VETRA
communication

VETRA radio communication system

for communication between trams and ground devices

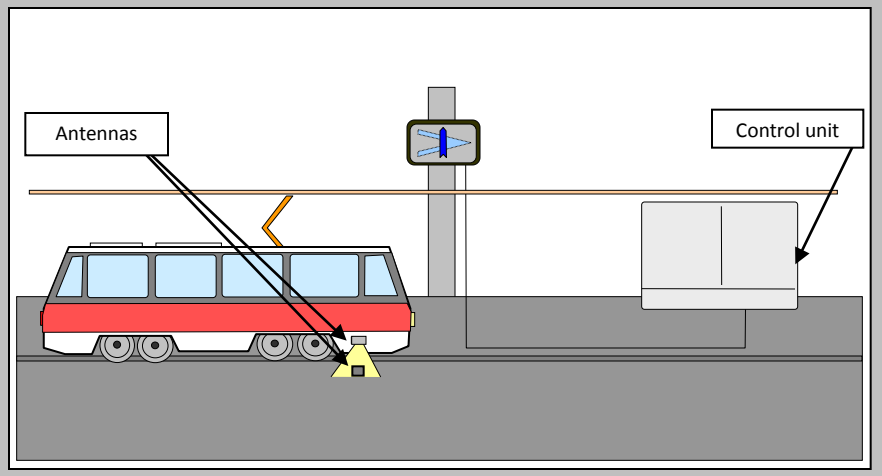


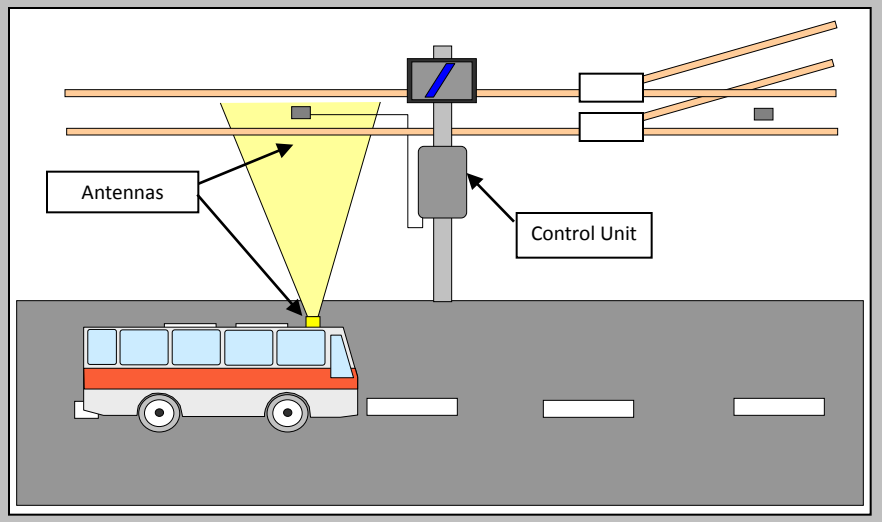
Elektroline, Inc.
Prague, Czech Republic
www.elektroline.cz

Introduction to the VETRA system

VETRA
communication

- Communication system between trams and ground devices
- Bidirectional communication possible
- Based on 2,4 GHz radio
- High-speed data transmission
- High resistance against disturbances





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Description of the VETRA system

Parts of the system

VETRA
communication





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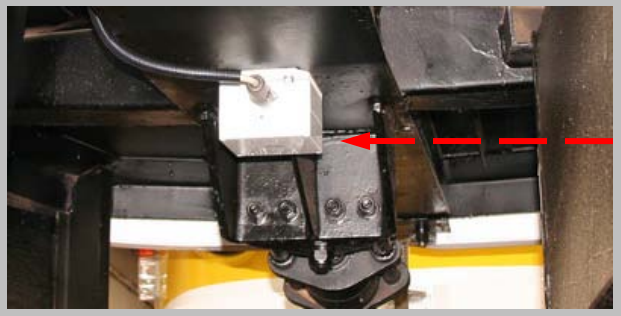
Description of the VETRA system
Parts of the system

VETRA communication

- Vehicle equipment
  - onboard terminal



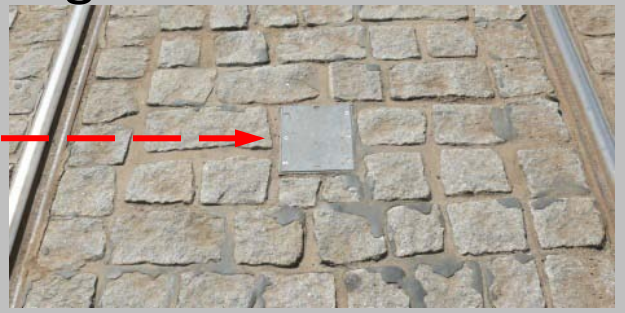
  - RS485 data connection
  - vehicle antenna



- Ground equipment
  - ground device



  - RS485 data connection
  - ground antenna*



*An OCL antenna can be used instead of ground antenna (OCL antennas are usually used for trolleybuses).

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VETRA system application
Automatic setting of switch points

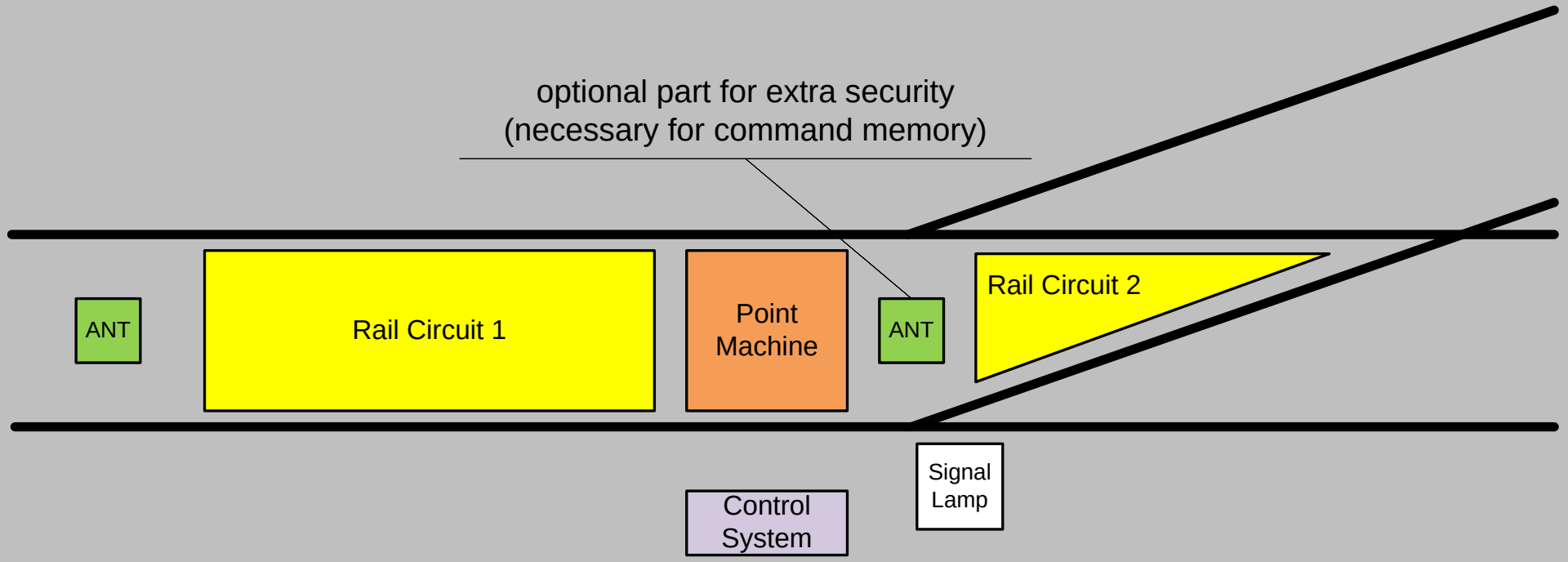
VETRA
communication

- Automatic setting of switch points according to route numbers
  - Tram is led through the city according to set route number
  - Driver has possibility to change direction by arrow buttons (when needed)
- Routes are fully programmable
- Simplifies and accelerates traffic through switch points



VETRA system application
Automatic setting of switch points

VETRA
communication



- Point machine: moves the switch point into desired position
- Control system: manages all switch point equipment
- Signal lamp: shows information about the switch point to tram driver
- ANT: receives commands from trams and secures the switch point
- Rail circuits: secure the switch point

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VETRA system application
Tram priority at level crossings

VETRA
communication



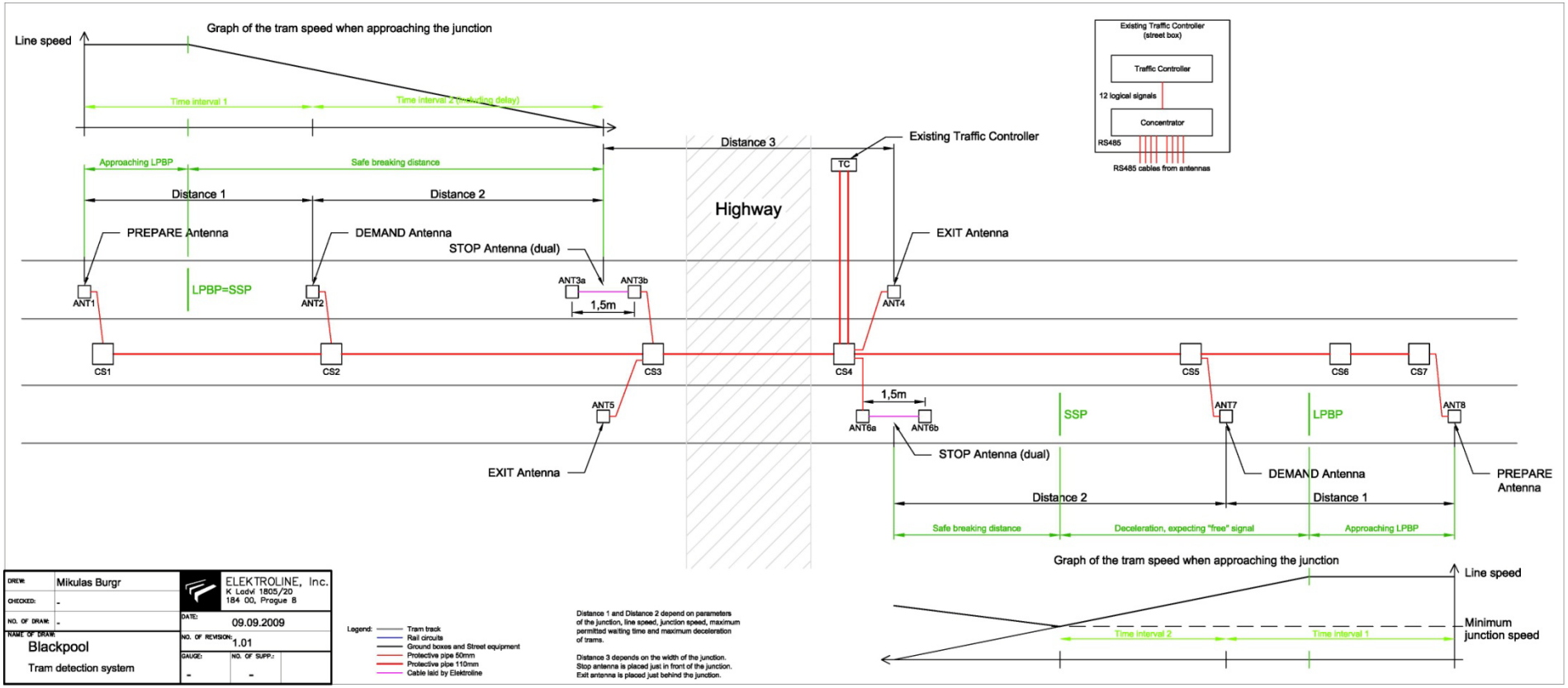
- Safe and reliable system for detection of trams at level crossings
- Elektroline offers complete solution for level crossings with road traffic
  - Tram traffic markedly accelerates
  - Less accidents

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VETRA system application

Tram priority at level crossings

VETRA communication



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VETRA system application
Vehicle localization system

VETRA
communication

- Exact localization using VETRA antennas
- Immediate information about exact tram position
  - to tram line dispatcher
  - to tram driver
  - to passanger information system
- Possible connection of more VETRA systems (e.g. switch point VETRA antennas can be used also for localization, etc.)



VETRA system application
Data for passenger information system

VETRA
communication



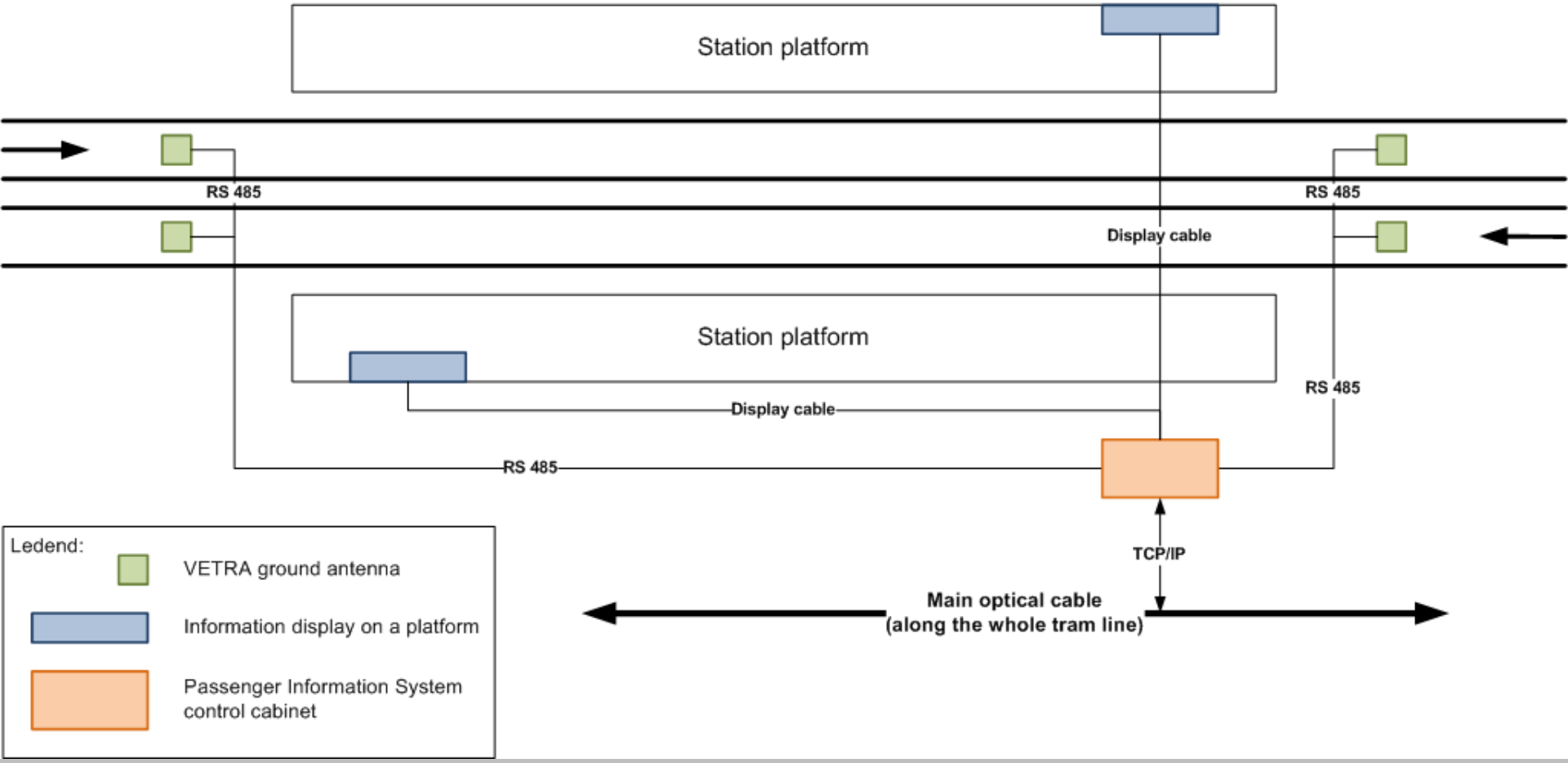
- Data from all VETRA systems can be integrated into passenger information system
- VETRA system can provide information about
  - tram location
  - line number
  - tram unique ID number
  - other information (programmable)

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VETRA system application
Data for passenger information system

VETRA communication

Passenger Information System with optical network communication (tram stop equipment)



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VETRA system application
Communication to vehicles

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- VETRA communication is <u>bidirectional</u>
- Possibility to send information from ground devices to vehicles
  - Information about tram's actual position
  - Information about traffic lights
  - Information about ground equipment status
  - etc...
- Programmable functions
- Connection to an onboard computer is possible



Summary
Advatages of the VETRA system

VETRA
communication

- **Small dimensions**
  => easy installation both in track and on vehicles
- **Fast bidirectional communication**
  => possibility to transmitt data both from/to a tram
  => communication is reliable even in high speed
- **2,4 GHz frequency**
  => free frequency band, no licences needed, no fees
- **Intelligent system of tram routes**
  => faster and safer traffic at switch points
- **Possible connection of more VETRA systems**
  => integrated system



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VETRA radio communication system

VETRA
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For additional information, please see:
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