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# NASA TECH BRIEF



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## Battery Charge Regulator Is Coulometer Controlled

The use of nickel/cadmium type primary cells in space applications is attractive in that these cells are capable of accepting a relatively high rate of charge without degradation. This is particularly important in the case of a satellite whose orbit involves a relatively short period in sunlight. To take advantage of the nickel/cadmium cell's tolerance for high charging rate, it is desirable to have a charge control method that permits maximum charge rate right up to full charge level.

Because the nickel/cadmium cell does not exhibit the end-of-charge voltage upswing except at very low temperatures, it is very difficult to control the charge by a voltage clamping method at normal operating ambients. Such techniques as voltage/current limiting, specific temperature control, and straight current limiting have been used in the past to control rate of charge but, generally speaking, either permit unnecessary overcharge or take excessive time.

A coulometer controlled battery charge regulator has been designed around a cadmium-cadmium type cell that overcomes the aforementioned disadvantages. This cell exhibits a characteristic whereby the voltage drop is approximately 50 millivolts until the coulometer's rated ampere hours have passed through the cell, at which time the voltage increases very rapidly.

The same characteristic is also exhibited in the opposite direction. When a portion of the ampere hour value has been reversed and then recharged, a minor hysteresis loop is traversed. The coulometer voltage will rise when the same ampere hour value has been put back in as has been removed. The use of the coulometer as an ampere hour measuring device permits all available current to go to the battery until full charge state is reached, at which time the charge rate is automatically reduced.

### Notes:

1. In view of the current interest in nickel/cadmium cells as energy sources for automotive vehicles, this method of charge control should be quite attractive for its time saving feature.
2. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer  
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Greenbelt, Maryland 20771  
Reference: B67-10446

### Patent status:

No patent action is contemplated by NASA.

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Category 01