# 5

# AutoGRAPH

## PRO

## QUICK START

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# INTRODUCTION

This document contains brief instructions for the AutoGRAPH 5 PRO Dispatch Program, version 2016.1.11 (revision 140), developed by TechnoKom, LLC.

AutoGRAPH 5 PRO is a multi-functional dispatch software based on the separate modules, which may be combined into a unified system. The main advantage of this system is a possible integration with other systems and building dispatch software of any complexity oriented both to the ordinary and advanced users. A great advantage consists in the fact that advanced users may develop their own modules and implement them in the AutoGRAPH 5 PRO program.



*Working with the AutoGRAPH 5 PRO dispatch program is discussed in more detail in the AutoGRAPH 5 PRO User Manual. This document contains information on the extended functions of the AutoGRAPH 5 PRO program, settings and installation of the additional modules making it possible to extend the functions of the dispatch program.*



*Depending on the scheme configuration and user access settings, some modules and options described in this document may be unavailable for the user.*

# GETTING STARTED

This section contains instructions on the first start of the program, opening of the required scheme and authorization.

> **NOTE**
>
> *The scheme is represented by a configuration of the AutoGRAPH 5 PRO program with a certain set of modules, a list of devices, geo-fences, etc.*
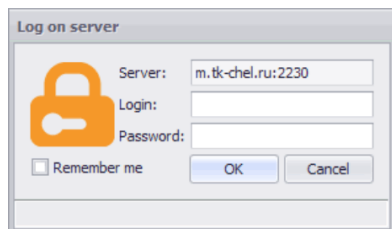
**Follow this procedure:**

• Start the AutoGRAPH 5 PRO program.

• A scheme used by the user during the previous session will be automatically opened together with the program. If the program is started for the first time after installation, a demonstration scheme will be automatically launched (if installed).

• If for some reason no scheme for launching was found on the disc (the scheme was deleted, relocated, uninstalled), a blank scheme template will be loaded. In this case, it is recommended to load the required scheme manually. For this purpose, choose *Menu bar > Scheme > Open* and select the required scheme in the drop-down list **(Fig. 1)**.
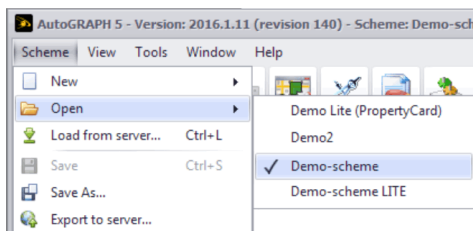


This list displays schemes located in the folder *\Schemes* in the program system folder. The folder for scheme storing is set at the program installation stage.

**Fig. 1. Scheme Loading.**

• In the AutoGRAPH 5 PRO program, a user authorization system is operating, that is only registered users have access to the program functions. After the scheme is loaded, the program will request a login and a password to obtain access to data on the server. Access parameters of the requested server are specified in Server line in the authorization window **(Fig. 2)**.



*Remember Me option makes it possible to save the current logging parameters on the server and not to re-request them upon each start of the program. The stored passwords may be changed in Options menu in section Servers – Download, saved accounts. Server parameters may be set in the Devices menu in the section Servers – Server, password for device.*

**Fig. 2. Authorization in the Program.**

Upon entering of the correct login and password, connection to the server will be established, and all data available for the user will be downloaded.



*The user account is created on the server from which the program requests data. A list of devices to which the user will have access is created for each user along with the account. To get login and password for the access to the AutoGRAPH 5 PRO program, contact your dealer.*

*A demo version with test data is provided to review basic features of the program. To log into demo version of the program, use login "demo" and password "demo".*



*A scheme of the AutoGRAPH 5 PRO program may be loaded from the server. To learn more about scheme loading from the AutoGRAPH server, see AutoGRAPH 5 PRO User Manual.*

# LIST OF DEVICES AND DATA REQUEST

The list of devices is a list of vehicles with on-board AutoGRAPH controllers or equipped with a satellite monitoring system from a third party manufacturer.

To receive data from the device and to process received data in the program, add this device to the program, and then set data receipt and processing parameters.

## LIST OF DEVICES CREATION

To create a list of devices, go to the Devices menu by choosing *Main bar > Setting > Devices*, or by pressing the Ctrl+D key combination.

The list of devices for the current scheme is shown on the left panel **(Fig. 3)**.

To add a new device to the list of devices, do the following:

• Choose a group to which you wish to add a new device. Choose Root Group to add a device to the root of the list.

• Then click the Add button or choose To add an Element command in the shortcut menu. The button is located at the bottom of the list **(Fig. 3, item 1)**.

• Enter a name of the new device **(Fig. 3, item 2)**.

• Enter a serial number of the on-board controller in the Serial No. field **(Fig. 3, item 3)**.

• Add all necessary devices to the list in a similar way.

• Save list by clicking the Apply button.

## DATA SOURCE SETUP
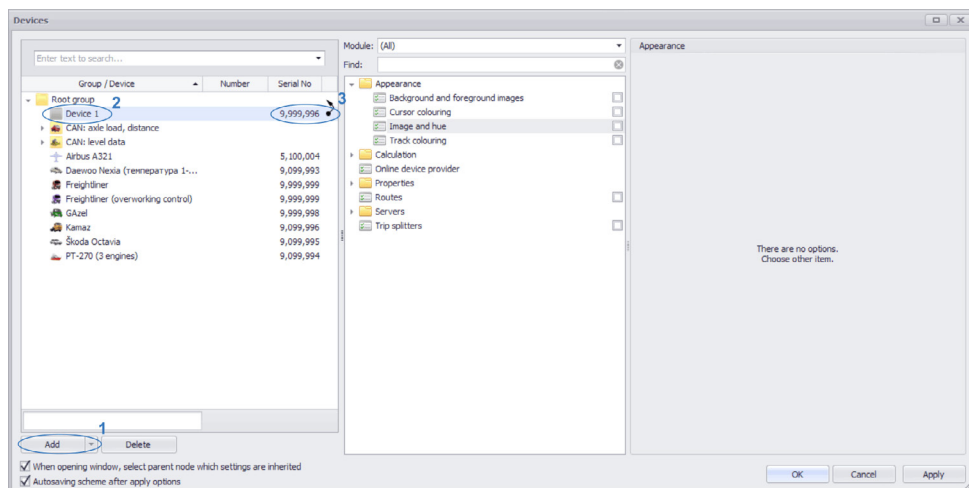


**Fig. 3. Adding New Devices.**

In order for the AutoGRAPH 5 PRO dispatch program to request data of the device from the AutoGRAPH server, set the parameters of this server.

**For this purpose, do the following:**

• Choose the device to be set in the Devices menu.

• Go to the Source tab of the settings section *Servers > Server, password for device*.

• On this tab, select the Server option and add to the table the server on which the data of the set device are stored. Specify the IP address or the name of the data server, port, and choose the version.

• If the server-based software has version 3.0, set a password for device to access the data of that device. The password needs to be set on the Password tab.
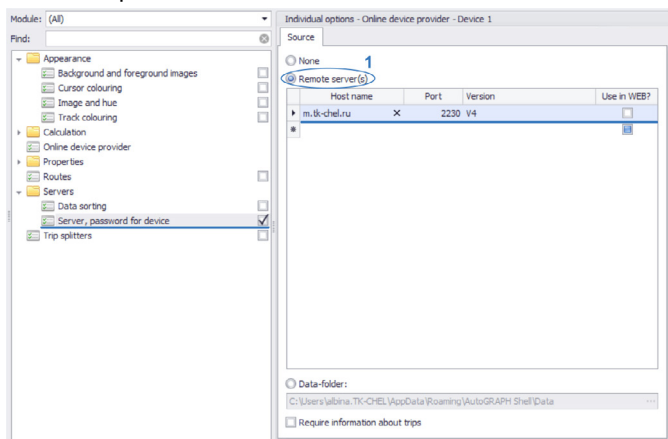


**Fig. 4. Server Setup.**

• Upon setting the server parameters, save changes by clicking the Apply button.
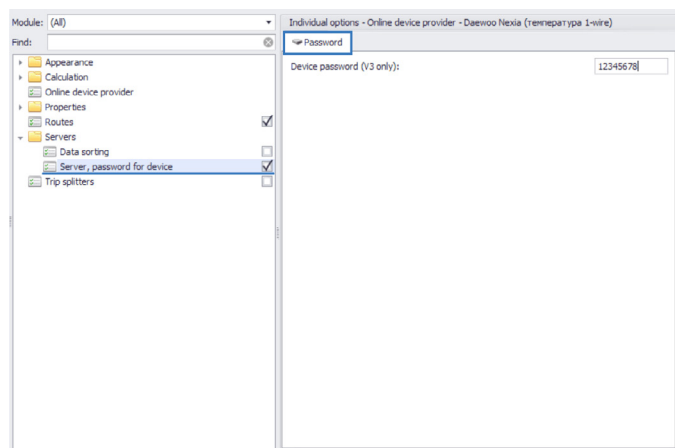


**Fig. 5. Setting of the Device Password.**

After application of the setting, the program will request data of the new device and offer

authorization on the server from which the data is requested unless the user is already authorized on that server. If on the specified server there is data from the device, and the user has access to them, i.e. the new device is included into the list of devices of the user and it is not disconnected by billing, data will be downloaded into the program.

## DATA LOADING FROM THE SERVER

Data is received using the Online Device Provider module **(Fig. 6)**.
Every Monday on 00:00:00 a.m. server time a file with .sbin extension containing device records is created on the server.
After a certain time the Online Device Provider manually or automatically requests the data from the server and loads them into the Data folder of the AutoGRAPH 5 PRO program.
The data is accessed using login and password in case of AutoGRAPH 4.0 or higher server version or using AutoGRAPH device password in case of AutoGRAPH 3.0 server version.

To request data from the server, click the Receipt button in the Online Device Provider window. After that the module will start requesting new data throughout the list of devices for the scheme.
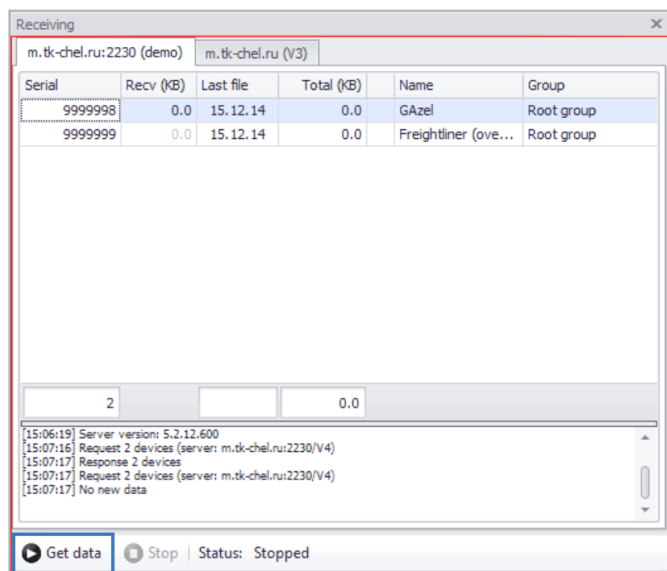


**Fig. 6. Data Request.**

# TRACK BUILDING

The track is a path of a vehicle travel built in accordance with the coordinate records of the AutoGRAPH device mounted on this vehicle. The track makes it possible to restore the history of the vehicle movement over the period of interest.

**To build a track, do the following:**
• Go to the Device Selector.
• To build a track over an arbitrary period, select the Time Span view for the list in the Device Selector **(Fig. 7)**.
• To build a track in accordance with the data over a week (starting on Monday 0:00:00 a.m.), select the Files view for the list in the Device Selector **(Fig. 8)**.
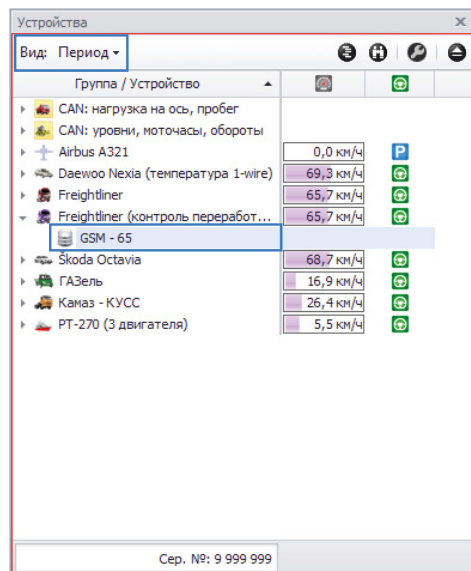


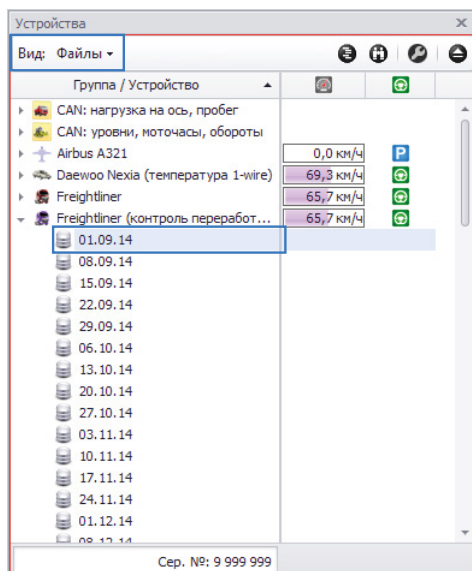**Fig. 7. Viewing Data for the Time Span.**                    **Fig. 8. Viewing Data from the Weekly File.**

• Choose data for viewing in the Device Selector and place the cursor on the file with the weekly data if the Files view is selected or on the data source if the Time Span view is selected.
• If the Time Span view is selected in the Device Selector, go to the Time Span Selector and choose period for data viewing **(Fig. 9)**. The user may choose one of the preset time spans or set an arbitrary period by entering the start and end time points of the period.
• After the data selection and setting of the time span, a track of the vehicle over the time span will be built on the map **(Fig. 9)**.
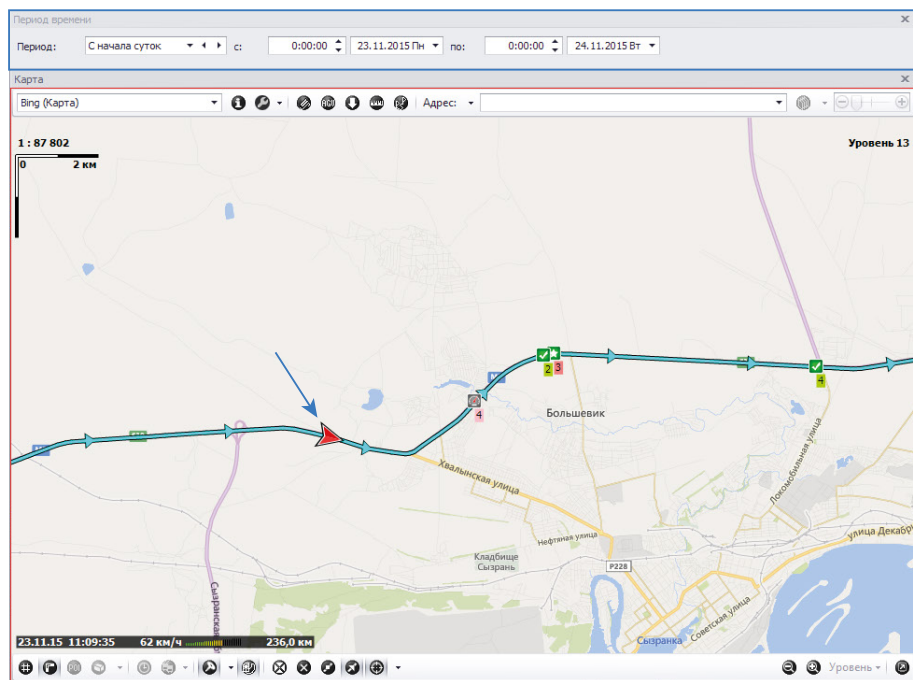
**Fig. 9. Vehicle Track.**

> **NOTE**
>
> *The AutoGRAPH 5 PRO program makes it possible to split the vehicle track into individual trips in accordance with the set conditions and to calculate vehicle parameters for these individual trips. To learn more about track splitting into trips and setting of splitters, see AutoGRAPH 5 PRO User Manual.*

# VEHICLE MONITORING

In addition to the track building and monitoring of the current location of vehicles, the AutoGRAPH 5 PRO program enables monitoring of the vehicle speed, fuel consumption, vehicle engine performance parameters, and recording of the speed violations, fillings, fuel draining, etc.
This section describes setting of the main vehicle parameters monitoring. The advanced users may set calculation of additional parameters using Parameter Designer.

**NOTE**  *More information on using Designer of parameters can be found in AutoGRAPH 5 PRO Program: Data Calculation and Processing.*

## VEHICLE SPEED MONITORING

To monitor vehicle speed and record speed violations, set the maximum speed limit. For this purpose, go to the Devices menu, choose the vehicle or a group of vehicles for setting, and then go to the Designer tab of the settings section *Calculation > Calculation parameters*. On this tab choose the *Speed* parameter in the Common Settings group, and then set the speed limit. In the AutoGRAPH 5 PRO program the maximum speed may be determined in several ways.
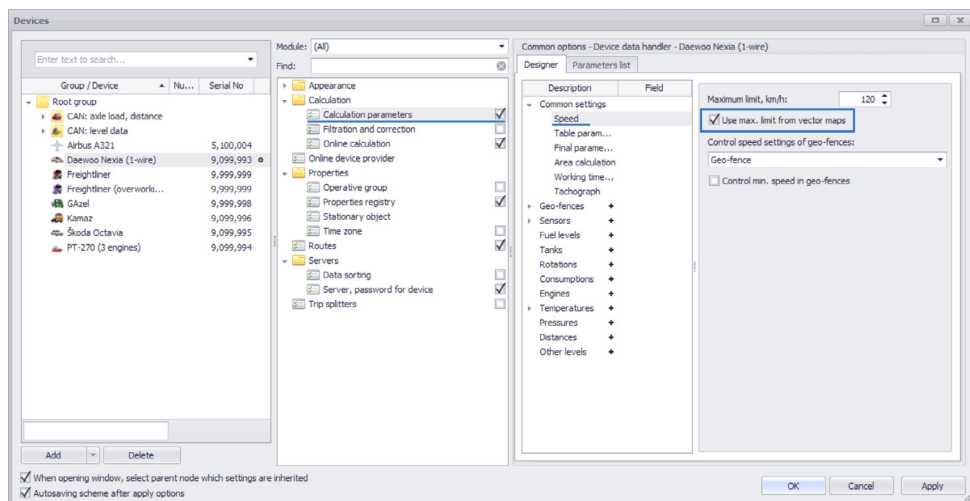


**Fig. 10. Setting of Vehicle Speed Monitoring.**

**FIXED SPEED LIMIT**

A fixed speed limit may be set for a vehicle or for a group of vehicles for the entire period of operation of the vehicle irrespective of the location. To set the maximum authorized speed, specify the speed limit in km/h in the Maximum Limit, km/h field **(Fig. 10)**.

**SPEED LIMIT FROM THE PROPERTIES REGISTRY**

The maximum speed limit may be set in Properties Registry of the vehicle. For this purpose, in the Devices menu go to the section *Properties > Properties registry* and on the Properties tab add a new SpeedMax property with Number type. Then set the maximum speed limit in the Value field of this property **(Fig. 11)**.

Setting of the maximum speed limit using Properties Registry allows setting a table of values for the property and setting an operating time for every value, as well as setting individual speed limits for a different vehicles if common calculation parameters are set for these vehicles.

To learn more about properties adding to the Properties Registry, see AutoGRAPH 5 PRO User Manual.
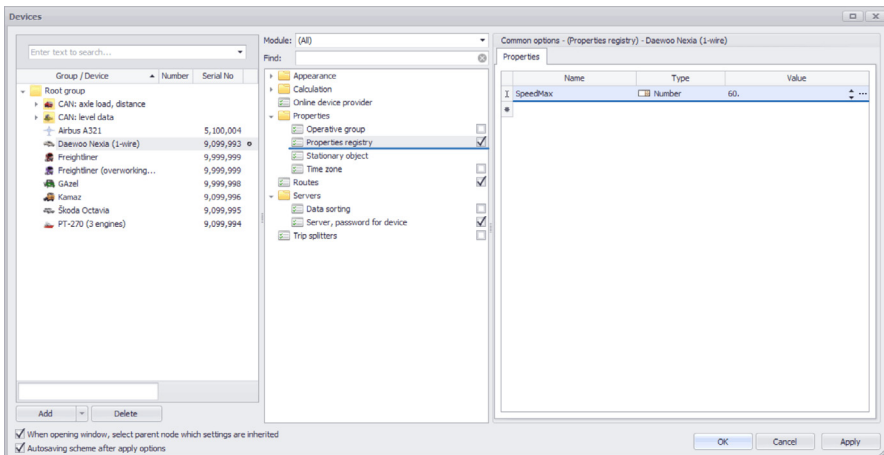


**Fig. 11. Speed Limit Setting Using Properties Registry.**
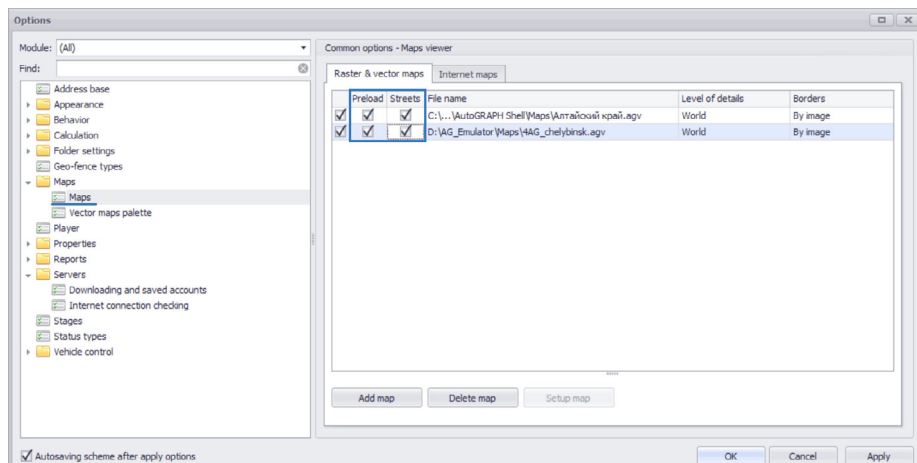
**SPEED LIMIT FROM THE VECTOR MAP**

The maximum speed limit may be determined pursuant to the vector map if this information is provided by the map configuration. Vector maps may contain information on speed settings of certain streets, which makes it possible to use different limits depending on the street on which the vehicle is.

To get information on speed settings from the vector map, go to the Designer of parameters, choose *Speed* in Common Settings group and enable the Use Max. Limit from Vector Maps option **(Fig. 12)**.
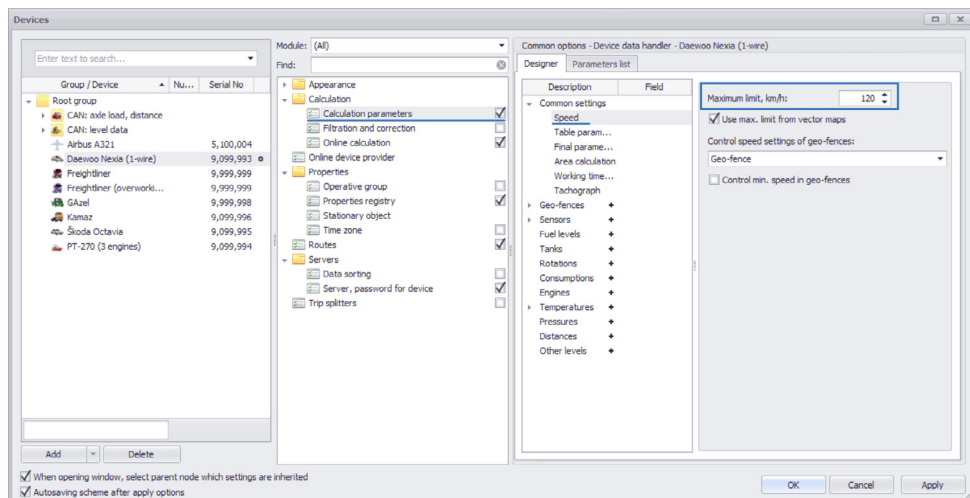
**Fig. 12. Use Maximum Speed Limit Set in the Vector Map.**

To get information on the speed settings of streets from the vector map, go to the section *Maps > Maps* of the Option menu, and then on the Raster and Vector Maps tab enable the Streets option opposite to the required map **(Fig. 13)**. It is also strongly recommended that preloading of the maps from which information on the speed settings is received would be enabled.



**Fig. 13. Enable Speed Information Downloading from the Vector Map.**

To set the speed settings in accordance with the vector map, specify the street on which the vehicle is. Street is searched for within a radius equal to the maximum radius of track matching to the vehicle routes. It is set in the Devices menu in the section *Calculation > Filtration and correction* on the Correction tab. To set the radius of matching, enable the Map Matching to Vector Map Roads, m option and set the maximum distance from the track to the road to which the track may be matched **(Fig. 14)**. The distance shall be specified in meters.
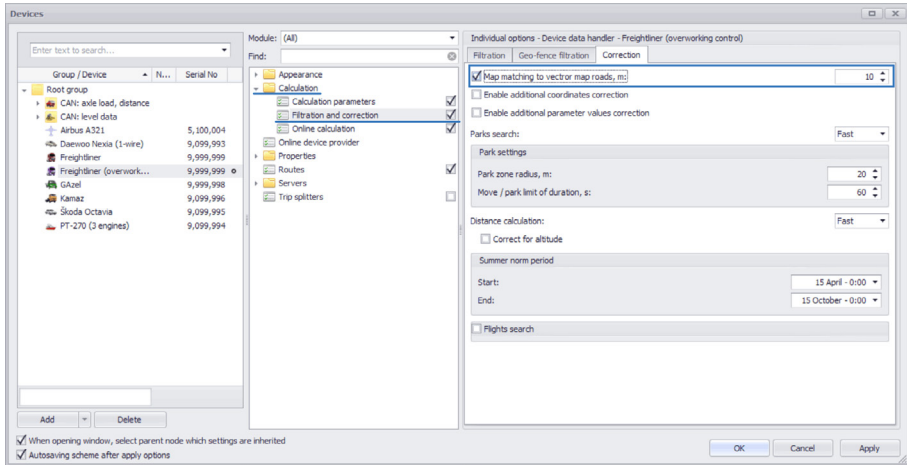
**Fig. 14. Setting of Track Matching to Vector Map Roads.**

> **NOTE**
>
> *Map Matching to Vector Map Roads, m is optional for setting the speed limit according to the vector map. Therefore, after setting the radius of matching, the option may be disabled.*

If several vector maps are chosen to search for the limit, the speed limit will be set in accordance with the first found street. If no value of the limit is obtained from the vector map, i.e. the vehicle is far from the street or the vehicle is outside of the vector map, then the maximum speed limit will be equal to the fixed limit set in the Maximum Limit, km/h field or to the value of SpeedMax property from Properties Registry if this property is set. However, the value from the Properties Registry will prevail.

If there is no speed limit on the street to which the vehicle track is matched, the maximum speed limit will be equal to 5 km/h.

> **WARNING**
>
> *Be careful while enabling the Use Max. Limit from Vector Maps option because if the vehicle track is mismatched to another road with other speed settings, violation of speed mode by the vehicle may be incorrectly registered.*

> **WARNING**
>
> *Setting of the maximum speed level according to the vector map requires great resources of the AutoGRAPH 5 PRO program. Thus, to improve performance, it is recommended to use small vector maps of individual cities instead of one large map of the country.*

> **NOTE**
>
> *Using GPSMapEdit software, it is possible to check whether the vector map contains information on the road speed modes.*

### SPEED LIMIT ACCORDING TO THE SETTINGS OF GEO-FENCES

In case the vehicle is located within a geo-fence, the maximum speed of the vehicle may be set in accordance with the speed settings for this geo-fence. By default, within a geo-fence the speed limit set in the vehicle settings is used. To monitor speed of the vehicle within geo-fence, go to the Devices menu to the section *Calculation > Calculation parameters*, and then to the settings of Speed parameter on the Parameter Designer tab, and in the Control Speed Settings of the Geo-Fences drop-down list choose a node of geo-fences within which you wish to check the speed of the vehicle **(Fig. 15)**.

To monitor the lower speed limit of the vehicle within geo-fences, enable the Control Min. Speed in Geo-Fences option.
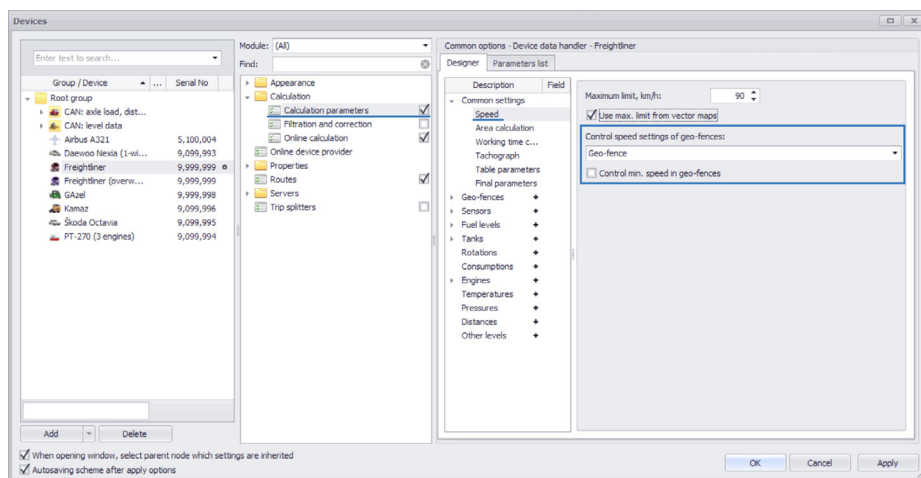


**Fig. 15. Speed Monitoring in Geo-Fences.**

If the Control Speed Settings of Geo-Fences option is enabled, and for the geo-fence within which the vehicle is located no speed settings are specified, the maximum speed limit set in the vehicle settings will be used.

> **NOTE**
>
> *For more information on the vehicle speed monitoring in the geo-fences see AutoGRAPH 5 PRO Program: Geo-Fences.*

Records on violation of the speed settings are displayed in the Data Viewer.



**Fig. 16. Records on Violation of Speed Settings.**

## FUEL MONITORING

The AutoGRAPH 5 PRO program makes it possible to monitor fuel level of the vehicle and record fillings as well as unauthorized fuel draining. For this purpose, add to the program a virtual fuel level sensor which will show current fuel level obtained from the actual sensor mounted on the vehicle or from CAN bus. Then link this sensor with the virtual tank that will show fuel level changes in the actual tank of the vehicle on the basis of data obtained from the sensor, and record draining and filling.

### TARE TABLE CREATION

To calculate the fuel tank level in accordance with the readings of the level sensors transmitted in ADC units, add a tare table of the sensor to the AutoGRAPH 5 PRO program.
The tare table shall be added to the Properties Registry of the set vehicle.

To add a tare table, do the following:
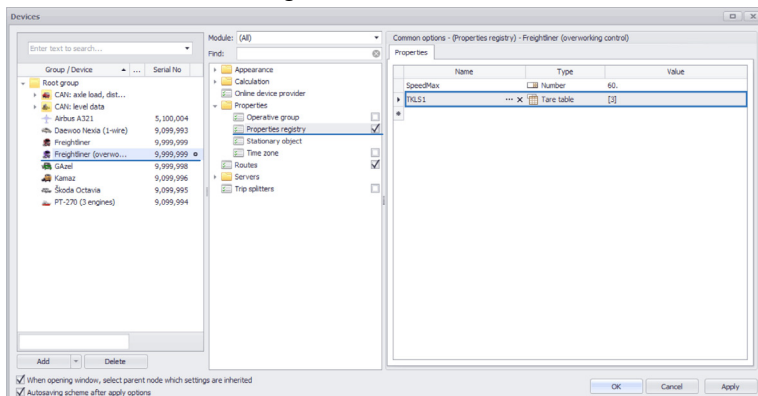• Go to the Devices menu.
• Choose a vehicle for setting.



**Fig. 17. Tare Table Entry in the Properties Registry of the Vehicle.**

- Go to the Properties tab in the settings section *Properties > Properties registry*.
- Add a new property to the Registry, specify the name and choose Tare Table type **(Fig. 17)**.
- Click ⋯ button in the Value field. Taring menu will be opened **(Fig. 18)**.
- If sensor readings depend on the power, enable the Input Values Depend on Supply Values option. This feature is mostly typical for the standard float sensors of the vehicles.
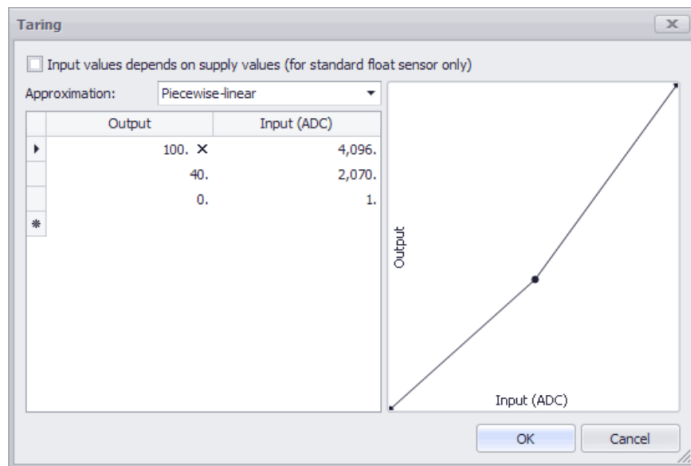


**Fig. 18. Tare Table.**

In the Approximation field choose a method for approximation of the taring curve drawn as per points of the tare table.
- Enter taring values into the table. Specify readings of the sensor in counts in the Input (ADC) field, and specify fuel tank level (liters) corresponding to the ADC readings in the Output field.
- After filling of the tare table, a curve drawn as per table points will appear on the right.

**FUEL LEVEL PARAMETER CREATION**

In order for the AutoGRAPH 5 PRO program to display the fuel level of the vehicle obtained from the fuel level sensor mounted in the tank and connected to the AutoGRAPH device, create a virtual sensor (fuel level parameter) in the AutoGRAPH 5 PRO program. For this purpose, open the Devices menu, choose the device to be set, and go to the Designer tab of the section *Calculation > Calculation parameters*. Then a new parameter shall be added to the Fuel Level group **(Fig. 19)**.
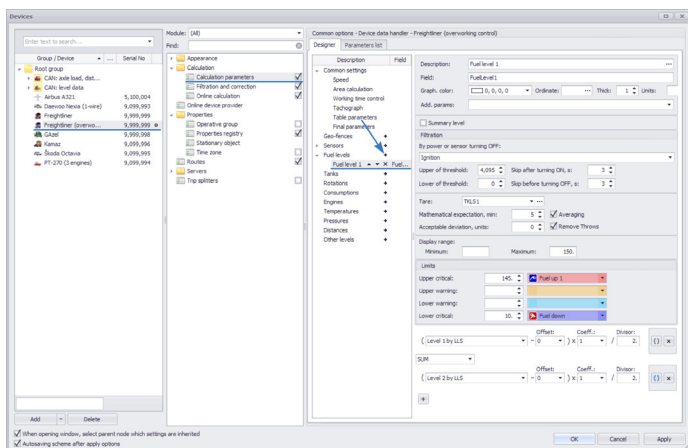
**Fig. 19. Level Parameters Creation**

Then the parameter needs to be set. For the correct display of the fuel level in the program, it is enough to specify the common settings and set filtration of the readings and a formula for parameter calculation. However, use of additional processing methods makes it possible to achieve more accurate readings of the fuel level.

### Common Settings

**Description** – a description of the parameter that will be displayed in data viewing modules. For instance, in the Charts Viewer.

**Field** – a name of the parameter that will be used to identify the parameter in logical expressions.

**Graph color** – a color of the fuel level graph in the Charts Viewer.

**Ordinate** – vertical axis designation of the parameter graph in the Charts Viewer.

**Thick.** – parameter graph thickness in the Chart Viewer. Zero value disables drawing of the parameter graph.

**Units** – a unit of measurement of the parameter. It is used for reference.

**Add. params** – additional parameters which will be calculated and displayed in the Trip Selector and in the Stages Viewer together with the fuel level.

### Filtration of the Incorrect Level Readings

In order to exclude false readings of the fuel level sensor, set the filtration of the readings. To that end, it is necessary to set the following parameters:

**By power and sensor turning OFF** – in the drop-down list choose parameters upon turning off which the level readings will be filtered. If several parameters are chosen, level readings will be filtered in case at least one of the parameters is OFF.

**Upper of threshold** – maximum value of the level readings in the ADC reports. Any readings exceeding the set threshold will be filtered out, and they will not be processed.

**Lower of threshold** – minimum value of the level readings in the ADC reports. Any readings below the set threshold will be filtered out, and they will not be processed.

**Skip after turning ON, s** – time period after on-board controller power turning on within which level readings will be skipped.

**Skip before turning OFF, s** – time period before on-board controller power turning off within which level readings will be skipped.

### Limitation of the Level Readings

The range of readings may be limited. In this case the parameter graph will display only those values which are within the permitted range. To limit the range of readings, go to the Display Range group of settings and set the following fields:

**Minimum** – a minimum value of the parameter in the units of measurement of the parameter.

**Maximum** – a maximum value of the parameter in the units of measurement of the parameter.

### Sensor Tare Table

In the Tare field choose the sensor tare table. The required tare table shall be added to the Properties Registry of the set vehicle in advance. For more details see Tare Table Creation section of this User Manual.

### Readings Averaging and Throws Filtration

In some cases abrupt throws and deviations in readings may occur. They may be filtered out by averaging. Filtration is performed by averaging of the readings over a time interval (averaging window) and evaluation of sensor readings deviation in relation to the average values. If the current value exceeds the average by more than the acceptable deviation, the reading will be filtered out. To filter throws, enable the Remove Throws option and set the following filtration parameters:

**Averaging window, min** – a time interval of the level readings averaging.

**Acceptable deviation, units** – an acceptable deviation of readings from the average value.

After filtration of throws, level readings are converted from ADC counts into liters (or other units of measurement) in accordance with the tare table, and then if Averaging option is enabled, each reading (except for filtered out throws) is averaged over the interval equal to the set averaging window.

### Warning Limits

Limits upon reaching of which warning icons will be displayed in viewers may be set for the level readings. Overall, 4 limits may be set: upper critical, upper warning, lower warning, and lower critical. In order for the limit to be processed, set a value of the limit and assign an icon to it. The limits are set in the Limits group of settings.

*Formula for the Level Parameter Value Calculation*

The fuel level parameter may be used to display readings of one sensor or a sum of a several sensors readings.  To set the formula, choose the initial parameter and set the offset, the coefficient, and the divisor in the drop-down list.  To group mathematical operations, parenthesis may be used in the formula.

For instance, Fig. 20 shows an example of the tank fuel level calculation in accordance with the readings of the fuel level sensor connected to the AutoGRAPH device via RS-485 bus and transmitting data on LLS protocol. To calculate the readings sum or an average value, set every sensor separately, set filtration parameters and taring, and then create a separate sensor which readings are formed as a sum of previously set sensors readings.



**Fig. 21. Calculation Formula.**

To control changes in the fuel level, a sensor readings graph may be drawn. For this purpose, go to the Charts Viewer and choose fuel level parameter by name in the list on the right **(Fig. 20)**. If warning limits are set for the parameter,  warning icons will appear on the graph in case level readings are outside of the permitted range.
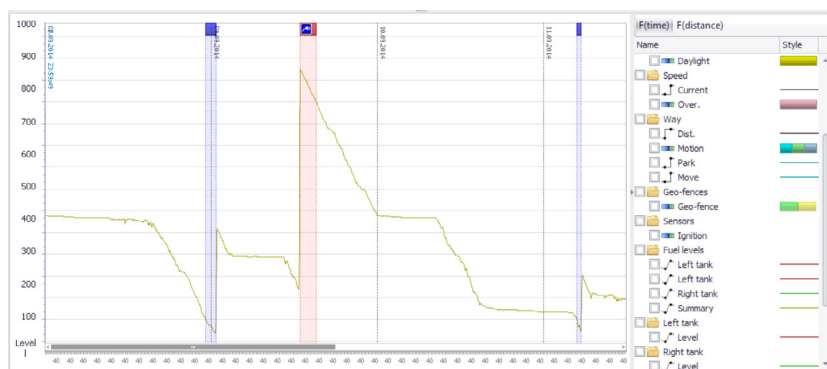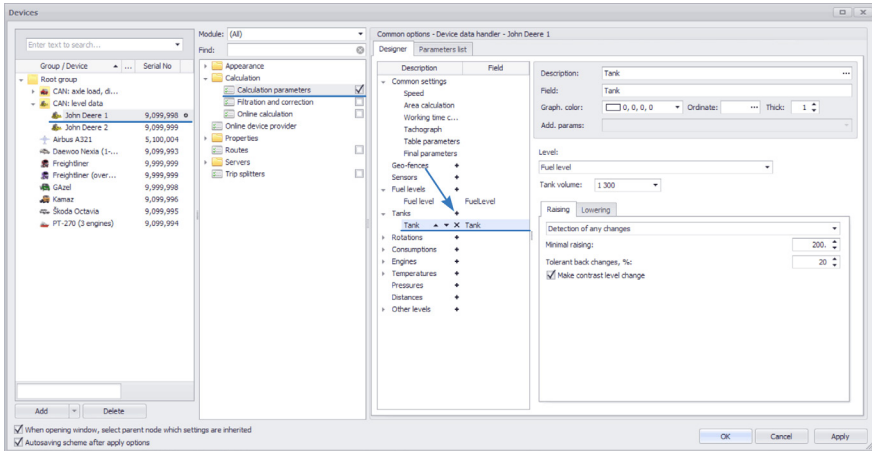


**Fig. 20. Graph of Fuel Level Changes.**

## VIRTUAL TANK CREATION

To create a virtual tank, go to the Devices menu, choose the device to be set, and go to the Designer tab of the section *Calculation > Calculation parameters*. Then a new parameter should be added to the Fuel group **(Fig. 22)**.

**Fig. 22. Tank Parameters Creation.**

### Virtual Tank Setup:

- Set common parameters of the tank like upon setting of the fuel level parameter.
- In the Level line choose previously created virtual fuel level sensor that will show current fuel level in the tank.
- In the Tank Volume field enter tank volume in liters.

### Monitoring of Fillings

In the AutoGRAPH 5 PRO program tank filling is identified by increase in fuel level exceeding the minimum acceptable raising limit.

To detect fillings, go to the Fillings tab **(Fig. 23)**.
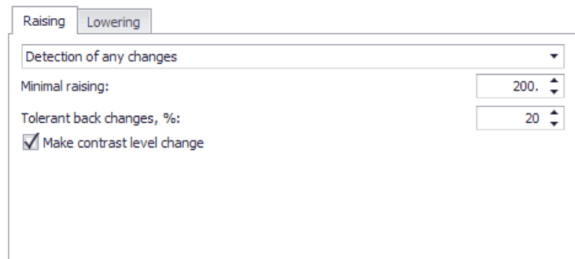


**Fig. 23. Setting of Filling Detection.**

- Then choose the Detection of Any Changes setting in the drop-down list. This method makes it possible to record any change in the fuel level including level raising due to the filling.
- In the Minimal Raising field set a minimum raising of the fuel level in liters which will be identified as filling.
- In the Tolerant Back Changes, % field set an acceptable value of fuel level lowering which is not considered the end of filling, but is caused by fuel fluctuation in the tank during movement of the vehicle, for example. The tolerant back change is set in % from the tank volume. If the tolerant back change is a positive value, the entire interval of level raising including the lowering not exceeding the tolerant back change is regarded as one filling. If the tolerant back change is a

negative value, every interval of fuel raising followed by lowering not exceeding the tolerant back change is regarded an individual filling.

### Monitoring of Draining

Draining is identified by limit values of fuel consumption by the vehicle while in motion and on park.

To set detection of draining, go to the Lowering tab **(Fig. 24)**.



**Fig. 24. Setting of Draining Detection.**

• Then choose the Detection of Excessive Changes setting in the drop-down list. This detection method is used mainly to detect drainings, and it makes possible to differentiate between fuel draining and level lowering caused by fuel consumption upon operation of the vehicle.

• In the Minimal Raising field set a minimum raising of the fuel level in liters which may be identified as draining.

• In the Minimal Lowering field set a criterion and a maximum limit of fuel consumption in motion and on park upon exceedance of which draining is detected. In the In Moving line set the limit fuel consumption while in motion. In the On Park line set the limit fuel consumption while on park. If no limit fuel consumption while on park is set, to detect draining on park the same limit as the one used while in motion will be used.

• To detect draining, additional fuel level lowering limits may be set, for instance, for cases when additional equipment is connected to the vehicle. To set the additional consumption limit, enable the Additional Limits by Sensor option, and in the drop-down list on the left choose a condition for selection of the additional limit – parameter, sensor or vehicle flag **(Fig. 25)**. If this option is enabled, depending on whether the selected sensor is on or off, different limits will be used to detect draining. The consumption limit in case of the turned on sensor needs to be set in the Lowering Limit: Off field, and the consumption limit in case of the turned off sensor, in the Lowering Limit: On field.
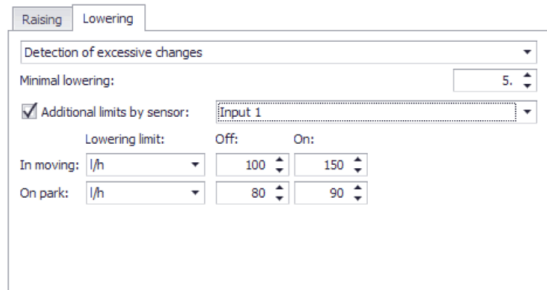
**Fig. 25. Setting of Draining Detection by Additional Limits.**

## MONITORING OF DRAINING AND FILLING

Upon setting of the draining and filling detection, a parameter with Switch type, ON status of which corresponds to the fuel draining or filling is automatically added to the AutoGRAPH 5 PRO program.

Using the Charters Viewer, it is possible to draw a graph of tank fuel level changes and obtain a chart of draining and filling parameter.

Sharp rise in level on the graph indicates filling **(Fig. 26, item 1)**, and level lowering may be draining **(Fig. 26, item 2)**. Upon detection of the draining or filling, intervals during which filling and draining was performed will be highlighted on the chart **(Fig. 26, item 3)**.
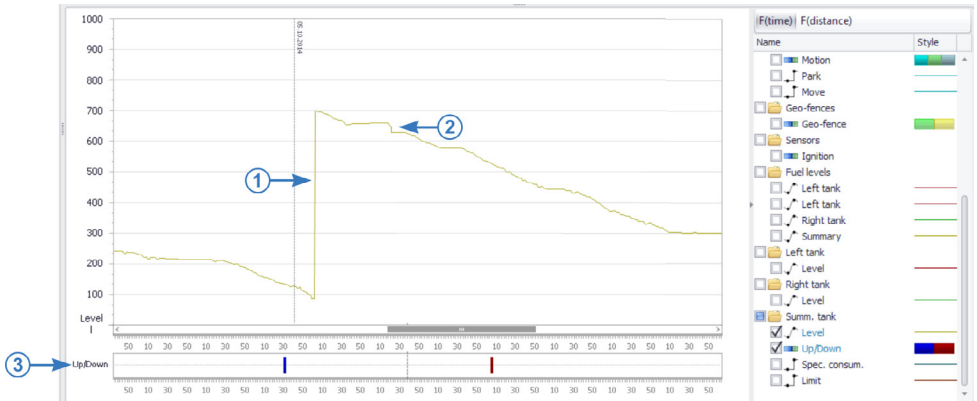


**Fig. 26. Fuel Level Graph.**

Using the Stages Viewer, it is possible to obtain a list of fillings and drainings. For this purpose, go to the Option menu, Stages settings section, and on the Stages Tabs tab add a new tab for the Stages Viewer **(Fig. 27)**:

• Set the tab name and choose an image.
• In the Filter field choose Parameter setting.
• In the Group/Parameter field enter a name of the parameter for the tank previously added to the Designer.
• Save the settings.

**Fig. 27. Settings of Filling and Draining Stages.**

In the Stages Viewer a new tab Tank will appear. It will display stages of fuel filling and draining over the selected period of data viewing.



**Fig. 28. Filling and Draining Stages.**

**GLONASS GPS**

# AutoGRAPH

**VEHICLE AND PERSONAL TRACKING SYSTEM**

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