of safety devices, etc., may prevent a heater from firing. **Any time a heater is subjected to freezing conditions, and the heater is not able to fire, and/or the water is not able to circulate, there is a risk of freezing in the heater or in the pipes in the system.** When water freezes, it expands. This can result in bursting of pipes in the system, or damage to the heater, which could result in leaking or flooding conditions.

Anti-freeze additives, such as glycol, must not be used in a direct potable water heating system, such as the Summit SMW.

6.3 Filling the System

1. Open all supply and return valves.
2. Fill system to minimum operating pressure 12 psig.
3. Bleed air from the coin vent on the top of the mixing valve.
4. Purge all lines by opening vents.
5. Turn off gas shutoff valve located above gas valve.
6. Switch on 120 volt power, the display will initially display [---] for five seconds before displaying [OFF].
7. If the flow (appliance discharge) temperature sensor is detecting a temperature below 39°F (4°C) it will display [ICE]. The appliance will then be in its Low Temperature Feature. The Summit will call for the pump to run for 5 minutes, or until the discharge temperature reaches 45°F (7°C). If the water temperature remains below 45°F (7°C) for 5 minutes, the Summit will attempt an ignition, in hopes of warming the water. After three attempts to

- ignite, the burner control will lock out and display [LO] (see Figure 19).
8. If the display remains at [OFF], press the on/off button (located at the right of the LED display) and the reset button on top of the control panel. The pump and the blower will start, the display will then successively indicate [Bft] (appliance discharge temperature) for 1 second and the actual temperature in degrees F for 3 seconds. The appliance will attempt to ignite three times after which it will lock out and display [LO]. The fan will stop and the pump will run on for a short period and then it will stop. Ensure that the system is fully discharged of all air and the water charge pressure is correct.
 9. Switch off the main electrical supply.
 10. System is now ready for operation.

WARNING

Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control that may have been under water.

6.4 Operating the Burner and Set Up (Refer to page 16)

The Summit condensing modulating appliance utilizes an advanced, state-of-the-art design. Proper setup is essential for safe and reliable operation. Problems such as failure to start, rough ignition, strong exhaust odors, etc. can be due to improper setup. Damage to the boiler resulting from improper setup is not covered by the limited warranty.

REQUIRED TOOLS:

CO₂ or O₂ Analyzer, Slope Gage, Magnehelic® or Minihelic® Differential Pressure Gage capable of reading -0.01 inches w.c., and a T-40 Torx® Screwdriver.

1. Using this manual, make sure the installation is complete and fully in compliance with the instructions.
2. Determine that the appliance and system are filled with water and all air has been bled from both. Open all valves.
3. Observe all warnings on the Operating Instructions label and turn on gas and electrical power to appliance.
4. Switch on the appliance power switch located on the left side of the control box.
5. If the appliance display indicates “bFt” and then temperature, go to step 6. If the display indicates “OFF”, depress the ON/OFF button. If the display indicates “LO” press the reset button.
6. The Summit will enter the start sequence. The blower and pump come on for pre-purge, then the ignitor warmup sequence starts and finally, the gas valve opens. If ignition doesn’t occur and display indicates “LO”, check that there is proper gas supply. Wait 5 minutes and depress the reset button to re-start ignition. If ignition still does not occur, and the display indicates “LO”, remove the front cover and turn the venturi throttle adjustment screw counter-clockwise four full turns. Wait 5 minutes and depress the reset button to restart the ignition sequence.
7. After the appliance starts, remove the front cover (if necessary). Remove the 1/8" NPT plastic plug from the flue pipe and insert your CO₂ or O₂ analyzer probe. Obtain the CO₂ or O₂ reading and compare it to the value in Table 4. Adjust the reading to match that value. To decrease CO₂ or increase O₂ turn the venturi throttle adjusting screw clockwise (see Figure 20 for identification of adjustment points.) To increase CO₂ or decrease O₂, turn counter-clockwise. NOTE: if adjusting procedure does not respond as described, turn the adjusting screw clockwise until the CO₂ values start to decrease (they will initially increase to 11.9% for natural gas or 13.8% for LP gas, and then respond as described above.) (If adjusting with an O₂ analyzer disregard this note and turn screw in either direction until the correct setting is obtained.) After the CO₂ or O₂ has been adjusted to the proper value, proceed to step 8.
8. Loosen the screw in the offset pressure port one turn and push the gage hose over the port and screw. Adjust offset pressure, if necessary, by removing the cover over the offset pressure adjusting screw and turning the screw until the proper value is obtained. Obtain another CO₂ or O₂ reading. If necessary, again adjust the CO₂ or O₂ to the proper value as in step 7. If the offset pressure has changed, adjust it to the proper value. When both the CO₂ or O₂ reading and the offset pressure reading are correct, remove hose and tighten screw in port. Replace cover over offset adjustment, remove sample line from flue pipe and replace the 1/8" NPT plastic plug. Replace the appliance front cover and check operation.
9. **After placing the appliance in operation, the Burner Safety Shutoff Device must be tested.** To test:
 - (a) Close gas shutoff valve with burner operating.
 - (b) The flame indicator light will go out and blower will continue to run for the post purge cycle. Three additional attempts to light will follow including pre-purge, ignitor on, valve/flame on and post purge.

Message	Identifies	To read or change mode
bFl	Appliance Discharge Temp (Supply)	During operation display will default to supply temperature.
on	On	Appliance in standby mode: will operate on call for domestic water or heat zone demand.
OFF	Off	Appliance switched OFF. Press ON/OFF button for "ON".
LO	Lock Out	After three trials for ignition, will stand in lockout. Press reset on top of panel to retry.
FL3	Third Failure (Failure Level)	Fault codes in memory apply to only to past failure conditions and are not indicative of current failure condition. Fault code pertaining to current failure condition will be displayed on readout prior to entering memory. To monitor, press and hold temperature button for five seconds. Display will indicate first of eight fault memories (FL1). Then display one of seven fault conditions that occurred previously. Display will sequence through the eight memories (see Section 8.3 for fault codes).
F-3	Fault Code (Three) There are 7 different Fault Codes defined.	
1CE	Low Water Temperature	Sensor has detected return temperature below 39°F (4°C).

Figure 19. Typical Display Identification Codes.

Ignition will not occur as the gas is off. The display will eventually show [LO] approximately 10 seconds after the gas valve has closed on the third ignition attempt.

- (c) Open gas shutoff valve. Press reset button on the top of the control panel. The ignition sequence will start again and the burner will start. The appliance will return to its previous mode of operation.

Caution

Should any odor of gas be detected, or if the gas burner does not appear to be functioning in a normal manner, close main shutoff valve, do not shut off switch, and contact your heating contractor, gas company, or factory representative.

- Check burner input. Appliance should be in operation for 5 minutes before checking input and all other appliances served by the gas meter should be shut off. With the burner operating at full input, determine the time required for the gas meter to deliver one cubic foot (CF) of gas. The time should be between 14.1 and 14.7 seconds for appliances operating on natural gas. For appliances operating on propane, the time should be between 35.3 and 36.7 seconds. Most propane installations do not have a gas meter. If no meter exists and the CO₂ or O₂ is within specification, the input will be correct. If adjustments are required, see Section 7.2.2.1 – Offset and Throttle Adjustment.

6.5 Mode and On/Off Buttons Operation

The on/off button is used to switch the appliance from standby [ON] to standby [OFF] and vice versa. It is NOT an isolation switch. The mode button accesses all other functions as shown in Figure 19.

6.6 Common Vent Test SMB-200/250 Boilers

When an existing boiler is removed from a common venting system, the common venting system is likely to be too large for proper venting of the appliances remaining connected to it.

At the time of removal of an existing boiler, the following steps shall be followed with each appliance remaining connected to the common venting system placed in operation, while the other appliances remaining connected to the common venting system are not in operation.

- Seal any unused openings in the common venting system.
- 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.
- Insofar as it 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 appliance 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. Place in operation the appliance being inspected. Follow the lighting instructions. 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 conditions of use.
7. Any improper operation of the common venting system should be corrected so that the installation conforms to the National Fuel Gas Code, ANSI Z223.1. When resizing any portion of the common venting system, it should be resized to approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z223.1.
5. Faire fonctionner le brûleur principal pendant 5 min ensuite déterminer si le coupe-tirage déborde à l'ouverture de décharge. Utiliser la flamme d'une allumette ou d'une chandelle ou la fumée d'une cigarette, d'un cigare ou d'une pipe.
6. Une fois qu'il a été déterminé, selon la méthode indiquée ci-dessus, que chaque appareil raccordé au système d'évacuation est mis à l'air libre de façon adéquate. Remettre les portes et les fenêtres, les ventilateurs, les registres de cheminées et les appareils au gaz à leur position originale.
7. Tout mauvais fonctionnement du système d'évacuation commun devrait être corrigé de façon que l'installation soit conforme au *National Fuel Gas Code, ANSI Z223.1/NFPA 54* et (ou) aux codes d'installation *CAN/CGA-B149*. Si la grosseur d'une section du système devrait être modifiée pour respecter les valeurs minimales des tableaux pertinents de l'appendice F du *National Fuel Gas Code, ANSI Z223.1/NFPA 54* et (ou) des codes d'installation *CAN/CGA-B149*.

6A. Common Vent Test

Au moment du retrait d'une chaudière existante, les mesures suivantes doivent être prises pour chaque appareil toujours raccordé au système d'évacuation commun et qui fonctionne alors que d'autres appareils toujours raccordés au système d'évacuation ne fonctionnent pas:

1. Sceller toutes les ouvertures non utilisées du système d'évacuation.
2. Inspecter de façon visuelle le système d'évacuation pour déterminer la grosseur et l'inclinaison horizontale qui conviennent et s'assurer que le système est exempt d'obstruction, d'étranglement, de fuite, de corrosion et autres défaillances qui pourraient présenter des risques.
3. Dans la mesure du possible, fermer toutes les portes et les fenêtres du bâtiment et toutes les portes entre l'espace, où les appareils toujours raccordés et les autres espaces du bâtiment. Mettre en marche les sècheuses, tous les appareils non raccordés au système d'évacuation commun et tous les ventilateurs d'extraction comme les hottes de cuisinière et les ventilateurs des salles de bain. S'assurer que ces ventilateurs fonctionnent à la vitesse maximale, Ne pas faire fonctionner les ventilateurs d'été. Fermer les registres des cheminées.
4. Mettre l'appareil inspecté en marche. Suivre les instructions d'allumage. Régler le thermostat de façon continue.

SECTION 7. Maintenance

7.1 System Maintenance

1. Lubricate the system water-circulating pump, if required, per the instructions on the pump. The internal pump in the SUMMIT appliance is water lubricated and requires no lubrication.
2. If a strainer is employed in a pressure reducing valve or the piping, clean it every six months.
3. Inspect the venting system for obstruction or leakage at least once a year.
4. Keep the appliance area clear and free from combustible materials, gasoline, and other flammable vapors and liquids.
5. If the appliance is not going to be used for extended periods in locations where freezing normally occurs, it should be isolated from the system and completely drained of all water. To accomplish this, remove the front cover, attach a hose to the appliance drain valve and open the valve. Also, open the air vent on top of the mixing valve to permit the entrance of air to displace the appliance water being drained.

The gas and electric controls on the appliance are engineered for long life and dependable operation, but the safety of the equipment depends on their proper functioning. It is strongly recommended that a qualified service technician inspect the basic items listed below every year.

- a. Ignition/Water temperature control
 - b. Automatic gas valve
 - c. Internal Pump
6. Low water cutoffs, if installed, should be inspected and flushed periodically.

⚠ WARNING

Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control that may have been under water.

7.2 Appliance Maintenance and Component Description

7.2.1 Appliance Pump

The appliance pump operates whenever there is a call for heat / hot water.

It is a wetted-rotor type pump and should always be filled with water when it is operating so that it will cool properly.

If a pump change is required for any reason, valve off the boiler and drain approximately 1 or 2 gallons (approx. 4-8L) of water from it. Turn off the main disconnect switch and unplug the pump wires, remove the pump motor. The pump housing need not be removed. The replacement pump motor should be installed in the reverse order. After filling the system be sure the combustion chamber coil is vented through the air vent located on top of the mixing valve.

7.2.2 Gas Valve

The gas valve is a solenoid operated, negative pressure regulated ratio valve. If necessary it may be adjusted as described in Section 7.2.2.1 below. It is designed to operate with supply pressures of 4-13 inches w.c. (1.0 to 3.2 kPa). To remove the gas valve, shut off 120-volt power and the gas shutoff valve. Remove the four screws from the upper flange, the three venturi mounting screws and remove the retaining screw and gas valve rectifier. The valve may now be removed. After the valve has been removed, replace with a new valve in the reverse order. Turn on gas shutoff valve and 120 volt power and check appliance operation and gas tightness of gas valve connections. Set the gas valve offset pressure.

7.2.2.1 Offset and Throttle Adjustment

If poor combustion is suspected because of a strong exhaust smell, pulsation in the exhaust, or nuisance flame failure lockouts, the gas valve throttle and offset pressure and exhaust CO₂ or O₂ should be checked and adjusted, if required. A Magnehelic® pressure gauge (with 0.02-in. W.C. divisions) and a CO₂ or O₂ tester are required for this adjustment.

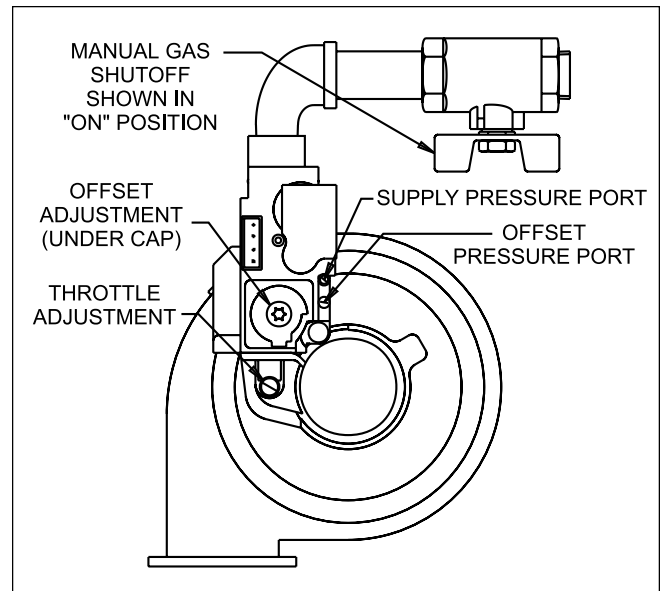


Figure 20. Gas Valve and Venturi Adjustment Points.

CO₂ or O₂ sampling may be taken at the exhaust terminal or at the sample port on the 3" exhaust located inside the front cover. If the CO₂ or O₂ is out of specification, the throttle adjustment should be checked. The most effective method of checking is by clocking the gas meter. Improper throttle adjustment resulting in low input and low CO₂ (or high O₂) can be corrected by turning the throttle adjustment screw counter clockwise. Turn clockwise to decrease input and CO₂ (or increase O₂). See Figure 20 for the location of the offset pressure port and the offset and throttle pressure adjustment. After the throttle adjustment has been completed and the input and CO₂ or O₂ are properly set, the offset pressure should be set to the values shown in Table 4.

When adjusting the offset pressure, the CO₂ will reduce slightly or the O₂ will increase slightly as the offset pressure is adjusted more negative. Adjust throttle adjustment again to obtain desired CO₂ or O₂. Offset pressure will not change when this adjustment is done.

	Equivalent Feet of Vent & Combustion Air Pipe Combined		
Natural Gas	Up to 20 ft. (6m)	21-89 ft. (6-27m)	90-110 ft. (27-34m)
CO ₂ Percent	9.1 ± 1	9.0 ± 1	8.9 ± 1
O ₂ Percent	5.0 ± 0.6	5.1 ± 0.6	5.2 ± 0.6
Offset Pressure	-0.016±0.004 in. WC -0.04±0.04 mbar	-0.020±0.004 in. WC -0.05±0.04 mbar	-0.024±0.004 in. WC -0.06±0.04 mbar
Propane Gas	Up to 20 ft. (6m)	21-89 ft. (6-27m)	90-110 ft. (27-34m)
CO ₂ Percent	10.2 ± 1	10.1 ± 1	10.0 ± 1
O ₂ Percent	5.5 ± 0.7	5.7 ± 0.7	5.8 ± 0.7
Offset Pressure	-0.020±0.004 in. WC -0.05±0.04 mbar	-0.024±0.004 in. WC -0.06±0.04 mbar	-0.028±0.004 in. WC -0.07±0.04 mbar

Table 4. CO₂ and Offset Pressure Set Points.

**ADJUSTMENT OF THE OFFSET PRESSURE
MUST ALWAYS BE DONE WITH THE
APPLIANCE AT FULL OUTPUT.**

Note: During the prepurge cycle, the gauge will indicate several inches W.C. negative pressure.

7.2.3 Safety Limit Switch

The Safety Limit Switch is a manual reset switch with a fixed set point of 245°F (118°C). To replace the switch, shut off the 120-volt power and valve off the appliance. Remove the switch from the jacket top and disconnect the two wires from the switch. Drain a gallon of water from the appliance drain and reclose. Loosen the compression nut at the mixing valve and remove the sensing bulb. To replace, perform the same operations in reverse. When tightening the compression nut, do not overtighten. After isolation valves have been opened, bleed air from the appliance through the air vent on top of the mixing valve. Switch on electrical power and restart appliance.

7.2.4 Appliance Control, Printed Circuit Board (PCB)

The Integrated Boiler Control Module controls the ignition process, the combustion process and the supply temperature and provides space/hot water heating on demand. The supply temperature may be reset by an optional sensor such as an outdoor air sensor to improve efficiency.

To do this, the control receives inputs from two (one optional) temperature sensors, an overheat thermostat (safety limit) and external heating control switch, such as a room thermostat, zone valve end switches, circulator relay contacts or aquastat. It then controls the pump, blower, ignitor and gas valve sequencing.

It constantly displays the appliance outlet temperature (Bft) when the appliance is operating in one of its demand modes. It also allows the user to find up to 8 previous faults stored in memory. The table of detectable faults is included in Section 8.3.

If replacement of PCB is necessary shut off the 120-volt power and disconnect the wire connectors from the PCB. Remove the PCB from its standoffs. Replace in reverse order ensuring that the connections are correct.

7.2.5 Ignitor / Flame Sensor Assembly

The ignitor is a "Hot Surface" type. It is energized whenever there is a call for heat and switched off when ignition is established and the flame has been sensed.

The flame sensor is a remote sensing flame rod that is connected directly to the circuit board "J5" terminal.

If the ignitor fails and the assembly must be replaced, always install a new ignitor gasket with the replacement assembly.

For sequence of operation, see Section 8.1 Sequence of Operation.

Caution

Ignitor gets hot.

7.2.6 Transformer

The control transformer accepts 120 VAC line voltage and provides 40 VA of 24 VAC control voltage for the boiler control ONLY. It is NOT capable of supplying control voltage for external devices such as zone valves, which MUST have their own separate power supply.

Should the transformer require replacing, shut off the 120-volt power. Unplug the transformer wires from the PCB, remove the mounting screws and remove the transformer.

Replace transformer in the reverse order.

7.2.7 Blower

The combustion air blower is a high-pressure centrifugal blower. It is powered by a line voltage, variable speed motor; the speed of which is controlled by the PCB. Its speed varies according to the temperature of the appliance discharge temperature.

If a blower change is required, turn off the 120-volt power and unplug the wires from the blower motor. Remove the four nuts from the blower discharge flange and the two screws that secure the venturi to the blower housing. Remove the complete assembly. Replace fan in reverse order, ensuring that all joints are made correctly and sealed.

After replacement, check the combustion by following Section 6.3 Operating the Burner and Set Up.

7.2.8 Mixing Valve

The Mixing Valve is a thermostatically controlled device that prevents the Primary Heat Exchanger (HX) from operating in the condensing mode. When the water temperature returning to the appliance is below 140°F, the mixing valve mixes outlet water with return water to maintain the Primary HX operating temperature above the condensation point (dew point) of the flue products.

To change the thermostatic element, valve off the appliance and switch off electrical power. Open the appliance drain and drain about a gallon of water and reclose. Remove the three cap screws from the top of the mixing valve and remove the top. Remove the thermostatic element and sealing ring. Remove the sealing ring from the element and install on replacement element. Replace the new thermostatic element and sealing ring (with barrel up). Replace the o-ring on the top, replace the top and cap screws and tighten. Turn valves on and bleed air from the air vent on the top of the valve. Switch on electrical power and restart appliance.

7.2.9 Cleaning the Primary Heat Exchanger Coil

The SUMMIT appliance is equipped with a premixed combustion system. This type of combustion system does not create free carbon (soot) except in very rare instances and therefore the combustion chamber coil will probably never need cleaning. If cleaning is required, proceed as follows: Turn off gas to the boiler, switch off the electrical power at the disconnect switch. Remove blower and burner. Use a compressed air source with a tube attached that is capable of being inserted through the hole from which the burner was removed and blow off all loose matter. Use proper eye protection and breathing apparatus to prevent injury from projected particles and dust. When finished cleaning with the compressed air, use a 'shop vac' to remove loose debris.

After cleaning, assemble the parts in the reverse order, open isolation valves and bleed air from the boiler and the system. Follow the lighting instructions and start the boiler. Check operation.

Note: The Warranty does not cover damage caused by lack of required maintenance, lack of water flow, or improper operating practices.

Fouling on the external surfaces of the heat exchanger is caused by incomplete combustion, and is a sign of venting and/or combustion problems. If major cleaning is required the most cost effective procedure is to replace the combustion coil assembly. The vent system should be inspected at the same time.

7.2.10 Burner

If cleaning is required, remove blower and burner. Burner may be cleaned by blowing off the outside surface with compressed air and wiping with a clean lint free rag. When replacing, install new gaskets.

7.2.11 Vent Terminals

If cleaning is indicated by a build up of foreign matter on the vent screens, clean with a brush and remove all loose material.

7.2.12 Condensate Collection System – Inspection and Cleaning

Visually inspect the condensate drain lines. If either clear plastic line appears to be full of condensate (water), loosen the nut on the appliance jacket that retains the line and remove the line from the fitting. Remove the obstruction from the line, replace the line and tighten fitting.

7.2.13 Routine Deliming Procedure – SMW-200/250 Water Heater

WARNING

Use proper protective equipment as specified by the supplier of the deliming solution when performing this procedure.

In hard water areas, the following procedure should be done on a regularly scheduled basis:

1. Close the gas cock or manual gas shutoff and shutoff the main disconnect switch.
2. Isolate the SUMMIT water heater from the system by closing the shutoff valves. If recirculation lines are piped into the system they must be isolated from the SUMMIT water heater also.
3. Remove the front panel from the appliance and connect a hose to the drain fitting (located under the cylindrical chamber). Relieve pressure at drain.
4. Connect a hose to the drain fitting provided by the installer at installation (located on the return line from the tank adjacent to the appliance).
5. Remove cover from Mixing Valve and remove thermostat. Wrap tape over and around cutaway sections of the mixing valve cover and replace all parts except the thermostat. Replace cover and tighten bolts.
6. Fill the Primary Heat Exchanger Coil with deliming solution using the hose connected under the cylindrical chamber. Use a small pump to do the filling from a plastic container and fill until the solution exits from the other hose previously installed. This hose should be elevated above the mixing valve at this time. Once solution starts to exit this hose, place it in the plastic container with the other hose and allow the solution to circulate until the solution is no longer foamy.
7. Shut off the pump and carefully disconnect it from the hose. Carefully drain solution from both hoses. Connect city water to the hose that was connected to the pump and flush for 5 minutes to remove residual solution. Remove hoses and restore mixing valve to its original condition (remove tape, install thermostat and other internal valve parts). Open all valves, bleed air from appliance and restart.

SECTION 8. Trouble Shooting

8.1 Sequence of Operation

The SUMMIT appliance is a cold start appliance that should start only on a call for heat from a tank aquastat, room thermostat, zone valve end switch or other space temperature control device. During normal operation the Digital Display will indicate (on) if the appliance is turned on and there is no call for heat. When there is a call for heat the following sequence will occur:

1. (a) The internal pump will start and the Digital Display will indicate (---) for 5 seconds.
(b) After 5 seconds the blower prepurge cycle will begin and continue for 6 seconds while the Digital Display alternately indicates (bFt) and (appliance discharge temperature in °F)
2. Following the prepurge cycle the hot surface ignitor will heat for 15 seconds while the blower continues to operate.
3. The gas valve will then be energized and open (green LED, marked GV on the PCB will light), gas will flow and ignition will occur.
4. After ignition and proof of flame (via the flame rod signal to ground), the ignitor will be deenergized after 8 seconds and the burner will modulate to high fire for maximum output.
5. The Digital Display should indicate a rapid rise in temperature to 150°F (1-2 minute duration). During this time, the mixing valve is positioned to recirculate water internally from the supply to the return to protect the boiler coil from condensation. Note: Failure to reach 150°F in the allotted time may be an indication of a defective mixing valve thermostat and must be corrected.
5. At 150°F the mixing valve will allow increased flow to the system and a gradual rise in temperature will exist until the temperature approaches the setpoint temperature. At the setpoint temperature, the input will start to decrease until the limit temperature is reached or the call for heat is satisfied. The input will be a minimum at limit temperature. **Note:** The pump will run for approximately 30 seconds after the burner turns off.

8.2 Trouble Shooting - Fault Codes

The Summit appliance is controlled by a Pactrol integrated control (PCB) which provides six fault codes, with eight memories. To obtain previous fault messages, press on the message center fault button

until the first fault code (FL1) is displayed. The last recorded fault will appear e.g. F-4 (appliance discharge thermistor faulty – open or shorted). The control will then sequence through all eight memories, indicating alternately the fault number and the fault code (FL1, F-?; FL2, F-?; ...; FL3, F-?). The fault number in fault code FL1 is the most recent fault.

NOTE: If the Summit is in a lockout condition, (LO appears on the display), then the problem is not related to a fault code. See section 8.5 to resolve problems when LO is displayed.

8.3 Fault Code Identification

The following six fault codes may be observed:

- F- Error corrected, control in auto reset period (10 seconds)
- F-0 No fault has occurred
- F-1 Error occurred while reading fault logic of main control
- F-2 Over heat thermostat (appliance discharge or Flue) has operated (open circuit)
- F-3 Fan fault
- F-4 Appliance discharge thermistor faulty (open or short-circuited)

8.4 Fault Correction

(see also Fault Trees in this Section)

- F-1 Switch off appliance and restart. If F-1 repeats, replace PCB
- F-2 The overheat thermostat (safety limit) opens at 245°F. Observe appliance operation if the appliance shuts off before the display indicates 245°F (107°C) replace safety limit. If the temperature rises rapidly and the safety limit operates, the internal pump is not operating. Refer to the wiring diagrams and check for voltage (120V) across the terminals on the PCB marked PMP.
 - a. If there is no voltage, and the PCB display does not indicate on or off, replace PCB.
 - b. If there is voltage, the pump or wiring is defective.

The Flue Overheat Thermostat will also create an F-2 error code because it is in series with the safety limit. If the pump checks out OK, check the Flue Overheat thermostat for continuity. Replace if open circuited.

- F-3 Attempt to start the appliance. Check combustion air blower operation. If F-3 is indicated again, replace blower.
- F-4 Check for damaged wiring or poor connection at sensor plug. If they are OK disconnect the sensor plug and check the resistance across the sensor terminals. The

resistance of a good sensor is 10,000 ohms @ 77°F (25°C). Replace sensor if resistance is less than 500 or more than 32,000 ohms.

- F-5 Check to see that the internal pump is operating. If it appears to be OK, check to determine if the pump is air bound. Check differential pressure switch.

8.5 Resolving Lockouts (LO)

Lockout will show as [LO] on the Summit display. **Lockout conditions are not associated with fault conditions. Accessing the memory of past faults will not help to troubleshoot lockout conditions.**

The memory does not need to be accessed. Memory fault codes are for error history only. All thermistor faults will show as “F” codes on the LED, and will never cause the LED to read “LO”.

There are many causes for lockouts. The four most common causes are: (1) poor flame sensor signal, (2) inadequate gas supply, (3) poor combustion, (4) ignitor failure.

1. Poor flame sensor signal: The burner control, PCB, will lockout if the flame sensor is grounded or if the flame signal it receives is less than 1 mA dc. To check for a grounded sensor, remove the flame sensor wire (yellow) from the PCB and, using a meter set for at least 100,000 ohms (Ω), check the resistance between the yellow wire terminal and the combustion chamber bottom pan. The resistance must be more than 250,000 Ω . If it is less, debris or moisture in the combustion chamber may be the cause. To correct, carefully remove the ignitor/flame sensor assembly. Look for debris on the assembly where the flame rod exits the ceramic tube. If debris exists, remove it. If this area is clean, insert a pencil or other round object into the flame sensor hole in the top combustion chamber head and roll it around to clear any debris that may exist inside the combustion chamber. Replace the ignitor/flame sensor assembly, reconnect the yellow wire on the PCB and start the boiler. If lockout persists, check the flame signal. To check the flame signal, disconnect the yellow wire from the flame sensor, connect a meter, set for microamps (mA) DC, between the flame sensor connector and the yellow wire connector. Start the boiler. If the meter reading is less than 1.00 mA DC, (see 3. below) “poor combustion”.
2. Inadequate gas supply: Before proceeding, ensure that the gas supply has not been shut off or the LP tank (LP boilers) is not empty. Then, reset the boiler and observe the operational cycle. Approximately 20 seconds after the start

of the cycle, the GV LED on the PCB should light. If it does not, reset the boiler and check for 24 VAC at the plug on the PCB. If the voltage is less than 20 VAC, and transformer voltage is 24 VAC replace the PCB. If the voltage is correct, connect a pressure gauge to the offset pressure port on the gas valve. Reset the boiler and observe the offset pressure at startup and after 20 seconds. The pressure will be ~ -2 in. w.c. at startup (during prepurge) and should become less negative (-0.01 in. w.c.) when the gas valve opens and gas flow starts. If the pressure remains at ~ -2 in. w.c. Throughout the cycle replace the gas valve.

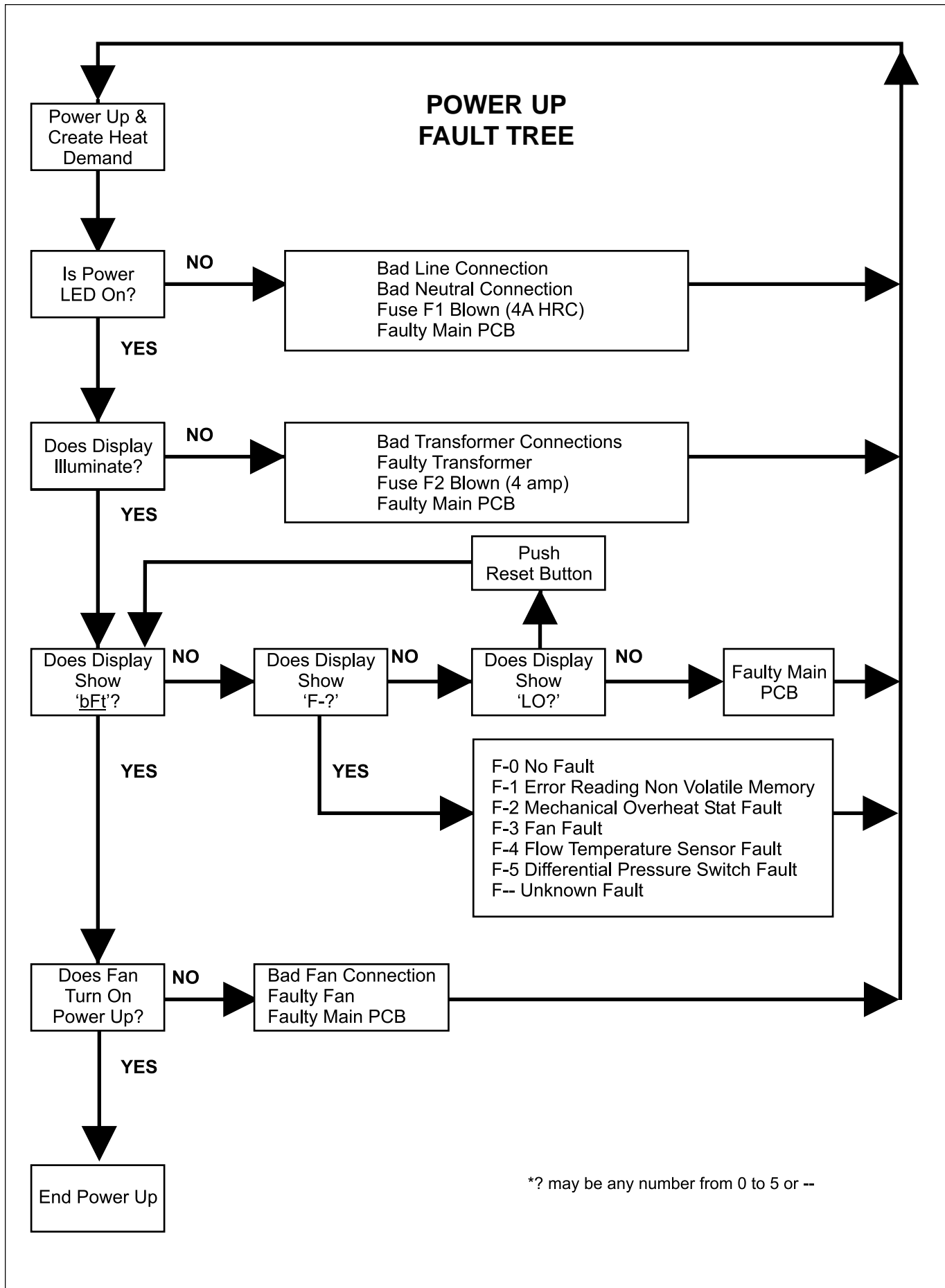
3. Poor Combustion: Poor combustion should be suspected if there is a strong flue gas odor. The odor may result from an improper gas/air ratio (high or low O_2 or CO_2). If an improper gas/air ratio is suspected refer to Section 7.2.2.1.
4. Ignitor failure: If the boiler goes through a normal start cycle but combustion does not occur, ignitor failure should be suspected. Check the ignitor by unplugging the ignitor plug and measuring the ignitor resistance. It should be 50-80 (Ω) Ohms. If the resistance is not 50-80 ohms (Ω), replace the ignitor. If the resistance is correct, reset the boiler and check for 120 VAC at the ignitor plug during the start cycle. If there is no voltage, replace the PCB or faulty ignitor wires.

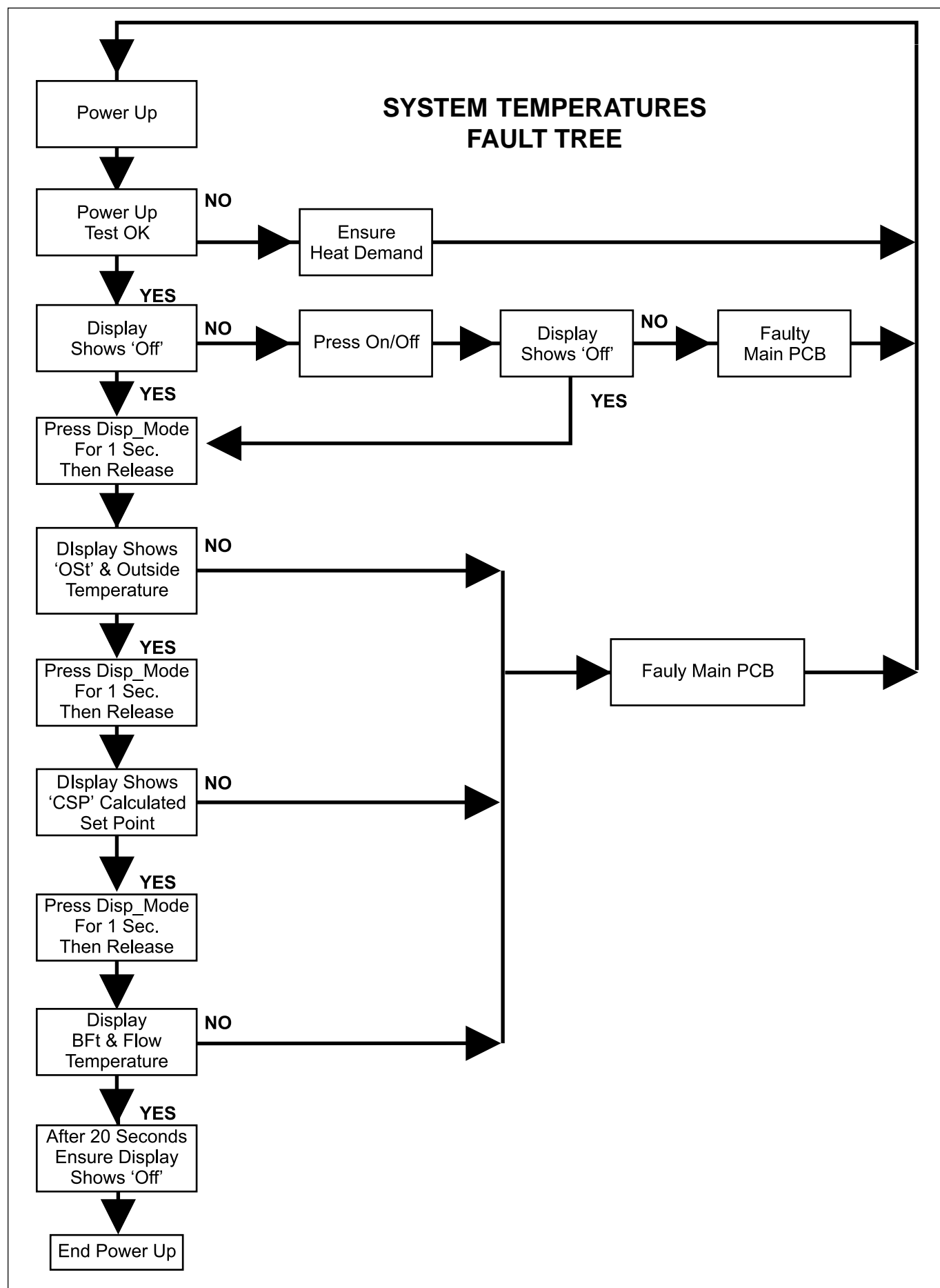
8.6. Delayed Ignition - Possible Causes

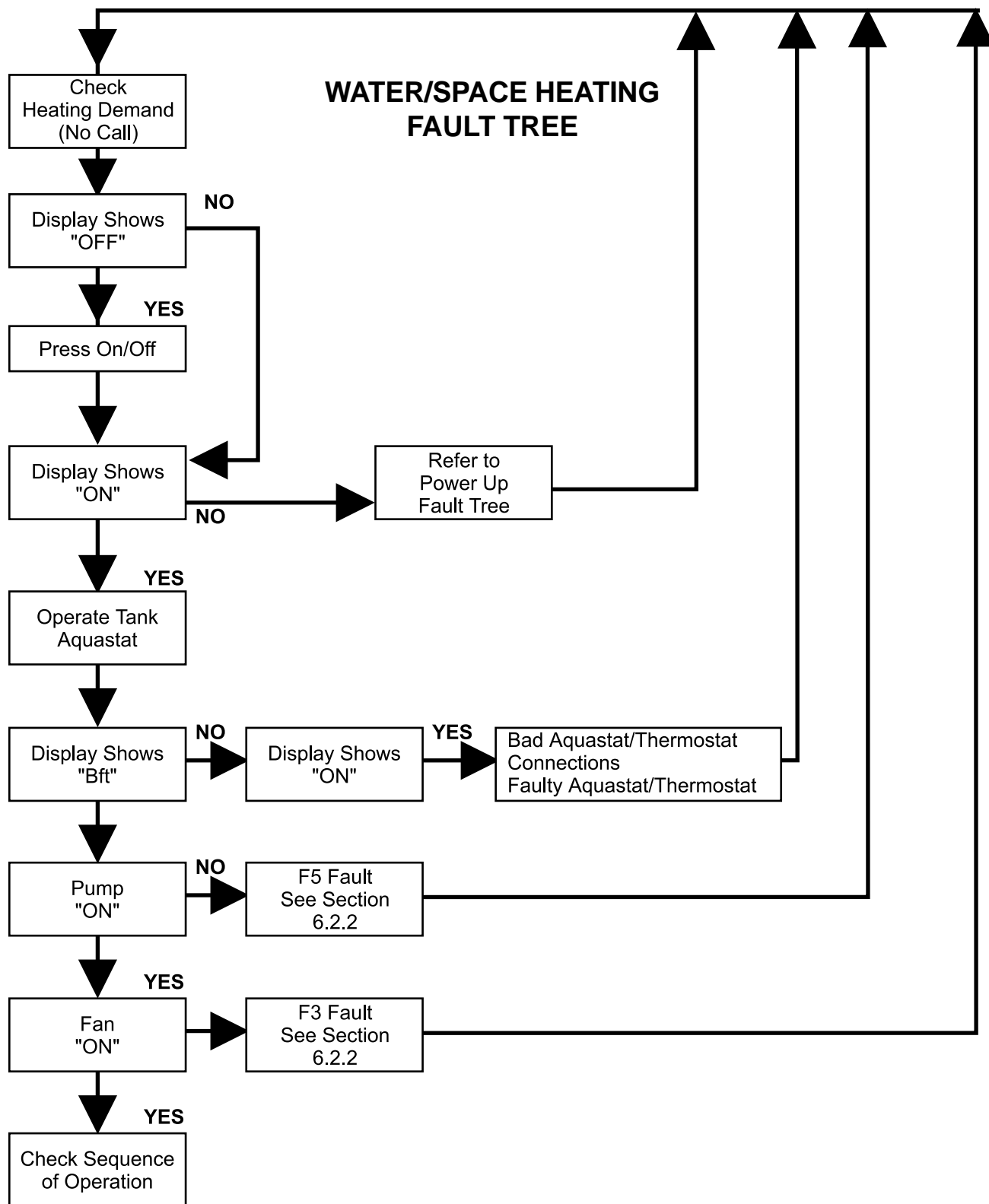
8.6.1 High Lockup Pressure (LP appliances) - occurs on start-up

High lock up pressure is the most common cause of delayed ignitions on LP fueled appliances. It may result from an improper second stage regulator selection or from a faulty regulator.

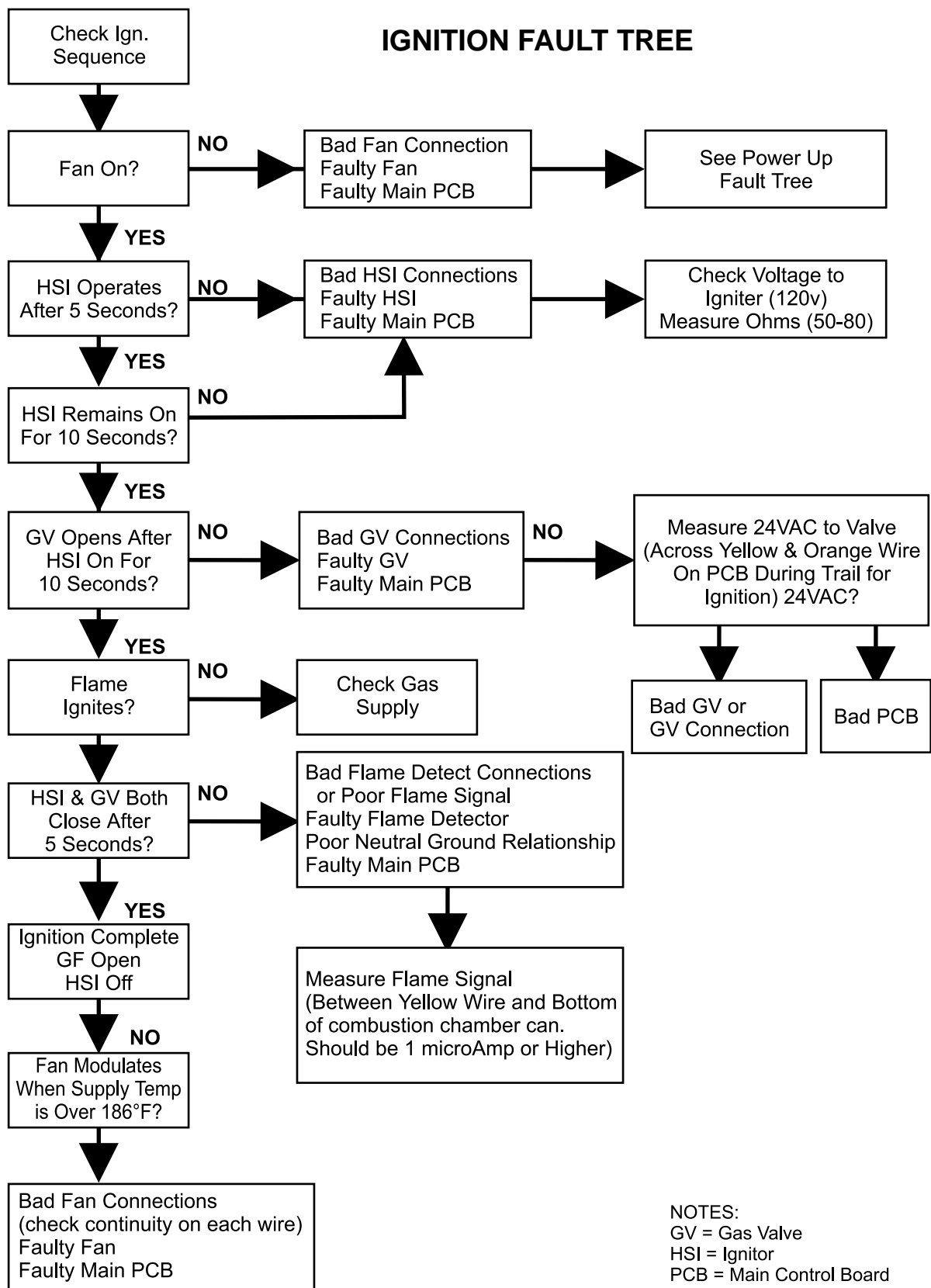
Lock up can be detected by measuring the gas supply pressure to the appliance at the inlet pressure port on the gas valve. The gas supply to the appliance must be shut off before making any connections. To check: use a water manometer or pressure gauge with a scale reading of at least 25 in. w. c. or 15 oz/in². Loosen the screw in the gas valve inlet pressure port one full turn and push the hose from the pressure gage over the pressure port. Turn on the gas supply. The SUMMIT appliance is designed to operate with supply pressures of 4-13 in. w. c. (2.3 - 7.5 oz/ in²). If the supply pressure exceeds 13 in. w. c. (7.5 oz/ in²) (with the appliance off) it is possible that this may be the cause of the delayed ignitions and the inlet pressure must be reset to ~ 9 in. w. c. (5.2 oz/ in²). Restart the appliance and then switch it off. If the inlet gas pressure exceeds 13 in. w. c. (7.5 oz/ in²) after the appliance is switched off, correct the lock up problem.







NOTE: The word "Thermostat" is used for all space heating control contacts such as zone valve end switches, circulator relay contacts, etc.



8.6.2 Gas Valve Regulation

Gas valve regulation problems can also cause delayed ignitions. See Sections 7.2.2 and 7.2.2.1

8.6.3 Defective Burner - occurs on startup or at burner shutdown

A defective burner can cause a delayed ignition during operation or at shutdown. If the gas supply pressure is proper, the gas valve is functioning properly and the gas valve throttle and offset pressure are set correctly, the burner should be inspected. For inspection: remove the blower and blower mounting piece as one unit. The burner is retained by the blower mounting piece and may be lifted out of the top of the chamber after the blower mounting piece and blower have been removed. There should be no distortion or perforations in the burner other than the punched holes. Replace if indicated.

8.7 Short Cycling

SMB-200/250 Boiler

Because the Summit is a modulating boiler and its input will decrease when there is a reduction in heating load, short cycling is greatly reduced. If the heating load drops below the minimum input of the boiler for an extended period, the boiler will have a tendency to short cycle. If short cycling is frequently experienced, regardless of the control's attempt to limit it, the heating load should be redistributed to control it.

8.8 Short Cycling

SMW-200/250 Water Heater

Short cycling will generally occur only in combination space heating and water heating applications when the water heater is operating in the space-heating mode. Because the Summit is a modulating water heater and its input will reduce when there is a reduction in heating load, short cycling is greatly reduced. If the heating load drops below the minimum input of the water heater for an extended period, the water heater will have a tendency to short cycle. If short cycling is frequently experienced, regardless of the control's attempt to limit it, the heating load should be redistributed to control it.

If short cycling occurs in a water heater application, it is probably caused by undersized piping between the water heater and the Storage Tank or by some other factor that restricts proper water flow through the water heater. The cause should be determined and corrected.

8.9 High Gas Consumption

Appliances operating with an improper air/fuel ratio are very inefficient and consequently, have very high gas consumption. Because efficiency is high when the CO₂ is high (or O₂ is low), appliances operating with low CO₂ or high O₂ (especially LP appliances) consume more gas. Adjust the CO₂ or O₂ for optimum efficiency. If no combustion analyzing equipment (CO₂ or O₂) is available then a proper adjustment of the air/fuel ratio (CO₂ or O₂) can not be accomplished. However, by briefly sniffing the flue gases it is possible to determine if the CO₂ or O₂ is within the proper range. No significant flue gas odor should be detected when combustion is proper. A strong piercing smell indicates poor combustion and generally a lean mixture (low CO₂ or high O₂). Check gas valve/venturi setup (Throttle and Offset Adjustment – Section 7.2.2.1) and adjust if indicated. **Do not attempt to correct combustion without an O₂ or CO₂ kit and a Magnehelic® pressure gage.**

SECTION 9.

Replacement Parts

Description	Part Number
1. Thermostat Kit (140°F)	2400-130
2. Pump, Grundfos, UP26-99F - SMB	2400-090**
2. Pump, Grundfos, UP26-99BF - SMW	2400-388***
3. Venturi, Gaskets included	2400-131
4. Exhaust (Flue) Assembly	2400-402
5. Blower	2400-133
6. Gas Valve	2400-134
7. Burner (Flameholder)	2400-135
8. Economizer Coil	*
9. Boiler Coil	*
10. Combustion Chamber Ass'y	2400-136
Gasket Kit (Not Shown)	2400-137
11. Ignitor/Flame Sensor Ass'y	2400-138
12. Pressure Gauge (75 PSI) - SMB	2400-574**
Pressure Gauge (300 PSI) - SMW	2400-150***
Pressure Relief Valve (50 PSI) - SMB	2400-316**
Pressure Relief Valve (125 PSI) - SMB	2400-097**
Pressure Relief Valve (150 PSI) - SMW	2400-095***
Appliance Control (PCB)	2400-139
Differential Pressure Switch	2400-106
Flue Overheat T'stat (Limit)	2400-058
Sensor, Appliance Discharge	2400-556
Safety Limit	2400-055
Exhaust (flue) Terminal	2400-104
Intake Terminal	2400-102
Wall Flange	2400-100
Propane Conversion Kit	2400-140

* Not Sold Separately, Part of 2400-136

** SMB-200/250 Only

***SMW-200/250 Only

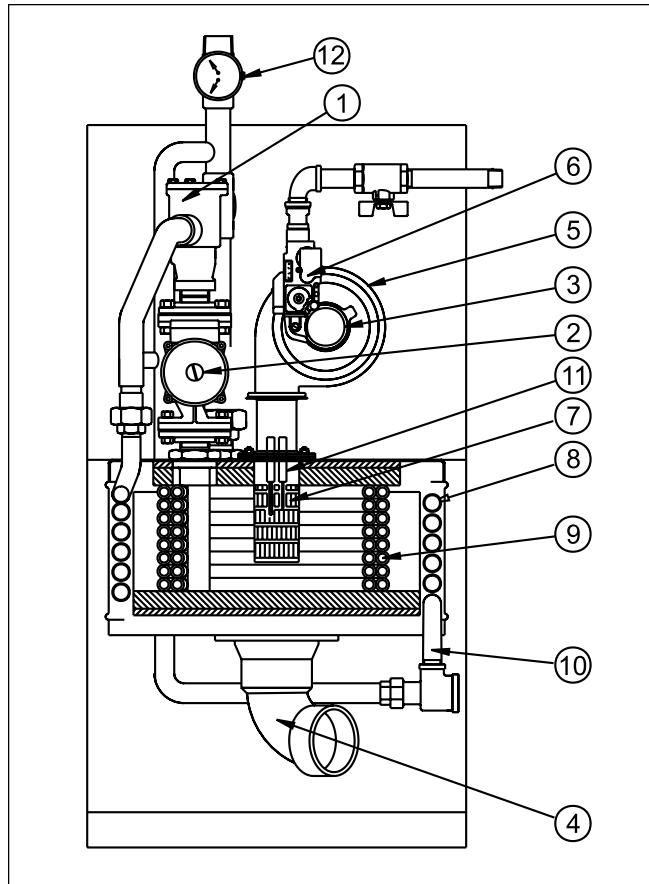


Figure 21. Parts Identification.



H2212100D

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800.900.9276 • Fax 800.559.1583 (**Customer Service, Service Advisors**)
20 Industrial Way, Rochester, NH 03867 • 603.335.6300 • Fax 603.335.3355
1869 Sismet Road, Mississauga, Ontario, Canada L4W 1W8 • 905.238.0100 • Fax 905.366.0130
www.Laars.com

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