



SPG-M041

IoT Gateway System

User's Manual 1st Ed

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Packing List

Before setting up your product, please make sure the following items have been shipped:

Item	Quantity
● SPG-M041	1

If any of these items are missing or damaged, please contact your distributor or sales representative immediately.

About this Document

This User's Manual contains all the essential information, such as detailed descriptions and explanations on the product's hardware and software features (if any), its specifications, dimensions, jumper/connector settings/definitions, and driver installation instructions (if any), to facilitate users in setting up their product.

Users may refer to the product page at AAEON.com for the latest version of this document.

Safety Precautions

Please read the following safety instructions carefully. It is advised that you keep this manual for future references

1. All cautions and warnings on the device should be noted.
2. All cables and adapters supplied by AAEON are certified and in accordance with the material safety laws and regulations of the country of sale. Do not use any cables or adapters not supplied by AAEON to prevent system malfunction or fires.
3. Make sure the power source matches the power rating of the device.
4. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
5. Always completely disconnect the power before working on the system's hardware.
6. No connections should be made when the system is powered as a sudden rush of power may damage sensitive electronic components.
7. If the device is not to be used for a long time, disconnect it from the power supply to avoid damage by transient over-voltage.
8. Always disconnect this device from any AC supply before cleaning.
9. While cleaning, use a damp cloth instead of liquid or spray detergents.
10. Make sure the device is installed near a power outlet and is easily accessible.
11. Keep this device away from humidity.
12. Place the device on a solid surface during installation to prevent falls
13. Do not cover the openings on the device to ensure optimal heat dissipation.
14. Watch out for high temperatures when the system is running.
15. Do not touch the heat sink or heat spreader when the system is running
16. Never pour any liquid into the openings. This could cause fire or electric shock.

17. As most electronic components are sensitive to static electrical charge, be sure to ground yourself to prevent static charge when installing the internal components. Use a grounding wrist strap and contain all electronic components in any static-shielded containers.
18. If any of the following situations arises, please the contact our service personnel:
 - i. Damaged power cord or plug
 - ii. Liquid intrusion to the device
 - iii. Exposure to moisture
 - iv. Device is not working as expected or in a manner as described in this manual
 - v. The device is dropped or damaged
 - vi. Any obvious signs of damage displayed on the device
19. **DO NOT LEAVE THIS DEVICE IN AN UNCONTROLLED ENVIRONMENT WITH TEMPERATURES BEYOND THE DEVICE'S PERMITTED STORAGE TEMPERATURES (SEE CHAPTER 1) TO PREVENT DAMAGE.**

Warning!



This device complies with Part 15 FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received including interference that may cause undesired operation.

Caution:

There is a danger of explosion if the battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions and your local government's recycling or disposal directives.

Attention:

Il y a un risque d'explosion si la batterie est remplacée de façon incorrecte. Ne la remplacer qu'avec le même modèle ou équivalent recommandé par le constructeur. Recycler les batteries usées en accord avec les instructions du fabricant et les directives gouvernementales de recyclage.

产品中有毒有害物质或元素名称及含量

AAEON System

QO4-381 Rev.A0

部件名称	有毒有害物质或元素					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯 醚(PBDE)
印刷电路板 及其电子组件	×	○	○	○	○	○
外部信号 连接器及线材	×	○	○	○	○	○
外壳	○	○	○	○	○	○
中央处理器 与内存	×	○	○	○	○	○
硬盘	×	○	○	○	○	○
液晶模块	×	×	○	○	○	○
光驱	×	○	○	○	○	○
触控模块	×	○	○	○	○	○
电源	×	○	○	○	○	○
电池	×	○	○	○	○	○

本表格依据 SJ/T 11364 的规定编制。

○：表示该有毒有害物质在该部件所有均质材料中的含量均在 GB/T 26572 标准规定的限量要求以下。

×：表示该有害物质的某一均质材料超出了 GB/T 26572 的限量要求，然而该部件

仍符合欧盟指令 2011/65/EU 的规范。

备注：

一、此产品所标示之环保使用期限，系指在一般正常使用状况下。

二、上述部件物质中央处理器、内存、硬盘、光驱、电源为选购品。

三、上述部件物质液晶模块、触控模块仅一体机产品适用。

China RoHS Requirement (EN)

Hazardous and Toxic Materials List

AAEON System

QO4-381 Rev.A0

Component Name	Hazardous or Toxic Materials or Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBBs)	Polybrominated diphenyl ethers (PBDEs)
PCB and Components	X	O	O	O	O	O
Wires & Connectors for Ext. Connections	X	O	O	O	O	O
Chassis	O	O	O	O	O	O
CPU & RAM	X	O	O	O	O	O
HDD Drive	X	O	O	O	O	O
LCD Module	X	X	O	O	O	O
Optical Drive	X	O	O	O	O	O
Touch Control Module	X	O	O	O	O	O
PSU	X	O	O	O	O	O
Battery	X	O	O	O	O	O

This form is prepared in compliance with the provisions of SJ/T 11364.

O: The level of toxic or hazardous materials present in this component and its parts is below the limit specified by GB/T 26572.

X: The level of toxic of hazardous materials present in the component exceed the limits specified by GB/T 26572, but is still in compliance with EU Directive 2011/65/EU (RoHS 2).

Notes:

1. The Environment Friendly Use Period indicated by labelling on this product is applicable only to use under normal conditions.
2. Individual components including the CPU, RAM/memory, HDD, optical drive, and PSU are optional.
3. LCD Module and Touch Control Module only applies to certain products which feature these components.

Table of Contents

Chapter 1 - Product Specifications	1
1.1 Specifications	2
Chapter 2 – Hardware Information	7
2.1 Dimensions	8
2.2 I/O Location.....	9
2.3 LED Indicators	10
Chapter 3 – Gateway Setup and Configuration.....	12
3.1 System Test and Initialization	13
3.1.1 Serial Connection	14
3.1.2 RJ-45 Ethernet Cable Wiring.....	14
3.1.3 Digital Input (DI) Connection	16
3.1.4 Relay Output Connection	17
3.1.5 WWAN Module Installation.....	18
3.1.6 SIM Installation.....	19
3.1.7 MicroSD Card Installation (Without Cover).....	20
3.2 Connecting Power Supply	21
3.3 Reset Button	23
3.4 Installation and Mounting.....	24
3.4.1 DIN Rail Mounting.....	25

Chapter 1

Product Specifications

1.1 Specifications

System

Processor	ARM® Cortex® -M4F
External flash	128 Mbit Flash
Storage	External MicroSD slot x 1 (Max 32GB)
Operating System	Zephyr v.3.0.99
Support Protocol	Dependent on real-time OS support
Indicator	LED indicator x 10 (for functional power/serial port/DI/RF activity/signal strength indicators)
Real time clock	Yes
Expansion	Mini-PCIe slot x 1 (UART signal, for wireless module) Nano SIM card slot x 2 Micro SD card slot x 1

Radio Frequency

LTE 4G (CAT 1) (by model)	<p>3GPP Rel.9 compliant protocol</p> <p>Frequency bands:</p> <p>FDD LTE: B1 /B2 /B3 /B4 /B5 /B7 /B8 /B12 /B13 /B18 /B19 /B20 /B25 /B26 /B28</p> <p>TDD LTE: B38/B39/B40/B41</p> <p>WCDMA: B1/B2/B4/B5/B6/B8/B19</p> <p>GSM: B2/B3/B5/B8</p> <p>Data rate:</p> <p>FDD LTE DL: Max. 150 Mbps, UL: Max. 50 Mbps</p> <p>TDD LTE DL: Max. 130 Mbps, UL: Max. 30 Mbps</p> <p>HSDPA: Max. 42 Mbps, HSUPA: Max. 5.76 Mbps</p>
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CAT NB / CAT M1
(by model)

WCDMA DL: Max. 384 kbps, UL: Max. 384 kbps
EDGE DL: Max. 296 kbps, UL: Max. 236.8 kbps
GPRS DL: Max. 107 kbps, UL: Max. 85.6 kbps

SIM Card Size: Micro-SIM slot

Antenna Type: External type

Antenna Connector: SMA-Male

3GPP Rel.14 compliant protocol

Frequency bands:

FDD LTE: B1/ B2/ B3/ B4/ B5/ B8/ B12/ B13/ B18/
B19/ B20/ B25/ B26/ B27/ B28/ B66/ B71/ B85

GSM: 850Mhz/900Mhz/1800Mhz/1900Mhz

Data rate:

LTE Cat.NB1 DL: max. 27 kbps, UL: max. 63 kbps

LTE Cat.NB2 DL: max.124 kbps, UL: max. 158
kbps

LTE Cat.M1 DL: max. 300 kbps, UL: max. 1.1 Mbps

SIM-Card type: Micro-SIM slot

Antenna Type: External type

Antenna Connector: SMA-Male

GPS

GPS/GLONASS/Galileo/BeiDou (Compass)

Antenna Type: External Type

Antenna Connector: SMA-Female

Communication Interface

Ethernet	10/100Mbps, Auto-sensing MDI/MDIX, RJ45 x 2
Magnetic Isolation Protection	1.5 KV
Serial Ports	Terminal Block x 2
Serial Standards	RS232, 3W-RS485, 2W-RS485 (software selectable)
Serial Baud Rate (Data Rate)	300 ~ 921.6kbps
Data Bits	7, 8
Parity	Odd, Even, None
Stop bits	1, 2
RS-232 Pinout	TxD, RxD, RTC, CTS, GND
RS-485 Pinout	3 Wire: Data-, Data+, GND 2 Wire: Data-, Data+
Terminator for RS-485	120 ohms (software selectable)
Magnetic isolation protection	-

Digital Input

Digital	Terminal Block x 4
Serial Standards	RS232, 3W-RS485, 2W-RS485
Input Types	P-switching
Input Filter Time	Input delay adjustable from 0 to 40ms (disabled, 0.3ms, 3ms, 10ms, 20ms, 40ms)
Input Mode	DI or Event Counter
Input Counter Frequency	20 Hz

Low Input Voltage	< + 5 V
High Input Voltage	+10 ~ +30 V
Sensor Type	Wet Contact, Dry Contact
Dry Contact	On: Short to GND Off: Open
Wet Contact (DI To COM)	On: 10 ~ 30 VDC Off: 0 ~ 3 VDC
Reverse Polarity Protection	Yes
Individual Channel Diagnostic	No
Magnetic Isolation Protection	1.5 kV

Relay Output

Relay Output	Terminal Block x 1
Output Types	Normally open (NO)
Output Delay	Output delay adjustable from 0 to 10s (no delay, 500ms, 1s, 2s, 5s, 10s)
Max. Output Current Per Input	1A at 250VAC 1A at 30VDC
Actuator Connection	2-wire
Individual Channel Diagnostic	No

Physical & Environmental

Power Ports	Terminal Block x 1 (Dual DC Power Inputs for Power Redundancy)
Power Supply Rated Voltage	12 / 24 VDC
Power Supply Voltage Range	9.6 ~ 31.2 VDC
Input Current	12V/2.29W, 24V/3.14W
Reverse Polarity Protection	Yes
Voltage Variation Protection	Yes

Mechanical

Enclosure	Metallic Casing
Dimensions (W x D x H)	6.2" x 6.2" x 1.0" (160mm x 106mm x 27 mm)
Weight	1.1 lb. (0.5 Kg)
Mounting	DIN Rail Mounting


Environmental

Operating Temperature	-4°F ~ 158°F (-20°C ~ 70°C)
Storage Temperature	-40°F ~ 185°F (-40°C ~ 85°C)
Operating Humidity	5% ~ 95%, non-condensing
Certification	CE / FCC

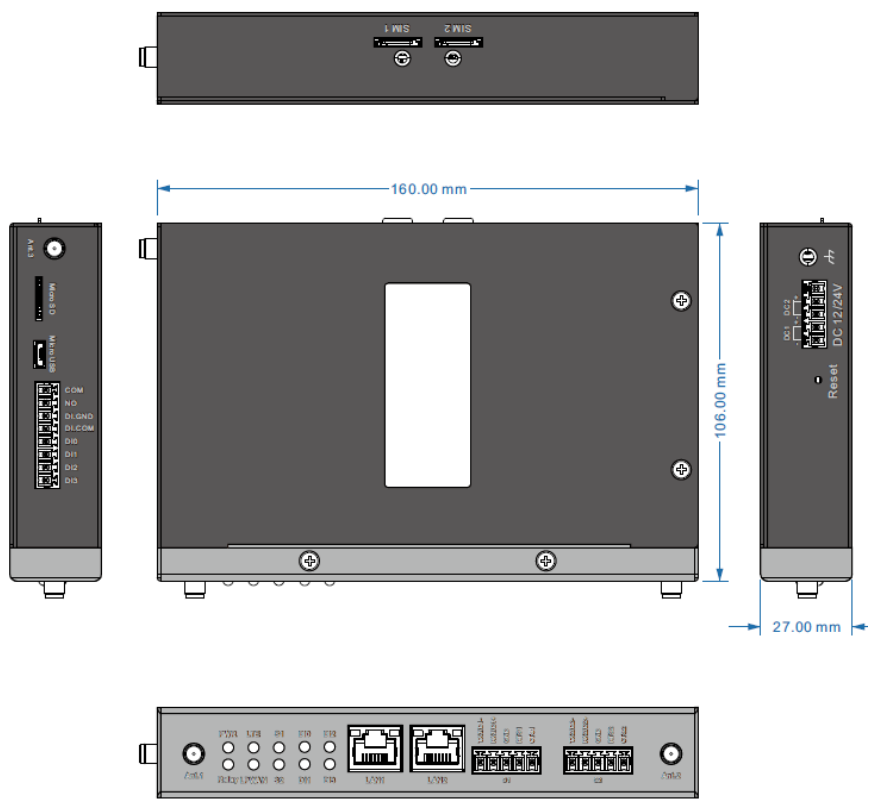


Chapter 2

Hardware Information

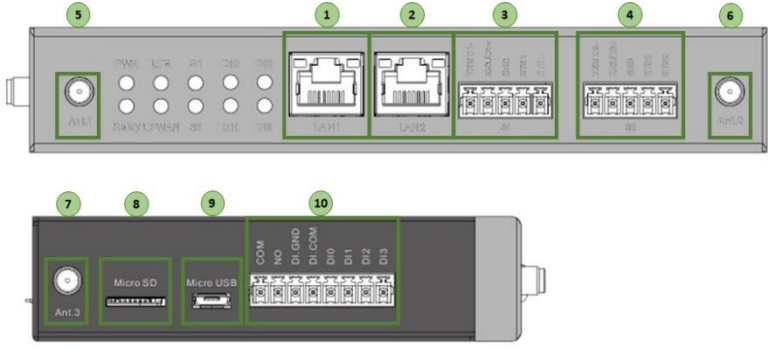


2.1 Dimensions



2.2 I/O Location

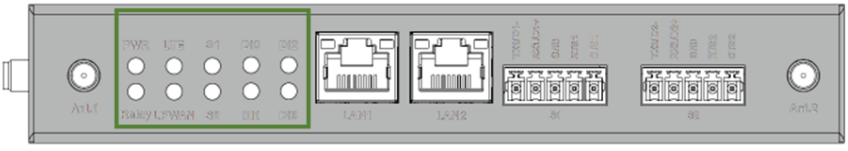
Please refer to the table below for the system's I/O layout so that you can configure your application



Label	Interface	Connection Type	Description
1	LAN 1	RJ-45	Connectivity for local network or internet access
2	LAN 2	RJ-45	Connectivity for local network or internet access
3	Serial 1	Terminal block	RS-232/RS-485, software selectable
4	Serial 2	Terminal block	
5	Antenna	RP-SMA (male)	Antenna for wireless WAN (3G/4G) access
6	Antenna	Reserved	-
7	Antenna	RP-SMA (female)	Antenna for GPS signal reception
8	External storage	Micro SD	Micro SD storage for system log, event message data storage
9	Console	Micro-USB	Interface for device administration
10	Digital Input x 4 Relay x 1	Terminal block	Please refer to sections 3.1.3 and 3.1.4 for more information

Note: For internet access, please ensure device obtains IP address via DHCP service from upper-level gateway/router.

2.3 LED Indicators



LED	Color	Definitions
PWR	Green	Off: Power is not fed to device
		Fast blinking: Device is in operation
LTE	Green/ Amber	Green: Wireless strength >75%
		Amber: Wireless strength 50 ~ 75%
		Amber blinking: Wireless strength 25 ~ 50%
		OFF: Wireless strength <25%
LPWAN	Green/ Amber	Operational while second module installed
		Off: System is not working.
Relay	Orange	Blinking: Ethernet port is transmitting or receiving data
		Steady on: Ethernet capable of 10Mbps or 100Mbps operations.
		Green
S1 (Serial 1)	Green	On: 100Mbps Ethernet connection.
	Red	Off: 10Mbps Ethernet connection.
S1 (Serial 1)	Green	Data transmission on the serial interface
	Red	Data reception on the serial interface

	Off	No data activity on the serial interface
S1 (Serial 2)	Green	Data transmission on the serial interface
	Red	Data reception on the serial interface
	Off	No data activity on the serial interface
D10 (Digital Input)	Yellow	On: incoming signal is transmitted to the port
	Off	No signal is sent to the port.
D11 (Digital Input)	Orange	On: incoming signal is transmitted to the port
	Off	No signal is sent to the port.
D12 (Digital Input)	Orange	On: incoming signal is transmitted to the port
	Off	No signal is sent to the port.
D13 (Digital Input)	Orange	On: incoming signal is transmitted to the port
	Off	No signal is sent to the port.



Chapter 3

Gateway Setup and Configuration



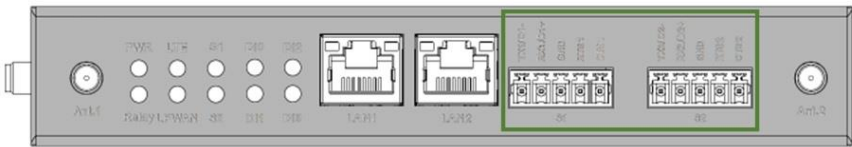
3.1 System Test and Initialization

- This chapter describes guidelines of the physical interfaces in SPG-M041. Please review the guidelines before installing the device.
- Ensure cabling is away from sources of electrical noise. Radios, power lines, and fluorescent lighting fixtures can interference with the device's performance.
- Ensure the cabling is positioned away from equipment that can damage the cables.
- In Ethernet 10/100 fixed port devices, the cable length from the fieldbus gateway to connected devices cannot exceed 100 meters (328 feet).
- Ensure airflow around the fieldbus gateway and respective vents is unrestricted. Without proper airflow, the fieldbus gateway can overheat. To prevent performance degradation and damage to the fieldbus gateway, make sure there is clearance at the top and bottom and around the exhaust vents.

3.1.1 Serial Connection

PG-M041 provides serial RS-485/RS-232 ports x 2, which are software-definable, users may setup type of communication interface (RS-232, 3-wire RS-485 or 2-wire RS-485) on serial port 1 & 2 to meet the application demands.

- Location of serial ports x 2 on SPG-M041:



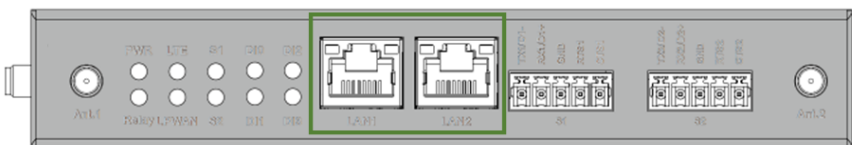
- Pinout of serial ports x 2 on SPG-M041:

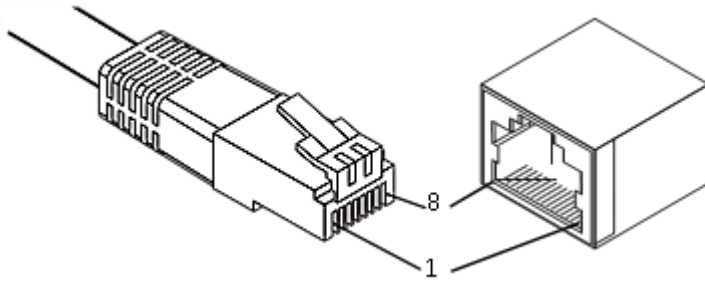
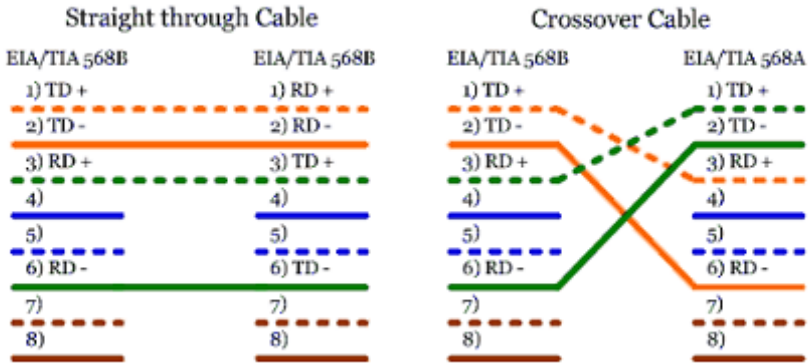
Pin	RS-232	RS-485
1	Data-	TxD
2	Data+	RxD
3	GND	GND
4		RTS
5		CTS

3.1.2 RJ-45 Ethernet Cable Wiring

For RJ-45 connectors' data-quality, twisted pair cabling (CAT5/5e or better) is recommended. The connector bodies on the RJ-45 ethernet ports are metallic and connected to the GND terminal. For best performance, use shielded cabling. Shielded cabling may also provide further protection.

- Location of ethernet ports x 2 on SPG-M041:



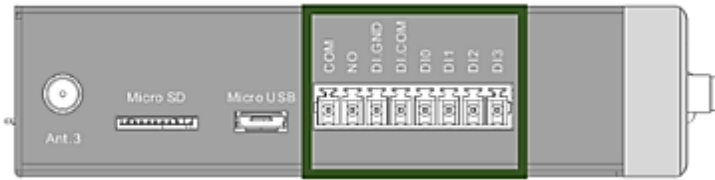


Note: Maximum cable length: 100 meters (328 ft.) for 10/100BaseT.

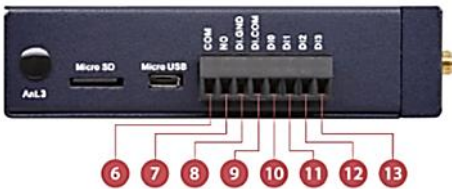
3.1.3 Digital Input (DI) Connection

SPG-M041 integrates a 4-channel digital input (DI) module. SPG-M-41 accepts 4 ~ 20V input voltage from most PLC, gateway or other signaling devices, which makes it more versatile in industrial applications.

- Location of 4 channel digital input on SPG-M041:

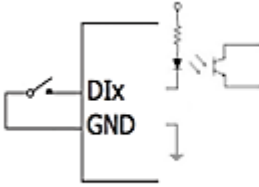


- Pinout of 4 channel digital input on SPG-M041:

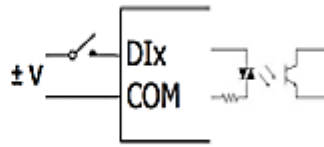


Pin	I/O
6	COM
7	Normal Open
8	DI.GND
9	DI.COM
10	DI0
11	DI1
12	DI2
13	DI3

- Wiring scheme of 4 channel digital input:



Dry Contact



Wet Contact

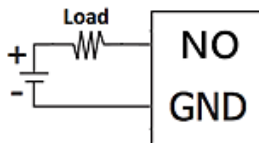
3.1.4 Relay Output Connection

SPG-M041 integrates single-channel relay output interface. Relay interface on SPG-M041 is ideal for low-power switching applications, such as ON/OFF control, event trigger, and it is safety value setting compliant.

- Location of one channel relay output on SPG-M041:



- Wiring scheme of relay output:



3.1.5 WWAN Module Installation

Before starting WWAN access on SPG-M041, please remove the upper case of the SPG-M041.

After opening the cover, refer to the block diagram below to find the position of WWAN module. Install the WWAN module, and fix antennas to the reserved antenna holes in the casing.

- WWAN module Mini-PCIe:



WWAN module installation:

- Make sure the IoT gateway is not powered on
- Make sure the IoT gateway is not powered on
- Open the case and identify the mPCIe slot on IoT gateway
- Align the WWAN module/card with the mPCIe slot and push the card straight into the mPCIe slot gently
- Secure the WWAN module/card to the pillar on the main board

3.1.6 SIM Installation

SPG-M041 has two SIM slots. SIM 1: Nano SIM (4FF) / Chip SIM (MFF2), and SIM 2: Nano SIM (4FF). The SIM slot locations are allocated at the rear of the product.

- Location of SIM card slot x 2 on SPG-M041:



- Find the SIM card slot on the rear panel
- Get a nano SIM card and install it on the SIM-carrier
- Ensure the SIM card fits on the SIM-carrier securely
- Flip the combo with the gold contacts facing down



- Insert the SIM card into the slot until hearing a click



3.1.7 MicroSD Card Installation (Without Cover)

The SPG-M041 provides a micro SD card slot to support features that log and store data.

Note: Only the FAT32 file system is supported.

Note: Before Installing a microSD Card, it is recommended to format the microSD card to FAT32 to ensure proper file read/write access.

- Location of MicroSD Card slot on SPG-M041:



1. The microSD card has a beveled edge. When installing the SD card, please make sure the card is aligned with the groove. If there is any resistance, remove the card and re-align it to the slot.
2. Insert the microSD card and press it in until a “click” is heard.



3.2 Connecting Power Supply

- Position cables with care. Do not position cables in places where they may be trampled or compressed by objects placed on them.
- Make sure that power-points and plugs are in good condition before using them.
- Do not overload the power-points or plugs.
- Make sure the product maintains a proper grounding connection.
- Use a power supply that meets the product requirements and complies with the relevant standards and regulations.
- Connect to power only after the installation of the system has been completed.
- Never connect or disconnect the cables with the system or the external apparatus switched ON.

Location of DC Power input connector on SPG-M041:



Label	Interface	Connector Type	Description
1	Reset	Push button	Reboot: Use a pointed object to press reset button to reboot.
2	V1-	Terminal block	Negative pole of power input 1
3	V1+	Terminal block	Positive pole of power input 1
4	V2-	Terminal block	Negative pole of power input 2
5	V2+	Terminal block	Positive pole of power input 2
6	Ground	Terminal block	Earthing point for power supply
7	Ground screw	-	-



- Insert a small flat-bladed screwdriver in the V1-/V1+ wire-clamp screws and loosen the screws
- Insert the negative/positive DC wires into the V1-/V1+ terminals of DC1. If power redundancy is enabled, connect DC2 in the same manner
- Tighten the wire-clamp screws to secure the DC wires in place
- Insert the terminal block and press it in until it is flush with the terminal block receptor on the SPG-M041

Note: Wire gauge for the terminal block should be in the range from 12 to 24 AWG.

Note: The SPG-M041 can be powered by using the same DC source for power redundancy feature.

A secondary power supply unit can be applied to IIoT gateway for power redundancy to reduce network downtime as well as preventing chaos brought by power loss.

Note: A DC voltage range of 12 to 24 VDC must be applied between the V1+/V2+ and the V1-/V2- terminal. The chassis ground screw terminal should be tied to the panel or chassis ground.

3.3 Reset Button

The SPG-M041 provides a RESET push button, the main function of which is to reboot and switch to driver installation.



Label	Interface	Connector Type	Description
1	Reset	Push button	Reboot: Use a pointed object to press reset button to reboot.

Reset console driver (new) installation:

- Connect administration computer and IoT gateway console port (micro USB port) with micro USB data cable
- Disconnect power source from device and use a pointed object to press and hold Reset button
- Feed power to device and release Reset button.
- Follow prompts on administration computer and complete the console driver installation
- Console driver is designed for Windows computer only

3.4 Installation and Mounting

This section describes the mounting procedure for the SPG-M041.

The following guidelines are provided to optimize device performance. A review of the guidelines should be performed prior to device installation.

- Ensure cabling is away from sources of electrical noise. Radios, power lines, and fluorescent lighting fixtures can interfere with device performance
- Ensure cabling is positioned away from equipment that can damage the cables
- In ethernet 10/100 fixed port devices, the cable length from the SPG-M041 to connected devices cannot exceed 100 meters (328 feet)
- Ensure airflow around the SPG-M041 (and respective vents) is unrestricted. Without proper airflow, the SPG-M041 can overheat. To prevent performance degradation and damage to the SPG-M041, make sure there is clearance at the top and bottom and around the exhaust vents.

3.4.1 DIN Rail Mounting

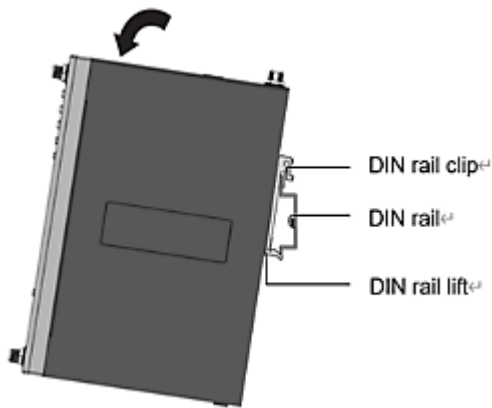
The DIN rail mount option is the quickest installation option. Additionally, it optimizes the use of rail space.

The metal DIN rail kit is secured to the rear of the SPG-M041. The device can be mounted onto a standard 1.37" (35mm) x 0.3" (7.5mm) sized DIN rail. The device can be mounted vertically or horizontally. Refer to the following guidelines for further information.

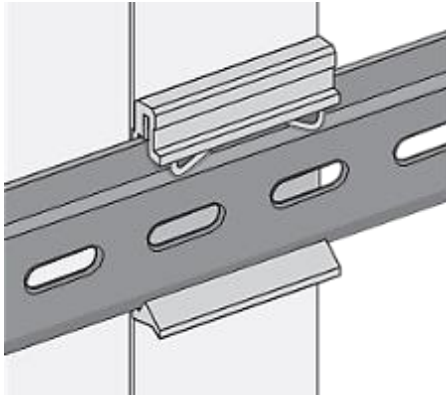
Note: A corrosion-free mounting rail is advisable.

When installing, make sure to allow for enough space to properly install the cabling.

1. Position the rear panel of the SPG-M041 in front of the DIN rail. While installing, please make sure DIN rail clip hooked DIN rail securely, as shown in the illustration.



2. Ensure the DIN rail is inserted behind the spring mechanism, and hook the DIN rail securely, as shown in the illustration.



Note: To prevent damage to the DIN rail clip or the DIN rail, do not install the DIN rail under or in front of the spring mechanism on the DIN rail clip.

Once the DIN rail is seated correctly in the DIN rail clip, press the front of the SPG-M041 to rotate the gateway down and into the release tab on the DIN rail clip. If seated correctly, the bottom of the DIN rail should be fully inserted in the release tab.

Removing the DIN-Rail Mount

1. Turn off/disconnect power from the IIoT gateway and disconnect all cables and connectors from the front panel of the SPG-M041.
2. Push down on the top of the DIN rail clip lift with finger. As the clip releases, lift the bottom of the SPG-M041, as shown in the following illustration.

