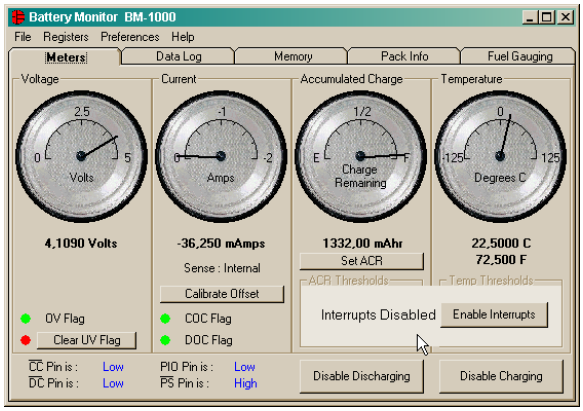
Battery Monitor BM-1000

A recurring problem during the development of devices with mobile wireless technology is the question, **"how long will the battery or the charged accumulator last?"**



This crucial question can only be partially or imprecisely answered using information contained in the data sheet.

With all mobile wireless applications a host of parameters that cannot be directly influenced determine the actual current consumption and thereby the remaining life of the battery or accumulator:

- Wireless characteristics such as the current field strength (dependent upon actual field strength, transmitter power will vary automatically).

- Each Cell transfer in the GSM Network makes at least one so-called „handover" necessary (= active wireless connection to the relative Base-stations). In transfer areas many handovers may also be executed. A much less known phenomenon though is the fact that mobile telephones themselves sometimes initialise Cell changes with only a change of direction but not a change in location. The reason for these transfers without a change in position lies in the different polarisation of the base station antenna or a search for a particular type of transmission. This means that current consuming cell changes are the order of the day even when the unit is stationary.

- So-called „Location-Updates", that are basically a sign of life from the Mobil-telephone application to the base station from whence they are requested depending upon the mobile network provider.

- Sometimes cell/battery producers are „protective" about the capacity data of their products. Furthermore the figures on the data sheet will naturally be ascertained under the most favourable conditions (agreeable temperature, comfortable current consumption), which in a real mobile wireless environment never really exist in this form.

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But also parameters, which can be influenced by the designer such as

- Selected mode (all components active/inactive, sleep mode and so forth.)
- Connected peripherals such as sensors
- Pull-up resistors

influence the current consumption dramatically, (an activated GPS-System for instance is the biggest current consumer).

All in all reliable information about actual current requirement of a mobile wireless application and the subsequent standby time can only be ascertained by testing. All other methods (adding the theoretical consumption, counting the GSM bursts etc.) are not applicable! Especially in mobile wireless applications with „long operating times" such as surveillance or locating devices, data-loggers or automatic meter reading (AMR) the current consumption can be ascertained in a few days under realistic conditions and then projected forward. The results normally lead to extraordinarily accurate predictions about actual stand-by times.

Protocol Files:

For these measurements Round Solutions offers the high precision **Battery-Monitor BM-1000**, which displays and/or protocols the complete charge and discharge procedure of attached accumulators. Changes in the current consumption of a mobile wireless application through hard- or software changes will be immediately visible. Recorded parameters will for instance be voltage, current, (charge and discharge current), cell temperature and the most importantly the current drawn (when charging the accumulator) or consumed (when discharging the accumulator) directly in Milliamp/hours.

Time	Voltage	Current	Temp	ACR	Protection	RAAC	RARC	RAE	TTFC	TAD Scaler
19:32:37	4,119	-108,750	24,500	-53,75	3		0			
19:33:37	4,109	-118,125	24,000	-55,50	3		0			
19:34:37	4,109	-109,375	23,500	-57,50	3		0			
19:35:38	4,104	-113,750	23,625	-59,25	3		0			
19:36:39	4,099	-111,250	23,250	-61,25	3		0			
19:37:39	4,099	-111,250	23,250	-63,00	3		0			
19:38:39	4,094	-126,875	23,000	-65,00	3		0			
19:39:39	4,094	-112,500	22,875	-66,75	3		0			
19:40:41	4,094	-113,125	22,875	-68,75	3		0			
19:41:41	4,089	-110,625	22,750	-70,75	3		0			
19:42:41	4,094	-105,000	22,750	-72,50	3		0			
19:43:41	4,089	-106,250	22,875	-74,50	3		0			
19:44:41	4,089	-108,125	22,875	-76,25	3		0			
19:45:43	4,085	-112,500	22,750	-78,25	3		0			
19:46:43	4,085	-112,500	22,625	-80,00	3		0			
19:47:43	4,085	-112,500	22,750	-82,00	3		0			
19:48:43	4,085	-110,625	22,625	-83,75	3		0			
19:49:45	4,085	-117,500	22,625	-85,75	3		0			
19:50:45	4,085	-111,250	22,500	-87,75	3		0			

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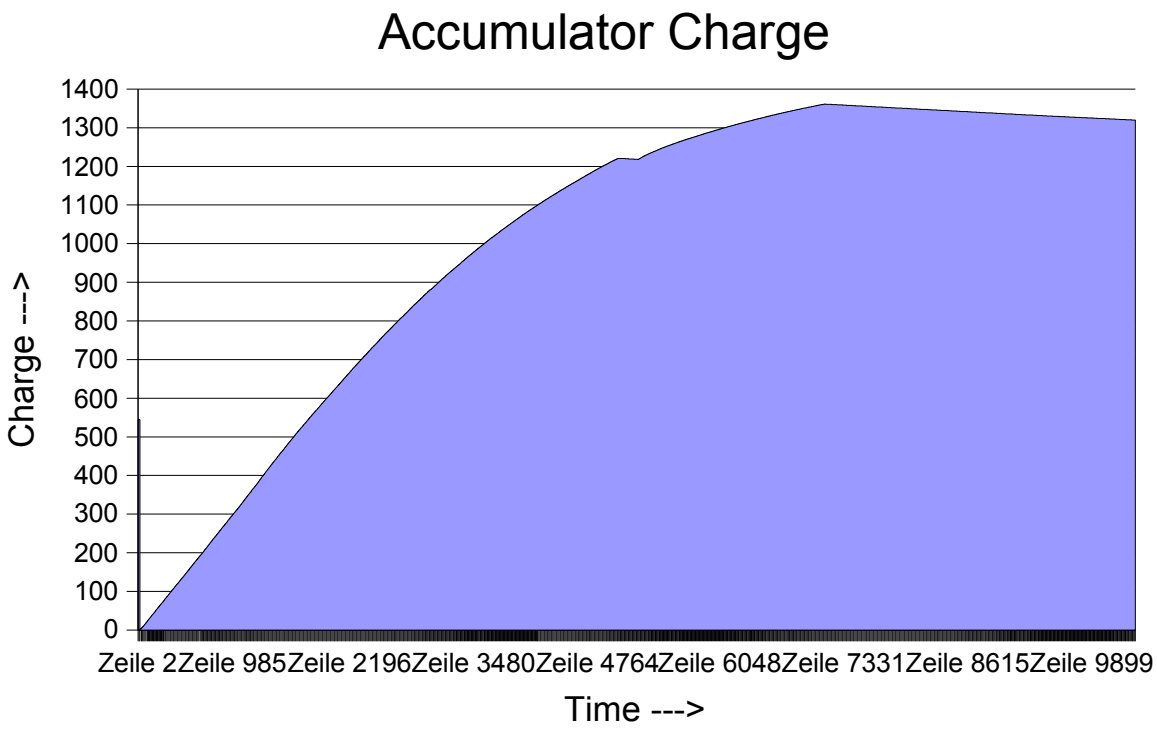
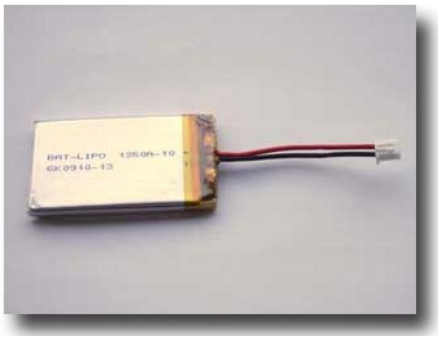
All data from a measuring run is clearly collated and can be processed and/or displayed within a spreadsheet application (Excel, OpenOffice Calc etc.) or in easily readable diagrammatic format.

Graph (produced with „OpenOffice Calc"):



In this diagram the charging sequence of a Lithium-Ion Polymer-Accumulator type „LiPo battery 3,7V / 1350 mAh" (RS-Order number BAT-LIPO01350A-10) is depicted. Using the line numbers, further data can be taken directly from the protocol file.



Using the graph the capacity data of the manufacturer „1350 mAh" can be very accurately tested.

Further diagrams with current, voltage- and temperature details are available.

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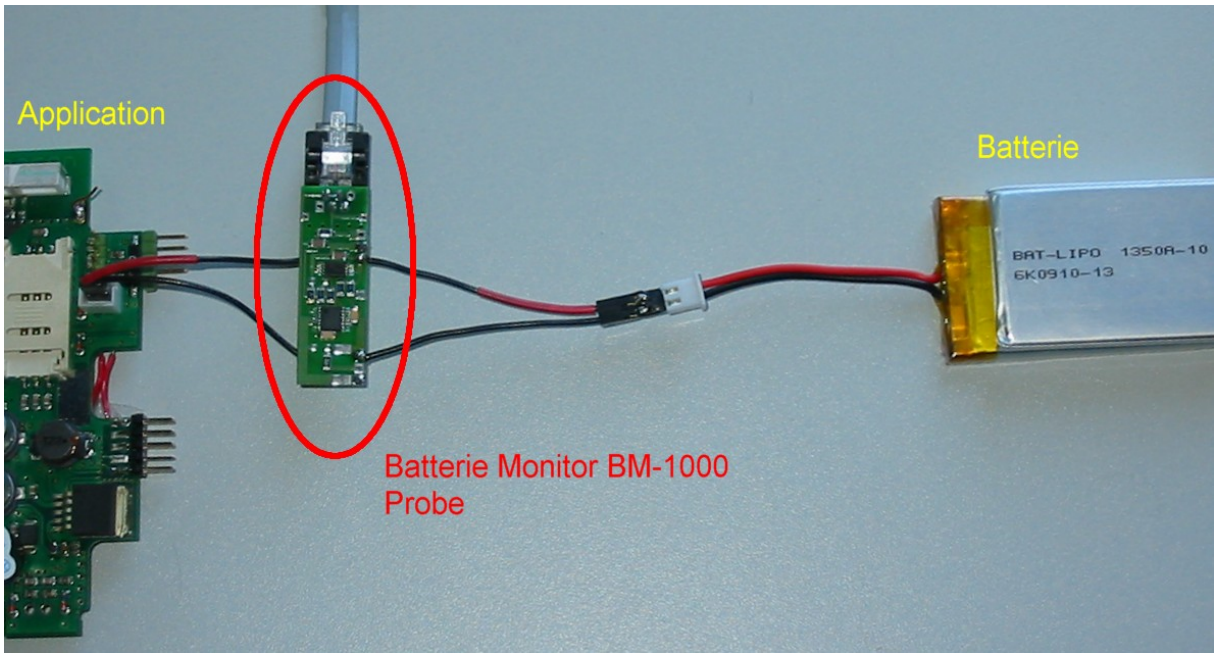
Installation:



Simply connect the **Battery Monitor BM-1000** with its „Probe" between the accumulator and the mobile wireless unit. With its internal resistance of 25mΩ it has only a minimal influence on the original circuit.

Connection to a PC requires a USB connector.

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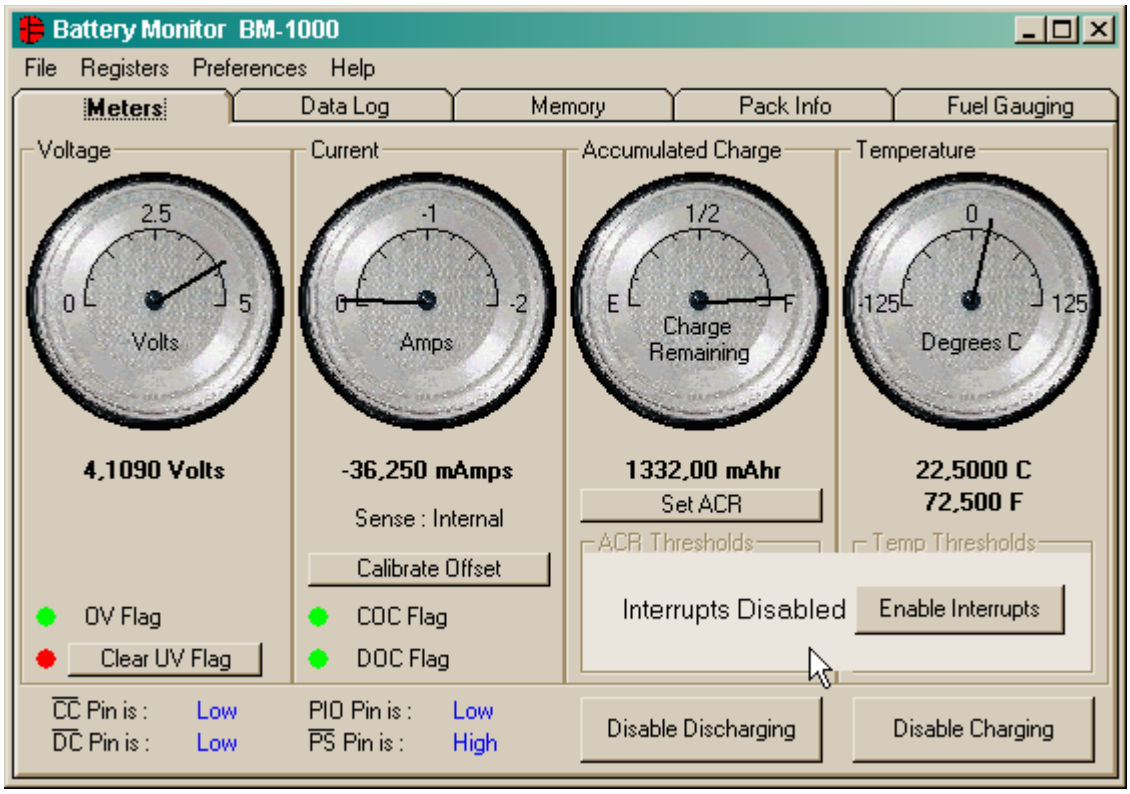
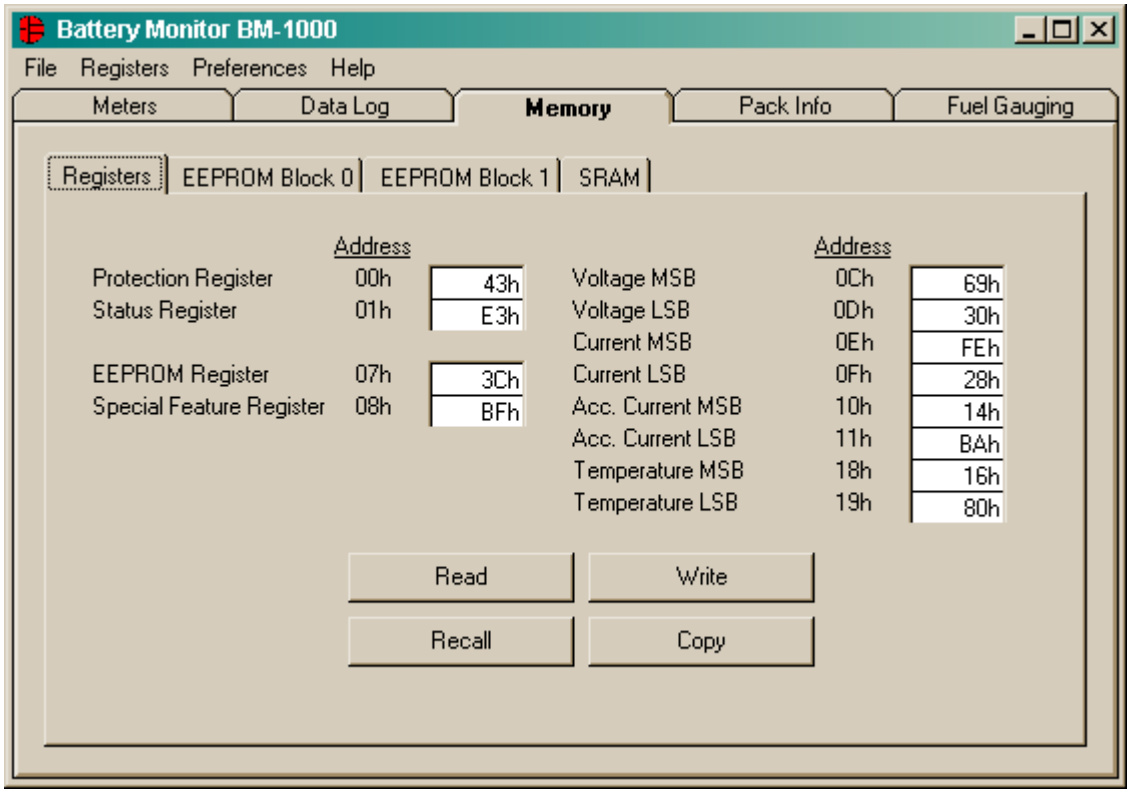
Operation:



The most important parameters will be collated in the display.



The internal registers are displayed here.

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GENERAL DESCRIPTION:

The **BM-1000** high-precision Li+ battery monitor is a data-acquisition, information-storage, and safety protection device tailored for cost-sensitive battery pack applications. This low-power device integrates precise temperature, voltage, and current measurement, non-volatile (NV) data storage, and Li+ protection. The **BM-1000** is a key component in applications including remaining capacity estimation, safety monitoring, and battery specific data storage.

FEATURES:

- **Li+ Safety Circuit**
  Over-voltage Protection
  Over-current/Short-Circuit Protection
  Under-voltage Protection
- **Host Alerted When Accumulated Current or Temperature Exceeds User-Selectable Limits**
- **0V Battery Recovery Charge**
- Internal 25m Sense Resistor
- **Current Measurement**
  12-Bit Bi-directional Measurement
  Internal Sense Resistor Configuration:
  0.625mA LSB and ±1.9A Dynamic Range
- **Current Accumulation:**
  Internal Sense Resistor: 0.25mAhr LSB
- **Voltage Measurement with 4.88mV Resolution**
- **Temperature Measurement Using Integrated Sensor with 0.125°C Resolution**
- **System Power Management and Control Feature Support**
- **32 Bytes of Lockable EEPROM**
- **16 Bytes of General-Purpose SRAM**
- **Low-Power Consumption:**
  Active Current: 60µA typically, 90µA maximum
  Sleep Current: 1µA typically, 2µA maximum

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