# GUARDIAN III
# Programmer Reference Guide

Changhong-Microsoft IoT Innovation Center

## Revision History

| Version | Description | Author | Date |
|---|---|---|---|
| V0.1 | Initial version | Junhui Lan | 7-21-2021 |
| V1.0 | Update | Junhui Lan | 10-11-2021 |
| V1.1 | Re-organized and update API | Richard Liang | 01-12-2022 |
| | | | |

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# 1 Introduction

Guardian III is an IoT gateway product series based on Microsoft Azure Sphere OS. It provides end-to-end IoT security solutions and can be used in a variety of industrial fields.
Guardian III has multiple types of southbound interfaces, such as LoRa, Bluetooth, Ethernet, CAN, RS422, RS485, etc., which can be easily connected to many devices or sensors. At the same time, it also includes three types of northbound interfaces (Wi-Fi, Ethernet, Cellular), you can easily connect to the Azure Cloud.
The Guardian III series includes three different product forms, namely GIIICM680L, GIIICM680E, and GIIICM680R. The main difference between the three product forms is the southbound interface.

**Product features：**

**GIIICM680L (GIIICM680L, GIIICM680L-CM2, GIIICM680L-CM6, GIIICM680L-CMA)**

- AI-Link WF-M620-RSD2 module
- Northbound link:
  - Cellular(4G/LTE) data communication (GIIICM680L does not include this feature)
  - Dual-band Wi-Fi, 2.4GHz and 5GHz
  - Ethernet port: RJ45 female, 10Mbps
- Southbound link:
  - Bluetooth 5.0 connectivity
  - LoRa data communication
  - USB port (Power + Data)
- GNSS location report
- MCU programming and debugging port
- A/C adapter DC 5V/2A
- 3 LED indicators: 2 programmable Red/Green LEDs, 1 BLE activity LED
- Operating temperature: -40 °C to +85 °C
- Operating humidity: 5% to 95% RH
- Dimensions: 95mm*95mm*25mm
- Enclosure: Mountable, Black color

**GIIICM680E (GIIICM680E, GIIICM680E-CE, GIIICM680E-CN)**

- AI-Link WF-M620-RSD2 module
- Northbound link:
  - Cellular(4G/LTE) data communication (GIIICM680E does not include this feature)
  - Dual-band Wi-Fi, 2.4GHz and 5GHz
  - Ethernet port: RJ45 female, 10Mbps
- Southbound link:
  - Bluetooth 5.0 connectivity
  - Ethernet port: RJ45 female, up to 1Mbps

- USB port (Power + Data)

- GNSS location report
- MCU programming and debugging port
- A/C adapter DC 5V/2A
- 3 LED indicators: 2 programmable Red/Green LEDs, 1 BLE activity LED
- Operating temperature: -40 °C to +85 °C
- Operating humidity: 5% to 95% RH
- Dimensions: 95mm*95mm*25mm
- Enclosure: Mountable, Black color

**GIIICM680R (GIIICM680R, GIIICM680R-CE, GIIICM680R-CN)**

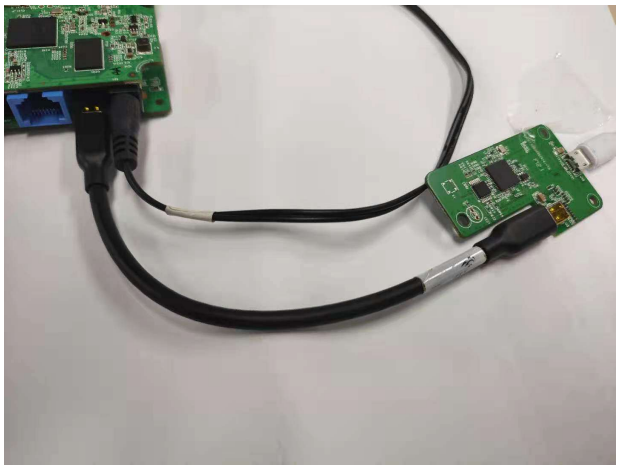
- AI-Link WF-M620-RSD2 module
- Northbound link:
  - Cellular(4G/LTE) data communication (GIIICM680R does not include this feature)
  - Dual-band Wi-Fi, 2.4GHz and 5GHz
  - Ethernet port: RJ45 female, 10Mbps
- Southbound link:
  - Bluetooth 5.0 connectivity
  - RS-422 or RS-485
  - CAN
- Modbus protocol supported
- GNSS location report
- MCU programming and debug port
- A/C adapter DC 5V/2A
- 3 LED indicators: 2 programmable Red/Green LED and 1 BLE activity LED,
- Operating temperature: -40 °C to +85 °C
- Operating humidity: 5% to 95% RH
- Dimensions: 95mm*95mm*25mm
- Enclosure: Mountable, Black color

# 2 Get started Guide

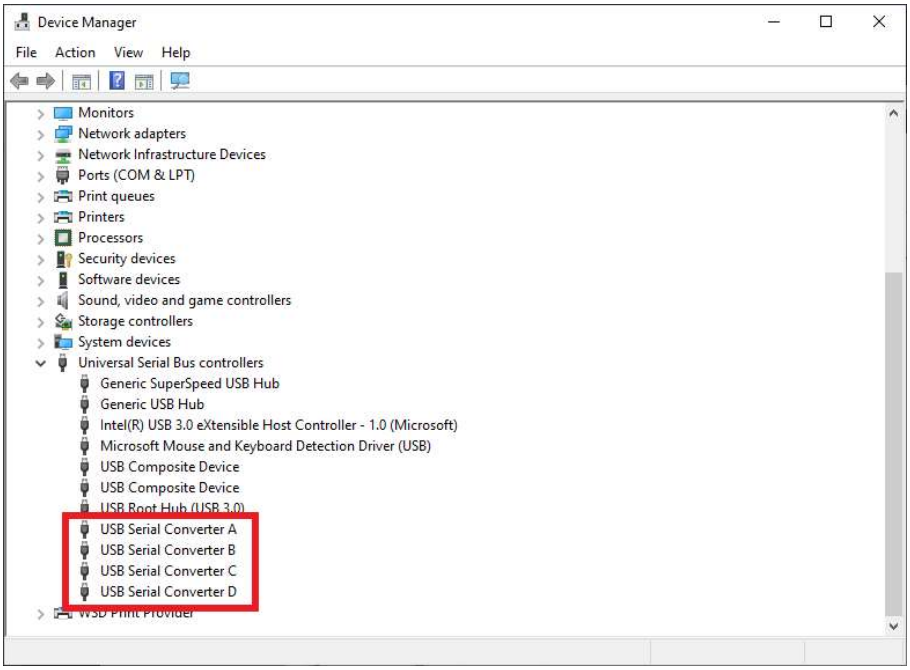
To use Guardian III series products for the first time, you must install Azure Sphere SDK and Dongle debug version driver.
For the establishment of Azure sphere development environment, please refer to:
https://docs.microsoft.com/en-us/azure-sphere/

## 2.1 Connecting the device

Connect Guardian III series products to your PC through USB.



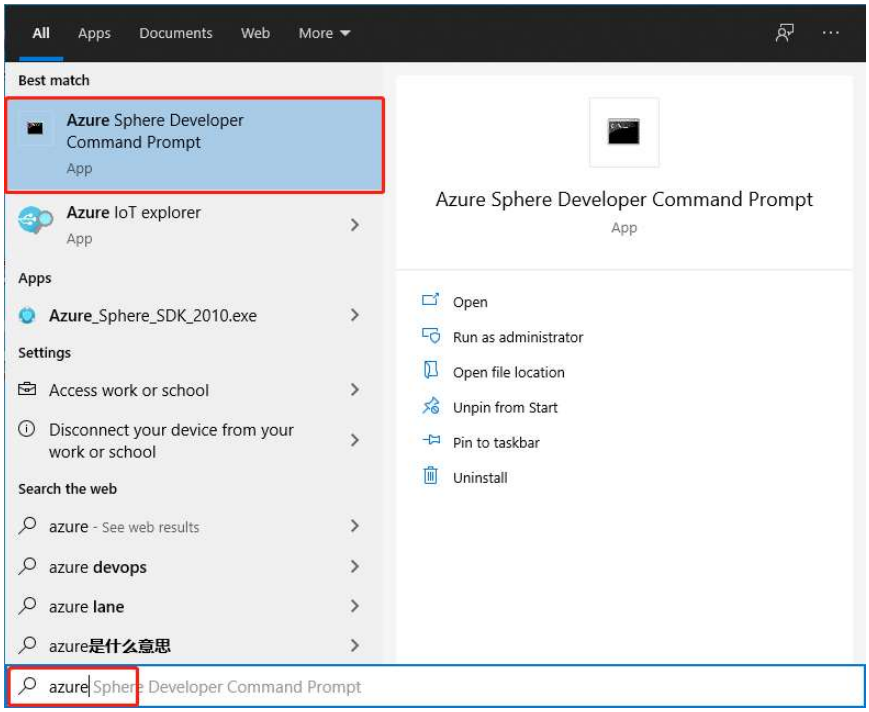
When plugged in, the device exposes four USB Serial Converters, the first time you plug in the device, the drivers should be automatically downloaded and installed. Installation can be slow. If the drivers are not installed automatically, right-click the device name in Device Manager and select Update driver. Alternatively, you can download the drivers from Future Technology Devices International (FTDI). Choose the driver that matches your Windows installation (32-bit or 64-bit).
To verify installation, open Device Manager. Under Universal Serial Bus controllers, look for four USB Serial Converters. Device Manager with four USB serial converters




## 2.2 Install the Azure Sphere SDK

- Download the SDK(https://aka.ms/AzureSphereSDKDownload/). Save the downloaded file on your PC.
- Run the downloaded .exe to install the SDK. Agree to the license terms, and then select Next.
- Select Install to begin installation.
- Accept the elevation prompt if one appears.
- When setup completes, restart your PC if the setup application requests it.

After installing the CLI for the first time, open the CLI through the start menu.



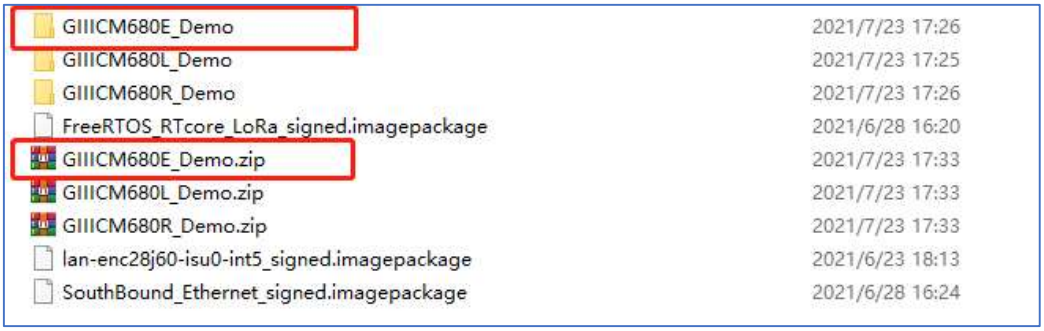

Run ***azsphere show-version*** to check whether it is installed, and the correct version is installed.


## 2.3 Install Visual Studio and the Azure Sphere extension

- Install Visual Studio, please refer to https://docs.microsoft.com/en-us/visualstudio/get-started/visual-studio-ide?preserve-view=true&view=vs-2019.
- To install the Visual Studio extension for Azure Sphere, see https://marketplace.visualstudio.com/items?itemName=AzureSphereTeam.AzureSphereSDKforVisualStudio2019.

## 2.4 How to run the sample code

Here is an example of running the GIIICM680E_Demo.zip sample code. Please use the decompression tool to decompress the sample code before running.




- Use the "azsphere login" command to log in to your Microsoft account（Each PC only needs to log in once.）

```
G:\Guardian III>azsphere device claim
warn: You are claiming a device to the following tenant:
warn: a87ad796-8231-4e7b-8bd0-d4b362f61b65
warn: Do you want to claim the device ID afca466b32e2142ea450003531a66fd43c60301a8fc2e24ca66fb07e1b16080c83f7a8e3b7a6ea1
a3526187f111a8bdff2bee9cef9a390952eaa7eac189a4791 to this tenant?
warn: You cannot change the Azure Sphere tenant this device is claimed to once this action has completed.
Enter 'yes' to continue. Enter anything else to exit.
> yes
Claiming device.
Successfully claimed device ID 'afca466b32e2142ea450003531a66fd43c60301a8fc2e24ca66fb07e1b16080c83f7a8e3b7a6ea1a3526187f
111a8bdff2bee9cef9a390952eaa7eac189a4791' into tenant 'guanghuipan' with ID 'a87ad796-8231-4e7b-8bd0-d4b362f61b65'.
```

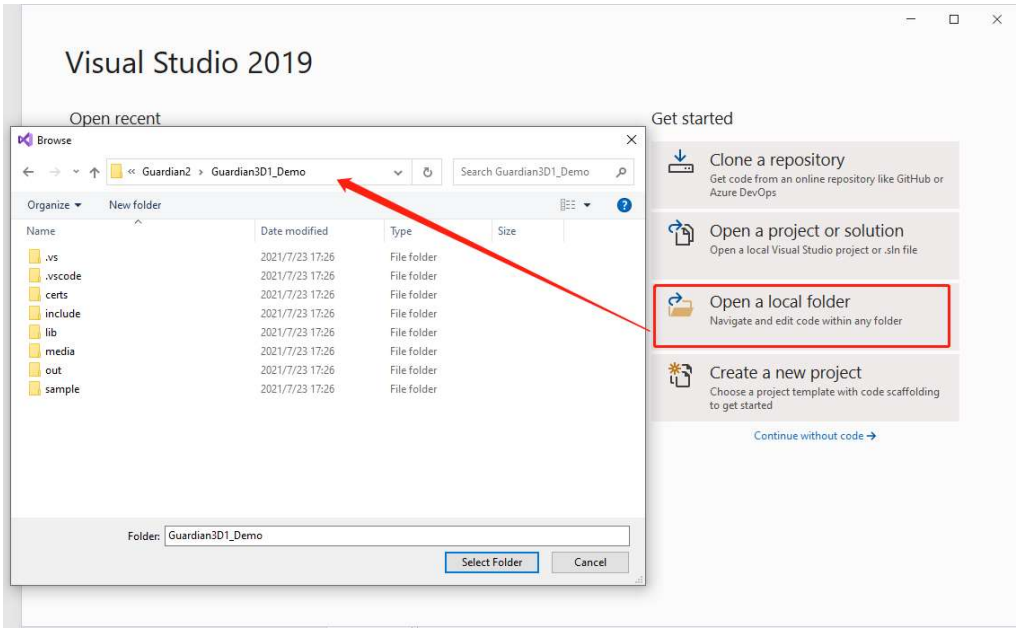
- Declare the device(Each device only needs to be declared once. For more information, please refer to: https://docs.microsoft.com/en-us/azure-sphere/install/claim-device?tabs=cliv2beta.)

```
G:\Guardian III>azsphere login
Login successful as '[redacted]'.
Selected Azure Sphere tenant is '[redacted]' (a87ad796-8231-4e7b-8bd0-d4b362f61b65)

G:\Guardian III>azsphere device claim
warn: You are claiming a device to the following tenant:
warn: a87ad796-8231-4e7b-8bd0-d4b362f61b65
warn: Do you want to claim the device ID afca466b32e2142ea450003531a66fd43c60301a8fc2e24ca66fb07e1b16080c83f7a8e3b7a6ea1
a3526187f111a8bdff2bee9cef9a390952eaa7eac189a4791 to this tenant?
warn: You cannot change the Azure Sphere tenant this device is claimed to once this action has completed.
Enter 'yes' to continue. Enter anything else to exit.
> yes
Claiming device.
Successfully claimed device ID 'afca466b32e2142ea450003531a66fd43c60301a8fc2e24ca66fb07e1b16080c83f7a8e3b7a6ea1a3526187f
111a8bdff2bee9cef9a390952eaa7eac189a4791' into tenant 'guanghuipan' with ID 'a87ad796-8231-4e7b-8bd0-d4b362f61b65'.

G:\Guardian III>
```

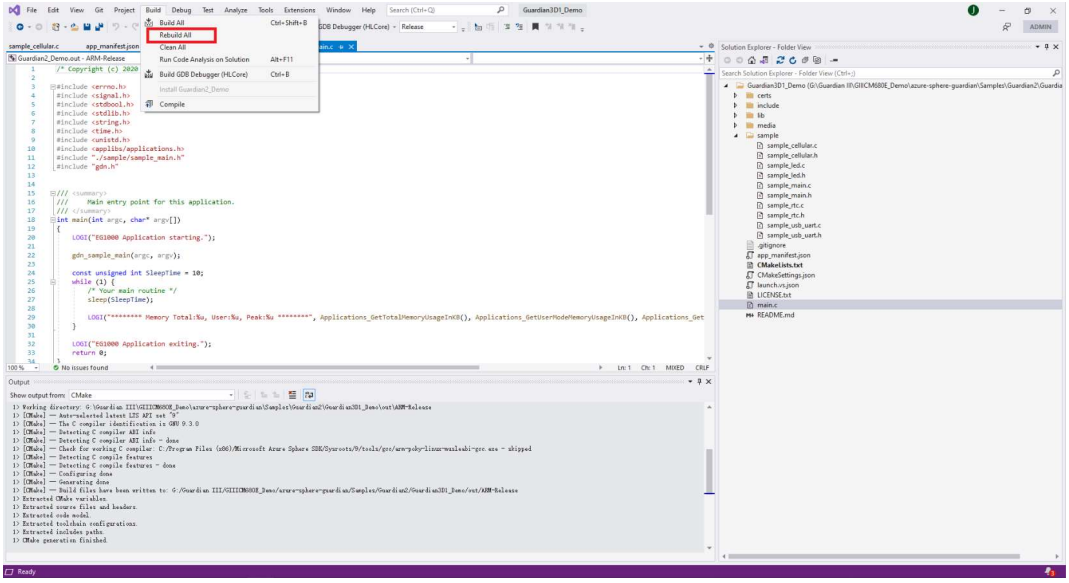
- Enable the developer mode of the device

```
G:\Guardian III>azsphere device enable-development
warn: The device already has the 'Enable App development' capability. No changes will be applied to its existing capabil
ities.
Application updates have already been disabled for this device.
Installing debugging server to device.
Deploying 'C:\Program Files (x86)\Microsoft Azure Sphere SDK\DebugTools\gdbserver.imagepackage' to the attached device.
Image package 'C:\Program Files (x86)\Microsoft Azure Sphere SDK\DebugTools\gdbserver.imagepackage' has been deployed to
 the attached device.
Previous device capabilities retained. Ensure that you have the correct development capabilities installed before contin
uing.
Successfully set up device for application development, and disabled application updates.
(Device ID: 'afca466b32e2142ea450003531a66fd43c60301a8fc2e24ca66fb07e1b16080c83f7a8e3b7a6ea1a3526187f111a8bdff2bee9cef9a
390952eaa7eac189a4791')

G:\Guardian III>
```

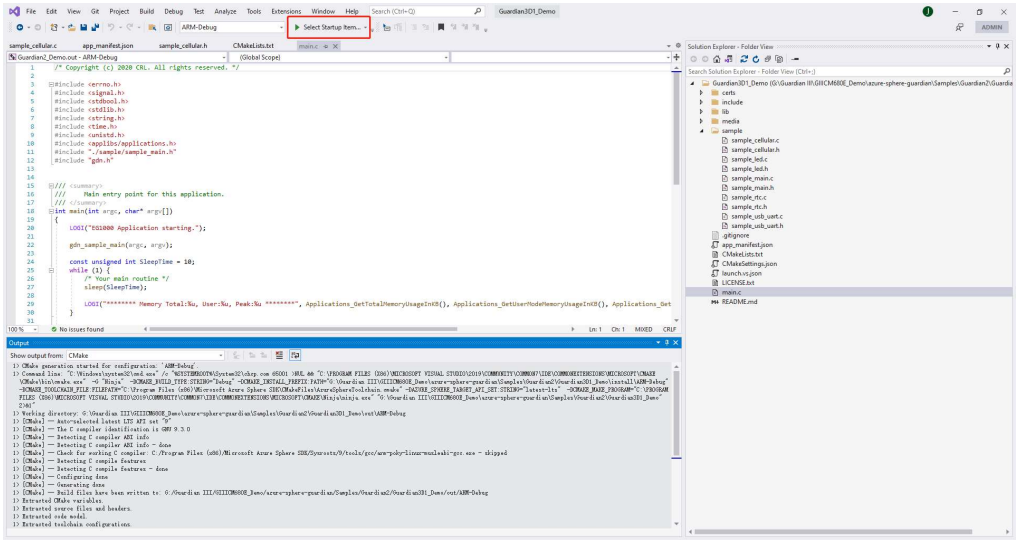
- Use Visual Studio to open the sample code.



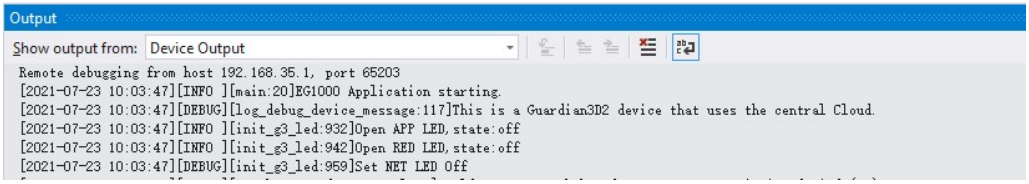

- Compile the sample code.



- Run the sample code.



When the following log print is entered in the log output window, it indicates that the sample code is running normally.




# 3 Sample and Test

In order to demonstrate the use of Guardian III series products, we provide basic sample codes and test methods for each product.

## 3.1 GIIICM680L

The sample code of GIIICM680L includes LEDs, LoRa, UART demo.

Package list:

FreeRTOS_RTcore_LoRa_signed.imagepackage

lan-enc28j60-isu0-int5_signed.imagepackage

GIIICM680L_Demo.zip

### 3.1.1 Run the sample code

1. Equipment Recover.

```
azsphere device recover
```

```
G:\Guardian III>azsphere device recover
Downloading recovery images...
Download complete.
Starting device recovery. Please note that this may take up to 10 minutes.
Board found. Sending recovery bootloader.
Erasing flash.
Sending 16 images. (5482396 bytes to send)
Sent 1 of 16 images. (5452312 of 5482396 bytes remaining)
Sent 2 of 16 images. (5336428 of 5482396 bytes remaining)
Sent 3 of 16 images. (5336036 of 5482396 bytes remaining)
Sent 4 of 16 images. (5048636 of 5482396 bytes remaining)
Sent 5 of 16 images. (5032408 of 5482396 bytes remaining)
Sent 6 of 16 images. (5001844 of 5482396 bytes remaining)
Sent 7 of 16 images. (2458896 of 5482396 bytes remaining)
Sent 8 of 16 images. (840740 of 5482396 bytes remaining)
Sent 9 of 16 images. (816164 of 5482396 bytes remaining)
Sent 10 of 16 images. (701264 of 5482396 bytes remaining)
Sent 11 of 16 images. (152180 of 5482396 bytes remaining)
Sent 12 of 16 images. (78240 of 5482396 bytes remaining)
Sent 13 of 16 images. (41164 of 5482396 bytes remaining)
Sent 14 of 16 images. (32768 of 5482396 bytes remaining)
Sent 15 of 16 images. (16384 of 5482396 bytes remaining)
Sent 16 of 16 images. (0 of 5482396 bytes remaining)
Finished writing images; rebooting board.
Device ID: 0668137ae1fd6def5800e5827113d45bb1bb6f5f42d2d76f9ce5eabdacd6305d2142f9086d2d677a623192e1f33c0e6771292c8e0fa74
a8970c3ed6bad57d30f
Device recovered successfully.
```

2. Enable the developer mode of the device

```
G:\Guardian III>azsphere device enable-development
warn: The device already has the 'Enable App development' capability. No changes will be applied to its existing capabil
ities.
Application updates have already been disabled for this device.
Installing debugging server to device.
Deploying 'C:\Program Files (x86)\Microsoft Azure Sphere SDK\DebugTools\gdbserver.imagepackage' to the attached device.
Image package 'C:\Program Files (x86)\Microsoft Azure Sphere SDK\DebugTools\gdbserver.imagepackage' has been deployed to
 the attached device.
Previous device capabilities retained. Ensure that you have the correct development capabilities installed before contin
uing.
Successfully set up device for application development, and disabled application updates.
(Device ID: 'afca466b32e2142ea45000353la66fd43c60301a8fc2e24ca66fb07e1b16080c83f7a8e3b7a6ea1a3526187f111a8bdff2bee9cef9a
390952eaa7eac189a4791')

G:\Guardian III>
```

3. Download the internal network card driver package;

```
azsphere device sideload deploy --imagepackage lan-enc28j60-isu0-int5_signed.imagepackage
```

```
G:\Guardian III>azsphere device sideload deploy --imagepackage lan-enc28j60-isu0-int5_signed.imagepackage
Deploying 'G:\Guardian III\lan-enc28j60-isu0-int5_signed.imagepackage' to the attached device.
Image package 'G:\Guardian III\lan-enc28j60-isu0-int5_signed.imagepackage' has been deployed to the attached device.
The device is rebooting.
```

4. Download the LoRa driver package;

```
azsphere device sideload deploy --imagepackage FreeRTOS_RTcore_LoRa_signed.imagepackage
```

```
G:\Guardian III>azsphere device sideload deploy --imagepackage FreeRTOS_RTcore_LoRa_signed.imagepackage
Deploying 'G:\Guardian III\FreeRTOS_RTcore_LoRa_signed.imagepackage' to the attached device.
Image package 'G:\Guardian III\FreeRTOS_RTcore_LoRa_signed.imagepackage' has been deployed to the attached device.
```

5. Run the sample code “GIIICM680L_Demo.zip”;  (Refer to section 2.4 )

## 3.1.2 APP LEDs

After the software package is installed, restart the device, and APP LED1 and APP LED2 will flash alternately in accordance with "green" -> "red" -> "off". as figure 23 show.

Figure 1: LED status

### 3.1.3 Test Lora

In order to complete the Lora test, we need to introduce the third LoRa test module, which mainly completes the conversion of LoRa data and USB serial port data in order to complete the data transmission and reception test. The test module needs to configure the following parameters:

**frequency：** 910.3M
**bandwidth：** 125K
**spreading factor：** 7
**coding rate：** 4/5
**CRC enabled：** true
**preamble length：** 8bytes
**power：** 20dbm
**invert IQ：** true

After using the serial port tool putty to connect the test module, the string sent by putty is sent to the device, and the device will return the data as it is after receiving the data, so you can see in putty that you are sending data.

### 3.1.4 Test UART

Use Type-B to connect the PC and the device. After the connection is complete, open the serial port through the serial port tool putty.
Type-B cable:

Figure 2: Type-B cable

Serial port connection parameters:

**Speed(baud):** 115200bps
**Data bits:** 8

**Stop bits:** 1
**Parity:** None
**Flow control:** None

After connecting the device with the serial port tool putty, the string sent by putty is sent to the device, and the device will return the data as it is after receiving the data, so you can see in putty that you are sending data.


Figure 3: putty output information

## 3.2 GIIICM680E

The sample code of GIIICM680E includes LEDs, W5500, UART demo.
Package list:

SouthBound_Ethernet_signed.imagepackage
lan-enc28j60-isu0-int5_signed.imagepackage
GIIICM680E_Demo.zip

### 3.2.1 Run the sample code

If you get a box with sample code loaded, do the following to test it:

1. Connect the debug dongle and power on the box, from the powershell of windows, check images installed, it should be like this:

```
PS C:\Users\richa> azsphere device image list-installed
Installed images:
 --> lan-enc28j60-isu0-int5
   --> Image type:    Board configuration
   --> Component ID: 91ecec4e-7e7e-40da-bb38-01f4d10f3f45
   --> Image ID:      c4402be3-d851-4035-842d-1e1a4177f944
 --> gdbserver
   --> Image type:    Application
   --> Component ID: 8548b129-b16f-4f84-8dbe-d2c847862e78
   --> Image ID:      4d151b4a-a1e6-4530-8347-38468df88834
 --> SouthboundEthernet
   --> Image type:    Application
   --> Component ID: 005180bc-402f-4cb3-a662-72937dbcde47
   --> Image ID:      aeda318f-66a8-4a2b-b534-3e2ae9d64504
 --> Guardian3RD2
   --> Image type:    Application
   --> Component ID: b5cd66c6-8b23-43d8-9991-7e5cc1656918
   --> Image ID:      3d487e63-836c-4c24-aa69-85fcf219ec50
```

2. Check interface connection:

```
PS C:\Users\richa> azsphere device network list-interfaces
InterfaceName  InterfaceUp  ConnectedToNetwork  IpAcquired  IpAddresses    ConnectedToInternet  IpAssignment  HardwareAddress
azspheresvc    True         False               False       192.168.35.2   False                None          None
eth0           True         True                True        192.168.86.25  True                 dynamic       f6:4e:06:b3:16:83
lo             True         False               False       127.0.0.1      False                None          None
wlan0          False        False               False       None           False                dynamic       60:1d:9d:f9:46:a6
```

3. Use the mobile App to watch southbound connection status. Refer 3.2.3 for the test setup.

If you get a brand-new box without code loaded, do the following to install test samples:

1. Equipment Recover.

   azsphere device recover

```
G:\Guardian III>azsphere device recover
Downloading recovery images...
Download complete.
Starting device recovery. Please note that this may take up to 10 minutes.
Board found. Sending recovery bootloader.
Erasing flash.
Sending 16 images. (5482396 bytes to send)
Sent 1 of 16 images. (5452312 of 5482396 bytes remaining)
Sent 2 of 16 images. (5336428 of 5482396 bytes remaining)
Sent 3 of 16 images. (5336036 of 5482396 bytes remaining)
Sent 4 of 16 images. (5048636 of 5482396 bytes remaining)
Sent 5 of 16 images. (5032408 of 5482396 bytes remaining)
Sent 6 of 16 images. (5001844 of 5482396 bytes remaining)
Sent 7 of 16 images. (2458896 of 5482396 bytes remaining)
Sent 8 of 16 images. (840740 of 5482396 bytes remaining)
Sent 9 of 16 images. (816164 of 5482396 bytes remaining)
Sent 10 of 16 images. (701264 of 5482396 bytes remaining)
Sent 11 of 16 images. (152180 of 5482396 bytes remaining)
Sent 12 of 16 images. (78240 of 5482396 bytes remaining)
Sent 13 of 16 images. (41164 of 5482396 bytes remaining)
Sent 14 of 16 images. (32768 of 5482396 bytes remaining)
Sent 15 of 16 images. (16384 of 5482396 bytes remaining)
Sent 16 of 16 images. (0 of 5482396 bytes remaining)
Finished writing images; rebooting board.
Device ID: 0668137ae1fd6def5800e5827113d45bb1bb6f5f42d2d76f9ce5eabdacd6305d2142f9086d2d677a623192e1f33c0e6771292c8e0fa74
a8970c3ed6bad57d30f
```

2. Enable the developer mode of the device

```
G:\Guardian III>azsphere device enable-development
warn: The device already has the 'Enable App development' capability. No changes will be applied to its existing capabil
ities.
Application updates have already been disabled for this device.
Installing debugging server to device.
Deploying 'C:\Program Files (x86)\Microsoft Azure Sphere SDK\DebugTools\gdbserver.imagepackage' to the attached device.
Image package 'C:\Program Files (x86)\Microsoft Azure Sphere SDK\DebugTools\gdbserver.imagepackage' has been deployed to
 the attached device.
Previous device capabilities retained. Ensure that you have the correct development capabilities installed before contin
uing.
Successfully set up device for application development, and disabled application updates.
(Device ID: 'afca466b32e2142ea45000353la66fd43c60301a8fc2e24ca66fb07e1b16080c83f7a8e3b7a6ea1a3526187f111a8bdff2bee9cef9a
390952eaa7eac189a4791')

G:\Guardian III>
```

3. Download the internal network card driver package.

   azsphere device sideload deploy --imagepackage lan-enc28j60-isu0-int5_signed.imagepackage

```
G:\Guardian III>azsphere device sideload deploy --imagepackage lan-enc28j60-isu0-int5_signed.imagepackage
Deploying 'G:\Guardian III\lan-enc28j60-isu0-int5_signed.imagepackage' to the attached device.
Image package 'G:\Guardian III\lan-enc28j60-isu0-int5_signed.imagepackage' has been deployed to the attached device.
The device is rebooting.
```

4. Download the W5500 driver package.

   azsphere device sideload deploy --imagepackage SouthBound_Ethernet_signed.imagepackage

```
G:\Guardian III>azsphere device sideload deploy --imagepackage SouthBound_Ethernet_signed.imagepackage
Deploying 'G:\Guardian III\SouthBound_Ethernet_signed.imagepackage' to the attached device.
Image package 'G:\Guardian III\SouthBound_Ethernet_signed.imagepackage' has been deployed to the attached device.
```

5. Run the sample code “GIIICM680E_Demo.zip”； (Refer to section 2.4 )

## 3.2.2 APP LEDs

After the software package is installed, restart the device, and APP LED1 and APP LED2 will flash alternately in accordance with "green" -> "red" -> "off". as figure 26 show.

Figure 4: LED status

### 3.2.3 Test Southbound Ethernet (W5500)

Use the RJ-45 network cable to connect the device and the PC and set the PC to DHCP client mode. After the connection is completed, W5500 will assign a 192.168.50.X sub-network IP to the PC, and the default gateway address is 192.168.50.1. As figure 27 show.

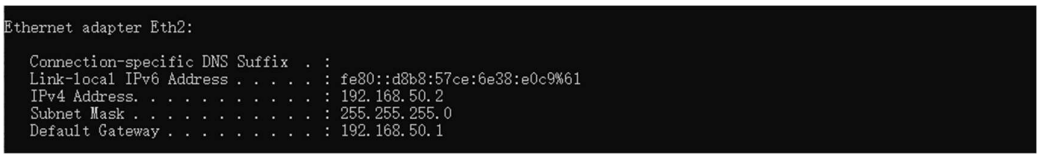



Figure 5: Get Client IP

The W5500 internal test module starts TCP port 5000 at 192.168.50.1 by default and uses putty to connect.

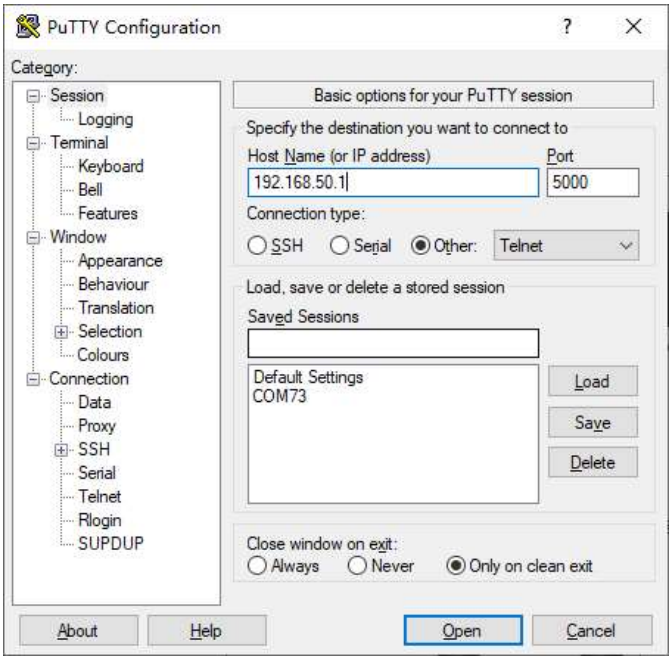



Figure 6: putty configuration parameters

Any data received by the W5500 internal test module will be returned as it is.


Figure 7: putty output information

### 3.2.4 Test UART

Use Type-B to connect the PC and the device. After the connection is complete, open the serial port through the serial port tool putty.

Type-B cable:

Figure 8: Type-B cable

Serial port connection parameters:

**Speed(baud):** 115200
**Data bits:** 8
**Stop bits:** 1
**Parity:** None
**Flow control:** None

After connecting the device with the serial port tool putty, the string sent by putty is sent to the device, and the device will return the data as it is after receiving the data, so you can see in putty that you are sending data.

Figure 9: putty output information

## 3.3 GIIICM680R

The sample code of GIIICM680R includes LEDs, CAN, RS422, RS485 demonstration.

Package list:

lan-enc28j60-isu0-int5_signed.imagepackage

GIIICM680R_Demo.zip

### 3.3.1 Run the sample code

1. Equipment Recover.

azsphere device recover

```
G:\Guardian III>azsphere device recover
Downloading recovery images...
Download complete.
Starting device recovery. Please note that this may take up to 10 minutes.
Board found. Sending recovery bootloader.
Erasing flash.
Sending 16 images. (5482396 bytes to send)
Sent 1 of 16 images. (5452312 of 5482396 bytes remaining)
Sent 2 of 16 images. (5336428 of 5482396 bytes remaining)
Sent 3 of 16 images. (5336036 of 5482396 bytes remaining)
Sent 4 of 16 images. (5048636 of 5482396 bytes remaining)
Sent 5 of 16 images. (5032408 of 5482396 bytes remaining)
Sent 6 of 16 images. (5001844 of 5482396 bytes remaining)
Sent 7 of 16 images. (2458896 of 5482396 bytes remaining)
Sent 8 of 16 images. (840740 of 5482396 bytes remaining)
Sent 9 of 16 images. (816164 of 5482396 bytes remaining)
Sent 10 of 16 images. (701264 of 5482396 bytes remaining)
Sent 11 of 16 images. (152180 of 5482396 bytes remaining)
Sent 12 of 16 images. (78240 of 5482396 bytes remaining)
Sent 13 of 16 images. (41164 of 5482396 bytes remaining)
Sent 14 of 16 images. (32768 of 5482396 bytes remaining)
Sent 15 of 16 images. (16384 of 5482396 bytes remaining)
Sent 16 of 16 images. (0 of 5482396 bytes remaining)
Finished writing images; rebooting board.
Device ID: 0668137aelfd6def5800e5827113d45bb1bb6f5f42d2d76f9ce5eabdacd6305d2142f9086d2d677a623192e1f33c0e6771292c8e0fa74
a8970c3ed6bad57d30f
Device recovered successfully.
```

2. Enable the developer mode of the device

```
G:\Guardian III>azsphere device enable-development
warn: The device already has the 'Enable App development' capability. No changes will be applied to its existing capabil
ities.
Application updates have already been disabled for this device.
Installing debugging server to device.
Deploying 'C:\Program Files (x86)\Microsoft Azure Sphere SDK\DebugTools\gdbserver.imagepackage' to the attached device.
Image package 'C:\Program Files (x86)\Microsoft Azure Sphere SDK\DebugTools\gdbserver.imagepackage' has been deployed to
 the attached device.
Previous device capabilities retained. Ensure that you have the correct development capabilities installed before contin
uing.
Successfully set up device for application development, and disabled application updates.
(Device ID: 'afca466b32e2142ea45000353la66fd43c60301a8fc2e24ca66fb07e1b16080c83f7a8e3b7a6ea1a3526187f111a8bdff2bee9cef9a
390952eaa7eac189a4791')

G:\Guardian III>
```

3. Download the internal network card driver package.

azsphere device sideload deploy --imagepackage lan-enc28j60-isu0-int5_signed.imagepackage

```
G:\Guardian III>azsphere device sideload deploy --imagepackage lan-enc28j60-isu0-int5_signed.imagepackage
Deploying 'G:\Guardian III\lan-enc28j60-isu0-int5_signed.imagepackage' to the attached device.
Image package 'G:\Guardian III\lan-enc28j60-isu0-int5_signed.imagepackage' has been deployed to the attached device.
The device is rebooting.
```

Run the sample code “GIIICM680R_Demo.zip”. Refer 2.4 for details.

### 3.3.2 APP LEDs

After the software package is installed, restart the device, and APP LED1 and APP LED2 will flash alternately in accordance with "green" -> "red" -> "off". as figure 32 show.

Figure 10: LED status

### 3.3.3 Test CAN

Use a third-party CAN test tool to connect the device. The CAN test module used in this example is a CAN module produced by China Chuangxin Technology.


Figure 11: CAN test module Appearance

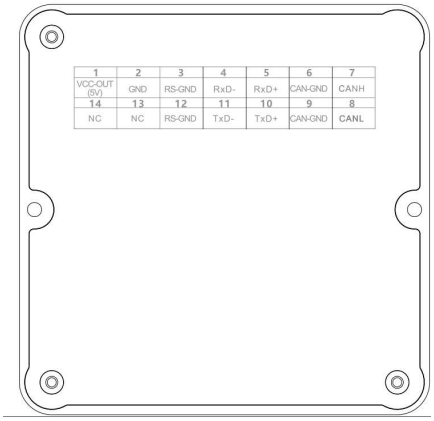



Figure 12: Device GPIOs

Use CAN connect the device, connect the wire sequence GPIO7---CHNH, GPIO8---CHNL.

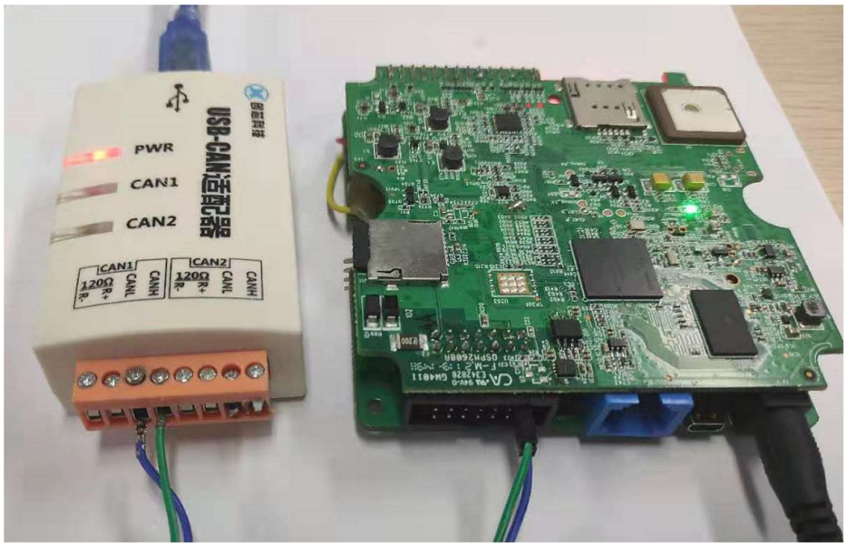



Figure 13: CAN connection diagram

After the connection is complete, use the test tool provided with the CAN test module to turn on the device.

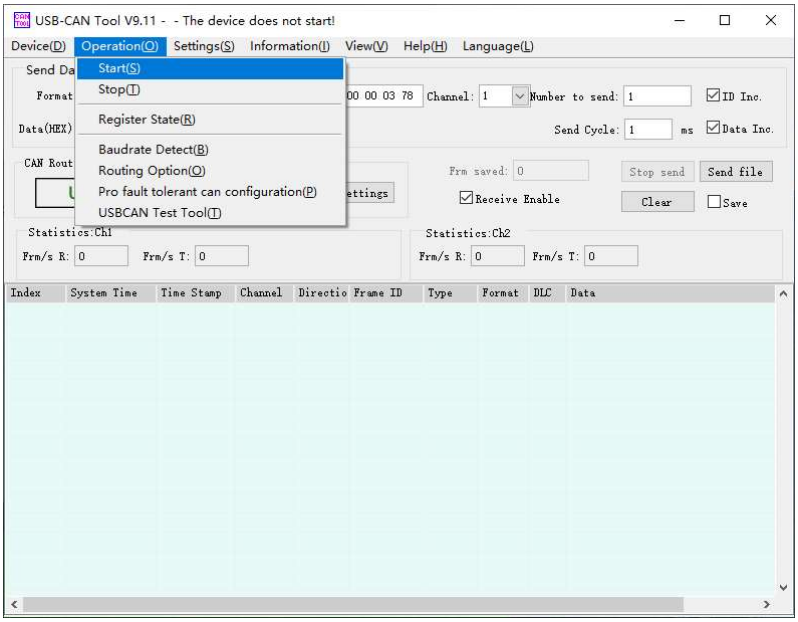



Figure 14: Open device

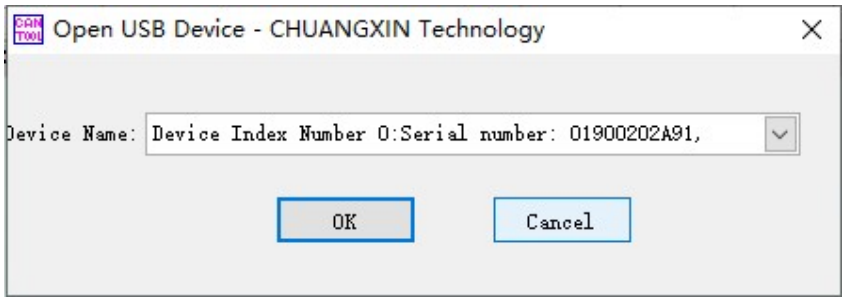



Figure 15: Device connection parameters

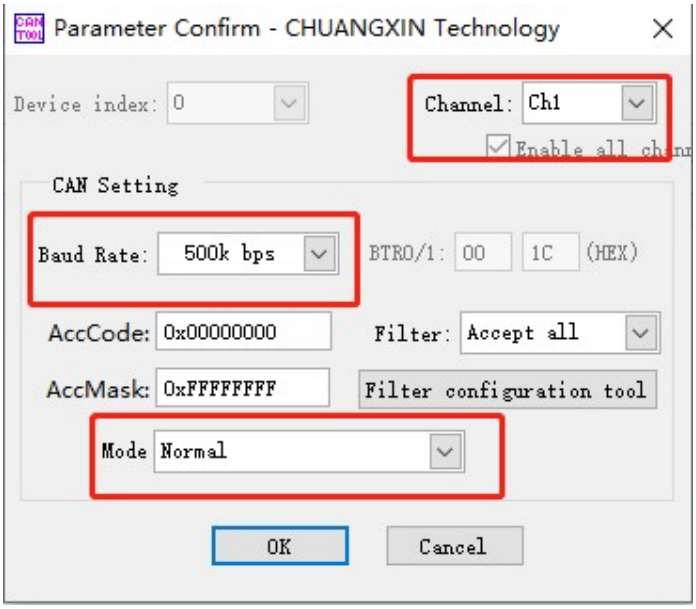



Figure 16: CAN interface parameters

After the test module is successfully connected to the device, send the test data to the device through the tool, and the device will return the test data as it is, as shown in the figure below. as figure 39 show.

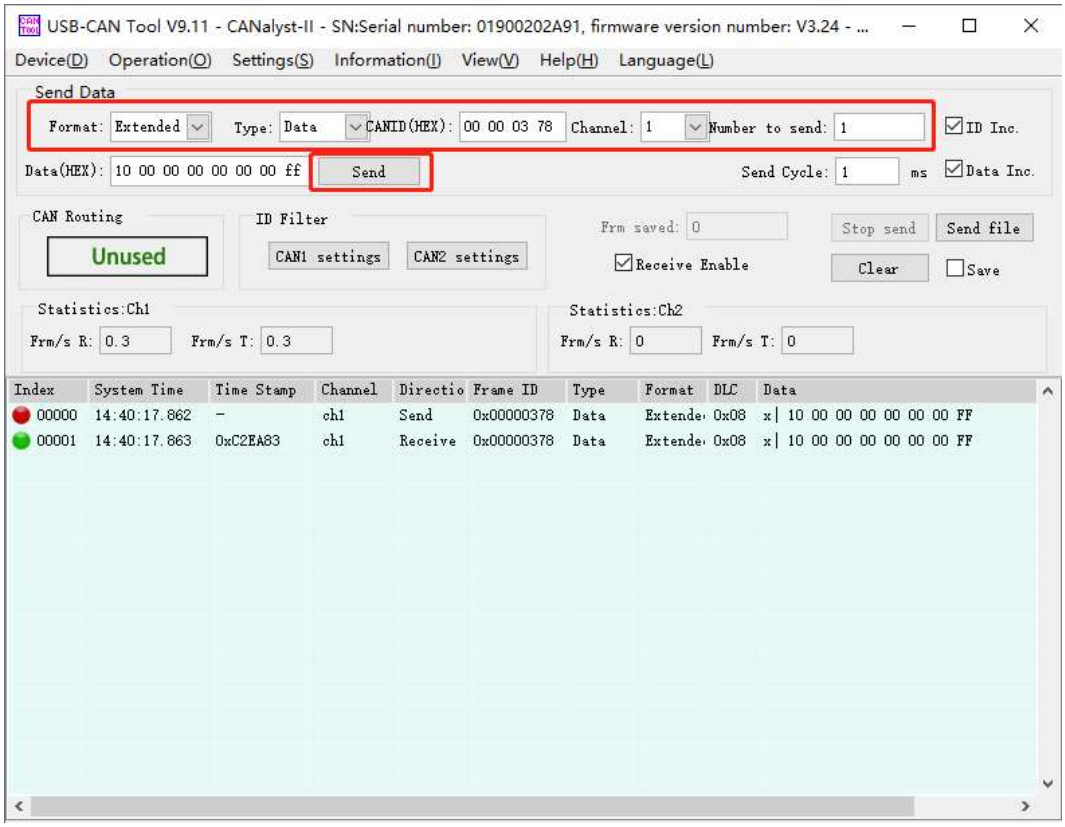



Figure 17: Data sending and receiving

### 3.3.4 Test RS422

The RS422 interface test needs to use a standard DB9 serial debugging line. In the example, the USB2.0 RS422/RS485 universal serial debugging line produced by China Z-TEK is used.

Figure 18: RS422/RS485 cable

Device and DB9 connection line sequence:

| **GIIICM680L** | | **DB9** |
|---|---|---|
| GPIO4(RXD-) | --- | T/R- |
| GPIO5(RXD+) | --- | T/R+ |
| GPIO10(TXD+) | --- | RXD+ |
| GPIO11(TXD-) | --- | RXD- |

Connection example diagram：

Figure 19: RS422 connection diagram

Connect the DB9 interface through putty, the baud rate is 115200bps, send data to the device, the device will return the data as it is. as figure 42 show.


Figure 20: putty output information

### 3.3.5 Test RS485

The RS422 interface test needs to use a standard DB9 serial debugging line. In the example, the USB2.0 RS422/RS485 universal serial debugging line produced by China Z-TEK is used.

Figure 21: RS422/RS485 cable

Device and DB9 connection line sequence:

| **GIIICM680L** | | **DB9** |
|---|---|---|
| GPIO4 | --- | T/R- |
| GPIO5 | --- | T/R+ |
| GPIO10 | --- | T/R+ |
| GPIO11 | --- | T/R- |

Connect the DB9 interface through putty, the baud rate is 115200bps, send data to the device, the device will return the data as it is. as figure 44 show.


Figure 22: putty output information

◆

# 4 Application API

## 4.1 Common API

Common API are the API functions can be called by all Guardian 3 products.

### 4.1.1 gdn_sys_init()

```
int gdd_sys_init ( int       argc,
                   char *  argv[]
                 )
```

Init the Guardian system hardware, it should be called before any other API.

**Parameters**

argc

argv

**Returns**

int 0 on success, -1 otherwise

### 4.1.2 gdn_daughter_board_power_down()

```
int gdn_daughter_board_power_down ( void   )
```

Power down daughter board to save power

**Returns**

int 0 on success, -1 otherwise

### 4.1.3 gdn_daughter_board_power_up()

```
int gdn_daughter_board_power_up ( void   )
```

Power up the daughter board to use its function

**Returns**

int 0 on success, -1 otherwise

### 4.1.4 gdn_change_network_type()

int gdn_change_network_type ( int networkType )

set network type and check

**Parameters**

networkType enum e_network_type

**Returns**

int 0 on success, -1 otherwisw

### 4.1.5 gdn_check_current_wifi_network_status()

int gdn_check_current_wifi_network_status ( void )

check current wifi status

**Returns**

int 0 on success, -1 otherwisw

### 4.1.6 gdn_check_network_ready()

int gdn_check_network_ready ( void )

check network ready state

**Returns**

int 0 Internet available, 1 Internet not available

### 4.1.7 gdn_get_network_type()

e_network_type gdn_get_network_type ( void )

get network type

**Returns**

e_network_type enum e_network_type

### 4.1.8 gdn_init_led()

int gdn_init_led ( void )

init LED

**Returns**

int 0 on success, -1 otherwise

### 4.1.9 gdn_set_led_status()

void gdn_set_led_status ( int type, unsigned char status)

Set LED status

**Parameters**

type led possition

state 0 off, 1 on

### 4.1.10 gdn_set_network_by_type()

void gdn_set_network_by_type ( int networkType )

set network type

**Parameters**

networkType enum networkType

### 4.1.11 gdn_watch_dog_feed()

void gdn_watch_dog_feed ( uint32_t watchedIndex )

watch dog feed

**Parameters**

watchedIndex watch dog index

### 4.1.12 gdn_watch_dog_init()

int gdn_watch_dog_init ( uint32_t watchedNum )

watch dog init

**Parameters**

watchedNum watch dog id

**Returns**

int 0 on success, -1 otherwise

## 4.2 Cellular related API

Cellular related API are API functions can be called by Guardian 3 with cellular modules.

### 4.2.1 gdn_init_cellular()

int gdn_init_cellular ( void )

This function initiates the communication between MT3620 with the cellular module. The application should call this before any other cellular related functions. It should be called after the system module's initialization.

**Parameters**

None

**Returns**

int 0 on success, -1 otherwise

### 4.2.2 gdn_config_cellular()

int gdn_set_cellular_config ( CELLULAR_CONFIG_S * cellular_config )

Configure Cellular properties: APN, username, password, pin number.

**Parameters**

cellular_config Attribute fields that need to be configured

**Returns**

int 0 on success, -1 otherwise

### 4.2.3 gdn_get_esim_id()

int gdn_get_esim_id ( ESIM_ID_S * esim_id )

get esim_id:IMI,QCCID

**Parameters**

esim_id The returned esim_id structure requires the user to allocate memory

**Returns**

int 0 on success, -1 otherwise

### 4.2.4 gdn_get_gps()

int gdn_get_gps ( GPS_INFO_S * gps )

get gps info:utc,longitude,latitude,altitude

**Parameters**

gps The returned gps structure requires the user to allocate memory

**Returns**

int 0 on success, -1 otherwise

## 4.2.5 gdn_handle_atcmd()

```
int gdn_handle_atcmd ( char *          atcmd,
                       unsigned int    timeout_ms,
                       char **         at_result,
                       unsigned int *  result_len
                     )
```

AT command transparent transmission to obtain corresponding response data.

**Parameters**

| | |
|---|---|
| atcmd | AT command sent |
| timeout_ms | Timeout waiting for reply |
| at_result | Returned data.The user does not need to allocate memory, but the user needs to release it after use |
| result_len | The length of the returned data |

**Returns**

int 0 on success, -1 otherwise

## 4.2.6 gdn_get_cellular_status()

```
int gdn_get_cellular_status ( CELLULAR_STATUS_S *  cellular_status )
```

get cellular status:state,signal-quality,access_tech,imei,registration-state,operator-code,operator-name

**Parameters**

cellular_status The returned cellular_status structure requires the user to allocate memory

**Returns**

int 0 on success, -1 otherwise

## 4.2.7 gdn_cellular_connect_state()

```
bool gdn_cellular_connect_state ( void   )
```

get nxp connect state

**Returns**

true connected

false not connected

### 4.2.8 gdn_get_wwan_info()

int gdn_get_wwan_info ( WWAN_INFO_S * wwan_info )

get wwan infomation: connected,suspended,wwan_if,ip_timeout,apn,roaming,method,address,prefix,prefix,dns,mtu

**Parameters**

wwan_info The returned wwan_info structure requires the user to allocate memory

**Returns**

int 0 on success, -1 otherwise

### 4.2.9 gdn_print_cellular_debug_info()

void gdn_print_cellular_debug_info ( void )

One time to print detailed information such as the complete status and attributes of the cellular.

## 4.3 GIIICM680L

Products: GIIICM680L, GIIICM680L-CM2, GIIICM680L-CM6, GIIICM680L-CMA.

### 4.3.1 gdn_close_usb_uart()

void gdn_close_usb_uart ( void )

gdn_close_usb_uart - close usb to uart by params including config and data handler,This is used for the FT234XD

### 4.3.2 gdn_open_usb_uart()

```
int gdn_open_usb_uart ( UART_Config *                config,
                        UART_DATA_HANDLER  handler
                      )
```

open usb to uart by params including config and data handler,This is used for the FT234XD

**Parameters**

config Defined by UART_Config

handler Callback defined by UART_DATA_HANDLER, if set NULL, using built-in handler

**Returns**

int 0 on success, -1 otherwisw

### 4.3.3 gdn_send_message_to_usb()

```
size_t gdn_send_message_to_usb ( uint8_t *  data,
                                 size_t     dataLen
                               )
```

send data to usb

**Parameters**

data data - Data buffer to send

dataLen dataLen - Length of data to send

**Returns**

size_t Bytes of sent data

### 4.3.4 gdn_lora_recv()

```
void gdn_lora_recv ( char *  buff
                     int     buff_len
                   )
```

LoRa devices' data receiver

**Parameters**

buff receive data buff

buff_len receive data buff len

## 4.4 GIIICM680E

Products: GIIICM680E，GIIICM680E-CN, GIIICM680E-CE

### 4.4.1 gdn_close_usb_uart()

```
void gdn_close_usb_uart ( void  )
```

gdn_close_usb_uart - close usb to uart by params including config and data handler,This is used for the FT234XD

## 4.4.2 gdn_open_usb_uart()

```
int gdn_open_usb_uart ( UART_Config *          config,
                        UART_DATA_HANDLER  handler
                      )
```

open usb to uart by params including config and data handler,This is used for the FT234XD

**Parameters**

config Defined by UART_Config

handler Callback defined by UART_DATA_HANDLER, if set NULL, using built-in handler

**Returns**

int 0 on success, -1 otherwisw

## 4.4.3 gdn_tcp_client_connect()

```
int gdn_tcp_client_connect ( int *          socket_fd,
                             const char *   ip,
                             unsigned short  port
                           )
```

tcp connect

**Parameters**

socket_fd socket fd

ip ip address

port port number

**Returns**

int 0 on success, -1 otherwisw

## 4.4.4 gdn_tcp_client_recv()

```
int gdn_tcp_client_recv ( int *            socket_fd,
                          char **          recv_buf,
                          unsigned int *   buff_len,
                          unsigned int     timeout_second
                        )
```

tcp receive

**Parameters**

socket_fd socket fd

recv_buf receive data buff

buff_len receive data buff len

timeout_second time out

**Returns**

int reality receive data len

## 4.4.5 gdn_tcp_client_send()

```
int gdn_tcp_client_send ( int *          socket_fd,
                          char *         buff,
                          unsigned int   len
                        )
```

tcp send

**Parameters**

socket_fd socket fd

buff send data buff

len send data buff len

**Returns**

int reality send data len

## 4.4.6 gdn_southboundEth_recv()

```
void gdn_southboundeth_recv ( char *           buff
                              int              buff_len
                              unsigned short   port
                            )
```

southbound ethernet data receiver

**Parameters**

buff receive data buff

buff_len receive data buff len

port port number

## 4.4.7 gdn_southboundEth_send()

```
void gdn_southboundeth_send ( char *           buff
                              size_t           buff_len
                              unsigned short   port
                            )
```

southbound ethernet send

**Parameters**

| | |
|---|---|
| buff | send data buff |
| buff_len | send data buff len |
| port | port number |

## 4.5 GIIICM680R

Products: GIIICM680R，GIIICM680R-CN, GIIICM680R-CE

### 4.5.1 gdn_close_can()

```
void gdn_close_can ( int  fd )
```

**Parameters**

fd CAN fd Indicates which CAN to close

### 4.5.2 gdn_close_rs422()

```
void gdn_close_rs422 ( void  )
```

close rs422 to uart by params including config and data handler.

### 4.5.3 gdn_close_rs485()

```
void gdn_close_rs485 ( void  )
```

close rs485 by params including config and data handler.

### 4.5.4 gdn_open_can()

```
int gdn_open_can ( eInterfaceType          interface,
                   eCANPort                port,
                   CANParameter_t *        parameter_can,
                   CAN_DATA_HANDLER        handler
                 )
```

Open CAN bus by params, baudrate and data handler...

**Parameters**

| | |
|---|---|
| interface | Use UART or SPI interface to connect to CAN module |

| | |
|---|---|
| port | Which channel CAN open, G3 only has port0 by default |
| parameter_can | struct of CANParameter_t |
| handler | Callback defined by CAN_DATA_HANDLER,Used by the user to process the received CAN data |

**Returns**

int 0 on success, -1 otherwise

## 4.5.5 gdn_open_rs422()

```
int gdn_open_rs422 ( UART_Config *          config,
                     UART_DATA_HANDLER      handler
                   )
```

open usb to uart by params including config and data handler.

**Parameters**

| | |
|---|---|
| config | Defined by UART_Config |
| handler | Callback defined by UART_DATA_HANDLER, if set NULL, using built-in handler |

**Returns**

int 0 on success, -1 otherwisw

## 4.5.6 gdn_open_rs485()

```
int gdn_open_rs485 ( UART_Config *          config,
                     UART_DATA_HANDLER      handler
                   )
```

open rs485 by params including config and data handler.

**Parameters**

| | |
|---|---|
| config | Defined by UART_Config |
| handler | Callback defined by UART_DATA_HANDLER, if set NULL, using built-in handler |

**Returns**

int 0 on success, -1 otherwisw

## 4.5.7 gdn_send_message_to_rs422()

```
size_t gdn_send_message_to_rs422 ( uint8_t *  data,
                                   size_t     dataLen
                                 )
```

Send data to rs422.

**Parameters**

data Data buffer to send

dataLen Length of data to send

**Returns**

size_t Bytes of sent data

## 4.5.8 gdn_send_message_to_rs485()

```
size_t gdn_send_message_to_rs485 ( uint8_t *  data,
                                   size_t     dataLen
                                 )
```

send data to rs485

**Parameters**

data Data buffer to send

dataLen Length of data to send

**Returns**

size_t Bytes of sent data

## 4.5.9 gdn_write_can()

```
void gdn_write_can ( int              fd,
                     CANWrite_t *     canPara,
                     const char *     dataToSend,
                     size_t           dataLen
                   )
```

Write data to the CAN bus.

**Parameters**

fd CAN fd Indicates which CAN to write

canPara struct of CANWrite_t

dataToSend Data buffer to send

dataLen Length of data to send

# 5 Support

For all general, partnership, career, and/or press inquiries, please contact us through email or phone number:

Email: crl@changhong.us
Phone: 1-408-970-0349
Address: 2580 North First Street, Suite 100, San Jose, CA 95131