



enerworks
Solar Heating and Cooling

Owner Manual

Pre-Heat Appliances Single Wall Heat Exchanger

(EWRA1, EWRA2)



232023

Pre-Heat Appliances Double Wall Heat Exchanger

(EWRA1-DWHX, EWRA2-DWHX)



232023



Single-Tank Appliances (USA only)

(EWRA1-ST, EWRA2-ST, EWRA1-DWHX-ST, EWRA2-DWHX-ST)



Solar Water Heating Appliances

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CALIFORNIA PROPOSITION 65 WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

 **Recognize this symbol as an indication of important safety information!**

 **EnerWorks Residential Solar Water Heating Appliances must be installed as directed by this manual by an EnerWorks-authorized dealer or warranty is void.**

WELCOME TO THE RENEWABLE ENERGY GENERATION!

Thank you for purchasing the EnerWorks Solar Water Heating Appliance. Investing in the EnerWorks Solar Water Heating Appliance is a decision you can feel good about. Solar thermal technology will significantly reduce your energy costs. It will also reduce your dependency on electricity or fossil fuels and the associated emissions.

This manual explains the operation of the EnerWorks Pre-Heat and Single-Tank Solar Water Heating Appliances, details their features and benefits; and describes service and maintenance requirements.

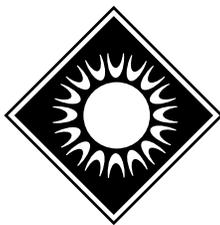
With the assistance of your EnerWorks-authorized dealer, please fully complete the included Product & Installation Registration Form. Keep the original for your records and ensure a copy is submitted to EnerWorks by fax, mail or e-mail. All information is kept strictly confidential. Your EnerWorks authorized dealer may also be able to enter the registration information online.

The included Maintenance Log should remain with the Appliance. With the initial installation and when service is performed on your Appliance, please have your EnerWorks-authorized dealer complete a log entry. Registration and log information is very important to ensure you receive timely and effective service.

The EnerWorks Solar Collector is one of the highest-rated in North America. This assessment was carried out by third-party testing under the supervision and scrutiny of the Solar Rating & Certification Corporation™ (SRCC™). The EnerWorks Solar Collector has SRCC™ OG-100 certification (Certification #: 100-2005-014A) and the EnerWorks Single Wall and Double Wall Heat Exchanger Appliances are certified to OG-300 standards. The OG-300 rating is on the back page of this manual. The installer should have checked off the appropriate model. This certification does not imply endorsement or warranty of these products by the SRCC™.

The Single Wall Heat Exchanger Pre-Heat Appliance and Single Tank described in this manual, when properly installed and maintained, meets or exceeds the standards established by the Florida Solar Energy Center (FSEC), 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.

The EnerWorks Pre-Heat Appliance is the first system in North America to achieve the Canadian Standards Association (CSA) certification (CSA F379.1). This certification does not imply endorsement or warranty by CSA.



232023



The EnerWorks Solar Water Heating Appliance must only be installed by an EnerWorks authorized dealer or warranty is void.



The installation of the EnerWorks Appliance involves plumbing to the domestic potable water. Local codes and legislation may require potable water plumbing to be completed only by a licensed plumber and/or electrical connections to be completed only by a licensed electrician. Building or plumbing permits and/or inspections may be necessary. It is the responsibility of the homeowner and of the installer to identify and to follow all local codes and regulations.

1.0 Solar Water Heater Appliance Description

1.1 How It Works

The EnerWorks Solar Water Heating Appliance has four main parts (Figs. 1 & 2) – the solar collectors, the line-set, the Energy Station and the solar storage tank.

The Energy Station uses a pump to circulate a heat-transfer fluid through the “collector loop”. This collector loop includes the solar collectors, the fluid lines or “line-set” and a heat exchanger. The collector loop is a “closed loop”, meaning there is no contact of the heat-transfer fluid with your potable water or with the atmosphere. The collector loop contains only a small volume of heat-transfer fluid which is freeze-protected. Though freeze protection may not be necessary in all areas, the heat-transfer fluid also has an elevated boiling point and so is suitable throughout North America.

When exposed to sunlight, the solar collectors get hot. As the heat-transfer fluid passes through the collectors, it absorbs heat and then travels down the line-set to the Energy Station. The hot fluid passes through the heat-exchanger and heat is transferred to your potable water. After giving up its heat to the potable water, the cool heat-transfer fluid is pumped back to the solar collectors to be heated again. Hot potable water is stored in the solar storage tank.

In the Pre-Heat Solar Water Heating Appliance (Fig. 1), the solar storage tank is a standard, North American, electric hot-water tank. No power is connected to this tank – it only stores solar-heated water. The solar storage tank is plumbed in series with the original water heater. Whenever hot water is used in the home, solar-heated water leaves the solar storage tank and enters the original water-heater. The original water-heater now requires much less energy for water heating.

Thus, the Solar Water Heating Appliance displaces energy, but it does not replace the original water-heater. The original heater guarantees hot water even under poor solar conditions (at night or when very cloudy). It also ensures that hot water is stored or supplied at an appropriate temperature to kill harmful bacteria. The acceptable temperature set-point is specified in local plumbing codes. Do not turn off or bypass the backup water heater. Even in summer months, additional heat from the backup heater may be required.

The Single-Tank Solar Water Heating Appliance (currently available only in the United States) incorporates solar water-heating and auxiliary water-heating in a single tank (Fig. 2). The Single-Tank Appliance is the solar solution for homes that cannot accommodate a solar storage tank in addition to their existing water-heater tank.

For more information please see section 6.0 Solar Water Heating Appliance Features.



The EnerWorks Solar Water Heating Appliance displaces energy used for heating water. It does not replace a water heater. An auxiliary water-heating unit must be in place to guarantee adequate temperatures to sterilize water as per local codes. The Single-Tank Appliance (USA only) incorporates solar and auxiliary water-heating in a single tank. Local codes dictate the mandatory set-point temperatures of these water-heaters and must be followed.

1.2 Pre-Heat Appliance Schematic

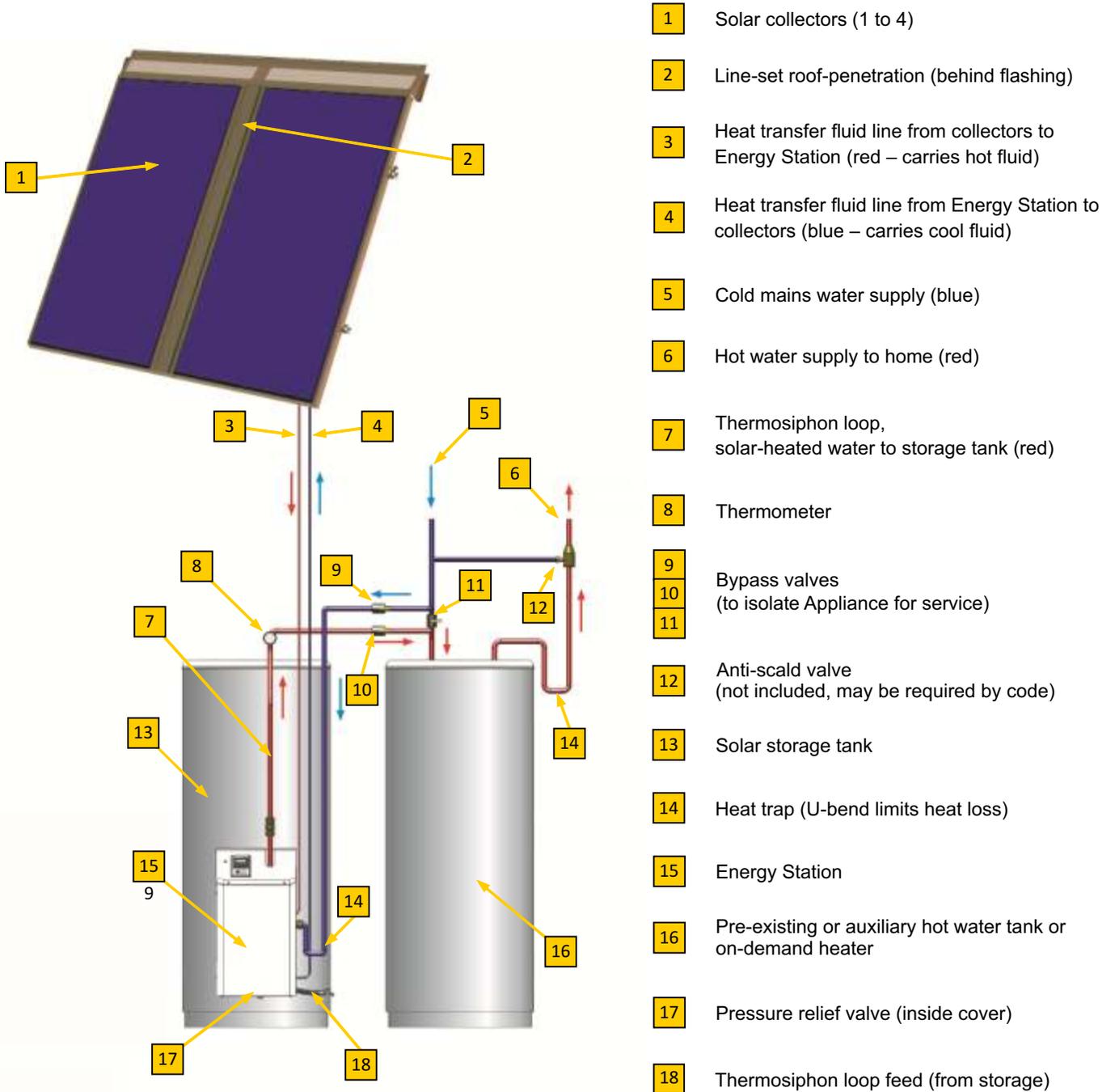


Fig. 1. EnerWorks Pre-Heat Solar Water Heating Appliance (with optional leaf-guard and energy monitoring).

1.3 Single-Tank Appliance Schematic (USA only)

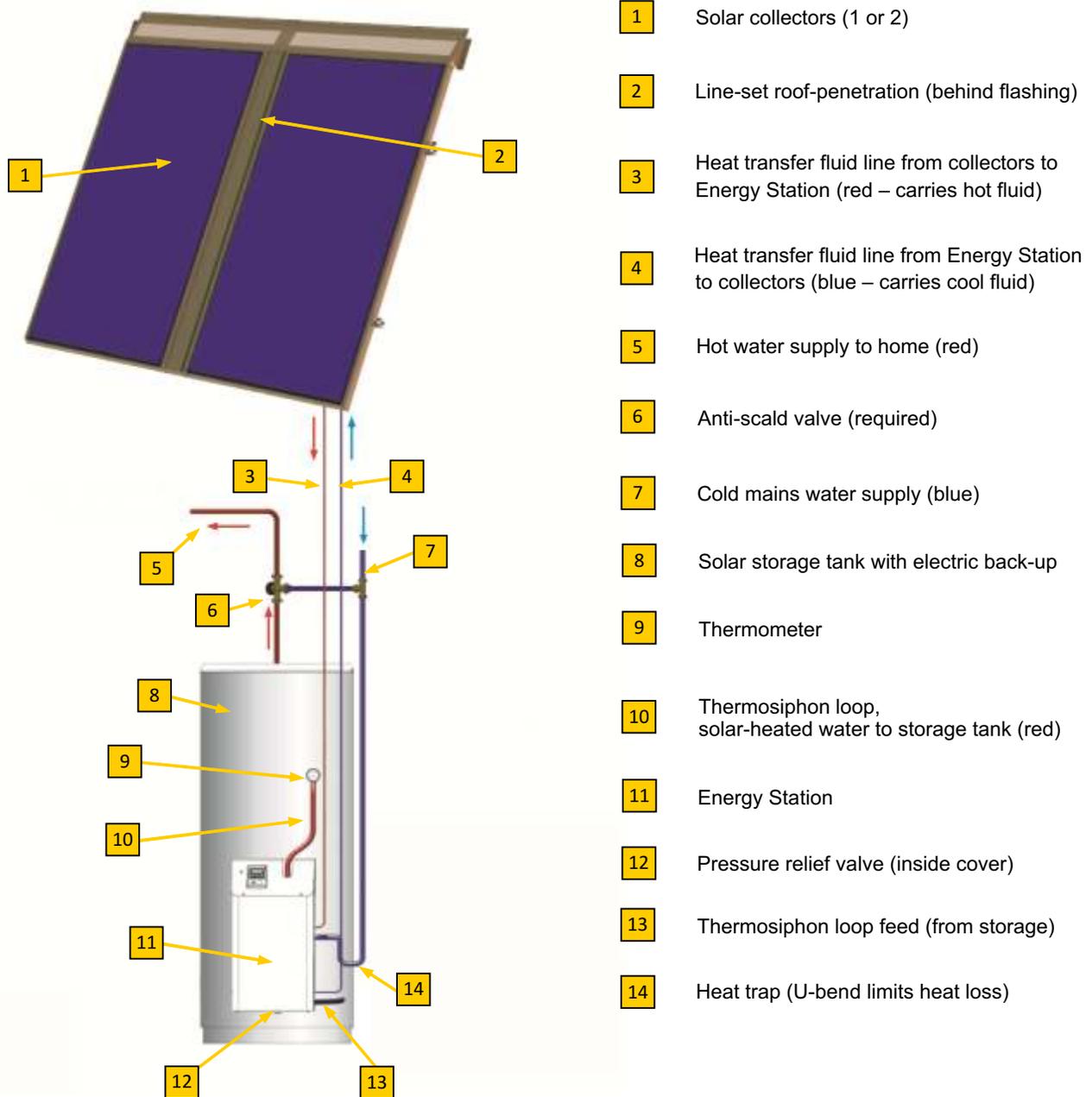


Fig. 2 EnerWorks Single-Tank Solar Water Heating Appliance (with optional leaf-guard and energy monitoring).

2.0 Safety, Installation and Operational Requirements

 **The installation of the EnerWorks Solar Water Heating Appliance requires specific knowledge and skill. An EnerWorks-authorized installer will be able to provide proof of successfully completing the EnerWorks Installation Training Program. Installation by individuals who are not EnerWorks-authorized will void the warranty.**

 **EnerWorks assumes no responsibility for damage, loss or injury related to improper installation, improper operation or modification of this Appliance.**

 **Improper installation, improper operation or modification of this Appliance will void the warranty.**

 **It is the responsibility of the installer and of the homeowner to ensure that all applicable building, plumbing, electric, and solar energy codes and permit requirements are observed.**

 **Observe any and all regulations relating to installation and operation of Solar Water Heating Appliances and to plumbing to potable water supply. A licensed plumber may be required for potable water connections. A licensed electrician may be required for electrical connections.**

 **Most jurisdictions require an anti-scald valve to be installed on the hot-water outlet of your water-heater. Ensure that this important safety device is properly installed and calibrated. An anti-scald valve is included with the Single Tank Appliance and must be properly installed on the hot-water outlet of the Single-Tank Appliance. EnerWorks strongly recommends the use of an anti-scald valve for use with the Pre-Heat Appliance even if not required by code.**

3.0 Water Quality

Water hardness affects the performance of shower heads, faucets, washing machines, dishwashers and hot water tanks. Hard water leads to mineral deposits and scale buildup that can limit water flow and damage your appliances.

A unique feature of the EnerWorks Solar Water Heating Appliance is its patented anti-fouling valve. Provided there is regular year-round use of hot water, this valve limits the formation of scale and mineral deposits and ensures that you will enjoy solar-heated hot water for years to come. See section 6.3 The EnerWorks Energy Station for more details.

Extremely hard water may negatively affect the performance and longevity of the EnerWorks Solar Water Heating Appliance. If your water hardness exceeds 12 grains per gallon (GPG), or 200 parts per million (ppm), a water softener must be installed such that water is softened before it passes through the EnerWorks Appliance (Note: This extreme level of hardness is unacceptable for most domestic use).

Before the Appliance is installed, determine the level of hardness of your water from your municipal water works. If this information is not available or if you are in a rural location, have your water hardness tested. Your dealer should do a water hardness test during the initial site survey.

High concentrations of iron and/or manganese (most often indicated by reddish and/or black deposits) must also be removed by filtration and treatment before the installation of the EnerWorks Solar Water Heating Appliance. Contact your local water treatment specialists for more information.

High concentrations of chlorine may damage the heat exchanger of the Solar Water Heating Appliance. If you or your municipal water works “shock” the water supply with high levels of chlorine, the EnerWorks Solar Water Heating Appliance must be isolated from the water supply until chlorine concentrations fall to acceptable potable water standards. **Do not run highly chlorinated water through the EnerWorks Solar Water Heating Appliance.** Alternatively, a carbon filter may be placed in the water line before the Solar Water Heating Appliance to eliminate high chlorine concentrations. Chlorine concentration cannot exceed 300 ppm.

 **If water hardness exceeds 12 GPG (200 ppm), a water-softener must be in line before the EnerWorks Appliance or warranty is void.**

 **In rural locations, water should not be shocked with chlorine, as high concentrations may damage the heat exchanger. The EnerWorks Solar Appliance must be by-passed until chlorine levels return to acceptable potable water standards. If this is not possible, a carbon filter must be placed in line to remove chlorine or the warranty is void.**

 **This EnerWorks Solar Appliance is intended for year-round use. The anti-fouling valve flushes the heat exchanger but only when hot water is being used. If use is limited, there is a greater potential for scale buildup.**

 **Ensure that power or gas supply and water supply to existing water-heater and to EnerWorks Solar Water Heating Appliance are off for installation, cleaning or service work.**

 **Assemblies and materials used during installation shall meet requirements of local, regional, state, provincial, and federal regulations and fire codes. Any penetrations made in drywall or any other firewall must be fixed to maintain integrity of fire protection.**

 **Use of heat transfer fluid other than a 50/50 mix by volume of Tyfocor Type L and neutral water (potable water quality, max 100 mg/kg chlorides, or demineralized water) is not permitted. Use of any heat-transfer fluid other than that specified by EnerWorks will void warranty, and may result in poor performance, equipment damage, or risk to health and safety.**



Do not touch solar collectors – they can get very hot. Do not remove insulation. Insulation limits heat-loss and helps achieve Appliance’s high performance. Insulation also prevents contact with hot parts.



DO NOT hammer, knock or use sharp objects such as snow shovels on solar collector glass. Do not spray water on collectors on a sunny day. Broken glass is not covered by warranty.

4.0 Appliance Operation And Maintenance

4.1 Appliance Operation

To turn on the Solar Water Heating Appliance, insert its power cord plug into a standard 120 VAC surge-protected electrical socket. A power bar with surge-protection may also be used.

The LCD screen will activate. Operation of the Solar Water Heating Appliance is automatic and the pump operation is controlled by the digital differential-temperature controller.

The Appliance includes a thermometer at the top of the thermosiphon loop. This shows the temperature of the solar-heated water and affirms that the Appliance is collecting solar energy.

Operation of the Appliance and its pump is automatic. But in the event of malfunction, to turn off or to shut down the Appliance, unplug its power cord or switch off the power bar.

4.2 Regular Maintenance

Regularly check the floor around the solar water-heating Appliance and storage tanks for leaks and listen for noise that is inconsistent with normal operation. If a leak or abnormal noise is detected, contact your installer. Also follow the regular maintenance directions of the storage tank manufacturer. Water-heater tank manufacturers suggest draining and/or flushing the tank at regular intervals to remove deposits.

Three years after commissioning, a service is required and the heat-transfer fluid must be checked. **Heat-transfer fluid must be checked at least every three years and changed if necessary.** Contact your installer for this important maintenance procedure and keep the receipt or work order with the Maintenance Log. This must be done to maintain warranty coverage. Though the fluid is of high quality and purity, it cycles through large temperature fluctuations and will start to degrade over time. If the fluid is left unchecked, its heat-transfer ability will diminish and Appliance performance will suffer. The fluid may also become acidic and prematurely corrode fluid lines and components.

4.3 Weather-Related Maintenance

1. Extremely high winds may damage trees and structures in the vicinity of the solar collectors. The collectors are extremely strong – eight adults can stand on the glass cover – but after a storm, EnerWorks recommends that an inspection of the installation be done. A qualified person with appropriate safety equipment should:

- a) Remove any debris that may have fallen onto the collectors.
 - b) Check and tighten bolts if necessary.
 - c) Check roof and wall penetrations for damage and repair as necessary.
2. The EnerWorks Solar Collectors, racks and mounting hardware are made of high-quality, corrosion-resistant galvanized steel. However, in coastal areas, salt spray may hasten the corrosion process. In coastal areas, regular maintenance should include hosing down collectors from the ground. Do not hose collectors down when they are hot. Only qualified persons with appropriate safety equipment should attempt getting on a roof.
3. After heavy snow falls and lack of sunshine, the collectors may be covered with snow.
- a) Snow and ice should not be removed with objects such as shovels – the collector glass could be damaged. **Glass breakage is not covered by warranty.** Collectors will quickly clear of snow once a small patch of the collector is exposed.
 - b) Do not pour water on collectors.
 - c) Snow shedding off a collector installed on a low-pitched roof may accumulate and lead to ice-damming. Remove snow from below collectors if necessary. Only qualified persons with appropriate safety equipment should attempt getting on a roof.
4. After a storm with freezing rain, collectors may be covered with ice. Do not attempt to clear collectors of ice.



If you are not able to contact or receive service from the EnerWorks-authorized installer or dealer that installed the EnerWorks Solar Water Heating Appliance, please contact EnerWorks through www.enerworks.com/contact-us/

5.0 Troubleshooting

The weather conditions for solar water heating are good, but the Appliance is not operating:

- a) If the digital display is off, is there electric power to the Appliance?
Check the fuse or breaker for the Appliance circuit and replace or reset if necessary. If the Appliance is plugged into a surge-protector or power-bar, the surge-protector or power-bar may need to be reset.
- b) The display is on and an error (“err”) is indicated. There is a temperature sensor fault. contact your EnerWorks-authorized dealer.

- c) An adequate temperature difference for operation is displayed. But the pump is off and there is no circulation between the collector and storage. Open a hot water tap for a few minutes or wait until next day once there has been large hot water usage and the temperature displayed on tank's thermometer has dropped (40 C). Does the pump start? If it does, your storage tank may have been full of hot water and the Appliance shut itself down to prevent overheating. Turning on the tap introduces cold water into the storage and the EnerWorks Appliance will start. If it does not start the tank over-temperature control may have to be reset. Contact your EnerWorks authorized-dealer.



Do not attempt to fix or to modify the EnerWorks Solar Water Heating Appliance. Contact your EnerWorks-authorized installer or dealer if you have questions or require service.

6.0 Solar Water Heating Appliance Features

6.1 The EnerWorks Solar Collector

6.1.1 Solar Glass

The Collector is covered with a low-iron, textured and tempered solar glass.

The presence of iron in normal window glass causes it to absorb some of the sun's energy. Low-iron glass is specifically designed to maximize its transmissivity, or its transparency to light. As such, it allows the maximum amount of light energy through to the absorber.

The textured surface of the solar glass limits its reflectivity. With normal glass, most light passes through, but a portion is reflected. The textured surface limits the amount of reflected light and maximizes the absorption of energy.

The solar glass not only protects the absorbing surface from the elements, it maintains an insulating air space above the absorber. If the glass was not present, much of the absorbed energy would be lost to the environment through convection. Unglazed (without glass) solar collectors have poor performance in windy conditions and when outdoor ambient temperatures are low. Glazed collectors have better performance throughout the year and in all weather conditions.

6.1.2 Solar Absorber

The absorbing surface is a thin aluminum sheet with a special coating specifically engineered to absorb 94% of the light energy that strikes it (if the absorber was covered by normal black paint it would absorb only about 70%). Due to changing weather and fluctuating temperatures, solar collectors experience expansion and contraction. With thermal cycling, pipe fittings and joints have the potential to develop leaks. The EnerWorks Collector has a continuous serpentine copper pipe laser-stitched to the back of the absorber. With no pipe fittings or joints inside, the EnerWorks Collector is very robust and will have a long operational life. This is not a declaration of warranty.

6.1.3 Collector Insulation

A rubber gasket separates the absorber from the galvanized steel frame. This prevents the conduction and loss of heat from the absorber to the frame. The back and sides of the EnerWorks Collector are insulated to ensure that the energy captured is transferred to your potable water and not lost to the environment.

6.1.4 Solar Collector Stagnation Control

If the heat-transfer fluid stops circulating, the Appliance experiences an event known as stagnation. Stagnation occurs during the night when there is no solar energy to be harvested and the circulation pump shuts down. If stagnation occurs during the day, however, the heat-transfer fluid in the Collector can overheat. If the fluid boils, a large volume expansion occurs. The fluid will also degrade prematurely, become acidic, and start to corrode pipes and fittings. The EnerWorks Appliance has been engineered to prevent the heat-transfer fluid from over-heating. Stagnation can occur during the day if there is a loss of power. The EnerWorks Appliance may also force itself into stagnation for safety reasons: if the water in the solar storage tank reaches its set-point, the controller will shut the pump down to prevent further heat-transfer. This safety feature prevents the solar storage tank from boiling and limits the risk of scalding.

Under stagnation conditions, the EnerWorks Solar Collector has a patented stagnation-control device that sheds excess heat to the environment (Fig. 3). If the Collector begins to overheat, a thermally-actuated spring opens a damper, allowing air to flow through the collector behind the absorber.

Excess heat is vented to the atmosphere and the fluid does not reach extreme temperatures – performance and operational life are extended. The stagnation-control mechanism also limits the fluid pressure – an important factor contributing to its excellent performance and safety certifications.



Do not tamper with stagnation-control device. This device safeguards Appliance from overheating.

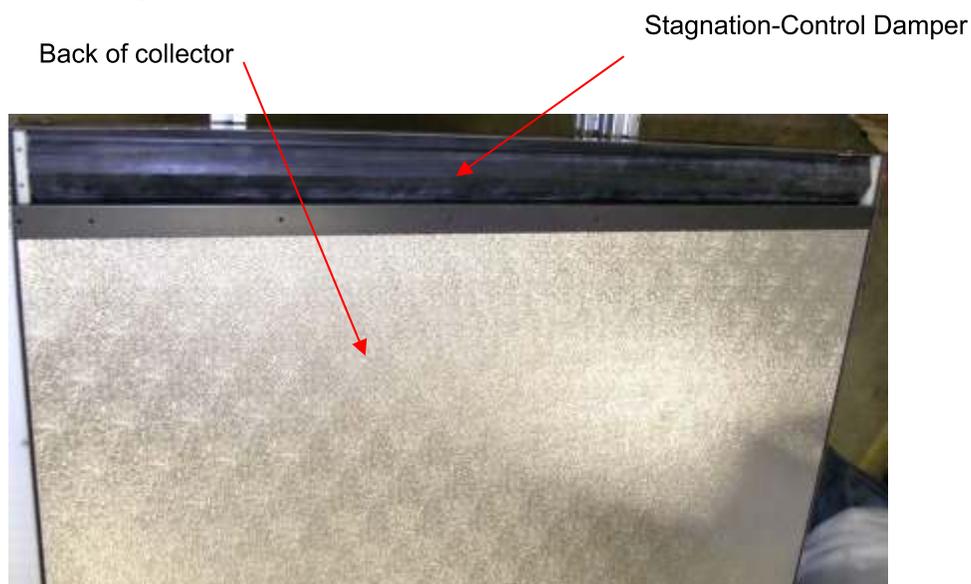


Fig.3. The Stagnation-Control Damper.

6.2 The Line-Set

The heat-transfer fluid carries heat from the solar collectors to your solar storage tank. It is pumped through a 3/8" refrigeration-grade, flexible copper line-set. The copper tube has a small diameter. This minimizes the volume of heat-transfer fluid in the Appliance. A typical installation will have only 1 to 1.5 US gal (4 to 6 L) of heat-transfer fluid. A small volume of heat-transfer fluid increases safety and is required by certification standards.

Refrigeration-grade copper ensures high-quality fluid lines that are flushed clean during manufacturing. This prevents contamination of the heat-transfer fluid by manufacturing lubricants and residues. A flexible line-set is easy to install and minimizes connections.

The line-set is insulated with high-temperature, closed-cell, elastomeric insulation. Insulation is very important to minimize heat loss and to ensure safety.

6.3 The EnerWorks Energy Station



Cover on Energy Station is designed to protect components from damage and to protect users from injury. Do not operate with Energy Station cover removed.

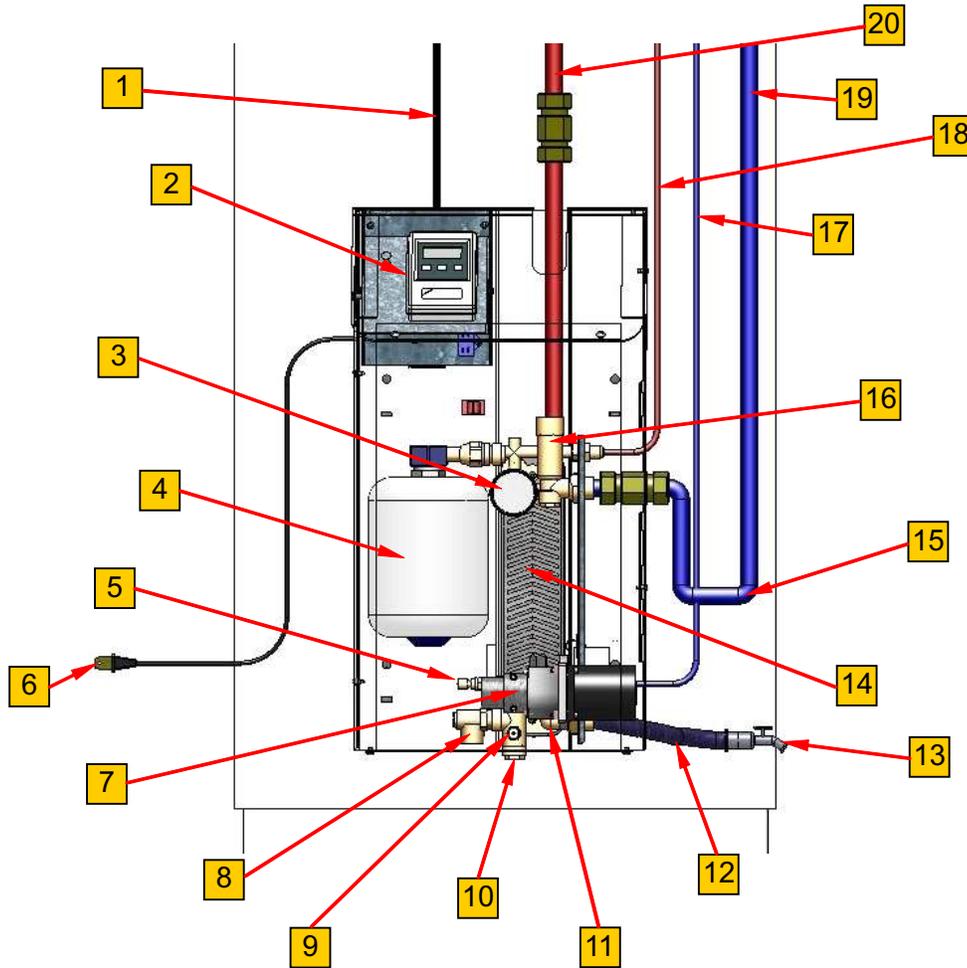


Cover must only be removed by an EnerWorks-authorized installer or dealer.

The Energy Station (Fig.4) contains the controller (2), a heat exchanger (14), the upper and lower manifolds (16,10), an expansion tank (4) and a pump and motor assembly (6).

The stainless-steel pump that circulates the heat-transfer fluid is a positive-displacement gear pump.

The heat exchanger's large surface area ensures a high rate of heat transfer from the heat transfer fluid to the potable water. Plate heat-exchangers have the potential to foul if scale accumulates on the inside surfaces. Scale formation is a symptom of hard water (high concentrations of dissolved calcium and magnesium ions). The EnerWorks Appliance limits scale buildup with its patented passive anti-fouling valve. When hot water is used in your home, cold water entering the solar storage tank is directed by the anti-fouling valve to back-flush the heat-exchanger. The cold water actually dissolves scale and flushes out deposits from the heat-exchanger. Its life and thermal performance are improved.



1	Over-temperature control wire	11	Lower manifold (behind pump assembly)
2	Differential Temperature Controller	12	Flexible corrugated water pipe, supply from storage to Energy Station
3	Pressure gauge	13	Solar storage tank drain
4	Expansion tank	14	Heat-exchanger
5	Charging port, return from system to reservoir	15	Heat trap
6	120 VAC, three-prong to grounded, surge protected outlet	16	Upper manifold with anti-fouling valve
7	Heat transfer fluid pump (positive-displacement gear pump)	17	Cold heat transfer fluid from heat-exchanger to collector(s)
8	Pressure relief valve (50psi)	18	Hot heat transfer fluid from collector(s) to heat-exchanger
9	Charging port, supply to system from charging pump and reservoir	19	Cold (mains) water inlet
10	Heat transfer fluid filter (in lower manifold)	20	Thermosiphon loop, hot water to storage from Energy Station

Fig.4 – Energy Station mounted to solar storage tank

7.0 EnerWorks Solar Water Heating Appliance Specifications

SOLAR COLLECTOR – FLAT PLATE	
Dimensions	Approx. 4' x 8' (1176 mm x 2448 mm)
Gross Area	30.94 ft ² (2.874 m ²)
Aperture Area	28.97 ft ² (2.691 m ²)
Dry Weight	111 lb (50.4 kg)
Fluid Capacity	0.3 US gal (1.2L) - 2.5 lbs (1.1Kg)
Solar Glass	Low-iron, textured and tempered glass
Absorber	Aluminum, selective surface absorbs 94% of incident solar radiation
Stagnation provisions	Patented thermally-actuated damper limits temperature and pressure
Temperature	up to 257°K (125°C)
ENERGY STATION	
Dimensions	Approx. 12" x 24" x 8" (320 mm x 614 mm x 211 mm)
Voltage	120 VAC. Max current 0.2 A
Power	23 W
Controller	Starts pump if temperature difference between solar collector and storage tank is 18 °F (10 °C) or greater
Temperature Sensors	Thermistors located inside solar collector, at bottom of storage tank
Over-Temp. Control	Shuts off pump if storage tank temperature exceeds maximum set-point
Heat Exchanger (single wall)	External single-wall brazed-plate (stainless steel, copper brazing. Surface area 600 sq. inches (0.39 m ²))
Heat Exchanger (double wall)	External double-wall brazed-plate (stainless steel, copper brazing. Surface area 744 sq. inches (0.48 m ²))
Surge Protection	Required to protect Appliance (not supplied by EnerWorks)
PRV	50 psi (3.4 bar) for single wall heat exchanger 125 psi (8.6 bar) for double wall heat exchanger
GENERAL	
Type of Appliance	Indirect, closed-loop, flat-plate collector solar thermal system with pressurized, freeze-protected heat-transfer fluid.
Heat-Transfer Fluid	50/50 Tyfocor Type L/water solution. Tyfocor Type L. Water must be distilled, de-mineralized. Contact your Enerworks authorized dealer for service.
Domestic Water Chlorine Concentration	Chlorine content must be no higher than that found in municipal water.
Domestic Water Hardness	Hardness must be less than 12 GPG (200 ppm).
Line-set	Insulated, refrigeration-grade flexible 3/8" copper lines.

8.0 System Model Numbers Approved by the SRCC™

	<p>This product certified by: Solar Rating & Certification Corporation™ www.Solar-Rating.org</p>	<p>EnerWorks, Inc. 969 Juliana Drive Woodstock, ON N4V 1C1 Canada</p>
Solar Energy Factor (SEFd)	SRCC Cert. No.	System Model:
1.6	2005012A	EWRA1-E40
1.6	2005012B	EWRA1-E80
2.4	2005012C	EWRA2-E80
1	2006004A	EWRA1-G40
1	2006004B	EWRA1-G80
1.2	2006004C	EWRA2-G80
1.8	2007010A	EWRA1-E80-1T
3.7	2007010B	EWRA2-E80-1T
3.4	2007010C	EWRA2-E120-1T
1.6	2012044A	EWRA1-DWHX-E50
2.5	2012044B	EWRA2-DWHX-E80
1	2012045A	EWRA1-DWHX-G50
1.4	2012045B	EWRA2-DWHX-G80
1.8	2012046A	EWRA1-DWHX-ST-E80-1T
3.5	2012046B	EWRA2-DWHX-ST-E80-1T
3.3	2012046C	EWRA2-DWHX-ST-E120-1T
The installed system is marked above.		



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