



SRG-IMX8P

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
● SRG-IMX8P	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. Make sure the power source matches the power rating of the device.
3. Position the power cord so that people cannot step on it. Do not place anything over the power cord.
4. Always completely disconnect the power before working on the system's hardware.
5. No connections should be made when the system is powered as a sudden rush of power may damage sensitive electronic components.
6. 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.
7. Always disconnect this device from any AC supply before cleaning.
8. While cleaning, use a damp cloth instead of liquid or spray detergents.
9. Make sure the device is installed near a power outlet and is easily accessible.
10. Keep this device away from humidity.
11. Place the device on a solid surface during installation to prevent falls
12. Do not cover the openings on the device to ensure optimal heat dissipation.
13. Watch out for high temperatures when the system is running.
14. Do not touch the heat sink or heat spreader when the system is running
15. Never pour any liquid into the openings. This could cause fire or electric shock.
16. 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.

17. If any of the following situations arises, please 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
18. **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。

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))	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 or 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	4
2.1 Dimensions	5
2.2 I/O Location.....	6
2.3 List of Connectors.....	7
2.3.1 DC Power (1)	8
2.3.2 HDMI Port (2)	8
2.3.3 USB 3.0 Port (3).....	8
2.3.4 Giga LAN Port (4).....	9
2.3.5 Indicators Light (5).....	10
2.3.6 CAN-FD Port (6).....	11
2.3.7 Reset Button (7).....	11
2.3.8 RS-232/422/485 Port (8).....	12
2.3.9 Micro SIM Slot (9)	12
2.3.10 Micro SD Slot (10)	13
2.3.11 Antenna (11)	13
2.3.12 Debug Port (12).....	14
2.4 Wireless Hardware Setup.....	15
2.4.1 Mini Card Installation	15
2.4.2 SIM Card Installation	18
2.4.3 SD Card Installation.....	18
Chapter 3 – Gateway Setup and Configuration	19
3.1 Connecting to System	20
3.2 User Account Management	23
3.2.1 To Add a User Account.....	23

3.2.2	To Delete a User Account.....	24
3.3	I/O Management.....	25
3.4	CAN-FD Pin Definition.....	26
3.5	Pin Definition: RS-232/422/485 x 2	28
3.6	Network Settings	30
3.6.1	Check the IP Setting.....	30
3.6.2	Set the Static IP	31
3.6.3	Set the Dynamic IP	32
3.7	Cellular Network Settings (Optional).....	33
3.7.1	Check the Cellular Module Status.....	33
3.7.2	Check Module Information in Minicom	35
3.7.2.1	Leave Minicom.....	37
3.7.3	Dial-up Cellular Module	38
3.8	Wi-Fi Network Settings (Optional).....	40
3.8.1	Scan Wi-Fi Access Point	40
3.8.2	Connect Wi-Fi Access Point.....	40
3.8.3	Check Wi-Fi signal	41
3.8.4	Disconnect Wi-Fi Access Point.....	41
3.8.5	Check Wi-Fi Connection Status	42
3.9	System Management.....	43
3.9.1	Check OS version	43
3.9.2	Check the Storage Status.....	44
3.9.3	Shutdown the System	44
3.9.4	Date and Time Settings.....	45
3.9.4.1	Check the Current Date and Time.....	45
3.9.4.2	Set a New Date and Time	45

Chapter 1

Product Specifications

1.1 Specifications

System

Processor	ARM® NXP i.MX8M Plus Quad-Core Cortex®-A53 1.6GHz Processor
Memory	Onboard DDR4L 2GB (Optional 4GB)
Storage	eMMC 16G (Optional 32GB)
Real Time Clock	RTC x 1, with 3V CR2032 Lithium battery
Security	TPM 2.0
Indicators	Programmable LED control x 7
Cellular	Mini PCIe Connector x 1 (USB signal)
Wireless LAN	Mini PCIe Connector x 1 (USB signal)
Operating System	Debian 10
Support Protocol	Modbus / MQTT Library (by request)

I/O

Serial Port	RS-232/422/485 switchable x 2, Phoenix Connector
Ethernet	RJ-45 Gigabit Ethernet x 2
USB	USB 3.0 Type-A x 2
CAN Bus	CAN-FD x 2 CH, Phoenix Connector
Display	HDMI x 1 (Output)
Power Connector	2-Pin 3.81mm Pitch Phoenix Connector
Debug Port	Micro USB x 1
Expansion Slot	SIM Card slot x 1 Micro SD slot x 1

Power Supply

Power Requirement	DC 9-36V
Power Consumption	9.36W (Full Loading)
MTBF (Hours)	479,374

Environmental

Dimension	5.54" x 3.86" x 1.89" (140.76mm x 98.2mm x 48mm)
Weight	2.1 lbs. (0.95Kg)
Mount Options	Wall Mount, Din Rail (Optional)
Operation Temperature	-4 °F ~ 158 °F (-20 °C ~ 70 °C)
Storage Temperature	-40 °F ~ 176 °F (-40 °C ~ 80 °C)
Operation Humidity	10% ~ 95% relative humidity, non-condensing

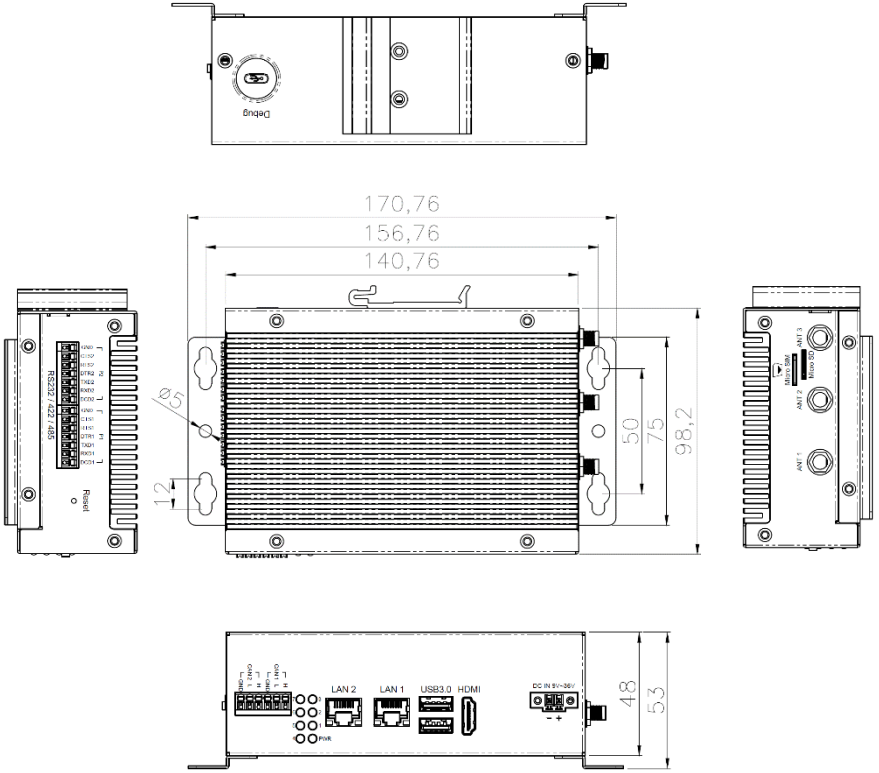
Certification

Vibration	3Grms/ 5~500 Hz operation – eMMC, MicroSD (IEC68-2-64)
Shock	30G peak acceleration (11 msec. Duration) IEC 68-2-27
CE/FCC	CE/FCC

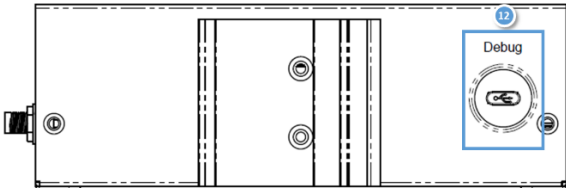
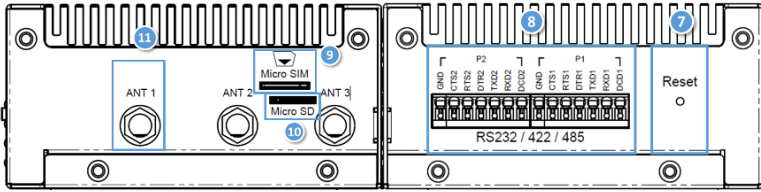
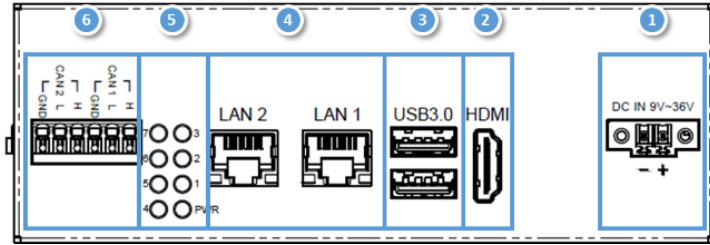
Chapter 2

Hardware Information

2.1 Dimensions



2.2 I/O Location

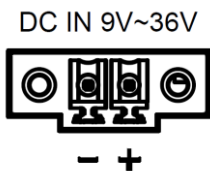


2.3 List of Connectors

The SRG-IMX8P features several connectors which can be configured for your application. This section details those connections and their specifications.

Label	Function
1	DC Power
2	HDMI Port
3	USB 3.0 Port
4	Giga LAN Port
5	Indicators Light
6	CAN-FD Port
7	Reset Button
8	RS-232/422/485 Port
9	Micro SIM Slot
10	Micro SD Slot
11	Antenna x 3
12	Debug Port

2.3.1 DC Power (1)



The gateway can accept DC 9-36V input through 2 pin phoenix connector.

2.3.2 HDMI Port (2)



The HDMI support port enables video output to an external display.

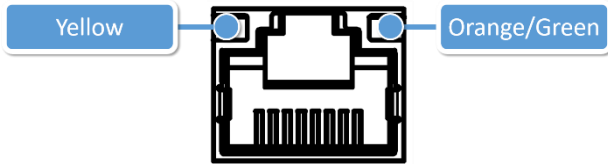
2.3.3 USB 3.0 Port (3)



The USB 3.0 is a type A connector, and can also support USB mass storage.

2.3.4 Giga LAN Port (4)

The standard RJ-45 LAN jack is provided the connection to the Local Area Network (LAN).

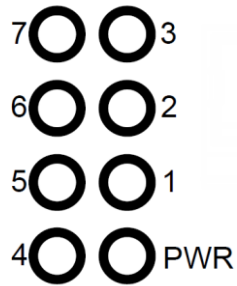


LED	Function	Status
Yellow	Active status	ON: LAN link is established. OFF: LAN link is not established. Blink: Data received and transmitted.
Orange/Green	Link Speed status	Green on: 100Mbps. Orange on: 1000Mbps.

2.3.5 Indicators Light (5)

User can control the 7 LED via the GPIO.

The control command for LED 1-7:



Control Command

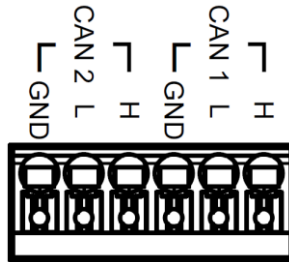
Turn On	<code>m0cli -c 0 -i 1 -v 1</code>
---------	-----------------------------------

Turn Off	<code>m0cli -c 0 -i 1 -v 0</code>
----------	-----------------------------------

Note: i: LED number.

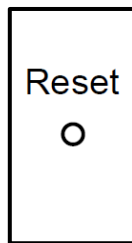
2.3.6 CAN-FD Port (6)

Provides two phoenix CANbus ports for external device connection.



Check chapter 3 for more information.

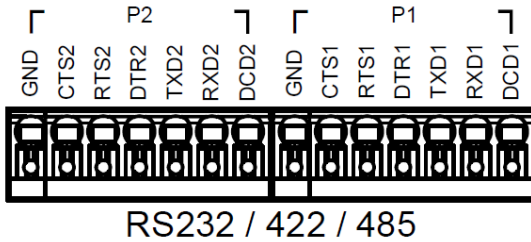
2.3.7 Reset Button (7)



Press the button to reboot the OS.

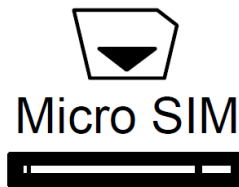
2.3.8 RS-232/422/485 Port (8)

Provides two phoenix connectors for RS-232/422/485 interface.



Check chapter 3 for more information.

2.3.9 Micro SIM Slot (9)



User can insert the micro SIM card into the slot when using an LTE module via the mini card slot.

2.3.10 Micro SD Slot (10)



Micro SD

User can increase the available storage by insert the micro SD card.

2.3.11 Antenna (11)

ANT 1



ANT 2



ANT 3

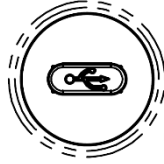


The 3 Antenna configurations are Wi-Fi, 4G, or LTE.

2.3.12 Debug Port (12)

Log into the gateway's Linux OS via SSH via debug port (Micro USB type).

Debug



Serial Port Settings

Baud rate	115200 bps
Parity	None
Data bits	8
Stop bits	1
Flow Control	None

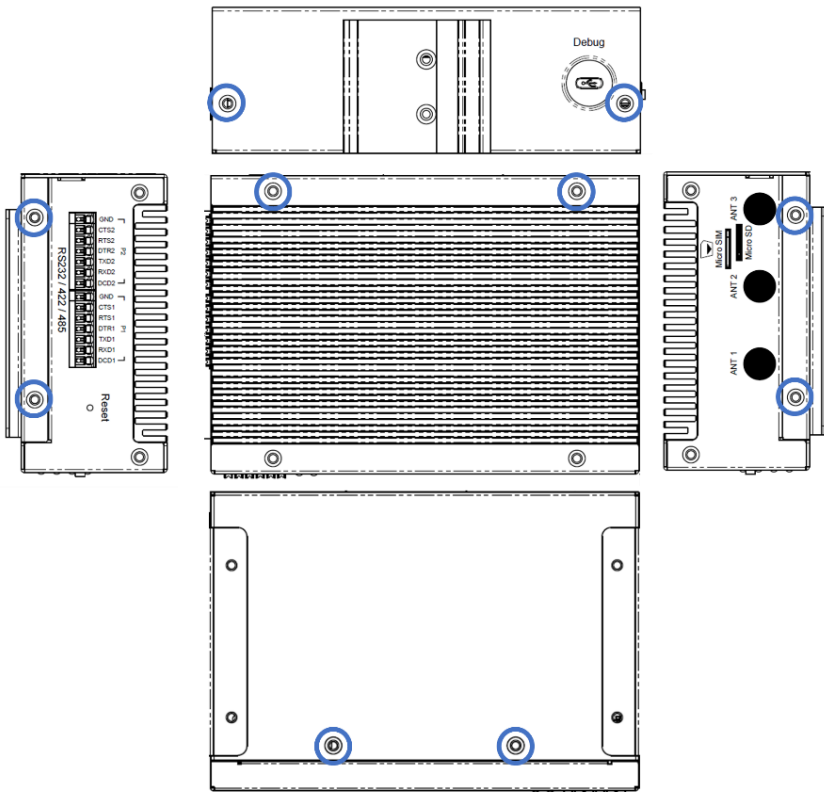
See chapter 3 for further information.

2.4 Wireless Hardware Setup

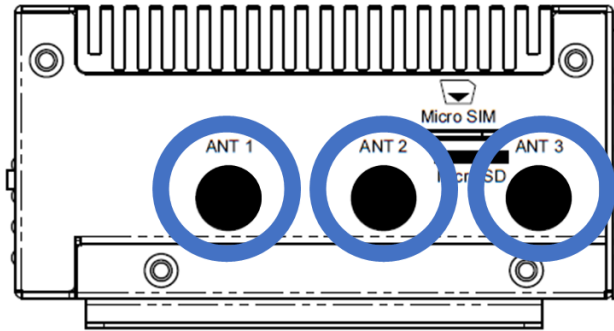
The SRG-IMX8P features both a SIM Card and Mini Card slot for connecting to wireless networks such as 4G/LTE, and Wi-Fi. This section details how to install a SIM Card, 4G/LTE module, and Wi-Fi module.

2.4.1 Mini Card Installation

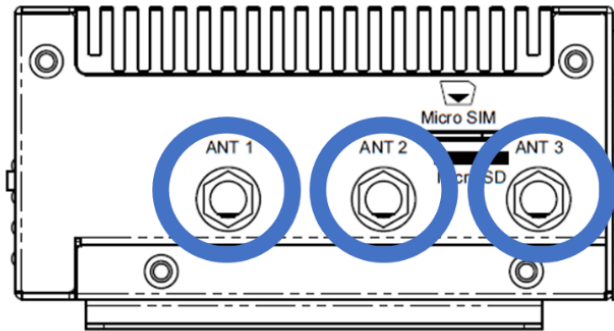
Step 1: Remove top cover by first removing the 10 screws securing the cover.



Step 2: Remove the plugs from the antenna holes:



Step 3: Install the RF coaxial cables on the antenna holes.


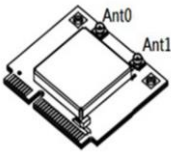




Step 4: Install Mini Card

Insert the 4G/LTE, or Wi-Fi/BT module into the slot and connect the RF coaxial cable to the module.

Note: The installation slots are the same as the photo.



Item	Module	Installation Location
Wi-Fi	 <p>WPET-236ACN(BT) FCC ID: R17A-WPET236ACNBT IC: 6158A-WPET236ACNBT MAC: 9906E978EBC3C S/N: 18A032000001 © 2016 WISEEYE</p> <p>WPET-236ACN(BT) module</p>	 <p>Install the RF cable to left conn. to support Wi-Fi signal. (ANT0 for WLAN only, ANT1 for WLAN+BT)</p>
4G/LTE	 <p>EG25-G module</p>	 <p>Install the RF cable to left conn. to support 4G/LTE signal.</p>

Step 5: Replace top cover and secure by fastening the top screws first, then the sides.

2.4.2 SIM Card Installation

To install a SIM Card (Micro SIM) simply insert the SIM Card into the slot on the side of the system as shown. Ensure the card is correctly oriented.



2.4.3 SD Card Installation

To install an SD Card simply insert it into the slot on the side of the system as shown. Ensure the card is correctly oriented.



Chapter 3

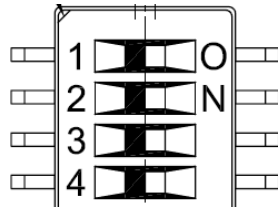
Gateway Setup and Configuration

3.1 Connecting to System

When connecting a PC or laptop to the SRG-IMX8P system, using PuTTY with Windows 10 is recommended. Users can download the software from the PuTTY website.

Step 1: Download the PuTTY tools: <https://www.putty.org/>.

Step 2: Switch jumper (SW3) to 0010. (Factory default settings).



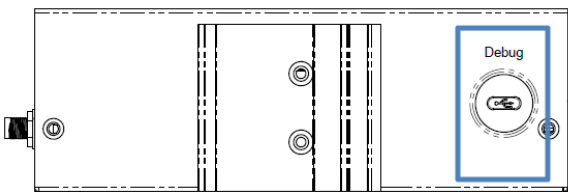
PIN 1, 2, 4: Switch to OFF.

PIN 3: Switch to ON.

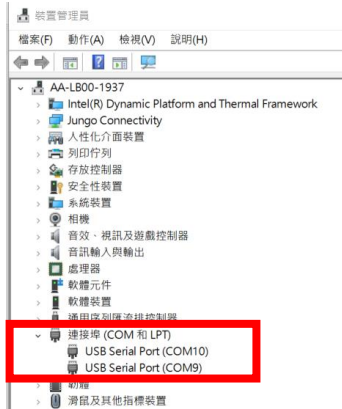
Step 3: Connect the gateway via a USB cable.

Connect your computer to the SRG-IMX8P using the micro USB port.

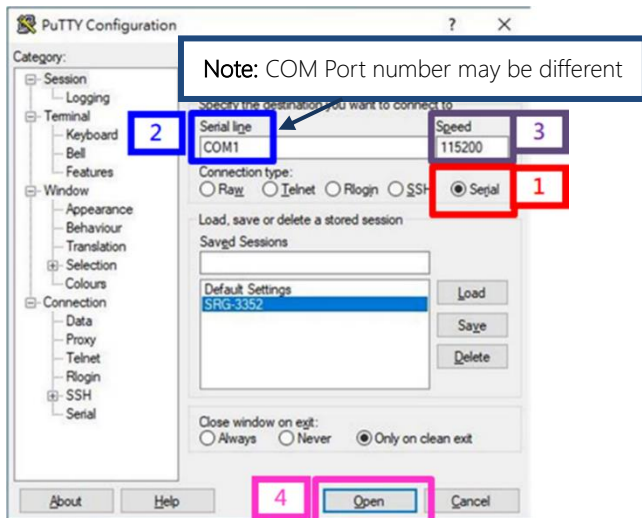
(Debug port is same side as din rail mounting holes), please see diagram below.



Step 4: Open Device Manager and locate Multifunction Composite Gadget. Double click on the device. A pop-up should appear, with a notice that the CDC Serial is unrecognized



Step 5: Open the PuTTY application. In the configuration menu, type in the COM port and type 115200 in the Speed column. Select "Serial" under the Connection Type heading, then click the Open button to run PuTTY..



3.2 User Account Management

This section will show you how to manage user accounts on this system.

3.2.1 To Add a User Account

Command Line:

```
$ sudo useradd USERACCOUNT
```

E.g. (USERACCOUNT : jonny)

```
$ sudo adduser jonny
```

When successful, output will display as below.

```
aaeon@imx8mm-bse:~$ sudo adduser jonny
[sudo] password for aaeon:
Adding user `jonny' ...
Adding new group `jonny' (1002) ...
Adding new user `jonny' (1002) with group `jonny' ...
Creating home directory `/home/jonny' ...
Copying files from `/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for jonny
Enter the new value, or press ENTER for the default
  Full Name []:
  Room Number []:
  Work Phone []:
  Home Phone []:
  Other []:
Is the information correct? [Y/n] y
```

3.2.2 To Delete a User Account

Command Line:

```
$ sudo userdel USERACCOUNT
```

E.g. (USERACCOUNT : jonny)

```
$ sudo userdel jonny
```

When successful, output will display as below.

```
aaeon@imx8mm-bse:~$ sudo userdel jonny  
[sudo] password for aaeon:
```

3.3 I/O Management

This section will show you how to operate the I/O function.

Control GPIO

Command:

```
gpioinfo: 85
```

Set GPIO direction:

E.g.

```
echo 85 > /sys/class/gpio/export  
echo "out" > /sys/class/gpio/gpio85/direction
```

Set GPIO ON:

E.g.

```
echo 1 > /sys/class/gpio/gpio85/value
```

Set GPIO OFF:

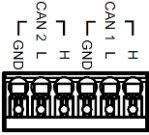
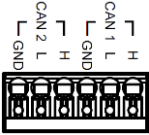
E.g.

```
echo 0 > /sys/class/gpio/gpio85/value
```

When successful, output will display as below.

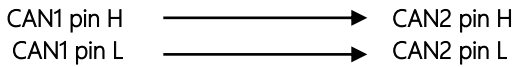
```
root@imx8mm-bse:~# echo 1 > /sys/class/gpio/gpio85/value  
root@imx8mm-bse:~# echo 0 > /sys/class/gpio/gpio85/value
```

3.4 CAN-FD Pin Definition

System Name	Position	Pin Definition	
		Pin	Definition
can0	 <p>CAN1</p>	1	H
		2	L
		3	GND
can1	 <p>CAN2</p>	1	H
		2	L
		3	GND

CAN Bus Read/Write

The two ports can be connected to each other, as below:



Command:



Run can bus script:

```
ifconfig can0 down  
ip link set can0 type can loopback off  
ip link set can0 type can bitrate 1000000 triple-sampling on  
  
ifconfig can1 down  
ip link set can1 type can loopback off  
ip link set can1 type can bitrate 1000000 triple-sampling on  
  
ifconfig can0 up  
ifconfig can1 up  
  
candump can0 &  
candump can1 &  
cansend can0 111#1122334455667788  
cansend can1 111#8877665544332211
```

When successful, output will display as below.

```
[ 2652.580273] IPv6: ADDRCONF(NETDEV_CHANGE): can0: link becomes ready  
[ 2652.603917] can: controller area network core  
[ 2652.608374] NET: Registered protocol family 29  
[ 2652.623926] can: raw protocol  
can0 111 [8] 11 22 33 44 55 66 77 88  
can1 111 [8] 11 22 33 44 55 66 77 88  
[ 2653.603356] IPv6: ADDRCONF(NETDEV_CHANGE): can1: link becomes ready  
can1 111 [8] 88 77 66 55 44 33 22 11  
can0 111 [8] 88 77 66 55 44 33 22 11
```

3.5 Pin Definition: RS-232/422/485 x 2

System Name	Position	RS232		RS422		RS485	
		Pin	Definition	Pin	Definition	Pin	Definition
/dev/tty xc0	 COM P1 (CN4)	1	-	1	DCD1	1	DCD1
		2	RXD1	2	RXD1	2	RXD1
		3	TXD1	3	TXD1	3	-
		4	-	4	DTR1	4	-
		5	-	5	-	5	-
		6	-	6	-	6	-
		7	GND	7	GND	7	GND
/dev/tty xc2	 COM P2 (CN5)	1	-	1	DCD2	1	DCD2
		2	RXD2	2	RXD2	2	RXD2
		3	TXD2	3	TXD2	3	-
		4	-	4	DTR2	4	-
		5	-	5	-	5	-
		6	-	6	-	6	-
		7	GND	7	GND	7	GND

Check/Switch RS-232/422/485 Mode

Command:

Check Current Mode:

COM P1 (CN4):

Mode 0 = GPIO85 signal inversion					
Mode 1 = GPIO86 signal inversion					
Switch Function	Mode 0	Mode 1	GPIO85	GPIO86	Function
Signal (High / Low)	1	0	0	1	RS232
Signal (High / Low)	0	1	1	0	RS485
Signal (High / Low)	1	1	0	0	RS485/RS422

COM P2 (CN5):

Mode 0 = GPIO87 signal inversion					
Mode 1 = GPIO12 signal inversion					
Switch Function	Mode 0	Mode 1	GPIO87	GPIO12	Function
Signal (High / Low)	1	0	0	1	RS232
Signal (High / Low)	0	1	1	0	RS485
Signal (High / Low)	1	1	0	0	RS485/RS422

RS232 mode GPIO control:

```

echo 0 > /sys/class/gpio/gpio85/value
echo 1 > /sys/class/gpio/gpio86/value
echo 0 > /sys/class/gpio/gpio87/value
echo 1 > /sys/class/gpio/gpio12/value

```

RS485 mode GPIO control:

```

echo 1 > /sys/class/gpio/gpio85/value
echo 0 > /sys/class/gpio/gpio86/value
echo 1 > /sys/class/gpio/gpio87/value
echo 0 > /sys/class/gpio/gpio12/value

```

RS422 mode GPIO control:

```

echo 0 > /sys/class/gpio/gpio85/value
echo 0 > /sys/class/gpio/gpio86/value
echo 0 > /sys/class/gpio/gpio87/value
echo 0 > /sys/class/gpio/gpio12/value

```

3.6 Network Settings



This section will show you how to check and setup the network settings.

3.6.1 Check the IP Setting

Command:

```
$ nmcli dev sh
```

NETWORKPROFILE ->It should be:

Profile	Support Hardware
LAN1	LAN 1 
LAN0	LAN 2 
Modem	4G LTE module

When successful, output will display as below.

```
root@imx8mm-bse:~# nmcli dev sh
GENERAL.DEVICE:                eth0
GENERAL.TYPE:                  ethernet
GENERAL.HWADDR:                A2:A6:69:56:C8:57
GENERAL.MTU:                   1500
GENERAL.STATE:                 100 (connected)
GENERAL.CONNECTION:           Wired connection 1
GENERAL.CON-PATH:              /org/freedesktop/NetworkManager/ActiveCo
WIRED-PROPERTIES.CARRIER:    on
IP4.ADDRESS[1]:               172.16.20.89/24
IP4.GATEWAY:                   172.16.20.254
IP4.ROUTE[1]:                 dst = 0.0.0.0/0, nh = 172.16.20.254, mt
IP4.ROUTE[2]:                 dst = 172.16.20.0/24, nh = 0.0.0.0, mt =
IP4.DNS[1]:                   172.16.1.2
IP4.DNS[2]:                   172.16.1.7
IP4.DOMAIN[1]:                aaeon.com.tw
IP6.ADDRESS[1]:               fe80::9cdb:d1fe:e066:38b0/64
IP6.GATEWAY:                   --
IP6.ROUTE[1]:                 dst = fe80::/64, nh = ::, mt = 100
IP6.ROUTE[2]:                 dst = ff00::/8, nh = ::, mt = 256

GENERAL.DEVICE:                eth1
GENERAL.TYPE:                  ethernet
GENERAL.HWADDR:                E2:B0:B8:09:41:1B
GENERAL.MTU:                   1500
GENERAL.STATE:                 100 (connected)
GENERAL.CONNECTION:           Wired connection 2
GENERAL.CON-PATH:              /org/freedesktop/NetworkManager/ActiveCo
WIRED-PROPERTIES.CARRIER:    on
IP4.ADDRESS[1]:               172.16.20.135/24
IP4.GATEWAY:                   172.16.20.254
IP4.ROUTE[1]:                 dst = 0.0.0.0/0, nh = 172.16.20.254, mt
IP4.ROUTE[2]:                 dst = 172.16.20.0/24, nh = 0.0.0.0, mt =
IP4.DNS[1]:                   172.16.1.2
IP4.DNS[2]:                   172.16.1.7
IP4.DOMAIN[1]:                aaeon.com.tw
IP6.ADDRESS[1]:               fe80::67c5:891d:f9c3:3afe/64
IP6.GATEWAY:                   --
IP6.ROUTE[1]:                 dst = fe80::/64, nh = ::, mt = 101
IP6.ROUTE[2]:                 dst = ff00::/8, nh = ::, mt = 256
```

3.6.2 Set the Static IP

Enter edit mode.

Command:

```
$ sudo nmcli connection add con-name eth0 type ethernet ifname eth0 ip4
```

```
192.16.12.21/24
```

```
$ sudo nmcli connection up eth0
```

```
$ sudo nmcli connection add con-name eth1 type ethernet ifname eth1 ip4
```

```
192.16.12.26/24
```

```
$ sudo nmcli connection up eth1
```

```
$ sudo nmcli dev sh
```

When successful, output will display as below.

```
aaeon@imx8mm-bse:~$ sudo nmcli dev sh
GENERAL.DEVICE:          eth0
GENERAL.TYPE:            ethernet
GENERAL.HWADDR:         A2:A6:69:56:C8:57
GENERAL.MTU:             1500
GENERAL.STATE:           100 (connected)
GENERAL.CONNECTION:     eth0
GENERAL.CON-PATH:       /org/freedesktop/NetworkManager/ActiveCo
WIRED-PROPERTIES.CARRIER: on
IP4.ADDRESS[1]:         192.16.12.21/24
IP4.GATEWAY:            --
IP4.ROUTE[1]:           dst = 192.16.12.0/24, nh = 0.0.0.0, mt =
IP6.ADDRESS[1]:         fe80::3be8:3be:2621:a4d1/64
IP6.GATEWAY:            --
IP6.ROUTE[1]:           dst = fe80::/64, nh = ::, mt = 101
IP6.ROUTE[2]:           dst = ff00::/8, nh = ::, mt = 256

GENERAL.DEVICE:          eth1
GENERAL.TYPE:            ethernet
GENERAL.HWADDR:         E2:B0:B8:09:41:1B
GENERAL.MTU:             1500
GENERAL.STATE:           100 (connected)
GENERAL.CONNECTION:     eth1
GENERAL.CON-PATH:       /org/freedesktop/NetworkManager/ActiveCo
WIRED-PROPERTIES.CARRIER: on
IP4.ADDRESS[1]:         192.16.12.26/24
IP4.GATEWAY:            --
IP4.ROUTE[1]:           dst = 192.16.12.0/24, nh = 0.0.0.0, mt =
IP6.ADDRESS[1]:         fe80::642f:d114:39c6:330c/64
IP6.GATEWAY:            --
IP6.ROUTE[1]:           dst = fe80::/64, nh = ::, mt = 102
IP6.ROUTE[2]:           dst = ff00::/8, nh = ::, mt = 256
```

3.6.3 Set the Dynamic IP

Enter edit mode:

Command:

```
$ sudo nmcli connection mod eth0 ipv4.method auto
```

```
$ sudo nmcli con mod eth0 -ipv4.addresses "192.16.12.21/24"
```

```
$ sudo nmcli connection up eth0
```

```
$ sudo nmcli connection mod eth1 ipv4.method auto
```

```
$ sudo nmcli con mod eth1 -ipv4.addresses "192.16.12.26/24"
```

```
$ sudo nmcli connection up eth1
```

```
$ sudo nmcli dev sh
```

When successful, output will display as below.

```
aaeon@imx8mm-bse:~$ sudo nmcli dev sh
GENERAL.DEVICE:                eth0
GENERAL.TYPE:                  ethernet
GENERAL.HWADDR:                A2:A6:69:56:C8:57
GENERAL.MTU:                   1500
GENERAL.STATE:                 100 (connected)
GENERAL.CONNECTION:           eth0
GENERAL.CON-PATH:              /org/freedesktop/NetworkManager/ActiveCo
WIRED-PROPERTIES.CARRIER:    on
IP4.ADDRESS[1]:                172.16.20.74/24
IP4.GATEWAY:                   172.16.20.254
IP4.ROUTE[1]:                 dst = 0.0.0.0/0, nh = 172.16.20.254, mt
IP4.ROUTE[2]:                 dst = 172.16.20.0/24, nh = 0.0.0.0, mt =
IP4.DNS[1]:                   172.16.1.2
IP4.DNS[2]:                   172.16.1.7
IP4.DOMAIN[1]:                aaeon.com.tw
IP6.ADDRESS[1]:               fe80::3be8:3be:2621:a4d1/64
IP6.GATEWAY:                   --
IP6.ROUTE[1]:                 dst = fe80::/64, nh = ::, mt = 103
IP6.ROUTE[2]:                 dst = ff00::/8, nh = ::, mt = 256

GENERAL.DEVICE:                eth1
GENERAL.TYPE:                  ethernet
GENERAL.HWADDR:                E2:B0:B8:09:41:1B
GENERAL.MTU:                   1500
GENERAL.STATE:                 100 (connected)
GENERAL.CONNECTION:           eth1
GENERAL.CON-PATH:              /org/freedesktop/NetworkManager/ActiveCo
WIRED-PROPERTIES.CARRIER:    on
IP4.ADDRESS[1]:                172.16.20.135/24
IP4.GATEWAY:                   172.16.20.254
IP4.ROUTE[1]:                 dst = 0.0.0.0/0, nh = 172.16.20.254, mt
IP4.ROUTE[2]:                 dst = 172.16.20.0/24, nh = 0.0.0.0, mt =
IP4.DNS[1]:                   172.16.1.2
IP4.DNS[2]:                   172.16.1.7
IP4.DOMAIN[1]:                aaeon.com.tw
IP6.ADDRESS[1]:               fe80::642f:d114:39c6:330c/64
IP6.GATEWAY:                   --
IP6.ROUTE[1]:                 dst = fe80::/64, nh = ::, mt = 104
IP6.ROUTE[2]:                 dst = ff00::/8, nh = ::, mt = 256
```

3.7 Cellular Network Settings (Optional)

This section will show you how to check and setup the cellular network setting.

3.7.1 Check the Cellular Module Status

Step 1: Leave Command:

```
$ apt-get install minicom
```

Then press 'Y'.

When successful, output will display as below.

```
root@imx8mm-bse:~# apt-get install minicom
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  lrzsz
The following NEW packages will be installed:
  lrzsz minicom
0 upgraded, 2 newly installed, 0 to remove and 448 not upgraded.
Need to get 365 kB of archives.
After this operation, 1.577 kB of additional disk space will be used.
Do you want to continue? [Y/n] Y
Get:2 https://deb.debian.org/debian bullseye/main arm64 lrzsz arm64 0.12.21-10 [83.5 kB]
Get:3 https://deb.debian.org/debian bullseye/main arm64 minicom arm64 2.8-2 [281 kB]
Fetched 365 kB in 2s (167 kB/s)
Selecting previously unselected package lrzsz.
(Reading database ... 38654 files and directories currently installed.)
Preparing to unpack .../lrzsz_0.12.21-10_arm64.deb ...
Unpacking lrzsz (0.12.21-10) ...
Selecting previously unselected package minicom.
Preparing to unpack .../minicom_2.8-2_arm64.deb ...
Unpacking minicom (2.8-2) ...
Setting up minicom (2.8-2) ...
Setting up lrzsz (0.12.21-10) ...
Processing triggers for mime-support (3.62) ...
root@imx8mm-bse:~#
```

Step 2: Leave Command:

```
$ minicom -s
```

When successful, output will display as below.

```
root@imx8mm-bse:~# minicom -s
```

Step 3: Choose “Serial port setup”, then press “A” to settings.

```
+-----[configuration]-----+
| Filenames and paths
| File transfer protocols
| Serial port setup
| Modem and dialing
| Screen and keyboard
| Save setup as dfl
| Save setup as..
| Exit
| Exit from Minicom
+-----+
```

Step 4: Leave Command:

```
$ /dev/ttyUSB3
```

Finish setting configuration, then press “Enter”, as below.

```
+-----+
| A - Serial Device      : /dev/ttyUSB3
| B - Lockfile Location : /var/lock
| C - Callin Program    :
| D - Callout Program   :
| E - Bps/Par/Bits      : 115200 8N1
| F - Hardware Flow Control : Yes
| G - Software Flow Control : No
| H - RS485 Enable      : No
| I - RS485 Rts On Send  : No
| J - RS485 Rts After Send : No
| K - RS485 Rx During Tx  : No
| L - RS485 Terminate Bus : No
| M - RS485 Delay Rts Before: 0
| N - RS485 Delay Rts After : 0
|
| Change which setting? █
+-----+
```

Step 5: Choose “Exit” to leave the dialog.

```
+-----[configuration]-----+
| Filenames and paths
| File transfer protocols
| Serial port setup
| Modem and dialing
| Screen and keyboard
| Save setup as dfl
| Save setup as..
| Exit
| Exit from Minicom
+-----+
```

3.7.2 Check Module Information in Minicom

Check if module is connected to the serial port:

Command:

```
$ AT
```

Check the SIM card status:

Command:

```
$ AT+CPIN?
```

Check module manufacturer information:

Command:

```
$ ATI
```

Check setting APN:

Command:

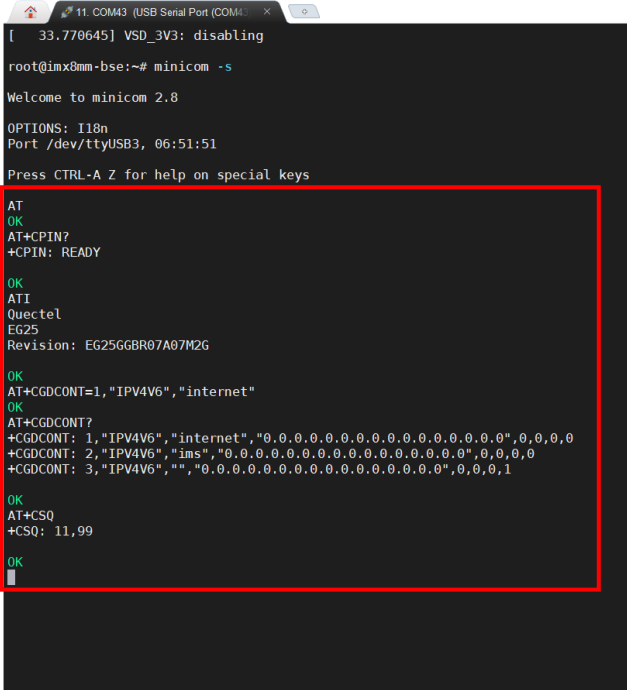
```
$ AT+CGDCONT=1,"IPV4V6","internet"
```

Check 4G signal quality:

Command:

```
$ AT+CGDCONT?  
$ AT+CSQ
```

When successful, output will display as below.

A screenshot of a terminal window titled "11. COM43 (USB Serial Port (COM43))". The terminal shows the execution of the "minicom -s" command. The output includes the minicom version (2.8), options (I18n), port information (/dev/ttyUSB3, 06:51:51), and a prompt to press CTRL-A Z for help. A red rectangular box highlights the AT command sequence and its output. The AT command sequence includes: "AT", "AT+CPIN?", "+CPIN: READY", "AT+CGDCONT=1,\"IPV4V6\",\"internet\"", "AT+CGDCONT?", "+CGDCONT: 1,\"IPV4V6\",\"internet\", \"0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0\",0,0,0,0", "+CGDCONT: 2,\"IPV4V6\", \"ims\", \"0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0\",0,0,0,0", "+CGDCONT: 3,\"IPV4V6\", \"\", \"0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0\",0,0,0,1", "AT+CSQ", "+CSQ: 11,99", and "OK".

```
[ 33.770645] VSD_3V3: disabling
root@imx8mm-bse:~# minicom -s
Welcome to minicom 2.8

OPTIONS: I18n
Port /dev/ttyUSB3, 06:51:51

Press CTRL-A Z for help on special keys

AT
OK
AT+CPIN?
+CPIN: READY

OK
ATI
Quectel
EG25
Revision: EG25GGBR07A07M2G

OK
AT+CGDCONT=1,"IPV4V6","internet"
OK
AT+CGDCONT?
+CGDCONT: 1,"IPV4V6","internet", "0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0,0,0
+CGDCONT: 2,"IPV4V6","ims", "0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0,0,0
+CGDCONT: 3,"IPV4V6","", "0.0.0.0.0.0.0.0.0.0.0.0.0.0.0.0",0,0,0,1

OK
AT+CSQ
+CSQ: 11,99

OK
```


3.7.2.1 Leave Minicom

Step 1: Press "Ctrl +A".

```
Minicom Command Summary
Commands can be called by CTRL-A <key>

Main Functions          Other Functions
Dialing directory..D  run script (Go)...G  Clear Screen.....C
Send files.....S     Receive files....R   cOnfigure Minicom..O
comm Parameters...P  Add linefeed....A   Suspend minicom...J
Capture on/off....L  Hangup.....H        eXit and reset...X
send break.....F    initialize Modem..M  Quit with no reset.Q
Terminal settings..T  run Kermit.....K    Cursor key mode...I
lineWrap on/off...W  local Echo on/off..E  Help screen.....Z
Paste file.....Y     Timestamp toggle..N  scroll Back.....B
Add Carriage Ret...U

Select function or press Enter for none.
```

Step 2: Press "X".

Step 3: Choose "Yes" then select "Enter" to leave Minicom.

```
+-----+
|               |
|   Leave Minicom?   |
|   Yes           No  |
|               |
+-----+
```

3.7.3 Dial-up Cellular Module

Check the cellular module status

Command:

```
$ sudo su  
# systemctl enable ModemManager  
# sudo systemctl start ModemManager  
# mmcli --list-modems
```

```
aaeon@imx8mm-bse:~$ mmcli --list-modems  
/org/freedesktop/ModemManager1/Modem/0 [Quectel] EG25
```

```
# mmcli -m 0
```

Result:

```
root@imx8mm-bse:~# mmcli -m 0  
-----  
General |  
| dbus path: /org/freedesktop/ModemManager1/Modem/0  
| device id: 85626768ea2df08fe57226507d2240c5c1b3aad7  
-----  
Hardware |  
| manufacturer: Quectel  
| model: EG25  
| firmware revision: EG25G68B07A07M2G  
| supported: gsm-umts, lte  
| current: gsm-umts, lte  
| equipment id: 86769042645385  
-----  
System |  
| device: /sys/devices/platform/soc80/32f10100.usb/38100000.dwc3/xhci-hcd.1.auto/usb1/1-1/1-1.3  
| drivers: option1, qmi_wwan_q  
| plugins: quectel  
| primary port: ttyUSB2  
| ports: ttyUSB0 (qcdm), ttyUSB1 (gps), ttyUSB2 (at), ttyUSB3 (at)  
-----  
Status |  
| unlock retries: sim-pin (3), sim-pin2 (3), sim-puk (10), sim-puk2 (10)  
| state: registered  
| power state: on  
| access tech: lte  
| signal quality: 60% (recent)  
-----  
Modes |  
| supported: allowed: 2g, 3g, 4g; preferred: none  
| current: allowed: 2g, 3g, 4g; preferred: none  
-----  
IP |  
| supported: ipv4, ipv6, ipv4v6  
-----  
3GPP |  
| imei: 86769042645385  
| operator id: 46692  
| operator name: Changhua Telecom  
| registration: home  
-----  
3GPP EPS | use mode of operation: csps-2  
-----  
SIM |  
| dbus path: /org/freedesktop/ModemManager1/SIM/0
```

Cellular module will show “register” status when module is ready.

Enable the cellular module

Command:

```
# mmcli -m 0 -e
```

Result:

```
root@imx8mm-bse:~# mmcli -m 0 -e
successfully enabled the modem
```

Dial up the cellular module

Command:

```
# nmcli -a
```

```
root@imx8mm-bse:~# nmcli -a
ttyUSB2: disconnected
"Quectel EG25-G"
gsm (option1, qmi_wwan_q), hw
```

```
# nmcli c add con-name test type gsm ifname ttyUSB2 apn internet
```

Result:

```
root@imx8mm-bse:~# nmcli c add con-name test type gsm ifname ttyUSB2 apn internet
Connection 'test' (0017d5f2-bddb-41ab-b530-d15cedf896bc) successfully added.
```

Check the cellular module connection:

Command:

```
# ifconfig
```

Result:

```
ppp0: flags=4305<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST> mtu 1500
    inet 10.69.247.28 netmask 255.255.255.255 destination 10.64.64.64
    ppp txqueuelen 3 (Point-to-Point Protocol)
    RX packets 133 bytes 10296 (10.0 KiB)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 136 bytes 9626 (9.4 KiB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

```
# ping 8.8.8.8
```

```
root@imx8mm-bse:~# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data:
64 bytes from 8.8.8.8: icmp_seq=1 ttl=55 time=51.7 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=55 time=77.1 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=55 time=34.1 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=55 time=146 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=55 time=44.5 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=55 time=42.3 ms
```

3.8 Wi-Fi Network Settings (Optional)

This section will show you how to check and setup the wireless network like Wi-Fi.

3.8.1 Scan Wi-Fi Access Point

Command:

```
# depmod -a 5.10.9-1.0.0+g32513c25d8c7
# modprobe 88x2bu
# nmcli radio wifi on
# nmcli dev wifi list
```

Result:

```
root@imx8mm-bse:~# nmcli dev wifi list
IN-USE  SSID      MODE   CHAN  RATE          SIGNAL  BARS  SECURITY
*       ABC       Infra  11   130 Mbit/s    4       _____  WPA2
       Aaeon-IOT Infra   5    270 Mbit/s    0       _____  WPA2
```

3.8.2 Connect Wi-Fi Access Point

Command:

```
# nmcli dev wifi connect 'SSID' password 'PASSWORD'
```

E.g.

```
# nmcli dev wifi connect 'ABC' password '12345678'
```

SSID->Which you want to connect

PASSWORD->Password for the chosen SSID

Result:

```
root@imx8mm-bse:~# nmcli dev wifi connect 'ABC' password '12345678'
[ 540.617680] start_addr=(0x20000), end_addr=(0x40000), buffer_size=(0x20000), smp_number_max=(16384)
[ 551.627441] start_addr=(0x20000), end_addr=(0x40000), buffer_size=(0x20000), smp_number_max=(16384)
[ 558.717225] IPv6: ADDRCONF (NETDEV_CHANGE): wlan0: link becomes ready
Device 'wlan0' successfully activated with '72039d20-705d-497d-bfdb-73f036a0fe53'.
```

```
nmcli connect show --active
```

Result:

```
root@imx8mm-bse:~# nmcli connect show --active
NAME  UUID                                TYPE  DEVICE
ABC   72039d20-705d-497d-bfdb-73f036a0fe53  wifi  wlan0
```

3.8.3 Check Wi-Fi signal

Command:

```
# ping 8.8.8.8
```

Result:

```
root@imx8mm-bse:~# ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=54 time=551 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=54 time=64.1 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=54 time=31.1 ms
```

3.8.4 Disconnect Wi-Fi Access Point

Command:

```
# sudo nmcli con down id 'SSID'
```

E.g.

```
# sudo nmcli con down id 'ABC'
```

SSID->Which you want to disconnect

Result:

```
root@imx8mm-bse:~# sudo nmcli con down id 'ABC'
Connection 'ABC' successfully deactivated (D-Bus active path: /org/freedesktop/NetworkManager/ActiveConnection/1)
```

3.8.5 Check Wi-Fi Connection Status

Command:

```
# nmcli connect show --active
```

Result:

The disconnected Wi-Fi status is shown in the picture as below:

```
root@imx8mm-bse:~# nmcli connect show --active
```

```
# nmcli dev
```

Result:

```
root@imx8mm-bse:~# nmcli dev
DEVICE  TYPE          STATE           CONNECTION
wlan0   wifi          disconnected     --
eth0    ethernet     unavailable     --
eth1    ethernet     unavailable     --
can0    can           unmanaged      --
can1    can           unmanaged      --
lo      loopback     unmanaged      --
```

3.9 System Management

This section will show you how to check and setup system settings such as the OS version, RTC, etc.

3.9.1 Check OS version

Command:

```
$ cat /etc/os-release
```

Result:

```
imx8mm-bse login: root
Password:
Last login: Fri Jul 22 06:16:47 UTC 2022 on ttyxc1
Linux imx8mm-bse 5.10.9-1.0.0+g32513c25d8c7 #1 SMP PREEMPT Tue Mar 9 02:17:18 UT
C 2021 aarch64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
root@imx8mm-bse:~# cat /etc/os-release
PRETTY_NAME="Debian GNU/Linux 10 (buster)"
NAME="Debian GNU/Linux"
VERSION_ID="10"
VERSION="10 (buster)"
VERSION_CODENAME=buster
ID=debian
HOME_URL="https://www.debian.org/"
SUPPORT_URL="https://www.debian.org/support"
BUG_REPORT_URL="https://bugs.debian.org/"
IMAGE_VERSION="V3"
```

3.9.2 Check the Storage Status

Command:

```
$df -h
```

Result:

```
root@imx8mm-bse:~# df -h
Filesystem      Size  Used Avail Use% Mounted on
/dev/root        3.4G  2.5G  683M  79% /
devtmpfs        942M   0  942M   0% /dev
tmpfs           960M   0  960M   0% /dev/shm
tmpfs           384M  1.5M  383M   1% /run
tmpfs           5.0M  8.0K  5.0M   1% /run/lock
tmpfs           4.0M   0  4.0M   0% /sys/fs/cgroup
tmpfs           192M   0  192M   0% /run/user/0
```

3.9.3 Shutdown the System

Command:

```
$sudo shutdown now
```

Result:

```
aaeon@imx8mm-bse:~$ sudo shutdown now
[sudo] password for aaeon:
Stopping Session 3 of user aaeon.
[ OK ] Removed slice system-modprobe.slice.
[ OK ] Stopped target Graphical Interface.
[ OK ] Stopped target Multi-User System.
[ OK ] Stopped target Login Prompts.
[ OK ] Stopped target RPC Port Mapper.
[ OK ] Stopped target Sound Card.
[ OK ] Stopped target Timers.
```


3.9.4 Date and Time Settings

3.9.4.1 Check the Current Date and Time

Command:

```
$ hwclock
```

Result:

```
root@imx8mm-bse:/rootfs/test# sudo su
root@imx8mm-bse:/rootfs/test# date -s "20220329 16:13:00"; hwclock -w
Tue 29 Mar 2022 04:13:00 PM UTC
root@imx8mm-bse:/rootfs/test# hwclock
2022-03-29 16:13:14.880132+00:00
root@imx8mm-bse:/rootfs/test# █
```

3.9.4.2 Set a New Date and Time

Command:

```
$ date -s "YYYYMMDD hh:mm:ss"; hwclock -w
```

E.g.

```
$ date -s "20220803 15:30:00"; hwclock -w
YYYY->Year
MM->Month
DD->Date
hh->Hour
mm->Minute
ss->Second
```

Result:

```
root@imx8mm-bse:~# date -s "20220803 15:30:00"; hwclock -w
Wed 03 Aug 2022 03:30:00 PM UTC
root@imx8mm-bse:~# timedatectl
    Local time: Wed 2022-08-03 15:30:42 UTC
    Universal time: Wed 2022-08-03 15:30:42 UTC
    RTC time: Wed 2022-08-03 15:30:42
    Time zone: Etc/UTC (UTC, +0000)
System clock synchronized: no
    NTP service: inactive
    RTC in local TZ: no
root@imx8mm-bse:~# hwclock
2022-08-03 15:30:57.196674+00:00
```