

ABSTRACT

The La Crosse BC-900 is a charger, tester, and conditioner for AA and AAA size rechargeable cells of the Ni-Cd and Ni-MH types. It offers extremely flexible management of its numerous functions. In this article, we review the features of this unit and give instructions for its operation.

INTRODUCTION

The La Crosse BC-900 is a charger, tester, and conditioner for AA and AAA size rechargeable cells of the Ni-Cd and Ni-MH types.

The unit can handle up to four cells at the same time. They may be of different types and/or sizes. Each of the four cell "compartments" is managed separately, and one can have the different compartments operating in different modes (1-3 charging, 4 testing, etc.), even starting at different times.

The unit is provided with an excellent instruction manual. In this article, I give operating instructions from a slightly different perspective.

FUNCTION MODES

The unit offers four basic functional modes:

Charge This charges the cell(s) (duh!). The nominal charge current can be set to 200, 500, 700, or 1000 mA. If only one or two cells are to be charged (and they must be only in compartments 1 and/or 4), charge currents of 1500 and 1800 mA can also be set.

The mode display shows CHARGE during the cycle and after it is completed. At the end of the cycle the information display shows **Full**. Various technical information about the process can be seen during the cycle and after by operating the Display key (the display information will be described later.)

After completion of the cycle, a trickle charge (5% of the chosen nominal charge current) will be applied until the cell is removed. (This is true for all operating modes.)

Discharge This discharges the cells to a predetermined end voltage (approximately 0.97 V for Ni-MH cells) and then fully (re)charges them. The nominal discharge current can be set to 100, 250, 350, or 500 mA; the nominal charge current will always be twice the discharge current.

The mode display shows DISCHARGE when the mode is selected and during the discharge phase; it changes to CHARGE for the (re)charge phase and shows that after the cycle is completed. At the end of the cycle the information display shows **Full**. Various technical information about the process can be seen during the cycle and after by operating the Display key.

The Discharge mode is especially useful for batteries of the Ni-Cd type, in order to overcome the "memory effect" to which they are subject.

Refresh This discharges the cells to the established end voltage, then recharges them, and then repeats this cycle until there is no substantial increase in the apparent capacity between successive discharge cycles (more about capacity reporting shortly) or until 10 cycles have been completed.¹ The nominal discharge current can be set to any of the values noted above for the Discharge mode, and the charge current will be twice that.

The mode display shows DISCHARGE REFRESH when the mode is selected and during the discharge phase; it changes to CHARGE REFRESH for the charge phase and shows that after the cycle is completed. At the end of the cycle the information display shows **Full**. Various technical information about the process can be seen during the cycle and after by operating the Display key.

Test This charges the cells, then discharges them to the established end voltage, then recharges them. The charge current can be set to the charge values noted above (200-1000 mA only), and the discharge current will be half that. The mode display shows DISCHARGE TEST when the mode is selected and during the discharge phase; it changes to CHARGE TEST for the charge phase and shows that after the cycle is completed. At the end of the test, the information display alternately shows **Full** and the capacity of the cell as determined during the discharge phase. Various technical information about the process can be seen during the cycle and after.

¹ The manual does not reflect the 10-cycle limit, but it has been stated by the manufacturer in other literature.

OPERATION

Startup

When you insert one or more cells into the compartments, the system automatically begins operation, initially in the Charge mode, with the nominal charge current at 200 mA (and a discharge current, if relevant, of 100 mA). (You will be able to change the mode and/or current if you wish.)

Completely "dead" cells will not be recognized.

Setting the current to other than the default value

Assuming the Charge mode is what you want, you may set the charge current to a different value by pressing the Current key, subject to the following time window scheme: if you insert one cell, you have 6 seconds to begin changing the charge current; if you do not do so by then, the default (200 ma) is "confirmed" and used for the run.

If multiple cells are already in place, this "current plan" (200 mA charge, 100 mA discharge if relevant) will apply to all their chambers. If there is any cell in chamber 2 or 3, no charge current over 1000 mA can be set.

If you do set the new current timely, then 6 seconds after the last change in value, the new setting is confirmed. After the current is confirmed, it cannot be changed for this run. If multiple cells are already in place, this current plan will apply to all the currently-occupied chambers.

If you are putting in several cells, if you insert each cell within 6 seconds of the previous one, the "current-setting window" timer resets. You will then have 6 seconds after putting in your last cell to change the charge current.

If you dawdle more than 6 seconds between cells, the charge current will be confirmed at the 200 mA default value (and the discharge current, where applicable, at 100 mA).

If you set the current for the first cell inserted to 1500 mA or 1800 Ma, chambers 2 and 3 are disabled, and their mode indications are blanked to so indicate.

You may provide for different currents for the different cells by setting the current for each cell before inserting the next, subject to an interesting restriction. Suppose that you insert a cell in Chamber 1, set the charge current to 500 mA, and allow that setting to be

confirmed. Then later, you put a second cell in chamber 2. (It need not be within a short time after the first cell is inserted.). You now have 6 seconds to change the current from the default (200 mA), if you wish to, but you can only set it at values up to the value set for the first chamber that was filled (in this example, you would be able to use 200 mA or 500 mA, but not 700 mA or 1000 mA).

Note that it is not necessarily chamber 1 whose setting becomes the upper limit for the whole operation; it is the chamber for which a current setting is first confirmed (even if with the default value).

Once the current for a chamber becomes confirmed, no further change in current can be made until the cell is removed from the chamber and it or a new cell is put back in.

Selection of mode

During startup, you can change the operating mode from the default Charge (for example, to Discharge, if that is the mode you really wanted to begin with). The Mode key must be held for one second before the first change occurs; subsequent presses step through all available modes. All occupied chambers are affected (unless chamber selection is used; see later).

If you start to do this within 6 seconds of putting in your last cell (and no change of current was made), the current-setting time window timer is forestalled; you will then have 6 seconds after the last operation of the mode change key to set the nominal current to the desired value. The setting will be of either the charge or discharge current, whichever pertains to the phase than comes first in the mode that has been selected. The other current is always proportional (the charge current being twice the discharge current).

You may also change the mode at any time during the entire process. If you change the mode after the current has been confirmed, the existing "current plan" for each chamber is retained (that is, a matching charge and discharge current at a ratio of 2:1).

Changing the mode during the cycle

As mentioned above, the mode can be changed at any time, even well into the cycle. If a new mode is set, it proceeds from its beginning. Thus, we cannot, for example, use mode change to prematurely terminate the initial charge phase of the Refresh mode but allow the rest of the process to proceed.

When a mode change is made after the current plan has been confirmed, the current plan remains in effect, and cannot be changed.

INFORMATION DISPLAY

Display items

The numerical display for each chamber can show:

- The cell voltage (to two decimal places)
- Current (the chosen nominal value before the setting is confirmed, the actual running value after that) in mA (four places)
- Accumulated current-time product (see further description below) in mA-hr (four places, to 1999) or A-hr (to two decimal places)
- Elapsed time for this phase of the cycle (hh:mm).

The value displayed can be changed by pressing the Display key to step through the different items. The same item is shown for all chambers (unless chamber selection is used; see below).

When a cell is first inserted in a chamber, the display initially shows the cell voltage, but after 4 seconds it changes to the current display (which will of course at this time be showing the default charge current setting).

Current-time/"capacity" indication

The unit keeps track of the total "current-time product" (in A-hr or mA-hr) during discharge and in some cases during charge. The number displayed is as follows, for each mode:

Charge The current-time product for the charging process, accumulated as we go (with the running total visible at any time). At the end of charging, the final total remains and can be displayed with the Display key.

Discharge During the discharge phase, the running total for the discharge; once discharge is completed and (re)charge begins, the accumulation starts over from zero and shows the running total for the (re)charge operation. At the end of charging, the charging total remains and can be displayed with the Display key.

Refresh During the discharge phase, the indication is of the accumulated total for this discharge. When a discharge cycle finishes and (re)charge begins, the total for the discharge phase is held (through the entire charge time—no charging accumulation is shown), and can be displayed by operating the Display key. When the next

discharge cycle begins, the discharge accumulation starts again from zero.

The current-time reading after completion of a discharge cycle is generally considered to reflect the "capacity" of the cell as of that cycle. Recall that the Refresh cycle will repeat until there is negligible increase in the noted capacity from one cycle to the next, or after 10 cycles have been completed.

Note that since Discharge mode does not begin by "topping off" the cell, the accumulated current-time value for the first discharge phase is rarely indicative of the "capacity" of the cell. Accordingly, a Refresh run will almost always involve at least three complete cycles.

Test During the discharge cycle, no display of the accumulating current-time product is available—if that item is selected with the display key, "----" is shown. When discharge is finished and (re)charge begins, the accumulated total during discharge (considered to indicate the capacity of the cell) is made available for display through the (re)charging cycle. At the end of the (re)charging cycle, the value is shown alternating with **Full**.

CHAMBER SELECTION

Ordinarily, the various controls (mode change, current selection, display selection) work on all active chambers. However, we can select an individual chamber for attention with the corresponding chamber selection key. Then the mode selection key and display selection key operate on only that chamber. The selection of a single chamber evaporates in about 9 seconds if we don't change anything for the chamber, or about 8 seconds after we make the last change to the display or mode for the chamber. We can of course select a different chamber at any time.

We really cannot set the charging/discharging current for individual chambers by way of the chamber selection keys. The only practical way to set different current values for different chambers is to put the cells in one at a time, setting the current for each before inserting the next. Remember to first insert the cell for which you wish to set the highest current plan (the rest can be inserted in any order)—later inserted cells cannot be set to any higher current plan.

There is no special haste required in this. When a cell is inserted in a chamber, we get a full current setting window time from the time of insertion.