VEHICLE
TRACKING SYSTEMS

iON Pro

Navigation User Terminal

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The iON Pro navigation user terminal is a versatile device designed for installation in a vehicle or speciality vehicle to control the proper use of a vehicle or fuel, to track the object location, the sensor and device states connected to the terminal.

In addition, iON Pro is a solution for monitoring the operating conditions of fixed-site facilities (vending equipment, boiler plants, diesel-generator units, oil storages, etc.).

Basic Functions

- Real-time positioning of a target object, determining its speed and moving direction
- Data collection from various connected sensors
- Data transmission to the server (on request or schedule)
- Program notification of an operator on "alarm events" (power cut-off, internal antennas failure, case tampering, speed violations, fuel draining, etc.), notification via SMS and email
- Data storage in the nonvolatile memory

Key Features

- Internal nonvolatile memory of large capacity (512 Mb – 10 million records)
- Driver behavior analysis*
- Power-saving modes
- Supports wide range of interfaces
- Supports remote updating of the terminal firmware
- SIM chip support
- Protection against tampering with the terminal (antenna connectors, cables, SIM card slots are protected by the cover with mechanical and electronic seal)
- Support for unloading data from the “black box” to a USB flash drive*
- AES encryption use for transmitting data to the server and unloading to a USB flash drive*

* The option is to be implemented

Operating Principle

The terminal receives data on its position, current time, speed and driving direction from the GPS and GLONASS satellites. If no access to the satellites provided (due to underground parking, reinforced concrete floors and walls, topographic features, etc.), the object is positioned via the nearest GSM stations.

The data received from the satellites and readings of the connected sensors are transmitted to the dedicated server over the GSM network (in the GPRS mode). Data is transmitted over the Internet.

The intuitive web interface allows the user to track the vehicle location and operating conditions via a PC, laptop, mobile phone or tablet computer from anywhere in the world.

Reliability, Efficiency and Smooth Operation in Any Conditions

Any business is focused on obtaining the greatest results. To achieve this goal you need to solve two main problems:

- Efficient workflow planning and management
- Reduction of possible losses

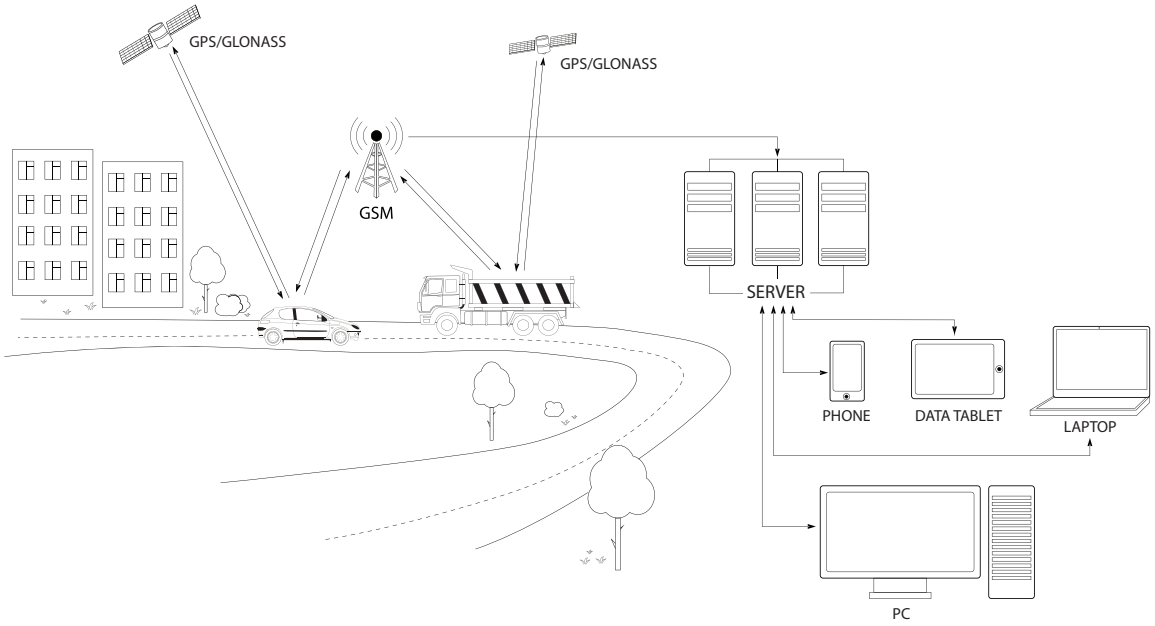
iON Pro is designed to solve these problems. Tracking of vehicle routes and travel time provides high performance, detecting unauthorized use and downtimes. Monitoring of fuel consumption minimize possible frauds of dishonest employees.

Moreover, when developing the device, we devoted special attention to its quality and reliability. The team of the iON Pro developers aimed at creating cost-effective and efficient equipment providing a maximum set of features. iON Pro stands out for its fault tolerance. To prevent the device from frauds and tampering, the connectors of interfaces, antennas and SIM cards are concealed by the housing containing the built-in sensor, which triggers and gives a signal to the server in case of an unauthorized opening. This terminal's feature prevents from data alterations and reduces to a minimum vehicle abuses, allowing you to save time and material supplies.

Reduction of Enterprise Costs and Workflow Optimization Using iON Pro

The terminals enable you to connect up to 8 digital liquid level sensors and up to 6 analog or frequency liquid level sensors. The information received from the sensors allows you to prevent unauthorized fuel draining and control the amount of fuel filling and waste. In addition, the terminal allows you to expand the number of connected liquid level sensors via the input expander.

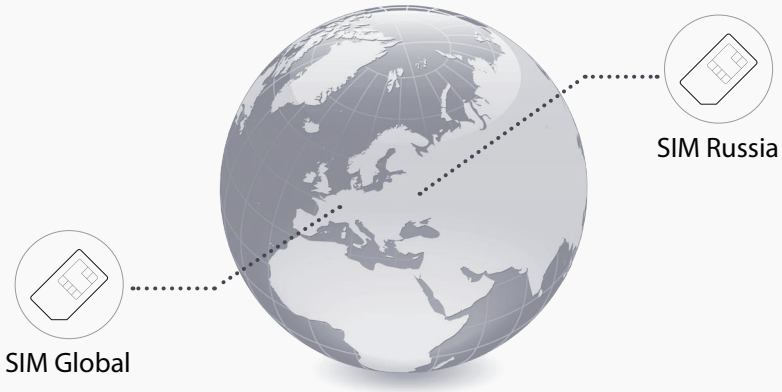
Data on traveled distance, tracking of vehicle movements both in a real-time and for specified time range enables you to prevent non-purpose use of the vehicle, fraud trips, and unauthorized downtimes.



Dual SIM Card Support

For the companies, involved in long-distance transportation, the problem of reducing the network traffic is especially urgent. This concerns both interurban and international transportation. iON Pro provides the solution to this problem.

The device supports two SIM cards, which provide flexible operation in a roaming area and smooth communication.



Surge Protection

The onboard power system in the trucks of Russian origin is characterized by voltage surges when switching on or off inductive loads (starter, electric drives, fan, air conditioning equipment). The iON Pro terminal is equipped with a protective diode against voltage surges, protection system against high-voltage noises and reverse voltage supply.

iON Pro features a wide range of input voltage — 9-50 V, maximum allowable voltage is 55 V.

The power circuit, used in the terminal, has been subject to a comprehensive testing and now is successfully applied in cars and trucks.

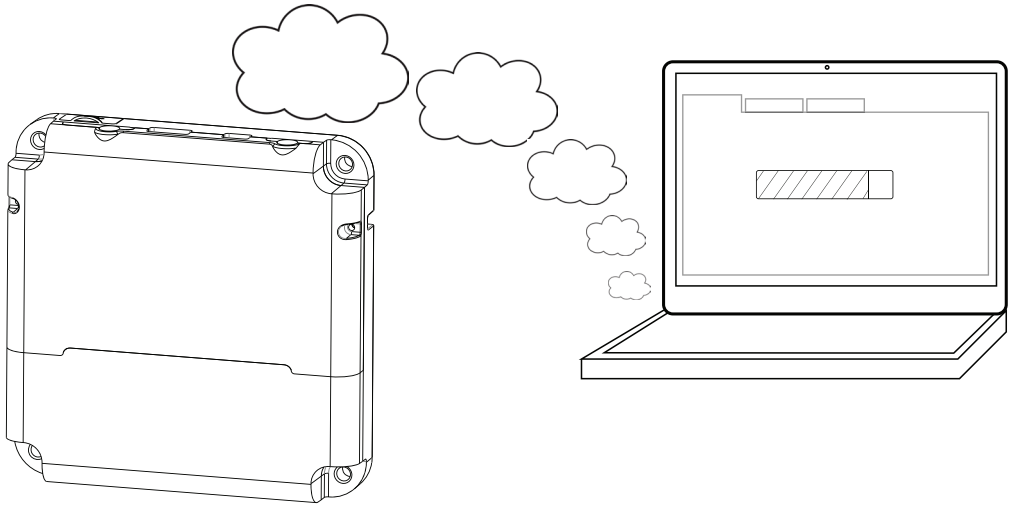
Operation in Harsh Environments

The iON Pro terminal complies with high requirements for reliable and smooth operation in harsh climatic conditions. Thus, the device supports operation even in areas with extremely low or high ambient temperatures.

The iON Pro housing is designed with account for protection against dust and moisture (IP54). Operating temperature range is -40°C to +60°C. The function of SIM card heating is provided.

Firmware Updating

The iON Pro navigation user terminal allows for remote firmware updating. The firmware updating can be also implemented automatically by the configured parameters, on a user's command through the web interface, when connecting to a PC as well as using an Android-based tablet computer (via a mini-USB connector).



Accelerometer + Gyroscope System

iON Pro is equipped with an accelerometer and a gyroscope which enable detection of vehicle movements, g-force, harsh accelerating, braking and cornering. Harsh breaking, accelerating and route changes can cause freight displacement in a container and damage the vehicle structural components. The accelerometer + gyroscope system allows the dispatcher to analyze driving style and signal such events as vehicle roll-over, harsh bump, loading on a tow truck, etc.).

On the market of onboard equipment such system is implemented only in the iON Pro navigation user terminal. The accelerometer + gyroscope system allows you to control proper use of a vehicle, and consequently to extend service life as well as to provide an instant signal about alarm situations to the dispatcher.

Connectivity

Unlike similar equipment, iON Pro supports a wide range of unterfaces:

- 2 x RS-485
- RS-232*
- CAN (J1939/FMS)
- SAE (J1708)
- 2 x 1-Wire
- USB

* *Optional (via the interface expander)*

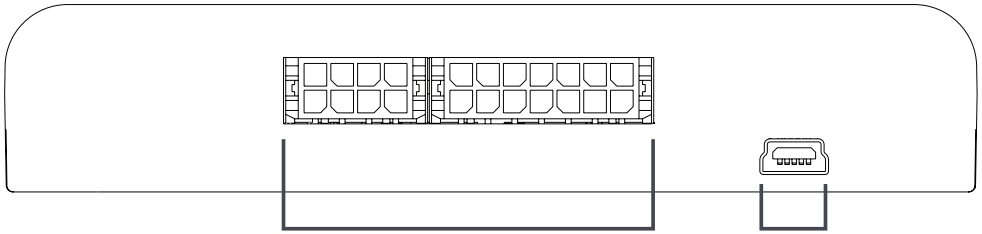
iON Pro is equipped with two RS-485 interfaces that enable connection of liquid level sensors, a liquid level indicator LLD and other additional equipment.

Two interfaces provide simultaneous connection of devices with incompatible protocols or different rates. The second interface enables the support of the J1708 protocol, widely applied in construction and agricultural machinery, some trucks and motor cars, which is currently not effected in the terminals of other manufacturers.

The RS-485 interface provides flexible configuration of the port basic parameters enhancing the possibilities for connection of devices.

When connecting via CAN or SAE bus, the device can receive data on vehicle operation directly from the onboard computer. The CAN interface supports the J1939/FMS protocol that specifies a common standard for trucks. To provide iON Pro compatibility with non-standard protocols, the multipurpose CAN_LOG controller can be used, which allows you to get information from a large fleet of trucks, motor cars or agricultural machinery.

iON Pro is equipped with two 1-Wire interfaces enabling the terminal to interact simultaneously with, for example, an identification system and with the temperature sensors. This feature distinguishes iON Pro from terminals of other manufacturers.



The driver identification system is equipped with a feedback option - it indicates the reading process of a driver's key. That is, in order to let the driver know if the system has identified a key-card, it is sufficient to connect a LED and a reader unit, or only a unit with an integrated LED to the terminal.

The maximum number of temperature sensors that can be connected to the terminal amounts to 15. It is the largest number of sensors supported by similar models. This feature considerably widens the range of tasks to be solved by the iON Pro terminal. For example, this can include monitoring of refrigerators, boiler plants, etc.

Mini-USB allows you to configure and test the terminal, read out the "black box" data, connect a web camera, display data on a computer screen without any optional adapters.*

iON Pro features six multipurpose inputs, with two ones serving as outputs. This feature enables the terminal to be used for solution of many tasks. Multipurpose inputs and inputs/outputs provide connection of any devices with an analog, discrete, or pulse input (fuel flow, fuel level, pressure, temperature, and ignition sensors, attachment sensors, tachometer, etc.). Moreover, all the inputs support input/output pull-up providing flexible configuration of the terminal.

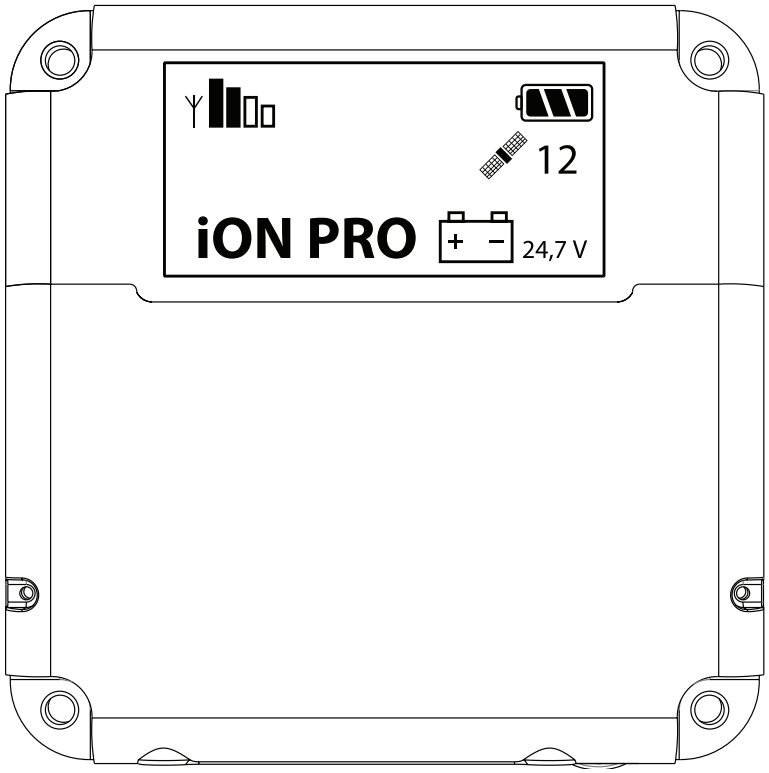
The iON Pro navigation user terminal finds an application for many sectors, such as freight and passenger transportation, agriculture, housing and public utilities, etc.

* The option is to be implemented

OLED Display

iON Pro features OLED display* providing visualization of main components of the system. With the cover removed the data, required for the persons responsible for configuration of the navigation equipment, is displayed, i.e. the number of detected satellites, methods of the terminal power supply, active SIM card, the status of connected sensors, traveled distance, etc.

With the cover closed, the data, required for the driver, is displayed, i.e. daily mileage, fuel consumption and other parameters.



* The option is to be implemented

Unique Features of the iON Pro Navigation User Terminal

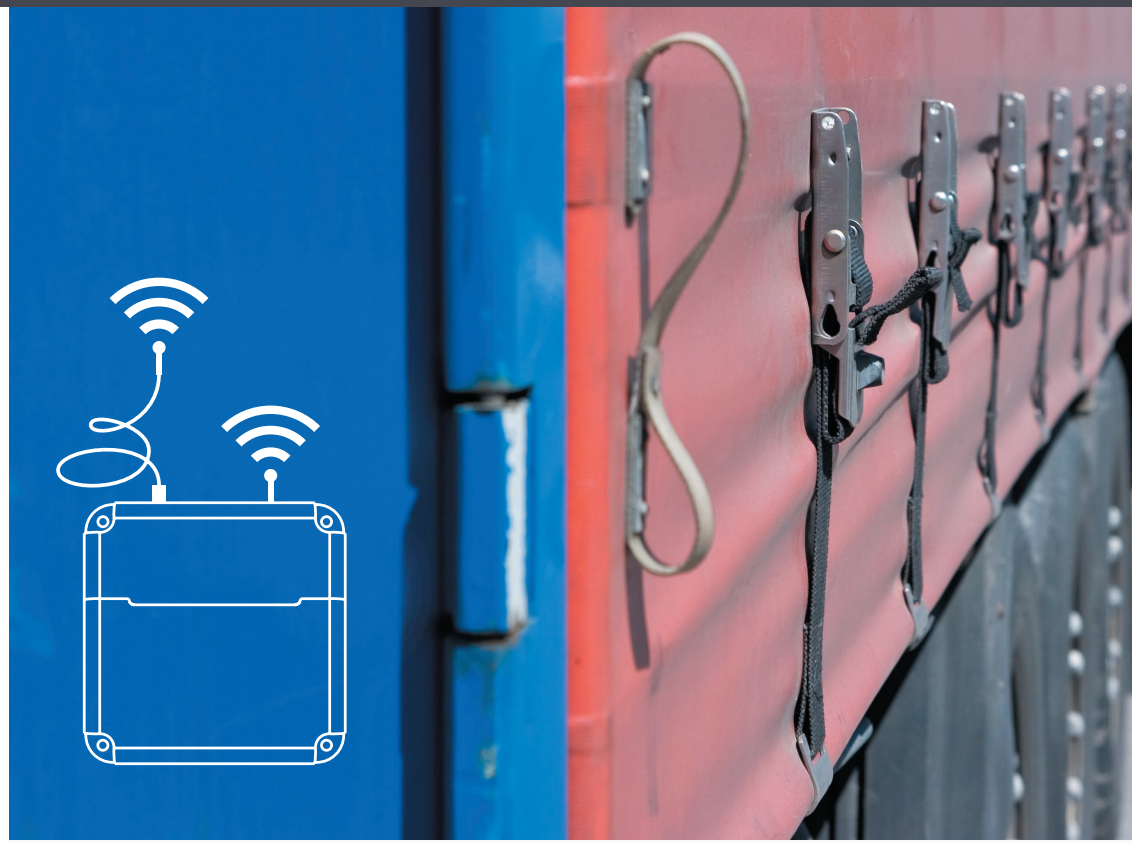
The features of the iON Pro navigation terminal compare favorably with similar products, currently delivered on the market. The team of developers has implemented the innovative solutions at affordable prices for an end user.

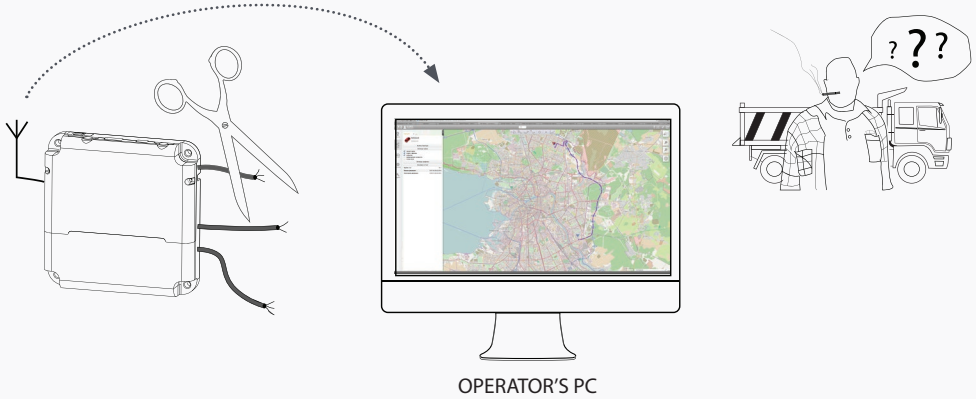
Built-in Redundant Antennas

iON Pro is the only navigation terminal equipped both with the external and internal GPS and GSM antennas and an option of switching between them. Sometimes the drivers try to put the onboard equipment out of operation or block it. The additional built-in antennas and a switching algorithm provide reliable and smooth operation of the device in harsh service conditions.

If the external antenna fails, the terminal automatically starts operating with a built-in one. In this case the signal and a message, containing information on the type of antenna failure, are sent to the server.

Thus, the system provides an outstanding reliability in harsh service conditions and ensures smooth operation even in an emergency.





Built-in Li-Pol Battery and Several Power-Saving Modes

Unlike similar models, iON Pro is equipped with a built-in lithium polymer battery (Li-Pol) of high capacity - 1900 mAh.

It enables smooth continuous operation of the terminal if no external power is supplied.

The onboard equipment consumes the battery energy of the vehicle even with the engine powered off. Therefore, after long idling there might be some problems with the engine start. To solve this problem, the iON Pro terminals are provided with the power-saving modes of flexible configuration. Switching between the modes is recorded by the server and displayed in the dispatcher application. Power-saving modes allow for significant GPRS traffic economy.

1. Low Power Mode. GPS and GSM operate at regular intervals. By default, the terminal is powered from the vehicle power system. The settings can be configured for the device power supply from the built-in battery. When the battery master switch is disabled, the terminal switches to modes 2 or 3 and operates from the built-in battery.

2. Sleep Mode. The terminal can respond to SMS commands. Power is provided from the built-in battery (if the master switch is off). The device wakes up at ignition start or start of motion.

3. Deep Sleep Mode. The vehicle battery provides the lowest power consumption. Power is provided from the built-in battery (if the master switch is on) or from the vehicle power system. The device wakes up at ignition start or start of motion (power consumption is 3.4 mA at 24 V power voltage and 6.1 mA at 12 V power voltage).

Power-saving modes provide considerable economy of SIM card traffic.

Large Capacity of the Built-in Memory

The device operation is based on a "black box" principle - all data, including time of events, is recorded to the internal nonvolatile memory and transmitted to the server. Thus, even with poor signal or no network available, all the information received by the terminal is stored.

Frequently the companies, involved in long-distance transportation, face the challenge of data loss due to communication cuts-off, a SIM card zero balance, failures of data collection servers, etc.

If no communication with the server available, all data is recorded into the built-in memory. The iON Pro navigation terminal can hold the largest volume of data compared to other similar products on the market. The built-in "black box" of the terminal can store data up to 5 years (when storing only GPS data - up to 27 years). Generally, navigation terminals can hold no more than 8 MB (250 thousand records). The capacity of the built-in nonvolatile memory amounts to 512 MB. It is enough for storing 10 million records!

The data can be transmitted to the server when communication is restored, or when connecting the device to a PC or via a USB flash drive.

Support for unloading data to a USB drive considerably expands the range of tasks that can be solved by iON Pro. Firstly, it provides considerable traffic economy. Secondly, it enables easy operation, which is especially important when using vehicles in hard-to-reach areas with poor signal or no cellular coverage. When unloading data, the security system with the built-in key is activated.

Another iON Pro benefit compared to similar models is the possibility to connect a standard webcam and record photos into the internal memory, which is not implemented by other manufacturers.*

* The option is to be implemented

Unique Mechanism of Data Transmission to the Server

Unlike similar models, data from the iON Pro terminal to the server is transmitted via two self-contained packets. The first one is a real time priority packet. You can configure the frequency of packet sending via the configuration manager, as well as data containing the packet (location data, current time, speed and driving direction as well as various events and parameters - fuel draining, filling, location of loading and unloading, speed violations, etc.). The second one contains data from the nonvolatile memory, i.e. stored data which is not yet transmitted to the server.

It allows the dispatcher to receive real time relevant information on vehicle movements and operation.

For example, if no connection with the device is established for several days (due to operation in an area of poor signal, no cellular coverage, technical problems with the server, etc.), first of all, the dispatcher receives the object's current position as soon as the device comes into contact, and all other data is received as the data is unloaded from the nonvolatile memory. Models produced by other manufacturers usually transmit data via a single packet, from old packets to new ones. It results it the situation that the dispatcher sees irrelevant information for a long time - the vehicle observed on the screen is displayed with old data. Moreover, the data transmission mechanism features flexible configuration - the device can be configured for unloading data by size and schedule.

Such data transmission algorithm is easy to use for operation of a dispatcher centre and cost-effective due to traffic saving in a roaming area. The real time priority packet can be disabled through the server or the configuration manager.

Integrated Protection System against Tampering with the Device Operation

In the process of the iON Pro development much attention has been devoted to protection of the device against tampering. The user's part is securely protected by the housing - all the connectors to connect wires, antennas, SIM card are concealed under the cover. After completing the configuration and connection procedures, the device is closed and sealed. The LED indicators light off in 20 minutes after closing the cover. This option has been implemented to prevent the driver's awareness of the device operating state (if required, the option can be disabled by the system administrator).

The components of the integrated protection for the iON Pro terminals are the following:

- ***Mechanical protection***. The installation package is supplied with the self-destroying seals from the manufacturer. In addition, the space for additional seal is provided.
- ***Electronic protection***. The device is equipped with the electronic seal placed under the case, which registers removal of the cover (for access to SIM cards, wires and antennas). When the case is opened, the terminal sends a signal to the server. The event of opening is displayed in the dispatcher program as a message.
- ***Warranty***. The device is supplied with the second electronic seal. The end user shall have no coverage or benefits under the warranty if the product has been subject to unauthorized tampering with the main watertight part of the tracking terminal.

Safety and Security of Passengers, Employees and Freight during Transportation

The safety of passengers, employees and freight is of utmost importance. The vehicle's interior can be equipped with an alarm button and voice communication with the dispatcher. In case of intruder's assault, road accidents and other abnormal situations, the driver can promptly send necessary information to the dispatcher station.

Voice communication can be implemented in one of the two options:

- Vehicle handsfree kit (a speaker + a microphone)
- Half-duplex communication kit (a speaker + a microphone with push-to-talk key)

Both modes feature a sound and a LED call indicators as well as a call answer button. In addition, the device is provided with the option of automatic response to a dispatcher call. When the connected smoke detector triggers, the device sends signal to the server about the smoke formation in the vehicle interior.

The event alarm system in the dispatcher program provides flexible configuration. In addition, SMS notification to the specified numbers is supported.

Conformity with the Requirements of the Russian Ministry of Transport Order No 285 for GLONASS or GLONASS/GPS Satellite Navigation Equipment

iON Pro conforms to the requirements specified in the order No 285 of the Russian Ministry of Transport with regard to the onboard equipment for monitoring of N-category vehicles intended for transportation of hazardous freight (except for vehicles intended for use in an area with potentially explosive atmosphere) and M-category vehicles used for commercial transportation of passengers.

- Provides the first current positioning at the "cold" start for no more than 40 seconds.
- Features the capacity of the internal nonvolatile memory enabling you to record 20 000 events registered in sequence. The events are automatically stored in the internal nonvolatile memory if data transmission over mobile wireless communication networks is unable. The content of the nonvolatile memory is automatically unloaded when data transmission over mobile wireless communication networks is restored.
- Operates for no less than one hour (at temperature of 20°C) in case of abnormal supply disconnection from the onboard power system.
- Features an alarm button.
- Provides use of RS232, RS485, CAN and USB interfaces for data communication with external devices and has no less than two discrete and two analog inputs.
- Dust- and moister proof.

ПРИКАЗ № 285
СООТВЕТСТВУЕТ ТРЕБОВАНИЯМ
МИНИСТЕРСТВО ТРАНСПОРТА РФ

- The iON Pro components include:
  - GLONASS or GLONASS and other GNSS-based navigation module;
  - GLONASS or GLONASS and other GNSS antenna built into the terminal's case or an external one;
  - built-in or external GSM/GPRS antenna;
  - built-in or separately placed alarm button.
- Complies with the requirements for the resistance to climatic and mechanical effect.
- Provides the vehicle positioning with the measurement error of maximum 16 meters on coordinate axes at confidence coefficient of 0.95.
- Provides self-sufficient operation due to a backup battery if no power from the onboard power system is supplied. The battery ensures no less than one hour of operation in a callback standby mode and 15 minutes in the mode of voice communication. The backup battery service life is no less than three years.

Benefits of Applying iON Pro in Workflow

- Identifies cases of unauthorized fuel use
- Identifies cases of unauthorized vehicle use, downtimes and idling
- Monitors the weak points in driver behavior, resulting in a more economically efficient vehicle maintenance and reduced fuel costs
- Counts the total number of attachment operating cycles, motometer and fuel waste
- Monitors sensors connected to the terminal - temperature, pressure, smoke, etc.
- Improves passenger, employee and freight safety and security
- Increases company's profit
- Optimizes workflow
- Reduces costs