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SRCC OG100 and FSEC Rated Collectors

Operations and Maintenance Manual for the "Skyline" 20-01 Collector



April 2006 (Note: Skyline was formerly called Fireball)

The solar energy system described by this manual, when properly installed and maintained, meets the minimum standards established by the SRCC. This certification does not imply endorsement or warranty of this product by SRCC.

"The solar energy system described by this manual, when properly installed and maintained, meets the minimum standards established by the Florida Solar Energy Center, in accordance with Section 377.705, Florida Statutes. This certification does not imply endorsement or warranty of this product by the Florida Solar Energy Center or the state of Florida."

CONGRATULATIONS!

You have just purchased the most attractive and easiest to install collector made! We have worked on every detail to assure you that the "Skyline" 20-01 collector will completely satisfy you in its very high level of performance and dependability.

Freeze Considerations, Limitations and Instructions

"Freeze tolerance limits are based upon an assumed set of environmental conditions"

"Extended periods of cold weather, including ambient air temperatures above the specified limit, may cause freezing in exposed parts of the system. It is the owner's responsibility to protect the system in accordance with the Supplier's instructions if the air temperature is anticipated to approach the specified freeze tolerance limit."

Freeze Conditions:

For "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. Collectors must be installed LEVEL to the ground for good drainage.

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. 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 or backup 12Volt power remains on, for up to 8 hours.

The "serpentine" absorber in "Skyline" 2001 horizontal mount collectors is less likely to freeze than a "parallel flow" absorber with multiple risers. This is because water flows through only one tube in a serpentine absorber unlike a parallel flow absorber where the flow could be unequal to non-existent in some of the tubes.

Skyline 2001 with Freeze Valve:

A "Thermal Freeze Valve" starts to open at about 40 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 Valve" including a freeze sensor and transformer (or 12 volt battery) for **Recirculation freeze protection** also causes water to flow out onto the roof as above but in addition causes the circulator 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 IS EXPECTED (Temperatures below 20F for system 3), OR LOSS OF POWER IS EXPECTED, YOU MUST DO THE

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.

EXPLANATION OF COMPONENTS

1 COLLECTOR:

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

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. 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 with state of the art UV treatment. It is factory guaranteed for 10 years against yellowing and has a useful life expectancy in excess of 15 years.

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 painted steel Hex screws and aluminum rivets are used as connectors. High quality 1" foil faced polyisocyanurate foam core insulation is used for the backboard.

1.3 ABSORBER:

The solar absorber, so called because it absorbs the sun's energy, is a proven all copper, "serpentine" or (Parallel flow for tilt kits) flow design with the highest quality "selective surface" black absorber coating available.

FOLLOWING:

- 1. Turn the solar the circulator off,**
- 2. Close the TWO solar loop isolation valves,**
- 3. Open the TWO solar loop hose bib drains and fully drain into a bucket. Caution, water may be hot! (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.**

HIGH TEMPERATURES

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

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. Tilt and Reorientation Tilt kits are 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.

1 THE BASIC COLLECTOR INSTALLATION STEPS

1. Unpack collector. If a split kits, if split kit, assemble the collector left and right sections into one unit.

2. Collector placement LEVEL 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 installed in collector hot outlet, PV panel mounted, PV and sensor wires connected and run to water heater area. 1/2" wall high temperature Insulation partly installed before tubing connections are made.

B. Look to see that the temperature reading on the collector Hot Return line has a higher reading than the temperature on the solar Feed line. During a sunny warm day the temperatures should get will over 100 degrees F, which verifies that the solar system is operating solely from the sun.

START UP and VERIFICATION OF OPERATION

START UP: Turn the pump switch to on, if the Sun is out, the pump should run quietly and the temperature on the Thermometer from the collector should start to go up. If the collectors were stagnating (in the hot sun for a period of time) the incoming pipe could get very hot. After a period of 20 - 25 minutes or so the two temperature gauges should stabilize and be with in 40 degrees of each other depending on how cold the tank water is and how intense the sun.

VERIFICATION OF OPERATION:

A. Pick a sunny time between 10AM and 2PM with the circulator on.

MAINTENANCE DETAILS

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

1 SUMMARY:

Item	Maintenance
1. Collector Glazing	Annual visual inspection from the ground.
2. Backup Storage Tank	Leave the water pressure on, twice a year Flush out a few gallons of water from the drain valve until the water runs clear. CAUTION: water may be hot!
3. "Quick Connect"	No annual maintenance.
4. Circulator	12 Volt: No regular maintenance required. See "Component Detail" and "Trouble Shooting" sections.

2 COLLECTOR GLAZING:

Annual visual inspection from the ground. Collector should be "self cleaning" by rain. 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 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.

3 FLUSHING THE STORAGE TANK EVERY SIX MONTHS:

- 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. (do this process to the backup tank)
- C. Open Valve Fully under pressure.
- D. Drain several gallons of water, to carry out sediment that accumulates.
- E. Close valve when water runs clear & remove hose.

4 INSTRUCTIONS FOR LEAVING FOR LONG PERIODS (Optional for two weeks or more in summer weather): The following procedure is recommended.

Turn water heater electric or gas off at the breaker. Allow a very small dribble of hot water to flow from one faucet to allow cold water to enter the water heater giving the system "work" to do.

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 backup tank element at fuse box or put gas heater in Pilot or Off position.

EMERGENCY SHUT- DOWN PROCEDURES

1 TO TURN OFF SOLAR SYSTEM: Switch "OFF" the PV Panel from Circulator.

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.

CAUTION! WHEN SHUTTING DOWN IN COLD WEATHER BE SURE TO DRAIN AND "BLOW OUT" solar loop to FREEZE prevent damage the collectors!

TROUBLE SHOOTING GUIDE

1 COLLECTOR:

Problem: Hazy Appearance:

Procedure: This could occur for several reasons. The collector could be very dirty See 6.2. Water can condense on the glazing when temperature differences occur on an exposed surface or after heavy rains, allow collector to fully dry out in the sun.

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. It is best to remove the lag, fill hole and relag.

QUESTIONS AND ANSWERS:

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.

WHAT ABOUT FREEZE PROTECTION?

The SolarRoofs.com's closed loop Thermosyphon 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.

WHAT ABOUT HIGH TEMPERATURES?

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

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 Polycarbonate 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.

Limited Warranty

SolarRoofs.com

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"Skyline" 20-01 10 Year Limited Warranty (Skyline, formerly Fireball)

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 ninety (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	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:

Percent of Original Suggested Retail:	
Year of Claim	Price Pro-Rated Towards Replacement
1-5	100%
6-10	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, when properly installed, will not be damaged by (ambient) hard freeze temperatures as low as 54 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 "Skyline" 20-01 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.

If unusual freeze conditions are predicted with an OPEN LOOP System:

it is **VITAL** 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 Skyline 20-01 collector will not be damaged by stagnation in ambient temperatures as high as 116.