

Time synchronization of electronic devices in RACKs NICA-MPD-PLATFORM using GPS NI-9467-c-RIO

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Structure of the presentation

- 1. Introduction to the project
- 2. System architecture
- 3. Interface
- 4. Future plans

Introduction to the project

- The main goal of the project is to provide accurate time synchronization for all CompactRio cassettes working in RACKs platform using GPS NI 9467 module.
- The project is a continuation of Rafał Koguciuk's work from 2017.

Used devices:

- Module NI-9467
- CompactRIO 9039

CompactRIO 9039



- Real-time embedded industrial controller
- Reconfigurable IO Modules
- FPGA module
- Ethernet expansion chassis

Module NI 9467

- Provides accurate time synchronization for CompactRIO systems
- Data synchronization GPS C Series
- Returns stationary global position after self-survey



Specification of NI 9467

- PPS accuracy +/- 100ns
- GPS antenna connector type SMA female
- Maximum altitude 5000 m above sea level
- 30 seconds to receive the ephemeris and almanac data and start computing location and timing fixes
- Time update every 1s

Interface working on FPGA

The screenshot displays a control interface for an FPGA-based system, organized into four columns:

- Column 1:** A numeric input field for "Timeout (Wait for Data Update)" is set to 0. Below it is a "Reset GPS" button with a red "Reset" label. Further down are four numeric input fields for "Altitude (m)" (146,20), "Latitude (°)" (56,761608), "Longitude (°)" (37,219376), and "Satellites Available" (10).
- Column 2:** A "Timed Out (Wait for Data Update)" indicator is shown as a green light. Below it are four numeric input fields for "PPS Timestamp (TAI)" (1564487353999999), "Antenna Status" (Normal), "GPS Status" (Normal), and "UTC Offset" (37).
- Column 3:** A numeric input field for "Timeout (Wait for PPS)" is set to 0.
- Column 4:** A "Timed Out (Wait for PPS)" indicator is shown as a green light. Below it are four status indicators: "Leap Second Direction" (Add), "UTC Offset Valid" (green light), "Leap Second Occurred" (black light), "Self-Survey Complete" (green light), and "Leap Second Pending" (black light).


Interface working on a user's computer

The screenshot shows a software interface for GPS data collection. It features several control elements and data displays:

- Timeout Data Update:** A numeric input field with the value '0' and a 'RESET GPS' button.
- Timeout:** Another numeric input field with the value '0' and a 'SAVE DATA' button.
- SAVE DATA:** A large button to save the collected data.
- RESET:** A prominent red button to reset the system.
- PATH:** A text input field with a file explorer icon to the right.
- Data Displays:** Several fields showing current GPS data: 'Altitude (m)' (146,2), 'Latitude (°)' (56,761608), 'Longitude (°)' (37,219376), 'Current time' (14:48:06, 30.07.2019), and 'Satelites available' (10).

Future plans

- Synchronization of many cRio cassettes on a 4 floor platform with RACKs in order to provide the same time to every electronic device
- Implementation to the NICA project



Thank you for your attention