

MightyWatt Application Note 001 – Battery Charger

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Introduction

Battery chargers, especially those for Li-Ion batteries, typically operate in a constant current and constant voltage mode. At the beginning of charging, the battery is charged with a constant current. When a specific voltage is reached, it is then kept constant until the current decreases below a chosen threshold and the battery is considered fully charged. Lead-acid batteries continue with constant current mode even after they are fully charged. This is called trickle charging and the purpose is to re-supply charge which is continuously consumed in chemical reactions inside the battery (self-discharge).

MightyWatt battery charger setup

An electronic load and a non-adjustable power supply can be coupled to create a programmable power supply, which can then (among other purposes) be used as a programmable battery charger (Figure 1). The constant current will be maintained in a standard constant current mode, the voltage at the battery will be sensed in the 4-wire mode and MightyWatt will switch to the constant voltage mode when the voltage reaches a set threshold. Then, the software-controlled constant voltage mode will keep a constant voltage until the current drops below a set value (Figure 2).

It is important to use software-controlled constant voltage mode; i.e., a mode with an inverted phase of the voltage feedback. In hardware-controlled; i.e., the standard constant voltage mode, the load expects the voltage to decrease when the current is increased. However, in the battery charger setup, the voltage is sensed on the battery and the larger the current into it, the larger the voltage across. Therefore, the hardware-controlled constant voltage mode would not work at all.

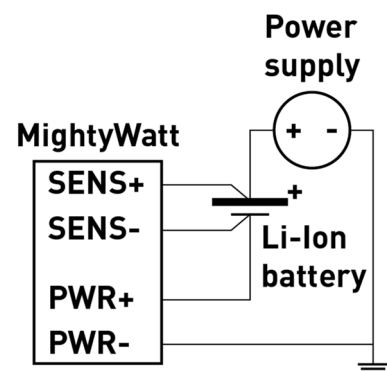


Figure 1: Connection schematic to create a programmable CC/CV Li-Ion battery charger.

The screenshot shows the MightyWatt software interface for setting up a battery charger program. The 'Watchdog' section has 'Stop if' set to 'Voltage' with a threshold of '4,25' V. The 'Voltage sense' section has 'Remote (4-wire, Kelvin)' selected. The 'Program' section contains a list of steps: 'Constant current 1 A, 3 h; skip if voltage > 4,2 V' and 'Constant SW controlled voltage 4,2 V, 3 h; skip if current < 0,05 A'. The 'SW controlled voltage' step is expanded, showing 'Value' set to '4,2' V, 'Duration' set to '3' h, and 'Skip if' set to 'Current' < '0,05' A. The 'Loop' section has 'Infinite' selected. Buttons for 'Start', 'Add', 'Remove', and navigation arrows are at the bottom.

Figure 2: Setting of CC/CV program to create a Li-Ion battery charger.