

ABM Technology



User benefits

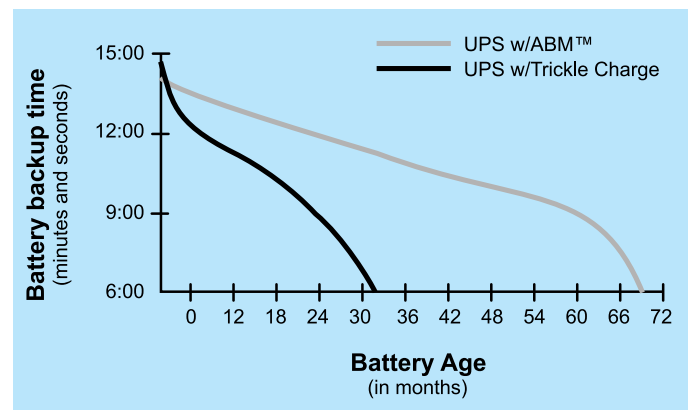
- Predictive and automatic diagnostics of battery health
- Significant extension of battery life compared to traditional charging method
- Optimisation of battery recharging time with dual mode charging method
- Automatic battery charge voltage compensation within 0 to +50°C temperature range

Superior battery management

Battery service life is a major contributor to UPS reliability. Since batteries are electrochemical devices, their performance gradually decreases over time. Premature wear-out means higher costs in terms of replacement labour and shorter service cycle. A worn battery entails a risk of unexpected load loss. In normal UPS operation, backup power is needed only occasionally and the battery 'wearing' rate depends strongly on how the full charge is being maintained. Excess charging is detrimental under any operating circumstances.

Significant extension of battery life

Eaton has created ABM® technology to extend the life of valve-regulated lead-acid batteries by applying sophisticated logic to the charging regime. Using the traditional trickle charge method, batteries become subject to electrode corrosion and electrolyte dry-out, especially in standby service use due to continuous float charging. ABM is essentially an addition of intelligence to the charging routine by preventing unnecessary charging, thus significantly retarding wear-out. ABM provides an additional feature for monitoring battery condition and advance warning about the end of battery life upon detection of a weak battery. It also optimises the recharge time, which is advantageous when there may be consecutive power outages within a short period. ABM has been used for over 15 years in our UPSs ranging from 1 to 160 kVA and is now applied in UPSs up to 1100 kVA.



ABM technology significantly increases battery service life.



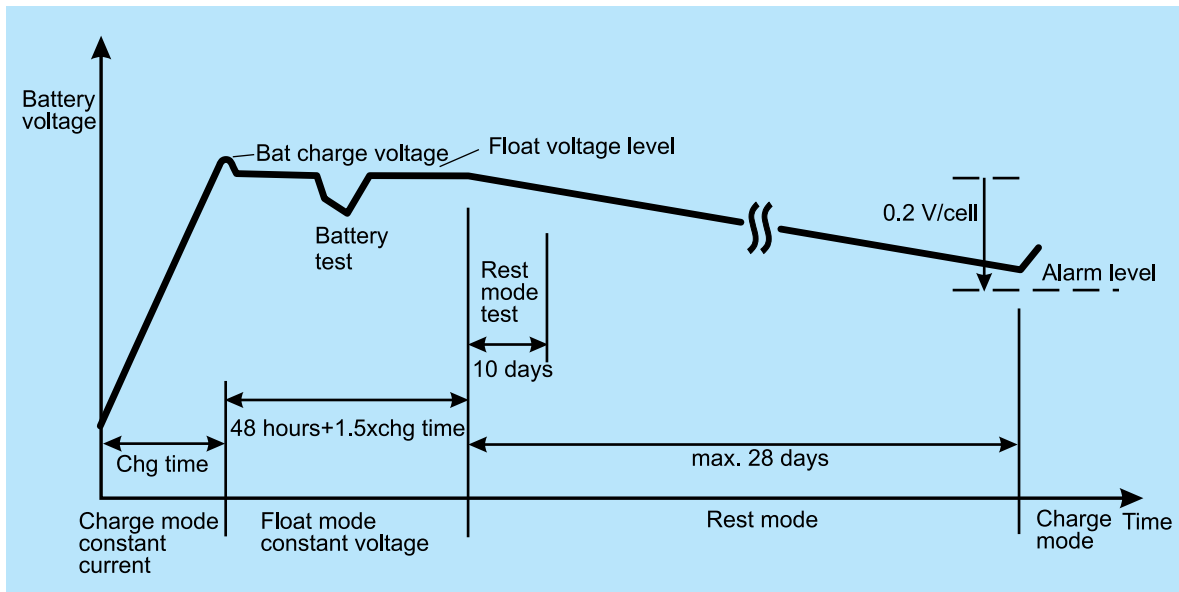
Powering Business Worldwide

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ABM cycle and operation – how does it work?

The basic idea of ABM is to leave a fully charged battery in rest mode for most of the time, and then apply charge current only at certain intervals. Initially, in order to charge up a fully or partly discharged battery, the charger starts at a constant current appropriate for the battery type used. When the battery voltage reaches a set level, the operation is changed to float mode using a constant but lower voltage, thus providing an optimum recharge time. The battery is kept at this voltage for 24 hours until it comes to the first test point. This takes approximately one minute, and during this period voltage drop measurements are taken while loading the battery, giving an indication of battery condition. The float charging is continued for an additional 24 hours, plus a period equal to 1.5

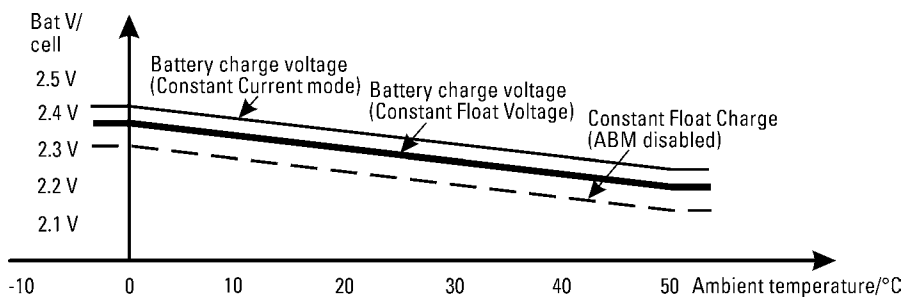
times the constant current charging time, before the rest mode is initiated. At this point, charging is discontinued for a maximum of 28 days – as if the batteries were disconnected. During the first 10 days the battery voltage is continuously monitored, and if it drops below 2.1 V/cell, the ABM restarts in charge mode and the user gets a notification of improper battery operation. If it drops below this limit after the 10-day period, charging is resumed without an alarm being raised. In short, the algorithm uses three charging stages in its operation. Thus, the batteries experience much less stress than in the case of traditional charging. A typical battery charging cycle without power interruptions is shown in the graph below.



Battery voltage during ABM charging process.

For convenience, the user has the facility to disable the ABM and instead select continuous 'constant voltage' charging whereby the charger uses a constant float voltage. 'ABM enabled' is the default setting. The charger voltage levels are (by default setting) programmed to be dependent on an internal temperature sen-

sor measurement, thus providing further enhancement to battery health. The external batteries can be also provided with temperature dependent charger voltage. For this purpose a Web/SNMP card with Environmental Monitoring Probe (EMP) is required.



Temperature compensated charger between $\pm 0^{\circ}\text{C}$... $+50^{\circ}\text{C}$ internal/external measurements.



Optional Web/SNMP card with EMP probe for temperature measurement of an external battery cabinet or rack.