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Neusys Technology Inc.

IGT-20/ IGT-21 Industrial Gateway



User Manual

Revision 1.2

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For questions in regards to hardware/ software compatibility, customers should contact Neosys Technology Inc. sales representative or technical support.

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Declaration of Conformity

FCC

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CE

The product(s) described in this manual complies with all applicable European Union (CE) directives if it has a CE marking. For computer systems to remain CE compliant, only CE-compliant parts may be used. Maintaining CE compliance also requires proper cable and cabling techniques.

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Safety Precautions

Read these instructions carefully before you install, operate, or transport the system.

- Install the system or DIN rail associated with, at a sturdy location
- Install the power socket outlet near the system where it is easily accessible
- Secure each system module(s) using its retaining screws
- Place power cords and other connection cables away from foot traffic. Do not place items over power cords and make sure they do not rest against data cables
- Shutdown, disconnect all cables from the system and ground yourself before touching internal modules
- Ensure that the correct power range is being used before powering the device
- Should a module fail, arrange for a replacement as soon as possible to minimize down-time
- If the system is not going to be used for a long time, disconnect it from mains (power socket) to avoid transient over-voltage

Service and Maintenance

- ONLY qualified personnel should service the system
- Shutdown the system, disconnect the power cord and all other connections before servicing the system
- When replacing/ installing additional components (expansion card, memory module, etc.), insert them as gently as possible while assuring proper connector engagement

ESD Precautions

- Handle add-on module, motherboard by their retention screws or the module's frame/ heat sink. Avoid touching the PCB circuit board or add-on module connector pins
- Use a grounded wrist strap and an anti-static work pad to discharge static electricity when installing or maintaining the system
- Avoid dust, debris, carpets, plastic, vinyl and styrofoam in your work area.
- Do not remove any module or component from its anti-static bag before installation

About This Manual

This manual introduces Neosys IGT-20/ IGT-21 industrial grade gateway that can be deployed in a complex communication network. The manual covers IGT-20/ IGT-21 connections, LED indicators, initial setup and installation of the system.

Revision History

| Version | Date | Description |
|---------|-----------|---|
| 1.0 | May. 2017 | Initial release |
| 1.1 | Sep. 2017 | Login via Ethernet update |
| 1.2 | Mar. 2018 | Added IGT-21 |

1.Introduction

Neosys IGT-20/ IGT-21 are rugged industrial grade ARM-based gateway. Based on Texas Instruments' Sitara AM335x family and coupled with Debian operating system, IGT-20/ IGT-21 are in compliance with CE/FCC, shock, vibration, etc. certifications.

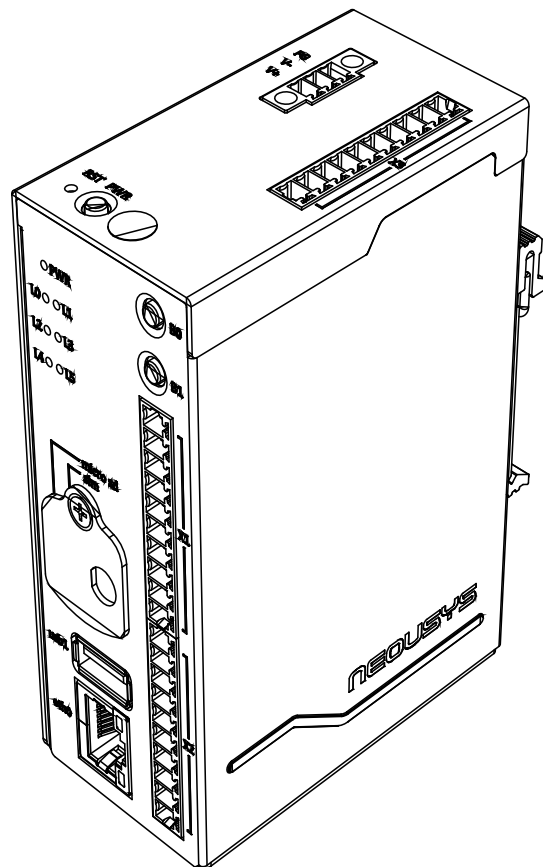
1.1 IGT-20/ IGT-21 Overview

Neosys IGT-20/ IGT-21 accept a wider range of power inputs from 8~25 VDC and has I/Os that are applicable to a range of industrial grade sensors. It also has four (4) built-in isolated digital inputs channels that accept discrete signals from various sensors or buttons/ switches and four (4) built-in isolated digital output channels to control actuators and indicators.

Network and communication wise, there are built-in mini-PCIe slot and a USIM holder for wireless network access through 3G, 4G or WiFi (mini PCIe WiFi module). There is also an opening at the top for SMA connector to boost wireless signals.

The system features an external and an internal microSDHC slots. The separate storage slot design allows system files and user data to be stored on different cards. The design can also expedite OS deployment for mass production scenarios.

As a gateway, users can take advantage of six programmable status LED indicators and two function buttons to operate IGT-20/ IGT-21 without using a keyboard/ mouse.



1.2 IGT-20/ IGT-21 Hardware Specifications

System Specification

| | |
|----------------------|--------------------------------|
| Processor | Texas Instrument Sitara AM3352 |
| Memory module | 1GB DDR3L SDRAM (onboard) |
| Power input | 8~25 VDC |

Input/ Output Interface

| | |
|------------------------------|--|
| Ethernet: | 10/ 100Mbit full-duplexed x1 |
| USB port | USB2.0 x1 |
| Storage expansion | Dual microSDHC (internal x1, external x1) |
| Serial port | Two RS-232/ 422/ 485 ports, configurable Up to 115.2kbps Auto flow control with RS-485 |
| Console port | 3-wired RS-232 x1 |
| LED indicator | LED indicator (user definable) x6 |
| Function button | Function button (user definable) x2 |
| CAN bus (IGT-21 only) | Isolated CAN bus port, 2.0A and 2.0B |
| Wireless expansion | mini PCIe + SIM slot x1 (USB signal only) |

Digital Input

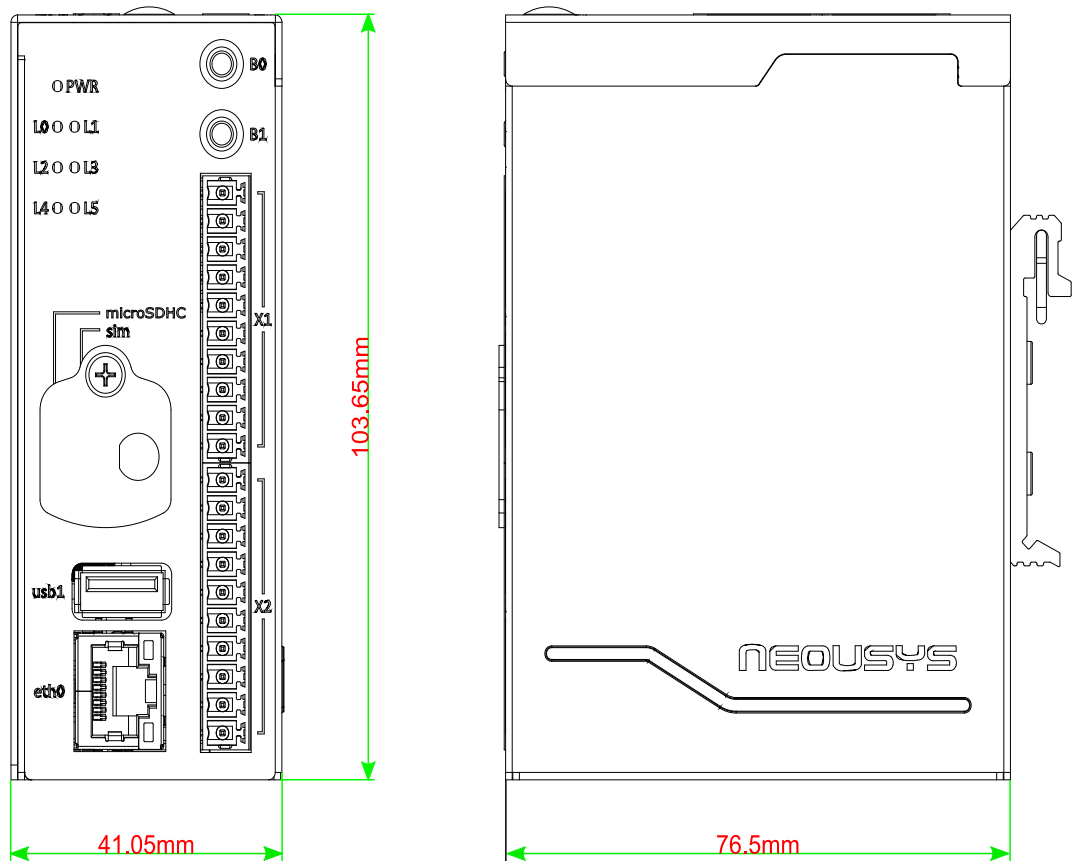
| | |
|--------------------------|---|
| Digital input | Built-in isolated digital input channels x4 |
| Interface | Photo-coupler |
| Isolation voltage | 2500Vms |
| Logic "0" voltage | 5~24V |
| Logic "1" voltage | 0~1.5V |
| Connector pitch | 3.81mm |

Digital Output

| | |
|--------------------------|--|
| Digital output | Built-in isolated digital output channels x4 |
| Interface | N-channel MOSFET |
| Isolation voltage | 2500Vms |
| Output voltage | Up to 24VDC |
| Output current | 100mA |
| Connector pitch | 3.81mm |

1.3 Enclosure Dimensions

Neosys IGT-20/ IGT-21 enclosure dimensions come in a footprint measuring just 103.65 (H) x 41.05 (W) x 76.5 (D) mm. The compact dimensions make it easy to setup and deploy in areas where space is limited. It also comes with a DIN clip for DIN-rail mounting purposes.



2. System Overview

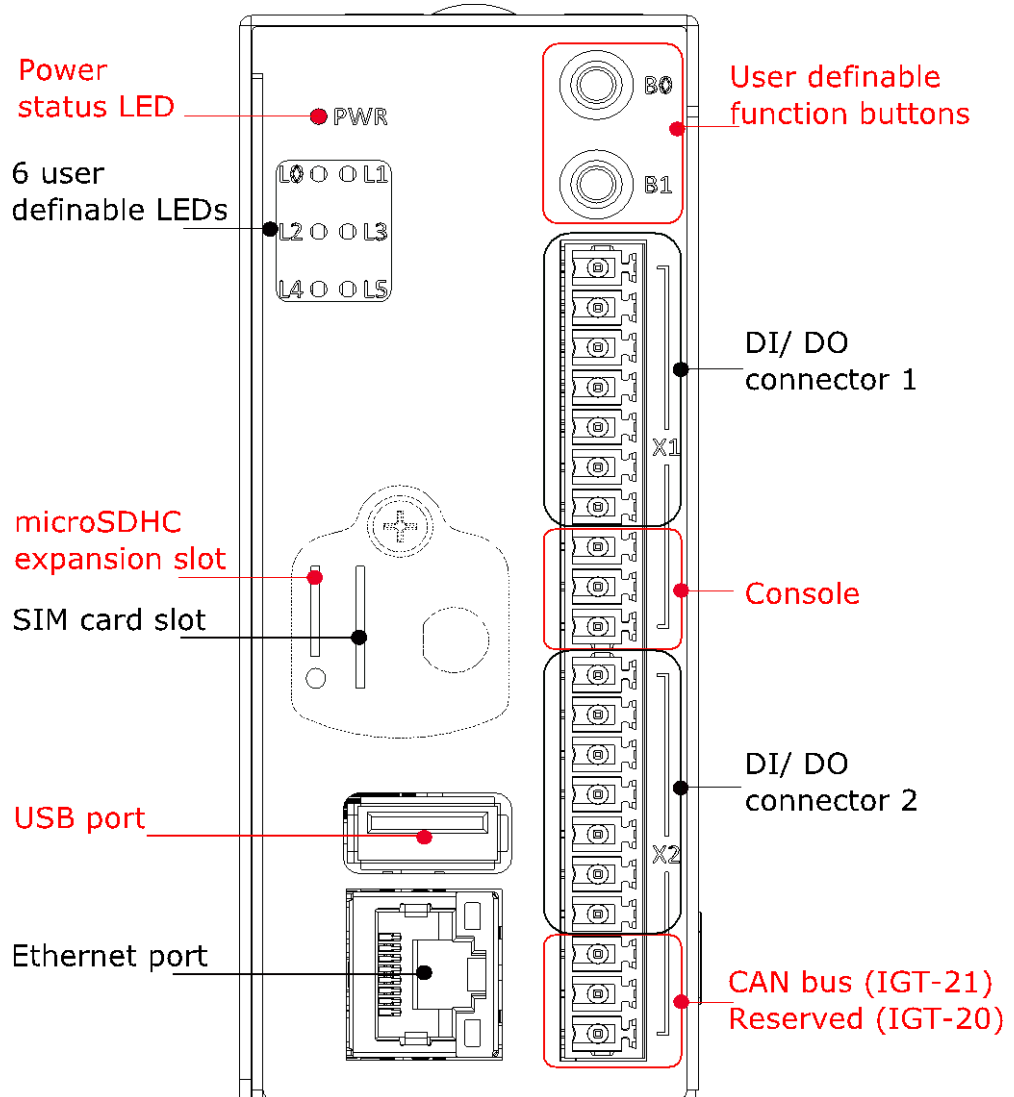
Upon receiving and unpacking your IGT-20/ IGT-21 system, please check immediately if the package contains all the items listed in the following table. If any item(s) are missing or damaged, please contact your local dealer or Neosys Technology.

2.1 IGT-20/ IGT-21 Packing List

| System Item | IGT-20/ IGT-21 | Qty |
|----------------|------------------------|-----|
| 1 | IGT-20 or IGT-21 | 1 |
| 2 | 3-pole terminal block | 1 |
| 3 | 10-pole terminal block | 3 |
| 4 | Cover plate | 1 |
| 5 | M3 flat screw | 1 |
| 6 | DIN-rail clip set | 1 |

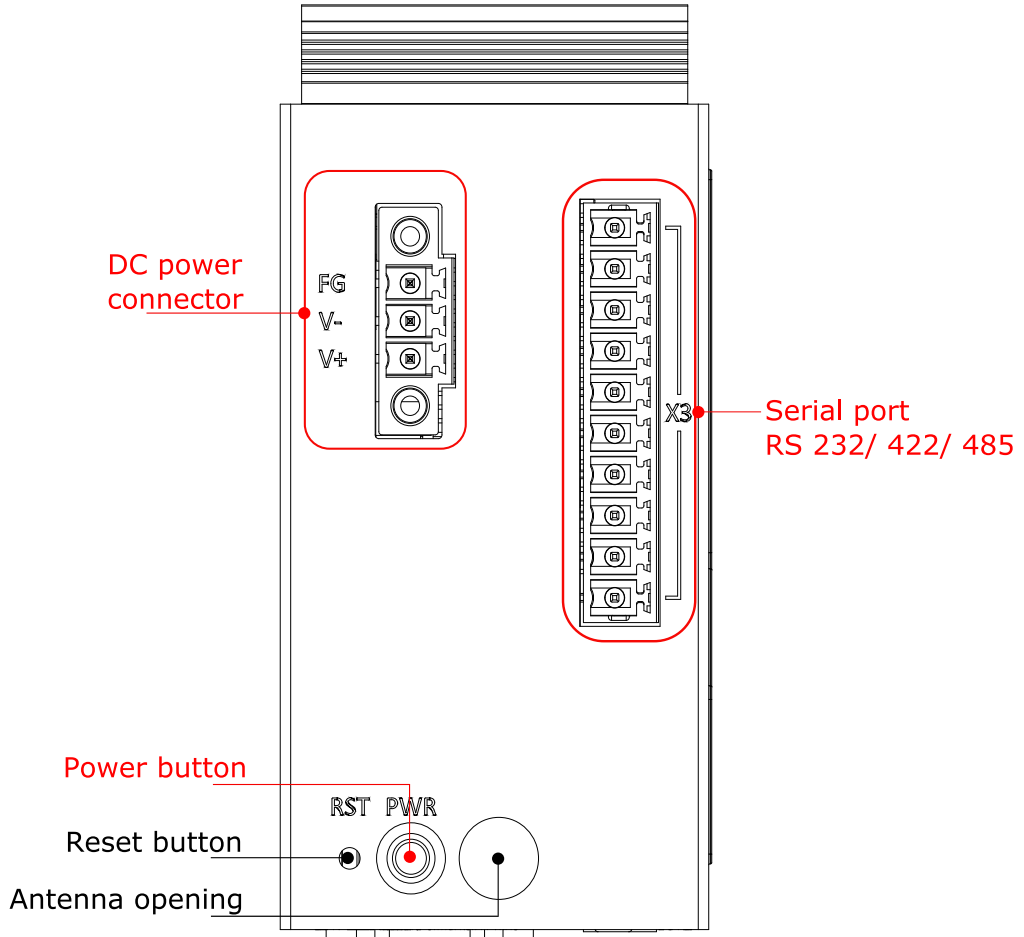
2.2 Enclosure Front Panel View

On the system's front panel, there is a power status indicator LED, six user-definable LEDs, microSDHC expansion slot, SIM card slot, USB port, Ethernet port, two user-definable function buttons, two DI/ DO connector, console and reserved ports.



2.3 Enclosure Top View

Top of the enclosure features a 3-pin DC power connector, serial port (RS-232/ 422/ 485), power button, reset button and an antenna opening.

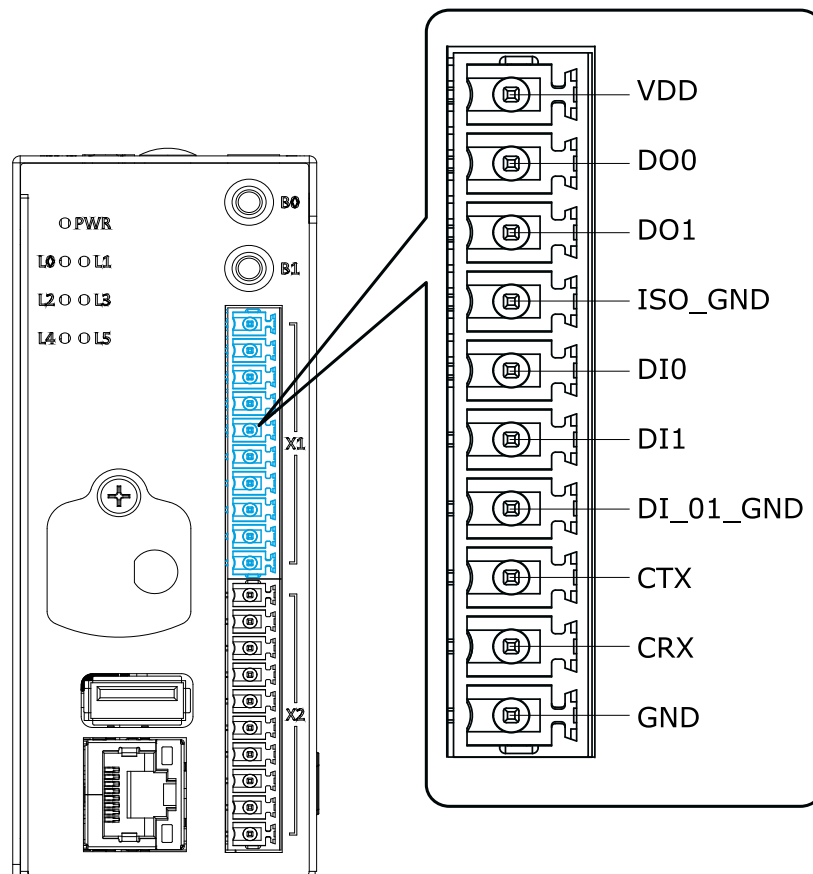


3. Digital I/O and DC Connector

There are three I/O connectors on IGT-20/ IGT-21, each serving a different purpose and function from one another. They consist of digital input/ output, console and serial port. There is also a DC connector at the top of the system.

3.1 Digital I/O Connector 1 Definition

The I/O connector 1 is located at the front panel of the system. The connector comprises of the first connector (pins 1~10 from the top). It has digital input/ output functions and console port connection capability. For initial login via console port, you **MUST** connect through connector 1's console.

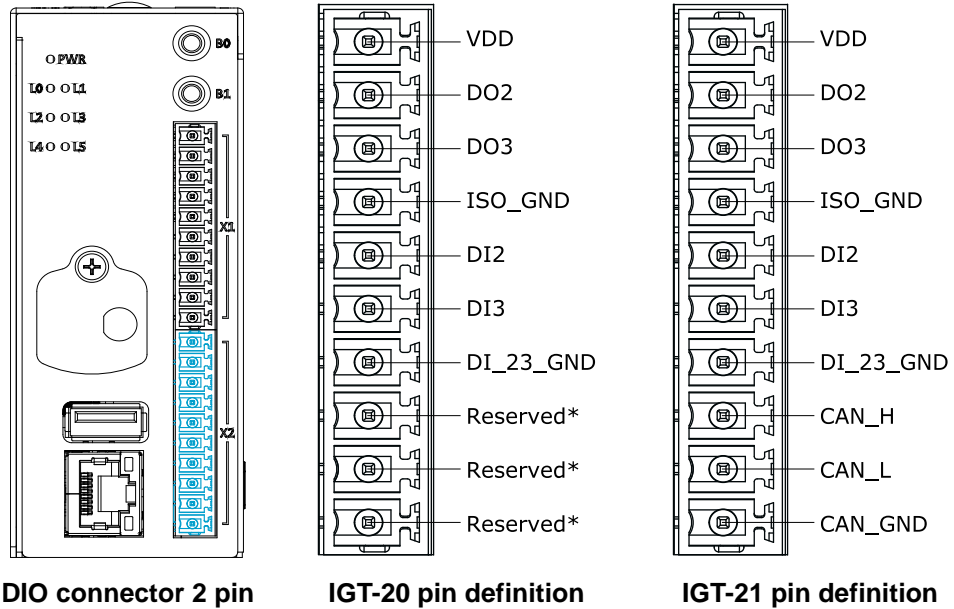


Digital I/O Connector 1 Pin

| Pin | Signal |
|------------------|--|
| VDD | Clamp voltage for inductive load. Ignore this pin if no inductive load |
| DO0 | Digital Output pin 0 |
| DO1 | Digital Output pin 1 |
| ISO_GND | Common of digital output, isolated ground. Connect this pin to ground of driving voltage |
| DI0 | Digital Input pin 0 |
| DI1 | Digital Input pin 1 |
| DI_01_GND | Common of DI0 and DI1 |
| CTX | Tx of console port |
| CRX | Rx of console port |
| GND | Ground of Console port. |

3.2 Digital I/O Connector 2 Definition

The I/O connector 2 is located at the front panel of the system. The connector comprises of the second connector (pins 11~20 from the top). It has digital input/output functions.



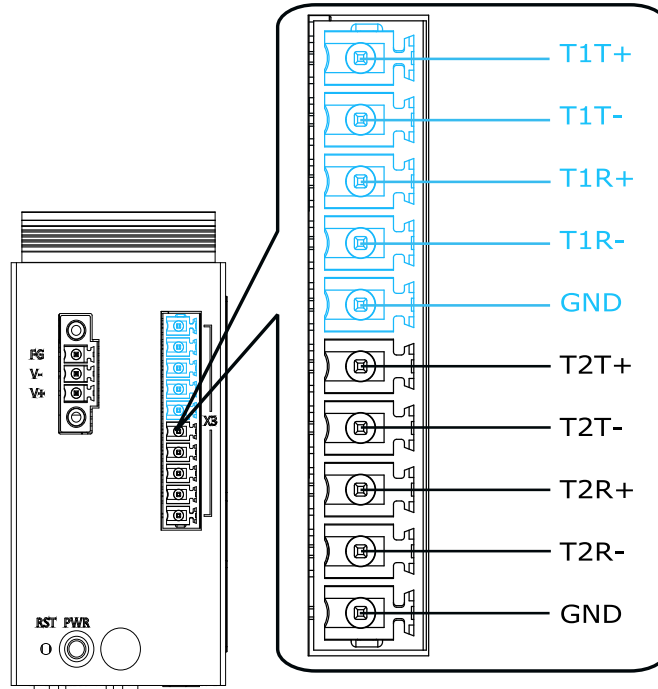
Digital I/O Connector 2 Pin

| Pin | Signal |
|------------------|--|
| VDD | Clamp voltage for inductive load. Ignore this pin if no inductive load |
| DO2 | Digital Output pin 2 |
| DO3 | Digital Output pin 3 |
| ISO_GND | Common of digital output, isolated ground. Connect this pin to ground of driving voltage |
| DI2 | Digital Input pin 2 |
| DI3 | Digital Input pin 3 |
| DI_23_GND | Common of DI2 and DI3 |
| CAN_H (IGT-21) | CAN high signal (IGT-21) |
| CAN_L (IGT-21) | CAN low signal (IGT-21) |
| CAN_GND (IGT-21) | CAN bus ground, this pin connects to ISO_GND internally (IGT-21) |

*DO NOT connect to reserved pins on IGT-20

3.3 Serial Port Definition

Located at the top of the enclosure, there are two sets of pin definitions on system's serial port (RS-232/ 422/ 485). In the preinstalled Debian operating system, the first set of pins are mapped to ttyS1 and the second set of pins are mapped to ttyS2.

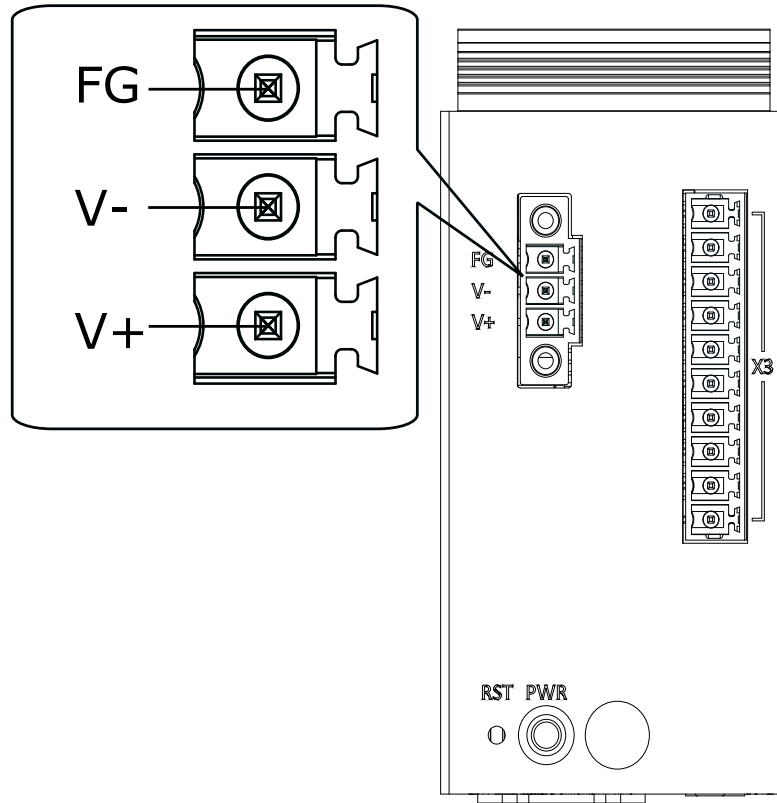


Serial Port Pin

| Port \ Pin | RS-422 | RS-485 | RS-232 |
|------------|--|----------------|-------------|
| T1T+ | TX+ of ttyS1 | Data+ of ttyS1 | Rx of ttyS1 |
| T1T- | TX- of ttyS1 | Data- of ttyS1 | - |
| T1R+ | RX+ of ttyS1 | - | Tx of ttyS1 |
| T1R- | RX- of ttyS1 | | - |
| T2T+ | TX+ of ttyS2 | Data+ of ttyS2 | Rx of ttyS2 |
| T2T- | TX- of ttyS2 | Data- of ttyS2 | - |
| T2R+ | RX+ of ttyS2 | - | Tx of ttyS2 |
| T2R- | RX- of ttyS2 | - | - |
| GND | Ground of serial port. This pin connects to system digital ground. | | |

3.4 DC Connector Definition

The DC connector can be located at the top of the system.



DC Connector Pin

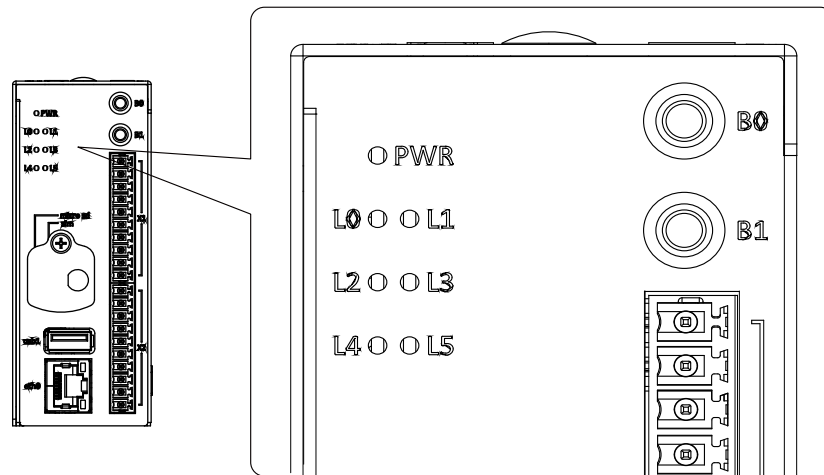
| Pin | Definition |
|-----|-----------------|
| V+ | V+ of DC input |
| V- | V- of DC input |
| FG | FG frame ground |

4. System LED

The system has 6 user definable LED indicators for users to program accordingly to their needs. However, there are some LEDs that come with preset default statuses that will be mentioned in this chapter. Other LEDs you will find on the system include the Ethernet port and the power status LED.

4.1 System Status LED

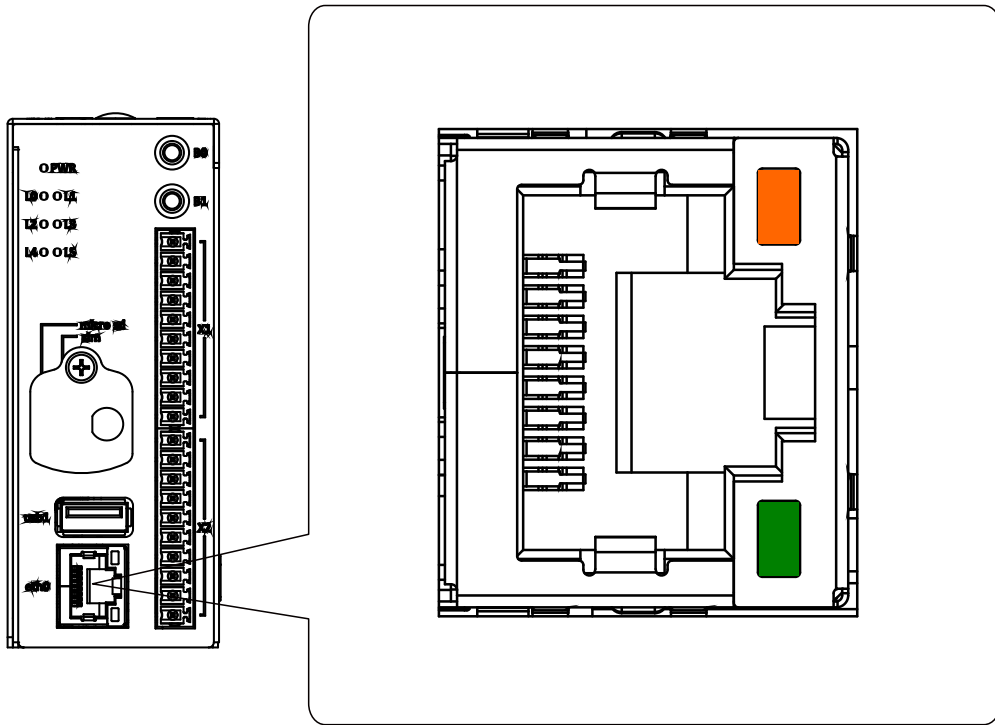
There are seven (7) system status LEDs that include a power status LED and six (6) programmable status LEDs where some may have predefined settings



| Front panel LED indicators | | | |
|----------------------------|--------------|-------------------------------------|---|
| Label | Name | Status description | Preset status |
| PWR | Power button | Green: System on Off: System off | NA |
| L0 | LED 1 | Amber, User definable | By default, it acts as the system's heartbeat, blinking twice per second. |
| L1 | LED 2 | Amber, User definable | NA |
| L2 | LED 3 | Amber, User definable | By default, it acts as the external microSDHC card's status LED |
| L3 | LED 4 | Amber, User definable | By default, it acts as the internal microSDHC card's status LED |
| L4 | LED 5 | Amber, User definable | NA |
| L5 | LED 6 | Amber, User definable | NA |

4.2 Ethernet Port LED

The Ethernet port provides network connectivity. In addition to the console port, it is one of the two ports that may be used for system's initialization. The LED status indicator light functions are described as below.



| LED indicator | LED color | Status description |
|--------------------------|--------------|---|
| Ethernet port LED | | |
| Connection status | Amber | Steady on: Connection established Blinking: Data activity |
| Connection Speed | Green | Steady on: 100Mbps connection established Off: 10Mbps connection established |

5. System Setup

The system setup involves programming LED definitions, hardware and DIN rail installation. However for this manual, we will be focusing on hardware and DIN rail installation only. Before you start, please make sure you have done the following:

It is recommended that only qualified service personnel should install and service this product to avoid injury.

During the process, please observe all ESD procedures to avoid damaging the equipment.

For internal, external microSDHC/ SIM card installation or replacement, make sure the system has powered off.

Before disassembling your system, please make sure the system has powered off with all cables (power, video, data, etc.) and antennae disconnected.

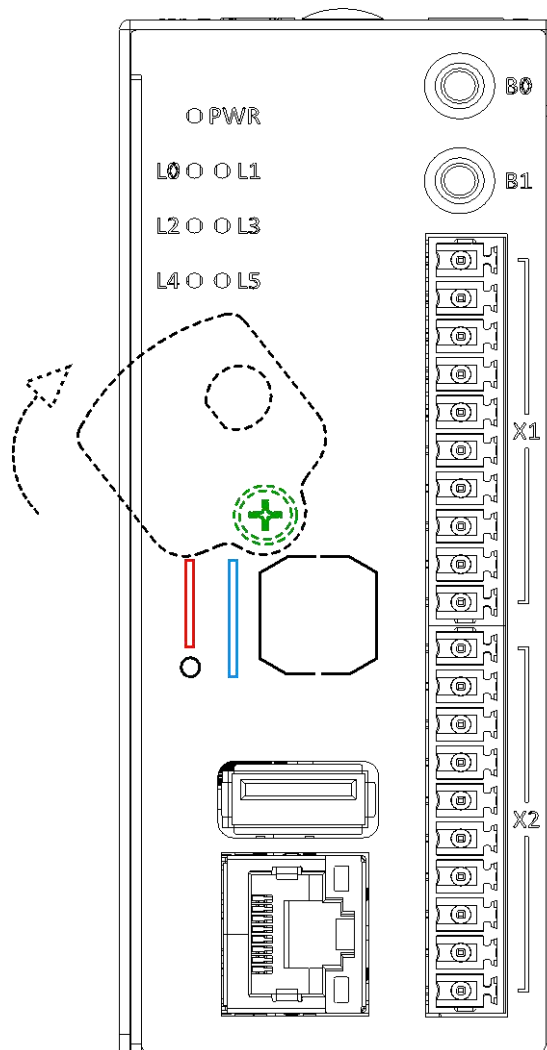
Place the system on a flat and sturdy surface (remove from mounts or out of server cabinets) before proceeding with the installation/ replacement procedure.

5.1 External microSDHC/ SIM Card Installation/ replacement

The external microSDHC/ SIM card slots can be located behind the cover-plate (dotted line) on the front panel. To replace or insert cards, you must loosen the screw securing the cover-plate to access the slots. The microSD card provides additional expansion storage while the SIM card offers wireless communication capability to the system.

Please ensure the system has powered off.

1. Loosen the screw (green) on the front panel just enough to move the cover-plate (dotted line) to the left to expose the microSDHC (red)/ SIM card (blue) slots.



2. If you already have cards in there and wanting to replace them, use your fingernail to push-in the card and the card will spring out just enough for you to retract them out of the slot.
3. The card insertion is directional. So gently insert the card, if you feel like the card is stuck, try turning the card around and try inserting it again. When properly inserted, you should hear a “click” sound.



WARNING

Prior to inserting the microSDHC or SIM card, please remember to power off the system as they are not hot-pluggable. Failure to do so may damage to the SIM card, system or result in data loss on the microSDHC card!



NOTE

The internal and external microSDHC cards are interchangeable. Either one can serve as expansion storage or system OS card. However during boot up, the system will detect the external slot for bootable OS before detecting the internal slot.

5.2 Internal microSDHC Card Installation/ Replacement

To access the internal microSDHC, you must disassemble the enclosure and cover.

To do so, please perform the following procedure:

1. Unfasten the screw on the side panel.



2. Unfasten the screw holding the cover plate.



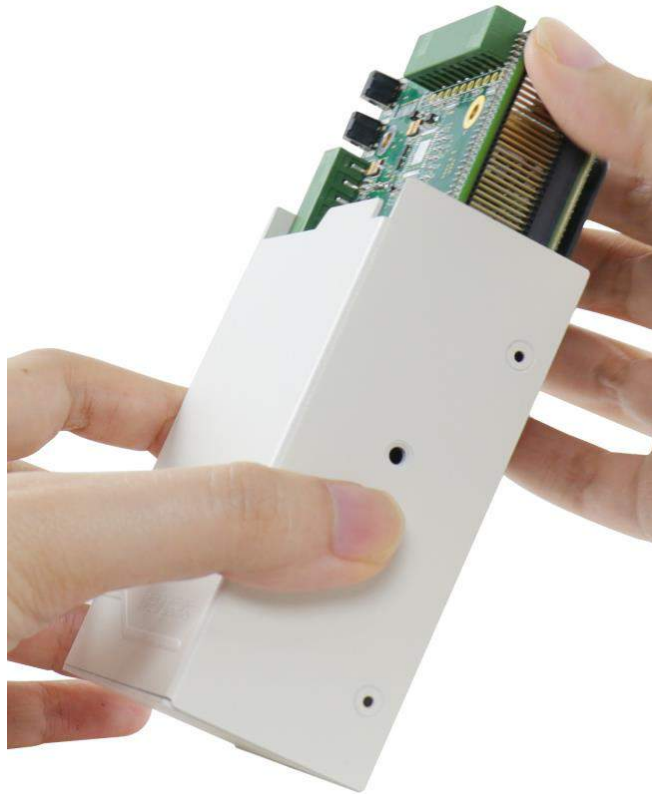
3. Place your thumbs firmly on the side of the cover and gently push upwards to remove it.



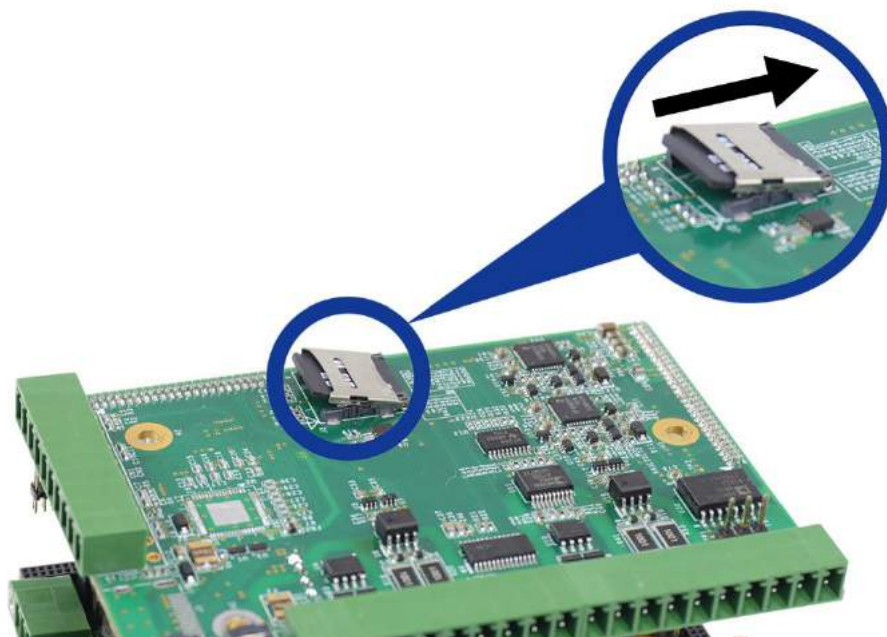
4. Once you have removed the cover, unfasten two screws that secure the PCBA in the enclosure.



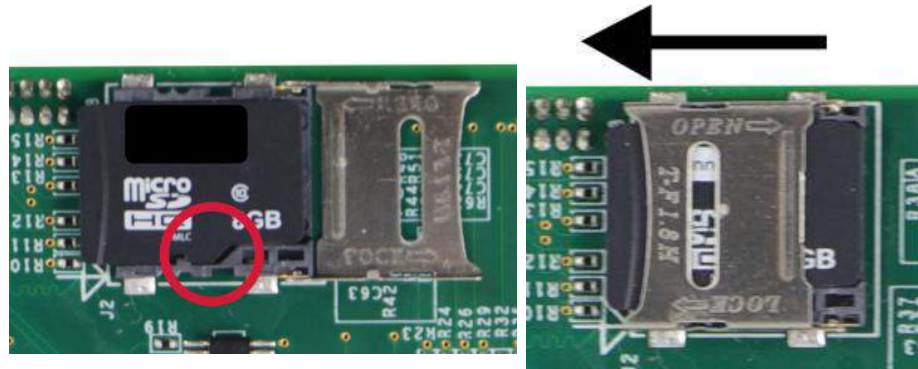
5. Gently pull the PCBA out of the enclosure.



6. With the orientation shown below, gently press down and slide the holder in the direction shown to unclip the microSDHC card. Flip open the holder to install/replace the microSDHC card.



- Place the replacement microSDHC card in the slot, make sure the notch matches (indicated by the red circle), flip the holder over to sit on top of the microSDHC card and slot, push in the direction shown to secure microSDHC card.



Make sure the notch meets

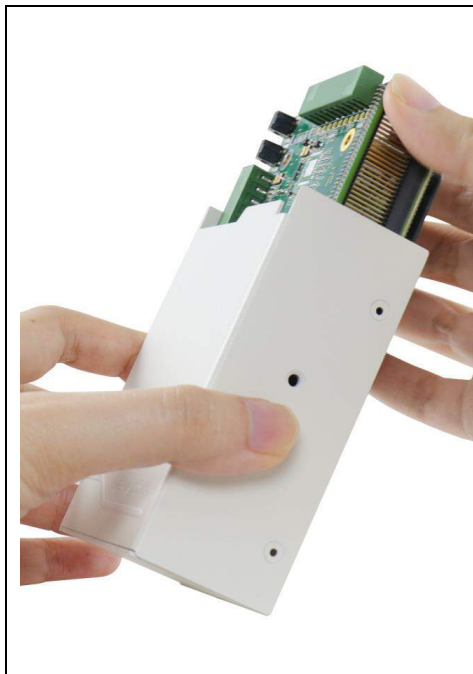
To secure the microSDHC card



NOTE

When in doubt which direction to lock and unlock the microSDHC card holder, please refer to the markings (OPEN/ LOCK) on the holder.

- Gently slide the PCBA back into the enclosure, making sure the connectors\ buttons meet the enclosure openings.



Slide back into enclosure



Make sure connectors meet

- Secure the two screws holding the PCBA to the enclosure.



- Install the cover, fasten the screws to secure the enclosure cover and cover plate.



Secure enclosure cover



Secure cover plate

5.3 CAN bus Termination

For CAN bus termination, please refer to the section “[Internal microSDHC Card Installation/ Replacement](#)” on how to disassemble the system enclosure to gain access to the resistor jumper pins (indicated in the illustration below).



Jumper installed: resistance enabled

Jumper not installed: resistance disabled

5.4 PCIe Mini Installation

To access the PCIe Mini card, you must disassemble the enclosure and cover.

To do so, please perform the following procedure:

1. Unfasten the screw on the side panel.



2. Unfasten the screw holding the cover-plate.



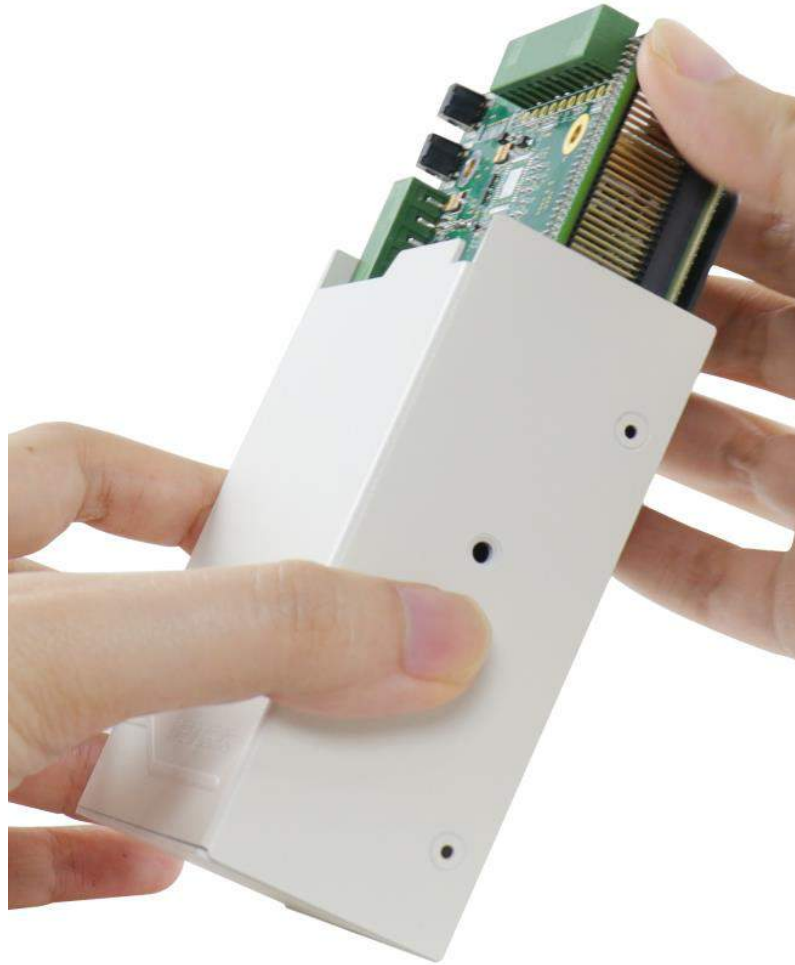
3. Place your thumbs firmly on the side of the enclosure and gently push upwards to remove the cover.



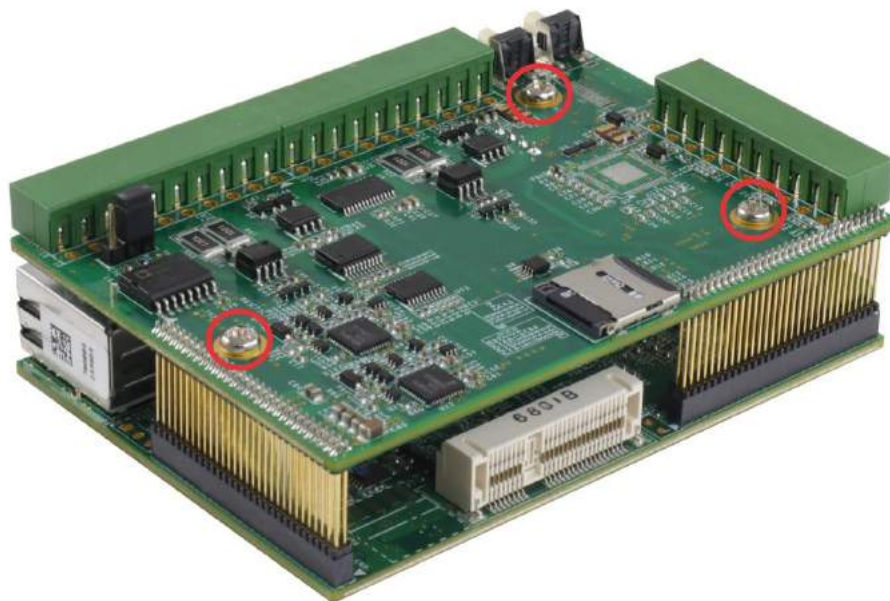
4. Once you have removed the cover, unfasten two screws that secure the PCBA in the enclosure.



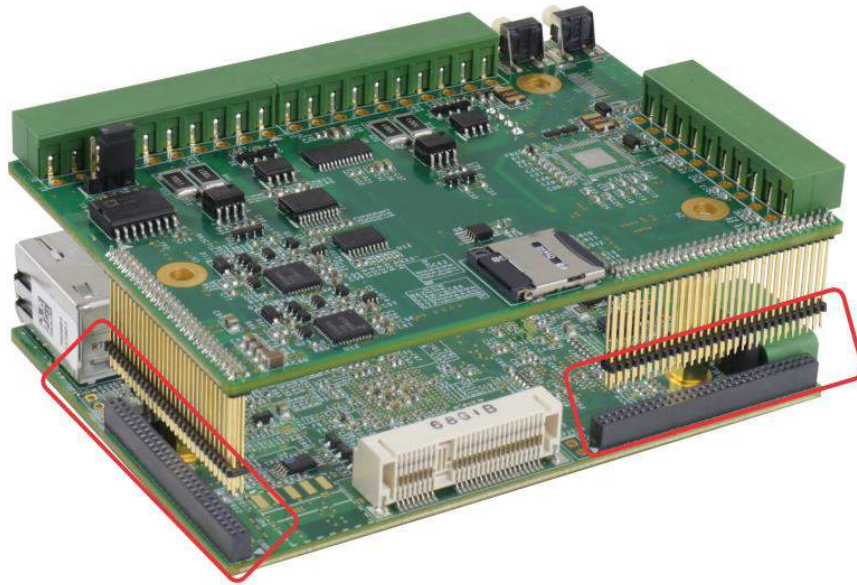
5. Gently pull the PCBA out of the enclosure.



6. Unfasten the three screws (indicated by red circles).



7. Separate the two PCBA layers apart by gently wiggling the pin/ connector section.



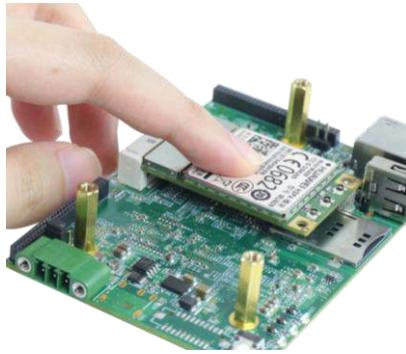
WARNING

Please be patient and gently wiggle the pin connector sections apart!
Excessive force may damage the pins or the connectors!

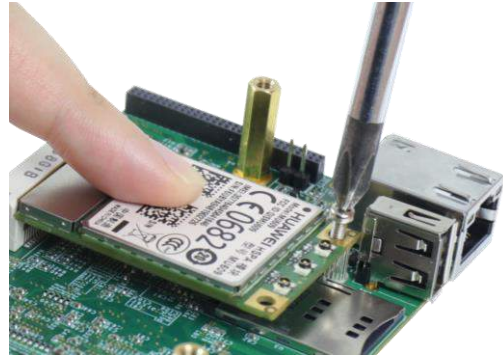
8. Locate the PCIe Mini slot and inset the module on a 45 degree angle.



9. Gently press the module down and secure the module with the dedicated screw.

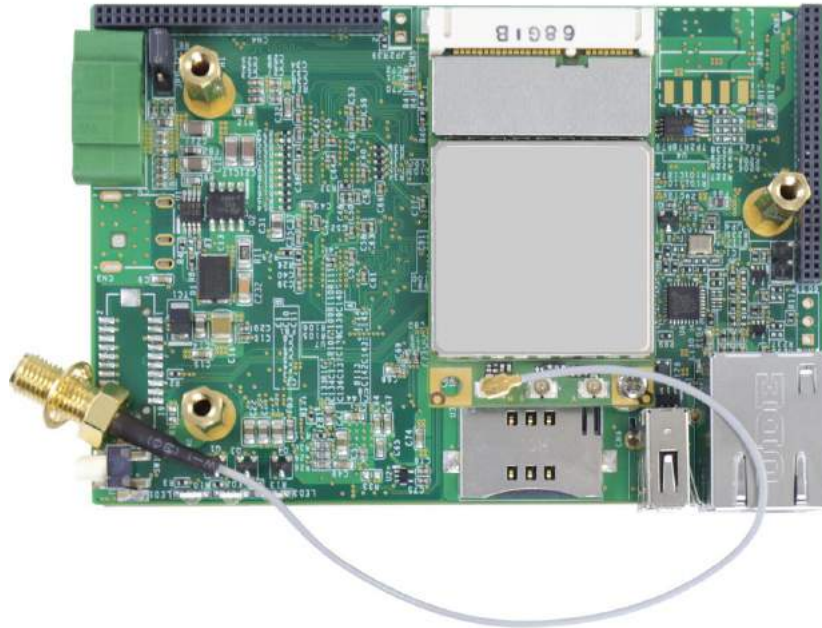


Gently press down



Secure with dedicated screw

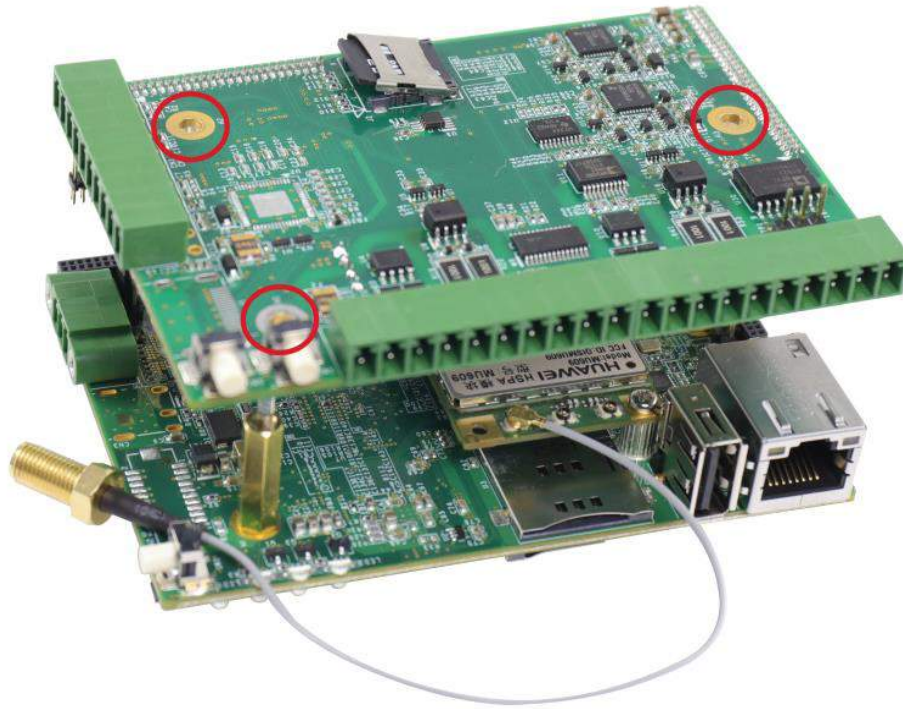
10. Clip-on PCIe Mini module's antennae (please refer to the module's user's manual on antennae cable connection).



NOTE

Please note how the antennae cable is routed. This is the recommended routing path to accommodate SMA-female connector installation.

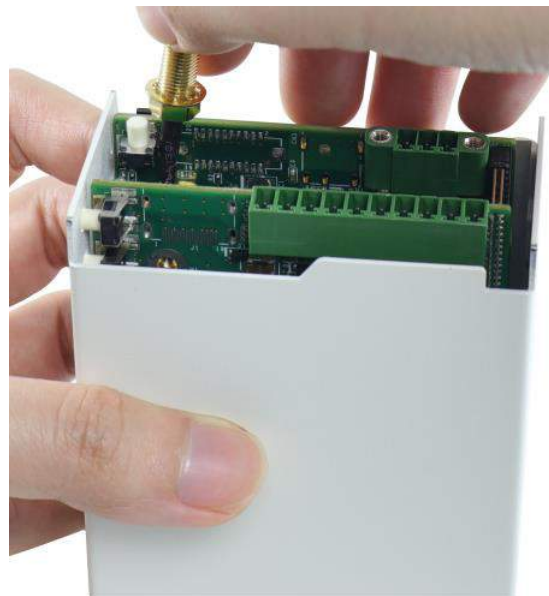
11. Matching the pins to the two connectors, stack the two PCBA's back together and fasten three screws (indicated by red circles) to secure the two PCBA's.



12. Insert the PCBA back into the enclosure, making sure the connectors\ buttons meet the enclosure openings and the SMA female connector is accessible.



Make sure connectors meet



Make sure SMA female connector is accessible

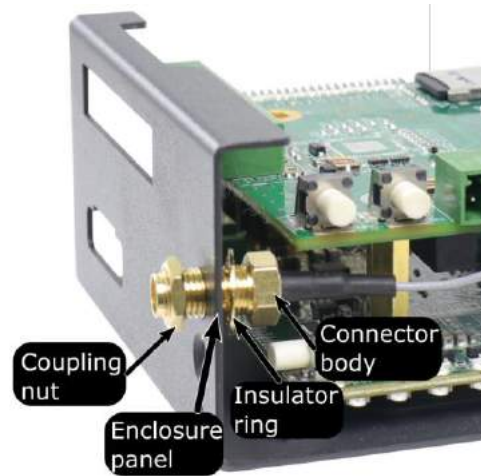
13. Secure the PCBA onto the enclosure by fastening the two screws.



14. Remove the antennae cover from the cover.



15. To install the SMA female connector, make sure the coupling nut sits outside the enclosure panel, insulator ring sits inside the enclosure panel with the connector body. Fasten the SMA female connector by turning the coupling nut and the connector body in opposite directions. Reinstall the cover and enclosure.



SMA female connector installation



Reinstall cover and enclosure



NOTE

Please fasten the SMA female connector before installing the cover and enclosure!

16. Secure the cover and cover plate by fastening respective screws.



Fastening the cover plate screw



Fastening the cover screw

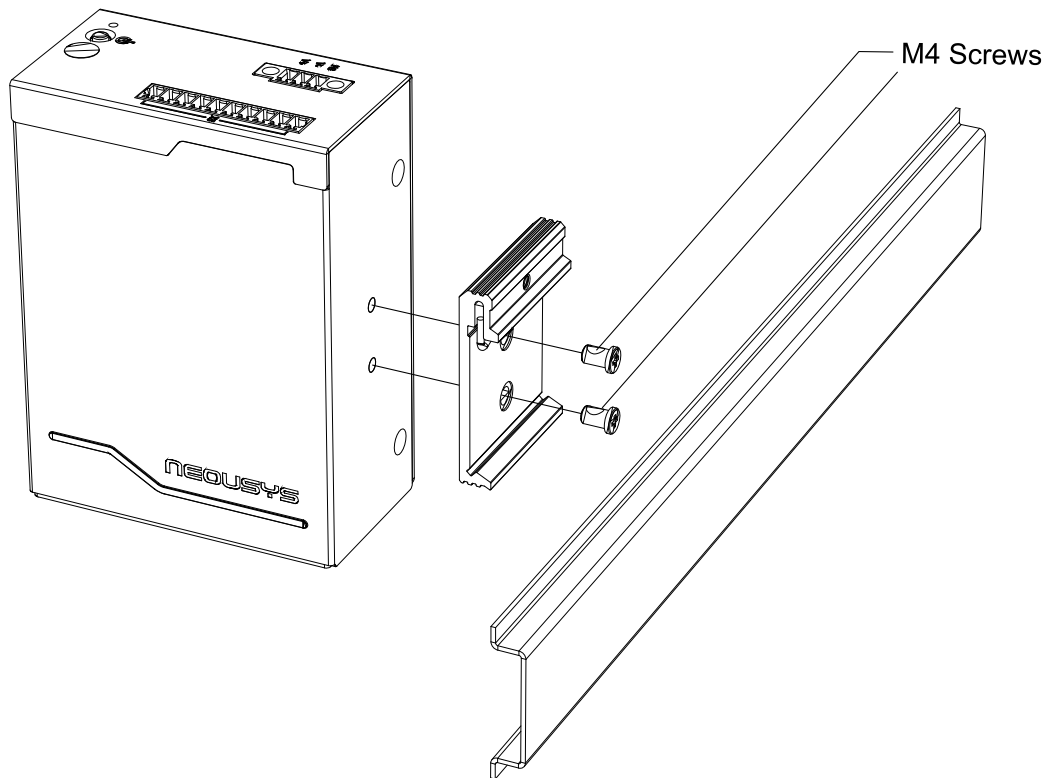
17. Install the antennae to complete the installation.



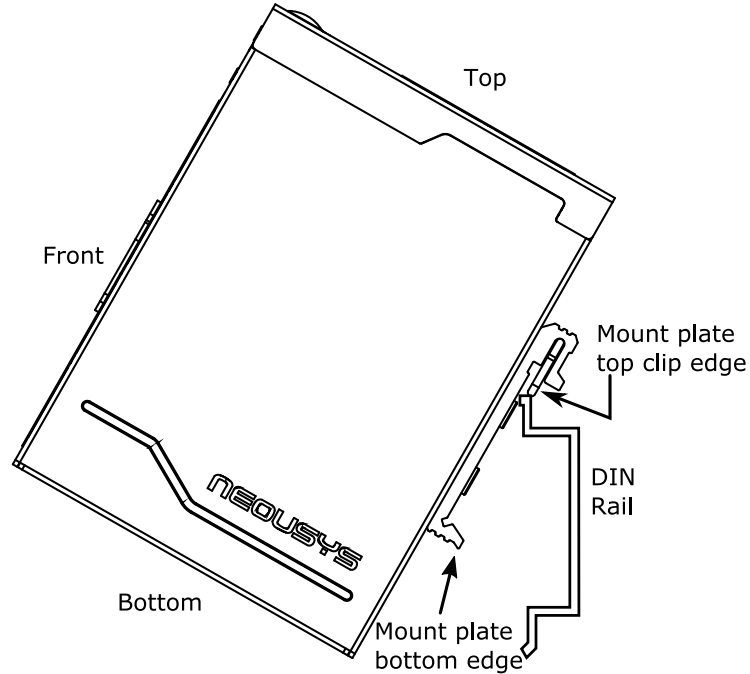
5.5 DIN Rail Installation

The DIN rail is easy to install and it is a convenient way to position the system once it has been initialized. The Din rail has been proven to be most beneficial in the industrial environment where space is limited. The mount plate comes with two M4 screws. Please refer to the illustration below to install the DIN clip/ rail.

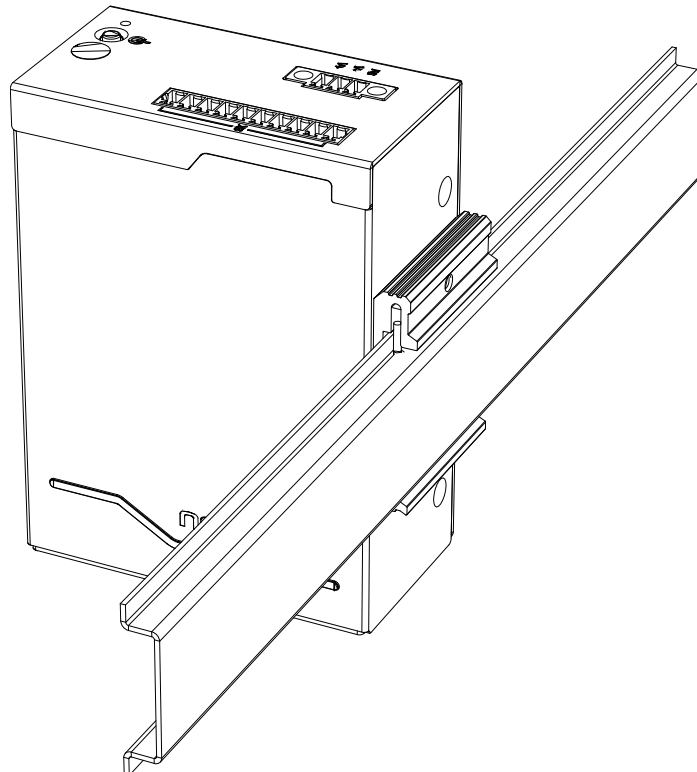
1. To install, secure the mount plate onto the rear of the system enclosure using the M4 screws provided.



2. To install the mount plate onto the DIN rail, you must come over the top of the DIN rail, tilting downwards, overlap the top clip edge of the mount plate onto the DIN rail first, then firmly press the bottom-front of the enclosure to clip the bottom edge of the mount plate.



3. Confirm the mount plate has indeed clipped onto the DIN rail for proper fit to complete the installation.




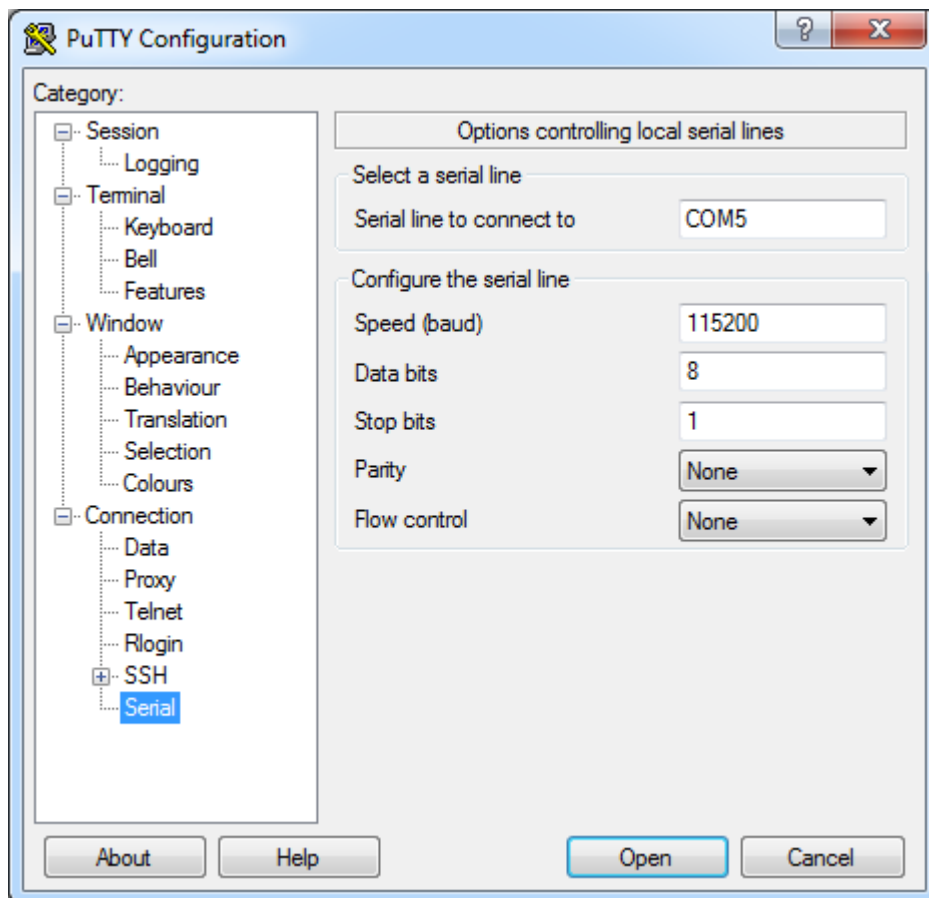
6. Initial Login

There are two ways to log into the system and setup the system. Method one is to login by connecting to the console port from host computer, and method two is to connect a host computer to the Ethernet port of IGT-20/ IGT-21 and access via a SSH-supported terminal application such as PuTTY. We will be using IGT-20 as an example in this section.

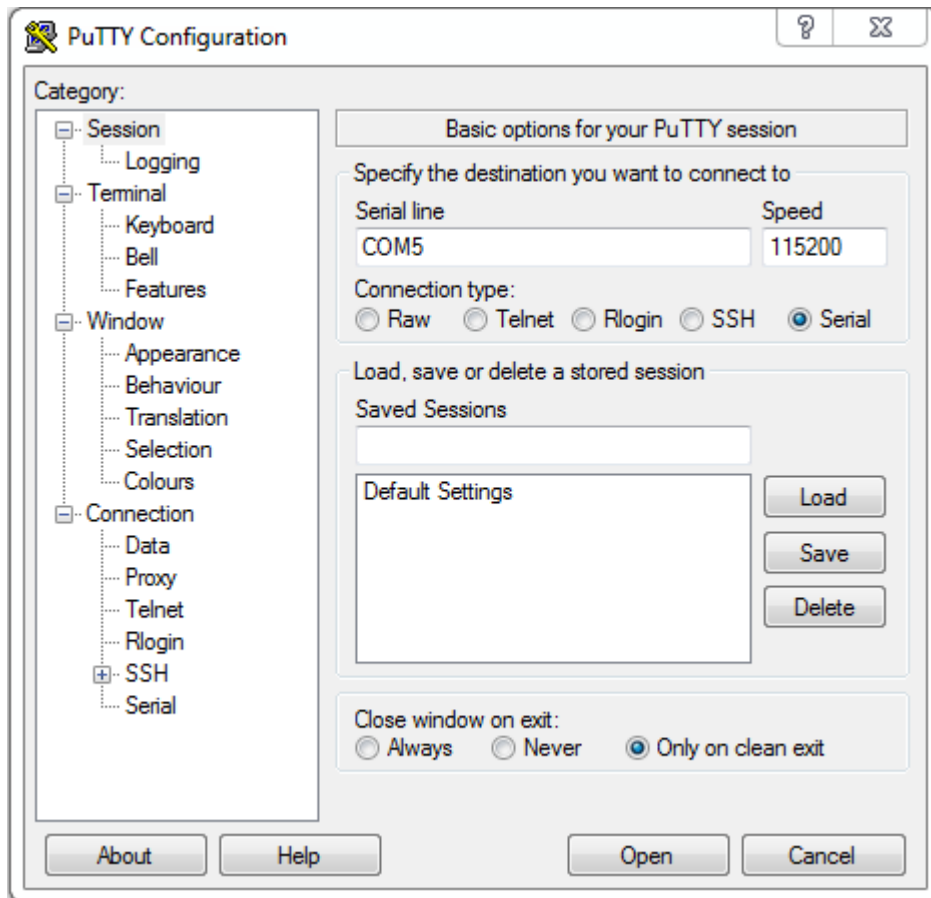
6.1 Login via Console Port

Establish a connection between your host computer and IGT-20 console port (connector 1, pins CTX, CRX and GND). Please note that a cross-over cable is required (CTX to Rx and CRx to Tx) and you must connect to system's [console port](#).

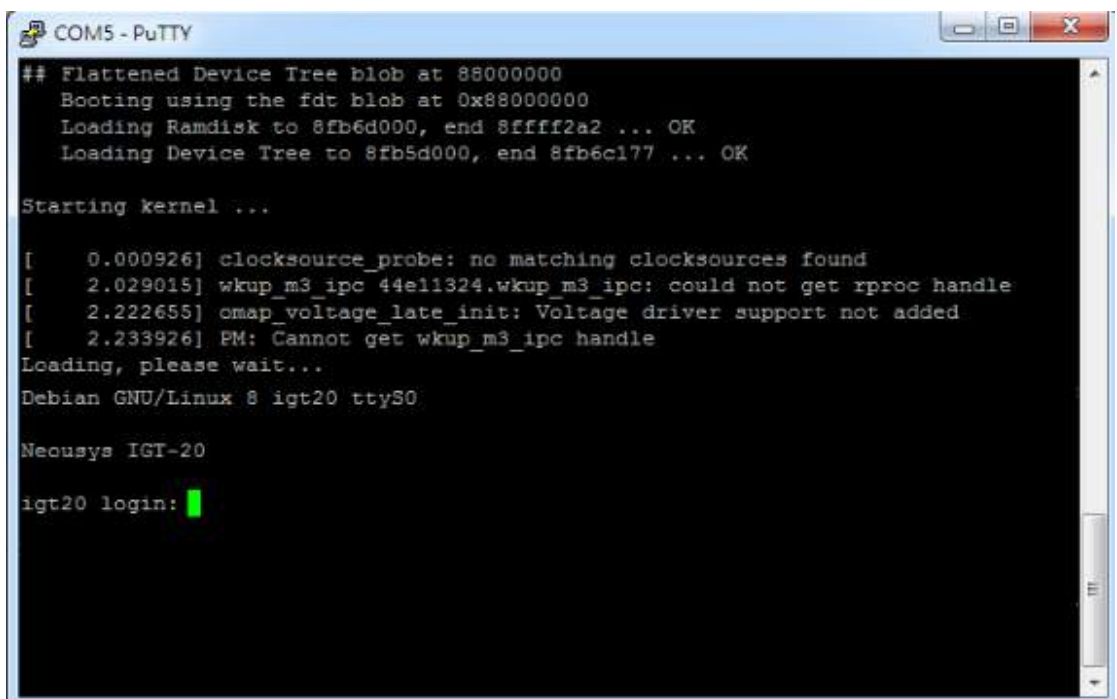
1. Right click on  `putty.exe`, click on "Run as administrator" to bring up the PuTTY Configuration window.
2. Go to Category > Serial, enter the COM port you connected your host computer to IGT-20/ IGT-21 and enter the following parameters:



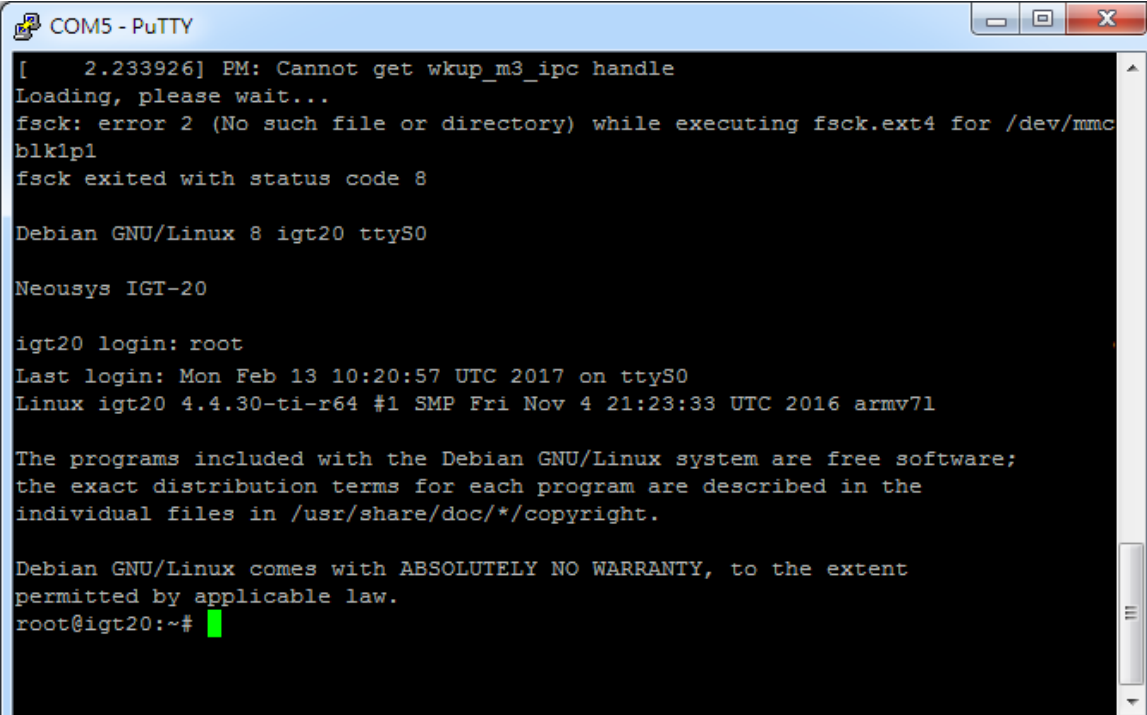
- Go back to Category > Session, select Serial and it should bring up the parameters set in the previous step. Click on “Open” when ready.



- A series of messages may appear, wait for “igt20 login:” prompt.



5. Enter "root" to login, password is not required and the Linux CLI prompt "root@igt20:~#" will appear. From here you may begin configuring your system.



```
COM5 - PuTTY
[ 2.233926] PM: Cannot get wkup_m3_ipc handle
Loading, please wait...
fsck: error 2 (No such file or directory) while executing fsck.ext4 for /dev/mmcblk1p1
fsck exited with status code 8
Debian GNU/Linux 8 igt20 ttyS0
Neosys IGT-20
igt20 login: root
Last login: Mon Feb 13 10:20:57 UTC 2017 on ttyS0
Linux igt20 4.4.30-ti-r64 #1 SMP Fri Nov 4 21:23:33 UTC 2016 armv7l

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@igt20:~#
```

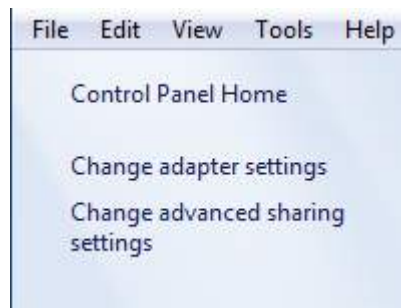
**NOTE**

Please remember to change the default password "root" to avoid unauthorized access.

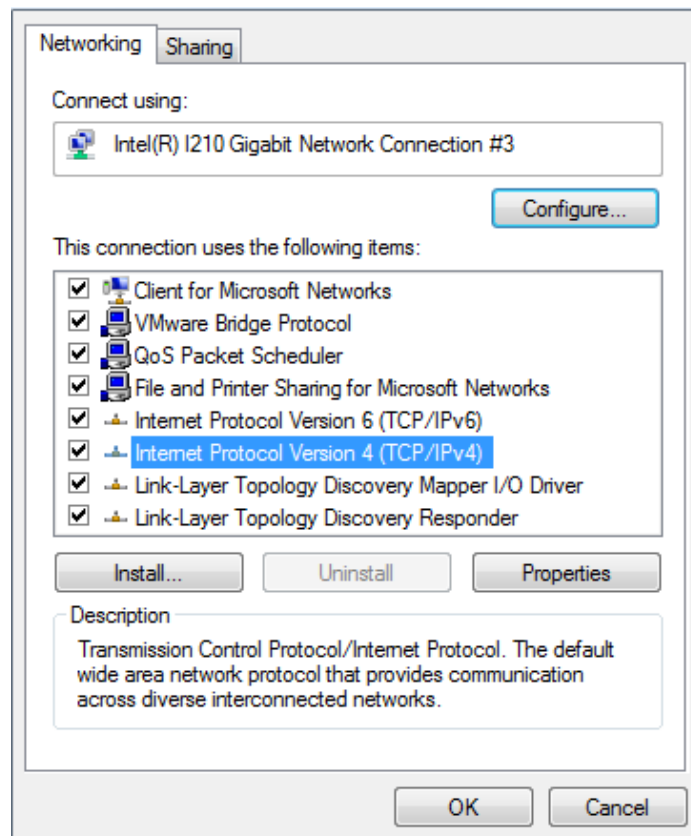
6.2 Login via Ethernet

Establish an Ethernet connection between your host computer and IGT-20, power on both systems. Please note that the Ethernet port on IGT-20 supports AUTO-MDIX meaning either a straight-through or cross-over cable can be used.

1. On your host computer, please go to “Start > Control Panel > View network status and tasks > Change adapter settings”.



2. Right click on the Ethernet adapter that has established a connection with IGT-20, click on properties and double click on **Internet Protocol Version 4 (TCP/IPv4)**.

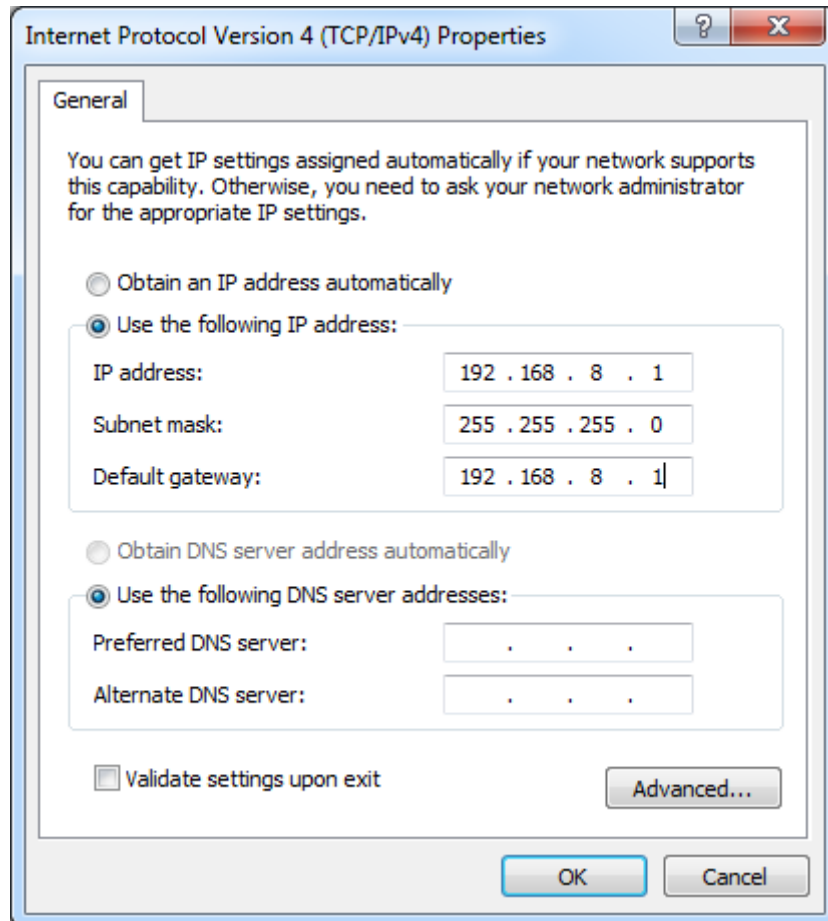



3. Enter the following IP parameters and OK.

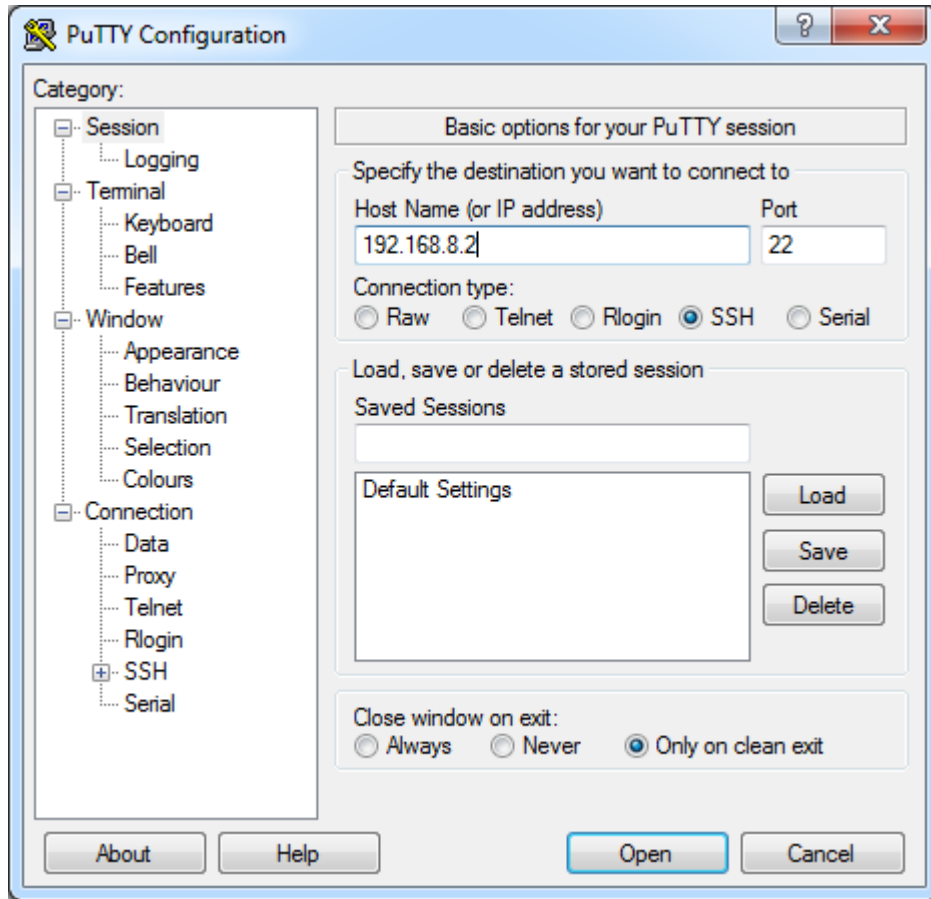
IP Address: 192.168.8.1

Subnet Mask: 225.225.225.0

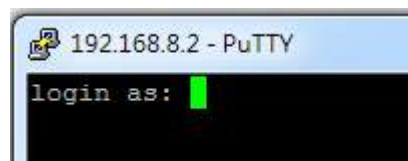
Default Gateway: 192.168.8.1



- Power on IGT-20 and right click on  putty.exe , click on “Run as administrator” to bring up the PuTTY Configuration window. Under “Session” category, select SSH, enter 192.168.8.2 as the destination you want to connect to. Click on Open when ready.



- A verification prompt may appear, click on Yes to continue and the PuTTY command prompt will show “login as:”, enter “root” and press Enter to continue.



NOTE

Please remember to change the default login “root” to one that you prefer for security purposes.