

SATEL MCCU-30

User Manual

Version 1.1



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1 IMPORTANT NOTICE

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2 RESTRICTIONS ON USE

SATEL MCCU-30 is allowed to be used in the following countries, either on licence free channels or on channels where the operation requires a licence. More detailed information is available at the local frequency management authority. AT, AU, BE, BG, CA, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MT, NL, NO, PL, PT, RO, SE, SK and US.



WARNING - RF Exposure!

To satisfy EU, FCC and IC RF exposure requirements for mobile transmitting devices, a separation distance of 60 cm or more should be maintained between any of the antennas of this device and persons during device operation.

The antennas used for this transmitter must not be co-located in conjunction with any other antenna or transmitter.

SATEL MCCU-30 has been approved by FCC and Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Antenna type	Manufacturer	Antenna model	Maximum gain (dBi)
Omnidirectional	PCTEL	MWU4063S (UHF)	3
Omnidirectional	PCTEL	BMLPV5000 (Cellular)	2.6
Omnidirectional	PCTEL	BMLPVDB2458 (Wifi & BT)	3 @2.4GHz band 4 @5GHz band

WARNING!

In USA and Canada this product is certified to use frequencies 406.1 – 430 MHz and 450 – 470 MHz. Using this device in USA or Canada outside these frequencies is prohibited.

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does

cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.

3 PRODUCT CONFORMITY

Hereby, SATEL Oy declares that SATEL MCCU-30 wireless router is in compliance with the essential requirements (radio performance, electromagnetic compatibility and electrical safety) and other relevant provisions of Directive 2014/53/EU. Therefore the equipment is labelled with CE-marking.



FCC notes

FCC CAUTION: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

- This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

Industry Canada notes

- **English Version**

- This device complies with Industry Canada's applicable licence-exempt RSSs. Operation is subject to the following two conditions:
- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

- **French Version**

- Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:
 - 1) l'appareil ne doit pas produire de brouillage;
 - 2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

English Version

Data transmission is always initiated by software, which is then passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinues transmission in case of either absence of information to transmit or operational failure.

French Version

La transmission des données est toujours initiée par le logiciel, puis les données sont transmises par l'intermédiaire du MAC, par la bande de base numérique et analogique et, enfin, à la puce RF. Plusieurs paquets spéciaux sont initiés par le MAC. Ce sont les seuls moyens pour qu'une partie de la bande de base numérique active l'émetteur RF, puis désactive celui-ci à la fin du paquet. En conséquence, l'émetteur reste uniquement activé lors de la transmission d'un des

4 WARRANTY AND SAFETY INSTRUCTIONS

Read these safety instructions carefully before using the product:

- Warranty will be void, if the product is used in any way that is in contradiction with the instructions given in this manual, or if the housing of the wireless router has been opened or tampered with.
- The wireless router is only to be operated at frequencies allocated by local authorities, and without exceeding the given maximum allowed output power ratings. SATEL and its distributors are not responsible, if any products manufactured by it are used in unlawful ways.
- The devices mentioned in this manual are to be used only according to the instructions described in this manual. Faultless and safe operation of the devices can be guaranteed only if the transport, storage, operation, and handling of the devices is appropriate. This also applies to the maintenance of the products.
- To prevent damage both the wireless router and any terminal devices must always be switched OFF before connecting or disconnecting any cables. It should be ascertained that different devices used have the same ground potential. Before connecting any power cables, the output voltage of the power supply should be checked.
- Any radio link can be susceptible to external interference and signal degradation by its nature. Because of that, the effects of possible interference mechanisms and the sufficient back-up schemes must be considered in the system design of the critical applications.

NOTE!

When selecting a suitable location for the wireless router it must be ensured that no water can get into the device under any conditions. Direct sunlight is also to be avoided. It is not recommended to install the device on a strongly vibrating surface. Suitable dampening and/or isolation materials should be used in cases where the installation surface will be subjected to vibration.



WARNING – Hot surfaces!

5 DESCRIPTION OF THE PRODUCT

SATEL MCCU-30 is a multi-technology wireless router. It has several wireless and wired technologies and they can be used in parallel.

SATEL MCCU-30 supports following wireless technologies:

- LTE Category 4 (max 150 Mbps downlink, 50 Mbps uplink) Internet connection
- SATEL-TR4+ UHF radio module for receiving GNSS RTK correction data, which is forwarded to client device through TCP socket or through SATEL MCCU-30's internal NTRIP caster
- Wireless LAN (2.4 & 5 GHz)
- Bluetooth (Classic & BLE)

Local connectivity to client device is through 1 Gigabit/s ethernet connection with a 8 pin M12 X coded female connector.

Power supply (9 to 40 VDC) is connected with a 5 pin M12 A coded male connector. This connector has also ignition sense line, which can be connected to vehicle's ignition switch.

SATEL MCCU-30 has internal eSIM, which is attached to main board, and a connector for replacable 4FF-factor (Nano-SIM) SIM card.

SATEL MCCU-30 core software is based on Linux and it follows IEC 62443 4-2 guidelines.

Antennas are connected to female SMA connectors (Wifi/BT, LTE main and Div, UHF antenna) or female SMA connectors (LTE antennas) with longer than 0.2 m antenna cables. Device also support longer than 3 m cables.

SATEL MCCU-30 wireless routers are professional heavy-duty devices that meet the requirements of machine control, smart farming and marine applications. They are built to last dirt, vibration, sand, dust, water and lightning.

SATEL MCCU-30 wireless routers have a profound electrical protection - both the power and data lines as well as the antenna interface are surge protected.

SATEL MCCU-30 wireless routers are IP67/IP69K rated against ingress of dust and high temperature, high pressure water when all connectors are mated. See more detailed description on chapter: 6 SATEL MCCU-30 technical specifications

Additionally, SATEL MCCU-30 wireless routers, when used on UHF mode, provide RF filtering on GNSS frequencies to work seamlessly in GNSS positioning applications.

SATEL MCCU-30 consists internally of main board and SATEL-TR4+ radio module, which is attached to main board. The main board has processor, memories, power supplies and protection circuits for ethernet and power connectors. Main board has also RF related surge

protection circuits, and additionally GNSS band reject filter on UHF RF line, to protect GNSS bands from possible emissions from UHF transmissions.

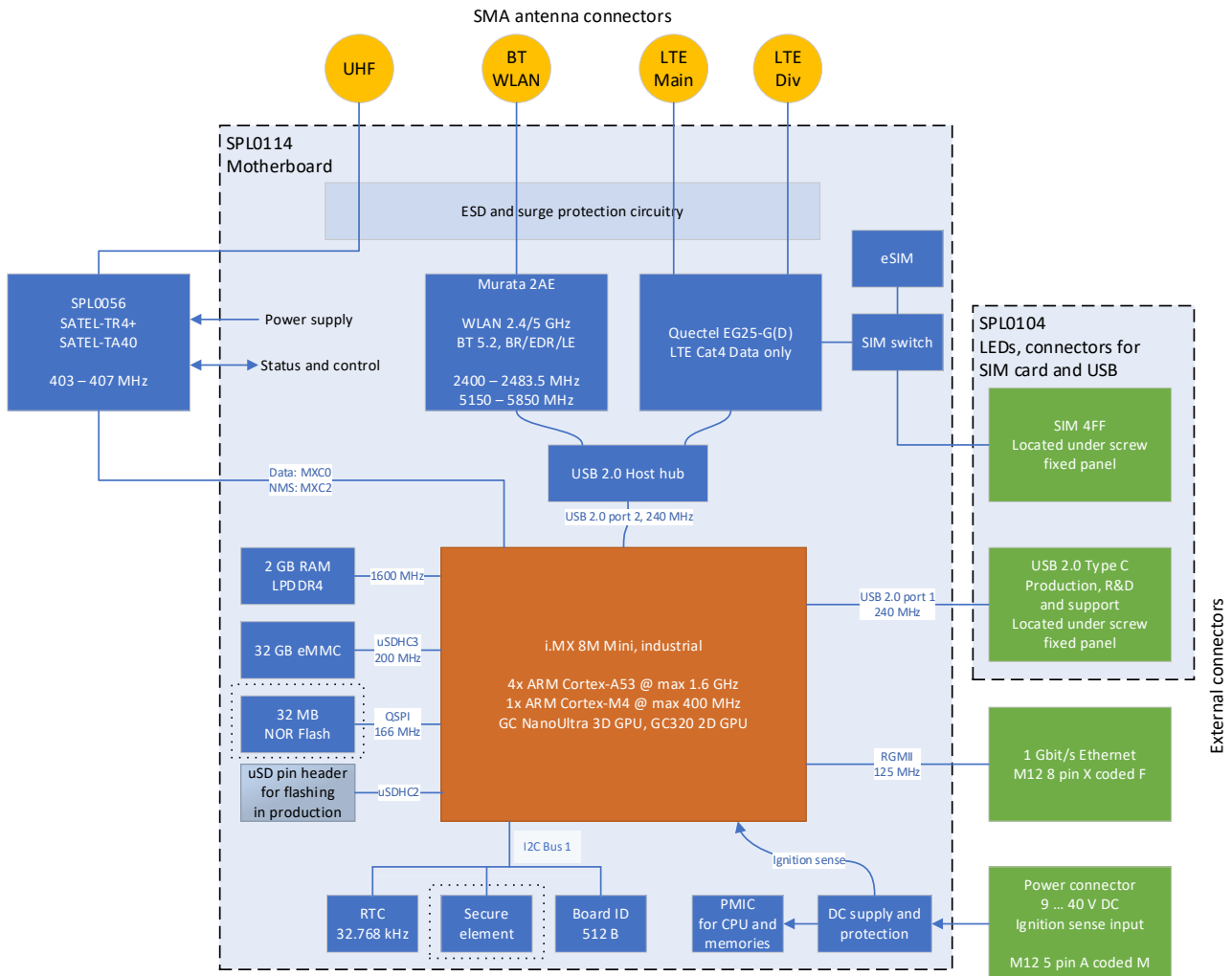


Figure 5-1: SATEL MCCU-30 simplified block diagram – components inside dot line boxes are not assembled by default

6 SATEL MCCU-30 TECHNICAL SPECIFICATIONS

6.1 Technical specifications in brief

ELECTRICAL INTERFACES	
Ethernet interface	1 Gigabit/s 1000Base-T ethernet (IEEE 802.3 ab)
Ethernet connector	8 pin M12, X coded, female (IEC 61076-2-109)
Power supply connector	5 pin M12, A coded, male (IEC 61076-2-101)
Antenna connectors	SMA, 50 Ω (IEC 61169-15)
SIM connector	4FF (nano-SIM) form factor (ETSI TS 102 221)
Service USB connector	Type C (IEC 62680-1-3)
GENERAL	
Operating voltage range	+9 ... +40 VDC
Ignition sense voltage range	See "Operating voltage range"
Absolute MAX voltage	+48 V (exceeding the value may damage the device)
Current consumption @ 12V	Max: 2000 mA @12 VDC i.e. 24 W Typical: <10W
Temperature ranges	-20 °C ... +55 °C Type Approval conditions -30 °C ... +70 °C Functional** -40 °C ... +85 °C Storage***
Antenna connectors	4 x SMA female 50 Ω
Height above sea level	Max 3600 meters
Construction	Aluminium housing
Size L x W x T / Weight	182 mm x 187 mm x 55 mm / 1550 g
Ingress protection	IP67 and IP69K with pure water when all connectors are mated.
COMPLIANT WITH THE INTERNATIONAL STANDARDS	
ESD protection	IEC 61000-4-2 Level 4: 8 kV contact, 15 kV air discharge
Surge protection	IEC 61000-4-5 Level 4: 4.0 kV, 2 kA, 2 Ω , 8/20 μ s pulse
Safety standard	IEC 62368-1
Immunity	EN 301 489-1 v2.2.1 20 V/m
Ingress	ISO 20653 and IEC 60529
Cyber security	EN 18031-1 (RED3.3e)

** Using the device beyond this region the functionality cannot be guaranteed.

*** Recommended storage is at dry, room temperature.

6.2 Technical specifications for cellular subsystem

SATEL MCCU-30 is equipped with LTE Category 4 module, Quectel EG25-G, which supports following cellular bands:

- GSM: B2, B3, B5, B8
- WCDMA: B1, B2, B4, B5, B6, B8, B19
- LTE FDD: B1, B2, B3, B4, B5, B7, B8, B12, B13, B18, B19, B20, B26, B28
- LTE TDD: B38, B39, B40, B41

Note that all bands may not be available in all variants due to local regulations.

Maximum Output Power:

- GSM850: Class 4 (33 dBm \pm 2 dB), GSM850 8-PSK: Class E2 (27 dBm \pm 3 dB)
- EGSM900: Class 4 (33 dBm \pm 2 dB), EGSM900 8-PSK: Class E2 (27 dBm \pm 3 dB)
- DCS1800: Class 1 (30 dBm \pm 2 dB), DCS1800 8-PSK: Class E2 (26 dBm \pm 3 dB)
- PCS1900: Class 1 (33 dBm \pm 2 dB), PCS1900 8-PSK: Class E2 (26 dBm \pm 3 dB)
- WCDMA: Class 3 (27 dBm \pm 1/-3 dB)
- LTE-FDD: Class 3 (23 dBm \pm 2 dB)
- LTE-TDD: Class 3 (23 dBm \pm 2 dB)

For CE mark the following cellular bands are supported in European Union region:

- GSM: B3, B8
- WCDMA: B1, B8
- LTE FDD: B1, B3, B7, B8, B20, B28
- LTE TDD: B38, B40r

Downlink MIMO i.e., RX diversity antenna is supported on LTE.

For complete information about cellular subsystem, please refer to LTE module manufacturer's pages: <https://www.quectel.com/product/lte-eg25-g>

6.3 Technical specifications for UHF radio

Please refer to SATEL-TR4+ documentation at:

<https://www.satel.com/products/radio-modems/satel-tr4/>

6.4 Technical specifications for Bluetooth and Wifi

SATEL MCCU-30 has an integrated Bluetooth and Wifi subsystem, which share the same antenna. This subsystem is implemented using Murata 2AE, which has FCC ID VPYLB2AE.

Radio certification information for 2AE module:

- USA (FCC): VPYLB2AE
- Canada (IC): 772C-LB2AE
- Europe: EN300328 v2.2.2, 301893 v2.1.1, EN300440 v2.2.1

Bluetooth subsystem details:

- Bluetooth 5.2
- Classic and Low energy
- Power class 1.5 i.e. max 10 dBm TX power at antenna port
- Qualification (QDID) number 173411

Wifi details:

- IEEE 802.11 a/b/g/n/ac
- 2.4 and 5 GHz frequency areas
- Access point functionality: MCCU-30 may provide local network connectivity over Wifi
- Client functionality: MCCU-30 may connect some other access point
- Maximum output power 20 dBm @ 2.4 GHz / 18 dBm @ 5 GHz (Wifi HW max value, depends on configuration.)
- WPA2/WPA3

7 CONNECTORS



Figure 7-1: SATEL MCCU-30 connector panel

SATEL MCCU-30 has following connectors. as seen in figure above, from left to right:

- Ethernet
- Bluetooth/Wifi
- UHF
- LTE diversity (RX only)
- LTE main (RX and TX)
- Power supply

On the top of the device, there is a SIM and service USB connectors are under screw attached panel, which device status indication LEDs.

Notes:

- IP67/IP69K rating of the device requires the mating connectors to be correctly assembled and connected into every connector in device. Check details from your cable supplier's datasheet(s).
- GND (pins 3 and 4 in power connector), the metal enclosure, grounding connector and the outer contact of the antenna connectors are galvanically connected.

7.1 Gigabit ethernet connector

The gigabit ethernet connector is 8-pin M12 X-coded female connector which has pinout according to IEC 61076-2-109.

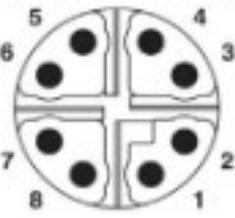
Connector cable end, reverse on panel	Pin#	Cable coding	Signal
	1	White/Orange	D1+
	2	Orange	D1-
	3	White/Green	D2+
	4	Green	D2-
	5	White/Brown	D3+
	6	Brown	D3-
	7	White/Blue	D4+
	8	Blue	D4-
	Shielding	Metal nut	

Table 7.1: 8 pin M12 X coded Ethernet connector pinout

The ethernet cable length should be max 3.0 meters.

7.2 Power supply connector

The power supply connector is 5 pin M12 A coded male connector which has pin layout according to IEC 61076-2-101.

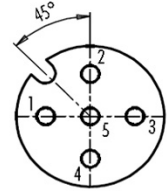
Connector cable end, reverse on panel	Pin#	Signal
	1	$V_{IN}, +9 \dots +40 \text{ V DC}$
	2	$V_{IN}, +9 \dots +40 \text{ V DC}$
	3	GND
	4	GND
	5	Ignition sense, same voltage range as V_{IN}

Table 7.2: 5 pin M12 A coded power supply connector pinout

SATEL MCCU-30 will consume electric power when connected to a power supply. The amount of power the modem consumes depends on the operational mode it functions. Highest power consumption is while all radios are on transmitting at maximum power and host CPU is running on maximum load. Even higher power is drawn from the power supply in a moment when the modem is being connected to a power supply. This so-called inrush current can be several times higher than normal current consumption but will last only few tens of milliseconds. For proper operation it is crucial to assure that the power supply has output power rated to higher than the maximum power consumption of the device and that the power supply can handle short inrush currents properly.

As an increased safety feature, it is recommended to add a fuse between the power supply and the modem. This assures that both, the device and the power supply, is protected against over current situations. Recommended fuse size is 5 A.

Power supply cable is recommended to be 1.5 mm² minimum. Also, as safety feature, the power supply cable length should be max 3.0 meters.

Power can be supplied from vehicle battery or from external power supply. SATEL MCCU-30's nominal voltage range refer to chapter 5.1.

Operating voltage range of SATEL-MCCU-30 is marked to a side of the housing as in Figure 7.2.



Figure 7-2 SATEL MCCU-30 Type Label sample.

7.3 Ignition sense feature

Whenever possible, SATEL MCCU-30 should be connected into vehicle's ignition sense line. This allows device's cellular modem to gracefully disconnect from cellular network. If operating power of SATEL MCCU-30 is just switched off, cellular connection to network just breaks, and this is seen as error behaviour on cellular network.

SATEL MCCU-30 senses the status of power connector pin #5 i.e. the ignition sense line. When the voltage in this line is the same as operating voltage, the device wakes from deep sleep mode, enters normal operating mode and starts radio operations. If the voltage in this line drops to zero, SATEL MCCU-30 disconnects from cellular network, stops all operations, and goes to power saving deep sleep mode.

If the ignition sense feature can't be taken into use i.e., the vehicle does not have ignition sense line available, the power supply pin #5 must be connected to operating voltage.

7.4 Antenna connectors

Device has four 50 Ω SMA antenna connectors (compliant to IEC 61169-15):

- Bluetooth/Wifi
- UHF
- LTE diversity (RX only)
- LTE main (RX and TX)

Antennas should always be connected when the power is on. Both LTE antennas need to be connected when using LTE to ensure proper cellular functionality and to ensure ingress protection. Removing the antenna while the transmitter is on may damage the power amplifier inside the transmitter. Antennas should not be connected directly to connectors; minimum length of the antenna cables is 0.2m.

When connecting antennas, maximum (and if possible, target) torque is 1.13 Nm.

IP67/IP69K rating of the device requires that all the antenna connectors are mated. See details from the connector manufacturer's datasheet.

If SATEL MCCU-30 is configured not to use some radio technology (e.g., Wifi), related antenna connector may be covered with a IP69K specified 50 Ω terminator.

7.5 SIM connector

SATEL MCCU-30 has nano-SIM (4FF) sized SIM connector (compliant to ETSI TS 102 221) under SIM and USB slot cover (please see Figure 7.3: SIM and USB slot cover and Figure 8.1). The SIM card should be inserted or replaced (please see Figure 7-4: How SIM card is inserted) only in dry and clean environment. When closing the cover, sealing ring must be properly placed and T25 screws must be tightened to 4 Nm torque.



Figure 7-3: SIM and USB slot cover

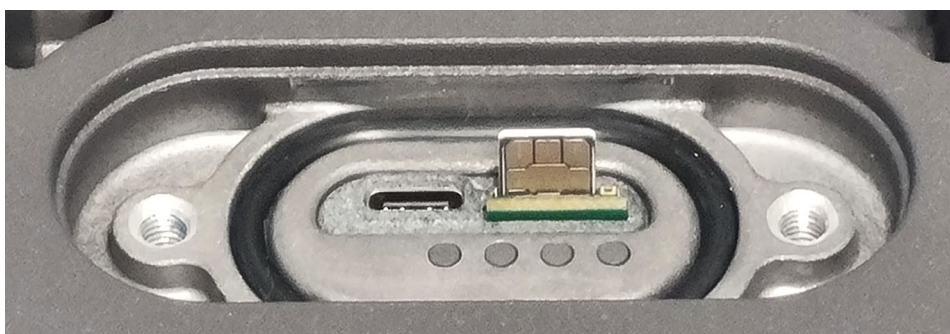


Figure 7-4: How SIM card is inserted

NOTE! IP67 and IP69K classification is not guaranteed when the SIM and USB slot cover is opened. It is possible that liquids or other damage might be caused by the open slot cover. Special care needs to be taken to ensure that the SIM and USB slot cover is tightly closed and tightened.

If SIM card is inserted or replaced, SATEL MCCU-30 configuration must be changed accordingly, otherwise MCCU-30's internet connectivity may be disabled.

7.6 USB service connector

SATEL MCCU-30 has USB service connector (compliant to IEC 62680-1-3) under SIM and USB slot cover (please see Figure 8.1).

NOTE: This connector is only for service use, end user must not connect anything to it except when otherwise clearly instructed.

NOTE! IP67 and IP69K classification is not guaranteed when the SIM and USB slot cover is opened. It is possible that liquids or other damage might be caused by the open slot cover. Special care needs to be taken to ensure that the SIM and USB slot cover is tightly closed and tightened.

8 LED INDICATORS

SATEL MCCU-30 has four LEDs visible to user. They are located below SIM and USB slot cover.



Figure 8-1: LEDs in SIM and USB slot cover

Intention of LEDs is to provide minimal feedback for user mainly for problem solving situations. LEDs are named as LED1, LED2, LED3 and LED4, counting from left.

In this document, LED blinking speeds are defined as follows:

- Steady: LED is constantly on
- Slow: LED is powered on for 500ms, powered off for 500ms, cycle repeats.
- Fast: LED is powered on for 100ms, powered off for 100ms, cycle repeats.

The idea for LED blinking speed is, that when some led is steady, it represents good situation. Slow blinking generally means, that something is limited, and fast, that something is more limited.

The LED logic in SATEL MCCU-30 is intentionally different to older SATEL products in sense, that earlier, red colour indicated transmission and orange indicated noise reception. In SATEL MCCU-30, red colour indicates some problem situation, including noise reception, and orange means either system power-up, service/test mode or sub-system upgrade. The first use case of SATEL MCCU-30 will not have UHF transmission, so orange colour is chosen to indicate transmission.

When system is powered on, all LEDs light up on white colour for few seconds. This is for user to quickly see, that LEDs are working properly. After this, LED 1 (system and ethernet status) blinks on slow orange to represent that system is still starting. When system has fully powered on, separate indicator LEDs switch to show their own subsystem status.

8.1 LED1 – system and ethernet status

LED color	LED blinking speed	Explanation
LED off	-	System has no power.
Orange	Fast	System is shutting down.
Orange	Slow	SATEL MCCU-30 System is starting up.
Green	Fast	Ethernet connection is not detected, but everything else is OK.
Green	Slow	Ethernet cable is connected, but speed is limited to 10/100 Mbps. Everything is otherwise OK.
Green	Steady	Ethernet cable is connected and 1 Gbps link is established. Everything is OK.
White	Fast	System is being upgraded, please wait. This led blinks through the whole upgrade process, also when sub-modules are upgraded.
White	Slow	System is in service mode.
Green and red cycle	Fast	System has detected security anomaly. Please check logs.
Red	Fast	Configuration error. Either revert or correct the configuration.
Red	Slow	System is in error state. Please restart the system.
Red	Steady	System is in critical error state. Call service.

8.2 LED2 – Cellular radio status

LED color	LED blinking speed	Explanation
LED off	-	Cellular subsystem is not powered on.
Orange	Fast	Cellular subsystem is searching for network.
Green	Fast	Cellular connection is established, but data does not flow. Everything is OK.
Green	Slow	Cellular connection is established, but it is slow (GSM or 3G). Everything is otherwise OK.
Green	Steady	LTE Cellular connection is established. Everything is OK.
White	Fast	Cellular system is being upgraded, please wait.
White	Slow	Cellular subsystem is in testing mode.
Red	Slow	Cellular subsystem can't establish connection to network. Check settings.
Red	Steady	Cellular subsystem is in critical error state. Call service.

8.3 LED3 – Wifi and Bluetooth status

LED color	LED blinking speed	Explanation
LED off	-	Wifi/Bluetooth subsystem is not powered on.
Green	Fast	Wifi subsystem is in client mode and searching for access point.
Green	Slow	Wifi subsystem is in client mode and connected to access point. Everything is OK.
Green	Steady	Wifi subsystem is in access point mode. Everything is OK.
Blue	Fast	Bluetooth subsystem is in pairing mode.
Blue	Steady	Bluetooth subsystem is on, Wifi is off. Everything is OK.
Green and blue cycle	Slow	Bluetooth subsystem is on, Wifi is in client mode and connected to access point. Everything is OK.
White	Slow	Wifi/Bluetooth subsystem is in testing mode.
Red	Steady	Wifi/Bluetooth subsystem is in critical error state. Call service.

8.4 LED4 – UHF radio status

LED color	LED blinking speed	Explanation
LED off	-	UHF subsystem is not powered on.
Orange	Fast	UHF subsystem is transmitting data. Everything is OK.
Orange	Slow	Noise or unknown signal in channel (general).
Green	Fast	UHF subsystem is receiving data. Everything is OK.
Green	Steady	UHF subsystem is idle. Everything is OK.
White	Fast	UHF subsystem is being upgraded, please wait.
White	Slow	UHF subsystem is in testing mode.
Red	Steady	UHF subsystem is in critical error state. Call service.

9 MECHANICAL DIMENSIONS

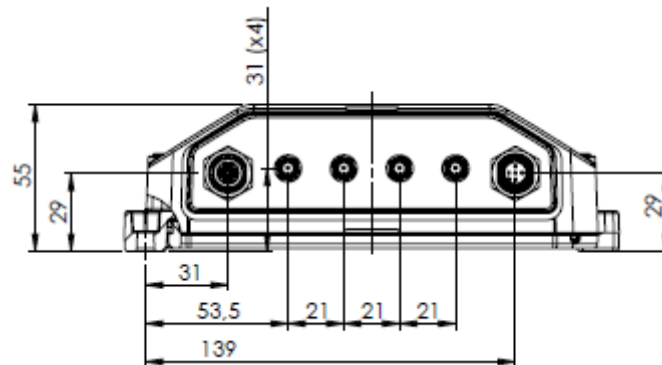


Figure 9-1 SATEL MCCU-30 mechanical dimensions (front view).

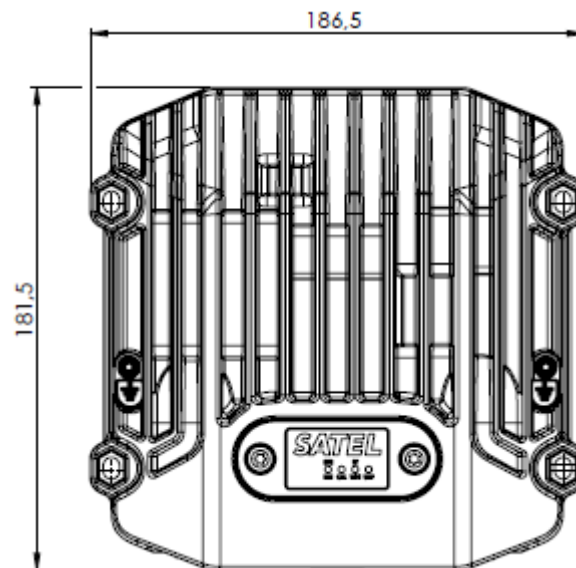


Figure 9-2 SATELMCCU-30 mechanical dimensions (top view).

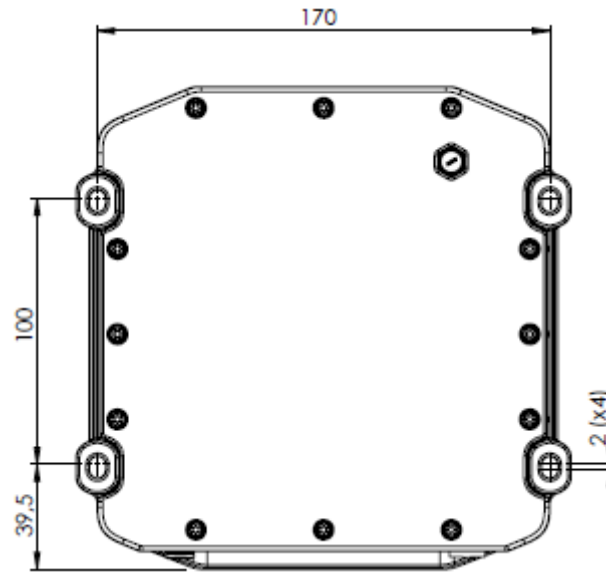


Figure 9-3 SATEL MCCU-30 mechanical dimensions (bottom view).

10 INSTALLATION

Installation must be done by professional/trained personnel.

SATEL MCCU-30 transceiver can be installed to any position from its 4 screw attachment points with maximum of M6 bolts/screws. It is recommended to use M6 washer together with bolt/screw.

SATEL MCCU-30 transceiver is waterproof fulfilling IP67 and IP69K specifications. Note that all connectors (ethernet, antennas, power supply) must be installed properly to reach the IP ratings. If MCCU-30 is configured not to use some radio technology (e.g., Wifi), related antenna connector may be covered with IP69K specified 50 Ω terminator.

Avoid installations to vibrating surfaces, hot places, directly to sunlight or under water. Avoid abrasion and impacts. Protect cables and antennas placing them away from damaging elements. Keep antennas in open space and away from interference.

When connecting antennas, use good quality RF-cables and keep distances to its shortest to minimize signal losses.

The following points must be considered when installing and configuring a radio modem:

- Do not connect power supply cable before all other connectors (antennas and ethernet) are properly connected.
- To ensure reliable operation the voltage output of the power supply must be stable enough and the current capability of the power supply must be sufficient.
- Antennas must be installed according to instructions.
- MCCU-30's IP and other network settings, for both ethernet and Wifi, must be installed according to host system configuration.
- All radio modems in the same system must be configured using same radio related settings (radio frequency, channel spacing, etc).
- Check the instructions of grounding the modem on chapter 10.3 Grounding.

NOTE!

It is not recommended to install the radio modem on a strongly vibrating surface. Suitable dampening and/or isolation materials should be used in cases where the installation surface will be subjected to vibration.

NOTE!

Do not expose the device to solvents or fuels/oils.

NOTE!

Opening of the housing (except SIM cover) of the device lead to warranty void.

10.1 Installation of the wireless router

SATEL MCCU-30 has four (4) fixing screw positions on its housing, which are used to attach the device to a structure, using M6 sized bolts or screws. Maximum torque for the bolts or screws is 5Nm.

The structure should be solid and even. There should be no curvature or bumps between MCCU-30 and the installation structure.

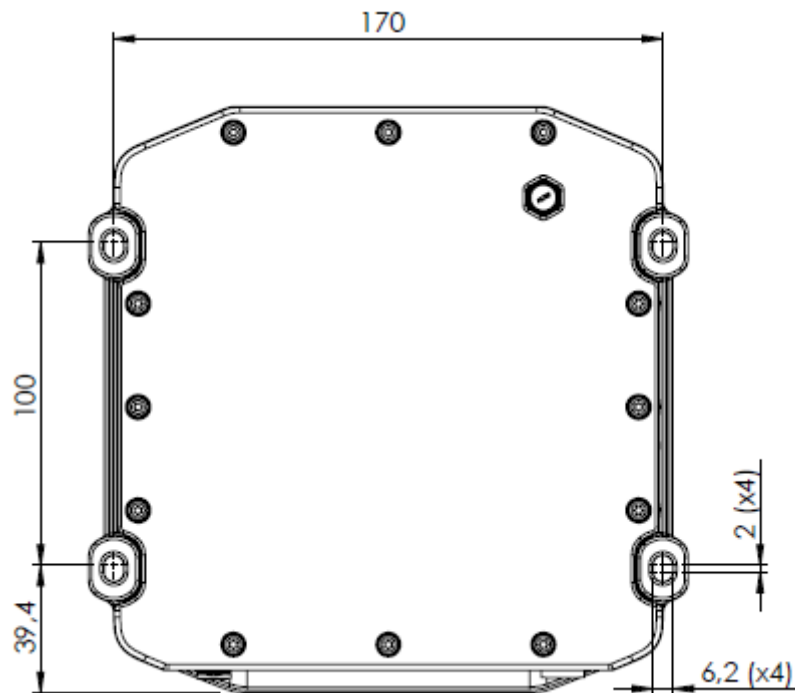


Figure 10-1: Mounting screw positions

10.2 Installation requirements

Electronic devices are sensitive to external influences which should be taken into consideration while taking the device into operation. Proper place for assembling is necessary for good performance and long lifespan.

Even though SATEL MCCU-30 is built to withstand external vibrations, shocks, temperature fluctuations and high/low temperatures still those occurrences should be avoided as much as possible to maximize the durability and longevity of the product. High temperature decreases the lifespan of the components whereas vibration and shocks weaken the mechanical structure and can drastically affect the performance in use.

10.3 Grounding

Besides the mains voltage safety, proper grounding is essential also for the error free operation of radio links and the protection against over voltages and lightning. Although SATEL MCCU-30

incorporates a robust internal surge protection, the surge spikes and power transients caused by lightning, ESD or other electrical systems must be discharged to earth ground.

Figure 10.2 shows grounding points of MCCU-30. The grounding cable can be connected to either of those using M5x10 machine screw.

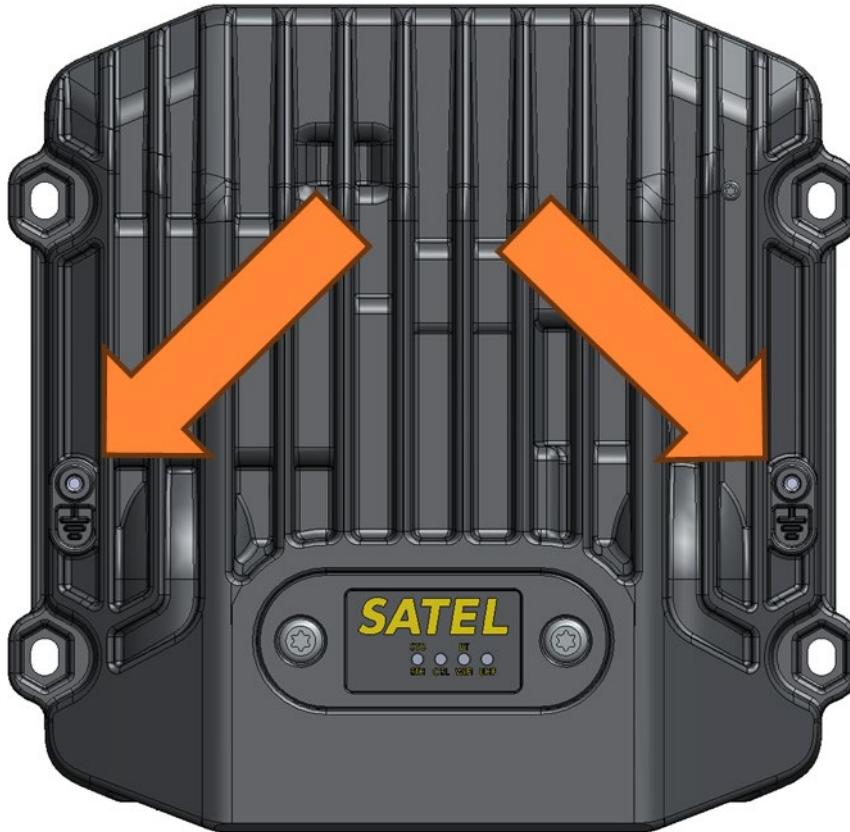


Figure 10-2: MCCU-30 grounding points

10.3.1 General installation guidelines for grounding:

Perform grounding of the system in accordance with local and national regulations.

Check the grounding related information of other products in the system.

Use short low impedance cables. Although DC resistance of a ground cable may be a fraction of an Ω , its impedance may be thousands of Ω s on the radio frequency. Wide copper straps are the best.

The ground connection should be connected directly to the power supply, not the ground connection of the load, to isolate the radio from voltage drops across the ground return for the load.

Equipment of the radio system should be grounded in a star ground configuration. The center of the star should be usually connected directly to a good external earth ground scheme.

10.4 Host system configuration

This chapter intends to present only most critical configuration items for host system.

10.4.1 Ethernet and Wifi

For both ethernet and Wifi, in the simplest form, SATEL MCCU-30 can act as DHCP server for the local network. In this case, MCCU-30 provides all settings for host system automatically.

If the local network is configured statically, i.e. there will be no DHCP server, following items need to be configured:

- SATEL MCCU-30's IP address as gateway
- SATEL MCCU-30's IP address MQTT API endpoint

For Wifi, AP settings (SSID and password) need to be configured.

10.4.2 GNSS RTK correction reception via UHF

GNSS RTK correction can be received to host system either via TCP socket or NTRIP (notice, NTRIP feature is still under development).

If TCP socket approach is used, following items need to be configured:

- SATEL MCCU-30's IP address
- SATEL MCCU-30's TCP socket number in which host system connects to (default: 2001)

If NTRIP approach is used, following items need to be configured:

- SATEL MCCU-30's IP address
- SATEL MCCU-30's built-in NTRIP caster
 - port (default: 2101)
 - mount point (default: mccu)
 - user (default: mccu30)
 - password (default: MCCU30)

11 SATEL MCCU-30 CONFIGURATION AND CONTROL

Please refer to document “SATEL MCCU-30 Configuration Instructions”, which explains principles of SATEL MCCU-30 configuration, local WebUI and local MQTT API.

Local Web UI provides the easiest way to configure the unit. Once MCCU-30 is attached to your computer (check that your computers IP address is on the same subnet than MCCU-30), open your computer’s web browser and type `http://10.10.100.1` in the address field to access the local web UI. Before the homepage opens, you will need to enter the user name and password. By using local web UI all the configuration parameters of SATEL MCCU-30 device are available and can be edited. Please check further details from document “SATEL MCCU-30 Configuration Instructions”.

<TO WHOM IT CONCERNS **ADD LINK TO THE SATEL WEB PAGE ONCE AVAILABLE**>

12 CELLULAR RF INTERFACE

SATEL MCCU-30 contains a Quectel EG25-G LTE Category 4 modem, which has global type approvals. Cellular modem has connectors for both main and diversity antennas, thus enabling RX MIMO for LTE. Both antennas must be connected, otherwise cellular modem performance may be significantly impaired.

12.1 SIM card

SATEL MCCU-30 has internal embedded eSIM card and replaceable 4FF form factor (nano-SIM) SIM card. MCCU-30 needs to be configured to either eSIM or 4FF SIM. Cellular modem does not support dual SIM operations, so both can't be selected.

After making changes to active SIM card selection, reboot of the device is needed to ensure that configuration is taken into use, same way as with all configuration changes.

12.1.1 eSIM effects to IP data traffic

When eSIM is chosen as active SIM card, all IP data is routed through eSIM provider's Point-of-Precence (PoP) center. Depending on eSIM provider, PoP may locate in different country than where MCCU-30 is used. This causes following challenges:

- IP geolocation services may not work properly
- Services restricted by IP location may not work properly
- IP traffic leaves original country and may be subject to other countries regulations
- IP traffic may face longer latencies than if used with 4FF SIM with local subscription
- Data throughput in general may be slower than if used with 4FF SIM with local subscription

12.2 Cellular RF interface configuration

Following items need to be configured for cellular interface to behave properly. Please ask these from your cellular operator.

- Access Point Name (APN)
- APN username
- APN password
- Preferred operator
- Selected operator

12.3 Cellular PLMN scan

SATEL MCCU-30 supports cellular PLMN scan operation i.e., the operation where device searches for all available cellular operators. The execution may take several minutes.

Please refer to SATEL MCCU-30 MQTT API for more information.

13 SATEL CONNECT – GLOBAL CONNECTIVITY SOLUTION

SATEL MCCU-30 contains a SATEL CONNECT - Global Connectivity solution. SATEL CONNECT offers global cellular connectivity.

13.1 Service

SATEL MCCU-30 has integrated eSIM card and offers SATEL CONNECT – Global connectivity solution, which allows end user to test the solution with complimentary 50 MB preloaded data. In case end user is willing to continue using SATEL CONNECT – Global Connectivity solution, the activation shall be done through web-portal, where all the data packages and possible top-ups are available as prepaid data packages. SATEL CONNECT is very easy to be taken into use, end user fills in the the needed information and pays the service with credit card. SATEL CONNECT is powered by TATA Communications, which is world leading connectivity service provider. TATA Communications has global presence and roaming agreements available with excellent coverage. Location of the device and network available has big effect on service coverage and performance. On certain locations there are possibility that service coverage has limitations or performance restrictions which might affect longer latency or smaller data throughput.

13.2 Activation

SATEL CONNECT – Global Connectivity solution is available as prepaid service package.

Following steps are needed to activate the service:

1. Enter the web-portal (<https://satel.hapyservices.com/>)
2. Fill in the details required
3. Select the needed data package
4. Pay with a credit card
5. Start using the service!

Service will send reminder to end user, if end user is running out of data or data package validity period is getting old. Service is maintained by Hapy Services.

13.2.1 **ICCID**

Each SATEL MCCU-30 device has integrated eSIM card with unique ICCID. To activate SATEL CONNECT – Global Connectivity solution, ICCID is mandatory information to be given. ICCID can be found from SATEL MCCU-30 carton box label as QR code (Figure 13.1), which can be read, copy and paste to SATEL CONNECT web portal for example by using cell phone.

ICCID can also be read from QR code on the type label (Figure 7.2.) attached to the device itself.

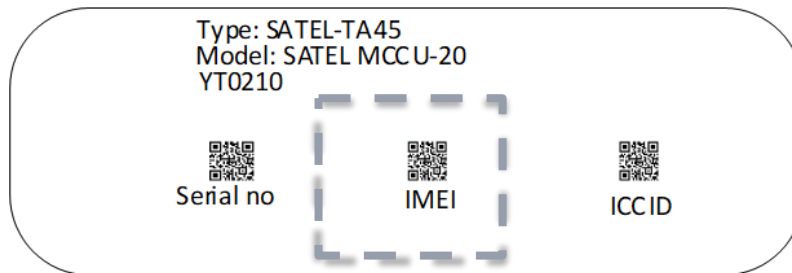


Figure 13-1. SATEL MCCU-30 carton box label, and ICCID on the right (circled).

14 SETTINGS

API and other details are available on request from SATEL technical support
(technical.support@satel.com)

14.1 Restoring SATEL MCCU-30 to default settings

In case the SATEL MCCU-30 has been misconfigured in way that it cannot be accessed through LAN, Wifi or SSR, MCCU-30 can be restored to default settings. Please contact SATEL tech support for help and instructions.

15 DEVICE SOFTWARE UPGRADE

SATEL MCCU-30 has various sub-modules, which contain different software. For example, the host system has its own software, LTE module has its own, and the UHF module has its own. All these will be upgraded in synchronization using SATEL provided mechanism.

The preferred way to upgrade SATEL MCCU-30 software is to use SSR, which commands SATEL MCCU-30 remotely. SATEL MCCU-30 can then download all software upgrade packages over the cellular network and performs the upgrade after packages have been downloaded and verified.

If SATEL MCCU-30's cellular network connection is not usable for downloading software packages, those can be served also over local network via API or via Local WebUI. Please refer to SATEL MCCU-30 MQTT API documentation for more information.

In any case, please **do not upgrade device software for any sub-component unless you are specifically instructed** to perform that operation. If software upgrade is needed, you will receive detailed instructions, along with software upgrade packages.

Please contact SATEL technical support for SW update package.

16 SATEL OPEN-SOURCE STATEMENTS

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16.2 Written offer for LGPL and GPL source code

Where such specific license terms entitle you to the source code of such software, SATEL will provide upon written request via email and/or traditional paper mail the applicable LGPL and GPL source code files via portable digital storage media for a nominal fee to cover shipping and media charges as allowed under those respective licenses.

16.3 AES encryption

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17 PROPOSALS FOR MORE RELIABLE RADIO LINK

In case where the environment is challenging the following methods can be used for improving the transmission reliability:

- Forward Error Correction, FEC, is recommended in challenging environment like urban areas.
- Directional antennas.
- Before building the radio link(s) it is highly recommended that the radio environment is measured to find out whether the radio environment is clean enough by using a spectrum analyser or radio module's RSSI, Received Signal Strength Indication, value.
- Co-operation with the local authority to find out the optimum free radio channel.
- If the channel is disturbed an external band-pass filter can be used for improving the filtering.
- If at the adjacent channel is TDMA, Time Domain Multiple Access, it is recommended to use time slot for receiving which is not in synchronization with the TDMA radio transmission.
- In Europe it is not recommended to use channels which are located near by the TETRA or television frequencies.

NOTE: Please notice that when operating on LTE B7 band there are restrictions on 2.4 GHz Wifi performance with upper channels (channels 8 and higher). In case you face issues with Wifi performance and LTE B7 band is in use by your LTE carrier, increasing Wifi and cellular antenna distance between each other or avoid using upper WLN channels, are the ways to mitigate the possible performance issues with Wifi.

18 VERSION HISTORY

Version history:

Version:	Date:	Remarks:
1.0	17.06.2025	First released version
1.1	09.07.2025	Figure changed for chapter 5 DESCRIPTION OF THE PRODUCT