PT100 Temperature Sensor Gateway

SIG-5560 User Manual

Version 1.2

Sollae Systems

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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.

Contents

1 Overview

1.1 Introduction

SIG-5560 is an industrial PT100 Temperature Sensor Gateway. This product consisting of a PT100 connection port and an FND(Flexible Numeric Display) for displaying a temperature. Users can remotely monitor the temperature measured by the sensor which is connected to this product by using Modbus/TCP.
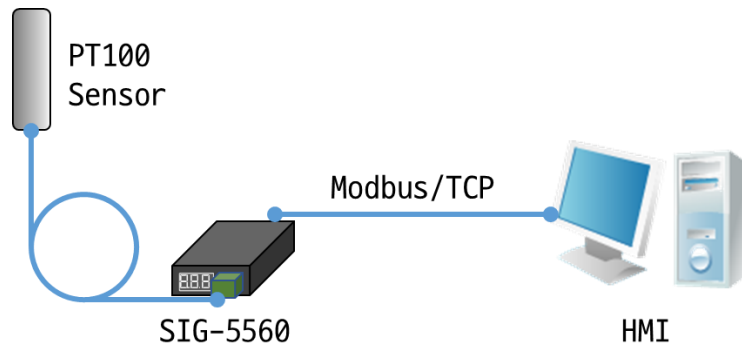
Figure 1-1 Diagram

1.2 Features

- PT100 connection port: support 3-wire PT100 sensors

- Display: a red 3-digit 7-segment LED

- Measurement Range: -200℃ ~ 850℃ (-328℉ ~ 1562℉)

- Measurement Error: within ±0.3℃ (±0.54℉)

- Protocol: Modbus/TCP

- Storing the lowest and the highest temperature

- Support multiple TCP connection (Max. 4 channels)

- Support a 1-bit ADC function for the *Internet Switch*

- Industrial temperature range (-40℃ ~ +85℃)

☞ *Internet Switch: A configuration that connects devices to each other without an HMI to transmit digital signals in both directions*

1.3 Specification

Analog Input	
Input Type	3-wire PT100 sensor (α=0.00385 Ω/(Ω·°C))
Resolution	16 bits
Number of Ports	1 port
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, Modbus/TCP, SSL/TLS
Indicators	
LED	PWR, RUN, 3-digit 7-segment LED
Management	
spFinder	Configuration and Monitoring Tool
Security	Password
Dimension	
Size	94mm x 57mm x 24mm
Weight	about 64g
Operating Environment	
Input Voltage	DC5V±0.25V
Protection	Reverse Voltage Protection / Surge Protection
Current Consumption	typically, 250mA
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 1-1 Specification

1.4 Interface
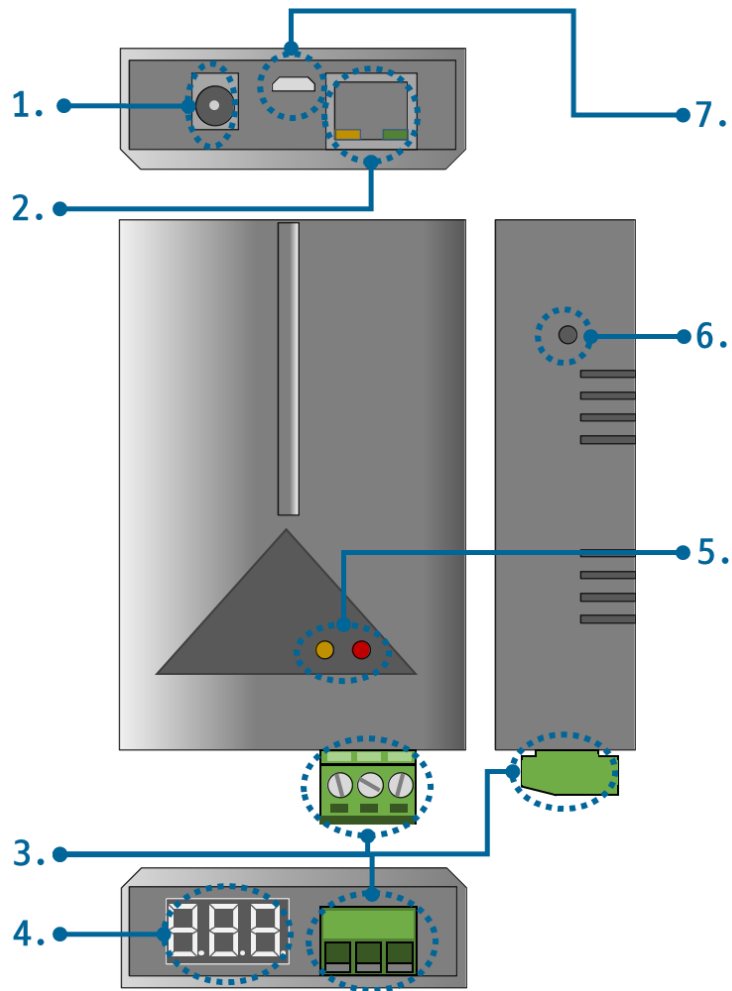
Figure 1-2 Interface

1.4.1 Power

SIG-5560 requires DC5V power supply whose specification is as follows:

Figure 1-3 Power

https://www.ezTCP.com
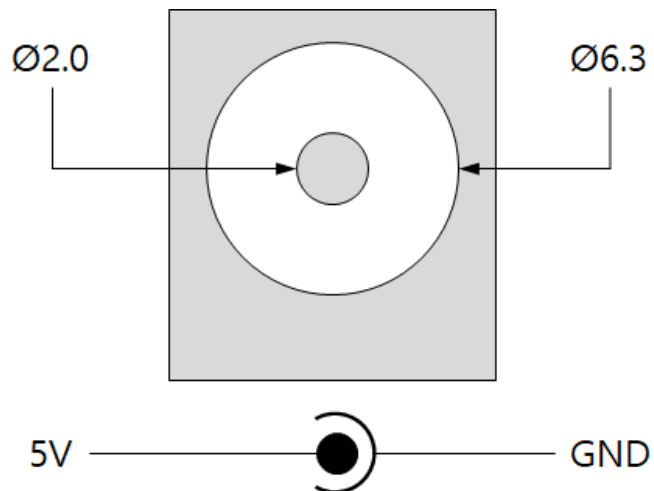
1.4.2 Ethernet

SIG-5560 provides 10/100Mbps Ethernet. The pin assignment is as follows:


```
#1 : Tx + (Out)
#2 : Tx - (Out)
#3 : Rx + (In)
#6 : Rx - (In)
```
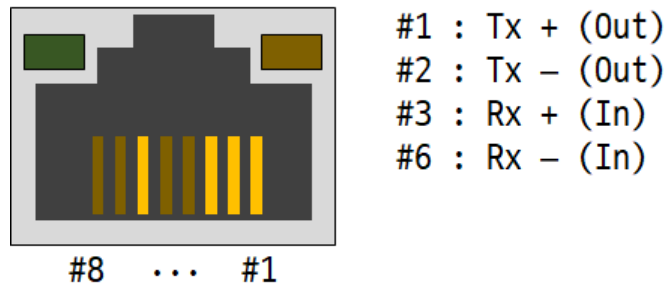
Figure 1-4 Ethernet

1.4.3 PT100 Connection Port

This port is interfaced with a 3.5mm pitch 3-pole terminal block. How to connect a PT100 sensor to this port is as follows:
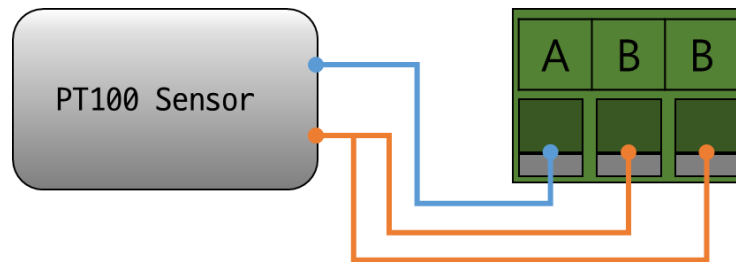
Figure 1-5 Connection with a PT100 sensor

● Port Specification

Division	Value
Sensor Type	3-wire PT100 (α=0.00385 Ω/(Ω·°C))
Measuring Range	-200℃ ~ 850℃ (-328℉ ~ 1562℉)

Table 1-2 Port Specification

1.4.4 LED

SIG-5560 provides 4 LEDs for indicating status.
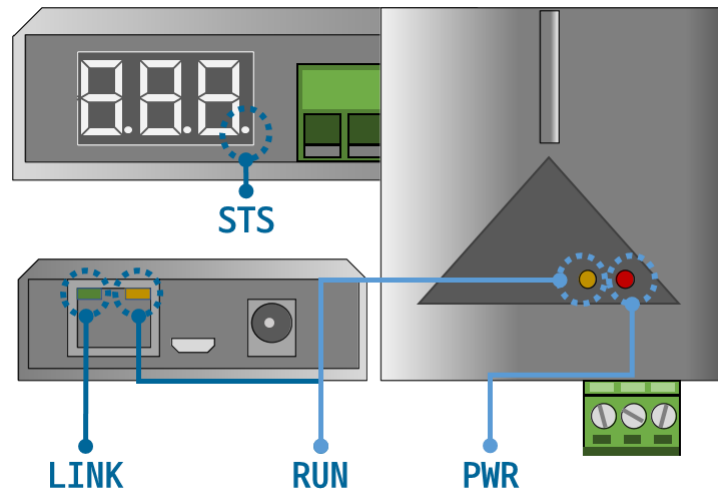
Figure 1-6 4 LEDs

LED operations according to each state are as follows:

When the supplied power is stable: PWR

PWR

When the supplied power is NOT stable: PWR

PWR

When the script is running: RUN

RUN

When the script is NOT running: RUN

RUN

When a network is NOT connected: LINK

LINK

When a network is connected: LINK

LINK

When an IP address is NOT assigned: STS

STS

When a TCP connection is NOT established: STS

STS

When a TCP connection is established: STS

STS

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1.4.5 Function Button

This button is used to implement a factory reset.

1.4.6 Setup Port

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

2 Preparation

2.1 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

2.2 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.

2.3 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.

2.4 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	sig-5560
Password	sig-5560

Table 2-1 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.*

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3 Settings

3.1 Network

3.1.1 Obtain an IP address automatically

This product can automatically obtain an IP address by DHCP. A DHCP server is required to use this.
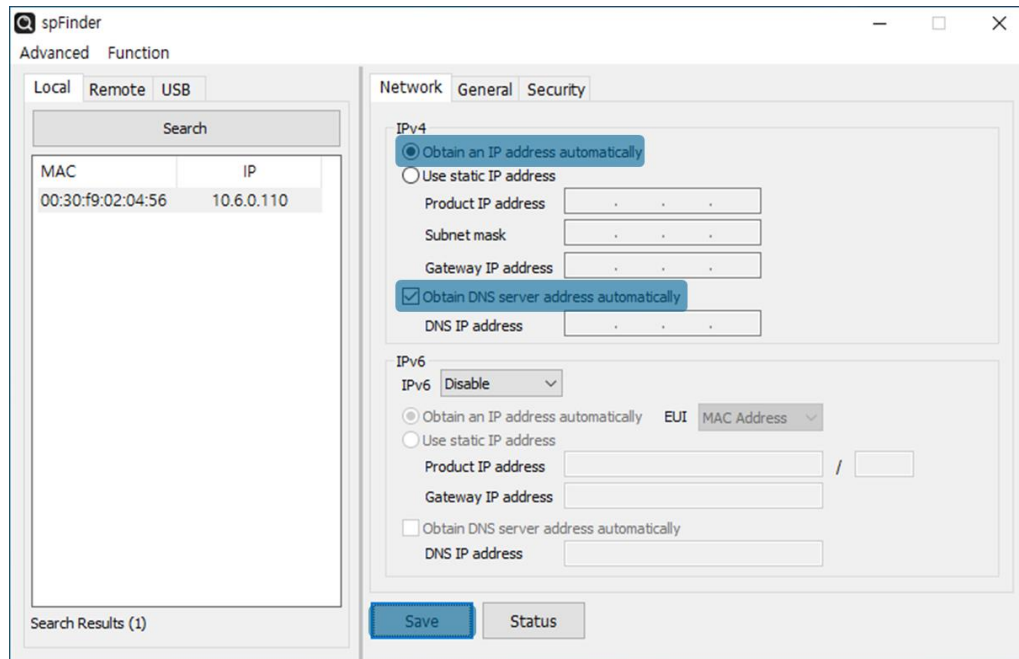
Figure 3-1 Obtain an IP address automatically

- Select the [Obtain an IP address automatically].

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

3.1.2 Use a Static IP address

You can set a static IP address to this product.
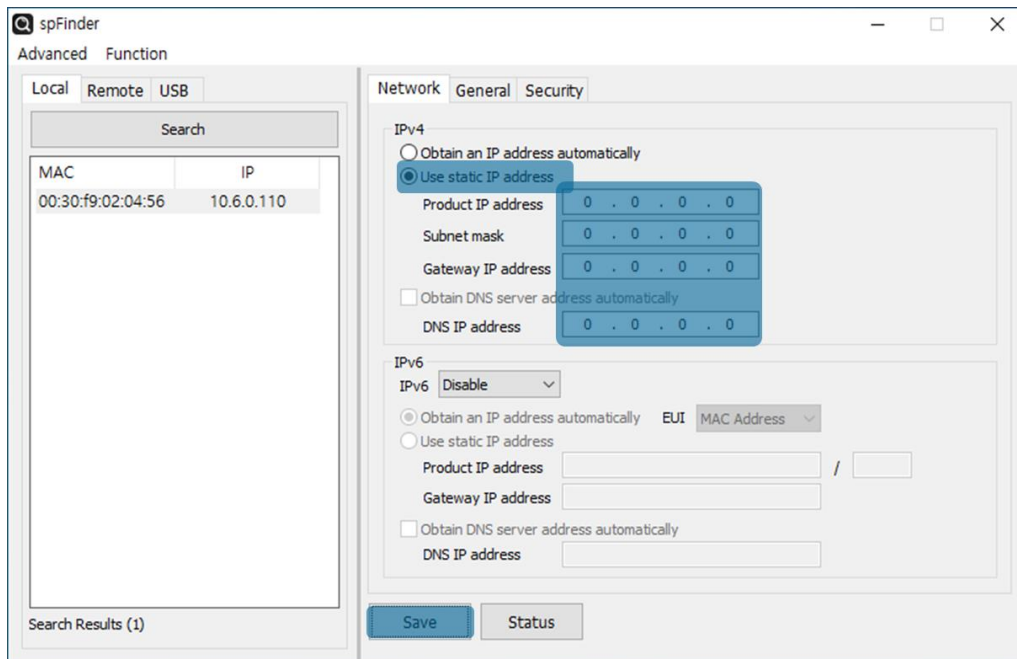
Figure 3-2 Use a static IP address

- Select the [Use static IP address].

- Set the [Local IP address], [Subnet mask], [Gateway IP address] and [DNS IP address].

- Click the [Save] button.

3.2 General
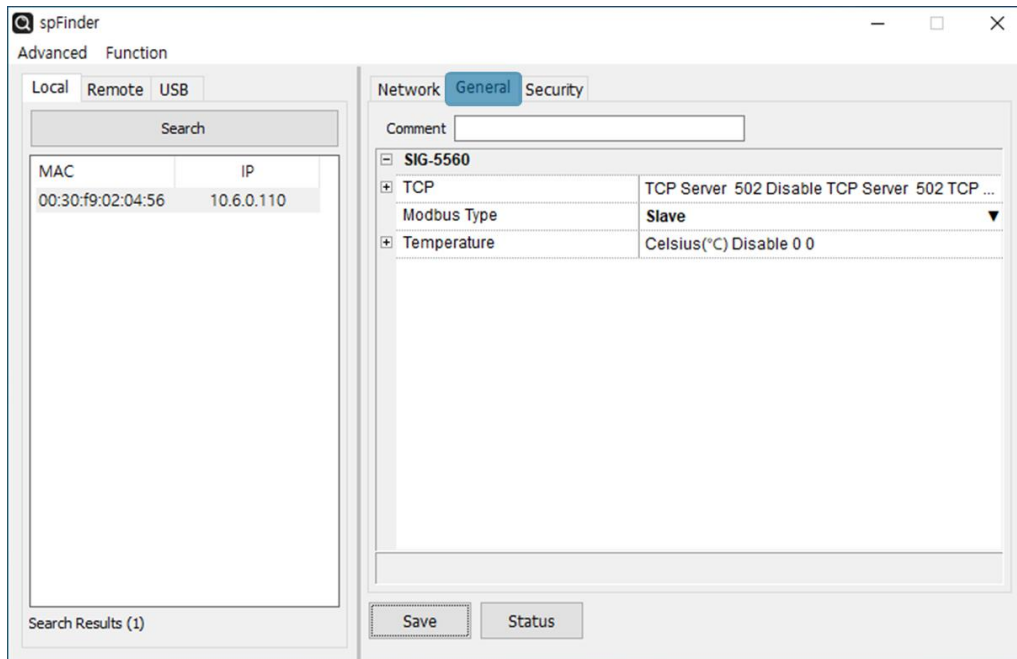
Figure 3-3 General

3.2.1 Comments

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

3.2.2 TCP

● Connection Mode

This item selects the TCP connection method. You can choose between TCP Server and TCP Client. The default is TCP Server.

● Peer Address

This item is to enter an IP address or a host name of the host to connect to. It is valid only when the Connection Mode is set to TCP Client.

● Port

This item is to set the port number for the TCP connection. It can be set between 0 and 65535. The default is 502.

● Multiple Connection

This item is used to enable/disable multiple TCP connections. When this item is set to Disable, only one TCP session (TCP0) can be used. If this item is set to Enable, four TCP sessions (TCP0 to TCP3) can be used.

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● Connection Timeout (Unit: sec)

This item is to set a timeout for terminating a TCP connection. If there is no valid Modbus/TCP data communication during the time set in this item, the TCP connection is terminated. The unit is seconds and can be set between 0 and 3600. Default value is 0. If this value is 0, this product does not terminate the TCP connection regardless of data communication.

3.2.3 Modbus Type

This item is to set the Modbus type. This product allows the Slave only.

3.2.4 Temperature

● Mode

This item selects the unit of temperature. The setting value can be selected either Celsius(℃) or Fahrenheit(℉). The default value is Celsius(℃).

● 1-bit ADC

This function converts analog input value into 1-bit digital value. This function is only used in Internet switch.

● 1-bit ADC: High Ref.

This is the reference value for judging HIGH in 1-bit ADC. Analog input value greater than this value is judged as HIGH. The setting unit follows the setting of Mode.

● 1-bit ADC: Low Ref.

This is the reference value for judging LOW in 1-bit ADC. Analog input value smaller than this value is judged as LOW. The setting unit follows the setting of Mode.

3.3 Security
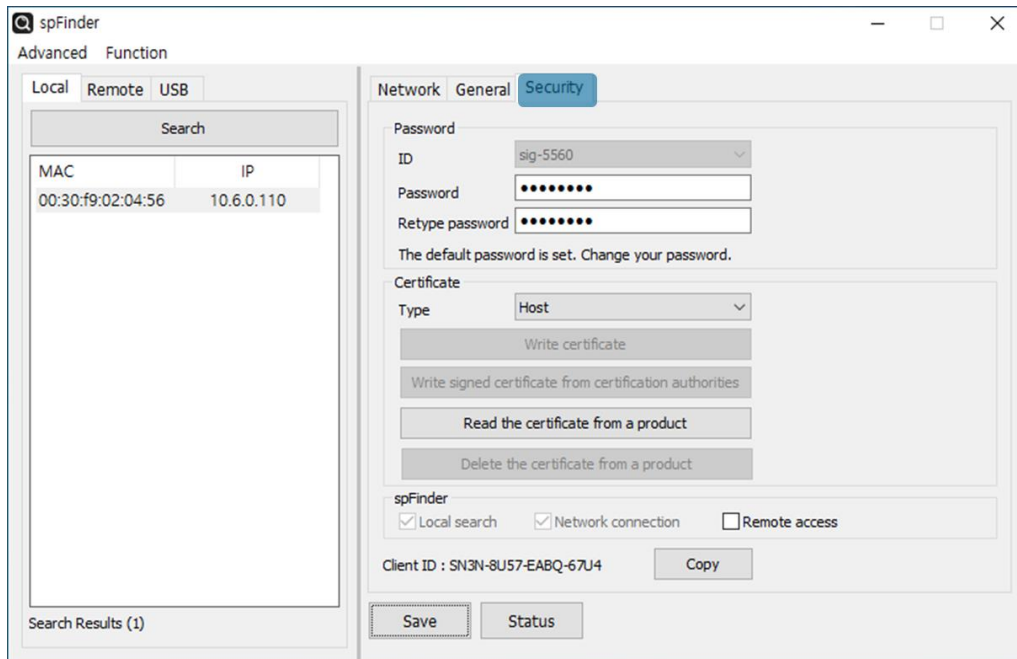
Figure 3-4 Security

3.3.1 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.

3.3.2 Certificate

This is not available for this product.

3.3.3 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.

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● Remote access

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

3.3.4 Client ID

This is NOT available for this product.

4 Management

4.1 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.

4.1.1 Product Information

● Product Information Window

This area shows some major information of your product.

```
Status                                                        ×

                                                Timeout - 29:59

  Product name : SIG-5560
  Pkgware : sig-5560, 0.0.1, 3.0.0
  Filename : sig_5560_3.0.0_p1.poc
  Uptime : 0days / 00:02:02
  IPv4 : 10.6.0.110
  Subnet : 255.255.255.0
  Gateway : 10.6.0.1
  DNS : 168.126.63.1

  TCP STATE
    TCP0 - TCP LISTEN

  MODBUS STATISTICS
    RX0 : Query(      0), Error(      0), Discard(      0)
    TX0 : Reply(      0), Error(      0)

  DEVICE STATISTICS
    TCP0  : TX        0 bytes / RX        0 bytes
    AI0   :    0.00 (min:    0.00, max:    0.00), 1-Bit ADC: Disabled

  Copy status                                            Close
```

Figure 4-1 Product Information Window

● Product Information List

Item	Description
Product name	Product name
Pkgware	Model name, package version, Firmware version
File name	File name
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 server IP address

Table 4-1 Product Information List

4.1.2 Communication Status

● Communication Status Window

This area shows some communication status of your product. This area is refreshed every second.
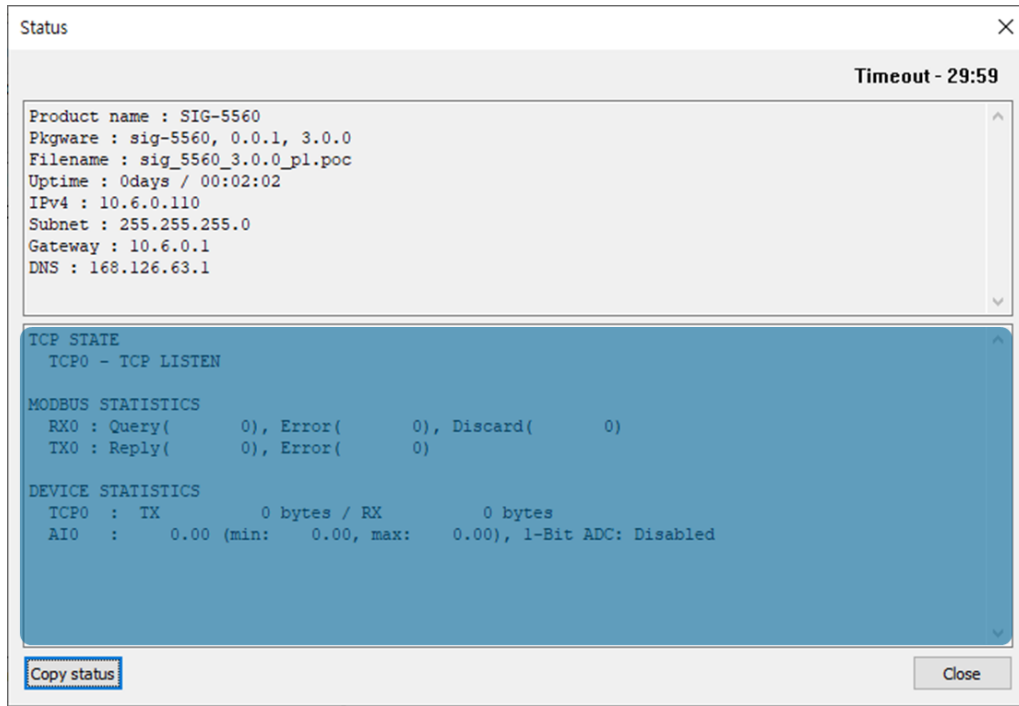
Figure 4-2 Communication Status Window

● 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 4-2 TCP STATE

● MODBUS STATISTICS

Item	Description
RX0~3	Statistics of incoming data from TCP: Query, Error, Discard
TX0~3	Statistics of outgoing data to TCP: Reply, Error
Query	The number of query frames received by the master
Error	The number of invalid frames among sent/received frames
Discard	The number of discarded frames not meet the protocol
Reply	The number of response frames sent to the master

Table 4-3 MODBUS STATISTICS

● DEVICE STATISTICS

Item	Description
TCP0~3	The byte count of TCP data: TX, RX
TX	The byte count of outgoing TCP data
RX	The byte count of incoming TCP data
AI0	Current temperature (the lowest, the highest temperature)
1-Bit ADC	Current 1-bit ADC value

Table 4-4 DEVICE STATISTICS

4.1.3 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.

4.1.4 Copy Status

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

4.2 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.

4.2.1 Online Upgrade

If you can access to the Internet by your PC, the Firmware can be upgraded online.
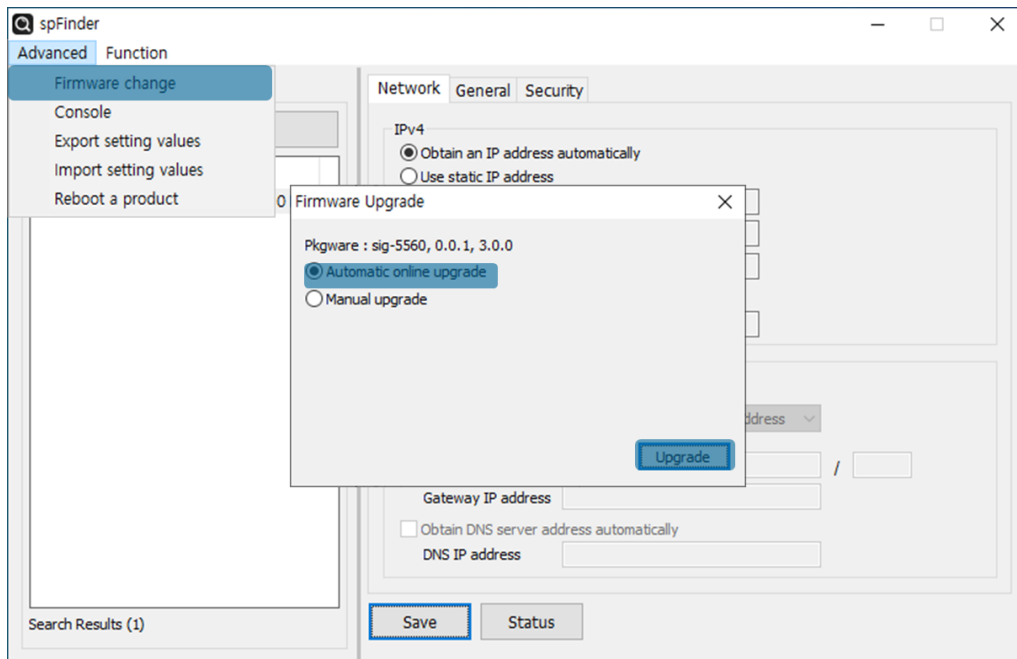
Figure 4-3 Online Upgrade

- Search and Connect to your product by spFinder.

- Click [Advanced] > [Firmware change] menu.

- Click [Upgrade] button selecting [Automatic online upgrade] menu.

4.2.2 Manual Upgrade
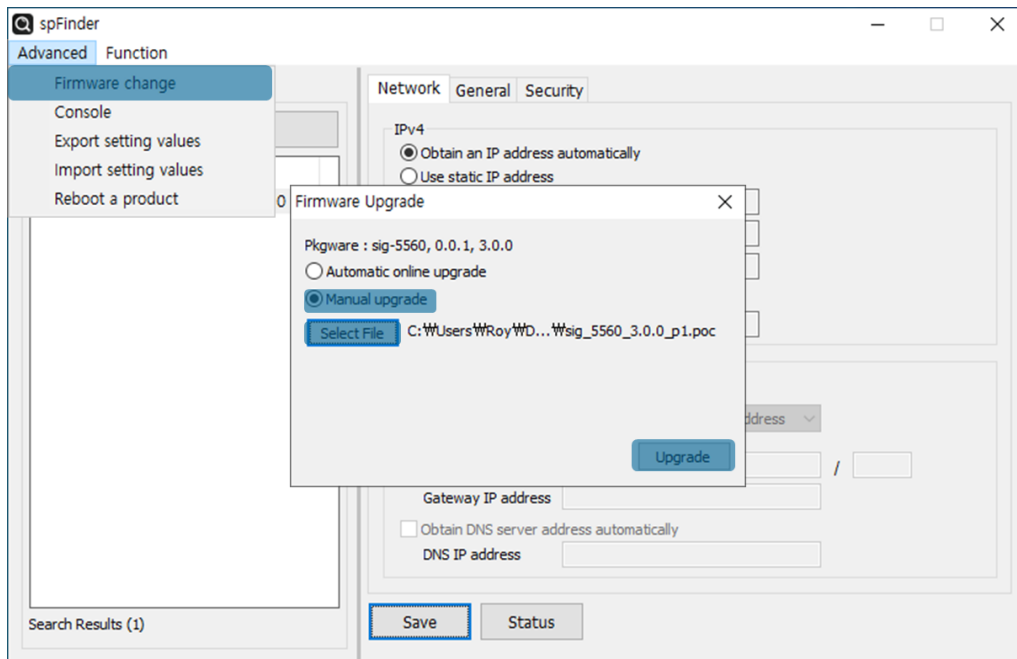
Figure 4-4 Manual Upgrade

● 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.

4.3 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.
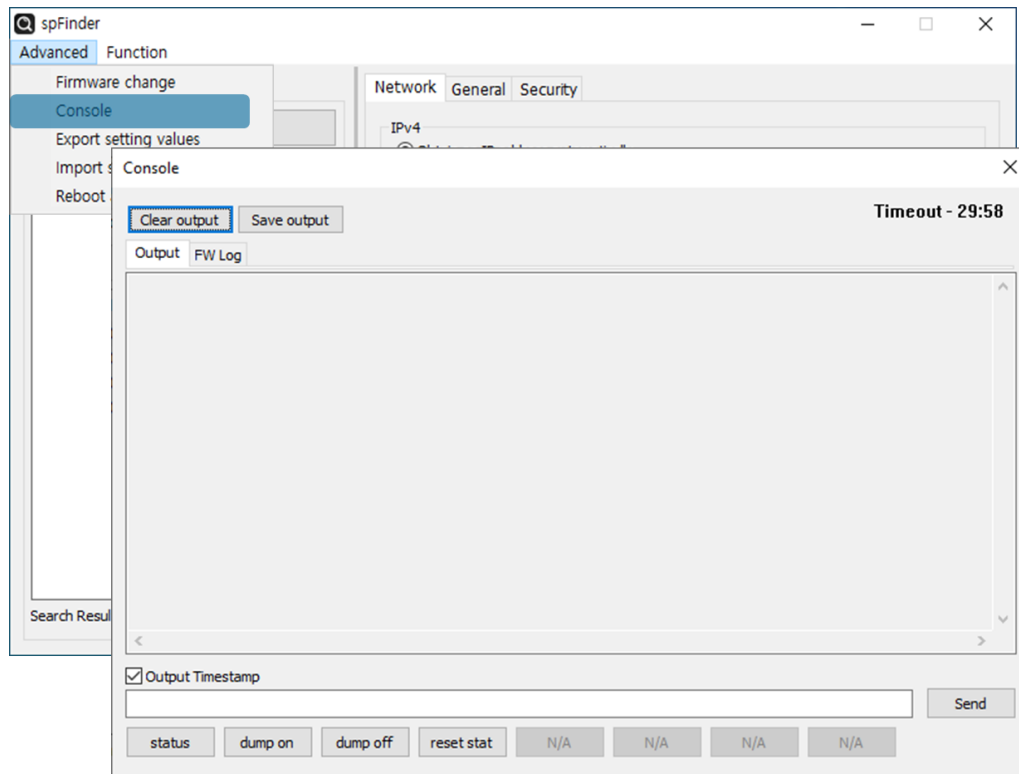
Figure 4-5 Console

4.3.1 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

- dump on

    Pressing this button starts printing communication data out on the network to

the Output tab

● dump off

Pressing this button stops printing communication data out on the network to the Output tab

● reset stat

Press this button to reset all the communication status information statistics of the product.

4.3.2 FW Log Tab

This tab displays the log message from Firmware.

4.3.3 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.

4.4 Export/Import Setting Values

The [Export setting values] menu saves all setting values of the product as a file except for the password. The [Import setting values] menu loads setting values from a file which is saved by the [Export setting values] menu. Note that you need to click the [Save] button to apply the setting to your product. Find these functions at the [Advanced] menu.
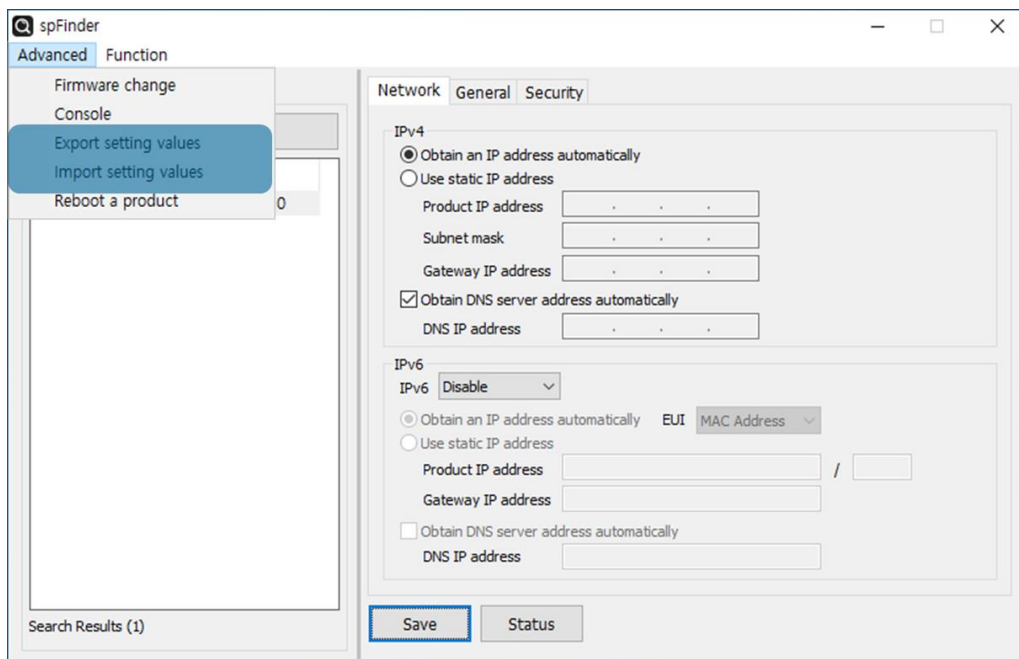
Figure 4-6 Export/Import Setting Values

4.5 Reboot a Product

This function is for rebooting a product.
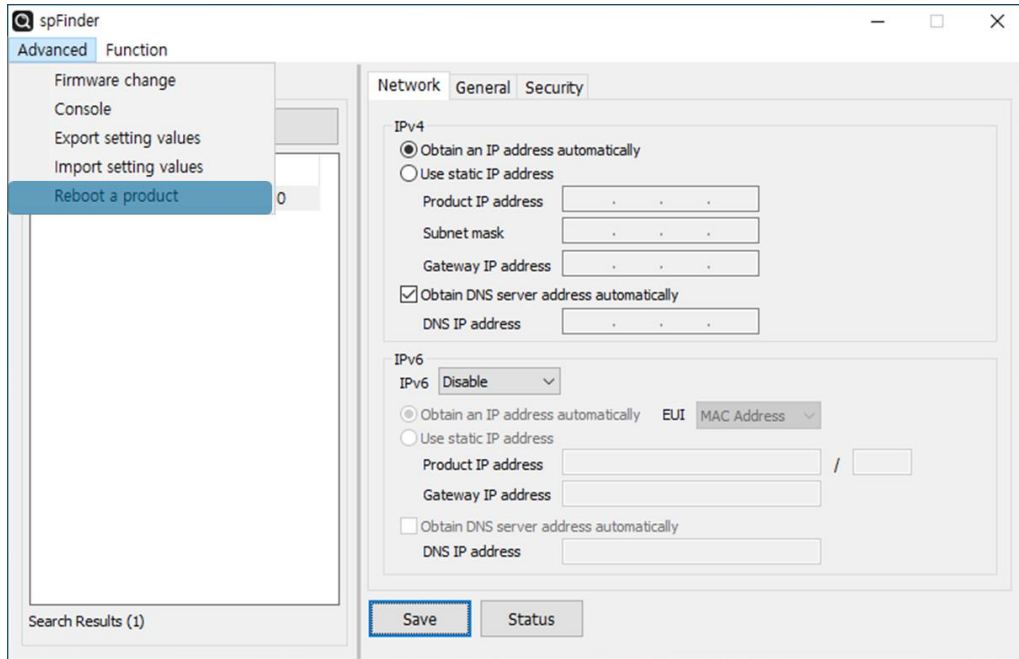
Figure 4-7 Reboot a Product

4.6 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.

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.

5   Register Map

5.1 Read Only

5.1.1 Temperature Value Register

This register is for storing the most recently measured temperature value.

Division	Address	Word Count	Type	Function Code	HMI Addressing Example
Port 0	0	1	Integer	04	30001

Table 5-1 Temperature Value Register

The temperature value is rounded to one decimal place and stored in multiples of 10. The byte order is big endian. For example, when the stored value is 272 (0x0110), the actual temperature is 27.2 degrees.

5.1.2 Error Code Register

This register is for storing an error code of the PT100 connection port.

Division	Address	Word Count	Type	Function Code	HMI Addressing Example
Port 0	8	1	Integer	04	30009

Table 5-2 Error Code Register

Error codes defined are as follows:

Code	Description
0	No error
1	H/W Init Error
2	H/W Runtime Error
3	RTD Sensor Disconnected
4	RTD Sensor Failed

Table 5-3 Error Code

5.1.3 The Lowest Temperature Value Register

This register is for storing the lowest value among measured temperatures.

Division	Address	Word Count	Type	Function Code	HMI Addressing Example
Port 0	16	1	Integer	04	30017

Table 5-4 5.1.3 The Lowest Temperature Value Register

The lowest temperature value is rounded to one decimal place and stored in multiples of 10. The byte order is big endian. For example, when the stored value is –71 (0xFFB9), the actual temperature is minus 7.1 degrees.

5.1.4 The Highest Temperature Value Register

This register is for storing the highest value among measured temperatures.

Division	Address	Word Count	Type	Function Code	HMI Addressing Example
Port 0	32	1	Integer	04	30033

Table 5-5 5.1.4 The Highest Temperature Value Register

The highest temperature value is rounded to one decimal place and stored in multiples of 10. The byte order is big endian. For example, when the stored value is 1271 (0x04F7), the actual temperature is 127.1 degrees.

☞ *The lowest and the highest temperature values can be initialized using the Reset The Lowest / The Highest Temperature Value Register.*

5.1.5 Temperature Value Register (FP32)

This register is for storing the most recently measured temperature value in a single-precision floating point format. The byte order is big endian.

Division	Address	Word Count	Type	Function Code	HMI Addressing Example
Port 0	48	2	FP32	04	30049

Table 5-6 Temperature Value Register (FP32)

5.1.6 The Lowest Temperature Value Register (FP32)

This register is for storing the lowest value among measured temperatures in a single-precision floating point format. The byte order is big endian.

Division	Address	Word Count	Type	Function Code	HMI Addressing Example
Port 0	64	2	FP32	04	30065

Table 5-7 5.1.3 The Lowest Temperature Value Register (FP32)

5.1.7 The Highest Temperature Value Register (FP32)

This register is for storing the highest value among measured temperatures in a single-precision floating point format. The byte order is big endian.

Division	Address	Word Count	Type	Function Code	HMI Addressing Example
Port 0	80	2	FP32	04	30081

Table 5-8 5.1.4 The Highest Temperature Value Register (FP32)

☞ *The lowest and the highest temperature values (FP32) can be initialized using the Reset The Lowest / The Highest Temperature Value Register.*

5.1.8 Device Information Register

Division	Address	Word Count	Type	Function Code	HMI Addressing Example
Vendor Name	400	7	ASCII	03	40401
Product Code	407	4	ASCII	03	40408
Version	411	5	ASCII	03	40412
Comment	416	16	ASCII	03	40417
Uptime	432	10	ASCII	03	40433
MAC Address	442	9	ASCII	03	40443
IP Address	451	8	ASCII	03	40452

Table 5-9 Device Information Register

- Vendor Name

  This is the Vendor Name

- Product Code

  This is the product code

- Version: Major, Minor, Revision

  This is the software version of the product

- Comment

  This is a comment of the product. This value can be set via spFinder.

- Uptime

  This is an uptime of the product. This value is recorded in the form of "day / hour:minute:second."

- MAC Address

  This is the MAC address of the product

- IPv4 Address

  This is the IP address of the product

5.2 Read / Write

5.2.1 Reset The Lowest / The Highest Temperature Value Register

This register is for initializing 4 register values: the lowest temperature value register, the lowest temperature value register (FP32), the highest temperature value register and the highest temperature value register (FP32). When the LSB of this register is set to 1, values of the 4 registers are initialized to zero. After the initialization, the LSB of this register set back to 0.

Division	Address	Bit Count	Type	Function Code	HMI Addressing Example
Port 0	160	1	Boolean	01, 05 or 15	00161

Table 5-10 Reset The Lowest / The Highest Temperature Value Register

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 SIG-5560 even if Sollae Systems Co., Ltd. or its distributors have been informed of such damages.

The SIG-5560 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 SIG-5560 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 SIG-5560 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 SIG-5560.

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 SIG-5560 including accompanying written material, hardware and firmware.

7.2.2 French version

● Documentation

La documentation du boîtier SIG-5560 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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Tous les boîtiers SIG-5560 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 SIG-5560 sans que la responsabilité de Sollae Systems Co., Ltd. et de ses distributeurs ne puissent être mise en cause, ni que le boîtier SIG-5560 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 SIG-5560 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 SIG-5560 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
2022.01.14.	1.0	1. Created	Roy Lee
2022.07.28.	1.1	1. Add a notification about FCC	Roy Lee
2023.09.26.	1.2	1. Apply changes of software: v2.1.0	Roy Lee