

WORKING OFF HIGHWAY

Mission-Critical Connectivity in Machine Control

SATEL provides robust solutions for off-highway machinery connectivity. The work site and the process connectivity requirements are implemented reliably and cost effectively.

SATEL connectivity technology is perfect for mission-critical operations. It is used globally in machine control systems such as smart farming, construction and mining, field metering and monitoring, surveying, forestry, telematics, autonomous vehicles and drones, emergency stop and demining.

Focus on mission-critical connectivity applications:

- RTK correction signaling for centimeter level positioning accuracy
- Collision avoidance signaling (CAS)
- Machine to machine commands (V2V also V2X)
- Secure firmware updates
- Central control signal
- Safety signaling
- Mission-critical telematics

Read more: www.satel.com

SATEL is the world's leading expert and innovator in wireless networking technology. We design, manufacture and offer high quality connectivity solutions that enable secure, mission-critical connections, utilizing the best characteristics of each technology for real-life use-cases.

You can contact us directly or get in touch with your local distributor.



SATEL

Mission-Critical Connectivity

ROBUST AND RELIABLE CHOICE

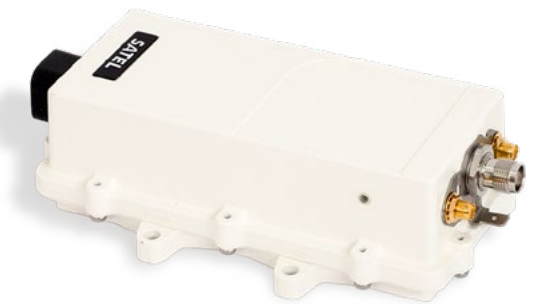
We at SATEL understand your business needs: Ultra-high reliability with robust mechanical design and cyber security.

The MCCU platform is designed to resolve connectivity challenges in harsh environments. It delivers mission-critical signaling from relatively small machine control messages with constant latency to wideband and low latency camera stream.

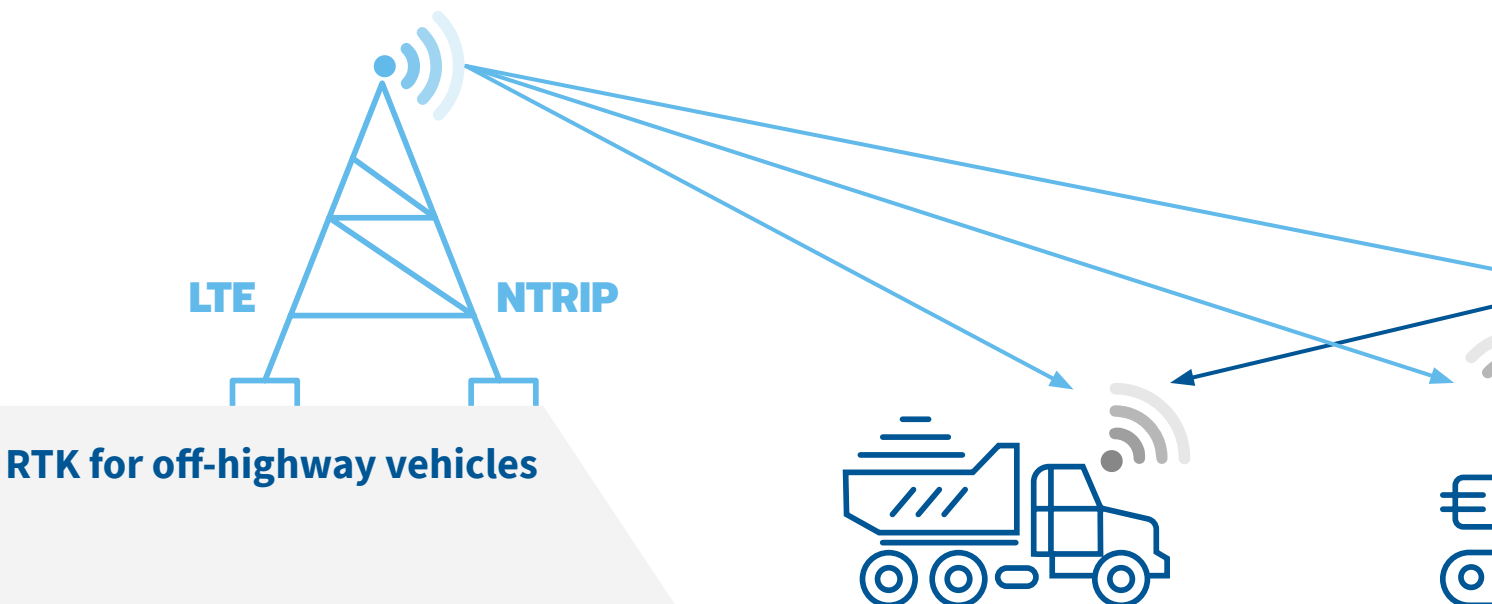
Intelligent integration of more than one radio technology can back-up each other to give more reliability and robustness for needs of mission-critical machine control. The MCCU platform can be configured optimally for each application without compromises and our engineering services for integration of connectivity technologies to vehicles benefit each counterparty.

Meeting the requirements

- Ultra-high reliability, often with back-up connectivity
- Cyber security
- Constant and low latency
- Confirmed minimum throughput
- Tolerance for very harsh environments



SATEL MCCU-20



INTRODUCING OUR SOLUTIONS

SATEL MCCU-20: **Cellular technology and UHF radio**

The SATEL MCCU-20 is a dual-technology RTK transceiver for receiving the GNSS RTK correction data to a moving vehicle with UHF radio based RTK or NTRIP over LTE. The RTK correction data is forwarded over RS-232 serial communication to machine control system.

The SATEL MCCU-20 has IP67 and IP69K classification and it withstands vibration and shock. It is based on field-proven mechanics, and all the electrical connections are equipped with surge and ESD (Electrostatic Discharge) protection.

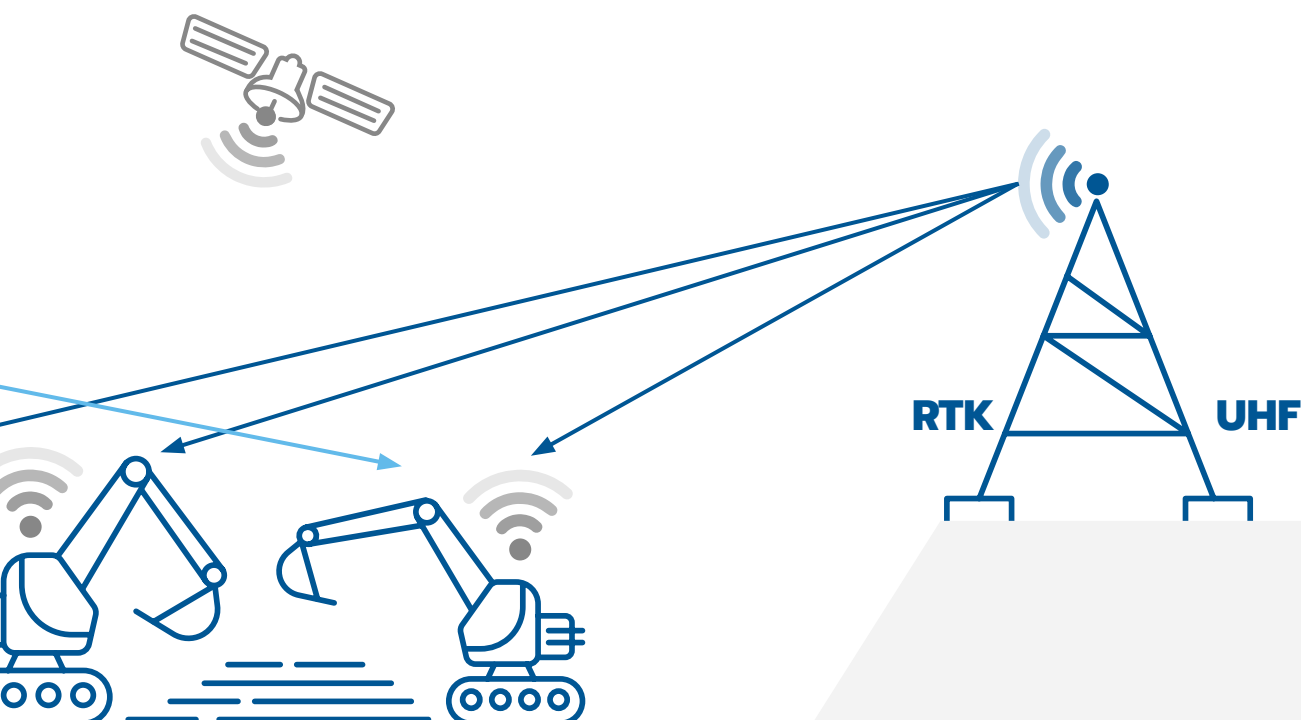
The machine and vehicle manufacturers and machine control system providers can integrate SATEL MCCU-20 to their offering without knowing what kind of technology is available in the operating area. The vehicle can be operated under varying connectivity environments.

SATEL MCCU-15: **Cellular technology**

The SATEL MCCU-15 is an RTK transceiver for receiving the GNSS RTK data to a moving vehicle with NTRIP over LTE. Robust hardware with IP67 and IP69K classification, field proven mechanics and surge protection combined. The SATEL MCCU-15 is a cost-effective option.

SATEL Proof-TR4+/-TR9: **UHF radio**

SATEL Proof-TR4+ / -TR9 is an RTK transceiver for receiving the GNSS RTK data to a moving vehicle with UHF radio based RTK. The modem consists of this IP69K sealed housing and a radio module using either 403-473 MHz or the ISM licence-free frequency band 902-928 MHz.



SATEL MCCU-20 & MCCU-15

SATEL MCCU-20: Two communication modules	LTE (NTRIP application, NMEA position upstream) and UHF 400 / 900 MHz radio (RTK Receiver)
SATEL MCCU-15: One communication module	LTE (NTRIP application, NMEA position upstream)
Serial interface	RS-232 (TD, RD lines)
Serial data speed	9600 – 921600 bps
Operating voltage	6–30 VDC
Temperature ranges	-30°C to +75°C (operational) -40°C to +85°C (storage)
Interface connector	Deutsch DT04-6P-CL09
Antenna connector	50 ohm, TNC female (tbc)
Power consumption	2 W max (tbc)
Housing	Shielded / bare PCB inside a metal housing
Size / Weight	176 mm x 95 mm x 42 mm / <500g
IP classification	IP67 / IP69K
Cellular bands	LTE-FDD: B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/ B19/B20/B25/B26/B28 LTE-TDD: B38/B39/B40/B41 WCDMA: B1/B2/B4/B5/B6/B8/B19 GSM: B2/B3/B5/B8

SATEL Proof-TR4+ / -TR9

SATEL order code	YM6577 SATEL Proof-TR4+ with AES YM6578 SATEL Proof-TR4+ w/o AES YM6410 SATEL Proof-TR9 region all YM6411 SATEL Proof-TR9 region US, CA YM6412 SATEL Proof-TR9 region AU, NZ, BR
Frequency	403 ... 473 / 902 ... 928 MHz
Channel width	12.5 / 20 / 25 kHz @ TR4
Spreading method	Frequency hopping @ TR9
RX sensitivity	-118 ... -105 dBm
TX power (max.)	1 W
Interface	RS-232 (TD, RD lines)
Operating voltage range	+7 ... +27.5 Vdc (-15% / +20%)
Power consumption TX / RX	7 / 1.2 W (typical)
Data speed (max.) radio / serial	28800 bps / 115200 bps @ TR4+ 115200 bps / 115200 bps @ TR9

Values are subject to change without a notice.

STANDARDS

In the EU the product falls under the scope of the radio equipment directive 2014/53/EU (RED). In the USA, the product fulfills relevant FCC parts.

Free fall	ISO 16750-3 (2012), Chapter 4.3
Operating shock	ISO 16750-3 (2012), Chapter 4.2.2
Random vibration	ISO 16750-3 (2012), chapter 4.1.2.7
Ingress Protection	ISO 20653 (2013), IP69K (150 bar)
Safety	IEC 62368-1
Conducted RF	ETSI EN 301 489-1 v.2.2.1
Radiated RF	EN 55032
ESD	IEC 61000-3-2 (2008-12) Level 4: 8 kV contact, 15 kV air discharge
RF immunity	IEC 61000-4-3 (2010-04) Level 4: 30 V/m
Surge	IEC 61000-4-5 (2005-11) Level 4: 4.0 kV, 2 kA, impedance 2 ohm, 8/20 us
Polarity	Reverse polarity protection -40 V

Integrated global roaming eSIM and traditional SIM card slot for local operator's subscription.

Type approvals for various markets are to be carried out. The road map of the approvals: Europe, Brazil, Japan, South Korea, Taiwan, China, Russia, Turkey, Turkmenistan, Azerbaijan, Uzbekistan, Kazakhstan, South Africa, Zimbabwe, Australia, New Zealand, Canada and USA (First operators: AT&T, Verizon).

Best for the job

Mission-critical connectivity is our expertise. We at SATEL help our customers find products that suit their needs the best, keeping in mind the right frequency ranges, compatibility with other system providers and operating environment.

The performance of SATEL technology is consistent and reliable. It is a safe way to ensure availability even in areas with limited coverage or no coverage at all.