

CERTIS TRAIN LOCALIZATION SYSTEM



- ▶ Utilizes the AURA Train Control System Ultrawide-Band RF Localization Module
- ▶ Provides precise, real-time train location information
- ▶ Significant cost & installation savings over traditional RFID & wheel odometry localization approaches
- ▶ Scheduled for Cenelec SIL4 safety certification in Q3, 2020



www.metrom-rail.com/CERTIS

ULTRAWIDE-BAND RADIO UTILIZATION

The AURA Train Control System deploys an advanced wireless technology called Ultrawide Band RF (UWB) as a means of providing industry-leading time-of-flight range precision. Within the full train control system, train localization is accomplished through an UWB localization module. This UWB module can be used as a separate system to achieve precision train localization as an integrated element into existing systems (such as CBTC), or as a stand-alone localization tool.

This localization system is called CERTIS. CERTIS can replace traditional RFID and dead-reckoning methods of identifying train position, and subsequently eliminating costly and difficult to install RFID and wheel odometry sensors. CERTIS operates wirelessly by communicating to wayside or trainborne elements to provide positioning information directly into a CBTC system; this includes real-time location tracking, distance to other trains, work zones, signals, platforms, and other key locations.

UWB is incredibly accurate and reliable in all possible deployment locations - especially in subways. UWB signals provide a high degree of security, as it is nearly impossible to isolate against the natural RF background environment. While UWB is capable of transmitting data, CERTIS can be complimented with the use of dedicated data networks to expand the capability of the system and to introduce various multimedia outlets into trains.



DEPLOYMENT, COST ADVANTAGES & FEATURES

CARBORNE & WAYSIDE

- ▶ CERTIS can be configured to interface with all commercial CBTC systems using a vital Ethernet interface protocol
- ▶ CERTIS equipment includes: a main control module slotting into a 1U rack slot in cab, a UWB transponder/antenna assembly located either outside vehicle or behind a front fascia, and wayside UWB nodes
- ▶ CERTIS provides vital train position, speed, direction of movement, consist length, and track occupancy data
- ▶ CERTIS eliminates the uncertainty of wheel slip, wheel slide, and wheel diameter calibration issues
- ▶ CERTIS provides static determination of consist orientation and train localization immediately upon initiation - no movement is required
- ▶ CERTIS includes hot-swappable dual main control modules for availability
- ▶ CERTIS performs internal data logging capability

COST SAVINGS & FEATURES

- ▶ Introduces rapid installation into almost any type of railcar, drastically reducing deployment time & project costs
- ▶ Modular hardware architecture allows for simple installation and maintenance
- ▶ Train localization upon start-up eliminates requirement to move train over multiple RFID tags to determine direction and location
- ▶ CERTIS provides an UWB link for interfacing to other UWB-equipped elements such as work equipment, roadway workers, signals, etc.



CERTIS STANDARDS COMPLIANCE

CERTIS is designed in accordance with multiple industry standards:

- ▶ AREMA: C&S Manual
- ▶ CENELEC: 50121, 50124-1, 50125, 50126-1:2017, 50126-2:2017, 50128-1:2011, 50129-2003, 50155:2017, 50159, 60529
- ▶ IEEE: 16-2004, 1474.1, 1474.3, 1476-2000, 1484-2000, 1558
- ▶ IPC: A-610G, 2221B
- ▶ NFPA: 130-2007

CERTIS TRAIN LOCALIZATION SYSTEM SPECIFICATION

CARBORNE:

Carborne Power

Power Source: 37.5 VDC nominal
Operating Input Voltage Range:
26 VDC to 47 VDC
Power Consumption: < 35 watts

Carborne Mounting

Width: 8.9"
Depth: 13"
Height: 1.75"
Rack: EIA 19" rack compliant

Carborne Environmental

Ambient Operating Temperature: -25°C to +70°C
Mechanical Shock: 5g pk & IEC 61373 compliant
Operating Vibration: 5-10 Hz 0.2" pk-pk; 10-200 Hz
1.0 g pk.

Carborne Antenna Module Environmental

Ambient Operating Temperature: -40°C to +70°C
Mechanical Shock: 10g pk & IEC 61373 compliant
Operating Vibration: 5-10 Hz 0.5" pk-pk; 10-200 Hz
2.5 g pk.
Ingress Protection: IP55 or better



CERTIS Control Module

WAYSIDE:

Wayside Power

Power Source: 24 VDC nominal
Operating Voltage Range: 12 VDC to 48 VDC
Power Consumption: < 20 watts

Wayside Mounting

Various mounting options available

Wayside Environmental

Ambient Operating Temperature: -40°C to +70°C
Mechanical Shock: 10g pk & IEC 61373 compliant
Operating Vibration: 5-20 Hz 0.1" pk-pk; 20-200 Hz 2.0 g pk.
Ingress Protection: IP55 or better



CERTIS Train and Wayside RF Modules

CERTIS CBTC INTERFACES

- ▶ All data communication interfaces support 10/100 Base T (100 Mbit) Ethernet
- ▶ Host Ethernet interface provides vital communications based upon the Hitachi Rail STS PEER protocol
- ▶ Host may query for various Certis configuration details, including firmware version & label, track map version & label, hardware ID, revision and serial number. "Label" may include agency name, transit system line name(s), and creation date
- ▶ Host may query for various Certis operational details, including current time, time synchronization status, Ethernet ports status, UWB status, UWB temperature, and log files
- ▶ Host may query for various Certis operational details, including current location, speed, direction of train, track ID, and location uncertainty. The Host may also configure Certis for periodic location reports at a specified rate
- ▶ SI units are used for data reports

CERTIS SAFETY

Processing Vitality

"Two of two" checked redundant processors, identical processors running similar code.

UWB Independence

Vital train position, speed, direction of movement, and track occupancy determination is accomplished comparing two independent UWB range measurements (independent UWB transponders on the train and at each wayside anchor location).

The UWB transponders operate on identical radio bands. The bandwidth is 1.7 GHz. Independence is achieved by operating the two different channels on (almost entirely) statistically orthogonal channels via CDMA techniques.

Failsafe Enforcement

Ambient temperature monitoring ensures operation only when within specified environmental conditions.

The final fail-safe stage in the Location Processor cuts off Ethernet communications to the host in the event of a fault.

The Ethernet communications cut off includes independent watchdog timer-based triggering from both processors.



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