

# Affordable Solar Contracting #C-20674

Congratulations! We gratefully appreciate your decision to "go solar". Your new solar water heating system will save, on average, eight barrels of imported oil each year of its useful life and also reduce your electric bill. Hawaii's 60,000 installed solar water heating systems currently save homeowners more than \$36,000,000 **each year** in residential utility costs. These savings are spent in Hawaii and thereby strengthen our economy. Replacing imported oil and coal with non-polluting renewable energy resources such as solar and wind energy also benefits and preserves Hawaii's most important asset - our environment.

Thank you also for selecting Hawaii's most popular solar equipment package, anchored by top of the line SunEarth solar collectors. Each component in your system has a long track record for reliable performance in our corrosive marine environment.

## 1) Primary System Components and Operational Principle

There are seven key components in your solar water heating system. These include the solar collector(s), collector mounting hardware and stainless steel fasteners, storage tank, differential temperature thermostat (controller), circulation pump, tank thermometer and time clock. In some systems the Goldline control and Grundfos circulating pump will be replaced with a "photovoltaic" solar module which produces 12 volt DC current and a 12 VDC circulating pump.

The high performance SunEarth solar collector(s) is the heart of your solar system. Simply stated, when the sun is shining, heat energy is absorbed by the collector's all copper absorber plate and transferred to the water circulating through the absorber plate piping. As this process is repeated during the average sunny day the temperature of the water in your storage tank will rise.

Systems installed with Goldline controllers and Grundfos circulating pumps operate on the principle of "differential temperature." The Goldline controller constantly senses the temperature difference between the hottest and coldest points in the system. The control automatically cycles the pump on and off during the day depending upon how much solar energy can be gained by each pass through the collector absorber plate. When there is very little additional heat to be gained, the control turns off the pump until the next morning. Under no circumstance should the pump be circulating at night.

Those systems which substitute a photovoltaic module and 12 VDC pump operate on a different principle. As sunlight strikes the photovoltaic module mounted on the roof near your collector an electrical current is set up which causes your 12 VDC pump to circulate. The intensity of the sunlight determines the speed at which the pump turns. In general, the sunnier and cloudless the weather, the better the system performance.

Regardless of which type of pumping system you have chosen, the circulating

pump may run constantly for hours at a time or intermittently throughout the day depending upon the demand for hot water, the weather, or the time of year. All Grundfos circulating pumps are water cooled and lubricated. It is not uncommon for the water passing through the pump to be 150 degrees F or warmer. Do not be alarmed if the pump is warm to the touch. This is quite normal.

Depending upon the system demand and the weather there may be times during the year when back-up utility power will be required to raise the tank temperature to a comfortable level. Your Ruud solar storage tank comes equipped with an auxiliary electric heating element for such occasions. The time clock installed with your system allows for either manual or automatic activation of the storage tank's electrical heating element. Check the tank thermometer to determine the usable temperature in the upper portion of your solar storage tank.

A basic system drawing is attached which describes and locates the key component parts of your solar system. The drawing depicts the **minimum** required equipment. Your system may include additional features and component parts.

## 2) Routine Maintenance Procedures

1) The most important component in your system, at least from a longevity standpoint, is often ignored and never seen. We are referring to the "sacrificial" magnesium anode rod installed in your Ruud solar storage tank. Anode rods are installed in all

glass lined water heaters and storage tanks to inhibit corrosion.

As the name implies, the "sacrificial" anode rod is consumed so that the tank lining is not. At a certain point in the process, however, the anode rod is no longer completely effective and the corrosive processes begin to eat away at the tank's glass lining. In time the storage tank, like any other kind of water heater, will begin to leak. The process is not reversible and the storage tank then must be replaced.

By changing the anode rod every five years you can usually extend the life of the Ruud solar storage tank. In Hawaii the annual average tank temperature is the primary determinant of tank life. The hotter the water, the faster the rate of internal corrosion in the storage tank. If your average annual system temperature is above 150 degrees F, you may want to think about an anode rod replacement every three or four years.

2) The solar storage tank also should be flushed annually to minimize sediment build-up on the bottom of the tank. If you live in an area with high mineral content in your water, flush the tank on a semi-annual basis.

3) If you live in a dusty area it is beneficial to overall system performance to periodically wash off any dirt that has settled on the collector glass.

4) Visually inspect the exterior pipe insulation annually and patch or repair any exposed surfaces or degraded areas. Repaint all exterior rubber insulation with a high quality latex paint

as needed. Two coats should be applied.

5) In the unusual instance of collector glass breakage, replace the glass immediately. This will reduce the likelihood of water accumulating in the collector box and deteriorating the insulation.

### **3) Emergency Maintenance Procedures**

Although very few things can happen to a solar water heating system which constitute an "emergency", there are occasions when you might have to shut down your system. Upon completion of the procedures detailed below call immediately for service.

1) The tank ruptures or is leaking: Turn off the circuit breaker to the solar storage tank. Close the cold water supply line isolation ball valve. This line serves the port on the top of your Ruud solar storage tank marked "Cold". This step will isolate your storage tank from the city water supply. Unplug your controller from the 120 volt wall receptacle. This will disarm the circulating pump.

2) Water is running off the roof: Unplug your controller from the 120 volt wall receptacle. Close the two isolation ball valves located in the collector supply and return lines. In most cases these valves will be located directly below the drain valves in either line. By closing these ball valves you will isolate the collectors from the tank and prevent any more water from entering the collectors.

### **4) Procedures For Vacation Or Extended Periods Of System Disuse**

Solar water heating systems can build up very high temperatures which can be detrimental to the primary components if the system is left unattended for long periods of time. There are at least two ways to deal this condition.

1) If the home will be unoccupied for a month or less, and your system is equipped with a Grundfos pump and Goldline controller, simply set the controller to the "ON" setting. This will run the pump twenty-four hours a day and cool off the solar heated water at night. The collector(s) will radiate heat to the atmosphere at night providing a very effective balance and preventing overheating. This will in no way harm the pump or add substantially to your electric bill.

2) For extended absences it is advisable to either drain the collector(s) or cover them with a heavy opaque material. If the system is completely drained remember that the controller must be set in the "OFF" position. Also make sure that the time clock is in the "OFF" position and that the timer "trippers" are not preset to turn the timer on and off during your absence.

### **5) What To Do If You Are Moving Into A New Home With A Solar Water Heating System**

In newly constructed homes your solar water heating system may not be operational when the home is "turned over." To ensure proper operation of your system you will need to perform three simple steps.

Step One: Check to see that the circulating pump is plugged into the power receptacle on the right hand side

of the Goldline differential controller mounted either on the wall or storage tank. The controller, in turn, must be plugged into a nearby 120 volt wall receptacle.

Step Two: The Goldline control has three setting options. These options are "ON", "OFF", and "AUTOMATIC". Remove the two screws which hold the plastic faceplate on the front of the control. Set the function labeled "SYSTEM TEST SWITCH" to the center, or "AUTOMATIC" setting.

At the same time check to see that the red dial marked "ON DIFFERENTIAL" is set to approximately 12. Turn carefully by hand to the correct position.

Disable the "HIGH LIMIT" setting by turning the red dial to the 200 setting. The high limit should not be set any lower on your solar system.

Replace the control faceplate. The system is now activated and set for automatic operation. The red LED indicator on the bottom of the controller marked "POWER" should always be on. The LED marked "1" will be on when the solar system is collecting solar energy. The LED marked "2" should never be on.

Step Three: Your system will be equipped with an electric time switch which is used to activate the 4500 Watt electric heating element in your Ruud solar tank. The time switch can be preset to go "ON" and "OFF" during brief periods of the day if necessary or desired. **Do not** use the house water heater circuit breaker as an on/off switch. Your timer performs this function.

To set the time of day and "trippers" read the instructions inside the timer box. If you experience a power outage, the time must be manually reset.

Many homeowners attach the "OFF" tripper to the time switch dial but not the "ON" tripper. If the switch is used infrequently to manually activate the electric heating element, this will ensure that the timer will be turned off within twenty-four hours even if you forget to do so by hand. This will save money on utility bills.

**Remember:** Your solar water heating system was installed to substantially reduce your dependence upon conventional utility generated electricity to heat your water and to save you money. Your timer should be in the "OFF" position most of the time.

## 6) System Warranty

Your system is covered by a full one year labor warranty from the date of Hawaiian Electric Company's acceptance of this installation. Individual component warranties are as specified by the manufacturer.