

Introduction to data logging and monitoring

This document details the options for data logging and monitoring solar water heating systems, these being;

1. Instantaneous and cumulative heat quantity counter within the controller using input flow
2. Instantaneous and cumulative heat quantity counter within the controller using flow meter
3. Winsol with a D-Logg USB server or Bootloader
4. Solar Monitor with a Bootloader
5. Next generation Solar Monitor

Controller Selection

Controller	Inputs / Outputs	Image
EcoSolar ESR21	3 inputs / 1 output Heat quantity counter, flow able to be preset or use EcoSolar VSG or electronic flow meters	
EcoSolar ESR31, (same as ESR21 but with system schematic graphic on LCD screen)	3 inputs / 1 output Heat quantity counter, flow able to be preset or use EcoSolar VSG or electronic flow meters	
EcoSolar UVR61R3	6 inputs / 3 output Heat quantity counter, flow able to be preset or use EcoSolar VSG or electronic flow meters	
EcoSolar UVR1611K (wall mounted) also UVR1611S (control board mounted)	16 sensor inputs, including two pulse inputs and one 4-20mA or 0-10V analogue input 4 speed-controllable outputs and 7 relay outputs Option to increase inputs and outputs using CAN I/O modules see bottom of this table	
CAN Monitor	This monitor is a user interface for the UVR1611, use where a smaller user interface is required to be more aesthetic	
Bootloader	This is the server to push data from the controller to a computer for the Winsol programme or web based Solar Monitor logging	
USB D-Logg	This is the server to push data from the controller to a computer for the Winsol programme. Upto two controllers can be connected to one USB D-Logg	
CAN I/O module—01/CAN-1/O45	Extension module for the UVR1611, with 4 inputs and 4 outputs. Outputs are 3 relays and 1 VSD.	

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CAN I/O module—01/CAN-1/035	Extension module for the UVR1611 with 3 inputs and 5 outputs. Outputs are 3 relays and 2 VSD.	
Flow meter	VSG1.5 – nominal flow 1.5m ³ / hour 1 pulse per 0.5 litres VSG2.5 – nominal flow 2.5m ³ / hour 1 pulse per 0.5 litres VSG6.0 – nominal flow 6.0m ³ / hour 1 pulse per 1 litres	
Electronic flow meter	Flows of 120 to 2,400 litres per hour, also available with an optional temperature sensor that connects to the controller's data line, useful when using the ESR controllers or when you need an additional sensor input	
GSM Antennae	Connect to Bootloader, insert Vodaphone (in NZ) simcard and use to send instant and cumulative heat information to other mobile phones. Can be programmed to send information periodically or you can send the Bootloader a text and it will reply with the information	

Option 1. Instantaneous and cumulative heat quantity counter within the controller using input flow

Overview

The EcoSolar ESR21, ESR31, UVR61 and UVR1611 controllers have internal instantaneous and cumulative heat quantity counters. The instantaneous heat quantity counter displays the heat being generated by the solar collectors. The heat is calculated from the flow rate that is entered by the user or installation technician, the controller monitors the temperature difference between the water flowing to and from the collectors to calculate the heat. Both the instantaneous and cumulative heat counters are shown on the LCD screen, the user can easily scroll between temperatures in the system and the heat quantity counters.

The flow rate must be known and preset in to the controller. It is assumed the flow rate doesn't change.

Equipment required

1. EcoSolar ESR21, ESR31, UVR61 or a UVR1611 solar Controller

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Option 2. Instantaneous and cumulative heat quantity counter using a flow meter

Overview

This option is the same as Option 1 but includes a flow meter that has a pulse output, use either the VSG or electronic flow meters, select a flow meter based upon the system flow rate. The electronic flow meter also allows a temperature sensor to be connected to the data line of the controller, beneficial when an additional sensor input is required. The flow meter monitors the flow rate within the solar water heating system and feeds these flow rates into the heat quantity counter calculation built in to the ESR and UVR controllers. The result is a significantly more accurate heat quantity counter and the flow does not need to be known.

Equipment required

1. EcoSolar ESR21, ESR31, UVR61 or a UVR1611 solar Controller
2. EcoSolar flow meter

Option 3. Winsol with a D-Logg USB server or Bootloader

Overview

This Option can be added on to either Option 1 or 2.

The EcoSolar ESR21, ESR31, UVR61 and UVR1611 controllers can connect to either the D-Logg USB server or a Bootloader which provide a link to a computer. The free Winsol data logging software provides a graph of the historical information and a screen which shows the instantaneous information from the inputs and outputs. The software is easy to use and sits on a local computer. Printing is done through taking screen dumps and inserting them in to a document such as a Microsoft Word file.

If a Bootloader is used a GSM ariel can be added which can send out SMS text messages for alarms or a user can send a text message to the Bootloader and the Bootloader will send out a text message with the current data as well as the cumulative heat.

Equipment required

1. EcoSolar ESR21, ESR31, UVR61 or a UVR1611 solar Controller
2. Flow meter or enter the flow rate in to the controller
3. USB D-Logg or Bootloader
4. Winsol software – freely downloadable
5. GSM ariel if the SMS text messaging is required

Option 4. Solar Monitor with a Bootloader

Overview

This Option can be added on to either Option 1 or 2.

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The EcoSolar ESR21, ESR31, UVR61 and UVR1611 controllers connect to a Bootloader, the Bootloader will need a power supply for all controllers other than the UVR1611 which provides power to the Bootloader.

The Bootloader is either connected to a Network or a Router and designated a static IP address. The Bootloader sends the instantaneous information and cumulative heat through to the Solar Monitor website. Network systems can have a Windows Service downloaded which pushes data from the network to the Solar Monitor website.

Solar Monitor provides an animated visual representation of the solar water heating system with realtime information. Solar Monitor is an effective commissioning tool for use by installers as well as allowing customers to monitor their own installations. It allows remote monitoring, logging, diagnostics and support, with automated alerts via SMS text messaging or emails and remote access.



The realtime information displayed depends upon the sensors installed and can be customised to suit each installation, requirements and the expected audience. Solar Monitor is suitable for large, complex, commercial and industrial, as well as domestic scale installations. Realtime information can include;

- System temperatures
- Pump operation
- Solar radiation, this also controls the extent of cloud cover displayed, great for children and education
- Instantaneous heat from solar system
- Heat input by backup heating and or electric elements
- System efficiency and an energy balance
- Cumulative heat recovered since zeroed, this is shown as kWhrs, as well as days of average house consumption, cups of tea and slices of toast, again great for children and education

If appropriate, the Solar Monitor also allows user interaction, if the mouse is moved over a component such as the cylinder or collectors a photo of their actual installation is shown with a brief description.

Solar Monitor also provides extensive data logging using graphs and an energy balance. This allows installers and customers to ensure correct system operation, determine the system performance and also provides an effective tool for commissioning, monitoring and providing annual reporting of a system's performance.

Solar Monitor includes automated notification and reporting, providing alerts if the system fails or under-performs and annual reporting, which is customisable to suit the customer.

Each client has a designated installation page and can limit access to the data choosing from three levels of security;

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1. **Private Installation** - only the customer can see the information.
2. **Members Only** - the customer allows a select group of people to access the information.
3. **Public** - the customer allows free access to the information

Solar Monitor uses cost effective technology and can be installed on existing as well as new systems.

Equipment required

1. EcoSolar ESR21, ESR31, UVR61 or a UVR1611 solar Controller
2. Flow meter or enter the flow rate in to the controller
3. Bootloader and power adapter if controller is a ESR21, ESR31 or UVR61
4. Setup Solar Monitor

Option 5. Next generation Solar Monitor

The next generation Solar Monitor will be launched shortly, this will incorporate the current animation, but will also be extended to include extensive automated reporting including comparing the performance of the system with predicted performance and benchmarking with other logged systems. A user will select a date range for which a detailed report will be generated, the report will be prepared and sent to the user.

The level of detail in the report will depend upon the extent of monitoring on the system, but the report will be able to include detailed information and graphs on the following;

- kWhrs generated and saved
- system efficiency based upon the heat generated and the quantity of solar radiation received
- energy balance including detailed graphical graphing and representation
- hot water consumption and heating demand and backup heating use
- instantaneous kW heating, solar radiation and system efficiency
- solar fraction v's hot water demand and solar radiation
- ambient conditions
- quantifying heat spent on frost protection in open loop systems

The above will be reported for the system and compared to similar systems as well as historical and benchmarked information to provide an estimate of how well the system is performing and whether improvements can be made or maintenance is required.

As well as monitoring the system operation the Solar Monitor can provide SMS and email alarms for any areas of concern or where improvements could be made including;

- frost protection
- collector low temperature
- collector over temperature
- thermosyphoning in a pumped system, i.e. heat lost at night
- no flow
- high or low efficiency
- backup heating overuse

This Solar Monitor will be invaluable for ensuring systems operate as intended, can be used by installers during the commissioning and maintenance periods as well as a maintenance and preventative maintenance tool, whereby the installer is notified if any of their customers systems require maintenance and can then contact the customer to organise a suitable time.

If you are interested in the Next Generation Solar Monitor, register with us to receive an invitation to become one of the first installations to be signed up for the monitoring.

Solar Monitoring Options