Serial Data Format

Watts Up? communicates with the outside world over a standard RS232 serial port. The following section gives technical specification for the communication protocol. This can be useful to programmers or other people who have special needs. Ordinary users can skip over this section.

I. DATA FORMAT. All commands and data packets have the following format.

1. Serial Format. Data is transmitted and received as standard RS232 data at 9600 baud, 8 data bits, 1 stop bit and no parity bit.

2. Character Format. Data consists of standard ASCII characters. Numbers are represented as strings of ASCII characters with no binary numbers.

3. Packets. All information is contained in packets. All characters outside of a packet are ignored. Packets begin with a pound sign "#" and end with a semicolon ";".

4. Arguments. Inside the packet are a series of arguments. Arguments can be strings or ASCII representations of numbers. Arguments are separated by commas ",". The last argument is terminated by the semicolon ";". No empty arguments are allowed. Each argument must have at least one character. For numerical arguments, the argument must be a valid ASCII Number (hex 30 through hex 39). String arguments must contain at least one character, even if it is just a space. Control character such as Carriage Return, Line Feed and Tab characters are ignored within a packet. Spaces are valid characters inside string arguments.

5. Commands. The first two arguments are single ASCII characters representing a Command and Subcommand. Commands and Subcommand specify an action to be carried out or specify the type of data in the packet. Commands from the **Watts Up** meter are generally lower case and commands from the PC are generally upper case. If there is no Subcommand, any ASCII character can be used, but a dash "-" is generally preferred.

6. Argument Count. The third argument is a numerical value that represents the number of arguments that follow. The two commands and the count itself are not included in the count.

7. Transactions. All data transfers are initiated by the PC. In other words, Watts Up never sends data to the PC unless the PC makes a specific request.

8. Syntax Diagram.

#<C1>,<C2>,<Nm>,<A1>,<A2>,...<An>;

<C1> = First Command
<C2> = Second Command
<Nm> = Number of Arguments
<A1> = Individual Arguments

8. Example.

#f,-,3,21,35,47,0;

9. Timeouts. The Meter will be expected to respond within two seconds of a request. If no response is received by the PC within two seconds, the software will timeout and it will be assumed that the Meter is not connected or is malfunctioning.

10. Aborting Meter Communication. Sending Control-X character (hex 18) to the meter will cause it to abort any pending communication.

II. COMMUNICATION FROM WATTS UP TO PC

1. Header Record With The Shown Text:

#h,-,16, Watts, Volts, Amps, Watt Hours, Cost, Mo. kWh, Mo. Cost,
 Max Watts, Max Volts, Max Amps, Min Watts, Min Volts,
 Min Amps, Power Factor, Duty Cycle, Power Cycle;

2. Data Preamble Record. This preamble record is sent before the main data record.

#n,-,3,<R>,<I>,<C>;

R = Reserve for future use.
I = This is the time in seconds between samples.
C = This is the count of the number of records that will be sent

3. Data Record:

#d,-,16, Watts, Volts, Amps, Watt hours, Cost, Mo. kWh, Mo. Cost,
 Max watts, Max volts, Max amps, Min watts, Min volts, Min amps,
 Power factor, Duty cycle, Power Cycle;

Details:

  A. All arguments are integer values.

  B. All electrical values such as watts, volts, amps etc. are represented as tenths of the basic unit. For example, watts would be represented as the number of tenths of watts. See table in Section IV. for more details.

  C. Duty cycle is represented as the percent of the time on versus time off.

  D. Power factor is the ratio of Watts versus Volt Amps.

  E. Cost is in tenths of a penny or if another currency is being used, a tenth of the smallest currency unit.

  F. Power cycle indicates that power was removed at some point during this sampling interval. Zero indicates that the power was on continuously during the sampling interval. Non-zero indicates that the power was removed at least once during the sampling interval.

4. Last record of data transfer.

#l,-,2,<R>,<I>;

R = Reserve for future use.
I = This is the time in seconds between samples.

5. Time stamp:

#s,-,2,<R>,<I>;

R = Reserved for future use.
I = This is the time in seconds between samples.

6. Meter Status.

#u,-,4, Cost per KWH, Cost for 2nd tier, Second tier threshold,
 Duty cycle threshold;

7. Calibration factors:

#f,-,14, Flags, Sample count, Volts gain, Volts bias, Amps gain, Amps bias,
Amps offset, Low amps gain, Low amps bias, Low amps offset, Watts gain,
Watts offset, Low watts gain, Low watts offset;

8. Watts Up Mode:

#m,-,1,ModeNumber;

Mode Number Descriptions

0	Watts	9	Clock months and days
1	Watts min.	10	Cost
2	Watts max.	11	Cost avg.
3	Power factor,	12	Volts
4	kWh	13	Volts min
5	kWh avg.	14	Volts max,
6	Elapsed time	15	Amps
7	Duty cycle,	16	Amps min
8	Clock hours and minutes	17	Amps max.

III. COMMUNICATION FROM PC TO WATTS UP

1. Request the header string information.

#H,R,0;

2. Request all data from the Watts Up data memory.

#D,R,0;

3. Clear the Watts Up data memory.

#R,W,0;

4. Request current time stamp and sampling interval.

#S,R,0;

5. Set time stamp and sampling interval.

#S,W,2, time in seconds, interval;

6. Start the Watts Up.

Internal Logging:
#L,W,3, I, Time stamp, Log interval in seconds;

External Logging:
#L,W,3, E, Time stamp, Log interval in seconds;

7. Stop the Watts Up logging and read the time stamp:

#L,R,0;

8. Request the Watts Up user settings:

#U,R,0;

9. Write User settings to Watts Up:

#U,W,4, Cost per KWH, Cost for 2nd tier, Second tier threshold,
 Duty cycle threshold;

10. Request Watts Up calibration factors:

#F,R,0;

11. Set the Watts Up Mode:

#M,W,1,ModeNumber;

Mode Number Descriptions

0	Watts	9	Clock months and days
1	Watts min.	10	Cost
2	Watts max.	11	Cost avg.
3	Power factor,	12	Volts
4	kWh	13	Volts min
5	kWh avg.	14	Volts max,
6	Elapsed time	15	Amps
7	Duty cycle,	16	Amps min
8	Clock hours and minutes	17	Amps max.

12. Request Watts Up Display Mode:

#M,R,0;

IV. UNITS AND FORMAT FOR THE VALUES SENT FROM THE DATA LOG:

Time stamp:	Accumulated Hours.
Time setting:	Month, Day, Hour, and Minute.
Volts:	Integer, volts * 10. (Tenths of volts).
Amps:	Integer, amps * 10. (Tenths of amps).
Watts:	Integer, watts * 10. (Tenths of watts).
Watt hours:	Integer, WH * 10. (Tenths of WH's).
Cost:	Integer, mills. (Tenths of cents or other currency).
Mo. Average:	Integer, Watt Hours * 10 (Tenths of WHrs).
Mo. Cost:	Integer, mills (Tenths of cents or other currency).
Max volts:	Integer, max volts * 10. (Tenths of volts).
Max amps:	Integer, max amps * 10. (Tenths of amps).
Max Watts:	Integer, max watts * 10. (Tenths of watts).
Min volts:	Integer, min volts * 10. (Tenths of volts).
Min amps:	Integer, min amps * 10. (Tenths of amps).
Min Watts:	Integer, min watts * 10. (Tenths of watts).

Power factor: Integer, 0 to 100. (Percent).
Duty cycle: Integer, 0 to 100. (Percent).