

# RailBox V2 series

High performance railway router, with WiFi 6 / WiFi 6E and LTE 4G / 5G connectivity for Onboard and Trackside communications



- Single or dual radio WiFi and cellular :
  - > WiFi 802.11ax MIMO 4T4R dual band 2.4 GHz and 5GHz
  - > WiFi 6E (6 GHz)
  - > 4G LTE category 12 or 5G cellular radio with dual sim
- 2 Ethernet ports 2.5Gbps
- Multi-functions router, AP, client, mesh
- Inter-Carriage Link (ICL):
  - > SRCC automatic coupling
  - > Ethernet Bypass relay (optional)
- Access Point:
  - > Load balancing, band steering, Hotspot 2.0
  - > Cybersecurity : Rogue AP Detection, WPA3 personal & enterprise
- Fast Roaming:
  - > CBB roaming with less than 0.1% packet loss
- NMS WaveManager
- EN50155, EN45545 certified router :
  - > Ultra-wide 24 to 110 VDC or PoE++ 802.3bt type 3
  - > Dual insulated redundant power supply input



## Introduction

RailBox V2 is a rugged device designed for railway and light rail applications. It can be mounted on trains, subways, trams or in any equipment that requires robustness and high bandwidth for innovative services on the move.

RailBox V2 can be implemented by system integrators and rail vehicle manufacturers who are seeking to establish reliable, efficient and agile network for:

- Uninterrupted train-to-trackside communications (CBTC, CCTV, VoIP, preventive maintenance, PIS...)
- Train and carriage coupling to establish an end-to-end Ethernet and IP backbone
- Passenger services like onboard WiFi, videostreaming, entertainment, infotainment...
- High Speed data offload at the station or depot

The device relies on the multi-streams MU-MIMO and beamforming technology that contributes to an expanded coverage, higher data throughput and increased radio link reliability.

It fulfills the most severe requirements in terms of operating environment: from -25°C to +70°C (extended : -40°C to +70°C), shock and vibration proof, protection against dust and water projections (IP66).

RailBox V2 is an evolution of Railbox, with exactly the same footprint (same dimensions and same connectors). This allows a smooth and cost-efficient upgrade of customers already equipped with Railbox products.

## Technical characteristics overview

|                                     |  |
|-------------------------------------|--|
| <b>Ethernet interface</b>           | 2-port Gigabit Ethernet 100/1000/2500 auto-sensing, up to 5 Gbps link aggregation, water and vibration proof rapid connect 8-point M12 X-coded connectors (CAT-6A) plug & play mode & auto MDI/MDIX cross-over, optional Ethernet bypass that redirects the network traffic in case of device or power supply failure (for daisy chain topologies)         |
| <b>Radio interfaces</b>             | Radio 1: none or WiFi<br>Radio 2: none or WiFi or cellular   |
| <b>Security</b>                     | Firewall, DoS, https, MAC filtering, WPA/WPA2/WPA3-Personal & Enterprise (IEEE 802.1X/RADIUS), tunnels L2 (GRE), VPN (OpenVPN, IPsec), SNMP V3, Rogue AP detector, File system integrity monitor, Strong password policy, Management of opened ports and services  |
| <b>WiFi Modes</b>                   | AP, client, MESH (IEEE 802.11s), infrastructure, fast roaming (less than 30 ms), WMM QoS   |
| <b>WiFi Services</b>                | Hot Spot 2.0, Wireless Load Balancing (load balancing, band steering, client roaming control, association control per SSID)  |
| <b>Cellular Services</b>            | Dynamic DNS, Auto APN, Switch SIM, Multi APN   |
| <b>ACKSYS enhanced features</b>     | Connect Before Break, Smart Redundant Carriage Coupling  |
| <b>Ethernet networking</b>          | Frames filtering, bridging, repeater, STP/RSTP, VLAN, DHCP (server & client), DNS relay, IPv6 compliant, LLDP  |
| <b>Ethernet routing</b>             | Multicast (PIM), IP redundancy (VRRP), static routes, NAT router, router, carriage coupling system (SRCC)  |
| <b>Administration</b>               | MQTT, http, https, SNMP agent (V1, V2C, V3), WaveManager administration software, save / restore configuration key (C-Key)   |
| <b>LEDs Signaling</b>               | Radio: quality, activity and status   Ethernet: link 100/1000/2500, activity   Power: on-off   |
| <b>Alarms &amp; Inputs</b>          | A 3-pin Waterproof M8 connector with:<br>- one solid state relay output warning (with configurable action), 1 Form A, 60VDC 80mA max<br>- one input for external device control 24VDC max  |
| <b>Power supply</b>                 | Dual insulated redundant input (1500V insulation, M12 connectors 4-pole A-coded) 24 to 110 VDC (EN50155 nominal), with ground lug. PoE++ 802.3bt type 3 model with ground lug also available.  |
| <b>Consumption</b>                  | 26W typical power consumption (dual radio), 30W max  |
| <b>Dimensions &amp; weight</b>      | Compact shockproof rugged aluminium enclosure, (L: 80 x l: 175 x h: 57 mm), 900g Removable fixing plate: 4-point fixing plate with ground lug (L: 80 x l: 225 x h: 4 mm), 200g   |
| <b>Standards and certifications</b> | CE (RED) Safety: EN 62368-1:2014+A11, EN62311<br>EMC: EN 301 489 [-1], [-17]<br>Radio: EN 300 328 (2.4 GHz), EN 301 893 (5 GHz, DFS)<br>EMC: EN 50155, EN 50121-4, EN 50121-3-2<br>Environmental:<br>• Shocks and vibration: EN 61373 (CAT 1 CLASS B)<br>• Climatic: EN60068-2 [-1, -2, -30]<br>• Fire/smoke: EN45545-2 (HL3), NF F16-101 (M1F1), NFPA 130 |
| <b>Environment</b>                  | Operating : -25°C to +70°C (HR 0-99%)<br>Extended : -40°C to +70°C / +85°C for 10 mn, EN 50155 class TX<br>Storage: -40°C to +80°C<br>IP66 seal rating, GORE ® protective vent (dehumidifying membrane)  |

## Technical characteristics overview

|  |   |  |  |  |
|--|---|--|--|--|
| <b>WiFi</b>  |   |  |  |  |
| <b>WiFi radio cards</b>  | 802.11n: MCS0-7<br>802.11ac: MCS0-9<br>802.11ac wave 2: MCS0-9<br>802.11ax (WiFi 6): MCS0-11  | 3 streams (up to 450 Mbps)<br>3 streams (up to 1.3 Gbps)<br>4 streams (up to 1.73 Gbps)<br>4 streams (up to 4.8 Gbps)                        | 3 QMA connectors<br>3 QMA connectors<br>4 QMA connectors<br>Up to 4 QMA connectors |  |
| <b>Operating frequencies</b>   | Supports all ISM and UNII bands, 2.4 and 5GHz<br>Supports HT20, HT40, HT80, HT160, depending on the WiFi radio card<br>Supports DFS and TPC<br>Supports 5.925 to 7.125 Ghz, only on WiFi 6E model   |  |  |  |
| <b>Radio max transmit power</b>  | Up to 24dBm (aggregate)   |  |  |  |
| <b>CELLULAR LTE 4G cat.12 : Worldwide coverage + GNSS (active antenna) - RailBox/xS model</b>            |   |  |  |  |
| <b>Operating frequencies</b>   | LTE-FDD (with Rx-diversity) B1/B2/B3/B4/B5/B7/B8/B12/B13/B14/B17/B18/B19/B20/B25/B26/B28/B29/B30/B32/B66<br>LTE-TDD (with Rx-diversity) B38/B39/B40/B41/B42/B43/B46/B48<br>WCDMA (with Rx-diversity) B1/B2/B3/B4/B5/B6/B8/B19   |  |  |  |
| <b>Cellular radio data rate</b>  | Max. downlink 600Mbps / Max. uplink 150 Mbps  |  |  |  |
| <b>SIM</b>   | 2 x micro SIM   |  |  |  |
| <b>Navigation</b>  | GNSS Multi-constellation (GPS, GLONASS, BeiDou, Galileo). Requires an active antenna.   |  |  |  |
| <b>Connectors</b>  | 2 x QMA for Cellular and 1 x QMA for GNSS   |  |  |  |
| <b>CELLULAR 5G WITH PASSIVE ANTENNA : Worldwide coverage + GNSS (passive antenna) - RailBox/xU model</b> |   |  |  |  |
| <b>Operating frequencies</b>   | 5G NR SA : n1/n2/n3/n5/n7/n8/n12/n13/n14/n18/n20/n25/n26/n28/n29/n30/n38/n40/n41/n48/n66/n70/n71/n75/n76/n77/n78/n79<br>DL 4x 4 MIMO : n1/n2/n3/n7/n25/n30/n38/n40/n41/n48/n66/n70/n77/n78/n79<br>UL 2x 2 MIMO : n38/n41/n48/n77/n78/n79<br><br>5G NR NSA : n1/n2/n3/n5/n7/n8/n12/n13/n14/n18/n20/n25/n26/n28/n29/n30/n38/n40/n41/n48/n66/n70/n71/n75/n76/n77/n78/n79<br>DL 4x 4 MIMO : n1/n2/n3/n7/n25/n30/n38/n40/n41/n48/n66/n70/n77/n78/n79 |  |  |  |
| <b>Cellular radio data rate</b>  | 5G SA Sub-6<br>5G NSA Sub-6<br>LTE<br>DC-HSDPA<br>HSUPA<br>WCDMA  | DL 2.4 Gbps; UL 900 Mbps<br>DL 3.2 Gbps; UL 550 Mbps<br>DL 1.6 Gbps; UL 200 Mbps<br>DL 42 Mbps<br>UL 5.76 Mbps<br>DL 384 kbps; UL 384 kbps   |  |  |
| <b>SIM</b>   | 2 x micro SIM   |  |  |  |
| <b>Navigation</b>  | GNSS Multi-constellation (GPS, GLONASS, BeiDou, Galileo). Requires a passive antenna.   |  |  |  |
| <b>Connectors</b>  | 4 x QMA for Cellular (or 3 x QMA for Cellular and 1 x QMA for GNSS)   |  |  |  |
| <b>CELLULAR 5G WITH ACTIVE ANTENNA Worldwide coverage + GNSS (active antenna) - RailBox/xV model</b>     |   |  |  |  |
| <b>Operating frequencies</b>   | 5G NR SA : n1/n2/n3/n5/n7/n8/n12/n20/n25/n28/n38/n40/n41/n48/n66/n71/n77/n78/n79<br>DL 4x 4 MIMO : n1/n2/n3/n7/n25/n38/n40/n41/n48/n66/n77/n78/n79<br>UL 2x 2 MIMO : n41<br><br>5G NR NSA : n1/n2/n3/n5/n7/n8/n12/n20/n25/n28/n38/n40/n41/n48/n66/n71/n77/n78/n79<br>DL 4x 4 MIMO : n1/n2/n3/n7/n25/n38/n40/n41/n48/n66/n77/n78/n79   |  |  |  |
| <b>Cellular radio data rate</b>  | 5G SA Sub-6<br>5G NSA Sub-6<br>LTE<br>DC-HSDPA<br>HSUPA<br>WCDMA  | DL 2.1 Gbps; UL 450 Mbps<br>DL 2.5 Gbps; UL 600/650 Mbps<br>DL 1 Gbps; UL 200 Mbps<br>DL 42 Mbps<br>UL 5.76 Mbps<br>DL 384 kbps; UL 384 kbps |  |  |
| <b>SIM</b>   | 2 x micro SIM   |  |  |  |
| <b>Navigation</b>  | GNSS Multi-constellation (GPS, GLONASS, BeiDou, Galileo). Requires an active antenna.   |  |  |  |
| <b>Connectors</b>  | 4 x QMA for Cellular and 1 x QMA for GNSS   |  |  |  |

## Ordering references

### RailBox/RRXB\_V2

Single or dual WiFi Access Point or LTE-A or 5G gateway for railway and mobile applications, shipped with a fixing plate (already mounted).

### RailBox/RRXB\_V2

| Radio 1 (R) coding   | Radio 2 (R) coding  | Power supply (X) coding  | Bypass (B) coding  |
|--|---|--|--|
| <b>0</b> = No radio<br><br><b>WiFi</b><br><b>1</b> = WiFi 802.11n (fast roaming, Mesh), -25°C to +70°C<br><b>2</b> = WiFi 802.11ac, -40°C to +75°C (+85°C for 10 mn, EN 50155 class TX)<br><b>5</b> = WiFi 802.11n (fast roaming, Mesh), -40°C to +75°C (+85°C for 10 mn, EN 50155 class TX)<br><b>D</b> = WiFi 802.11ax 2.4GHz and 5GHz, -40°C to +70°C (+85°C for 10 mn, EN 50155 class TX)<br><b>E</b> = WiFi 6E (6 GHz band) | <b>0</b> = No radio<br><br><b>WiFi</b><br><b>1</b> = WiFi 802.11n (fast roaming, Mesh), -25°C to 70°C<br><b>2</b> = WiFi 802.11ac, -40°C to +75°C (+85°C for 10 mn, EN 50155 class TX)<br><b>5</b> = WiFi 802.11n (fast roaming, Mesh), -40°C to +75°C (+85°C for 10 mn, EN 50155 class TX)<br><b>D</b> = WiFi 802.11ax 2.4GHz and 5GHz, -40°C to +70°C (+85°C for 10 mn, EN 50155 class TX)<br><br><b>Cellular + GNSS</b><br><b>S</b> = 4G LTE cat 12 (Worldwide) + GNSS (active antenna)<br><b>U</b> = 5G (Worldwide) + GNSS (passive antenna)<br><b>V</b> = 5G (Worldwide) + GNSS (active antenna) | <b>A</b> = +24VDC to +110VDC (EN 50155 nominal)<br><br><b>P</b> = PoE++ 802.3bt type 3 | <b>0</b> = No Bypass<br><b>Y</b> = Bypass<br><br><i>The Ethernet bypass redirects the network traffic in case of device or power supply failure (useful for daisy chain network topologies)</i><br><br><b>Note: Bypass is not compatible with PoE model.</b> |

### Combination examples (non-exhaustive list)

| RailBox model | Radio 1  | Radio 2           | Number of radio connectors |           | Type                        | Power supply | Bypass |
|---------------|----------|-------------------|----------------------------|-----------|-----------------------------|--------------|--------|
|               |          |                   | Radio 1                    | Radio 2   |                             |              |        |
| RailBox/D0P0  | 802.11ax | none              | 4                          | 0         | WiFi                        | PoE          | NO     |
| RailBox/DDAY  | 802.11ax | 802.11ax          | 4                          | 4         | WiFi                        | 24-110 VDC   | YES    |
| RailBox/DSA0  | 802.11ax | LTE cat 12 + GNSS | 4                          | 2 +1      | WiFi + cellular + GNSS (WW) | 24-110 VDC   | NO     |
| RailBox/DUA0  | 802.11ax | 5G + GNSS         | 4                          | 4 or 3 +1 | WiFi + cellular + GNSS (WW) | 24-110 VDC   | NO     |
| RailBox/DVA0  | 802.11ax | 5G + GNSS         | 3                          | 4 +1      | WiFi + cellular + GNSS (WW) | 24-110 VDC   | NO     |
| RailBox/E0P0  | WiFi 6E  | none              | 4                          | 0         | WiFi                        | PoE          | NO     |
| RailBox/EDAY  | WiFi 6E  | WiFi 6            | 4                          | 4         | WiFi                        | 24-110 VDC   | YES    |

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