# Operation Instruction

## SR81

## Intelligent Controller

## for Split Pressurized Solar Hot Water System


**Safety information**

**1.1 Installation and commissioning**

When laying all wires, please ensure that no damage occurs to any of the constructional fire safety measures presented in the building.

The controller must not be installed in well ventilated areas.

Before connecting the device, ensure that the supply voltage matches the specifications on the controller.

Sensor wires and or sensor extensions are not to be installed with Power supply cables within the same conduit as this would cause interference.

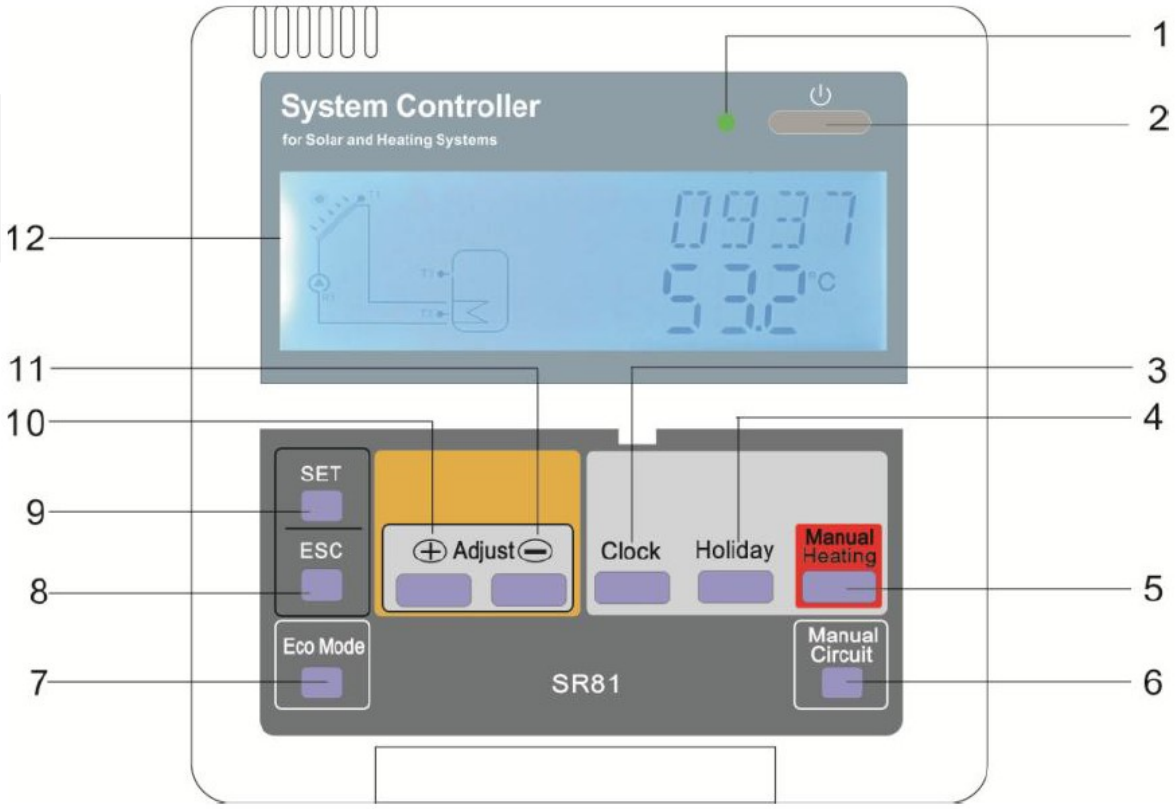
**1.2 About this manual**

This manual describes the full operation and setting up of the SR81 Solar Thermal controller. All Steps must be followed to ensure the system is operating properly.

**1.3 Liability waiver**

The manufacturer can't monitor the compliance with these instructions or the circumstances and methods used for installation, operation, utilization and maintenance of this controller. Improper installation can cause damages to material and person. For this reason, ITS Solar and Heat Pumps cannot take responsibility and liability for losses, damages or cost that might arise due to the improper installation, operation or wrong utilization and maintenance or that occurs in some connection with the aforementioned. The manufacturer preserves the right to make changes to the product, technical data or installation and operation instructions without prior notice. As soon as it becomes evident that safe operation is no longer possible (e.g. visible damage). Please immediately take the device out of operation.

***Operating functions on Display***



| Nr. | Button |
|---|---|
| 1 | Power indication lamp |
| 2 | “On/Off” |
| 3 | “Clock” |
| 4 | “Holiday” |
| 5 | “Manual Heating” |
| 6 | “Manual Circuit” |
| 7 | “Eco Mode” |
| 8 | “Exit” |
| 9 | “Adjust” |
| 10 | Upwards adjust “+” |
| 11 | Downwards adjust “-” |
| 12 | LCD Display screen |

| Status Description | Code | Lighting | Blinking |
|---|---|---|---|
| Exceed the maximum temperature of storage | SMX | ☀ | |
| Running of storage emergency shutdown function | | ☀ | ⚠ |
| Running of collector emergency shutdown function | OCEM | | ⚠ + ☀ |
| Running of collector cooling | OCCO | | ☀ |
| Running of tank cooling function | OSTC | | ☀ |
| Start of anti-freezing function | OCFR | ❄ | |
| Running of anti-freezing function | OCFR | | ❄ |

**Technical data**

**Power supply:** 100…240V ~ (50…60Hz)

**Rated impulse voltage:** 2.5KV

**Housing**-Plastic ABS

**Mounting**-Wall mounting

**Operation:** 10 push buttons at the front cover

**Protection type:** IP40

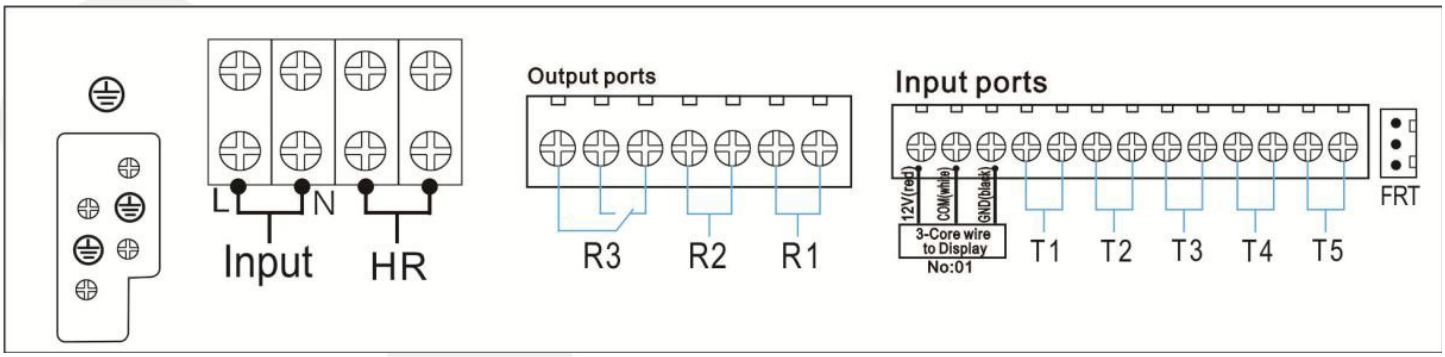
**3000W/4000W MAX of electrical heater should be remarked in the purchased order**

**Dimension of display:** 120*120*18mm

**Dimension of controller board with 1500W output:** 200*140*43mm

**Dimension of controller board with 4000W output:** 218*165*55mm

**Note:** there are 4 inputs for NTC10K, B=3950 temperature sensor, but only 1 sensor are included in the standard delivery Pack; the other two should be purchased separately by customer if necessary. An ITS Solar and Heat Pumps NTC10K Micro sensor is required for all retro fit and is not included as standard.




| Sensor ports | Description | | Relay outputs | Description |
|---|---|---|---|---|
| T1 | Collector temperature sensor PT1000 | | R1 | For solar circuit pump |
| T2 | Temperature sensor on the bottom part of tank. NTC10K | | R2 | 1. for DHW circuit function（CIRC）<br>2.OHDP（Thermal energy transferring, R2,R3 can be selected） |
| T3 | Temperature sensor on the upper part of tank. NTC10K | | | |
| T4 | Temperature sensor on DHW Pipe. NTC10K | | R3 | 1.TIME（Timer function）<br>2.AH（Automatic thermostat function |
| T5 | Temperature sensor for thermostat function NTC10K | | HR | For back-up heating |

## 1 - Time setup

Before activating power to the SR81 Solar thermal controller, please ensure that all required sensors and circulation pumps are connected.
Once the system has been activated, all settings can be done.

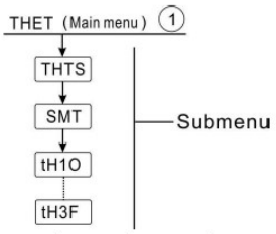
- ✓ Press "CLOCK", time will display on the screen and the hour "00" flashes
- ✓ Press +/- button to adjust the value
- ✓ Press "CLOCK" again for the minute "00" to flash
- ✓ Press +/- to adjust the value
- ✓ Press "ESC" button to save the new values

Note: In case of a power failure to the controller, date and time settings will be memorized in the controller to a maximum of 36 hours.

## 2 - Deactivation of T3 Sensor

The T3 NTC10K sensor is required on the top of the storage tank to read the hottest part of the stored hot water. As most system are retro fit system, it is seldom that adequate space is available to add the T3 sensor inside the tank to take these readings accurately. For this reason it is critical that the T3 sensor be deactivated where the T2 sensor will then automatically take over all its functions. To deactivate the T3 function, proceed with the following steps:

**Menu Structure**

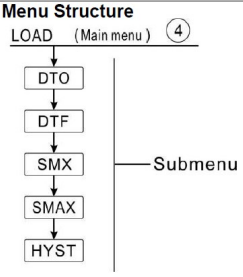



| Main menu | Submenu | Factory set | Adjustable range | Step per adjust | Description |
|---|---|---|---|---|---|
| THET | | | | | Timing heating function |
| | THTS | S3 | S2. S3 | | Select desired sensor of heated tank (S3 for T3, S2 for T2) |
| | SMT | OFF | ON/OFF | | Intelligent heating Mode |
| | tH1O | 04:00 / 40℃ | 00:00-23:59/ 0-93℃ | 0.5C | Switch-on time and temperature of the first heating section |
| | tH1F | 05:00/ 50℃ | 00:00-23:59/ 2-95℃ | 0.5C | Switch-off time and temperature of the first heating section |
| | t H2O | 10:00 / 40℃ | 00:00-23:59/ 0-93℃ | 0.5C | Switch-on time and temperature of the second heating section |
| | tH2F | 10:00 / 50℃ | 00:00-23:59/ 2-95℃ | 0.5C | Switch-off time and temperature of the second heating section |
| | tH3O | 17:00 / 50℃ | 00:00-23:59/ 0-93℃ | 0.5C | Switch-on time and temperature of the third heating section |
| | tH3F | 22:00 / 55℃ | 00:00-23:59/ 2-95℃ | 0.5C | Switch-off time and temperature of the third heating section |

STEP 1:

- ✓ Press the "SET" button to access the main menu and select the THET timing menu
- ✓ Press "SET" to set the parameter and "THTS S3" shows on the display
- ✓ Press "SET" for "S3" to flash
- ✓ Press +/- to select the desired sensor (S2)
- ✓ Press "ESC" to save the setting

**Menu Structure**




| Main menu | Sub menu | Factory set | Adjustable range | Step per adjust | Description |
|---|---|---|---|---|---|
| LOAD | | | | | Tank heating |
| | DTO | 6K | 1-50K | 0.5K | Switch-on temperature difference of tank heating |
| | DTF | 4K | 0.5-49.5K | 0.5K | Switch-off temperature difference of tank heating |
| | SMX | 70℃ | 4-95℃ | 1℃ | Maximum temperature of tank |
| | SMAX | S3 | S2. S3 | | Sensor for Maximum temperature of tank ( S3 for T2, S2 for T2) |
| | HYST | 2K | 0.1-10K | 0.1K | Hysteresis of maximum temperature of tank |

STEP 2:

- ✓ Select “THET” in the main Menu
- ✓ Press + for CIRC
- ✓ Press + for PWD and press set to pass through code (x 5)
- ✓ “LOAD” is now displayed
- ✓ Press “SET” for DTO
- ✓ Press “SET” and adjust value to 8.0 (differential start up for solar pump)
- ✓ Press ‘SET” to lock value
- ✓ Press + to access SMAX (x 3)
- ✓ SMAX is now displayed, Press “SET” , S3 flashes and use +/- to select sensor (S2)
- ✓ Press “ESC” to save settings

**3 Electrical Element Timer (SMT Intelligent Heating)**

Whenever the solar thermal energy is not enough to heat the stored volume, the solar thermal controller will check the temperature in the stored volume (T2) and activate back up heating within the allocated time windows. This can be adjusted by activating SMT and following the below steps:

- ✓ Press the "SET" button to access the main menu and select the THET timing menu
- ✓ Press "SET" to set the parameter and "THTS S3" shows on the display
- ✓ Press "SET" for "S3" to flash
- ✓ Press +/- to select the desired sensor (S2)
- ✓ Press "SET" or "ESC" to save the setting

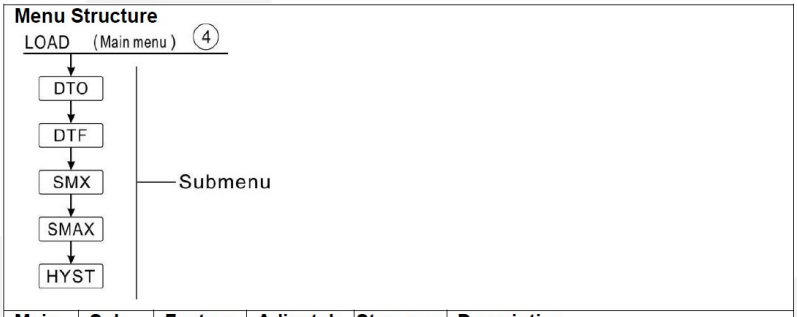
- ✓ Press + to access the submenu and "SMT OFF" will display
- ✓ Press +/- to activate the function
- ✓ Press "set" to save the setting

- ✓ Press "+" to access the timing window of the Switch ON and OFF time sections. "tH1O 04:00" displays on the screen
- ✓ Press "SET" to adjust hour settings. "04" flashes
- ✓ Press + to adjust value
- ✓ Press "SET" for minutes
- ✓ Press +/- to adjust value
- ✓ Press "SET" for activation min Temperature (default 40°C)
- ✓ Press +/- to adjust value
- ✓ Press "SET" to save setting and move back to tH1O
- ✓ Press "SET" for tH1F to display
- ✓ Press "SET" for "05" to flash
- ✓ Press +/- to adjust value
- ✓ Press "SET" for minutes
- ✓ Press +/- to adjust value
- ✓ Press "SET" for de-activation max Temperature (default 50°C)
- ✓ Press "SET" to save and move back to tH1F
- ✓ Press + to move to time window tH2O and follow the same procedure as well as for tH3O

NB - Keep THTS on S2

**4 Minimum and Maximum Tank temperature settings (SMX)**

When the storage tank reaches the desired temperature, circulation between the tank and collector will be stopped to prevent over heating of the storage tank. The default maximum tank temperature is 70°C and when the tank temperature drops 2°C below this value, circulation will resume heating up the tank again.




| Main menu | Sub menu | Factory set | Adjustable range | Step per adjust | Description |
|---|---|---|---|---|---|
| LOAD | | | | | Tank heating |
| | DTO | 6K | 1-50K | 0.5K | Switch-on temperature difference of tank heating |
| | DTF | 4K | 0.5-49.5K | 0.5K | Switch-off temperature difference of tank heating |
| | SMX | 70℃ | 4-95℃ | 1℃ | Maximum temperature of tank |
| | SMAX | S3 | S2. S3 | | Sensor for Maximum temperature of tank ( S3 for T2, S2 for T2) |
| | HYST | 2K | 0.1-10K | 0.1K | Hysteresis of maximum temperature of tank |

Setup:

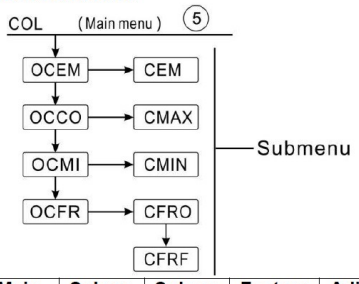
- ✓ Press the "SET" button to access the main menu and select the THET timing menu
- ✓ Press + till PWD appears
- ✓ Press "SET" 5 times
- ✓ Select "LOAD" from Main menu
- ✓ Press "SET", DTO 6K displays on the screen. (DTO= differential control)
- ✓ Press "SET", 6K flashes
- ✓ Press +/- to adjust the value for the (8k is recommended)
- ✓ Press "SET" or "ESC" to save settings
- ✓ Press +, DTF 4k displays
- ✓ Press "SET", 4k flashes
- ✓ Press +/- to adjust the value (recommended 4k)
- ✓ Press "SET" or "ESC" to save settings

- ✓ Press +, SMX 70°C displays
- ✓ Press "SET", 70°C flashes
- ✓ Press +/- to adjust value (recommended 70°C)
- ✓ Press "SET" or "ESC" to save settings
- ✓ Press +, SMAX S3 displays on screen (sensor selection – T2 / S2 was already selected on point 2 in the manual)
- ✓ Press "SET", s2/s3 flashes
- ✓ Press +/- to adjust value
- ✓ Press "SET" or "ESC: to save settings
- ✓ Press +, HYST 2K displays (differential restart of heating process)
- ✓ Press "SET", 2K flashes
- ✓ Press +/- to adjust value
- ✓ Press "SET" or "ESC" to save settings

## 5 Minimum and Maximum Panel temperature settings

NOTE, it is important to deactivate the panel max temperature setting to ensure the differential control function affectively

**Menu structure**



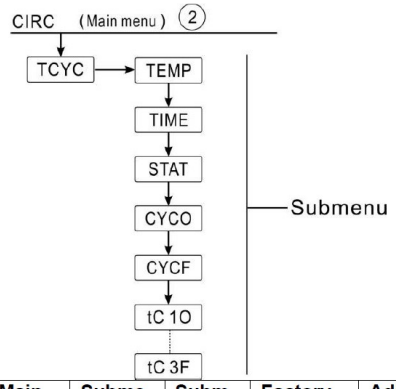

| Main menu | Submenu 1 | Submenu 2 | Factory set | Adjustable range | Step per adjust | Description |
|---|---|---|---|---|---|---|
| COL | | | | | | **Collector function** |
| | OCEM | | ON | | | Collector emergency shutdown function on/ff |
| | | CEM | 130℃ | 80-200 ℃ | 1℃ | Temperature of collector emergency shutdown(hysteresis 10K) |
| | OCCO | | OFF | | | Collector cooling function on/off |
| | | CMAX | 110℃ | 70-160 ℃ | 1℃ | Temperature of collector cooling ( hysteresis 5°C) |
| | OCMI | | OFF | | | Collector minimum temperature function on/off |
| | | CMIN | 10℃ | 10-90℃ | 1℃ | Temperature of collector minimum function |
| | OCFR | | OFF | | | Anti-freeze function on/off |
| | | CFRO | 4℃ | -40-8℃ | 0.5℃ | Switch-on temperature of anti-freeze function |
| | | CFRF | 5℃ | -39-9℃ | 0.5℃ | Switch-off temperature of anti-freeze function |

- ✓ Press the “SET” button to access the main menu and select the THET timing menu
- ✓ Press + till PWD appears
- ✓ Press “SET” 5 times
- ✓ “LOAD” appears on Main menu
- ✓ Press “+”
- ✓ Select “COL” function from main menu
- ✓ Press “SET”, OCEM displays
- ✓ Press “SET” again, OCEM ON displays
- ✓ Press “SET”, ON flashes
- ✓ Press +/- to adjust value to OFF
- ✓ Press “SET” or “ESC” to save settings

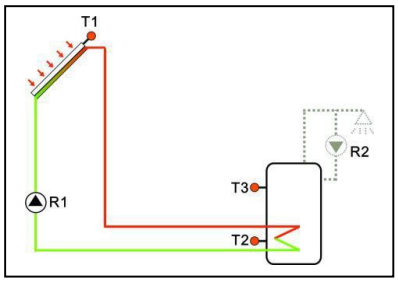
## 6 Ring Mains Function (CIRC DHW)

The SR81 has a hot water reticulation function where a secondary pump is connected to R2 and a hot water sensor (T4) is connected and fitted to the return line. This function has two control modes.

**Menu Structure**

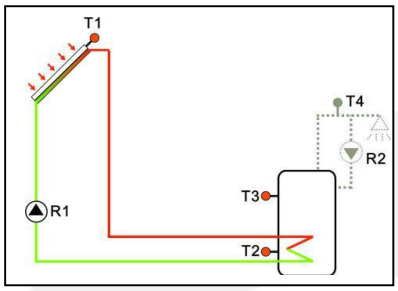



| Main menu | Submenu 1 | Submenu 2 | Factory set | Adjustable range | Step per adjust | Description |
|---|---|---|---|---|---|---|
| CIRC | | | | | | DHW circuit function |
| | TCYC | | OFF | ON/OFF | | Activate / deactivate the DHW circuit function |
| | | TEMP | OFF | | | Temperature control DHW pump |
| | | TIME | ON | | | Time control DHW pump |
| | | STAT | ON | ON/OFF | | Tank temperature (T3 ) 2°C higher than the preset switch-off DHW circuit temperature. |
| | | CYCO | 40 ℃ /3min | 5-53℃/1-30min | 0.5 ℃ /1min | Switch-on temperature or running time |
| | | CYCF | 45 ℃ /15min | 7-55℃/0-60min | 0.5 ℃ /1min | Switch-off temperature or stop time |
| | | t C1O | 05:00 | 00:00-23:59 | | Switch-on time for the first time section |
| | | t C1F | 07:00 | 00:00-23:59 | | Switch-off time for the first time section |
| | | t C2O | 11:00 | 00:00-23:59 | | Switch-on time for the second time section |
| | | t C2F | 13:00 | 00:00-23:59 | | Switch-off time for the second time section |
| | | t C3O | 17:00 / | 00:00-23:59 / | | Switch-on time for the third time section |
| | | t C3F | 22:00 | 00:00-23:59 | | Switch-off time for the third time section |




6.1 Ring Mains Timer

Within the allocated time window, the DHW circulation pump is controlled with the timer.
The pump is triggered by the time window and as per default settings, will run for 3minutes (Adjustable 0-30min) and then stop for 15minutes (adjustable 0-60min).
This process will repeat itself within the allocated time sections.
It is important to note – If CYCF is set to 0minutes within the specified time section, the circulation pump will run continuously without stopping throughout the allocated time frame.




6.2 Ring mains timer + Temperature Control (recommended)

The temperature control DHW pump within the preset 3 Time windows is triggered when the T4 return temperature sensor is below 40°C and stops again when the T4 rises to 45°C. The tank temperature (T3) however must be min 2°C higher than the T4 switch off temperature. If it is lower, it will not activate the R2 circulation pump.

Setup: If any time windows are not to be used, set the start time as well as the stop time to the same value (Example: Start 10:00 and stop 10:00)

- ✓ Press the "SET" button to access the main menu and select the THET timing menu
- ✓ Press + till CIRC appears
- ✓ Select form main menu CIRC (DHW)
- ✓ Press "SET", "TCYC" displays
- ✓ Press "SET" again, TCYC OFF displays
- ✓ Press "SET" , OFF flashes
- ✓ Press +/- button to activate the function (ON)
- ✓ Press "SET" or "ESC" to save settings

- ✓ Press + , TEMP OFF displays (Temperature control mode)
- ✓ Press "SET", OFF flashes
- ✓ Press +/- button to activate the function )ON)
- ✓ Press "SET" or "ESC" to save settings

- ✓ Press +, TIME ON displays on the screen (time control mode, default activated)
- ✓ Press "SET", ON flashes
- ✓ Press +/- button to deactivate this function (OFF Displays)
- ✓ Press "SET" or "ESC" button to save the settings

- ✓ Press + button, STAT ON displays (switch on conditions under temperature control mode)
- ✓ Press "SET" , ON flashes
- ✓ Press+/- to deactivate this function (OFF displays)
- ✓ Press "SET" or "ESC" to save settings

- ✓ Press +, CYCO 40°C displays on screen.
- ✓ Press "EST", 40°C flashes
- ✓ Press +/- to adjust the value start temperature
- ✓ Press "SET" or "ESC" to save settings

- ✓ Press +, CYCF 45°C displays (Switch off temperature)
- ✓ Press "SET", 45°C flashes
- ✓ Press +/- to adjust the switch –off value (adjustable +2-55°C)
- ✓ Press "SET" or "ESC" to save settings
- ✓ Press + to access 3 Time Window settings (tC1O 05:00 displays for START timer 1)
- ✓ Press "SET" , 05hour flashes
- ✓ Press+/- to adjust the hour value of the start
- ✓ Press "SET" , Minute "00" flashes
- ✓ Press +/-, to adjust the value
- ✓ Press "SET" or "ESC" to save the settings
- ✓ Press + to access 3 Time Window settings (tC1F 07:00 displays for STOP timer 1)
- ✓ Press "SET", hour 07 flashes
- ✓ Pres +/- to adjust value
- ✓ Press "SET", time 00 flashes
- ✓ Press+/- to adjust value
- ✓ Press "SET" or "ESC" to save settings
- ✓ Press + to access the start of the 2nd time window and repeat all the steps above as well for the 3rd time window.

**7 Holiday Mode**

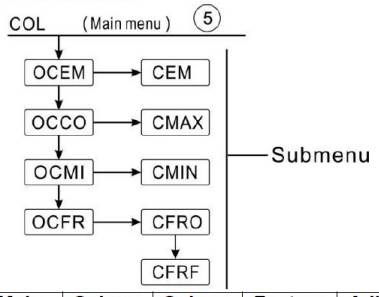
- ✓ Press and hold HOLIDAY for 5 seconds, HDAY displays with 05 flashing
- ✓ Press the +/- to adjust the amount of days you wish the system to run for
- ✓ Press "ESC" to save settings
- ✓ Press HOLIDAY again to deactivate the function

Note – Adjustable 0-99 days

**8 Freeze Protection (OCFR)**

Freeze protection must be activated in all frost prone areas or area's where possible seasonal frost can be expected. **Ensure to first adjust CFRF before CRFO is adjusted**

**Menu structure**




| Main menu | Submenu 1 | Submenu 2 | Factory set | Adjustable range | Step per adjust | Description |
|---|---|---|---|---|---|---|
| COL | | | | | | **Collector function** |
| | OCEM | | ON | | | Collector emergency shutdown function on/ff |
| | | CEM | 130℃ | 80-200 ℃ | 1℃ | Temperature of collector emergency shutdown(hysteresis 10K) |
| | OCCO | | OFF | | | Collector cooling function on/off |
| | | CMAX | 110℃ | 70-160 ℃ | 1℃ | Temperature of collector cooling ( hysteresis 5°C) |
| | OCMI | | OFF | | | Collector minimum temperature function on/off |
| | | CMIN | 10℃ | 10-90℃ | 1℃ | Temperature of collector minimum function |
| | OCFR | | OFF | | | Anti-freeze function on/off |
| | | CFRO | 4℃ | -40-8℃ | 0.5℃ | Switch-on temperature of anti-freeze function |
| | | CFRF | 5℃ | -39-9℃ | 0.5℃ | Switch-off temperature of anti-freeze function |

- ✓ Select OCFR from Submenu, OCFR displays on the screen
- ✓ Press “SET”, OCFR OFF displays
- ✓ Press “SET”, OFF flashes
- ✓ Press +/- to adjust value to OCFR ON

- ✓ Press +, CFRO 4°C flashes (activation temperature in Panel)
- ✓ Press “SET”, 4°C flashes
- ✓ Press +/- to adjust value (Adjust to 6°C)
- ✓ Press “SET” or “ESC” to save settings
- ✓ Press +, CFRF 5°C displays (deactivation temperature in Panel)
- ✓ Press “SET”, 5°C flashes
- ✓ Press +/- to adjust value for deactivation (Adjust to 8°C)
- ✓ Press “SET” or “ESC” to save settings
- ✓ Press “ESC” to return to previous menu

The SR81 controller comes with, 1 x NTC10K Micro thermal sensor for the storage tank (T2). Additional PT1000 thermal sensor is required for the Solar panel (T1)

Please ensure to test voltage prior to connecting the circulation pump and 220V AC Input power supply.

***Warranty Conditions:***

The SR81 Thermal controller carries a standard 12 month warranty from date of purchase. The warranty is a carry in warranty and is warranted to the original owner only. Should the item be considered faulty, the SR81 Thermal Controller must be returned to ITS Solar in original packaging and invoice for inspection. Only once an inspection on the Thermal Controller has been completed, can the warranty procedure be completed.

All operating procedures must be adhered to. The SR81 Thermal Controller is not suited for external installation unless protected from all environmental conditions and has a strict maximum electrical element load of 3000W / 3kW. The warranty will become null and void if not installed in the prescribed manner.

***Warranty Term:***

The Warranty Term commences on the date of the customer's invoice and shall run for the full period specified. The warranty is limited to the original owner and is not transferable.

***Exclusions:***

The above mentioned Limited Warranty does not cover products damaged as a result of accident, abuse, misuse, improper installation or maintenance, external power fluctuations or external influence, rodent damage, corrosion or any act of God. The warranty is also rendered null and void should units leave South African borders unless prior approval is obtained from ITS Solar and Heat Pumps. Damage caused by failure to operate the SR81Thermal Controller in accordance with ITS Solar and Heat pumps written instructions as well as damage caused by lightning, electrical surges, blown fuses, open circuit breakers, winds, corrosive environments or other, voids the warranty.