GYRFALCON

UNIVERSAL BATTERY CHARGER & ANALYZER

INTRODUCTION

Overview

ENOVA GYRFALCON charger integrates both charging and discharging functions, offering an efficient, reliable, and user-friendly charging solution through software optimization. It is designed to provide users with a safe, convenient, and high-performance charging experience, meeting diverse needs and delivering exceptional value and user satisfaction.

Features

The S8000/S4000 Pro, as a high-end hobby-grade charger, adopts a new hardware architecture to ensure efficient, precise, and safe charging. It is compatible with various rechargeable batteries, allowing precise control of charge/discharge current and termination voltage, and displays real-time data on current, voltage, and capacity, making the charging process transparent and controllable. Additionally, it effectively addresses internal heating issues during high-current charging, enhancing charging stability. Furthermore, it integrates multiple practical utilities, supports extensive personalized settings, and allows parameter configuration, remote control, and firmware upgrades via PC software, delivering a smarter and more convenient user experience.

User Interface

The S8000/S4000 Pro offers two UI interaction modes—Normal Mode `Normal(Break-In), Normal(Storage)` and Professional Mode—to cater to different user needs. Normal Mode is suitable for daily quick operations, while Professional Mode allows users to deeply configure all technical parameters, meeting the personalized needs of advanced users.

The device comes with 32 built-in working programs, which can be freely edited in Professional Mode or adjusted via the PC software configurator. Each channel can select any of these programs as the default. Additionally, in both Normal and Professional Modes, users can quickly

access programs 0-9 and use the copy function to synchronize channel parameters, enhancing operational efficiency.

The charger features an intuitive interface design, convenient operation logic, and clear status indicators, ensuring users can easily manage efficient and convenient charging with minimal learning curve.

Indicators

A key component of the UI is the RGB LED integrated with the channel number buttons, which provides real-time status information for each channel.

- Empty Channel (Black SNB): Indicates no battery is inserted; the LED is off.
- Ready Channel (White SNB): Indicates the channel is ready to start a program; the LED is white.
- Busy Channel (Red SNB): Indicates the channel is executing a charge/discharge program; the LED is red.
- Finished Channel (Green SNB): Indicates the program has completed normally; the LED is green.
- Setup Channel (Yellow SNB): Indicates the program is being configured or global parameters are being adjusted; the LED is yellow.
- Activation Channel (Flashing Purple SNB): Indicates that the 0V activation program has been initiated for this channel, the LED is flashing purple.
- Inactive channels refer to empty or ready channels, while active channels refer to busy or finished channels. A flashing red SNB indicates an error, abnormal program termination, or similar issues.

Function Buttons

- The "SETUP" button in the bottom left corner serves similar functions in different contexts, typically representing cancel, abort, pause, return, or exit operations.
- The "ENTER" button in the bottom right corner is used for "enter, next, save," or "confirm" operations.
- The "SELECT" button is used for "up/down" or "increase/decrease" operations, such as changing program numbers, scrolling options, and selecting parameters. Changing the program number means switching to a new program with a new number, which also changes the program's content. For faster programming, the modified program can be saved as a new program number or as temporary programs.

Screen

The 192×64 LCD screen features six common views that users should familiarize themselves with:

1. **Total Overview (TOV)**: For active channels, it displays real-time voltage, current, capacity, and other key information. For inactive channels, it shows the program name and number assigned to that channel. It also displays error messages, such as when a program terminates abnormally.
2. **Global Settings View (GSV)**: The S8000/S4000 Pro has many global parameters that users can check or configure. Users access these through the settings options in the Global Settings View (GSV). These global parameters may relate to the entire device, a specific channel, or certain programs.
3. **Programming View (CPV)**: Users can quickly change the running program by program number or name or reconfigure the desired technical parameters. Note that the CPV is divided into Normal Mode and Professional Mode, with different interfaces. In Professional Mode (CPV-Pro), every technical parameter of the 32 programs can be configured, and upon completion, the program number itself can be changed and saved, or it can be saved as a temporary program. In Normal Mode (CPV-Nor), only a few

technical parameters can be configured, and it can only be saved as a temporary program.

4. **Real-time Status View (CSV)**: Suitable for active or inactive channels. In addition to the basic information already provided in the TOV, this view displays other data or status information, such as energy, power, internal resistance, and time.
5. **Voltage Calibration View (VCV)**: Users need to remove all batteries and enter the Voltage Calibration View for the corresponding channel to calibrate its voltage. Note: The voltage output is constant at 4.2V.
6. **Current Calibration View (CCV)**: Users also need to remove all batteries and enter the Current Calibration View for the corresponding channel, then follow the prompts to connect the battery to calibrate the channel's charge and discharge currents. Note: The charge current output is constant at 1A, and the discharge current output is constant at 800mA.

Accuracy

Under laboratory conditions, the S8000/S4000 Pro maintains an accuracy of ±1mV or ±1mA within the tolerance specified in its datasheet. In typical applications, even when using 2-3 cells under moderate load without external auxiliary cooling, the device can still achieve maximum precision. This is thanks to the built-in heat sink and cooling fan, which effectively help dissipate heat. However, under extreme loads and high-temperature environments, especially during summer heat, when the device continuously outputs the maximum discharge power of 16W, the accumulated heat may slightly affect accuracy, although this impact is relatively minor. Stress tests show that the device can operate stably under high-load conditions without performance degradation. To ensure the device always maintains optimal performance, we recommend increasing external cooling measures when the case is detected to be hot.

SAFETY NOTICE

Warnings and Safety Precautions

- Do not use the device unattended. If any abnormality is detected, stop using it immediately and refer to the manual for handling.
- Ensure that the correct program and parameters are selected and set. Improper programs or settings may damage the charger or even cause fire or explosion risks.
- Do not charge primary batteries (such as alkaline, zinc-carbon, lithium, CR123A, CR2, etc.), as this may cause explosions or fires.
- Do not charge or discharge any battery that is leaking, swollen, has damaged packaging or casing, or has changed color or shape.
- Use the original adapter and power cord to power the device. To reduce the risk of power cord damage, do not plug or unplug by pulling the power cord. The allowed DC input voltage is **10-20V**.
- If the device is damaged in any way, do not continue using it.
- Do not expose the device to direct sunlight, heating devices, open flames, or environments with extreme temperatures or rapid temperature changes.
- Do not expose the device to rain, water, moisture, high humidity, or dust. The device is only suitable for normal indoor environments.
- Use the device in a well-ventilated area and ensure it is placed on a hard, flat, smooth, heat-resistant, non-combustible, and non-conductive surface. Do not place the device on carpets, car seats, or similar surfaces. Ensure the operating area is away from flammable or volatile substances.
- Avoid subjecting the device to mechanical vibrations or impacts to prevent damage.
- Do not short-circuit the positive and negative terminals of the channels or other parts of the device, and avoid allowing metal wires or other conductive objects to enter the device.
- Pay attention to the polarity markings on the device channels and ensure the battery is placed with the positive terminal facing up.

- Do not touch the hot surfaces of the device. Batteries or the device may become hot during high-load or high-power charging and discharging.
- Do not block the ventilation holes at the bottom or around the device.
- Do not overcharge or over-discharge batteries. Recharge depleted batteries as soon as possible.
- When not in use, remove all batteries and unplug the device.
- Disassembling, modifying, or tampering with the device may void the warranty. Please refer to the warranty terms.
- Do not misuse the device in any way! Use it only for its intended purpose and functions.

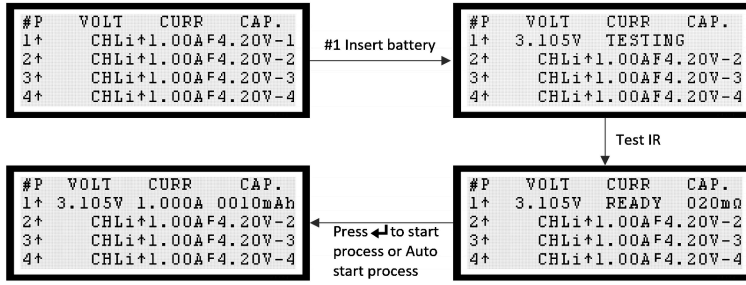
Quick Start Guide

Please read the warnings and safety precautions first, then follow the operating instructions.

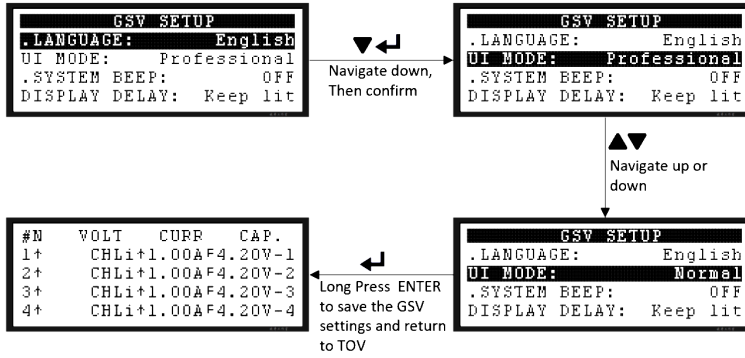
Operating Instructions

1. Remove all batteries before operation for proper handling.
2. First, connect the 10-20V (48W or more) DC power adapter plug to the charger, then plug the 110/220V AC end of the adapter into a household power outlet. In this order, the device will start up (factory default is Professional Mode). If you need to switch the UI mode, refer to section 5.
3. Insert cylindrical rechargeable batteries into empty channels with the correct polarity (note: ensure the battery type matches before insertion, as the device does not automatically detect battery types). The charger will automatically detect and display the battery's internal resistance (this value may have errors and is for reference only; users can configure whether to enable internal resistance detection in the GSV). At this point, the corresponding channel will light up white, indicating the channel is ready with a battery inserted. If the charger is set to Auto Mode (if you need to

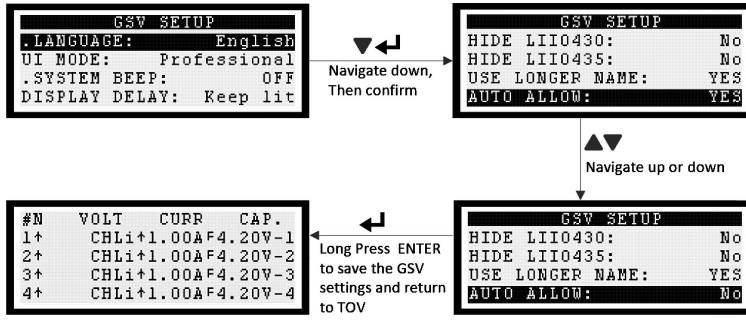
switch to Non-Auto Mode, refer to section 6), and it is not the first time starting the program (whether in Auto Mode or Non-Auto Mode, a depress of the ENTER key is required after a POWER CYCLE), the channel program will run automatically, and the corresponding channel will light up red, indicating the channel's program has started. If the charger is set to Non-Auto Mode or it is the first time starting the program, a depress of the ENTER key is required for the channel to start working. The #P or #N in the top left corner of the TOV view distinguishes whether the current UI mode is Professional Mode (Professional) or Normal Mode (Normal-Break-In, Normal-Storage).



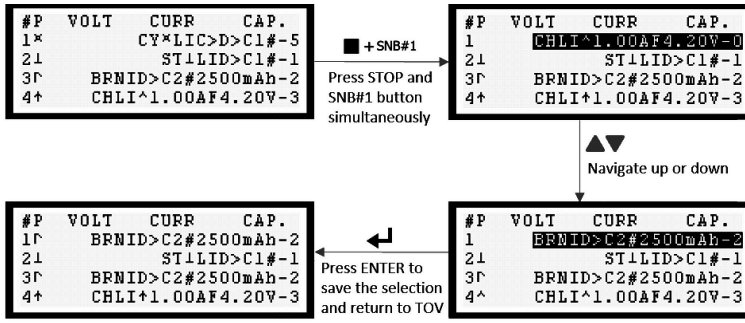
4. Before starting the program on a channel, ensure the correct program is assigned to it. You can click the channel button to switch from the main view to the real-time status view, where you can see some details or the real-time status of the program. Click the ENTER key to return to the total view. You can also long-press the channel button to switch from the main view to the programming view to check or edit the corresponding program parameters (see "How to Edit Programs" for details).
5. If you need to switch from "Professional Mode" to "Normal Mode": First, remove all batteries from the channels, then simultaneously press the "SETUP" and "ENTER" keys to enter the GSV view. Use the "▼" button to navigate down to the "UI MODE" option, and click "ENTER" to enter the settings. Use the "▼/▲" buttons to select "Normal Mode" or other options as needed, then long-press "ENTER" to confirm the selection. Similar operations can be used to adjust other global parameters.



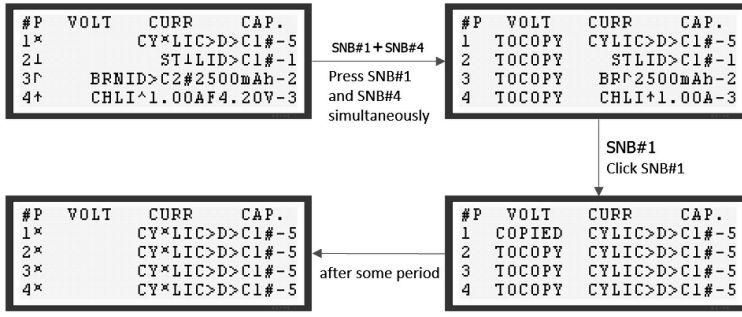
6. If you do not want the charger to automatically start the program after inserting a battery, you can disable the auto-start function by following these steps: First, remove all batteries from the channels, then simultaneously press the "SETUP" and "ENTER" keys to enter the GSV view. Use the "▼" button to navigate down to the "AUTO START ENABLE" option, and click "ENTER" to enter the settings. Use the "▼/▲" buttons to change the parameter to "No," then depress "ENTER" to confirm the selection.



7. **Quick Operation**,This operation helps users select programs 0-9 more quickly in Normal and Professional Modes. Typically, users can customize programs 0-9 in Professional Mode according to their daily preferences, then access these programs more conveniently through quick operations, significantly reducing the number of button presses. In this example, we will demonstrate quick operation for the first channel: In the TOV, simultaneously press the SETUP and SNB#1 buttons. This will activate the quick operation function for Channel 1. Click the ▲ or ▼ buttons to find the desired program, then click ENTER to confirm your selection.

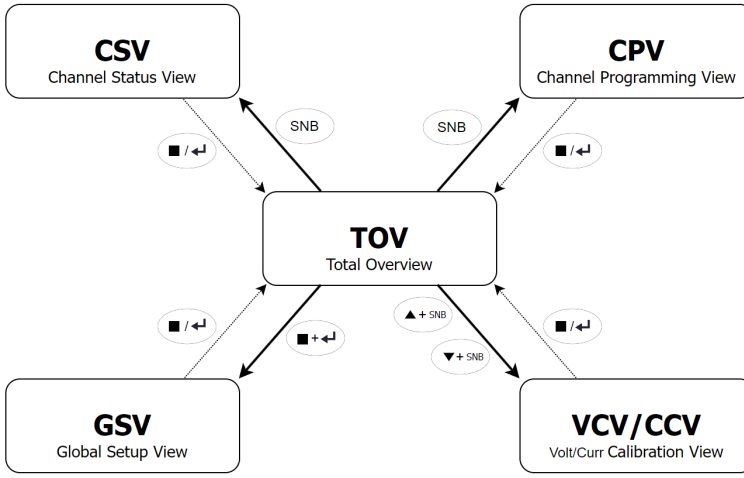


8. **Copy Operation**, This operation allows users to quickly copy a channel's program to other inactive channels in Normal and Professional Modes. In this example, all four channels are inactive, and we will copy Channel 1's program to Channels 2, 3, and 4:
   Step 1: Simultaneously press SNB#1 and SNB#4. This will activate the copy operation for all inactive channels between the two selected channels.
   Step 2: Click SNB#1. At this point, Channel 1's program will be copied to Channels 2, 3, and 4.



9. **Reset Default Program Operation**, depress the SETUP button. All inactive channels' programs will revert to the DEF-PRGM program set in the GSV for the corresponding channel.
10. **0V Activation Operation**: Simultaneously pressing the ENTER and SNB of an inactive channel will initiate the 0V activation program for that channel, which runs for 2 minutes by default. This is recommended for protected li-ion batteries with a protection circuit or 1.5V li-ion batteries. It is not recommended to activate over-discharged li-ion batteries without a protection circuit.

11. The following diagram shows how the six common views of the user interface are interrelated



11. The following table summarizes the control methods in the user interface

	Inactive Slot	Active Slot
SNB#1	Click: go to CSV of #1 Depress: go to CPV of #1	Click: go to CSV of #1 Depress: go to CPV of #1
SNB#2	Click: go to CSV of #2 Depress: go to CPV of #2	Click: go to CSV of #2 Depress: go to CPV of #2
SNB#3	Click: go to CSV of #3 Depress: go to CPV of #3	Click: go to CSV of #3 Depress: go to CPV of #3
SNB#4	Click: go to CSV of #4 Depress: go to CPV of #4	Click: go to CSV of #4 Depress: go to CPV of #4
SETUP	Click in CPV/GSV/CSV/VCV/CCV:CANCEL,QUIT,RETURN Depress in CPV/GSV/CSV/VCV/CCV:QUIT	Click in CSV:QUIT,RETURN Depress in CSV:QUIT
UP	Click in CPV/GSV/CSV/VCV/CCV:NEXT Depress: scroll up thru CPV/GSV/CSV	Click in CSV:NEXT Depress: scroll up thru CSV
DOWN	Click in CPV/GSV/CSV/VCV/CCV:NEXT Depress: scroll up thru CPV/GSV/CSV	Click in CSV:NEXT Depress: scroll up thru CSV
ENTER	Click in CPV/GSV/VCV/CCV:ENTER OR NEXT Depress in CPV/GSV: SAVE&EXIT&RETURN to TOV	Click in CSV:RETURN to TOV Depress in CSV:RETURN to TOV
SETUP+ENTER	Go to GSV	NONE
UP+SNB#?	Go to SNB#? CCV	NONE
DOWN+SNB#?	Go to SNB#? VCV	NONE
SETUP+SNB#?	Go to SNB#? QUICK SETUP	NONE

How to Edit Programs (Professional Mode)

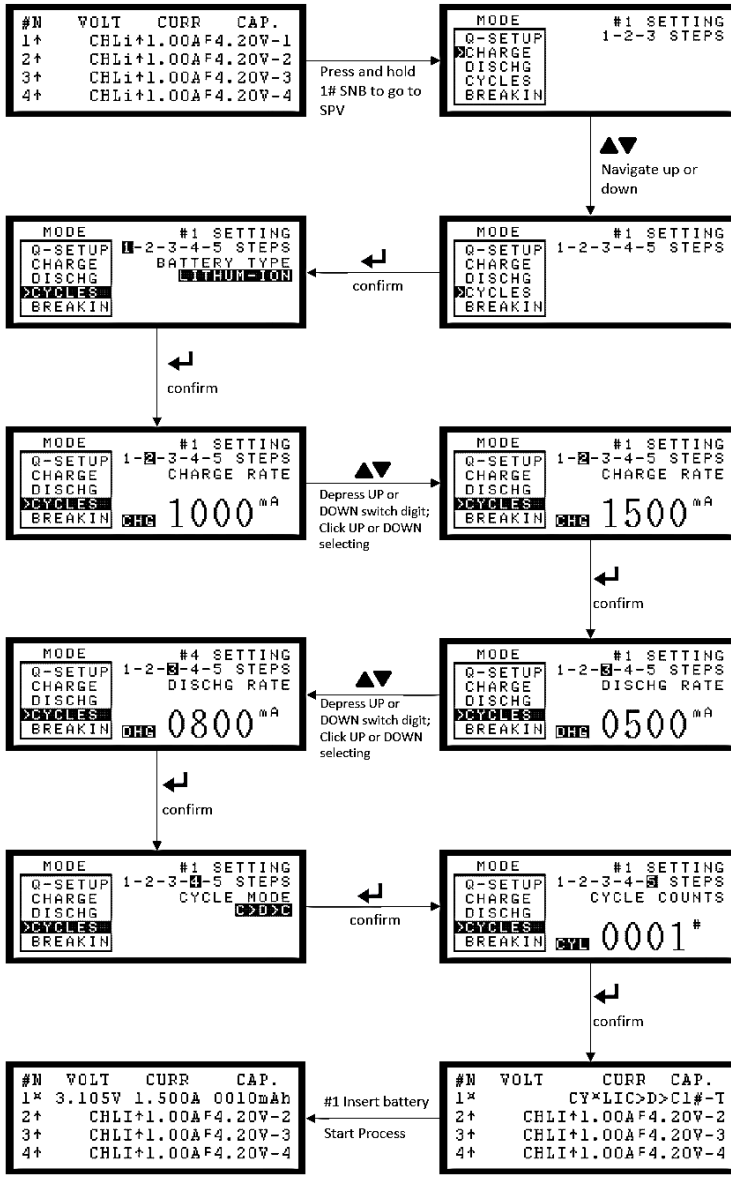
1. In Professional Mode, users can edit all technical parameters, flexibly configuring programs to meet specific needs.

2. In this example, we will insert a lithium-ion battery into Channel #1. Before inserting the battery, we will edit a program and save it as Program [5].
   Configuration is as follows: Mode is set to Cycle, Charge Current is 1.500A, Discharge Current is -0.800A, and it is saved as Program Number [05]. Similar operations can be used to configure other technical parameters as needed.
   Note: LONG NAME and SHORT NAME are automatically generated by the charger and cannot be changed (V.38 or later firmware allows custom names via the TC Configurator). The ▲ and ▼ buttons support both click (Click) and long-press (Depress) in various contexts.


#P VOLT CURR CAP.
1↑ CHLi↑1.00AF4.20V-1
2↑ CHLi↑1.00AF4.20V-2
3↑ CHLi↑1.00AF4.20V-3
4↑ CHLi↑1.00AF4.20V-4
Press and hold 1# SNB to go to SPV
#1 PROGRAM[1]
BATT TYPE: Lithum-ion
MODE: Charge
PRE-CHG CURR: 0.100A
C.Current: 1.000A
Navigate down, Then confirm
#1 PROGRAM[1]
BATT TYPE: Lithum-ion
MODE: Charge
PRE-CHG CURR: 0.100A
C.Current: 1.000A
Selecting
#1 PROGRAM[1]
BATT TYPE: Lithum-ion
MODE: Cycle
CYCLE MODE: C>D>C
CYCLE COUNTS: 1 Counts
Confirm selection, then navigate down
#1 PROGRAM[1]
CYCLE MODE: C>D>C
CYCLE COUNTS: 1 Counts
PRE-CHG CURR: 0.100A
C.Current: 1.000A
Confirm, then selecting
#1 PROGRAM[1]
CYCLE MODE: C>D>C
CYCLE COUNTS: 1 Counts
PRE-CHG CURR: 0.100A
C.Current: 1.500A
Confirm selection, then navigate down
#1 PROGRAM[1]
PRE-CHG TIME: 180MIN
CHARGE TIME: 600MIN
CUT VOLTAGE: 2.800V
D.Current: -0.800A
Confirm, then selecting
#1 PROGRAM[1]
PRE-CHG TIME: 180MIN
CHARGE TIME: 600MIN
CUT VOLTAGE: 2.800V
D.Current:. -0.500A
Confirm selection, then navigate down
#1 PROGRAM[1]
D.RESTING: 15MIN
LONG NAME: CY*LIC>D>C1#
SHORT NAME: CYLIC>D>C1#
SAVE.TO: 00
Confirm, then selecting
#1 PROGRAM[1]
D.RESTING: 15MIN
LONG NAME: CY*LIC>D>C1#
SHORT NAME: CYLIC>D>C1#
SAVE TO: 05
Save to[optional]
Press ↵ to save settings
Return to TOV
#P VOLT CURR CAP.
1* CY*LIC>D>C1#-5
2↑ CHLI↑1.00AF4.20V-2
3↑ CHLI↑1.00AF4.20V-3
4↑ CHLI↑1.00AF4.20V-4
#1 Insert battery
Start Process
#P VOLT CURR CAP.
1* 3.105V 1.500A 0010mAh
2↑ CHLI↑1.00AF4.20V-2
3↑ CHLI↑1.00AF4.20V-3
4↑ CHLI↑1.00AF4.20V-4

How to Edit Programs (Normal Mode)

1. In Normal Mode, users can only edit a few key technical parameters, with other parameters remaining at default values.
2. In this example, we will insert a lithium-ion battery into Channel #1. Before inserting the battery, we will edit a temporary program and save it as Temporary Program [T]. "T" stands for Temporary. Configuration is as follows: Mode is set to Cycle, Charge Current is 1.500A, Discharge Current is -0.800A. Similar operations can be used to configure other technical parameters as needed.
   Note: LONG NAME and SHORT NAME are automatically generated by the charger and cannot be changed (V.38 or later firmware allows custom names via the TC Configurator). The ▲ and ▼ buttons support both click and depress in various contexts.


#N VOLT CURR CAP.
1↑ CHLi↑1.00A↑4.20V-1
2↑ CHLi↑1.00A↑4.20V-2
3↑ CHLi↑1.00A↑4.20V-3
4↑ CHLi↑1.00A↑4.20V-4
Press and hold 1# SNB to go to SPV
MODE #1 SETTING
Q-SETUP 1-2-3 STEPS
>CHARGE
DISCHG
CYCLES
BREAKIN
Navigate up or down
MODE #1 SETTING
Q-SETUP 1-2-3-4-5 STEPS
CHARGE
DISCHG
>CYCLES
BREAKIN
confirm
MODE #1 SETTING
Q-SETUP 1-2-3-4-5 STEPS
CHARGE BATTERY TYPE
DISCHG LITHUM-ION
>CYCLES
BREAKIN
confirm
MODE #1 SETTING
Q-SETUP 1-2-3-4-5 STEPS
CHARGE CHARGE RATE
DISCHG
>CYCLES
BREAKIN CHG 1000 mA
Depress UP or DOWN switch digit; Click UP or DOWN selecting
MODE #1 SETTING
Q-SETUP 1-2-3-4-5 STEPS
CHARGE CHARGE RATE
DISCHG
>CYCLES
BREAKIN CHG 1500 mA
confirm
MODE #1 SETTING
Q-SETUP 1-2-3-4-5 STEPS
CHARGE DISCHG RATE
DISCHG
>CYCLES
BREAKIN CHG 0500 mA
Depress UP or DOWN switch digit; Click UP or DOWN selecting
MODE #4 SETTING
Q-SETUP 1-2-3-4-5 STEPS
CHARGE DISCHG RATE
DISCHG
>CYCLES
BREAKIN CHG 0800 mA
confirm
MODE #1 SETTING
Q-SETUP 1-2-3-4-5 STEPS
CHARGE CYCLE MODE
DISCHG C>D>C
>CYCLES
BREAKIN
confirm
MODE #1 SETTING
Q-SETUP 1-2-3-4-5 STEPS
CHARGE CYCLE COUNTS
DISCHG
>CYCLES
BREAKIN CYL 0001 #
confirm
#N VOLT CURR CAP.
1* 3.105V 1.500A 0010mAh
2↑ CHLI↑1.00A↑4.20V-2
3↑ CHLI↑1.00A↑4.20V-3
4↑ CHLI↑1.00A↑4.20V-4
#1 Insert battery
Start Process
#N VOLT CURR CAP.
1* CY*LIC>D>C1#-T
2↑ CHLI↑1.00A↑4.20V-2
3↑ CHLI↑1.00A↑4.20V-3
4↑ CHLI↑1.00A↑4.20V-4

Battery Knowledge

What do 0.5C, 1C, -C/4, etc., mean?

This is shorthand for representing charge/discharge rates based on battery capacity. Substitute the battery's rated capacity for "C," then divide by 1 hour, and multiply by the coefficient to calculate the specific current value. For example:

For a 2100mAh battery, 0.3C represents a charge current of 630mA or 0.63A (=2100mAh ÷ 1h × 0.3).

For a 3400mAh battery, -C/4 (or -0.25C) represents a discharge current of 0.85A (=3400mAh ÷ 1h × -0.25).

How to Choose the Appropriate Discharge Rate

The battery industry defines "standard discharge" as a controlled discharge at a constant current of *-0.2C* at room temperature. By definition, discharging a brand-new, fully charged battery under these conditions will yield its nominal capacity. Additionally, battery manufacturers typically list the minimum or rated capacity of a battery in product specifications and test it using higher, more common discharge rates (such as -0.5C or -1C). However, when analyzing and comparing batteries from different sources, a more common approach is to use a fixed discharge current (such as -0.5A or -1.0A), which is independent of the battery's nominal capacity, thus enabling a uniform comparison standard.

How to Choose the Appropriate Charge Rate

Rechargeable Li-ion Batteries: Battery manufacturers typically define "standard charge" as charging at 0.5C at room temperature. Users are advised to consult the battery's specifications for detailed information.

Rechargeable NiMH Batteries: Charging too quickly may damage the battery and prevent it from fully charging, while charging too slowly not only takes longer but may also prevent the charger from correctly terminating the charge. Therefore, unless otherwise specified, it is not recommended to use charge rates below 0.3C or above 1.0C. If in doubt, refer to the instructions on the battery packaging, consult the specifications, or contact the battery manufacturer directly for the best charge rate.

Battery Matching

As a general principle, in multi-cell applications, do not mix batteries of different types, capacities, voltages, or manufacturers.

It is recommended to use Refresh Mode to measure the capacity of batteries of the same model and pair or group those with capacities within ±5% of each other.

Using mismatched batteries in multi-cell applications may lead to reduced performance, shorter runtime, and even battery damage, over-discharge, or polarity reversal.

Battery Forming Charge

New Ni-MH or Ni-Cd batteries, or batteries stored for long periods, may experience chemical deactivation. Battery Forming Charge is a charge-discharge-charge cycle mode that fully charges the battery at a very low current, reactivating it.

In some cases, this process may need to be repeated two to three times to achieve optimal results.

Battery Forming Charge can be simulated using "Break-in Mode," which follows a D>C>D>C (Discharge > Charge > Discharge > Charge) sequence. However, to maintain optimal battery health, performing two to three cycles at standard charge/discharge rates may be more effective.

Battery Voltage

Battery manufacturers typically specify recommended charge/discharge rates in their datasheets based on minimum, rated, typical, or nominal capacity. However, in practical applications, to facilitate performance comparisons between different batteries, it is common to choose a fixed pair of charge/discharge rates (e.g., 1.0A/-0.5A or 1.0A/-1.0A) and apply them to batteries of various sizes or capacities, even if they are not very similar.

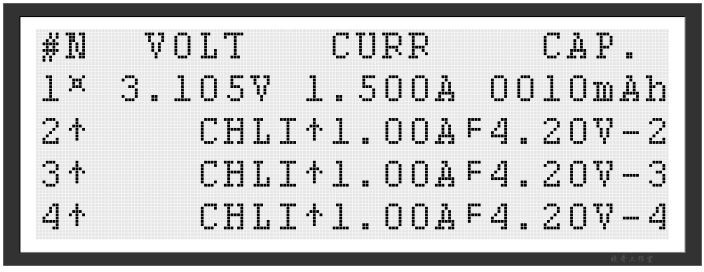
Regarding battery voltage, in most cases, there is no need to change the default values of the voltage options.

In fact, increasing the maximum charge voltage of lithium-ion batteries is dangerous, while discharging a battery below the minimum discharge voltage will harm its lifespan.

	NiMH / Eneloop	NiCd	Li-ion Std	Li-ion4.30V	Li-ion4.35V	Li-ion1.50V	LiFePO4
Nominal voltage	1.2V	1.2V	3.6V 3.7V	3.8V	3.8V	1.4-1.5V	3.2V
Charge voltage max.	1.65V	1.65V	4.20V	4.30V	4.35V	5.0V	3.60V
(range)	1.47~1.80V	1.47~1.80V	4.00~4.25V	4.10~4.35V	4.10~4.40V	4.80-5.0V	3.40~3.65V
Restart voltage	OFF	OFF	OFF	OFF	OFF	n/a	OFF
(range)	1.30~1.45V	1.30~1.45V	3.98~4.18V	4.08~4.28V	4.08~4.33V	n/a	3.38~3.58V
Storage voltage	n/a	n/a	3.80V	3.90V	3.90V	n/a	3.30V
(range)	n/a	n/a	3.65~4.00V	3.75~4.10V	3.75~4.10V	n/a	3.15~3.40V
Standard charge	0.5C	0.1~0.5C	0.5C	0.5C	0.5C	n/a	1C
Rapid charge	≤1C	≤1C	≤1C	≤1C	≤1C	n/a	≤4C
Standard |discharge|	0.2C	0.2C	0.2C	0.2C	0.2C	n/a	0.5C
Typical |discharge|	0.2~2C / 0.5~3C	0.5~2C	0.5~2C	0.5~2C	0.5~2C	n/a	1~8C
Disch voltage min.	0.95V	0.85V	2.50V	2.75V	2.75V	n/a	2.00V
(default)	1.00V	0.90V	3.00V	3.30V	3.30V	n/a	2.40V
(range)	0.50~1.10V	0.50~1.10V	2.50~3.65V	2.65~3.75V	2.65~3.75V	n/a	2.00~3.15V

Total Overview (TOV)

How to Get There — Depending on the situation, clicking the SETUP button once, twice, three times, or more will return you to the TOV.
How to Exit — In the TOV, remove all batteries and unplug the device's power cord.



The Total Overview (TOV) is the main view. It intuitively displays the most important information about channel operations in a table format. The top row displays column headers, including Channel Number (#), Battery Voltage (VOLT), Current (CURR), and Transferred Charge (CAP, often simply referred to as capacity). The second row starts with "1," indicating #1, thus referring to the first channel, i.e., the channel with the number 1 on the Channel Number Button (SNB#1); the next row starts with "2,"

and so on.
The symbol next to the channel number indicates the operation mode. Voltage is displayed in 1-volt (1V) units, rounded to 3 decimal places, current in 1-ampere (1A) units, also rounded to 3 decimal places, and capacity in 1-milliampere-hour (1mAh) units.

When no battery is inserted in a channel, the screen will display the long name of the program assigned to that channel. The long name includes not only the program number but also key program parameters such as charge rate and battery type, helping users quickly identify and fully understand the current settings.

When a battery is inserted—please note the correct polarity—the screen will display its voltage, as well as the specific program pre-assigned to that slot, identifiable by its number. Unless you are certain that this program is the one you want to run on the battery, you must check or change the program number or program settings.

The TOV is also used to display error messages or real-time status information. For example, it provides prompts when a program terminates abnormally. If an error occurs, the corresponding SNB button will flash red, and the user must judge and take appropriate action to exit the error message.

The controls in TOV are as follows

- If the charger is set to manual mode (GSV - "AUTO START ENABLE" is "No"), or if the charger is starting a program for the first time after a restart. When there are ready channels, a depress of the "ENTER" button will immediately start all ready channels.
- If all channels are empty, simultaneously pressing **SETUP + ENTER** will enter the **GSV**.
- **Clicking** an inactive or active channel's **SNB** will enter its **CSV**.
- **Depressing** an inactive or active channel's **SNB** will enter its **CPV**.
- If all channels are empty, simultaneously pressing **▼(DOWN) + SNB** will enter the corresponding channel's **VCV**.
- If all channels are empty, simultaneously pressing **▲(UP) + SNB** will enter the corresponding channel's **CCV**.

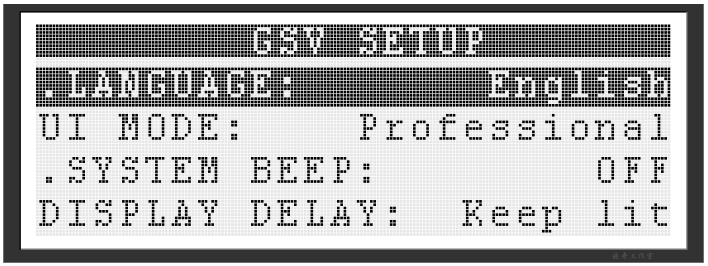
- Simultaneously pressing **SETUP + SNB** will enter its QUICK-SETUP. This operation is very useful when you are familiar with the parameters of programs 0-9 and need to quickly select one of them for operation.
- Depressing the **SETUP** button will reset all inactive channels to the default program (set in GSV - "DEF PRGM").
- Simultaneously pressing the **ENTER + SNB** of an inactive channel will initiate the 0V activation program for that channel. By default, the program runs for 2 minutes. Depress of the **SETUP** can exit the activation program.

By observing the sign of the battery current and the symbols or other text information on the TOV (e.g., TESTING, RESTING, READY, etc.), it is easy to see which program phase the channel is currently in. The symbols for operation modes are as follows.

- Symbol for CHARGE operation mode: ↑
- Symbol for DISCHARGE operation mode: ↓
- Symbol for REFRESH operation mode: ↕
- Symbol for CYCLE operation mode: ¤
- Symbol for STORAGE operation mode: ⊥
- Symbol for BREAK_IN operation mode: ↱

Global Setting View (GSV)

How to Get There — In the TOV, when all channels are empty, simultaneously pressing **SETUP + ENTER** will enter the GSV.
How to Exit — In the GSV, clicking the SETUP button once or twice will cancel changes, exit the GSV, and return to the TOV.



The S8000/S4000 Pro has many global parameters that users can check or configure. Users access these through the settings options in the Global Settings View (GSV). These global parameters may relate to the entire charger, a specific channel, or certain programs. Changes to the settings are not saved until a depress of ENTER (= save and exit) exits the view.

The controls in GSV are as follows

- Click or depress the UP or DOWN buttons to navigate items or allow the user to make selections.
- Click the ENTER button to enter an option (= enter) or confirm a selection (= OK).
- Depress the ENTER button to save all changes (= save and exit), then return to the TOV.
- Click the SETUP button to cancel changes (= cancel), which may ultimately return to the TOV (= exit).
- In GSV, the SNBs do not respond.

If a menu item is preceded by a dot, it indicates that the item does not support settings. Items are listed in alphabetical order:

ACTIVATE BATT ENABLE

Enable/disable user's ability to use the 0-volt battery activation function. This function is not recommended for unprotected over-discharged lithium-ion batteries.

AUTO-START ENABLE

Enable/disable the automatic execution of the preset program when a battery is inserted into a channel.

CALIBRATION ENABLE
Enable/disable the voltage/current calibration function.

CALIBRATION RESET
Executing this will clear all user calibration parameters (a total of 4 voltage, 4 charge current, and 4 discharge current calibration values) and restore factory calibration benchmarks. This operation is independent of a factory reset, affects only calibration data, and is irreversible.

COMPLETION SCREEN FLASH
Enable/disable dynamic prompts or alerts on the screen when a task is completed or an anomaly occurs.

COMPLETION BEEP ENABLE
Enable/disable dynamic prompts or alerts via the buzzer when a task is completed or an anomaly occurs.

DISPLAY DELAY
Set the LCD backlight sleep threshold. For example, "1 minute" means the backlight will automatically turn off if the user does not press any buttons or insert/remove batteries within 1 minute.

FANS SWITCH
Enable/disable active cooling during discharge.

FW VERSION
Display the current firmware version.

FACTORY RESET
Executing this will clear all user data (programs/GSV/calibration) and restore the initial state. Warning: This operation is irreversible.

HW Version
Display the current hardware version.

LDSP DISABLE
Disable/enable the 1.5V lithium battery charging safety protection function. When enabled and the battery type is Li-ion 1.50V, the device will issue a warning when inserting a lithium-ion battery or NiMH battery.

LISP DISABLE
Disable/enable the lithium-ion battery charging safety protection function. When enabled and the battery type is Li-ion Std, Li-ion 4.30V, Li-ion 4.35V, or $LiFePO_4$, the device will issue a warning when inserting a NiMH or 1.5V Li-ion battery.

KEY BEEPING
Enable/disable tactile feedback beeps when touching the buttons.

LANGUAGE
Display the current UI language environment (only English is supported and cannot be configured).

LCD CONTRAST
Adjust the LCD display contrast.

TEST IR ALLOW
Enable/disable the IR detection function.

UI Mode
`Normal(Break-In), Normal(Storage), Professional` allow users to switch between a brief menu or extended menu in the CPV (Charger Programming View) (default). Normal Mode (Normal-Break-In, Normal-Storage) uses more preset parameters. Professional Mode allows configuration of all technical parameters. Normal Mode is more suitable for users who only want to perform simple charge/discharge operations on batteries without concerning themselves with technical details.

#1/2/3/4 DEF_PRGM
Users can set a default program for each channel. DEF-PRGM can be any of the 32 programs.

Channel Programming View (CPV)

How to Get There — In the TOV, depressing an inactive or active channel's SNB will enter the CPV.
How to Exit — Clicking the SETUP button once, twice, or more will eventually return to the TOV, and no changes will be saved.

Function

In the CPV, users can either change the program number to quickly activate any of the 32 global programs or edit the detailed configuration of the selected program. There are a total of 32 programs on the charger that can be edited. Changes to the programs remain effective after power-off, and only a factory reset will delete the programs you created.

Concept

After entering from the TOV, first identify the program number assigned to the channel. At any time, each channel is assigned a specific program number, and users should always know which program is set in the selected channel, identifiable by its two-digit number in brackets. As a fundamental concept behind the entire user interface, no channel can be without an assigned program number.

Save To

How or when to save a program? Changes to the program number or program configuration are not saved until clicking (= save) or long-pressing (= save and exit) the ENTER button. When navigating to an option other than "SAVE TO" or "Program Number," long-pressing the ENTER button will only allow saving the program as a temporary program. When navigating to the "SAVE TO" option, clicking ENTER enters the settings, where you can choose to save the program to its original number, or change the program number, then click or long-press ENTER (= save and exit) to save it as the original number or a new program number. If the program number is already in use by another channel, it will automatically be saved as a temporary program.

Temporary Program

The program currently running in an active or inactive channel can still be edited in another channel, saved as a temporary program, and run in other channels. Although this feature may sometimes be useful, it is not recommended. Because it may lead to not needing to assign a new program number to similar programs every time an existing program is modified. The original program will not be affected by the modified program settings. Typically, the recommended practice for creating similar programs is to assign them new program numbers via the "Save To" program option.

Note: Programs modified in Normal Mode can only be saved as temporary programs.

The controls in CPV are as follows

- Click or depress the UP or DOWN buttons to browse options or allow the user to make selections.
- Click the ENTER button to enter an option (= enter) or confirm a selection (= OK).
- Depress the ENTER button to save all changes, then return to the TOV (= save and exit).
- Click or depress the STOP button to cancel changes (= cancel), which may eventually enter the TOV (= exit), thus restoring the original program settings or program number.
- In the CPV, the SNBs do not respond.

The following is a list of program options in the CPV applicable to all battery types

BATTERY TYPE

In the current firmware, the following battery types are supported:

- Ni-MH, nominal voltage 1.2V. The mainstream choice for consumer-grade AA rechargeable batteries, widely used in cameras, electronic devices, flashlights, electric tools, toys, and home scenarios.
- Ni-Cd, nominal voltage 1.2V. Due to containing environmentally toxic substances, single-cell batteries have gradually exited the market, only retaining specific battery pack applications. Special attention should be paid to child safety protection.
- Li-ion Std (Lithium-Ion), nominal voltage 3.6V/3.7V. The most common types include lithium-cobalt (Li-cobalt) and lithium-manganese (Li-manganese), both of which are applicable under this setting. Lithium-ion batteries use the recommended CC-CV (Constant Current-Constant Voltage) charging algorithm, with cutoff current and voltage customizable by the user. Typically, the safe voltage threshold is 4.20V, and over-voltage charging carries risks (protected 18650 batteries will automatically cut off). Theoretically,

a single non-cylindrical lithium-ion battery can be charged using alligator clip charging cables/auxiliary devices, but for safety reasons, users are advised to use dedicated chargers.

- LiFePO4 (Lithium Iron Phosphate), nominal voltage 3.2V. This is a safer lithium-ion battery, with a charging upper limit of 3.65V and a discharge limit of no less than 2.0V. Do not confuse it with lithium polymer batteries (LiPo).
- Li-ion 4.30V (High-Voltage Lithium-Ion), nominal voltage 3.8V. Similar to standard lithium-ion batteries, but these batteries can be safely charged up to 4.30V. This option may pose safety risks to users unfamiliar with battery knowledge, and special attention should be paid to not using it for standard lithium-ion batteries!
- Li-ion 4.35V (High-Voltage Lithium-Ion), nominal voltage 3.8V. Similar to standard lithium-ion batteries, but these batteries can be safely charged up to 4.35V. This option may pose safety risks to users unfamiliar with battery knowledge, and special attention should be paid to not using it for standard lithium-ion batteries!
- Li-ion 1.50V, nominal voltage 1.50V. By using a built-in voltage regulation circuit, the lithium cell's 3.7V is stepped down to a stable 1.5V output, compatible with traditional alkaline battery devices (such as remote controls, toys). Its voltage remains constant throughout, avoiding performance degradation due to decreasing power, and it has high energy density and lightweight, suitable for high-power devices (cameras, flashlights). Combining the high efficiency of lithium batteries with the compatibility of alkaline batteries, it is an ideal choice for durable electronic devices.

TASK

High-end battery chargers and RC chargers typically offer up to 6 typical charge programs or operating modes. The S8000/S4000 Pro has all these modes and may add more through future firmware upgrades.

- Charge: Charges according to the appropriate algorithm for the selected battery type, such as CC (Constant Current) for Ni-MH/Ni-Cd, CC-CV (Constant Current-Constant Voltage) for Li-ion, etc. Charging will end when the battery is full or other termination conditions are met. Suitable for situations where the battery needs to be replenished but does not require capacity measurement,

recommended for known good and frequently used batteries, with the shortest duration.

- Refresh: Essentially the same as Cycle mode, performs C>D>C (Charge→Discharge→Charge), with N=1 cycle, and inserts rest intervals between processes. At the end of the cycle, the TOV will report the discharge capacity. This mode is suitable for automatically analyzing battery capacity while keeping the battery fully charged. For degraded NiMH rechargeable batteries, it is recommended to use this mode once every 10 cycles, especially for NiMH batteries. Note that in other chargers, this mode may be called Refresh&Analyze Mode, Test Mode, Nor Test Mode, Check Mode, Cycle Mode, Alive Mode, etc. However, the S8000/S4000 Pro series follows the standard definition and does not use confusing naming.
- Break-in: Based on the IEC 61951-1 Ed. 3.0 (2013-10) and IEC 61951-2 Ed. 3.0 (2011-05) standards, it performs an industry-standard procedure to verify the rated capacity of a single Ni-Cd or NiMH battery. The standard requires:
    1. First, discharge at -0.2C constant current to a cutoff of 1.0V;
    2. Then, charge at 0.1C constant current for 16 hours (including 6 hours of overcharge);
    3. After that, rest for 1-4 hours;
    4. Then, discharge at -0.2C constant current for 5 hours to 1.0V.
    5. Rest again for 1-4 hours;
    6. Finally, charge at 0.1C constant current for 16 hours to cutoff.

  The complete process takes over 39 hours, until the rated capacity is reached, otherwise the battery does not meet the nominal capacity requirements. Additionally, a similar C>D>C process can serve as battery forming charge. It is recommended to perform this mode once every 30 cycles for NiMH batteries or every six months, suitable for new batteries and those that cannot be recovered by Refresh Mode. Since Break-in Mode is based on timed charge termination, it cannot be simulated by Cycle Mode. It is not applicable to $LiFePO_4$ or other li-ion rechargeable batteries.

- Discharge: Only performs discharge, i.e., D, with possible rest intervals inserted during the process (e.g., D>). The maximum discharge current for all battery types is -1.000A/channel. This mode is suitable for analyzing the remaining charge in the battery.
- Cycle: Supports automatic cycling of custom charge/discharge processes. Suitable for long-term unattended testing scenarios, such as evaluating the decay of a brand of batteries after 100 cycles. For NiMH batteries, initial high-rate cycling can effectively precondition new batteries or wake up long-stored batteries, and the test can be manually terminated when the discharge capacity stabilizes. Note that batteries have a limited number of cycles, and they must be recycled when they reach the end of their lifespan.
- Storage: Only applicable to rechargeable lithium batteries, ensuring the battery enters the recommended stable storage voltage for long-term storage. By reducing the charge current (CV phase) or discharge current (reverse CV phase), the target voltage is gradually approached. For rechargeable Ni-based batteries, no special storage preparation is required, refer to BU-702.

MAX CAPACITY

Primarily a safety option, allowing users to set a reasonable upper limit for the amount of charge transferred during each charge/discharge process in the program. For example, for a battery with a nominal capacity of 3500mAh, 4200mAh can be set to provide a 20% safety buffer. The capacity cutoff function is used to prevent overcharge or over-discharge, especially for batteries with unknown performance or capacity. Additionally, this setting can be used to terminate the channel early after transferring a specific amount of charge, to meet specific needs. In some cases, setting it to the maximum value of 9999mAh may be convenient. In Break-in tasks, users must input the battery's nominal capacity as accurately as possible.

PRECHARGE CURRENT

Nominal pre-charge current, which must be set for work tasks that include at least one charge process. When the battery is at a very low voltage or deeply discharged state, a lower charge current is used to gently activate the battery, reducing the risk of temperature rise and

avoiding damage from high-current impact, while providing a smooth transition for subsequent normal charging.

CHARGE CURRENT/CHARGE RATE

Nominal charge current, which must be set for work tasks that include at least one charge process. The S8000/S4000 Pro uses constant current charging, not pulse charging. Note that during the CV phase of lithium-ion battery charging or in Storage Mode, the initial charge current is automatically reduced.

MAX CHARGE CURRENT/MAX CHARGE RATE

Applicable only to Li-ion 1.5V battery charging task. The default fixed value is 2A for the S8000 and 1A for the S4000 Pro. Please note that in Li-ion 1.5V battery charging tasks, the actual charge current is determined by the battery's built-in circuit and will not exceed the default fixed value.

PLATFORM VOLTAGE/PLATFORM VOLT

Applicable only to Li-ion 1.5V battery charging task. The default fixed voltage is 4.850V. Please note that in Li-ion 1.5V battery charging tasks, the charging process is autonomously controlled by the battery's built-in circuit.

DISCHARGE CURRENT/DISCHARGE RATE

Nominal discharge current, which must be set for work tasks that include at least one discharge process. The device can simultaneously discharge 4 NiMH batteries or 4 lithium batteries at a rate of -1A/channel. The S8000/S4000 Pro uses constant current discharge, not pulse discharge. Note that when the DISCHARGE REDUCE option is activated, the initial discharge current is automatically reduced. For programs requiring discharge currents below -0.05A, users can adjust the DISCHARGE REDUCE option to achieve lower discharge currents.

CHARGE RESTING

Used to set the rest time after the end of a charge process, adjustable between 0 and 180 minutes, applicable only to work tasks that include at least one charge process. During this period, the charge current remains at 0.00A, allowing the battery to cool and rest. Note that in Cycle Mode, there is no additional rest phase after the cycle ends.

DISCHARGE RESTING

Used to set the rest time after the end of a discharge process, adjustable between 0 and 180 minutes, applicable only to work tasks that include at least one discharge process. During this period, the discharge current remains at 0.00A, allowing the battery to cool and rest. Note that in Cycle Mode, there is no additional rest phase after the cycle ends.

CYCLE COUNT

Refers to the number of cycles, applicable only to Cycle Mode (Cycle, N=1...9) or Refresh Mode (Refresh, N=1). For other modes (including Break-in), this option is invalid.

Like exercise, moderate cycling helps maintain battery health and improve performance; however, excessive cycling accelerates material aging and shortens battery life. For battery testers, multiple cycles can be used to analyze battery capacity decay.

CYCLE MODE

In this device, a Cycle is defined as a work sequence that includes at least 1 charge and 1 discharge, which can be performed in different orders. For example:

- "D>C>D": Discharge first, then fully charge, and discharge again.
- "C>D>C, N=2": Represents C>D>C>D>C, i.e., a complete cycle of charge-discharge-charge, repeated 2 times.
- "C>D, N=2": Represents C>D>C>D, i.e., a complete cycle of charge-discharge, repeated 2 times.

Users can set CHARGE RESTING (Charge Rest Time) and DISCHARGE RESTING (Discharge Rest Time) to control the rest duration between charge and discharge processes. However, in Cycle Mode, the program will end directly after the last charge/discharge without an additional rest phase.

CUT VOLTAGE

Refers to the discharge cutoff voltage, applicable to all discharge processes except Storage tasks. When the battery voltage drops to this value (measured under actual load conditions), the discharge process will terminate.

If the DISCHARGE REDUCE option is activated, this value serves as the constant voltage for the reverse CV phase of the discharge process until

discharge termination. Before discharge starts, this value should be lower than the battery's initial voltage; otherwise, the setting is meaningless. If set too low, it may cause over-discharge, damaging the battery.

CUT TIME

Specifies a timer cutoff, i.e., when the total running time of the discharge program reaches this value, the charger will forcibly stop and display an abnormal termination message. This function is primarily a safety option but can also be used to intentionally terminate the program after a set time.

CHARGE TIME

Refers to the maximum allowable duration of continuous charging, i.e., when the total running time of the charge program reaches this value, the charger will forcibly stop and display an abnormal termination message. This function is primarily a safety option but can also be used to intentionally terminate the program after a set time.

PRECHARGE TIME

Refers to the maximum allowable duration of continuous pre-charging, i.e., when the total running time of the pre-charge program reaches this value, the charger will forcibly stop and display an abnormal termination message. This function is primarily a safety option.

END VOLTAGE

Applicable to the CV phase (Constant Voltage phase) of the lithium-ion battery charging algorithm. When the battery voltage reaches the target voltage (END VOLTAGE) (e.g., 4.20V), this option maintains the voltage constant and automatically reduces the charge current until it drops to the set value (END CURRENT), terminating the charge.

END CURRENT

Applicable to the CC phase (Constant Current phase) of the lithium-ion battery charging algorithm. When the battery voltage reaches the target voltage (END VOLTAGE) (e.g., 4.20V), the charge current is automatically reduced until it drops to the set value (END CURRENT), terminating the charge.

- A higher termination current helps extend battery life but may prevent the battery from being fully charged to its rated capacity.

- This parameter is defaulted to 10% of the constant charge current (CHARGE CURRENT), in line with industrial standards.

DISCHARGE REDUCE

Applicable to discharge processes in the program. Similar to the CV phase of the lithium-ion battery charging algorithm, when the battery voltage reaches the cutoff voltage (CUT VOLTAGE), enabling this option maintains the voltage constant while automatically reducing the discharge current to the set value until discharge termination. Enabling this option extends discharge time, allowing the battery to release more energy, but it will not let the battery voltage drop below the set cutoff voltage. Since the battery's open-circuit voltage will rebound after discharge ends, reducing the discharge current helps minimize the rebound. However, excessively extending discharge time may be detrimental to battery health and is generally not very useful, although the discharge process in Storage Mode can benefit from it.

RESTART VOLTAGE

When the charge program ends, due to self-discharge, the voltage of poorly maintained batteries may drop rapidly. Setting a restart voltage 0.05V lower than the target voltage (TARGET VOLTAGE)/termination voltage (END VOLTAGE) ensures that the battery voltage does not drop too low when the battery is removed. This value cannot be higher than the target voltage or termination voltage. What happens when the voltage drops by 0.05V? It depends on the firmware version. Generally, the charge channel will restart charging. The default setting is "Off," and it is only enabled during charge tasks.

DELTA PEAK

Delta peak sensitivity is a technical parameter controlling the charge termination of NiMH/NiCd batteries, typically achieved through negative voltage difference (-dV) or negative voltage rate change (-dV/dt) methods, or through zero voltage difference (0dV) or zero voltage rate change (0dV/dt) methods. Normally, during constant current charging, the battery voltage will peak when fully charged. Higher sensitivity settings ensure the battery is fully charged but may lead to excessively long charge times. The "0dV" method terminates charging when the voltage reaches the plateau stage, i.e., when there is no significant voltage drop. This typically occurs with aging batteries or at low charge rates, or both.

As a rule of thumb, using the -dV method ensures better charge completion, while the 0dV method is suitable for all other cases.

PRE TO FAST VOLT

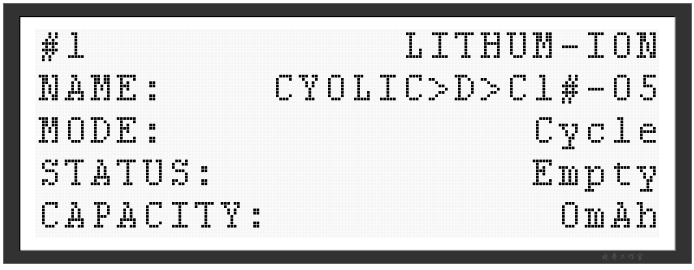
Refers to the constant current pre-charge applied to deeply discharged batteries (Li-based: voltage < 3.0V; Ni-based: voltage < 1.0V/cell) during the initial charge phase, switching to constant current fast charge when the voltage recovers to the safe threshold (PRE TO FAST VOLT: 3.0V for Li, 1.0V for Ni).

SAVE TO

By assigning a program number, modified program configurations can be saved under different program numbers without affecting the original program. Alternatively, the program can be saved under the original number, overwriting it. If the target number is already in use by another channel, the device will automatically save it as a temporary program. "Temporary" means the program will not be saved after power-off.

Channel Status View (CSV)

How to Get There — In the TOV, click the SNB of an inactive or active channel to enter the CSV.
How to Exit — In the CSV, click the ENTER or SETUP button to return to the TOV. Alternatively, the system will automatically return to the TOV after a period of user inactivity.



The Channel Status View (CSV) is suitable for active and inactive channels. For these channels, the CSV can be accessed from the TOV. In addition to the most basic information provided in the TOV, the CSV also displays information such as power, energy, time, internal resistance, and real-time status.

The controls in CSV are as follows

- Click or depress UP or DOWN to scroll through information lines.
- Click the ENTER button (= return) to return to the TOV.
- Click the SETUP button (= return) to return to the TOV.

The top row displays the channel number (on the left) and the battery type (on the right). The information items are listed in the following order

TASK

Displays the type of task currently being executed or completed by the channel. For example, lithium-ion batteries support five core tasks: Charge, Refresh, Cycle, Discharge, Storage. Each task is accompanied by a unique identifier for quick recognition.

STATUS

Displays the current program execution phase and channel status in real-time. For example, the charge program has four phases: Pre-Charge, Constant Current Charge (CC Charge), Constant Voltage Charge (CV Charge), Charge Complete. The channel's possible operating states include Empty, Ready, Busy, etc.

CAPACITY

Displays the cumulative charge transferred between the device and the battery in real-time: Discharge capacity during discharge, charge capacity during charge. At the end of cycle programs (e.g., Break-in, Refresh, or Cycle), their discharge capacities are also displayed. The unit is milliampere-hour (mAh).

VOLTAGE

Displays the battery voltage during charge or discharge in real-time. Ni-based batteries display OCV (Open Circuit Voltage), while Li-based batteries display CCV (Closed Circuit Voltage). The physical unit is volts (1V).

DISCHG CURRENT/CHARGE CURRENT

Displays the actual current passing through the battery in real-time. Negative values indicate discharge current, positive values indicate charge current, according to EE101 standards. The physical unit is amperes (1A).

CYCLE COUNT

Displays the current cycle count and the total number of cycles, i.e., the current cycle count and the total number of cycles to be completed.

POWER

Displays the instantaneous power transfer rate between the device and the battery. Battery power is the product of instantaneous load voltage and instantaneous current. Negative values indicate the battery is discharging, positive values indicate the battery is charging. The unit is watts (W). The maximum charge power is approximately 9W/channel, and the maximum continuous discharge power is approximately -4.5W/device.

ENERGY

Displays the energy transferred between the device and the battery since the current charge or discharge program began. Positive values indicate energy transfer from the device to the battery (charge), negative values indicate energy transfer from the battery to the device (discharge). Due to the battery's internal resistance, some energy is lost as heat. The unit is joules (J) or more commonly watt-hours (Wh).

BATTERY IR

Displays the battery's internal resistance in milliohms (mΩ). The device performs a quick standard test to measure the battery's internal resistance at the start of the program. Aged or poorly maintained batteries typically have higher internal resistance, leading to increased heat during charge/discharge. This measurement may be slightly affected by battery contact pressure and temperature, resulting in minor accuracy fluctuations.

TIME

Displays the running time of the current program. The timer resets to zero when the program enters a new phase.

TOTAL TIME

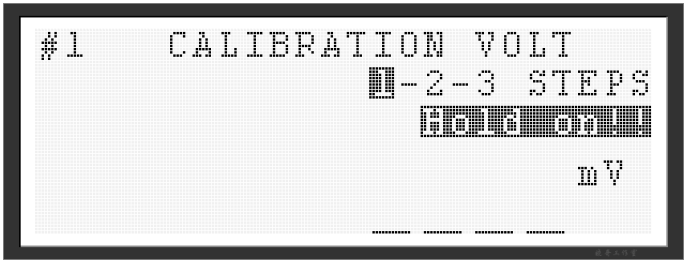
Displays the total running time since the start of the entire task.

USER CALIBRATION

The S8000/S4000 Pro uses technology similar to modern digital multimeters, with a microprocessor controlling and regulating charge/discharge processes through series current measurement and parallel voltage measurement. Each device is rigorously tested and calibrated to 2.5-digit precision at the factory. Users can perform personalized fine-tuning using higher-precision instruments to meet specific reference standards.

Voltage Calibration View（VCV）

How to Get There — In the TOV, with all channels empty, simultaneously press **▼(DOWN) + SNB** to enter VCV.
How to Exit — In the VCV, click the SETUP button once, twice, or more to eventually return to the TOV, and no changes will be saved.



The controls in VCV are as follows

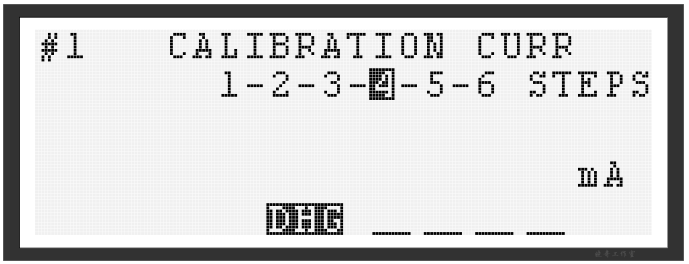
- Click UP/DOWN to make the charger display value match the corresponding digit on an external meter.
- Click the corresponding channel SNB to switch the digit to be calibrated.
- Click ENTER to confirm the selection (= OK), proceed to the next step (= Next), or save the calibration value and return to the TOV (= Save&Exit).
- *Note: The VCV mode view supports digit-by-digit calibration, ensuring measurement accuracy meets personalized needs. The calibration process can be canceled and exited at any time.*

User Voltage Calibration Steps

1. Preparation: Voltage calibration does not require batteries. The entire process includes 3 steps. Remove all batteries before calibration.
2. Enter Calibration Mode: Connect the power and display the TOV, then simultaneously press DOWN + SNB#1 to enter Channel #1 voltage calibration mode. After a few seconds, the screen displays the channel voltage (3 decimal places, e.g., "4.198V"). Use a high-precision digital multimeter (DMM) in the 1V range to measure the actual voltage of the channel (e.g., "4.2005V"). When measuring, connect the DMM's positive probe to the channel's positive terminal and the negative probe to the channel's negative terminal. Note: During voltage calibration, the charger outputs a constant 4.20V voltage.
3. Input the Measured Value: Round the DMM reading to 3 decimal places and input it using the UP, DOWN, or SNB buttons. Press ENTER to proceed to the next step or save. Repeat 3 times to complete calibration.
4. Calibrate Other Channels: Repeat the same steps for the remaining 3 channels.
5. Verify Calibration Results: Use your DMM to re-measure the stable voltage of other batteries and check if the S8000/S4000 Pro readings match.

Current Calibration View（CCV）

How to Get There — In the TOV, with all channels empty, simultaneously press **▲(UP) + SNB** to enter CCV.
How to Exit — In the CCV, click the SETUP button once, twice, or more to eventually return to the TOV, and no changes will be saved.



The controls in CCV are as follows

- Click UP/DOWN to make the charger display value match the corresponding digit on an external meter.
- Click the corresponding channel SNB to switch the digit to be calibrated.
- Click ENTER to confirm the selection (= OK), proceed to the next step (= Next), or save the calibration value and return to the TOV (= Save&Exit).
- *Note: The CCV mode view supports digit-by-digit calibration, ensuring measurement accuracy meets personalized needs. The calibration process can be canceled and exited at any time.*

User Current Calibration Steps

1. Preparation: Prepare a high-performance lithium-ion battery with a voltage between 3.3V and 3.6V, and use a digital multimeter (DMM) in the 1A range for precise measurement (3 or more decimal places).
2. Enter Calibration Mode: After powering on the device and displaying the TOV interface, simultaneously press SNB#1 + UP to enter Channel #1 current calibration mode. The entire calibration includes 6 steps: the first 3 steps calibrate charge current, and the

last 3 steps calibrate discharge current. Follow the prompt "Connect batt!!" to insert the battery. After a few seconds, the DMM displays a stable reading (e.g., "1.00639A"), and the charger screen displays 3 decimal places (e.g., "1.003A").

3. Input the Measured Value: Round the DMM reading to 3 decimal places and input it using the UP, DOWN, or SNB buttons. Press ENTER to confirm and proceed to the next step or save the calibration value. Repeat 6 times to complete calibration (steps 4-6 calibrate discharge current). Note: During charge current calibration, the charger outputs a constant 1.000A; during discharge current calibration, the charger outputs a constant 0.800A.
4. Calibrate Other Channels: Repeat the same steps for the remaining 3 channels.
5. Verify Calibration Results: Check if the S8000/S4000 Pro readings match the DMM at different charge/discharge current settings (e.g., 0.050A, 0.100A, 0.500A, 1.500A, 2.000A, -0.500A, -0.100A, -0.800A, -1.000A).

For ease of discussion, the following abbreviations are introduced

- [30] = Program 30, ..., [01] = Program 1
- #4 = Channel 4, ..., #1 = Channel 1
- SNB = Channel Number Button or its LED indicator
- SNB#1 = Channel Number Button for Channel 1
- TOV = Total Overview View
- VCV = Voltage Calibration View
- CCV = Current Calibration View
- CSV = Channel Status View
- CPV = Channel Programming View
- GSV = Global Settings View
- CC = Constant Current
- CV = Constant Voltage
- To depress = Long press (hold down)

- To click = Short press (press and release)
- To press = Can refer to either short press or long press (no specific distinction)

Channel Status Descriptions

- Empty Channel = Channel with no battery, i.e., SNB indicator is black
- Ready Channel = Channel ready to start a program, i.e., SNB indicator is white
- Inactive Channel = Empty or ready channel
- Busy Channel = Channel running a program, i.e., SNB indicator is red
- Finished Channel = Channel where the program has completed normally, i.e., SNB indicator is green
- Active Channel = Channel that is running or has completed a program

Other Terms

- Electric charge transfer = Charge or discharge
- Routine = Part of a program, including charge, discharge, or rest
- Operation mode = Charge, Discharge, Storage, Cycle, Refresh, or Break-in mode
- Program = An operation mode bound to a complete set of settings and assigned a unique program number
- Program number = The number represents the actual program, not just a number
- Cycle = At least 1 charge + 1 discharge, or 1 discharge + 1 charge sequence

SPECIFICATIONS

Input Power	DC 10-20V/48W(S8000)/24W(S4000 Pro)	PSU adapter output specs
Circuit Power	max. Charge power < 40W; max. Discharge power < |-20W|	|x|=x, for x>0 |x|=-x, for x<0
Battery Count	1~4 single cells, cylindrical	4 independent slots
Battery Size Specs	AAAA, AAA, AA, Sub-C, C, D 10340, 10350, 10440, 10500, 12340, 12500, 12650, 13450, 13500, 13650, 14350, 14430, 14500, 14650, 16340, cr123, 16500, 16650, 17350, 17500, 17650, 17670, 18350, 18490, 18500, 18650, 18700, 20700, 21700, 22500, 22650, 25500, 26500, 26650, 26700, 32600**, 32650**, 32700**	**2 cells can fit together with 2 other batteries
Operating Voltage Range	0.2V~ 5.0V/Channel	max. admissible voltage < 5.0V
Battery Chemistry Type	NiMh, NiCd, Eneloop, Li-ion Std, Li-ion 4.30V, Li-ion 4.35V, LiFePO4, Li-ion 1.50V	The first three types use Pulse charging algorithm;The last four types use CC-CV charging algorithm
Battery Capacity	50mAh ~ 9999mAh	Safety cut-off
UI Mode	3	Normal(Break-In), Normal(Storage), Professional
Charge Current Range	0.03A~ 2.0A(S8000)/Channel 0.03A~1.0A(S4000 Pro)/Channel	0.001A increments
Charge Algorithm	NiMh/NiCd/Eneloop: CC w/-dv or 0dv; LiXX: CC-CV w/TC	NiMh/NiCd/Eneloop:Delta peak detection LiXX: TC-CC-CV termination current
CV Termination Current	0.01A ~1.60A	For LiXX batteries
-dV Sensibility	0dV, or 1mV ~ 9mV	for NiMh/NiCd
Discharge Current Range	-0.03A~-1.00A	|-0.001A| increments
Discharge Reduce	-0.02A~-1A	|-0.001A| increments
Operation Modes	Charge, Discharge, Storage, Break_in, Refresh, Cycle	Available selection depends on BATTERY TYPE
Cycle Count	1 ~ 10	The default is 1.
Cycle Modes	4	C>D, C>D>C, D>C, D>C>D
Rest Time	1min ~180min	CHARGE RESTING vs. DISCHARGE RESTING
Safety Timer	1min ~ 1000min total time	Safety cut-off
Memory	32 global programs	Programs 0~9 are optional programs for quick operation
Display	192*64 LCD b/w	w/ background lighting
RGB LED	4	Channel number buttons
Controls	via 8 buttons, PC Link	
Beep	1	
Small fan	2	
Internal Temperature	85℃	Safety net
Operating Temperature	0℃ ~ 40℃	Ventilated room
Calibration	Factory calibration, User calibration	Can be reset
Reset	Software reset, hardware reset	The latter undocumented
Voltage	±1mV internal resolution	≤0.1% accuracy at lab conditions
Current Measurement	±1mA internal resolution	≤0.1% accuracy at lab conditions
Current fluctuation range	±10mA	≤5mA at lab conditions
Standby Current	<1mA /battery	Ready Channel
External	DC input; PC Link,	Micro USB for PC Link
Firmware Update	YES	Via PC Link
Dimensions(L x W x	227*141*58mm	Not so compact
Material	PC + ABS casing, aluminum heatsink	w. mini cooling fan
Weight	550g(approx.)	Unplugged device

CONFORMITY DECLARATION

S8000/S4000 Pro satisfies all relevant and mandatory CE directives and FCC Sub Part C Intentional Radiators section 15.247

The product has been tested to meet the following technical standards:

	Test Standards	Title	Result
CE-RED	EN 300328	Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using wide band modulation techniques article 3.1(b) EMC requirements	Conform
	EN 301489-1	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services. Part 1: Common technical requirements	Conform
	EN 301489-17	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services. Part 17:Specific conditions for Broadband Data Transmission Systems article 3.1(a) Health requirements	Conform
	EN 62479	Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz) article 3.1(a) Safety	Conform
FCC	FCC SubPart C Intentional Radiators section 15.247	Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, and 5725 - 5850 MHz.	Conform

FCC Note

This device complies with Part 15 of the FCC Rules.

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Disclaimer: The manufacturer is not responsible for any radio/television interference caused by unauthorized modifications to the device, which may void the user's authority to operate the equipment.
Safety Distance: To comply with FCC RF exposure guidelines, the device must be installed and operated at a distance of at least 20cm from the human body.

ShenZhen Enova Technology Co., Ltd declares that this battery charger and analyzer complies with the essential requirements and other relevant provisions of Directive 2014/53/EU.

Environmental Disposal Note

When this device reaches the end of its life, it must not be disposed of as general household waste. Please take it to a local waste collection point or recycling center.
This regulation applies to the EU and other European countries with independent waste collection systems.

Liability Statement

1. This charger is only for use with the battery types specified in the manual. ENOVA is not responsible for losses caused by other uses.
2. ENOVA is not responsible for any damage caused by the user's failure to follow the operating instructions or improper operation.
3. The maximum liability is limited to the invoice amount of the ENOVA product directly involved in the incident (unless otherwise stipulated by law).

Warranty and Service

1. Warranty Coverage: Within 1 year from the date of purchase, for faults caused by manufacturing/assembly defects.
2. Service Content: Free repair or replacement.
3. Exclusions:
    - Damage caused by misuse, modification, or failure to follow operating procedures.
    - Only applicable to users within China.
    - Overseas users must handle warranty matters through the purchasing channel (due to shipping costs and customs complexity, ENOVA does not directly provide overseas warranty services).

Technical Support

If you encounter issues not covered in the manual, please contact:sales1@enova18650.com

Special Thanks

Name	Link
SammysHP	https://www.sammyshp.de/
TimMC	https://timmcmahon.com.au/
HKJ	https://lygte-info.dk/project/TestControllerIntro%20UK.html
dmenezes	https://www.durval.com

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