
SolaStat

SolaStat-Pool



Installation Guide.

SolaStat-Pool Installation Guide Index.

Description, Ordering and Specifications.	
Index	page 2
Features	page 3
Introduction	page 3
Ordering Information.	page 3
SolaStat-Pool Users Guide.	
Principle of Operation.	page 4
User Adjustable Pool Comfort Temperature	page 4
Tropical Mode	page 4
Frost Adjustable Value	page 4
Sensor Diagnostics:	page 4
Smart Shutdown:	page 5
Pump Override	page 5
Test.	page 5
Low Voltage Option	page 5
Display Panel Description.	page 5
Optional System Enhancements.	page 5
SolaStat-Pool System Adjustable Values.	page 6
Installer Details.	page 6
SolaStat-Pool Safety Instructions.	
General Safety Instructions.	page 7
Installation Precautions.	page 7
Electrical Precautions.	page 7
SolaStat Pool Mounting.	
Where to mount the SolaStat-Pool.	page 8
Mounting the SolaStat-Pool.	page 8
Mounting the Sensors.	page 8
SolaStat-Pool Operation.	
Connect the Pump.	page 9
Power Up.	page 9
Basic SolaStat-Pool Installation.	page 9
SolaStat-Pool Sensor Maintenance.	
Lengthening SolaStat-Pool Sensor Wire.	page 10
Replacing a SolaStat-Pool Sensor.	page 10
SolaStat-Pool Sensor Resistance Table	page 10
SolaStat-Pool Programming.	
SolaStat-Pool Programming.	page 11
SolaStat-Pool Programming Table.	page 12
Pump ON / Pump OFF Adjustable Range.	page 12
Tropical Mode, Pump ON / Pump OFF Adjustable Range.	page 12
Frost Adjustable Value	page 12
SolaStat-Pool Specifications and Limit of Liability.	
Specifications	page 13
Product Liability	page 13
SolaStat-Pool Trouble-shooting Guide.	page 14
SolaStat-Pool Plumbing Issues.	
Disclaimer.	page 15
Introduction.	page 15
Solar Warm Water Specifics.	page 15
Tempering valve.	page 15
Non return valve.	page 15
Air Relief Valves.	page 15
Cavitation.	page 15

SolaStat-Pool. Solar Warm Water Controller.



Features.

- Intelligent Heat Extraction From Solar Water Collectors.
- Large 20mm Soft Green Digital LED Display c/w 8 Status Lights.
- High Quality, Efficiency, Reliability and +/-1C Accuracy.
- Stainless Steel, Water Resistant Temperature Sensors.
- Pre-wired with Mains Plugs and Sockets, no Electrician Required.
- Pre-Programmed to Customer's Specification at No Extra Cost.
- All Values and Functions Installer Adjustable.
- Access Code Protected Front Panel Programming.
- Sensor Diagnostics and Smart Shutdown.
- Frost Protection Prevents Panels Freezing.
- Tropical Mode for Cooling at Night.
- Easy to Install with External Mounting Holes.
- Complies with Safety & EMC standards.
- Attractive Polycarbonate Enclosure.
- Enclosure and cables UV resistant.
- Water Resistant.
- Rear Cable Entry Option.
- 2HP (1500W) Relay Standard.



Z495



SolaStat Models Include:

- SolaStat-Eco: Controller c/w 4 Status Lights.
- SolaStat-Plus: Controller c/w Display.
- SolaStat-Pool: Pool Controller c/w Display.
- SolaStat-Rmt: Remote Display.
- SolaStat-Rly: Slave Relay for HWC Control.
- SolaData: PC Datalogging & Comms.

Introduction.

SolaStat-Pool is Smart; it's a microprocessor based Differential Solar Warm Water Controller. The SolaStat-Pool is easy to install, easy to use, easy to programme and visually appealing.

SolaStat-Pool has Advanced Functions and takes the basics of differential control and frost protection and adds to these user adjustable pool Comfort temperature, active night cooling (Tropical), sensor diagnostics, smart shutdown, comprehensive status displays, digital temperature display, with the options of digital communications, remote display units, SolaData PC graphic datalogging and energy calculating software.

ICM (Instrumentation Control Manufacturing Ltd) has experience in designing and manufacturing Solar Warm Water Controllers to Industrial Electronic Standards for over 15 years. This has earned ICM a reputation for Quality, Accuracy, Efficiency and Reliability.

Ordering Information.

SolaStat-Pool Standard Unit: Digital Display, 8 Status Lights, 2m Pool Sensor, 10m Roof Sensor, 1 x 2hp Relay, 2m Mains Cable, Pump Outlet, and Water Resistant Enclosure.

SolaStat-Pool - ☐ - Adjustable Value Specify adjustable values as required.
PS

SolaStat Pool Ranging Options.				
Power Supply	PS	Adjustable Value	Specify Within	Std. Model
85~264Vac/dc	H	Pump Off	1~20C	2C
22~90Vdc	M	Pump On	2~21C	5C
10~28Vac/dc	L	Tropical Off	1~10C, OFF	3C
		Tropical On	2~11C, OFF	6C
		Frost	1~10C, OFF	4C

High temperature silicon sensor cable and rear cable entry options are available.

Quality Assurance Programme.

The modern technology and strict procedures of the ISO9001 Quality Assurance Programme applied during design, development, production and final inspection grant the long term reliability of the instrument.

SolaStat-Pool Users Guide.

Your SolaStat-Pool has a microprocessor at its core that intelligently and automatically controls your Solar Heated Pool or Spa at greater efficiency. The SolaStat-Pool measures water temperatures at two places in the system and turns on a water pump at the optimum time. The pump moves water from the solar collector into the pool.

The SolaStat-Pool has advanced features that protect the system from damage, run self diagnostics, and will keep you informed as to what the SolaStat-Pool is measuring and what decisions it is making.

You can set your maximum desired pool 'COMFORT' temperature as follows. Press the 'NEXT' button until the 'SET' light is ON. Then press the '+' or '-' buttons on the SolaStat-Pool to set your 'Comfort' Temperature. This value will be remembered even in the event of power interruption.

The Tropical Mode can be set to cool the pool at night if the pool temperature becomes too warm, this is most likely to occur in very hot regions.

There are also accessories that let you record and graph in real time on your PC all measured values and decisions made by your SolaStat-Pool as well as an option for a remote display (or several with individual power supplies) of all the same information but 100's of metres away.

Principle of operation.

The solar warm water collector sensor is called	'ROOF'
The pool outlet sensor is called	'POOL'
The user adjustable target pool temperature is called	'SET'

The SolaStat-Pool is a differential solar warm water controller. The controller measures the temperature at the 'ROOF' sensor and compares this to the 'POOL' sensor. If the difference between the roof and the pool is greater than the programmed upper limit (typically 5C) then the pump turns ON and transfers heated water from the solar collector to the pool and replaces this with cooler water from the pool. When this happens the pool heats up and the collector tends to cool down. The heat difference is reduced to a point where the lower limit (typically 2C) is reached and the pump turns OFF. This cycle repeats as long as the sun shines and there is a difference in temperature, the pool heats up progressively this way.

Another way of thinking of this is to say;

- The pool temperature + the 'Pump ON' temperature is the value the solar collector (ROOF) must rise to before the pump will turn on.
- And the pool temperature + the 'Pump OFF' temperature is the value the solar collector (ROOF) must drop to before the pump will turn off.

User Adjustable Pool 'COMFORT' Temperature is the value the pump will be disabled at, to stop more heated water from the solar collector entering the pool. Once the pool is 2C below the Comfort temperature the pump will be enabled and the system is free to restart the Pump ON/ Pump OFF energy gathering as described above.

Tropical mode will cool the pool (at night). Tropical Mode is activated when the pool water temperature has risen more than 2C above the Comfort adjustable value. When the solar collector is cooler than the pool by the programmed 'Tropical On' Value (typically 6C), the pump turns ON and transfers cooled water from the solar collector to the pool and replaces this with warmer water from the pool. When this happens the pool cools down and the collector tends to warm up. When this cooling difference is reduced to a point where the 'Tropical Off' Value (typically 3C) is reached the pump turns OFF. The pool cools down progressively as this cycle repeats until the pool has reached the Comfort adjustable value at which time the controller exits Tropical mode.

Frost Adjustable Value can be enabled and will protect the solar collector from freezing in mild frost areas. This will turn the pump on to move a small amount of water through the collector. Heavy frost areas may need other solutions such as glycol based systems.

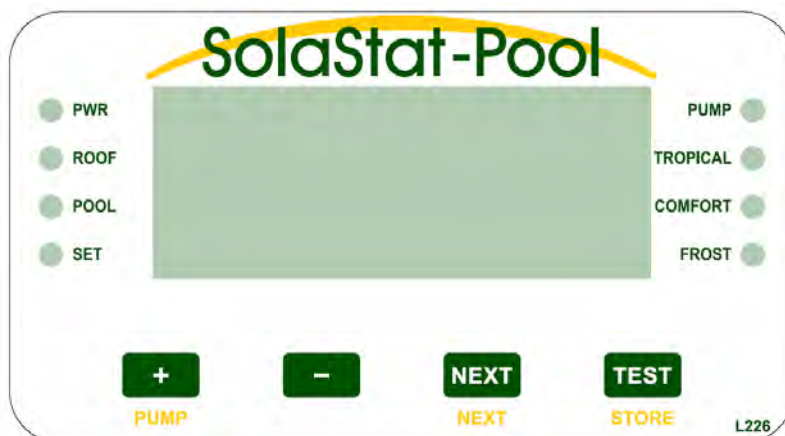
The SolaStat-Pool has other additional special features to those mentioned above.

• **Sensor diagnostics:** The SolaStat-Pool constantly checks the sensors. If a sensor is below -20C the display reads 'Lo'. If a sensor is above 140C the display reads 'Hi'. If the roof sensor reads 'Hi', the pump is disabled. If a sensor is outside the specified temperature range of -40C to 150C then the Display reads 'SSd' and the controller enters Smart Shutdown mode. When the display reads 'SSd' the sensor has either a steady light for a temperature above 150C (possibly shorted sensor or wire) or a flashing light for a temperature below -40C (possibly open sensor or broken wire). For example if the 'Roof' sensor wire is cut during some building work then the SolaStat-Pool display reads 'SSd', the 'Roof' light flashes and the controller enters Smart Shutdown mode until the wire is repaired.

SolaStat-Pool Users Guide, Cont.

- **Smart Shutdown (SSd):** In Smart Shutdown mode, the Display reads 'SSd' and the pump is disabled except for 'Frost' protection when the Roof sensor is working.
- **Low Voltage:** The SolaStat-Pool has a wide range of power supply options including low voltage (10~28Vac/dc). Using an isolated low voltage power source in conjunction with our SolaStat-Rly slave relay (low voltage option) it is possible to safely run the unit near the water but still have a 'remote' mains powered pump.
- **Pump override:** For added flexibility you can make the pump operate manually. The pump will turn on as long as the 'Pump' button is held down unless the pump is already on in normal operation. Pump manual override does not work when 'SET' reading is selected.
- **Test:** This button will cause all the lights to flash for 3 seconds then display for 3 seconds the number of times the pump has operated. This count will reset and start again after '999'.

SolaStat-Pool Display Panel Description.



- The 'PWR' light on indicates that power is being applied to the unit.
- 'ROOF', 'POOL' or 'SET' lights will be on to indicate which temperature is being displayed. Only 1 of the 3 can be on in normal operation. If more than 1 of these lights are on then it is in Smart Shutdown mode and 'SSd' will be on the display.
- The 'PUMP' light will be on when the pump is on.
- 'TROPICAL' light is on when Tropical mode is active. This indicates the pool water is warmer than the Comfort adjustable value. When the pool water is being cooled through the solar collectors (usually at night), the pump and 'Pump' light will be on at the same time as the Tropical light.
- The 'COMFORT' light is on when pool water temperature reaches or is close to, the user set Comfort temperature. The pump will not activate now until the pool is below the Comfort adjustable value by 2C or the controller is in active 'TROPICAL' or active 'FROST' mode.
- The 'FROST' light comes on when the value stored for the onset of a frost condition has been detected on the solar collector. To stop the collector freezing and bursting, the pump will come on just enough to raise the temperature of the collector by 2C.
- The 'PUMP' button will turn the pump on as long as the button is held down, unless of course the pump is already on in normal operation. Pump manual override does not work when 'SET' reading is selected.
- When 'SET' display is selected the 'Pump' button now becomes the '+' to increase the Comfort temperature, '-' button will decrease the Comfort adjustable value.
- The 'NEXT' button will step from Roof to Pool to Set and the display will show the relevant temperature in C. If a sensor is below -20C the display reads 'Lo'. If a sensor is above 140C the display reads 'Hi'. If a sensor is outside the specified temperature range of -40C to 150C then the Display will read 'SSd' and the 'NEXT' button is disabled.
- The 'TEST' button will check the system (all lights flash) then display the number of times the pump has been on. This count will reset and start again after '999'.

Optional System Enhancements.

- | | |
|--------------|--|
| SolaStat-Rmt | A remote display which repeats the display information of the SolaStat-Pool. |
| SolaData | Data comms will send what the SolaStat-Pool is doing to your PC and visually present the information with graphs, logic states, energy generated and energy used values. |

SolaStat-Pool System Adjustable Values.

Installer to fill in at installation time or after any change in program adjustable values.

System Adjustable Values		
Function	Factory Values	Installation Values
Pump OFF	2C	____C
Pump ON	5C	____C
Tropical OFF	3C	____C
Tropical ON	6C	____C
Frost	4C	____C

Notes.

- 1. Pump ON must always be higher than Pump OFF.
- 2. A disabled value is indicated by 'OFF'

Installer Details.

Contact:

Phone:

Address:

.....

.....

SolaStat-Pool Safety Instructions and Limit of Liability.

Read safety instructions and limit of liability before proceeding with the installation.

General Safety Instructions.

1. This installation guide is for the installation of SolaStat-Pool solar warm water controllers only and is not an installation guide for any other part.
2. The complete installation should be checked at least annually for damage or malfunction.
3. All servicing to be carried out by an authorised service agent only.
4. All aspects of the installation must comply with local electrical and plumbing regulations (and any special solar warm water regulations).

Installation Precautions.

1. Must be installed away from water sources such as rain, leaking pipes, or wet floors and must not be installed in damp areas like bathrooms.
2. Must be installed away from direct sunlight, flammable liquids or radiant heat sources.
3. Power leads must be facing directly down, not sideways or upwards.
4. Must be in a safe environment for users to inspect display panel.
5. Failure to mount sensors correctly can lead to a poorly controlled solar warm water system with safety issues like overheating and over pressure damage to the plumbing and freezing damage to the solar collector.
6. Alteration of installer level program values outside those recommended values by ICM and other parts supplied can lead to dangerous conditions and/ or damage to parts of the solar warm water system.

Electrical Precautions.



CAUTION: Dangerous Voltages may be present. The SolaStat has no user serviceable parts. Protective enclosure only to be opened by qualified personnel. Remove ALL power sources before removing protective cover.



1. All mains voltage electrical work to be carried out by a qualified electrician, especially external power outlet socket installation.
2. A readily accessible disconnect device, overcurrent device and RCD Protection rated to suit the size of the pump plus 5VA must be incorporated in the power supply wiring. The overcurrent device for a 1500W, 240Vac pump must not exceed 10Amps.
3. It is recommended that sensor leads be kept 300mm away from mains and comms cables.
4. Do not use mains power extension cords unless approved by the manufacturer. Water resistant plugs and sockets should be used.
5. The SolaStat-Pool controlled output (PUMP) is connected to the input power supply wiring and is not isolated from it. Supply voltages will be output through that outlet during activation.
6. Always use within specified voltage and load ranges. Never use with damaged leads, plugs or sockets.
7. Do not allow the sensor cables to come within 10mm of the high voltage connectors or components inside the enclosure.
8. Comply with local special electrical regulations for Pool and Spa's.

Warning:

These products are not designed for use in, and should not be used for patient connected applications. In any critical installation an independent fail-safe back-up system must always be implemented.

SolaStat-Pool Mounting.

Where to mount the SolaStat-Pool.

1. Against a flat vertical surface with sufficient strength to hold the enclosure and any additional weight from the plugs, sockets and cables.
2. Power leads must be facing directly down, not sideways or up.
3. Safe for users to inspect.
4. The display can be easily read and buttons accessed.
5. Allow for cable runs, location of power outlets and lengths of wires.
6. Do not mount in direct rain or sunlight.

Mounting the SolaStat-Pool.

1. There is no need to open the enclosure during a standard installation.
2. Allow for the enclosure dropping 5mm from screw centres once mounted (keyhole mounting system).
3. Place drill guide template against wall, checking for level alignment. 4 screws are supplied, 2 are chip board screws and 2 are combination Gib/ wood screws. It is recommended that all 4 mounting holes are used with at least 2 firmly secured into wood. The outer plastic Gib anchors will self tap into Gib board and their inner metal screws fix into the centre of the plastic anchors.
4. Mark and drill/ screw as appropriate leaving the heads of the screws above the surface by approximately 3mm.
5. Place unit over the 4 screw heads, unit should slide down 5mm into the 'key' slots and become secured to the wall. You will need to adjust screw height to obtain a secure fit.

Mounting the Sensors.

This is Critical to the Success of the Installation.

The sensors are the only way the SolaStat-Pool can efficiently control and protect the system.

1. **The 10m ROOF Sensor.** (Labelled 'ROOF SENSOR - Solar Collector.)
The 'ROOF' sensor is best fitted into an immersion 'pocket' just inside the solar collector in the warm water outlet pipe. Liberally apply heat transfer compound between the sensor and the lining of the 'pocket'. Sensor should be sealed with neutral cure sealant and externally lagged, also the cable should be insulated from the bare pipe. Heat transfer compound is available from your distributor or ICM Ltd.
2. **The 2m POOL Sensor.** (Labelled 'POOL SENSOR'.)
The 'POOL' sensor is best fitted into an immersion 'pocket' as close as possible to the pool. Liberally apply heat transfer compound between the sensor and the lining of the 'pocket'.

Warning.

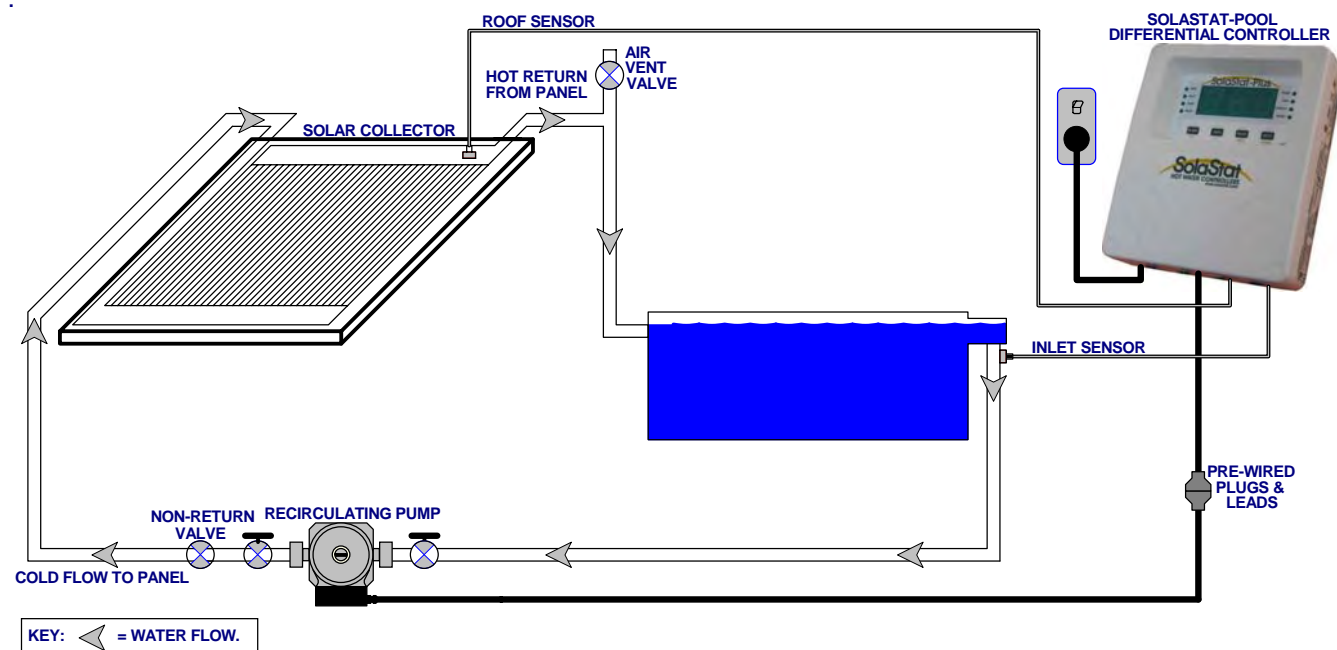
1. Sensors must not be immersed in water.
2. It is recommended that sensor leads be kept 300mm away from mains and comms cables.
3. Ensure the correct sensors are mounted in the correct place.
4. Failure to properly mount the 'POOL' sensor as prescribed in the method above can result in;
 - a. The system may not operate at greatest efficiency.
 - b. There may be inaccurate pool water readings on the display.
 - c. Target temperatures may be inaccurate.
5. Failure to correctly mount the 'ROOF' sensor as prescribed in the method above can result in;
 - a. The system may not operate at greatest efficiency.
 - b. Failure to detect Frost conditions. Collector can burst.
 - c. Warm water readings on the display may be misleading.
 - d. The pump may run on too long.
6. Do not mount sensors in direct rain or sunlight.

SolaStat-Pool Operation.

Connect the Pump.

Plug in the pump to the 'PUMP' socket on the SolaStat-Pool. This should not exceed the 2hp load rating as specified on the label on the side of the enclosure.

Basic SolaStat-Pool Installation.



Note. This diagram is only to be used as a general guide and not all the required components are shown. Each installation needs to be customised to suit its situation. Always use best plumbing and electrical practices, and comply to any regulatory requirements.

Power Up.

Before you connect the power;

1. Read safety instructions, warnings and limit of liability before proceeding.
2. Complete all the installation and securely mount the SolaStat-Pool.
3. Power outlet socket to be installed by a qualified electrician.
4. Ensure suitable over-current protection and RCD Protection for the SolaStat-Pool and pump are in place.
5. There is no water, metal shavings or other electrical hazards to contaminate the plug, socket, wiring or surrounding environment.

Only then;

Plug it in and turn it on.

What You Should See.

The first thing you should see after power up is;

1. A digital readout of the 'POOL' temperature in degrees Celsius.
2. On the left the 'PWR' light and the 'POOL' light should be on.
3. On the right the lights will be on depending on how the solar warm water system is operating.

The pump operation can be tested by pressing the 'PUMP' button. This will turn the pump on as long as the button is held down, unless of course the pump is already on in normal operation. Pump manual override does not work when 'SET' reading is selected.

The SolaStat-Pool is now installed and should be working. It would be best to observe some solar hot water pump cycles but this will rely on the sun shining. Check all functions are working correctly before leaving the installation.

Note 1. See User Guide for explanation of display and status lights.

Note 2. See "Trouble shooting" section if system not working correctly.

SolaStat-Pool Sensor Maintenance.

Lengthening SolaStat-Pool Sensor Wire.

The sensor wire can be lengthened within certain guidelines. Poor connections or induced interference can cause false temperature readings.

1. The sensor is not polarized- it can be connected either way around.
2. The wire normally used for sensor lengthening is twin 0.5mm² stranded speaker wire.
3. Firmly attach wires to each other by either soldering (heatshrink over each joint) or by quality screw terminals. Joins must be kept dry.
4. It is recommended that sensor leads be kept 300mm away from mains and comms cables.
5. Over 20 metres; extra care must be taken to avoid electrical interference being picked up.
6. In 'noisier' electrical environments screened cable may be required.
7. The absolute maximum cable length is 100 metres.

Replacing a SolaStat-Pool Sensor.



CAUTION: Dangerous Voltages may be present. The SolaStat has no user serviceable parts. Protective enclosure only to be opened by qualified personnel. Remove ALL power sources before removing protective cover.



If a damaged sensor needs to be replaced then the cover of the enclosure will need to be opened unless the choice is made to join the wires externally (see "Sensor Wire Lengthening" section).

1. Remove the mains power supply, preferably remove the plug from the wall socket. Make sure no other power source is feeding back through other connections.
2. Remove the 4 screw covers on each corner of the lid of the enclosure. This will require a fine tipped tool such as a screw driver. Be careful not to damage the lid. Always press the tool away from you to avoid injury if you slip.
3. Remove the 4 screws that hold the lid on.
4. Unscrew the damaged sensor from the terminal block.
5. Loosen the cable clamp for the sensor leads.
6. Carefully pull the wire back through the opening in the bottom case.
7. Thread the new sensor wire back through where the old one came from.
8. Place the wires of the new sensor into the terminal block where the old sensor came from and retighten the screws.
9. Do not allow the sensor cables to come within 10mm of the high voltage connectors or components inside the enclosure. Tighten the screws on the cable clamp.
10. Replace the lid, replace the 4 screws and tighten.
11. Push in 4 new screw covers available from your distributor or ICM Ltd. Note: there are locating lugs to ensure correct orientation.
12. Reconnect the SolaStat-Pool and turn on the power.
13. Check sensor is reading correctly and check SolaStat-Pool operation as per "What You Should See" section of this manual.

The table below has the correct resistance values of the sensor at different temperatures. The sensor must be removed from the SolaStat-Pool to measure these values correctly. Follow the above procedure for removal of the sensor.

Sensor Resistances	
Temperature	Resistance in kw
0°C	27.25
25°C	10.00
50°C	4.162
75°C	1.925
100°C	0.973
Above 150C or 'short'. 'SSd' on Display Sensor Light On	<0.300
Below -40C or 'open'. 'SSd' on Display Sensor Light Flashing	>200

A short circuit can be caused by the sensor wires being connected together. Check the wires are not partially cut. (eg Sharp roofing iron.) or moisture is not getting into the sensor causing corrosion.

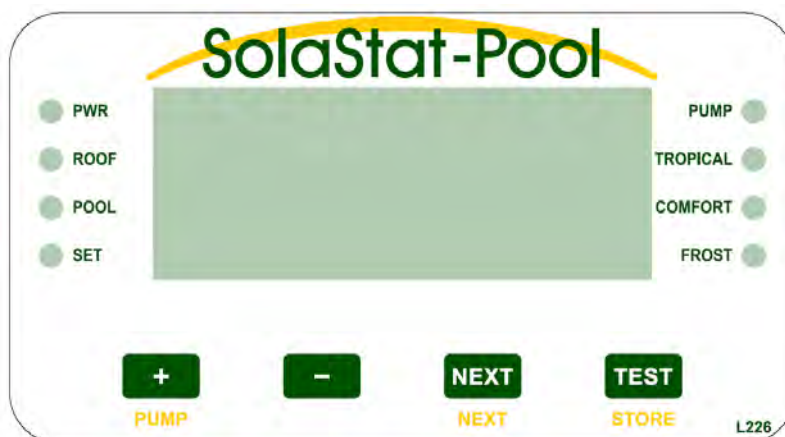
An open circuit can be caused by the sensor wires being broken. Check the wires are not cut. (eg Sharp roofing iron.) or moisture is not getting into the sensor causing corrosion.

SolaStat-Pool Programming.

If the adjustable values from the factory are inappropriate for the installation (see included document stating programmed values) then the unit needs to be programmed.

The programming access code is for distributor or installer use only, as using incorrect adjustable values can cause inefficiencies in the system or cause damage to the system voiding the warranty. Once new values are 'stored' they are permanently written into memory and will be retained when power is removed.

Note: Immediately after reprogramming please fill out the 'Installation Adjustable Values' in the 'System Adjustable Values' table in the user guide. (Page 6.)

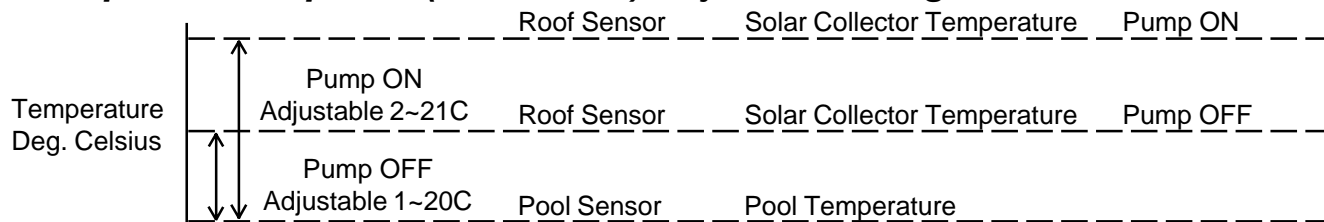


1. The small yellow letters/words under the buttons now apply.
2. Enter the installer programming access code. Available from distributors.
3. Every 10 seconds the characters 'PRG' will flash on the display indicating you are in programming mode.
4. The 'PUMP' light will be flashing to indicate the number being displayed is the 'Pump OFF' value.
5. The 'Pump OFF' can be adjusted using the '+' and '-' . Move onto the next value by pressing 'NEXT'.
6. Now the 'PUMP' light will be on continuously to indicate the number being displayed is the 'Pump ON' value.
7. The 'Pump ON' can be adjusted using the '+' and '-' . Move onto the next value by pressing 'NEXT'.
8. The 'TROPICAL' light will be flashing to indicate the number being displayed is the 'Tropical OFF' value.
9. The 'Tropical OFF' can be adjusted using the '+' and '-' . Move onto the next value by pressing 'NEXT'.
10. Now the 'TROPICAL' light will be on continuously to indicate the number being displayed is the 'Tropical ON' value.
11. The 'Tropical ON' can be adjusted using the '+' and '-' . Move onto the next value by pressing 'NEXT'.
12. Now the 'FROST' light will be on continuously to indicate the number being displayed is the 'frost' value.
13. The 'FROST' can be adjusted using the '+' and '-' .
14. All the values have now been entered. The values can be checked by simply pressing 'NEXT' to cycle through all the values noting which light is on and what value is displayed (as per the 'SolaStat-Pool Programming Table').
15. To store all the values in permanent memory press 'STORE' at any stage and the values will be written to memory and the unit will exit programming mode and return to automatic operation. The unit will also store the values and exit if no key is pressed for 1minute while in the programming mode.
16. Fill out the 'System Adjustable Values' in the user guide. (Page 6.)

SolaStat-Pool Programming Table. Also refer principle of operation.

Programming Table for Adjustable Values.				
Adjustable Value	Light indication	Typical	Range	Disable/Function
Pump OFF (differential)	Pump Flashing	2C	1-20C	n/a
Pump ON (differential)	Pump Steady	5C	2-21C	n/a
Tropical OFF	Tropical Flashing	3C	1-10C	<1C=Disable. Display='OFF'.
Tropical ON	Tropical Steady	6C	2-11C	Tropical OFF ='OFF'. Display = 'OFF'
Frost	Frost steady	4C	1-10C	>10C=Disable. Display='OFF'

Pump ON / Pump OFF (Differential) Adjustable Range.



- Notes
1. Pump ON must always be higher than Pump OFF.
 2. A disabled value is indicated by 'OFF'
 3. Fill out programming record in User Guide.

Pump ON and Pump OFF.

Technically Pump ON and Pump OFF values are the 'ROOF' sensor temperature minus the 'POOL' sensor temperature and are called differential temperatures.

Example. Pump ON = 5C and Pump OFF = 2C.

When the solar collector has risen to 5C hotter than the Pool the pump turns on.

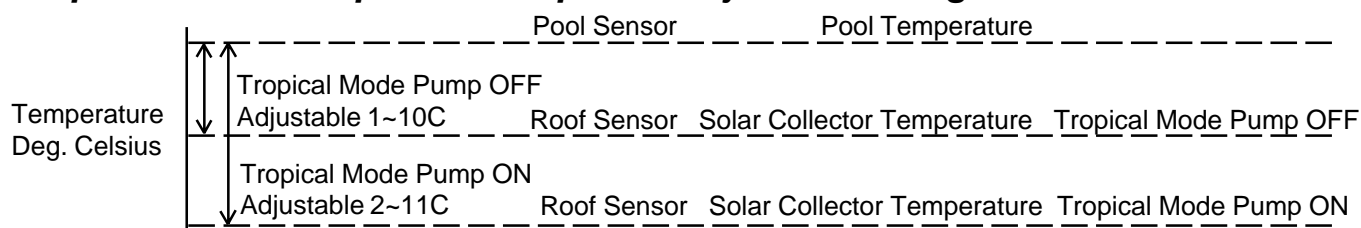
When the solar collector has fallen to 2C hotter than the Pool the pump turns off.

In lower temperature systems like swimming pools or underfloor heating gain more energy from the sun by transferring more water at lower temperatures and so have typical adjustable values of 5C Pump ON and 2C Pump OFF.

Increasing the 'Pump ON' value will let the solar collector heat up more before heat is transferred to the pool. The advantage is hotter water entering the pool but may mean less operations and lost energy on partly sunny days.

Increasing the 'Pump OFF' value will mean the overall temperature of the water coming from the solar collector is hotter on average when the pump turns off. This will help overcome heat losses in pipes ensuring the water entering the pool remains hotter than the water already there but may result in less energy being transferred as above.

Tropical Mode Pump ON / Pump OFF Adjustable Range.



TROPICAL mode is active cooling of the pool (at night). Tropical Mode is activated when the pool water temperature has risen more than 2C above the Comfort adjustable value. When the solar collector is cooler than the pool by a programmed amount (ie; Pool Sensor - Tropical ON) then the pump is turned on to pass water through the collector and radiate excess heat into the night air. When the solar collector has reached a lower programmed amount (ie; Pool Sensor - Tropical OFF) then the pump turns off. When the pool has fallen in temperature to the user adjustable Comfort temperature, the controller exits Tropical mode.

Frost Adjustable Value

The 'FROST' Adjustable Value is critical to avoid damage to solar collectors. The appropriate value depends on installation variables such as geographic location, angle and type of solar collector, sensor placement, fluid used, etc. All of these must be considered when determining the 'FROST' value. This is the installers' responsibility. We recommend 4C as a minimum for the 'FROST' Adjustable Value in mild frost areas only but this may need to be increased for some installations.

SolaStat-Pool Specifications.

Power Supply.

Supply Voltage.	-H	85~264Vac/dc (Standard model.)
	-M	22~85Vdc. (Must be specified at time of ordering.)
	-L	10~28Vac/dc. (Must be specified at time of ordering.)
Max power usage.		5VA + external loads.

Relay Outputs.	1 x 2HP (1500W) motor or 10A resistive.
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Sensors.

Display range	-20 ~ +140C
Control Range	-40 ~ +150C
Stainless steel tip	-40 ~ 150C; 6mm diameter x 30mm
PVC Sensor cable	-40 ~ +105C; 4mm diameter, UV resistant. (Standard Models)
Silicon Sensor Cable	-40 ~ +150C; 4mm diameter, UV resistant. (Special Order)
Accuracy	+/-1C @ 25C

Adjustable Values Range. (Adjustable in programming mode.)

Pump ON (Differential)	2~21C (Roof – Pool sensor)
Pump OFF (Differential)	1~20C (Roof – Pool sensor)
Tropical Mode, Pump ON	1~10C (Pool – Roof Sensor) or OFF.
Tropical Mode, Pump OFF	2~11C (Pool – Roof Sensor) or OFF.
Frost Protection:	1~10C with +2C hysteresis or OFF.

User Adjustable Comfort Range. (User Adjustable.)

Pump Inhibit	10~40C
Hysterisis	-2C for Pump ON/OFF (Differential) operation. +2C for Tropical Mode, Pump ON/OFF Operation.

EMC and Safety Compliances.

Emissions:	EN 55022-A, CTick.
Immunity:	EN 50082-1.
Safety Compliance:	EN 60950, CTick.

General Specifications. (Unless otherwise stated in other input specifications.)

Operating Temperature:	0~60C
Operating Humidity:	90% RH Max. Non-Condensing
Enclosure Construction	Polycarbonate - Impact Resistant UL94 V-2 Non Burning, UV Stabilized Water resistant or rear entry option available.
Dimensions	L=167, W=142, H=40mm, excluding glands and cables
Weight.	Standard model + sensors + packaging = 1200grams

Product Liability.

This information describes our products. It does not constitute guaranteed properties and is not intended to affirm the suitability of a product for a particular application. Due to ongoing research and development, designs, specifications, and documentation are subject to change without notification. Regrettably, omissions and exceptions cannot be completely ruled out. No liability will be accepted for errors, omissions or amendments to this specification. Technical data are always specified by their average values and are based on Standard Calibration Units at 25C, unless otherwise specified. Each product is subject to the 'Conditions of Sale'.

SolaStat-Pool Trouble-shooting Guide.

This is intended as an initial guide to minimise service calls.

Trouble Shooting		
Symptom	Cause	Solution
No operation, no display and no lights	a. No power	a. Check mains outlet. b. Check fuses.
POWER light on but no display or corrupted display.	a. Power brown out. b. Unit Damaged.	a. Remove power while brownout condition is present. b. Remove power for 10 minutes, repower and see if unit is operating. If not unit needs repair.
Display on, pump not running and yet is sunny outside. PUMP light is ON;	a. Pump faulty or disconnected.	a. See if pump has become unplugged.
Display on, pump not running and yet is sunny outside. PUMP light is OFF. COMFORT light is OFF.	a. Sensor not mounted properly. b. Water not hot enough yet. c. Roof Sensor reads 'Hi' on display.	a. Check sensor is thermally bonded to Solar collector outlet. b. Check temperatures of Roof and Pool, they need to be greater than the difference programmed for pump ON. Wait. c. Normal Operation, Pump Disabled.
Display on, pump will not operate and yet is sunny outside. Pump light is OFF. COMFORT Light is ON.	a. Comfort Temperature has been exceeded.	a. If Pool temperature greater than User Adjustable Comfort Temperature then is working normally.
Pump running for very long periods.	a. May be normal operation. b. Pump is cavitating. c. Settings incorrect. d. Airlock.	a. Check with Installer. Pool Installations can have long pump run times due to lower Differential Settings and larger collector surface area. b. If pump is making noise like stones passing through it then it is cavitating. See SolaStat Plumbing Issues. c. Check programming correct for pool. d. Air Relief Valves not installed/functioning.
Pump runs at night. FROST light is ON.	a. Frost outside.	a. Normal operation.
Pump runs at night. FROST light is OFF. TROPICAL light is OFF.	a. System is reverse thermosiphoning.	a. Plumbing measures to stop problem needed.
'Lo' on Display.	a. Sensor below -20C.	a. Check Outside Temperature.
'Hi' on Display.	a. Sensor above 140C.	a. Check Collector has water in it.
'SSd' on Display. ROOF Light Flashing.	a. Wire to Roof sensor broken. b. Roof Sensor Damaged. c. Roof Sensor below -40C.	a. Repair wire. b. Replace Roof Sensor. c. Check Outside Temperature.
'SSd' on Display. ROOF Light ON.	a. Wire to Roof Sensor shorted. b. Roof Sensor Damaged. c. Roof Sensor above 150C.	a. Repair Wire. b. Replace Roof Sensor. c. Check Collector has water in it.
'SSd' on Display. POOL Light Flashing.	a. Wire to Pool sensor broken. b. Pool Sensor Damaged.	a. Repair wire. b. Replace Pool Sensor
'SSd' on Display. POOL Light ON.	a. Wire to Pool Sensor shorted. b. Pool Sensor Damaged.	a. Repair Wire. b. Replace Pool Sensor

SolaStat-Pool Plumbing Issues.

Disclaimer.

For full information on compliance and safety standards for solar warm water systems the appropriate local standards must be referred to. All plumbing to be carried out by qualified plumbers only.

We provide the following information as a guideline only to help obtain the greatest efficiency from the system. Any information supplied here is based on feedback to us by experienced solar warm water professionals and in no way represents a complete guide to plumbing such a system, as we are not plumbers and do not represent ourselves as such. Best plumbing practices must be used in all instances.

Introduction.

Any solar warm water system involves professional level plumbing and water much hotter than would normally be seen in standard domestic warm water systems. For this reason Instrumentation Control Manufacturing Ltd recommends any installation is carried out by a registered and qualified plumber. All parts including the pump must be rated for the elevated temperatures found in solar warm water systems.

Solar Warm Water Specifics.

1. Non Return Valve / System.

Hot water rises and cold water falls. If the solar collector is colder than the pool, such as during the night, the warm water from the pool can self thermosiphon up to the collector. The collector now radiates the heat to the cool night air and the water descends back down to the pool. To stop this loss of warm water at night or during cloudy skies there should be a one way or 'non return' valve or similar measure fitted. It may also be possible to achieve this with the way the collectors or plumbing is installed etc.

The failure of this non return valve is a common problem with solar warm water systems. The orientation of the valve as per manufacturer's instructions is critical. Also the valve sometimes will not close when swarf or other debris get caught in the valve seat.

2. Air Relief Valves / Vacuum break.

It is important that air relief valves are fitted to the highest point of both the feed to and the return from the solar water collectors or other relief system. Otherwise air locks can occur within the piping etc. (An air lock in the system will increase the head that the pump is working against and for some installations this is too much and the water ceases to circulate. For systems where air locks occur, the pump may need to be set to a higher speed or a higher head pump installed).

3. Cavitation.

A pump is used to circulate the water between the pool and the collector.

If the pressure at the inlet or impellor of the pump falls below the vapour pressure of the liquid being pumped, cavitation will occur. Cavitation in a pump is more likely to occur as the temperature of the water rises and/or the pressure of the water decreases.

Bubbles form when the water is sucked into the pumps impellor and collapse again as small implosions when the water is ejected out of the impellor which can be so rapid that a rumbling/cracking noise is produced (it sounds like stones passing through the pump) and there can be damage to the impellor and other sensitive components as well as a drop in water volume moved.

As cavitation gets worse, less and less water is moved, often reaching a point where no water at all moves. Since the solar warm water controller is still reading a 'differential' requiring water to flow then the pump stays on until the vapour point drops. The vapour point drops either by water pressure increasing or water temperature decreasing. When the pump is cavitating it may run continuously for several hours.

SolaStat-Pool Plumbing Issues, Cont.

To minimise cavitation;

1. Make sure the pump is appropriate for the installation.
2. If a variable speed pump then select the best setting (a slower speed that still has enough head pressure is best as this will create the lowest pressure difference in the pump).
3. Mount the pump as low as is possible to achieve highest water pressure out of the tank feeding into the pump.
4. Lower the resistance to water flow into the pump, such as less bends or more gradual bends, or wider diameter pipes. Recommended minimum diameter pipe 1/2".
5. In exceptional cases a larger pump with a larger impellor may need to be fitted to reduce vacuum at the impellor.

SolaStat Distributor.

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