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## *SmartTimer*®

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The Smart device management system  
User manual

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## Typical use case

The SmartTimer can manage your geyser, pool pump, heating or cooling of greenhouse, fish tanks and much more.

You can set SmartTimer to be just a timer to handle up to 30A loads or to turn on when the temperature is above a set temperature or below a set temperature. Where there is a timing or temperature control need, SmartTimer can do it.

## Exclusion of liability

The manufacturer cannot monitor the compliance to this manual as well as the conditions, methods of installation and operation. Improper installation of the system may result in damage to the device, property or bodily injury.

Therefore, we assume no responsibility for loss, damage or costs which result from or are in any way related to incorrect installation, improper operation, incorrect execution of installation work and incorrect usage and maintenance.

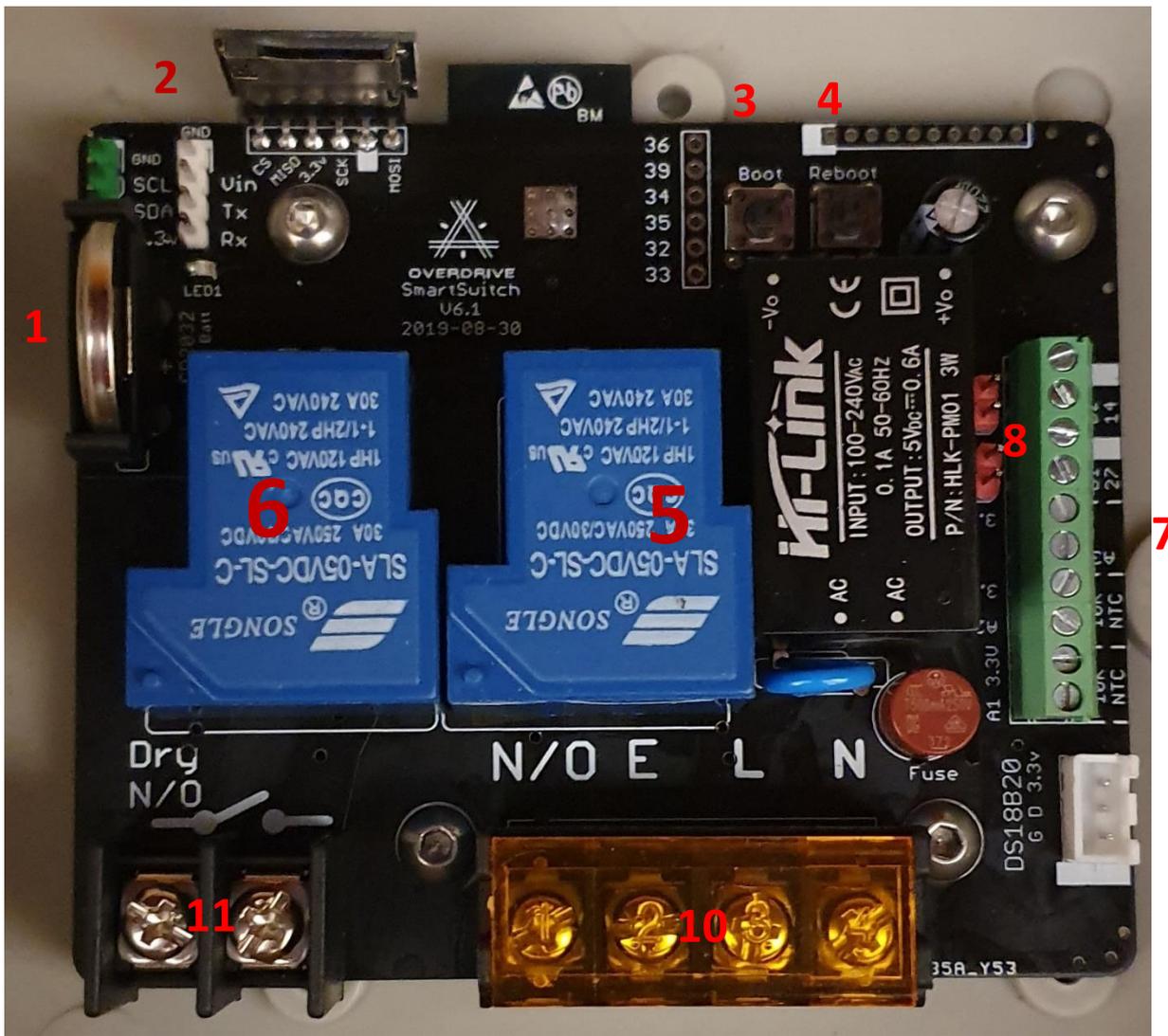
The manufacturer reserves the right to make changes to the product, technical data or assembly and operating instructions without prior notice.

**Customer feedback on possible improvements are always welcome. Contact details available at [www.overdrive.technology](http://www.overdrive.technology)**

## Technical Parameters

- Operating voltage 230VAC / 50HZ.
- Main Relay contact rating 30AMP (Max 4KW).
- Secondary relay contact rating 30AMP (Max 4KW). (optional)
- Operating voltage range 160V – 250V AC.
- Temperature setting ranges 25 - 84°C.
- Maximum temperature 85°C.
- Heat failure – when increase at a rate of less than 4°C per hour.
- Thermal Cut-out 90° C
- Temperature accuracy dependent on probe technology. NTC typically ~2%, DS18B20 typically ~0.5%
- Temperature calibration setting
- Temperature probe failure detection.
- Temperature probe range for geyser is -30 to + 130° C.

# Hardware

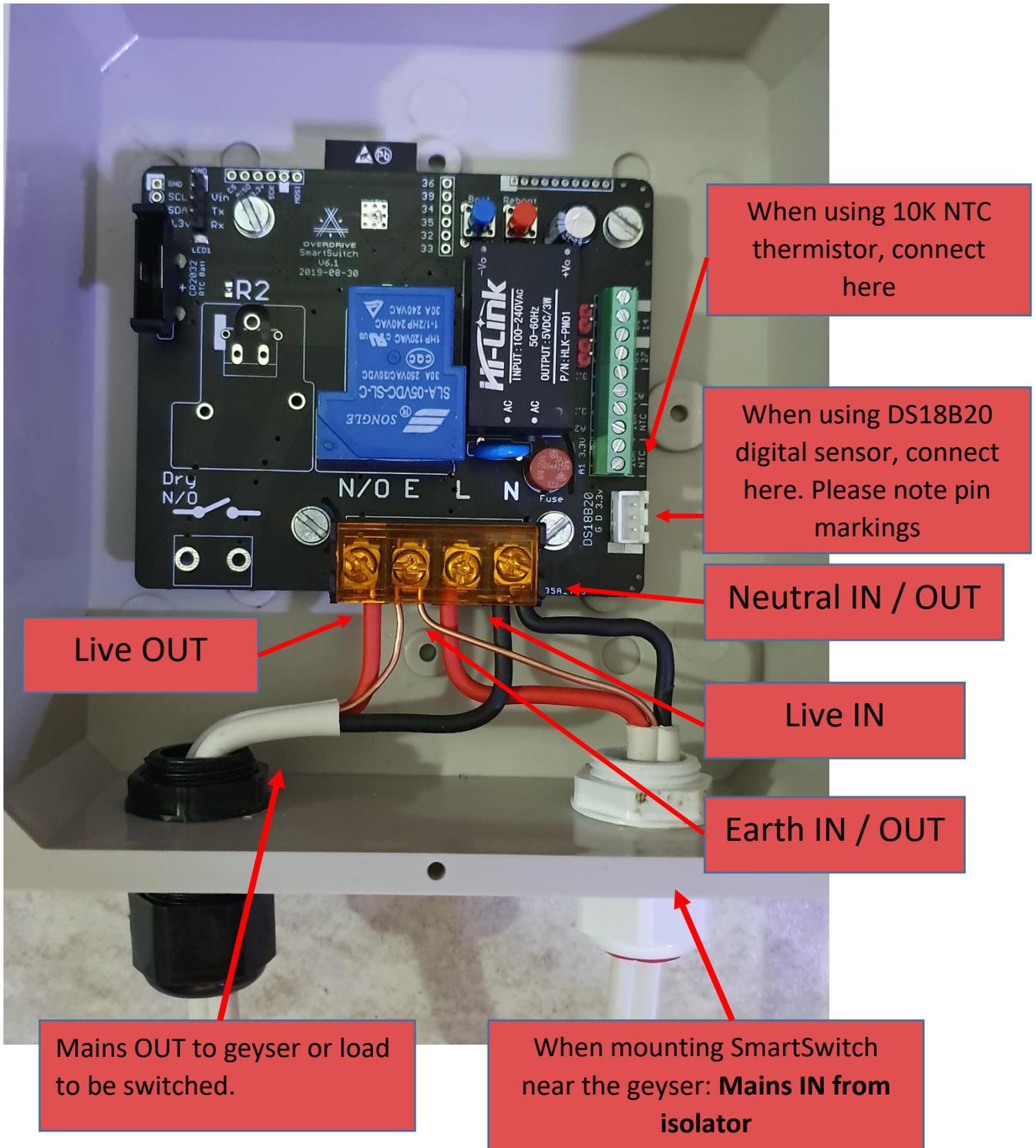


1. Real Time Clock (RTC) Battery. CR2032.
2. (Optional) microSD card slot for logging of data.
3. Boot Button / Button 1.
  - 3.1. Pressing this button for more than 3 seconds and less than 12 seconds continually will place the SmartTimer into Access Point mode. It will disconnect from any Wifi network, restart and present as SmartTimer when scanning for Wifi networks.
  - 3.2. Pressing this button for more than 12 seconds and less than 20 seconds continually will reset all settings to default.
  - 3.3. Pressing this button for more than 20 seconds continually will format the onboard storage and reset all settings to default.
4. Reboot button. Press this button to reboot the device.

The SmartTimer is based on the ESP32 and as such, can be flashed with any firmware you choose. To place the SmartTimer in firmware upload mode, you need to press and hold the Boot button and quickly press and release the Reboot button. You may now use the serial port to upload your firmware. You may also use the OTA firmware upload facility described below under the section "Update"

5. Relay 1: This is the relay that does the switching for the SmartTimer. It and the circuit is rated at 30A / 250VAC.
6. (Optional) Relay 2: This is the relay that does the switching for the SmartTimer. It and the circuit is rated at 30A / 250VAC.
7. Digital and Analogue inputs. From bottom to top:
  - 7.1. A1: Analog 1 typically used to measure 10K NTC thermistors used but other brands of geyser management devices. This input has a precise 10K  $\Omega$  resistor connected to ground.
  - 7.2. 3.3v output. Typically connect the other lead of the NTC thermistor to this terminal.
  - 7.3. A2: Analog 1 typically used to measure 10K NTC thermistors used but other brands of geyser management devices. This input has a precise 10K  $\Omega$  resistor connected to ground.
  - 7.4. 3.3v output. Typically connect the other lead of the NTC thermistor to this terminal.
  - 7.5. A3: Raw ADC input.
  - 7.6. 3.3v.
  - 7.7. Digital pin 27
  - 7.8. Ground
  - 7.9. Digital Pin 14
  - 7.10. Ground
8. 10K pullup pins for Digital pin 27 and 14. Bridge the jumper to enable the 3.3v pullup
9. OneWire interface. This connector is used to interface with the Maxim DS18B20 digital temperature sensor. It is the preferred way to read the temperature with this system.
10. Mains Power connector. Labelling explained:
  - 10.1. N – Neutral
  - 10.2. L – Live
  - 10.3. E – Earth
  - 10.4. N/O – Normally open contact. When the relay turns on, it bridges Live and this terminal
11. (Optional) Dry Contact terminal for optional Relay 2

# Install



When temperature monitoring is desired, SmartTimer should be installed as close to the device (eg. Geyser) to be monitored. If an isolator is required for the device to be managed, SmartTimer should be installed in between the isolator and the managed device.

If no temperature management is required, SmartTimer can be installed wherever it is convenient. Please ensure that the install location has sufficient WiFi coverage.

## Access Point (AP) Mode

**When the SmartTimer starts up for the first time, it will be in Access Point mode.**

There are 2 ways to place the SmartTimer into AP mode.

Press and hold Button 1 for more than 3 seconds and less than 12 seconds. The blue light (LED1) will start flashing after 4 seconds.

OR

Power cycle the SmartTimer 3 times, with no more than 5 seconds between each power cycle. Eg. Turn on for 1 second, turn off...

Turn on for 1 second, turn off...

Turn on for 1 second, turn off...

Turn on.

Once AP mode is enabled, the SmartTimer will reboot and start the AP. The blue led will flash continually.

If you scan for nearby wifi networks you will see SmartTimer

You may now connect to it.

The password for the AP is: 12345678

Once connected to the SmartTimer AP, go to the web interface to start the configuration of your device.

The address of the web interface on the AP is: [Http://192.168.4.1](http://192.168.4.1)

The default username and password are both: admin

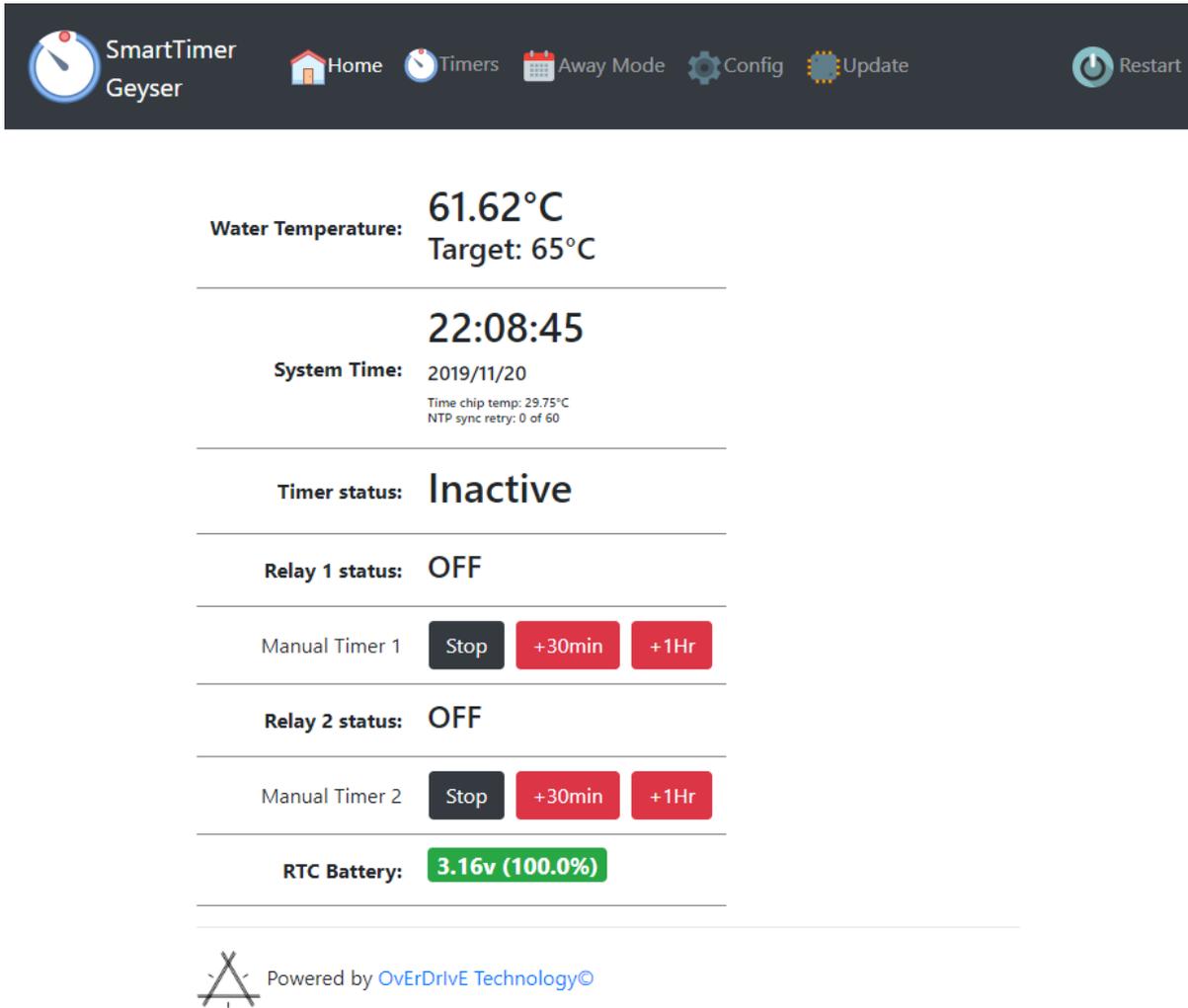
## First use

**On first boot, the SmartTimer will be in AP mode.**

Follow the steps above to connect to the SmartTimer

Navigate to the config page to configure the SmartTimer for your installation. It is recommended to first connect the SmartTimer to your home network and then continue the configuration.

## Main Interface



The screenshot shows the main interface of the SmartTimer Geyser. At the top, there is a navigation bar with icons for Home, Timers, Away Mode, Config, Update, and Restart. The main content area displays the following information:

- Water Temperature:** 61.62°C, Target: 65°C
- System Time:** 22:08:45, 2019/11/20. Subtext: Time chip temp: 29.75°C, NTP sync retry: 0 of 60
- Timer status:** Inactive
- Relay 1 status:** OFF
- Manual Timer 1:** Stop, +30min, +1Hr
- Relay 2 status:** OFF
- Manual Timer 2:** Stop, +30min, +1Hr
- RTC Battery:** 3.16v (100.0%)

At the bottom, there is a logo for OvErDrivE Technology and the text "Powered by OvErDrivE Technology©".

On the main page you can see the following depending on your settings:

- Current measured water temperature (if temperature probe is available)
- Currently set target water temperature (if temperature probe is available)
- System time and date
- Temperature of timing chip/ SmartTimer circuit board
- The amount of retries to contact the time update server. 0 is displayed when there is no issue. Error will be displayed after 60 failed attempts
- Timer status. If manual or automatic timer is active, the remaining time for the timer is displayed
- Away mode. If away mode is active, the automatic timers will not activate and Away Mode will display in the Timer status area. Manual timers can still be started.
- Relay 1 status. This is the physical state of the relay.
- Stop all timers for relay 1
  - Manual timer start (increment by 30 minutes)
  - Manual timer start (increment by 1 hour)
- Relay 2 status (Optional). This is the physical state of relay 2.
- (Optional) Stop all timers for relay 2
  - Manual timer for relay 2 start (increment by 30 minutes)
  - Manual timer start (increment by 1 hour)

- Battery voltage for the Real time clock backup battery

## Configuration

In order to use your SmartTimer, you need to configure it to suit your needs. Below is a brief description of each of the settings found on the configuration page.

### Basic settings:

Device Name:	This is a friendly name for your device. If you use MQTT, this name will be used for the topics.
Device MODE	Mode of operation for the timer: <ul style="list-style-type: none"> <li>• Geyser Management: Keep temperature at set temperature if a temperature sensor is present. Try to detect temperature is anomalies whilst in operation.</li> <li>• Turn on ABOVE temperature: Turn on when the detected temperature is above set threshold.</li> <li>• Turn on BELOW temperature: Turn on when the detected temperature is below set threshold.</li> <li>• Just a switch: Ignore temperature during switching operation, but display temperature if a temperature sensor is present.</li> </ul>
Has relay 2:	Does the SmartTimer have relay 2 installed and is it to be used.
Has Temp Sensor 1:	Is a temperature sensor installed with SmartTimer relay 1 or will it purely be used as a timer.
Temp sensor type:	The type of temperature sensor 1 connected to SmartTimer. Currently NTC 10K thermistors and Maxim DS18B20 class digital temperature sensors are supported.
Sensor address:	When using Maxim DS18B20 class digital temperature sensors you can specify which sensor is bonded to a relay.
Target Temp:	If a temperature sensor is used, a target temperature must be set for the system. The temperature range is 25-85 max
Temp Bias:	If you find a bias between the temperature the system reports versus the actual temperature from water at the tap, you may adjust that differential here. The bias temperature is added to the system reported temperature; eg. If the water from the tap is 3°C hotter than the displayed temperature, you add a value of -3 here.
Has Temp Sensor 2:	Is a temperature sensor installed with SmartTimer relay 2 or will it purely be used as a timer.
Temp sensor type 2:	The type of temperature sensor 1 connected to SmartTimer. Currently NTC 10K thermistors and Maxim DS18B20 class digital temperature sensors are supported.
Sensor address 2:	When using Maxim DS18B20 class digital temperature sensors you can specify which sensor is bonded to a relay.
Target Temp 2:	If a temperature sensor is used, a target temperature must be set for the system. The temperature range is 25-85 max
Temp Bias 2:	If you find a bias between the temperature the system reports versus the actual temperature from water at the tap, you may adjust that differential here. The bias temperature is added to the system reported temperature; eg. If the water from the tap is 3°C hotter than the displayed temperature, you add a value of -3 here.

## Network settings:

SSID:	Name of Wifi network SmartTimer must connect to.
Networks in range:	A list of near by Wifi networks will be displayed that is visible to the SmartTimer controller. You may click on the name of the network to automatically populate the SSID field.
Password:	Password for the Wifi network SmartTimer is to connect to.
DHCP:	Should SmartTimer automatically obtain a network IP address or do you want to set a static IP address. It is recommended to set a static IP address.
IP:	Static IP address.
Netmask:	Network mask for your IP address range.
Gateway:	The gateway address.
DNS:	The DNS address.
Test WiFi button	<b>Press this button once you have entered your wifi information in order to test the wifi configuration. A message will be displayed underneath this button. If successful, the message "WiFi can connect" in green will be displayed. If, after 5 seconds, no connection could be made, the message ""WiFi could not connect" would be displayed in red.</b>
MQ Server:	DNS Name or IP address for your MQTT server.
MQ Port:	The TCP port your MQTT server is listening on.
MQ WebSocket port	If you enable websockets on your MQTT server, please enter the port here. SmartTimer has a built in MQTT websocket version of the main page designed to be used with tablets or phones as information displays for SmartTimer.
MQ Username:	If security is set for your MQTT server you may enter the username here
MQ Password:	If security is set for your MQTT server you may enter the password here
Device Username:	This is the username that is required when accessing the SmartTimer web page. Default is <b>admin</b> <b><u>To disable the password protection, leave username and password blank.</u></b>
Device Password:	This is the password that is required when accessing the SmartTimer web page. Default is <b>admin</b>

## Time settings:

The SmartTimer can connect to an internet time server to automatically update its time. This feature is dependent on a Wifi connection that has internet available.

NTP Server:	DNS name or IP address of your desired Network Time Protocol server
Update: minutes (0=disable)	How often, in minutes, should SmartTimer try and update its time over the internet. Set to 0 to disable automatic time updates.
Timezone	The time zone you are in (South Africa is GMT+02:00)
Daylight saving:	Enable Daylight saving if you use it in your area
Manual time: Time(24H):	Manually update the time with the given values.

### Alert E-Mail settings:

SmartTimer can send out alert e-mails, should errors arise. The settings below relates to the e-mail SMTP settings to enable the sending of e-mails. This feature is dependent on a Wifi connection that has internet available.

SMTP Server:	Name or IP address of SMTP server. Eg. Smtplib.com
SMTP port:	Port for SMTP server. Eg. 465
Require SSL:	Does your SMTP server require TLS/SSL
Require authentication:	Does your SMTP server require authentication
SMTP user:	Username for the SMTP server (if required)
SMTP pass:	Password for the SMTP server (if required)
Send alert from Address:	The address that you are sending the e-mail from (typically your SMTP username)
Send alert to Address:	The e-mail address you want to send the alert e-mail to.

There is a Test e-mail button you can click to try and send a test e-mail with the settings entered above. Make sure you receive the test email. It may be in your spam folder.

### Dynamic DNS settings:

In order to access your devices from anywhere, you need to know what your external IP is or a dynamic DNS service to take care of that for you. SmartTimer supports updating your external IP to Freemyip.com. You can go to [Freemyip.com](http://Freemyip.com) to claim a subdomain for your network. Copy and Paste the update URL you are provided into the FreemyIP URL field.

Choose an update interval that suits your needs. 120 minutes is recommended. Click Test to test that your configuration is working.

### Advanced settings:

It is possible to run the firmware on alternate hardware and you may choose to use different pin assignments for the relay outputs. This can be set in this section.

## Timer configuration

Timer

< Prev   Next >

Enable Timer

Use Relay 1

Use Relay 2

Custom temperature

Temperature target:  °C

Timer Start HH:MM  :

Timer End HH:MM  :

Day of week

Monday

Tuesday

Wednesday

Thursday

Friday

Saturday

Sunday

SmartTimer has 20 timers available.

Use the <Prev, Next> buttons or drop-down list to select the timer you want to configure.

Each timer has the following settings depending on the hardware configuration.

Enable Timer	Enable or disable the current timer
Use Relay 1 (optional if relay 2 is present)	Should this timer use relay 1. If no relay 2 is present, this will be the default option and you will not be presented with this option
Use Relay 2 (optional if relay 2 is present)	Should this timer use relay 2. If no relay 2 is present, this will be the default option and you will not be presented with this option
Custom temperature (If temperature sensor is	PLEASE NOTE. Only Relay 1 is linked to the temperature sensor. Each timer can have its own temperature setting. If disabled, the timer

configured)	will use the global temperature set in the configuration page.
Start Time	The time the timer must start.
End Time	The time the timer must stop
Day of week	What day of the week must the timer run.

## Away Mode / Holiday timing

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**Away mode de-activated**

Enable or cancel Away mode. Away mode will ignore all timers from the time it is activated up to the date selected (including).

Selected date

October 2019						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9

**Submit** **Cancel Away Mode**

Away mode suspends all automatic timers during the time it is active.

You can start away mode by selecting the date you want to suspend all timers to (including).

You can cancel away mode at any time by clicking on the cancel away mode button. On the main page you will see a message indicating away mode is active. Eg.

**Timer status:** **Away mode ON**  
**Ending: 3/10/2019**

If you click on the Away mode ON red button, it will also take you to the away mode page.

Manual timers will still be able to run during away mode. Eg.

**Timer status:** **Away mode ON**  
**Ending: 3/10/2019**  
**Manual Running**  
**Ending: 00:29:55**

## Firmware Update

Firmware updates will be available if required at <http://overdrive.technology/SmartTimer>

To update the firmware, download the latest firmware to your pc/laptop/tablet/phone.

Navigate to the Update page of the SmartTimer controller.

Verify that the firmware date is later than that what is shown on the page.

Click on Choose file. Select the firmware you just downloaded.

A progress bar will be displayed with the progress of the update.

Once done, the controller will restart and the new firmware will be applied. This should take 20 seconds.

## Errors

“SmartTimer controller hardware is reporting temperatures above safe operating conditions. This will cause overheating and possible hardware damage. Please investigate.”:

The controller board temperature sensor read a value of 85°C or above. This is not a safe temperature for the electronics to operate at. Please ensure there are no shorts on the controller board and that sufficient ventilation is available for the controller.

“ADS1015 not found”:

Error with the Analog to digital converter”: Damage to control board is likely.

“Temp Sensor missing”:

No temperature sensor detected. Please verify cabling of probe and/or test if probe is not damaged.

“Temp too LOW”:

The temperature probe reported a temperature lower than the -50°C temperature threshold. Please verify cabling of probe and/or test if probe is not damaged.

“Temp too HIGH”:

The temperature probe reported a temperature higher than the 85°C temperature threshold. Please verify cabling of probe and/or test if probe is not damaged.

“RTC time ERROR. Time chip not started or corrupt, please investigate.”:

A problem was detected with the time chip and could not reliably obtain the time. Please investigate. Possible damage to control board.

“Time server unreachable after 120 attempts”:

If the SmartTimer was set to connect to the internet to obtain the time and could not do so after attempting 120 times, this error will be displayed and an e-mail error will be sent if possible.

Please ensure the time server settings are correct and that the SmartTimer has internet connectivity.