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e-Plate Operation Overview

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Introduction

Fundamentals

e-Pate® technology is the next generation of long range RFID (Radio Frequency IDentification). The objective is wireless and automated data collection of vehicles and other assets over large distances.

How RFID works

Data is transmitted via high frequency radio waves between a tag and an interrogator. Information stored on the tag can be read and processed. Data can be exchanged over large distances, even in extreme environmental conditions such as dust, dirt, rain, snow and extreme temperatures
The core element of the system is the active e-Plate tag, which can communicate its' unique ID at a rapid rate of transmission over very large distances (up to 100 meters/300 feet). The reader, i-Port R2 can decode data simultaneously from hundreds of these tags within seconds. Connection of the reader to a host computer system enables global data accessibility via a variety of software platforms.

Characteristics of e-Plate

- UHF Frequency (868 / 915 MHz)
- Large read range of up to 100 meters (300 feet)
- Variable read range from just a few meters up to 100 meters (300 feet)
- Memory capacity 13 Byte (17 characters)
- Long transponder battery lifetime (up to 10 years)
- Anti-collision process and multi-tag handling

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System Overview

- Tags from the e-Plate series transmit stored data over large distances. The high data transmission rate ensures optimal communication.

- The fixed reader (i-PORT R2) receives the data transmitted by the tags in regular intervals and buffers the received data for later transmission via the network connected to a master PC.

- Handheld readers, based on the PC-card i-CARD III, can also be used to receive transmissions from the tags over distances up to 30m. After decoding, this data can either be processed locally or transferred to a network via optional radio cards (WLAN, GPRS etc).

e-Plate System Components

The e-plate System consists of 4 main components:

1. Active tags with internal power supply, which are used to identify vehicles or assets
2. Reader (i-PORT; fixed-mounted) or handheld devices (mobile) which exchange information with the tags and host computer systems
3. Various antenna types / characteristics for different applications
4. A central computer system as basis for control and monitoring

i-PORT R2

The i-PORT R2 is a reader for the e-Plate series of broadcast tags. Built into a compact metal housing, the i-Port R2 receives transmissions from the e-Plate at distances of up to 100 meters (300 feet).

A simple master/slave protocol enables data exchange. Not only does the protocol contain the data received from the tag but it can also provide information about the time of data reception, field strength and information about the number of times the reader has received the tag.

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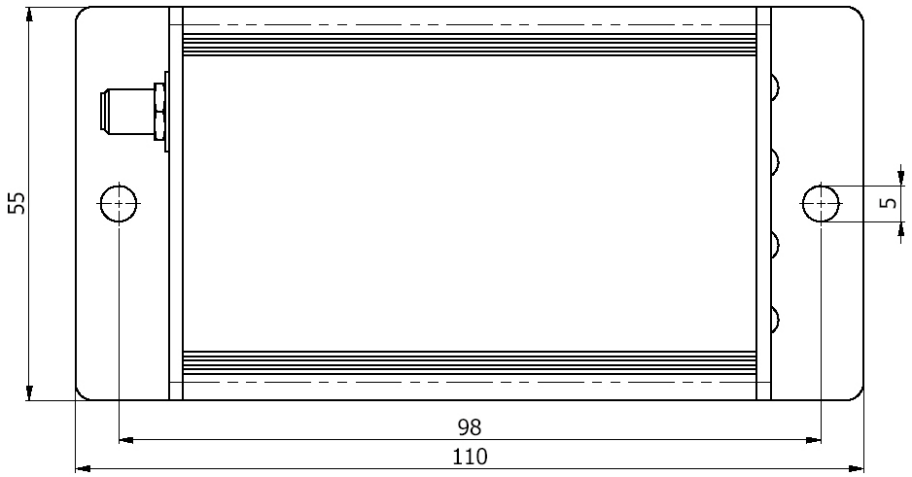

Physical dimensions of I-Port R2

Antennas

e-Plate antennas are distinguished by their compact design. A variety of antennas can be used, depending on application. The antennas are differentiated by characteristics such as polarization, apex angle, and gain. An optimal fit to the read zone is achieved by the right choice of antenna characteristics and receive sensitivity.
As the antennas are passive system elements, no tuning is required, which facilitates installation and maintenance.

Elliptical Polarized Antennas

Because of the wide apex angle (120º) a large read zone is achieved, which is desirable when a large quantity of tags need to be read at one time, or when tags moving at great speeds need to be interrogated.
Since the polarization is elliptical, orientation of the tag relative to the antenna is not important. If the tag is in front of the antenna the tag may be polarized horizontally or vertically along the line of sight of the antenna. Due to its small size and weight, this antenna is very easy to integrate.

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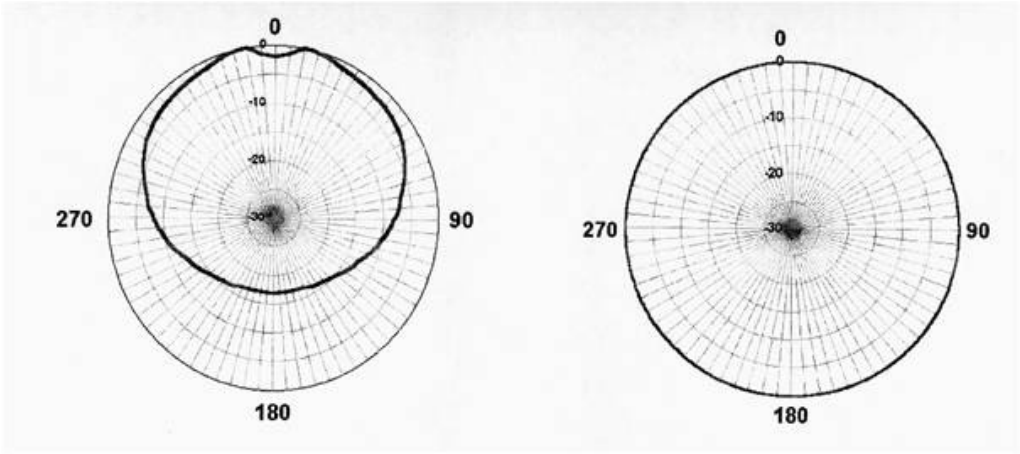

Azimuth and elevation pattern above

e-Plate embedded Tag

This active tag is particularly suited for Identification, Tracking and Tracing of vehicles.

Using e-Plate technology, distances of up to 100 meters (300 feet) can be achieved with this tag. A design life of up to 10 years depending on transmission rate can be expected due to the tag's minimal energy requirement.

Used in combination with the i-PORT R2 or i-CARD III, several hundred tags can be detected nearly simultaneously, thanks to an anti-collision algorithm

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Field	Data Length (Bit)
Start Delimiter	8
Protocol ID and Version	8
Age Counter	16
ID (17 Char of 6 Bit)	102 (+2 padding)
Flags	8
CRC	16

The table above shows the actual data sent from the tag over the air interface to the I-Port R2 reader.

Physical

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e-Plate can be produced in any size, format and construction (aluminium, embossed or flat, or plastic, vinyl etc), reflectivity or colour to suit licence plate regulations throughout the world.

Position
A single e-Plate mounted at the front of a vehicle or at the rear in the case of motorcycles in place of a conventional plate is sufficient.

Tamper Evident
If any attempt to remove the e-Plate from the vehicle occurs the tag and number plate are destroyed making it impossible to refit the e-plate to another vehicle.

Mounting
e-Plate is fitted to the vehicle utilising the vehicle's existing number plate mounting points.

Why in the number plate

1. 100% encapsulated against environmental issues.
2. Every vehicle has one.
3. Number plate is part of the vehicle test criteria in most countries.
4. Cannot be tampered with without destroying the plate and tag.
5. Always in the same position.
6. Controlled and regulated manufacture and supply.

Why a continuous broadcast tag

1. Low cost infrastructure.
2. Small profile allows encapsulation into plate.
3. Low power consumption.
4. Accurate usage / life prediction.
5. Minimal data transmission results in low network traffic.
6. Small profile reader and antennas results in unobtrusive roadside equipment.
7. Tag can only be programmed at point of manufacture via contact therefore data cannot be changed.
8. Rolling encryption prevents replay attack.
9. Low collision rates. Transmission time 2 milliseconds.

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Why 868 - 915MHz

1. Well-regulated band. Minimal interference.
2. Low duty cycle results in low power consumption and longer life.
3. No interference from wireless communications devices i.e. Microwave, wireless headsets and car immobilisers
4. Long read ranges.

Why not backscatter systems

1. Short read range
2. Expensive antennas and decoder equipment.
3. Obtrusive roadside equipment.
4. High power consumption.

Example of network communications.