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**Power**

**Connecting To Power Line**

Use only the supplied Power Adapter.

**Connecting To Battery**

**Warning:** Do NOT connect the FAHREnergy HRV-Solar directly to a car battery under charge. All cars and most car battery chargers increase the battery voltage above the 13.4V maximum voltage level.

You must use the PWM-Solar unit (bought separately).

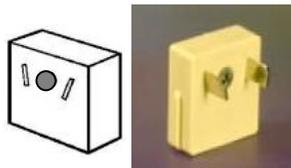
The PWM-Solar unit protects the FAHREnergy HRV-Solar against over voltage and allows for Quiet Mode and very low energy consumption.

**Connecting FAHREnergy HRV-Solar To A Caravan:**

Some examples of ‘standard’ caravan plugs and sockets are shown below



12V caravan socket & plug  
Non polarised



12V caravan socket & plug  
Polarised



12V caravan socket & plug  
One pin. Polarised



12V caravan  
‘lighter’ socket  
& plug. One  
pin. Polarised

**\* 6W boosted 28 times**

**\* Caravan storage energy reduced more than 100 times**

Connecting The FAHREnergy Solar PWM-Supply:



The PWM-Supply is provided with open wires (no plug) due to the lack of a common standard for plugs in caravans.

Connect this plug to the FAHREnergy HRV-Solar Unit

Use a plug of the type used in your caravan. Connect the brown ■ wire to the + (plus) terminal and the blue ■ wire to the – (minus) terminal of your polarised caravan plug.

By changing the position of the rocker switch on the PWM-Solar unit, you may switch between Full and Quiet mode.

Full Mode delivers to 60m<sup>3</sup> / h of heat recovered fresh air and consumes ca. 6 watt at 12VDC.  
 Quiet Mode delivers 40m<sup>3</sup> / h of heat recovered fresh air and consumes 4 watt at 12VDC.  
 (Quiet mode is also Power Save Mode. Conversion efficiency is >90%).

**Connecting To Solar Panel (Solar energy increased 28 times)**

**Warning:** Do NOT connect the FAHREnergy HRV-Solar directly to a solar panel. Solar panels may deliver voltages above 13.4V and thus damage the HRV electronics.

You must use the PWM-Solar unit (bought separately).  
 The PWM-Solar unit protects the FAHREnergy HRV-Solar against over voltage and allows for Quiet Mode and very low energy consumption.

**6W is boosted to 170W** during a year (average 13°C in/out temperature difference).  
 Due to the extreme low power consumption and high efficiency of both the FAHREnergy HRV-Solar as well as the PWM-Solar supply, a 12V / 6 watt solar panel delivers adequate electricity (energy).

**IMPORTANT:**

Always use the 12V solar panel together with a 12V accumulator (for example a car battery).

The reason for the above:

**Low** sun energy results in less than necessary power for proper functioning of the HRV. The remaining energy would be delivered by the battery.

**High** sun energy would deliver more energy than needed. The PWM-Solar will waste excess energy in order to protect the HRV. A battery could store such excess energy.



**Too High** sun energy will heat the PWM-Solar polymer fuse. The fuse will then cut the connection to the solar panel in order to prevent damage to the electronics.

**Note** that the polymer fuse resets automatically when it has cooled down (this takes some time). Avoid this situation as the fuse is limited in the number of times it will reset. The fuse cannot be replaced.

In Quiet mode a 6w solar panel delivers 2 watt extra which is stored in the accumulator.

During 6 month of the year a 6 watt solar panel and a 60Ah charged accumulator will typically run the HRV in quite mode for 10 days before a charge is needed (5 hours sun per day).

Using a 10 watt solar panel and a 60Ah charged accumulator will typically run the HRV for 15 days before a charge is needed (5 hours sun per day).

Using a 20watt solar panel and a 12Ah charged battery would run the HRV continuously at 5 hours sun every day (summertime, northern hemisphere).

**Prolonged Periods Without Sunshine (winter)**

Use the supplied 110/230 Vac power supply if power is available.

**Long Periods Using Battery (No solar panel or no sun)**

A standard 12V / 60Ah accumulator stores 720watt hours.

In Quite Mode the HRV will run for up to 7.5 days before a charge of the accumulator is needed. Longer periods without charge need a similarly larger accumulator.

***Positioning The HRV In A Caravan Or Yacht***

Preferred position is Horizontal:

Keep the HRV at least 7cm from any wall. This gives space for the DC power jack and the ducts.



- The supplied transport / installation brackets (feet) reduce vibrations in this position.
- Eventual condensation is easier to collect.

Collection tray size: 33 \* 25 \* 1cm.

Vertical surface, horizontally positioned, fans up:

Space may demand the HRV to be attached to a vertical surface.

In this position the supplied transport / installation brackets (feet) cannot reduce vibrations.

Possible condensation does not trickle into the fans (motors)

Collection tray size: 33 \* 15 \* 1cm.



Avoid these two positions:

Vertical surface, horizontally positioned

Vertical surface, horizontally positioned, fans down



### Attaching The FAHReenergy HRV-Solar

If you have easy access to the chosen surface you may attach the HRV directly to the surface.

Termination 



The easiest method:

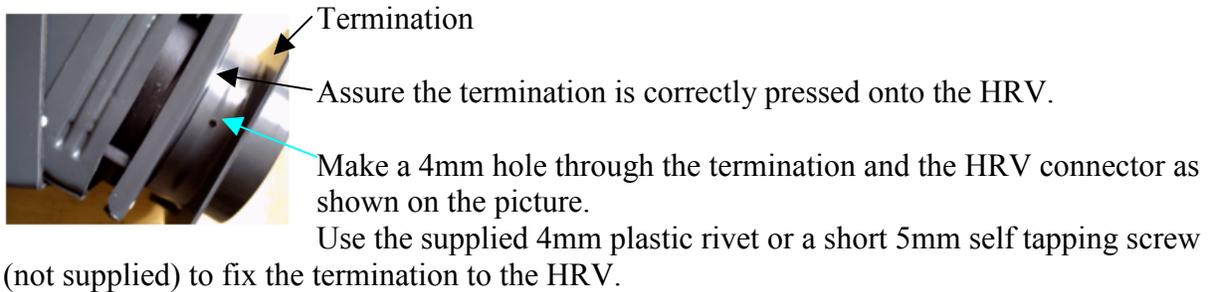
Cut a MDF or plywood board of the size 58 \* 28.5 \* 1cm.

Connect all the 4 terminations to the HRV. Position the HRV on the board and mark the 8 holes.

Remove the terminations from the HRV and screw the terminations onto the board, using 3.5mm screws.

**IMPORTANT: Do NOT thighten the screws!!**

You may now attach the HRV to the terminations.



## Condensation, Moisture

Condensation occurs when the Relative Humidity (RH%) has reached 100 %. This happens especially when the air is cooled.

A rule of thumb is:

The RH% increases 3% per degree Celsius the air is cooled.

The RH% decreases 3% per degree Celsius the air is warmed.

Condensation in the FAHReenergy HRV-Solar occurs mainly when the inside air is cooler than the outside, fresh air. As the outside fresh air passes through the HRV, it is cooled towards the inside temperature. This cooling increases the humidity. If the temperature difference is large (more than 5°C) condensation may occur

In general:

Condensation never occurs when the inside temperature is higher than the outside temperature.

### Condensation Collection

Put a tray under the HRV.

A cheap lightweight condensation tray may be made of a tinfoil tray. Place a piece of wood, the size you want the tray to be, in the tinfoil. Bend the tinfoil around the wood. Remove the wood. Cut the height to 1cm using a pair of scissors.





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FAHReenergy HRV-Solar Installation

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### **Caravan Storage (energy consumption reduced 125 times)**

The FAHReenergy HRV-Solar prevents mould and rot during storage.

Continuous balanced heat recovered fresh air enters your caravan at virtually no cost.

Your caravan will at all time stay dry and pleasant using only 4 watt.

The energy consumed, during one month of continuous fresh air ventilation, is only 2.9kilowatt hours.

2.9kilowatt hours of energy (electricity) costs around 50 pence!

Compare this to today's standard 500watt electrical heating and you have saved 360kilowatt hours per month!

**The monthly energy consumption, during storage, is reduced 125 times!**

## **Appendix**

**More about installation, efficiency and more here:**

<http://www.fahreenergy.org.uk/install/>

You will find the same documents by selecting  from the home page [www.fahreenergy.co.uk](http://www.fahreenergy.co.uk)

**More about RH here:**

[http://en.wikipedia.org/wiki/Relative\\_humidity](http://en.wikipedia.org/wiki/Relative_humidity)

### **Enclosed In The FAHReenergy HRV-Solar**

1 of FAHReenergy HRV-Solar unit

4 of Transport / installation terminations (feet)

1 of 110 to 230 Vac SMP power supply

4 of 4mm plastic rivets

1 of FAI, FAO, OAI, OAO adhesive labels