LINC Node

IoT Gateway

User Manual

UM-6019, Rev. E, 2025/10/08

ADB SAFEGATE

A.0 Disclaimer / Standard Warranty

CE certification

The equipment listed as CE certified means that the product complies with the essential requirements concerning safety and hygiene. The European directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

ETL certification

The equipment listed as ETL certified means that the product complies with the essential requirements concerning safety and C22.2 No.180:13 (R2018) regulations. The CSA directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

All Products Guarantee

ADB SAFEGATE will correct by repair or replacement per the applicable guarantee below, at its option, equipment or parts which fail because of mechanical, electrical or physical defects, provided that the goods have been properly handled and stored prior to installation, properly installed and properly operated after installation, and provided further that Buyer gives ADB SAFEGATE written notice of such defects after delivery of the goods to Buyer. Refer to the Safety section for more information on Material Handling Precautions and Storage precautions that must be followed.

ADB SAFEGATE reserves the right to examine goods upon which a claim is made. Said goods must be presented in the same condition as when the defect therein was discovered. ADB SAFEGATE furthers reserves the right to require the return of such goods to establish any claim.

ADB SAFEGATE's obligation under this guarantee is limited to making repair or replacement within a reasonable time after receipt of such written notice and does not include any other costs such as the cost of removal of defective part, installation of repaired product, labor or consequential damages of any kind, the exclusive remedy being to require such new parts to be furnished.

ADB SAFEGATE's liability under no circumstances will exceed the contract price of goods claimed to be defective. Any returns under this guarantee are to be on a transportation charges prepaid basis. For products not manufactured by, but sold by ADB SAFEGATE, warranty is limited to that extended by the original manufacturer. This is ADB SAFEGATE's sole guarantee and warranty with respect to the goods; there are no express warranties or warranties of fitness for any particular purpose or any implied warranties of fitness for any particular purpose or any implied warranties other than those made expressly herein. All such warranties being expressly disclaimed.

Standard Products Guarantee

Products manufactured by ADB SAFEGATE are guaranteed against mechanical, electrical, and physical defects (excluding lamps) which may occur during proper and normal use for a period of two years from the date of ex-works delivery, and are guaranteed to be merchantable and fit for the ordinary purposes for which such products are made.

Note

See your applicable sales agreement for a complete warranty description.

Replaced or repaired equipment under warranty falls into the warranty of the original delivery. No new warranty period is started for these replaced or repaired products.

FAA Certified products manufactured by ADB SAFEGATE

ADB SAFEGATE L858 Airfield Guidance Signs are warranted against mechanical and physical defects in design or manufacture for a period of 2 years from date of installation, per FAA AC 150/5345-44 (applicable edition).

ADB SAFEGATE LED products (with the exception of obstruction lighting) are warranted against electrical defects in design or manufacture of the LED or LED specific circuitry for a period of 4 years from date of installation, per FAA EB67 (applicable edition). These FAA certified constant current (series) powered LED products must be installed, interfaced and powered with and through products certified under the FAA Airfield Lighting Equipment Program (ALECP) to be included in this 4 (four) year warranty. This includes, but is not limited to, interface with products such as Base Cans, Isolation Transformers, Connectors, Wiring, and Constant Current Regulators.

Note

See your sales order contract for a complete warranty description.

Replaced or repaired equipment under warranty falls into the warranty of the original delivery. No new warranty period is started for these replaced or repaired products.

Liability

WARNING

Use of the equipment in ways other than described in the catalog leaflet and the manual may result in personal injury, death, or property and equipment damage. Use this equipment only as described in the manual.

ADB SAFEGATE cannot be held responsible for injuries or damages resulting from non-standard, unintended uses of its equipment. The equipment is designed and intended only for the purpose described in the manual. Uses not described in the manual are considered unintended uses and may result in serious personal injury, death or property damage.

Unintended uses, includes the following actions:

- Making changes to equipment that have not been recommended or described in this manual or using parts that are not genuine ADB SAFEGATE replacement parts or accessories.
- Failing to make sure that auxiliary equipment complies with approval agency requirements, local codes, and all applicable safety standards if not in contradiction with the general rules.
- Using materials or auxiliary equipment that are inappropriate or incompatible with your ADB SAFEGATE equipment.
- Allowing unskilled personnel to perform any task on or with the equipment.

Copyright Statement

Table of Contents

List of Figures

List of Tables

1.0 Safety

Introduction to Safety

This section contains general safety instructions for installing and using ADB SAFEGATE equipment. Some safety instructions may not apply to the equipment in this manual. Task- and equipment-specific warnings are included in other sections of this manual where appropriate.

1.1 Safety Messages

HAZARD Icons used in this manual

For all HAZARD symbols in use, see the Safety section. All symbols must comply with ISO and ANSI standards.

Carefully read and observe all safety instructions in this manual, which alert you to safety hazards and conditions that may result in personal injury, death or property and equipment damage and are accompanied by the symbols shown below.

	WARNING Failure to observe a warning may result in personal injury, death or equipment damage.
	DANGER – Risk of electrical shock or ARC FLASH Disconnect equipment from line voltage. Failure to observe this warning may result in personal injury, death, or equipment damage. ARC Flash may cause blindness, severe burns or death.
	WARNING – Wear personal protective equipment Failure to observe may result in serious injury.
	WARNING – Do not touch Failure to observe this warning may result in personal injury, death, or equipment damage.
	CAUTION Failure to observe a caution may result in equipment damage.
	ELECTROSTATIC SENSITIVE DEVICES This equipment may contain electrostatic devices.

Qualified Personnel

	**Important Information** The term **qualified personnel** is defined here as individuals who thoroughly understand the equipment and its safe operation, maintenance and repair. Qualified personnel are physically capable of performing the required tasks, familiar with all relevant safety rules and regulations and have been trained to safely install, operate, maintain and repair the equipment. It is the responsibility of the company operating this equipment to ensure that its personnel meet these requirements. Always use required personal protective equipment (PPE) and follow safe electrical work practice.

1.1.1 Introduction to Safety

CAUTION

Unsafe Equipment Use
This equipment may contain electrostatic devices, hazardous voltages and sharp edges on components

- Read installation instructions in their entirety before starting installation.
- Become familiar with the general safety instructions in this section of the manual before installing, operating, maintaining or repairing this equipment.
- Read and carefully follow the instructions throughout this manual for performing specific tasks and working with specific equipment.
- Make this manual available to personnel installing, operating, maintaining or repairing this equipment.
- Follow all applicable safety procedures required by your company, industry standards and government or other regulatory agencies.
- Install all electrical connections to local code.
- Use only electrical wire of sufficient gauge and insulation to handle the rated current demand. All wiring must meet local codes.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Protect components from damage, wear, and harsh environment conditions.
- Allow ample room for maintenance, panel accessibility, and cover removal.
- Protect equipment with safety devices as specified by applicable safety regulations
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning prior to returning power to the circuit.

Failure to follow these instructions can result in serious injury, death or equipment damage

Additional Reference Materials

Important Information

- IEC – International Standards and Conformity Assessment for all electrical, electronic and related technologies.
- IEC 60364 – Electrical Installations in Buildings.
- CSA – C22.2 No.180:13 (R2018), series isolating transformers for airport lighting.
- FAA Advisory: AC 150/5340-26 (current edition), Maintenance of Airport Visual Aid Facilities.
- Maintenance personnel must refer to the maintenance procedure described in the ICAO Airport Services Manual, Part 9.
- ANSI/NFPA 79, Electrical Standards for Metalworking Machine Tools.
- National and local electrical codes and standards.

1.1.2 Intended Use

CAUTION

Use this equipment as intended by the manufacturer
This equipment is designed to perform a specific function, do not use this equipment for other purposes

- Using this equipment in ways other than described in this manual may result in personal injury, death or property and equipment damage. Use this equipment only as described in this manual.

Failure to follow this instruction can result in serious injury or equipment damage

1.1.3 Operation Safety

CAUTION

Improper Operation
Do Not Operate this equipment other than as specified by the manufacturer

- Only qualified personnel, physically capable of operating the equipment and with no impairments in their judgment or reaction times, should operate this equipment.
- Read all system component manuals before operating this equipment. A thorough understanding of system components and their operation will help you operate the system safely and efficiently.
- Before starting this equipment, check all safety interlocks, fire-detection systems, and protective devices such as panels and covers. Make sure all devices are fully functional. Do not operate the system if these devices are not working properly. Do not deactivate or bypass automatic safety interlocks or locked-out electrical disconnects or pneumatic valves.
- Protect equipment with safety devices as specified by applicable safety regulations.
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Never operate equipment with a known malfunction.
- Do not attempt to operate or service electrical equipment if standing water is present.
- Use this equipment only in the environments for which it is rated. Do not operate this equipment in humid, flammable, or explosive environments unless it has been rated for safe operation in these environments.
- Never touch exposed electrical connections on equipment while the power is ON.

Failure to follow these instructions can result in serious injury, death or equipment damage.

1.1.4 Material Handling Precautions : Storage

CAUTION

Improper Storage
Store this equipment properly

- If equipment is to be stored prior to installation, it must be protected from the weather and kept free of condensation and dust.

Failure to follow this instruction can result in equipment damage

1.1.5 Arc Flash and Electric Shock Hazard

DANGER

SERIES CIRCUITS HAVE HAZARDOUS VOLTAGES
THIS EQUIPMENT PRODUCES HIGH VOLTAGES TO MAINTAIN THE SPECIFIED CURRENT - DO NOT DISCONNECT WHILE ENERGIZED.

- ALLOW ONLY QUALIFIED PERSONNEL TO PERFORM MAINTENANCE, TROUBLESHOOTING, AND REPAIR TASKS.
- ONLY PERSONS WHO ARE PROPERLY TRAINED AND FAMILIAR WITH ADB SAFEGATE EQUIPMENT ARE PERMITTED TO SERVICE THIS EQUIPMENT.
- AN OPEN AIRFIELD CURRENT CIRCUIT IS CAPABLE OF GENERATING >5000 VAC AND MAY APPEAR OFF TO A METER.
- NEVER UNPLUG A DEVICE FROM A CONSTANT CURRENT CIRCUIT WHILE IT IS OPERATING; ARC FLASH MAY RESULT.
- DISCONNECT AND LOCK OUT ELECTRICAL POWER.
- ALWAYS USE SAFETY DEVICES WHEN WORKING ON THIS EQUIPMENT.
- FOLLOW THE RECOMMENDED MAINTENANCE PROCEDURES IN THE PRODUCT MANUALS.
- DO NOT SERVICE OR ADJUST ANY EQUIPMENT UNLESS ANOTHER PERSON TRAINED IN FIRST AID AND CPR IS PRESENT.
- CONNECT ALL DISCONNECTED EQUIPMENT GROUND CABLES AND WIRES AFTER SERVICING EQUIPMENT. GROUND ALL CONDUCTIVE EQUIPMENT.
- USE ONLY APPROVED ADB SAFEGATE REPLACEMENT PARTS. USING UNAPPROVED PARTS OR MAKING UNAPPROVED MODIFICATIONS TO EQUIPMENT MAY VOID AGENCY APPROVALS AND CREATE SAFETY HAZARDS.
- CHECK THE INTERLOCK SYSTEMS PERIODICALLY TO ENSURE THEIR EFFECTIVENESS.
- DO NOT ATTEMPT TO SERVICE ELECTRICAL EQUIPMENT IF STANDING WATER IS PRESENT. USE CAUTION WHEN SERVICING ELECTRICAL EQUIPMENT IN A HIGH-HUMIDITY ENVIRONMENT.
- USE TOOLS WITH INSULATED HANDLES WHEN WORKING WITH AIRFIELD ELECTRICAL EQUIPMENT.

FAILURE TO FOLLOW THESE INSTRUCTIONS CAN RESULT IN DEATH OR EQUIPMENT DAMAGE

1.1.6 Important Notice

Due to the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the ADB SAFEGATE product are used in a normal manner with a well-constructed network, the ADB SAFEGATE product should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. ADB SAFEGATE accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the ADB SAFEGATE product, or for failure of the ADB SAFEGATE product to transmit or receive such data.

1.1.7 Safety and Hazards

Do not operate the ADB SAFEGATE product in areas where blasting is in progress, near medical equipment, near life support equipment, or any equipment which may be susceptible to any form of radio interference. In such areas, the ADB SAFEGATE product **MUST BE POWERED OFF**. The ADB SAFEGATE product can transmit signals that could interfere with this equipment.

The driver or operator of any vehicle should not operate the ADB SAFEGATE product while in control of a vehicle. Doing so will detract from the driver or operator's control and operation of that vehicle. In some jurisdictions, operating such communications devices while in control of a vehicle is an offence.

Warning:*DO NOT USE THE USB CONNECTOR IN A HAZARDOUS AREA.*

Warning:*DO NOT USE THE RESET BUTTON IN A HAZARDOUS AREA.*

This device is suitable for use in Class 1 Div 2 Groups A, B, C, and D locations. Ambient temperatures of -30C to +60C. UL Listed for use in ambient temperatures not exceeding 60C.

Warning:*Explosion Hazard. Do not connect or disconnect while circuit is live or unless the area is known to be free of ignitable concentrations.*

The device is required to be installed in a tool-secured enclosure with the appropriate type rating.

1.1.8 Limitation of Liability

Patents This product may contain technology developed by or for Sierra Wireless Inc. This product includes technology licensed from QUALCOMM®. This product is subject to one or more patents licensed from MMP Portfolio Licensing.

Trademarks ADB SAFEGATE® and LINC® are registered trademarks of ADB SAFEGATE BV.

Sierra Wireless®, Legato®, and the Sierra Wireless logo are registered trademarks of Sierra Wireless.

Windows® is a registered trademarks of Microsoft Corporation.

Linux® is the registered trademark of Linus Torvalds in the U.S. and other countries.

Macintosh® and Mac OS X® are registered trademarks of Apple Inc., registered in the United States and other countries.

QUALCOMM® is a registered trademark of QUALCOMM Incorporated. Used under license.

Other trademarks are the property of their respective owners.

2.0 Introduction

LINC Node is a small, rugged, programmable Internet of Things (IoT) gateway that extracts locally available data from intelligent airfield ground lighting devices and delivers it to your instance of Cortex Service , ADB SAFEGATE's cloud solution for airside asset management. It enables connectivity of existing infrastructure and initiates your Airside 4.0 journey.

2.1 Manual Introduction

This document provides a manual for the installation and use of LINC Node.

The following chapters contain detailed information about commissioning, maintaining and replacing LINC Node.

2.1.1 How to work with the manual

1. Be familiar with the structure and content.
2. Carry out the actions completely and in the given sequence.

2.2 Overview

LINC Node is a small, rugged, programmable Internet of Things (IoT) gateway that extracts locally available data from intelligent airfield ground lighting devices and delivers it to your instance of Cortex Service , ADB SAFEGATE's cloud solution for airside asset management. It enables connectivity of existing infrastructure and initiates your Airside 4.0 journey.

2.2.1 LINC Node

Introduction

LINC Node is a small, rugged, programmable Internet of Things (IoT) gateway that extracts locally available data from intelligent airfield ground lighting devices and delivers it to your instance of Cortex Service , ADB SAFEGATE's cloud solution for airside asset management. It enables connectivity of existing infrastructure and initiates your Airside 4.0 journey.

Uses

LINC Node provides an interface for airports to consult intelligent AGL device information from anywhere at any time on any device with internet connectivity (tablet, mobile phone). It can be used for the following applications:

Having this information readily available on a portable device reduces the amount of time spent driving on site to collect the information that is already there. Getting immediate alerts on the smartphone in case of an operational problem reduces the response times to fix the issue.

CCR Connect

- Insulation Resistance Monitoring and trending
- CCR Status monitoring (temperature, step, output, etc.)
- Open circuit alarms

PAPI Connect

- Glide Angle trending and alarm
- Horizontal Angle trending and alarm
- Red/White LED alarm
- Heater fault alarm
- Temperature trending

Customer Benefits

- Reduced personnel movement time
- Information ready at hand anytime, anywhere

- Improved maintenance cycles
- Historical trending
- Automated work orders
- Alarm notification on mobile devices via e-mail or Microsoft Teams message

LINC Node Technology

- LINC Node uses cellular technology to provide a secure and reliable connection to your AGL devices. It has a built-in intelligence capable of formatting and packaging the data that goes to the cloud. LINC Node will use a dedicated network to ensure the operational integrity of the ALCMS network and only allows for monitoring of data to prevent any intrusive attacks.
- Security of data transport is ensured with zero-touch security provisioning, secure boots and secure firmware upgrade, automated and unlimited key rotations over the air for edge-to-cloud authentication.
- LINC Node uses Low Power Wide Area (LPWA) technology (CAT-M1, NB-IOT) and GSM (2G) technology.
- Manufactured by Sierra Wireless

Features

- CCR variant can connect up to 16 devices
- PAPI variant connects to 1 PAPI
- ADB SAFEGATE's proven Cortex Service platform will display LINC Node's data (requires subscription)

System Overview

Figure 1: LINC Node CCR Connect

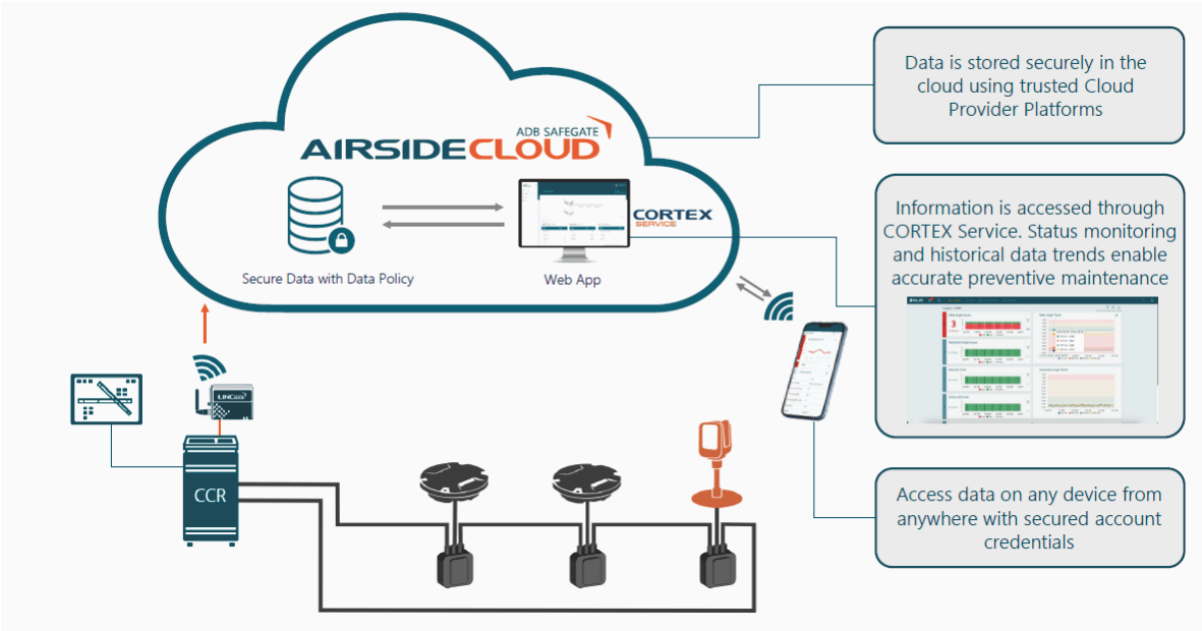


Figure 2: LINC Node PAPI Connect

Table 1: Overall System Specifications

Description	Specification
Operating temperature	-30 °C to +75 °C
Operating humidity	Max. 96 %RH
Dimensions	75 x 60 x 32 mm excluding connectors;
Weight	158g
Vibration and Shock	Vibration spec: MIL-STD-810G, Method 514.6C, Category 4CWV (Composite Wheeled Vehicle); Mechanical shock spec: MIL-STD-810G, Method 516.6; Procedure I (Functional Shock)
ESD	8KV contact discharge, 15KV air discharge
Mounting Options	Bracket for screw/wall and DIN rail mounting
Input Voltage	4.75Vdc to 32Vdc
Connections	USB2.0 micro-B Ethernet variant: 10/100BASE
	Serial variant: RS-485 half-duplex Maximum baud rate: 115200 bit/s Maximum cable length: 25 meters at 115200 bit/s, 40 meters at 38400 bit/s.

Table 2: Compliance with RF Standards

Description	Specification
Air Interface	LTE Cat-M1/NB1, EDGE/GSM/GPRS
Frequency Bands	B1, B2, B3, B4, B5, B8, B12, B13, B17, B18, B19, B20, B26, B28
4G LTE	
3G UMTS/HSPA+	-
2G EDGE/GSM/GPRS	850, 900, 1800, 1900
Regulatory Approvals	FCC/IC, CE&RoHs, REACH, RCM, Safety IEC60950 -1, UL Listed, GCF, PCTRB
Radio Module	WP7702

Note

LINC Node is delivered with a SIM card on Cellular LWPA with private APN and has a 2G back-up connection. Most countries are included but check with your Sales Representative for coverage and certification.

Table 3: Compatible Devices

Device Version	Serial Connection	Ethernet Connection
MCR	Multiwire or Dual J-bus	-
CRE/VIS[1][2]	EPS495 Multiwire or dual JBUS (min. RCB FW 1.07 required)	EPS495 needs additional Moxa serial/ethernet adapter
	EP00047	EP00047 (min. RCB FW 2.04 required)
ASG 8000i	All models	All models
LED PAPI[3]	2014 & 2018 model	-

[1] Always check with your local Sales team for your specific CCR interface compatibility, we recommend upgrading CRE/VIS to firmware v4.32/5.22

[2] In case of redundant system use, one port will need to be made available for LINC Node.

[3] LED PAPI may need a firmware upgrade to enable additional information upload.

Table 4: Ordering Codes

Part Number	Description
LN00E1	LINC Node, Ethernet Port can connect up to 16 devices
LN00S1	LINC Node, Serial Port can connect up to 16 devices
LN00P1	LINC Node, connects 1 LED PAPI

2.2.2 Illustrations

Figure 3: LINC Node Illustration

2.3 Key Features

- The following LINC Node variants are currently available:
  - Ethernet
  - Serial
- Ethernet 10/100 Mbps
- USB 2.0
- mini-SIM slot
- IoT expansion card slot (not used today)
- GNSS (GPS/Galileo/GLONASS/BeiDou[1]) (not used today)
- Linux-based Legato Embedded Application Framework
- ADB SAFEGATE All-in-One Edge-to-Cloud solution

Figure 4: LINC Node (Ethernet variant)

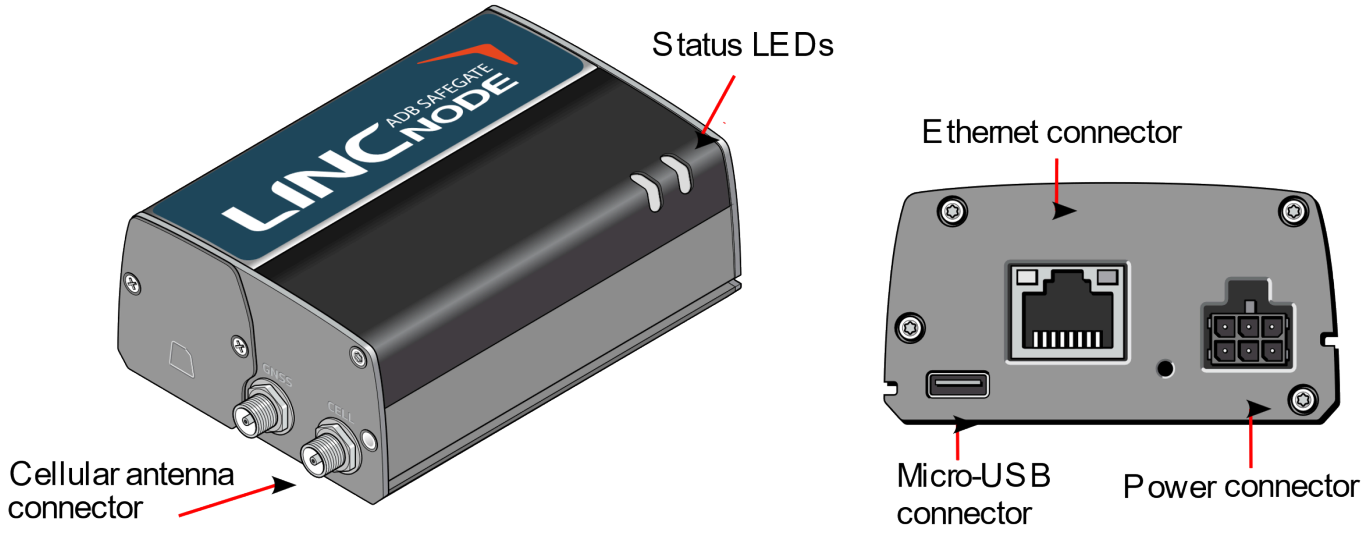
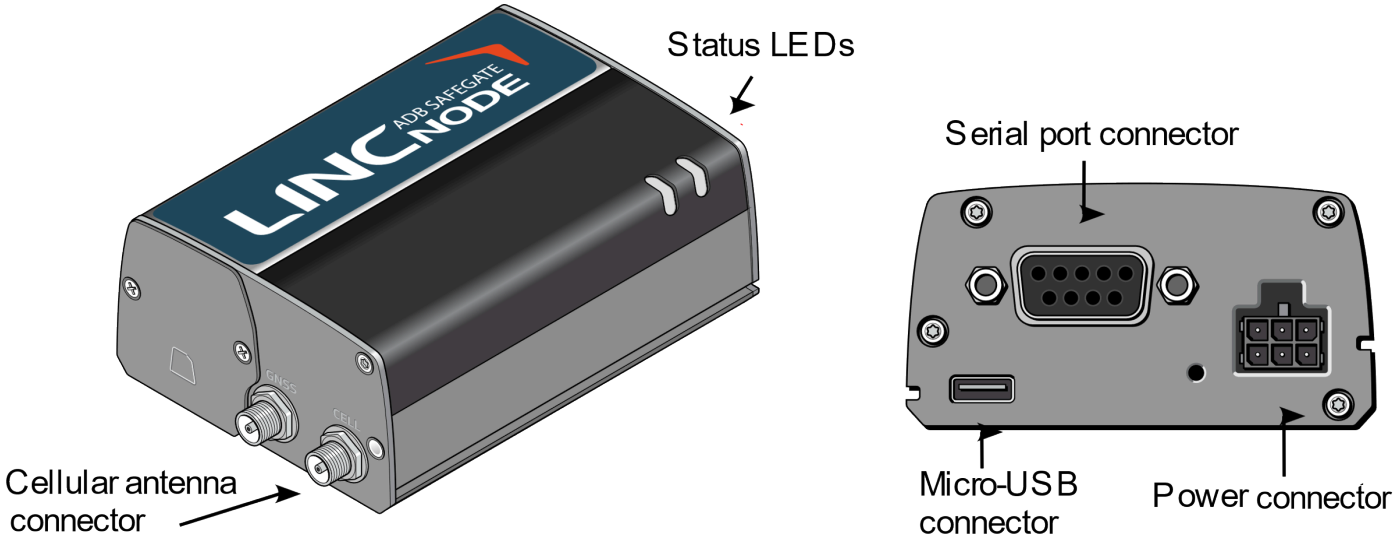


Figure 5: LINC Node (Serial variant)



2.4 Accessories

The following items come with the LINC Node gateway:

- DC power supply and cable
- Mounting bracket
- Cellular antenna
- 35mm DIN rail clips and M4 screws
- IoT Card (only for PAPI variant)
- Flatcable for 2014 PAPI Control board (only for PAPI variant)
- Flatcable for 2018 PAPI Control board (only for PAPI variant)

3.0 Installation and Startup

This chapter shows how to connect, install, and start the ADB SAFEGATE LINC Node.

It also describes the front panel LEDs and I/O functionality.

3.1 Tools and Materials Required

- mini-SIM card (provided by ADB SAFEGATE)
- #1 Philips screwdriver
- Laptop computer
- AC adapter or DC power cable
- micro-B USB cable
- Cellular antenna
- GNSS antenna (optional)

3.2 Installation Overview

The steps for a typical installation are:

1. Insert the SIM card and optional IoT Expansion card.
2. Mount and ground the LINC Node.
3. Connect the antenna.
4. Check the LINC Node operation.
5. Connect to Device
    a. CCR Connect
    b. PAPI Connect

The following sections describe these steps in detail. Read these sections carefully before performing the installation.

3.3 Step 1: Insert the SIM Card

The ADB SAFEGATE LINC Node has one mini-SIM (2FF) card slot and comes with one SIM card already installed.

If the SIM card has not already been installed, insert the SIM card into the gateway before connecting any external equipment or power to the LINC Node.

To install the SIM card:

1. Use a Philips screwdriver to remove the cover.
2. Orient the SIM card, as shown in the figure below. The gold contacts on the SIM card face up.
3. Gently slide the SIM card into the slot until it clicks into place.

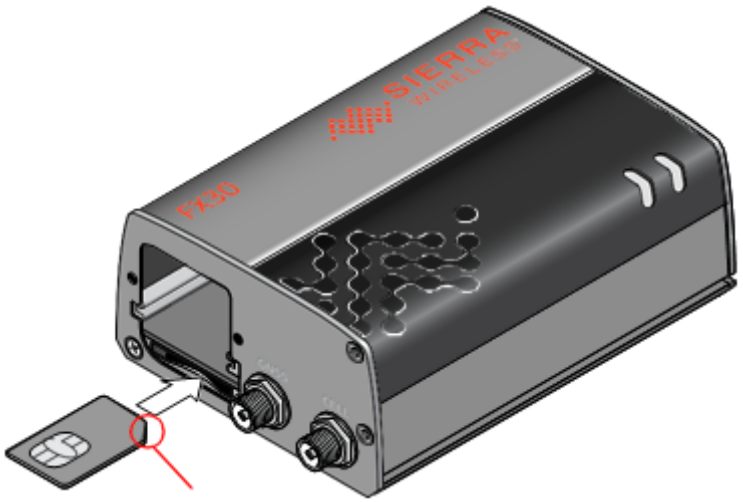
   To remove the SIM card, press it in, and release it. Gently grip the SIM card and pull it out.

Note

Note the location of the notch.

4. Reattach the cover.

Figure 6: Installing the SIM card



3.4 Step 2: Mount and Ground the LINC Node Chassis

You can flat mount the LINC Node or mount it on a DIN rail.

Mount the LINC Node where:

- There is easy access for attaching the cables.
- Cables will not be constricted, close to high amperages, or exposed to extreme temperatures.
- The front panel LEDs are easily visible.
- There is adequate airflow.
- It is away from direct exposure to the elements such as sun, rain, dust, etc.

You can mount the LINC Node:

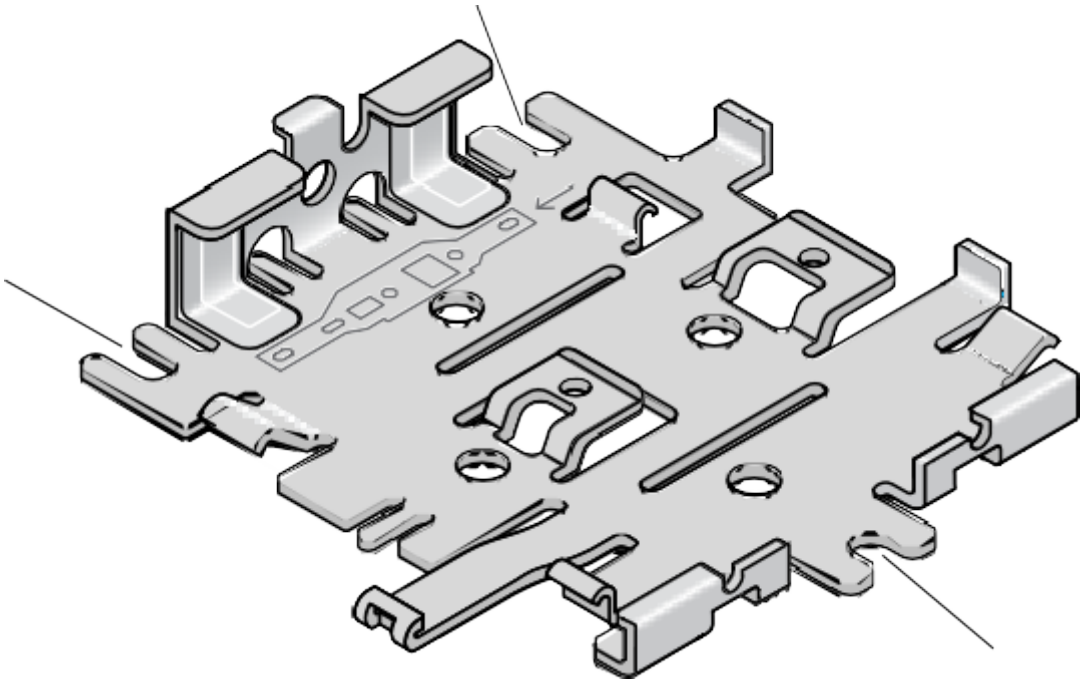
- On a flat surface
- On a DIN Rail

3.4.1 Flat Mount

To mount the LINC Node on a flat surface:

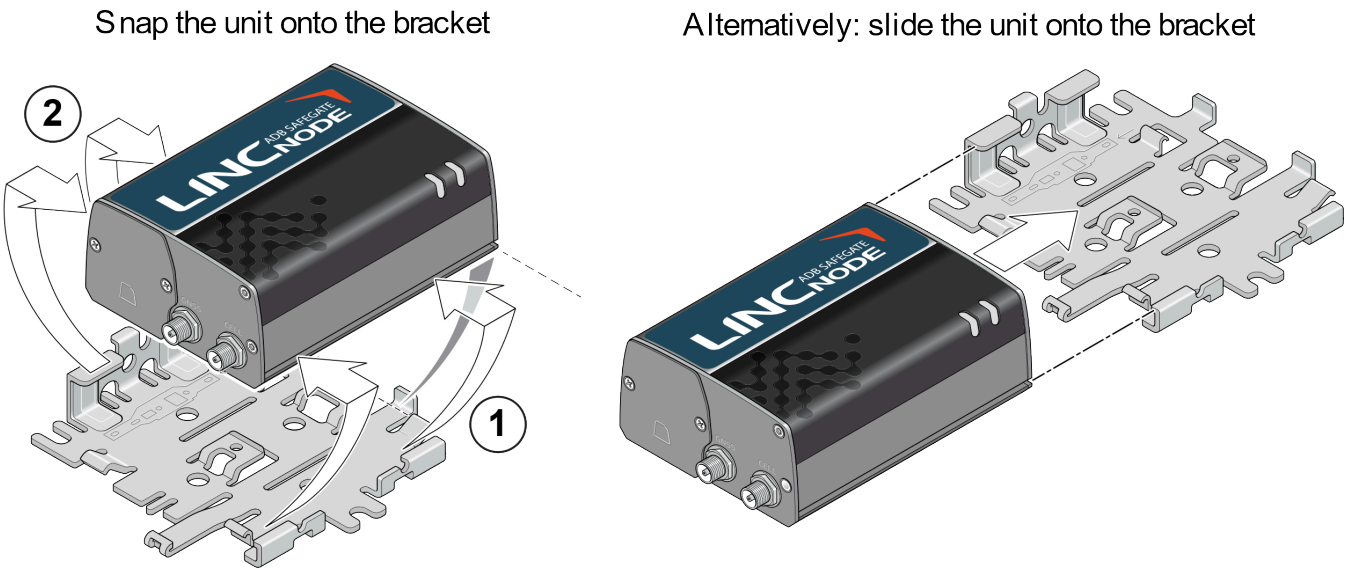
1. Attach the bracket to the mounting surface, using the attachment points shown in Figure 7

Figure 7: Mounting Bracket With Attachment Points



2. Snap (recommended) or, if access space is limited, slide the LINC Node onto the bracket.

Figure 8: Mounting the Unit onto the Bracket



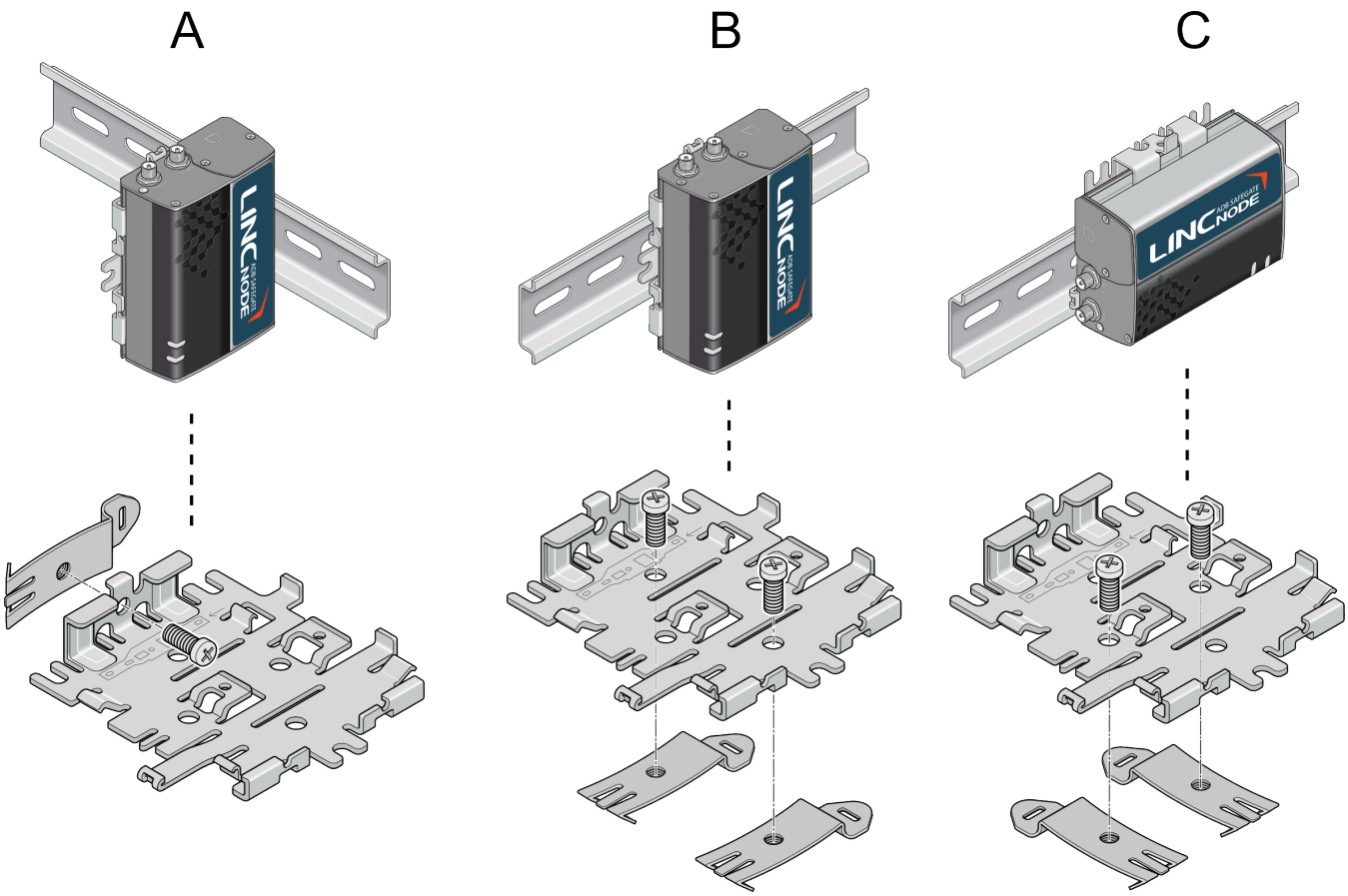
3.4.2 Mounting on a DIN Rail

To mount the LINC Node on a DIN rail:

1. A. Attach the DIN rail clips to the bracket as shown in Figure 9.
   B. If you are mounting the LINC Node on its edge, attach one DIN rail clip to the side of the bracket.
   C. If you are mounting the LINC Node horizontally or vertically, attach two DIN rail clips to the bottom of the bracket.

Note
For orientation A, attach one DIN rail clip to the side of the bracket. For orientations B and C, attach two DIN rail clips to the bottom of the bracket

Figure 9: Mounting on a DIN Rail



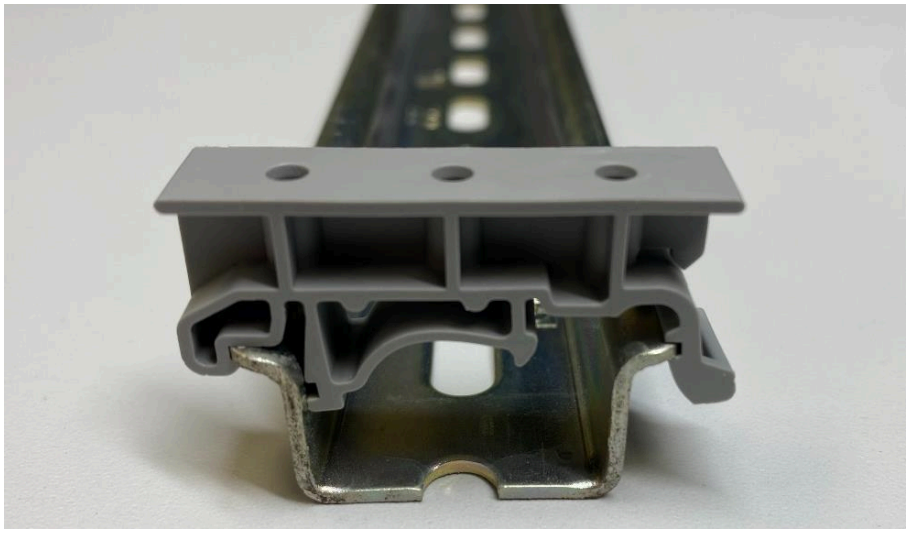
2. Slide or snap the LINC Node onto the bracket, as shown in Figure 8.
3. Attach the LINC Node to the DIN Rail. See Figure 9.

Earthing Connection

It is necessary and mandatory to connect the metal DIN rail to the main earthing of the location with a standard yellow 2.5mm^2 earth wire:

Note

The housing body of the LINC Node is connected to the internal ground (DC)! It is recommended to use a plastic DIN rail or plastic clips for the assembly to avoid connection the GND to the earthing directly and keep these two isolated.



3.5 Step 3: Connect the Antenna

WARNING

This gateway is not intended for use close to the human body. Antennas should be at least 8 inches (20 cm) away from the operator.

The LINC Node has two SMA female antenna connectors:

- Cellular antenna connector
- GNSS antenna connector

  GNSS bias supports 3.15 V antennas

For regulatory requirements concerning antennas, see Maximum Antenna Gain.

Note

The antenna should not exceed the maximum gain specified in RF Exposure. In more complex installations (such as those requiring long lengths of cable and/or multiple connections), you must follow the maximum dBi gain guidelines specified by the radio communications regulations of the Federal Communications Commission (FCC), Industry Canada, or your country's regulatory body

To install the antenna:

1. Connect the cellular antenna to the SMA cellular antenna connector.

   Mount this antenna so there is at least 20 cm between the antenna and the user or bystander.

2. If used, connect a GNSS antenna to the SMA GNSS antenna connector. Mount the GNSS antenna where it has a good view of the sky (at least 90°).

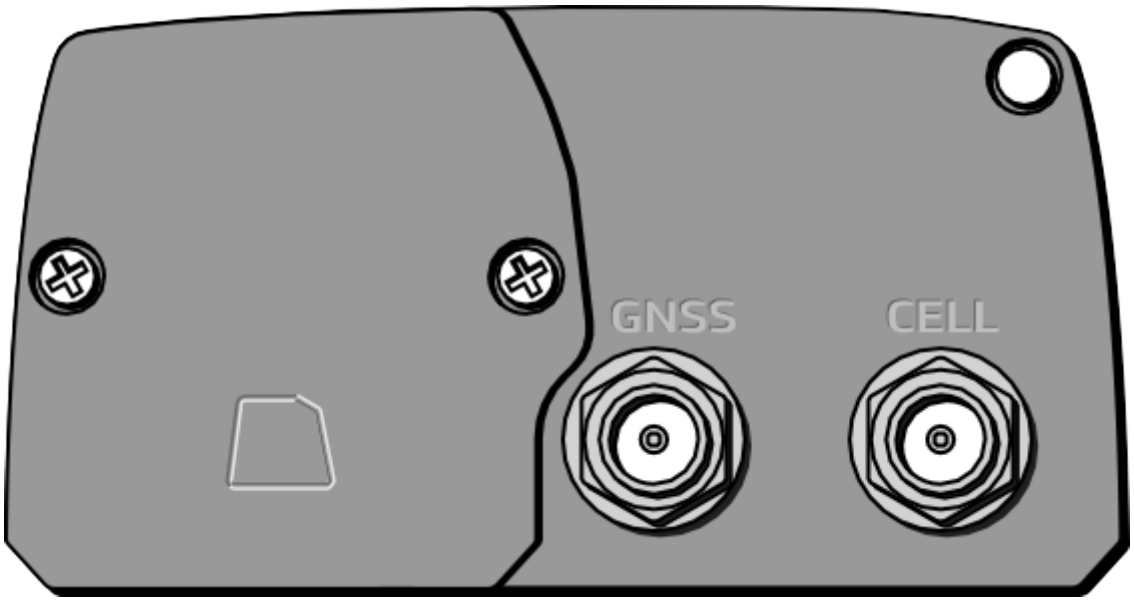
Note

Take extra care when attaching the antennas to the SMA connectors. Finger tight (approximately 0. 6–0.8 Nm 5–7 in-lb.) is sufficient and the max torque should not go beyond 1.1 Nm (10 in-lb.).

Note

If the antennas are located away from the gateway, keep the cables as short as possible to prevent the loss of antenna gain. Route the cables so that they are protected from damage and will not be snagged or pulled on. There should be no binding or sharp corners in the cable routing. Excess cabling should be bundled and tied off. Make sure the cables are secured so their weight will not loosen the connectors from the gateway over time.

Figure 10: GNSS and Cellular Antenna Connectors



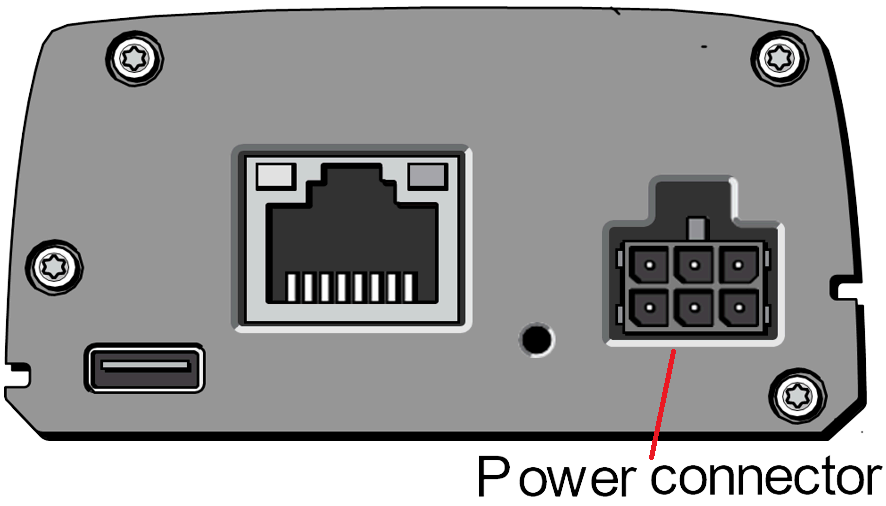
3.6 Startup

In this section, "LINC Node" refers to either one or multiple LINC Nodes.

3.6.1 Powering up the LINC Node

To power up the LINC Node, plug in the connector to the power socket.

Figure 11: LINC Node Power Connector



3.7 Step 4: Check the LINC Node Operation

On initial power up, the Power LED is red. When the processor boots up, the LED turns amber (by default). The Power LED can be controlled by Legato applications.

If the Power LED does not turn on, ensure that the:

- Power connector is plugged in and supplying voltage of 4.75 V or greater.
- On/Off (pin 3) is connected to the battery or power source.

3.7.1 Ethernet LEDs

The connector has two LEDs that indicate speed and activity. When looking into the connector:

- Right LED: Activity (blinking amber)
- Left LED:Connection speed (green indicates a 100 Mbps link, and off indicates no cable is connected or a 10 Mbps link is detected).

3.7.2 Reset to Factory Default Settings

Note

Resetting the gateway to the factory default settings will remove all customized configuration settings in /etc and /data, including the root password.

Note

Performing a factory reset could result in your LINC Node no longer automatically connecting to AVMS. If you perform a factory reset, please issue the AT command AT+WDSC=3,60 to ensure your device checks in to AVMS every 60 minutes.

To reset the LINC Node to the factory default settings, upon applying power, press and hold the reset button for about 10 seconds.

3.8 Step 5: Connect to Device

3.8.1 CCR Connect

Note
CCR connect is currently only available on CRE and MCR3 Constant Current Regulators.

Both the Ethernet and the Serial variants of LINC Node can be connected with Constant Current Regulators. The following sections include instructions and limitations for each variant.

Figure 12: CCR Connect Package Content

3.8.1.1 LINC Node Ethernet

Power Cable Preparation

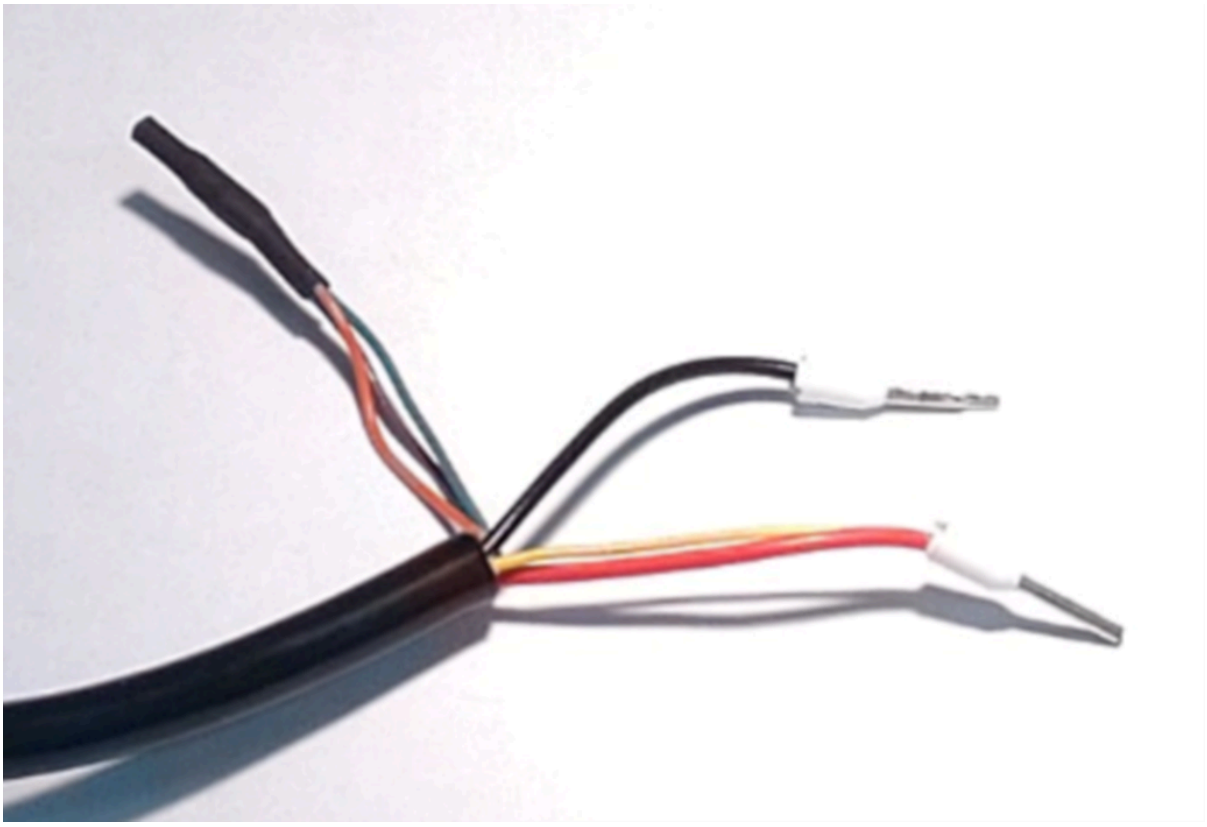
If necessary, adjust the length of the original power cable cord by cutting of unnecessary patch, such that the cable fits your final setup.

The following power cable wires must be clamped with ferrules:

- Black wire, should be connected to power supply negative potential
- Red and yellow wires should be tied together and connected to power supply positive potential.

You can cut the remaining wires in the loom or seal them carefully. The Figure below shows an example of power cable termination.

Figure 13: Original Power Supply Cable Termination with Ferrules



Ethernet Interface Connection

The LINC Node Ethernet device can operate up to four MOSBUS TCP CCRs compatible with MCR2 and MCR3 protocols. The table below lists key device specifications.

Specification	Value
Ethernet interface configuration	▪ 10/100 Mbps ▪ RJ-45 connector, use CAT5 or greater Ethernet cable
Supported protocols	MCR2, MCR3
Supported CCRs	ADB SAFEGATE's CRE/VIS: ▪ remote control board EPS495 (old remote plus moxa serial/ethernet adaptor) ▪ remote control board EP00047 (remote2020 with native ethernet RJ45) with RCB FW 2.04 or above
Power supply requirements	▪ DC Voltage range: +5...+32V ▪ Power: average 2.5W, peak 7.5W

Use Cat5 or greater Ethernet cable for interfacing the LINC Node to CCRs. For details on connecting the LINC Node device to the Constant Current Regulator refer to the installation manual documents for the respective CCRs.

Required CCR Configuration (Applies to CRE/VIS)

- LINC Node must be connected to port B of the remote board in case control system is connected to port A
- CRE/VIS: "A only" control should be selected after LINC Node installation
- Modbus timeout to be raised, using remote2020 debugger tool, to 600 seconds or higher (possible for remote2020 firmware 2.04 and above).

Limitations

- LINC Node Ethernet supports up to 16 assets. To connect more than one asset to LINC Node simultaneously, an ethernet switch is required.
- The **"192.168.2.*"** subnet **is not usable** with LINC Node (reserved for commissioning tool)
- Modbus RTU over TCP protocol is not supported today
- Only non-redundant installations supported today

3.8.1.2 LINC Node Serial

Use twisted pair shielded cable for interfacing the LINC Node Serial device to the CCR(s). [Table] lists pinout of DB9 connector on the LINC Node Serial device. For connecting LINC Node device to the constant current regulator, refer to the installation manual documents for the respective CCRs.

Table 5: Key Device Specifications

Specification	Value
Serial interface configuration	▪ RS-485 half-duplex (2-wire) ▪ SW-configurable termination resistor (enabled by default) ▪ Maximum baud rate: 115200 bit/s ▪ Maximum cable length: 25 meters at 115200 bit/s, 40 meters at 38400 bit/s
Supported protocols	MCR2, MCR3

Supported CCRs	▪ ADB SAFEGATE MCR3: Any
	▪ ADB SAFEGATE CRE:
	  ▪ EPSILON CS00190 (EPS495 old remote), multiwire control
	  ▪ EPSILON CS00190 (EPS495 old remote), dual JBUS (**RCB FW 1.07 and above required**)
	  ▪ ADB SAFEGATE EP0004 (remote2020)

Power supply requirements	▪ DC Voltage range: +5...+32V ▪ Power: average 2.5W, peak 6W

Daisy-chaining of multiple regulators is made by connecting respective RS-485 interfaces in parallel. The very last unit in the net must have a termination resistor enabled.

Serial Interface Connection

Use a twisted pair shielded cable (STP) to interface the Linc Node Serial device to the CCR(s). Connect all 3 signals (RS-485 Positive, RS-485 Negative and Ground) between the Linc Node and the regulators according to:

- Table 6 shows the pinout of the DB9 connector on the Linc Node Serial device.
- Table 7 shows the pinout for the connection to the 32-pole connector on the CRE.
- Figure 14 shows the pinout for the connector on the MCR3 regulator.

Table 6: DB9 Connector Pinout Description

DB9 Pin	Description
1	RS-485 Negative Signal
2	RS-485 Positive Signal
5	Ground

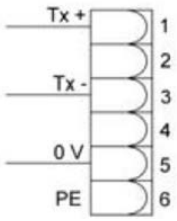
Table 7: J-Bus interface (Fixed) on the CRE Regulator Side

Function	Terminal number on 32-pole connector	Relay number on Remote Control PCB (unless indicated otherwise)
RS485 BusA GND	30	DB9.3
RS485 BusA Data -	32	DB9.2

Table 7: J-Bus interface (Fixed) on the CRE Regulator Side

Function	Terminal number on 32-pole connector	Relay number on Remote Control PCB (unless indicated otherwise)
RS485 BusA Data +	31	DB9.1
RS485 BusB GND	27	DB92.3
RS485 BusB Data +	28	DB92.2
RS485 BusB Data -	29	DB92.1

Figure 14: Pinout for MCR3 (Bus A on P1 and P2, Bus B on P3 and P4)



Daisy-Chaining

Daisy-chaining of multiple regulators is achieved by connecting respective RS-485 interfaces in parallel.

Figure 15: Daiy-Chaining Example (1)

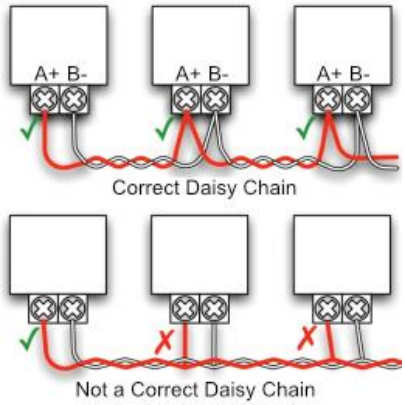
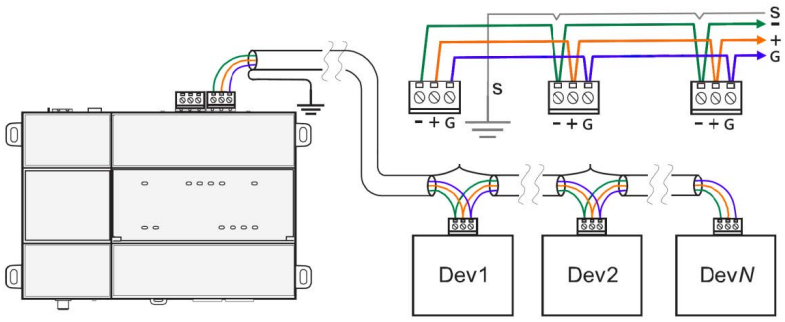
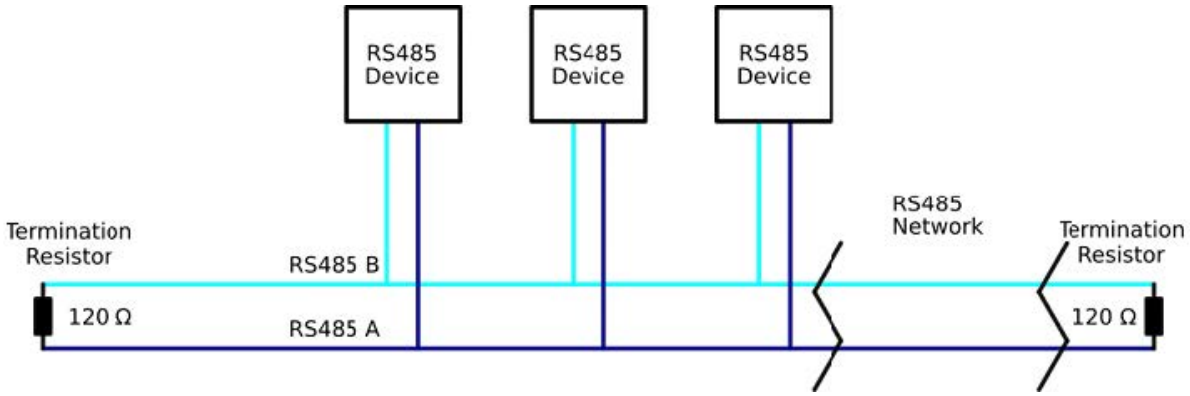


Figure 16: Daisy-Chaining Example (2)



- The pairs must be kept twisted for daisy chaining (follow the picture above).

- The unshielded cable ends at the connector terminals must be minimized.
- The shielding sleeves/cover/foil must be connected to the ground ONLY on the master device side (close to the main power supply).
- Avoid routing the cables near a switching or magnetic device (fluorescent lamps, motors, pumps, motor drivers, fans etc).
- Avoid looping the bus: The bus must start at the master side and end at one of the devices.
- After daisy chaining, all the termination resistors must be removed apart from the master and the very far-end device:



- The termination resistors must be enabled on the LINC Node (via the Commissioning Tool) and the last CCR in the chain.
- Please refer to the respective CCR manuals for the location of termination jumpers.

Required CCR Configuration

LINC Node must be connected to port B of the communication board in case control system is connected to port A.

- **For CRE/VIS CCRs**: "A only" control should be selected after LINC Node installation.
- **For MCR3**: "A control, B, monitoring" should be selected after LINC Node installation.

CRE/VIS software: remote reset should be disabled as follows:

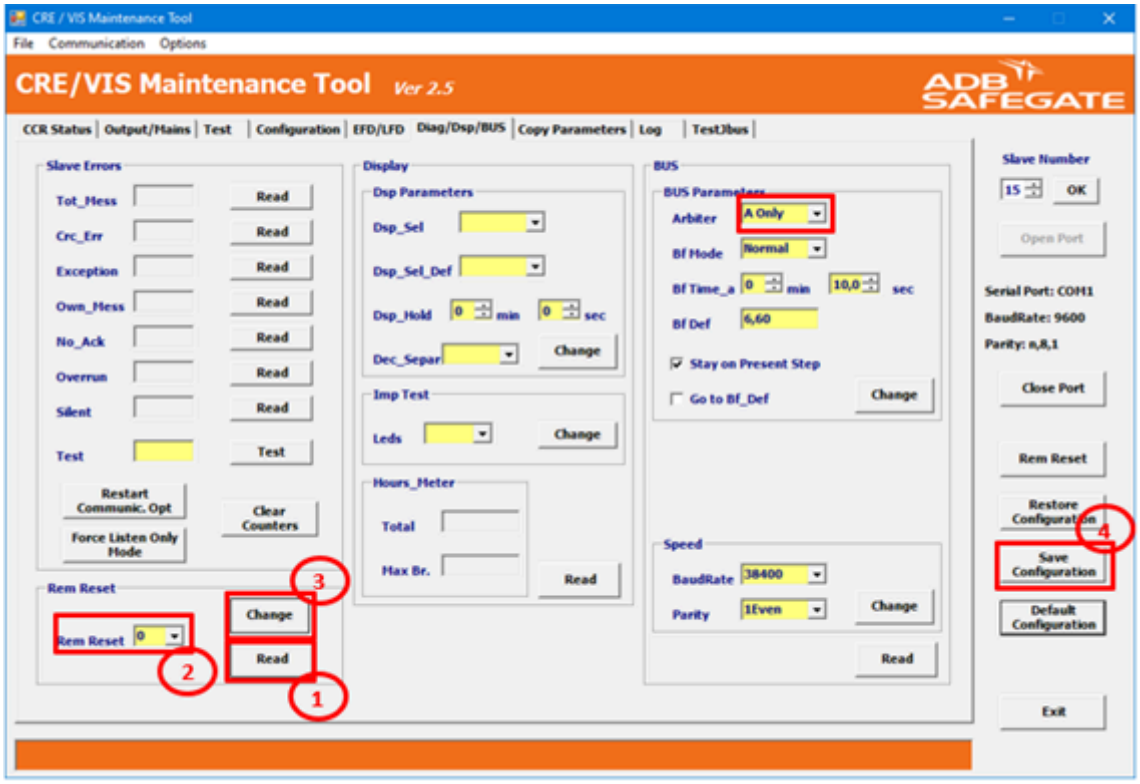
One has to configure the unit using ADB SAFEGATE's WinCCR software to disable remote rest as shown in Figure 17.

1. Run WinCCR, connect to the unit and go to **Diag/Dsp/BUS** page
2. Under **Rem Reset** press **Read** (1) to read the setting.
3. When **Rem Reset** indicates a "1", change it to "0" (2), press **Change** (3) and then **Save Configuration** (4)

Note

Make sure that on HMI, **Multiwire** is selected for the remote control **Menu** — "MAINT" — <password> — "MORE" — "-->" — "..>" — REMOTE CONTROL MODE = Multiwire.

Figure 17: WinCCR Software Screenshot of Bus Configuration Page



Limitations

- The LINC Node Serial device can operate up to sixteen daisy-chained MODBUS RTU CCRs compatible with MCR2 and MCR3 protocols.
- Only non-redundant installations supported today.

3.8.2 PAPI Connect

Here is a list of the needed equipment and tools for installing the LINC Node retrofit Kit on the PAPI:

- Reliance PAPI Light (with old or new control board, current or voltage driven version)
- A complete retrofit kit including the interface card, LINC Node, screws, cables and other accessories.
- Screw drivers (Tox #8 and 20, Philips/Pozidriv)

Figure 18: PAPI Connect Package Content

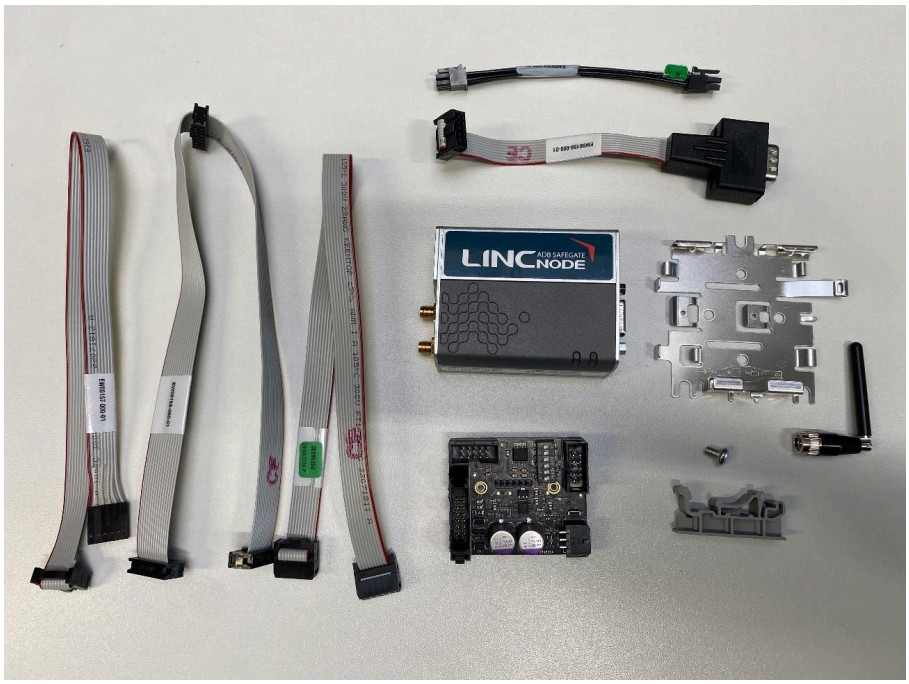
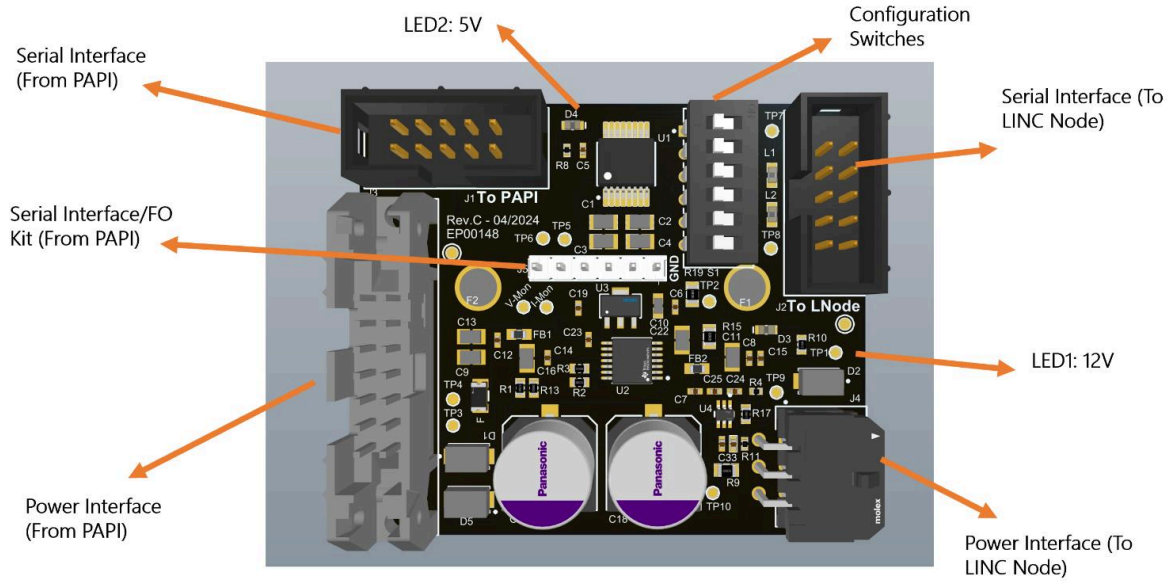


Figure 19: PBCA Map

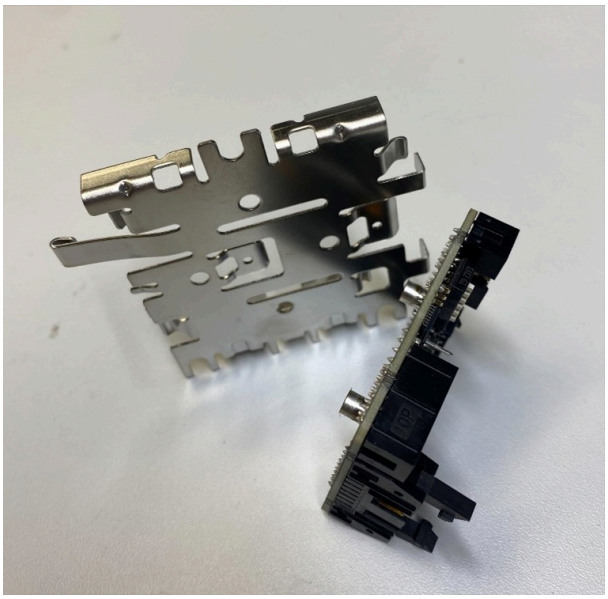


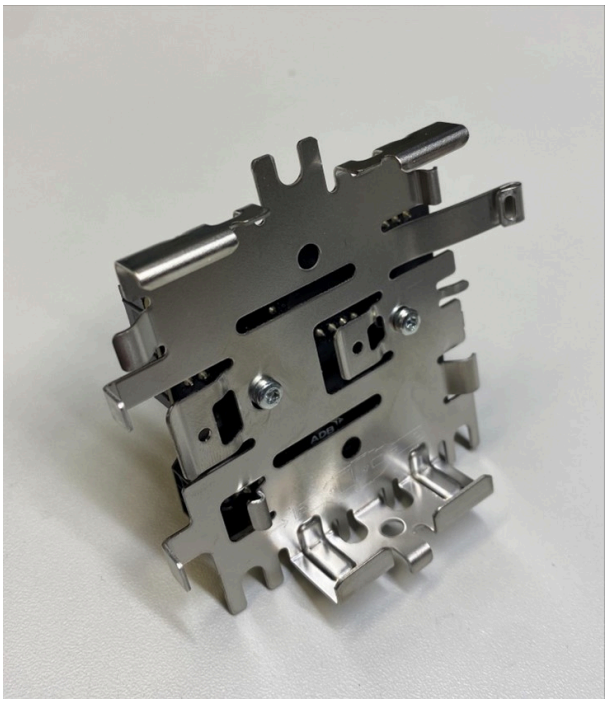
3.8.2.1 Installation

Step 1: Assembling the interface board

The interface card (IoT card) must be assembled on the bracket with 8mm screws (one pair) as shown in Figure 20:

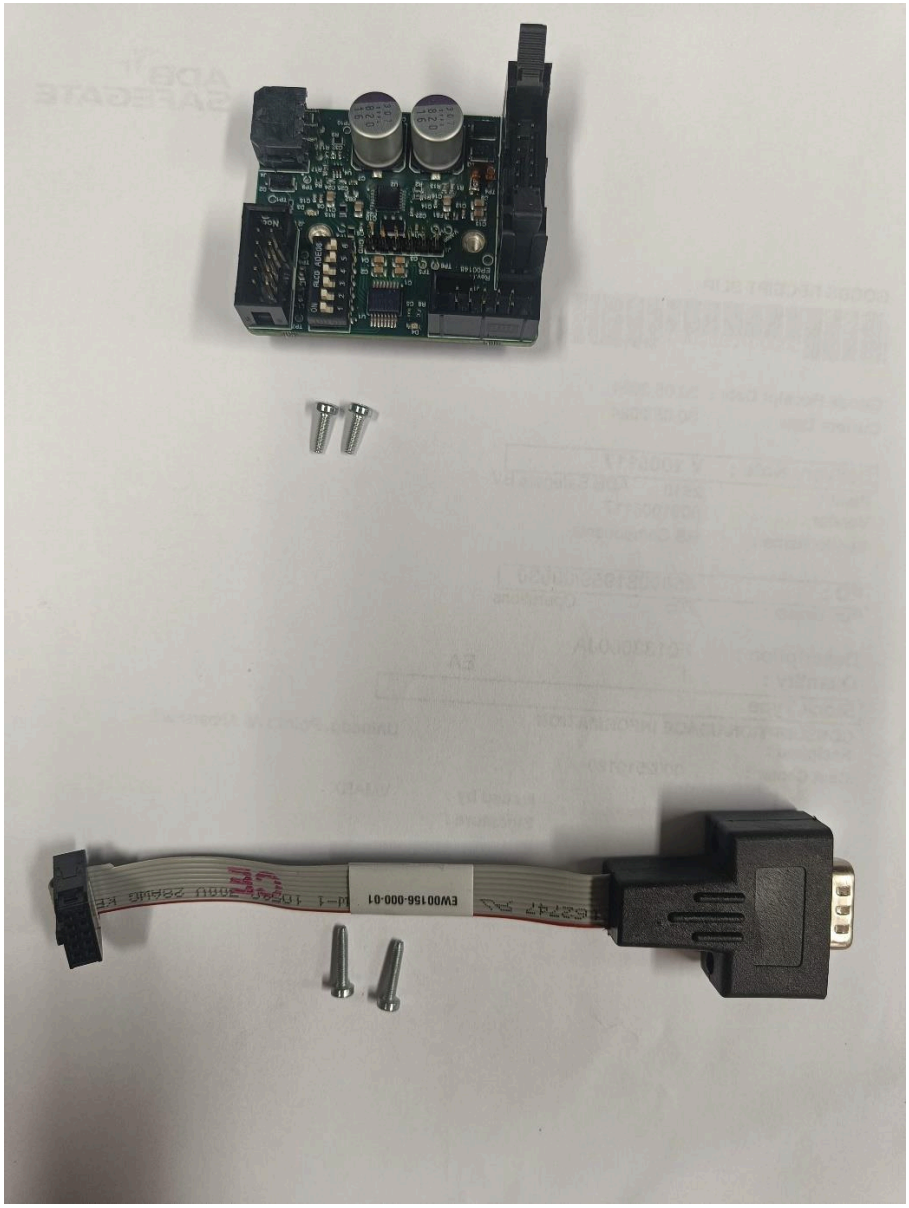
Figure 20: Interface Board Assembly





ATTENTION

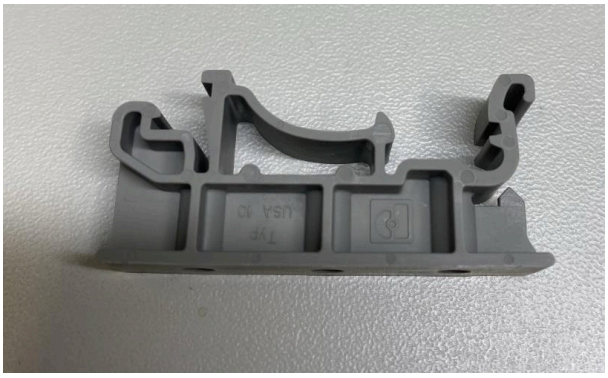
- Consider the orientation and correct placement of the board on the bracket!
- The maximum torque for fastening the M2.5 screws is about 0.8-1 Nm, higher values can break the screw head or loosen the PCB nut.
- Only use 8 mm screws for attaching IOT card to bracket, 12 mm screws are reserved for serial cable.



Step 2: Assembling the rail clip

The rail clip must be assembled on the bracket with the available screw as shown in the picture below

Figure 21: Rail Clip Assembly (1)



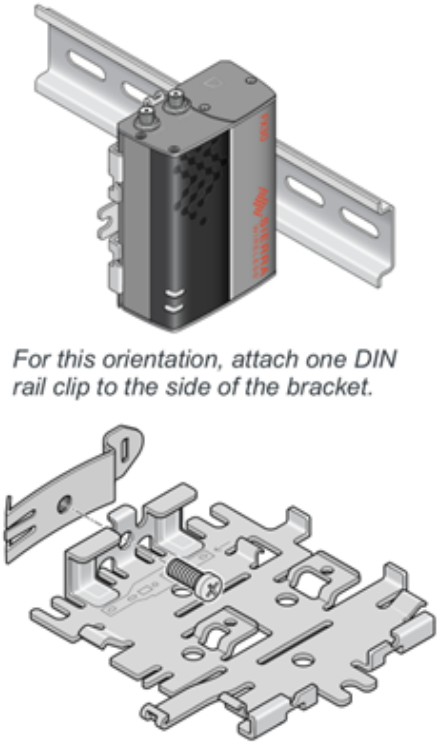
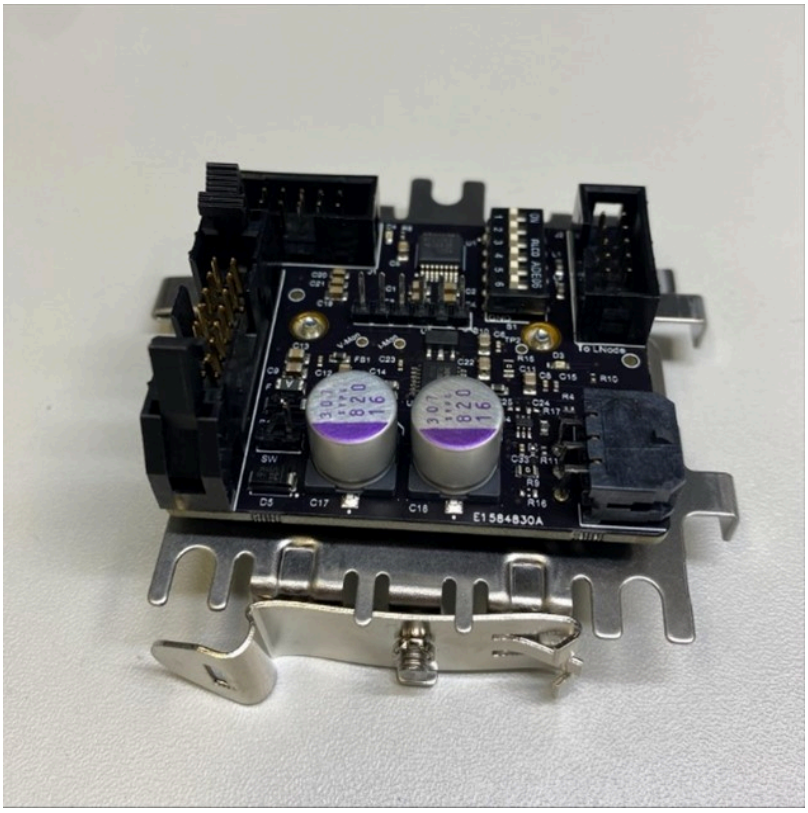


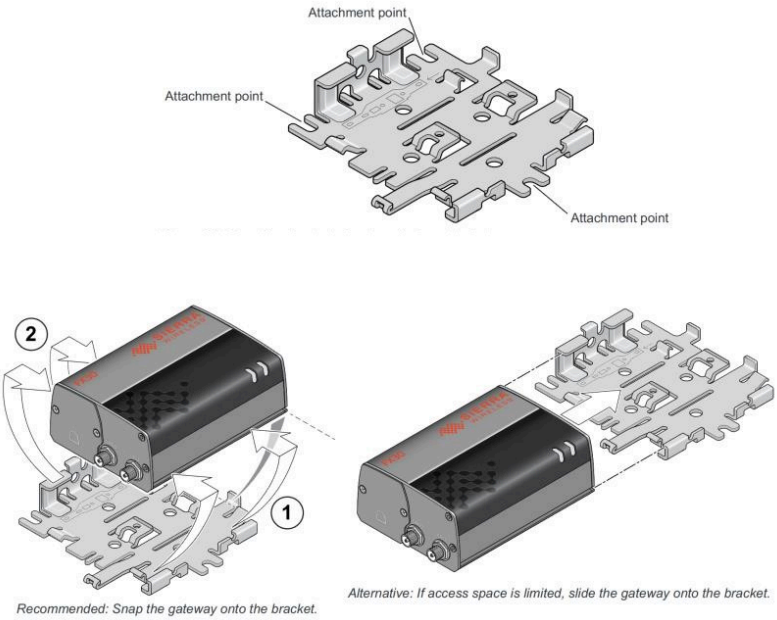
Figure 22: Rail Clip Assembly (2)

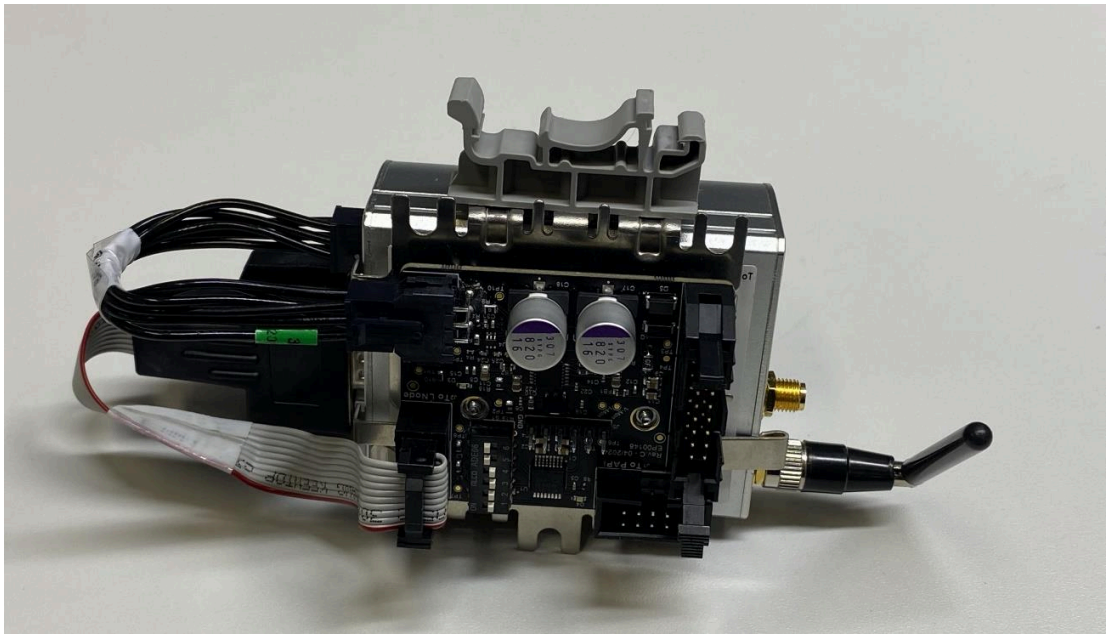


Step 3: Assembling the bracket on the LINC Node

Attach the bracket to the mounting surface, using the attachment points shown below:

Figure 23: Bracket Assembly on the LINC Node





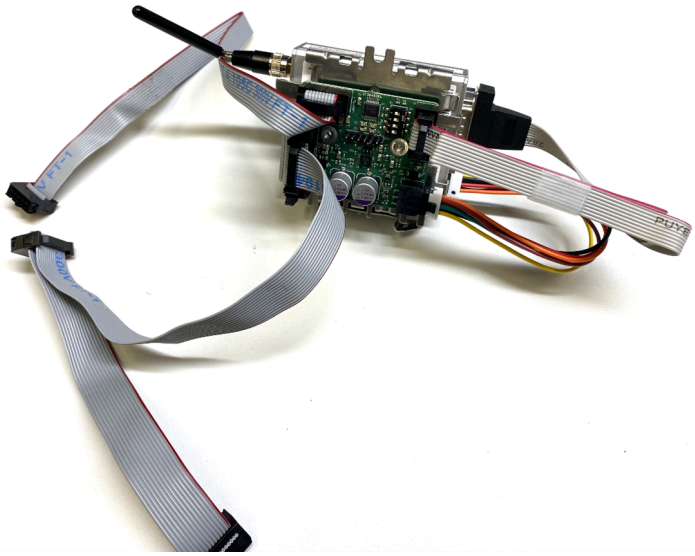
Step 4: Configuring the DIP Switches

To support both PAPI control board versions, the serial interface mode can be selected with a 6-position DIP switch. Check the control board version and configure the switches as shown in the table below:

Switch #	Old Control Board	New Control Board
1	OFF	ON
2	OFF	ON
3	OFF	ON
4	OFF	ON
5	ON	OFF
6	ON	OFF

Note

The other combinations of DIP switch states can lead to an unknown/non-functional interface.

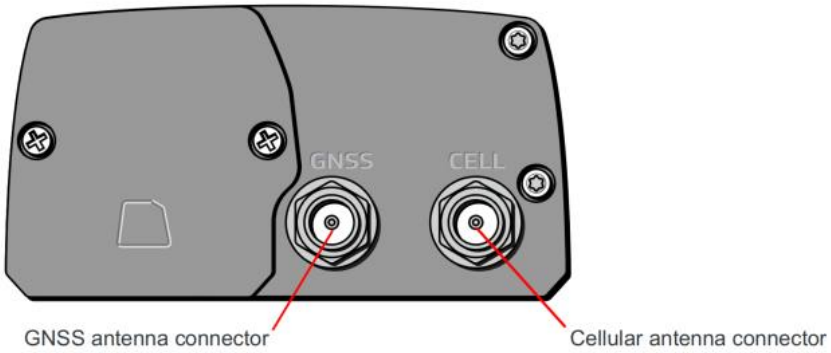


Step 5: Mounting the Antenna

Install the cellular antenna in the correct antenna SMA socket as shown in the picture:

Figure 24: Antenna

Figure 25: Antenna Connector



IMPORTANT

Take extra care when attaching the antennas to the SMA connectors. Finger tight (approximately 0.6–0.8 Nm 5–7 in-lb.) is sufficient and the max torque should not go beyond 1.1 Nm (10 in-lb.).

Step 6: Assembling the Unit on the DIN Rail of PAPI

The installation location of the LINC Node inside the PAPI is shown in the picture below:

Figure 26: RELIANCE PAPI Upper View

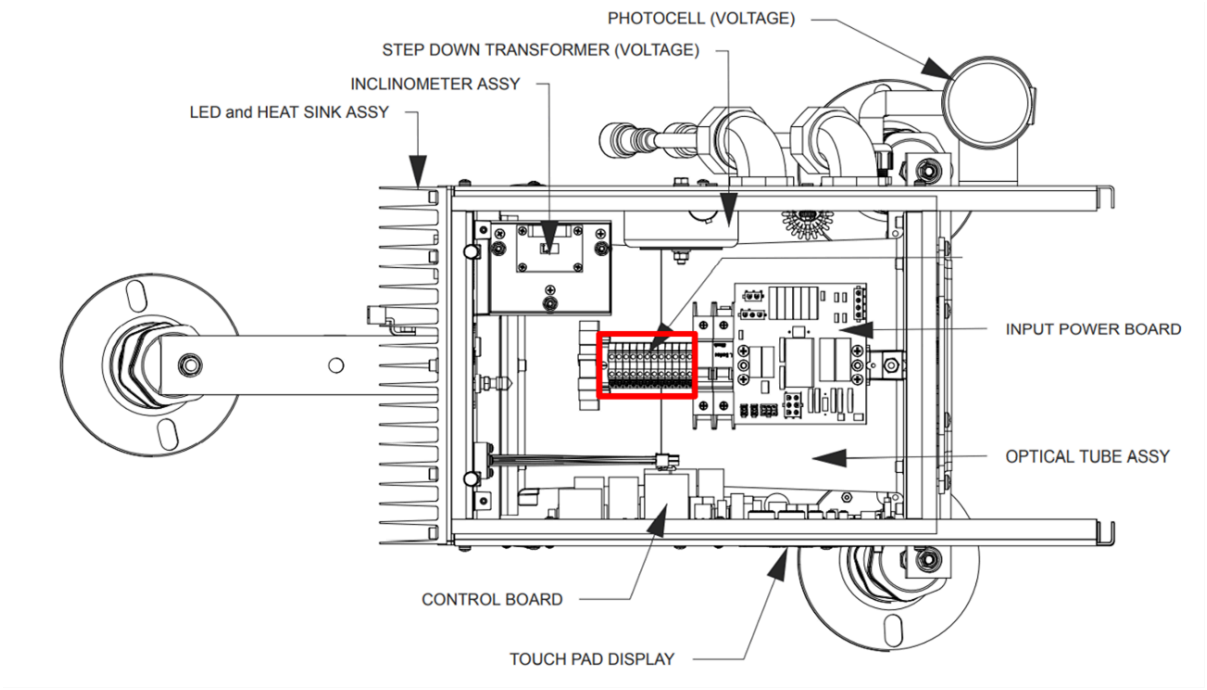
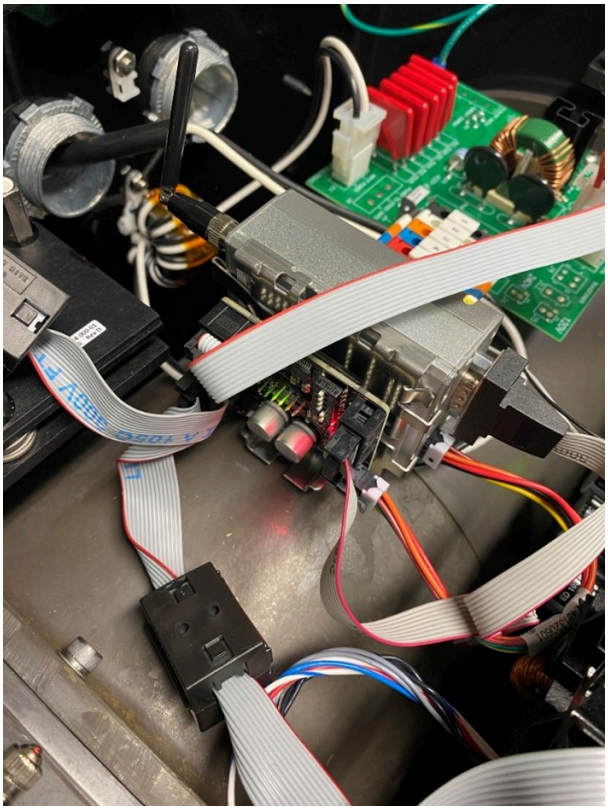


Figure 27: Assembled View



Note

The DIN rail clip can be installed more tightly by pushing it into the lower step of the clip if the LINC Node assembly does not secure tight enough on the DIN rail.

Figure 28: Regular Installation

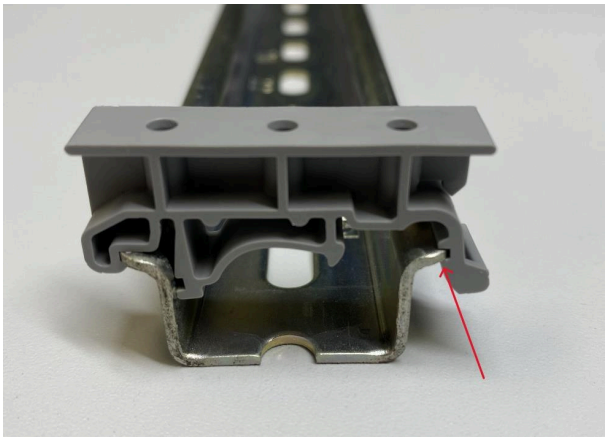
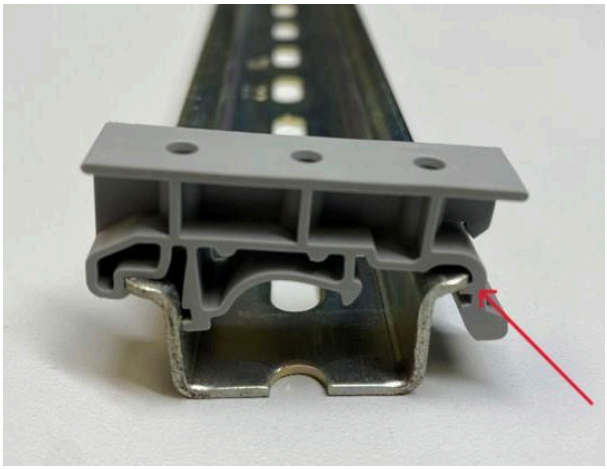


Figure 29: Tight Installation



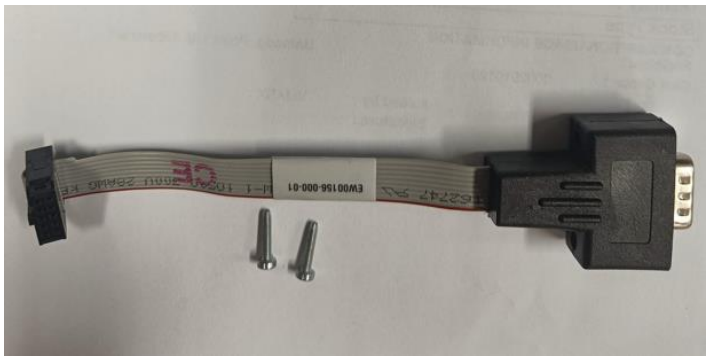
Step 7: Connecting the Cables

There are 4 pieces of the cable to connect to the unit. Before connecting any cables, make sure that the PAPI system is off and discharged or unplugged. The Figure below shows (from left) the serial cables for the new control board (up) and the old control board (down), the LINC Node power cable, the LINC Node serial cable (board to LINC Node) and the IDC power cable (PAPI to board and inclinometer).

Figure 30: Cables Required for PAPI Connect

A) Connect the Serial Interface cable (From board to LINC Node)

Figure 31: Serial Cable Assembly



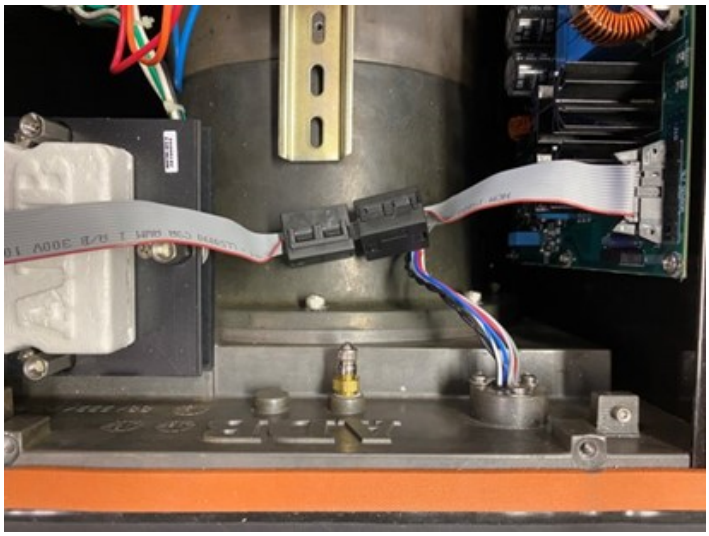
Note
To connect the serial DB9 connector, the existing standoff nuts must be removed.

Attach the DB9 connector with the available 12mm screws to the female connector of the LINC Node.

CAUTION
Double-check the 10-pin black box connector. There are two similar receptacles on board. This cable must be connected to the one with the text: “TO LINC Node”

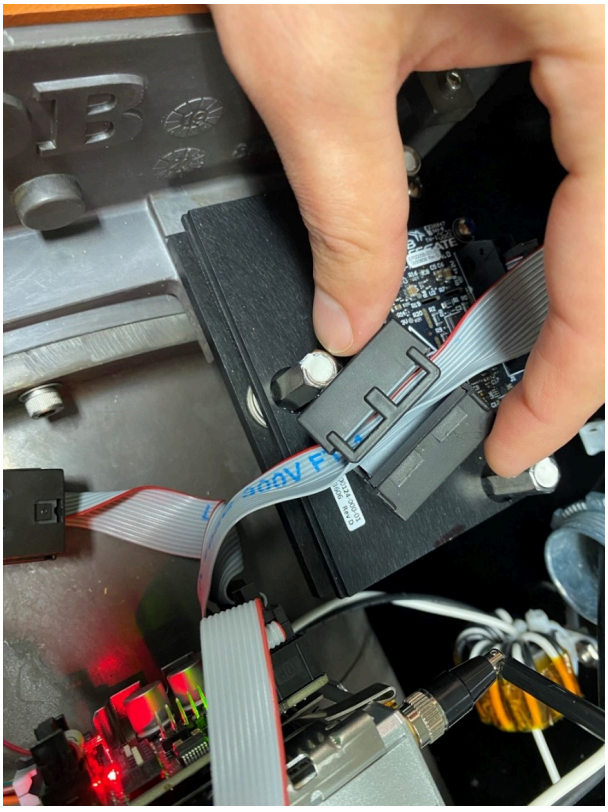
B) Connect the Power IDC cable (From PAPI to the board)

The control board sources the power of the card and eventually LINC Node through the inclinometer IDC cable. Normally, PAPI has an IDC cable between the control board and the inclinometer (small white isolated box. This cable must be replaced with the new cable to enable it to power up the card.



IMPORTANT

The ferrite clamps must be mounted on the new cable after replacing the cables.



C) Connect the Power Cable (To LINC Node)

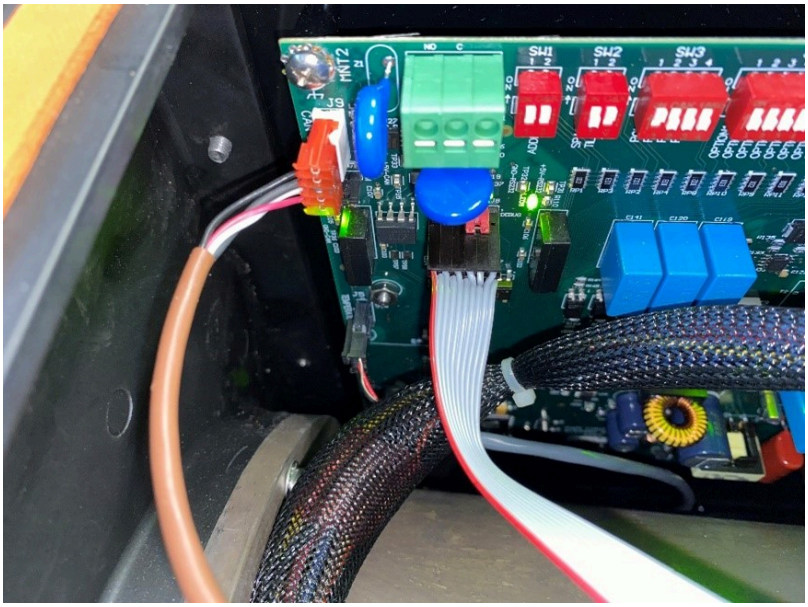
Figure 32: LINC Node Power Cable

Note
If the connector plugged correctly, you should listen or feel the clicking sound of the locking mechanism of the connector.

D) Connect the Serial Cable (From board to PAPI)

Version 1: Only for the new PAPI Control Board (2018)

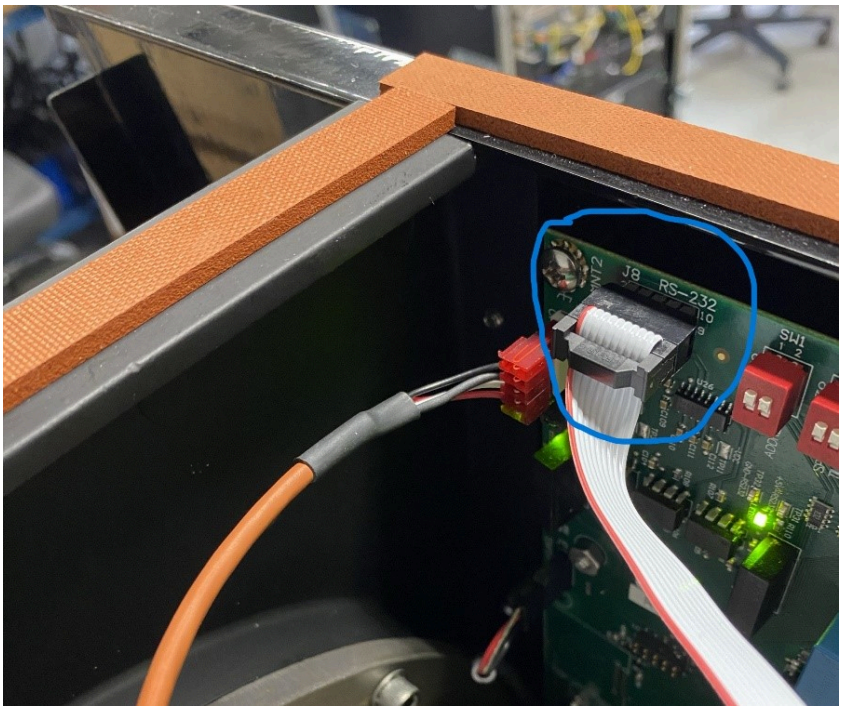
CAUTION
Inserting the single-row header on PAPI control board is prone to mistake! The orientation of the connector (red-wire side) must be as shown in Figure.

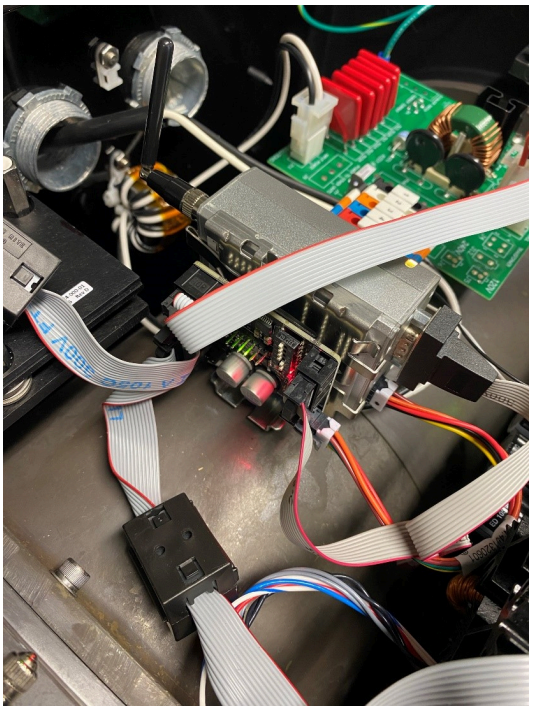


Version 2: Only for the old PAPI Control Board (2014)

CAUTION

The orientation of pin 1 (red-wire side) must be as shown in Figure.



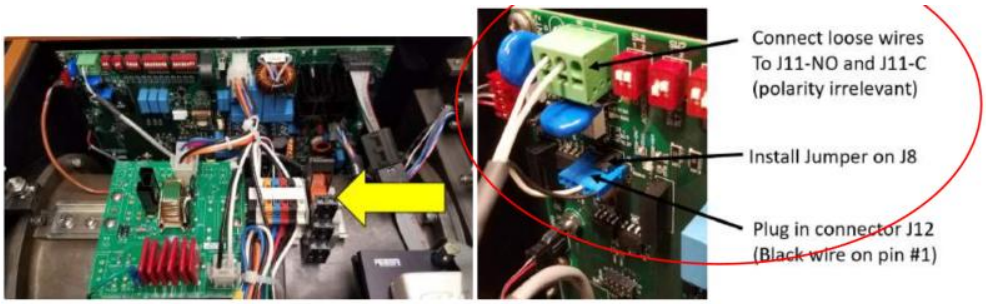


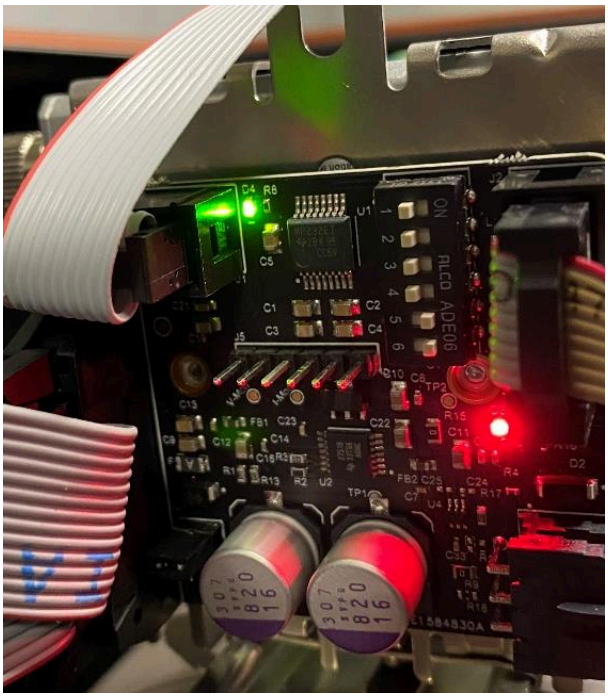
E) Connect the Fail-Open Kit

Note
The optional Fail-Open feature is provided with the light unit when specified (see ordering codes). Available with the Current Powered non-redundant system only. Installed on the primary light unit only.

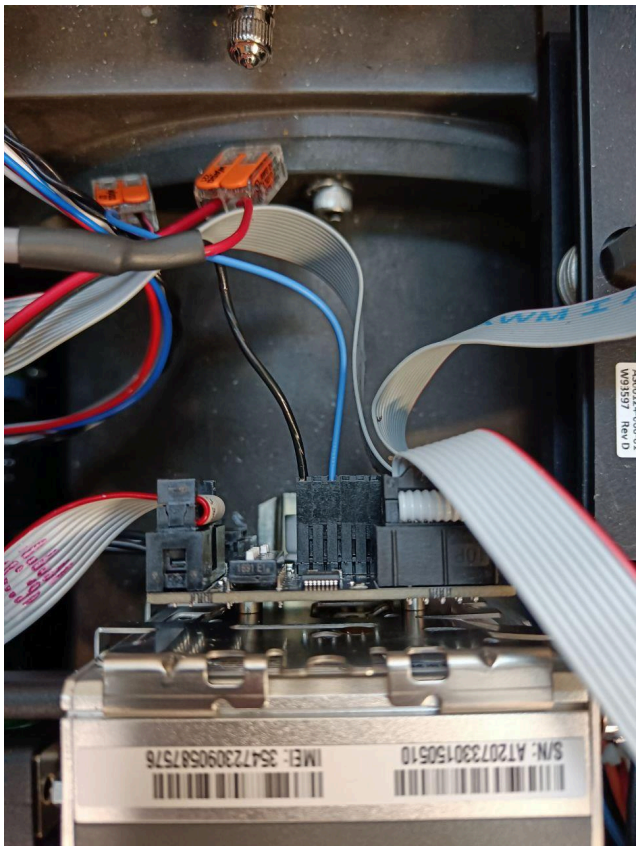
The Fail-Open (FO) kit can be connected to the PAPI in the same way instructed in the Fail-open document, but since the LINC Node serial connector already occupies the J8 connector, the FO kit can be connected to the available pin headers on the interface board:

Figure 33: FO Kit Connection

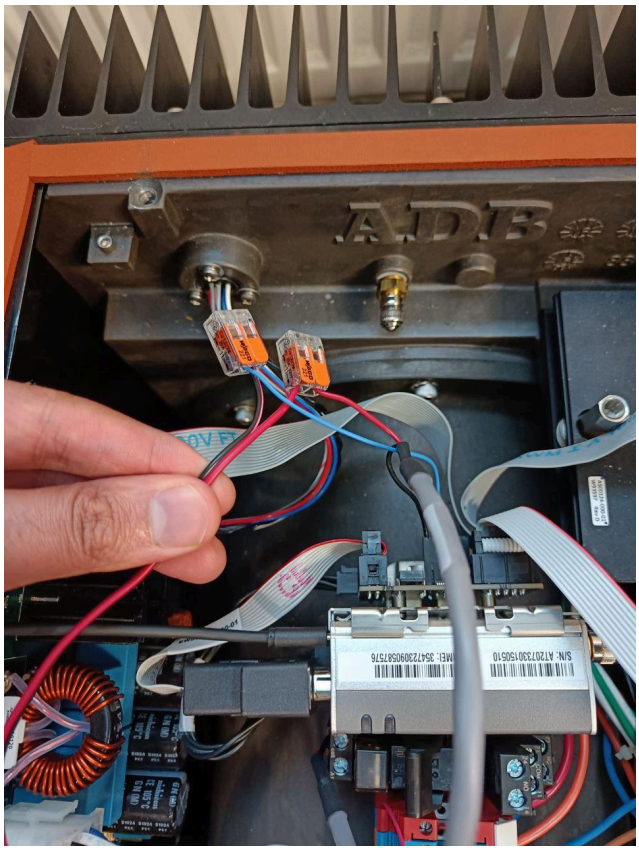


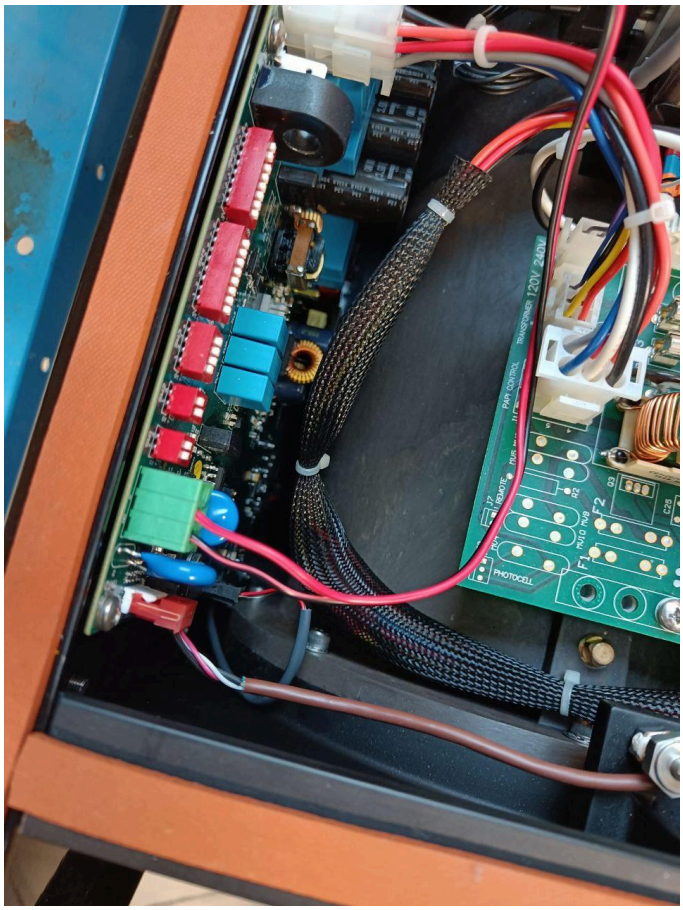


Note
The pin header shown in the figure above has the same pinout as the one on the PAPI control board.



To connect the alarm wires, a pair of about 20cm extension wires and two pieces of Wago wire-wire connector will be needed:

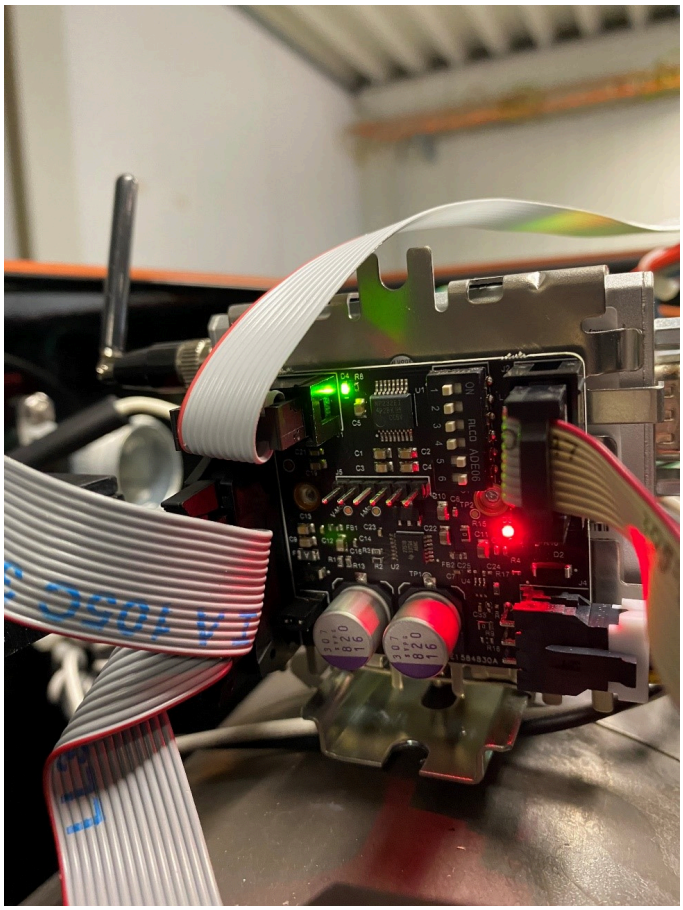




Step 7: Power up the PAPI

After connecting all of the connectors and verifying them, the PAPI can be powered up. After powering up, two visible LEDs on the board will turn on.

Item	Color	Indication
LED1	Red	The board is powered by +12V
LED2	Green	The serial communication power (+5V)



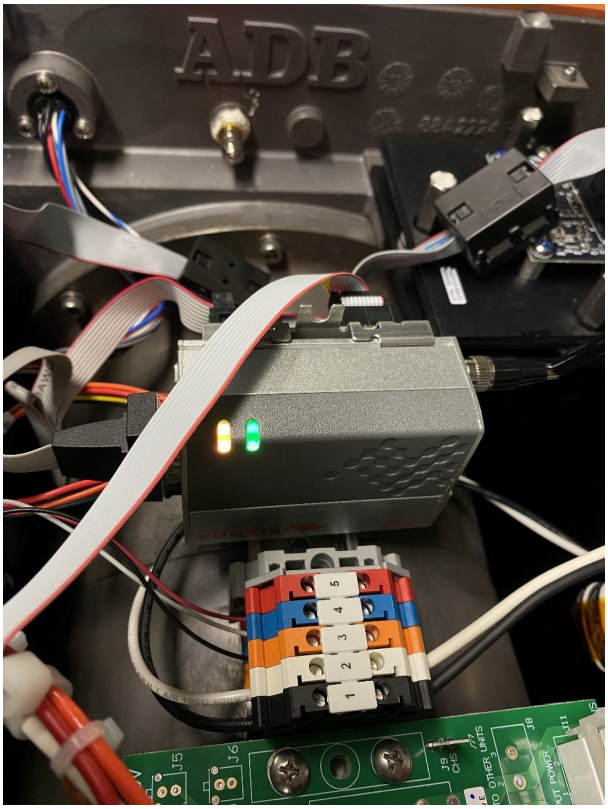
On the LINC Node the ,power LED will go ON immediately and the LED color shows the status of the device:

LED	Color/Pattern	Description
Power (Default Behavior)	Off	No power or input voltage ≥32VDC or ≤4.75VDC
	Solid Red	Gateway is powered on, not attached to cellular network.
	Solid Amber	Attached to cellular network
User	Possible Colors ▪ Red ▪ Green ▪ Amber	User-defined behavior

If the LINC Node attaches to the network, the power LED will be solid amber.

The next step is waiting for the user LED to turn on:

Color	Indication
Red	No valid serial communication with PAPI
Green	Confirms serial communication with PAPI



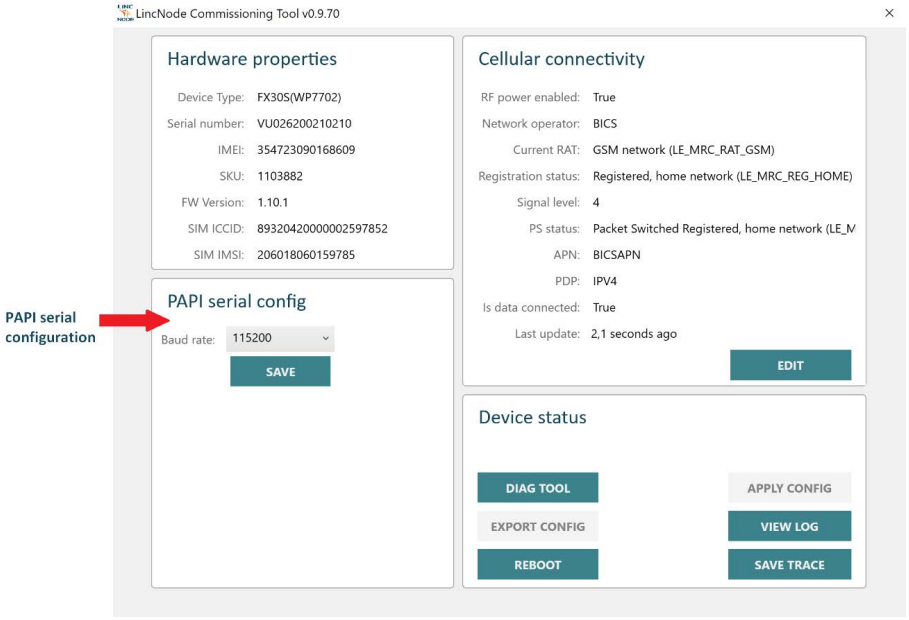
Configuring the Baud Rate of the LINC Node Serial Port

If the LINC Node User LED is GREEN, this process can be skipped. Otherwise, if the User LED remains RED after a few minutes, the following instructions allow configuring the LINC Node baud rate correctly.

Note

For old PAPI control boards (LPL models from 2014) running a firmware anterior to version 1.12.0.2, the baud rate of the LINC Node serial port must be configured to 9600 bps. For PAPI control boards running firmware version 1.12.0.2 or a more recent version, the baud rate must be configured to 115200 bps.

Connect a micro-USB cable to the LINC Node and to the laptop. Open the LINC Node Commissioning Tool and wait for the LINC Node device to be detected. Once the device is ready, the application will display the dashboard showing the device information. The interface to configure the LINC Node baud rate should be displayed in the bottom left corner:



Select the appropriate baud rate depending on the PAPI control board firmware version and click **SAVE**. A message box will be displayed to confirm if the change was applied successfully. After one minute, the User LED of the LINC Node should turn GREEN.

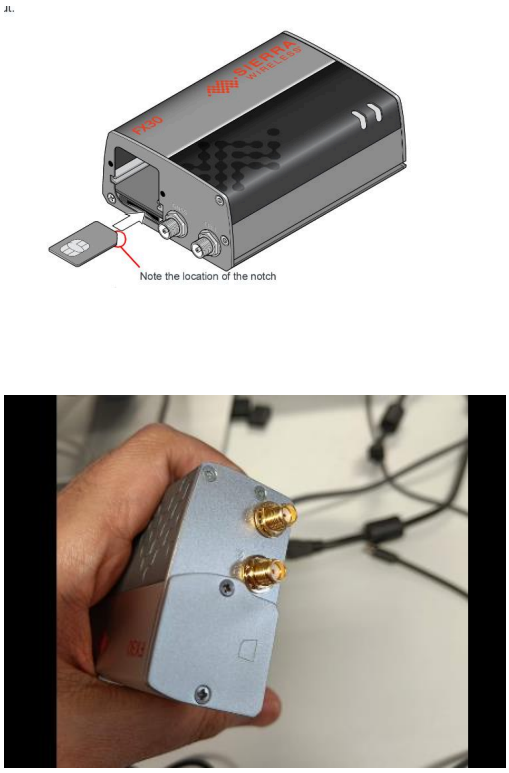
3.9 LINC Node Replacement

In case of hardware damage, where the LINC Node unit is not usable anymore, a new LINC Node kit (Part No: LN00P1) needs to be acquired.

Upon arrival of the new LINC Node kit, the user needs first to switch the SIM card present in the new unit with the SIM card from the previous LINC Node unit, as follows:

1. Use a Phillips screwdriver (#1) to remove the SIM cover for both old and new LINC Node units.
2. Remove the SIM card from the old unit by pushing it inwards then out. Insert this SIM card in the new unit (scrap the SIM card already present in the new unit from factory) and push it until it clicks.
3. Put the cover back and fasten both screws.

Figure 34: LINC Node Replacement



After switching SIM cards, the new unit needs to be installed and commissioned as described in the LINC Node Commissioning section.

After commissioning the new LINC Node, users need to follow the "Setting UNIT ID" process, as described in the Commissioning manual.

Note
Make sure you share the IMEI of new unit with the CORTEX Service team to activate the CORTEX Service/cloud connection.

Note
In case the old SIM card is broken/not usable, users can keep the SIM card present in new LINC Node unit and request a new CORTEX Service LINC Node connection via a JIRA ticket.

4.0 Commissioning Tool and Process

This section provides information on the LINC Node Commissioning Tool operating instructions. It s applicable to LINC Node devices that have been successfully provisioned and are ready to be used in a real installation.

WARNING

Maintenance and service personnel performing these operations should have knowledge of LINC Node device properties and functionality, and should be able to perform Modbus RS-485 or Ethernet installations and configuring of slaves/CCRs (for connected CCRs) and serial configuration (for connected LED PAPI).

The Commissioning Tool application offers a convenient environment for the following commissioning activities:

- Monitoring device cellular network and data connectivity status
- Configuration of the application mode: PAPI or CCR
- Configuration of the Modbus interface
- Configuration of the Modbus assets (CCRs)
- Configuration of the serial port for connection to PAPI

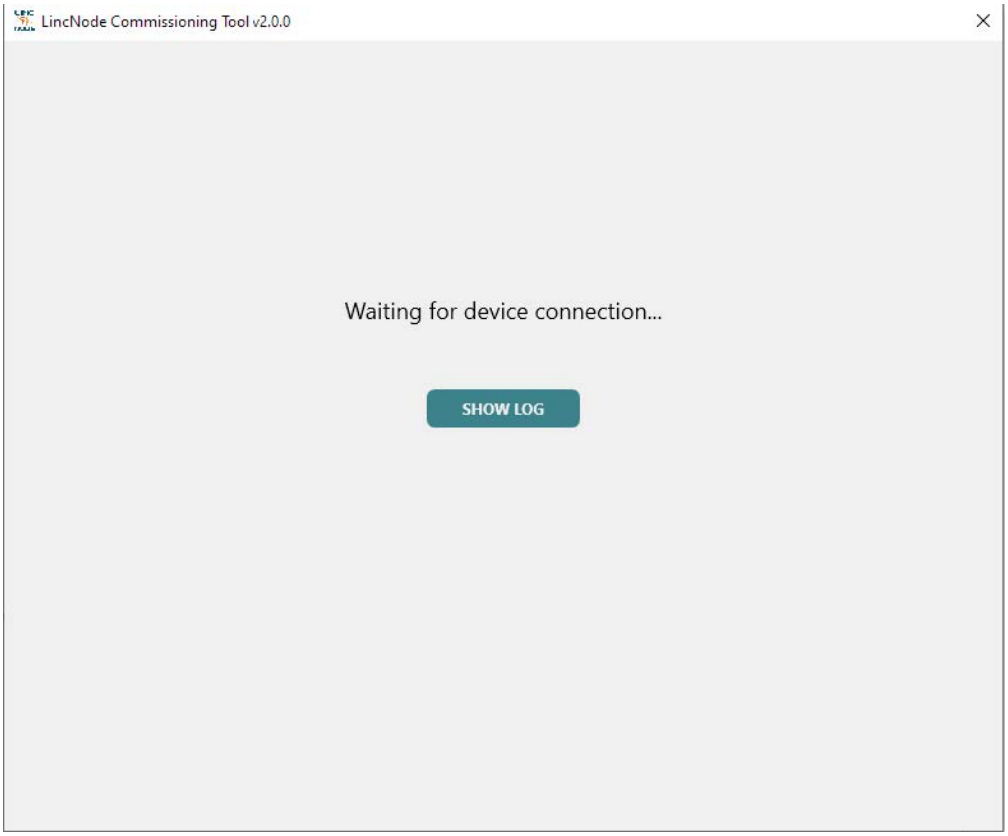
4.1 Commissioning Tool Operation

Login and Automatic Device Identification

Make sure the device is powered on and it is connected to your computer using a suitable micro-USB cable (for reference, a Mouser cable).

Start the application by executing "LnCommTool.exe". The program verifies all necessary files are present and the application window appears. The "Waiting for device connection" message will appear first. This process may last 1-1.5 minutes from the moment a powered-on LINC Node device is connected to a PC. The "Show log" button allows viewing the application log messages that provide more details on ongoing operations.

Figure 35: Application Window Main Screen - Waiting for Device Connection



When the application successfully detects the device, the dashboard screen appears.

Configuring and Monitoring the Device with the Dashboard

The dashboard screen ([Fig 1.x] consists of the following sections:

- **Hardware properties** displays key device properties, such as serial number and IMEI, among others
- **Cellular connectivity** shows device cellular network and data connectivity status
- **Modbus assets** shows the number of Modbus assets (CCRs) configured
- **Modbus interface settings** section allows to configure IO properties of the physical interface that is used to operate Modbus protocol. This section is different depending on the type of Modbus interface Lincnode device supports (Serial or Ethernet). Serial- and Ethernet-device dashboards are illustrated in Figure 2 and Figure 3 respectively.
- **Modify** button opens CCRs configuration page.
- **Application mode** shows the current operating mode. Mode can be changed here.
- **Device status** section only has indication whether devices settings changed and new configuration needs to be applied (button "Apply config"). It also allows to view the application log messages (button "View log").

Figure 36: Serial Device Dashboard View

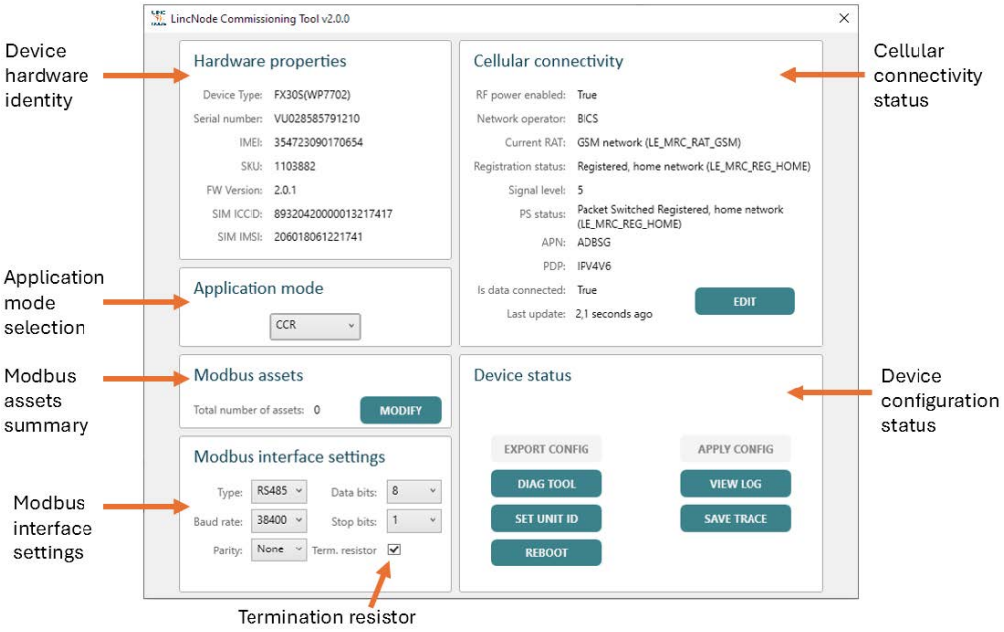
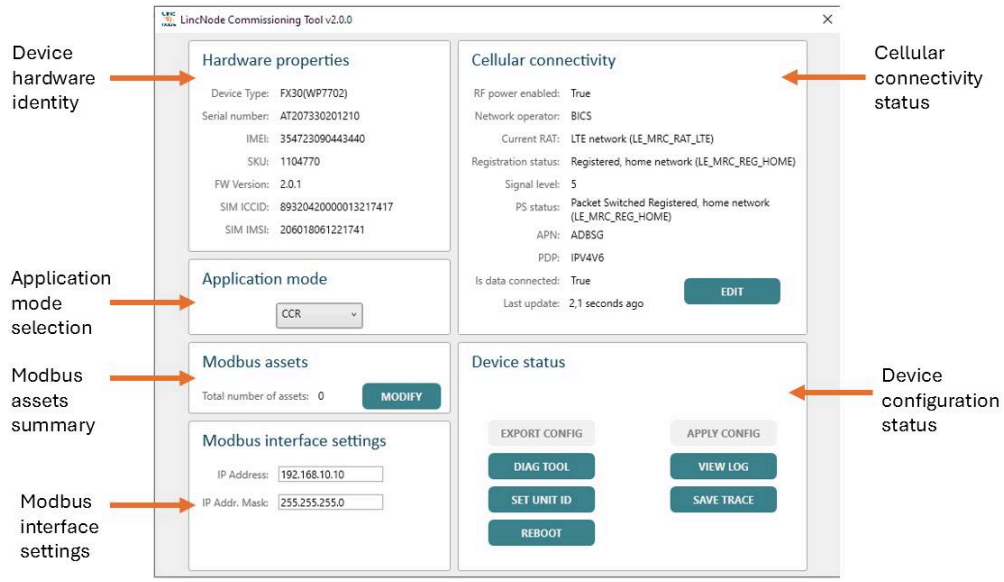


Figure 37: Ethernet Device Dashboard View



Verifying Device Cellular Network Registration

Prior to configuring Modbus interface and assets, it must be ensured that the device has been registered on the cellular network and the data connectivity is enabled. All the required information can be viewed at the **Cellular Connectivity** section, in the following parameters:

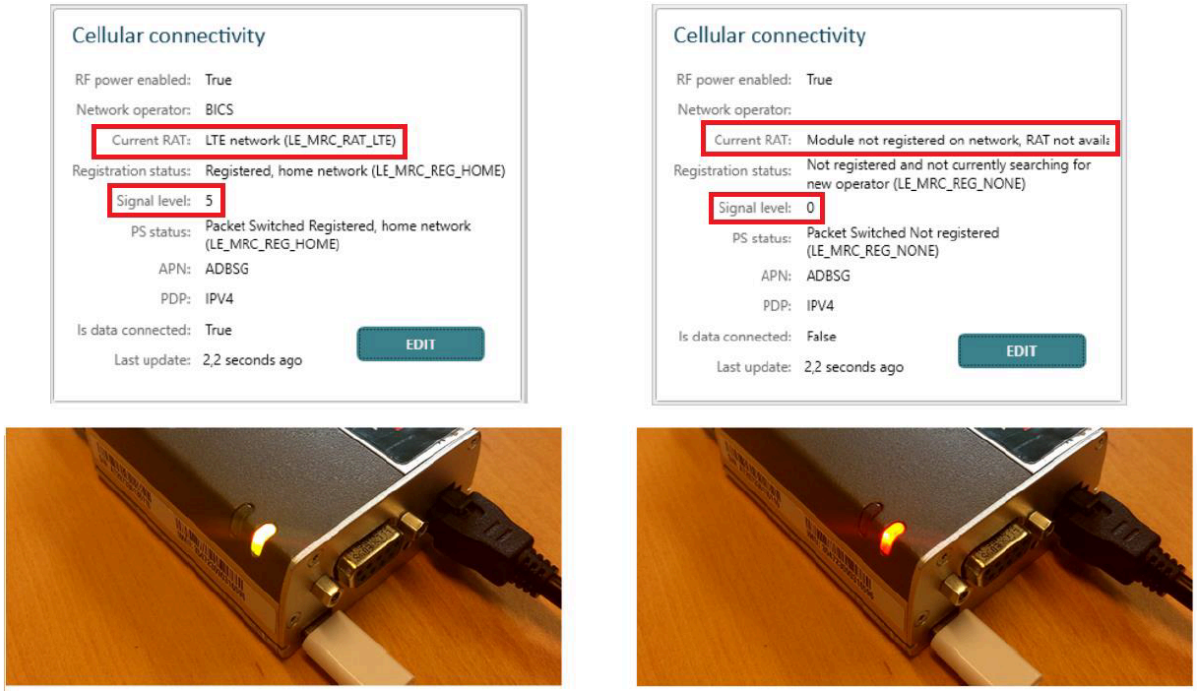
Table 8: Cellular Connectivity Status Essential Parameters

Parameter	Expected Value	Error
Current RAT	A message indicating either LTE or GSM network presence	"Not registered" message
Signal level	Any value above zero	0
Is data connected	True	False

An alternative way to observe cellular network status is the color of the Status LED on the LINC Node unit:

- **Amber LED**: Device is registered on the network.
- **Red LED**: There is a problem. Figure 4 shows how parameters in the Cellular connectivity section correspond to the color of Status LED.

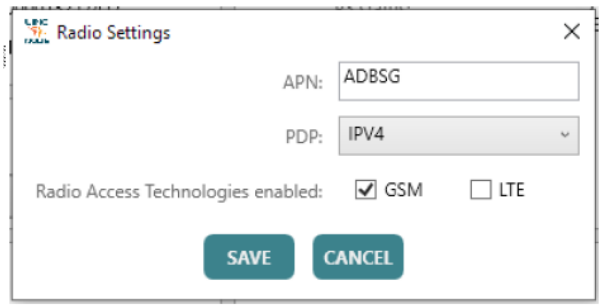
Figure 38: Cellular Network Status and Status LED (Left Amber, Right Red)



Modifying Radio Settings (Not Required by Default)

The tool also allows changing radio settings, such as APN, PDP type and Radio Access Technologies. If a change in one of those settings is required, click "Edit" at te Cellular Connectivity section. opens a configuration window displaying the current settings:

Figure 39: Radio Settings Window



4.2 LINC Node for CCR

Prepare all the materials and setups required for the process according to the installation documents RD3 and RD4:

- Windows 10 compatible PC or laptop connected to Internet with Sierra-Wireless WP7702 driver installed.
- Provisioned LINC Node device assembly with power supply and circuit breaker.
- Installation of properly configured CCRs with Modbus interface connection established.
- Micro-USB cable.

Commissioning Process

The following steps are required for successful commissioning of the LINC Node device:

1. Power up LINC Node device and run the Commissioning Tool application.
2. Verify that the LINC Node device is identified from the dashboard of the Commissioning Tool.
3. Verify that the LINC Node device is registered on the cellular network.
4. Configure Modbus interface settings.
5. Configure the list of CCRs.
6. Apply the configuration.
7. Write down the configuration and provide it to the CORTEX Service team. (Alternatively, click **EXPORT CONFIG** on the **Device Status** pane. Save it as an CSV and provide this file in a JIRA ticket).

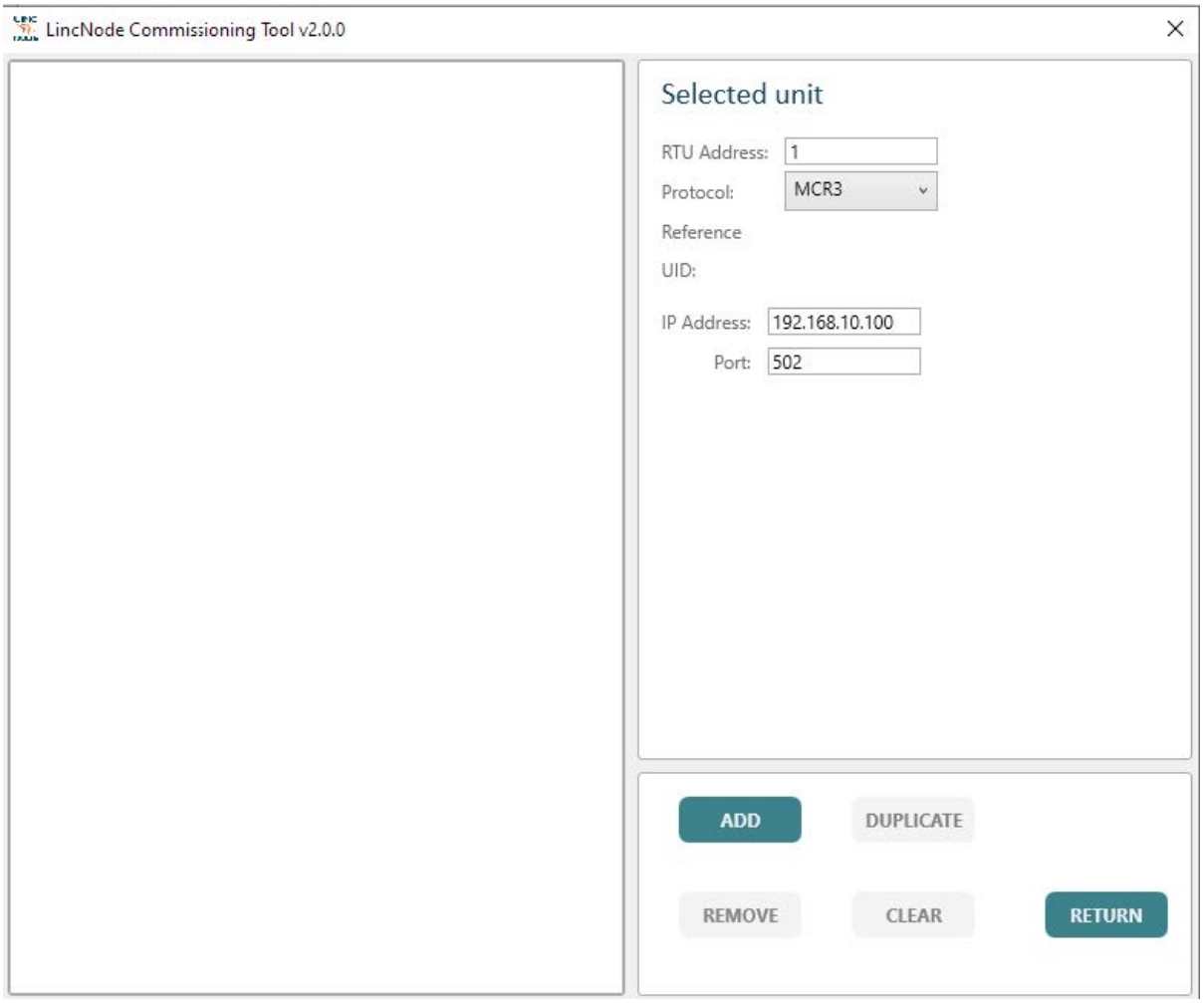
Configuring Modbus Interface and the CCRs

If the cellular network registration of the LINC Node was successful, the commissioning process can continue by (1) configuring the Modbus interface and (2) adding the connected assets (CCRs).

1. In the **Modbus Interface Setting**s section enter the correct parameters:
    - For an Ethernet device: enter LINC Node unit IP address and mask (CIDR format)
    - For a Serial device: enter serial interface configuration (baud rate, data bits, stop bits, parity) and enable the termination resistor checkbox
2. Click "Modify" on the **Modbus assets** section. The application window will show the CCRs configuration page [xref).

The following figure shows a blank configuration page for the Ethernet version of the LINC Node device. In case of a Serial device, IP address and Port settings will not be shown.

Figure 40: Assets Configuration Screen without Configured Units



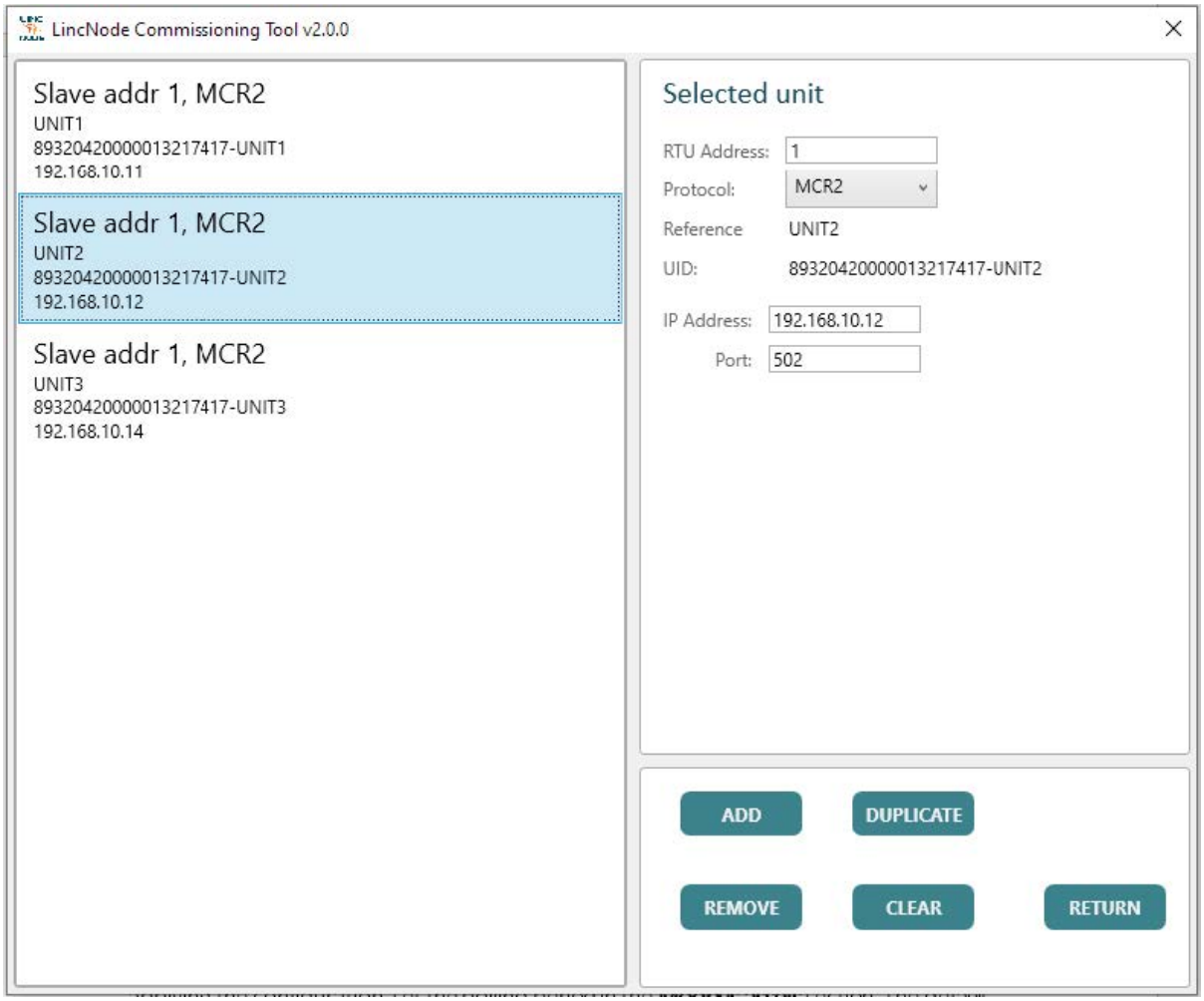
Enter the RTU address, select the protocol (MCR2 or MCR3), IP address and TCP port (in case of Ethernet device) of the CCR unit you wish to add and click **Add**. The unit should appear in the list.

This page allows adding, duplicating and deleting units (Figure 7). Individual unit parameters can be modified by selecting a single unit and directly editing its settings.

Note
All listed units should operate using a single protocol.

After configuring all units, click **Return** to return to the dashboard screen.

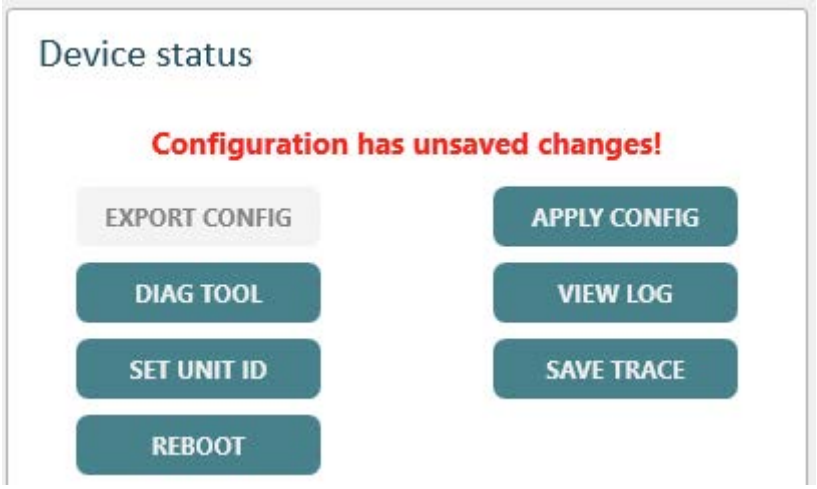
Figure 41: Assets Configuration Screen with Several Configured Units



Finalizing the Configuration

Upon return to the dashboard screen after configuring units, the **APPLY CONFIG** option is enabled and the message "Configuration has unsaved changes" is displayed (Figure 8). After changes are saved, click **APPLY CONFIG**. After the configuration is applied, the application will notify the user with a message box.

Figure 42: Device Status Indicating Presence of Unsaved Configuration



Providing the Configuration Details to the CORTEX Service Team via JIRA Ticket

When the commissioning process has been completed, write down the following:

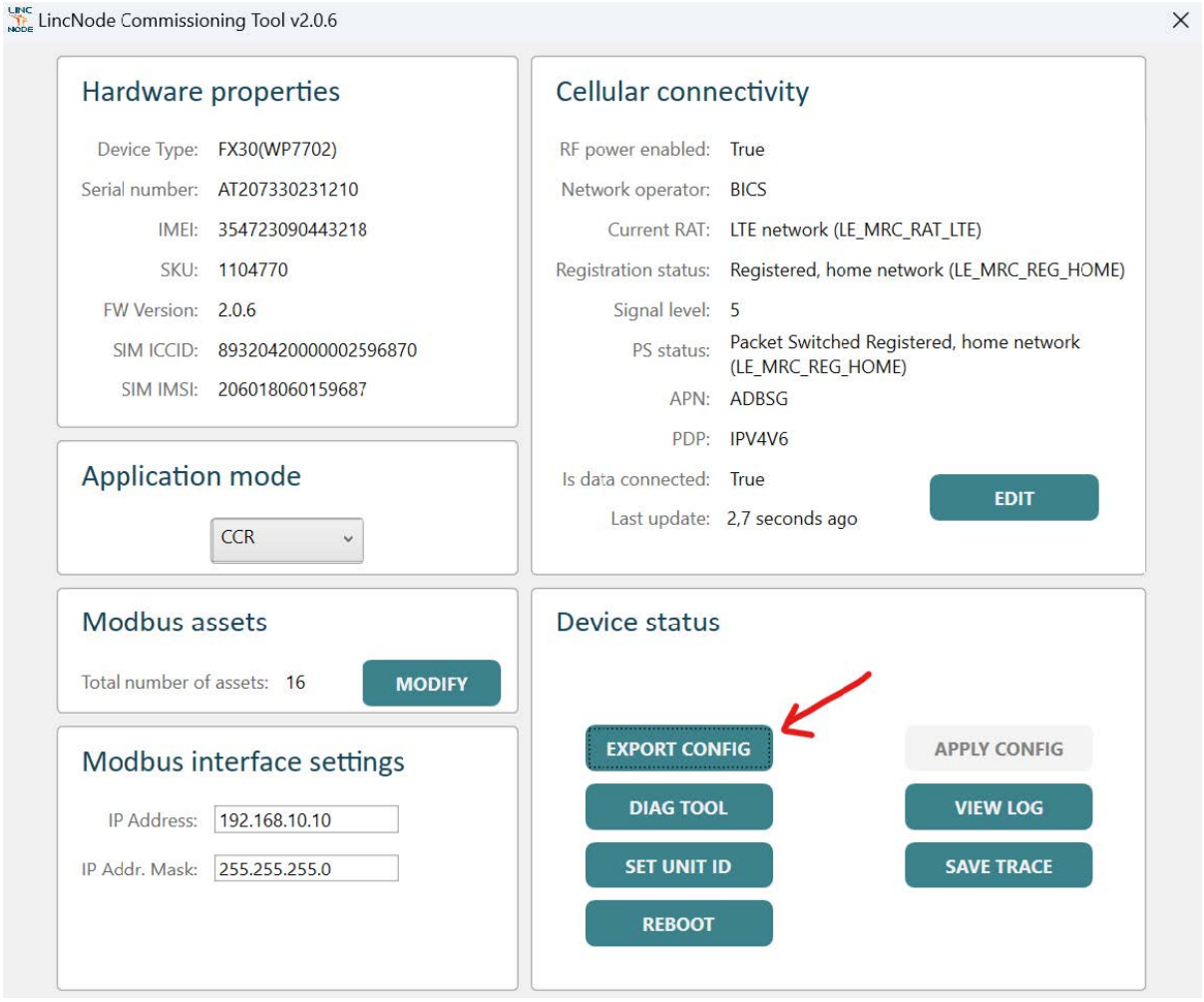
- **List of CCRs** — names, RTU addresses (and IP addresses in case of Ethernet), protocol
- **Location** of the unit or **substation coordinates**
- **Serial port configuration** — baud rate, parity, number of data and stop bits.

Alternatively, go to **Device Status** pane and click **EXPORT CONFIG.** Save the file and provide it in the JIRA ticket.

Note

The JIRA ticket can be opened from this URL.

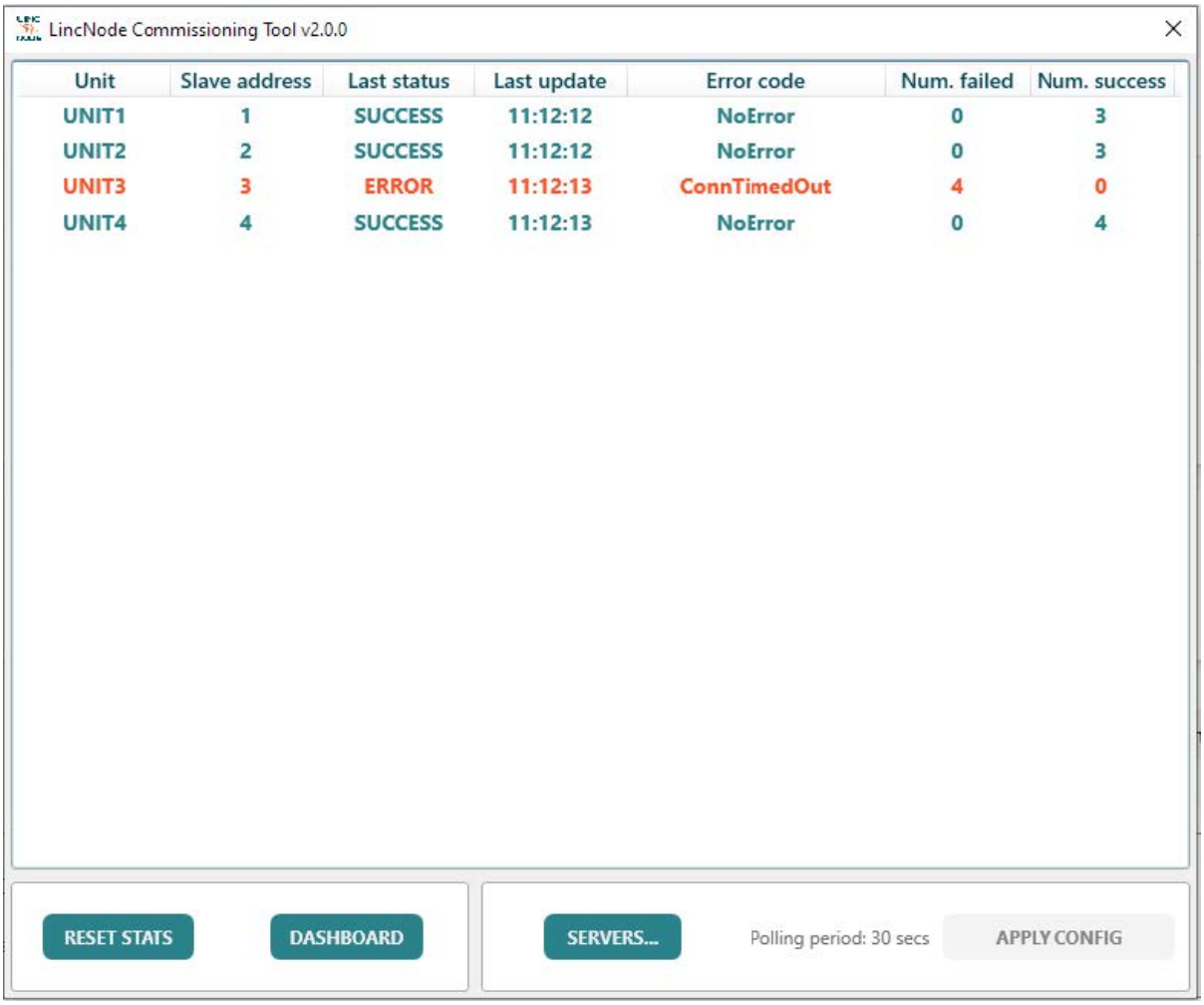
Figure 43: Export Config Option



Diagnostics Interface

The commissioning tool offers a diagnostics interface to check assets configuration. Click **DIAG TOOL** to open this interface:

Figure 44: Diagnostics Interface for CCR



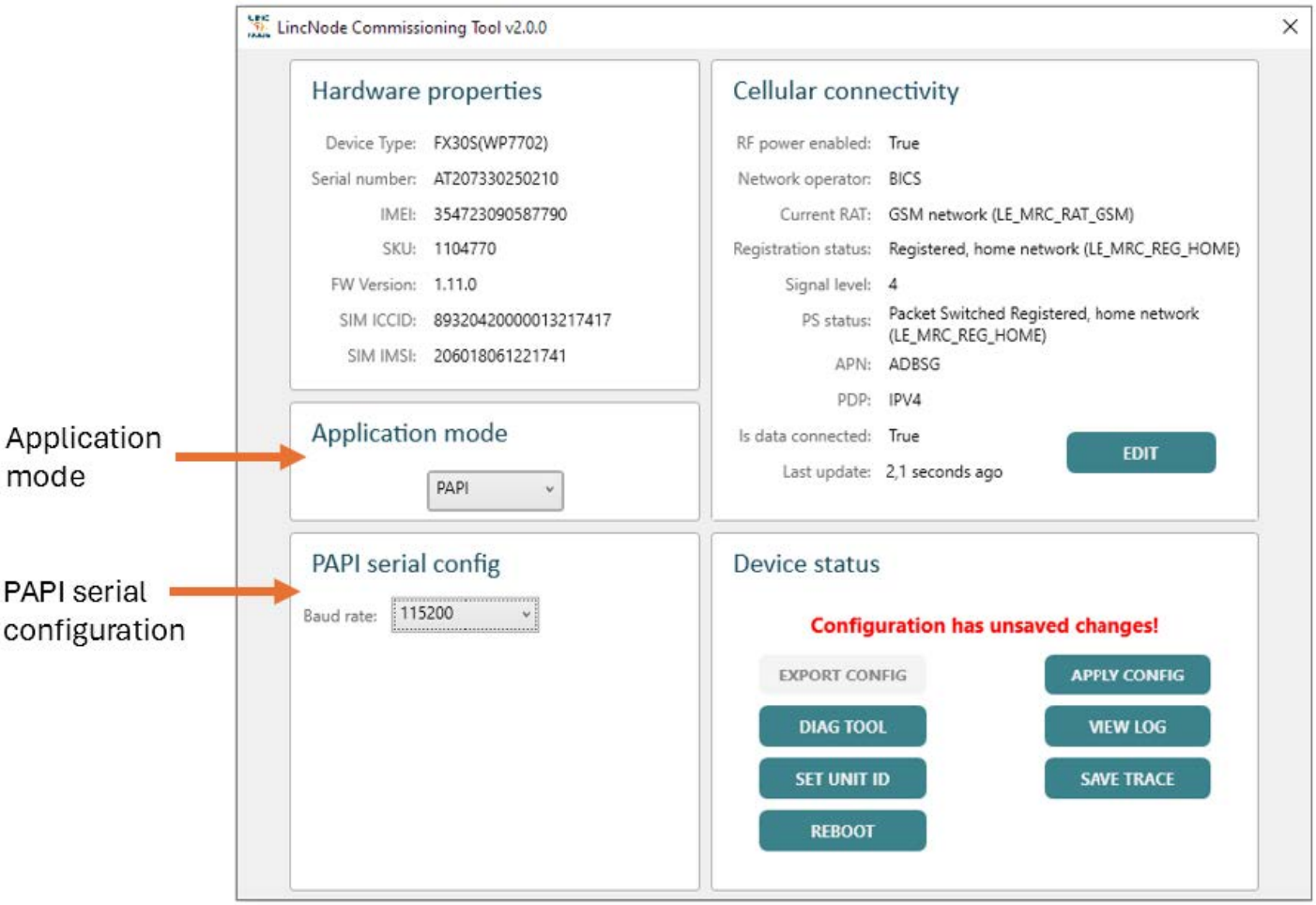
The interface shows all the configured CCRs and their respective status. Clicking **SERVERS** opens the CCR configuration page and allows modifying settings as needed.

4.3 LINC Node for PAPI

Configuring Baud Rate for PAPI

When the LINC Node device operates in PAPI mode, the **Application mode** section displays "PAPI" and there is a **PAPI serial config** section below that allows configuring the baud rate of the serial port.

Figure 45: Commissioning Tool Dashboard for PAPI



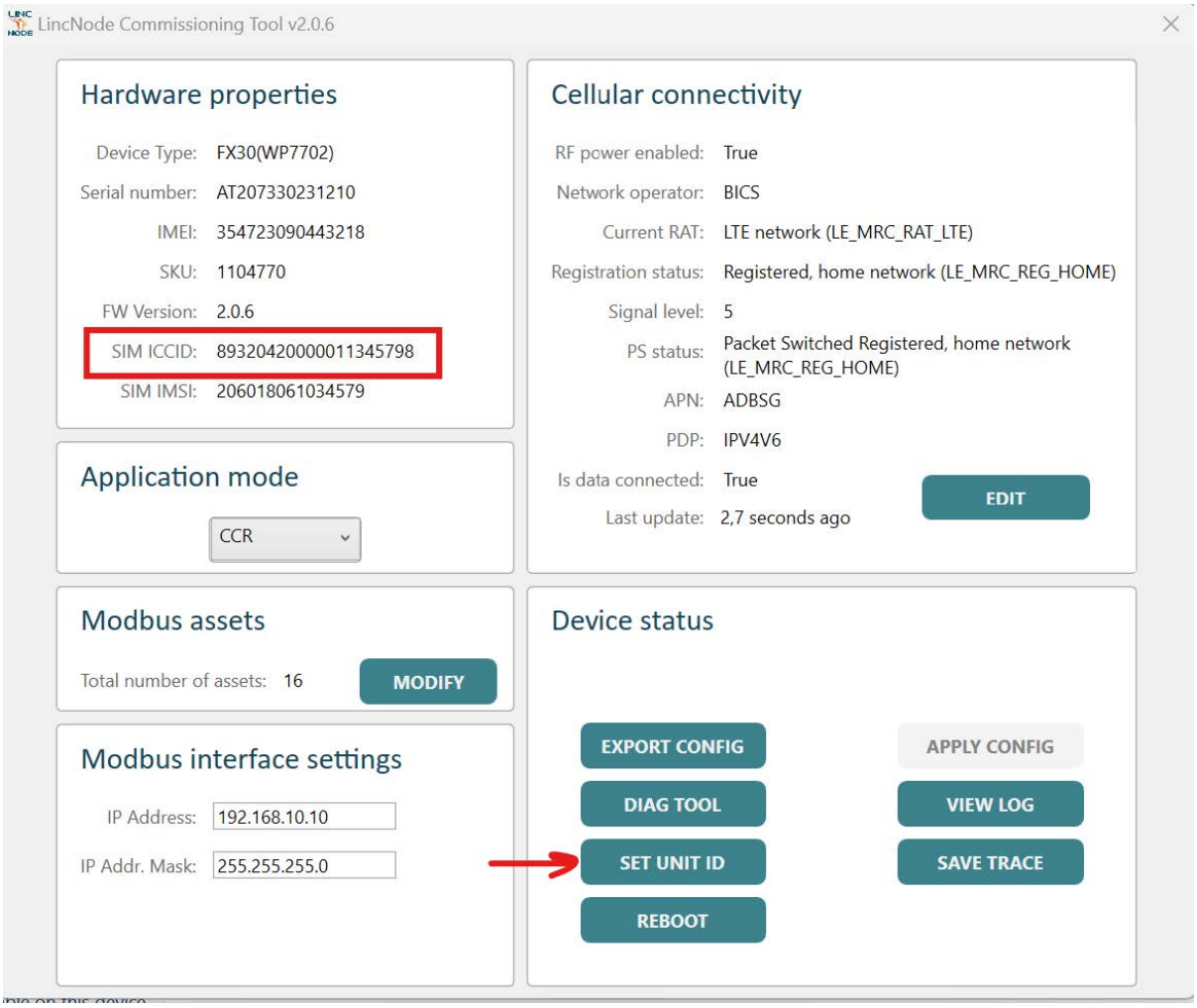
Select the appropriate baud rate depending on the PAPI control board (9600 bps or 115200 bps) and click **APPLY CONFIG** button to save the configuration to the device. A message box will be displayed to confirm whether the change was applied successfully.

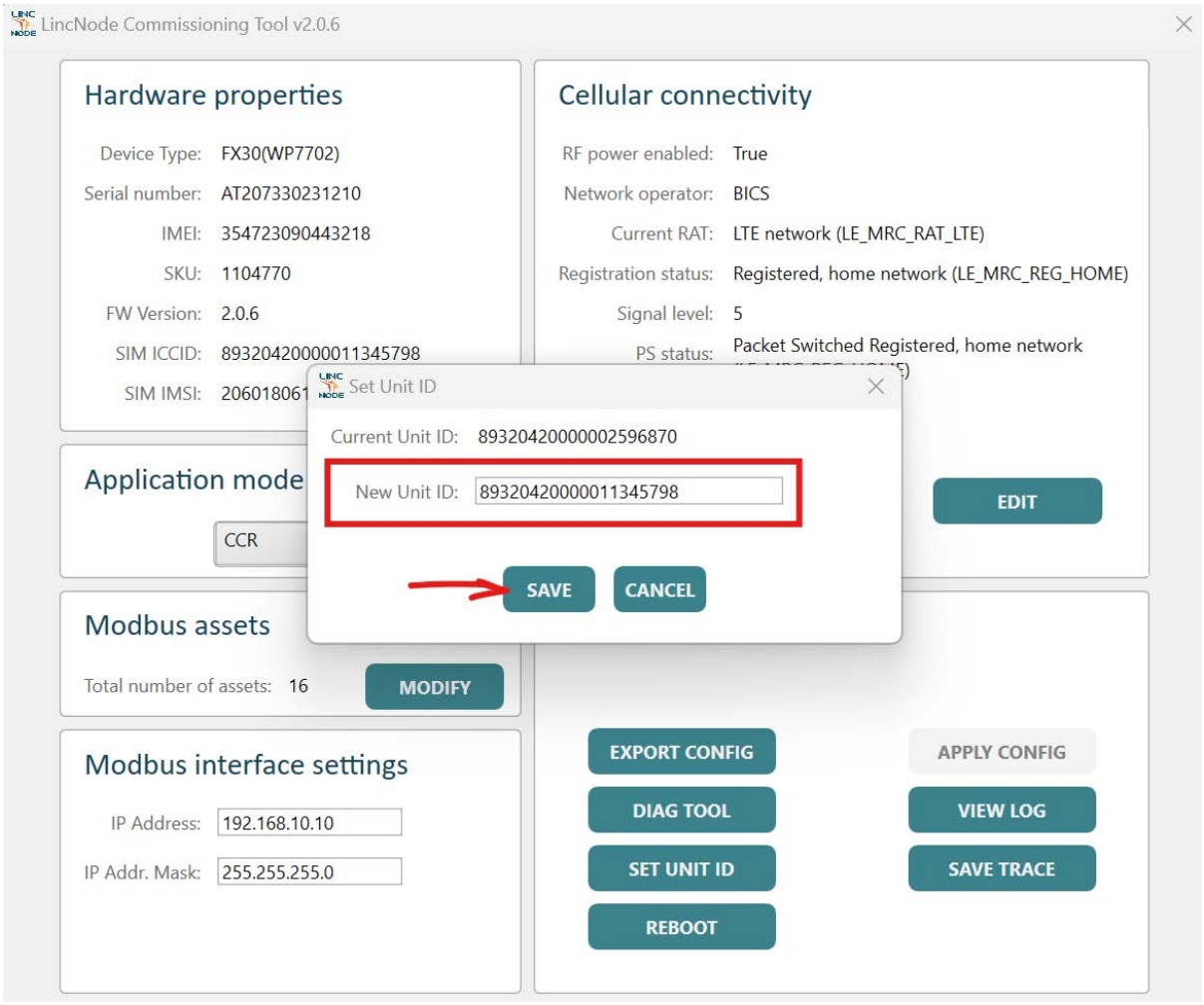
Note

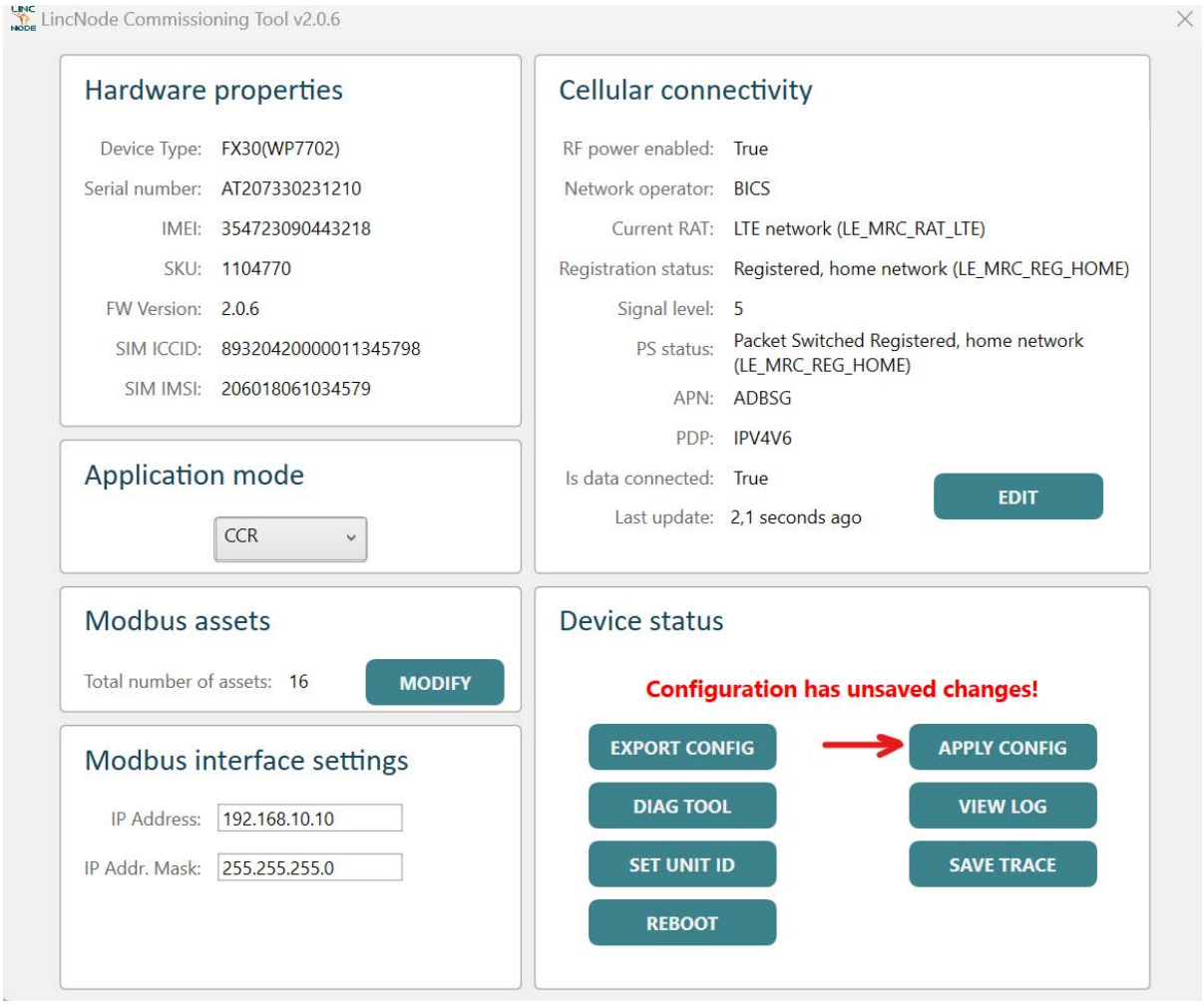
For old PAPI control boards (LPL models from 2014), running a firmware anterior to version 1.12.0.2, the baud rate must be configured to 9600 bps. For PAPI control boards running firmware version 1.12.0.2 or a more recent version, the baud rate must be configured to 115200 bps (DEFAULT).

4.4 Setting UNIT ID

To set unit IDs (only in case LINC Node hardware replacement), copy the SIM ICCID number, click on **Set unit ID** on the **Device Status** pane and paste the SIM ICCID. Save the new unit ID and then click **APPLY CONFIG** on same pane.







5.0 Specifications

This section describes the LINC Node gateway specifications.

Table 9: Specifications

Certification and Interoperability	**Emissions / Immunity**	▪ CE (Including EMC Test case for vehicle installation EN301489) ▪ ACMA RCM ▪ FCC ▪ Industry Canada
	Safety	▪ CB Report IEC 60950-1 ▪ UL Listed
	Industry Certification for Vehicles	▪ E-Mark UN ECE Regulation No. 10 Rev. 5
	Environmental Compliance	▪ RoHS 2011/65/EU (RoHS 2) ▪ WEEE ▪ REACH
	GSM/HSPA+ Certifications	▪ PTCRB ▪ GCF
Environmental Testing	**Vibration (operational)**	MIL-STD-810G, test method 514.6C Category 4 CWV (Composite Wheeled Vehicle)
	Shock (operational)	MIL-STD-810G, test method 516.6
	SAE J1455 (Shock and Vibration) for heavy-duty vehicles	▪ Vibration: Section 4.10.4.2 Cab Mount ▪ Shock: Section 4.11.3.4 Operational Shock ▪ Electrical: 12 and 24 V systems Section 4.13.1—12 and 24 V Section 4.13.2—SAE J1113-11 Level IV
	Temperature (operational)	MIL-STD-810G, test methods 501.5, 502.5 (-30° to +75°C) *Note: Surface temperature is recorded as 82.3°C at 60°C ambient. Final temperature code is subject to change when installed in end enclosure.*
	Temperature (non-operational)	MIL-STD-810G, test methods 501.5, 502.5 (-40° to +85°C)
	Thermal shock	MIL-STD-810G, test method 503.5
	Humidity (operational)	MIL-STD-810G, test method 517.5 95% RH over temperature range of +20°C to + 60°C
	IP rating	IP30
	Drop (non- operational)	ISTA 2A 2001, test categories 1, 4, 5, and 6
Electrostatic discharge (ESD)		8 KV contact discharge, 15 V air discharge
Mobile Network Operator Certification (pending)		AT&T (planned)
Network Technology	**LTE, HSPA+ GSM /GPRS / EDGE**	For lists of supported bands, see Radio Frequency Bands
Host Interfaces	**Antenna connectors**	▪ Cellular ▪ GNSS

Table 9: Specifications

	USB	▪ USB 2.0 micro-B connector complies with USB Version 2.0 for high speed operation
		▪ ADB SAFEGATE recommends you:
		  ▪ Use a USB 2.0 cable
		  ▪ Connect directly to your computer for best throughput.

	Ethernet	▪ 10/100 Base-T RJ-45 Ethernet ▪ Auto-crossover support ▪ Auto-negotiation, full- and half-duplex ▪ Not software configurable
	Serial	▪ RS-485 half-duplex ▪ Maximum baud rate: 115200 bit/s ▪ Maximum cable length: 25 meters at 115200 bit/s, 40 meters at 38400 bit/s.
	SIM Card Interface	▪ Mini-SIM (2FF) SIM card operated at 1.8 V/3.3 V.
Power Adapter Pins		6-Pin connector: ▪ Power ▪ Ground ▪ On/Off ▪ I/O1 ▪ I/O2 ▪ I/O3
LEDs **See LED Behavior**		2 LEDs: ▪ Power ▪ User configurable
Mechanical Specifications **For mechanical drawings, dimensions, and weight, see Mechanical Specifications**		▪ Housing—The LINC Node is made of ruggedized powder-coated aluminum. ▪ RoHS2—The LINC Node complies with the Restriction of Hazardous Substances Directive 2011/65/EU (RoHS2). This directive restricts the use of hazardous materials in the manufacture of various types of electronic and electrical equipment.
Screw Torque Settings		▪ Mount screws 1.1 N-m (10 in-lb) ▪ Antennas Finger tight (5–7in-lb.) is sufficient and the max torque should not go beyond 1.1 N-m (10 in-lb).
Operating Voltage		4.75 to 32 VDC
GNSS Technology	**Satellite channels available**	Acquisition: 118 Simultaneous tracking: 40
	Support for predicted orbits	Yes
	Predicted orbit CEP- 50 accuracy	5 meters
	Constellations	
	GNSS Message Protocol	NMEA

Table 9: Specifications

	Standalone Time to First Fix (TTFF)	▪ Hot start: 1 second ▪ Warm start: 29 seconds ▪ Cold start: 32 seconds
	Sensitivity	Standalone or MS-based tracking sensitivity: -158 dBm Cold start sensitivity: -143 dBm MS-assisted GNSS acquisition sensitivity: -156 dBm

5.1 Radio Frequency Bands

Table 10: LINC Node Radio Module WP8548

Radio Technology	Band	Frequency (Tx)	Frequency (Rx)
HSPA+	Band 1	1920–1980 MHz	2110–2170 MHz
	Band 2	1850–1910 MHz	1930–1990 MHz
	Band 5	824–849 MHz	869–894 MHz
	Band 6	830–840 MHz	875–885 MHz
	Band 8	880–915 MHz	925–960 MHz
	Band 19	830– 845 MHz	875–890 MHz
GSM / GPRS / EDGE	Band 850	824–849 MHz	869–894 MHz
	Band 900	880–915 MHz	925–960 MHz
	Band 1800	1710–1785 MHz	1805–1880 MHz
	Band 1900	1850–1910 MHz	1930–1990 MHz

Table 11: LINC Node Radio Module WP7607-1

Radio Technology	Band	Frequency (Tx)	Frequency (Rx)
LTE	Band 1	1920 –1980 MHz	2110–2170 MHz
	Band 3	1710 –1785 MHz	1805–1880 MHz
	Band 7	2500 –2570 MHz	2620–2690 MHz
	Band 8	880 –915 MHz	925–960 MHz
	Band 20	832 –862 MHz	791–821 MHz
	Band 28	703 –748 MHz	758–803 MHz
HSPA+	Band 1	1920 –1980 MHz	2110– 2170 MHz
	Band 8	880 –915 MHz	925–960 MHz
GMS/GPRS/EDGE	900	880 –915 MHz	925–960 MHz
	1800	1710 –1785 MHz	1805–1880 MHz

Table 12: LINC Node Radio Module WP7702

Radio Technology	Band	Frequency (Tx)	Frequency (Rx)
LTE	Band 1	1920 –1980 MHz	2110– 2170 MHz
	Band 2	1850 –1910 MHz	1930– 1990 MHz

Table 12: LINC Node Radio Module WP7702

Radio Technology	Band	Frequency (Tx)	Frequency (Rx)
	Band 3	1710 –1785 MHz	1805–1880 MHz
	Band 4	1710 –1755 MHz	2110–2155 MHz
	Band 5	824 –849 MHz	869–894 MHz
	Band 8	880 –915 MHz	925–960 MHz
	Band 12	699 –716 MHz	729 –746 MHz
	Band 13	777 –787 MHz	746–756 MHz
	Band 17	704 –716 MHz	734–746 MHz
	Band 18	815 –830 MHz	860–875 MHz
	Band 19	830 –845 MHz	875–890 MHz
	Band 20	832 –862 MHz	791–821 MHz
	Band 26	814 –849 MHz	859–894 MHz
	Band 28	703 –748 MHz	758–803 MHz
GSM / GPRS / EDGE	Band 850	824 –849 MHz	869–894 MHz
	Band 900	880 –915 MHz	925–960 MHz
	Band 1800	1710 –1785 MHz	1805–1880 MHz
	Band 1900	1850 –1910 MHz	1930– 1990 MHz

Table 13: LINC Node Radio Module WP7611-1

Radio Technology	Band	Frequency (Tx)	Frequency (Rx)
LTE	Band 2	1850 –1910 MHz	1930– 1990 MHz
	Band 4	1710 –1755 MHz	2110–2155 MHz
	Band 5	824 –849 MHz	869–894 MHz
	Band 12	699 –716 MHz	729 –746 MHz
	Band 13	777 –787 MHz	746–756 MHz
	Band 14	788 –798 MHz	758–768 MHz
	Band 25	1850 –1915 MHz	1930–1995 MHz
	Band 26	814 –849 MHz	859–894 MHz
	Band 66	1710 –1780 MHz	2110–2200 MHz
	Band 71	663 –698 MHz	617–652 MHz
UMTS	Band 2	1850 –1910 MHz	1930–1990 MHz
	Band 4	1710 –1755 MHz	2110–2155 MHz
	Band 5	824 –849 MHz	869–894 MHz

Table 14: GNSS Bands Supported

Band	Frequency
GPS L1	1575.42 MHz
GLONASS L1 FDMA	1602 MHz
Galileo E1	1575.42 MHz
BeiDou (WP7607-1/WP7702/WP7611-1)	1561.098 MHz
QZSS (WP7607-1/WP7611-1)	1575.42 MHz

5.2 Radio Module Conducted Transmit Power

The following tables provide radio module conducted transmit power specifications.

Table 15: Radio Module WP8548 Conducted Transmit Power

Band	Conducted Tx Power (dBm)	Notes
HSPA+		
Band 1 (IMT 2100 12.2 kbps) Band 2 (HSPA+ 1900 12.2 kbps) Band 5 (HSPA+ 850 12.2 kbps) Band 6 (HSPA+ 800 12.2 kbps) Band 8 (HSPA+ 900 12.2 kbps) Band 19 (HSPA+ 850 12.2 kbps)	+23 ±1	Connectorized (Class 3)
GSM/GPRS/EDGE		
GSM 850	+32 ±1	GMSK mode, connectorized (Class 4, 2 W; 33 dBm)
E-GSM 900	+32 ±1	
DCS 1800	+29 ±1	GMSK mode, connectorized (Class 1, 1 W; 30 dBm)
PCS1900	+29 ±1	
GSM 850	+26.5±1	8PSK mode, connectorized (Class E2; 0.5 W; 27 dBm)
E-GSM 900	+26.5±1	
DCS 1800	+25.5±1	8PSK mode, connectorized (Class E2; 0.4 W; 26 dBm)
PCS1900	+25.5±1	

Table 16: Radio Module WP7607-1 Conducted Transmit Power

Band	Conducted Tx Power (dBm)	Notes
LTE		
Bands 1, 3, 7, 8, 20, 28	+23±1	Connectorized (Class 3)
HSPA+		
Band 1 Band 8	+23±1	Connectorized (Class 3)

Table 16: Radio Module WP7607-1 Conducted Transmit Power

Band	Conducted Tx Power (dBm)	Notes
GSM/GPRS/EDGE		
E-GSM 900	33+1/-2	GMSK mode, connectorized (Class E4; 2 W; 33 dBm)
	27±2.5	8PSK mode, connectorized (Class E2; 0.5 W; 27 dBm)
DCS 1800	30+1/-2	GMSK mode, connectorized (Class 1, 1 W; 30 dBm)
	26±2.5	8PSK mode, connectorized (Class E2; 0.4 W, 26 dBm)

Table 17: Radio Module WP7702 Conducted Transmit Power

Band	Conducted Tx Power (dBm)	Notes
LTE		
Bands 1, 2, 3, 4, 5, 8, 12, 13, 17, 18, 19, 20, 26, 28	+23±1	
GSM/GPRS/EDGE		
GSM 850	+32±1	GMSK mode (Class 4; 2 W, 33 dBm)
	+27±1	8PSK mode (Class E2; 0.5 W, 27 dBm)
E-GSM 900	+32±1	GMSK mode (Class 4; 2 W, 33 dBm)
	+27±1	8PSK mode (Class E2; 0.5 W, 27 dBm)
DCS 1800	+29±1	GMSK mode (Class 1; 1 W, 30 dBm)
	+26±1	8PSK mode (Class E2; 0.4 W, 26 dBm)
PCS 1900	+29±1	GMSK mode (Class 1; 1 W, 30 dBm)
	+26±1	8PSK mode (Class E2; 0.4 W, 26 dBm)

Table 18: Radio Module WP7611-1 Conducted Transmit Power

Band	Conducted Tx Power (dBm)	Notes
LTE		
Bands 2, 4, 5, 12, 13, 14, 25, 26, 66, 71	+23±1	Power class 3
WCDMA		
Bands 2, 4, 5	+23±1	Power class 3 bis

5.3 Mechanical Specifications

Figure 46: Top View

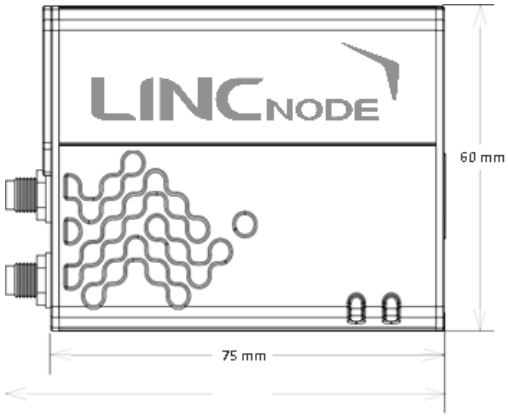
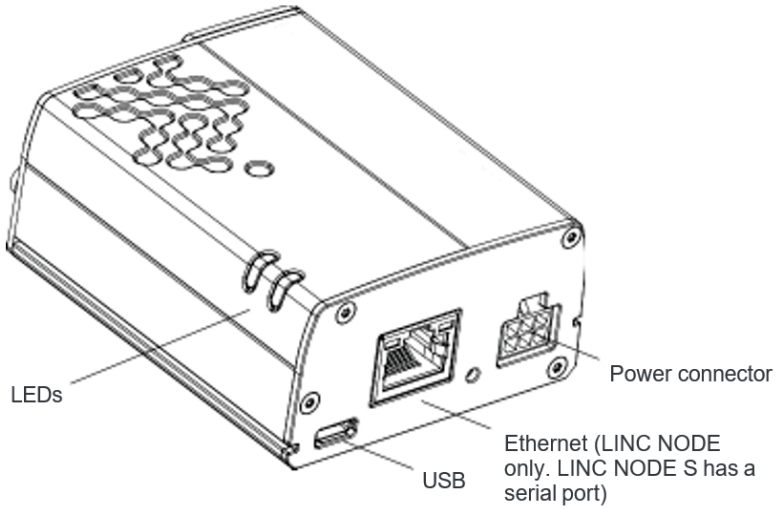
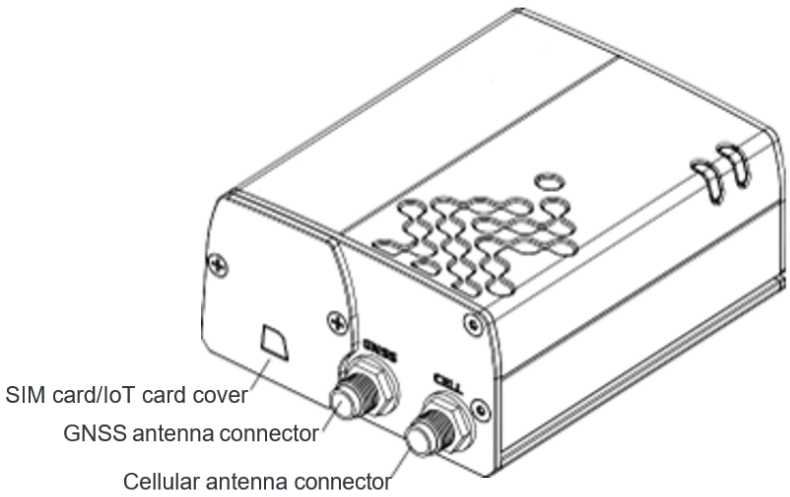


Figure 47: End Views





Weight	158 g (5.57 oz.)
Dimensions (l x w x h)	▪ 75 × 60 × 32 mm (excluding connectors) ▪ 82 × 60 × 32 mm (including connectors)

Figure 48: Mounting Bracket (Side View)

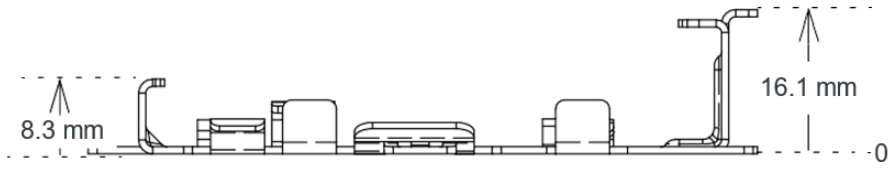


Figure 49: Compatibility Bar

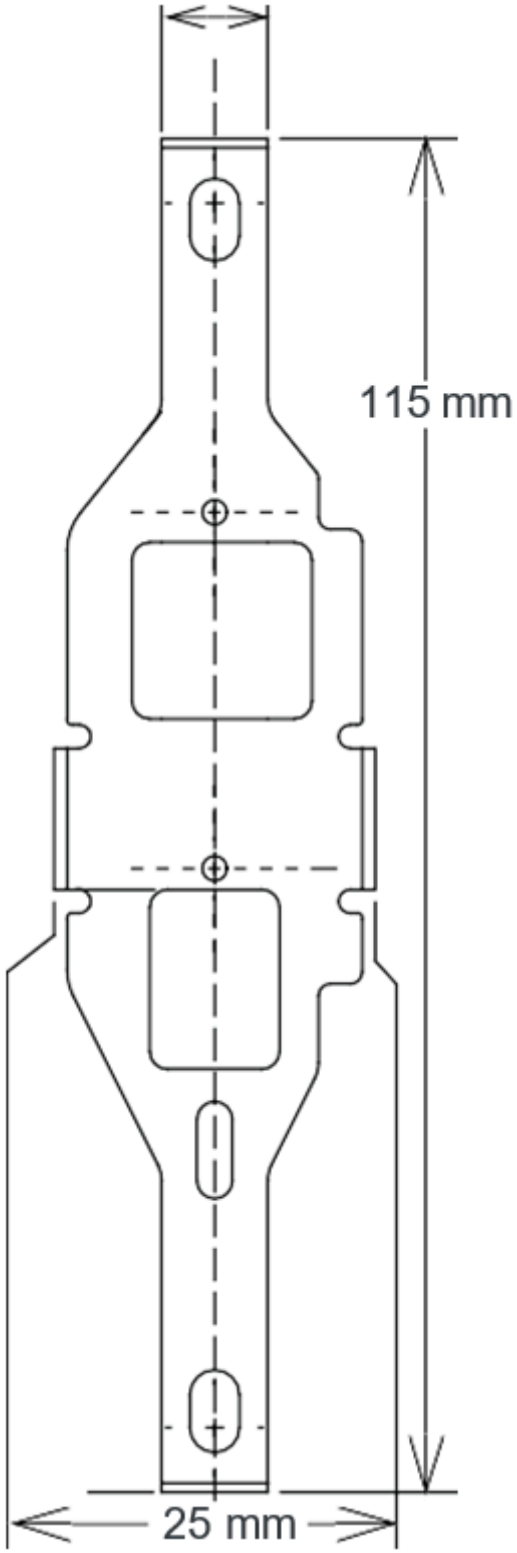


Figure 50: Mounting racket (Top View)

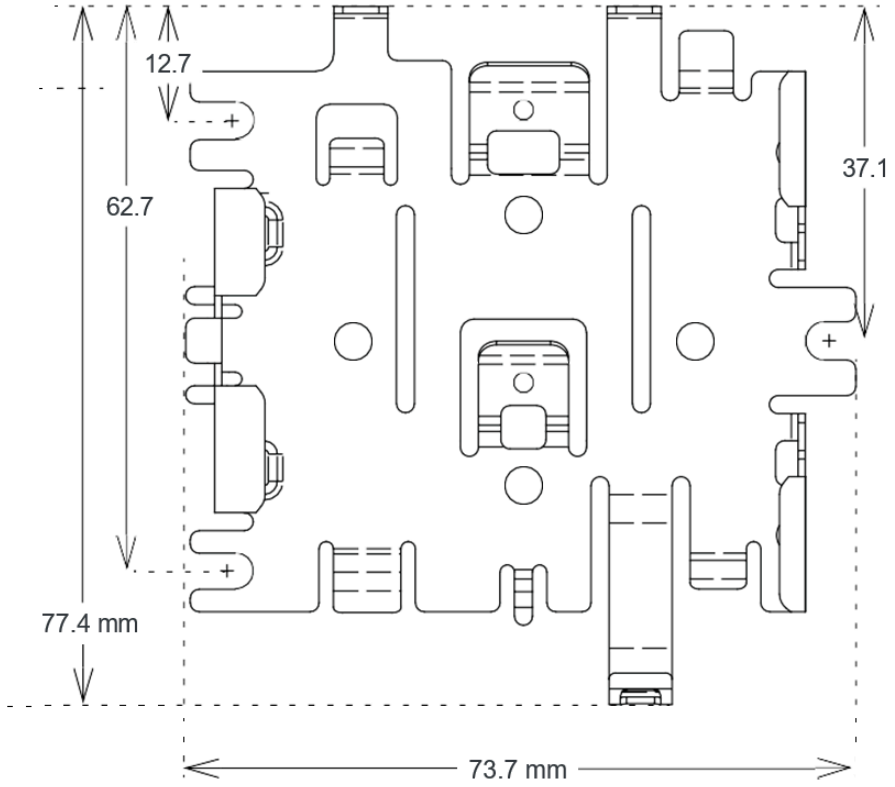


Figure 51: Assembly

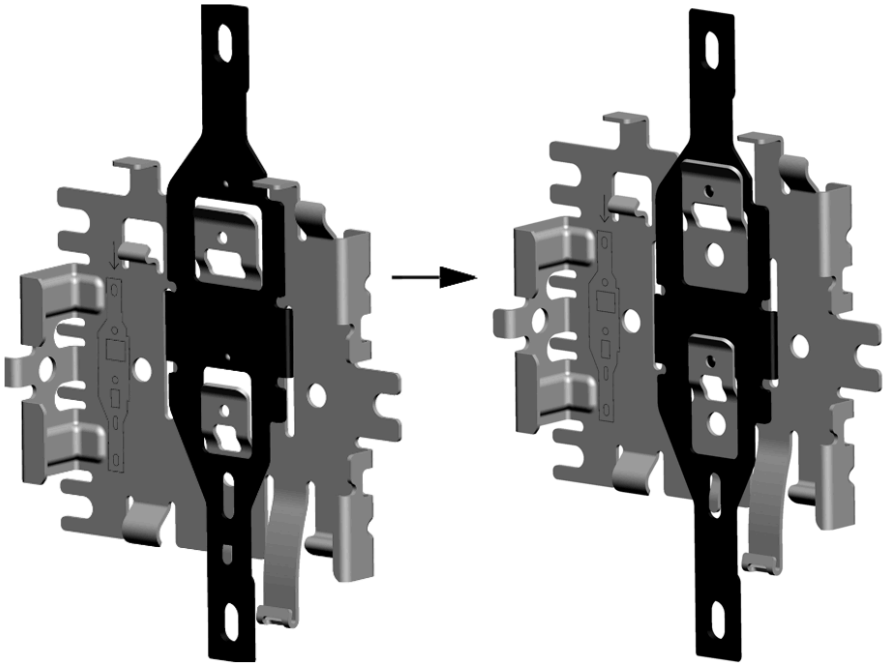
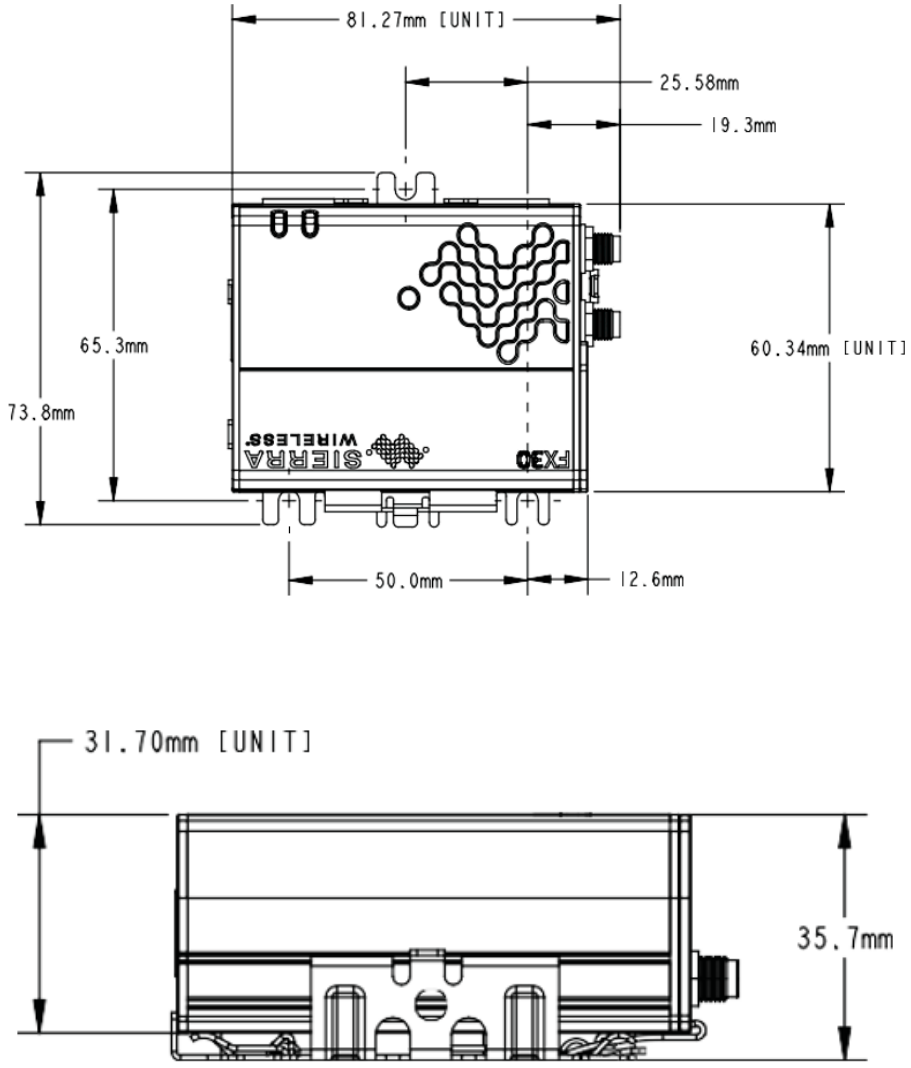
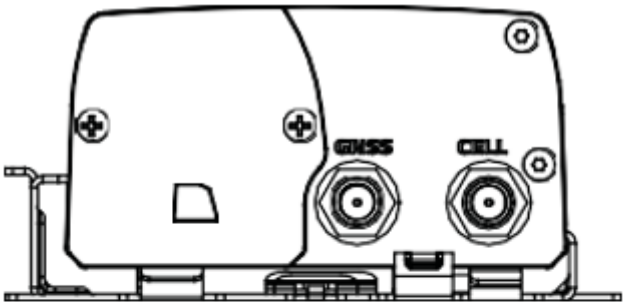
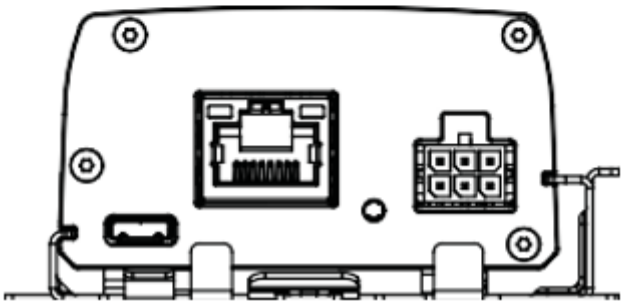


Figure 52: LINC Node on Mounting Bracket (Top, Side and End Views)







5.4 Power Consumption

Table 19: Power Consumption – Active Mode LINC Node 3G (WP8548)

Mode	Conditions	Voltage V	Max continuous mA | mW		Burst mA | mW	
Active Idle	USB and Ethernet cables are plugged in	24	40	960		
		12	74	888		
		4.5	180	810	208	936
Active Full Function HSPA+	Max Tx power (+23 dBm) USB 70 Mbps Ethernet 55 Mbps	24	138	3312	145	3480
		12	265	3180	270	3240
		5	604	3020	645	3225
Active Full Function GSM	Max Tx power (+31 dBm) USB 70 Mbps Ethernet 55 Mbps	24	110	2640	308	7392
		12	212	2544	600	7200
		5	550	2750	1670	8350

Table 20: Power Consumption – Active Mode LINC Node Cat-1 (WP7607-1)

Mode	Conditions	Voltage V	Max continuous mA | mW		Burst mA | mW	
Active Idle	USB and Ethernet cables are plugged in	24	94	2254	TBD	
		12	183	2195	TBD	
		4.5	439	1977	TBD	

Table 21: Power Consumption – Active Mode LINC Node Cat-1 (WP7607-1)

Mode	Conditions	Voltage V	Max continuous mA | mW		Burst mA | mW	
Active Full Function LTE	Max Tx power (-18 dBm) USB 103 Mbps Ethernet 85 Mbps	24	112	2680	TBD	
		12	209	2511	TBD	
		4.5	542	2441	TBD	

Table 22: Power Consumption – Active Mode LINC Node Cat-M (WP7702)

Mode	Conditions	Voltage V	Max continuous mA | mW		Burst mA | mW	
Active Idle	USB and Ethernet cables are plugged in	24	56	1364	236	5672
		12	114	1371	532	6382
		4.5	254	1141	1339	6027
Active Full Function GSM	Max Tx power (+33 dBm) USB 110 Mbps Ethernet 94 Mbps	24	195	4686	274	6584
		12	357	4282	622	7461
		4.5	918	4133	1560	7022
Active Full Function LTE	Max Tx power (+23 dBm) USB 110 Mbps Ethernet 94 Mbps	24	174	4184	290	6971
		12	319	3824	658	7900
		4.5	820	3690	1652	7435

Table 23: Power Consumption – Active Mode LINC Node Cat-M (WP7611-1)

Mode	Conditions	Voltage V	Max continuous mA | mW		Burst mA | mW	
Active Idle	USB and Ethernet cables are unplugged	24	57	1359	236	5672
		12	114	1366	532	6382
		4.5	253	1137	1339	6027
Active Full Function LTE	Max Tx power (+33 dBm) USB 110 Mbps Ethernet 94 Mbps	24	198	4747	317	7610
		12	372	4461	718	8625
		4.5	973	4379	1804	8118
Active Full Function HSDPA	Max Tx power (+33 dBm) USB 110 Mbps Ethernet 94 Mbps	24	202	4841	306	7347
		12	379	4543	694	8327
		4.5	993	4469	1742	7837

Table 24: Power Consumption – Off and Ultra Low Power Modes (all LINC Node variants)

Mode	Conditions	Voltage V	Max continuous µA | µW[1]	
Off	On/Off is set to Off	24	71	1697
		12	36	436

[1] The LINC Node protection circuitry results in the increase in current as voltage increases.

Table 24: Power Consumption – Off and Ultra Low Power Modes (all LINC Node variants)

Mode	Conditions	Voltage V	Max continuous µA | µW
		5	16 78
Ultra Low Power	Triggering timer	24	351 8414
		12	172 2059
		5	168 842

5.5 Important Information for North American Users

WARNING

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense. Changes or modifications to this device not expressly approved by ADB SAFEGATE could void the user's authority to operate this equipment.

5.6 RF Exposure

In accordance with FCC/IC requirements of human exposure to radio frequency fields, the radiating element shall be installed such that a minimum separation distance of 20 cm should be maintained between the antenna and the user's body.

WARNING

This product is only to be installed by qualified personnel.

To comply with FCC/IC regulations limiting both maximum RF output power and human exposure to RF radiation, the maximum antenna gain must not exceed the specifications listed in the following section for the device used.

5.7 Maximum Antenna Gain

The antenna gain must not exceed the limits and configurations shown in the following tables:

Device	Frequency Band	FCC ID/IC Number N7NWP8/2417C-WP8 Maximum Antenna Gain (dBi)
ADB SAFEGATE LINC Node	2	3
	5	4
	GPRS/EDGE 850	4
	GPRS/EDGE 1900	3

Device	Frequency Band	FCC ID/IC Number N7NWP76A/2417C-WP76A Maximum Antenna Gain (dBi)
ADB SAFEGATE LINC Node	4	6
	13	6

Device	Frequency Band	FCC ID/IC Number N7NWP76C/2417C-WP76C Maximum Antenna Gain (dBi)
ADB SAFEGATE LINC Node	2	6
	4	6
	5	6
	12	6
	HSPA+ 2	6
	HSPA+ 4	6
	HSPA+ 5	6

		FCC ID/IC Number N7NWP77B 2417C-WP77B Maximum antenna gain (dBi)[1]	
Device	**Frequency Band**	**Standalone**	**Collocated[2]**
AirLink LINC Node	2	9	8
	4[3]	6	6
	5	7	6
	12	6	6
	13	6	6
	17[4]	6	6
	26	7	6
	GSM 850	4	3
	PCS 1900	3	3

5.8 EU

ADB SAFEGATE hereby declares the ADB SAFEGATE LINC Node LN00P1 device is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EU.

The LINC Node LN00P1 displays the CE mark.

CE

The declaration of conformity made under Directive 2014/53/EU can be accessed here.

WARNING

Changes or modifications to this device not expressly approved by ADB SAFEGATE could void the user's authority to operate this equipment.

[1] Maximum antenna gain is 3 dBi in Japan for all channels.

[2] Antenna gain limit when module collocated with Wi-Fi/Wimax/BT radios.

[3] B4—CAT-M1 only.

[4] B17—CAT-NB1 only.

WARNING
This product is only to be installed by qualified personnel.

5.8.1 Declaration of Conformity

The Declaration of Conformity made under Directive 2014/53/EU is available for viewing at source.sierrawireless.com.

5.8.2 WEEE Notice

If you purchased your ADB SAFEGATE LINC Node in Europe, please return it to your dealer or supplier at the end of its life. WEEE products may be recognized by their wheeled bin label on the product label.

5.9 Notice for Brazilian Users

WARNING
This is a class A product. In a domestic environment this product may cause radio interference, in which case the user may be required to take adequate measures.

5.10 IMDA

Complies with IMDA Standards DA103548

Appendix A: SUPPORT

Our experienced engineers are available for support and service at all times, 24 hour/7 days a week. They are part of a dynamic organization making sure the entire ADB SAFEGATE is committed to minimal disturbance for airport operations.

ADB SAFEGATE Support

Technical Support – Global

Customers in Europe, the Middle East, Africa or Asia Pacific are more than welcome to our portal for technical support. Trained in all areas of system issues, troubleshooting, quality control and technical assistance, our highly experienced Technical support specialists are available 24 hours a day, seven days a week to provide assistance over the phone. In the Americas, we also offer live technical support.

Live Technical Support – Americas

If at any time you have a question or concern about your product, contact ADB SAFEGATE's US-based technical support specialists, available 24 hours a day, seven days a week, to assist you via phone.

ADB SAFEGATE Americas Technical Service & Support (US & Canada) :**+1-800-545-4157**

ADB SAFEGATE Americas Technical Service & Support (Canada): **+1-905-631-1597**

ADB SAFEGATE Americas Technical Service & Support (International): **+1-614-861-1304**

We can also be reached via email during regular business hours:

Airfield and Gate: **techservice.us@adbsafegate.com**

Gate: **gateservice.us@adbsafegate.com**

We look forward to working with you!

Before You Call

When you have an airfield lighting or system control system problem, prior to calling, please ensure the following:

- Review the product's manual and troubleshooting guide.
- Be located with the product ready to troubleshoot.
- Have all necessary information available: airport code/company name, customer id number, contact phone number/email address, product/part number.
- Have a True RMS meter available and any other necessary tools.

When calling about an issue with Safedock A-VDGS, we can serve you better if you collect the following information before you call:

- Relevant information regarding the issue you are calling about, such as gate number, flight number, aircraft type and time of the event.
- What, if any, actions have been taken to resolve the issue prior to the call.
- If available, provide a CCTV recording of the incident to aid in aligning the information from the Safedock log file.

Note

For more information, see www.adbsafegate.com, contact ADB SAFEGATE Support via email at support@adbsafegate.com or

Europe: +32 2 722 17 11

Americas: +1 614 861 1304. Press 3 for technical service or press 4 for sales support.

China: +86 (10) 8476 0106

Middle East and Africa: +971 4 452 7575

A.1 ADB SAFEGATE Website

The ADB SAFEGATE website, www.adbsafegate.com, offers information regarding our airport solutions, products, company, news, links, downloads, references, contacts and more.

A.2 ADB SAFEGATE Recycling

ADB SAFEGATE is fully committed to environmentally-conscious manufacturing with strict monitoring of our own processes as well as supplier components and sub-contractor operations. ADB SAFEGATE offers a recycling program for our products to all customers worldwide, whether or not the products were sold within the EU.

ADB SAFEGATE products and/or specific electrical and electronic component parts which are fully removed/separated from any customer equipment and returned will be accepted for our recycling program.

All items returned must be clearly labeled as follows:

- For RoHS/WEEE Recycling
- Sender contact information (Name, Business Address, Phone number).
- Main Unit Serial Number.

ADB SAFEGATE will continue to monitor and update according for any future requirements for EU directives as and when EU member states implement new regulations and or amendments. It is our aim to maintain our compliance plan and assist our customers.

A.2.1 Local Authority Recycling

The disposal of ADB SAFEGATE products is to be made at an applicable collection point for the recycling of electrical and electronic equipment. The correct disposal of equipment prevents any potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling. The recycling of materials helps to conserve natural resources. For more detailed information about recycling of products, contact your local authority city office.

A.2.2 ADB SAFEGATE Recycling

ADB SAFEGATE is fully committed to environmentally-conscious manufacturing with strict monitoring of our own processes as well as supplier components and sub-contractor operations. ADB SAFEGATE offers a recycling program for our products to all customers worldwide, whether or not the products were sold within the EU.

ADB SAFEGATE products and/or specific electrical and electronic component parts which are fully removed/separated from any customer equipment and returned will be accepted for our recycling program.

All items returned must be clearly labeled as follows:

- For RoHS/WEEE Recycling
- Sender contact information (Name, Business Address, Phone number).
- Main Unit Serial Number.

ADB SAFEGATE will continue to monitor and update according for any future requirements for EU directives as and when EU member states implement new regulations and or amendments. It is our aim to maintain our compliance plan and assist our customers.

Empowering the Airside Evolution

WWW.ADBSAFEGATE.COM

SMARTER. BETTER. NOW.

ADB SAFEGATE