Addendum ADD01 to DTFRUS068 for RailBox/XRXX_V2, /XSXX_V2, /XUXX_V2 & /XVXX_V2



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I. Glossary

APN: Access Point Network

ISP: Internet Service Provider

GUI: Graphic User Interface

SIM: Subscriber Identify Module

RSSI: Received Signal Strength Indicator

NAT: Network Address Translation

ICMP: Internet Control Management Protocol

UDP: User Datagram Protocol

TCP: Transmission Control Protocol

BER: Bit Error Rate estimator

ARFCN: Absolute Radio Frequency Channel Number

LAC/CID: Base station Local Area Code and Cellular cell ID.

MCC/MNC: Mobile Country Code / Mobile Network Code

II. OVERVIEW

This manual comprises all information to set-up the LTE and 5G product versions: The RailBox/XRXX_V2, /XSXX_V2, /XUXX_V2 and /XVXX_V2.

The first radio is: 0 antenna (no radio) or WIFI with 3 or 4 antennas according to the version

The second radio is a cellular module: 3 or 4 or 5 antennas according to the version



Figure 1: RailBox/DSA0_V2 example



Figure 2: RailBox/DVA0_V2 example

III. Cellular and GNSS Interfaces hardware part

A. Antenna connectors

Product version	Radio	Cellular Antenna connectors
RailBox/XRXX_V2	LTE Cat 6 Passive GNSS	3 cellular antennas: • Main (mandatory) antenna • Diversity (optional) antenna • Passive GNSS antenna*. (*It is mandatory to use a GNSS passive antenna)
RailBox/XSXX_V2	LTE Cat 12 Active GNSS	3 cellular antennas: • Main (mandatory) antenna • Diversity (optional) antenna • Active GNSS antenna with 1.8V power supply*. (*It is mandatory to use a GNSS active antenna)
RailBox/XUXX_V2	5G NR Sub-6 Bands DL: LTE Cat 19 UL: LTE Cat 18 Passive GNSS	4 cellular antennas: • ANT 1: 5G NR, LTE, WCDMA antenna • ANT 2: 5G NR, LTE, passive GNSS L5 antenna*. • ANT 3: 5G NR, LTE antenna • ANT 4: 5G NR, LTE, WCDMA, passive GNSS L1 antenna*. (*It is mandatory to use a GNSS passive antenna)
RailBox/XVXX_V2	5G NR Sub-6 Bands DL: LTE Cat 16 UL: LTE Cat 18 Active GNSS	5 cellular antennas: • ANT 1: Active GNSS L1, L5 antenna with 1.8V power supply *. • ANT 2: 5G NR, LTE, WCDMA antenna. • ANT 3: 5G NR, LTE, WCDMA antenna. • ANT 4: 5G NR, LTE, WCDMA antenna. • ANT 5: 5G NR, LTE, WCDMA antenna. (*It is mandatory to use a GNSS Active antenna)

B. Led indicators

LEDs	State	Description
Cellular Activity	Off	No transmission
	On / Flashing	Transmission occurs
Cellular State	Off	Disabled by configuration
	Flashing	Searching a BTS* antenna
	On	Attached to a BTS* antenna
GNSS State	Off	Disabled by configuration
	Flashing	Searching satellites
	On	Sync'd to satellites

*Base Transceiver Station

C. Cellular Radio characteristics

Version	RailBox/XRXX	RailBox/XSXX	RailBox/XUXX	RailBox/XVXX
Cellular Radio characteristics				
Type	LTE Cat 6	LTE Cat 12	5G	5G
Region	North America	Global	Global	Global (except for China)
Radio bands	**LTE-FDD**: B2/4/5/7/12/13/25/26/29/30/66; **LTE-TDD**: B41; **Up to 2 × CA**: B2+B2/5/12/13/293; B4+B4/5/12/13/293; B5+B5/7/25/30/66; B7+B7/12/26; B12+B12/25/30/66; B13+B66; B25+B25/26; B30+B29; B66+B29/66; B41+B41; **WCDMA**: B2/4/5	**LTE-FDD**: B1/2/3/4/5/7/8/12/13/14/ 17/18/19/20/25/26/28/29/30/32/66; **LTE-TDD**: B38/39/40/41/42/43/46/ 48(CBRS); **Up to 3 × CA**: Intra-band and Inter-band; **WCDMA**: B1/2/3/4/5/6/8/19	**5G NR**: n1/2/3/5/7/8/12/13/14/18/20/25/ 26/28/29/30/38/40/41/48/66/70/71/75/76/77/78/79; **LTE-FDD**: B1/2/3/4/5/7/8/12/13/14/17/18/19/20/25/ 26/28/29/30/32/66/71; **LTE-TDD**: B34/38/39/40/41/42/43/48; **LAA**: B46; **WCDMA**: B1/2/4/5/8/19	**5G NR**: n1/2/3/5/7/8/12/20/25/28/38/40/41/48/ 66/71/77/78/79; **LTE-FDD**: B1/2/3/4/5/7/8/12(17)/13/14/18/19/ 20/25/26/28/29/30/32/66/71; **LTE-TDD**: B34/38/39/40/41/42/43/48; **LAA**: B46; **WCDMA**: B1/2/3/4/5/6/8/19
Maximum bitrates	**LTE-FDD**: Max. 300 (DL)/Max. 50 (UL); **LTE-TDD**: Max. 226 (DL)/Max. 28 (UL) **DC-HSDPA**: Max. 42 Mbps (DL)/ **HSUPA**: Max. 5.76 Mbps (UL) **WCDMA**: Max. 384 Kbps (DL/UL)	**LTE-FDD**: Max. 600 Mbps (DL)/Max. 150 Mbps (UL); **LTE-TDD**: Max. 408 Mbps (DL)/Max. 90 Mbps (UL) **DC-HSDPA**: Max. 42 Mbps (DL)/ **HSUPA**: Max.11.2 Mbps (UL) **WCDMA**: Max. 384 Kbps (DL/UL)	**5G SA Sub-6**: Max. 2.4 Gbps (DL)/Max. 900 Mbps(UL); **5G NSA Sub-6**: Max. 3.4 Gbps (DL)/Max. 550 Mbps (UL) **LTE-FDD**: Max. 1.6 Gbps (DL)/Max. 200 Mbps (UL) **WCDMA**: Max. 42 (DL)/Max. 5.76 (UL)	**5G SA Sub-6**:Max. 2.1Gbps (DL)/Max. 450Mbps (UL); **5G NSA Sub-6**:Max. 2.5Gbps (DL)/Max. 650Mbps (UL); **LTE-FDD**: Max. 1 Gbps (DL)/Max. 200 Mbps (UL); **WCDMA**: Max. 42 (DL)/Max. 5.76 (UL)
SIM slots	2xMicroSIM	2xMicroSIM	2xMicroSIM	2xMicroSIM
GNSS Performance				
Satellite constellations	GPS/ GLONASS/ BeiDou/ Galileo/ QZSS	GPS/GLONASS/BeiDou/Galileo/QZSS	GPS/GLONASS/BDS/Galileo/QZSS	GPS/GLONASS/BDS/Galileo/QZSS
Sensitivity	**Cold start:** -145 dBm **Reacquisition:** -157 dBm **Tracking:** -157 dBm	**Cold start:** -148 dBm **Reacquisition:** -160 dBm **Tracking:** -159 dBm	**Cold start:** -147 dBm **Reacquisition:** -160 dBm **Tracking:** -160 dBm	**Cold start:** -142 dBm **Reacquisition:** -154 dBm **Tracking:** -154 dBm
TTFF (open sky)	**Cold start:** 43s (Autonomous), 10.5s (XTRA enabled) **Warm start:** 35s (Autonomous), 4.5s (XTRA enabled) **Hot start:** 4.5s (Autonomous), 3,5s (XTRA enabled)	**Cold start:** 27.46s (Autonomous), 17.07s (XTRA enabled) **Warm start:** 26.45s (Autonomous), 1.53s (XTRA enabled) **Hot start:** 1.02s (Autonomous), 1,03s (XTRA enabled)	**Cold start:** 27.93s (Autonomous), 19.25s (XTRA enabled) **Warm start:** 11.55s (Autonomous), 0.94s (XTRA enabled) **Hot start:** 1.09s (Autonomous), 0,79s (XTRA enabled)	**Cold start:** 36.26s (Autonomous), 11.09s (XTRA enabled) **Warm start:** 34.05s (Autonomous), 2.02s (XTRA enabled) **Hot start:** 1.22s (Autonomous), 1.11s (XTRA enabled)
Accuracy (open sky)	**CEP-50**: 2.5m	**CEP-50**: 2.08m	**CEP-50**: 1.35m	**CEP-50**: 1.9m

D. SIM card insertion

RailBox Series Cellular Router are products designed to accept 2 SIM cards in Nano-SIM format (the smallest format). We invite our customers to double check the compatibility of their SIM card and follow these steps below:

1. Power Off the Router by unplugging the power Supply.
2. If necessary, move the product in a safe area free from dust and water
3. Unscrew the top 4 screws of the box and remove the cover (2Nm +/-10%) with « in a criss-cross pattern »
4. Locate the two flat Micro SIM slots near the lights for WIFI (border side)
5. Choose one slot; they are labelled on one side (near the center of the device PCB)
6. To open the slot: make the slot cover slide by pushing it gently towards the border side
7. Now the cover can be lifted from the center side, around the axle which is at the border side
8. Place the Micro SIM card, gold contacts facing down, cut corner towards the border side
9. Lower back the slot cover and push it towards the SIM slot label, you should hear a faint click
10. Put back the cover in place and tight the 4 screws in a criss-cross pattern to a torque of 2Nm ±10%
11. Insert your SIM card into the SIM socket.



IV. Cellular and GNSS Interfaces software part

A. Cellular interface

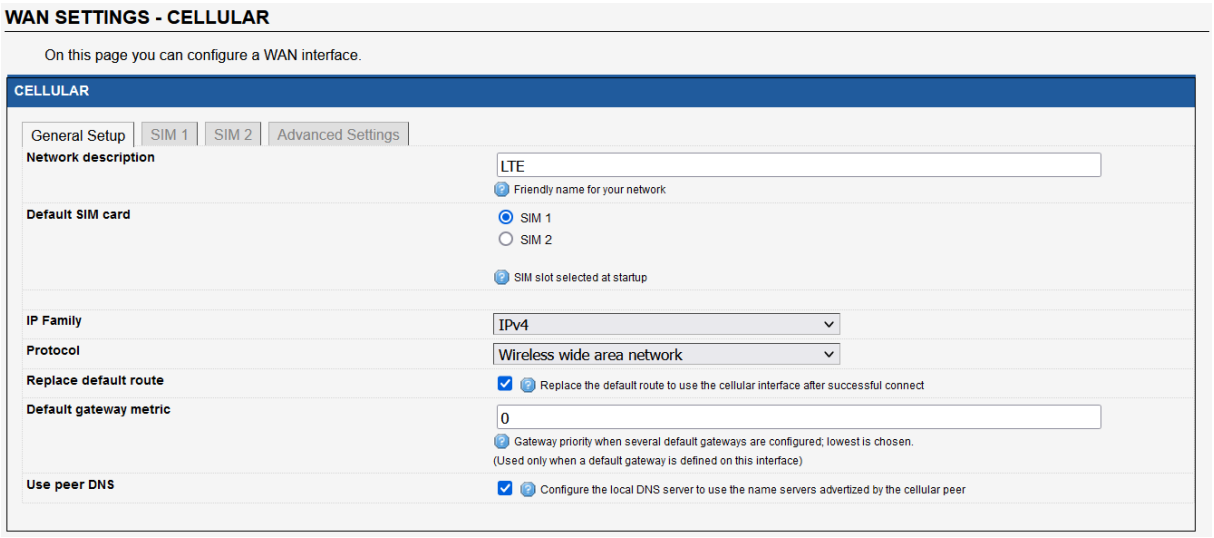
The Cellular Radio interface is enabled by default. It is an IP-only interface. The operator sets an IP address using DHCP. The interface cannot be inserted in a layer 2 Bridge.

There is only one page of configuration, which can be reached either by

- SETUP→Physical Interfaces→Cellular
- Or SETUP→Network→Cellular

There are 4 tabs:

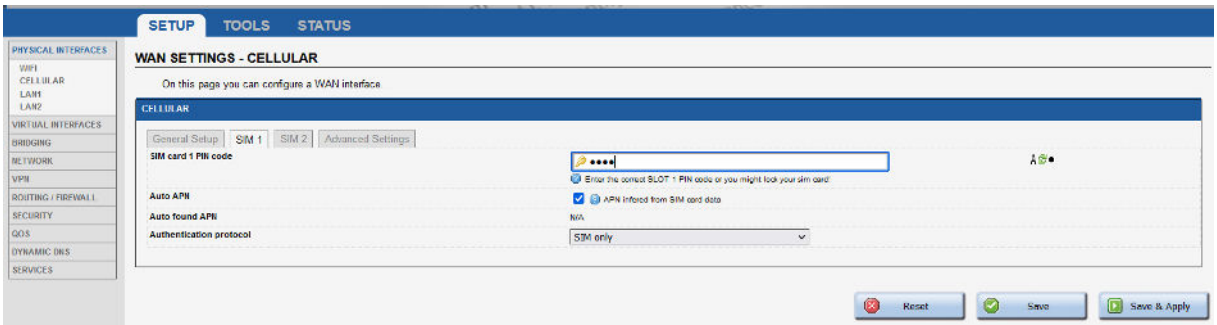
1. General setup



- Select IPv4 in IP family
- Check Replace default route
- Set 0 as routing metric 0 for default gateway
- Check Use peer DNS in case DNS is on the LAN to use the ISP DNS
- Save

2. SIM1, SIM2

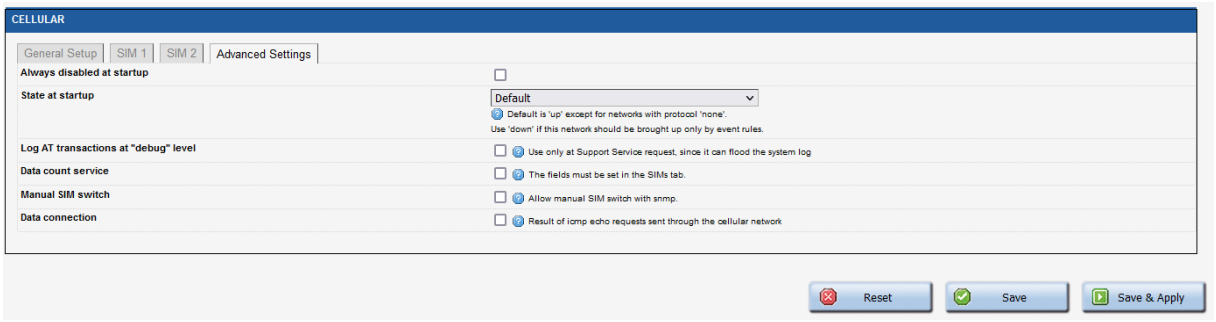
- Select the correct SIM slot and insert PIN code
- Select Auto APN box.



3. Advanced settings

These settings must not be used for normal operation. In this section you can:

- Enable AT transactions logs for better understanding in troubleshoot in case of issue.
- Save and apply the config
- Enable Data count service to count the mobile Data count
- Enable manual SIM switch to allow switch SIM by SNMP
- Tick the Data Connection in order to verify data connectivity



To check NMEA frame in CLI, we need to enable Cellular Log Level to Debug for more GNSS information in log.

Go in Tools Logs Setting→ Cellular → Log Setting

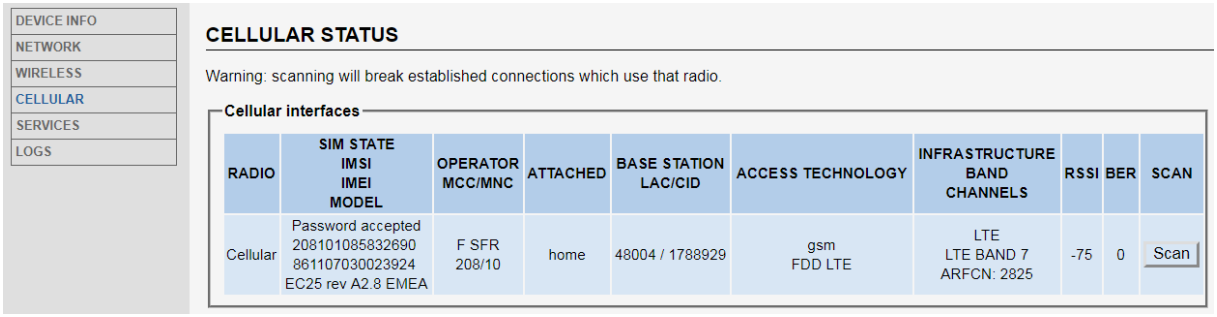


- Save and apply the config

4. Cellular status

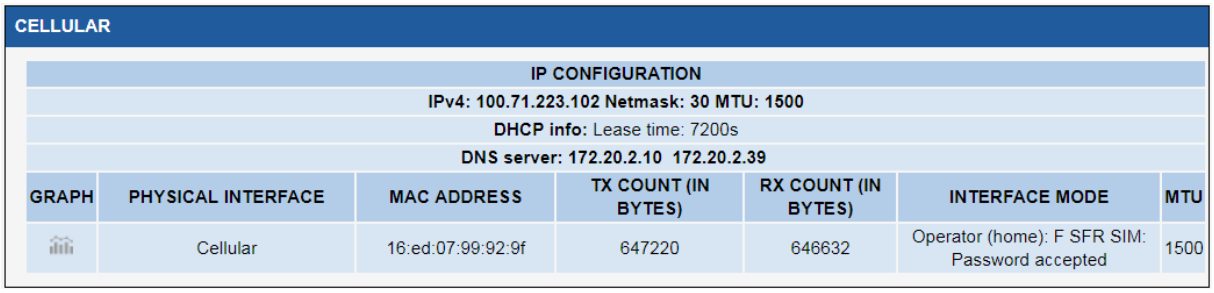
These settings must not be used for normal operation.

There is a STATUS→Cellular page which gives some information after the interface is enabled.



Model	The last part gives the supported country area.
MCC/MNC	Operator's international code.
Attached	Home means attached to a base station managed by the SIM provider. Roaming means attached to a compatible operator.
LAC/CID	Base station Local Area Code and Cellular cell ID.
ARFCN	Absolute Radio Frequency Channel Number.
RSSI	Signal quality estimator.
BER	Bit Error Rate estimator; estimated number of errors per 10000 bits (see 3GPP TS 45.008)

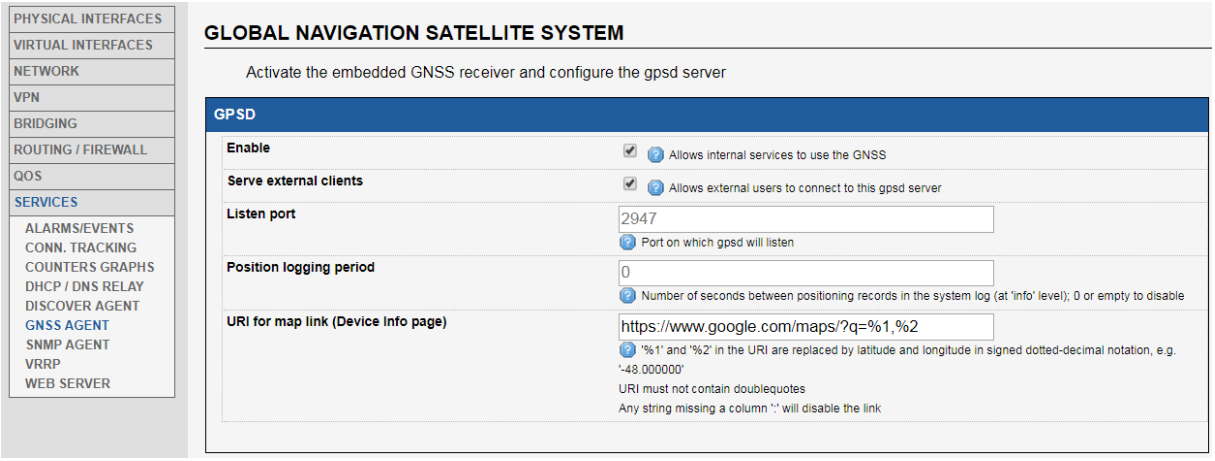
The STATUS→Network page informs about IP interfaces, including Cellular.



B. Position Acquisition System

The GNSS (Global Navigation Satellite System) service is disabled by default. It combines the position acquisition hardware and a well-known server named "gpsd" (see http://www.catb.org/gpsd/).

There is one page for configuration: SETUP→Services→GNSS Agent.



Enable	Enable use of the GNSS antenna.
Serve external clients	Enable devices on the LAN to query the position information from the gpsd serve using its published interface (see http://www.catb.org/gpsd/client-howto.html) or existing clients like “gpsmon”. If not checked, the position is only available in the following places: • STATUS→Device Info page • SNMP in OIDs acksys/serviceStatus/ss-gnss • System log (at “info” log level)
Position logging period	Delay between two position samples written to the System log. “0” to disable logging.
URI for map link	The STATUS→Device Info page uses the position data to set up a link. The default link is to Google Maps. You can change this to any target URL, using %1 and %2 as latitude and longitude parameters. URL missing a column disables the link.