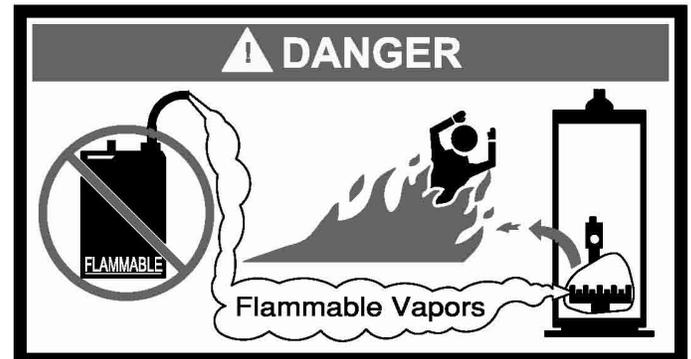




POWERED DIRECT VENT SERIES GAS-FIRED COMMERCIAL WATER HEATER (INDEPENDENT PVC VENTING)



⚠ WARNING: If the information in these instructions is not followed exactly, a fire or explosion may result causing property damage, personal injury or death

- 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 neighbor's phone. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department.
- For your family's comfort, safety and convenience, it is recommended this water heater be installed and serviced by a plumbing professional.

INSTALLATION/OPERATION MANUAL WITH TROUBLESHOOTING GUIDE

PLACE THESE INSTRUCTIONS ADJACENT TO WATER HEATER AND NOTIFY OWNER TO KEEP FOR FUTURE REFERENCE

SECTION I: IMPORTANT INFORMATION

READ CAREFULLY

This gas-fired water heater is design certified by CSA International under the American National Standard, Z21.10.3 and CAN/CGA 4.3-M (as indicated on the rating plate). These standards are available from CSA Standards Association, 5060 Spectrum Way Mississauga, Ontario L4W 5N6 CANADA.

This water heater must be installed in accordance with local codes. In the absence of local codes, it must be installed in compliance with the National Fuel Gas Code (ANSI Z223.1-Latest Edition), or in Canada CAN/CGA B149.1 Natural Gas Installation Code (Latest Edition) or CAN/CGA B149.2 Propane Installation Code (Latest Edition).

The following terms are used throughout this manual to bring attention to the presence of hazards at various risk levels, or to important information concerning product life.

DANGER

Indicates an imminently hazardous situation, which, if not avoided, will result in death, serious injury or substantial property damage.

CAUTION

Indicates potentially hazardous situation, which, if not avoided, may result in moderate or minor injury or property damage.

WARNING

Indicates a potentially hazardous situation, which, if not avoided, could result in death, serious injury or substantial property damage.

NOTICE

Indicates special instructions on installation, operation or maintenance, which are important but not related to personal injury hazards.

NOTICE

This water heater has a limited warranty. The warranty for this water heater is valid only if the water heater has been installed, maintained and operated in accordance with these instructions. The warranty does not cover damage or injury caused by the use of any energy-saving devices (other than those authorized by the manufacturer) in conjunction with this water heater. The use of unauthorized energy-saving devices may decrease the life of the water heater and endanger life and/or property. The manufacturer will not be liable for any damage, injury, or loss of life resulting from alteration and/or failure to comply with these instructions.

IMPORTANT-Before proceeding, please inspect the water heater and components for possible damage. **DO NOT** install damaged components. If damage is evident, please contact the supplier where the water heater was purchased or the manufacturer listed on the rating plate for replacement parts.

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DANGER

DO NOT store or use gasoline or other flammable, combustible, or corrosive vapors and/or liquids in the vicinity of this or any other appliance.

This water heater is equipped with an adjustable thermostat to control water temperature. Hot water temperatures required for automatic dishwasher and laundry use can cause scald burns resulting in serious personal injury and/or death. The temperature at which injury occurs varies with the person's age and the time of exposure. The slower response time of disabled persons increases the hazards to them. **NEVER** allow small children to use a hot water tap, or to draw their own bath water. **NEVER** leave a child or disabled person unattended in a bathtub or shower.

Toxic chemical, such as those used for boiler treatment, **must not** be introduced into potable water used for space heating.

This water heater **must not** be connected to an existing heating system or component(s) previously used with a non-potable water heating appliance.

All piping components connected to this water heater for space heating applications must be suitable for use with potable water.

WARNING

Improper installation, adjustments, alteration, service or maintenance can cause property damage, personal injury or loss of life. Failure to follow all instructions in the proper order can cause personal injury or death. Read and understand all instructions, including all those provided with the appliance before installing, starting-up, operating, maintaining or servicing this appliance. Keep this manual and literature in legible condition with this water heater for reference by owner and service technician.

This water heater requires regular maintenance and service to operate safely. Follow the instructions contained in this manual.

Installation, maintenance, and service must be performed only by a qualified, skilled and knowledgeable installer or service provider.

Installation is not complete unless a temperature and pressure relief valve is installed into the proper location at the top of this water heater.

It is the responsibility of the installing contractor to see that all controls are correctly installed and are properly operating when the installation is complete.

DO NOT operate this water heater without first being certain it is filled with water.

DO NOT tamper with or alter the water heater and/or controls.

DO NOT operate water heater with jumpered or absent controls or safety devices.

DO NOT operate water heater if any external part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system including gas controls, which has been under water.

DO NOT attempt to use this water heater with any gas other than the type listed on the rating plate. Do not attempt to convert this water heater for use with a gas other than the type for which it is equipped. Failure to use the proper gas can create an unsafe condition resulting in property damage, bodily injury, or death. Consult your local gas supplier or gas company if there are any questions.

For installations in high altitude regions, this water heater must be ordered from the supplier to the manufacturer's specifications for that particular altitude. Contact the company listed on the rating plate when ordering high altitude constructed water heaters.

Incorrect operation of this appliance may create a hazard to life and property and will nullify the warranty.

DO NOT operate this water heater if the input rate exceeds the rate shown on the water heater rating plate.

This water heater contains very hot water under high pressure. Do not unscrew any pipe fittings nor attempt to disconnect any components of this water heater without positively assuring the water is cool and is not under pressure. Always wear protective clothing and equipment when installing, starting up or servicing this water heater to prevent scald injuries. Do not rely on the temperature gauges to determine the temperature. Do not touch any components unless they are cool.

This water heater must be properly vented and connected to an approved vent system in good condition. **DO NOT** operate water heater with the absence of an approved vent system. A clean and unobstructed vent system is necessary to allow noxious fumes that could cause injury or loss of life to vent safely and will contribute toward maintaining the water heater's efficiency.

WARNING

This water heater needs fresh air for safe operation and must be installed so there are provisions for adequate combustion and ventilation air. Insufficient air supply will cause a recirculation of combustion products resulting in contamination that may be hazardous to life. This will result in carboning or sooting of the combustion chamber, burners, and flue tubes and creates a risk of asphyxiation.

Water heater materials of construction, products of combustion and the fuel contain carbon monoxide, nitrogen oxides, aldehydes and/or other toxic or harmful substances which can cause death or serious injury and which are known to the state of California to cause cancer, birth defects and other reproductive harm. Always use proper safety clothing, respirators and equipment when servicing or working nearby this water heater.

Flammable items, pressurized containers or any other potential fire hazardous articles must never be placed on or adjacent to the water heater. Open containers of flammable material should not be stored or used in the same room with this water heater.

Insulation blankets are not required for this water heater. This water heater meets or exceeds the ASHRAE/IES 90.1b (latest edition) standards with respect to insulation and standby loss requirements.

Setting the water temperature to the maximum set point can result in scalding hot water delivered to the faucets. It is highly recommended that the maximum setpoint be adjusted to the lowest temperature possible for the needs of the installation. See following section in this Installation/Operation Manual to change the maximum setpoint limit (max setpoint). Make sure the water heater control display is not in a public area that can result in the temperature settings being improperly adjusted.

Hydrogen gas can be produced in an operating water heater that has not had water drawn from the tank for a long period of time (generally two weeks or more). Hydrogen gas is extremely flammable. To prevent the possibility of injury under these conditions, we recommend the hot water faucet to be open for several minutes at the kitchen sink before you use any electrical appliance, which is connect to the hot water system. If hydrogen is present, there will be unusual sounds such as air escaping through the pipes as hot water begins to flow. Do not smoke or have open flame near the faucet at the time it is open.

WARNING

Liquefied petroleum gases/propane gas is heavier than air and will remain at floor level if there is a leak. Basements, crawl spaces, closets and areas below ground level will serve as pockets for accumulation of leaking gas. Before lighting, smell all around the appliance area for gas. Be sure to smell next to the floor.

IF YOU SMELL GAS:

- **DO NOT try to light any appliance.**
- **DO NOT touch any electric switch; do not use any telephone in your building.**
- **Immediately call your gas supplier from a telephone in another building. Follow the gas supplier's instructions.**
- **If you cannot reach your gas supplier, call the fire department.**

DO NOT OPERATE THE APPLIANCE UNTIL THE LEAKAGE IS CORRECTED!

To comply with NSF requirements this water heater is to be:

- a) Sealed to the floor with sealant, in a smooth and easily cleanable way, or
- b) Installed with an optional leg kit that includes legs and/or extensions that provide a minimum clearance of 6" beneath the water heater.

SECTION II: SPECIFICATIONS

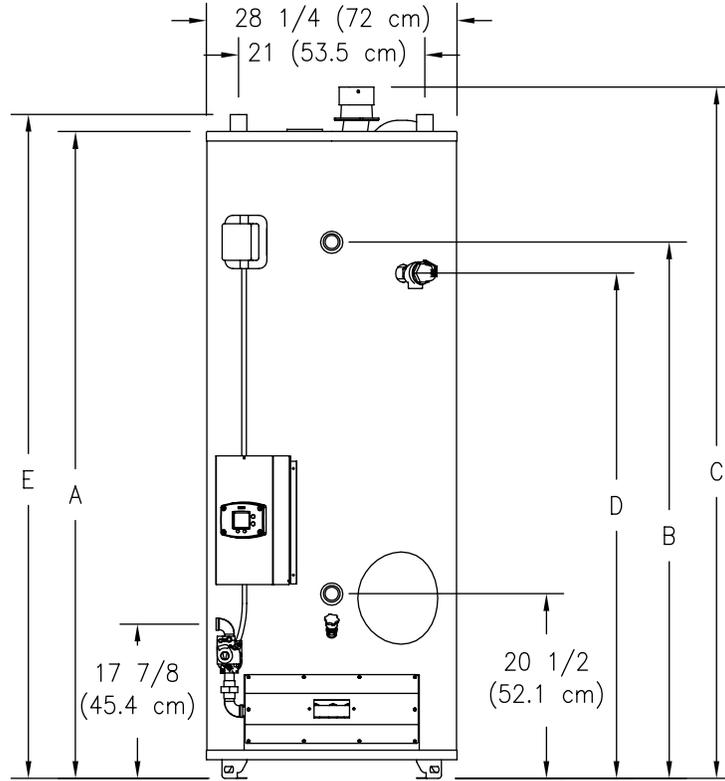


Figure 1. Dimensional layout

Model Description			Dimensions for Figure 1				
Capacity	Input (BTU/hr)		A	B	C	D	E
(Gal)	Nat.	LP	(In.)	(In.)	(In.)	(In.)	(In.)
100	199,999	199,999	72.13	60.31	77.19	56.81	74.13
100	150,000	150,000	72.13	60.31	77.19	56.81	74.13
100	250,000	225,000	72.13	60.31	82.13	56.81	74.13
80	250,000	225,000	63.13	51.31	68.19	47.81	65.13
80	199,999	199,999	63.13	51.31	68.19	47.81	65.13
80	150,000	150,000	63.13	51.31	68.19	47.81	65.13

Model Description			Dimensions for Figure 1				
Capacity	Input (kW/hr)		A	B	C	D	E
(Liter)	Nat.	LP	(cm)	(cm)	(cm)	(cm)	(cm)
378.5	58.6	58.6	183.2	153.2	196.1	144.3	188.3
378.5	43.9	43.9	183.2	153.2	196.1	144.3	188.3
378.5	73.2	65.9	183.2	153.2	208.4	144.3	188.3
302.8	73.2	65.9	160.4	130.3	173.2	121.4	165.4
302.8	58.6	58.6	160.4	130.3	173.2	121.4	165.4
302.8	43.9	43.9	160.4	130.3	173.2	121.4	165.4

SECTION III: GENERAL INFORMATION

FEATURES

1. Porcelain enamel lined tank provides corrosion protection with a tough glass lining on the interior of the tank.
2. Magnesium anodes provide an extra measure of protection and extends tank life.
3. Direct Vent design with an induced draft blower. Flue gases are exhausted and combustion air is taken from outside the building through 3" or 4" PVC, CPVC, or ABS pipe. Maximum venting distance for each pipe of 40 feet with one elbow for 3" diameter pipe and 55 feet with one elbow for 4" diameter pipe. May be horizontally or vertically vented. See venting section for complete details.
4. Hand Hole Cleanout allows inspection of tank interior and allows the removal of lime and sediment deposits.
5. Honeywell Integrated Water Heater has the following features:
 - Attractive digital water heater display on control panel for precisely setting and displaying the temperature setpoint. Pressing temperature up and down buttons changes the temperature setpoint. Temperature format may be displayed in degrees F or degrees C.
 - Single control board with plug in wiring controls temperature, ignition, and induced draft blower operation.
 - Reduced number of parts for servicing and wiring.
 - Plug in wiring reduces chance of miswiring.
 - Water heater display will show diagnostic codes in the event the water heater needs servicing. Aids in diagnosing and servicing the water heater. Temperature of the tank sensors can be monitored in the Service Mode.
 - Water heater display can show up to 10 previous error codes to further aid in servicing the water heater.

WARNING

Keep clear of combination temperature and pressure relief valve discharge line outlet. The discharge may be hot enough to cause scald injury. The water is under pressure and may splash.

For protection against excessive temperatures and pressure, install temperature and pressure protective equipment required by local codes, but not less than a combination temperature and pressure relief valve certified by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials as meeting the requirements of the Standard for *Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems*, ANS Z21.22 and the Standard *CAN1-4.4 Temperature, Pressure, Temperature and Pressure Relief Valves and Vacuum Relief Valves*. The combination temperature and pressure relief valve shall be marked with a maximum set pressure not to exceed the maximum working pressure of the water heater. The combination temperature and pressure relief valve shall also have an hourly rated temperature steam BTU discharge capacity not less than the hourly rating of the water heater.

Install the combination temperature and pressure relief valve into the opening provided and marked for this purpose on the water heater.

Note: Some models may already be equipped or supplied with a combination temperature and pressure relief valve. Verify that the combination temperature and pressure relief valve complies with local codes. If the combination temperature and pressure relief valve does not comply with local codes, replace it with one that does. Follow the installation instructions above on this page.

Install a discharge line so that water discharged from the combination temperature and pressure relief valve will exit within six (6) inches (15.2 cm) above, or any distance below the structural floor and cannot contact any live electrical part. The discharge line is to be installed to allow for complete drainage of both the combination temperature and pressure relief valve and the discharge line. The discharge opening must not be subjected to blockage or freezing. **DO NOT** thread, plug or cap the discharge line. It is recommended that a minimum clearance of four (4) inches (10.2 cm) be provided on the side of the water heater for servicing and maintenance of the combination temperature and pressure relief valve.

Do not place a valve between the combination temperature and pressure relief valve and the tank.

DISHWASHING MACHINE REQUIREMENTS

All dishwashing machines meeting the National Sanitation Foundation requirements are designed to operate with water flow pressures between 15 and 25 pounds per square inch. Flow pressures above 25 pounds per square inch, or below 15 pounds per square inch, will result in improperly sanitized dishes.

The National Sanitation Foundation also recommends circulation of 180°F water. Where this is done, the circulation should be very gentle so that it does not cause any unnecessary turbulence inside the water heater. The circulation should be just enough to provide 180°F water at the point of take-off to the dishwashing machine. Adjust flow by means of the valve in the circulation line.

SECTION IV: INSTALLATION INSTRUCTIONS



! WARNING

INSTALLATION OF THIS WATER HEATER REQUIRES ABILITY EQUIVALENT TO THAT OF A LICENSED TRADESMAN IN THE FIELD INVOLVED. PLUMBING, AIR SUPPLY, VENTING, GAS SUPPLY AND ELECTRICAL WORK ARE REQUIRED.

DO NOT ATTEMPT TO LIGHT ANY GAS APPLIANCE IF YOU ARE NOT CERTAIN OF THE FOLLOWING:

- Liquefied petroleum gases/propane gas and natural gas have an odorant added by the gas supplier that aids in detection of the gas.
- Most people recognize this odor as a "sulfur" or "rotten egg" smell.
- Other conditions, such as "odorant fade" can cause the odorant to diminish in intensity, or "fade", and not be as readily detectable.
- If you have a diminished sense of smell, or are in any way unsure of the presence of gas, immediately contact your gas supplier from a telephone in another building.
- Gas detectors are available. Contact your gas supplier or plumbing professional for more information.

Liquefied petroleum gases/propane gas is heavier than air and will remain at floor level if there is a leak. Basements, crawl spaces, closets and areas below ground level will serve as pockets for accumulation of leaking gas. Before lighting, smell all around the appliance area for gas. Be sure to smell next to the floor.

IF YOU SMELL GAS:

- Do not try to light any appliance.
- Do not touch any electric switch; do not use any telephone in your building.
- Immediately call your gas supplier from a telephone in another building. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

DO NOT OPERATE THE APPLIANCE UNTIL THE LEAKAGE IS CORRECTED!

This water heater must be located in an area where leakage of the tank, water line connections, or the combination temperature and pressure relief valve will not result in damage to the area adjacent to the water heater or to lower floors of the structure. When such locations cannot be avoided, a suitable drain pan must be installed under the water heater. The drain pan depth must be suitable for draining and collecting water, and have a minimum length and width of at least four (4) inches (10.0 cm) measured from the jacket of the water heater. The drain pan, as described above, can be purchased from your plumbing professional. The drain pan must be piped to an adequate drain. The piping must be at least 3/4 inch (2.0 cm) in diameter and pitched for proper drainage. It is recommended that a minimum clearance of four (4) inches (10.2 cm) be provided on the side of the water heater for servicing and maintenance of the combination temperature and pressure relief valve.

Water heaters are heat producing appliances. To avoid damage or injury there shall be no materials stored against the water heater and proper care shall be taken to avoid unnecessary contact (especially by children) with the water heater components. **UNDER NO CIRCUMSTANCES SHALL FLAMMABLE MATERIALS, SUCH AS GASOLINE OR PAINT THINNER BE USED OR STORED IN THE VICINITY OF THIS WATER HEATER, VENT-AIR INTAKE SYSTEM OR IN ANY LOCATION FROM WHICH FUMES COULD REACH THE WATER HEATER OR VENT-AIR INTAKE SYSTEM.**

Failure to adhere to these installation and operating instructions may create a hazard to life and property and will nullify the warranty.

Minimum Clearances

CAUTION

The National Fuel Gas Code (ANSI Z233.1- latest edition) or in Canada The Natural Gas or Propane Installation Code CAN/CGA (B149.1, B149.2- latest edition), expressly prohibits the following:

- a. Installation of a water heater in a bathroom, bedroom, or any occupied room normally kept closed.
- b. Installation of a water heater in a garage, unless the unit is installed so that the burner and ignition devices are at least eighteen (18) inches (45.8 cm) above floor level and protected to avoid damage by a moving vehicle.

If the buildings cold water supply has a back-flow preventer, check valve or water meter with check valve, provisions for thermal expansion of water in the hot water system must be provided.

The location of this water heater is of the utmost importance. Before installing this water heater, you should read the Installation section of these instructions. After reading these Installation and Operating Instructions, select a location for the water heater where the floor is level and is easily accessible to water lines, gas supply (type identified on the rating plate), an adequate open drain, and within the maximum specified venting distance to an outside wall or roof for the direct vent terminal. **DO NOT locate the water heater where water lines could be subjected to freezing temperatures. Make sure the cold water pipes are not located directly above the gas control so that condensate during humid weather does not drip or accumulate on the controls.**

This installation must allow access to the front of the water heater and adequate clearance shall be provided for servicing and operating this water heater. The water heater may be installed on either a combustible or non-combustible floor. If the water heater is to be installed directly on carpeting, it shall be installed on top of a metal or wood panel (or equivalent) extending beyond the full width and depth of the appliance by at least three (3) inches (7.6 cm) in any direction or, if the appliance is to be installed in an alcove or closet, the entire floor shall be covered by the panel. The minimum clearances to combustibles for this water heater are given on the following pages. A minimum of 24 inches (61 cm) front clearance shall be provided for inspection and servicing. Adequate clearances shall be provided for easy access to controls by service personnel to enable proper cleaning, servicing, and operation of the water heater. Under no circumstances is the front of the water heater to be placed in a position where the burner tray assembly cannot slide out for removal when servicing.

This water heater MUST be installed indoors out of the wind and weather.

Note: For California installation this water heater must be braced, anchored, or strapped to avoid falling or moving during an earthquake. See instructions for correct installation procedures. Instructions may be obtained from DSA Headquarters Office, 1102 Q Street, Suite 5100, Sacramento, California 95811.

Water heater corrosion and component failure can be caused by the heating and breakdown of airborne chemical vapors. Examples of some typical compounds that are potentially corrosive are: spray can propellants, cleaning solvents, refrigerator and air conditioning refrigerants, swimming pool chemicals, calcium and sodium chloride, waxes and process chemicals. These materials are corrosive at very low concentration levels with little or no odor to reveal their presence.

NOTICE

DAMAGE TO THE WATER HEATER CAUSED BY EXPOSURE TO CORROSIVE VAPORS IS NOT COVERED BY THE WARRANTY. DO NOT OPERATE THE WATER HEATER IF EXPOSURE HAS OR WILL OCCUR. DO NOT STORE ANY POTENTIALLY CORROSIVE COMPOUNDS IN THE VICINITY OF THE WATER HEATER OR THE DIRECT VENT TERMINAL.

This water heater may be installed in an alcove on combustible flooring with clearances from combustible materials as shown in the following clearances illustration of this Installation and Operation Instruction Manual.

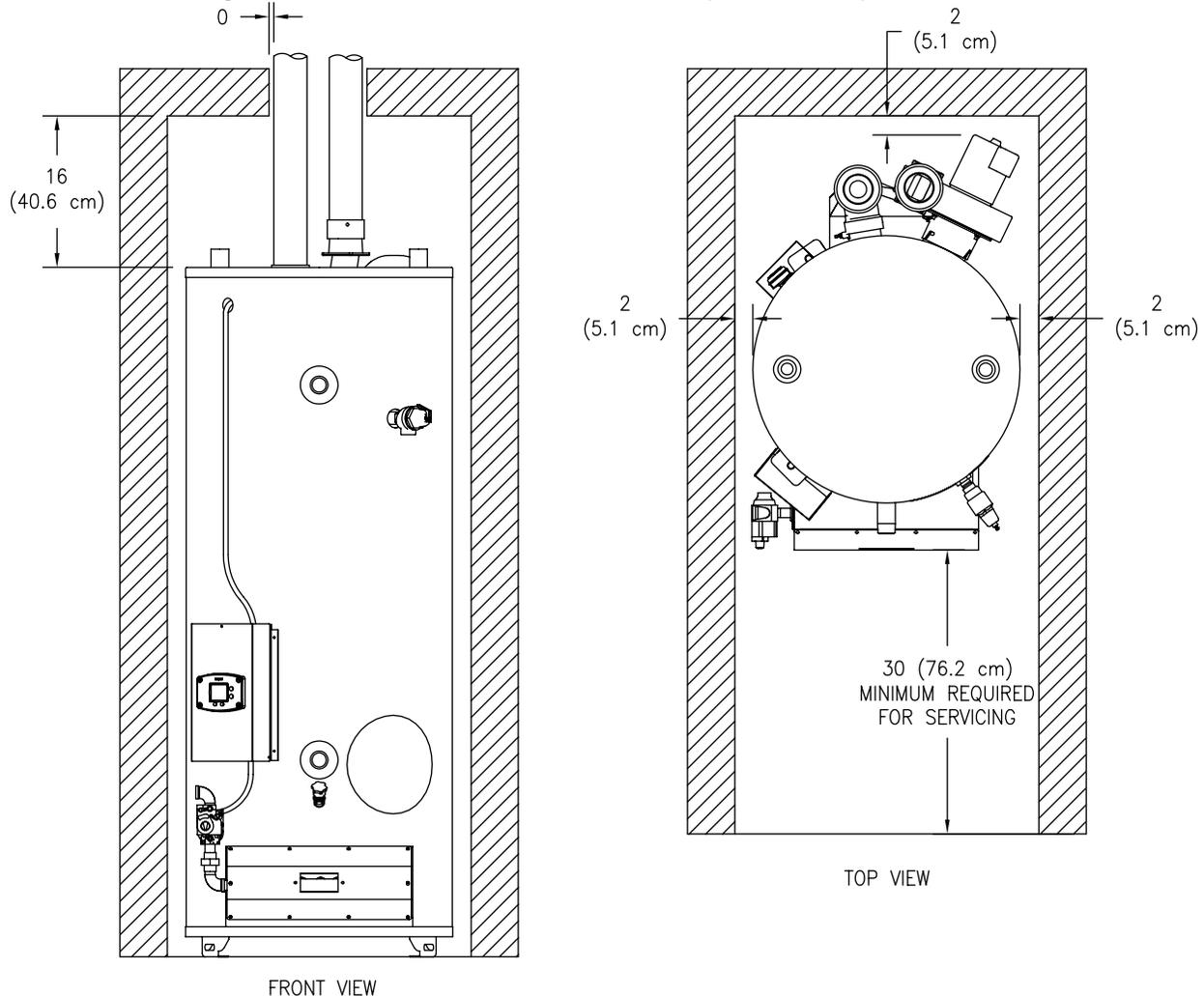
UNPACKING

INSPECT SHIPMENT carefully for any signs of damage.

1. All equipment is carefully manufactured, inspected and packed.
2. Any claims for damage or shortage in shipment must be filed immediately with the manufacturer noted on the rating plate label.

LOCATE WATER HEATER in front of final position before removing crate.

1. LOCATE so that venting connections will be short and direct.
2. THIS WATER HEATER IS SUITABLE FOR INSTALLATION ON COMBUSTIBLE FLOOR.
3. Proper venting practices must be considered when selecting a location for this water heater. For exact venting specifications, please consult the Venting section of these Installation and Operating Instructions.
4. It is recommended that a minimum clearance of four (4) inches (10.2 cm) be provided on the side of the water heater for servicing and maintenance of the combination temperature and pressure relief valve.



MINIMUM CLEARANCES

Figure 2

REMOVE CRATE

1. Remove all banding and pry off crate sides carefully so as not to damage the water heater.
2. Carefully roll/lift the water heater from the crate base.

MOVE WATER HEATER TO PERMANENT POSITION by sliding or walking. Place drain pan underneath water heater

INSTALL TEMPERATURE AND PRESSURE RELIEF VALVE (if not already installed).

This water heater must be located in an area where the general public does not have access to set temperatures.

AIR REQUIREMENTS

1. Do not obstruct the flow of ventilating air.
2. For safe operation, adequate air is needed for combustion and ventilation. Sooting may result in serious damage to the water heater and risk of fire or explosion. It can also create a risk of asphyxiation. Such a condition often will result in a yellow, luminous burner flame, causing carboning or sooting of the combustion chamber, burner and flue tubes.



WARNING

IMPORTANT-The flow of combustion and ventilating air must not be obstructed.

SECTION V: VENTING

WARNING

The direct vent system must be properly installed. Failure to properly install the direct vent system could result in property damage, personal injury, or death.

DO NOT install any damaged venting system components. If damage is evident then please contact the supplier where the water heater was purchased or the manufacturer listed on the rating plate for replacement parts.

Use only the vent terminals provided or factory authorized for venting this water heater.

NOTICE

For installations in Canada, field supplied plastic vent piping must comply with CAN/CGA B149.1 (latest edition) and be certified to the Standard For Type BH Gas Venting Systems, ULC S636. Components of this listed system shall not be interchanged with other vent systems or unlisted pipe/fittings. All plastic components and specified primers and glues of the certified vent system must be from a single system manufacturer and not intermixed with other system manufacturer's vent system parts.

The supplied vent connector and vent termination are certified as part of the water heater.

This water heater is a Powered Direct Vent Gas Water Heater where all air for combustion is obtained from the outside atmosphere and all flue gases are discharged to the outside atmosphere. The venting system consists of separate PVC combustion air intake and flue exhaust pipes. Venting may be run horizontally through an outside wall or vertically through a roof through 3" (7.6 cm) or 4" (10.2 cm) diameter PVC, ABS or CPVC pipe for models with input ratings under 200,000 Btu/hr. Models with input ratings over 200,000 Btu/hr. (check the model nameplate) must use 4" (10.2 cm) diameter PVC, ABS, or CPVC only. The water heater is supplied with a screened intake and exhaust 90° elbow referred to as the exhaust vent or combustion air intake terminal (see figure 5). Consult the venting table in this section for the maximum venting distances with 3" (7.6 cm) and 4" (10.2 cm) PVC pipe.

Note: The combustion air intake must be piped to the outdoors as outlined in the following instructions in order for this appliance to be a direct vent water heater.

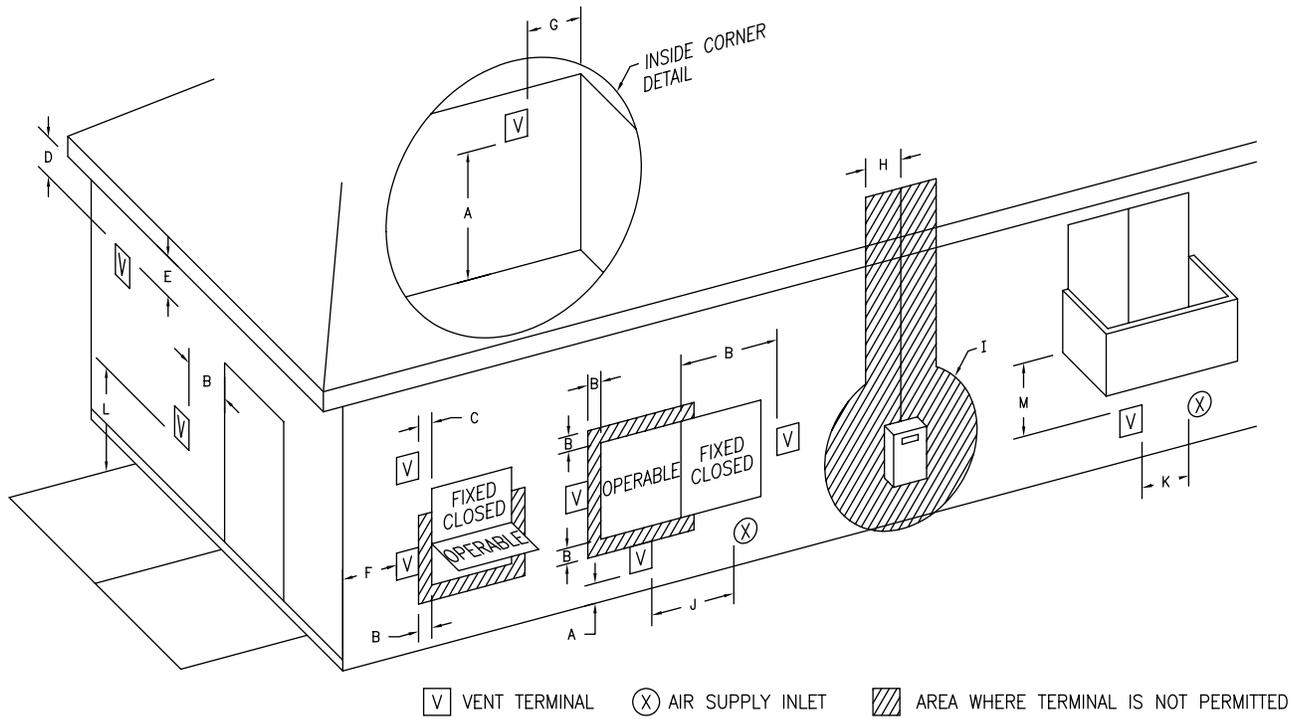


Figure 3.

Direct Vent Terminal Clearances

		Canadian Installations¹	US Installations²
A=	Clearance above grade, veranda, porch, deck or balcony	12 inches (30 cm)	12 inches (30 cm)
B=	Clearance to widow or door that may be opened	36 inches (91 cm)	12 inches (30 cm)
C=	Clearance to permanently closed widow	*b	*b
D=	Vertical clearance to ventilated soffit located above the terminal within a horizontal distance of 2 feet (61 cm) from the center line of the terminal	12 inches (30 cm) *a	12 inches (30 cm) *a
E=	Clearance to unventilated soffit	12 inches (30 cm) *a	12 inches (30 cm) *a
F=	Clearance to outside corner	*b	*b
G=	Clearance to inside corner	*b	*b
H=	Clearance to each side of center line extended above meter/regulator assembly	3 feet (91 cm) within a height 15 feet (4.6 m) above the meter/regulator assembly	*b
I=	Clearance to service regulator vent outlet or oil tank vent	36 inches (91 cm)	*b
J=	Clearance to non-mechanical air supply inlet to building or the combustion air inlet to any other appliance	36 inches (91 cm)	12 inches (30 cm)
K=	Clearance to a mechanical air supply inlet	6 feet (1.83 m)	3 feet (91 cm) above if within 10 feet horizontally
L=	Clearance above paved sidewalk or paved driveway located on public property	7 feet (2.13 m) †	*b
M=	Clearance under a veranda, porch, deck, or balcony	12 inches (30 cm) ‡	*b

¹ In accordance with the current CAN/CGA-B149 *Installation Codes*.

² In accordance with the current ANSI Z223.1-(Latest edition)/NFPA 54 *National Fuel Gas Code*.

† A vent shall not terminate directly above a sidewalk or paved driveway that is located between two single-family dwellings and serves both dwellings.

‡ Permitted only if a veranda, porch, deck or balcony is fully open on a minimum of two sides beneath the floor.

*a) A minimum clearance value determined by testing in accordance with section 2.20.

*b) "Clearance in accordance with local installation codes and the requirements of the gas supplier".

The vent system must terminate so that proper clearances are maintained as cited in local codes or the latest edition of the National Fuel Gas Code, ANSI Z223.1.73.4e and 7.8a, b as follows:

1. Do not terminate near soffit vents or crawl space or other area where condensate or vapor could create a nuisance or hazard or cause property damage.
2. Do not terminate the exhaust vent terminal where condensate or vapor could cause damage or could be detrimental to the operation of regulators, relief valves, or other equipment.
3. Do not terminate the exhaust vent terminal over public area or walkways where condensate or vapor can cause nuisance or hazard.
4. The vent shall terminate a minimum of 12 inches above expected snowfall level to prevent blockage of vent termination.

Vent pipes serving power vented appliances are classified by building codes as “vent connectors”. Required clearances from combustible materials must be provided in accordance with information in this manual under LOCATION OF WATER HEATER and CLEARANCES, and with National Fuel Gas Code and local codes.

Note: Provide protection of the building materials from degradation by flue gases from the exhaust vent terminal.

Horizontal And Vertical Direct Vent Lengths for 199,999 and 150,000 Btu/hr. Input Models

Reference the Venting Component Tables listed in the Installation (Direct Vent System Installation) for the maximum vent lengths using 3” (7.6 cm) diameter PVC, ABS or CPVC piping. If longer venting distances are required than shown for 3” (7.6 cm) diameter pipe, then 4” (10.2 cm) diameter pipe may be used. The distances shown in the tables are for each separate pipe (air intake and exhaust vent).

Do not exceed the maximum allowed exhaust vent or combustion air pipe distances for the number of elbows listed. Refer to the venting distances listed in tables 1-4 in this installation and operating instruction manual.

Note: The supplied exhaust vent and combustion air intake terminals may be used to vent through outside walls of any thickness as long as the maximum allowed venting distances are not exceeded.

Maximum Venting Distances

(Horizontal, Vertical, or Combined for models under 200,000 Btu/hr. input ratings only)

TABLE 1 – EXHAUST VENT AND COMBUSTION AIR INTAKE PIPE LENGTHS FOR 3” (7.6 cm) PVC	
Number of 90° Elbows (Excluding vent terminals)	Maximum distance of straight pipe (excluding vent terminal) to exterior wall or roof.
1	40 ft. (12.19 m)
2	35 ft. (10.67 m)
3	30 ft. (9.14 m)
4	25 ft. (7.62 m)

TABLE 2 – EXHAUST VENT AND COMBUSTION AIR INTAKE PIPE LENGTHS FOR 4” (10.2 cm) PVC (For distances longer than 3” (7.6 cm) PVC)	
Number of 90° Elbows (Excluding vent terminals)	Maximum distance of straight pipe (excluding vent terminal) to exterior wall or roof.
1	55 ft. (16.8 m)
2	50 ft. (15.2 m)
3	45 ft. (13.7 m)
4	40 ft. (12.2 m)

Note: Each 90° elbow reduces the maximum venting distance by 5 ft. (1.52 m). Two 45° elbows are equal to one 90° elbow. Do not use 4” (10.2 cm) diameter PVC for venting distances less than 40 ft. (12.19 m) (with 1 elbow). Use 3” (7.6 cm) PVC for venting distances of 40 (12.19 m) feet or less.

The total combined distances of vertical and horizontal pipe with equivalent elbow lengths cannot exceed the maximum distance of straight pipe listed in the tables 1-4.

NOTICE

IMPORTANT - Do not exceed the venting distances or the number of elbows listed. Exceeding the maximum venting distances may cause the water heater to malfunction or cause an unsafe condition.

The exhaust vent adaptor and gasket with mounting bolts are located inside the cardboard carton with the vent terminal. The exhaust vent adaptor and gasket must be installed on the blower outlet flange before attempting to connect the 3” (7.6 cm) diameter plastic vent pipe to the water heater.

Direct Vent System Installation (199,999 and 150,000 Btu/hr. input models)

! WARNING

The direct vent system must be properly installed. Failure to properly install the direct vent system could result in property damage, personal injury or death.

The water heater requires its own separate venting system. Do not connect the exhaust vent into an existing vent pipe or chimney.

! CAUTION

Do not install any damaged direct vent system components. Contact the manufacturer of the water heater for replacement parts. Use only the vent terminals provided or factory authorized for venting this water heater.

The flow of combustion air must not be restricted. Keep the direct vent terminal openings clear of objects, shrubs, snow and debris.

This water heater is a power direct vent appliance and is designed to vent both its products of combustion and provide the combustion air supply through 3" (7.6 cm) or 4" (10.2 cm) diameter Schedule 40 PVC, ABS or CPVC pipe to the outdoors. This water heater may be vented either through the wall or vertically through the roof. The blower outlet adaptor provided in the vent kit carton and combustion air inlet connection are designed to fit 3" (7.6 cm) diameter schedule 40 plastic pipe. Remove the plastic exhaust vent adaptor and gasket from the vent kit carton. Line up the gasket screw clearance holes with the vent adaptor flange and place on top of the blower outlet flange. Assemble the adaptor with the gasket to the blower outlet using the four (4) nuts, bolts, and washers provided in the kit.

If 4" (10.2 cm) diameter pipe is used, a bell reducer must be used at the blower outlet and air intake connections. Seal the joint between the PVC pipe and the blower outlet collar with silicone sealant (not supplied) (See figure 4). Table 1 lists the maximum vent lengths for this water heater using 3" (7.6 cm) PVC. If possible, locate the water heater so that the venting length and number of elbows are kept to the minimum distance necessary to reach the outside. Use the 3" (7.6 cm) vent and intake air terminals supplied with the water heater to terminate on the outside of the building. When using 4" (10.2 cm) diameter pipe, optional 4" (10.2 cm) diameter vent terminals must be used and are available from your dealer. Refer to the venting illustrations on the following pages. Make sure the exhaust vent pipe terminal rear edge is at least 6" (2.5 cm) away from the edge of the wall (see figure 5).

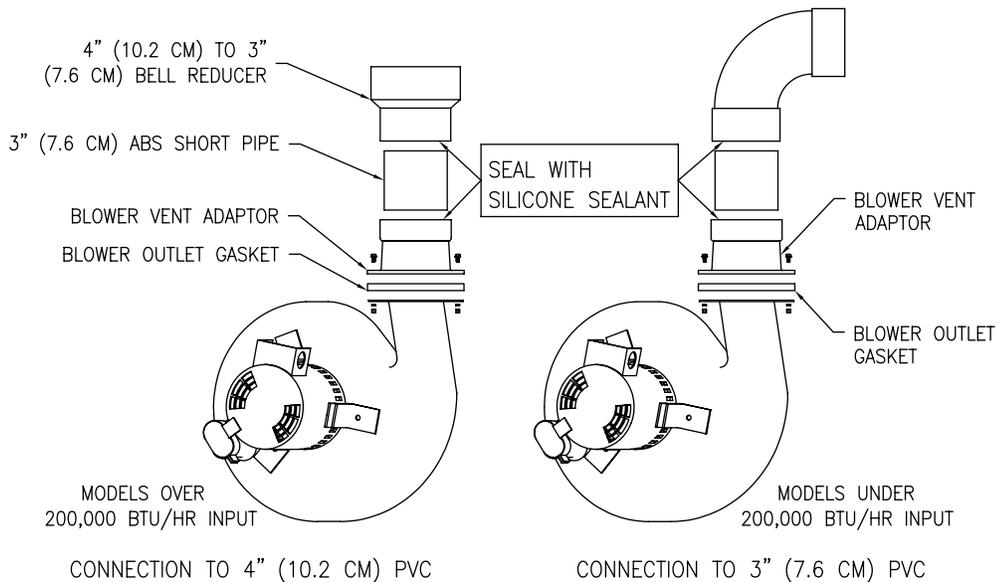


Figure 4

! CAUTION

IMPORTANT - All of the Exhaust Venting connections must be leak checked with a soap solution upon initial start up of the water heater. Any leaks must be repaired before continuing operation of the water heater.

NOTE: ABS or CPVC pipes may be substituted for PVC pipe.

Through the Wall Venting:

Cut two 3 1/2 in. (8.9 cm) diameter holes (for 3" (7.6 cm) diameter pipe) or 4 1/2" (11.4 cm) diameter holes (for 4" (10.2 cm) diameter pipe) in the wall with the centerline hole distances at least 6" (15.2 cm) apart, but not more than 24" (61 cm) apart in the location where the exhaust vent and air intake terminals will exit the outside wall. Use the proper PVC cement to secure the 90° exhaust vent and air intake terminals provided with the water heater to the plastic pipes. The distance between the back edge of the 90° exhaust vent terminal and the exterior wall (see Figure 5) must be 5 inches (12.7 cm) more for the exhaust vent terminal than the air intake terminal. Use the proper cement and assembly procedures to secure the vent connector joints between the terminal and the blower outlet. Provide support brackets for every 3 feet (.91 m) of horizontal vent.

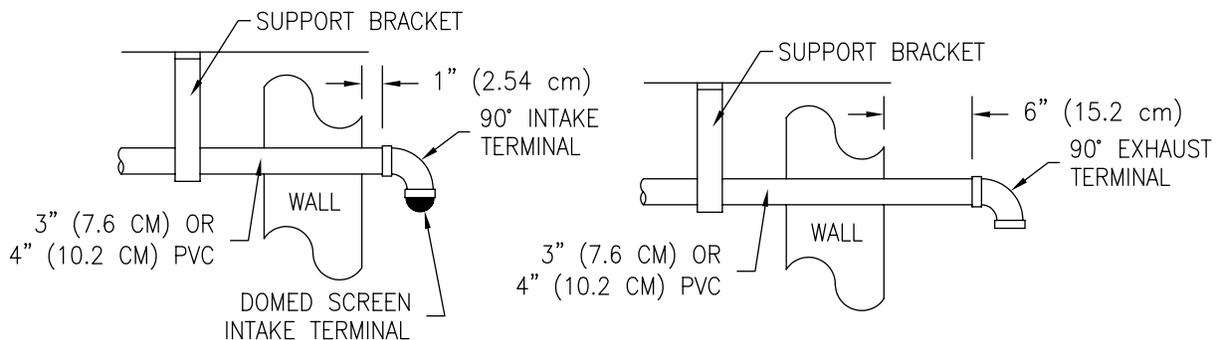


Figure 5

Through the Roof Venting: (Vertical Venting)

Cut the necessary holes through the roof and ceiling and install the exhaust vent and air intake plastic pipes as shown in Figure 6. Make sure that the installation meets the local codes and/or The National Fuel Gas Code ANSI Z223.1 (Latest Edition) or CGA/CAN B149 Propane or Natural gas Installation Code.

All vertical exhaust vent runs or horizontal runs more than 15 feet in length may accumulate condensate in the exhaust vent pipe and exhaust blower and will require the installation of a drain tee and condensate trap. A drain tee and condensate trap are available from your installer or the manufacturer of the water heater and must be installed in the horizontal exhaust vent as close as practical to the blower vent connection (See Figures 7B and 7C). When using the condensate tee, the exhaust vent piping must slope with a 1/4" (6.35 mm) per foot pitch toward the condensate tee. For short horizontal runs (less than 15 feet (4.57 m)) without the condensate tee, slope the exhaust vent piping toward the outside vent terminal so that any condensate will drain out the vent terminal (see figure 7A). Venting arrangements required for low ground clearance (figure 8) will require a condensate tee with the pipe sloped toward the tee.

Connect 3/8" (15.9 mm) plastic tubing from the barbed fitting on the condensate tee and form a loop using wire ties or tape as shown in figures 7B and 7C before running to a drain or condensate pump. The loop forms a drain trap so that flue gases do not escape into the room.

! CAUTION

A drain loop must be installed in the drain tubing to serve as a condensate trap to prevent flue gases from escaping into the room. Refer to figures 7B, 7C, and the instructions discussing the condensate drain tee and trap under the vertical venting section.

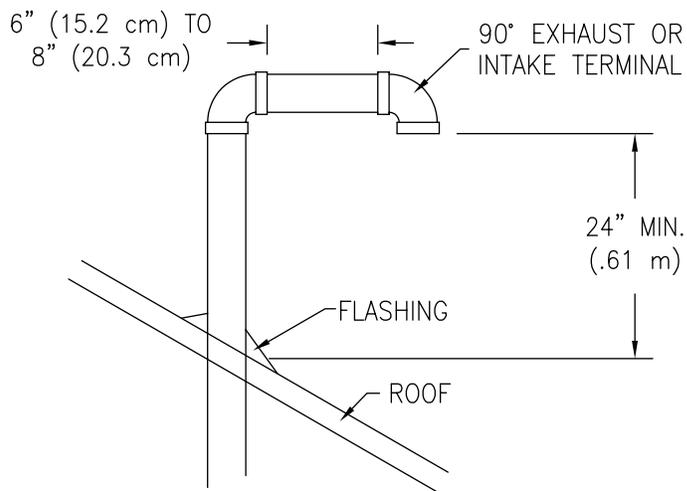


Figure 6

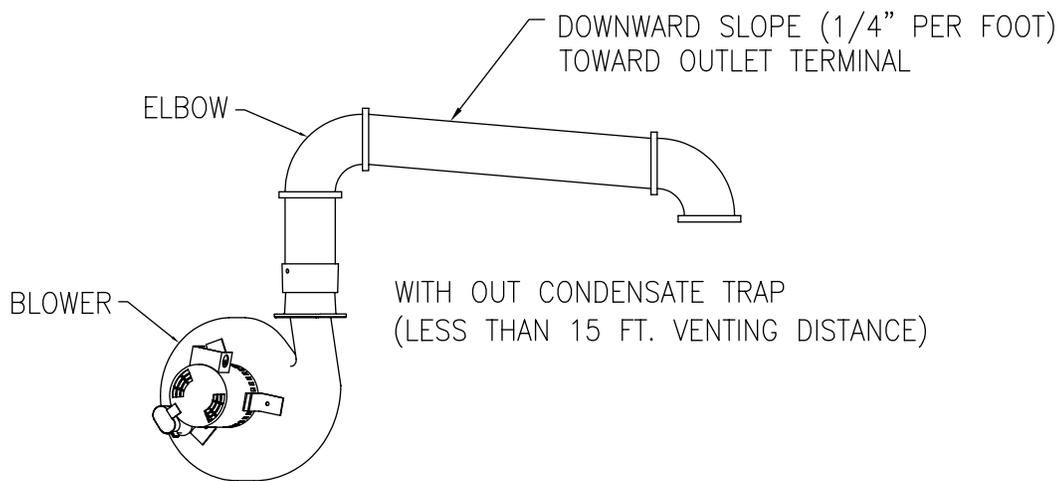


Figure 7A

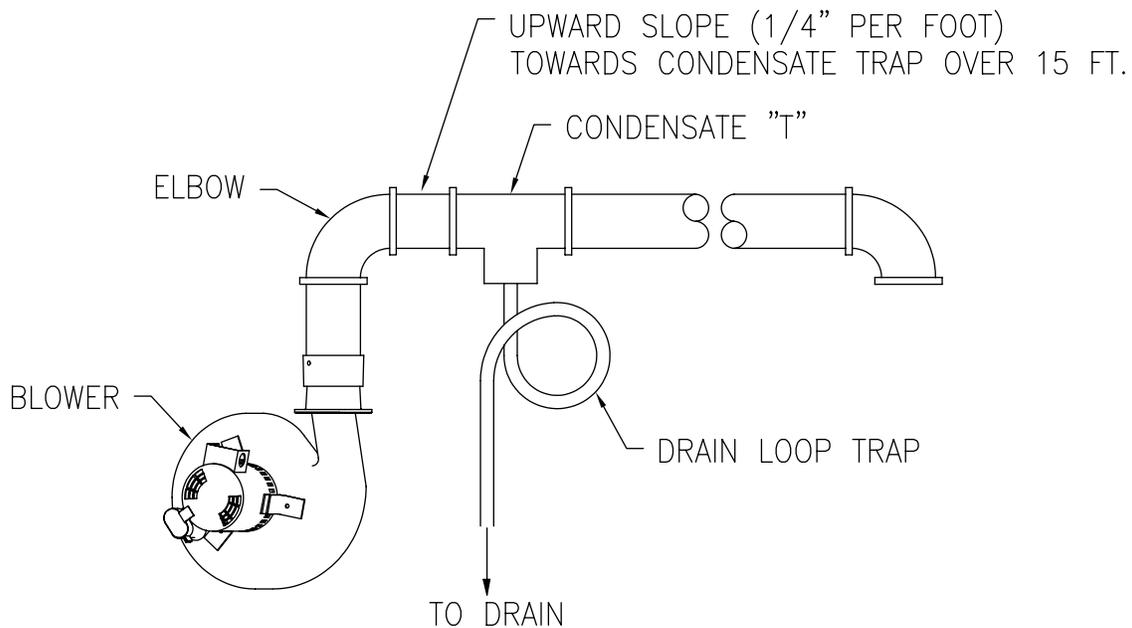


Figure 7B

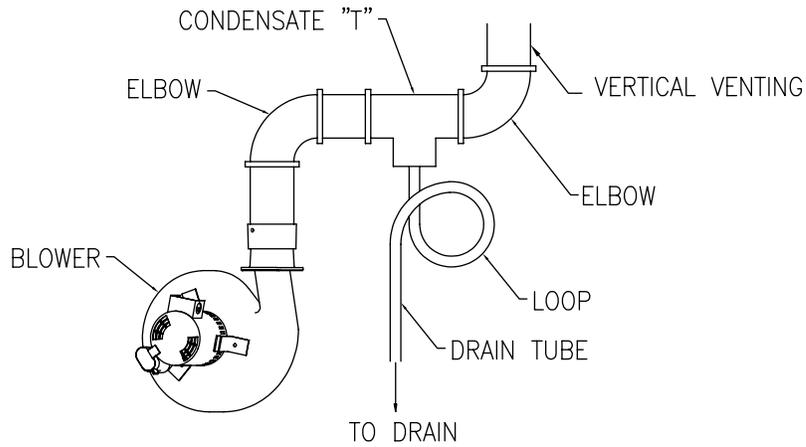


Figure 7C

Through the Wall Venting With Low Ground Clearance:

When venting cannot exit through the wall at a height greater than or equal to 12" (30.5 cm) (and above expected snow level) from the ground, then the installation must be modified as shown below (see Figure 8). Refer to Tables 3 or 4 for maximum venting lengths using 3" (7.6 cm) or 4" (10.2 cm) diameter plastic pipe.

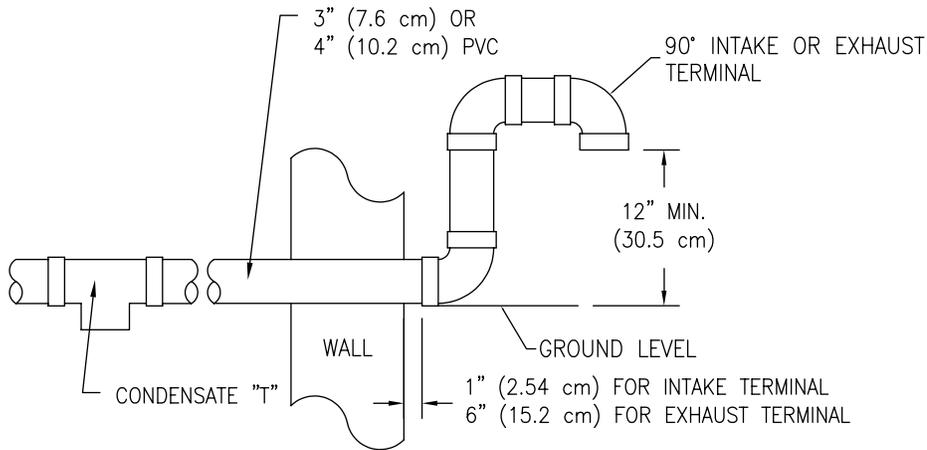


Figure 8

TABLE 3		
3" (7.6 cm) PVC EXHAUST VENT OR COMBUSTION AIR INTAKE PIPE LENGTHS FROM INSIDE WALL FOR LOW GROUND CLEARANCE INSTALLATIONS		
Termination	# of Elbows	Maximum Length
(2) 90° Elbows with (1) 90° Elbow	1	30 ft (9.1 m)
(2) 90° Elbows with (1) 90° Elbow	2	25 ft (7.6 m)
(2) 90° Elbows with (1) 90° Elbow	3	20 ft (6.1 m)
(2) 90° Elbows with (1) 90° Elbow	4	15 ft (4.6 m)

TABLE 4		
4" (10.2 cm) PVC EXHAUST VENT OR COMBUSTION AIR INTAKE PIPE LENGTHS FROM INSIDE WALL FOR LOW GROUND CLEARANCE INSTALLATIONS		
Termination	# of Elbows	Maximum Length
(2) 90° Elbows with (1) 90° Elbow	1	45 ft (13.7 m)
(2) 90° Elbows with (1) 90° Elbow	2	40 ft (12.2 m)
(2) 90° Elbows with (1) 90° Elbow	3	35 ft (10.7 m)
(2) 90° Elbows with (1) 90° Elbow	4	30 ft (9.1 m)

Direct Vent System Installation for Models with Input Ratings Over 200,000 Btu/Hr.

Models with input ratings over 200,000 Btu/hr. must use 4" (10.2 cm) diameter PVC, ABS, or CPVC pipe. Install the blower adaptor exhaust vent assembly and gasket supplied in the vent kit carton on the exhaust blower outlet flange as described in the previous section. Connect the 4" (10.2 cm) pipe to the 4" (10.2 cm) reducers attached to the combustion air intake pipe and blower exhaust outlet. The supplied 4" (10.2 cm) exhaust vent and combustion air intake terminals must also be used. Follow the venting system installation instructions for installing 4" (10.2 cm) diameter pipe detailed on pages 14-17 and figures 4-8 and follow the venting tables 5 and 6 for the maximum venting distances.

Maximum Venting Distances (Horizontal, Vertical, or Combined)

TABLE 5	
EXHAUST VENT OR COMBUSTION AIR INTAKE PIPE LENGTHS FOR 4" (10.2 cm) PVC	
Number of 90° Elbows (Excluding vent terminals)	Maximum distance of straight pipe (excluding vent or air intake terminal) to exterior wall or roof.
1	55 ft. (16.8 m)
2	50 ft. (15.2 m)
3	45 ft. (13.7 m)
4	40 ft. (12.2 m)

TABLE 6		
4" (10.2 cm) PVC EXHAUST VENT OR COMBUSTION AIR INTAKE PIPE LENGTHS FROM INSIDE WALL FOR LOW GROUND CLEARANCE INSTALLATIONS		
Terminating	# of Elbows	Maximum Length
(2) 90° Elbows with (1) 90° Elbow	1	45 ft (13.7 m)
(2) 90° Elbows with (1) 90° Elbow	2	40 ft (12.2 m)
(2) 90° Elbows with (1) 90° Elbow	3	35 ft (10.7 m)
(2) 90° Elbows with (1) 90° Elbow	4	30 ft (9.1 m)

SECTION VI: WATER CONNECTIONS

NOTE: *BEFORE PROCEEDING WITH THE INSTALLATION, CLOSE THE MAIN WATER SUPPLY VALVE.*

After shutting off the main water supply, open a faucet to relieve the water line pressure to prevent any water from leaking out of the pipes while making the water connections to the water heater. After the pressure has been relieved, close the faucet. The COLD water inlet and HOT water outlet are identified on the top and front of the water heater. Make sure the dip tube is in place before making the cold water connection. Make the proper plumbing connections between the water heater and the plumbing system to the house. Install a shut-off valve in the cold water supply line.

CAUTION

If sweat fittings are to be used, **DO NOT** apply heat to the nipples on top or side of the water heater. Sweat the tubing to the adapter before fitting the adapter to the water connections. It is imperative that heat is not applied to the nipples containing a plastic liner.

Keep clear of the combination temperature and pressure relief valve discharge line outlet. The discharge may be hot enough to cause scald injury. The water is under pressure and may splash.

WARNING

FAILURE TO INSTALL AND MAINTAIN A NEW, LISTED TEMPERATURE AND PRESSURE RELIEF VALVE WILL RELEASE THE MANUFACTURER FROM ANY CLAIM, WHICH MIGHT RESULT FROM EXCESSIVE TEMPERATURE AND PRESSURES.

Hydrogen gas can be produced in an operating water heater that has not had water drawn from the tank for a long period of time (generally two weeks or more). Hydrogen gas is extremely flammable. To prevent the possibility of injury under these conditions, we recommend the hot water faucet to be open for several minutes at the kitchen sink before you use any electrical appliance, which is connected to the hot water system. If hydrogen is present, there will be an unusual sound such as air escaping through the pipes as hot water begins to flow. Do not smoke or have open flame near the faucet at the time it is open.

NOTICE

If this water heater is installed in a closed water supply system, such as the one having a back-flow preventer in the cold water supply, provisions must be made to control thermal expansion. **DO NOT** operate this water heater in a closed system without provisions for controlling thermal expansion. Warranties do not cover damages from thermal expansions such as pressure bulges and/or deformities. Your water supplier or local plumbing inspector should be contacted on how to control this situation.

After installation of the water lines, open the main water supply valve and fill the water heater. While the water heater is filling, open several hot water faucets to allow air to escape from the water system. When a steady stream of water flows through the faucets, close them and check all water connections for possible leaks. **NEVER OPERATE THE WATER HEATER WITHOUT FIRST BEING CERTAIN IT IS FILLED WITH WATER.**

! WARNING

Keep clear of combination temperature and pressure relief valve discharge line outlet. The discharge may be hot enough to cause scald injury. The water is under pressure and may splash.

For protection against excessive temperatures and pressure, install temperature and pressure protective equipment required by local codes, but not less than a combination temperature and pressure relief valve certified by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials as meeting the requirements of the Standard for *Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems, ANS Z21.22* and the Standard *CAN1-4.4 Temperature, Pressure, Temperature and Pressure Relief Valves and Vacuum Relief Valves*. The combination temperature and pressure relief valve shall be marked with a maximum set pressure not to exceed the maximum working pressure of the water heater. The combination temperature and pressure relief valve shall also have an hourly rated temperature steam BTU discharge capacity not less than the hourly rating of the water heater.

Install the combination temperature and pressure relief valve into the opening provided and marked for this purpose on the water heater.

Note: Some models may already be equipped or supplied with a combination temperature and pressure relief valve. Verify that the combination temperature and pressure relief valve complies with local codes. If the combination temperature and pressure relief valve does not comply with local codes, replace it with one that does. Follow the installation instructions above on this page.

Install a discharge line so that water discharged from the combination temperature and pressure relief valve will exit within six (6) inches (15.2 cm) above, or any distance below the structural floor and cannot contact any live electrical part. The discharge line is to be installed to allow for complete drainage of both the combination temperature and pressure relief valve and the discharge line. The discharge opening must not be subjected to blockage or freezing. **DO NOT** thread, plug or cap the discharge line. It is recommended that a minimum clearance of four (4) inches (10.2 cm) be provided on the side of the water heater for servicing and maintenance of the combination temperature and pressure relief valve.

Do not place a valve between the combination temperature and pressure relief valve and the tank.



DANGER

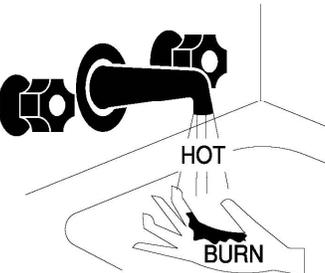
Water temperature over 125°F can cause severe burns instantly or death from scalds.

Children, disabled and elderly are at highest risk of being scalded.

Review this instruction manual before setting temperature at water heater.

Feel water before bathing or showering.

Temperature limiting valves are available.



This water heater can deliver scalding temperature water at any faucet in the system. Be careful whenever using hot water to avoid scalding injury. Certain appliances such as dishwashers and automatic clothes washers may require increased temperature water. By setting the thermostat on this water heater to obtain the increased temperature water required by these appliances, you may create the potential for scald injury. To protect against injury, you should install an ASSE approved mixing valve in the water system. This valve will reduce point of discharge temperature by mixing cold and hot water in branch supply lines. Such valves are available from the manufacturer of this water heater or a local plumbing

supplier. Please consult with a plumbing professional. For information regarding space-heating water connections and plumbing arrangements, refer to the section, "Installation Instructions for Potable Water and Space Heating" in this Installation and Operating Instruction Manual.

APPROXIMATE TIME/TEMPERATURE RELATIONSHIPS IN SCALDS	
120°F (49°C)	More than 5 minutes
125°F (52°C)	1½ to 2 minutes
130°F (54°C)	About 30 seconds
135°F (57°C)	About 10 seconds
140°F (60°C)	Less than 5 seconds
145°F (63°C)	Less than 3 seconds
150°F (66°C)	About 1½ seconds
155°F (68°C)	About 1 second

SECTION VII: GAS CONNECTIONS

The gas supply lines must meet all requirements of the National Fuel Gas Code (ANSI Z223.1-Latest Edition), or in Canada CAN/CGA B149.1 Natural Gas Installation Code (Latest Edition) or CAN/CGA B149.2 Propane Installation Code (Latest Edition).

The minimum permissible gas supply pressure for the purpose of input adjustment is one (1.0) inch (0.25 kPa) water column above the operating manifold pressure. See the rating plate and gas valve for the manifold pressure and gas type. The maximum permissible gas supply pressure is fourteen (14.0) inches (3.5 kPa) water column for natural gas and liquefied petroleum gases/propane gas.

1. Connect this water heater only to the type of gas (Natural or Propane gas) as shown on the rating plate. Use clean black iron pipe or equivalent material approved by local codes and ordinances. (Dirt and scale from the pipe can enter the gas valve and cause it to malfunction). The inlet gas line must have a minimum length of three (3) inches (7.6 cm) drip leg (*sediment trap*) installed as close to the water heater's gas valve as possible. A ground joint union must be installed as close to the water heater as possible in the gas supply line feeding the water heater to permit servicing of the water heater. Compounds used on the threaded joints of the gas piping must be resistant to the action of liquefied petroleum gases/propane gas. DO NOT apply pipe dope to the gas valve inlet and make certain that no pipe dope has become lodged in the inlet screen of the gas valve. Extreme care must be taken to ensure no pipe dope enters the gas valve. Avoid excessive torque when tightening the gas supply line to the gas valve. Excessive torque may result in cracking of the gas valve housing and could create a gas leak. The suggested maximum torque is 31.5 ft. lbs. (4.4 kg-m).

WARNING

The manufacturer of this water heater will not be liable for any damage or injury caused as a result of a cracked gas inlet as a result of excessive torque.

2. This water heater and its gas connection must be leak tested before placing the water heater in operation. Check for gas leaks with a soap and water solution and a brush or a commercial leak detector fluid. **NEVER USE A MATCH OR OPEN FLAME FOR TESTING!**

CAUTION

The water heater and individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of the system at test pressures in excess of 1/2 psi (3.5 kPa). The water heater must be isolated from the gas supply piping system by closing its manual shutoff valve during any pressure testing of the gas supply system at test pressures equal to or less than 1/2 psi (3.5 kPa). The supply line must be capped when not connected to the water heater.

3. While checking for leaks care must be taken to prevent solution from contacting the electrical connections at the control. If electrical connections at the control become wet, they must be thoroughly dried before attempting to operate the water heater.

WARNING

Installation or service of this water heater requires ability equivalent to that of a licensed tradesman in the field involved. Plumbing, air supply, venting, gas supply and electrical work are required.

Light the unit in accordance with the operating instructions label attached to the water heater.

Under no circumstances should the input rate exceed the input rate shown on the water heater rating plate. Over firing could result in damage or sooting of the water heater.

If the unit is exposed to the following, do not operate water heater until all corrective steps have been made by a factory authorized independent service contractor or qualified service professional.

1. Flooding to or above the level of the burner or controls
2. External firing
3. Damage
4. Firing without water
5. Sooting

SECTION IX: ELECTRICAL CONNECTIONS

! WARNING

Turn off or disconnect the electrical power supply to the water heater before servicing. Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. Verify proper operation after servicing.

All electrical wiring must be installed and grounded in accordance with local codes, or in the absence of local codes, the National Electrical Code, ANSI/NFPA 70 and/or CSA C22.2 Electrical Code.

The water heater must be wired to a 115 volt, 60 Hz, AC power supply. The water heater should be wired on a separate circuit and breaker. If a flexible line cord and plug is permitted by local code, then provide a three wire grounding type receptacle within reach of the line cord provided on the control box. Do not plug the line cord into a receptacle that can have the power supply interrupted by a switch that is used to control lights or another appliance.

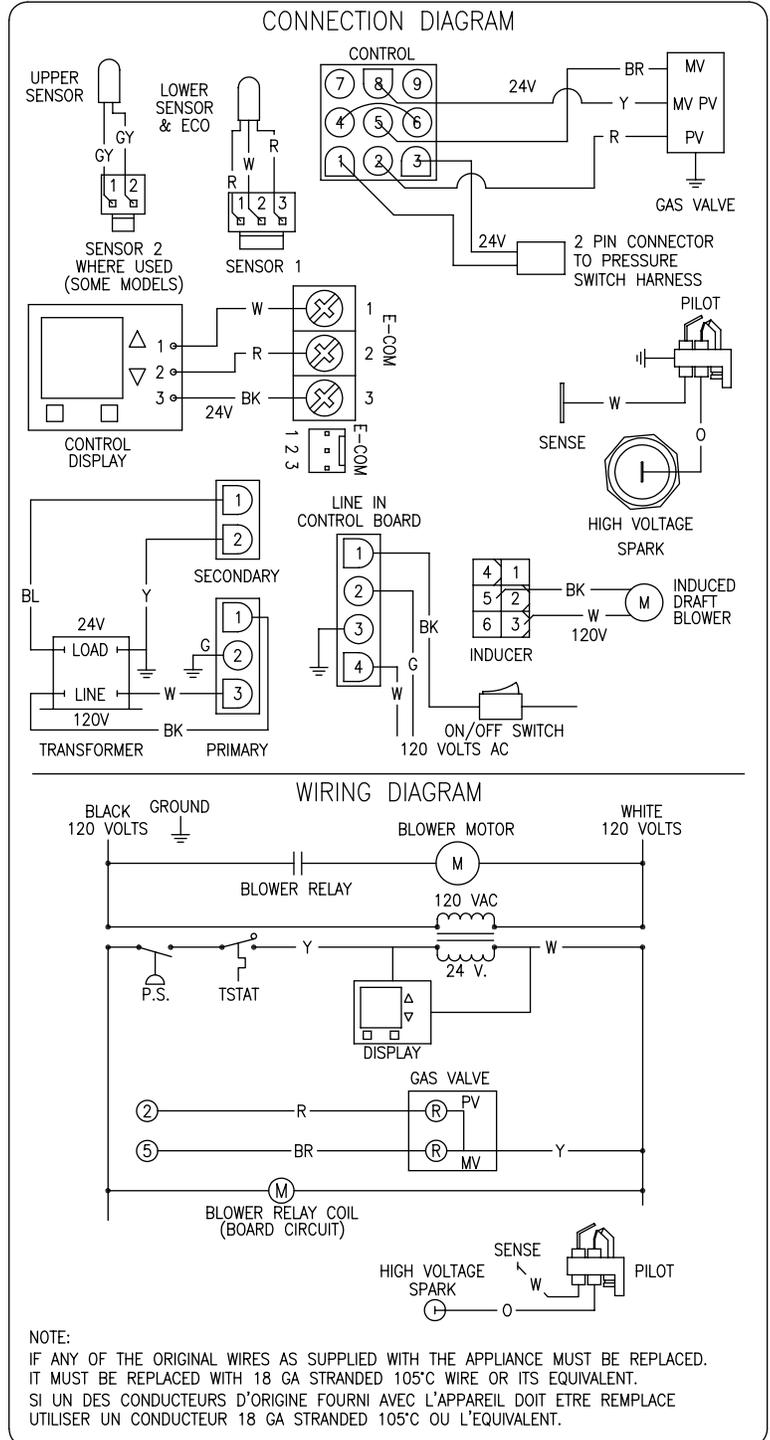
If wiring in conduit is required, cut the line cord close to the control board and make the appropriate wiring connections.

! CAUTION

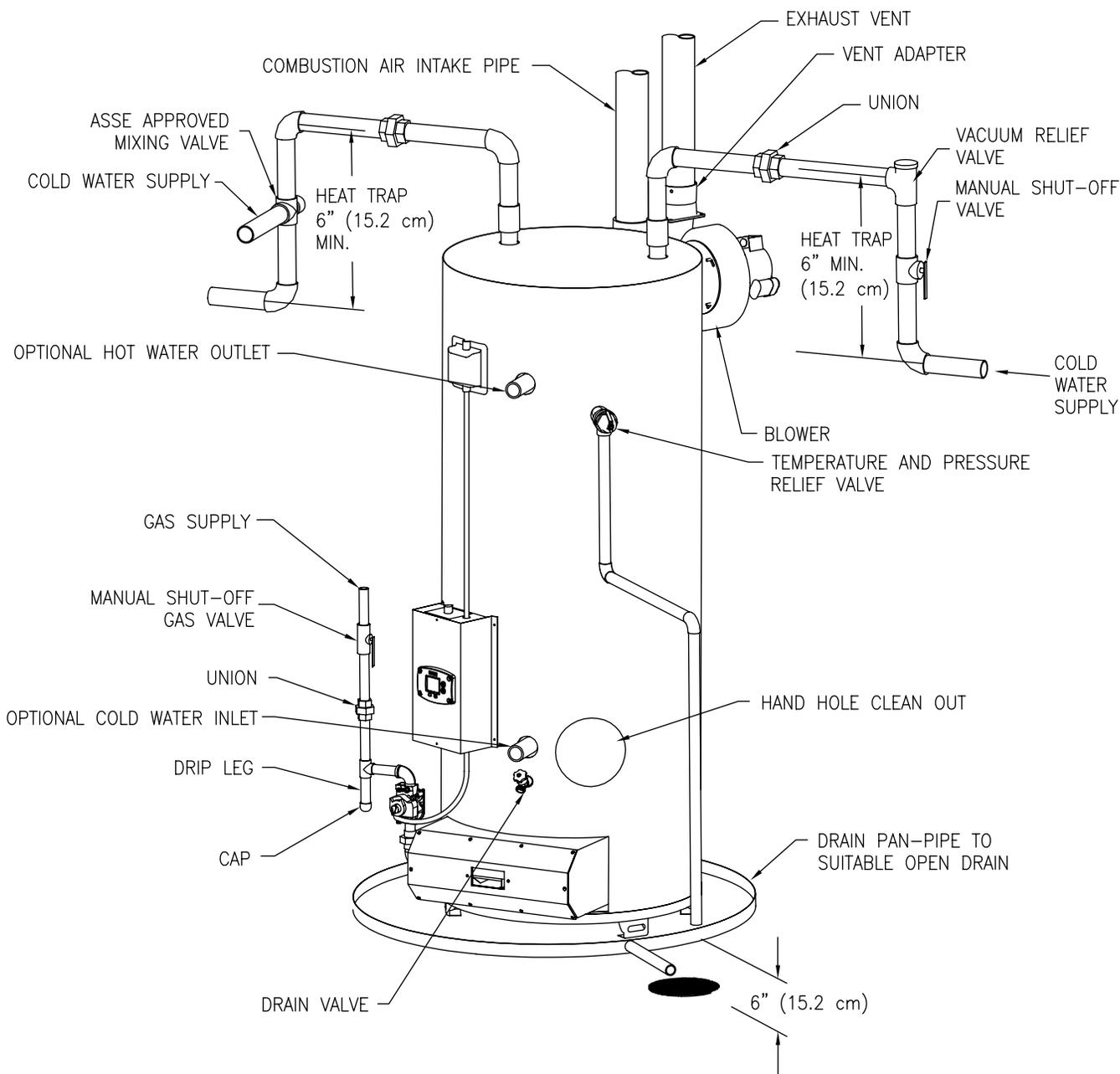
This water heater **must** be wired on a separate circuit. Failure to wire on a separate circuit may cause improper operation or failure of the electrical components of the water heater. Refer to the "Electrical Connections" section of the Installation and Operating Instructions Manual for complete instructions on electrical wiring and connections to the water heater.

Do not energize the electric circuit before the water heater tank is filled with water.

Wiring Diagram (to the right)



TYPICAL INSTALLATION



Notes: The heat trap shown above is not part of the water heater, only a piping suggestion to reduce the standby heat loss. The drain pan may be purchased from your water heater supplier.

WARNING

Water heaters are heat-producing appliances. To avoid damage or injury there must be no materials stored against the water heater or direct vent system, and proper care must be taken to avoid unnecessary contact (especially by children) with the water heater and direct vent system. **UNDER NO CIRCUMSTANCES SHALL FLAMMABLE MATERIALS, SUCH AS GASOLINE OR PAINT THINNER BE USED OR STORED IN THE VICINITY OF THIS WATER HEATER OR IN ANY LOCATION FROM WHICH FUMES COULD REACH THE WATER HEATER.**

Lighting And Shutdown Instructions

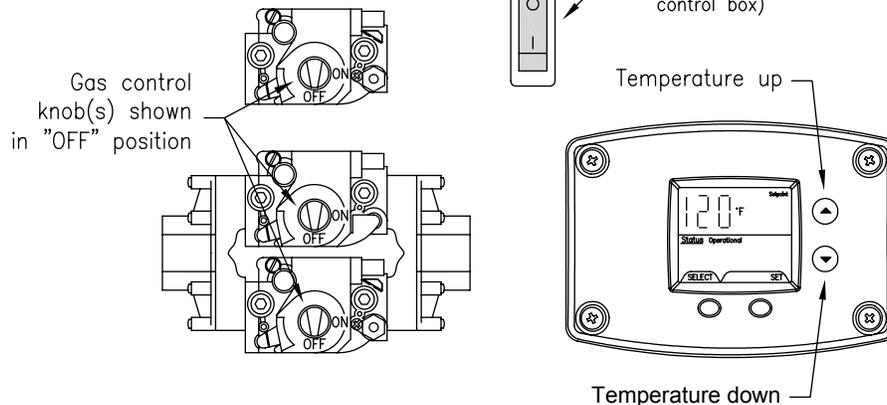
FOR YOUR SAFETY READ BEFORE OPERATING

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 is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
- B. BEFORE OPERATING smell all around the appliance 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. Use only your hand to push in or turn the gas control knob(s). Never use tools. If the knob(s) 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.
- D. 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.

LIGHTING INSTRUCTIONS

1. STOP! read the safety information above on this label.
 2. Set the thermostat to lowest setting.
 3. Turn off all electrical power to the appliance.
 4. This appliance is equipped with an ignition device which automatically lights the pilot. Do not try to light the pilot by hand.
 5. Turn off the main power switch.
 6. Turn gas control knob(s) clockwise to "OFF."
7. Wait (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 on main power.
 9. Set the thermostat to desired setting.
 10. Turn gas control knob(s) counterclockwise to "ON".



TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off the main power switch.
3. Turn gas control knob(s) clockwise to "OFF."



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 including gas controls, which has been under water.

SECTION X: OPERATING INSTRUCTIONS

TEMPERATURE ADJUSTMENT

APPROXIMATE TIME/TEMPERATURE RELATIONSHIPS IN SCALDS	
120°F (49°C)	More than 5 minutes
125°F (52°C)	1½ to 2 minutes
130°F (54°C)	About 30 seconds
135°F (57°C)	About 10 seconds
140°F (60°C)	Less than 5 seconds
145°F (63°C)	Less than 3 seconds
150°F (66°C)	About 1½ seconds
155°F (68°C)	About 1 second

DANGER

Hotter water increases the risk of scald injury. Scalding may occur within five (5) seconds at a temperature setting of 140°F (60°C). To protect against hot water injury, install an ASSE approved mixing valve in the water system. This valve will reduce point of discharge temperature by mixing cold and hot water in branch water lines. A licensed plumbing professional or local plumbing authority should be consulted.

This water heater is equipped with an energy cut out device to prevent overheating. Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the appliance and call a qualified service technician.

CAUTION

This water heater, when set at a lower temperature setting, is not capable of producing hot water of sufficient temperature for sanitizing purposes.

NOTICE

Whenever the water heater is filled with cold water, condensate will form on the cool tank surface and drops of water will fall on the hot burner and combustion chamber surfaces producing a “sizzling” noise. Condensation is normal and does not indicate a leak. It will disappear when the tank becomes heated.

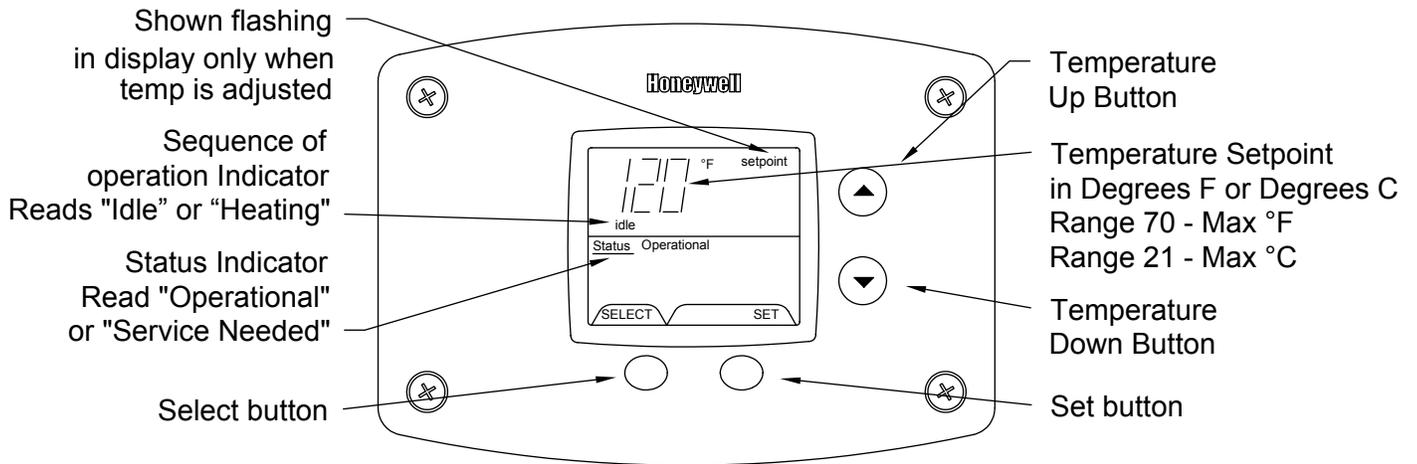
The lower the temperature setting, the greater the energy efficiency, both to heat the water and to maintain the storage temperature during standby periods. Lower water temperatures also extend tank life. Remember, no water heating system will provide exact temperatures at all times. Allow a few days of operation at this setting to determine the correct temperature setting consistent with the requirements for the installation.

The water heater temperature setting is adjusted by using the control display mounted to the front of the control panel of the water heater. The water heater thermostat is set at the lowest setpoint of 70°F when shipped from the factory. The control display shows the temperature setpoint in degrees Fahrenheit (°F) or degrees Celsius (°C), and the status of the water heater (“Idle” or “Heating”). If the water heater is functioning normally, the display will also show “Operational”.

For energy efficient operation of your water heater, the suggested initial temperature setting is 120°F (49°C). During the winter season, or any cold period, you may desire a higher temperature setting to adjust for the colder incoming water. This adjustment, however, may cause additional condensation to form on the cooler tank surface. This does not mean the tank is leaking. During summer months, the warmer incoming water temperatures will benefit the performance of your water heater and reduce the amount of condensation developed.

Condensation does not mean your tank is leaking. Over 40% of reported tank leaks on installation are proven to be condensation. To avoid unnecessary expense and inconvenience, make sure the tank is leaking before calling a service person.

Water Heater Display and Control Buttons



WARNING

If the water heater display does not show "Operational" in the "Status" indicator, there may be an operating malfunction with the water heater. If this is the case, a numeric code will be displayed. Refer to the label next to the display for the definition of the error code and call your plumbing professional or service agent to service the water heater. Do not try to reset the water heater without having a qualified service person to diagnose and correct the problem. If the display is blank or does not show an error code, make sure there is power to the water heater.

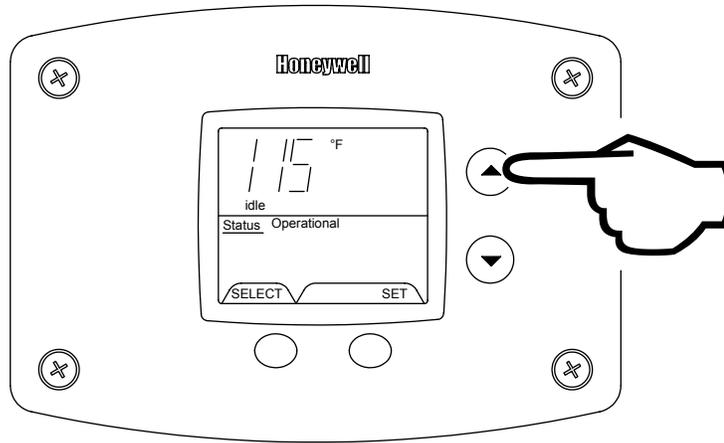
Setting the water temperature to the maximum set point can result in scalding hot water delivered to the faucets. It is highly recommended that the maximum setpoint be adjusted to the lowest temperature possible for the needs of the installation. See following section to change the maximum setpoint limit (max setpoint). Make sure the water heater control display is not in a public area that can result in the temperature settings being improperly adjusted. See previous warning on scalds and an ASSE approved mixing valve.

NOTICE

When the maximum setpoint is reached, the display will show "Max Setpoint" without the setpoint value. The maximum setting is equal to approximately 180°F (82°C). The default temperature setpoint from the factory is 70°F (21°C).

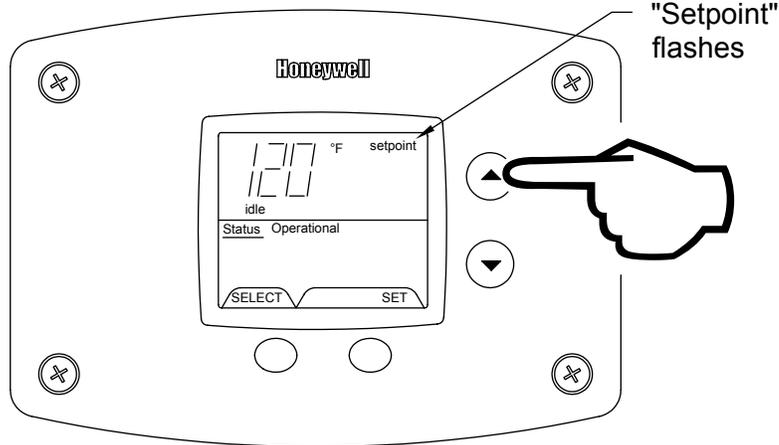
TO INCREASE SETPOINT TEMPERATURE

Step 1: Depress and hold "Temperature Up" button until desired setpoint temperature appears in the display.



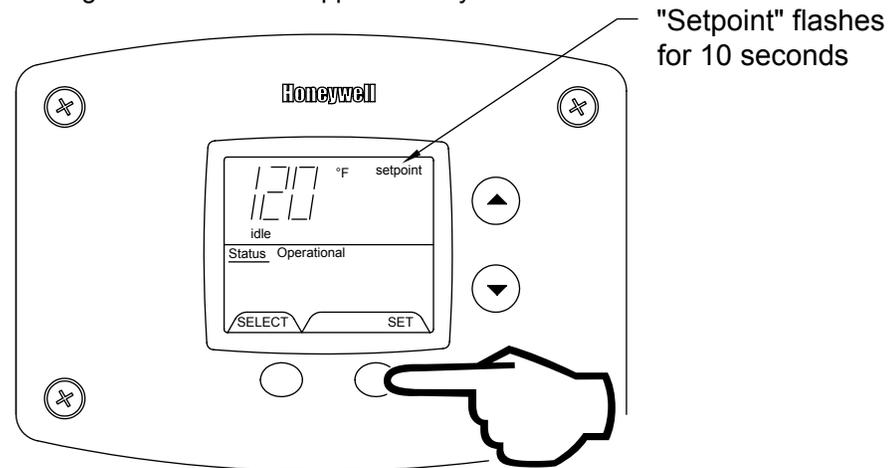
Step 1

Step 2: "Setpoint" indicator begins flashing in the display after pressing "Temperature Up" button.



Step 2

Step 3: Press "SET" button for new setting to take effect immediately. "Setpoint" will stop flashing. If the "SET" button is not pressed, the new temperature setting will take effect in approximately 10 seconds.

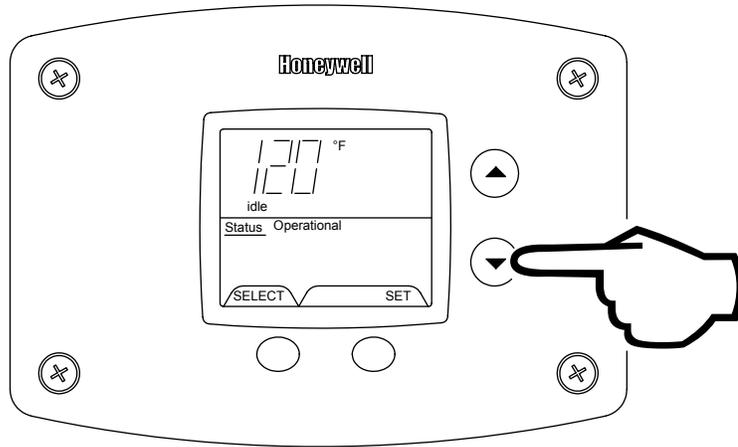


Step 3

Press SET Button for setting to take effect immediately

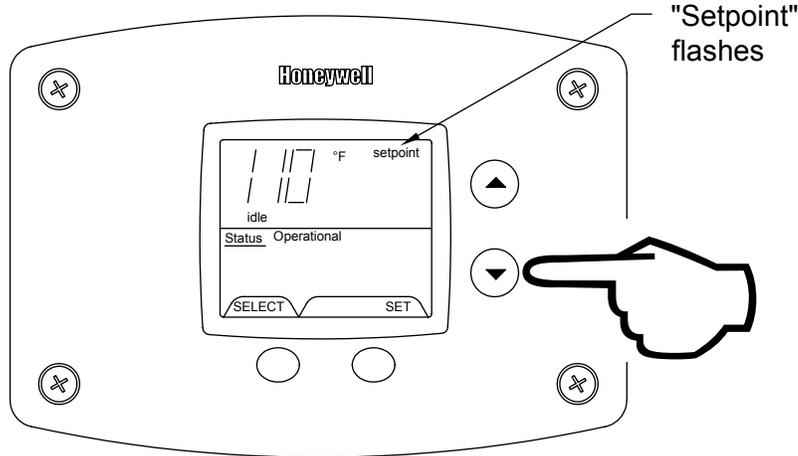
To Decrease Setpoint Temperature

Step 1: Depress and hold "Temperature Down" button until desired setpoint temperature appears in the display.



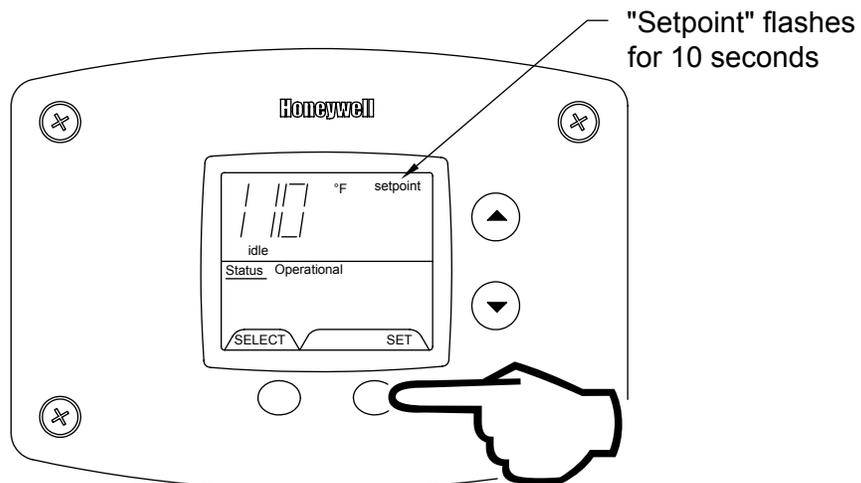
Step 1

Step 2: "Setpoint" indicator begins flashing in the display after pressing "Temperature Down" button.



Step 2

Step 3: Press "SET" button for new setting to take effect immediately. The setpoint will stop flashing. If the "SET" button is not pressed, the new temperature setting will take effect in approximately 10 seconds.

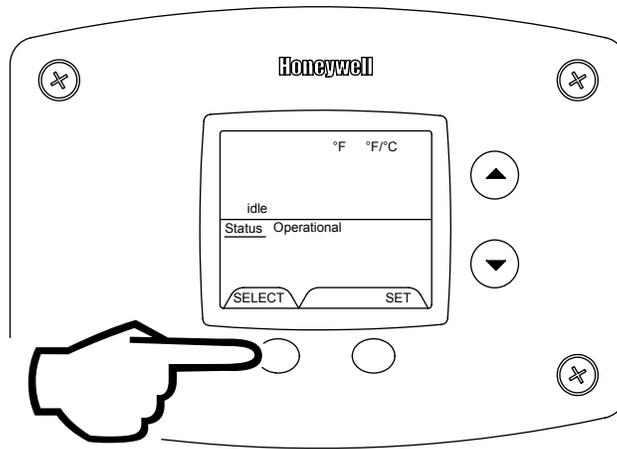


Press SET for setting to take effect immediately

Step 3

To Change Temperature Format in Display from °F to °C or °C to °F:

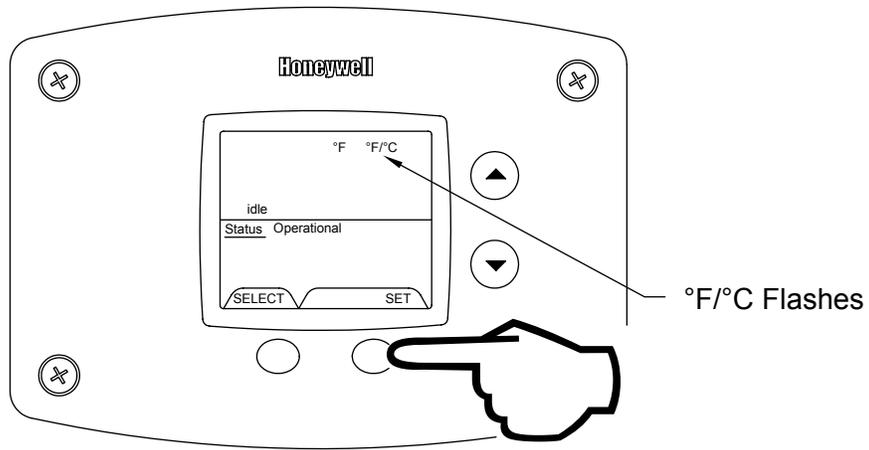
Step 1: Press "SELECT" button until °F/°C is displayed.



Press select

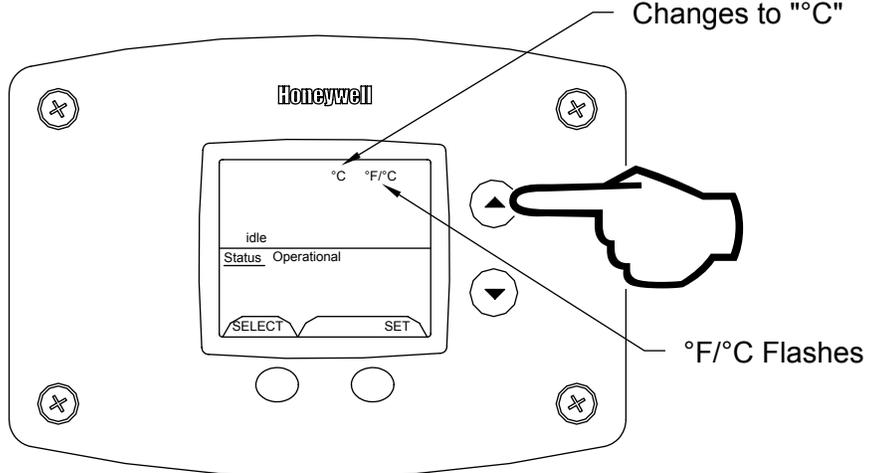
Step 1

Step 2: Press "SET" button to change temperature format. Symbol °F/°C will flash.



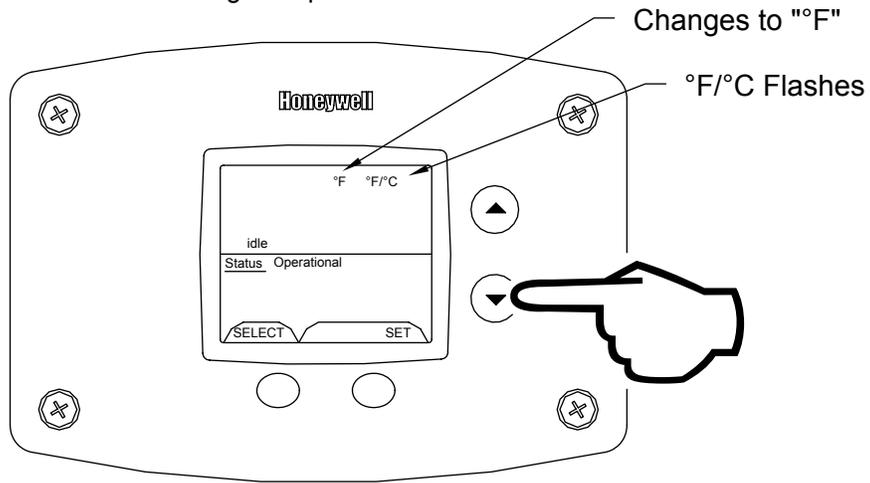
Step 2

Step 3a: Press "Temperature Up" button to change temperature format to °C.



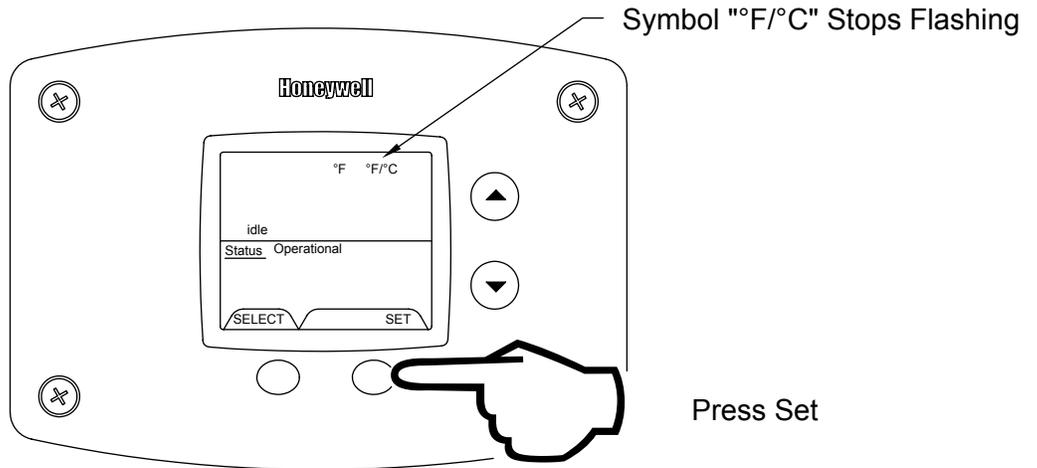
Step 3a

Step 3b: Press "Temperature Down" button to change temperature format to °F.



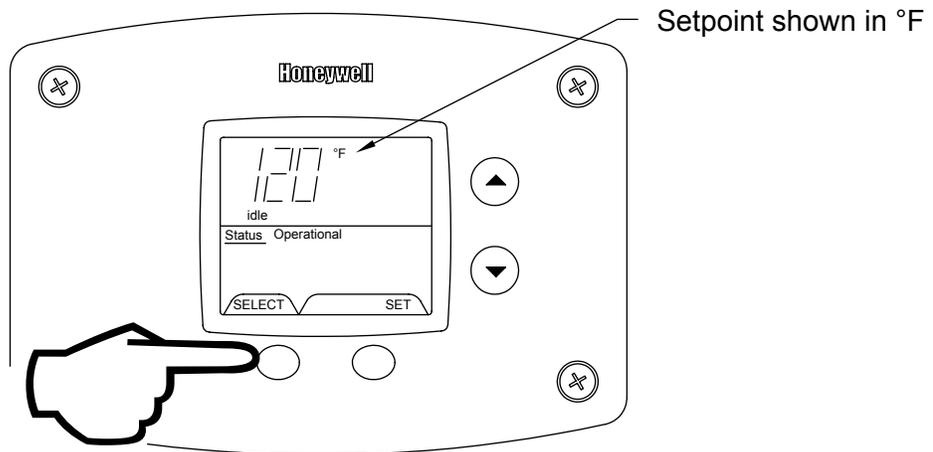
Step 3b

Step 4: Press "SET" button to confirm °F or °C format. °F/°C will stop flashing. Setpoint display will appear in the format selected (°F or °C) in 10 seconds.



Step 4

Step 5: Pressing "SELECT" button will return display to setpoint in format selected (°F or °C) immediately.



Press select

Step 5

An automatic gas shut-off device (ECO) is incorporated in the sensor and control board which will shut off all gas supply to the burner and pilot if the water heater temperature exceeds 200°F (93°C). Should the ECO function (open), the water temperature should be reduced to approximately 120°F (49°C) and follow Lighting Instructions to place the water heater in operation. The water heater must have the problem corrected by a qualified service person before putting the water heater back in operation. It is recommended that all service work be performed by a qualified service agency.

If the water heater is to remain idle for 30 days or more or is subjected to freezing temperatures while shut off, the water heater and piping should be fully drained (See “To Drain the Water Heater”) and the drain valve should be left fully open.

 **WARNING**

Hydrogen gas can be produced in an operating water heater that has not had water drawn from the tank for a long period of time (generally two weeks or more). Hydrogen gas is extremely flammable. To prevent the possibility of injury under these conditions, we recommend the hot water faucet to be open for several minutes at the kitchen sink before you use any electrical appliance which is connected to the hot water system. If hydrogen is present, there will be an unusual sound such as air escaping through the pipes as hot water begins to flow. Do not smoke or have open flame near the faucet at the time it is open.

SECTION X: MAINTENANCE

Burner Flame Check

At the time of installation and at periodic intervals (about every 3 months), a visual check of the pilot and burner flames should be made to determine if they are burning properly. No adjustment to the air shutter should be required for this heater. The burner flames should be blue with yellow tips. A blue-orange flame is characteristic of operation on liquefied petroleum (LP) gas. If the burner flame does not appear as described, an air shutter adjustment may be required. The burner tube flames should light smoothly from the pilot.

NOTICE

IMPORTANT- In the event of an emergency, turn off the gas and electric (if applicable) to the appliance.

IMPORTANT- The water heater should be inspected at a minimum annually by a qualified service technician for damaged components and/or joints not sealed. DO NOT operate this water heater if any part is found damaged or if any joint is found not sealed.

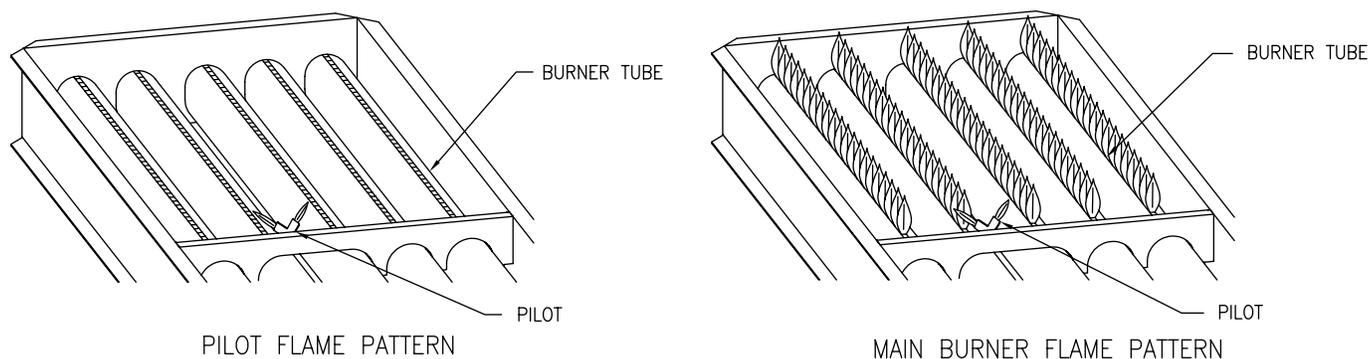


Figure 9

Note: Actual burner may not appear as shown in Figure 9.

TO FILL THE WATER HEATER

1. Close the water heater drain valve by turning the knob or valve stem clockwise. If alternative water connections are provided but not used, make certain they are plugged (i.e. rear connections).
2. Open the cold water supply shut-off valve.
3. Open several hot water faucets to allow air to escape from the system.
4. When a steady stream of water flows from the faucets, the water heater is filled. Close the faucets and check for water leaks at the water heater drain valve, combination temperature and pressure relief valve and the hot and cold water connections.
5. To restore operation of the water heater, refer to operating instruction label on the water heater.

TO DRAIN THE WATER HEATER

Should it become necessary to completely drain the water heater, make sure you follow the steps below:

1. Reduce the thermostat to the lowest setting. Depress the control panel rocker switch on the top of the control box to the "OFF" position. Disconnect power to the water heater.
2. Rotate and partially depress gas control knob clockwise to the "OFF" position.
3. Shut off the gas supply to the water heater.
4. Close the cold water supply shut-off valve.
5. Open the drain valve or valve stem on the water heater by turning the knob counter-clockwise. The drain valve has threads on the end that will allow the connection of a standard hose coupling.
6. Open a hot water faucet to allow air to enter the system.

To refill the water heater, refer to "To Fill the Water Heater."

A qualified service technician should perform the following maintenance at the minimum periodic intervals suggested below. In some installations, the maintenance interval may be more frequent depending on the amount of use and the operating conditions of the water heater. Regular inspection and maintenance of the water heater will help to insure safe and reliable operation.

1. Annual checks of the ignition systems, temperature controls and any other water heater controls are necessary to ensure proper operation. Also, all safety shut-off valves must be checked to verify proper operation and tightness.
2. The entire combustion system must be sealed for this water heater to function properly. Make sure the burner access panel is kept tightly sealed. The combustion air supply pipe at the rear of the water heater must be tightly sealed to the dilution air tee and combustion air boot. Replace any damaged parts. The entire venting system and combustion air supply parts must be inspected at least annually for integrity of all joints.
3. The flow of combustion and ventilation air **MUST NOT** be restricted. Keep the direct vent terminal openings clear of objects, shrubs, snow, and debris. Check to make sure the vent terminal is not damaged.
4. At all times keep the water heater area clear and free from combustible materials, gasoline and other flammable vapors and liquids.
5. Annually conduct a visual check of the pilot and burner flames to determine that they are burning properly. See "Burner Flame Check" section for an illustration of the proper burner flame pattern.
6. At annual intervals check the flue baffles for deterioration and scale or carbon deposits. Clean if necessary and brush the flue tubes if excessive scale or deposits are found on the baffles. Replace any baffles that have become excessively warped or deteriorated. Check the flue collector gasket for integrity and replace if necessary. Cleaning of the flue baffles and flue tubes should be done prior to cleaning the burners, since deposits may fall on the burners during cleaning or checking the baffles.
7. Annually remove the main burner rack assembly to clean orifices and related parts of any dirt or other foreign material. Inspect the burner ports for obstructions or debris and clean with a wire brush, vacuum, or use a mild detergent solution to clean as needed. Inspect the pilot. Carefully clean the electrode and flame sense rod with emery cloth. The spark electrode (rod closest to the pilot hood) gap should be 1/8" (3.2 mm). **NOTE:** It is imperative for proper operation of the water heater that the main burner rack be replaced in the original location.

To remove the burner rack assembly, follow the procedure outlined below:

- a) Shut off the gas and electrical supply to the water heater.
- b) Remove the pilot tube fittings at the gas valve and combustion box.
- c) Disconnect wires to gas valve. Open control box and disconnect pilot spark and flame sense wires.
- d) Disconnect the gas pipe union below the gas valve.
- e) Remove the three screws securing the gasketed manifold pipe flange on the left side of the combustion box.
- f) Remove the burner access panel screws and lower the hinged panel.
- g) Carefully remove and push the pilot wire grommet into the combustion box with the pilot wires.
- h) Disconnect the pilot tube fitting on the inside bulkhead fitting of the combustion box.
- i) Unthread the gas pipe assembly from the manifold inside the combustion box.
- j) Remove the screw securing the curved burner shroud on the top center securing the burner assembly to the tank skirt.
- k) Slide out the burner rack assembly.
- l) To remove the individual burners from the rack, the burner assembly shroud assembly must be removed from the burner rack by removing the four (4) screws securing the shroud to the rack. **The shroud must be reattached to the burner rack after reinstalling the burners back in the rack.**

To reinstall the burner rack, reverse the above procedure.

Alternate method for removing the burner rack, when there is at least 20" (50.8 cm) clearance on the left front side:

- a) Shut off the gas and electrical supply to the water heater.
- b) Disconnect both pilot tube fittings at the combustion box bulkhead fitting.
- c) Disconnect wires to gas valve. Open control box and disconnect pilot spark and flame sense wires.
- d) Disconnect the gas pipe union either above or below the gas valve.
- e) Remove the three screws securing the gasketed manifold flange on the left side of the combustion box.
- f) Remove the burner access panel from the front of the combustion box.
- g) Carefully remove and push the pilot wire grommet into the combustion box with the pilot wires.
- h) Remove the four screws securing the manifold to the burner rack.
- i) Carefully remove the manifold through the left side opening in the combustion box.
- j) Remove the screw securing the curved burner shroud on the top center securing the burner assembly to the tank skirt.
- k) Slide out the burner rack assembly.
- l) To remove the individual burners from the rack, the burner assembly shroud assembly must be removed from the burner rack by removing the four (4) screws securing the shroud to the rack. **The shroud must be reattached to the burner rack after reinstalling the burners back in the rack.**

To reinstall the burner rack, reverse the above procedure.

8. At least once a year, check the combination temperature and pressure relief valve to insure that the valve has not become encrusted with lime.
Lift the lever at the top of the valve several times until the valve seats properly without leaking and operates freely.

 **WARNING**

When lifting lever of the combination temperature and pressure relief valve, hot water will be released under pressure. Be careful that any released water does not result in bodily injury or property damage.

Keep clear of the combination temperature and pressure relief valve discharge line outlet. The discharge may be hot enough to cause scald injury. The water is under pressure and may splash.

9. Monthly drain off a gallon of water to remove silt and sediment.

 **WARNING**

THIS WATER MAY BE HOT!

10. If the combination temperature and pressure relief valve on the appliance discharges periodically, this may be due to thermal expansion in a closed water supply system. Contact the water supplier or local plumbing inspector on how to correct this situation. Do not plug the combination temperature and pressure relief valve outlet.
11. All models are equipped with a cleanout opening to aid in removal of hard water deposits from the tank bottom. If this water heater operates under hard water conditions, the following should be performed at least every 3 months: Drain the water heater. Remove the cleanout jacket cover and tank cover. When cleaning the tank, care must be taken to avoid trying to break deposits loose as this could damage the glass lining and shorten the life of the water heater. After cleaning, replace the cleanout tank cover and jacket cover, and refill with water. Refer to the section, "General Operation" in this Installation and Operating Instruction manual for the procedures for filling and draining the water heater.
12. Four sacrificial anode rods have been installed in the tank head to extend tank life. The anode rods should be inspected annually for corrosion and replaced when necessary to prolong tank life. Water conditions in your area will influence the time interval for inspection and replacement of the anode rod. The use of a water softener may increase the speed of anode consumption. More frequent inspection of the anode is needed when using softened (or phosphate treated) water. Contact the plumbing professional who installed the water heater or the manufacturer listed on the rating plate for anode replacement information.

- 13. The induced draft blower motor used in this model series has sealed bearings and does not have provisions for oiling the bearings.
- 14. The vent system must be inspected at least once a year to ensure against leakage of exhaust products.



FOR YOUR SAFETY, **DO NOT** ATTEMPT REPAIR OF COMBINATION GAS CONTROL, BURNERS OR GAS PIPING. REFER REPAIRS TO A QUALIFIED SERVICE TECHNICIAN.

Contact your supplier, plumbing professional or contact the company at the address given on the rating plate of the water heater for replacement parts.

Provide the part name as well as the model and serial number(s) of the water heater(s) when ordering parts.

READ THE WARRANTY FOR A FULL EXPLANATION OF THE LENGTH OF TIME THAT PARTS AND THE WATER HEATER ARE WARRANTED.

Manufactured under one or more of the following U.S. Patents: RE.34,534; B1 5,341,770; 4,416,222; 4,628,184; 4,669,448; 4,672,919; 4,808,356; 4,829,983; 4,861,968; 4,904,428; 5,000,893; 5,023,031; 5,052,346; 5,081,696; 5,092,519; 5,115,767; 5,199,385; 5,277,171; 5,372,185; 5,485,879; 5,574,822; 5,596,952; 5,660,165; 5,682,666; 5,761,379; 5,943,984; 5,954,492; 5,988,117; 6,142,216; 6,684,821; 7,063,132; 6,395,280; 7,007,748
Other U.S. and Foreign patent applications pending. Current Canadian Patents: 1,272,914; 1,280,043; 1,289,832; 2,045,862; 2,092,105; 2,107,012; 2,108,186; 2,112,515

Complete the following information and retain for future reference:

Model No: _____

Serial No: _____

Service Phone
Days: _____ Nights: _____

Address: _____

Supplier: _____

Supplier Phone No: _____

SECTION XI: DIAGNOSTIC AND TROUBLESHOOTING GUIDE

DIAGNOSTIC GUIDE FOR HONEYWELL INTEGRATED CONTROL SYSTEM SEQUENCE OF OPERATION FOR PDV AND INDUCED DRAFT MODELS

1. When the tank temperature drops below the temperature setpoint on the display, the control sends power to the induced draft blower to start the ignition sequence.
2. When blower reaches the full operating speed, the pressure switch closes, completing the 24 volt circuit to the safety circuit of the control. If the exhaust vent becomes blocked or the blower fails, the pressure switch will open, the gas valves close, and the blower stops after a 5 second post-purge. The blower will restart and continue to operate in the lockout condition until the blockage is removed or the venting problem is corrected. Error code 29 will appear on the water heater display.
3. The control will continue to operate the blower for 15 seconds to “prepurge” any flue products remaining before starting the ignition sequence.
4. After the prepurge period, the control sends 24 volt power to the pilot valve “PV” terminals on the gas valve allowing pilot gas to flow to the pilot. The control also sends high voltage through the pilot electrode to spark to the pilot hood and ignite the pilot gas. If the pilot does not ignite within 90 seconds, the pilot valve is denergized and the sparking stops for 75 seconds. The control will attempt to ignite the pilot two more times. If the pilot does not light on the 3rd attempt, the control will go into “soft lockout” for 1 hour and then will repeat the 3 ignition attempts. The blower is off during the “soft lockout” period.
5. When the pilot is lit, the flame is sensed by the flame sense rod. The flame sense signal received by the control board causes the sparking to stop and the main gas valve to open. The main burners ignite from the pilot flame. The pilot is continually monitored by the flame sensing circuit. If for any reason, the pilot flame is not sensed by the flame sensing circuit, the gas valves close. After a 75 second delay, the pilot valve opens and the pilot electrode sparks to relight the pilot. The same sequence will occur in the event of a power supply or gas supply interruption.
6. The main burners continue to operate until the water temperature in the tank increases past the control setpoint, which will cause the gas valve to close. The blower stops operating 5 seconds after the gas valve closes. The water heater remains in the standby mode until the temperature drops below the setpoint and initiates another heating cycle.
7. If for some reason, the tank temperature should reach or exceed 200°F, then the control closes the gas valve and goes into a “hard lockout” state and will not operate until reset by a qualified service person. The display will read “error code 65”, which indicates the tank high limit temperature has been exceeded. No attempt should be made to reset the control until a service person has corrected the cause of the high limit condition. Refer to the diagnostic service section at the end of this Installation and Operating Instructions Manual.

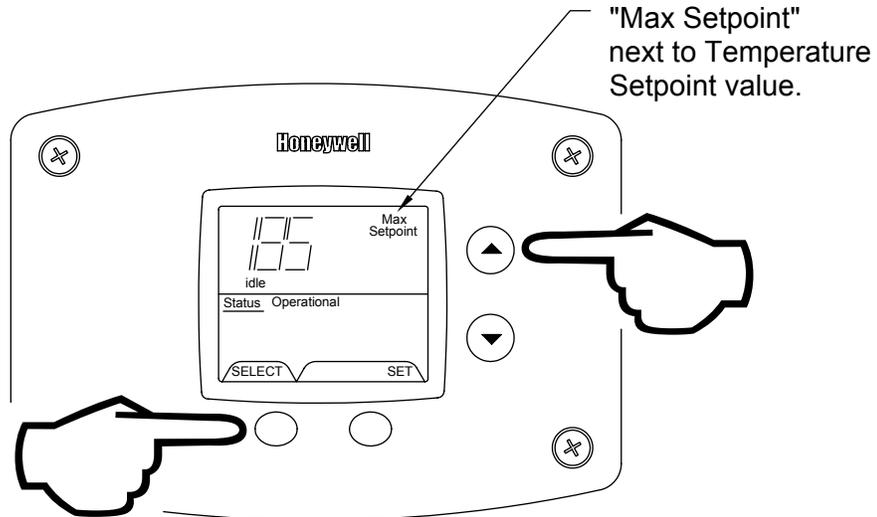
ACCESSING SERVICE MODE ON THE WATER HEATER DISPLAY (FOR SERVICE PERSONNEL ONLY)

The display has a “service mode” for changing the maximum setpoint and accessing information in aiding servicing of the water heater. This procedure is for service and installation personnel only. To enter the Service Mode, follow the steps illustrated below:

WARNING

The following procedure is for service and installation personnel only. Resetting lockout conditions without correcting the malfunction can result in a hazardous condition.

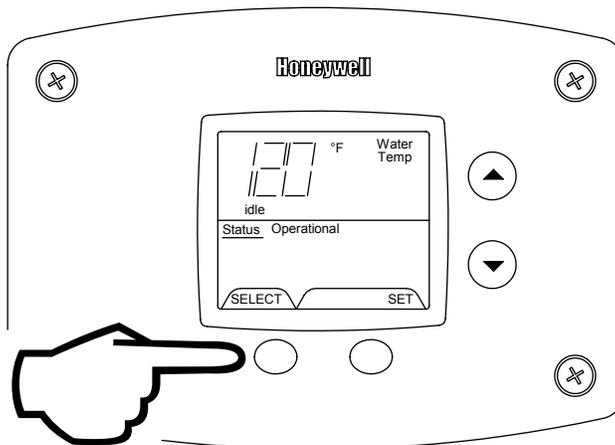
Step 1: Press “Select” and “Temperature Up” buttons together and hold for 3 seconds until “Max Setpoint” is shown in the display.



NOTICE

30 Seconds after the last button press, the display will automatically return to the “User Mode”. Simultaneously pressing the “Select” and “Temperature Up” buttons will switch the display immediately to the “User Mode”.

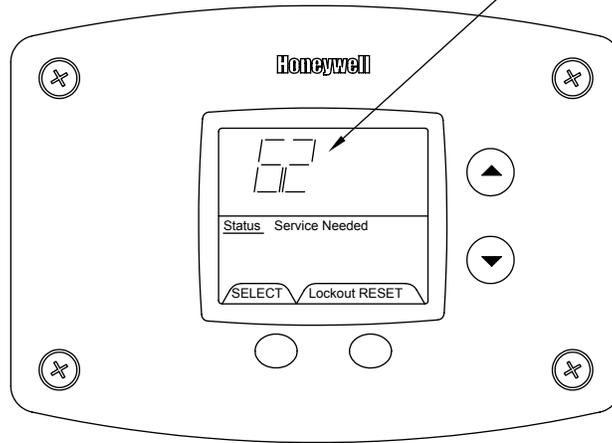
Step 2: Pressing “Select” button will change display to next mode



The following is the sequence of modes available in “Service Mode” by pressing the “Select” button:

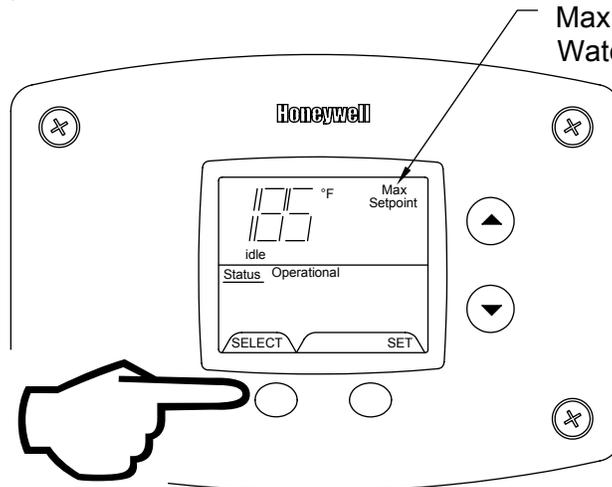
Error Code Number (Display/Reset). This is only shown if there is an operating error in the “User Mode”.

Error Code Shown
in Water Heater Display

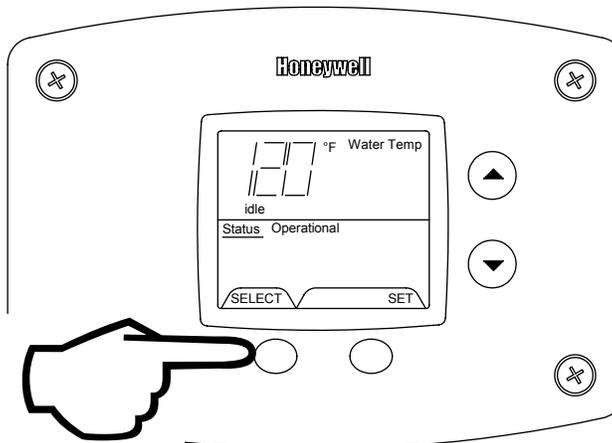


1. Max Setpoint (Display/Change)

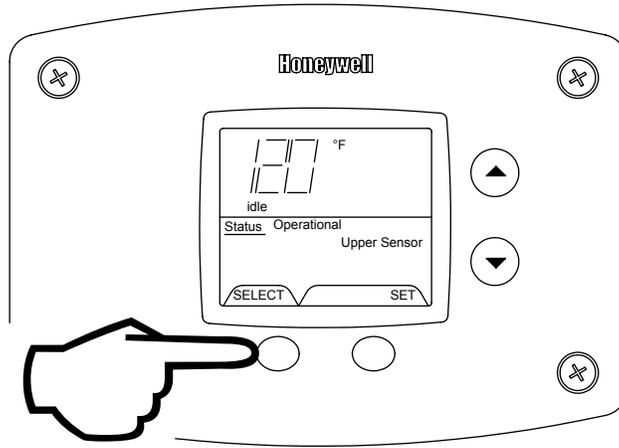
Max Setpoint value
Water Heater Display



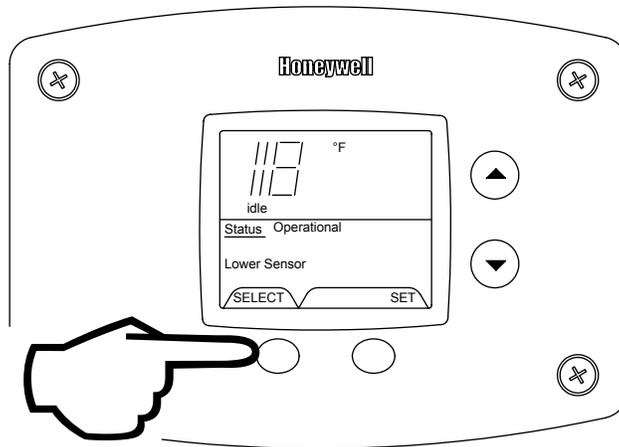
2a. Water Temperature Average (Displays average if there are two sensors – sensor temperature displayed if single sensor is used).



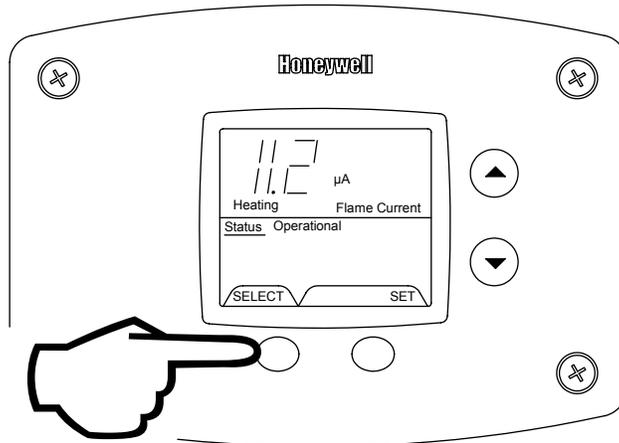
2b. Water Temperature - Upper Sensor (Displays if there is an upper sensor – some models)



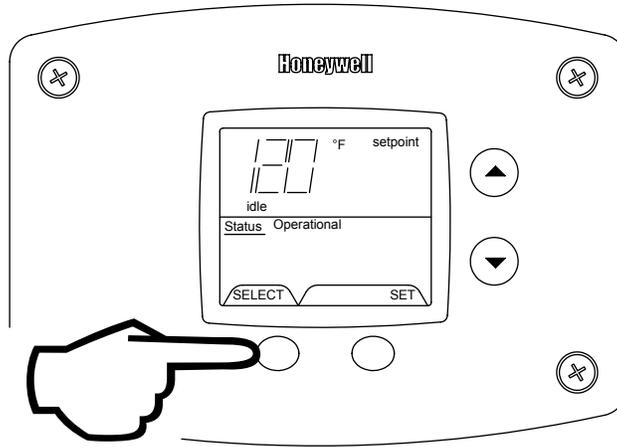
2c. Water Temperature - Lower Sensor (Displays if there are two sensors)



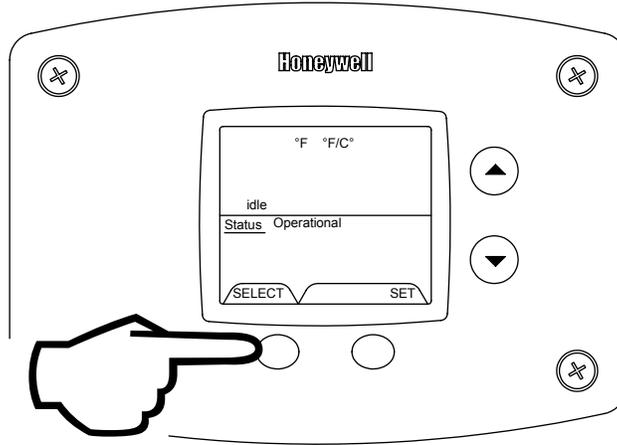
3. Flame Current of Pilot Flame Sensor (Displays only in the Heating Cycle)



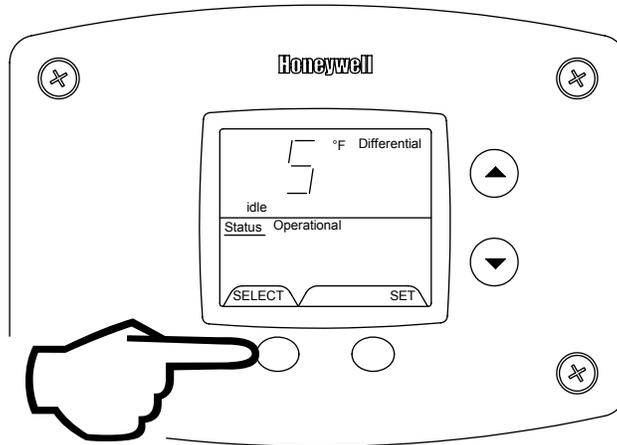
4. Setpoint (Display/Change)



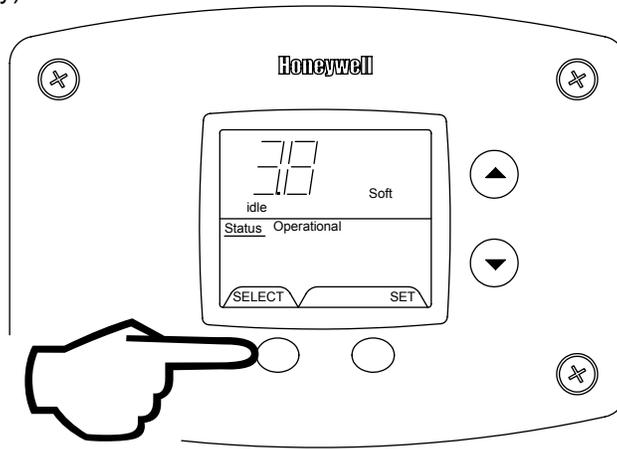
5. °F/°C (Display/Change)



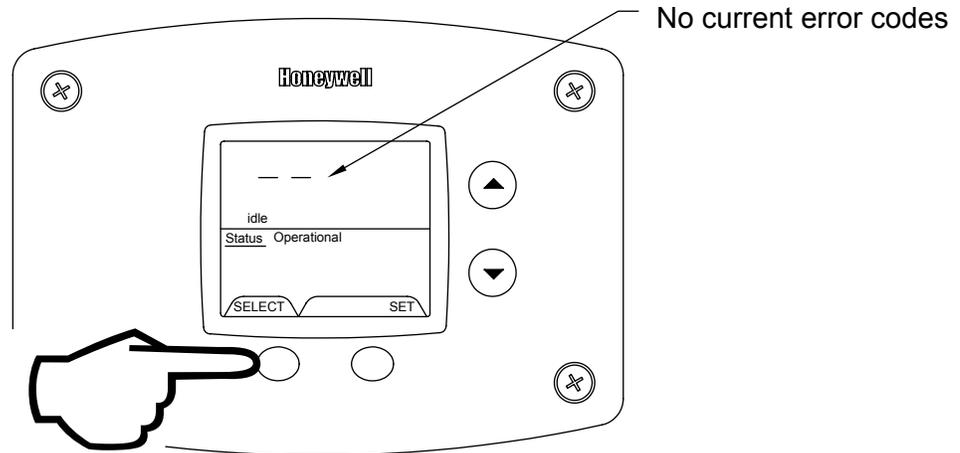
6. Differential (Display only – shows the differential of the thermostat)



7. Software Version (Display only)



8. Error Code History (Displays if there are present error codes or up to 10 previous error codes). Water Heater Display will show -- if there are no error codes.

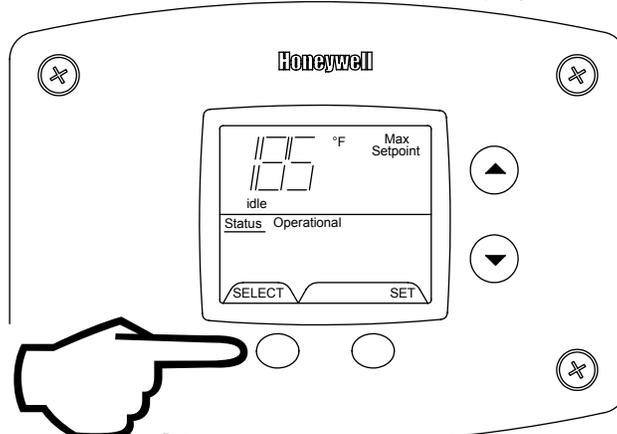


To change the Maximum Setpoint Limit (Max Setpoint) for the temperature setpoint:

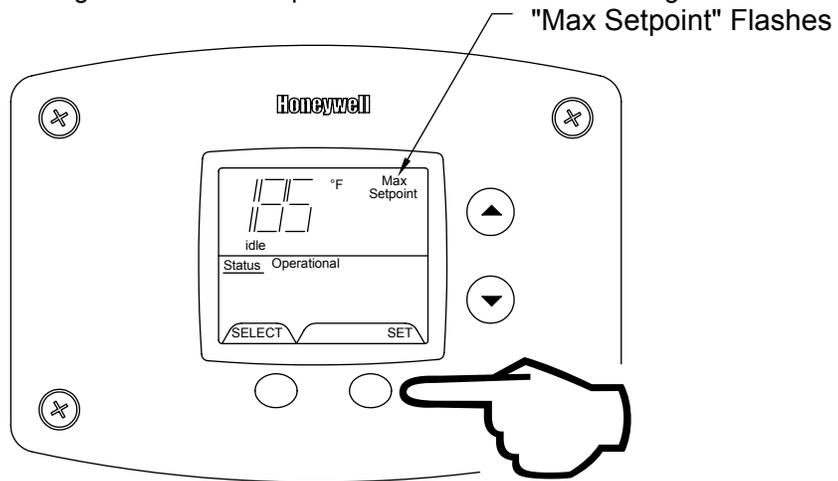
 **WARNING**

Setting the water temperature to the maximum set point can result in scalding hot water delivered to the faucets. It is highly recommended that the maximum setpoint be adjusted to the lowest temperature possible for the needs of the installation. See following section to change the maximum setpoint limit (max setpoint). Make sure the water heater control display is not in a public area that can result in the temperature settings being improperly adjusted. See previous warning on scalds and an ASSE approved mixing valve.

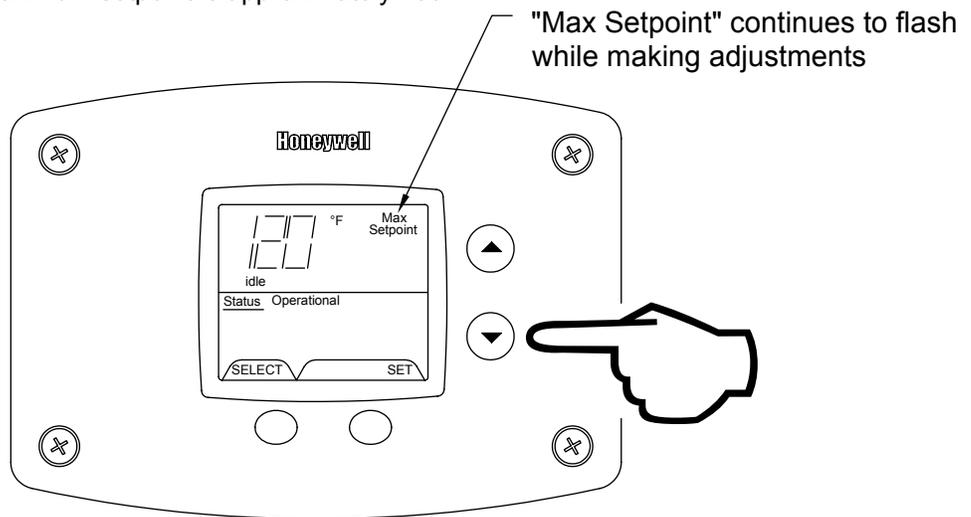
Step 1: In service mode press the "Select" button until "Max Setpoint" is displayed.



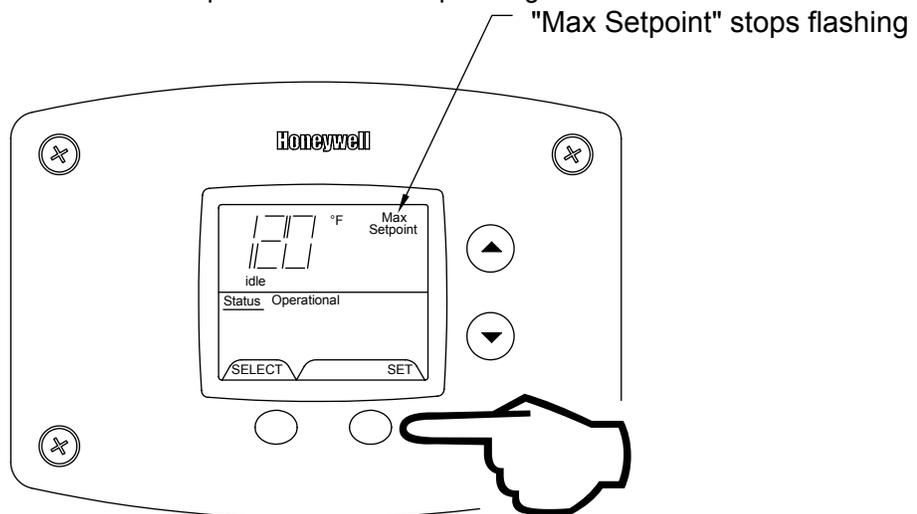
Step 2: Press "Set" button to enter setting mode. "Max Setpoint" will flash to indicate setting mode.



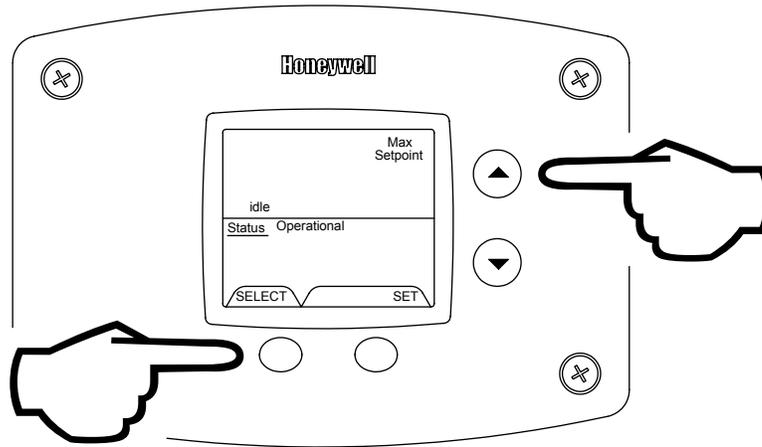
Step 3: Press the "UP" or "DOWN" buttons to change the maximum setpoint value. This will limit the maximum setpoint the user can select. Note: The maximum setpoint is approximately 180°F.



Step 4: Press "Set" button to confirm new "Max Setpoint" value and stop setting mode.



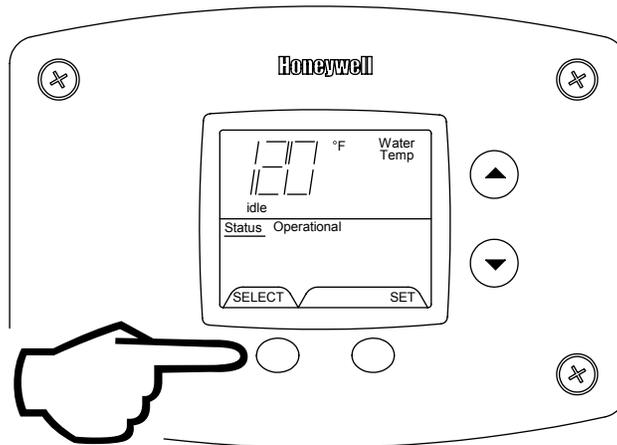
Step 5: 30 Seconds after the last button press, the Water Heater Display will go back to “User Mode”. It will read “Max Setpoint” without showing a temperature value if the temperature setpoint is at the maximum setting. The Water Heater Display can be set back to the “User Mode” immediately by pressing both the “Temperature Up” and “Select” buttons together for 3 seconds.



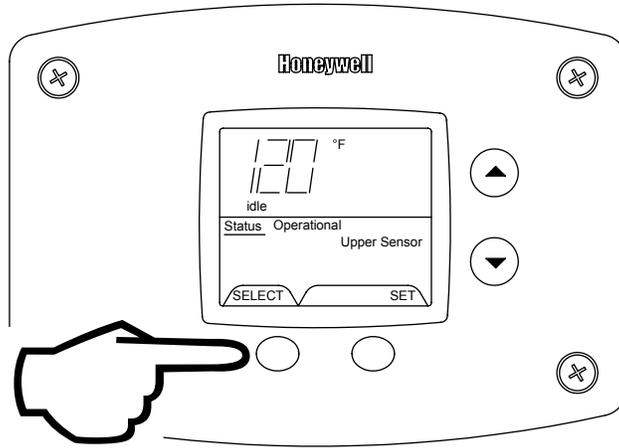
Exiting Service Mode

Display of Water Temperature:

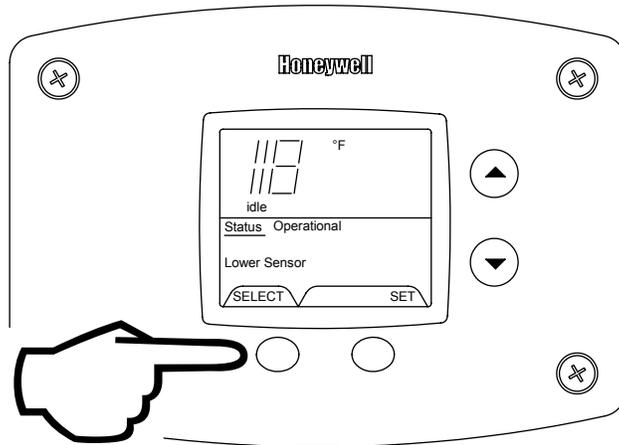
Step 1: In Service Mode, Press the “Select” button until “Water Temp” is displayed in the upper right section of the water heater display. For water heaters using two temperature sensors in the tank, this will be the average reading between the two sensors. For water heaters using a single sensor, this is the reading for the sensor.



Step 2: For water heaters using two temperature sensors, pressing the “Select” button again displays the Upper Sensor temperature reading. “Upper Sensor” will be displayed in the lower right side of the status window of the water heater display.

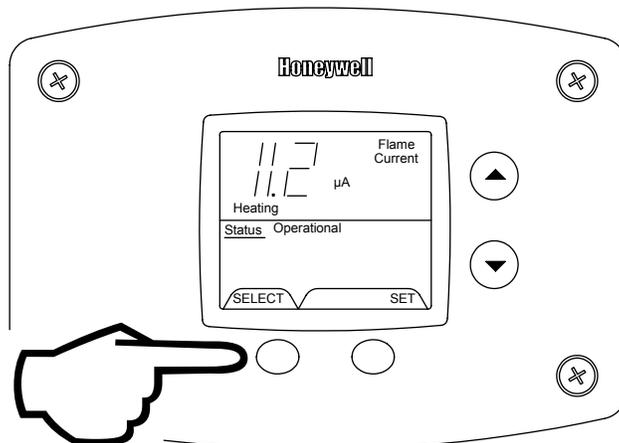


Step 3: For water heaters using two temperature sensors, pressing the “Select” button again displays the Lower Sensor temperature reading. “Lower Sensor” will be displayed in the lower left side of the status window of the water heater display.



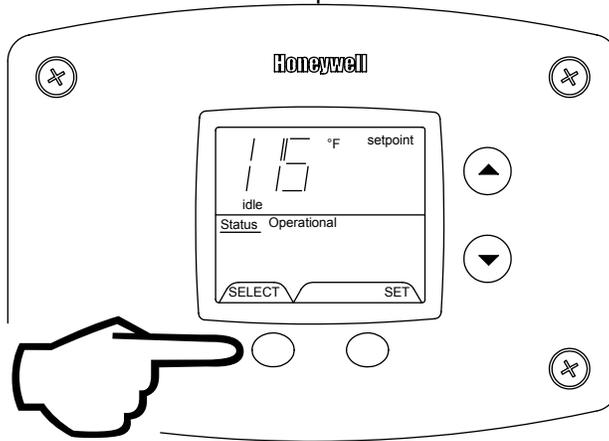
To Display Flame Sense Current of the Pilot Flame Sensor:

The pilot flame sense current is available only when the burners are in operation. Step 1: Make sure the status displays “Heating” or draw enough hot water to start the burners. Step 2: Enter the “Service Mode” described previously. Step 3: Press the “Select” button until a number value is displayed with “Flame Current” to the right of the number. The value displayed is in microamps (μA).

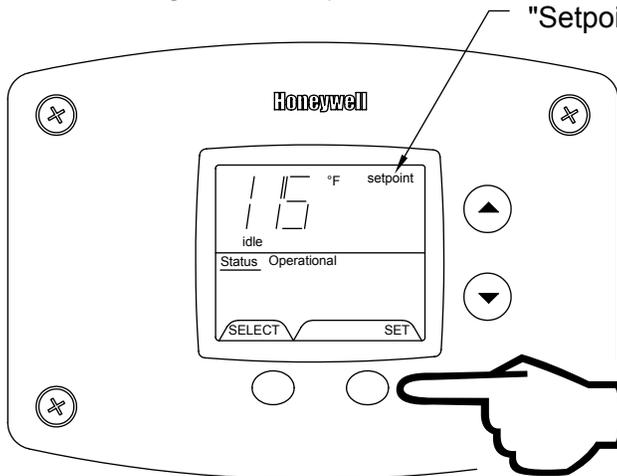


To Display and Change Temperature Setpoint:

Step 1: In "Service Mode" press the "Select" button until "Setpoint" is shown in the water heater display.



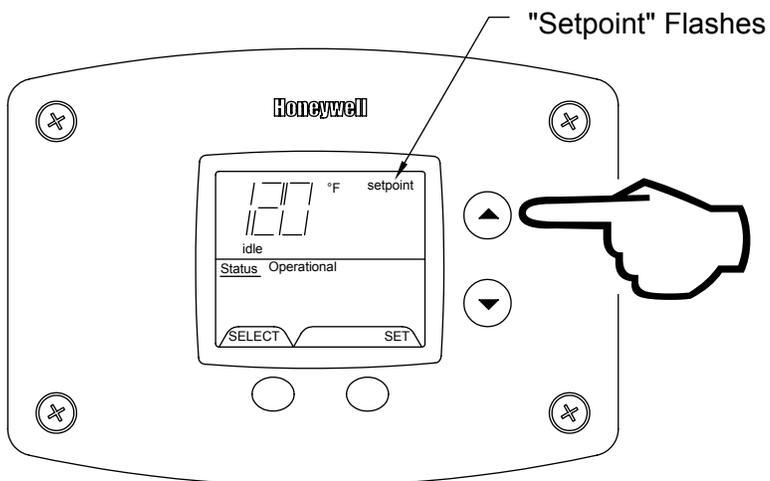
Step 2: Press the "Set" button to enter the setting mode. "Setpoint" will flash in the water heater display.



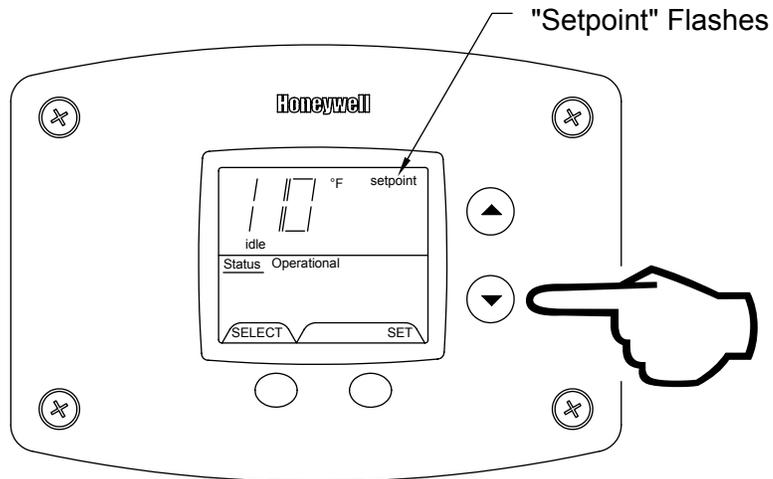
Step 3: To raise the temperature setpoint, press the "Temperature Up" button until the desired temperature is shown on the water heater display.

NOTICE

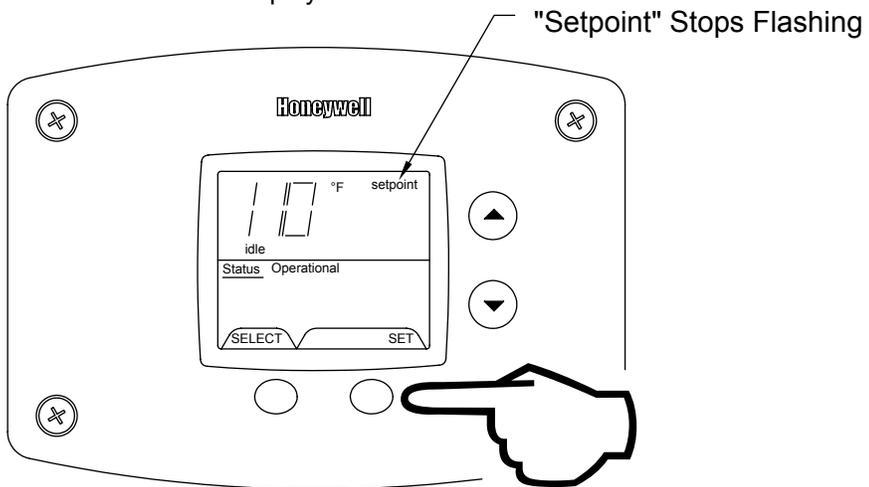
Note: The maximum temperature that can be set in the Water Heater Display is limited to the "Max Setpoint" described previously. To change the "Max Setpoint", refer to the procedure "To Change the Maximum Setpoint Limit..." described previously under "Accessing the Service Mode on the Water Heater Display".



Step 4: To lower the temperature setpoint, press the “Temperature Down” button until the desired temperature is shown on the water heater display.



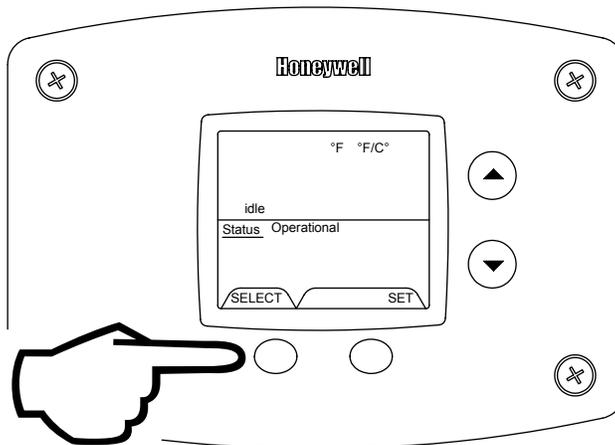
Step 5: When the desired setpoint is reached on the water heater display, press the “Set” button to confirm the new setpoint. “Setpoint” stops flashing in the water heater display.



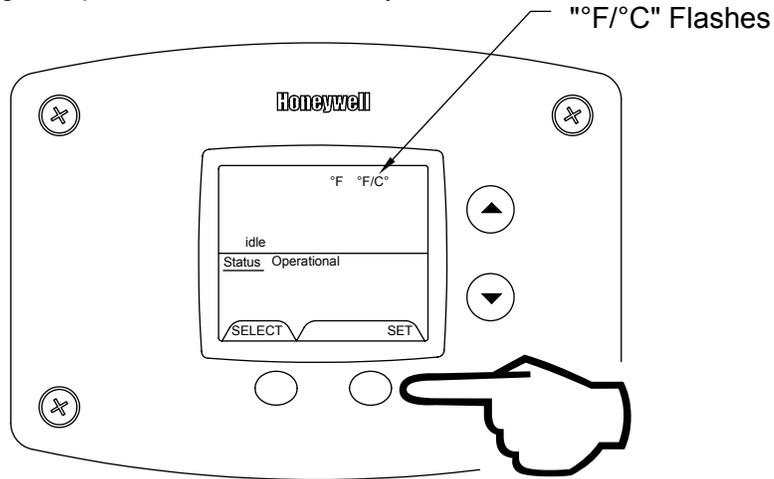
To Display and Change Temperature Format (°F/°C):

To Change Temperature Format in Display from °F to °C or °C to °F:

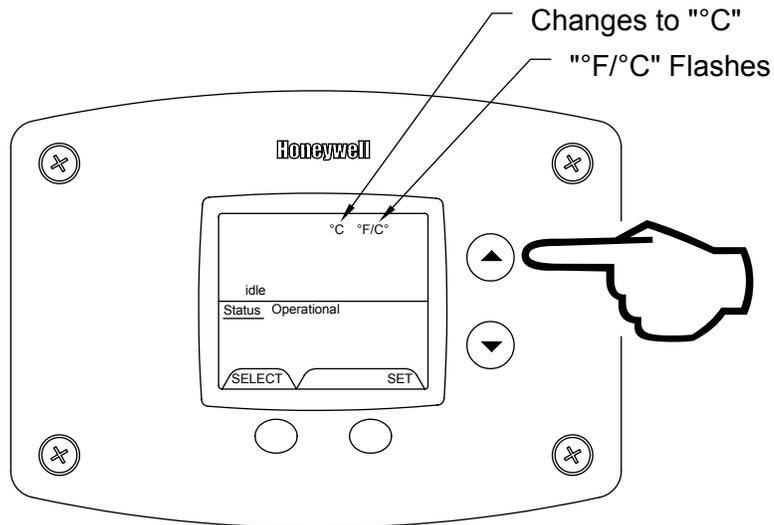
Step 1: While in “Service Mode”, press “Select” button until “°F/°C” is shown in the upper right portion of the water heater display.



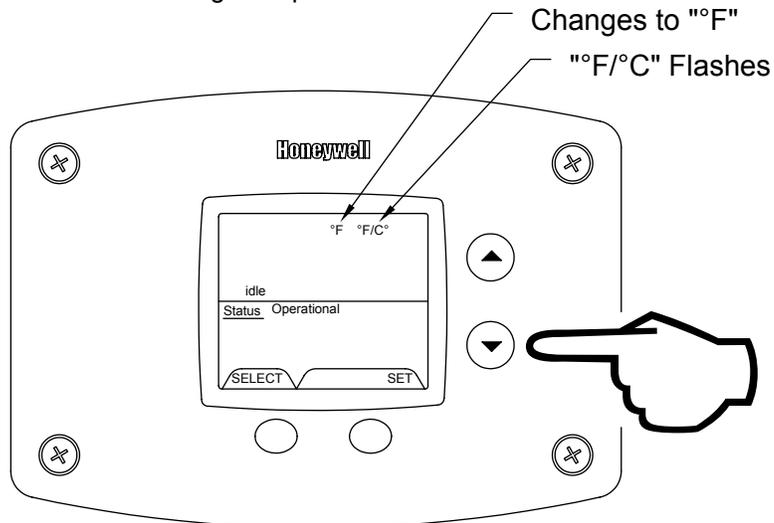
Step 2: Press "Set" button to change temperature format. "°F/°C" symbol will flash in the water heater display.



Step 3a: Press "Temperature Up" button to change temperature format to °C

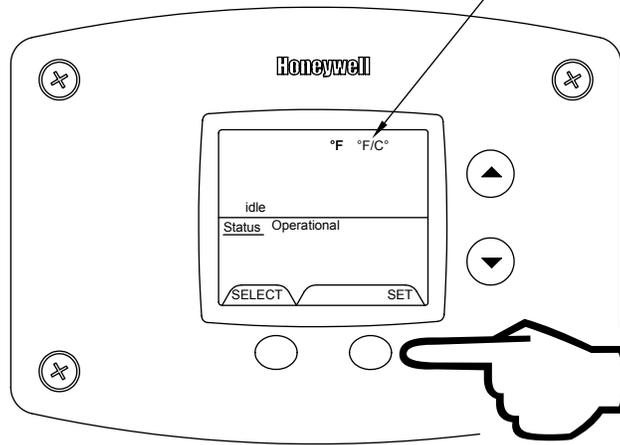


Step 3b: Press "Temperature Down" button to change temperature format to °F.



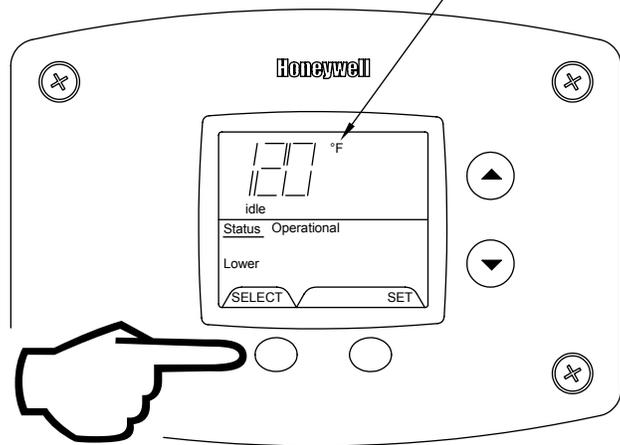
Step 4: Press "Set" button to confirm °F or °C format. °F/°C will stop flashing.

"°F/°C" Symbol Stops Flashing



Step 5: Pressing "Select" button will return display to setpoint in format selected (°F or °C) immediately.

Setpoint shown in °F



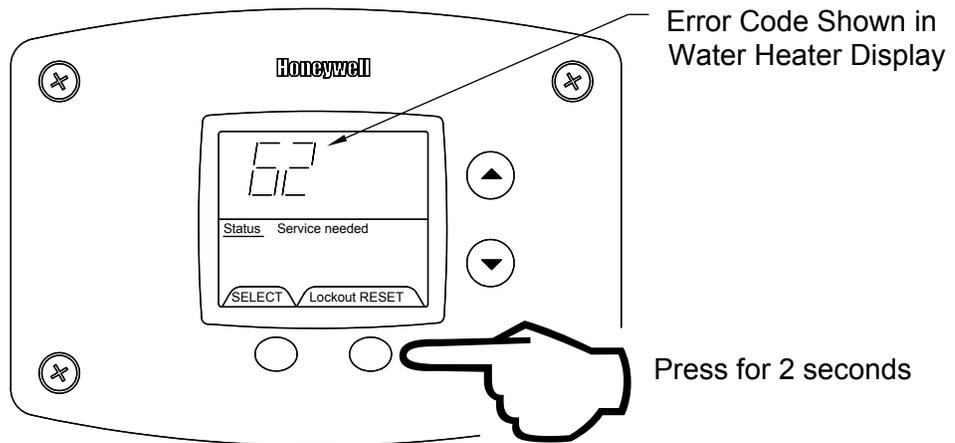
How to reset the control from Lockout Conditions:



The following procedure is for service and installation personnel only. Resetting lockout conditions without correcting the malfunction can result in a hazardous condition.

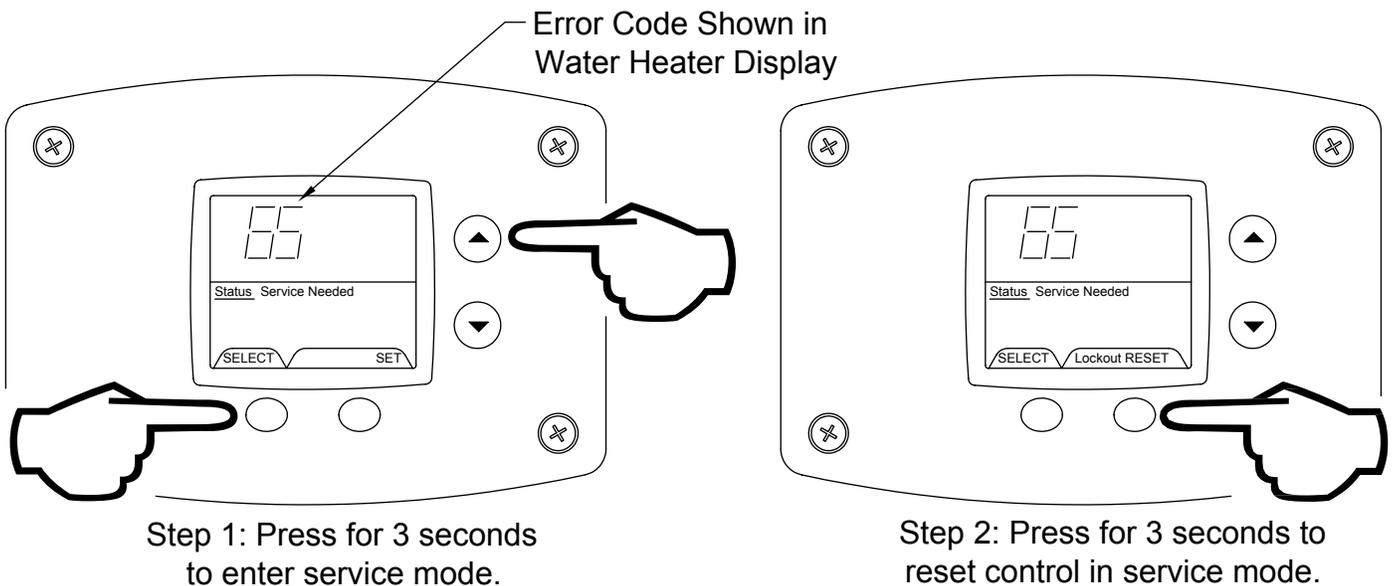
If an error code is displayed (except for #4, low flame sense current), the water heater will be in a “lockout condition” with the water heater display showing the error code number and “Service Needed” in the status section of the display window. Error codes 62 (maximum number of retries detected) and 63 (maximum number if ignition recycles detected) are “Soft Lockouts” in which the control can be reset in the “User Mode” by pressing the lower right button under “Lockout Reset” shown in the lower right portion of the display. The control will also go through 3 attempts to relight the burners every hour in the soft lockout condition.

Resetting Error Codes in Soft Lockout Condition



All other error codes will put the water heater into a “Hard Lockout” condition, in which the water heater will not operate and cannot be reset in the “User Mode”. To reset a hard lockout, first enter the “Service Mode” described earlier by pressing both the “Temperature Up” and “Select Buttons” at the same time for 3 seconds. Then press the lower right button under “Lockout Reset” in the water heater display and hold for 3 seconds.

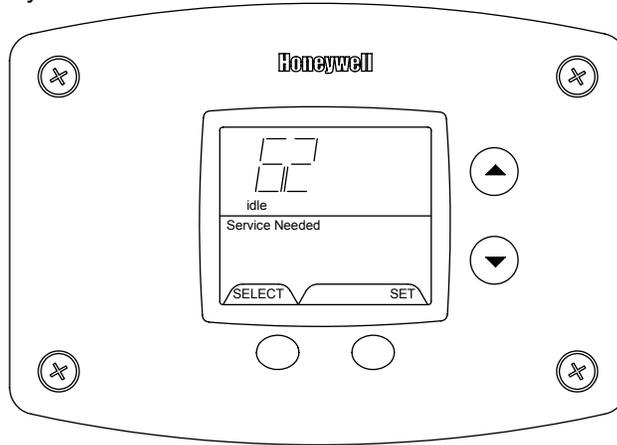
Resetting Error Codes in Hard Lockout Condition



Error Codes and Error History Display:

If there is an operating problem with the water heater, an error code number will appear on the water heater display with “Service Needed” to the right of the “Status” indicator. The error code label is located below the water heater display and the following section in this Installation and Operating Instruction Manual explains the error codes with corrective actions to repair the water heater.

Example of Error Code in the Display:



Error Code History:

In “Service Mode” pressing the “Select” button after the “Software Version” (item 8 in the previously described sequence of service modes) will show an error code history, if there have been any previous operating problems with the water heater. If the display shows --, there is not a current error code.

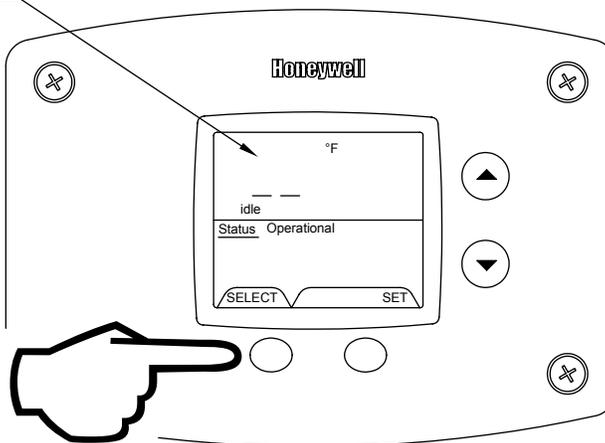
The Water Heater Display will provide up to 10 previous error codes. The oldest error code will be stored in code index #1 and the most recent in code index #10 (if there are 10 error codes).

To view previous error codes:

Step 1:

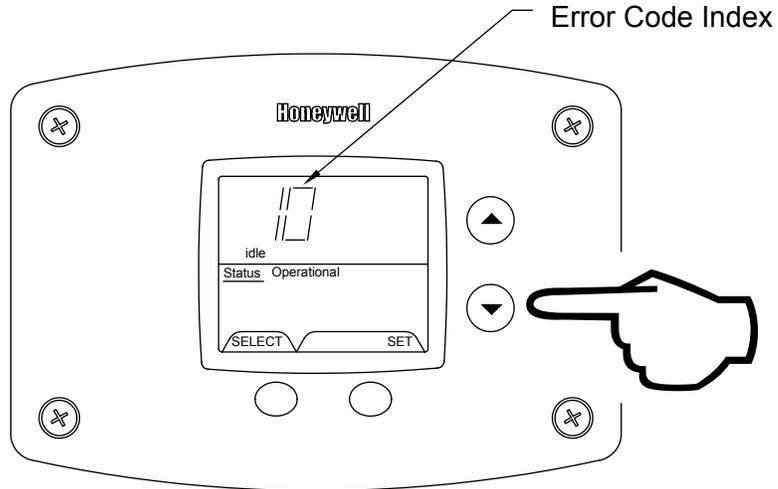
In “Service Mode” press the “Select” button until the next display after the “Software Version”. If there are no current error codes, the display will show --.

No Current Error Code



Step 2:

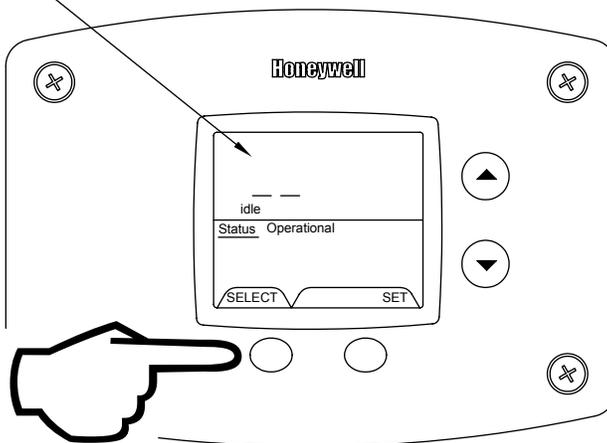
Press the "Temperature Down" button to select the error code index, starting with the most recent error code "10".



Step 3:

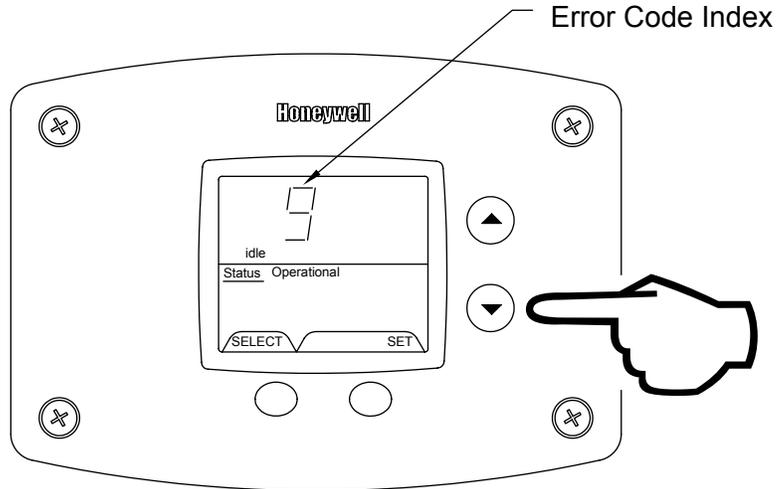
Press the "Select" button to view the error code for "code 10". If there is a number displayed, note what the number is. The label next to the water heater display will identify the code number. If no number is displayed with only a "--" in the water heater display, then there has not been an error code for error code index 10.

No Error Code Shown
for Code Index 10



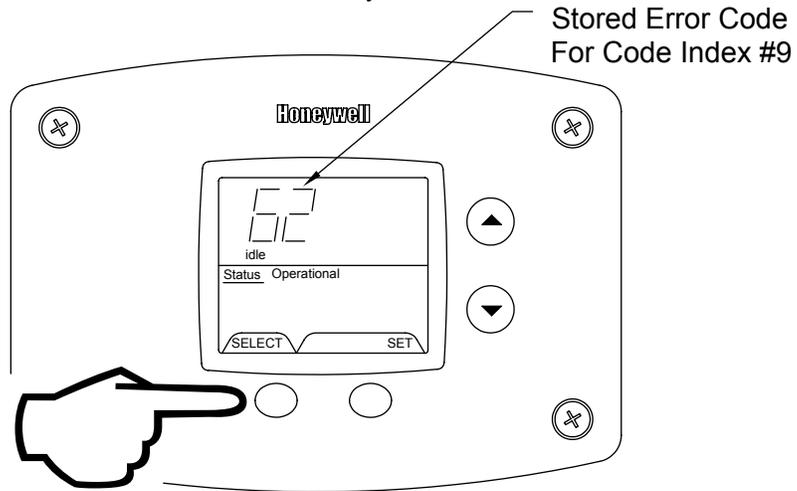
Step 4:

Press the "Temperature Down" button to change to the previous code index, code #9.



Step 5:

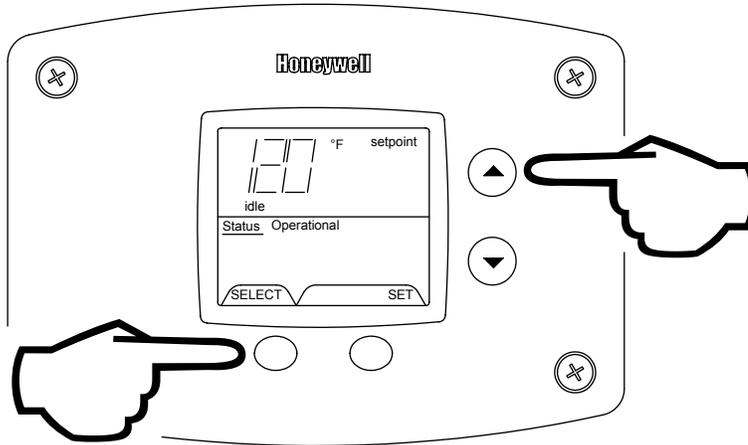
Press the "Select" button for code index #9 to view if there are any code numbers.



Step 6:

Continue pressing the “Temperature Down” button to change to the next error code index and press “Select” to view the error code number, if any, for that index number. Continue on to index #1, the oldest error code index. The water heater display will store up to 10 error codes with the oldest code starting in code index #1 with the most recent code in code index #10.

Step 7: 10 seconds after the last button press, the Water Heater Display will revert back to the current error code display. To exit Service Mode, either wait 30 seconds or press Temperature Up button and Select Button for 3 seconds.



Exiting Service Mode

DIAGNOSTIC ERROR CODES AND TROUBLESHOOTING PROCEDURES FOR HONEYWELL INTEGRATED CONTROLS (PDV AND INDUCED DRAFT MODEL SERIES)

Error Code	Definition of Code	Cause of Problem and Actions Taken to Correct
4	Low Flame Sense Current	Determine flame sense current in the Service Mode with the water heater operating. If less than 1.0 microamps, check pilot flame sense rod and wire. Clean flame sense rod with emery cloth. If problem is not solved, replace pilot.
2	Pressure Switch Failed to Open (Stuck Closed)	The pressure switch contacts did not return back to the normally open position at the end of the last heating cycle. The control checks to make sure the pressure switch is in the normally open position before allowing the blower to start the ignition sequence. Check to make sure the pressure switch tubing is not blocked. If the pressure switch tubing is clear, replace the pressure switch.
29	Pressure Switch Failed to Close	The pressure switch contacts did not close after the blower was energized. Check to make sure the blower is energized at the beginning of the heating cycle. If the blower did not start, check to make sure there is power to the motor. Replace blower or control board if defective. Check to make sure the venting system is not blocked. Make sure the vent length does not exceed the specified limits. Make sure the vent terminal is not blocked. Check to make sure the pressure switch tubing is clear. Replace the pressure switch if the venting system has checked out O.K. Control will reset once problem is corrected.
6	Flame Sensed Out of Normal Sequence (Before Opening Gas Valve or After Closing Gas Valve)	Check to make sure gas valve has closed. No voltage should be present at the gas valve before or after ignition cycle. Make sure wire positions on the wire harness are correct. If gas valve is stuck open, replace.

Error Code	Definition of Code	Cause of Problem and Actions Taken to Correct
23	Flame Detected Before Ignition	Check to make sure gas valve has closed. No voltage should be present at the gas valve before the ignition cycle. Make sure wire positions on the wire harness are correct. If gas valve is stuck open, replace.
24	Flame Detected After Heating Cycle Completes	Check to make sure gas valve has closed. No voltage should be present at the gas valve before the ignition cycle. Make sure wire positions on the wire harness are correct. If gas valve is stuck open, replace.
31	Upper Sensor Readings Faulty	Resistance of upper sensor out of operating range. Check continuity of wire harness to upper sensor, and if O.K., replace upper sensor.
32	Lower Sensor Readings Faulty	Resistance of lower sensor out of operating range. Check continuity of wire harness to lower sensor, and if O.K., replace lower sensor.
57	Flame Rod Shorted to Ground	Pilot flame sensor rod is shorted to ground. Check to see if flame sensor wire has bare spots touching metal parts or if flame sensor rod is touching the pilot shield or other metal parts. Replace pilot if flame sense wire is damaged or flame rod is bent. Make sure pilot shield is not touching the pilot flame sensor.
58	AC Line Frequency Error – Signal Too Noisy or Frequency Incorrect	Check line voltage frequency to the water heater. Determine if there are wide fluctuations. Call an electrician if the problem persists. The water heater should be on a separate line.
59	Line Voltage Too Low or High	Check line voltage to the water heater. Determine cause of low or high voltage. Call an electrician or your utility. The water heater should be on a separate line.
61	DC Output Voltage Unstable	Check line voltage to the water heater for erratic readings. Also check wiring to make sure there are no shorts. If power supply and wiring are O.K., replace control board.
62	Maximum Number of Retries Detected	Pilot is either not lighting or not staying lit during ignition cycle. Check inlet gas pressure for minimum pressure on rating label. Is pilot electrode sparking? Check gas valve wire harness for broken wires or shorts. If 24 volts is present between PV and PV/MV terminals at the gas valve, replace gas valve. Check for voltage output to the yellow and red gas valve wires on the control board pins. If during the ignition trial period, there is no voltage present at the control board pin terminal for the red and yellow wires leading to the gas valve, then replace the control board. Replace pilot if wires are damaged or electrode is damaged.
63	Maximum Number of Ignition Recycles Detected	Pilot flame is lost during run cycle, then reestablished on ignition cycle. Check inlet gas pressure. Is gas pressure dropping below the minimum operating pressure on the rating label after the main gas valve opens? Is the gas pipe size to the water heater adequate? Check the pilot shield position and condition of the burners. Clean or replace as needed. Check the pilot flame and observe the microamp output on the run cycle. Check the pilot tubing to the pilot and replace if crimped or damaged. Replace pilot if wires, flame sensor, or electrode is damaged.
64	Electronics Failure	Replace control board.
65	High Water Temperature (Over 200°F)	Water temperature in tank has exceeded 200°F. Check lower sensor. Make sure sensor is fully inserted into the well (clip on sensor wire secures sensor in place). Check lower and upper (where used) sensor readings. If not within specifications, replace sensor. If sensor and wire harnesses check O.K., replace control board.

Procedure for Checking Thermostat Sensors

Set the thermostat above water temperature (See temperature adjustment section) and observe system through one (1) complete cycle. Make sure system operates as desired.

To check the upper sensor or lower sensor assembly, compare the resistance of the sensor terminals (blue leads for upper sensor, yellow and black lead for lower sensor) as measured by an ohmmeter to the water temperature as measured by an accurate thermometer. Thermistor resistance increases as the temperature decreases. The tables below show the correct sensor resistance at various temperatures. Replace the sensor if the ohm reading in the chart does not approximate the reading from the sensor at the temperature measured in the tank.

In Degrees F										
°F	0	1	2	3	4	5	6	7	8	9
40	26109	25400	24712	24045	23399	22771	22163	21573	21000	20445
50	19906	19383	18876	18383	17905	17440	16990	16553	16128	15715
60	15314	14925	14548	14180	13823	13477	13140	12812	12494	12185
70	11884	11592	11308	11032	10763	10502	10248	10000	9760	9526
80	9299	9078	8862	8653	8449	8250	8057	7869	7685	7507
90	7333	7165	7000	6839	6683	6531	6383	6238	6098	5961
100	5827	5697	5570	5446	5326	5208	5094	4982	4873	4767
110	4663	4562	4464	4368	4274	4183	4094	4006	3922	3839
120	3758	3679	3602	3527	3453	3382	3312	3244	3177	3112
130	3048	2986	2925	2866	2808	2752	3697	3643	2590	2538
140	2488	2439	2391	2344	2298	2253	2209	2166	2124	2083
150	2043	2004	1966	1928	1891	1856	1820	1786	1753	1720
160	1688	1656	1625	1595	1566	1537	1509	1481	1454	1427
170	1402	1376	1351	1327	1303	1280	1257	1235	1213	1191
180	1170	1150	1129	1110	1090	1071	1053	1035	1017	999
190	982	965	949	933	917	901	886	871	857	842
200	828	814	801	788	775	762	749	737	725	713

In Degrees C										
°C	0	1	2	3	4	5	6	7	8	9
0	32648	31026	29495	28049	26682	25389	24166	23010	21915	20879
10	19898	18968	18088	17253	16461	15710	14998	14322	13680	13071
20	12492	11942	11419	10922	10450	10000	9572	9165	8778	8409
30	8057	7722	7403	7099	6808	6532	6268	6016	5775	5546
40	5327	5117	4917	4726	4543	4368	4201	4042	3889	3742
50	3602	3468	3340	3217	3099	2986	2878	2774	2675	2579
60	2488	2400	2316	2235	2157	2083	2011	1942	1876	1813
70	1752	1693	1637	1582	1530	1480	1432	1385	1340	1297
80	1256	1216	1177	1140	1105	1070	1037	1005	974	944
90	916	888	861	835	810	786	763	741	719	698

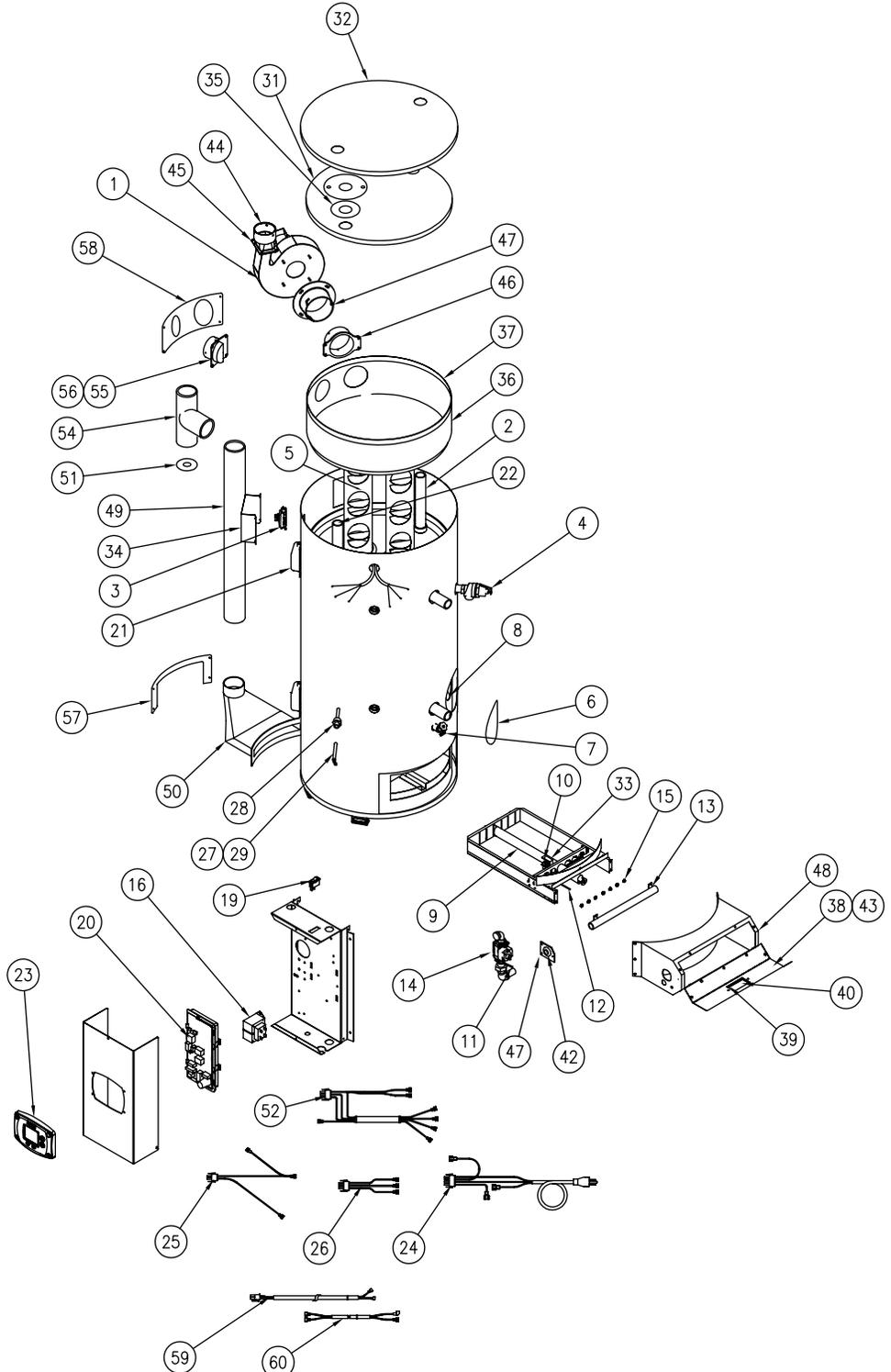
SECTION XII: PARTS LIST

PART NAME AND DESCRIPTION
1. Induced Draft Blower Assembly
2. Diptube
3. Pressure Switch
4. T&P Valve
5. Flue Baffle
6. Cleanout Access (Jacket) Cover
7. Drain Valve
8a. Cleanout Cover
8b. Cleanout Cover O-Ring (under cover – not shown)
9. Main Burner Tubes
10. Pilot Assembly
11. Pilot Supply Tube (Control Side)
12. Pilot Supply Tube (Burner Side)
13. Main Burner Manifold
14. Gas Valve
15. Main Burner Orifice
16. Transformer
17. Ignition Module
18. Anode Rods (4) (Not shown–top of tank)
19. On-Off Switch
20. Integrated Control Board
21. Utility Cover
22. Outlet Nipple
23. Temperature Display
24. Power Cord
25. Secondary T'former Wire Assy
26. Primary T'former Wire Assy
27. Lower Sensor Retainer Clip
28. Lower Thermostat Well
29. Lower Sensor
30. Pressure Switch Tubing (Not Shown–2 pcs)
31. Flue Collector Head
32. Jacket Head
33. Pilot Shield
34. Pressure Switch Cover
35. Collector Nipple Gaskets (2)
36. Flue Collector
37. Flue Collector Gasket (Top Edge)
38. Burner Access Cover Gasket
39. Sight Glass Gasket
40. Sight Glass
41. Tank (Not shown)
42. Manifold Flange
43. Burner Access Cover
44. Blower Outlet Connection
45. Blower Outlet Flange Gasket
46. Collector to Blower Transition
47. Blower Mounting Flange w/ Pressure Tap
48. Front Combustion Box Assy
49. Combustion Air Tube
50. Combustion Air Inlet Boot
51. Combustion Air Orifice (Inside Dilution Air Tee)
52. Gas Valve Wire Harness
53. Vent Safety Switch (Not Shown–Located Below Blower Outlet Flange)
54. Dilution Air Tee
55. Dilution Air Inlet
56. Dilution Air Pressure Tap
57. Escutcheon–Rear Boot
58. Blower Escutcheon
59. Blower Wiring Harness
60. Pressure Switch Harness

REPLACEMENT PARTS LIST FOR POWERED DIRECT VENT MODELS

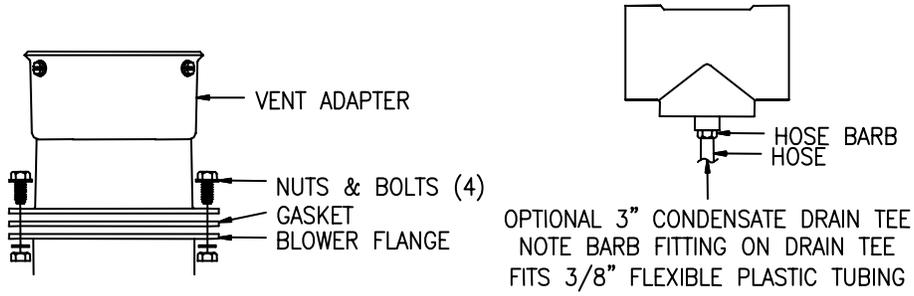
Contact your supplier, plumbing professional or the company listed on the rating plate of the water heater for replacement parts.

Provide the part name as well as the model and serial number(s) of the water heater(s) when ordering parts. When applicable, the following information shall be provided: type of gas, voltage and amperage, item number (from the following list) and description (from the following list).

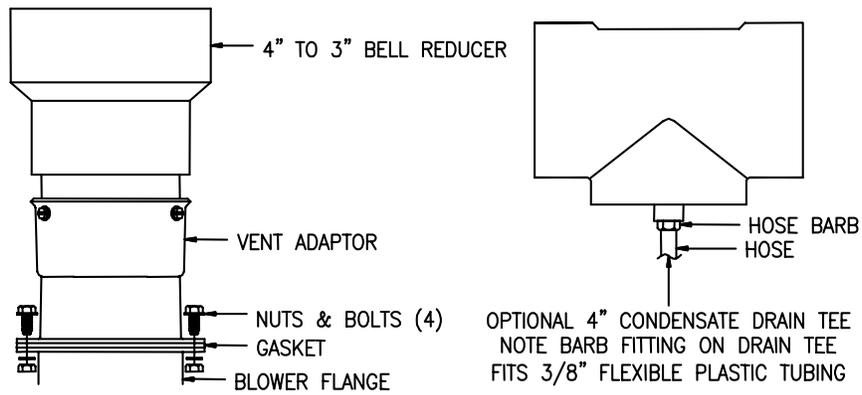


VENT KIT COMPONENTS AND OPTIONAL CONDENSATE TEE

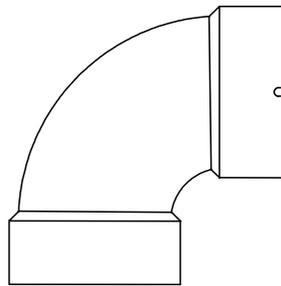
150,00 AND 199,999 BTU/HR. MODELS: 3" VENT KIT



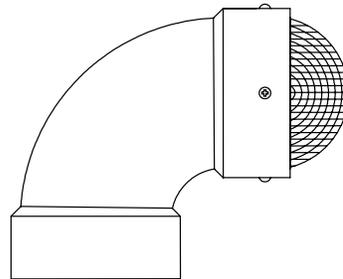
MODELS OVER 200,000 BTU/HR.: 4" VENT KIT



COMMON: 3" AND 4" VENT KIT



3" OR 4" EXHAUST TERMINAL



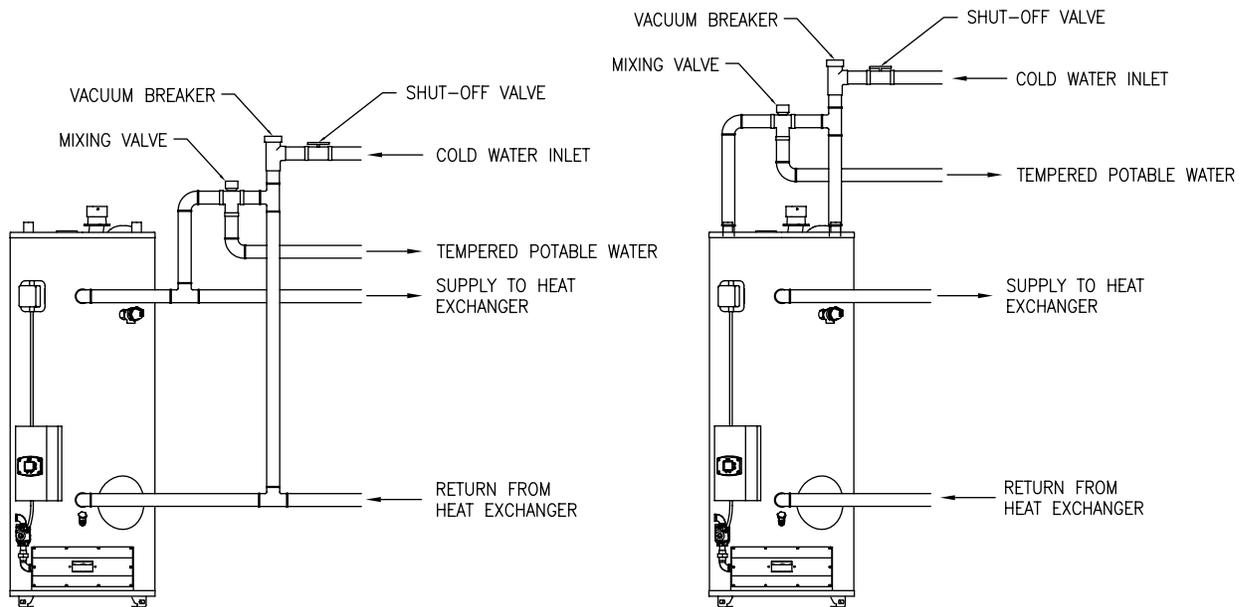
3" OR 4" INTAKE TERMINAL

SECTION XIII: INSTALLATION FOR POTABLE WATER AND SPACE HEATING

THE FOLLOWING INSTRUCTIONS ARE FOR INSTALLATION OF: GAS WATER HEATERS SUITABLE FOR WATER (POTABLE) HEATING AND SPACE HEATING

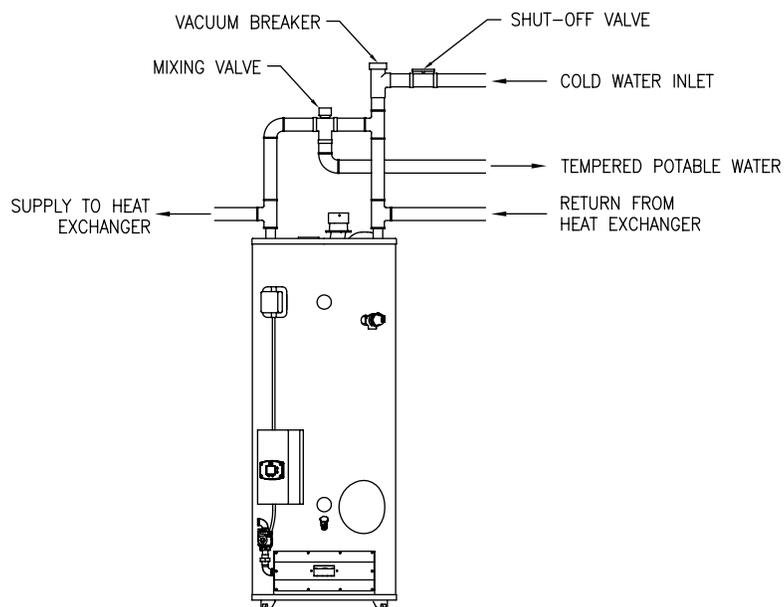
1. All piping components connected to this water heater for space-heating applications must be suitable for use with potable water. In Massachusetts, space heating piping **must not** exceed 50 feet.
2. Toxic chemicals, such as those used for boiler treatment, **must not** be introduced into potable water used for space heating.
3. This water heater **must not** be connected to an existing heating system or component(s) previously used with a non-potable water heating appliance.
4. When the system requires water for space heating at temperatures higher than required for other uses, such as an ASSE approved mixing valve must be installed to temper the water for those uses in order to reduce the scald hazard potential.

Please refer to the illustrations below and on the following pages for suggested piping arrangements.



Suggested Piping Arrangement For Side Connections

Suggested Piping Arrangement For Top and Side Connections



Suggested Piping Arrangement For Top Connections



BRADFORD WHITE[®]
W A T E R H E A T E R S

**PDV(S,T) MODEL SERIES AND INDUCED DRAFT (D80T725,
D65T625) MODEL SERIES WATER HEATERS WITH
HONEYWELL INTEGRATED CONTROL SYSTEM**

SERVICE **MANUAL**

**Troubleshooting Guide
and Instructions for Service**
(To be performed **ONLY** by qualified service providers)



(PDV80S Shown)

PDV80S150
PDV802200
PDV80S250
PDV100S150
PDV100S200
PDV100S250
PDV80T300
PDV100T360
D80T725
D65T625

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Pressure Switch Testing	27	PDV24-II
Pilot Operation Testing	30	PDV24-III
Main Burner Operation Testing	33	PDV24-IV
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Anode Removal & Inspection	42	PDV24-VIII
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FEATURES OF PDV-S MODEL SERIES

- Power vented direct vent design, uses a blower to vent the flue products to the outside and pull combustion air in from outside the building
- Independent Venting - Exhausts flue products and supplies combustion air through two separate 3" or 4" PVC, CPVC or ABS pipes. Maximum venting distance of 40 ft. with one 90 degree elbow for each pipe in 3". The 250,000 Btu/hr. model vents with 4" PVC, CPVC, or ABS only. Maximum vent length is 55 feet with one 90 degree elbow in 4" pipe (each pipe) for all models.
- Electronic ignition - Pilot is automatically lit and monitored by the Honeywell Integrated Ignition Control system. Main burners light from the pilot. Pilot and main burners shut off at the end of each water heating cycle.
- Electronic thermostat and LCD Display - Accurately monitors the tank temperature and the setpoint is easily adjusted by using the temperature UP and DOWN buttons on the display on the control box cover.

FEATURES OF PDV-T MODEL SERIES

- Power vented direct vent design, uses a blower to vent the flue products to the outside and pull combustion air in from outside the building
- Co-axial Venting (pipe inside a pipe) - Combustion air enters from outside the building through an outer pipe and exhausts flue products through the inside pipe. May be vertically or horizontally vented with a maximum venting distance of 19'-6" (19 feet, 6 inches) with one 90 degree elbow.
- Electronic ignition - Pilot is automatically lit and monitored by the Honeywell Integrated Ignition Control system. Main burners light from the pilot. Pilot and main burners shut off at the end of each water heating cycle.
- Electronic thermostat and LCD Display - Accurately monitors the tank temperature and the setpoint is easily adjusted by using the temperature UP and DOWN buttons on the display on the control box cover.

FEATURES OF INDUCED DRAFT MODELS

- High Capacity power vented design, uses a blower to pull the flue products out the water heater. Designed to vent vertically through 8 inch diameter type B venting system. Uses room air for combustion.
- Electronic ignition - Pilot is automatically lit and monitored by the Honeywell Integrated Ignition Control System. Main burners light from the pilot. Pilot and main burners shut off at the end of each water heating cycle.
- Electronic thermostat and LCD Water Heater Control Display - Accurately monitors the tank temperature and the setpoint and is easily adjusted by using the temperature UP and DOWN buttons on the display on the control box cover.

FEATURES OF HONEYWELL INTEGRATED CONTROLS SYSTEM

- Attractive digital water heater display on control panel for setting and displaying the temperature setpoint. Pressing temperature up and down buttons changes the temperature setpoint. Same water heater display used on all models. Temperature format may be displayed in degrees F or degrees C.
- Single control board with plug in wiring controls temperature, ignition, and blower operation.
- Reduced number of parts for servicing and wiring.
- Plug in wiring reduces chance of miswiring.
- Water heater display will show diagnostic codes in the event the water heater needs servicing. Aids in diagnosing and servicing the water heater.
- Water heater display can show previous error code history to further aid in servicing the water heater.

It is intended for this manual to be used by qualified service personal for the primary purpose of troubleshooting analysis and repair of the Bradford White PDV & Induced Draft Series Water Heaters. Understanding the sequence of operation section of this manual will contribute greatly to troubleshooting this product.

Troubleshooting begins by noting the error code, if any, on the water heater control display and finding the section in this service manual for diagnosing the problem for this error code. This step by step procedure beginning on page 5 will direct the service provider to a series of test procedures to determine root cause of failure.

Contact Technical support immediately if diagnosis is not determined using the methods described in this service manual.

Tools Required for Service

Manometer:	Two types available, a liquid "U" tube type or a digital (magna-helic) type. This device is used to measure gas and/or air pressures and vacuum.
Multi-Meter:	A digital type is strongly recommended. This device is used to measure electrical values. The meter you select must have the capability to measure volts AC, volts DC, Amps, micro-amps and ohms.
Thermometer:	Used to measure water temperature. An accurate thermometer is recommended.
Water Pressure Gage:	Used to measure water supply pressure. Also used to determine tank pressure by adapting to the drain valve of the heater.
Jumper Leads:	A length of wire (12" min.) with alligator clip at both ends.
Various Hand Tools:	Pipe wrench, channel locks, open end wrench set, 12" crescent wrench, Allen wrench set, torx bit set, screw drivers (common & phillips), long reach (12") magnetic tip phillips head screw driver #2 tip, ¼" nut driver, pliers (common & needle nose), socket set including a 1-1/16 deep well socket, wire cutters, wire strippers, wire crimpers, torpedo level, small shop vac, step ladder, and flashlight.

Specifications

Power Supply	Dedicated 120 VAC, 60 Hz., 15 A
Current Draw	Less than 5 Amps
Gas Supply Connection	PDV-S & PDV-T MODELS: 3/4" NPT Minimum connection to gas valve. INDUCED DRAFT MODELS: 1" NPT Minimum connection to gas valve. Schedule 40 black iron pipe recommended for all models.
Approved Gas Type	Natural or Propane. Gas supply must match the gas type listed on the water heater rating label.
Gas Pressure (Nat. & L.P.)	Manifold Pressure: 4.5" w.c. natural gas, 10.0" w.c. L.P. Gas Supply Pressure: At least 1" above manifold pressure with water heater operating, 14" w.c. maximum
Venting System	PDV-S MODELS: Power vented through either 3" or 4" diameter PVC, CPVC, or ABS pipe for 150,000 or 199,999 Btu/hr. models, 4" only for 250,000 Btu/hr. models. Refer to the installation instruction manual for further information on venting lengths and installation requirements. PDV-T MODELS: Power vented through Co-axial Venting (pipe inside a pipe) - Combustion air enters from the outside the building through an outer pipe (200mm diam.) and exhausts flue products through the inside pipe (130mm diam.). Refer to the installation instruction manual for further information on venting lengths and installation requirements. INDUCED DRAFT MODELS: Connect 8" vent to blower vent collar for venting through a chimney or type B vent only. Vertical venting only.
Minimum Clearance for Servicing	30" Front Clearance, 16" Top, 2" Sides and Rear
Maximum Water Supply Pressure	150 PSI
Thermostat Sensor(s)	Redundant thermister with 11,900 + or - 0.5% ohms resistance at 70 deg. F. Sensor inside well for lower sensor. PDV-T model series and Induced Draft models also use an upper sensor (dual sensors for these models).
Control Board	Honeywell Integrated Control Board for Temperature Control, Induced Draft Blower, and Ignition Control Functions. Operates on 24 volts AC current from transformer. Single sensor boards for PDV-S models and dual sensor boards for PDV-T models and Induced Draft models.
Control Display	Honeywell LCD Control Display with Temperature Setpoint, Format, and Error Code Display in User Mode, Diagnostic Functions in Service Mode. Communicates with Control Board. 24 volts AC. Same control display used on all models.
Transformer	120 VAC Primary, 24 VAC Secondary, 40 VA
Pilot	Intermittent Pilot with Spark Electrode and Flame Sensor monitored by Control Board
Induced Draft Blower	PDV-S MODELS: 115 VAC, 60 Hz., 4.3 Amps. PDV-T MODELS AND D80T725, D65T625: 115 VAC, 60 Hz., 3.6 Amps.

- 1 Thermostat calls for heat:

The relay closes on the control board, sending line voltage (115-120 volts) from “inducer” terminals #5 and 3 on the control board to the induced draft blower.

- 2 The blower starts and when sufficient vacuum is achieved, the pressure switch closes and completes the 24 volt circuit between terminals 1 and 3 on the Control Plug to the the board, allowing the ignition sequence to proceed. The blower “purges” any remaining combustion products from the previous cycle for 15 seconds before allowing the pilot to light. This is the pre-purge period of the ignition cycle.
- 3 Trial for ignition (three 90 second ignition trials, with 75 second pauses between trials).

Control Board simultaneously sends:

1. 24 volts from control pin terminal #8, to “MV/PV” terminal of gas valve (common terminal).
2. 24 volts from control pin terminal #2, to “PV” terminal of gas valve to establish gas flow at pilot.
3. Low current high voltage from “spark” terminal, to generate spark at the pilot and ignite pilot gas flow.
4. Pilot flame proving signal (measured in micro-amps) from the “sense” terminal, to prove pilot flame.

- 4 Once pilot flame is proven, sparking will stop.

- 5 Once sparking stops, 24 volts is sent from control pin terminal #5 on control board, to “MV” terminal on gas valve to establish main burner gas flow. Main burners ignite from the pilot flame.

The control board constantly monitors pilot flame through the flame sensor rod. If pilot flame is lost, pilot and main burners are shut down. After a 75 second inter-purge period, the control will attempt to re-light the pilot beginning at sequence 3 above.

- 7 Main burner fires until the thermostat is satisfied. The control board interrupts 24 volts through the gas valve circuit. Pilot and main burners are turned off.

- 8 The induced draft blower shuts off 5 seconds after the gas valve closes. This is the post-purge period.

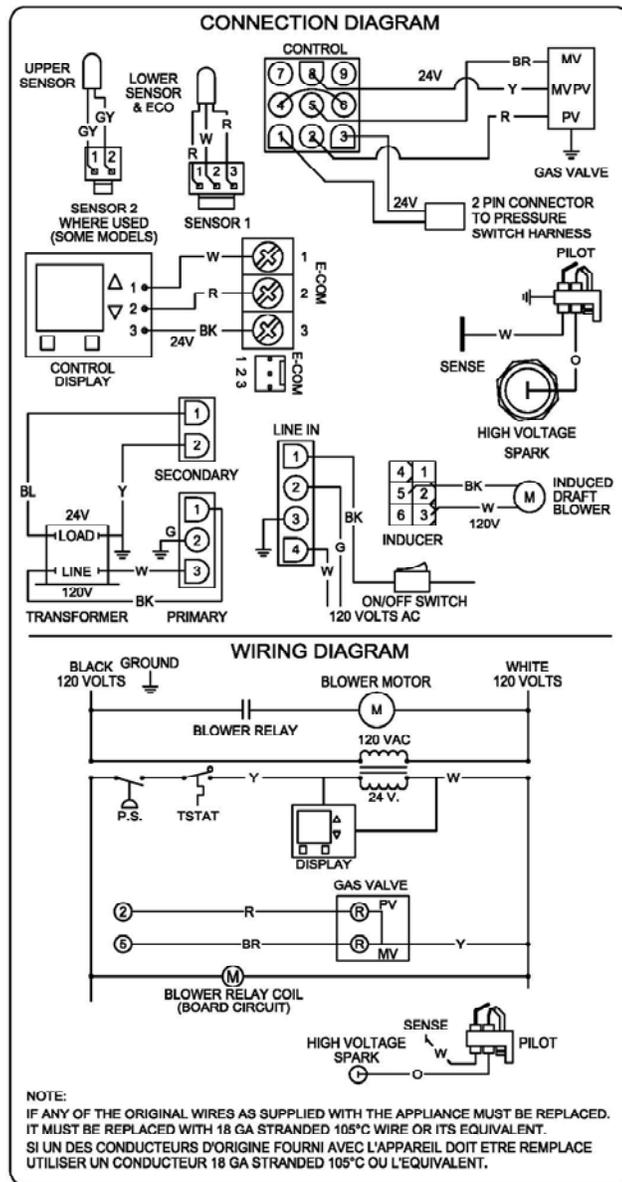
LOCKOUT CONDITION

Control board will go into “Soft Lockout” if the pilot cannot be lit after 3 ignition trials. The water heater display indicates a lockout condition by showing an error code number (62 or 63) with “Service Needed” in the display window. Refer to error codes in the diagnostic section of this Service Manual. In a “Soft Lockout” condition, the control will wait for 60 minutes and then make 2 more attempts to light the pilot and establish the main burners.

Soft lockout reset is accomplished by depressing the lower right button under “Reset” for 3 seconds.

If the water heater should reach 200 degrees F, then the high limit control will shut off the burners and the water heater will go into a “Hard Lockout”. Error code 65 will be shown in the water heater display. The control can only be reset in the “service mode”, which is detailed in the next section of this Service Manual.

If the exhaust or intake terminals become blocked during operation or if the blower motor fails, the pressure switch will open and error code 29 will appear in the display. When the condition is corrected, the error code will disappear and the water heater will resume normal operation. No resetting of the control display is needed for the pressure switch error code.



WIRING DIAGRAM

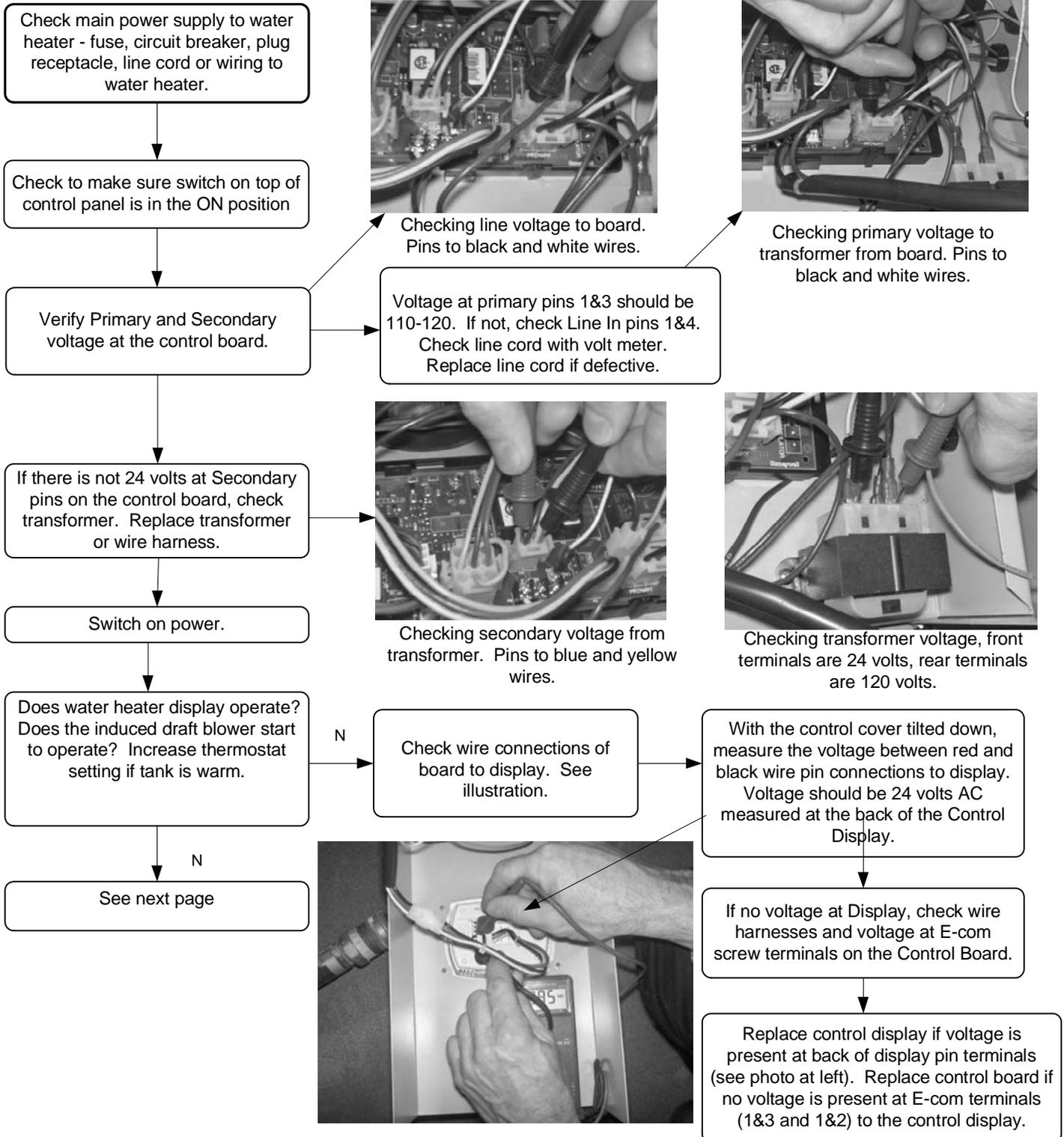
TROUBLESHOOTING

CAUTION

Use Caution Not to Damage Connectors when making Voltage Measurements or Jumping Terminals

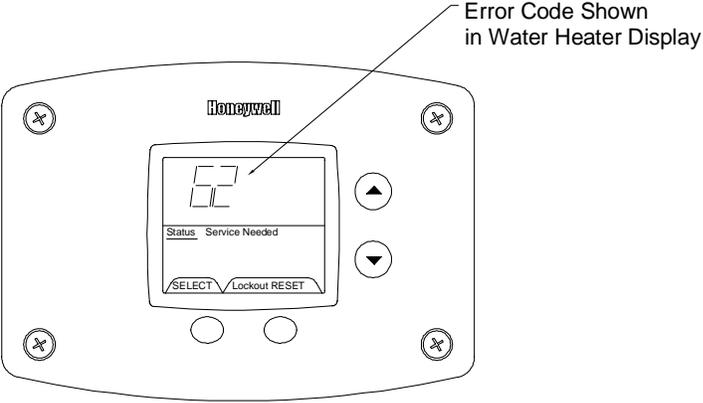
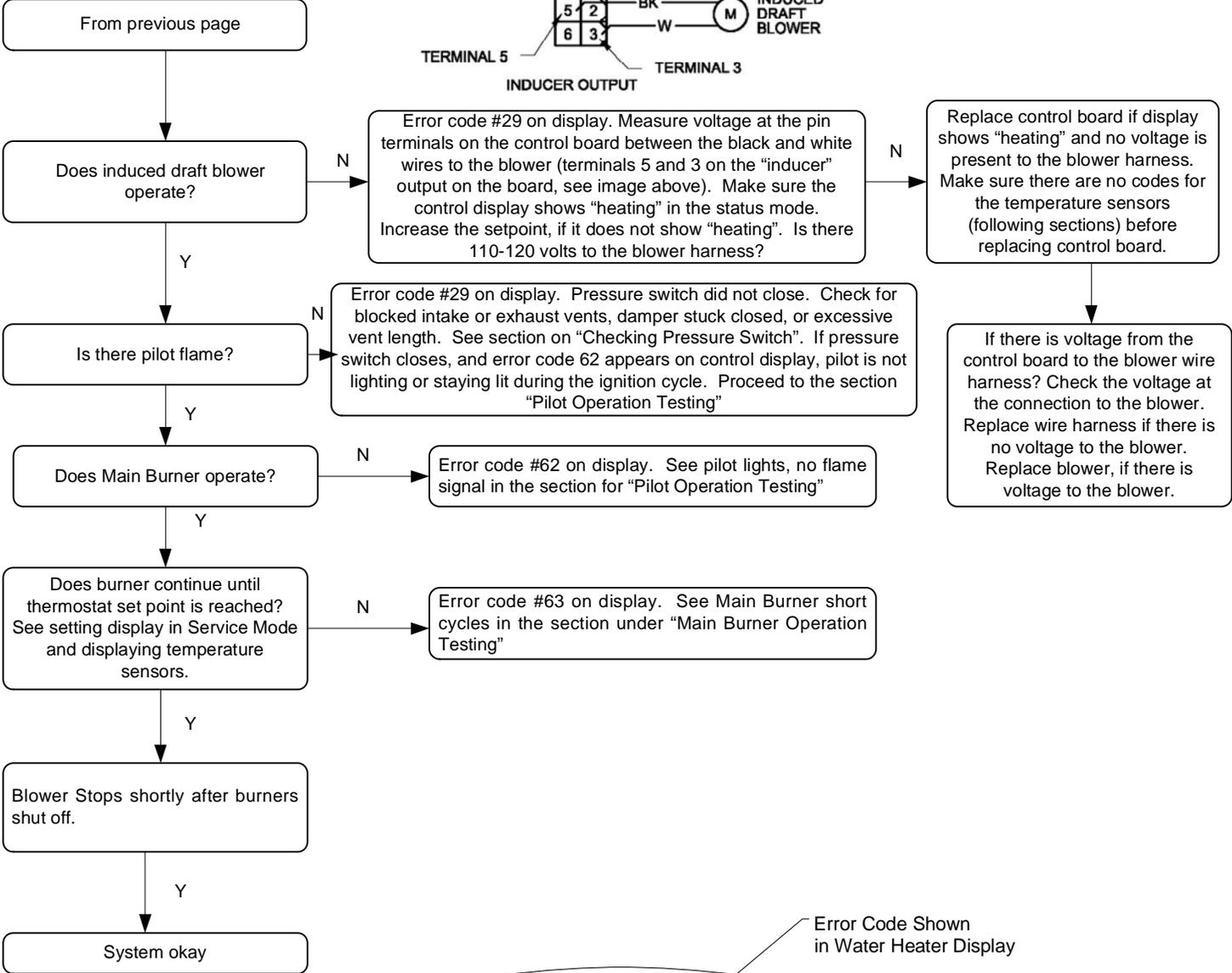
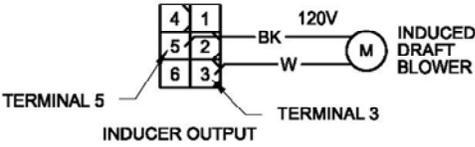
Water Heater Fault: Water heater does not operate

Display Error Code: Water heater display does not operate - blank display



TROUBLESHOOTING

CAUTION
Use Caution Not to Damage Connectors when making Voltage Measurements or Jumping Terminals

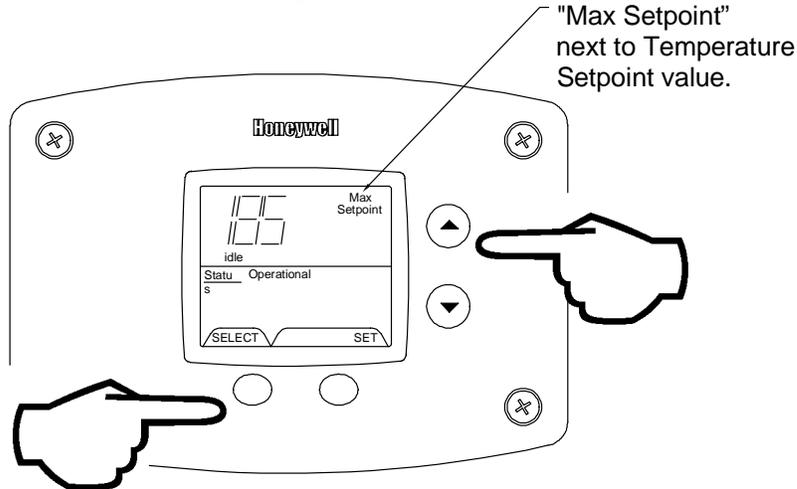


Example of error code shown on control display.

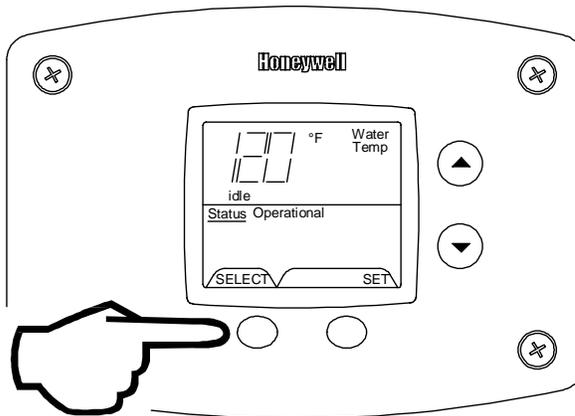
ACCESSING SERVICE MODE ON THE WATER HEATER DISPLAY (FOR SERVICE PERSONNEL ONLY)

The display has a “service mode” for changing the maximum setpoint and accessing information in aiding servicing of the water heater. This procedure is for service and installation personnel only. To enter the Service Mode, follow the steps illustrated below:

Step 1: Press “Select” and “Temperature Up” buttons together and hold for 3 seconds until “Max Setpoint” is shown in the display.

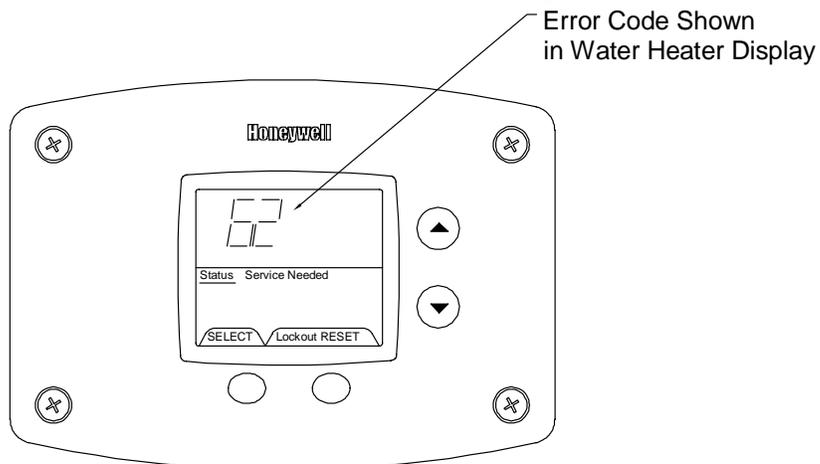


Step 2: Pressing “Select” button will change display to next mode

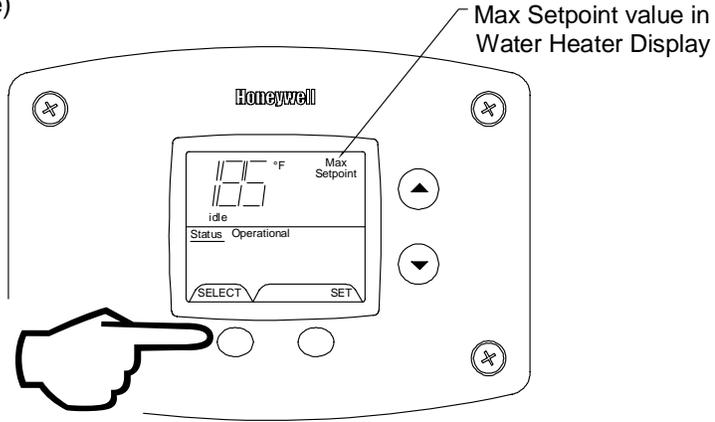


The following is the sequence of modes available in “Service Mode” by pressing the “Select” button:

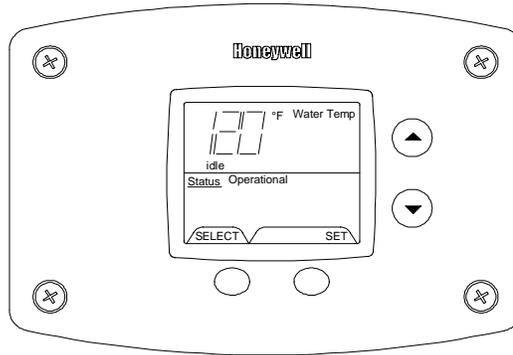
Error Code Number (Display/Reset). This is only shown if there is an operating error in the “User Mode”.



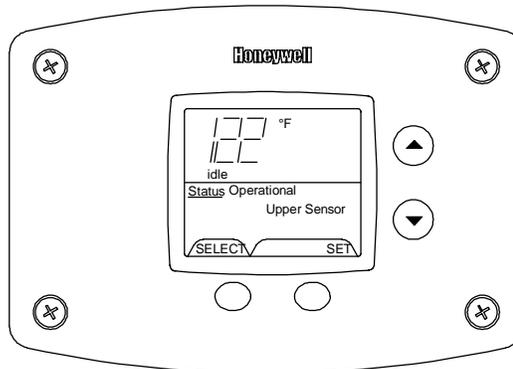
1. Max Setpoint (Display/Change)



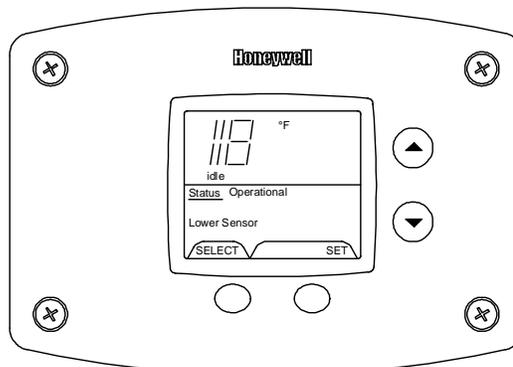
2a. Water Temperature Average (Displays average if there are two sensors - sensor temperature displayed if single sensor is used).



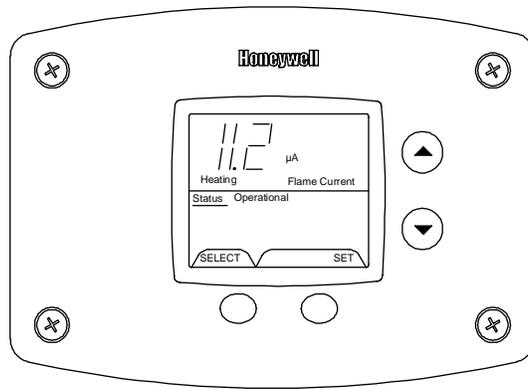
2b. Water Temperature - Upper Sensor (Displays if there is an upper sensor - some models)



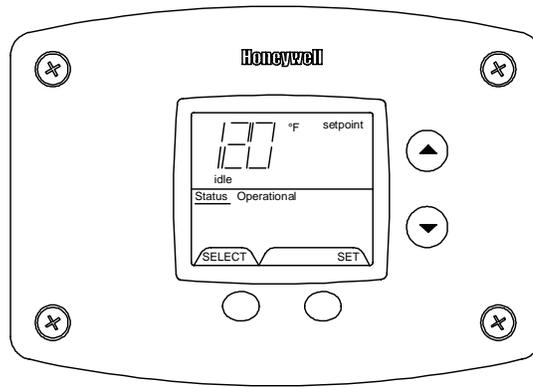
2c. Water Temperature - Lower Sensor (Displays if there are two sensors)



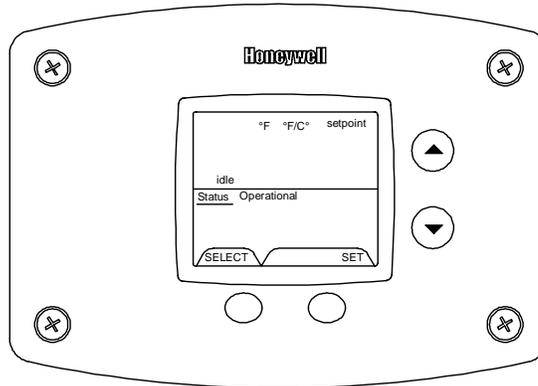
3. Flame Current of Pilot Flame Sensor (Displays only in the Heating Cycle)



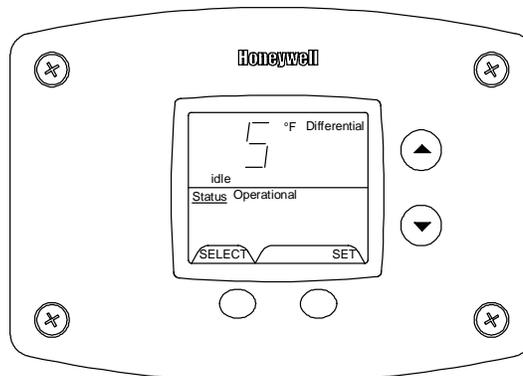
4. Setpoint (Display/Change)



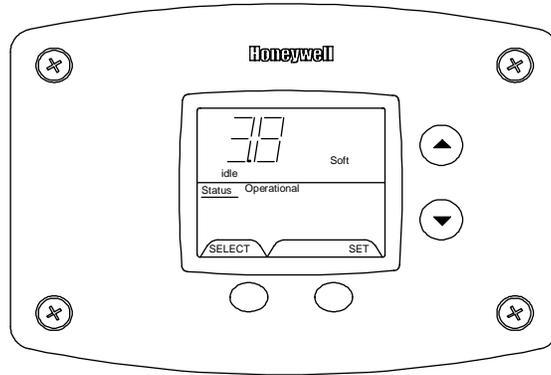
5. °F/°C (Display/Change)



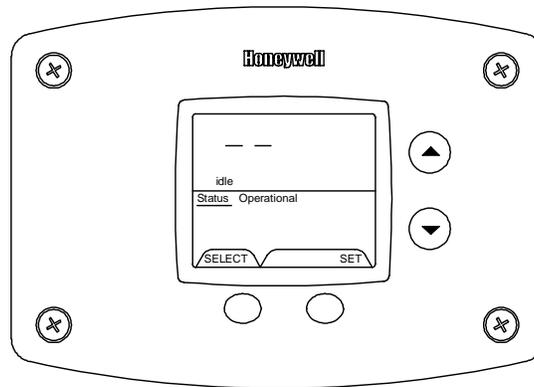
6. Differential (Display only - shows the differential of the thermostat)



7. Software Version (Display only)



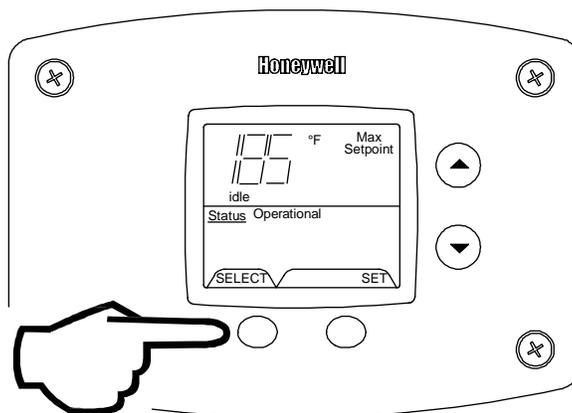
8. Error Code History (Displays if there are present error codes or up to 10 previous error codes). Water Heater Display will show a "--" if there are no error codes.



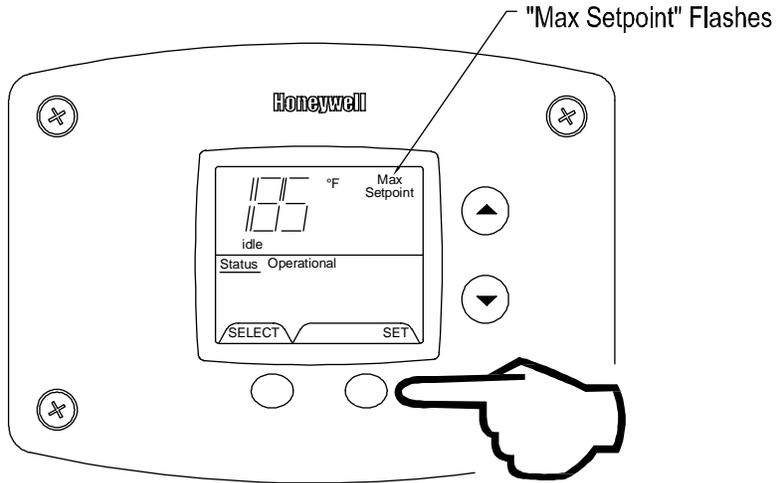
To change the Maximum Setpoint Limit (Max Setpoint) for the temperature setpoint:

Step 1: In service mode press the "Select" button until "Max Setpoint" is displayed.

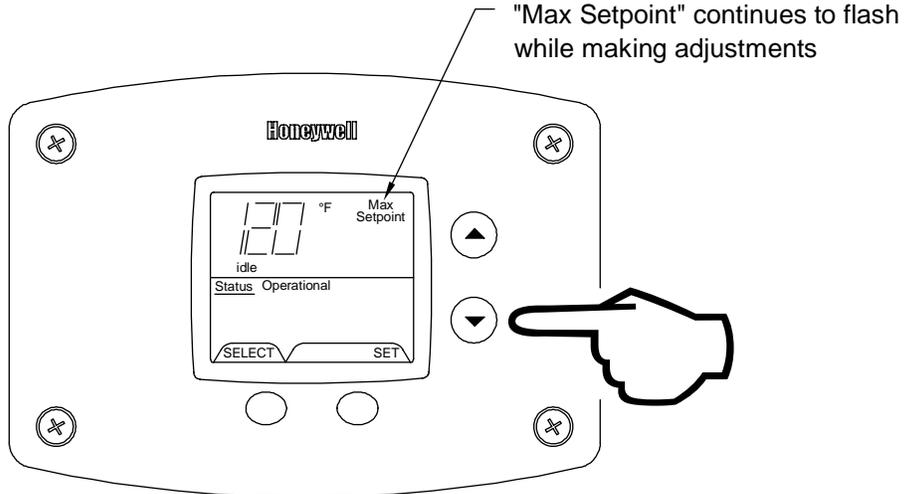
WARNING
Setting the water temperature to the maximum set point can result in scalding hot water delivered to the faucets. It is highly recommended that the maximum setpoint be adjusted to the lowest temperature possible for the needs of the installation. Make sure the water heater control display is not in a public area that can result in the temperature settings being improperly adjusted.



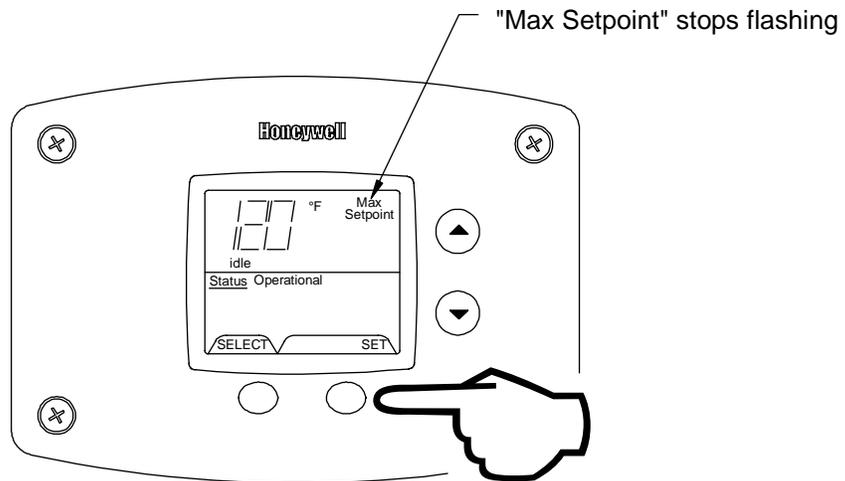
Step 2: Press "Set" button to enter setting mode. "Max Setpoint" will flash to indicate setting mode.



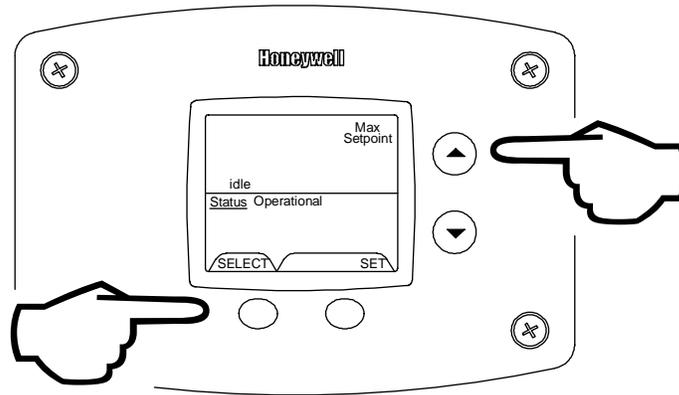
Step 3: Press the "UP" or "DOWN" buttons to change the maximum setpoint value. This will limit the maximum setpoint the user can select. Note: The maximum setpoint is approximately 180°F.



Step 4: Press "Set" button to confirm new "Max Setpoint" value and stop setting mode.



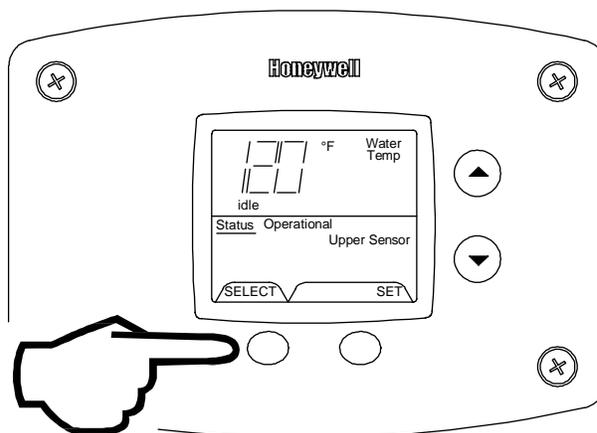
Step 5: 30 Seconds after the last button press, the Water Heater Display will go back to "User Mode". It will read "Max Setpoint" without showing a temperature value if the temperature setpoint is at the maximum setting. The Water Heater Display can be set back to the "User Mode" immediately by pressing both the "Temperature Up" and "Select" buttons together for 3 seconds.



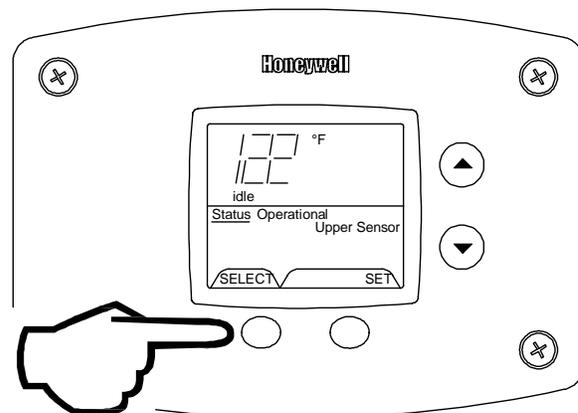
Exiting Service Mode

Display of Water Temperature:

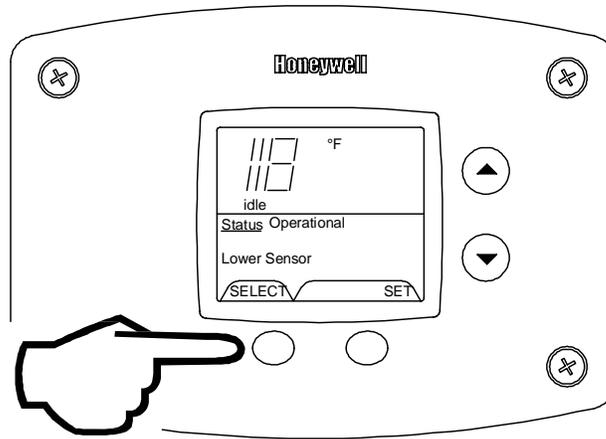
Step 1: In Service Mode, Press the "Select" button until "Water Temp" is displayed in the upper right section of the water heater display. For water heaters using two temperature sensors in the tank, this will be the average reading between the two sensors. For water heaters using a single sensor, this is the reading for the sensor.



Step 2: For water heaters using two temperature sensors, pressing the "Select" button again displays the Upper Sensor temperature reading. "Upper Sensor" will be displayed in the lower right side of the status window of the water heater display.

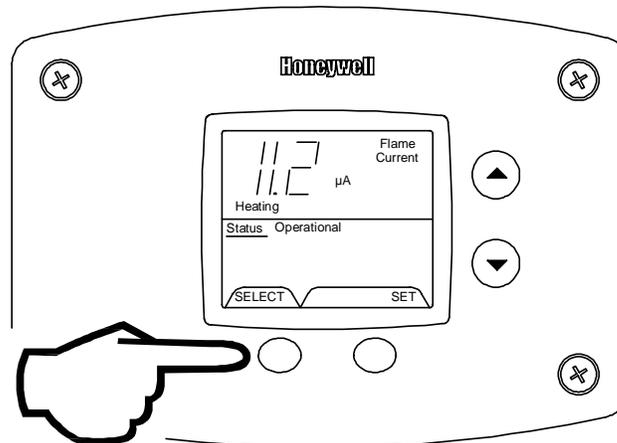


Step 3: For water heaters using two temperature sensors, pressing the “Select” button again displays the Lower Sensor temperature reading. “Lower Sensor” will be displayed in the lower left side of the status window of the water heater display.



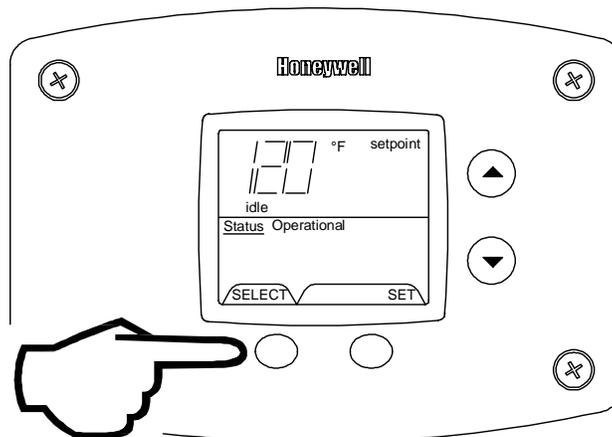
To Display Flame Sense Current of the Pilot Flame Sensor:

The pilot flame sense current is available only when the burners are in operation. Step 1: Make sure the status displays “Heating” or draw enough hot water to start the burners. Step 2: Enter the “Service Mode” described previously. Step 3: Press the “Select” button until a number value is displayed with “Flame Current” to the right of the number. The value displayed is in microamps (μA).

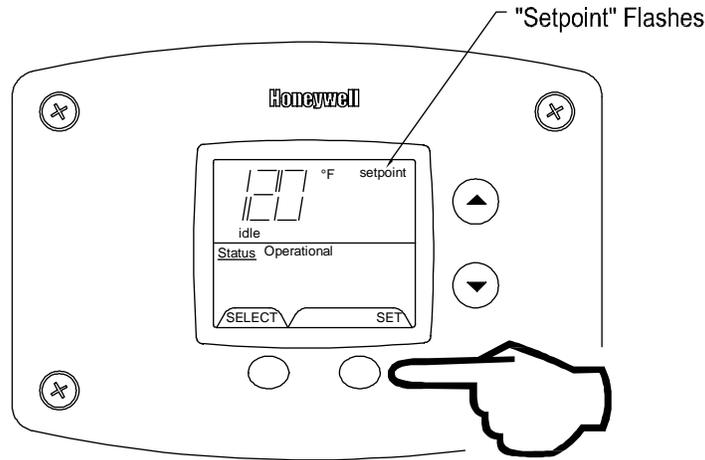


To Display and Change Temperature Setpoint:

Step 1: In “Service Mode” press the “Select” button until “Setpoint” is shown in the water heater display



Step 2: Press the "Set" button to enter the setting mode. "Setpoint" will flash in the water heater display.



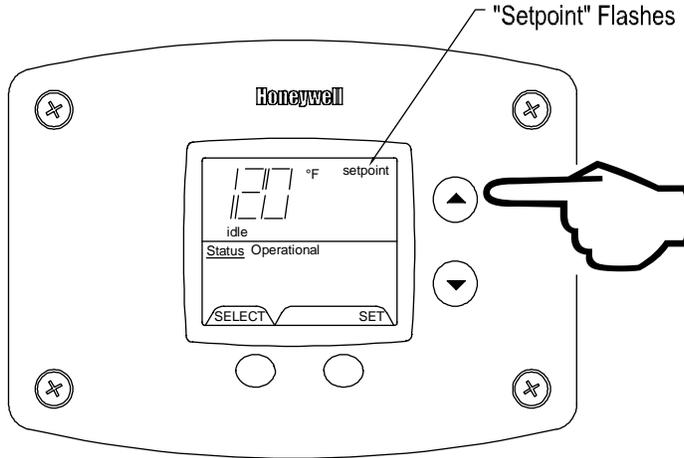
Step 3: To raise the temperature setpoint, press the "Temperature Up" button until the desired temperature is shown on the water heater display.

NOTICE

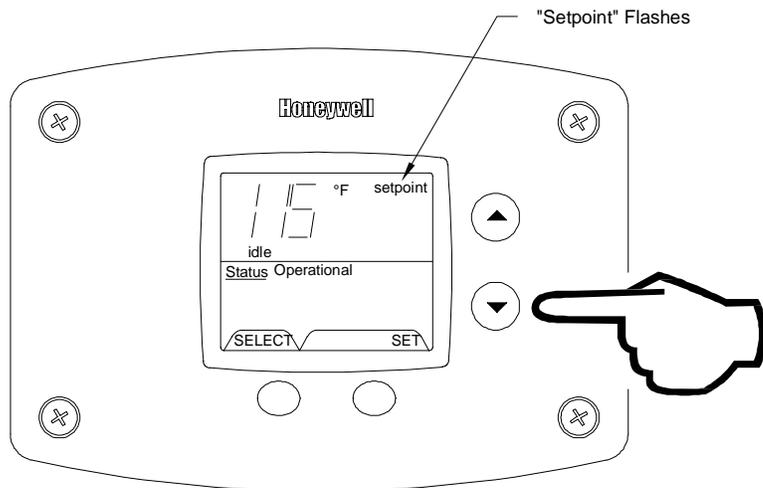
The maximum temperature that can be set in the Water Heater Display is limited to the "Max Setpoint" described previously. To change the "Max Setpoint", refer to the procedure "To Change the Maximum Setpoint Limit..." described previously under "Accessing the Service Mode on the Water Heater Display".

WARNING

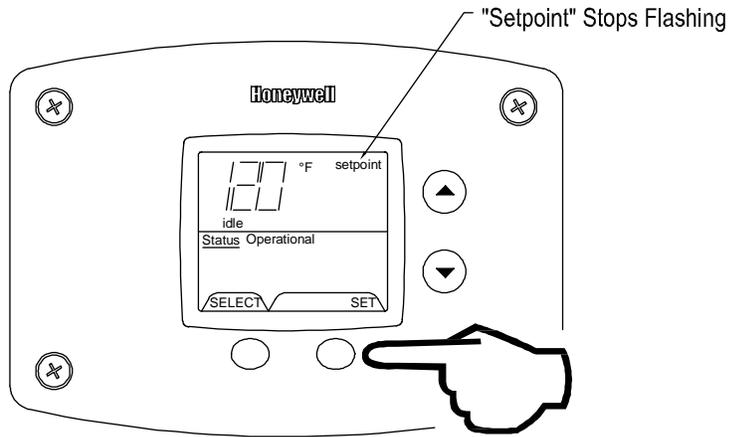
Setting the water temperature to the maximum set point can result in scalding hot water delivered to the faucets. It is highly recommended that the maximum setpoint be adjusted to the lowest temperature possible for the needs of the installation. Make sure the water heater control display is not in a public area that can result in the temperature settings being improperly adjusted.



Step 4: To lower the temperature setpoint, press the "Temperature Down" button until the desired temperature is shown on the water heater display.



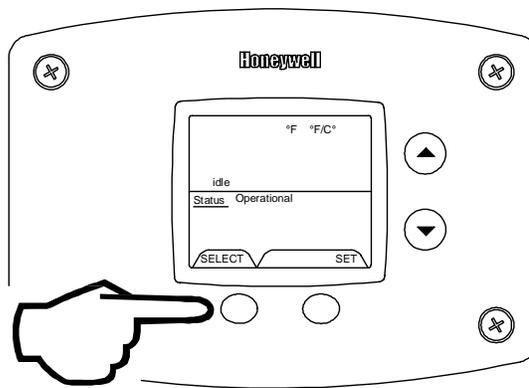
Step 5: When the desired setpoint is reached on the water heater display, press the “Set” button to confirm the new setpoint. “Setpoint” stops flashing in the water heater display.



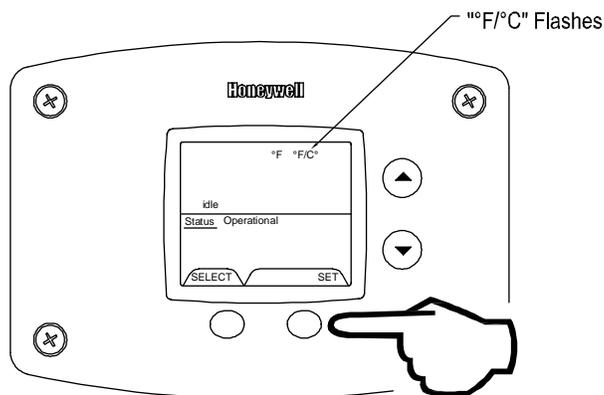
To Display and Change Temperature Format (°F/°C):

To Change Temperature Format in Display from °F to °C or °C to °F:

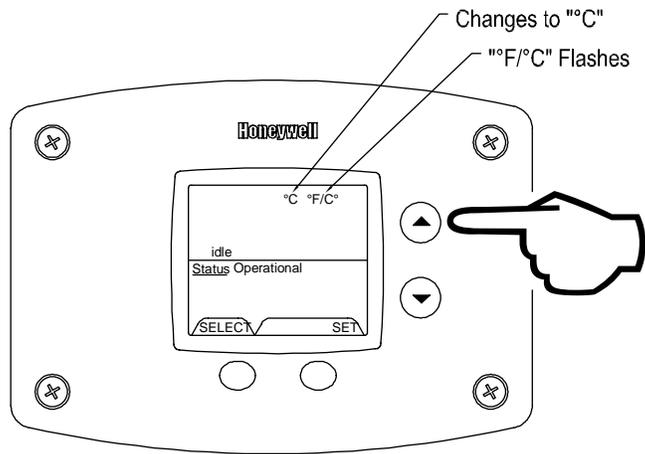
Step 1: While in “Service Mode”, press “Select” button until “°F/°C” is shown in the upper right portion of the water heater display.



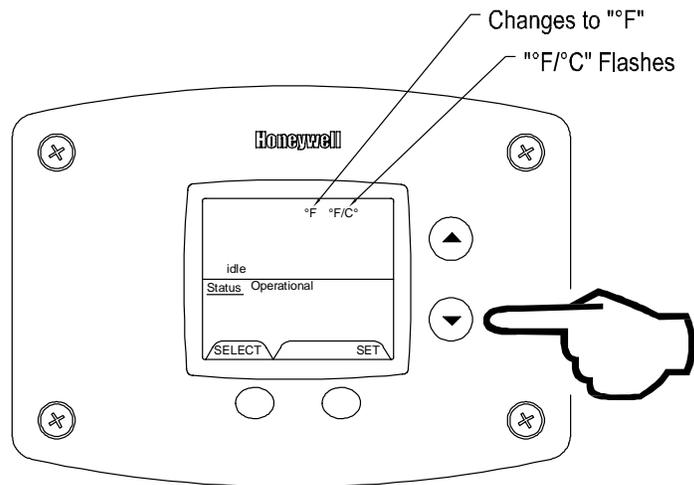
Step 2: Press “Set” button to change temperature format. “°F/°C” symbol will flash in the water heater display.



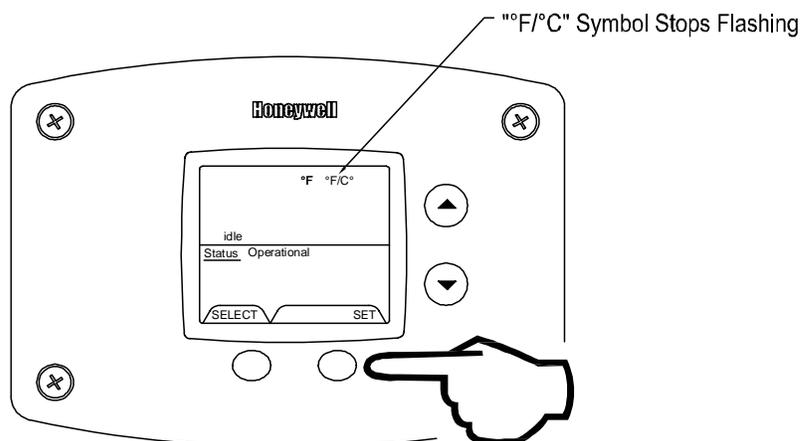
Step 3a: Press "Temperature Up" button to change temperature format to °C



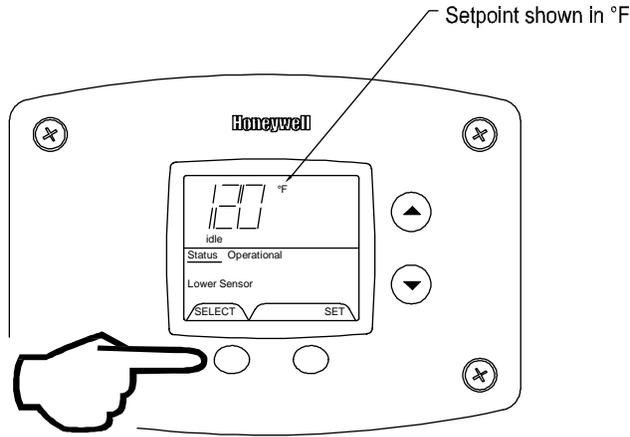
Step 3b: Press "Temperature Down" button to change temperature format to °F



Step 4: Press "Set" button to confirm °F or °C format. °F/°C will stop flashing

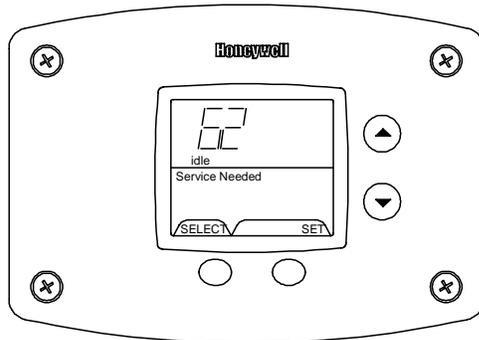


Step 5: Pressing “Select” button will return display to setpoint in format selected (°F or °C) immediately



Error Codes and Error History Display:

If there is an operating problem with the water heater, an error code number will appear on the water heater display with “Service Needed” to the right of the “Status” indicator. The error code label is located under the Water Heater Display and the following section in this Service Manual explains the error codes with corrective actions to repair the water heater.



Example of Error Code in the Display

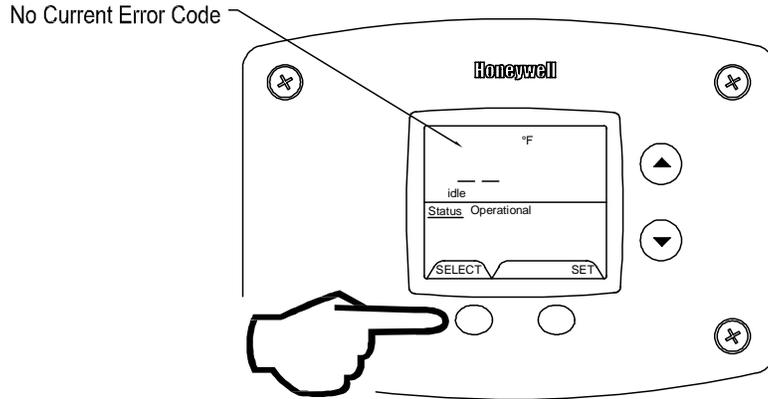
Error Code History:

In “Service Mode” pressing the “Select” button after the “Software Version” (item 8 in the previously described sequence of service modes) will show an error code history, if there have been any previous operating problems with the water heater. If the display shows --, there is not a current error code. The Water Heater Display will provide up to 10 previous error codes. The oldest error code will be stored in code index #1 and the most recent in code index #10.

To view previous error codes:

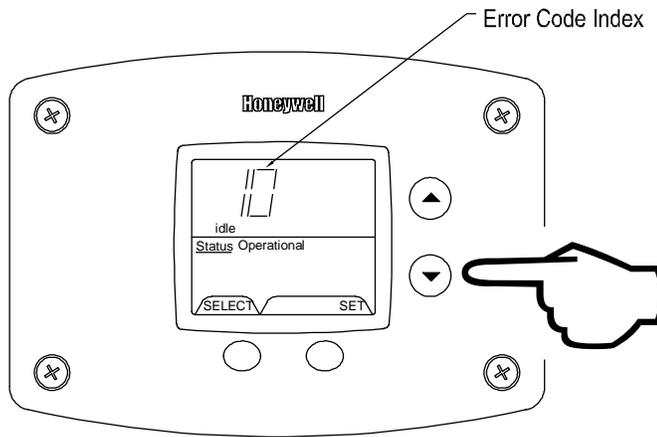
Step 1:

In "Service Mode" press the "Select" button until the next display after the "Software Version". If there are no current error codes, the display will show -- .



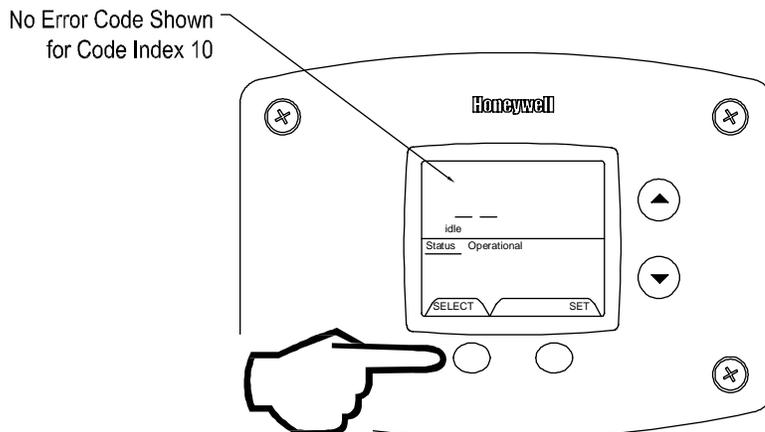
Step 2:

Press the "Temperature Down" button to select the error code index, starting with the most recent error code "10".

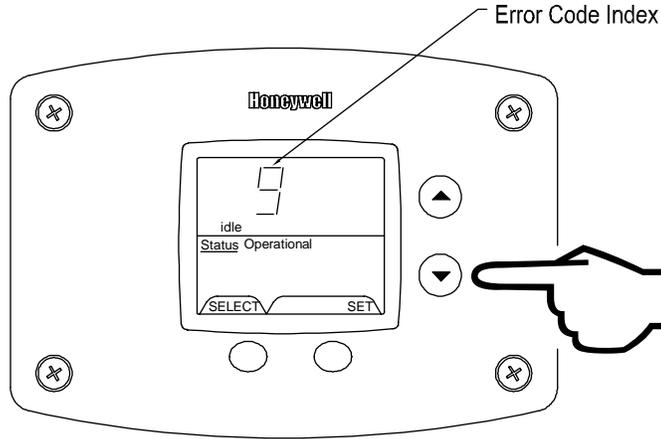


Step 3:

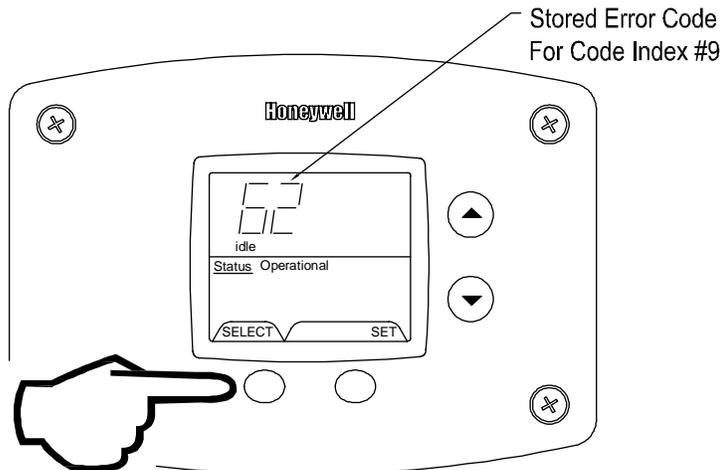
Press the "Select" button to view the error code for "code 10". If there is a number displayed, note what the number is. The label next to the water heater display will identify the code number. If no number is displayed with only a "--" in the water heater display, then there has not been an error code for error code index 10.



Step 4:
Press the "Temperature Down" button to change to the previous code index, code #9.

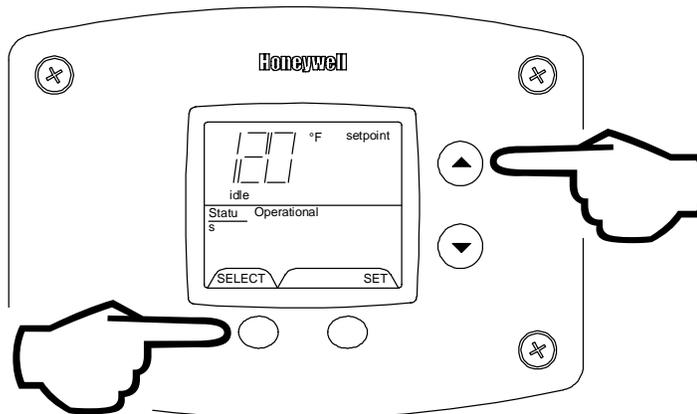


Step 5:
Press the "Select" button for code index #9 to view if there are any code numbers.



Step 6:
Continue pressing the "Temperature Down" button to change to the next error code index and press "Select" to view the error code number, if any, for that index number. Continue on to index #1, the oldest error code index. The water heater display will store up to 10 error codes with the oldest code starting in code index #1 with the most recent code in code index #10.

Step 7: 10 seconds after the last button press, the Water Heater Display will revert back to the current error code display. To exit Service Mode, either wait 30 seconds or press Temperature Up button and Select Button for 3 seconds.



Exiting Service Mode

ERROR CODE DEFINITIONS

If the water heater has an operating problem, there will be a number in the water heater display with "Service Needed" shown below the error code number. Note the error code and the definition in the chart below. This label appears on the control box under the water heater display. The following sections will provide instructions for servicing each error code.

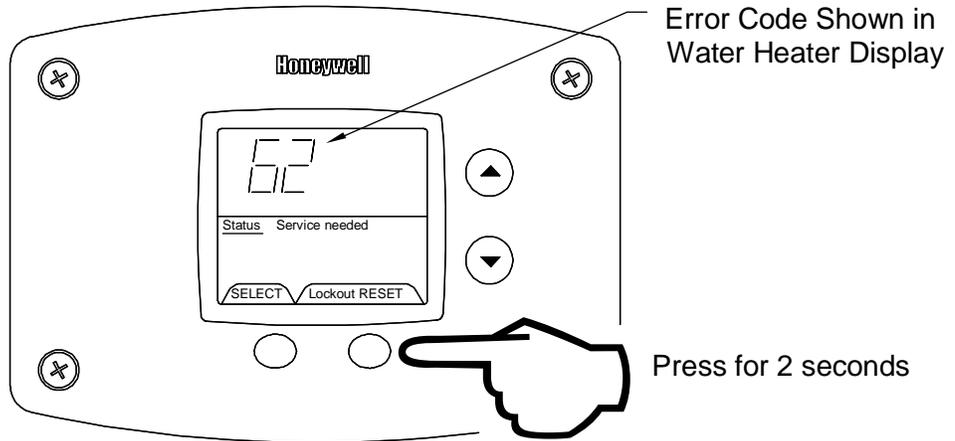
HONEYWELL INTEGRATED CONTROL ERROR CODE DISPLAY FOR PDV AND INDUCED DRAFT MODELS	
ERROR CODE	DEFINITION
4	LOW FLAME SENSE CURRENT
2	PRESSURE SWITCH FAILED TO OPEN (STUCK CLOSED)
29	PRESSURE SWITCH FAILED TO CLOSE (STUCK OPEN)
6	FLAME SENSED OUT OF NORMAL SEQUENCE (BEFORE OPENING GAS VALVE OR AFTER CLOSING GAS VALVE)
23	FLAME DETECTED BEFORE IGNITION
24	FLAME DETECTED AFTER A HEATING CYCLE COMPLETES
31	UPPER SENSOR READINGS FAULTY
32	LOWER SENSOR READINGS FAULTY
57	FLAME ROD SHORTED TO GROUND
58	AC LINE FREQUENCY ERROR – SIGNAL TOO NOISY OR FREQUENCY INCORRECT
59	LINE VOLTAGE TOO LOW OR HIGH
61	DC OUTPUT VOLTAGE UNSTABLE
62	MAXIMUM NUMBER OF RETRIES DETECTED
63	MAXIMUM NUMBER OF IGNITION RECYCLES DETECTED
64	ELECTRONICS FAILURE
65	HIGH WATER TEMPERATURE (OVER 200°F)

IF ANY OF THE ABOVE CODES APPEAR ON THE CONTROL DISPLAY, CONTACT YOUR PLUMBER OR QUALIFIED SERVICE AGENT FOR SERVICE OF THIS WATER HEATER.

▲ WARNING

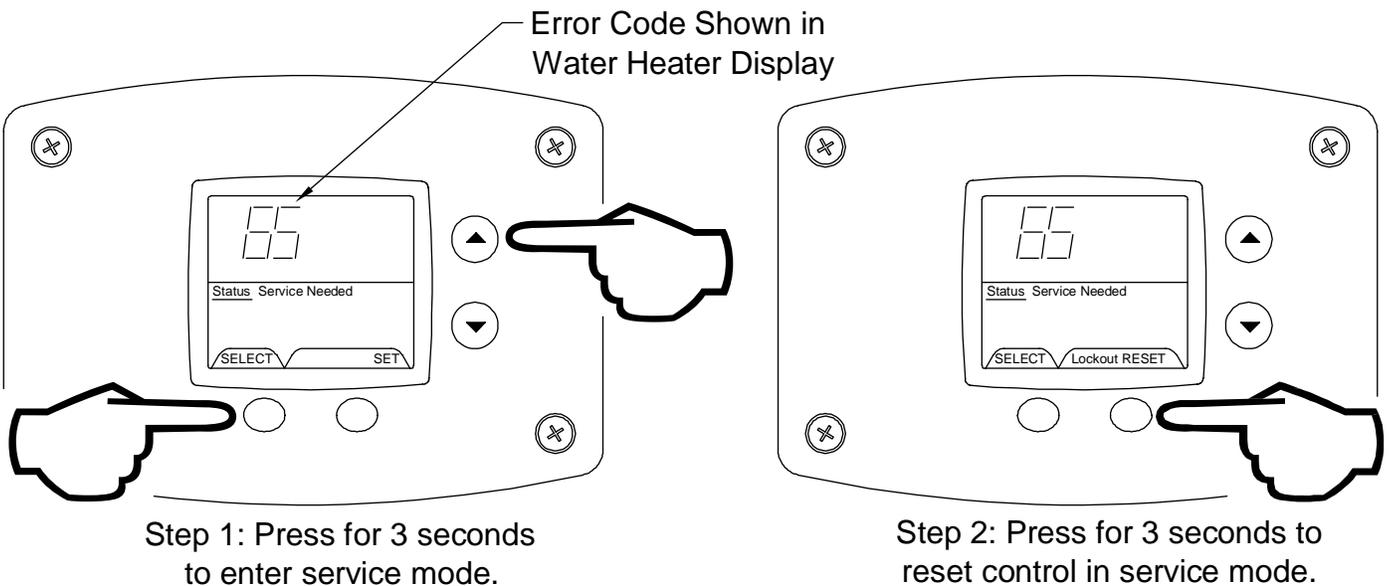
The following procedure is for service and installation personnel only. Resetting lockout conditions without correcting the malfunction can result in a hazardous condition.

If an error code is displayed (except for #4, low flame sense current), the water heater will be in a “lockout condition” with the water heater display showing the error code number and “Service Needed” in the status section of the display window. Error codes 62 (maximum number of retries detected) and 63 (maximum number if ignition recycles detected) are “Soft Lockouts” in which the control can be reset in the “User Mode” by pressing the lower right button under “Lockout Reset” shown in the lower right portion of the display. The control will also go through 3 attempts to relight the burners every hour in the soft lockout condition.



All other error codes will put the water heater into a “Hard Lockout” condition, in which the water heater will not operate and cannot be reset in the “User Mode”. To reset a hard lockout, first enter the “Service Mode” described earlier by pressing both the “Temperature Up” and “Select Buttons” at the same time for 3 seconds. Then press the lower right button under “Lockout Reset” in the water heater display and hold for 3 seconds.

Resetting Error Codes in Hard Lockout Condition



▲ DANGER
120 volt exposure. To avoid personal injury, use caution while performing this procedure.

▲ CAUTION
Be Careful When Making Voltage Measurements or Jumping Terminals Not to Damage or Deform Connectors or Connector Pins.

Condition: Water Heater Not Operating
Display shows error code "31" (Upper Sensor Readings Faulty) or error code "32" (Lower Sensor Readings Faulty)

Unplug or disconnect electrical power to the water heater

Check continuity of wire harness to affected sensor. Measurement of ohmmeter should be close to 0 ohms. Replace wire harness if high resistance is measured (over 0.5 ohms) Check wires for intermittent connections, shorts, frayed insulation. Replace if necessary

If wire harness checks out O.K., check sensor resistance detailed in the section for testing sensor resistance. Replace the upper or lower sensor as indicated by error code number.

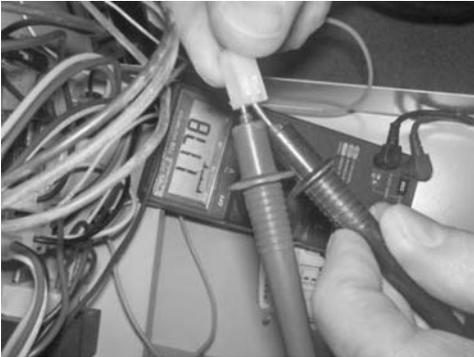
Turn power on to water heater. Run water heater through heating cycle and verify proper operation. Sensor temperature can be viewed when burner shuts off (see section on viewing the display in "Service Mode".

Condition: Water Heater Not Operating
Display shows error code "65"
High Water Temperature (over 200 deg. F)

WARNING
Do not reset the display from the hard lockout state without correcting the cause of the overheating condition

Turn power "OFF".
Draw water to cool tank below 120 deg. F

Check lower sensor. Is the sensor fully inserted into the well? Sensor is held in place with a clip fastened to the well (see photo) Check lower sensor wire making sure it is not damaged or has breaks in the wire insulation. Check upper harness wires to upper sensor, if used (some models).



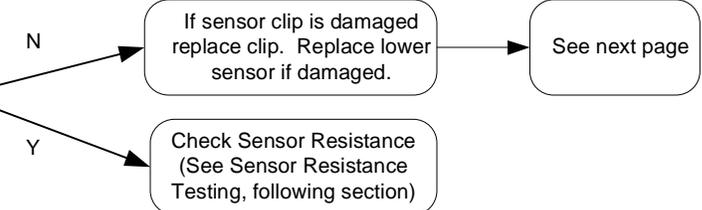
Measuring upper sensor resistance through wire harness (disconnected at control board).



Checking continuity of upper sensor wire harness.



Removing lower sensor from well. Held in place by a clip fastened to well shoulder.



WARNING!

Do not operate water heater without verifying that the overheating condition has been corrected.

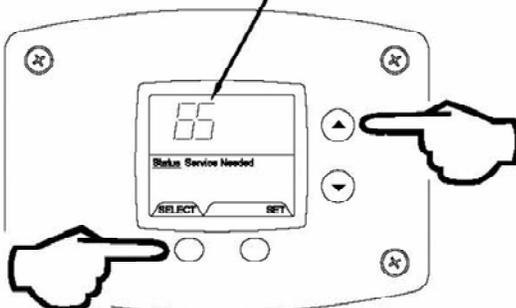
Condition: Water Heater Not Operating
Display shows error code "65"
High Water Temperature (over 200 deg. F)
Continued

Once cause of overheating condition has been diagnosed and corrected, the control may be reset

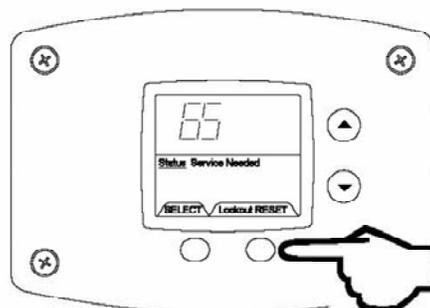
- Reconnect and switch on power to the water heater.
- Enter service mode on the water heater display (see illustration)
- Press button under "Lockout Reset" and hold for 3 seconds.
- Set thermostat to the desired setting.
- Water heater should start.
- Monitor temperatures for one complete heating cycle making sure the maximum tank temperature remains well below 200 deg. F

This water heater is equipped with a manual reset type gas shutoff device designed to shut off the gas to the burners if excessive water temperature occurs. To reset the control, first press the "temperature up" and "select" buttons on the water heater display for 3 seconds to enter service mode. Then press the lower right button under "RESET" in the display for 3 seconds.

Error code 65 indicates high limit lockout condition



Step 1: Press for 3 seconds
to enter service mode.



Step 2: Press for 3
seconds to reset control.

Conditions: Upper or Lower Sensor Reading Faulty, High Water Temperature, or suspect thermostat is not accurate.

SERVICE PROCEDURE PDV24-I Thermostat Circuit Testing

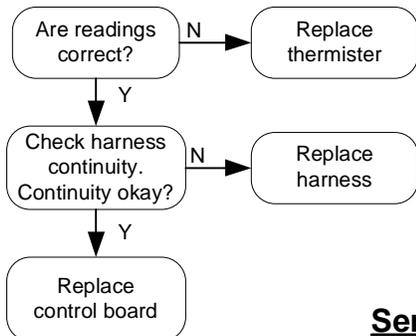
Sensor Resistance Testing

Upper Sensor

1. Determine resistance value of upper sensor using an ohmmeter. Test across grey wires.
2. Draw quart of water off **T&P valve**. Using a thermometer, determine water temperature.
3. Use table below to verify correct resistance per water temperature measured.

Lower Sensor:

1. Determine resistance value of lower sensor. Test across center wire (common) to each outside wire. Resistance of both thermistors in the lower sensor should be close to each other. If the resistance values for both thermistors are not close to each other, replace the lower sensor. The dual thermistors are used to provide high limit protection in case the thermostat circuit fails to shut off the water heater.
2. Draw quart of water off **Drain Valve**. Using a thermometer, determine water temperature.
3. Use table below to verify correct resistance per water temperature measured.



Upper thermister location (applicable models)

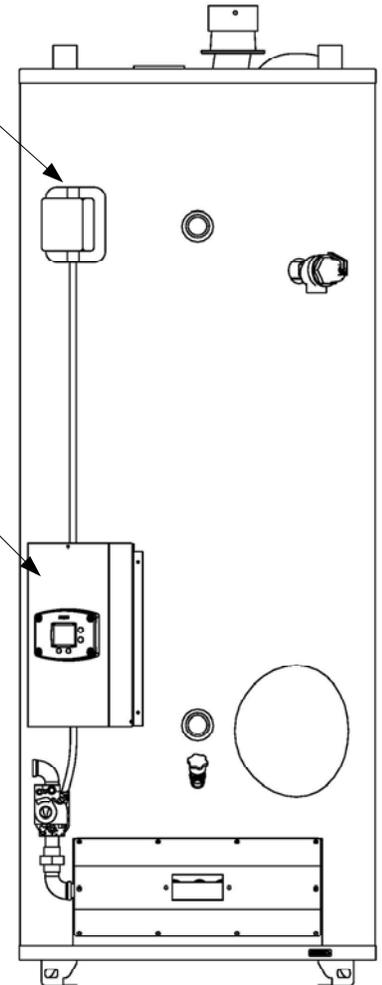


Checking resistance of upper sensor

Lower thermister access located inside control box.



Checking resistance of lower sensor (center and outside pins)



CAUTION
Be Careful When Making Resistance Measurements Not to Damage or Deform Connectors or Connector Pins.

Sensor Resistance at Various Temperatures

Example: If water temperature is 84°F, then the resistance through the sensor would be 8449 (see shaded area).

NOTE: Sensor resistance increases as the temperature falls.

In Degrees F										
°F	0	1	2	3	4	5	6	7	8	9
40	26109	25400	24712	24045	23399	22771	22163	21573	21000	20445
50	19906	19383	18876	18383	17905	17440	16990	16553	16128	15715
60	15314	14925	14548	14180	13823	13477	13140	12812	12494	12185
70	11884	11592	11308	11032	10763	10502	10248	10000	9760	9526
80	9299	9078	8862	8653	8449	8250	8057	7869	7685	7507
90	7333	7165	7000	6839	6683	6531	6383	6238	6098	5961
100	5827	5697	5570	5446	5326	5208	5094	4982	4873	4767
110	4663	4562	4464	4368	4274	4183	4094	4006	3922	3839
120	3758	3679	3602	3527	3453	3382	3312	3244	3177	3112
130	3048	2986	2925	2866	2808	2752	2697	2643	2590	2538
140	2488	2439	2391	2344	2298	2253	2209	2166	2124	2083
150	2043	2004	1966	1928	1891	1856	1820	1786	1753	1720
160	1688	1656	1625	1595	1566	1537	1509	1481	1454	1427
170	1402	1376	1351	1327	1303	1280	1257	1235	1213	1191
180	1170	1150	1129	1110	1090	1071	1053	1035	1017	999
190	982	965	949	933	917	901	886	871	857	842
200	828	814	801	788	775	762	749	737	725	713

DANGER
120 volt exposure. To avoid personal injury, use caution while performing this procedure.

CAUTION
Be Careful When Making Voltage Measurements or Jumping Terminals Not to Damage or Deform Connectors or Connector Pins.

Condition: Blower operates, burners not lit. Display shows error code "29" (Pressure Switch Failed to Close).

Minimum Differential Dual Tap Pressure Switch Settings:
(Contacts open)

PDV80S,100S-150 models:	-2.00" w.c.
PDV80S,100S-200 models:	-1.20" w.c.
PDV80S,100S-250 models:	-2.00" w.c.
PDV80T300 models:	-1.20" w.c.
PDV100T360 models:	-0.60" w.c.

Connect a digital manometer to the tubing for the pressure switches and determine the average reading. See table at right for pressure switch settings and minimum readings required. Is the pressure switch reading at least 0.20" above the switch reading for the model tested (see chart at right)?

Note: During normal hot running conditions, the pressure switch readings should be at least 0.20" higher than the above readings where the pressure switch will open.

Check intake and exhaust vent terminals outside the building. Is there any blockage from debris (leaves, ice, snow, paper, etc.). If so, clear intake or exhaust vent terminals. Pressure switch should close and the burners should fire.

PDV80,100S-150,200 Models with 3" PVC vent: Maximum Distance of 40 feet with one 90 deg. elbow for intake or exhaust (subtract 5 feet for each additional elbow).
For venting with 4" PVC vent: Maximum distance of 55 feet with one 90 deg. elbow for intake or exhaust (subtract 5 feet for each additional elbow).

Check the total equivalent vent length by adding up the total number of elbows and the straight lengths of vent pipe for the intake and exhaust pipe (or coaxial vent pipe for PDV-T model series). See table at right for maximum distances. If the venting distance is excessive, reduce the number of elbows or route the vent terminals to a shorter distance outside the building.

PDV80S,100S-250 Models with 4" PVC vent: Maximum distance of 55 feet with one 90 deg. elbow for intake or exhaust (subtract 5 feet for each additional elbow).

If the venting system and vent terminals are O.K., but the pressure switch reading is still low, check the pressure switch tubing to make sure there are no small holes or kinks. Make sure there are no drops of condensate in the tubing. Check the pressure switch tubing connection fitting and pressure tap to make sure it is not clogged with dirt. Blow through tubing to verify that the pressure taps and tubing are clear and not leaking.

PDV80T300, PDV100T360 Models with coaxial venting system: Maximum venting distance of 19 feet 6 inches with one 90 deg. elbow. Each additional elbow reduces the venting distance by 39".

See installation instruction manuals supplied with the water heater for further details on proper venting installations.

PDV-S MODELS: Check the vent safety thermal switch near the outlet of the blower (see photo at right). Press the red reset button. (See photo on next page). If you feel a slight click, the temperature was excessive and the switch opened. Check to be sure the burner access screws are tight and the gasket is in good condition (see section on servicing the burners)

If the pressure switch readings are at least 0.20" w.c. above the above pressure switch settings for the installed model and the switch does not close, then replace the pressure switch with the same setpoint.



Checking pressure switch contacts. Contacts are open if blower is operating and there is 22-26 volts measured between the two contacts (as in photos)

DANGER
120 volt exposure. To avoid personal injury, use caution while performing this procedure.

CAUTION
Be Careful When Making Voltage Measurements or Jumping Terminals Not to Damage or Deform Connectors or Connector Pins.

PDV(S & T) Models



Check pressure switch tubing to the pressure switch. Make sure tubing does not have kinks, holes, condensate, or dirt blocking air pressure to the switch. The tubing to the blower tap attaches to the - (minus) tap on the pressure switch.

Vent Safety Switch (PDV-S Models Only)

Red reset button



Vent safety thermal switch on PDV-S blower. Depress red reset button in center of switch. If a slight click is felt, switch opened. Check for loose or leaking burner access panel (see section on servicing burners)

Induced Draft Models (D80T725 & D65T625):



Induced Draft Models use a single tap pressure switch to measure vacuum in the flue collector. The pressure switch is located inside the control box (see photo to left). Connect a digital manometer to a tee in the pressure switch tubing and measure the vacuum with the blower operating. The vacuum should be in the range of -1.70" to -2.10" w.c. The pressure switch **contacts will open at -1.25"** and **close by -1.40" w.c.** If the vacuum is below -1.50", check to make sure the flue damper is fully open when the blower is operating. Make sure the damper and rod are not binding. Make sure there are no restrictions in the venting system and that is at least 8" in diameter. Venting is for vertical gravity venting only. Insure that there is sufficient combustion air to the utility room.

SERVICE PROCEDURE PDV24-II
Pressure Switch Testing

DANGER
120 volt exposure. To avoid personal injury, use caution while performing this procedure.

CAUTION
Be Careful When Making Voltage Measurements or Jumping Terminals Not to Damage or Deform Connectors or Connector Pins.

Condition: Blower does not operate, burners not lit. Display shows error code "29" (Pressure Switch Failed to Close).

With a voltmeter, check to make sure the "line in" connection to the control board has 110-120 volts. Make sure the secondary plug from the transformer to the board has 24 volts at the yellow and blue wire pin terminals (see photos to right).

Make sure the water heater control display shows "Heating" in the status window. Raise the setpoint if needed. If there is no call for heat and the setpoint is well above the tank temperature, refer to the thermostat troubleshooting and replacement section.

If the water heater control display shows "Heating" and the blower is off, Error code 29, then check the voltage output at the blower plug on the board. Should read 110-120 volts between the black and white wires to the blower (terminals 5 and 3 on the inducer output on the control board, see illustration to the right).

If there is voltage between the black and white wires to the blower plug on the board, then check the voltage at the blower connection on the blower (see photo at right). If no voltage is present, replace the wire harness. If there is 110-120 volts, replace the blower.

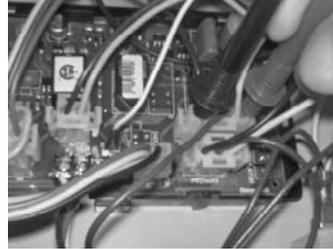
Condition: Blower does not operate, burners not lit. Display shows error code "2" (Pressure Switch Failed to Open - Stuck Closed).

Disconnect power and remove the pressure switch cover (previous photo-PDV models). Disconnect wires on the pressure switch. Measure continuity on the pressure switch terminals with an ohmmeter. If there is continuity, the pressure switch is stuck closed. Make sure pressure switch has not been bypassed (jumpered). The control will not operate with a jumpered pressure switch.

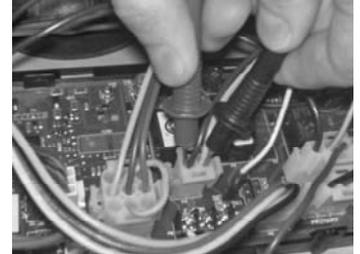
If pressure switch contacts are stuck closed, check the pressure switch tubing for condensate, dirt, or kinks. If the tubing is O.K., replace the pressure switch with the same setting.

Reconnect power. Verify proper operation.

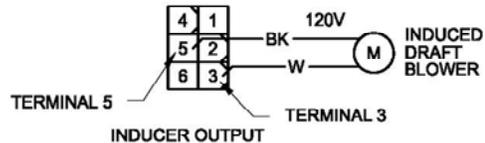
If there is no voltage on the control board to the blower plug and the control display shows "Heating", then replace the control board.



Checking line voltage to board. Pins to black and white wires.



Checking secondary voltage from transformer. Pins to blue and yellow wires.



Checking line voltage at the blower wire harness connection on blower.

⚠ DANGER
120 volt exposure. To avoid personal injury, use caution while performing this procedure.

⚠ CAUTION
Be Careful When Making Voltage Measurements or Jumping Terminals Not to Damage or Deform Connectors or Connector Pins.

Condition:
Pilot will not light or stay lit, Error codes 62, or 63 shown on Water Heater Display

Reset control by pressing the lower right button under "reset" on the display for 3 seconds. Does control board start ignition sequence and start sparking (sparking noise at pilot or at board)

N → Replace control board

Y → Is there spark at the pilot?

N → Check for:
Loose or damaged ignition wire
Grounded pilot electrode
Damaged pilot.

Y → Is there 22-27 volts AC output across terminal pins 8 & 2 on "Control" plug of Control Board? Carefully insert meter probe in wire plug to check pin terminals. Make sure control is in the trial for ignition sequence (see sequence of operation). (see photo at top of page)

N → Replace control board.

Y → Is there 22-27 volts AC input across wire leads "MV/PV" & "PV" at Gas Valve? (see photo to the right)

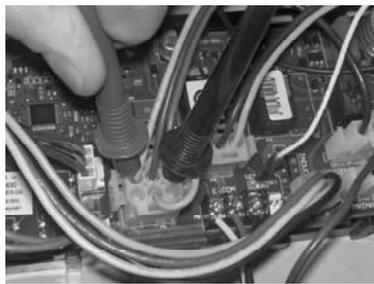
Y → Loosen pilot tubing connection at the gas valve and soap test. Is there pilot gas flow out of the gas valve? See pilot illustration for pilot inspection.

Y → Check for clogged or kinked pilot tube, clogged pilot orifice. Clean or replace as needed. (see photo below)

N → Check wire harness for damage or loose connections. Repair or replace as needed.

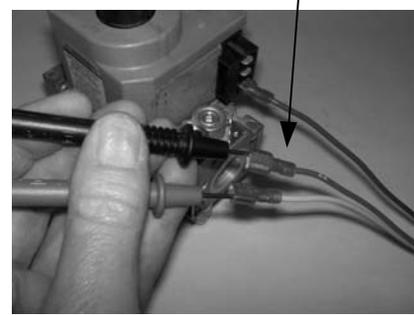
N → Tighten pilot tube connection at the gas valve. Check incoming gas pressure to water heater. if okay, replace gas valve

Turn on power to the water heater and verify proper operation

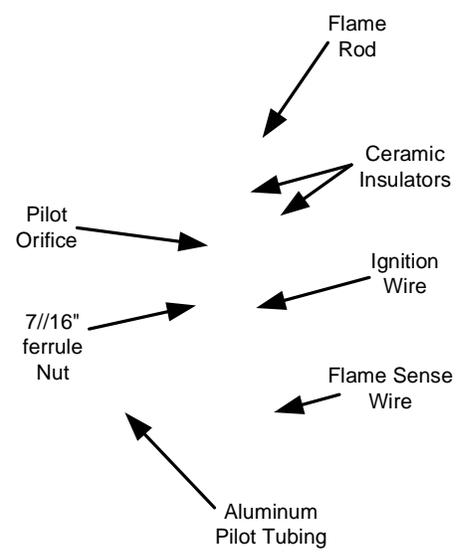


Checking for 24 volts output to pilot valve (yellow and red wire pin terminals on control board "control" plug).

Check across "MV/PV" & "PV" Wire leads to gas valve



Checking MV pin terminal to gas valve wire harness for 24 volts output to gas valve during heating cycle (pilot must be lit with no sparking).



SERVICE PROCEDURE PDV24-III
Pilot Operation Testing

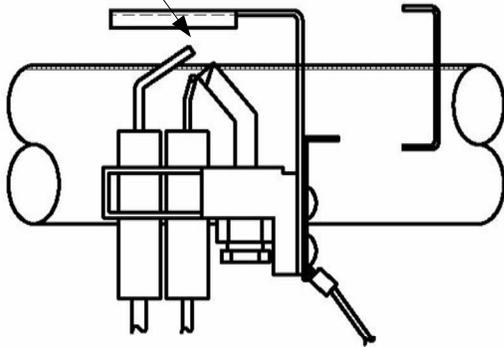
Condition:
Error code 57: Flame Rod Shorted to Ground

Disconnect power. Shut off gas supply to water heater. Slide out burner assembly. See section on removing pilot and main burner assembly.

Check to see if pilot shield is touching pilot flame sensor or flame sensor touching pilot hood. Bend shield to prevent interference.

Check pilot flame sense wire for broken insulation. Replace pilot if defective

Make sure pilot shield clears flame sense rod



Reinstall pilot and burner assembly. Reconnect gas line union, turn on gas. Reconnect power and verify proper ignitions.

⚠ DANGER
120 volt exposure. To avoid personal injury, use caution while performing this procedure.

⚠ CAUTION
Be Careful When Making Voltage Measurements or Jumping Terminals Not to Damage or Deform Connectors or Connector Pins.

Condition:
Pilot lights, no or low flame signal. Control Display shows "4" or "62" for Error Codes (Service Needed). Control continues to spark until system "Lock Out". Main burner will not light.

Check for loose or damaged flame sense lead from pilot to module. (see illustration to the right). Is flame sense lead okay?
N → Repair wire lead or replace pilot.

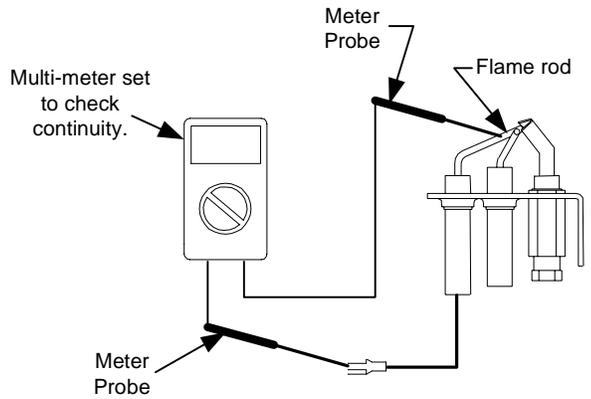
Check for loose or damaged ground wire(s) from gas valve to control board. Check continuity of wires with ohmmeter. Are ground wires okay?
N → Repair ground wire(s) or replace as needed.

Check venting conditions (vent length & number of elbows) Is vent system okay?
N → Correct improper venting condition.

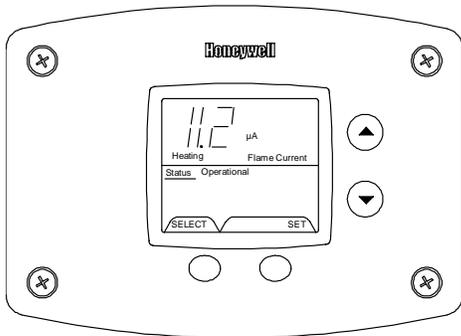
Is heater condensing causing pilot interruption?
Y → Make sure pilot shield is in place and not bent or damaged (refer to section on main burner and pilot assembly) . Determine cause for condensing and correct. Under sized water heater or high demand periods

The microamp output of the pilot may be checked by entering "Service Mode" on the water heater display and pressing "Select" until the flame current is shown. The control must be in the heating mode with the pilot lit to display a reading. See section on accessing service mode on the water heater display.
NOTE: Check continuity of flame sense lead to flame rod. If no continuity, clean pilot flame rod or replace pilot. Check pilot flame appearance - if weak check for clogged pilot orifice, bent pilot tubing, or low inlet gas pressure. (see above illustration)

Micro-amp readings
0.000 Micro Amp = Replace control board or pilot if wire is damaged.
1.0 micro amp or less = Clean pilot flame rod or replace pilot.



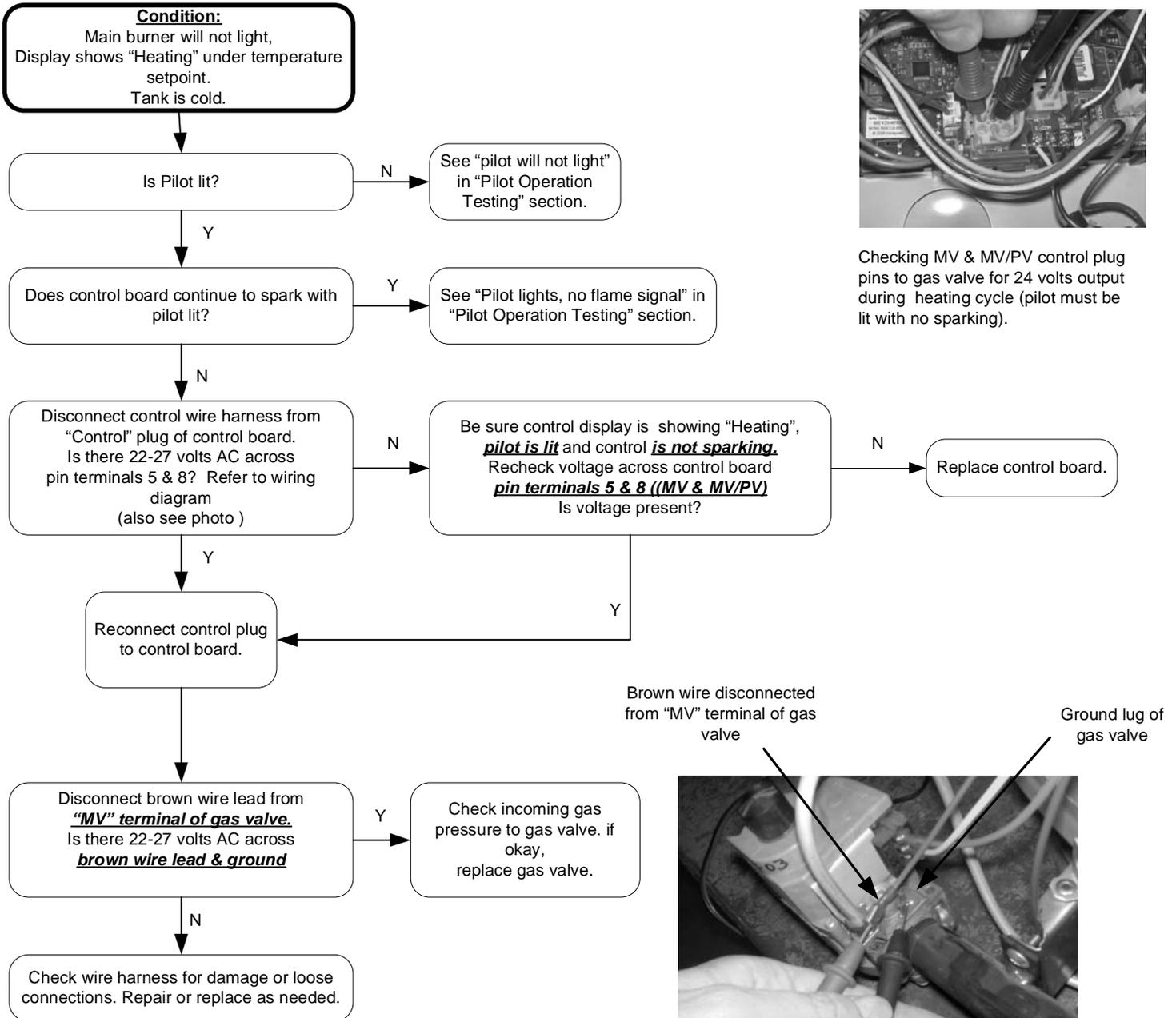
Checking pilot flame sensor wire and flame rod for continuity.



Pilot flame sensor microamp output shown in display using service mode. Pilot must be lit to get reading.

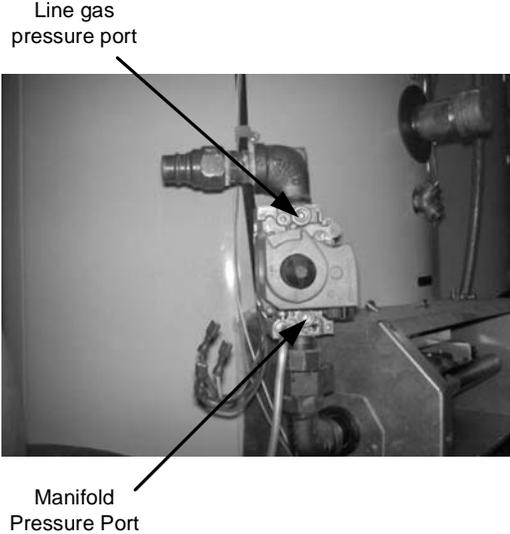
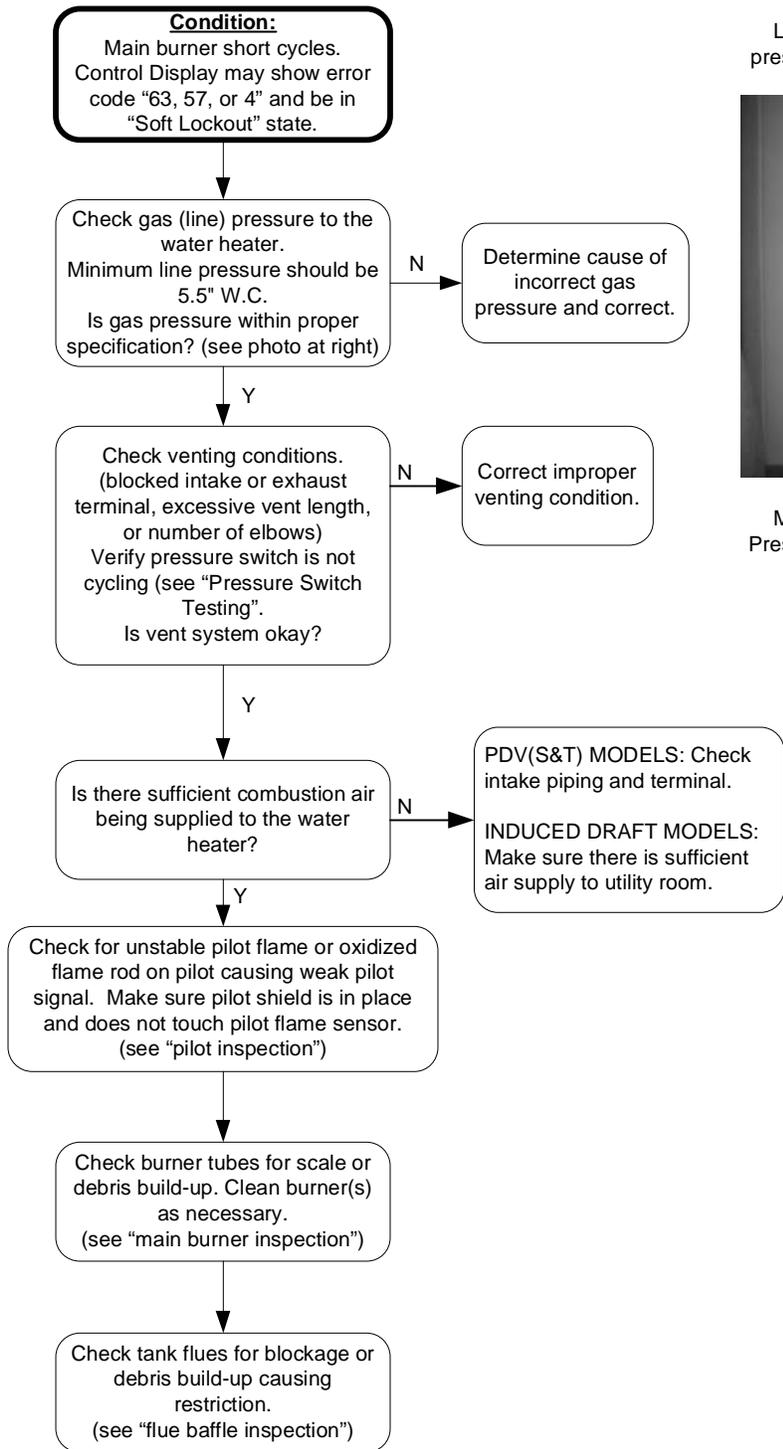
⚠ DANGER
120 volt exposure. To avoid personal injury, use caution while performing this procedure.

⚠ CAUTION
Be Careful When Making Voltage Measurements or Jumping Terminals Not to Damage or Deform Connectors or Connector Pins.



⚠ DANGER
120 volt exposure. To avoid personal injury, use caution while performing this procedure.

⚠ CAUTION
Be Careful When Making Voltage Measurements or Jumping Terminals Not to Damage or Deform Connectors or Connector Pins.



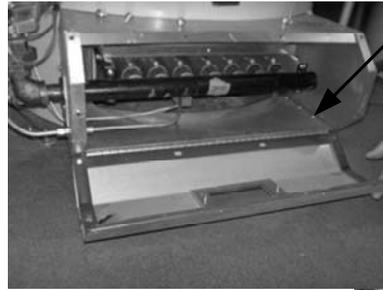
Connect hose barb to manifold pressure port, then connect monometer to measure gas manifold pressure.

⚠ WARNING
Water Heater components may be HOT when performing the following steps in this procedure. Take necessary precaution to prevent personal injury.

PDV (S&T) MODELS



Step 1: Remove burner box cover screws



PDV-S MODELS
(Hinged Door)



PDV-T MODELS
(Removable Door)

Step 2: Open Burner Box Cover



Step 3: Disconnect Pilot Fitting from Burner Box



Step 4: Disconnect gas valve wires and pilot tube



Step 5: Disconnect and Remove Gas Valve



Step 6: Remove pipe flange plate from Burner Box

⚠ WARNING
Water Heater components may be HOT when performing the following steps in this procedure. Take necessary precaution to prevent personal injury.

PDV (S&T) MODELS



Step 7: Remove manifold bracket screws



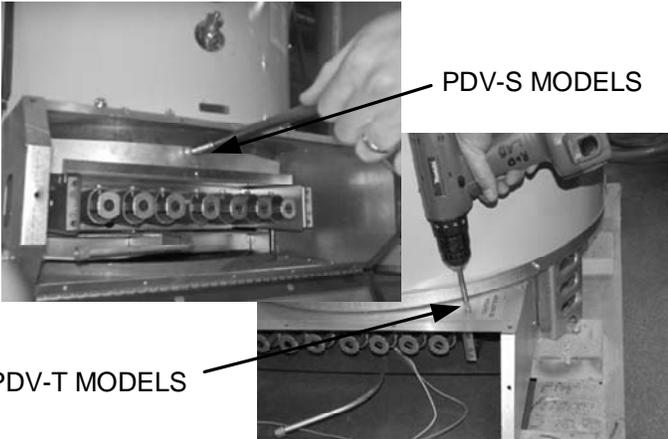
Step 8: Remove manifold from Burners



Step 9: Slide manifold out through side flange opening in Burner Box



Step 10: Disconnect Pilot Tube Fitting from inside Burner Box



PDV-S MODELS

PDV-T MODELS

Step 11: Remove screw fastening burner to burner box/burner shroud.

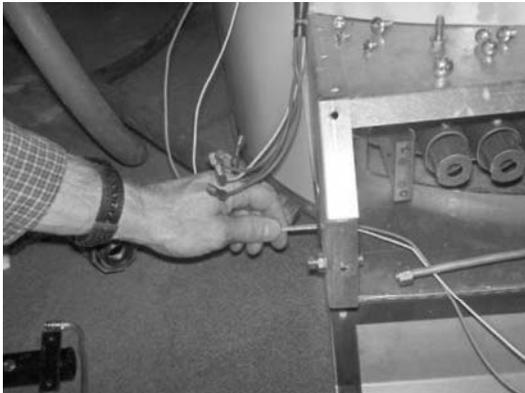


Step 12: Disconnect Pilot wires from control board and remove from Control Box

⚠ WARNING

Water Heater components may be HOT when performing the following steps in this procedure. Take necessary precaution to prevent personal injury.

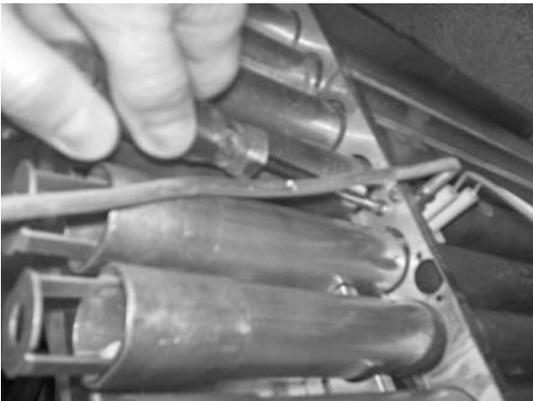
PDV (S&T) MODELS



Step 13: Pull pilot wires through burner box



Step 14: Slide out burner assembly



Step 15: To remove pilot, remove pilot bracket screws



Step 16: Slide pilot assembly to back of burner rack



Step 17: Pilot removal for servicing.

⚠ WARNING

Water Heater components may be **HOT** when performing the following steps in this procedure. Take necessary precaution to prevent personal injury.

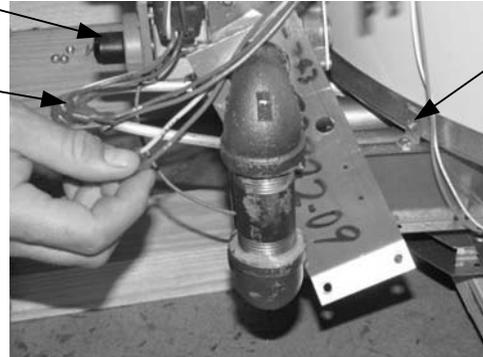
INDUCED DRAFT MODELS

Main Burner Removal

- Step 1. Disconnect (un-plug) water heater from electrical supply.
- Step 2. Turn "OFF" gas supply to water heater.
- Step 3. Rotate gas valve control knob to the "OFF" position (see photos at right).
- Step 4. Disconnect Gas supply line from the gas valve.
- Step 5. Disconnect wire leads from gas valve (see photos at right).
- Step 6. Disconnect white flame sense wire & orange ignition wire from Control Board (see photos at right).
- Step 7. Remove the two burner rack mounting screws (see photos).
- Step 8. Slide complete burner rack out from water heater (see photos below).
- Step 9. To install burner, reverse above procedure.
- Step 10. Check for gas leaks and verify proper operation.

Gas Valve
Control Knob

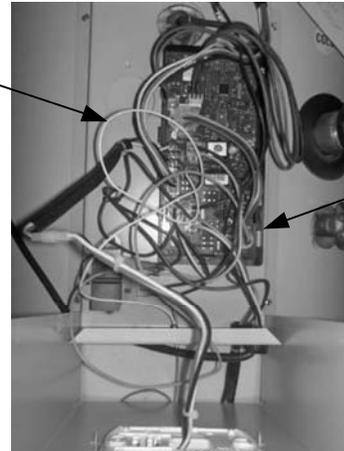
Gas Valve
Wire Leads



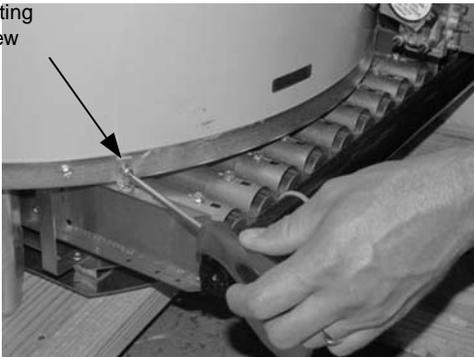
Burner Rack
Mounting
Screw

Pilot Flame Sense
Wire (White)

Pilot spark wire
(Orange)



Burner Rack
Mounting
Screw



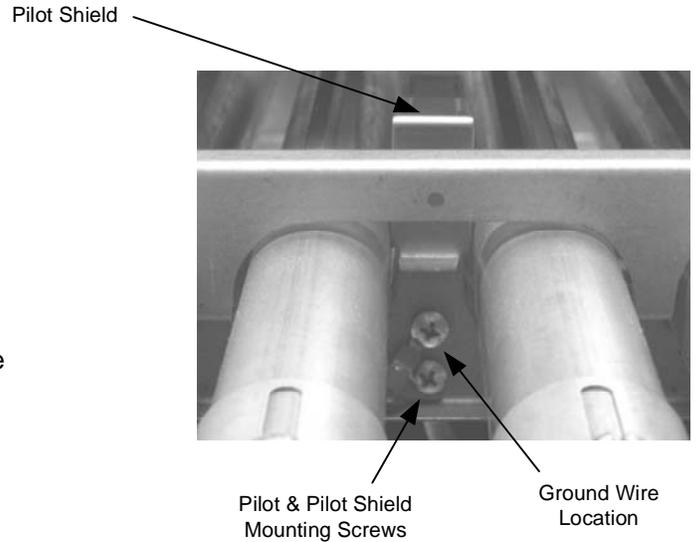
Pilot Draft
Shield



PDV (S&T) AND INDUCED DRAFT MODELS

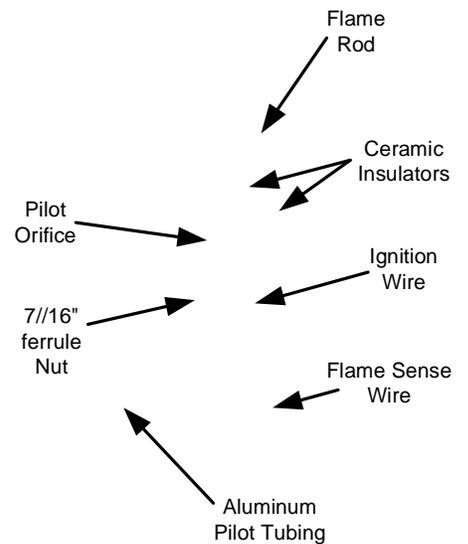
Pilot Burner Removal

- Step 1. With burner rack removed from heater, disconnect pilot tube connection from gas valve
- Step 2. Remove the two pilot burner mounting screws securing the pilot and pilot shield in place.
- Step 3. Remove pilot shield and pilot from burner rack.
- Step 4. To install pilot burner and pilot shield, reverse above procedure. Be sure to reconnect green ground wire.

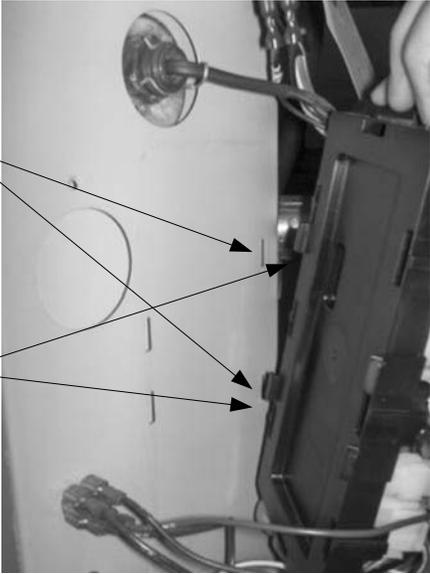
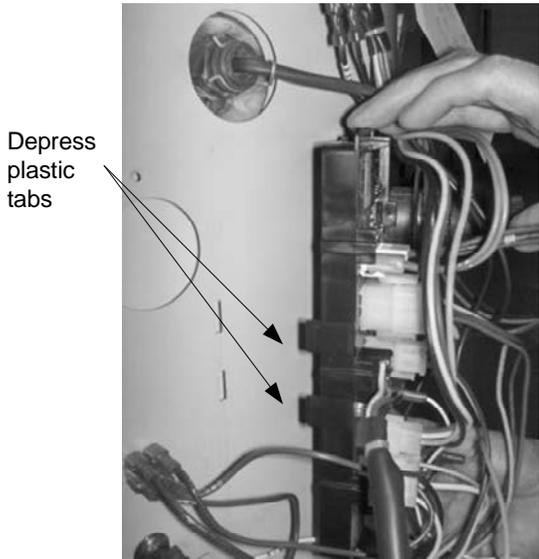


Pilot Burner Inspection

- Step 1. Inspect pilot for the following:
 - a) Broken or cracked ceramic insulators. If found, pilot must be replaced.
 - b) Damaged electrode or flame sense wire. If found, pilot must be replaced.
 - c) Oxidation build-up on flame rod. Clean flame rod or replace pilot as necessary.
- Step 2. Inspect pilot orifice:
 - a) Remove 7/16" ferrule nut from bottom of pilot.
 - b) Remove pilot tube and orifice from pilot.
 - c) Inspect pilot tube for blockage. Clean or replace as necessary.
 - d) Inspect pilot orifice for blockage. Clean or replace as necessary.



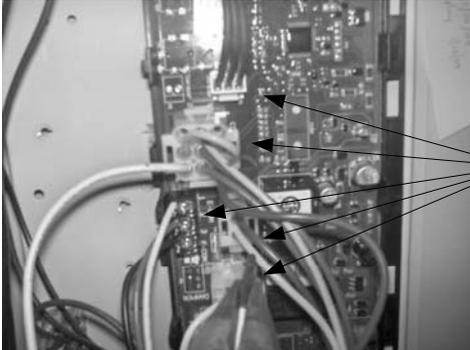
⚠ DANGER
120 volt exposure. To avoid personal injury, unplug while performing this procedure.



Control board replacement

Step 1. Depress left plastic tabs and pull out from slots in control panel

Step 2. Tilt control panel to the right and slide control hook tabs from slots in control panel.



Step 3. Unplug wire connections from board and replace.



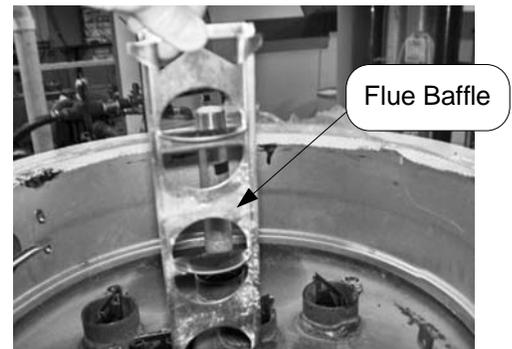
Remove lower sensor

Remove clip, pull sensor out.

⚠ WARNING

Heater components may be HOT when performing the following steps in this procedure. Take necessary precaution to prevent personal injury.

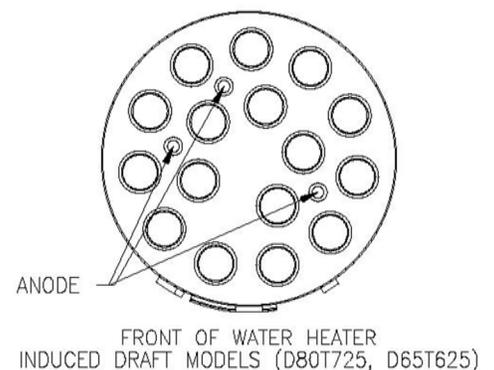
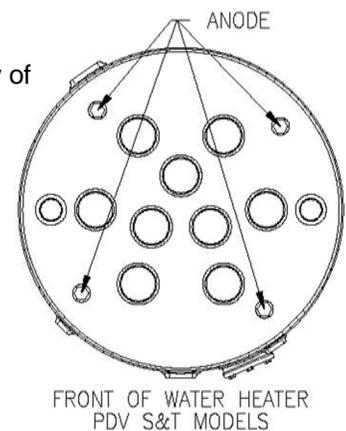
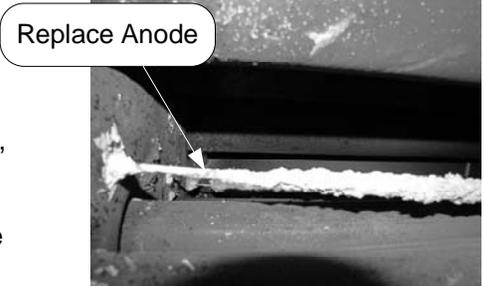
- Step 1. Disconnect (unplug) water heater from electrical supply.
- Step 2. Turn "OFF" water supply to water heater.
- Step 3. Open a near by hot water faucet to relieve tank pressure.
- Step 4. Connect hose to drain valve of water heater and route to an open drain. Open drain valve and drain a minimum of 5 gallons of water from the water heater. Close drain valve and disconnect drain hose from water heater.
- Step 5. If required, disconnect top plumbing connection from top of water heater.
- Step 6. Remove screws holding jacket head to top of water heater and remove jacket head from top of water heater. Note, it may be necessary to use a screw driver to pry underneath jacket head.
- Step 7. If required, remove insulation from top of water heater to expose collector cover.
- Step 8. Remove screws from top (or side) of collector cover. Note, it may be necessary to chisel away some foam to access screws.
- Step 9. Remove collector cover from water heater.
- Step 10. Remove flue baffles from water heater. Note, it may be necessary to use pliers to loosen and remove baffles from flue tubes.
- Step 11. Visually inspect flue baffles. Flue baffles may show signs of oxidation; this is normal. If the oxidation has deteriorated any portion of the flue baffle, replacement is recommended. If any restrictors are missing, replacement is recommended.
- Step 12. Upon completion of inspection or subsequent replacement, reinstall flue baffles into heater.
- Step 13. Reinstall collector cover and insulation (if applicable) over collector cover.
- Step 14. Reinstall jacket head.
- Step 15. Reconnect plumbing connection to top of water heater & turn on water supply if required.
- Step 16. Check for leaks and verify proper operation.



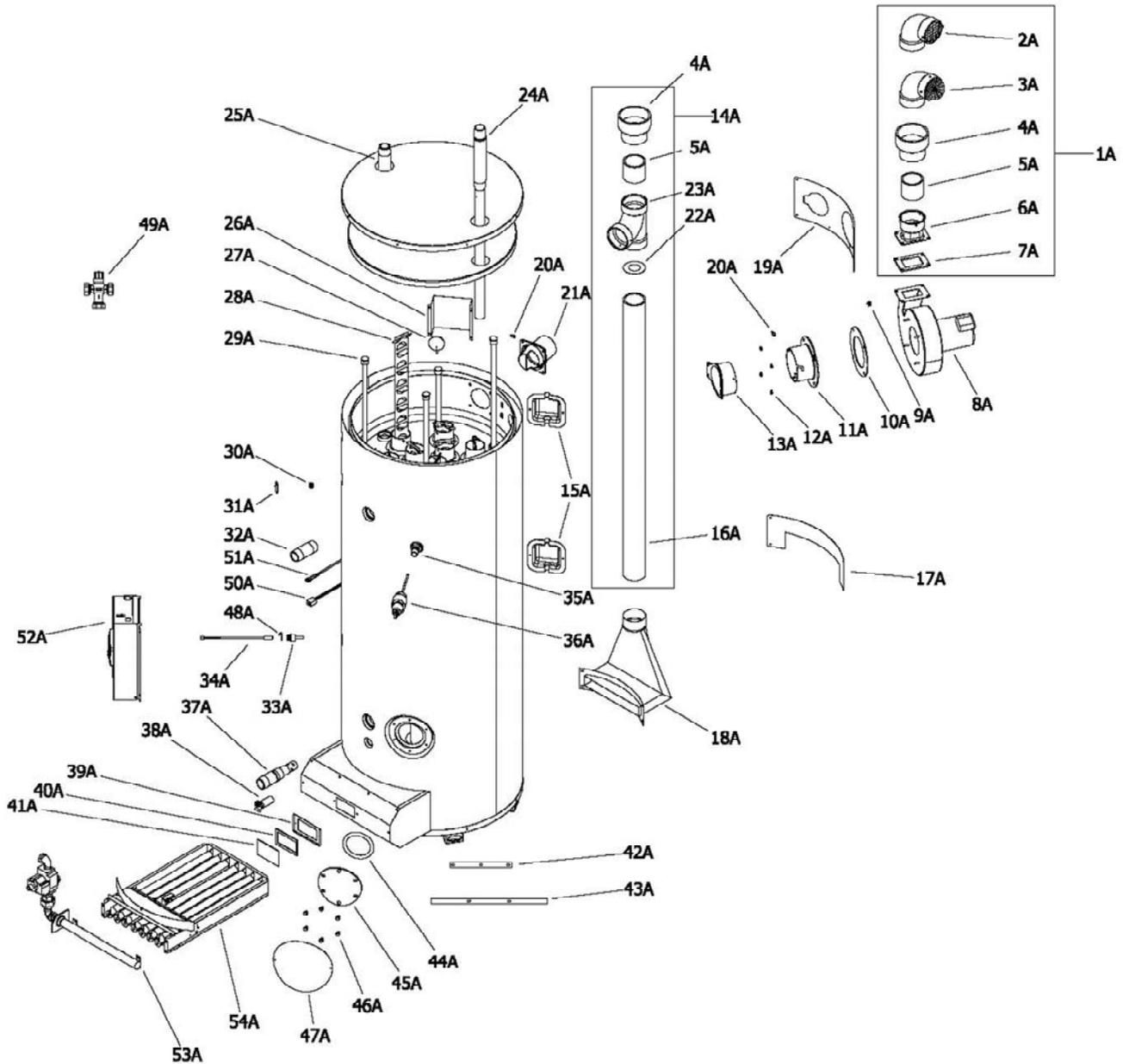
PDV Models

⚠ WARNING
Water Heater components may be HOT when performing the following steps in this procedure. Take necessary precaution to prevent personal injury.

- Step 1. Disconnect (unplug) water heater from electrical supply.
- Step 2. Turn "OFF" water supply to water heater.
- Step 3. Open a near by hot water faucet to relieve tank pressure.
- Step 4. Connect hose to drain valve of water heater and route to an open drain. Open drain valve and drain a minimum of 5 gallons of water from the water heater. Close drain valve and disconnect drain hose from water heater.
- Step 5. If required, disconnect top plumbing connection from top of water heater.
- Step 6. Remove screws holding jacket head to top of water heater and remove jacket head from top of water heater. Note, it may be necessary to use a screw driver to pry underneath jacket head (see photos at right).
- Step 7. Remove insulation from top of water heater to expose collector cover, if necessary. (see bottom of page for approx. anode locations)
- Step 8. Remove screws from top (or sides) of collector cover. Note, it may be necessary to chisel away some foam to access screws.
- Step 9. Locate and remove anode rods from top of water heater (1-1/16 hex socket).
- Step 10. Visually inspect anode rod. Anode rod may show signs of depletion; this is normal. If the anode shows signs of depletion (approximately 5/8", see photo at right), replacement is recommended. If any of the steel core of the anode is exposed, replacement is recommended.
- Step 11. Upon completion of inspection or subsequent replacement, reinstall anode rods into water heater.
- Step 12. Check for leaks.
- Step 13. Reinstall collector cover & insulation over collector cover, if applicable.
- Step 14. Reinstall jacket head.
- Step 15. Reconnect plumbing connection to top of water heater if required.
- Step 16. Restore water supply and power to water heater.
- Step 17. Verify proper operation.

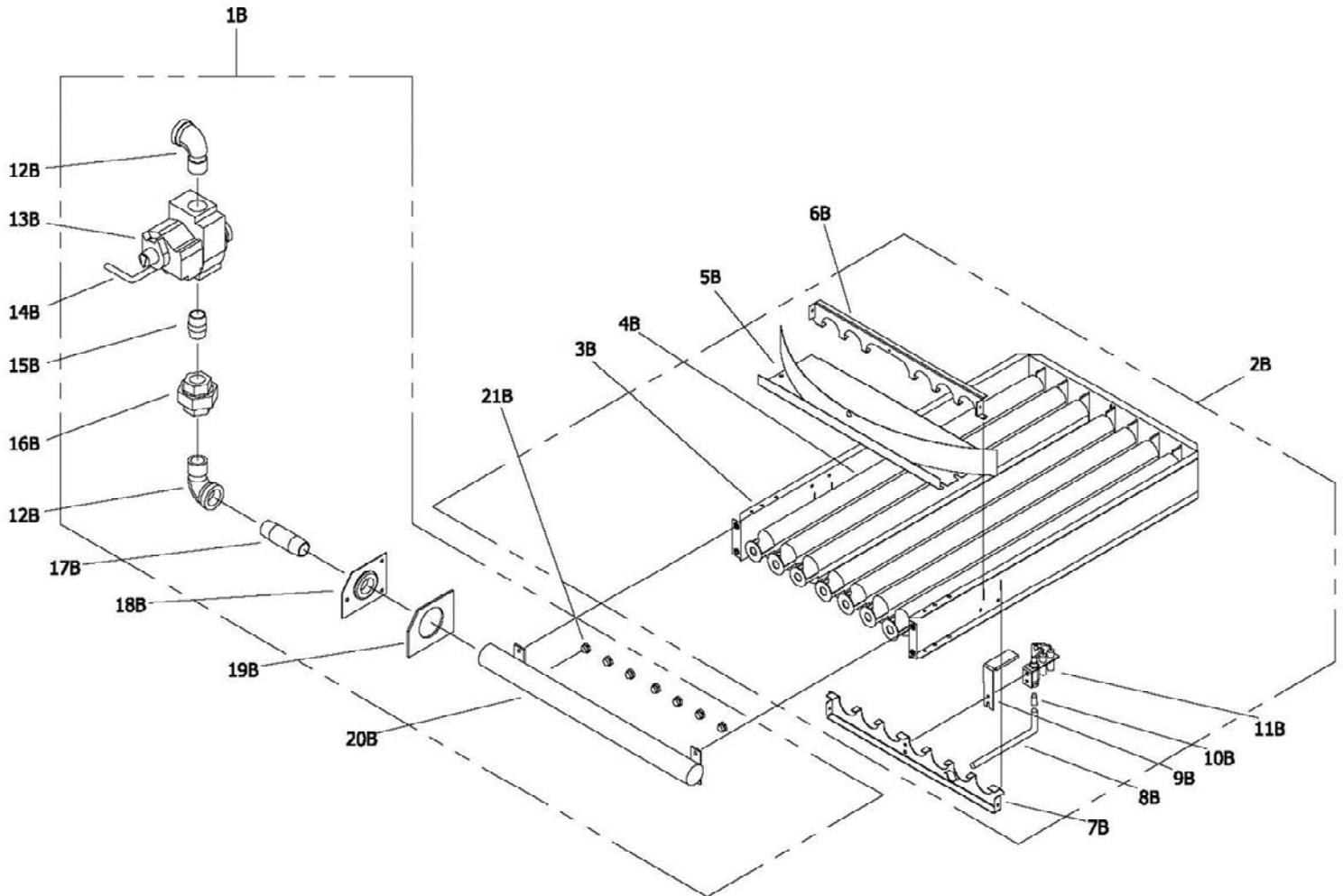


Generic Parts List
PDV-S



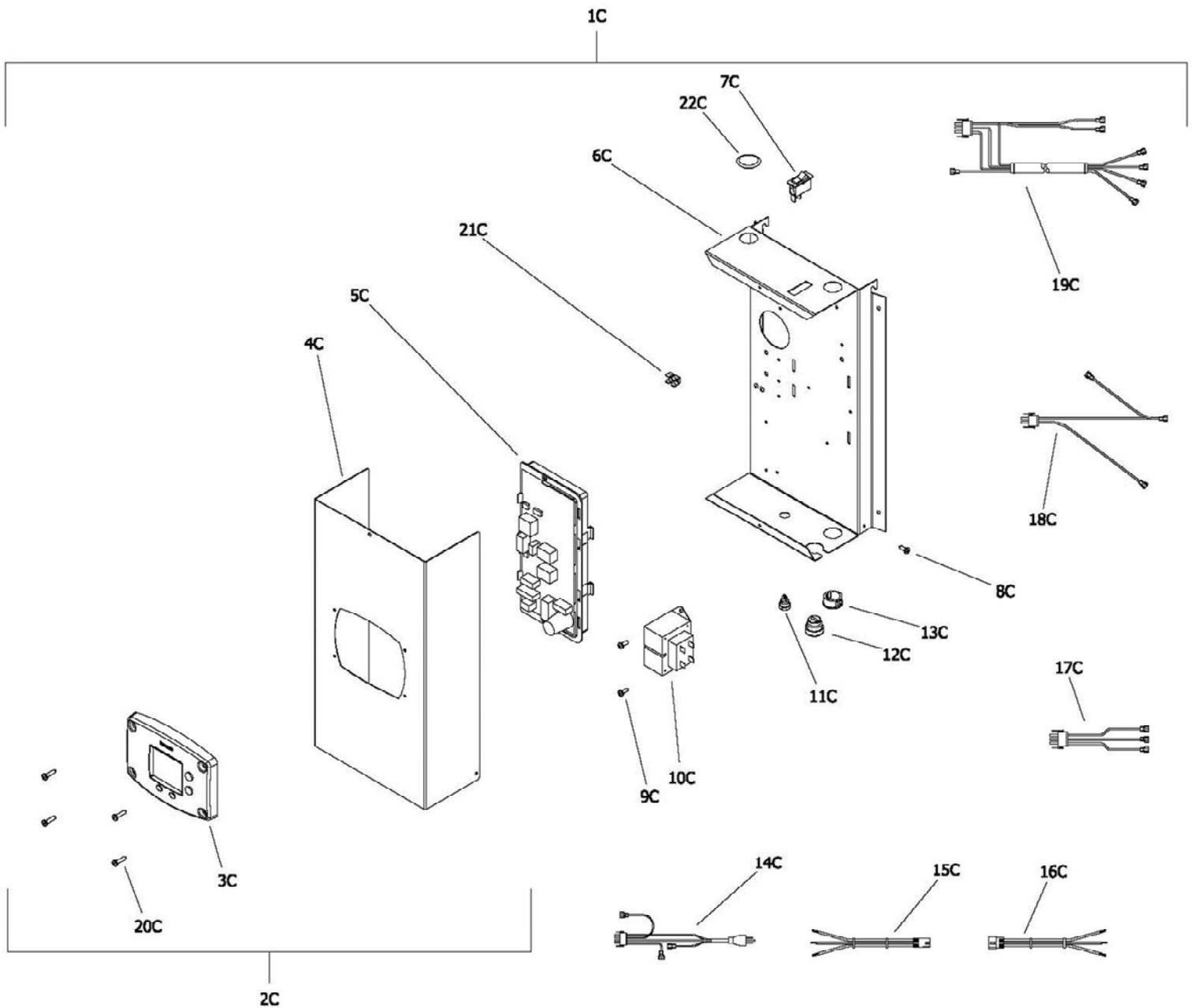
- | | | |
|-------------------------------------|--------------------------------|-----------------------------------|
| 1A. Vent Kit | 18A. Combustion Box Boot | 35A. T & P Nipple |
| 2A. Vent Elbow | 19A. Blower Escutcheon | 36A. T & P Valve |
| 3A. Intake Terminal | 20A. Blower Hose Barb | 37A. Cold Water Inlet Nipple |
| 4A. Vent Reducer | 21A. Air Inlet | 38A. Drain Valve |
| 5A. PVC Pipe | 22A. Vent Orifice | 39A. Sight Glass Holder |
| 6A. Blower Vent Adaptor | 23A. Air Intake Tee | 40A. Sight Glass Gasket |
| 7A. Blower Receptacle Gasket | 24A. Cold Water Inlet Dip Tube | 41A. Sight Glass |
| 8A. Blower | 25A. Hot Water Outlet Nipple | 42A. Combustion Box Gasket |
| 9A. Temperature Switch | 26A. Pressure Switch Cover | 43A. Combustion Box Gasket |
| 10A. Blower Intake Gasket | 27A. Pressure Switch | 44A. Cleanout Gasket |
| 11A. Blower Mounting Flange | 28A. Flue Baffle | 45A. Cleanout Cover (Tank) |
| 12A. 1/4-20 Hex Nut | 29A. Hex Head Anode | 46A. 5/16-18 Hex Screw |
| 13A. Collector to Blower Transition | 30A. Pipe Plug | 47A. Cleanout Cover (Jacket) |
| 14A. Air Intake Assembly | 31A. Hole Closure | 48A. Lower Thermostat Sensor Clip |
| 15A. Utility Cover | 32A. Hot Water Outlet Nipple | 49A. ASSE Approved Mixing Valve |
| 16A. Air Intake Pipe | 33A. Lower Thermostat Well | 50A. Blower Harness |
| 17A. Cover Rear Boot | 34A. Wire Harness Lower Sensor | 51A. Pressure Switch Harness |

Generic Parts List
PDV S



- | | |
|------------------------|----------------------------|
| 1B. Gas Valve Assembly | 12B. Street Elbow |
| 2B. Burner Assembly | 13B. Gas Valve |
| 3B. Burner Rack | 14B. Aluminum Tubing |
| 4B. Burner Tube | 15B. Nipple Close |
| 5B. Burner Shroud | 16B. Union |
| 6B. Burner Draft Panel | 17B. Nipple |
| 7B. Burner Support | 18B. Combustion Box Flange |
| 8B. Aluminum Tubing | 19B. Flange Gasket |
| 9B. Pilot Shield | 20B. Manifold |
| 10B. Pilot Orifice | 21B. Main Burner Orifice |
| 11B. Pilot Assembly | |

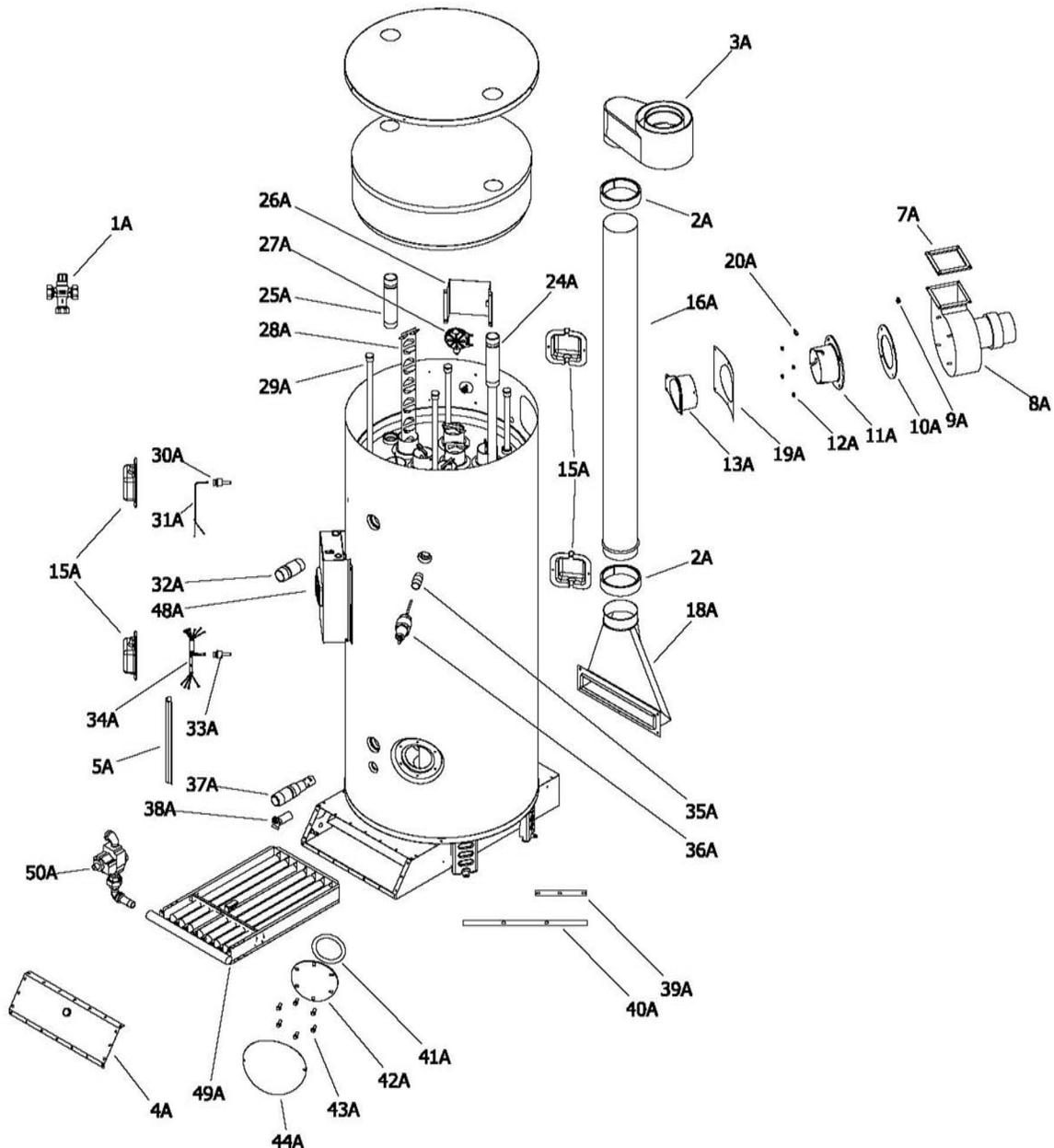
Generic Parts List
PDV-S



- 1C. Control Box Assembly
- 2C. Control Box Cover Assembly
- 3C. Honeywell Display
- 4C. Control Box Cover
- 5C. Integrated Control Board
- 6C. Control Box Panel
- 7C. Power On/Off Switch
- 8C. Pan Head Screw w/adh.
- 9C. Pan Head Screw #8-18
- 10C. Transformer
- 11C. Strain Relief Bushing 1/2"

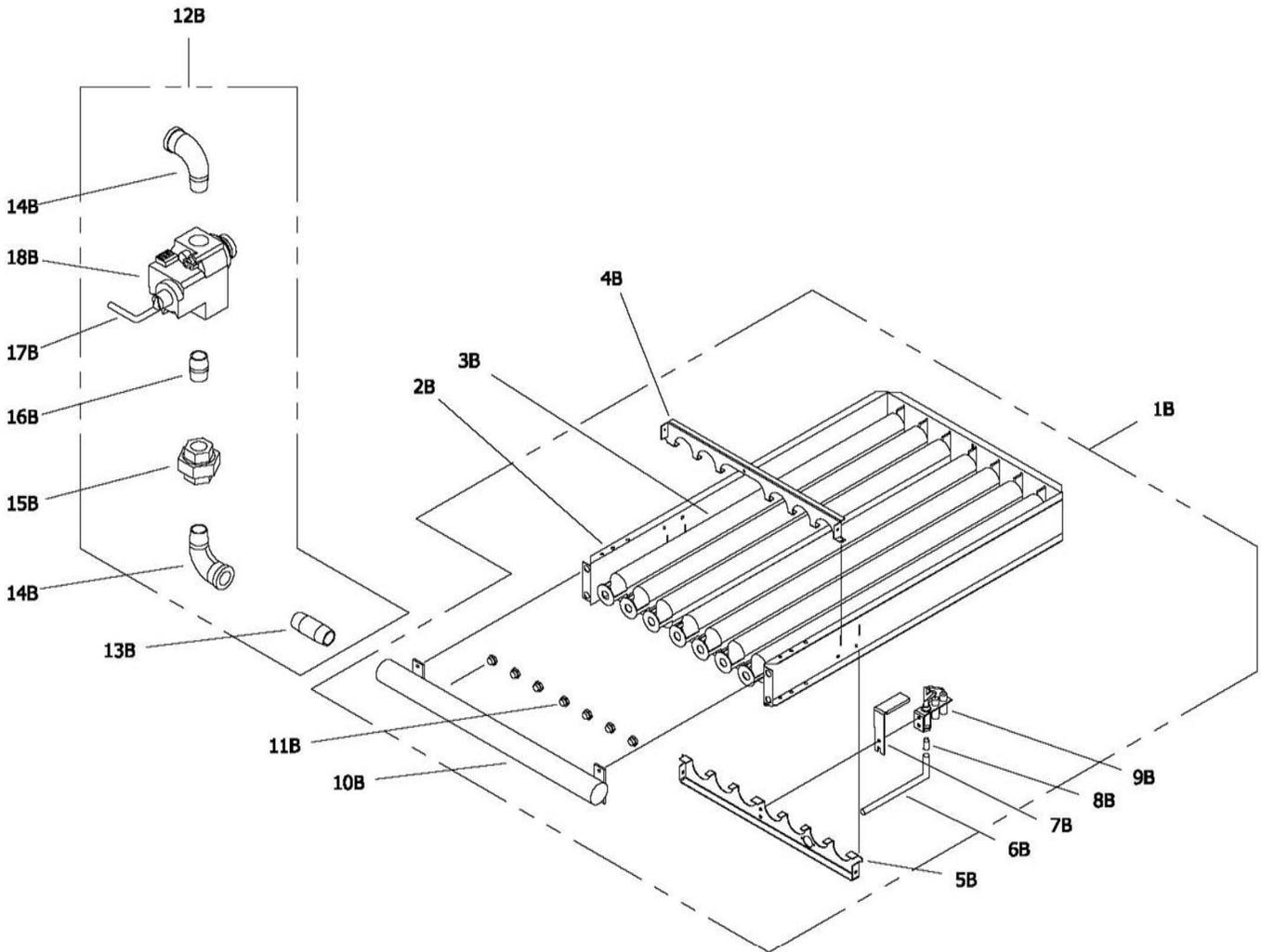
- 12C. Strain Relief Bushing 7/8"
- 13C. Snap-In-Bushing 7/8"
- 14C. Power Cord Wiring Harness
- 15C. Display Control Wiring Harness
- 16C. Display Cover Wiring Harness
- 17C. Primary Transformer Wiring Harness
- 18C. Secondary Transformer Wiring Harness
- 19C. Gas Valve Control Wiring Harness
- 20C. Pan Head Screw #8-18.
- 21C. Ground Lug
- 22C. Snap-In-Plug 7/8"

Generic Parts List
PDV-T



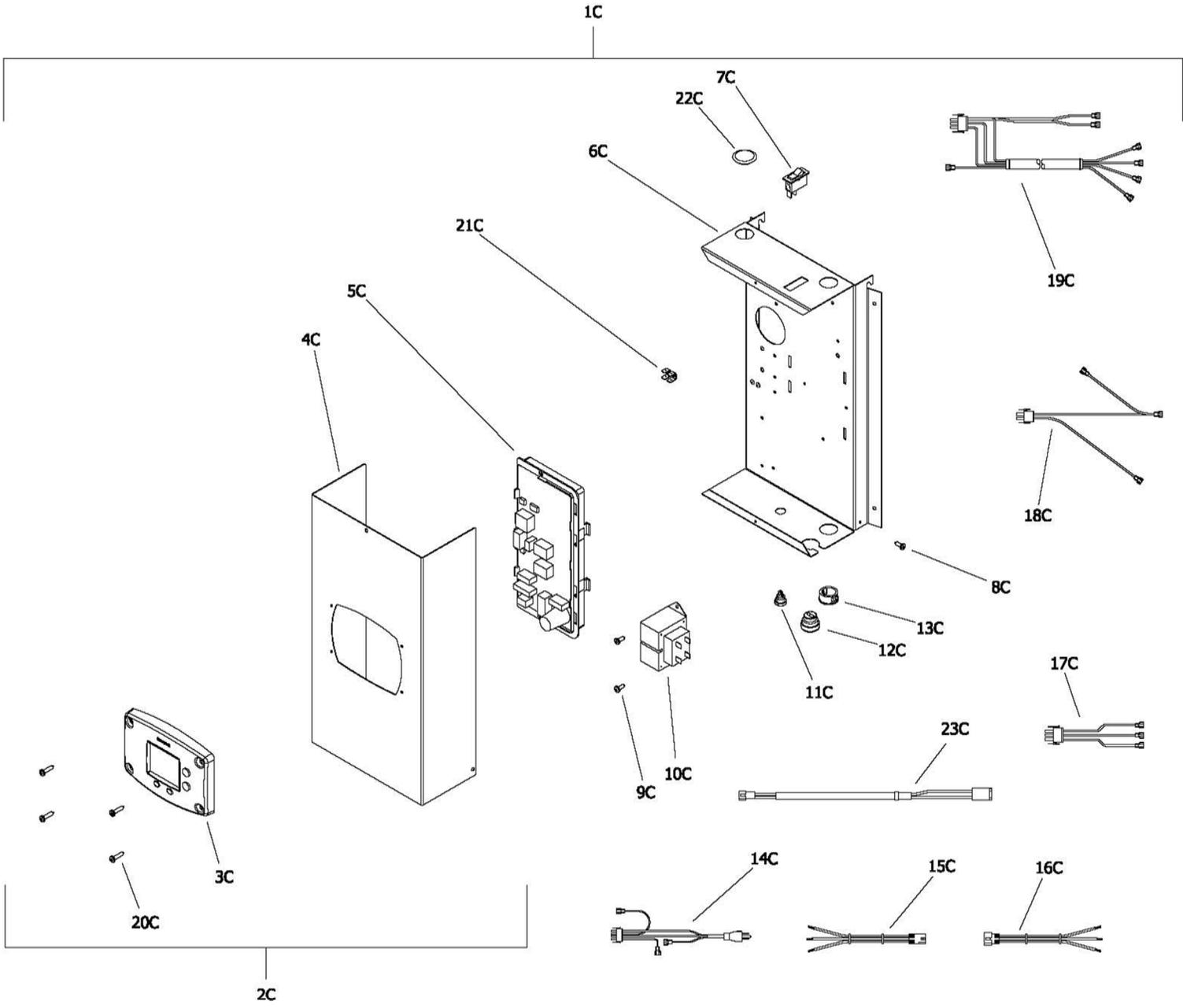
- | | | |
|-------------------------------------|--------------------------------|--------------------------------|
| 1A. ASSE Approved Mixing Valve | 18A. Combustion Box Boot | 35A. T & P Nipple |
| 2A. Vent Clamp | 19A. Blower Escutcheon | 36A. T & P Valve |
| 3A. Blower Vent Adapter | 20A. Blower Hose Barb | 37A. Cold Water Inlet Dip Tube |
| 4A. Combustion Box Cover | 24A. Cold Water Inlet Dip Tube | 38A. Drain Valve |
| 5A. Wire Raceway | 25A. Hot Water Outlet Nipple | 39A. Combustion Box Gasket |
| 7A. Blower Receptacle Gasket | 26A. Pressure Switch Cover | 40A. Combustion Box Gasket |
| 8A. Blower | 27A. Pressure Switch | 41A. Cleanout Gasket |
| 9A. Temperature Switch | 28A. Flue Baffle | 42A. Cleanout Cover (Tank) |
| 10A. Blower Intake Gasket | 29A. Hex Head Anode | 43A. 5/16-18 Hex Screw |
| 11A. Blower Mounting Flange | 30A. Upper Thermostat Sensor | 44A. Cleanout Cover (Jacket) |
| 12A. ¼-20 Hex Nut | 31A. Upper Sensor Wire Harness | |
| 13A. Collector to Blower Transition | 32A. Hot Water Outlet Nipple | |
| 15A. Utility Cover | 33A. Lower Thermostat Sensor | |
| 16A. Air Intake Pipe | 34A. Lower Sensor Wire Harness | |

Generic Parts List
PDV T



- | | |
|--------------------------|-------------------------|
| 1B. Burner Assembly | 12B. Gas Valve Assembly |
| 2B. Burner Rack | 13B. Nipple |
| 3B. Burner Tube | 14B. Street Elbow |
| 4B. Burner Draft Panel | 15B. Union |
| 5B. Burner Support | 16B. Nipple Close |
| 6B. Aluminum Tubing | 17B. Aluminum Tubing |
| 7B. Pilot Shield | 18B. Gas Valve |
| 8B. Pilot Orifice | |
| 9B. Pilot Assembly | |
| 10B. Manifold | |
| 11B. Main Burner Orifice | |

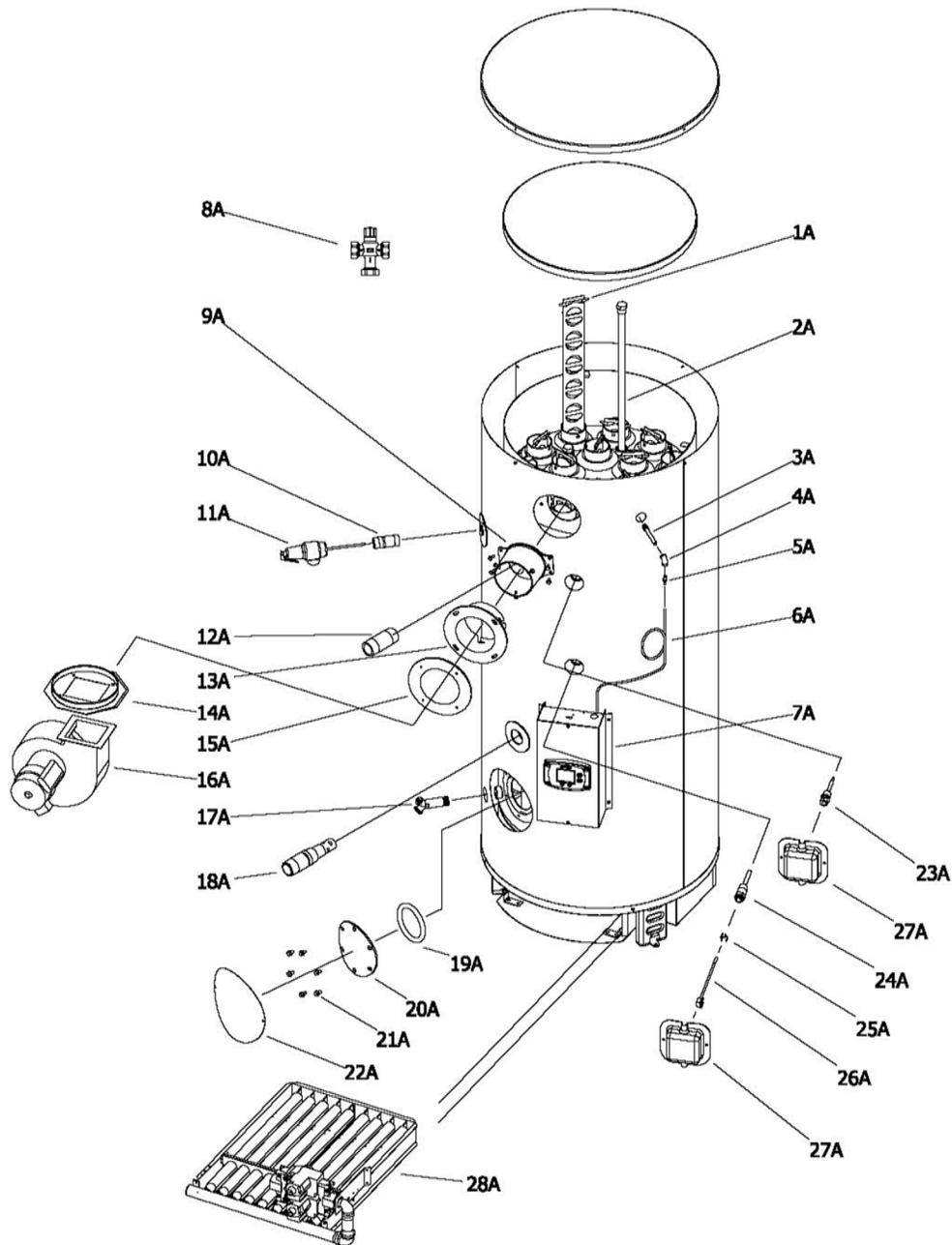
Generic Parts List
PDV-T



- 1C. Control Box Assembly
- 2C. Control Box Cover Assembly
- 3C. Honeywell Display
- 4C. Control Box Cover
- 5C. Integrated Control Board
- 6C. Control Box Panel
- 7C. Power On/Off Switch
- 8C. Pan Head Screw w/adh.
- 9C. Pan Head Screw #8-18
- 10C. Transformer
- 11C. Strain Relief Bushing 1/2"

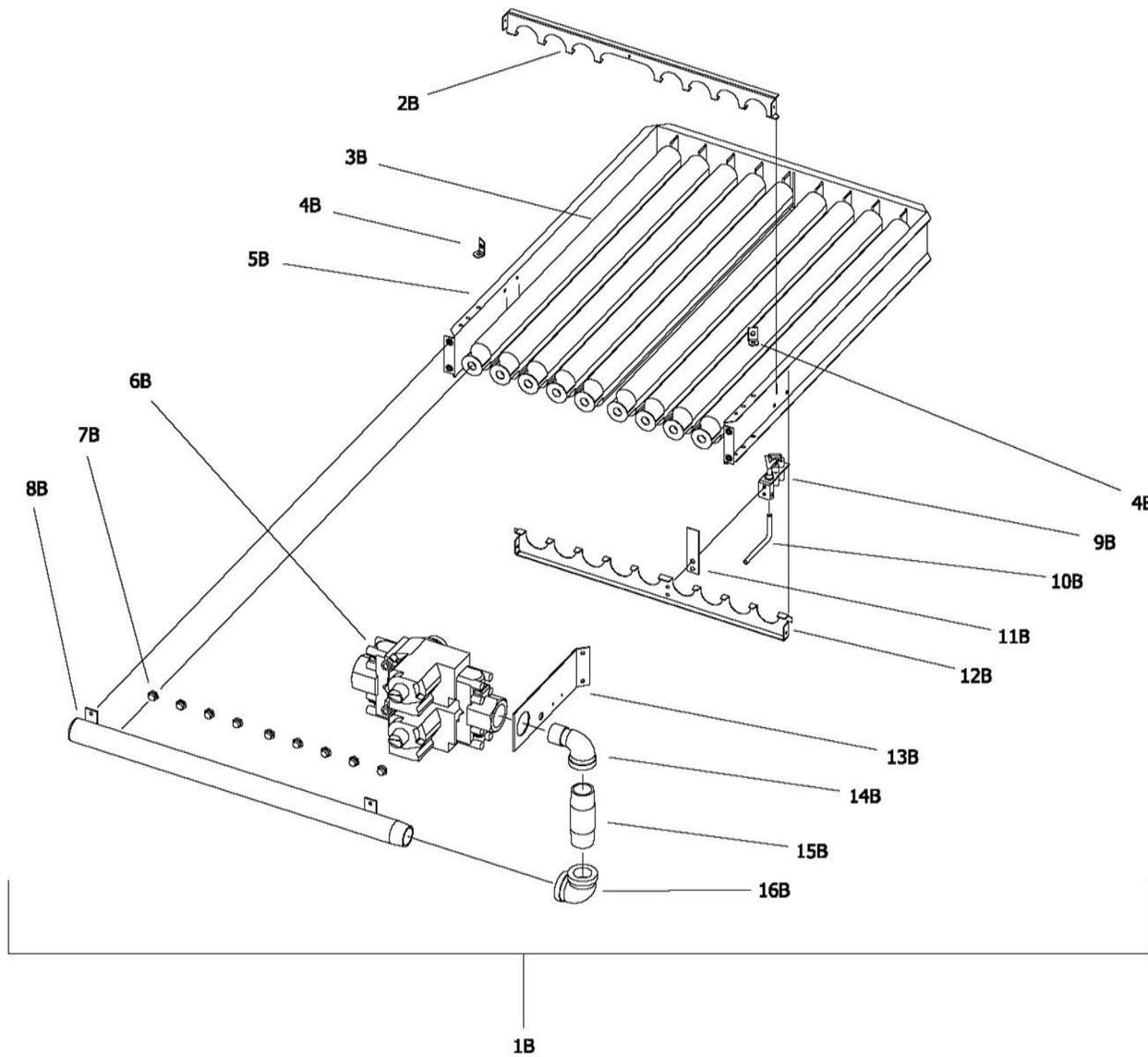
- 12C. Strain Relief Bushing 7/8"
- 13C. Snap-In-Bushing 7/8"
- 14C. Power Cord Wiring Harness
- 15C. Display Control Wiring Harness
- 16C. Display Cover Wiring Harness
- 17C. Primary Transformer Wiring Harness
- 18C. Secondary Transformer Wiring Harness
- 19C. Gas Valve Control Wiring Harness
- 20C. Pan Head Screw #8-18.
- 21C. Ground Lug
- 22C. Snap-In-Plug 7/8"
- 23C. Upper Sensor Harness

Generic Parts List
INDUCED DRAFT MODELS



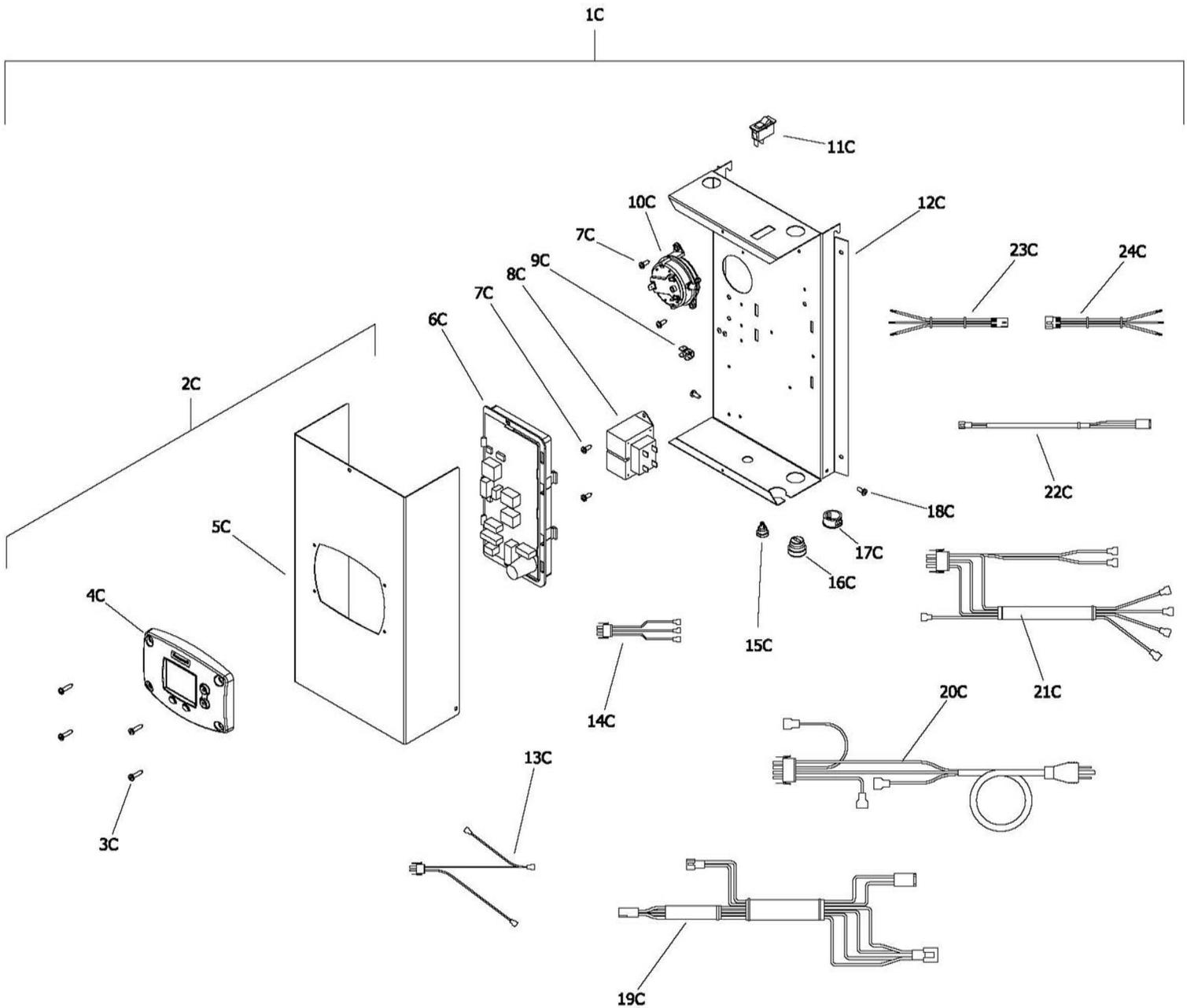
- | | |
|--------------------------------|--------------------------------|
| 1A. Flue Baffle | 15A. Flange Gasket |
| 2A. Hex Head Anode | 16A. Blower |
| 3A. Pressure Tap Fitting | 17A. Drain Valve |
| 4A. 1/8" NPT Elbow | 18A. Cold Water Inlet Dip Tube |
| 5A. Hose Barb | 19A. Cleanout Gasket |
| 6A. Silicone Hose | 20A. Cleanout Cover (Tank) |
| 7A. Control Box Assembly | 21A. 5/16-18 Hex Screw |
| 8A. ASSE Approved Mixing Valve | 22A. Cleanout Cover (Jacket) |
| 9A. Blower Transistion | 23A. Upper Thermostat |
| 10A. T & P Nipple | 24A. Lower Thermostat Well |
| 11A. T & P Valve | 25A. Lower Thermostat Clip |
| 12A. Hot Water Outlet Nipple | 26A. Lower Thermostat Sensor |
| 13A. Blower Flange Mount | 27A. Utility Cover |
| 14A. Vent Adapter | 28A. Burner Assembly |

Generic Parts List
INDUCED DRAFT MODELS



- | | |
|-----------------------------|-----------------------------|
| 1B. Burner Assembly | 9B. Pilot Assembly |
| 2B. Burner Panel | 10B. Aluminum Tubing |
| 3B. Burner Tube | 11B. Pilot Draft Shield |
| 4B. Burner Mounting Bracket | 12B. Burner Support |
| 5B. Burner Rack | 13B. Valve Support Bracket |
| 6B. Dual Gas Valve Assembly | 14B. 1" NPT Street Elbow |
| 7B. Main Burner Orifice | 15B. 1" NPT X 3-1/2" Nipple |
| 8B. Manifold | 16B. 1" NPT Elbow |

Generic Parts List
INDUCED DRAFT MODELS



- 1C. Control Box Assembly
- 2C. Control Box Cover Assembly
- 3C. Pan Head Screw #8-18
- 4C. Honeywell Display
- 5C. Control Box Cover
- 6C. Integrated Control Board
- 7C. Pan Head Screw #8-18
- 8C. Transformer
- 9C. Ground Lug
- 10C. Pressure Switch
- 11C. Power On/Off Switch
- 12C. Control Box Panel

- 13C. Secondary Transformer Wiring Harness
- 14C. Primary Transformer Wiring Harness
- 15C. Strain Relief Bushing 1/2"
- 16C. Strain Relief Bushing 7/8"
- 17C. Snap-In-Plug 7/8"
- 18C. Pan Head Screw w/adh.
- 19C. Blower Wiring Harness
- 20C. Power Cord Wiring Harness
- 21C. Gas Valve Control Wiring Harness
- 22C. Upper Sensor Harness
- 23C. Display Control Wiring Harness
- 24C. Display Cover Wiring Harness

