MANUAL FOR RD1031

Product Manual Version #0.00

ABSTRACT

This manual is intended as an information guide for operating RD1031 Gateway which is a part of SEDEMAC's R2D3 IIoT platform.

Doc #SED-MAN-RD1031-002

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Safety Instructions

General Instructions

- ✓ This document includes important instructions that should be followed during installation and maintenance of the RD1031 Gateway.
- ✓ For safety reasons, the manufacturer recommends that this equipment be installed and serviced by an authorized service personnel. Follow all applicable state and local electrical codes.
- ✓ Efficient and safe operation of RD1031 Gateway can be acquired only if the equipment is correctly operated, configured and maintained.
  **Many accidents arise due to ignorance or illiteracy towards the elemental rules of safety and precautions.*

The following safety notations found throughout this document indicate potentially hazardous conditions to the operator, service personnel or the equipment.

	• Highlights an essential element of a procedure to ensure correctness
	• Indicates a procedure or practice, which could result in damage or destruction of equipment, if not followed strictly
	• Indicates a procedure or practice, which could result in injuring personnel or loss of life, if not followed correctly

Electrical Safety

- ✓ Electric shock can cause severe personal injury or death.
- ✓ Ensure the generator set must be grounded before performing any installation or service.
- ✓ Generators produce high electrical voltages, direct contact with it can cause fatal electrical shock. Prevent contact with terminals, bare wires, connections, etc., while the generator and related equipment are running. Do not tamper with interlocks.
- ✓ To handle the maximum electrical current, sizes of wire gauge used for electrical connections and wirings must be appropriate to which they will be subjected to.

In Operation Safety

- ✓ Before installing RD1031 Gateway, ensure that all power voltage supplies are positively turned off at their source. Disconnect the generator's battery cables and remove panel fuse to prevent accidental start up. Disconnect the cable from the battery post, indicated by a NEGATIVE, NEG, or (–) first. Reconnect the negative cable last. Failure to do so will result in hazardous and possibly fatal electrical shock.
- ✓ Remove electric power supply before removing RD1031 Gateway or touching other electrical parts.
- ✓ Use extreme caution when working on electrical components. High voltage can cause injury or death.
- ✓ Use rubber insulative mats placed on dry wood platforms over floors that are metal or concrete when working near generator set or other electrical equipment.

- ✓ Do not wear damp clothing (particularly wet shoes) or allow skin surface to be damp when handling electrical equipment.
- ✓ Do not operate any electrical device or wires while standing in water, while barefoot, or while hands or feet are wet. **It may result in severe electrical shock**.
- ✓ Do not wear jewellery. Jewellery can cause a short circuit within electrical contacts and cause shock or burning.
- ✓ In case of an accident caused by electric shock, immediately shut down the electrical power source. If this is not possible, try to release the victim from the live conductor. **Avoid direct contact with the victim.** Use a nonconducting object, like, a rope or wooden stick, to release the victim from the live conductor. If the victim is unconscious, apply first aid and get immediate medical help.

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List of Abbreviation

This list contains the list of acronyms used in this document and it can be used to refer their respective description. This list does not contain units of measure.

Acronym	Description
CTC	Centre To Centre
GCU	Genset Control Unit
Genset	Generator Set
GND	Ground
LED	Light Emitting Diode
USB	Universal Serial Bus

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1 Introduction

This document elucidates information necessary for operating SEDEMAC's RD1031 Gateway that comes under SEDEMAC's R2D3 IIoT product suite. It empowers the user with the necessary information for using RD1031 Gateway in an application that involves communication of the genset with SEDEMAC's remote server.

SEDEMAC's RD1031 Gateway boasts modern technology with robust hardware. It helps manage power-backup operations in a streamlined, measurable and process driven way. It tracks the genset operation and condition remotely, helping the user in eliminating unnecessary fuel wastage and keeps the genset in healthy condition. RD1031 Gateway comes in with a reliable two-way communication channel through MODBUS over RS485, which not only enables the user to remotely start & stop the generator, but also helps the user to change the modes of genset. RD1031 Gateway is features rich with 4G LTE, 2G, 3G Fall-back and Wi-Fi outbound communication. It also acknowledges alarms and relay the respective information to the appropriate contact person near the generator vicinity.

RD1031 deployment helps in various industries to operate their network operation centers. It is beneficial to eliminate reconciliation deficits for fuel consumption, maximize generator up-time and minimize maintenance visits on site therefore reducing labour cost for monitoring the genset site.

R2D3 system can monitor, analyse and generate reports of various genset related parameters that can help user to streamline the operations.

SEDEMAC's R2D3 IIoT platform has 3 elements, RD1031 Gateway: R2D3 device, R2D3 Hub: web application and R2D3 Droid: Android mobile application to monitor and control the genset sites.

Below figure shows the R2D3 architecture.

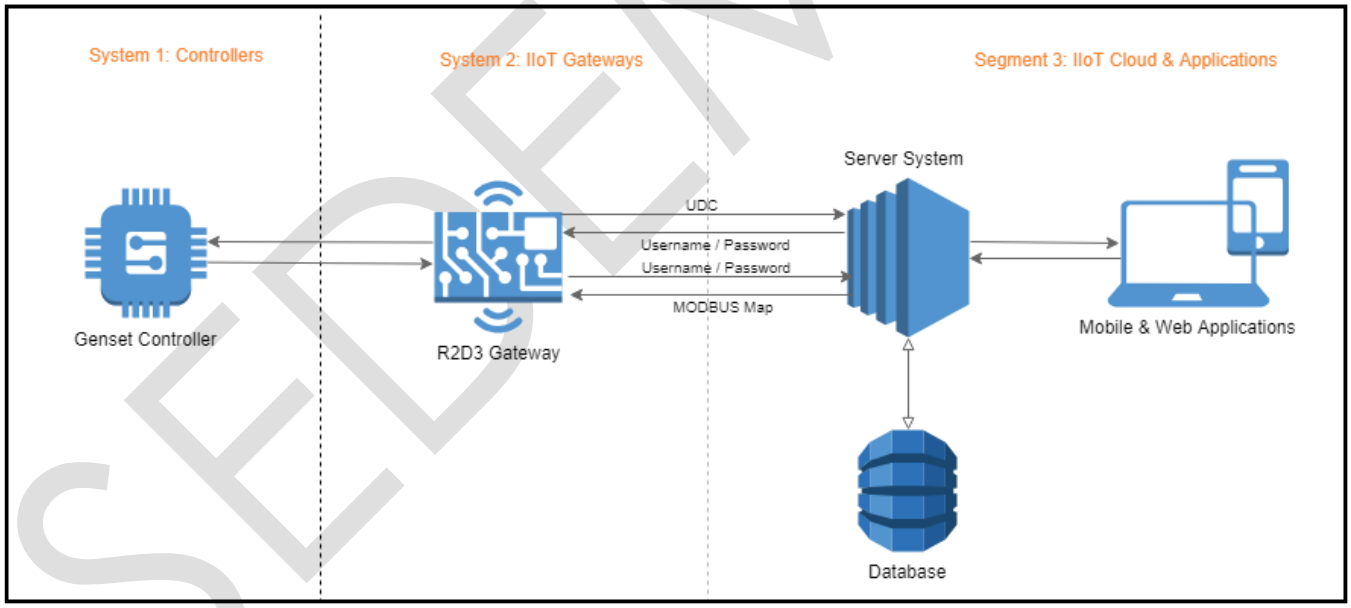

Figure 1: R2D3 architecture

1.1 Key Highlights of the Product

SEDEMAC's R2D3's IIoT platform caters to genset/power backup industry which not only monitors but also remotely controls the genset. This platform can easily integrate with leading operations and accounting software like SAP, Fresh-Desk. It provides an opportunity for large engine OEMs, genset OEMs, renters and maintenance service providers to reinvent their operational processes using the power of IIoT.

- Remote monitoring and control of genset with the help of laptop/mobile.

- Provided with the multiple communication Gateways like USB, RS485, Wi-Fi.
- Robust design with the modern technology and features.
- Inbound communication (GCU to R2D3 Gateway) - MODBUS over RS485
- Outbound Communication (R2D3 Gateway to Server / Cloud) - 4G LTE with 2G, 3G Fall-back & Wi-Fi.
- Configuration & Troubleshooting: USB 2.0 Type B connector
- 50+ parameters displayed (configurable update time) for a fleet of up to 10,000 generators
- RD1031 Gateway supports all SEDEMAC GCU's MODBUS map

1.2 Product Features

Following table gives a brief overview of various product features of the RD1031

Features list

- RS485
- Wi-Fi
- GPRS (4G LTE CAT 1/2G/3G)
- GPS positioning

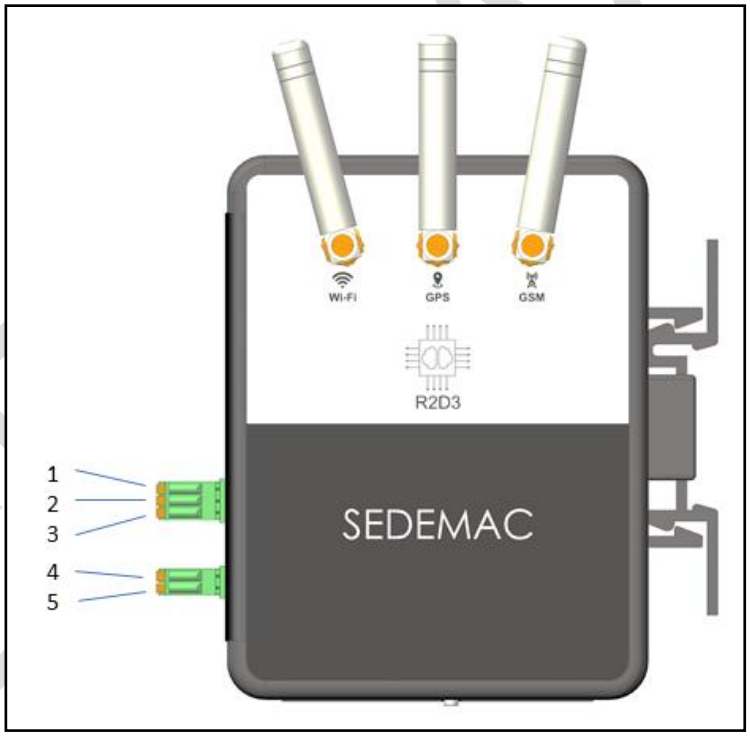

Figure 2: RD1031 Gateway front fascia with terminal numbers

NOTE:	• Connector numbers are not shown on front fascia of the Gateway. • Connector numbers shown in above image are for reference only. Same numbers are used as terminal numbers throughout the document.

2 Hardware Specifications

This section gives the detailed information about the hardware used in the RD1031 Gateway.

2.1 Operating Temperature

Following table gives an information about the optimum operating temperature of RD1031 Gateway.

Table 1: Operating temperature

Minimum Temperature	-30^0 C
Maximum Temperature	55^0 C

2.2 Power Supply Specifications

Following table gives an overview of power supply specifications

Table 2: Power supply specifications

Terminal number	1, 2 (Ground and Battery positive respectively)
Supply voltage range	8 to 32 V-DC (Suitable for 12 V-DC system)
Cranking drop out period	50 mS
Maximum reverse voltage	-32 V-DC (on power supply lines)

2.3 Terminals

RD1031 Gateway host following terminals and the details are given below:

2.3.1 RS485 Connector

For RS485 connection, RD1031 gateway uses 3-pin connector as shown in Figure 3

Figure 3: 3 pin female (mating) connector

Below table gives the detailed information about their type, manufacturer, quantity and ordering number of the connector.

Table 3: 3 -pin connector details

Connector type	Manufacturer	Female (Mating)	Pitch	Quantity (Nos)
3-Pin	Phoenix*	1881338	2.5 mm	1

*https://www.phoenixcontact.com

Below table gives the information about the terminal details of RD1031 for the RS485 connection purpose.

Table 4: RS485 connection details

Terminal Sr. No.	Name	Description	Phoenix Female (Mating) Connector Part No.
1	RS485_A	RS485 – A	1881338
2	RS485_B	RS485 – B	
3	RS485_IG	Ground	

2.3.2 Power Supply Connector

For power supply, RD1031 gateway uses 2-pin connector as shown in Figure 4

Figure 4: 2 pin female (mating) connector

Below table gives the detailed information about their type, manufacturer, quantity and ordering number of the connector.

Table 5: 2- pin connector details

Connector type	Manufacturer	Female (Mating)	Pitch	Quantity (Nos)
2-Pin	Phoenix*	1881325	2.5 mm	1

*https://www.phoenixcontact.com

Below table gives the information about the terminal details of RD1031 for the power supply connection purpose.

Table 6: Power supply connection details

Terminal Sr. No.	Name	Description	Phoenix Female (Mating) Connector Part No.
4	BATT +	Battery positive	1881325
5	BATT -	Battery ground	

2.3.3 SIM Card Holder

RD1031 Gateway connects to the R2D3 cloud through GPRS/Wi-Fi. For GPRS connection, you need an active SIM card (4G/3G/2G SIM cards are supported) with data connection. The SIM card holder is accessible by opening the device and it uses regular SIM card.

Figure 5: SIM card holder

NOTE:	It is recommended to use industrial grade SIM card if the device is being installed inside the genset canopy.

2.3.4 USB Host Connector

RD1031 Gateway connects to “Mobile Flash” utility through USB Type-B connector.

Figure 6: USB host connector

2.3.5 Antenna Connector

R2D3 Gateway uses three SMA antennae connectors for Wi-Fi, GPS and GSM.

Figure 7: Antenna connector

2.4 Communication Ports

R2D3 uses two types of communication ports for the configuration and serial communication purpose. Following table gives the detailed information about these communication ports.

Table 7: Communication port details

USB	• USB 2.0 Type B • For connection purpose to “Mobile Flash” utility on the mobile
RS485	• Half Duplex • Max Baud Rate 115200 • Data connection 3 wire • Output pin A & B has on board termination resistor of 120Ω

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	• Common-mode operating range and bus-pin fault protection up to ±70V • Maximum distance of line is 500m • **Terminal number: 1, 2, 3**

2.5 Dimensions

This section gives overall dimension details of RD1031 Gateway. Refer Figure 8

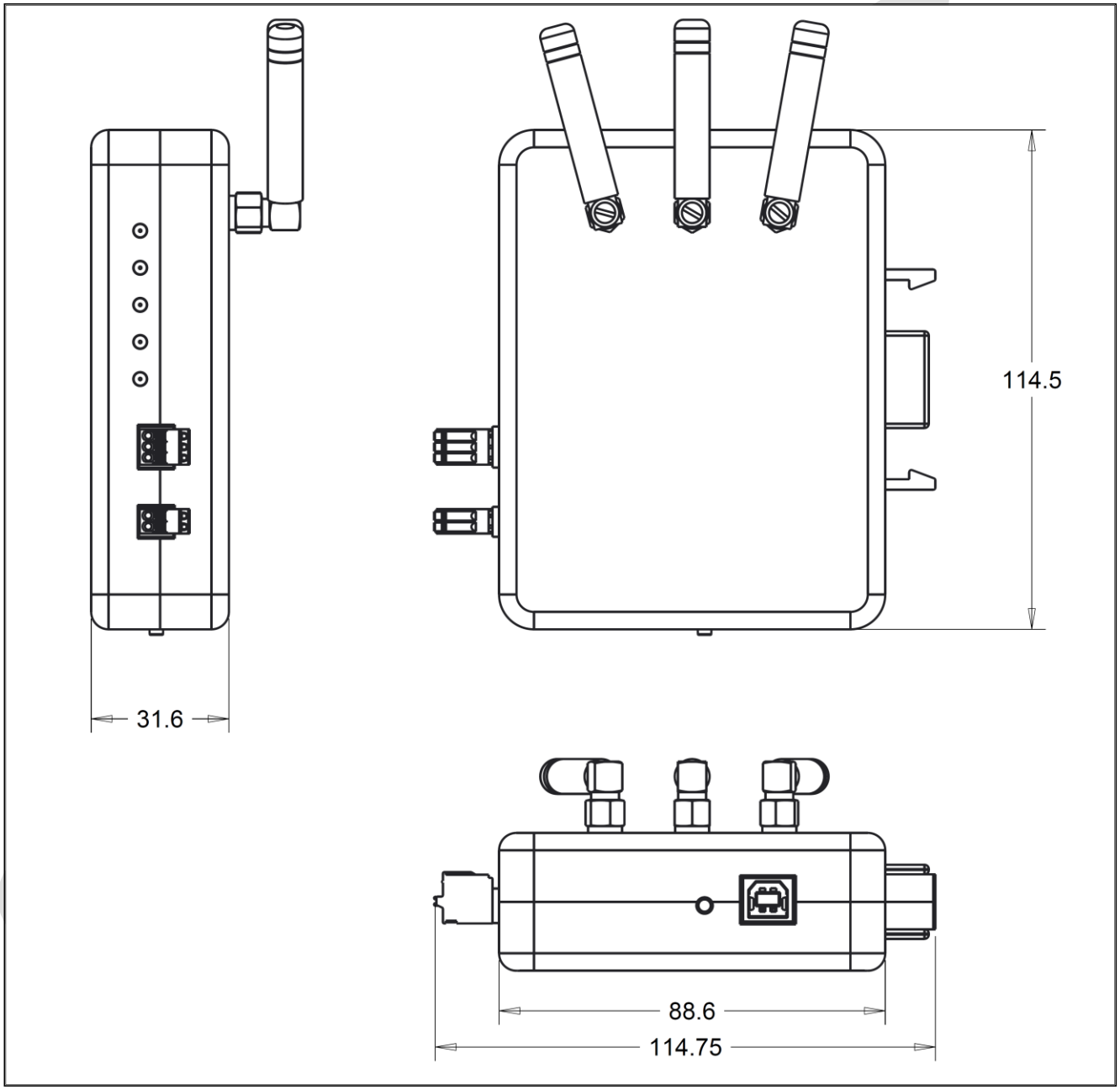

Figure 8: RD1031 Gateway dimensions

3 Installation

This section gives the detailed information about RD1031 Gateway mounting and outbound communication installation.

3.1 SIM Card Installation

RD1031 Gateway uses 4G/3G/2G network for the communication. A standard size SIM card slot is provided in the Gateway to use the 4G/3G/2G services. Follow the below steps to install SIM card in RD1031 Gateway.

- Power off RD1031 Gateway.
- Remove the back cover, unfasten the 4 screws with the help of screw driver and pull the upper casing. Refer Figure 9

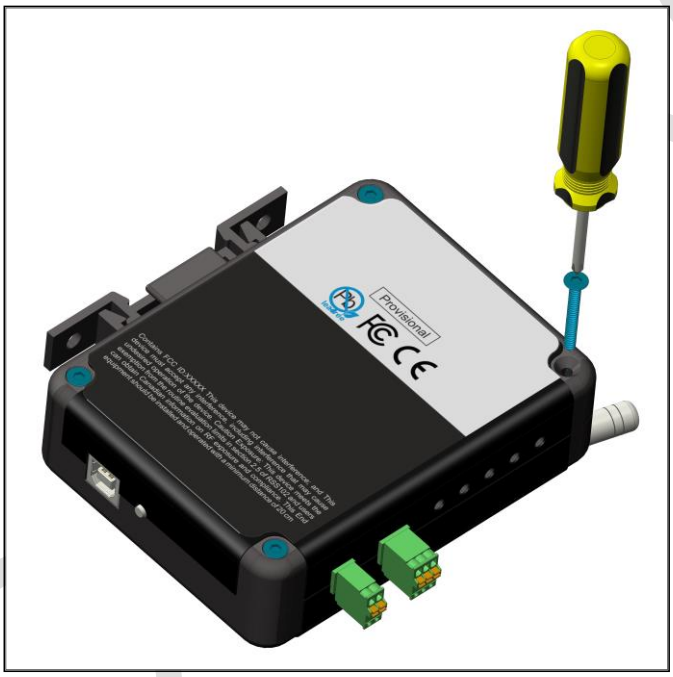

Figure 9: Removal of back casing for SIM card installation

- Install SIM card in SIM card holder.

To install SIM card in SIM card holder, follow below steps

- Slide the metal strip in the direction shown in “1” Figure 10 and open the SIM card holder.
- “2” Shows the opened SIM card holder. Insert the standard size SIM card in between the cavity of the metal strip and SIM card holder as shown in “3” Figure 10.
- Close the SIM card holder and slide the metal strip in the direction as shown in “4” Figure 10 to lock.

You can listen to a click sound on the lock and unlock of the SIM card holder.

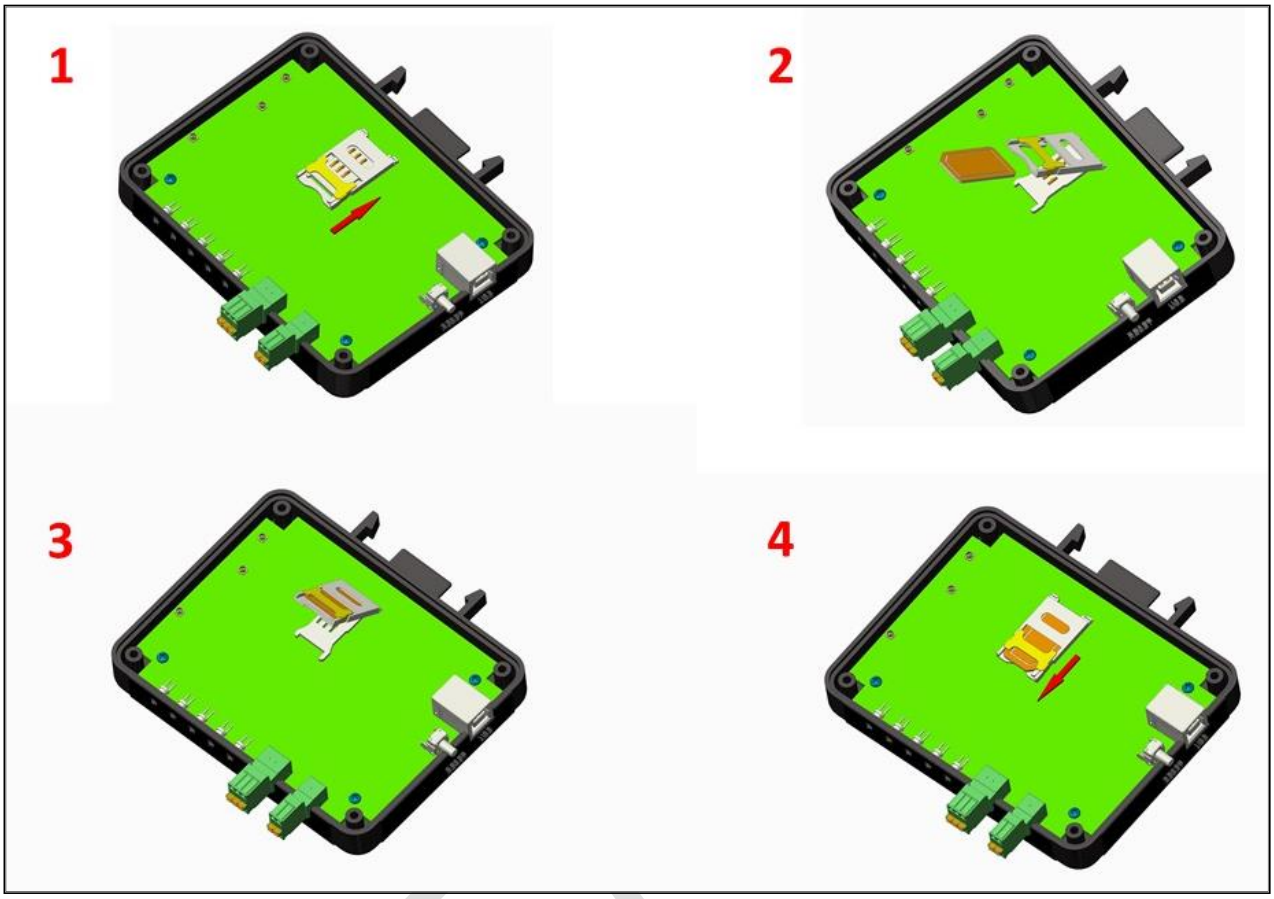

Figure 10: SIM card Installation

3.2 Wi-Fi Configuration

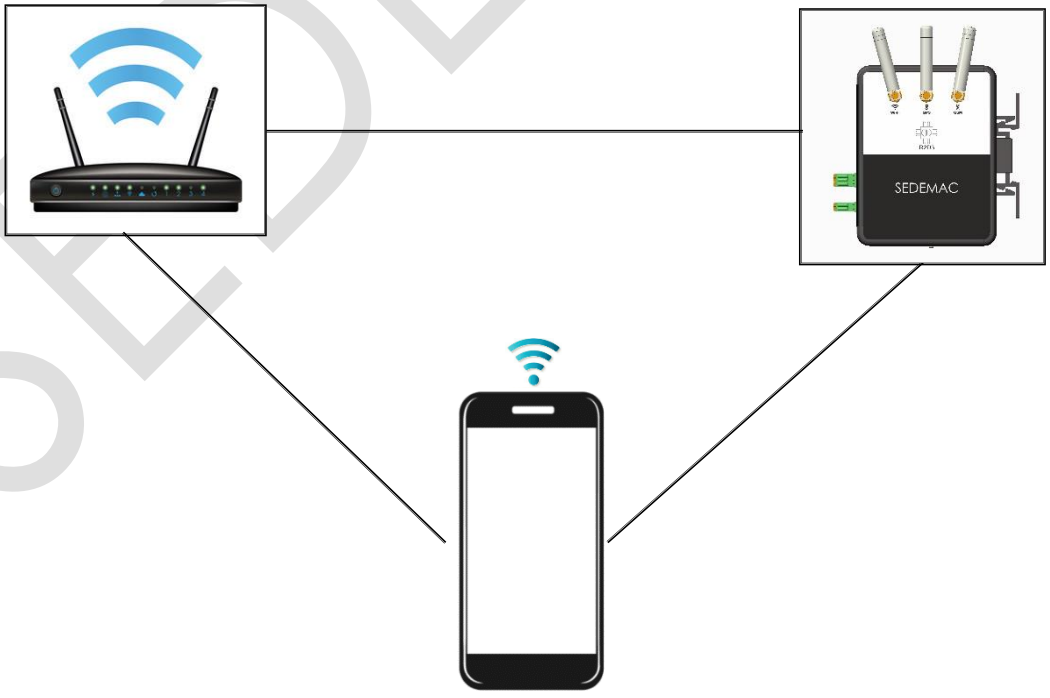

Figure 11: Wi-Fi Installation

- First power ON the R2D3 device, if not.
- Press “Reset” key for more than 3 seconds to enter Wi-Fi provisioning mode.
- Observe Wi-Fi LED and wait for few seconds till LED starts blinking alternately in RED and GREEN. It shows the device is in Wi-Fi provisioning mode.
- Open R2D3 Droid mobile app. Please make sure data connection of your phone is turned off.
- Click on “Provisioning” menu.

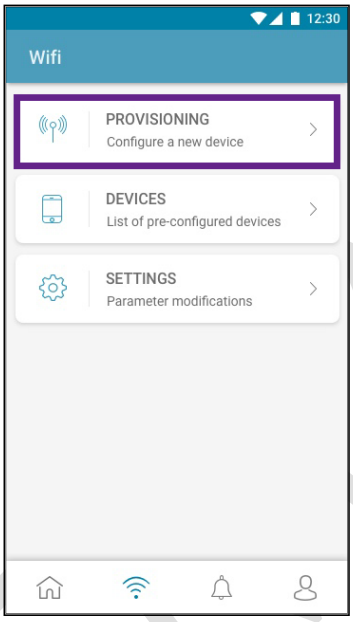

Figure 12: R2D3 Droid screen: provisioning menu

- Select SEDEMAC Wi-Fi SSID from the drop-down list of ‘Device to configure’.

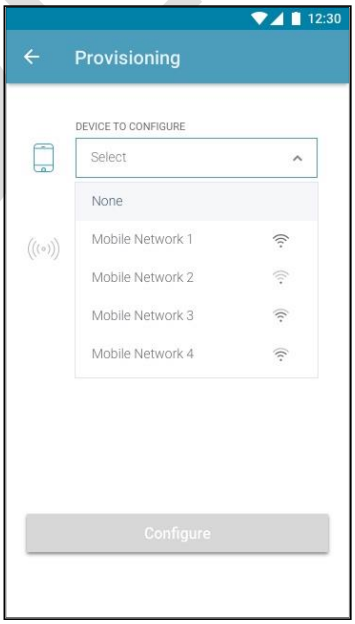

Figure 13: R2D3 Droid screen: list of available devices

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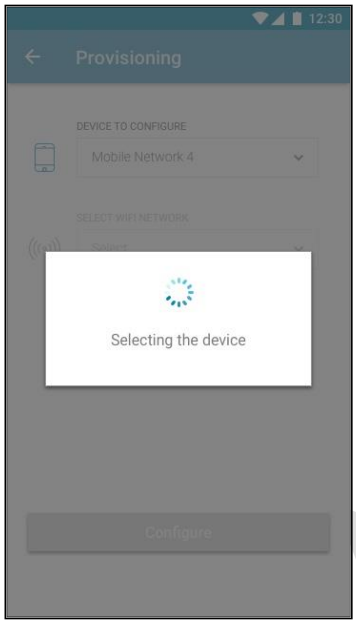

Figure 14: R2D3 Droid screen: selecting the device

- Following screen will appear once the device connects successfully.

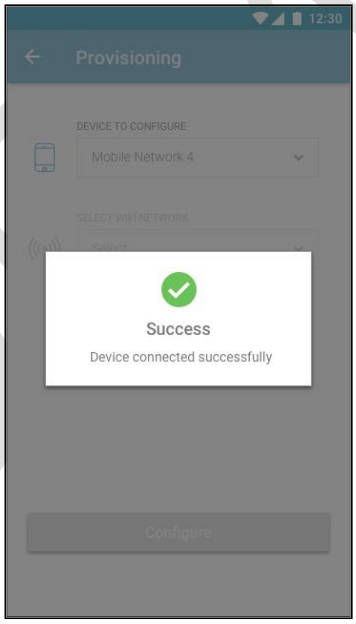

Figure 15: R2D3 Droid screen: device connected successfully

- Now select the available Wi-Fi network, enter the password and click the next arrow.

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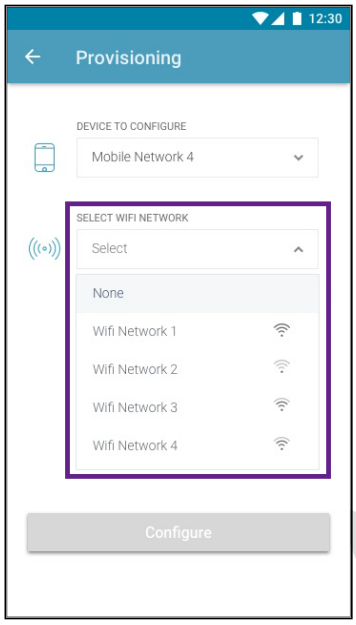

Figure 16: R2D3 Droid screen: list of available Wi-Fi networks

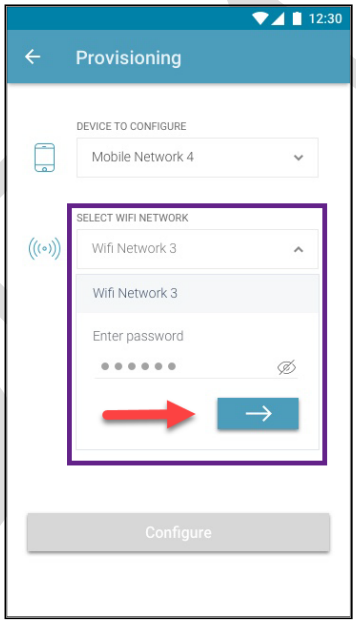

Figure 17: R2D3 Droid screen: enter password

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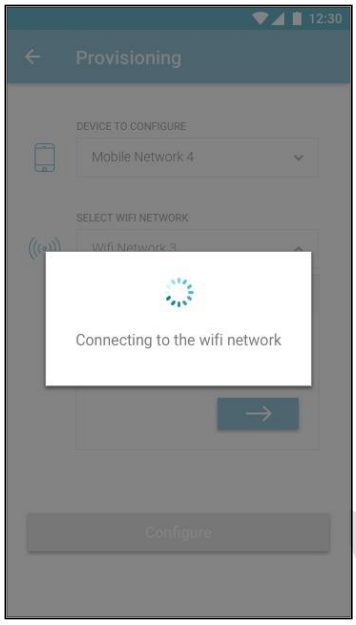

Figure 18: R2D3 Droid screen: connecting to the Wi-Fi network

- Following screen will appear once the Wi-Fi connects successfully.

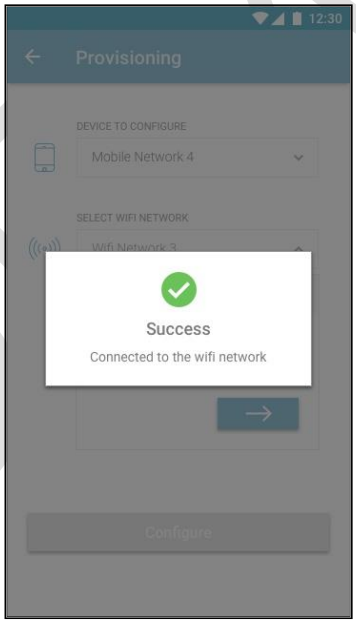

Figure 19: R2D3 Droid screen: Wi-Fi connected successfully

- Click “Configure”.

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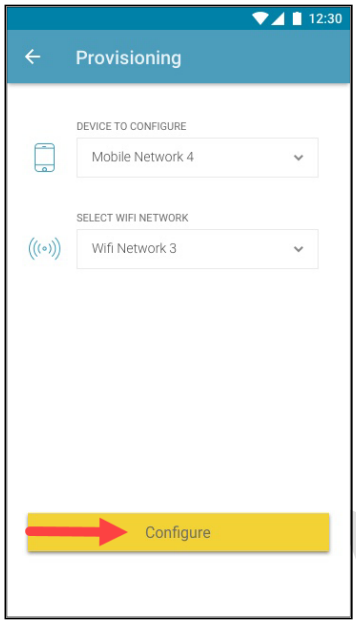

Figure 20: R2D3 Droid screen: device configure

- Now it starts configuring the device.

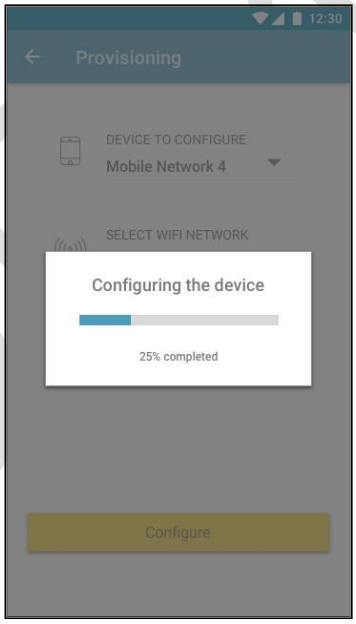

Figure 21: R2D3 Droid screen: configuring the device

- Following screen will appear once the device is successfully configured.

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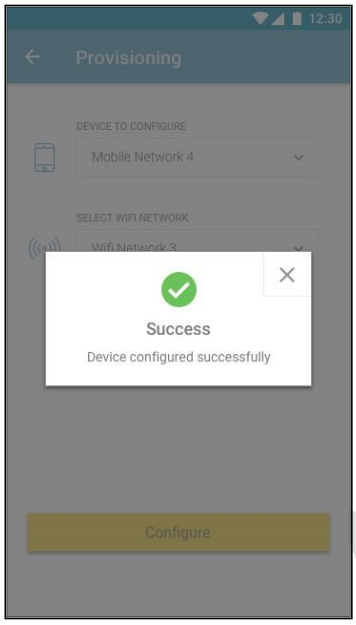

Figure 22: R2D3 Droid screen: device configured successfully

3.3 Antenna Mounting

Mount the Wi-Fi, GPS and GSM antenna as shown in Figure 23.

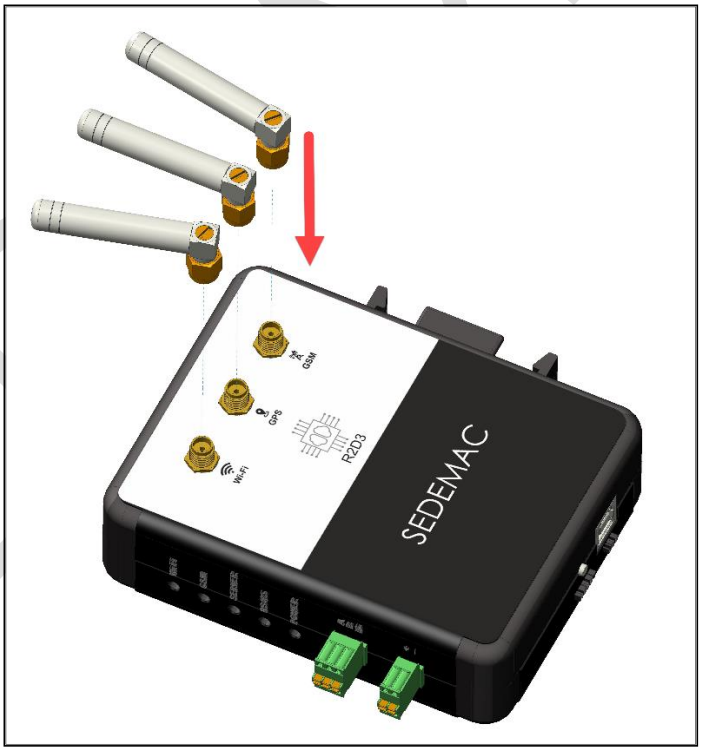

Figure 23: Antenna mounting

Figure 24 shows antenna assembly on RD1031 Gateway.

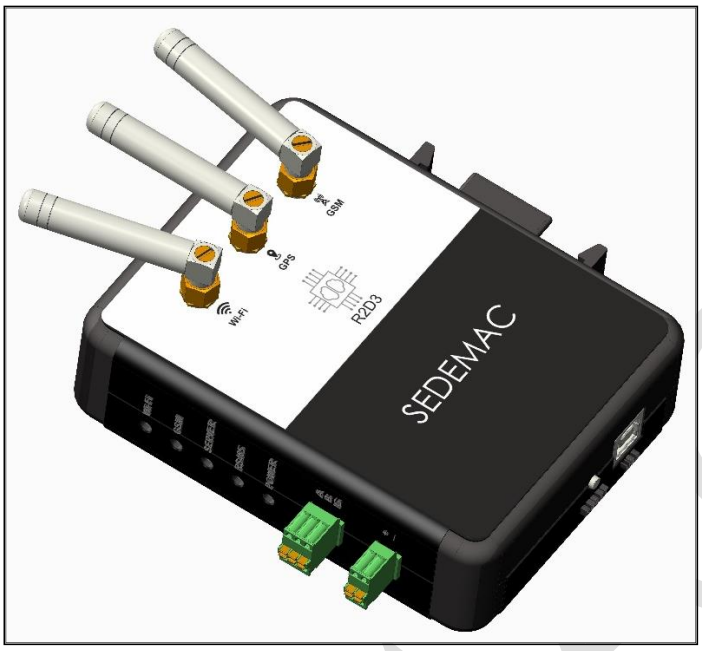

Figure 24: Antenna assembly

3.4 Gateway Mounting

RD1031 Gateway can be mounted by following two methods.

1. By Snap fit (Default mounting)
2. By DIN rail

NOTE:	Default mounting bracket is already provided with the product kit. The same bracket can be used to mount RD1031 on DIN rail. Refer Figure 28 and Figure 29

If DIN rail is available for the mounting, then RD1031 Gateway can be mounted on DIN rail.

3.4.1 Snap Fit Mounting

Figure 25 shows the screw mounting of bracket in control panel or on any mounting surface. The bracket uses M4 screws for the mounting. Drill two appropriate holes at the distance of 64mm (CTC) as shown in Figure 25. Place the bracket and fasten the screws.

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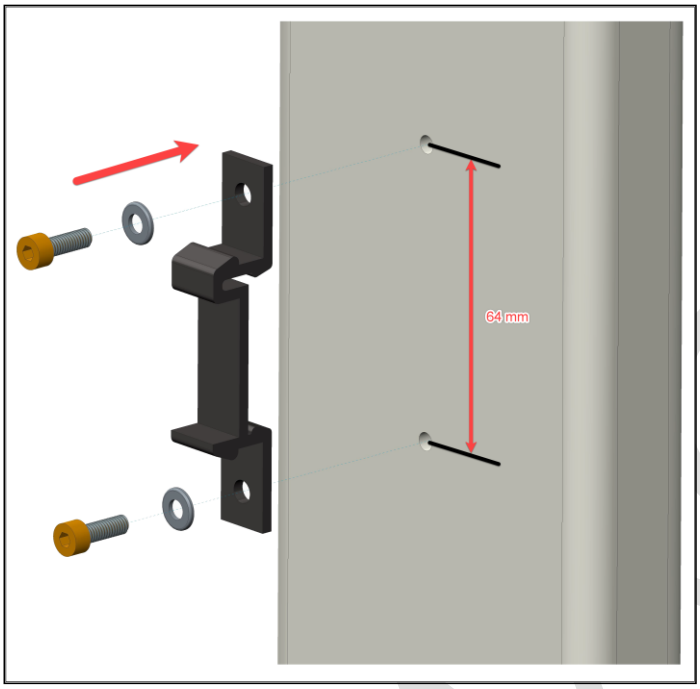

Figure 25: Bracket mounting with screws

Press the RD1031 Gateway on the mounted bracket; “Click” sound confirms the proper fitting of the Gateway on bracket. Refer Figure 26 & Figure 27

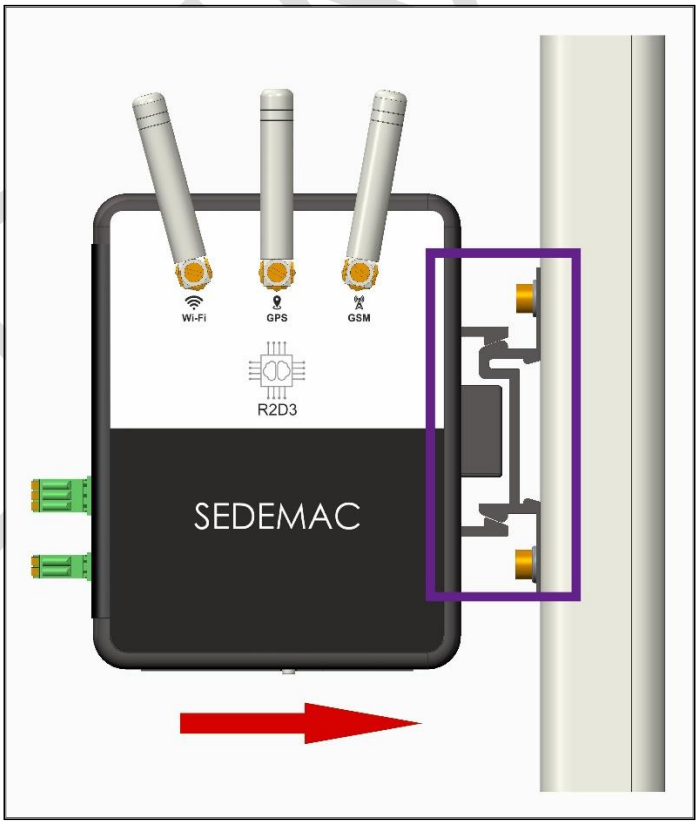

Figure 26: Snap fit of RD1031 Gateway

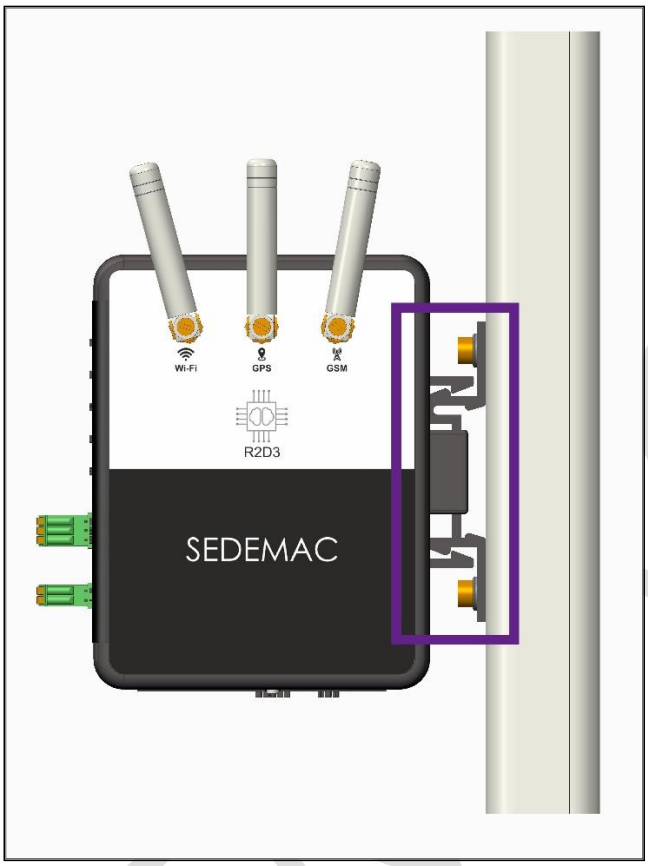

Figure 27: Snap fit assembly of RD1031

3.4.2 DIN Rail Mounting

Follow below steps for RD1031 mounting with the help of DIN rail.

1. RD1031 Gateway has bracketed slot for DIN rail mounting. Slide the RD1031 Gateway over DIN rail as shown in Figure 28.

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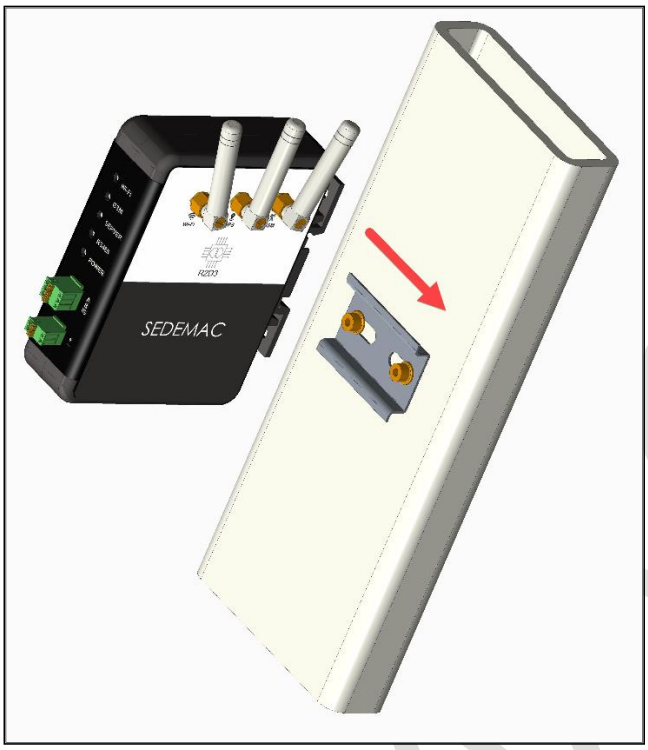

Figure 28: RD1031 Gateway mounting on DIN rail

2. Figure 29 shows final fitment of the RD1031 Gateway on DIN rail.

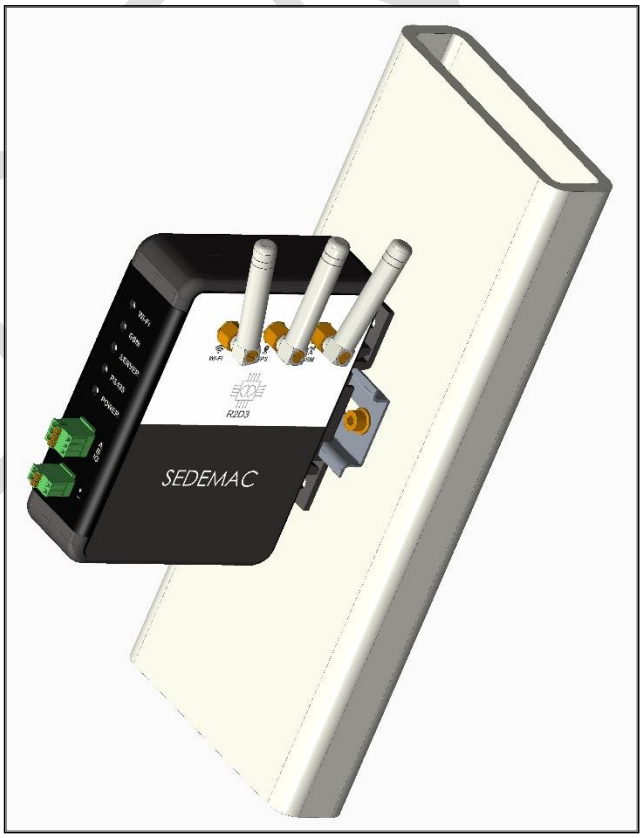

Figure 29: DIN rail fitting

3.5 RS485 Installation

RD1031 Gateway is connected to genset controller through RS485 interface. Make sure that the cable connecting RS485 terminals is shielded. Controller acts as slave and RD1031 Gateway acts as a master in the configuration. Make sure to check the slave ID of the controller and configure it to the master before installing.

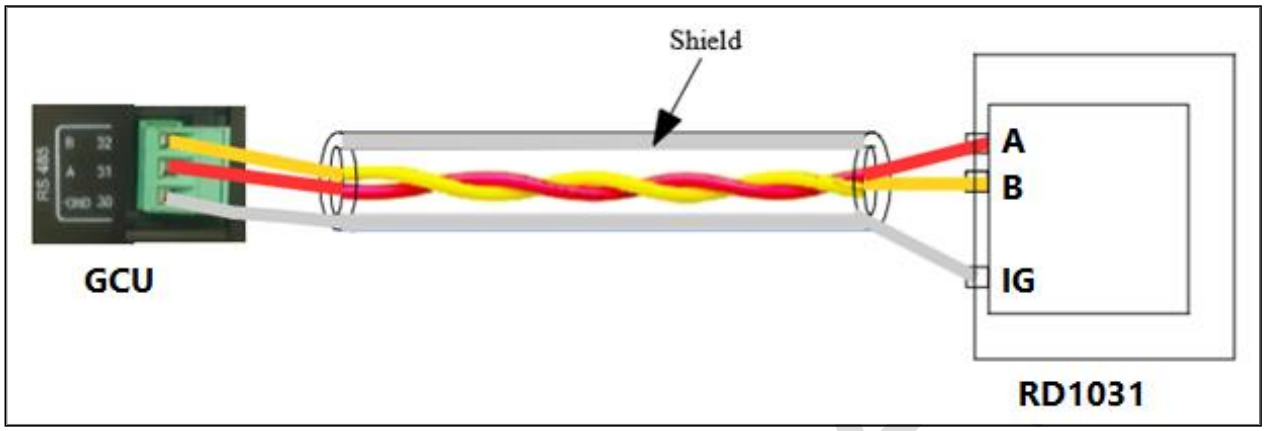

Figure 30: RS485 installation

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4 Operation

RD1031 Gateway communicates to the GCU/ECU, which monitors the genset at site. It also communicated with the server and transfers the information monitored by GCU. This information is recorded in the server.

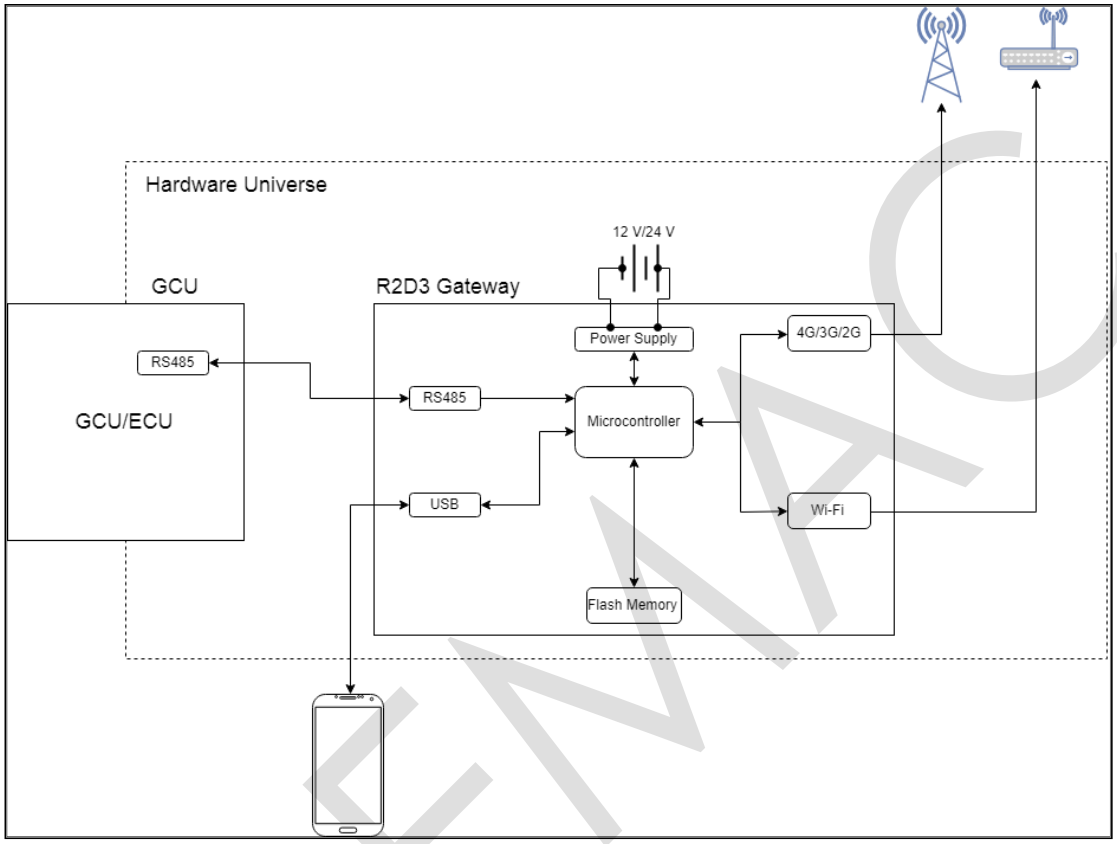

Figure 31: Operation of R2D3

4.1 Connection Details

Connection details of RD1031 Gateway:

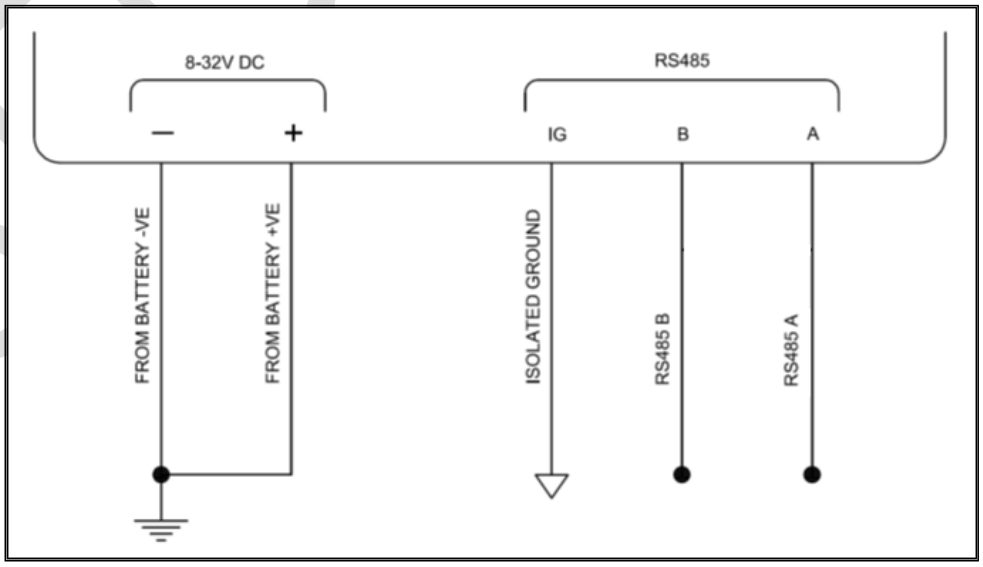

Figure 32: RD1031 connection details

4.2 Description of keys and LED indication

Below illustrations shows different parts of the RD1031 Gateway. Refer Figure 33

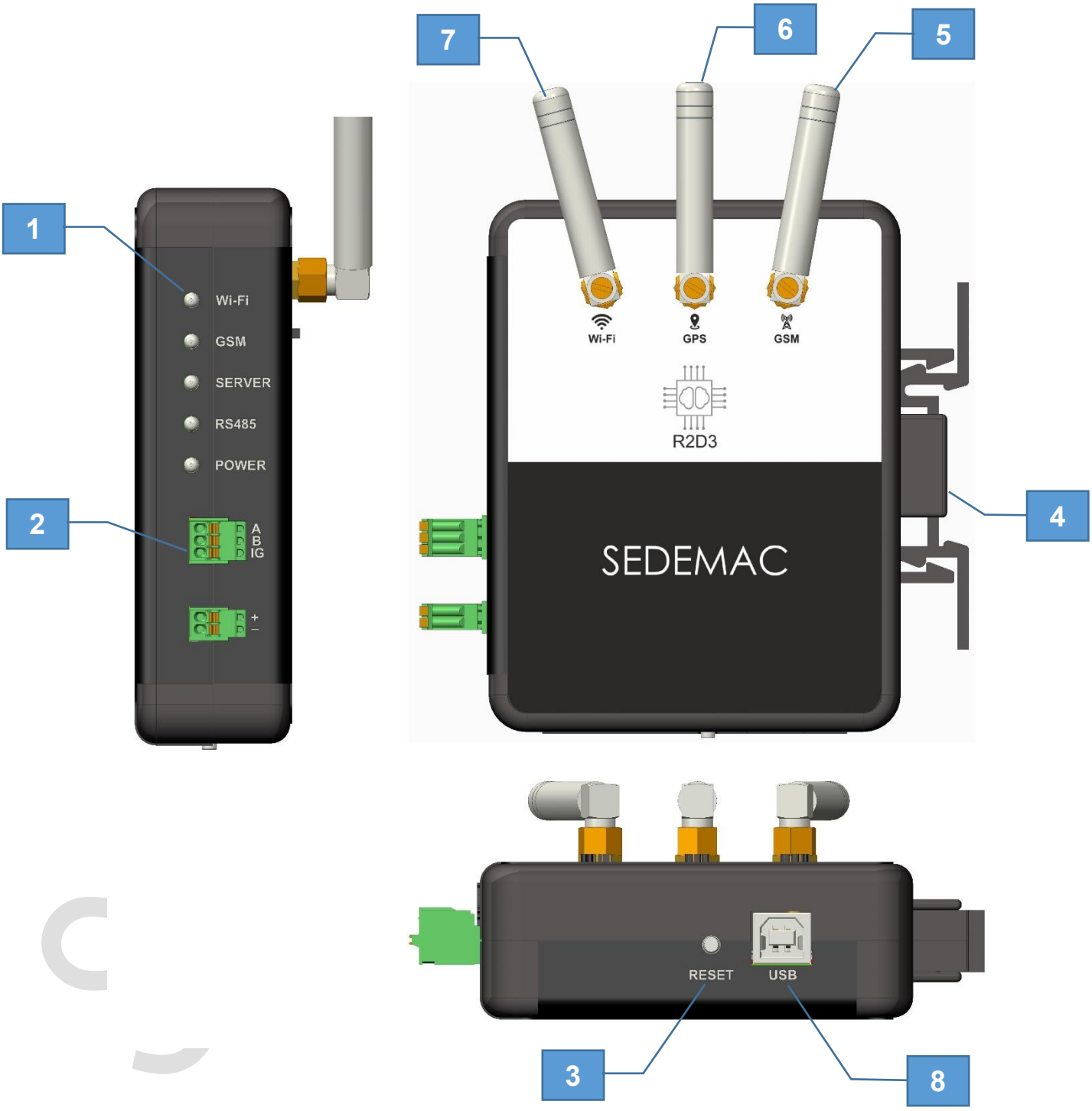

Figure 33: Control keys function

1. Indication LEDs
2. Terminal connectors
3. Reset key
4. Mounting bracket
5. GSM antenna
6. GPS antenna
7. Wi-Fi antenna
8. USB port

4.3 LED Diagnostics

RD1031 Gateway is provided with five of LEDs for various indications. These LED indications are easy to understand and helpful to know the working status of the Gateway. Below table gives an information about the LED light indication for different purposes in different modes.

Table 8: LED diagnostics

LED	Control Connections	Behaviour
Power	Power Circuit	• Indicates if the Gateway is powered ON or OFF • For LED ON, Gateway is on
Network Status (GPRS)	GPRS Module	• Continuous red: GSM network not available, SIM not present, not enough data balance • Green blinking: Connected to the server. The frequency of blinking will indicate network strength*
Wi-Fi	Module and MCU	• Continuous red: Not Provisioned • Red Blinking: Provisioned but not connected • Alternate green and red blinking: In Provisioning mode • Continuous orange: Connected to Wi-Fi network but data connection is unavailable • Green blinking: Connected to the server. The frequency of blinking will indicate network strength*
RS485	MCU	• Continuous green: RS485 communication is established • Continuous red: MODBUS map is received from the server but there is an error in RS485 connection • Red Blinking: No MODBUS map received from the server
Server	MCU	• Continuous red: Enabled to established server connection • Continuous green: Server Connection Established

**The RSSI levels/signal strength is only calculated at the time of connection and thereafter LED blinks with the same frequency considering the same signal strength follows.*

4.4 Reset Key Function

Reset Button used in the following ways-

- When pressed for less than 3 secs: gives a network reset to the module - equivalent to power on power off reset.
- When pressed for more than 3 secs: If the Gateway is already powered ON, it enters Wi-Fi provisioning mode to configure Wi-Fi.
- When pressed before providing power to the Gateway: enters the programming mode and wait for firmware upgradation through “Mobile Flash”.

5 Firmware Upgradation

List of equipment:

- The android mobile phones having OTG (On The Go) and data connectivity.
- USB cable 2.0 Type B

Figure 34: USB cable 2.0 Type B

- According to the type of USB cable supported by the mobile phone, following types of OTG cable are used:
  - Micro USB to USB 2.0 Type B

Figure 35: Micro USB to USB 2.0 Type B

  - USB Type C port to USB 2.0 Type B

Figure 36: USB Type C to USB 2.0 Type B

5.1 Mobile Flash Installation

- Download “Mobile Flash” utility from Google Play Store.
- Click on “INSTALL”.

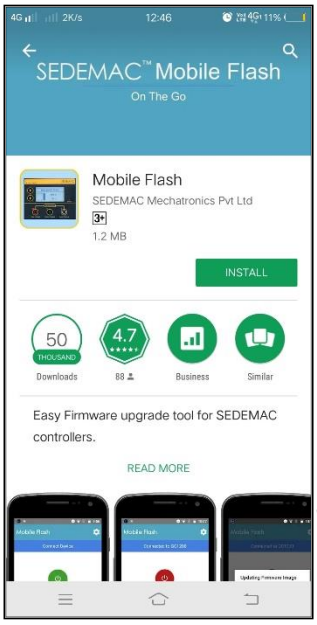

Figure 37: Mobile Flash screen: install

- Click on “OPEN” and allow app to access photos, media, and files on your device.

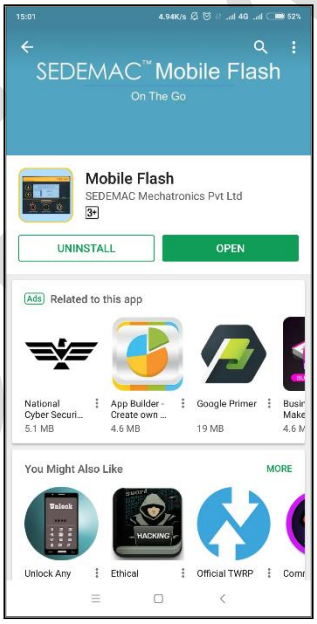

Figure 38: Mobile Flash screen: open the app

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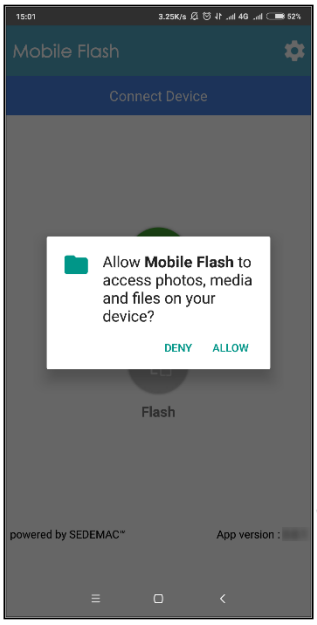

Figure 39: Mobile Flash screen: allow access of phone

- Tap “YES” to select Product categories.

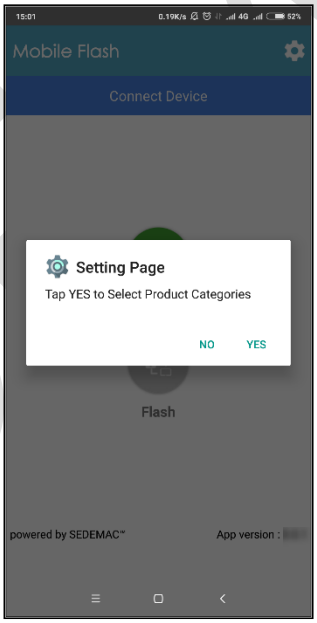

Figure 40: Mobile Flash screen: select product categories

- Click on “R2D3” and save it. A screen will pop-up with a message “Data downloaded successfully”.

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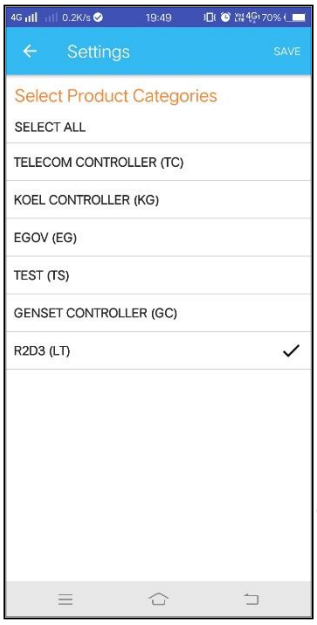

Figure 41: Mobile Flash screen: select R2D3 in product categories

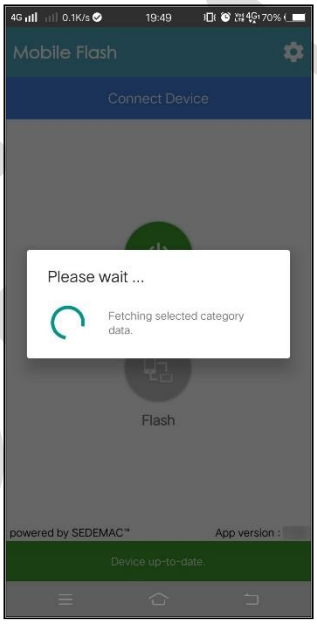

Figure 42: Mobile Flash screen: fetching selected category data

- This completes the software installation process.

5.2 Hardware connection of RD1031 Gateway and android mobile

- Connect Android phone and target device with OTG cable & USB cables as shown in the image.

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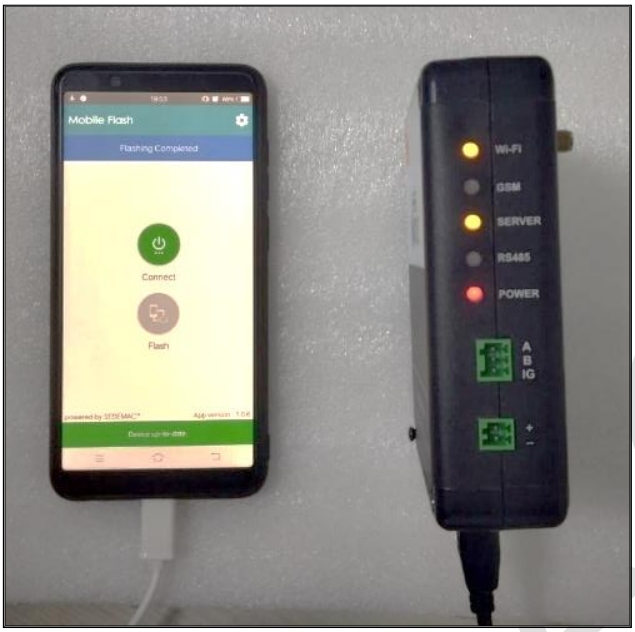

Figure 43: RD1031 Gateway and android mobile hardware connection

- Put RD1031 in programming mode. Refer Reset Key Function.

5.3 Firmware flashing

- After successful hardware connection, click on Mobile Flash app, a message will pop-up on mobile screen, click on “OK”.

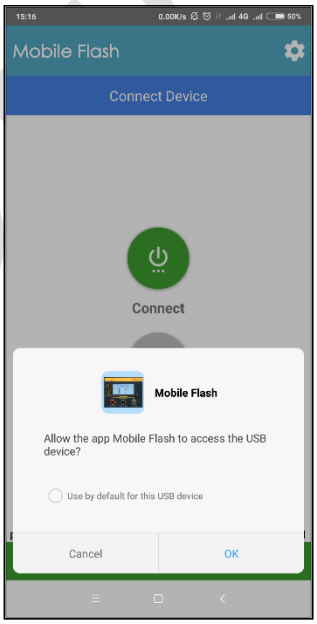

Figure 44: Mobile Flash screen: allow app to access USB device

- Click on “Connect” button and status will change from “Ready to connect” to “Connected to RD1031”.

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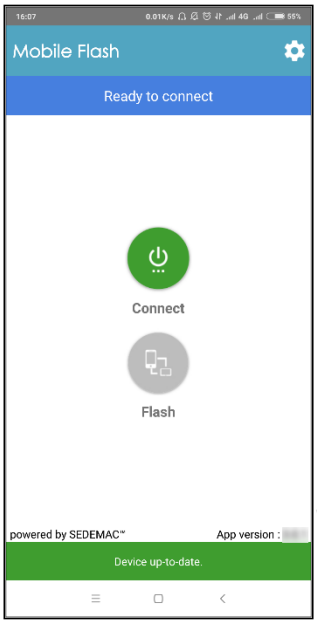

Figure 45: Mobile Flash screen: ready to connect

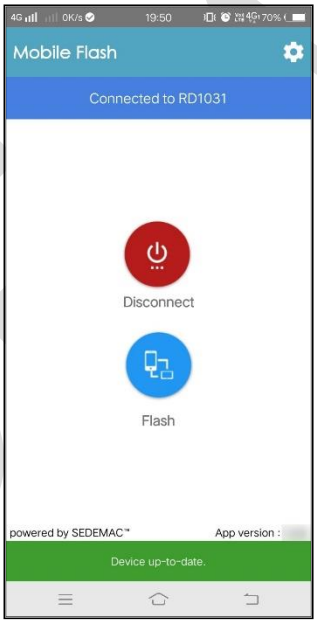

Figure 46: Mobile Flash screen: connected to RD1031

NOTE:	Do not remove USB cable during flashing.

- Now click on “Flash” button.
- An Alert message will pop-up to Turn ON airplane mode, click on “OK”.

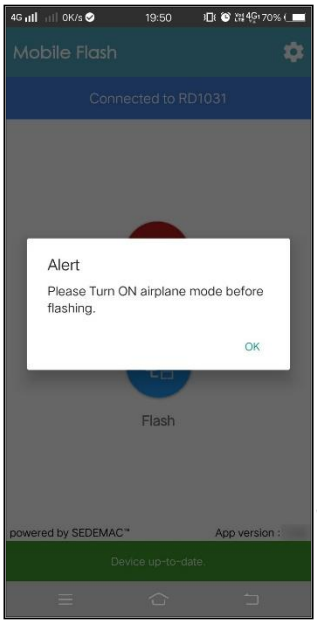

Figure 47: Mobile Flash screen: alert for turn on airplane mode

- Go to your mobile setting and turn airplane mode ON.

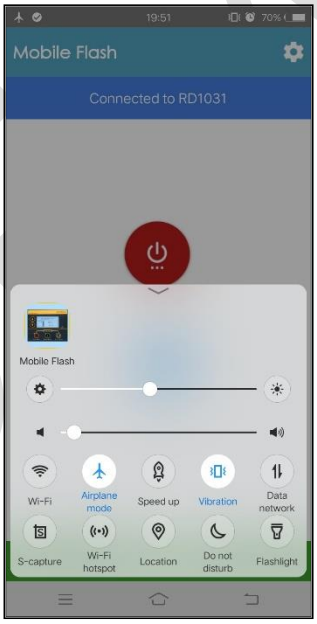

Figure 48: Mobile Flash screen: airplane mode on

- Click on “Flash” option again & firmware will start updating.

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Figure 49: Mobile Flash screen: updating firmware

- Once 100% of flashing of file completed, Click on “OK”.

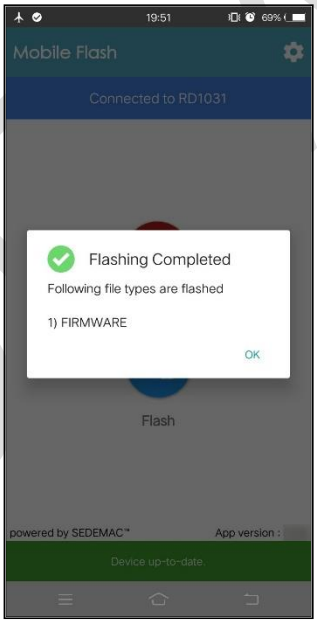

Figure 50: Mobile Flash screen: flashing completion

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Notes

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Disclaimer: Due to continuous development, the details provided in this document are subject to change without any prior notice.

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