A Closer Look

Battery Status Information for Boston Scientific Pacemakers and Defibrillators

Accessing Battery Information

Upon interrogation of one of the referenced Boston Scientific implantable devices, a Summary Dialog screen displays a battery status symbol and the Approximate time to explant (Figure 1). The status symbol is a visual representation of current battery status/time remaining.

![Figure 1. Summary Dialog screen](image1)

Battery information is also found within the programmer System Summary screen and the Battery Status screen (Figure 2), which also displays Approximate time to explant, a Time Remaining gauge, and an button/link to the Battery Status Detail screen.

![Figure 2. Battery Status screen of a TELIGEN ICD](image2)

Time Remaining Gauge – This gauge provides a visual representation of time remaining to explant. The needle position is determined by comparing the device’s current battery status and power consumption at the current programmed settings to an original engineering longevity estimate for a typically-programmed device.

**NOTE:** If current device function (monitoring and therapy) and programmed parameter settings require more energy consumption than the typical model, it is possible that the gauge may appear less than “full” shortly after implantation.

With consistent power consumption, the needle will decrement steadily throughout the life of the device. However, note that the time remaining can increase (and needle position increment) if power consumption decreases. When the needle position reaches a status of Explant, **device replacement must be scheduled.**
**IMPORTANT NOTE:** Three months after a status Explant is reached, the device will indicate a status of Battery Capacity Depleted. At this point, device functionality will be restricted and therapy can no longer be guaranteed. If Battery Capacity Depleted is displayed, the patient should be scheduled for immediate device replacement. For device behaviors associated with a specific battery status, refer to product Instructions for Use (Reference Guide).

**Approximate Time to Explant** - This indicator provides an estimate of calendar time remaining until the device will reach a battery status of Explant. Approximate time to explant is displayed as years, months, or < 3 months. When a battery status of Explant is reached, the text under the gauge will read “Explant was reached on <date>.” A three-month replacement window – starting on the indicated date – is available to schedule replacement of the device.

The Approximate time to explant is calculated using battery capacity consumed to monitor, pace, and/or deliver shocks (ICD/CRT-Ds), charge remaining, and power consumption at current programmed settings. Monitoring also includes daily battery voltage checks, which is not displayed on programmed screens. Similar to the needle on the Time Remaining gauge, the Approximate time to explant can and will adjust if programmed settings change, therapy or telemetry use change, or power consumption otherwise increases or decreases over time. This fluctuation is normal, and will stabilize as the pulse generator collects new data and recalculates its prediction. Causes of fluctuation may include, but are not limited to the following:

- If parameter values are reprogrammed, the Approximate time to explant will be estimated based on the new values. Shortly after reprogramming, there will be little recent usage history available, so the Approximate time to explant may change somewhat from week to week. However, as new data is collected over the next month, the Approximate time to explant should stabilize.

- Similar to reprogramming, there will be little recent usage history immediately following implantation. For seven days following the pulse generator implant, the programmer will display a static Approximate time to explant, based on model-dependent longevity constants stored in the programmer. Once enough usage data has been collected (over the next month), device-specific predications will be displayed.

- If programmer telemetry is used frequently or for long durations (for example, multiple device interrogations to verify device function following a series of radiation treatments) or if pacing rate or energy temporarily increases significantly, the Approximate time to explant will react/decrease accordingly. However, when the telemetry or therapy use returns to normal, the Approximate time to explant will recover over the next month.

- Therapy demand and certain patient health conditions can increase power consumption and corresponding longevity may be reduced. For example, sensing a high number of events associated with chronic atrial fibrillation requires significant microprocessor usage, causing additional power consumption. For patients with chronic atrial fibrillation, if the clinical benefit of increased longevity outweighs the clinical value of the data collected by the atrial lead, power consumption can be improved by programming the device to a non-atrial sensing mode such as VVI(R) and disabling RA sensing on the Brady Settings screen > Leads. **NOTE:** Although atrial sensing is not required for VVI(R) pacing, atrial sensing remains active to support other device features such as VT/SVT discrimination (in both pacemakers and defibrillators). For this reason, disabling RA sensing is also necessary to improve power consumption.

**Battery Status Detail**

The Battery Status Detail screen (Figure 3) presents battery-usage information that may be helpful when troubleshooting device performance or assessing the longevity impact of device reprogramming. It includes information such as Power Consumption (average daily use of power at current programmed settings) and Power Consumption Percentage (a comparison of current power consumption to the estimates used to quote longevity (shown on the Battery Detail screen). If, for example, the power consumption percentage reads 96%, the device may have a slightly longer life than projected at the given parameters, because the device is consuming less energy than a device operating under the usage conditions described on the screen. **NOTE:** In an individual programming session, the Power Consumption / Percentage will adjust/predict real-time; however, the device requires approximately one month to reflect the actual power consumption at new settings.

![Figure 3. Battery Detail screen of a COGNIS CRT-D](image-url)
Magnet Rate for Pacemakers and CRT-Ps

For referenced pacemakers and CRT-Ps, if the Magnet Response is programmed to Pace Async, the battery status/time remaining can also be assessed using a manually applied external magnet stronger than 70 gauss. The measured pacing rate during magnet application provides an indication of battery status/time remaining as follows:

- 100 ppm (paces per minute) indicates more than one year remaining,
- 90 ppm indicates 1 year or less remaining, and
- 85 ppm indicates a status of Explant.

**NOTE**: Boston Scientific ICDs and CRT-Ds do not have a Magnet Rate function.

For additional battery information, please reference the product Instructions for Use *(Physicians Technical Manual and Reference Guide)* or contact Boston Scientific Technical Services.

---

1. For Pacemakers and CRT-Ps, the Battery Status screen does not include Charge Time, rather it includes a section on Magnet Rate.
2. The Physician's Technical Manual includes longevity models for several usage options. The model chosen for the Time Remaining gauge is dependent on product family.
3. For Pacemakers and CRT-Ps, the Battery Detail screen does not include Shock, Charge Time, and Capacitor Reform information.