



Apricus Sentinel S Series Controller Installation Overview

North American Edition

(Revision 1.0 - Aug 2008)

Controller Installation

1. Controller Models

a) Apricus offers a number of different controller models for use with both domestic and commercial applications. , Apricus has chosen the German controller manufacturer RESOL to provided “Apricus Sentinel” branded controllers. Resol is one of the largest suppliers global suppliers of controllers for thermal solar applications. All Apricus Sentinel solar controllers offer the ability to connect a data-logger or external display.

Below is a summary of the three controller models currently offered by Apricus:

Model	Applications	No. Tanks	Relays	Sensors
Sentinel S3	Simple domestic	1	2	4
Sentinel S6	Complex domestic Simple Commercial	2	2	4
Sentinel S7*	Complex commercial systems	4	7	12

Note that nearly all domestic system formats only require the Sentinel S3 controller.

* Need to order at least 14days in advance, no stock held.

2. Controller Design

- a) The Sentinel S3 and S6 models both share the same casing format and mount into the front of the Apricus Pump Station.
- b) LCD display provides comprehensive system status
- c) 3 button controls for programming
- d) Fully adjustable system functions and temperature ranges

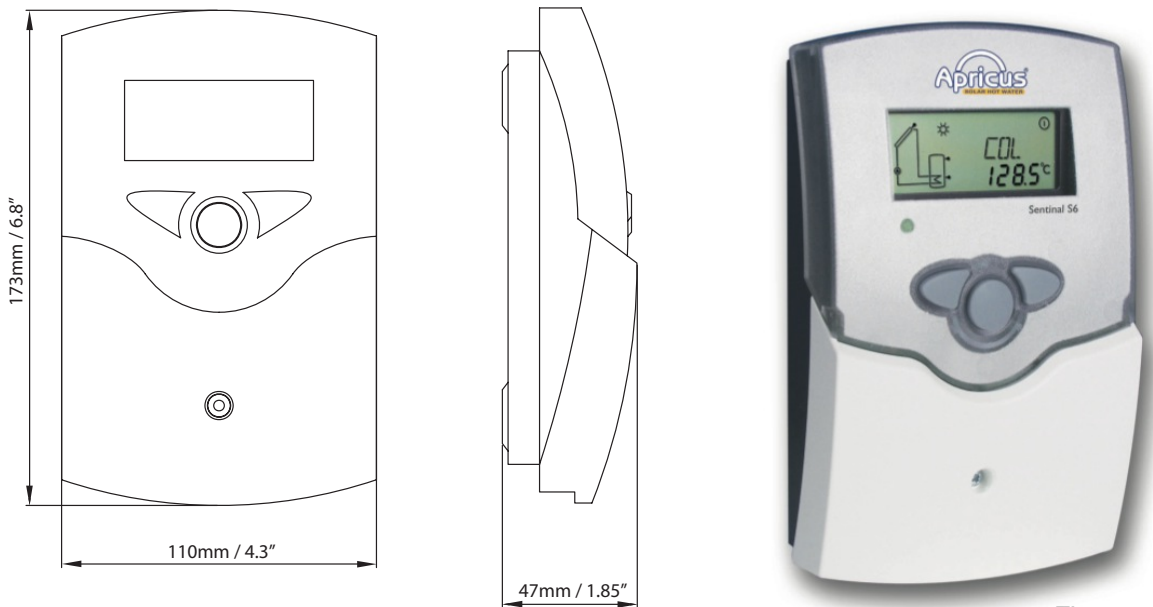


Fig. 2

3. Sensors

a) Sentinel S3 or S6 controllers are pre-wired with three of the four thermistors: Sensor 2, Sensor 3 and Sensor 4. Sensor 1 is not prewired as it must be run down from the roof to the controller. Refer to section 6.4 for details.

The most common positions for the sensors are as follows:

- Sensor 1 (S1): Collector
- Sensor 2 (S2): Bottom of Tank
- Sensor 3 (S3): Top of Tank
- Sensor 4 (S4): Return line of solar loop (for kWh output readings)

Correct sensor locations for various system configurations are presented in section 10.

b) There are two types of thermistors available for use with Sentinel controllers:

FKP6 (dark grey sheath) are designed for a temperature range from -56°F to +356°F and are used for S1 & S3. FRP6 (light grey sheath) are designed for a temperature range from -14°F to +176°F and are used for S2 & S4.

c) Sensors should not be fully immersed in water.

d) Sensors should be coated with silicone thermal paste to aid heat transfer.

e) Sensor cables should not be exposed to sunlight, and must be protected from contact with sharp metal edges that could cut the cable. This is especially important when pulling the S1 cable through the roof space.

4. Electrical & Sensor Connection

⚠ WARNING

Any electrical work completed must adhere to local electrical safety regulations, using the services of a qualified electrician as required.
 Do not connect the power supply of the controller while the front case is open.
 Take care when working with electricity in wet areas.

a) Figure 6.4, below, provides details of the power, relay and sensor connections.

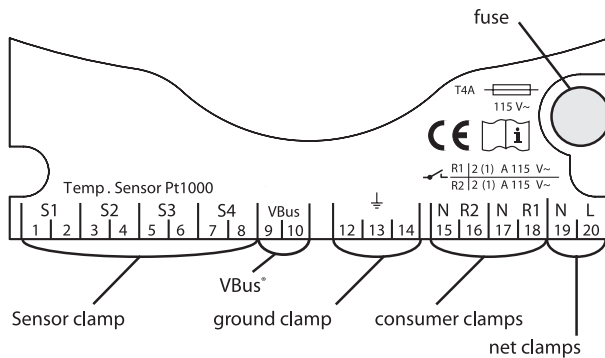


Fig. 4

- Relay 1
 - 18 = Live (R1)
 - 17 = Neutral (N)
 - 13 = Ground clamp (⊕)
- Relay 2
 - 16 = Live (R2)
 - 15 = Neutral N
 - 14 = Ground clamp (⊕)

The temperature sensors (S1 - S4) should be connected to the following terminals independently of polarity:

- 1 / 2 = Sensor 1 (e.g. Collector)
- 3 / 4 = Sensor 2 (e.g. Bottom of Tank)
- 5 / 6 = Sensor 3 (e.g. Top of Tank)
- 7 / 8 = Sensor 4 (e.g. Return Line)

The power supply is connected to the clamps:

- 19 = Neutral (N)
- 20 = live (L)
- 12 = Ground clamp (⊕)



Dangerous voltage on contact!



Electrostatic discharge can lead to damages of electronic components!

- b) For the North American market Apricus Sentinel controllers are 110Volts. They should not be used with higher voltage power supplies.
- c) It is highly recommended that the solar loop (copper or stainless steel) be grounded to avoid lightning related damage. In areas prone to lightning strikes the power supply to the controller should also be suitably protected.
- d) The Apricus Sentinel controllers are supplied with a standard North American plug. No cutting or extension of the cable is permitted unless completed by a qualified electrician.

5. Controller Functions

- a) The primary purpose of the Sentinel controller is to regulate the operation of the circulation pump. Many additional functions are also available to regulate the tank temperature, provide freeze protection, measure energy output and many more.
- b) In a solar thermal collector system, it is important to extract heat from the collector as quickly as possible, thus allowing the collector to run at the lowest possible temperature which in turn maximizes efficiency. The controller achieves this by measuring the temperature at the outlet of the solar collector and also the bottom of the solar storage tank. This temperature difference is referred to as a delta-t, often written as Δt . When the collector is hotter than the bottom of the tank by a set amount, usually about 14°F / 8°C the controller will supply power to the pump which circulates water through the collector. Once the temperature levels drop below a set level the pump turns off again. This cycle continues throughout the day, with the frequency and length of pump run dependent on solar radiation levels.
- c) The follow table provides an overview of the key functions that are use for most domestic installations. Standard setting for various systems are provided in Apricus system diagrams.

Code	Function	Description
DTO	Pump Switch ON Temperature Differential	Turns solar circulation pump ON
DTF	Pump Switch OFF Temperature Differential	Turns solar circulation pump OFF
SMX	Maximum Tank Temperature	Turns circulation pump OFF
EM	Collector Shutdown Temperature	Once this temperature is reached the circulation pump switches off and allows the collector to stagnate.
OCX	Collector Cooling Option	Circulates pump when tank is above SMX limit but collector is cooler, thus cooling the system.
CMX	Maximum Collector Temperature	Once this temperature is reached the circulation pump switches ON to try and cool down the collector. This will occur only until the SMX value for the tank is reached.
OCN	Minimum Operation Temperature Function	This temperature must be reached before normal solar heating function (DTO) will commence.
CMN	Collector Minimum Temperature Setting	Temperature Setting for OCN
OCF	Freeze Protection Function	Turns pump ON if collector gets too cold - only necessary for DIRECT FLOW systems
CFR	Freeze Protection Temperature Setting	Temperature Setting for OCF
OREC	System Cooling Cooling Function	Runs the circulation pump continually if the tank maximum temperature (SMX) is reached in order to cool the system. Will continue at night until the tanks drops back below the SMX level.
OTC	Evacuated Tube Function	Special function designed for Evacuated Tube systems to extract all possible heat during low radiation conditions.

AHO	Heat Dissipation or Boost Switch ON Temp	If AHO < AHF the system performs a boosting function, running a boiler loop circulation pump. If AHO > AHF the system performance heat dissipation switching a solenoid valve or running a circulation pump.
AHF	Heat Dissipation or Boost Switch OFF Temp	
OHQM	Heat Output Measurement	Turn ON to measure collector heat output.
FMAX	Flow Rate Value	Enter flow in litres/min to allow accurate heat output measurement.
MEDT	Liquid Type	Entering the liquid type is required so that accurate energy calculations can be made. 0 = water 1 = propylene glycol
MED%	Glycol Concentration	% concentration of glycol. This is not an option if water is selected in MEDT. In most cases glycol will be a 50% premix.
UNIT	Temperature Setting	Can change from °F to °C
HND1	Relay 1 Control	Turns relay 1 to OFF, AUTO, ON
HND2	Relay 2 Control	Turns relay 2 to OFF, AUTO, ON

For additional functions please refer to controller manuals

6. Controller Display

The display is separated into 3 mains areas:

a) System Arrangement. Depending on the controller unit the number of system options may differ. The screen shot below is of the Sentinel S6 controller which has 9 system options.

The most common arrangements for domestic applications are Arr 1 and Arr 3, shown in figure 6.1, below.

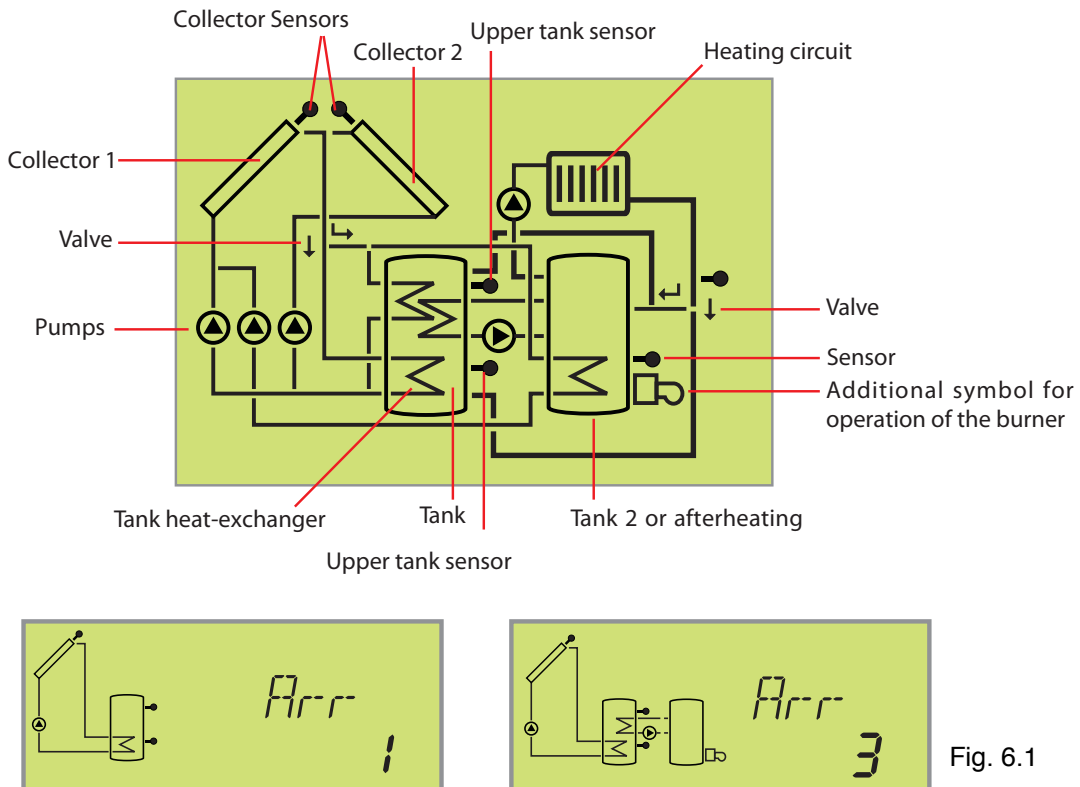


Fig. 6.1

b) Notifications - indicate the system status, including pump operation, freeze protection and any errors.

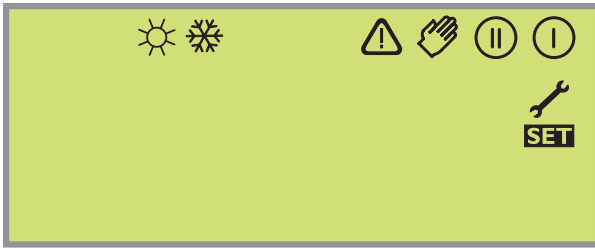


Fig. 6.2

Symbol	standard	blinking
⏏	relay 1 active	
⏏	relay 2 active	
☀	maximum tank limitation active / maximum tank temperature exceeded	collector cooling function or recolling function active
❄	antifreeze- function activated	collector minimum limitation or antifreeze function active
⚠		collector security shutdown or tank securtiy shutdown active
⚠ + 🔧		sensor defect
⚠ + 🖐		manual operation active
SET		an adjustment channel is changed SET-mode

b) Text & Temperature



Fig. 6.3

7. Controller Operation (S3 & S6 models only)

a) The controller settings are programmed using the 3 front panel buttons. **Forward** is used to progress through menu items or increase temperature values. **Backward** is used to move back through menu items or decrease temperature values. **SET** is used to go into edit mode and to confirm adjustments.

b) To change the controller settings following these steps:

1. Click **Forward** until the **SET** icon is displayed.
2. While holding down **Forward**, press and hold **Backward** for 3-4 secs until the display changes to **Arr**, then release the **Backward** button immediately followed by the **Forward** button. The controller is now in programming mode.
3. Pressing **Backward** beyond the the **Arr** function will return to normal operating mode.
4. Press **Forward** to cycle through the functions.
5. Press **SET** to go into edit mode.
6. Press **Forward** and **Backward** to adjust function status (ON/OFF) or temperature setting.
7. Press **SET** to confirm and return to function selection.

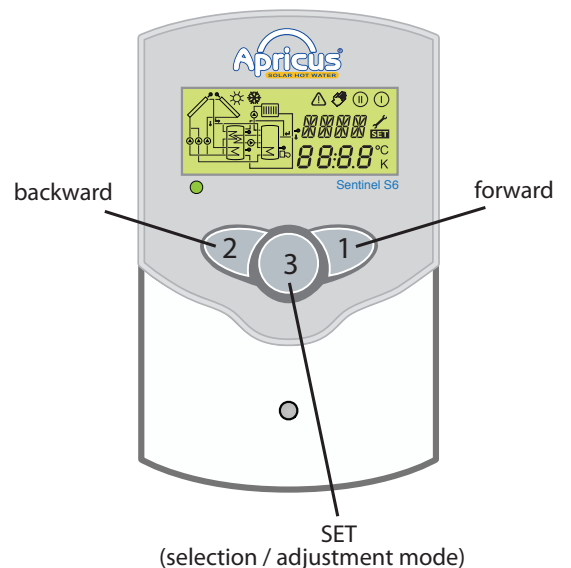


Fig. 7