NORTH CAROLINA
SOLAR CENTER

SOLAR CENTER INFORMATION

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Troubleshooting Your Solar Water Heating System

When hot water is used in a home, it is often difficult to know whether it was heated by the sun or by an auxiliary water heater. Some solar water heating systems may have indicators which show when there is a problem, but many do not. This fact sheet is designed to help the homeowner determine whether or not their solar water heating system is working properly and, if not, some possible steps to remedy the problem. For those that are uncomfortable with small repairs, any reference to remedies requiring repair work should be referred to a repair contractor. Lists of repair contractors are available from the North Carolina Solar Center.

The first step in determining if a solar water heating system is operating properly is to turn off the auxiliary water heater. This is accomplished by turning off the circuit breaker to an electric unit or turning a gas unit to pilot or off. This test should not be attempted in winter months since the availability of solar energy is less and may cause a shortage of hot water even when the system is working properly. During periods of sunny weather and moderate hot water usage, most solar domestic water heating systems will be sufficient to handle the water heating needs of a typical home. If the auxiliary unit has been off for more than a day and bright sun is striking the collectors, the piping to and from the storage tank should be warm to the touch (or very hot--BE CAREFUL). This means that the collectors are supplying heat. If no heat is felt or significant shortages in hot water are experienced, it is likely there is a problem with the system.

The following is a listing of components contained in most solar systems which may be responsible for poor system performance:

Component	Possible Cause	Remedy/Check
Collectors	1. Partially shaded 2. Improper orientation 3. Improper tilt 4. Insufficient area 5. Improperly plumbed 6. Dirty glazing	1. Reduce shading or move collectors. 2. Check direction; face south +/- 45 degrees. 3. Check tilt; set equal to latitude +/- 15 degrees. 4. Install more collectors. 5. Compare with system schematic. 6. Clean--only when cool.
Differential Controller	1. Improper operation (cycling, late turn-on) 2. Improper wiring or loose connections 3. Faulty sensor wiring	1. Check sensor placement. Adjust for good contact with piping. Insulate from surrounding air. 2. Compare with system schematic. Check for proper connections. Tighten loose connections. 3. Check wiring for breaks, metal contact, water exposure and/or corrosion. Seal all splices.
Piping	1. High heat losses 2. Nighttime thermosiphoning 3. Improperly plumbed 4. Isolation valves closed 5. Flow blockage 6. Low system pressure	1. Check insulation for splits, deterioration, absence. 2. Check if collector pipes are warm at night. Check for pump running at night. Contact installer. 3. Compare with system schematic. Check flow direction. 4. Open valves. 5. Flush system. Check effluent for dirt/scale. 6. Check pressure gauge. Refer to owner's manual for correct pressure.
Pump	1. No power 2. Faulty pump 3. Runs continuously 4. Improperly installed	1. Check breaker, pump cord, controller fuse--if any. 2. Listen for irregular noises in pump operation. Feel pipes for temperature difference. Pipe returning from collectors should be warmer than pipe going to collectors. 3. Check control system for breaks and shorts. 4. Compare with system schematic.
Tank	1. Insufficient size 2. High storage losses	1. Tank should have roughly 1.5 gallons of storage per square foot of solar collector area 2. Check insulation and location of tank.

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For more specific symptoms and remedies, the following is a list which may help pinpoint specific problems:

Symptom	Component	Possible Cause	Remedy/Check
Pump runs continuously	Controller	1. Controller in "on" position 2. Shorted or open sensor wire	1. Turn to normal "run" or "auto" mode. 2. Check wiring for continuity. Repair or replace.
No hot water in morning	Check Valve	1. Stuck open (nighttime thermosiphoning)	1. Replace check valve.
	Controller	1. Sensor wires reversed	1. Check wiring and connect properly.
Noisy system	Pump	1. Bearings need lubrication 2. Air locked	1. Oil per manufacturer's recommendation. 2. Loosen vent screw, if any. Bleed air.
	Piping	1. Entrapped air (direct systems only) 2. Pipe vibration	1. Purge system by running water up supply pip and out drain on return line (isolation valves closed). 2. Isolate piping from walls.
Does not drain	Vacuum breaker/ Air vent	1. Dirty or stuck seat	1. Disassemble and clean. Replace if necessary.
	Piping	1. Insufficient slope 2. Air pockets	1. Check for vertical drop in all horizontal runs. 2. Check for high points in collector piping.
Fluid leak	Collectors	1. Burst due to freezing or excessive pressures	1. Isolate system, turn off collector and contact installer.
	Piping	1. Thermal expansion loosened connections	1. Tighten adjustable connections.
	Valves	1. Valve gland nuts loose 2. Seats deteriorated	1. Tighten nuts. Replace seal/packing if necessary. 2. Replace seat washers. Redress seat. Replace valve if necessary.
High electric use	Tank	1. Lower element connected 2. Thermostat set too high	1. Check wiring. Contact installer if necessary. 2. Check setting and adjust to desired temperature.
	Piping	1. Collector return above tank thermostat	1. Check tank plumbing. Contact installer if necessary.

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