



Connecting Technologies

PULSE MINING PANEL

User Manual



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General Information

This User Manual (hereinafter — manual) applies to the Pulse Mining panels STRM. 083.00.00.000 (hereinafter — panel), used with tire pressure monitoring systems (TPMS) of vehicles of various purposes. This manual is intended for the personnel of operating organizations. This manual contains information about the characteristics and operation of the panel, instructions for its proper and safe operation (intended use, maintenance, storage, and transportation) and assessment of its technical condition in determining the need to send it for repair. Please, refer to the documentation of the other components of the TPMS for information on the operation of the other components.

Definitions and abbreviations

1. **Panel** — the Pulse Mining display panel, STRM.083.00.00.000.
2. **TPMS** — a tire pressure monitoring system.
3. **Wireless pressure sensors** — pressure sensors designed to measure tire pressure and temperature and transmit the information to the panel via the radio channel.
4. **Vehicle** — a vehicle in which the system is integrated.
5. **Wialon Server** — a server to store TPMS data and other parameters.
6. **Wheel layout** — a conventional graphic representation of the location of tires on the axes of the vehicle, which is necessary to understand on which tire a specific pressure sensor is installed.
7. **Wireless module** (as applied to the panel) — the hardware built into the panel, allowing it to interact with radio pressure sensors.
8. **CAN Interface** (as applied to the panel) — the hardware built into the panel, allowing it to connect to a single CAN network with other electronic units of the vehicle. Notice that the SAE J1939 protocol is only supported. CAN is also used for service connection to a PC.
9. **RS232 Interface** (as applied to the panel) — the hardware built into the panel, allowing it to communicate with different electronic devices supporting this method of connection.
10. **Reference pressure** — a tire pressure to determine a warning signal: low pressure, puncture, axle imbalance, etc. The reference pressure is set according to the road conditions and is determined by the vehicle and tire manufacturers.
11. **Low pressure** — a tire condition in which the pressure is lower than the reference pressure by a specified percentage or less.
12. **High pressure** — a tire condition in which the pressure is higher than the reference pressure by a specified percentage or more.

1 Description and operating

1.1 Product description

The Pulse Mining Panel is a part of the TPMS, which is designed to receive and process the information coming from wireless pressure sensors automatically. The panel also allows to set a wheel layout, add or remove pressure sensors, set thresholds of measured values etc.

The panel provides the user with comprehensive information including: low/high tire pressure alarm, high temperature alarm, tire leak alarm, single axle pressure differential alarm, and inter-axle pressure differential alarm. All parameters of the controlled system can be set by the user.

If the set tire pressure values are exceeded, the panel will automatically switch from normal display mode to alarm mode: it will display a message on the screen and beep. The screen will also display information on problem tires.

In addition to the above-mentioned functions, the panel allows to save the data received from the sensors in the internal memory as data files that can be downloaded to a laptop, tablet, or smartphone via Wi-Fi. The panel also enables remote monitoring of vehicle tires by using the GSM network or the Wialon server.

1.2 Specifications and delivery package

Table 1: Specifications of the panel

Parameter	Value
Power supply voltage range, V	8...32
Power consumption, W	5
Display size	135 × 82 mm; 3.37"
CAN interface	1
RS232 interface	supported
Wi-Fi connection	supported
GSM/GPRS connection	supported
Degree of protection according to GOST 14254-2015	IP67 ¹

Notes: 1. The SIM card slot plug (pos. 4 in Fig. 2) must be closed, and the mating part of the connector (pos. 1 in Fig. 2) must be properly connected.

Table 2: Package contents

No	Item	Number	Note
1	Pulse Mining display panel; STRM.083.00.00.000	1	Includes bracket with fasteners
2	Antenna BY-GPS/GLONASS-03	1	Includes 5 m cable and cable ties
3	Antenna ANT GSM AG360 SMA-M 2.5M	1	Includes 2.5 m cable and cable ties
4	Antenna TK-378	1	Includes 5 m cable, antenna bracket and cable ties
5	Cable harness; STRM.083.88.01.000	1	Includes cable ties

1.3 Product structure

The panel consists of a display, a microcontroller, and a radio module for operation with pressure sensors, control keys, LED indicators, and a sound alarm unit. The display panel has a built-in GPS receiver to obtain data about the location of the tracked vehicle, built-in Wi-Fi and GSM modules used for wireless connections. Integrated GSM module requires an active SIM to be installed.

Front side of the panel is shown in Figure 1.



Figure 1: Front side of the panel

To control over the panel, membrane keys 1-6 are used. Information on the operation of the TPMS is presented on display 7. Panel operation status and warning signals are displayed using LED indicators 8, 9. The sound alarm is placed behind the keys.

Table 3 summarizes the assignment of the panel keys, and Table 4 shows the assignment of LED indicators.

Table 3: Keys description

Pos.	Name	Mode	Function
1	Power on/off 	All	Switch on/off the panel
2	"Warning" 	All	Show the information on faults in tires
3	"MENU" 	All	Use a menu function / enter the main menu / cancel actions when in a menu / exit menus and submenus
		Keyboard mode	Change the active keys' layout
4	"Up" 	All	Go one position up in the menu
6	"Down" 	All	Go one position down in the menu
5	"Select" 	All	Select a function or enter the menu
		Keyboard mode	Confirm and save
7	—	All	Display

Table 4: LEDs description

Pos.	LED color	Mode/state	Function
8	Red	Blink	Requires operator attention, dangerous conditions are present.
		Steady light	Dangerous conditions are present, but the operator is notified.
		Off	No dangerous conditions.
9	Yellow	Blink	Unread warnings are available.
		Steady light	The operator read all the warnings.
		Off	No active warnings.

Back side of the panel is available in two versions which are presented in figures 2, a and b. Table 5 shows the purpose of connectors and components on the back side.

1.4 Installation and wiring

1.4.1 In-cab installation

The panel is mounted in a vehicle cabin usually on the top board of the cab or on the dashboard. The IP67 design also allows the panel to be mounted in open cabs. The Pulse Mining is mounted with brackets, screws, and nuts.

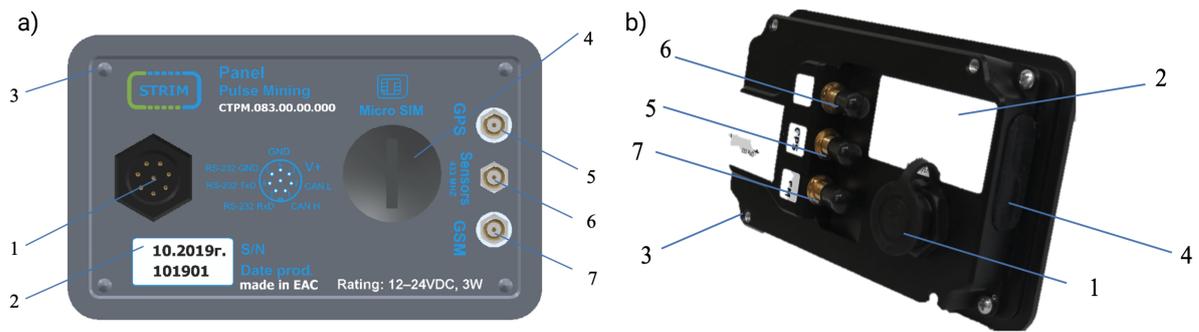


Figure 2: Back side of the panel

Table 5: Back side components' description

Pos.	Description	Function
1	Power connector	To supply power to the panel, also used for CAN/RS232 connection.
2	Date of manufacture and serial number of the panel	The serial number encrypts the password to access the settings when the security function is enabled.
3	Holes for installing the external mounting bracket	—
4	Cover sealing the SIM card slot	—
5	GPS antenna slot	To connect the GPS antenna.
6	Wi-Fi antenna slot	To connect the Wi-Fi antenna.
7	GSM antenna slot	To connect the GSM antenna.

The mounting components are included in the package. Fig.3, a shows the installation of the Pulse Mining on the dashboard. The dashboard requires a 127×74 mm rectangular hole with a tolerance of ± 0.5 mm. The panel is installed into this hole. On the back side of the panel two stops are installed and secured with screws $M3 \times 10$. Then, with $M4 \times 30$ screws the entire construction is fixed in the dashboard as shown in Fig.3, b. The $M4 \times 30$ screws are secured with M4 lock nuts to prevent unscrewing.

Figure 4 shows the installation of the panel on the dashboard by using an external bracket.

Mount the bracket to the panel using the four $M3 \times 10$ screws and washers provided. Mark and drill two $4.5 \dots 5$ mm diameter holes 50 mm apart at the base of the bracket. Mount the panel with the bracket to the external dashboard using the supplied M4 set ($M4 \times 10$ screws, 4 washers and M4 nuts). Adjust the panel position with the vertical and horizontal hinges (Fig.4) by unlocking them first. The position of the panel should allow the operator to see the display clearly. After adjustments are made, lock the hinges 2 and 3.

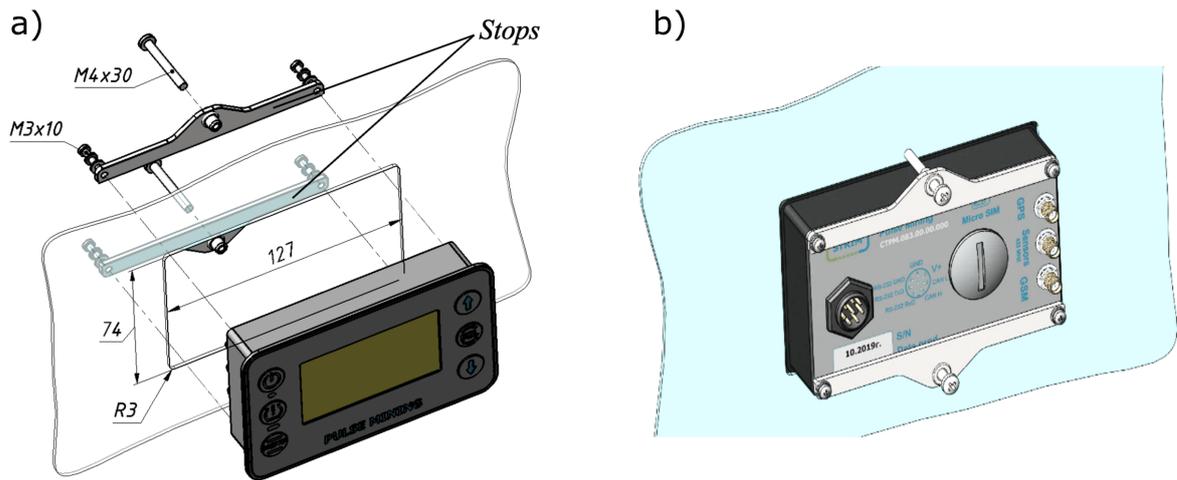


Figure 3: Installation on the dashboard

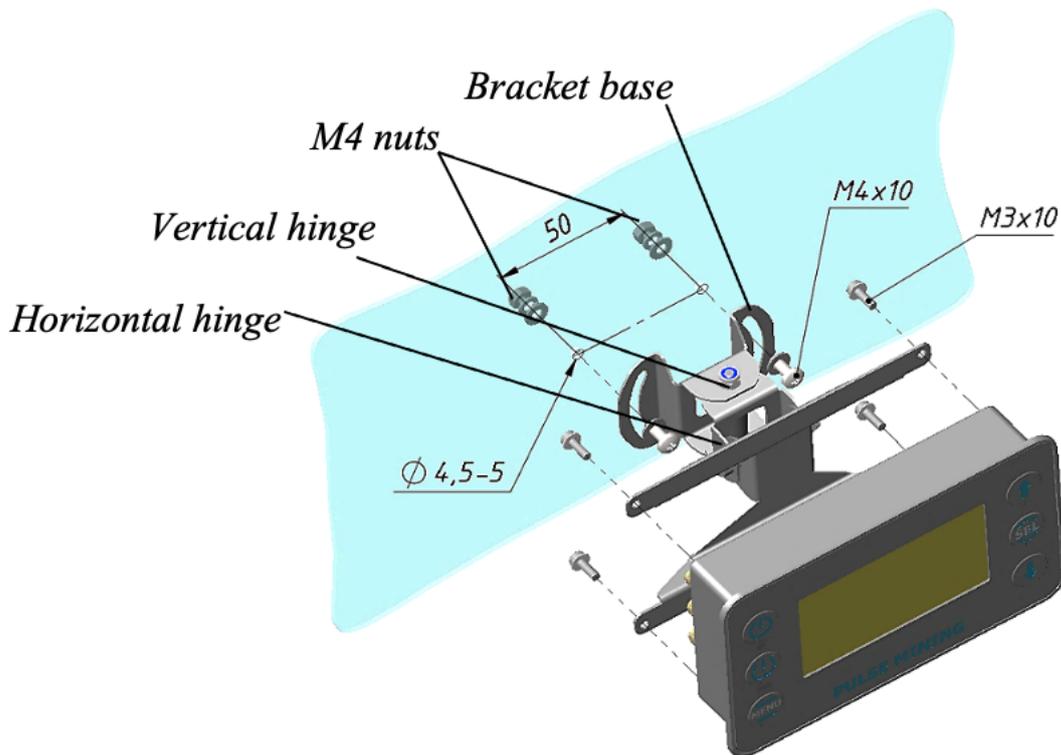


Figure 4: Installation on the dashboard with an external bracket

1.4.2 Connecting to power supply and installing SIM

Please note that the power connection to the panel must be performed by qualified personnel. The power connection to the panel is made with the help of cable harness STRM.083.88.00.000, which is included in the package. The harness is connected to connector 1 (Figure 2) on the back side of

the panel. The harness and the connectors are shown in Fig.5 The wiring harness is secured along the track with the bundled cable ties. CAN must be connected to a vehicle's CAN bus connector. RS232 must be connected to a data tracker. The positive pole of power supply must be connected to the ignition switch of the vehicle. It is not necessary to install a fuse, because it is part of the panel. The negative pole of power supply must be connected to the common bus or the vehicle chassis. After the harness has been laid, the panel harness connector must be installed. To do this, insert the connector into the connector lock and turn clockwise until it clicks.

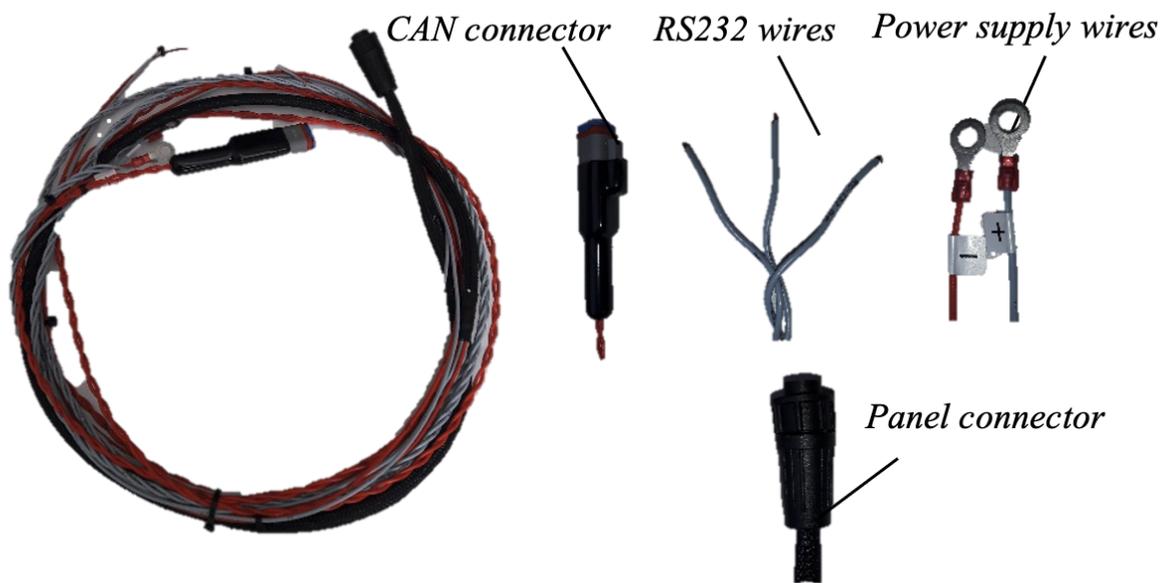


Figure 5: Wires and connectors

In order to transmit data to a remote server by using GSM/GPRS, a micro SIM must be installed into the SIM slot. Installation of the SIM must be done before mounting the panel on the bracket.

The SIM installation procedure differs depending on the panel series. For the series 1, the SIM card installation procedure is shown in Fig.6 a-e. Remove cover 1 from panel housing 2 (Fig.6 a). Slide retainer 3 in the direction indicated by arrow and set aside upwards as shown in Fig.6 b. Insert SIM card 4 into slot 5 (Fig. 6 c). Close locking mechanism 3 and slide it back (Fig.6 d). Please make sure that the SIM card is securely fastened with slip 3. Insert plug 1 into the opening of body 2 so that the sealing ring of the plug adjoins tightly to surface 6 of cover 2 (Fig.6 e).

For version 2, the installation procedure is shown in figures7, a-c. Remove protective cover 1, then press button 2 and remove SIM holder 3. Insert mini SIM 4 into the holder and place it back into the slot, then put the cover back.

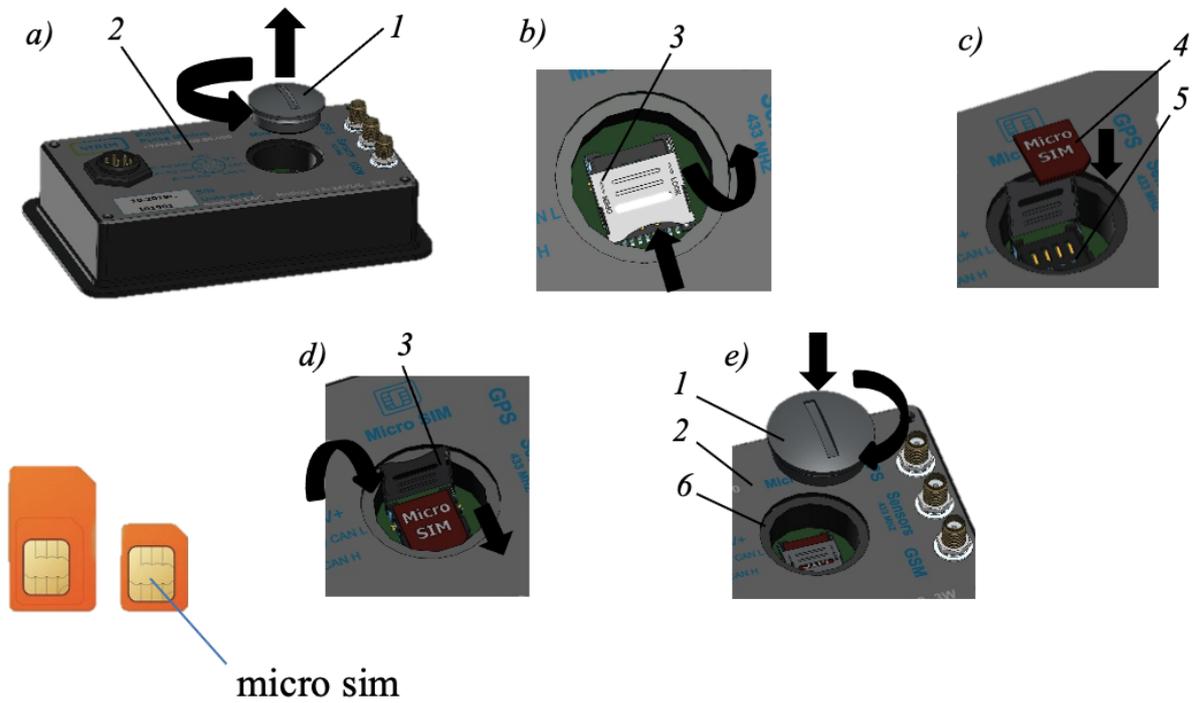


Figure 6: Installing a SIM. Panel series 1

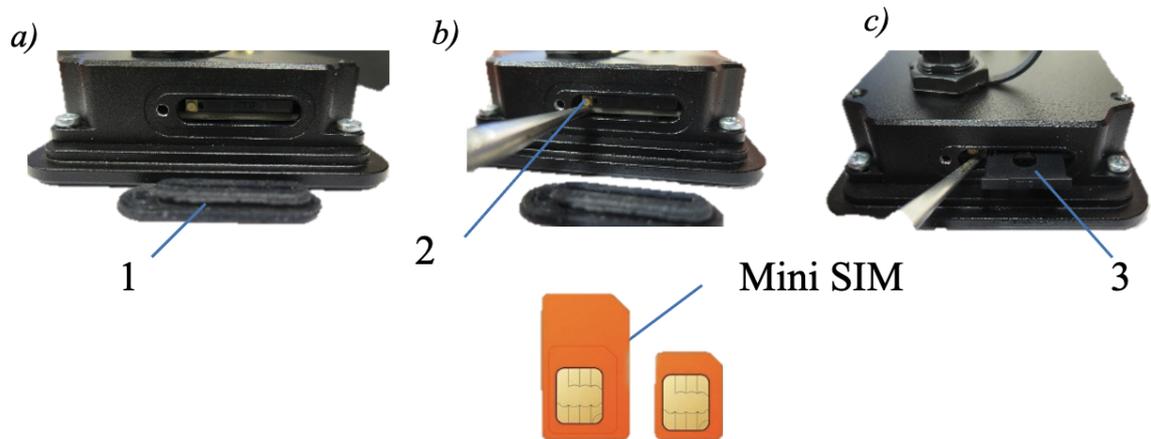


Figure 7: Installing a SIM. Panel series 2

1.4.3 Installing antennas

Antennas are required to receive radio signals from wireless pressure sensors and GPS/GSM wireless communication functions. Please pay attention to the antennas' placement because it affects the strength of signals received. For reliable communication with the pressure sensors it is recommended to install the antenna outside the vehicle. It is also permissible to install the antenna inside the cabin in cases where installation outside is not possible for some reason. However, it is important that a sufficient signal strength

from the sensors is ensured.

Wireless antenna. For tractors and trucks, it is recommended to place the antenna between the frame side members, preferably in the middle of the chassis. The antenna must be oriented with the end downwards. For buses and trolleybuses it is difficult to install between the frame side members due to the low level of the passenger compartment floor. In this case the antennas can be mounted outside on the sides or inside the cabin. For semi-trailers, the antenna is mounted in the center of the semi-trailer, as in the case of tractors, between the frame members.

The antenna is installed on special bracket, which is included in the package. Installation of the antenna on the bracket and the dimensions of the bracket are shown in Fig.8 a and b. Also, the antenna can be glued to the windshield or a plastic panel (Fig.8 c). Two M6 × 20 screws and M6 nuts with washers from the package should be used to fix the bracket.

When the antenna is installed and connected, to check the signal level use the menu **Diagnostics** (see section 1.11.3) — RF level. The signal level is displayed in range 0...100 dB. The minimum signal level should not be lower than 12...15 dB. If the signal strength is too low, the antenna position must be changed.

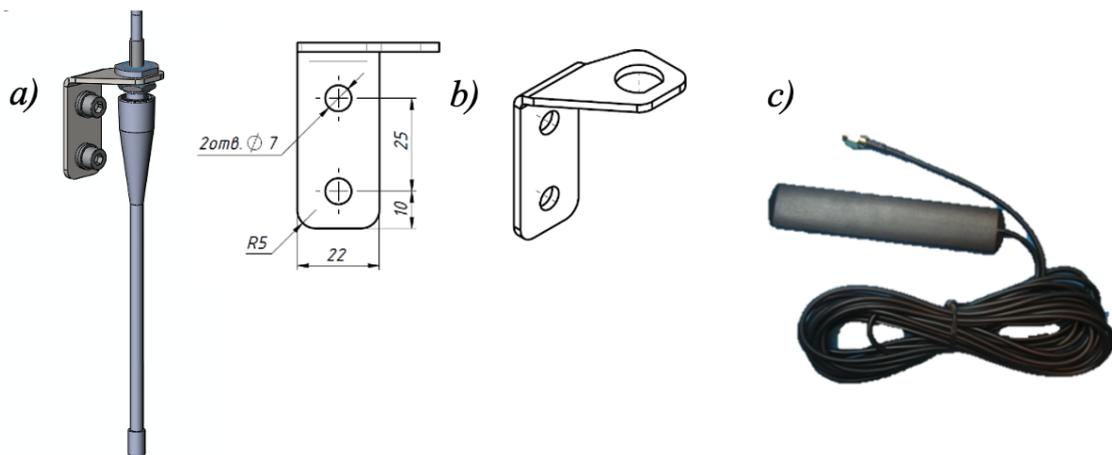


Figure 8: Wireless antenna setup

GSM antenna. The appearance of the antenna is shown in Fig.9. The antenna is installed on the windshield of the vehicle. For this purpose there is a special sticky strip on it. The GSM antenna must be connected to the GSM socket according to fig.2, pos. 7. Correctness of the antenna installation is determined by the signal strength level (see section 1.14.1) in the area of good GSM signal.

GPS antenna. The appearance of the antenna is shown in Fig.10. The antenna is included in the package. The antenna is fixed externally to a metal surface of the vehicle with built-in magnet. The GPS antenna must



Figure 9: GSM antenna

be connected to the GPS socket according to Fig.2, pos. 5. Correctness of installation is determined by the number of satellites discovered. The minimum number of satellites is at least 4 (see section 1.14.5).



Figure 10: GPS antenna

1.5 Initial power up

The initial power up of the panel displays `Pressure Monitor` screen shown in Fig.11. The message `No vehicle` is also displayed. The initial setup of the panel must be done in order to display the wheel layout, which can be done via the panel menu.

No vehicle

Figure 11: GPS antenna

1.6 Menu structure

The functions and parameters of the TPMS, as well as the settings of wireless modules, and information display are managed via the menu of the panel. To enter the menu, press `MENU` key when the panel operates in the `Pressure Monitor` mode (see section 1.11.4). The menu has the following structure:

- `Vehicle settings` — Used to configure TPMS;
- `Sensors` — Used to add, remove, and setup wireless pressure sensors;
- `Display settings` — Display options and settings;
- `System settings` — Contains general panel settings;
- `Communication settings` — Used to configure Wi-Fi and GSM wireless functions;
- `Tracker settings` — Used to configure the tracker (Wialon server, GPS).

Note. The functions of keys used for navigation are described in Table 3.

1.7 Using the on-screen keyboard

The on-screen keyboard is used to enter names, passwords, and identification numbers of sensors. Fig.12 shows the on-screen keyboard in the "Vehicle ID" entry mode.

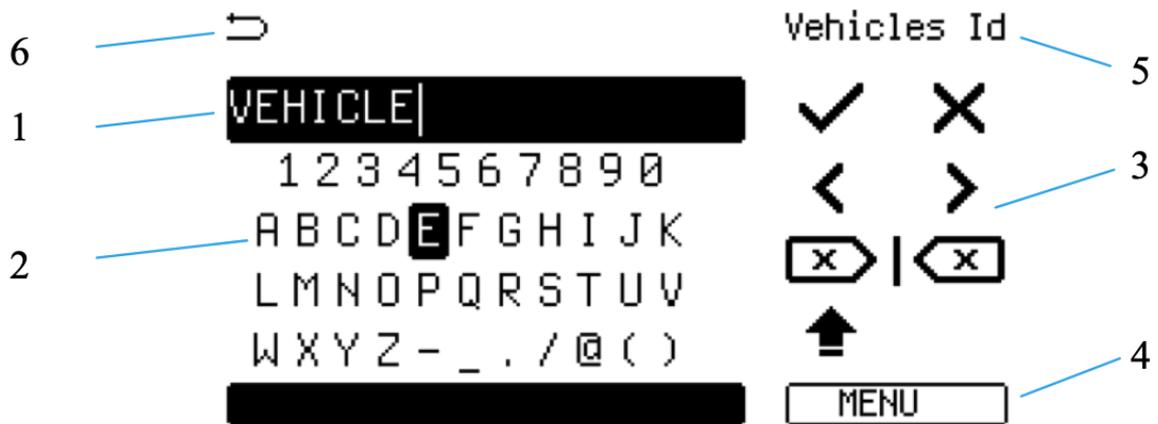


Figure 12: On-screen keyboard in the vehicle name entry mode

1 — text input field, 2 — selection palette for numbers and letters, 3 — editing tools palette, 4 — menu status indicator (colored means active/selected), 5 — name of edited parameter, 6 — return to previous screen.

To enter a text, switch to the menu of selection of numbers and letters (pos. 2 on Fig.12) by pressing the **MENU** key. The selected menu has shaded area 4. Use Δ / ∇ keys to select a character and confirm the selection with \circ key. The selected character will be displayed in area 1. The desired text can be typed by selecting the letters and numbers of area 2. The text length must be maximum of 9 characters. Confirm each new character selection with \circ key. When finished entering, press **MENU** key to switch to area 3 with editing tools. To save the entered text, use Δ / ∇ keys to select symbol 1 according to Fig.13.

Description of the controls as shown in Fig.13:

- Confirm the entered information;
- Cancel the entered information;
- Move the cursor one position left;
- Move the cursor one position right;
- Delete the character to the right of the cursor;

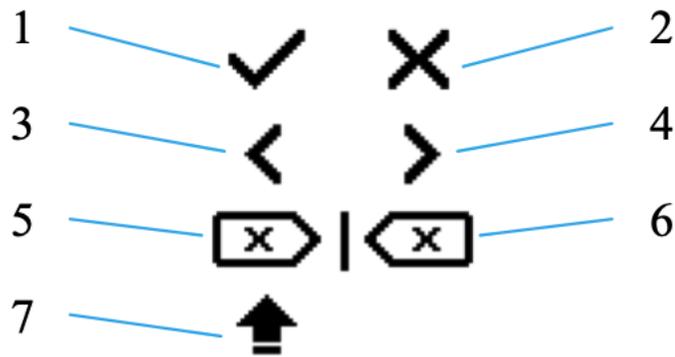


Figure 13: On-screen keyboard controls

- Delete the character to the left of the cursor;
- Case selector (capital/small letters).

1.8 Display settings

`Display settings` menu includes the following settings:

- Sound settings;
- Brightness settings;
- Logo screen settings;
- Time display options;
- Test mode (to check if the screen and keys are working properly);

1.8.1 Sound notification settings

Sound notifications are configured by using the `Sound settings` submenu, which is called from the `Display settings` menu. The following settings and functions can be configured:

- `Key beep sound` — Key press sound volume adjustment;
- `Alert sound` — Enable/disable alert sound;
- `Repetition period` — Alert repetition time adjustment.

Key beep sound — Use Δ / ∇ keys to increase or decrease the volume of beeper (Fig.14). Select $\boxed{0}$ to mute the key press sound. To set the maximum possible volume, select $\boxed{5}$. Press \circ to confirm the selection and then press $\boxed{\text{MENU}}$ to exit the submenu.

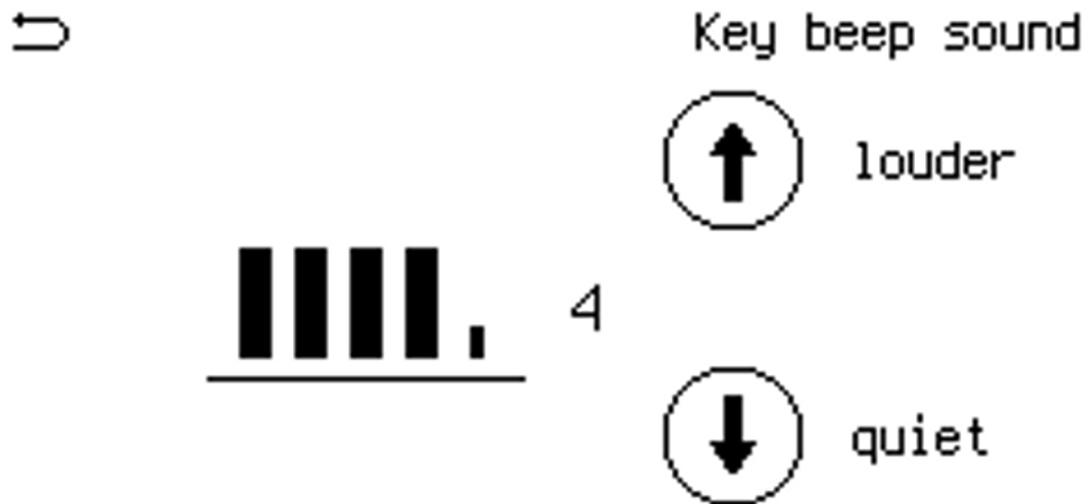


Figure 14: Key beep sound settings

Alert sound — setting up the warning sound in case of a tire emergency state. The alert sound is activated by selecting $\boxed{\text{Yes}}$ in the $\boxed{\text{Enable sound}}$ menu. Deactivation is done by selecting $\boxed{\text{No}}$. The repetition period can be changed on $\boxed{\text{Repetition period}}$ tab with Δ / ∇ keys (see Fig.15). The repetition period can be set from 30 to 240 seconds in 30-second increments.

1.8.2 Brightness adjustment

The following options are available in $\boxed{\text{Brightness settings}}$ submenu:

- $\boxed{\text{LCD brightness}}$ — adjust the LCD screen brightness;
- $\boxed{\text{LED brightness}}$ — adjust the brightness of the LEDs and key backlight;

Selecting any of these items displays the screen presented in Fig.16. Use Δ / ∇ keys to increase or decrease brightness of the LCD or LEDs. The value 0 corresponds to the minimum brightness, the value 10 corresponds to the maximum possible brightness. Adjusting brightness of the LEDs also changes brightness of the panel keys backlight. To confirm the settings press \circ , then press $\boxed{\text{MENU}}$ to exit the submenu.



Repetition period

Adjust Value
30 sec

Figure 15: Repetition period of the alert sound



LCD brightness

Adjust Value
10



Figure 16: Brightness adjustment screen

1.8.3 Logo screen settings

When the panel is powered on, a company logo can be displayed, the logo can be customized. In submenu `Logo screen settings` called from the `Display settings` the following options are available:

- `Show logo screen` — Enable/disable the option;
- `Select logo` — Logo selection;
- `Enter logo timer` — Display time adjustment.

To show the logo at power on select `Yes` in the `Show logo screen` menu or select `No` to disable this option. To select the logo to be displayed, use the \triangle / ∇ keys in the `Select logo` menu, confirm the selected logo by pressing the `o` key.

The logo display time can be set in the menu `Enter logo screen timer`. Acceptable values are 1 . . . 240 s.

1.8.4 Enable/disable clock screen

The display settings include a function to display the clock. Select `Yes` in the `Show clock screen` menu to enable this option or `No` to disable it. If this option is enabled, the panel will show the clock screen (Fig.17).



Figure 17: Clock screen option is enabled

1.9 System settings

The following settings are available in `System settings` submenu:

- `Language` — Language selection;

- `Clock` — Date/time settings;
- `Measurement units` — Pressure and temperature units settings;
- `Auto-update time` — Enable/disable time auto-update function;
- `Security` — Set/remove a password to access the menu;
- `System Info` — Shows current software version;
- `Format flash file storage` — Format built-in file storage;
- `Reset to factory settings`.

1.9.1 Language selection

The language selection is made in the `Language` menu, which is submenu of the `System settings`. The available languages are English and Russian. The language selection is done with \triangle / ∇ keys. To apply the selected language, press \circ .

1.9.2 Date/time settings

The date and time are set in the `Clock` submenu, called from the `System settings`. This submenu allows to:

- `Set time`;
- `Set date`;
- `Choose a time zone`.

The time is set in the `Set time` section, available from the `Clock` submenu (see Fig.18). The date is set in section `Set date` in the same way.

Time zone settings are made in the `Time zone` section (see Fig.19). Selection of the time zone is made with \triangle / ∇ keys. Confirm the selected time zone by pressing \circ .

1.9.3 Pressure and temperature units

The pressure and temperature units are selected in the `Measurement units` submenu of the `System settings` (see Fig.20). For pressure unit settings use the `Pressure` tab, for temperature unit settings use the `Temperature` tab. Available units: **bar**, **psi**, **kPa** for pressure, **°C**, **°F** for temperature. To select a unit use the \triangle / ∇ keys, save the selected unit by pressing \circ .

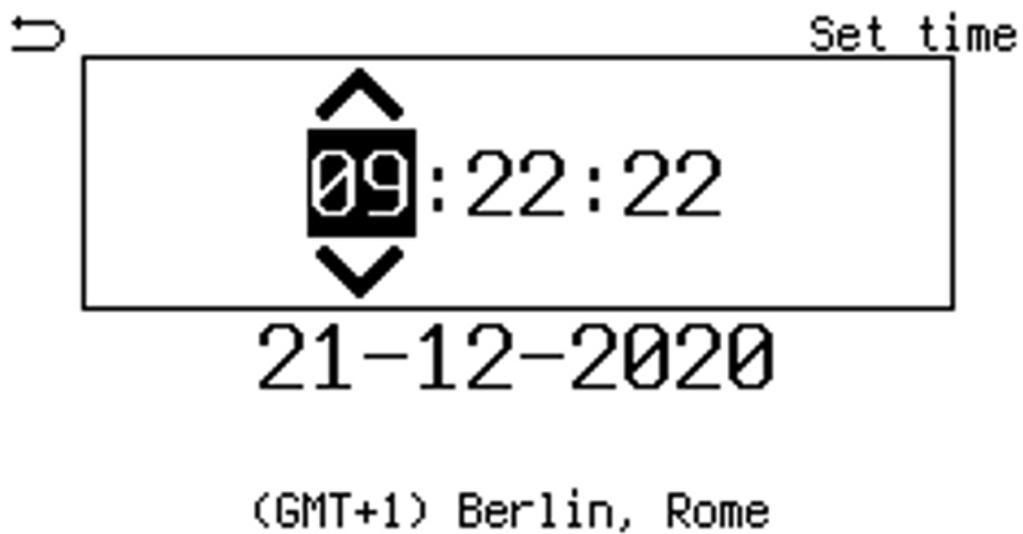


Figure 18: Time/date setting screen

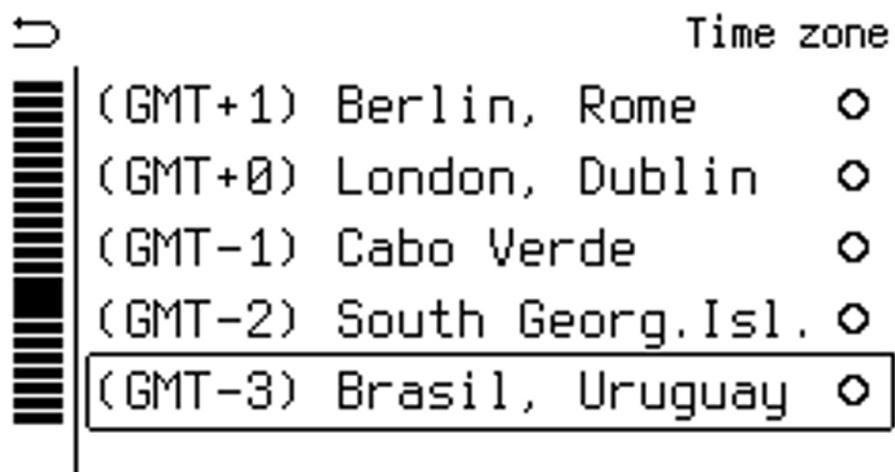


Figure 19: Time zone selection screen

1.9.4 Enable/disable automatic time update

In the `Auto-update time` section of the `System settings` menu it is possible to activate the automatic update of system time. The following options are available:

- `OFF` — Auto-update is off;

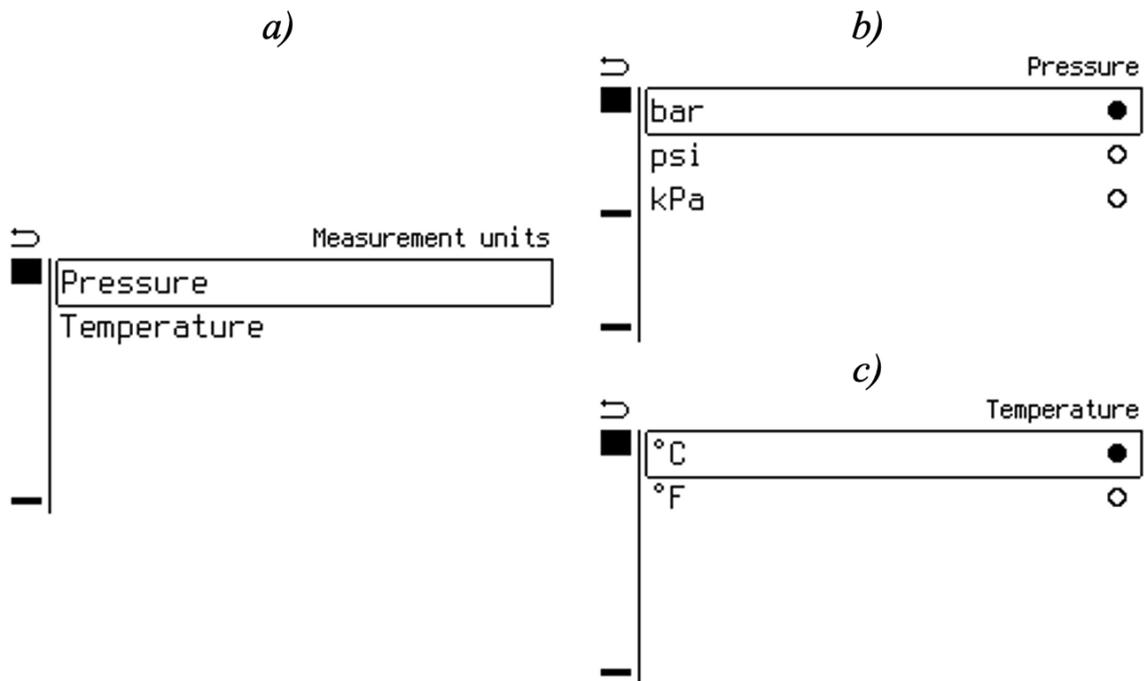


Figure 20: Pressure and temperature unit selector

- **Auto-update on** — Auto-update is on, using the GPS;
- **Wialon** — Auto-update using is on, using the Wialon server.

Use Δ / ∇ keys to select one of the options and then press \circ to confirm the selection.

1.9.5 Security settings

To prevent unauthorized access to the panel settings, use the security options available in the **Security** section of the **System settings** menu:

- **Enable password** — Enable password protection;
- **Setup password** — Password selection;
- **Logout admin** — Change the rights in the system from admin to user.

Enable password protection by selecting **Yes** tab in the **Enable password** menu. Once password protection is enabled, enter it by using the on-screen keyboard (see Fig.21). After entering the password, it must be confirmed by re-entering it.

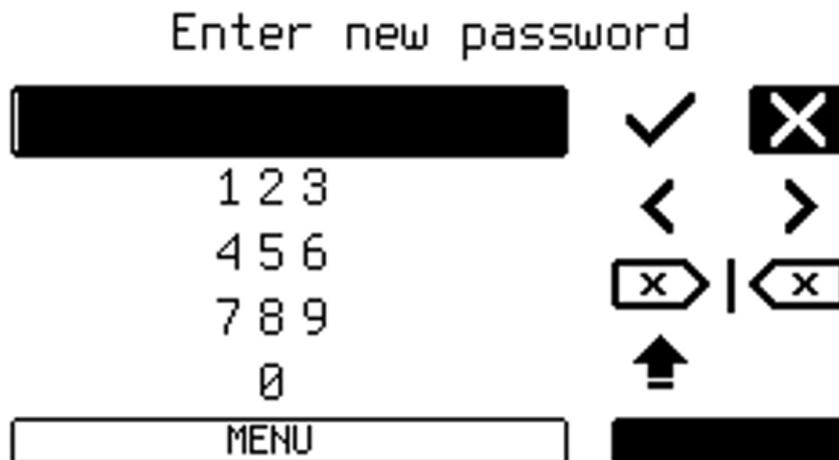


Figure 21: Password setup screen

If the passwords match, the message **Password correct** (Fig.22, b), will be displayed. If the passwords do not match, the error message will be displayed (Fig.22, a).



Figure 22: Password setup screen

The password entered must be memorized. If the password is activated, access to the settings will be locked and only diagnostic data remain available. To access the settings, go to the `Security` menu, once the password protection is activated, there will be only one tab available — `Enter as admin`. By selecting it, enter the password. If the password is entered incorrectly, the message like in Fig.22, a will appear.

Note: If the password is entered incorrectly three times, the message "**Password incorrect. Contact support. Provide the current date and serial (XXXXX). Exit to menu in X s**" will be displayed. In this case it is

necessary to contact STRIM support (current contact information can be found on the official website strim-tech.com in the "For clients" section) in order to get password recovery instructions.

If the panel operates with "administrator" rights, which allow changing the system settings, it is recommended to lower the rights in the system for additional security. Select the `Logout admin` tab in the `Security` menu. If a password was previously enabled and set, the permission level will be changed to `user`. If the password is disabled, the user rights cannot be changed, and the following message will be displayed: "**Password disabled or undefined**".

1.9.6 Getting software and hardware info

Information about the panel and its software can be found in the `System info` menu, which is called from the `System settings` menu. The following information is available:

- `Software version`;
- `Software build date`;
- `Service number`;
- `Boot version`.

Please pay attention to the important parameter `Service number`. The number is used when recovering a forgotten password (see 1.9.5). `Software version` is used to control over the latest software updates.

1.9.7 Formatting internal storage

The built-in flash drive in the Pulse Mining panel stores system log files, tracker data files, and software. It is possible to format the storage by selecting `Format flash file storage` from the `System settings menu`. The section with the item `Start` will appear. Press the `o` key to start the formatting process.

Note. All data will be deleted. Make a backup copy before formatting.

1.9.8 Factory reset

To reset the panel, use the `Reset to factory settings` submenu available in the `System settings` menu. To start reset procedure select `Yes, I confirm`. Select `No, I'm not sure` to exit the reset menu.

Note. Factory reset will delete all saved layouts, pressure and temperature reference values, warning settings, server communication settings, Wi-Fi settings, etc.

1.10 TPMS settings

The tab `Vehicle settings` used to configure the TPMS. A view of the menu is shown in Fig.23.

The following settings are available:

- Adding/removing a vehicle;
- Entering a name of the vehicle;
- Creation of the wheel diagram of the vehicle;
- Setting reference pressure values;
- Setting alerts.

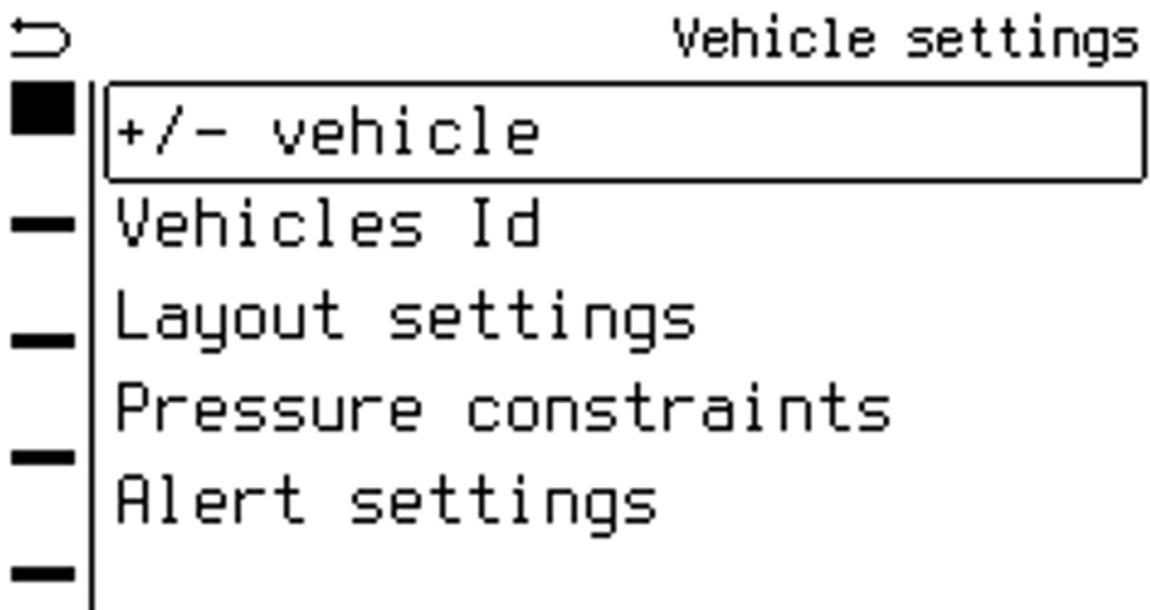


Figure 23: Vehicle settings screen

1.10.1 Adding/removing vehicles

The Pulse Mining can display tire pressures and temperatures for up to five vehicles. For example, one tractor can be equipped with four trailers

or semi-trailers. To add/remove a vehicle, select the tab `+/- vehicle` from `Vehicle settings` — Fig.23. The menu `+/- vehicle` (Fig.24, a) with five positions will be displayed. If the panel used for the first time, the positions have generic names `Vehicle0`, `Vehicle1`, etc.

To add or remove vehicles select a position (`Vehicle0`, `Vehicle1` ... `Vehicle4`) from the menu `+/- vehicle` using the keys (see table 3) and activate them. For example, in Fig.24, b vehicles numbered 1 and 2 (`Vehicle0` and `Vehicle1`) are activated. In order to confirm the choice it is necessary to exit the submenu by pressing `MENU` key. Once all the vehicles were renamed (see section 1.10.2), this menu will display the selected names instead of generic ones (see Fig.24, c).

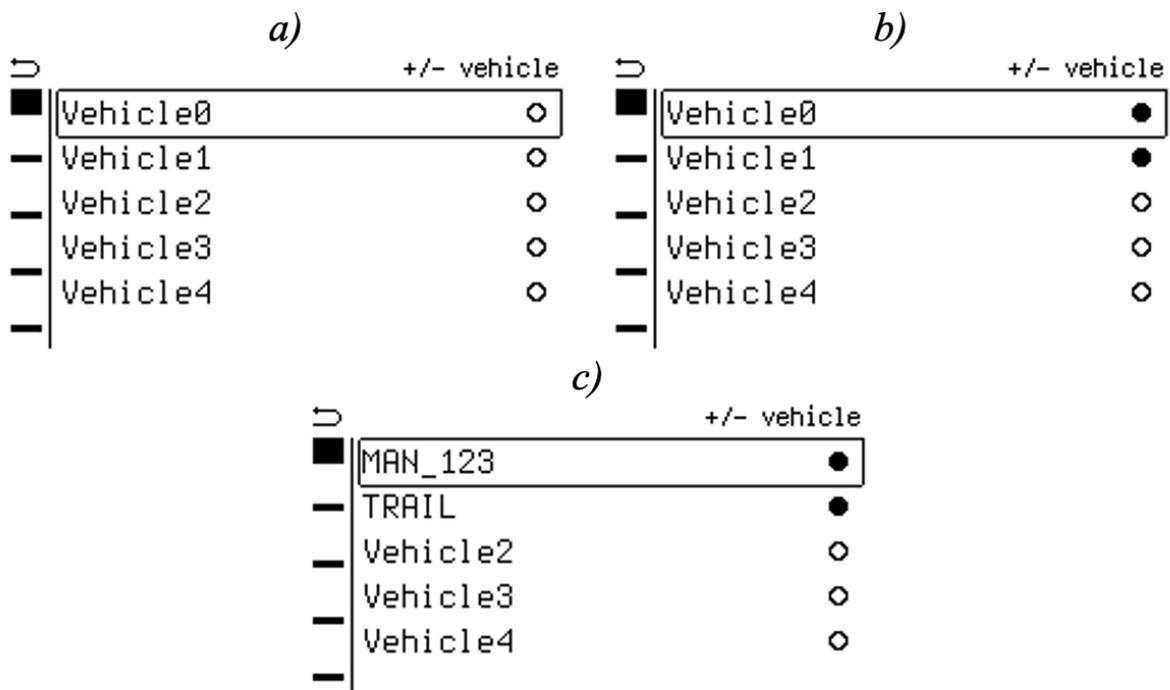


Figure 24: Adding, removing, and renaming vehicles

Note: If you uncheck the checkboxes of already configured vehicles, their settings are not being deleted. Deactivated vehicle becomes unavailable for monitoring, its wheel pattern is not shown on the TPMS display, the information coming from the sensors is ignored.

1.10.2 Editing IDs of vehicles

To set a unique name (Vehicle ID) for each vehicle, use `Vehicle ID` section, accessible from `Vehicle settings` menu (fig.23). In the submenu that appears (Fig.25), select the vehicle to be renamed by using $\Delta \nabla$ keys.

Enter an ID by using the on-screen keyboard as shown in Fig.26, a. After confirming the entry, the previous menu will be displayed with the new ID

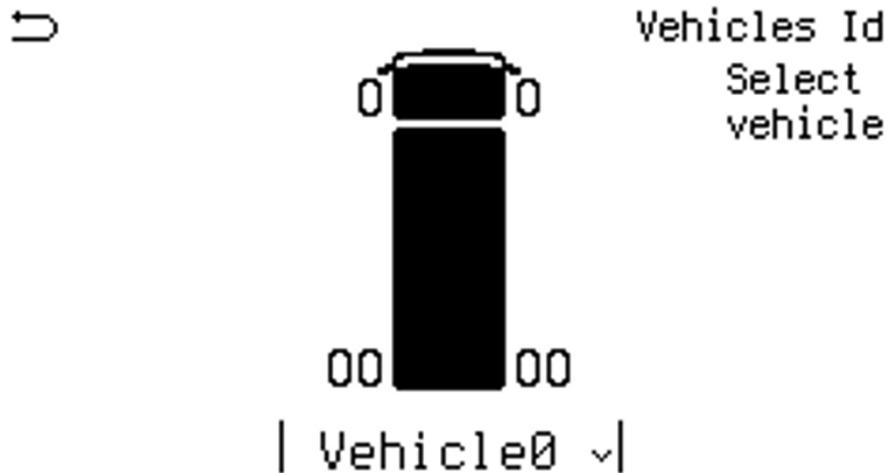


Figure 25: Select a vehicle to rename

of selected vehicle (see Fig.26, b). It is possible now to continue entering IDs for other vehicles or exit to the main menu.

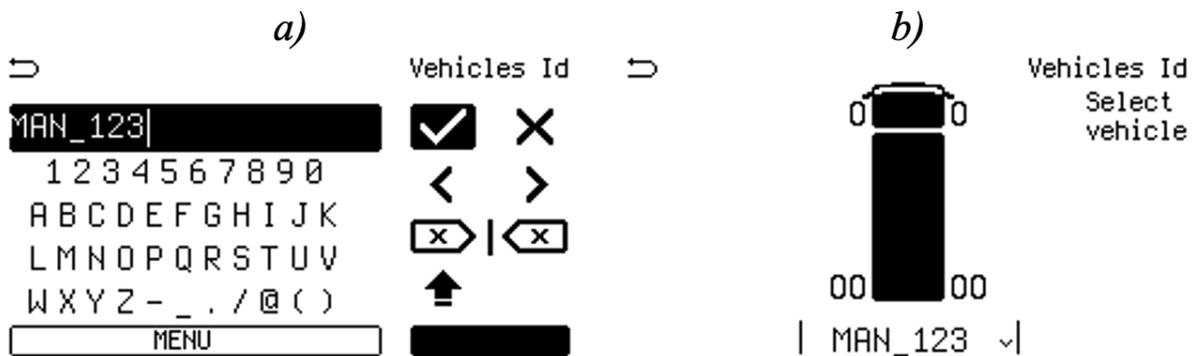


Figure 26: Example of entering Vehicle ID. In this example, name "MAN_123" is used

1.10.3 Creating wheel layouts

The wheel layout is a graphic representation of the vehicle and its wheels. It is necessary to connect radio sensors to wheels and subsequently display the pressure data. To create the wheel layout, select `Layout settings` tab in `Vehicle settings` menu. The section `Layout settings` will be displayed (see Fig.27). Next, you need to do the following steps:

1. **Select vehicle** — select the vehicle for which the wheel layout will be created;
2. **Select platform** — select one of the available platforms of the vehicle;
3. **Select/configure layout** — select one of the available preset wheel layout or configure a custom layout.

The vehicle selection screen is as shown in Fig.27, a. In this figure, the numbers denote: 1. **Platform** — platform type; 2. **Layout** — number of wheel layouts (in the form **X / Y**, where **X** — number of wheel layouts, **Y** — number of available wheel layouts for selected platform). In case the platform has only one available display option, the layout field is not displayed.

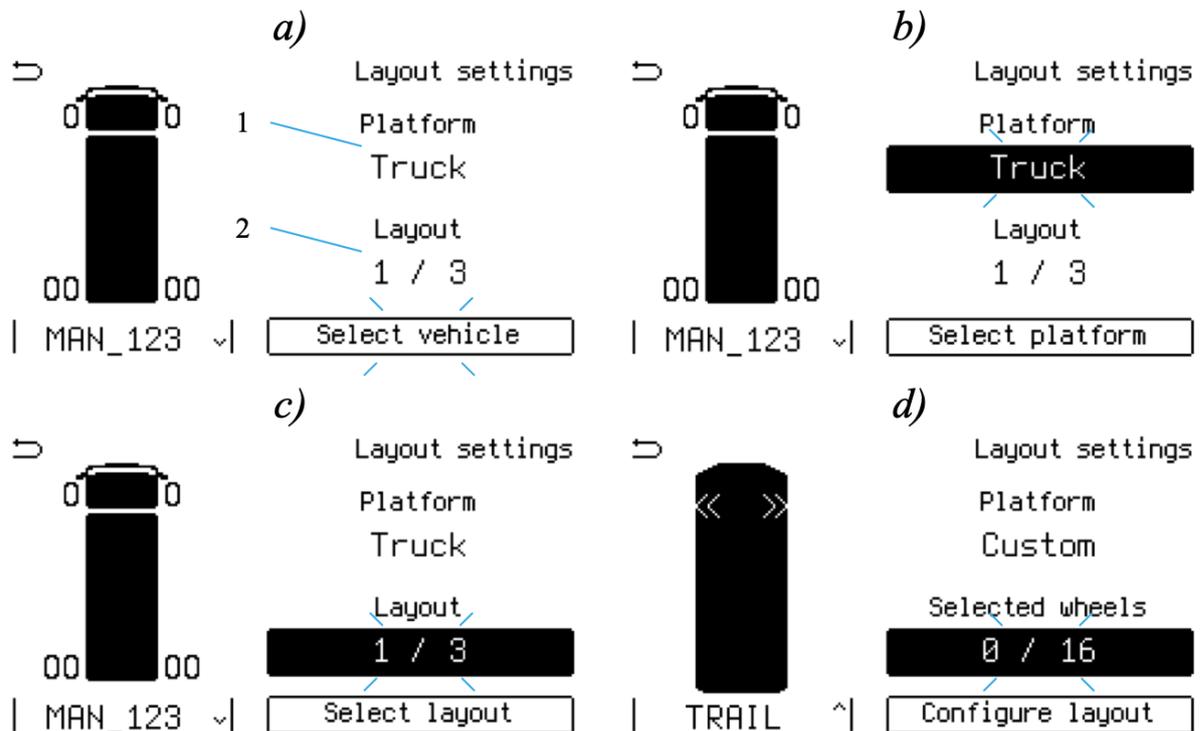


Figure 27: Creating wheel layout: a) vehicle selection; b) platform selection; c) layout presets; d) custom layouts

Use Δ / ∇ keys to select the desired vehicle. The \circ key is used to confirm and move to the platform selection. The platform type allows you to select the appearance to be displayed on the screen of the selected vehicle. Figures 28, 29 show images of the preset platform types.

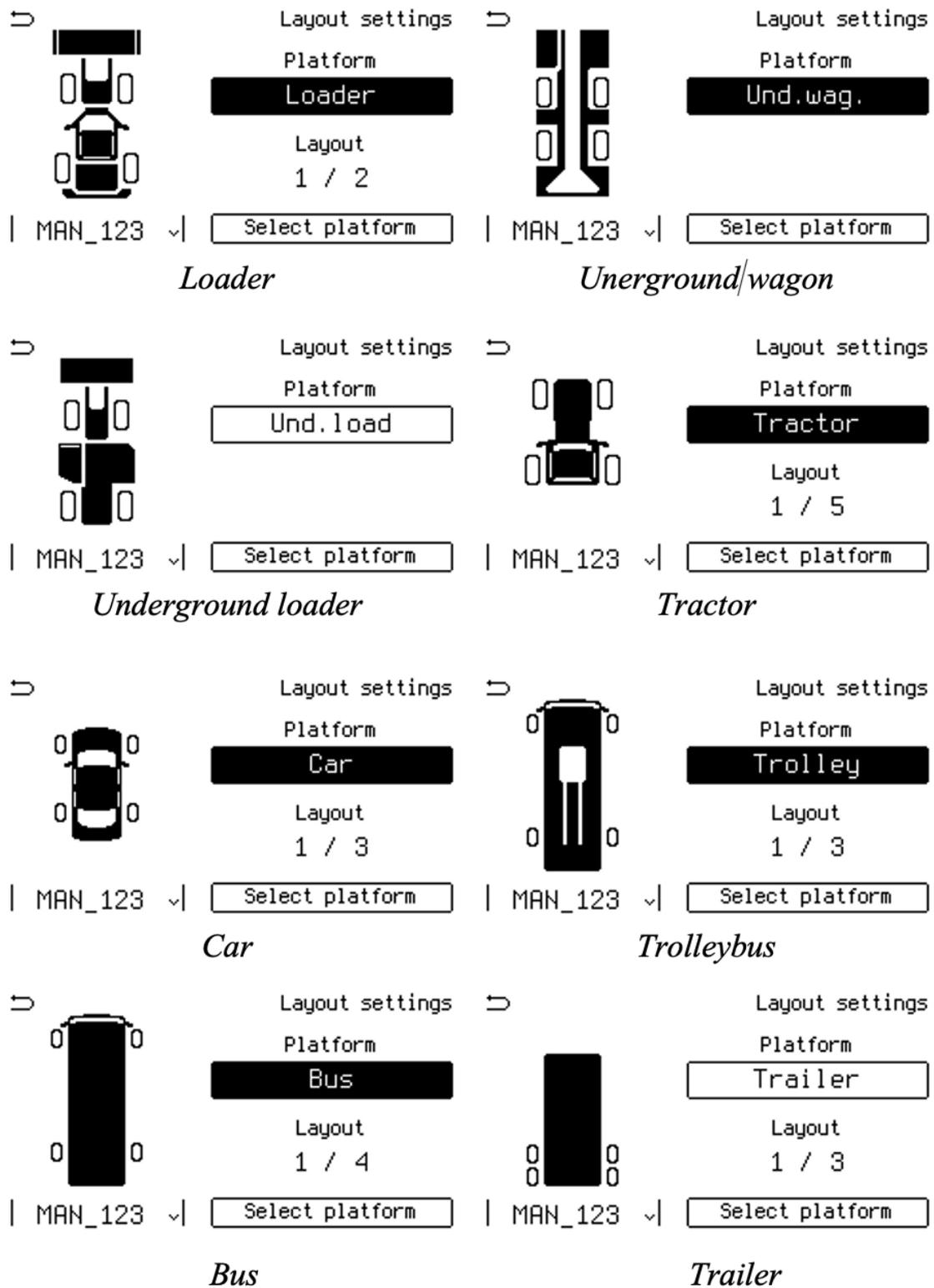


Figure 28: Preset platforms

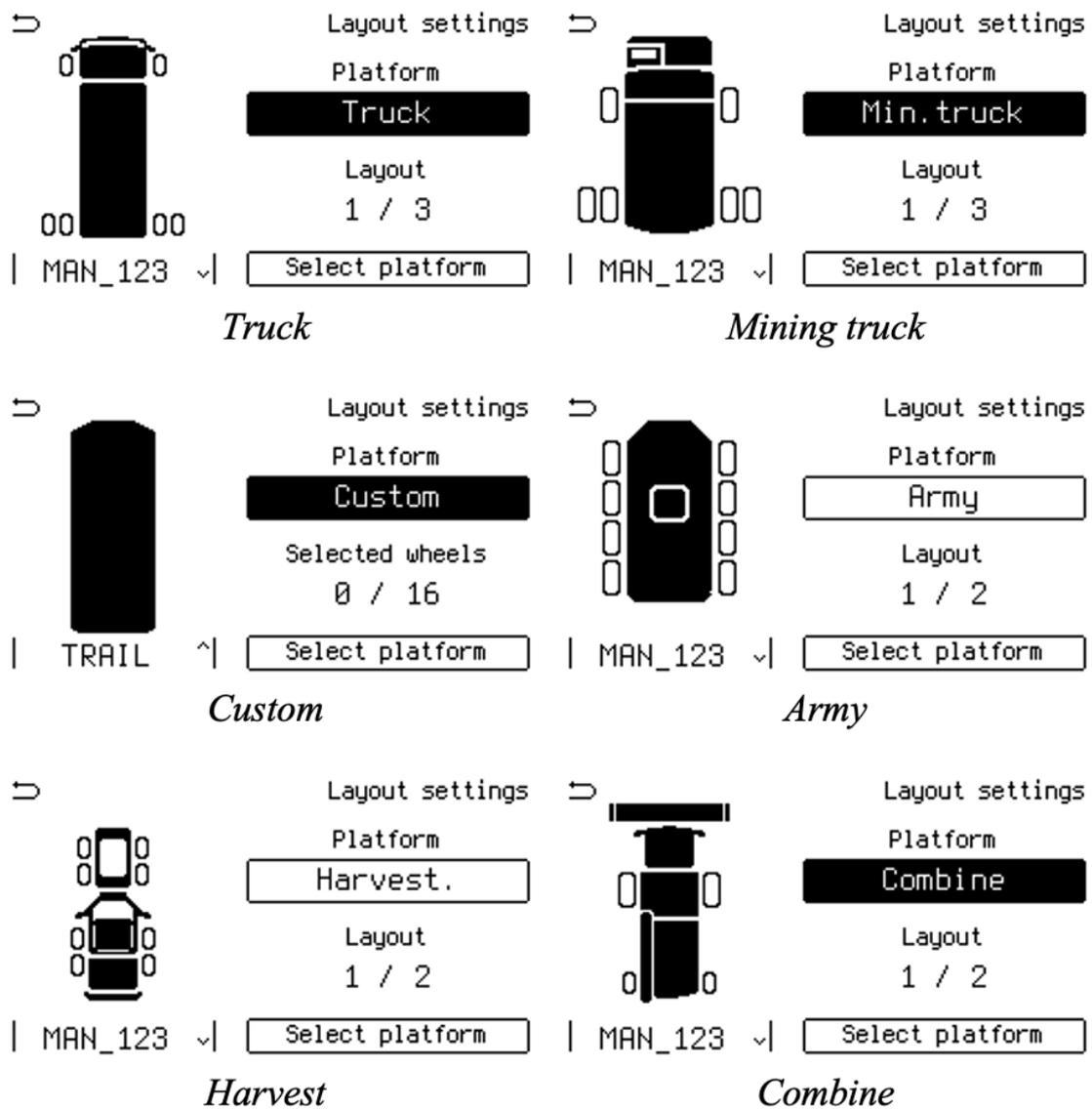


Figure 29: Preset platforms (continued)

Use \triangle / ∇ keys to select a platform type that corresponds to the vehicle to be set up. Press \circ key to confirm and move to the wheel layout configuration. If selected platform does not have available wheel layouts to configure, the setup process terminates here.

Wheel layout allows to specify the number of axles and the number of wheels in each axle. If one of the standard platforms has been selected, the typical configurations of wheel diagrams corresponding to this platform are available to choose from. Use \triangle / ∇ keys to select an appropriate one and then press \circ to confirm the selection. For example, when `truck` platform was selected, available presets of wheel layouts are shown in Fig.30.

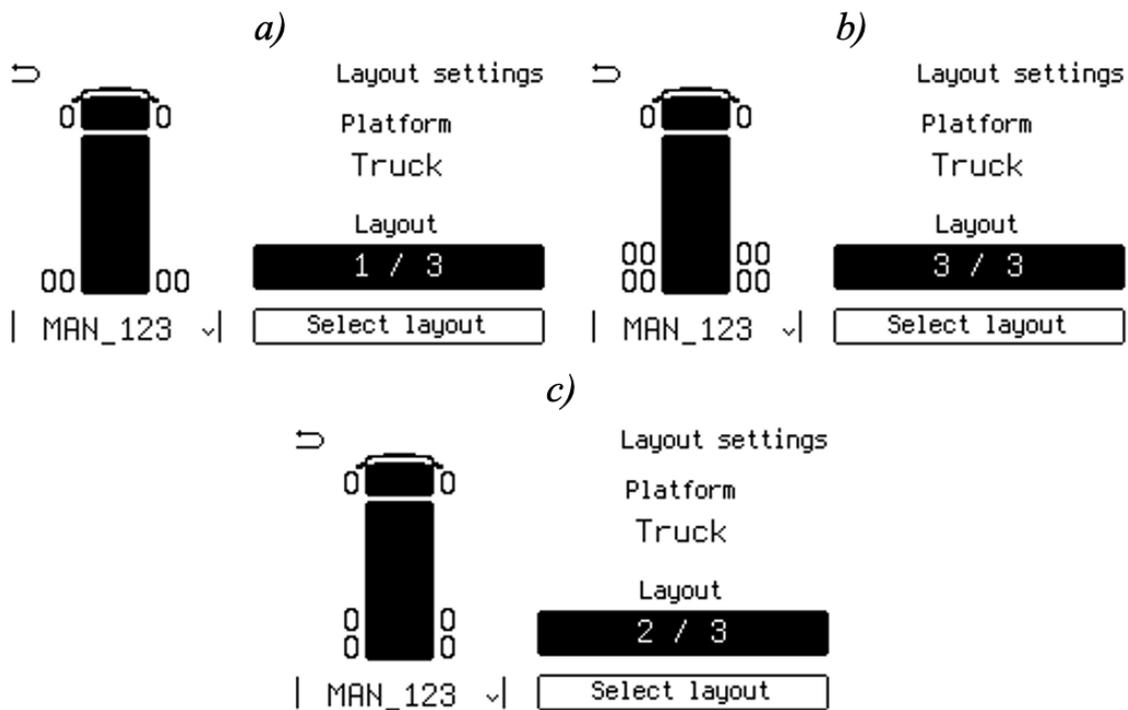


Figure 30: Available wheel layouts for platform "Truck": a) 2 axles, 2/4; b) 3 axles, 2/4/4; c) 3 axles, 2/2/2

If a custom platform is selected, it is possible to configure the wheel layout different from the preset (see Fig.). The double arrows \ll and \gg in the figure indicate the selected axle. `Selected wheels` area displays the number of installed tires for the wheel pattern `X / Y`, where `X` is the number of installed tires, `Y` is the number of available tires. There are 8 axles available to configure, each axle can have up to 6 wheels with total number of wheels of the whole vehicle not more than 16. Select the number of wheels by using \triangle / ∇ keys. To move to the next axle, press \circ , to return to the previous axle, press `MENU`. The total number of already selected wheels in the scheme is displayed under the wheel diagram. For example, Fig.31 illustrates the setup process of 3-axle 12-wheel layout.

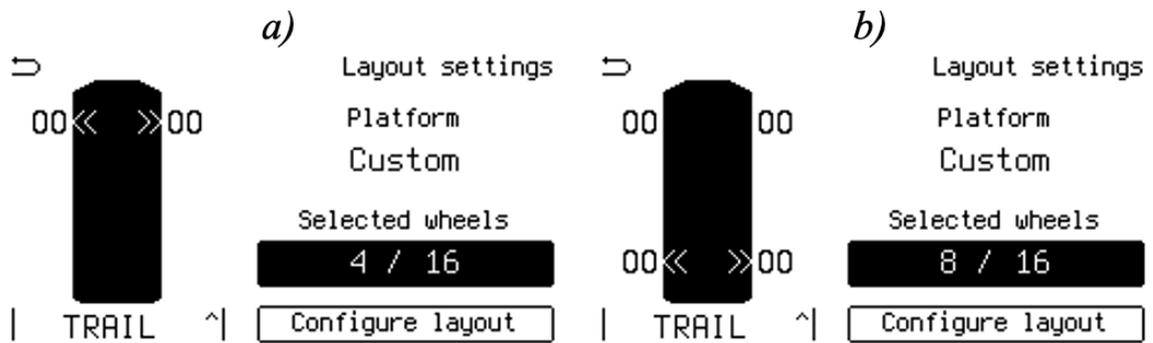


Figure 31: Custom wheel layout: a) 1 axle, 4 tires; b) 2 axles, 4/4 tires

To confirm the settings press `o` key when 8th axle of the custom wheel layout is highlighted (see. Fig.32). Wheels layouts for other active vehicles can be configured by following the same steps.

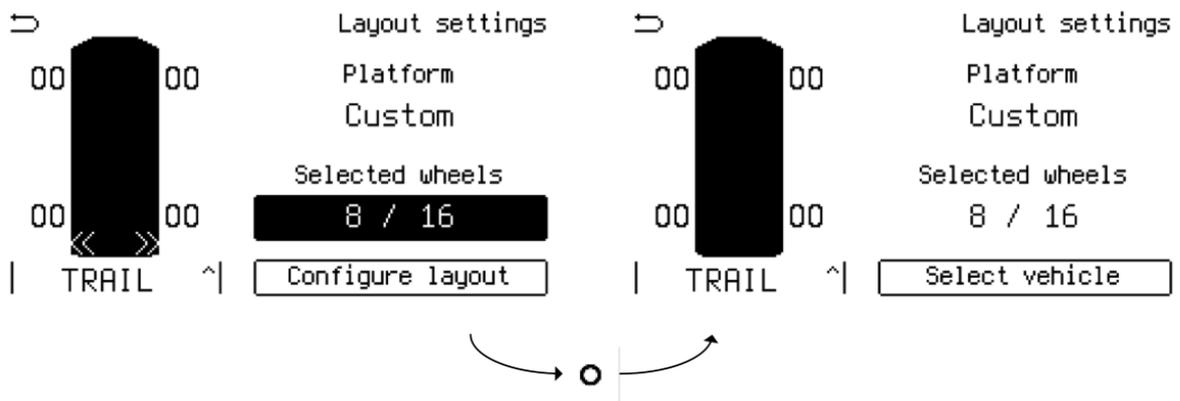


Figure 32: Finishing the layout setup

1.10.4 Setting tire pressure constraints

The panel allows to monitor the tire pressure and generate warning signals if one of the preset levels is exceeded.

The following levels can be set:

- `Reference pressure` — basic tire pressure, in relation to which warning signals are formed: low pressure, tire puncture, pressure imbalance on the axle, etc.
- `High pressure` — value of pressure in tires, excess of which is dangerous and a warning signal is formed;

- **Low pressure** — value of pressure in tires, lowering of which is dangerous and a warning signal is generated;

Pressure constraints are set in the **Pressure constraints** tab of **Vehicle settings** (see Fig.33). The left side of the tab displays the wheel layout of selected vehicle. The right side of the tab is used to display the following values: reference pressure (designated by number 1), high pressure in % of the reference and absolute value (designated by numbers 2 and 3 respectively), low pressure in % of the reference and absolute value (designated by numbers 4 and 5 respectively). The values on the screen are displayed as **X..Y z**, where **X** is minimum value, **Y** is maximum value, **z** is measurement unit. If all tires have identical values for one or more parameters, it will be displayed once.

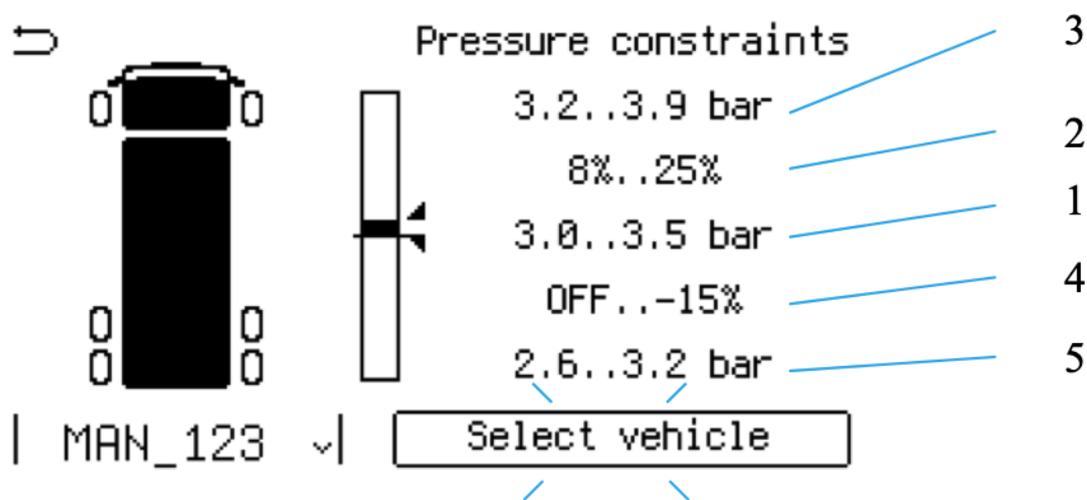


Figure 33: Pressure constraints tab

Figure 33 shows that the reference pressure for the vehicle is set from 3.0...3.5 bar, the high pressure is from 8% to 25% (or 3.2 to 3.9 bar in absolute values), the low pressure is from OFF (not set) to -15% (or 2.6 to 3.2 bar in absolute values).

The following steps are required when setting pressure limits:

1. Select a vehicle to be adjusted;
2. Select one of the enter modes: vehicle/axle/wheel;
3. Input and confirm required values.

Select a vehicle among the activated ones by using Δ / ∇ keys (see 1.11.1) in order to show the current vehicle settings. Confirm the selection by



Pressure constraints

Select enter mode
for wheels
for axles
for vehicle

Figure 34: Pressure constraints: enter mode selection

pressing \circ or press `MENU` to return to the main menu. After confirmation, `select enter mode` screen appears as shown in Fig.34.

The following modes are available:

- `for vehicle` — entering identical settings for all wheels;
- `for axles` — entry of the identical settings for individual axles;
- `for wheels` — independent setting of pressures for individual wheels;

By selecting one of the enter modes, it is now possible to enter values (as shown in Fig.35) in the following sequence:

1. `Setup base`
2. `Setup range`
3. `Setup low`
4. `Setup high`

The blinking area of the screen highlights the value being edited and the tires in the layout for which changes are being made also blink. The value is set with \triangle / ∇ keys. Press \circ to confirm the changes or `MENU` to return to the previous step. Pressing \circ without changing a value will skip to the next

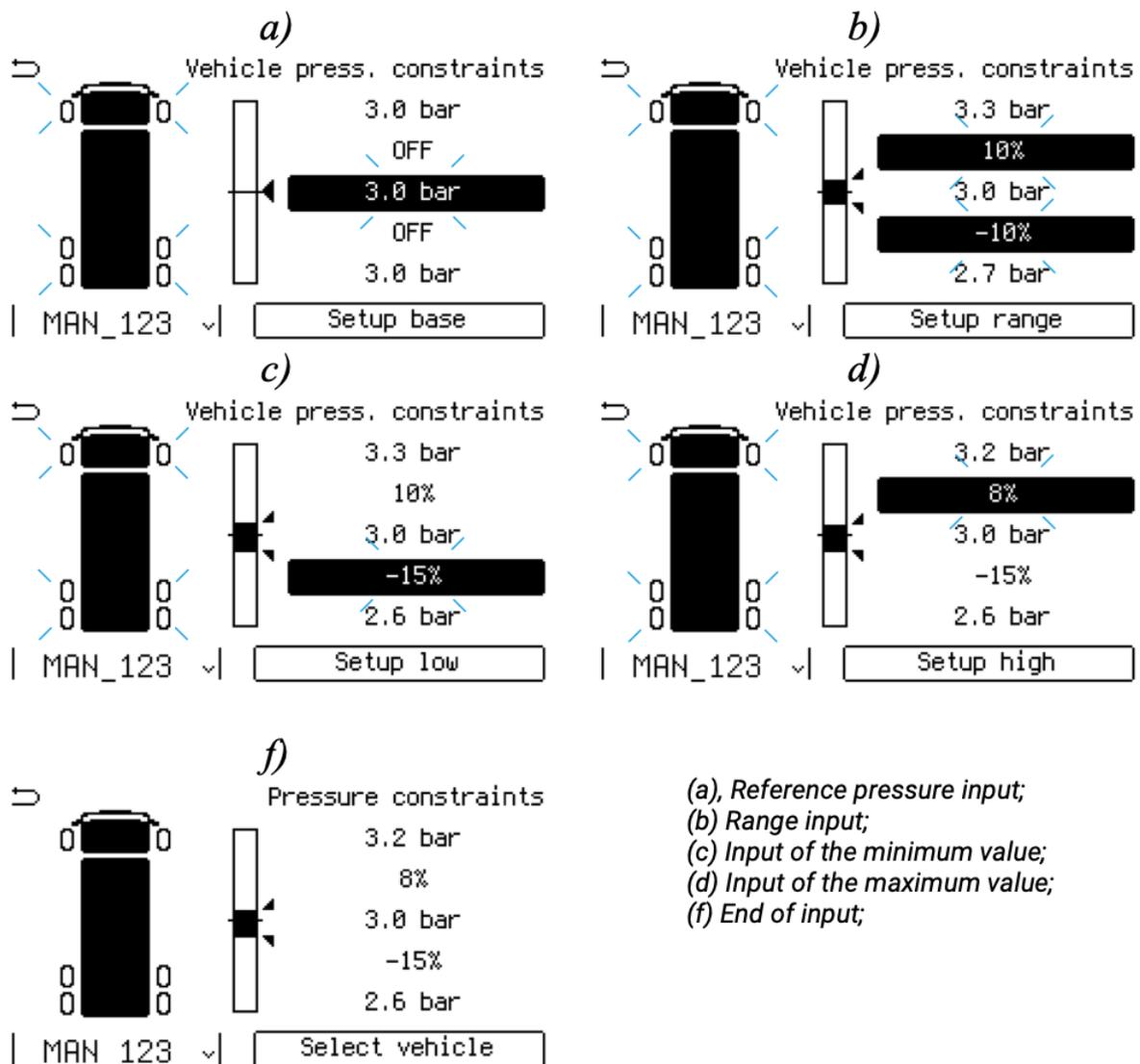


Figure 35: Pressure constraints: `for vehicle` enter mode

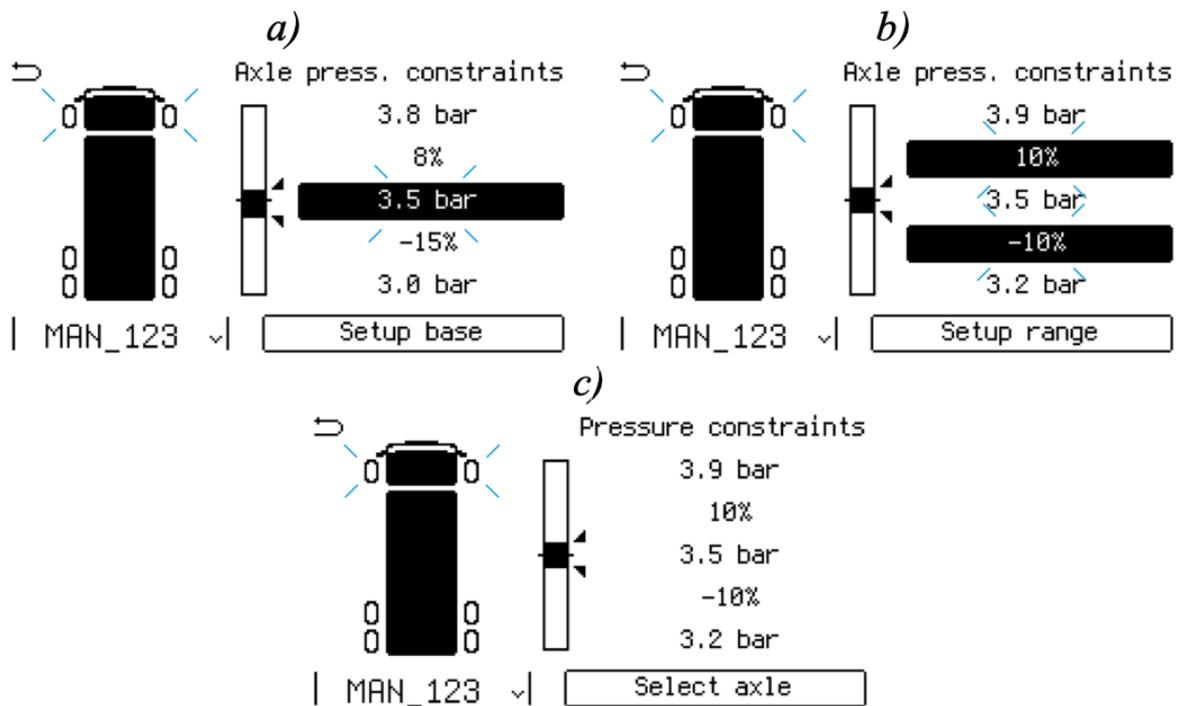
step leaving the value unchanged. Holding down `o` key will close the entry mode.

In the `for vehicle` mode the user can change the pressure settings for all tires of the selected vehicle. All tires will flash in the wheel layout diagram. In the **first step** it is necessary to enter the reference pressure (Fig.35, a). In the **second step** it is possible to enter the maximum and minimum pressure values (Fig.35, b). The extreme pressure value can be set from 0 to 80%, in steps of 1% (setting 0% OFF deactivates the corresponding warning). In the **third step** the value of minimum pressure must be set (Fig.35, c), in the **fourth step** — the value of maximum pressure (Fig.35, d). After making all the changes there is a return to the `Select vehicle` screen, providing the possibility to configure other vehicles (Fig.35, f).

By selecting `for axles` the user can change settings for each of the axles of the vehicle in the same way as described above. All tires of the

active axle for which the setting is being made will flash on the screen. As an example, Fig.36 shows the input screen when the parameters of the first axis are changed. For example, a reference pressure of 3.5 bar was set for it (Fig.36, a) and the pressure range from -10% to +10% (Fig.36, b).

In the `for wheels` mode, the user can change settings for each tire more precisely (see Fig.37). The tire being tuned for flashes on the screen. In this mode, each tire is tuned in turn.



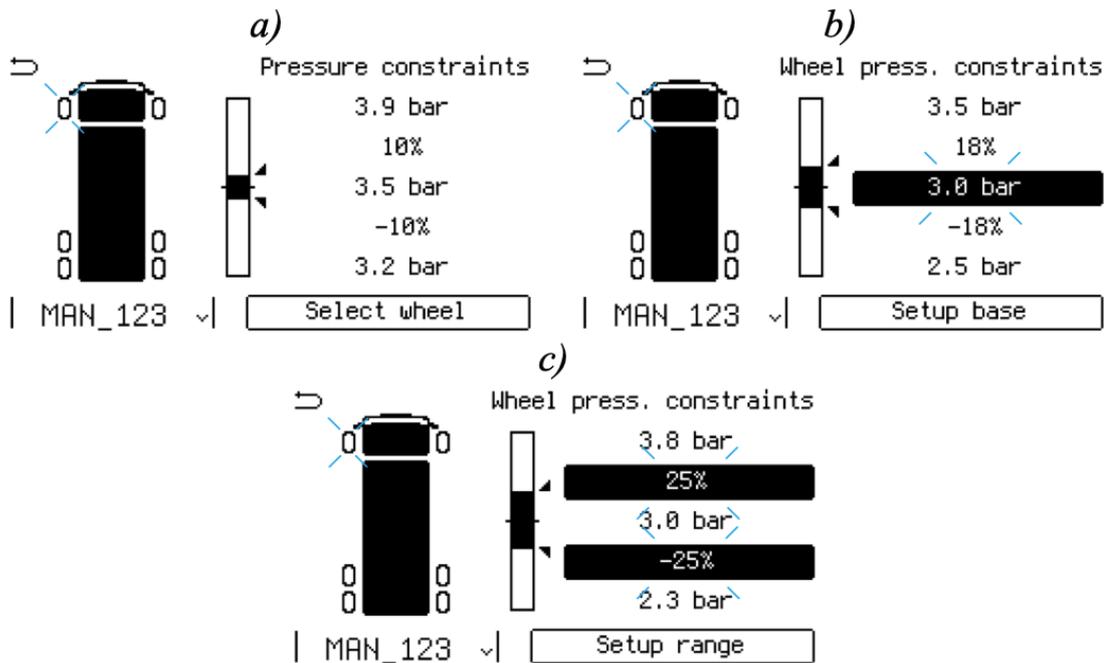
- a) reference pressure input;
- b) range input;
- c) selecting the axle;

Figure 36: Pressure constraints: `for axles` enter mode

1.10.5 Alert settings

The panel can be configured to generate warnings and messages when tire emergencies occur. Warning settings are located in the `Alert settings` section, accessible from the `Vehicle settings` menu. The user can configure the following warnings:

- low pressure;
- high pressure;
- pressure imbalance;



- a) selecting the tire;
- b) reference pressure input;
- c) range input;

Figure 37: Pressure constraints: `for tires` enter mode

- temperature warning;
- leak detection;
- sensor timeout.

If one of the above events occurs, the panel generates a sound alarm with corresponding message screen.

The `Low Pressure` warning in the Pulse Mining panel currently has two settings:

- Alert `Extreme Low Pressure` — the value is set in % of the reference pressure (the Extreme Low Pressure value is set as described in section 1.10.4);
- Warning `Low Pressure` — 5/8 of the `Extremely Low Pressure` setting and can only have two (on/off) values.

To set the warning for **low pressure** use the `Underpressure warning` section from the `Alert settings` menu. At first (Fig. 45, a), the vehicle for which the changes will be made must be selected by pressing $\Delta\nabla$ and confirm the selection by pressing \circ . After that (Fig.38, b) with the keys $\Delta\nabla$

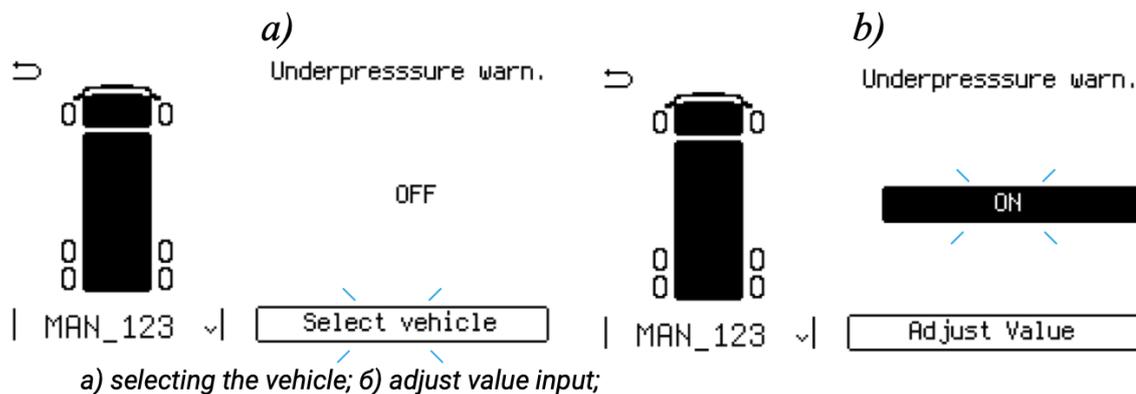


Figure 38: Low pressure alert settings

select the set point value. The setting `Underpressure warning` can only take two values ON and OFF. In case the pressure drops below the allowable pressure, a warning signal will be generated. For example, an extremely low pressure is set to -10%, in which case, if the pressure drops by $\frac{5}{8} \times 10\% = 6.25\%$, a warning alarm will be generated. After entering the setting, the panel takes the user to the first vehicle selection screen, giving the opportunity to make adjustments for other vehicles. The `high pressure` warning setting is made when setting the pressure limit (see section 1.10.4). The `Pressure imbalance`, `Temperature` and `Leak detection` warnings are set in the same way as for the `Underpressure warnings`, using the same items from the `Alert settings` menu.

To control the inter-axle and inter-axle differences, information is taken from sensors whose readings are within the high or low pressure limits. If there is a pressure difference between any two wheels of any axle of the vehicle by % more than that set with the `Pressure imbalance` menu, a pressure imbalance will be diagnosed with a warning signal. In this case, the axle of the vehicle in which the inter-axle imbalance is detected is excluded from the diagnosis of the inter-axle imbalance. In case of a pressure difference between any two axles of the vehicle by % set by the user, the imbalance will also be diagnosed.

To set the temperature warning, select the `Temperature` tab from `Alert settings`.

The specific feature of the input is the setting of numerical values of temperatures in absolute values. The setting is made with the Δ / ∇ keys in steps of 1 °C or 1 °F. This value is used to generate the warning signal `High temperature` with the temperature indication. The limit value for the temperature of the air in the tires is defined by the manufacturer. As a rule, this value ranges from 90 to 100 °C. A temperature value exceeding 100-120 °C considered as dangerous. Note that since the sensor is installed

outside the tire, the value should be set in the range of 70...80 °C. Also consider that an adequate tire temperature can be determined at low speed or when the vehicle is stopped, because at high speed the sensor is being cooled by the air flow.

The **Leak detection** tab of the **Alert settings** is used to set the **leak warning**. This alarm can only be set to **ON** or **OFF**. Leak detection is the drop in tire pressure over a period of time and is defined as the ratio of the pressure drop to the allowable time interval. This parameter is set in the panel firmware and cannot be adjusted by the user.

Sensor timeout is the time of "silence" of radio sensors, above which the message about absence of the sensor and loss of communication with it appears. If the system works correctly, the maximum time value does not exceed 5 minutes.

To set the sensor timeout, go to the **Sensors timeout** tab in the **Alert settings** section. On the **Sensors timeout** screen (Fig.39), use the keys Δ / ∇ to select the desired value and confirm the changes by pressing the key \circ .

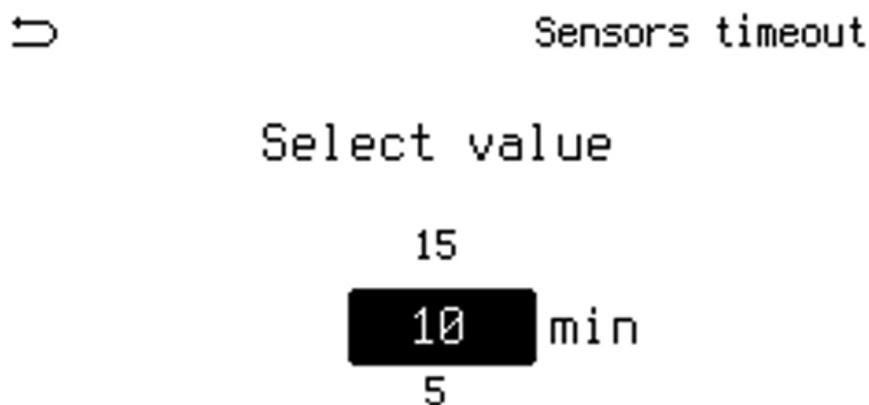


Figure 39: Sensors timeout setting screen

This setting applies to all vehicles registered in the system. If there is no information from any sensor for a period of time exceeding the set value, the panel will display a warning message. It is recommended to set the timeout value in the range of 10...15 minutes.

1.11 Configuring sensors

The `Sensors` menu is used to configure the pressure sensors. The menu includes the following:

- Adding sensors to the wheel layout diagram;
- Deleting sensors from the wheel layout diagram;
- Deleting all sensors from the wheel layout diagram;
- Showing the status and diagnostic info of sensors.

1.11.1 Adding sensors

To use pressure sensors, it is necessary to add and attach them to the wheel layout diagram of the vehicle. Before adding sensors, the settings described in section 1.10 must be made. To add sensors, select the `Add sensor` tab from the `Sensors` menu. A screen like the one shown in Fig.40.

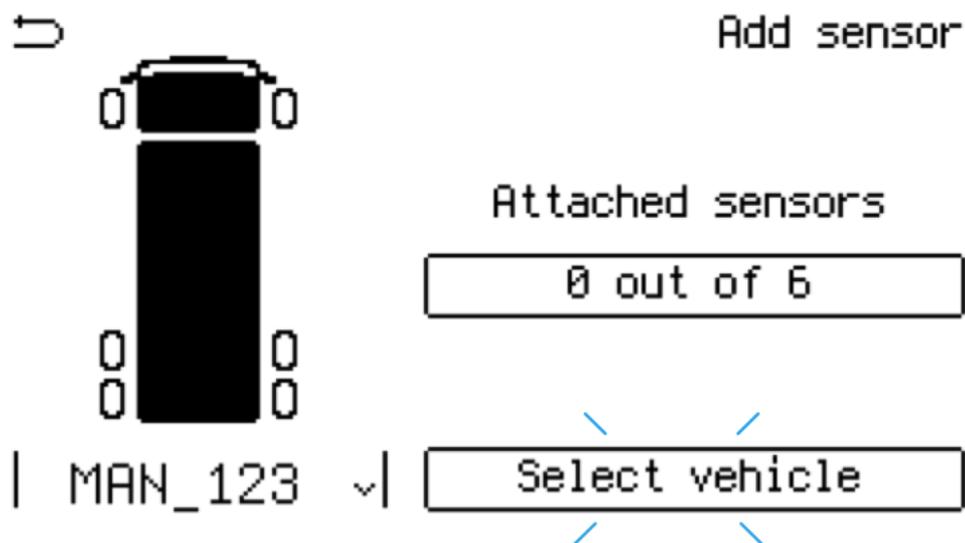


Figure 40: Adding sensors to the layout

The number of sensors attached to the given vehicle can be seen in the field `Attached sensors` `X out of Y`, where X is the number of sensors attached, Y is the number of sensors available for connection. Use the Δ / ∇ keys to select the vehicle (for example, named `MAN_123`, as in Fig.40) in which the sensors will be added to the wheel diagram, and press \circ to confirm. Then use Δ / ∇ to select the position in the wheel layout diagram (see fig.41) for the sensor to be connected (the selected tire flashes in the diagram) and

use the `o` key to confirm the selection. If no sensors are currently assigned to the selected tire, `Position is empty` will be displayed.

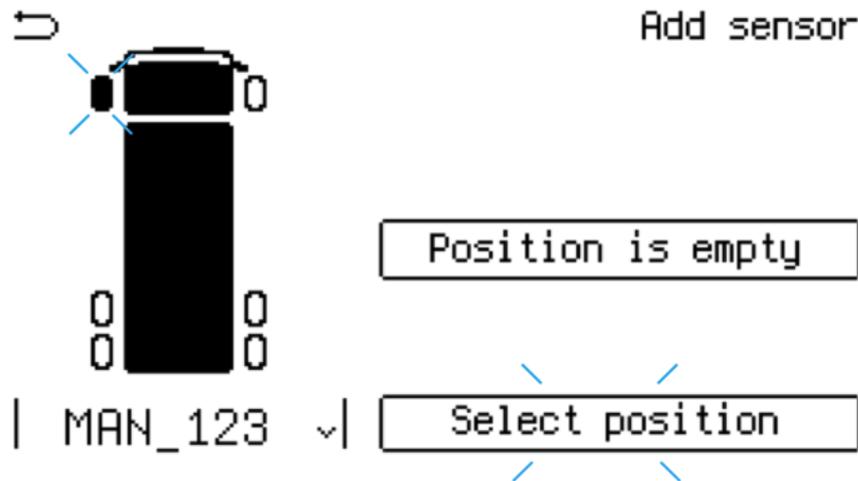


Figure 41: Selecting the sensor position

On the screen that appears, use the keys `△▽` to select the method of adding a sensor `Select add method` (see Fig.42), and by pressing the key `o` go to add a sensor to the diagram. The following methods of adding are available:

1. `Search for new air` — searching for new installed sensors;
2. `Enter ID manually` — enter the six-digit serial number of the sensor manually;
3. `Select from list` — select a sensor from the list of active sensors.

To find recently installed sensors, select `Search for new air`. While searching for new sensors, a moving "o" symbol will appear on the screen (see Fig.43). The sensor must be placed on the valve as it is shown on fig.44 at the selected position according to the wheel diagram, then wait until the sensor is detected (up to 60 seconds).

When the panel detects a sensor, its ID will appear on the screen (for example, the sensor with serial number ABC000 was detected in Fig.45). Confirm by pressing the key `o` and move to the next wheel. Pressing the key `MENU` puts the panel back into the sensor waiting mode, where it will remain until the next signal from the installed sensor is received. The process of adding other sensors is the same. Press `MENU` to exit this mode.



Figure 42: Sensor adding methods

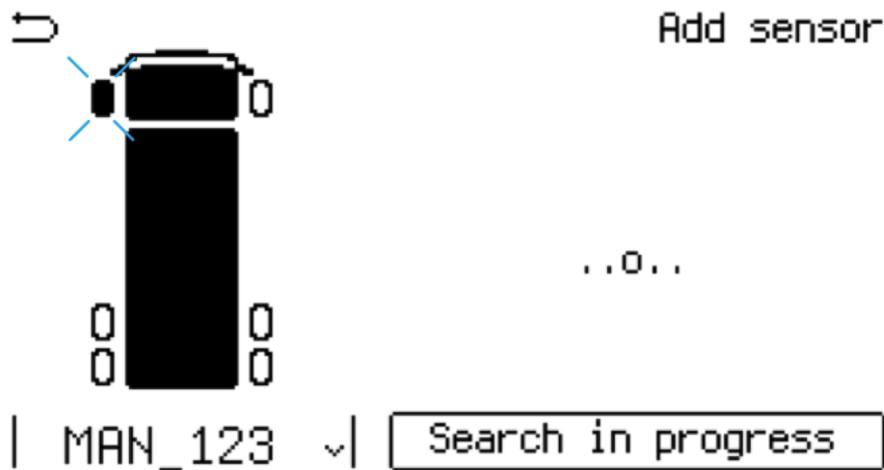


Figure 43: Detecting the installed sensor

In the **Enter ID manually** method of adding, the menu for entering the sensor ID will be displayed (see Fig.46). Enter the ID shown on the side of the sensor housing.

In the **Select from list** method of adding, the panel will display a list of sensors from which the panel has received information for the last 10 minutes.

Each entry in the list contains:



Figure 44: Installing the sensor on the tire valve

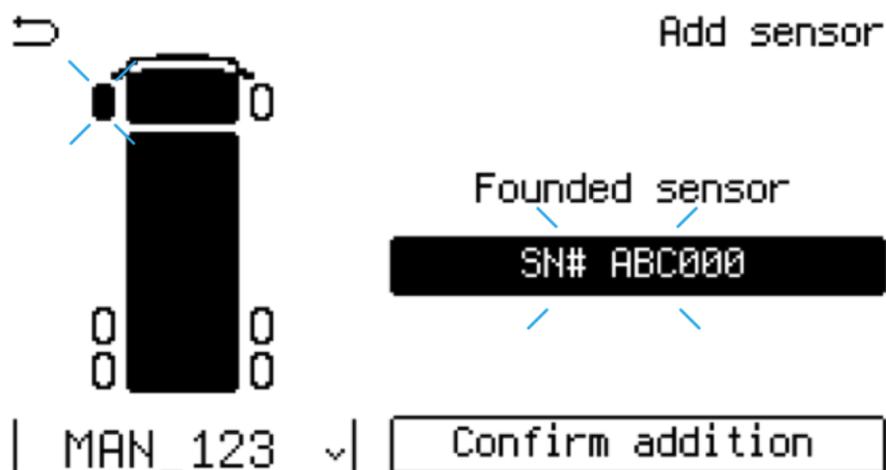


Figure 45: Screen showing that sensor ABC000 has been found

- The number of the entry in the list;
- Serial number of the active sensor;
- Value of pressure and signal level received from the sensor during the last data exchange;
- The time elapsed since the last communication with the sensor (in minutes);

Use the keys Δ ∇ to select the sensor from the list (by its ID, pressure or signal level) and press \circ to confirm the selection.

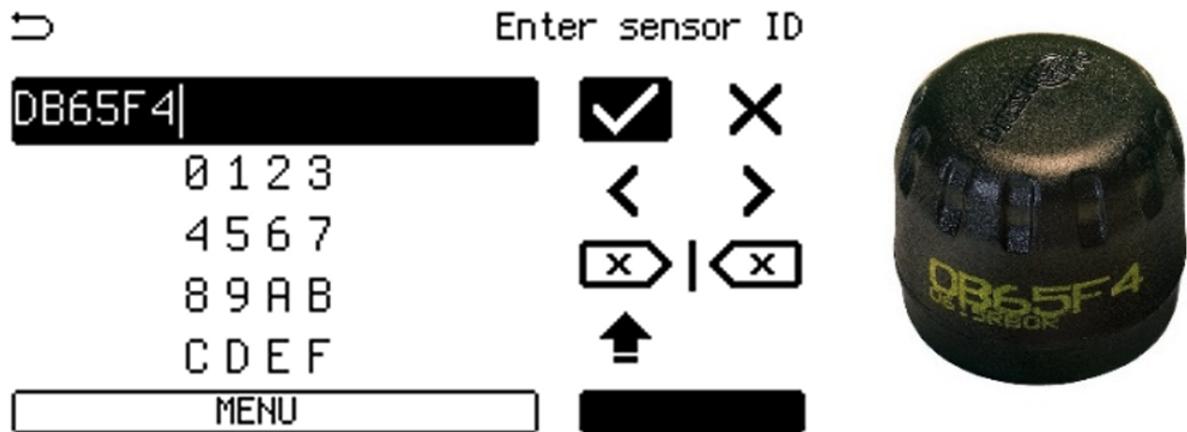


Figure 46: Entering sensor ID manually

Note: At the stage of selection of the sensor position in the wheel diagram, a situation when the sensor is already fixed at this position in the panel may occur. In this case, in the information field of the wheel layout diagram the message `Change sensor SN#SENSORID ?` will be displayed, containing the serial number of the attached sensor (for example, in Fig. 57 the sensor with ID=ABC000 is attached behind the left tire of the first axle of MAN_123).

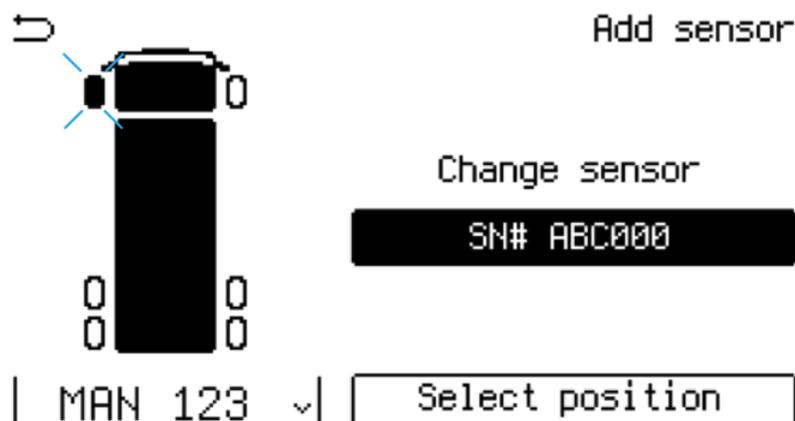


Figure 47: Message on replacing the sensor on the position

Pressing the `o` key will delete the information about the connected sensor at the selected position and the panel will go to the list from which you can select a new sensor to the active position of the wheel diagram. This point

applies to all three sensor input methods.

1.11.2 Deleting sensors

There are two ways to delete connected sensors. The first way is to delete all existing sensors. To do this, select `Delete all sensors` in the `Sensors` menu. On the screen that appears, use the keys Δ / ∇ to select the vehicle (fig.48, a) whose wheel diagram will be reset and press the key \circ . Confirm the deletion of all sensor information of the selected vehicle (fig.48, b) by pressing \circ .

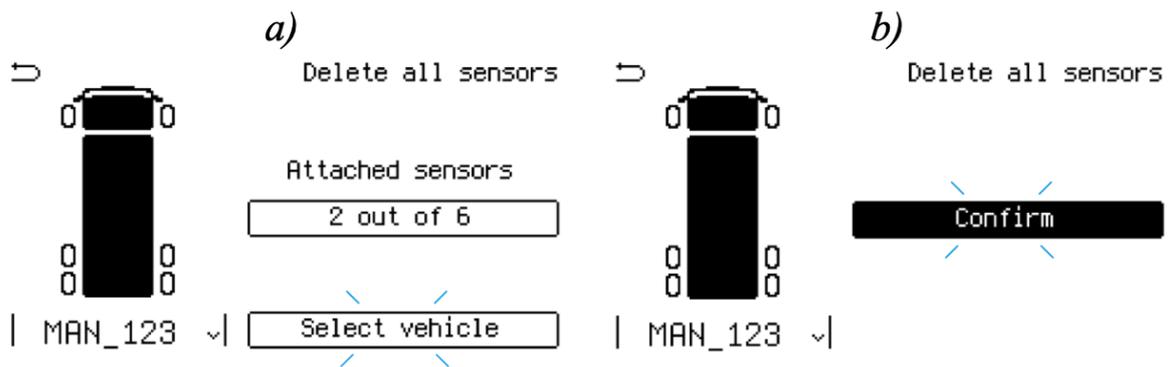


Figure 48: Remove all sensors

The second way is to delete the selected sensors in the wheel diagrams. To do this, select `Delete sensor` in the `Sensors` menu. On the screen that appears, select the vehicle in which you want to delete some sensors in the wheel layout (Fig.49, a), and press the button \circ . The first tire in the wheel circuit with the connected sensor will be highlighted, and the screen will display a warning about deleting the sensor, containing its serial number (see Fig.49, b).

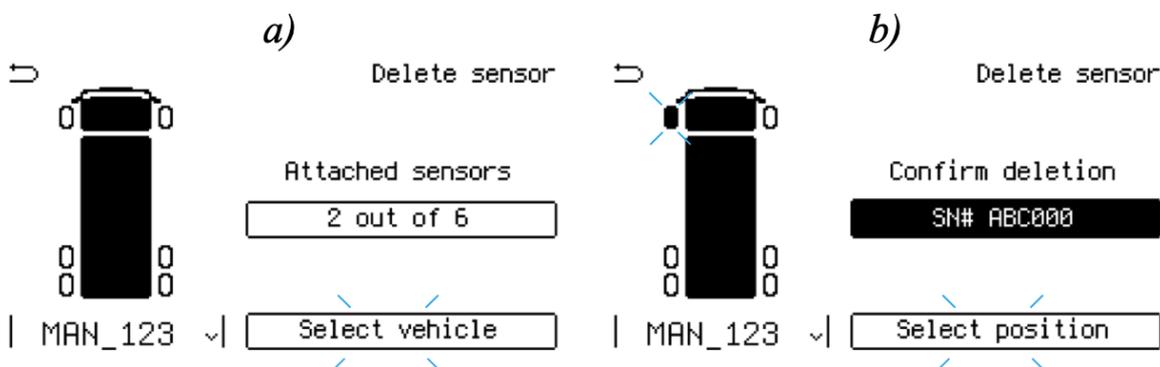


Figure 49: Remove selected sensors

To confirm, press the button \circ . As a result, in the selected position of the wheel diagram the information about the sensor will be deleted and the panel will move to the next sensor in the diagram. To switch between the sensors fixed in the wheel diagram use the keys \triangle ∇ .

1.11.3 Viewing diagnostic information

To view diagnostic information, select the **Diagnostics** tab from the **Sensors** menu. As a result, the screen will appear as shown in Fig.50.

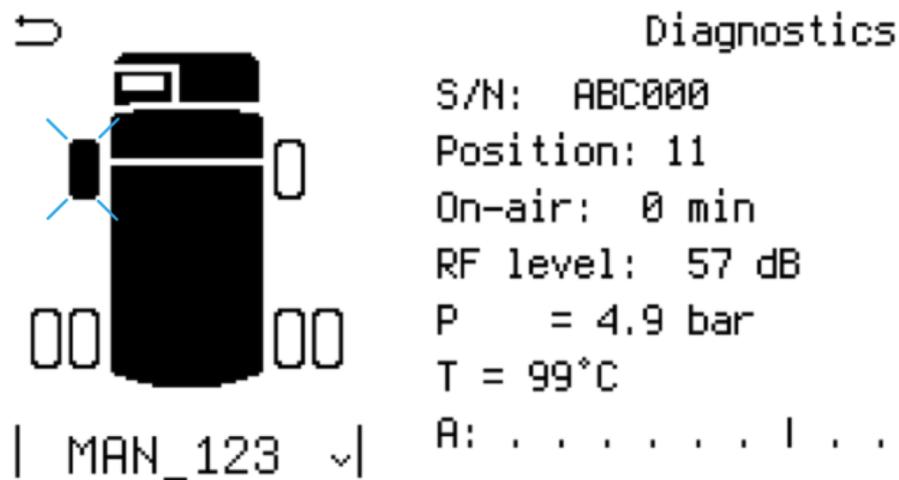


Figure 50: Diagnostic information about the state of sensors

Diagnostic information on the sensor is displayed as a list of parameters. The tire with the sensor, blinks on the screen. The diagnostic information includes (according to Fig. 60 from top to bottom):

- The serial number of the sensor;
- Its position in the XY wheel pattern (where: X — axle number, Y — wheel number in the axle);
- Time elapsed since the last information from the sensor;
- Signal level from the sensor detected by the receiver antenna (takes values from 0 to 100, where 0 — bad signal, 100 — very good signal);
- Pressure value: alternating on the screen — measured by the sensor / reference - P/P_{ref} ;
- Current temperature value measured by the sensor;

- error information.

Switch between the available sensors with the $\Delta\nabla$ keys. To exit the screen, press **MENU**. One way to use the diagnostic information is to choose a right place for the radio antenna (see 1.4.3). When installing the antenna, it is important to estimate the RF level from all sensors, this parameter should not be lower than 12...15 dB.

1.11.4 Displaying the TPMS main operation mode

When the settings are made as described in parts 1.6 — 1.11, the panel is ready to operate as part of the vehicle. The main operating mode of the panel is **Pressure Monitor** mode, where the screen displays the TPMS operating diagram with pressure, tire temperature and emergency state warnings.

The main screen can also display information:

- On the vehicle;
- On axles;
- On tires.

Switching between display modes is done by pressing the key \circ . Fig.51 shows a view of the screen in the mode of displaying information about the vehicle. In this mode, the following blocks are displayed on the screen:

1. Wheel diagram of the selected vehicle (for example, in the figure you can see a diagram of a truck with two axles with six wheels);
2. Selector of the vehicle with the name of the selected one;
3. Values of minimum pressure and temperature among all wheels;
4. Values of maximum pressure and temperature among all wheels.

Press the keys $\Delta\nabla$ to switch between the vehicles displayed on the screen. The screen shown in Fig.52 is used to display information about one of the axes. Fig.52, a shows the state of the first axle while Fig.52, b shows the state of the second one. To the left of the vehicle wheel diagram the pressures and temperatures of the left tires of the selected axle are displayed, to the right of the wheel diagram the pressures and temperatures of the right tires of the selected axle are displayed. Since the first axle has one tire each on the left and right, the screen shows these two values. The second axle has two tires each. The values can also be seen on the screen. The

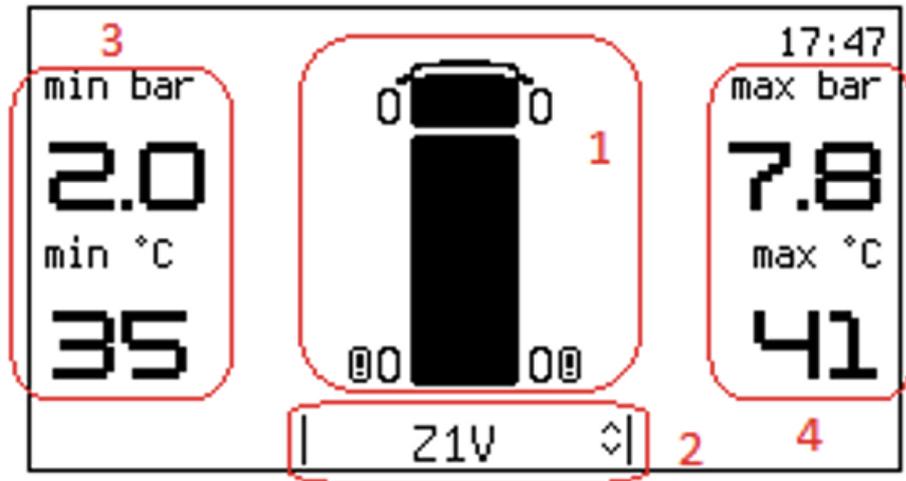


Figure 51: Main screen contents

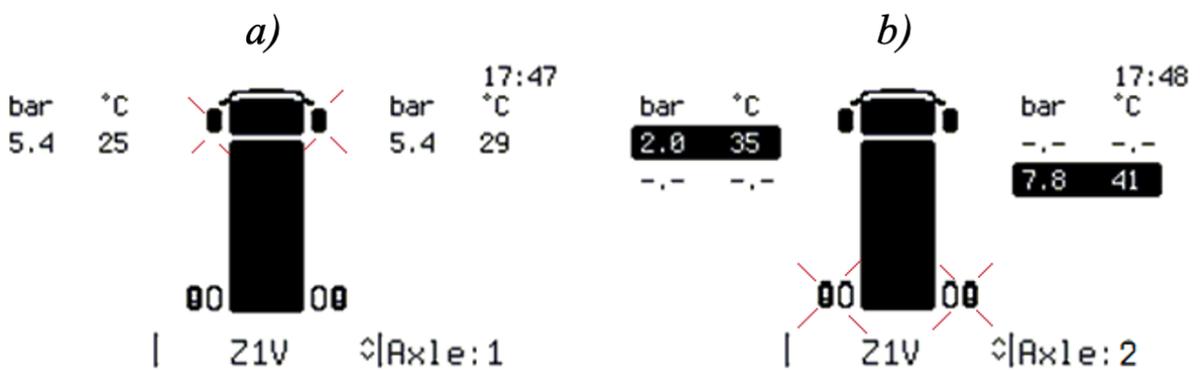


Figure 52: Main screen: axles

values highlighted with a filled rectangle indicate the presence of warnings for this particular tire. At the same time, the tires of the selected axle in the wheel layout diagram are flashing.

The screen shown in Fig.53 is used to display information about all tires of the vehicle. To the left of the wheel diagram the pressures and temperatures of the left tires are displayed, to the right of the wheel diagram the pressures and temperatures of the right tires are displayed. Values highlighted with a filled in rectangle indicate warnings for that tire. The selected wheel on the diagram flashes. At the same time the value of pressure and temperature of the selected wheel, is highlighted by a rectangle. If the selected tire has an active warning, the highlighted pressure and temperature values flash on the screen as well.

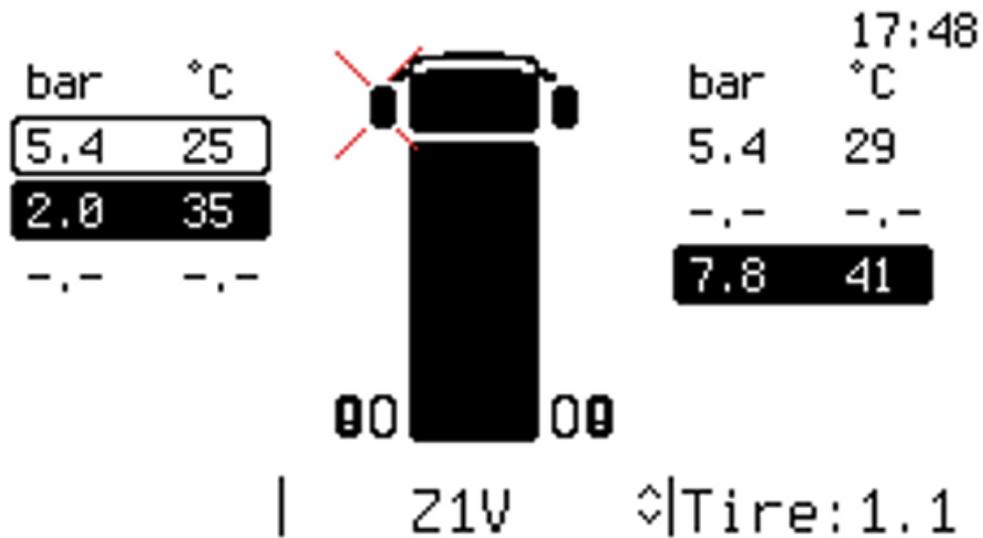


Figure 53: Main screen: tires

1.12 Displaying alerts and warnings

During its operation, TPMS monitors the state of the tires and generates various warnings and alerts. A special panel screen mode is used to display alerts that occur during operation of the system. It is possible to enter this mode from the main screen in one of the following ways:

- Manually by pressing the button .
- Automatically on the occurrence of any alarm or warning signal.

To increase the information value in this mode, the screen displays information only about one of the alerts. An example of the screen in this mode is shown in Fig.54.

This screen displays the following information:

1. The wheel diagram of the vehicle that has the problem tire;
2. icon of an active alert;
3. Description of the failure;
4. Vehicle name installed.

For example, in Fig.54 it can be seen that the first tire of the second axle of "MAZ" vehicle has low Pressure warning. The tire pressure is 2.0 bar, with a base pressure of 5.0 bar set.

Fig.55 illustrates possible tire emergency conditions and warnings being displayed on the panel's screen:

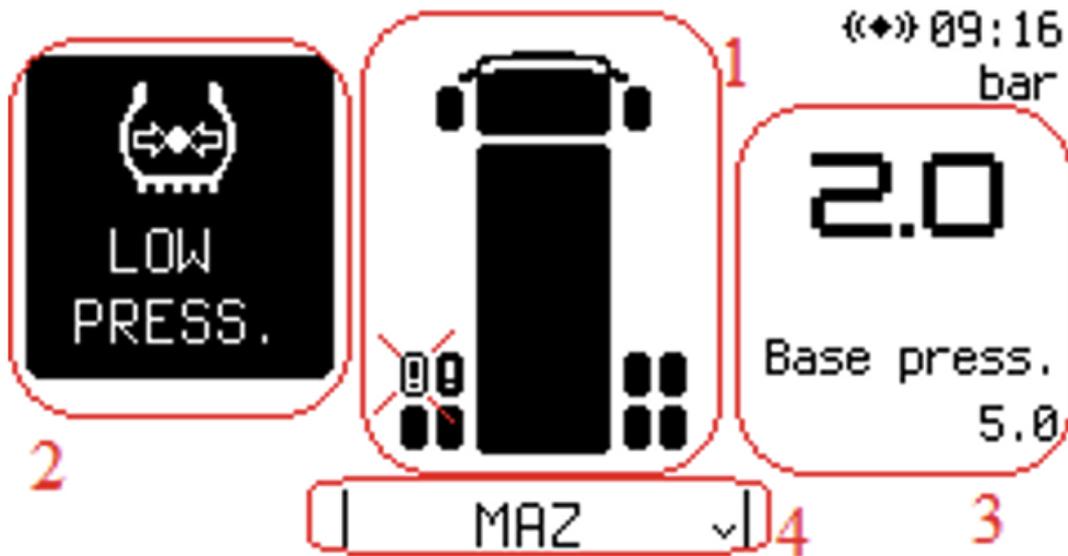


Figure 54: Alert mode screen

- High pressure (7.8 bar with a baseline of 5.0 bar) (a);
- High temperature 91 °C (b);
- Pressure imbalance, tire pressures are within the limits (4.9 and 6.1 bar, respectively) but the pressure difference is higher than the set value (c, d).

If there are no warnings, the screen in this mode will look like in Fig.56.

1.13 System restart

Changes to some parameters (GSM, Wi-Fi) take effect only after restarting the system. To restart the device, hold the  key for at least five seconds, after which the restart screen will appear. Use the   buttons to select Yes and press the  button.

If the user interface does not respond, the device can be restarted by holding down the  key for a long time (at least 10 seconds).

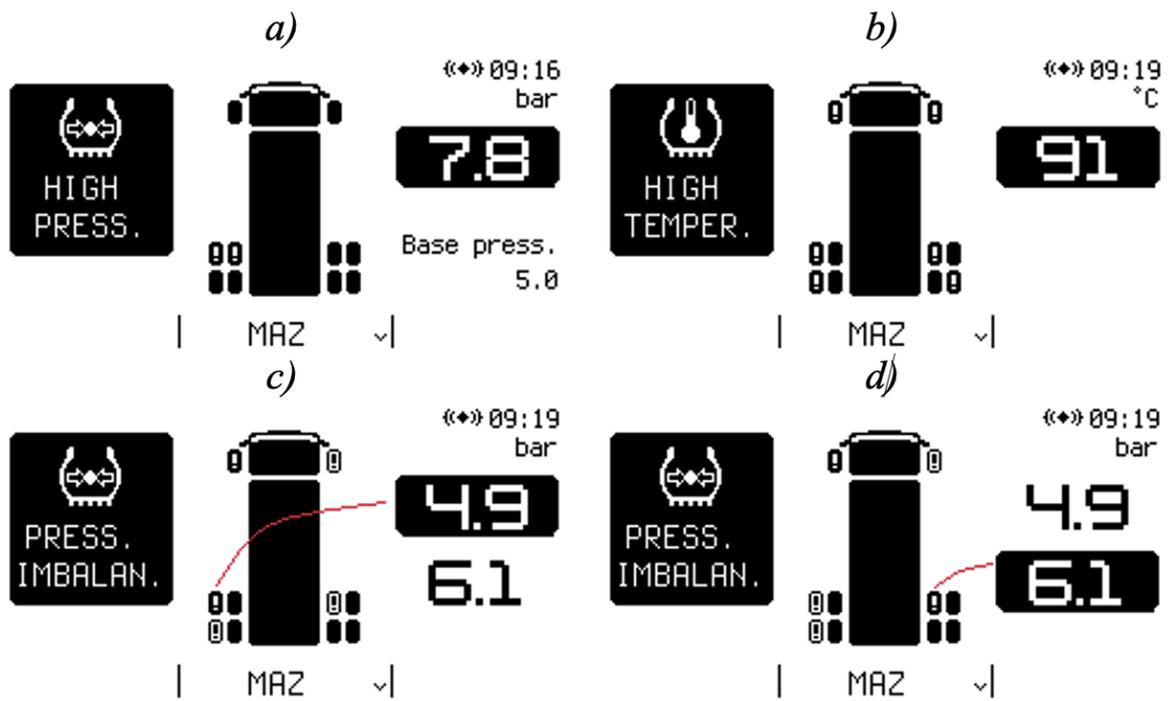


Figure 55: Example of warning screens

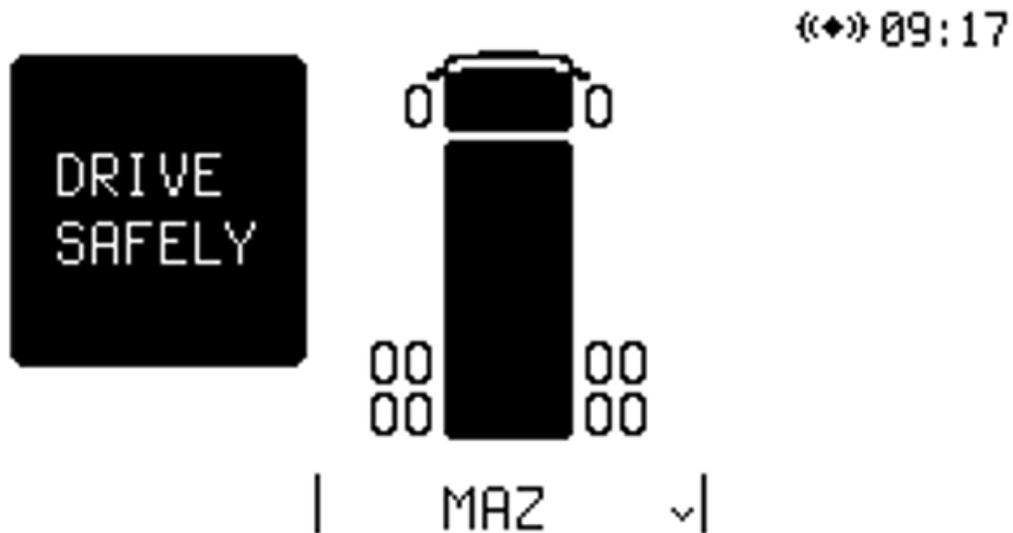


Figure 56: No warnings screen

1.14 Using Wialon

The Pulse Mining panel installed on the vehicle displays data in real time on the display, but can also collect and transmit data on pressures, and tire temperatures via GSM connection to a remote Wialon server. Wi-Fi connection is used to view the stored tire parameters on the built-in flash

drive. The viewing is carried out via a special web-page, using which the selected files can also be transferred to a computer/smartphone.

To activate data transfer to the Wialon server the following settings must be done:

- Configure GSM network;
- Configure the Wialon server;
- Activate Wi-Fi;
- Activate data collection;
- Configure GPS.

1.14.1 Setting up GSM

Before configuring the cellular settings, make sure that the SIM card is installed. The installation procedure is described in section 1.4.2. Select the `Cellular setting` tab from `Communication settings` to set up the cellular network. The `Cellular setting` menu has the following tabs:

- `GSM/SIM information`;
- `Enable GSM`;
- `PIN code`;
- `Data roaming`;
- `Access Point Names`.

The `Enable GSM module` tab is used to enable and disable GSM module. To enable GSM module, select `Enable GSM`. After GSM activation, it is necessary to enter the PIN code, if required by the SIM card. To enter the PIN code, select the `PIN code` tab.

To activate data roaming, the tab `Data roaming` is used. To allow roaming, select `Yes`. Select `No` to disable this feature.

Note! For the use of traffic in roaming, the service provider will require additional payment for communication services!

The `Access Point Names` tab is used to configure the access point. The APN settings include:

- `APN name`;
- `Username`;

- `Enter password`;

`APN name` — allows the cellular data subscriber to access data services. `APN name` can be obtained from the mobile service provider on its website.

To configure the username, select the `Username` tab. This will display an on-screen keyboard, using which you need the username issued by GSM operator. To enter a password, use the `Password` tab. The password also needs to be obtained from the GSM operator. After entering all the settings, be sure to restart the system (see 1.13).

To check the connection, select the `GSM/SIM information` tab from the `Cellular setting` menu. On the screen that appears (example in Fig.57) you will see the information that depends on the GSM status. If registration in the cellular network was successful, the screen displays the name of the operator and the signal strength.

```
GSM/GPRS information
Operator: A1 BY
signal level      ████
Press MENU to exit screen
```

Figure 57: GPRS/GSM information screen

An important parameter is the GSM signal strength. The signal strength allows you to understand how well the GSM antenna is installed. In the area of reliable reception the signal level should be at least 5 bars. If GSM operation is prohibited (the parameter `Enable GSM` is set to OFF in the panel settings), the message `GSM module switched off` is displayed on the screen.

If it is impossible to register in the cellular network, wrong settings are entered or the `GSM module` is faulty, the message `GSM module faulted` is displayed, as well as the error code, which can take values according to Table 6.

Table 6: GSM error codes

Error code	Description
Module error	GSM module fault
Invalid PIN	Wrong PIN code entered
Unspecified APN	APN is not set correctly
Registration error	Failed to register on the cellular network
No SIM	SIM is not installed

1.14.2 Setting up Wialon

Wialon server menu includes panel settings for working with Wialon server and transmitting data about bus status and other parameters of the vehicle. Wialon parameters configuration is performed in `Wialon settings` section, which is available from `Tracker settings` menu.

There are the following tabs:

- `Wialon info` — see the server connection status;
- `IP address` — enter the Wialon server address;
- `Port` — input the server port;
- `Unique ID` — input a unique device ID;
- `KeepAlive period` — setting the period of maintaining connection with the server;
- `Enable` — to enable data transfer to the server.

Select `Wialon information` tab from `Wialon settings` to view the connection status. Server connection status will be displayed on the screen, which includes the following info:

- `Server:`, IP address. For example, `193.193.165.165`;
- `ID` — the unique identifier of the device (object) used for connection in the database of the monitoring server;
- Connection status, possible values are described in Table 7.

In the `Setting up` and `Ready` states, the interface (Wi-Fi or GSM), through which the connection to the server is made, is additionally indicated in parentheses. For example, `Ready (GSM)`. In the `Fault` state, the error type is additionally displayed, possible error codes are listed in table 8.

Table 7: GSM error codes

Error code	Description
Waiting link	Waiting for a TCP connection to the server
Setting up	Waiting for authorization after a TCP connection is established
Ready APN	Authorization was successful
Fault	Settings error or malfunction
Switched off	Sending data to the monitoring server is disabled

Table 8: Server connection error codes

Error code	Description
Server error	The monitoring server returned an error
Server unspecified	Monitoring server IP address not set
No login	A unique ID is not set

Table 9: Server error additional codes

Error code	Description
Unknown ID	ID is incorrect
Password	Wrong password inserted
no reg	Failed to register a data message
CRC	CRC check error

In the case of the `Server error`, the information that was returned by the server is additionally displayed. Possible options are listed in Table 9.

If a server error is logged, the panel disconnects from the server and stops trying to connect until the parameters are changed or restarted.

1.14.3 Setting up Wi-Fi connection

The Wi-Fi settings are made in the `WiFi settings` section, available from the `Communication settings` menu.

The `WiFi settings` menu has the following tabs:

- `Wi-Fi information`;
- `SoftAP settings` — Wi-Fi settings in access point mode. The mode is used to access the web-interface of the panel, and only one device (a laptop or smartphone) can be connected;
- `Station settings` — Wi-Fi settings in station mode which is used to connect to the monitoring server, but also possible to access the web interface.

To view the Wi-Fi information, select the `WiFi information` tab. In this menu the following information is available:

- `Module status`;
- `Access point status`;
- `Station status`.

`Module status` shows whether the device is ready or not for Wi-Fi. The following values are available:

- `Init` — module initialization;
- `Ready` — ready for work;
- `Module not found` — Module not detected;
- `Module error` — Wi-Fi module failure;
- `Unknown error`.

`Access point status` includes the following values:

- `Init` — initializing the device to work via Wi-Fi;

- `Ready` — ready for work;
- `Off` — the access point is disabled;
- `No SSID` — SSID is not set;
- `No password` — no password set while the encryption is enabled;
- `Short password` — password is less than 8 characters;
- `Invalid channel` — wrong channel is set;
- `Invalid IP` — no IP is set.

`Station status` section includes the following values:

- `Init` — device initialization;
- `Connected` — there is a connection to the network, but the DHCP server has not given an IP address yet;
- `Connection error` — connection error, most likely due to an incorrect password inserted;
- `Search` — searching for networks;
- `Off` — Option is disabled;
- `No SSID` — SSID is not set;

Setting up Wi-Fi in AP mode

In AP mode, it is possible to connect with any Wi-Fi enabled device to the panel. To configure this mode, use the `Soft AP settings` tab, available in the `WiFi settings` menu

The `Soft AP settings` tab options allow to prepare the access point for operation. The following options are available in the `Soft AP settings` menu:

- Allow operation in AP mode;
- SSID entry;
- Wireless channel selection;
- Wi-Fi encryption settings;
- IP address settings;

- MAC address settings;
- Wi-Fi password settings;
- Wi-Fi settings overview;

The activation of the access point is done in the **Enable** tab of the **Soft AP settings**. In the **Enable** menu, select **Yes**.

To enter the name of the access point, use the **Enter name SSID** tab of the **Soft AP settings**. The name is entered by using the on-screen keyboard (see section 1.7). Any sequence of characters can be used, limited to the number of characters when entering from the on-screen keyboard.

The wireless channel is selected in the **Enter channel** tab of the **Soft AP settings**. Available channels: from 1 to 13. It is important to note that if there are a lot of devices, their work on same channel will have a negative effect on the network bandwidth.

Wi-Fi encryption is set in the **WiFi encryption** tab. Select the encryption with the \triangle / ∇ keys. The following values are available:

- None (no encryption);
- WPA-PSK;
- WPA2-PSK;
- WPA-PSK/WPA2-PSK.

Encryption is selected according to the characteristics of the devices to be paired with. If any of the encryption methods is selected, a password is required. The recommended encryption type is WPA2-PSK.

Enter the IP address of the access point in **Enter IP** under **Soft AP settings**. You can change the MAC address, if necessary, in the **MAC-address** tab of the **Soft AP settings** menu.

The password is set in the **Set/change password** tab of the **Soft AP settings** menu. The password must contain at least 8 characters. After entering all the Wi-Fi access point parameters, they can be viewed in the **View settings** tab.

Setting up Wi-Fi in station mode

In station mode, the panel connects to the Wi-Fi network. The **Station settings** tab of the **WiFi settings** menu is used to configure the panel in station mode. The Station settings menu is shown in Fig.58.

Station settings

view settings

Enable

Enter name (SSID)

select SSID from list

MAC-address

set/change password

Figure 58: Wi-Fi station settings

The settings in `Station settings` allow to prepare the Wi-Fi station for operation. The following options are available in the `Station settings` menu:

- Allow operation in station mode;
- SSID entry;
- SSID selection from list;
- MAC address settings;
- Wi-Fi password settings;
- Wi-Fi settings overview;

The station mode is activated in the `Enable` tab of the `Station settings`. In the `Enable` menu, select `Yes`. The SSID name can be selected from the list or entered manually. Manual entry of SSID name is necessary in the case when you connect to the hidden network, and it is not possible to select it from the list. Manual entry of SSID is done in `Enter name SSID` tab of `Station settings` menu. If the name has uppercase and lowercase letters, then it must be entered case-sensitive.

It is possible to connect to a network by selecting it from the list of detected networks. To do this, use the tab `Select SSID from list` from

`Station settings`. A list of networks will appear, and you have to select the network you want to connect to.

MAC-address is entered in the tab `MAC-address` from the menu `Station settings`.

To set the password in station mode, select the tab `Set/change password` from `Station settings`. The password is entered using the on-screen keyboard. After setting all the parameters in the `View settings` tab of `Station settings`, you can view the network settings.

1.14.4 Data capture settings

The tracker data saving options are configured in the `Data capture` item of the `Tracker settings` menu. The following options are available:

- `Capture period` — the period of data recording in minutes, if the value `0` is set, the periodic recording is disabled;
- `Capture by events` — allows recording data by events (occurrence or change of warnings).

1.14.5 GPS status

The panel includes GPS receiver and transmits data about the position of the vehicle to the server. The tab `GPS status` allows to determine the GPS status. Using this tab, provided the GPS antenna is correctly connected to the panel (see section 1.4.3), a screen with the following parameters will be displayed:

- Satellites — e.g. 11 - (number of defined satellites);
- Longitude — e.g. 30.332588°;
- Latitude — e.g. 53.858829°;
- HDOP — horizontal deviation, e.g. 0.93.

For normal operation of GPS — the number of detected satellites must be at least 4. In case the satellites are not found, the following will be displayed: `GPS state: search` (see Fig.59).

GPS status
GPS state: search

Press MENU to exit screen

Figure 59: Wi-Fi station settings

1.15 Web-interface access

1.15.1 General information

The web-interface of the panel is designed to monitor and control the device with a laptop or smartphone, to update the firmware of the device, as well as to view the system event log and monitoring log. To access the web-interface it is required to connect to the panel via Wi-Fi (the panel must be configured to work as an access point, refer to page 57) by the IP address set in the menu `Enter IP`.

1.15.2 Firmware update

The firmware update is performed on the tab `Firmware`. It is necessary to press the `Select File` button, in the window that appears select the bin-file with the new firmware version, and then the process of its downloading to the device begins. Please wait for the pop-up notification that the file has been downloaded successfully, and then the device will restart automatically.

If an error message appeared, or if there is no message about successful downloading for a long time (more than 2 minutes), the device must be restarted (see section 1.13).

Note. When uploading the file, the initial file integrity check is performed and if the file is damaged or is not a valid firmware file, the error message `CRC32 error` will appear.

1.15.3 System tray icons

The system tray is an area at the bottom of the main screen that displays icons that inform you about the status of the device. Possible icons with descriptions are shown in Table 10.

Table 10: Tray icons description

Icon	Description
GSM	
	GSM is on, signal strength
	GSM fault
GPS	
	GPS is on, satellites found
Wialon	
	Wialon server is connected
	Wialon settings are incorrect
	Wialon server is connected but the data tracking is off
Wi-Fi	
	Wi-Fi AP is on
	Wi-Fi AP settings are incorrect
	Wi-Fi station mode: searching for network
	Wi-Fi connection is established
	Wi-Fi station mode: settings are incorrect
Other	
	Hardware fault
	File system / storage fault
	System restart required

2 Troubleshooting

Table 11: Troubleshooting

Item	Signs of malfunction	Possible causes of malfunction
1	The display does not light up when the power is turned on	The cable or power connector is damaged. Replace the cable or contact the service center.
2	There are vertical or horizontal lines on the panel screen	Display malfunction. Contact the service center.
3	Unable to add or remove sensors	Antenna or antenna cable fault. Radio-module fault. Contact the service center.
4	GPS: unable to find satellites	GPS antenna or module fault. Contact the service center.
5	No response when panel keys are pressed	System freeze: try to restart the panel. Keys are defective: contact the service center.

3 Maintenance

There are no special maintenance operations for the display panel. When a malfunction is detected, follow the recommendations given in Section 2. If they are not successful, this is a reason to send the panel in for repair.

4 Storage

The product should be stored in storage condition 2 (C) according to GOST 15150-69.

Storage of products in the same room with acids, reagents, and other chemically active substances that can affect them, is not allowed.

5 Transportation

Indication panels in original manufacturer's package can be delivered by any kind of transport in accordance with protection against atmospheric precipitations according to storage condition 2 (C) GOST 15150-69, by transportation condition depending on mechanical factors influence according to C category of GOST 23216-78 and according to the rules effective for

the corresponding type of transport. Unpacking of products in winter time is made in heated rooms, in which the temperature is set according to storage conditions with keeping in it for 6 hours.

6 Package

Indication panels must be packaged one by one. Indication panel and all accompanying documentation must be placed in the package of category KU-1 according to GOST 23216. Type of transport packaging with the type of inner packaging must comply with GOST 23216-78. Transport packaging must be made of corrugated cardboard of T15 grade according to GOST 7376-89

Change registration sheet