

# AC Power Analyzer Kit

## Hardware Manual

Rev. 1r1



WATTS VA  
AMP RMS  
VAR PF  
VOLT RMS

The AC Power Analyzer Kit is a front end measuring module that you can easily integrate to any circuit and systems requiring AC power measurements functionalities. It can accurately measure RMS Voltage and Current, and with phase information, resolve these into data components essential for a comprehensive AC Power Analysis.

Measurement results are streamed out through a TTL UART compatible serial port. Data output format is available in CSV form, making data collection task easy for your microcontroller or PC. It can also be selected in formatted form for direct output to serial display devices, such as e-Gizmo 4x20 Serial LCD Display kit. In fact, it is possible to build a standalone AC power measuring instruments with the addition of serial LCD display.

Visit this kit's product page at  
[www.e-gizmo.com](http://www.e-gizmo.com)  
for updates and additional informations

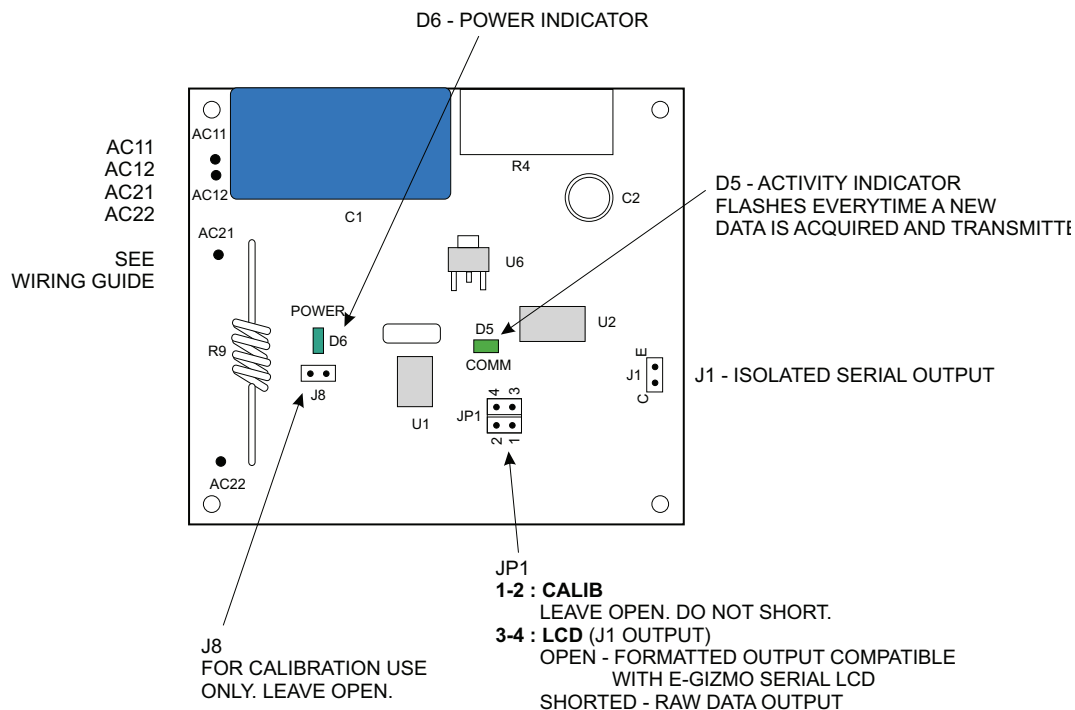
### Features

- Single Phase Power Analyzer
- Based of Cypress CS5463 Energy Analyzer IC
- Zilog Encore XP! Controller
- Isolated serial output(UART TTL)
- Formatted Output Display for e-Gizmo Serial LCD for stand alone measurements.
- Measured Parameters:
  - Volt (RMS)
  - Ampere (RMS)
  - Real Power WATTS
  - Apparent Power VA
  - Reactive Power VAR (calculated)
  - Power Factor PF

### General Specifications

Operating Voltage: 180-250V AC 60Hz  
Maximum Current Capacity : 10 A  
Maximum Load Capacity: 2200 VA  
Power Consumption: 4W Typical  
Accuracy: +/- 3%, (+/-1% Typical)\*

*\* It is possible to improve accuracy to less than 1% by replacing the copper current shunt with a precision current*



**Figure 1.** Location of jumper blocks and connection points.

## Jumper and Connectors

### J1. Open Collector Isolated Serial Output

Pin	Description
1	Collector
2	Emitter

### JP1. Calibration and Output Format Jumper Block

Pin	Description
1-2	CALIBration use only. Leave Open
3-4	J1 Output Format OPEN- Formatted for Serial LCD Display SHORTED - CSV Format

## Serial Communications

To read data from the communications port J1, the host controller must be configured with the following communications settings:

Baud Rate: 9600 baud  
Data: 8 bits  
Parity: None  
Stop Bit: 1  
Handshake: None

At the end of each measurement cycle (1 sec), measurement data are automatically dumped in the selected format through serial port J1.

With jumper installed on JP1 3-4, data is transmitted in Comma Separated Values CSV form, and in the following string format:

“STAT,Watts,VA,VAR,PF,VOLT,AMP,”

Where:

STAT

= “InRange” – measurement within instrument range (normal)

= “Overflow” – measurement overflow error. Following data are invalid

Watts

-2200.0 to +2200.0 Watts - real (RMS) Power  
Watts

VA

0000.0 to 2200.0 VA – Apparent Power VA

VAR

-2200.0 to +2200.0 VA – Reactive Power VAR

PF

-0.9999 to + 0.9999 – Power Factor

VOLT

180.00 to 250.00 – RMS Volt V

AMP

0.0 to 9.999 Amp – RMS Current AMP

Example:

From the stream

“InRange,-0250.6,0010.0,-0150.2,+0.6228,220.39,0.5806,”

STAT = InRange, measurement is OK

Watts = -0250.6

VA = 0010.0

VAR = -0150.2

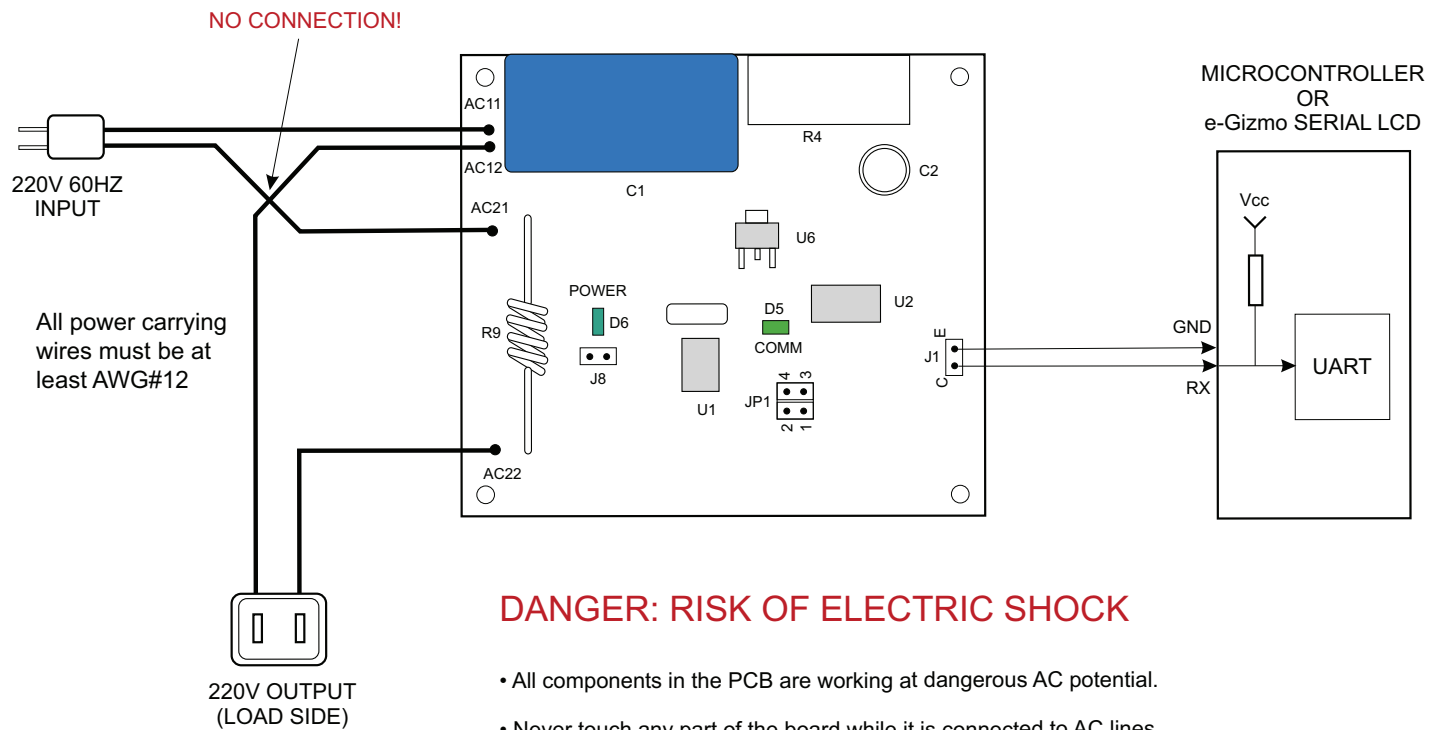
PF = +0.6228

VOLT = 220.39

AMP = 0.5806

If STAT= Overflow, one or more measurement inputs exceeded the instrument capacity. Data that follows is invalid.

We can extract the measurement data as follows:



## DANGER: RISK OF ELECTRIC SHOCK

- All components in the PCB are working at dangerous AC potential.
- Never touch any part of the board while it is connected to AC lines.
- Link to other circuits can be made safely only through the isolated port J1. Do not attempt to connect additional devices using any other part of the circuit!
- To be assembled by experienced builders or under the guidance of experienced project builders only.

**Figure 2.** AC Power Analyzer kit wiring diagram.

## J1 Serial Interface

The AC Power Analyzer serial data output is available through the J1 port. J1 is an optocoupler output and is galvanically isolated from the rest of the circuit. It is the only port where you can safely connect other low voltage devices.

J1's open collector output has the advantage of being compatible with almost all logic levels, requiring only one pull-up resistor for the interface (Figure 3a). In fact, you can even connect J1 directly to a RS-232C level port (Figure 3b) without the need for level converter circuit (e.g. MAX232C). If your host side program has control on the state of RS-232C handshaking lines, you can even eliminate the pull up resistor. Figure 3c illustrates one workable scheme. This connection can be used on a PC running the AC Power Analyzer Visual Basic application program template. The source code of this program can be downloaded from the product page of the kit at [www.e-gizmo.com](http://www.e-gizmo.com).

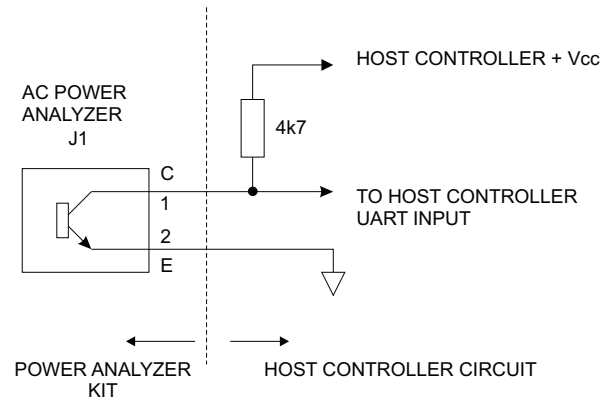


Figure 3a.

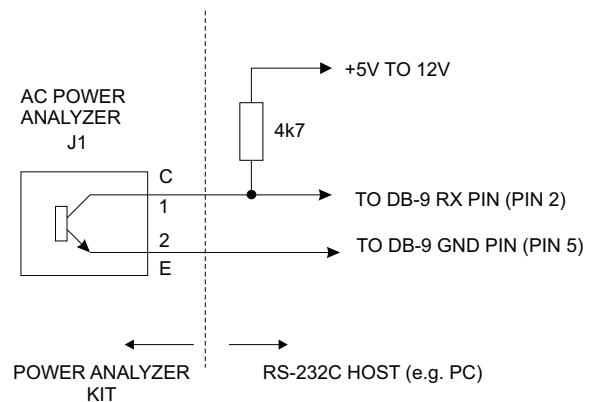


Figure 3b.

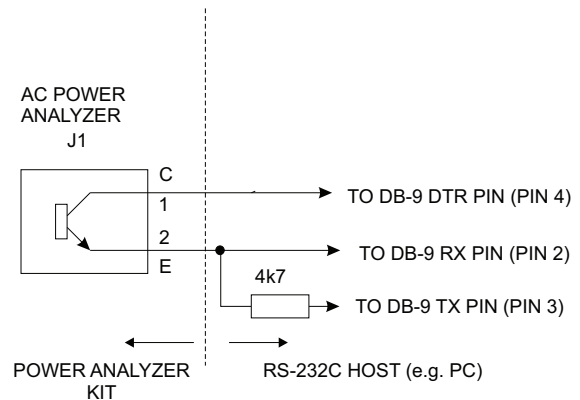


Figure 3c.

**Figure 3.** J1's open collector output allows the AC Power Analyzer kit to be easily interfaced with wide range of devices of differing logic levels. See text for more details.