



*Connected Tube* **CT**

Solar Pool Heating Systems

# OWNER'S MANUAL

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FOR USE WITH SWIMMING POOLS  
TO HARNESS THE ENERGY OF  
THE SUN

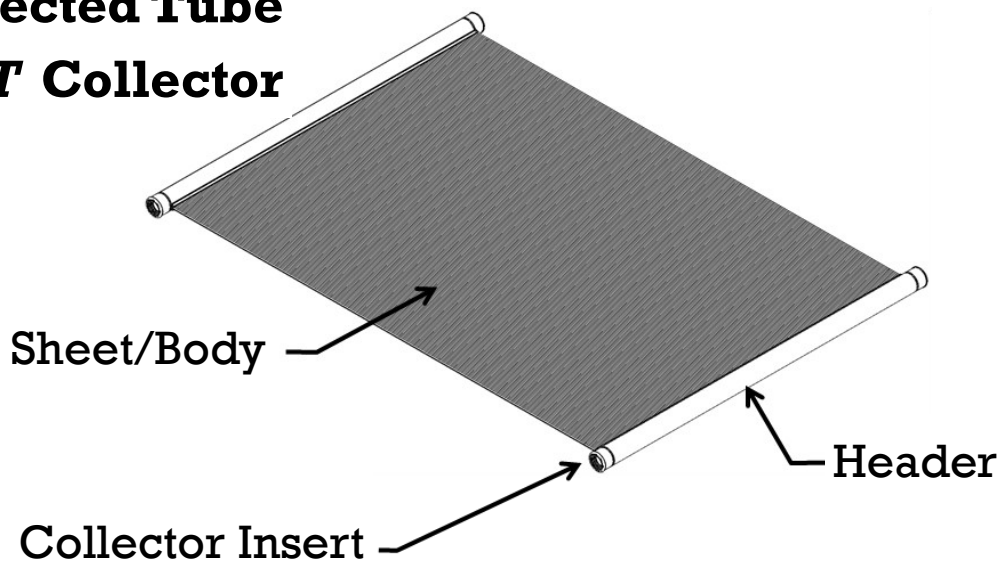
Made in the U.S.A.

# Owner's Manual

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## Connected Tube CT Collector



**Figure 1 | Connected Tube CT Collector Make Up**

Each Collector consists of the Sheet or Body, the Collector Insert and a Header Pipe. The Sheet or Body is the primary portion of the collector which collects thermal energy from the sun and may also be referred to as a Thermal Collector.

## Your Connected Tube CT System

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**Since 1969, FAFCO®'s goal has been to design, test, and produce the world's highest performing solar pool heating systems. Your Connected Tube CT system represents the most efficient solar system to date. By diverting pool water to the solar collectors, your pool will be able to harness even more heat naturally than ever before.**

Founded in 1969, FAFCO® Inc. is the oldest and largest solar thermal company in the United States and for decades, has been the solar thermal industry leader. FAFCO®'s Connected Tube CT collectors are the highest performing American made solar thermal collector; manufactured in Chico, California.

## What to Expect From Your Connected Tube System

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1. Raise and maintain your pool's temperature 5 to 15° F over a period of several days of good weather.
2. 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 your pool's temperature by keeping the heat from escaping the pool).
3. Give you years of trouble-free service.

## Theory of Operation

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As summer seasons approach, the strength of the sun's rays intensify due to a more direct exposure to the sun. This means more and more energy can be captured for our use which can be harnessed and directed into swimming pools and used to increase a homeowner's comfort for free. Water flows through the hundreds of small diameter tubes constituting each Thermal Collector, taking heat from the sun and often even reducing temperatures of the roof itself.

The heated water then returns to the swimming pool to reduce, and often eliminate, the need for a conventional pool heater, further reducing household energy costs.

# System Specifications

## Connected Tube *CT* Collector Specifications

Collector Area	48ft <sup>2</sup> , 40ft <sup>2</sup> , 32ft <sup>2</sup> , 24ft <sup>2</sup> , 20ft <sup>2</sup> , 16ft <sup>2</sup>
Collector Dimensions (HxWxD)	4ft x (12ft, 10ft, 8ft), 2ft x (12ft, 10ft, 8ft)
Weight (lbs empty)	22.0 (48ft <sup>2</sup> ), 19.0 (40ft <sup>2</sup> ), 16.0 (32ft <sup>2</sup> ) 11.0 (24ft <sup>2</sup> ), 9.5 (20ft <sup>2</sup> ), 8.0 (16ft <sup>2</sup> )
Roof load (lbs full)	66.9 (48ft <sup>2</sup> ), 58.9 (40ft <sup>2</sup> ), 50.1 (32ft <sup>2</sup> ) 33.4 (24ft <sup>2</sup> ), 29.5 (20ft <sup>2</sup> ), 25.1 (16ft <sup>2</sup> )
Fluid Capacity (gal)	5.4 (48ft <sup>2</sup> ), 4.8 (40ft <sup>2</sup> ), 4.1 (32ft <sup>2</sup> ) 2.7 (24ft <sup>2</sup> ), 2.4 (20ft <sup>2</sup> ), 2.1 (16ft <sup>2</sup> )
Fluid Connection Type	FAFCO® Proprietary
Chemical Resistance	Chlorine and Saline Pool Compatible
Freezing	Drain at 45°F prior to Freezing Conditions
Absorptivity	0.96
Emissivity	0.90

## Thermal Specifications\*

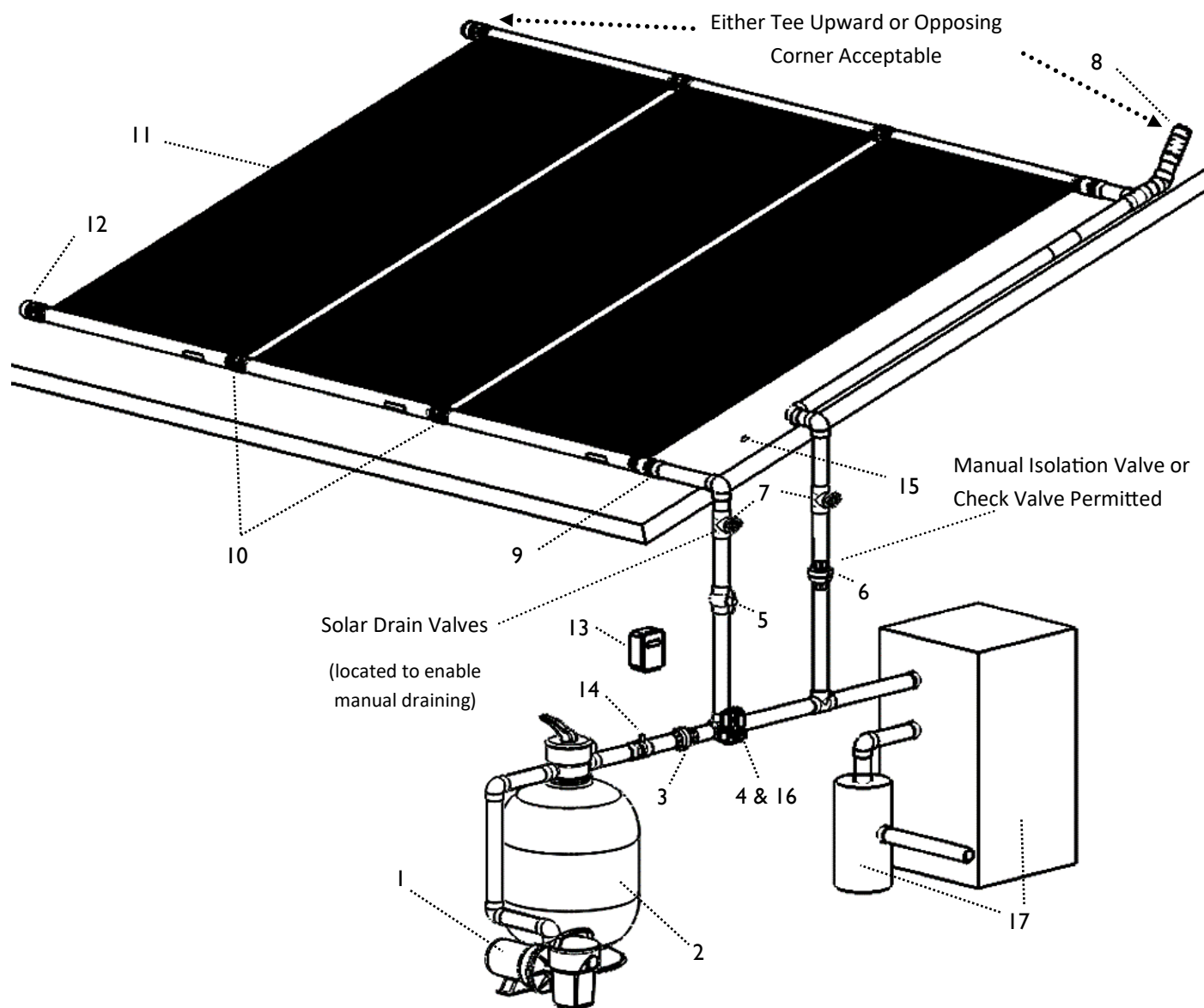
Thermal Energy Output	1800 Btu / (ft <sup>2</sup> -day)
System Operating Pressure (<100 °F) At Bottom Header	30 psi
System Intermittent Pressure (<100 °F) At Bottom Header	40 psi
Factory Test Pressure / Burst Pressure Per Collector	50 psi / 220 psi
Recommended Flow Rate Per Collector	0.1 gal/min/ft <sup>2</sup>
Delta T (at y intercept)	6°F
Operating Temperature Range (typical)	60-100 °F
Stagnation Temperature	160°F

\*All performance data calculated at STC (Standard Test Conditions) 80 °F, 317 Btu/hr./ft<sup>2</sup>, 1.5 AM, Inlet Water of 70 °F, Wind speed=3 mph

Connected Tube *CT* Collectors have been certified and listed for the following:

- SRCC OG-100 #10001954
- ICC-SRCC Listing #16006

# Typical Connected Tube CT Pool Heating System



**Figure 2 | Example Connected Tube CT System**

The typical Connected Tube CT solar pool system consists of a combination of FAFCO®-sourced parts and standard equipment. The above figure and the component list below depicts standard equipment components and shows the proper placement of all components. All FAFCO® Connected Tube CT pool systems should have the standard equipment listed and shown.

## 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 5" Hose Connection
- 10 3.5" Couplers
- 11 Connected Tube CT Collectors

### Automation Equipment

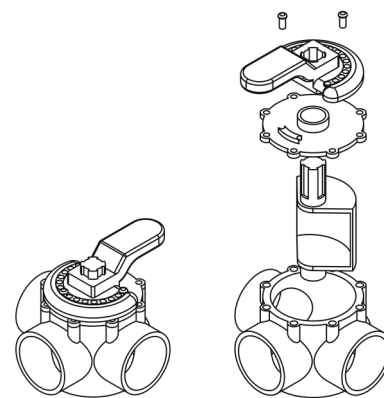
- 12 End Cap
- 13 Automation Controller
- 14 Pool Temperature Sensor
- 15 Solar Temperature Sensor
- 16 Actuator for Diverter Valve
- 17 Auxiliary Equipment

### Optional Pool Equipment (Aux)

- A Auxiliary Heater
- Not Shown:  
*Chlorinator, Additional Pumps*

## Figure 3

### Diverter Valve Schematic



# What Do the Components In my System Do?

## **1. The Connected Tube *CT* Collector**

When used in pool heating applications, Connected Tube *CT* collectors provide enhanced performance by:

- Returning the heated water to the pool, extending your swim season.
- Reducing and often eliminating the cost of operating conventional pool heating equipment.

## **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 is installed in the supply line and allows you to isolate the Connected Tube *CT* 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 is installed in the return line allowing isolation and prevents over-pressurizing your system.

## **4. Diverter Valve**

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

## **5. Auxiliary Heating Equipment**

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

## **6 . Pump and Filter**

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

## **7. Check Valve**

When the pump shuts off, the Connected Tube *CT* System will drain. A Check Valve prevents the water in the collectors from flowing backwards through the Filter and backwashing.

## **8. Vacuum Relief Valve (VRV)**

The VRV must be located at the highest point in the system. It seals the system while operating and opens under high vacuum so the system drains when shut off.

## **9. End Caps**

The End Caps seal the headers at the corners of the collector rows which aren't plumbed with a supply or return line.

## **10. Automation Equipment**

The Automation System uses a controller to run the pool pump, control a diverter valve, and direct pool water to the Connected Tube *CT* collectors through use of a control system which analyzes pool and roof temperatures via feedback sensors. If not properly configured, the Automation Equipment can cause the pool to lose heat rather than store it.

# Before Calling Your Service Provider

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## **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 (if equipped)?
5. Are the collectors "cool" to the touch while operating 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 after the initial purging of the collectors (3-5 minutes), this may be an indication that water circulation through the collectors 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 collectors 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 strongly suggested to perform a winterization and spring tune-up for your Connected Tube CT system annually so that you don't void the warranty.**

If you choose to winterize your system yourself, follow these steps:

1. Ensure that the pump is not running.
3. Open manual drain valves if equipped.
4. Remove Vacuum Relief Valve and end caps at the lowest collector and store for winter
5. Let the system drain completely for a few minutes.
6. Close the solar isolation valves.
7. Ensure the diverter valve is set to bypass the Connected Tube CT System and that the automation equipment is properly decommissioned for winter use.
8. Ensure that the diverter valve is turned to the thermal off position and turn on the pool equipment. 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 collectors.

## System Start-up After Freezing Conditions

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**It is strongly suggested to perform a winterization and spring tune-up for your Connected Tube CT system annually so that you don't void the warranty.**

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

1. Ensure the pump is not running
2. Close solar drain valves if included
3. Reinstall end caps and vacuum relief valve
4. Open the solar isolation valves
5. Turn on the pool pump and recommission the solar automation system
6. Inspect the system for any leaking and address as needed
7. Watch the pool inlet to ensure that all air is purged and that no champagne bubbles remain. If bubbles remain, address the issue
8. Run through the automation system and ensure the system is operating as intended
9. Address anything that may need service or attention as necessary
10. The pool pump, filter, sweep, solar system and any other applicable equipment can now be used for the summer



# **General Tips For Optimum Performance**

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1. Connected Tube *CT* collectors should be clear of debris or excessive dust and dirt, remove as needed.
2. Pool covers help your pool retain heat, reduce water loss and chemical usage caused by evaporation.
3. The use of variable speed pumps is recommended to conserve energy.
4. Maintaining a recommended water flow rate allows for ideal pool water turnover and proper regulation of pool chemistry. This keeps your pool clean and clear while making the Connected Tube *CT* system perform optimally.
5. In hotter summer months, consider adjusting your automation system to heat only during the hottest part of the day, but for a shorter duration thus reducing the need to run your pool pump. This will optimize system performance without over-heating your pool.

**Whenever service is required for components in your FAFCO Connected Tube *CT* pool system, contact your local FAFCO Distributer.**

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## **Revision History**

<b>Rev.</b>	<b>Date</b>	<b>Comments</b>
-	04/14/2020	Initial Release

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