Wattmon
Remote Monitoring & Control Platform

Features

- Wide input voltage range of 5-60V DC with high efficiency DC-DC converter
- 8 GB MicroSD card included for data storage
- Built-in 10 Mbit Ethernet
- Integrated web server and uPHP scripting language
- RS-485 Modbus RTU Port for communication with multiple devices
- Does not require a permanent Internet connection
- Generate graphs locally on the device, without the need for any software
- Configurable through web browsers
- Advanced automation without the need to program a single line of code

Introduction

Wattmon (Short for Watt Monitor) is a flexible embedded monitoring & control platform that runs a web server and PHP-compatible scripting language.

The device is suited for remote monitoring and control and can be accessed through a 3G or GPRS USB dongle or over Ethernet. The web interface is optimized for size and speed, and scales for mobile devices as well as standard web browsers. Wattmon updates its current IP address on the main Wattmon website, making the device easily reachable at all times through http://wattmon.com/live/ with minimal configuration.

Wattmon interacts with devices such as current sensors and relays, pulse/frequency counters and power meters, which can all be daisy-chained using standard RJ45 patch cables. A simple device configuration tool lets you integrate a new device quickly. Third party devices such as inverters, charge controller or industrial equipment that are Modbus-RTU compatible can also be easily integrated by writing a simple driver descriptor file.

Applications

- Solar/Wind Energy Monitoring
- Battery Monitoring
- Grid-Tie inverter performance monitoring
- Water pumping and automatic tank level control
- Weather stations
- Cell Tower Monitoring

Benefits

Wattmon is highly flexible and setups can easily be customized for your needs. Although it is well suited for energy monitoring, it can do much more. Unlike most Internet-enabled data loggers, Wattmon does not upload data but instead stores it locally on a MicroSD card, with up to three years of storage. The real power of the device is in the automation of outputs based on inputs from the data being logged. For the hobbyist and home automation enthusiast, this product delivers a powerful combination of advanced features and user-friendliness.
The data can be accessed at any time through the Internet, or downloaded from the card directly onto a PC in CSV format.

Platform

The Wattmon platform consists of a Wattmon master unit (WM60) and one or more add-on modules. The different module types and function are described below.

Module	Function
C252, C502, C752	Hall effect DC current sensor module (dual channel) able to measure amps without the requirement of a physical connection. This together with the WM60 is sold as the 'WattmonSolar Kit'. Additional current sensors can be purchased for setups requiring monitoring of multiple strings. The module comes in 25A, 50A and 75A versions.
I3O2	This module has 3 digital inputs that can be connected to switches such as float switches in a water tank, to provide feedback on water level height. It also has 2 relay outputs which can handle 5 A AC or DC, allowing you to control smaller loads to even power a higher load through the use of an external contactor
A5S1	This module has 5 analog inputs, and can be provided with 5V inputs or 300V inputs – the higher version can be used to measure high voltage battery banks. The module also has a single channel Shunt amplifier (20mV) which can be used to measure current through a shunt resistor, or even connect directly to a Pyranometer to measure solar irradiation. The 5V version can also connect to various sensors (pressure, temperature, radiation) which provide analog outputs.
IP1	This module has a PWM output tha can be controlled from the wattmon, from a few herz to several kilohertz. This can be used to control an SSR and divert load to a heating element for example, or control dimming in a light.
IF1	This module counts pulses are measures frequency, and can be used to monitor water flow speed and volumes, or wind speed when connected to an anemometer
3-Phase AC Meter	This Modbus module provide 100A per channel, 3 Phase AC power measurement (V, A, W, kW)
AC16	Single phase AC power measurement (V,A,W and kWh) up to 16A
DS16B20	Temperature sensors (waterproof or with lug) for measuring ambient temperature. Works between -10 and +125 degrees C

Wattmon Solar Kit

This combination includes one Wattmon device and one dual current sensor device along with cables and lugs required for installation.

This product will monitor your battery bank and give you detailed graphs of your energy generation and consumption. This is a must-have tool for everyone depending on solar or renewables for their energy.

Key Features

• Tracks your battery bank and predicts remaining capacity in percent and run time in minutes.
• Logs detailed data and provides daily and monthly graphs of battery percent and kW in and out.
• Built in web server and local data storage, easily accessible via a local LAN or remotely through the Internet.
• Highly modular allowing you to easily interface with additional sensors and relays for control
• Powerful customization without the need for a single line of programming
• Does not require a permanent Internet connection for data logging

Kit Contents

1 x Wattmon Master Module
1 x C752 Current Sensor Module
2 x RJ45 Patch Cable (1m)
1 x DC Power cable
2 x DC Lug for 16mm2 cable

Specifications

Voltage	0-60V DC input (directly connected to battery upto 48V)
Power Consumption	< 2W (< 4W with 3G Dongle)
Connectivity	10Mbit Ethernet, GPRS or 3G (via USB Dongle)
Processor	PIC32MX795 PIC Controller
Operating System	WattmonOS
Current Sensing	0-75A DC (2 channels) with 50mA Accuracy

Wattmon Solar Hybrid Kit

This combination includes one Wattmon device, one dual C752 current sensor device and one I3O2 module along with cables and lugs required for installation.

This product will monitor your battery bank and give you detailed graphs of your energy generation and consumption. You can also control up to 2 outputs based on flexible triggers such as battery percentage, making it possible to optimize energy flow. This is a must-have tool for everyone depending on solar or renewables for their energy.
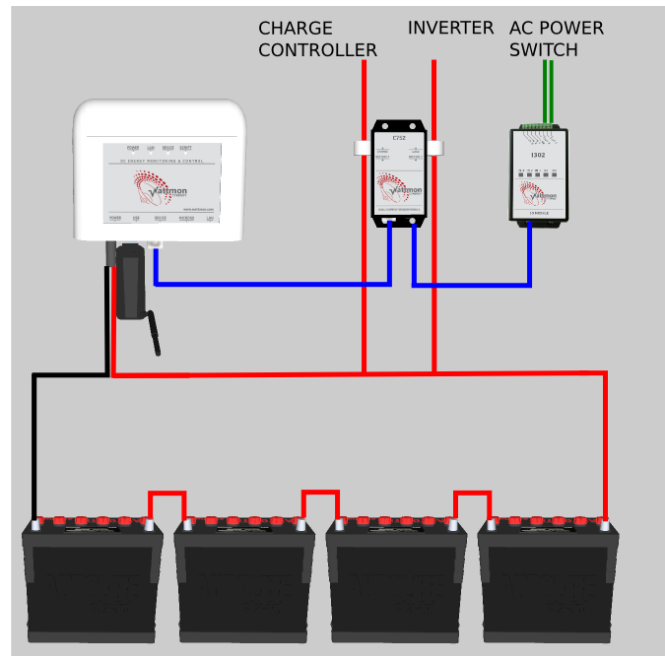
Key Features

- Tracks your battery bank and predicts remaining capacity in percent and run time in minutes.
- Logs detailed data and provides daily and monthly graphs of battery percent and kW in and out.
- Built in web server and local data storage, easily accessible via a local LAN or remotely through the Internet.
- Highly modular allowing you to easily interface with additional sensors and relays for control
- Powerful customization without the need for a single line of programming
- Does not require a permanent Internet connection for data logging

Kit Contents

1 x Wattmon Master Module
1 x C752 Current Sensor Module
1 x I3O2 Module
3 x RJ45 Patch Cable (1m), 1 x DC Power cable. 2 x DC Lug for 16mm2 cable

Specifications

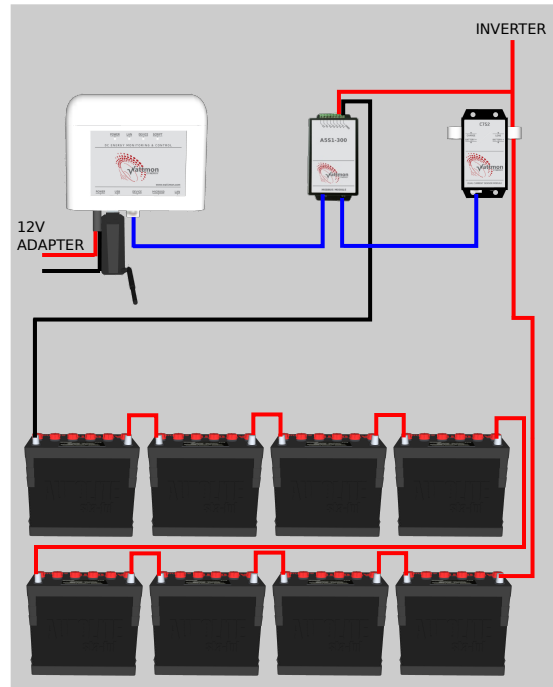|	
Voltage	0-60V DC input (directly connected to battery upto 48V)
Power Consumption	< 2W (< 4W with 3G Dongle)
Connectivity	10Mbit Ethernet, GPRS or 3G (via USB Dongle)
Processor	PIC32MX795 PIC Controller
Operating System	WattmonOS
Current Sensing	0-75A DC (2 channels) with 50mA Accuracy
Control	2 x 5A relays (isolated)

Wattmon High Voltage Kit

This combination includes one Wattmon device one C752 dual current sensor device, one A5S1-300 module along with cables and lugs required for installation.

This product will monitor your high voltage (up to 300V DC) battery bank and give you detailed graphs of your energy generation and consumption. This is a must-have tool for everyone depending on solar or renewables for their energy.

Key Features

- Tracks your battery bank and predicts remaining capacity in percent and run time in minutes.
- Logs detailed data and provides daily and monthly graphs of battery percent and kW in and out.
- Built in web server and local data storage, easily accessible via a local LAN or remotely through the Internet.
- Highly modular allowing you to easily interface with additional sensors and relays for control
- Powerful customization without the need for a single line of programming
- Does not require a permanent Internet connection for data logging

Kit Contents

1 x Wattmon Master Module
1 x C752 Current Sensor Module
1 x A5S1 Module
2 x RJ45 Patch Cable (1m)
1 x 12V 1000mA Power Adapter
2 x DC Lug for 16mm2 cable

Specifications

Voltage	12V DC through power adapter
Power Consumption	< 2W (< 4W with 3G Dongle)
Connectivity	10Mbit Ethernet, GPRS or 3G (via USB Dongle)

Processor	PIC32MX795 PIC Controller
Operating System	WattmonOS
Current Sensing	0-75A DC (2 channels) with 50mA Accuracy
Voltage Sensing	0-300V DC (5 channels, common ground)

Separate 3rd Party Modules

The following modules and add on sensors can be easily integrated into Wattmon. Items are organized by category.

AC Power Measurement

	3-Phase Power Meter with Modbus RTU output Provides Volts, Amps, Watts, Frequency and kWh. This is made in India. It can measure up to 5A without an external CT, and could measure up to 100kW with the help of a CT. This meter is unidirectional.
	Bidirectional 3-Phase Power Meter with Modbus This meter can handle up to 100A per channel without the need for any external CT. It can provide Volts, Amps, Watts and kWh. This is perfect to measure grid-tie setups where exported solar energy should be measured independently of the inverter.

Wind Measurement

Anemometer

An anemometer measures wind speed. This can be easily interfaced with a Wattmon IF1 module, and can be converted in a wind speed in meters/second. Typical anemometers have a 5V supply.

Solar Measurement

Pyranometer

A pyranometer or radiation sensor will provide an analog output voltage based on solar radiation. These can be connected to an A5S1 module which has 5 analog input channels and converted to the proper units by simple calibration.

Temperature Measurement

DS18B20 Sensors

Wattmon communicates with Dallas onewire sensors and can interface with temperature sensors to get accurate process data. These temperature sensors can be either waterproof type or lug type to measure battery temperature. Up to 10 sensors can be connected per Wattmon device.

I3O2 Input Output Module

The I3O2 module can be used to trigger a device (contactor, load, etc.) based on signals given to the I3O2 module. There are three available inputs (I3) and 2 available outputs (O2). The input pins, IN1, IN2, IN3, are labeled below and shows the basic layout of the module. The output pins are labeled OUT1 and OUT2, and the 5V output is the 5V pin.
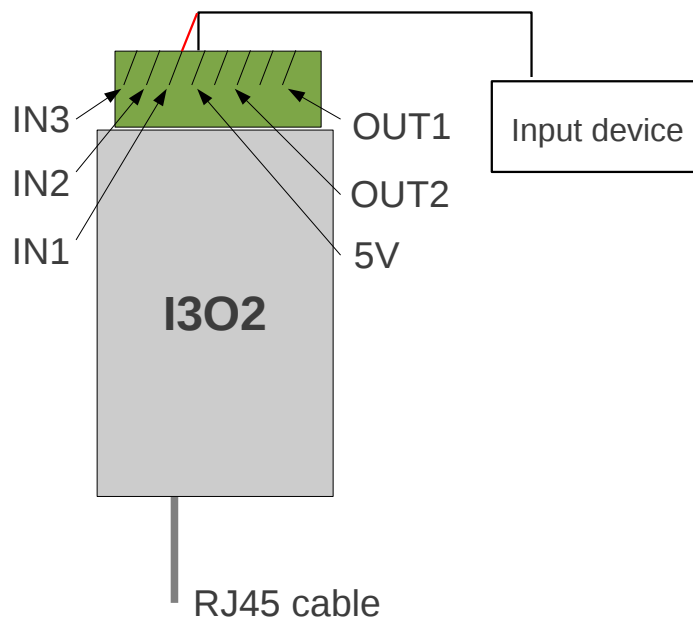

Layout of I3O2 Module

Applications of I3O2 Module

Water Tank

The I3O2 module can be used along with float sensors to monitor levels in a tank. With three inputs possible, three levels of a tank can be measured (such as high, medium, and low). In this example, the three input pins being used will be for three float sensors (high, medium, and low water levels in the tank). The relay output pins will be used to trigger turning on and off the pump being used to fill the water tank. Wattmon can be programmed to trigger the pump to turn on when the water level is below the bottom float sensor and turn off when the water level is above the top float sensor. This section will illustrate how this can be done.

To set up the I3O2 module and float sensors, wire the black sensor wire from the float sensor into the 5V pin of the I3O2 module. Wire the red sensor wire into the IN1 pin. Do the same for the second and third float sensors; connect the first sensor wire into the same 5V pin and the second sensor wire into the corresponding input pin (IN2 or IN3). A schematic can be seen below.
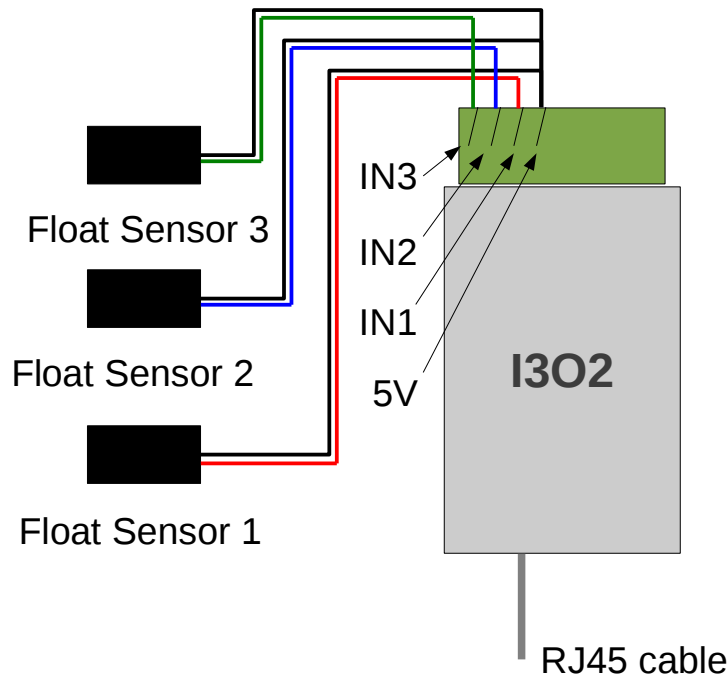
I3O2 with Float Sensors

High Power Control

The I3O2 module can also be used in conjunction with a contactor, a type of relay. From the OUT1 pin on the I3O2 module connect a sensor wire to the A1 terminal. Connect a second sensor wire from the A2 terminal to the neutral screw (NO13). Connect a third sensor wire from the second pin of the OUT1 to the L1 screw on the contactor. The contactor will switch on when there is a great enough voltage across the A1 and A2 terminals. The live wire will be the sensor wire connected from L1 back to the I3O2 module. The neutral wire is the sensor wire from A2 to the neutral contact to the input side of the contactor.
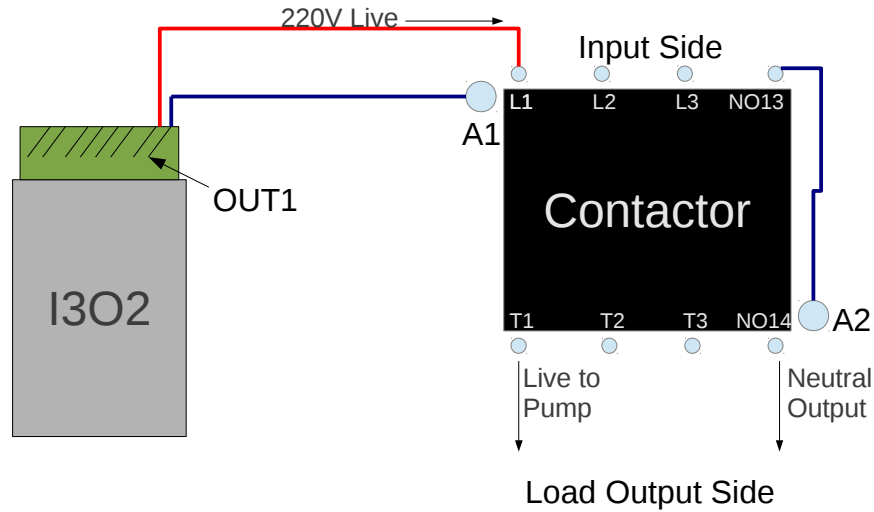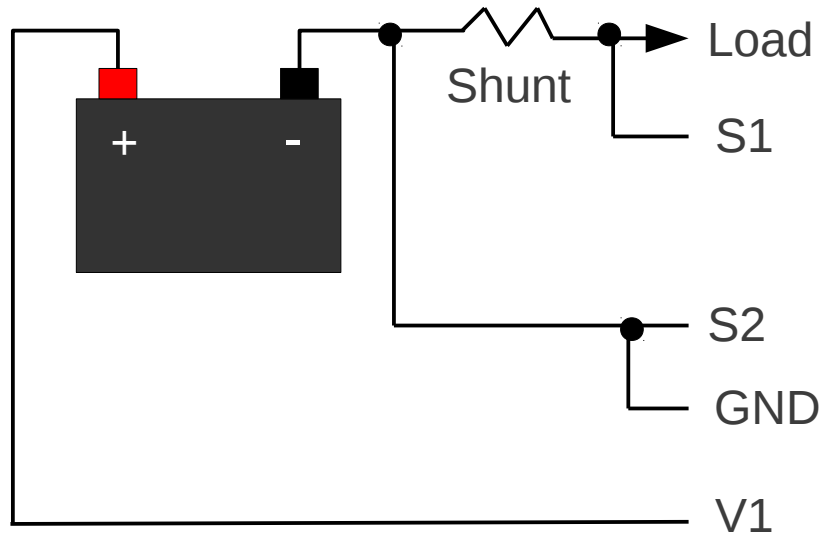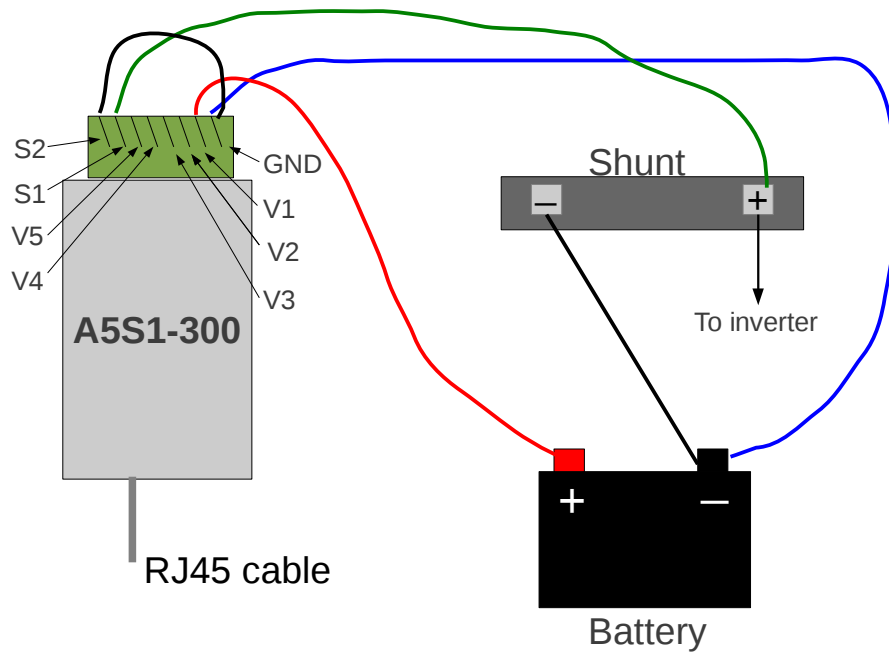
Contactor wiring diagram

A5S1 Module

The A5S1 module can be used for a variety of analog measurement. There are two versions: A5S1-5 which has a limit of 5V per channel, and the A5S1-300 which handles 300V per channel. The Wattmon High Voltage Kit comes with the A5S1-300 Analog Module (A=Analog, 5=5 channels, S1=one shunt, 300=300 V)

Connecting a shunt resistor

To setup, connect a sensor wire from the GND pin on the module to the ground of the battery. Connect a sensor wire from the GND pin to the S2 pin, and a sensor wire from the S1 to the other side of the shunt. To measure voltage, connect from the positive terminal of the battery to the V1 pin. Connect a sensor wire from the ground side of the shunt to the ground of the battery. See diagram below.
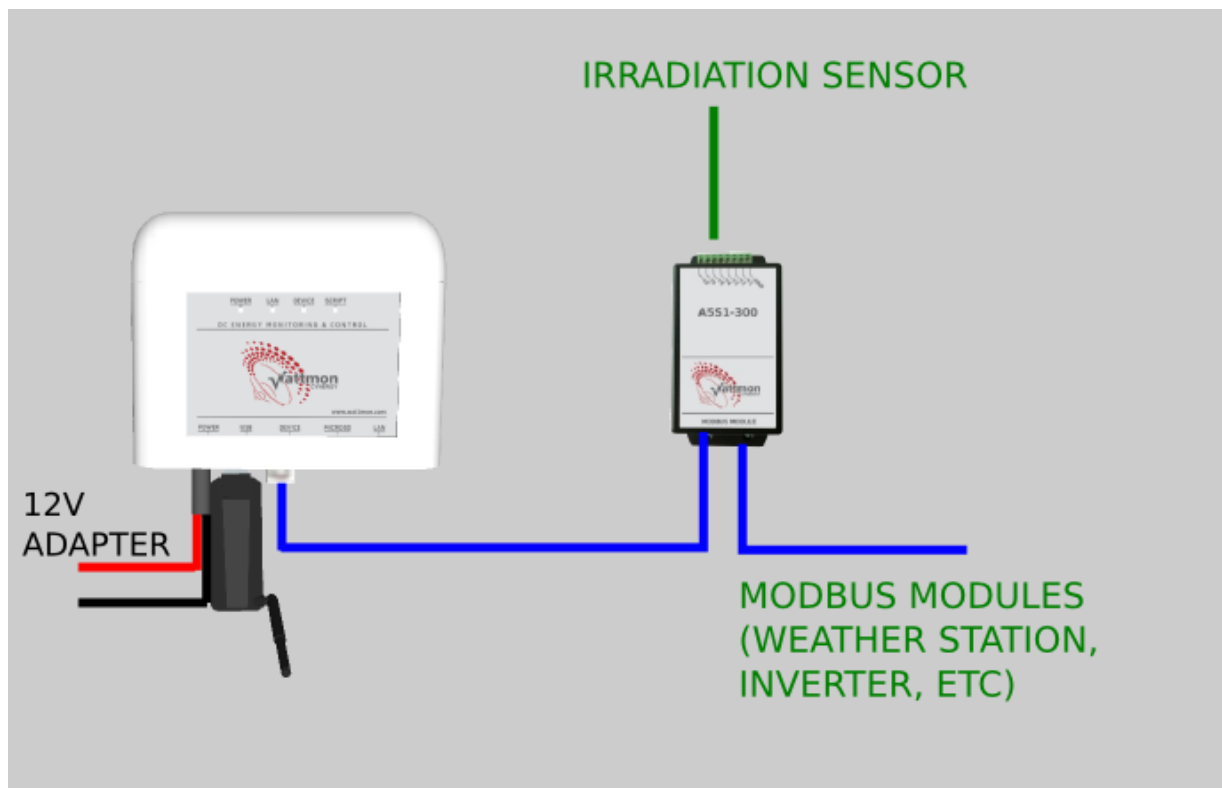
Load

Shunt

S1

S2

GND

V1

High Voltage Layout

S2

S1

V5

V4

GND

V1

V2

V3

A5S1-300

Shunt

To inverter

RJ45 cable

Battery

Wattmon High Voltage Kit

Measuring Analog Sensors

The A5S1-5V can also be used to interface with various sensors as shown in the diagram below.

Irradiation sensors or any pressure transducers with 0-5V output can be measured using this module. For very small voltages (0-20mV) the shunt inputs can also be used – this is necessary for some anemometers.

For more details, visit http://www.wattmon.com

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Address:

Maitreye,

Auroville 605101

Tamil Nadu

India

Email: wattmonsolar@gmail.com