MODULAR BATTERY MONITORING SYSTEM

Installation and Service Manual

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1. SAFETY INFORMATION

Before using, read this service manual to ensure correct usage through understanding. After reading, keep it in a safe place for future reference. Misuse of this product can result in personal injury or physical damage. All installation instructions must be strictly followed.

Various symbols are used in this manual in order to ensure proper use prevent dangers and material damage. The meanings of these symbols are explained below.

ABOUT THE SYMBOL	
CAUTION	Indicates situations that, if ignored, could result possibly in personal injury or physical damage.
WARNING	Indicates situations that, if ignored, could result in death or serious injury.
DANGER	Indicates situations that, if ignored, could possibly result in personal injury or even death.

DANGER

HAZARDOUS VOLTAGE

Batteries and battery cabinets contain potentially lethal voltages. To avoid electrical shock or burn, turn of main supply and control voltages before performing installation or maintenance. Even when the AC power is cut off, there is energy in the batteries, so battery intervention should be done with personal protective equipment.

WARNING

WHEN YOU WORK NEAR LEAD-ACID BATTERIES:

1. A staff member should be within reach of the person performing the action or close enough to come to help in the event of an accident.

2. Equipped safety glasses and protective clothing should be used. Eye contact should be avoided when working around the battery. If battery acid comes into contact with skin or clothing, the contact area should be immediately washed with soap and water. If the acid comes into contact with the eyes, they should be washed with cold water for at least 10 minutes and medical attention should be sought as soon as possible.

3. Care should be taken when working with metal tools (screwdriver, washer, etc.) around a battery. If a metal tool is dropped near the battery, it may cause a spark or short circuit between the battery terminals and some other metal parts. Either event can cause a dangerous electric shock hazard, fire or even explosion.

4. Personal items such as rings, bracelets, necklaces and watches should be removed when working with a lead acid battery. A lead-acid battery can short-circuit a metal ring or other piece of jewelry that can cause severe burns.

WARNING

RISK OF EXPLOSIVE GASSES.

Batteries generate explosive gasses during normal operation, and when discharged or charged.

The manufacturer is not responsibility for any damage caused by mishandling that is beyond normal usage defined in this service manual.

2. ACRONYMS

Acronym	Definition
BMS	Battery Monitoring System
UPS	Uninterruptible Power Source
DC	Direct Current
AC	Alternating Current
SNMP	Simple Network Management Protocol

3. INTRODUCTION

In general, the Battery Monitoring System (BMS) is an electronic system that monitors a battery and battery pack by preventing the battery from operating outside the safe working area and by calculating the desired data and reporting the data that monitors the environment. Eagle Eye Battery Monitoring System (BMS) is a combination of hardware and software that instantly monitors the values of the batteries used in critical energy infrastructures, determines the problems that may occur in each battery, detects battery failures and informs the user about the battery status with the interface software. Eagle Eye Battery Monitoring System works like a protector and ensures that the batteries remain within the optimum operating range by examining the operating conditions.

The general features of Eagle Eye and its benefits to the user are given below;

Features and Benefits

Extends the lifetime of the batteries in the infrastructure.

Reduce maintenance and replacement costs through effective protective and preventive maintenance.

Provides maximum benefit with minimum workforce.

Ensures remote access, giving you the opportunity to manage your business anytime, anywhere.

Provides planned battery procurement by avoiding emergency situations.

Enables the identification and verification of the warranty status with recorded data and reporting.

Ensures improvements in business insurance premiums as risks are reduced to minimum.

Keeping your staff away from battery racks / chambers and vulnerable areas makes sure their safety and activities continue without interruption. This allows you to focus on your core activities by simplifying your work safety and health planning.

3.1. System Structure

Eagle Eye is a battery monitoring system that measures and records the voltage, internal resistance, temperature and string current in the battery series or a in parallel on a string basis.

The modular architecture of system has the benefit to be easily customizable (see APP 1) to record other parameters on request (i.e. humidity, temperature sensor etc.).

Eagle Eye monitoring system consists of the battery (cell) module, string module, control module and accessories of this modules, each module functions as following;

Table 1. Modules and Definition Table **Module Name**	**Remark**
Battery Monitoring Module (BATMOD-XXX)	Determination single battery voltage, temperature, resistance
String Monitoring Module (STRMOD-XXX)	Determination the string voltage, string current, ambient temperature and humidity.
Control Module (CONMOD-XXX)	Realization battery data acquisition, control, alarm and event logging upload
Accessories	Power Supply, Measuring Cable, Data Cable, Current sensor and Current Measuring Cable

System components and their definitions are given in APP 1 and the following the structure of the system are available;

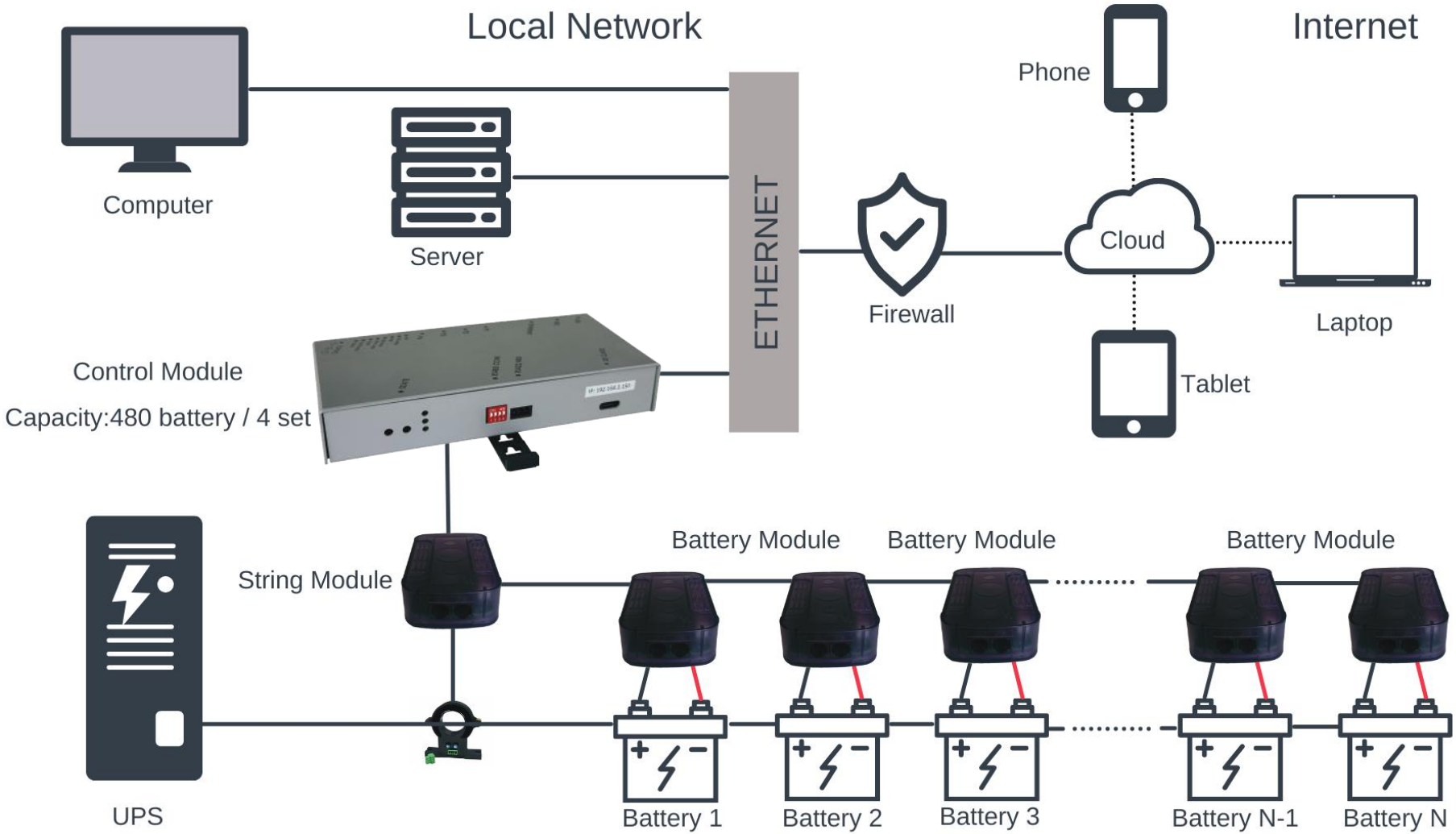


Figure 1. Structure of Eagle Eye

3.2. Application

Eagle Eye battery monitoring system:

- Support to monitor single unit between 1V-16V batteries.
- Support to monitor single group 1-120 units' batteries.
- Support up to 4 string per system.
- Measurement max. group voltage 1-2500V
- Measurement current -500A --- +500A
- Measurement internal resistance 100uΩ --- 65mΩ

3.3. Measurement

Each battery monitoring module (BATMOD) continuously measures the following battery parameters:

- Voltage: The battery module measures the real-time voltage of the battery. Temperature: The battery module measures the negative pole temperature of the battery.
- Internal resistance (Ri): The battery module measures the internal resistance of the battery.

The string monitoring module (STRMOD) continuously measures for each string of batteries:

- Voltage: String module measures the real-time voltage of the string.
- Current: String module measures the real-time current of the string.

The control module (CONMOD) continuously measures the data it receives from the battery monitoring and string monitoring module:

- Battery Data Acquisition: String module collects data from COM1 to COM2 via two RJ11 ports and communicates with the battery using UART communication line. All data is transferred to the control module via the UART communication line.
- RS485 Interface: Control module provides one RS485 interface, support the international common MODBUS-RTU protocol.

4. PRODUCT DETAILS AND INSTALLATION

4.1. Operating Conditions

- Operating Temperature: 0°C ~ +50°C
- Storage Temperature: -10°C ~ +70°C
- Working Humidity:5 % ~ 90 % RH
- Atmosphere Pressure: 80 – 110 kPa

4.2. Eagle Eye Features

Eagle Eye battery monitoring system is divided into a battery monitoring module, string monitoring module and control module.

4.2.1. Battery Monitoring Module

Battery (cell) module is specially designed as highly integrated smart module for VRLA VLA and Ni-Cd batteries, can quickly and accurately measure the batteries voltage, resistance and negative pole temperature.

Indicate Light Illustration

In normal condition and when the 'State' button on the control module is pressed, the light notification definitions on the battery module are as follows;

Table 2. Battery Monitoring Module Normal State Light Notification Table

No	Color	State	Definition
1	Green	0.2 sec. led @ 30 sec	Connection is available
2	Yellow	Continuous / 0.2 sec. led@5 sec / 0.7 sec. led @1 sec	IR Test / No message*/ Software update
3	Red	Continuous / 0.2 sec. led @5 sec	No Application (Only Boot Loader) / No Connection

*If data is not coming at more than 30 sec.

Table 3. Light Notification Table with Battery Monitoring Module State Button Active

No	Color	State	Definition
1	Green	0.5 sec. led@1 sec	Do not overstep lower or upper limit values
2	Yellow	0.5 sec. led@1 sec	Limit values in the warning band
3	Red	0.5 sec. led@1 sec	Overstep lower or upper limit values

Dimensions (mm)

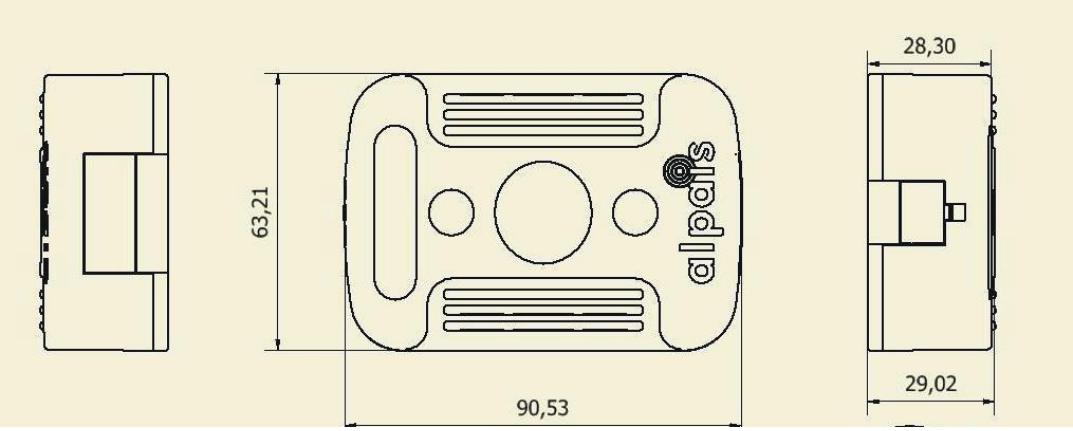


Figure 2. Dimensions of Battery Monitoring Module

4.2.2. String Monitoring Module

String module is specially designed as highly integrated smart module for VRLA, VLA and Ni-Cd batteries, can quickly and accurately measure the string voltage, charge and discharge current other parameters.

Indicate Light Illustration

In normal condition and when the 'State' button on the control module is pressed, the light notification definitions on the string module are as follows;

Table 4. String Monitoring Module Normal State Light Notification Table

No	Color	Status	Definition
1	Green	0.2 sec. led @ 30 sec	Connection is available

Table 5. String Monitoring Module State Button Active Light Notification Table

No	Color	Status	Definition
1	Green	0.5 sec. led@1sec	Do not overstep lower or upper limit values
2	Yellow	0.5 sec. led@1 sec	Limit values in the warning band
3	Red	0.5 sec. led@1 sec	Overstep lower or upper limit values

Dimensions (mm)

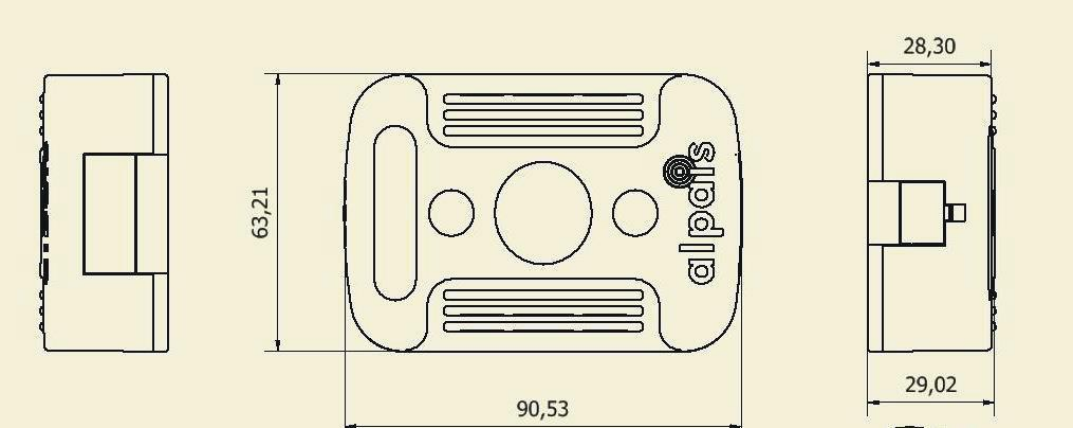


Figure 3. Dimensions of String Monitoring Module

4.2.3. Control Module

Control Module collects and compiles data from the battery monitoring and string monitoring module. It communicates with the user interface and transmits the data it collects.

Indicate Light Illustration

The light notification definitions in the control module are as follows. Does not apply to light notifications on embedded server-enabled control module.

Table 6. Table of Light Notifications of Control Module

No	Color	Status	Definition
1	Green	Short flashing light	The program is ready to run
2	Yellow	Short flashing light	Battery Module application on Control Module
3	Red	Continuous Light / Short flashing light	No network connection can be established via Ethernet / Verifying peripheral units

Dimensions (mm)

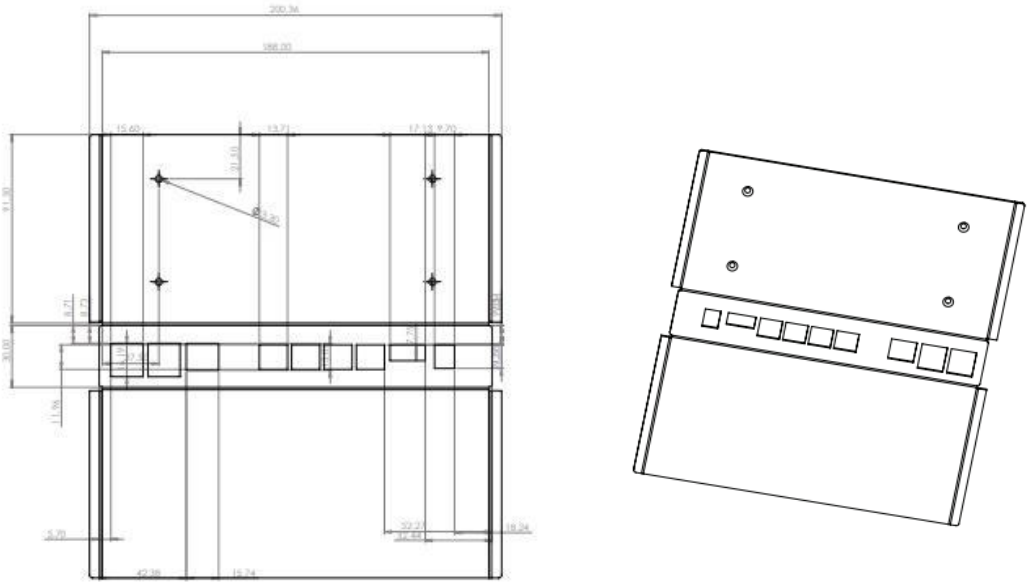


Figure 4. Dimensions of Control Module

4.2.4. Current Sensor

A current sensor is used for each string to measure the current passing through each string. (50 ≈ 500 A)

The Main Terminal Definitions

Table 7. Current Sensor Main Terminal Definitions Table

No	Symbol	Definition
1	15 V+	+15 V terminal input
2	15 V-	-15 V terminal input
3	V_{out}	Output voltage
4	0 V	GND

Dimensions (mm)

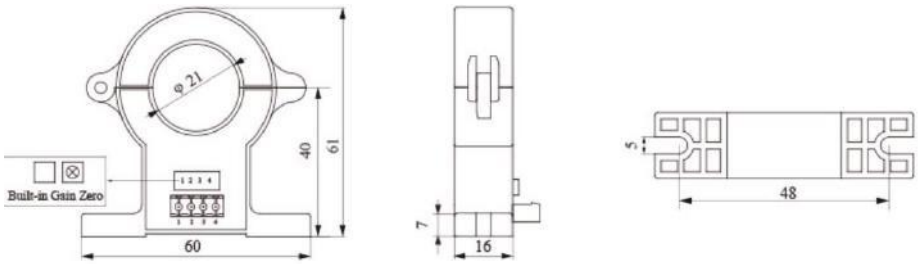


Figure 5. Dimensions of Current Sensor

4.3. Installation and Assembly

Absolutely read the safety information before installation!

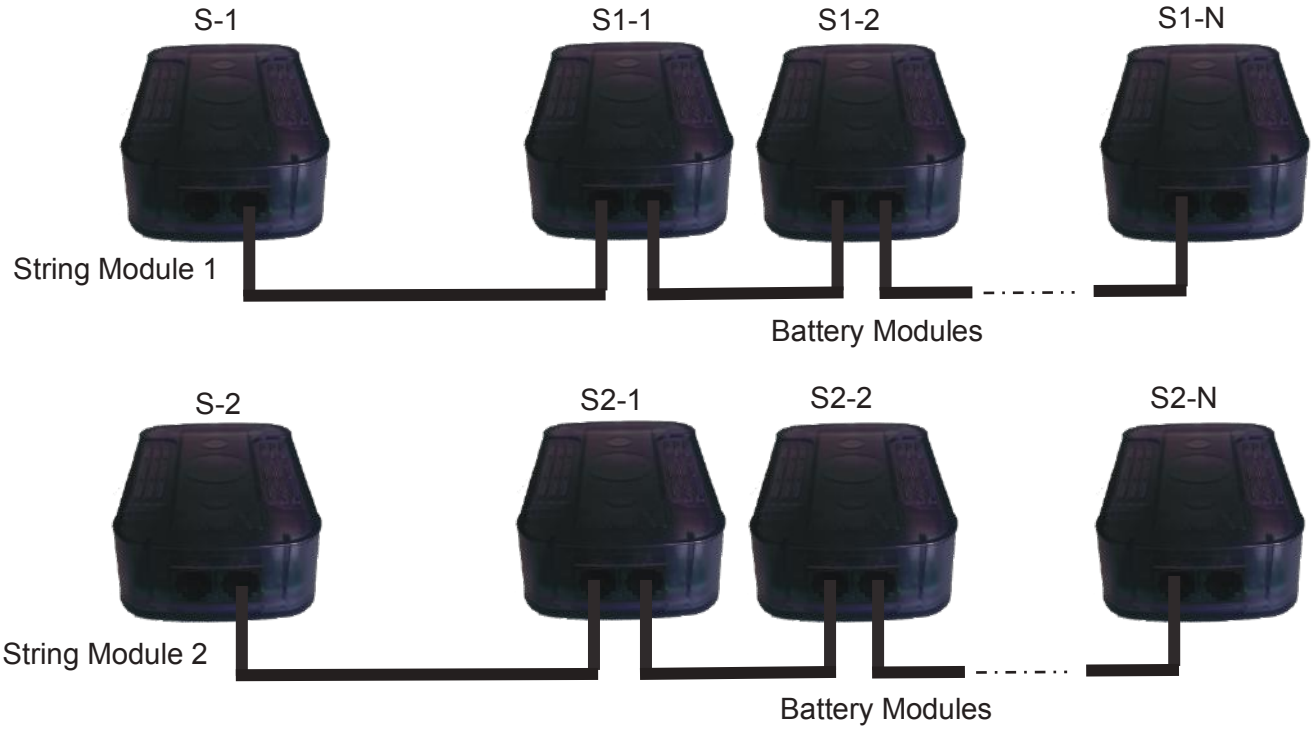
Step	Description	Control
1	Preparation of the site survey and necessary installation information (APP 2) by the customer	
2	Confirmation of site survey and installation information	
3	Making necessary occupational safety prevention and preparations (gloves, protective goggles, etc.)	
4	Preparation of the necessary hand tools (APP 3)	

5	Turning OFF the battery circuit breaker in the handle	

4.3.1. Preparation of Batteries

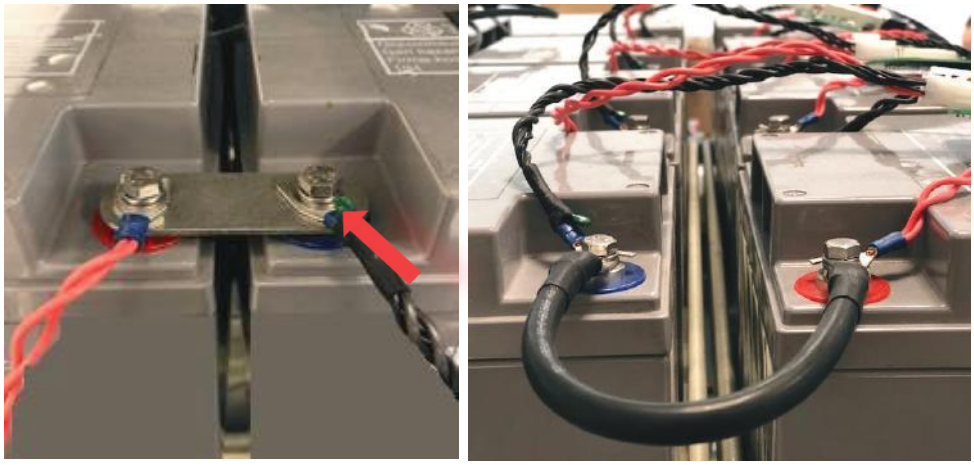
It is checked whether the batteries are disconnected from the power.

If not, the battery in each string is numbered. It is recommended to number S1-1 or K1-1. (SA-B: String ranch A and B. Battery)



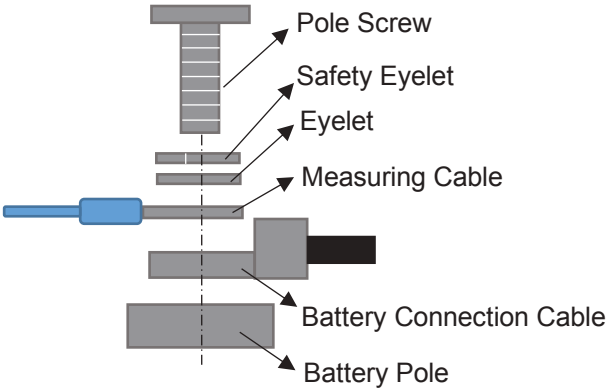
4.3.2. Installing Measuring Cables

The measurement cable is inserted by removing the measurement cable socket to the terminals of the batteries in the relevant string and it is tightened back with the appropriate torque. This process is repeated for each battery as specified.



Busbar Type Jumper Cable Type Jumper

The connection shape of the measuring cables must be as follows;



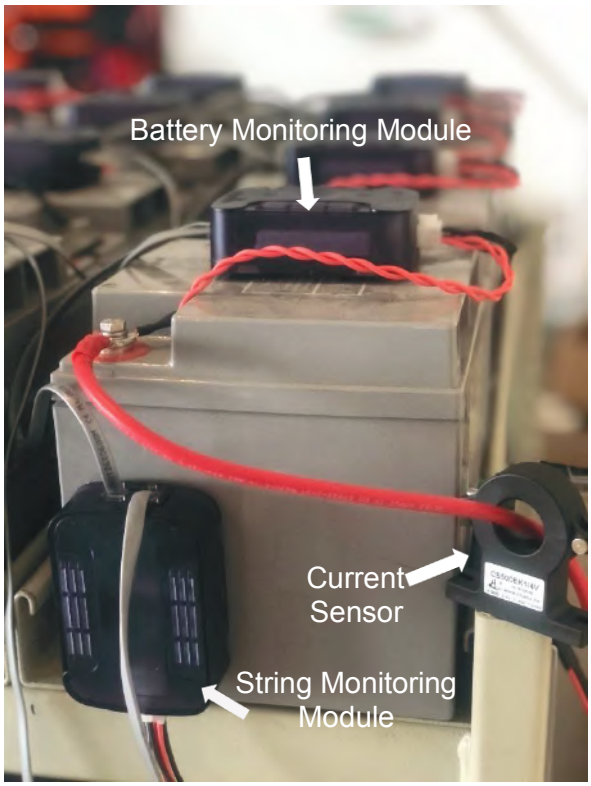
4.3.3. Connecting the Battery Module to the Battery

The application surfaces of the batteries are cleaned. The battery modules are fixed to this surface with the help of double-sided tape.

The empty end of measuring cable is connected to the battery module with the help of the connector. This process applies to all batteries in that string. In this case, each of the battery modules must flash the yellow. If the battery modules have not received the addressing before, they also flash the red light.

4.3.4. Connecting the String Module

The string module is positioned in front of the 1. battery module at an appropriate point for each string. The current sensor is also fixed so that it passes through the power cable to the first battery of the corresponding string. And its wiring is made between the string module and current module.



4.3.5. Batteries and String Data Connection

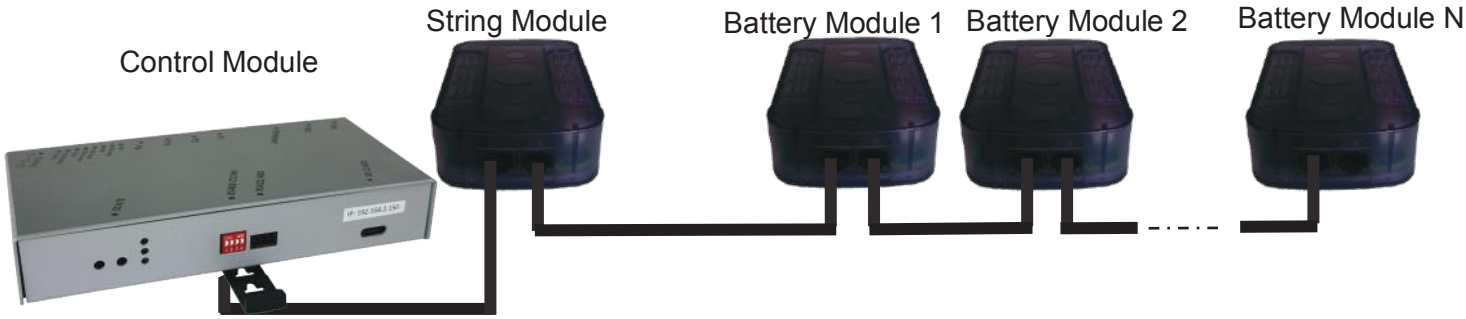
The prepared data cables firstly are connected to the string module from the ‘J3’ output and finally are connected to the ‘J2’ input of the first battery module. This connection also continues until you reach the J2 input of the last battery module. The ‘J3’ output of the last battery module will stay idle. This process is repeated for each string.

4.3.6. Connecting the Control Module

All the strings for the control module are taken into consideration and assembled by selecting a suitable location. The 12V / 2A adapter from the 220 V line, which was prepared before installation, is connected and the control module is powered up by the adapter. The red light in the control module is expected to illuminate.

From the string output (P1-P2-P3-P4) of the control module, the ‘J2’ input of the string module in the corresponding string is connected to the data cable. After the control

module has been configured (see 4.4), Control Module automatically loads the current software to the battery modules in each string .



4.4. Control Module Configuration

Netconf service application is used to change the required parameter settings (IP address, Upgrade, Offset etc.) on the control module. The installer will provide 'NetConf' file from the manufacturer.

4.4.1. Netconf Physical Connection

The installer must make the necessary connection between the 'RS422 converter' and the control module as described; It should be connected from the B(D-) terminal on the RS422 converter to the 2nd pin of the serial communication port and from the A(D+) terminal on the RS422 converter to the 1st pin of the serial communication port.

Figure 6. Serial Communication Port

NOTE: In order to identify the required port after the connection, the appropriate driver must be installed or installed. (See https://www.ftdichip.com/Drivers/VCP.htm 64-bit or 32-bit software for Windows can be downloaded directly).

4.4.2. Netconf Application Communication

NetConf interface opens. As shown in the Figure 7, the connected port is detected by the program. When the detected port is selected, the connection is provided with 'Connect' button. The Baudrate value registered in CONMOD is automatically detected.

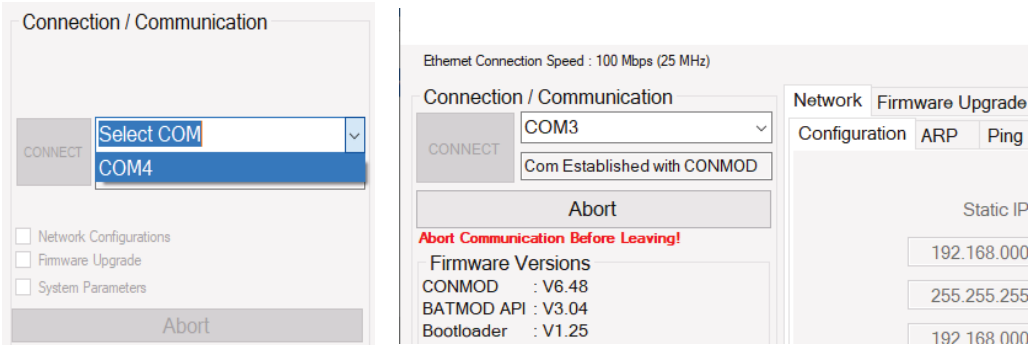


Figure 7. NetConf Interface

4.4.3. Netconf / Network Settings

First, 'Network_Configurations' button is selected. On the right screen, 'Bring' button displays the network information installed in the control module (see Table 8). This information is arranged according to the area to be installed and updated with Update button (see Figure 8).

NOTE: Control modules with 'Embedded Web Server' do not require network setup. Network Settings will be made from APP 7.

Table 8. Network Configuration Table

Name	**Description**
IP Address	The IP address of the control module.
Destination IP	The IP address of the Eagle Eye interface.
NetMask	It is a network mask.
Gateway	The address of the gateway.
MAC Address	Control module has a MAC address.
Destination Port	60000 (Port is the data stream).
Unique_ID	The number given to the device in the Eagle Eye interface. If the customer wishes to monitor their batteries via livedemo.Eagle Eye.com.tr, the unique number of all devices must be different.
NTP Address	It measures algorithms, delays on the network and on the target machine. The IP address to synchronize the clock must be entered.

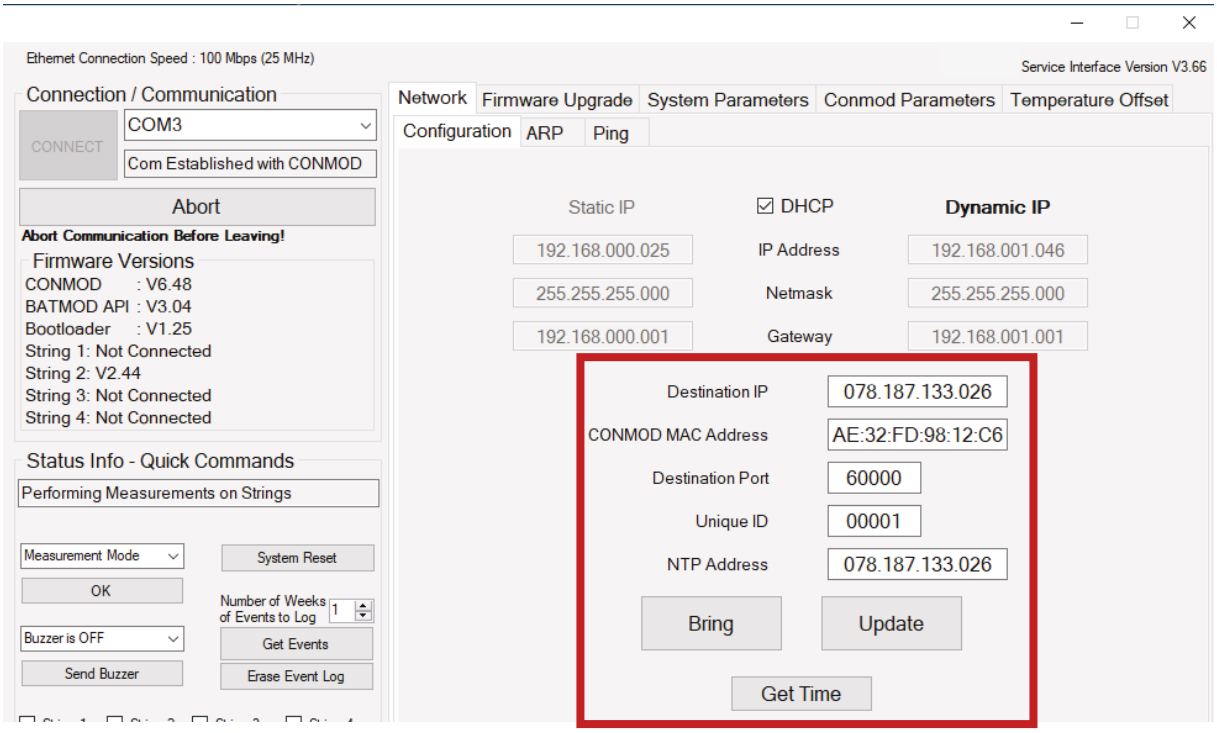


Figure 8. Network Configuration Setup

4.4.4. Netconf / Message Display and Software Update

All transactions made by CONMOD under the name 'Status Info' are written as messages. This message can be used to check which operation CONMOD is currently performing or which operation it cannot perform. With the 'System Reset' button, CONMOD can be soft reset (See Figure 9).

'Firmware Upgrade' button is selected to load the current BATMOD application in CONMOD when in the Installation mode. Select the BATMOD application in .bin format with 'Choose File' button on the right. The new BATMOD application will be loaded to CONMOD with 'Load File'. The desired string will be selected with the 'Upgrade BatMods Firmware' button, and BATMODs will be applied.

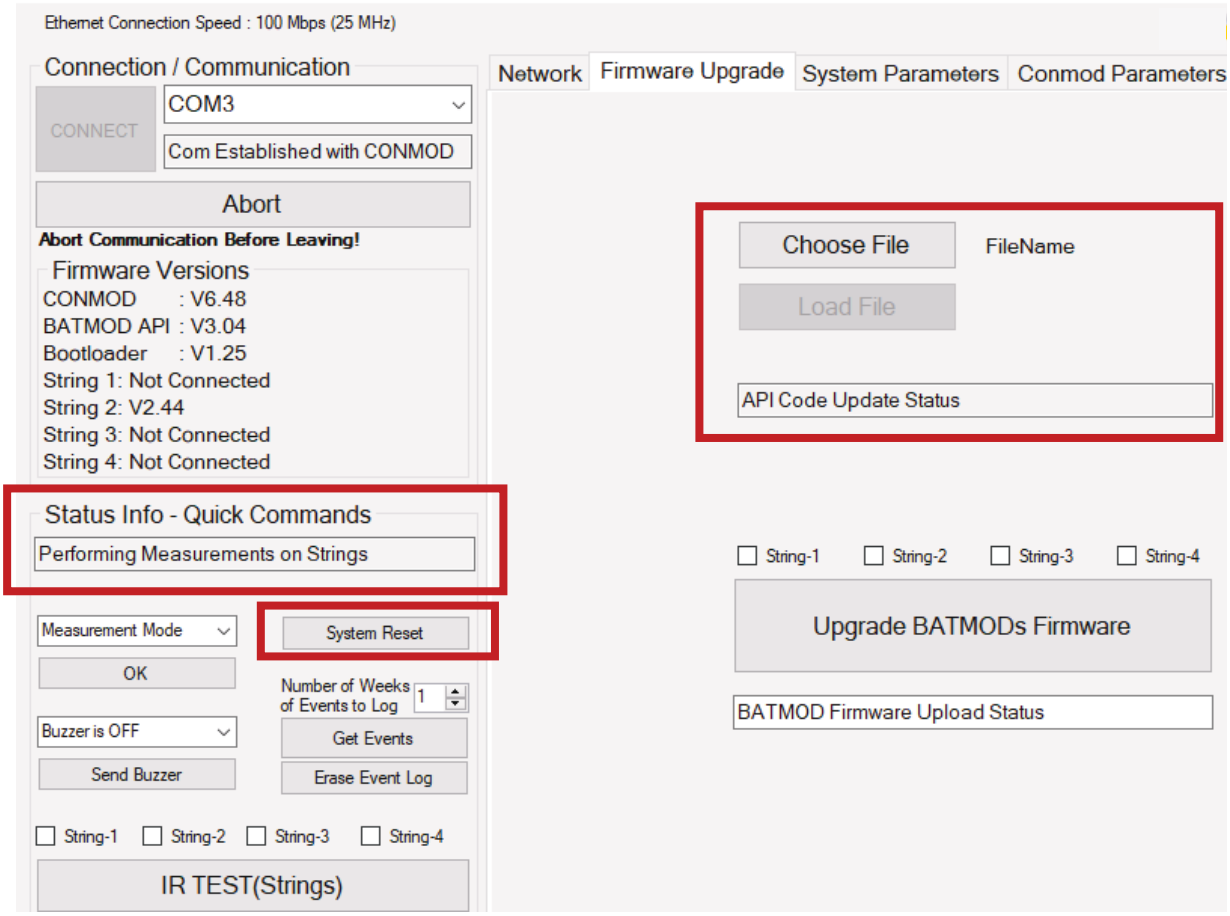


Figure 9. Firmware Upgrade

4.4.5. Netconf / Installation and Measurement Mode

'Installation Mode' selected from the lower left section and 'OK' button is pressed for Installation Mode. Batteries are expected to receive addressing. After the confirmation command has been received, the display will show the number of batteries in each string. 'Measurement Mode' option is selected and the verification code is waited for Measurement Mode. In measurement mode, a data stream is provided every 30 seconds. In order to receive data from the system, 'Measurement Mode' must be selected. (See Figure 10).

All events written to CONMOD can be downloaded in txt format with the Get Events button. Logs are taken weekly, the number of weeks to be selected is written in the box. A string-based internal resistance test is performed on each string with the 'IR TEST' button. (See Figure 10).

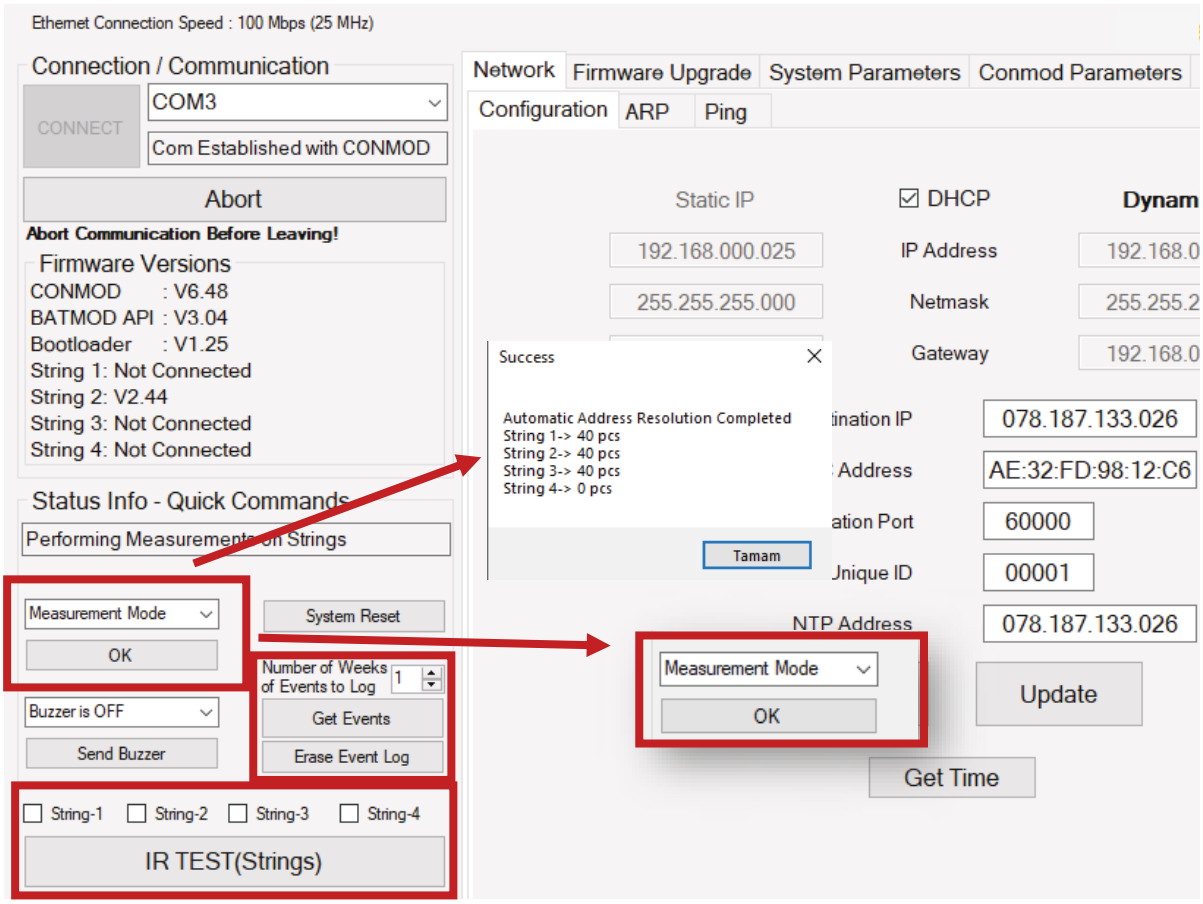


Figure 10. Installation and Measurement Mode

4.4.6. Netconf / System Parameters

'System_Parameters' button is selected to change the system parameters on the right-hand screen, 'Bring' button displays the parameter information that loaded in the control module for each string (see Table 9). This information is arranged according to the area to be installed for each string and updated with 'Update' button (see Figure 11).

Table 9. System Parameter Setup Table

Name	Description
Bat-mod and Str-Mod Device Type	The versions should be selected according to the known battery and lever modules.
Current Sensor Coil Number	The number must be indicated by the same cable through the current sensor.
Current Sensor Max. Magnitude (A)	Maximum current value of the current sensor in each string
Batteries Default Max Voltage(mV)	The maximum voltage value stated in the technical documents of the batteries should be written.

Batteries Default Charge(mAmp*h)	Ah value of batteries
Batteries Default Internal Resistance (microOhm)	It is the internal resistance value specified in the technical document of the batteries.
Internal Resistance	The periodic IR measurement time and the number of batteries to be measured must be set.

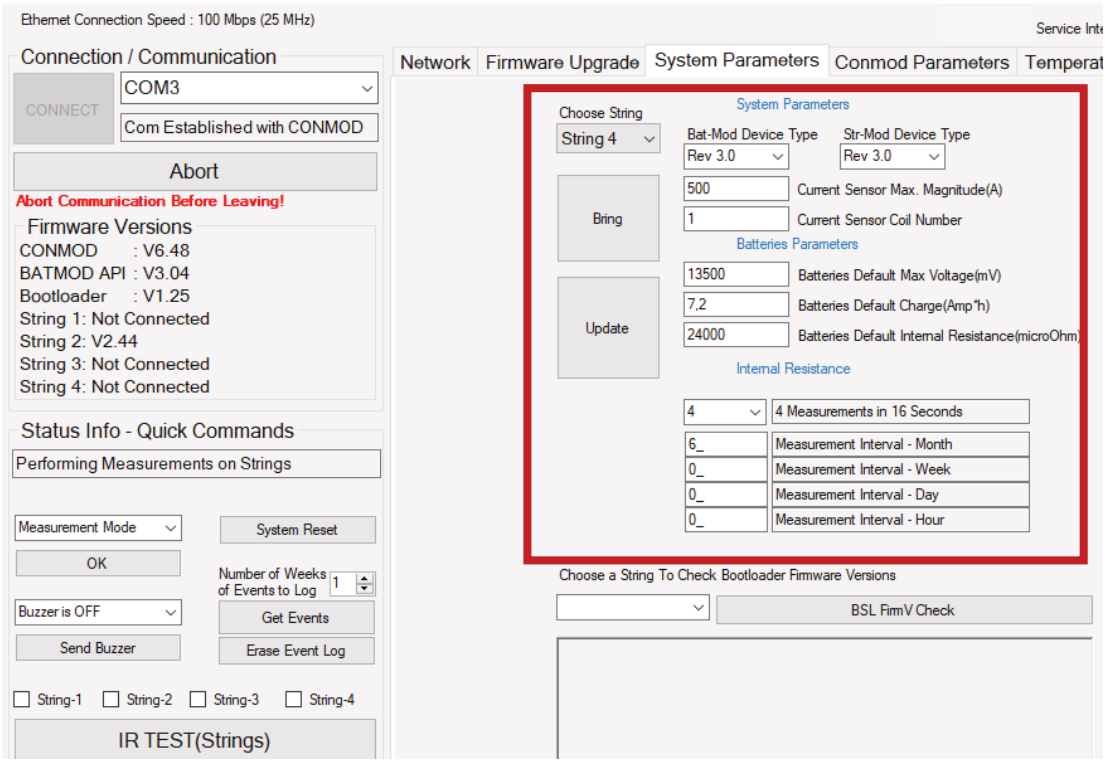


Figure 11. System Parameters

4.4.7. Netconf / CONMOD Parameters

To make CONMOD settings, the 'Conmod Parameters' button is selected. 'Conmod Mode' is selected according to the way CONMOD communicates. In the first installation, when 'Normal Mode' is selected, all strings must be tested for internal resistance once. The internal resistance test can be observed via BATMODs or the Netconf screen. The BATMODs will alternately flash their yellow light during the IR test. After the internal resistance measurement process is completed, 'Smart Mode' should be selected and the determined % margin value should be entered. In addition, optionally, the string can be selected to perform manual/periodic internal resistance measurement in floating charging or idle states. 'Slave ID' is required for operation in Modbus protocol. To save each feature, the desired state can be selected by pressing the 'Update' button. The current status is displayed with the 'Bring' button. (See Figure 12).

With the 'Erase EEPROM' button, all previously configured data is reset.

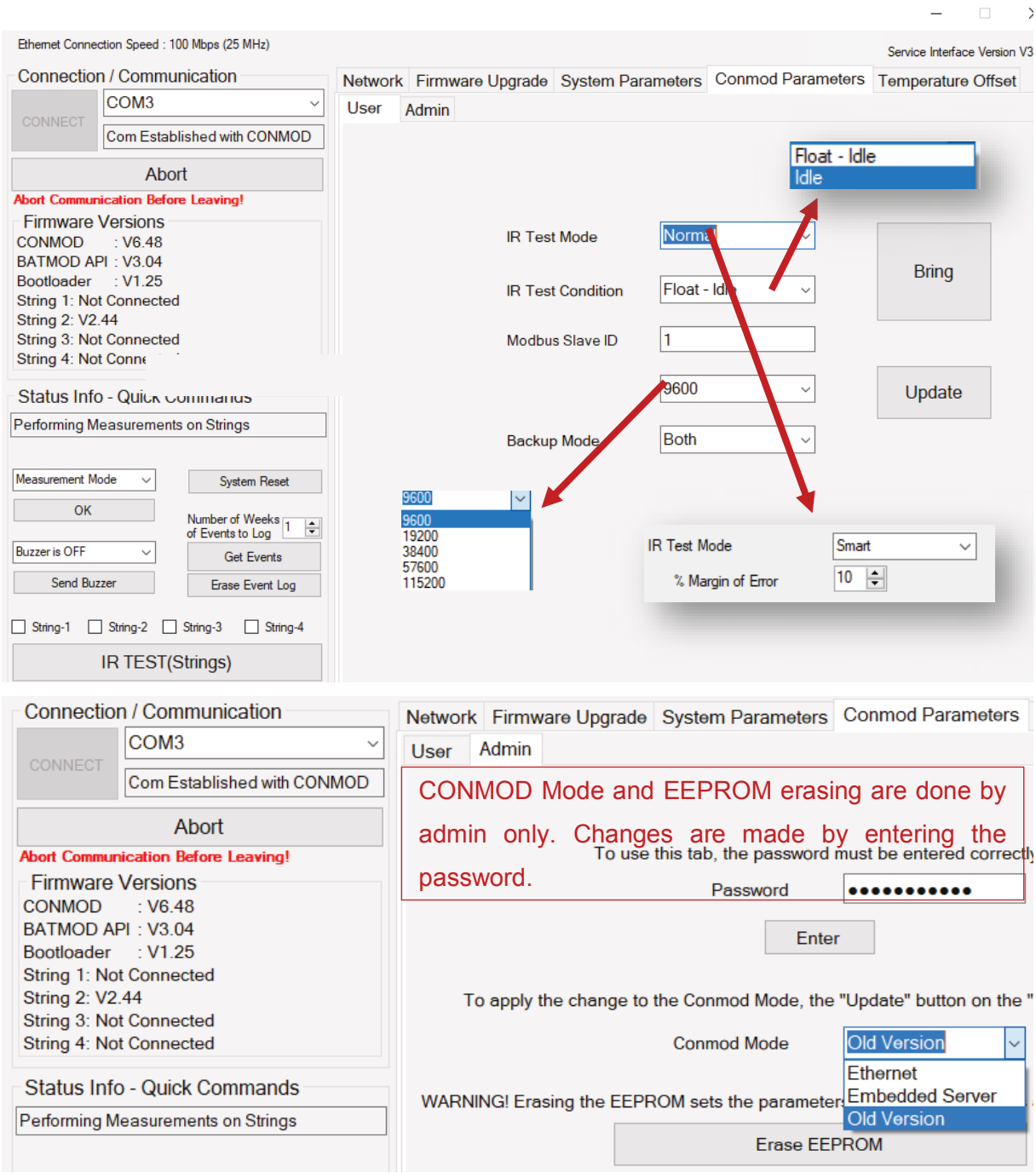


Figure 12. Smart Mode Feature

4.4.8. Netconf / Temperature Offset

Press the 'Temperature Offset' button to adjust the temperature offsets of each string and battery. Click the 'Update' button for the changes made in each string. The current status is displayed with the 'Read' button (See Figure 13).

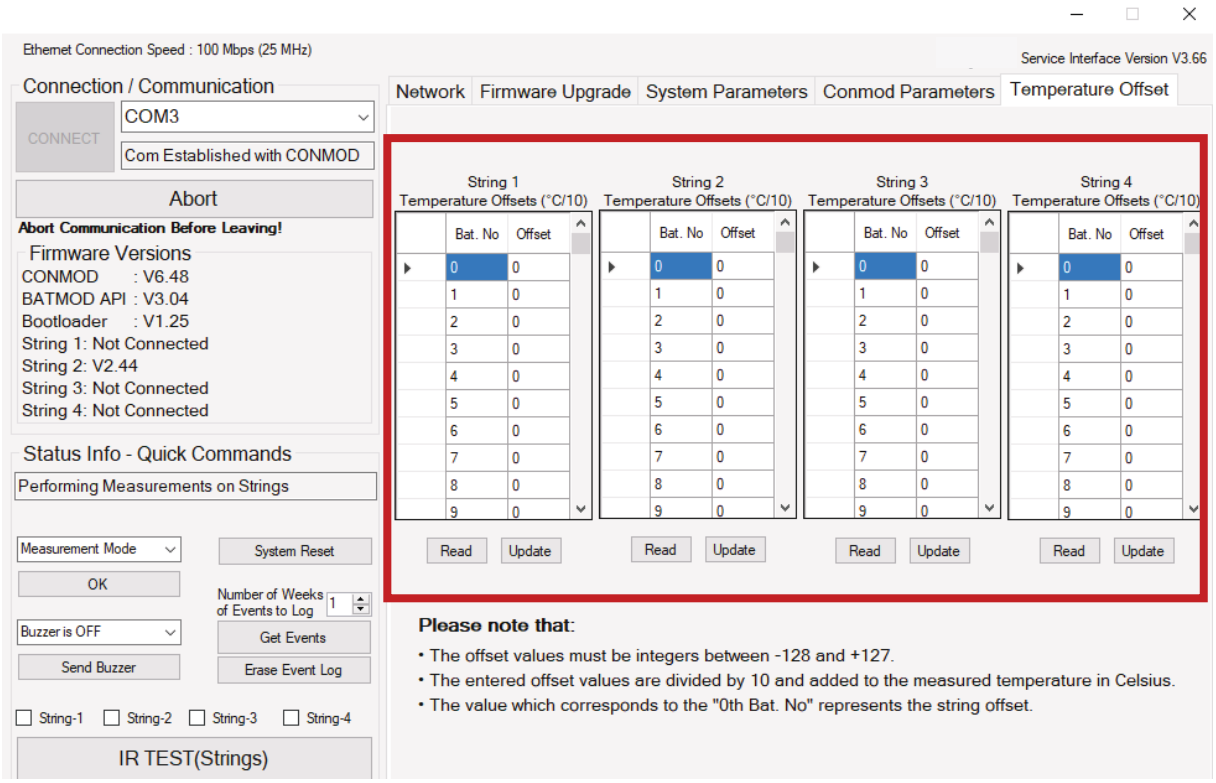


Figure 13. Temperature Offset

'Abort' button to release connection line and process is completed.

4.5. Eagle Eye Software Installation

a) We will check the Site Survey Information given to us by the relevant company before the installation (see APP 2).

b) System requirements are completed and checked (see APP 4).

c) Eagle Eye software is installed (see 5).

d) Software is introduced to the user interface and tested.

NOTE: Control modules with Eagle Eye embedded web server feature do not require software installation. SKIP CHAPTER 5. Only network settings should be made. (See APP 7.)

5. Eagle Eye SOFTWARE CONFIGURATION

In the product with Embedded Server, the 'Eagle Eye SOFTWARE CONFIGURATION' section is skipped.

The software installation must be done after completing the system requirements. If the installation will take place on the virtual server, the server version in the institution should be specified in the site survey. The customer is given a CD or USB stick and Image File (.ova or .ovf extension) to install the software on his own server. The customer will install the software.

Server is to be installed on a local PC (Windows operating system is installed), those steps should be followed;

a) The Image File is provided with the CD or USB memory to the customer to install on the local PC. The existing Image file has .ova or .ovf extension.
b) If the local PC is not Linux-based, VM VirtualBox Software is installed on the PC. (See https://www.virtualbox.org/wiki/Downloads)
c) 'Eagle Eye Image File' supplied to the customer opens via VM VirtualBox. (See Figure 14)

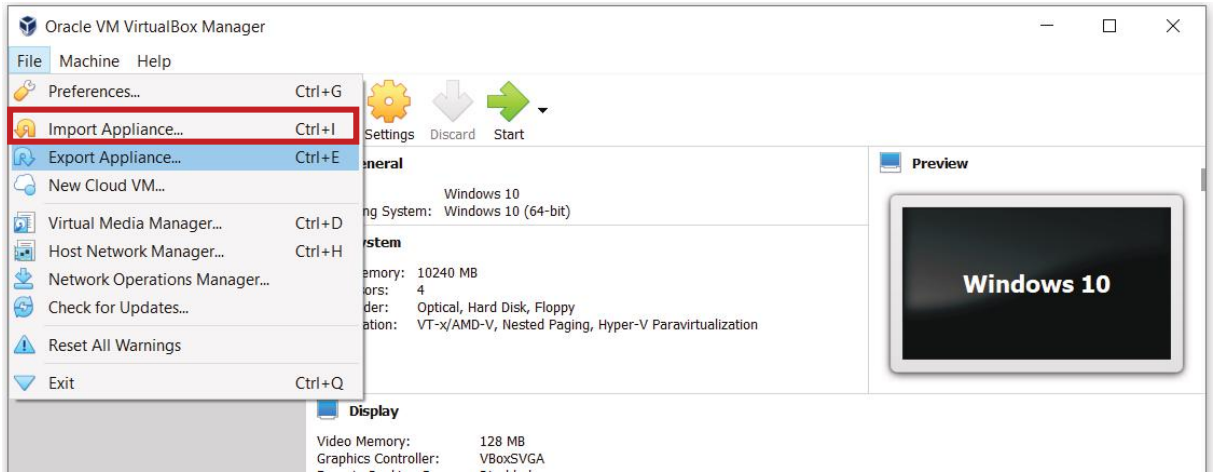


Figure 14. WM VirtualBox Software

d) To import, select the Image File and click on 'Next'. How much space (memory) should be allocated to the program on the local PC from the 'Device Settings' section. Recommended memory is at least 4GB. The selected options should not be changed. (See Figure 15).

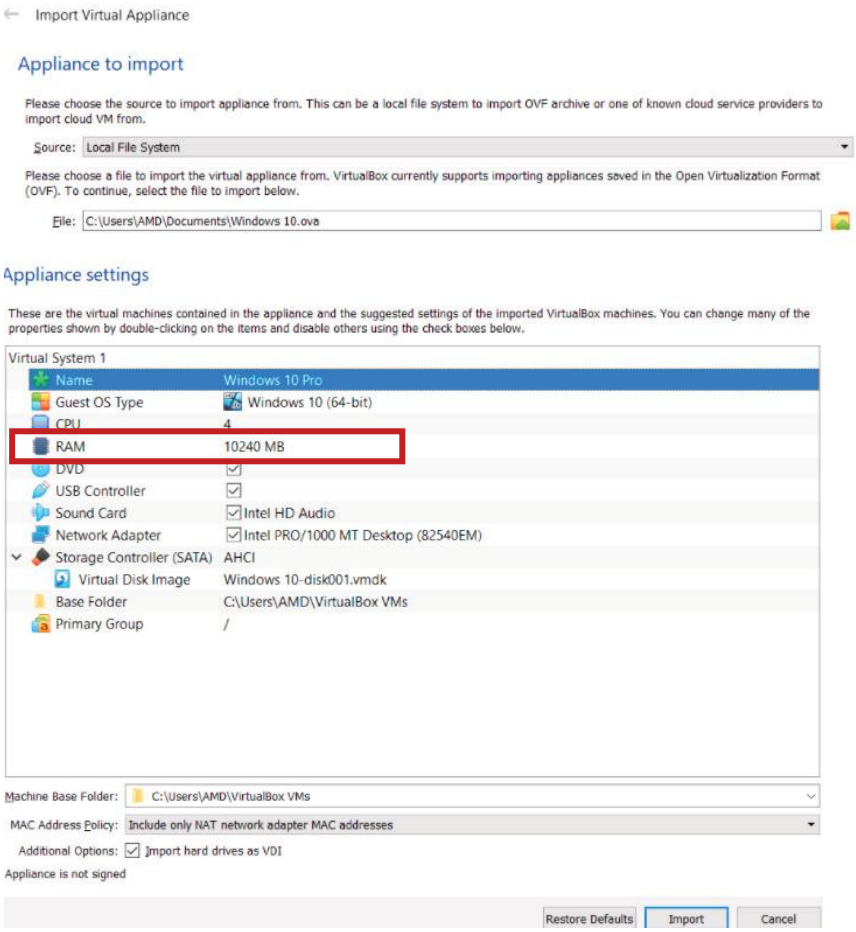


Figure 15. Import Image File

In VirtualBox Software, go to Network page in Settings. Select your Ethernet Network Interface Controller as a Bridge Adapter. Otherwise, the PC cannot communicate with the virtual server.

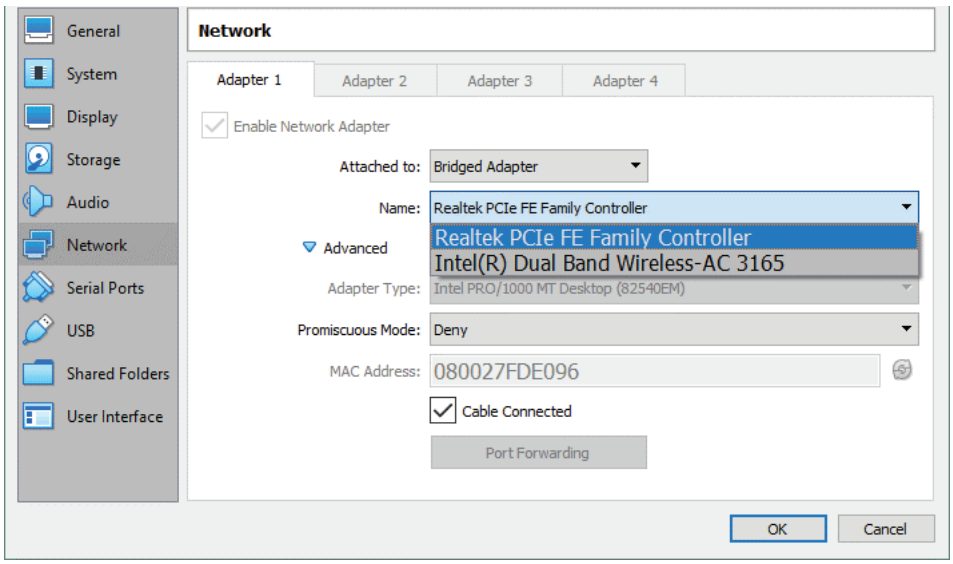


Figure 16. Bridge Settings

The following option must be checked wherever installed with Virtualbox.

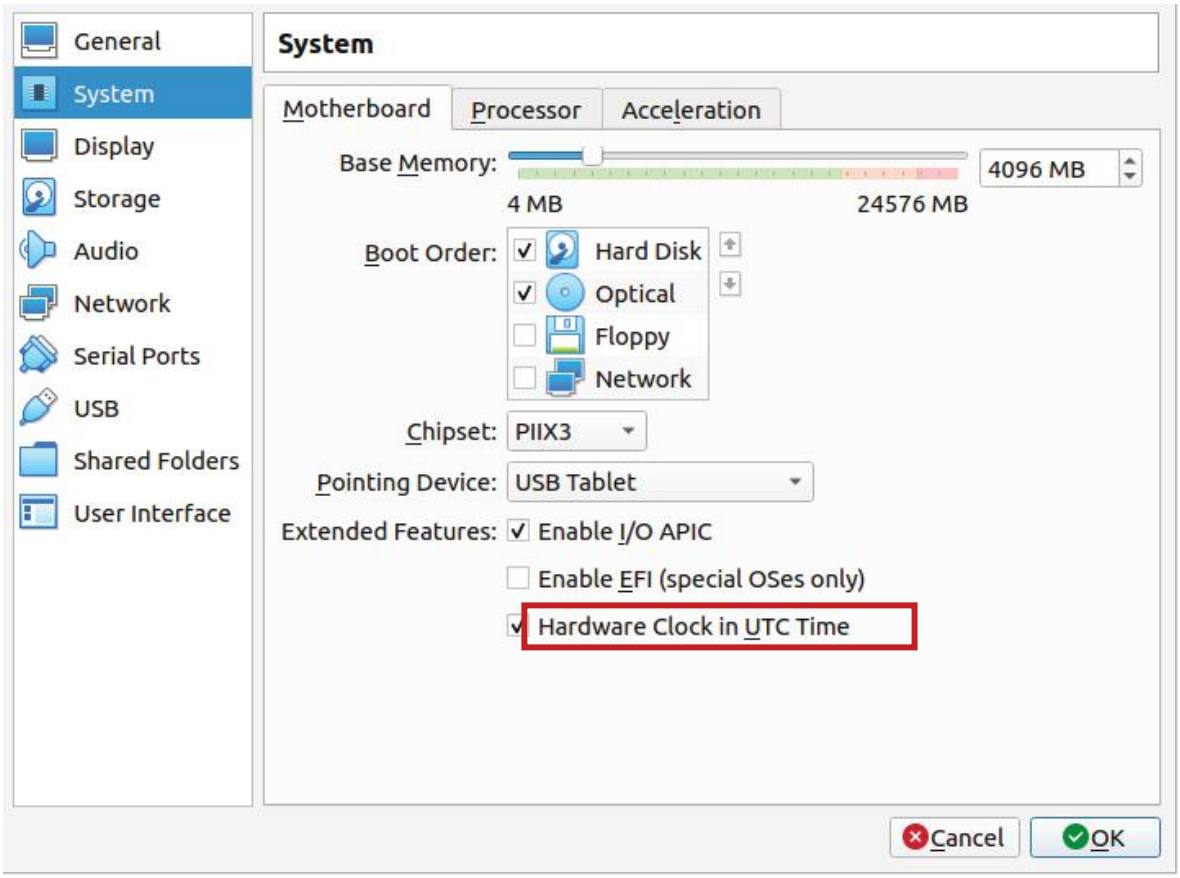


Figure 17. Time Settings

e) After clicking the Import message, the file is expected to get. After double-clicking on the file, it is waited for the login screen to open. (If the Change Network Settings screen appears the first time the file is opened, press OK without making changes.) Login with the user name and password. (See Figure 18). See APP 5 for remote access. After access, the following input screen is displayed.

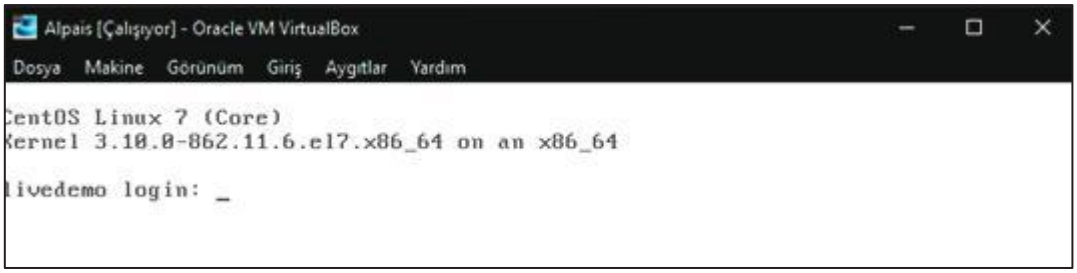


Figure 18. Login

f) After the login information, 'nmtui' is written to the console screen to make Network configuration settings. (see Figure 19)

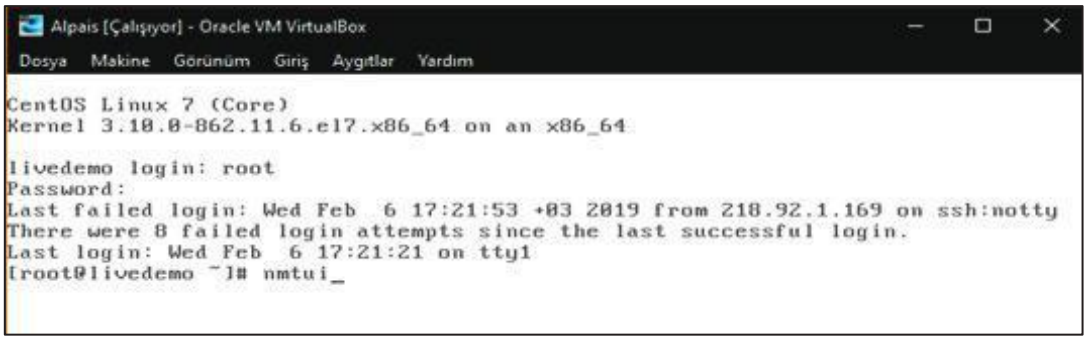


Figure 19. Console Screen

g) All operations are followed sequentially as shown in the Figure 20. 'IPV4 Configuration' is set manually. If there is one-to-one connection with the Control Module, only the IP Address is given. Prefix must be entered as Subnet Mask (see APP 6). If not, the gateway information should be given with the IP address. All changes are saved with 'Ok' button (IP Address and Gateway must be given according to customer request).

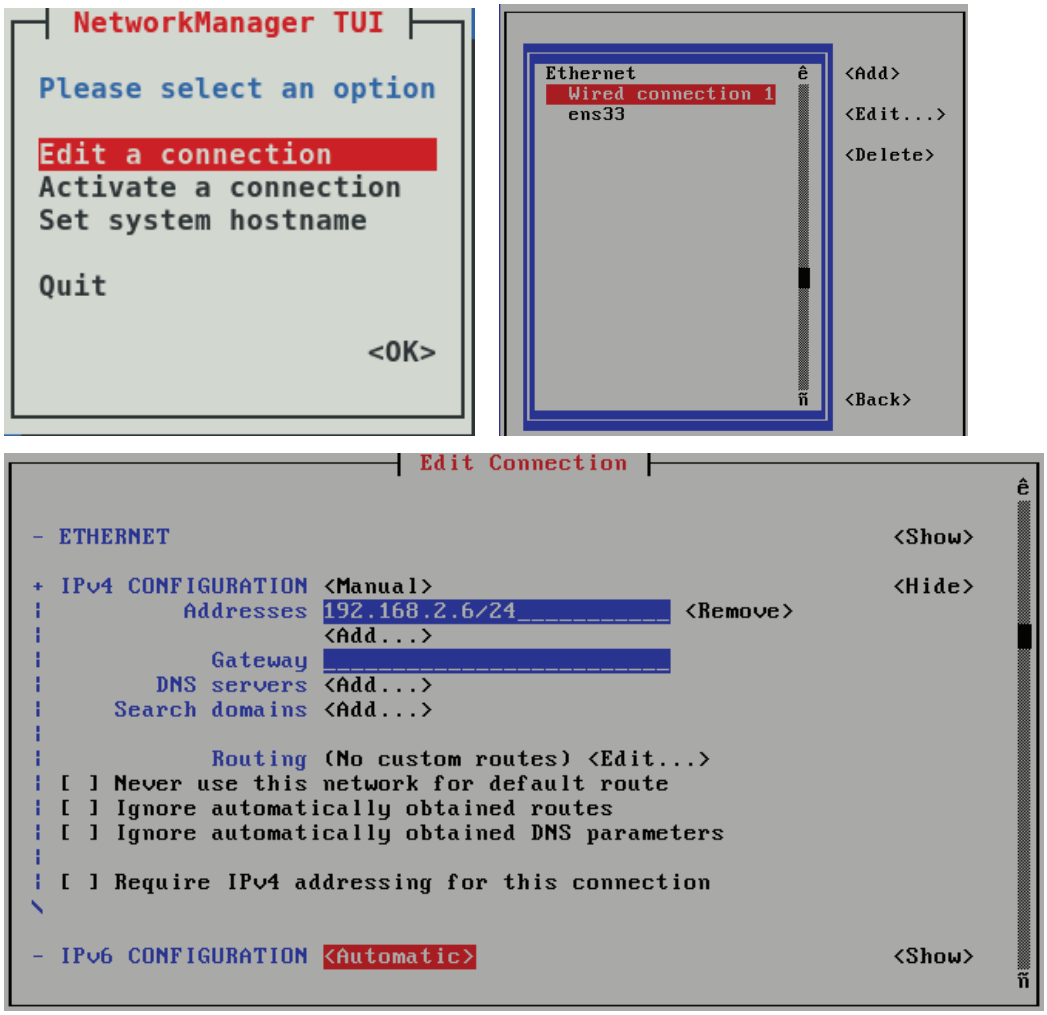


Figure 20. Edit Connection

h) Returning to 'NetworkManager TUI' page follows the Operations in the Figure 21. Check whether the connection is active and return to the 'NetworkManager TUI' page. (To be active, it should look like the Figure 21). Finally, 'Quit' is output from the tab.

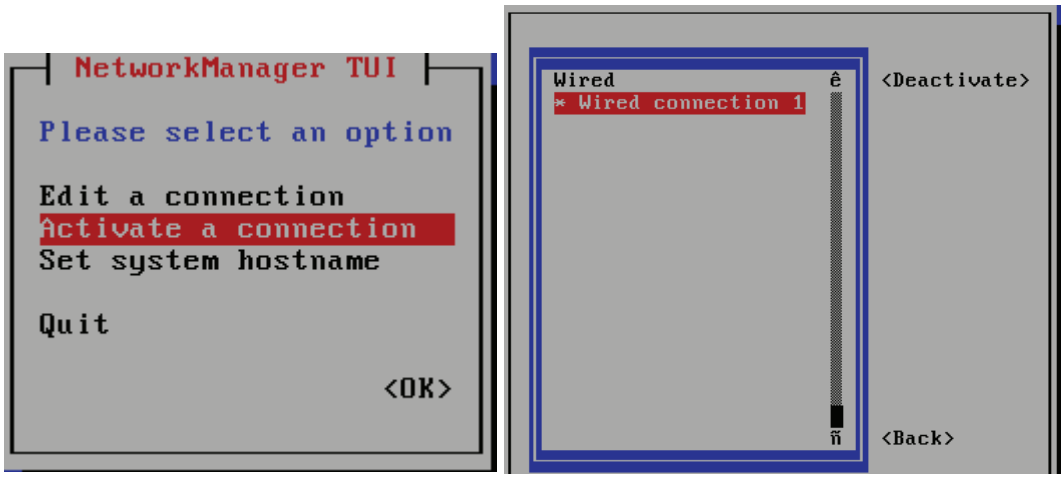


Figure 21. Connection Activation

i) The Ethernet port of the control module is connected to the Ethernet port of the PC or modem using an Ethernet cable. The program restart as given 'reboot' command on the console screen. Re-entry must be made. 'ip addr' command is written to the console screen the accuracy of the given IP Address is queried.

```
[root@localhost ~]# ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: enp0s17: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP
 group default qlen 1000
    link/ether 08:00:27:c9:22:89 brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.6/24 brd 192.168.2.255 scope global noprefixroute enp0s17
       valid_lft forever preferred_lft forever
    inet6 fe80::5147:b035:e37b:c96b/64 scope link noprefixroute
       valid_lft forever preferred_lft forever
[root@localhost ~]# _
```

Figure 22. IP Address Verification

j) From the PC's 'Network Connections', go to the 'Ethernet Properties.' Following the operations in the Figure 23, an IP Address is defined to the PC.

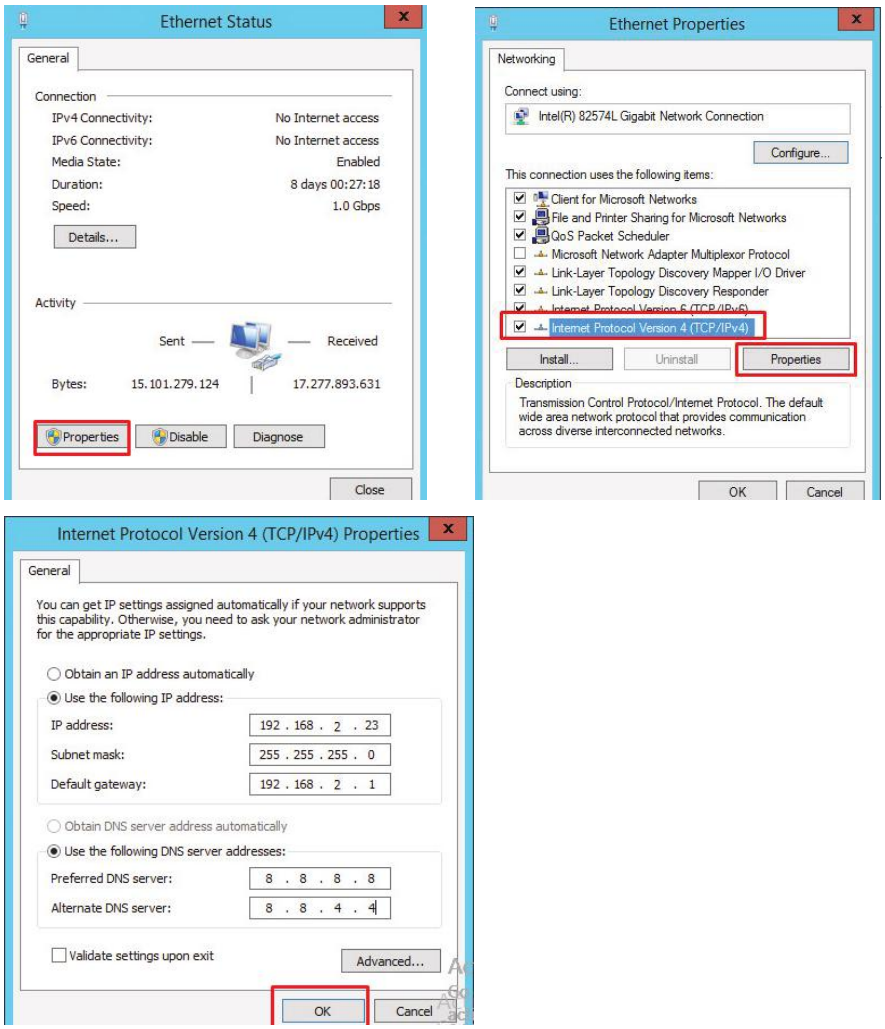


Figure 23. PC Ethernet Setup

k) ‘Command Prompt’ is written to the PC's search field. ‘IPCONFIG’ command is written to the console screen and the supplied PC IP address is verified.

```
C:\Users\gozde>IPCONFIG

Windows IP Configuration


Ethernet adapter VirtualBox Host-Only Network:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::7c21:fb7e:8fc9:11fb%9
   IPv4 Address. . . . . . . . . . . : 192.168.56.1
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :

Wireless LAN adapter Yerel Ağ Bağlantısı* 1:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Wireless LAN adapter Yerel Ağ Bağlantısı* 2:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::a8a3:ede2:9b2a:8f12%16
   IPv4 Address. . . . . . . . . . . : 192.168.2.12
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 192.168.2.1
```

Figure 24. PC IP Address Verification

l) Before this step, the Control Module is reset (Powered off). The control module must be configured at this stage. The procedures in Figure 25 are followed to verify that the Server IP Address and the PC IP Address are communicating. The 'ping Server IP Address' command is entered on the console screen and the data flow is observed (Ex: ping 192.168.2.6). The data stream is interrupted with CRTL+C.

```
Microsoft Windows [Version 10.0.19042.867]
(c) 2020 Microsoft Corporation. Tüm hakları saklıdır.

C:\Users\gozde>ping 192.168.2.6

Pinging 192.168.2.6 with 32 bytes of data:
Reply from 192.168.2.6: bytes=32 time<1ms TTL=64
Reply from 192.168.2.6: bytes=32 time<1ms TTL=64
Reply from 192.168.2.6: bytes=32 time<1ms TTL=64
Reply from 192.168.2.6: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.2.6:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Figure 25. Server IP Address Communication

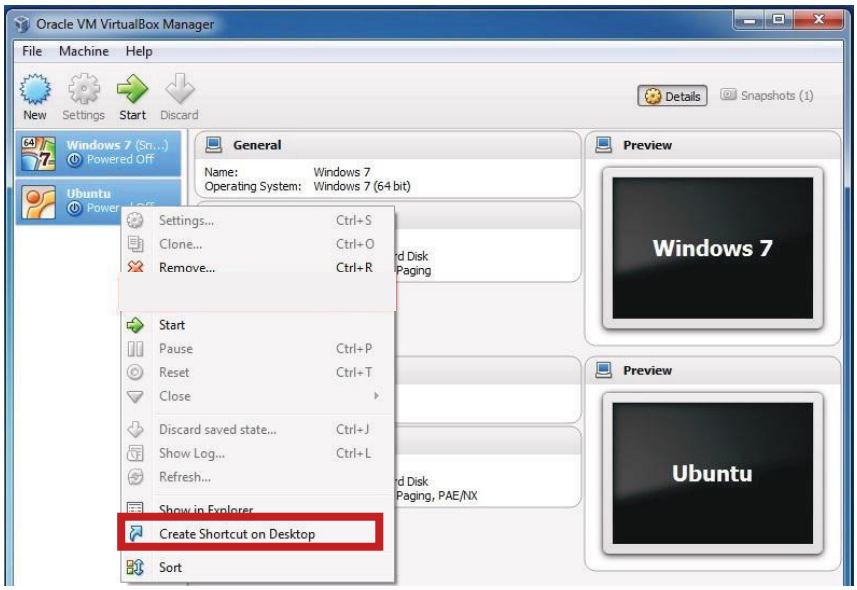
m) Depending on the structure of the company, extensions may change such as .ova .

n) Access to the Eagle Eye Interface via the browser and the server IP address.

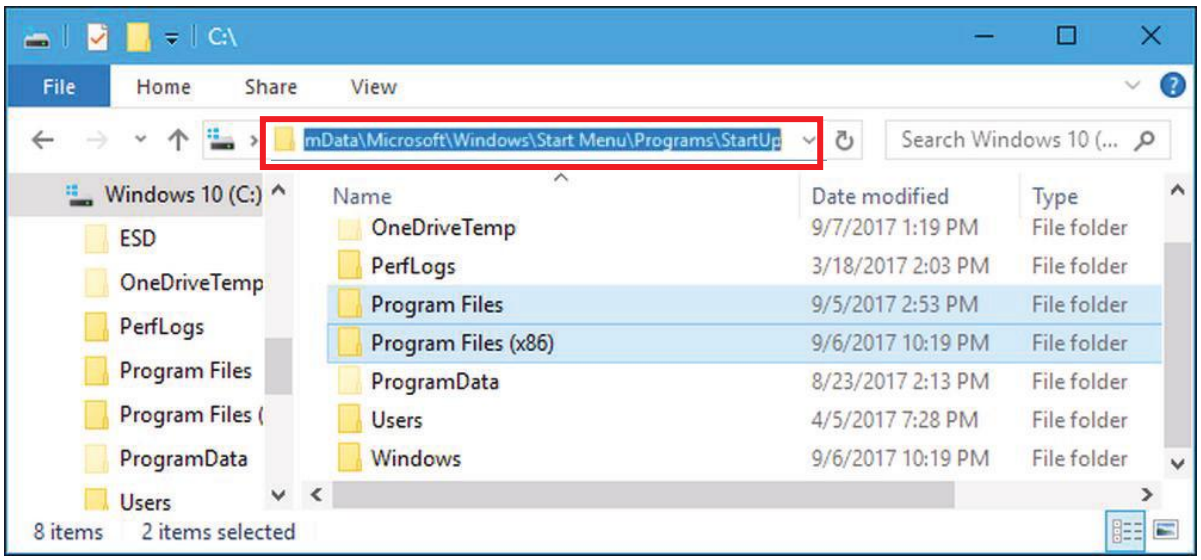
5.1. Automatic Start of Virtual Server

The following steps must be followed for the virtual server to start automatically.

• The shortcut to the virtual server is added to the desktop. Left click on the screen. Click the 'Create Shortcut on Desktop' button.

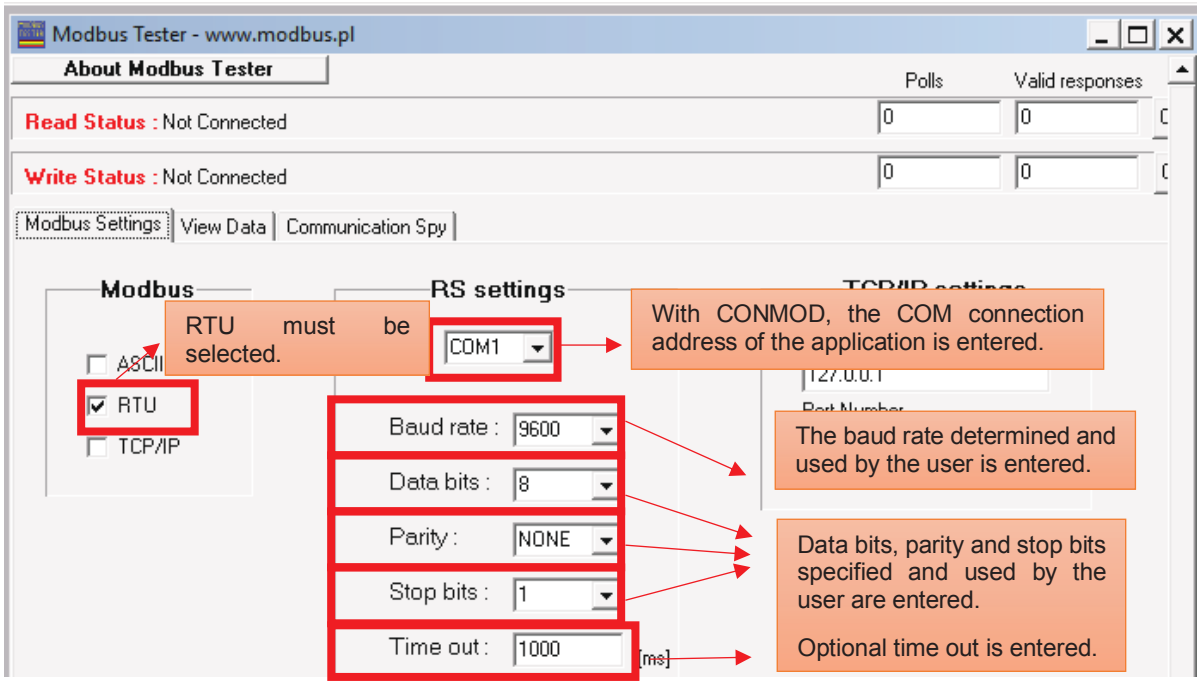


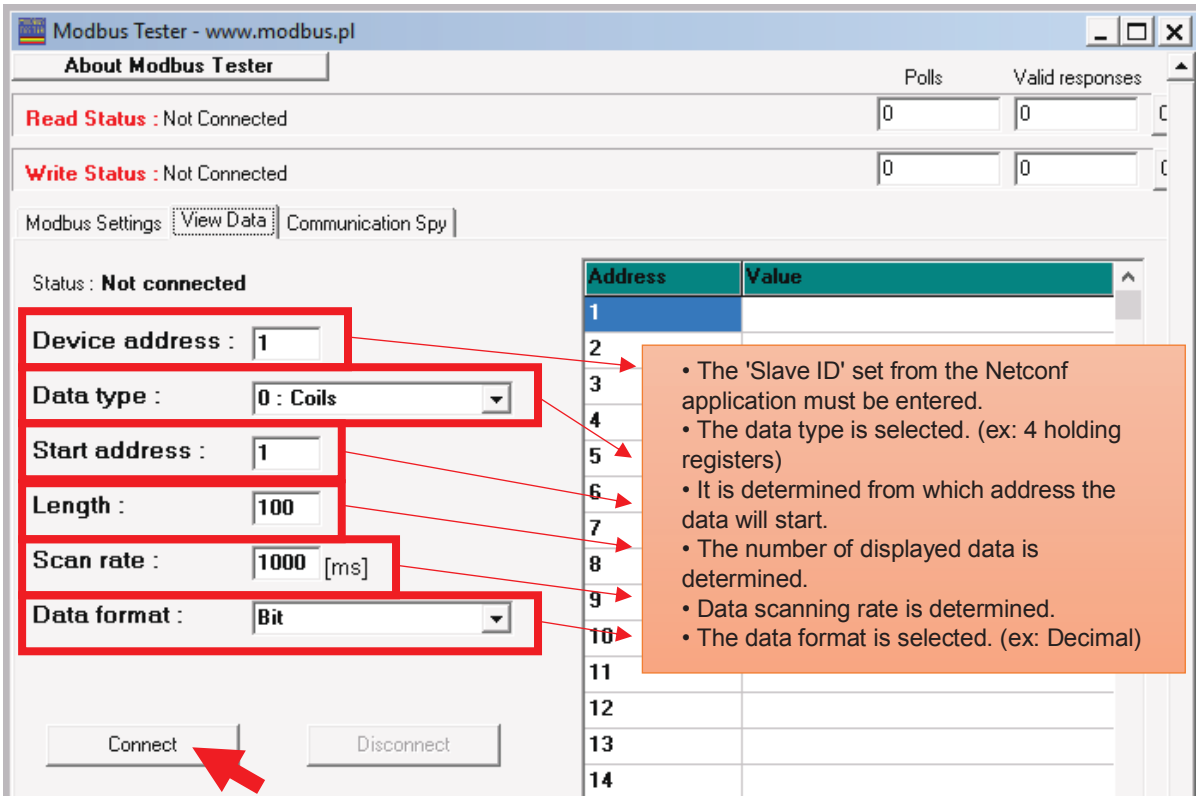
The created shortcut is copied to 'C:\ProgramData\Microsoft\Windows\Start Menu\Programs\StartUp'.



5.2. Modbus Features

Many different applications can be used to test CONMOD's MODBUS RTU connection. Below are descriptions for the most common application. Many of these expressions are used.





After all the parameters are edited, click 'Connect'. It will read 'Read OK' on the Read Status screen. Data will be written in the table on the right screen. Also, the number of 'Polls' and 'Valid Responses' must be equal.

6. USER INTERFACE

Installation, configuration, adjustment, alarm notification and monitoring related to the system is performed via web based BMS software. The BMS Software is run on a Linux based operating system to maintain system stability.

General Information

1. Battery and string-based monitoring within the BMS is performed. For each item listed below, alarm limits can be programmed and assigned by assigning upper, lower and warning limits.

- Voltage Value for Each Battery.
- Internal Resistance Value for Each Battery.
- Temperature Change for Each Battery.
- Current Value for Each String.
- Ambient Temperature Value
- Ambient Humidity

2. When alarm conditions occur, the software is had the ability to give the following parameters as visual or audible alerts (see 7).

3.Measured data except the internal resistance value is measured in 30 second period. Internal resistance value is measured in weekly periods. In addition, the internal resistance measurement period can be adjusted arbitrarily.

4.All the data is recorded and they should be able to be displayed as spreadsheet in many formats (e.g. Microsoft Excel, Pdf). Recording conditions are determined every 30 seconds in case of an alarm and/or warning, and once an hour in daily data.

5.The system is supported Modbus RTU, MODBUS TCP/IP and SNMP protocols.

6.The system is managed the alarm data through the software.

7.The system be able to report various parameters.

8.The BMS software be able to run both on the local network and on the internet.

9.Installed systems in physically different countries, cities and regions belonging to the same user can be monitored from a single point with BMS software.

10.The battery monitoring system input screen must be password protected.

6.1. Introduction to the User Interface

For the embedded server control module, the IP set in APP 7 is written on the browser screen. In other cases, the Server IP address set in the Eagle Eye SOFTWARE CONFIGURATION section is written to the browser screen.

The following screen will open in the browser. Login with username and password.

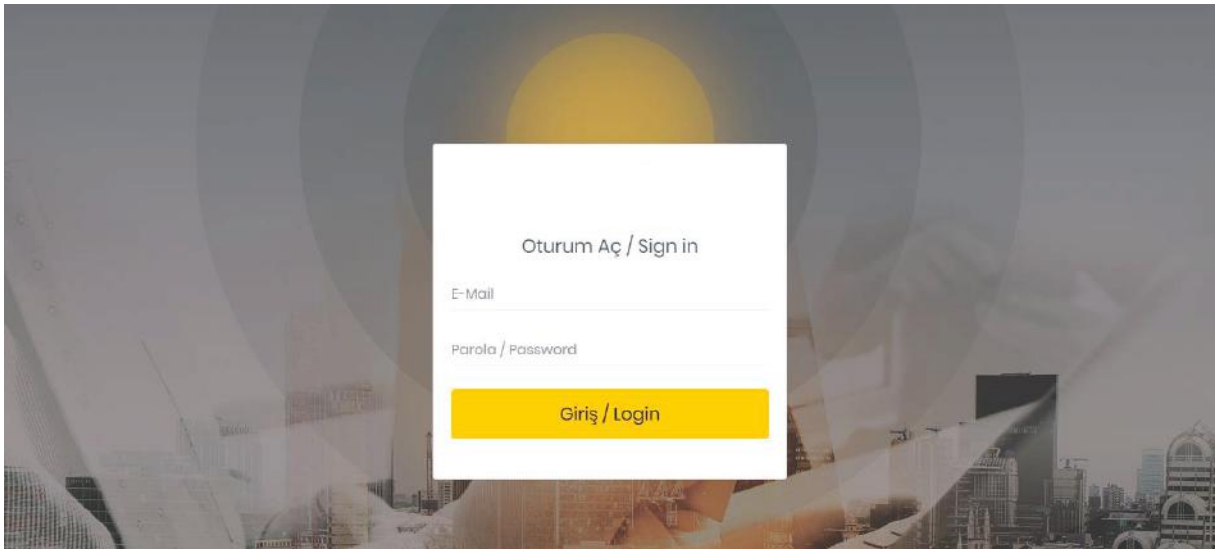


Figure 26. Eagle Eye Interface Login

Installation and settings will be made for the system connected via the interface. Before the installation, the 'Definitions' on the interface must be entered. Then ‘Edit System’ should be done from the 'System' tab. Finally, the threshold and limits of the system installed on the 'Settings' tab should be set.

6.2. Interface Screen – Definitions

6.2.1. Companies

First of all, the company to be installed must be registered in the interface. For this process, click on the Definitions-Companies tab. Then click the 'Add Company' button. Enter the company information in the table that opens. The important point here is mail and server and port information. Finish the process by clicking the 'Save' button. The registered company will appear as a list at the bottom of the page. E-mail notifications will be sent to users via e-mail registered as a company. Therefore, after the company is registered, you must perform the mail test successfully with the 'Test Mail' icon at the bottom right. If a test e-mail message is received as ‘Failed’, check your e-mail, password, server and port information (See Figure 27).

The icons on the right of the list line are used to edit or delete the companies added to the list.

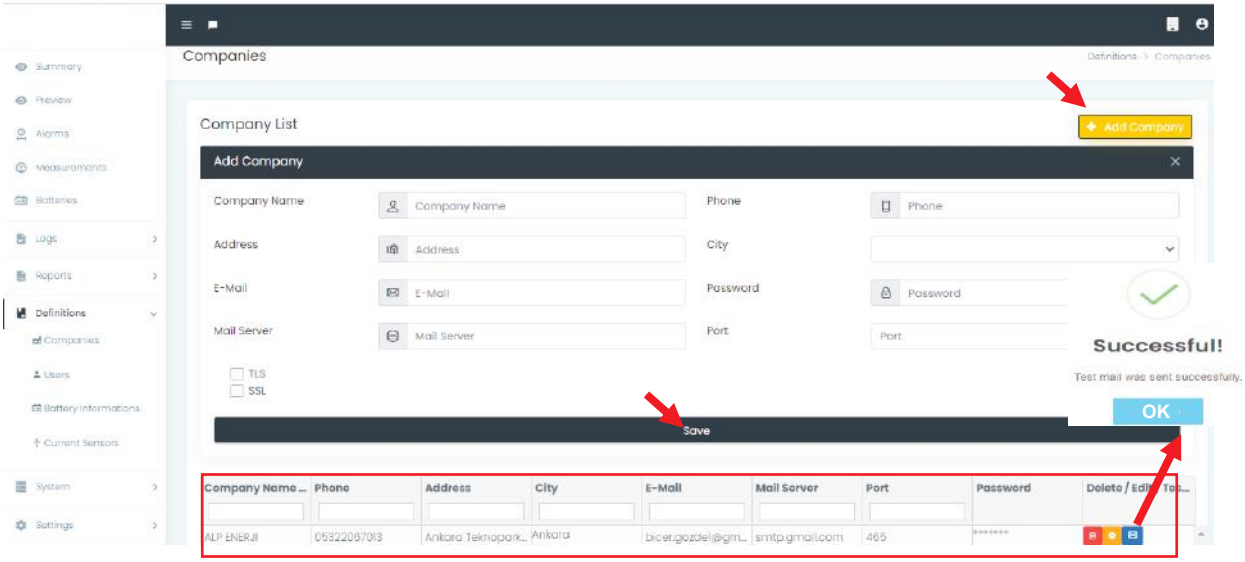


Figure 27. Definitions-Companies

6.2.2. Users

For this process, click on the Definitions>Users tab. Then click the 'Add User' button. Enter the user information in the table that opens. Finish the process by clicking the 'Save' button. There are 3 different structures as a position. (See Figure 28).

Admin: Can access and make changes to the settings of all existing companies and the devices under this system. It can also access all e-mails.

Company Admin: He can only access and make changes to the settings of the company he is registered with and the devices under it. At the same time, it can access the e-mails of the registered company.

Company User: It can only access the settings of the registered company and the devices under it. At the same time, he can access the e-mails of the registered company.

The icons on the right of the list line are used to edit or delete the users added to the list.

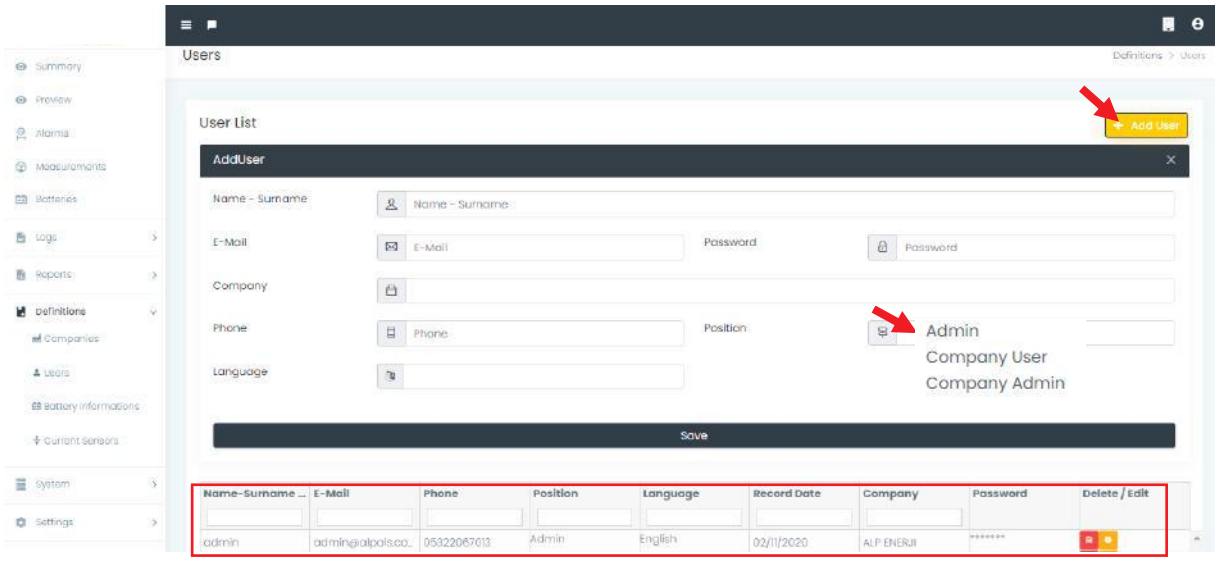


Figure 28. Definition-Users

6.2.3. Battery Information and Current Sensors

For this process, click on the Definitions>Battery Information tab. Then press the 'Add Battery' button. Enter the battery information used in the table that opens. Finish the process by clicking the 'Save' button. The 'Internal Resistance (mohm)' parameter to be considered here. This value is directly used for the internal resistance base value when the IR option is selected in the battery type (See Figure 29). To add a current sensor, click the Definitions-Current Sensors tab and click the 'Add Sensor' button. Enter the sensor information to be used in the table that opens. Finish the process by clicking the 'Save' button.

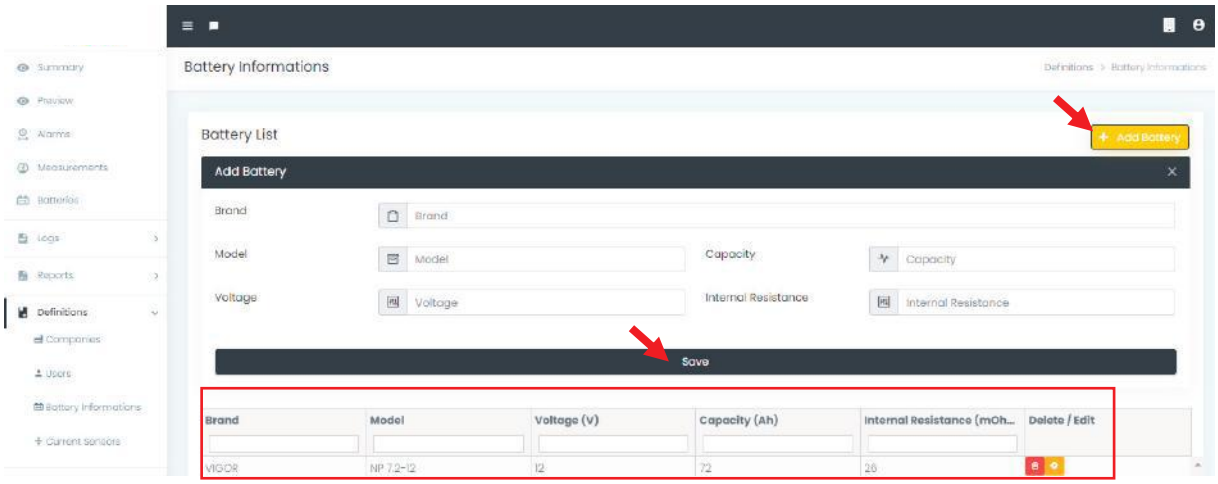


Figure 29. Definitions-Battery Information

6.3. Interface Screen – System

6.3.1. Edit System

After the physical connections and software installation, the devices will come to the 'System Setup' screen. From here, click on the relevant device. First, the device general information will open. With the 'Next' button, you move to the next page.

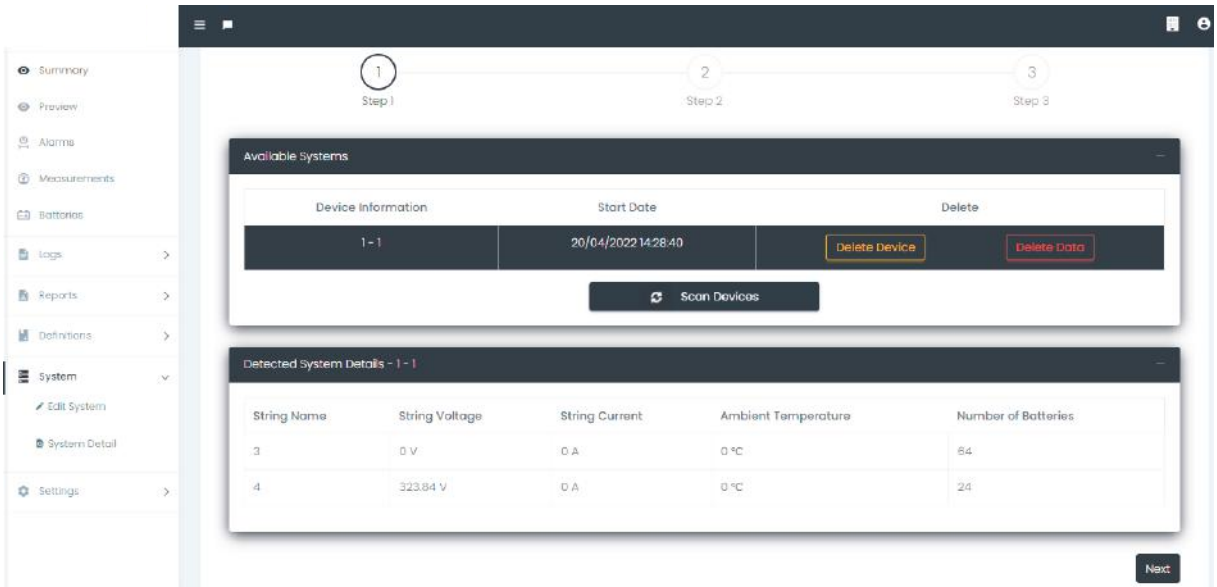


Figure 30. System Setup

On the next page, the device name and model are entered first. Then the battery internal resistance initial value and limit values are selected. The selection is explained in detail in the relevant title (See 6.2.2., 6.4.2.). If the battery internal resistance initial value is selected as 'Present Values', the last measured internal resistance value is taken as a basis for each battery separately. If 'Values in Battery Type' is selected, a certain value is assigned as the initial value to all batteries in the string.

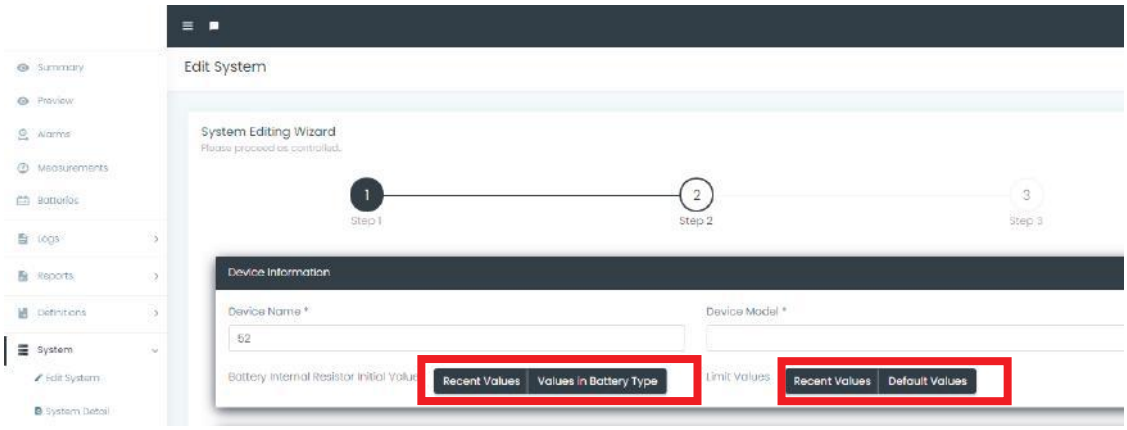


Figure 31. Internal Resistance Base Value and Limit Values

After the battery internal resistance initial value is selected, adjustments are made for each string. The critical parameter here is the battery type selection. If the initial value is selected as 'Value in Battery Type', the base value will be taken according to the battery type defined here. (See Figure 32).

If the limit values are selected as 'Present Values', the last values held separately for each string are recorded as the internal limit value. If 'Default Values' is selected, the default values are saved as limit values according to the battery type (2V-12V) selection in each string. Critical notifications will be selected with default values. In case of notification, the interface will come as a notification message and e-mail.

After the settings of all strings are made, the next page is passed with the "Next" button.

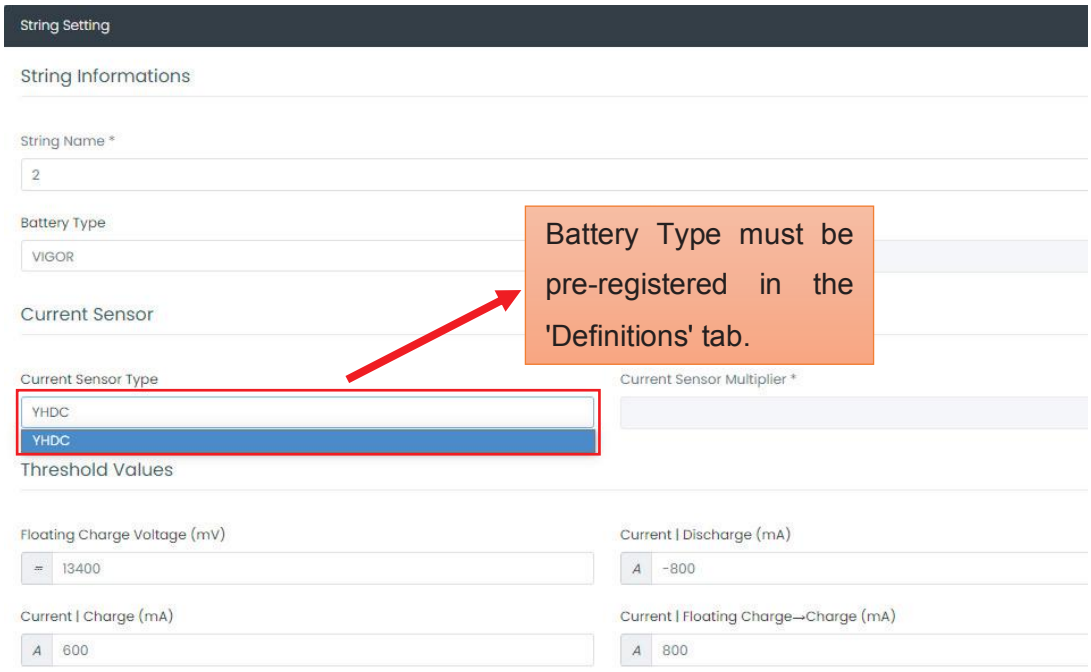


Figure 32. Battery Type Selection

In the last step, the company selection is made so that the relevant device is under the desired company. The installation process is terminated by clicking the 'Save' button (See Figure 33).

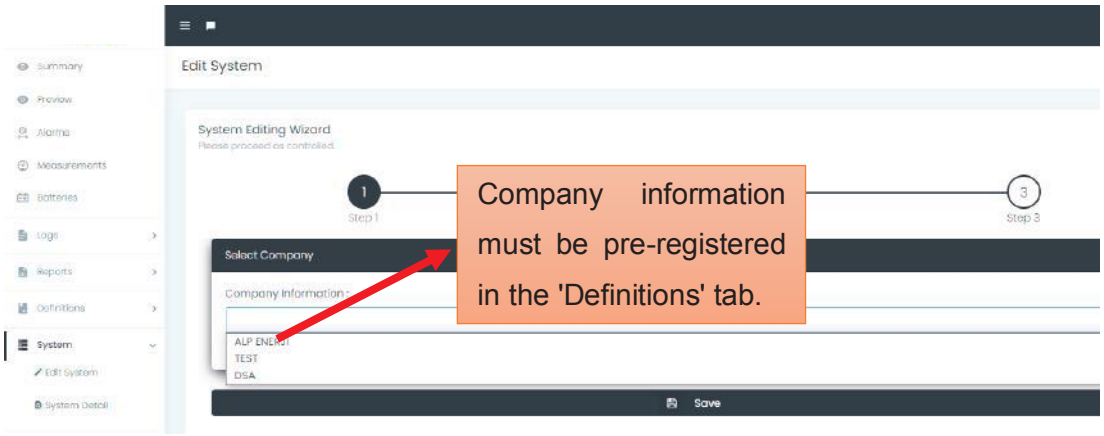


Figure 33. Company Selection

It is used to edit the information of the existing device. In addition, the device's history data or the device itself can be deleted from this tab.

6.3.2. Internal Resistance Base Value

Installation on New Batteries

The internal resistance values of new batteries settle within the first 6 months from the first use. Therefore, as internal resistance base values within the first 6 months; The

first measurement test values to be made after installation will be taken as the base value for each battery. Therefore, the reference value for each battery will be the first measurement value of that battery.

When applying this method, it should be confirmed whether the internal resistance test results are in a region close to each other in the 20-30% band of the average value. If there is a value outside of this band, in order to determine that it is not sourced from the battery production line; measuring cable, tightening torque value, etc. The source of the deviation should be understood by checking the elements and necessary corrections should be made. If there is no improvement, the relevant battery should be focused on, if any, it should be checked with a standard test device, if necessary, planning should be made for the replacement of the battery.

Installation on Existing Batteries

If the Eagle Eye battery monitoring system is installed on existing batteries; The distribution of the first results obtained in the first internal resistance test to be made will be examined, the average of the region where the distribution is concentrated will be taken and the result will be evaluated as the internal resistance base value that will be valid for all batteries and input will be made to the interface.

6.3.3. System Detail

The software version of the existing device, device name, module version etc. information such as this tab. At the same time, from this tab, the control module can be pinged and the logs kept on the interface can be taken (See Figure 34).

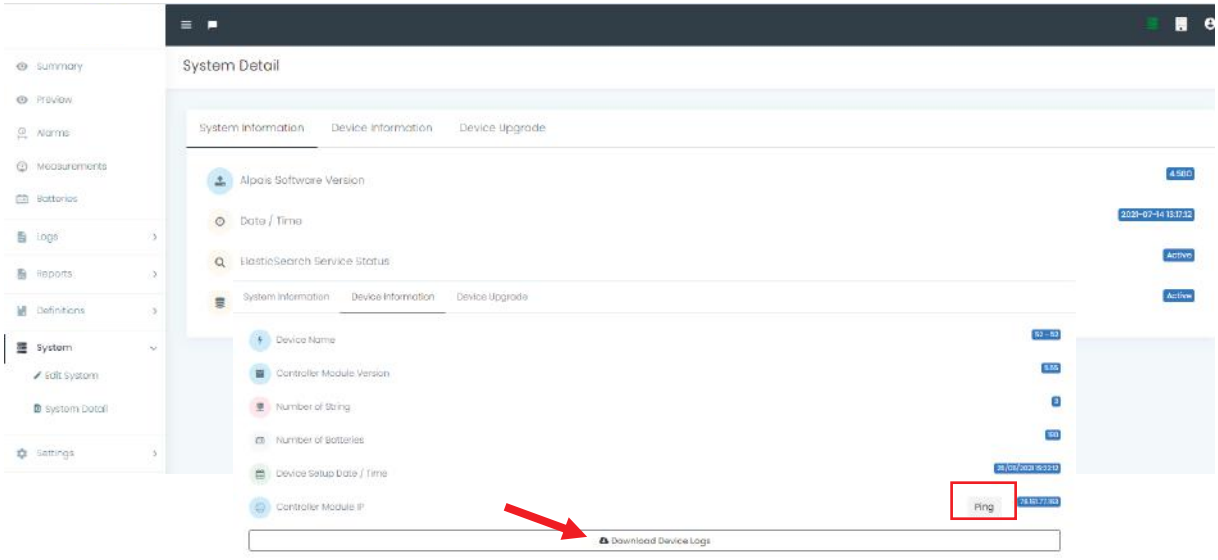


Figure 34. System Detail

6.4. Interface Screen – Settings

6.4.1. Threshold Values

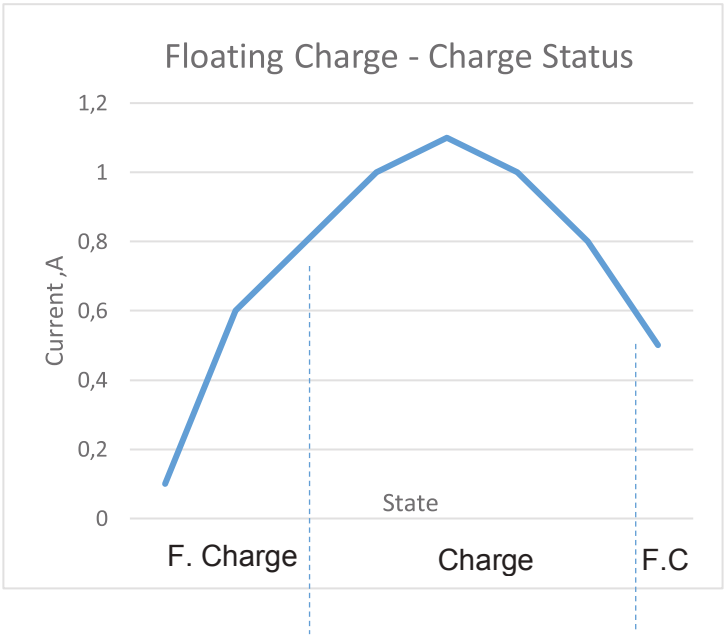
Threshold values will be set for each string. To edit the default values, click the edit button on the right of the sleeve line. Relevant values are entered on the screen that opens. The process ends with the 'Save' button.

Floating Charge Voltage: The recommended floating charge voltage value of the battery is entered. This voltage is used to decide whether the system is idle or floating states.

Discharge Current: When the string current value exceeds this limit, it will show the discharge status.

Charge Current: When the system is discharged or idle, the string current value will show the charge status when it exceeds this limit.

Floating Charge Current: When the system is in floating charge, the string current value will show the charge status when the value exceeds this limit. Current values can be seen in the adjacent graph.



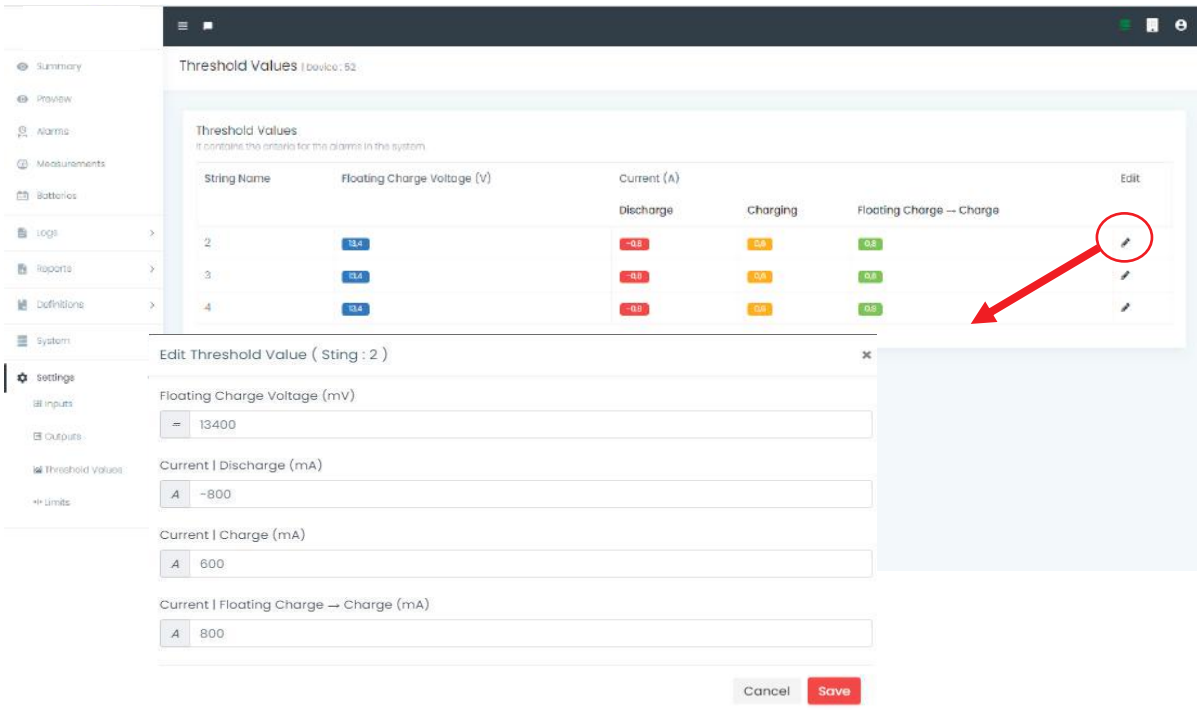


Figure 35. Threshold Values

6.4.2. Limits

Limits will be set for each string. The recommended limit values are given below without the customer's request. Changes are made to the parameter in the relevant string on the device to be updated. Either click on the 'Save' button on the right of the handle to be changed. If changes have been made to more than one string and parameter, click the 'Save All' button at the bottom right of the page (See Figure 36).

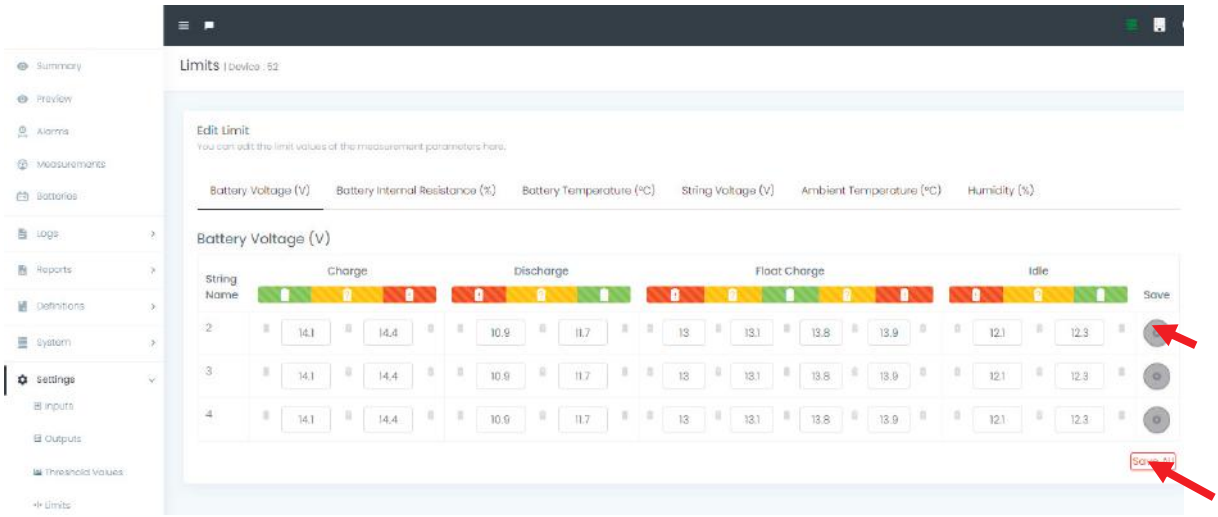


Figure 36. Limits

Battery Voltage: Must be entered separately for charge, discharge, floating charge and idle states. The following recommended values can be entered for 2V, 6V, 8V and 12V batteries.

	To Set Limit and Alarm Values					
Status / Battery	Max. Charge Warning (V)	Max. Charge Alarm (V)	Min. Decharge Alarm (V)	Min. Decharge Warning (V)	Min. IDLE Alarm (V)	Min. IDLE Warning (V)
12 V	14.1	14.4	10.9	11.7	12.1	12.3
8 V	9.4	9.6	7.26	7.8	8.1	8.2
6 V	7.05	7.2	5.45	5.85	6.1	6.2
2 V	2.35	2.4	1.82	1.95	2.02	2.1

EX: In the charging state, any battery will generate a warning when the voltage exceeds 14.1 V.

In case of discharge, it will generate an alarm when any battery voltage drops below 10.9 V.

	To Set Limit and Alarm Values			
Status / Battery	Min. F. Charge Alarm (V)	Min. F. Charge Warning (V)	Max. F. Charge Warning (V)	Max. F. Charge Alarm (V)
12 V	13	13.1	13.8	13.9
8 V	8.7	8.73	9.2	9.3
6 V	6.5	6.55	6.9	6.95
2 V	2.17	2.18	2.3	2.32

Battery Internal Resistance: If the recommended limit values are max. 30% above the base value, it can create a limit for the warning state, and if it is above max. 50%, it can create a limit for the alarm state. When any battery exceeds 30% of the base value, it will create an alarm status when the warning status exceeds 50%.

Battery Temperature: Limit values will vary according to the environment. Therefore, the limit will be set for alarm conditions at max. and min. values. When any battery temperature goes below the specified min value and above the specified max. Value, it will create an alarm condition.

String Voltage: It will be written automatically based on the values set in the battery voltage limits. Changes cannot be made.

Ambient Temperature: Limit values will vary according to the environment. Therefore, the limit will be set for alarm conditions at max. and min. values. When any string temperature goes below the specified min. value and above the specified max. Value, it will generate an alarm condition.

Humidity: Limit values will vary according to the environment. Therefore, the limit will be set for warning and alarm conditions at max values. When the humidity value of any string exceeds the determined max. warning value, it will create an alarm condition when the warning condition exceeds the max. alarm value.

6.4.3. Interface Notification and Mail Notification Feature

In order to be informed of any normal, warning or alarm situation, it may be requested to receive an SMS, notification or e-mail notification on the subject. In this case, the icon next to each parameter and status is clicked. From the page that opens, the feature of receiving notifications in the interface or receiving notifications by mail is clicked. In addition, the frequency of the normal status, warning or alarm notification can be set from the incoming page. After the changes made, the 'Save' button should be pressed (See Figure 37).

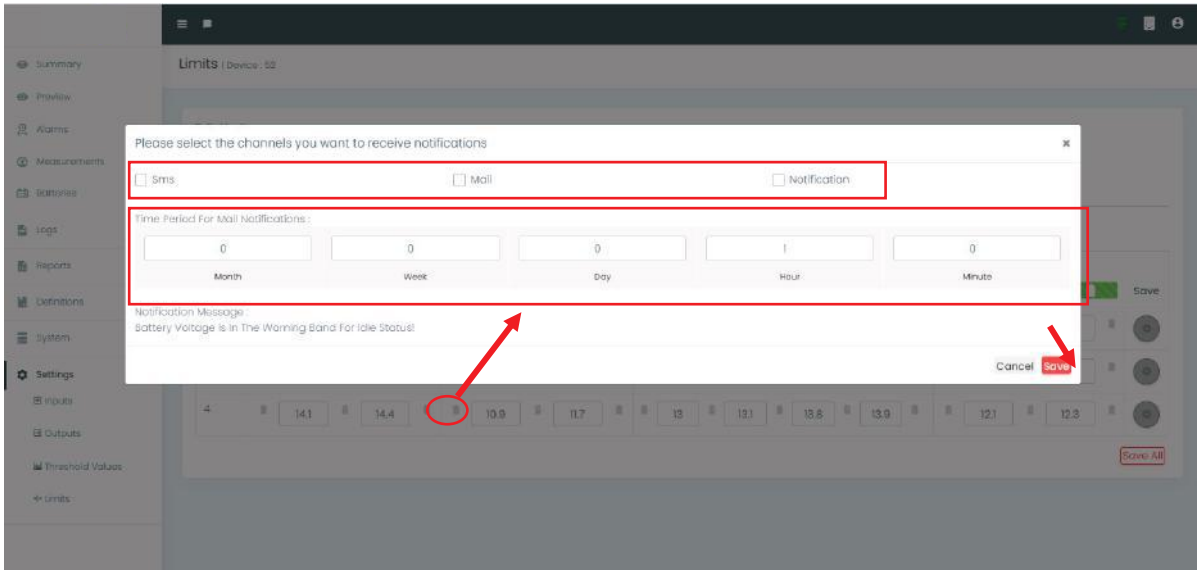


Figure 37. Notification and E-mail

7. EVENTS AND ALARMS

When alarm conditions occur, the software is had the ability to give the following parameters as visual or audible alerts.

1. The system is had the ability to configure predetermined or programmed limits on the battery, string, or system.
    - Battery and String Voltage
    - Internal Resistance
    - String Current
    - Charge / Discharge Period
    - Battery Temperature
    - Ambient Temperature/Humidity
2. The system is had 1 dry contact outputs to control external systems / devices.
3. The internal resistance measurement period is programmable at the entire system or string level.
4. The BMS sends an email when the corresponding alarm condition occurs. Each email transmission is included details about the system device information, battery, string, date, time, and alarm type (Voltage, Internal Resistance, Current, Temperature, Discharge / Charge).

8. OTHER FUNCTIONS

8.1. Data Collection

Control Module is provided 4-channel RS485 communication, collects battery data at setting time, equipped with control connection alarm and internal resistance test. The control module is collected the data of each battery and each string. Each control module is supported maximum 4 string connections. Each RS485 channel is connected with max. 120 battery modules. The ID number of the battery module unit in each group must be different.

Table 10. Control Module Channel Table

Group No	Channel	Description
Group 1	Serial Interface A	One control module is connected with 4 battery group. The number of batteries in each group cannot be more than 120.
Group 2	Serial Interface B	
Group 3	Serial Interface C	
Group 4	Serial Interface D	

8.2. Communication

String modules and battery modules are provided information to the control module. They are provided this communication with UART. The distance between the batteries must not be more than 1 m in order to ensure the communication qualities. In addition, the total distance of UART communication line should not exceed 50 m. It can be wakened by the control module or base station.

Control Module is provided communication with internet and computers via Ethernet or RS485. In addition, Ethernet line cable should not be longer than 3 m. Communication is supported by the international MODBUS-RTU protocol. Modbus will be shared with the relevant user on request. The communication parameters are Counter Address ID and Baud Rate.

9. MAINTENANCE AND TROUBLESHOOTING

Table 11. Maintenance and Troubleshooting Table

Problems	Causes	Solutions
For Control Module		
No power after power on	Power supply failure	1.Check the terminal and make sure with correct power supply 2. Check the fuse of power supply
No communication with the server	Do not allow or block	1.Check the settings 2.Check IP Setup
Cannot communication with the battery/string module	Communication interference	Check the data cables where the battery module and string module is connected to the control module.
For Battery Monitoring Module		
No led light after power on	Power cannot input to the device	1. Check whether the proper power is supplied on the + and - terminal 2. Test for proper battery voltage. 3. Check the cable connection
Control Module cannot communication with the battery module	Unit ID of the module is incorrect	Check whether address of the module is the same as main device
	Communication interference	Check communication line
Measuring value incorrect or incompatible with aim	Voltage measurement wrong	1.Check the connection 2.Check whether measurement voltage compatible with device rated parameter
	Temperature measurement wrong	1.Check whether measurement temperature compatible with device rated parameter
	Internal resistance measurement wrong	1.Check whether measurement IR compatible with device rated parameter
For String Monitoring Module		
No led light after power on	Power cannot input in the device	Check whether the proper power is supplied on the module

Control module cannot communication with the string module	Communication interruption	Check communication cable
Measuring value incorrect or incompatible with aim	Current measurement wrong	1.Check whether measurement current compatible with device rated parameter 2.Check hall sensor setting
	Temperature measurement wrong	Check whether measurement temperature compatible with device rated parameter
	Humidity measurement wrong	Check whether measurement temperature compatible with device rated parameter

10. TECHNICAL SPECIFICATIONS

Table 12. Control Module Technical Specifications Table

Control Module	
Operating Conditions	
Operating Temperature	0≈50 °C (32-122 °F)
Storage Temperature	-10≈70°C (14-158 °F)
Relative Humidity Ratio	5%-90% RH
Atmospheric Pressure	80 - 110 kPa
Power Input	12 VDC @ 2A
Max. Power Consumption	20 Watt
Communication Interface	
RS485	Modbus RTU
Ethernet	SNMP, MODBUS TCP (optional)
Features	
Number of String	4 different string can be monitored
Number of String Module	1 string module at each string
Number of Battery Module	120 Battery Module at string, 480 Battery Modules in total
Input / Output	
Relay Output	2 x Dry Contact Output, 400V (AC-DC) 120mA (optionally digital)
Digital Input	2 x 12-24VDC
Electrical Isolation	2000V

Physical Characteristics	
Dimensions (HxWxD)	40,5 x 200 x 95,5 mm or 192 x 97 x 38 mm
Enclosure	Metal
Color	Grey

Table 13. Battery Monitoring Module Technical Specifications Table

Battery Monitoring Module	
Compatibility	
Battery Type	VRLA, Ni-Cd, VLA (optional)
Battery Voltage Monitoring	
Voltage Range	1-16 V
Resolution	1 mV
Accuracy	0.05% ± 6 mV
Internal Resistance Monitoring	
Resistance Range	0.1 – 64 m ohms
Resolution	1 µ ohm
Accuracy	± 2%
Temperature Monitoring	
Temperature Range	0≈50 °C (32-122 °F)
Resolution	0.1 °C
Accuracy	± 2 °C

Protection	
Isolation	2000 V Opto Isolation
Short Circuit Protection	Maximum 3.5 A (Internal Fuse)
Reverse Polarity Protection	Provide protection at rated voltage against reverse connection
Environmental Conditions	
Operating Temperature	0–50°C (32–122°F)
Storing Temperature	-10–70°C (14–158°F)
Relative Humidity Ratio	%5-%90 RH
Atmospheric Pressure	80-110kPa
Power Value	
Power Consumption	50 mA @ 2V Battery 10 mA @ 12V Battery
Running Current	
Nominal Operation	10 mA -50 mA
During Internal Resistance Test	0.167 A/min
Sleeping Mode	<10 mA
Communication	
Data Transmission Interface	Serial Modbus Protocol
Features	
Auto Addressing	Automatic addressing during installation or replacement
Physical Characteristics	

Dimensions (H x W x D)	91 x 63 x 29 mm
Enclosure	ABS
Color	Black or Semi-Transparent

Table 14. String Monitoring Module Technical Specification Table

String Monitoring Module	
Current Monitoring	
Current Range	0 – 500 A
Resolution	10 mA
Accuracy	± 1%
Current Sensor	Hall Effect
Temperature Monitoring	
Temperature Range	0≈50 °C (32-122 °F)
Resolution	0.1 °C
Accuracy	± 2 °C
String Voltage Monitoring	
Voltage Range	1-2500 V DC
Resolution	10 mV
Accuracy	%0.1
Humidity Monitoring	

Humidity Range	%5 ≈ %90 RH
Resolution	%1 RH
Accuracy	%5
Protection	
Isolation	2000 V Opto Isolation
Short Circuit Protection	Max. 3, 5 A (Internal fuse)
Environmental Conditions	
Operating Temperature	0–50°C (32–122°F)
Storing Temperature	-10–70°C (14–158°F)
Relative Humidity Ratio	%5-%90 RH
Atmospheric Pressure	80-110kPa
Power Value	
Power Consumption	1.2 Watt
Running Current	
Nominal Operation	100 mA
Communication	
Data Transmission Interface	Serial Modbus Protocol
Physical Characteristics	
Dimensions (H x W x D)	91 x 63 x 29 mm

Enclosure	ABS
Color	Black or Semi-Transparent

11. APPENDIX

APP 1. SYSTEM COMPONENTS OF Eagle Eye

SYSTEM STRUCTURE		EXPLANATION	PRODUCT CODE
CONTROL MODULE		Control Module* **Optionally Hydrogen Gas Sensor**	CONMOD-B
		Control Module with Embedded Software **Optionally Hydrogen Gas Sensor**	CONMOD-B01
STRING MODULE		String Module with Temperature and Humidity Sensors	STRMOD-ENV
BATTERY MODULE		1.2V Battery Module 2V Battery Module 6V Battery Module 12V Battery Module	BATMOD1.2 (BATMOD1.2-T) BATMOD02 (BATMOD02-T) BATMOD06 (BATMOD06-T) BATMOD12 (BATMOD12-T)
ACCESSORIES	DATA CABLE	Cable Terminal: RJ12 Input, L:xx cm L:30cm, 40cm, 50cm, 100cm, 150cm, 300cm, 500cm, 10m or 20m ***Optionally Halogen free type *** ** Optionally 10m and 20m**	DATACAB0XX
	BATTERY MEASUREMENT CABLE	Cable Terminal: Faston Type, L:30 cm Cable Terminal: O Type, r:5 mm L:30 cm Cable Terminal: O Type, r:6 mm L:30 cm Cable Terminal: O Type, r:8 mm L:30 cm Cable Terminal: O Type, r:10 mm L:30 cm ***Optionally Halogen free type ***	MEACAB-F-30 MEACAB-O-M5-30 MEACAB-O-M6-30 MEACAB-O-M8-30 MEACAB-O-M10-30
	CURRENT SENSOR	Rated Input: 50A (Measure Range : -0 ± 100A) Rated Input: 100A (Measure Range : -0 ± 200A) Rated Input: 200A (Measure Range : -0 ± 400A) Rated Input: 500A (Measure Range : -0 ± 1000A)	CS050 CS100 CS200 CS500
	POWER SUPPLY	12V DC Power Supply	PA-12-2
CONTROL MODULE CABINET SOLUTION		Dimensions: 300x600x165mm (for 1 Control Module) Dimensions: 500x600x165mm (for 2 Control Module)	PTC-1 PTC-2

*The minimum specifications of your PC or server that you will use for the software of the non-embedded control module should be 4 GB of RAM, a 1 gigahertz (GHz) processor and 25 GB of free hard disk space.
Note: Our solutions vary according to user demand. The standard dimensions and product dimensions can be changed according to the requirements of the Project if technically appropriate.

APP 2. INFORMATION FOR SITE SURVEY REQUIREMENTS

Eagle Eye UPS Battery Monitor – Site Survey

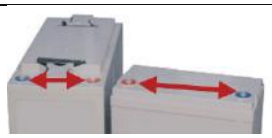
1. USER INFORMATION

Contact Name	]	**Company Name**	
Email		**Site Name**	
Phone		**Battery Name**	

2. BATTERY SYSTEM INFORMATION

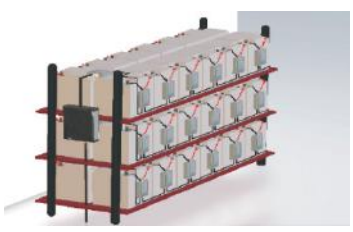
Battery Make		**Units per String**	
Model		**Number of Strings**	
Capacity		**Current Sensor Value**	☐ 50A ☐ 100A ☐200A ☐ 500A ☐ 1000A
Type	☐ Lead Acid ☐ Ni-Cad	**String Link Section** *(Value written on the cable between UPS & batt)*	
Nominal Voltage	☐ 1.2V ☐ 2V ☐ 4V ☐ 6V ☐ 8V ☐ 12V		
Measured Voltage		**UPS/Rectifier Make**	
Power Supply		**UPS/Rectifier Model**	

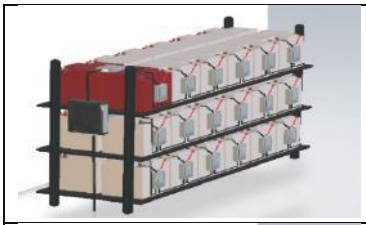
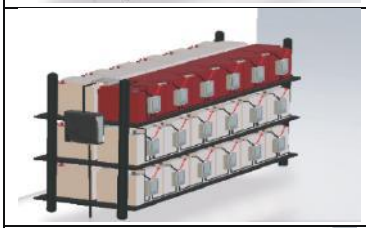
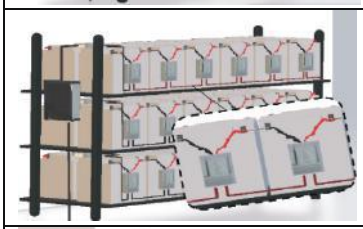
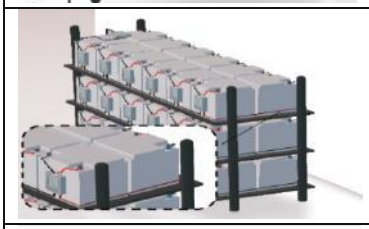
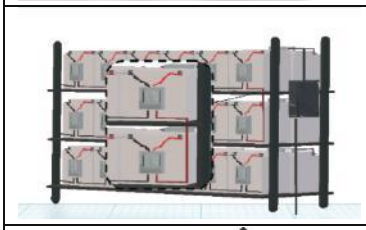
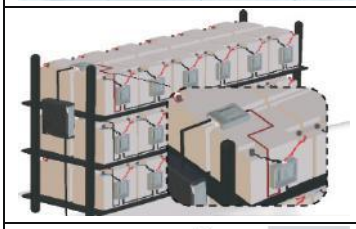
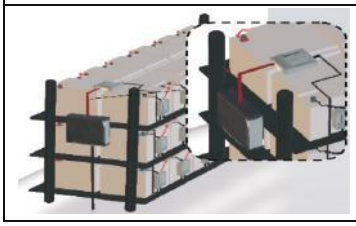
3. BATTERY MEASUREMENT CABLE INFORMATION

	Distance Between Battery Lead Terminal:		cm
			Inch

Lead Terminal Screw Size:
☐ M5 (5mm) ☐ M6 (6mm) ☐ M8 (8mm) ☐ M10 (10mm) ☐ M12 (12mm) ☐ FASTON (6.3mm)

4. BATTERY / SHELF LAYOUT INFORMATION

	Total Number of Shelves:	

	Number of Batteries in Each Shelf		
	Number of Batteries in Each Row:		
	Data Cable Length Between Side-by-Side Battery Modules **(Max. 100cm / 39”)**		cm
			Inch
	Data Cable Length Between Back-to-Back Battery Modules **(Max. 100cm / 39”)**		cm
			Inch
	Battery Module Data Cable Length Shelf to Shelf **(Max. 100cm / 39”)**		cm
			Inch
	Data Cable Length Between Back-to-Back Battery Modules: **(Max. 1000cm / 394”)**		cm
			Inch
	Data Cable Length Between String and Control Modules: **(Max. 1000cm / 394”)**		cm
			Inch

5. PRODUCT INFORMATION AND OPTIONS

☐ Battery Voltage ☐ Battery Temp. ☐ Battery Internal Resistance ☐ String Current	Other Customer Requests:

6. SOFTWARE REQUIREMENT INFORMATION

This applies to non-embedded server options. The server can be pre-installed on the BMS.

Infrastructure to Install Software:			
☐ Virtual Server/VM ESXi Version: ☐ 6.0 ☐ 6.5 ☐ Other:	☐ Computer on the network	☐ Computer outside the network	
IP Information:			
ALPAIS Software	IP Address	Subnet Mask	Gateway
Control Module	IP Address	Subnet Mask	Gateway
Port to Open	60000, 80, 22		
E-Mail Server Information:			
SMTP Server Address	E-Mail	Password	
☐ SSL		☐ TLS	

7. PERSONNEL INFORMATION

If different from contact information entered above.

Survey Contact		Email	
Company		Phone	

APP 3. HAND TOOLS REQUIRED FOR INSTALLATION

The recommended hand tools to be used in the installation are as follows;

Crimping Pliers

Plug Crimping Pliers

Socket Set

Industrial Gloves

Multimeter

Cable Tester

Tools may differ depending on the installation location.

APP 4. SYSTEM REQUIREMENTS

• 1 Server (If not in Eagle Eye Embedded Server Control Module feature)

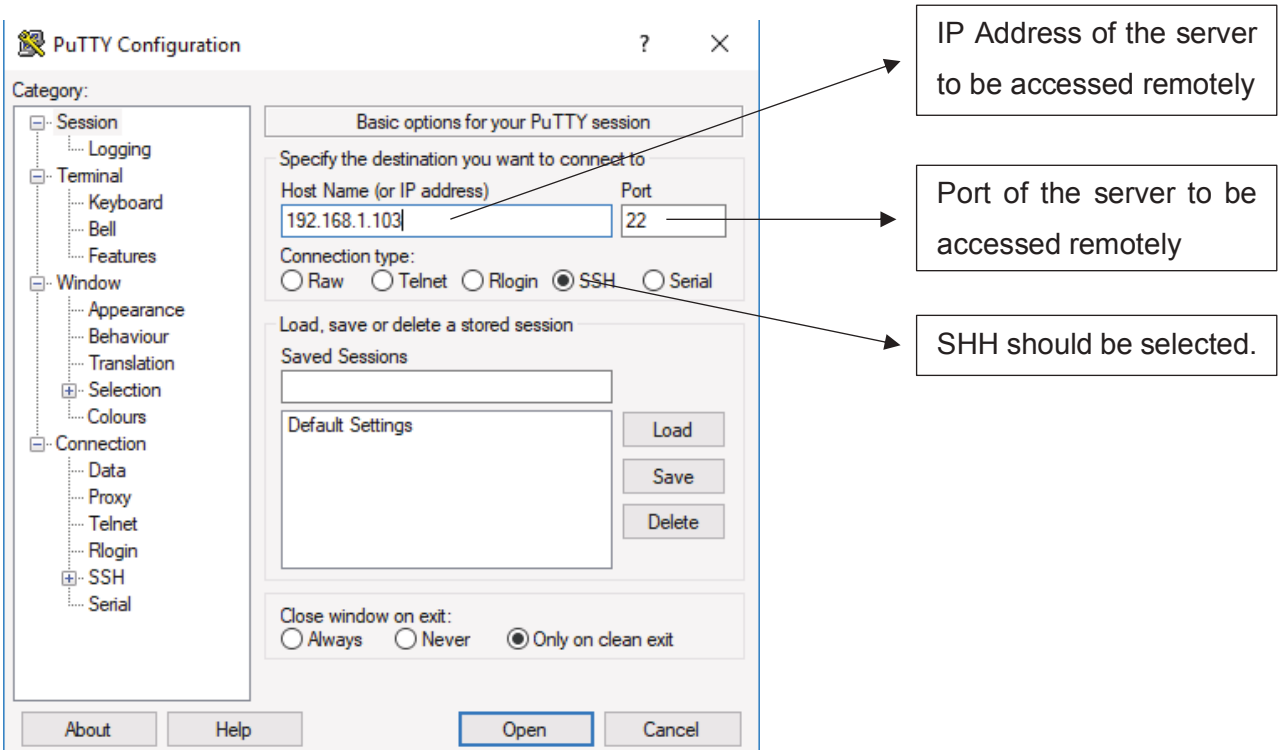
Recommended server features are as follows

- Core speed of 1.3 GHz or faster
- Min 2 core CPU
- Min 4 GB RAM
- Min 25 GB of free hard disk space

APP 5. REMOTE ACCESS

First of all, the personnel (that will make remote access) should open Putty program on PC. If the program is not available, it must be downloaded free of charge (https://www.putty.org/). Putty is an open-source software that provides connection to the Linux operating system server on the network. The server connected to Putty can be managed with various commands through the terminal.

a) The server opens to the internet with a specific port from the other side.
b) The personnel that make remote access, will open the Putty program.
c) The following places are filled.



d) After pressing 'Open' button, the input screen appears.
e) Access to server / device is provided with user name and password.
f) Return to 5 for subsequent operations.

APP 6. SUBNET MASK ADJUSTMENT SAMPLE

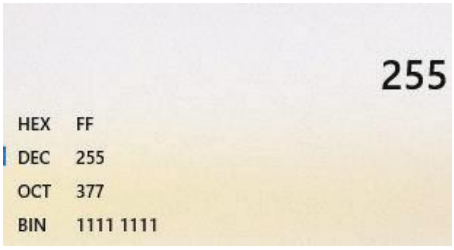
The Subnet Mask prefix must be entered when the IP address is given in the VMware Program. In the 'Address' section shown in Figure 20, Subnet Mask should be entered with IP.

Sample:

IP Address to Enter: 192.168.1.55

The Subnet Mask: 255.255.255.0

Assuming that, Subnet Mask is calculated as prefix;



The BIN value was calculated as 1111 1111. So, every 255 is 8 and 1 means 8. In the example given, the Subnet Mask has 3 pieces of 255 so it has 24 pieces in total.

In Figure 20, IP and Subnet Mask given in the example to 'Addresses' section on the IPV4 CONFIGURATION page are entered as follows;

Addresses: 192.168.1.55 / 24

IP Add. Subnet M

APP 7. EMBEDDED WEB SERVER CONMOD NETWORK SETTING

Control Module (CONMOD) has a self-embedded server, follow the steps below to change the server settings as you wish. The embedded server default IP is 192.168.1.50.

a) Make sure the CONMOD is powered and the Ethernet connection is plugged into the CONMOD and back to the PC.

b) Free Putty Software is installed on the PC and its installation is completed. (See https://www.putty.org/)

c) From the Network Connections of the PC, go to the 'Property' tab of the Ethernet. An IP Address is defined to the PC by following the example procedures in Figure 38. Since the default embedded server IP (192.168.1.50) for communication is in 192.168.1.x/24 network, the PC side should also set accordingly.

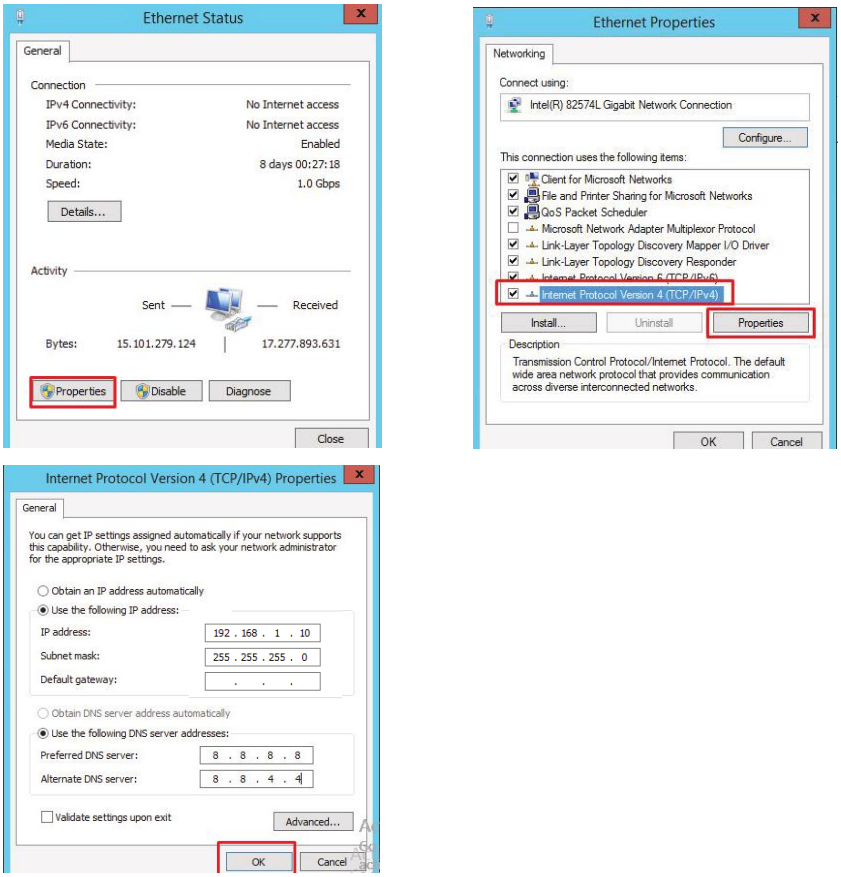


Figure 38. Network Settings

d) To see if the connection is successful, ping the server with the command 'ping 192.168.1.50' from the command prompt application of the PC.

e) Open the Putty application. While the settings are selected as in Figure 39, '192.168.1.50' is written in the 'Host Name' section and the 'Open' button is pressed.

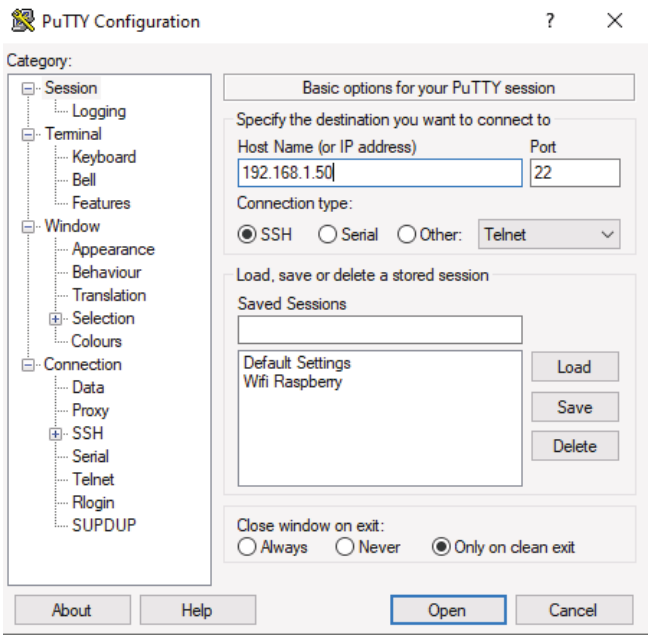
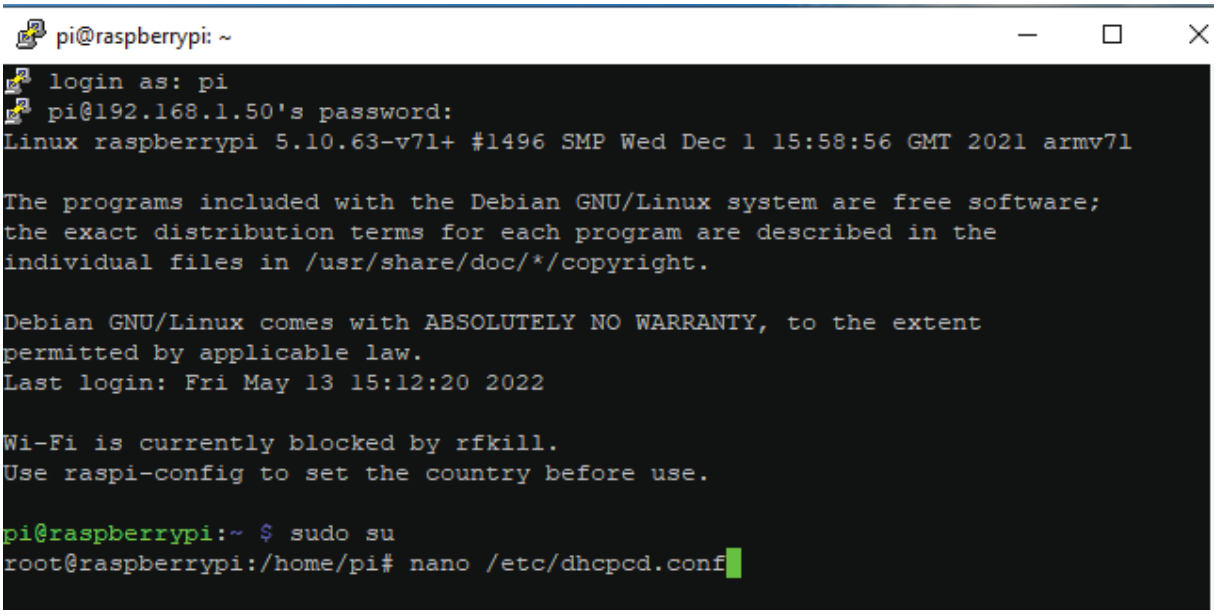


Figure 39. Putty Configuration

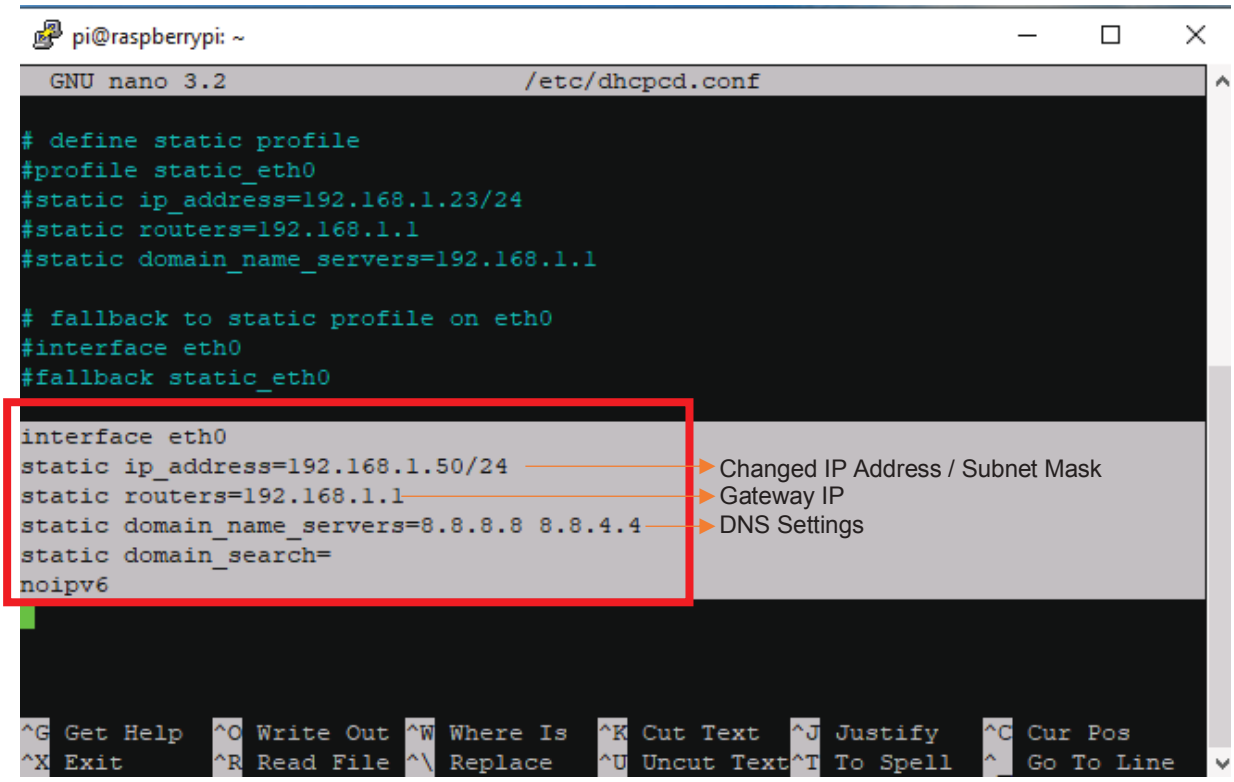
f) The user name and password must be entered on the black screen that appears. (Username:pi / Password:rasp) For authorization, the following commands should be entered in order as follows;

sudo su

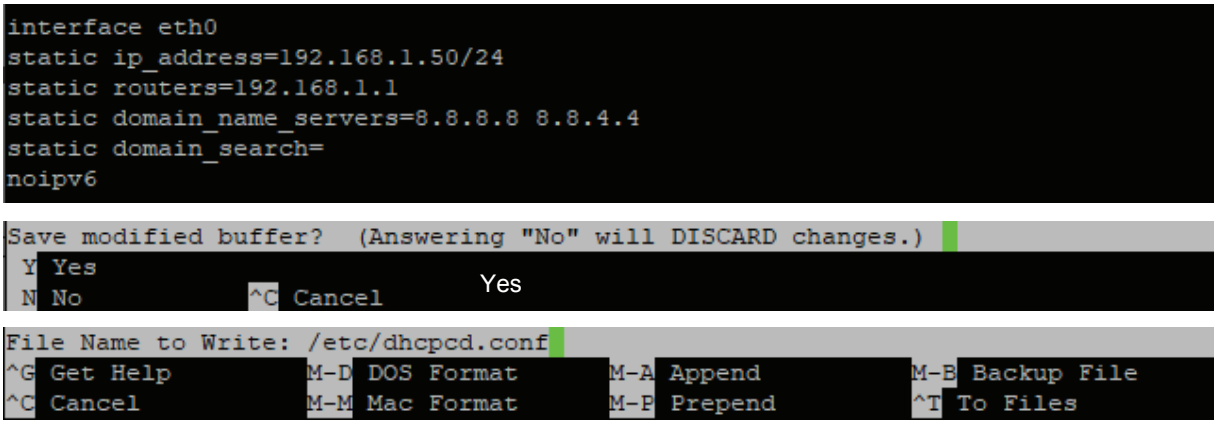
nano /etc/dhcpcd.conf



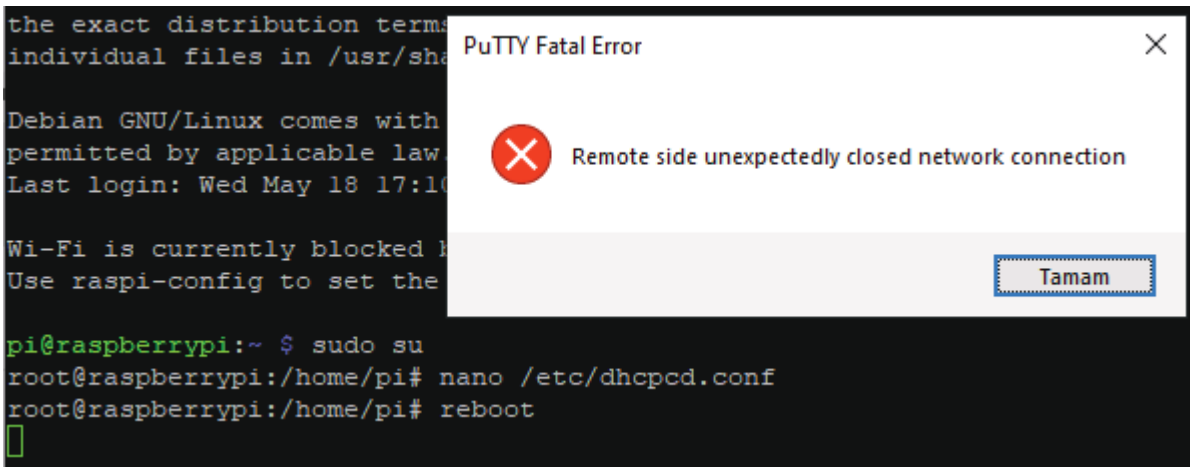
g) At the bottom of the file network settings can be changed as follows;



h) After the IP Settings are made, the changes are saved with CTRL+X.



i) Enter “reboot” command for the changes to take effect.



j) The interface is accessed with the changed server IP Address. See 6.1.