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System for monitoring of passenger traffic “POTOK”

The real quantity of passengers, carried in public transport often remains a secret for most of transport companies. The main reason is that the management of these companies can judge this amount only on the basis of circumstantial evidence - amount of daily receipts. It is not a secret that drivers and conductors often underestimate this amount. As a result, a company loses up to 20% of profit.

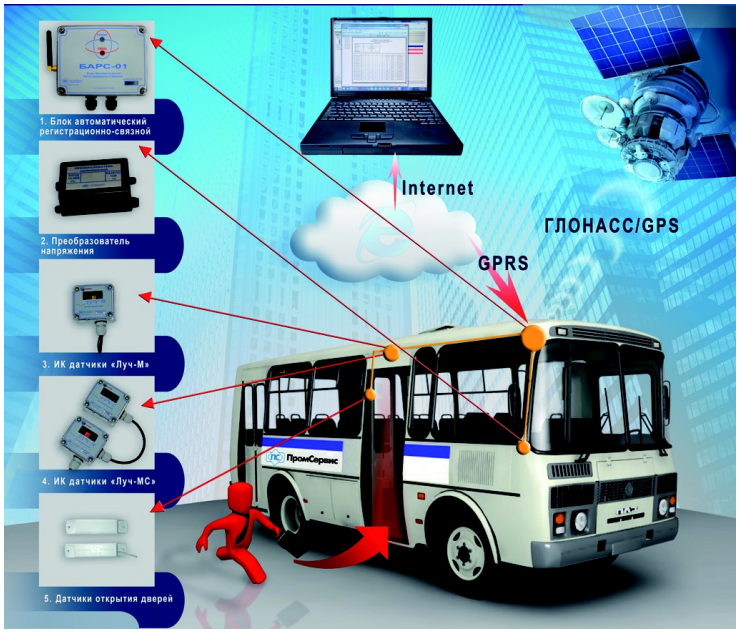
One of effective solutions of this problem is calculation of passengers by means of monitoring system “POTOK”.

Application: automated accumulation of data about passengers’ transportation rate in on-land vehicles. This system is able to assure fair and continuous control.

Principle of operation is based on counting of doorway crossings by passengers, realized by means of infrared sensors, mounted in the door opening(s) of a vehicle. Information about quantity of carried passengers transfers to control station by means of channels of cellular communications GSM-900/1800 standard in GPRS mode.

System for monitoring of passenger traffic “POTOK” allows to proceed prompt **control and analysis of routine movement of vehicles**, including:

1. Evaluation of quantity of carried people (per hour/day/month/year) and level of the route’s workload;
2. Calculation of total receipts;
3. Analysis of emergencies, connected with operation of equipment, installed at vehicles;
4. Optimization of transport traffic schedule;
5. Putting reasonable quantity of buses (or other vehicles) on every rout.



Configuration of “POTOK” system:

- Control station - PC, connected to Internet, with installed software POTOK-Express;
  - Transport sets (one set per each vehicle);
  - Data transfer medium: cellular channels standard GSM 900/1800 in batch communication mode or Internet-channels.

Software “POTOK-Express” proceeds broadcasting, processing and backup of data from each transport set, provides user an information in a required form about quantity of carried passengers (per hour/day/month/year), quantity of passengers that are inside a vehicle at the moment, workload of a rout, quantity of passengers who got in and got out at each station.

The software also allows to proceed remote adjustment of the system’s transport set(s) operation.

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Transport set, installed at each vehicle, **includes:**

1) Automated registration and communication unit BARS-01-T (a terminal), designed for reading of data about quantity of doorway crossings from infrared sensors and backup of this info in private nonvolatile memory.

The terminal also transfers data to control station, controls emergency situations and registers them in the log with fixation of time; it is possible to adjust a function of SMS alert to dispatcher's mobile phone in order to inform control services promptly.

2) Infrared sensors "LUCH-M" or "LUCH-MC" – one for every door (width max 80 sm) or door leaf.

Infrared sensors designated for calculation of doorway crossings quantity (with detection of direction – sensors "LUCH-MC") and identification of emergency situations, connected with long-time blocking of a doorway.

One IR-sensor should me mounted at each door opening (or each door leaf in case if width of door opening is more than 80 sm).

All sensors are connected to information network through interface RS-485 by means of ModBus RTU protocol.

3) Contactless sensors of door opening (one per each doorway, supplied as an option) – provide detection of door position and inform IR-sensors by loop-down signal when a door is opened in order to define an interval of crossings registration and duration of stops.

4) **Voltage transducer** protects system from electrical influence of vehicle's equipment by means of galvanic isolation.

5) **Connection cables** provide integration of all elements of transport set into united information network. All junctions are effected through car connectors.

Main functionality of software:

- Supporting of all types of system transport sets;
- Creation of hierarchical structure of organizations, routes, drivers and vehicles;
- Overview of accounting object's status in real time mode;
- Review of archive data for each object or group of objects per each stop, day, month;
- Generation of accounting documentation, sorted by organizations, routes, drivers and vehicles;
- Display of backup information in graphic mode;
- Maintenance of routine schedules;
- Maintenance of drivers' working schedules;
- Storage of detailed information about every object;
- Remote configuring of transport sets, as well as adjustment of time, schedule and ways of transport sets' interrogation;
- Arrangement of authorized access with matching of users with enterprises;
- Preparation of financial statistics for every vehicle and for an organization as a whole.

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“POTOK” system is currently available in two **modifications**:

- "POTOK-XX-I-T" – with a function of total count of doorway crossings by passengers (registration of incoming and outgoing passengers) and transmission of information via GSM channels;

- "POTOK-XX-N-T" – with calculation of occupancy of the vehicle (separate accounting of incoming and outgoing passengers) and transmission of information via GSM channels.

Principle of operation

After mounting of a transport set and connection it to vehicle’s accumulator unit, the terminal (BARS-01-T) carries out regular interrogation of installed IR-sensors to read information about a number of doorways crossings during stops.

When doors are closed, every IR-sensor is in standby mode, in which movements of passengers under the sensor are ignored.

In 1.5 sec after a door opening, a relevant IR-sensor registers a stop.

When doors are opened, IR-sensors calculate a quantity of doorway crossings by passengers, with control of "false" actuations. In case of a crossing that does not correspond to preset parameters (duration, interval between crossings) this crossing is not counted and considered as false actuation.

BARS-01-T terminals execute transmission of backup data to control station upon its request and transmission of data about emergency situations by means of cellular communication channels (GSM). During all period of operation terminals stay in the network and in case of brake of communication they try to recover it. In order to monitor a state of communication channel, service software of control station requests each terminal for information with 2 minutes intervals.

In case of alarm sensor or key switch actuation, a terminal sends information about this event to dispatcher’s PC and to official mobile phones (up to 2 numbers), as SMS-messages, if this option is configured.

It is allowed to connect terminals to a PC for setting and reading of archive data by means of service software "Configurator BARS-01" in case if it is not possible to connect to backup server via GSM channel.