



SolarRoofs.com

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Model: “Fireball 2001”

Operation and Maintenance Manual

March, 2001

CONGRATULATIONS!

You have just purchased the most attractive and cost effective active solar water heater made! We have worked on every detail to assure you that the “Fireball 2001” (Patent Pending) water heater will completely satisfy you in its very high level of performance, dependability and designed in ease of installation.

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1.0 INTRODUCTION

We at SolarRoofs.com wish to thank you for your purchase of our high quality solar water heating system. Your purchase not only represents a wise financial investment but also an important personal contribution toward solving our nation's energy and environmental problems.

Your solar "Fireball 2001" water heater was designed to be the best looking, and most cost effective product on the market. In addition, it is designed to require little or no maintenance and to have components that are easily replaced at low cost.

In the summer, depending on system sizing and demand, close to all of a family hot water needs can

be supplied. During the winter, the system will still supply a portion of your hot water. The electric element or gas water heater acts as a "backup" to the solar system and automatically makes up the difference when needed.

The total yearly percentage of your water heating needs that solar will cover for the rest of the year depends upon the amount of daily sunlight and outdoor temperature. As a rule of thumb, in mild climates, a 40 sq/ft system should supply about 65% of a family of four's yearly hot water needs. In sunny and warm climates such as Florida, Arizona and parts of California, 85% or better can be achieved.

1.1 MAINTENANCE SUMMARY

Note: See detailed maintenance steps by component starting with section 6.2.

Item	Maintenance
1. Hard Freeze Condition	-Open Loop Systems: Drain system See 1.11
2. Collector Glazing	-Annual visual inspection from the ground. See 6.2
3. Backup Storage Tank	-Flush a few gallons out twice a year. See 6.3.
4. Solar Storage Tank	-Flush a few gallons out twice a year. See 6.3.
5. Pump	-110 March, Oil annually, 12 Volt pump, no regular maintenance required. See "Component Detail" and "Trouble Shooting" sections. See 3.4.
6. Differential Control / Timer / PV Panel	- No regular maintenance required. See "Component Detail" section for temperature settings and Trouble Shooting section. See 3.6.

1.2 Freeze Considerations, Limitations and Instructions

Freeze Conditions:

Systems 1, 2, 3 are "Open Loop" Systems Subject to Freeze Damage

All open loop system (street pressurized water in the collector) collectors, components and lines, whether they include freeze protection devices or not, are not covered for freeze damage and their solar loop should be fully drained in hard freeze conditions.

Open loop (collector continually open to street pressure water), serpentine copper absorber collectors with "Thermal Freeze Valves" are generally considered to be protected in light and very infrequent (1 to 4 times per year) freeze conditions for temperatures as low as 30 degrees F. Serpentine copper absorber collectors with "Thermal Freeze Valves" and Differential Control Recirculation freeze protection are generally considered to be protected in light and infrequent (4 to 12 times per year) freeze conditions for temperatures as low as 20 degrees F as long as 110v power remains on.

The "serpentine" absorber in a "Fireball 2001" is less likely to freeze than a "parallel flow" absorber with multiple risers. This is because equal flow is present in all tubes where it could be unequal to non existent in some of the tubes in the multiple risers of a parallel flow system.

A "Thermal Freeze Valve" (on system 1B, 2B and 3B) starts to open at about 38 degrees F allowing a small amount of water to flow out on the roof thus causing water to flow up from the bottom of the storage tank, through the absorber, and out onto the roof as long as temperatures remain low.

A "Thermal Freeze Valves" including a **Differential Control Recirculation freeze protection** (systems 2B and 3B) also causes water to flow out onto the roof as above but in addition causes the pump to continuously circulate water at a greater rate of flow in the entire solar loop from the bottom of the tank

and back to the lower part of the tank as long as the power is on. Naturally the lower part of the tank can get very cold in the process. Having the electric element on gives further protection in freezing temperatures.

DRAINING THE SYSTEM

IF A HARD FREEZE (Temperatures below 38F for systems 1, 2, and 3) IS EXPECTED, YOU MUST DO THE FOLLOWING:

1. Turn the solar the pump off,
2. Close the TWO solar loop isolation valves,
3. Open the TWO solar loop hose bib drains and fully drain into a bucket. (You may want to use a hose for this but usually under 2 gallons of water will drain out)
4. Connect a short section of laundry hose to the "hot return line" hose bib (Line from the collector with no circulator (pump) above it)
5. Blow into the hose until all residual water in the absorber is out and air flows freely out the "cool feed line" hose bib.

Closed Loop Systems 4 and 5

The SolarRoofs.com's closed loop Propylene Glycol Antifreeze heat exchange system's collector as well as feed and return lines, when properly installed, will not be damaged by (ambient) hard freeze temperatures as low as 60 degrees F below zero. In freezing situations, the solar storage tank must be kept in an area above 32 degrees F.

HIGH TEMPERATURES

The Fireball 2001 collector will not be damaged by stagnation in ambient temperatures as high as 116F

1.3 “Fireball 2001” Solar Water Heater Specifications

COLLECTOR (Panel)

Trim & Frame Materials:	Finished 27 mil Aluminum Trim and Frame = Total 54 mil (1.37 mm).
Absorber Material:	“Black Crystal” coated - all Copper with compression unions BP systems : Black Paint with Aluminum Fin on Copper Tube with compression unions.
Glazing:	.236” (6.0 mm) Twinwall Polycarbonate UV Treated
Dimension / Weight:	FIREALL 2001-144.3”x 20.”x 3” 38 lb (3.67 m x 0.51 m x 0.076 m 17.24 Kg) 18.4 Net s/f (1.71 m ²)
Fluid Capacity:	. 4 Gallons
Recommended Flow Rates:	.20 to .35 GPM (0.946 to 1.324 L/min)
Maximum Working Pressure:	150 PSI (10.21 atm).
Maximum Stagnation Temp:	250 °F (121.11 °C).
Heat Transfer Fluid:	Potable water or Propylene glycol
Standard Components:	Mounting rails, mounting brackets, tech screws and lags
Color:	Musket Brown (CI01) + optional colors

PUMP OR CIRCULATOR (standard)

Type: 115 Volt AC Taco 006 Bronze or equal

PV (Photovoltaic) POWERED CIRCULATOR (option)

PV Panel: 11 or 21 Watt, 12 Volt DC
Circulator: 12 Volt - “El Sid”, 12 Volt Hartell, March or equal.

FREEZE PROTECTION (Optional)

Type: Passive Thermal Bleed Valve for light freeze protection down to 30F
Temperature to open: 45 °F (1.66 °C) Starts to open and drip water at 45° F
Type: Recirculation with 40F Freeze Snap Switch for 110Volt Differential Controller or with 12 Volt Circulator with Transformer for light freeze protection down to 20F.

CONNECTING LINES, INSULATION (standard)

Tubing: 1/2” (12.7 mm) OD copper - 50’ (15.24 m)
Insulation (6’ (1.83 m) supplied): 1/2” (12.7 mm) ID 1/2” (12.7 mm) or 3/4” (19.05 mm) wall

TUBING CONNECTION METHODS (standard)

Type: Brass Union, Compression, (Solder for Thermosyphon to tank)

STORAGE TANK (Not Supplied)

Standard Connections: Use Existing 50 gal (189.27 L) - 120 gal (454.25 L) tank
Heat Exchanger Option: Existing 50 - 120 gal. with side pressure relief port,
or 2nd tank with side connect pressure relief port.
Max. Temp. - 190 °F (87.77 °C)
Max. Pressure - 150 psi (10.21 atm)

“THERMOSYPHON” HEAT EXCHANGER (option)

(for use with standard circulator and differential control or with PV Option)
Type: Thermosyphon, double wall, 3’ (.914 m) long, and 4’ (1.22 m) for 4 collector systems.
Heat Exchanger Fluid: Propylene Glycol (Sierra)
Components: Expansion Tank, two special check valves,
fill, drain, and pressure relief valves.

CONTROL (standard - non freeze application)

Type: 120⁰ F snap switch in collector with Transformer for system 1 only
Type: PV Panel automatically turns pump off and on with the sun

DIFFERENTIAL CONTROL – System 2 and 4

Type: Independent Energy or Equal
Sensors: Two Sensors with wire
Turn on Differential: 8 - 24 °F (Ave. set 12 °F)
Turn off Differential: 4 °F (fixed) - Recirculate turn on: 38 °F (3.33 °C)
Power requirements: 105- 120VAC, 50/60hz,
Output power: 115VAC, 1/3HP (248.56 W)

Although we will make every effort to give notice, Specifications and prices subject to change without notice.

2.0 SYSTEM OPERATION

MAJOR COMPONENTS:

(A more detailed description of the components follows)

- A) **The SOLAR COLLECTOR** on the roof collects the sun's energy for heating your water.
- B) The **CIRCULATOR** (or pump) is used to move the solar heat transfer fluid, water.
- C) The **CONTROL**: Differential Control or Timer, The former being the optional control system which senses when to turn the pump on or off relative to the availability of energy in the collector and the latter the standard system's control that is simply set to turn the pump on and off during normal sun hours. Photovoltaic powered pumps simply turn on and off with the sun.
- D) **“QUICK CONNECT” TANK CONNECTION**: The unit that connects the collector feed and return lines to the storage tank. It unit includes shut off and drain valves as well as the solar pump.
- E) Optional **“THERMOSYPHON”** Freeze Protection.

Note: With a Differential Control, on hot nights, it is possible for the pump to turn on for short periods because the collectors could be over 12 degrees warmer than the bottom of the solar tank especially after hot water use, your system is collecting "nocturnal" heat.

3.0 EXPLANATION OF COMPONENTS

3.1 COLLECTOR:

The collector uses high performance “Black Crystal” or Black Chrome” absorbers for maximum performance and uses tough Lexan, “Twinwall” Glazing to make the system light weight and easy to install. These materials are very durable.

3.1.1 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.

3.1.2 FRAME CONSTRUCTION:

Designed to emulate a skylight in appearance and construction. The frame and trim made out of bent 27 mil aluminum. Special 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.

3.1.3 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.

3.2 “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 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 pump 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.

Most systems also include a “Thermal Freeze Valve” which is important for protection against freeze damage to the collector. This valve opens when temperatures go below 35° 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.

3.3 THERMOSYPHON HEAT EXCHANGER (System 4):

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.

“Double walled” tubes go through the center of the large waterside copper tube. These tubes are “double walled” to provide a double wall of protection against leakage of food grade “Propylene Glycol” (glycol) into the water (a more than highly unlikely event given that the water side is at a much higher pressure than the solar glycol side). These 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. The check valve prevents cooler glycol in the collector from causing a reverse 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.

3.4 PUMP:

Standard pumps are quiet, long life and low power consumption 115V AC units with built in line cord for connection to control system.

All low voltage and PV Pumps are permanently oiled and do not need any service.

3.5 CONNECTING LINES:

The piping consists of 1/2" outside diameter soft copper plumbing tubes. Connections are made using standard brass compression unions.

3.6 DIFFERENTIAL CONTROLLER (System 2 and 4):

An electronic differential temperature thermostat 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.

3.6.1 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 attached to the hot side of the floating valve. These are directly wired to the differential controller box. Climate considerations effect the placement of the sensors.

3.6.2 TEMPERATURE SETTINGS:

Timer: Simply plug the pump into the timer and set for the best hours of sunshine for your system, generally a minimum of 6 hours per day. Examples: South facing collector, 9AM to 5PM, East facing, 8 am to 2PM, West facing, 11 AM to 6PM. Reoriented south on a shallow pitch roof would be the same as South.

Differential Control: These settings may be preset or made inside the differential control box. Please consult your dealer as to settings in your area.

	RANGE	SUGGEST
Storage High Limit	110 to 230 F	185 F
Turn On	8-24 F	12-16 F
Turn Off	4 F (preset)	4 F (preset)

NOTE: When used, Be sure the "OFF/ON/AUTO switch is in the AUTO (for automatic) position. It is also accessed through the lower trap door. To open, insert into the small opening, a key or screwdriver and pry open.

4.0 OVERVIEW of PROCEDURES FOR INSTALLATION

Installation must comply with local building, electrical and plumbing codes.

shade for at least eight hours of the best available sun. An 18-degree tilt kit is available.

It is most easily installed near the peak of a southerly facing asphalt shingle roof, however, it can be installed in many situations, such as cedar shake and tile roofs. The south-facing roof must be free of

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.

4.1 THE BASIC INSTALLATION STEPS

- 1.Unpack collector, assemble the collector left and right sections into one unit.
- 2.Collector placement on roof located, rafters located and marked, end mounting rails with brackets lagged into rafters, collector placed into mounting rail brackets, center mounting rail and brackets placed and lagged 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 Quad -Rod 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.

5.0 VERIFICATION OF OPERATION

- A. Pick a sunny time between 10AM and 2PM.
- B. Timer is plugged in and set or PV Panel is connected or:
- C. Differential Controller is plugged into a live outlet and or operation switch is in "AUTO" position. (Open lower

trap door by using screwdriver or key).

D. Quickly feel the pump for a soft vibration (CAUTION HOT!), and listen for soft and quiet circulation.

E. Listen for quiet, steady rush of water.

F. Warmer (or hotter) water is coming into the "Quick Connect" unit or "Thermosyphon" than is leaving it.

6.0 MAINTENANCE DETAILS

Note: See detailed maintenance steps by component following this summary.

6.1 SUMMARY:

Item	Maintenance
1. Collector Glazing	Annual visual inspection from the ground.
2. Backup Storage Tank (Solar/Conventional)	Flush a few gallons out twice a year.
3. "Quick Connect" or "Quad Rod"	No annual maintenance. Change "Quad Rod" glycol every 5 years
4. Pump	110-Volt March: OIL once a year. 12 Volt: No regular maintenance required. See "Component Detail" and "Trouble Shooting" sections.
5. Differential Controller	No regular maintenance required. See "Component Detail" section for temperature settings and Trouble Shooting section for maintenance.

6.2 COLLECTOR GLAZING:

Annual visual inspection from the ground. Collector should be "self cleaning" by the rains. In extreme conditions pollen and dust can build up. This dirt can be washed off with a hose and possibly a wet soft cloth and mild detergent. Never use harsh items to clean the glazing surface as this could damage the protective UV resistant "B" coating on the Lexan glazing surface. Damage of this sort is not covered by warranty. If you clean the glazing with a wet soft cloth, use plenty of water and wipe up and down in the direction of the ribs, never in a circular or back and forth motion.

6.3 FLUSHING THE BACKUP STORAGE TANK EVERY SIX MONTHS:

"Also see Single Sheet Instruction and Service Summary".

A. CAUTION: Water May Be Very Hot, drain to an outside area of your home.

B. Attach hose to WATER HEATER or BACKUP TANK DRAIN at the very bottom of the tank attached to the "Quick Connect" unit or "Quad Rod".

C. Open Valve Fully.

D. Drain several gallons of water, to carry out sediment that accumulates.

E. Close valve & remove hose.

6.4 INSTRUCTIONS FOR LEAVING FOR LONG PERIODS (two weeks or more): The following procedure is recommended.

A. Systems with Differential Control: During hot weather: turn solar system to "ON" at Differential Controller or plug pump directly into the outlet. This will cool the tank off overnight preventing over temperature conditions during the day. **Never turn the Differential Control off or unplug it during**

cold weather if you have RECIRCULATION FREEZE PROTECTION as the system may be freeze damaged!

OPTIONAL: If you do not want your water heater on while away, follow these directions

(this can save \$ costs due to standing losses):

C. Turn off power to backup tank element at fuse box.

D. In hot weather, bypass timer by plugging pump directly into the wall or turn Controller to "ON" but remember to turn it to AUTO when you return!

7.0 EMERGENCY SHUT - DOWN PROCEDURES

7.1 TO TURN OFF SOLAR SYSTEM: Unplug Pump from Timer, or Move Differential Controller switch to "OFF" position or Disconnect PV Panel from Pump as appropriate.

7.2 TO TURN OFF WATER HEATING SYSTEM:

1. WARNING: Shut-off power or gas to the water heater.

2. Turn main "DHW Shut-Off Valve - Normally Open", to closed position.

8.0 TROUBLE SHOOTING GUIDE

8.1 COLLECTOR:

Problem: Hazy Appearance:

This could occur for several reasons. The collector could be very dirty. Water can condense on the glazing when temperature differences occur on an exposed surface or after heavy rains.

Problem: A small amount of water is leaking through the roof.

Procedure:

Check where lags have penetrated through roof sheathing and where Sealant (caulking) has been applied. Reapply as needed or remove lag, fill hole and relag.

8.2 SOLAR TANKS:

Problem: Need to bypass the solar system or shut pressure off to water storage tanks.

Procedure:

A. Solar/Electric Water Heater: A water shut-off valve is always provided and located on the cold feed line (water from city or well) to the UP tank heat exchanger. In any sort of an emergency, closing this valve can stop hot water flow. This is your isolation valve and turns off the water pressure for the total water heating system.

WARNING: Be sure to shut off electric power to this tank.

Problem: The water temperature into the home is too hot.

Procedure:

Check the element set point on the electrical tank. Check the mixing (tempering) valve (see system schematic) set point, lower temperature until comfortable. **Install a Mixing Valve.**

8.3 PUMP:

Problem: Pump is not shutting off at night.

Procedure:

Make sure the Differential Controller is in the AUTO for automatic position.

See "Component Detail, Control System-Temperature Settings section or call dealer.

Problem: Pump is making "surging" or other noises or gets hot.

Cause: air is in the pump from low water or improper charging which allowed air into solar loop.

Procedure:

Turn the pump off and check the water pressure, valves or glycol charge immediately and recharge as needed.

8.4 DIFFERENTIAL CONTROLLER:

Problem: System is not operating.

Procedure:

Check to see if the circuit breaker is "On" or controller is plugged in and set in the "AUTO" position.

Problem: System shuts off too early or too late.

Procedure:

Check on the placement or condition of sensors or PV Panel.

9.0 QUESTIONS

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. This is because of what is known as "The First Law of Solar", which is "Keep It Cool". In other words, the lower the temperature a collector can work at, the greater its efficiency and the more energy it can deliver.

Street water is usually 55 to 60 degrees F but an element at the bottom of the tank will heat this water electrically to at least 110 degrees F. The collector must do its job starting at 110 degrees F rather than 55 or 60 degrees F. It is easy to see that more electricity will be used. 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. By "staging" the use of water (not having two showers going at once, etc.), the element has time to "recover" the water temperature on cloudy days, so this problem is easily overcome.

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. This greatly increases the solar efficiency by not allowing the element to come on during hours of solar gain as well as keeping it off during non-use nighttime hours. Ideally, it is most efficient to completely turn off the electricity in sunny weather.

Your system will give you many years of trouble free service and savings if the simple procedures outlined are followed. If you have any questions, your dealer or the factory will be happy to answer them. Your satisfaction is our greatest interest! Please give us your feedback on the system and we hope you recommend it to your friends!

THANK YOU for YOUR Investment in the Environment,

Now enjoy the Savings!

Your Dealer and SolarRoofs.com

TOLL FREE HELP NUMBER: 1-888-801-9060

10.0 Warranty

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"Fireball 2001" 10 Year Limited Warranty

SolarRoofs.com warrants its exclusive solar water heating systems to be free from defects in material and workmanship as set forth under the terms of this warranty when correctly installed according to manufacturers installation instructions. If any defects due to faulty materials or workmanship are found, and SolarRoofs.com is notified within sixty (90) days of discovery of such defects, SolarRoofs.com will, at its option, either repair or replace the covered part or parts within a reasonable time, subject to the limitation and conditions set forth herein. A replacement may consist of a new or factory rebuilt component or part of at least the same quality. Replacements are warranted only for the unexpired term of the original warranty. This warranty applies to the first retail buyer at the original site of installation however

transfers can be made for up to 5 years after purchase.

Due to the high level of variability, open loop system collector absorbers can not be warranted against freeze damage. At the factories discretion, and as a service to customers, SolarRoofs.com will make repairs at the factory at no charge and with no time limitations, when the freeze damaged section is returned to the factory, transportation prepaid. SolarRoofs.com wishes to keep all systems in operation for decades and will do all it reasonably can do to aid the customer. The UPS shipped absorber is in 5 easy to remove sections so removal, shipment and repair is facilitated in the rare case of freeze damage.

TERMS OF LIMITED WARRANTY

TEN YEAR COLLECTOR LIMITED WARRANTY

SolarRoofs.com warrants the collector for a ten year period subject to the following limitations and conditions. The sole obligation of SolarRoofs.com is expressly limited to replacement or repair of the defective component and/or part. SolarRoofs.com will either repair or replace the defective component and/or part at SolarRoofs.com's

discretion. The replacement is expressly contingent upon the purchaser paying to SolarRoofs.com or it's dealer the difference between the suggested retail price of the replacement materials at the time the warranty claim is made and the pro-rated portion of the then current suggested retail price in accordance with the following schedule:

Year of Claim	Percent of Original Suggested Retail Price Pro-Rated Towards Replacement
1-5	100%
6-7	90%
7-8	80%
9-10	60%

FIVE YEAR COLLECTOR LIMITED WARRANTY INCLUDING TRANSPORTATION

SolarRoofs.com warrants the solar collector to be free from defects in material and workmanship when installed in accordance with industry standards and the SolarRoofs.com installation manual 100% for a full five years from the date of original installation. If a defect occurs under normal use and service during the first through fifth years and that part is returned to the factory or dealer, SolarRoofs.com will, at

its option, either repair or replace the covered component and/or part within a reasonable time without charge for parts, transportation (by UPS ground), or reasonable labor costs. The costs of any field inspection necessary to determine the extent of any damage is also included within the scope of this warranty if a product defect is found otherwise normal service charges apply.

LIMITED TEN YEAR COMPONENT WARRANTY

SolarRoofs.com Warrants its' "Quick Connect" unit, Heat Exchanger, Drainback Tank, and other components manufactured by SolarRoofs.com for a ten year period from the date of original installation. The sole obligation of SolarRoofs.com is expressly limited to replacement or repair of the defective part, at SolarRoofs.com's discretion, with

replacement expressly contingent upon the purchaser paying to SolarRoofs.com the difference between the suggested retail price of new materials at the time the warranty claim is made and the pro-rated portion of the original suggested retail price in accordance with the following schedule:

Year of Claim

**1-5
6-10**

Percent of Original Suggested Retail Price Pro-Rated Towards Replacement

**100%
50%**

SolarRoofs.com will not be responsible for any labor for removal, reinstallation, or transportation to SolarRoofs.com, of any components and/or parts under the limited component warranty. Non SolarRoofs.com manufactured valves, vents, circulators, controls, sensors, timers, switches, expansion tanks, vents, pressure relief valves are covered 100% for one year.

SolarRoofs.com has an extremely strong **commitment to very high customer satisfaction** and the cost effectiveness of its products, thus, at its' sole discretion, it may make exceptions to any of the above limitations to solve any unusual problems.

LIMITATIONS AND EXCLUSIONS

This warranty does not cover defects of any kind resulting from exposure to harmful materials, fire, flood, lightning, hurricane, tornado, hailstorm, windstorm, earthquake, or other acts of God, vandalism, explosions, acetic, caustic or highly mineralized water or other fluids, operation of the collector under excessive pressure or excessive flow rates, alteration, abuse, negligence, accident, misuse, falling objects or any other cause beyond the control of SolarRoofs.com or the contractor.

SolarRoofs.com's sole responsibility is to repair or replace defective parts as stipulated above and in no way accepts any responsibility for consequential or incidental damages resulting from failure of any part of the solar water heating system. **THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE. SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.** No person is authorized to make any representation or warranty on behalf of SolarRoofs.com or any of its dealers other than as set forth herein.

COLLECTOR TEMPERATURE CONSIDERATIONS, LIMITATIONS, CONDITIONS and INSTRUCTIONS:

FREEZE CONDITIONS: The SolarRoofs.com's closed loop Propylene Glycol Antifreeze heat exchange system's collector as well as feed and return lines, when properly installed, will not be damaged by (ambient) hard freeze temperatures as low as 60 degrees F below zero. In freezing situations, the solar storage tank (and drainback tank if included) must be kept in an area above 32 degrees F.

All open loop system (street pressurized water in the collector) collectors, components and lines, whether they include freeze protection devices or not, are not covered for

freeze damage and their solar loop should be fully drained in hard freeze conditions.

Open loop (collector continually open to street pressure water), serpentine copper absorber collectors with "Thermal Freeze Valves" are generally considered to be protected in light and very infrequent (1 to 4 times per year) freeze conditions for temperatures as low as 30 degrees F. Serpentine copper absorber collectors with "Thermal Freeze Valves" and Differential Control Recirculation freeze protection are generally considered to be protected in light and infrequent (4 to 12 times per year) freeze conditions for temperatures as low as 20 degrees F as long as 110v power remains on.

The "serpentine" absorber in a "Fireball 2001" is less likely to freeze than a "parallel flow" absorber with multiple risers. This is because equal flow is present in all tubes where it could be unequal to non existent in some of the tubes in the multiple risers of a parallel flow system.

A "Thermal Freeze Valve" starts to open at about 38 degrees F allowing a small amount of water to flow out on the roof thus causing water to flow up from the bottom of the storage tank, through the absorber, and out onto the roof as long as temperatures remain low.

A "Thermal Freeze Valves" including a Differential Control Recirculation freeze protection system also causes water to flow out onto the roof as above but in addition causes the pump to continuously circulate water at a greater rate of flow in the entire solar loop from the bottom of the tank and back to the lower part of the tank as long as the power is on. Naturally the lower part of the tank can get very cold in the process. Having the element on gives further protection in freezing temperatures.

HARD FREEZE WARNING For Open Loop Systems

If unusual freeze conditions are predicted, it is recommended that the solar the pump turned off, solar loop isolation valves be closed, the solar hose bibs opened and fully drained into a bucket. After this, connect a short section of laundry hose to the "hot return line" hose bib and blow into it until all residual water in the absorber is out and air flows freely out the "cool feed line" hose bib. See Installation Manual as well as Operation and Maintenance Manual for further details.

HIGH TEMPERATURES

The Fireball 2001 collector will not be damaged by stagnation in ambient temperatures as high as 116.