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Necessary Tools, Devices and Materials

In order to connect passenger counting sensor IRMA MATRIX, manufactured by IRIS GMBH company, to Galileosky tracking devices (hereinafter – tracking device) you need:

1. Electrical tools.
2. Set of connecting wires.
3. Windows-based computer with the installed program of configuration of Galileosky tracking devices – “Configurator”. You can download the latest version of it here: https://galileosky.com/podderzhka/programmyi.html
General Information

Galileosky Base Block and Galileosky 7 tracking devices have a function that enables to work with passenger counting sensor IRMA MATRIX manufactured by IRIS GMBH https://www.irisgmbh.de

External view is presented in picture 1.

Galileosky devices offer the possibility to record number of passengers enter and exit and transmit these data and other external information to the monitoring software.

**ATTENTION!** This functionality is implemented in the tracking devices by means of Easy Logic technology (https://galileosky.com/products/easylogic.html).

In order to work with IRMA MATRIX sensor, minimal firmware version should be:

- For Base Block and Galileosky v7.0 devices 20.4.

Connection of up to 6 IRMA MATRIX sensors is possible.
Connection of Passenger Counting Sensor IRMA MATRIX to the Tracking Device

Sensor IRMA MATRIX is connected to the tracking device via CAN interface in accordance with the schemes presented in Picture 2.

The devices do not have separate electrical termination (termination load) for CAN-bus. It is necessary to add 120 Ohm resistors into both ends of the bus between CAN_H and CAN_L contacts. Connection of IRMA MATRIX sensors is provided in the manufacturer’s User manual.

**ATTENTION!** Grounds (GND) of the tracking device and the sensors must be connected, power supply is provided separately.

![Connection schemes of IRMA MATRIX sensor](Pic. 2)
Presetting of IRMA MATRIX Sensor

Before setting Galileosky tracking devices it is necessary to carry out the presetting of the IRMA MATRIX sensor. For that you need to perform the following actions:

1. Connect IRMA MATRIX sensor to PC with the help of the sensor’s wire with LAN connector;
2. On the sensor backside you can find its IP-address. In the PC you are configuring the sensor with set the IP-address from the same subnet.
3. Launch “DIST500-Configuration” service program to configure IRMA MATRIX sensor.

**ATTENTION!** “DIST500-Configuration” service program for configuration is provided together with IRMA MATRIX sensor by the manufacturer. The settings, described below, are relevant only for cooperation with Galileosky tracking devices. Other settings are carried out in accordance with the manufacturer’s recommendations.

4. To set the sensor setting go to menu Configuration/Select sensor(s) to be configured...(Pic.3)

5. In the opened field select the necessary sensor and click «OK» (Pic. 4).
6. Select the needed configuration mode Configure Sensor and click «Ок» button (Pic.5).

7. Set the values for every sensor in ascending order for each field “Function Area Address” starting with 1 (Pic.6)
Function Area Address value must be different for all connected sensors IRMA MATRIX (Pic.7)
8. Enable settings for sabotage detection if necessary (Pic. 8).

9. After the settings are completed click «Apply» button.

**ATTENTION!** Setting IRMA MATRIX sensor is performed in accordance with manufacturer’s recommendations. Picture 9 shows an example of connecting the sensor in the vehicle.
Connection of Entry Monitoring Sensor

Cooperation of IRMA MATRIX sensor and Galileosky tracking device allows to control doors state and manage passenger counting when the doors are open/closed.

The algorithm minds the state of discrete-analog input that the entry monitoring sensor is connected to by means of special commands. Depending on the entry state IRMA MATRIX either activates and counts passengers or deactivates and does not count passengers:

- Entry status is 1 – the door is open, IRMA MATRIX sensor is activated, passengers are counted;
- Entry status is 0 – the door is closed, IRMA MATRIX sensor is deactivated, passengers are not counted.

ATTENTION! Connection of entry monitoring sensors can be carried out either with positive voltage or with ground switching. You can find more details of discrete-analog sensors’ connection in the user manuals from our site https://galileosky.com/podderzhka/dokumentacziya.html

ATTENTION! Number of installed IRMA MATRIX sensors is limited by a number of discrete-analog inputs in the tracking device. Thus, for example, Base Block tracking devices have 4 discrete-analog inputs, Galileosky 7.0 devices – 6, so it is possible to connect 4 sensors to Base Block tracking devices and 6 sensors to Galileosky 7.0 devices.
Setting Galileosky Tracking Device to Work with IRMA MATRIX Sensor

Galileosky device scans IRMA Matrix sensor and records the data about passengers on a cumulative total.

To set the device for working with passenger counting sensor IRMA MATRIX you need to do the following:

1. Launch Configurator software;
2. Insert a SIM-card with active function of GPRS connection into the tracking device;
3. Go to tab «Commands», send command "script galileosky/irma_matrix" and till the command is confirmed by the tracking device (Pic.10);

**ATTENTION!** The algorithm "galileosky/irma_matrix" is incompatible with other algorithms, that involve CAN-bus.

4. Make sure the algorithm is downloaded. You can see it on the "Device" tab (Pic.11).
5. Perform the settings for CAN interface in the following way: go to the tab Settings -> CAN and select “EasyLogic CAN handler” for Filter type parameter (Pic. 12);

6. Perform the settings for entry monitoring sensors in the following way:
6.1. Run command SHOWALLIRMAS to the tracking device for showing all the sensors. In the response you will receive information about the index, given to each sensor. This index is required for further settings of the sensor.

Example of running the command (Pic. 13):

Command: SHOWALLIRMAS

Response: functional adress - input | 1-0 | 2-99 | 0-99 | 0-99 | 0-99 | 0-99

Response parameters:
- “Functional adress” is the assigned to the sensor Function Area Address index, it is further used in a command for additional DAI setting as the sensor of door opening; value 0 denotes that no sensors are enabled.
- “input” is DAI number, which is set as entry monitoring sensor for the IRMA MATRIX sensor, value 99 denotes that none of the inputs is set working with entry monitoring sensors.
In the example above the informative data are 1-0 and 2-99, whereas:

- 1 and 2 are index numbers assigned to the sensor;
- 0 denotes that sensor 1 is attached to DAI0, 99 denotes that sensor 2 is not attached to DAI.

6.2. Run command ADDIRMA functional_address,InN

Where:

- functional_address is the index of IRMA MATRIX sensor, which is defined by SHOWALLIRMAS command;
- InN is the number of DAI which the entry monitoring sensor is connected to.

If IN0 is used as the input for sensor 1 of door opening and IN1 is used for sensor 2, then the command for setting should be the following (Pic. 14):

ADDIRMA 1,0
ADDIRMA 2,1
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(version 4 dated from February 19, 2019)

6.3. In case you need to erase settings of all kind, use the command CLEARALLIRMAS (Pic.15)

6.4. To set the value of “Delay of door closing” (this is the period that is required for the door to be closed completely as this value can be different in different vehicles) run command SETDELAY N, where N is given in milliseconds.

Example of command execution (Pic. 16)

7. Go to tab «Settings» -> «Protocol» and select Main packet parameter for User array (Pic.17)
8. Click “Apply” button.
9. You can check if the additional equipment works correctly in the “Troubleshooting” tab with enabled parameter “Algorithm and script diagnostics” (Pic. 18)
Setting the Monitoring Software

After setting the tracking device you need to perform the settings of the monitoring software. If your monitoring software does not support user array processing, you should individually prepare the software that would process the data in accordance with the data exchange protocol and set it in the monitoring server. Description of data exchange protocol of the tracking device and the server is presented in the following document — “Server Exchange Protocol”, which you can find in our site in the tabs Support -> User Guides -> Galileosky Protocol -> Server exchange protocol of Galileosky tracking devices https://galileosky.com/podderzhka/dokumentacziya.html.

Galileosky tracking devices enable to transmit to the monitoring software the following parameters:

- Sensor address;
- Sensor state;
- Number of entering passengers;
- Number of exiting passengers.

The array’s first byte contains type of the data and is equal to 0x0A.

The array includes 6 groups, each of them contains received data from correspondent sensor.

Each of 6 sensors records 8 bytes.

Maximum array size is equal to 49 bytes.

The format of recorded data (bytes order is little-endian) for one group:

<table>
<thead>
<tr>
<th>№ of field</th>
<th>Size in bytes</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>Sensor address (last 17 bit of sensor’s MAC-address)</td>
</tr>
</tbody>
</table>
| 2          | 1            | Sensor state:
|            |              | - 0 – normal work of the sensor;                              |
|            |              | - 1 – the sensor detected sabotage event;                     |
|            |              | - 2 – the sensor works with parameter values from the backup memory; |
|            |              | - 3 – there is no parameter copy in the memory;               |
|            |              | - 4 – the configuration includes one or more incorrect parameters; |
|            |              | - 5 – the sensor works in the service mode;                   |
|            |              | - 6 – configuration data contains incorrect settings;         |
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- 7 – maximum temperature has been exceeded at least once;
- 8 – maximum temperature is exceeded at the moment;
- 9 – FPGA is overloaded;
- 10 – lower voltage is detected;
- 11 – the sensor has sent message about an error
- 12 – connection problem, respond from the sensor has not been received.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

The results of data transmission of events and photos are presented in the monitoring software in the following order (Pic. 19):

Connection of passenger counting sensor IRMA MATRIX to Galileosky tracking device is completed, the tracking device is ready for use.

RSA “Galileosky”, LLC produces satellite monitoring equipment for GPS and GLONASS real time vehicles monitoring. The tracking devices determine the mobile object location recording the time and route as points with geographical coordinates and send the data to the server to be further processed and sent to the traffic controller panel.

In addition, a number of other vehicle parameters are recorded: the state of analog and discrete inputs of the tracking device and the state of digital interfaces.

The tracking devices can be used in any vehicle.