

Solar Water Heating Controller

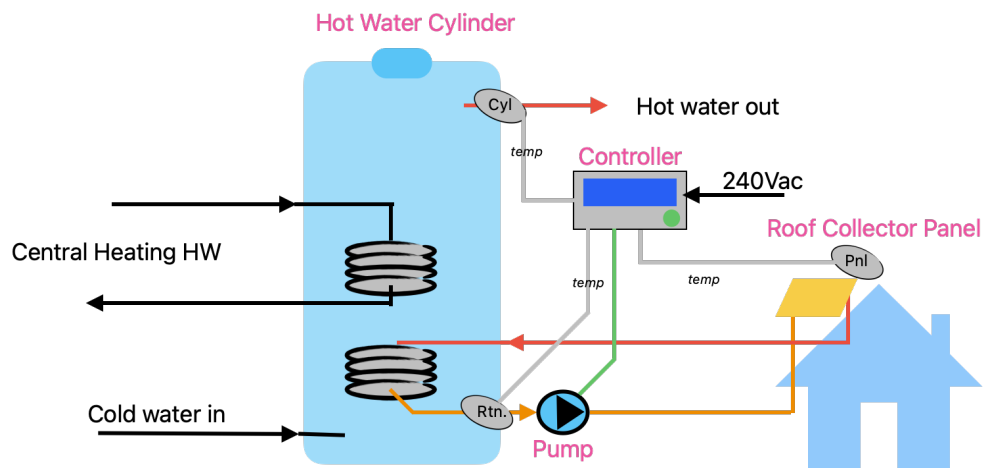
User Manual

Firmware: SWHController6_5_9

1. Overview

The controller automatically operates a solar hot water circulation pump using information from three temperature sensors. It compares the solar collector temperature with the return water temperature and circulates water only when useful solar energy is available. Manual Override, Backup mode, frost indication and pump protection are also provided.

After a power interruption the system restarts and runs in Auto mode.



Typical Installation

The controller compares the collector (**Pnl**) temperature with the return water (**Rtn**) temperature. When the collector panel is sufficiently hotter than the return water, the circulation pump transfers heat into the hot water cylinder. The **Cyl** sensor monitors the stored water temperature for information only.

2. Power-up Sequence

On power-up the LCD displays firmware information followed by the controller parameters:

- Firmware version (current v6_5_9)
- Pump ON differential: 12°C
- Pump OFF differential: 4°C
- Frost warning temperature: 4°C
- Minimum cycle time: 25 seconds (10 s minimum ON, 15 s minimum OFF)
- Maximum continuous pump run: 16 hours

After the startup screens the controller enters AUTO mode. The top line scrolls 'Auto' when the pump is running.

3. Normal LCD Display

Top line	Meaning
Rtn Cyl Pnl	AUTO mode with pump OFF. Labels for the three displayed temperatures.
Auto	Auto – Automatic control is active. The word Auto scrolls across the display while the pump is operating
Override	Pump ON. Expires after 12 hours and reverts to AUTO mode.
Backup	Pump forced OFF.
Starting	Displayed only during startup.

Bottom line displays three temperatures:

- Left: Outlet to pump. **Rtn - return**
- Centre: Cylinder temperature at top of tank. **Cyl - cylinder**
- Right: Solar panel (collector) on roof. **Pnl - panel**

Temperatures are displayed to one decimal place – they are not calibrated

4. Icons

Lock icon: Pump state is held because the minimum ON or OFF timer is counting down. If flashing, a 12-hour pump overrun fault has occurred.

Snowflake icon: Frost protection temperature reached (collector $\leq 4^{\circ}\text{C}$).

Entire top line flashing: One or more temperature sensors are outside their valid operating range. *An open circuit sensor will read 150.*

A flashing lock icon indicates that the pump has exceeded the maximum continuous operating time and has been stopped for protection.

5. Push Button

Button action	Function
Tap (<1 s)	Return to AUTO mode.
Short press (1–5 s)	Manual Override. Pump forced ON. Override will expire to AUTO after 12 hours
Long press (5–10 s)	Backup mode. Pump forced OFF.
Held >10 s	Detected as STUCK for diagnostics; no separate operating mode.

The display text is in Capitals when a button press is detected.

6. Automatic Operation

The pump starts when the collector temperature is at least **12°C warmer** than the return water temperature. Once operating, it continues until the temperature difference falls below **4°C**. Using different ON and OFF temperatures (hysteresis) prevents rapid cycling under changing cloud conditions.

7. Pump Protection

Minimum ON time: 10 seconds.

Minimum OFF time: 15 seconds.

Maximum continuous running is 16 hours. If exceeded the controller stops the pump, flashes the lock icon and requires a button press to clear the fault.

8. Frost Behaviour

When the collector temperature falls to 4°C or below the frost icon is shown. If frost protection is required, the user may select **Override**, allowing warm water from the storage tank to circulate through the collector. If the Override had been selected for frost protection, the controller automatically returns to AUTO once the collector warms above the frost threshold.

9. Display Summary

Mode

Power on
 AUTO, pump OFF
 AUTO, pump ON
 Manual, pump ON (12hrs expiry)

Backup – pump off
 Sensor fault
 Pump lock
 Frost
 Overrun fault

Display

Version and parameter screens
Rtn Cyl Pnl
 Auto (scrolls while pump runs)
 Override - automatically changes to AUTO after 12 hours
 Backup
 Top line flashes
 Lock icon
 Snowflake icon
 Flashing lock icon

10. Operating Parameters

Pump ON differential: 12°C

Pump OFF differential: 4°C

Frost threshold: 4°C

Moving average: 40 samples over approximately 8 seconds.

Maximum sensor range: -30°C to +120°C.

Controller mode after power restoration: **AUTO** – warnings cleared