SIGMA EQ evo

50W

LiPo/LiFe/LiIon:	**1 - 6S**
NiMH/NiCd:	**1 - 16S**
Pb:	**2 - 20V**
Charge Power:	**50W**
Charge Rate:	**0.1A - 5A**

Ripmax

Operating Manual

PLEASE READ THIS
OPERATING MANUAL COMPLETELY
AND CAREFULLY AS IT CONTAINS
A WIDE VARIETY OF SPECIFIC PROGRAMMING
AND SAFETY INFORMATION.
THE SELECTION OF THE CORRECT OPERATING
PARAMETERS IS THE RESPONSIBILITY OF THE
USER. KEEP THIS MANUAL IN A SAFE PLACE, AND
BE SURE TO PASS IT ON TO THE NEW OWNER IF
YOU EVER SELL YOUR SIGMA EQ EVO.

CONTENTS

FOREWORD

Thank you purchasing the Sigma EQ Evo balance charger. This product is a rapid charger with a high performance microprocessor and specialised operating software. Please read this entire operating manual completely and carefully before using this product. It covers a wide range of information on operating and safety. Please use this product in the company of a specialist if you are unsure of any aspect of its use.

Specifications

Operating voltage range:	DC 11.0~18.0 Volt
	AC 100~240 Volt
Circuit power:	Max.charge power 50W [DC Input]
	50W [AC Input]
Charge current range:	0.1~5.0A
Current drain for balancing Li-po:	460mA/cell
NiCd/NiMH battery cell count:	1~16 cell
Li-ion/Li-Fe/Li-Po cell count:	1~6 series
Pb battery voltage:	2V~20V
Weight:	590g (Net Weight)
Dimensions:	180x145x57mm

SPECIAL FEATURES

Optimised operating software

Sigma EQ Evo features an AUTO function that sets the feeding current during the process of charging. For Lithium batteries, it can help prevent overcharging, which may lead to an explosion due to user error. It can disconnect the circuit automatically and alarm when detecting any malfunction. All the programs in this product are controlled through two way links and communication, to achieve maximum safety and minimize problems. Many settings can be configured by the user.

Internal independent lithium battery balancer

The Sigma EQ Evo employs an individual-cell-voltage balancer. It isn't necessary to connect an external balancer for balance charging.

Adaptable to various type of lithium battery

Sigma EQ Evo is adaptable to various types of Lithium battery, such as Li-ion, Li-Po, Li-HV and the new Li-Fe series of batteries.

Fast charge mode for lithium batteries

Needs to charge Lithium batteries can vary. The "fast" charging function reduces the duration of charging, but can reduce battery life.

Maximum safety

Delta-peak sensitivity (NiCd & NiMH): The automatic charge termination program based on the principle of Delta-peak voltage detection. When the battery's voltage exceeds the limit, the process will be terminated automatically.

Automatic charging current limit

You can set the upper limit for the charging current when charging your NiCd or NiMH battery; It is useful for NiMH batteries of low impedance and capacity in the "AUTO" charging mode.

Capacity limit

The charging capacity is always calculated as the charging current multiplied by time. If the charging capacity exceeds the limit, the process will be terminated automatically. You can set the maximum value.

*Temperature threshold**

The battery's internal chemical reaction can cause the temperature of the battery to rise. If the temperature limit is reached, the process will be terminated. *This function is available by connecting an optional temperature probe, which is not included as standard.
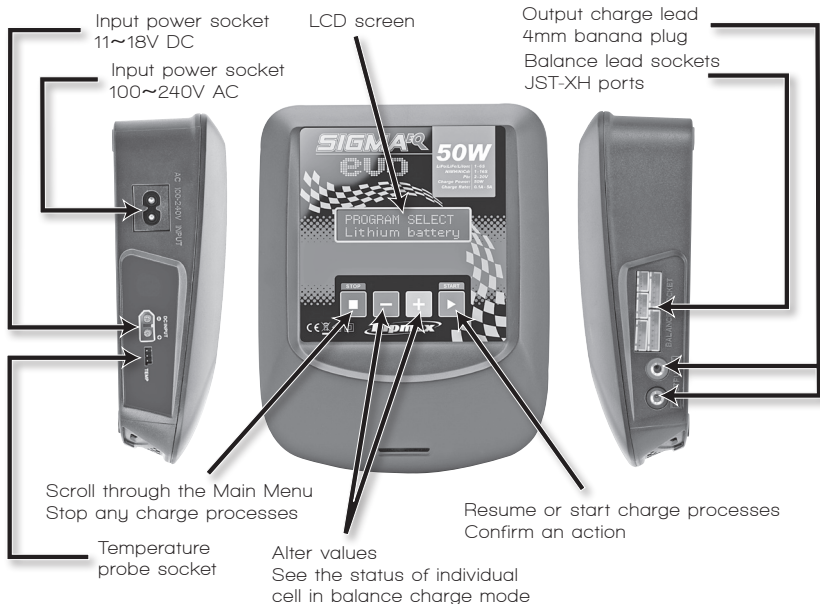
Processing time limit:

You can limit the maximum, total process time to avoid any possible unwanted damage to the battery if detecting errors is unusual.

Input power monitoring

To protect a car battery used as DC input power from being damaged, the voltage is constantly monitored. If it drops below the lower limit, the process will be ended automatically.

CHARGER LAYOUT

Input power socket 11~18V DC

Input power socket 100~240V AC

LCD screen

Output charge lead 4mm banana plug

Balance lead sockets JST-XH ports

PROGRAM SELECT
Lithium battery

Scroll through the Main Menu
Stop any charge processes

Temperature probe socket

Alter values
See the status of individual cell in balance charge mode

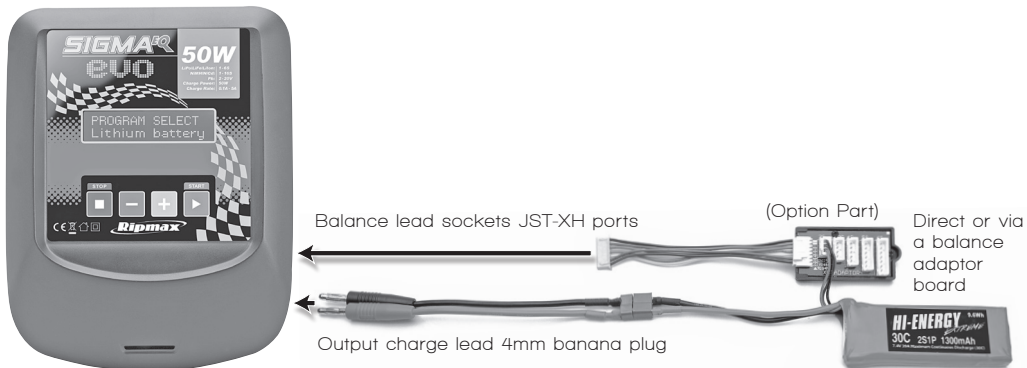Resume or start charge processes
Confirm an action

LITHIUM POLYMER BALANCE CHARGE PROGRAM CONNECTION DIAGRAM

This diagram shows the correct way to connect your battery to the Sigma EQ Evo charger whilst charging in the balance charge program mode only.

⚠ WARNING:
Failure to connect as shown in this diagram will damage this charger.

Balance lead sockets JST-XH ports

(Option Part)

Direct or via a balance adaptor board

Output charge lead 4mm banana plug

The main battery leads must be connected along with the balance lead connector as shown, before charging your battery.

⚠ *WARNING AND SAFETY NOTES*

These warnings and safety notes are particularly important. Please follow the instructions for maximum safety or the charger and the battery can, at best, be damaged, or at worst, cause a fire.

❗ Never leave the charger unattended when it is connected to its power supply. If any malfunction is found, TERMINATE THE PROCESS AT ONCE and refer to this manual.

❗ Keep the charger well away from dust, damp, rain, heat, direct sunshine and vibration. Never drop it.

❗ The allowable input voltage is 11-18V DC or 100-240V AC but not both at the same time.

❗ This charger and the battery should be put on a heat-resistant, non-flammable and non-conductive surface. Never place them on a car seat, carpet or similar. Keep all flammable and volatile materials away from operating area.

❗ Make sure that you know the specifications of the battery to be charged to ensure that it meets the requirements of this charger. If the program is set up incorrectly, the battery and charger may be damaged. It can also cause a fire or explosion due to over charging. The warranty is not valid for any damage or subsequent damage arising as a result of a misuse or failure to observe the procedures outlined in this manual. Always charge in well ventilated areas.

❗ Battery type limits NOTE: IC = 1 X Capacity in Amps, so 2200mAh is 2.2A.

NiCd/NiMH Voltage level:1.2V/cell - Allowable fast charge current:1C-2C (depends on the performance of the cells).

Li-ion Voltage level:3.6V/cell Max.charge voltage:4.1V/cell - Fast charge current: 1C or less.

Li-Po Voltage level:3.7V/cell Max. charge voltage: 4.2V/cell - Allowable fast charge current: 1C or less recommended. Consult the battery manufacturer for higher.

Li-Fe Voltage level:3.3V/cell Max. charge voltage:3.6V/cell - Fast charge current: 1C or less. Consult battery manufacturer for higher.

Li-HV Voltage level:3.85V/cell Max.charge voltage: 4.35V/cell - Allowable fast charge current: 1C or less Consult the battery manufacturer for higher.

Pb Voltage level:2.0V/cell (Lead-acid) Max. charge voltage: 2.46V/cell - Allowable fast charge current: 0.2C or less.

⚠ *To avoid a short circuit between the charge leads, always connect the charge cable to the charger first, then connect the power source.*
Reverse the sequence when disconnecting.

⚠ *Do not connect more than one battery pack to this charger at any one time.*

⚠ *Never attempt to charge the following types of batteries.*

A battery pack which consists of different types of cells (including different manufacturers).

Non-rechargeable batteries (Explosion hazard).

Batteries that require a different charge technique from NiCd, NiMh, Li-ion, Li-Fe, Li-HV, LiPo or Gel cell (Pb, Lead acid).

A faulty or damaged battery.

A battery fitted with an integral charge circuit or a protection circuit.

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

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

⚠ *Please bear in mind the following points before commencing charging:*

Did you select the appropriate program suitable for the type of battery you are charging?

Did you set up appropriate current for charging?

Have you checked the battery voltage? Lithium battery packs can be wired in parallel and in series, i.e. a 2 cell pack can be 3.7V (in parallel) or 7.4V (in series).

Have you checked that all connections are firm and secure? Make sure there are no intermittent contacts at any point in the circuit.

⚠ *Charging.*

During the charge process,a specific quantity of electrical energy is fed into the battery. The charge quantity is calculated by multiplying charge current by charge time. The maximum permissible charge current varies depending on the battery type or its performance and can be found in the information from the battery manufacturer. Only batteries that are expressly stated to be capable of quick-charge should to be charged at rates higher than the standard charge current.

Connecting the battery to the output socket of the charger: Red is positive and black is negative.
Due to the difference between resistance of different cables and connectors, the charger may be unable to detect the correct resistance of the battery pack. The essential requirement for the charger to work properly is that the charge lead should be of adequate conductor cross-section, and high quality connectors (which are normally gold-plated) should be fitted to both ends.

Always refer to the manual from the battery manufacturer pertaining to charging methods, recommended charging current and charging time. Lithium batteries should be charged according the charging instruction provided by the manufacturer only.

Attention should be paid to the connection of Lithium battery in particular.

Do not attempt to disassemble a battery pack arbitrarily.

Please note that Lithium battery packs can be wired in parallel and in series. In parallel connection, the battery's capacity is calculated by doubling a single cell's capacity. They stay the same as a series wired pack. It is recommended to only charge series wired packs.

⚠ *Program flow chart.*
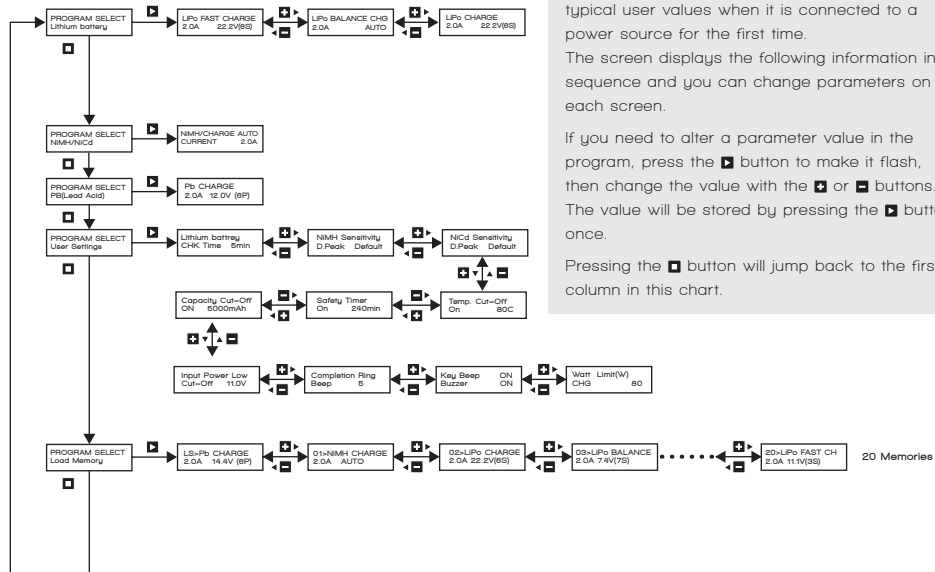
As a default setting, this charger will be set to typical user values when it is connected to a power source for the first time.
The screen displays the following information in sequence and you can change parameters on each screen.

If you need to alter a parameter value in the program, press the ▶ button to make it flash, then change the value with the ➕ or ➖ buttons. The value will be stored by pressing the ▶ button once.

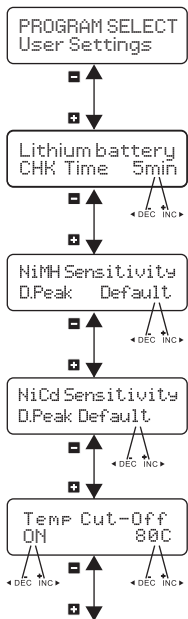Pressing the ◀ button will jump back to the first column in this chart.


```
PROGRAM SELECT        LiPo FAST CHARGE     LiPo BALANCE CHG     LiPo CHARGE
Lithium battery       2.0A    22.2V(6S)    2.0A       AUTO      2.0A    22.2V(6S)

PROGRAM SELECT        NiMH/CHARGE AUTO
NiMH/NiCd             CURRENT      2.0A

PROGRAM SELECT        Pb CHARGE
PB(Lead Acid)         2.0A    12.0V (6P)

PROGRAM SELECT        Lithium battery      NiMH Sensitivity     NiCd Sensitivity
User Settings         CHK Time   5min      D.Peak   Default     D.Peak   Default

Capacity Cut-Off      Safety Timer         Temp. Cut-Off
ON     5000mAh        On       240min      On         80C

Input Power Low       Completion Ring      Key Beep    ON       Watt  Limit(W)
Cut-Off    11.0V      Beep        5        Buzzer      ON       CHG          80

PROGRAM SELECT        LS>Pb CHARGE         01>NiMH CHARGE       02>LiPo CHARGE     03>LiPo BALANCE              20>LiPo FAST CH
Load Memory           2.0A    14.4V (6P)   2.0A      AUTO       2.0A    22.2V(6S)  2.0A    7.4V(7S)    ......   2.0A   11.1V(3S)   20 Memories
```
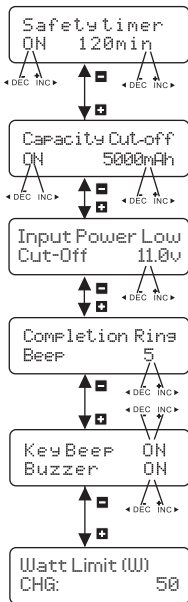
12

```
PROGRAM SELECT
User Settings
```

To avoid an erroneous setting by the user, the charger will automatically detect the cell count of a Lithium battery at the beginning of the charge process. To prevent an over discharged battery from being detected incorrectly, resulting in an error, you can set a time limit for the processor to verify the cell count. The default setting is 5 minutes which is typically enough time to properly detect the cell count. For batteries of a larger capacity, you may extend the time, and for the batteries of a smaller capacity, you may reduce the time or use with the default value.

```
Lithium battery
CHK Time    5min
        ◄DEC  INC►
```

This setting is for NiMH batteries only. This screen allows you to set the delta peak detect settings between 5mV and 25mV per cell. The default is set at 10mV, suiting most applications.

```
NiMH Sensitivity
D.Peak   Default
        ◄DEC  INC►
```

This setting is for NiCd batteries only. This screen allows you to set the delta peak detect settings between 5mV and 25mV per cell. The default is set at 10mV, suiting most applications.

```
NiCd Sensitivity
D.Peak Default
        ◄DEC  INC►
```

The screen shows the cut-off temperature of a battery. You can press "the ▬ button" or "the ▬ button" to select the cut-off temperature (Temp. Range: 0~90°C). The maximum temperature of the battery can be set during the charge process. The process will be terminated automatically to protect battery once the temperature of battery reaches this value. This feature is accomplished through a temperature probe (optional).

```
Temp Cut-Off
ON          80C
◄DEC  INC►  ◄DEC  INC►
```

```
Safety timer
ON    120min
◄DEC INC►      ◄DEC INC►
```

When the charge process starts, the integrated safety timer starts to run simultaneously. If an error is detected or the termination circuit can not detect weather the battery is fully charged or not, this function is programmed to prevent extreme overcharging. Please refer to the statement below to calculate the timer you set.

```
Capacity Cut-off
ON    5000mAh
◄DEC INC►      ◄DEC INC►
```

The program provides, a maximum capacity protection function. If the Delta-peak voltage can not be detected or the safety timer does not time out, the charge process will stop automatically, when the battery reaches the user-set maximum charge capacity.

```
Input Power Low
Cut-Off    11.0v
          ◄DEC INC►
```

This function monitors the voltage of the DC input battery used to power this charger. If the voltage is lower than the set value, the program will end forcibly to protect the input battery.

```
Completion Ring
Beep        5
          ◄DEC INC►
```

This setting sets the amount of beeps the charger speaker plays when the selected charge function completes.

```
          ◄DEC INC►
Key Beep    ON
Buzzer      ON
          ◄DEC INC►
```

The beep is to confirm user operation every time a button is pressed.
The beep or melody sounds at various times during operation to confirm different mode changes. This function can be switched on or off.

```
Watt Limit (W)
CHG:        50
```

You can set a Watt limit for the charge rate between 30W and 50W.

Safe timer Calculation

When charging NiCd or NiMH batteries , divide the capacity by, the current,then divide the result by 11.9, set this number of minutes as the value for the safety timer setting . If the charger stopped at this time limit, about 140% of the capacity will have been fed into the battery.

For example:

Capacity	Current	Safety Time
2000mAh	2.0A	(2000/2.0=1000)/11.9=84 minutes
3300mAh	3.0A	(3300/3.0=1000)/11.9=92 minutes
1000mAh	1.2A	(1000/1.2=833)/11.9=70 minutes

Lithium (LiIo/LiPo/LiFe/LiHV) program

The program is only suitable for charging Lithium batteries with a nominal voltage of 3.3/ 3.6/3.7 / 3.85V/cell.
Different batteries have different charge techniques. There are two linked processes termed as constant voltage and constant current.
The charge current varies according to battery capacity and specification.
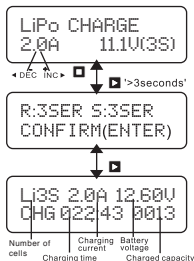The final voltage individual cell is very important.
It should precisely match the voltage of the battery type: LiPo is 4.2V, LiIo is 4.1V, LiFe is 3.6V, LiHV is 4.35V.
The charge current and total voltage of the battery should be correctly set.
The final voltage is not adjustable and is set at safe value already.
When you want to change the values of parameters, please press the ▶ button to make it flash and then use the ➕ or ➖ button to change the value.
Then press the ▶ button again to store the value.

```
LiPo CHARGE
2.0A      11.1V(3S)
◄ DEC  INC ►  ■   ■ '>3seconds'
```

```
R:3SER S:3SER
CONFIRM(ENTER)
      ▼ ■
```

```
Li3S 2.0A 12.60V
CHG 022:43 0013
```
Number of cells / Charging time / Charging current / Battery voltage / Charged capacity

Charging of Lithium battery without balancing cells

The left side of the first line shows the type of battery you chose. The value on the left of the second line of the charger is current set. After setting the current and voltage, press the ■ button for more than 3 seconds to start the process. This then displays the number of cells you set up and the processor detects. "R" shows the number of cells detected by the charger and "S" is the number of cells set by you at the previous screen. If both numbers are identical you can start charging by pressing the ■ button.

If not, press the ■ button to go back to previous screen and carefully check the number of cells in the battery pack before going ahead.

This screen shows the real-time status during the charge process.
Press the ■ button once to stop the charge process.
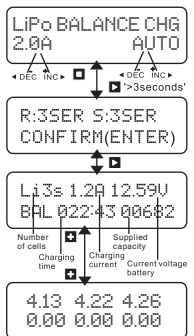
Charging Lithium batteries in the cell balance mode

This function is for balancing the voltage of Lithium-polymer battery cells while charging.
In the balance mode, the battery needs to have a balance lead connected to the appropriate individual port on the right side of the charger. You need to connect the battery's output plugs to the 4mm output sockets of charger also. Charging in this mode is different from the normal modes, because the built-in processor monitors voltage of individual cells and controls input current fed into each cell to 'balance' the voltages.

```
LiPo BALANCE CHG
2.0A        AUTO
◄ DEC  INC ►  ■   ■ '>3seconds'
```

The value on the left side of the second line sets the charge current. The value on the right side of the second line sets the battery pack's voltage. After setting current and voltage, press the ■ button for more than 3 seconds to start the process.

```
R:3SER S:3SER
CONFIRM(ENTER)
      ▼ ■
```

```
Li3s 1.2A 12.59V
BAL 022:43 00682
```
Number of cells / Charging time / Charging current / Supplied capacity / Current voltage battery
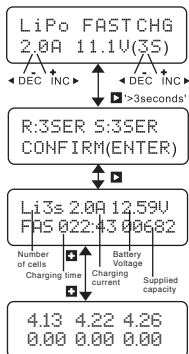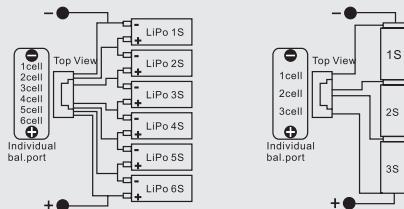
This displays the number of cells you set up and the processor detects. "R" shows the number of cells detected by the charger and "S" is the number of cells set by you at the previous screen. If both numbers are identical you can start charging by pressing the ■ button. If not, press the ■ button to go back to the previous screen and carefully check the number of cells in the battery pack before going ahead.

```
4.13 4.22 4.26
0.00 0.00 0.00
```

This screen shows the real-time status during the charge process.
Press the ■ button once to stop the charge process.

Individual Cell Connection Diagram

Pin-assignment of 4-pin and 7-pin JST-XH balance connector


```
LiPo FASTCHG
2.0A 11.1V(3S)
◄ - DEC INC + ►    ◄ - DEC INC + ►
        ▲ ▼  ▶ '>3seconds'
R:3SER S:3SER
CONFIRM(ENTER)
        ▲ ▼  ▶
Li3s 2.0A 12.59V
FAS 022:43 00682
```
Number of cells
Charging time
Charging current
Battery Voltage
Supplied capacity

```
4.13  4.22  4.26
0.00  0.00  0.00
```

### Fast Charging a Lithium battery

When charging lithium batteries in the fast mode the charging current will become lower towards the end of charging cycle. When the current is down to 1/5 of the current you set during the CV term, it will stop the process and eliminate the forcible requirement of the balance precision (Whether it is been connected to the balance port or not). In the fast mode the charging capacity is slightly lower than in normal charge mode, but the charging time is reduced.

You can set up the charging current and voltage of the battery pack.
Press the ▶ button to display voltage confirmation.
Then press the ▶ button again to confirm and begin charging.

This screen shows the real-time status of "fast charging". Press the ▶ button once to stop the charge process.

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Voltage balancing and monitoring

The processor monitors the voltage of each cell when the battery packs are in the charge process. If the voltage of any cell is abnormal, the Sigma EQ Evo will show an error message and terminate the program. If there is battery damage or disconnection, you can see the error message and press the ■ button to know which cell is damaged.

```
BATTERY VOL ERR
CELL LOW VOL
```
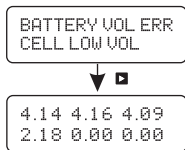
The processor detects that the voltage of one cell is too low.

▼ ■

```
4.14 4.16 4.09
2.18 0.00 0.00
```

The 4th cell was damaged. Note: The value of a voltage may be zero if disconnection occurs.

Charging of NiCd/NiMH battery

```
NiMH CHARGE AUTO
CURRENT   1.0A
```

◄ DEC – + INC ►

■ >3seconds
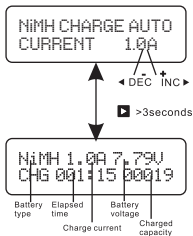
This program is for charging and discharging of NiCd/NiMH batteries associated with R/C model applications. You can press the ■ button to make the parameter flash and then the ■ or the ■ button to change the parameter value. Press the ■ button to store the value and move onto the next parameter.
Only the battery type and current can be adjusted

```
NiMH 1.0A 7.79V
CHG 001:15 00019
```

Battery type   Elapsed time   Charge current   Battery voltage   Charged capacity

The screen shows the real-time status. Press the ■ button to end the program. A sound will be emitted to indicate the end of program.

Pb (lead-sulphuric acid) battery program

This program is only suitable for charging a Pb (lead-acid) batteries with nominal voltage from 2 to 20V. A Pb (lead-acid) battery is completely different to a NiCd / NiMH battery. These batteries can only deliver current lower in comparison to their capacity. The same restriction applies to the charging process.

Consequently, the optimum charge current can only be 1/10 of the capacity. A Pb battery can not be fast-charged. Please follow the instructions provided by the battery manufacturer. You can press the ▣ button to make it flash and alter the value of the parameters using ▣ or the ▣ buttons, press the ▣ button to store the value.

Charging of a Pb battery

```
Pb CHARGE
4.0A  12.0V(6P)
```
◂DEC INC▸   ◂DEC INC▸
Bat.Type
Stop
▣
>3seconds
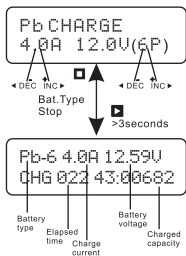
Set up the charge current on the left and the nominal voltage on the right.
The range of current is 0.1- 5.0A, and the voltage should match the battery being charged.
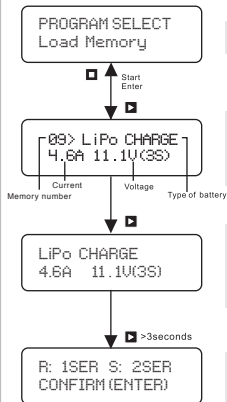Press the ▣ button for more than 3 seconds to start charging.

```
Pb-6 4.0A 12.59V
CHG 022 43:00682
```
Battery type
Elapsed time
Charge current
Battery voltage
Charged capacity

This screen displays the real-time charging status.
Press the ▣ button to end the program.

Note: Only charge PB batteries in a well ventilated area.

Data memory program

For your convenience the Sigma EQ Evo has a data memory function. It automatically stores 20 operational data sets, so you can call back the data when charging.

PROGRAM SELECT
Load Memory

Select "Load Memory" from the main menu, then press the ▶ button.

◻ ▲ Start Enter
▼ ▶

┌─09> LiPo CHARGE─┐
 4.6A 11.1V(3S)

Memory number | Current | Voltage | Type of battery

Press the ◻ or the ▬ buttons to cycle through the saved profiles.
There are memory slots from 1 through to 20, plus "LS", which automatically saves the last charging profile used.

▼ ▶

LiPo CHARGE
4.6A 11.1V(3S)

Press the ▶ button to customize the saved profile.
Here you can use the ▶ button to rotate between different settings.
Press the ◻/▬ buttons to change them, then press the ▶ button again to save.

▼ ▶ >3seconds

R: 1SER S: 2SER
CONFIRM(ENTER)

Once the setup is complete, you can either press and hold the ▶ button to run the profile, or you can simply press the ◻ button to save the profile and exit.

Various Information in the program
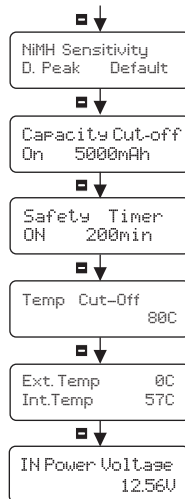
LiLO/LiPo/LiFe/LiHV
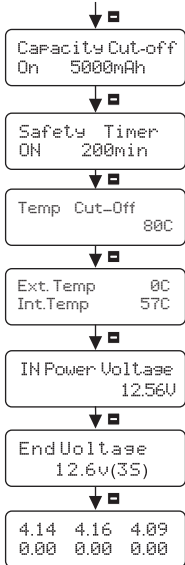
You can inquire about various information on the LCD screen during the charging process. Press the ▬ button, the charger will display user's setting. You can press the ➕ button to monitor the voltage of each cell while the battery is connected to the balance port of the charger.

```
Capacity Cut-off
On    5000mAh
```

It shows the displayed final voltage when the program ends.

```
Safety  Timer
ON     200min
```

```
Temp Cut-Off
              80C
```

The battery is connected to a port through a balance cable. You can check voltage of each cell in the battery pack.
When the cable is connected to a port on the right SIDE of the charger, the program will display voltage of up to 6 cells.
The battery pack needs an output connector connected with each cell via the balance port.

NiMH/NiCd

```
NiMH Sensitivity
D. Peak    Default
```

```
Ext. Temp     0C
Int.Temp     57C
```

```
Capacity Cut-off
On    5000mAh
```

```
IN Power Voltage
            12.56V
```

The external temperature is displayed when the optional temperature probe is used. (Sold separately)

```
Safety  Timer
ON     200min
```

```
End Voltage
   12.6v(3S)
```

```
Temp Cut-Off
              80C
```

```
4.14  4.16  4.09
0.00  0.00  0.00
```

```
Ext. Temp     0C
Int.Temp     57C
```

```
IN Power Voltage
            12.56V
```

Warning and error information

The Sigma EQ Evo incorporates a variety of functions for the systems to verify processes and the state of the electronics. In case of an error the screen will display the cause of error and emit an audible sound.

REVERSE POLARITY	Incorrect polarity connected.
CONNECTION BREAK	Battery connection is interrupted.
SHORT ERR	Short-circuit of the output terminals.
INPUT VOL ERR	The DC input battery has too low voltage.
VOL SELECT ERR	The voltage of the battery pack has been selected incorrectly!
BREAK DOWN	The charger has malfunctioned. Seek professional advice.
BATTERY CHECK LOW VOLTAGE	The voltage is lower than the value set. Please check the number of cells in the battery pack.
BATTERY CHECK HIGH VOLTAGE	The voltage is higher than the value set. Please check the number of cells in the battery pack.

Warning and service

We warrant this product for a period of one year (12 months) from the date of purchase. This guarantee applies to materials or operational defects, which are present at the time of purchasing the product. During that period we will repair or replace, without service charge, any product deemed defective due to those causes.

You will be required to present proof of purchase (invoice or receipt). This warranty does not cover the damage due to wear, overloading, incorrect handling or use of incorrect accessories.

This warranty does not affect your statutory rights.

ϵ Sigma EQ EVO

This product complies with the essential requirements of all appropriate EU directives. A copy of the declaration of conformity can be obtained from Ripmax Ltd, www.ripmax.com

Instruction for disposal of WEEE by users in the European Union

Electrical equipment marked with the crossed wheelie bin symbol must not be discarded in the standard household waste. Instead, it should be taken to a suitable specialist disposal location or your dealer.

Manufactured for: Ripmax Ltd., 241 Green Street, Enfield. EN3 7SJ. United Kingdom

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