

NOTES AND PRECAUTIONS

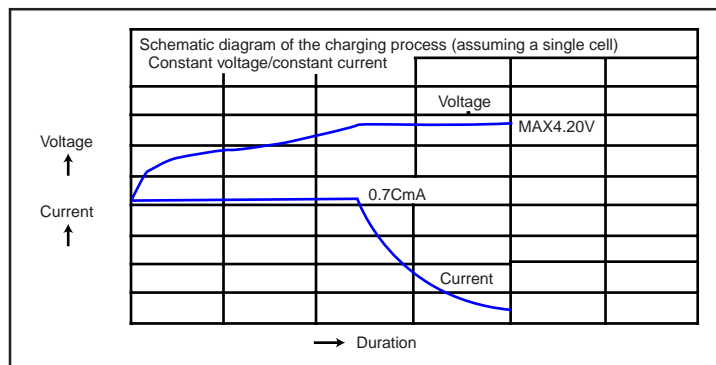
• Safety Precautions for the Lithium Ion Battery Pack

Use of Lithium Ion Batteries and the Design of Equipment That Uses These Batteries

In general, lithium ion batteries are used in battery packs that contain both lithium ion batteries and battery protection circuits. Both items are sealed in a container made of a material such as resin so that the battery pack cannot be easily disassembled.

1. Charging the Batteries

The “constant voltage/constant current” method is used to charge lithium ion batteries. (See Figure below.)



(1) Charge Voltage

The maximum voltage is 4.2 V x the number of cells connected in series.

(2) Charge Current

We recommend 0.7 CmA.

When the voltage per cell is 2.9V or less, charge using a charge current of 0.1CmA or less.
(Contact Panasonic for information regarding pulse charging.)

(3) Charge Temperature

The batteries should be charged at temperatures between 0°C and 45°C.

(4) Reverse-polarity Charging

Verify the polarity of the batteries before charging to insure that they are never charged with the polarity reversed.

2. Discharging the Batteries

(1) Discharge Current

The current should be maintained at 1.0 CmA or less (Consult Panasonic if you plan to discharge the batteries with a current in excess of 1.0 CmA).

(2) Discharge Temperature

The batteries should be discharged at a temperature between -20°C and +60°C.

(Consult Panasonic if you plan to discharge the batteries at temperatures less than -10°C.)

(3) Discharge Termination Voltage

Avoid discharging at voltages less than 3.0 V per cell. Overdischarge can damage the performance of the battery. Equip the unit with a mechanism to prevent overdischarge, especially in situations where the user may forget to turn the equipment off.

NOTES AND PRECAUTIONS - CONTINUED

3. Equipment Design

(1) Installing Battery Packs in the Equipment

To avoid damage to the battery pack, make sure that the battery pack is positioned away from heat sources in the equipment or in the battery charger.

(2) Mechanisms to Prevent Dropping

Be sure to use a battery pack lock mechanism to prevent the battery pack from being ejected when the equipment is dropped or receives a sudden impact.

(3) Preventing Short Circuits and Reversed Connections

Use a terminal structure that makes it unlikely that the terminals will be shorted by metallic necklaces, clips, hairpins, etc. Structure the battery and the terminals to the battery in such a way that the battery pack cannot be put in backwards when installed in the charger or the equipment.

(4) Inclusion in Other Equipment

If the battery is built into other equipment, use caution to strictly avoid designing airtight battery compartments.

(5) Terminal Materials in the External Equipment

Use materials that are highly resistant to corrosion (such as nickel or nickel-coated copper). If contact resistance is an issue, we recommend that you use contact plating (such as gold plating) on the terminals.

4. Storing the Batteries

The batteries should be stored at room temperature, charged to about 30 to 50% of capacity. We recommend that batteries be charged about once per year to prevent overdischarge.

5. Use of the Batteries

See the section on "Safety Precautions for the Lithium Ion Battery Pack."

6. Other

The Chemical Reaction

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as charge, discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the batteries cannot maintain a charge for long periods of time, even when they are charged correctly, this may indicate it is time to change the battery.

7. Please Note

The performance and life expectancy of batteries depends heavily on how the batteries are used. In order to insure safety, be sure to consult with Panasonic in advance regarding battery charging and discharging specifications and equipment structures when designing equipment that includes these batteries.

Please Note:

Panasonic assumes no liability for problems that occur when the Notes and Precautions for use listed above are not followed.

SAFETY PRECAUTIONS FOR LITHIUM ION BATTERY PACKS

• Safety Warnings

1. When Using the Battery

WARNING

- (1) Misusing the battery may cause the battery to get hot, explode, or ignite and cause serious injury. Be sure to follow the safety rules listed below:
 - Do not place the battery in fire or heat the battery.
 - Do not install the battery backwards so that the polarity is reversed.
 - Do not connect the positive terminal and the negative terminal of the battery to each other with any metal object (such as wire).
 - Do not carry or store the batteries together with necklaces, hairpins, or other metal objects.
 - Do not pierce the battery with nails, strike the battery with a hammer, step on the battery, or otherwise subject it to strong impacts or shocks.
 - Do not solder directly onto the battery.
 - Do not expose the battery to water or salt water, or allow the battery to get wet.
- (2) Do not disassemble or modify the battery. The battery contains safety and protection devices which, if damaged, may cause the battery to generate heat, explode or ignite.
- (3) Do not place the battery on or near fires, stoves, or other high-temperature locations. Do not place the battery in direct sunshine, or use or store the battery inside cars in hot weather. Doing so may cause the battery to generate heat, explode, or ignite. Using the battery in this manner may also result in a loss of performance and a shortened life expectancy.

CAUTION

- (1) If the device is to be used by small children, the caregiver should explain the contents of the user's manual to the children. The caregiver should provide adequate supervision to insure that the device is being used as explained in the user's manual.
- (2) When the battery is worn out, insulate the terminals with adhesive tape or similar materials before disposal.
- (3) Immediately discontinue use of the battery if, while using, charging, or storing the battery, the battery emits an unusual smell, feels hot, changes color, changes shape, or appears abnormal in any other way. Contact your sales location or Panasonic if any of these problems are observed.
- (4) Do not place the batteries in microwave ovens, high-pressure containers, or on induction cookware.
- (5) In the event that the battery leaks and the fluid gets into one's eye, do not rub the eye. Rinse well with water and immediately seek medical care. If left untreated the battery fluid could cause damage to the eye.

2. While Charging

WARNING

- (1) Be sure to follow the rules listed below while charging the battery. Failure to do so may cause the battery to become hot, explode, or ignite and cause serious injury.
 - When charging the battery, either use a specified battery charger or otherwise insure that the battery charging conditions specified by Panasonic are met.
 - Do not attach the batteries to a power supply plug or directly to a car's cigarette lighter.
 - Do not place the batteries in or near fire, or into direct sunlight. When the battery becomes hot, the built-in safety equipment is activated, preventing the battery from charging further, and heating the battery can destroy the safety equipment and can cause additional heating, breaking, or ignition of the battery.
- (2) Do not continue charging the battery if it does not recharge within the specified charging time. Doing so may cause the battery to become hot, explode, or ignite.

SAFETY PRECAUTIONS FOR LITHIUM ION BATTERY PACKS - CONTINUED

CAUTION

The temperature range over which the battery can be charged is 0°C to 45°C. Charging the battery at temperatures outside of this range may cause the battery to become hot or to break. Charging the battery outside of this temperature range may also harm the performance of the battery or reduce the battery's life expectancy.

3. When Discharging the Battery

WARNING

Do not discharge the battery using any device except for the specified device. When the battery is used in devices aside from the specified device it may damage the performance of the battery or reduce its life expectancy, and if the device causes an abnormal current to flow, it may cause the battery to become hot, explode, or ignite and cause serious injury.

CAUTION

The temperature range over which the battery can be discharged is -20°C to 60°C. Use of the battery outside of this temperature range may damage the performance of the battery or may reduce its life expectancy.

To insure the safe use of this battery, contact Panasonic when designing a device that uses this battery.