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“Skyline” Closed Loop System 5

Models: “200152C80EX”, “200153C80EX” and “200154C80EX”

SRCC OG300 Rated Systems

(Skyline, formerly Fireball)

Operation and Maintenance Manual

April 2006



The solar energy system described by this manual, when properly installed and maintained meets or Exceeds the minimum standards established by the Solar Rating and Certification Corporation (SRCC) and the collectors meet or exceed SRCC OG100 and FSEC minimum standards. This certification does not imply endorsement or warranty of this product by SRCC or FSEC. (Note: SkyLine formerly Fireball)

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 Patented “Skyline” 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 "SkyLine" 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 in the top of the 80EX tank can act 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 hard freeze climates, a 60 sq/ft system should supply about 65% of a family of four's yearly hot water needs. In milder climates, a 40sq/ft system will usually supply 65% or better.

1.1 MAINTENANCE SUMMARY

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

Item	Maintenance
1. Hard Freeze Condition	-Closed Loop Freeze Proof Systems 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	-12 Volt pump, no regular maintenance required. See "Component Detail" and "Trouble Shooting" sections. See 3.4.
6. PV Panel	- No regular maintenance required. See "Component Detail"

1.11 Freeze Tolerance Limitations and Instructions

FREEZE TOLERANCE LIMITS ARE BASED UPON AN ASSUMED SET OF ENVIRONMENTAL CONDITIONS

CLOSED LOOP SYSTEM 5 FREEZE CONDITIONS

The SolarRoofs.com's closed loop Propylene Glycol Antifreeze heat exchange system's collector as well as feed and return lines will not be damaged by (ambient) hard freeze temperatures as low as -54 degrees F below zero with a 60/40 mixture of

propylene glycol/water. The solar storage tank must be kept in an area above 32 degrees F.

HIGH TEMPERATURES

The SkyLine collector will not be damaged by stagnation in ambient temperatures as high as 120F

1.2 Systems Covered, Specifications and System Schematics

The following Systems, Components and Options are Wholly or Partly Covered in this Manual

Standard Color for all systems Musket Brown. See Options for Colors.

System 5. Complete 20 Square Foot (1.86 m²), 20" x 12' (.508 m x 3.66 m), Solar Panel with mounting kit and Rails, **12 Volt PV Powered Circulator + Complete Rheem Double Wall Heat Exchanger Tank Connections.** These advanced 12V PV powered systems have matched PV Panels and Pumps for best operation. 2 collector system includes ElSid Circulator with 11 Watt PV Panel, A larger 12V Electronic Circulator and 21 Watt PV Panel is used for 3 or 4 collectors, with 25' of wire, 50' - 1/2" OD Copper connecting line, all line connections, Collector Air Vent and Pressure Relief Valve, Temperature Gauge, Install Kit, full instructions, Owners Manual. Includes Expansion Tank and all Connections. Full instructions and modified hardware included.

Two, Three and Four Collectors

Tilt Kit (option) Tilts collectors approximately 18 degrees from existing roof angle, Other angles available on request. Tilt kits are used when a better winter angle is desired on a low pitch roof or to "re-orientate" panels to face south by running the panels up and down an East or West facing roof.

Single Panel: Collector kit with 3 Modified 24" brackets with 6" legs and hardware:

(Option Code /#TKSF01) Single panel tilt kit:

Double panels: Collector kit 3 - 4' Heavy Alum. channels with 12" legs and hardware:

(Option Code /#TKSF02) Double panel tilt kit:

Collector COLOR Options - Optional Colors Include: Colonial Gray, Tahoe Blue(CI03), Colonial Red (CI04), Forest Green (CI05), White (CI06) as well as other attractive colors
(Option Code /Co##): Optional Colors - Each Collector:

Components (for individual purchase):

SkyLine 2001 Collector with 6 Ell brackets:

MVWA, Watts Mixing Valve:

HE80, Full connections for the 80 gallon Rheem / Rudd heat exchanger, pre-assembly with 1 floating check valve, charging hose bib ports with isolation valve, pressure gauge, expansion tank:

TC01, Taco 006 110V Circulator:

ES10, El Sid 10 Watt 12V Circulator:

HC18, Hartel 18 Watt 12V Circulator:

PV11, UniSolar 11 Watt 12V Panel:

PV21, UniSolar 21 Watt 12V Panel:

PR75, 75 Pound Pressure Relief Valve:

CV01, Floating Ball Check Valve:

TR50, 50 foot roll of 3/8" ID, 1/2" OD soft copper tubing includes 2 compression unions:

"SkyLine 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 unions.
Glazing:	.236" (6.0 mm) Twinwall Polycarbonate UV Treated
Dimension / Weight:	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

PV (Photovoltaic) POWERED CIRCULATOR

PV Panel:	11 or 21 Watt, 12volt DC
Circulator:	12 Volt - "El Sid", 12 Volt Hartell or equal.

FREEZE PROTECTION

Type: Closed Loop Glycol with Storage Tank Heat Exchanger. Sierra Antifreeze-Coolant, Propylene Glycol.
The SolarRoofs.com's closed loop Propylene Glycol Antifreeze heat exchange system's collector as well as feed and return lines will not be damaged by (ambient) hard freeze temperatures as low as -54 degrees F below zero with a 60/40 mixture of propylene glycol/water. The solar storage tank must be kept in an area above 32 degrees F.

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 Heat Exchanger)
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STORAGE TANK - Rheem / Rudd (Not Supplied)

	80 Gallon Tank with In Tank Double Wall Heat Exchanger.
Fluid Used:	Propylene Glycol (Sierra)
Components Supplied:	Expansion Tank, one floating ball check valve, Temperature Gauge, fill, drain, and pressure relief valves.

CONTROL

Type:	12 Volt Circulator with Switch, which automatically regulates circulator operation.
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Although we will make every effort to give notice, Specifications and prices subject to change without notice.

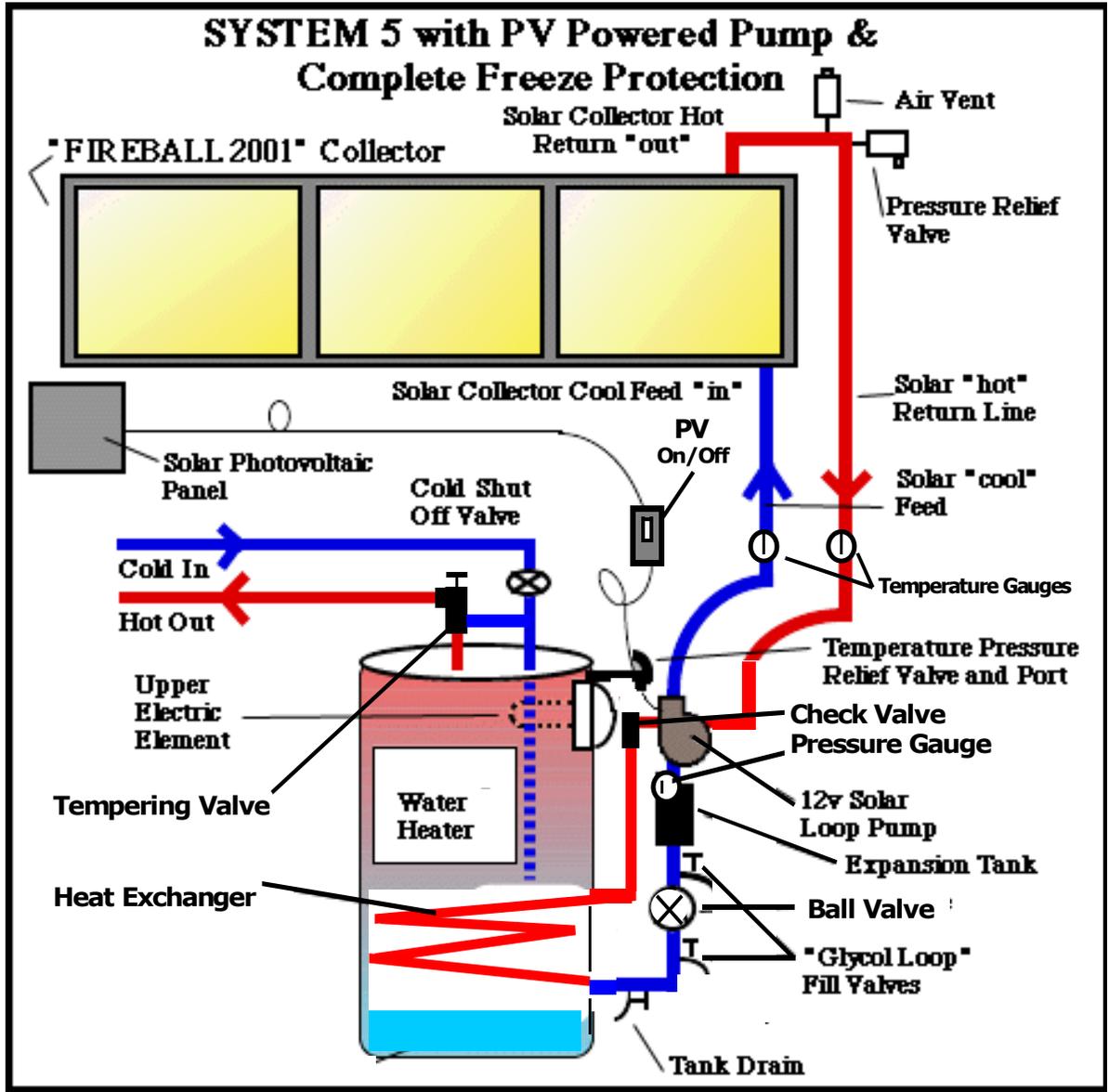
1.3 Antifreeze Safety Data - - Sierra Antifreeze-Coolant

FLUID HANDLING, SAFETY AND FIRST AID:

1. Store fluid in tightly closed and properly vented containers, away from heat, sparks or open flame. Dispose of any aqueous waste at permitted landfill sites only.
2. Chemical splash goggles or full face shield must be worn when possible eye contact exists.
3. Ingestion: Give pint of luke warm water or induce vomiting if large quantity is ingested.
4. EMERGENCY PHONE: 1-800-424-9300 (CHEMTREC)

Freezing point:	-28 deg F (50/50 mixture)
Flash Point:	211F
Boiling point:	365 deg F
Appearance:	Green
Specific Gravity:	1.04
Vapor Density:	2.6

SYSTEM 5 with PV Powered Pump & Complete Freeze Protection



2.0 SYSTEM OPERATION

MAJOR COMPONENTS:

(A 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**: This system comes standard with Photovoltaic (PV) power. The pump simply turns on and off during normal sun hours.
- D) **Freeze Protection and Line Connections.**
- E) The **SOLAR STORAGE TANK.**

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, back and trim are made out of bent 27 mil aluminum. Special steel Hex screws and aluminum rivets are used as connectors.

High quality 1" foil faced polyisocyanurate foam core insulation is used under the absorber and 1/2" is used on the sides.

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 FREEZE PROTECTION HEAT EXCHANGER

"Double walled" Heat Exchanger in the Rheem Storage Tank 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 that wrap around the tank 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 with roof splash guard, and an air vent to allow any trapped air to escape at the high point of the solar loop.

3.3 SOLAR STORAGE TANK

The Rheem Storage Tank Mdl# RH-81V080HE1 must be purchased from your local supplier.

3.4 PUMP:

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.

4.0 OVERVIEW of PROCEDURES FOR INSTALLATION

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

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

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

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, if collector is a two piece unit, 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.

5. Water Heater Element turned off, water drained, old tank removed, 80 Gal Heat Exchanger tank installed, water connections made including tempering valve, collector cool feed (from pump) and hot return lines connected by compression union.

6. Water heater filled, solar loop purged of air, pump switch connected to PV wire, solar loop charged with Propylene Glycol per instructions, finish insulating lines, Element connected and turned on.

5.0 VERIFICATION OF OPERATION

Check the two temperature gauges when system is operating on a sunny day. The temperature gauge on the line returning from the collector should show a higher temperature than the temperature indicated on the line going to the collector from the tank.

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. Storage Tank - 80 Gal Rheem HE	Flush a few gallons out twice a year. Change propylene glycol every 5 years
3. 12 Volt Pump	No annual maintenance. See "Component detail" and "Trouble shooting."

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 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 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 DRAIN at the very bottom of the tank.
- 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):

6.5 The following procedure is recommended.

Allow a very slight drip out of one hot water faucet.

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

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

Turn off power to tank element at fuse box.

7.0 EMERGENCY SHUT- DOWN PROCEDURES

7.1 TO TURN OFF SOLAR SYSTEM: Move Pump switch to "OFF" position.

7.2 TO TURN OFF WATER HEATING SYSTEM:

1. WARNING: Shut-off power 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 tank.

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 tank. 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.

8.3 PUMP:

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 glycol charge (should be at least 25 pounds) and recharge as needed.

Problem: Pump shuts off too early or too late.

Procedure:

Check on the placement or condition PV Panel.

9.0 QUESTIONS

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

off the electricity in sunny weather.

An 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

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

SolarRoofs.com Inc.

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Phone: (888) 801-9060 (916) 481-7200 Fax: 481-7203

Email: Info@SolarRoofs.com Web: www.SolarRoofs.com

"Skyline" 20-01 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:

Percent of Original Suggested Retail

Year of Claim
1-5
6-7
7-8
9-10

Price Pro-Rated Towards Replacement

100%
90%
80%
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:

Percent of Original Suggested Retail Year of Claim
1-5
6-10

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 it's 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 will not be damaged by (ambient) hard freeze temperatures as low as -54 degrees F below zero with a 60/40 mixture of propylene glycol/water.

The solar storage tank must be kept in an area above 32 degrees F.

See Installation Manual as well as Operation and Maintenance Manual for further details.

HIGH TEMPERATURES

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