FAFCO®

COOLPV®

Solar Energy Perfected

CanadianSolar

OWNER'S MANUAL

FOR USE WITH SWIMMING POOLS
TO ENHANCE SOLAR ELECTRIC
(PV) PERFORMANCE

Made in the U.S.A.

FAFCO
SOLAR WATER HEATING

Owner's Manual

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"Diablo Solar installed our CoolPV® System so our south-facing roof could be used to substantially reduce our electric bill while using the same roof space to keep our pool warm"

Meaghann and JD Tenuta
System Owner's
Chico, CA

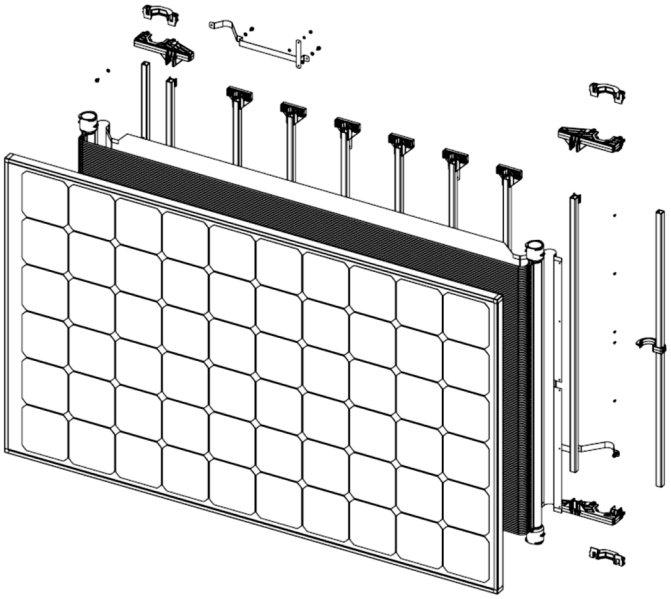


Figure 1

CoolPV® Panel Components

Each CoolPV® Panel consists of (left to right) a PV Module, a FAFCO Inc. Thermal Collector, and a support structure which ensures thermal connection between the Module and Collector.

Your CoolPV® System

Your CoolPV® System represents the most advanced solar system to date. CoolPV® maximizes the use of your roof by enhancing electrical output while simultaneously heating your swimming pool.

As the third generation system based on a US Navy contract, CoolPV® combines one of the world's largest leading manufacturer of solar photovoltaic modules and provider of solar energy solutions with the highest performing American made solar thermal collector. CoolPV® Panels are manufactured in Chico, California by FAFCO® Inc. Founded in 1969, FAFCO® Inc. is the oldest and largest solar thermal company in the United States.

"The most notable feature of Fafco's CoolPV® System was the ease of installation. The roof installation of a CoolPV® Panel is virtually identical to a regular PV Module"

Mike Powers
Diablo Solar Services
Martinez, CA

What to Expect From Your CoolPV® System

1. Noticeable increase in your electrical performance.
2. Raise and maintain your pool's temperature 5 to 15° F over a period of several days of good weather.
3. Eliminate or significantly reduce the cost of operating your fossil fuel pool heater, but not necessarily replace it during the colder, less sunny months (a pool cover will enhance #1 & 2 above).
4. Give you years of trouble-free service.

Theory of Operation

As Photovoltaic (PV) solar modules reach higher temperatures, such as those common on a roof, they lose efficiency and produce less electricity. CoolPV® Panels solve this issue by directly cooling the module. Each CoolPV® Panel attaches a FAFCO Inc. Thermal Collector to the back face of the PV module. Water flows through the hundreds of small diameter tubes constituting each Thermal Collector, taking heat from the module, increasing the electrical performance of CoolPV® by up to 10% higher than uncooled modules.

CoolPV® then returns the heated water to the pool. This reduces, and often eliminates, the need for a traditional pool heater, which further reduces household energy costs.

System Specifications

295W CoolPV® Panel Specifications (CS6K-295MS, PN: 09883) [1]	
Panel Area	17.6 ft^2 (1.67 m^2)
Panel Dimensions (HxWxD)	65 x 39 x 4.72in (1650 x 992 x 120 mm)
Weight	55.3 lbs (25.1 kg)
Roof load	3.2 psf (15.6 kg/m^2)
Fluid Capacity	0.75 gal (2.8 L)
Fluid Connection Type	FAFCO® Proprietary
Electrical Connection Type	T4 series

[1]Electical Specifications are based on Canadian Solar Inc. UL1703/UL2703 Certification Ratings

Electrical Specifications[2]	***295W***
Rated Electrical Output (P_{max})	295 Watts
Open Circuit Voltage (V_{oc})	39.5 V
Rated Voltage (V_{mpp})	32.3 V
Short Circuit Current (I_{sc})	9.75 A
Rated Current (I_{mpp})	9.14 A
Temperature Coefficient - P_{max}	-0.39 % / K
Temperature Coefficient - V_{oc}	-0.29 % / K
Temperature Coefficient - I_{sc}	0.05 % / K
Electrical Efficiency	18.02 %
System Voltage Max	1000 VDC
Power Tolerance	-0 / +5 W_p
Number of Cells/Type	60 / Mono-crystalline
NMOT	43±3 °C

[2]All performance data calculated at STC (Standard Test Conditions) 25 °C, 1000 W / m^2, 1.5 AM

Thermal Specifications[3]	
System Operating Pressure (<100 °F)	20 psi (140 kPa)
Factory Test Pressure / Burst Pressure Per Collector	50 psi / 220 psi (350/1500 kpa)
Recommended Flow Rate Per Collector	1.5 gpm (5.7 lpm)
Delta T (at y intercept)	3.3 °F (1.8°C)
Operating Temperature Range (typical)	60-100 °F (15-38°C)
Stagnation Temperature	140 °F (58°C)

[3]All performance data calculated at STC (Standard Test Conditions) 25 °C, 1000 W / m^2, 1.5 AM, Inlet Water of 20 °C

CoolPV® Panels have been certified to meet the following standards:

- ICC-SRCC™ OG-100 Solar Collector Standard (All Sections)
- ANSI/UL1703 Standard for Flat Plate PV Modules and Panels

  Section 25: Bonding Path Resistance Test

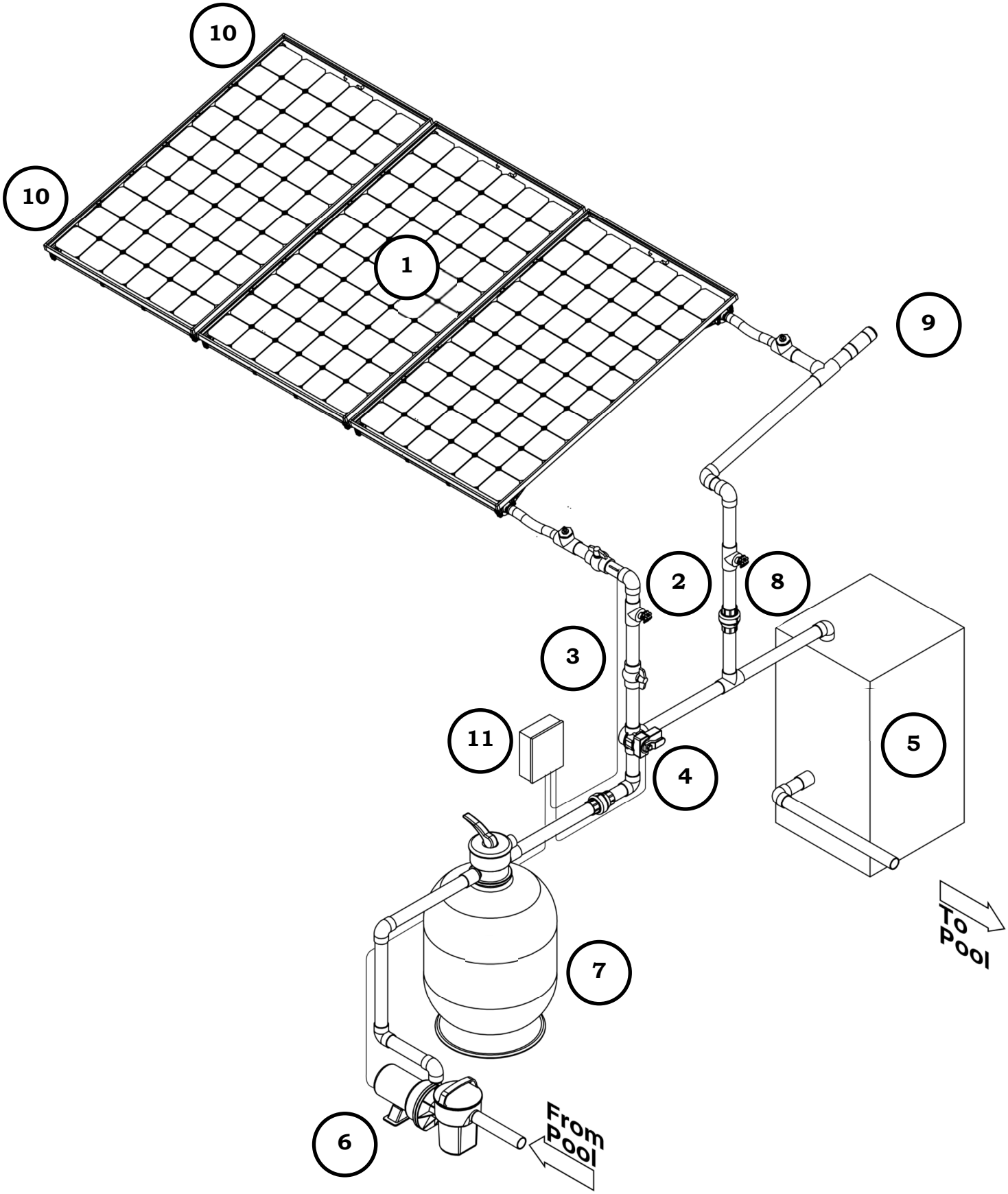
  Section 31: Fire Tests (Class A)

  Section 41: Mechanical Load Tests

  Note: CoolPV® Panels maintain a 50psf Design load rating per UL2703, when used with UniRac® Solar Mount Racking Systems.

Figure 2

Components of a Typical CoolPV® System



What Do the Various Components Do?

1. The CoolPV® System

When used in pool heating applications CoolPV® provides enhanced performance by:

- Cooling the CoolPV® Panels to enhance electrical output.
- Returning the heated water to the pool, extending your swim season.

2. Solar Drain Valves

Spigot style valves ensure draining. Some systems may instead connect a hose to the system's lowest point, which can then be run through the downspout of your gutter for easy ground access.

3. The Isolation Valves

A manually operated valve (3a) is installed in the supply line and allows you to isolate the CoolPV® System from the filtration system. It is primarily used when backwashing the filter or at any time it is desirable to isolate the system. A check valve (3b) is installed in the return line to allow isolation and prevent over-pressurizing your system.

4. Diverter Valve

Automatically controlled valve that diverts the pool or spa water to the thermal system.

5. Your Heater

It is only needed to give your pool a supplemental heat boost, or when weather or special occasions demand higher pool temperatures.

6 & 7. Your Pump and Filter

For optimal performance a variable speed pump is preferred. Please contact your FAFCO Inc. dealer for more information. Keeping your skimmer and pump baskets clean enhance performance by ensuring the maximum flow of cooling water. When cleaning the filter the solar system should be isolated, preventing debris from entering the system.

8. Check Valve

When the pump (6) shuts off, the CoolPV® System (1) will drain. A Check Valve prevents the water in the panels from flowing backwards through the Filter (7) and backwashing.

9. Vacuum Relief Valve (VRV)

Seals the system under pressure while maintaining a vacuum to minimize pumping power required. The VRV must be located at the highest point in the system.

10. End Caps

These seal the headers on the end Solar Collectors in the System.

11. Solar Automation Controller

The Solar Automation Controller regulates the system automatically. By reading sensors on the roof and in the pool water, it determines the optimum times run the thermal portion of your CoolPV system.

Before Calling Your Dealer For Service

If The System Does Not Appear To Be Supplying Sufficient Electrical Power:

Check for shading of the panels and consider seasonal or other explanations. If the issue remains unresolved call your authorized FAFCO Inc. dealer.

If Your Concern Relates To The Heating Of Your Pool:

1. Has your filter been backwashed and are the skimmer and the pump basket clean?
2. Have you been refilling the pool with a lot of cold water lately?
3. Has the weather been marginal?
4. Have you been using your pool cover as instructed?
5. Are the panels operating "cool" to the touch on a sunny day?

If There Are No Initial Bubbles When Plumbing Turns On

Bubbles on start-up are caused because air in the system must be replaced by water from your pool to cool your PV modules and heat your pool simultaneously. If no bubbles appear check the following:

1. Ensure that the pump is running.
2. Check the isolation valve to make sure it is open.
3. Make sure the diverter valve is in the correct position.

Tiny Champagne Bubbles

If tiny champagne bubbles continue past the initial purging of the panels (3-5 minutes), this may be an indication that the water circulation through the panels has been reduced. To ensure that the system has proper flow check the following:

1. Has your filter been backwashed and are the skimmer and the pump baskets clean?
2. Check the isolation valve to make sure it is open.
3. Make sure the diverter valve is in the correct position.

If the bubbles continue with the solar turned off, check the piping leading to the pump for a suction side leak.

Some small bubbles may always be discharged into the pool due to the particular operating characteristics of the individual system. They do not affect the operation of the system nor impair the proper function of any other pool equipment.

Freeze Protecting Your System

The installations most prone to freeze damage include systems that have panels below the pool water level and systems installed in hard freeze locations. All systems, when shut down for the winter, must be checked to ensure that they are completely drained.

It is suggested to set up a winterization and spring tune-up schedule with your FAFCO Inc. Authorized Dealer. CoolPV® Systems are not warranted against freeze damage.

If you choose to winterize your system yourself, please follow the steps bellow:

1. Ensure the diverter valve is set to bypass the CoolPV® System.
2. Ensure that the pump and filter are not running.

For panels below pool level, item 7 must be done before proceeding to item 3.

3. Open manual drain valves.
4. Remove Vacuum Relief Valve
5. Remove end caps at the lowest panel.
6. Let the system drain completely.
7. Close the isolation valve.
8. Turn on the pool equipment, ensuring that the diverter valve is turned to the thermal off position. Let the system run for at least 5 minutes while checking to make sure no water is coming out of the end cap area of the panels.

System Start-up After Freezing Conditions

It is suggested to set up a winterization and spring tune-up schedule with your FAFCO Inc. Authorized Dealer. CoolPV® Systems are not warranted against freeze damage.

If you choose to start up the system yourself, please follow the steps bellow:

1. Ensure the diverter valve is set to bypass the CoolPV® System.
2. Ensure that the pump and filter are not running.
3. Make sure that the end caps and vacuum relief valve are installed and the clamps are properly tightened. End Caps can be tightened to no more than 10in-lbs.
4. Close manual drain valves.
5. Open the isolation valve.
6. Turn the diverter valve to allow flow through the thermal system. (You may have to first select the “manual on” function of your controller)
7. Turn on the pump and filter.

Commissioning and Warranty Registration

This document is to be filled out by the lead solar installer during Installation and Final Commissioning of the CoolPV® System. Keep this form in a safe location and be sure to send a copy to FAFCO, Inc. within 30 days of system installation date or system will not be eligible for installer incentive program credits.

Home Owner: _____ **Phone:** _____
(First and Last Name) *(Primary)*

Email: _____ **Sales Rep:** _____
(For essential contact and warranty registration purposes) *(Dealer sales representative who sold system to customer)*

Installation Address: _____
(House Number, Street, City, State, Zip Code, Country)

System Installed By: _____ **Install Date:** ___/___/___
(Company)

_____ **Date:** ___/___/___
(Authorized CoolPV Installer)

Array Layout: *(check boxes)*

A copy of the system layout has been: ☐ Attached ☐ Sketched

☐ Panel stickers removed from face of module and included on the system layout.

Array Plumbing Method	**Pipe Used to Plumb System**	**System Location**
☐ End Supply/Return	☐ CPVC	☐ 1st Story
☐ Reverse/Return	☐ PVC	☐ 2nd Story

Roof Orientation *(circle all that apply)* N NE E SE S SW W NW

Filter Pressure Readings

Thermal System OFF: _____ ON: _____ Difference: _____ ( )psi / ( )kPa

Grounding and Racking: *(check boxes)*

☐ UniRac Pro Series Mid Clamps Used ☐ UniRac Solar Mount Racking System Used

☐ All Panels Grounded ☐ All Racking Grounded

☐ All Mid Clamps Were Tightened and Torqued

☐ All End Clamps Were Tightened and Torqued

☐ All Panel Clamps Were Checked for Secure Fastening

Certification Labels Present: *(check boxes)*

☐ ANSI/UL1703, TUV Rheinland (top header pipe)

☐ OG-100, ICC-SRCC (top header pipe)

FAFCO Installation Stickers Placed: *(check boxes)*

☐ Thermal Supply ☐ Thermal Drain Valve

☐ Thermal Return ☐ From Pool

☐ Thermal Supply Isolation Valve ☐ To Pool

☐ Thermal Return Check Valve

FAFCO Assigned Warranty Registration Number: _____

General Tips For Optimum Performance

1. PV modules perform best when clean. Consider washing your CoolPV® Panels periodically.
2. Pool covers help your pool retain heat, reduce water loss caused by evaporation, and provide a safer environment when designed and installed properly.
3. The use of variable speed pumps is recommended to conserve energy.
4. Maintaining a high rate of water flow allows for rapid pool water turnover and proper regulation of pool chemistry. This keeps your pool clean and clear while making the CoolPV® System perform optimally.
5. In hotter summer months consider adjusting your automatic system to heat only during the hottest part of the day. This will optimize system performance without over-heating your pool.

Whenever service is required for other components in your pool system please call your dealer for service.

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