TwinTemp Combination RV Heating System

Instantaneous Gas *TwinTemp*
Installation and Operating Instructions

The *TwinTemp* models are certified to CSA ANSI Z21.10.3 * CSA 4.3:19 standard as a direct vent automatic instantaneous water heater / furnace, designed to be installed in recreational vehicles or manufactured (mobile homes). The installation, must comply to local codes or in the absence of local codes must conform to one of the following:

** The National Fuel Gas Code, ANSI Z223.1/NFPA 54 and/or CSA B149.1, Natural Gas and Propane Installation Code*

** The Manufactured Home Construction and Safety Standard, Title 24 CFR, Part 3280 and/or CSA Z240 MH Series, Manufactured Homes; or*

** Recreational Vehicle, NFPA 1192, and/or CAN/CSA-Z240 RV Series*

If an external electrical source is utilized, the appliance, when installed, must be electrically grounded in accordance with local codes or in the absence of local codes, with the National Electrical Code, ANSI/ NFPA 70, and/or CSA C22.1, Canadian Electrical Code, Part 1.

FOR YOUR SAFETY
WHAT TO DO IF YOU SMELL GAS

- Evacuate all persons from vehicle.
- Extinguish any open flame.
- Shut off the gas supply at the gas container or source.
- Do not touch any electrical switch or use any phone or radio in the vehicle.
- Do not start the vehicle's engine or electrical generator.
- Contact the nearest gas supplier or qualified service technician for repairs.
- If you cannot reach a gas supplier or qualified service technician, contact the nearest fire department.
- Do not turn on the gas supply until the gas leak(s) has been repaired.
- Installation and service must be performed by a qualified installer, service agency or gas supplier.

FOR YOUR SAFETY

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

WARNING!

Improper installation, adjustment, alteration, service or maintenance can cause property damage, personal injury or loss of life. Refer to the installation instructions and/or operating instructions provided with this appliance. A qualified installer service agency or the gas supplier must perform installation and service.

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

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Please read these instructions thoroughly before starting your installation

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

Installation Instructions for the *TwinTemp*

The TwinTemp must be installed with a minimum clearance of 1" from combustibles.

Every *TwinTemp* is inspected and tested before it leaves the factory. In order for this unit to operate safely and effectively, all installation instructions must be followed. Failure to comply with all installation and operating instructions will void the warranty. *PrecisionTemp, Inc.* will not be responsible for anything that is a result of non-compliance. Keep this book with the *TwinTemp* at all times.
It contains instructions regarding installation, operation and maintenance of your *TwinTemp*.
If you need further information, contact your dealer, your nearest service center or *PrecisionTemp Inc.*

The *TwinTemp* is designed to be installed in a ventilated compartment of the vehicle such as a lower luggage compartment or "basement" and vented through the bottom of that compartment to the outside. The heater must not be mounted in the living area or in a way that it receives its combustion air from the living area or flues into the living area. Doing so will void the warranty and cause the heater to malfunction and could cause damage, injury or death.

Please read these instructions before making any modification to the construction of your RV.

Installation Overview

The installation of the *TwinTemp* system is done in three steps:

- Installation of main heating unit and exhaust system
- Installation of blower heating units and thermostats
- Routing wiring and high temperature tubing from main heating unit to blowers.

Installation of main heating unit
When selecting an installation location, please note the following installation requirements:

- Surface should be able to support at least 100 pounds,

* The TwinTemp must be installed with a minimum clearance of 1" from combustibles.

* When the *TwinTemp* is installed directly on carpeting, the it shall be installed on a metal or wood panel extending beyond the full width and depth of the appliance by at least 3 in (76.2 mm) in any direction or, if the appliance is installed in an alcove or closet, the entire floor shall be covered by the panel.

- The front and side panels of the heater should be accessible for inspection and servicing,

- The vent and combustion air supply must be able to be installed through the floor without interference with frame members or other equipment,
- The compartment where the heater is installed must not be air tight from the outside. There should be at least 20 square inches of fresh air available from the outside, NOT FROM THE LIVING AREA. CAUTION: The combustion-air cannot be supplied from any compartment which may contain combustible gases (i.e. Battery gases, Gasoline fumes, Propane fumes, etc.)
- Water, gas, and electric line should be able to be run to the installation.
- Installation must be done to allow at least 8" access to the front and at least 10" access to the right side panel. There must be access to all plumbing connections if they are not made prior to securing the installation into place.
- There should be at least 1" clearance on the back and top of unit. At least 6" of top clearance is recommended to facilitate startup.
- It is recommended to Install the heater as close to the gas supply as practical to minimize length of the gas line.

Mounting Unit

Using the template, (illustration 1), determine *TwinTemp* installation location.

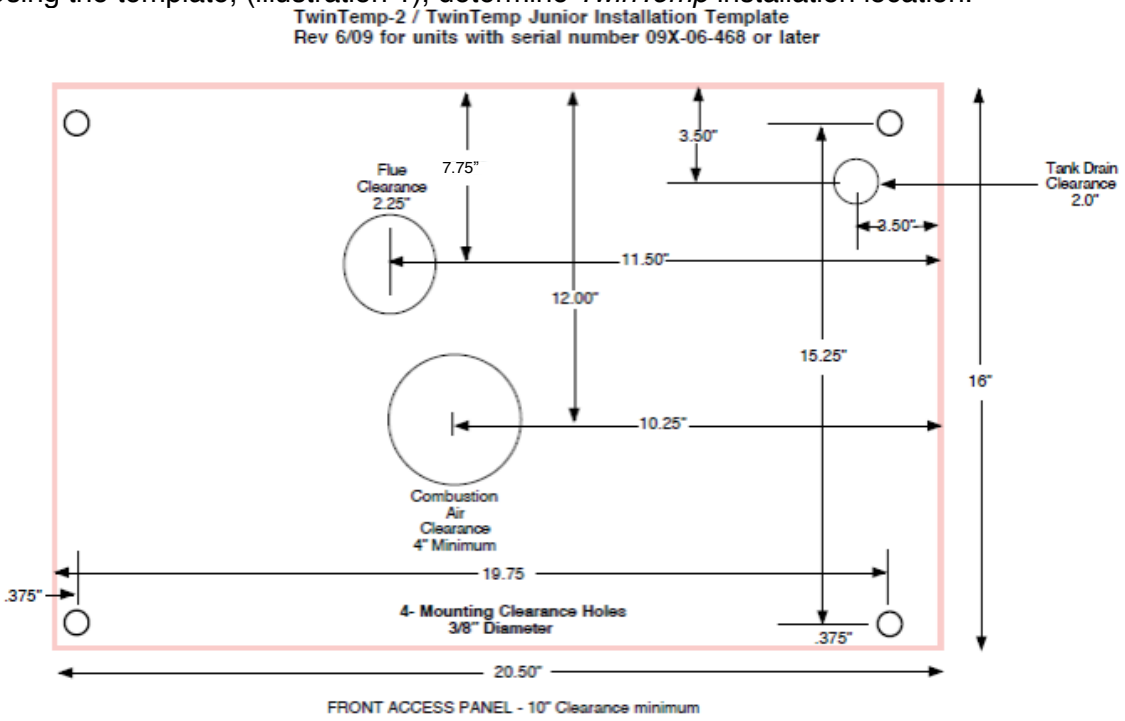


Illustration 1

Note the locations of the flue and combustion air cut-outs and mounting holes. Be sure they will not interfere with any framing members or other wiring or equipment under the coach. Be sure to observe proper clearances around the unit.

NOTE:

The TwinTemp must be installed with a minimum clearance of 1" from combustibles and enough clearance to allow access to the front removable panel for service.

If the *TwinTemp* cannot be mounted with sufficient access to the connection side of the unit to make connections after installation, these connections must be made prior to mounting the unit. See the sections regarding Plumbing Hook-ups, Wiring Hook-ups and Gas Line Hook-up.

Using the provided 1/4" X 20 bolts, secure the mounting plates to the four corner holes on the bottom of the *Twintemp.* Lift the *TwinTemp* into position taking care not to damage the flue transition pipe, protruding from the bottom. Align the flue transition pipe with the flue cutout. Drop unit into place and screw the mounting plate to the mounting surface on all four corners.

Exhaust Pipe and Combustion Air Installation

The standard exhaust is a 2" elbow 17" long that attaches to the 2" exhaust pipe extending from the bottom of the unit. After the *TwinTemp* unit is secured into place the exhaust is installed as follows:

- Secure the short end of the exhaust pipe elbow to the 2" exhaust pipe extending from the bottom of the *TwinTemp*. Secure with self tapping metal screws. Pre-drill holes if necessary. Additional lengths can be added to accommodate various floor thicknesses if necessary.
- The longer end of the pipe must not point to the front of the coach and must protrude at least 4" from under the side of the coach. An exhaust pipe clamp should be used to secure to coach chassis. All fitting should have at least 1/2" clearance from combustibles.
- Additional lengths can be added to accommodate various installations.
- An optional 4" rubber boot can be installed through the mounting floor to direct all outside air into the TwinTemp. A screen can cover this hole, but the openings should be no smaller than 3/8" in diameter and should be kept clean and free of debris.

Interior Heat Exchanger (Blower) and Room Thermostat Mounting Locations

Up to six blowers can be installed in the *TwinTemp* system. Blowers are plumbed in series and should be laid out to minimize the loop length. The mounting locations for the thermostat should be selected carefully to ensure even heat distribution throughout each heating zone. Do not mount the thermostat where it can be affected by: drafts or dead spots behind doors, radiant heat from the sun or appliances or unheated areas such as an outside wall behind thermostat.

Locate the heat exchangers so that even heat distribution will be felt throughout the interior. For slideouts, it is recommended to place a blower(s) on the opposite side of the coach, pointing towards the slideout. Sufficient return-air must be supplied to each interior blower. (See Illustration 2). Mounting blowers without sufficient ventilation will severely reduce their overall heating performance. In order to provide sufficient ventilation, the "return-air" registers must be the same size, or larger than the outlet-air registers. Return air must be supplied from the interior heating zones. Allow for access to all heat exchangers for tubing hook-up and for potential servicing and cleaning.

To mount the blowers once all permanent mounting locations have been selected, cut out the opening for each outlet-air and return-air register and screw down each heat exchanger permanently into place. .

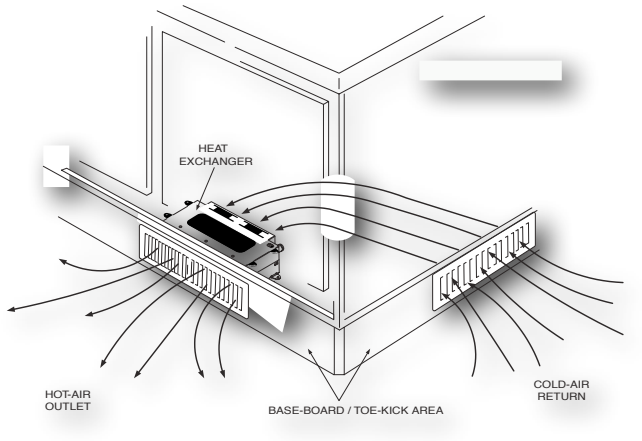


Illustration 2

1. Cut out an opening for each heat exchanger and cold-air return.
2. Mount each Heat Exchanger permanently into place.
3. Install the hot-air outlet and cold-air returns.

There must be complete access to the heat exchangers until the plumbing and electrical hook-ups have been made.

Mounting location for the fresh water tank heat exchanger (OPTIONAL)

If used, a fresh water tank blower should be strategically placed in the domestic water plumbing area to prevent freezing of the plumbing lines and storage tank. Position the fresh water tank heater in the water storage tank / plumbing bay area so even-heat distribution will be achieved. NOTE: the optional heat exchanger with the built-in thermostat should be used.

For best heating results, place the heat exchanger as close to the floor of the plumbing bay as possible, (heat will naturally rise). Sufficient ventilation (cold-air return) must be supplied. Return air should be supplied from the same compartment.

Connecting Gas Supply

The gas line should be of approved type and size with a 3/8" female flare nut. If the gas line is very long or has numerous bends, it should not be less than 5/16" ID or performance of the *TwinTemp* will suffer. The maximum inlet gas pressure must not exceed 14 water column inches (WCI) and no less that 10 WCI dynamic pressure. This gas line should be one uninterrupted line from the LPG tank regulator with no tees or connections within the coach. Some standards may require a manual gas shut off valve in the gas line external to the *TwinTemp*. *The TwinTemp must be isolated from the gas supply system during any pressure testing of that system at test pressures equal to or in excess of 1/2 PSIG.*

The flare nut on the gas line should be hand connected to the flare connection on the *TwinTemp* to assure it is not cross-threaded.

NO pipe dope should be used on this flare connection. Tighten with a wrench. This connection should be tested for leaks prior to start-up, using soapy water or liquid leak test solution. Do not use a flame to test for leaks.

Wiring

The *TwinTemp* is pre-wired internally with a multi-pin connector running out of the connection of the back of the unit. (See Illustration 4). 12 VDC *TwinTemp* power switch should remain OFF through installation. The mating harness should be used to make the 12 VDC, thermostat and blower connections. Follow the color coding as shown in Illustrations 4 and 5.

- **12 Volt DC power hook-up**

This is the main power harness that should be switched at a panel inside the coach on a 10 amp circuit. The wire must not be smaller than 14 gauge. Red is positive (+) #2 terminal and black (or green) is negative (-) #1 terminal. Under-sizing this wire will result in the *TwinTemp* malfunctioning.

- **Room thermostat and blower harness**

Run 18 gauge minimum wires to the room thermostat. The red wire #5 terminal is the positive power to the thermostat and the white wire #6 terminal is the return from the thermostat.

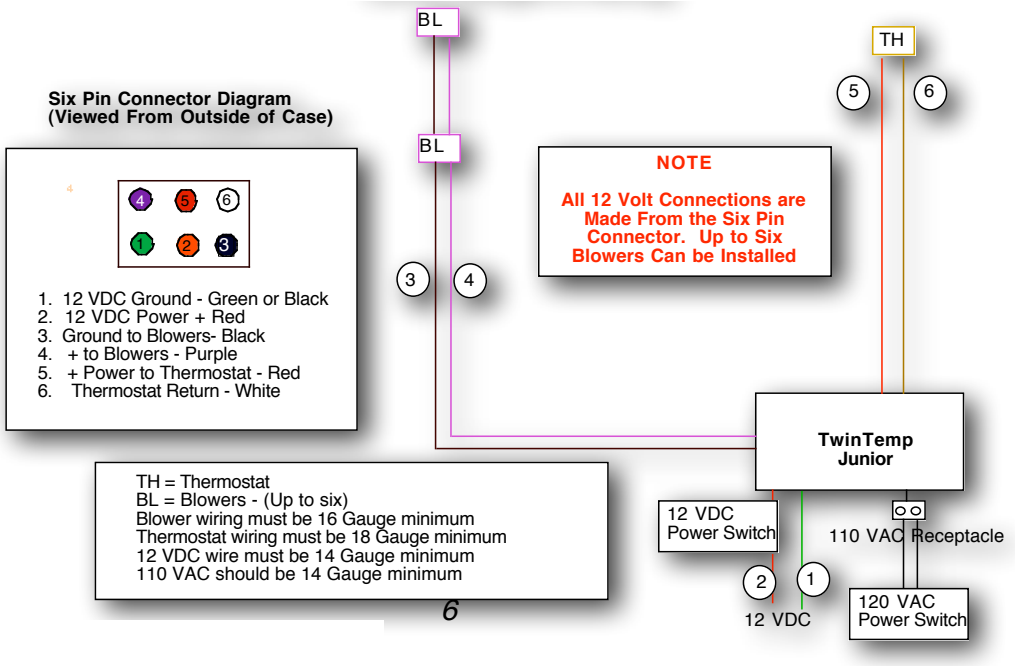
16 gauge minimum wire should be wired in parallel to each blower circuit. The black wire is negative (-) #3 terminal and should be connected to the black wire on the blowers and the purple wire is positive (+) #4 terminal and connected to the red wire on the blowers. Again, observes all wire colors in the illustration. (Note: See 12 pin connector diagram for TwinTemp 2)

110 Volt AC Electric Element Cord

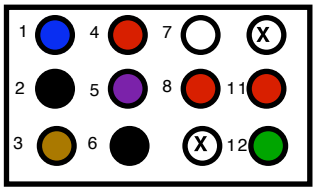
This wire is provided with a 15 amp "SJO" plug that is to be plugged into the back of the TwinTemp and a switched outlet "handy box". This should be a dedicated 15 amp circuit that is switched and fused at a panel inside the coach. Keep power off to this circuit at this time. If this circuit is energized prior to filling the system with antifreeze, severe damage will occur.

If an external electrical source is utilized, the appliance, when installed, must be electrically grounded in accordance with local codes or, in the absence of local codes, with the *National Electrical Code*, ANSI/NFPA 70, and/or the CSA C22.1, *Canadian Electrical Code, Part I*.

TwinTemp Wiring Diagram



12 Pin Connector Diagram
(Viewed From Outside Case)



1. Blue Zone 2 Blower +
2. Black Zone 2 Blower -
3. Brown Zone 2 T-stat-
4. Red Zone 2 T-stat +
5. Purple Zone 1 Blower +
6. Black Zone 1 Blower -
7. White Zone 1 T-stat -
8. Red Zone 1 T-stat +
11. Red 12 VDC Supply +
12. Green 12 VDC Supply -

Plumbing

NOTE:

* The piping and components connected to the water heater for the space heating application shall be suitable for use with potable water.

* Toxic chemicals, such as used for boiler treatment, shall not be introduced into the potable water used for space heating;

* The TwinTemp shall not be connected to any heating system or component(s) previously used with a non-potable water heating appliance;

* The TwinTemp incorporates a mixing valve to temper the water in order to reduce scald hazard potential.

* A 35 PSI pressure relief valve is installed on the right side of the case. There must be a 3/4" NPT pipe installed to the discharge of the PRV to direct any fluids outside if a discharge should occur. Never plug the outlet on this device. No reducing coupling or other restriction installed in discharge line. Discharge line should be installed to allow complete drainage of valve and line.

The Plumbing installation involves two systems:

- Heating system blowers
- Domestic hot water system

It is recommended to use 5/8" OD PEX high temperature tubing and push fitting, similar to that *PrecisionTemp* can supply. Otherwise, adapter will be required to make the connections.

Heating system blower piping

The heating system consist of one zone with up to six blowers (Two zones on TwinTemp 2). The *TwinTemp* has a supply line and a return line connection.

Prior to running the PEX pipe , it is advisable to connect all plastic push fitting to the blowers and the *TwinTemp* water / anti-freeze connections before running the PEX pipes. Use a high quality teflon tape on these fitting when making the connections. Take care not to let the teflon tape to get into the system.
(See illustration 7).

Install all PEX pipe and mark with labels at both ends. Arrows should indicate the supply and return lines. Minimize extreme bends and any extreme rises in height should be avoided. Be sure to secure all PEX where necessary, and apply protective shielding in areas where chafing may occur.

As shown in Illustration 6, the 3-way by-pass valve and tee fitting should be installed between the supply and return fitting in heating loop. This is to prevent the heated anti-freeze from circulating to the blower units in warm weather, when space heat is not required.

Connect the supply line from the *TwinTemp* to the by-pass tee and then continue it to the inlet fitting on the closest blower unit. Be sure the end of the PEX is cut perfectly square and push it into the push fitting until it bottoms out.

Then pull gently on the PEX tube to assure it is tight into the fitting to avoid leaks.

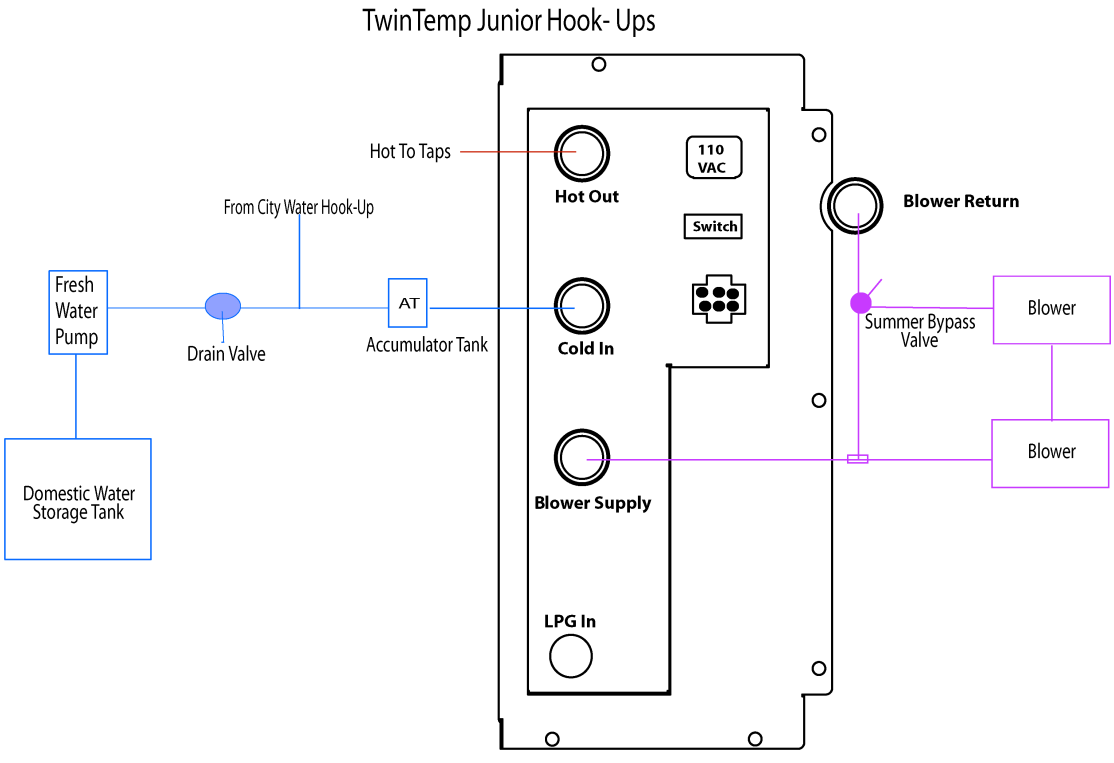
Continue the PEX tube from the outlet fitting of the blower to the inlet fitting of the next blower. Continue this process until all blowers in loop have been plumbed, (up to six blowers).

From the outlet fitting of the final blower in the loop, return the PEX line to the 3-way by-pass valve and continue back to the *TwinTemp* return fitting of the *TwinTemp.* As above, all PEX tubing should be tightly secured to all of the push fitting on the blowers and the *TwinTemp.*

Domestic hot water piping

Although the *TwinTemp* is capable of delivering continuous hot water on demand, the plumbing system for the domestic hot water is plumbed exactly as it would be with basic recreational vehicle hot water systems. (See Illustration 6). The pressure cold water supply is connected to the "Cold" fitting on the *TwinTemp* and the hot water line to the fixtures is connected to the "Hot" fitting. As when running the heating system tubing, be sure to secure the push fitting to the *TwinTemp* using teflon tape and cut the PEX tubing square and bottom it out into the push fittings.

If the coach is equipped with water pipes other than 5/8" OD PEX tubing, adapters should be used to make the connections to the 1/2" NPT connections on the *TwinTemp*.



Filling heating system with anti-freeze

Before turning on the power to the *TwinTemp* system, it must be completely filled with a propylene Glycol boiler antifreeze / water mixture and completely purged of all air. A 50 /50 mixture of water and a high temperature propylene glycol must be used. Contact *PrecisionTemp* for recommended suppliers. Never use automotive or other toxic anti-freeze.
Fill system as follows:

- Remove small top access panel and radiator type cap from the top of the tank. (See Illustration 8)
- Using the fill valve assembly tube supplied and a funnel to fill the tank. (See Illustration 9)
- Remove hose from barb fitting and screw the valve assembly into fitting in top of radiator fitting
- Put hose back onto barb fitting &turn red handle to open position
- Using a funnel on the hose, fill the tank with anti-freeze / water mix. This should use about three gallons.

- Turn on the the main 12 VDC power and the power switch on the *TwinTemp*.
- Set the thermostat to its highest setting. Do not turn on propane at this time. The pump will start to circulate the anti-freeze through the blower circuit and the anti-freeze level in the tank will drop.
- Top off the tank with water / anti-freeze mix.
- When tank is full, take funnel off & put end of hose into a jug
- Turn on gas & power and the burner should light. Let system run until it is to temperature. Expanding anti-freeze will flow out of the top of the tank and into jug as it heats up
- When anti-freeze stops flowing, turn off system, close red valve, unscrew valve assembly from unit and replace and tighten radiator cap after wiping cap and seat with a clean rag.
- Check all fitting in heating system for leaks and correct if necessary.

Illustration 8

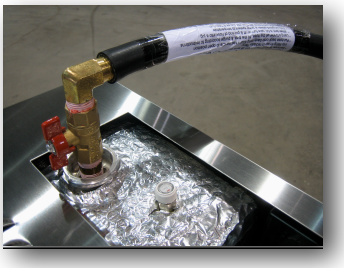


Illustration 9

Operating Instructions

You can now turn on the propane supply again and the coach's water pressure pump. The *TwinTemp* is now ready to operate. Again, check for leaks. Before operating the *TwinTemp* for the first time, it is important to know the proper "Sequence of Operation" to insure understanding of operation. The power switch should be turned on only after it is assured the system is filled with anti-freeze and there are no leaks. The domestic water system should be pressurized and checked for leaks. The propane system should be turned on and checked for leaks.

Sequence of Operation is as follows:

The 12 VDC power and switch on *TwinTemp* is turned on.
Tank thermostat inside unit turns on pump and burner ignites automatically.
Anti-freeze circulates from burner to blowers and back to tank as it heats.
Burner remains in high fire until set temperature is approached and gas is modulated to low burn until set temperature is attained.
Burner & pump shut down when set temperature is attained. This takes about 5-15 minutes depending on ambient temperature.
TwinTemp is now in standby mode until a room thermostat is activated or hot water is called for.

If room heat is needed

Set room thermostat to desired temperature.
The pump and blowers activate and within seconds heat is delivered from blowers.
When tank temperature is below set point the burner will re-light and maintain proper tank temperature.
When room reaches set temperature, the pump and blowers will go off.
If tank temperature is below set temperature, pump 1 and the burner will stay on until tank reaches set temperature.

If hot water is needed

Once the tank reaches set temperature (5–15 minutes after system is turned on), continuous hot water is delivered when any tap is opened. Delivery temperature is determined by the setting of the mixing valve (Adjustable 100° - 145°F). (See Illustration 11)
Tank thermostat turns pump and burner on automatically when tank temperature starts to drop.
Antifreeze circulates from burner and back to tank as it heats.
Burner remains in high fire until set temperature is approached and gas modulates burner to low burn until set temperature is attained.
Burner & pump shut down and system returns to stand-by mode.

Illustration 11

<u>To operate the *TwinTemp*:</u>

Hot Water

1. Pressurize the water system by turning on pump or city water pressure.
2. Purge all air from system by turning on the taps until there is a steady stream of water. Turn off taps. Check for leaks.
3. Turn on the propane supply at tank and the manual gas valve if installed in system.
4. Turn on the 12 VDC power supply and switch on the *TwinTemp*. If this the first time the system has been used, power may have to be cycled several times in 5 second intervals until air is purged from the gas line. Using sight hole, verify burner is on.
5. It will take about 5-15 minutes for system to heat up.

6. Turn on any hot water tap. Continuous hot water will be delivered in the time it takes to get from the *TwinTemp* to the tap. Hot water temperature can be changed by adjusting mixing valve.

(See Illustration 11)

Space Heating

1. Follow procedure 3 – 5 of “Hot Water” section above.
2. Set the room thermostat to the desired temperature.
3. Blowers will provide heat within seconds of being activated.
4. When set temperature is attained, blowers will shut down.

WARNING: Always turn off the 12-volt power supply to the heater during any fueling operations. Operating the *TwinTemp* or any other ignition source during fueling could cause a fire or explosion, which could result in serious injury or death.

NOTE: Should overheating occur or the gas supply fails to shut off, turn off gas valve at the supply tank. Immediately call a qualified service technician.

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

NOTE: When using an "on/off" button on a shower head or an outside wash down box, always turn off the hot and cold water valves when finished. Not doing so will result in cold water bleeding into the hot water system and causing cold water or alternating warm and cold water will result.

The *TwinTemp* is designed to give a continuous flow of hot water as long as required and maintain the approximate set temperature through all flow rates within the capacity of the heater (88°F temperature rise per GPM). If the hot water and space heating are being used simultaneously, the hot water function takes priority. During heavy hot water usage, the blowers may shut off temporarily to prevent a drop in water temperature. They will automatically turn back on when the system demand is reduced.

110 volt heating element

The *TwinTemp* is equipped with a 110 VAC electric heating element to provide small amounts of hot water or space heating, such as washing hands or dishes. The electric element can be used with or without the propane burner, but for continuous hot water or space heat, the propane burner must be used. To operated, turn the 110 volt switch panel on in the coach and be sure the power wire is plugged into the handy box in the *TwinTemp* compartment.

For small amounts of hot water only, there is no need to turn the 12 Volt power on to the *TwinTemp*. However, if space heat is require, the 12 volt switch must be turned on. If there is a higher demand for heat than the 110 volt element can provide, the propane burner will activate automatically.

Changing Hot Water Temperature Setting

The temperature on your *TwinTemp* has been factory set to approximately 115°F. It is not recommended that you change this setting. Changing this setting could result in dangerously hot temperatures that could result in severe injury. If it is necessary to change the setting it can be done as follows:

Open access door on the front of the heater. Turn the adjustment knob **counterclockwise to increase** temperature or **clockwise to decrease** temperature. The setting range is between 100°F to 145°F. (See Illustration 11)

Summer Operation

When the space heating function of the *TwinTemp* is not needed, the heated anti-freeze should not be circulated to the blowers. To prevent this circulation, the knob on the 3-way by-pass valve installed in the blower circuit of the *TwinTemp* should be turned 1/4 turn. When heating is again needed, this knob should be turned 1/4 turn in the opposite direction. This adjustment should only be needed twice a year for summer / winter operation.

Routine Maintenance

All faucet aerators and shower head screens in the coach should be cleaned regularly.
It is recommended that the *TwinTemp* be inspected by a qualified service technician at least once a year. Particular attention should be paid to the following:

1.Be sure that the air inlet openings and flue area are clear of any debris or obstructions, (leaves, bugs, nests, spider webs, etc.) Be sure nothing is stored against the unit that would block air or access.
2. Be sure anti-freeze level in tank is up to the bottom of the filler cap. Top off if necessary with non toxic 50 / 50 mix of specified anti-freeze and water.
3. Check that heater mounting is still secure to the coach. Tighten if necessary.
4. Check all water and anti-freeze tubing and fittings on the *TwinTemp* and blowers for potential water leaks and carefully tighten or repair if necessary.
5. Visually inspect wiring. Be sure there is no chafing of the insulation.

Winterizing

If the hot water system of the TwinTemp is allowed to freeze severe damage can occur. Although the heat exchanger contains only about a pint of water, it must be purged if the coach is laid up for the winter or will be used in freezing situations without being on.

To winterize, pump the pink RV antifreeze through the plumbing system until the pink liquid is seen coming from the hot water faucets. If the plumbing system is blown out with air. Turn on a hot water tap until there is only air coming out. No bypass valve is required in the system.

If there are any questions regarding operation or servicing of the *TwinTemp*, please contact: