

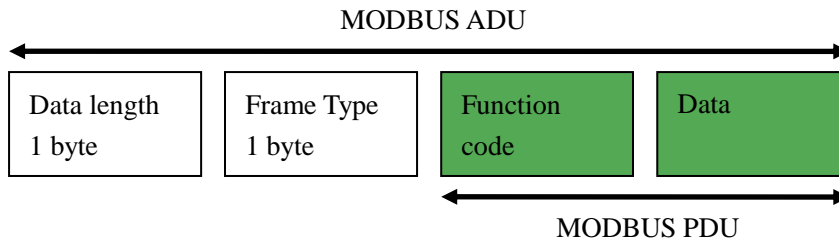
iCharger X/S MODBUS Protocol (V2.0)

Supports two hardware connection: USB, adopting MODBUS bus protocol. Click <http://www.modbus.org/> for more information.

General description:

The iChargeX adopts packet length of 64 bytes HID protocol transmission when connecting USB, and on this basis, we have developed a MODBUS-HID protocol:

MODBUS-HID Frame Structure:



Data length: the total length of the MODBUS HID ADU is less than or equal to 64, so that the function codes 0x03, 0x04 a frame can read continuously register number is ≤ 30 ; function code 0x10 a frame can write continuously register number is ≤ 28 .

Frame Type: MODBUS HID fixed to 0x30. (Compatible with of LogView the frame type uses the 0x10, 0x11, 0x20, and not be elaborated here)

Function code and Data: the MODBUS PDU data, see details on the MODBUS protocol description

iCharge X only implements the Modbus 0x03, 0x04, 0x10 function code

HID Modbus Demo Code (VC2005) Download: <http://www.hillrc.com/UploadFiles/DemoJunsimodbusHID.zip>

iCharger X Address Map:

Function code(0x04) Read-only area	0x0000—0x00ff	Device only reads message
	0x0100—0x01ff	Channel 1 only reads message
	0x0200—0x7fff	Reservation
Read and write area Function code(0x03)--read code(0x10)--write	0x8000—0x83ff	Control register
	0x8400—0x7fff	System storage area
	0x8800—0xbfff	Memory Index storage area
	0x8c00—0x9000	Memory storage area

The detailed use of address for each area is related with the models.

The register of X6 is as below

Device only reads message (base address: 0x0000)

Address Offset	Name	Data type	Remark
0	Device ID	U16	
1-6	Device SN	S8[12]	
7	Software version	U16	
8	Hardware version	U16	
9	SYSTEM length	U16	
10	MEMORY length	U16	
11	Status word	U16	Bit0-run flag Bit1-error flag Bit2-control status flag Bit3-run status flag Bit4-dialog box status flag Bit5-cell voltage flag Bit6-balance flag

Input read-only (base address: 0x0100)

Address Offset	Name	Data type	Remark
0-1	Timestamp	U32	
2-3	The current output power	U32	
4	The current output current	S16	
5	The current input voltage	U16	
6	The current output voltage	U16	
7-8	The current output capacity	S32	
9	The current internal temperature	S16	
10	The current external temperature	S16	
11-26	Cell 0-15 voltage	U16	X6,S6 only uses 11—16; X8 only uses 11—18; X12 only uses 11—22
27-34	Cells 0-15 balance status	U8	X6,S6 only uses 27—29; X8 only uses 27—30 X12 only uses 27—32
35-50	Cell 0-15 internal resistance	U16	X6 ,S6 only uses 35—40; X8 only uses 35—42 X12 only uses 35—46
51	The cells' total internal resistance	U16	
52	Line internal resistance	U16	
53	Cycles count	U16	
54	Control status	U16	
55	Run status	U16	

56	Run error	U16	
57	Dialog box ID	U16	
57-87	Cell 0-15 capacity	S32	X6,S6 only uses 57—67; X8 only uses 57—71; X12 only uses 57—75;

Control register (base address: 0x8000)

Address Offset	Name	Data type	Remark
0	Select to run operations	U16	Values 0—Charge;1—Storage; 2—Discharge; 3—Cycle; 4—Only Balance;5—Power
1	Select MEMORY	U16	Values 0--31
2	Select CHANNEL	U16	Values must = 0
3	Order lock	U16	0x55aa Unlock
4	Order	U16	See enum ORDER
5	Limit current	U16	
6	Limit voltage	U16	

Order register:

Send an order to order register should first unlock order lock, and write **0X55AA** to the order lock register to unlock, write any other values to lock.

Command value	Name	Remark
0	ORDER_STOP	Stop running the selected channel charge/discharge procedures
1	ORDER_RUN	Run the selected channel & MEMORY & PROGRAM
2	ORDER_MODIFY	Modify the limited current and voltage parameters when running
3	ORDER_WRITE_SYS,	Save System data in the RAM to flash memory
4	ORDER_WRITE_MEM_HEAD	Save MemHead data in the RAM to the flash memory
5	ORDER_WRITE_MEM	Save Memory data in the RAM to the flash memory
6	ORDER_TRANS_LOG_ON	Open Log transmission, this data is used for "Logview" software
7	ORDER_TRANS_LOG_OFF	Close Log transmission
8	ORDER_MSGBOX_YES	Dialog box to respond to <YES>
9	ORDER_MSGBOX_NO	Dialog box to respond to <NO>

System Storage area (base address: 0x8400)

Address Offset	Name	Data type	Remark
0	System parameters	SYSTEM	0 To ((sizeof(SYSTEM)+1)/2-1)

Reading register is read from the flash memory of the device iCharger X, and refresh at the same time the mirror in RAM; writing register is write changes to the mirror in RAM. Write the mirror to the flash memory of the device must through the ORDER_WRITE_SYS order.

```
#define INPUT_SOURCE_MAX 4
```

```
typedef __packed struct _INPUT
```

```
{
```

```
    u16 InputLowVolt;           // input low voltage protection (P7-1)
    s16 InputCurrentLimit;     // input current maximum limit (P7-2)
    u16 ChargePower;           //Charger power(P7-3)
    u16 RegEnable;              //Regenerative enable(P7-4)
    u16 RegVoltLimit;          //Regenerative voltage limit(P7-5)
    s16 RegCurrentLimit;       //Regenerative current limit(P7-6)
    u16 RegPowerLimit;         //Regenerative power limit(P7-7)
    u32 RegCapLimit;           ///Regenerative cap limit(P7-8)
```

```
}INPUT;
```

```
typedef __packed struct _SYSTEM
```

```
{
```

```
    u16 TempUnit;              //Temperature unit (P1-1)
    u16 TempStop;              //Cut-off temperature(P1-2)
    u16 TempFansOn;           //Fans on temperature(P1-4)
    u16 TempReduce;           //Power reduce temperature(P1-3)
    u16 FansOffDelay;         //Fans off delay (P1-5)
    u16 LcdContraste;         //LCD contrast (P2-2)
    u16 LightValue;           //backlight value(P2-1)
    u16 BeepType[4];          //Beep type long beep, short beep, continuous beep (P3-3)
    u16 BeepEnable[4];        //Beep enable (P3-1)
    u16 BeepVOL[4];           //Beep volume (P3-2)
    u16 SelectLanguage;       //Language =0:english =1:german(P4-1)
    u16 SelectAdj;            //The current calibration(P5-1)
    u16 Ver;                   // System Version, only read
    u16 SelInputSource;        //select input source 0-3(P6-1)
    INPUT InputSource[INPUT_SOURCE_MAX]; //0-3 Input sources (P7 details see INPUT)
    u16 DischargePower         //Discharge Power(P6-2)
    u16 MonitorLogInterval;    //Sampling interval 0.1S as an unit(P8-1)
    u16 MonitorLogSaveToSD;    //0:do not output log to SD =1:output log to SD(P8-2)
    u16 ServoType;            //Servo type (P9-1)
    u16 ServoUserCenter;       //servo pulse center (P9-2)
    u16 ServoUserRate;         //servo frame refresh rate (P9-3)
    u16 ServoUserOpAngle;     //45 degrees pulse width (P9-4)
    u16 Dump[12];             // Reservation
```

```
}SYSTEM;
```

Address Offset	Name	Data type	Remark
0	Temperature unit	U16	= 0: degrees Celsius = 1: Fahrenheit
1	Cut-off temperature	U16	65.0—80.0 (default 75.0)
2	Fans on temperature	U16	30.0—50.0(default 40.0)
3	Power reduce temperature	U16	5.0—20.0(default 10.0)
4	Fans off delay	U16	0—10min(default 2min)
5	LCD contrast	U16	0—32(default 16)
6	Backlight value	U16	0—32(default 16)
7-10	Beep type	U16[4]	
11-14	Beep enable	U16[4]	
15-18	Beep volume	U16[4]	
19	Select language	U16	0:english 1:german (default:0)
20	The current calibration value	U16	=0:system calibration value (default) =1:user calibration value
21	System parameter version	U16	Only read
22	Select input source	U16	0--3
23-31 Input source 0	Input low voltage protection	U16	X6: 7-31V(default:7V) X8:9-48V (default:9V)
	Input current maximum limit	U16	1-35A(default:35A)
	Charger power	U16	X6:5-800W(default:800W) X8:5-1100W(default:1100W)
	Regenerative enable	U16	=0:Disable =1:enable (default:0)
	Regenerative voltage limit	U16	X6:7-31V
	Regenerative current limit	U16	1-35A(default:10A)
	Regenerative power limit	U16	X6:5-800W(default:800W) X8:5-1100W(default:1100W)
	Regenerative cap limit	U32	0 and 100--999900mAh(default: 0=Ignore)
32-40 Input source 1	the same as above		
41-49 Input source 2	the same as above		
50-59 Input source 3	the same as above		
60	Discharge power	U16	X6:5—30(default 30) X8:5—50(default 50)
61	Monitor sampling interval	U16	5—600(default 10) 0.1S as an unit
62	Allow Log output	U16	0:do not output log to SD 1:output log to SD
63	Servo type	U16	=0:1500us analog servo(default) =1:1500us digital servo

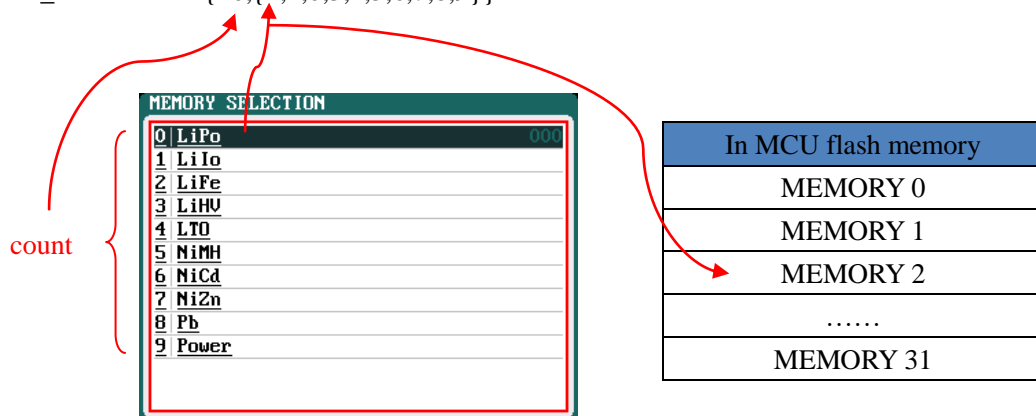
			=2:760us digital servo =3:user -defined
64	Servo pulse center	U16	7000—16000(default15000)
65	servo frame refresh rate	U16	40—700(default1 50)
66	45 degrees pulse width	U16	1000—10000(default1 5000)
67-78	Dump[12]	U16	Reservation

Memory Index Storage Area (base address: 0x8800)

```
#define LIST_MEM_MAX      32
typedef __packed struct MEM_HEAD
{
    u16 Count; //0—LIST_MEM_MAX
    u8 Index[LIST_MEM_MAX]; //0xff-- empty 0xfe--hidden 0-LIST_MEM_MAX
}MEM_HEAD;
#define MEM_HEAD_DEFAULT {10,{0,1,2,3,4,5,6,7,8,9}}
```

For example:

MEM_HEAD = {10,{2,1,0,3,4,5,6,7,8,9}}



Address Offset	Name	Data type	Remark
0	Memory head information	MEM_HEAD	0 TO ((sizeof(MEM_HEAD)+1)/2-1)

Reading register is read from the flash memory of the device iCharger X, and refresh at the same time the mirror in RAM; writing register is write changes to the mirror in RAM. Write the mirror to the flash memory of the device must through the ORDER_WRITE_MEM_HEAD order.

Memory storage area (base address: 0x8c00)

Address Offset	Name	Data type	Remark
0	Memory information	MEMORY	0 TO ((sizeof(MEMORY)+1)/2-1)

Reading register is read from the flash memory of the device iCharger X, and refresh at the same time the mirror in RAM; writing register is write changes to the mirror in RAM. Write the mirror to the flash memory of the device must through the ORDER_WRITE_MEM order.

```
#define MEM_NAME_LEN 37
typedef __packed struct MEMORY
```

```

{
u16 UseFlag; //Use flag 0xffff—EMPTY 0x55aa—USED 0x0000—FIXED
s8 Name[MEM_NAME_LEN+1]; // Program name (M1_1)
u32 Capacity; // Nominal capacity (M1_4)
u8 AutoSave; // The program runs automatically saved(M2_1)
u8 LiBalEndMode; //Li -battery balance end current mode(M8_1)
u8 Dump1[7]; // Reservation
u16 OpEnable; //Enable module or not, represents with bit0-15 respectively
//Charge(bit0) ,Storage(bit2) ,Discharge(bit3) ,Cycle(bit4) ,OnlyBalance(bit5)
// (M6_5) (M10_5) (M11_4) (M12_4) (M15_1)

u8 ChannelMode; // Reservation
u8 SaveToSD; // =0:do not output log to SD =1:output log to SD (M2_5)
u16 LogInterval; //sampling interval 0.1S as an unit (M2_3)
u16 RunCounter; //run counter (M2_2)

u8 Type; //Bat. Type: 0-LiPo, 1-LiLo, 2-LiFe, 3-LiHV, 4-LTO, 5-NiMH, 6- Nicd
// 7-NiZn, 8-Pb, 9-Power, 10-User (M1_2)

u8 LiCell; //Li-battery number of cells (M1_3)
u8 NiCell; //Ni-battery number of cells (M1_3)
u8 PbCell; //Pb-battery number of cells (M1_3)

u8 LiModeC; //Charge mode (M6_2)
u8 LiModeD; //Discharge mode(M14_1)
u8 NiModeC; //Charge mode: Normal,REFLEX (M19_2)
u8 NiModeD; //Discharge mode: Reservation
u8 PbModeC; //Charge mode: (M16_2)
u8 PbModeD; //Discharge mode: Reservation

u8 BalSpeed; //Balance speed: 0--slow 1--normal 2--fast (M6_2)
u8 BalStartMode; //Balance start mode (M7_1)
u16 BalStartVolt; //Balance start voltage Reservation
u8 BalDiff; // Balanced stop accuracy (mV) (M7_2)
u8 BalOverPoint; //Balance over point(M7_4)
u8 BalSetPoint; //The minimum voltage difference and set point when balance charge terminates
//for example: 4.2Vcharges LiPo,BalSetPoint=5, then stops at 4.195V
//(M7_3)

u8 BalDelay; //Balance delay end time(M7_5)

u8 KeepChargeEnable; //keep charging(M9_4)

u16 LiPoChgCellVolt; //LiPo cell charge voltage (M6_4)
u16 LiLoChgCellVolt; //LiLo cell charge voltage (M6_4)
u16 LiFeChgCellVolt; //LiFe cell charge voltage (M6_4)

```

u16 LiPoStoCellVolt; //LiPo cell storage voltage([M11_1](#))
u16 LiLoStoCellVolt; //LiLo cell storage voltage([M11_1](#))
u16 LiFeStoCellVolt; //LiFe cell storage voltage([M11_1](#))

u16 LiPoDchgCellVolt; //LiPo cell discharge end voltage([M10_2](#))
u16 LiLoDchgCellVolt; //LiLo cell discharge end voltage([M10_2](#))
u16 LiFeDchgCellVolt; //LiFe cell discharge end voltage([M10_2](#))

u16 ChargeCurrent; // Set charge current([M6_1](#))
u16 DischargeCurrent; //Set discharge current([M10_1](#))

u16 EndCharge; //Charge end current([M6_3](#))
u16 EndDischarge; //Discharge end current([M10_3](#))
u16 RegDchgMode; // Discharge mode([M10_4](#))

u16 NiPeak; // Ni-battery sensitive voltage([M18_1](#))
u16 NiPeakDelay; // deltaV check delay([M18_2](#))

u16 NiTrickleEnable; //Enable trickle charge([M18_3](#))
u16 NiTrickleCurrent; //Trickle charge current([M18_4](#))
u16 NiTrickleTime; // Trickle charge([M18_5](#))

u16 NiZeroEnable; // Ni charging 0 voltage allowed ([M18_6](#))

u16 NiDischargeVolt; //Ni discharge voltage ([M20_2](#))
u16 PbChgCellVolt; //Pb cell charge voltage ([M16_4](#))
u16 PbDchgCellVolt; //Pb cell discharge voltage ([M17_2](#))
u16 PbFloatEnable; //Pb cell float enable **Reservation**
u16 PbFloatCellVolt; //Pb cell float voltage **Reservation**

u16 RestoreVolt; //Low voltage restore voltage ([M3_1](#)) ([M9_1](#))
u16 RestoreTime; // Low voltage restore time ([M3_2](#)) ([M9_2](#))
u16 RestoreCurent; // Low voltage restore current ([M3_3](#)) ([M9_3](#))

u16 CycleCount; //Cycle count([M12_2](#))
u16 CycleDelay; //Cycle interval([M12_3](#))
u8 CycleMode; //Cycle mode([M12_1](#))

u16 SafetyTimeC; //Safety time ([M4_3](#))
u16 SafetyCapC; //Safety capacity%([M4_2](#))
u16 SafetyTempC; //Safety temperature([M4_1](#))
u16 SafetyTimeD; //Safety time([M5_3](#))
u16 SafetyCapD; //Safety capacity%([M5_2](#))


```

u16 SafetyTempD;           // Safety temperature(M5\_1)

u8 RegChMode;             //Channel regenerative mode Reservation
u16 RegChVolt;           // Channel regenerative limited voltage Reservation
u16 RegChCurrent;        // Channel regenerative limited current Reservation

u8 FastSto;              //Li-battery fast storage (M11\_3)
u16 StoCompensation;     //Storage compensation voltage(M11\_2)

u16 NiZnChgCellVolt;     // NiZn cell charge voltage (M6\_4)
u16 NiZnDchgCellVolt;   // NiZn cell discharge end voltage(M10\_2)
u8 NiZnCell;            // NiZn-battery number of cells(M1\_3)

u16 LiHVChgCellVolt;    //LIHV cell charge voltage(M6\_4)
u16 LiHVStoCellVolt;    //LIHV cell storage voltage(M11\_1)
u16 LiHVDchgCellVolt;   //LIHV cell discharge end voltage(M10\_2)

u16 LTOChgCellVolt;     // LTO cell charge voltage(M6\_4)
u16 LTOSToCellVolt;     // LTO cell storage voltage(M11\_1)
u16 LTODchgCellVolt;    // LTO cell discharge end voltage(M10\_2)

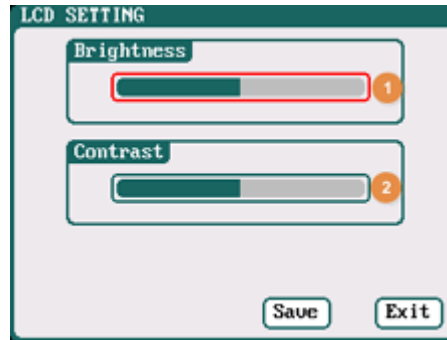
u16 UserChgCellVolt;    // User cell charge voltage(M6\_4)
u16 UserStoCellVolt;    // User cell storage voltage(M11\_1)
u16 UserDchgCellVolt;   // User cell discharge end voltage(M10\_2)
u8 UserCell;           // User battery number of cells(M1\_3)

u16 DigitPowerVolt;     // Output Voltage of Digital Power Supply (M13\_2)
s16 DigitPowerCurrent; // Limited Current of Digital Power Supply(M13\_3)
u16 DigitPowerSet;     // Digital Power Settings:bit0-LOCK,bit1-Auto start,bit2-Live update(M13\_3)
u8 Dump;               // Reservation
}MEMORY;

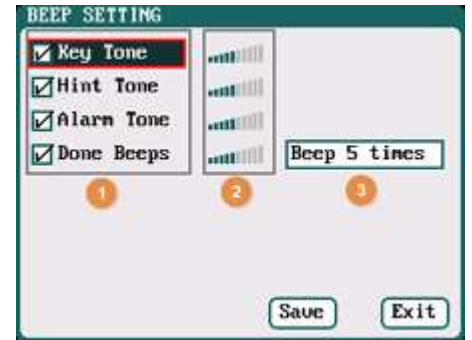
```



P1



P2



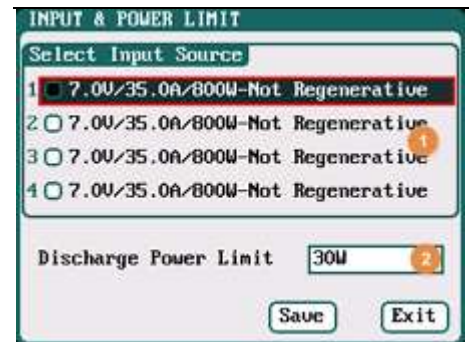
P3



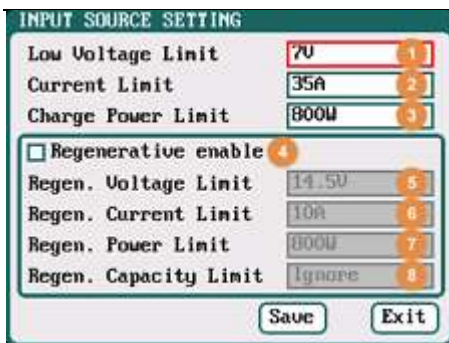
P4



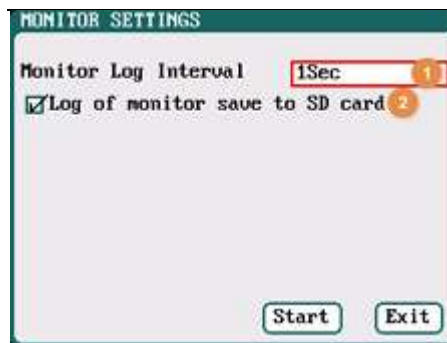
P5



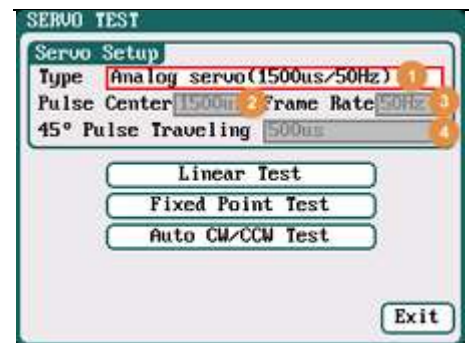
P6



P7



P8



P9

MEMORY(OO) SETUP

LiPo 2A 1

Program Type **LiPo** 2

Storage Cells **Auto** 3

Discharge Capacity **Ignore** 4

Cycle Balance Only

Option Exit Save

M1

MEMORY OPTION

Auto save before the program runs 1

Run Counter **0** 2

Log Interval **1Sec** 3

Continue logging after completion 4

Log save to SD card 5

Back

M2

PB ADVANCED SETUP

Low voltage restore setup

Restore Lowest Voltage **1V/Cell** 1

Restore Charge Time **3Min** 2

Restore Charge Current **0.1A** 3

Back

M3

CHARGE SAFETY SETUP

Cut-Temp. **45°C/113°F** 1

Max Capacity **120%** 2

Safety Timer **Off** 3

Back

M4

DISCHARGE SAFETY SETUP

Cut-Temp. **45°C/113°F** 1

Max Capacity **90%** 2

Safety Timer **Off** 3

Back

M5

LIPO CHARGE SETUP

Chg Current **2A** 1

Chg Mode **Normal Bala** 2 (Set...)

Chg End Current **10%** 3 (Set...)

Chg Cell Volt **4.2V/Cell** 4

Show 5 Advanced Safety Back

M6

LIPO CHARGE BALANCE SETUP

Balance Start **CV - 0.2V** 1

Balance Diff **5mV** 2

Balance Set Point **5mV** 3

Balance Over Charge **0mV** 4

Balance Done Delay **1Min** 5

Back

M7

LIPO BALANCE CHARGE END SETUP

End Current OFF, Detect Balance ON 1

End Current ON, Detect Balance OFF

End Current OR Detect Balance

End Current AND Detect Balance

Back

M8

LIPO ADVANCED SETUP

Low voltage restore setup

Restore Lowest Voltage **1V/Cell** 1

Restore Charge Time **3Min** 2

Restore Charge Current **0.1A** 3

Keep charging after t 4 done Back

M9

LIPO DISCHARGE SETUP

Discharge Current **2A** 1

Discharge Voltage **3.5V/Cell** 2

End Current **50%** 3

Regenerative Mode **Off** 4

Show 5 Advanced Safety Back

M10

LIPO STORAGE SETUP

Storage Cell Voltage **3.85V/Cell** 1

Storage Compensation **0.01V/Cell** 2

Accelerated storage 3

Show 4 Back

M11

LIPO CYCLE SETUP

Cycle Mode **CHG->DCHG** 1

Cycle Count **3** 2

Delay Time **3Min** 3

Show 4 Back

M12

MEMORY(OO) SETUP

Power (5V/15A)

Option Type **Power** 1

Lock 4 Voltage **5V** 2

Auto start Current **15A** 3

Live update

Option Exit Save

M13

LIPO DISCHARGE ADVANCED SETUP

Extra Discharge Enable 1

Balance Enable

Back

M14

LIPO ONLY BALANCE SETUP

Show 1 Back

M15

PB CHARGE SETUP

Chg Current **2A** 1

Chg Mode **Normal** 2

Chg End Current **10%** 3

Chg Cell Volt **2.4V/Cell** 4

Show 5 Advanced Safety Back

M16

PB DISCHARGE SETUP

Discharge Current **2A** 1

Discharge Voltage **1.8V/Cell** 2

End Current **50%** 3

Regenerative Mode **Off** 4

Show 5 Safety Back

M17

NIMH CHARGE OPTION SETUP

-dV Detection

Sensitivity **3mV** 1

Delay Time **3Min** 2

Allow 0V Charge 6

Trickle Charge

Enable 3

Current **0.05A** 4

Timeout **5Min** 5

Back

M18

NIMH CHARGE SETUP

Chg Current **2A** 1

Chg Mode **Normal** 2

Show 3 Advanced Safety Back

M19

NIMH DISCHARGE SETUP

Discharge Current **2A** 1

Discharge Voltage **0.8V** 2

End Current **50%** 3

Regenerative Mode **Off** 4

Show 5 Safety Back

M20