

AUTOMATIC VEHICLE IDENTIFICATION SYSTEM

RFID is a wireless technology used in applications to identify and receive information about vehicles passing by the entrance or exit gate, with no need to stop the vehicle or to open window.

As the vehicle moves into the readers area of interrogation, the reader is activated and begins signaling using electromagnetic waves. The transponder subsequently transmits its unique ID information to the reader, which in turn converts it, through the software technology, into useful information.

After signal detection, reader compares data from vehicle, with data base. If the access is allowed, sends controlling signal to lift up a barrier.

Basic advantage of using our system is possibility of complete control on entrance or exit gate including keeping of data about date, time of passing through, number of barrier, vehicle ID. After identification of the transponder, data is submitted to the supervision center. Modem for data transmission provides permanent connection to the control center.

Depending on the configuration of the system, it is possible to meet following goals:

- Control of vehicle movement on departure platforms:
 - Automatic evidence of arrival onto departure platforms
 - Automatic evidence of departure from departure platforms
- Control of vehicle movement on arrival platforms:
 - Automatic evidence of arrivals
 - Announcement of bus arrivals

1.1 Starting technical and operating demands:

- readers with accessories are mounted on an appropriate way on the entrance or exit depot gate
- every vehicle has its own identification device
- every identification device has a unique eight-digit code
- the system identifies vehicles 24 hours /day
- the method of mounting the identification device on vehicle is simple and vandal-proof
- the method of installing the equipment on gates is simple and vandal-proof
- the equipment works in all climate conditions in this area
- the simple and reliable data transmission from the identification location to the supervision center is assured so that immediate update of data is provided
- the relevant data arrive to the supervision center in a form suitable for further computer processing
- the system has an expansion possibility, as to increase the number of check points and vehicles
- the system has an upgrade possibility, such as combining similar systems (remote-control and guidance of vehicles, the announcement of vehicles, which have the priority of depart guaranteed on the intersections, etc)
- the system ensure the identification of vehicles when the speed is until 200 km/h (in this case isn't in particular important, because it's assumed that on the entering in the depot there would be a footlights, there so the vehicle has to stop for a while).

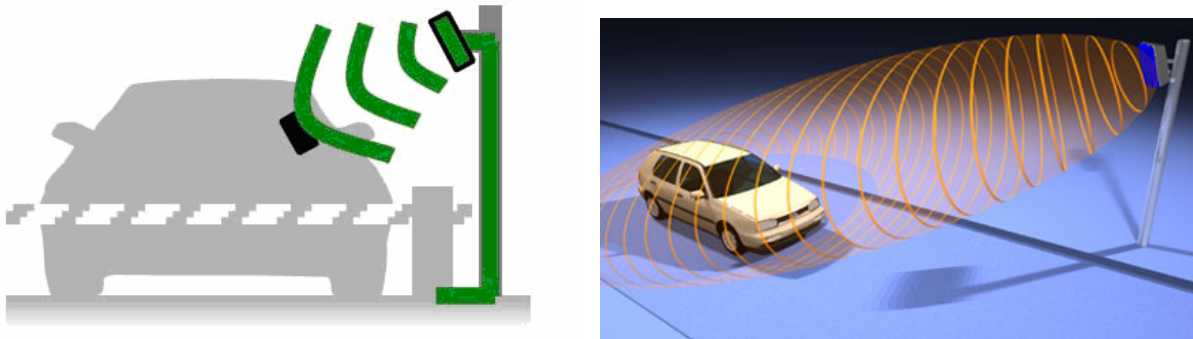


Fig. 1 Principle of automatic identification of vehicles

1.2 Technical solution

The basic elements of this system are manufactured by the Nedap company. We offer integration of the system and development of software modules. The basic elements of the system are:

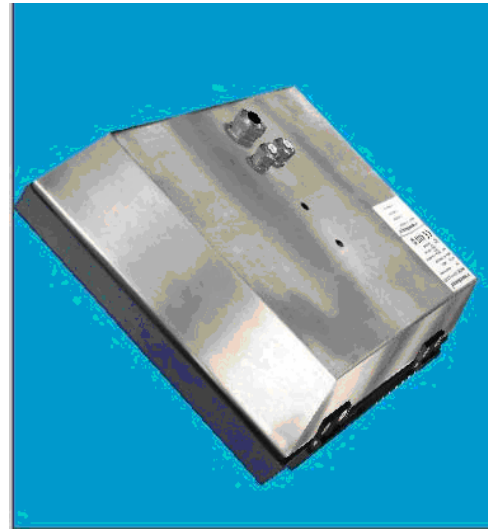
- The control station consisting of
 - Vehicle identifier (active RFID transponder)
 - mounting accessories
 - power supply
 - signalization equipment
- vehicle identifier (active RFID transponder)
- Supervisory system consisting of:
 - PC computer in the supervision center
 - Equipment for transponder personalization
 - application software –ITG Bus tracking
 - elements of connecting the reader with a PC computer.

The reader is a device, which establishes communication with a vehicle identifier when found in the reading area and reads its characteristic number. If more identifiers are in the reading area at the same time, the reader has the ability of identifying all of them. Every transponder is visible only once when it gets in reading area. The information about the actual date and time, joined by the ID number and those data are transferred to the computer system in the supervision center.

The identifier is being installed inside a vehicle-for example on the windshield or lateral window gluing or attaching with a vacuum sink. There is no need of its electric or similar connections to the units of the vehicle. The dimensions of the identifier are Ø 70 mm; thickness 3 mm. It's structure is compact, resistive to extreme environmental conditions. It has built in a lithium battery, which secures him a working life of 6 years.



Fig. 2 Reader a) rear



b) front

There is no need for maintenance because it has its own unique eight digital numbers. With the reader, communications is on frequency of 2.45 GHz, when it's found in the reading area, on the distance that isn't bigger then 8-10 meters.



Fig. 3 Transponder a) front



b) rear

After the identification of the transponder, the following data are sent to supervision computer:

- the gate where the identification was made
- serial number of the identifier,
- date of the identification,
- exact time of the identification.

In addition, some other actions could be initiated after the transponder identification, such as:

- turn on green light (entry allowed), or red light (entry forbidden).
- Open mechanical barrier (if entry allowed)
- activating video surveillance system.

3.1 Basic characteristics of the key components of the system:

- **Reader** (TRANSIT standard reader):
- compact industrial design
- protected from mechanic and climate exertion (weather proof protect)
- reading distance is up to 12 m
- speed of vehicle which is going to be identified can be up to 200 km/h
- multi-channel frequency offset (make possible use of any number of readers close to each other with no interference)
- few different interfaces (RS232, RS 422, 20 mA CL, Profibus DP, TCP/IP)
- weight 5 kg
- dimension 310 x 250 x 100 mm
- operating in climatic conditions from -30 up to +55 °C
- power supply 230 V=10 %, 100 mA, 50-60 Hz/ 22...30 VDC, max 1A
- certificate: European Directive for EMC 89/336/EEC, EN50081-1, EN50082-1 i EN50082-2, ETS0908, EN 60950

Transponder (Window Button):

- exceptional design and performance
- working frequency 2.45 GHz and 120 kHz
- dimension Ø76 mm, weight 55g
- operating in climatic conditions from -20 up to +85 °C
- detection range up to 12 m
- humidity 10-93 %, without condensation
- it has built in a lithium battery, which secures a working life of 5 years (working life does not depend on number of detections in reading area)
- can be installed on the windshield or lateral window
- identification R/O 8 digits.

4. Application software for ITG-Bus Tracking

The application software package **ITG-BusTracking** provides basic data for vehicles entry to and exit from depot. It can be customized according to user's requirements..

The following data are sent to the supervision computer:

- the gate where the identification was made
- identifier serial number
- date of identification
- the exact time when the identification was made
- operation that was initiated:
 - green light on (entry allowed) or red light on (entry forbidden)
 - barrier was open (entry was allowed)
 - video surveillance system was activated

This package was developed with standard software tools, under Windows environment.