

FAFCO®



# OWNER'S MANUAL

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

Made in the U.S.A.



# Owner's Manual

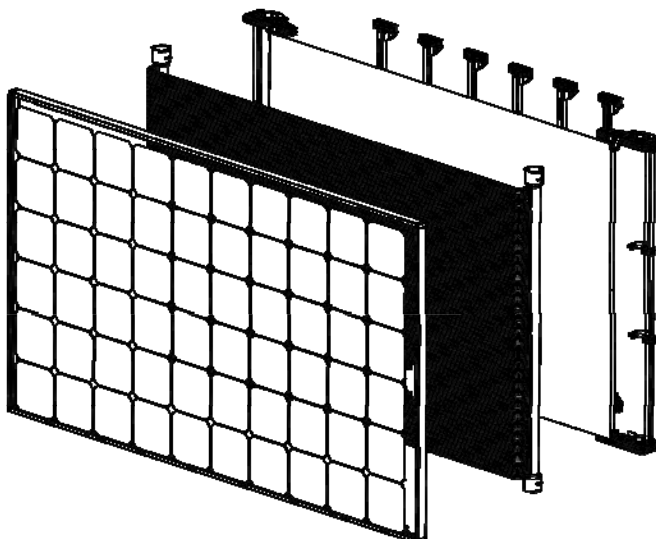
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*“Diablo Solar installed our CoolPV<sup>®</sup> System so our south-facing roof could be used to substantially reduce our electric bill while using the*

Meaghann and JD Tenuta  
System Owner’s  
Chico, CA



**Figure 1**

### **CoolPV<sup>®</sup> Panel Components**

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

## Your CoolPV® System

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**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 the highest performing American made electric PV module 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 solar electric PV modules are manufactured in Portland, Oregon by SolarWorld, the oldest and largest PV manufacturer 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

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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

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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 and increasing the electrical performance of the CoolPV® Panels. The heated water then returns to the swimming pool to reduce, and often eliminate, the need for a pool heater. This further reduces household energy costs.

# Commissioning and Warranty Registration

This document is to be filled out by the lead solar installer during installation of your CoolPV<sup>®</sup> 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)

**Home Owner Email:** \_\_\_\_\_  
(For essential contact and warranty registration purposes)

**Installation Address:** \_\_\_\_\_  
(House Number, Street, City, State, Zip Code)

**Sales Representative:** \_\_\_\_\_  
(Dealer sales representative who sold system to customer)

**System Installed By:** \_\_\_\_\_ **Install Date:** \_\_\_/\_\_\_/\_\_\_  
(Company) **Date:** \_\_\_/\_\_\_/\_\_\_  
 \_\_\_\_\_  
(Authorized CoolPV<sup>®</sup> Installer)

Array Plumbing Method	Pipe Used to Plumb System	System Location
<input type="checkbox"/> End Supply/Return	<input type="checkbox"/> CPVC	<input type="checkbox"/> 1 <sup>st</sup> Story
<input type="checkbox"/> Reverse/Return	<input type="checkbox"/> PVC	<input type="checkbox"/> 2 <sup>nd</sup> Story

## Array Layout

- A copy of the Dealer's layout for this system has been attached.  
 A copy of the Dealer's layout for this system has been sketched.

## Roof Orientation

Circle all that apply for installations across multiple roof pitches

N NE E SE S SW W NW

## Filter Pressure

Thermal System Off: \_\_\_\_\_ psi

Thermal System On: \_\_\_\_\_ psi

Pressure Difference: \_\_\_\_\_ psi

## Stickers Placed

- |   |  |
|---|--|
| <input type="checkbox"/> Thermal Supply                 | <input type="checkbox"/> Thermal Drain Valve |
| <input type="checkbox"/> Thermal Return                 | <input type="checkbox"/> From Pool           |
| <input type="checkbox"/> Thermal Supply Isolation Valve | <input type="checkbox"/> To Pool             |
| <input type="checkbox"/> Thermal Return Check Valve     |  |

**FAFCO Assigned Warranty Registration Number:** \_\_\_\_\_

# Commissioning and Warranty Registration

## CoolPV® System Layouts (complete for each roof pitch)

Cross out panels until your Layout is Represented, Put a Number on Each Panel for Labeling on Next Page. Sketch and Label Supply and Return Plumbing


### Flow Balancing Measurements

*For systems with multiple rows. Record the final pressure drop measurement across each row.*

Row	1	2	3	4	5	6
$\Delta P$ (psi)						

**Note: If Bank size is 1-15 panels, Reverse Feed/Return Plumbing is Permissible**  
**If Bank size is 1-10 panels, Same Side Feed/Return is Permissible**

# Commissioning and Warranty Registration

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*Remove label from CoolPV® Panel and Attach to this sheet for warranty registration*

1.

**Remove each Panel Sticker and Place Next  
to Proper Panel Number from Layout, Attach  
Additional Pages as Needed**

# System Specifications

## CoolPV® Panel Specifications

Panel Area	18 ft <sup>2</sup>
Panel Dimensions (HxWxD)	65.95 x 39.40 x 4.51 in
Weight	62.6 lbs
Roof load	3.5 psf
Fluid Capacity	.8 gal
Fluid Connection Type	FAFCO® Proprietary
Electrical Connection Type	H4

## Electrical Specifications\*

**275W**

Rated Electrical Output (P <sub>max</sub> )	275 Watts
Open Circuit Voltage (V <sub>oc</sub> )	39.4 V
Rated Voltage (V <sub>mp</sub> )	31.0 V
Short Circuit Current (I <sub>sc</sub> )	9.58 A
Rated Current (I <sub>mp</sub> )	8.94 A
Temperature Coefficient - P <sub>max</sub>	-0.43 % / K
Temperature Coefficient - V <sub>oc</sub>	-0.31 % / K
Temperature Coefficient - I <sub>sc</sub>	0.044 % / K
Electrical Efficiency	16.40%
System Voltage Max	1000 VDC
Power Tolerance	-0 / +5 W <sub>p</sub>
Number of Cells/Type	60 / Mono-crystalline
NOCT	48 °C

\*All performance data calculated at STC (Standard Test Conditions) 25 °C, 1000 W / m<sup>2</sup>, 1.5 AM

## Thermal Specifications\*

Heat Output	3400 btu / hr (1000 Watts)
System Operating Pressure (<100 °F)	20 psi
Factory Test Pressure / Burst Pressure Per Collector	50 psi / 220 psi
Recommended Flow Rate Per Collector	1.5 gpm
Delta T (at y intercept)	3 °F
Operating Temperature Range (typical)	60-100 °F
Stagnation Temperature	175 °F

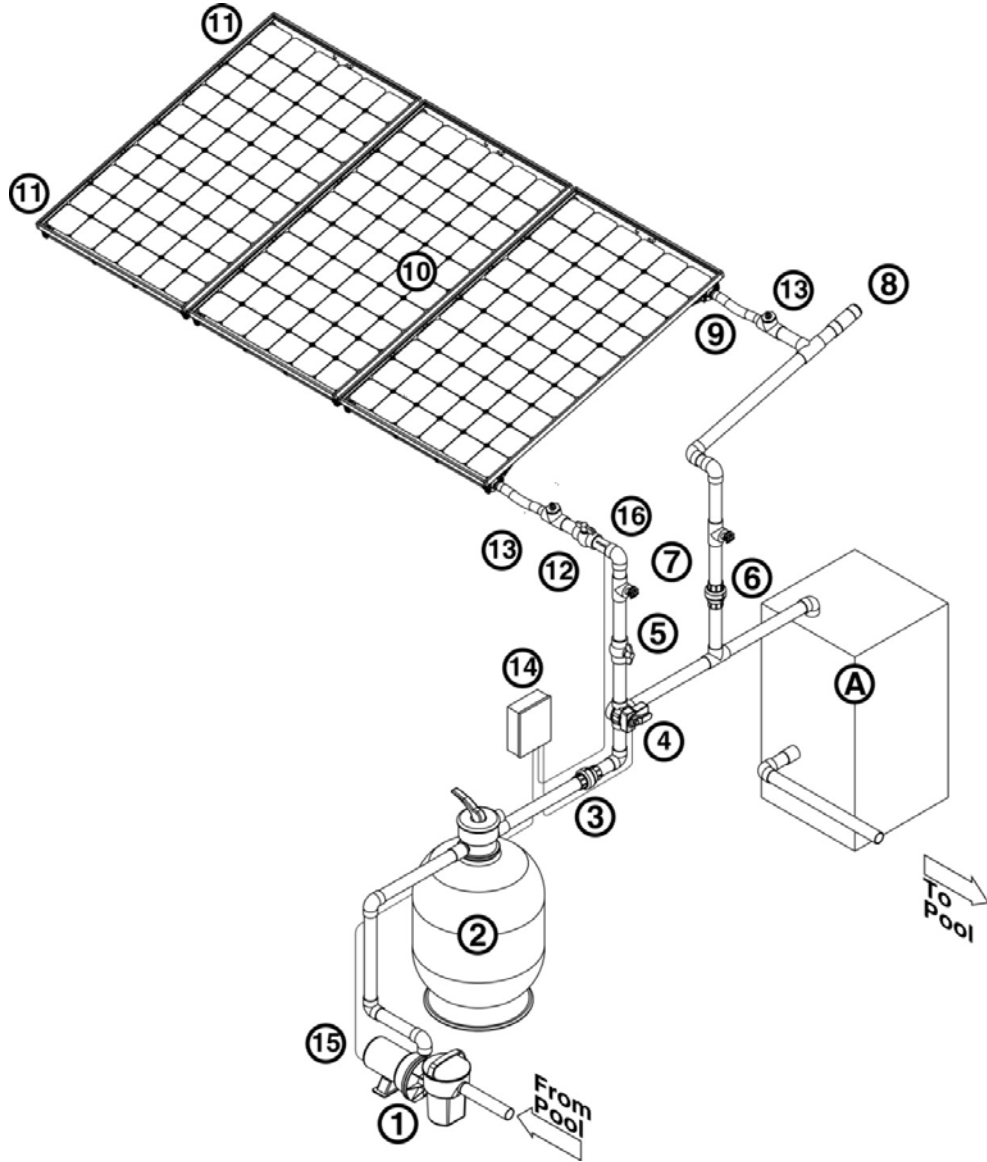
\*All performance data calculated at STC (Standard Test Conditions) 25 °C, 1000 W / m<sup>2</sup>, 1.5 AM, Inlet Water of 20 °C

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

- SRCC OG-100
- Compliance with UL1703 Class A Fire Rating

**Figure 2**

**Typical CoolPV® System**



**Legend for Figure 2**

**Standard Equipment**

- 1 Pool Pump
- 2 Filter
- 3 Check Valve
- 4 Diverter Valve
- 5 Isolation Valve
- 6 Isolation Check Valve
- 7 Solar Drain Valves (2)
- 8 Vacuum Relief Valve
- 9 Hose Connection
- 10 CoolPV® Panels
- 11 End Cap
- 12 Balancing Valve
- 13 Test Port

**Automation Equipment**

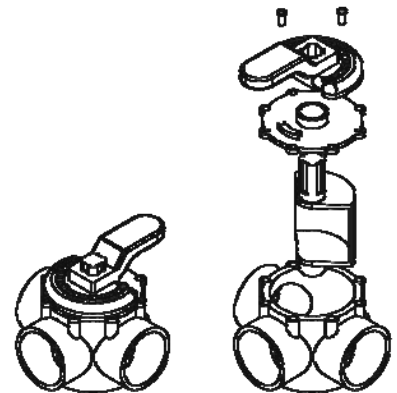
- 14 Control Panel
- 15 Pool Temperature Sensor
- 16 Solar Temperature Sensor

**Optional Pool Equipment**

- A Back Up Heater
- Not Shown:  
Chlorinator  
Additional Pumps

**Figure 3**

**Diverter Valve Schematic**





# What Do the Various Components Do?

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## 1. The CoolPV® System

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

- Cooling the 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 (5) 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 (6) is installed in the return line allowing isolation and prevents over-pressurizing your system.

## 4. Diverter Valve

An automatically controlled valve (4) that diverts the pool or spa water to the thermal system.

## 5. Your Heater

It is only needed to give your spa 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 (1) shuts off, the CoolPV® System will drain. A Check Valve (3) prevents the water in the panels from flowing backwards through the Filter (2) and backwashing.

## 9. Vacuum Relief Valve (VRV)

Seals the system while operating. Opens under high vacuum so the system drains when shut off. The VRV (8) must be located at the highest point in the system.

## 10. End Caps

The End Caps (11) seal the headers on the end Solar Collectors in the System.

## 11. Control Panel

The Control Panel (14) regulates the system automatically. By reading sensors on the roof and in the pool water it determines the optimum times to run the thermal system and cool the PV Panels (10).

## **Before Calling Your Dealer For Service**

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

Notice if there are panels which see significant amounts of shade throughout the day. Reduced power production will result from increased cloud cover and reduced sunlight. If the issue remains unresolved call your FAFCO® authorized 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 by air in the system being replaced by water and indicate optimized performance. 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?
2. Are the skimmer and the pump baskets clean?
3. Check the isolation valve to make sure it is open.
4. 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

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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.

**CoolPV® Systems are not warranted against freeze damage. It is strongly suggested to set up a winterization and spring tune-up schedule with your FAFCO® Inc. Authorized Dealer so that you don't violate the warranty by performing maintenance yourself.**

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

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

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. (See Installation Manual for proper torque specifications).
4. Close manual drain valves if included.
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, filter and automation system making sure all systems are working properly.

# General Tips For Optimum Performance

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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.**

**FAFCO, Inc.**

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Rev: A  
05/18/16  
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