

REKOSER MONITORING SYSTEM

**RMS
ENGINEERING MANUAL**

REKOSER

The logo for REKOSER features the word "REKOSER" in a bold, italicized, red sans-serif font. The letter "K" is stylized, with a thick red horizontal bar extending from its base to the right, ending in a small upward-pointing hook.

REKOSER

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Printed in Spain




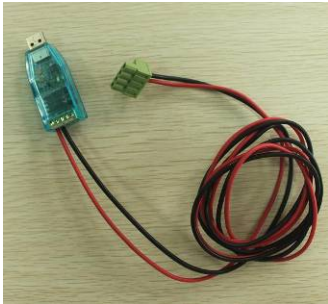

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Tools required for installation and Debugging

NO.	Picture	Description
Installation tools		
1		Socket wrench 12902 Socket head 12307/309/311
2		Multimeter VC9807A+
3		Clamp Meters VC3266D
4		Stripper 91108
5		Phillips-head screwdriver 61213

6	 A flat-head screwdriver with a black handle and a silver metal shaft, lying horizontally on a light brown cardboard surface.	Flat-head screwdriver 61311
7	 A Phillips-head screwdriver with a red and yellow handle and a silver metal shaft, lying vertically on a light-colored wooden surface.	Phillips-head screwdriver 61211
8	 A pair of needle nose pliers with black handles and long, thin, pointed jaws, lying vertically on a light-colored wooden surface.	Needle nose pliers 70124A
9	 A pair of diagonal pliers with black handles and curved, pointed jaws, lying vertically on a light-colored wooden surface.	Diagonal pliers 70221A
10	 A pair of crimping pliers with yellow handles and a complex metal head with multiple crimping dies, lying vertically on a light-colored wooden surface.	Crimping Pliers G51303

11		<p>Scissors 03131</p>
12		<p>Wrench 47222</p>
<p>Debugging tools</p>		
13		<p>Lap top</p>
14		<p>485 Converter and wire</p>
15		<p>Engineering manual (this manual)</p>

1 Overview

The Rekoser Monitoring System (RMS) is a stand-alone monitor for UPS applications. It provides early warnings for backup battery problems. In a RMS there is one CM module and one or more RMS-TA modules, TC modules. In some cases, the system may also include a remote computer.



Figure 1-1-1

The RMS standard configuration has the following features and functionality:

- Online monitoring of cell voltage, internal resistance, cell temperature, overall voltage, charge and discharge current and ambient temperature.
- Automatic over-limit alarm
- Displays data on CM module
- Key data can be saved on CM module, and a remote computer or a device can access CM module to pool out the data through a RS485 port or Ethernet port
- Comes standard with two dry contact outputs on CM module

Optional features:

- Comes with a network upload port
- 5.7 inch display

Rekoser technology provides its users with easy step-by-step installation plans, engineering drawings, device configuration, wiring methods and wiring diagram.

Installation steps are as follows:








- Check inventory of equipment and accessories according to the packing list upon arrival.
- A detailed explanation of Installation plan with step by step instructions following the engineering drawings will be provided with on-site installation by a Huasu Engineer or Agent. Conditions will be determined at the installation location as well as the methods of alignment. Once the Engineer has properly installed and explained instructions of operation and maintenance to the user and client, approval is required by the client.
- Mounting equipment.
- Wiring.
- Testing.
- Check before approval.
- Training

The above contents will be described in detail below.



2 System Components and Module Description

2.1 System Components

Standard configuration below:

Part Number	Picture	Descriptive name
1		RMS-TA Module
2		RMS-CM Module
3		RMS-TC Module
4		RMS-CT
5		RMS-TA test cable
6		RMS-TC test cable
7		RMS-TA communication cable
8		Power cable

Optional parts

Part number	Picture	Descriptive name
1		Monitoring Module
2		Converter

The system topology is below:

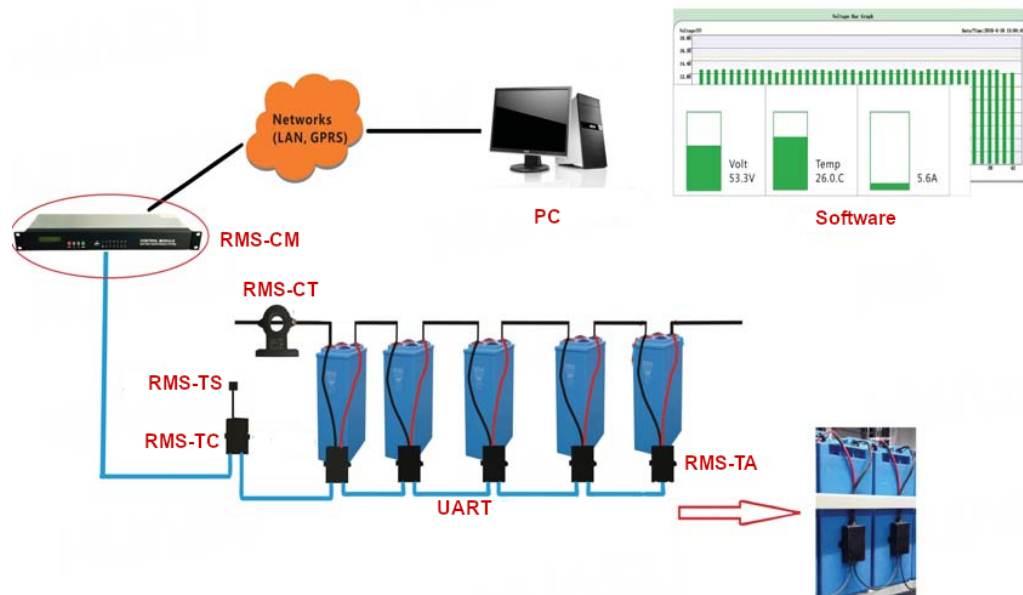


Figure 2-1-1

2.2 RMS-TA Module

The RMS-TA Module monitors cell voltage of a single battery, internal resistance and temperature and uploads data via the communications port. The RMS-TA doesn't have an alarm function. It is powered by monitored battery. The module comes in 2V type, with maximum power usage less than 0.15W and a 12V type, with maximum power usage of less than 0.25W. The module should only be used with its assigned battery type; otherwise, damage to the module may occur.

The module interface is described in the following figure below.

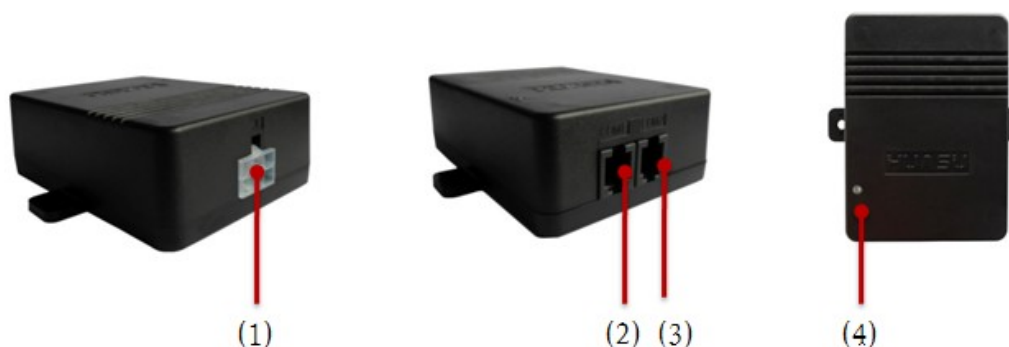


Figure 2-2-1

NO.	Name	Description
(1)	J1	Test port, connects with battery negative and positive poles.
(2)(3)	COM1/COM2 port	This is an internal parallel UART Port, which are used in communication between RMS-TA Modules.
(4)	LED	A double colors LED with a yellow and green light, the green light indicates power on, the yellow shows that communication is connected.

2.3 RMS-CM Module

The CM Module connects with RMS-TA modules and receives data including cell voltage, cell internal resistance and cell temperature. The RMS-CM displays all battery data. One RMS-CM module can manage up to 6 battery strings and each string is up to 300 batteries. The details of functionality are shown below:

- a、 Reads data from RMS-TA module.
- b、 Comes with an LCD Display that checks real-time monitoring data and shows history of alarm records.
- c、 Can set parameters for operation limitations.
- d、 Automatic alarm function. In the event of an alarm, an LED light will flash and a buzzer will sound, the corresponding dry contact will automatically shut off.
- e、 Connects to a host computer through an RS485 or a Ethernet port.

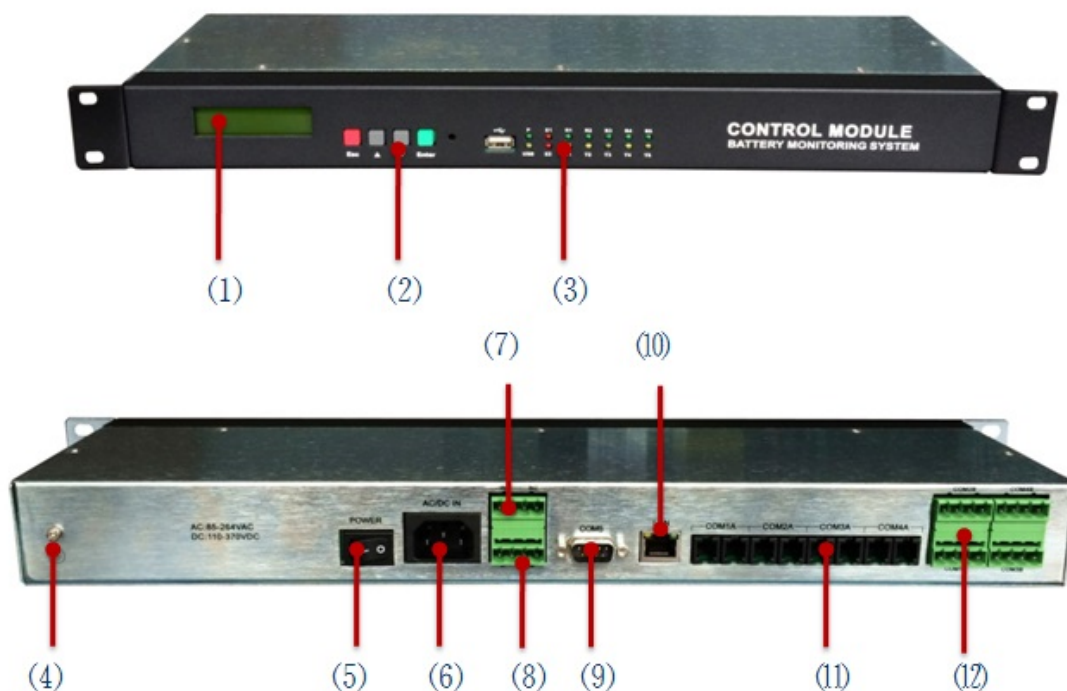


Figure 2-3-1

NO.	Name	Description
(1)	LCD display	Two lines of text are displayed, 122X32.
(2)	Button	Total of four buttons, “Esc” for exit, “▲”“▼”for page up/page down, “Enter” for confirmation.
(3)	LED	POWER: is the power light; E1:indicates a communication error; E2: indicates a battery alarm; Rx1/Tx1:COM1 is sending and receiving data; Rx2/Tx2、Rx3/Tx3、Rx4/Tx4、Rx5/Tx5: corresponds with COM2、COM3、COM4 and COM5 .
(4)	Ground	Connects to the ground.
(5)	Power switch	Controls RMS-CM Module power input.
(6)	Power Input	85~264VAC input, less than 15W for each RMS-CM.
(7)	For future	-----
(8)	Dry Contact	J1 for module or communication error, J2 for battery alarm, DC220V/1A
(9)	COM5 port	Data upload port that connects to a remote computer through an RS485, Pin9 is - and Pin5 is +, the baud rate is 19200BPS.
(10)	LAN	10M/100M, RJ45,communicates with a LAN.
(11)	COM1A-COM4A	Connects to RMS-TA modules or a RMS-TC module, one port is able to communicate with 240 modules
(12)	COM1B-COM4B	Supplies a 12 Volts power to RMS-TC module. Pin 3 is +, pin 4 is -.

2.4 RMS-TC Module

The RMS-TC monitors charge and discharge current and ambient temperature for one string. The RMS-TC communicates with the RMS-CM module through the COM1 and COM2 parallel port. One string needs one RMS-TC Module. The following details are shown below.



Figure 2-4-1

NO.	Name	Description
(1)	J1 port	Connects to the current transformer and the ambient temperature sensor.
(2)	LED	A double colors LED with a red and green light, the green light indicates power on, the red shows that communication is connected.
(3) (4)	COM1/COM2 port	This is an internal parallel UART Port, which are used in communication with a RMS-TA and a RMS-CM module.
(4)	VIN port	Power input, DC8-13V, where the left is + and right is -, Powered by the RMS-CM, where the maximum power is less than 2 watts.

2.5 Converter

The Converter is only used for connecting RMS-TA modules directly to a monitoring system without a RMS-CM module. It converts the UART bus to a RS485 bus. Every 130 RMS-TA Modules require a converter for configuration.

The following details are shown below.

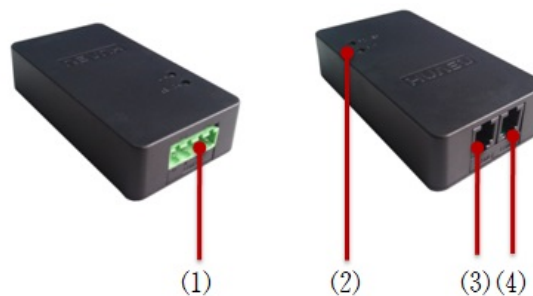


Figure 2-5-1

NO.	Name	Description
(1)	COM3 port	It's a RS485 port. The pins of COM3 from the left are B, A, +, -, where B is - of RS485, A is + of RS485, baud rate is 9600BPS, +/- is a 12VDC input with maxima 0.3W power dissipation.
(2)	LED	POWER: indicates power on; R/T: indicates communication.
(3)	COM1/COM2 port	This is an internal parallel UART Port. These ports are used in communication with RMS-TA modules.

3 Installation and Mounting

3.1 Numbering the Batteries

Before connecting the RMS-TA to the batteries, the batteries should be numbered and labeled correctly by using a label to paste on the surface of the battery where the labels are easy to be seen. The first battery, or, battery NO.1 must be the first one on the string positive terminal, the NO.2 is the battery following the NO.1 battery, and so on. The last battery is the one attached closest to the string negative terminal. The batteries must be numbered in accordance with this method.

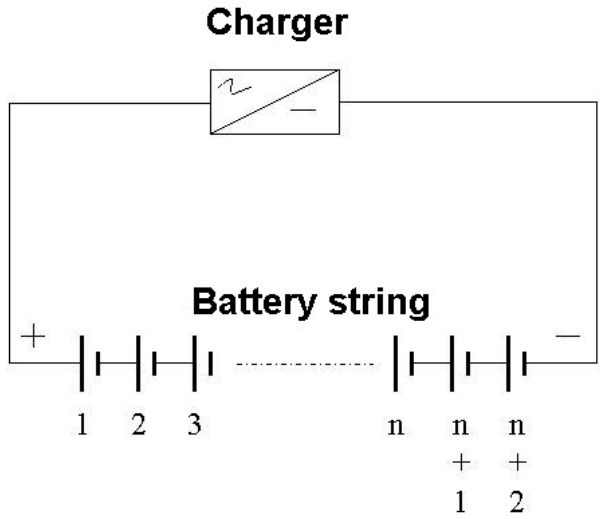


Figure 3-2-1



Figure 3-2-2

3.2 Connecting RMS-TA Test Cable To A Battery

Each battery should be connected to one RMS-TA test cable on its poles. Put the red wires on the positive pole of the battery (See (1)), and the black ones for the negative pole(See (2)).

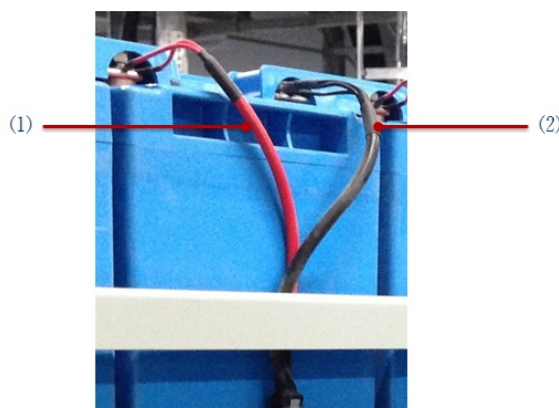


Figure 3-2-1

3.3 Mounting RMS-TA Module

Pastes the RMS-TA on a side of battery case, then plug the RMS-TA test cable in the port J1 on the modules (See (1)), the LED will turn on. Connect all RMS-TA as a loop with the communication cables after finishing address settings (See (2)).

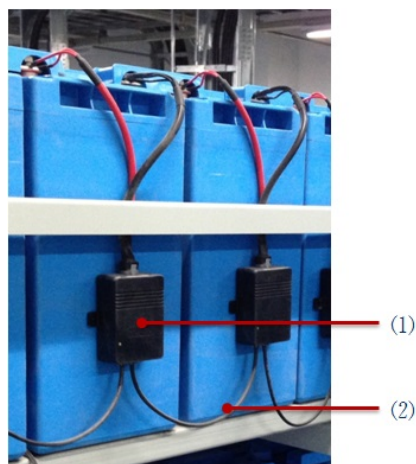


Figure 3-3-1

3.4 Address Setting For RMS-TA Module

The initial address is 1 for all modules and need to set to comply with the application. The max address which may be set is 240, all modules with different address connected to a same communication bus.

Using address module to set RMS-TA module address


If a lot of modules need to be set, using a address module will be more convenient. Just connect the address module to the RMS-TA's COM1, and set the new address on the address module then enter, the address will be changed to new one.

Using RMS-CM module to set RMS-TA module address

Connects the RMS-TA to the COM1A of RMS-CM module, and then follow below steps:

Enter the menu "3 Setup ":


```

┌───────────────────────────────────────────────────────────────────────────────────┐
│  3 Setup  
│ 4 Addr. Wr.  
└───────────────────────────────────────────────────────────────────────────────────┘

```

Choose "3.6 Mod Para":

```

┌───────────────────────────────────────────────────────────────────────────────────┐
│  3.6 Mod Para  
│ 3.7 Initial R  
└───────────────────────────────────────────────────────────────────────────────────┘

```

Choose the current address of the module:

```

┌───────────────────────────────────────────────────────────────────────────────────┐
│ Select Mod addr:  
│ COM1, 001  
└───────────────────────────────────────────────────────────────────────────────────┘

```

Press the button "Enter":

```

┌───────────────────────────────────────────────────────────────────────────────────┐
│ COM1,001#-Module  
│ Wait.....  
└───────────────────────────────────────────────────────────────────────────────────┘

```

Then the module type and firmware version will be showed:

```

┌───────────────────────────────────────────────────────────────────────────────────┐
│ COM1,001#-Module  
│ H3G-TA, REV.A9.12  
└───────────────────────────────────────────────────────────────────────────────────┘

```

Press the button "Enter", showing the battery voltage:

```

┌───────────────────────────────────────────────────────────────────────────────────┐
│ COM1,001#-TA-V  
│ 13.896V  
└───────────────────────────────────────────────────────────────────────────────────┘

```

Press the button "▼", showing IR and temperature:

```

┌───────────────────────────────────────────────────────────────────────────────────┐
│ COM1,001#-TA-R  
│ 0 μ Ω , Normal  
└───────────────────────────────────────────────────────────────────────────────────┘

```

```

┌───────────────────────────────────────────────────────────────────────────────────┐
│ COM1,001#-TA-T  
│ +26.2°C , Normal  
└───────────────────────────────────────────────────────────────────────────────────┘

```

Continue to press the button "▼", showing the module's address:

```

┌───────────────────────────────────────────────────────────────────────────────────┐
│ COM1,001#-TA -Addr  
│ 001  
└───────────────────────────────────────────────────────────────────────────────────┘

```

Press the button "Enter" then press the button "▼" or "▲" to enter a new address, then press the button "Enter":

```

┌───────────────────────────────────────────────────────────────────────────────────┐
│ COM1,001#-TA -Addr  
│ 032  
└───────────────────────────────────────────────────────────────────────────────────┘

```

Replace the module from the battery after finishing the address change, continue above steps to set another module's address.

3.5 RMS-CT and RMS-TC Module Installation

The Current Transfer (RMS-CT) should be mounted on a battery cable and let the cable go through the RMS-CT.



Figure 3-5-1

Keep the direction same between it showed on the RMS-CT and charge current flows.

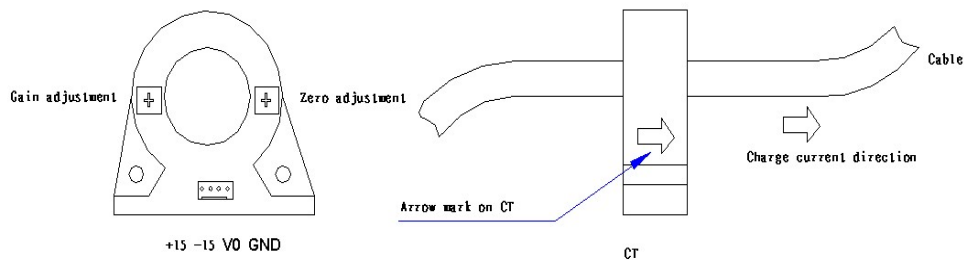


Figure 3-5-2

The RMS-TC can be mounted on the battery rack near the RMS-CT, the cable (1) is a RMS-TC test cable, the other end of which connects to the RMS-CT, the communication cable (2) connects RMS-TC and the first RMS-TA, the cable (3) connects the RMS-TC to a RMS-CM module. The power for the RMS-TC is from the RMS-CM through the cable (4).

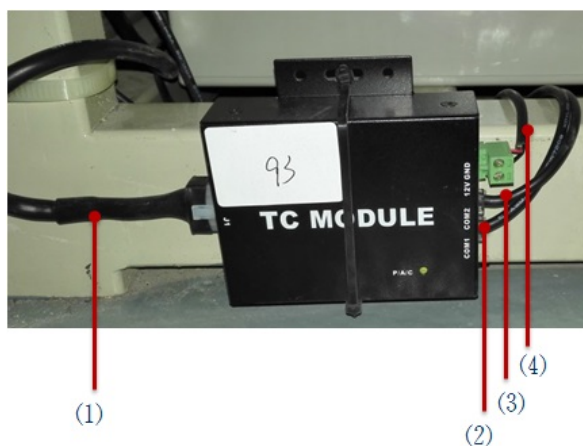


Figure 3-5-3

The default address for RMS-TC is 1, which can be changed with the RMS-CM module or the address module like the way the RMS-TA does. The address assigned to RMS-TC module is 241 by “Easy Setup”, so the RMS-TC module’s address should be changed to that address before connecting to RMS-CM module.

3.6 RMS-CM Module Installation And Wiring

RMS-CM module can be mounted in a rack or on the battery rack as below:



Figure 3-6-1



Figure 3-6-2

The RMS-CM module communicates with RMS-TA and RMS-TC via the ports COM1A, COM2A, COM3A and COM4A. Each port can monitor RMS-TA modules up to 130 or 240, and one RMS-CM module can manage battery strings up to 6. For one battery string and less than 240 batteries, connect all RMS-TA and RMS-TC modules together with the communication cables, then come to RMS-CM module’s COM1A and make a cycle like the drawing below. Also need a power supply from COM1B’s pin 3 and pin 4 for the RMS-TC module on VIN.

Connect the RMS-CM module on the port AC/DC IN to a power supply, the voltage range of which is required from 85V~264VAC or 110V~370VDC.

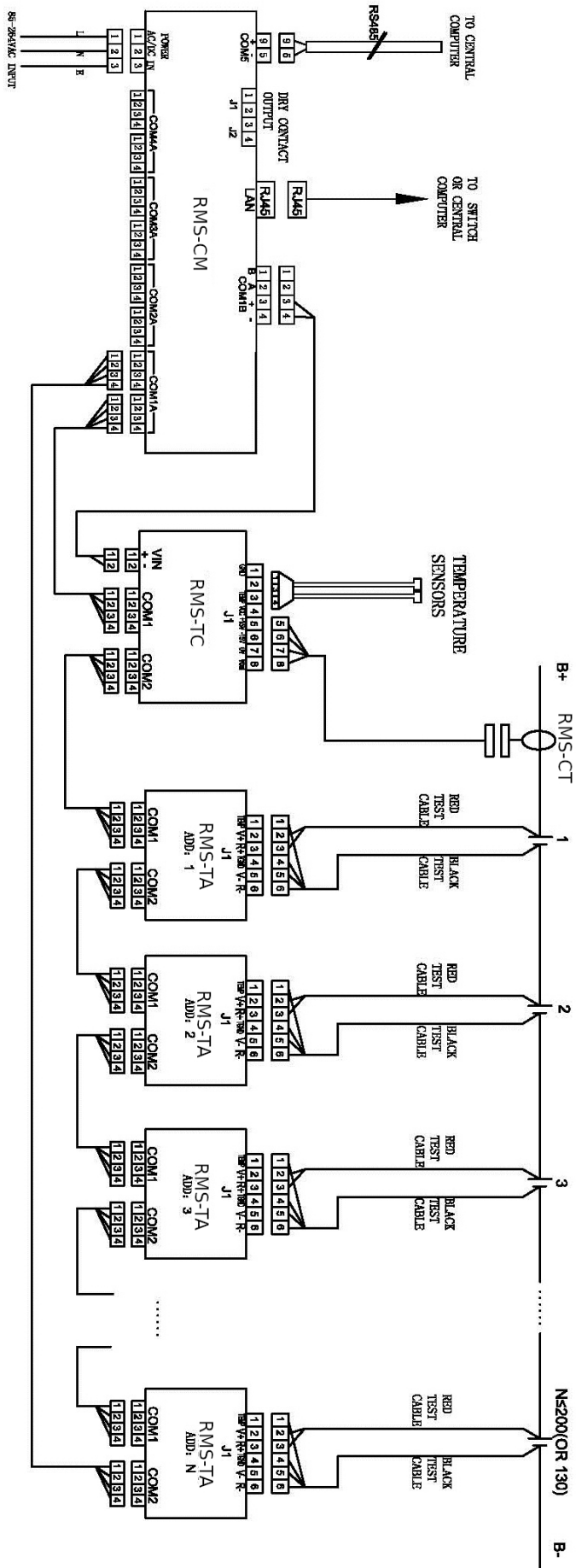


Figure 3-6-3

4 Settings

Turn on the power switch on the rear panel of the RMS-CM module, press the button “Esc” after seconds, it will display the main interface on the LCD like below:

```
1#: OK  2#: --  3#: --
4#: --  5#: --  6#: --
```

All the statuses of 6 battery strings are showed as “OK” or “-” or “!”, in which “-” means no this string and “!” means have a alarm with this string.

4.1 Easy Setup

When it's the first time to run the RMS-CM module, strongly advise to use “1 Easy Setup” to finish parameter settings.

Press the button “Esc” on the main interface → “C. Setup” → Enter password 2022 → “1 Easy Setup”, then enter string number which could be up to 6:

```
Set→String Qty
      1
```

And basic information for each string, then RMS-CM module will set the rest parameters automatically. But resistance base values for each battery should be set manually, please follow the instructions in another item.

```
S1→Basic Set
      2V, 300AH, 40
```

That “Easy Setup” will assign each communication port on RMS-CM module for different string, for a sample, port COM1A for string1, port COM2A for string2, etc. So when you connect the RMS-TA and RMS-TC modules for each string, you must follow this rule and it means all RMS-TA and RMS-TC modules for string1 must be connected to the port COM1A.

The address assigned to RMS-TC module is 241 by “Easy Setup”, so the RMS-TC module's address should be changed to that address before connecting to RMS-CM module.

After getting above steps done, press the button “Esc” to go back to the main interface.

4.2 Data Checking

See all data on RMS-CM module to check if all wirings and parameters are correct.

Enter the menu “A. Mon. Data” → Select string then press “Enter”:

```
S1 V-data time:
      2014-02-11 15: 04
```

The time is the last updated time for battery voltage values. Press “▼” :

```
S1 R-data time:
      2014-02-01 00: 04
```

The time is the last updated time for battery resistance values. Continue to press “▼” :

```
S1 V&C:
      352.5V +0.1A
```


“V” means string voltage and “C” means string current. Continue to press “▼” :

S1-001#:	+23.5 °C
13.235V	3256 uΩ

It is showed the temperature, voltage and IR for battery 1 of string 1. Continue to press “▼” and will see the data for each battery. At the last page the ambient temperatures will be displayed:

Ambient:	
+23.5°C	+23.5 °C

If finding any incorrect values, need to check the wirings, parameters and others related.

4.3 Alarm Checking

Any alarm happened, a sign “!” will appear on the main interface and the lamps on the front panel will light up.

1#: !	2#: OK	3#: --
4#: --	5#: --	6#: --

Press “Enter” to see the details:

S1 C/V alarm
S1 S/V alarm

S1: String 1
C/V: Cell voltage
S/V: String voltage

To see more detailed, enter the menu “B Alarm Info.”→ “B.1 Curr. Alm.” → Choose a string → Use “▲ “ or “▼” to see all alarms.

In the menu “B.2 Alarm Rec.” all recovered alarms will be showed.

During alarming, the buzzer in CM module will turn on and press “Esc” twice to turn it off. Also it can be shut down in the menu “5.5 Beep Ctrl “.

4.4 Internal Resistance Test and Setting

The RMS-CM module will perform IR test once a month automatically, and for the first time to run it, IR test should be done manually for getting the base IR values for each battery.

In the menu “2 R Test “, choose a string then press “Enter” to start a IR test, which will take around 10 minutes to half hours depends on battery number. If you want to interrupt the process during IR test, just switch off the RMS-CM module.

After finishing a IR test, the setting for the base IR values should be done as below.

For New Batteries

After performing a resistance test, the values can be used as a standard resistance for those specific batteries. See the steps below to set a standard resistance setting.

“3 Setup”→“3.8 R Set”→Choose the string then press “Enter”, the last IR values will be saved as standard IR values. After that, RMS-CM will alarm if any IR value is higher 50% than the standard one during an IR test.

For Old Batteries

After performing a resistance test on the old batteries, work out the average value as a standard resistance. See the steps below to set a standard resistance setting for old batteries.

“3 Setup” → “3.7 Initial R” → Choose the string → Press “▲” to the page with “All”, then enter the average value.

4.5 Reading Accuracy Checking

Using a valid meter to measure each battery’s voltage and temperature, or just choose the 5 batteries with the highest values and the 5 batteries with the lowest values to measure, then compare the results with the readings on RMS-CM module and check if it is meet the requirements.

For IR, as the equipments with different IR test methods will get different results, so usually just to check the repeating accuracy. Perform IR test for 3 times and calculate the repeating accuracy. For most applications, 5% is acceptable for IR repeating accuracy.

In some projects, customers will require the IR values match to some IR meters from other companies. Our BMS can be done to close the values from that kind of meters in the menu “4 Addr. Wr.” → “4.1 Addr. Wr.” → change the value in the register 464071.

5 Connecting BMS to a Remote Computer

5.1 Via RS485

The COM5 on the RMS-CM Module is used to connect to a remote computer. It complies with the MODBUS proposal.

Communication type: RS-485/2 wires

Baud rate: 19200 BPS

Pin layout: pin 9 is -, pin 5 is +

In the event that a device needs to connect two or more RMS-CM Modules through the same RS485 bus, the RMS-CM Module’s addresses need to be changed. The default address is 1, and follows the below steps to change it:

“3 Setup” → “3.3 GL Set” → Press “▼” to the page “Mod Addr” to enter a new address.

5.2 Via LAN port

The port LAN on the CM module supports the proposals like MODBUS/TCP and SNMP, the IP for the port can be set in the menu “3 Setup” → “3.3 GL Set” → Press “▼” to the page “IP Addr”, “Mask”, “Gateway” to finish the settings.

5.3 Via Dry Contact

There are two dry contacts on the rear panel on the RMS-CM module with J1 and J2, J1 for module or communication error and J2 for battery alarm. The contacts can stand the voltage DC220V with 1A current.

6 Advanced Setting

6.1 Changing Alarm Limits

In the menu “3 Setup” → “3.5 Str Set” → Choose a string then press “▼” to the page where you want to change the parameters.

6.2 IR Setting

Changing IR alarm limit

The default rate is 50% that means the battery IR is higher 50% than the standard one stored in the RMS-CM, RMS-CM will give an IR alarm.

That rate can be changed in the menu “3 Setup” → “3.5 Str Set” → Choose a string

then press “▼” to the page “Times R”, enter a new one and save it.

Changing IR cycle’s number

For one battery string, if the battery number is less than 60, the IR cycle’s number is same as the battery one, if it is more than 60, the IR cycle’s number is 60. On the page “Cycle Set” in the menu “3.5 Str Set”, the cycle number can be changed to one bigger than 10.

Changing IR interval time

Every month IR test will be performed automatically, which can be changed to one day or several days on the page “ R Interval” in the menu “3.3 GL Set”.

6.3 Connecting One More Strings To The Same Port On RMS-CM Module

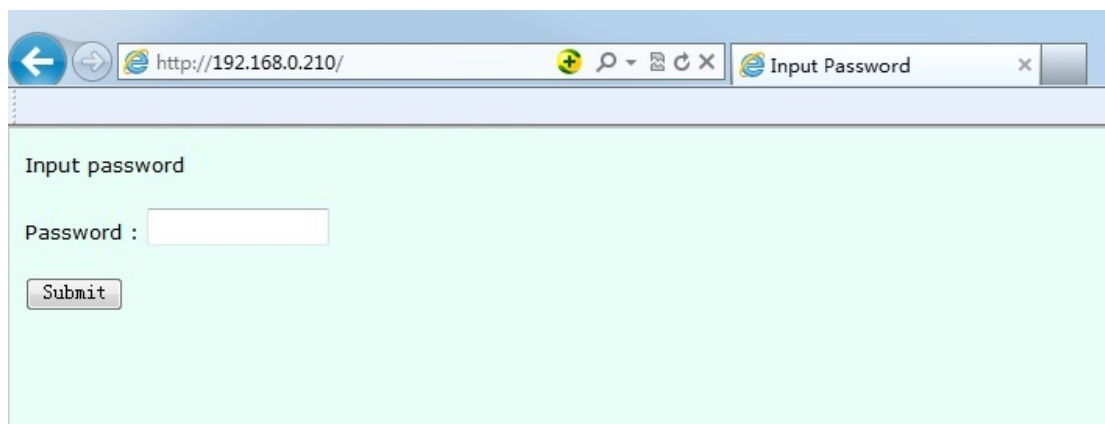
Each port of RMS-CM module is assigned for one string after a “Easy Setup”, if you want to connect another string’s TA and TC modules to the same port, the below steps should be done.

“3 Setup” → “3.5 Str Set” →Choose a string then press “▼”to the page “DCM addr”, enter the port number and the address of the first TA module in the string.

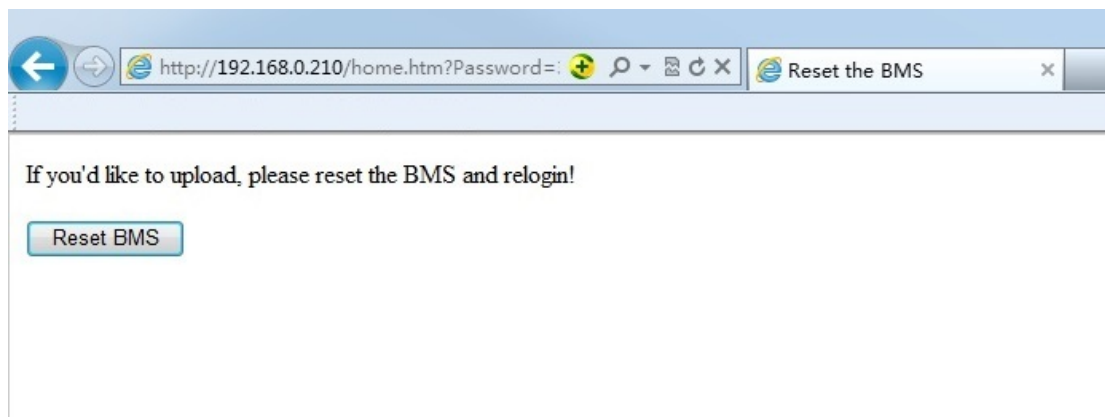
Rd→S1→DCM addr
COM1, 1

6.4 Online Updating Firmware

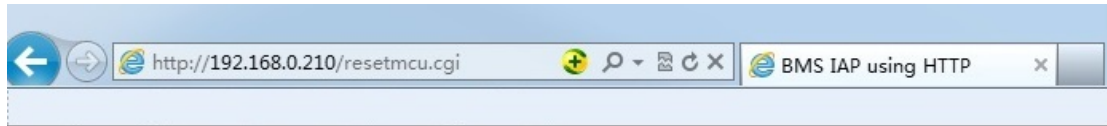
RMS-CM module’s firmware can be updated online on the port LAN via an Ethernet. Connect a computer to the RMS-CM module or both connect to an Ethernet. Run IE on the computer and enter the RMS-CM’s address (192.168.0.105 from factory):



Enter 2022 in the password blank:

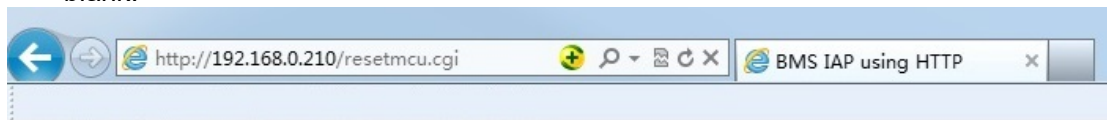


Click 'Reset BMS':



BMS Reset Done ! Please flash the webpage.

After reloading the web, enter admin in the User ID blank and 2022 in the Password blank:

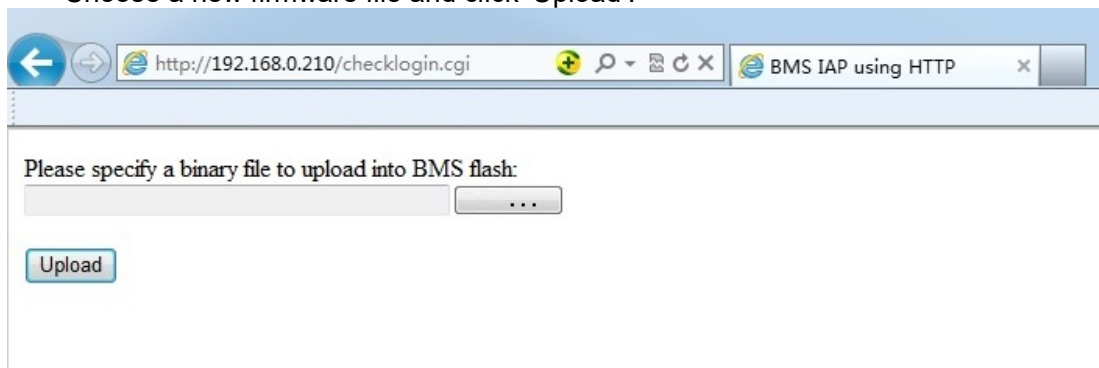


Login

Enter user ID and password:

User ID Password

Choose a new firmware file and click 'Upload':



The updating process starts and will finish in few minutes.

7 Menu Description

Menu name	Description
A.Mon.Data	View monitored battery data
B.Alarm Info.	View the last 100 alarm records
B.1 Curr. Alm.	Not recovered alarms
B.2 Alarm Rec.	recovered alarms
C.Setup	Set all parameters
1 Easy Setup	A easy way to set all parameters
2 R Test	Perform a resistance manually
3Setup	
3.1 Evt Hist	The last 50 event records

3.2 Alm Hist	The last 100 alarm records
3.3 GL Set	All general parameters
3.4 Features	Choose features
3.5 String Set	Set all parameters for a string
3.6 Mod Par. Chang	RMS-TA or RMS-TC module's address
3.7 Initial R	Standard resistance value for each battery
3.8 R Reset	Replace the standard IR values with the last measured ones
4 Addr. Wr.	
4.1 Addr. Wr.	Change the value in a register
4.2 Read	Read the value in a register
5 Tools	
5.1 Erase Data	Erase records in Main Module
5.2 Load Fac.	Recover all parameters to factory settings
5.3 Load Def.	Recover all parameters to default settings
5.4 Save Def.	Save the current settings as a default
5.5 Beep Ctrl	Turn on or off the beep
6 Reset	Restart RMS-CM module