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"Fireball 2001" Patent Pending

System Overview

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MAJOR COMPONENTS

COLLECTOR:

The Fireball 2001 collector uses a high performance "Black Crystal" selective coating absorber with very low emissivity and high absorbtivity for maximum performance. The inside walls of the collector feature a super high emissivity white coating to greatly reduce heat loss and reflect otherwise lost heat back onto the absorber. The unbreakable Lexan, "Twinwall" Glazing is very light weight. A unique and exceptionally strong mounting rail and sandwiched bracket system fully supports the width of the collector. The results are a high performance, ultra strong, ultra light weight and easy to install collector.

GLAZING:

The glazing or "window" to the collector takes the brunt of the harsh sun's rays and traps them inside to create a greenhouse effect similar to what is experienced when getting into a car with its windows closed on a sunny summer day. This glazing has an insulating effect that traps heat better than glass in cold weather. It is much lighter and will not break like glass. The glazing is 20 square feet of a tough 6 mill (1/4") LEXAN double-walled polycarbonate material manufactured by General Electric (GE) with state of the art UV-protective acrylate surface treatment. It is factory guaranteed for 10 years.

FRAME CONSTRUCTION:

Designed to emulate a skylight in appearance and construction. The Patent Pending frame and trim is made out of Professionally finished bent 27 mil aluminum with ultra strong sandwiched mounting brackets. Special color keyed steel Hex screws and aluminum rivets are used as connectors. High quality 3/4" foil faced polyisocyanurate foam core insulation is used for the backboard.

ABSORBER:

The solar absorber, so called because it absorbs the sun's energy, is a proven all copper, "serpentine" design with the highest quality "selective surface" black absorber coating available.

"QUICK CONNECT" TANK CONNECTION UNIT (System 1, 2, and 3):

This high quality copper and brass unit allows for the quickest possible connection of the collector feed and return lines to the storage tank. This unit causes the existing "backup" tank to directly capture solar heated water. It is equipped with two shut off "isolation valves" to quickly close off the solar loop if needed or to allow the complete drainage of the solar loop for freeze protection through the two drain valves (hose bibs) mounted directly above the isolation valves.

The solar circulator is mounted on the collector feed line directly above the hose bib. Two unions are included to allow easy shipping and assembly as well as a low point tank drain hose bib. On the roof, mounted at the outlet of the collector, is a safety pressure relief valve and an air vent to allow any trapped air to escape at the high point of the solar loop.

A Passive "Thermal Freeze Valve" option is available for protection against freeze damage to the collector in open loop systems. This valve opens when temperatures go below 38° F (some valves are set to open at 45°) causing warmer water from the bottom of the storage tank to go through the collector. A check valve on the hot collector return side of the Quick Connect unit causes the flow of water to be mostly through the collector feed line and thus through all the collector tubes.

OPTIONAL THERMOSIPHON HEAT EXCHANGER (System 4 and 5):

This highly effective unit consists of a large vertically oriented waterside THERMOSIPHON loop copper tube. This tube is normally connected at the bottom of the water heater through the drain port and to the upper part of the tank through the pressure relief valve. A small amount of soldering is usually required to make this connection.

Small "double walled" tubes go through the center of the larger waterside copper tube(s). These tubes are "double walled" to provide a double wall of protection against leakage of food grade "Propylene Glycol" (glycol) into the water (a highly unlikely event given that the water side is at a much higher pressure than the solar glycol side). The inner tubes are part of the completely separate solar loop and are heated by the flow of glycol pumped (and thus circulated) through the collector.

A brass low point tank drain hose bib is also included. The "solar loop" is charged with food grade Propylene Glycol through two hose bibs, which have a check valve between them. A unique check valve prevents cooler glycol in the collector from causing a re-

verse flow of fluid at night from cooling the water heater. Included on the solar loop, mounted below the pump, is an "Expansion Tank" which is very important to allow for the expansion and contraction of the glycol in the closed solar loop. On the roof, mounted at the outlet of the collector, is a safety pressure relief valve and an air vent to allow any trapped air to escape at the high point of the solar loop.

CIRCULATOR (PUMP):

Standard high quality pumps are quiet, long life and low power consumption. 115V AC units come with built in line cord for easy connection to the control system. All Pumps are permanently oiled and do not need any service.

The ultra reliable 12 Volt "ElSid" circulator has no moving motor parts, has a life expectancy of over 20 years and only needs a 5 or 10 watt PV panel depending on application. A high quality Hartell 12 Volt Electronic circulator is used for larger closed loop PV systems.

CONNECTING LINES:

The piping consists of 1/2" outside diameter (3/8" Nominal) soft copper plumbing tubes. Connections are made using standard brass compression unions. 50' of tubing is included with the kit.

DIFFERENTIAL CONTROLLER (System 2 and 4):

An electronic differential temperature control is designed specifically to regulate a solar system's operation. Its basic function is to monitor collector and storage temperatures and to automatically turn a circulation pump ON or OFF at the appropriate temperature differentials. Only the highest quality controllers are used.

SENSORS:

Two sensors perform the temperature sensing function. One is placed at the bottom of the solar heat exchanger tank, up against the outside of the core of tank. The other sensor is placed just inside the collector through the absorber hot out hole. The sensors are directly wired to the differential controller box.

An optional freeze sensor attaches to the hot out line just as it leaves the collector box. This sensor closes at 40F for Recirculation freeze protection which is used extensively in mild weather conditions where temperatures occasionally dip below freezing (to as low as 20F for a few hours). It is thus is used for a higher level of Freeze Protection in light freeze areas than the Thermal freeze valve allows.

OVERVIEW of PROCEDURES FOR INSTALLATION

Installation must comply with local Building, Electrical, Plumbing and Permit codes.

The collector is most easily installed on a southerly facing asphalt shingle roof, however, it can be installed in many situations, such as cedar shake, tile roofs and off orientation situations. The south-facing roof must be free of shade for at least eight hours of the best available sun. A standard 18-degree tilt kit as well as custom tilt kits are available for reorientation.

A way must exist to run solar lines inside the house or garage from the attic to the solar tank. The collector should be centered in such a way as to look balanced between house features.

THE BASIC INSTALLATION STEPS

(3 to 8 hours required to install, depending on situation and experience)

1. Unpack collector, assemble the collector left and right sections into one unit as per pictures and instructions.

2. Collector placement on roof located, rafters located and marked, end mounting rails with brackets lagged and sealed into rafters, collector placed into mounting rail brackets, center mounting rail and brackets placed, lagged and sealed into rafter, mounting rail brackets screwed into collector.

3. Collector compression unions connecting air vent, pressure relief valve and components installed, two 1 1/2" holes drilled into roof for hot feed and cool return lines. Shingles trimmed and "Roof boots" installed under shingles and into holes.

4.Collector cool feed (bottom compression union) and hot return lines (top compression union) installed through roof boots to tank area. Sensor, if used, installed in collector hot outlet, (or PV wire where used), connected and run to water heater area. Insulation partly installed before tubing connections are made. PV panel installed if used.

5. Water Heater Element or Gas turned off, water drained, lower drain removed, "Easy-Connect Assembly" installed, (or Thermosyphon Heat Exchanger if used) collector cool feed (from pump) and hot return lines connected by compression union.

6. Water heater refilled, solar loop purged of air, pump plugged into timer (or PV wire or Differential Controller connected where used). Air purged using return line hose bib, finish insulating lines, Element or Gas turned back on.

How do I get the most efficiency from my solar water heater?

As a standard electric water heater usually has two elements, having an electrician disconnect the lower element will increase the efficiency of the solar system. When disconnecting the lower element it is important to be aware that you will have less continuous supply of water on cloudy days because only the upper element is heating the water. Another easy method to increase storage efficiency is to have a 220-volt timer installed by an electrician. It will activate the element for 3 hours in the early morning (say from 5AM to 8AM) for showers etc. and on again in the early evening (say from 4PM to 10PM) for evening use if solar gain hasn't been good that day. For safety sake, it may be wise to install a Mixing valve to protect children and the elderly from high temperatures, especially with larger systems. See installation and O & M manuals for details.