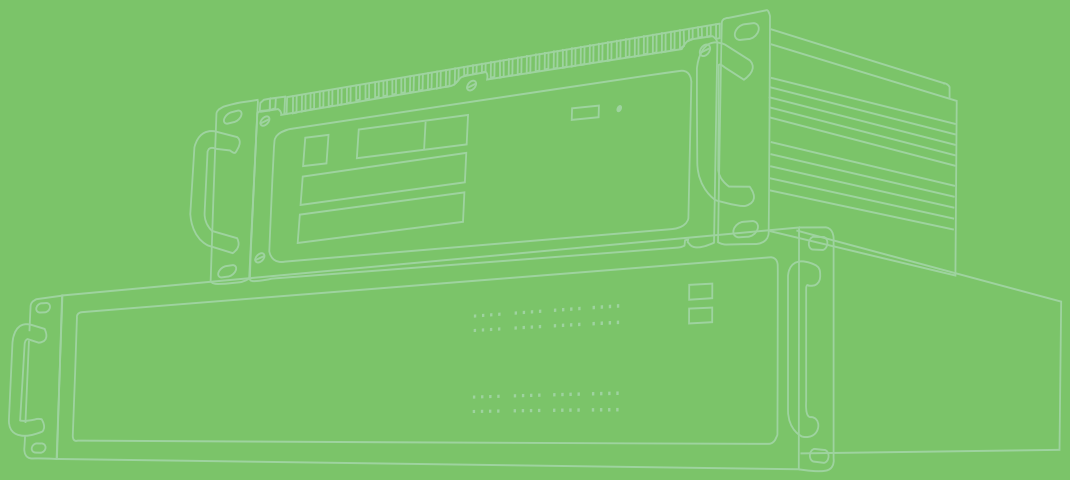

User Manual

ECU-1270

Expandable Industrial IoT Gateway

ADVANTECH

Enabling an Intelligent Planet

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Acknowledgments

Support

For more information on this and other Advantech products, please visit our website at

http://www.advantech.com

For technical support and service, please visit our support website at:
http://www.advantech.com/support/

Part No. 2003U12700 Edition 1

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Product Warranty (2 years)

Advantech warrants the original purchaser that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced free of charge during the warranty period. For out-of-warranty repairs, customers will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.

If you believe your product to be defective, follow the steps outlined below.

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware, and software used, etc.) Note anything abnormal and list any onscreen messages displayed when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain a return merchandise authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and a proof of purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of purchase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

Declaration of Conformity

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This type of cable is available from Advantech. Please contact your local supplier for ordering information.

Test conditions for passing also include the equipment being operated within an industrial enclosure. In order to protect the product from damage caused by electrostatic discharge (ESD) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

FCC Class A

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 this event, users are required to correct the interference at their own expense.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support to obtain the latest product information.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:
   - Product name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Packing List

Before system installation, check that the items listed below are included and in good condition. If any item does not accord with the list, contact your dealer immediately.

- ECU-1270 main unit
- DIN rail mount bracket x 1
- Wall mount bracket x 1
- Screws x 4 for DIN rail & wall mount kit
- Screws for mPCIe and PoE PD x 6
- Screws for M.2 x 1
- 20pin terminal block x 1
- 2pin terminal block x 1
- Jumper x 1

Safety Precautions - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from the PC chassis before manual handling. Do not touch any components on the CPU card or other cards while the PC is powered on.
- Disconnect the power before making any configuration changes. A sudden rush of electricity after connecting a jumper or installing a card may damage sensitive electronic components.

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all power outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Protect the equipment from humidity.
6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. Do not cover the openings.
8. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
9. Position the power cord away from high-traffic areas. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage from transient overvoltage.
12. Never pour liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If any of the following occurs, have the equipment checked by service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated the equipment.
    - The equipment has been exposed to moisture.
    - The equipment is malfunctioning, or does not operate according to the user manual.
    - The equipment has been dropped and damaged.
    - The equipment shows obvious signs of breakage.
15. Do not leave the equipment in an environment with a storage temperature of below -20 °C (-4 °F) or above 60 °C (140 °F) as this may damage the components. The equipment should be kept in a controlled environment.
16. CAUTION: Batteries are at risk of exploding if incorrectly replaced. Replace only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.
17. In accordance with IEC 704-1:1982 specifications, the sound pressure level at the operator's position does not exceed 70 dB (A).

DISCLAIMER: These instructions are provided according to IEC 704-1 standards. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Contents

Chapter 1

Overview

1.1 Introduction

The ECU-1270 is an industrial-grade IoT gateway built for versatility. It serves as the critical connection point for various devices, addressing the diverse needs of industrial applications. Unlike off-the-shelf solutions that often require compromises in functionality or cost, the ECU-1270 allows for flexible expansion to meet a wide range of application demands—without long waits or custom development. Optimize your operations efficiently with the ECU-1270, the gateway that adapts to you.

1.2 Specifications

1.2.1 General

Table 1.1: General	
Certification	CE, FCC, UL 62368, IEC-62368
Dimensions (W x D x H)	140 x 93 x 32 mm (5.51 x 3.7 x 1.26 in.)
Enclosure	Aluminum Housing
Mounting	Wall-Mount, DIN-rail Mount
Power Consumption	Power source from 10~36V_{DC} power adaptor: ■ 10~36 V_{DC} @ 0.65~0.2 A Typ. ■ 10~36 V_{DC} @ 1.5~0.4 A Max. (Optional) Power source from PoE PD: ■ 48 V_{DC} @ 0.32 A Max.
Power Connector	1 x 2-Pin Terminal Block, 16~24 AWG

1.2.2 System

Table 1.2: System	
CPU	TI AM6734, Quad-Core ARM Cortex A53, up to 1.4GHz
Memory	2 or 4 GB (up to 8GB) LPDDR4
Storage	16 or 32 GB (up to 128 GB) eMMC
Real Time Clock	Yes
Display	Optional HDMI
FRAM	Optional
LED	2 x LED (1 x Power, 1 x programmable)
Button	Reset (optional recovery)
TPM	Optional

1.2.3 I/O Interface Overview

Table 1.3: I/O Interface Overview	
Serial	2 x Isolated RS-485/232, software configurable
Console	1 x RS-232 (USB type C connector)
LAN	2 x 1,000Mbps Ethernet (RJ-45) Optional PoE PD on LAN1 via expansion module
USB	1 x USB3.0
SD Card	1 x Micro SD Card Slot
SIM Card	1 x Nano SIM card slot
I/O Connector	1 x 20-pin Terminal Block, 16~24 AWG

1.2.4 I/O Expansion

Table 1.4: I/O Expansion	
Port A	Optional "2 x RS-485" or "2 x CAN FD“ add-on module
Port B	Optional "2 x RS-485" or "3 x DI, 4 x DO“ add-on module
M.2 & mPCIe	1 x Mini-PCIe (Full-size) (Signal: USB2.0) for LTE (SIM card slot connected) 1 x M.2 E-key 2230 (Signal: USB2.0 & PCIe)

1.2.5 Serial Communication (Default & Expansion)

Table 1.5: Serial Communication (Default & Expansion)	
Ports	2 on default unit (COM0, 1) 2 on extra expansion slots (4 ports max., COM2~5)
Mode supported	Default unit: 2x RS232 or RS485, software configurable Expansion slots: 2x RS485 for each slot
Baud rate	RS-232: 115,200 bps max. RS-485: 460,800 bps max.
Isolation Protection	2,000 V_{DC}
Available on expansion slot	Expansion A, B

1.2.6 CAN FD Expansion

Table 1.6: CAN FD Expansion	
Ports	2
Protocol	CAN FD with CAN 2.0 A/B backward compatible
Speed	CAN 2.0: 1Mbps max. CAN FD: ■ Arbitration phase: 1Mbps max. ■ Data phase: 5Mbps max.
Isolation Protection	2,000 V_{DC}
Available on expansion slot	Expansion A

1.2.7 Digital I/O Expansion

Table 1.7: Digital I/O Expansion	
Digital Input	
Channels	3, dry contact and wet contact are supported
Input Voltage Level (wet contact)	Logic 0: 0~3 V_{DC} Logic 1: 10~40 V_{DC}
Isolation Protection	2,000 VDC
Digital Output	
Channels	4, open collector/sink type/NPN
Output Rating	10~30 V_{DC}, 100 mA max. per channel
Isolation Protection	2,000 V_{DC}
Available on expansion slot	Expansion B

1.2.8 Operating System

Table 1.8: Operating System	
Operating System	Yocto Linux with EdgeLink, or Ubuntu on different models

1.2.9 Environment

Table 1.9: Environment	
Operating Temperature	Main unit: -40~70˚C (-40~158˚F) With wireless modules and PoE PD modules installed: -40~55˚C (-40~131˚F)
Storage Temperature	-40 ~ 85°C (-40 ~ 185°F)
Operating Humidity	Up to 90% RH, non-condensing
Ingress Protection	IP30

1.2.10 EdgeLink*

Table 1.10: Supported Protocol	
South Bound	**North Bound**
IEC 60870-5-101	Modbus Server
IEC 60870-5-103	IEC 60870-104 Server
IEC 60870-5-104	WASCADA (WebAccess)
DL/T 645-2007	BACnet Server
DL/T 645-1997	OPC UA Server
IEC 62056-21	Data Transfer
ODBC	SNMP
JDBC	
OPCUA Client	
BACnet IP	
BACnet MS/TP	
SNMP	
Modbus Client	

Table 1.11: EdgeLink Functions	
PLC Driver Support	ABB/Advantech/Allen-Bradley/BECKHOFF/ DELTA/ FATEK/GE/Honeywell/Keyence/Mitsubishi/Omron/ Panasonic/Schneider/Sharp/Siemens/Toyopuc/ Wago 750/Yaskawa/Yokogawa
Programming	Linux C, Python
Configuration Tool	EdgeLink Studio
Data Monitoring	20,000 Tags MAX.
Cloud Connectivity (MQTT)	EdgeHub, WISE-PaaS, Azure, AWS, Google Cloud, IoT Core and more
Database Transmission	SQL Server, MySQL, ORACLE, FTP Server
VPN	Open VPN

* EdgeLink is bundled with Yocto Linux version. Please refer to EdgeLink specification for more details.

1.3 Default Software Configurations

Table 1.12: Default Software Configurations	
Operating System	Ubuntu/Yocto + EdgeLink
Programming Support	Linux C, Python
SSH	Enabled on LAN1 & LAN2
Login Details (SSH/Console)	User Name: root Password: None (press “Enter”) Console baud rate: 115,200
Default Ethernet Mode	DHCP
Default IP (without DHCP server)	LAN1: 10.0.0.1 LAN2: 11.0.0.1
Serial Port Modes	RS-485

1.4 Dimensions

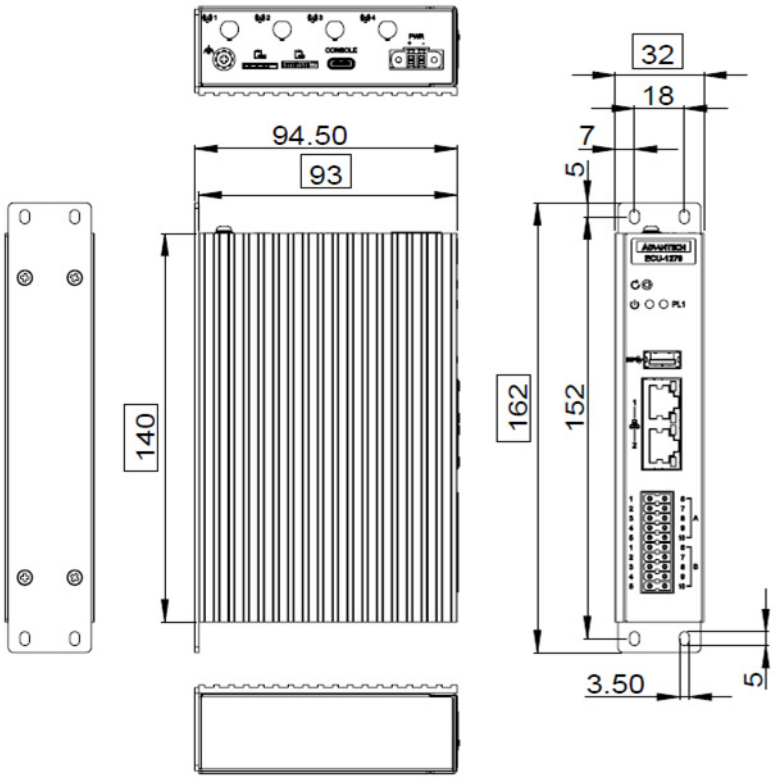


Figure 1.1 Dimension of ECU-1270

Chapter 2

Operation Details

2.1 Product Overview

2.1.1 Outlook

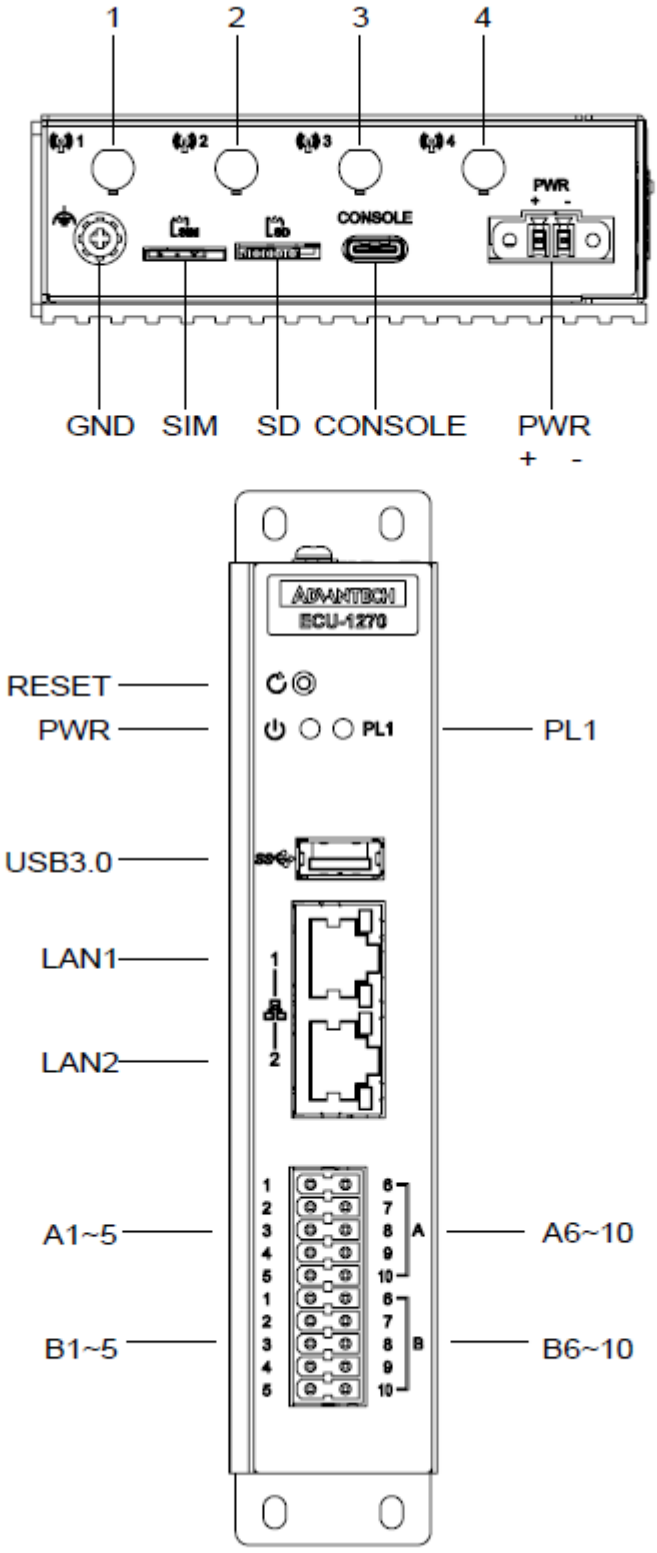


Figure 2.1 Outlook of ECU-1270

2.1.2 Internal Switch, Jumper and Connectors

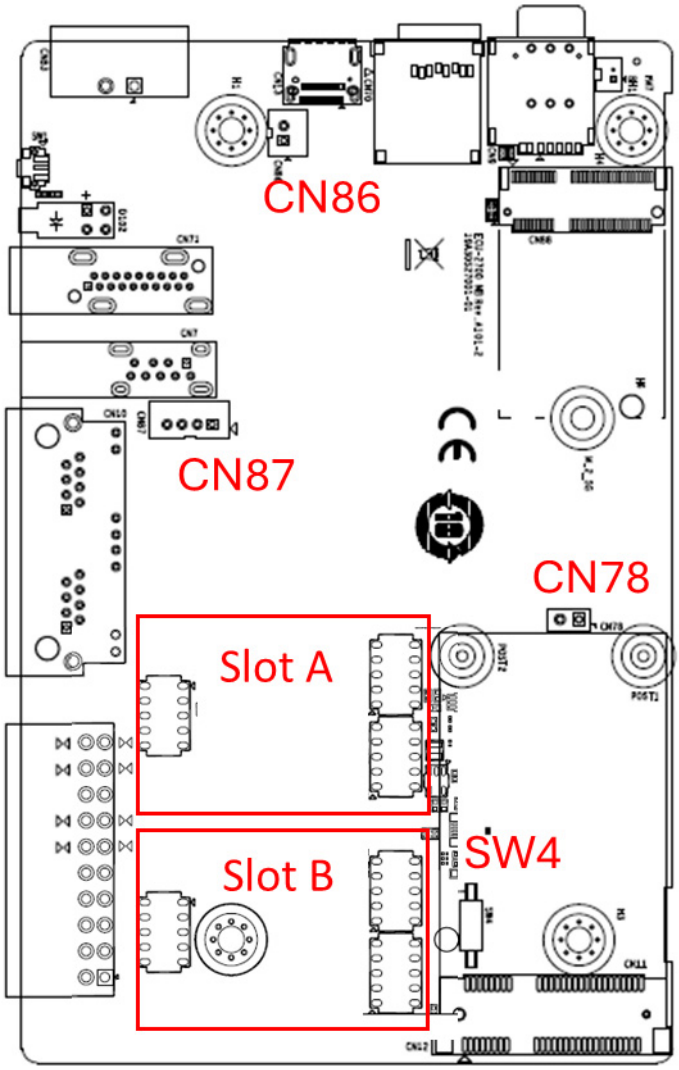


Figure 2.2 Internal layout of ECU-1270

Table 2.1: Internal Switch, Jumper and Connectors

Items	Description	Functions
SW4	Boot option	Select boot option between SD card and eMMC
CN78	Secure boot configuration	Enable/disable programming eFuse for secure boot
CN86, CN87	PoE Module Connection	Connect to PoE module to enable PoE PD on LAN1
Slot A	Expansion slot A	Expansion for CAN FD and serial ports
Slot B	Expansion slot B	Expansion for Digital I/Os and serial ports

2.2 System Button

Table 2.2: System Button			
Button	**Description**	**Action**	**Function**
Reset	Reset button	Single Press	Hardware reset

2.3 LED Indicator Status

Table 2.3: LED Indicator Status			
LED	**Description**	**Off**	**On**
PWR	Power Indicator	Power Off	Power On
PL1	Programable LED1	Programmed Off	Programmed On

2.4 Jumper Settings

Table 2.4: Jumper Settings			
Jumper location	**Description**	**Open**	**Close (jumper installed)**
CN78	Secure boot configuration	eFuse programming disabled	eFuse programming enabled

2.5 Switch Configurations

Table 2.5: Switch Configurations			
Switch location	**Description**	**Up (1)**	**Down (ON)**
SW1	Boot Option Selection	Boot from eMMC	Boot from SD card*

Note!

** In the default unit along with default Ubuntu image/EdgeLink Yocto image, the SD card boot isn't available. The SD card boot would only be available when the boot environment is re-configured to SD card available. Please contact Advantech when you have this kind of demand.*

2.6 Serial Port Mode Settings

The serial port mode on the ECU-1270 main unit (COM0 & COM1) are software configurable. It's configured by the command *com_mode_config* in command prompt. Below are the examples and the prototype of the function.

```
root@ecu1270-b94d84:~# com_mode_config
usage: /usr/bin/com_mode_config get | set [COM_NUM(AL) [COM_MODE]]
  /usr/bin/com_mode_config get             # get COM0/COM1 RS232/RS485 mode
  /usr/bin/com_mode_config set COM0 232    # set COM0 mode to RS232
  /usr/bin/com_mode_config set ALL 232    # set COM0 and COM1 mode to RS232
root@ecu1270-b94d84:~# com_mode_config get
COM0 MODE is RS485
COM1 MODE is RS232
root@ecu1270-b94d84:~# com_mode_config set COM0 232
setup COM0 MODE to RS232
root@ecu1270-b94d84:~# com_mode_config set COM1 485
setup COM1 MODE to RS485
root@ecu1270-b94d84:~# com_mode_config set ALL 232
setup ALL MODE to RS232
```

2.7 Console Prompt and SSH Connection

The console prompt has a UART to USB bridge designed. Users can access it using an USB type C cable. After connecting to it, users shall see an "unknown serial device" in the system. Installing the console driver, then a COM/serial/tty device would show up in the device manager (Windows) or /dev/tty* (Linux). Open the designated serial port using a terminal tools would allow users to access the console prompt.

2.8 Image Update

The ECU-1270 provides two options for the image update. If the ECU-1270 model is with the EdgeLink, the update can rely on the EdgeLink Studio to proceed an online update. On the other hand, if the device isn't EdgeLink installed, you can proceed with the SD card instead.

Note: You don't often meet this situation to update your image. You should consult the technical support to make sure this is necessary.

2.8.1 Update via EdgeLink Studio (EdgeLink Device Only)

Connect the device via Ethernet and open the EdgeLink Studio, right click to find “image Update”, and the prompt would show up to select the update file.

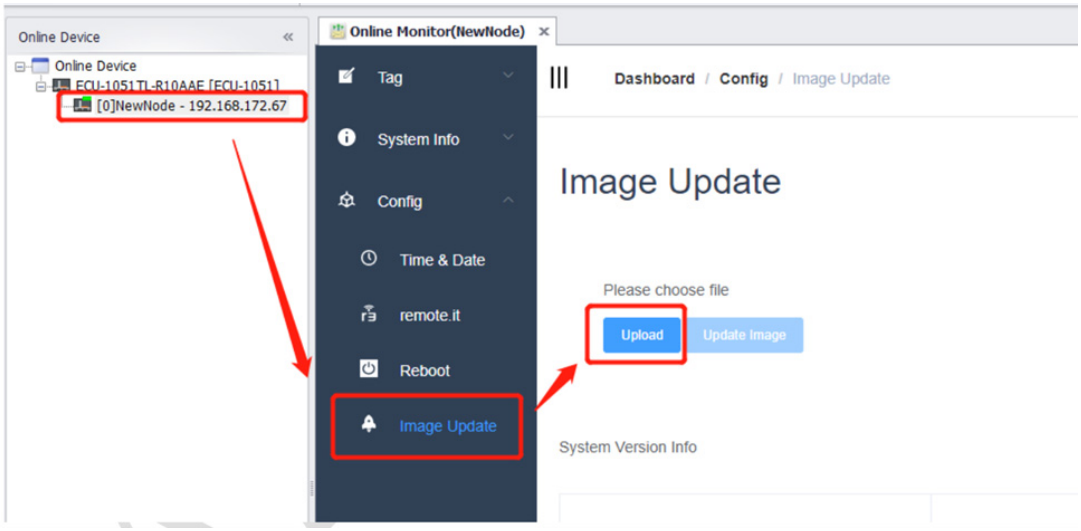


Figure 2.3 Update image via EdgeLink

Once the file is uploaded, click update image to start the process. If the box “Restore factory default setting” is checked, the existing EdgeLink project in the ECU would be clear. If it’s not checked, the device will run the project after the system reboot.

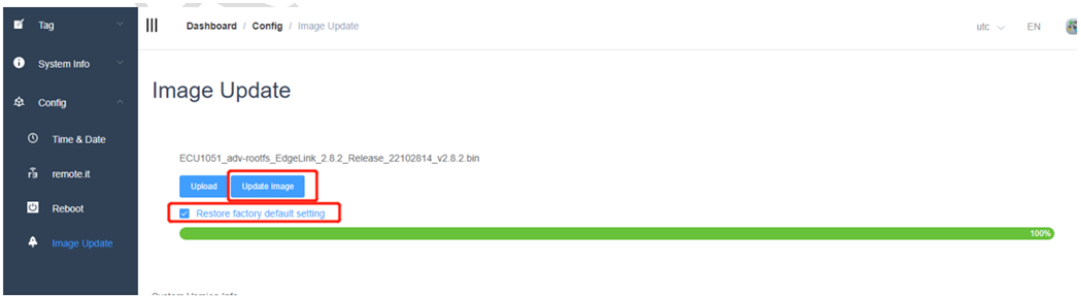


Figure 2.4 Update image via EdgeLink (conti.)

After the updating, the device will restart automatically, the notification message like shown in Figure 2.5.

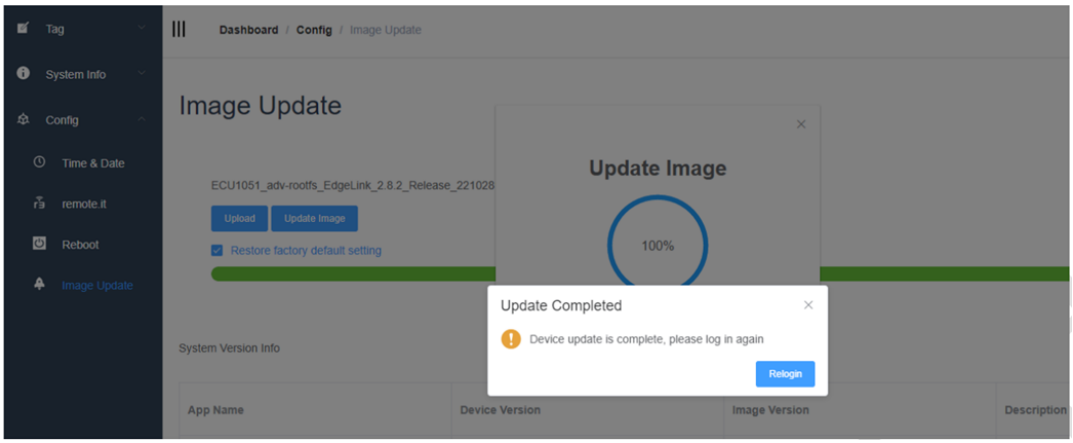


Figure 2.5 Update completed

2.8.2 Update via SD Card

1. Download the update (xxxx.bin) file from Advantech Support Portal. Search ECU-1270 and you'll find the download link
2. Prepare an SD card with FAT32 format and at least 32GB capacity. Change the subfile name from .bin to .zip and unzip the files to the SD card.

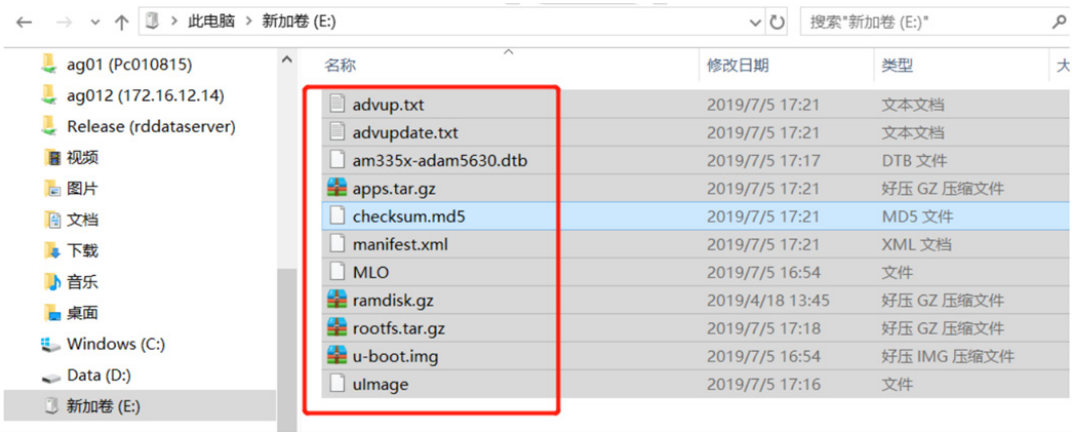


Figure 2.6 Files unzipped from the package

3. If this device has EdgeLink installed, and you expect to clear all the EdgeLink project, please revise the parameter advfactory to "y" in the advupdate.txt.

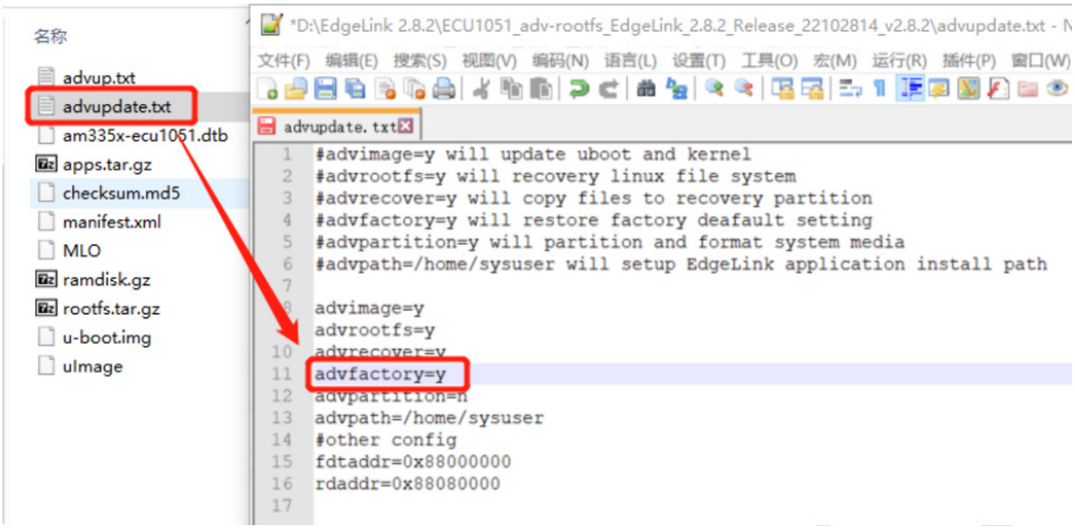


Figure 2.7 Settings return the device to factory default after image update

4. Insert the SD card to the slot on the device and power the device on and leave the boot option as eMMC, then the update would start automatically along with the bootup process. Once the update is finished, you'll see the Linux prompt show up in the console port.
5. Unplug the power and remove the SD card. The image update is completed.

Chapter 3

Signal Connection for I/O Interfaces

3.1 Power Connection

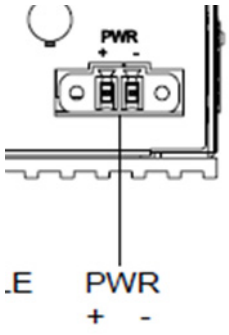


Figure 3.1 Power connector layout

Table 3.1: Power Connection	
Pin	**Description**
PWR+	Positive pole of power input
PWR-	Negative pole of power input

3.2 Ethernet Ports

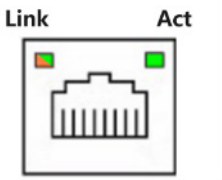


Figure 3.2 RJ45 LAN connector layout

Table 3.2: Ethernet Ports		
LED	**Status**	**Description**
Link	Off	10Mbps
	Orange	100Mbps
	Green	1000 Mbps
Act	Green	No data transmission
	Green Blinking	Transmitting data

3.3 USB Port

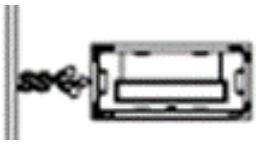


Figure 3.3 USB connector layout

3.4 I/O Port Pin Assignment

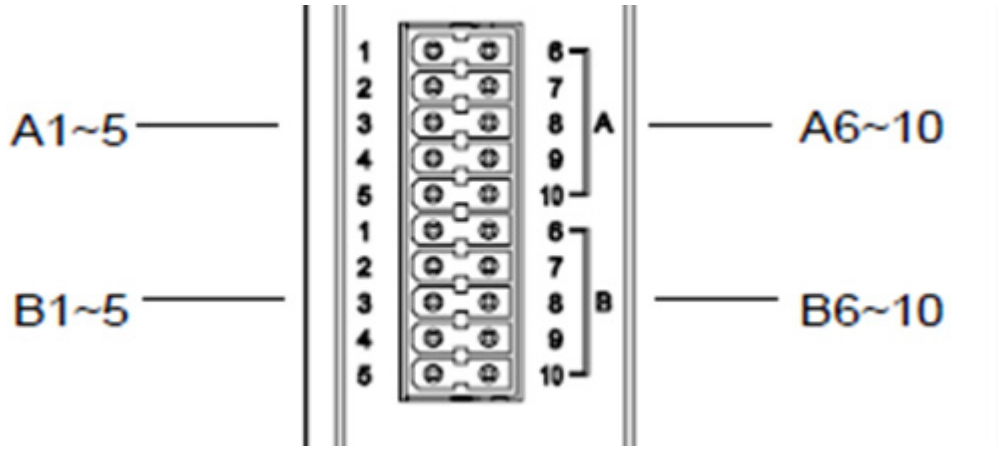


Figure 3.4 I/O connector layout

Table 3.3: I/O Port Pin Assignment

I/O Group	PIN No.	Main Unit	RS-485	CAN FD	DIO
Group A	1	Rx0/Data+0			
	2	Tx0/Data-0			
	3	GND			
	4	Rx1/Data+1			
	5	Tx1/Data-1			
	6		Data+2	CAN High 0	
	7		Data-2	CAN Low 0	
	8				
	9		Data+3	CAN High 1	
	10		Data-3	CAN Low 1	
Group B	1		Data+4		Digital Output channel 0
	2		Data-4		Digital Output channel 1
	3				Digital Output channel 2
	4		Data+5		Digital Output channel 3
	5		Data-5		Common connection for digital output
	6				Digital Input channel 0
	7				Digital Input channel 1
	8				Digital Input channel 2
	9				Common connection for digital input
	10				Ground for digital I/O

The extra RS-485, CAN FD and digital I/Os are available whenever the corresponded expansion module is plugged in the expansion slot.

3.4.1 CAN Ports

The Hn and Ln should connect to CAN High and CAN Low respectively on the device end to complete a CAN communication wiring.

3.4.2 Serial Ports

RS-232: The Rx should connect to Tx of the device, and Tx should connect to Rx of the device. GND connect to device ground pin.

RS-485: The D+ should connect to Data+ of the device, and the D- should connect to Data- of the device.

3.4.3 Digital Input/Output Signal Connections

Digital Input (Dry Contact)

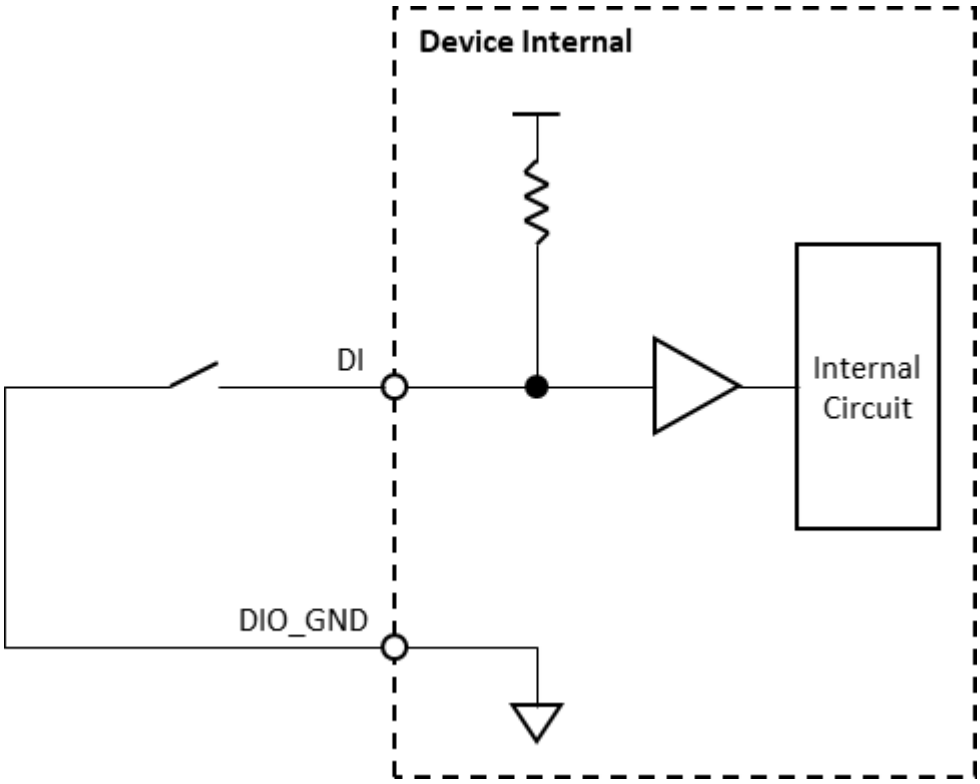


Figure 3.5 Signal connection of digital input (dry contact)

Digital Input (Wet contact)

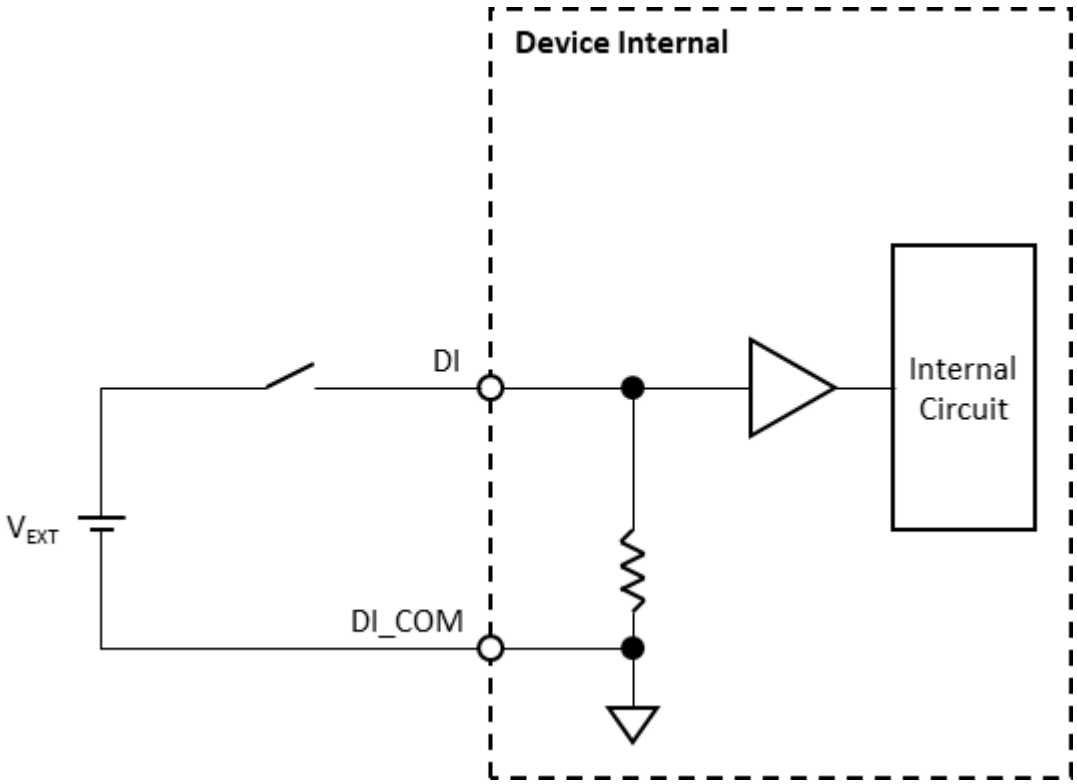


Figure 3.6 Signal connection of digital input (wet contact)

Digital Output

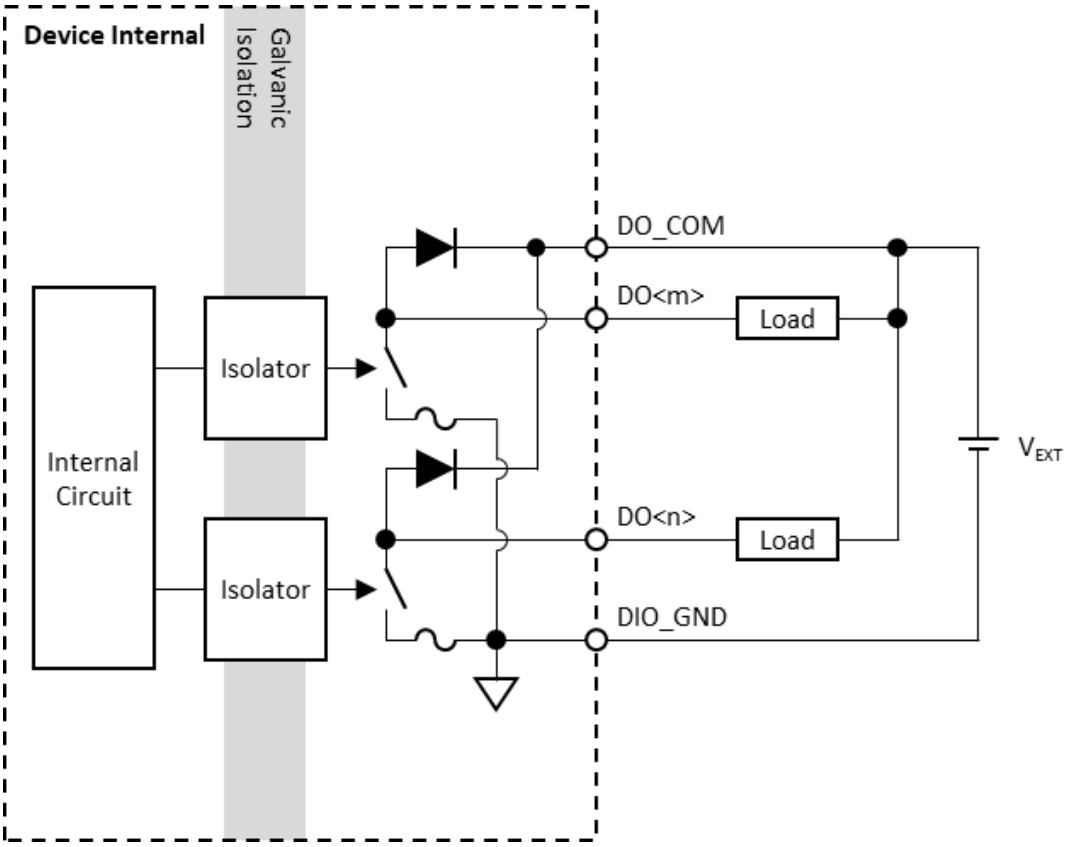


Figure 3.7 Signal connection of digital output

Chapter 4

System Installation Guide

4.1 Expansion Port/Module Installation

4.1.1 M.2 & Mini PCI Express

1. Unscrew the side plate and open the enclosure.

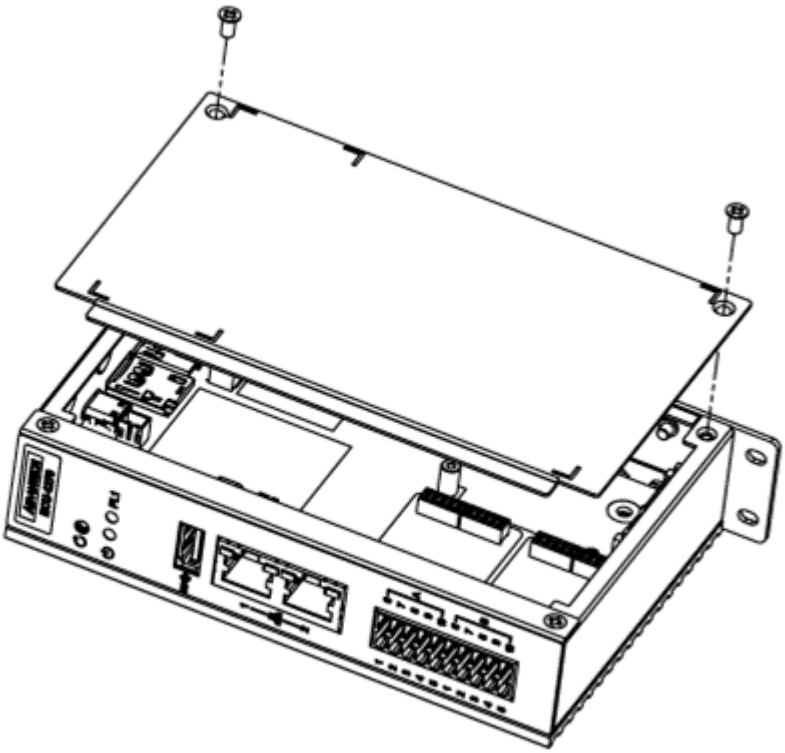


Figure 4.1 Unscrew to open the enclosure

2. Insert the M.2 or Mini PCI Express module in the slot and screw them onto the corresponding screw holes.

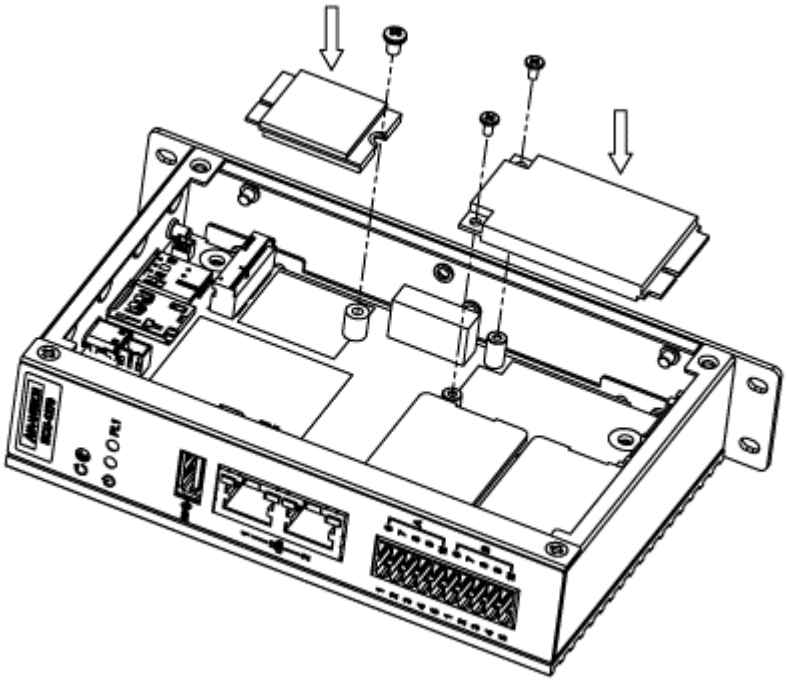


Figure 4.2 Install the M.2 and MiniPCIe modules

3. Screw the side plate back.

4.1.2 Expansion Slots

1. Unscrew the side plate and open the enclosure, same as shown in Figure 4.1.
2. Insert the module(s).

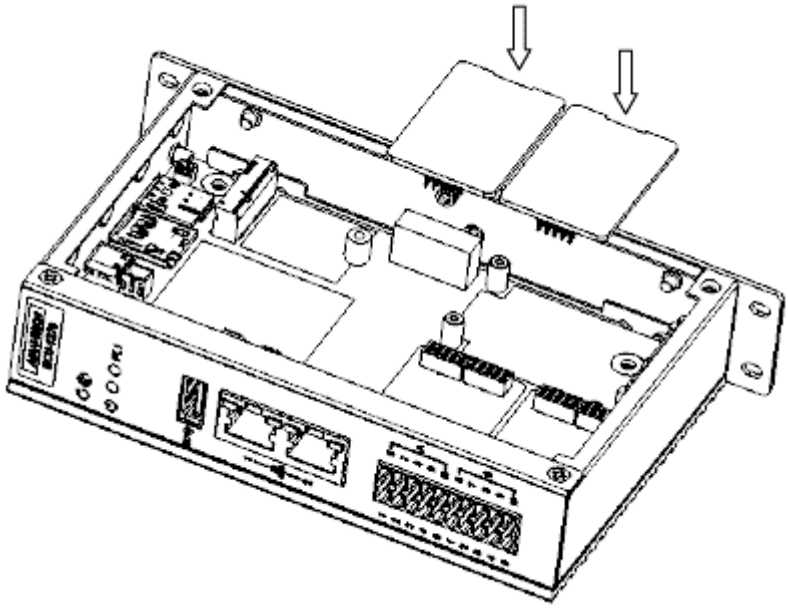


Figure 4.3 Install the expansion modules

3. Screw the side plate back
4. Stick the pin definition on the corresponding column. The sticker is packed along with the expansion module.

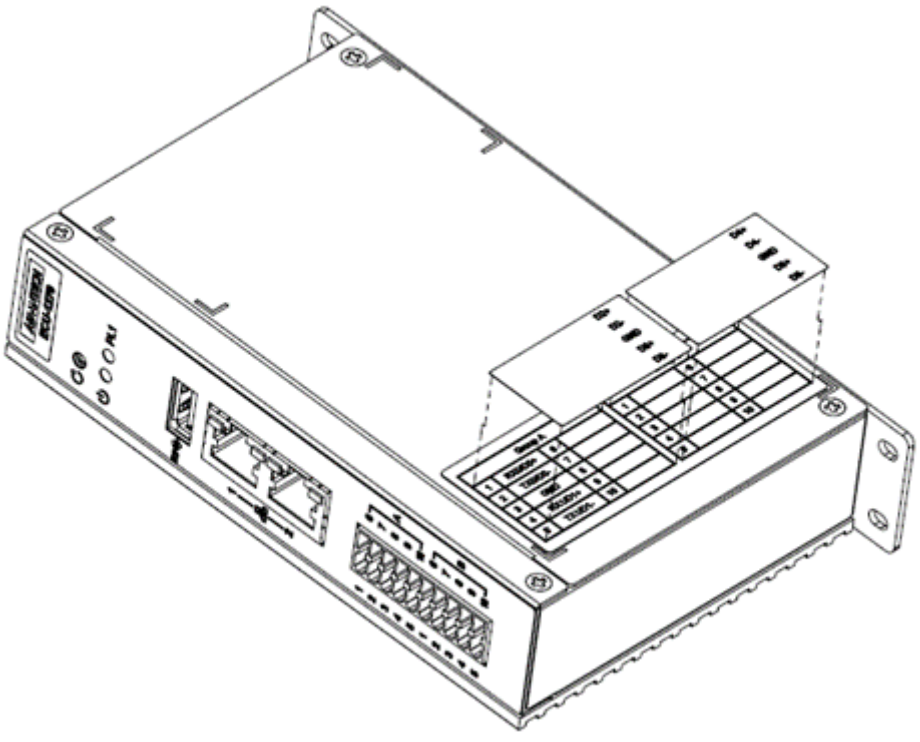


Figure 4.4 Stick the pin assignment stickers

4.1.3 PoE Module

1. Unscrew the side plate and open the enclosure, same as shown in Figure 4.1.
2. Screw the PoE module onto the side plate.Please follow the instructions in the figure below to ensure the module does not have mechanical interference with the board after assembly.

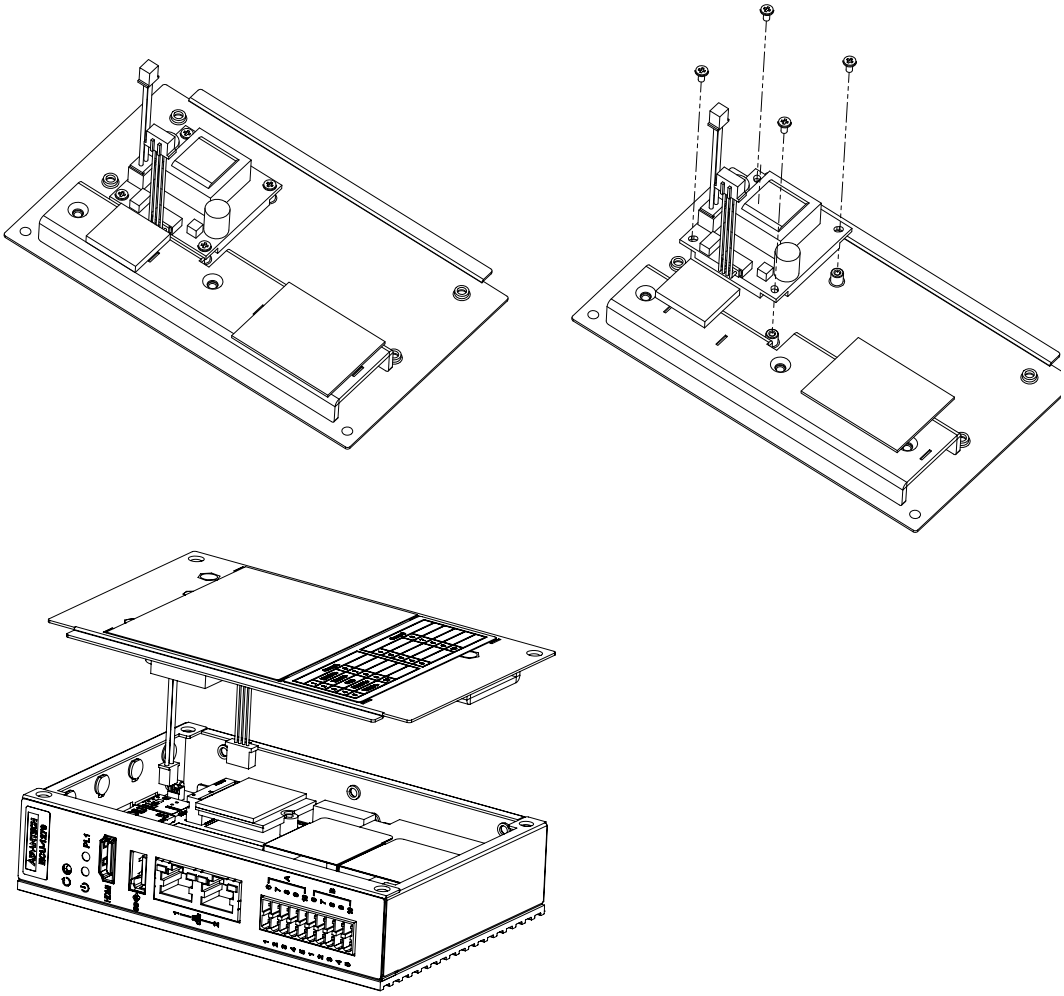
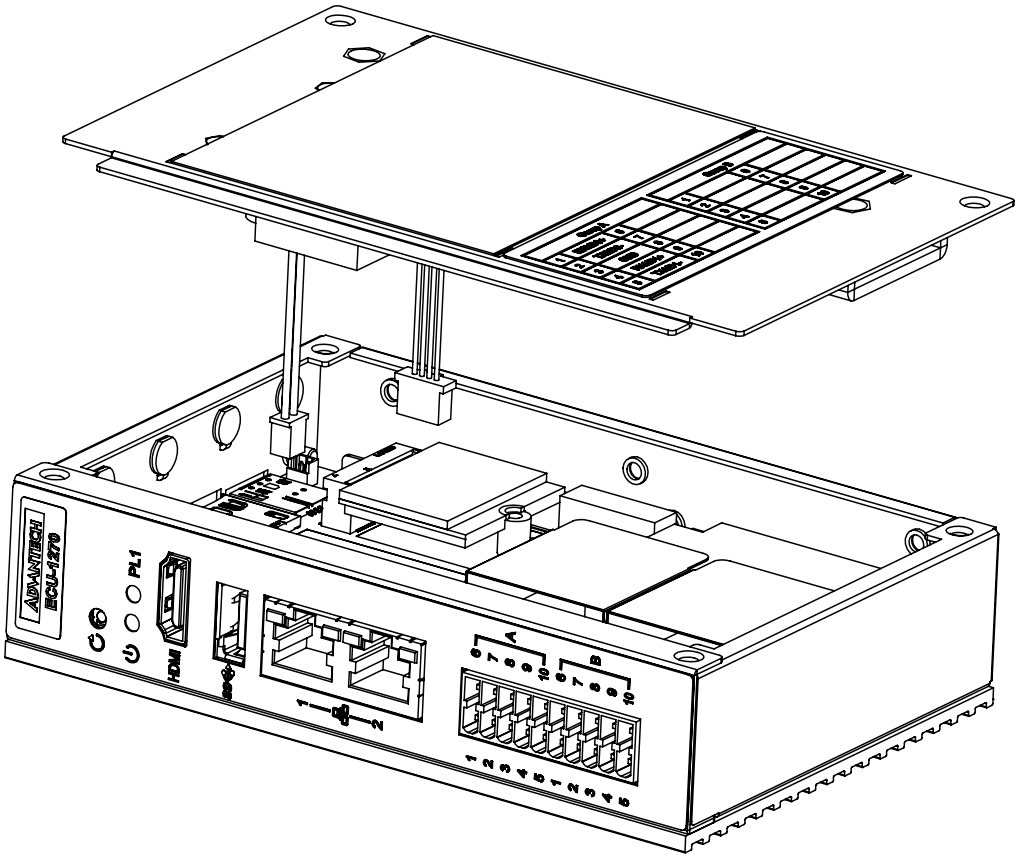


Figure 4.5 Screw the PoE module onto the side plate

3. Insert the cable to corresponding connectors respectively. 2-pin cable to CN86, 4-pin cable to CN87.
4. Screw the side plate back.



4.2 DIN Rail Kit Installation

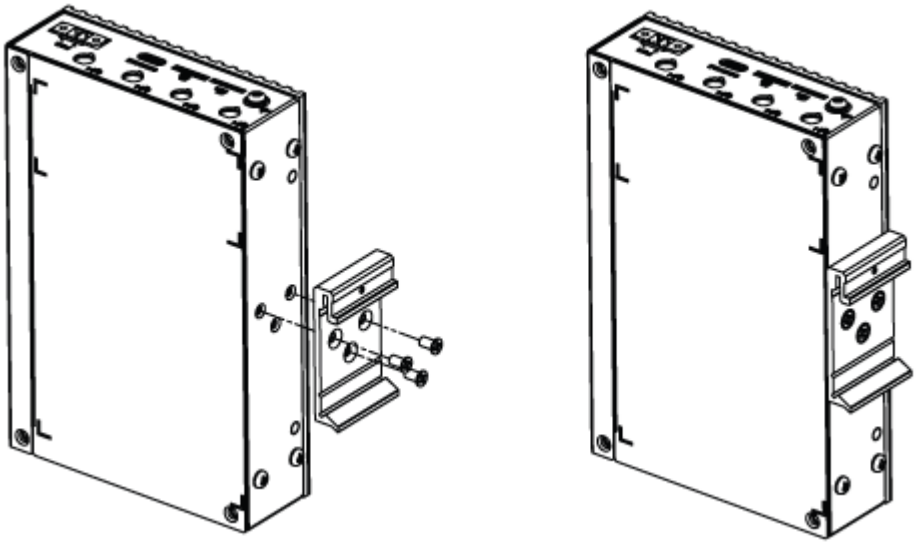


Figure 4.6 Screw the DIN rail kit onto the back of the device

4.3 Wall Mount Kit Installation

There are 2 screws on the back of the device already, you should first unscrew them, and screw the wall mount kit onto the back of the device.

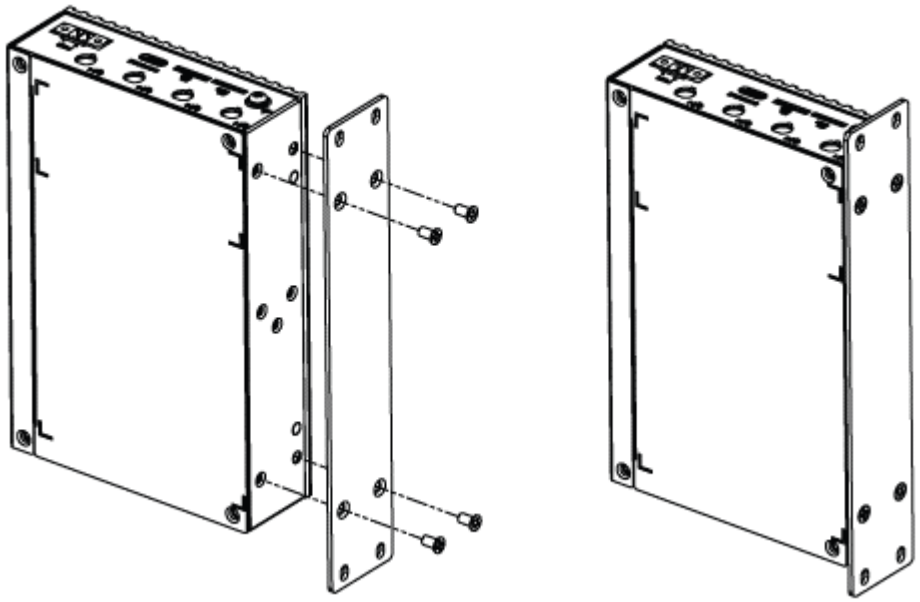


Figure 4.7 Screw the wall-mount kit onto the back of the device

4.4 Antenna Connector Installation

The antenna holes are reserved on the top of the device. Before installing the antenna connectors, you should bend the cover to open the installation hole. And then, follow figure 4.8 to install the connectors through the hole.

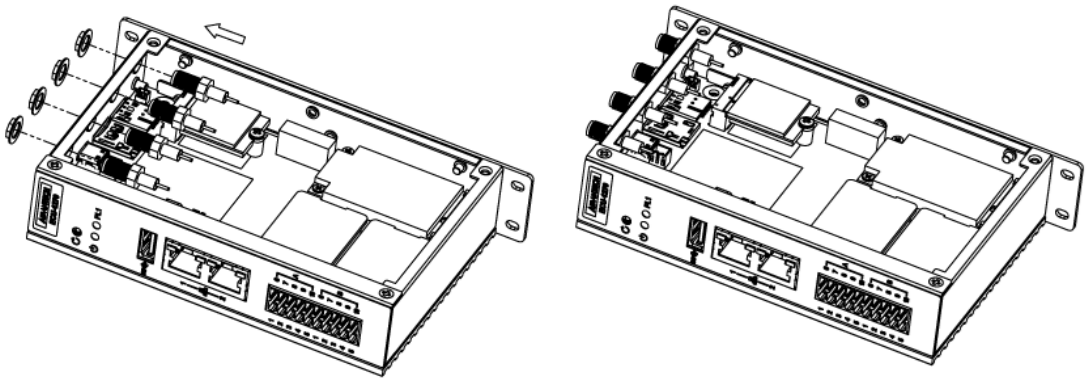


Figure 4.8 Screw the antenna connectors to the

4.5 Ground Connection

To create good ground connection, the ground wire should be connected to the enclosure GND. Unscrew and connect the ground wire then screw it back to complete the ground connection. The suggested wire is 18~22 AWG.

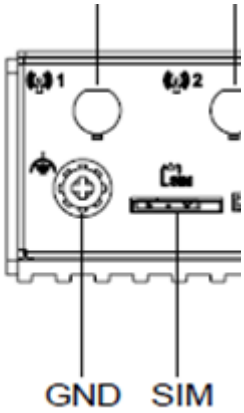


Figure 4.9 Layout of the top side

4.6 Field Installation Safety Notification

4.6.1 Required Heat Dissipation Space

To retain a good heat dissipation environment for the ECU-1270, a clearance between the ECU-1270 and other devices, especially those that generate more heat, is required. The picture below describes the spacing requirement, where A = 50 mm and B = 100 mm.

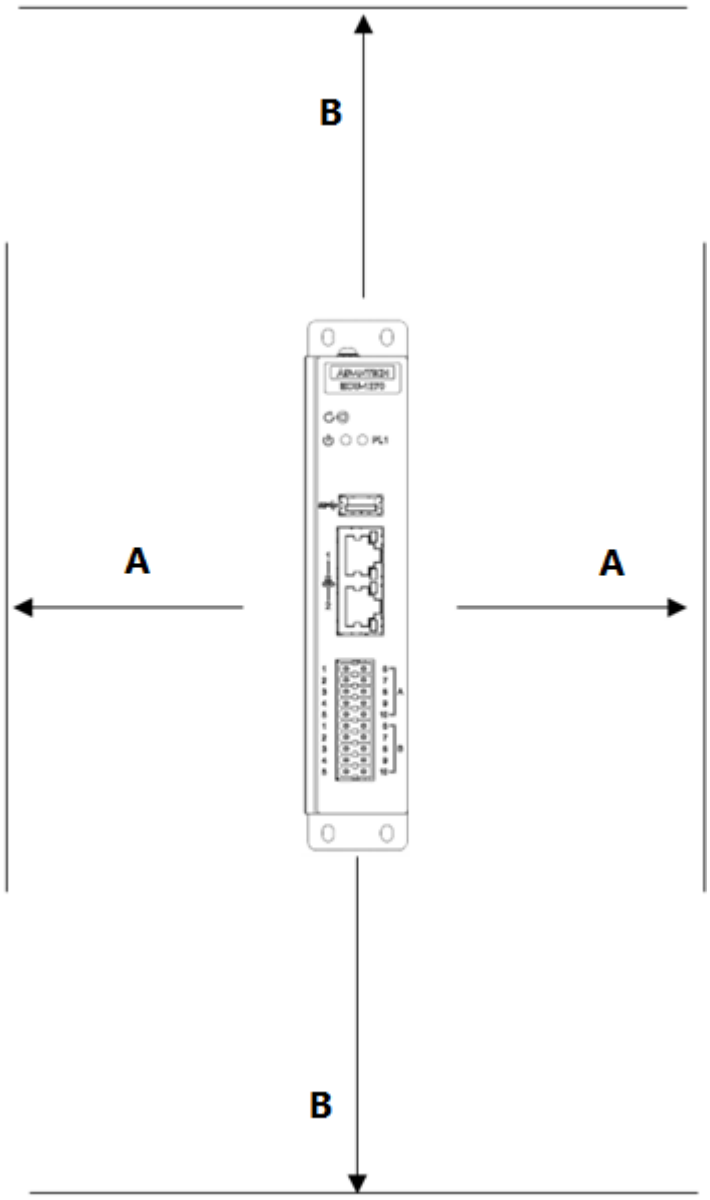


Figure 4.10 Suggested installation space reserved for the ECU-1270

4.6.2 Din Rail Installation

Please note that when installing the DIN-rail mounting onto the DIN-rail frame, there's only one way to install/uninstall the ECU-1270 onto/from the DIN rail. Refer to Figure 4.11 for the details, left: Installing the device on DIN-rail, right: Uninstall the device from DIN-rail.

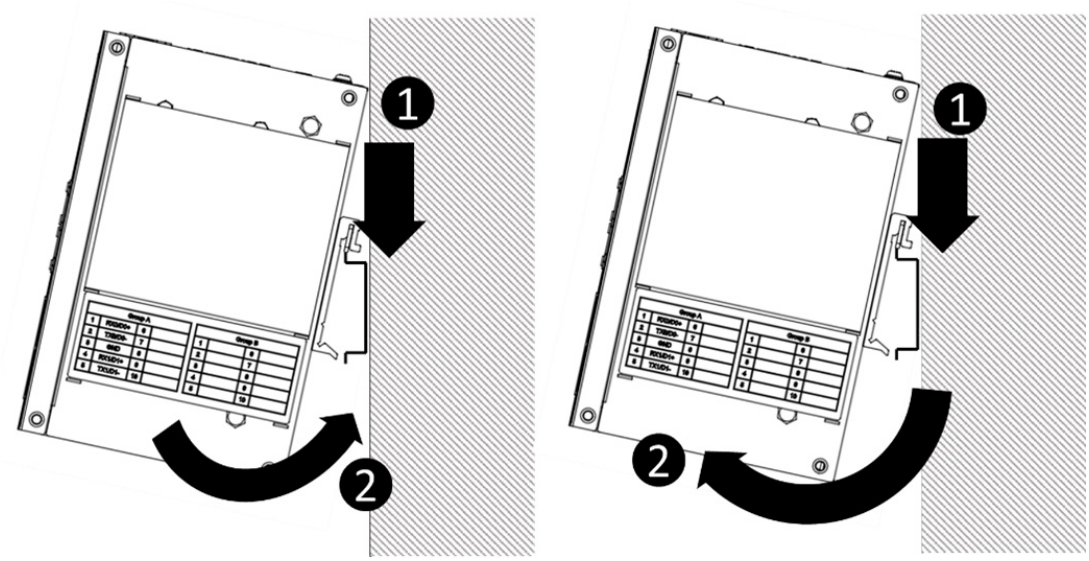


Figure 4.11 Install and release the ECU-1270 for DIN rail mounting

4.6.3 Power Requirement

This product is intended to be supplied by an UL certified power supply or dc source suitable for use at minimum Tma 70°C whose output meets SELV or ES1 and is rated 10~36Vdc, 1~0.3 A min., if need further assistance, please contact Advantech for further information. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet. By means of a power cord connected to a socket-outlet with earthing connection.

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Please verify specifications before quoting. This guide is intended for reference purposes only.

All product specifications are subject to change without notice.