

RS422/RS485 Modbus Gateway

SMG-5420 User Manual

Version 1.2



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.

Contents

1	Modbus Overview	4
1.1	Modbus	4
1.2	Modbus Gateway	5
2	Product Overview	6
2.1	Product Overview	6
2.2	Features	6
2.3	Components	6
2.4	Specification	7
2.5	Interface	8
2.5.1	Power	8
2.5.2	Ethernet	9
2.5.3	Serial Port	9
2.5.4	LED	11
2.5.5	Function Button	12
2.5.6	Setup Port	12
3	Preparation	13
3.1	Installing the Setting Tool	13
3.2	Connecting a Product	13
3.3	Searching Devices	13
3.4	Logging in	13
4	Settings	14
4.1	IP Address	14
4.1.1	Obtain an IP address automatically	14
4.1.2	Use a Static IP address	15
4.2	SMG-5420	16
4.2.1	Transmission Mode	16
4.2.2	Baudrate (unit: bps)	16
4.2.3	Serial	17
4.2.4	TCP	17
4.2.5	Advanced	18
4.3	Advanced settings	20
4.3.1	Password	20
5	Management	21
5.1	Checking Status	21
5.1.1	Product Information	21
5.1.2	Communication Status	22
5.2	Upgrading Firmware	24
5.2.1	Online Upgrade	24

5.2.2 Manual Upgrade - 25 -

5.3 Factory Reset - 26 -

6 Technical Support and Warranty- 27 -

6.1 Technical Support - 27 -

6.2 Warranty - 27 -

6.2.1 Refund - 27 -

6.2.2 Free Repair Services - 27 -

6.2.3 Charged Repair Services..... - 27 -

7 Precaution and Exemption from Liability- 28 -

7.1 Precaution - 28 -

7.2 Exemption from Liability - 29 -

7.2.1 English version - 29 -

7.2.2 French version - 30 -

8 Revision History- 32 -

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

With the evolution of networks, the demand for network communications of industrial equipment has also increased. As a result, a network version became a necessity for the Modbus protocol, the TCP/IP version called Modbus/TCP is released.

1.2 Modbus Gateway

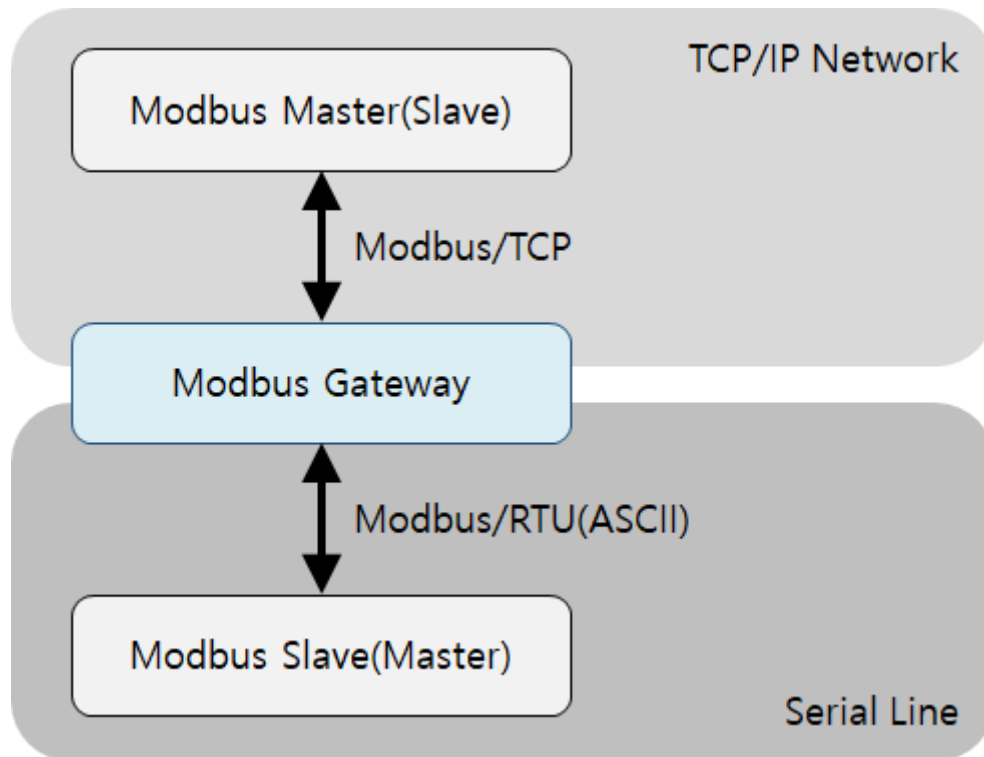


Figure 1-1 Modbus Gateway

Devices that use Modbus/TCP cannot directly communicate with devices that use serial line Modbus protocols. Because not only the physical interfaces are different but also the protocols are not compatible. If you want to implement the communication, you need a device that convert and route data of both sides. We call that kind of device Modbus Gateway.

2 Product Overview

2.1 Product Overview

SMG-5420 is an industrial Modbus Gateway that converts and routes Modbus data between the serial line and Modbus/TCP. This can help communicate between Modbus master (or slave) of serial line and Modbus slave (or master) of network.

SMG-5420 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
- Self-developed TCP/IP stack

2.3 Components

- SMG-5420's main body
- DC 5V power adapter (optional)
- 1.5M LAN cable (optional)
- USB cable (Type A plug to Micro Type B plug, optional)
- Bracket (optional)
- Mounter for Din-Rail (optional)

2.4 Specification

Power	Input Voltage	DC 5V ($\pm 0.5V$)
	Current Consumption	typically, 145mA
Dimension	94mm x 57mm x 23mm	
Weight	Approximately 67g	
Interface	Serial	1 x RS422/RS485 (baud rate: 1,200bps ~ 230,400bps)
	Network	10Base-T/100Base-TX Ethernet
Temperature	Operating & Storage: $-40 \sim 85^{\circ}C$	
Approval	KC, CE, FCC	
RoHS	RoHS Compliant	

Table 2-1 Specification

2.5 Interface

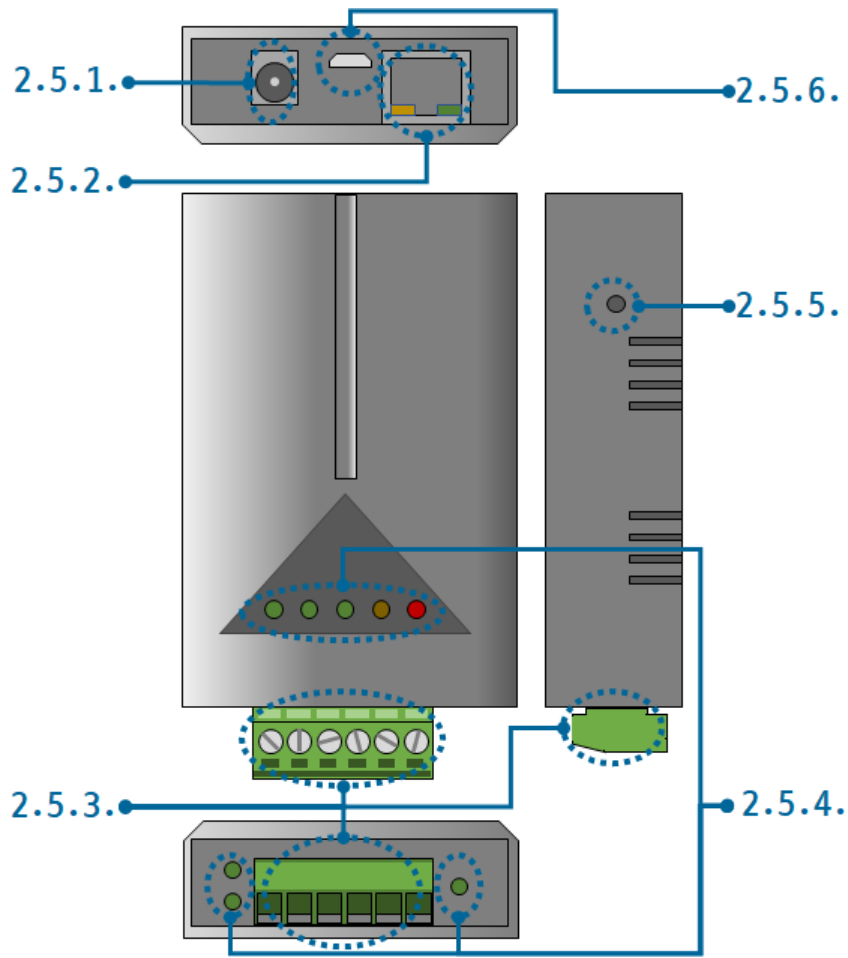


Figure 2-1 interface

2.5.1 Power

SMG-5420 requires DC5V power supply whose specification is as follows:

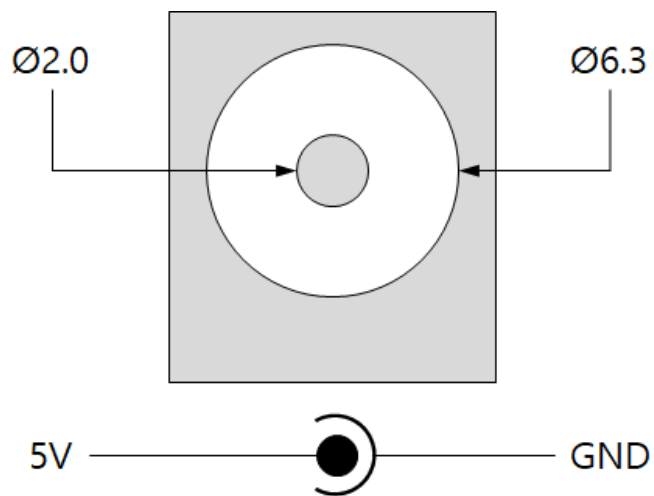


Figure 2-2 Power

2.5.2 Ethernet

SMG-5420 provides 10/100Mbps Ethernet. The pin assignment is as follows:

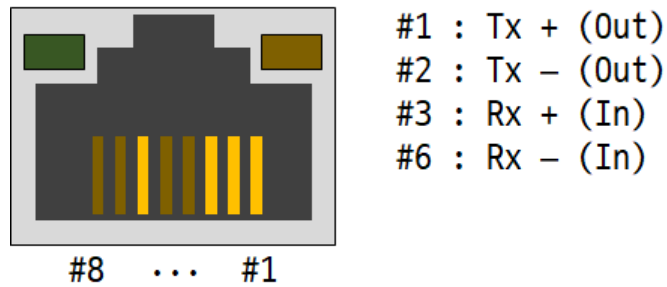


Figure 2-3 Ethernet

2.5.3 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 serial port parameters

SMG-5420 has a 3.5mm pitch 6-pole terminal block for connecting serial devices.

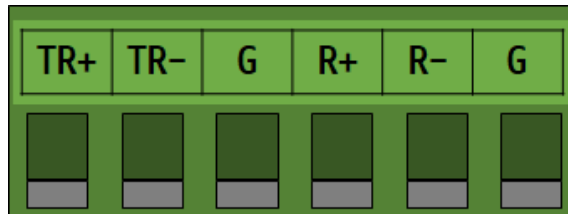


Figure 2-4 Serial Port

- 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.*

2.5.4 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 a network is connected and an IP address is NOT assigned: LINK



When a network is connected and an IP address is assigned: LINK



When a TCP connection is NOT established: MTX & MRX



When a TCP connection is NOT established: STS



When a TCP connection is established: STS



When sending valid Modbus data to the TCP: MTX



When receiving valid Modbus data from the TCP: MRX



When sending valid Modbus data to the serial port: STX



When receiving valid Modbus data from the serial port: SRX



2.5.5 Function Button

This button is used to implement factory reset.

2.5.6 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 to 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. Once you select one of products searched and click it with right button of your mouse, three menus will be popped up.

- Setup: Setting the product
- Status: Monitoring status of the product
- Console: Displaying console messages

3.4 Logging in

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

Division	Default Values
ID	smg-5420
Password	smg-5420

Table 3-1 default values of ID and password

☞ *If the product has the default value for a password, spFinder automatically processes the login.*

4 Settings

4.1 IP Address

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.

The screenshot shows the 'Product settings' window for the SMG-5420 device. The window is titled 'Product settings' and has a close button (X) in the top right corner. The main content area is divided into two sections: IPv4 and IPv6.

IPv4 Section:

- There are two radio buttons: 'Obtain an IP address automatically' (selected) and 'Use static IP address'.
- Below the radio buttons are four input fields: 'Local IP address', 'Subnet mask', 'Gateway IP address', and 'DNS IP address'. Each field contains a single dot (.) as a placeholder.
- There is a checked checkbox labeled 'Obtain DNS server address automatically'.

IPv6 Section:

- The 'IPv6' dropdown menu is set to 'Disable'.
- There are two radio buttons: 'Obtain an IP address automatically' (unselected) and 'Use static IP address'.
- Next to the 'Obtain an IP address automatically' radio button is a dropdown menu labeled 'EUI' with 'MAC Address' selected.
- Below the radio buttons are three input fields: 'Local IP address', 'Gateway IP address', and 'DNS IP address'. The 'Local IP address' field has a slash (/) and a smaller input field to its right.
- There is an unchecked checkbox labeled 'Obtain DNS server address automatically'.

At the bottom of the window, there are five buttons: 'Advanced', 'Export', 'Import', 'Write', and 'Close'.

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 [Write].

4.1.2 Use a Static IP address

You can set a static IP address to this product.

The screenshot shows the 'Product settings' window for the SMG-5420 device. The 'IP Address' tab is selected, and the device name 'SMG-5420' is displayed. The IPv4 section is active, with the 'Use static IP address' radio button selected. The IPv4 configuration fields are as follows:

Field	Value
Local IP address	0 . 0 . 0 . 0
Subnet mask	0 . 0 . 0 . 0
Gateway IP address	0 . 0 . 0 . 0
DNS IP address	0 . 0 . 0 . 0

The 'Obtain an IP address automatically' radio button is unselected. The 'Obtain DNS server address automatically' checkbox is also unselected. The IPv6 section is disabled, with the 'IPv6' dropdown set to 'Disable'. The 'Obtain an IP address automatically' radio button is selected, and the 'EUI' dropdown is set to 'MAC Address'. The 'Use static IP address' radio button is unselected. The IPv6 configuration fields are empty.

At the bottom of the window, there are buttons for 'Advanced', 'Export', 'Import', 'Write', and 'Close'.

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 [Write] button to finish settings.

4.2 SMG-5420

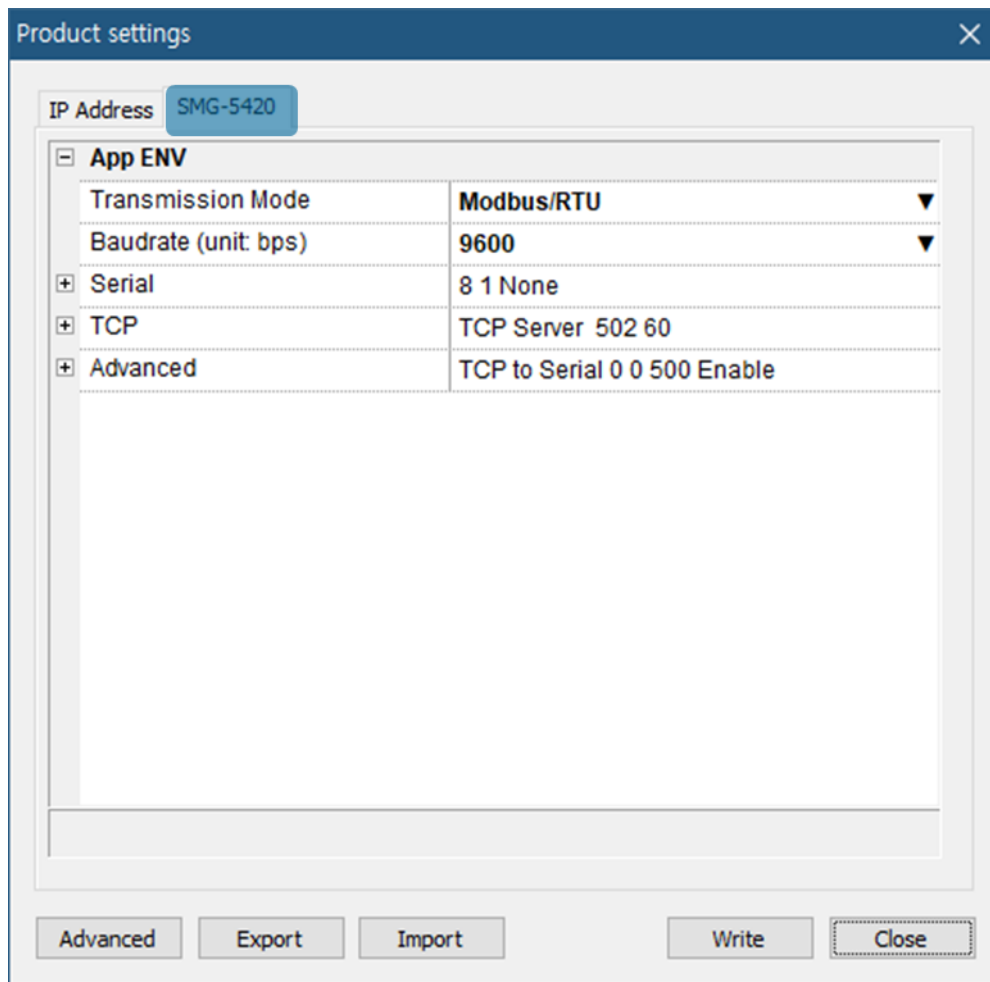


Figure 4-3 Modbus Gateway

4.2.1 Transmission Mode

This setting selects a transmission mode of serial line Modbus data. You can select Modbus/RTU mode or Modbus/ASCII mode and the default is Modbus/RTU.

4.2.2 Baudrate (unit: bps)

This setting selects a baud rate of serial port. You can select one from the list or type a baud rate. The default is 9,600bps.

4.2.3 Serial

Parameter	Available Values	Default Values
Data Bits	8 or 7 (7-bit is only available on using Parity)	8
Stop Bits	1 or 2	1
Parity	None, Even, Odd, Mark or Space	None

Table 4-1 Serial

4.2.4 TCP

- Communication Mode

This setting defines a communication mode for TCP. TCP Server and TCP Client are available and the default is TCP Server.

- Peer Address

This setting defines an IP address of TCP server to be connected. This setting is valid only if the Communication Mode is set to TCP Client.

- Port

This setting defines a port number for TCP connection. The default is 502.

- TCP Timeout (Unit: sec)

This setting defines expiration time for TCP connection in idle state. The idle state means there is no sent or received data on TCP. The unit is second and the default is 60.

4.2.5 Advanced

- Query Flow

This setting defines a direction of Modbus query. You can select TCP to Serial or Serial to TCP and the default is TCP to Serial.

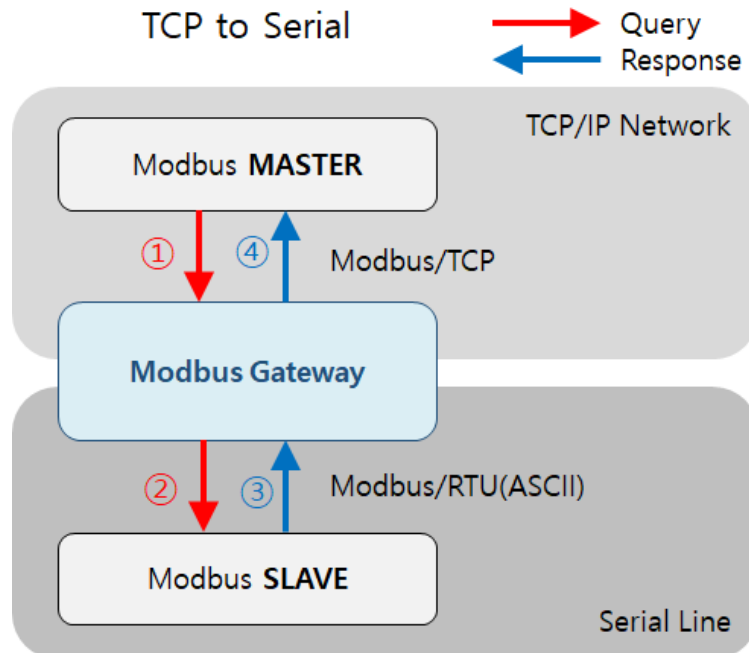


Figure 4-4 TCP to Serial

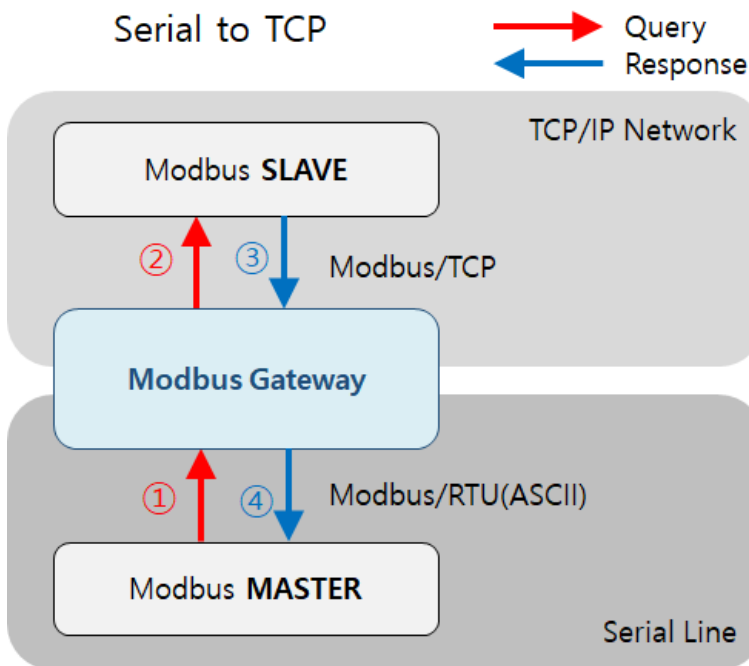


Figure 4-5 Serial to TCP

- Slave Address

This setting defines the slave address used for serial line Modbus communication. This value can be set from 0 to 247. The default value is 0.

If this value is non-zero, the product will send only the frames whose slave address matches this value among the query frames received from the master of the serial line. In addition, this value is used as slave address when passing query frame of master received from network to slave.

On the other hand, if this value is 0, the product forwards all valid query frames received from the master of the serial line to the slave. In addition, when passing the master's query frame received from the network to the slave, the unit ID in the query is used as the slave address.

- Unit ID

This setting defines the Unit ID for Modbus/TCP communication. This value can be set from 0 to 247. The default value is 0.

If this value is non-zero, the product will send only the frames whose unit ID matches this value among the query frames received from the master of the network. In addition, this value is used as unit ID when passing query frame of master received from the serial line to slave.

On the other hand, if this value is 0, the product forwards all valid query frames received from the master of the network to the slave. In addition, when passing the master's query frame received from the serial line to the slave, the slave address in the query is used as the unit ID.

- Response Timeout (Unit: ms)

This setting defines expiration time for a Modbus query. The default is 500.

- Send Gateway Exception

This setting defines to send gateway's exception data or not. When this value is Enable, gateway sends exception data. The default is Enable.

4.3 Advanced settings

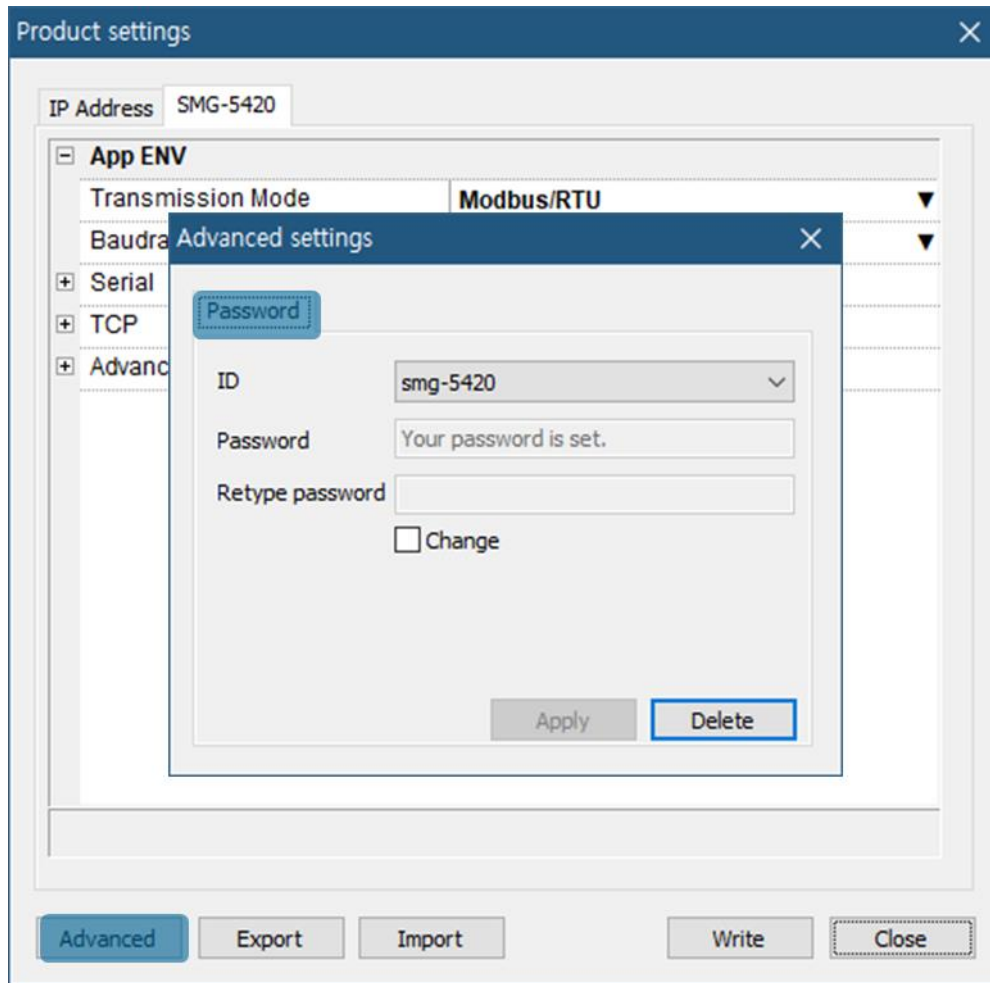


Figure 4-6 Advanced settings

4.3.1 Password

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

5 Management

5.1 Checking Status

5.1.1 Product Information

- Product Information Window

This area shows some major information of your product.

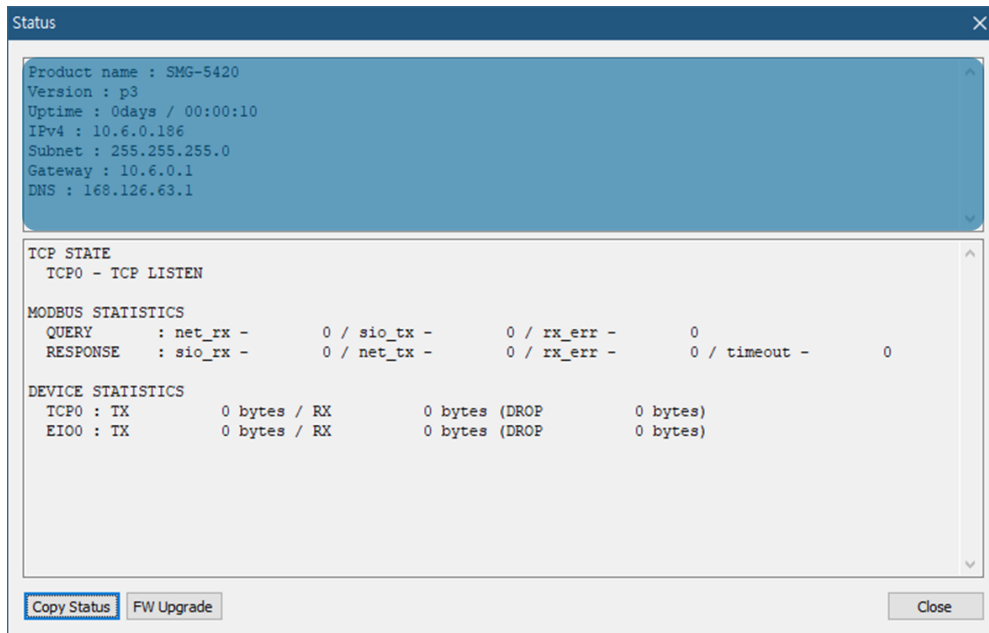


Figure 5-1 Product Information Window

- Product Information List

Item	Description
Product name	Product name
Version	Firmware version
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 list

5.1.2 Communication Status

- Communication Status Window

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

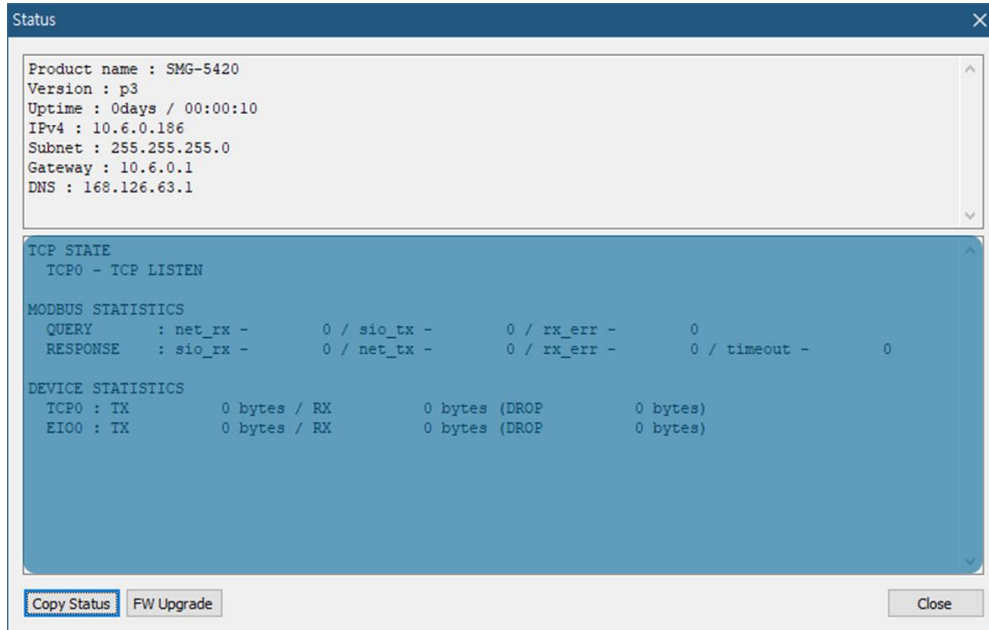


Figure 5-2 communication status window

- TCP STATE

Status	Description
LISTEN	Listen
CLOSED	Disconnected
CONNECTED	Connected (IP and port of the connected host will be shown)
CONNECTING	Connecting
DISCONNECTING	Disconnecting

Table 5-2 TCP STATE

- MODBUS STATISTICS

Item	Description
QUERY	Statistics of master's query frame
RESPONSE	Statistics of slave's response frame
net_rx	The quantity of received frame from the network
net_tx	The quantity of sent frame to the network
sio_rx	The quantity of received frame from the serial
sio_tx	The quantity of sent frame to the serial
rx_err	The quantity of discarded frame because of errors
timeout	The quantity of discarded frame because of timeout

Table 5-3 MODBUS STATISTICS

● DEVICE STATISTICS

Item	Description
TCP0	Statistics of TCP data (Unit: byte)
EI00	Statistics of serial data (Unit: byte)
TX	The quantity of sent byte to TCP (or serial)
RX	The quantity of received byte from TCP (or serial)
DROP	The quantity of discarded byte because of errors

Table 5-4 DEVICE STATISTICS

5.2 Upgrading Firmware

New firmware can be released when adding functions or fixing bugs. If you are using old firmware, you can upgrade it to new one. The spFinder provides both online and manual upgrade.

- ☞ *After the firmware transfer is complete, it takes about 10 seconds or more for the actual upgrade to complete. Therefore, NEVER TURN OFF THE POWER until the LED operation of the product returns to normal.*

5.2.1 Online Upgrade

You can upgrade firmware online if your PC is connected to the Internet.

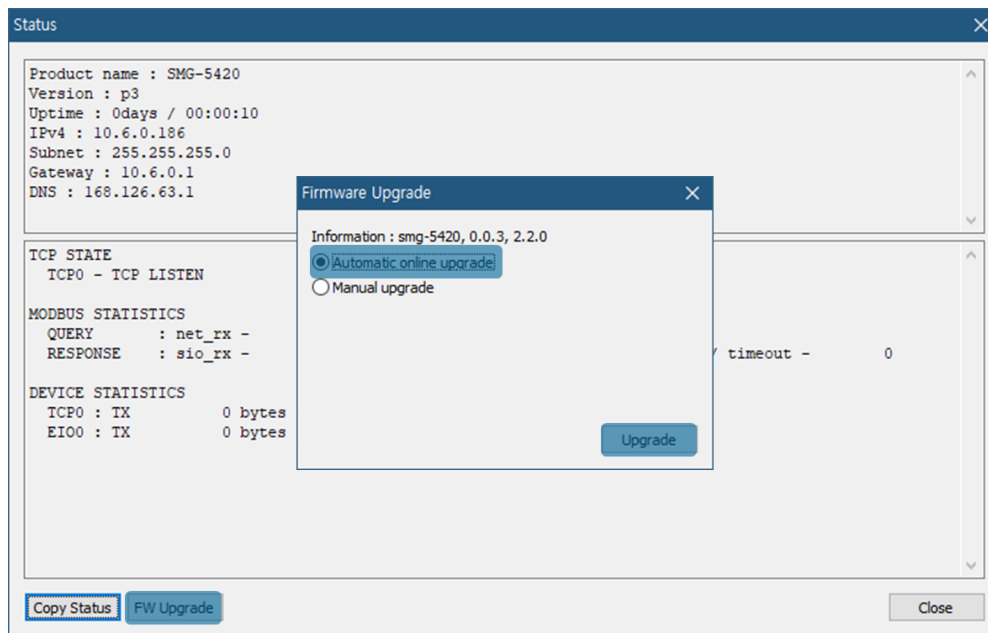


Figure 5-3 online upgrade

- Connect the product to your PC via network or USB.
- Run the spFinder and search the product.
- Open the [Status] window and press the [FW Upgrade] button.
- Press the [Upgrade] button after selecting the [Automatic online upgrade].

5.2.2 Manual Upgrade

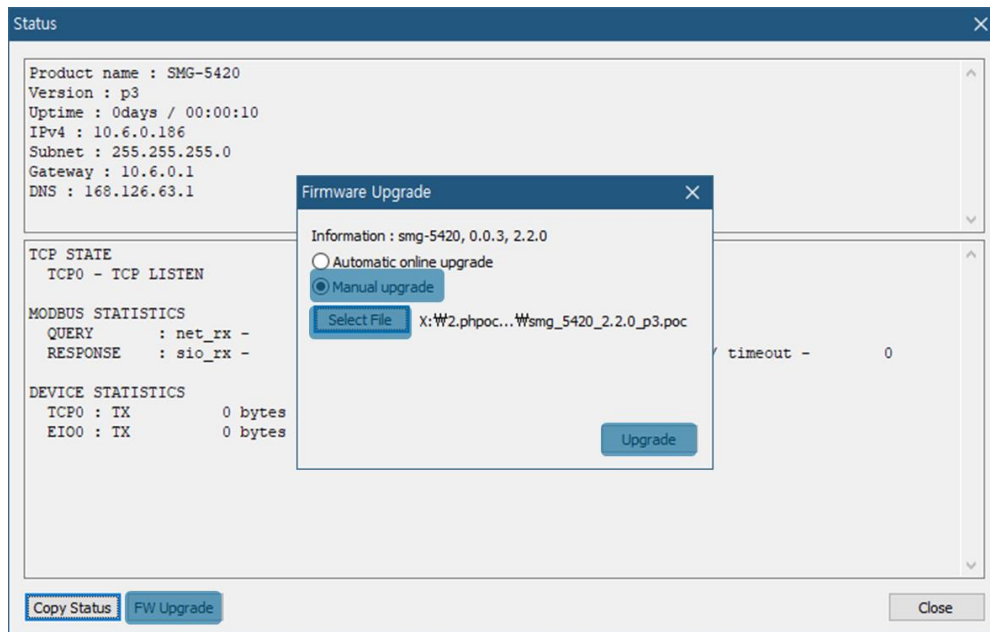


Figure 5-4 manual upgrade

- Download a firmware file on the website of Sollae Systems to your PC.
- Connect the product to your PC via network or USB.
- Run the spFinder and search the product.
- Open the [Status] window and press the [FW Upgrade] button.
- Select the [Manual upgrade] and load the firmware file by pressing the [Select File] button.
- Press the [Upgrade] button.

5.3 Factory Reset

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

1. Press and immediately release the function button.



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



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



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



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
- Website Address for Customer Support: <https://www.eztcp.com/en/support/>

6.2 Warranty

6.2.1 Refund

Upon the customer's request to refund the product within two weeks after purchase, Sollae Systems will refund the product.

6.2.2 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.

6.2.3 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 alteration 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-5420 even if Sollae Systems Co., Ltd. or its distributors have been informed of such damages.

The SMG-5420 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-5420 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-5420 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-5420.

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-5420 including accompanying written material, hardware and firmware.

7.2.2 French version

- Documentation

La documentation du boîtier SMG-5420 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.

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Le boîtier SMG-5420 est exclusivement prévu pour un usage en intérieur, dans un environnement sec et non poussiéreux. Le boîtier SMG-5420 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-5420 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-5420 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-5420 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-5420 sans que la responsabilité de Sollae Systems Co., Ltd. et de ses distributeurs ne puissent être mise en cause, ni que le boîtier SMG-5420 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-5420 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-5420 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
2019.06.20.	1.0	1. Initial release	Roy Lee
2019.07.08.	1.1	1. Correct some errors	Roy Lee
2020.01.23.	1.2	1. Add Upgrading Firmware chapter 2. Apply changes of spFinder UI 3. Apply changes of parameters: Slave Address, Unit ID 4. Improve some expressions	Roy Lee