Lithium Polymer (LiPo) Battery Warnings

- **Never charge a lithium polymer battery with a charger designed for NiCd, NiMH, or any other type of battery chemistry. Use ONLY a charger designed for LIPO batteries. Failure to do so may cause a fire, which may result in personal injury and property damage.**

- Battery charging/discharging and observation should occur in an isolated safe location outside of any building or vehicle and away from any combustible material. The middle of a cement driveway is a good example of a safe location. Never charge/discharge the battery inside a house, garage, building, warehouse or vehicle.

- It is solely the user's responsibility to assure that the charger used in the charging/discharging process works properly. ONLY charge LiPo batteries with a good quality Lithium Polymer balanced charger. Failure to do so may cause a fire, which may result in a personal injury or property damage.

- Inspect the battery before the charging/discharging and storage process. Check for damages, leaks, broken connectors, and puffiness. Check the battery voltage. Normal voltage should be approximately between 3.3v-4.2v per cell. If the voltage is significantly less than the normal voltage (less than 3.3v per cell), do not charge/discharge the pack.

- The charging rate should not exceed 1C (one times the capacity of the battery, for example: charge an 800mAh battery at or below 0.8A, charge a 3000mAh battery at or below 3A). Higher charging rate may damage the battery and result in fire.

- Charge/discharge each battery pack individually. Set the cell count, charging current, and voltage on the charger for the charging/discharging process correctly.

- Do not over charge/discharge the battery; doing so will damage the battery. Do not discharge a battery pack to a level below 3.3V per cell.

- **Do not leave a LiPo battery unattended during the charging/discharging process. During the charging/discharging process, users should monitor the process constantly and react to any potential problems that may occur.**

- **Always place the battery in a fireproof container alone when charging/discharging. The middle of a cement driveway is a good example of a safe location. Do not charge/discharge a battery inside a house, garage, vehicle, building or near any combustible material.**

- **Always store the battery in a fireproof container alone Do not store a battery near any combustible material.**

- Do not continue to use a damaged battery. Recycle any damaged batteries to a certified battery recycling facility as soon as possible.

- Allow battery to cool down to normal temperature before recharging. Never exceed 140 degrees F during the charging/discharging process.

- Short circuiting the battery can cause fires. If you accidentally short a battery, you should place the battery in a safe area for observation for approximately one hour.

- Never modify the battery by yourself. If you need to cut the terminal wires, soldering connectors, please consult an experienced user before operation.

- Use the battery with care and avoid puncture to the battery. Puncturing a LiPo battery can cause fire.

- Store batteries at room temperature between 40 to 70 degrees F. Never store battery pack inside your vehicle if the internal temperature exceeds 120 degrees F. If storing for a period of time(more than a week), batteries should be stored at 3.8V to 3.9V per cell.

- Never expose batteries under direct sunlight or heat for an extended period of time. Exposing batteries at a temperature greater than 140 degrees for an extended period of time (more than 20 minutes) can damage the battery and cause a possible fire.

- Inspect batteries if crashed. Crashed batteries should be placed in a safe area for observation for at least one hour.

- Do not allow LiPo cells to overheat at any time. Cells which reach greater than 140 degrees F will usually become damaged and will catch fire.

- Do not use batteries that lose 20% of their capacity.

- Do not expose LiPo cell to water or moisture at any time.

- Do not assemble LiPo cells or pre-assembled packs together with other LiPo cells or packs.

- Always store LiPo battery in a secure location away from children.

- Always remove the LiPo battery if your model is involved in any kind of crash. Carefully inspect the battery and connectors for even the smallest damage. CAUTION: cells may be hot!

- Do not allow the electrolyte to get into your eyes or on your skin. Wash affected areas immediately if you come into contact with the electrolyte substance. Do not alter or modify connectors or wires of a LiPo battery pack.

- Do not have contact with a leaky/damaged battery directly.

- Do not charge/discharge battery out of recommended temperature range (Charge: 32 to 110 degrees F; Discharge: 32 to 140 Degrees F)

- During the charging/discharging process, if at any time you witness a battery starting to balloon or swell up, discontinue the charging/discharging process immediately. Disconnect the battery and place it in a safe observation area for approximately one hour. Continuing to charge a battery that has begun to swell will result in fire.

By purchasing and using this battery, the buyer and user assumes all risks associated with this product. If you do not agree with these conditions, do not proceed to use the battery. You must read the above safety instructions and warnings before charging/discharging your batteries. Manufacturers, distributors, and retailers assume no liability for failure to comply with the warning and safety guidelines.
This product is for experienced adult remote control users only. It is not recommended for children under the age of 18. All minors should be accompanied by an adult when operating a Li-Po battery. This product requires proper operating knowledge to avoid any accidents. Failure to take caution when operating this product may result in serious injury or property damage. It is the owner's responsibility to operate this product in a safe manner. Manufacturers and its distributors are not responsible for any bodily injury(s) and/or property damage that may occur from the use of or caused by this product.

Lithium Battery Operation Guideline and Safety Instruction

- **Operating lithium polymer batteries is dangerous; user must follow proper usage guidelines to operate. Failure to do so will cause a fire, which may result in serious personal injury and property damage.**
- **By purchasing this battery, the buyer and user assumes all risks associated with this product. If you do not agree with these conditions, please return the battery immediately before use.**
- **Product warranty is limited to original defects in material and workmanship. Warranty does not cover collateral damage. Misuse, abuse, incorrect charging and other inappropriate use of this product are not covered under warranty.**
- **Must keep Li-Ion & Polymer battery pack away from children and minors.**
- **Do not charge/discharge, use a battery inside house, garage, building, warehouse, or vehicle under any circumstances.**

Before charging/discharging:

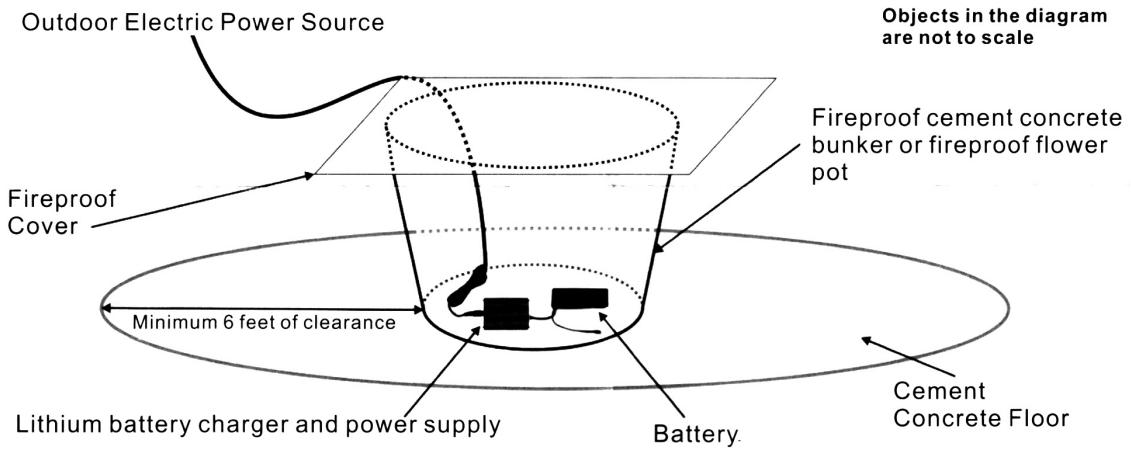
- Inspect the battery for any damages. Do not charge a damaged battery.
- Inspect the battery for swelling. Do not charge a swellen battery.
- Inspect the battery for possible battery fluid leaks. Do not charge a leaking battery.
- Inspect the voltage for each battery cell. If the cell voltage is significantly lower than the normal voltage (3.3v per cell) or the voltage of each cell is significantly different, the battery may be in a defective condition. Do not charge the battery.
- Wire lead shorts can cause a fire. Never make a wrong polarity connection when charging and discharging battery packs. Always double check the polarity of the batteries connectors.
- **Use ONLY charger designed for Lithium Polymer/Li-ion battery. Do not use a NiMH or NiCd charger. If the charger can support different battery types, Be absolutely sure to select the Lithium Polymer battery type on the charger. Failure to do so may cause a fire, which may result in personal injury and property damage.**
- Verify that the lithium polymer charger is in good condition. A poor quality charger can be dangerous. It is solely your responsibility to assure that the charge you use works properly. Always monitor the charging process to assure batteries are being charged properly. Failure to do so may result in a fire.
- Battery charging/discharging and observation should occur in an isolated safe location outside of any building or vehicle and away from any combustible material. The middle of a cement driveway is a good example of a safe location. Never charge/discharge the battery inside the house, garage, building, warehouse, or vehicle under any circumstances.

Charging/discharging the battery:

- Li-Ion and Polymer battery packs may explode and cause a fire if misused or defective. We require that all LI-ion battery consumers to be professional and have the capability to handle emergencies.
- **Do not leave battery unattended during the charging/discharging process. During the charging/discharging process, user should monitor the process constantly and react to potential problem that may occur.**
- In case of emergency, discontinue the process immediately, disconnect the battery, place it in a safe area, and observe it for approximately one hour. This may cause the battery to leak and the reaction with air may cause the chemicals to ignite, resulting in a fire. A safe area should be outside of any building or vehicle and away from any combustible materials. A battery can still ignite even after one hour.
- **Do not charge batteries packs in series. Charge each battery pack individually. Failure to do so may result in incorrect battery recognition and charging functions. Overcharging may occur and cause a fire.**
- Check cell voltage after the first charge.
  For example: 1-Cell: 4.2V (4.15 to 4.22) 2-Cell: 8.4V (8.32 to 8.44)
  3-Cell: 12.6V (12.48 to 12.66) 4-Cell: 16.8V (16.64 to 16.88)
- Do not discharge battery to a level below 3V per cell under load.
- **Do not damage the battery cell. Puncture of cells may cause a fire.**
- Operating Charging Temperature: 32 to 110 degree F; Discharge: 32 to 130 degree F
- Let battery cool down to an ambient temperature before charging/discharging.
- During charging/discharging, and handling of batteries, do not exceed 140 degree F.

- You must select the charge rate current that does not to exceed 1C (one times the capacity of the battery). A higher setting may cause a fire. The below chart is calculated at 1 x capacity of the pack.
  For Example: 2000 mAh: Charge below 2.0 Amps
  3000 mAh: Charge below 3.0 Amps
- **Selecting cell count, voltage and current other that the one printed on the battery (always confirm the label is correct), can cause a fire.**
- Put the battery in a fireproof container and charge it in an isolated area away from other flammable materials. Always have a fire extinguisher for emergency use. If at any time you witness a battery starting to balloon, swell up, smoke, and discontinue the charging process immediately.
- **Please use the following diagram as reference to setup the charging station. Failure to do so will cause a fire, which may result in serious personal injury and property damage.**
  - Use a fireproof cement concrete bunker or fireproof material flower pot as the charging container.
  - Put the charging container on a cement concrete floor.
  - The horizontal clearance radius for the charging container should be at least **6** feet.
  - The vertical clearance for the charging container should be at least 10 feet.
  - Cover the charging container with a fireproof material cover
  - Monitor the charging process for the whole time. Do not charge the battery unattended.
  - In case of fire, disconnect from the electrical power source immediately.
  - Do not put any combustible materials near the charging area

Charging/Discharging Safety Setup



Using the battery:

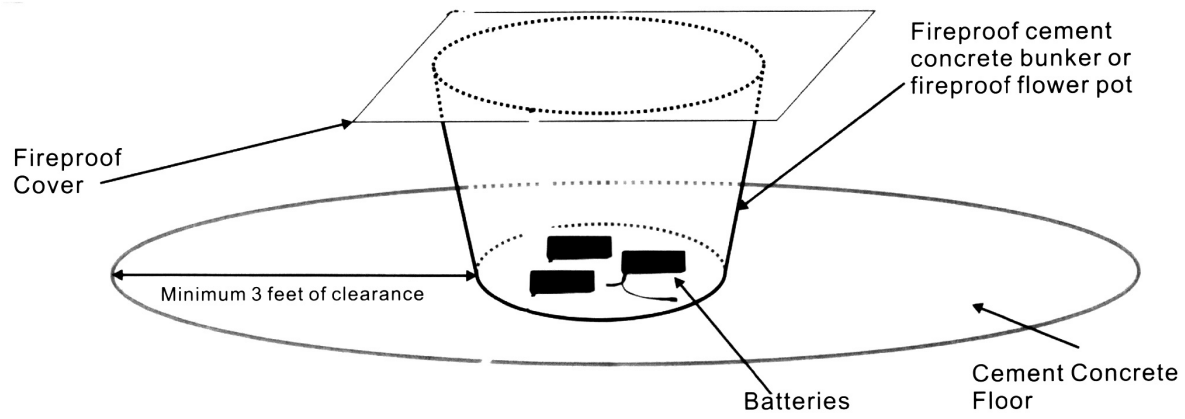
- **Do not use a battery inside house, garage, building, warehouse, or vehicle under any circumstances.**
- Inspect the battery for any damages. Do not use a damaged battery.
- Inspect the battery for swelling. Do not use a swollen battery.
- Inspect the battery for possible battery fluid leaks. Do not use a leaking battery
- Inspect the voltage for each battery cell. If the cell voltage is significantly lower than the normal voltage (3.3v per cell) or voltage the voltage of each cell is significantly different, the battery may be in a defective condition. Do not charge the battery.
- Make sure the wire connection polarity is correct; do not short circuit the battery.
- In the event of a crash due to bad shipment or other reason, you must remove battery for observation and place in a safe open area away from any combustible material for approximately one hour.
- If for any reason you need to cut the terminal wires, it will be necessary to cut each wire separately, ensuring the wires do not touch each other or a short may occur, potentially causing a fire.
- To solder a connector: Be careful not to short the wire lead. If you accidentally cause the battery to short, place it in a safe open space and observe the battery for approximately one hour. A battery may swell or even possibly catch fire after a period of time.
- Never drop the batteries.
- Place battery in protection case to prevent accidental damage.

- In case of emergency, discontinue the process immediately, disconnect the battery, place it in a safe area, and observe it for approximately one hour. This may cause the battery to leak and the reaction with air may cause the chemicals to ignite, resulting in a fire. A safe area should be outside of any building or vehicle and away from any combustible materials. A battery can still ignite even after one hour.

Storing the battery:

- Constantly check the condition of the battery inside the storage container at least once a week. Do not leave the battery unattended for a long period of time.
- Do not put any combustible materials near the storage container.
- Verify the battery is in good condition before storage.
- The storage area should be clean, cool (not exceeding 85 Degrees F), dry, and ventilated. Store battery at room temperature between 40 and 80 degrees F for best results.
- Do not expose battery pack to direct sunlight (heat) for extended periods.
- When transporting or temporarily storing in a vehicle, temperature range should be greater than 20 degrees F but no more than 140 degrees F. Storing battery at temperatures greater than 140 degrees F for extended periods of time (more than 2 hours) may cause damage to battery and possible fire.
- Charge the battery every 2 months to keep it fresh if you don't use it.
- Never store a battery pack inside your car in high temperatures, since high temperatures could cause the battery to ignite a fire.
- **Please use the following diagram as reference to setup the storing station. Failure to do so will cause a fire, which may result in serious personal injury and property damage.**
  - Use a fireproof cement concrete bunker or fireproof material flower pot as the storage container.
  - Put the storage container on a cement concrete floor.
  - The horizontal clearance radius for the storage container should be at least 3 feet.
  - The vertical clearance for the storage container should be at least 10 feet.
  - Cover the storage container with a fireproof material cover.

Storage Safety Setup



Objects in the above diagram are not to scale

Thank you for purchasing the 680 Charger. You get a rapid charger/discharger with a built-in balance, which is computerized with a high performance microprocessor and specialized operating software.

Please read this entire operating manual completely and attentively as it contains a wide variety of specific programming and safety information.

Specifications

Operating voltage range:	DC 10.0—18.0 Volt
Circuit power:	max. 80W for charging max.10W for discharging
Charge/Discharge current range:	0.1—6.0A/0.1—2.0A
Current drain for balancing Li-po:	300mAh/cell
NiCd/NiMH battery cell count:	1—15Cells
Lithium battery cell count:	1—6Series
Pb battery voltage:	2 to 20V

Special features

Optimized operating software

When charging or discharging, it has an “AUTO” function that sets the feeding current automatically. Especially for Lithium batteries, it can prevent the over-charging can lead to an explosion by users fault. Every program in the unit is controlled with mutual links and communication for every possible error so it introduces a maximum safety. These can be set at users option.

Dual input power

It employs the circuit that maximum output power of 50W for charging. As a result, it can charge up to 15

cells of NiCd/NiMH and 6 series of Lithium batteries with maximum current of 5A. But there might be the limit of feeding current to a higher voltage of battery. Please refer to “Maximum circuit power charge”.

Individual voltage balancer for Lithium batteries inside

It has an individual-cell-voltage balancer inside. So it does not need any balancer separately when charging Lithium batteries (LiIon/LiPo/LiFe) for cell voltage balancing.

Balance individual cells on discharge

It also can monitor and balance individual cells of the Lithium battery pack during the discharge process. If the voltage of any one cell varies abnormally, the process will be stopped with the error message.

Accept various types of Lithium battery

It can accept three types of Lithium batteries: LiIon, LiPo and LiFe. They have different characteristics by their chemistry. You can select any one of them that you are going to process before the job. For their specifications, refer to “Warnings and safety notes” section.

Lithium battery “Fast” and “Storage” mode

You can charge Lithium battery for special purposes. “Fast” charge reduces the charging time of Lithium battery and “Storage” mode controls the final voltage of the battery to be suit for long time storage.

Maximum safety

Delta-peak sensitivity: The automatic charge

termination program works on the principle of the Delta-peak voltage detection. (NiCd/NiMH)

Auto-charge current limit: When charging NiCd or NiMH at “AUTO” current mode, you can set the upper limit of charge current to avoid from high current charging. This is very useful when charging the low impedance and small capacity NiMH battery in “AUTO” mode.

Capacity limit: The charging capacity always calculated by multiple of the charging current and time. If the charging capacity exceeds the limit the process will be terminated automatically when you set the maximum value.

Temperature limit: The temperature of the battery on charging will rise by its internal chemical reaction. If you set the limit of temperature the process will be expired forcibly when the limit has reached.

Processing time limit: You can also restrain the maximum process time to prevent from any possible defect.

Input power monitor: To protect the car battery using as DC input power from being damaged the voltage of it always monitored. If it drops below the lower limit the process will be ended automatically.

Data store/load

For users convenience it can store maximum 5 data of different batteries. You can establish the data contains program setting of the battery to charge or discharge continually. These data can be called out at any time you need and the process can be executed without program setting.

Cyclic charging/discharging

Perform 1 to 5 cycles of charge> discharge or discharge> charge continually for battery refreshing and balancing.

PC based analysis using USB communication

For technical expert, it offers PC based program can analysis the characteristic of the battery by USB port. It shows a graph of voltage, current, capacity and temperature curves. It also shows the individual voltage of each cell in the Lithium battery pack.
PC-LINK USB adaptor can be purchased separately.

Warnings and safety notes

Those warnings and safety notes are particularly important. Please follow the instructions for a maximum safety; otherwise the charger and the battery can be damaged violently. And also it can cause a fire to injure a human body or to lose the property.

1.Never leave the charger unsupervised when it is connected to its power supply. If any malfunction is observed immediately terminate the process and refer to the operation manual.

2.Keep away the charger from dust, damp, rain, heat direct sunshine and vibration. Do not drop it.

3.The circuit of this charger is designed to be powered by a 12V DC. But do not supply both input power simultaneously. The circuit can be damaged permanently.

4.This charger and battery to be charged and discharged should be set up on a head-resistant, non-inflammable and non-conductive surface. Never place them on a car seat, carpet or similar.

5.Keep all the inflammable volatile materials well away from operation area.

6.Be sure to understand the information of the battery to be charged or discharged accurately. If the program is set up incorrectly the battery can severely be damaged. Especially Lithium battery can cause a fire or an explosion by over-charging.

NiCd/NiMH voltage level: 1.2V/cell
allowable fast charge current: 1C—2C depends on the performance of cell
discharge voltage cut off level: 0.85V/cell(NiCd), 1.0V/cell(NiMH)

Lilo voltage level: 3.6V/cell
max. charge voltage: 4.1V/cell
allowable fast charge current : 1C or less
min. discharge voltage cut off level: 2.5V/cell or higher

LiPo voltage level: 3.7V/cell
max. charge voltage: 4.2V/cell
allowable fast charge current : 1C or less
min. discharge voltage cut off level: 3.0V/cell or higher

LiFe voltage level: 3.3V/cell
max. charge voltage: 3.6V/cell
allowable fast charge current : 4C or less (e.g.A123M1)
min. discharge voltage cut off level: 2.0V/cell or higher

Pb (Lead-acid) voltage level: 2.0V/cell
max. charge voltage: 2.4V/cell
allowable fast charge current : 0.4C or

less
min. discharge voltage cut off level:
1.75V/cell or higher

7.To avoid short-circuits between the charge lead, always connect the charge cable to the unit first and only then to the battery to be charged or discharged. Reverse the sequence when disconnection.

8.Do not connect more than one battery pack to charge at any one time.

9.Do not attempt to charge or discharge below types of battery:

1)Battery pack, which consists of different types of cell (including different manufacturers).

2)Battery, which is already fully charged or just slightly discharged.

3)Non-rechargeable batteries. (Explosion hazard)

4)Batteries that require a different charge technique from NiCd, NiMH, Lilon, LiPo, LiFe or Pb.

5)Faulty or damaged battery.

6)Battery fitted with an integral charge circuit or a protection circuit.

7)Batteries installed in a device, or which are electrically linked to other components.

8)Batteries that are not expressly stated by the manufacturer to be suitable for the currents the charger delivers during the charge process.

10.Please check below point before charge operation.

1)Select the appropriate program which is suitable for the type of battery.

2)Set up adequate current for charging or discharging.

3)Lithium battery pack can be composed with parallel

and series circuits mixed. You have to check the composition of the battery pack carefully before charging.

4)Be sure all the connections firm and safe, on intermittent contact at any point in the circuit.

General notes on operating it.

Charging

A specific quantity of electrical energy is fed into the battery during charge process. The charge quantity is calculated by multiplying charge current by charge time. The maximum permissible charge current varies according to the battery type or its performance, and can be found in the information provided by the battery manufacturer. It is only allowed to charge batteries at rates higher than the standard charge current if they are expressly stated to be capable of quick-charge.

Connect the battery to charge to output terminal of the charger using suitable charge lead. They are red, positive (+) and black, negative (-). Since the charger cannot detect the difference between the internal resistance of the battery pack, cable resistance and connector transfer resistance, the first requirement if the charger to work properly is that the charge lead should be of adequate conductor cross-section. And also high-quality connectors (normally gold-contact type) must be fitted to both ends.

Refer to the information provided by the battery manufacturer regarding charging methods, and verify the recommended charge current and charge time. Especially for Lithium batteries, you have to follow the charge instruction provided by the manufacturer strictly.

Do not attempt to disassemble the battery pack

arbitrarily.

You have to pay attention to verify the capacity and the voltage of the Lithium battery pack. It may be composed of parallel and series connection mixed. In parallel link the capacity of the battery pack is multiplied by the number of cells but the voltage remains same. That kind of voltage imbalance causes a fire or explosion during charge process. We recommend you compose the Lithium battery pack in series only.

Discharging

The typical purpose of discharge is to determine the residual capacity of the battery, or to lower the voltage of battery to a defined level. When you discharge the battery you also have to pay attention to the process same as charging. To avoid the battery becoming deep-discharged, set the final discharge voltage correctly. Lithium batteries should not be deep-discharged to lower than the minimum voltage, as this leads to a rapid loss of capacity or a total failure. Generally, you do not need to discharge Lithium battery voluntarily.

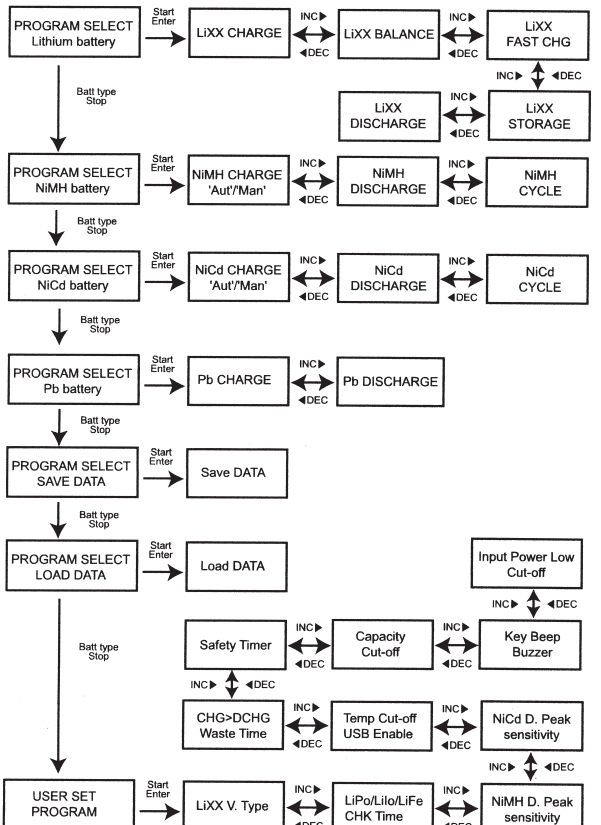
Some rechargeable batteries are said to have a memory effect. If they are partly used and recharged before the whole charge is drawn out, they “remember” this and next time will only use that part of their capacity. This is a “member effect”. NiCd and NiMH batteries are said to suffer from memory effect. They prefer complete cycles; fully charge then use until empty, do not recharge before storage—allow them to self-discharge during storage. NiMH batteries have less memory effect than NiCd.

The Lithium battery prefers a partial rather than a full

discharge. Frequent full discharges should be avoided if possible. Instead, charge the battery more often or use a larger battery.

The brand-new NiCd battery pack is partially useful with its capacity until it has been subjected to 10 or more charge cycles in any case. The cyclic process of charge and discharge will lead to optimize the capacity of battery pack.

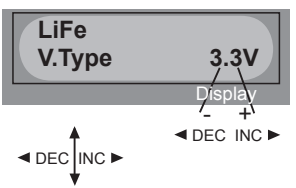
Program flow chart



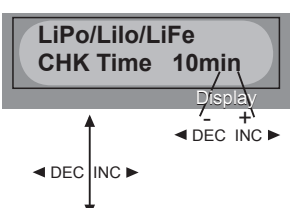
Initial parameter set up (Users set up)

It will be operated with the default value of the essential user settings when it is connected to a 12V battery or a AC wall socket for the first time. The screen displays the following information is sequence and the user can change the value of parameter on each screen.

When you are willing to alter the parameter value in the program, press **Start/Enter** key to make it blink then change the value with **INC/DEC** key. The value will be stored by pressing **Start/Enter** key once.

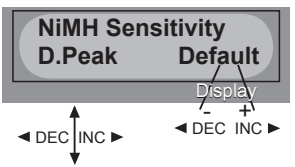


The screen displays the nominal voltage of Lithium battery. There are three kinds of Lithium battery; LiFe(3.3V), LiIo(3.6V) or LiPo(3.7V). this is very important so you have to check the battery carefully and set it up correctly. If it is different from correct value the battery can explode during charge process.

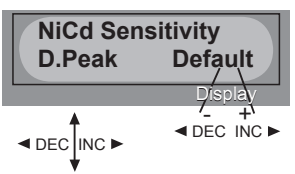


It recognise the cell count of Lithium battery automatically at the beginning of charge or discharge process to avoid from erroneous setting by user. But deeply discharged battery can be

perceived incorrectly. To prevent the error, you can set the time term to verify the cell count by the processor. Normally, 10 minutes are enough to perceive the cell count correctly. For the battery of larger capacity, you may extend the time term. But if you set the time term too long for the battery of smaller capacity, the charge or discharge process can be finished within the time term with the erroneous cell count. This may cause the fatal result. If the processor recognizes the cell count incorrectly at the beginning of charge or discharge process, you may extend the time. Otherwise, you had better use with the default value.



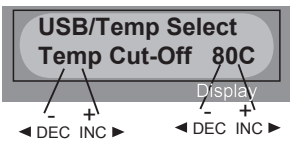
This shows the trigger voltage for automatic charge termination of NiMH and NiCd battery. The effective value ranges from 5 to 20mV per cell. If the trigger voltage is set higher, there is a danger of overcharging the battery; if it is set lower, there is a possibility of premature termination. Please refer the technical specification of the battery.



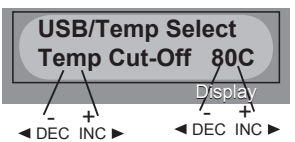
(NiCd default: 12mV, NiMH default: 7mV)

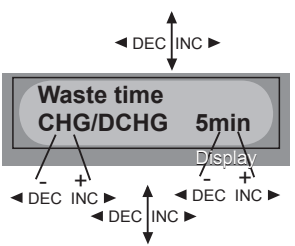
You can select the function of 3-pin port at left side of

the unit.It can be used temperature sensor port or USB port selected at this screen.If the port is assigned as a temp. port,an optional temperature probe contacting the surface of battery can be used.When it is selected as an USB port ,you can link the charger to your PC via an optional USB cable. This can utilize the optional software that can show you the charge process at PC.



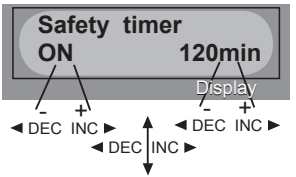
You can set the maximum temperature at which the charger should allow battery to reach during charge. Once a battery reaches this temperature during charge, the process will be terminated to protect the battery.



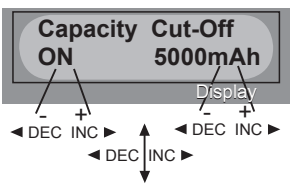


The battery is on the cyclic process of charge and discharge can often become warm after charge or discharge period. The program can insert a time delay to occur after each charge and discharge process to allow the battery adequate time to cool down before being subjected to the next process. The value ranges from 1 to 60 minutes.

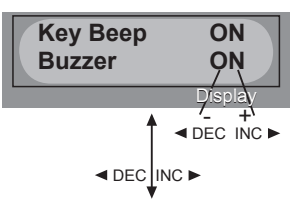
When you start a charge process, the integral safety timer automatically starts running at the same time. This is programmed to prevent overcharge the battery if it proves to be faulty, or if the termination circuit cannot detect the battery full. Please refer the statement in below to calculate the time setting.

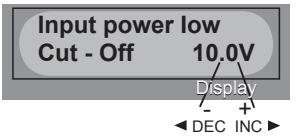


This program sets the maximum charge capacity that will be supplied to the battery during charge. If the delta-peak voltage is not detected nor the safety timer expired by any reason, this feature will automatically stop the process at the selected capacity value.



The beep sounds at every time pressing the buttons to confirm your action. The beep or melody sounded at various times during operation to alert different mode changes. These audible sounds can be on or off.





This program monitors the voltage of input DC battery. If the voltage drops below the value you set the operation forcibly terminated to protect the input battery.

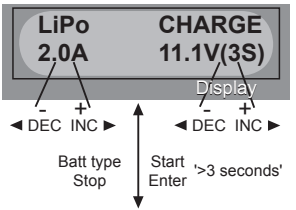
Lithium battery (Lilo/LiPo/Life) program

These programs are only suitable for charging and discharging Lithium batteries with a nominal voltage of 3.3V, 3.6V and 3.7V per cell. These batteries need to adopt different charge technique is termed a constant voltage (CV) and constant current (CC) method. The charge current varies according to the battery capacity and performance. The final voltage of charge process is also very important; it should be precisely matched with the charade voltage of the battery. They are 4.2V for LiPo, 4.1V for Lilo, and 3.6V for LiFe. The charge current and nominal voltage as for cell count set on the charge program must always be correct for the battery to be charged.

When you are willing to alter the parameter value in the program, press **Start/Enter** key to make it blink then change the value with **INC** or **DEC** key. The value will be stored by pressing **Start/Enter** key once.

Charging Lithium battery

The left side of the first line shows the type of battery you select at the users setting. The value on the left side of second line sets a charge current and the value on the right side of second line sets the voltage of the battery

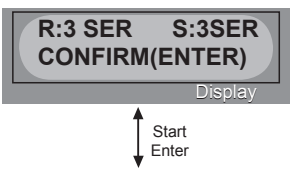


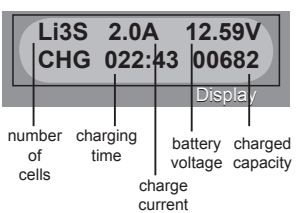
pack.

After setting the current and voltage press **Start/ Enter** key for more than 3 seconds to start the process.

(Charge current: 0.1—5.0A, Voltage: 1—6 series)

This shows the number of cells you set up and the processor detects. “R:” shows the number of cells found by the charger and “S:” is the number of cells selected by you at the previous screen. If both numbers are identical you can start charging by press **Start/ Enter** button. If not, press **Batt type/Stop** button to go back to previous screen. Then carefully check the number of cells of the battery pack to charge again.





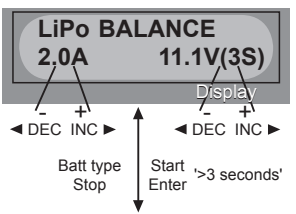
The screen shows the present situation during charge process. To stop charging press **Batt type/Stop** key once.

Charging Lithium battery at balance mode

This is for balancing the voltages of Lithium batteries

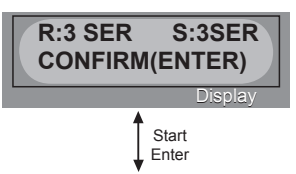
of the battery pack to be charged. To do this, the battery pack being charged should have the individual cell connector. And connect it to the individual port at the right side of charger with a suitable connection cable that fits with your battery pack. And also, you need to connect the battery output plug to the output of charger.

In this mode, the charging process will be different from ordinary charging mode. The internal processor of the charger will monitor the voltages of each cell of the battery pack and controls the charging current that is feeding to each cell to normalize the voltage.



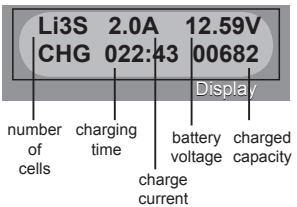
The value on the left side of second line sets a charge current and the value on the right side of second line sets the voltage of the battery pack.

After setting the current and voltage press **Start/Enter** key for more than 3 seconds to start the process.



This shows the number of cells you set up and the processor detects. “R:” shows the number of cells found by the charger and “S:” is the number of cells selected by you at the previous screen. If both numbers are identical you can start charging by press **Start/Enter** button. If not,

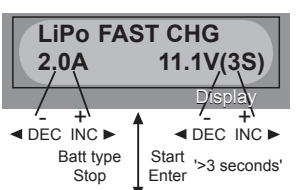
press **Batt type/Stop** button to go back to previous screen. Then carefully check the number of cells of the battery pack to charge again.



The screen shows the present situation during charge process. To stop charging press **Batt type/Stop** key once.

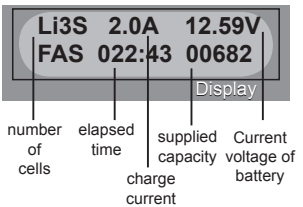
"FAST" charging Lithium battery

The charging current is getting smaller as the process goes to the near end term of Lithium battery charging. To finish charging process earlier, this program eliminate certain term of CV process. Actually, the charging current will goes to **1/5** from the initial value to end the process while the normal charging goes to **1/10** during CV term. The charging capacity may be a bit smaller than normal charging but the process time will be reduced.



You can set up the charging current and the voltage of the battery pack being charged. As you press **Start/Enter** button the voltage

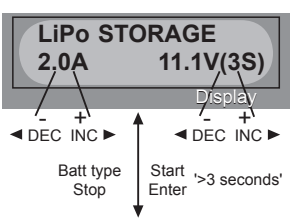
confirmation will be displayed. And then, if you confirm the voltage and current, press **Start/Enter** button again to start charging.



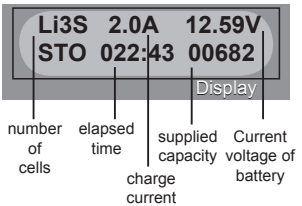
This shows the present state of “FAST” charging. To stop charging arbitrary, press **Batt type/Stop** key once.

“STORAGE” control Lithium battery

This is for charging or discharging Lithium battery not to be used for the time being. The program will determine to charge or discharge the battery to the certain voltage depending on the voltage of the battery at its initial stage. They are different from the type of the battery, 3.75V for Lilo, 3.85V for LiPo and 3.3V for LiFe per cell. If the voltage of battery at its initial stage is over the voltage level to storage, the program will start to discharge.



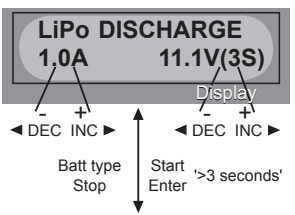
You can set up the current and the voltage of the battery pack to be charged. The current will be used for charge or discharge the battery to reach the “storage” level of voltage.



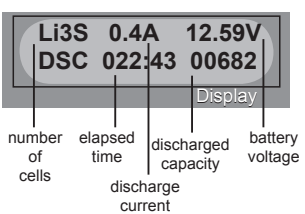
The screen shows the present situation during charge process. To stop charging press **Batt type/Stop** key once.

Discharging Lithium battery

The value of discharge current on the left side of screen may not exceed 1C for a maximum safety and the final voltage on the right should not be under the voltage level that is recommended by the battery manufacturer to avoid deep discharging.



To start to discharge press **Start/Enter** key for more than 3 seconds.

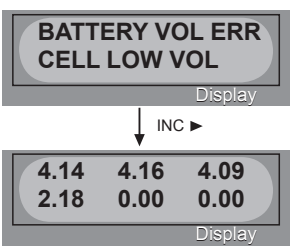


This shows the present state of discharge. To stop discharging press **Batt type/Stop** key once.

Voltage balancing and monitoring during the discharge

The processor monitors the voltage of individual cells during “storage-mode” and “discharge” of Lithium battery pack. It tries to normalize the voltages to be equal. For this feature, the individual plug of the battery pack should be connected to the individual port of the charger.

If the voltage of any one or more cells varies abnormally during the procedure, it terminates the process forcibly with the error message. If this happens, the battery pack contains the bad cell, or the bad connection of the cable or plug. You can easily know which one cell is bad by pressing INC button at time of showing the error message.



The processor found that the voltage of one of the cell in the Lithium battery pack is too low.

In this case, the 4th cell is bad. If there happens the connection-break of the cable or plug, the voltage value may show zero.

NiMH/NiCd battery program

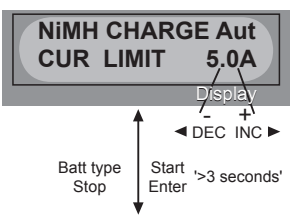
These programs are for charging or discharging NiMH (Nickel-Metal-Hydride) or NiCd (Nickel-Cadmium) battery commonly used for **R/C** models applications. To alter

the value at the display, press **Start/Enter** key to make it blink then change the value using **INC** or **DEC** key. The value will be stored by pressing **Start/Enter** key once.

To start the process, press **Start/Enter** button for more than 3 seconds.

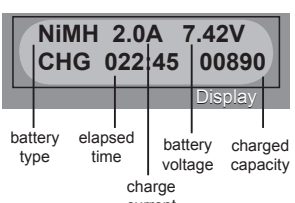
Charging NiCd/NiMH battery

This program simply charges the battery using the current you set. In “Aut” mode, you need to set the upper limit of charge current to avoid from higher feeding current that may damage the battery. Because some batteries of low impedance and small capacity can lead to the higher charge current by the processor at automatic charge mode. But in “Man” mode, it will charge the battery with the charge current you set at the display. Each mode can be switched by pressing **INC** and **DEC** button simultaneously when the current field is blinking.



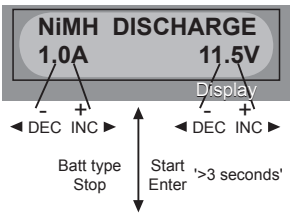
The screen displays the current state of charging. To stop the process, press **Batt type/Stop** key once.

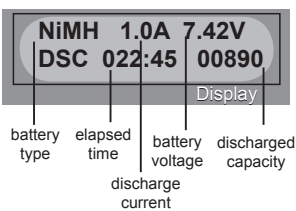
The audible sound indicates you the end of process.



Discharging NiCd/NiMH battery

Set discharge current on the left and final voltage on the right. The discharge current ranges from 0.1 to 1.0A and the final voltage ranges from 0.1 to 25.0V. To start the process, press **Start/Enter** key for more than 3 seconds.



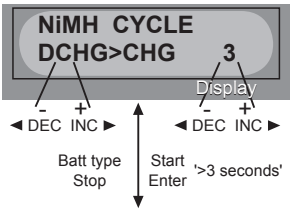


The screen displays the current state of discharge. You can alter the discharge current by pressing Start/Enter key during the process. Once you change the current value, store it by pressing **Start/Enter** button again.

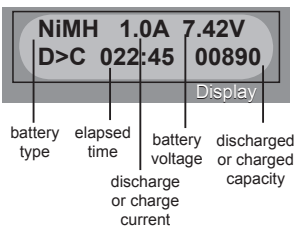
To stop discharging press **Batt type Stop** key once. The audible sound indicates you at the end of process.

Charge-to-discharge & discharge-to-charge cycle NiMH/NiCd battery

Set the sequence on the left and the number of cycle on the right. You can use this function for balancing, refreshing and break-in the battery. To avoid rising temperature of the battery, there will a brief cool-off period that already fixed at “User setting” after each

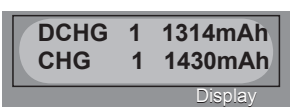


charge and discharge process. The cycling number ranges from 1 to 5.



To stop the process, press **Batt type/Stop** key once.

You can change the discharge or charge current by pressing **Start/Enter** key once during the process. The audible sound indicates you the end of process.



At the end of the process, you can see charged or discharged electric capacities of the battery at each cyclic process.

By pressing **INC** or **DEC** button, the screen shows the result of each cycle in order.

Pb (lead-sulphuric acid) battery program

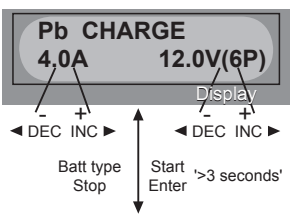
This is programmed for charging Pb (lead-acid) battery with nominal voltage from 2 to 20V. Pb batteries are totally different from NiCd or NiMH batteries. They can only deliver relatively lower current compare to their capacity, and similar restrictions definitely apply

to charge. So the optimal charge current will be 1/10 of the capacity. Pb batteries must not be charged rapidly. Always follow the instruction is supplied by the manufacturer of battery.

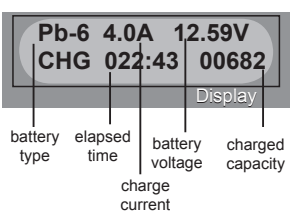
When you are willing to alter the parameter value in the program, press **Start/Enter** key to make it blink then change the value with **INC** or **DEC** key. The value will be stored by pressing **Start/Enter** key once.

Charging Pb battery

Set up the charge current on the left and the nominal voltage of the battery on the right. The charge current ranges from 0.1 to 5.0A and the voltage should be matched with the battery being charged.



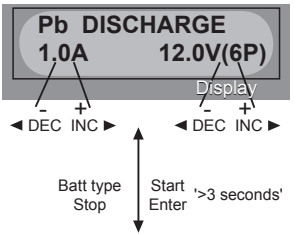
Start the charge process by pressing **Start/Enter** key for more than 3 seconds.



The screen displays the state of charging process. To stop charging forcibly, press **Batt type/Stop** key once.

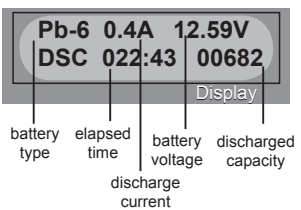
The audible sound indicates you at the end of process.

Discharging Pb battery



Set discharge current on the left and final voltage on the right. The discharge current ranges from 0.1 to 1.0A.

To start the process, press **Start/Enter** key for more than 3 seconds.



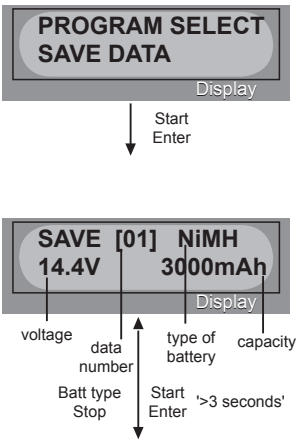
The screen displays the current state of discharge. You can alter the discharge current by pressing **Start/Enter** key during the process. Once you change the current value, store it by pressing **Start/Enter** button again.

To stop discharging press **Batt type/Stop** key once. The audible sound indicates you at the end of process.

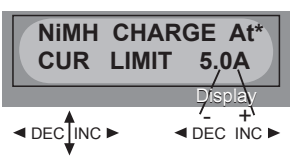
Save Data program

It has a data storage and load program for your convenience. This feature can store up to 5 battery data by number that represent the individual specification of batteries you are using. They can be called back for the process of charging or discharging without setting up the program again. To set up the parameter value in

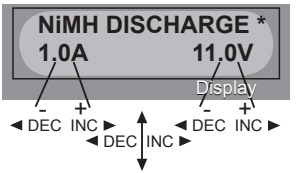
the program, press Start/Enter key to make it blink then change the value with **INC or DEC** key.



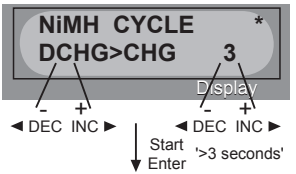
The parameter value setting up in this screen dose not affect charge or discharge process. They only represent the specification of the battery. The following screens will automatically be displayed exactly matched with the battery type you set up. The example shows the battery pack of NiMH, 12 cells and 3000mAh of capacity.



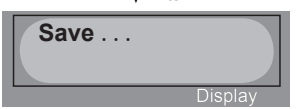
Set up the charge current for manual charge mode, or the current limit for automatic charge mode. Each mode can be switched by pressing **INC and DEC** button at the same time when the current field is blinking.



Setting up discharge current and final voltage.



Setting up the sequence of charge and discharge, and the cycling number.

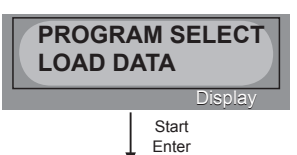


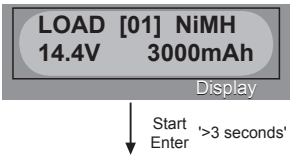
Saving the data.

Load Data program

This program calls back the data that was stored at “Save Data” program.

To load the data, press **Start/Enter** key once to blink the data number field and select the number using **INC or DEC** key then press **Start/Enter** key for more than 3 seconds.





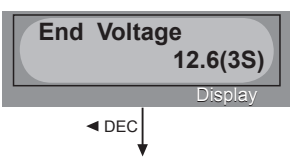
Select the data number to be called back.

The data matched with the number will be displayed at this time.

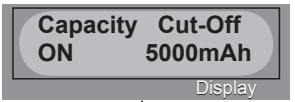
Loading the data.

Various information during the process

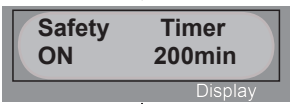
You can inquire various information on LCD screen during charging or discharging process. When you press DEC button the charger shows the establishment of user settings. And also you can monitor the voltage of individual cell by pressing INC button when the individual connection cable is linked to the Lithium battery being processed.



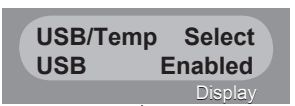
The final voltage will be reached at the end of process.



◄ DEC

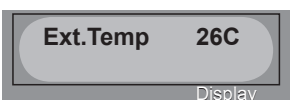


◄ DEC



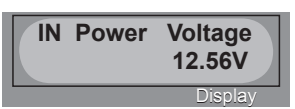
The 3-pin port is assigned as an USBport.

◄ DEC



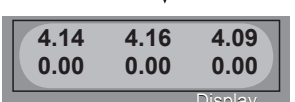
The external temperature only will be displayed when using the thermal probe.

◄ DEC



The present voltage of input power.

◄ DEC



Using the individual connection cable to the battery, you can check the

individual voltages of each cell in the battery pack. When connect the cable to the port on the right side of the charger the program shows the voltage of each cells for maximum 6 cells in sequence. To utilize this feature, the battery pack must have output connector that linked to each cells.

Warning and error messages

It incorporates various functions of protective and monitoring system to verify functions and the state of its electronics. In any case of occurring error, the screen displays the cause of error that is self-explanatory with audible sound.

The output is connected to a battery with incorrect polarity.

This will be displayed in case of detecting an interruption of the connection between battery and output or voluntarily disconnecting the charge lead during the operation of charge or discharge on output.

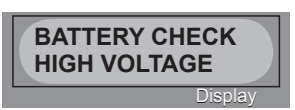
There was a short-circuit at OUTPUT. Please check the charging leads.

The voltage of input power lowers the limit.

The voltage of Lithium battery pack was selected incorrectly. Verify the voltage of battery pack carefully.

There happens malfunction at the charger circuit by any reason.

The processor detects the voltage is lower than you set at Lithium program. Please check the cell count of the cell one by one.



The processor detects the voltage is higher than you set at Lithium program. Please check the cell count of the cell one by one.

The voltage of one of the cell in the Lithium battery pack is too low. Please check the voltage of the cell one by one.

The voltage of one of the cell in the Lithium battery pack is too high. Please check the voltage of the cell one by one.

There are bad connection at the individual connector. Please check the connector and cables carefully.

The internal temperature of the unit goes too high. Cool down the unit.

The processor can not continue to control the feeding current by any reason. The unit needs to be repaired.

Glossary of terms

Amps(A): The unit of measure for charge or discharge electric current. The program of the charger will show most of the current in amps(A) at its LCD screen.

Milli-amps(mA) : The electric current, being amps(A) multiplied by 1000 and noted as “mA”. So 2.0A is the same as 2000mA (2.0*1000). Or, to convert mA to amps, divide the mA number by 1000. So 200mA is the same as 0.2A. If a current value is below 1.0A, the LCD screen

of the charger will still show the current in amps, not milli-amps. For example, a current of 600mA will be displayed as 0.6A, and a current of 100mA will actually be shown as 0.1A.

Capacity, milli-amp hours (mAh), and amp-hours (Ah): Charge energy stored by a battery is called capacity, which is defined as how much current a battery can supply constantly over one hour of time. Most hobby batteries are rated for capacity in “mAh” or milliamp hours. A 650mAh battery can deliver 650mA of current for one hour (650mA*1hr=650mAh). The batteries of very large capacity, such as lead-acid(Pb) batteries, are usually rated in “Ah” or amp-hours. A “12V 60Ah” car battery can deliver 60 amps of current for one hour (60Ax*1hr=60Ah).

Nominal voltage(V) : The nominal voltage of the battery pack can be determined as follows :

- NiCd or NiMH: multiply the total number of cells in the pack by 1.2. A 8-cell pack will have a nominal voltage of 9.6 volts (8*1.2).
- LiPo: multiply the total number of cells in the pack by 3.6. A 3-cell Lilo wired in series will have a nominal voltage of 11.1 volts (3*3.7).
- Lilo: multiply the total number of cells in the pack by 3.6. A 2-cell Lilo wired in series will have a nominal voltage of 11.1 volts (3*3.6).
- LiFe: multiply the total number of cells in the pack by 3.3. A 4-cell Lilo wired in series will have a nominal voltage of 11.1 volts (4*3.3).

If the nominal voltage of the battery is not printed on the battery’s label, consult your battery manufacturer or

supplier. Do not guess the rated voltage of battery.

"C"-rating: Capacity is also referred to as the "C" rating. Some battery suppliers recommend charge and discharge currents based on the battery "C" rating. A battery's "1C" current is the same number as the battery's rated capacity number, but noted in mA or amps. A 600mAh battery has a 1C current value of 600mA, and a 3C current value of (3*600mA) 1800mA or 1.8A. The 1C current value for a 3200mAh battery would be 3200mA(3.2A).

Maximum circuit power chart

For the voltage of battery is more than 10V, the actual amount of charge current delivered to the battery might automatically be limited so not to exceed the charger's maximum rated charging power of 50 watts. And also, for the battery having more than 5V, the discharge current delivered to the battery might be limited by the maximum rated discharge power of 5 watts. The actual feeding current will be as follow;

Individual cell connection diagram(pin-assignment of 7-pin)