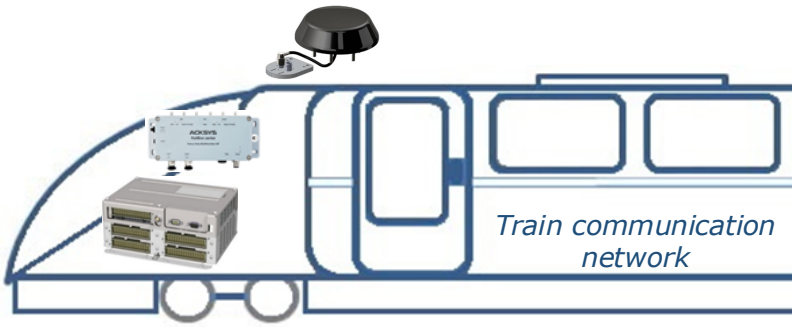
Train Geolocalisation System



Application note
GPSD Client

004_APN_004_A.0

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Purpose of document

RIOM is Ethernet-based input/output controller designed to be embedded on-board rolling stock vehicles.

RIOM is fully compliant with the EN50155 standard for railway systems.

This application note describes the implementation of the ACKSYS Railbox as a position acquisition system in the TCMS and the GPSD client function block using **Straton** software.

Following User Manuals for RIOM are available:

- ✓ User Manual "Hardware specifications" P_DOC_RIOM_001E
- ✓ User Manual "User's manual STRATON programming" P_DOC_RIOM_006E

Safety instructions

Following symbols are used in this documentation in order to avoid user for potential risks:


Risk of personal injury or damage to the equipment.


Risk of an electrical hazard.

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1. Introduction

The function block allows the RIOM to communicate with a GPSD server through TCP-IP sockets, in order to recover the geographical position of the system. The GPSD server is part of the GNSS receiver embedded in a railway router. A Railbox V2 series from ACKSYS connected to an OmPlecs TOP 200 Multiband-Train antenna from ANTONICS, have been used for design and test.

1.1. Glossary and acronyms

TCMS	Train Control Monitoring System
VCU	Vehicle Control Unit
GPS	Global Positioning System
GNSS	Global Navigation Satellite System

1.2. Hardware description

RIOM, acting as a VCU, ACKSYS Railbox as a position acquisition system, as well as the ANTONICS antenna and Ethernet Switch are units fully compliant with the EN50155 standard, and are designed to be integrated in embedded railway systems and subsystems.

Figure 1 : Leroy Automation RIOM and ACKSYS Railbox V2 series

Figure 2 : ANTONICS OmPlecs TOP 200 Multiband-Train antenna and MIOS MTES6407 Switch

1.3. System architecture

The RIOM and Railbox communicate over the Ethernet network. The Railbox recovers the geographical position from the ANTONICS active antenna by radio frequency through a coaxial cable.

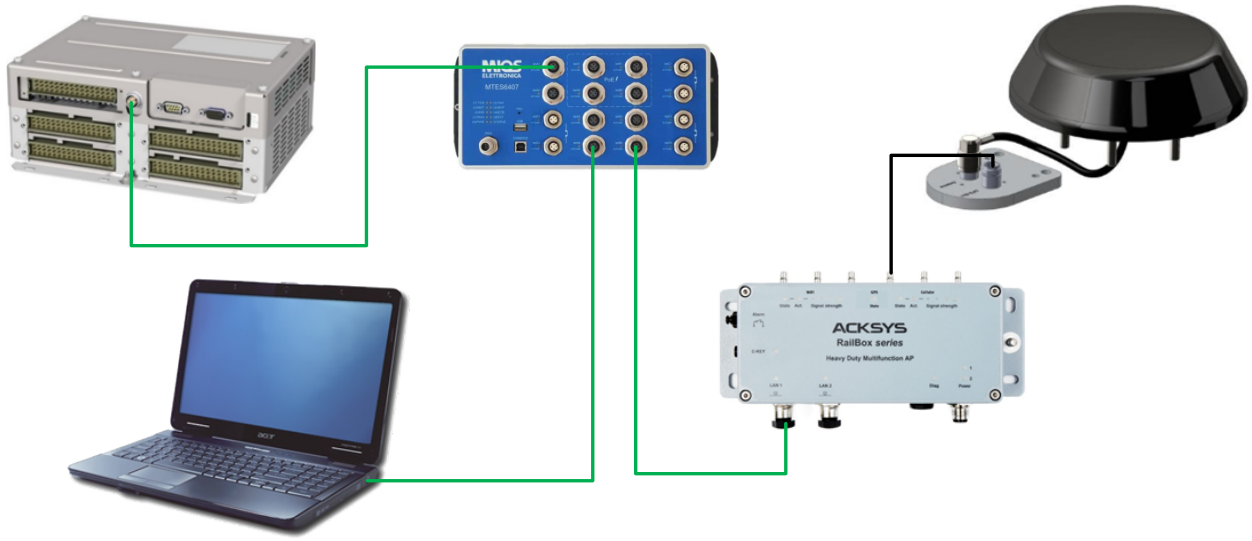

Figure 3 : System architecture

2. ACKSYS Railbox settings

The Railbox features a cellular radio network interface and a position acquisition system. The settings can be done using the web interface of the Railbox server.

Position acquisition system

The Railbox shall be connected to a GNSS antenna, it supports simultaneous satellite constellations (GPS, Galileo, GLONASS and Beidou).

The GNSS service is disabled by default. It combines the position acquisition hardware and a well-known server named "gpsd" (see https://gpsd.gitlab.io/gpsd/index.html).

There is one page for configuration from railbox's web server:

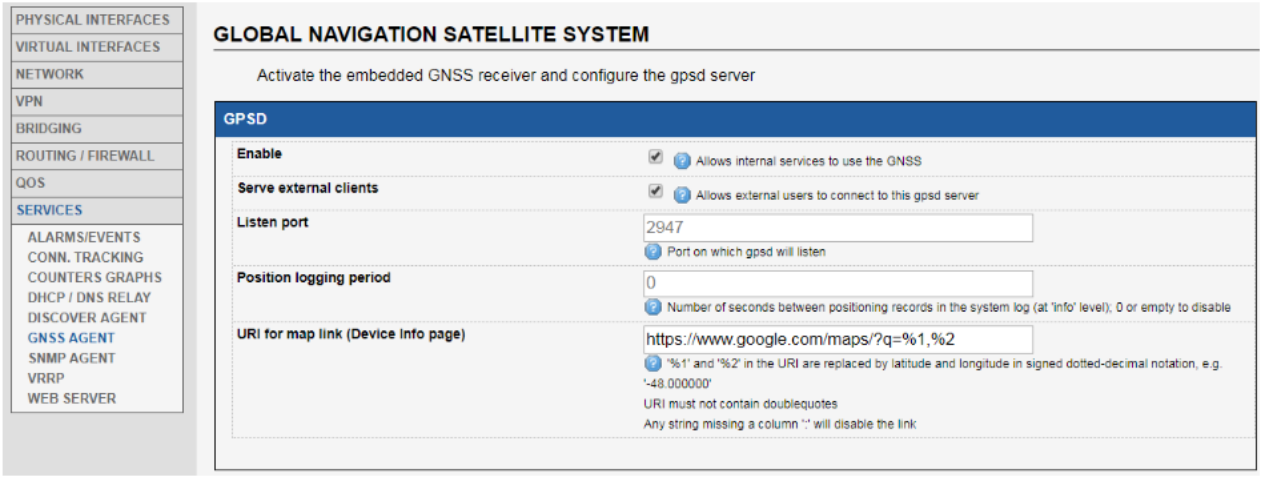

Figure 4 : Railbox GNSS Agent settings

For further information, please refer to « **RailBox_Cellular-DTFRUS054_ADD01** » from ACKSYS's technical documentations.

3. RIOM programming

The IDE used for programming the RIOM is the **Straton** software from Copa-Data, its main features are listed below:

- Process programming in IEC61131-3 languages,
- Network configuration through a Fieldbus editor,
- Real time monitoring tools for the projects debugging.

Description

The function block opens a client TCP-IP sockets to communicate with a GPSD server. The IP address and server port are configurable as inputs parameters. The messages sent by the server use the JSON protocol.

This function has been developped for GPS receivers, therefore its waits for a TPV class message in order to extract the timestamp and the geographical position composed of the latitude, longitude and altitude.

GPSD_CLIENT library

The « FB_GPSD_CLIENT » function block must be imported into the user project from the provided library.

```
1  Inst_FB_GPSD_CLIENT('192.168.1.200'(*IP_ADDRESS: STRING*), 2947(*PORT: DINT*));
2
3  date_time '2023/03/11 09:18:38'  := Inst_FB_GPSD_CLIENT.DATE_TIME '2023/03/11 09:18:38' ;
4  lat '43.551454767'  := Inst_FB_GPSD_CLIENT.LAT '43.551454767' ;
5  lon '1.512341117'  := Inst_FB_GPSD_CLIENT.LON '1.512341117' ;
6  alt '166.500'  := Inst_FB_GPSD_CLIENT.ALT '166.500' ;
7  ok FALSE  := Inst_FB_GPSD_CLIENT.OK FALSE ;
8  nb_ok  3678  := Inst_FB_GPSD_CLIENT.NB_OK  3678 ;
9  status  0  := Inst_FB_GPSD_CLIENT.STATUS  0 ;
```

Figure 5 : Example of programmation in Straton

For further information about the implementation of the funtion block using **Straton** software, please refer to the dedicated user's manual « **004_UMA_061** ».

Appendix: Table of Figures