

## SAMPLE CONSUMPTION AND COSTS FOR TYPICAL APPLIANCES

| Appliance              | Wattage   | Daily Cost | Monthly Cost | Annual Cost |
|------------------------|-----------|------------|--------------|-------------|
| Refrigerator           | 250 watts | \$.25      | \$7.50       | \$90        |
| Computer               | 60 watts  | \$.12      | \$3.46       | \$41        |
| 100 bulb on 12 hrs/day | 100 watts | \$.10      | \$2.88       | \$35        |

Sample consumption and costs for typical appliances (using an electricity rate of 8 cents per kilowatt hour)

### TECHNICAL SPECIFICATIONS

- > 120 VAC, 60 Hz, 15 amps continuous
- > \* Higher ratings of 100-277V, 50/60 Hz, and 20 amps require appropriate country specific cord set and receptacle, and is NOT UL listed
- > True RMS power measured and displayed
- > Accuracy: +/- 1.5% + 3 counts  
*Below 60 watts, amps and power factor accuracy degrades.*
- > USB interface (PRO and ES)
- > Mains supply voltage fluctuations not to exceed +/- 10% of the nominal voltage
- > Input is via 6' electric cord, output is via outlet on top of meter

### FOR UL RATING

- > Indoor use only
- > Altitude up to 2000 meters
- > Temperature 5° C to 40° C
- > Installation Category II
- > Pollution Degree 2
- > Maximum relative humidity 80% for temperatures up to 31° C decreasing linearly to 50% relative humidity at 40° C.

### CLEANING

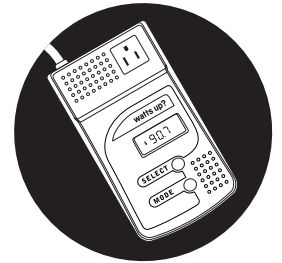
Watts up? may be cleaned using a dry soft towel. Do not use liquids to clean. Do not disassemble. There are no spare parts. No preventative maintenance is required. If the case breaks or other physical damage is apparent, do not use.

### WARNING

Watts up? is not a toy and is only intended for use by people over the age of 10. Never open the case. Shock hazard exists. Watts up? is not water resistant. As with all electronic equipment, avoid water and liquids. Do not touch Watts up? if it is wet. Watts up? is not repairable. If Watts up? is used in a manner not specified herein, the protection provided by Watts up? may be impaired.

### WARRANTY

Watts up? is guaranteed for 12 months from date of purchase. If a problem arises, simply return the meter to the place of purchase, along with proof of purchase, for a new meter or credit. For technical assistance or repair, please call toll free: 877.WATTS01 (877.928.8701). Electronic Educational Devices believes it is everyone's responsibility to help the environment. In this effort, e.e.d purposefully uses recycled components wherever possible and minimizes extraneous packaging. We hope that using Watts up? helps people understand the costs involved with electricity, and thereby encourages conservation and participation in environmental issues.



## OPERATORS MANUAL

POWER ANALYZER, WATT METER AND ELECTRICITY MONITOR

# watts up?

AND

wattsup? PRO



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## OPERATORS MANUAL

Watts up? incorporates sophisticated digital electronics that enable precise and accurate measurements in an easy-to-use format. State-of-the-art digital microprocessor design utilizes high-frequency sampling of both voltage and current measurements for true power. Power factor is captured so even phase-shifted loads such as motors are accurately measured. Watts up?PRO downloads data to a PC for graphing and charting, and includes a payback calculator which automatically calculates the number of months to payback a new energy efficient appliance. Fast, intuitive and easy-to-use, Watts up? quickly and accurately measures any 100-240\* VAC appliance.

## QUICK REFERENCE GUIDE

This quick reference guide lists all the displays. They are numbered 1-18, and are each described in more detail in the pages that follow.

| WATTS MODE            |                 | DISPLAY   |
|-----------------------|-----------------|---|
| MODE default          | SELECT default  | 1 CURRENT WATTS<br><i>(Meter defaults to this mode on start)</i>                                  |
| SELECT >click 1       |                 | 2 MINIMUM WATTS<br><i>(SELECT &gt;hold H Resets Minimum Watts)</i>                                |
| SELECT >click 2       |                 | 3 MAXIMUM WATTS<br><i>(SELECT &gt;hold H Resets Maximum Watts)</i>                                |
| SELECT >click 3       |                 | 4 POWER FACTOR  |
| SELECT >click 4       |                 | 5 VOLT AMPS (apparent PWR)  |
| WATT HOURS (KWH) MODE |                 | DISPLAY   |
| MODE >click 1         | SELECT default  | 6 CUMULATIVE WATT HOURS   |
|                       | SELECT >click 1 | 7 AVERAGE MONTHLY KWH   |
| TIME MODE             |                 | DISPLAY   |
| MODE >click 2         | SELECT default  | 8 ELAPSED TIME<br><i>(SELECT &gt;hold H Resets Time, Cost, KWH, Duty Cycle, Monthly Averages)</i> |
|                       | SELECT >click 1 | 9 DUTY CYCLE<br><i>(SELECT &gt;hold H Set Duty Cycle Threshold)</i>                               |
|                       | SELECT >click 2 | 10 FREQUENCY (Hz)   |
| COST MODE             |                 | DISPLAY   |
| MODE >click 3         | SELECT default  | 11 CUMULATIVE COST<br><i>(SELECT &gt;hold H Set Rate)</i>   |
|                       | SELECT >click 1 | 12 AVERAGE MONTHLY \$<br><i>(SELECT &gt;hold H Change \$ to ¢)</i>                                |
| VOLTS MODE            |                 | DISPLAY   |
| MODE >click 4         | SELECT default  | 13 LINE VOLTAGE   |
|                       | SELECT >click 1 | 14 MINIMUM VOLTS<br><i>(SELECT &gt;hold H Resets Minimum Volts)</i>                               |
|                       | SELECT >click 2 | 15 MAXIMUM VOLTS<br><i>(SELECT &gt;hold H Resets Maximum Volts)</i>                               |
| AMPS MODE             |                 | DISPLAY   |
| MODE >click 5         | SELECT default  | 16 CURRENT AMPS<br><i>(Meter cycles back to WATTS after AMPS)</i>                                 |
|                       | SELECT >click 1 | 17 MINIMUM AMPS<br><i>(SELECT &gt;hold H Resets Minimum Amps)</i>                                 |
|                       | SELECT >click 2 | 18 MAXIMUM AMPS<br><i>(SELECT &gt;hold H Resets Maximum Amps)</i>                                 |

Thanks for purchasing Watts up? It will help you understand the cost of your electricity, your power quality and how your appliances operate. Watts up? is easy-to-use, but to make sure you get the most out of your meter, skim through the entire manual so you understand all the capabilities of Watts up?

## GETTING STARTED

*PRO and ES users should see that section at the end of the manual*

1. Plug Watts up? into a standard 120\* volt AC wall outlet.
2. Plug an appliance into Watts up?
3. Turn on the appliance.

You'll see a reading like "35.7 WATTS." Watts up? always displays WATTS mode when first plugged in. There are six "modes" on the Watts up? meter. Modes are the major values that the meter displays. The modes are: WATTS, WATT HOURS, TIME, COST, VOLTS, and AMPS. Each mode includes one or more detail readings. For example, when in the WATT mode, you can see detail about watts, such as the MINIMUM WATTS or the MAXIMUM WATTS. The six modes and their detail readings are shown on the quick reference guide. To learn more about each mode, refer to the sections that follow.

4. To cycle through modes, simply click the MODE button. Each time you click the MODE button, you'll cycle to another mode.
5. To cycle through details within a mode, simply click the SELECT button while in that mode.
6. To reset any reading, press and hold the SELECT button for one second.

Clicking the MODE button cycles the display through all 6 modes, always in the same order. If you get confused, simply click the MODE button repeatedly until you get to the WATTS mode. Or simply unplug Watts up? and plug it back in. The display will now be in the WATTS mode. Unplugging Watts up? also resets all the values except RATE and THRESHOLD.

## MODES

This section describes each mode and the detail you can see within each mode. The detail readings are accessed by clicking the SELECT button while in the respective mode. If the MODE button is clicked while viewing a detail reading, Watts up? exits the detail reading and displays the next mode. For example, if MAXIMUM WATTS is being viewed and the MODE button is clicked, then the WATT HOUR mode is displayed. Examples shown represent a 150 watt bulb turned on eight hours per day for two days.

## WATTS MODE

Watts up? always turns on in WATTS mode.

150 WATTS

### 1 CURRENT WATTS

When you turn on Watts up? or cycle to the WATTS mode, true RMS watts (the wattage currently being consumed) are automatically displayed. If nothing is plugged into Watts up?, the display reads zero (0).

MIN 8.8 WATTS

### 2 MINIMUM WATTS

Click the SELECT button while in the WATTS mode. The display now shows the MINIMUM WATTS since Watts up? was plugged in or since the MINIMUM was last reset. This usually reads zero. It is used to determine the lowest wattage drawn for appliances that run continuously.

To reset the value after the appliance is on, press and hold the SELECT button for 1 second.

MAX 315 WATTS

### 3 MAXIMUM WATTS

Click the SELECT button again. The display now shows the MAXIMUM WATTS since Watts up? was plugged in or since the MAXIMUM was last reset. This will read zero (or a small value, since there is often a surge when plugging Watts up? in) until an appliance is plugged in and turned on.

To reset the MAXIMUM, press and hold the SELECT button for one second.

#### 4 POWER FACTOR



Click the SELECT button again. The display now shows power factor for the appliance currently plugged in. POWER FACTOR is a number between zero and one, and it represents the phase angle shift between the voltage and current. To figure POWER FACTOR, Watts up? performs the following calculation: Watts / Volt \* Amps.

#### 5 VOLT AMPS (APPARENT PWR)

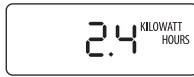


Click the SELECT button while in the WATT HOUR mode. The display now shows the volt amps, or apparent power. Volt amp is the product of the RMS Volts and RMS Amps. It does not take into account phase angle, which is the distinction between apparent power and active, or real power (see watts).

Click the SELECT button again. The display returns to the WATTS mode.

### WATT HOURS MODE

Click the MODE button.



#### 6 CUMULATIVE WATT HOURS

The display now indicates the cumulative WATT HOURS used since Watts up? was plugged in or TIME was last reset. Watt hours equal watts multiplied by time. For instance, a 150 watt bulb plugged in for 1 hour will consume 150 watt hours. In two hours, it will have consumed 300 watt hours. As the value increases, the display will automatically change units to KILOWATT HOURS (1 kilowatt hour (kwh) = 1000 watt hours).



#### 7 AVERAGE MONTHLY KWH

Click the SELECT button while in the WATT HOUR mode. The display now shows how many watt hours will be consumed each month. This is a pro-rated average, calculated since Watts up? was plugged in or TIME was last reset. The formula is:

$$\text{AVERAGE MONTHLY KWH} = (\text{watt hours}) / \{(\# \text{ of elapsed days}) / (30 \text{ days})\}.$$

It is used to determine how much electricity is used per month. Resetting the TIME will also reset the MONTHLY AVERAGE.

Click the SELECT button again. The display returns to the WATT HOURS mode.

### TIME MODE

Click the MODE button again.



#### 8 ELAPSED TIME

The display now indicates the elapsed TIME since Watts up? was plugged in or TIME was last reset. The TIME is first displayed in minutes and seconds (i.e. 1:25 means one minute and 25 seconds), up to 20 minutes. At 20 minutes, the display changes to hours and minutes and the HOURS symbol turns on (i.e. 1:25 now means one hour and 25 minutes). At 20 hours, the display changes to days and hours, and the DAYS symbol turns on (i.e. 12:17 means 12 days and 17 hours). At 20 days, the display changes to days with a decimal point, and the HOURS symbol turns off (i.e. 22.7 means 22 days and 7 tenths. 7 tenths is about 16 hours and 45 minutes).

|  |                          |
|--|--------------------------|
| 0:00 – 19:59 (Zero to 19 minutes, 59 seconds)                                    | Display > no symbol      |
| 0:20 – 19:59 (20 minutes to 19 hours, 59 minutes)                                | Display > HOURS          |
| 0:20 – 19:23 (20 hours to 19 days, 23 hours)                                     | Display > HOURS and DAYS |
| 20.1 – 1999 (20 1/10 days to 1999 days. After 1999 days, start over at 1 second) | Display > DAYS           |

Press and hold the SELECT button for one second while in the TIME mode to reset the TIME, WATT HOUR, COST, DUTY CYCLE and MONTHLY AVERAGE values back to zero. These values, as well as MINIMUMS and MAXIMUMS are also reset when Watts up? is unplugged.

#### 9 DUTY CYCLE



Click the SELECT button while in the TIME mode. The display now shows the DUTY CYCLE as a percentage (the number will be between zero and 100). DUTY CYCLE is the percent of time the appliance is above a threshold level. The default threshold is 100 watts, so the DUTY CYCLE will display the percentage of time the load is above 100 watts. The threshold can be changed to any number between one and 4800 watts.

For example, plug a refrigerator into Watts up?. The DUTY CYCLE will be the percent of time that the refrigerator compressor is running (if the threshold is set to more than the wattage of the refrigerator light bulb).

Click the SELECT button again. The display now returns to the TIME mode.

#### DUTY CYCLE WATTS THRESHOLD



DUTY CYCLE is the percent of time the appliance is above a threshold level. The default threshold is 100 watts, so the DUTY CYCLE will display the percent of time the appliance is above 100 watts. To change the threshold, go to the DUTY CYCLE display. Press and hold the SELECT button until the SET, DUTY CYCLE, WATTS symbols come on. UP/DOWN indicators will alternately flash. Click the SELECT button and the value will change in the direction of the arrow. Holding the SELECT button changes the value faster. Click the MODE button when the threshold is correct. It is recommended that you reset the TIME (see below) after changing the DUTY CYCLE THRESHOLD, because the duty cycle value is a real-time calculation.

#### 10 FREQUENCY (Hz)



Click the SELECT button while in the TIME mode. The display now shows the frequency. The meter measures the nominal frequency (50 Hz or 60 Hz) at initial power on. It then displays actual frequency in real time. Many calculations utilize calibration factors that are frequency dependent, so it is recommended that the meter be power cycled when changing between nominal frequencies.

### COST MODE

Click the MODE button again.



#### 11 CUMULATIVE COST

The display now indicates the amount of money consumed since Watts up? was plugged in or TIME was last reset. Tenths of a cent are initially displayed, so “.001” means 1/10 of a cent. “.234” means 23 and 4/10s cents. “3.24” means three dollars and 24 cents.



#### 12 AVERAGE MONTHLY COST

Click the SELECT button while in the COST mode. The display now shows the cost per month for whatever is plugged in. This is a pro-rated average, calculated since Watts up? was plugged in or TIME was last reset. The formula is:

$$\text{AVERAGE MONTHLY \$} = (\text{cost}) / \{(\# \text{ of elapsed days}) / (30 \text{ days})\}.$$

This value will change quickly when something is first plugged in. For refrigerators and other appliances that turn on and off, wait until the value no longer changes for an accurate reading. This may take a few hours, or even longer depending on how often the appliance cycles on and off.

Click the SELECT button again. The display now returns to the COST mode.



## SETTING RATES (COST MODE)

The COST is calculated by multiplying the kilowatt-hours by the rate charged by the utility. Most rates range from 3 cents to twenty-five cents per kilowatt-hour, although they can be even higher. Call your utility or look on your utility bill and divide the cost for electricity by the number of kilowatt-hours consumed to determine your local rate. The default rate that Watts up? uses is 8 cents per kilowatt-hour. To change the rate in Watts up?, go to the COST mode. Press and hold the **SELECT** button until the *SET and RATE* symbols come on. *UP/DOWN* indicators will alternately flash. Click the **SELECT** button and the value will change in the direction of the arrow. Holding the **SELECT** button changes the value faster. The rate can be set for any amount between 0.001 to 65.5 per kilowatt hour. Click the **MODE** button when the rate is correct. To change the symbol between \$ and the Euro symbol, hold the **SELECT** button down for one second while in the Average Monthly Cost **MODE**.

## VOLTS MODE

Click the **MODE** button again.



### 13 RMS VOLTS

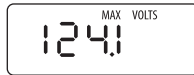
The display now indicates the RMS VOLTS.



### 14 MINIMUM RMS VOLTS

Click the **SELECT** button while in the VOLTS mode. The display now shows the MINIMUM RMS VOLTS since Watts up? was plugged in or since the MINIMUM was last reset. This can be a good indication of the line quality serving the outlet.

To reset the value to zero, press and hold the **SELECT** button for one second.

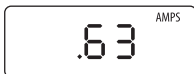


### 15 MAXIMUM RMS VOLTS

Click the **SELECT** button again. The display now shows the MAXIMUM RMS VOLTS since Watts up? was plugged in or since the MAXIMUM was last reset. This value could represent voltage surges, which is when the voltage momentarily increases. To reset the value to zero, press and hold the **SELECT** button for one second. Click the **SELECT** button again. The display now returns to the VOLTS mode.

## AMPS MODE

Click the **MODE** button again.



### 16 RMS AMPS

The display indicates the RMS AMPS being drawn by the appliance plugged into Watts up?.



### 17 MINIMUM RMS AMPS

Click the **SELECT** button while in the AMPS mode. The display now shows the MINIMUM RMS AMPS since Watts up? was plugged in or the MINIMUM was last reset. This will typically read zero. It is used to determine the lowest amperage drawn for appliances that run continuously. To reset the value after the appliance is turned on, press and hold the **SELECT** button for one second.



### 18 MAXIMUM RMS AMPS

Click the **SELECT** button again. The display now shows the MAXIMUM RMS AMPS since Watts up? was plugged in or the MAXIMUM was last reset. This will read zero (or a small value, since there is often a surge when plugging Watts up? in) until an appliance is plugged in and turned on. To reset the value to zero, press and hold the **SELECT** button for one second. Click the **SELECT** button again. The display now returns to the AMPS mode.

## WATTS UP? PRO AND ES

The PRO and PRO ES models store all the values described above into memory, and time stamp the occurrence of any power cycle. The LCD continually flashes “LOG” while this is happening. If the meter is unplugged, or power is interrupted, the data in memory is maintained and data will continue to be stored when power is restored. The data can then be downloaded to a computer. The meter can log in two interval modes: automatic or user selectable. This selection is made in the PC software. The default is automatic. In the automatic mode, the data is stored every second until the memory fills - approximately 2000 records (more if not all fields are recorded). At that point, every other record is deleted and the sample rate doubles (2 seconds). The meter continues to store new data until the memory fills again. The process repeats (deleting every other record and doubling the interval) indefinitely.

## USER SELECTABLE INTERVAL (SETTING THE INTERVAL)

1. Start the “Watts Up” application on the PC.
2. Select “Meter settings” and select the “Logging” tab / page
3. Enter the desired interval value. The value in the “duration” box shows the amount of time the meter will log at the interval value.
4. Click the “Send to Meter” button.

The interval can be changed at any time. However, all the data in the meter memory will have the same interval time stamp when downloaded. It is not possible to have some data in the meter at one interval, and subsequent data with a different interval. Therefore, we recommend downloading the data from memory and saving it to the PC prior to changing the interval. Otherwise, the data may have inaccurate time stamps when downloaded.

## MEMORY FULL (FOR USER SELECTABLE INTERVAL)

The meter will flash “MEM FULL” when the meter memory is full (this does not apply to automatic logging, because the memory never completely fills in that scenario).

The meter has two modes when the memory is full: stop or overwrite. This selection is made in the PC software application. The default is stop. If STOP MODE is selected, the logging will stop when the memory is full. MEM FULL will flash on the LCD and LOG will no longer flash. This indicates that the meter is NO LONGER LOGGING, and is not storing any data to memory. The memory must be erased for the meter to start logging again. The values displayed on the LCD are still accurate however.

If “OVERWRITE” MODE is selected, the logging will continue when the memory is full in a FIFO (first in, first out) manner. So data at the beginning will be deleted as new data is continually added to the end. “MEM FULL” and “LOG” will flash on the LCD. This indicates that the meter IS LOGGING, but data is being lost. The values displayed on the LCD are still accurate however.

## ERASING MEMORY

The memory can be erased by holding the **SELECT** button down within the first few seconds after the meter is plugged in while the display is flashing “CLR MEM”. It can also be erased from the PC application. The display will show flash “CLR MEM” for several seconds while the memory is erased.

The PRO and PRO ES models come with a CD and a USB cable.. An extensive help file is available in the program to answer questions. To install the program, simply insert the CD into your computer's CD drive and follow the on-screen directions. If nothing happens, select START, then RUN, and select the file: wusetup.exe The install wizard will then start.