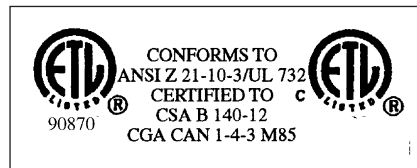




The **deltaelite** Models

F-25/30/35/40 & 45 Combination Heaters



- Input from 100,000 to 199,000 Btu/hr -

* INSTALLATION AND MAINTENANCE * M A N U A L

NOTICE

Warranty Registration Card must be filled out by the customer and mailed within thirty (30) days of installation in order to gain warranty coverage.

When receiving Triangle Tube units, any claims for damage or shortage in shipment must be filed immediately against the transportation company by the consignee.

Leave all documentation received with appliance with owner for future reference.

WARNING

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

For Your Safety

- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.
- WHAT TO DO IF YOU SMELL GAS
 - Do not try to light any appliance
 - Do not touch any electrical switch; do not use any phone in your building.
 - Immediately call your gas supplier from a neighbor's phone. Follow the gas supplier's instructions.
 - If you cannot reach your gas supplier, call the fire department.

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

PRODUCT AND SAFETY INFORMATION

Definitions 1
Product Warnings 2-3
Operating Restrictions 4
Code Restrictions 4

SECTION I - PRE-INSTALLATION ITEMS

Code Compliance 5
Determining Product Location 5
Boiler Replacement. 5
Recommended Clearances 5-6
Flooring and Foundation. 6
Residential Garage Installations 6

SECTION II - COMBUSTION AIR AND VENTING

Providing Air for Combustion and Ventilation. 7-8
Removal of an Existing Boiler from a Common Vent. 8

SECTION III - UNIT PREPARATION

Handling Instructions 9
Hydrostatic Pressure Test
 Hydrostatic Test Preparation. 9
 Hydrostatic Test Procedures 9-10
 Completion of Hydrostatic Test and Draining 10

SECTION IV - DOMESTIC PIPING

General Piping Requirements. 11
Domestic Supply Pressure 11
Thermal Expansion. 11
Water Hammer 11
Temperature / Pressure Relief Valve 11-12
Thermostatic Mixing Valve 12

U-Tube Assembly 12-13
Domestic Drain Valve 13
Multiple Units Installation 13
Storage Tank Application 13
TR/Smart Series Application 14
Domestic Piping Diagrams 14-16

SECTION V - PRIMARY PIPING

General Piping Requirements
 Low Water Cut-off Device 17
 Backflow Preventer 17
Primary System Piping Applications 17
Expansion Tank and Makeup Water
 Diaphragm (Bladder) Expansion Tank 17
 Closed-Type (Standard) Expansion Tank 17
Circulator 18
Closet (Zero Clearance) Applications 18
Sizing Primary Piping 18
System Piping - Zone Circulators 18
System Piping - Zone Valves 18
System Piping - Radiant Heating with Mixing Valves 18-19
System Piping - Multiple Units Installation 19
Primary Piping Diagrams 20-23

SECTION VI - VENTING

General Requirements 24
Oil Vent Piping 24-25
Oil Vent -Direct Vent Applications 25
Gas Venting - General Requirements 26
Masonry and Metal Chimneys 26
Type B Vent Systems 26
Vent Connectors 27
Common Vent System 27

SECTION VII - FUEL PIPING

Gas Supply Piping Connection 28
Pipe sizing -Natural Gas 29
Natural Gas Supply Pressure Requirements 29

Pipe Sizing - Propane Gas 30
Propane Gas Supply Pressure Requirements 30
General Oil Piping Guidelines 30

SECTION VIII - INTERNAL WIRING

General Requirements. 31
Internal Control Wiring Diagrams 31-32

SECTION IX - EXTERNAL WIRING

Installation Compliance 33
Line Voltage Connections. 33
Thermostat Wiring 33
Outdoor Temperature Limit 33
External Control Wiring Diagrams. 34-36

SECTION X - START-UP PREPARATION

Check System and Domestic Water Chemistry
 Water pH Level 6.0 to 8.0 37
 Water Hardness Less Than 7 Grains. 37
 Chloride Concentration Less Than 80mg/L 37
 Chlorinated Water. 37
Flush Primary and Domestic System 37
Check and Test Antifreeze 37
Use of Antifreeze in the Primary System. 38
Filling the Inner (Domestic) Tank and System 38
Filling the Outer (Primary) Tank and System 38-39
Check Low Water Cut-off Device. 39
Check for Gas Leaks. 39
Check Thermostat Circuit. 39

SECTION XI - START-UP PROCEDURES

Final Checks Before Start-up 40
ELITE Start-up 40-41

SECTION XII - TEMPERATURE LIMITS

Setting Primary Thermostat Limit 42
Adjustment of Secondary Thermostat Limit 42
Setting the Thermostatic Mixing Valve 43

SECTION XIII - CHECK-OUT PROCEDURES

Check-out Procedures 44

SECTION XIV - INSTALLATION RECORD

Installation Record 45

SECTION XVII - REPLACEMENT PARTS

Replacement Parts 46-49

PRODUCT SPECIFICATIONS

Specifications 50-51

The following terms are used throughout this manual to bring attention to the presence of potential hazards or to important information concerning the product.

DANGER

Indicates the presence of a hazardous situation which, if ignored, will result in death, serious injury or substantial property damage.

NOTICE

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

WARNING

Indicates a potentially hazardous situation which, if ignored, can result in death, serious injury or substantial property damage.

BEST PRACTICES

Indicates recommendations made by Triangle Tube for the installers which will help to ensure optimum operation and longevity of the equipment

CAUTION

Indicates a potentially hazardous situation which, if ignored, may result in minor injury or property damage.

NOTICE

Triangle Tube reserves the right to modify the technical specifications and components of its products without prior notice.

WARNING

Bacteria can develop in the domestic water system if certain minimum water temperatures are not maintained.

DANGER

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

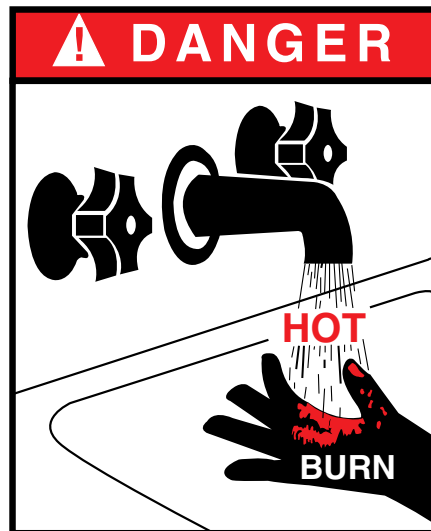
- Children, disabled and elderly are at highest risk of being scalded.
 - **Never leave them unattended in or near shower, bathtub or sink.**
 - **Never allow small children to use a hot water faucet or draw their own bath.**
- If any one using hot water in the building fits this description or codes require specific water temperatures at hot water faucet, we recommend:
 - a) ensure the factory installed thermostatic mixing valve is working properly.
 - b) to set the thermostatic mixing valve for the lowest temperature which satisfies your hot water need.

CAUTION

Protection must be taken against excessive temperature and pressure!

TO PROTECT AGAINST EXCESSIVE TEMPERATURE AND PRESSURE

- Check if the Temperature and Pressure (T&P) relief valve is in the location provided. (Domestic Water)
- Check if the 30 psi relief valve supplied is in the location provided. (Primary water)
- To avoid injury, install the relief devices to comply with local code requirements.



DANGER

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

DANGER

WHAT TO DO IF YOU SMELL GAS

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

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

WARNING

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

CAUTION

To prevent damage to inner tank, installer must:

- Fill inner tank prior to outer tank during start-up.
- Relieve primary system pressure below 15 psig prior to draining inner tank.

WARNING

Qualified Installer:

Prior to installing this product read all instructions included in this manual. Perform all installation steps required in this manual in the proper order given. Failure to adhere to the guidelines within this manual can result in severe personal injury, death or substantial property damage.

Homeowner:

- This product should be maintained / serviced and inspected annually by a qualified service technician.
- This manual is intended for use by a qualified Installer/Service Technician.

NOTICE

Please reference the unit's model number and the serial number from the rating label when inquiring about service or troubleshooting.

NOTICE

Triangle Tube accepts no liability for any damage resulting from incorrect installation or from the use of components or fittings not specified by Triangle Tube.

OPERATING RESTRICTIONS

- Maximum working pressure for inner (domestic water) tank is 150 psig.
- Maximum working pressure for outer (primary water) tank is 45 psig.
- Inner tank has factory installed Temperature & Pressure Relief Valve with an AGA rating of 100,000 Btu/hr for PG-25 and 200,000 Btu/hr for PG-30/35/40/45.
- Outer tank has a factory installed 30 psig relief valve rated at 535,000 Btu/hr
- Electrical rating: 120 V, 60 Hz, less than 12 amperes
- pH & chloride limits for the ELITE are:
 - Chloride, less than 80 mg/l.
 - pH, 6.0 - 8.0.

NOTICE

Any water conditioning system must be installed and maintained in accordance with manufacturer’s specifications.

- 180° Maximum operating temperature - primary side.
- 120° Maximum outlet/mixed temperature - domestic side.

CODE RESTRICTIONS

Single wall heat exchanger in the ELITE complies with National Standard Plumbing Code, provided that:

- Outer tank water (including additives) is practically non-toxic, having toxicity rating or Class of 1, as listed in Clinical Toxicology of Commercial Products,
- Outer tank pressure is limited to maximum 30 psig by approved relief valve.

Single wall heat exchangers are permitted under the Uniform Plumbing code - Paragraph L3.2. if they satisfy all of the following requirements.

1. The heat transfer medium is potable water or contains only substances which are recognized as safe by the U.S. Food and Drug Administration.
2. The pressure of the heat transfer medium is maintained less than the normal minimum operating pressure of the potable water system
3. The equipment is permanently labeled to indicate that only additives recognized as safe by the FDA shall be used in the heat transfer medium.

Or, per Uniform Plumbing Code paragraph L3.3 as follows:

Other heat exchanger designs may be permitted where approved by the Administrative Authority.

SECTION I - Pre-Installation Items

Code Compliance

This product must be installed in accordance to the following:

- All applicable local, state, national and provincial codes, ordinances, regulations and laws.
- The National Fuel Gas Code NFPA54/ANSI Z332.1 - Latest edition.
- Installation of Oil Burning Equipment NFPA 31 - Latest Edition
- National Electric Code ANSI/NFPA 70.
- For installations in Canada -“Installation Code for Gas Burning Equipment” CGA/B149.
- For installations in Canada - Installation code for Oil Burning Equipment - CSA/B139.

Determining Product Location

Before locating the ELITE check for convenient locations to:

- Domestic water supply piping
- Heating system piping
- Venting
- Gas or oil supply piping
- Electrical service

Ensure the area chosen for the installation of the ELITE is free of any combustible materials, gasoline and other flammable liquids.

WARNING

Failure to remove or maintain the area free of combustible materials, gasoline and other flammable liquids or vapors can result in severe personal injury, death or substantial property damage.

Ensure the ELITE and its controls are protected from dripping or spraying water during normal operation or service.

The ELITE should be installed in a location so that any water leaking from the tank or piping connections or relief valves will not cause damage to the area surrounding the unit or any lower floors in the structure.

- When such a location is unavoidable a suitable drain pan with adequate drainage should be placed under the unit. The drain pan must not restrict the flow of combustion air to the unit.

Boiler Replacement

If the ELITE is replacing an existing boiler / hot water heater system, the following items should be checked and corrected prior to installation:

- Primary and domestic piping leaks and corrosion.
- Improper location and sizing of the expansion tank on the primary heating loop.
- Improper sizing of the thermal expansion tank (if used) on the domestic supply line.
- Vent condition and sizing.

Recommended Clearances

The ELITE is approved for zero clearance to combustibles, excluding the vent hood and vent piping.

Vent hood and vent piping - 6 inches from combustible materials when using type “L” double wall vent.

Vent Piping - 18 inches from combustible materials when using single wall vent.

Primary and domestic hot water piping - 1 inch from combustible material.

BEST PRACTICES

To provide serviceability to the unit it is recommended that the following clearances be maintained:

Top and vent hood area - 36 inches.

Front and burner area - 24 inches.

Rear and primary piping areas - 12 inches.

WARNING

When installing the ELITE in a confined space, sufficient air must be provided for proper combustion and venting and to allow under normal operating condition, proper air flow around the product to maintain ambient temperatures within safe limits to comply with the National Fuel Gas Code NFPA 54 - latest edition.

Flooring and Foundation

The ELITE is approved for installation on combustible floors, but **never on carpeting**.

WARNING

Do not install the ELITE on carpeting even with a metal or wood foundation base. Fire can result causing severe personal injury, death or substantial property damage.

Installer should provide a solid brick or concrete foundation pad, at least 2 inches above the floor level if:

- There is a potential for the floor to become flooded. The height of the foundation should be such to sufficiently elevate the unit.
- The floor is dirt, sand, gravel or other loose material.
- The flooring is severely uneven or sloped.

The minimum foundation size required is 24 inches x 23 inches.

Residential Garage Installations

When installing the ELITE in a residential garage the following special precautions per NFPA 54/ANSI Z223.1 must be taken:

- Mount the unit with a minimum 18 inches above the floor level of the garage. Ensure the burner and ignition devices / controls are no less than 18 inches above the floor level.
- Locate or protect the unit in a manner so it cannot be damaged by a moving vehicle.

SECTION II - Providing Air for Combustion and Ventilation

WARNING

The installer must provide adequate combustion and ventilation to the area in which the ELITE is installed. Providing adequate air ensures proper combustion and reduces the potential risk of severe personal injury or death from carbon monoxide emissions if a flue gas leakage occurred.

WARNING

The installer should not install an exhaust fan in the room with the ELITE. The exhaust fan could affect the combustion of the burner or cause potential flue gas leakage resulting in severe personal injury or death.

NOTICE

The installer should consider the condition and age of the building when determining air for ventilation. Older buildings (buildings with single pane windows and minimal weather-stripping around doors and windows) tend to have adequate natural infiltration and ventilation without providing dedicated air openings. Newer buildings (buildings with double pane windows and weather-stripped doors and windows) are unlikely to have natural infiltration and ventilation, thus must be provided with dedicated air openings.

The installer must follow the requirements of state, provincial or local codes when sizing and locating adequate air openings for combustion and ventilation.

In absence of the codes the installer may opt to use the following guidelines when the ELITE is installed in a confined room as defined by NFPA 31 as a room with less than 7200 cubic feet per 1 GPH of input of all appliances located in the area (7200 cubic feet is defined as a room with 8 foot ceiling and 33.5 ft x 33.5 ft in dimension):

Two Permanent Openings - One opening must commence within 12 inches of the ceiling and the other opening within 12 inches of the floor. The opening must have a minimum height or length dimension of 3 inches, the actual dimensions are based on:

Using Inside Air - Each opening must be connected freely to the areas having adequate infiltration from the outside. Each opening should be at least 140 sq. inches per 1 GPH of input (1 sq. inch per 1000 BTU input). This input should include all appliances (gas and/or oil) plus any appliances that may draw air from the room such as clothes dryers.

Using Outside Air - Each opening should be connected directly or by ducts to the outdoors or to a crawl space or attic area that is freely connected with the outdoors. The openings should be sized as follows:

Through outside wall or vertical ducts - The openings should be a minimum 35 sq inches per 1 GPH input (1 sq. inch per 4000 BTU input) of all appliances (gas and/or oil) plus any appliances that may draw air from the room such as clothes dryers.

Through horizontal ducts - The openings should be a minimum 70 sq. inches per 1 GPH input (1 sq. inch per 2000 BTU input) of all appliances (gas and/or oil) plus any appliances that may draw air from the room such as clothes dryers.

Where ducts are used, the size of the duct should equal the free area of the opening in which the duct is connected to.

The installer should compensate for any louvers, grilles or screens when determining the free air of the opening. The installer should refer the louver or grille manufacturer's instruction for determining free area. In absence of the manufacturer's instructions the installer should use the following as a guideline:

- Wood louvers will provide 20 to 25% free area
- Metal louvers or grilles will provide 60 to 75% free air

Installers should lock louvers in the open position or provide an interlock system to prove the louvers are in the open position prior to operation of the ELITE.

Removal of an Existing Boiler from a Common Vent System

BEST PRACTICES

For installations in which the ELITE is replacing an existing boiler / hot water heater system, which was connected to a common vent system with other appliances, the following steps shall be conducted with each remaining appliance connected to the common venting system:

1. Any unused openings in the common venting system must be sealed.
2. A visual inspection of the venting system must be conducted for proper sizing and horizontal pitch. The inspection should ensure no blockage or restriction is within the vent system, and there is no leakage, corrosion or other items, which could cause an unsafe condition.
3. To adequately test the venting system, close all exterior doors and windows and all doors between the area containing the remaining appliances connected to the common vent system and other areas of the building. Turn on any clothes dryers and any other gas appli-

ance not connected to the common vent system. Turn on all exhaust fans, i.e. range hoods and bathroom exhaust fans, preferably at maximum speed. Close any fireplace dampers.

4. Place in operation the first appliance being inspected that is connected to the common vent system. The remaining appliances should not be in operation. Follow the appliance's lighting instructions and adjust the thermostat to allow the appliance to operate continuously.
5. Test for spillage at the draft hood relief opening after 5 minutes of main burner operation. Spillage can be detected using the flame of a match or candle or with smoke from a cigarette.
6. Once it has been determined that each remaining appliance connected to the common vent system is properly vented, return doors, windows, exhaust fans, fireplace dampers and any operating gas appliance to their previous condition.

Should any improper operation of the common venting system be detected in the outlined test, the condition should be corrected so the vent system conforms with the National Fuel Gas Code, NFPA 54/ ANSI Z223.1 - latest edition. Canadian installations must conform with B149.1 or 149.2 Installation Code.

SECTION III - Unit Preparation

Handling Instructions

The ELITE is generally easier to handle and maneuver once removed from the shipping carton and pallet.

To remove the shipping carton and pallet:

- a. Remove the shipping straps and open the top of the shipping carton to remove the wood shipment insert.
- b. Lift the shipping carton over the unit to remove. If ceiling height is limited the carton maybe cut open using care not to damage the exterior jacket of the unit.
- c. Discard all packing materials.

Hydrostatic Pressure Test

BEST PRACTICES

Prior to permanently connecting water, oil/gas supply or electrical supply, perform a pressure hydrostatic test of the outer tank to ensure all piping connections were not damaged during shipment.

Hydrostatic Test Preparation

1. Mount the circulator on the supply pipe as shown in Fig. 7 page 20.
2. Temporarily plug the primary return connections as shown in Fig. 7 page 20 using a 1" NPT pipe plug. Use pipe dope sparingly to allow removal of the plugs upon completion of the test.
3. On the outlet flange of the circulator pipe install a 1" NPT nipple and shut-off valve. Use pipe dope sparingly to allow removal of the fittings upon completion of the test.

NOTICE

To avoid getting water onto the unit and/or surrounding area additional piping from the shut-off to a catch bucket or drain may be required.

4. Connect a hose to the primary circuit drain valve located per Fig. 28 page 50, Item 2 and connect the other end to a fresh water supply. Ensure the hose can be used as a drain hose upon completion of the test.

Hydrostatic Test Procedures

1. Open the shut-off valve installed on the outlet flange of the circulator.
2. Open the fresh water supply valve and then open slowly the primary circuit drain valve to fill the outer tank with water.
3. When the water within the outer tank reaches the shut-off on the primary supply, close the primary circuit drain valve.
4. Close the shut-off valve, on the top of the circulator.
5. Slowly reopen the primary circuit drain valve until the test pressure on the temperature / pressure gauge reaches **10 psig maximum**. Close the primary circuit drain valve.

CAUTION

To prevent damage to the inner tank the test pressure must not exceed 10 psig.

6. Allow the test pressure to remain for 10 minutes.

WARNING

Do not leave the unit unattended while pressurized. A cold water fill could expand and cause excessive pressure, resulting in severe personal injury, death or substantial property damage.

7. Ensure constant gauge pressure has been maintained throughout the 10 minute test. Check for leaks at all fitting joints. Repair if found.

WARNING

Leaks must be repaired immediately when detected. Failure to repair leaks can damage the unit, resulting in substantial property damage.

8. Check continuity using a multimeter across the terminals of the LWCO device. The contacts on the LWCO should be closed. See item 6 in Fig. 24 page 47 for location of the LWCO.

Completion of Hydrostatic Test and Draining

1. Disconnect the fill hose from the fresh water source and direct the hose to a suitable place of drainage.
2. Open the primary drain valve and completely drain the unit. To aid in draining, open the shut-off valve on the primary supply.
3. Remove the hose from the primary drain valve when draining is complete.
4. Remove the plugs, nipple, shut-off valve and any other piping unless they will remain for use in the system piping.

SECTION IV - Domestic Piping

CAUTION

The Temperature / Pressure relief valve is not intended for constant duty, such as relief of pressure due to normal thermal expansion.

General Piping Requirements

- All plumbing must meet or exceed all local, state and national plumbing codes.
• Use pipe dope or tape suitable for potable water.
• Use isolation valves to isolate system components.
• Install unions for easy removal of the ELITE from the system piping.

Water Hammer

Water hammer is the effect of sudden pressure changes occurring in the domestic piping. These pressure changes are typically the result of "fast acting" positive shut-off valves closing. These types of valves can be typically found on dishwashers and clothes washers.

Domestic Supply Pressure

For applications in which the domestic supply pressure exceeds 70 psig it is recommended to install a pressure reducing valve on the cold water supply.

The effects of water hammering can cause damage to system components and tank welds on the unit.

Maintaining the cold water supply at or below 70 psig will prevent normal thermal expansion from repeatedly forcing the T&P relief valve open.

Installation of hammer arresters is recommended at these types of appliances, which incorporate "fast-acting" positive shut-off valves. Consult the manufacturer of water hammer arresters for recommendation on sizing and installation requirements.

Thermal Expansion

If the cold water supply contains a backflow preventer, check valve and / or a pressure reducing valve, the installer must install a domestic thermal expansion tank on the cold water supply. (See Fig. 2 page 14)

Temperature / Pressure Relief Valve

The ELITE has a factory installed Temperature / Pressure Relief valve. Ensure the rating of the T&P relief valve is correctly sized as follows per AGA:

Installing a thermal expansion tank will prevent normal thermal expansion from repeatedly forcing the T&P relief valve open.

Table with 2 columns: Model and AGA Rating. Rows include F-25 (100,000 Btu/hr), F-30 (200,000 Btu/hr), F-35 (200,000 Btu/hr), F-40 (200,000 Btu/hr), and F-45 (200,000 Btu/hr).

When installing a thermal expansion tank ensure the charge pressure of the tank is equal to the cold water supply pressure at the point of installation. Consult the thermal expansion tank manufacturer's instructions for further information on installation and sizing.

The installer must install discharge piping onto the T&P relief valve. The discharge piping must be:

- Made of material serviceable for temperatures of 250°F or greater.
- Directed so that any hot water discharge flows away from all persons.
- Directed to a suitable place of drainage.
- Installed as to allow complete draining of the T&P relief valve and the discharge piping.
- Terminated with a plain end, not with threads.

CAUTION

Failure to properly direct the discharge piping of the T&P relief valve may result in flooding of the area adjacent to the unit and or lower floors in the structure causing substantial property damage.

The installer **must not** install the T&P relief valve discharge piping in a manner that is:

- Excessively long: Using more than 2 elbows and/or 15 feet of discharge piping can reduce the discharge capacity.
- Terminated directly into a drain: The discharge piping must terminate within 6 inches of the drain. Check with local plumbing codes for termination guidelines.
- The discharge piping is plugged, reduced in size or restricted in any manner.
- The discharge piping is subject to freezing.

WARNING

DO NOT install any valves between the T&P relief valve and the discharge piping. DO NOT plug the T&P relief valve or the discharge piping. Improper placement and piping of the T&P relief valve can cause severe personal injury, death or substantial property damage.

Thermostatic Mixing Valve

The ELITE contains a factory installed thermostatic mixing valve with built-in check valve.

The operating range of the thermostatic mixing is 90°F to 120°F.

For applications with a domestic recirculation loop, the recirculation pump should be controlled by an aquastat. The maximum recommended setting of the aquastat is 10°F lower than the thermostatic mixing valve setting.

DANGER

For proper operation of the thermostatic mixing valve and to prevent potential scalding hazards, the recirculation loop should be controlled by an aquastat. DO NOT use continuous recirculation.

U-Tube Assembly

The ELITE is supplied with a U-Tube Assembly that directs cold water to the thermostatic mixing valve.

To install the U-Tube Assembly the installer must:

1. Disconnect the cold inlet adapter/union from the thermostatic mixing valve.
2. Using needle-nose pliers remove the plastic check valve assembly from the adapter.

3. Solder the U-Tube Assembly onto the adapter. (See Fig. 1)
4. Once the adapter has sufficiently cooled, re-insert the check valve assembly making sure of orientation and reconnect onto the mixing valve.

If the installation of the ELITE requires domestic hot water for a commercial dishwasher, the installer may insert a tee connection between the unit and the mixing valve to provide 140°F domestic hot water. The installer must reference local plumbing codes to ensure if this type of application is permissible.

DANGER

The thermostatic mixing valve MUST be installed and utilized on the ELITE. Removal of the thermostatic mixing valve will result in severe personal injury or death.

CAUTION

The manual valve on the U-Tube assembly must remain in the full open position for proper operation of the thermostatic mixing valve.

Domestic Drain Valve

- The installer must install a drain valve and drain leg as shown in Fig. 2 page 14 or Fig. 3 page 15.
- The drain valve should be positioned close to the floor to aid in the siphon action required to drain the inner tank.

Multiple Units Installation

For applications using multiple units the domestic piping should be piped using a balanced manifold arrangement.

The installer should remove the thermostatic mixing valve from the units and install a single thermostatic mixing valve at the outlet of the hot water manifold. The thermostatic mixing valve should be sized according to the required flow rate and pressure drop. Refer to the thermostat mixing valve manufacturer specification and installation instructions for more details.

Reference Fig. 4, page 15 for piping diagram.

Storage Tank Application

For applications requiring large volumes of domestic hot water in a relative short period, the installer may include a storage type tank (see Fig. 5 page 16) in the domestic piping. The installer must:

1. Relocate the thermostatic mixing valve from the ELITE to the outlet of the storage tank.
2. Provide recirculation from the storage tank back to the ELITE using a bronze type circulator. Maximum recommended flow rate is 5 to 10 gpm.

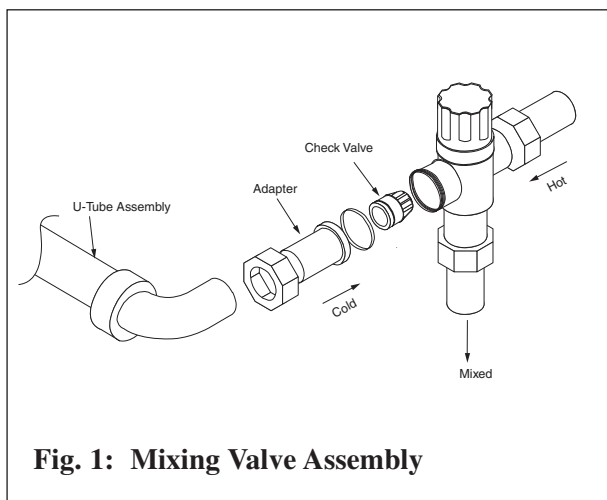


Fig. 1: Mixing Valve Assembly

TR/SMART Series Application

For applications requiring large volumes of domestic hot water over an extended period, the installer may include a Triangle Tube TR/SMART Indirect Water Heater in conjunction with the ELITE. (See Fig. 6 page 16)

The domestic system recirculation, if used, is directed to the TR/SMART Series Tank. The circulator should be controlled by an aquastat.

The primary piping to the TR/SMART Series tank must comply with the piping methods details in SECTION V - Primary Piping or with other recognized piping methods.

Additional information regarding domestic and primary piping can be found in the TR/SMART Installation Manual.

Domestic Piping Diagrams

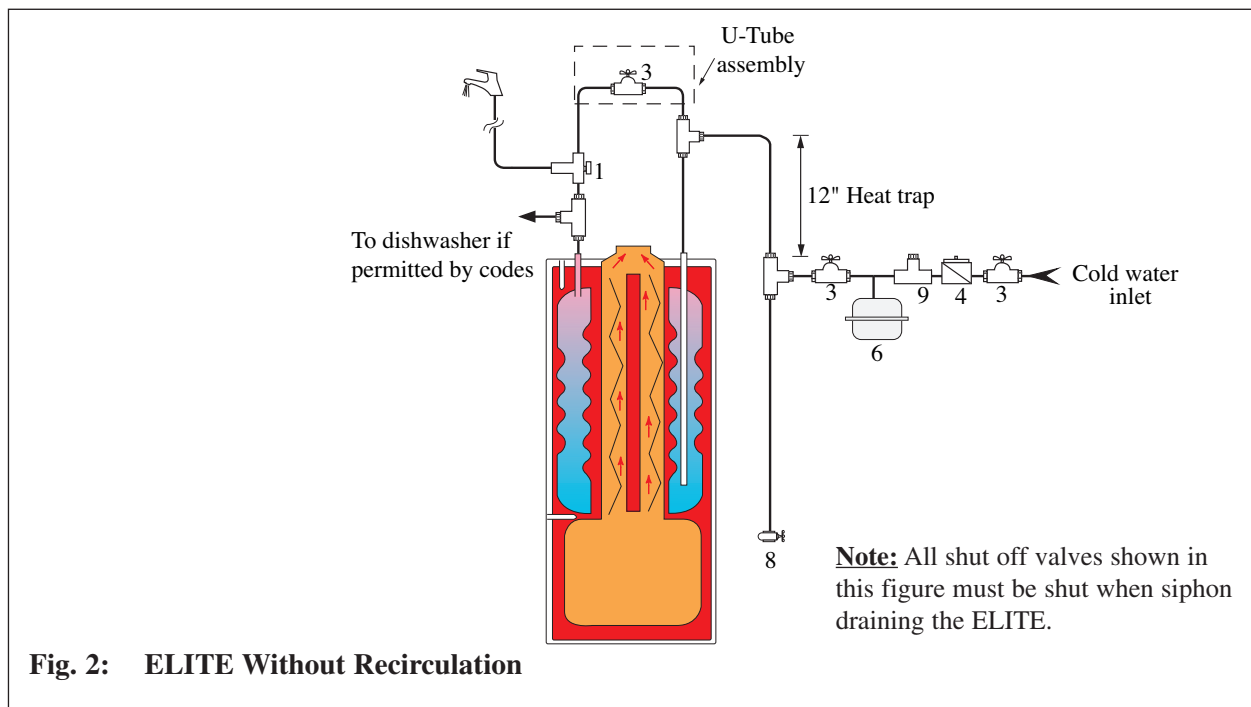
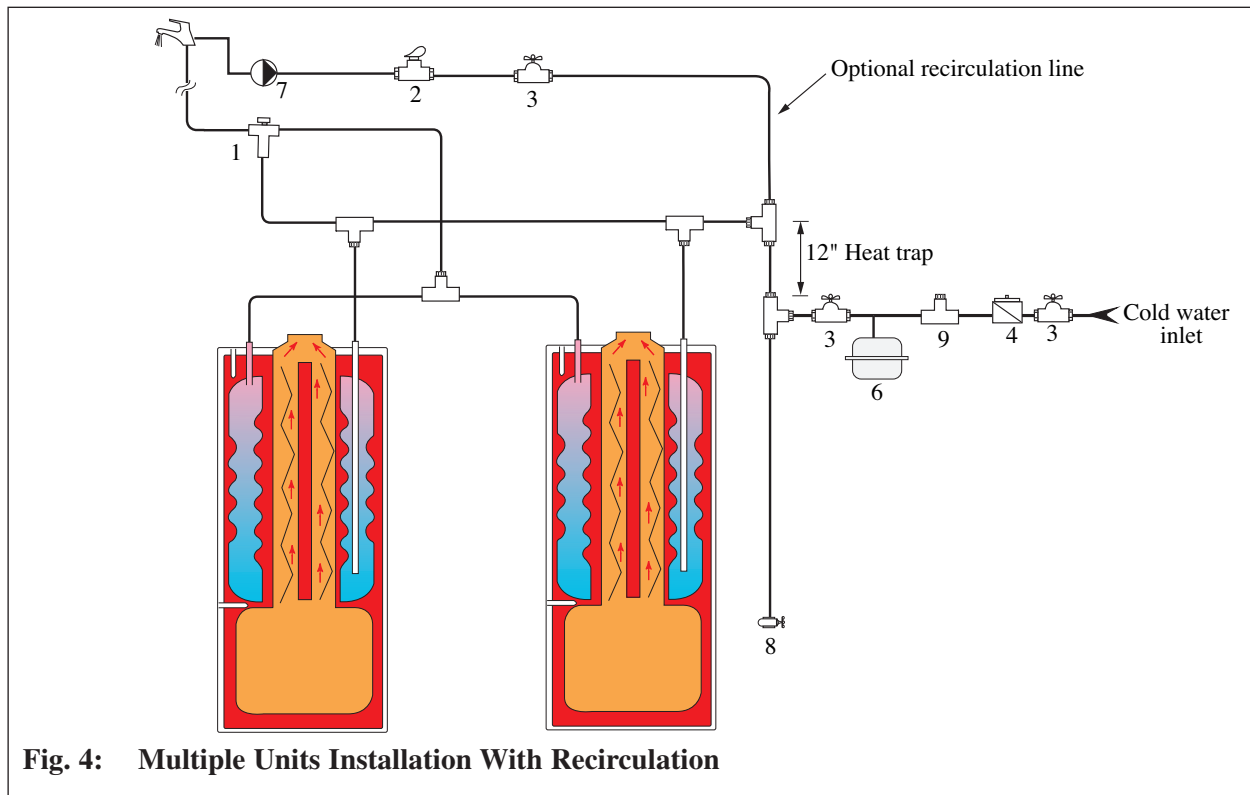
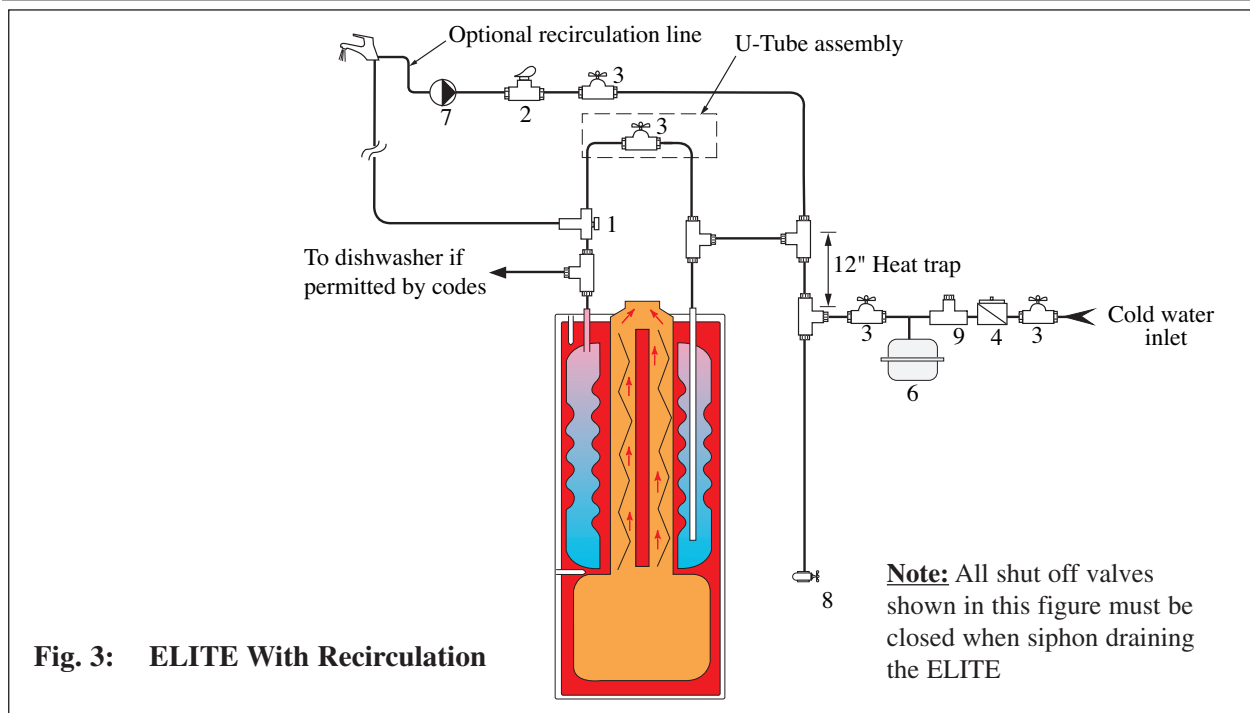


Fig. 2: ELITE Without Recirculation

- | | |
|---|---------------------------|
| 1. Mixing valve with check valve | 6. Thermal expansion tank |
| 3. Shut off valve | 8. Domestic drain valve |
| 4. Backflow preventer or pressure reducing valve* | 9. Vacuum breaker* |

* Optional devices may be required by local Codes



- | | |
|---|--|
| 1. Mixing valve with check valve | 6. Thermal expansion tank |
| 2. Flow check valve | 7. Circulator (controlled by aquastat) |
| 3. Shut off valve | 8. Domestic drain valve |
| 4. Backflow preventer or pressure reducing valve* | 9. Vacuum breaker* |

* Optional devices may be required by local Codes

Domestic Piping

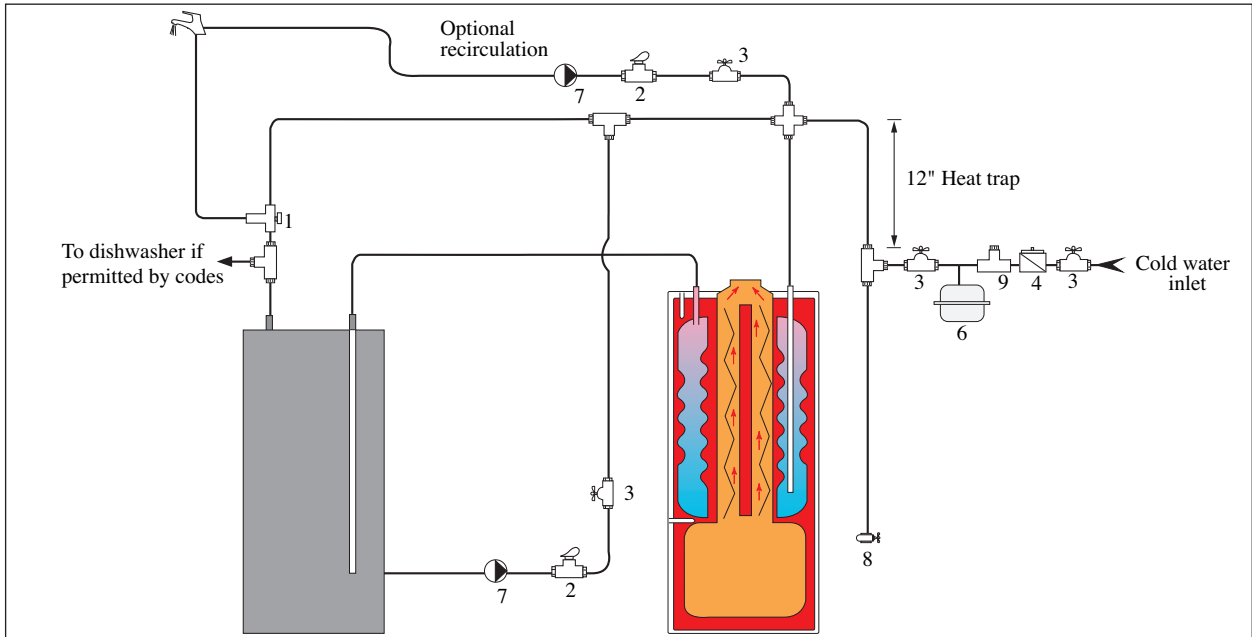


Fig. 5 : ELITE with Storage Tank

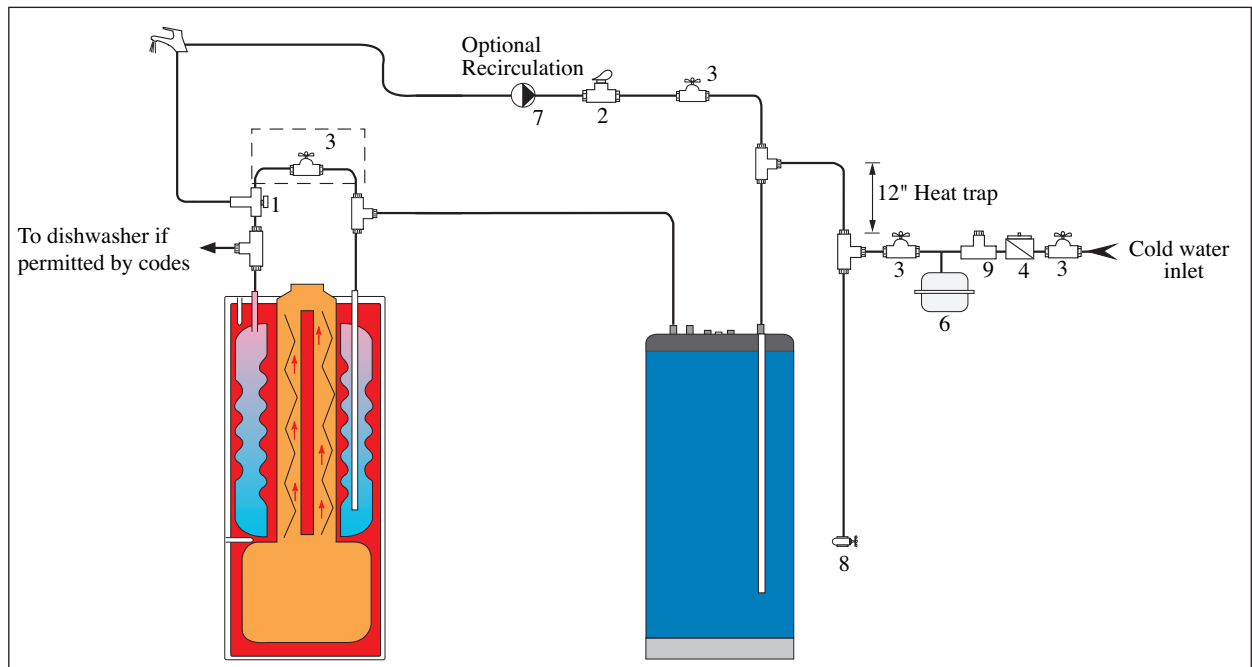


Fig. 6: ELITE with TR/SMART Indirect Water Heater

- | | |
|---|--|
| 1. Mixing valve with check valve | 6. Thermal expansion tank |
| 2. Flow check valve | 7. Circulator (controlled by aquastat) |
| 3. Shut off valve | 8. Domestic drain valve |
| 4. Backflow preventer or pressure reducing valve* | 9. Vacuum breaker* |

* Optional devices may be required by local Codes

SECTION V - Primary Piping

General Piping Requirements

Low Water Cutoff Device

- The ELITE is equipped with a factory installed pressure switch style Low Water Cut Off device.
- The minimum operating system pressure allowable with this device is 10 psig.
- Check local codes which require a low water cutoff device for compliance of this device.

Backflow Preventer

- Use a backflow preventer valve in the make-up water supply to the unit as required by local codes.

Primary System Piping Applications

BEST PRACTICE

All piping applications shown in this installation manual utilize a primary/ secondary piping arrangement. This method is recommended as a means to provide priority to the production of domestic hot water. For other piping arrangements, consult the Engineering Department at Triangle Tube or consult other approved/recognized design arrangements.

BEST PRACTICE

On piping applications utilizing a single zone or other recognized piping design arrangements it is recommended the installer uses flow/check valves with weighted seats at or near the appliance to prevent gravity circulation.

Expansion Tank and Makeup Water

Ensure the expansion tank is properly sized for the outer tank volume (22 gallons) and the system volume and temperature.

CAUTION

Undersized expansion tanks will cause system water to be lost through the pressure relief valve and cause additional makeup water to be added to the system. Eventual primary tank failure can result due to this excessive makeup water addition.

The expansion tank must be located as shown in Fig. 7, 7A or 7B page 20 or as per recognized design methods. Refer to the expansion tank manufacturer instructions for additional installation details.

Connect the expansion tank to an air separator only if the air separator is located on the suction side (inlet) of the system circulator. Always locate and install the system fill connection at the same location as the expansion tank connection to the system.

Diaphragm (Bladder) Expansion Tank

Always install an automatic air vent on the top of the air separator to remove residual air from the system.

Closed-Type (Standard) Expansion Tank

It is recommended to pitch any horizontal piping toward the expansion tank 1 inch per 5 feet of piping. Use 3/4" piping for the expansion tank to allow air within the system to rise.

For proper operation of the expansion tank and system, remove the factory installed automatic air vent from the ELITE and plug the connection. (See Item 10, Fig. 28 page 50)

CAUTION

DO NOT install automatic air vents on a closed-type expansion tank system. Air must remain in the system and be returned to the expansion tank to provide an air cushion. An automatic air vent would cause air to be vented from the system resulting in a water-logged expansion tank.

Circulator

The ELITE is supplied with a circulator that is pre-wired to allow for domestic priority. Locate the circulator in the return or supply piping as shown in the piping diagrams included in this manual.

Closet (Zero Clearance) Applications

For applications in closets or zero clearances, the installer may use the upper primary connection shown as Item 4 Fig. 28 on page 50 as a primary return connection. The air elimination, expansion tank and make-up water system should then be piped directly into the primary loop of the space heating prior to the system circulator.

Sizing Primary Piping

See Fig. 8 through 11, pages 21 - 22, for recommended piping arrangements based on various applications. In all diagrams, the space heating system is isolated from the ELITE using primary / secondary piping connections.

Size the piping and system components required in the space heating system using recognized design methods.

System Piping - Zone Circulators

Connect the ELITE to the system piping as shown in Fig. 9 page 21 when zoning with zone circulators. The circulator supplied with the ELITE should not be used for a heat zone. It must supply only the primary loop.

Install a separate circulator for each zone of space heating.

To control the zone circulators refer to Fig. 19, page 35.

NOTICE

To ensure adequate flow rate through the ELITE, maintain a minimum 1 inch diameter on the system piping connecting the unit to and from the primary / secondary connection.

System Piping - Zone Valves

Connect the ELITE to the system piping as shown in Fig. 9 page 21 when zoning with zone valves. The primary / secondary piping ensures the priority is given to the production of domestic hot water.

To control the system zone valve refer to Fig. 18, page 34.

NOTICE

To ensure adequate flow rate through the ELITE, maintain a minimum 1 inch diameter on the system piping connecting the unit to and from the primary / secondary connection.

System Piping - Radiant Heating with Mixing Valve

Connect the ELITE to the system piping as shown with a radiant system using a thermostatic mixing valve as shown in Fig. 11 page 22. The primary / secondary piping ensures sufficient return temperature to the ELITE.

NOTICE

If the radiant system tubing contains no oxygen barrier, a stainless steel heat exchanger must be used. Failure to install a heat exchanger could lead to premature failure of the outer tank and void any warranty claim.

WARNING

Radiant heating system piping should include a means of regulating the boiler return water. The return water temperature to the unit should be maintained at 130°F or higher. Failure to prevent low return water temperature to the unit could cause premature failure of the unit and it's burner system resulting in severe personal injury, death or substantial property damage.

Size the system piping and circulator to provide the flow needed for the radiant system.

To control the zone circulators refer to Fig. 19, page 35.

NOTICE

To ensure adequate flow rate through the ELITE, maintain a minimum 1 inch diameter on the system piping connecting the unit to and from the primary / secondary connection.

System Piping - Multiple Units Installation

Use a balance manifold system as the primary / secondary connection to the space heating piping as shown in Fig. 12 page 23.

Refer to Fig. 7 page 20 to install air elimination and expansion tank.

For the space heating piping refer to the applications mentioned in this manual or use recognized design methods.

NOTICE

To ensure adequate flow rate through the ELITE, maintain a minimum 1 inch diameter on the system piping connecting the unit to and from the primary / secondary connection.

Near Appliance Piping

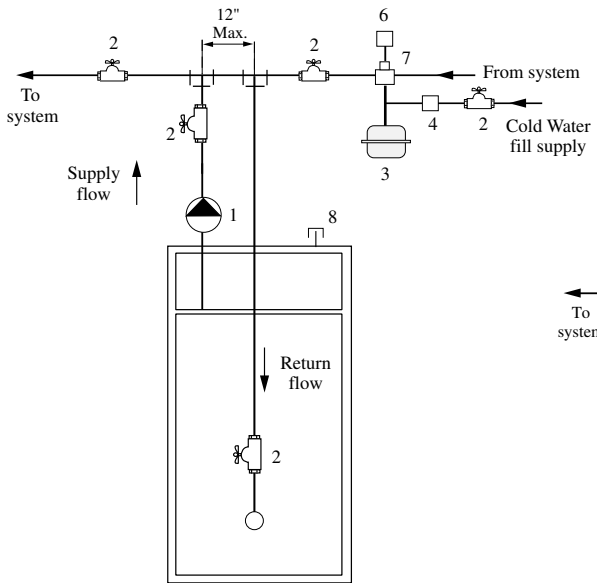


Fig. 7 : Near Appliance Primary Piping with a Diaphragm Type Expansion Tank

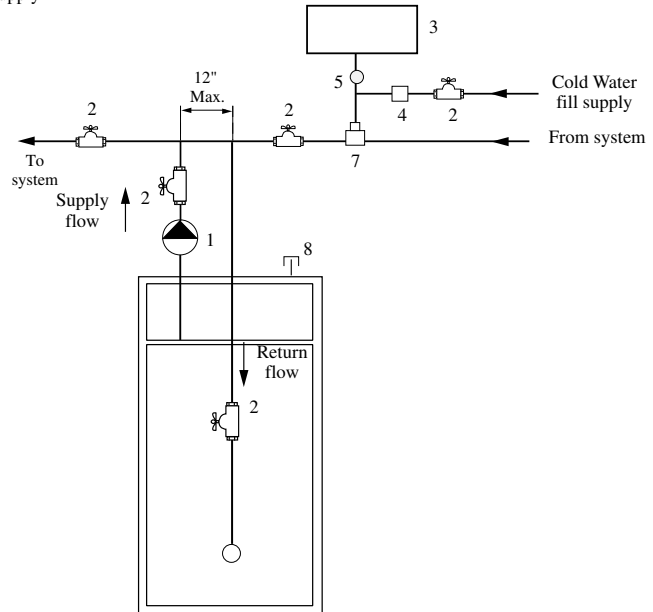


Fig. 7A : Near Appliance Primary Piping with Closed - Type Expansion Tank

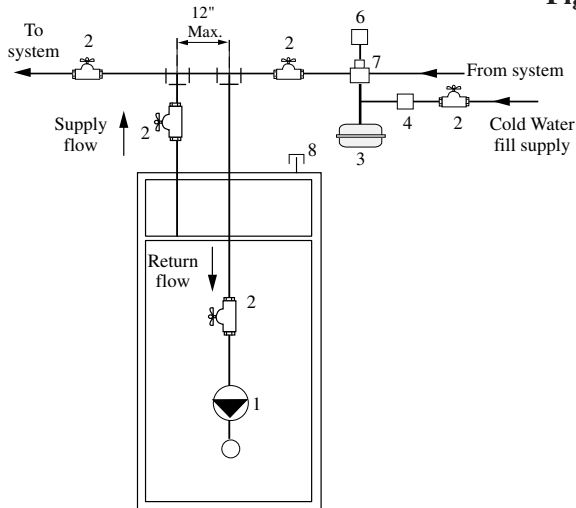


Fig. 7B : Near Appliance Primary Piping with Diaphragm - Type Expansion Tank (Alternate Circulator Location)

- | | | |
|-------------------------|-----------------------|---------------------|
| 1. Appliance Circulator | 4. Auto fill valve | 7. Air Separator |
| 2. Shut Off valve | 5. Tank fitting | 8. Plug (by others) |
| 3. Expansion tank | 6. Automatic air vent | |

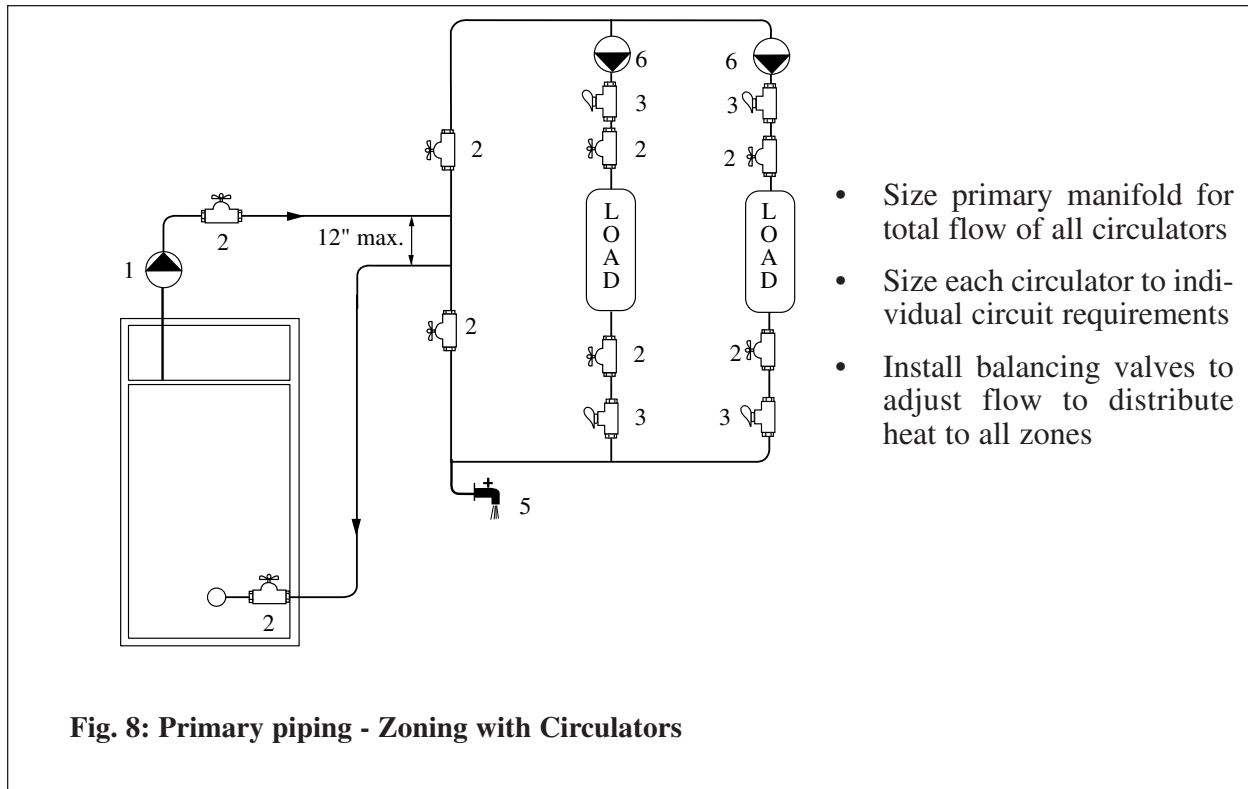


Fig. 8: Primary piping - Zoning with Circulators

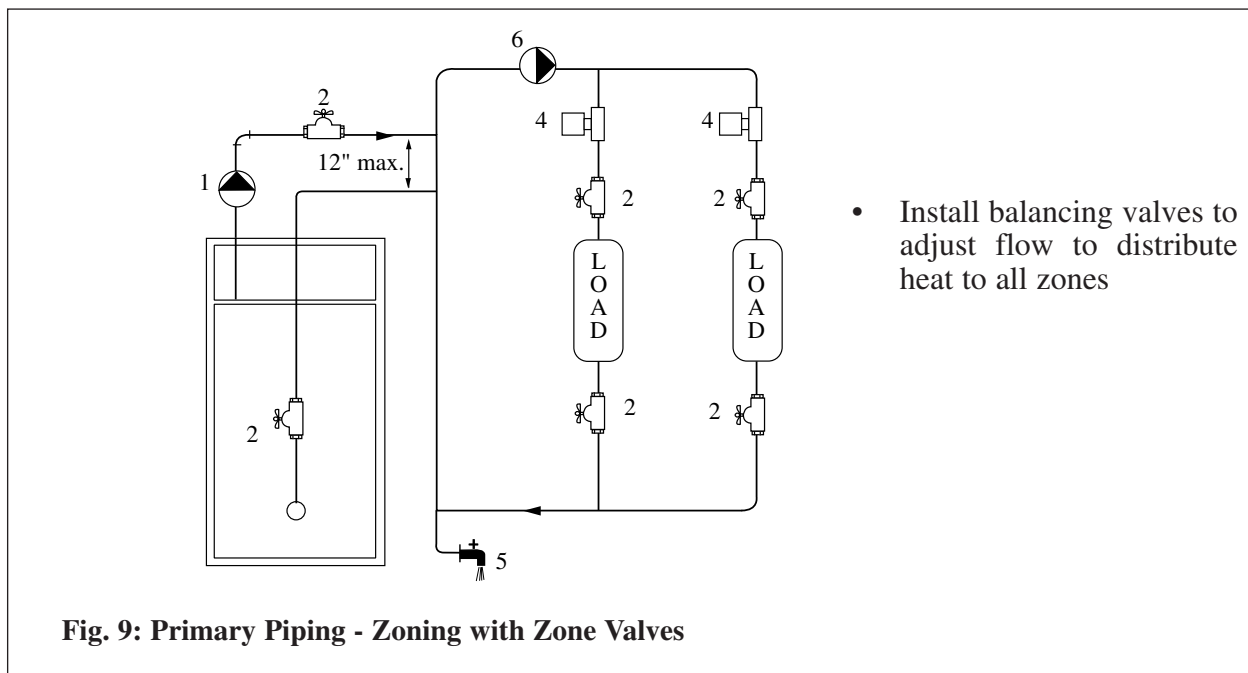


Fig. 9: Primary Piping - Zoning with Zone Valves

- 1. Appliance circulator
- 2. Shut-off valves
- 3. Flow check valve
- 4. Zone valve

- 5. System purge valve
- 6. System circulator

Note: See page 20 for near appliance piping.

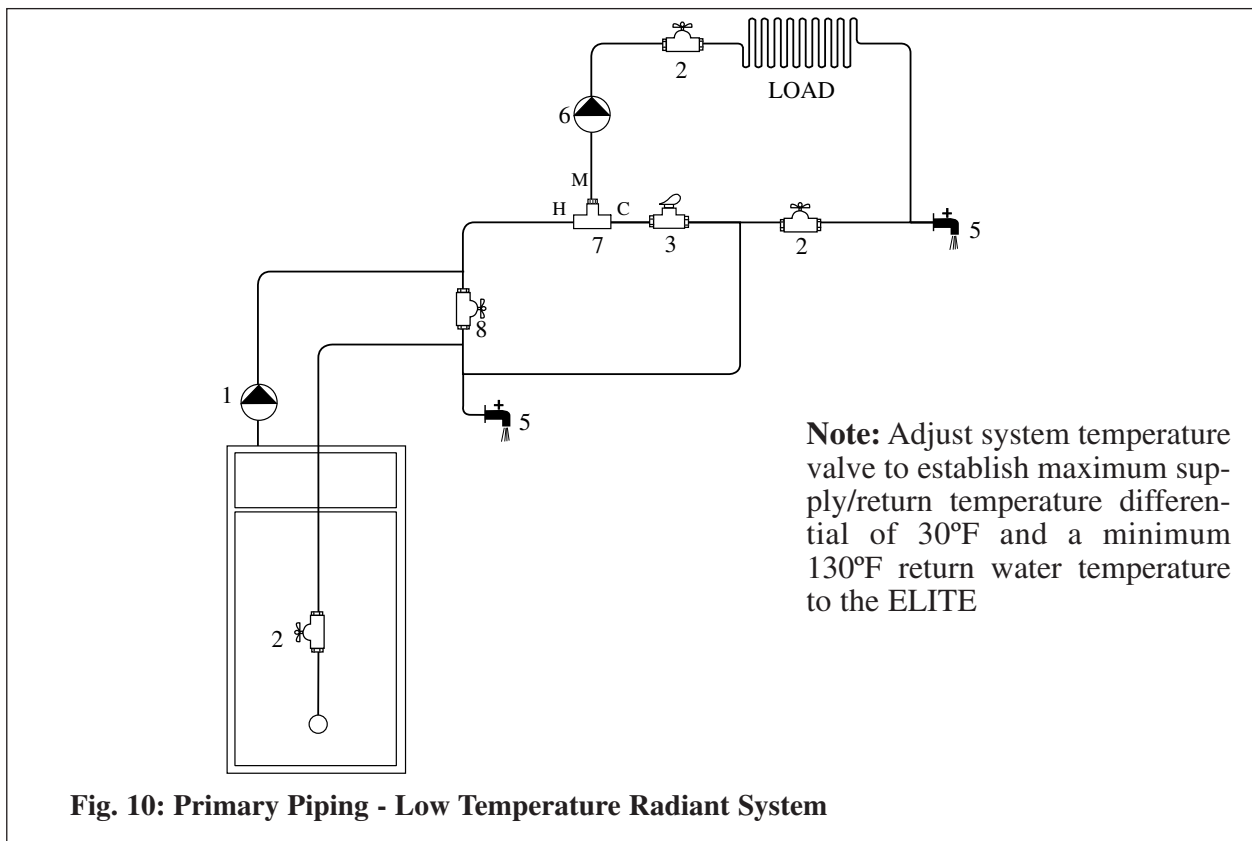


Fig. 10: Primary Piping - Low Temperature Radiant System

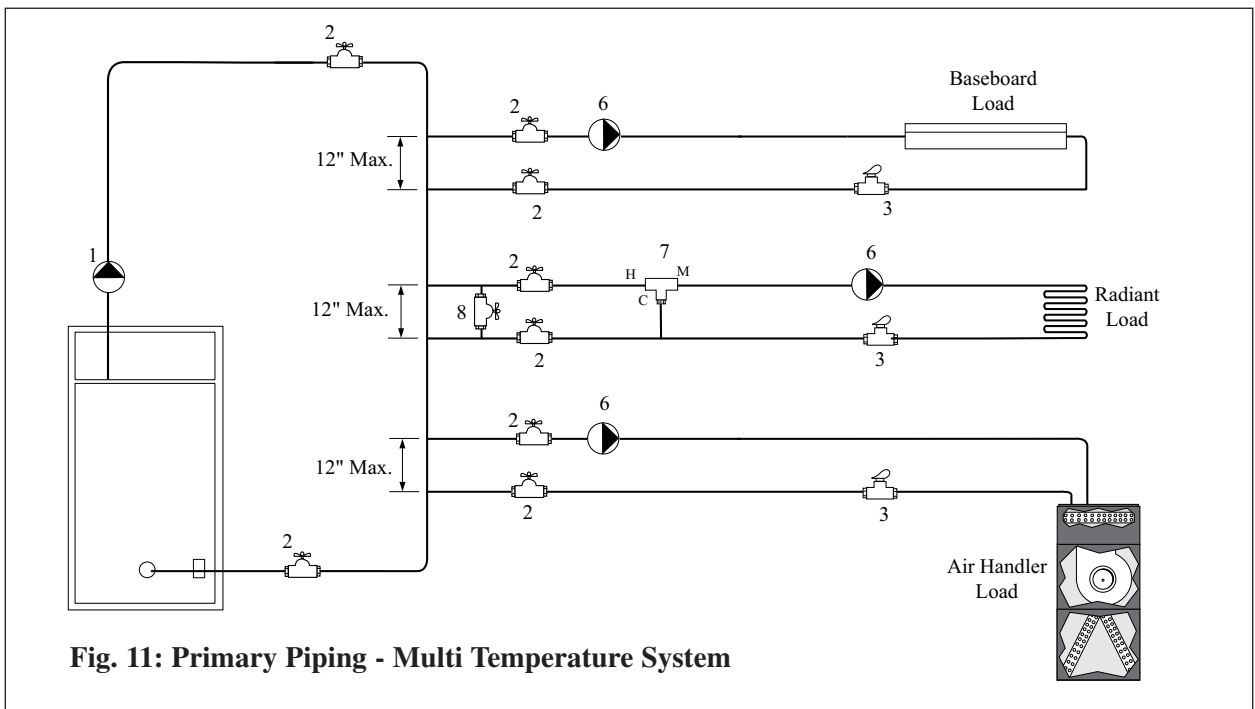


Fig. 11: Primary Piping - Multi Temperature System

- | | |
|---------------------|--|
| 1. Circulator | 5. Purge valve |
| 2. Shut Off valves | 6. System circulator |
| 3. Flow check valve | 7. 3-way mixing valve |
| 4. Zone valve | 8. System Temperature valve (See note above) |

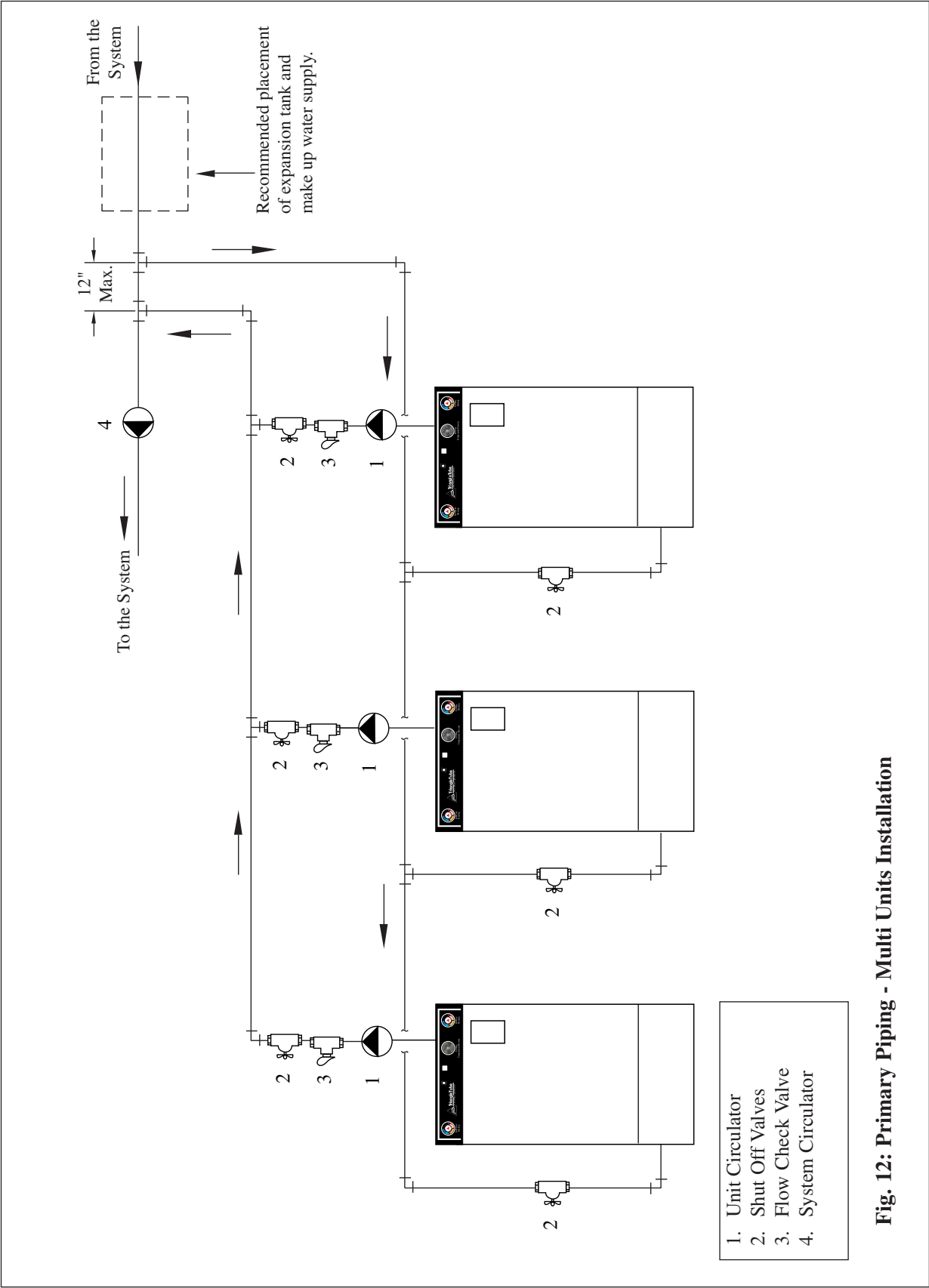


Fig. 12: Primary Piping - Multi Units Installation

SECTION VI - Venting

Oil Vent - General Requirements

WARNING

Improper installation of vent system could cause improper draft causing flue gas leakage and carbon monoxide emissions, which could cause severe personal injury or death.

Installation must comply with local requirements for oil burning appliances. In absence of local codes the installer should refer to:

- NFPA 31, Installation of Oil-Burning Equipment
- NFPA 211, Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances.
- In Canada, the installer should refer to CSA B139, Installation Code for Oil-Burning Equipment.

NFPA 211 requires the chimney to be lined before connecting to the ELITE appliance.

DANGER

Inspect existing chimney before installing the ELITE. Failure to complete the following guidelines will result in severe personal injury or death:

- **Clean the chimney, including removal of any blockages**
- **Repair or replace any deteriorating or damaged vent pipe or liner**
- **Repair any damaged chimney mortar or joints**

The chimney must extend a minimum 3 feet above the highest point where it passes through the roof and 2 feet higher than any portion of the building within 10 feet.

The cross sectional area of the chimney and the height must be increased at minimum 4% per 1,000 feet of elevation above sea level.

The installer must maintain minimal clearances from the vent pipe to combustible material as follows:

- Type "L" doublewall vent - 6 inches
- Single wall vent pipe - 18 inches

The chimney size should be maintained as minimal, oversize chimneys could result in the formation of condensate in the chimney.

Oil Vent Piping

WARNING

Long horizontal vent runs, excessive number of tees or elbows or other fittings that restrict the combustion flue gas flow can result in potential flue condensation, flue gas leakage and/or carbon monoxide emissions, which can lead to severe personal injury or death.

When the burner and the ELITE are properly installed, the overfire draft on the ELITE should be approximately (-)0.01" w.c to (-)0.02" w.c.

Minimum Chimney Size - Oil Fired				
ELITE Model	Flue Outlet Diameter	Minimum I=B=R Chimney Size		Minimum Chimney Height
		Rectangle	Round	
F-25 F-30 F-35	5 inch	8" x 8"	6"	15 ft
F-40 F-45	7 inch	8" x 8"	7"	15 ft

Install a barometric control device in the vent connector as shown in Fig. 13 and 13A and adjust per the manufacturer's instruction when excess draft needs to be relieved or when applicable codes require such a device.

Install an induced draft fan in the chimney for applications in which:

- Excessive resistance to the flow of flue gases is expected
- The cross-sectional area of the chimney is smaller than the minimal area required
- The chimney height is less than the minimal requirement

When using an induced draft fan the installer should seal all vent joints and provide an interlock system for the ELITE to ensure fan operation.

Oil Vent - Direct Vent Applications

The installer must read and comply with the direct vent instruction outline in Triangle Tube Oil-Fired Direct Vent Instructions.

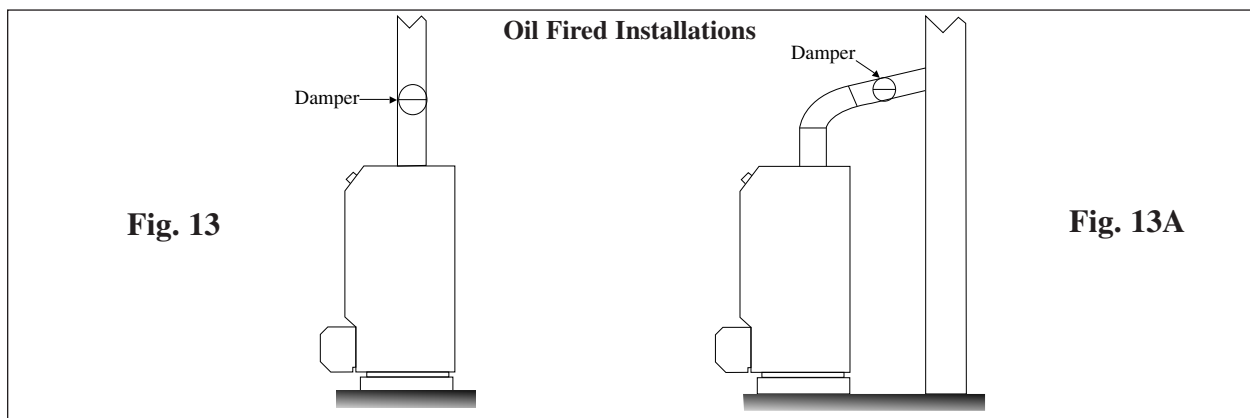
The installer should give attention to the location of the ELITE prior to installation. The installer should:

- Locate the unit for shortest possible vent length and the most direct path to the outside wall.
- Note that flue gases will form a white plume in colder climates which may obstruct window views

- Note that prevailing winds could cause nuisance lockouts, freezing of condensate and water/ice build-up may occur on buildings, plants and roofs.

The installer should consider the following when determining the location of the vent termination:

- Locate or guard the vent termination in a manner to prevent accidental contact by people or pets.
- Vent must terminate at least 4 feet below and 4 feet horizontally or 1 foot above any window, door or gravity air inlet to the building.
- Vent must terminate not less than 7 feet above grade when located adjacent to a public sidewalk.
- Terminate the vent at least 6 feet from adjacent walls
- The bottom of the vent termination shall be located at least 1 foot above the grade, including normal snowline.
- DO NOT terminate the vent into window wells, stairwells, alcoves, courtyards or other recess area.
- DO NOT terminate vent above any window, door or gravity inlet as condensate can freeze causing ice formations.



Gas Venting -General Requirements

The venting system must be installed in accordance with:

- NFPA 54 National Fuel Gas Code, ANSI Z223.1.
- NFPA 211 Standard for Chimneys, Vent and Solid Fuel Burning Appliances.

For installations in Canada the venting system must be installed in accordance with:

- CGA / B149 Installation Code for Gas Burning Equipment.
- Prior to installing the appliance into an existing chimney or venting system, the vent system should be inspected for condition and obstructions.

WARNING

If the inspection reveals the vent system is not safe for the intended use, it shall be repaired, rebuilt, lined, relined or replaced with a vent or chimney to conform to NFPA 211, latest edition. Failure to conduct such an inspection and/or repair could result in severe personal injury, death or substantial property damage.

- No portion of the venting system shall extend into or pass through any circulating air duct or furnace plenum.
- The gas venting system shall be installed, supported and spaced in accordance with their listings and the manufacturer's instructions.

Masonry and Metal Chimneys

- The NFPA code book severely limits the installation of the ELITE into a masonry chimney. For applications using either interior or exterior masonry chimney a listed, approved metal chimney lining system should be used.

BEST PRACTICE

For any applications using an exterior chimney it is recommended that an insulated or stainless steel chimney lining system be used.

NOTICE

A chimney with one or more sides exposed to the outside of the structure is considered to be an exterior chimney.

- The chimney shall extend at least 5 feet above the highest connected appliance flue collar.
- The chimney shall extend at least 3 feet above the highest point where it passes through a roof of a building and at least 2 feet higher than any portion of a building within a horizontal distance of 10 feet.

Type B Vent Systems

- The vent system should terminate in accordance with NFPA 54, latest edition, provided the termination is at least 8 feet from a vertical wall or similar obstruction.

BEST PRACTICE

The Type B vent system shall extend in a general vertical direction with offsets not exceeding 45 degrees. A vent system having not more than one 60 degree offset shall be permitted. Any angle greater than 45 degrees is considered horizontal.

BEST PRACTICE

The total horizontal distance of a vent plus the horizontal vent connector shall not be greater than 75% of the vertical height of the vent.

Vent Connectors

- When a vent connector must be located in or pass through an un-conditioned space, attic or crawl space, that portion of the vent connector must be listed as Type B or other approved material having equivalent insulation qualities.
- The minimum clearance to combustibles for single wall vent connectors shall be 6 inches.
- The minimum clearance to combustibles for Type B vent connectors shall be 1 inch or per vent manufacturer's instructions.
- The vent connector shall be installed in a manner to avoid excessive turns or other construction features that create excessive resistance to the flow of the vent gases.
- The vent connector should be installed in a manner without any dips or sags and should slope upward toward the vent or chimney at least 1/4 inch per 1 foot.
- The location of the appliance should be located as close to the vent or chimney to maintain the vent connector length as short as possible.

- The entire length of a vent connector shall be readily accessible for inspection, cleaning and replacement.
- The diameter of the vent connector should not be upsized more than two sizes greater than the flue outlet diameter.

WARNING

The vent system must be designed and installed in compliance with all applicable codes. Failure to properly size and install the vent system could result in severe personal injury, death or substantial property damage.

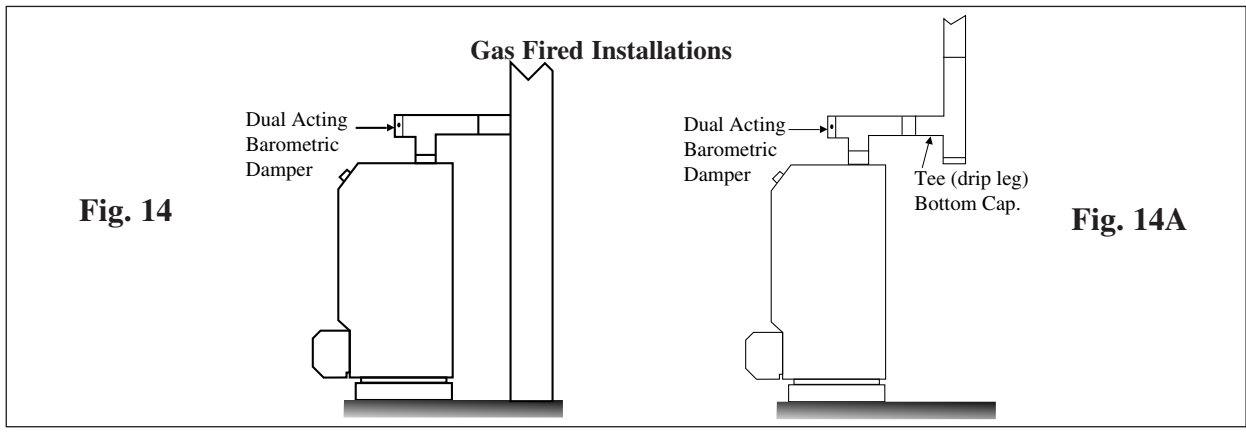
Common Vent Systems

The ELITE may be vented into a common vent system using the guidelines and sizing Tables of the National Fuel Gas Code NFPA 54 ANSI Z223.1 latest edition.

The ELITE may also be vented into a common multi story vent using the guidelines and sizing Tables of the National Fuel Gas Code NFPA 54 ANSI Z223.1 latest edition.

BEST PRACTICE

The maximum horizontal length allowable should not exceed 75% of the height of the vent or chimney assuming no offsets in the vertical vent.



SECTION VII - Fuel Piping

Gas Supply Piping Connection

NOTICE

The gas supply piping must be installed in accordance to all applicable local, state and national codes and utility requirements.

1. Remove the burner jacket hood. Refer to Fig. 15 to pipe gas supply to the burner.
 - a. Install a pipe union at the factory supplied gas nipple, for ease of service.
 - b. Install a manual shutoff valve in the gas supply piping as shown in Fig. 15. For installations in Canada the installer must tag and identify the main shutoff valve.
 - c. Install a drip leg on the gas supply line prior to connecting to the ELITE gas train as shown in Fig. 15.
2. Support the gas piping using hangers. Do not support the piping by the unit or its components.
3. Purge all air from the gas supply piping.
4. Before placing the ELITE into operation, check and test all connections for leaks.

Close the manual shutoff valve during any pressure test with less than 13" w.c..

Disconnect the ELITE and its gas valve from the gas supply piping during any pressure test greater than 13" w.c..

WARNING

Do not check for gas leaks with an open flame. Use a gas detection device or bubble test. Failure to check for gas leaks can cause severe personal injury, death or substantial property damage.

5. Use pipe dope compatible with natural and propane gases. Apply sparingly only to the male threads of pipe joints so that pipe dope does not block gas flow.

WARNING

Failure to apply pipe dope as detailed above can result in severe personal injury, death or substantial property damage.

WARNING

Use a two-wrench method of tightening gas piping near the unit and its gas valve. Use one wrench to prevent the gas valve line connection from turning and the second to tighten adjacent piping. Failure to support the gas valve connection piping could damage the valve and the gas line components.

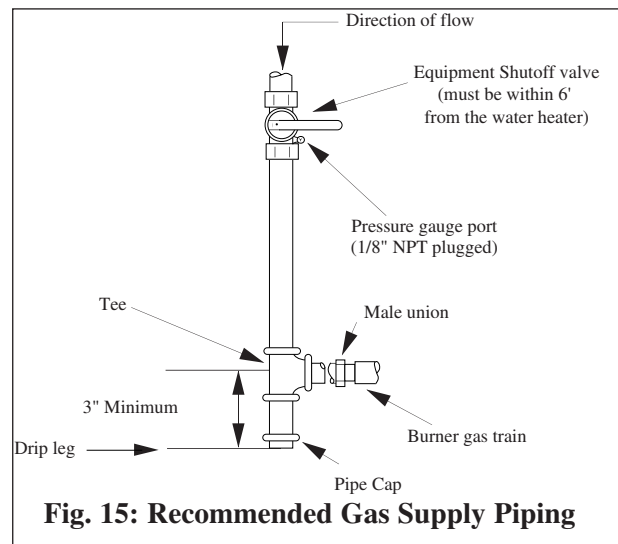


Fig. 15: Recommended Gas Supply Piping

Pipe Sizing - Natural Gas

1. Refer to Table 1 for pipe length and diameter requirements. Based on rated ELITE input (divide by 1,000 to obtain cubic feet per hour).
 - Table 1 is based on Natural Gas with a specific gravity of 0.60 and a pressure drop through the gas piping of 0.30" w.c..
 - For additional gas piping sizing information, refer to ANSI Z223.1. For Canadian installations refer to B149.1 or B149.2.

Natural Gas Supply Pressure Requirements

1. Pressure required at the gas valve inlet supply pressure port:
 - Maximum 13" w.c. at flow or no flow conditions to the burner.
 - Minimum 5" w.c. during flow conditions to the burner. Must be verified during start up.
2. Install 100% lockup gas pressure regulator in the gas supply line if inlet pressure can exceed 13" w.c at any time. Adjust the lock-up pressure regulator for 13" w.c maximum.

Pipe Sizing - Propane Gas

1. Contact the local propane gas supplier for recommended sizing of piping, tanks and 100% lockup gas regulator.

Propane Gas Supply Pressure Requirements

1. Adjust the propane supply regulator provided by the gas supplier for 13" w.c. maximum pressure
2. Pressure required at the gas valve inlet supply pressure port:
 - Maximum 13" w.c. at flow or no flow conditions to the burner
 - Minimum 5" w.c. during flow conditions to the burner. Must be verified during start up.

Table 1: Gas piping sizing - Natural Gas

Length of Pipe in Feet	Capacity of Pipe in Cubic Feet of Gas Per Hour (based on 0.60 specific gravity, 0.30" w.c. pressure drop)				
	SCH 40	1/2"	3/4"	1"	1-1/4"
10	132	278	520	1050	1600
20	92	190	350	730	1100
30	73	152	285	590	860
40	63	130	245	500	760
50	56	115	215	440	670
75	45	93	175	360	545
100	38	79	150	305	460
150	31	64	120	250	380

General Oil Piping Guidelines

Location and installation of oil tanks, oil piping and burners must comply with:

- NFPA 31, Standard for the Installation of Oil-Burning Equipment
- Local codes and regulations
- Manufacturer's information provided with the burner and oil pump.

For installations in Canada, CSA B139, Installation of Oil-Burning Equipment

If the fuel tank is installed or any part of the fuel tank is above the level of the burner, an anti-siphon device must be installed to prevent the spillage of oil in the event of an oil line break.

Support oil line as required by local codes.

All tank connections should be made using swing joints or copper tubing to prevent possible line breakage in the event of tank settlement. When using swing joints ensure they are made to tighten as the tank settles. All thread connections should be made with a non-hardening pipe joint compound.

WARNING

Do not use Teflon tape to seal any oil connections. Teflon tape can cause oil valves to fail, creating potential hazards. Do not use compression type fittings at the burner all fittings should be flare type.

SECTION VIII - Internal Wiring

General Requirements

WARNING

ELECTRICAL SHOCK HAZARD. For your safety, disconnect electrical power supply to the unit before servicing or making any electrical connections to avoid possible electric shock hazard. Failure to do so can cause severe personal injury or death.

- Wiring must be N.E.C Class 1.
- If original wiring as supplied with the unit must be replaced, use only type 90°C wire or equivalent.
- The ELITE must be electrically grounded as required by National Electrical Code ANSI/NFPA 70 - latest edition.

NOTICE

All electrical contacts shown in Figures 15 & 16 pages 31 & 32 do not have electrical power applied. Shown as “off-shelf” condition.

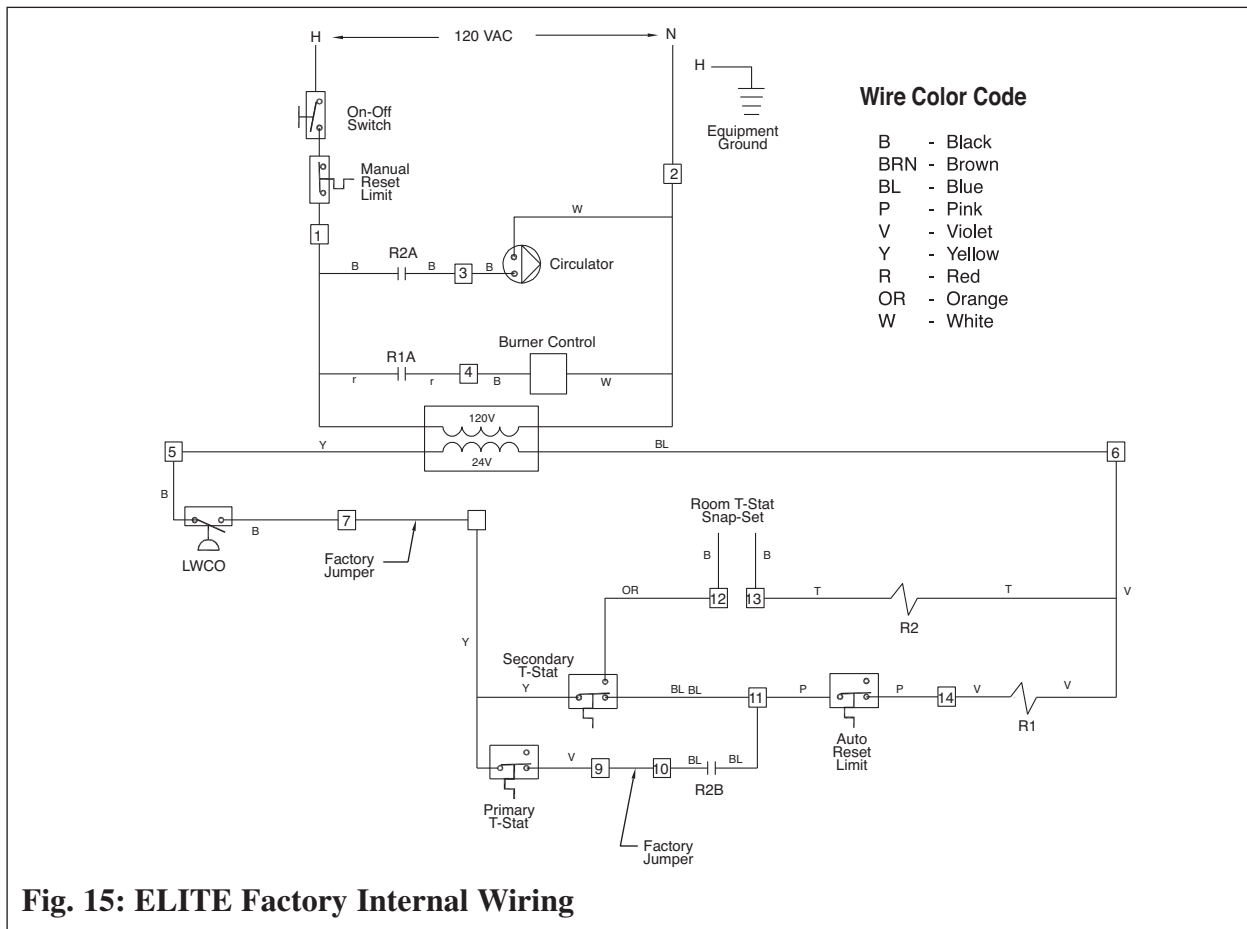


Fig. 15: ELITE Factory Internal Wiring

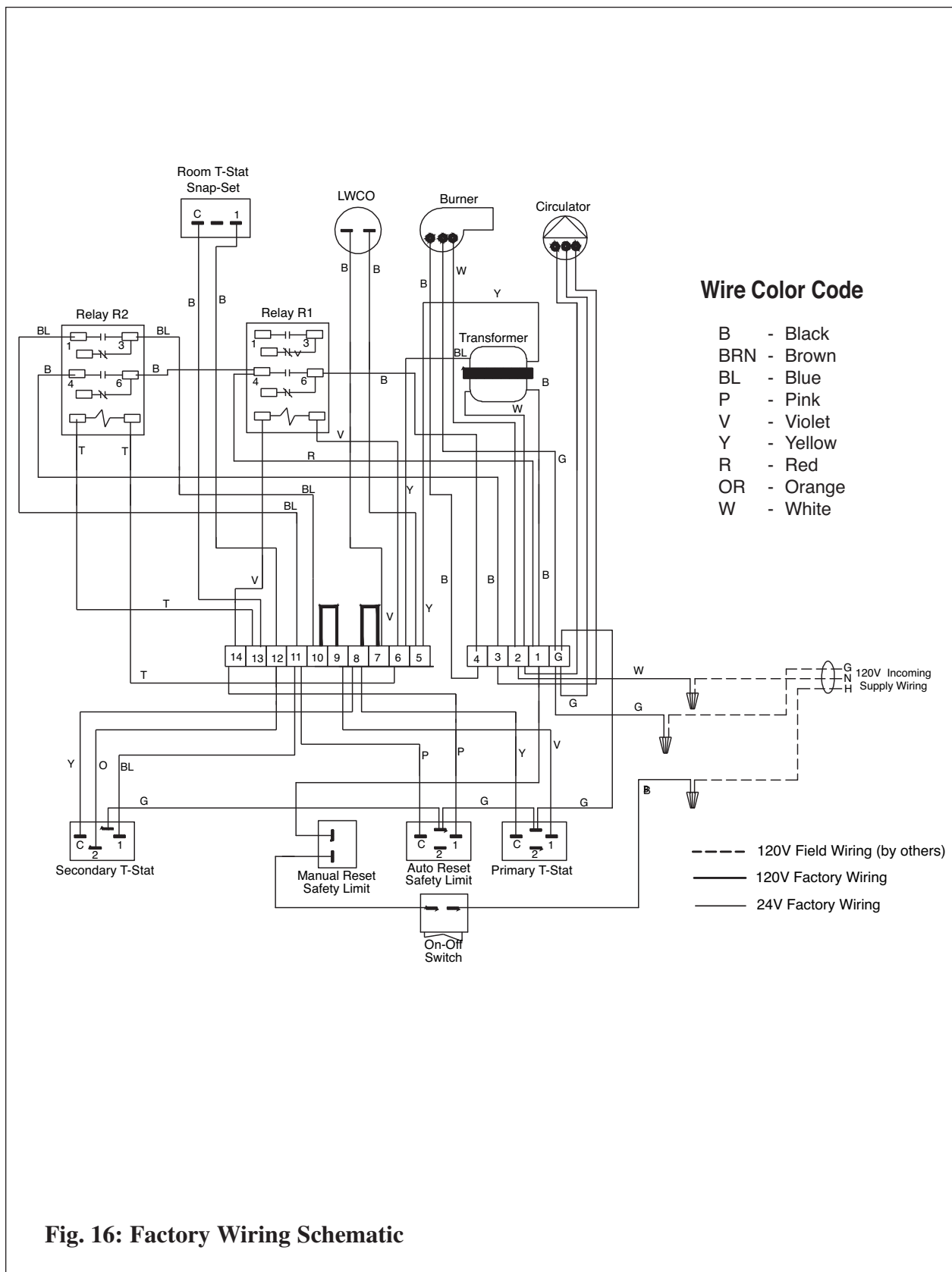


Fig. 16: Factory Wiring Schematic

SECTION IX - External Wiring

Installation Compliance

All field wiring made during installation must comply with:

- National Electrical Code NFPA 70 and any other national, state, provincial or local codes or requirements.
- In Canada, CSA C22.1 Canadian Electrical Code Part 1, and any other local codes.

Line Voltage Connections

1. Connect 120 VAC power wire to the line voltage leads located behind the front control panel.
2. Route the incoming 120 VAC power wire through the right side jacket panel.
3. Use the wire nuts provided to ensure a tight and secure connection.
4. The unit is provided with a service switch, check local code requirements for compliance.

NOTICE

If local electrical codes or conditions require an additional service switch, the installer must provide and install a fused disconnect or 15 amp (minimum) service switch.

Thermostat Wiring

1. Connect room thermostat or the end switch (isolated contact only) of a relay control panel to the Room Thermostat Snap-set located on the rear jacket panel.
2. Remove the snap-set cover and connect the thermostat wiring to terminals C and 1 per Fig. 17.
3. For proper operation install the room thermostat on an inside wall away from influences of heat and cold, i.e. water pipes,

areas of draft, lighting fixtures and fireplaces.

4. Set the thermostat anticipator (if applicable) as follows:
 - Set for 0.2 amps when wired directly to the Room Thermostat Snap-set.
 - Set to match the total electrical power requirements of the connected devices when wired to zone relays or other devices. Refer to the relay manufacturers' specifications and the thermostat instructions for additional information on the anticipator setting.

Outdoor Temperature Limit

1. The ELITE may operate with a variable primary operating temperature using an outdoor reset control provided by the installer.
2. Remove the factory jumper across terminals 9 and 10 of the wiring terminal.
3. Set the operating limits of the outdoor limit control as follows:
 - Maximum operating temperature of 180°F.
 - Minimum operating temperature of 150°F.
4. Set the primary thermostat to the highest possible setting.

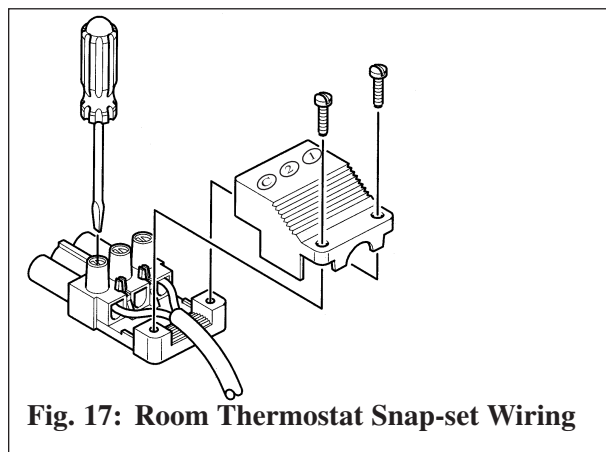
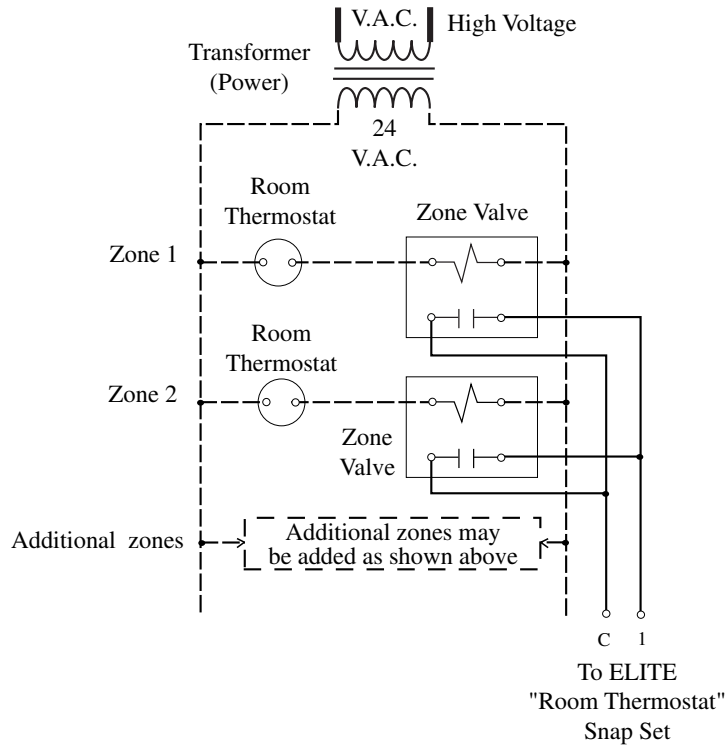


Fig. 17: Room Thermostat Snap-set Wiring

4 Wire Zone Valve



3 Wire Zone Valve

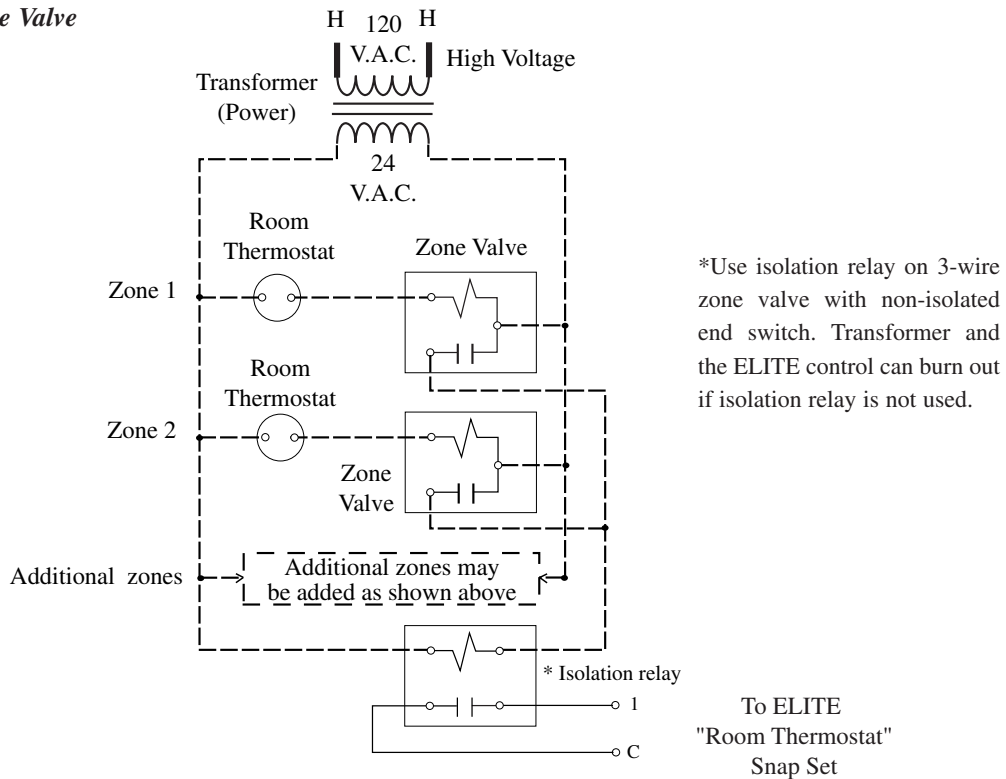


Fig. 18: Multiple Zone Field Wiring Using Zone Valves

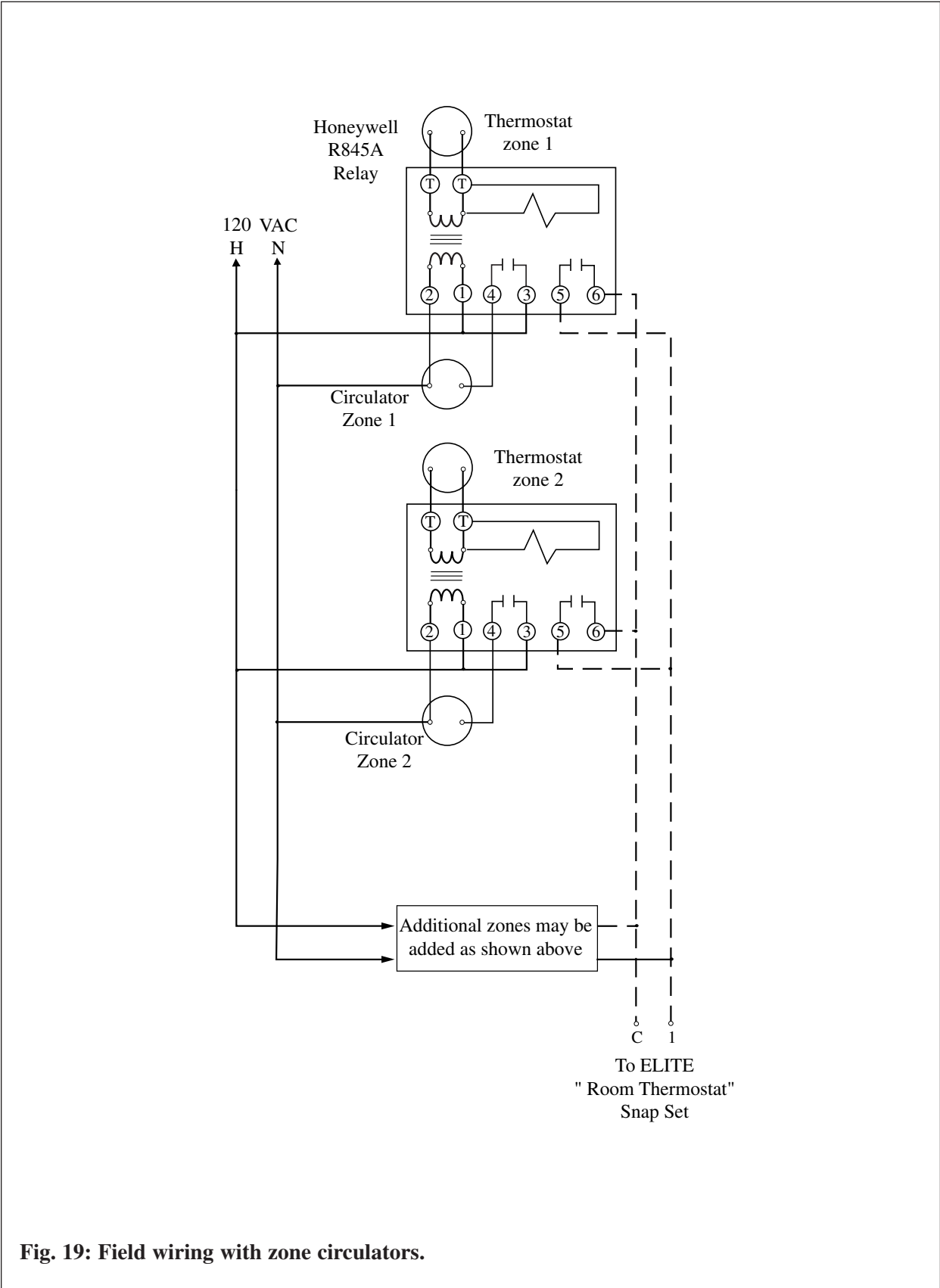


Fig. 19: Field wiring with zone circulators.

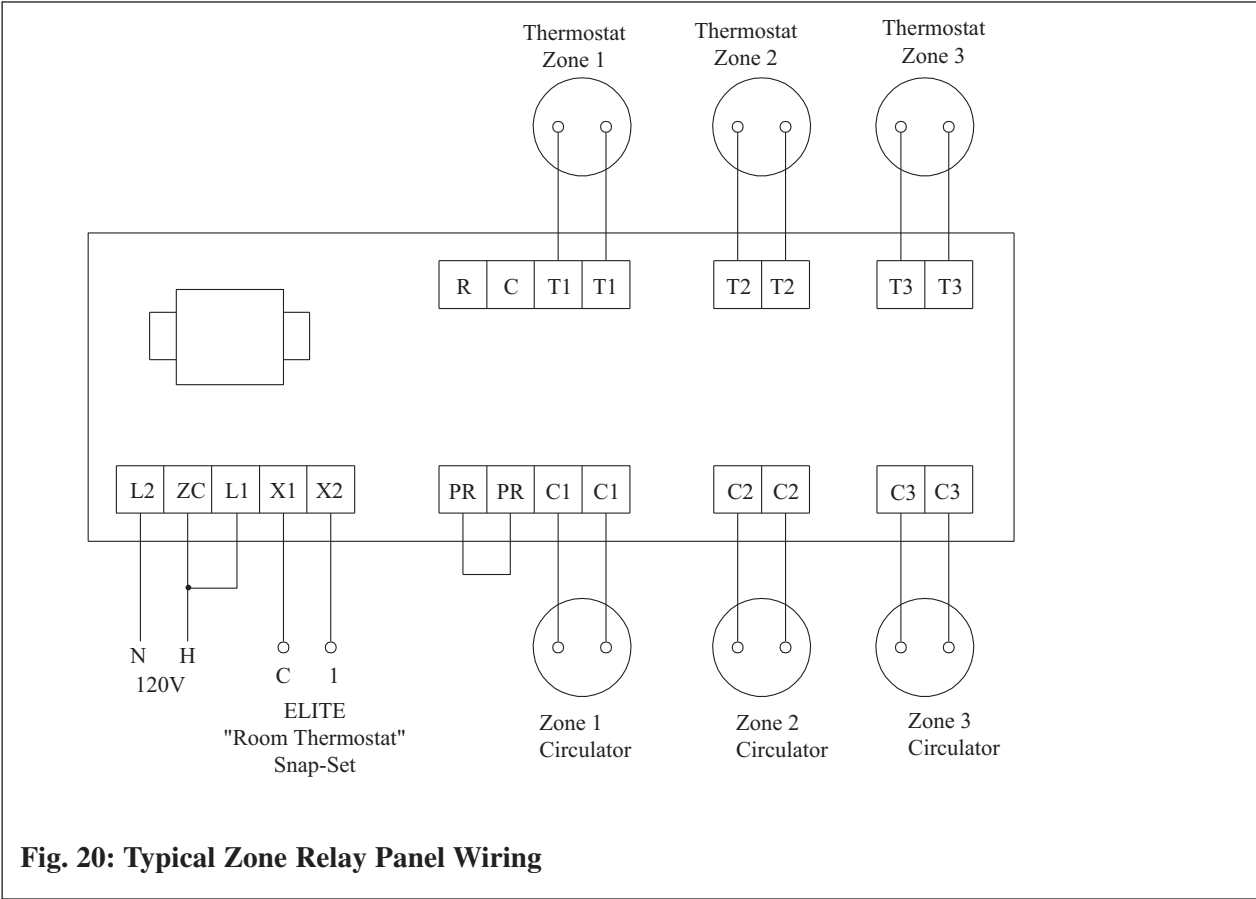


Fig. 20: Typical Zone Relay Panel Wiring

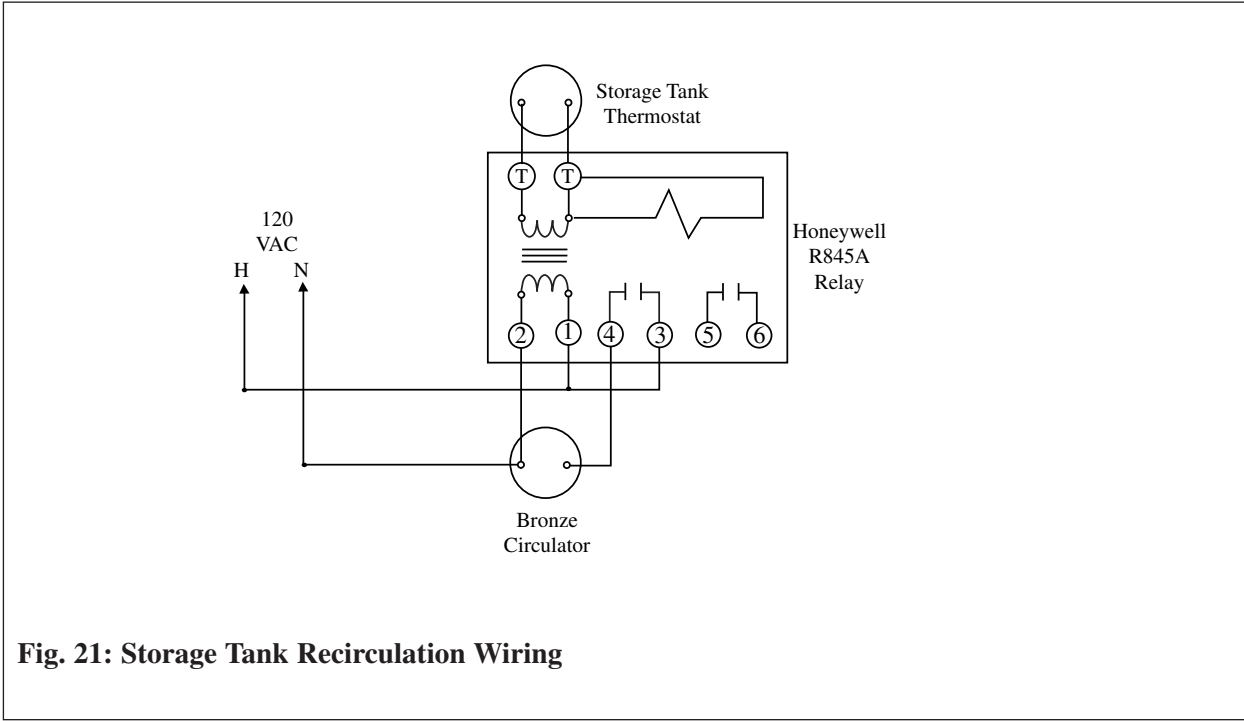


Fig. 21: Storage Tank Recirculation Wiring

SECTION X - Start Up Preparation

Check System and Domestic Water Chemistry

WARNING

Do not use petroleum-base cleaning or sealing compounds in the primary system. Damage to seals and gaskets in the system components could occur, resulting in substantial property damage.

NOTICE

System water including additives must be practically non-toxic, having a toxicity rating or Class of 1, as listed in Clinical Toxicology of Commercial Products.

Water pH Level 6.0 to 8.0

Maintain the primary system water pH between 6.0 and 8.0. Check using litmus paper or contact a water treatment company for a chemical analysis.

If the pH does not meet this requirement, do not operate the ELITE or leave the unit filled until the condition is corrected.

Water Hardness Less Than 7 Grains

For areas with unusually hard water (hardness above 7 grains) consult a water treatment company.

Chloride Concentration Less Than 80 mg/L

For those installations that use a water softener or conditioner, consult the water treatment company.

NOTICE

Any water conditioning system must be installed and maintained in accordance with the water conditioner's manufacturer's specifications and within the operating guidelines of the ELITE.

Chlorinated Water

Do not use the ELITE inner or outer tank to heat a swimming pool or spa directly.

Maintain the chlorine level of the water in the inner and outer tanks at levels considered safe for drinking.

Flush Primary and Domestic System to Remove Sediment

The installer must flush both the primary and domestic system to remove any sediment to allow proper operation of the ELITE.

Flush the systems until the water runs clean and is free of sediment.

For primary zoned systems, each zone should be flushed through a purge valve. Purge valves and isolation valves should be installed on each zone to allow for proper flushing of the system.

Check and Test Antifreeze

For primary systems containing antifreeze solutions, follow the antifreeze manufacturer's instructions in verifying the inhibitor level and to ensure the fluid characteristics are within specification requirements.

Due to the degradation of inhibitors over time, antifreeze fluids must be periodically replaced. Refer to the manufacturer of the antifreeze for additional instructions.

NOTICE

System water including additives must be practically non-toxic, having a toxicity rating or Class of 1, as listed in Clinical Toxicology of Commercial Products.

Use of Antifreeze in the Primary System

WARNING

NEVER use automotive or ethylene glycol antifreeze or undiluted antifreeze in the primary system as freeze protection. This can cause severe personal injury, death or substantial property damage if ignored.

Determine the antifreeze fluid quantity using the system water content volume and following the antifreeze manufacturer instructions.

The primary outer tank volume of the ELITE is 20 gallons. Remember to include the volume of the expansion tank.

Check with local codes requirements for the installation of back flow preventers or actual disconnect from the make up water supply line.

Ensure the concentration of antifreeze to water does not exceed a 50/50 ratio.

NOTICE

System water including additives must be practically non-toxic, having a toxicity rating or Class of 1, as listed in Clinical Toxicology of Commercial Products.

Filling the Inner (Domestic) Tank and System

WARNING

Proceed with filling instructions for the inner and outer tanks only after ensuring the water meets the requirements listed in this installation manual. Failure to comply could result in damage and improper operation of the unit.

CAUTION

Never operate the ELITE unless both the inner and outer tanks are completely filled.

CAUTION

Always fill the inner tank prior to filling and pressurizing the outer tank. Failure to properly fill the inner tank could result in damage to the inner tank.

1. Ensure the domestic drain valve is closed.
2. Open the isolation valves on the domestic cold supply piping to the ELITE and on the domestic hot outlet piping to the building.
3. Vent any air from the domestic piping system by opening faucets near the unit. Continue filling the domestic system until there is a constant flow of water from the faucets.
4. Close the hot water faucets.

Filling the Outer (Primary) Tank and System

1. Close the primary drain valve located on the rear of the unit and any manual or automatic air vent in the system.
2. Open all system isolation valves.

3. Fill the outer tank to correct system pressure. Correct pressure will vary with each application.

NOTICE

Typical residential system fill pressure is 12 psi. System pressure will increase when system temperature increases. Operating pressure of the system should never exceed 25 psi.

4. Allow air to escape from the outer tank by opening the automatic air vent provided with the ELITE.
5. Purge air in each zone of the primary system through the purge valve. Open air vents to allow air to be purged in the zones.
6. Once the system is completely filled and purged of all air, check the system pressure and check for leaks.

Check Low Water Cut-Off Device

- The ELITE is provided with a factory installed Low Water Cut-Off device that measures system pressure of more than 10 psi.
- Remove the front jacket panel and check for continuity across the low water cut-off device wire terminals. The contacts should be closed when system pressure is greater than 10 psi.

Check For Gas Leaks (if applicable)

WARNING

Prior to start-up and during initial operation, smell near the floor and around the unit for gas odorant or any unusual odor. Do not proceed with the start-up if there is any indication of a gas leak. Any leaks found must be repaired immediately.

WARNING

Propane installations only - The propane supplier mixes an odorant with the propane to make its presence detectable. In some cases the odorant can fade and the gas may no longer have an odor.

Prior to start-up of the unit and periodically after start-up have the propane supplier check and verify the odorant level.

Check Thermostat Circuit

- Unplug the Room Thermostat Snap-set located on the rear of the unit.
- Connect a voltmeter across the end terminals of the male half of the Room Thermostat Snap-set.
- Close each thermostat, zone valve and relay in the external circuit one zone at a time and check the voltage reading across the plug.
- There should **NEVER** be voltage measured at the plug.
- If voltage is measured at the plug under any condition, check and correct the external wiring.

NOTICE

In systems using 3-wire zone valves backfeed of voltage to the unit is a common problem. Use an isolation relay to prevent voltage from the external circuit from entering the Room Thermostat Snap-set.

SECTION XI - Start-Up Procedures

Final Checks Before Start-up

- Verify the ELITE and the primary and domestic systems are full of water and all system components are correctly set for operation.
- Verify Start-up Preparation items outlined on pages 37 thru 39 have been completed.
- Verify all electrical connections are correct and securely fasten.
- Inspect vent piping and combustion air inlet piping for signs of deterioration from corrosion, physical damage or sagging. Verify combustion air piping and vent piping are intact and correctly installed.
- Adjustment of the Secondary Thermostat Limit.

The Secondary (Domestic) Thermostat located on left side of the control panel maintains the minimum domestic water storage temperature.

Set the thermostat knob as shown in Fig. 22 page 42.

Maximum limit setting is 140°F

ELITE Start-up

Turn the ON-OFF switch located on the front control panel to the OFF position. Turn the electrical supply or any service switch to the unit in the ON position.

- Check Domestic Piping.

Check domestic piping and system components for leaks. If found, shut down the unit and repair immediately.
- Check Primary Piping.

Check primary system piping and components for leaks. If found, shut down the unit and repair immediately.

Purge any remaining air from the system piping. Air in the system piping will

interfere with circulation creating heat distribution problems and system noise.

- Check Vent Piping

Check for gas-tight seal at every connection and seam of the venting.

WARNING

Venting system must be sealed gas-tight to prevent flue gas spillage and potential carbon monoxide emissions, which will result in severe personal injury or death.

- Check Gas Piping (if applicable)
 1. Check around the unit for gas odor following the procedure outlined in this manual on Page 39.

WARNING

If any gas leaks are found or suspected, shut the unit down immediately. Use a gas detection device or bubble test to locate the source of the gas leak and repair at once. Do not operate the unit until the leak is corrected. Failure to comply with this procedure could result in severe personal injury, death or substantial property damage.

- Check Oil piping (if applicable)

Check for any leakage at the pump and all fittings
- Verify Flame Pattern and Combustion

Check the flame pattern through the inspection port of the burner. The flame should be stable.

Test for CO₂ or O₂ and for CO. The combustion reading should be within the range listed in Table 2 page 41. The CO level should not exceed 100 ppm when combustion is correct.

WARNING

A combustion test must be performed after any burner adjustments are made. Allow the unit to operate for approximately 10 minutes after adjustment before measuring any combustion levels. Failure to comply with these procedures could result in severe personal injury, death or substantial property damage.

- Check overfire draft

The overfire draft should measure typically (-) 0.01" w.c to (-) 0.02" w.c in the combustion chamber. Refer to Triangle Tube's Burner Specification for actual measurements.

- Measure Input - Natural Gas Only

1. Operate the unit for approximately 10 minutes.
2. Turn off all gas appliances within the building.
3. At the gas meter, record the time required to use one cubic foot of gas.
4. Calculate gas input using the following equation:

$$3600 \times 1000 / \text{number of second recorded for one cubic of gas} = \text{BTU/H.}$$

5. The BTU/H calculated should approximate the input rating listed on the unit.

Table 2: Recommended Combustion Levels

	Natural Gas	Propane	Oil
O2 Min.	3.00%	3.00%	4.60%
O2 Max.	5.00%	5.00%	6.00%
CO2 Min	9.00%	10.50%	11.00%
CO2 Max	10.00%	12.00%	12.00%

SECTION XII - Temperature Limits

NOTICE

DANGER

Studies have indicated that dangerous bacteria can form in the potable water distribution system if certain minimum water temperatures are not maintained. For prevention of this, it is recommended that the Secondary Thermostat be set as shown in Fig. 23 and maintained at 130°F to 140°F.

To adjust the thermostat settings:

- Turn thermostat knob clockwise to increase water temperature
- Turn thermostat knob counter-clockwise to decrease water temperature.

Setting Primary Thermostat Limit.

- The Primary (Space Heating) Thermostat located on the right side of the control panel acts as the high limit during the space heating function.
- Set the thermostat knob as shown in Fig. 22.
- Maximum limit setting is 180°F

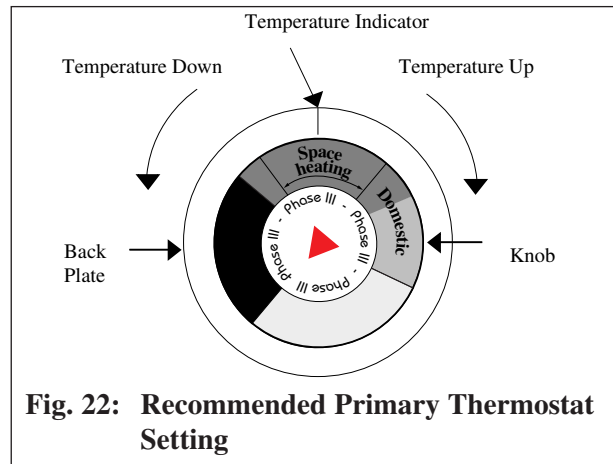


Fig. 22: Recommended Primary Thermostat Setting

NOTICE

To ensure proper function of the limits the Primary Thermostat must be set higher than the Secondary Thermostat.

Adjustment of Secondary Thermostat Limit

- The Secondary (Domestic) Thermostat located on left side of the control panel maintains the minimum domestic water storage temperature.
- Set the thermostat knob as shown in Fig. 23.
- Maximum limit setting is 140°F.

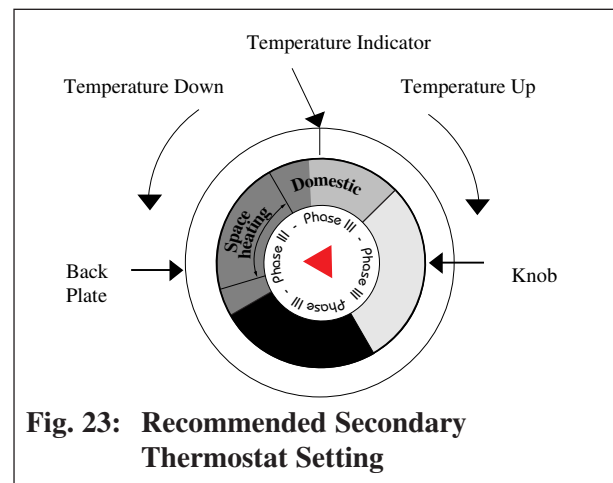


Fig. 23: Recommended Secondary Thermostat Setting

□ Setting the Thermostatic Mixing Valve

NOTICE

The thermostatic mixing valve controls the outlet hot water temperature delivered to the faucets.

WARNING

POTENTIAL SCALD HAZARD The mixing valve must be installed on the ELITE. Removal of the mixing valve will create a potential scald hazard resulting in severe personal injury or death.

If any adjustment needs to be made on the valve:

- Use a L-Key to remove the set screw securing the knob to the valve.
- Remove the knob and lock ring from the valve.
- Replace the knob and adjust the set temperature of the valve to the desired temperature.

NOTICE

To calibrate the outlet temperature, allow the water to run for approximately 2 minutes and measure the water with a thermometer. To adjust the valve setting, rotate the knob clockwise to decrease the water temperature or counter-clockwise to increase the water temperature.

- Once the desired temperature is achieved, remove the knob and refit the lock ring onto the valve aligning the ring indicator mark with the valve's "Mix" marking.
- Locate the tab on the inner face of the knob into the retainer in the locking ring. Secure the knob with setscrew.
- Record the valve performance on the Installation Record included in this manual.

DANGER

For proper operation of the thermostatic mixing valve, the manual valve on the U-tube assembly MUST remain open to avoid a potential scald hazard.

SECTION XIII- Check-Out Procedures

NOTICE

Perform the following check-out procedures as outlined and check off items as completed. When procedures are completed, the installer should complete the installation record on page 45.

Check-out Procedures

- Both inner and outer tanks filled with water.
- Water chemistry checked and verified as outlined on page 37.
- The automatic air vent on the unit and any place within the system are open one full turn.
- Air is purged from the heating zones and primary system.
- Domestic piping is purged of air and has been checked for leaks.
- Thermostat circuit wiring checked and verified that no voltage is present to the Room Thermostat Snap-set as outlined on page 39.
- Combustion levels and flame pattern verified as outlined on page 40.
- Measure the rate of input on Natural Gas as outlined on page 41.
- Primary and Secondary Thermostat properly set as shown in Fig. 22 and 23 page 42.
- The thermostatic mixing valve adjusted to the desired domestic hot outlet temperature.
- Adjusted balancing valves and system limit controls to provide design temperatures to the primary space heating system.
- In multiple zone applications, adjusted for correct flow of primary heating water to each zone.
- Check and verified room thermostat function properly and the thermostat heat anticipator (if used) was properly set.
- Observed several operating cycles for proper operation of the ELITE and the system.
- Set the room thermostat(s) to the desired room temperature.
- Reviewed all instructions shipped with the ELITE with the homeowner or maintenance personnel.
- Complete the Installation Record on page 45.
- Ensure all manuals and other documentation are returned to the Installation envelope and given to the owner for safekeeping.

SECTION XIV - Installation Record

ELITE Model Number: _____

Serial Number: _____

Date of Installation: _____

Fuel: Natural Gas Propane Oil

Burner Model: _____

Measured Rate of Input: _____ Btu/hr _____ GPH

Thermostatic Mixing Valve Setting: _____ °F

Measured Domestic Outlet Temperature: _____ °F

Combustion Readings:

CO₂ _____ % Nozzle Size _____ gph

O₂ _____ % Nozzle Angle _____ °

CO _____ ppm Pump Pressure _____ psig

The following items were completed during installation:

- Installation instructions have been followed and completed
- Check-out procedures have been followed and completed
- Information regarding the unit and installation received and left with owner / maintenance personnel.

Installer Information

(Company) _____

(Address) _____

(Address) _____

(Phone Number) _____

SECTION XVII - Replacement Parts

Replacement Parts

WARNING

Replacement parts can be ordered and purchased through a local Triangle Tube distributor. When ordering parts, specify the Model Number and Serial Number. Include a description of the part and a replacement part number. Using modified or other manufacturer parts will not be covered by warranty and may damage or cause improper function of the unit.

NOTICE

Refer to pages 47 and 49 for description and replacement part numbers.

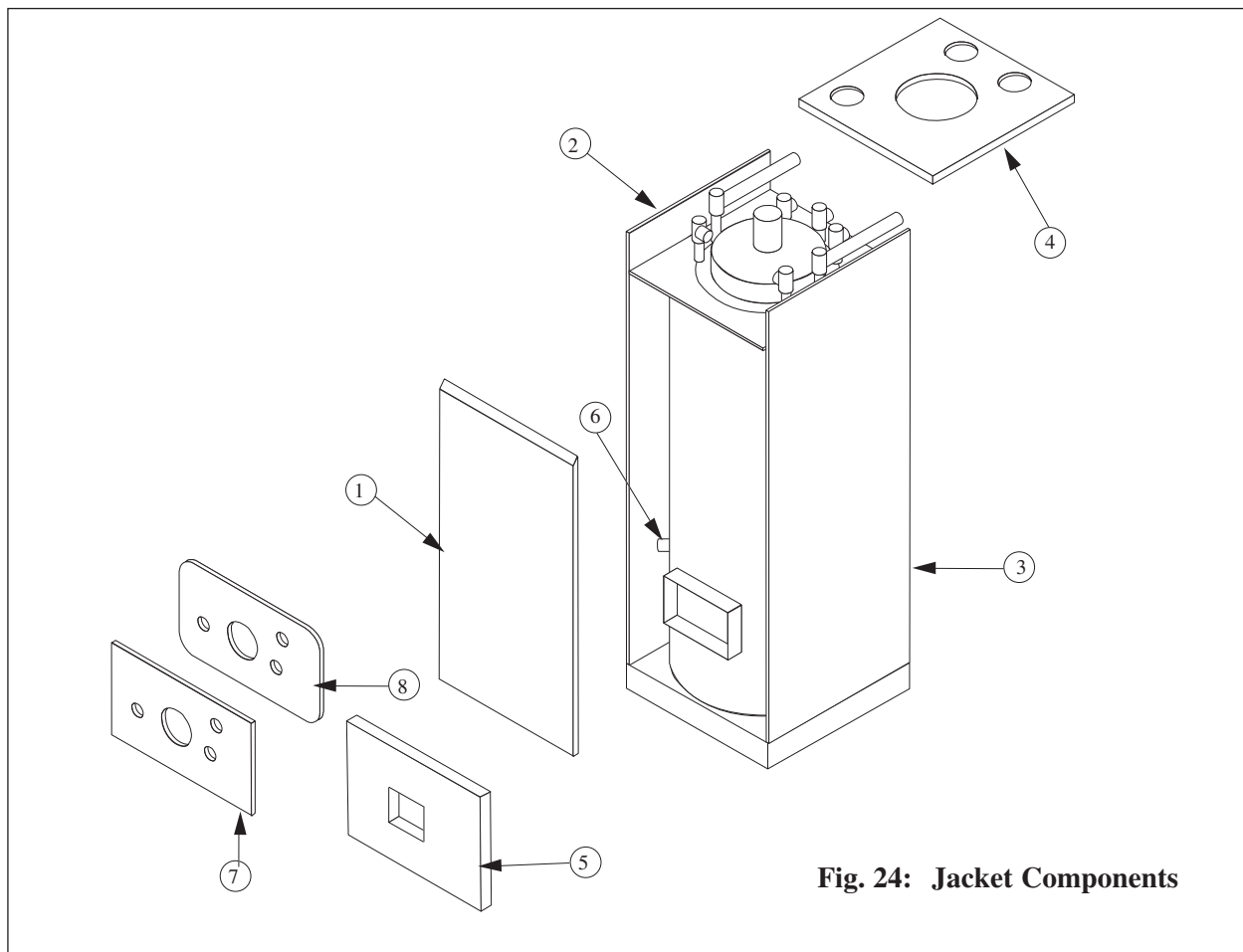


Fig. 24: Jacket Components

Item	Part No.	Description	Quantity required by Model	
			F-25/ 30/35/40	F-45
	HMJKTF25	Complete Jacket Set	1	
	HMJKTF40	Complete Jacket Set		1
1	HMJKT25F HMJKT40F	Jacket, Front Jacket, Front	1	1
2	HMJKT25L HMJKT40L	Jacket, Left side Jacket, Left side	1	1
3	HMJKT25R HMJKT40R	Jacket, Right side Jacket, Right side	1	1
	HMJKT25B HMJKT40B	Jacket , Back Jacket , Back	1	1
4	HMJKT25TOP HMJKT40TOP	Jacket, Top cover Jacket, Top cover	1	1
5	HMHOO06	Burner Jacket Panel	1	1
6	PGRKIT20	Low Water Cut-Off Device LWCO	1	1
7		Burner Mounting Plate	1	1
7	HMINS04	Burner Plate Insulation	1	1

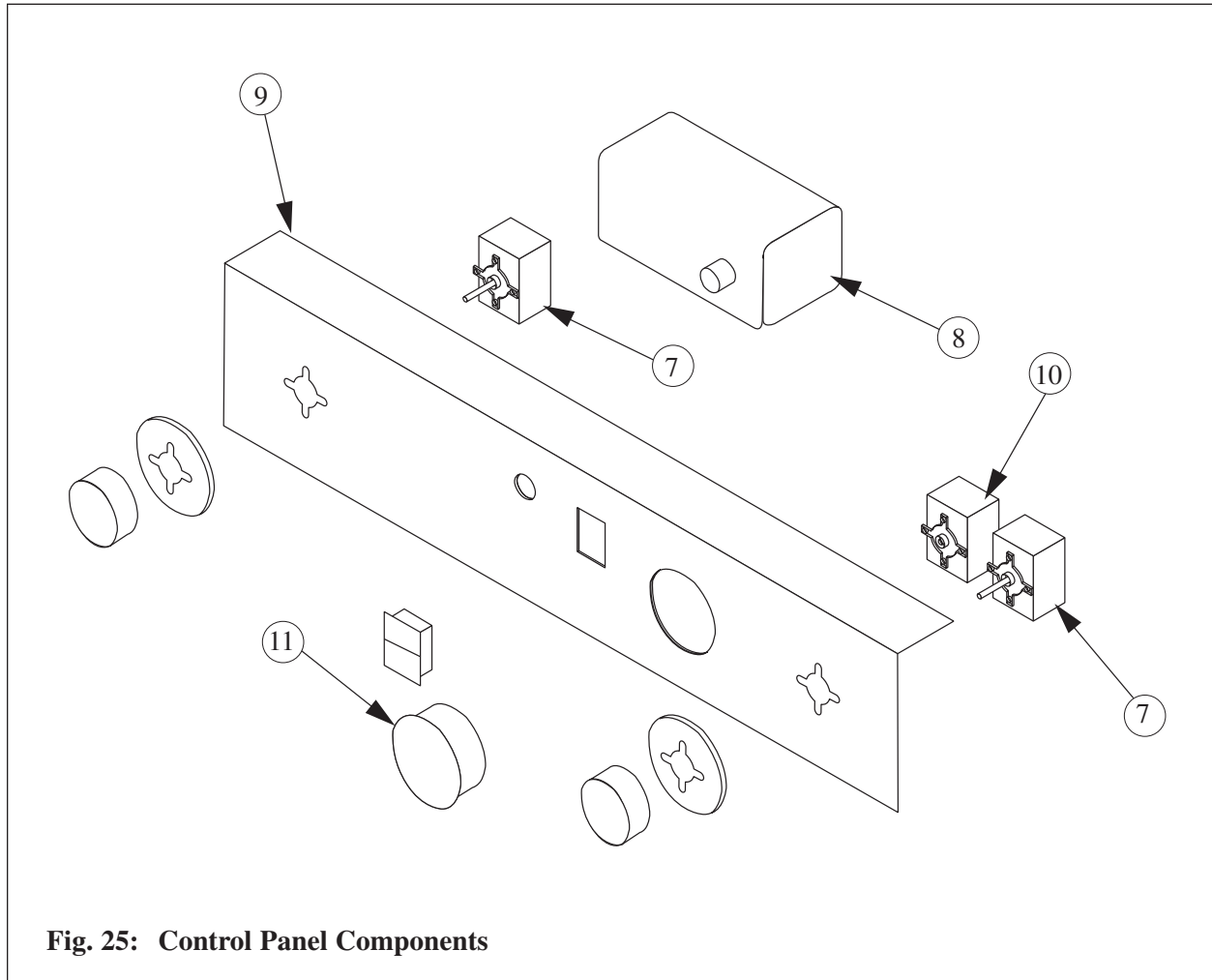


Fig. 25: Control Panel Components

Item	Part No.	Description
7	PGRKIT21	Operating Thermostat Primary or Secondary
8	PGRKIT 22	Manual Reset Hight Limit Pre-set at 205°F
9	HMCS01	Control Panel
10	PGRKIT23	Auto Reset High Limit Pre-Set at 194°F
11	HMGAU01	Temperature / Pressure Gauge

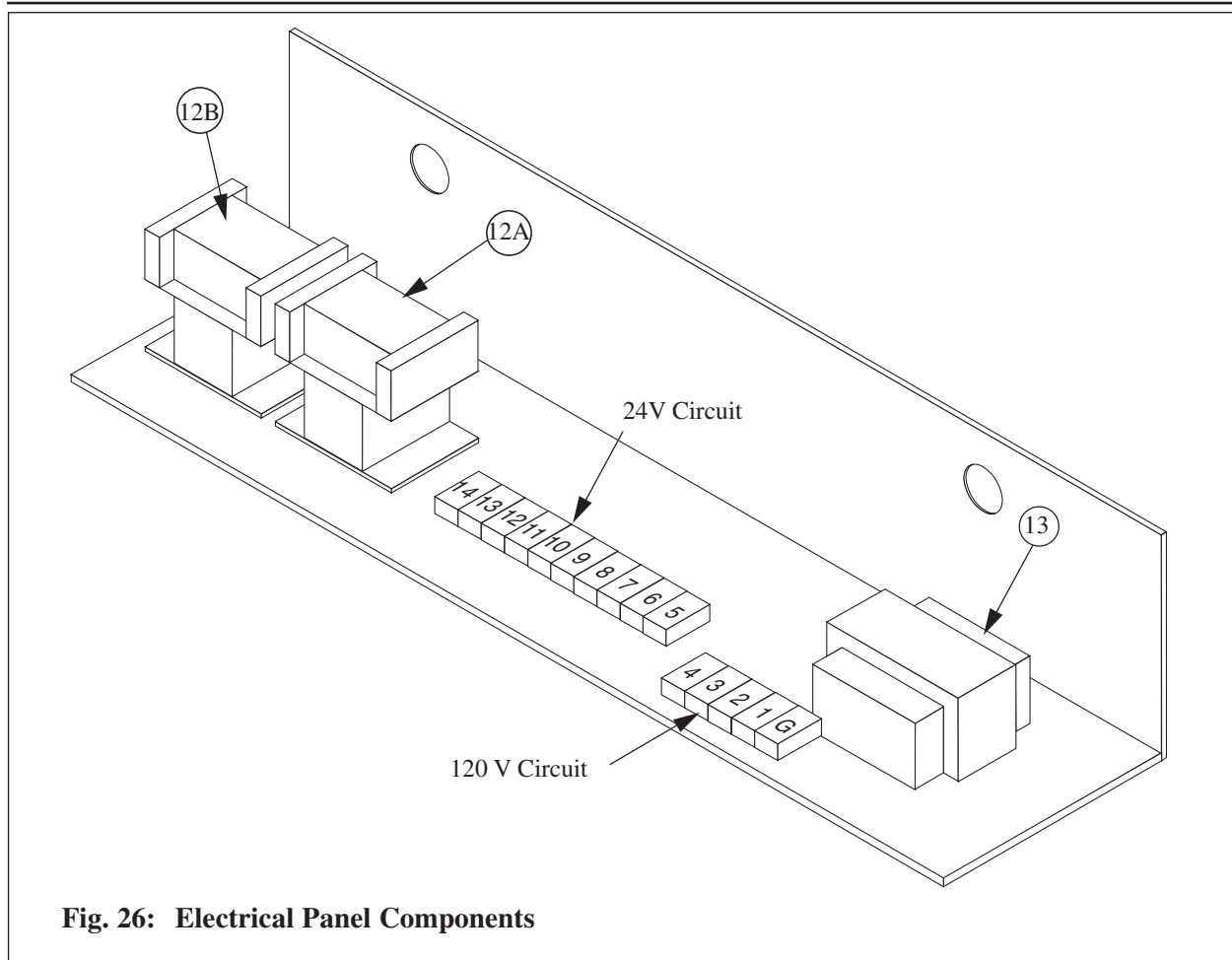


Fig. 26: Electrical Panel Components

Item	Part No.	Description
12A	PGRKIT19	R1 Relay - Controls Burner Function
12B	PGRKIT 19	R2 Relay - Controls Domestic Priority & Circulator
13	PGRKIT18	120 V-24 V 40VA Transformer

Part No.	Description
HMRLV01	Pressure Relief Valve 30 psi
P3AVT01	Air Vent
HMVLV07	Thermostatic Mixing valve 3/4"
HNSNP02	Snap sets Male / Female
HMTPV01	Temperature/Pressure Relief Valve (PG PLUS-30/35/40/45 only)
HMTPV03	Temperature/Pressure Relief Valve (PG PLUS-25 only)

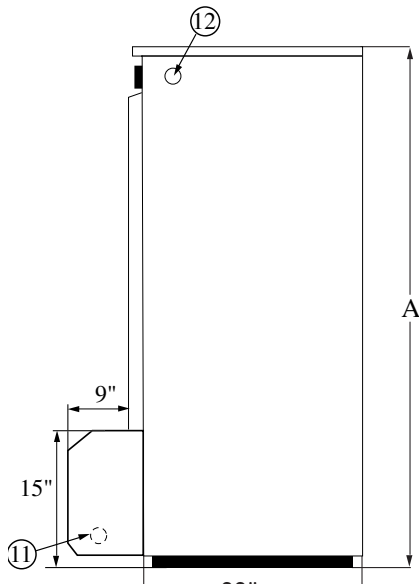


Fig. 27: Side view

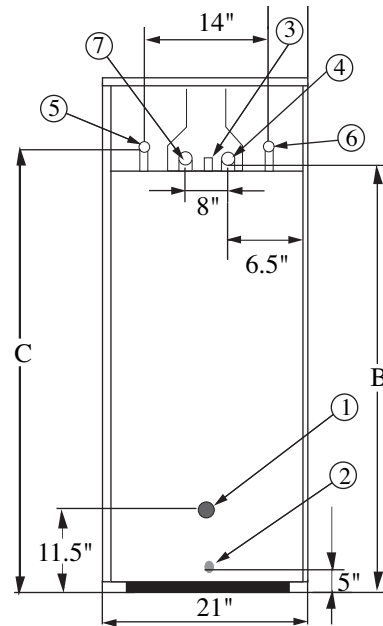


Fig. 28: Rear view

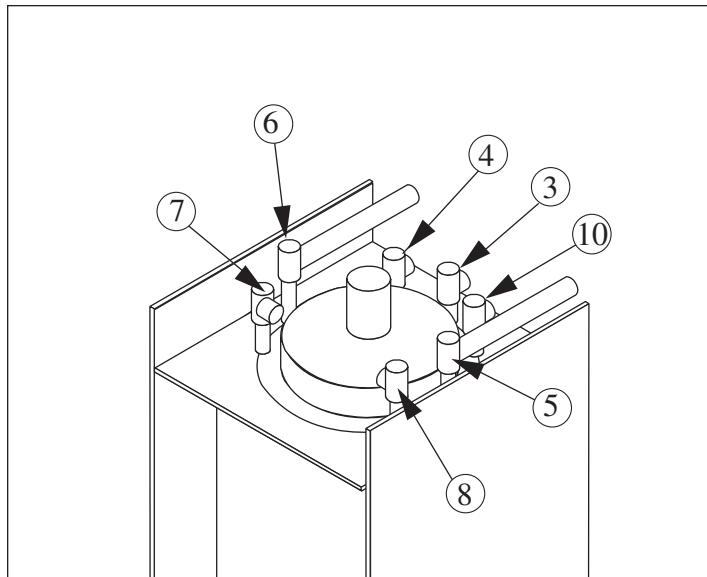


Fig. 29: Top view of ELITE

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Primary circuit, ϕ 1" NPT 2. Primary circuit drain valve connection, ϕ 1/2" NPT 3. Domestic temperature/pressure relief valve (150 psi), ϕ 3/4" NPT 4. Primary circuit & pressure relief valve (30 psi), ϕ 1" NPT 5. Domestic cold water inlet, ϕ 3/4" NPT 6. Hot water outlet & secondary thermostat sensor, ϕ 3/4" NPT | <ol style="list-style-type: none"> 7. Manual reset safety sensor & pressure indicator sensor, ϕ 3/4" NPT 8. Primary thermostat sensor, temperature indicator sensor and automatic reset safety sensor, ϕ 1/2" NPT 9. L.W.C.O. pressure sensor, ϕ 1/2" NPT (shown as Item 6 on page 47) 10. Primary circuit & air vent, ϕ 1" NPT |
|--|---|

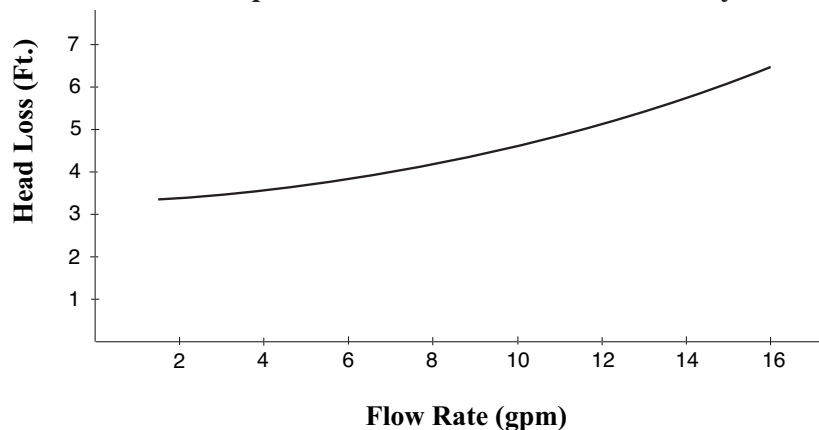
Table 3: Dimensional Data

Type		F-25	F-30	F-35	F-40	F-45
Input Nat. Gas	Btu/hr	100,000	120,000	140,000	165,000	199,000
Inner Tank Capacity	Gal	20	20	20	22	22
Outer Tank Capacity	Gal	22	22	22	18	18
Dimensions	Inches					
A		59	59	59	67	67
B		21	21	21	21	21
C		22	22	22	22	22
D		54.5	54.5	54.5	60.5	60.5
E		14	14	14	14	14
F		54	54	54	62.5	62.5
G		8	8	8	8	8
H		11.5	11.5	11.5	11.5	11.5
J		5	5	5	5	5
Vent size		5	5	5	7	7
Connections:						
TP Valve (domestic)		3/4"	3/4"	3/4"	3/4"	3/4"
Domestic water	ø	3/4"	3/4"	3/4"	3/4"	3/4"
Primary connection	ø	1 "	1 "	1 "	1 1/4 "	1 1/4 "
Drain	ø	1/2"	1/2"	1/2"	1/2"	1/2"
Empty weight	lb	345	345	345	485	485
Heat exchanger surface	Sq. Ft.	17	17	17	26.5	26.5

Table 4: ELITE Data

Model	10 Min. Peak Flow (gallons)	1st Hour Rating (gallons)	Continuous Flow @ 80°F Rise (gph)
F-25	56	163	128
F-30	61	188	153
F-35	65	214	179
F-40	74	249	210
F-45	81	292	254

Graph 1: ELITE Pressure Loss - Primary Side



**Additional quality water heating equipment available
from
Triangle Tube/Phase III**

Phase III Indirect Fired Water Heaters



- Exclusive "Tank-in-Tank" design
- Stainless steel construction
- Available in 8 sizes and 2 models
- Limited LIFETIME residential warranty
- 15 year limited commercial warranty
- Self cleaning/self descaling design

TTP Brazed Plate Heat Exchangers



- For domestic water, snow melting, radiant floor, refrigeration
- Plates made of stainless steel, with a 99.9 % copper and brazed, ensuring a high resistance to corrosion
- Self cleaning and self descaling
- Computerized sizing available from Triangle Tube/Phase III
- Available in capacities from 25,000 BTU/hr to 5,000,000 BTU/hr

Maxi-flo Pool and Spa Heat Exchangers



- Construction of high quality corrosion resistant stainless steel (AISI 316)
- Specially designed built-in flow restrictor to assure maximum heat exchange
- Compact and light weight
- Available in 5 sizes that can accommodate any size pool or spa



Freeway Center - 1 Triangle Lane - Blackwood, NJ 08012
Tel: (856) 228 8881 - Fax: (856) 228 3584
<http://www.triangle-tube.com>
E-mail: Info@triangle-tube.com

Member of

