MasterCAN Tool

CAN BUS IMITATOR/ANALYSER

MasterCAN Tool Lite

MasterCAN Tool Pro

OPERATION MANUAL

Version 3.0
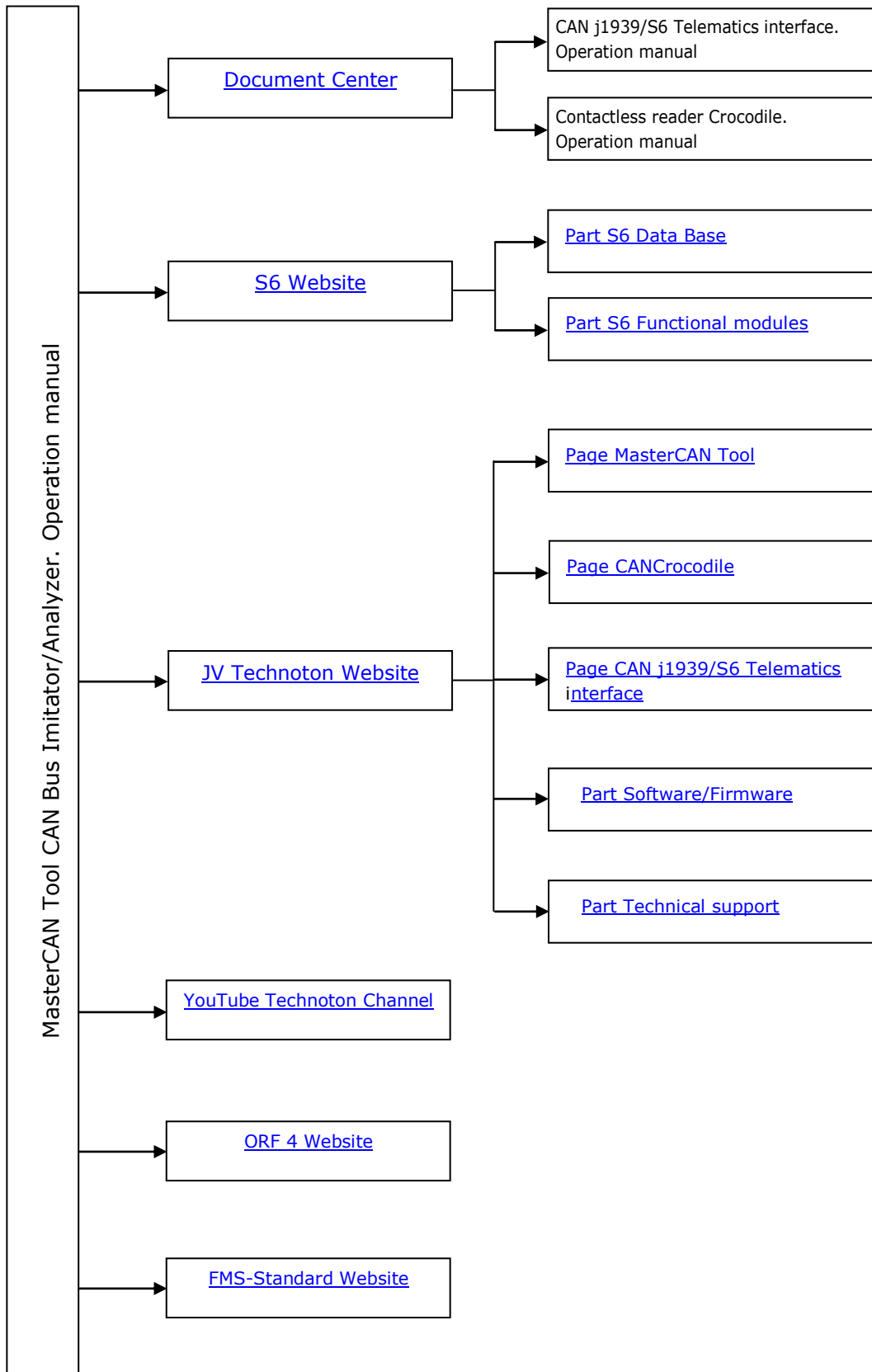
S6

TECHNOTON

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Revision history

Version	Date	Editor	Description of changes
1.0	02.2013	OD	Basic version.
2.0	03.2015	OD	• Description of MasterCAN Tool Pro and MasterCAN Tool Lite models. • The procedure for installation and use of MasterCAN Tool version 3.2 software.
3.0	03.2018	OD	**1)** Modification of design and changes in the supplied accessories kit. **2)** Advantages of MasterCAN Tool Version 4.0 software: • adjustable CAN bus Bitrate; • CAN bus load indicator; • option of enabling the inbuilt CAN bus terminal resistor using software; • option of changing the ID length 11 bit/29 bit during modeling PGN raw data; • maintaining the data log of CAN bus, with saving it in the log file. **3)** The Manual terminology updated; **4)** The structure of external links added.

Structure of external links

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                                          ┌──────────────────────────────────┐
                                          │ CAN j1939/S6 Telematics interface.│
                                     ┌───▶│ Operation manual                  │
                                     │    └──────────────────────────────────┘
              ┌─────────────────┐    │    ┌──────────────────────────────────┐
         ┌──▶│ Document Center  │────┤    │ Contactless reader Crocodile.     │
         │   └─────────────────┘    └───▶│ Operation manual                  │
         │                               └──────────────────────────────────┘
         │                               ┌──────────────────────────────────┐
         │                          ┌───▶│ Part S6 Data Base                 │
         │   ┌─────────────────┐    │    └──────────────────────────────────┘
         ├──▶│ S6 Website      │────┤    ┌──────────────────────────────────┐
         │   └─────────────────┘    └───▶│ Part S6 Functional modules        │
         │                               └──────────────────────────────────┘
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         │                          ├───▶│ Page CANCrocodile                 │
         │                          │    └──────────────────────────────────┘
         │   ┌─────────────────┐    │    ┌──────────────────────────────────┐
         ├──▶│ JV Technoton    │────┼───▶│ Page CAN j1939/S6 Telematics      │
         │   │ Website         │    │    │ interface                         │
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         ├──▶│ YouTube Technoton Channel│
         │   └────────────────────────┘
         │   ┌─────────────────┐
         ├──▶│ ORF 4 Website   │
         │   └─────────────────┘
         │   ┌─────────────────────┐
         └──▶│ FMS-Standard Website│
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MasterCAN Tool CAN Bus Imitator/Analyzer. Operation manual

Terms and Definitions

S6 — Technology of combining smart sensors and other IoT devices within one wire network for monitoring of complex stationary and mobile objects: vehicles, locomotives, smart homes, technological equipment etc. The technology is based and expands SAE J1939 automotive standards.

Information on cabling system, service adapter and S6 software refer to CAN j1939/S6 Operation manual.

CAN (Controller Area Network) — serial digital bus-type communication interface to comply with ISO 11898-1:2003 International Standard.

Different high-level protocols can be used in the CAN bus to transmit data: J1939, CANopen, DeviceNet, CAN Kingdom etc.

CAN bus is designed to unite various electronic executive units and sensors in the automobile industry or industrial automation systems.

At present, the employment of CAN vehicle bus to receive data on the Vehicle in GPS/GLONASS vehicle monitoring systems is of major interest.

FMS — Data packets of onboard vehicle data buses which comply with the document "FMS-Standard Interface description" (FMS-Standard). FMS-Standard is the open standard of the FMS interface designed by the world leading truck producers.

A detailed description of FMS messages is contained in the document "FMS-Standard Interface description" (FMS-Standard). The current version of the document can be downloaded at the developing company site http://www.fms-standard.com.

OBD-II (On-board diagnostics) — the international standard of vehicle on-board diagnostics. CAN and K-Line buses are used in the OBD-II to transmit data. Depending on the vehicle manufacturer OBD-II employs protocols ISO 9141-2, ISO 14230 KWP 2000, SAE J1850 VPW/PWM, ISO 15765-4 CAN.

OBD-II Standard provides access to parameters and codes of malfunctions of engine and transmission control systems, enables to monitor the onboard computer data and carry out diagnostics of the Vehicle onboard set of electronic control modules.

PGN (Parameter Group Number) — Is a combined group of S6 parameters, which has common name and number. Functional modules (FM) of the Unit can have input/output PGNs and setup PGNs.

SPN (Suspect Parameter Number) — Informational unit of S6. Each SPN has determined name, number, extension, data type and numerical value. The following types of SPN exist: Parameters, Counters, Events. SPN can have a qualifier which allows qualification of parameter's value (e.g. – Onboard power supply limit/Minimum).

Onboard equipment (OE) — Telematics system elements, directly installed in Vehicle.

CAN j1939/S6 Telematic interface is an interface designed by Technoton on the basis of CAN (SAE J1939). CAN j1939/S6 Telematic interface is a hardware/software set designed to collect and integrate data from standard and additional Vehicle Onboard Equipment into the Telematic System while receiving data from one or several CAN buses; also to configure and provide power supply for telematic sensors.

Please, see animated video to get the idea of CAN j1939/S6 interface advantages compared to the traditional telematic architecture.

The architecture of CAN j1939/S6 Telematic interface is built on the basis of the unified cable system, physical interfaces and protocols:

- CAN 2.0B physical interface is used to transmit data;

- Data exchange via CAN bus is determined by the Data Link layer of the protocol, in accordance with SAE J1939/21 Standard;

- Parameters, structure and contents of data are determined by the application level of the protocol, in accordance with SAE J1939/71 protocol and S6 Database.

Telematics terminal (Tracking device) is a unit of Telematics System used for reading the signals of Vehicle standard and additional sensors, getting location data and transmitting the data to the Server.

Telematics system — complex solution for vehicle monitoring in real time and trip analysis. The main monitored characteristics of the vehicle: Route, Fuel consumption, Working time, technical integrity, Safety. In includes On-board report, Communication channels, Telematics service ORF 4.

Vehicle an object controlled within Telematic system. Usually Vehicle means a truck, tractor or bus, sometimes a locomotive or river boat. From Telematic system point of view, stationary objects are also considered to be Vehicles: diesel gensets, stationary tanks, boilers/burners.

Function module (FM) unit-embedded component of hardware and software combination, executing a group of special functions. Uses input/output PGNs and settings PGNs.

Unit is an element of vehicle on-board equipment compatible with S6 bus, which uses S6 Technology.

Introduction

Recommendations and rules set forth in the Operation Manual are applied to MasterCAN Tool CAN bus Imitator/Analyzer (further on — MasterCAN Tool).

This document contains information regarding MasterCAN Tool designation, design, functional performance, specifications, as well as recommendations on MasterCAN Tool connection and use. Besides, this document includes the description of MasterCAN Tool software (versions from 4.0 and higher).

MasterCAN Tool **— is a powerful hardware/software tool for professionals in the area of design and servicing of** Onboard equipment **and software of vehicle** Telematic systems**.**

MasterCAN Tool key features:

- Data monitoring (PGN) in the CAN Vehicle bus according to SAE J1939 protocol detailed by their individual parameters (SPN) which simplifies its analysis;
- Mode of PGN raw data modeling for testing Units using S6 Technology;
- Mode of telematic PGN imitation of S6 Database with an option of SPN editing;
- An option of selection the ID length — 11 bits/29 bits which enables to model PGN raw for CAN 2.0A/CAN 2.0B interfaces;
- Adjustable CAN bitrate in the CAN bus;
- An option to enable the terminal resistor of CAN bus using software;
- CAN bus load indicator allows to analyze the current network traffic, in accordance with CAN SAE J1939 protocol;
- CAN bus data logging with its saving in the file;
- sniffer mode provides for simple and secure connection to the Vehicle CAN bus using CANCrocodile Contactless Reader;
- easy-to-use and user-friendly software interface;
- compliance with Units, Database and cabling system S6 Technology;
- conformity with European and national automotive standards;
- power supply from the PC USB-port or from the Vehicle onboard circuit.

⚠️ **ATTENTION:** It is strongly recommended to follow strictly the instructions of the present Manual when using, mounting or maintaining MasterCAN Tool.

The manual is intended for specialists familiar with the rules for performing repair and assembly works on Vehicles that have professional knowledge of electronic and electrical equipment of Vehicles.

MasterCAN Tool is represented by the following models:

1) MasterCAN Tool Lite — has basic functionality to receive data (PGN) of CAN Vehicle bus (SAE J1939) or using S6 Technology.
2) MasterCAN Tool Pro — has extended functionality to receive/transmit data (PGN) of CAN Vehicle bus (SAE J1939) or using S6 Technology.

The Manufacturer guarantees MasterCAN Tool compliance with the requirements of technical regulations subject to the conditions of storage, transportation and operation set out in this Manual.

> ⚠️ **ATTENTION:** Manufacturer reserves the right to modify MasterCAN Tool specifications that do not lead to a deterioration of the consumer qualities without prior customer notice.

1 General information and technical specifications

1.1 Purpose of use and areas of application

MasterCAN Tool **is designed for** monitoring, emulation*, modeling of data and data analysis ([PGN](#)) of [CAN](#) Vehicle bus (SAE J1939) or [CAN j1939/S6 Telematic interface](#).

Areas of application:

- analysis of data from electronic modules of CAN Vehicle bus (SAE J1939) (see figure 1 a);
- designing, adjustment and testing of telematic equipment using SAE J1939 protocol for data exchange (see figure 1 b);
- monitoring standard and additional [Onboard equipment](#) connected using [S6 Technology](#) (see figure 1 c).
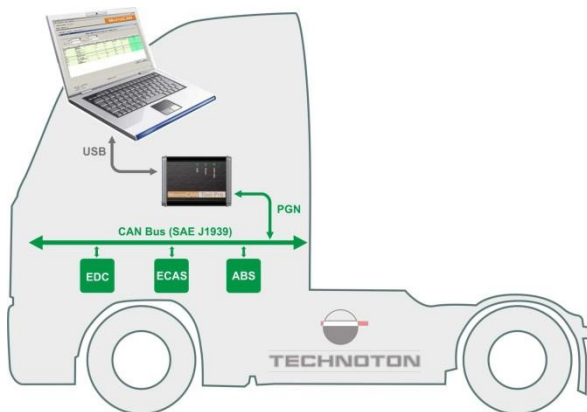
a) analysis of data from devices connected to CAN Vehicle bus
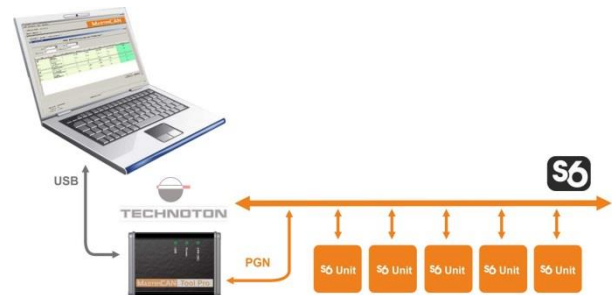
b) development and testing equipment which employs SAE J1939 Protocol
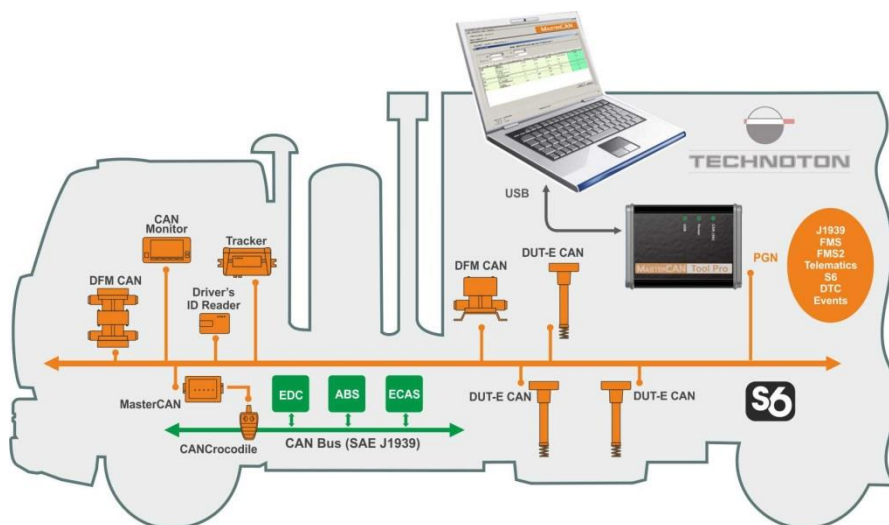
c) monitoring the equipment operation and maintenance using S6 Technology

Figure 1 — Areas of MasterCAN Tool application

* This feature is implemented only in MasterCAN Tool Pro.

1.2 Functional Features

MasterCAN Tool supports data exchange between the personal computer (further on PC) and CAN Vehicle bus (SAE J1939) or Units connected using S6 Technology.

To employ MasterCAN Tool, you need to download the special MasterCAN Tool software (further on Software) and install it on the PC.

The functionality of MasterCAN Tool hardware/software set is listed in table 1.

Table 1 — Functionality of MasterCAN Tool

Functional Features	MasterCAN Tool Lite	MasterCAN Tool Pro
Reception of PGN from CAN bus (SAE J1939) or using S6 Technology and their display as detailed SPN.	+	+
Modeling PGN raw data with parameters set by the user (test messages).	+	+
Emulation of individual PGN with SPN that can be edited or creation of PGN groups and their transmission to CAN bus (SAE J1939) or using S6 Technology.	-	+
Saving/opening for editing the file of the created PGN groups and test messages.	*	+
Data entry/opening the data log (log file) for the analysis of data received from CAN bus (SAE J1939) or using S6 Technology.	+	+
Update of the inbuilt software (firmware update) of MasterCAN Tool Adapter.	+	+
Adjustable CAN bitrate (SAE J1939) or using S6 Technology.	+	+
Enabling CAN bus terminal resistor with software.	+	+
Selection of ID length 11 bit/29 bit in the mode of PGN raw data modeling.	+	+
Indicator of CAN bus current load.	+	+
* MasterCAN Tool Lite has a feature of saving/opening only for test messages.		

1.3 Delivery set

1	MasterCAN Tool Adapter	– 1 pc.;
2	Specification	– 1 pc.;
3	MasterCAN Tool J1939 cable	– 1 pc.;
4	MasterCAN Tool OBD2 cable	– 1 pc.;
5	MasterCAN Tool CW cable	– 1 pc.;
6	S6 2-1 Mol power T-connector with power wire	– 1 pc.;
7	S6 Mol Plug	– 1 pc.;
8	USB A-B cable	– 1 pc.;
9	Contactless reader CANCrocodile	– 1 pc.

Figure 2 — MasterCAN Tool delivery set

1.4 MasterCAN Tool Adapter

1.4.1 Purpose, external view and design

MasterCAN Tool Adapter (further on — Adapter) is designed to exchange data between the PC and CAN Bus or CAN j1939/S6 Telematic interface (see figure 3).

1 – casing with the hardware module inside;

2 – **USB** connector to connect to the PC;

3 – **S6** connector (CAN j1939/S6 digital interface) to connect to the CAN Vehicle bus or using S6 Technology;

4 – green/red **USB** LED indicator for control of data exchange via USB interface;

5 – green/red **Power** LED indicator for control of power supply;

6 – green/red **CAN (S6)** LED indicator for control of access to CAN bus or CAN j1939/S6 Telematic interface.

Figure 3 —MasterCAN Tool external view and design
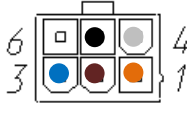
1.4.2 CAN j1939/S6 digital interface characteristics

Specifications of CAN j1939/S6 digital interface of MasterCAN Tool Adapter correspond to S6 Technology. The data exchange protocol is built on the basis of SAE J1939 Standard and complies with its requirements. MasterCAN Tool may operate with any PGN of S6 Database.

The adapter parameters configuration via CAN j1939/S6 interface (see 2.5), the selection of the required operation mode (see 3.1) and data processing are carried out using MasterCAN Tool software. The current software version can be loaded at https://www.jv-technoton.com/, section Service Software.

The Adapter connection to the Vehicle CAN bus or using S6 Technology is carried out in accordance with the designation of contacts of **S6** connector (see table 3).

Table 2 — Designation of contacts of S6 connector

Connector Pinout	Connector Contact Number	Wire		Signal	
		Marking	**Color**	**Designation**	**Parameters**
	1	VBAT	Orange	Power "+"	Analog, voltage 9…45 V
	2	GND	Brown	Ground "-"	—
	3	CANH	Blue	CAN HIGH	Digital, SAE J1939 Standard
	4	CANL	White	CAN LOW	
	5	KLIN	Black	K-Line	Digital, ISO 14230 Standard

1.4.3 LED-indicators' signal description

Table 3 – Indications of the Adapter LED indicators

LED Indicator		Signal description
Marking	**Status and lght color**	
CAN (S6)	████████████ (green solid)	Access to CAN bus or CAN j1939/S6 Telematic interface is available
	██ ██ ██ (red blinking)	No access to CAN bus or CAN j1939/S6 Telematic interface
	No signal	Disconnection of CAN bus or CAN j1939/S6 Telematic interface
Power	████████████ (green solid)	Power supply from USB is on
	██ ██ ██ (green blinking)	Power supply from onboard circuit is on; USB interface is off
	No signal	Power supply is off or the voltage value is below the minimally allowed
USB	████████████ (green solid)	Data exchange via USB interface is in progress
	██ ██ ██ (red blinking)	No data exchange via USB interface
	No signal	USB interface is off

1.4.4 Main specifications

Table 4 — MasterCAN Tool main exploitation specifications

Parameter, measuring unit	Value
Communication interface with the Vehicle CAN bus or CAN j1939/S6 Telematic interface	CAN j1939/S6 (CAN 2.0B (SAE J1939))
Communication interface with PC	USB
CAN bitrate, kbit/s	100/125/250/500/1000
Nominal supply voltage, V	12/24
Power supply voltage range, V	9…45
Current consumption at nominal supply voltage 12 V/24 V, mA, not more than	200/100
Operating ambient temperature, °C	-10…+60
Ingress protection rating	IP40
Weight, kg, not more	0.3
Overall dimensions, mm, not more	see figure 4

1.4.5 Overall dimensions
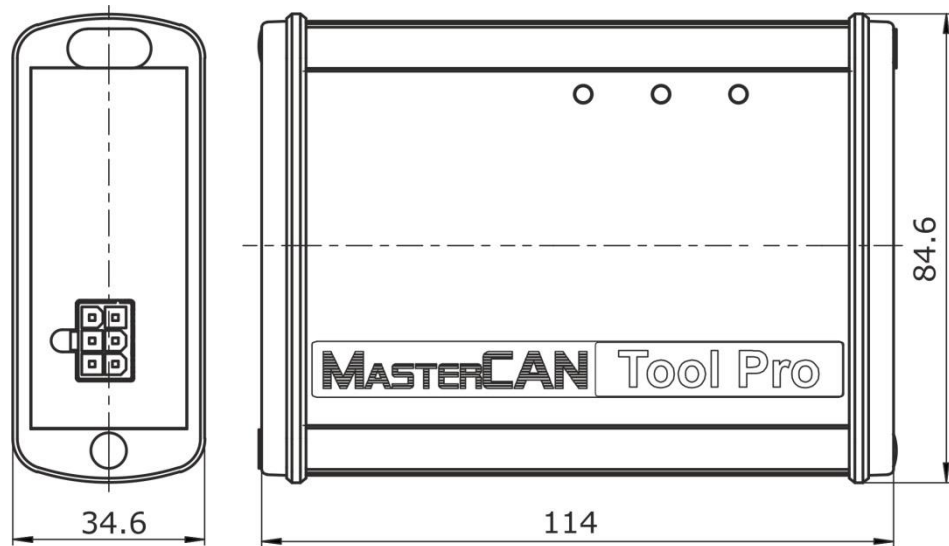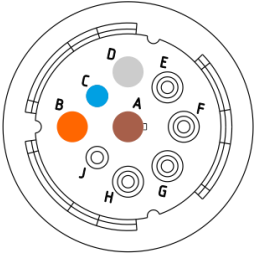
Figure 4 — MasterCAN Tool Adapter overall dimensions

1.5 Cables

1.5.1 MasterCAN Tool J1939 cable

MasterCAN Tool J1939 cable is designed to connect the Adapter to the Vehicle CAN bus and the onboard circuit power supply through the diagnostics connector Deutsch J1939 9 pin.
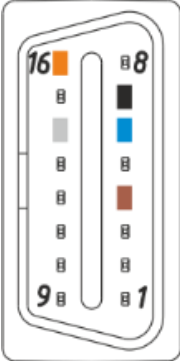
Table 5 — Specifications of connectors of MasterCAN Tool J1939 cable

Connector Pinout	Connector Contact Number	Wire		Signal	
		Marking	Color	Designation	Parameters
Connector A: to connect to the Vehicle connector Deutsch J1939 9 pin Connector B: to connect to S6 connector of the Adapter	B (for connector A) 1 (for connector B)	VBAT	Orange	Power "+"	Analog, voltage 9…45 V
	A (for connector A) 2 (for connector B)	GND	Brown	Ground "-"	—
	C (for connector A) 3 (for connector B)	CANH	Blue	CAN HIGH	Digital, SAE J1939 Standard
	D (for connector A) 4 (for connector B)	CANL	White	CAN LOW	

1.5.2 MasterCAN Tool OBD2 cable

MasterCAN Tool OBD2 cable is designed to connect the Adapter to the Vehicle CAN bus and the onboard circuit power supply through the diagnostics connector OBD-II 16 pin standard.
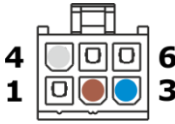
Table 6 — Specifications of connectors of MasterCAN Tool OBD2 cable

Connector Pinout	Connector Contact Number	Wire		Signal	
		Marking	Color	Designation	Parameters
Connector A: to connect to the Vehicle connector OBD-II 16 pin Connector B: to connect to S6 connector of the adapter	16 (for connector A) 1 (for connector B)	VBAT	Orange	Power "+"	Analog, voltage 9…45 V
	4 (for connector A) 2 (for connector B)	GND	Brown	Ground "-"	—
	6 (for connector A) 3 (for connector B)	CANH	Blue	CAN HIGH	Digital, SAE J1939 Standard
	14 (for connector A) 4 (for connector B)	CANL	White	CAN LOW	
	7 (for connector A) 5 (for connector B)	KLIN	Black	K-Line	Digital, ISO 14230 Standard

1.5.3 MasterCAN Tool CW cable

MasterCAN Tool CW cable is designed to connect the Adapter to the Vehicle CAN bus.
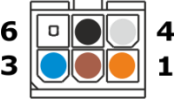
Table 7 — Specifications of connectors of MasterCAN Tool CW cable

Connector Pinout	Connector Contact Number	Wire		Signal	
		Marking	**Color**	**Designation**	**Parameters**
	2	GND	Brown	Ground "-"	—
	3	CANH	Blue	CAN HIGH	Digital, SAE J1939 Standard
	4	CANL	White	CAN LOW	

1.5.4 S6 2-1 Mol power T-connector with power wire

T-connector with power wire S6 2-1 Mol power is designed to connect the Adapter to the Vehicle CAN bus using CANCrocodile and to connect additional power supply from the onboard circuit (in case it is needed).

Table 8 — Specifications of connectors of S6 2-1 Mol power T-connector with power wire
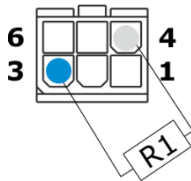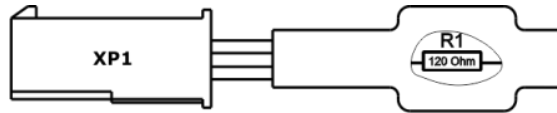
Connector Pinout	Connector Contact Number	Wire		Signal	
		Marking	Color	Designation	Parameters
Connector A: to connect using S6 Technology or to CAN bus using CANCrocodile Connector B: to connect to S6 connector of the adapter Connector C: spare one	1	VBAT	Orange	Power "+"	Analog, voltage 9…45 V
	2	GND	Brown	Ground "-"	—
	3	CANH	Blue	CAN HIGH	Digital, SAE J1939 Standard
	4	CANL	White	CAN LOW	
	5	KLIN	Black	K-Line	Digital, ISO 14230 Standard

1.5.5 S6 Mol Plug

S6 Mol plug is designed to ensure the correct data transmission to <u>CAN</u> bus using its communication line or using <u>S6 Technology</u>, in accordance with SAE J1939 Standard requirements.

S6 Mol plug is fixed between the ends of CAN HIGH and CAN LOW wires, when the Adapter is connected to a device that does not have the inbuilt terminal resistor.

Table 9 — Specifications of S6 Mol plug

Connector Pinout	Connector Contact Number	Wire		Signal	
		Marking	Color	Designation	Parameters
	3	CANH	Blue	CAN HIGH	Digital, SAE J1939 Standard
	4	CANL	White	CAN LOW	
R1 — inbuilt terminal resistor 120 Ohms. XP1 — connector to connect S6 Mol plug to S6 cable system.					

1.5.6 USB A-B cable

USB A-B cable is designed to connect the Adapter to the PC. The external view of the USB A-B cable connectors is provided in figure 5.

USB A   **USB B**
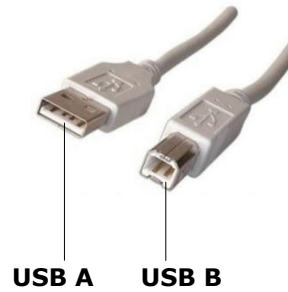
Figure 5 — USB A-B cable connectors

USB A connector is connected to any vacant USB port of PC, while USB B is connected to the USB connector of the Adapter.

2 MasterCAN Tool connecting and configuring

2.1 Hardware requirements

To employ MasterCAN Tool, you need IBM-compatible PC (desktop or notebook) to meet the following requirements:

- CPU — Intel or AMD with a minimum clock speed of 2500 MHz;
- RAM — at least 3 GB;
- USB port;
- screen resolution not less than 800x600;
- operating system (X32/X64) — Windows 7/10;
- special software (USB driver and MasterCAN Tool software) need to be installed on PC.

2.2 Software installation

Before you start using MasterCAN Tool, you need to download and install the following software on the PC:

1) USB driver of the virtual COM-port STM32 Virtual COM Port Drive, which is to be loaded from the developing company site depending on the version of the Windows Operating System and its bitset (x86/x64). In the process of the USB driver installation, please, accept the License Agreement and follow all the instructions of the installer.

Note: To download the USB driver, you need to get registered.

2) MasterCAN Tool Software; its current version can be downloaded at the Technoton website at https://www.jv-technoton.com/ (Software Section).
In the process of the special Software installation you need to follow all the instructions of the installer.

After the successful software installation the PC is ready for work with MasterCAN Tool.

2.3 MasterCAN Tool Connecting

2.3.1 Exterior inspection prior to works start

It is necessary to conduct MasterCAN Tool exterior inspection for the presence of the possible defects arisen during transportation, storage or careless use:

- visible damages of the adapter body;
- connector and insulation damages of cables.

Contact the supplier if any defects detected.

2.3.2 Operation restrictions

During the MasterCAN Tool connection to the Vehicle CAN bus or using S6 Technology you must exclude:

- ingress of fuel and lubricants and moisture to the contact pins of adapter slots or connectors of cables;
- potential damage of the adapter and cables by the rotating and heating elements of the engine.

⚠️ **ATTENTION:** To avoid any MasterCAN Tool failures in communication between PC and the Adapter make sure there are no sources of electromagnetic interference close to the workplace (running electric motors, welding equipment, high-power transformers, power lines, etc.).

2.3.3 Power Supply Connection

Power supply for MasterCAN Tool Adapter is provided from the PC USB port and the Vehicle onboard circuit.

In the majority of cases the Adapter connection to the PC USB port is sufficient to provide power supply for its operation. In rare cases you may need to connect the Adapter through the **USB hub with external power supply**.

In case the Adapter is used as a secondary power source for CANCrocodile, while it gets its power supply from the PC USB port, enable the **External Power Source** setting in the window **CAN Setup** (see 2.5). In all other cases, including the connection of power supply for CANCrocodile from the Vehicle onboard circuit the setting **External Power Source** should be disabled.

In case of MasterCAN Tool connection to Units using S6 Technology the power is supplied to the Adapter through S6 cable system.

In case of MasterCAN Tool connection to CAN Vehicle bus with MasterCAN Tool J1939/MasterCAN Tool OBD2 cables the power is supplied to the Adapter from the Vehicle onboard circuit.

⚠️ **ATENTION:** Before you start connecting MasterCAN Tool to the onboard circuit to provide power supply for it, cut off the Vehicle electric circuits. For this purpose use the accumulator battery switch or disconnect the battery contacts.

Terminals (ordered separately) are recommended for electrical connection to power supply wires (see figure 6).

Figure 6 — Terminals for connecting to power supply wires

2.3.4 Using CANCrocodile to connect to CAN Bus

For quick and secure connection of MasterCAN Tool to cables of the Vehicle CAN bus we recommend to use CANCrocodile Contactless Reader from the supplied accessories kit.
CANCrocodile enables to receive data from CAN bus without breaking the insulation coating of wires and without the electric contact; **it is particularly important, when you perform such operations in vehicles during their warranty period**.

CANCrocodile is connected to **S6** connector of MasterCAN Tool and generates the output signal which coincides in its data contents with data readings from the connected CAN bus.
Detailed information on CANCrocodile and its connection to CAN Vehicle bus is provided in Crocodile Contactless Readers Operation Manual.
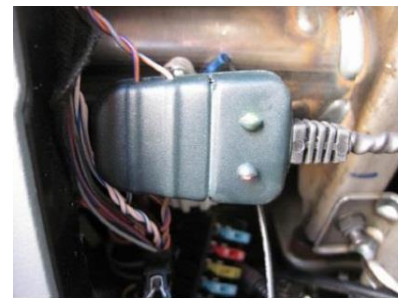
| *a) external view* | *b) connection to onboard CAN bus* |

Figure 7 — CANCrocodile Contactless Reader

ATTENTION: In case of contactless connection of the Adapter to CAN bus with CANCrocodile:
1) The Software may operate only in the **PGN Monitoring** mode.
2) In the window **Dialog** (see 2.5) enable: **External Power Source** (in case of power supply only from the PC USB port) and **Sniffer Mode**.
3) The connection of power supply for CANCrocodile from the Vehicle onboard circuit is allowed using S6 2-1 Mol power T-connector from the supplied accessories kit. In this case disable **External Power Source** in the window **Dialog**.

2.3.5 Connection to CAN Vehicle bus

The most suitable location for the connection of MasterCAN Tool is the driver's cabin. Its connection in other locations is also allowed, if a better access to wires of CAN onboard bus is provided there.

For connecting the Adapter to the wires of CAN bus with MasterCAN Tool CW cable we recommend to purchase and employ **connectors** (see figure 8).

Figure 8 — Connectors for connecting to CAN Bus wires

The Adapter is connected to CAN Vehicle bus with cables from the supplied accessories kit, in accordance with connection diagrams provided in figure 9.

To connect the Adapter, you are to perform the operation in the order outlined below:

1) Connect the Adapter to CAN Vehicle bus using the appropriate method of connection depending on the conditions for the particular Vehicle:

   - CANCrocodile Contactless Reader and S6 2-1 Mol power T-connector for power supply (see figure 9 a);

   - MasterCAN Tool CW cable and connectors (see figure 9 b);

   - MasterCAN Tool OBD2 cable (see figure 9 c);

   - MasterCAN Tool J1939 cable (see figure 9 d).

2) Connect the power supply (see 2.3.3).

3) Connect the Adapter to the PC vacant USB port with the USB A-B cable.

4) Switch on the power supply (Battery).

Note — You can connect the Adapter to the PC USB port both before and after the power supply (Battery) is on and after the software is launched.
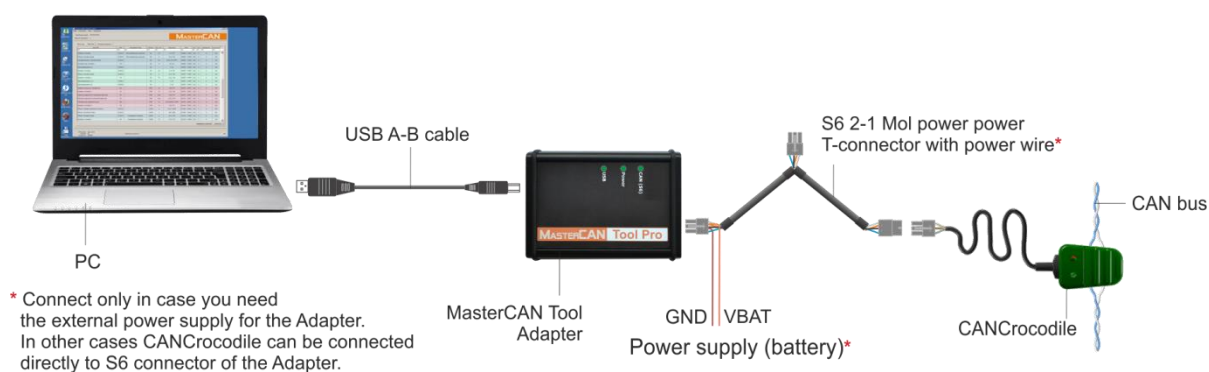
a) contactless connection with CANCrocodile
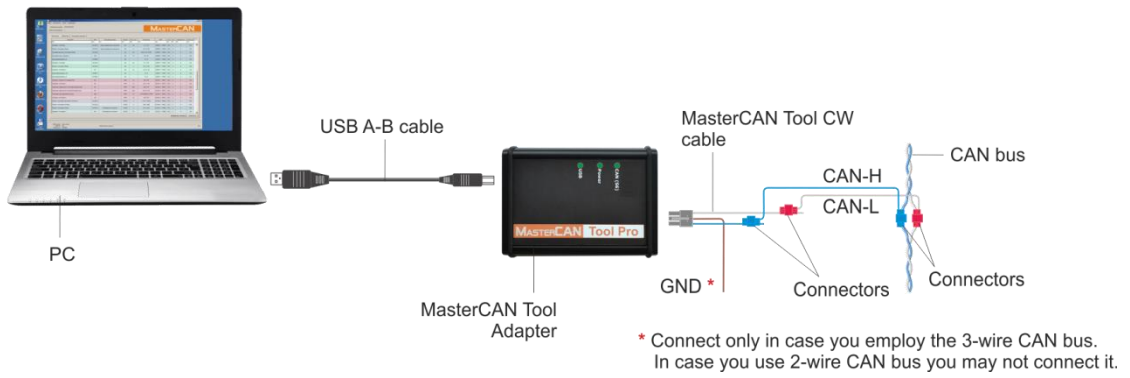
b) contact connection with MasterCAN Tool CW cable
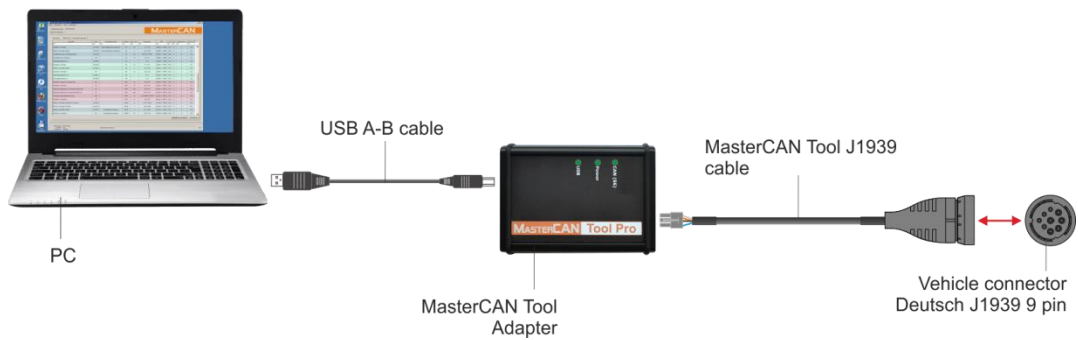
c) contact connection with MasterCAN Tool OBD2 cable
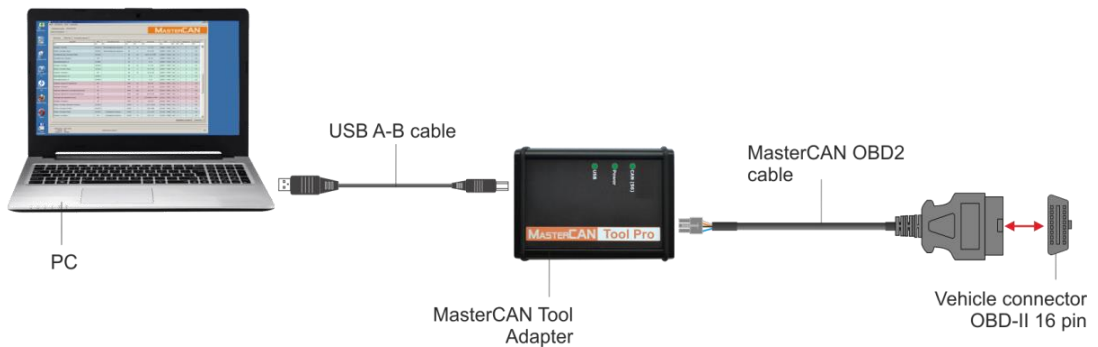
d) contact connection with MasterCAN Tool J1939 cable

Figure 9 — Examples of diagrams of MasterCAN Tool connection to the Vehicle CAN bus

2.3.6 Connection using S6 Technology

The connection of MasterCAN Tool to Units using S6 Technology is carried out according to the connection diagram presented in figure 10.

To connect MasterCAN Tool, you are to perform operations in the following order:

1) Connect **S6** connecter of the Adapter to any vacant input of S6 cable system (see figure 10).
2) Connect the Adapter to the PC vacant USB port with the USB A-B cable.
3) Switch on the power supply (Battery).

Note — You can connect the Adapter to the PC USB port both before and after the power supply (Battery) is on and after the software is launched.
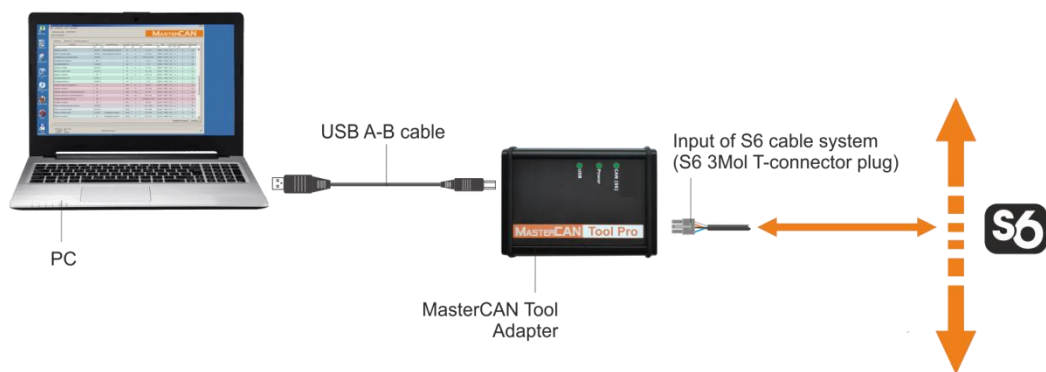
Figure 10 — MasterCAN Tool connection diagram using S6 Technology

2.4 Function check

If the installation of the software and the connection of the MasterCAN Tool have been performed correctly, Windows automatically detects adapter connected to PC's USB port as USB device and enables virtual COM port driver for it. The virtual COM port will be displayed in the list of ports of Windows Device manager (see figure 11).
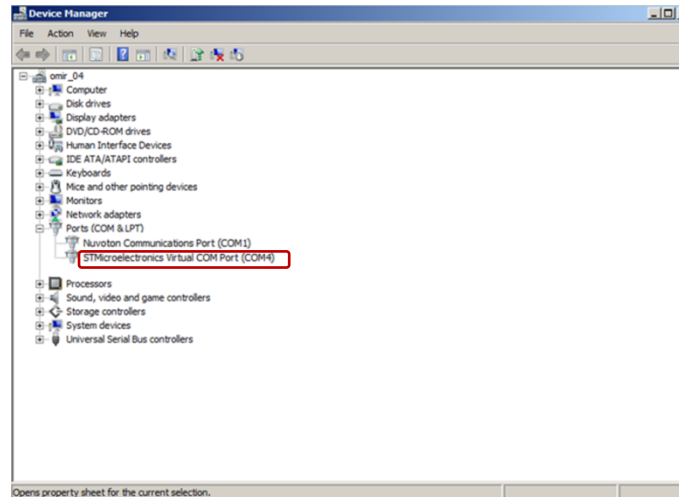
Figure 11 — MasterCAN Tool virtual COM-port in the Device Manager

MasterCAN Tool is ready for operation from the moment the power supply is on (from the Vehicle onboard circuit or from the USB port of PC).

See table 3 for signal description of LED indicators located on the Adapter.

2.5 Starting and preliminary configuration of software

To start MasterCAN Tool software, click on the shortcut ![MasterCAN Tool 2] created on the Windows desktop in the process of the software installation. Before you connect the Adapter, the software interface is inactive except the button to change the interface language (see figure 12). To establish a communication session with the PC, connect the MasterCAN Tool Adapter to the PC USB port.
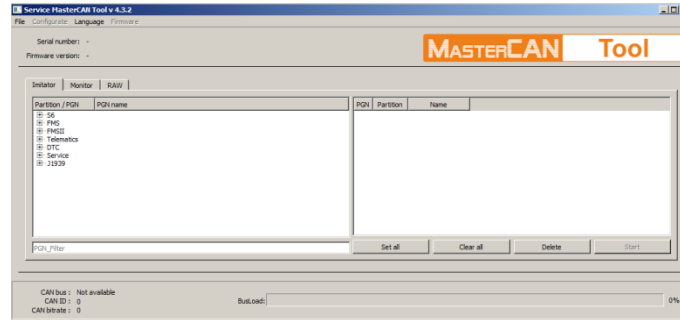
Figure 12 — View of the Software interface in the absence of communication between the Adapter and PC

2...5 s after the Adapter connection to the PC USB port the software interface will automatically activate and assume the active mode view (see figure 13).
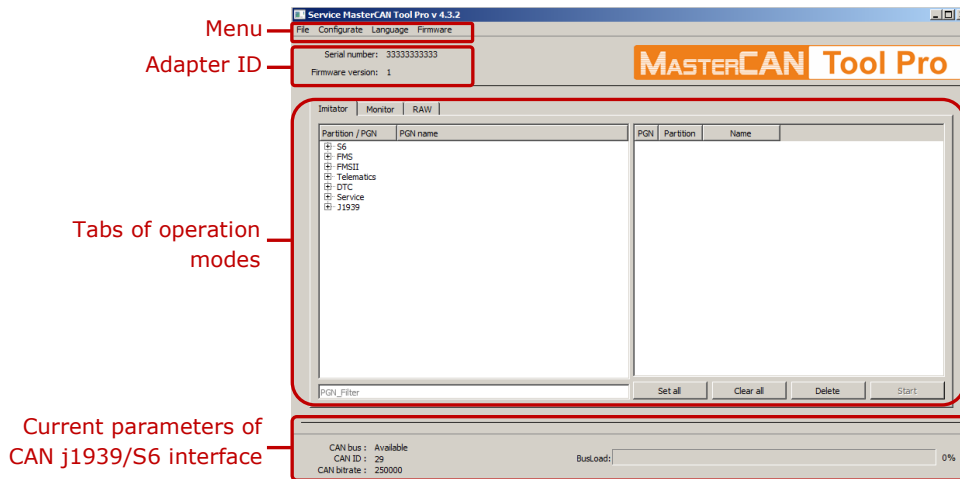
Figure 13 — Software interface view after the establishment of a communication session with PC

The following buttons are available in the **Menu** to work with the software:

File Configure Language Firmware

button to select the firmware file and start the update procedure for the inbuilt Adapter software;

button to select the language of the interface;

button to open the window of the Adapter connection parameters configuration in case of using CAN j1939/S6 interface;

button to load/save files of PGN groups generated before or test messages as well as for data entry/opening the current data log of CAN j1939/S6 interface.

In the area **Adapter ID** information on the serial number and the firmware version of the connected MasterCAN Tool Adapter is displayed.

Tabs of operation modes are designed to select the required mode of operation of MasterCAN Tool: PGN monitoring/PGN emulation/PGN raw data modeling (see 3.1).

In the area **Current parameters of CAN j1939/S6 interface** the following data is displayed:
- Indicator of current CAN bus load;
- Message of CAN bus availability for data exchange;
- The selected CAN ID length for PGN raw data modeling;
- The selected CAN bitrate.

To configure the Adapter connection parameters via CAN j1939/S6 interface, open the window **Dialog** by pressing the buttons Configure → Select configurations ... (see figure 14):

1) From the dropdown list **CAN bitrate** select CAN bitrate from the following range of values: 100; 125; 250; 500; 1000 Kbit/s (by default — 250 Kbit/s).
2) In the area **CAN ID** select the required ID length (CAN ID) for raw data modeling (29 bit by default). 11 bit ID is used in PGN of CAN 2.0A interface, while 29-bit ID — in PGN of CAN 2.0B interface.
3) In the area **CAN terminal resistor** you may enable/disable (enabled by default) the inbuilt terminal resistor (120 Ohms) between contacts CAN LOW and CAN HIGH of **S6** Adapter connector. Enabling the terminal resistor ensures correct data transmission via CAN 2.0B (J1939) communication line in case of the Adapter connection to CAN bus or using S6 Technology.
4) In the area **External power supply** in case of contactless connection to CAN bus with CANCrocodile switch on power supply for CANCrocodile (switched off by default) through **S6** Adapter connector (see 1.4.2).
5) In the area **Sniffer mode** you may enable/disable (disabled by default) the data reading mode in case of connection to CAN bus with CANCrocodile. In this case the PGN emulation mode does not work.

To activate changes in the Adapter settings for CAN j1939/S6 interface, press
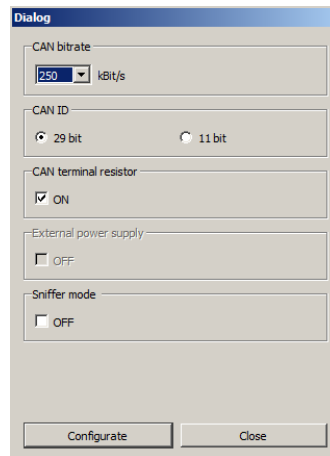[Configurate] button at the bottom of **Dialog** window.

*Figure 14— Window of the Adapter connection parameters configuration
for CAN j1939/S6 interface*

If you need to connect two or more MasterCAN Tool Adapters to the PC at one time, click the desktop shortcut again after you have established communication with the first Adapter. The connection with the third and next adapters is established in a similar way.

⚠️ **ATTENTION:** In case you connect several MasterCAN Tool adapters to the PC, make use of the USB hub with external power supply to reduce the load on the PC USB ports.

3 Work with MasterCAN Tool Software

3.1 Modes of operation

In the left upper portion of the Software window (see figure 13) there are three tabs enabling the user to select the required mode of MasterCAN Tool operation:

1) PGN Monitoring Mode (**Monitor** tab) — continuous automatic reception of all PGN from CAN bus (SAE J1939) or using S6 Technology and detailing individual SPN in real time.

2) PGN Emulation Mode (**Imitator** tab) — transmission of selected PGN with specified SPN parameters to CAN bus (SAE J1939) or using S6 Technology.

WARNING: PGN emulation mode is available only in case you employ MasterCAN Tool Pro. In case you use MasterCAN Tool Lite, there is no **Imitator** tab in the Software window.
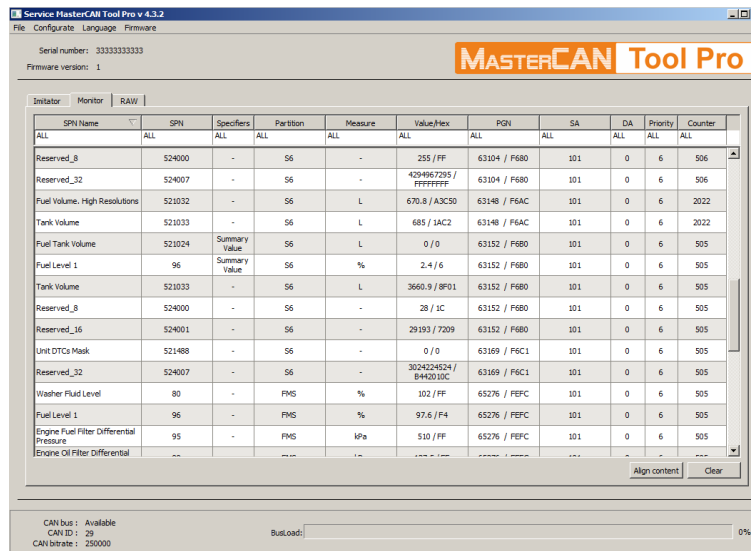
3) PGN raw data modeling mode (**RAW** tab) — generation and transmission test data packets to CAN bus (SAE J1939) or using S6 Technology with simultaneous monitoring all received PGN in real time by their ID or contents.

3.1.1 Work in the PGN monitoring mode

For monitoring PGN received from CAN bus (SAE J1939) or using S6 Technology you should open the **Monitor** tab. This tab allows you to view and analyze in real time SPN of all received PGN which comply with SAE J1939 Standard.

In the **Monitor** tab SPN are presented in the form of a table with the following columns (see figure 15):
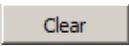
- **SPN name** — the parameter designation;
- **SPN** — the parameter number;
- **Specifiers** — additional field which is employed in the SPN description to specify the meaning of the parameter (e.g. front axle load, the number of the engine starts at the temperature below zero);
- **Partition** — designation of the corresponding set of messages;
- **Measure** — unit of the parameter measurement;
- **Value/Hex** — numeric value of the parameter in the decimal/hexadecimal form;
- **PGN** — message number;
- **SA** — unique network address of the message sending device (Source Address) for its identification in the CAN bus or in case of connection using S6 Technology;
- **DA** — unique network address of the message receiving device (Destination Address) for its identification in the CAN bus or in case of connection using S6 Technology;
- **Priority** — priority of the message to which the parameter is related;
- **Counter** — counter of messages, with the number of messages increment during the opersation period.

Figure 15 — Example of SPN detailed presentation in the Monitor tab

To delete all received messages from S6 (CAN) bus from the **Monitor** tab, [Clear] button in the right bottom corner of the Software is used.

[Align content] button is used for automatic alignment of the table columns width, in accordance with the text width.

ATTENTION: During work with MasterCAN Tool Pro the Software enables the user to receive and monitor the incoming PGN in the PGN monitoring mode and simultaneously transmit PGN in the mode of PGN emulation.

To save on the PC the log file of the data log (PGN) received from CAN bus or using S6 Technology in the PGN***** Monitoring Mode, open the menu **File → Write log** and in the window **Save as** specify the file name. In the process of the log file saving the message `logging` is displayed in the upper portion of the Software window.

To abort saving the log file, use the menu **File → Stop log**.

To open the earlier saved log file, open the menu **File → Log open** and select the required file (**.log**) from the window **Open File**.

---

* You may also save/open the log file of the data log in the PGN emulation mode and the PGN raw data modeling mode

3.1.2 Work in the PGN emulation mode

⚠️ **ATTENTION:** Work in the PGN emulation mode is possible only in case you use the model MasterCAN Tool Pro.

In order to transfer PGN into CAN Bus (SAE J1939) or using S6 Technology, you are to open the **Imitator** tab (see figure 16). The following PGN sets are located in its left portion (further on — sets):

- S6 — a special set of PGN developed by Technoton for data transmission by S6 units. It complies with SAE J1939/71 Standard requirements;
- FMS — a set of PGN containing basic parameters from onboard data buses of trucks. It complies with the FMS-Standard Interface description Standard of world leading producers of trucks;
- FMSII — a set of additional PGN (apart from PGN contained in the FMS-Standard) containing basic parameters from onboard data buses of trucks. It complies with SAE J1939/71 Standard requirements;
- Telematics — a set of telematic PGN developed by Technoton which accumulates basic data on the Vehicle performance. It complies with SAE J1939/71 Standard requirements;
- DTC — a set of codes of active (DM1) and saved (DM2) Units malfunctions, in accordance with SAE J1939/73 Standard;
- Service — a set containing PGN to generate requests to Units of S6 (CAN) Bus (complies with SAE J1939/21 Standard);
- J1939 — this set contains all special PGN including those developed by Technoton which are not contained in other sets. It complies with SAE J1939/71 Standard requirements.

⚠️ **ATTENTION:** A detailed description of PGN supported by CAN j1939/S6 Telematic interface for all sets of is provided at the Technoton site at http://s6.jv-technoton.com.

To select PGN from the list of sets, you are to unfold the required set in the left window of the **Imitator** tab (**Section/PGN** column). Select the needed PGN from the opened tree-structured list. Add the PGN to the right window of the **Imitator** tab (**PGN** column) by double clicking or by drag-and-drop. To delete the selected PGN, you may use the button Delete .

For quick search of the necessary PGN enter its number or words from its name into the field **PGN Filter**. The needed PGN will be filtered from sets in the left window of the **Imitator** tab.
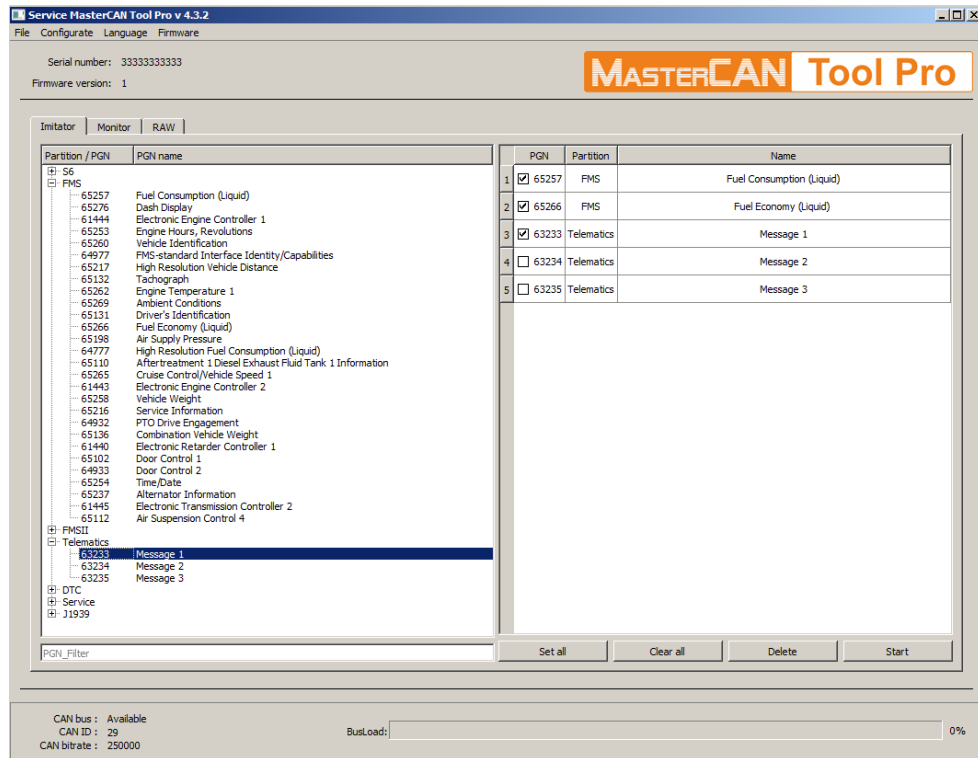
Figure 16 — Example of PGN selection in S6 Imitator tab

If you double click the line of the selected PGN, its parameters (SPN) will be available for editing. In PGN editors the following parameters common for all [PGN](#) are available for editing for every set (see figure 17):

- **DA** — unique network address of the message receiving device (Destination Address) for its identification in the [CAN](#) bus or in case of connection using [S6 Technology](#). The network address can be changed within the range of values from 0 to 255 in the decimal presentation;

- **SA** — unique network address of the message sending device (Source Address) for its identification in the CAN bus or in case of connection using S6 Technology. The network address can be changed within the range of values from 0 to 255 in the decimal presentation;

- **Priority** — message priority specified depending on its importance. The range of values within which they can be changed: from 0 to 7 (for PGN of S6, FMS, FMSII, Telematics and J1939 sets) and from 3 to 7 (for PGN of DTC and Service sets);

- **Period** — time period for message transmission. The range of changing values is from 0 to 65534 ms. If this period is 0 ms, the message is sent only upon request.
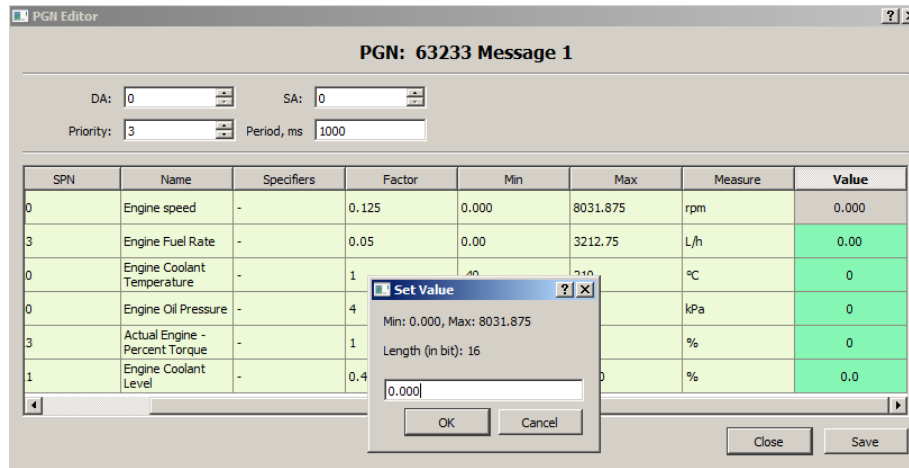
a) PGN editor (for sets S6, FMS, FMSII, Telematics, J1939)
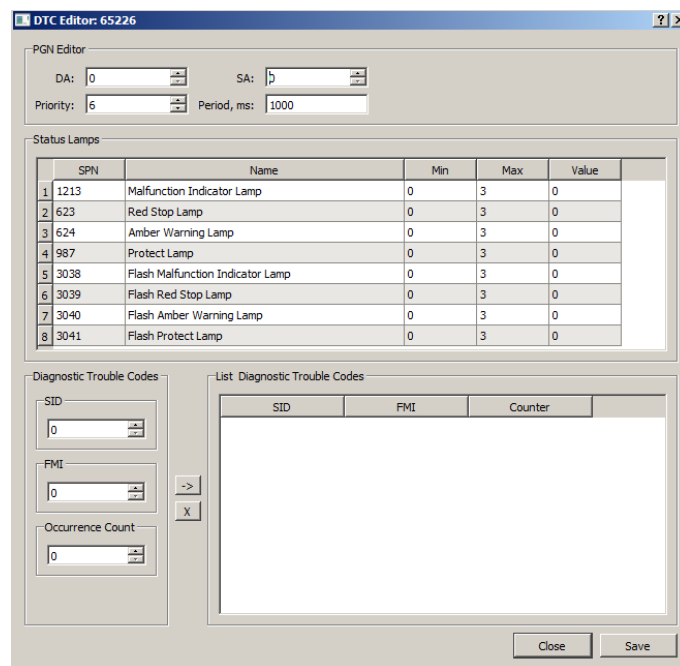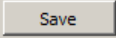

b) DTC editor (for set DTC)
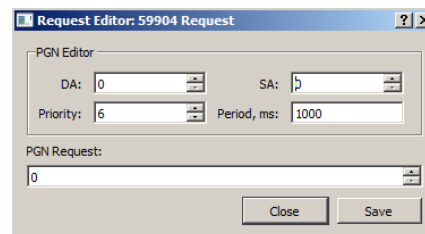
c) Request editor (for set Service)

Figure 17 — Examples of PGN editors in different sets

1) In PGN editors of S6, FMS, FMSII, Telematics, J1939 sets (see figure 17 a) SPN numeric values are available for editing (**Value** column in the table of parameters).

To change SPN, double click on the parameter line. Enter the necessary parameter value in the field for editing of the **Set Value** window.

In this window there are prompts on the range of changing numeric values and the bit length of each edited SPN.

Press [Save] button to make these PGN changes effective.
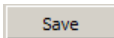
2) In the Diagnostic Trouble Codes editor of the DTC set (see figure 17 b) you can create the user list of trouble codes for the selected SPN.
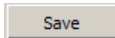
To add an entry into the **List Diagnostic Trouble Codes** (right bottom portion of the DTC Editor window), highlight the line of the necessary SPN in the table **Status Lamps** (central part of the DTC Editor window).
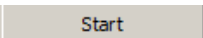
After that, specify the following values in the corresponding fields for editing of the area **Diagnostic Trouble Codes** (left bottom part of the DTC Editor window):
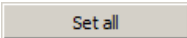
- **SID** — faulty element ID. Range of changing values from 0 to 524287;
- **FMI** — malfunction Type ID. Range of changing values from 0 to 31;
- **Counter** — malfunctions counter. Range of changing values from 0 to 126. To switch off the counter, enter 127.

After pressing [->] button, the entry of the malfunction code for the selected parameter will be added to the Codes List. To delete the entry from the Codes List window, use [X] button.
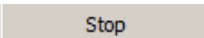
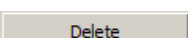To make the changes of the failure codes effective, press [Save] button.

3) In the editor of Service requests (see figure 17 c) you can generate a user request for the necessary PGN. For this purpose you should enter the message number into the field for editing **Requested PGN**. To save the created request, press [Save] button.
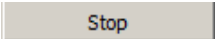
To transmit the selected PGN to CAN bus or using S6 Technology, checkmark them and press [Start] button.

The button [Set all] allows to checkmark simultaneously all PGN located in the right window of the **Imitator** tab.

To cancel simultaneously all selected PGN, use [Clear all].

To cancel the transmission of PGN to CAN bus or using S6 Technology, you should use [Stop] button (see figure 18).

[Delete] button is used to delete the selected PGN.

You should take note that during the transmission of the generated PGN group to CAN Bus or using S6 Technology parameters (SPN) are not available for editing. To edit SPN, you need to abort the process of PGN transmission by pressing [Stop] button, then double click the selected PGN and open the window of its editor.
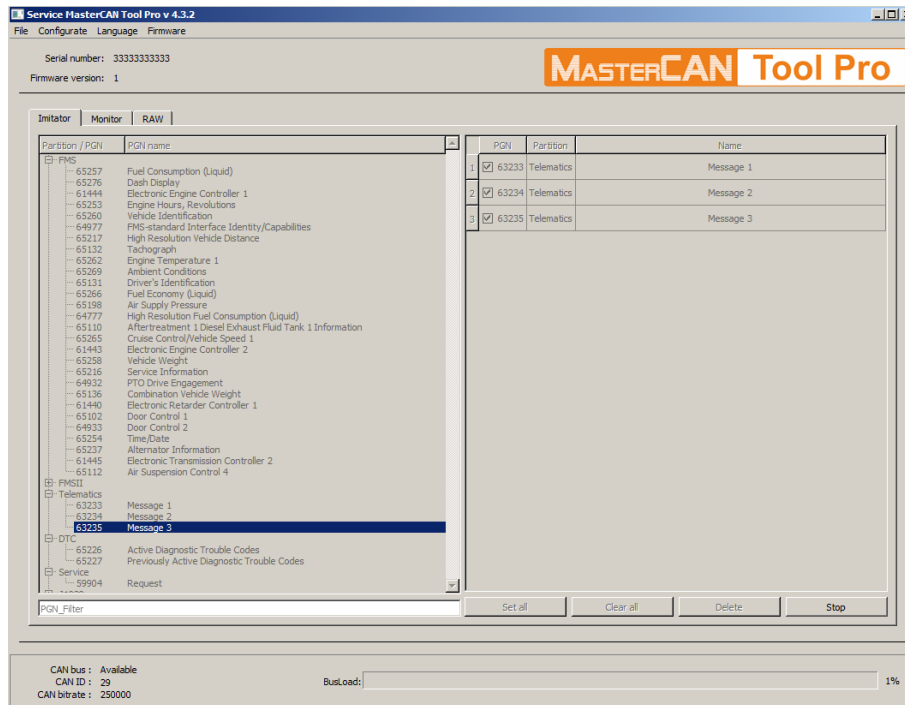

Figure 18 — Transmission of the generated PGN group to CAN bus or using S6 Technology

To save the data file (PGN) on the PC disc in the PGN emulation mode*, open the menu **File → Save** and specify the file name in the window **Save as**.
To open the earlier saved data file, open the menu **File → Open** and from the window **Open File** select the necessary file (**.toolProj**).

* You may also save/open the data file in the mode of modeling PGN raw data.
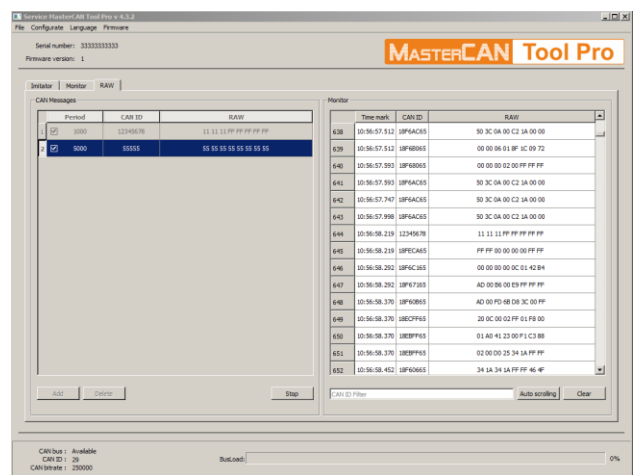
3.1.3 Work in the mode of modeling raw data of PGN

To model PGN raw data of CAN bus (SAE J1939) or Telematic interface CAN j1939/S6, you should open the **RAW** tab (see figure 19).

The **RAW** tab is designed to:

- create and transmit user (test) PGN to CAN bus or using S6 Technology;
- monitor and carry out detailed analysis of user (test) and all other PGN received from Units using S6 Technology or from CAN bus with a possibility to view their ID (CAN_ID) and raw data (DATA).
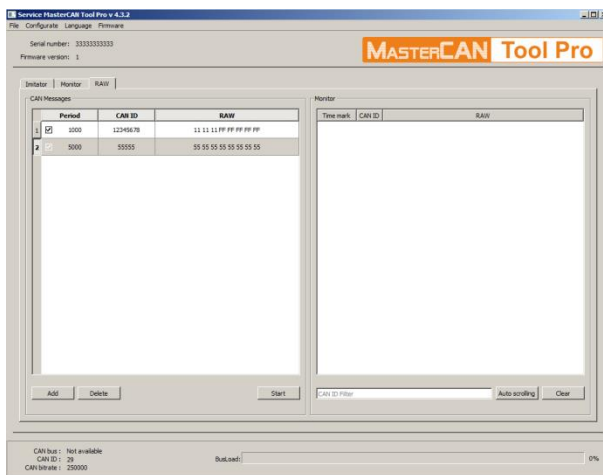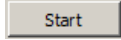

a) addition of test PGN   *b) transmission of test PGN and monitoring CAN bus*

Figure 19 — Example of work with RAW tab

To create a test PGN, press [Add] button. A standard PGN template with the following fields available for editing will be added to the **CAN Messages** window (left portion of the **RAW** tab window):

- **Period** — to enter values (in milliseconds) of the period for transmission of the modelled PGN;
- **CAN ID** — to enter the arbitration field ID of the modelled PGN in the hexadecimal presentation;
- **RAW** — to enter the contents of the data field of the modelled PGN in the hexadecimal presentation.
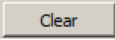
To delete the test PGN, highlight it and press [Delete] button.

To transmit one or several modelled PGN to CAN Bus or using S6 Technology, you are to checkmark them on the left side and press the [Start] button. After that, MasterCAN Tool will receive and display them in real time in the **Monitor** window (right portion of the **RAW** tab).
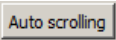
⚠️ **ATTENTION:** Apart from test messages, all received PGN from CAN bus or using S6 Technology are also displayed in the **Monitor** window.

All displayed messages in the **Monitor** window are presented in the form of a timeline chart with an option of monitoring the time of their reception (**Time Mark** column), ID (**CAN ID** column) and contents (**RAW** column).

The button [Clear] is designed to delete all PGN received until the moment of their deletion from the **Monitor** window.

For quick search of the message by the ID of the arbitration field, enter the ID into the field of the window **CAN ID Filter**. The necessary message will be filtered from all displayed PGN of the **Monitor** window.

[Auto scrolling] button is designed for the user convenience during analyzing messages. It allows to keep permanently the latest received message in the bottom line of the Monitor window.

3.2 Adapter firmware update

⚠️ **ATTENTION**: The Adapter firmware update should be carried out exclusively for implementing improvements, recommended by the Manufacturer.

To update the Adapter firmware, you should perform operations in the following order:

1) Disconnect the Adapter power supply from the Vehicle onboard circuit.

2) Disconnect the connector of **S6** adapter from CAN bus or from the CAN j1939/S6 Telematic Interface.

3) Connect the Adapter to the USB port of PC.

4) By pressing the buttons Firmware → Select firmware file ... open the file selection dialogue and select the firmware file (***.blf3**). After the autocheck of the firmware file for its integrity and compatibility the software will activate the loader mode and the window **Burn progress** will appear showing the per cent of loading the firmware file into the Adapter memory (see figure 20).
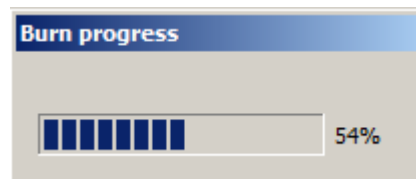

Figure 20 — MasterCAN Tool firmware update progress

During the loading period of the firmware file you would observe red blinking lights of all the Adapter LED indicators in turn.

⚠️ **WARNING:** To avoid the Adapter failure, **it is forbidden** before the end of the data loading operation and the software automatic reboot:
- to switch off the PC;
- to disconnect the Adapter from the PC;
- to run any resource-intensive applications on the PC.

In case the firmware update procedure is successful, you will observe the simultaneous blinking of green lights of all the Adapter LED indicators. After that, the Adapter will be ready for use and the software will display the new firmware version.

If the firmware update procedure has been completed incorrectly, disconnect the USB cable from the Adapter and connect it again in 5 s. In this case the inbuilt loader will be activated which will enable to repeat the firmware update procedure from the start and recover the Adapter operability. If another attempt is also unsuccessful, we recommend to contact Technoton technical support, e-mail: support@technoton.by.

3.3 Completion of work with software and disconnection of the Adapter

To complete the work with the software, you are to perform operations in the following order:

1) Close the software window by pressing ⊠ button in the upper right portion of the software window.

2) Cut off the Vehicle onboard circuit.

3) Disconnect the Adapter power supply from the Vehicle onboard circuit.

4) Disconnect S6 connector of the Adapter from the CAN Vehicle bus or from CAN j1939/S6 Telematic interface.

4 Storage

MasterCAN Tool is recommended to be stored in dry enclosed areas.

MasterCAN Tool storage is allowed only in original packaging at temperature range from -50 to +40 °C and relative humidity up to 100 % at +25 °C.

Do not store MasterCAN Tool in the same room with substances that cause metal corrosion and/or contain aggressive impurities.

MasterCAN Tool shelf life must not exceed 24 months.

5 Transportation

Transportation of [MasterCAN Tool](#) is recommended in closed transport that provides protection for MasterCAN Tool from mechanical damage and precipitation.

When transporting by air, MasterCAN Tool must be stored in heated pressurized compartments.

Air environment in transportation compartments should not contain acid, alkaline and other aggressive impurities.

Shipping containers with packed MasterCAN Tool should be sealed.

6 Utilization/re-cycling

MasterCAN Tool does not contain harmful substances and ingredients that are dangerous to human health and environment during and after the end of life and recycling.
MasterCAN Tool does not contain precious metals in amount that should be recorded.

Contacts

Manufacturer

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Technical support

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