

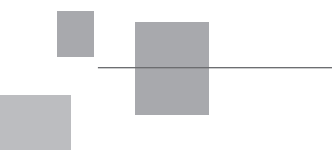


American Standard[®]
Water Heaters

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Water Heaters



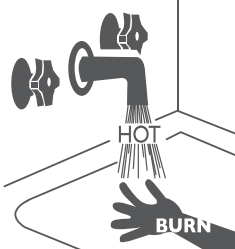
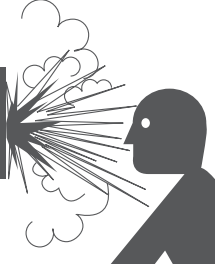


MODELS:
ULN80 - 125
ULN80 - 165
ULN80 - 180
ULN80 - 199
ULN100 - 199
ULN100T - 199
ULN100 - 250
ULN100 - 270
ULN100 - 300
ULN80 - 365
ULN80 - 399
ULN80 - 512

**operating, installation and
service manual**
Commercial Gas Water Heater

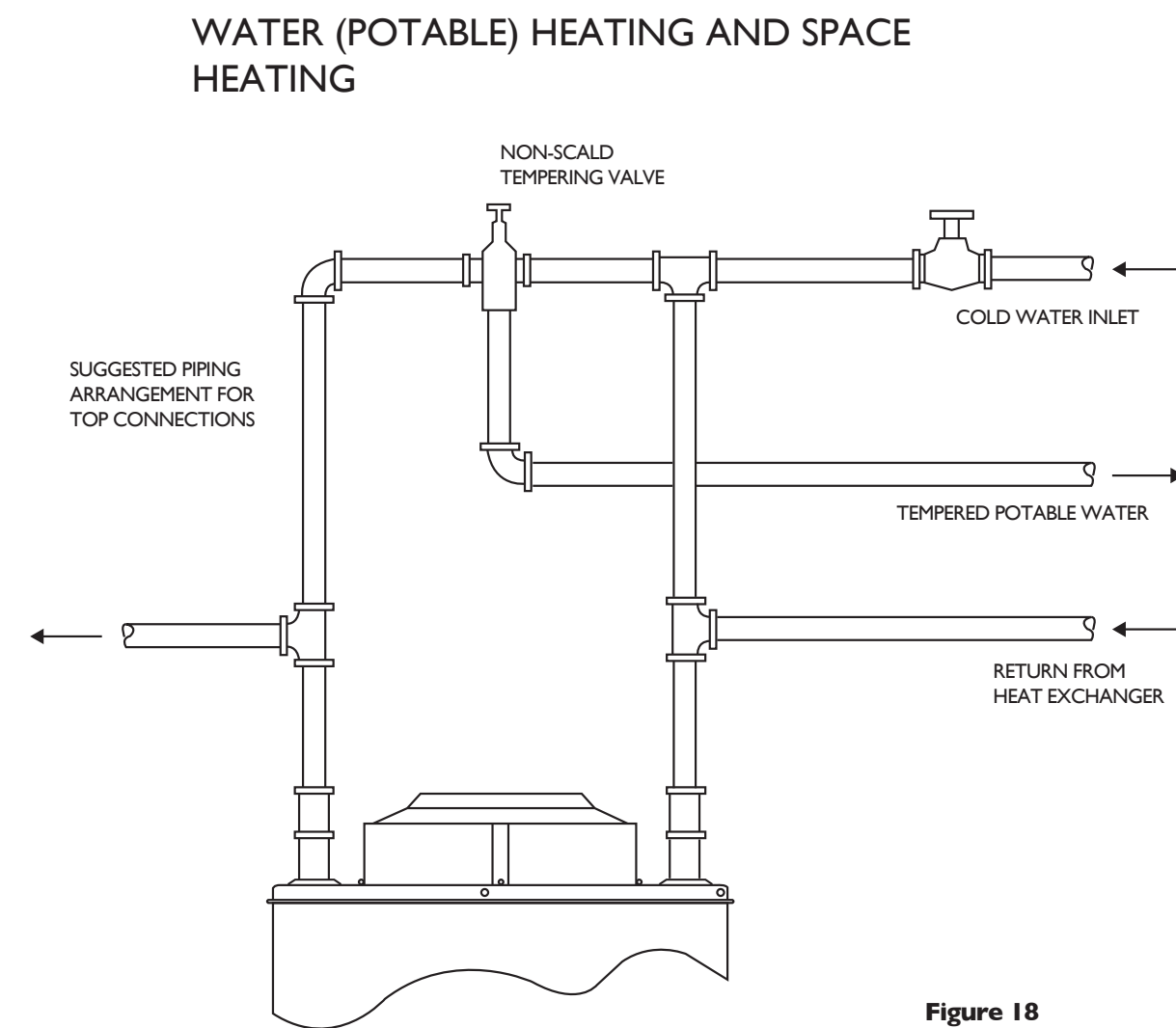


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1 (800) 900-9063 • (909) 392-0230 • Fax (909) 392-7302

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ITEM 1102823

| | | | |
|---|--|--|--|
|  | <p>WARNING</p> <p>Read and understand instruction manual and safety messages before installing, operating or servicing this water heater.</p> <p>Failure to follow instructions and safety messages could result in death or serious injury.</p> <p>Instruction manual must remain with water heater.</p> |  | <p>WARNING</p> <p>Fire Hazard</p> <p>For continued protection against risk of fire:</p> <ul style="list-style-type: none"> Do not install water heater on carpeted floor. Do not operate water heater if flood damaged. |
| <p>DANGER</p>  | <p>Water temperature over 125°F (52°C) can cause severe burns instantly resulting in severe injury or death.</p> <p>Children, the elderly, and the physically or mentally disabled are at highest risk for scald injury.</p> <p>Feel water before bathing or showering.</p> <p>Temperature limiting valves are available.</p> <p>Read instruction manual for safe temperature setting.</p> |  | <p>WARNING</p> <p>Explosion Hazard</p> <ul style="list-style-type: none"> Overheated water can cause water tank explosion. Properly sized temperature and pressure relief valve must be installed in opening provided. |
| <p>WARNING</p> <p>Fire or Explosion Hazard</p> <ul style="list-style-type: none"> Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance. Avoid all ignition sources if you smell LP gas. Do not expose water heater control to excessive gas pressure. Use only gas shown on rating plate. Maintain required clearances to combustibles. Keep ignition sources away from faucets after extended period of non-use. <p>Read instruction manual before installing, using or servicing water heater.</p> | | <p>WARNING</p> <p>Breathing Hazard - Carbon Monoxide Gas</p>  <ul style="list-style-type: none"> Install vent system in accordance with codes. Do not operate water heater if flood damaged. High altitude orifice must be installed for operation above 7,700 feet (2,347m). Do not operate if soot buildup. Do not place chemical vapor emitting products near water heater. Gas and carbon monoxide detectors are available. <p>Breathing carbon monoxide can cause brain damage or death. Always read and understand instruction manual.</p> | |
| <p>CAUTION</p> <p>Improper installation and use may result in property damage.</p> <ul style="list-style-type: none"> Do not operate water heater if flood damaged. Inspect and replace anode. Install in location with drainage. Fill tank with water before operation. Be alert for thermal expansion. <p>Refer to instruction manual for installation and service.</p> | |  | <p>WARNING</p> <ul style="list-style-type: none"> Before servicing the water heater, make sure the blower assembly is unplugged or the electrical supply to the water heater is turned "OFF". Label all wires prior to disconnection when servicing controls. Wiring error can cause improper and dangerous operation. Verify proper operation after servicing. Failure to do this could result in death, serious bodily injury, or property damage. |

COMBINATION SPACE HEATING / POTABLE WATER HEATING SYSTEM



REPLACEMENT PARTS ILLUSTRATION

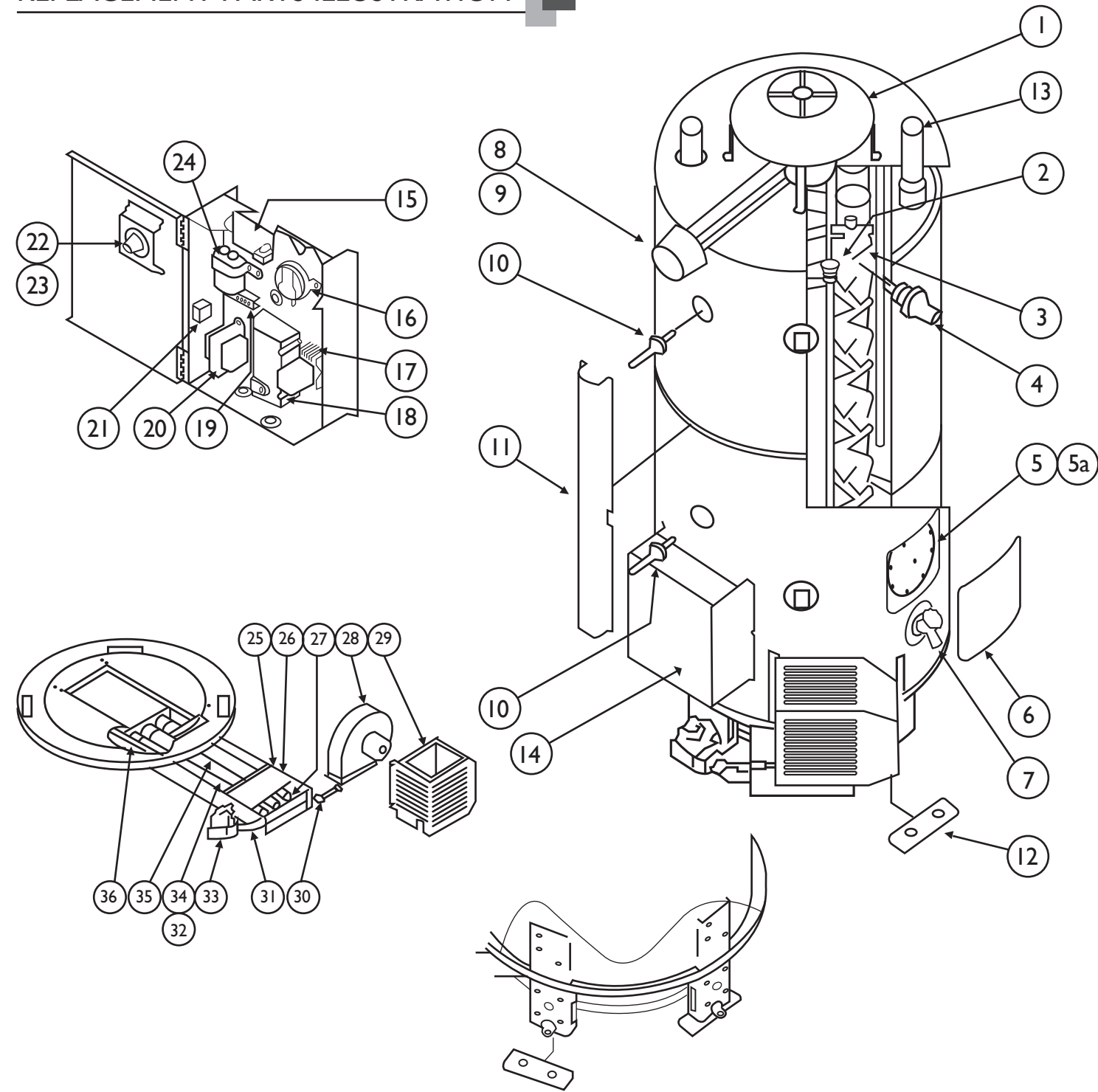


Figure 17

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WARRANTY LIMITATIONS

THE MANUFACTURER OF THIS WATER HEATER WILL NOT BE RESPONSIBLE FOR TANK FAILURES OR WATER HEATER FAILURES RESULTING FROM ANY OF THE FOLLOWING CONDITIONS AND MAY AT ITS DISCRETIONS VOID THE WATER HEATER WARRANTY WHEN THESE CONDITIONS RESULT IN PREMATURE FAILURES OF THE TANK OR COMPONENTS

1. INSTALLATIONS NOT COMPLYING WITH ALL LOCAL CODES.
2. FAILURES DUE TO UNDERSIZING OF THE WATER HEATER AND SUBSEQUENT EXCESSIVE BURNER FIRING.
3. BAD WATER CONDITIONS SUCH AS WELL WATER WITH EXCESSIVE MINERAL DEPOSITS. IT IS THE RESPONSIBILITY OF THE INSTALLER TO TAKE WHAT EVER STEPS ARE REQUIRED INCLUDING THE INSTALLATION OF WATER HEATER SOFTENERS, TO PREVENT EXCESSIVE LIME BUILD UP AND SUBSEQUENT METAL FATIGUE DUE TO OVER HEATING OF THE TANK BOTTOM AND TO USE THE HAND HOLE CLEANOUT PROVIDED IN THIS WATER HEATER TO KEEP LIME DEPOSITS IN THE TANK BOTTOM EXCEEDING FROM 2" HEIGHT.
4. INSTALLATION OF MULTIPLE WATER HEATERS IN LINE RATHER THAN PARALLEL RESULTING IN EXCESS FIRING AND/OR EXCESSIVE CONDENSATIONS ON FIRST HEATER IN SERIES OR OUT OF BALANCE PILOT OUTAGES AND PREMATURE FAILURE OF BURNER COMPONENT PARTS WILL OCCUR.
5. FAILURE TO PROVIDE ADEQUATE COMBUSTION AIR AND A CONTAMINATED AIR OUTLET OR TO ADEQUATE PROPER VENTING RESULTING IN NEGATIVE AIR PRESSURE DUE TO IMPROPER LOCATION OR LACK OF COMBUSTION SHOWN ON OWNERS OPERATION MANUAL AND THE INSTALLATION IN COMPLIANCE WITH UNIFORM PLUMB CODE.
6. FAILURE TO INSTALL HEATERS TO MANUFACTURE AND BUILDING SAFETY STANDARDS WILL CAUSE PREMATURE FAILURE OF COMPONENT PARTS, HAZARDOUS CONDITIONS AND FAILURE OF THE HEATER OR COMPONENTS CAUSED BY CHEMICALS OR SOLVENTS BEING STORED IN THE IMMEDIATE VICINITY OF THE WATER HEATER.
7. FAILURE TO PROVIDE A PROPERLY SIZED EXPANSION TANK ON THE COLD WATER LINE ON A CLOSED SYSTEM.
8. FAILURE ADEQUATE GAS SUPPLY AND PROPER PRESSURE AS OUTLINED ON OWNERS OPERATION MANUAL INSTALLED IN COMPLIANCE WITH UNIFORM PLUMBING CODE.
9. FAILURE TO INSTALL TEMPERATURE PRESSURE RELIEF VALVE DRAIN AS PER OWNERS OPERATION MANUAL AND IN COMPLIANCE WITH UNIFORM PLUMBING CODE.
10. FAILURE TO INSTALL ELECTRIC IN COMPLIANCE TO OPERATION MANUAL AND TO NATIONAL ELECTRIC CODE.

CONSUMER RESPONSIBILITIES

THIS MANUAL HAS BEEN PREPARED TO ACQUAINT YOU WITH THE INSTALLATION, OPERATION AND MAINTENANCE OF YOUR GAS WATER HEATER AND TO PROVIDE IMPORTANT SAFETY INFORMATION. WE URGE YOU TO READ ALL INSTRUCTIONS THOROUGHLY BEFORE ATTEMPTING INSTALLATION OR OPERATION OF YOUR WATER HEATER. KEEP THESE INSTRUCTIONS FOR FUTURE REFERENCE.

The manufacturer of this water heater will not be liable for any damages caused by failure to comply with the installation and operating instructions outlined on the following pages. These instructions are a guide for the correct installation of your water heater. If you lack the necessary skills required or have difficulty following the directions, you should not proceed but get help from a qualified person for that part of the installation you do not understand. Your gas-fired water heater is design-certified by ETL. The installation should conform with the local code or the authority having jurisdiction, or in the absence of such, the National Gas Code. ANSI Z223.1 NFPA 54. A copy of the Code can be purchased from American Gas Association Order Processing, 400 N. Capital St. N.W. Washington D.C. 20001 e-mail ordering: www.aga.org Fax ordering: 866-8 16-9444. A rating plate identifying your water heater will be found next to the gas control valve (thermostat).

PRESSURE BUILD-UP IN CLOSED WATER SYSTEMS

The water utility supply meter may contain a check valve, back flow preventer or water pressure reducing valve. This will create a closed water system. During the heating cycle of the water heater, the water expands creating a pressure build up in the water system. A temperature and pressure relief valve must be installed on the water heater (150 PSI maximum pressure setting. See Temperature and Pressure Relief Valve). To prevent the temperature and pressure relief valve from discharging hot water, loss of energy, and reduce the possible build-up of lime on the temperature and pressure relief valve seat.

WARNING CLOSED WATER SYSTEMS

If the water supply system contains a check valve, back flow preventer or water pressure reducing valve you will have closed water system and the pressure will build up during the water heating cycle. The temperature and pressure relief valve on the water heater will leak during the water heating cycle resulting in loss of energy. To prevent the build up of lime in the T&P valve and damage to the water heater by pressure surges you must install an expansion tank on the cold water supply line. The thermal expansion tank should have a minimum capacity of 4.5 U.S. gallons. It requires both T&P valves and expansion tanks for closed system.

Multiple water heating system and/or a system with additional storage tank must be sized by thermal expansion tank manufacturer.

WARNING

FAILURE TO PROVIDE AN EXPANSION TANK ON THE COLD WATER LINE ON A CLOSED SYSTEM WILL VOID THE WARRANTY ON THE WATER HEATER.

REPLACEMENT PARTS LIST (SEE FIGURE 17)

PARTS REPLACEMENT MUST BE PERFORMED BY A QUALIFIED INSTALLER, SERVICE AGENCY OR GAS SUPPLIER

The following parts may be ordered through your plumber, a local plumbing supply company, or direct from the factory. Parts will be shipped at prevailing prices and will be billed accordingly. Refer to warranty for company address.

IMPORTANT: When ordering replacement parts, provide model number, serial number, type of gas, item number (from the following list), part description, voltage and wattage (when applicable).

It is imperative that replacement of main burner orifices, pilot burner and gas valve be ordered for the gas type. Natural gas will be marked as manifold pressure specified on page No. 26 (2,0" or 2,5")

| PART NO. | DESCRIPTION |
|----------|--|
| 1 | DRAFTHOOD |
| 2 | ANODE ROD |
| 3 | FLUE BAFFLE |
| 4 | TEMPERATURE AND PRESSURE RELIEF VALVE |
| 5 | HAND HOLE COVER TANK COVER PLATE |
| 5a | HAND HOLE COVER GASKET (not pictured) |
| 6 | HAND HOLE COVER JACKET |
| 7 | DRAIN VALVE |
| 8 | FLUE DAMPER |
| 9 | DAMPER HARNESS |
| 10 | TEMPERATURE SENSOR |
| 11 | CAPILLARY TUBE COVER |
| 12 | TANK LEG THERMAL BREAK (Required on all combustible floor installations) |
| 13 | DIP TUBE |
| 14 | CONTROL BOX |
| 15 | ELECTRONIC WATER HEATER CONTROLLER |
| 16 | LOW AIR PRESSURE SWITCH |
| 17 | RELAY |
| 18 | IGNITION CONTROL |
| 19 | TERMINAL BLOCK |
| 20 | TRANSFORMER |
| 21 | ON/OFF SWITCH |
| 22 | KNOB |
| 23 | POTENTIOMETER |
| 24 | CAPACITOR |
| 25 | BURNER TRAY |
| 26 | BRACKET BURNER |
| 27 | MAIN BURNER ORIFICE |
| 28 | BLOWER |
| 29 | BLOWER SHIELD |
| 30 | BLOWER CONNECTOR |
| 31 | MAIN BURNER MANIFOLD |
| 32 | PILOT SUPPLY TUBE |
| 33 | GAS VALVE |
| 34 | PILOT BURNER ASSEMBLY |
| 35 | MAIN BURNER TUBE(S) |
| 36 | RAIL |

| CONDITION | CAUSE | REMEDY |
|-----------------------------------|---|---|
| High operating costs | Improper calibration | Replace control valve |
| | Temperature set too high | Turn temperature knob to desired temperature |
| | Sediment or lime in tank | Clean out sediment; Refer to page 22 |
| | Heater too small for job | Install adequate heater |
| | Leaking faucets | Repair faucets |
| | Gas leaks | Check with utility - repair at once |
| | Wasted hot water | Advise customer |
| | Long runs of exposed piping | Insulate |
| | Hot water piping in outside wall | Insulate |
| Insufficient hot water | Low gas pressure | Check with utility |
| | Orifice too small | Replace with correct orifice |
| | Temperature set too low | Turn temperature dial to desired temperature |
| | Heater too small for job | Install adequate heater |
| | Leaking faucets | Repair faucets |
| | Wasted hot water | Advise customer |
| | Long runs of exposed piping | Insulate |
| | Hot water piping in outside wall | Insulate |
| Slow water recovery | Insufficient secondary air | Clear the area near the heater |
| | Low gas pressure | Check with utility |
| | Orifice too small | Replace with correct orifice |
| | Dial selector set too low | Turn temperature dial to desired temperature |
| | Sediment or lime in tank | Clean out sediment; Refer to Page 22 |
| | Heater too small for job | Install adequate heater |
| | Wasted hot water | Advise customer |
| Drip from relief valve | Excessive water pressure | Use pressure reducing valve |
| Electronic control fails to close | Defective electronic control | Replace with new electronic control |
| Condensation | | See Page 23 |
| Combustion Odors | Insufficient secondary air Flue clogged | Provide ventilation to heater Clean-check for source of trouble & correct |
| Smoking and carbon formation | Insufficient secondary air | Provide ventilation to heater |
| | Low gas pressure | Check with utility |
| | Orifice too large | Replace with correct orifice |
| | Flue clogged | Clean-check for source of trouble & correct |
| | Heater installed in confined area | Provide ventilation by use of louvers in wall or duct |

WARNING
 FAILURE TO PROVIDE A PROPERLY SIZED AND INSTALLED EXPANSION TANK ON THE COLD WATER LINE ON A CLOSED SYSTEM VOID THE WARRANTY ON THE WATER HEATER.
 MULTIPLE WATER HEATING SYSTEM AND OR A SYSTEM WITH ADDITIONAL STORAGE TANK MUST BE SIZED BY THERMAL EXPANTION TANK MANUFACTURE

FOR YOUR SAFETY
 Do not use or store gasoline or any other flammable vapors, liquids, or materials in vicinity of this or any other appliance.

FOR YOUR SAFETY - 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.

WARNING
 Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer, service agency or the gas supplier.

Please complete the following information at the time of installation. This should be retained and presented along with the warranty in the event a claim is necessary.

MODEL NUMBER: _____ TYPE: _____
 SERIAL NUMBER: _____
 INSTALLATION ADDRESS: _____

THIS WATER HEATER HAS BEEN INSTALLED IN ACCORDANCE WITH THESE INSTALLATION INSTRUCTIONS AND LOCAL CODE REQUIREMENTS ON _____ DATE

INSTALLER: _____

THIS WATER HEATER MUST BE PROPERLY AND REGULARLY MAINTAINED. FAILURE TO DO SO WILL VOID THE WARRANTY.

IMPORTANT

BEFORE PROCEEDING WITH THE INSTALLATION OF THIS WATER HEATER, READ AND THOROUGHLY UNDERSTAND THESE INSTALLATION AND OPERATION INSTRUCTIONS. IF THERE ARE ANY QUESTIONS, THIS INSTALLATION SHOULD BE PERFORMED BY A QUALIFIED SERVICE PERSON.

GENERAL

INSPECT SHIPMENT: Inspect water heater for possible damage. If damaged, notify carrier immediately. Check markings on rating plate to make certain it corresponds with your application.

Read these instructions thoroughly before proceeding with the installation of this new gas-fired water heater. If there is any difficulty understanding all or any part of these instructions, it is recommended that a qualified service person perform the installation.

NOTICE: The manufacturer's warranty does not cover damage or injury cause 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 held liable for loss or injury resulting from the use of any unauthorized device in conjunction with this water heater.

This water heater has been equipped for use with one type of gas only. Compare the information provided on the rating plate affixed to the front of the water heater, making sure that the gas stated on the rating plate is the same as the gas to be used. **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 local gas supplier or gas company if there are any questions.

For installations 2000 ft. and above, 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 label when ordering high altitude constructed water heaters.

For any questions not covered in this booklet, contact your dealer or write to us at the address shown the rating plate affixed to the front of the water heater.

This water heater has been designed and manufactured for the express purpose of heating and storing potable water and space heating. See page 23 for space heating instructions. Any use other than this purpose will release the manufacturer from any liability or warranty claims stemming from the issue of this product. Consult local authorities.

CAUTION

DO NOT STORE OR USE FLAMMABLE LIQUIDS, VAPORS, OR MATERIALS IN THE VICINITY OF THIS OR ANY OTHER APPLIANCE.

For installation on combustible flooring , the tank leg thermal break piece identified as part No 12 on the replacement parts illustration must be installed under each leg

INSTALLATION

Location- Select a location accessible to water lines, gas supply (type identified on the rating plate), an adequate open drain, and as close as practical to a chimney or gas vent. When installed, the water heater must be level. To prevent excessive heat loss through water piping, locate the water heater as close as practical to the areas of greatest hot water usage. Do not locate the water heater where lines could be subjected to freezing temperatures.

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.

COMMON COMPLAINTS

FOLLOWING IS A LIST OF THE MOST COMMON COMPLAINTS RELATED TO THE USE OF WATER HEATERS. MANY COMPLAINTS ARE DUE TO ITEMS NOT DIRECTLY RELATED TO THE WATER HEATER. DO NOT ATTEMPT TO SERVICE THE WATER HEATER OR PERFORM OTHER RECOMMENDATIONS ON THIS LIST UNLESS YOU ARE TRAINED AND QUALIFIED TO DO SO.

| CONDITION | CAUSE | REMEDY |
|-------------------------------------|------------------------------------|---|
| Burner will not ignite | No gas | Check with utility |
| | Dirt in gas line | Notify utility-install dirt trap in gas lines |
| | Pilot line clogged | Clean-check for source of trouble & correct |
| | Main burner line clogged | Clean-check for source of trouble & correct |
| | Defective electronic controller | Replace with new electronic controller |
| | Thermostat set too low | Turn temperature dial to desired temperature |
| | Heater installed in confined area | Provide ventilation by use of louvers in wall or duct |
| | Defective gas valve | Replace with new gas valve |
| Burner flame floats-lifts off ports | Defective Damper (WHEN APPLICABLE) | Replace Damper (WHEN APPLICABLE) |
| | Defective Blower | Replace Blower |
| | High gas pressure | Check with utility |
| | Orifice too large | Replace with correct orifice |
| Burner flame yellow lazy | Flue clogged | Clean-check for source of trouble & correct |
| | Main burner line clogged | Clean-check for source of trouble & correct |
| | Heater installed in confined area | Provide ventilation by use of louvers in wall or duct |
| | Cold drafts | Check source & correct |
| Burner flame too high | Insufficient secondary air | Clear the area near the heater |
| | Orifice too large | Replace with correct orifice |
| Flame burns at orifice | Low gas pressure | Check with utility |
| | Defective gas valve | Replace with new gas valve |
| Pilot flame too small | Low gas pressure | Check with utility |
| | Pilot line clogged | Clean-check for source of trouble & correct |
| | Pilot line not clogged | Adjust pilot |

PILOT AND MAIN BURNER

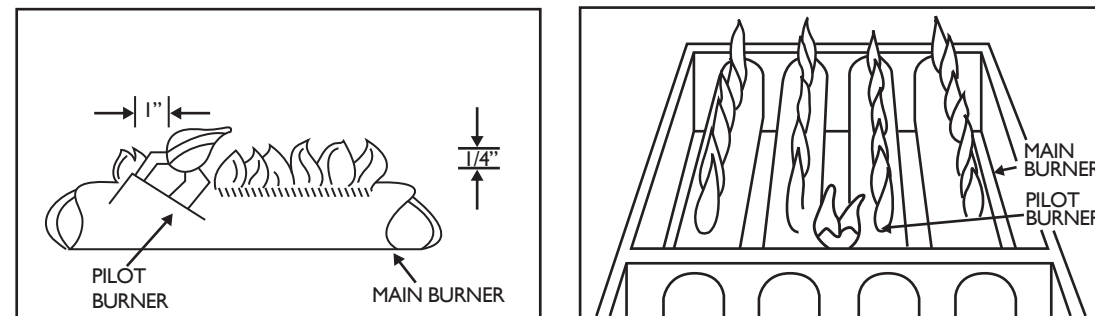


Figure 16

WATER HEATER SOUNDS

1. Possible noises due to expansion and contraction of some metal parts during periods of heat-up and cool-down do not represent harmful or dangerous conditions.
2. Sediment buildup in the tank bottom will create varying amounts of noise, and left in the tank, will cause premature tank failure.
3. Condensation causes sizzling and popping within the burner areas during heating and cooling periods and should be considered normal. See Condensation.

DRAINING

The water should be drained if being shut down during freezing temperatures. Also, periodic draining and cleaning of sediment from the tank may be necessary. See Page 22.

1. Turn ON/OFF switch to the OFF position.
2. Close the cold water inlet valve to the heater.
3. Open a nearby hot water faucet.
4. Open the heater drain valve.
5. If the heater is going to be shut down and drained for an extended period, the drain valve should be left open.

WARNING

THIS WATER CAN BE HOT



CAUTION

THIS WATER HEATER SHOULD NOT BE USED TO HEAT A SPA OR HOT TUB

SERVICE MUST BE PERFORMED BY A QUALIFIED INSTALLER, SERVICE AGENCY OR GAS SUPPLIER

Clearance/Flooring- (fig. 2) If the water heater is installed directly on carpeting, it must be installed on a metal or wood panel which extends beyond the full width and depth of the water heater by at least 3 inches in any direction. If the water heater is installed in an alcove, the entire floor must be covered by the panel. A minimum of 24 inches front clearance shall be provided for inspection and servicing. This water heater may be installed in an alcove on combustible flooring with clearances from combustible materials as shown in Figures 1 and 2.

CAUTION

The National Fuel Gas Code (ANSI Z223.1 /NFPA 54) 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 above floor level and protected to avoid damage by moving vehicle. See Figure 3.

CLEARANCES FROM COMBUSTIBLE CONSTRUCTION

| | A | B | C | D |
|-------------|-----|----|----|----|
| ULN80-125 | | | | |
| ULN80-165 | 18" | 2" | 6" | 6" |
| ULN80-180 | | | | |
| ULN80-199 | | | | |
| ULN100-199 | | | | |
| ULN100T-199 | | | | |
| ULN100-250 | 18" | 2" | 6" | 6" |
| ULN100-270 | | | | |
| ULN100-300 | | | | |
| ULN80-365 | | | | |
| ULN80-399 | 18" | 2" | 6" | 6" |
| ULN80-512 | | | | |

REMEMBER: Flammable vapors may be drawn to this water heater from other areas of the structure by air currents.
NOTE: HEATER SHALL BE LOCATED OR PROTECTED SO IT IS NOT SUBJECT TO PHYSICAL DAMAGE BY MOVING VEHICLES OR AREA FLOODING.

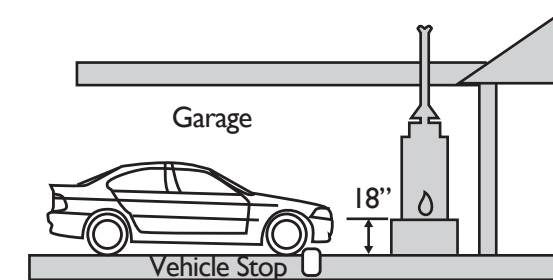


Figure 3

Typical Installation in Residential Garages (Illustration copyright by the American Gas Association. Used by permission of the copyright holder.)

Figure 1

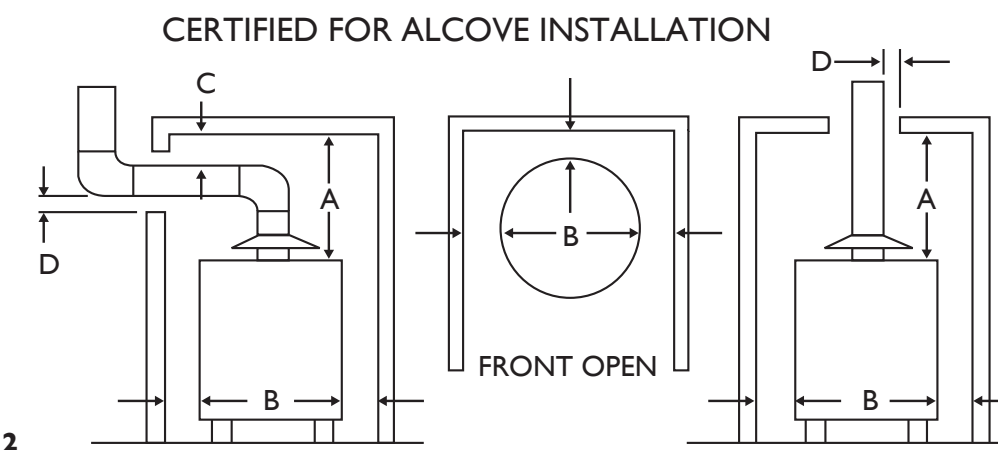


Figure 2

CERTIFIED FOR INSTALLATION ON COMBUSTIBLE FLOOR *

* For installation on combustible flooring, the tank leg thermal break piece identified as part No. 12 on the replacement parts illustration must be installed under each leg.

Combustion and Ventilation Air- Provisions must be made for adequate combustion and ventilation air. Details outlining proper air supply for various types of installation are prescribed by the National Fuel Gas Code (ANSI Z-223.1/ NFPA 54) latest edition. If the water heater is installed in unconfined space within the building, infiltration air may be adequate for proper combustion and ventilation. Buildings of tight construction (weather stripping, caulked, etc.) require additional air from outdoors.

If the water heater is installed in a confined space (volume is less than 50 cu. ft. per 1000 BTUH of the total input rating of all gas appliances in that space), air must be supplied through two permanent openings. One opening shall be within 12 inches from the top of the enclosure and one within 12 inches of the bottom. The openings must be protected by metal louvers or 1/4" min. mesh metal screen. The size of the openings are as follows:

- 1.- If the openings communicate directly with an additional room(s) of sufficient volume, each opening shall have a minimum free area opening of 1 sq. in. per 1000 BTUH of the total input rating of all gas appliances in the confined space, but not less than 100 sq. inches.
- 2.- If the openings communicate directly with the outdoors or through vertical ducts with the outdoors, each opening shall have a minimum free area of 1 sq. in. per 4000 of the total rating of all gas appliances in the enclosure.
- 3.- If the openings communicate with the outdoors through horizontal ducts, each opening shall have a minimum free area of 1 sq. in. per 2000 BTUH of the total rating of all gas appliances.

CAUTION

The draft diverter relief opening of the water heater and the combustion air inlet must be in the same atmospheric pressure zone. Large exhaust fans in kitchens or other locations can lower the air pressure inside an enclosure and interfere with proper operation and venting of the water heater. In these cases, the water heater should be installed in a separate room with combustion and ventilation air supplied directly from outdoors as previously described.

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

Products of this sort must not be stored near the water heater, nor should air which is brought in contact with the water heater contain any of these chemicals. Flammable vapors may be drawn by air currents from other areas of the structure to this appliance. If necessary, uncontaminated air should be obtained from remote or outside sources.

THE WARRANTY ON THIS WATER HEATER DOES NOT COVER DAMAGE CAUSED FROM OPERATION IN A CORROSIVE ATMOSPHERE.

Water Damage/Drain Pan- The water heater should be located in an area where leakage of the tank or connections 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 HAVING A LENGTH AND WIDTH AT LEAST 3 INCHES GREATER THAN THE DIAMETER OF THE WATER HEATER, A MAXIMUM HEIGHT OF 1-3/4 INCHES, AND BE PIPED TO AN OPEN DRAIN. DO NOT RESTRICT THE FLOW OF COMBUSTION AIR.

GAS PRESSURE

With the water heater in operation (main burner on), the maximum supply pressure must not exceed the specified value below, and the minimum supply and normal manifold pressures are as follows:

| | Supply Pressure | | Manifold Pressure | |
|-------------|-----------------|------|-------------------|------|
| | MAX. | MIN. | NORMAL | |
| Natural Gas | | | | |
| | ULN80-512 | 11" | 5" | 2.5" |
| | Other Models | 11" | 5" | 2" |

Some models have values higher or lower than those noted above. Refer to pressure noted on the label affixed to the front of the water heater. Consult your local gas company or gas supplier if correction is necessary.

EMERGENCY SHUTDOWN INSTRUCTIONS

Should the water heater be subjected to heater, fire, or other unusual condition, turn off gas at manual shut-off valve and water inlet valve to heater. Refer to figure 5. Do not place water heater in operation again until it has been thoroughly checked by qualified personnel.

TAMPERING

Tampering with the gas valve, igniter control, or temperature and pressure relief valve is DANGEROUS and voids all warranties. Only qualified personnel should service these components

WARNING

Should overheating occur or the gas fail to shut off, turn off the manual gas control valve to appliance, and call a qualified service person to check for the cause


MAINTENANCE

BURNER MAINTENANCE

At least every 3 months, visually check burner and pilot flames and compare with the sketch below. Observation of the gas flame should show the burner flame to be a soft blue with the suggestion of slight yellow tips. It is to be noted that the flame of a light color may not be a carbonizing flame.

Carbonizing flames are to be avoided and can be determined by wiping the tip of the combustion chamber when the flames is extinguished and the combustion chamber has cooled to determine if any carbon or soot has been deposited. If the burners are dirty or clogged with lint or soot, the burners can be cleaned with soap and water. If sooting re-occurs, refer to common complaints, page 28 and 29

TO TURN OFF GAS TO APPLIANCE

1. Set the thermostat to lowest setting.
2. Turn off all electrical power to the appliance if service is to be performed.
3. Turn the gas valve knob clockwise  to "OFF" position.

HI-TEMPERATURE LIMIT

The temperature sensor is equipped with a high temperature limit switch (ECO). The ECO will shut off the gas supply to the burner and pilot in the event the water temperature exceeds 190° F. To restart the unit the temperature sensor must be replaced. Models with damper device have 2 sensors, models without damper device have 1 sensor.

WATER TEMPERATURE REGULATION

The temperature of the water in the heater can be regulated by the setting of the temperature dial inside the control box. To adjust the temperature setting, remove cover and rotate dial to desired temperature setting (See fig 15).

DANGER

Water temperatures over 125°F can cause severe burns instantly or death from scalds. Children, disabled, and elderly are at highest risk of being scalded. Feel water before bathing or showering. Temperature limiting valves are available, and should be installed when lower outlet temperatures are required.

TEMPERATURE CONTROL

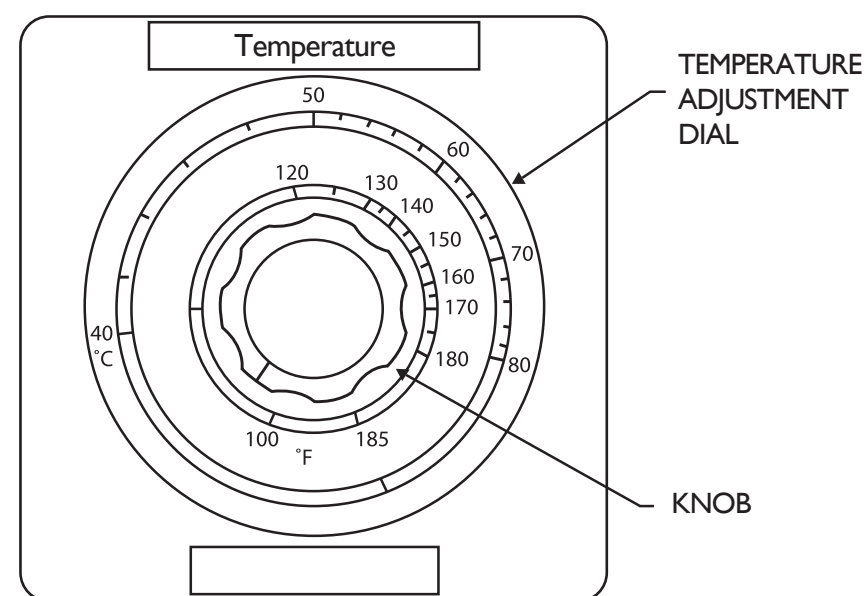


Figure 15

DRAFTHOOD LOCATION & FLUE DAMPER INSTALLATION

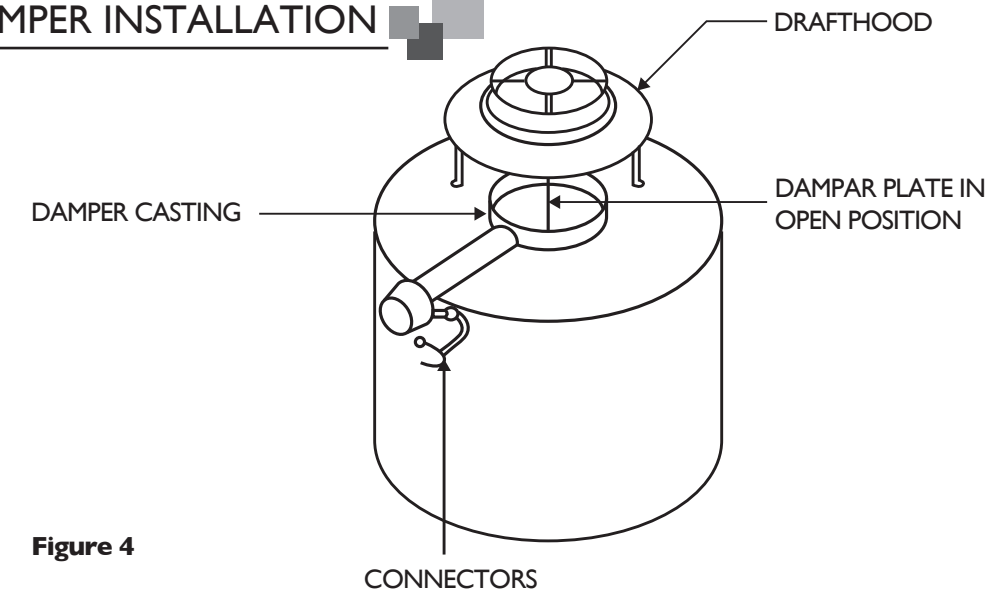


Figure 4

DRAIN PAN INSTALLATION AND CONSTRUCTION MUST CONFORM TO LOCAL CODES AND ORDINANCES. IF NOT INSTALLED AND OPERATED IN ACCORDANCE WITH THESE INSTRUCTIONS, UNDER NO CIRCUMSTANCES WILL THE MANUFACTURER OF THIS WATER HEATER BE LIABLE FOR ANY WATER DAMAGE OR INJURY IN CONNECTION WITH THIS WATER HEATER.

VENTING

IMPORTANT NOTICE

This water heater may be installed as a replacement with venting that met the existing codes at the time of the installation of the original water heater.

WARNING

The installer to check the installation for venting and for spillage all around the draft hood relief opening after five minutes of operation the method to check for flue products spillage should utilize a flame or a match, or candle or smoke or flame from another source such as a cigarette or grill lighter wand. The procedure used should be to play the flame or smoke around the perimeter of the draft hood from the outside. If spillage is encountered, it would be manifested by smoke escaping away from the draft hood or by the flame being extinguished while outside of the hood. Good venting would be indicated by smoke and the flames being drawn into the draft hood.

Draft Diverter- This water heater has been shipped with a draft diverter for which it was designed with reference to the horizontal and vertical planes. If removed, the draft diverter shall be replaced in the same position and secured to the jacket top by the screws with which it was installed.

Vent Piping- This water heater must be connected to a masonry chimney or venting system approved by local codes or ordinances. The vent connector used to attach the draft diverter outlet to the chimney or approved vent must be of the same diameter as the draft diverter outlet or larger. For proper venting in certain installations, a larger vent connector may be needed. Consult venting tables in National Fuel Gas Code ANSI Z223.1/NFPA 54 latest or current or local code officials for proper application in your area.

CAUTION

Do not turn on electrical power to water heater until flue damper is installed and the water heater is filled with water.

Better combustion is achieved by avoiding numerous elbows in the vent piping. Horizontal piping must be sloped upward at least 1/4 inch per linear foot of length. All connections in venting system must be securely fastened with sheet metal screws or other approved method. Check local codes and ordinances.

Failure to install a proper venting system can result in fire, injury, or death.

WATER CONNECTIONS

Installation- Refer to Figure 5 for typical installation. Connect the hot and cold water supply to the water heater, hot to the location marked "HOT" and cold to the location marked "COLD". Note: If making cold water connection on top, determine that the dip tube is in place. If sweat connections are used, sweat tubing to adapter before attaching adapter to the top cold water inlet as it may contain a nonmetallic dip tube. When making these connections, use a good grade of pipe joint compound. Be familiar with the location of the shut-off valve in the cold water line feeding the water heater (See Figure 5). If a valve is not present, one shall be installed as shown in Figure 5.

Do not install a check valve or other device that would prevent reverse flow of water ("closed system") unless required by local codes. A closed system will result in frequent operation of the relief valve. Provisions must be made for protection against thermal expansion in the event of a closed system (Page 1). Warranties do not cover pressure bulges and/or deformities.

This water heater is capable of delivering high temperature hot water at any faucet in the system. For general purpose, when used for shower and washer hands must be set below 125°F to prevent scalds. Care must be taken whenever using hot water to avoid scalding injury. Certain appliances require high temperature hot water (such as dishwashers and automatic clothes washers). In order to prevent potential scald injury, install an anti-scald tempering valve in the water system.

GAS PIPING

Use clean black iron pipe or equivalent material approved by local codes and ordinances for gas piping. Install a ground-joint-union in the supply line as close to the water heater as possible. A manual gas shut-off valve should be above floor level and readily accessible. A drip leg (consisting of a pipe tee, 4 inch nipple, and a cap) should be installed as shown in Figure 5.

Make sure the gas supplied to the heater is the same type as listed on the rating plate. **DO NOT ATTEMPT TO USE THIS WATER HEATER WITH ANY GAS OTHER THAN THE TYPE LISTED ON THE RATING PLATE.**

Compound used for the connection of all gas piping should be resistant to the action of liquefied petroleum (L.P.) gases. Apply pipe dope sparingly to the male threads only. **DO NOT** apply pipe dope to the gas valve inlet. Make certain that no pipe dope has become lodged in the inlet screen of the gas valve. This will restrict the flow of gas. When attachment of gas piping to gas valve inlet is made, extreme care must be taken to prevent pipe dope from entering the gas valve inlet and to avoid excessive torque to prevent cracking of the gas valve inlet housing. The suggested maximum torque is 31.5 ft. lbs. The manufacturer of this water heater will not be liable for any damage or injury caused as a result of a cracked gas inlet from excessive torque.



FOR YOUR SAFETY READ BEFORE OPERATING

WARNING

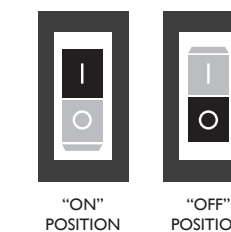
If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury or loss of life.

- 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 area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.
WHAT TO DO IF YOU SMELL GAS
 - . Do not try to light any appliance.
 - . Do not touch any electric switch; do not use any phone in your building.
 - . Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
 - . If you cannot reach your gas supplier, call the fire department.
- C. Use only your hand to push in or turn the gas valve knob. Never use tools. If the knob will not push in or turn by hand, don't try to repair it, call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- 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.

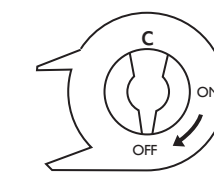
OPERATING INSTRUCTIONS

- 1.- STOP! Read the safety warnings 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.-For models using gas valve with round control knob, turn gas valve knob clockwise  to "OFF".
- 6.-Turn the ON/OFF switch on the water heater to the "ON" position. See ON/OFF switch position figure.
- 7.-For models using gas valve with round control knob, turn gas valve knob counterclockwise  to "ON"
- 8.- Wait five (5) minutes to clear out any gas. If you then smell gas, STOP! Follow in the safety information above on this label. If you don't smell gas, go to next step.
- 9.- Set temperature control to desire setting.
- 10.- If ignition of the pilot and main burner is not established in approximately one minute, turn the electrical to the heater "OFF" and then back "ON". this will reset the ignition cycle.
- 11.- Repeat step until ignition of the pilot and main burner is established.
- 12.- If the appliance will not operate, follow the instructions "To Turn Off Gas To Appliance" and call your service technician or gas supplier.
- 13.- check all pipe connections in the gas line and at the gas valve for gas leaks. Use a soap and water solution for this operation. **NEVER USE AN OPEN FLAME FOR THIS PURPOSE.**
- 14.- Damper must be in open position when appliance main burner is operating. (WHEN APPLICABLE)

SWITCH POSITION



GAS VALVE CONTROL SHOWN IN "OFF" POSITION



COMBINATION SPACE HEATING /POTABLE WATER HEATING SYSTEM

When using this heater as a source of heat for a combination space heating/potable water heating system, be sure to follow manual(s) shipped with air handler system. Refer to figure 18 page 32. Note the following warnings:

Toxic chemicals, such as those used for boiler treatment, shall NEVER be introduced into this system.

This unit may NEVER be connected to any existing heating system or component(s) previously used with a non-potable water heating appliance.

DO NOT use with piping that has been treated with chromates, boiler seal or other chemicals.

DO NOT add boiler treatment or any chemicals to any heat piping, since the piping contains potable water.

DO NOT use with ferrous piping. The system should be installed only with new piping that is suitable for potable water, such as copper or polybutylene. DO NOT use with PVC piping.

DO NOT use with any pumps, valves, or fittings that are not completely compatible with potable water piping.

DO NOT use valves that may cause excessive restriction to water flow. USE FULL FLOW BALL OR GATE VALVES ONLY.

DO NOT tamper with the thermostat, gas valve, igniter control or temperature and pressure relief valve. Tampering with any of these components is DANGEROUS and can result in property damage or severe injury. Tampering voids all warranties. Only qualified personnel should service these components.

DO NOT use 50/50 solder in potable water lines.

IF THE SPACE HEATING system requires water temperatures in excess of 140°F, a mixing valve or other means should be installed in the domestic (potable) hot water supply to limit the RISK OF SCALD DAMAGE.

SOME JURISDICTIONS may require a backflow preventer in the incoming cold water line to the water heater. In such cases, the temperature and pressure relief valve on the water heater may weep or relieve due to expansion of the heated water. A diaphragm-type expansion tank will normally eliminate this weeping condition. Please read and follow the manufacturer's instructions for installation of such tanks.

VENTING SYSTEM INSPECTION

Check the draft hood relief opening (Figure 5) using a match flame after 15 minutes of operation. Pass the match flame around the relief opening of the draft hood. A steady flame drawn into the opening indicates proper draft. If the flame flutters or is blown out this would indicate spillage and corrective action must be made to the vent. (Figure 5)

At least every 3 months a visual inspection should be made of the venting system. You should look for:

Obstructions which could cause improper venting.

Obstructions which could cause improper venting.

Damage or deterioration which could cause improper venting or leakage of combustion products.

CONDENSATION

Whenever the heater is filled with cold water there will usually be a certain amount of condensation formed while the burner is ON. Moisture from the products of combustion condenses on the cooler tank surfaces to produce a "sizzling" or "frying" noise. During the winter months this condition will be more pronounced. Condensation is normal and should not be confused with a leaking tank. The water will be noted at different times of the year and in varying quantities.



BEFORE PLACING THIS WATER HEATER IN OPERATION SEE "CONDENSATION" ON PREVIOUS PARAGRAPH.

TYPICAL INSTALLATION

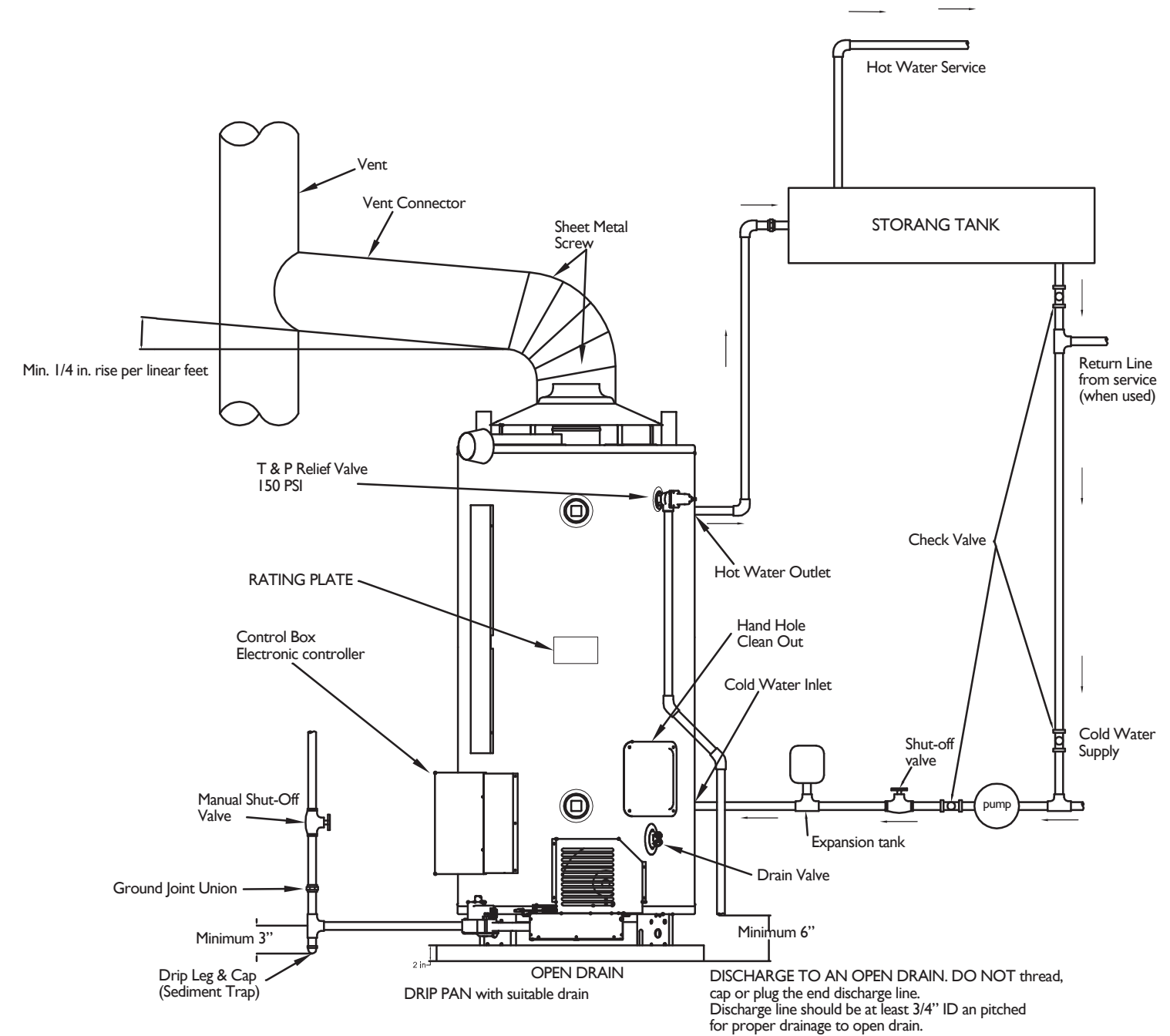
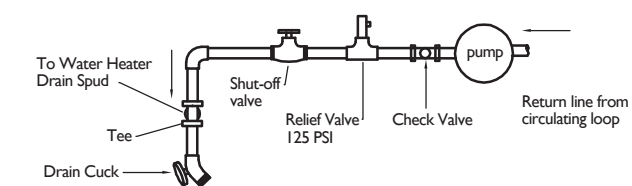
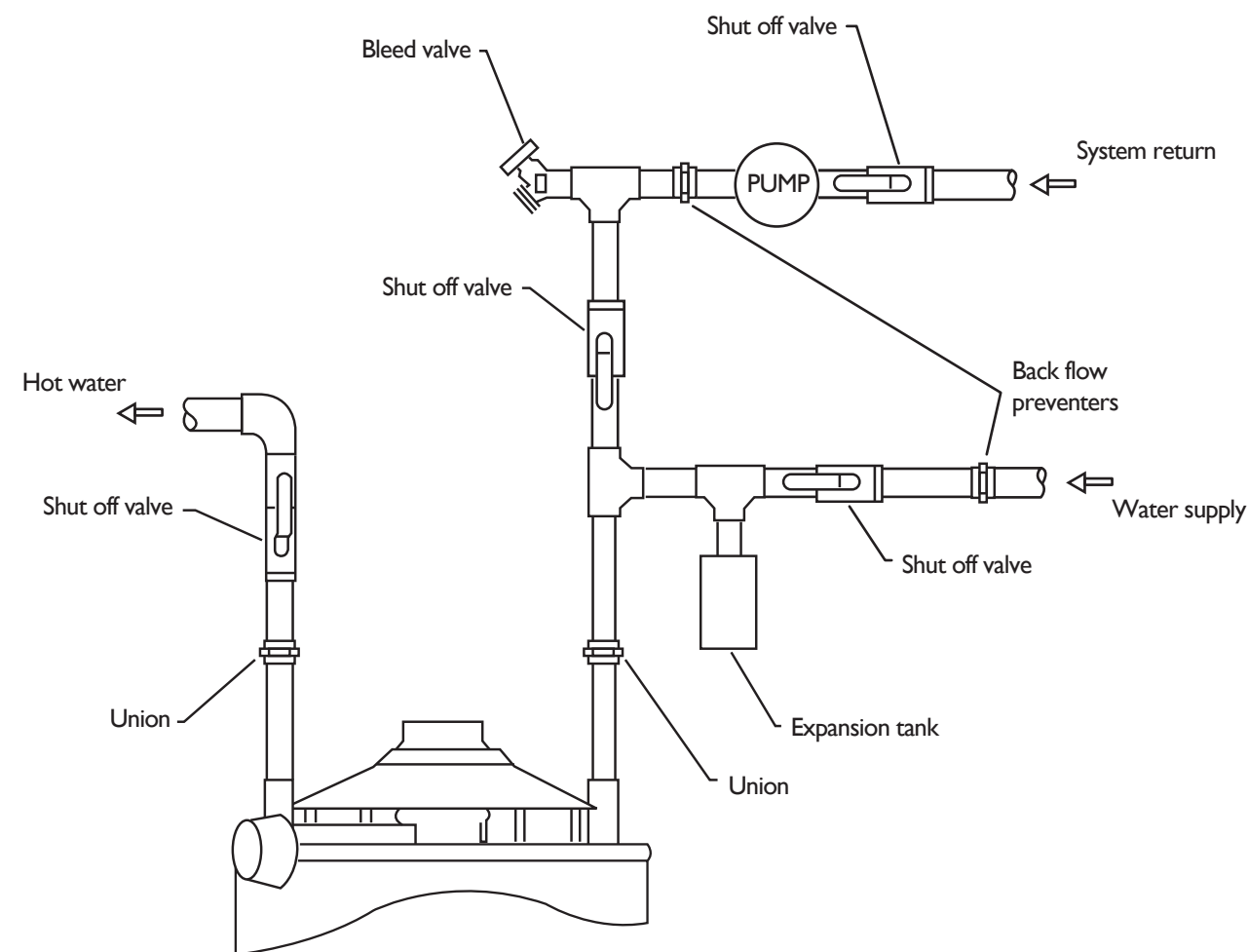


Figure 5



SINGLE COMMERCIAL GAS MODEL TOP CONNECTIONS WITH RETURN CIRCULATION



DANGER

DO NOT STORE OR USE ANY COMBUSTIBLE MATERIALS OR LIQUIDS, SUCH AS GASOLINE, PAINT THINNERS OR OTHER FLAMMABLE VAPORS NEAR ANY GAS BURNING APPLIANCES. VAPORS MAY BE IGNITED BY THE PILOT OR MAIN BURNER FLAMES. NO OBSTRUCTION SHOULD BE IN THE FLOW OF COMBUSTION AND VENTILATION AIR.

INSTRUCTIONS FOR CLEANING TANK

A clean-out procedure is provided for periodic cleaning of the tank. Be sure that you have a gasket on hand before proceeding. Part Number 44002.

1. Shut off gas supply to water heater.
2. Shut off electric supply.
3. Shut off water supply to water heater.
4. Open the nearest hot water faucet.
5. Attach hose to drain valve, and open drain valve so water can drain from water heater.

WARNING

This water can be hot.

6. Remove jacket clean-out cover from jacket (4 screws).
7. After the water heater has been drained, remove the hex head bolts and the plate will come loose. If necessary, tap lightly on the outside edge.
8. After tank has cooled, remove loose scale and lime deposits from inside tank, being careful not to break glass lining.

TO RETURN WATER HEATER TO OPERATION

1. Replace hand hole cleanout gasket.
2. Re-install hand hole plate, with the hex head bolts, inserting all bolts in place before beginning final tightening. Tighten bolts, rotating on opposite sides, rather than in a continuous circular pattern.
3. Tighten water connection. Open cold water inlet valve to fill tank. When water flows in a steady even stream, close hot water faucet previously opened.
4. Turn on gas and/or electric supply to heater.
5. Using lighting instructions located on jacket of heater, put heater into operation.

VACATION

When the heater is not to be used for extended periods of time (vacations, etc.) turn the temperature dial to its lowest setting. This will maintain the water at relatively low temperatures with minimum energy losses and prevent the tank from freezing during cold weather. When making adjustments to the thermostat temperature setting, refer to the section on THERMOSTAT. Also refer to Page 14 WARNING HYDRO-GEN GAS.

NATURAL GAS MODELS

IF YOU SMELL GAS:

- 1.- Open windows.
- 2.- Get all people out of the building.
- 3.- DO NOT light matches.
- 4.- DO NOT touch electrical switches (on or off).
- 5.- Extinguish any open flames.
- 6.- Use an outside phone and immediately call the gas company and the fire department. Ask for instructions. Before hanging up, give your name and address.
- 7.- DO NOT go back into the building. If help is coming, wait for it outside of the building.

L.P. (PROPANE, BOTTLED) GAS MODELS

L.P. GAS IS HEAVIER THAN AIR

Should there be a leak in the system, the gas will settle at FLOOR LEVEL. Basements, crawl spaces, skirted areas under mobile homes (even when ventilated), closets and areas below ground level will serve as pockets for the accumulation of gas.

BEFORE LIGHTING, sniff at FLOOR LEVEL

IF YOU SMELL GAS. FOLLOW THESE RULES:

- 1.- Open windows.
- 2.- Get all people out of the building.
- 3.- DO NOT light matches. Extinguish any open flame.
- 4.- DO NOT touch electrical switches (on or off).
- 5.- SHUT OFF GAS at L.P. tank outside of the building.
- 6.- Use an outside phone and immediately call the gas company and the fire department. Ask for instructions. Before hanging up, give your name and address.
- 7.- DO NOT go back into the building. If help is coming, wait for it outside of the building.

OUT OF FUEL

When your L.P. tank runs out of fuel, turn off gas at all gas appliances including gas to pilots. After L.P. tank is refilled, all appliances must be re-lit according to the manufacturer's instructions.

EXPOSURE TO WATER

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.

AIR SUPPLY

Important air for combustion and ventilation must not come from a corrosive atmosphere. Any failure due to corrosive elements in the atmosphere is excluded from warranty coverage.

The following types of installation (not limited to the following) will require outdoor air for combustion due to chemical exposure and may reduce but not eliminate the presence of corrosive chemicals in the air.

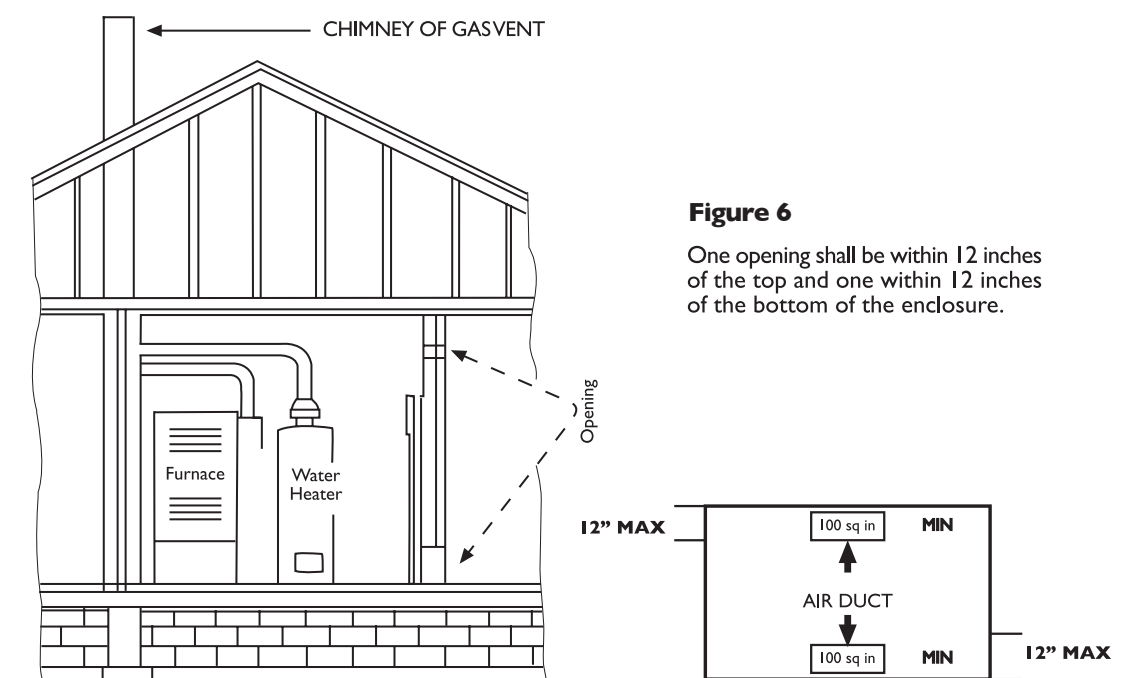
- . Beauty shops.
- . Photo processing labs.
- . Buildings with indoor pools
- . Water heaters installed in laundry, lobby or craft rooms.
- . Water heaters installed in chemical storage areas.

Combustion air must be free of acid-forming chemicals such as sulfur, fluorine, chlorine. These elements are found in aerosol sprays, detergents, bleaches, cleaning solvents, air fresheners, paint and varnish removers, refrigerants, and many other commercial or household products. When urned, vapors from these products form highly corrosive acid compounds. These products should not be stored or used near the water heater or air inlet.

Combustion and ventilation air requirements are determined by the location of the water heater. The water heater may be located in either an open (unconfined) area or in a confined area or small enclosure, such as a closet or small room. Confined spaces are areas with less than 50 sq.ft.

ALL AIR FROM INSIDE THE BUILDING

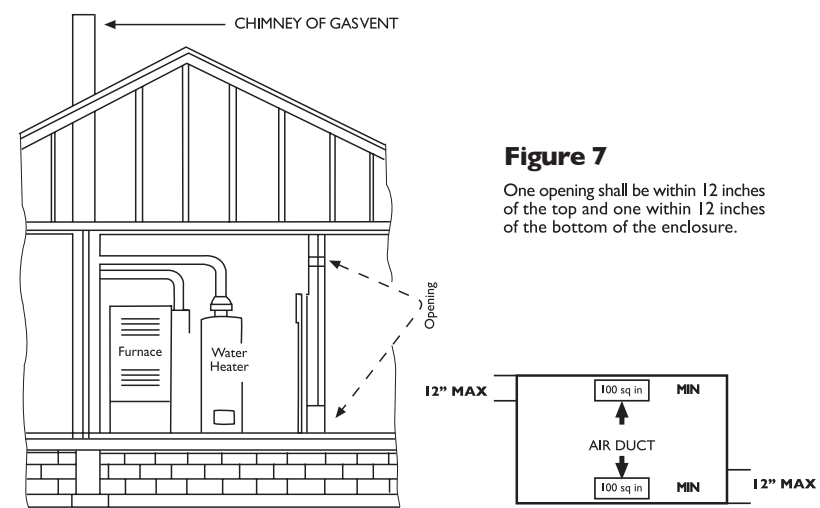
The confined space shall be provided with two permanent openings communicating directly with an additional room(s) of sufficient volume so that the combined volume of all spaces meets the criteria for an unconfined space shall be considered in making this determination. Each opening shall have a minimum free area of 1 square inch per 1,000 BTU per hour of the total input rating of all gas utilization equipment in the confined space, but not less than 100 square inches.



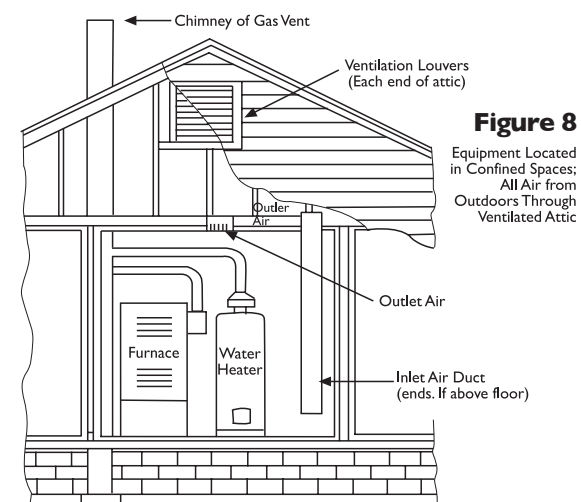
ALL AIR FROM OUTDOORS

The confined space shall be provided with two permanent openings, one commencing within 12 inches of the top and one commencing within 12 inches of the bottom of the enclosure. The openings shall communicate directly, or by ducts, with the outdoors or spaces (crawl or attic) that freely communicate with the outdoors.

When directly communicating with the outdoors each opening shall have a minimum free area of 1 square inch per 4,000 BTU per hour of total input rating of all equipment in the enclosure. (Figure 7)



When communicating with the outdoors through vertical ducts, each opening shall have a minimum free area of 1 square inch per 4,000 BTU per hour of total input rating of all equipment in the enclosure. (figure 8)



1. When communicating with the outdoors through horizontal ducts, each duct opening shall have a minimum free area of 1 square inch per 2,000 BTU per hour of total input rating of all equipment in the enclosure. (figure9)

When ducts are used, they shall be of the same cross-sectional area as the free area of the openings to which they connect. The minimum dimension of the rectangular air ducts shall not be less than 3 inches. For other combustion and ventilation air openings, refer to the National Fuel Gas Code ANSI Z223.1.*

Prove Pilot Ignition by use of Flame Sensor. Ignition of pilot gas is verified by a flame sensor. The flame sensing electrode is located in the pilot flame pattern and through a flame rectification process verifies that a correctly sized pilot flame exists. This causes shut off of the spark circuit and opens the main gas valve.

Main Gas Valve. when the flame sensor verifies an adequate pilot flame igniting sparks are shut off and the main gas valve opens allowing gas flow to the main burners. Main burner gas is ignited by the pilot burner. The pilot burner is an intermittent type device and remains lit for the duration of the burn cycle.

Electronic Control satisfied (Temperature sensor & potentiometer). This action opens a switch breaks the electric circuit to the gas valve. The flue damper motor is energized to turn the damper to the closed position (WHEN APPLICABLE), the combustion air blowers shut off.

Power Failure of interruption. The gas valves, which are held open by electromagnetic coils close shutting off all gas flow. Restoration of power initiates the sequence of operation from the beginning.

Loss of Flame Sensing. On loss of pilot flame or loss of flame sensing (burned off electrode, broken sensor lead), the ignition module shuts off main gas flow and immediately re-starts the pilot ignition sequence while maintaining operation of the combustion air blower and holding the flue damper in the open position. If the pilot flame can be re-established within 90 seconds, the normal operation sequence will be resumed. On loss of flame sensing due to shorting of the flame sensor lead, the ignition module shuts off main gas and unless the short is correct within 90 seconds, the ignition control will lock out and manual restart will be required after the shorting problem is fixed.

Lockout and Continuous Retrial for Ignition. The ignition module is designed to lock out operations if the pilot burner cannot be ignited within 90 seconds from the start of the ignition sequence. In order to prevent property damage (winter freeze-up as an example) and when the failure for the pilot to ignite is due to possible utility problems, (low gas pressure, low line voltage, rolling blackouts etc.) the ignition module will try to restart operation of the unit continuously every hour until operation is restored (after power loss is restored)

WARNING

TO AVOID POSSIBLE INJURY, FIRE AND EXPLOSION, READ THESE PRECAUTIONS BEFORE ATTEMPTING TO LIGHT OR RELIGHT THE PILOT. Check the rating plate near the gas control thermostat for correct gas. DO NOT USE THIS WATER HEATER WITH ANY GAS OTHER THAN THE ONE LISTED ON THE RATING PLATE (Figure 5). Failure to use the correct gas can cause problems which result in DEATH, SERIOUS BODILY INJURY, OR PROPERTY DAMAGE. If you have any questions or doubts consult your gas supplier or gas company.

DAMPER OPERATION SEQUENCE

LEGEND

- DM Damper Motor
- F Fuse
- EC Electronic Cont.
- ES Endswitch
- CM Control Module
- R Relay Coil
- R1 N/C Relay Contact
- R2 N/O Relay Contact
- SS1 N/C Safety Switch Contact
- SS2 N/O Safety Switch Contact

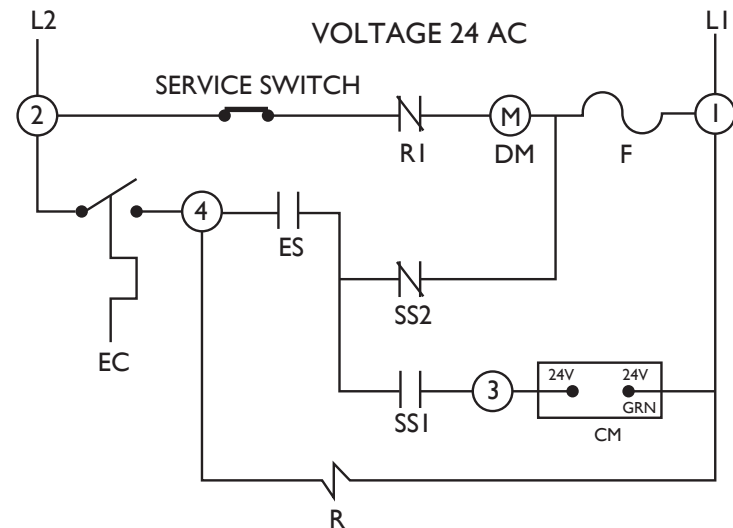


Figure 14

OPERATION

Sequence of operation ULNOx Water Heater

Call for Heat. Turning on the on/off switch provides 24 volts to the control circuit. Closing a circuit switch in the electronic controller completes a 24 volt circuit to the ignition module. The following conditions can cause the electronic controller switch to close: Activation of the electric on/off switch from a cold startup or on demand for hot water due to cool off tank hot water due to flow of cold water to tank, or startup from cold conditions, or the adjustment of the electronic controller to a temperature setting that is higher than the water temperature of the water contained in the tank.

Ignition Module. A circuit in the ignition module is activated to initiate a burner cycle.

Damper Proving (WHEN APPLICABLE). The flue damper motor starts and the flue damper rotates 90 degrees from a closed to a vertical (open) position. The damper proving switch must close to permit the ignition sequence to continue.

Combustion Air / Purge Blower. After the integral flue damper proving switch is satisfied (WHEN APPLICABLE), the blower cycle is initiated. The blower motor turns on for about 2 seconds without any attempt of gas flow as part for the purge cycle to flush the combustion chamber of any unburned gas.

Air Pressure Switch. the blower motor drives a fan which forces air into the burner tray assembly, through the burners, and into combustion chamber and out of the appliance vent. to prove the presence of adequate air supplies for combustion, the appliance employs an air proving pressure switch. This switch has the tube sensor mounted to the outlet duct. when the blower develops adequate positive pressure for good combustion performance the sensor tube pressure at the diaphragm closes the pressure switch circuit allowing the pilot gas ignition circuit to be energized.

Pilot Valve Opens and Pilot ignition. The spark ignition circuit is energized and the pilot valve opens to allow pilot gas flow. A series of electric sparks are generated and the sparks jump a gap to ground at the ignition electrode. The gas flow from the pilot burner passes through the spark gap in the electrode and a hot spark ignites the pilot gas.

NOTE: If the equipment room is located against an outside wall and the air openings communicate directly with the outdoors, each opening shall have a free area of not less than one square inch per 4,000 BTU per hour of the total input rating of all equipment in the enclosure.

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DISCHARGE OF PURGED GASES

When removing purged gases from a piping system, care should be taken to not create hazardous condition, such as discharging the gases into a confined area or in an area which contains an ignition source.

VENT PIPE SYSTEM

The water heater must be connected to the chimney. The vent pipe from the heater to the chimney (vent connector) must be no less than the diameter of the drafthood outlet on the heater and should slope upward to the chimney at least 1/4 inch per linear foot.

Due to great variances in installations, unforeseeable by the manufacturer of the water heater, increased size vent connectors and pipes may be necessary for proper venting.

Consult your local utility. They will aid you in determining the proper venting for your heater from the vent tables in the american National Standard Z223.1 (NFPA 54) "National Fuel Gas Code"

There are various types of vent dampers currently available. Some of these vent dampers are certified by the Canadian Standard Association Laboratories. The certifications apply to the vent damper device only and do not mean they are certified for use on this water heater. The use of these devices is not permitted by the manufacturer of this water heater.

VENTING

IMPORTANT NOTICE

This water heater may be installed as a replacement with venting that met the existing codes at the time of the installation of the original water heater.

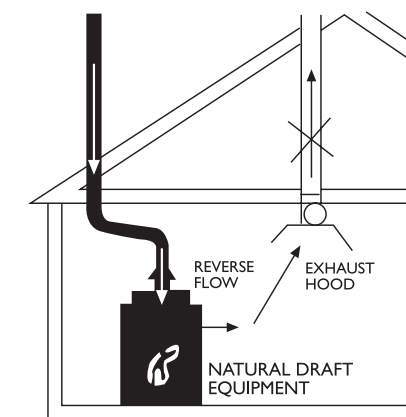
This water heater uses a non-direct, single-pipe vent system to remove exhaust gases created by the burning of fossil fuels. Air for combustion is taken from the immediate water heater location or is ducted in from the outside (see "Combustion Air Supply and Ventilation").

This water heater must be properly vented for the removal of exhaust gases to the outside atmosphere. Correct installation of the vent pipes system is mandatory for the proper and efficient operation of this water heater and is an important factor in the life of the unit.

U.L. approved fuel gas and carbon monoxide (CO) detectors are recommended in all applications and should be installed using the manufacturer's instructions and local codes, rules, or regulations.

Important: If you lack the necessary skills required to properly install this venting system, you should not proceed, but get help from a qualified service technician.

MECHANICAL EXHAUSTING AND FIREPLACES
the operation of air- moving devices such as exhaust fans, ventilation system, clothes dryers fireplaces, etc. can affect the proper operation of gas utilization equipment. Consequently, special attention must be given to conditions these devices may create to avoid unsatisfactory operation of the equipment.



- POTENTIAL HAZARDOUS DOWNDRAFT OPERATION**
- . EXHAUST FANS
 - . VENTILATION SYSTEM
 - . CLOTHES DRYERS
 - . FIREPLACES
 - . OTHERS

After completing all gas connections, check each gas connection and fitting for leaks. Use a soap and water solution or a commercial leak detector fluid. NEVER USE MATCHES OR OPEN FLAME WHEN CHECKING FOR GAS LEAKS.

The water heater and its individual gas shut off valve must be disconnected from the gas supply piping system during any pressure testing or that system at test pressures in excess of 1/2 psi (14" W.C.) or 3.5kPa.

The water heater must be isolated from the gas supply piping system by closing its individual manual shut-off valve during any pressure testing of the gas supply piping system at test pressures equal to or less than 1/2 psi (14" W.C.) or 3.5kPa.

If the gas valve is subjected to pressure exceeding 1/2 psi, the damage to the gas valve could result in an extremely hazardous condition. If this has occurred, the gas valve must be replaced. Contact your dealer for service. It is recommended that all service work be done by a qualified service agency

INSTALLATION SAFETY WARNING L.P. UNITS

Liquefied petroleum (L.P.) 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, sniff at floor level. IF YOU SMELL GAS, follow applicable instructions on Front Cover or Page 21, DO NOT OPERATE APPLIANCE UNTIL LEAKAGE IS CORRECTED.

WARNING

NEVER OPERATE AN EMPTY OR PARTIALLY FILLED WATER HEATER

ANODES

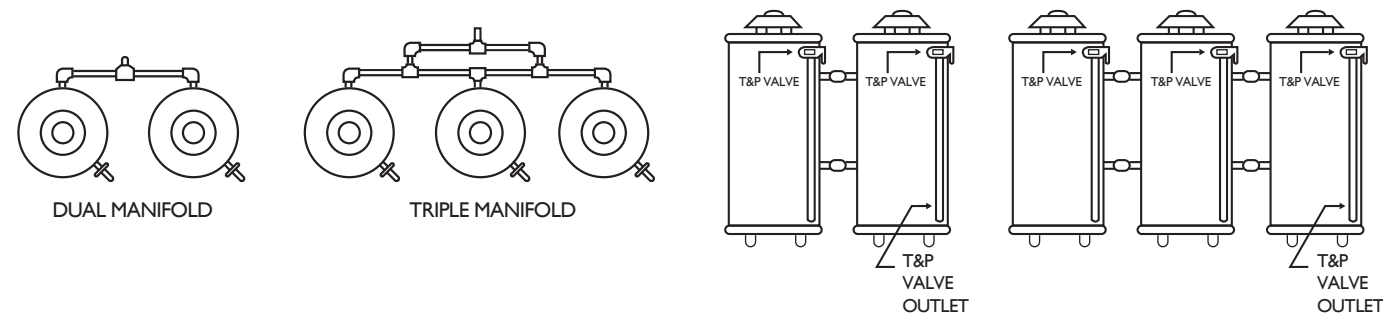
This water heater is supplied with anode rods designed to extend tank life and reduce corrosion. Anodes emit a weak flow of electrical current through the water to protect the tank. When present in "highly active" water, a "rotten egg" odor may be produced from the gases from the anodes, mixing with the water. This is not the fault of the water heater. Chlorination of the water supply system should minimize this condition. (Consult your telephone directory for local water treatment specialists). **REMOVAL OF AN ANODE ROD WILL VOID THE WARRANTY.**

MULTIPLE HEATER INSTALLATION

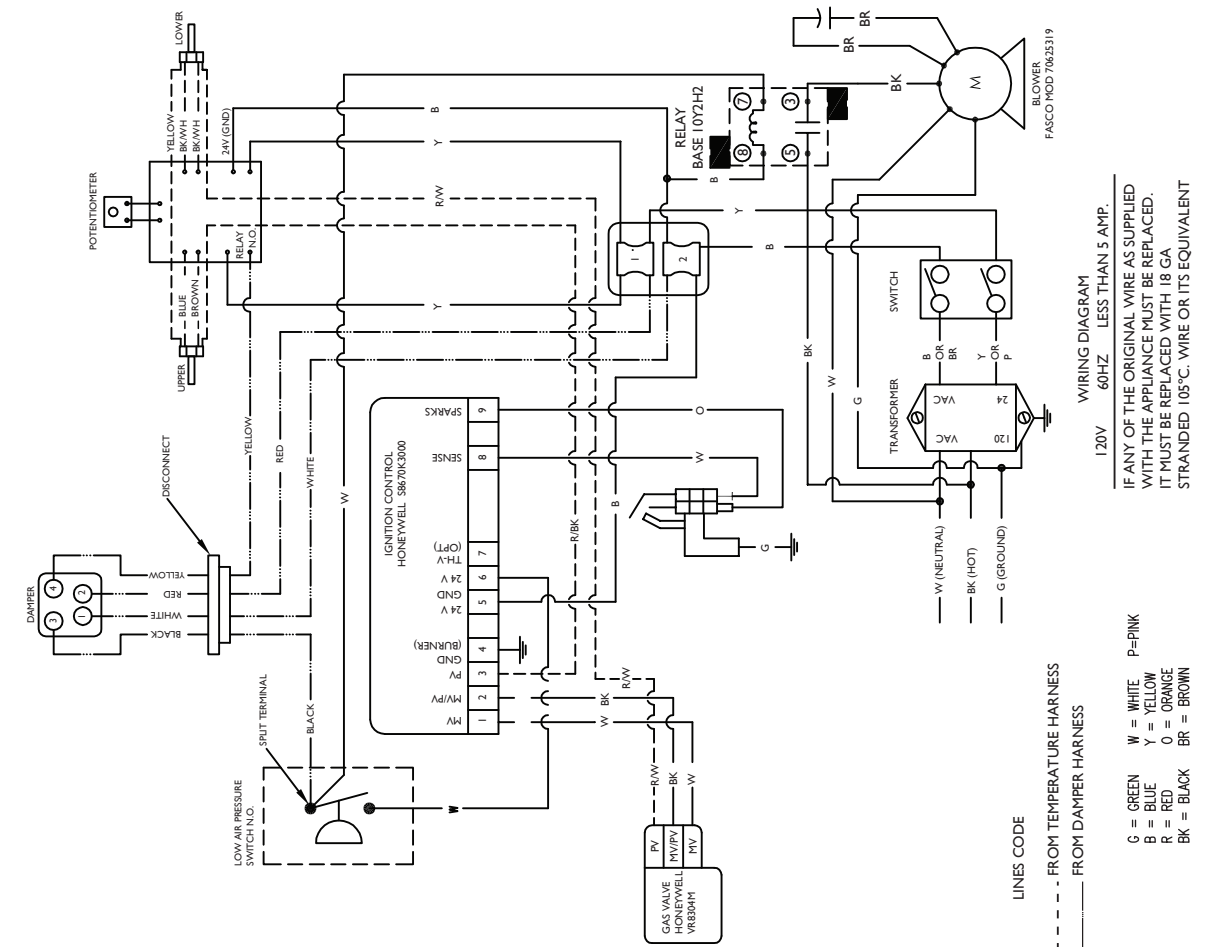
INSTALLATION DIAGRAMS INSTALLATIONS WHERE HEATERS ARE MANIFOLDED.

All heaters should have approximately the same input rate. To manifold a high input heater with a low input heater will result in the lower input heater running excessively. It is preferable for all heaters to be the same model.

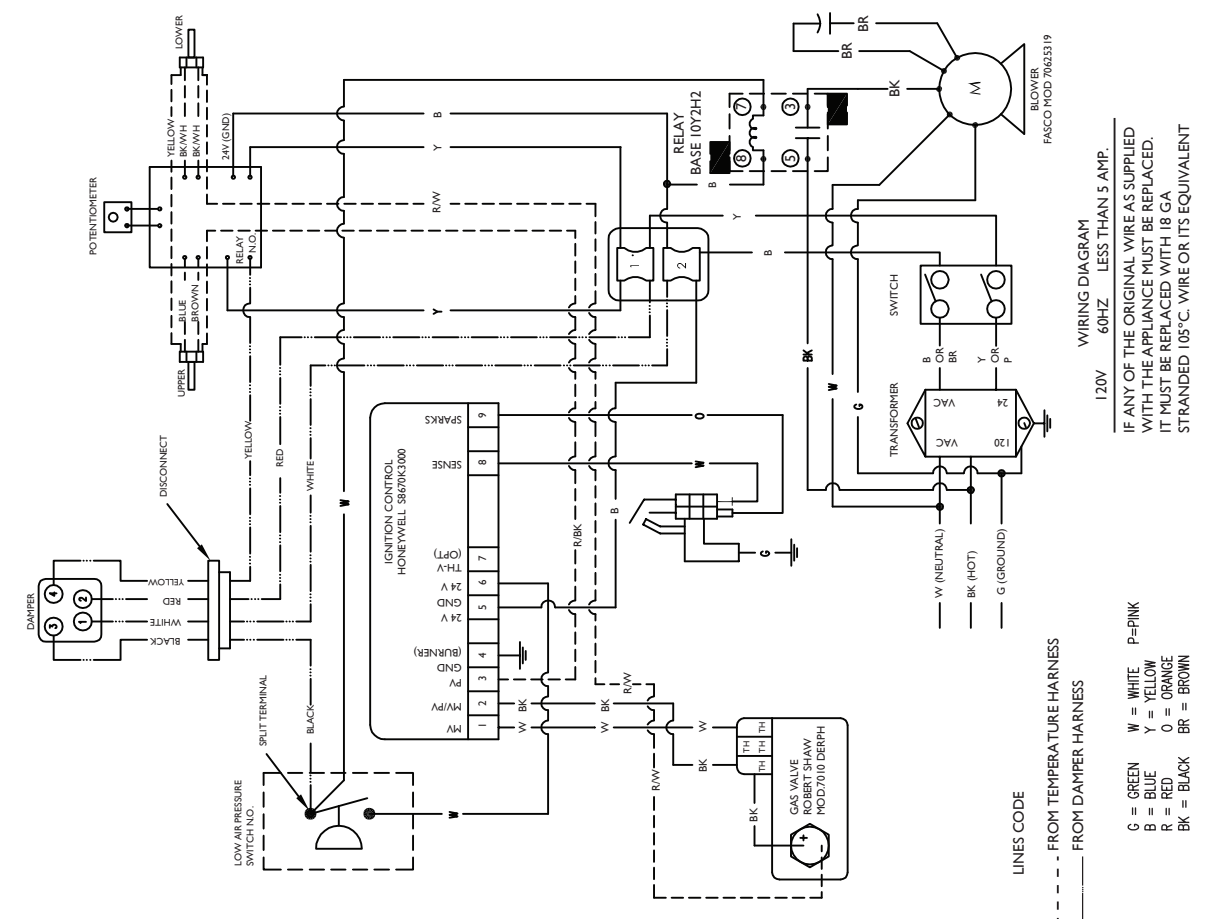
All heaters must be evenly spaced to provide identical number of turns, length and size of pipes in each manifold. This is absolutely necessary to insure a balanced condition to all heaters in the installation.



WIRING DIAGRAM ULN MODELS (EXCEPT ULN 80-512)



WIRING DIAGRAM ULN 80-512



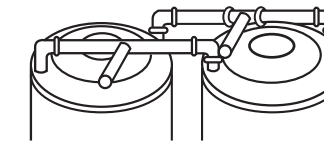
INSTALLATION CHECK LIST

Before putting burner in operation

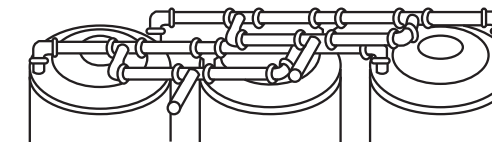
This is presented for ease of reference. It is not comprehensive. All instructions and warnings must be read and adhered to

- A. HEATER LOCATION
 - Close to area of vent.
 - Indoors and protected from freezing temperatures.
 - Proper clearance from combustible surfaces observed and heater not installed directly on carpeted floor.
 - Sufficient fresh air supply for proper operation of heater.
 - Air supply free of corrosive elements and flammable vapors.
 - Provisions made to protect area from water damage.
 - Sufficient room to service heater.
- B. WATER SUPPLY (See WATER PIPING)
 - Install cold water inlet valve (Figure 5)
 - Heater completely filled with water.
 - Water connection tight and free of leaks.
- C. RELIEF VALVE
 - Install a new Temperature and Pressure Relief Valve properly and discharge line run to open drain.
 - Discharge line protected from freezing (Figure 5)
- D. GAS SUPPLY
 - Gas supply same as the type of gas listed on the rating plate.
 - Gas line equipped with shut-off valve, union and drip leg (Figure 5).
 - Approved pipe joint compound used.
 - Soap and water solution used to check all connections and fittings for possible gas leaks.
 - The installer to visually determine that the main burner flames are burning correctly without lifting, floating or flashing back and that the air shutters should be adjusted and locked to a position that results in correct burner flame pattern (see page 14) after to turn on water heater.
- E. VENTING
 - Draft diverter properly installed.
 - Vent connector(s) securely fastened together with screws.
 - Vent connector(s) at least 6" from combustible material.
 - Check with spill test
- F. ELECTRICAL
 - 120 VAC supply.
 - ON-OFF switch near heater.
 - Cove on junction box.
- G. DAMPER
 - Damper in place on heater flue collector outlet.
 - Damper plate has free movement.

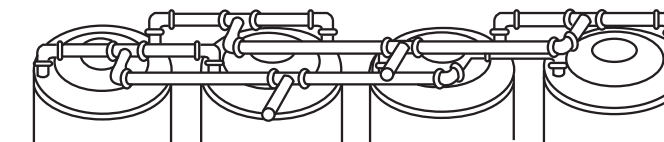
INSTALLATION (Using Top Connect Only)



Typical installation showing two (2) Commercial Heaters in parallel manifold using top connect only.



Typical installation showing three (3) Commercial Heaters in parallel manifold using top connect only.



Typical installation showing four (4) Commercial Heaters in parallel manifold using top connect only.

Figure 10

HYDROGEN GAS

WARNING

Hydrogen gas can be produced in a hot water system that has not been used 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 be opened for several minutes at the kitchen sink before you use any electrical appliance which is connected to the hot water system. Do not light a cigarette, cigar or pipe. Do not smoke. If hydrogen is present, there will probably be an unusual sound such as air escaping through the faucet as the water begins to flow. Remember, no smoking or open flame near the faucet at the time it is opened.

TEMPERATURE AND PRESSURE RELIEF VALVE

For protection against excessive pressures and/or temperatures, a temperature and pressure relief valve must be installed in the opening marked "temperature and pressure relief valve". A design certified by a nationally recognized testing laboratory that maintains periodic inspection of production of listed equipment or materials, as meeting the requirements for Relief Valves and Automatic Gas Shut-off devices for Hot Water Supply Systems, ANSI Z21.22. Pressure rating of the valve must not exceed the working pressure shown on the rating plate of the water heater. Relief piping must terminate 6 inches above a floor drain or external to the building. Do not thread, cap, or plug the end of this discharge line. Be certain that no contact is made with any live electrical part. Do not connect discharge line directly to drain. (Figure 5)

To prevent bodily injury, hazard to life or damage to property, the relief valve must be allowed to discharge water in the event of excessive temperature or pressure developing in the water heater. The function of the temperature and pressure relief valve is to discharge water in large quantities should circumstances demand. If the discharge pipe is not directed to a drain as shown in Figure 5, or other suitable means, the water flow may cause property damage.

The discharge line:

- (1) Must not be smaller than the pipe size of the relief valve,
- (2) Must not be plugged or blocked,
- (3) Must be of material capable of withstanding 210°F without distortion,
- (4) Must be installed so as to allow complete drainage of both the temperature and pressure relief valve and discharge line,
- (5) Must terminate at an adequate drain (Figure 5)
- (6) Must not have any valve between the relief valve and the end of the discharge line.

Failure to install and maintain a new properly listed temperature and pressure relief valve will release the manufacturer from any claim which might result from excessive temperature or water pressure.

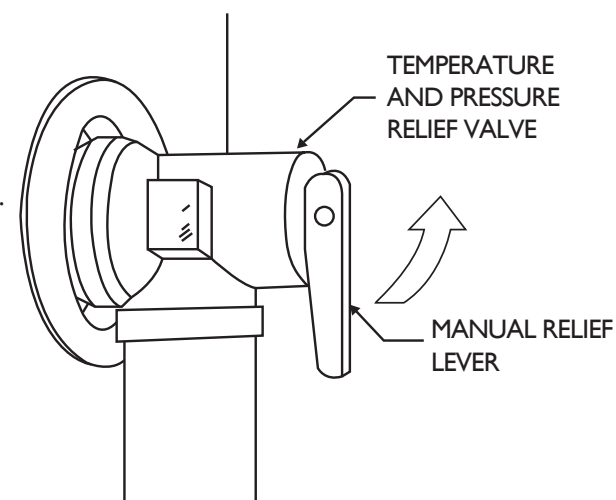


Figure 11 DISCHARGE LINE TO DRAIN

WARNING

Do not attempt to operate this water heater with the cold water inlet valve closed. Manually operate the pressure-temperature relief valve at least once a year. To prevent water damage, discharge line must terminate at an adequate drain. Standing clear of the outlet (discharge water may be hot), lift and release the lever handle on the pressure-temperature relief valve to make the valve operate freely.

If the temperature and pressure relief valve on the appliance discharges periodically, this may be due to thermal expansion in a closed water supply system (see "Pressure Build-Up in Water System" -Page 1). Contact the water supplier or local plumbing inspector on how to correct this situation. Do not plug the temperature and pressure relief valve.

ELECTRICAL

120 VAC LESS THAN 5 AMPS

When installed, this appliance must be electrically grounded in accordance with local codes or in the absence of local codes, with the National Electrical Code, ANSI/NFPA NO. 70-Latest Edition and Canadian Electrical Code CSA #22.2.

Electrical ON-OFF control must be located near heater in accordance with local code.

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

Refer to Page 18, for wiring diagram for models with damper device

JUNCTION BOX

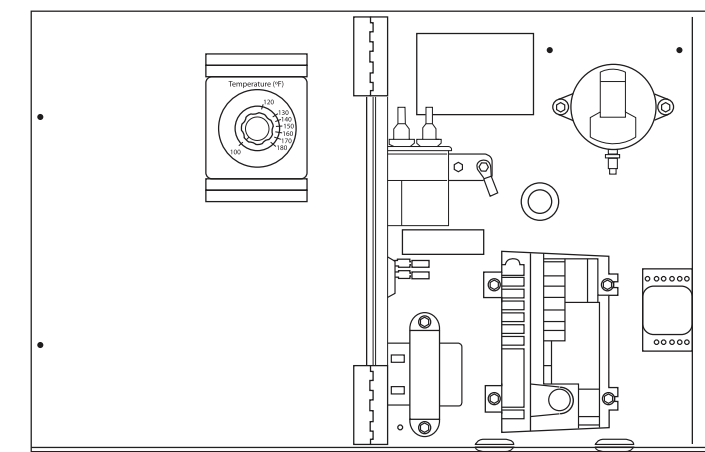


Figure 12

FILLING HEATER WITH WATER

- 1.- Close the heater drain valve by turning the handle to the right (clockwise). The drain valve is on the lower front of heater.
- 2.- Open the cold water supply valve to the heater.
- 3.- To insure complete filling of the tank, allow air to exit by opening the nearest hot water faucet. Allow water to run until a constant flow is obtained. This will let air out of the heater and the piping.

CAUTION

Operating an empty or partially filled heater will result in damage to the tank.

- 4.- Check all new water piping for leaks. Repair as needed.
- 5.- Unit is ready to be started. Follow lighting instructions on Page 24.

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