

RS422/RS485 Modbus Gateway

SMG-5521 User Manual

Version 1.0

Sollae Systems

<https://www.ezTCP.com>



This symbol, found on your product or on its packaging, indicates that this product should not be treated as household waste when you wish to dispose of it. Instead, it should be handed over to an applicable collection point for the recycling of electrical and electronic equipment. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences to the environment and human health, which could otherwise be caused by inappropriate disposal of this product. The recycling of materials will help to conserve natural resources. For more detailed information about the recycling of this product, please contact your local city office, household waste disposal service or the retail store where you purchased this product.

Note:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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1 Modbus Overview

1.1 Modbus

Modbus is a serial communications protocol originally published by Modicon (now Schneider Electric) in 1979 for use with its programmable logic controller (PLCs). As a matter of fact, Modbus has become a standard communication protocol.

Modbus serial line protocol is a master-slave protocol that a master communicates with one or more slaves. A master sends Modbus queries to slaves and slaves send responses to the master.

There are two transmission modes in Modbus serial line protocol and those are RTU and ASCII. Comparisons of those two modes are as follows:

Division	Modbus/RTU	Modbus/ASCII
Basic	Commonly used More efficient than ASCII mode	Less efficient than RTU mode Used when the timer-related requirements of the RTU mode cannot be met
Coding System	8-bit binary	Hexadecimal, ASCII characters
Bits per Byte	1 start bit 8 data bits, LSB sent first 1 parity bit (or no parity bit) 1 stop bit (or 2 bits with no parity)	1 start bit 7 data bits, LSB sent first 1 parity bit (or no parity bit) 1 stop bit (or 2 bits with no parity)
Message Framing	Use time intervals char interval ≤ 1.5 char frame interval ≥ 3.5 frame	Use ASCII characters Start – 0x3A (':') End – 0x0D0A (CR+LF) char interval ≤ 1 second
Frame Checking Filed	CRC	LRC
Frame description	Slave Address (1) Function Code (1) Data (0 ~ 252) CRC (2)	Start (1) Slave Address (2) Function Code (2) Data (0 ~ 504) LRC (2) End (2)

Table 1-1 Comparisons of Modbus/RTU and Modbus/ASCII

The Modbus RTU/ASCII communication is restricted by distance limitations. However, the Modbus gateway was developed to effectively extend the range for Modbus devices.

1.2 Modbus Gateway

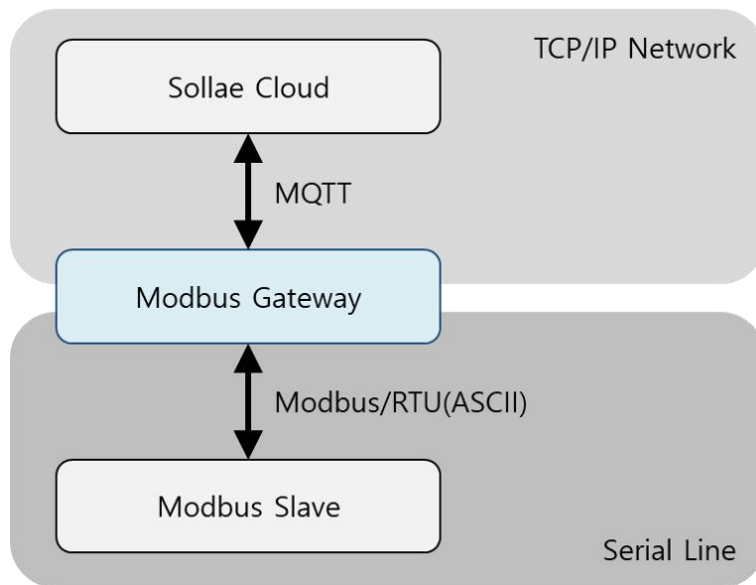


Figure 1-1 Modbus Gateway

The communication range of the Modbus RTU/ASCII device is restricted. However, the Modbus Gateway extends this range by collecting data from the Modbus device and transmitting it securely to the Sollae Cloud via the Internet. Within the Sollae Cloud platform, the data is efficiently managed, stored, and visualized in diverse ways. Moreover, the Sollae Cloud facilitates communication between Modbus devices, enabling actions such as activating a relay from one device based on a temperature threshold detected by another device.

2 Product Overview

2.1 Product Overview

The SMG-5521 serves as an industrial Modbus Gateway, connecting your Modbus RTU/ASCII devices/sensors to the Sollae Cloud. Through the Sollae Cloud's web interface, you gain the ability to both retrieve data from and control your Modbus RTU/ASCII devices/sensors. Moreover, you can take advantage of the Sollae Cloud's advanced features like event-action triggers, email notifications, graphical representations, and customizable dashboards.

SMG-5521 provides 10/100Mbps Ethernet and RS422/RS485 serial port.

2.2 Features

- RS422/RS485 Modbus Gateway
- 10Base-T/100Base-TX Ethernet
- RS422/RS485 serial port
- Freely connected to Sollae Cloud via MQTT
- Data is encrypted and securely transmitted using TLS 1.2
- Client certificate authentication for devices
- Data is stored on Sollae Cloud for up to 30 days
- Various widgets on Sollae Cloud for data visualization
- Inter-device Event-Action
- Email Notification
- Industrial temperature range (-40℃ ~ +85℃)

2.3 Specification

Serial Physical Interface	
Serial Interface	RS422/RS485 TX+, TX-, RX+, RX-, GND with embedded 3.9K biasing resistors and TVS TRX+, TRX-, GND with embedded 3.9K biasing resistors and TVS
Connector	3.5mm Pitch Terminal Block
Serial Port Property	
Baudrate	1,200 ~ 230,400bps
Data Bits	8bits, 7bits with Parity
Parity	None, Even, Odd, Mark, Space
Stop Bit	1, 2
Network Physical Interface	
Network Interface	10Base-T/100Base-TX Ethernet(RJ45) Ethernet Speed Auto Sense

	1:1 or Cross-over Cable Auto Sense
Software Functions	
Protocols	IPv4/IPv6 Dual Stack TCP/UDP, ICMP, DHCP, mDNS, MQTT Modbus/RTU, Modbus/ASCII, SSL/TLS
Indicators	
LED	PWR, LINK, RUN, MTX, MRX, STX, SRX, STS
Management	
spFinder	Configuration and Monitoring Tool
Security	Password
Dimension	
Size	94mm x 57mm x 23mm
Weight	about 66g
Operating Environment	
Input Voltage	DC5V±0.5V
Protection	Reverse Voltage Protection / Surge Protection
Current Consumption	typically, 273mA
Operating Temperature	-40℃ ~ +85℃
Storage Temperature	-40℃ ~ +85℃
Certificate	
KC	Registration (KN 32, KN 35)
CE	EMC 2014/30/EU, RoHS 2011/65/EU
FCC	FCC Part 15 Subpart B, Class A

Table 2-1 Specification

2.4 Interface

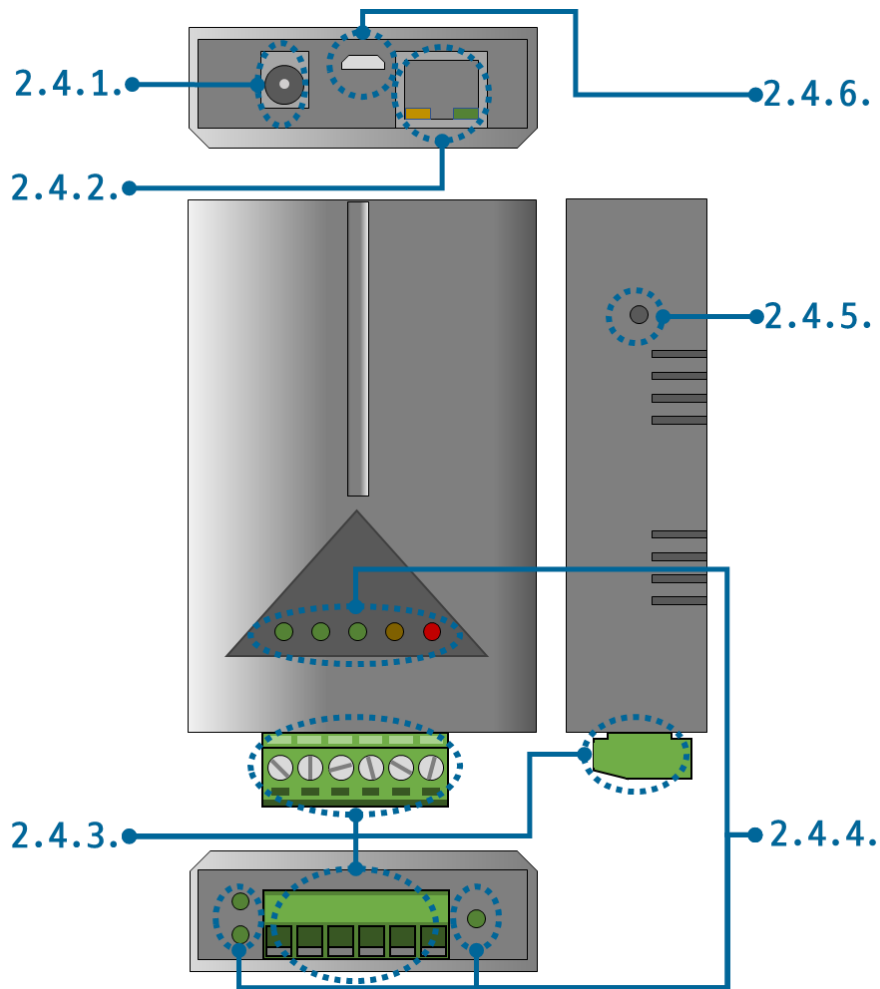


Figure 2-1 Interface

2.4.1 Power

SMG-5521 requires DC5V power supply whose specification is as follows:

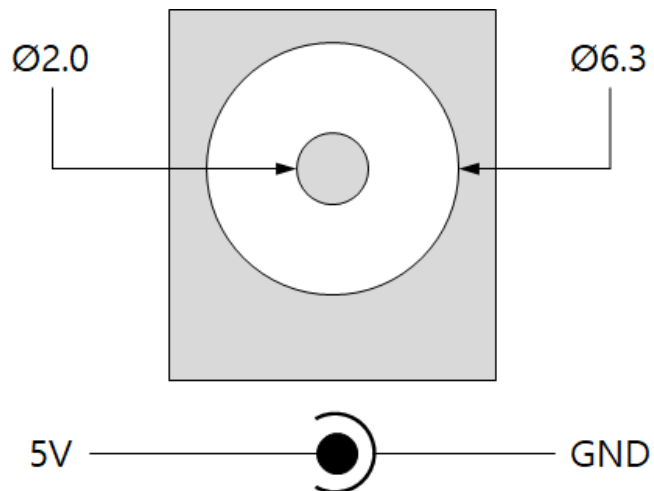


Figure 2-2 Power

2.4.2 Ethernet

SMG-5521 provides 10/100Mbps Ethernet. The pin assignment is as follows:

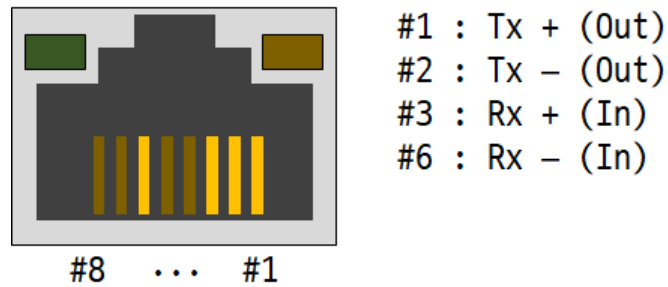


Figure 2-3 Ethernet

2.4.3 Serial Port

SMG-5521 has a 3.5mm pitch 6-pole terminal block for connecting serial devices.

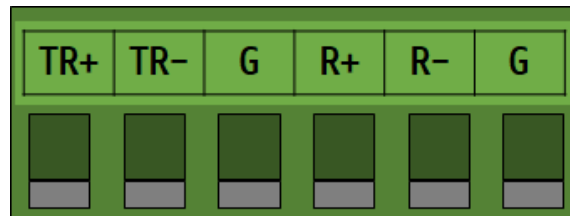


Figure 2-4 Serial Port

● Port Specification

Parameter	Value
Number	1
Type	RS422/RS485
Baud rate	1,200 ~ 230,400 [bps]
Parity	NONE, EVEN, ODD, MARK or SPACE
Data bit	8 or 7 (7-bit is only available on using Parity)
Stop bit	1 or 2

Table 2-2 Port Specification

- RS485 Signal Lines

Label	Name	Description	Level	I/O	Wiring
TR+	TRX +	Data +	RS485	In/Out	Required
TR-	TRX -	Data -	RS485	In/Out	Required
G	GND	Ground	Ground	-	Required

Table 2-3 RS485 Signal Lines

- RS422 Signal Lines

Label	Name	Description	Level	I/O	Wiring
TR+	TX +	Transmit Data +	RS422	Out	Required
TR-	TX -	Transmit Data -	RS422	Out	Required
R+	RX +	Receive Data +	RS422	In	Required
R-	RX -	Receive Data -	RS422	In	Required
G	GND	Ground	Ground	-	Required

Table 2-4 RS422 Signal Lines

☞ *Each signal line for RS422/RS485 has a 3.9KΩ built-in biasing resistor.*

2.4.4 LED

LED operations according to each state are as follows:

When the supplied power is stable: PWR



When the supplied power is NOT stable: PWR



When the script is running: RUN



When the script is NOT running: RUN



When a network is not connected: LINK



When connected to Sollae Cloud: LINK



When a TCP connection is NOT established: MTX & MRX



When the device obtained an invalid IP address



When the device obtained a valid IP address



When sending data to the Sollae Cloud: MTX



When receiving data from the Sollae Cloud: MRX



When sending data to the serial port: STX



When receiving data from the serial port: SRX



2.4.5 Function Button

This button is used to implement a factory reset.

2.4.6 Setup Port

This port is used for making a connection with a PC via USB cable.

3 Preparation

3.1 Installing the Setting Tool

You need a program which is called spFinder to use this product. Download the program on our web site and install it on your PC.

Functions of the spFinder are as follows:

- Searching products connected via network and USB
- Setting products
- Monitoring status of products

3.2 Connecting a Product

Connect a product with your PC via a LAN cable or a USB cable. In the case of using a LAN cable, note that your PC and the product should be on the same local area network.

3.3 Searching Devices

Run spFinder on your PC and press the search button. If you select the product found, the setup menu appears on the right.

3.4 Logging in

Before accessing the searched product, you need to log in first. The default ID and password are as follows:

Division	Default Values
ID	smg-5521
Password	smg-5521

Table 3-1 The default values of ID and password

☞ *If you search the product via network and it has the default value for a password, spFinder automatically processes the login.*

4 Settings

4.1 IP Network

4.1.1 Obtain an IP address automatically

This product can automatically obtain an IP address by DHCP. A DHCP server is required to use this.

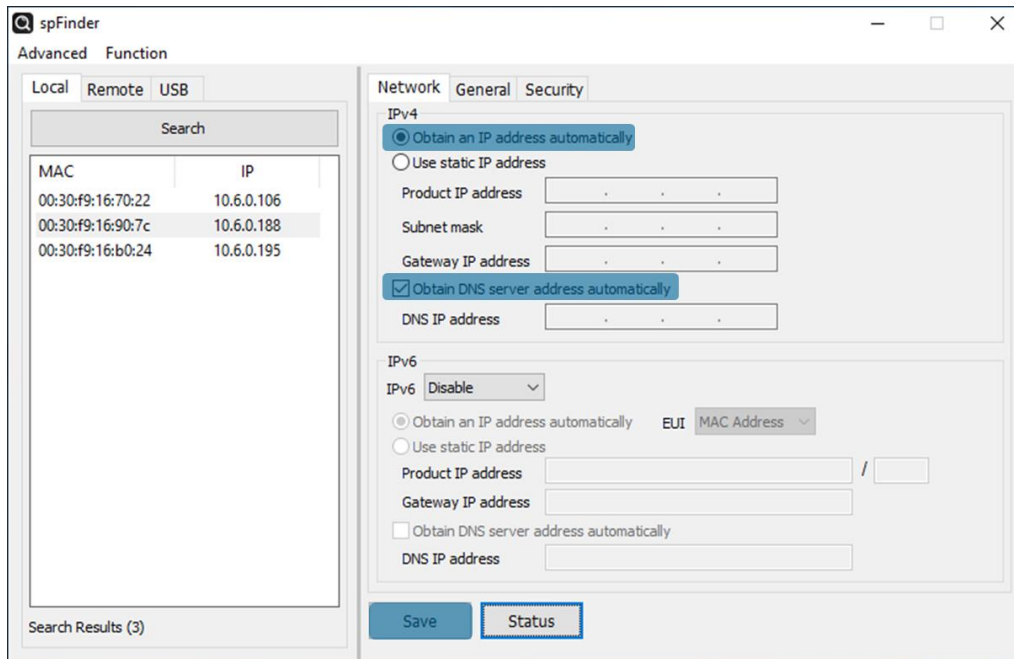


Figure 4-1 Obtain an IP address automatically

- Select the [Obtain an IP address automatically].
- Check the [Obtain DNS server address automatically] and click the [Save] button.

4.1.2 Use a static IP address

You can set a static IP address to this product.

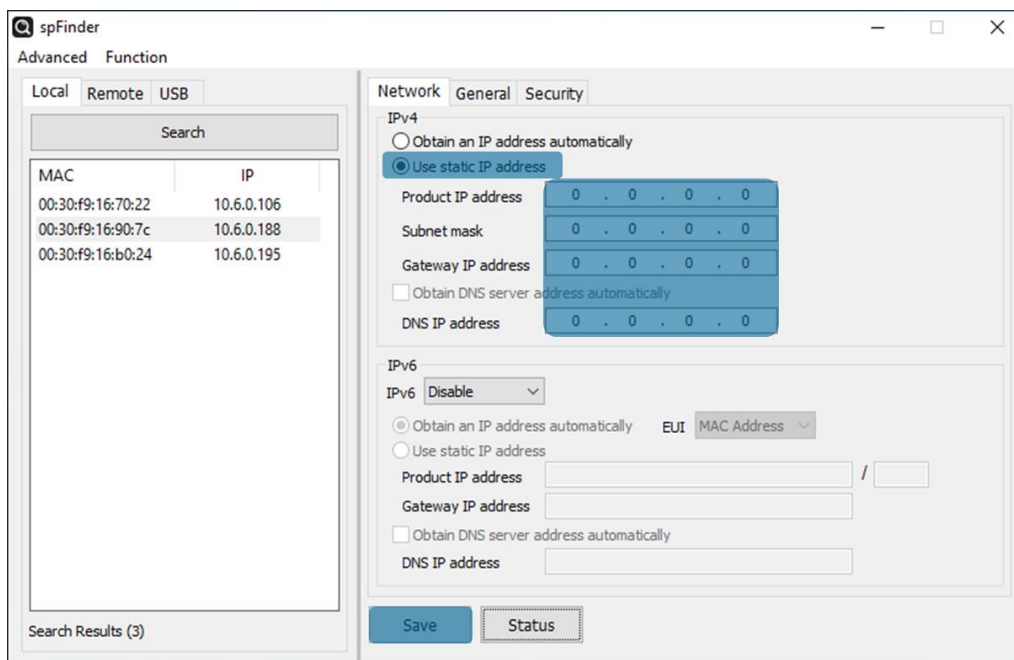


Figure 4-2 Use a static IP address

- Select the [Use static IP address].
- Set the [Local IP address], [Subnet mask], [Gateway IP address] and [DNS IP address].
- Click the [Save] button.

4.2 General

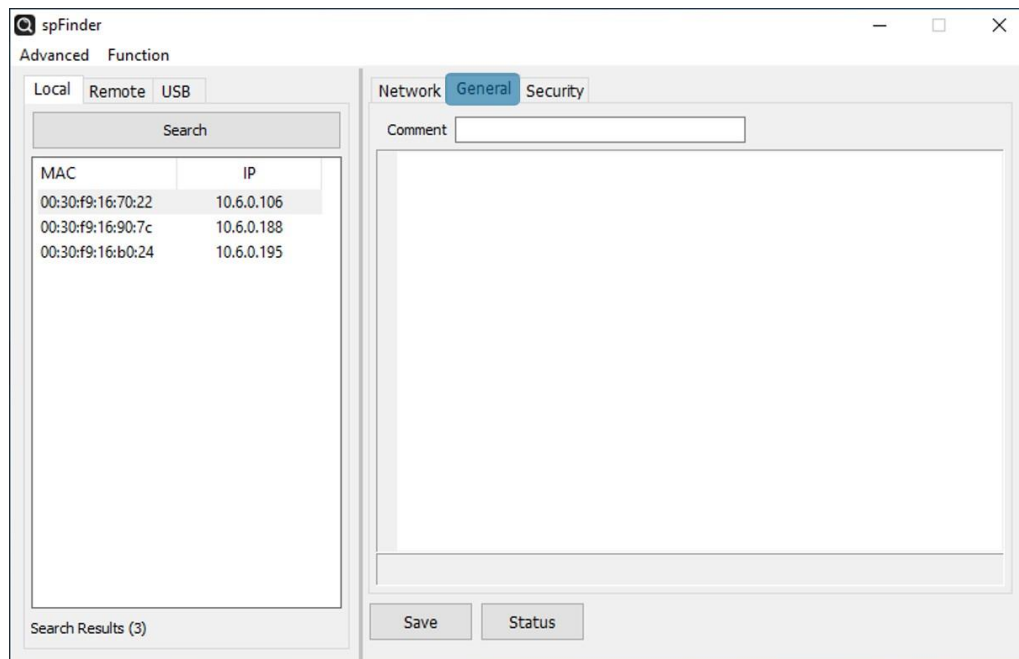


Figure 4-3 General

4.2.1 Comment

This setting is for storing the product description. The maximum setting size of this item is 32 bytes.

4.3 Security

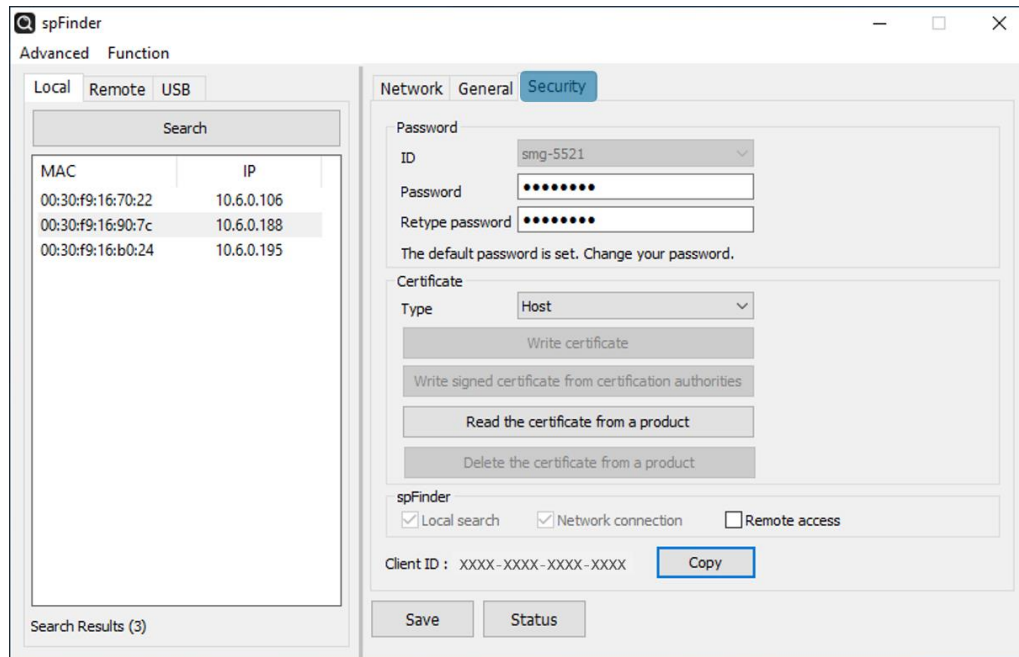


Figure 4-4 Security

4.3.1 Password

Both ID and password are required to access this product. Note that changing the default password to another is highly recommended for security. The password should be longer than 8 characters.

- Input a password to use to [Password] and [Confirm password].
- Click the [Save] button.

4.3.2 Certificate

All TLS certificates were preloaded to the device, please ignore this part.

4.3.3 spFinder

These items are related to spFinder use.

- Local search
If this item is not checked, you will not be able to search for or connect to the product on your local network. This item can be set only when the product is connected via USB.
- Network connection
If this item is not checked, the product cannot be searched on the local network and the product cannot be connected on the local or remote network. This item can be set only when the product is connected via USB.

- Remote access

If this item is checked, the product can be connected from the remote network.
For security, this item is unchecked by default.

4.3.4 Client ID

The Unique ID which is used to register the device under your account in Sollae Cloud. See more detail on [Sollae Cloud](#).

5 Management

5.1 Checking Status

This is a function to view the current status of the product. Information in the [Status] window is automatically updated every second. After searching and connecting the product with spFinder, press the [Status] button to display this window. When you open this window, the spFinder connects to the product and keeps the connection until you close the window or time out. While the connection is maintained, other hosts cannot access the product using the spFinder.

5.1.1 Product Information

- Product Information Window

This area shows some major information of your product.

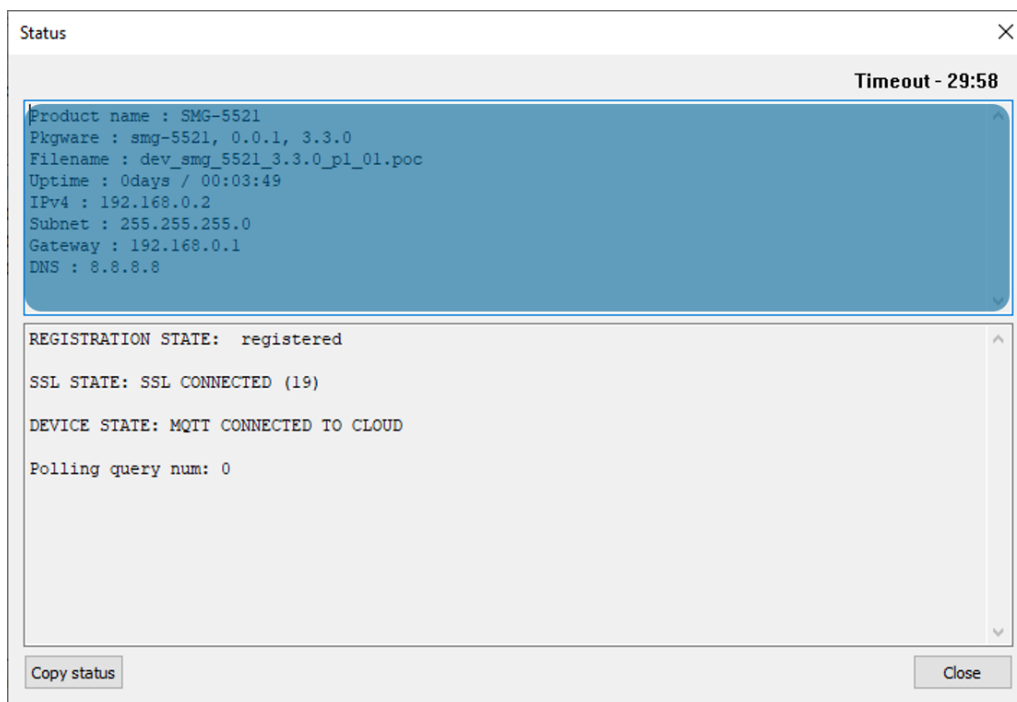


Figure 5-1 Product Information Window

- Product Information

Item	Description
Product name	Product name
Pkgware	The version of Firmware
File name	File name of Firmware
Uptime	Elapsed time since it boots up (day / hour:min:sec)
IPv4	Assigned IPv4 address
Subnet	Assigned subnet mask
Gateway	Assigned gateway IP address
DNS	Assigned DNS IP address

Table 5-1 Product Information

5.1.2 Communication Status

- Communication Status Window

This area shows some communication status of your product. This area is refreshed every second.

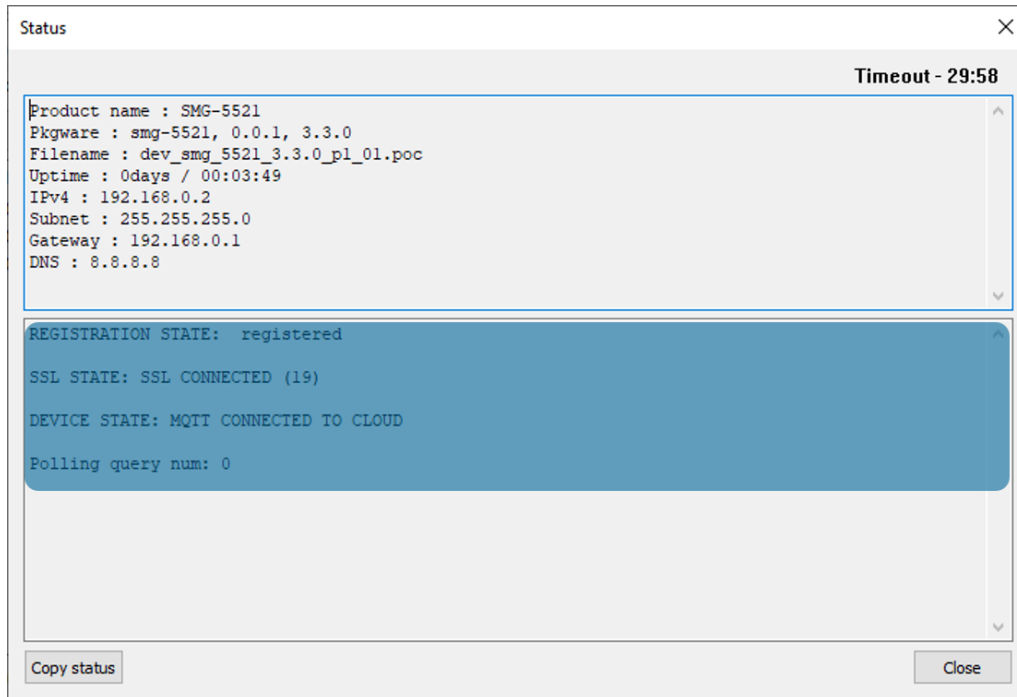


Figure 5-2 Communication Status Window

- REGISTRATION STATE

The registration state indicates whether the device is registered on Sollae Cloud under an account or not.

Status	Description
checking	Checking the registration status
unregistered	The device is unregistered under any account
registered	The device was registered under an account

Table 5-2 REGISTRATION STATE

- SSL STATE

SSL/TLS connection state.

Status	Description
SSL CLOSED	Disconnected
SSL CONNECTING	Connecting
SSL CLOSING	Closing connection
SSL CONNECTED	Connected

Table 5-3 SSL STATE

- DEVICE STATE

The device operation state.

Status
STARTING
UPDATING INFORMATION TO CLOUD
FAILED TO UPDATE INFORMATION TO CLOUD
DEVICE IS UNREGISTERED TO AN USER
CONNECTING MQTT SERVER
MQTT CLOSED
MQTT CONNECTED TO CLOUD
MQTT PING TO CLOUD
DELAYING BEFORE RECONNECTING
UPGRADING PKGWARE
CONFIGURING DEVICE
APPENV FAILED
CERTS FAILED

Table 5-4 DEVICE STATE

- Polling Query Num

The number of Modbus and HMI query set via Sollae Cloud for the device.

5.1.3 Timeout

This is the timeout display function that appears in the upper right of the status window. When this time reaches zero, the connection between spFinder and the product is lost. The initial value is 30 minutes. If you move the mouse pointer in the internal area of the status window, the timer is reset to the initial value again.

5.1.4 Copy status

Clicking this button copies all information displayed in the current status window to the clipboard.

5.2 Firmware Change

New firmware can be released when adding functions or fixing bugs. If you are using old firmware, you can upgrade it to the latest version. Firmware can be upgraded online or manually via spFinder.

5.2.1 Automatic Online Upgrade

If you can access to the Internet by your PC, the Firmware can be upgraded online.

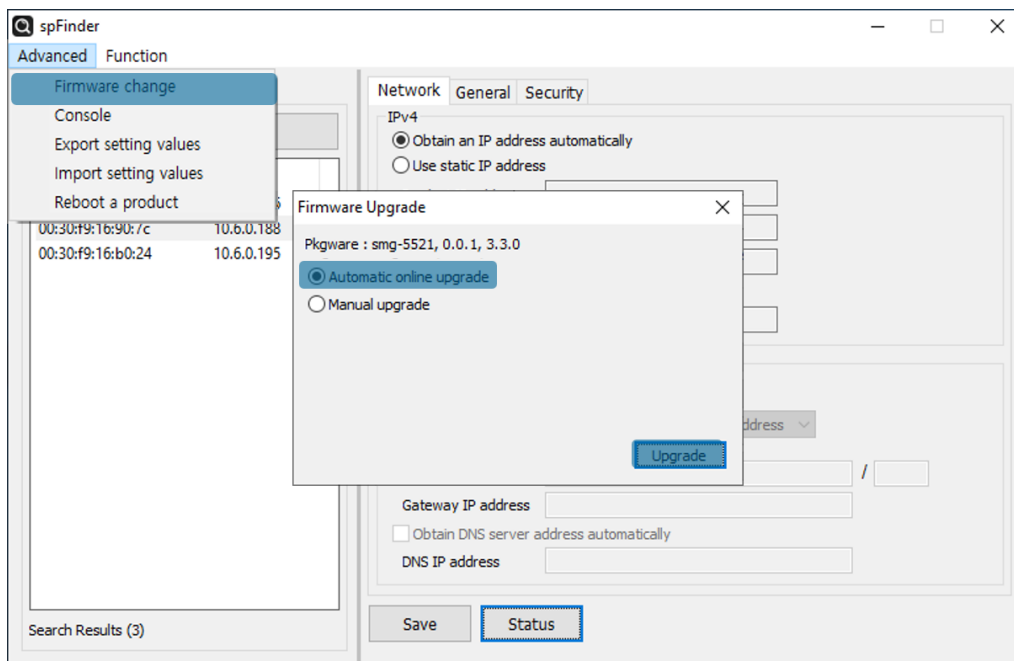


Figure 5-3 Automatic Online Upgrade

- Search and Connect to your product by spFinder.
- Click [Advanced] > [Firmware change] menu.
- Click [Upgrade] button selecting [Automatic online upgrade] menu.

5.2.2 Manual Upgradde

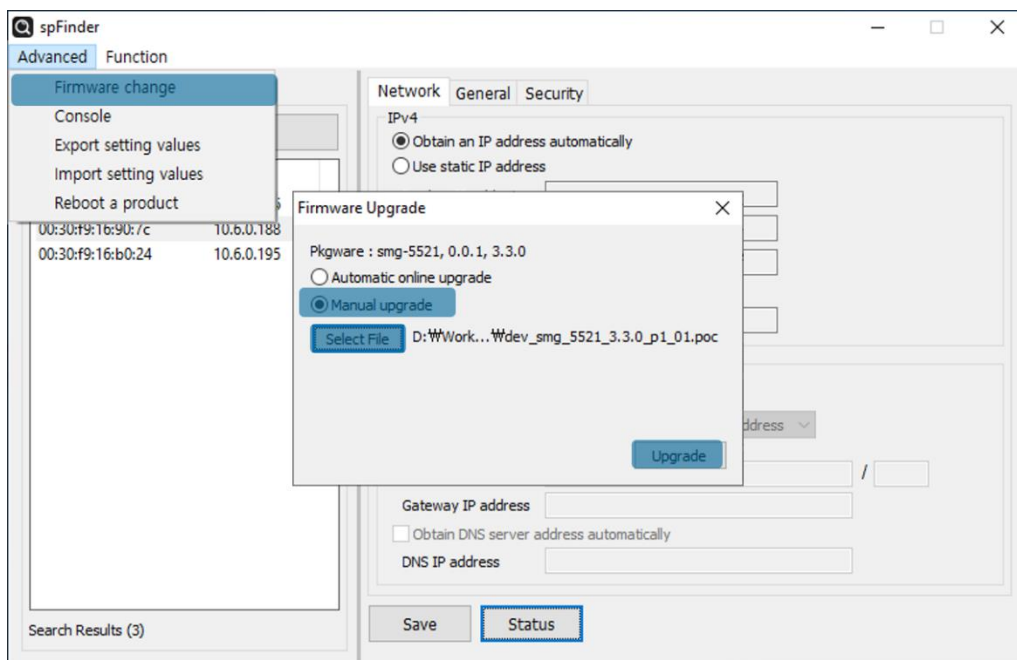


Figure 5-4 Manual Upgrade

- Download a Firmware file to your PC.
- Search and connect to your product by spFinder.
- Click [Advanced] > [Firmware Change] menu.
- Select to [Manual upgrade] on the [Firmware Upgrade] window.
- Click [Select File] button and select the Firmware file on you PC
- Click [Upgrade] button.

5.2.3 Remote Upgrade via cloud

See [Cloud User Guide](#)

5.3 Console

The console function analyzes and displays the Modbus frames sent and received by the product.

After searching and connecting the product with spFinder, click [Console] in the [Advanced] menu to display the console window. When you open this window, the spFinder connects to the product and keeps the connection until you close the window or time out. While the connection is maintained, other hosts cannot access the product using the spFinder.

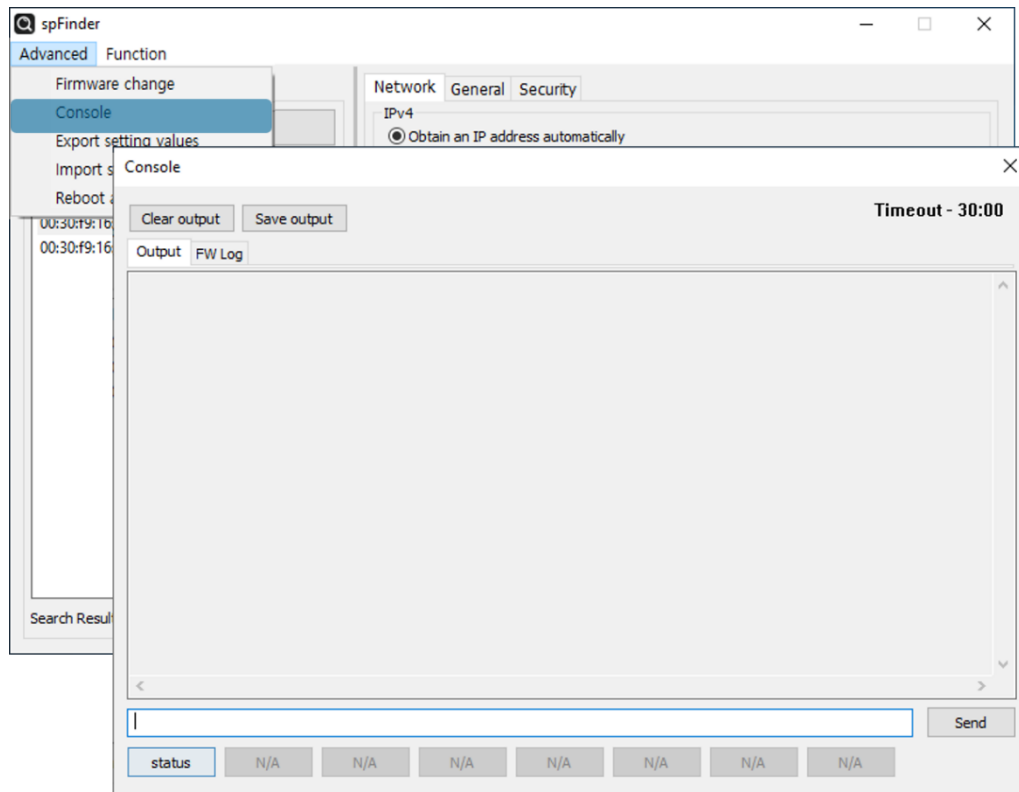


Figure 5-5 Console

5.3.1 Output Tab

This tab displays console messages.

- Clear output

Pressing this button clears all output messages on the Output tab.

- Save output

Press this button to save the message to be output to the Output tab as a file. While saving the message as a file, the size of the saved file is displayed, and the Timeout function does not work.

- status

Pressing this button outputs product status information on the Output tab

5.3.2 FW Log Tab

This tab displays the log message from Firmware.

5.3.3 Timeout

This is the timeout display function that appears in the upper right of the console window. When this time reaches zero, the connection between spFinder and the product is lost. The initial value is 30 minutes. If you move the mouse pointer in the internal area of the console window, the timer is reset to the initial value again. This function does not work while using the [Save output] function.

5.4 Export/Import Setting Values

The [Export setting values] menu saves setting values of your product as a file. The password is not included in the file. The [Import setting values] menu loads a setting value from a file which is saved by the [Export setting values] menu. Find these functions at the [Advanced] menu.

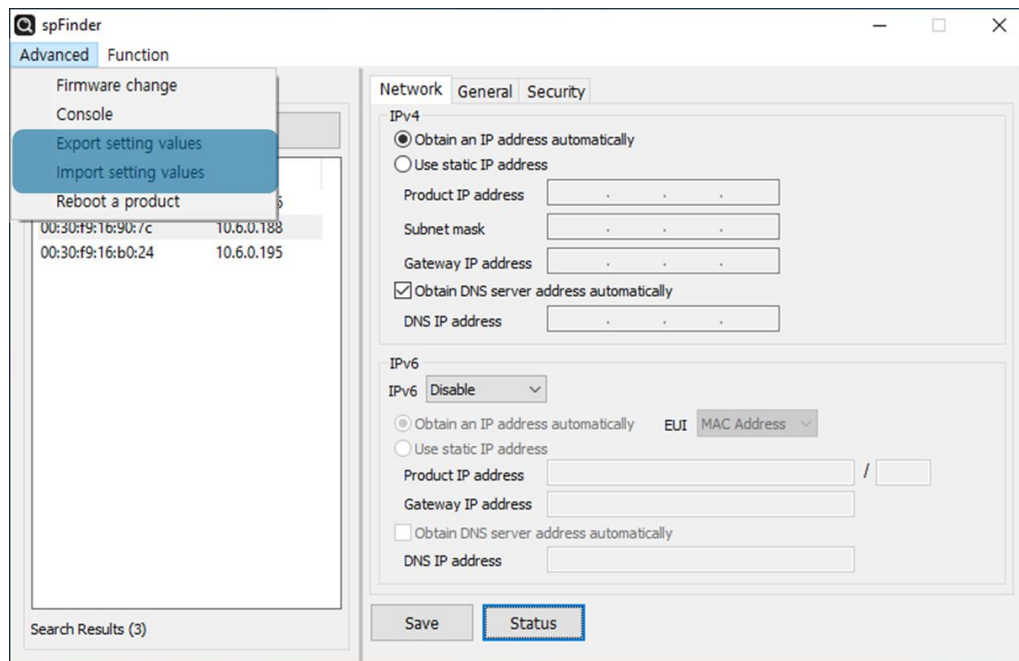


Figure 5-6 Export/Import Setting Values

5.5 Reboot a Product

This function is for rebooting a product.

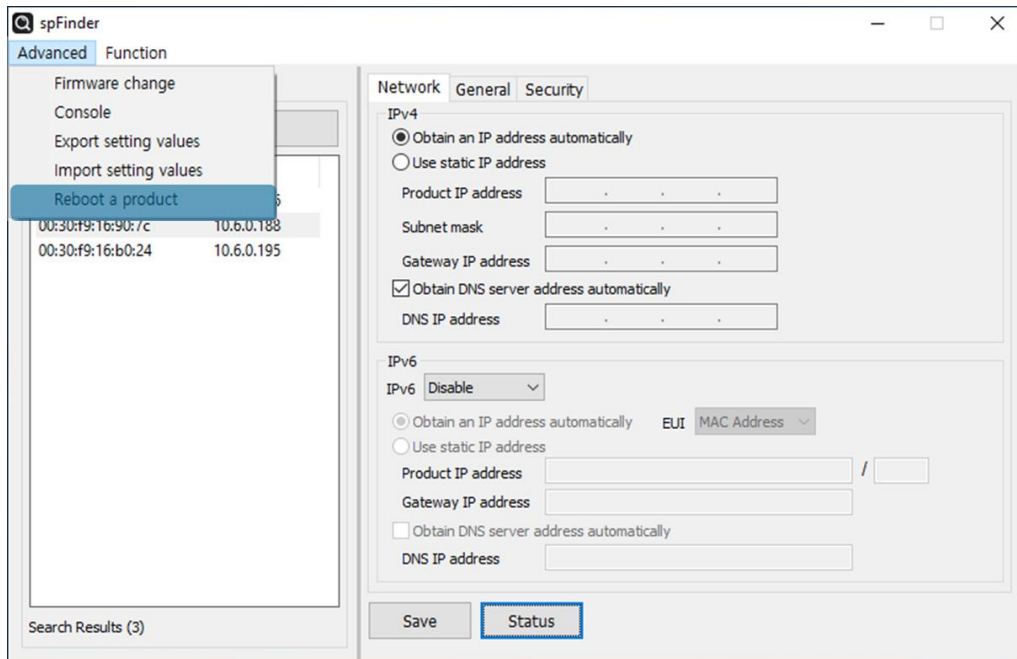


Figure 5-7 Reboot a Product

5.6 Factory Reset

Performing the Factory Reset, you can restore all the settings to the default including the password. Follow the procedure below by checking the status of RUN LED.

1. Press and immediately release the function button.

RUN

2. Press the function button and keep the state more than 5 seconds.

RUN

3. Once the RUN led is turned off, release the button within 2 seconds.

RUN

2 seconds

4. The factory reset is started when you release the button. After that, your product will reboot.

RUN

6 Technical Support and Warranty

6.1 Technical Support

If you have any question regarding operation of the product, visit Customer Support FAQ corner and the message board on Sollae Systems' web site or send us an email at the following address:

- E-mail: support@eztcp.com
- Q & A board: <https://www.eztcp.com/en/support/qna.php>

6.2 Warranty

6.2.1 Free Repair Services

For product failures occurring within 2 years after purchase, Sollae Systems provides free repair services or exchange the product. However, if the product failure is due to user's fault, repair service fees will be charged or the product will be replaced at user's expense.

6.2.2 Charged Repair Services

For product failures occurring after the warranty period (2 years) or resulting from user's fault, repair service fees will be charged and the product will be replaced at user's expense.

7 Precaution and Exemption from Liability

7.1 Precaution

- Sollae Systems is not responsible for product failures occurring due to user's alternation of the product.
- Specifications of the product are subject to change without prior notice for performance improvement.
- Sollae Systems does not guarantee successful operation of the product if the product was used under conditions deviating from the product specifications.
- Reverse engineering of firmware and applications provided by Sollae Systems is prohibited.
- Use of firmware and applications provided by Sollae Systems for purposes other than those for which they were designed is prohibited.
- Do not use the product in an extremely cold or hot place or in a place where vibration is severe.
- Do not use the product in an environment in which humidity is high or a lot of oil exists.
- Do not use the product where there is caustic or combustible gas.
- Sollae Systems does not guarantee normal operation of the product under the conditions a lot of noise exists.
- Do not use the product for a purpose that requires exceptional quality and reliability relating to user's injuries or accidents – aerospace, aviation, health care, nuclear power, transportation, and safety purposes.
- Sollae Systems is not responsible for any accident or damage occurring while using the product.

7.2 Exemption from Liability

7.2.1 English version

In no event shall Sollae Systems Co., Ltd. and its distributors be liable for any damages whatsoever (including, without limitation, damages for loss of profit, operating cost for commercial interruption, loss of information, or any other financial loss) from the use or inability to use the SMG-5521 even if Sollae Systems Co., Ltd. or its distributors have been informed of such damages.

The SMG-5521 is not designed and not authorized for use in military applications, in nuclear applications, in airport applications or for use in applications involving explosives, or in medical applications, or for use in security alarm, or for use in a fire alarm, or in applications involving elevators, or in embedded applications in vehicles such as but not limited to cars, planes, trucks, boats, aircraft, helicopters, etc.

In the same way, the SMG-5521 is not designed, or intended, or authorized to test, develop, or be built into applications where failure could create a dangerous situation that may result in financial losses, damage to property, personal injury, or the death of people or animals. If you use the SMG-5521 voluntarily or involuntarily for such unauthorized applications, you agree to subtract Sollae Systems Co., Ltd. and its distributors from all liability for any claim for compensation.

Sollae Systems Co., Ltd. and its distributors entire liability and your exclusive remedy shall be Sollae Systems Co., Ltd. and its distributors option for the return of the price paid for, or repair, or replacement of the SMG-5521.

Sollae Systems Co., Ltd. and its distributors disclaim all other warranties, either expressed or implied, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose, with respect to the SMG-5521 including accompanying written material, hardware and firmware.

7.2.2 French version

- Documentation

La documentation du boîtier SMG-5521 est conçue avec la plus grande attention. Tous les efforts ont été mis en œuvre pour éviter les anomalies. Toutefois, nous ne pouvons garantir que cette documentation soit à 100% exempt de toute erreur. Les informations présentes dans cette documentation sont données à titre indicatif. Les caractéristiques techniques peuvent changer à tout moment sans aucun préavis dans le but d'améliorer la qualité et les possibilités des produits.

- Copyright et appellations commerciales

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En aucun cas Sollae Systems Co., Ltd. ou un de ses distributeurs ne pourra être tenu responsable de dommages quels qu'ils soient (intégrant, mais sans limitation, les dommages pour perte de bénéfice commercial, interruption d'exploitation commerciale, perte d'informations et de données à caractère commercial ou de toute autre perte financière) provenant de l'utilisation ou de l'incapacité à pouvoir utiliser le boîtier SMG-5521, même si Sollae Systems Co., Ltd. ou un de ses distributeurs a été informé de la possibilité de tels dommages.

Le boîtier SMG-5521 est exclusivement prévu pour un usage en intérieur, dans un environnement sec et non poussiéreux. Le boîtier SMG-5521 n'est pas prévu, ni autorisé pour être utilisé en extérieur, ni de façon embarquée dans des engins mobiles de quelque nature que ce soit (voiture, camion, train, avion, etc...), ni en milieu explosif, ni dans des enceintes nucléaires, ni dans des ascenseurs, ni dans des aéroports, ni dans des enceintes hospitaliers, ni pour des applications à caractère médical, ni dans des dispositifs de détection et d'alerte anti-intrusion, ni dans des dispositifs de détection et d'alerte anti-incendie, ni dans des dispositifs d'alarme GTC, ni pour des applications militaires.

De même, le boîtier SMG-5521 n'est pas conçu, ni destiné, ni autorisé pour expérimenter, développer ou être intégré au sein d'applications dans lesquelles une défaillance de celui-ci pourrait créer une situation dangereuse pouvant entraîner des pertes financières, des dégâts matériel, des blessures corporelles ou la mort de personnes ou d'animaux. Si vous utilisez le boîtier SMG-5521 volontairement ou involontairement pour de telles applications non autorisées, vous vous engagez à soustraire Sollae Systems Co., Ltd. et ses distributeurs de toute responsabilité et de toute demande de dédommagement.

En cas de litige, l'entière responsabilité de Sollae Systems Co., Ltd. et de ses distributeurs vis-à-vis de votre recours durant la période de garantie se limitera exclusivement selon le choix de Sollae Systems Co., Ltd. et de ses distributeurs au remboursement de votre produit ou de sa réparation ou de son échange. Sollae Systems Co., Ltd. et ses distributeurs démentent toutes autres garanties, exprimées ou implicites.

Tous les boîtiers SMG-5521 sont testés avant expédition. Toute utilisation en dehors des spécifications et limites indiquées dans cette documentation ainsi que les court-circuit, les chocs, les utilisations non autorisées, pourront affecter la fiabilité, créer des dysfonctionnements et/ou la destruction du boîtier SMG-5521 sans que la responsabilité de Sollae Systems Co., Ltd. et de ses distributeurs ne puissent être mise en cause, ni que le boîtier SMG-5521 puisse être échangé au titre de la garantie.

- Rappel sur l'évacuation des équipements électroniques usagés

Le symbole de la poubelle barré présent sur le boîtier SMG-5521 indique que vous ne pouvez pas vous débarrasser de ce dernier de la même façon que vos déchets courants. Au contraire, vous êtes responsable de l'évacuation du boîtier SMG-5521 lorsqu'il arrive en fin de vie (ou qu'il est hors d'usage) et à cet effet, vous êtes tenu de le remettre à un point de collecte agréé pour le recyclage des équipements électriques et électroniques usagés. Le tri, l'évacuation et le recyclage séparés de vos équipements usagés permettent de préserver les ressources naturelles et de s'assurer que ces équipements sont recyclés dans le respect de la santé humaine et de l'environnement. Pour plus d'informations sur les lieux de collecte des équipements électroniques usagés, contacter votre mairie ou votre service local de traitement des déchets.

8 Revision History

Date	Version	Description	Author
2024.05.16.	1.0	1. Initial release	khanh