SPS30-48/MR4815 Rectifier System

User's Guide

V1.0

Qingdao Powtech Electronics Co., Ltd.

Safety Notice

In order to avoid accident, read the manual thoroughly before operation. The rules should be obey are not only the items "careful, attention, warning, danger" included in the manual, they are just complementarities of safety operation. So people who installs or operates the equipment should be trained before operation.

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1 System Overview

1.1 System configuration

Fig1-1 System view

SPS30-48/MR4815 Power System is a 19" 1U rack-mount power system. It provides DC power by using two MR4815 rectifiers, the battery can be shut down by BLVD located in the shelf inside while DC voltage is less than the battery protection voltage .The system is supported by a single CAS-03D monitor that provides all control and operational conditions, as well as alarms and output parameter configuration. It operates from -40℃ to +75℃, and it is designed for the harsh outside environment. System view is shown as fig1-1.

System configuration is shown as table1-1.

Table1-1 System configuration

Power	Input voltage	Output voltage	Output current	Accuracy	Part model
1740W	90-300Vac	53.5V	30A	≤±1%	SPS30-48/MR4815
Distribution Section					
AC input	30A/3P×1				
AC output	N/A				
DC output	30A/1P(30A breaker)				
Battery input	30A/3P×1(30A breaker)				

1.2 Operation principles

When AC input power is in normal condition, the power system is in floating charge. A rectifier converts AC to DC to power the loads and floating-charge battery units. Rectifiers'

output is in non master-slave mode to keep equilibrium output. The output voltage is adjusted automatically by the Controller for the battery floating charge.

When AC input is off, battery units will power the loads. If battery units are over-discharged, the controller will control the DC contactor to disconnect the battery units from the loads.

When AC input recover, rectifiers output DC current to loads, and at the same time charge the battery units with limited current. When voltage of battery units reaches equalizing value, charging current will be down slowly and it will keep the charge voltage till the charge current is less than change-over current value, then controller controls the rectifiers to enter the floating-charge mode.

1.3 System Outlines

W*D*H – (mm)	Weight – (kg)
482.6mm×280mm×43.5mm	8kg
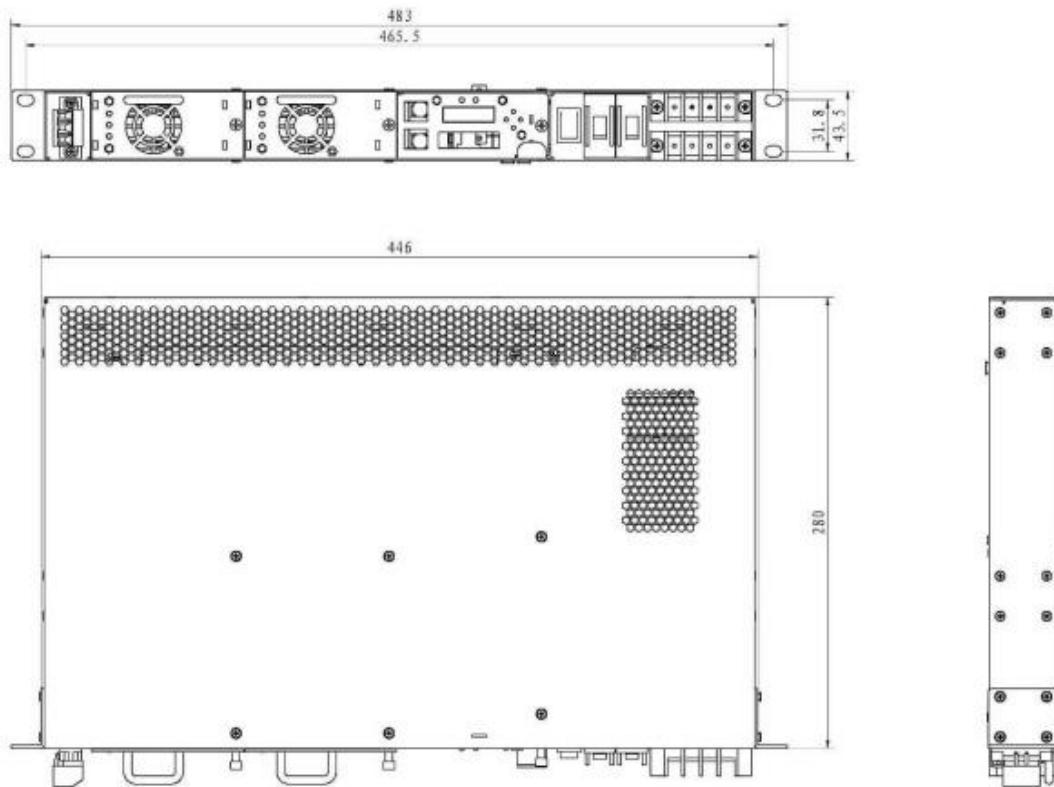
2 System Features and Specifications

2.1 System Features

(1) Universal AC input voltage range:
   90 ~ 300VAC; 176VAC ~ 300VAC @100% loads.
(2) High Power factor: 0.99@100% loads
(3) High reliability
(4) High power density
(5) Hot-plug
(6) Operation Temperature Range:-40 °C- +75 °C
(7) 1U height shelf

2.2 System Specifications

Input Characteristics

Input Voltage	176～300Vac full load 90～176Vac De-rating
Input Voltage (maximum)	300Vac
Frequency Range	45 -65Hz
Input Current (maximum)	16A
Power Factor	≥0.99
Efficiency	≥91%
THD	<5%

Output Characteristics

Vo Set Point (min/typ/max)	42/53.5/58 (Vdc)
Io Output	30A @53.5Vdc
Output Power	1740W
Output Noise (maximum)	<200 mV (peak to peak, bandwidth 20MHz)
Psophometric noise	<2 mV
Dynamic Response (maximum)	5%
Turn On Delay (maximum)	8 sec
Load Sharing (min/max)	-5/5 (%)

Protection Characteristics

	Min	Typ	Max	Unit	Notes
Over Temperature protection			75	℃	
Input over voltage protection		300		Vac	
Input under voltage protection		80		Vac	
Output over voltage protection		59		Vdc	
Short circuit protection					No damage within long time

Environmental Characteristics

Parameter	Min	Typ	Max	Unit	Notes
Storage Temperature	-40		85	℃	
Operating Temperature (internal cooling)	-40		75	℃	−5 to +50 degree C with full performance, derating from 50C to 75C,
Humidity	5		95	%	Relative Humidity Non Condensing
Insulation Resistance	20MW				AC-Enclosure(500VDC)
	20MW				AC-DC(500VDC)
	20MW				DC-enclosure(500VDC)
Dielectric Strength			2121		AC-Enclosure
			4242	Vdc	AC-DC
			707		DC-enclosure

2.3 Rectifier

The MR4815 rectifier is rated for 870 Watt constant output power when operated at 176/300VAC inputs, it provides approximately half of its rated output when operated at 90VAC. This auto-sensing circuit enables each rectifier to automatically adjust its output to the available input voltage. The rectifier will provide up to 100% of rated power at 50℃. As temperature increase from 50℃ to 75℃, the internal thermal power limit circuit linearly decreases power. In the typical operating range, the rectifier has power factor greater than 0.99, total harmonic distortion less than 5%, and highest efficiency greater than 92%. Each hot-swappable rectifier has an integral multi-speed cooling fan and 3 LED status indicators.
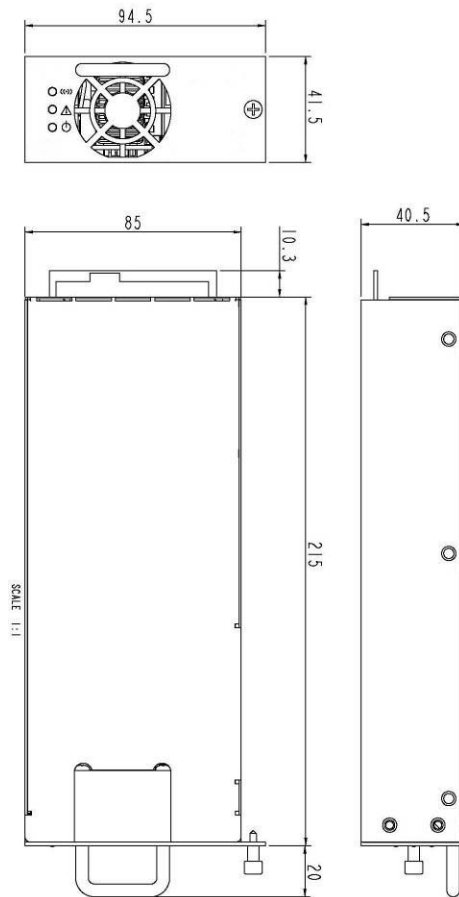
Table 6   Dimension and Weight

W*D*H – (mm)	Weight – (kg)
94.5*215*40.5	1kg

2.4 Controller

There are LCD display, LED indicators, keys, RS232/RS485 communication ports on the front panel of the monitor CAS-03D

Parameter measurement and monitoring	AC input voltage, DC output voltage, rectifier output current, charging and discharging current
Fault detection	AC input faults, DC output faults, Rectifier output current limiting, Module over hot, Fan failure, Battery output voltage low, Battery melt fuse failure
Parameter control	Charging current, Auto converting between equalizing and floating charge, Rectifier current limit, Module power On/Off, Primary and secondary power off.
Battery management	Boost/Float change automatically Current limiting for equalizing charge,
Interface	LCD, Chinese character, English optional, 4 key operation
Alarm warning	Sound, light, Dry contact outputs
Communication	RS232/RS485/LAN
Power	DC48V / 0.5A
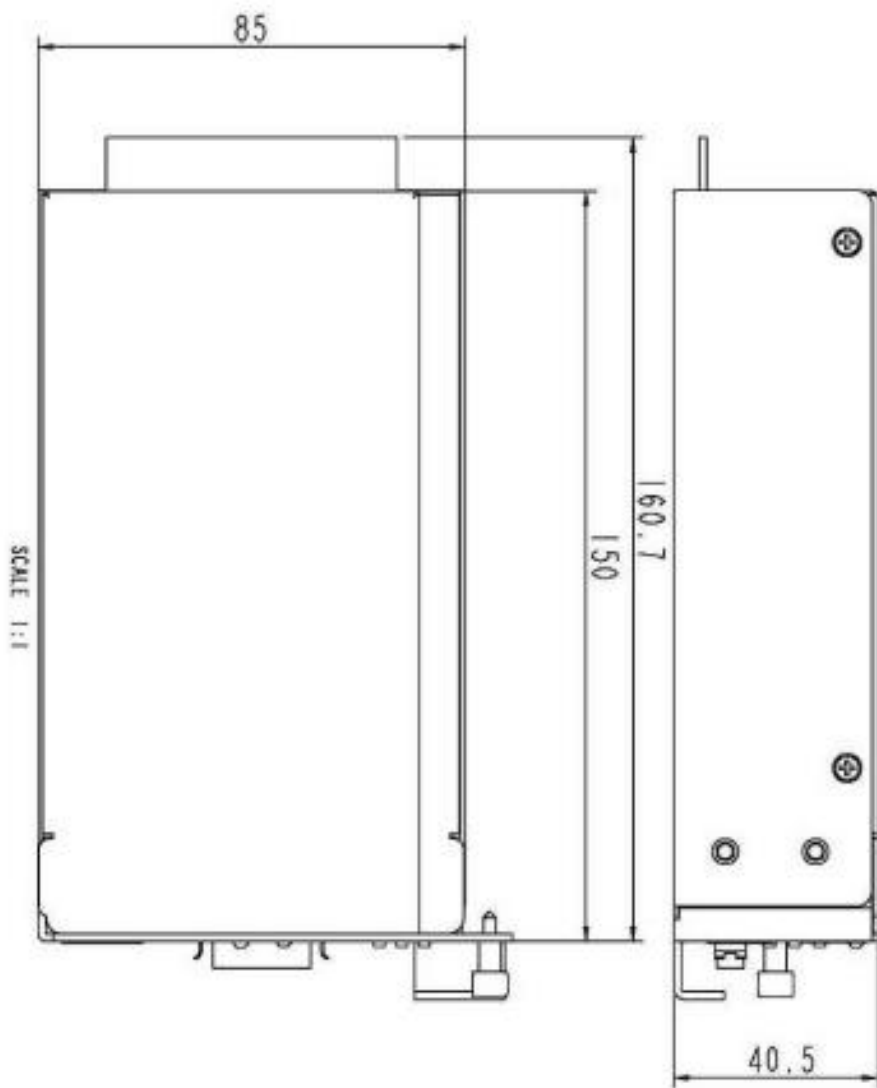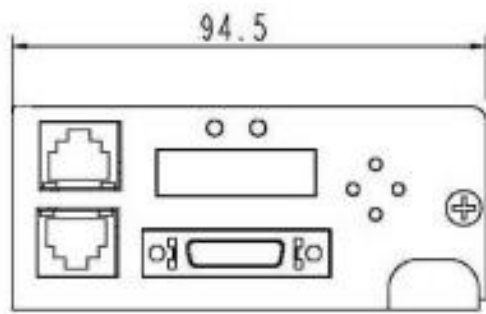
W*D*H – (mm)	Weight – (kg)
94.5*150*40.5	<0.6kg

3 Installation

Concerning the safety of yourself and this equipment, please follow the following installation procedures.

Warning: Making sure the AC circuit breaker and DC circuit breaker in "Off" position before installation.

3.1 Shelf installation in the cabinet

Inserting the empty housing into the system rack cabinet and screwing down securely.

3.2 Battery Connection

Select Battery Type:

1) If you use lithium battery, please push switch button to Lithium battery.

2) If you use Lead-acid battery, please push switch button to Lead-acid battery.

Connecting the batter cables securely with lugs to the battery wiring connectors on the distribution panel on the front shelf, BAT+/BAT- are for Battery input

Warning: It may damage or equipment if misconnect the "+" and "-" of the batteries.

3.3Load connection

Connecting the load cables securely with lugs to load connectors (+) and load connectors (-) on the distribution panel on the front shelf.

Warning: It may damage the load equipment if misconnect the "+" and "-" of the load.

3.4AC Connection

Connecting the AC input cables securely to the AC input connection terminals on the distribution panel on the front housing.

"L "---- AC Line terminal, "N "--- Neutral terminal; "E" --- protective earth.

Warning: Misconnecting the "L" and "N" is strictly forbidden. Using 6 mm^2 or bigger cable to connect the Earth "E", otherwise the anti-lightning won't work properly.

3.5 RJ45 of controller is RS232/RS485 port

Connector	Pin No	Definition	Note
CON9 (RJ45)	1	A485	RS485+
	2	B485	RS485-
	3	TXD	RS232 TXD
	4	VPGND	RS232 Gnd
	5		
	6	RXD	RS232 RXD
	7		N/A
	8		N/A

Notice

1: In front panel of the system, the pin number from left to right of RJ45 is pin1 to pin8.

3. 6 After finished the above, make a through check and make sure all the cable connection correct.

3.7 Inserting all the modules including rectifiers into the housing and screwing down securely.

Warning: Making sure the AC circuit breaker and the power switch of the controller in "Off" position when inserting the rectifiers and AC unit.

4 Controller operation

4.1 Functions and features

(1) Electric parameters detection and measurement:
 AC input voltage, DC output voltage, rectifiers output current, charge and discharge current of battery units, temperature of battery units.

(2) System failures detection
Problems and failures can be detected from: AC input, DC input, output current limitation of rectifiers, over temperature of rectifiers, cooling fans, lightning protection and surging protection, battery capacity, melt fuse of battery units and distribution.

(3) Electric parameters Control
Adjusting range of DC output voltage: 42.0V-58V
Limiting range of rectifier output current: 5.0A-33.0A

(4) Battery management
floating voltage switching：   Manual /auto
Battery low voltage (LVD) protection
Battery charge mode selection：Equalizing charge mode with limited current, thermal compensation for floating charge, accumulative number indication of ampere-hours of battery discharge.

(5) Rectifier control:

Rectifier switch on/off

You can get the main system messages including system voltage, load current, battery current and running status in the home page.Home page 1 will be displayed after started up. You may press key "▼" to turn to home page 2 and 3. For more details, please refer to Fig4-1.

```
┌─────────────────────┐
│ Voltage：  53.5V    │
│ Current：   10A     │
└─────────────────────┘
          ▼
┌─────────────────────┐
│ BAT1Cur：   0A      │
│ BAT1Cur：   0A      │
└─────────────────────┘
          ▼
┌─────────────────────┐
│ 2011-05-01  13:58   │
│     Alarm           │
└─────────────────────┘
```
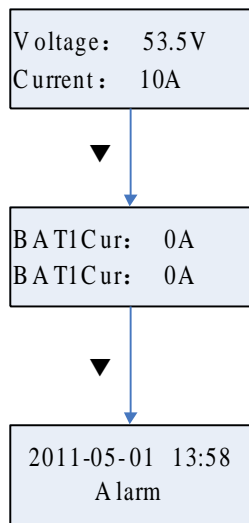
Fig4-1. Home Page

4.2 Menu Structure

Tree menu was used in CAS-03D controller, so you may look up the system messages and parameters quickly. Press key "ENT" will turn to submenu and "ESC" to exit, "▲" and "▼" are used to select message in the same level menu. Menu structure will be seen in Fig4-2.

MainPage — Voltage: 53.5V / Current: 10A

FirstGrade:
- MAIN MENU — Alarm Msg
- MAIN MENU — System Msg
- MAIN MENU — System Ctl
- MAIN MENU — Setting

- ALARM MSG — ActAlarm
- ALARM MSG — HisAlarm
- SYSTEM MSG — Rectifiers
- SYSTEM MSG — Battery
- SYSTEM MSG — SWVersion
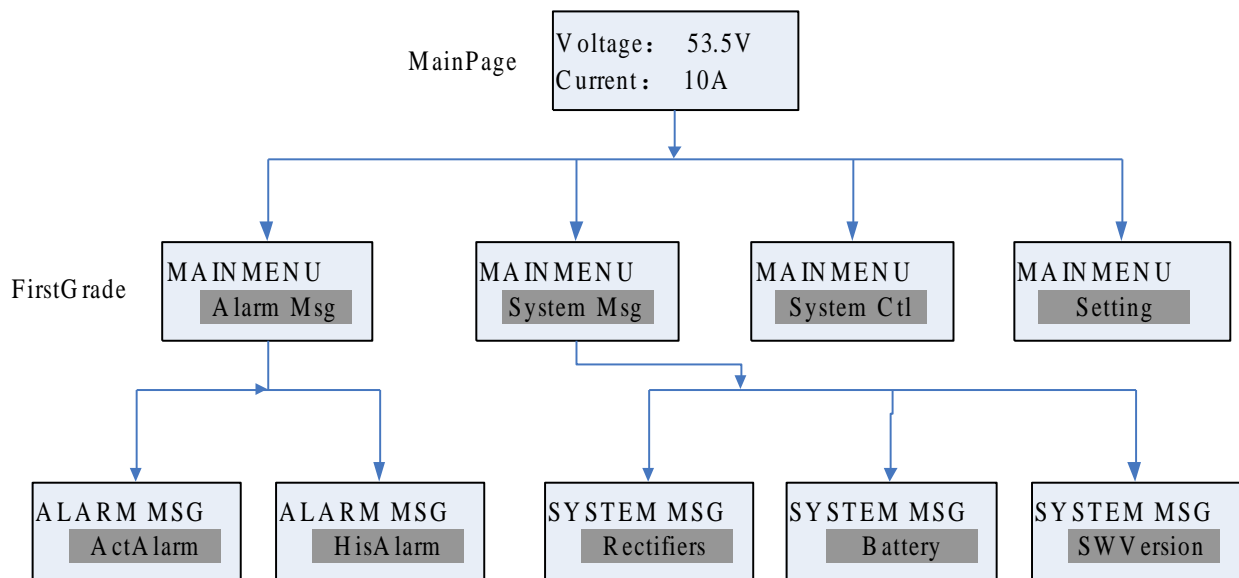
Fig4-2. Menu Structure

4.3 Alarm Message

CAS-03D is able to save 64 pieces active alarms and 200 pieces history alarms. You may view these message by operating "Act Alarm" and "His Alarm" menu.

4.3.1 Active Alarm

When a fault happens in power system and the fault was set to be major or minor alarm level, controller will give an alarm with bright light and buzzer sound. You could check what's the fault name and when it happened by pressing into "Act Alarm" menu. Flow is shown in Fig4-3.

```
              ┌─────────────────┐
              │ ALARM MSG       │
              │   ActAlarm      │
              └─────────────────┘
                      │
                     ENT
                      ▼
              ┌─────────────────┐
Alarm Name    │ 1 Major Alarm   │
              │ AC Input Flailure│
              └─────────────────┘
                      │
                      ▼
              ┌─────────────────┐
Alarm Begin Time │ 110501 13:30:06 │
              └─────────────────┘
```
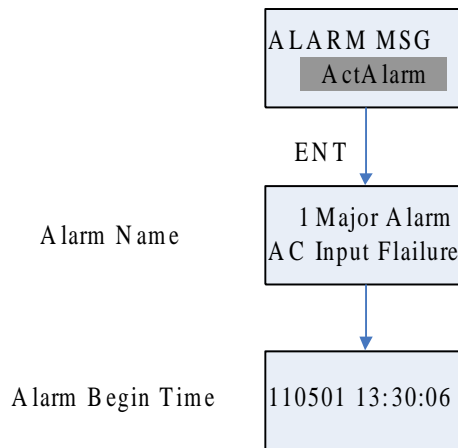
Fig4-3. Active Alarm

4.3.2 History Alarm

After the active alarm is gone, it will be changed to history alarm and saved in E2PROM. You may view when the alarm   happened and ended   by pressing into "His Alarm" menu. Operation is showed in Fig4-4.

```
              ┌─────────────────┐
              │ ALARM MSG       │
              │   HisAlarm      │
              └─────────────────┘
                      │
                     ENT
                      ▼
              ┌─────────────────┐
Alam Name     │   1Alarm        │
              │ AC Input Low    │
              └─────────────────┘
                      │
                      ▼
Alarm Happen Time ┌─────────────────┐
Alarm End Time    │110501 13:30:00  │
                  │110501 13:30:15  │
                  └─────────────────┘
```
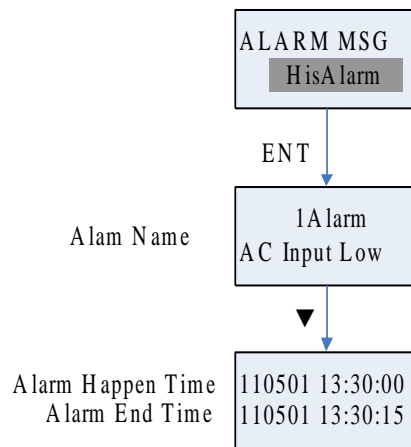
Fig4-4. History Alarm

4.4 System Message

Some important messages of the power system including rectifier messages, battery messages and software version may be viewed by operating "System Msg" menu.

4.4.1 Rectifier Message

You may view the rectifiers' messages   including rectifier No., input voltage, output voltage, current limit point, on-off status and limit status, by operating "Rectifiers" menu. Flow is shown in Fig4-5.

```
┌─────────────────┐
│ SYSTEM MSG      │
│  [Rectifiers]   │
└─────────────────┘
      │ ENT
      ▼
┌─────────────────┐
│ RECT: 1         │
│ Output: 53.5Vdc │
└─────────────────┘
      │
      ▼
┌─────────────────┐
│ Output: 10.0A   │
│ Input: 220Vac   │
└─────────────────┘
      │
      ▼
┌─────────────────┐
│ CurLimit:       │
│         400A    │
└─────────────────┘
      │
      ▼
┌─────────────────┐
│ Status: On      │
│ IsCurLimit: N   │
└─────────────────┘
```

Fig4-5. Rectifier Message

4.4.2 Battery Message

You may view batteries' message including battery current, remain capacity, charge mode , battery temperature and ambient temperature by looking-over "Battery Msg" menu. Flow is shown in Fig4-6.

```
┌──────────────────┐         ┌──────────────────┐
│ SYSTEM MSG       │         │ Cyc BC Afer：     │
│      Battery     │────────▶│      180day       │
└──────────────────┘         └──────────────────┘
         │ ENT                         │
         ▼                             ▼
┌──────────────────┐         ┌──────────────────┐
│ BAT1Cur：0.0A     │         │ Next Discharge：  │
│ RemainCap：100%   │         │     NA   day      │
└──────────────────┘         └──────────────────┘
         │ ▼                           │ ▼
         ▼                             ▼
┌──────────────────┐         ┌──────────────────┐
│ BAT2Cur：0.0A     │         │ BattTemp：        │
│ RemainCap：100%   │         │      25℃          │
└──────────────────┘         └──────────────────┘
         │ ▼                           │ ▼
         ▼                             ▼
┌──────────────────┐         ┌──────────────────┐
│ BC Mode：         │         │ EnviTemp：        │
│      Float       │         │      25℃          │
└──────────────────┘         └──────────────────┘
```
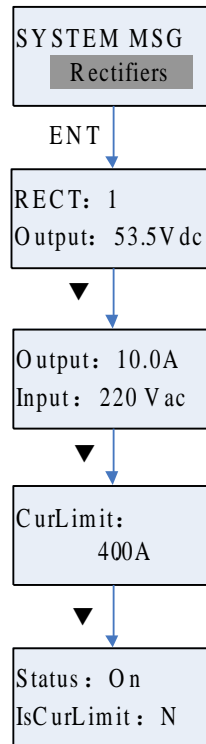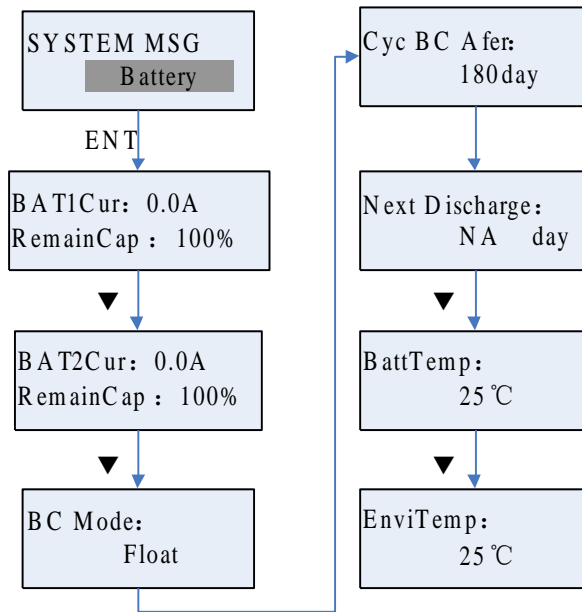
Fig4-6. Battery Message

4.4.3 Software Version

You may view the software version of the controller by pressing "ENT" enter "SW Version" menu. Flow is shown in Fig4-7.

```
┌──────────────────┐
│ SYSTEM MSG       │
│     SWVersion    │
└──────────────────┘
         │ ENT
         ▼
┌──────────────────┐
│ SW REV：          │
│       0.033      │
└──────────────────┘
```
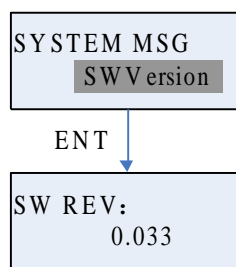
Fig4-7. Software Version

4.5 System Control

You can control the system by changing the parameters in the "System Ctl" menu. The current limit point of rectifier ,quick EQ charge, LCD background light,and on/off status of rectifiers can be controlled.The flow is shown in Fig4-8.

```
┌─────────────────────┐
│ M A IN M E N U      │
│    System Ctl       │
└─────────────────────┘
       ENT
        │
        ▼
┌─────────────────────┐          ┌─────────────────────┐
│ ManualLimit：N       │          │ Rect Manual         │
│ Quick EQ：     N     │          │ Control：    N      │
└─────────────────────┘          └─────────────────────┘
        │                  ▼
        ▼                            ──────────
┌─────────────────────┐              ──────────
│ EQ Vol：  56.4V     │          ┌─────────────────────┐
│ EQ Time： 180m      │          │ Rect Manual         │
└─────────────────────┘          │ Control：    Y      │
        │                        └─────────────────────┘
        ▼                                 │
┌─────────────────────┐                   ▼
│ CurLimit：1.000     │          ┌─────────────────────┐
│ LcdB light：39%     │          │ RectNum：    1      │
└─────────────────────┘          │ RectStatus：   On   │
                                 └─────────────────────┘
```
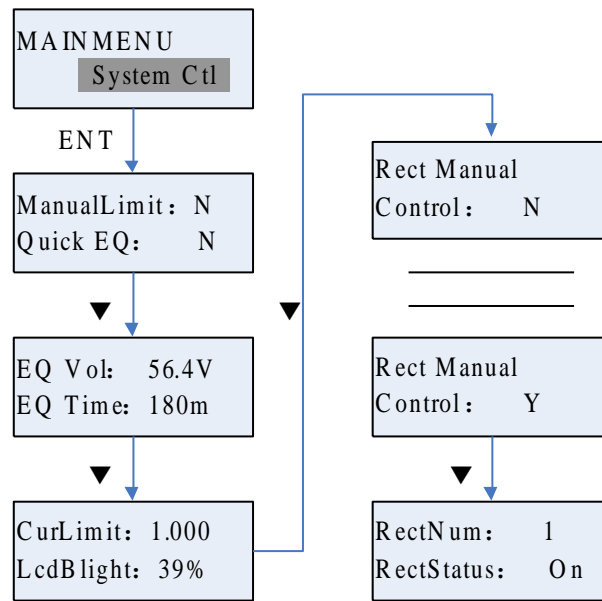
Fig4-8. System Control

You may pitch on one parameter by moving cursor to its place and pressing "ENT", the background will turn to black. Then press "▲" or "▼" to change the selected parameter value and "ENT" to save this change. For more details about parameters of system control ,please refer to Table4-1.

Table4-1 System Control Parameter

Parameter	Range	Default	Tips
Manual Limit	Y/N	N	Y：Limit output current with "CurLimit"
			N：Disable manual limit
Quick EQ	Y/N	N	Y：Set output voltage to EQ Voltage
			N：Disable Quick EQ
EQ Vol	Float voltage-DC voltage high	56.4V	Output voltage when equal charge
EQ time	60min-2880min	180min	Continuous equal charge time
CurLimit	0.2-1.0	1	Rectifier output current when enable manual limit
LCDBlight	28%-50%	39%	LCD background light
Rect Manual Control	Y/N	N	Y：Enable manual control rectifier
			N：Disable manual control rectifier

RectNum	1-32	1	The number of rectifier to be controlled
RectStatus	On/Off	On	On：Turn on the selected rectifier
			Off：Turn off the selected rectifier

Only changing the value of "Rect Manual Control" to "Y", can you manually control the rectifier on/off. After that ,you may press "▼" to display controlling screen, and choose the rectifier No. you want to change its on/off status , change the value of "RectStatus" to turn on or turn off the rectifier at last.

4.6 Settings

Most of parameters of the power system can be modified in "Settings" menu. This menu contains six submenu such as alarm settings, battery settings, DC settings, system settings, energy saving and battery test. The menus is shown in Fig4-9. In order to protect parameters from unprofessional operation, three groups password were built. Only inputting the exact password can you have the right to operate. From lowest priority to the highest is user password(1111), engineer(2222) password and manager password(3333). The higher priority, the more messages can be viewed, and the more parameters can be modified.
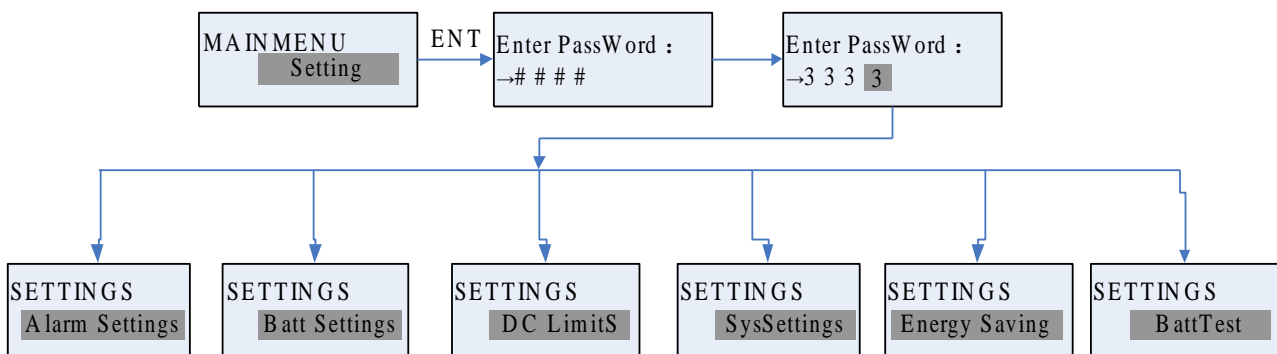

Fig4-9. Setting Menu Structure

Key "ENT" must be pressed to choose the first number of password, and press "▲" key to increase or "▼" key to decrease the number, then press "ENT" to confirm the number you have modified. You can follow these steps to modify the last numbers.

4.6.1 Alarm Settings

You may setup all alarm level, correlative relay, sound disable/enable, and digital sensor input type in "Alarm Settings" menu. Its structure is shown in Fig4-10.
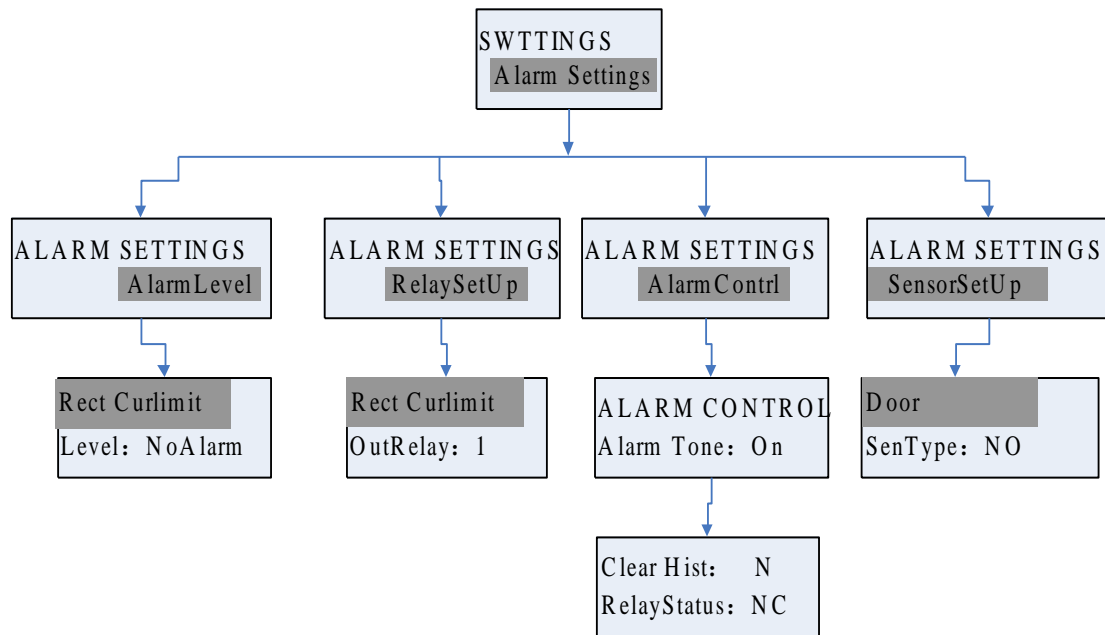

Fig4-10.Alarm Settings Menu

Total 32 alarms can be configured to independent alarm level and independent relay. CAS-03D provides 3 alarm levels: NoAlarm, Minor and Major, and 4 correlative relays. Default settings were shown in Table4-2.

Table4-2 Default Alarm Settings

Alarm Name	Level	Correlative Relay	Tips
Rect limit	NoAlarm	None	Faults inner rectifier or between rectifiers
Rect DCOverVolt	Major	3	
Rect DCUnderVolt	Major	3	
Rect ACOverVolt	NoAlarm	None	
Rect ACUnderVol	NoAlarm	None	

Rect Fan Fault	Minor	3	
Rect AmbOverTemp	NoAlarm	None	
Rect AmbUnderTemp	NoAlarm	None	
Rect PFCOverTemp	NoAlarm	None	
Rect DCOverTemp	NoAlarm	None	
Rect NoRespond	NoAlarm	None	
Rect DCDCEEPROM	NoAlarm	None	
Rect Derated_AC	NoAlarm	None	
Rect DeratedTmp	NoAlarm	None	
Rect Curr Share	NoAlarm	None	
Rect Comm Fault	Major	3	Communication break off with controller
ACInput Failure	Minor	1	System input voltage high or low
AC Stop	Major	1	
Output Fault	Minor	3	System output voltage high or low
Batt Over-Curr	Minor	4	
BattTemp Fault	Minor	4	
AmbiTemp Fault	Minor	4	
Batt CB Alarm	Major	2	
Load CB Alarm	Major	2	
LLVD	NoAlarm	None	
BLVD	Major	None	
SPD	NoAlarm	None	
Smoke	NoAlarm	None	
Water	NoAlarm	None	
Door	NoAlarm	None	
Digital5	NoAlarm	None	
Digital6	NoAlarm	None	

Please press into "Alarm Level" menu if you want to modify a alarm level. Press "▲" or "▼" to choose the alarm to be setup, and press "ENT" to confirm you selection. Then press "▼" to move cursor to level parameter and make the parameter to be active by pressing "ENT", press "▲" or "▼" to modify level value and "ENT" to confirm the modification. The same way can be used to modify correlative relay.

Alarm sound and relay status can be set if you press into "Alarm Control" menu.in addition, you can clean up history alarm note if necessary. Digital input type can be configured if needed. Table4-3 is

referred to your modify operation.

Table4-3 Alarm Control Or Sensor Setup

Parameter	Range	Default	Tips
Alarm tone	Disable/Enable	Disable	Disable：No sound when alarm happens
			Enable：Buzzer sounds when alarm happens
Alarm relay status	NC/NO	NC	NO：Relay close when no alarm
			NC：Relay open when no alarm
Clean up history alarm	Y/N	N	Y：Clean up history alarm
			N：No effect
Sensor type	NC/NO	NO	NO：Normal open Sensor
（Door Smoke Water SPD）			NC：Normal close Sensor

4.6.2 Battery Settings

Some parameters of battery management could be configured in "Batt Settings" menu, such as float charge voltage, battery capacity, BLVD voltage, LLVD voltage, charge coefficient, and so on. Flow is shown in Fig4-11 and parameters in Table4-4.
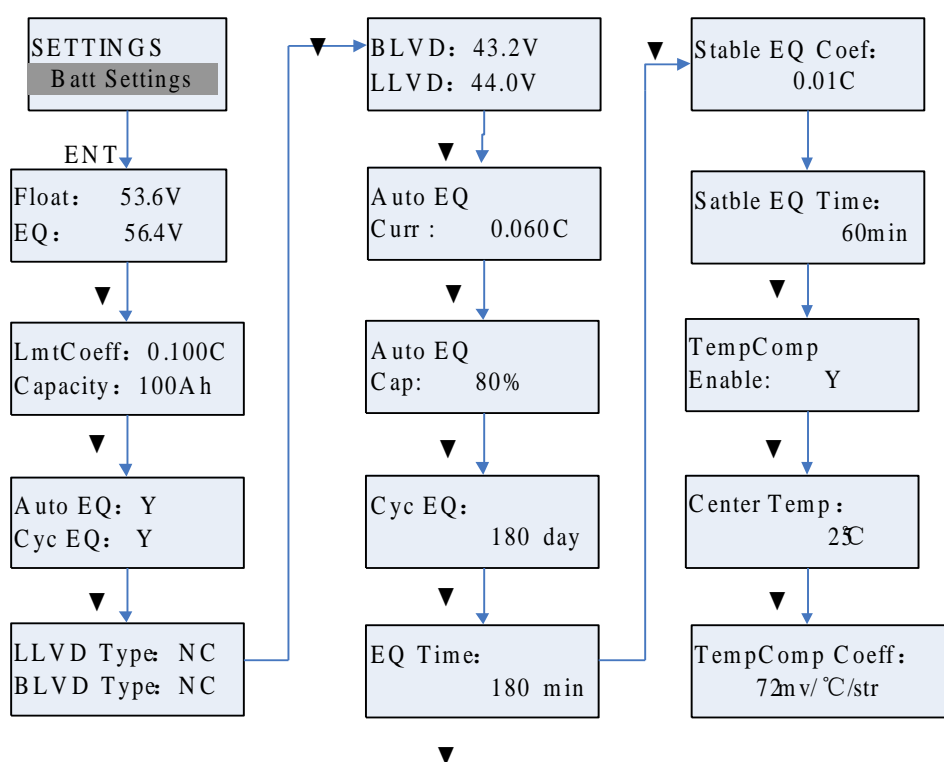
SETTINGS
 Batt Settings

ENT

Float： 53.6V
EQ： 56.4V

▼

LmtCoeff： 0.100C
Capacity： 100Ah

▼

Auto EQ： Y
Cyc EQ： Y

▼

LLVD Type： NC
BLVD Type： NC

BLVD：43.2V
LLVD： 44.0V

▼

Auto EQ
Curr : 0.060C

▼

Auto EQ
Cap: 80%

▼

Cyc EQ:
180 day

▼

EQ Time:
180 min

▼

Stable EQ Coef:
0.01C

▼

Satble EQ Time:
60min

▼

TempComp
Enable: Y

▼

Center Temp：
25℃

▼

TempComp Coeff：
72mv/℃/str

Fig4-11.Battery Settings

Table4-4 Battery Management Parameters

Parameters	Range	Default	Tips
Float	42.0V--EQ	53.5V	Float charge mode output voltage
EQ	Float--DC High	56.4V	EQ charge mode output voltage
LimitCoeff	0.100C--1.00C	0.100C	The charge current of battery to be limited, C is battery capacity. For example, C is 100Ah, then 0.1C is 0.1*100=10A.
Capacity	10Ah—9999Ah	100Ah	Battery capacity
Auto EQ	Y/N	Y	Enable/Disable automatic EQ charge
Cyc EQ	Y/N	Y	Enable/Disable automatic cycle charge
LLVD Type	NO/NC	NO	Load LVD type
BLVD Type	NO/NC	NO	Battery LVD type
BLVD	40.0V--LLVD	43.2V	Cut off important load when system voltage below this value
LLVD	BLVD—DC Low	44.0V	Cut off non-important load when when system voltage below this value
Auto EQ Curr	0.040C--0.080C	0.060C	Turn to EQ charge if battery current over this value

Auto EQ Cap	10%--99%	80%	Turn to EQ charge if battery capacity lower then this value
Cyc EQ	2--360day	180day	Cycle EQ charge time
EQ Time	60min--2880min	180min	Continuous EQ charge time
Stable EQ Coeff	0.002C--0.05C	0.010C	Turn to stable EQ charge from EQ charge mode if battery current less than this value
Stable EQ Time	0--120min	60min	The time stable EQ charge mode last
TempComp Enable	Y/N	Y	Y：Enable temperature compensating
			N：Disable temperature compensating
Center Temp	10℃--40℃	25℃	The center for temperature compensating
TempComp Coeff	0-500 mV/℃	72mV/℃	The step of voltage compensation when the battery temperature is higher or lower than center temperature

4.6.3 DC Limit Settings

You may change the DC limit parameters including DC output over/under voltage,battery/Environment over/under temperature ,shunt coefficient by operating the "DC limits" menu. For more details about the parameters, please refer to Table4-5,and the flow is shown in Fig4-12.
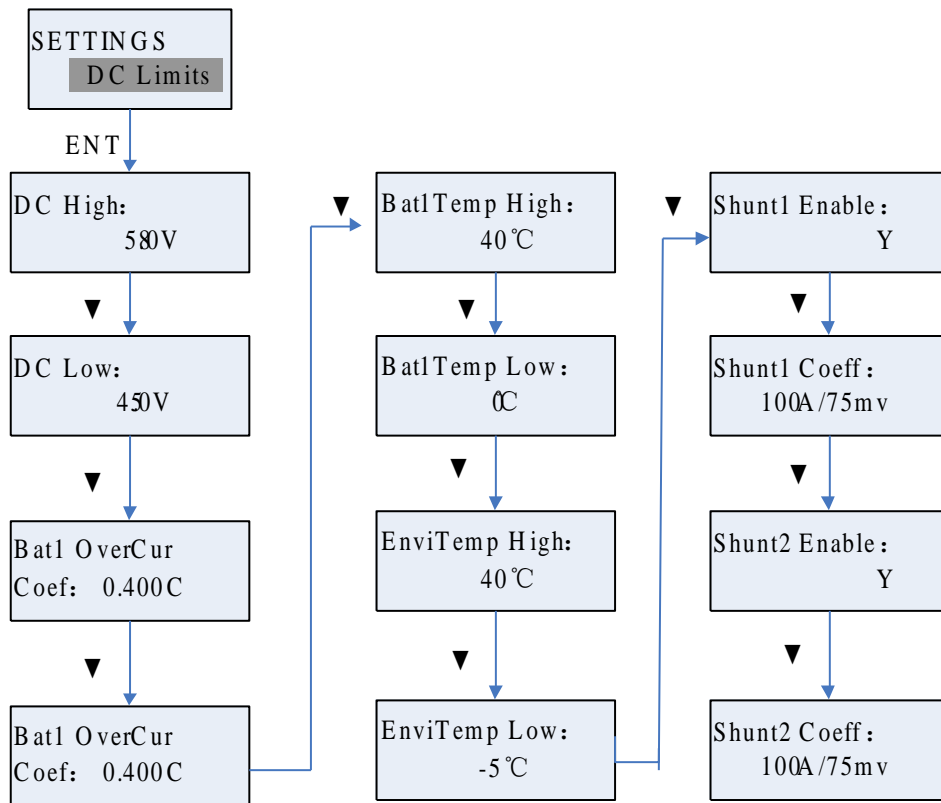
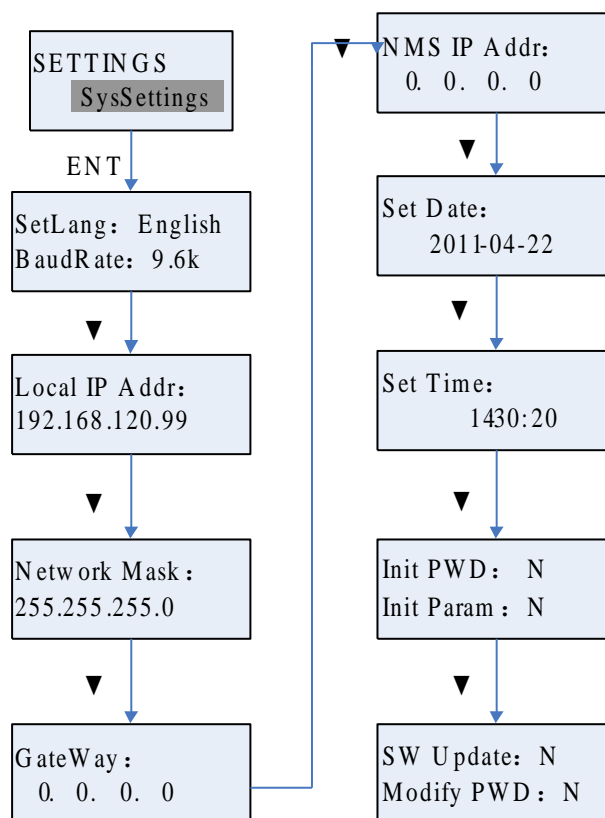Fig4-12 DC Limits Settings

Table4-5 DC Parameter illustration

Parameter	Range	Default	Illustration
DC High	DC Low Point-60V	58V	DC output over voltage point
DC Low	LLVD Point-DC High Point	45V	DC output under voltage point
Bat1 OverCur	0.1C-0.5C	0.4C	Charge of battery over current point
Bat2 OverCur			
BatTemp High	10℃-75℃	40℃	Battery over temperature point
BatTemp Low	-10℃-40℃	0℃	Battery under temperature point
EnviTemp High	10℃-75℃	40℃	Environment over temperature point
EnviTemp Low	-10℃-40℃	-5℃	Environment under temperature point
Shunt1 Enable	Y/N	Y	Y:Enable Shunt1
			N:Disable Shunt1
Shunt1 Coeff	0-2000A/1-500mV	100A/75mv	must match the actual shunt is used for battery1
Shunt2 Enable	Y/N	Y	Y:Enable Shunt2

			N:Disable Shunt2
Shunt2 Coeff	0-2000A/1-500mV	100A/75mv	must match the actual shunt is used for battery2

4.6.4 System Parameter

Fig4-13 System Parameter Settings

You may change system parameters including language,date,time ,system code,and update software by operating the "SysSettings" menu. If you want to use SNMP to communicate with the central monitor unit, you may change the IP address,Mask

address,and Gateway.The operating flow is shown in Fig4-13.

```
            SETTINGS                        NMS IP Addr：
             SysSettings                      0. 0. 0. 0

              ENT                                 ▼
       SetLang： English                  Set Date：
       BaudRate： 9.6k                      2011-04-22

              ▼                                 ▼
       Local IP Addr：                    Set Time：
       192.168.120.99                       1430:20

              ▼                                 ▼
       Network Mask：                     Init PWD： N
       255.255.255.0                      Init Param： N

              ▼                                 ▼
       GateWay：                          SW Update： N
         0. 0. 0. 0                       Modify PWD： N
```

The value of baudrate means the speed of RS232/RS485 bus used to communicate with host.If you want to reset all the parameter of the controller,you may change the value of "Init Param" to "Y".You may

update the software through these menus if necessary.

4.6.5 Energy Saving

In order to make rectifiers work on the most efficient point, the controller will control the rectifiers work or sleep to save energy. You may change the parameters by operating the "Energy Saving" menu. The function is disable acquiescently. For more details about the parameters, please refer to Table4-6,and the flow is shown in Fig4-14.
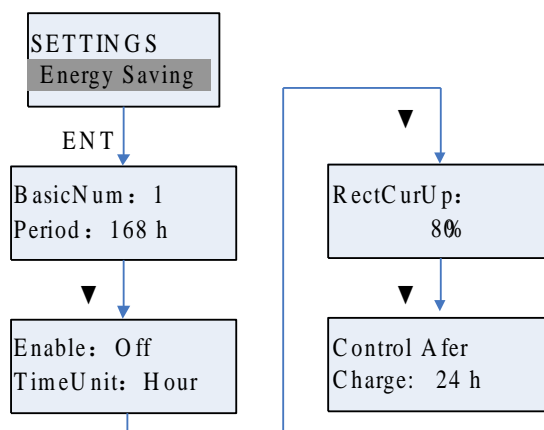

Fig4-14 Energy Saving Settings

Table4-6 Energy Parameters

Parameter	Range	Default	Illustration
BasicNum	1—2	1	The least quantity of working rectifiers in energy saving mode
Period	1h-720h	168h	The period of the rectifier from sleeping to working
Enable	Close/Open	Close	Close：Enable energy saving Open：Disable energy saving
Time Unit	min/hour	hour	Hour:The time parameters about energy saving runs in hours Min:The time parameters about energy saving runs in minutes
RectCurUp	80%-95%	80.00%	If the load of each rectifier is over this value, the controller will turn on the sleeping rectifiers one by one ,until the load is under it.
Control Ater Charge	1-240	24h	The controller start to work in Energy Saving mode after working the time be set.

The energy saving function of CAS-03D controller is turn off acquiescently,you may turn on it by changing the "Enable" value to "On" if necessary. The controller supplies two energy saving modes, one is for common rectifiers,the other is for mixed rectifiers.The controller can identify two modes automatically.

Energy Saving mode1(all the rectifiers are common or high efficiency):

A、Turn off rectifiers: If the load of each rectifier is under 40% of its rated load,the controller will turn off the rectifiers one by one,until the load is over 40%.Actually,the least quantity of working rectifiers will match to the "BasicNum".

B、Turn on rectifiers: If the load of each rectifier is over the value(default:80%) set in "RectCurUp", the controller will turn on the sleeping rectifiers one by one ,until the load is under the value.

C、Sleep by turns：If there are some rectifiers sleeping,the controller will turn on one,when its sleeping time meets the time set in "period",and then
turn off the working longest rectifier.

Energy Saving mode2(there are common rectifiers and high efficiency rectifiers in the system):

Let's suppose 1# and 2# to be high efficiency rectifier,3# and 4# to be common rectifier.

A、Turn off rectifiers: If the load of each rectifier is under 40% of its rated load, the controller will turn off the rectifiers one by one, until the load is over 40%. The controller will turn off the common rectifiers first,the order is 4#>3#>2#>1#. Actually, the least quantity of working rectifiers will match to the "BasicNum".

B、Turn on rectifiers: If the load of each rectifier is over the value(default:80%) set in "RectCurUp", the controller will turn on the sleeping rectifiers one by one, until the load is under the value.The controller will turn on the high efficiency rectifiers first,the order is 1#>2#>3#>4#.

C、Sleep by turns：If there are some rectifiers sleeping,the controller will turn on one,when its sleeping time meets the time set in "period",and then
turn off the working longest rectifier.The controller will turn on the high efficiency rectifier first(if there is),and turn off the common rectifier(if there is).

4.6.6 Battery Test

The battery test function of CAS-03D controller is turn off acquiescently.
You may turn on the function by operating the "Batt Test" menu,and change other parameters about battery test. For more details about the parameters, please refer to Table4-7,and the flow is shown in Fig4-15.
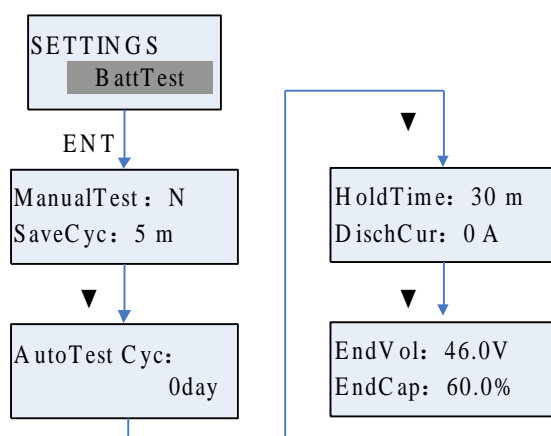

Fig4-15 Battery Test Settings

Table4-7 Battery Test Parameter

Parameter	Range	Default	Illustration
Manual Test	Y/N	N	Y：Enable manual battery test N：Disable manual battery test
Save Cyc	2—10min	5min	The period that save the data of battery
Auto Test Cyc	0—365day	0	0：Disable automatic test 1-365：The period of automatic test
Hold Time	5—1200min	30min	Time that the test will hold
DischCur	0—600A	0A	0:Discharge with the actual load 1-600：The discharge current we want to reach
End Vol	42.0V-48V	46.0V	When the battery voltage is lower than this value, the test will end
End Cap	1%-99%	60.00%	When the battery capacity is lower than this value, the test will end

4.6.7 AC Parameter

You may change the AC input over/under voltage point by operating the "AC Settings" menu.For more details,please refer to Table4-8 and Fig4-16.
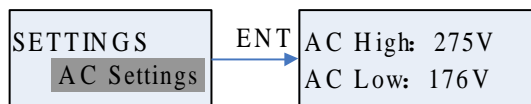
```
SETTINGS          ENT  AC High: 275V
     AC Settings        AC Low: 176V
```

Fig4-16 AC Settings

Table4-8 AC Parameter

Parameter	Range	Default	Illustration
AC High	250V—300V	275V	AC input over voltage point
AC Low	100V—220V	176V	AC input under voltage point

4.6.8 Alarm summarize

The CAS-03D controller supplies 32 alarm types. It shows sound, light, and trigger correlative relay when an error happens.You can close or open the alarm,and choose the correlative relay by setting the alarm parameters.If you want to know more about the alarm, please refer to the section 4.6.1.

5 Maintenance

Please refer to Table5-1.

Table5-1 Faults Analysis

Faults	Possible causes	Solution
Battery current Inaccurate	The shunt coefficient is set wrong	Check the shunt coefficient in controller, and insure it match the character wrote on the shunt
Controller can not control the LVD contactor open or close	The LLVD Type or BLVD Type is set wrong	Check the LLVD Type and BLVD Type, and insure it match the contactor type
Communication break off between controller and rectifiers	The connection is loose or CAN bus is connected wrong	Fasten the connection of the CAN bus, and check polarity of bus
The LCD display improperly	LCD has an error	Please contact the manufacturer
The Controller does not work	The fuse of the controller is	Please contact the manufacturer

	broken	

6 Service information

6.1 Warranty

This product is warranted against defect in materials and workmanship for a period of one year from date of shipment. During warranty period, Qingdao Powtech Electronics Co. Ltd. will, at its option, either repair or replace products that prove to be defective. For repair services under warranty, the product may be returned to Powtech.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from unauthorized modification or misuse, or operations beyond the described in this manual. No other warranty is expressed or implied.

Whilst every care has been taken in compiling the information in this publication, Powtech cannot accept legal liability for any inaccuracies contained herein. Powtech has an intensive program of design and development which may well alter product specification, and reserve the right to alter specification without notice and whenever necessary to ensure optimum performance from its product range.

In particular,Powtech is not responsible for any lost profits or revenue, loss of use software, loss of data, cost of substitute software, claims by third parties, or for other similar costs. In no case shall Powtech's liability exceed the amount of the license fee.

6.2 Service contact

If you have any questions or need more information in using of these rectifier modules, please contact the following:

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Fax:86-532-88721733