

The Energy Access Handheld Reader



Overview

The Handheld Reader (HHR) is designed to read and display data from batteries that comply to the standard Smart Battery Specifications. The HHR has two modes of operation: reading and logging. In the reading mode, the HHR reads a single parameter from the battery pack and displays it on its internal LCD screen. This information is updated every second and two front-panel buttons let you scroll through the list of displayable parameters. In logging mode, the reader is also connected to an external computer. Every 10 seconds a group of seven parameters is read from the pack and stored in a file on the computer. The data file can then be used to track and graph battery performance.

Reading Mode

To read a single battery parameter, simply plug the battery cable into the jack marked "Battery" on the front of the HHR and plug the other end into the pack. When connected properly, the LED on the Handheld Reader will flash and the LCD screen will display the battery voltage. (The HHR draws its operating power from the pack. If you connect it backwards, it will not damage the HHR or the pack, but HHR will give no response.) Once connected, you should see the following on the display:

Voltage
12345 mV 09

The upper line tells what parameter is being displayed. The lower line tells the value of the parameter (including the units of that value) and the two-digit hexadecimal code of the parameter being displayed. If you push the UP or DOWN buttons, you can scroll to another parameter.

Manufacturer Access	00	Average Time to Empty	12
Remaining Capacity Alarm	01	Average Time to Full	13
Remaining Time Alarm	02	Charging Current	14
Battery Mode	03	Charging Voltage	15
At Rate	04	Battery Status	16
At Rate Time to Full	05	Cycle Count	17
At Rate Time to Empty	06	Design Capacity	18
At Rate OK	07	Design Voltage	19
Temperature	08	Specification Info	1A
Voltage	09	Manufacture Date	1B
Current	0A	Serial Number	1C
Average Current	0B	Reserved	1D
Max Error	0C	Reserved	1E
Relative State of Charge	0D	Reserved	1F
Absolute State of Charge	0E	Manufacturer Name	20
Remaining Capacity	0F	Device Name	21
Full Charge Capacity	10	Device Chemistry	22
Runtime to Empty	11	Manufacturer Data	23

There are 36 possible parameters that can be displayed. These are listed in the table above. The meaning of many of them is fairly straight forward, but for precise explanations, the user is referred to the Smart Battery Specifications at www.sbs-if.org.

Because the table is fairly long and the most commonly used parameters are scattered throughout the table, the HHR employs a scheme to give rapid access to these commonly used parameters. The initial parameter displayed is voltage. When the UP button is pressed, the HHR cycles through the common parameters in this order: Voltage, Current, Temperature, Charging Voltage, Charging Current, Battery Status, Relative State of Charge, Cycle Count, and

Max Error. Further pressing of the UP button will start you at the top of the parameter list and let you cycle through it in order.

If you initially press the DOWN button at the opening display, you will simply cycle through the above list starting at the bottom and moving toward the top. If you wish to return to the opening display to gain rapid access to the common parameters, simply press both the UP and DOWN buttons simultaneously. The LED will flash whenever a button is pressed.

Logging Mode

To log battery data, you must connect the HHR to a computer. Plug the appropriate end of the serial data cable into the jack labeled "Computer" on the front of the HHR. Plug the other end into a serial communications port on the computer. Load and start the logging program on the computer. It is named HHRLog.exe and runs in a DOS window.

You will first be prompted for the number of the com port that you are using. Once you have entered this, you will see the words "Waiting for data" displayed on the computer screen.

Connect the HHR to a battery pack. The HHR will show the battery voltage on its LCD display. To commence the logging process, press the LOG button on the HHR. The computer screen should now show a display like:

Note: Data is saved in HHRLog.csv
Hit F2 to exit

Data Point	1	
Requested Voltage	12600	mV
Actual Voltage	12345	mV
Requested Current	2000	mA
Actual Current	1985	mA
Battery Temperature	25.6	deg C
Battery Status	0 192	
Chosen Parameter	48 57	

A file named "HHRLog.csv" has been created in the directory from which you are running the logging program. The file format is known as .csv (for "comma separated variables") and is recognized by Excel. Every 10 seconds a new set of data will be added to this file. You can temporarily suspend the logging process by pressing the LOG button on the HHR. To completely terminate the process, hit F2 on the computer. Note that the LED operation becomes inverted when you are in logging mode. That is, the LED lights continuously except when a button is pressed or a periodic logging occurs.

Each set of logged data contains eight items. The first item indicates the data point number and simply shows how many points have been logged. The subsequent seven items are all read from the pack itself. The first six are the parameters needed to control charging and discharging of the pack. Note that

the Battery Status is shown as a pair of decimal numbers. When translated into a 16-bit binary number, these indicate the status and alarm bits of the pack. Again the user is referred to the SBS specifications for a full explanation of the use and meaning of these bits.

The final item in the log is indicated as the Chosen Parameter. This corresponds to whatever is indicated by the LCD display on the HHR. You can set this to any of the parameters in the above list. Since most of the parameters are read from the pack as two 8-bit numbers, the logging program displays these as two decimal numbers ranging from 0-255. (In the example shown above, the HHR was displaying the battery voltage and the Chosen Parameter was reported as 48, 57. To relate these, simply calculate $48 \times 256 + 57 = 12345$ to get the actual voltage.)

Special Functions

The final four parameters in the function table (Manufacturer Name, Device Name, Device Chemistry, and Manufacturer Data) all produce more than two numbers when read from the pack and are handled differently than the other parameters.

Manufacturer Name, Device Name and Device Chemistry are all read as blocks of eight text characters. This text will be correctly displayed on the LCD screen of the HHR. However, if these parameters are included as part of a data log, only the ASCII numerical representations of the first two characters will be displayed on the computer screen or saved as part of the log file.

Manufacturer Data is stored in the pack as a block of unspecified length. The HHR is able to read up to 32 bytes of data for this function. Since these will not fit on the LCD display, only the number of bytes in this block is shown on the HHR. Instead, the data are sent to the computer for display when the HHR is used in logging mode. These data appear on the computer screen, but only the block length is stored in the data log itself.