

Warnings

- Follow all recommended maintenance and operating instructions for the Smart Battery and associated ZOLL charging/testing systems. If a problem or question arises, contact Technical Service. Do not use the Smart Battery until it has been inspected, tested, and recalibrated by the appropriate personnel and you have been adequately trained in the proper use of the Smart Battery.
- Keep a fully charged spare battery pack available at all times with the Monitor/Defibrillator. Replace the battery immediately upon low battery message.
- Do not install batteries into Monitor/Defibrillators when storage may exceed 90 days. Battery damage may occur.
- Do not immerse or set the Smart Battery in fluid.
- Do not use alcohol or ketones (MEK, acetone, etc.) on the Smart Battery. Do not autoclave the Smart Battery.
- The Smart Battery is protected against interference from radio frequency emissions typical of two way radios and cellular phones (digital and analog) used in emergency service/public safety activities. Users of the Smart Battery should assess the device's performance in their typical environment of use for the possibility of radio frequency interference from high power sources.
- Do not use the Smart Battery if the case is cracked or broken.
- ZOLL charging/testing systems used with the Smart Battery should be calibrated or tested periodically using the appropriate Service Manual.
- The Smart Battery may feel warm to the touch following an excessive number of defibrillation discharges at maximum energy.
- Locate the Smart Battery and ZOLL resuscitation devices where they cannot harm the patient or user if they fall.
- Under certain fault conditions, it is possible for small amounts of hydrogen gas to be released during charging of the battery pack. This may present a hazard.

General

Test: ZOLL recommends that all battery testing be performed with a ZOLL battery charger, such as the Base PowerCharger^{4x4} or a ZOLL Battery Support System labeled "Smart Battery Ready".

Temperature: 0°C to 50°C (operating)
15°C to 35°C (optimal battery charging)
-40°C to 70°C (storage)

Humidity: 5% to 95% (relative humidity - non condensing)

Cleaning

Clean the ZOLL Smart Battery, with a soft damp cloth and mild soap.

Daily Check

Press the **Press For Display**  button and verify the battery is fully charged and no faults exist.

Service

U.S.A. Customers

Should the ZOLL Smart Battery require service, contact ZOLL Medical Corporation Technical Service Department at 1-800-348-9011 (in Massachusetts: 1-978-421-9655).

International Customers

Should the ZOLL Smart Battery require service, contact the nearest authorized ZOLL Medical Corporation service center.

Product Description

The ZOLL Smart Battery Module consists of a reusable electronics module and replaceable cell pack. A built-in microprocessor monitors battery use/recharge and tracks the amount of usable monitoring time remaining in the battery. Whenever a Smart Battery (Battery Pack equipped with a reusable Smart Battery Module) is placed in a ZOLL monitor/defibrillator, the device measures its rate of energy delivery and displays the remaining usable monitoring time.

The ZOLL Smart Battery is also designed to help users determine the monitoring run time during the recharge process or when the battery pack is sitting idle.

The reusable ZOLL Smart Battery Module microprocessor monitors both battery capacity and charge state to compute approximate monitoring time. Since, battery capacity diminishes over the useful life of all batteries, the Smart Battery must periodically recalibrate its capacity in order to provide continued accuracy. The battery's **Fault: Test Battery Before Using**

indicator () will illuminate to indicate the need for such recalibration. When this occurs, recalibration is accomplished by placing the Smart Battery in a ZOLL Base PowerCharger^{4x4} or a ZOLL Battery Support System labeled "Smart Battery Ready" and depressing the TEST button. This process will test, recalibrate, and recharge the battery, restoring battery level indicator accuracy.

(**Note:** Recalibration is automatic with Base PowerCharger^{4x4} Auto Test).

Controls and Indicators

 **Press For Display**

Illuminates the battery level indicators to display the approximate amount of time the monitor/defibrillator will operate (in monitoring mode) before the battery is depleted. Depressing this button will cause all indicators to blink once and then the appropriate indicators will illuminate for 10 seconds unless the battery is in use/recharge (then they will remain on).

 **Fault: Test Battery Before Using**

Illuminates to indicate that the Smart Battery is in need of recalibration or that a fault condition has been detected. If the

 **FAULT** indicator remains lit after the Smart Battery has been recalibrated (tested), refer to the Diagnostics Mode Fault Code Section for instructions on how to determine the nature of the fault or return to ZOLL Technical Service.

 **Battery Level Indicators**

The Smart Battery includes five indicators for displaying the amount of monitoring time contained in the battery. To check the

state of the battery, depress the  **Press For Display** button and assure that all five indicators are illuminated to confirm that the battery pack has been fully recharged. The top most indicator will typically be extinguished within a few minutes after the battery is placed in use to show that at least some energy has been used.

The remaining four battery level indicators display the approximate monitoring time for a 1400 series device that can be expected from the battery. As the battery pack is used, the pattern of illuminated indicators will change to display the present battery state. When only the bottom indicator is illuminated, the Smart Battery pack is low and should be recharged.

When the Smart Battery is powering a monitor/defibrillator or when it is in the process of being recharged, the battery level indicators will automatically display the battery's remaining useable monitoring time. When the battery is not in use or is installed in an inactive monitor/defibrillator, the indicators will all be extinguished.

Notes:

- A fully charged Smart Battery will provide a minimum operating time of 2.0 hours in the monitoring mode for the PD 2000/D 2000, and PD 1400/D 1400 devices and 1.5 hours in the monitoring mode for the ZOLL 1600 and ZOLL 1700.
- It is normal for the Smart Battery to show as much as 1.5 hours of monitoring run time left on the defibrillator when the Low Battery message is displayed on the screen.
- The battery level display will illuminate when it is inserted into the charger or when it is in a monitor/defibrillator and the unit is turned on. It can take up to 10 seconds for the Battery Level display to turn on. (The display may turn off near the end of the charge cycle).
- If a fully charged battery is inserted into a charger all of the indicators may remain off.
- When the   **Press For Display** button is depressed at least one LED will always illuminate with no delay. If a fault is present, only the Fault indicator will illuminate while the Battery Level indicators remain off.
- Before storing batteries, make sure that they are fully charged.
- The top indicator of a fully charged ready Smart Battery in storage should extinguish between 3 and 5 weeks. If the indicator extinguishes before three (3) weeks or after 5 weeks a fault condition may exist.

Charging, Testing and Recalibration

ZOLL Smart Batteries may be charged by any of ZOLL's Charging systems. Use of any other charger will not allow Smart Battery gauge to be fully operational but the battery will still be charged.

Recalibration, the act of restoring full and accurate function to the Smart Battery must be performed using the Base PowerCharger^{4x4} or a ZOLL Battery Support System labeled "Smart Battery Ready." (Older model Battery Support Systems may require upgrades to enable this recalibration. Please contact your local sales representative.)

Recalibration is necessary when the battery has been used

approximately 20 times or the  **FAULT - Test Battery** indicator is illuminated on the Smart Battery. Recalibration is performed by placing the Smart Battery in the Base PowerCharger^{4x4} or a ZOLL Battery Support System labeled "Smart Battery Ready" and pressing the **TEST** button.

The modular AC PowerCharger which attaches to the ZOLL Monitor/Defibrillator is unable to recalibrate the Smart Battery.

AC PowerCharger users should place the Smart Battery in the Base PowerCharger^{4x4} or a ZOLL Battery Support System labeled "Smart Battery Ready" and press the **TEST** button for recalibration. It is also possible to recalibrate the Smart Battery

by draining the Smart Battery from a fully charged state to shut off in a ZOLL defibrillator and then recharging.

ZOLL Medical Corporation recommends that all Smart Batteries be tested for capacity at least every 90 days.

Diagnostics Mode

Absolute Battery Capacity

Press and hold the   **Press For Display** button for approximately 5-10 seconds and release. The absolute battery capacity will be displayed on the battery level gauge for a few seconds as follows:

BATTERY LEVEL	DIAGNOSTIC STATE OF CAPACITY
	> 2.8 Amp Hours
	2.5 to 2.8 Amp Hours
	2.25 to 2.5 Amp Hours
	2.0 to 2.25 Amp Hours
	< 2.0 Amp Hours

TIME TO TEST/REPLACE CELL PACK

If the top four indicators on the battery capacity gauge are not lit, you should put the battery in a charger and perform a manual test. If the battery fails the manual test, do not use the battery. Consult ZOLL Technical Service to obtain replaceable cell packs and instructions for use with the reusable Smart Battery Module.

Fault Code

Press and hold the   **Press For Display** button for 14-16 seconds to check which fault is present.

If a fault is present, the  **FAULT** indicator will blink as follows: ½ second on followed by ½ second off for the number of times equal to the fault code.

If more than one fault is present, the **FAULT** indicator will blink the number of times equal to the fault code followed by a brief delay then blink the number of times equal to the next fault code, and so on.

The following table lists the fault codes, the conditions that generated the faults, and recommended actions you should take.

Fault Code and Recommended Actions Table

Fault Code	Condition	Recommended Action
0	(No Blink) Recalibration Required	Manual Test in 4x4
1	Battery Capacity too Low	Manual Test in 4x4
2	Current Range	Return to ZOLL Medical Corp
3	Voltage Range	"
4	Temperature Range	"
5	Data Checksum	"
6	Voltage A/D Fault	"
7	Temperature A/D Fault	"
8	Current A/D Fault	"
9	Program Checksum	"
10	Voltage Self-Test Fail	"
11	Current Self-Test Fail	"
12	RAM Test Fail	"
13	N/A	N/A
14	N/A	N/A
15	N/A	N/A
16	Power-Loss	Manual Test in 4x4

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When last fault code has displayed, there will be a brief delay, after which the **FAULT** indicator will light and remain on.