

## SMON – Monitor System

### Overview

There are 4 components that make up the system:



1.



2.



3.



4.

1. The Dallas iButton ID key
2. The Master Unit
3. The Refresher Units
4. The Monitor Boxes

### Master Unit

Every Speedheat franchise gets issued with a Master unit and a Dallas iButton. The Master is recharged with the iButton (a touch memory chip in a metal housing with a unique serial number). Note: we are not referring to battery charge here!

#### Preparing the Master Unit

- Insert 2 X AA batteries into the **Master** Unit. (A steady green light will be displayed)
- Touch the Dallas **iButton** to the receptacle on the side of the **Master** Unit. (The **Master** Unit now 'belongs' to that unique **iButton**)
- A red light will flash and the unit will beep indicating that it is empty.
- Touch the **iButton** to the receptacle on the **Master** Unit again to fill it with **Refresher** charges (10).
- The unit will stop beeping and a green light will flash.
- A fully charged Master Unit can be used to recharge a Refresher up to 10 times, after which it must be recharged itself by means of the iButton.



#### Low Master Charge Indication

When the Master is low on Refresher charges ( $\leq 4$  charges left), the LED will flash red and the unit will start ticking! When the Master doesn't have any Refresher charges left, it will beep.

#### Master Battery Low Indication

Low battery is indicated by means of ticking, however the LED will flash green. A single tick means that the battery is low, triple tick means the battery requires replacement urgently. Note that not all firmware revisions have this feature. (M3 = not installed.)

## Refresher Units

Refreshers inherit the unique serial number of the Master they are connected to on the first time, after which they only listen to this Master. One Refresher is typically carried in every installation vehicle in order to 'refresh' Monitors, so that they can be re-used on different heaters. The refresher is re-charged (50 new charges) by connecting it to the master's male connector.

### Preparing the Refresher Unit

- Insert 2 X AA batteries into the **Refresher** Unit. (A steady green light will be displayed)
- Connect the **Refresher** to the **Master** Unit. (The **Refresher** now belongs to the **Master** Unit and indirectly to the unique **iButton**)
- It will indicate a low Refresher charge. Connect the Refresher once more to the Master to fill it with **Refreshes (50)**. (note that the Refresher charge has nothing to do with the battery charge.)
- The LED will start flashing green indicating that it is ready to refresh **Monitor** boxes.



### Low Refresher Charge

If the Refresh-level is low (less than 20 Refreshes left) the Refresher will start ticking and the LED will be flashing red. If no Refreshes are available the Refresher will beep!

### Refresher Battery Low

Low battery is indicated by means of ticking, however the LED will flash green. A single tick means that the battery is low, triple tick means the battery requires replacement urgently. Note that not all firmware revisions have this feature. (R3 = not installed.)

## Monitors

### Preparing the Monitor

- Disconnect the Black Leads
- Wait for the **Monitor** to "wake up"
- The monitor will sound an open circuit alarm
- Connect the **Monitor** to the **Refresher**
- The green light will flash and a short beep will be heard shortly before the **Monitor** goes to sleep. (The **Monitor** now belongs to the **Refresher** Unit and indirectly to the **Master** and the **iButton**).
- Remove the monitor from the **Refresher**
- Connect the Black Leads together
- After 3 seconds the monitor will "go to sleep"
- The **Monitor** is now ready to be connected to a SPEEDHEAT heater.



(Easiest is to connect the crocodile clip of the green lead to the centre connector and whilst holding a black crocodile clip in each hand, touch the left and right connector onto the Refresher at the same time).

## CONNECTING A MONITOR TO A HEATER

Wake the **Monitor** up by disconnecting the two black crocodile clips. In the event that the monitor does not wake up immediately, short the green crocodile clip momentarily to the black crocodile clips.

The **Monitor** will emit a fast ticking sound that indicates that it is ready to be connected to a SPEEDHEAT or Coldbuster heater. If the monitor beeps (hi-lo) go to 'Preparing the Monitor' above.

Connect the two black leads to the heater element and the green lead to the screen. After +/- 2 seconds you will get a confirmation beep. The **Monitor** is now tuned to the heater it is connected to and will only work on an identical heater model. (The monitor stores the heater resistance in its memory and will sound an alarm if this resistance changes outside the set limits +/- 12.5% of the starting value).

To use the **Monitor** with a different heater, it must first be refreshed.

### **Tick-Toggle feature:**

You can turn the **Monitor** "ticking" On and Off by momentarily touching the two Black Leads together. A lo-hi or hi-lo beep will be heard indicating that the tick sound has been enabled, respectively disabled. Don't hold the two Black leads together for too long (< 3 seconds) as it will cause the monitor to go to sleep.

### **TESTING A MONITOR**

Once the monitor is connected and tuned to a heater, you may test if is working correctly:

1. Shorten the black leads together for 3 seconds – The monitor must go to sleep.
2. Open the black leads and disconnect the heater. After a short while, the monitor must wake up and the LED light must give 5 flashes. These are red and green depending on the battery charge level. There should be at least one green flash. (If there are 5 red flashes the battery must be replaced.)
3. About 2 seconds after connecting a refreshed monitor to a heater as described above, it must show a flashing green light and the beeper must be quiet or make a ticking sound only.
4. Disconnect the green lead from the monitor. There should be an alarm from the beeper and the LED must flash red. (No screen connection).
5. Reconnect the screen and disconnect one of the black leads – the monitor should give a hi-lo beep sound and the LED must flash red (Element faulty).
6. Reconnect the element and ensure there is no alarm. Wet your finger and touch herewith simultaneously the metal part of one black and the green connector. The monitor must again sound an alarm (Insulation resistance).

In monitoring mode the LED should flash green. When the battery only shows one green flash during the battery check, the LED will flash red and green alternately showing that the battery is low. If the battery is flat and needs to be replaced, the monitor will flash red only.

Note that the frequency of the flashing light in alarm mode is faster than in monitoring mode!  
Monitoring mode = once per second, alarm mode = twice per second.

Sometimes it is useful that the monitor ticks in monitoring mode, but at other times you may not want that. In order to switch the ticking of the monitor on or off, touch the black leads together for about one second. The monitor will sound a lo-hi beep and will start ticking, or the monitor will sound a hi-lo beep and will stop ticking.

Note that after the monitor has gone to sleep and has subsequently woken up, the ticking mode will normally also have changed from on to off or vice versa.

### **PREVENTING ELECTRICAL DAMAGE TO A MONITOR**

**Important: Always discharge a heater immediately after testing the insulation resistance with an insulation tester. The heater retains the charge and will destroy the monitor if not discharged beforehand.**

### **Firmware**

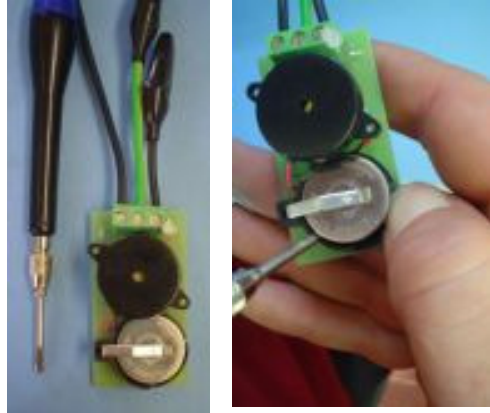
Firmware revision refers to the programme stored in the microprocessor. This information is written on a label on the printed circuit board. (e.g. HS4).

The microprocessor can be updated if new firmware is available (Flash memory).

## REPLACING THE BATTERY

CR2032 Cell coin batteries may be acquired in bulk from Klimax Mfg. Ltd. at an attractive price.

Push with your thumb onto the battery holder as shown in the photograph whilst sliding the battery out with a suitable tool e.g. a small screwdriver. **Do not lift or bend the clip, which holds the battery down.** After the battery has been removed a new battery can easily be slipped under the spring clip – watch the polarity (+ = UP).



Replacing the battery will reset the microprocessor. If the black leads are open, the monitor should wake up and show 5 green flashes. Since the battery voltage depends on the temperature, this may not always be the case when the batteries are cold.

The number of green flashes relate to the voltage of the battery and do not exactly indicate the amount of charge or energy left in the battery.

If the monitor does not restart correctly after the battery is replaced, remove the battery and leave it out for a few minutes. After reinstalling the battery, the monitor should behave normally.

Carefully line up the LED with the hole in the box lid by manipulating the printed circuit board by holding the leads, before pushing the box all the way closed.

## REPLACING THE ENCLOSURE

If the enclosure is damaged, it may be replaced. New enclosures and labels are available from Klimax Mfg. Ltd. The box will not completely close in case of older type monitors that have the microprocessor installed in a socket.



## INFORMATION LABEL



Ensure every monitor has a label attached with the number the customer should dial in case the monitor sound an alarm. Labels can be obtained from Klimax.

## ALARM AS HEARD THROUGH A TELEPHONE

Because of the frequency of the monitor alarm is higher than a normal telephone can handle, listening to a monitor may be confusing as a beep may sound like a tick. In such case the frequency will indicate if there is indeed an alarm. (alarm = 2x per second, monitor tick = 1 x per second). Getting the customer to describe the sound or to mimic it, may solve this dilemma.

## LIMITATIONS OF A MONITOR - APPARENT MONITOR FAILURE

It's important to realise that a monitor cannot detect all faults. The only faults a monitor can detect are:

1. If the heating element is completely cut or its resistance has changed by 12.5%.
2. In case the primary insulation is damaged and the insulation resistance has become lower than 1 M $\Omega$  measured at 3 Volt.

In practice, a monitor will detect damage in more than 90% of the cases. An insulation tester at 1000 Volt will detect all insulation faults, however, it would also not indicate e.g. if the core element was partially severed or stretched, which may cause the heater to burn out. This type of damage can only be found through stress testing (Current must be drawn through the heater and the temperature of the element must be measured during this test!).

### **REPAIR OF FAULTY MONITORS**

The new monitors are low cost and if a monitor fails, it cannot be repaired economically and it should be replaced. Apart from the battery, there are no user serviceable parts.