SRT-IMX8P

Gateway & Expansion Board

User's Manual 1st Ed

Copyright Notice

Acknowledgment

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Packing List

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

Item	Quantity
● SRT-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 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
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.

FCC Statement

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.

China RoHS Requirements (CN)

产品中有毒有害物质或元素名称及含量

AAEON Main Board/ Daughter Board/ Backplane

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	X	X	O	O	O	O
外部信号连接器及线材	X	X	O	O	O	O

O：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 SJ/T 11363-2006 标准规定的限量要求以下。

X：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T 11363-2006 标准规定的限量要求。

备注：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。

China RoHS Requirement (EN)

Poisonous or Hazardous Substances or Elements in Products

AAEON Main Board/ Daughter Board/ Backplane

Component	Poisonous or Hazardous Substances or Elements					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated Biphenyls (PBB)	Polybrominated Diphenyl Ethers (PBDE)
PCB & Other Components	X	X	O	O	O	O
Wires & Connectors for External Connections	X	X	O	O	O	O

O： The quantity of poisonous or hazardous substances or elements found in each of the component's parts is below the SJ/T 11363-2006-stipulated requirement.

X: The quantity of poisonous or hazardous substances or elements found in at least one of the component's parts is beyond the SJ/T 11363-2006-stipulated requirement.

Note: The Environment Friendly Use Period as labeled on this product is applicable under normal usage only

Table of Contents

Chapter 1

Product Specifications

1.1 Specifications

System	
Processor	Arm® NXP i.MX8M Plus Quad-Core Cortex®-A53 1.6GHz Processor (NPU Optional)
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)
Wi-Fi & Bluetooth	Mini PCIe Connector x 1 (USB signal)
Operating System	Debian® 10
Support Protocol	—

I/O	
Serial Port	RS-232/422/485 Switchable x 2, Phoenix Connector
Ethernet	Gigabit Ethernet x 2 (RJ-45)
USB	USB 3.0 x 2 (Type-A)
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 MicroSD Slot x 1
Other Interfaces	—

Power Supply

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

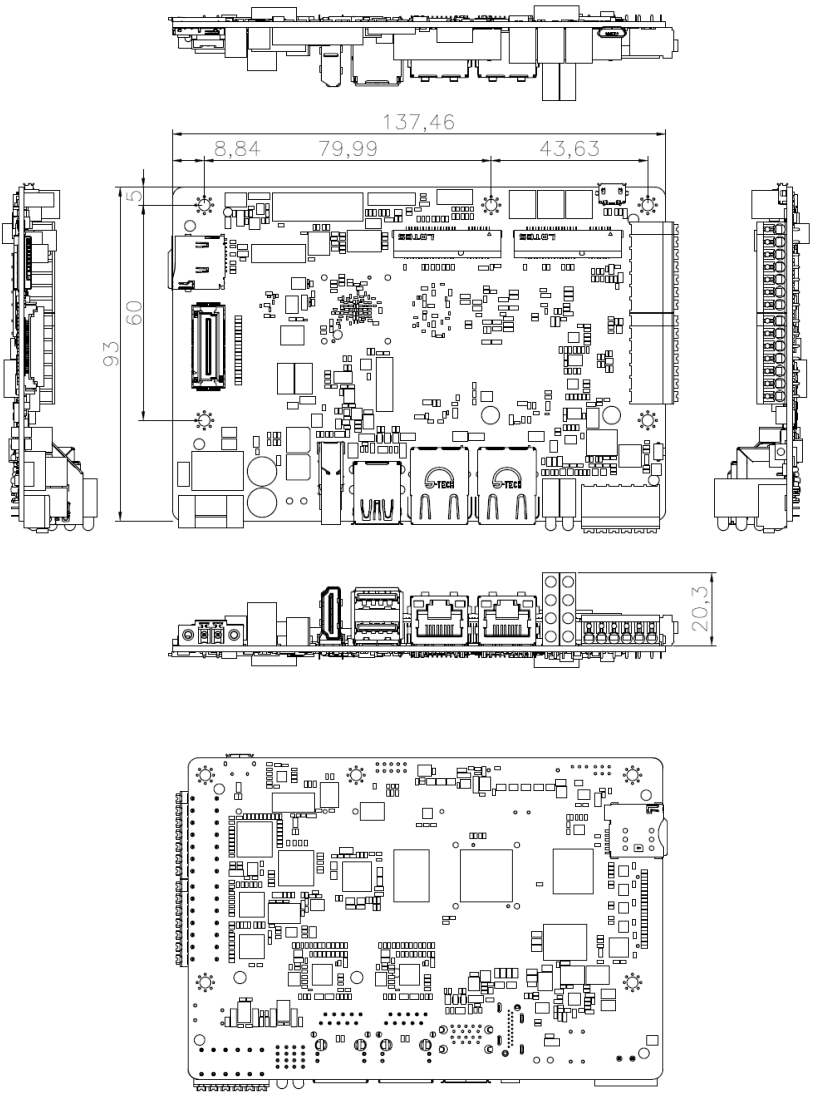
Environmental

Dimension	3.66" x 5.43" (93mm x 138mm)
Weight	0.7 lb. (0.35 Kg)
Mount Options	—
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	CE/FCC

Chapter 2

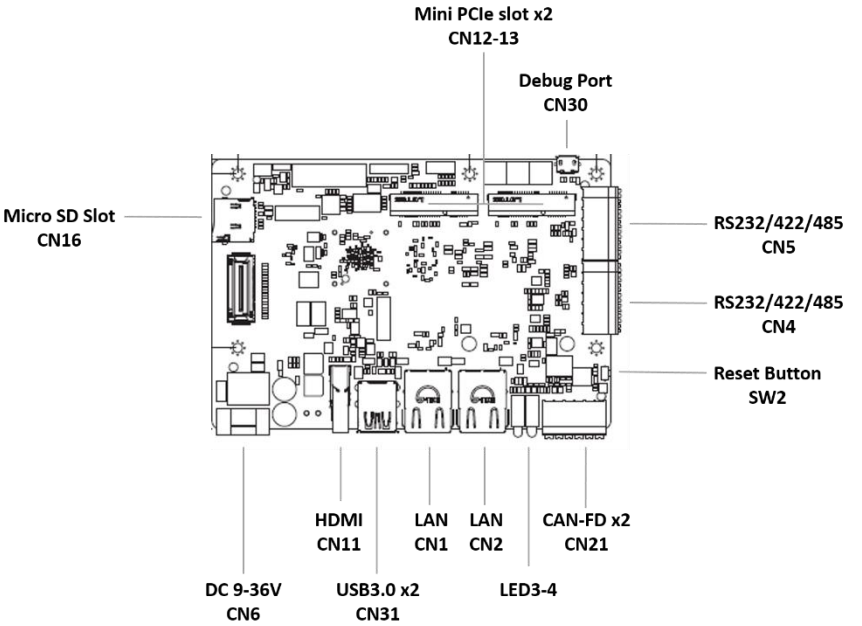
Hardware Information

2.1 Dimensions

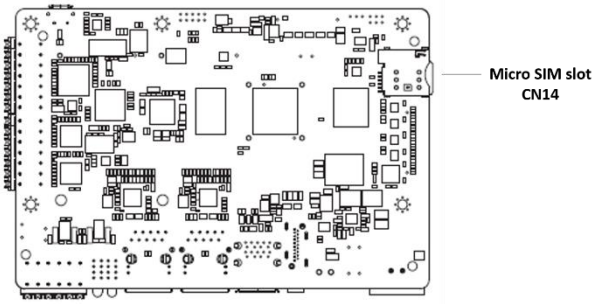


2.2 I/O Location

Top



Bottom

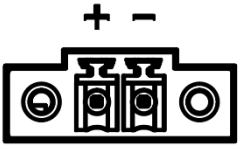


2.3 List of Connectors

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

Label	Function
CN6	DC 9-36V Power
CN11	HDMI Port
CN31	USB 3.0 Port
CN1/2	Giga LAN Port
LED3/4	Indicators Light
CN21	CAN-FD Port
SW2	Reset Button
CN4/5	RS-232/422/485 Port
CN14	Micro SIM Slot
CN16	Micro SD Slot
CN12/13	Mini PCIe Slot
CN30	Debug Port

2.3.1 DC Power (CN6)



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

Note: Input connector should be secured by 18-24mm AWG wire and torque value of 2kg lb.-in.

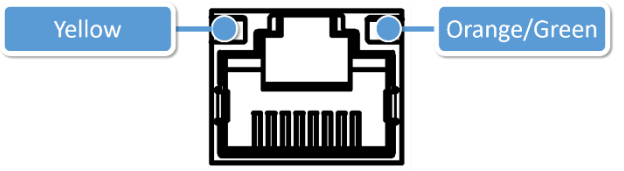
2.3.2 HDMI Port (CN11)

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

2.3.3 USB 3.0 Port (CN31)

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

2.3.4 Giga LAN Port (CN1/CN2)



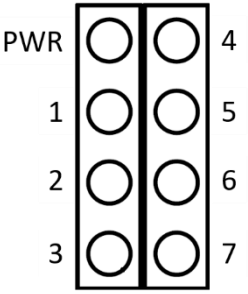
The standard RJ-45 LAN Jack provides connection to the Local Area Network (LAN).

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 (LED3/LED4)

User can control the 7 LED via the GPIO.

The control command for LED 1:

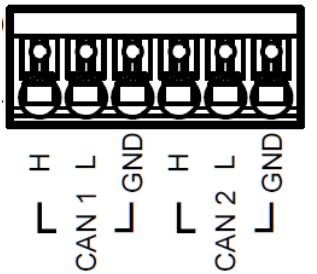


Control Command	
Turn On	m0cli -c 0 -i 1 -v 1
Turn Off	m0cli -c 0 -i 1 -v 0

Note: i: LED number.

2.3.6 CAN-FD Port (CN21)

Provides two phoenix CANbus ports for external device connection.



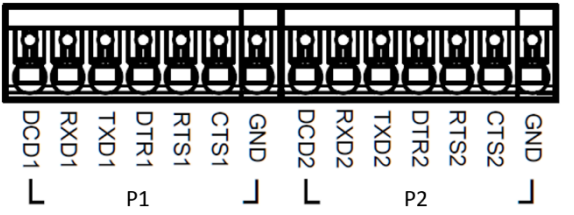
Check Chapter 3 for more information.

2.3.7 Reset Button (SW2)

Press the button to reboot the OS.

2.3.8 RS-232/422/485 Port (CN4/CN5)

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



Check chapter 3 for more information.

2.3.9 Micro SIM Slot (CN14)

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

2.3.10 MicroSD Slot (CN16)

User can increase the available storage by insert the microSD card.

2.3.11 Mini PCIe slot (CN12/CN13)

The two slots support Wi-Fi or 4G LTE modules.

2.3.12 Debug Port (CN30)

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

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

See Chapter 3 for further information.

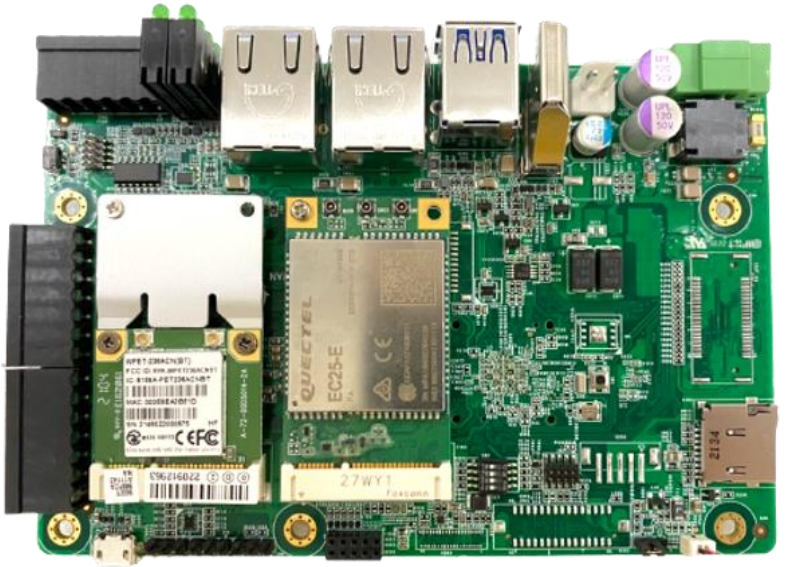
2.4 Wireless Hardware Setup

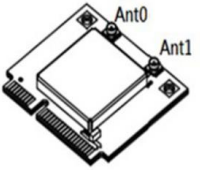
SRT-IMX8P features mini PCIe slots and a Micro SIM card slot for connecting to wireless networks such as 4G LTE and WiFi. This section details how to install a SIM Card, 4G/LTE module, and WiFi module.

2.4.1 Mini Card Installation

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 below image.



Item	Module	Installation Location
Wi-Fi	 WPET-236ACN(BT) module	 Install the RF cable to left conn. to support Wi-Fi signal. (ANT0 for WLAN only, ANT1 for WLAN+BT)
4G/LTE	 EG25-G module	 Install the RF cable to left conn. to support 4G/LTE signal.

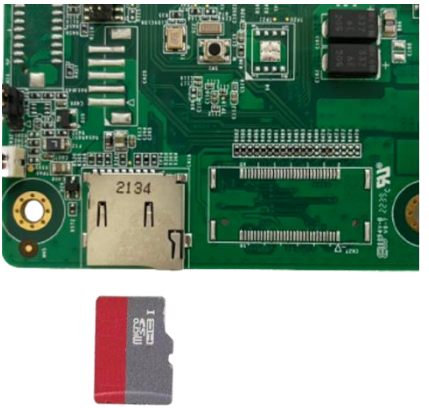
2.4.2 SIM Card Installation

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



Chapter 3

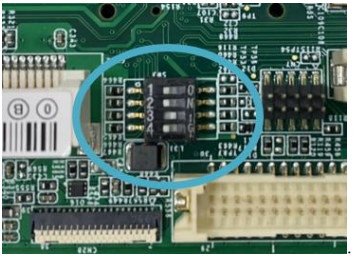
Gateway Setup and Configuration

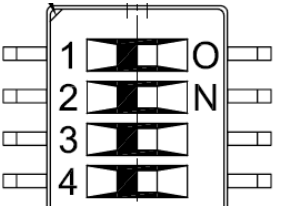
3.1 Connecting to the System

When connecting a PC or laptop to the SRT-IMX8P, 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).



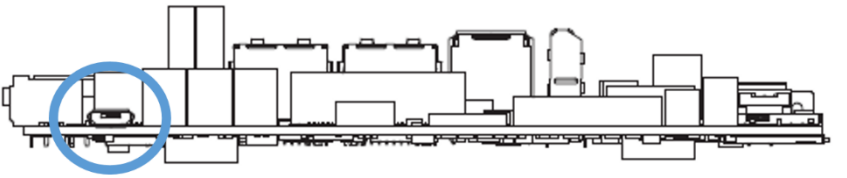


PIN 1, 2, 4: Switch to OFF.

PIN 3: Switch to ON.

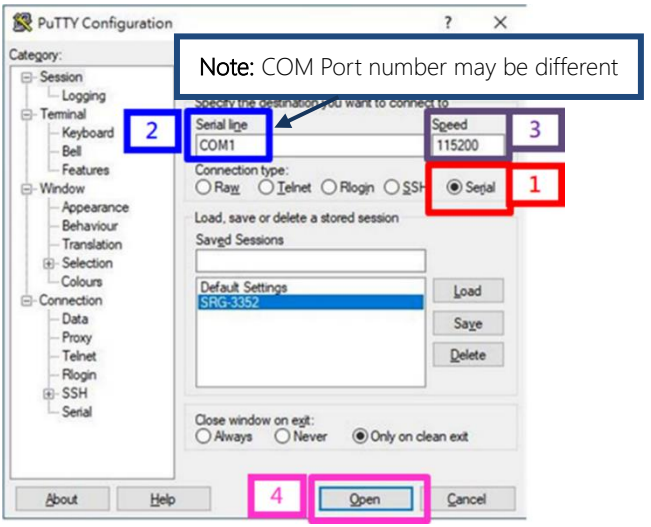
Step 3: Connect the gateway via a USB cable.

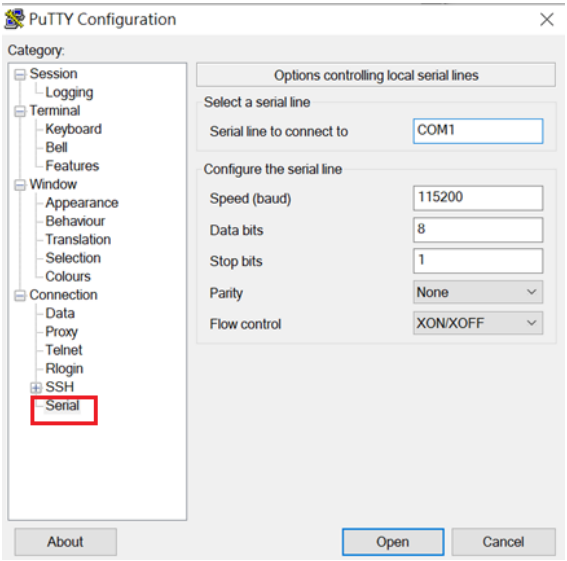
Connect your computer to the SRT-IMX8P using the Micro USB port.



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..



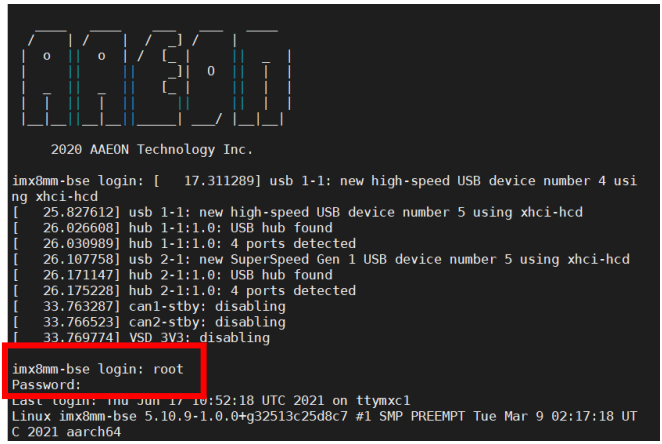


Step 6: Log into the system using the below credentials.

Username: root

Password: aaeon

You will see a welcome message when you have successfully connected to the gateway.



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:

gpionum: 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:

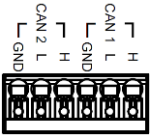
E.g.

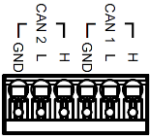
echo 0 > /sys/class/gpio/gpio85/value

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

<table>
<tr><th>System Name</th><th>Position</th><th colspan="2">Pin Definition</th></tr>
<tr><td rowspan="4">can0</td><td rowspan="4"> 

CAN1</td><td>Pin</td><td>Definition</td></tr>
<tr><td>1</td><td>H</td></tr>
<tr><td>2</td><td>L</td></tr>
<tr><td>3</td><td>GND</td></tr>
<tr><td rowspan="4">can1</td><td rowspan="4"> 

CAN2</td><td>Pin</td><td>Definition</td></tr>
<tr><td>1</td><td>H</td></tr>
<tr><td>2</td><td>L</td></tr>
<tr><td>3</td><td>GND</td></tr>
</table>

CANBus Read/Write

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

CAN1 pin H → CAN2 pin H
CAN1 pin L → CAN2 pin L

Command:

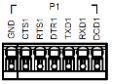
Run CANBus script:

```
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	
/dev/ttym xc0	 COM P1 (CN4)	Pin	Definition	Pin	Definition	Pin	Definition
		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/ttym xc2	 COM P2 (CN5)	Pin	Definition	Pin	Definition	Pin	Definition
		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	RS-232
Signal (High/Low)	0	1	1	0	RS-485
Signal (High/Low)	1	1	0	0	RS-485/RS-422

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	RS-232
Signal (High/Low)	0	1	1	0	RS-485
Signal (High/Low)	1	1	0	0	RS-485/RS-422

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:dl14:39c6:330c/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'.

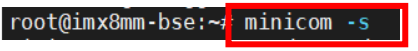
When successful, output will display as below.

```
root@imx8mm-bse:~# apt-get install minicom
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:1 https://deb.debian.org/debian bullseye/main arm64 lrzsz arm64 0.12.21-10 [83.5 kB]
Get:2 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 ... 30654 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:~#
```

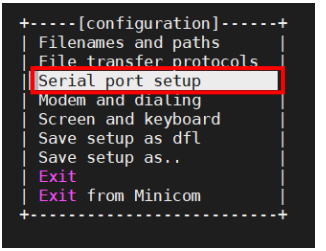
Step 2: Leave Command:

$ minicom –s

When successful, output will display as below.



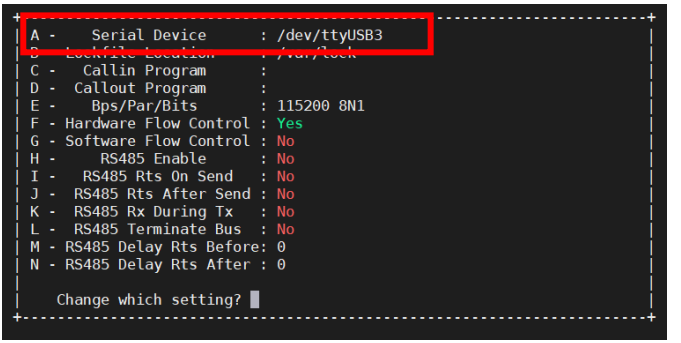
Step 3: Choose "Serial port setup", then press "A" to settings.



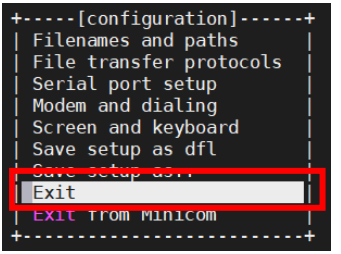
Step 4: Leave Command:

$ /dev/ttyUSB3

Finish setting configuration, then press "Enter", as below.



Step 5: Choose "Exit" to leave the dialog.



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:

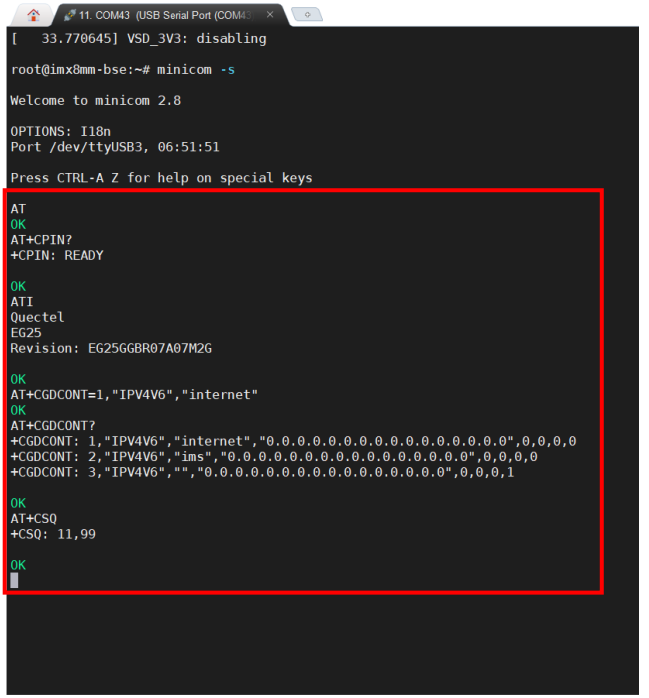
$ AT+CGDCONT=1,"IPV4V6","internet"

Check 4G signal quality:

Command:

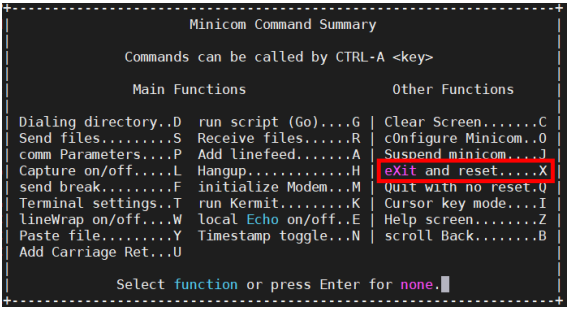
$ AT+CGDCONT?
$ AT+CSQ

When successful, output will display as below.



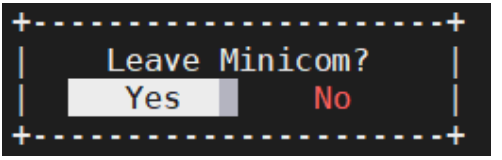
3.7.2.1 Leave Minicom

Step 1: Press "Ctrl +A".



Step 2: Press "X".

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



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: EG25GGBR07A07M2G
           |            supported: gsm-umts, lte
           |              current: gsm-umts, lte
           |        equipment id: 867698042645385
  ------------------------------
  System   |               device: /sys/devices/platform/soc@0/32f10100.usb/38100000.dwc3/xhci-hcd.1.auto/usb1/1-1/1-1.3
           |              drivers: option1, qmi_wwan_q
           |               plugin: 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: 867698042645385
           |         operator id: 46692
           |       operator name: Chunghwa Telecom
           |        registration: home
  ------------------------------
  3GPP EPS | ue 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

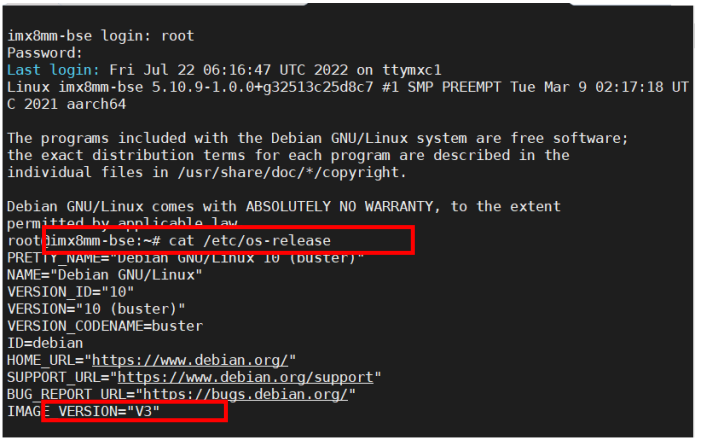
This section will show you how to check and setup system settings such as the OS version, RTC, etc.

3.9.1 Check OS version

Command:

$ cat /etc/os-release

Result:



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
```

3.10 Install Docker

This section will show you how to install Docker and setup the system settings.

Note: Ensure LAN cable is plugged in prior to setting up system settings.

Step 1: Leave Command:

 # sudo apt-get update

```
root@imx8mm-bse:~# sudo apt-get update
```

Result:

```
Reading package lists... Done
root@imx8mm-bse:~#
```

Step 2: Leave Command:

 # sudo apt-get install apt-transport-https ca-certificates curl gnupg lsb-release

Then press "Y"

Result:

```
root@imx8mm-bse:~# sudo apt-get install apt-transport-https ca-certificates curl
 gnupg lsb-release
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ca-certificates is already the newest version (20210119).
gnupg is already the newest version (2.2.27-2+deb11u2).
gnupg set to manually installed.
lsb-release is already the newest version (11.1.0).
The following packages were automatically installed and are no longer required:
  bsdmainutils cpp-8 libasan5 libck0 libcodec2-0.8.1 libcroco3 libevent-2.1-6
  libevent-core-2.1-6 libevent-pthreads-2.1-6 libgcc1:armhf libgssdp-1.0-3
  libgupnp-1.0-4 libice6 libicu63 libisl19 libjim0.77 libjsoncpp1 libmpdec2
  libperl5.28 libpython2-stdlib libpython2.7-minimal libpython2.7-stdlib
  libpython3.7-minimal libpython3.7-stdlib libsm6 libx264-155 libxi6 libxtst6
  perl-modules-5.28 python2 python2-minimal python2.7 python2.7-minimal
  python3.7-minimal x11-common
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  apt-transport-https curl
0 upgraded, 2 newly installed, 0 to remove and 47 not upgraded.
Need to get 423 kB of archives.
After this operation, 597 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

Step 3: Leave Command:

 # curl -k -fsSL https://download.docker.com/linux/debian/gpg | sudo gpg --dearmor -o /usr/share/keyrings/docker-archive-keyring.gpg

Then press "Y"

Result:

```
root@imx8mm-bse:~# curl -k -fsSL https://download.docker.com/linux/debian/gpg |
sudo gpg --dearmor -o /usr/share/keyrings/docker-archive-keyring.gpg
File '/usr/share/keyrings/docker-archive-keyring.gpg' exists. Overwrite? (y/N)
```

Step 4: Leave Command:

 # echo "deb [arch=$(dpkg --print-architecture) signed-by=/usr/share/keyrings/docker-archive-keyring.gpg] https://download.docker.com/linux/debian $(lsb_release -cs) stable" | sudo tee /etc/apt/sources.list.d/docker.list > /dev/null

Result:

```
root@imx8mm-bse:~# echo "deb [arch=$(dpkg --print-architecture) signed-by=/usr/s
hare/keyrings/docker-archive-keyring.gpg] https://download.docker.com/linux/debi
an $(lsb_release -cs) stable" | sudo tee /etc/apt/sources.list.d/docker.list > /
dev/null
root@imx8mm-bse:~#
```

Step 5: Leave Command:

 # sudo apt-get update

Result:

```
root@imx8mm-bse:~# sudo apt-get update
Get:1 file:/var/lib/local-apt-repository ./ InRelease
Ign:1 file:/var/lib/local-apt-repository ./ InRelease
Get:2 file:/var/lib/local-apt-repository ./ Release [1,279 B]
Get:2 file:/var/lib/local-apt-repository ./ Release [1,279 B]
Get:3 file:/var/lib/local-apt-repository ./ Release.gpg
Ign:3 file:/var/lib/local-apt-repository ./ Release.gpg
Get:4 https://download.docker.com/linux/debian bullseye InRelease [43.3 kB]
Hit:5 https://deb.debian.org/debian bullseye InRelease
Hit:6 https://deb.debian.org/debian bullseye-backports InRelease
Get:7 https://download.docker.com/linux/debian bullseye/stable arm64 Packages [1
5.2 kB]
Fetched 58.5 kB in 1s (52.8 kB/s)
Reading package lists... Done
root@imx8mm-bse:~#
```

Step 6: Leave Command:

 # sudo apt-get install docker-ce docker-ce-cli containerd.io

```
root@imx8mm-bse:~# sudo apt-get install docker-ce docker-ce-cli containerd.io
```

Then press "Y"

```
Do you want to continue? [Y/n]
```

Step 7: Leave Command:

Modify /etc/docker/daemon.json (ex: vim)

{

"storage-driver": "overlay2"

}

Step 8: Restart the Device and Leave Command:

$ sudo docker run hello-world

Result:

```
Hello from Docker!
This message shows that your installation appears to be working correctly.

To generate this message, Docker took the following steps:
 1. The Docker client contacted the Docker daemon.
 2. The Docker daemon pulled the "hello-world" image from the Docker Hub.
    (arm64v8)
 3. The Docker daemon created a new container from that image which runs the
    executable that produces the output you are currently reading.
 4. The Docker daemon streamed that output to the Docker client, which sent it
    to your terminal.

To try something more ambitious, you can run an Ubuntu container with:
 $ docker run -it ubuntu bash

Share images, automate workflows, and more with a free Docker ID:
 https://hub.docker.com/

For more examples and ideas, visit:
 https://docs.docker.com/get-started/
```