

**AutoSat**.com

## **Fuel Level Sensor Adjusting Software**



# **Autosat FLS**

**User's Manual**

**Version 1.4.0**

**Saint-Petersburg**

**2014**

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## 1 Introduction

Autosat FLS software provides configuration and diagnostics of capacitive-type fuel level sensors (FLSs), which are installed in fuel tanks of vehicles and special equipment as a part of satellite monitoring systems. The software is designed to work with Autosat FLSs, but it can also be used for Omnikikm FLSs and compatible sensors by other manufacturers.

Autosat FLS is installed on stationary computers or laptops with the Windows operating system. Currently, all 32-bit and 64-bit versions of Windows (from Windows XP to Windows 8.1) are supported.

A special adapter is required to connect the computer to the FLS. It is recommended to use Autosat FLS USB Adapter manufactured by Autosat. The Adapter is connected to the USB port. It is also possible to use Omnicomm UNU adapter, as well as other adapters or cables with RS-485 or RS-232 interfaces, which can be connected to a USB port or to a sequential port.

The software includes Autosat FLS program, which is used immediately to configure the sensors, as well as Autosat FLS USB Adapter drivers. The software is supplied as an installation package.

Autosat FLS program allows you to perform all the typical operations, which are required when installing FLSs on the vehicle (indicating levels for empty and full tanks, calibrating). For Autosat FLS, the program allows you to configure additional FLS parameters and update its firmware. Also, the program provides you with basic capabilities for FLS diagnostics, displaying real-time data coming from the FLS.

For all questions related to the operation of the FLSs and the use of Autosat FLS software, contact the FLS supplier or Autosat Group technical support. Contact details are available on [autosat.com](http://autosat.com).

## 2 Getting Started

### 2.1 Installing Programs

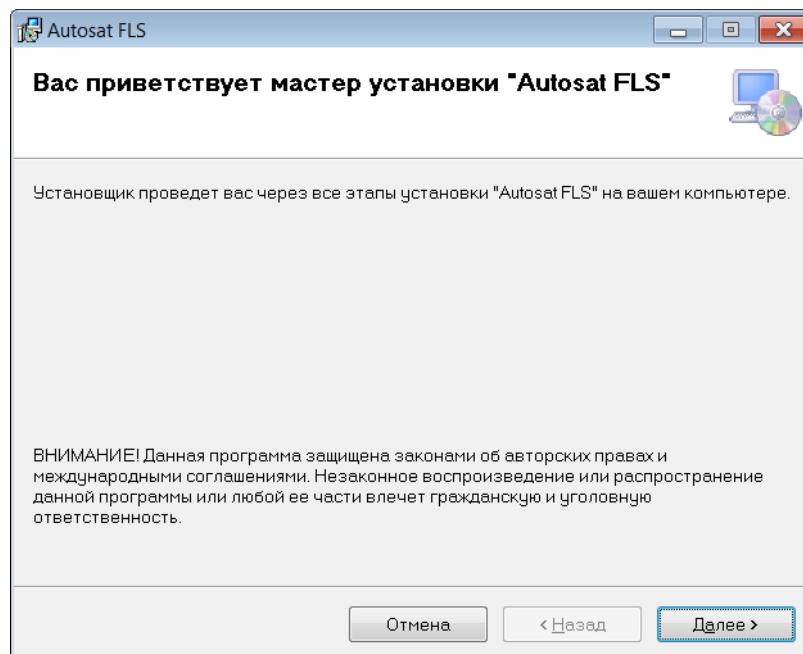
To install Autosat FLS software, use the installation package provided by your FLS supplier. In addition, the installation package can be downloaded from *autosat.com*. The installation package data is about 3 megabytes.

You need to have Windows administrator privilege to install the program. Make sure that your account has administrator privilege. If necessary, contact your system administrator.

Some anti-virus programs do not allow you to run the installation program or even block it after launch. In this case, you need to disable the anti-virus program for the time you install the program.

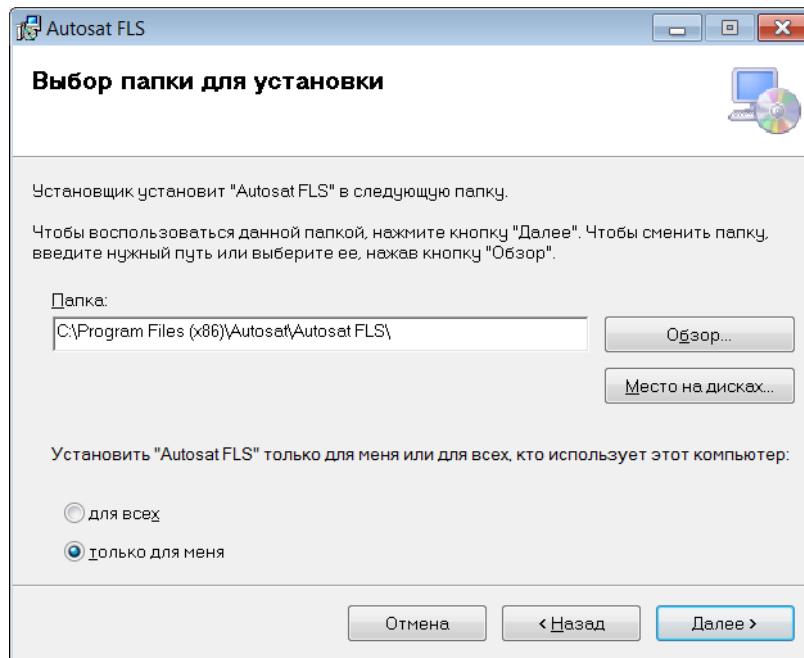
Do not connect Autosat FLS USB Adapter to the computer before installing the software. If the adapter is connected, disconnect it.

If the installation package is on a mass storage device (CD-ROM or USB-drive), connect it to the computer. Use Windows Explorer to open the installation package folder. The installation package includes the files INSTALL.MSI and SETUP.EXE. To start the installation process, run any of them. Once you do that, you will see the installation wizard window.



Click *Next* to continue the installation. To cancel the installation at any time, you can click *Cancel*. In this case, all changes will be canceled.

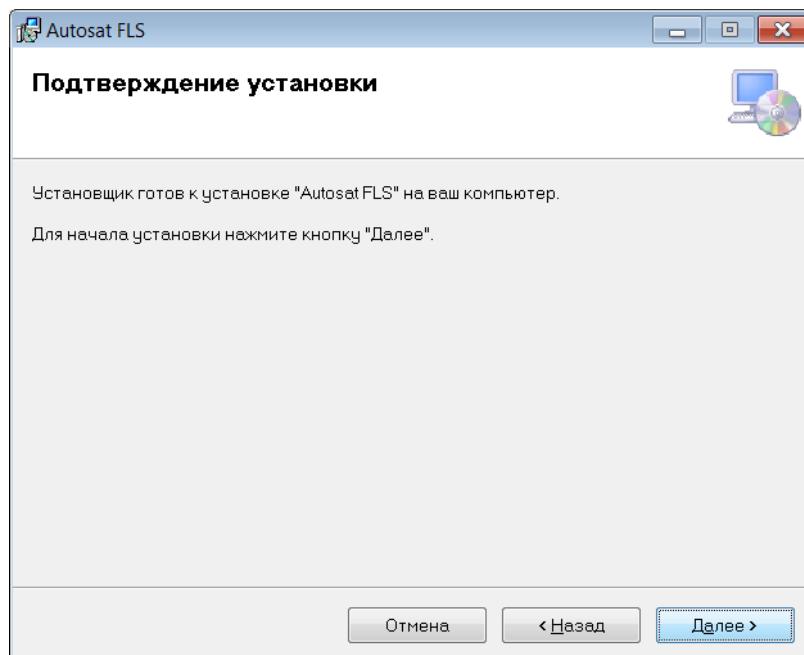
The next step is to select the folder to install the software. The files necessary for running the software will be copied to this folder.



Select the folder to which the program will be installed or use the suggested folder. If the folder with the selected name is missing, it will be created automatically.

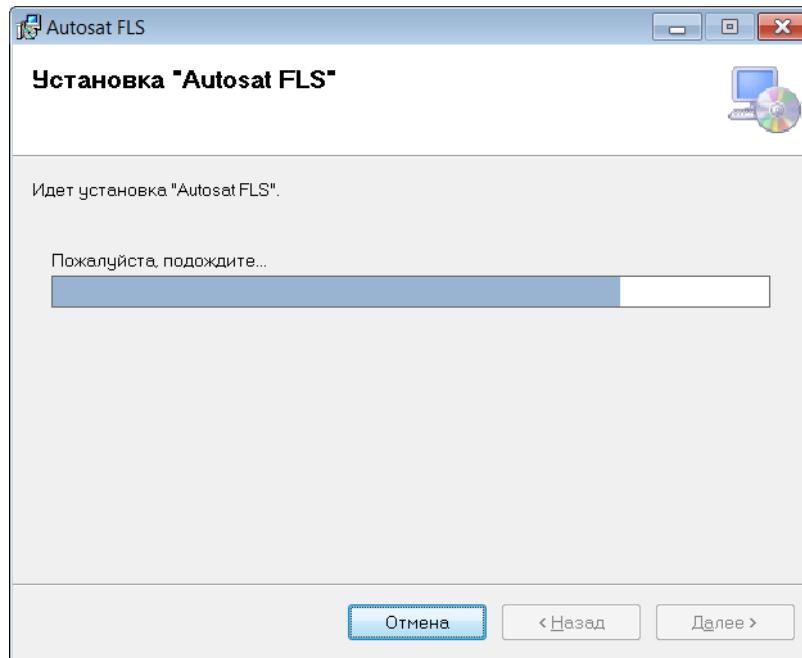
If the program should be available to all users of the computer, select *For Everyone*. Otherwise, select *Only for me*. Click *Next* to continue the installation or *Back* to return to the previous window.

After selecting all the settings, a confirm box appears.

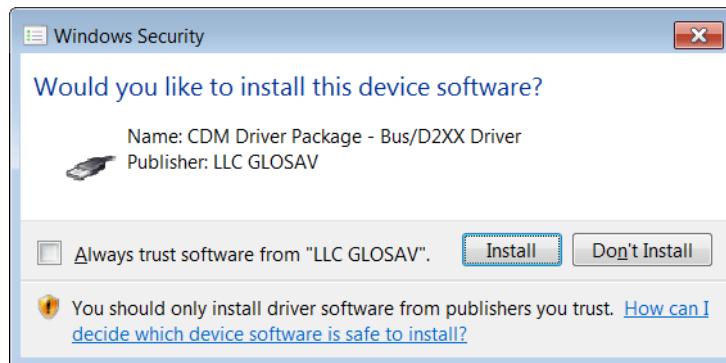


Click *Next* to continue the installation.

Wait until the installation process is finished.

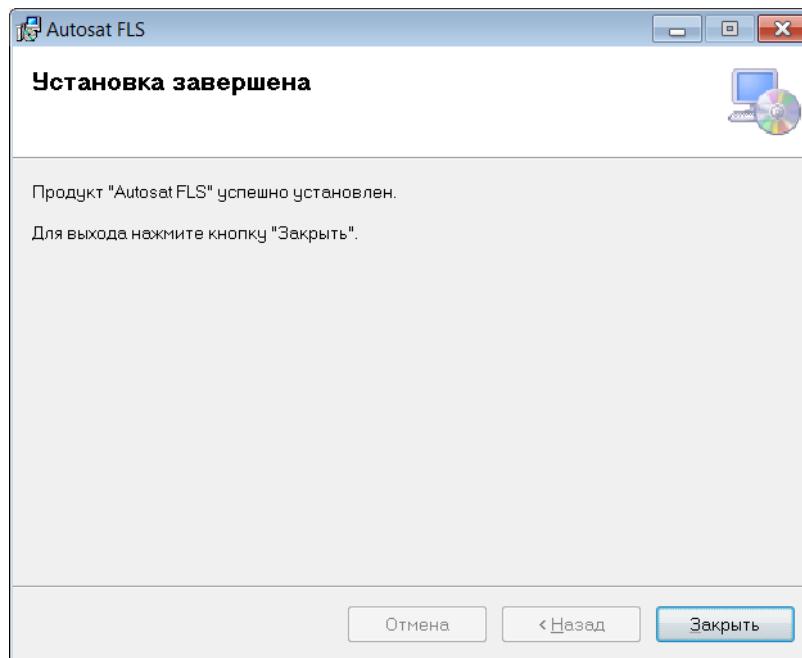


During the installation, the drivers of the FLS communication adapter are installed to the computer. You need to confirm that you trust the software manufacturer and allow the installation.



Click *Instal* to continue the installation. If the drivers are not installed, Autosat FLS installation will be cancelled.

After successful installation, you will see a message.



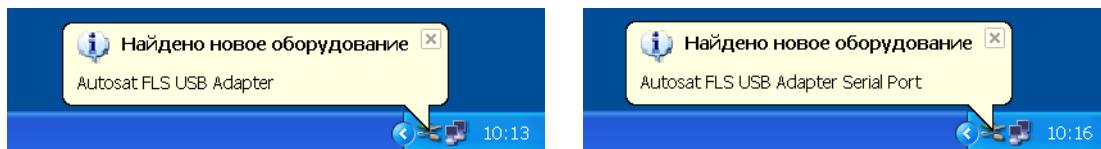
Click *Close* to complete the installation process.

## 2.2 Connecting Adapter to Sensors

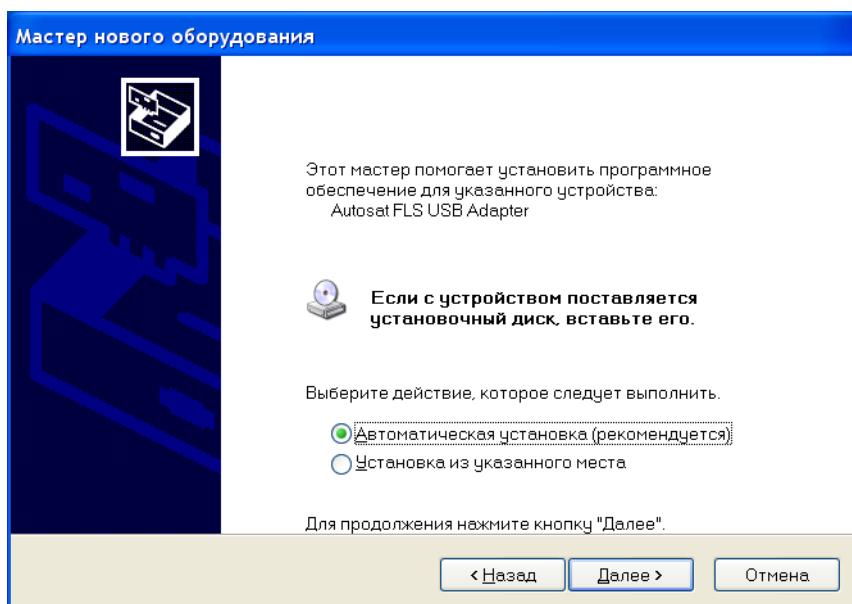
A special adapter is required to connect the computer to the fuel level sensor. It is recommended to use Autosat FLS USB Adapter, which is manufactured by Autosat and connected to the USB port. It is also possible to use Omnicomm UNU adapter, as well as other adapters or cables with RS-485 or RS-232 interfaces connected to a USB port or to a sequential port.

Below you will find recommendations for using Autosat FLS USB Adapter by Autosat. When using other adapters, refer to their manufacturers' documentation. Autosat FLS program allows you to work with any adapters via a hardware or virtual serial port.

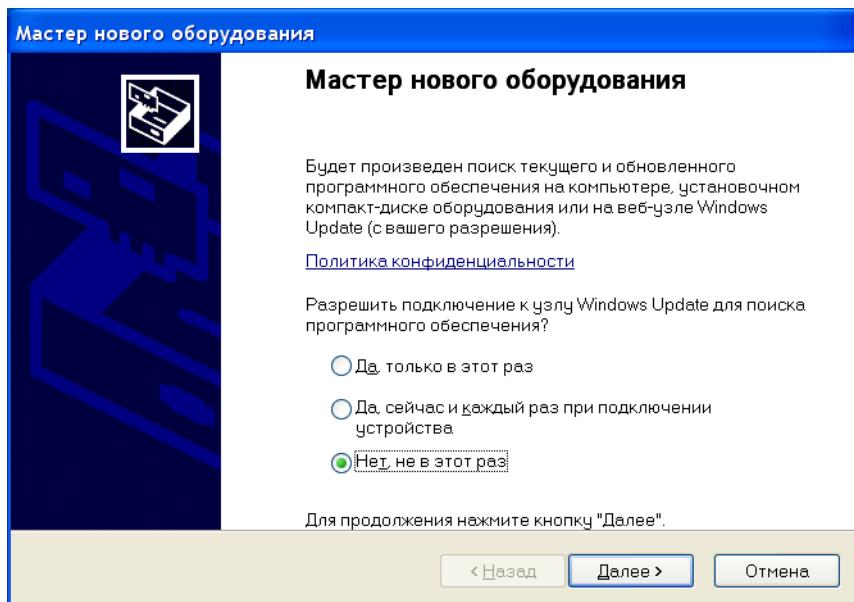
After installing the software, connect Autosat FLS USB Adapter to any USB port on the computer. Windows will automatically detect the type of the connected hardware and configure the previously installed drivers. Depending on the version of Windows and the security settings, additional messages may appear several times during the driver configuration process.



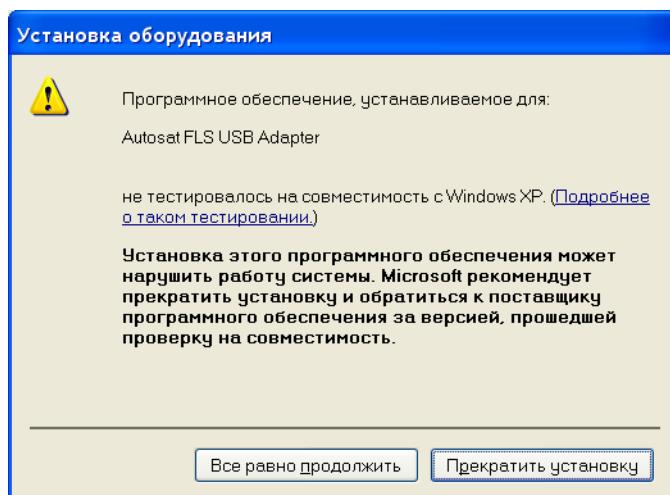
When *New Hardware Wizard* appears, select *Automatic installation* and click *Next*.



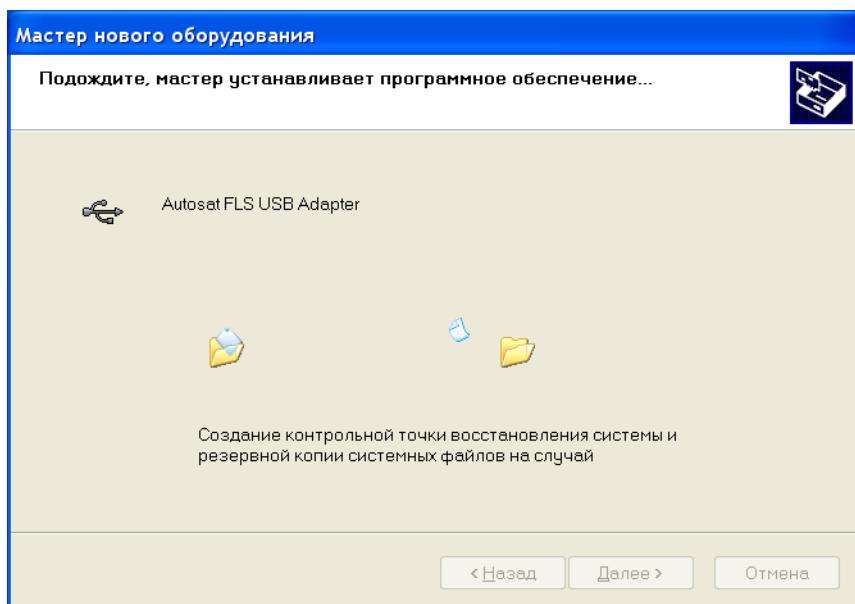
If the *Allow connection to Windows Update?* prompt appears, select *No, not this time*.



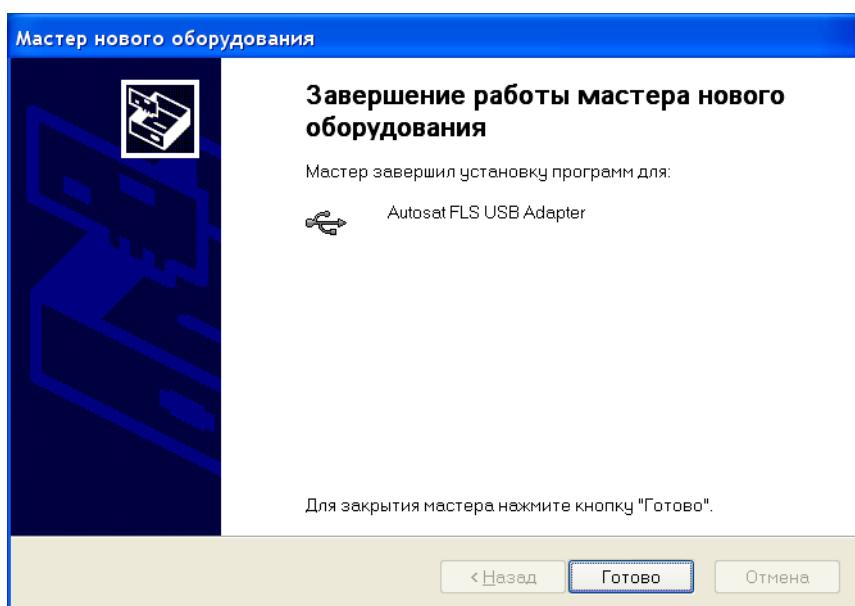
When the warning *The software you are installing for Autosat FLS USB Adapter has not passed Windows Logo testing to verify its compatibility with Windows XP* appears, click *Continue anyway*.



Wait until the driver configuration is complete.



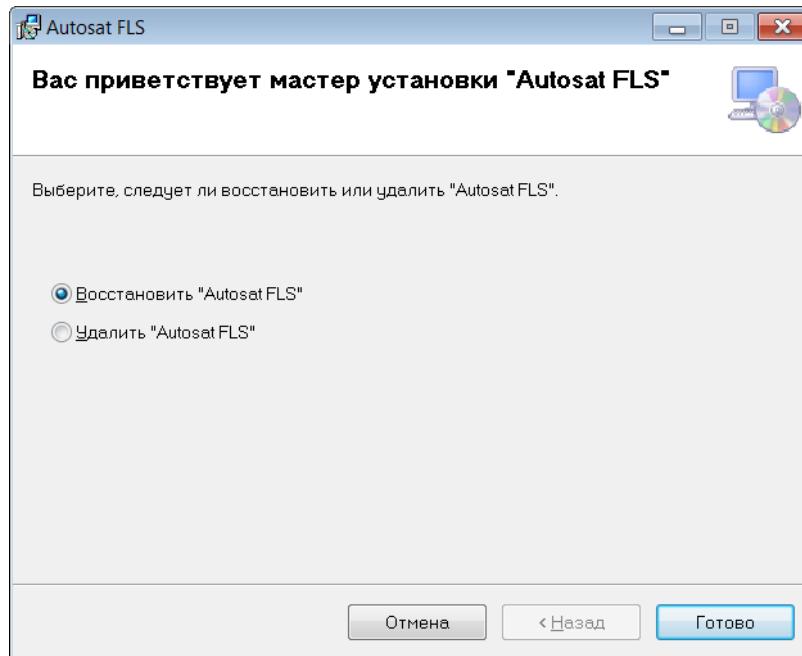
After the drivers have been configured successfully, you will see a message informing you that the new hardware wizard has completed work.



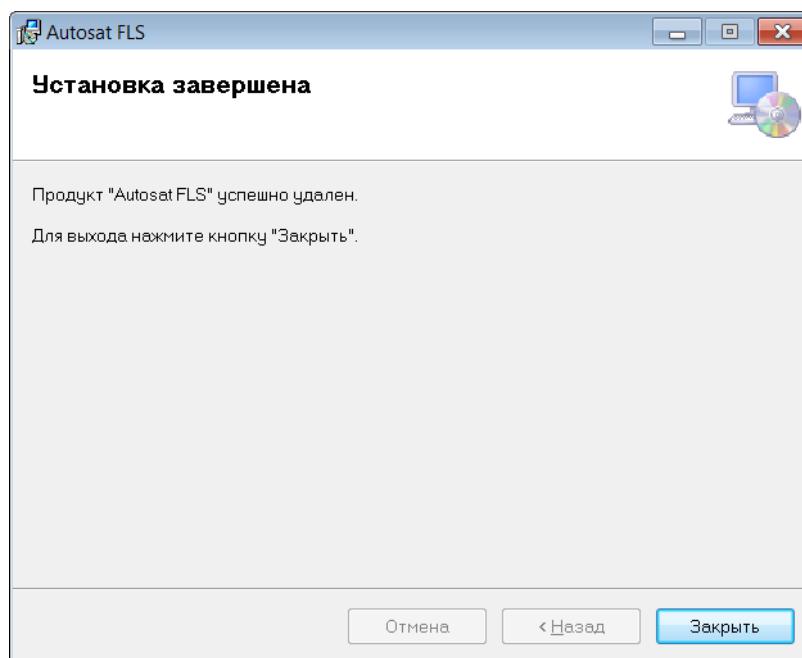
Click *Done*.

## 2.3 Program Recovering and Removing

If you need to recover damaged Autosat FLS software files or remove the software from your computer, run *Setup* again. The Installation Wizard appears.



Choose *Recover* or *Remove*. Click *Done* and wait for the installation program to complete.

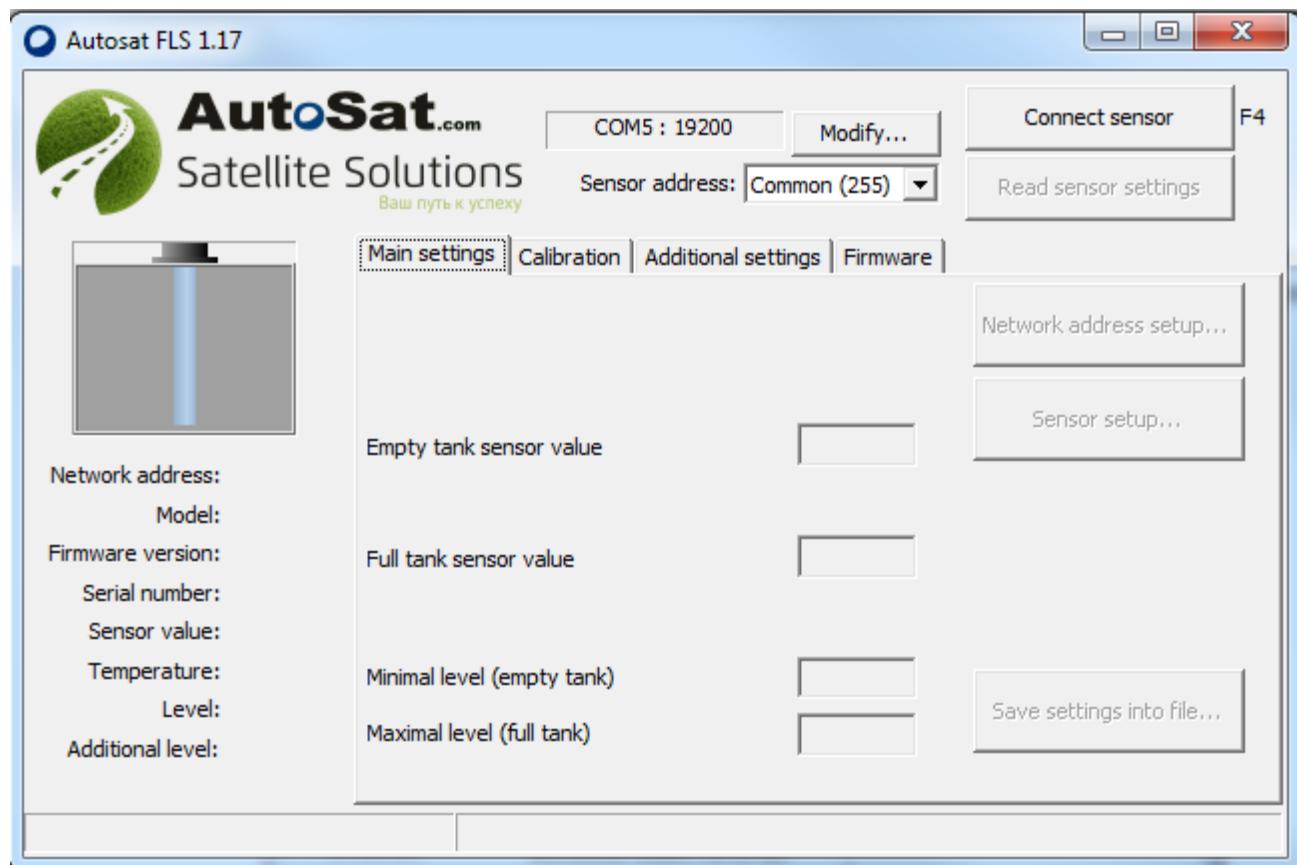


After the message *Installation completed* appears, click *Close*.

## 3 FLS Setup Program

### 3.1 Program Launch

To start the FLS setup program, use the command in the Windows start menu. The command is called *Autosat FLS* and it is in the *Autosat* group. After that, the main program window appears.



The main window contains the following sections:

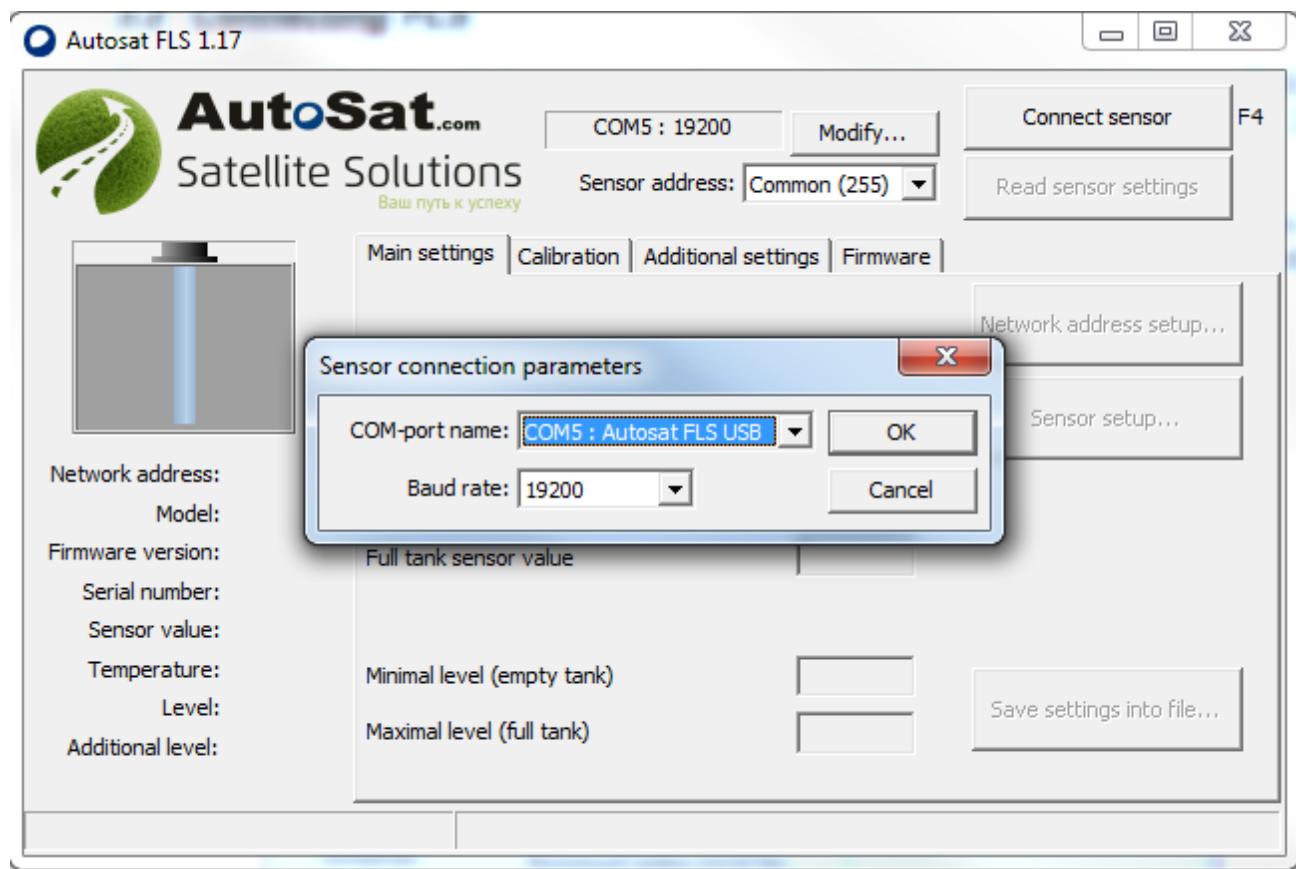
- Sensor communication parameters (at the top of the window). The port for connecting Autosat FLS USB Adapter is displayed and chosen here, if necessary. The data transfer speed is displayed here, too. There are also sensor connection establishment and disconnection buttons, as well as a sensor parameter request button.
- Information about the sensor (in the left part of the window). After sensor communication is established, the network address, serial number, model and version of the sensor firmware are displayed here. Also in this section you will see the values measured by the sensor (level, temperature, etc.). The level measured by the sensor is shown graphically, when the green background indicates a stabilized level, and the red background indicates an unstabilized one. The sensor should only be read after the level has stabilized.
- Sensor settings are divided into several groups (main parameters, calibrating, additional parameters, firmware).
- The status bar, which displays messages about the program operation, is at the bottom of the window.

The size of the program window can be changed with a mouse, as well as using the buttons on the right of the window title bar. When you resize the window, the font size changes. Thus, it makes it convenient to read information on screens of different sizes.

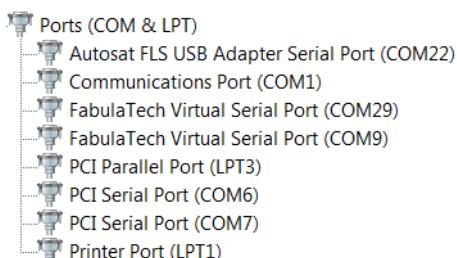
### **3.2 Connecting FLS**

The computer with the installed program must be connected to the sensor via the Autosat FLS USB Adapter. The procedure for connecting the adapter to the computer is described in Section 2.2. The adapter connector must be connected to the sensor connector.

When the adapter is connected to the computer, a new COMx serial port is created, where x is the number assigned by the system. This port must be selected in Autosat FLS program correctly. To select a port, click *Edit* in the sensor communication parameters.

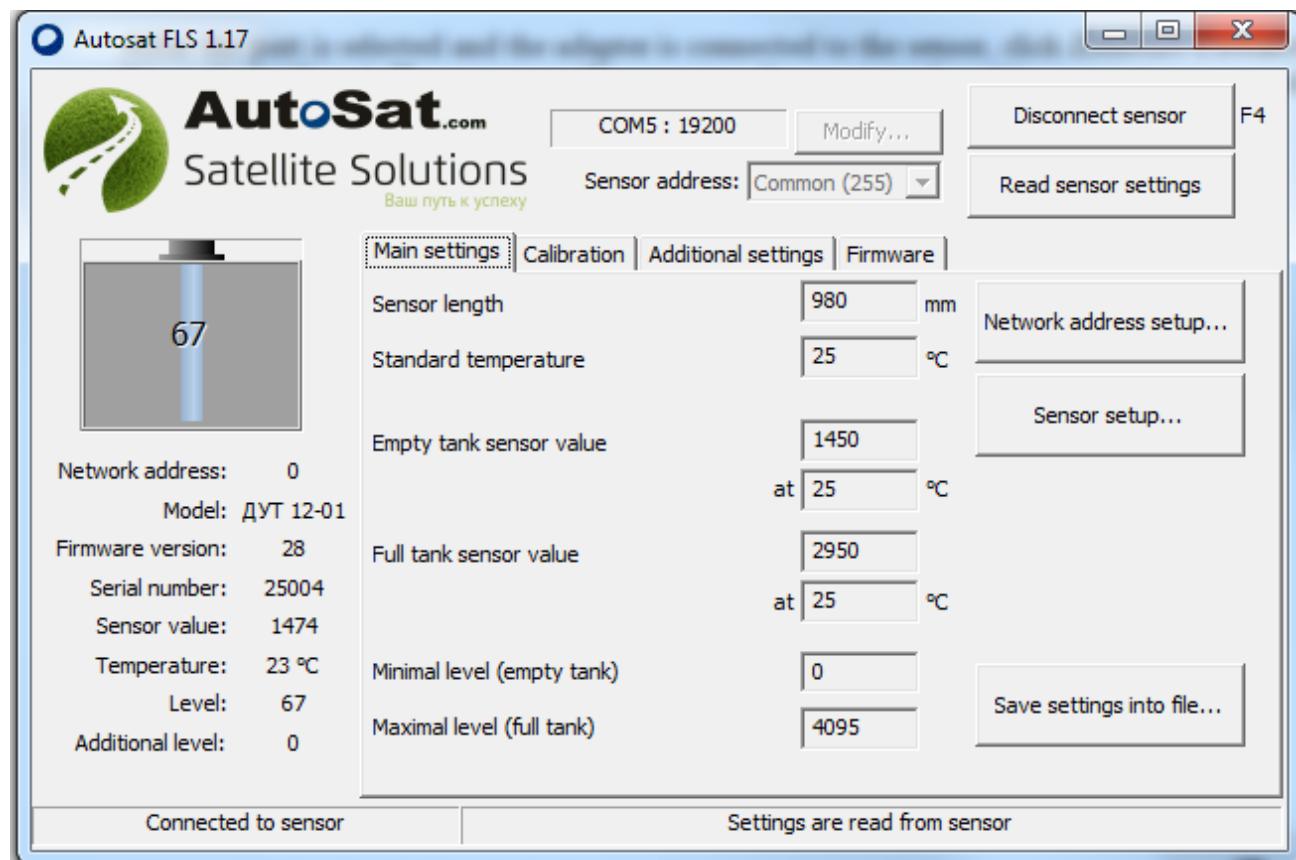


The adapter port is listed as *Autosat FLS USB*. By default, the program selects this port automatically. If you use a communication adapter by another manufacturer, select the port corresponding to it. If necessary, you can check the port names using Windows Device Manager.



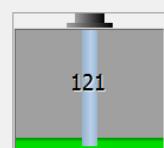
The speed of communication with the sensor should always have a value equal to 19,200.

After the port is selected and the adapter is connected to the sensor, click *Establish Connection* or F4 on the keyboard. The program will connect to the sensor and read its parameters automatically. The texts *Sensor connected* and *Parameters read from sensor* appear in the status bar.



After stabilizing the fuel level, the level indicator background changes to green.

To break the connection with the sensor, click *Disconnect* or F4 on the keyboard.



If the connection is not established, the message *Waiting for the sensor response* appears in the status bar. In this case, you should check the selected port again, the indication on the adapter (the red and green LEDs should be on), and the connection of the adapter to the sensor.

The disconnect with the sensor may be caused by a malfunction of the sensor itself or damage to the cable. To monitor the successful operation of the computer, the program and the adapter, it is recommended to connect a functional sensor.

By default, the program uses a *generic address* (255) to communicate with the sensor. This mode allows you to establish a connection regardless of the network address set in the sensor. However, if several sensors are connected at the same time, the use of a generic address is not possible and the connection will not be established. When connection is simultaneous, each sensor has its own address, and in the program it is necessary to manually select the address of the sensor you want to communicate with.

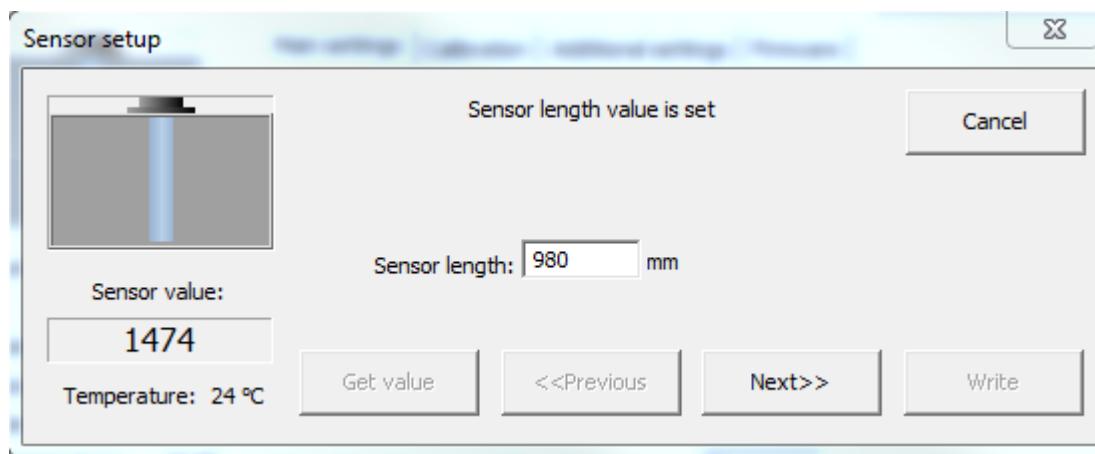
The process of configuring network addresses with simultaneous connection of several sensors is described in Section 4.3 below.

### 3.3 Adjusting FLS

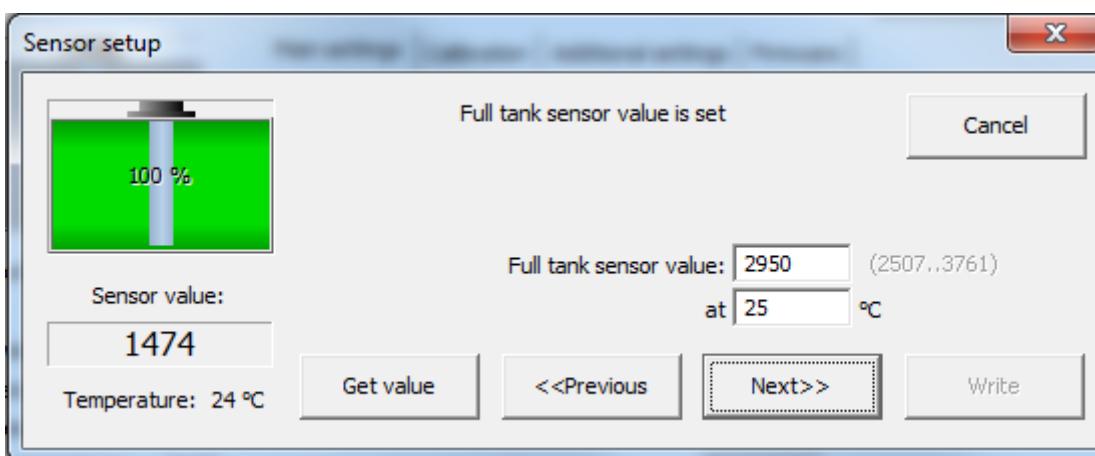
When installing the sensor on the vehicle, its measuring tube is shortened to the size of the tank. Changing the length of the FLS entails a change in its characteristics, so the installation requires adjustment of the main parameters. These parameters include the sensor length, as well as the level values for an empty and full tank.

Before adjusting the sensor, check that there is a protective cap on the end of the measuring rod. If there is no cap, the accuracy of the adjustment is lower.

Click *Configure Sensor*. The window for setting the sensor length appears.



Enter the actual length of the sensor tube (from the plastic head of the sensor to the end of the tube) and click *Next*. The window for setting the value for the full tank appears.



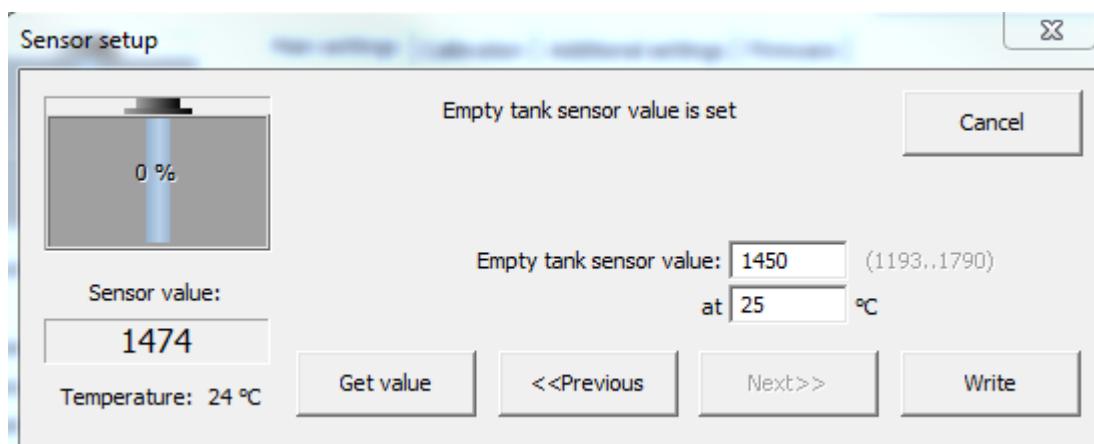
Before entering the value, it is necessary to fill the measuring tube with fuel completely. This can be done in one of the following ways:

- Seal the vent holes on the tube near the sensor head with adhesive tape, turn the sensor upside down and fill it with fuel using a funnel.
- Fully immerse the measuring tube in the fuel tank.
- If the sensor is installed in the tank of the vehicle, fill the tank with fuel completely.

When filling the measuring tube with fuel, it is necessary to take measures so that no bubbles (including air bubbles) remain inside the tube. After filling, wait for the value to stabilize. When you click *Take Value*, the current value is copied into the field for the full tank. If necessary, it can be adjusted manually.

Press *Next* to enter the value for the empty tank, or *Back* to return to the previous step. At any time, you can press *Cancel* to cancel all changes to the sensor settings.

The next step is to enter a value for the empty tank.



Before entering the value, it is necessary to drain the fuel from the measuring tube completely. If the sensor is installed in the tank of the car, you need to drain the fuel from the tank completely. When you click *Take value*, the current value is copied into the value field for the empty tank. If necessary, the value can be adjusted manually.

It is necessary to enter the value for the empty tank after the measuring tube was first filled with fuel, and then the fuel was drained. Inside the tube, there is a certain amount of fuel, so after draining, wait at least 1 minute. Entering the value for the empty tank without first filling the tube with fuel increases the level measurement error.

Press *Save* to save all changes and save the settings to the sensor memory. To return to the previous step, click *Back*.

### **3.4 Calibrating FLS with Digital Interface**

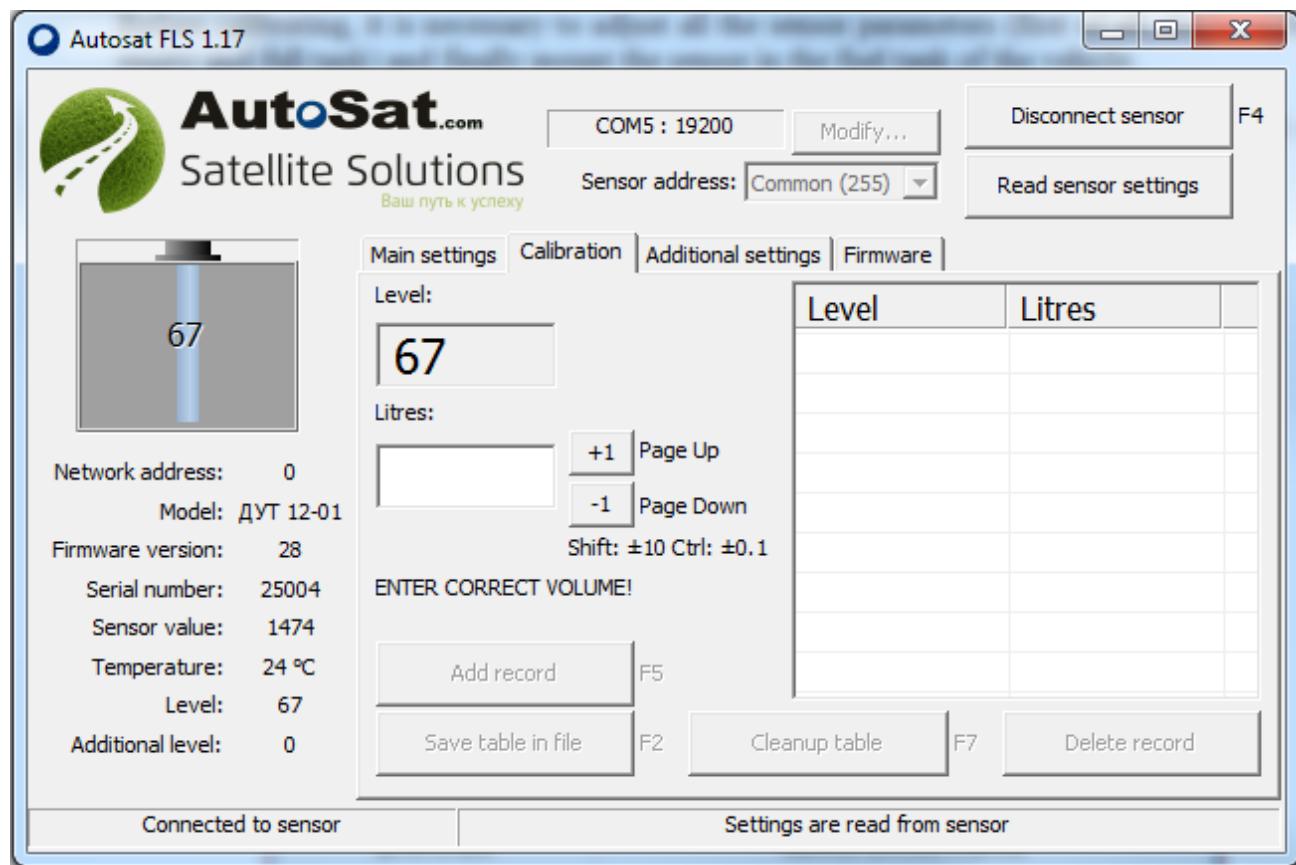
Calibrating is the compilation of a table of correspondence between the level and fuel volume in the tank. With the help of the calibration table, the fuel level measured by the sensor is recalculated into the fuel volume in the tank. The dependence of the level on the fuel volume is determined by the tank shape and, as a rule, it is unique for the vehicle. Therefore, each vehicle equipped with a FLS needs to be calibrated separately. Even on vehicles of the same brand and model, the use of the same calibration table leads to an increase in the error in determining the fuel volume in the tank and the values associated with it.

Unlike other parameters configured with Autosat FLS software, the calibration table is not stored in the sensor. Usually, the table is loaded into the satellite monitoring software, which processes data from the fuel level sensor, determines fuel consumption, fueling and drains.

Autosat FLS program allows you to automate the creation of a calibration table. The table can be saved to a text file for further upload to the transport monitoring system. If the monitoring system does not automatically load the calibration table or does not support the text file format, the contents of the table can be copied to paper and loaded manually. **The calibrating function is available for sensors with digital interface only.**

Before calibrating, it is necessary to adjust all the sensor parameters (first of all, the level for the empty and full tank) and finally mount the sensor in the fuel tank of the vehicle.

To perform calibrating in Autosat FLS program, you must connect to the sensor and select *Calibrating* in the sensor parameters.



The calibration table is on the right of the window, the level measured by the sensor and the corresponding fuel volume in liters are displayed in columns. At the beginning of calibrating, this table is empty. There are fields of the current level and fuel volume on the left. When you click *Save* or F5, the current level and volume are copied to a new row in the table.

Calibrating usually starts when the vehicle tank is empty or almost empty. Then fuel is added to the tank in batches, while the volume of the fuel to be filled is measured with the help of a high-accuracy counter or a measuring container. After each batch, a new volume of fuel and its corresponding level are recorded in the table. The order should be the following:

- Enter the fuel current volume in the tank. The value can be entered by using the keyboard or the buttons "+1" and "-1" or the *Page Up* and *Page Down* keys. The value increment and decrement steps can be changed by pressing the *Shift* and *Ctrl* keys on the keyboard. With the *Shift* key pressed, the step is increased to 10 liters, while the text on the buttons changes to "+10" and "-10". With the *Ctrl* key pressed, the step decreases to 0.1 liters.

- Wait until the fuel level is stabilized (green level indicator).
- Press *Save* or F5, and a new line is added to the calibration table with the current values.
- Fuel up the tank and repeat all the described operations.

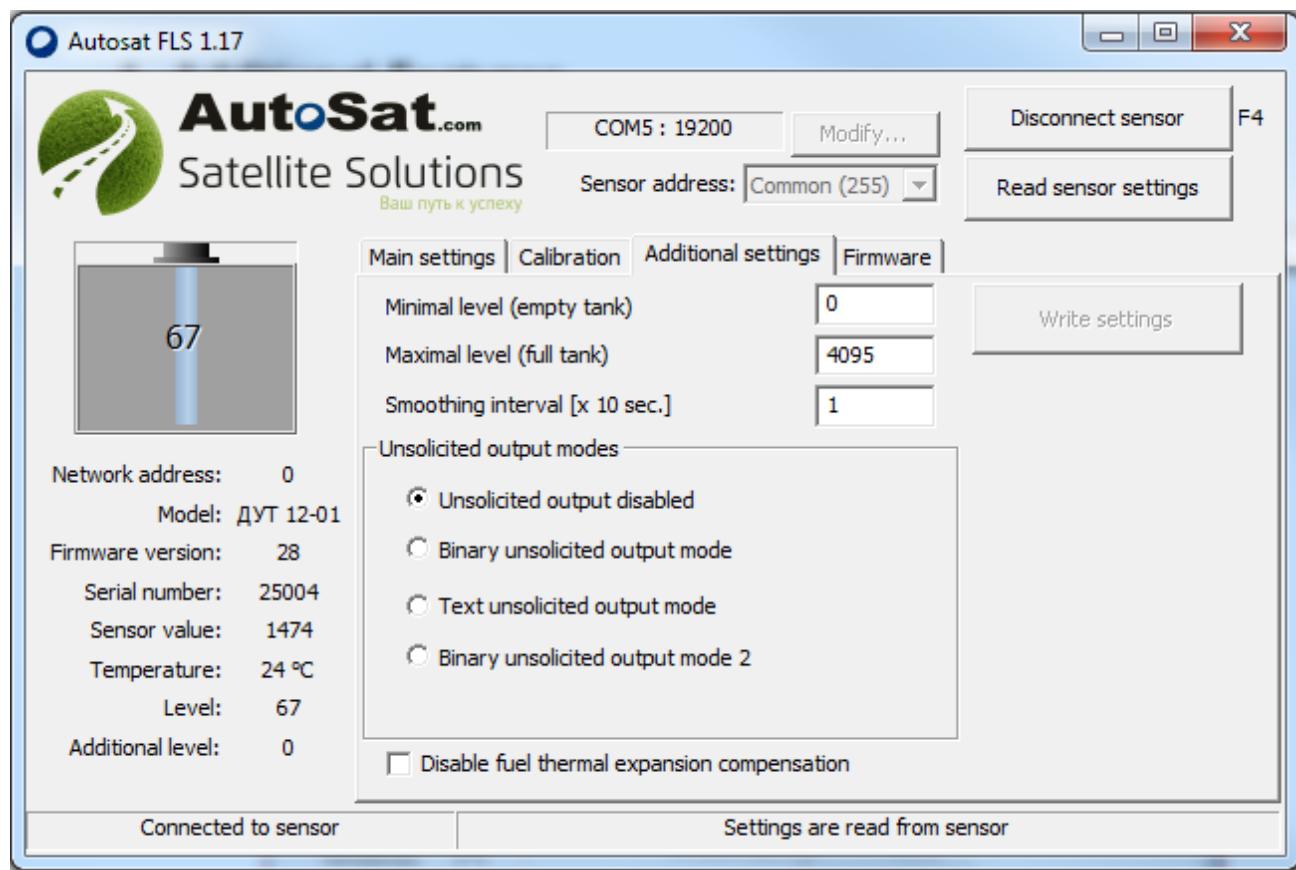
If you add incorrect data to the table accidentally, select the wrong line and click *Delete entry*. If necessary, use *Clear table* or F7 to delete all entries from the table

After completion of calibrating (the tank is completely filled with fuel), the table can be saved using *Save to file*. You need to select a folder and a file name.

## 4 Additional Features

### 4.1 Changing Additional FLS Parameters

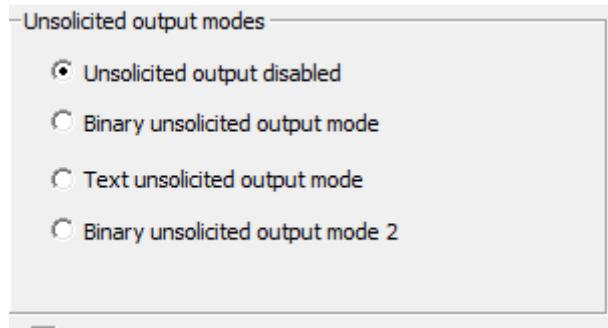
FLS additional parameters should be changed only if it is necessary for the correct operation of the monitoring equipment to which the sensor is connected. To do this, in Autosat FLS program you need to connect to the sensor and select *Additional parameters* in the sensor parameters.



*Minimum level* and *Maximum level* parameters determine the level value given by the sensor for an empty and full tank, respectively. Typical values are from 1 to 1,023 or from 1 to 4,095. After changing the values, click *Save Parameters* to save the new parameters in the sensor memory.

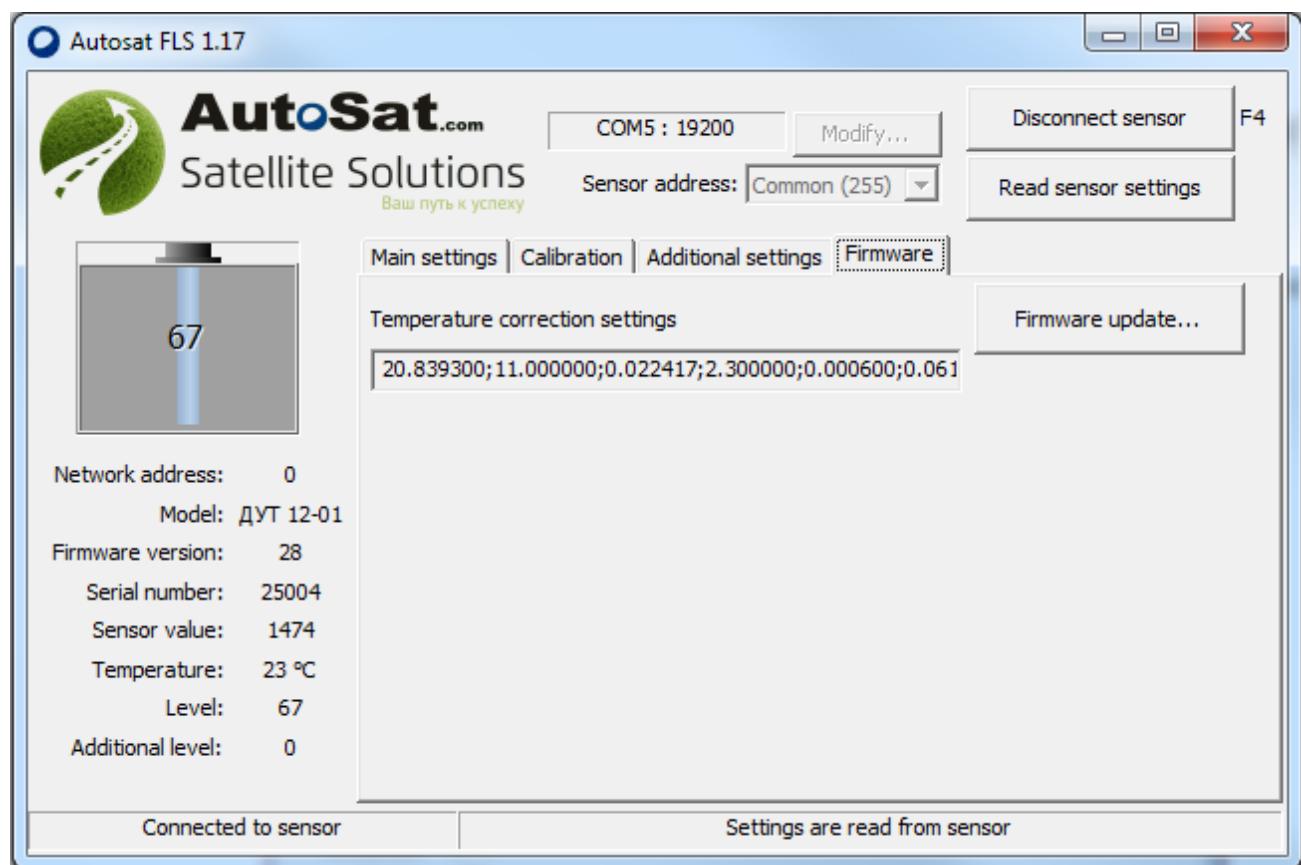
*Independent result output mode* must be set to work correctly with some types of vehicle monitoring equipment. This setting is only available for sensors with digital interface. When using most types of equipment, the independent result output should be turned off.

For sensors with an analog output, *output mode* can be selected. The value is selected depending on the model of the equipment, which is used, and the type of input to which the sensor is connected.



## 4.2 Firmware Upgrade

In the section *Firmware* it is possible to update the Autosat FLS firmware (internal software).



Also in this section, the values of the temperature correction level parameters are displayed. You cannot change these parameters using Autosat FLS.

To update the sensor firmware, you need to obtain a file with the new firmware from the manufacturer and copy it to the computer on which Autosat FLS program is installed. After clicking *Update Firmware*, you should select the folder and the firmware file and wait for the update to finish.

### **4.3 Simultaneous Connection of several FLSs**

Several FLSs can be installed on vehicles with several tanks, as well as with tanks of complex shape. In this case, each sensor must have its own network address, so that monitoring equipment can request data from each sensor separately. Connecting several sensors requires the use of the RS-485 interface and is not supported by all types of vehicle monitoring equipment.

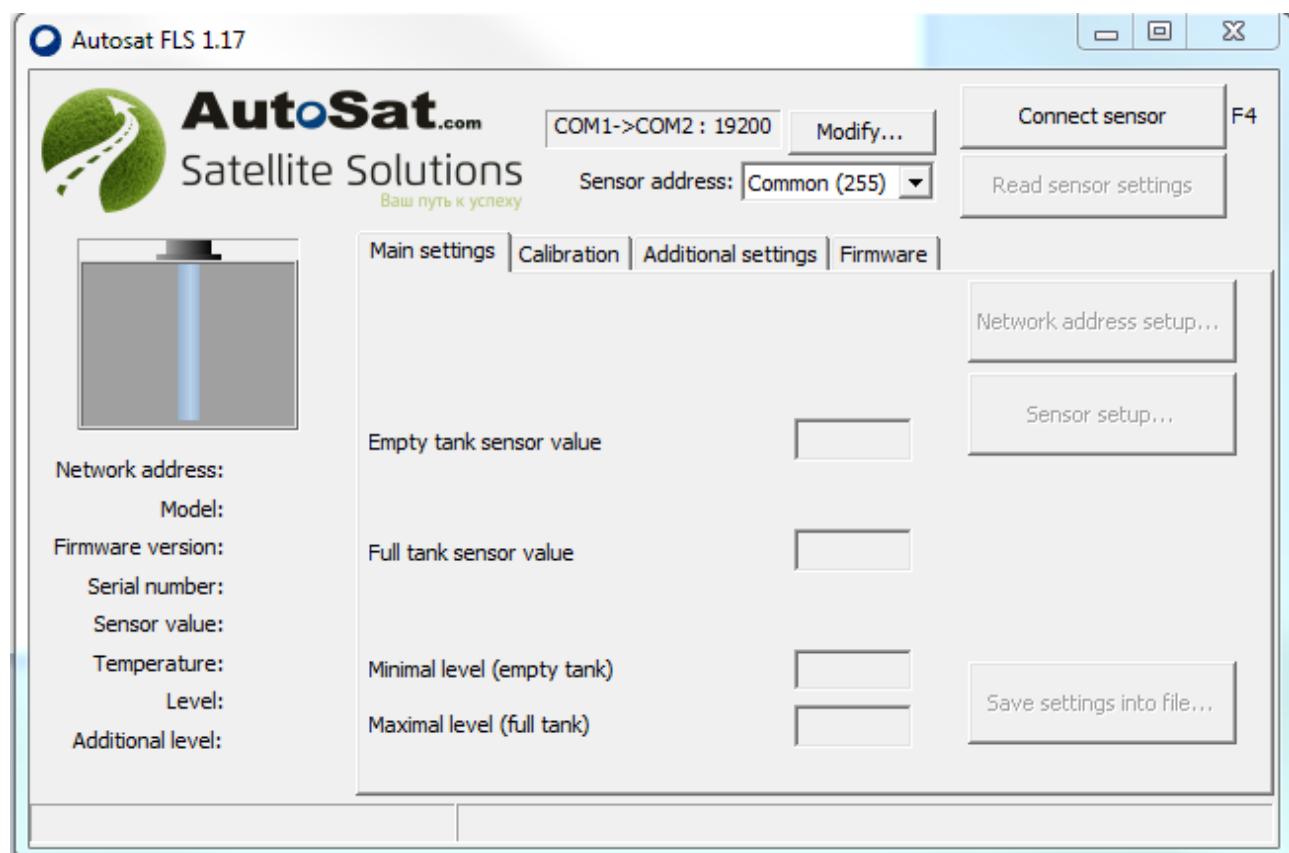
The default network address is 0 in the sensors. By default, the monitoring equipment uses address 0 or generic address 255. If you install a single sensor on the vehicle, no additional settings are required.

When installing several sensors on the vehicle, you need to change their network addresses so that the sensor addresses differ from each other. It is also necessary to configure the monitoring equipment and specify the network addresses of all installed sensors. The adjustment procedure is described in the User's Manual of the corresponding equipment.

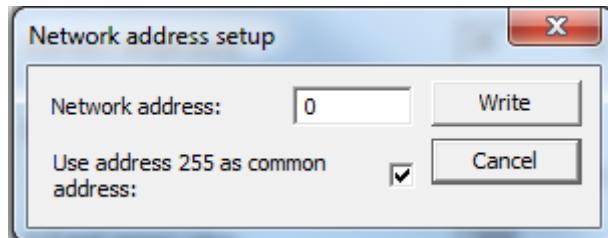
Changing network addresses of sensors is possible both before installation on the vehicle, and for sensors which have already been installed on the vehicle. In the second case, there should be a possibility to disconnect the specific sensors from communication lines temporarily, or to turn off power to the specific sensors.

Changing the sensors network addresses using Autosat FLS program is in the following order:

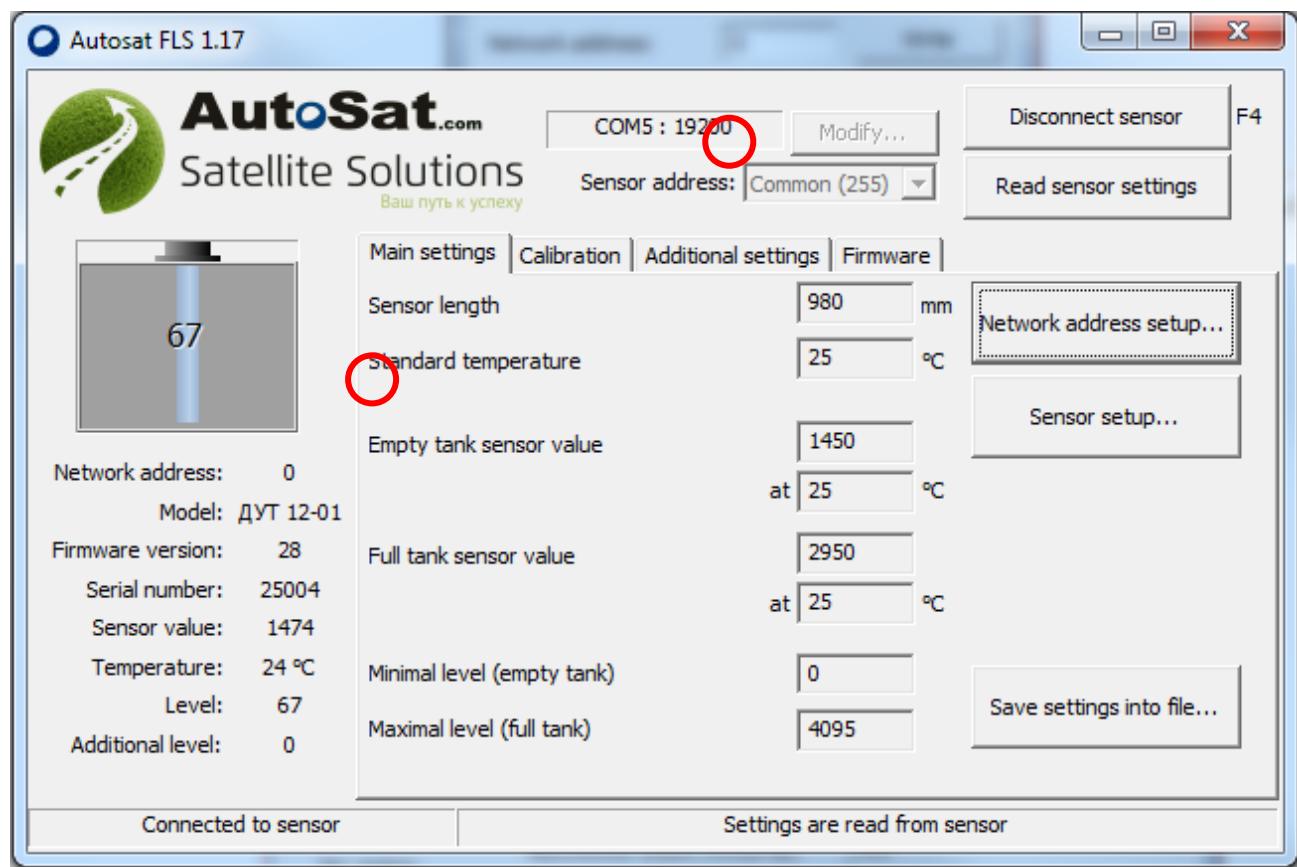
1. Connect one fuel level sensor and disconnect all other sensors.
2. Run Autosat FLS program.
3. Select the network address 0 (the address of the connected sensor) in the communication settings.



1. Click *Establish connection* or *F4*. Make sure that the connection to the sensor has been established and address 0 is displayed in the sensor information.
2. Click *Configure network address*. A window to enter a new address appears.



3. Enter network address 1 and click *Save* to save the changes. Make sure that the new address appears in the sensor information and in the communication settings.



4. Click *Disconnect* or *F4*. Make sure that communication with the sensor is broken and the address and other data are not displayed in the sensor information.
5. Connect the second sensor. This sensor still has a network address of 0. The first sensor should not be disabled, since its network address has already been changed to 1 and the addresses of the connected sensors differ from each other.
6. In the communication settings, select the network address 0 (the address of the sensor, which has just been connected).
7. Repeat steps 4 through 9 for all connected sensors. For each next sensor, you must set a new network address (1, 2, 3, etc.). The address of the last sensor can be changed, or left as 0.

8. Configure the monitoring equipment to work with several sensors and enter the newly installed network addresses of the sensors. Check that the monitoring equipment receives information from all sensors.