PALADIN

L120 Pro

OPERATING INSTRUCTIONS

Please keep for future reference

Thank you for purchasing this Paladin L120 Pro charger. We are sure you will be pleased with its performance and features. In order to ensure that you obtain the maximum benefit from its operation, please read these instructions carefully.

SPECIFICATIONS

Input Voltage	10~15V DC
Battery Type & Cells	1~12 Lithium-Ion or Lithium-Polymer cells (3.6V or 3.7V respectively) 1~12 LiFePO4 cells (3.3V) 1~30 Nickel-Cadmium cells 1~30 Nickel-Metal Hydride cells 1~6 Lead-Acid cells (2V per cell)
Battery Capacity	100mAh ~ 20,000mAh adjustable ONLY for Lithium-Ion, Lithium-Polymer and LiFePO4
Charge Rate	0.1A ~ 10A Adjustable in 100mA steps (2C charge rate available for Li-Po Batteies)
Discharge Rate	0.1A ~ 10A in 100mA steps (auto limited to 80W max)
Trickle Charge Rate	0 ~ 500mA & Automatic
Balancing	Interface compatible with Fusion 6 & 12 cell balancers
Charge Termination	"Zero Delta V" peak detection for NiCd/NiMH "Constant current / constant voltage" for Li-Ion/Po LiFe and Pb
Delta Peak Sensitivity	5mV ~ 20mV (per cell)

SPECIAL FEATURES

- Automatic settings for charging and discharging NiCd/NiMH packs.
- 10 user definable intelligent battery memories that enable individual pack parameters to be stored, i.e. battery type, number of cells, battery capacity, charge current and discharge current. As a result of this, up to 10 different battery packs can have their individual charge/discharge requirements set.
- Pack Cycling (Charge to Discharge / Discharge to Charge) (NiCd/MiMH)
- Cycling repeat 1~5 times with 1~30min delay between cycles (NiCd/MiMH)
- 2 -line, 16 character, blue backlit, LCD makes the screen extremely clear and legible.
- Various warning messages for incorrect input voltage, wrong connections, unsuitable battery condition and reverse polarity on output.
- Automatic initial charge stage checks the condition of the battery being charged. If the battery is not in a condition suitable for charging, the display shows a warning message "Output Battery Connector Error" along with an audible warning.

SAFETY PRECAUTIONS

- **DO NOT** attempt to charge incompatible types of rechargeable batteries. This charger is designed to only charge and discharge Nickel-Cadmium, Nickel-Metal Hydride, Lithium-Ion, Lithium-Polymer, LiFePO4 and Lead-Acid batteries.
- Make sure you place the charger on a firm level surface for charging.
- **DO NOT** attempt to charge batteries at excessive fast charge currents. Check with your battery manufacturer for the maximum charge rate applicable to your battery.
- **DO NOT** use automotive type battery chargers to power the charger.
- **DO NOT** leave the charger unattended while charging. Disconnect the battery and remove input power from charger immediately if the charger becomes hot. Allow the charger or battery to cool down before reconnecting.
- **DO NOT** allow water, moisture or foreign objects into the charger.
- **DO NOT** place the battery or charger on or near a flammable object while in use. Keep away from carpets, cluttered workbenches, etc.
- **DO NOT** cover the air intake holes on the charger as this could cause the charger to overheat.
- Connect the input leads to a 12V power supply first, then connect the battery.
- **DO NOT** disassemble the charger.
- This unit is **not intended** for use by young children or infirm persons unless they have been adequately supervised by a responsible person to ensure that they can use it safely.
- Young children should be **supervised** to ensure that they do not play with the Paladin L120 Pro.
- **DO NOT** attempt to charge non-rechargeable batteries.
- The battery must be placed in a well ventilated area (for charging lead-acid batteries)
- **After charging**, disconnect the battery charger from the power supply first, then disconnect the battery.

LITHIUM ION/POLYMER BATTERY SAFETY WARNINGS

Ensure that the charger and battery are placed on a non-flammable surface whilst charging and ideally charge outdoors wherever possible. **NEVER** charge a Lithium ION/Polymer/Fe battery inside a vehicle whatever the circumstances.

ALWAYS ensure that the charger is correctly set for the battery being charged, checking both voltage and capacity. Be particularly careful if using a series/parallel battery pack, or if using packs of different specifications with the same charger.

NEVER charge at a rate higher than that recommended by the cell manufacturer, this can be very dangerous.

DO NOT leave Lithium ION/Polymer/Fe batteries unattended whilst they are charging. Monitoring the batteries during charging is very important.

ALWAYS monitor the temperature of the battery being charged every few minutes. If the battery becomes hot to the touch, disconnect it from the charger immediately and allow to cool. **DO NOT** recommence charging until the battery and charger have been checked for compatibility and the charger settings have been confirmed as being correct.

In the unlikely event of the Lithium ION/Polymer/Fe battery catching fire **DO NOT** use water to attempt to put the fire out, instead use sand or a fire extinguisher designed for electrical fires.

When used correctly, Lithium ION/Polymer/Fe battery packs are as safe as any other type of rechargeable battery pack.However they do require different charge regimes to the longer established Nickel Cadmium and Nickel Metal Hydride technologies and **have the potential of catching fire if severely mistreated**.

If Lithium Polymer battery packs are short-circuited or severely over-charged elemental Lithium may be deposited internally, and if the battery pouch is damaged this can escape from inside the battery. If this occurs a fire may be caused, as elemental **Lithium is highly reactive when exposed to water or moisture**, producing flammable hydrogen gas and corrosive fumes. Elemental Lithium is not produced unless the battery pack is severely mistreated, so in normal usage there is no likelihood of explosion or fire.

LITHIUM ION/POLYMER/FE BATTERIES

Lithium battery packs must **NEVER** be discharged below 3 volts per cell as this will result in damage to the cells. If the voltage is allowed to drop below 3 volts per cell the battery voltage may seem to recover following a charge, but the battery may not then give its full nominal capacity and a reduction in performance is likely – allowing the voltage to drop below 3 volts per cell will invalidate all warranty claims.

NEVER charge Lithium Polymer battery packs at greater than 4.2V per cell, Lithium Ion at 4.1V volts per cell or LiFe at greater than 3.7V per cell as this will cause irreversible damage to the cells and will invalidate all warranty claims.

DO NOT use discharge rates in excess of those specified with the battery pack as this will result in a significant drop in voltage under load and will dramatically reduce the number of charge/discharge cycles the battery pack will give.

DO NOT attempt to charge Lithium battery packs whilst the input 12 volt battery is being charged, as the voltage supplied to the Lithium Polymer charger may be too high.

If disposing of Lithium battery packs ensure that the pack is fully discharged by using a light bulb, electric motor or similar to completely discharge the pack.

DO NOT allow any Lithium battery pack to short-circuit as this is likely to result in a minor explosion and consequent fire.

BEFORE charging any Lithium battery packs they should be closely inspected for any damage, such as punctures in the sleeving or if the battery has swollen or expanded in size. If any such damage is detected **DO NOT** charge, even if the battery otherwise appears to be brand new.

Before commencing charging **ALWAYS** double check the settings on the charger to ensure it is set correctly for the battery pack to be charged. Using the wrong settings is likely to result in damage to the battery pack being charged and could result in the battery catching fire.

INPUT POWER

12V DC
Connect the charger's red alligator clip to the positive (+) terminal on the power source and the black alligator clip to the negative (-) terminal. The charger will display "Input voltage" error message if the input is below 10V or above 15V. If this happens, please recheck the input power supply to make sure correct power is present.

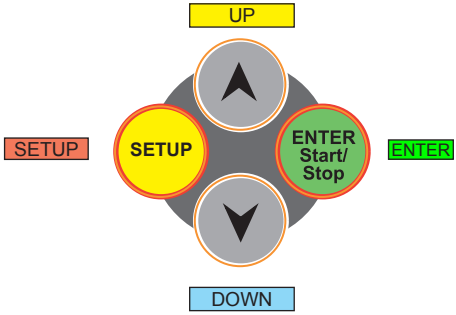
OUTPUT BATTERY CONNECTIONS

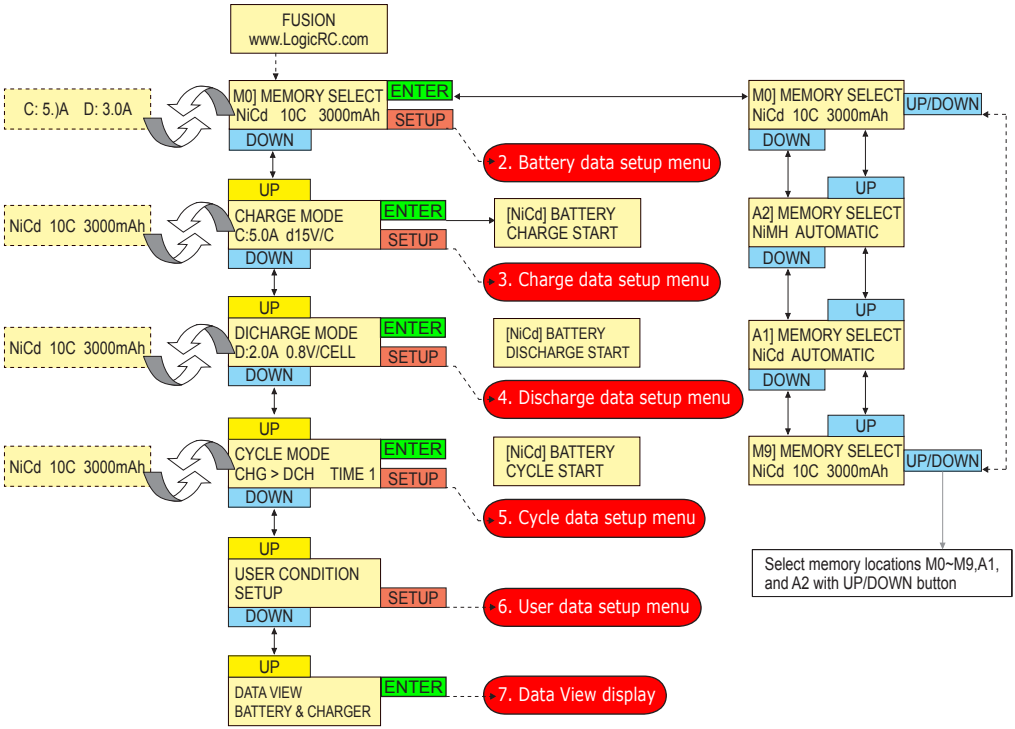
Two 4mm banana sockets are located on the right side of the charger. Connect the battery main power leads to these sockets with the positive (+) lead connected to the red socket and the negative (-) lead to the black socket. You may need to purchase an adaptor lead to suit the specific connector on you battery and make this more convenient. The "Connect Error" error message will be displayed if trying to start charging without connecting a battery to these sockets. The "Open Circuit" error message will be displayed if a battery becomes disconnected from the charger while a function is in progress. A "Reverse Polarity" error message will be displayed if a battery is connected to the charger in reverse.

Note: In order to balance Lithium batteries during charge or discharge, please use the appropriate Fusion balancer.

1. MAIN MENU

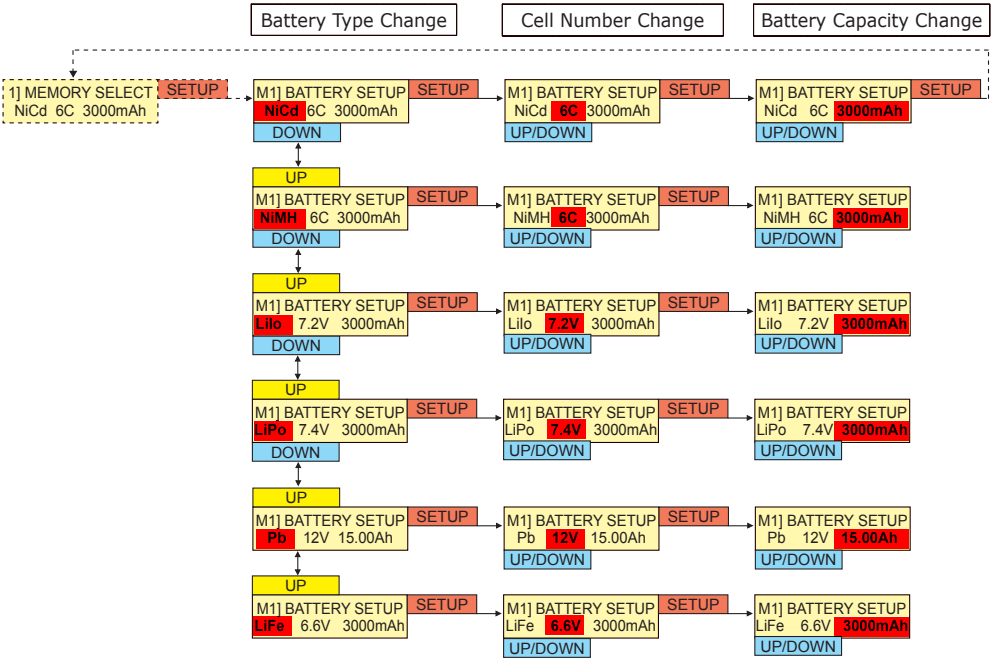
When the charger is turned on, it will enter the main menu, then use the buttons on the charger (as shown below) to navigate through the menus.
All the functions have been detailed in the following sections to to help you familiarise you with the programming and features included in this Paladin L120 Pro.





2. BATTERY DATA SETUP MENU

In this mode, you can set each battery type / cell number / battery capacity in a memory. Adjust the desired parameters with UP/DOWN buttons.

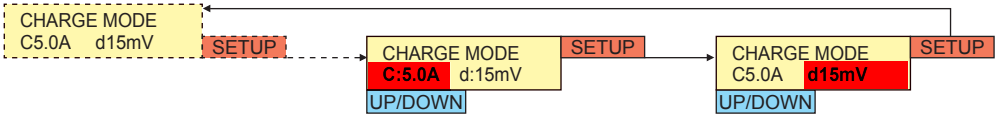


NOTE: The Paladin L120 Pro is supplied with the 10 memories already programmed. Unless these programs exactly match your requirements, it will be necessary to modify them to suit the battery packs being charged.

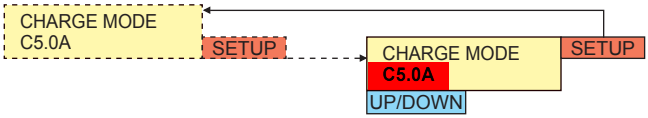
Factory Default Parameters								
	CELL	**CAPACITY**	**CHAGE**	**DISCHARGE**	**DELTA**	**DCH VOLT**	**CYCLE DIR**	**CYCLE TIME**
NiCd	6CELL	3000mAh	3.0A	3.0A	5mV	0.8V/CELL	CHG>DCH	1TIME
NiMH	6CELL	3000mAh	3.0A	3.0A	5mV	0.8V/CELL	CHG>DCH	1TIME
LiPo	7.4V	3000mAh	3.0A	3.0A	X	3.0V/CELL	X	X
Li-Ion	7.2V	3000mAh	3.0A	3.0A	X	3.0V/CELL	X	X
Pb	12V	15.00Ah	3.0A	3.0A	X	X	X	X
LiFe	6.6V	3000mAh	3.0A	3.0A	X	3.0V/CELL	X	X

3. CHARGE DATA SETUP MENU

NiCd & NiMH battery → Set charge capacity and Delta peak sensitivity.

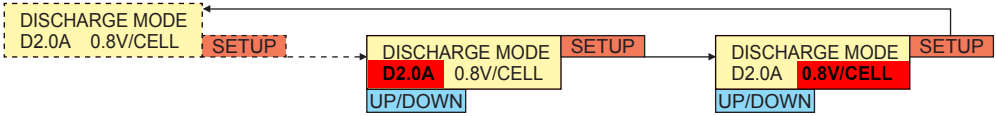


Li-Ion/Po & Pb battery → Set the charge capacity. Note: In case of charging Lithium batteries, it is NOT possible to set charge rates over 2C of the selected battery capacity.

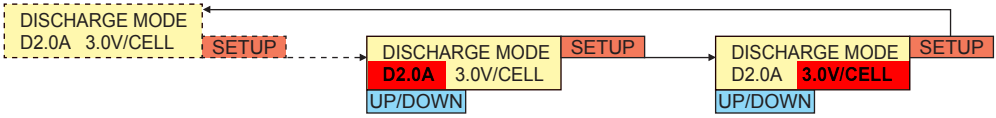


4. DISCHARGE DATA SETUP MENU

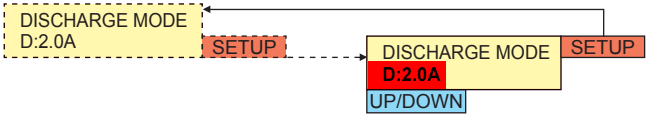
NiCd & NiMH battery → Set discharge rates and discharge cut-off voltages.



Li-Ion/Pro battery → Set discharge rates and discharge cut-off voltages.

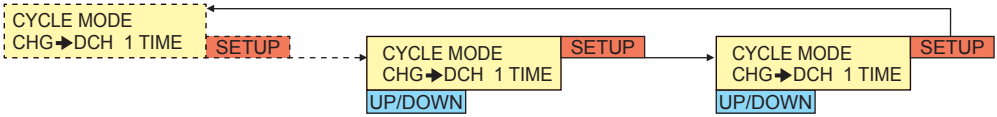


Pb battery → Set discharge rates (The Discharge cut-off voltage is fixed at 1.8V per cell)



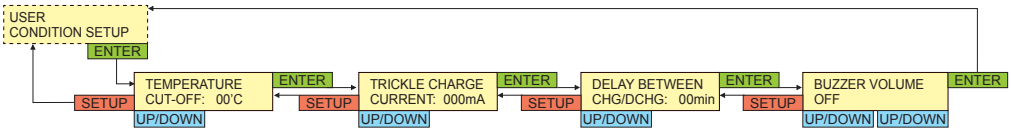
5. CYCLE DATA SETUP MENU

NiCd & NiMH battery only→ Set cycle direction and cycle times.



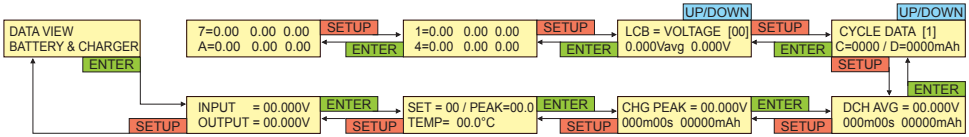
6. USER DATA SETUP MENU

Each user setup data is separately stored in each memory.



7. DATA VIEW DISPLAY

All data of the cycle 1 to 5 times can be referred to with UP & DOWN buttons.
Note: LCB means Lithium Cell Balancer.



1. Input voltage
2. Output voltage

1. Setting temperature
2. Peak temperature
3. Temperature now

1. Charge peak voltage
2. Charge time
3. Charge capacity

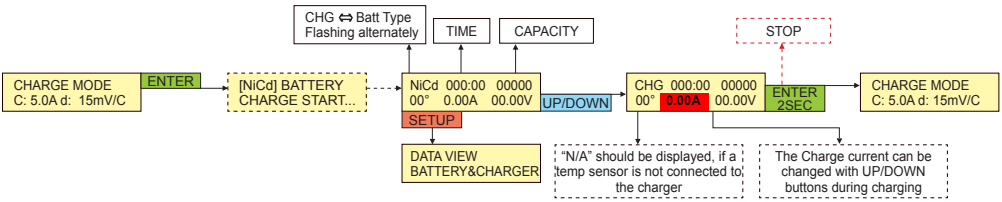
1. Discharge average voltage
2. Dischrge time
3. Discharge capacity

8. OPERATING DISPLAY

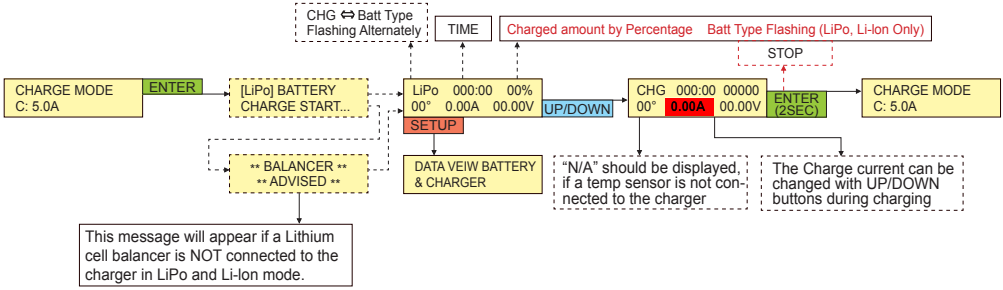
If the ENTER (Start/Stop) button is pressed at Charge, Discharge, or Cycle menus, the selected mode is activated.

It is possible to change charge rates with the UP/DOWN buttons during operation, however, the charge rates can not be adjusted in Auto mode, or during CV (Constant Voltage) charge.
If the ENTER button is pressed again during operation, the operation will stop and revert to the main display.
While the charger is being operated, the DATA VIEW screens can be shown by pressing the SETUP button.

NiCd, NiMH, Pb CHARGE OPERATING

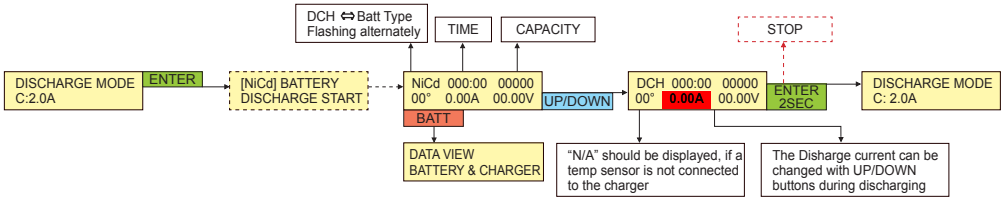


Li-Po, Li-Ion, CHARGE OPERATING

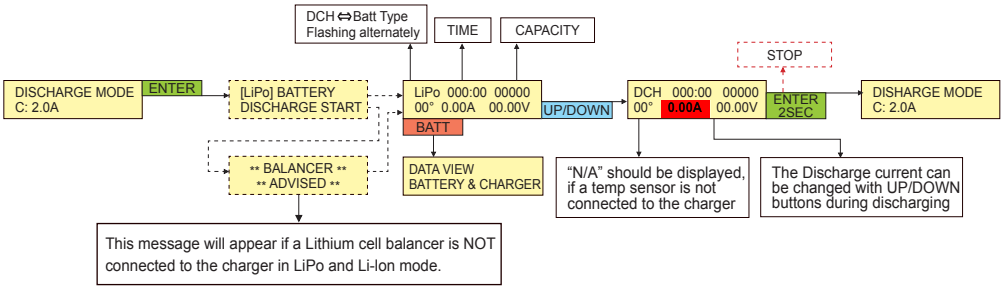


Note : In this Lithium mode, the charged amount can be shown as a percentage. So, you can stop charging and disconnect the Lithium battery pack if this percentage is indicated 80% ~ 90% as you should be able to use this 80%~90% charged battery pack already if you want.

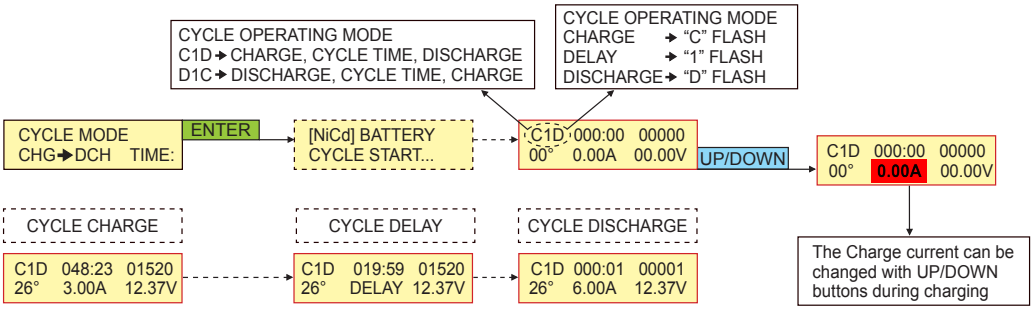
NiCd, NiMH, Pb DISCHARGE OPERATING



Li-Po, Li-Ion, DISCHARGE OPERATING

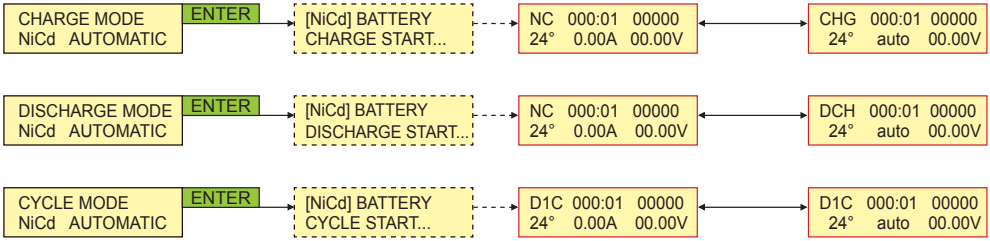


CYCLE OPERATING



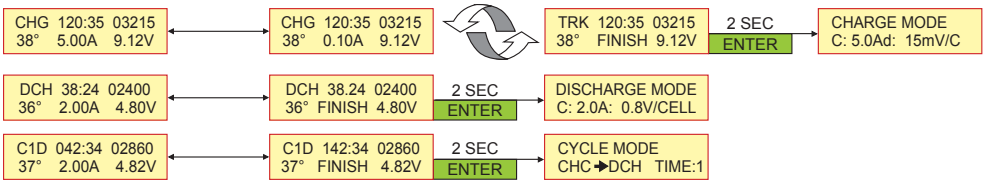
AUTOMATIC OPERATING

While Auto mode is being activated, "auto"⇔"current" is alternately displayed.
AUTO cycle operation is fixed as discharge → charge once.
Delay time is fixed as 10 minutes in Auto mode.



END OPERATION

If the ENTER button is pressed for 2 seconds in the END display, it reverts to the main display.
(If the ENTER button is briefly pressed or the battery pack is disconnected, it won't revert to the main display.)
Operating data can be referred to the above "7. Data View Display "
During trickle charging, the parameters of " CHG, TRK, FINISH, trickle current " are blinking.



Trickle charge

- If trickle currents are set to 100~500mAh at "USER CONDITION SETUP", the trickle charge proceeds with the selected trickle currents.
- The trickle charge proceeds with 1/20 currents of the selected capacity in Auto mode, however, there is NO trickle charge in cases of lower than 100mAh.
- Even if the trickle currents are set, if a charge process is stopped due to the optional temperature, or safety-timer function, the trickle charge won't work at all.

10. MESSAGE DISPLAY

INPUT VOLTAGE ERROR 0.00Vi	When the input voltages exceed the range of 9.5~15.5V.
OUTPUT BATTERY CONNECT ERROR	When the charger starts without connecting to the battery pack.
OUTPUT BATTERY REVERSE POLARITY	When the charger starts without connecting the battery pack in reverse.
OUTPUT BATTERY OPEN CIRCUIT	When the battery pack is disconnected during operation.
OUTPUT CIRCUIT PROBLEM	When the battery terminals short-circuit for a while.
PAUSE... CHARGER TOO HOT	When the temperature of the charger rises over 115°C, the charger stops temporarily until the temperature drops lower than 70°C.
OUTPUT VOLTAGE TOO HIGH 0.00V	When the output voltges are too high.
OUTPUT VOLTAGE TOO LOW 0.00V	When the output voltages are too low.
TEMPERATURE SENSOR ERROR	When the thermal probe is incorrectly connected, or the probe is defective.
BATT. TEMPERATURE TOO HIGH 00.0°C	When the temperature of the battery pack is higher than the selected temperature, this message is shown. The previous operation should resume when the temperature of the battery pack becomes 2°C lower than the selected temp.
INTERNAL TEMP SENSOR ERROR	When the temperature of the charger rises over 125°C.
DATA COMMUNICA- TION ERROR	When the internal interface of the charger is defective.

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