

## Installation and Operation Instructions for

# Brute Mini

Residential  
Gas-Fired  
Hydronic Boilers  
Model BJVS

Sizes 50-225

U.S. Patent No. 1,609,692  
Canada Patent No. 383,318

Vent damper is optional in some provinces of Canada..

**These instructions are to be stored next to the boiler for reference purposes.**

**FOR YOUR SAFETY:** This product must be installed and serviced by a professional service technician, qualified in hot water boiler 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.

### **⚠ 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 êtes.
- 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.

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## SECTION 1. General Information

### 1A. Introduction

This manual provides information necessary for the installation, operation, and maintenance of the Bradford White Model BJVS low pressure, copper tube hydronic boiler.

All application and installation procedures should be reviewed completely before proceeding with the installation. Consult the Bradford White 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.

#### **WARNING**

This hydronic boiler must be installed in accordance with the procedures detailed in this manual, or the Bradford White 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 with the latest edition of CAN/CGA B149.1 OR .2 installation codes for gas burning appliances, and/or local codes.

Any modifications to the boiler, its gas controls, gas orifices, wiring or draft inducer assembly may void the warranty. If field conditions require modifications, consult the factory representative before initiating such modifications.

#### **ATTENTION**

L' eau chaude chaudière doit être installé en conformité avec les procédures détaillées dans ce manuel, ou le Bradford White garantie sera annulée. L'installation doit être conforme aux exigences de la juridiction locale ayant l'autorité, et, aux ÉTATS-UNIS , à la dernière édition du National gaz carburant Code, ANSI Z223.1. Au Canada, l'installation doit être conforme à la plus récente édition de la norme CAN/CGA B149.1 ou .2 codes d'installation gaz pour appareils de combustion et/ou codes locaux.

### 1B. Warranty

Bradford White appliances are covered by a limited warranty.

All warranty claims must be made to an authorized Bradford White wholesale rep / distributor. To find information about the wholesalers in your area, please go to **www.bradfordwhite.com**. and click on 'Wholesalers'.

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.

The warranty does not cover damage caused by improper assembly installation, operation or field modification.

### 1C. Heater Identification

Consult the rating plate on the boiler. The following example simplifies the heater identification:

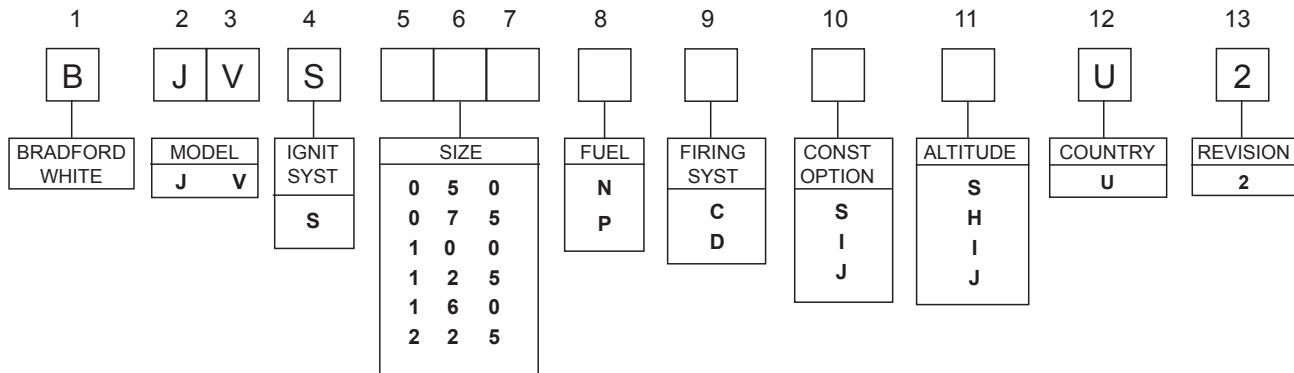


Table 1. Boiler Model Identification.

#### MODEL NOMENCLATURE

1ST THRU 3RD CHARACTERS (MODEL DESIGNATION)

BJV = BRADFORD WHITE CORP.

BRUTE MINI

4TH CHARACTER (IGNITION SYSTEM)

S = SPARK IGNITION

5TH THRU 7TH CHARACTERS (SIZE)

INPUT MBTU / H

8TH CHARACTER (FUEL)

N = NATURAL GAS

P = PROPANE GAS

9TH CHARACTER (FIRING SYSTEM)

D = ON / OFF

10TH CHARACTER (CONSTRUCTION OPTION)

I = (STANDARD)

J = PUMP (050-125 ONLY)

11TH CHARACTER (ALTITUDE IN FEET)

S = (0 - 2,000) NATURAL OR (0 - 5,000) PROPANE

H = (2,001 - 5,000) NATURAL

I = (5,001 - 8,000) NATURAL AND PROPANE

J = (8,001 - 10,000) NATURAL AND PROPANE

12TH CHARACTER (COUNTRY)

U = USA & CANADA

13TH CHARACTER (REVISION)

2 = SECOND REVISION

## SECTION 2.

### Boiler Assembly and Placement

#### 2A. Field Assembly

The Brute Mini is available only with a spark ignition system and this is indicated on the rating plate, which can be found on top of the boiler in the right rear corner. The Bradford White automatic vent dampers are also standard sizes. And the Bradford White side wall power venters can be used on sizes. Special instructions for their installation are included in the vent damper and power venter package. Read them carefully before installation.

#### Vent Damper:

1. Brute Mini's have built-in draft diverter for natural draft operation.
2. Find the vent damper box which is located in the boiler package.
3. Install the vent damper directly to the top of the draft diverter outlet with the damper operator facing to the front of the boiler, and with the flow direction arrow pointing upward. Use the vent damper wire harness provided with the boiler to connect the vent damper to the boiler. The bracket end of the harness should be connected to the vent damper actuator.
4. Install the metal plug provided with the vent damper onto the damper plate hole.

- Do not modify the automatic vent damper device. It is very important that no other vents are closed. Provide at least six inches clearance between the automatic vent damper and combustible construction, and be sure to allow access for servicing the damper.

**Temperature/Pressure Gauge:** Install the temp/pressure gauge provided in the parts box.

## 2B. Boiler Placement

- The boiler must be placed to provide clearances on all sides for maintenance and inspection. There must also be minimum distances maintained from combustible surfaces. Avoid locations which can be damaged by water or moisture.
- A minimum of 15" (381mm) access must be available in front of the boiler for burner tray removal. Consult local codes for clearances to hot water pipes and accessories.
- If the boiler is to be installed in a garage, all burners and burner ignition devices must have a minimum 18" (457mm) clearance above the floor.**
- Boilers can be installed in a closet as long as the minimum clearances shown in **Table 2** are observed. Special attention should be paid to clearances between the front of the boiler and the closet door when it is closed (see **Figure 2**).

## 2C. Flooring

BJVS model boilers can only be installed on noncombustible flooring.

**All boilers must be installed on a level floor and must NEVER be installed on carpeting. NEVER store objects on or around the boiler.**

**Noncombustible flooring** is defined as flooring material and surface finish not capable of being ignited and burning and with no combustible materials against the underside. Acceptable materials are those consisting entirely of a combination of steel, iron, brick, tile, concrete, slate, glass or plaster.

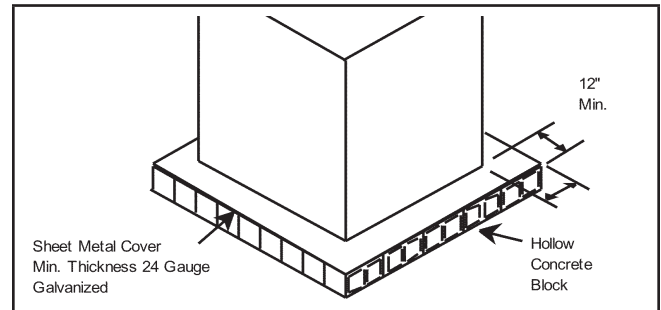
### **⚠ WARNING**

This boiler is intended for indoor installation only. Do not install this boiler in a location subject to negative pressure, or improper operation will occur.

### **⚠ Avertissement**

Cette chaudière est destinée pour une installation intérieure uniquement. Ne pas installer cette chaudière dans un endroit soumis à pression négative, ou fonctionnement incorrect se produira

**The Brute Mini can be installed on a combustible floor if a noncombustible base assembly, available from Bradford White, is used.** See the Parts List at the back of this manual for the appropriate Noncombustible Base Kit part number.



**Figure 1. Typical Combustible Floor Installation.**

As an alternative to the Bradford White Noncombustible Base Kit, in the United States the National Fuel Gas Code allows a heater to be placed on a combustible surface when there is a platform under the heater made of hollow masonry no less than 4 inches (102 millimeters [mm]) thick, covered with sheet metal at least 24 gauge thick and extending beyond the full width and depth of the heater by at least 12 inches (305mm) in all directions. The masonry must be laid with ends unsealed, and joints matched to provide free circulation of air from side to side through the masonry (see Figure 1). If the boiler is installed in a carpeted alcove, the entire floor of the alcove must be covered by a noncombustible platform.

## 2D. Clearance / Closet Installations

All Brute Mini JV's can be installed in a closet as long as the minimum clearances are observed.

See **Table 2A** and **Figure 2B** for clearances required for the Brute Mini

Special attention should be paid to clearances between the front of the boiler and the closet door when it is closed.

Consult the American National Standard Z21.13 for more information concerning closet installations. In Canada, refer to the latest edition of CSA-B149.1.

### **⚠ Caution**

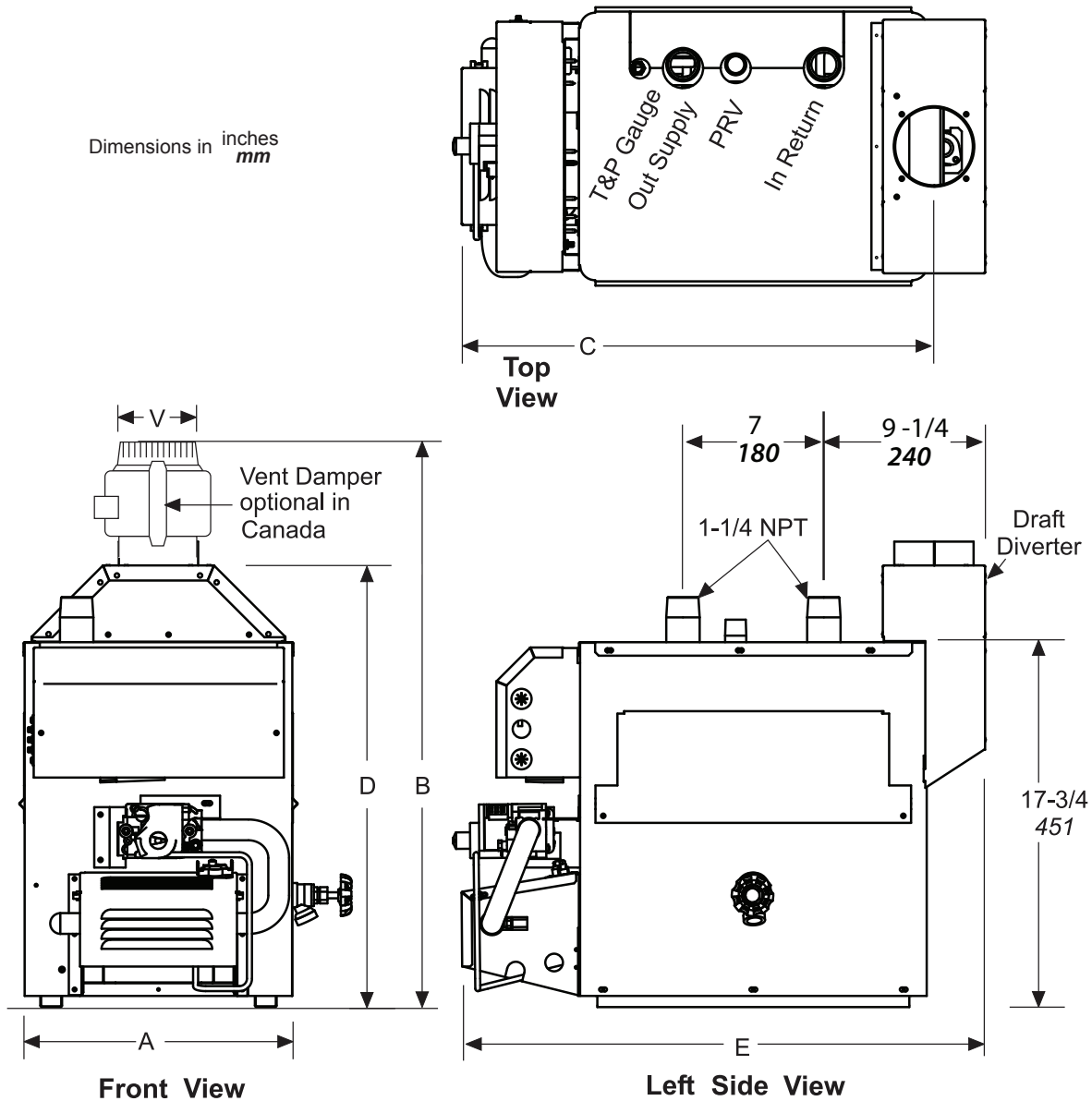
Do not force motor operation when operator is fastened to the damper by moving the damper blade, turning the shaft or by turning the position indicator.

### **⚠ Attention**

Ne pas tourner le registre manuellement avec ou sans courant électrique ou le moteur sera endommagé.

**2E. Dimensional Information**

Dimensions in inches  
mm



Size	A		B		C		D		E		V		Water Conn	Gas Conn
	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm	in.	mm		
50	13-3/8	340	27-3/4	710	23-5/8	600	21-3/4	550	26-1/2	670	4	10	1-1/4	1/2
75	13-3/8	340	27-3/4	710	24-1/8	610	21-3/4	550	27-1/2	700	5	13	1-1/4	1/2
100	16-7/8	430	28-3/4	730	24-1/8	610	22-3/4	580	27-1/2	700	5	13	1-1/4	1/2
125	16-7/8	430	28-3/4	730	23-5/8	600	22-3/4	580	27-1/2	700	6	15	1-1/4	1/2
160	20-3/8	518	28-3/4	730	23-5/8	600	22-3/4	580	27-1/2	700	6	15	1-1/4	1/2
225	25-5/8	651	31-1/2	800	23-1/4	590	23-3/4	630	27-1/2	700	7	18	1-1/4	3/4

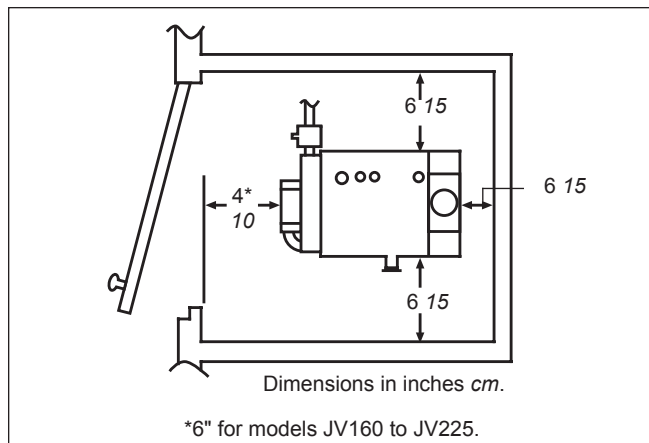
**BJVS Dimensions**

Boiler Sizes	50 - 125		160 - 225	
Clearances	in	cm	in	cm
Left side	6	15	6	15
Right side	6	15	6	15
Rear	6	15	6	15
Front	4	10	4	10
Flue	6	15	6	15
Top	23	58	36	91

**Table 2A Minimum Boiler Clearances**

**Note:** Clearances listed are manufacturer's tested values. These are given as minimum values. Where local and national codes apply, and values are different than those listed use the greater value to ensure safe operation.

**Minimum Boiler Clearances from Combustible Surfaces.**  
**Dégagements Minimaux à Assurer Entre Ics Parois de L'appareil et les Constructions Combustibles**



**Figure 2B. Closet Installation**

## SECTION 3. Air and Venting

### 3A. Combustion Air Supply

The boiler location must provide sufficient air supply for proper combustion, and ventilation of the surrounding area as outlined in the latest edition of U.S. ANSI standard Z223.1 or in Canada, CAN/CGA-B149.1 or .2, and any local codes that may be applicable.

In general, these requirements specify that the boiler rooms which represent confined spaces should be provided with two permanent air supply openings; one within 12 inches (305mm) of the ceiling, the other within 12 inches (305mm) of the floor.

**NOTE:** In Canada, follow Canadian Standard, CAN/CGA-B149 or local codes.

**Outside Air Supply:** When combustion air is supplied directly through an outside wall, each opening should have a minimum free area of one square inch per 4,000 BTU/h (6 sq. cm per 1.2 kW) input of the total input rating of all appliances in the enclosed area.

**Inside Air Supply:** When combustion is supplied from inside the building, each opening should have a minimum free area of one square inch per 1,000 BTU/h (6 sq. cm per 0.3 kW) input of the total input rating of all appliances in the enclosed area. These openings should never be less than 100 square inches (645 sq. cm).

Boiler Size	Outside Air Area		Inside Air Area	
	sq. in	sq. cm	sq. in.	sq. cm
50	15	97	100	645
75	20	129	100	645
100	25	161	100	645
125	32	206	125	807
160	40	258	160	1032
225	60	387	225	1452

\*Area indicated is for one of two openings: one at floor level and one at the ceiling, so the total net free area would be double the figures shown. For special conditions, refer to NFPA54 ANSI Z223.1. In Canada, refer to the National Standard CAN1-B149.1 or .2, which differs from this table.  
 NOTE: Check with louver manufacturers for Net Free Area of Louvers. Correct for screen resistance to the Net Free Area if a screen is used.

**Table 3. Minimum Recommended Air Supply to Boiler Room**

**Exhaust Fans or Vents:** Any equipment which exhausts air from the boiler room can deplete the combustion air supply or reverse the natural draft action of venting system. This could cause flue products to accumulate in the boiler room. Additional air must be supplied to compensate for such exhaust.

The information in **Table 3** is not applicable in installations where exhaust fans or blowers of any type are used. Such installations must be designed by qualified engineers.

If a blower or fan is used to supply air to the boiler room, the installer should make sure it does not create drafts which could cause nuisance shutdowns. If a blower is necessary to provide adequate combustion air to the boiler, a suitable switch or equivalent must be wired into the boiler control circuit to prevent the boiler from firing unless the blower is operating.

The boiler must be completely isolated and protected from any source of corrosive chemical fumes such as those emitted by trichloroethylene, perchloroethylene, chlorine, etc.

### 3B. Venting

**Vent Categories:** Brute Mini BJVS is a natural draft appliance for Category I venting only.

#### ⚠ WARNING

This boiler must be vented in accordance with Part 7, Venting of Equipment, of the latest edition of the National Fuel Gas code, ANSI Z223.1 and all applicable local building codes. In Canada, follow CAN/CGA B149 Installation codes. Improper venting of this appliance can result in excessive levels of carbon monoxide which can result in severe personal injury or death!

#### ⚠ AVERTISSEMENT

Cette chaudière doit être ventilée, conformément aux dispositions de la partie 7, de la ventilation de l'équipement, de la dernière édition du National gaz carburant code, ANSI Z223.1 et tous les codes du bâtiment locaux. Au Canada, CAN/CGA B149 codes d'installation. Une mauvaise ventilation de cet appareil peut entraîner des niveaux excessifs de monoxyde de carbone qui peut entraîner de graves blessures ou la mort!

The boiler vent collar must be fastened directly to an unobstructed vent pipe with rustproof sheet metal screws no longer than 1/2" (13mm) and located to prevent interference with the inducer damper.

Do not weld the vent pipe to the boiler collar. The weight of the stack must not rest on the boiler. The boiler top must be easily removable for normal boiler service and inspection.

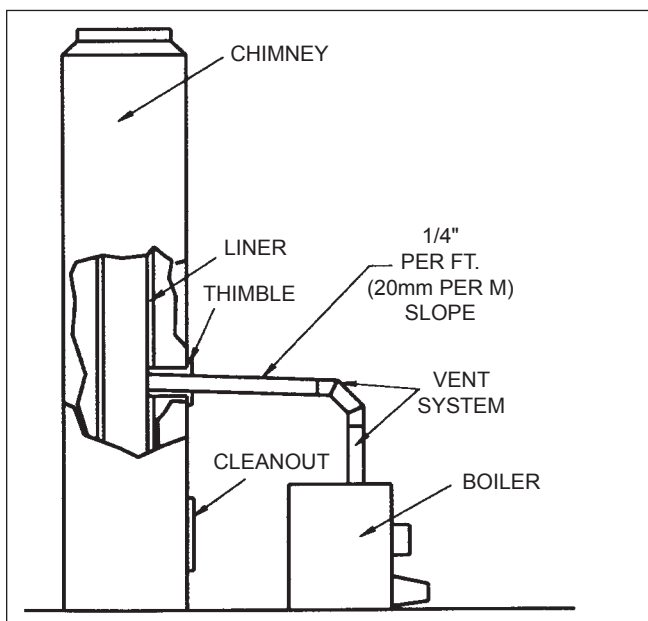


Figure 3. Chimney Venting.

Avoid terminating boiler vents near air conditioning or air supply fans. The fans can pick up exhaust flue products from the boiler and return them to the building, creating a possible health hazard. Avoid oversized vent pipe or extremely long runs of the pipe, which may cause excessive cooling and condensation.

### 3C. Vertical Venting - Category I

**All venting must comply with fuel gas code and be installed by a licensed professional.**

The Brute Mini boiler can be vented into a masonry chimney, (see Figure 2) provided several conditions are met:

1. The chimney must have an appropriate tile lining that is clean, properly constructed and properly sized.
2. The chimney passage way shall be examined to ascertain that it is clear and free of obstructions.
3. If a chimney rebuild is required, it shall conform to nationally recognized standards (see National Building Code or ANSI/NFPA 211).
4. The boiler must not be connected to a fireplace, wood stove or other solid fuel burning equipment.
5. When the boiler and a hot water heater are to be connected to the same chimney, they must have their own vent connector and enter the chimney at least 6" (152mm) apart.

**IMPORTANT NOTE:** Always provide a minimum clearance of 6" (152mm) between Type C (single wall) vent pipe and any combustible materials.

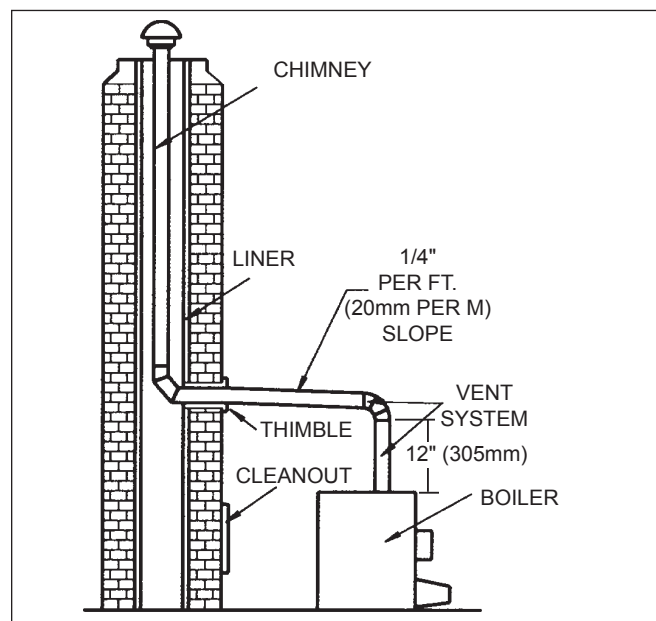


Figure 4. Vertical Venting.



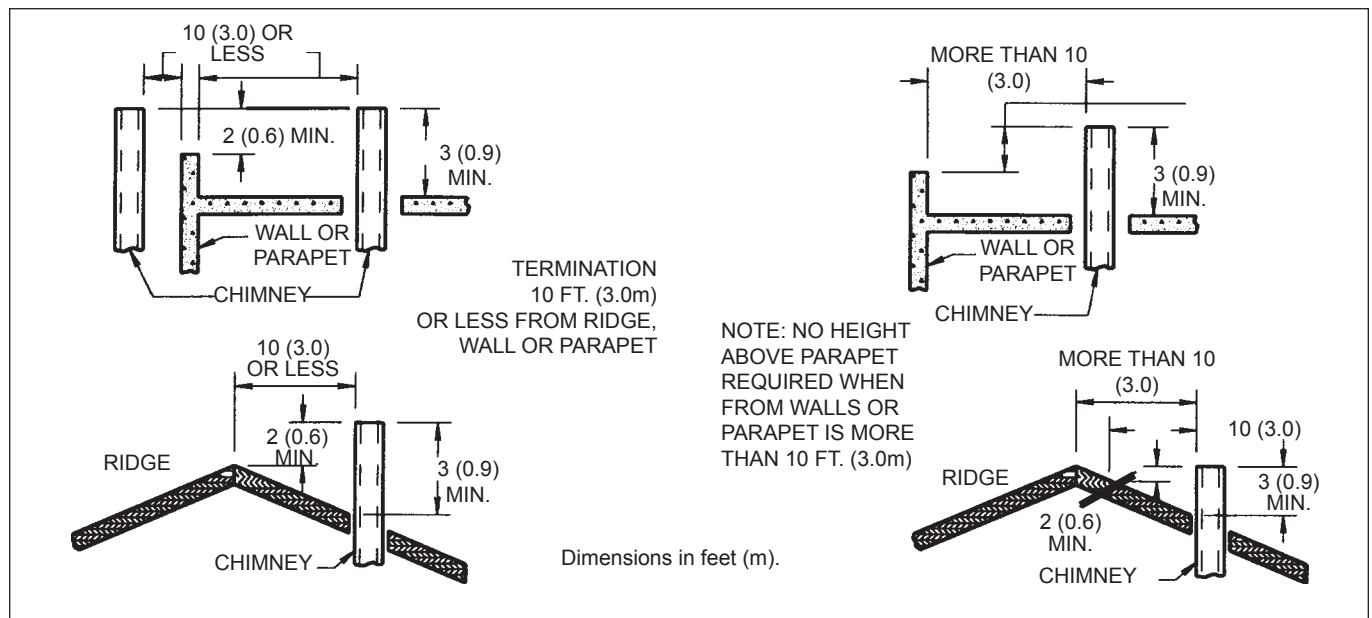


Figure 5. Vertical Vent Termination.

**⚠ WARNING**

Do not store any chemical, cleaners, or other corrosive material near combustion air openings or in the room. Avoid locating dryer vents in the vicinity of combustion air openings. Failure to prevent corrosive materials from mixing with combustion air can result in reduced boiler life and unsafe boiler operation.

**⚠ AVERTISSEMENT**

N'entreposer aucun produit chimique, produit nettoyant ou produit corrosif à proximité des bouches d'air de combustion ou dans la pièce. Éviter de placer des tuyaux de ventilation pour sècheuse à proximité des bouches d'air de combustion. Le fait de laisser des matières corrosives se mélanger à l'air de combustion risque de réduire le cycle de vie de l'appareil de chauffage et de compromettre son fonctionnement.

**⚠ WARNING**

Single wall vent pipe must NEVER pass through interior walls or through floors or ceilings! Failure to comply with this warning could result in a fire causing property damage, personal injury, or death!

**⚠ AVERTISSEMENT**

Paroi simple tuyau d'évent doit jamais passer par l'intérieur les murs ou par planchers ou plafonds ! Le non-respect de cet avertissement peut provoquer un incendie causant des dommages matériels ou corporels, ou de mort!

When installing the vent system, all applicable national and local codes must be followed! The use of thimbles, firestops and other protective devices, when penetrating combustible or noncombustible construction, must be in accordance with all applicable national and local codes.

An unused lined chimney can be used as a raceway for single wall vent pipe, (see Figure 3). Never run vent pipe through a flue that has another appliance attached to it.

**3D-1. Horizontal Venting - Category III**

The Brute Mini BJVS cannot be vented horizontally.

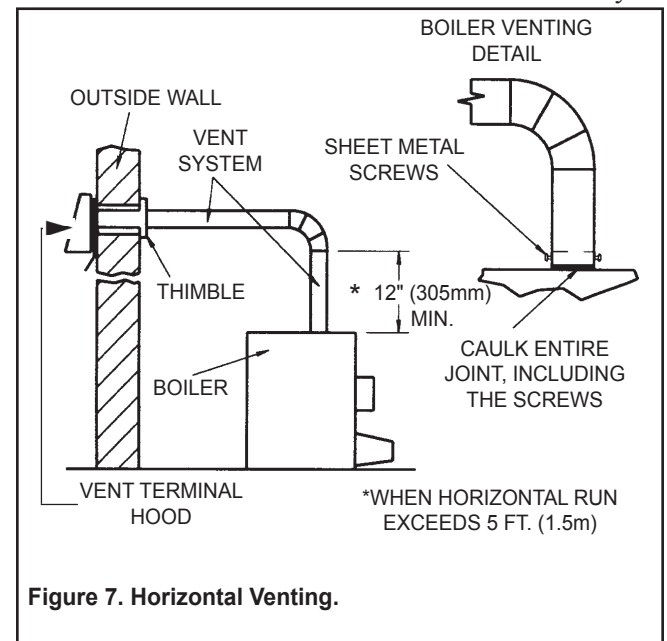


Figure 7. Horizontal Venting.

### 3D-2. Vent Connections

The vent system must be gas tight. All seams and joints must be sealed with silicone sealant or adhesive tape having a minimum temperature rating of 400°F (204°C). Use at least three corrosion resistant screws at each slip joint, when required.

For best results, horizontal vent systems should be as short and straight as possible. Material of vent connectors shall be as follows:

Description	Manufacturer	Product
High Temperature RTV	Dow Corning	Trade Mate
2" (51mm) wide Aluminum foil tape - adhesively backed	Venture	Product #3243
2" (51mm) wide Aluminum foil tape - adhesively backed	3M	Product #433

**Vent Sealing Materials.**

Materials	Vent Length
<p><b>In U.S.A.:</b> UL type 304, 316 or 294-C stainless steel or equal 26 gauge minimum.</p> <p><b>In Canada:</b> Use "BH-Type" vent material certified to ULD-S636 Class I (more than 135°C, but not more than 245°C flue gas temperature), made of AL29-4C stainless steel or equal.</p>	Up to a maximum of 55' (17m) of equivalent pipe run (including required elbows).
<i>Do not use plastic venting of any kind.</i>	

The boiler vent collar must be fastened to the vent pipe with rustproof metal screws no longer than 1/2" (13mm) and sealed with high temperature (500°F / 260°C) silicone sealant. For larger diameter vent pipes, use a sealed reducer fastened directly to the boiler collar and seal all joints as indicated in **Figure 7**. Allow the sealant to cure for 24 hours before operating the boiler.

The entire vent system must not exceed the size specified in **Table 4**.

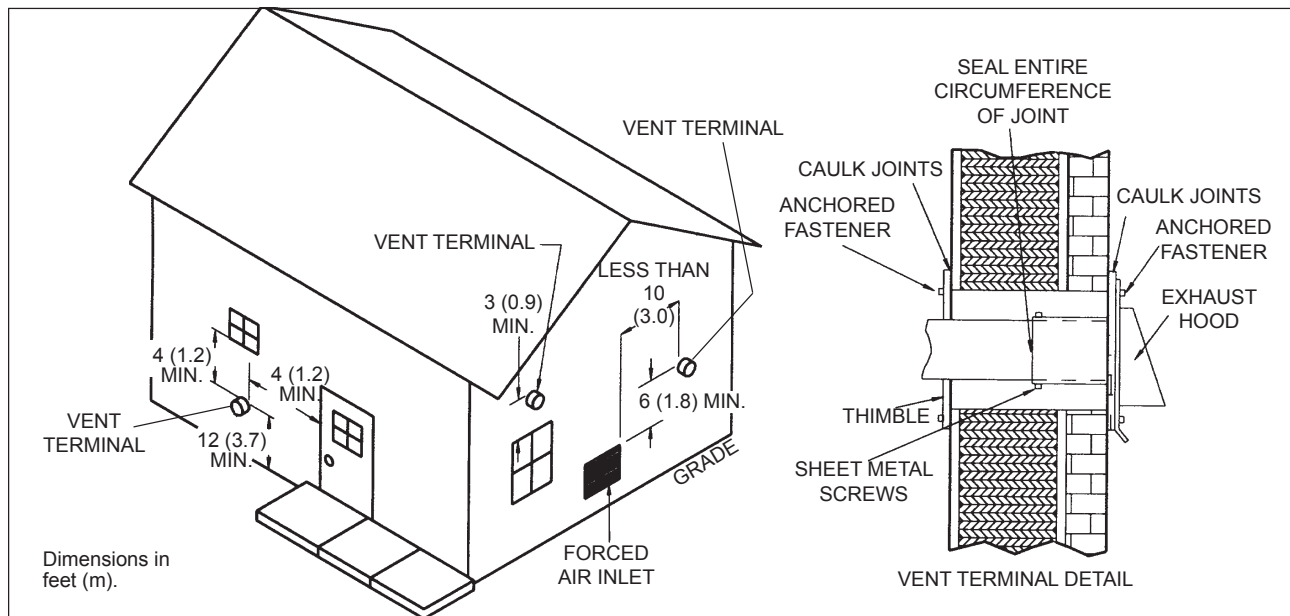
The following criteria must be observed:

1. Attach a vertical pipe at least 12" (305mm) high to the boiler outlet before the horizontal run if run exceeds 5 feet (**see Figure 5**).
2. Support the vent run at 3' (.9m) intervals with overhead hangers.
3. Pitch down the vent run, toward the vent terminal (hood), 1/4" per foot (20mm per meter).
4. Do not locate any joint screws at the bottom of the vent run.

Size	Diameter		No. of Elbows	Horizontal Run Length	
	in.	mm		ft.	m
50 - 160	4	102	4	35	10.7
225	4	102	2	10	3.0
225	6	152	4	35	10.7

*For each elbow eliminated, add 5' (1.5m) of allowable vent.*

**Table 4. Horizontal Venting Configuration.**



**Figure 6. Horizontal Vent Termination.**

### 3E. Common Venting System

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.

1. Seal any unused openings in the common venting system.
2. Visually inspect the venting system for proper size and horizontal pitch and determine there is no blockage or restriction, leakage, corrosion or other deficiencies which could cause an unsafe condition.
3. 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 gas burning appliance not connected to the common venting system. Turn 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 burner opening after five minutes of main burner operation.
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 the installation conforms with the National Fuel Gas Code, ANSI Z223.1. When re-sizing any portion of the common venting system, the common venting system should be re-sized to approach the minimum size as determined using the appropriate tables in Appendix G in the National Fuel Gas Code, ANSI Z223.1.

#### **WARNING**

Operation of appliances with a blocked common vent may lead to serious injury or death. Safety devices must be implemented to prevent blocked common vent operation. If safe operation of all appliances connected to a common vent cannot be assured, including prevention of spillage of flue gasses into living spaces, common venting should not be applied, and appliances should each be vented separately.

#### **AVERTISSEMENT**

Le fonctionnement des appareils avec un système d'évacuation bloqué peut provoquer des blessures graves, voire la mort. Des dispositifs de sécurité doivent être installés pour éviter le blocage des systèmes d'évacuation. Si le fonctionnement de tous les appareils connectés à un système d'évacuation commun ne peut pas être assuré, y compris la prévention de la dispersion des gaz toxiques dans les espaces habités, on ne devrait pas installer un système d'évacuation commun et chaque appareil devrait être ventilé séparément.

## SECTION 4. Gas Connections

### 4A Gas Supply and Piping

**⚠ WARNING**

The Brute Mini is designed for use with either natural gas or LP gas. Check the rating plate to be sure that the boiler is designed to use the type of gas being supplied. **DO NOT ATTEMPT TO CONVERT THIS HEATER FOR USE WITH ANY OTHER TYPE OF FUEL.**

**⚠ AVERTISSEMENT**

Les appareils de chauffage à faibles sont conçus pour être utilisés avec du gaz naturel ou du gaz de pétrole liquéfié (GPL). Vérifiez l'information inscrite sur la plaque signalétique du pour vous assurer que l'appareil est conçu pour le type de gaz fourni. **NE PAS ESSAYER DE CONVERTIR CET APPAREIL À UN AUTRE TYPE DE GAZ.**

Supply Pressure	Minimum	Maximum
Natural Gas	5.5 Inches WC (1.3 kPa)	10.5 Inches WC (2.5 kPa)
LP Gas	10.0 Inches WC (2.4 kPa)	13.0 Inches WC (3.1 kPa)

**Table 5. Gas Supply Pressure Requirements.**

**⚠ Caution**

Permanent damage to the gas valve will occur if the following procedures are not followed.

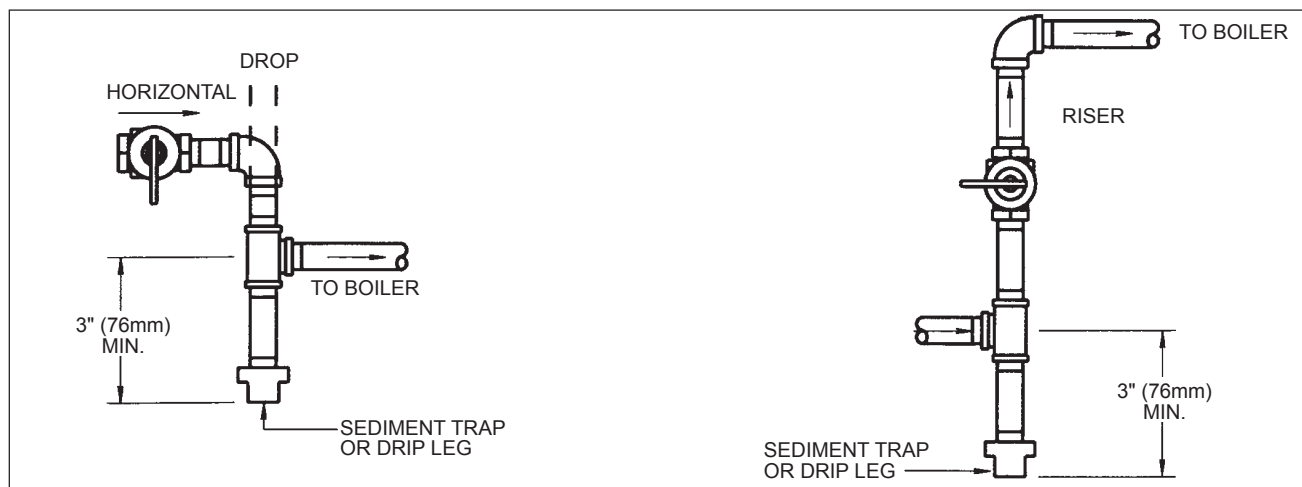
**⚠ Attention**

Vous endommagerez la soupape de gaz si vous ne respectez pas les procédures suivantes.

- Gas piping installation must be in accordance with the latest edition of ANSI Z223.1 and all local codes. In Canada, the installation must be in accordance with CSA-B149.1 and all local codes that apply.
- Check the gas supply to be sure that it is the same as the gas indicated on the boiler's plate. Brute Mini boiler, as shipped from the factory, is certified to operate within the altitude range indicated on the rating plate. If a field conversion to a different altitude range or different gas should be necessary, conversion parts are available. Contact a Bradford White representative or the factory for the correct part numbers to order for conversions

- Use the figures in **Table 6** to size the gas inlet piping from the gas meter to the heater. Check all local codes for compliance before installing the heater.

Boiler Size						
Distance From Gas Meter	50	75	100	125	160	225
Pipe Size						
0-50 0-15m	1/2	3/4	3/4	3/4	1	1
50-100' 15-30m	3/4	3/4	3/4	1	1	1-1/4

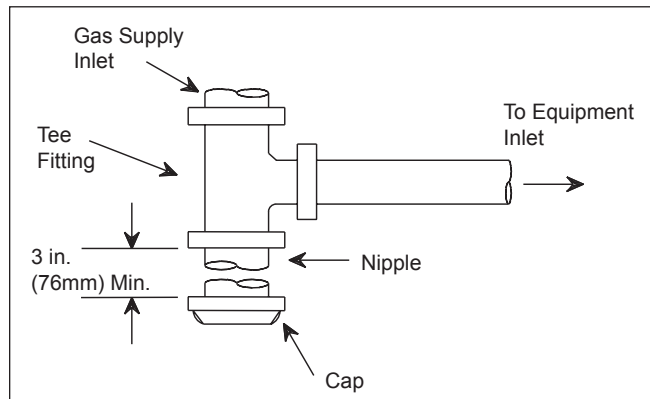


**Figure 8. Gas Supply Piping.**

100-200' 30-60m	3/4	1	1	1	1-1/4	1-1/4
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**\*Note:** These figures are for Natural Gas (.65 Sp. Gr.), and are based on 1/2" water column pressure drop. Check supply pressure with a manometer, and local code requirements for variations. For LPG, reduce pipe diameter one size, but maintain a 1/2" minimum diameter. A 'normal' number of Tees and elbows have been taken into allowance.

**Table 6. Natural Gas Pipe Size Requirements\***



**Figure 9. Typical design for a sediment trap/drip leg.**

4. A sediment trap (drip leg) must be installed ahead of the gas controls (see Figure 8). Fit the trap with a threaded cap which can be removed for cleaning.
5. Install a manual gas shutoff valve for service and safety. Do not use a restrictive gas cock. Flexible gas connectors, if used, must be CSA rated for the total input rating of the boiler.
6. Disconnect the boiler and its individual shutoff valve from the gas supply system during pressure testing of the system at pressures higher than 1/2 pounds per square inch (psi) (3.45 kilopascals [kPa]). If the test pressure is equal to or less than 1/2 psi (3.45 kPa), close the manual shutoff valve on the heater during the piping pressure test.
7. If the gas supply pressure is less than required, check for undersized pipe between the meter and the boiler, a restrictive fitting, or an undersized gas meter. Gas supply pressures to the heater are listed in Table 5.

**NOTE:** The maximum inlet gas pressure must not exceed the specified value. The minimum value listed is for the purpose of input adjustment. Refer to Table 5.

**NOTE:** The boiler and all other gas appliances sharing the boiler gas supply line must be firing at maximum capacity to properly measure the

inlet supply pressure. Low gas pressure could be an indication of an undersize gas meter and/or obstructed gas supply line.

8. The correct high fire burner manifold gas pressure is stamped on the rating plate. The regulator is pre-set at the factory, and normally requires no further adjustment. For two-stage units (100-225) be sure the unit is able to fire at both high and low fire.
9. Before operating the boiler, the complete gas supply system and all connections must be tested for leaks using a leak detector solution. Do not use an open flame.

**⚠ Caution**

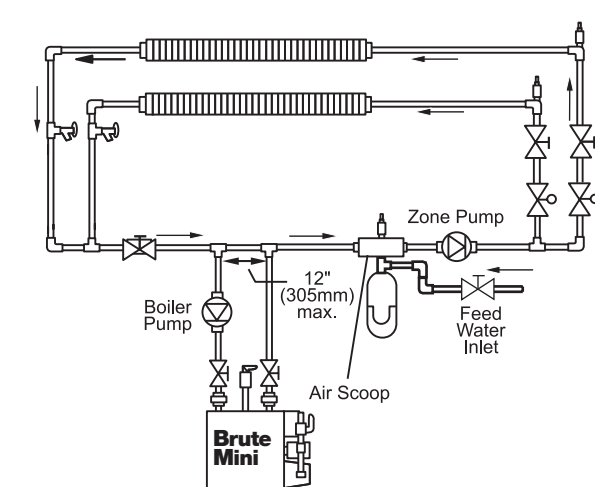
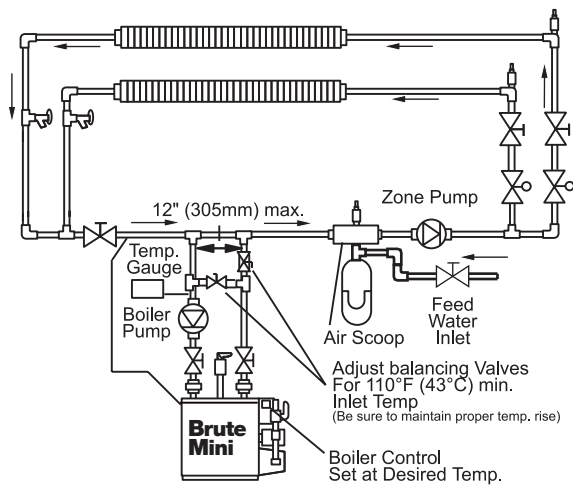
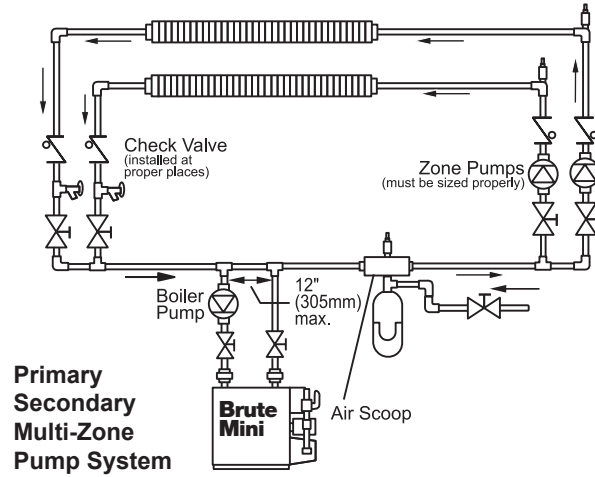
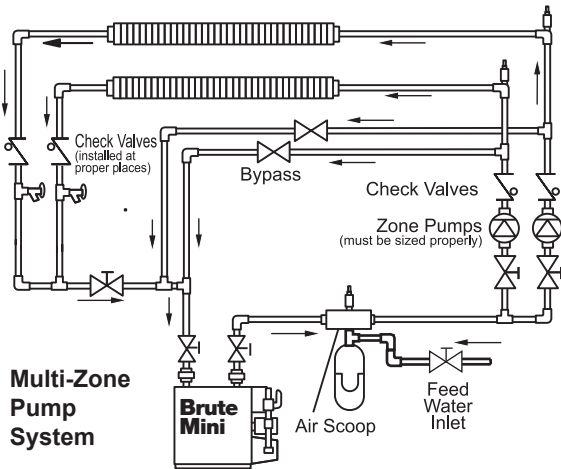
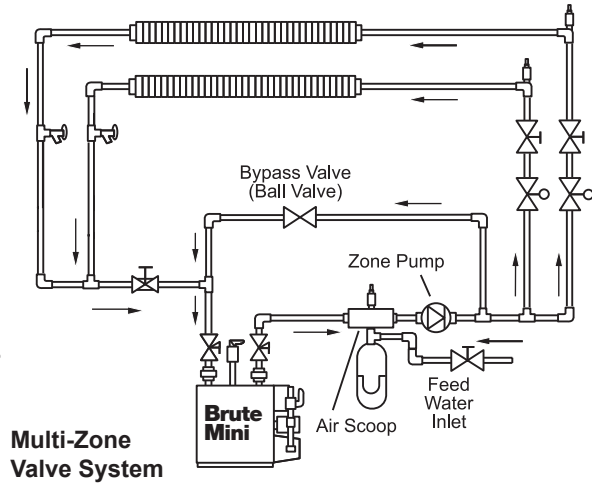
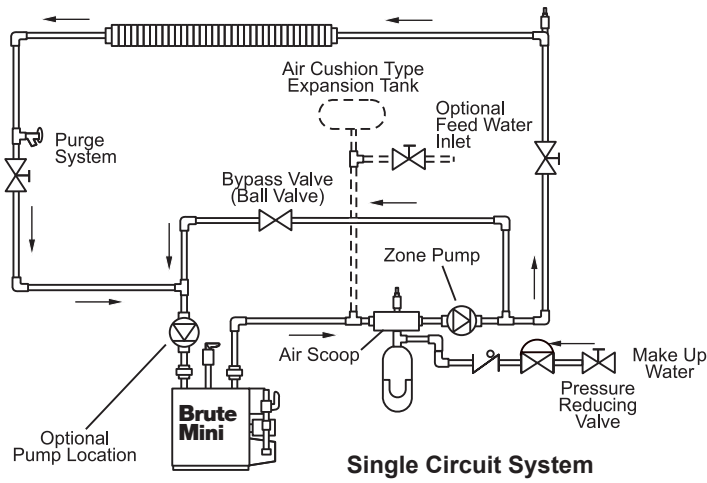
Some leak test solutions (including soap and water) may cause corrosion or stress cracking. Rinse the piping with water after testing.

**⚠ Attention**

Certaines solutions d'essai d'étanchéité (y compris l'eau et le savon) peuvent causer de la corrosion ou de la fissuration. Rincez les tuyaux à l'eau après l'essai d'étanchéité.

#### 4B Special Precautions for LP Gas

LP Gas is heavier than air and can therefore more readily collect or “pool” in enclosed areas if provision for proper ventilation is not made. Be sure to pay special attention to proper ventilation for LP gas. Locate boilers a safe distance from LP gas cylinders and filling equipment. In the United States, consult the “National Fuel Gas Code” (NFPA 54 / ANSI Z223.1, latest edition) or in Canada, the Propane Installation Code (CSA-B149.1), any local codes and fire protection authorities about specific installation restrictions in your area.



KEY:	PUMP	CHECK VALVE	VALVE	ZONE VALVE	UNION	AUTO AIR BLEEDER
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Figure 10. Typical Plumbing Installations.

## SECTION 5. Water Connections

### 5A. Water Piping

Figure 10. shows ‘typical’ plumbing installations. Be sure to provide unions and isolation valves at the boiler inlet and outlet so it can be isolated for service. Check local codes for specific plumbing requirements before beginning the installation.

An ASME pressure relief valve is supplied on all BJVS boilers, and is pre-set at 30 PSI. The valve outlet piping must discharge to a drain. Under no circumstances should the relief valve piping be a closed circuit.

A pressure reducing valve (automatic feed) must be used to maintain the system at constant proper pressure (see Figure 10). Supply properly installed purge valves to eliminate air from each circuit.

A drain valve is supplied with the boiler, and can be found in the plastic bag shipped with each boiler. This valve is to be installed on the lower right side of the boiler and is used for draining the unit. **To drain the boiler completely, open the drain valve and remove the two drain plugs located on the lower left side of the boiler.**

Be sure to include air vent devices located at the highest point in the system to eliminate trapped air, and an air elimination device near the outlet side of the BJVS boiler. Manual vent valves are recommended. Hot water piping should be supported by suitable hangers or floor stands, NOT by the boiler. Due to expansion and contraction of copper pipe, consideration should be given to the type of hangers used. Rigid hangers could transmit noise through the system caused by the piping sliding in the hangers. It is recommended that padding be used when rigid hangers are installed.

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

A properly sized expansion tank must be included in the system.

### 5B By-pass Piping

The following information and suggestions are made on by-pass piping as it affects the temperature rise at the boiler. A boiler temperature rise must be taken on all BJVS boiler installations. If the temperature rise exceeds 30°F (17°C) at full rate, it is an indication that the boiler is not receiving adequate water flow. Check the pump for any obstruction, replace the pump with a larger size where necessary, or install a system by-pass as indicated in **Figures 10 and 11.**

A full sized, 1¼" bypass with balancing valves is strongly recommended for all systems, and required when: 1) the boiler is installed without primary-secondary piping in a multiple zone system; 2) when the return water temperature can be expected to be lower than 120°F (44°C); or 3) whenever the system piping on the outlet side of the boiler may allow reduced flow through the heat exchanger, causing excessive temperature rise (see Section 5.2).

**Note:** Bradford White strongly recommends a primary/secondary piping system for all installations, especially sizes 125, 160 and 225. In this system, a circulator is dedicated to pumping the boiler only. This circulator should be sized for the boiler head loss and flow rate.

All precautions must be taken by the installer to insure that a maximum temperature rise through the boiler does not exceed 30°F (17°C). The temperature rise on boilers installed in multi-zone systems using zone valves must be taken when the zone of the longest length and/or the zone of the highest head loss is open.

A full size, 1¼" diameter by-pass with balancing valve must be installed if a return water temperature below 120°F (44°C) is expected under operating conditions regardless of boiler size. This may be expected in many systems, including in-floor radiant and snow melt systems.

Size	15°F 8°C				20°F 11°C				25°F 14°C			
	Flow Rate		Headloss		Flow Rate		Headloss		Flow Rate		Headloss	
	gpm	l/s	ft	m	gpm	l/s	ft	m	gpm	l/s	ft	m
50	5.3	0.3	0.3	0.1	4	0.3	0.2	0.1	3.2	0.2	0.1	0
75	8	0.5	0.6	0.2	6	0.4	0.3	0.1	4.8	0.3	0.2	0.1
100	10.7	0.7	1.3	0.4	8	0.5	0.7	0.2	6.4	0.4	0.5	0.2
125	13.3	0.8	2.2	0.7	10	0.6	1.3	0.4	8	0.5	0.8	0.2
160	17	1.1	2.5	0.8	12.8	0.8	1.8	0.5	10.2	0.6	1.2	0.4
225	24	1.5	5	1.5	18	1.1	3.1	0.9	14.4	0.9	1.9	0.6

gpm = Water Flow in gallons per minute. l/s = Water flow in liters per second.  
 ft = Pressure drop (headloss) through the boiler in feet of water. m = Pressure drop (headloss) through the boiler in meters of water.  
 Notes: 1. Shaded area is the recommended flow and temperature rise.  
 2. Temperature rise and associated flow rates are based on high fire operation at the Normal Input Rate from the rating plate.

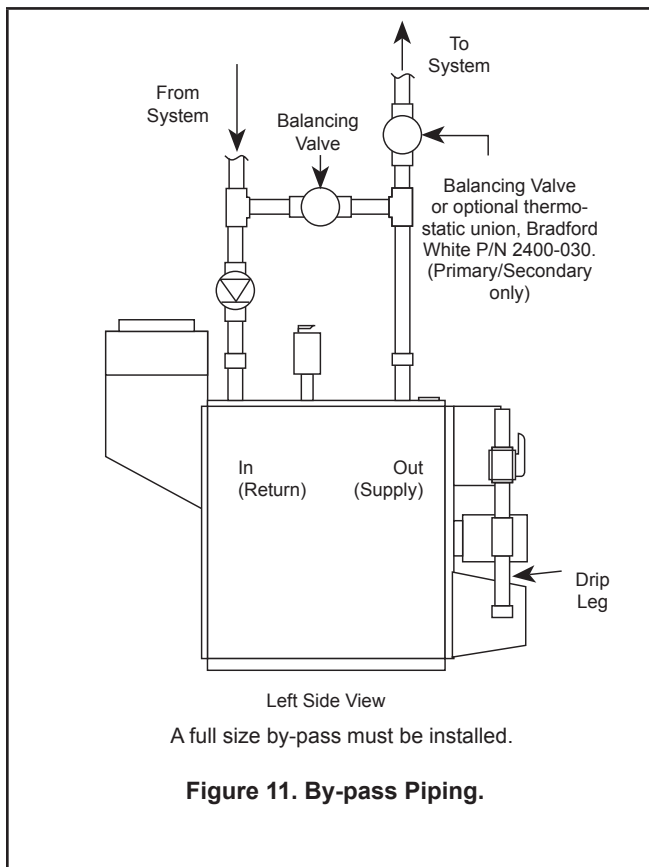
Table 7. Temperature Rise °F °C.

**5C Adjusting the bypass:**

Refer to **Figure 11**. Provide a means of measuring temperature on the inlet pipe to the boiler such as using a strap on or infrared thermometer. Starting with both balancing valves fully open, start the boiler. Adjust the balancing valve on the return to the system slowly to provide 120°F (44°C) water at the inlet to the boiler, leaving the bypass balancing valve fully open. As the system warms up, this valve may need to be adjusted open. In rare cases, this valve will have to be kept fully open, and the bypass balancing valve adjusted toward closed to prevent heated bypass water from satisfying the call for heat when the system is up to temperature.

**5D Alternate Auto-Bypass Operation**

Use of the Bradford White thermostatic union, p/n 2400-030, can provide automatic bypass operation in primary - secondary piped systems (but cannot be used when primary - secondary piping is not used). The thermostatic union is installed on the outlet piping, after the bypass assembly. It can be used in place of a balancing valve. It opens fully at 140°F (see **Figure 11**). Contact the factory for more information.



**5E Flow Requirements**

All high recovery, low volume water boilers must have adequate flow for efficient operation. Pump selection is critical to this goal, and pumps should be selected to provide for system design water temperature rise. **Table 7** details temperature rise and water flow (GPM) for the Brute Mini boilers.

**Damage from improper flow is not warranted.**

Failure to insure proper water flow through the heat exchanger of the boiler will void the Bradford White warranty. Flow can be verified by measuring the difference in water temperatures between the boiler inlet and outlet. For example: For a JV-100 installation, the inlet water temperature is 160°F (71°C), and the outlet temperature is 180°F (82°C) at Normal Input Rate from the rating plate. That means there is a 20° (11°C) temperature rise through the boiler. According to **Table 7**, that would indicate a flow rate of 8 GPM (0.5L/S). Temperature rise must be measured with the longest (highest head) zone calling for heat alone.

Other factors to be considered before selecting a pump are pipe size, the number of fittings throughout the system, smoothness of the interior surface of the pipe, the quantity of water flowing through the pipe, whether a glycol solution is being used, and the total length of piping in the system. **Table 8** provides example pump selection criteria using Type L copper piping, one zone valve and up to eight elbows for single zone systems. Consult the factory or a qualified system designer if you have more fittings or different size or type of pipe.

Size	1/2" Pipe		3/4" Pipe			1" Pipe			1-1/4" Pipe		
	Pump H.P.		Pump H.P.			Pump H.P.			Pump H.P.		
50	50	99	390	680	*	*	*	*	*	*	*
75	*	35	160	300	460	640	*	*	*	*	*
100	*	*	77	150	260	330	620	*	*	*	*
125	*	*	27	80	140	170	360	600	*	*	*
160	*	*	*	25	72	57	160	330	190	480	*
225	*	*	*	*	*	*	*	110	*	69	330

\*A circulator and/or primary/secondary piping are required. Consult factory.

1. Chart is based on 30°F (17°C) maximum temperature rise.
2. Calculations are based on Type L copper tubing with one zone valve and eight elbows.
3. Typical circulating pumps: 1/25 HP=Taco 007, B&G LR-20 or SLC-25, Grundfos UP15-42F, or equivalent. 1/12 HP=B&G LR-12, Grundfos UP26-42F, or equivalent. 1/6 HP=B&G series HV, Grundfos UP43-75, or equivalent.

**Table 8. Maximum Suggested Circuit Length in Feet.**



## **5F Chilled Water Systems**

If the boiler is installed in conjunction with refrigeration systems, it shall be installed so that the chilled medium is piped in parallel with the heating boiler with appropriate valves to prevent the chilled medium from entering the heating boiler.

When boiler piping is connected to heating coils, which are in close proximity to refrigerated air circulation, there must be flow control valves or other automatic methods to prevent gravity circulation of the boiler water during the cooling cycle.

## **5G Oxygen Permeable Systems**

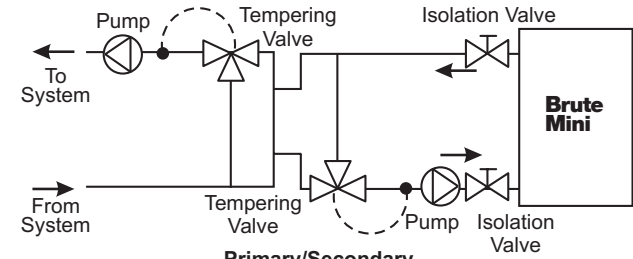
The BJVS boiler must not be direct connected to a heating system utilizing oxygen permeable tubing. Provide a water-to-water heat exchanger between systems to prevent corrosion of ferrous metals such as the boiler's piping wet walls, etc. Air elimination devices are not sufficient protection, and corrosion damage is not covered under the limited warranty.

## **5H Anti-Freeze**

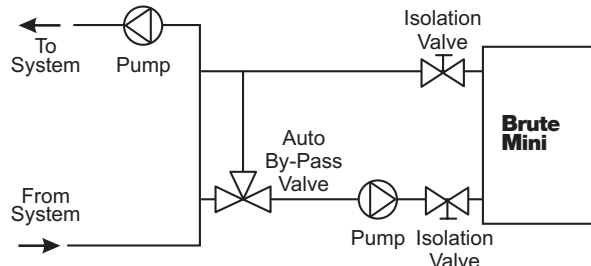
Non-toxic HVAC anti-freeze may be added to the hydronic system provided the concentration does not exceed 50%, and the anti-freeze contains an anti foamant and rust inhibitor. Follow the anti-freeze manufacturer's recommendations for yearly or biannual replacement of system anti-freeze. Never use automotive anti-freeze in a boiler system.

The preferred piping configuration for JV boilers is always using primary/secondary piping. There are some applications that are acceptable without primary/secondary piping, see below.

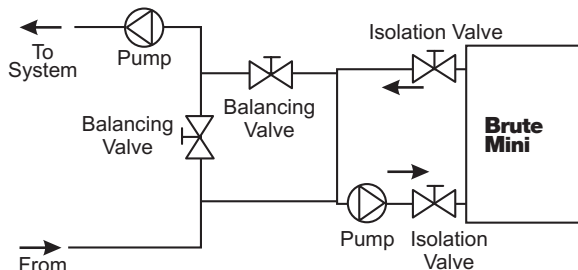
**LOW TEMP SYSTEMS**



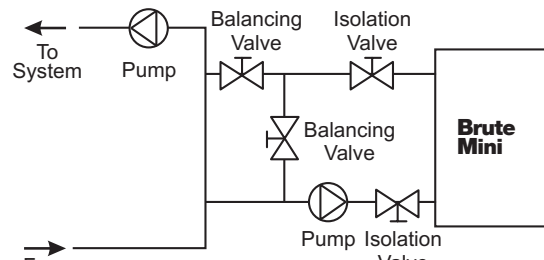
**Primary/Secondary System Loop with Tempering Valve and Pump with Boiler Loop with Tempering Valve and Pump**



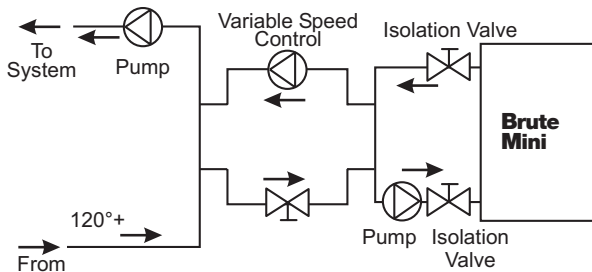
**Primary/Secondary Piping with Automatic By-Pass**



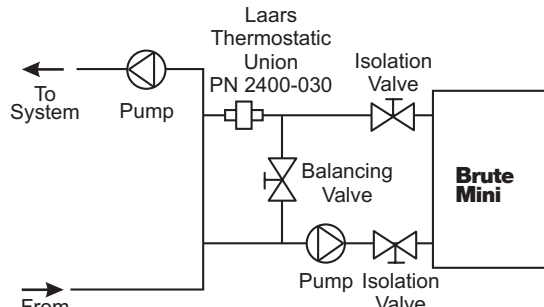
**Primary/Secondary Piping with Field Balancing (for Fixed Low Return Temperatures)**



**Primary/Secondary Piping with By-Pass (for Fixed Low Return Temperatures)**

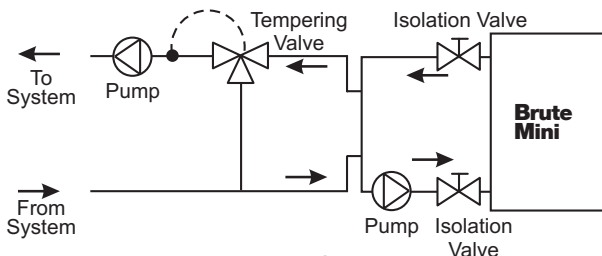


**Primary/Secondary Piping with Variable Speed Injection**

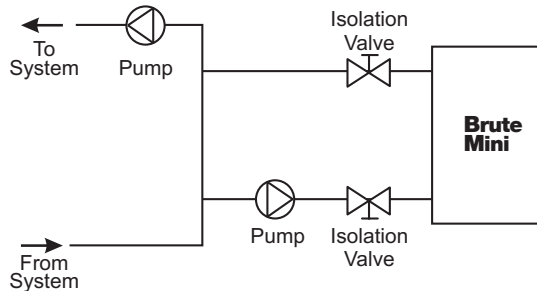


**Primary/Secondary Piping with Laars Thermostatic Union as an Automatic Bypass**

**NON-LOW TEMPERATURE SYSTEMS (120°F+ Return Temps)**



**Tempering Valve with System Loop and Boiler Loop Pump**



**Simple Primary/Secondary Piping - Hydronic - Not Low Temp**

**Figure 12. Typical Plumbing Diagrams.**

NOTE: All closed loop systems should include air elimination, expansion tank and feed water inlet. Place at point of lowest pressure (typically at the inlet of pump).

NOTE: Ball valves should not be used as balancing valves. Only use for shutoff apps.

## SECTION 6.

### 6A. Electrical Wiring

Follow these instructions to make the necessary initial electrical connections.

1. Remove the two screws attaching the front cover of the control box.
2. There are wires coiled in the area on the right side of the control box, supplied with wire nuts: black wires and white wires.
3. Follow the schematic in **Figures 14A. and 14B.** Remove the wire nut from the two sets of wires, and connect the hot lead from the 115V power supply, and the neutral lead to the white wires.
4. Attach the leads from the wall thermostat to the terminal strip, located on the left side of the control box.
5. Check the boiler wiring and pump for correct voltage, frequency and phase. If the pump circuit is other than 115V, be sure there is an appropriate transformer or relay installed. The pump relay is suitable for pumps of 1/3 HP or less (max 5A).
6. For systems with multiple zone pumps or valves (see **Figure 17**).

A means of disconnecting the electrical supply must be provided within sight of the boiler. The pump and boiler must be wired as shown to insure that the pump is running whenever the boiler is firing.

**Flow Switch:** If the system includes a flow switch, it should be wired in series with the high-limit switch. The boiler will not fire unless the pump is running and the flow switch is closed.

Field installed safety devices and operating controllers, such as valve end switches, relays, timers, can be connected to the boiler through the wall thermostat circuit. Do not exceed a draw of 40VA on the transformer secondary. A 2-Amp fuse is here to protect the transformer.

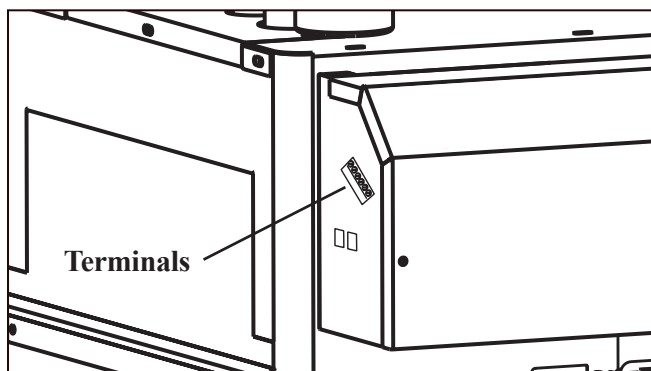


Figure 13

#### **⚠ WARNING**

The boiler 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 the 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.

#### **⚠ AVERTISSEMENT**

La chaudière doit être mis à la terre conformément aux prescriptions de l'autorité ayant juridiction ou, en l'absence de telles exigences, avec la dernière édition du national Electrical Code, ANSI/NFPA 70, aux ÉTATS-UNIS et à la dernière édition de la norme CSA C22.1 Code électrique canadien, partie 1, au Canada. Ne pas compter sur le gaz ou l'eau tuyauterie à la masse des pièces métalliques de la chaudière. Tuyau en plastique ou diélectrique les syndicats peuvent isoler la chaudière électrique.

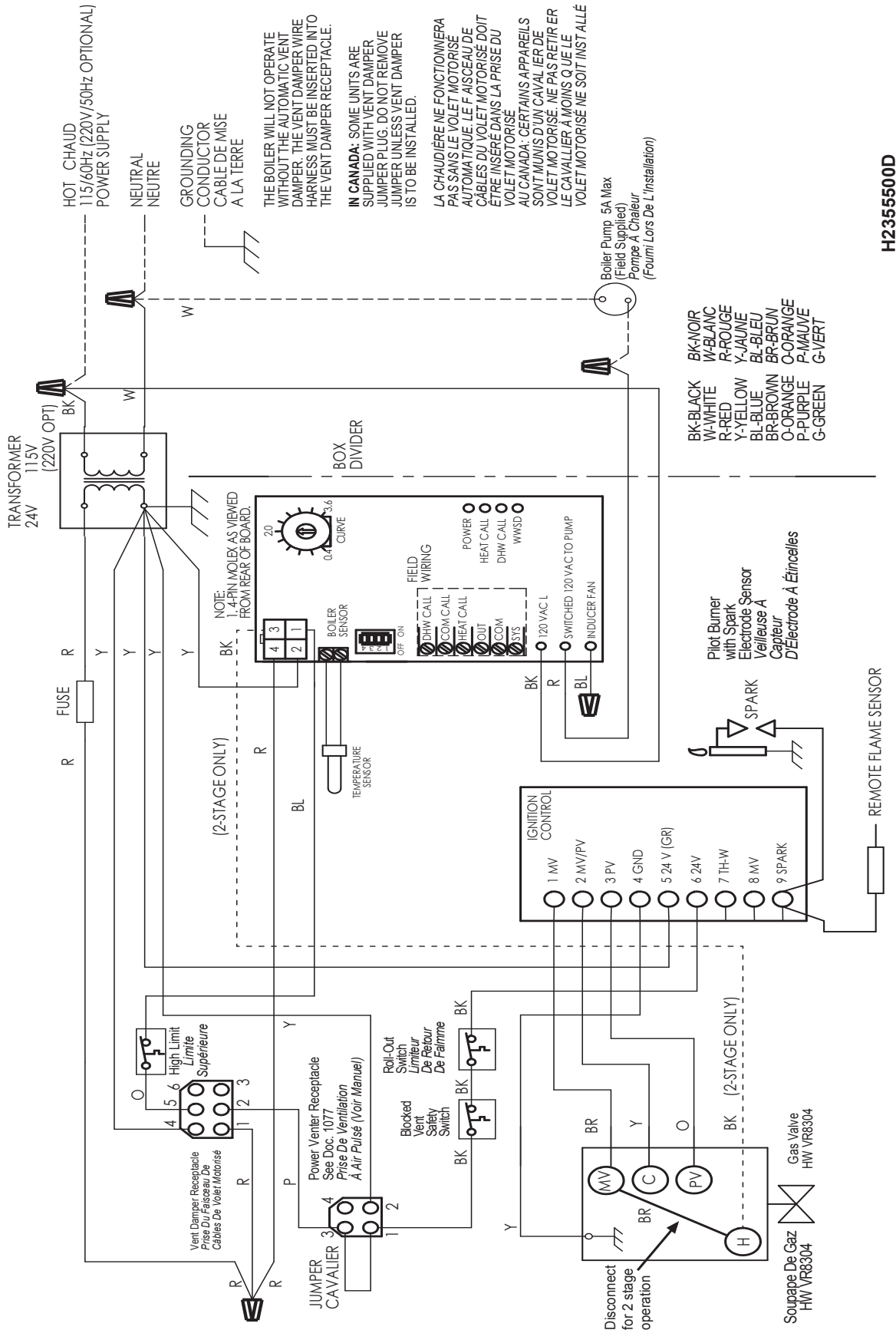


Figure 13B

### 6B. Outdoor Reset.

To comply with Federal Law, the Brute Mini automatically sets water temperature based on outdoor temperature. A sensor (E2347400) supplied must be located outdoors yet out of direct sunlight. If not connected, the boiler may not be fully functional. Connect the sensor to the terminals labeled "COM" and "OUTDOOR" located on the left side of the control box, using outdoor rated min 24 gauge wire. (See **Figure 13**)

6C. Wiring Diagram and Ladder Diagram



H2355500D

Figure 14B. Wiring Diagram,

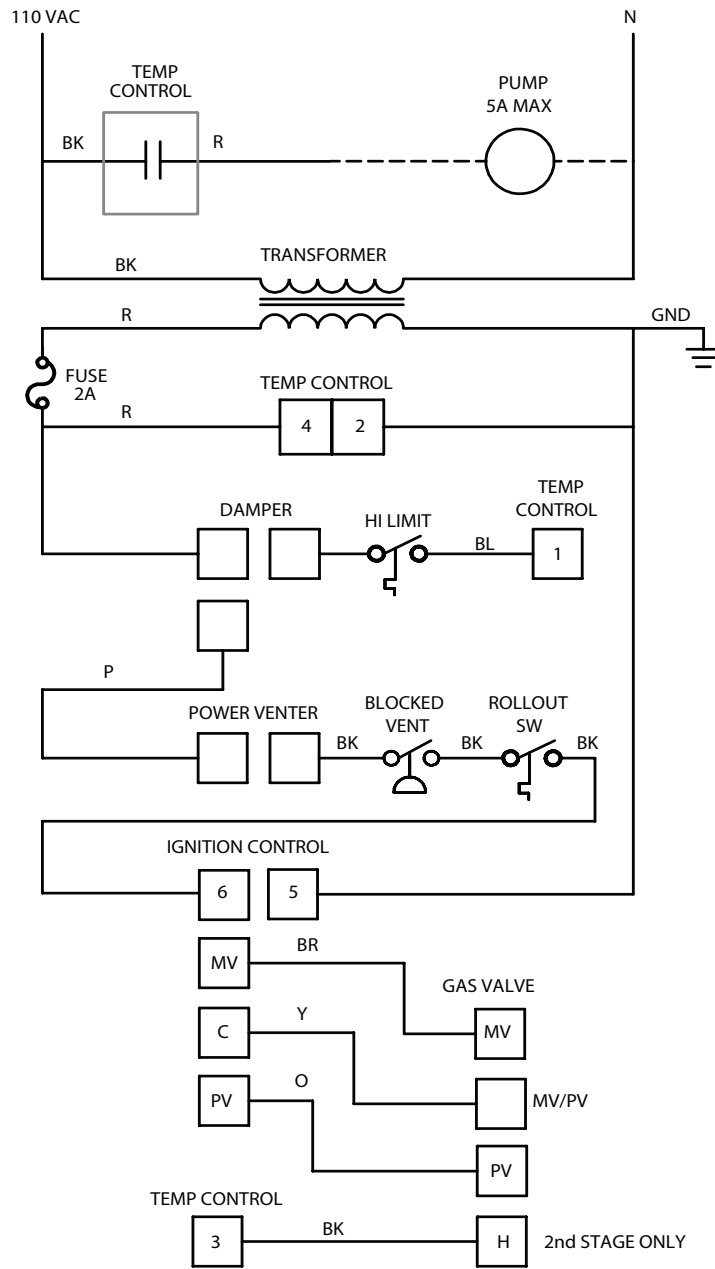


Figure 15B. Ladder Diagram

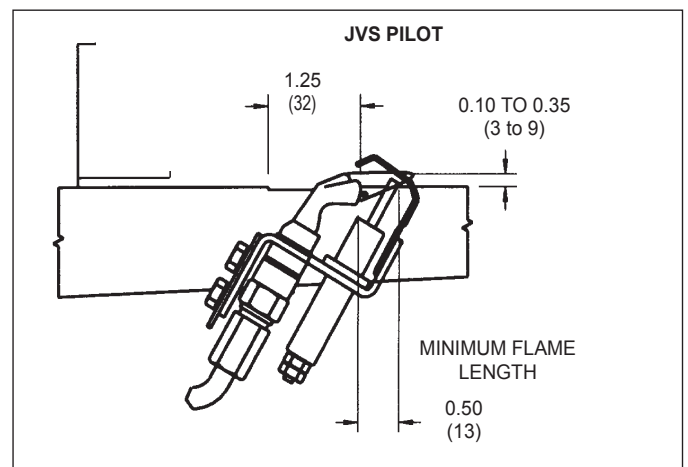
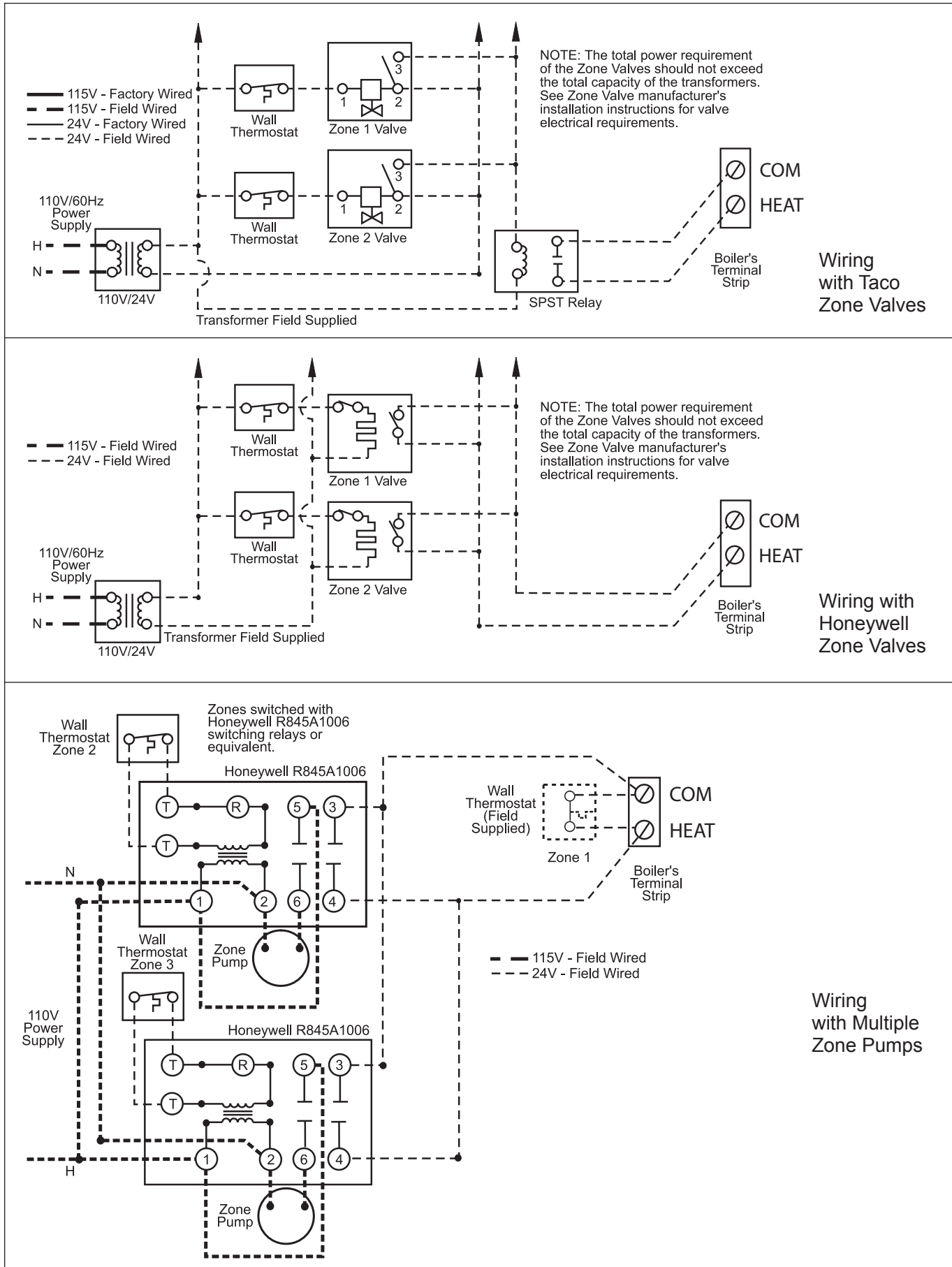


Figure 16. Main Burner/Pilot Flame Pattern.



**Figure 17. Multiple Zone Wiring.**

## SECTION 7.

### 7A Filling the System

It is crucial to the efficient operation of the system that all air be removed from the circuit. For this reason, an air scoop and vent should be located close to the boiler outlet, and there should be a minimum distance between cold water feed and system purge valve.

1. When the system has been completely installed, close all air vents and open the makeup water valve. Allow the circuit to fill slowly.
2. If a make-up water pump is employed, adjust the pressure to provide a minimum of 12 psi (83kPa) at the highest point in the circuit. If a pressure regulator is also installed in the line, adjust it to the same pressure.
3. Close all valves. Purge one circuit at a time as follows:
  - a. Open one circuit drain valve and let water drain out for at least 5 minutes. Be certain there are no air bubbles visible in the water stream before closing the drain valve.
  - b. Repeat this procedure for each circuit.
4. Open all valves after all circuits have been purged.
5. Run the system circulating pump for a minimum of 30 minutes with the boiler shut off.
6. Open all strainers in the system, and check for debris.
7. Recheck all air vents as described in Step 3.
8. Inspect the liquid level in the expansion tank, with the system full of water, and under normal operating pressure, to ensure proper water level in the expansion tank.
9. Start up boiler according to the procedures described in Section 2 and operate the system, including the pump, boiler, and radiation units, for one hour.
10. Recheck the water level in the expansion tank. If it exceeds 1/2 of the volume of the tank, open the tank drain and reduce the water level.
11. Shut down the entire system, and vent all radiation units and high points in the system.
12. Close the water makeup valve and check the strainer in the pressure reducing valve for sediment or debris. Reopen the water makeup valve.
13. Verify system pressure with the boiler pressure gauge before beginning regular operation.
14. Within 3 days of start-up, recheck and bleed all air vents and the expansion tank using these instructions.

## SECTION 8.

### Operating Procedures

Before placing the boiler in operation, check and reset the safety shutoff devices. Once the boiler is connected to the gas and water piping and after all the requirements in previous pages have been met, follow these procedures:

#### 8A. System Start-up

1. Verify that the pump system is operating properly:
  - a. Shut off the manual gas valve located outside the boiler.
  - b. Raise the wall thermostat high enough to call for heat.
  - c. The pump should come on immediately. If it does not, test the electrical circuits.
2. Pilot and Main Burner Lighting:
  - a. The BJVS boiler does not require manual lighting. The pilot is controlled by the automatic ignition system.
  - b. Different models of the BJVS boiler utilize various gas valves. Although the gas valves may have different control knobs, they are all similar in operation.
  - c. Understand and follow the operating instructions that are applicable to the type of ignition system installed on the boiler.
3. The pilot and main burners will automatically ignite when there is a call for heat.

#### 8B. Sequence of Operation



1. Wall thermostat will call for heat.
2. Pump relay will turn on the circulating pump.
3. If water temperature is below the limit setting, the inducer motor relay will turn on the draft inducer (JVH).
4. Pressure switch will sense the fan (JVH only) operation and send 24 volts to the flame rollout switch.
5. In normal conditions, the flame rollout switch will be in a closed position. 24 volts will be sent to the gas valve/controller, the igniter will glow/spark and the pilot valve will open, lighting the pilot.
6. After pilot is proven to be lit, the main gas valve will open, the main burners will ignite and continue until either the primary control, hi-limit or wall thermostat opens.
7. When the wall thermostat is satisfied, the burners will shut off. The relays will turn off the draft inducer (JVH only) and the circulating pump. When the room temperature falls below the wall thermostat setting, the cycle will repeat.

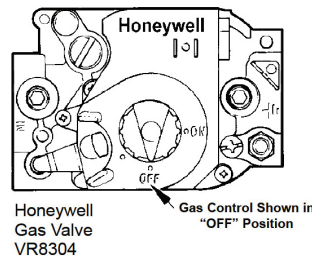
**⚠ WARNING: If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.**

- This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light pilot by hand.
- 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.
- Use only your hand to push in or turn the gas control knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- 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 which has been under water.


## 8C. Operating Instructions Brute Mini BJVS

### OPERATING INSTRUCTIONS

- STOP! Read the safety information above on this label.
- Set the thermostat to lowest setting.
- Turn off all electric power to the appliance.
- This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
- Turn gas control knob clockwise  to "OFF".
- Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. If you smell gas, STOP! Follow "B" in the safety information above (to the left) on this label. If you don't smell gas, go to next step.
- Turn gas control knob counterclockwise  to "ON".
- Set thermostat to desired setting.
- Turn on all electric power to the appliance.
- 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



- Set the thermostat to lowest setting.
- Turn off all electric power to the appliance if service is to be performed.
- Turn gas control knob clockwise  to "OFF".

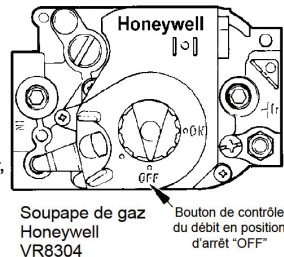
### POUR VOTRE SÉCURITÉ, LISEZ AVANT DE METTRE EN MARCHÉ

**⚠ AVERTISSEMENT: Quiconque ne respecte pas à la lettre les instructions dans la présente notice risque de déclencher un incendie ou une explosion entraînant des dommages, des blessures ou la mort.**


- Cet appareil est muni d'un dispositif d'allumage qui allume automatiquement la veilleuse. Ne tentez pas d'allumer la veilleuse manuellement.
- AVANT DE FAIRE FONCTIONNER**, reniflez tout autour de l'appareil pour déceler une odeur de gaz. Reniflez près du plancher, car certains gaz sont plus lourds que l'air et peuvent s'accumuler au niveau du sol.  
**QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ**
  - Ne pas tenter d'allumer d'appareil.
  - Ne toucher à aucun interrupteur; ne pas vous servir des téléphones se trouvant dans le bâtiment.
  - Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions du fournisseur.
  - Si vous ne pouvez rejoindre le fournisseur, appelez le service des incendies.
- Ne poussez ou tournez la manette d'admission du gaz qu'à la main; ne jamais utiliser d'outil. Si la manette reste coincée, ne tentez pas de la réparer; appelez un technicien qualifié. Le fait de forcer la manette ou de la réparer peut déclencher une explosion ou un incendie.
- N'utilisez pas cet appareil s'il a été plongé dans l'eau, même partiellement. Faites inspecter l'appareil par un technicien qualifié et remplacez toute partie du système de contrôle et toute commande qui ont été plongés dans l'eau.

### INSTRUCTIONS DE MISE EN MARCHÉ

- ARRÊTEZ ! Lisez les instructions de sécurité sur la portion supérieure.
- Réglez le thermostat à la température la plus basse.
- Coupez l'alimentation électrique de l'appareil.
- Cet appareil est muni d'un dispositif d'allumage automatique de veilleuse. Ne pas tenter d'allumer la veilleuse à la main.
- Tourner le bouton de commande dans le sens des aiguilles d'une montre  pour le mettre en position d'arrêt "OFF".
- Attendre cinq (5) minutes pour laisser échapper tout le gaz. Reniflez tout le gaz. Reniflez tout autour de l'appareil, y compris près du plancher, pour déceler une odeur de gaz. Si vous sentez une odeur de gaz, ARRÊTEZ ! Passez à l'étape "B" des instructions de sécurité sur la portion supérieure (à gauche) de cette étiquette. S'il n'y a pas d'odeur de gaz, passez à l'étape suivante.
- Tourner le bouton de commande dans le sens contraire des aiguilles d'une montre  pour le mettre en position de marche "ON".
- Réglez le thermostat à la température désirée.
- Mettez l'appareil sous tension.
- Si l'appareil ne se met pas en marche, suivez les instructions intitulées "Comment couper l'admission de gaz de l'appareil" et appelez un technicien qualifié ou le fournisseur de gaz.



### COMMENT COUPER L'ADMISSION DE GAZ DE L'APPAREIL

- Réglez le thermostat à la température la plus basse.
- Coupez l'alimentation électrique de l'appareil s'il faut procéder à l'entretien.
- Tourner le bouton de commande dans le sens des aiguilles d'une montre  pour le mettre en position d'arrêt "OFF".



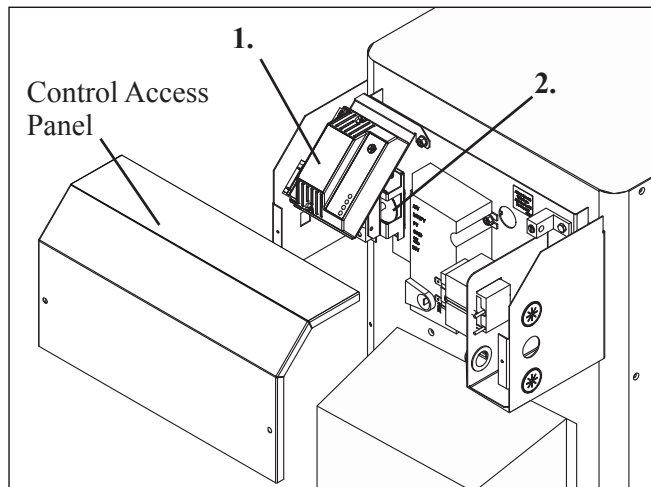


Figure 18A.

### 8.D Operating Temperature Controls

Note: The Temperature Controllers, the Dip switch panel, and the LED panel can be found under the Control Access Panel after removing the bolts.

Two temperature controls are now standard on all JVS boilers.

**1. The primary temperature controller** maintains all normal heating operations.

**2. A secondary, mechanical high-limit aquastat** provides safe shutdown, should the primary controller fail.

**Important:** If the secondary controller (See **Figure 18A** and **Figure 18B**) dial is set below 220F, it may inhibit proper operation of the primary controller. Prior to calling for technical support, please ensure high limit control is set for at least **220F**.

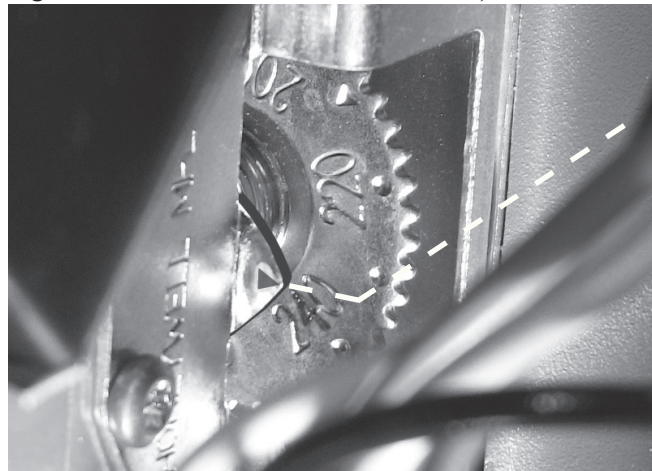


Figure 18B. Secondary, mechanical high-limit aquastat

**Pump Operation.** When a call for HEAT and/or DHW is present the boiler pump will turn on. Post purge can be selected via dip switch #5, Pump Post Purge Inactive (Off) /Active 3 min. (On). In the On position the pump will continue to run for 3 min after the last call has been satisfied. When the dip switch is

Off there is no post purge of the pump, the pump turns off immediately after the last call is removed. Bradford White strongly recommends using a pump post purge. During WWSD and a call for HEAT is present the pump will remain off.

**Pump Exercising** The control exercises the boiler pump every 3 days of inactivity. While the control is exercising the pump all LEDs will turn off and the power LED will flash for 10 seconds.

**Staging (where applicable – factory setting):** Dip #1 is used to select the number of stages: 2-Stage (Off) / Single Stage (On).

**Note:** Use of 2-Stage operation may reduce efficiency.

For 2-stage operation, the first stage is cycled on Proportional error and the second stage is cycled based on PI according to a fixed algorithm. No user adjustment is necessary.

**Note:** All stages are turned off when the water outlet temperature reaches the Maximum setting that is elected via dip switch #4, Boiler Maximum 210°F (Off) / 190°F (On).

**Auto Boiler Target Setpoint: Space Heating:**

The boiler target temperature is automatically determined from Space Heating and DHW requirements. Space heating is based on outdoor reset. When both a Heat Call and a DHW Call are present at the same time, the control operates to provide the higher boiler target temperature.

**Heating Curve (Outdoor Temperature Reset)**

The control uses a linear heating curve to calculate a target setpoint. The following data are used to calculate the target setpoint from the outdoor temperature.

1. The heating curve or reset ratio (RR) is set by the potentiometer with a range of 0.4 to 3.6.
2. The room temperature is fixed at 70 deg F.

Outdoor Temp F	Heating Curve=Reset Ratio (RR)=		
	1.0	2.0	3.0
	<b>Boiler Target F</b>		
-30	170	210	210
-20	160		
-10	150		
0	140		
10	130	190	
20	130	170	
30		150	190
40		130	160
50			130
60			130
70	WWSD OFF		

Reset Ratio Calculation:

Boiler Target = 70 + RR \*(70 - Actual Outdoor)

Table 9

**DHW Operation** The boiler target for DHW calls is fixed at 180 deg F.

Note: There is no control of a DHW pump, so the boiler pump runs with the call for DHW.

**Limiting** The boiler target is limited to a minimum and a maximum target to ensure that the water temperature does not exceed the limits.

**1. Target Min** - The boiler target minimum is the point at which the stages will start to turn on to maintain a minimum water temperature. The Boiler Minimum water temperature is 130 deg F, regardless of other calculated targets. To ensure that the water temperature is greater than the Boiler Minimum water temperature the target is increased to allow the stages to cycle on by the Boiler Minimum water temperature, Boiler Minimum target is set to Boiler Minimum + differential/2.

**2. Target Max** - The boiler target maximum is the point at which the stages will start to turn off to maintain a maximum water temperature. The Boiler Maximum water temperature is set by setting dip switch #4: Boiler Maximum 210°F (Off) / 190°F (On).

To ensure that the water temperature is less than the Boiler Maximum water temperature the target is decreased to allow the stages to cycle off by the Boiler Maximum water temperature, Boiler Maximum target is set to Boiler Maximum - differential/2.

**Auto Differential** The control automatically adjusts differential to prevent short cycling and maximize the lifetime of components.

**WWSD Operation** Warm Weather Shutdown - WWSD feature is selected via dip switch #3, WWSD Inactive (Off) / Active 70°F (On). WWSD point is fixed at 70 deg F. Control exits WWSD when the outdoor temp falls to 65 F. When there is a call for HEAT and the control is in WWSD the HEAT call will be ignored. When there is a call for DHW and the control is in WWSD the DHW call will be satisfied. WWSD LED turns on when control detects WWSD.

#### Summary of Dip Switch Settings:

#1 Two Stage (Off) / Single Stage (On)

(Note: Efficiency may be reduced with 2-stage operation.)

#2 (Off) / Outdoor Reset (On) (Note: Outdoor Reset is required for residential operation)

#3 WWSD Inactive (Off) / Active 70°F (On)

#4 Boiler Maximum 210°F (Off) / 190°F (On)

#5 Pump Post Purge Inactive (Off) / Active 3 min. (On)

#### LEDs State Description

1. Power
2. Heat – On = call for heat; Flashes for Boiler sensor error
3. DHW – On = call for DHW; Flashes for outdoor sensor error
4. WWSD – On = Outdoor Reset AND WWSD Active AND control in WWSD; Flashes for outdoor sensor error, operation continues with fixed boiler target of 140°F.

#### Summary of Input Sensors:

1. Outdoor sensor - monitors the outside air temperature for outdoor reset mode
2. Boiler outlet sensor -monitors the water temperature of the boiler outlet supply
3. System Supply sensor - monitors the water temperature of the system supply

The boiler outlet sensor is required at all times. If the boiler outlet sensor has any fault then the control will flash an error and turns all stages off. The system supply sensor is optional and utilizes primary / secondary piping. If the system supply sensor has a fault then the control flashes an error message and operates using the boiler outlet sensor (system supply = boiler outlet).

Model Number	Input, MBH	Heating Capacity, MBH	Net AHRI Rating Water, MBH	AFUE, %
BJVS050	50	43	37	85
BJVS075	75	64	56	85
BJVS100	100	85	74	85
BJVS125	125	106	92	85
BJVS160	160	136	118	85
BJVS225	225	191	166	85

**Table 10. Efficiencies**

## SECTION 9.

### 9A. Maintenance

1. Lubricate the water circulating pump per the instructions on the pump.
2. If a strainer is employed in a pressure reducing valve or the piping, clean it every six months.
3. At start-up, and periodically thereafter, the burner and pilot flames should be observed. If the flame has the appearance of “sooting” tips, check for debris near the orifices and call the service technician.
4. Ensure proper operation of the mechanical damper, mounted in the flue collar, by observing the damper handle. Be sure the handle swings when the draft inducer starts (depending on the boiler size, swing may be as little as 30°). Remove any obstructions and clean around the pivot rod (handle) holes.
5. Inspect the venting system for obstruction, leakage or corrosion at least once a year.
6. Keep the boiler area clear and free from combustible materials, gasoline, and other flammable vapors and liquids.
7. Be sure that all combustion air and ventilation openings are unobstructed.
8. Upon completion of the installation, inspect the external surfaces of the heat exchanger for fouling based on the following schedule:  
24 hours - 7 days - 30 days - 90 days  
Once every six months thereafter.
9. If the boiler is not going to be used for long periods of time in locations where freezing occurs, it should be completely drained of all water. To accomplish this, there is a drain valve on the right side of the boiler which can be opened. This will drain the right side of the boiler. There are two plugs located on the left side of the heater which must be removed to drain that side. Both sides must be drained.

10. The gas and electric controls on the boiler are engineered for long life and dependable operation, but the safety of the equipment depends on their proper functioning. It is strongly recommended that the basic items listed below be inspected by a qualified service technician every year.
  - a. Water temperature controls.
  - b. Pilot safety system.
  - c. Automatic gas valves.
  - d. Fan proving switch.
  - e. Inducer/Blower assembly.
  - f. Mechanical flue damper operation.

#### WARNING

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

#### AVERTISSEMENT

La garantie ne couvre pas les dommages causés par l'absence d'entretien, absence de débit d'eau, ou pratiques de fonctionnement irrégulières

Fouling on the external surfaces of the heat exchanger is caused by incomplete combustion, and is a sign of venting and/or combustion air problems. The heat exchanger can be inspected by using a flashlight and placing a mirror under the burners. An alternate method is to remove the venting and top panel to inspect the exchanger from above. The vent system should be inspected at the same time. If cleaning is required:

- a. Shut off all power to the boiler.
- b. Remove the venting top, flue collector, draft inducer assembly, and heat exchanger baffles.
- c. Remove the burner tray.
- d. Use a hand-operated spray bottle filled with water, and a wire brush to clean soot and loose scale from the underside of the heat exchanger. **DO NOT USE COMPRESSED AIR, HIGH PRESSURE WATER, OR A GARDEN HOSE.**
- e. Clean any fallen debris from the bottom of the unit.
- f. Check to make sure the burner ports and pilot assembly are free of debris before returning the burner tray to its original position.
- g. Reassemble the boiler in reverse order, making sure to replace the heat exchanger baffles.

## 9B. Electrical Troubleshooting

1. Remove the control box cover on the front of the boiler.
2. Verify that 115 volts is reaching the boiler by testing across the black wire and the white wire on the transformer.
3. Verify 24 volts transformer output by placing the meter leads on the yellow and red wires. If 24 volts is not evident, replace the transformer. Perform the following series of tests with one meter lead attached to the yellow wire on the transformer.
4. Place the second lead on the "HEAT" connection on the terminal board. Turn the wall thermostat high enough to call for heat. If the meter fails to register 24 volts, the thermostat or its circuit may be defective.
5. Place the second lead on the purple wire terminal on the hi-limit switch. If no voltage across the switch, check for defective hi-limit, open circuit due to excessive water temperature, or a low temperature setting.
6. For JVH only, place the second lead on the blue wire terminal on the fan proving switch. If voltage is present, skip to step 8. If voltage isn't present, connections or the draft inducer/motor could be defective.
7. Verify the voltage across the roll-out safety switch.
8. If it is determined that there is voltage to the gas valve, the pilot is lit and the pilot sensor is properly positioned, and the thermostat is set high enough to call for heat, the gas valve or the pilot assembly may be defective.
9. See Section 8E for LED fault codes on temperature controller.

### **Caution**

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

### **Étiquette**

de mise en garde tous les fils avant le débranchement lors de l'entretien. Les erreurs de câblage peut causer le mauvais et dangereux. Vérifier le fonctionnement correct après l'entretien

### **WARNING**

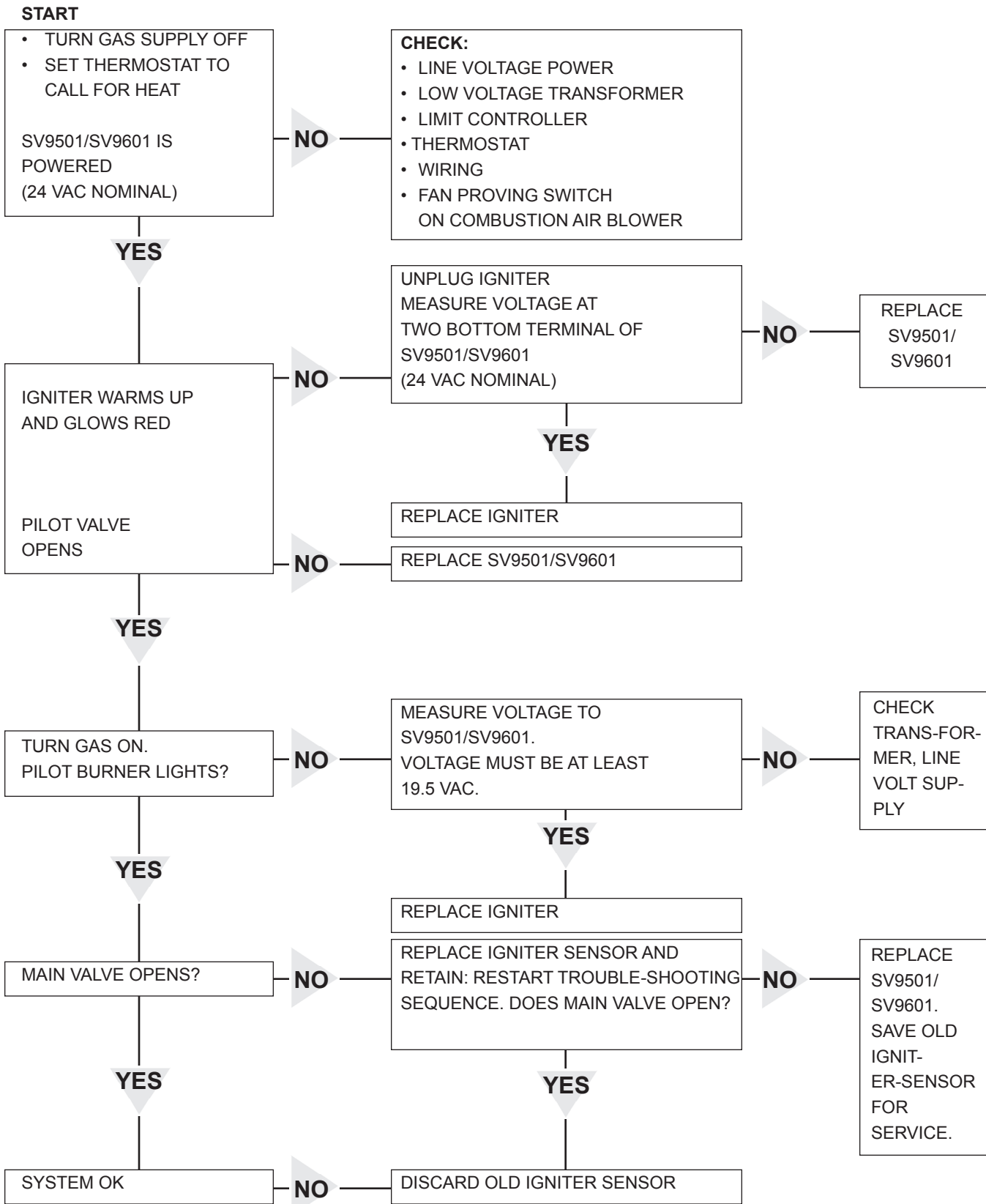
Follow local regulations with respect to installation of carbon monoxide (CO) detectors and manufacturer's maintenance schedule of the boiler.

### **AVERTISSEMENT**

Conformez-vous aux réglementations locales pour ce qui est de l'installation de détecteur de monoxyde de carbone (CO) et du programme de maintenance du fabricant de la chaudière.

#	Symptom	Cause	Remedy
1	Pump not operating	No power . . . . . Pump defective . . . . . Incorrectly wired . . . . .	Check circuit breakers and power source. Replace. Recheck wiring diagrams.
2	Pilot outage	Inlet gas pressure too low . . . . .	Consult gas utility company. Inlet gas pressure to boiler should be 5.5" (1.4 kPa) to 9.0" (2.2 kPa) water column on natural gas. 10.0" (2.5k Pa) to 14.0" (3.4 kPa) on propane gas.
		Inlet gas pressure too high causing an unstable blowing pilot. . . . .	Pressure should be regulated within limits shown above.
		Damaged pilot. . . . .	Replace.
		Dirty pilot. . . . .	Blow dust or lint out of pilot.
		Plugged or undersized pilot. . . . .	Replace pilot orifice.
3	Flame roll-out on start-up	Blocked outlet	Check flue damper operation.
		Pilot out of position (delayed ignition) . . . . .	Correct pilot position.
		Blocked heat exchanger or flue . . . . .	Clean and correct as necessary.
		Refractory tile out of place . . . . .	Correct or replace tile as necessary.
4	Flame has lazy yellow tip	Low primary air . . . . .	Correct manifold pressure according to rating plate. Correct orifice size if necessary (see parts list). Clean burner ports if dirty.
5	Not enough heat	Inadequate gas supply . . . . .	Gas meter too small. Gas line from meter to boiler too small.
		Low manifold gas pressure . . . . .	Gas pressure on boiler manifold, with Modusnap valve wide open. Should be adjusted to 4.0" (1.0 kPa) W.C. natural gas 9.0" (2.2 kPa) W.C. propane.,
		Boiler size inadequate . . . . .	Replace with boiler of higher input.
6	Pump noisy	Air in volute . . . . .	Bleed air from volute. Check pump alignment.
		Worn coupling or bearings . . . . .	Replace worn parts.
7	Boiler pounding or knocking	Too low water flow through boiler . . . . .	Check temperature rise between inlet and outlet boiler piping. 15°F (8°C) to 25°F (14°C) temperature rise is recommended. If temperature rise is over 25°F (14°C), increase pipe size or pump capacity or locate obstruction. Check for stuck closed zone valves. Check for zone pumps not operating. Check for closed valve in system.
8	Boiler condensing	Low water temperature . . . . .	Flue product moisture will condense at the start-up until the boiler water temperature reaches the normal operating conditions.
9	Pump cavities or low water pressure at boiler gauge or bubbles in system at high temperature	Defective fill valves or pressure regulator . . . . .	Replace.
		Oversized expansion tank . . . . .	Replace.
		Expansion tank piped incorrectly . . . . .	Re-pipe expansion tank to suction size of pump at high temperature.
10	Pressure relief valve opens	Waterlogged expansion tank . . . . .	Drain 2/3 of the water from the expansion tank.
11	Pilot is lit but main burners will not come on	Boiler off on hi-limit control . . . . .	Check for low water flow or hi-limit setting.
		Boiler incorrectly wired . . . . .	On single or multiple zone systems with zone valves, room thermostat should be wired to T-T terminals. For multiple zone systems with ozone pumps, thermostats for extra zones should be wired to R&A terminals.
		Broken wire in thermostat circuit or defective thermostat . . . . .	Check continuity through thermostat circuit with
12	Boiler short cycles	Heat anticipator in room thermostat set too low . . . . .	Increase setting (1.0 is usually satisfactory)
		Low water flow through boiler . . . . .	Increase size of pump or increase piping size.
		Hi-limit switch may be set too low . . . . .	Increase setting to at least 20°F (11°C) over outlet water temperature.

## Troubleshooting Honeywell SV9501/SV9601 Hot Surface Pilot System



## SECTION 10. Replacement Parts

### 10A Glossary of Terms

**Air Vent**

A device used to purge air from the Circuit. Should be located at the highest point in the Circuit.

**Branch**

The section(s) of supply and return piping, including the heat distribution units connected directly to the trunk. Also referred to as a “zone”.

**By-Pass**

A section of pipe (including an adjustable valve) that diverts part of the water flow from undersized piping to the boiler. Adjusted to maintain minimum flow requirement (GPM) through the boiler.

**Circuit**

Entire water circulation piping, beginning and ending at the boiler (Series Loop System).

**Expansion Tank (Compression Tank)**

Installed in the circuit to accommodate excess water produced by heat expansion.

**Heat Distribution Units**

Transfers heat from the water supplied by the boiler to the area to be heated through the use of baseboard, convactor, radiator, finned tube. Also known as “radiation”.

**Isolation Valve**

Used to isolate the boiler from the circuit. It minimizes the amount of water drained from the system.

**Primary-Secondary Piping**

Two or more interconnecting circulating loops, each with its own pump. Primary =System Circuit; Secondary=Boiler Circuit.

**Reverse-Return Piping**

Balanced, equal flow (first in, last out) piping. Utilized with multiple boilers and/or radiation. Applied with single system pumps, or primary-secondary pump.

**System Purge Valve**

A device used to purge air from the circuit. Should be located as close as possible to the cold water feed, but not immediately after the cold water feed.

**Temperature Controllers**

**The primary temperature controller** maintains all normal heating operations.

**A secondary, mechanical high-limit aquastat** provides safe shutdown, should the primary controller fail.

**Trunk**

The section of piping which connects the boiler return and supply with the branch(es). Also known as a “main” or “header”. Should be same size as boiler inlet/outlet connections.

**Zone Pump**

Circulators installed in branch piping that divert hot water coming from the boiler into various areas (zones) of a building.

**Zone Valve**

Diverts hot water from the boiler into various areas (zones) of a building.

**10C Parts List JVS**

Description	BJVS-50	BJVS-75	BJVS-100	BJVS-125	BJVS-160	BJVS-225
<b><u>Gas System</u></b>						
1 Pilots						
Pilot Assembly (Nat.)	R0061600	R0061600	R0061600	R0061600	R0061600	R0061600
Pilot Assembly (LP)	W0039600	W0039600	W0039600	W0039600	W0039600	W0039600
2 Main Gas Valves						
Gas Valve, Natural	R0385100	R0385100	R0407700	R0407700	R0407700	R0407700
Gas Valve, LP	V0077500	V0077500	V0079100	V0079100	V0079100	V0079100
3 Gas Manifold	L0052601	L0052602	L0052603	L0052604	L0052603	L0052604
3 Burner, Main	L0052500	L0052500	L0052500	L0052500	L0052500	L0052500
4 Burner W/Pilot Bracket	L0056500	L0056500	L0056500	L0056500	L0056500	L0056500
Burner/Air Shutter (LP) (not shown)	L0055900	L0055900	L0055900	L0055900	L0055900	L0055900
Gas Orifices (not shown)						
Gas Orifice (Nat.)	L0032200	L0032200	L0032200	L0032200	L0032200	L0032200
Gas Orifice (LP)	L0032900	L0032900	L0032900	L0032900	L0032900	L0032900
<b><u>Electrical System</u></b>						
5 Controller	RE2344300	RE2344300	RE2344300	RE2344300	RE2344300	RE2344300
6 Transformer 115/24V (40VA)	R0021300	R0021300	R0021300	R0021300	R0021300	R0021300
7 Ignition Control	E2102800	E2102800	E2102800	E2102800	E2102800	E2102800
8 Limit Switch	R0061300	R0061300	R0061300	R0061300	R0061300	R0061300
9 Blocked Vent Safety Switch	R2061100	R2061100	R2061100	R2061100	R2061100	R2061100
10 Roll-out Safety Switch	E2103200	E2103200	E2103200	E2103200	E2103200	E2103200
Wiring Harness (not shown)	E2347700	E2347700	E2347700	E2347700	E2347700	E2347700
Hi-Tension Lead (not shown)	10449514	10449514	10449514	10449514	10449515	10449516
Fuse, 5-Pack, 4-Amp (not shown)	RE0084401	RE0084401	RE0084401	RE0084401	RE0084401	RE0084401
Temp Sensor (not shown)	E2347600	E2347600	E2347600	E2347600	E2347600	E2347600
Outdoor Sensor (not shown)	E2347400	E2347400	E2347400	E2347400	E2347400	E2347400
<b><u>Water System</u></b>						
11 Heat Exchanger	R0402001	R0402002	R0402003	R0402004	R0402005	R0402006
12 Pressure Relief Valve, 30PSI	R0061400	R0061400	R0061400	R0061400	R0061400	R0061400
13A Well, Immersion, 1/2" NPT	E0025902	E0025902	E0025902	E0025902	E0025902	E0025902
13B Well, Immersion, 3/4" NPT	E2345700	E2345700	E2345700	E2345700	E2345700	E2345700
14 Drain Valve 1/2" NPT (not shown)	70-216	70-216	70-216	70-216	70-216	70-216
Temp/Pressure Gauge (not shown)	R0060600	R0060600	R0060600	R0060600	R0060600	R0060600
<b><u>Jacket and Fire Box Components</u></b>						
15 Draft Diverter	11020101	11020102	11020103	11020104	11020105	11020106
16 Rear Panel	11020201	11020201	11020203	11020203	11020205	11020206
17 Jacket	11020301	11020301	11020303	11020303	11020305	11020306
18 Top	11020401	11020401	11020403	11020404	11020405	11020406
19 Cover, Piping, Top	11047603	11047604	11047603	11047604	11047604	11047606
20 Flue Collector	20034901	20034902	20034903	20034904	20034905	20034906
21 Access Panel HX, (L&R)	10535900	10535900	10535900	10535900	10535900	10535900
22 Base, Control Box	20608500	20608500	11045700	11045700	11045700	11045700
23 Cover, Control Box	11045901	11045901	11045800	11045800	11045800	11045800
24 Burner Cover	10500601	10500601	10500602	10500602	10494105	10494106
25 Heat Exchanger Baffle	10485301	10485308	10485309	10485311	10485310	10485306
26 Tile Cover	10469501	10469502	10469503	10469504	10469505	10469506
27 Refractory, Front	T0022001	T0022002	T0022003	T0022004	T0022605	T0022606
28 Refractory, Rear	T0021701	T0021702	T0021703	T0021704	T0021705	T0021706
29 Base Assembly	10467101	10467102	10467103	10467104	10467105	10467106
Non-Combustible Base Kit (optional)	10466701	10466701	10466702	10466702	10466703	10466704
<b><u>Vent Damper Components</u></b>						
Vent Damper Assembly (not shown)	E2071501	E2071502	E2071502	E2071503	E2071503	E2071504
Vent Damper Harness (not shown)	E0099100	E0099100	E0099100	E0099101	E0099101	E0099101



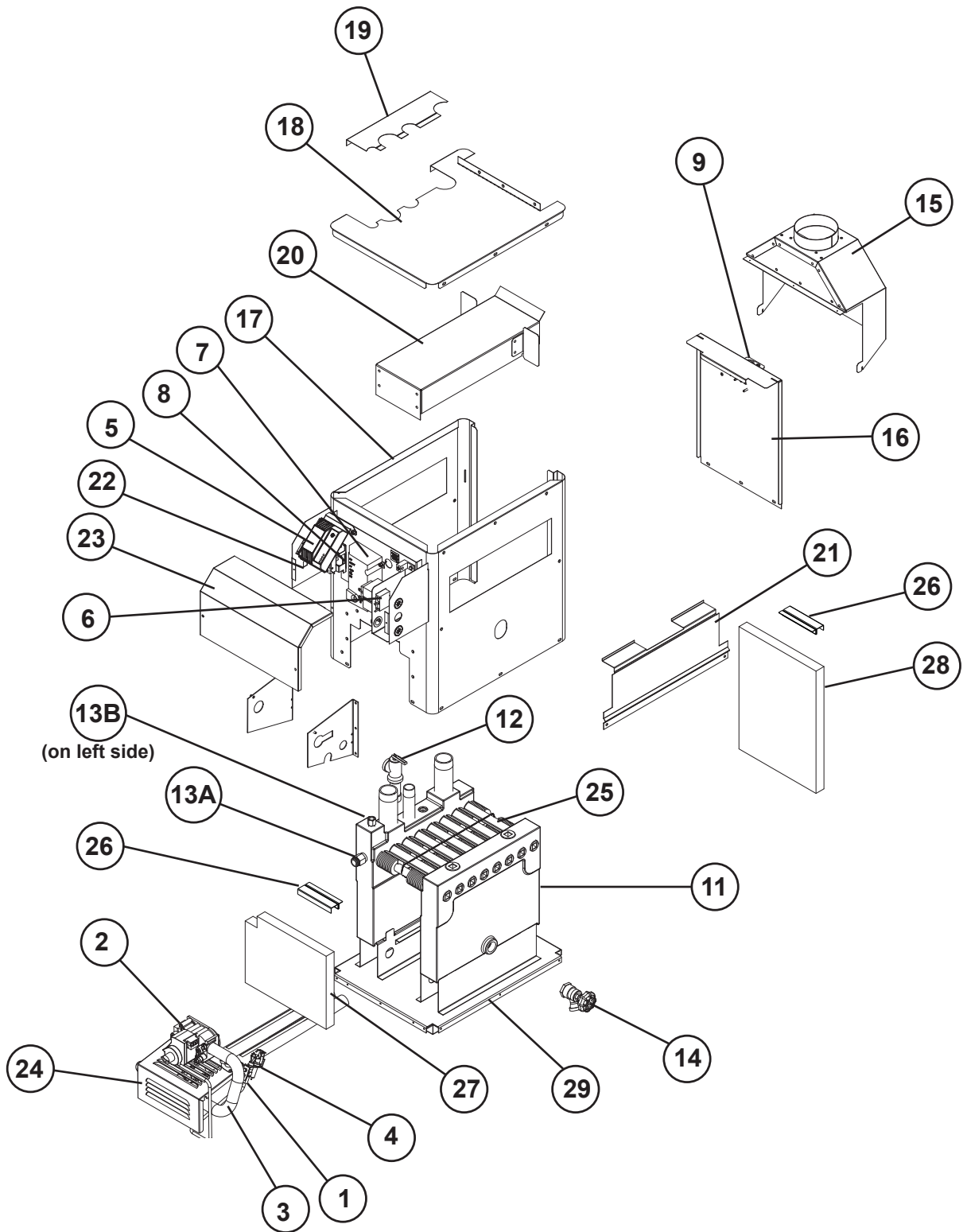


Figure 19B. JVS Parts Identification.



H2359000C