Dedicated Short Range Communication Link
PREMID® TS3200/05

General

The PREMID® TS3200/05 system comprises a family of equipment for dedicated short-range communication (DSRC). All components are designed to meet the requirements for Electronic Fee Collection (EFC) applications such as road tolling, access control and parking in cases where communication between a vehicle and the roadside is required in a single lane environment.

The combination of full compliance with CEN DSRC standards and a modular design ensures scalability for widespread deployment and provides the basis for a regional interoperability strategy according to the public document 'Global Specification for Short Range Communication' (GSS).

The basic platform for a PREMID® TS3200/05 based Roadside System (RS) consists of an in-lane software configurable Single Lane Transceiver TS3251/01A and a compact Transaction Controller TS3236/01B that handles parts of, or complete EFC transactions.

This facilitates an easy, rapid and low cost integration to a Host Computer (Lane Controller) using an Ethernet network (TCP/IP) interface.

The Transceiver TS3251/01A is designed with a communication zone that will meet the requirements for most single lane applications. However a larger zone (e g for extra wide lanes) can be obtained simply by deploying an additional Transceiver connected to the same Transaction Controller.

Whatever the need, all modules are mechanically robust and protected against demanding environmental conditions experienced in exposed locations whether in the city or on a remote toll plaza. The consistently high performance of the components assures reduced operating costs and a secure and effective fee collection.

Charging services are provided by a CEN DSRC and GSS compatible Transponder mounted in all vehicles. The PREMID® Transponders are available for mounting in all types of vehicles from private cars to commercial trucks. The Transponders are available with different functionality and may be used either in centralised accounting applications or in more complex applications when additional data is to be stored in the transponder or when the Transponder must include a user interface or a smart card reader.

The basic Transponders TS3204 and TS3205 provide the platform for future upgrading of existing or new implementations and no compromises have been made on data security and integrity. All transactions may be secured with modern cryptographic techniques based on DES mechanisms to resist fraud and to deter theft or misuse.

The Components

The PREMID® Single Lane DSRC modules comprise three distinct groups;

- Roadside System (RS) including Transceiver, Transaction Controller, Cables and Accessories.
- Transponders and Transponder Accessories.
- Accessories for integration, Transponder administration and first line maintenance.

Transaction Controller

Transaction Controller TS3236/01B

The PREMID® Transaction Controller TS3236/01B acts as an interface between a Host Computer (Lane Controller), and a Transponder. The unit contains embedded firmware with functionality to detect and perform transactions with Transponders passing through the communication zone established by one or two Transceivers connected to the Controller.

The Transaction Controller may handle parts of or a complete defined payment transaction including security, such as the A1-transaction, and this enables interoperability with other EFC systems and the use of CEN compatible Transponders from other vendors. This helps to simplify the application in the Host Computer and it is easy for the integrator to adapt to the requirements of the toll system.

The communication protocol between the Transaction Controller and the Host Computer is TCP/IP and a standard Ethernet 10BaseT interface is used

Host software source code examples for Linux and Windows NT are available showing how to implement the communication with the Transaction Controller.

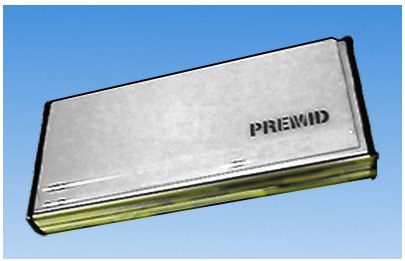
The Transaction Controller is software configurable to be able to handle different EFC Applications and the DSRC parameters such as Transceiver carrier frequency, sub carrier frequency and power level are all configurable by messages from the Host.

The Transaction Controller's supervising function continuously monitors the functionality of the Roadside System, and provides status information to the Lane Controller in case of malfunctioning.

The diagnostic facilities, available via the Transaction Controller's Terminal port, makes installation and system troubleshooting fast and easy.

Through this interface it is possible to debug and diagnose the interface to the Host Computer and the Communication with Transponders.

Single Lane Transceiver



Single Lane Transceiver TS3251/01A

The PREMID® Single Lane Transceiver TS3251/01A establishes a microwave communication link between the Transaction Controller and Transponders installed on passing vehicles to enable the exchange of data between the RS and the Transponder.

The communication zone (see figure below) for Transponders mounted in passenger cars and commercial vehicles as trucks and buses defines the area where communication between the Roadside System and the Vehicle can take place. The figure is relevant for an overhead mounted Transceiver. For a plaza-based installation a Transceiver is located in every lane where a transaction is required. To enlarge the communication zone two transceivers may be installed adjacent to each other and may be connected to the same Transaction Controller.

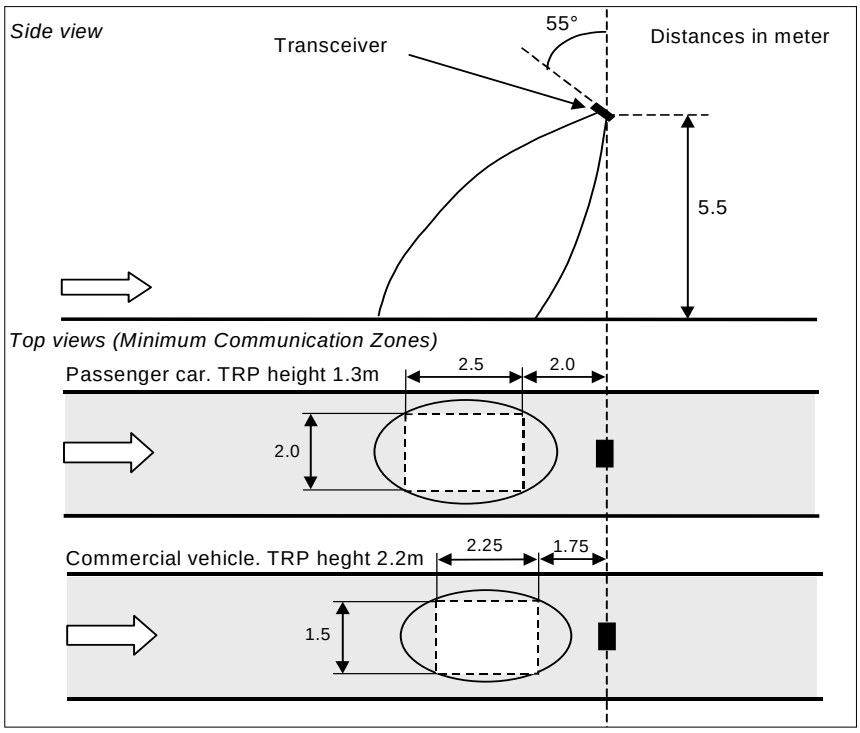
Within the limits defined by the CEN prEN 12253 standard, some of the Physical Layer attributes are software programmable:

- Operating frequency may be any one of four permitted channels namely: 5.795 GHz, 5.8025 GHz, 5.8075 GHz and 5.8125 GHz.
- Uplink subcarrier may be 1.5 or 2.0 MHz.

High device availability is also ensured through the use of built-in continuous function and status monitors that in case of malfunction provide warnings via the Transaction Controller to the Host Computer.

The Transceiver is connected to the roadside cabinet with a pair of industry-standard power and signal cables, available in lengths up to 200m.

Additional standard accessories include the TS3212/01A Transient Protection Unit, TS3217/xx prefabricated Signal and Power cables or Connector kits and the TS3215/00A Power Supply for one Transceiver.



Communication zones for TS3200/05

Transponder

TS3204 series Transponder, Bracket TS3220/00A for Cars with raked windscreen

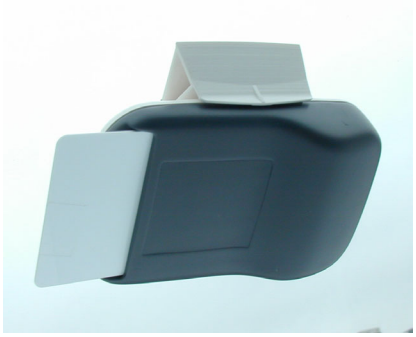
TS3204 series Transponder, Bracket TS3220/01A for Trucks and Buses with vertical windscreen.

Each member of the PREMID® family of Transponders is designed with a specific purpose. The basic function is to provide communication services when the vehicle passes through a communication zone. With a selection of Transponder brackets all vehicle categories are served from passenger cars to commercial trucks and public service vehicles.

The capacity of the User Memory in the Transponder is sufficient to store vehicle and account parameters. The memory is partitioned into data structures defined by 'Elements' and 'Attributes' according to the standards prEN 12834 Application Layer and prEN ISO 14906 EFC Application Interface. Each Element may be protected by either a key or password and access to this partition from an unauthorised Roadside System will be completely denied.

For operators managing centralised accounts the TS3204 series Transponders provide basic functionality including a simple audible interface to the driver.

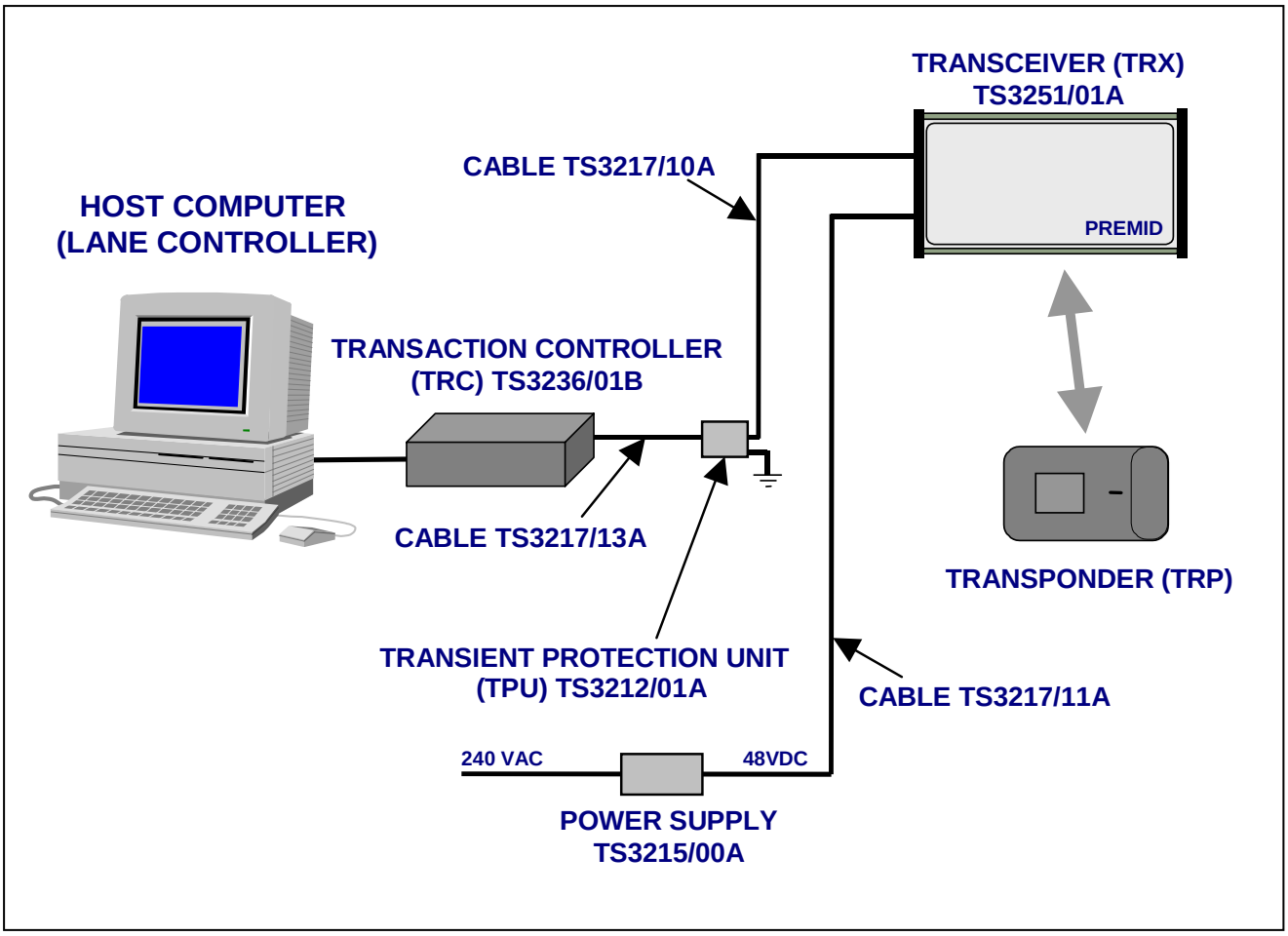
The more than 12 years expected operating lifetime for the TS3204 Transponders with only one battery change will fulfil the requirements from any toll system.



TS3205 series Transponder with Smart Card interface

For more sophisticated distributed payment options the TS3205 series Transponder adds an integrated reading facility for Smart Cards (ICCs).

Whichever unit is chosen, by the operator or by the subscriber, communication-level interoperability with other CEN and GSS-compliant Roadside Systems is assured.



TS3200/05 System overview

General System Data

Link Characteristics

Downlink

- Frequencies: 5.7975, 5.8025, 5.8075 and 5.8125 GHz
- Emitted power: Maximum 2W (33dBm) E.I.R.P.
- Antenna Polarisation: Left hand circular.
- Modulation: Two level amplitude modulation
- Data Coding: FM0
- Data rate: 500 kBit/s

Uplink

- Subcarrier frequencies: 1.5 and 2.0MHz
- Antenna Polarisation: Left hand circular
- Subcarrier modulation: M-PSK
- Data Coding: NRZI
- Data rate: 250 kBit/s

Reference Standards

- prEN 12253 RTTT-DSRC Physical Layer using microwaves at 5.8GHz
- prEN 12975 RTTT-DSRC Data Link Layer: Medium Access and Logical Link Control
- prEN 12834 RTTT-DSRC, Appli-cation Layer
- prEN 13372 DSRC Profiles for RTTT Applications
- prEN ISO 14906 EFC - Application Interface for DSRC.
- Compliant with GSS v 3.0 and the A1-specification ER9_1.3

Type Approvals

- The TS3200/05 components fulfil the requirements of EU Directives: 1999/5/EC, 89/336/EEC and 73/23/EC for Radio, EMC and Low Voltage.

Link Components

Transaction Controller

- TS3236/01B Transaction Controller, basic version. Performs Transactions based on GSS and the A1 specification.

Transceiver

- TS3251/01A Single Lane Transceiver

Cables

- TS3217/13A Cable (2 m) Transaction Controller - TPU for one Transceiver, with mounted connectors.
- TS3217/01A Transceiver Signal Cable (RG58C/U PE 50 ohm). Length specified at time of order, **excl.** connectors
- TS3217/10A/xxx Transceiver Signal Cable, Length xxx m, max 200 m (xxx = multiple of 5 m: 005, 010, …..200) with mounted connectors.
- TS3217/03A Transceiver Power Cable (5x0.75). Length specified at time of order, **excl.** connectors
- TS3217/11A/xxx Transceiver Power Cable, Length = xxx m, max 200 m (xxx = multiple of 5 m: 005, 010, …..200) with mounted connectors
- TS3217/05A Connector kit including connectors for both Signal and Power cables

Road Side Accessories

- TS3212/01A Transient Protection Unit (TPU)
- TS3215/00A Transceiver Power supply 48 VDC, 1 Amp
- TS3216/00A Crimp tools for connector kit
- TS3216/01A Test Adapter
- TS3216/02A Test Transponder

Transponders

- TS3204/02A Transponder Unit with buzzer (excluding bracket)
- TS3204/00A Transponder Unit with buzzer and tamper detection (excluding bracket)
- TS3205/00A Transponder Unit with smart card interface and buzzer (excluding bracket)
- TS3220/00A Transponder bracket, raked windscreens (passenger cars)
- TS3220/01A Transponder bracket, vertical windscreens (commercial vehicles)
- TS3220/05A Slide-in transponder bracket, raked windscreens (passenger cars)

Technical Documentation

Data Sheets

- Single Lane Transceiver TS3251/01A
- Transaction Controller TS3236/01B
- Transponder Unit TS3204/02A (Buzzer)
- Transponder Unit TS3204/00A (Buzzer, Tamper detection)
- Transponder Unit TS3205/00A (Smart Card reader, Buzzer)
- Test transponder TS3216/02A

Technical Manuals

- System Description TS3200/05
- Programmer's Manual TS3200/05, Roadside System
- Installation and Service Manual. TS3200/05, Roadside System
- Device Description Transponder TS3204

Environmental Impact

- All TS3200/05 products include components selected to minimise environmental impact and are marked to assist recycling or safe disposal.

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