

# INSTALLATION & MAINTENANCE MANUAL

## CONQUEST® WATER HEATER

### MODELS (20, 25, 30) L 100 A-GCL



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

**IMPORTANT:** THIS MANUAL CONTAINS INFORMATION REQUIRED FOR INSTALLATION, OPERATION AND MAINTENANCE OF THIS EQUIPMENT. READ AND FOLLOW THE INFORMATION IN THIS MANUAL AND ALL OTHER PROVIDED INSTRUCTIONS, LABELS AND MARKINGS BEFORE INSTALLING, OPERATING OR SERVICING THIS UNIT.



**TO THE INSTALLER:** After installation, these instructions must be given to the equipment user or left near the appliance.

**SPECIAL INSTRUCTIONS TO THE OWNER:** Retain this manual for future reference. These instructions contain important information that will help you in maintaining and operating this appliance.



**PVI**

PVI INDUSTRIES, LLC - Fort Worth, Texas 76111 - Web [www.pvi.com](http://www.pvi.com) - Phone 1-800-433-5654

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**Warranty forms ship separately with each product.**

# CONQUEST® WATER HEATER

## 1 SAFETY CONSIDERATIONS

**WARNING:** If the information in the supplied manual(s) is not followed exactly, a fire, explosion or exposure to hazardous materials may result, causing property damage, personal injury or death.

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

### FOR YOUR SAFETY

- **Do not** store or use gasoline or other flammable vapors or liquids in the vicinity of this or any other appliance.
- **Ne pas** entreposer ni utiliser d'essence ou ni d'autres vapeurs ou liquides inflammables à proximité de cet appareil ou de tout autre appareil.

### 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 location away from your building and the smell of gas. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

### QUE FAIRE SI VOUS SENTEZ UNE ODEUR DE GAZ:

- Ne pas tenter d'allumer d'appareil.
- Ne touches à aucun interrupteur; ne pas vous servir des téléphones se trouvant dans le bâtiment.
- Appelez immédiatement votre fournisseur de gaz depuis un voisin. Suivez les instructions de fournisseur.
- Si vous ne pouvez rejoindre le fournisseur, appelez le service de incendies.

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

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

This product contains, or may come to contain materials that have been identified as carcinogenic, or possibly carcinogenic to humans. Before installing, servicing or removing this product, read and follow the supplied instructions

Clearance in accordance with the local installation codes and the requirements of the gas supplier.

Dégagement conforme aux codes d'installation locaux et aux exigences du fournisseur de gaz.

Should overheating occur or the gas supply fail to shut off, turn off the manual gas control valve to the appliance.

En cas de surchauffe ou si l'alimentation en gaz ne s'arrête pas, fermez manuellement le robinet d'arrêt de l'admission de gaz.

**WARNING:** Installation and service must be performed by a qualified installer, service agency or the gas supplier, who must read and follow the supplied instructions before installing, servicing or removing this appliance. Refer to the information contained in this manual. Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury, exposure to hazardous materials or death.

**WARNING:** Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the unit and to replace any part of the control system, all gas controls and all other items affecting safe appliance operation and which has been under water.

**AVERTISSEMENT:** N'utilisez pas cet appareil s'il a été plongé dans l'eau, même partiellement. Faites inspecter l'appareil par un technicien qualifié et remplacez toute partie du système de contrôle et toute commande qui ont été plongés dans l'eau.

**WARNING:** In an emergency shut the main gas supply valve to the appliance from a location safely away from the emergency. Failure to follow these instructions can cause property damage, personal injury, and exposure to hazardous materials or death.

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## PRODUCT SAFETY INFORMATION REFRACTORY CERAMIC FIBER PRODUCT WITH CRYSTALLINE SILICA

**WARNING:** This product contains or may come to contain crystalline silica, which has been identified by the International Agency for Research on Cancer (IARC) as carcinogenic to humans. This product also contains refractory ceramic fibers, which have been identified by the IARC as possibly carcinogenic to humans. Avoid breathing fiber particulates and dust.

### **RISKS:**

- Air borne fibrous insulation is a possible cancer hazard by inhalation.
- Airborne crystalline silica may cause silicosis (lung disease) by inhalation.
- May cause temporary irritation to eyes, skin, and respiratory tract.

### **PRECAUTIONARY MEASURES:**

- Minimize airborne fibers with engineering controls.
- Use NIOSH/MSHA approved respirators as required (see MSDS).
- Wear long sleeved, loose-fitting clothing, eye protection and gloves.

### **FIRST AID MEASURES:** (If any of the irritations listed persists, seek medical attention)

- Eyes: Flush with water.
- Skin: Wash with soap and warm water.
- Ingestion: Do not induce vomiting. Get medical attention if gastrointestinal symptoms develop.
- Inhalation: Remove to fresh clean air.

**WARNING:** If you are unfamiliar with the safe handling of refractory ceramic fiber products, or if you wish additional information prior to beginning any disassembly of the water heater or boiler that might expose refractory ceramic fiber materials, contact: Unifrax Corporation, 2351 Whirlpool Street, Niagara Falls, NY 14305-2413, 1-800-322-2293.

### **IDENTIFICATION OF REFRACTORY CERAMIC FIBER MATERIALS (RCF):**

The burner assembly utilizes RCF material. (The RCF materials are located within the product and not generally exposed except during service, disassembly or assembly.)

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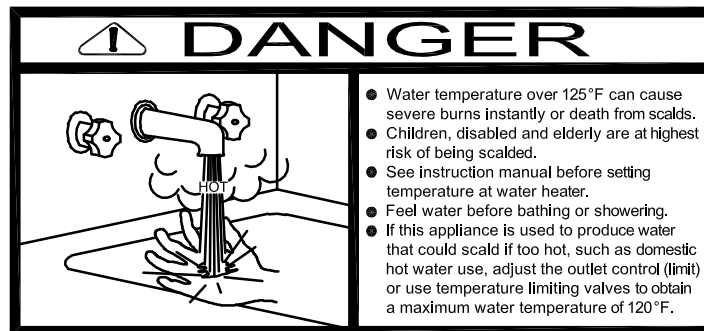
## IMPORTANT SAFETY NOTE

*It takes only 5 seconds of skin contact with 140°F water to cause a second degree burn! You must protect against high water temperatures at all lavatories, tubs, showers and other points of hot water contact.*

**Accidental scalding from high water temperatures is a greater risk in some types of installations. Some examples are:**

**HOMES FOR THE MENTALLY HANDICAPPED  
HOMES FOR THE PHYSICALLY HANDICAPPED  
HOSPITALS AND NURSING HOMES  
ELDER CARE FACILITIES AND REST HOMES  
ORPHANAGES AND CHILD CARE FACILITIES**

**OTHER INSTALLATIONS - WHERE RESPONSE TO CONTACT WITH HOT WATER MAY BE SLOWER OR WHERE THE DANGER OF HOT WATER CONTACT IS GREATER**



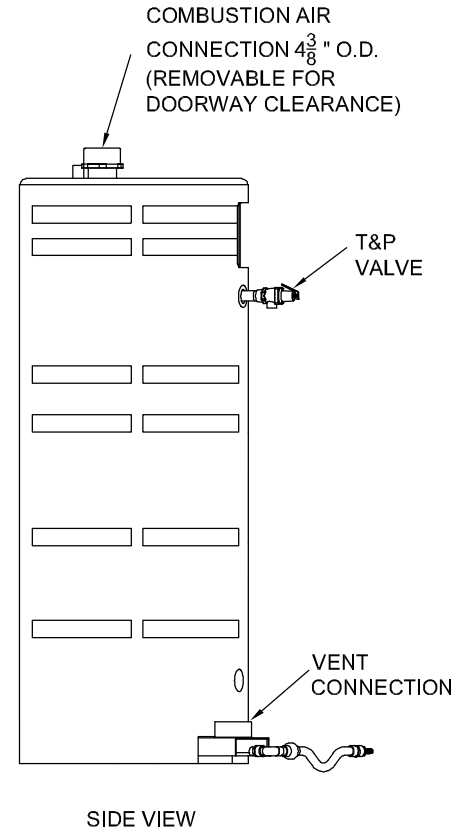
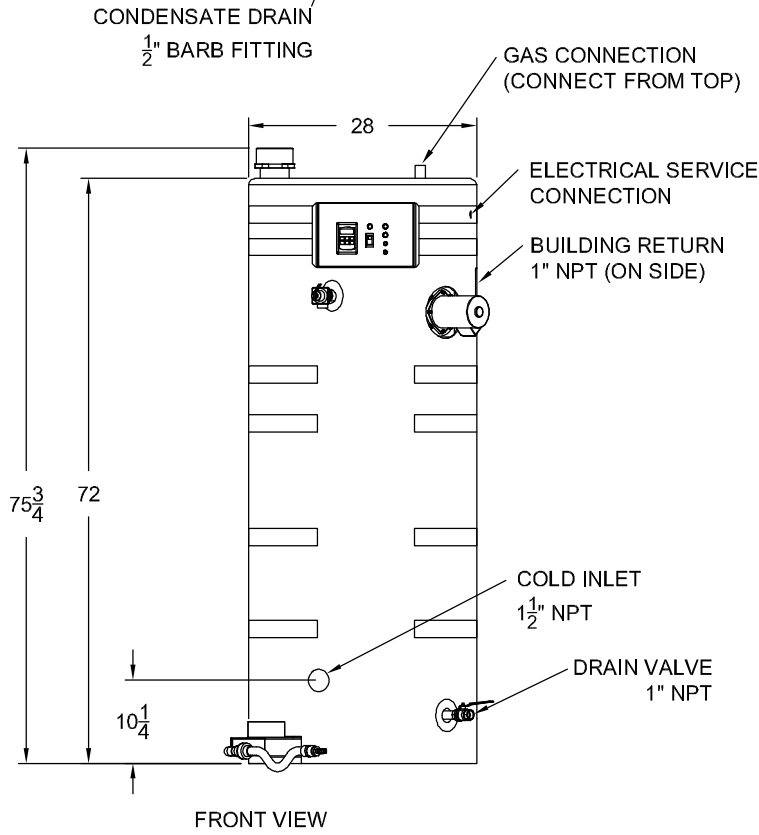
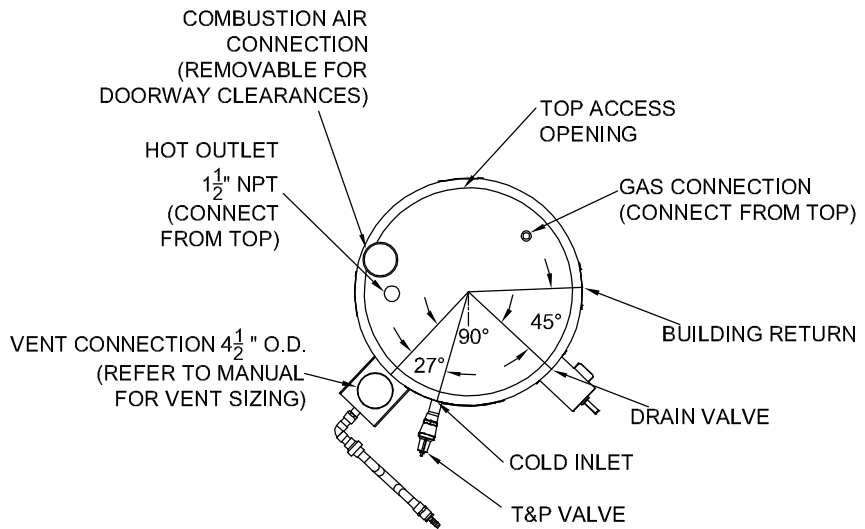
**Thermostatically controlled mixing valves must be used in the design of the potable hot water system.**

**Potable hot water should be tempered to no more than 110°F when used for bathing or other personal uses.**

**Good engineering practice mandates the use of thermostatically controlled mixing valves set at 120°F or less to keep the delivered water temperature below scalding temperatures**

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## 2 PRODUCT DESCRIPTION Component, Controls and Connection Locations (Locations May Vary)



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## 3 WATER HEATER INSTALLATION

### 3.1 Checking Equipment Before You Install

- Inspect the unit completely upon receipt from the freight carrier before signing the bill of lading. Inspect the appliance and all accompanying parts for signs of impact or mishandling. Verify the total number of pieces shown on packing slips with those actually received. Contact the freight carrier immediately if any damage or shortage is detected.
- Check the data decal on the appliance. Be sure the electrical, water and gas supply is adequate for the installation.
- Carefully remove all side and top shipping supports and bracing. If possible, do not remove the wooden base/skid assembly until the product has been moved to its final location for installation and operation (see: Handling and Locating the Water Heater).

### 3.2 Codes

The equipment must be installed in accordance with those installation regulations in force in the local area where the installation is to be made. Authorities having jurisdiction must be consulted before installation is made. In the absence of such requirements, the installation must be in accordance with the instructions in this manual, appliance markings and supplemental instructions and in compliance with the latest edition of the National Fuel Gas Code, ANSI Z223.1/NFPA 54. Where required by the Canadian authority having jurisdiction, the equipment must be installed in accordance with the latest edition of the CAN/CSA B149.1-10 Natural Gas and Propane Installation Code and applicable Provincial Regulations. All appliances conform to the current edition of the ASME Boiler and Pressure Vessel Code, Section IV, Part HLW.

### 3.3 Electrical Requirements

See appliance rating decal for electrical service requirements. The appliance must be electrically supplied and grounded in accordance with the requirements of the authority having jurisdiction or, in the absence of such requirements, with the latest edition of the National Electrical Code ANSI/NFPA No. 70. In Canada, the electrical service must conform to local electrical codes and/or CSA C22.1, Canadian Electrical Code, Part 1.

- All wiring between the unit and field installed devices must be made with type T copper wire.
- Line voltage wire exterior to the appliance must be enclosed in approved conduit or approved metal clad cable.
- To avoid serious damage, **DO NOT** energize the unit until the system and appliance is full of water.

Utiliser du fil de cuivre de la taille appropriée pour le service électrique entrant. Les dommages résultant de l'utilisation de fil d'aluminium seront exclus du champ d'application de la garantie de cet appareil.

### 3.4 Handling and Locating the Water Heater

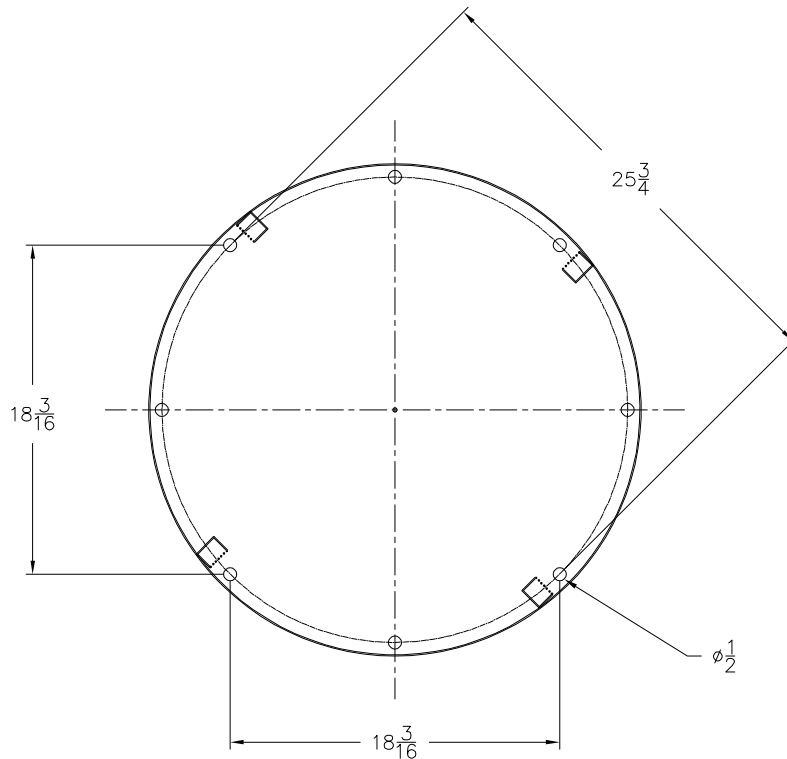
**WARNING: Use industry standard safe rigging methods, such as strapping around the water heater base/skid assembly and using spreader bars, when attempting to lift or move this product. Failure to follow industry standard safe rigging methods can result in property damage, serious injury or death.**

- 1 The water heater must be located indoors.
- 2 This water heater can be installed directly on a combustible floor.
- 3 Locate the water heater in an area that is not exposed to freezing temperatures.
4. Locate on a level surface. Installation on a 4 inch to 6 inch housekeeping pad is recommended.
5. Locate the water heater near a floor drain. Locate the unit so if the tank or water connections should leak, water damage will not occur to the adjacent area or to lower floors of the building. When such locations are unavoidable, install an adequately drained metal drain pan underneath the water heater. The manufacturer's warranty does not cover water damage.
6. Protect associated electrical components and electrical connections from water (dripping, spraying, rain, etc.) during appliance operation and service.
7. Locate the water heater where the vent and air intake piping, when installed, will remain within the maximum equivalent lengths allowed. See Venting.



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8. Use the following diagram to locate anchors or attachment points, when connecting the heater to the floor. Typical concrete anchors: 5/16" x 1-3/4" double expansion shield



### 3.5 Clearances To Combustible Surfaces

The minimum clearance to combustible material is 15" from the top, 24" from the front and zero clearance (0") from the sides and back of the water heater. The Conquest can be installed directly on a combustible floor.

Distance minimale aux matériaux combustibles est égale à zéro (0 cm) sur les côtés et à l'arrière, avant les 61 cm, 38 cm de haut et peut être installé directement sur un plancher combustible.

### 3.6 Service Clearances

Additional clearance beyond the minimum required to combustible material should be considered to facilitate easy access for inspection and service of items such as the burner, gas controls and plumbing connections. Also allow sufficient space for installing and servicing building water, gas, vent, combustion air, electrical, pump and other auxiliary/optional equipment and connections.

### 3.7 Other Code and Regulatory Clearances and Requirements

Additional clearance beyond the minimum required to combustible materials and other requirements may be required to comply with local, state or national codes and regulations. It is to the responsibility of the installer to comply with these requirements. Examples of codes or regulations that may apply are the National Electric Code, State/Regional/National drain water and flue emissions regulations, the National Fuel Gas Code, Building Construction and Safety Codes, the Americans with Disabilities Act (ADA) and, in states where a water heater above a certain input or storage capacity is considered a boiler, the applicable boiler code requirements, the applicable boiler installation requirements in "Safety Code for Controls and Safety Devices for Automatically Fired Boilers" (CSD-1) and other regulatory requirements.

# CONQUEST® WATER HEATER

## 4 GENERAL PIPING GUIDELINES

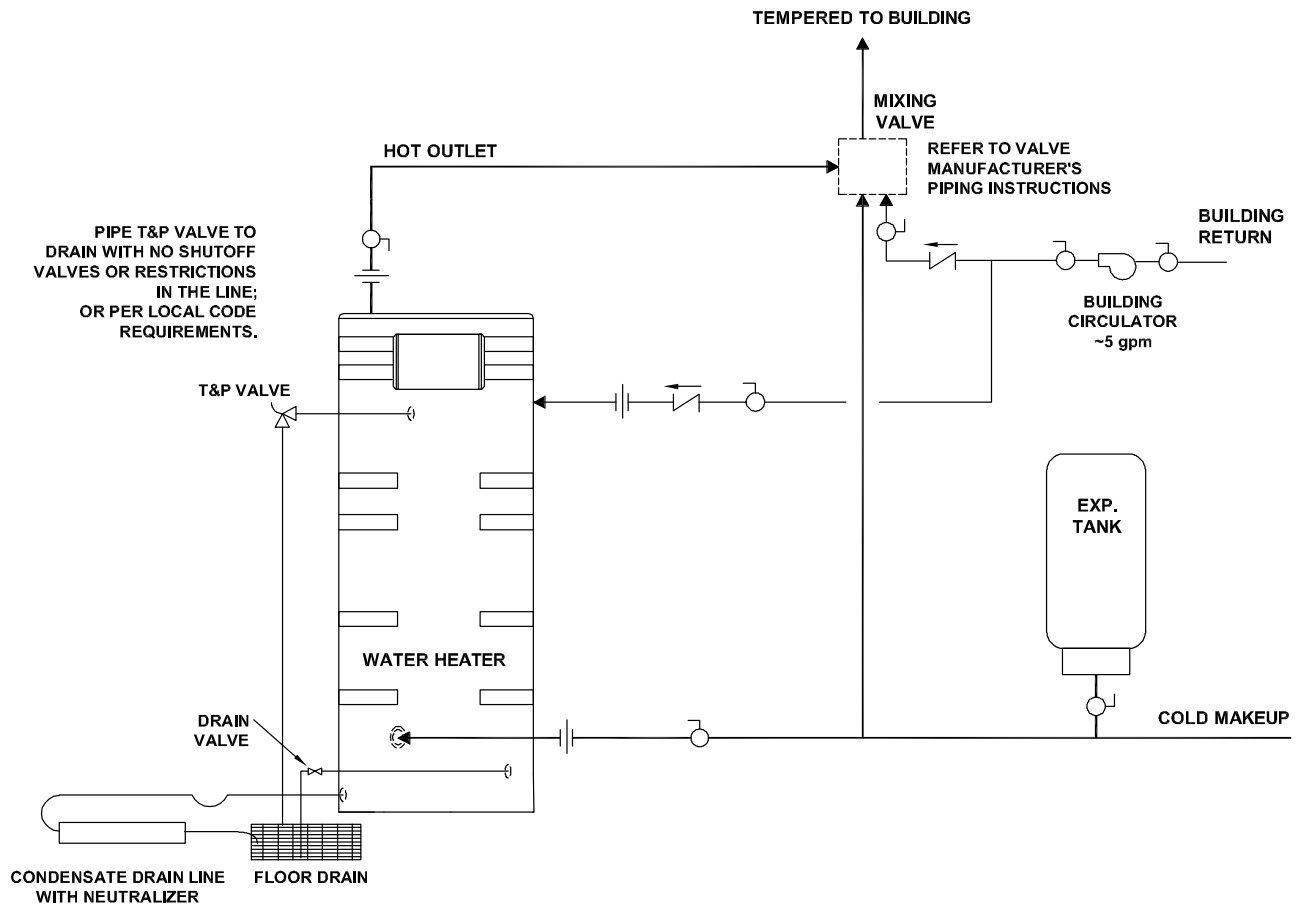
### 4.1 Inlet and Outlet Connections

1. Use only non-ferrous water piping and fittings. Do not use galvanized pipe or fittings. Use of ferrous or galvanized pipe or fittings can cause rust to form.
2. Install shut-off valves and unions on the inlet and outlet water piping for servicing. Use caution when threading pipe nipples into tank connections to prevent cross threading, or over-tightening. Always use a back-up wrench on tank nipples when tightening unions, valves, etc.
3. Insulate hot water and return circulation lines. Insulate cold water supply lines if subject to freezing during shutdown periods. **IMPORTANT:** Do not use the plumbing connected to the appliance as a ground for welding or any other purpose.
4. Pipe the drain valve to a suitable open drain capable of receiving discharge temperatures up to 212°F.

**IMPORTANT:** Cold inlet water to the Conquest should not exceed 100°F. Do not connect the building return or dishwasher recirculation piping to the cold inlet water supply. The Conquest utilizes cold inlet water to help extract almost all of the heat energy from the products of combustion, which lowers the vent temperature to allow the use of PVC vent pipe. Higher cold inlet water temperatures will reduce heater efficiency and increase the vent temperature. If the vent temperature approaches the maximum allowed, a vent temperature limit switch will cycle the heater off to protect the PVC vent.

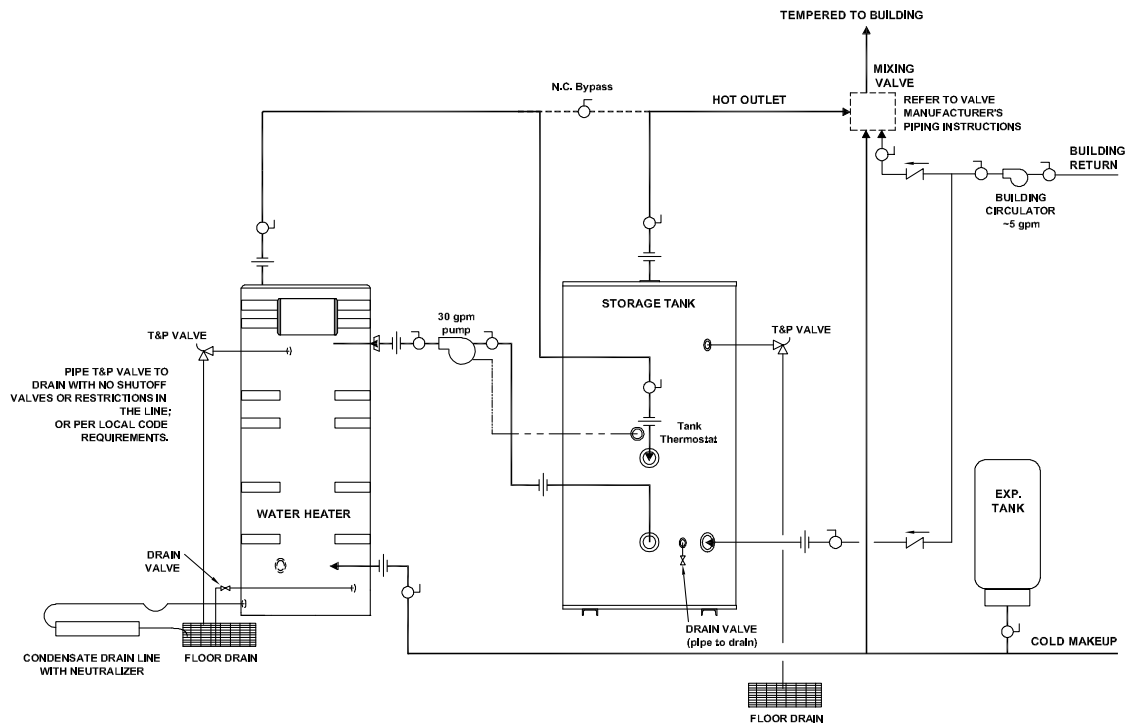
### 4.2 Building Return Piping

To maximize water heater efficiency, do not connect the building return or dishwasher recirculation piping ( $\approx 5$  gpm) directly to the cold inlet. Connect directly to the dedicated building return fitting located at the rear of the tank at mid-tank level.



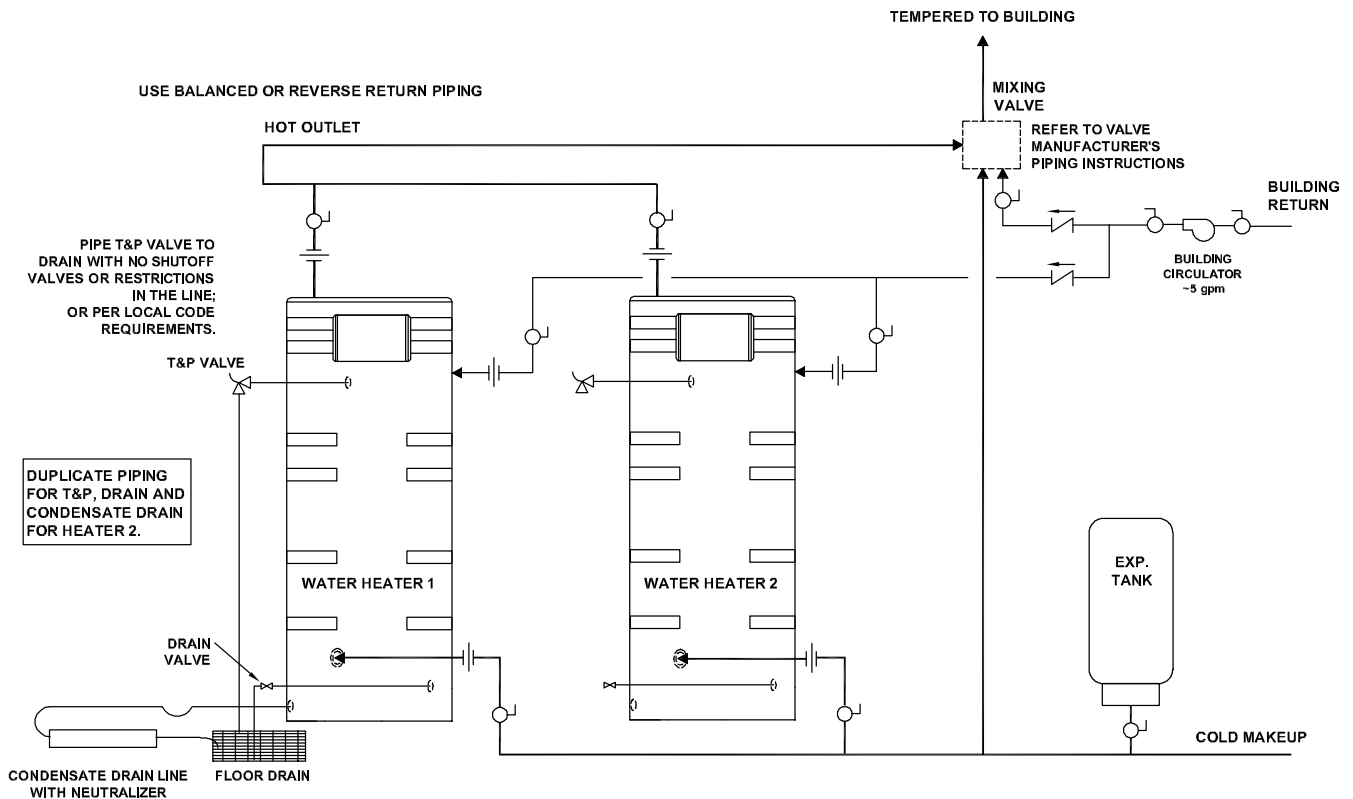
**SINGLE WATER PIPING**

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- Notes:**
1. Do not exceed 160°F stored water temperature in the storage tank.
  2. Circulating pumps require separate electrical circuit wired through the tank thermostat. Tank-mounted thermostat energizes pump on a call for heat. Heater runs independently on its own set point. Pump de-energizes when tank temperature is restored.
  3. Bypass piping allows heater to continue operation with the storage tank removed from the system.
  4. During initial startup of the heater and tank, the heater may cycle occasionally.

## SINGLE STORAGE WATER HEATER WITH SUPPLEMENTAL STORAGE TANK



## TWO WATER HEATERS WITH REVERSE RETURN PIPING

# CONQUEST® WATER HEATER

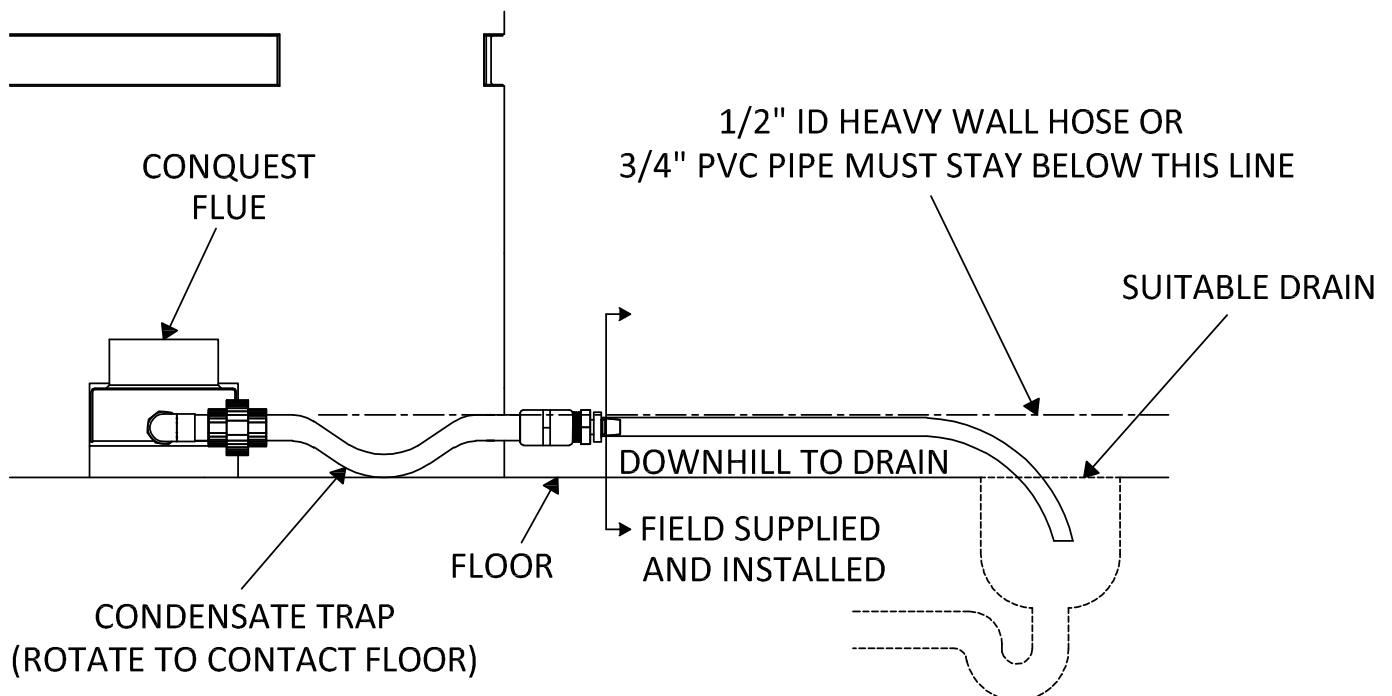
## 5 CONDENSATE DRAIN, TRAP & DISPOSAL

The Conquest water heater produces a significant amount of condensate. The condensate drain is under slightly positive flue pressure, so the provided 3/4" PVC condensate trap must always be used. This trap is sized and designed to fill with the proper amount of condensate to create a liquid barrier to prevent flue gases escaping through the condensate drain into the installed space.

**WARNING: The trap included with this unit must be installed and maintained as described in these instructions and must be included as part of the condensate piping system. This trap is required to keep hazardous products of combustion from continually entering the installed space where the condensate piping terminates. Failure to properly install this trap can cause, personal injury, exposure to hazardous materials or death.**

1. Attach the 3/4" PVC fitting from the union on the condensate trap assembly to the PVC pipe exiting the flue collector located near the front of the Conquest. Additional PVC fittings and pipe can be added to the flue collector connection to relocate the condensate trap assembly as long as all added parts are at the same elevation. After attachment, the trap must be rotated so the offset in the pipe aims down toward the floor. Do not rotate the offset toward the ceiling. Do not use tools to tighten the PVC union. Hand-tighten the PVC union to seat the internal gasket.
2. Do not combine condensate drains from multiple condensing appliances into a single drain line. Route each drain line into a drain suitable for condensate and make certain the end of the drain lines are not submerged or otherwise blocked.
3. All condensate plumbing must be protected from freezing. Do not locate the condensate piping such that an ice dam of frozen condensate can block condensate from leaving the outlet.
4. The condensate is only slightly acidic (3-5 PH), however, local codes may require it to be neutralized prior to entering the drainage system. An optional, field installed, Condensate Neutralization System is available from the factory.
5. Connect a condensate drain line or the PVI Condensate Neutralization System to the barbed hose connection, sized for 1/2" ID heavy wall Vinyl tubing rated for 170°F or higher, located at the end of the condensate trap. All piping from the condensate trap to the suitable drain must remain below the highest point (top of the condensate outlet pipe) on the properly attached condensate trap.

### Condensate Trap Without Optional Condensate Neutralizer



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## 5.1 Condensate Neutralization System (optional)

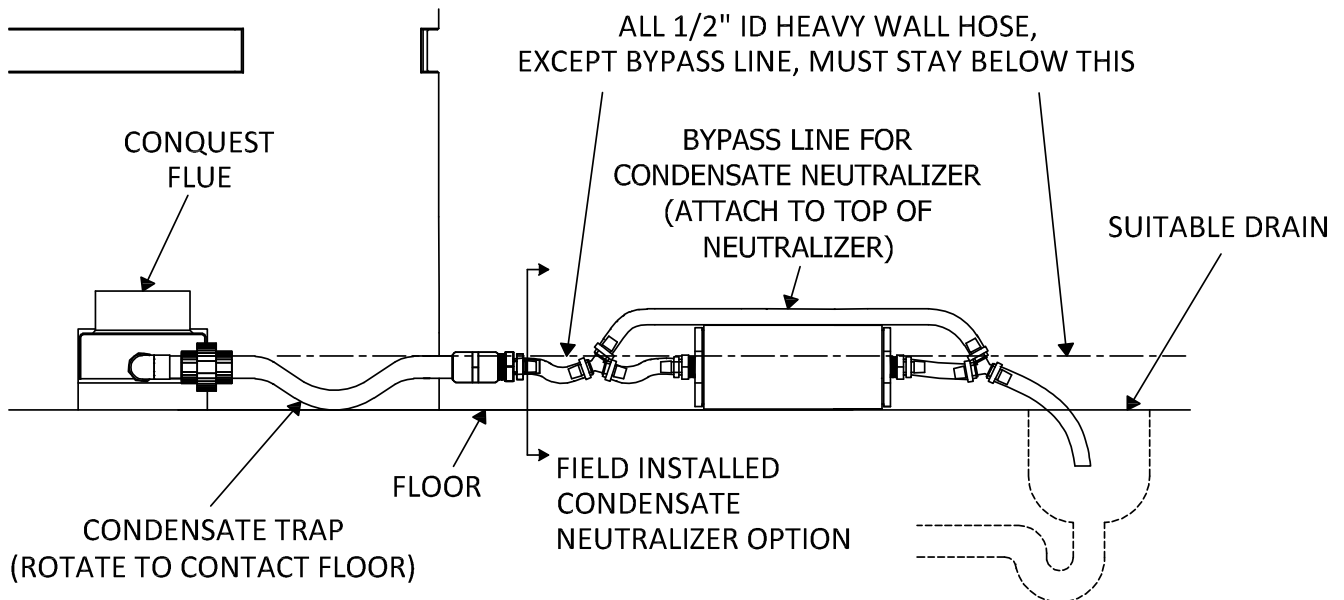
Condensate is only slightly acidic (3-5 PH), however this slight acidity can be neutralized by routing it through an optional PVI Condensate Neutralization System. Some "authorities having jurisdiction" require such neutralization before condensate disposal through a suitable drain. Condensate is neutralized while slowly flowing through a container filled with renewable crushed limestone. The condensate neutralizer reduces or avoids the need for separate chemical treatment or dilution using substantial quantities of tap water. Contact your local PVI representative to obtain a Condensate Neutralization System and follow the instructions included for assembly and connection.

Condensate Neutralization Systems (CNS) Installation Requirements:

1. Follow the steps 1 through 6 in the Condensate Drain, Trap & Disposal section above.
2. The Condensate Neutralization System (CNS) must be mounted horizontally and level, with the mounting strap legs on the floor.
3. Locate the CNS in a convenient place between the condensate outlet and a suitable drain and where the 3" threaded end cap can be removed to recharge the Neutralizer with crushed limestone.
  - a. The CNS must be located such that condensate will flow downhill from the condensate trap outlet to the inlet on one end of the CNS and downhill from the other end of the CNS to the drain. If this continuous downhill flow is not maintained, the trap will not properly operate and condensate could back up into the heater.
  - b. Follow the instructions included in the Condensate Neutralization System for connecting the supplied 1/2" Vinyl tubing.
4. Keep the Condensate Neutralization System closed at all times, except for when the appliance is turned off for maintenance to recharge the condensate neutralizer with limestone.

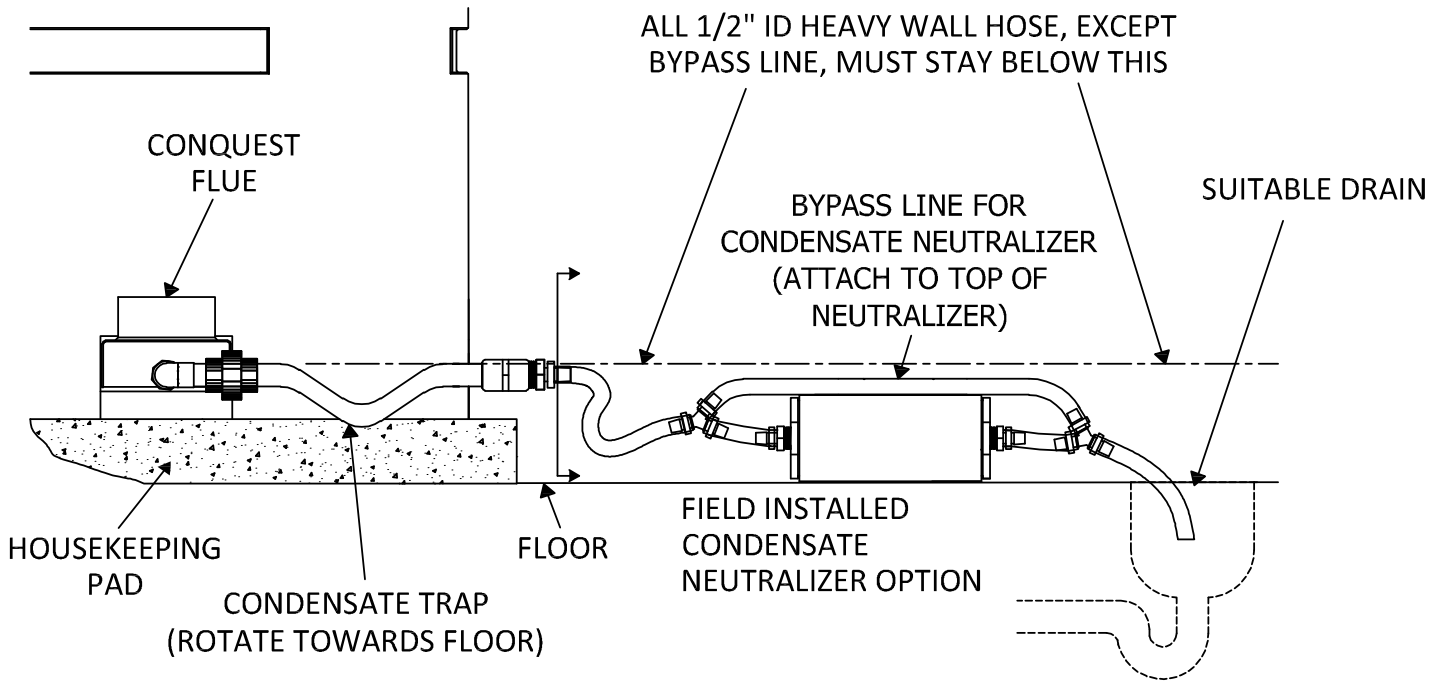
**WARNING: Keep the Condensate Neutralization System closed at all times the appliance is operating. The system must remain closed to prevent hazardous products combustion from continually enter the room. Failure to keep the Condensate Neutralization System closed during appliance operation can cause property damage, personal injury, exposure to hazardous materials or death.**

Condensate Trap With Optional Condensate Neutralizer Located On Same Level As Conquest



# CONQUEST® WATER HEATER

## Condensate Trap With Optional Condensate Neutralizer Located Below Conquest



## 6 GAS SUPPLY AND PIPING

Verify the type of gas specified on rating plate is supplied to the unit. This unit is orificed for operation up to 2000 feet altitude. Appliance Btu/h input derates 4% per 1000 feet elevation above sea level. Consult Factory for installations above 2000 feet elevation.

### 6.1 Gas Train and Controls Certification

**NOTE:** The gas train and controls assembly provided on this unit have been tested under the applicable Nationally Recognized Standard to comply with safety and performance criteria such as ignition, combustion and safety shutdown operation.

### 6.2 Gas Control Trains

All models include the following gas control train components: manual shutoff valve, two safety shutoff valves, zero governor type regulator, manual test valve and manifold pressure taps. These components may be separate or combined in a common housing.

**WARNING:** Do not adjust or remove any screws or bolts on gas train control components which are secured with a red or blue sealing compound. In addition to voiding warranties and certification listings, such adjustment or disassembly can cause improper operation which could result in property damage, personal injury or death.

### 6.3 Inlet Pressure

Measure at the inlet pressure tap located at the main gas cock. The inlet pressure must remain within the minimum and maximum values while the unit is at rest and while the unit is operating at maximum firing rate.

INLET PRESSURE	NAT. GAS	Propane
Maximum Static Pressure (Inches-Water Column)	14.0"	13.0"
Minimum Flow Pressure (Inches-Water Column)	3.5"	8.0"

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## 6.4 Manifold Pressure

Measure at the pressure tap located downstream side of the manual valve closest to the burner. The rated manifold pressure appears on the product data label located near the front of the appliance.

## 6.5 Gas Piping Size

Do not use the gas pipe connection size to determine the gas supply piping. Designing and sizing a gas supply piping system requires consideration of many factors and must be done by a gas supply piping expert. Always follow NFPA 54 National Fuel Gas Code for gas pipe sizing and gas pipe system design. The following charts provide examples of some of the information used by the gas supply piping expert to determine proper pipe sizes.

Use the values in the following table to add the equivalent straight pipe for each elbow or tee to obtain the total distance from the meter:

CONVERT FITTINGS TO EQUIVALENT STRAIGHT PIPE*								
Diameter Fitting (inches)	¾"	1"	1¼"	1½"	2"	3"	4"	5"
Equivalent Length of Straight Pipe (feet)	2'	2'	3'	4'	5'	10'	14'	20'

Use the following table to determine the possible pipe size based on distance from gas meter for a Single Unit Installation using Schedule Metallic Gas Pipe.\*

SINGLE UNIT INSTALLATION – POSSIBLE SCHEDULE 40 METALLIC GAS PIPE SIZE*					
Distance from meter in equivalent feet of schedule 40 metallic gas pipe.* Based on inlet pressure less than 2 psi, specific gravity of 0.60 and a pressure drop of 0.5 in. w.c.					
MODEL	0' - 50'	51' - 100'	101' - 200'	201' - 300'	301' - 500'
20	1"	1"	1-1/4"	1-1/2"	2"
25	1"	1-1/4"	1-1/4"	1-1/2"	2"
30	1"	1-1/4"	1-1/4"	1-1/2"	2"

\*See NFPA 54 National Fuel Gas Code for actual pipe size selection and for sizing Propane gas piping

MULTIPLE UNIT INSTALLATIONS SCHEDULE 40 METALLIC GAS PIPE SIZE CHART*														
Maximum Capacity of Pipe in Thousands of BTU's per hour for gas pressures of 14 Inches Water Column (0.5 PSIG) or less and a pressure drop of 0.05 Inch Water Column (Based on NAT GAS, 1025BTU's per Cubic Foot of Gas and 0.60 Specific Gravity).*														
Nominal Iron Pipe Size, Inches	Length of Pipe in Straight Feet													
	10	20	30	40	50	60	70	80	90	100	125	150	175	200
3/4	369	256	205	174	155	141	128	121	113	106	95	86	79	74
1	697	477	384	328	292	267	246	256	210	200	179	164	49	138
1 1/4	1400	974	789	677	595	543	502	472	441	410	369	333	308	287
1 1/2	2150	1500	1210	1020	923	830	769	707	666	636	564	513	472	441
2	4100	2820	2260	1950	1720	1560	1440	1330	1250	1180	1100	974	871	820
2 1/2	6460	4460	3610	3100	2720	2460	2310	2100	2000	1900	1700	1540	1400	1300
3	11200	7900	6400	5400	4870	4410	4000	3800	3540	3300	3000	2720	2500	2340
4	23500	16100	13100	11100	10000	9000	8300	7690	7380	6870	6150	5640	5130	4720

\*See NFPA 54 National Fuel Gas Code for actual pipe size selection and for sizing Propane gas piping

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## 6.6 Appliance Isolation During Gas Supply Piping Pressure Test

1. The appliance and its provided manual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of ½ PSI (3.5 kPa).
2. The appliance must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressures equal to or less than ½ PSI (3.5 kPa).
3. The appliance and its gas connection must be leak-tested before placing it in operation.

## 6.7 Gas Connection

1. Safe operation of unit requires adequate gas supply with the required static and dynamic (flow) pressures. Actual piping selection depends on many variables that must be carefully considered by the gas piping system designer.
2. Do not select gas pipe sizes based only on the supplied tables. These tables are for use by the gas piping system designer as a reference in checking pipe size selections.
3. Gas pipe size may be larger than heater connection.
4. Installation of a union is suggested for ease of service.
5. Install a manual main gas shutoff valve on the gas supply piping connected to the appliance to isolate the burner and gas train from the main supply gas in compliance with NFPA 54 National Fuel Gas Code and most local Codes.
6. The gas system installer must clearly identify the emergency shut-off device.
7. A sediment trap (drip leg) MUST be provided in the inlet of the gas connection to the unit.
8. The combination gas valves and/or gas regulators incorporate either an internal vent limiter or an externally mounted vent limiting orifice and 1/4" aluminum tube located in a "T" attached to the regulator vent port. Venting to outdoors is not required. Never remove, cut, splice or alter the flexible tubing attached directly to the regulator vent port or to a vent limiting fitting attached externally to the regulator, as this will cause unreliable ignition and can cause improper operation.

Although not required, a connection to the open end of the 1/4" aluminum tube can be made and routed to the outdoors. No other connection point is allowed. Do not remove the aluminum tubing and connect directly to the "T", as damage to the required vent limiter and improper gas control could result.



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## 7 COMBUSTION AND VENTILATION AIR

Provisions for adequate combustion and ventilation air to the mechanical room must be in accordance with Section "Air for Combustion and Ventilation" in the latest edition of the NFPA 54 National Fuel Gas Code, ANSI Z223.1 and/or CAN/CSA B149, Installation Codes or applicable provisions of the local building codes. Any method addressed in NFPA 54 National Fuel Gas Code section "Air for Combustion and Ventilation is acceptable and several are outlined below.

### 7.1 Equipment Located In Confined Spaces

Equipment located in confined spaces requires two openings, one commencing within 12" (30.5 cm) from the top of the enclosure/room and one commencing within 12" from bottom of the enclosure/room to assure adequate combustion air and proper ventilation. The total input of all gas utilization equipment installed in the room must be used to determine the required minimum air volume needed for combustion, ventilation and dilution of flue gasses. Also consider makeup air requirements from other equipment within the mechanical room or other rooms that are pressure connected with the mechanical room. Some examples of other makeup air requirements are from kitchen exhaust hoods, clothes dryers, powered exhaust fans, etc.

- **All Air From Outdoors:**

Each opening requires a minimum free area of 1 square inch per 4000 Btu/hr of the total input rating of all appliances in the enclosure, if directly communicating with the outdoors or communicating to the outdoors through vertical ducts.

Each opening requires a minimum free area of 1 square inch per 2000 Btu/hr of the total input rating of all appliances in the enclosure, if communicating with the outdoors through horizontal ducts.

- **All Air From Inside The Building:**

Follow the requirements of NFPA 54 National Fuel Gas Code, ANSI Z223.1 section "Indoor Combustion Air."

- **Combination Of Air From The Indoors And From The Outdoors:**

Follow the requirements of NFPA National Fuel Gas Code, ANSI Z223.1 section "Combination Indoor and Outdoor Combustion Air."

- **From Outdoors Through One Opening:**

Follow the requirements of NFPA National Fuel Gas Code, ANSI Z223.1 section "One Permanent Opening Method."

**NOTE:** This unit may be installed with a remote air intake system which uses a make-up air duct to draw combustion air directly from outdoors.

**WARNING:** Adequate clean combustion air must be provided to the appliance. The appliance must never operate under a negative pressure. Particular care must be taken when exhaust fans, compressors, air handling units, etc. may rob air from the appliance. The combustion air supply must be completely free of any chemicals or fumes, which may be corrosive to the appliance. Some common chemical fumes to avoid are fluorocarbons and other halogenated compounds, most commonly present as refrigerants or solvents, such as Freon, trichloroethylene, perchlorethylene, chlorine, etc. These chemicals, when in contact with the equipment or when burned, form acids which quickly attack the tubes, flue collector, stack and other appliance and auxiliary equipment. Failure to provide adequate clean combustion air or operating under negative pressure can cause premature, unwarranted product failure or unsafe operation producing carbon monoxide that could escape into the building. Exposure to carbon monoxide can lead to personal injury or death.

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## 7.2 Maximum Allowed Remote Combustion Air Inlet Length (Equivalent Length)

A vertical or horizontal remote air inlet system can be connected to this appliance without modification. The maximum length of field supplied single wall pipe, such as galvanized ventilation pipe, is shown in the chart below titled Maximum Air Inlet Duct Equivalent Length. Use metal tape or RTV sealant to seal each pipe joint.

Maximum Air Inlet Duct Equivalent Length			
Duct Size	3" Duct	4" Duct	6" Duct
Max Equivalent Length	100 feet	150 feet	200 feet

To determine the maximum straight length of duct allowed, use the Duct Fitting Equivalent Length chart below to find the total equivalent length for all duct fittings in your combustion air system. Then subtract this number of feet from the total equivalent length allowed in Maximum Air Inlet Duct Equivalent Length chart above. The sum of this calculation is the maximum length of straight duct allowed. If a longer length is required, repeat the calculation using a larger duct size. No additional deduction is required for the addition of the duct system terminal.

Duct Fitting Equivalent Length			
Duct Pipe:	3" Duct	4" Duct	6" Duct
90° Elbow	22 feet	22 feet	16 feet
90° Long Radius Elbow	12 feet	12 feet	10 feet
45° Elbow	12 feet	12 feet	10 feet

The following remote air duct information is provided for use in design calculations, if needed.

Remote Air Duct Specifications	
Input MBtu/h	Required Air (SCFM)
199	44
250	54
299	65

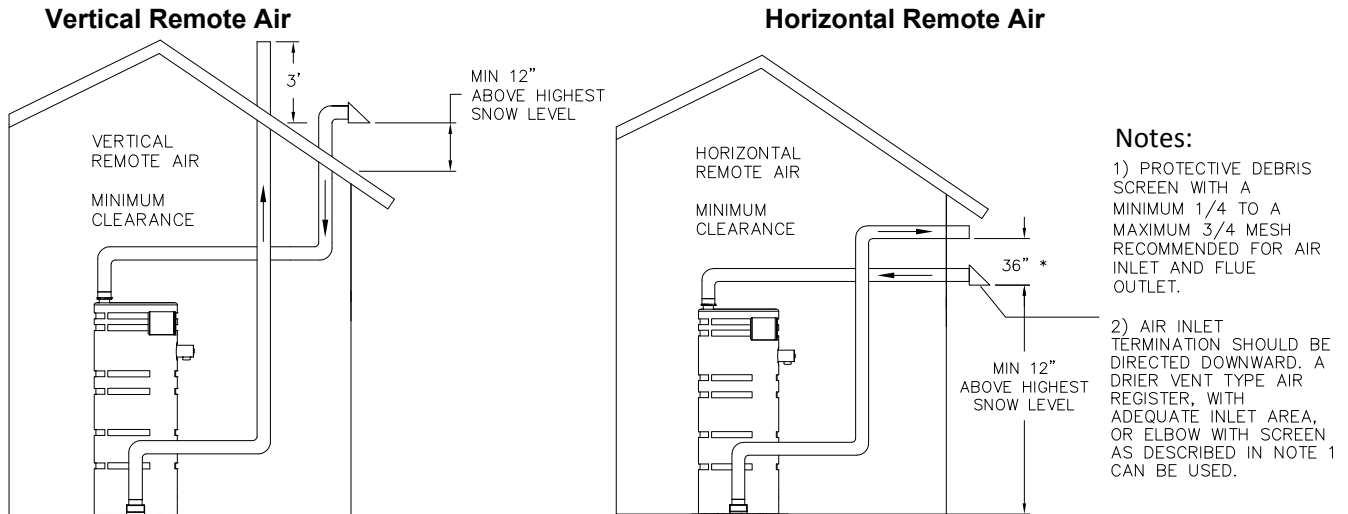
## 7.3 Remote Combustion Air Cap

A suitable remote air termination must be used to prevent water, debris, animals or obstructing material from entering the remote air supply.

## 7.4 Vertical or Horizontal Remote Air Duct Termination

- Air inlet must be located no less than 3 feet (0.91m) below the exhaust terminal if they are within 10 feet (3.05 m) of each other, unless the flue outlet terminates with a straight discharge. If the flue outlet terminates with a straight discharge, the air inlet can be located no less than 18 inches (0.46m) below the exhaust terminal.
- If terminating through the roof, the air inlet must terminate at least 12 inches (0.3 m) above roof level and at least 12 inches (0.3 m) above snow levels.
- If terminating through a sidewall, the air inlet must terminate at least 12 inches (0.3 m) above grade and/or at least 12 inches (0.3 m) above possible snow levels.

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\* When flue outlet is terminated with a straight discharge, separation of terminations must be a minimum of 18".

## 7.5 Combining Remote Air Ducting

Each water heater **MUST** have separate intake piping, unless the air inlet piping, exhaust duct and other system considerations have been fully evaluated and a combined duct system designed by one of the duct design firms identified at [www.pvi.com/vent-design.html](http://www.pvi.com/vent-design.html). Before operation of a combined remote air ducting system, all of the duct design firm's system installation and operation requirements must be in place, their instructions followed and the system must be properly maintained.

**WARNING: Do not combine remote air ducting of multiple appliances into a single remote air duct unless the combined remote air ducting system has been evaluated and designed by a specified duct design firm and the combined remote air duct system is installed, operated and maintained following instructions from that firm. Combining remote air ducting without following these requirements can result in failure of the water heater and venting system and/or exposure to carbon monoxide and can result in property damage, personal injury or death.**

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## 8 VENTING

### 8.1 Venting the CONQUEST:

All Conquest models use the positive pressure generated by the burner system blower to push combustion products out of the vent. Since the vent system is under positive pressure and must be capable of containing condensate, it must be constructed of schedule 40 or 80 solid PVC or CPVC pipe. Do not use PVC or CPVC pipe with cell/foam type construction (such as "CellCore") or other non-solid PVC or CPVC plastic pipe. Polypropylene or single or double wall stainless steel venting listed by ETL, UL, ULC or CSA for Category IV positive pressure gas appliance venting may be used instead of solid PVC or CPVC plastic pipe venting.

Utilisez une catégorie IV PVC, CPVC ou ETL, UL, ULC ou CSA acier inoxydable ou inscrits conduit d'évacuation en polypropylène. Ne sélectionnez pas la taille du tuyau de ventilation basée uniquement sur le diamètre raccord de l'appareil.

Follow the instructions below for installing solid PVC or CPVC pipe. For other listed vent materials, follow the vent manufacturer's instructions for installation, sealing, supporting and terminating their vent system. Do not insulate plastic vent pipe.

The stainless steel vent connection located near the front of the water heater is 4-1/2" O.D., to accept a 4 inch PVC or CPVC pipe coupling. A reducer coupling may also be used to accommodate smaller or larger vent pipe. (See Maximum Vent Length tables). Do not use a barometric damper with the Conquest positive pressure vent.

The Conquest water heater can be vented either vertically, through a ceiling or roof, or horizontally through a wall. The Conquest is a Category IV positive pressure gas appliance venting and can be routed to the outdoors in any direction, from the flue outlet of the water heater, except down. The vent must be installed and supported at least every four feet to slope downward toward the water heater vent connection with at least ¼ inch drop per linear foot of horizontal vent run, to allow proper drainage of accumulated condensation. All penetrations through walls and roofs must be weather and gas tight, such that rain and products of combustion cannot pass from outdoors back indoors.

Additional steps required when venting with solid PVC or CPVC pipe:

1. Read and follow the information, instructions and warnings in "VENTING" section.
2. Do not insulate the plastic vent pipe.
3. Design the vent pipe route so that normal expansion (pipe getting longer) and contraction (pipe getting shorter), due to on and off temperatures, does not bind or put stress on cemented pipe fittings.
4. A 4 inch pipe coupling must always be the first fitting attached to the Conquest vent connection when using a PVC or CPVC vent system. If a listed stainless steel or polypropylene Category IV vent system is used, the correct adapter for attaching and sealing to the Conquest 4-1/2 inch O.D. vent connection must be obtained from the manufacturer of the vent system to be installed.
5. For PVC or CPVC, dry-fit the 4" pipe coupling onto the Conquest vent connector. Then remove the coupling and apply a liberal coating of room temperature vulcanizing (RTV) adhesive to the outside of the vent connector and to the inside of the plastic pipe coupling. Before the RTV sets, slide the coupling over the vent connector while rotating approximately 1/8 of a turn. Inspect and apply additional RTV to the joints, if needed to provide a sound air and water tight seal.
6. Drill a pilot hole through the the PVC or CPVC coupling flange and into the center of the stainless steel vent connector flange in three equally spaced locations around the pipe. Drive stainless steel sheet metal screws through the pilot holes to attach and firmly hold the plastic coupling onto the vent connector flange.
7. Clean and deburr all solid PVC or CPVC pipe ends, then trial assemble the entire vent system vent before joining with cement. Mark the pipe and fittings to identify their locations, then disassemble. Reassemble the vent system using fresh PVC cement to connect PVC pipe and fresh CPVC cement to connect CPVC pipe. If both solid PVC and solid CPVC pipe are used in the same vent system, all joints between the two types of pipe must be made with fresh cement suitable for both materials. Follow the cement manufacturer's instructions for making sound air and water tight joints.
8. Vent support – For PVC or CPVC, the vent system must be supported at intervals no greater than four feet, to prevent sagging, distortion and stress on pipe fittings. Vertical pipe must also be supported to avoid stress on all cemented pipe fittings and to prevent putting excessive weight on the appliance vent connection. For listed stainless steel or polypropylene vent system, follow the vent system manufacturer's instructions.

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9. Testing for leaks – Once the vent system is installed, it must be checked to confirm all joints in the vent system are air and water tight. After the vent is assembled, close the end of the vent with a taped plastic bag or some other temporary closure. With the gas supply turned off, energize the Conquest combustion blower to apply air pressure to the vent system. Spray each joint and vent connection with commercially available leak detection liquid to confirm no air is escaping from any point. Repair any leaks and retest. After testing is complete, de-energize the combustion blower, wipe clean the leak detection liquid and REMOVE the temporary vent closure.
10. The vent pipe must be sealed at the point where it passes through a wall or roof, to prevent rain, insects or flue products from entering the living space or interior of the building.
11. For proper vent operation and to protect the gas vent from wind and weather, attach a UL listed vent termination to the outdoor end of the vent or otherwise provide suitable termination to prevent wind, water, debris or animals from obstructing or entering the vent.
12. Do not use a barometric damper with the Conquest venting system. Barometric dampers are designed for use with certain Category I negative pressure vent systems. The Conquest uses certain Category IV positive pressure vent systems and will not operate safely with a barometric damper.

**WARNING: Use only solid PVC or CPVC pipe or use Polypropylene or stainless steel venting (single or double wall) listed by a nationally recognized testing laboratory for Category IV positive pressure gas appliance venting. Use of ABS pipe, or use of PVC or CPVC pipe with cell/foam type construction or use of use of venting materials other than specified in these instructions can result in failure of the venting system and/or exposure to carbon monoxide or other toxic fumes, which can result in property damage, personal injury or death.**

**WARNING: Do not vent this water heater into an existing or traditional gas vent or chimney, do not combine the vent with any other appliance and do not use a barometric damper in the vent. Such venting could result in failure of the venting system and/or exposure to carbon monoxide which can result in property damage, personal injury or death.**

## 8.2 Maximum Vent Length (Equivalent Length)

The maximum length of field supplied Category IV vent is shown in the chart below:

Maximum Allowable Equivalent Vent Length			
Vent Size	3" Vent	4" Vent	6" Vent
Max Equivalent Length	100 eq. feet	150 eq. feet	200 eq. feet

Pipe fittings reduce the maximum allowable vent length. Use the Category IV vent manufacturer's equivalent length deduction for all elbows, terminations, etc. If the information is not readily available from the vent manufacturer, use the Vent Fitting Equivalent Length chart below to find the total equivalent length for all vent fittings in your combustion air system. Then subtract this number of feet from the total equivalent length allowed in Maximum Category IV Vent Equivalent Length chart above. The sum of this calculation is the maximum length of straight vent allowed. If a longer length is required, repeat the calculation using a larger vent size. When using this chart, no additional deduction is required for the addition of the vent system terminal.

Vent Pipe Fitting Equivalent Length					
Vent Pipe:	PP *	PP *	Other **	PP *	Other **
	3" Vent	4" Vent	4" Vent	6" Vent	6" Vent
90° Elbow	22 feet	22 feet	22 feet	22 feet	16 feet
90° Long Radius Elbow	12 feet	12 feet	12 feet	14 feet	10 feet
45° Elbow	12 feet	12 feet	12 feet	14 feet	10 feet

\* PP = polypropylene

\*\* Other = PVC, CPVC or Stainless Steel

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The following vent information is provided for use in design calculations, if needed.

Venting Specifications		
Input MBtu/h	Combustion Air Volume (cfm)	Max Vent Press. " W.C.
199	68	0.5
250	85	0.5
299	103	0.5

## 8.3 Vertical or Horizontal Vent Termination:

1. The vent terminal must have a minimum clearance of 4 feet (1.22 m) horizontally from, and in no case be located above or below, unless a 4 foot (1.22 m) horizontal distance is maintained from electric meters, gas meters, regulators and relief equipment.
2. The vent cap must terminate at least 3 feet (0.91 m) above any forced air inlet within 10 feet (3.05 m).
3. The vent shall terminate at least 4 feet (1.22 m) below, 4 feet (1.22 m) horizontally from or 1 foot (0.3 m) above any door, window or building air inlet to the building.
4. The vent system shall terminate at least 1 foot (0.3 m) above grade and at least 1 foot (0.3m) above possible snow accumulation levels and shall terminate at least 7 feet (2.13 m) above grade when located adjacent to public walkways or gathering areas.
5. To avoid a blocked flue condition, keep the vent cap clear of snow, ice, leaves, debris, etc.
6. The vent must not exit over a public walkway, near soffit vents or crawl space vents or other areas where condensate or vapor could create a nuisance or hazard or cause property or could be detrimental to the operation of regulators, relief valves or other equipment.
7. A horizontal vent must extend one foot beyond the wall.
8. A horizontal vent terminal must not be installed closer than 3 feet (0.91m) from an inside corner of an L-shaped structure.
9. A vertical vent must exhaust outside the building at least 3 feet (0.91m) above the point of the exit and at least 2 feet (0.61 m) above the highest point of the roof within a 10-foot (3.05 m) radius of the termination.
10. A vertical termination less than 10 feet (0.91 m) from a parapet wall must be a minimum of 2 feet (0.61 m) higher than the parapet wall.

## 8.4 Combining Category IV Vents

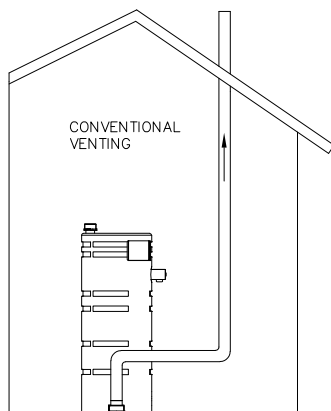
Combined Conquest Category IV gas vent systems must incorporate an Exhausto, Tjernlund or US Draft variable speed, modulating, mechanical draft inducer capable of maintaining the appropriate negative draft at the end of the common flue, to assure that all water heaters in the combined vent system operate with a negative draft. **Do not exceed negative 0.25" W.C.** See "Combining Vents with a Draft Inducer" illustration below.

Combining the exhaust vents of multiple Conquest condensing water heaters into a common, unpowered or "gravity" vent is never recommended (i.e. venting as Category II). Conquest water heaters are too efficient and their flue products are too cold to generate the natural buoyancy required for such combined vent systems to function reliably and safely.

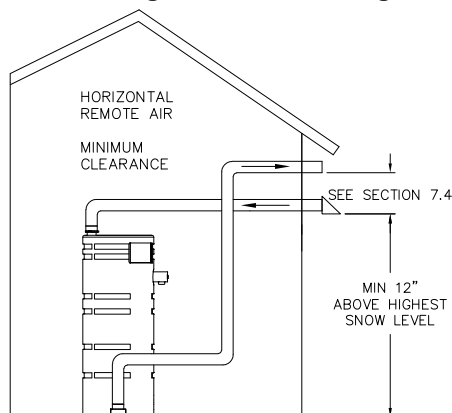
**WARNING: Do not connect multiple water heaters vents into a single unpowered or fixed speed powered vent. This could cause unsafe operation and the potential for poisonous carbon monoxide to enter occupied areas. Such improper installation can cause property damage, personal injury, exposure to hazardous materials or death.**

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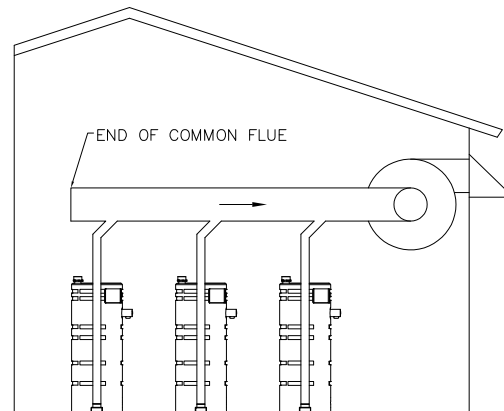
## Conventional Venting



## Through the Wall Venting



## Combining Vents with a Draft Inducer



## 8.5 Concentric Vent for Combustion Air and Exhausting Flue Products

Concentric venting, to enable a single side wall or roof penetration for both combustion air and flue exhaust terminations, is available for the Conquest following the instructions located at [www.pvi.com/vent-design.html](http://www.pvi.com/vent-design.html). Before operating the Conquest, confirm all of the associated installation, operation and maintenance requirements provided for the concentric vent are followed.

## 8.6 Connecting to an Existing Vent System

Do not connect the Conquest to an existing vent system, until it has been confirmed the existing vent system complies with all requirements for a new vent system. A venting system in full compliance with the instructions provided in this manual is required for safe and reliable operation of the Conquest. Do not connect the Conquest to a masonry chimney.

**WARNING:** Before operating the appliance connected to an existing vent system, confirm the vent system complies with all guidance and requirements for a new vent system specified in this manual. Failure to confirm the existing vent system complies can result in unsafe operation and the potential for poisonous carbon monoxide to enter occupied areas and can cause property damage, personal injury, exposure to hazardous materials or death.

## 9 OPERATING AND SAFETY CONTROLS

### 9.1 Temperature and Pressure Relief Valve(s)

A Temperature and Pressure Relief Valve(s) sized in accordance with the ASME Boiler and Pressure Vessel Code, Section IV HLW is installed in the tank.

**WARNING:** Secure the relief valve discharge pipe to a suitable floor drain such that very hot water does not openly splash during a significant relief valve discharge. If the relief valve discharge pipe is not routed and secured to a suitable drain, hot water discharge can result in property damage, scalding and personal injury or death.

- Follow the temperature and pressure relief valve manufacturer's installation instructions and all local, regional and national codes applicable to temperature and pressure relief valve installation and discharge piping.
- The relief valve discharge pipe must not be smaller than the relief valve opening and must be secured to prevent it from lifting out of the drain under discharge pressure and must be routed to allow complete drainage of the valve and line.
- Do not plug the relief valve (s) or install a reducing coupling, valve or other restriction in the relief valve(s) discharge line(s), as this will eliminate the critical water temperature and pressure protection it provides.
- Thermal Expansion - A relief valve that periodically discharges may result from thermal expansion if the water heater is installed in a system closed by components, such as a backflow preventer or check valve in the cold water supply. These systems must be provided with means to control expansion. Contact a water heater or plumbing professional to resolve this situation.

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**WARNING: Do not plug the relief valve(s), use discharge piping smaller than the relief valve opening or install a reducing coupling, valve or other restriction in the relief valve discharge line. Failure to comply with these relief valve and discharge piping requirements can prevent the relief valve from providing its intended temperature and pressure protection, which can result in a sudden loss of pressure containment that can cause property damage, exposure to hazardous materials, personal injury or death.**

## 9.2 Cathodic Protection

PVI water heaters do not utilize cathodic protection. However, in hot water systems utilizing cathodic protection, hydrogen gas can be produced when the hot water system 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, one of the hot water system faucets should be opened for several minutes before using any electrical device connected to the hot water system. If hydrogen is present, there will be an unusual sound such as air escaping through the pipe as the hot water begins to flow. Do not smoke, have open flames or turn electrical switches on or off near the faucet at the time it is open.

## 9.3 Electronic Low Water Cut-Off

When the water level is above the electrode position in the tank, the reset pushbutton will energize the control (LED will be lit). The control remains energized until the water level drops below the electrode position (LED will not be lit). Unless otherwise specified, there is a three-second time delay on decreasing level. Water level must be below tank probe location for full three seconds before control de-energizes. The Electronic Low Water Cut-Off is located in the top head of the water heater.

**WARNING: Turn off all electrical service to the appliance when accessing the limit or other controls located inside the control cabinet or inside the burner vestibule inside the top of the appliance. Close and fasten the control cabinet and burner vestibule cover before restoring electrical service to the appliance. The cabinet and burner vestibule contain High Voltage wiring and terminals. If the electrical service is not turned off and these terminals are touched, a dangerous shock causing property damage, personal injury or death could occur.**

**Coupez l'alimentation avant intervention sur l'appareil.**

## 9.4 Operating Temperature Control

**An adjustable digital operating control is located in the front control panel. The control is factory pre-set at approximately 120 F.** To adjust the setpoint, push the SET key. The upper display will show "St1", while the lower display shows its value. Push the SET key again to modify St1. The value of St1 will flash in the lower display. Adjust the setpoint by pushing the UP or DOWN keys. Push the SET key again to confirm the value. To exit, press SET + UP or wait 15 seconds without pressing any key. See TempTrac Electronic Controller Pane, Section 10.1, in this manual for more information.

Le thermostat est réglé à environ 49 degrés Celsius. Températures de l'eau supérieures à 52 degrés Celsius peut causer instantanément de graves brûlures ou la mort de brûlures. Suivez les instructions dans le manuel d'installation pour modifier la température de l'eau.

## 9.5 High Water Temperature Limit Control

The appliance is equipped with a manual reset high limit control to turn off the burner when the water temperature in the tank exceeds the set point of the control. This control is located inside the burner vestibule accessed from the top of the Conquest. The high limit control is reset by pressing the limit reset button accessible through a hole in the metal cover on top of the appliance. Pressing the reset on the high limit control will not cause the control to reset until the water temperature has dropped below the set point of the manual reset high limit control.

**WARNING: Turn off all electrical service to the appliance when accessing the limit or high limit control located inside the control enclosure located inside the burner vestibule and close and fasten the control enclosure and burner vestibule cover before restoring electrical service to the appliance. The the control enclosure and burner vestibule contain High Voltage wiring and terminals. If the electrical service is not turned off and these terminals are touched, a dangerous shock could occur, causing personal injury or death.**



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## 10 TEMPTRAC<sup>™</sup> ELECTRONIC CONTROLLER PANEL

### 10.1 Principle Of Operation

The water heater operates to satisfy the setpoint of the TempTrac digital control whose sensor is located near the top of the water heater tank. Demand (flow) will typically create a drop in temperature, thus activating the water heater to add heat to the stored water. This setpoint is the desired water temperature to maintain.



### 10.2 Upper LED Readout

The default display of the upper readout (Probe TP1) is the water temperature near the hot water outlet. This sensing location serves as the primary water temperature control for the TempTrac.

This readout can display additional information by pushing the EXT button to cycle through the following items:

- The temperature reading from (Probe TP3) which is located in the vent connection and monitors the flue gas temperature.
- The firing rate of the burner, indicated by 0 to 100%.
- The temperature difference between Probe TP1 and Probe TP2.

All of the display information described above is available for monitoring through the optional MODBUS RTU interface.

### 10.3 Lower LED Readout

The default display of the lower readout (Probe TP2) is the water temperature sensed near the middle of the water heater tank. This is used to anticipate changes in the stored water temperature and ensure a more consistent water supply temperature.

### 10.4 Control Buttons

<b>SET</b>	Displays and modifies the temperature set points. In programming mode, it selects a parameter or confirms an operation.
<b>UP</b>	Displays and modifies the energy saving (Night Time setback) settings. In programming mode, it browses the parameter codes or increases a displayed value.
<b>DOWN</b>	Displays the working hours of the load relays. In programming mode, it browses the parameter codes or decreases a displayed value.
<b>CLOCK</b>	Changes lower display from the stored water temperature to current time and day.
<b>EXT</b>	Changes upper display from Probe TP1 temperature to Probe TP3 temperature or displays the temperature difference of the stored water temperature minus Probe TP2 temperature.
<b>ON/OFF</b>	Switches the control ON or OFF.

(See TempTrac User Manual PV500-41 for full description)

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## 10.5 To View the Setpoint

- Push and release the **SET** key to see the set point value.
- To return to normal display, press **SET + UP** or wait 15 seconds without pressing any key.

## 10.6 To Change The Setpoint

- Push the **SET** key. The upper display will show the “St1” parameter name, while the lower display will show its value.
- Use the **UP** or **DOWN** key to cycle through the parameter names.
- Push the **SET** key to modify a parameter value. The value starts flashing in the lower display.
- To change it push the **UP** or **DOWN** keys. Push the **SET** key again to confirm the value and pass to the setting of next set point.
- Repeat this process as needed to change other parameters.
- **To Exit:** press **SET + UP** or wait 15 seconds without pressing any key.

**NOTE:** Each point has a time out of 15 seconds. If any key is pushed within 15 seconds the controller exits the set points programming procedure.

**NOTE:** The set value is stored even when the procedure is exited by waiting the time-out to expire.




## 10.7 To Change Other Parameters

- Push the **SET and DOWN** arrow simultaneously for 3 seconds.
- Select the required parameter. The name of the parameter is on the upper display; its value is on the lower display.
- Press the **SET** key: the value of the parameter will start blinking.
- Use **UP** or **DOWN** to change the value.
- Press **SET** to store the new value and move to the following parameter.
- **To Exit:** Press **SET + UP** or wait 15s without pressing a key.

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## 10.8 LED Display Alarm Messages

Alarm messages are displayed in the upper LED readout and alternate with the default display. An alarm LED ICON is also illuminated.

ALARM MESSAGE	CAUSE	RESULTS OF ALARM CONDITION	RECOMMENDED ACTION
"P1"	TP1 probe failure	Inlet temperature sensor is not connected or is reading incorrectly. Call for heat and burner modulation output signal will revert to low fire.	Check wiring and sensor Terminals 14 & 17
"P2"	TP2 probe failure	Temperature sensor is not connected or is reading incorrectly.	Check wiring and sensor Terminals 15 & 17
"P3"	TP3 probe failure	Temperature sensor is not connected or is reading incorrectly or flue gas temperature protection is disabled.	Check wiring and sensor Terminals 16 & 17
"HA"	High temperature limit setpoint exceeded	Audible alarm sounds, operation continues.	Manual reset required
"LA"	Low temperature alarm	Audible alarm sounds, operation continues.	
AL1	Digital input 1 is activated.	Unit de-energized after timer delay. Audible alarm sounds.	Manually reset required
AL2	Digital input 2 is activated. This alarm indication is dedicated to the Alarm On Any Failure feature of this product.	Unit de-energized after timer delay. Audible alarm sounds. Alarm contacts close for remote indication of alarm. Internal alarm register will communicate an alarm condition through the Modbus RTU communication link.	Manually reset required
AL3	Digital input 3 is activated.	Unit de-energized after timer delay. Audible alarm sounds.	
Mn1	Maintenance alarm for output 1	Buzzer sounds, operation continues	Check wiring and sensor
Mn2	Maintenance alarm for output 2	Buzzer sounds, operation continues	Check wiring and sensor
Mn3	Maintenance alarm for output 3	Buzzer sounds, operation continues	Check wiring and sensor
"rtc"	The real time clock has lost its setting	Energy saving function disabled	Reprogram clock
CONTROL MESSAGE	CAUSE	RESULTS OF CONTROL CONDITION	NOTES
 On	A call-for-heat condition	The burner operating sequence should begin.	If the burner does not operate, check safety devices or Remote Proving Interlock
 Flashing	The remote enable/disable has been triggered	The small flame icon will flash indicating the standby state	The <b>R1-R2</b> terminals have been opened by the remote master control. The heater will remain in standby.
	Integral circulation pump	The integral circulation pump will operate until the water temperature has equalized	Pump may operate before, during or after the call-for-heat

# CONQUEST® WATER HEATER

## 11 REMOTE CONNECTIONS – TERMINAL STRIP

### 11.1 Making BMS/BAS remote connections for analog and binary (on/off) signals

A terminal strip for the remote connection is located behind the bottom control panel door and is accessed removing the four thumb screws a lifting the hinged door.

**IMPORTANT:** Do not use single strand bell wire for remote field connections to terminals R1-R2 and C1-C2. Use only multi-strand copper wire. See table below for wire length and gauge:

Wire Gauge	18 GA	16GA	14 GA	12 GA
Maximum Length	30 FT	50 FT	75 FT	100 FT

**WARNING:** Turn off all electrical service to the appliance when accessing the remote connections and close and fasten the control cabinet cover before restoring electrical service to the appliance. The remote connection terminals are High Voltage or may become High Voltage. If the electrical service is not turned off and these terminals are touched, a dangerous shock could occur, causing personal injury or death.

Coupez l'alimentation avant intervention sur l'appareil.

### 11.2 Terminal Functions - The following describes the functions of each of these terminals and the proper method for interfacing with an Energy Management System:

**L1-L2:** Used for incoming 120VAC power supply connection.

Terminal **L1** is the hot terminal and **L2** is neutral. See the product catalog or specification document for circuit ampacity rating.

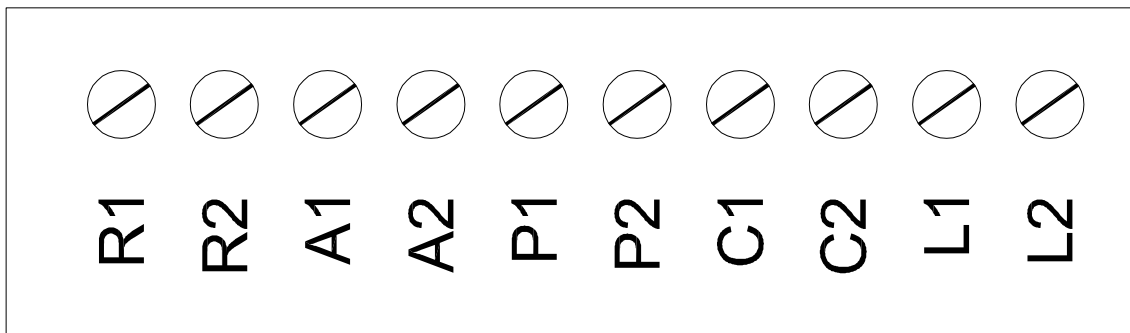
**R1-R2:** Used to activate / de-activate water heater from remote master control. When switching this low current circuit, a relay with gold plated contacts or the use of two relay contacts in parallel must be used. Terminals are wired to a relay in a remote Energy Management System. When the relay closes, the circuit from R1 to R2 is completed and appliance controls are enabled. This appliance ships from factory with a jumper between terminals. Remove jumper when connecting to a remote controller. The indication of this function is described in section **10.8 LED Display Alarm Messages**.

**A1-A2:** Used to activate a remote alarm, signaling shutdown of combustion control.

Provides a maximum 3 amp relay contact closure when the flame safeguard terminates combustion due to a tripped safety interlock (i.e.: air proving switch, high limit switch or flame sensor, etc.).

**P1-P2:** Provides a low amperage dry contact to control remote equipment (i.e. mechanical room air louvers, draft inducer or power vent, etc.). Do not directly energize pumps or motors through these terminals. If operation or repositioning of the remote equipment is required for safe operation of the appliance, the remote equipment must send a return proving signal to terminals C1-C2, via its proving switch, to confirming proper operation or repositioning to enable the appliance to energize.

**C1-C2:** Used for proving operation of remote device. Terminals are wired to a proving switch on a remote device such as a power venter, louvers or a combination of these in series. When all remote proving switches close, the circuit from C1 to C2 is completed and the appliance controls are enabled. This appliance ships from the factory with jumper between terminals C1 and C2 that must be removed when a proving switch is connected.



# CONQUEST® WATER HEATER

## 12 SEQUENCE OF OPERATION

### 1. Incoming 120VAC

- a. Full time power to the Fuse
- b. Full time power to the Main Control Switch

### 2. Power On - When the main control switch is turned on:

- a. 120V is applied to the step-down transformer (24V)
- b. 120V is applied to the L.W.C.O. terminal L1 (if used)
- c. 120V is applied to the Fenwal Flame Ignition Control
- d. 24V is applied to the TempTrac operating temperature control terminal L1

### 3. Control Device Pre-check – Power flows through the following control devices before reaching the call-for-heat control. The following devices are listed in circuit order:

- a. The Electronic Low Water Cut-Off control when installed is the first device in the control circuit.
- b. The High Gas Pressure and Low Gas Pressure Switch (if equipped) are energized and their monitored pressures are proved.
- c. The High Temperature Limit is energized.
- d. Terminals P1-P2 are closed to activate any connected remote devices
- e. The circuit between Terminals C1-C2 is closed by any connected remote proving switches, enabling the water heater to continue the sequence of operation.

### 4. Call For Heat - If the TempTrac operating control senses a call-for-heat condition and the previous control devices are energized the following sequence will begin:

- a. The Airflow-Proving Switch then proves the operation of the burner blower.
- b. The thermostat contact on the Fenwal Flame Ignition Control is energized.


### 5. Heat-Up - Following the pre-purge delay, the hot surface igniter will be energized:

- a. The flame control will send 120V to the hot surface igniter for 20 seconds.

### 6. Ignition - When dwell time is completed a 4-second Trial for Ignition (TFI) period is initiated:

- a. The Delay-On (Low Fire Hold) Relay and the Gas Safety Valves are energized.
- b. During TFI the flame safeguard control will monitor the flame using flame rectification through the hot surface igniter.
- c. If the flame control senses the presence of flame before the end of the TFI period, the igniter will be de-energized and the flame control will continue to monitor the flame, through the igniter, until the operating thermostat ends the call for heat condition.

### 7. Integral Circulating Pump – The circulating pump is controlled independently of the call-for-heat.

- a. When the main control switch is turned on and the TempTrac is energized. The TempTrac will continuously monitor the water temperature in the tank and attempt to maintain a uniform water temperature within the tank by using the provided circulating pump located on the top of the tank.
- b. The pump operation is indicated at the TempTrac by illumination of the  icon.
- c. The operation of the integral circulating pump may occur before, during or after the call-for-heat period.

### 8. Loss of Flame Signal

- a. If the ignitor fails to sense flame during an attempt to light the burner (trial for ignition), the ignition control will lockout. However, if the ignitor fails to sense the flame at any time during normal burner operation (flame failure), the gas valve will be closed and another call for-for-heat sequence will be initiated to attempt to relight the burner. Unless the Conquest contains the CSD-1 option, this attempt to relight the burner and sense flame fails will be tried three times, then the ignition control will shut-down and lockout. If the Conquest contains the CSD-1 option and this attempt to relight the burner and sense flame fails (single retry), the ignition control will shut-down and lockout. The blower will complete post-purge operation to exhaust any remaining combustion products until the call for heat ends.

# CONQUEST<sup>®</sup> WATER HEATER

## 9. Alarm on Any Failure

- a. When any safety device or remote proving interlock prevents the burner from firing within the allotted time period, once the call-for-heat is initiated, the TempTrac will initiate an alarm notification. This notification is indicated in the following ways:
  - i. A flashing alarm message is displayed on the TempTrac screen.
  - ii. A high pitch beeping audible alarm.
  - iii. The dry contacts at terminals A1 & A2 will close. 3 amp max load.
  - iv. The alarm register, accessible through the Modbus RTU communication option.
- b. To reset the TempTrac once the alarm is activated, attempt to determine the safety device which caused the condition and correct the condition. Once the condition is corrected the TempTrac can be reset by pressing any button. If the lockout is caused by the ignition control, power must be re-cycled in order to reset the ignition module
- c. See the troubleshooting guide for more details.

# CONQUEST<sup>®</sup> WATER HEATER

## 13 INITIAL STARTUP

### 13.1 Initial Startup Requirements

Installation must be complete prior to performing initial startup; and the startup must be complete prior to placing the water heater into service. Starting the water heater without proper piping, combustion air, venting or electrical connections or control settings can be dangerous and may void the product warranty. The following startup instructions must be followed precisely in order to achieve safe and efficient operation to assure trouble-free service life.

**WARNING: Proper startup must be made by a qualified installer or service agency, who must read and follow the supplied instructions and appliance markings. Failure to complete proper startup before use, tampering with controls or not following all instructions and markings may damage this equipment, void the warranty and may result in property damage, personal injury or death.**

### 13.2 Tools and Instrumentation Required

- Stack Temperature Gauge
- Stack Draft Gauge
- Electronic Combustion Analyzer
- Two U-tube Manometers or pressure gauges
- AC/DC Multi-meter (with 20,000 OHM/Volt rating)
- Amp Meter
- Normal Hand Tools

### 13.3 Resources

- Product Installation & Maintenance Manuals
- Start-up Report with instructions
- Local, State, & Federal Codes
- Toll Free 24-Hour Technical Support: 1-800-433-5654

### 13.4 On Site Considerations


- Electrical Supply in accordance with Nameplate Rating
- Uncontaminated Combustion Air
- Adequate Fuel Supply
- Treated Water Supply (Water heaters)
- Consistent Draft

### 13.5 Startup Procedure

1. Carefully study the burner start-up information included in this manual.
2. Fill system tank with water.
  - a. Close the drain valve.
  - b. Open a nearby hot water faucet or open the temperature and pressure relief valve to permit the air in the system to escape.
  - c. Fully open the cold water inlet valve to fill the tank.
  - d. Close the hot water faucet opened in step b when water starts to flow.
  - e. If venting through the temperature and pressure relief valve when filling the appliance, ensure the relief valve has been returned to the proper operating condition prior to start-up.
3. Be sure all connections into the tank are tight, as leaks at tank fittings will damage the insulation.
4. **CAUTION:** Conduct the following gas train leakage test before start-up, at annual intervals and prior to investigating the cause of any reported occurrences of delayed ignition.
  - a. Using an appropriate bubble detection solution, thoroughly coat all gas train pipe connections. If any bubbles are detected, the leaking connection must be tightened, recoated, and rechecked to assure stoppage of the leak.

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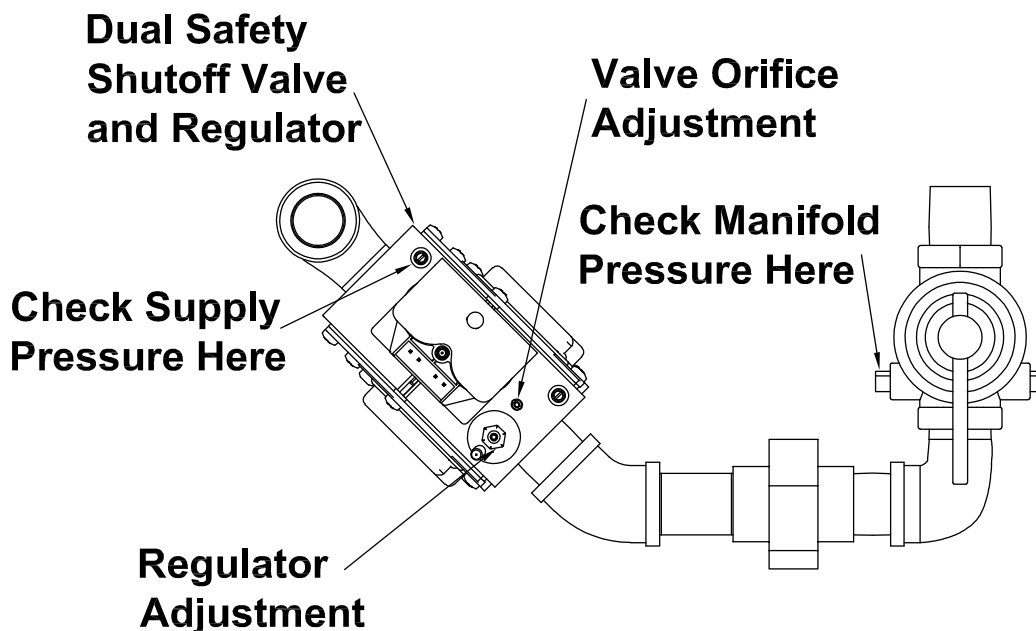
- b. Attach a manometer to measure the gas pressure at the manual gas shutoff valve located just upstream of the gas train. Adjust gas train inlet pressure to the specified value (e.g. 10.5" W.C.), and tightly close the gas train manual shutoff valve closest to the burner.
  - c. Reattach the manometer to the gas train manual shutoff valve at the burner and record the measured gas pressure in inches of water column (W.C.). Measure gas pressure again after 15 minutes. If gas pressure has increased 0.5" W.C. or more, the gas leak must be isolated to one or more of the operating gas valves. (For example, a solenoid actuated gas shutoff valve.) After any leaking valve is replaced, the reassembled gas train must be leak tested again before start-up is attempted.
5. Open the hinged, top enclosure panel cover on the appliance to expose control circuit. A wiring diagram is attached to the back of this panel.
  6. Visually check that all components are intact and no damage has occurred during transit.
  7. Check all connections within the control cabinet. A loose connection could cause intermittent shutdowns.
  8. The burner uses a hot surface igniter (HSI) as the ignition source. The gas control system may use a single gas pressure regulator and valves, valve regulator combinations or multiple gas trains.
  9. Connect a test meter to the ignition control to read the flame current in microamps.
- NOTE:** Some flame controls read the flame signal in micro amps and some in volts DC.
- CAUTION:** Be sure the tank is filled with water. Dry firing can cause unwarranted damage to the appliance.
10. Check the inlet gas pressure before start-up, using a manometer or a 0 to 28" W.C. pressure gauge for inlet gas pressure. (This is the pressure measured before all components in the gas train.) This manometer must stay connected throughout the testing, as the inlet pressure must be monitored during the firing of the burner. Record static pressure; it must not exceed 10.5" W.C. Pressures above this could cause damage to the diaphragm in the gas valve or pressure regulator. The inlet gas pressure must not fall below 3.5" W.C.
  11. Connect a second manometer to the manifold test port at the shutoff valve closest to the burner.
  12. **Turn-off main gas shutoff valve.**
  13. **Disable or jumper out any BMS/BAS control interface to allow independent setup and adjustment of each water heater.**
  14. Turn unit on using the rocker switch on the front of the control enclosure. When the burner fails to light, the flame control will lockout.

The burner combustion must be checked using a combustion analyzer to verify it is operating in accordance with the requirements of 13.5.23 "Burner Combustion Adjustment".
  15. **Turn-on main gas shutoff valve.**
  16. If the TempTrac operating control switch is closed (indicated by the  icon), the burner blower should come on and pre-purge begins.
  17. If nothing happens, check for a safety device lockout. Some safety devices such as the Low Water Cut-off, Gas Pressure Switches and the High Temperature limit will require manual reset after lockout and therefore can be easily identified.
  18. When the blower motor starts, the Flame Ignition Control will not be energized until positive air flow is established and the Remote Proving Interlock, when used, has closed. If the Flame Ignition Control does not energize, see the troubleshooting guide for help.
  19. The Air Proving Switch can be easily identified by checking for 120V on both sides of the switch.
  20. If the amber colored call-for-heat indicating light is not illuminated, it is likely that the Remote proving interlock is open. Check remote devices.
  21. After the pre-purge, the flame control energizes the HSI for the heat up period, approximately 20 seconds. At the end of that period the gas valve is opened for approximately 4 seconds. After the burner lights and the primary safety control senses a flame, the burner will remain on until the call for heat is satisfied or operation is interrupted by a safety device.



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22. If the burner fails to light, the flame control will recycle two more times before lockout unless the Conquest contains the CSD-1 option. There is only a single try for ignition with the CSD-1 option. When lockout occurs, cycle the main power switch to reset the flame ignition control before the alarm-on-any-failure occurs. When the burner fails to ignite, the most common cause at startup is air in the gas supply. This can usually be corrected with multiple cycles or bleeding the line manually. If the burner lights but blows out, ensure that the burner firing rate is locked in low fire and check for improper combustion or weak flame signal as a possible cause.
23. Burner Combustion Adjustment  
Burner combustion must only be adjusted using a combustion analyzer. Do not attempt to adjust burner by sound or sight. With the burner firing, insert the combustion analyzer probe in the flue vent approximately two feet from the appliance.  
The heater is adjusted as follows:  
With the burner firing, adjust the valve orifice screw counter-clockwise to increase gas flow or clockwise to decrease flow. The desired CO<sub>2</sub> in the combustion products must be between 8.5 and 9.5% for natural gas and between 9.5 to 10.5% for LP gas. Do not attempt to adjust combustion based on manifold pressure alone. Manifold pressure should only be used as a reference point. It should not be necessary to adjust the regulator for this model. **See Gas Train Illustrations for details.**
- WARNING: Do not continue to operate the appliance with carbon monoxide levels above 200 ppm. Carbon monoxide is a colorless, odorless and poisonous gas that commonly results from gas combustion. High concentrations of Carbon Monoxide are extremely dangerous to humans and animals. Operation of an appliance at carbon monoxide levels above 200ppm can cause unsafe operation and the potential for poisonous carbon monoxide to enter occupied areas. Such improper installation can cause property damage, personal injury, exposure to hazardous materials or death.**
24. Enable or reconnect any BMS/BAS control interface removed prior to the setup and adjustment of each water heater.



**Gas Train Illustration for Model 20, 25 & 30**  
(Optional components may not be shown)

# CONQUEST® WATER HEATER

## 14 NSF FOOD SERVICE INSTALLATION GUIDELINES

All Conquest water heater models that have the Intertek ETL Sanitation mark on the information decal affixed to the front of the appliance are listed to NSF 5-2009e.

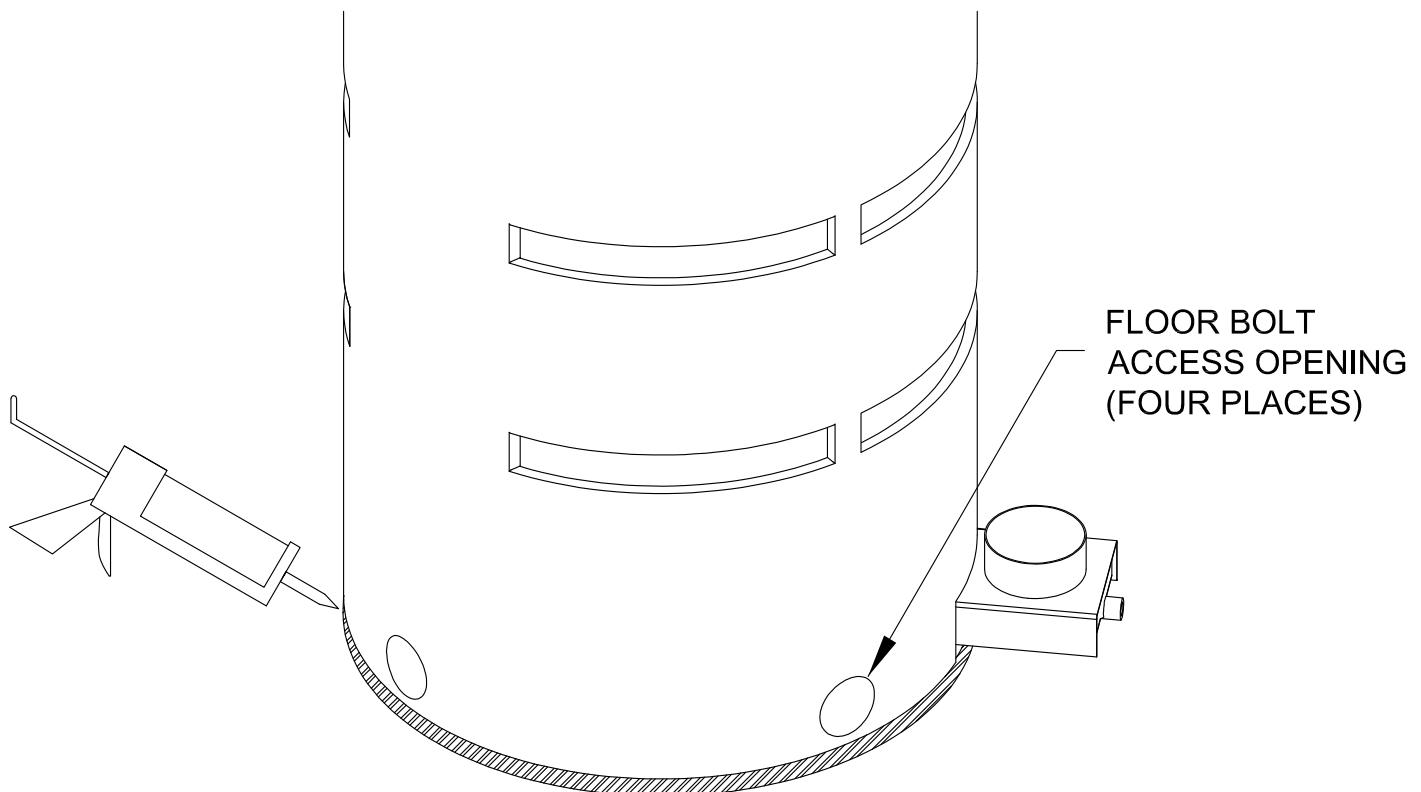
This section provides additional information for architects, designers, and contractors in food service installations requiring compliance with NSF codes. NSF/ANSI 5 - 2009e establishes health and sanitation requirements for the materials, design and construction of commercial water heaters. All Conquest water heaters are certified for compliance with NSF-5 by ETL Intertek and are therefore recognized as suitable for installation and use in commercial food service applications when installed and used according to these instructions.

**WARNING: Do not use a pressurized water source to clean this water heater. If the food service installation requires pressurized washing, the water heater must be isolated from water spray. Failure to isolate the heater from pressurized water may cause a hazardous condition resulting in property damage or high voltage electrical shock, causing personal injury or death.**

Conquest water heaters can be adjusted to operated at temperatures up to 190°F. Refer to the "Temperature Setting" section of this manual for instructions to adjust the thermostat to the desired temperature.

**NSF Installation** - The NSF 5 listed Conquest water heater requires no modification to become NSF 5 compliant, is designed to supply potable hot water and is not intended or suitable for other purposes. Where feasible, the water heater should be located separate from food and utensil handling areas. When this is not possible in a food service installation, the water heater must be sealed to the floor to prevent water from accumulating underneath. The floor must be clean, smooth and level for adequate sealing. Seal the water heater to the floor using an RTV sealant (such as Red Devil 0826, Saf-T-Lok 732 or RTV 102 or an equivalent). Follow the sealant manufacturers instructions to lay a bead of sealant between the edge of the heater base and the floor. The supplied covers over the four floor bolting access openings must be installed.

**NSF Service and Maintenance** - NSF 5 for food service installations require the appliance and its installation to prevent harborage of vermin. Tight construction of the properly installed and assembled heater enclosure does not provide a haven for pests. If the floor bolting access covers do not seal completely, they must be replaced with direct replacement covers, available from PVI.



# CONQUEST® WATER HEATER

## 15 TROUBLESHOOTING GUIDE

Problem	Probable Cause	Corrective Action	
Starting or Pre-purge Failure	Power Supply	Check fuse and/or circuit breaker.	
	On-Off Switch	Check if On-Off switch is illuminated when on. If not check panel fuse or incoming power.	
	Temperature Control TempTrac	Check that the operating temperature control is set higher than the temperature of the water heater. See Table 10.8 for indications of control or sensor faults.	
	Remote enable/disable open	See Table 10.8 for indication of condition. Enable water heater or place jumper between terminals R1-R2.	
	Electronic Low Water Cut-off (when installed)	Check internal ELWCO board for indication of failure. The red LED indicates a safe condition. Manual reset is required.	
	Gas Pressure Switches (when installed)	Gas pressure switches are attached to the gas train. Check for a tripped condition indicated by the manual reset button on the switch. Correct low gas pressure condition at the supply.	
	High Temperature Limiting Device	The high limit device is set at 200°F. This device is located at the control flange on the top head of the tank. A high temperature condition may be caused by a failure of the TempTrac, temperature sensors or the circulation pump. This failure requires manual reset.	
	Combustion Air blower		Check if fan control relay is closed
			Blower motor may have failed.
	Air-proving Switch (if blower is functioning)		Check switch contacts are closed.
			Check for 120V at the N.O. side of air switch
			Check for 120V at the common side of air switch
			Check if switch tubing is connected on both ends
Flame Safeguard Control		Check for bad ground or bad control. Replace if necessary.	
Remote Proving Interlock		When terminal C1 and C2 are used a proving circuit for remote equipment, failure to close this circuit within the allotted time for Call-for-Heat will prevent operation and cause an alarm indication. Check for proper operation and proving of remote equipment.	
Loose Wire Connections		Check connections to all components	
Flame Failure	Power Supply	120 VAC is required for operation. Low voltage can cause failure. Voltage below 110 VAC must be investigated.	
	Flame Safeguard Control	Check for bad ground or bad control. Replace if necessary.	
	Hot Surface Igniter	Check resistance at room temperature and then the amperage draw during heat-up. Replace if the measured amperage is not within 3.5 to 5.0 Amps or if measured resistance is not within 40-100 ohms (at room temperature). Also, check for overheating condition due to damaged refractory around igniter.	
	Air-proving Switch	Check if switch is bouncing. Adjust or replace.	
	Gas Pressure	Check for proper inlet static and dynamic gas pressure, 3.5" WC minimum.	
	Combustion	Inadequate flame signal may result from improper combustion. Adjust to proper CO2 levels. Inability to achieve proper CO2 levels may be caused by a defective gas valve, a defective regulator or blockage in the in the burner or combustion air supply.	
	Grounding	Check for proper ground from flame control to burner housing.	

# CONQUEST® WATER HEATER

## 16 REPLACEMENT PARTS

### 16.1 Burner Assembly

#### Burner Assembly Illustration for Models 20, 25, 30

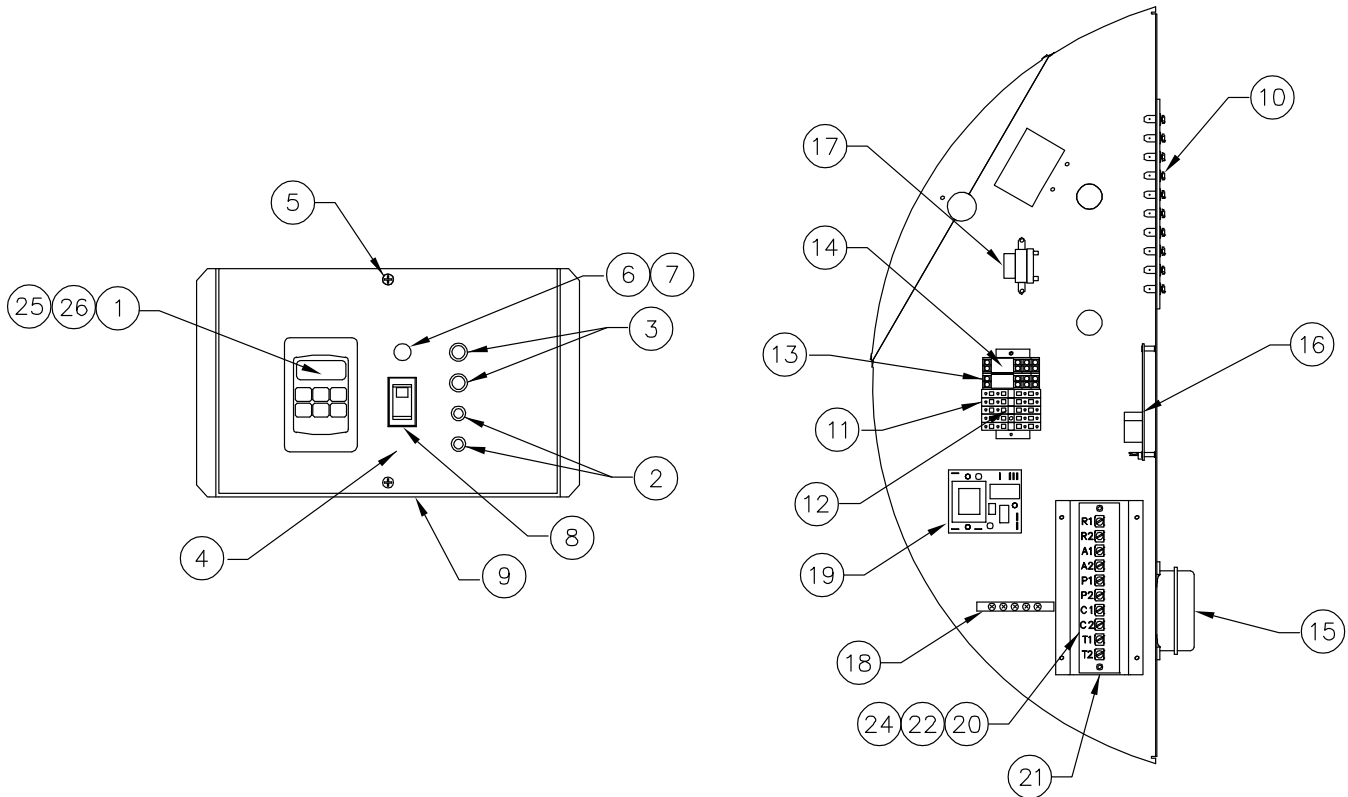
(Optional components may not be shown)

LIST OF MATERIALS			
ITEM	QTY	P/N	DESCRIPTION
BURNER ASSEMBLY COMPONENTS			
	1	119467	BLOWER FIXED SPEED
2	4	3475	1/4 HEX NUT
3	4	3494	1/4 LOCK WASHER
4	4	15607	1/4 FLAT WASHER
5	1	110897	WIRE HARNESS
6	1	5902	3/4 COUPLING
7	1	SEE BOM	CAP, ORIFICE 3 OD
8	1	124894	FLEXIBLE ADAPTER 2 1/2 LG
9	1	118016	ELL BRASS HOSE CONNECTOR
10	1	124215	3 PVC X 5 1/2 PIPE
11	1	124172	3 TO 4 PVC BUSHING
12	1	124176	AIR INLET SCREEN 4 5/16 OD
13	3	76797	3/4 SS TEK SCREW
14	1	115277	BURNER
15	2	120493	BLOWER FLANGE GASKET
16	2	79972	1/4 WING NUT
17	1	6175	3/4 ELL 45
18	1	107775	HOT SURFACE IGNITER
19	1	111791	IGNITER GASKET
20	1	124160	BURNER BULKHEAD
21	1	124895	RETAINER DISK
22	1	120333	1/4 NYLON HOSE CLAMP
23	2 FT	101923	3/16 ID SILICONE TUBING
24	1	124218	3 STREET ELL PVC
25	3	5989	3/4 X CL NIPPLE
26	1	5928	3/4 UNION
27	2	6184	3/4 STREET ELL 90
28	1	5991	3/4 X 2 NIPPLE
29	1	5336	3/4 SHUTOFF VALVE
30	1	5995	3/4 X 6 NIPPLE
31	1	109509	3/4 GAS VALVE
32	1	38607	STAR WASHER 1/4
33	2	124710	HOSE CLAMP 4 1/2 ID
34	1	123823	BULKHEAD PLATE
35	1	124509	BULKHEAD INSULATION
36	1	124161	AIR INTAKE ASSY

**NOTE:**  
A. CONNECT TUBING TO HOSE BARB ON AIR INTAKE.  
B. CONNECT TUBING TO GAS VALVE REGULATOR AND SECURE WITH CLAMP.  
C. ATTACH SCREEN TO BUSHING WITH (3) TEK SCREWS.  
D. GLUE TOGETHER BULKHEAD AND REFRACTORY.  
1. APPLY GLUE LIBERALLY, CLAMP PARTS WITH C CLAMPS AND METAL RINGS.  
2. USE IGNITER BLOCK TO INDEX PLATE AND REFRACTORY DURING GLUE PROCESS.  
E. USE PVC PRIMER AND GLUE TO ATTACH ELBOW TO PIPE. DO NOT GLUE 4X3 BUSHING TO PIPE.

# CONQUEST® WATER HEATER

## 16.2 Control Panel Enclosure Component Layout and Replacement PN's

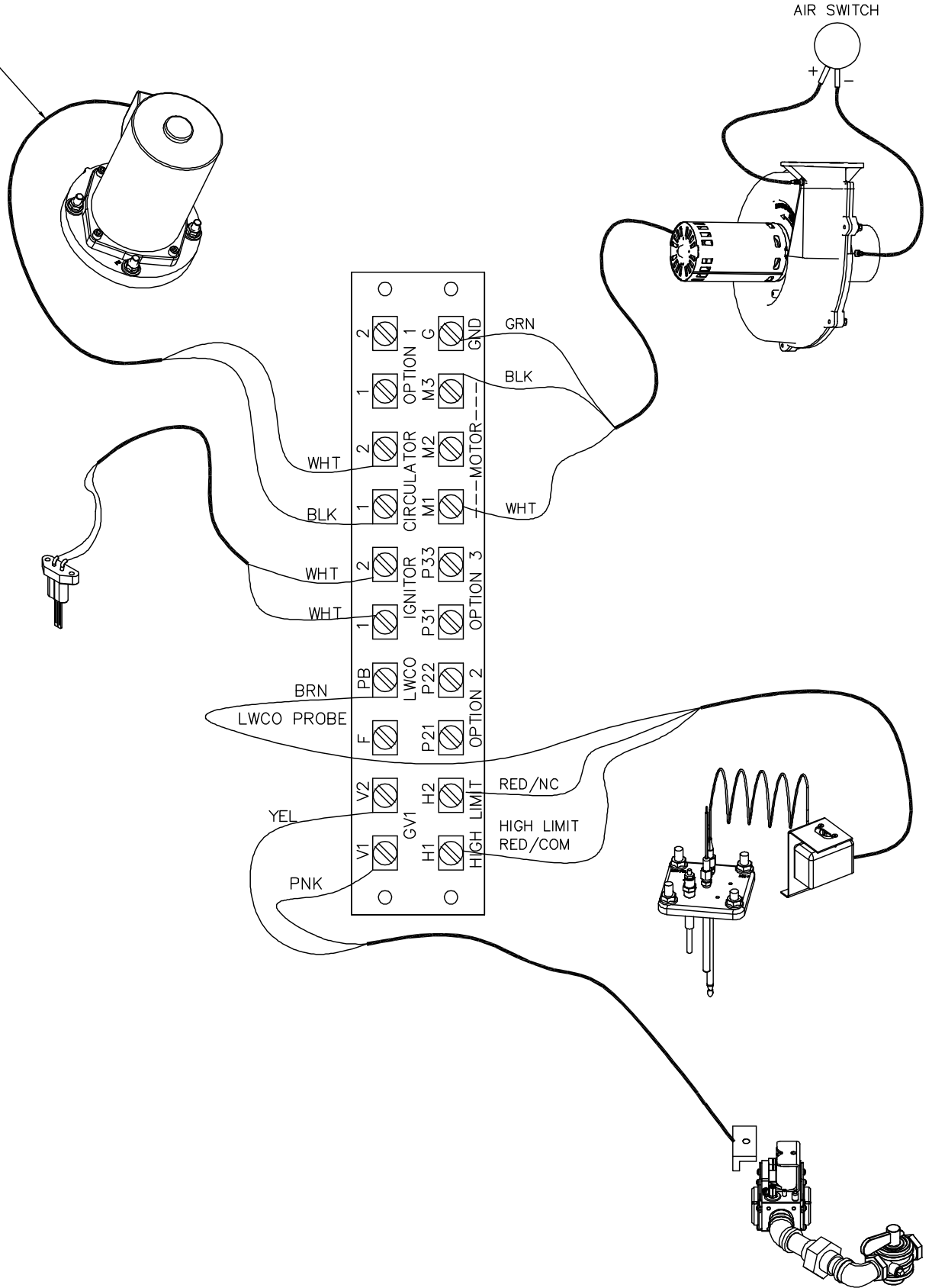


LIST OF MATERIALS			
ITEM	QTY	PART NO.	DESCRIPTION
CONTROL PANEL COMPONENTS			
1	1	122644	TempTrac Control 199 – 300 MBtu/H
2	2	70573	Reset / Test Switch N.C. Momentary
3	2	122342	Indicating Light
4	1	-	Main Decal
5	2	152249	Screw 10-24 X 1/2
6	1	5613	Fuse Holder
7	1	76267	Fuse
8	1	70565	On / Off Switch
9	1	121250	Metal Face Plate
10	1	122346	Terminal Board
11	6	122319	Terminal Block
12	4	122320	Terminal Block Jumper
13	2	122317	Relay Socket
14	2	124344	Relay DPDT
15	1	121444	Air Proving Switch
16	1	120294	Flame Control His
17	1	122318	120V To 24V Transformer
18	1	122321	Ground Bar
19	1	113915	Electronic Low Water Cutoff
20	1	122595	Terminal Board Field Access
21	1	121749	Terminal Board Mount
22	2	102467	Jumper, Elec-Tron #ESJ-145
23	2	105266	Thermostat Probe Dixell 5"
24	1	123328	Thermostat Probe Dixell 2"
25	2	122746	Jumper, Elec-Tron #ESJ-154
26	1	102163	Thermostat Probe Dixell 25"

# CONQUEST® WATER HEATER

## 16.3 Component Wiring and Conduit Routing Details

INCLUDE 24" OF  
ADDITIONAL WIRE  
LENGTH FOR PUMP



# CONQUEST® WATER HEATER

## 17 PERIODIC MAINTENANCE

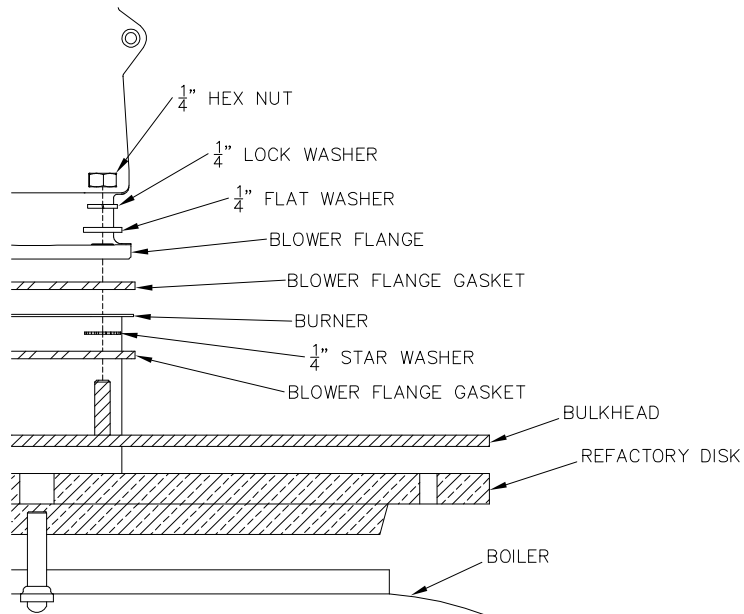
Listed below are items that must be checked to ensure safe reliable operations. Maintenance must be performed by a qualified service or maintenance provider. To ensure proper maintenance, the following instructions should be posted near the appliance and maintained in legible condition. Verify proper operation after servicing.

**WARNING: When servicing the controls, use exact, Factory authorized, replacement parts and label all wires prior to disconnection. Verify proper operation after servicing. Incorrect parts substitution and wiring errors can cause damage, improper operation, fire, carbon monoxide, exposure to toxic fumes or other unexpected and unsafe conditions that can result in fire, personal injury or death.**

1. Examine the appliance and venting system at least once a year. Check more often in first year to determine inspection interval.
  - a. Check all joints and pipe connections for tightness, corrosion or deterioration.
  - b. Check the electronic-ignition system for quick ignition and a proper flame signal.
  - c. Check all safety controls including thermostats for proper operation.
  - d. Check safety shut-off valves for operation and tightness.
  - e. Have the entire system, including, but not limited to, the burner, heat exchanger and venting system, periodically inspected by a qualified service agency.
2. Exposure to Dusty or Dirty Combustion Air: An appliance installed in a dust or dirt contaminated atmosphere will require more frequent inspection and cleaning of the burner to prevent nuisance shutdowns or premature burner failure.
3. Any sign of soot on the heat exchanger or in the flue indicates the need for a combustion inspection. Properly installed and adjusted units seldom need heat exchanger cleaning. If soot has formed, the most common causes are restricted combustion air or excessive gas. A blocked heat exchanger can cause unsafe operation and will reduce efficiency. To inspect and clean the heat exchanger, a qualified service agent or installer should use the procedures described in items 4, 5 & 6 below.
4. All gaskets on disassembled components must be replaced on reassembly with exact, Factory Authorized, replacement parts only. Gasket kits are available from your PVI Industries® Representative or by contacting PVI Industries®, LLC.
5. Burner and/or Heat Exchanger Inspection and Cleaning Procedure:
  - a. Turn off main power to unit.
  - b. Turn off gas supply.
  - c. Write notes and/or take pictures during this process to aid in correct reassembly.
  - d. Disconnect electrical the components by disconnecting the wires going to terminal strip in the top control enclosure and the respective conduit connections on the back of the control enclosure. If a wiring diagram is not attached to the back of the enclosure door or otherwise provided with the water heater, make careful notes of the locations for all the wires.
  - e. Remove the metal cover on top of the appliance by disconnecting the fasteners holding it to the plastic jacket.
  - f. Remove the hot surface igniter, (HSI) from the burner. Be very careful not to bump the igniter element due to the fragility of the igniter.
  - g. Break the unions that connect the gas train to the blower and the gas supply pipe. Remove the gas train.
  - h. Remove the nuts that secure the burner top plate to the combustion chamber and lift the blower/burner assembly up until it is completely extracted from water heater.
  - i. Inspect top plate refractory for damage. The refractory must provide a tight seal against the top edge of the burner deck.
  - j. Inspect the burner surface for signs of cracking or thermal fatigue.

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- k. If internal inspection of the burner is desired or the burner or blower must be replaced, remove the nuts that attach the blower to the burner top plate to remove the blower. The burner can now be extracted. Be careful not to damage the refractory when removing the burner. With the burner removed, inspect the deck surface of the burner for lent or other blockage carried in the fuel air stream. If blockage has accumulated, use brush to loosen debris and use a vacuum or water to remove it from the burner cavities.
  - l. Replace any damaged components and reassemble in reverse order. (4-5 ft/lbs).
  - m. Cycle unit and test to verify all safety and operating controls are properly functioning and the burner top plate flange is free of leaks.
6. The flue connector is connected to the flue collector shell by 8 studs and the seal between them is maintained by die-cut elastomeric gasket. A leak at this joint may be evidenced by condensate forming on the surrounding surfaces or pooling below the connection. Any leak must be addressed immediately by replacing the gasket with the factory authorized replacement part only.
  7. Inspect the integral circulation pump for gasket leaks or failure or the pump motor. Rotation of the pump is indicated by the cooling fan on the back of the motor. See the Troubleshooting Guide or Table 10.8 for information about operation of the pump.
  8. Inspect low water cutoffs and relief valves for proper operation at every six months, or more often if indicated by inspection.
  9. Keep appliance area clear and free from combustible materials, gasoline and other flammable vapors and liquids.
  10. Check frequently to be sure the flow of combustion and ventilation air is unobstructed to the appliance.
  11. When electrical controls are serviced or replaced, label all connections as they are removed, to know the proper placement on the replacement part.
  12. All replacement parts are available through your PVI Industries<sup>®</sup> Dealer. If you need assistance identifying or contacting your local dealer, you may contact PVI Industries, LLC directly at the address and telephone number located on the first and last page of this manual.
  13. If the appliance is to be shut down for an extended period of time, the primary gas valve and the water supply should be shut off. When the appliance is returned to service, any standing water in the tank must be flushed and a thorough inspection of all utilities and general appliance condition should be conducted.



**Burner Attachment Layering Illustration**



# CONQUEST<sup>®</sup> WATER HEATER

## 18 RECOMMENDED MAINTENANCE SCHEDULE

Regular service by a qualified service agency and routine maintenance must be performed to ensure safe, reliable and efficient operation.

### Yearly (Every 12 Months)

Schedule annual service call by qualified service agency.

1. Check for piping leaks around pumps, relief valves, and tank connections. Repair, if found.
2. Check to ensure area is free from combustible materials, gasoline, and other flammable vapors or liquids.
3. Visually inspect venting system for proper function, deterioration or leakage.
4. Check temperature and pressure relief valve. Refer to manufacturer's instructions on valve.
5. Inspect condensate drain and ensure condensate is directed to an appropriate condensate system or drain, as required by local codes.
6. Check all operation of safety devices. Refer to manufacturer's instructions.
7. Inspect burner and gas train components for wear or deterioration.
8. Check the electronic-ignition system for quick ignition and proper flame signal.
9. Check gas safety shut-off valves for proper operation and tightness.
10. Follow startup procedure in the Installation & Maintenance Manual.

### Semi-Annually (Every Six Months)

1. Test Low-water-cut-off (if equipped). Refer to manufacturer's instructions and reset.
2. Test the electronic-ignition flame failure detection system. Refer to manufacturer's instructions and reset.

### Monthly

1. Check condensate drain system and refill the condensate neutralizer with limestone (change interval as needed).
2. Visually inspect venting system for proper function, deterioration or leakage.
3. Confirm the low-water cutoff and alarm are operating.

### Daily

1. Check for and remove any obstruction to the flow of combustion or ventilation air to the unit.
2. Check to ensure area is free from combustible materials, gasoline, and other flammable vapors or liquids.
3. Check gauges, monitors and indicators.

### As Required

1. Flush and clean tank as required.

# CONQUEST<sup>®</sup> WATER HEATER

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Since PVI cannot control the use of the appliance, water conditions, or maintenance, the warranty on the heat exchanger does not cover poor performance, structural failure, or leaking due to an excessive accumulation of scale.

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MODEL NUMBER: \_\_\_\_\_

SERIAL NUMBER: \_\_\_\_\_

INSTALLATION DATE: \_\_\_\_\_

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