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## I. Introduction

The RailBox/x4 and the RailBox/x7 versions feature a Cellular Radio Network interface and a Position Acquisition System.

### A. Cellular Interface

The radio interface supports UMTS and LTE cat 4. (E-UTRAN) connections to a compatible mobile phone network:

- Main (**mandatory**) antenna
- Diversity (optional) antenna
- Two SIM card slots located inside the case
- State / Activity / Signal strength LEDs.

### B. Position Acquisition System

The GNSS (Global Navigation Satellite System) provides geographical position determination:

- One **active** GNSS antenna. (It is mandatory to use an active antenna).
- GPS State LED
- Supports simultaneous satellite constellations: GPS, Galileo, GLONASS, Beidou.

## II. Addendum to the RailBox quick start guide DTFRUS054

The quick installation guide DTFRUS054 for the "WiFi-only" RailBox models applies to the cellular models RailBox/x4 & /x7, except for the differences underlined below.

Antennas connectors

Cellular Main

Cellular Diversity

GNSS

Sample GNSS antenna

Display LEDs

Cellular Signal Strength Bargraph

Cellular Activity

Cellular State

GNSS State

LED meaning	LEDs	Display	Meaning
LED meaning	Cellular Signal Strength Bargraph	0, 1, 2, 3 or 4 LEDs are lit depending on reception conditions	Shows quality of radio signal received from the attached operator base antenna
	Cellular Activity	Off	No transmission
		On / Flashing	Transmission occurs
	Cellular State	Off	Disabled by configuration
		Flashing	Searching a base antenna
		On	Attached to base antenna
	GNSS State	Off	Disabled by configuration
		Flashing	Searching satellites
		On	Sync'd to satellites

**RailBox/x4**

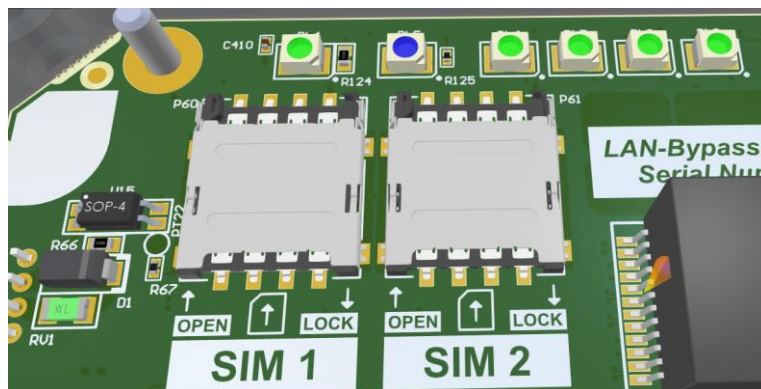
Cellular Radio characteristics	
Type	LTE Cat 4 EMEA
Radio bands	B1/B3/B5/B7/B8/B20@FDD LTE; B38/B40/B41@TDD LTE; B1/B5/B8@WCDMA; B3/B8 @GSM
Maximum bitrates (Mbps)	LTE-FDD: Max 150 (DL)/ Max 50 (UL) LTE-TDD: Max 130 (DL)/ Max 30 (UL) DC-HSPA+ : Max 42 (DL)/ Max 5.76 (UL) WCDMA : Max 0.384 (DL)/ Max 0.384 (UL) EDGE : Max 0.296 (DL)/ Max 0.2368 (UL) GPRS : Max 0.107 (DL)/ Max 0.0856 (UL)
Antenna connectors	2xQMA
SIM slots	2xMicroSIM
GNSS characteristics	
Satellite constellations	GPS, GALILEO, GLONASS, BEIDOU (automatic selection)
Sensitivity	-157 dBm (-146 dBm at cold start)
TTF (open sky)	35s (cold start), 26s (warm start)
Accuracy (CEP)	Horizontal: 1.5 m (5 feet) Vertical: 20m (66 feet)
Antenna connector	1xQMA

**RailBox/x7**

Cellular Radio characteristics	
Type	LTE Cat 4 GLOBAL WORLDWIDE
Radio bands	B1/B2/B3/B4/B5/B7/B8/B12/B13/B18/ B19/B20/B25/B26/B28@FDD LTE; B38/B39/B40/B41@TDD LTE; B1/B2/B4/B5/B6/B8/B19@WCDMA; B2/B3/B5/B8@GSM
Maximum bitrates (Mbps)	LTE-FDD: Max 150 (DL)/ Max 50 (UL) LTE-TDD: Max 130 (DL)/ Max 30 (UL) DC-HSPA+ : Max 42 (DL) HSUPA: Max 5.76 (UL) WCDMA : Max 0.384 (DL)/ Max 0.384 (UL) EDGE : Max 0.296 (DL)/ Max 0.2368 (UL) GPRS : Max 0.107 (DL)/ Max 0.0856 (UL)
Antenna connectors	2xQMA
SIM slots	2xMicroSIM
GNSS characteristics	
Satellite constellations	GPS, GALILEO, GLONASS, BEIDOU (automatic selection)
Sensitivity	-157 dBm (-146 dBm at cold start)
TTF (open sky)	35s (cold start), 26s (warm start)
Accuracy (CEP)	Horizontal: 1.5 m (5 feet) Vertical: 20m (66 feet)
Antenna connector	1xQMA

### SIM card insertion

- 1) Unplug 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
- 4) Locate the two flat SIM slots near the lights for WiFi 1 (border side)
- 5) Choose one slot; they are labeled 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 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  $2\text{Nm} \pm 10\%$



### III. Addendum to the WaveOs User Guide DTUS070

#### A. Cellular interface

The Cellular Radio interface is disabled 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 5 tabs:

#### 1. General setup

<b>PHYSICAL INTERFACES</b> WIFI CELLULAR LAN 1 LAN 2	<b>WAN SETTINGS - CELLULAR</b> On this page you can configure a WAN interface.
<b>VIRTUAL INTERFACES</b> NETWORK VPN BRIDGING ROUTING / FIREWALL QOS SERVICES	<div style="background-color: #0056b3; color: white; padding: 2px;"><b>CELLULAR</b></div> <div style="border: 1px solid #ccc; padding: 5px;"> <div style="display: flex; justify-content: space-between; border-bottom: 1px solid #ccc; margin-bottom: 5px;"> <span>General Setup</span> <span>Cellular Settings</span> <span>SIM 1</span> <span>SIM 2</span> <span>Advanced Settings</span> </div> <div style="display: flex; margin-bottom: 5px;"> <div style="flex: 1; border-bottom: 1px solid #ccc; padding-bottom: 2px;"><b>Enable interface</b></div> <div style="flex: 0 0 20px; text-align: center;"><input checked="" type="checkbox"/></div> </div> <div style="display: flex; margin-bottom: 5px;"> <div style="flex: 1; border-bottom: 1px solid #ccc; padding-bottom: 2px;"><b>Network description</b></div> <div style="flex: 0 0 20px; text-align: center;"><input type="text" value="Cellular"/></div> </div> <div style="display: flex; margin-bottom: 5px;"> <div style="flex: 1; border-bottom: 1px solid #ccc; padding-bottom: 2px;"><b>Protocol</b></div> <div style="flex: 0 0 20px; text-align: center;"><input type="text" value="DHCP"/></div> </div> </div>

Enable Interface	Cellular interface is disabled by factory settings. Check this box to use the interface.
Network description	Friendly name of the interface.
Protocol	Read only field. Only DHCP for IPv4 is supported.

#### 2. Cellular settings

<b>CELLULAR</b>
<div style="display: flex; justify-content: space-between; border-bottom: 1px solid #ccc; margin-bottom: 5px;"> <span>General Setup</span> <span>Cellular Settings</span> <span>SIM 1</span> <span>SIM 2</span> <span>Advanced Settings</span> </div> <div style="display: flex; margin-bottom: 5px;"> <div style="flex: 1; border-bottom: 1px solid #ccc; padding-bottom: 2px;"><b>Default to SIM card 2</b></div> <div style="flex: 0 0 20px; text-align: center;"><input checked="" type="checkbox"/></div> <div style="flex: 1; border-bottom: 1px solid #ccc; padding-bottom: 2px;"><input type="checkbox"/> Use the SIM card in slot 2 at startup</div> </div> <div style="display: flex; margin-bottom: 5px;"> <div style="flex: 1; border-bottom: 1px solid #ccc; padding-bottom: 2px;"><b>Replace default route</b></div> <div style="flex: 0 0 20px; text-align: center;"><input checked="" type="checkbox"/></div> <div style="flex: 1; border-bottom: 1px solid #ccc; padding-bottom: 2px;"><input type="checkbox"/> Replace the default route to use the cellular interface after successful connect</div> </div> <div style="display: flex; margin-bottom: 5px;"> <div style="flex: 1; border-bottom: 1px solid #ccc; padding-bottom: 2px;"><b>Use peer DNS</b></div> <div style="flex: 0 0 20px; text-align: center;"><input checked="" type="checkbox"/></div> <div style="flex: 1; border-bottom: 1px solid #ccc; padding-bottom: 2px;"><input type="checkbox"/> Configure the local DNS server to use the name servers advertised by the cellular peer</div> </div>

Default to SIM card 2	Check to use SIM2 slot. Uncheck to use SIM1 slot.
Replace default route	Check this box to override configured default route using the gateway acquired from DHCP on the cellular interface.
Use peer DNSs	Check this box to override configured DNS using the ones acquired from DHCP on the cellular interface.

### 3. SIM1, SIM2

PIN code	SIM card PIN code. <b>Warning:</b> using the wrong PIN may lock out the SIM card after two tries.
Access point (APN)	Access point name, needed for UMTS fallback.
Authentication protocol	Authenticate to operator using SIM IMSI, or use legacy PAP/CHAP with user and password.

### 4. Advanced settings

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.

CELLULAR						
IP CONFIGURATION						
IPv4: 100.71.223.102 Netmask: 30 MTU: 1500						
DHCP info: Lease time: 7200s						
DNS server: 172.20.2.10 172.20.2.39						
GRAPH	PHYSICAL INTERFACE	MAC ADDRESS	TX COUNT (IN BYTES)	RX COUNT (IN BYTES)	INTERFACE MODE	MTU
	Cellular	16:ed:07:99:92:9f	647220	646632	Operator (home): F SFR SIM: Password accepted	1500

## 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.

PHYSICAL INTERFACES

VIRTUAL INTERFACES

NETWORK

VPN

BRIDGING

ROUTING / FIREWALL

QOS

SERVICES

ALARMS/EVENTS

CONN. TRACKING

COUNTERS GRAPHS

DHCP / DNS RELAY

DISCOVER AGENT

GNSS AGENT

SNMP AGENT

VRRP

WEB SERVER

### GLOBAL NAVIGATION SATELLITE SYSTEM

Activate the embedded GNSS receiver and configure the gpsd server

**GPSD**

**Enable**  Allows internal services to use the GNSS

**Serve external clients**  Allows external users to connect to this gpsd server

**Listen port**  Port on which gpsd will listen

**Position logging period**  Number of seconds between positioning records in the system log (at 'info' level); 0 or empty to disable

**URI for map link (Device Info page)**  '%1' and '%2' in the URI are replaced by latitude and longitude in signed dotted-decimal notation, e.g. '-48.000000'. URI must not contain doublequotes. Any string missing a column ':' will disable the link

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 <a href="http://www.catb.org/gpsd/client-howto.html">http://www.catb.org/gpsd/client-howto.html</a> ) or existing clients like “gpsmon”.  If not checked, the position is only available in the following places: <ul style="list-style-type: none"> <li>STATUS→Device Info page</li> <li>SNMP in OIDs acksys/serviceStatus/ss-gnss</li> <li>System log (at “info” log level)</li> </ul>
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.