MasterCAN Display

CAN j1939/S6 DISPLAY
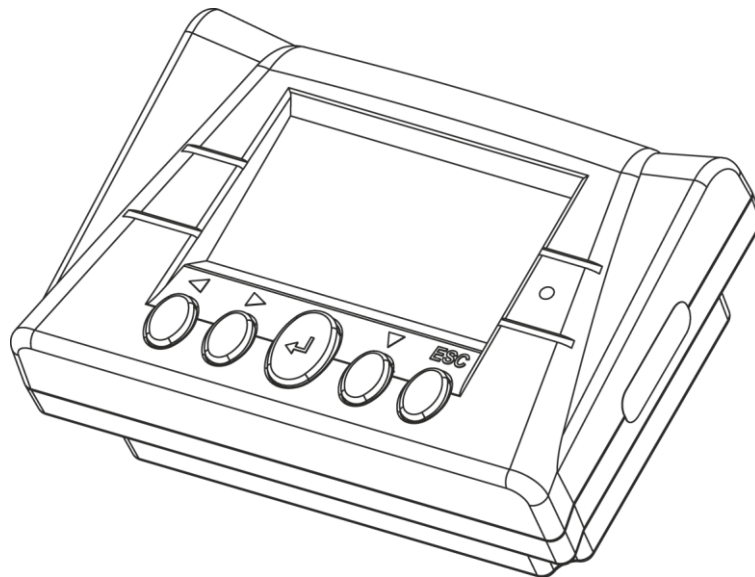
MasterCAN Display 35

OPERATION MANUAL

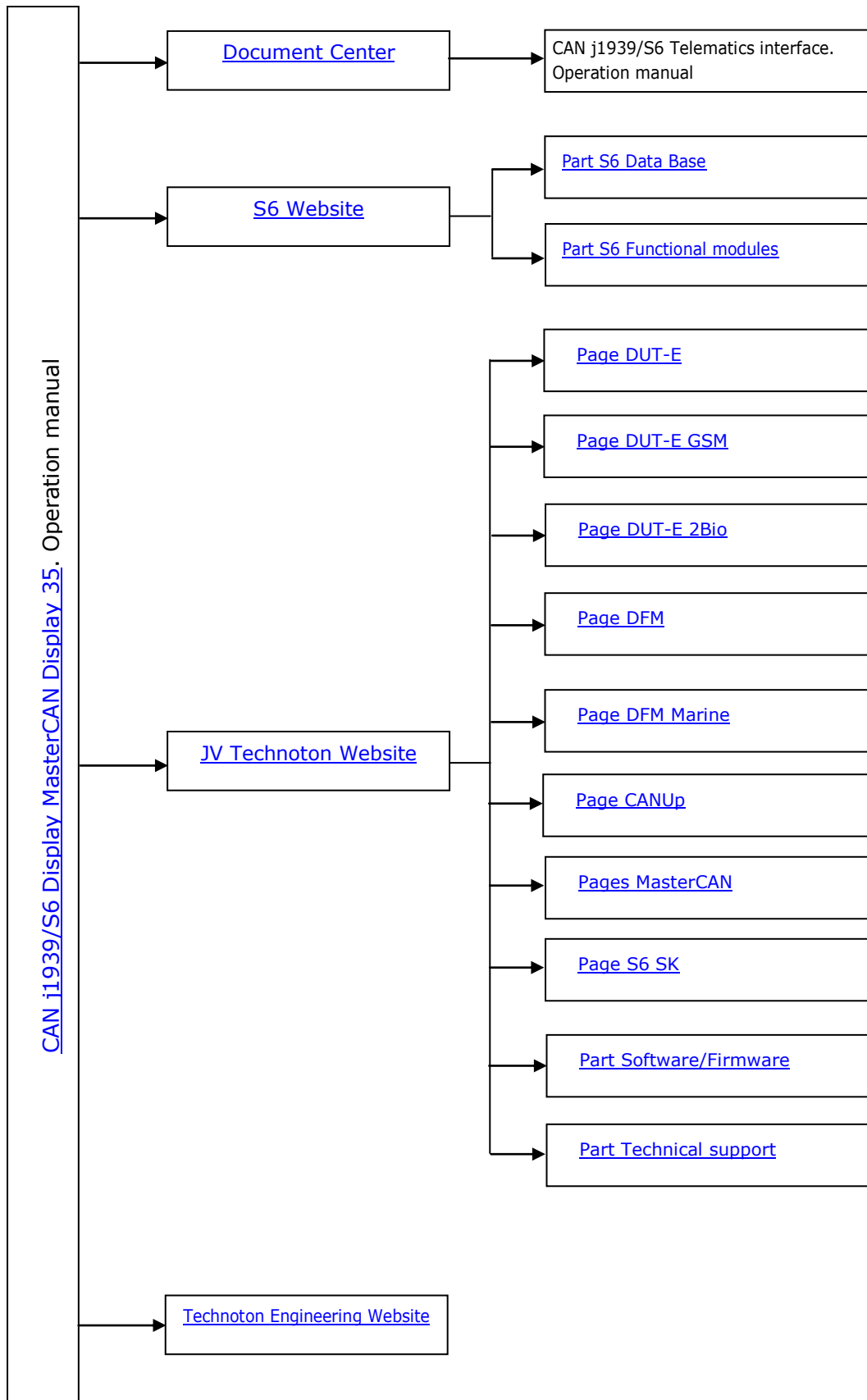**Version 2.0**

TECHNOTON

Contents

Revision history

Version	Date	Editor	Description of changes
1.0	06.2018	OD	Basic version.
2.0	12.2018	OD	• Changes in the set of parameters displayed on pre-set screens of different MasterCAN Display 35 modifications are updated and reflected in diagrams. • Changes in MasterCAN Display 35 delivery set are reflected. • New functional features of MasterCAN Display 35 are included: - new design of the main menu and information screens; - monitoring of Units Events and malfunctions; - menu of settings; - resetting Counters that can be cleared (for "Marine" modification); - switching the display into the "sleeping" (energy-saving) mode; - displaying electronic passport; - manual and automatic adjustment of the display backlighting; - sound signal for incoming messages and pressing buttons. • A table containing a list of equipment that must be connected to different modifications of MasterCAN Display 35 in order to display the standard set of specified parameters on pre-set screens is created. • An example of Units connection diagram to MasterCAN Display 35 using new components of S6 cable system is provided.

Structure of external links

```
CAN j1939/S6 Display MasterCAN Display 35. Operation manual
    │
    ├──────→ Document Center ──────→ CAN j1939/S6 Telematics interface.
    │                                 Operation manual
    │
    ├──────→ S6 Website ──────┬──────→ Part S6 Data Base
    │                         │
    │                         └──────→ Part S6 Functional modules
    │
    ├──────→ JV Technoton Website ──┬──────→ Page DUT-E
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    │                               └──────→ Part Technical support
    │
    └──────→ Technoton Engineering Website
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Terms and Definitions

IoT Burger is the Technology of creating smart sensors and complex telematics IIoT devices operating in real time with built-in analytic features (further on – IoT Burger). The basis of IoT Burger is the software/hardware core, a set of ready-to-use universal Functional Modules, the database of standartized IoT parameters.

Particular features of IoT Burger:

- inbuilt analytic features for maximum treatment of signals within the device itself;
- a possibility to design devices with extremely low power consumption;
- doesn't require programming in the majority of applications, flexible setup;
- using inexpensive industrially manufactured equipment parts;
- measurement and treatment of "quick" processes which is impossible to implement using cloud technologies;
- an option of ready Reports delivery to the user avoiding server platforms;
- the inbuilt system of data authenticity assurance (self-diagnostics, authorization, impact control).

The technology provides for the availability of several measurement channels in any device including pre-set analytical treatment (filtration, linearization, thermal compensation) and the controlled error of measurement.

Devices created using IoT Burger may be united to form a wire-connected or wireless connection network. Data may be transmitted to the telematics server, to popular IoT platforms, by SMS, E-mail, to social networks.

At present, GSM 2G/3G data transmission standards are used in devices with IoT Burger. The reports transmitted contain data on instant and average values of Parameters, Counters, Events. The flexible system of Reports setup enables the user to select the optimal ratio of the data completeness and the volume of traffic.

CAN j1939/S6 Display MasterCAN Display 35 is designed using IoT Burger Technology.

S6 is the 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.

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).

Event — relatively rare and sudden change in SPN. For example, the attempt to falsify values of "Instant fuel consumption" counter by applying electromagnetic field to fuel flow meter will be recognized as "Interference" Event. An Event can have one or several characteristics. "Interference" Event has the following: date/time and duration of interference. When the Event occurs, a terminal unit registers the time of occurrence, which is later mentioned in a report on the event. Thus, the Event is always attached to exact time and place of occurrence.

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

Parameter — time-varying or space characteristic of the Vehicle (SPN value). For example, speed, fuel volume in the tank, hourly fuel consumption, coordinates. Parameter is usually displayed in the form of graph, or averaged data.

Counter — cumulative numerical characteristics of Parameter. Counter is represented by a number, which can only grow in time. Examples of Counters: fuel consumption, engine operation time, total distance and other.

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 Telematics system. Usually Vehicle means a truck, tractor or bus, sometimes a locomotive or river boat. From Telematics 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 out in this Operation Manual apply to **MasterCAN Display 35 CAN j1939/S6 Display** (further on — MasterCAN Display 35), model code — **04**, manufactured by JV Technoton, Minsk, Republic of Belarus.

Model code of MasterCAN Display 35 is defined by first two digits of serial number, which is printed on nameplate placed in the lower part of back cover or printed on package label (see figure 1).
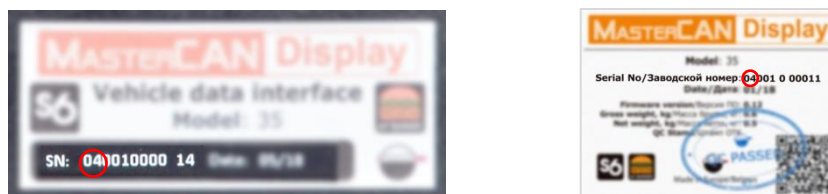

Figure 1 — Finding out model code of MasterCAN Display 35

The manual contains information on design, operation principle, specifications and instructions on connection, configuration and use of MasterCAN Display 35.

MasterCAN Display 35 **— a tool for supervising operation parameters of complex vehicles and stationary machines.**

MasterCAN Display 35 key features:

- possibility to display selected Vehicle operation parameters from total 3500+ received via CAN j1939/S6 interface;
- converting voltage/frequency signals of analog sensors into digital messages (SPN) and displaying it on the screen;
- flexible configuration of display of parameters (up to 21 group, 10 screens in each group, 1 or 2 parameters on each screen);
- special modifications of MasterCAN Display 35 — "Truck", "Tractor" and "Vessel" have pre-set information screens displaying performance parameters of primary interest for specific types of equipment;
- compliance with Units, Database and cabling system S6 Technology;
- based on IoT Burger Technology, which ensures data processing by electronic module of MasterCAN Display 35 with no need of additional data processing units;
- unique diagnostics functions, allowing to check operability of MasterCAN Display 35 itself and Units connected using S6 Technology;
- signal cables and fasteners included in delivery set;
- automatic display brightness adjustment;
- conformity with European and national automotive standards.

For MasterCAN Display 35 configuration using cable connection to the PC you should use S6 SK service adapter (to be purchased separately) and the Service S6 MasterCAN service software (the software current version can be downloaded at https://www.jv-technoton.com/, section Software/Firmware).

Features of different modifications of MasterCAN Display 35:

1) MasterCAN Display 35 U ("Universal") — Display modification with extended user rights regarding configuration of information screens. It is designed for monitoring parameters of any fixed/mobile objects equipped with a standard CAN-bus, S6 Units, analog sensors.

It has 27 pre-set screens with SPN values received via CAN j1939/S6 interface and one screen with converted signals from analog inputs (see B.4).

A user of MasterCAN Display 35 U can:

- delete and edit pre-set screens;
- configure displaying any of 3500+ parameters (SPN) of S6 Database;
- create and configure the maximum possible number of information screens (200 screens with SPN received via CAN j1939/S6 interface and one screen with converted signals from analog inputs);
- conduct flexible configuration of parameters displayed (one/two SPN on the screen, change SPN name and designation).

2) MasterCAN Display 35 G ("Truck") — Display modification designed to monitor parameters of tractor trucks equipped with a standard CAN-bus, S6 Units, analog sensors.

It has 27 pre-set screens with SPN values received via CAN j1939/S6 interface and one screen with converted signals from analog inputs (see B.1).

A user of MasterCAN Display 35 G can:

- add the number of screens up to 10 in each of the pre-set groups;
- edit the screen with converted signals from analog inputs;
- load SPN designation.

A user of MasterCAN Display 35 G cannot:

- delete and edit pre-set screens;
- create new groups of screens;
- change SPN name.

3) MasterCAN Display 35 T ("Tractor") — Display modification designed to monitor parameters of farming machinery equipped with a standard CAN-bus, S6 Units, analog sensors.

It has 23 pre-set screens with SPN values received via CAN j1939/S6 interface and one screen with converted signals from analog inputs (see B.2).

A user of MasterCAN Display 35 T can:

- add the number of screens up to 10 in each of the pre-set groups;
- edit the screen with converted signals from analog inputs;
- load SPN designation.

A user of MasterCAN Display 35 T cannot:

- delete and edit pre-set screens;
- create new groups of screens;
- change SPN name.

4) MasterCAN Display 35 M ("Vessel") — Display modification designed to monitor parameters of sea and river vessels equipped with S6 Units.

It has 39 pre-set screens with SPN values received via CAN j1939/S6 interface (see B.3).

A user of MasterCAN Display 35 M can:

- add new groups to the pre-set groups of screens to the maximum possible number (21);
- add the number of screens up to 10 in each of the pre-set groups;
- reset flow meter counters (counters that can be reset) while viewing the corresponding screens;
- load SPN designation.

A user of MasterCAN Display 35 M cannot:

- delete and edit pre-set screens;
- change SPN name.

Diagrams of pre-set information screens for all modifications of MasterCAN Display 35 are provided in annex B.

Table 1 — Equipment that should be connected to MasterCAN Display 35 in order to display a standard set of parameters on pre-set screens

Designation of Equipment	Number for modifications of MasterCAN Display 35, pcs.				Note
	G	T	M	U *	
DFM CAN **/ DFM D CAN Fuel flow meter	1	1	2	1	Connection using S6 Technology (to **S6** connector).
DFM Marine CAN Fuel flow meter	-	-	2	-	Connection using S6 Technology (to **S6** connector).
DUT-E CAN / DUT-E 2Bio / DUT-E GSM Fuel level sensor	2	2	2	2	Connection using S6 Technology (to **S6** connector) in any combination of fuel level sensors.
MasterCAN CC Vehicle data interface	1	1	-	1	To connect to standard vehicle CAN-bus, you may use any of these Units. We recommend to connect MasterCAN CC to CAN-bus using CANCrocodile or CANCrocoLITE contactless readers.
FMSCrocodile CCAN Contactless reader-converter					
MasterCAN DAC2113 J1939 i/o module	2	-	-	1	Connection using S6 Technology (to **S6** connector).
CANCrocodile / CANCrocoLITE *** Contactless reader	1	1	1	1	Connection to **S6** connector, operation in the snuffer mode.
GNOM DDE / GNOM DP Axle Load Sensor	2	-	-	2	Connection to **SENS** connector in any combination of models and types of sensors used.
DUT-E AF Fuel level sensor					

* In case of pre-set groups of screens, replacement by groups of screens with parameters specified by the user; see the number of Units available for connection by means of S6 Technology in table 3.

** In case of connection of one-chamber flow meters, SPN values that can be displayed only by differential flow meters are not shown.

*** In case of CANCrocodile / CANCrocoLITE connection, data display is only possible on the screens for T-CAN source of input data. In this case, simultaneous connection of other Units to **S6** connector is not allowed.

ATTENTION: It is strongly recommended to follow strictly the instructions of the present Manual when using, mounting or maintaining MasterCAN Display 35.

The Manufacturer guarantees MasterCAN Display 35 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 Display 35 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, application area, operation principle

MasterCAN Display 35 is designed for displaying current values of:

- SPN received from Units using S6 Technology (see table 3);
- SPN received from standard automotive CAN bus;
- Voltage/frequency signals (see 1.4.3) of standard and additional automotive sensors.

Application areas:

1) MasterCAN Display 35 CAN j1939/S6 Display can be used within Telematics system as a tool for supervising operation parameters "on board" of complex vehicles, railroad machinery and water vessels.

MasterCAN Display 35 is installed on a Vehicle and can simultaneously receive data (SPN) from standard automotive CAN bus and Units connected using S6 Technology.

Also MasterCAN Display 35 can convert output signals of standard or additional voltage/frequency sensors into digital data (SPN). Depending on model (see page 9) and user configurations, MasterCAN Display 35 can show up to 201 screens containing SPN values (maximum 2 parameters per screen) (see figure 2).
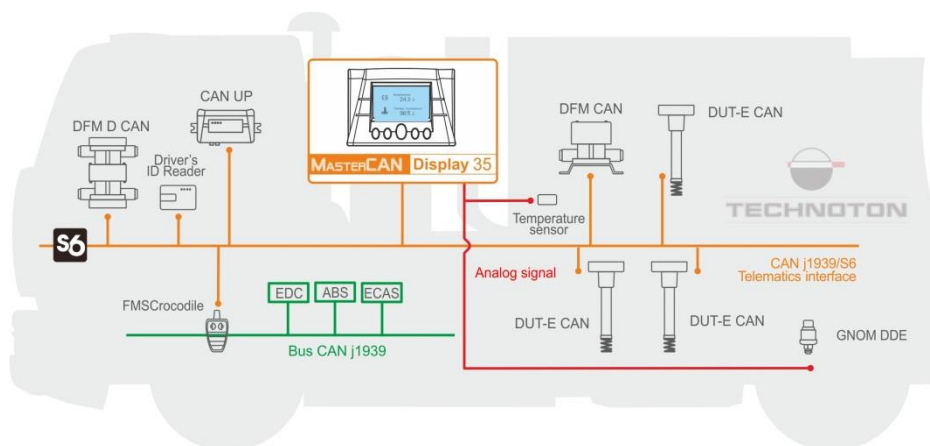

Figure 2 — Example of using MasterCAN Display 35 within Telematics system for supervising operation parameters of a Vehicle

2) MasterCAN Display 35 CAN j1939/S6 Display can be used independently of any telematics system for supervision of operation parameters of stationary machines – sets of diesel generators, boilers, technological equipment and complex objects like granaries etc. (see figure 3).
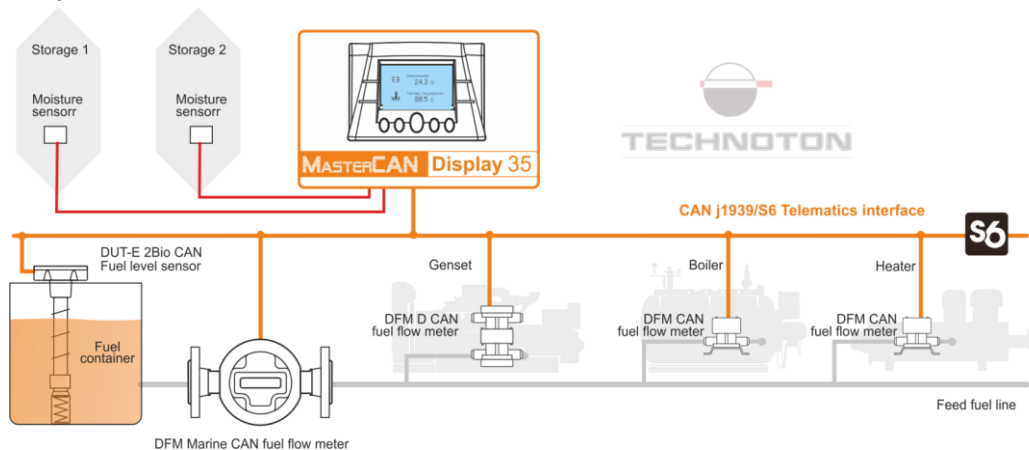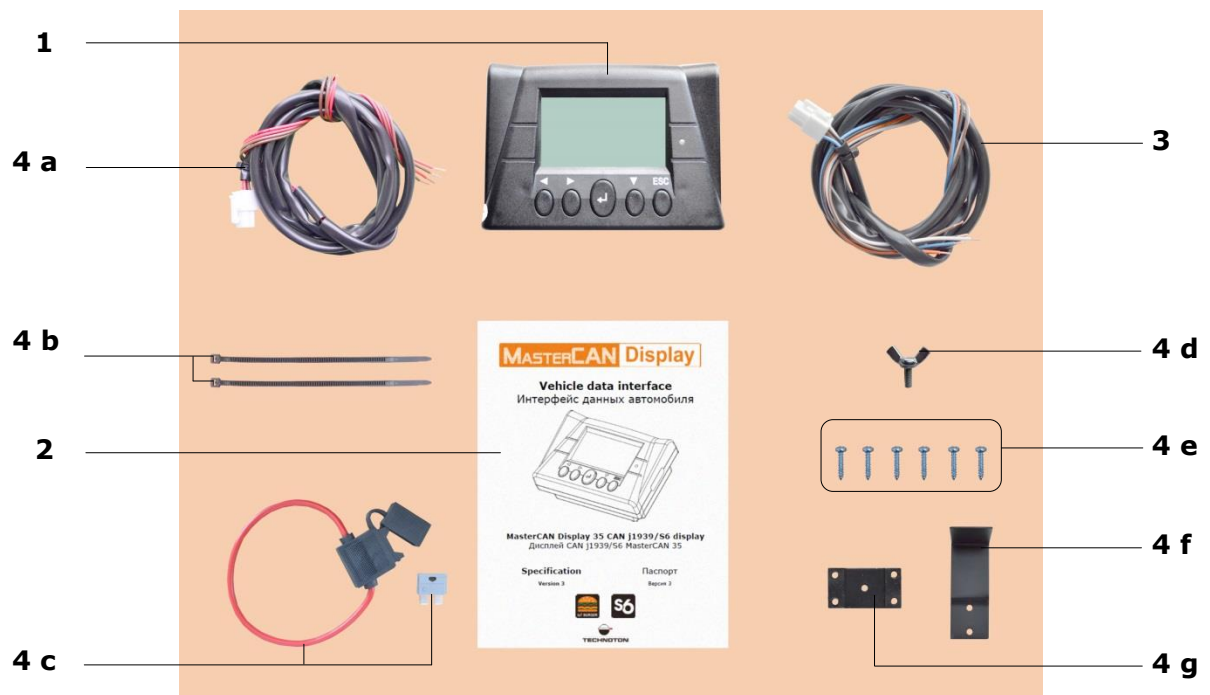

Figure 3 — Example of using MasterCAN Display 35 independently of Telematics system for supervising operation parameters granary

1.2 Exterior view and delivery set

1	MasterCAN Display 35	– 1 pc.;
2	Passport containing an enclosed information sheet with factory settings and information on navigation between the screens	– 1 pc.;
3	S6 signal cable (2 m)	– 1 pc.;
4	Mounting kit (1 pc.) including:	
a)	SENS signal cable (1.4 m)	- 1 pc.;
b)	cable tie	- 2 pcs.;
c)	fuse with holder (2 A)	- 1 pc.;
d)	wing screw	- 1 pc.;
e)	self-tapping screw 2.9x9.5	- 6 pcs.;
f)	mounting plate	- 1 pc.;
g)	plate fixator	- 1 pc.

Figure 4 — MasterCAN Display 35 delivery set

1.3 Design

a) front view   *b) back view*
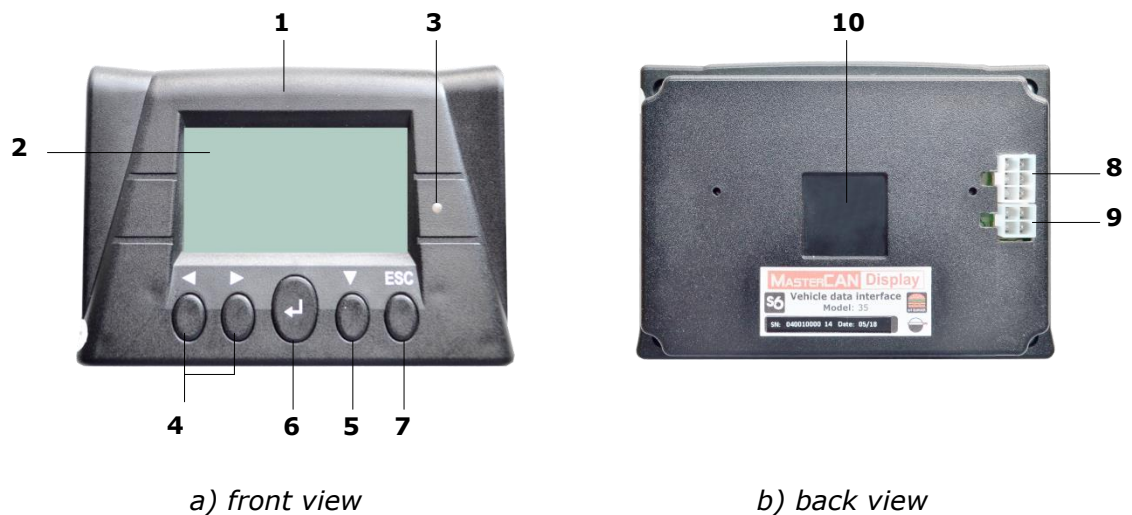
1 – body with electronic module inside;
2 – LCD with backlight;
3 – ambient light sensor for automatic adjustment of LCD brightness;
4 – horizontal selection buttons;
5 – vertical selection button;
6 – confirmation button;
7 – escape (cancel) button;
8 – **S6** socket (for connecting to CAN j1939/S6 interface and onboard electrical network of Vehicle);
9 – **SENS** socket (input for connecting voltage/frequency automotive sensors);
10 – groove for fixing mounting plate to back cover.

Figure 5 — MasterCAN Display 35 design

1.4 Technical specifications

1.4.1 Main specifications

Table 2 — MasterCAN Display 35 main specifications

Parameter, measuring unit	Value
Digital interface	CAN j1939/S6
Physical signal inputs (2 pcs.)	Analog/Frequency
Power supply voltage range, V	9…45
Maximal current consumption at supply voltage 12/24 V, mA, not more than	100/50
Temperature range, °C	-10*…+60
Ingress protection rating	IP40
Liquid-crystal display (LCD)	128x64 monochrome, with automatic and manual adjustment of backlighting
Weight, kg, not more than	0.25
Overall dimensions, mm, not more than	see figure 6
* If the ambient temperature is below -10 °C, LCD display of MasterCAN Display 35 switches off automatically, but the device itself is active and operative. If the temperature rises above -10 °C, LCD display switches on automatically.	

1.4.2 CAN j1939/S6 digital interface protocol and characteristics

Specifications of CAN j1939/S6 MasterCAN Display 35 digital interface correspond to S6 Technology. The data transfer protocol is based on SAE J1939 standard and meets its requirements.

Configuration of MasterCAN Display 35 connection to CAN j1939/S6 interface and selection of SPN for displaying on screens is carried out using Service S6 MasterCAN software via K-line interface (ISO 14230). The software current version can be downloaded at https://www.jv-technoton.com/, section Software/Firmware.

MasterCAN Display 35 mode of data reception/transmission is automatic. Baud rate values list 100; 125; 250; 500; 1000 kbit/s (by default — 250 kbit/s).

Any SPN from S6 Database except those in text format can be selected to be displayed.

To identify Units when connecting MasterCAN Display 35 using S6 Technology, choose unique network address (SA) using Service software and following the table 2 below.

Table 3 — Allowed network addresses for S6 Units connected to MasterCAN Display 35

S6 Units		Maximum number on one Vehicle	Allowed network address (SA)
Type	**Model**		
CAN j1939/S6 Display	MasterCAN Display 35	2	109, 110
Online telematics gateway	CANUp 27	1	100
Fuel flow meters	DFM CAN	8	111…118
	DFM Marine CAN		
Fuel level sensors	DUT-E CAN	8	101…108
	DUT-E GSM		
	DUT-E 2Bio		
Vehicle data interfaces	MasterCAN CC	2	122, 142
	MasterCAN C232/485	2	124, 144
	MasterCAN V-Gate	2	125, 145
Contactless reader-converter	FMSCrocodile CCAN	1	122
J1939 i/o modules	MasterCAN DAC15	2	126, 146
	MasterCAN DAC2113		127, 147

1.4.3 Specifications of signals analog inputs

MasterCAN Display 35 has two configurable analog inputs (see table 4).

Table 4 — Specifications of signals of MasterCAN Display 35 analog inputs

Signal type, measurement units	Value
Voltage, V	0.5…10
Frequency, kHz (amplitude 8…10 V)	0.01…10
Note – Input resistance of analog input is 140 kOhms.	

Selection of necessary type of input signals (voltage/frequency) and configuration of convertion of their levels into SPN values is carried out using Service S6 MasterCAN (see A.5).
The software current version can be downloaded at https://www.jv-technoton.com/, section Software/Firmware.
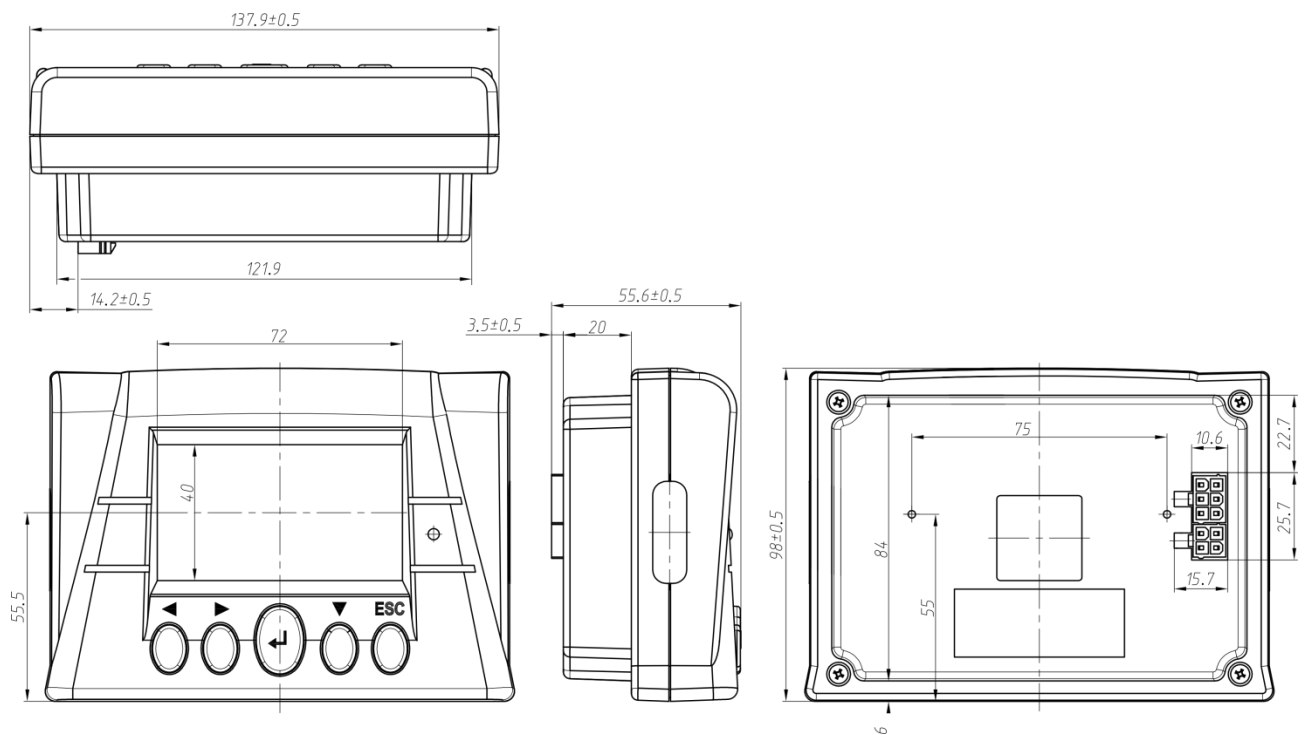
1.4.4 Overall dimensions

Figure 6 — MasterCAN Display 35 overall dimensions

2 MasterCAN Display 35 installation

> **ATTENTION:**
> **1)** When mounting MasterCAN Display 35, strictly follow safety rules of car repair works as well as local safety rules of the customer' company
> **2)** Before the start, it is recommended to carefully study through the electrical circuit diagram and Operation manual for the Vehicle, where MasterCAN Display 35 is mounted.

For MasterCAN Display 35 correct operation its mounting and configuration should be carried out by certified specialists who have passed corporate technical training.

2.1 Exterior inspection prior to starting works

It is required to conduct MasterCAN Display 35 exterior inspection for the presence of the possible defects of body or connectors arisen during transportation, storage or careless use.

Contact the supplier if any defects are detected.

2.2 Choosing installation place

MasterCAN Display 35 installation should be done in a dry location protected from aggressive impact of the environment. MasterCAN Display 35 should not be mounted near heating and cooling devices (e.g. the climate control system). Also, it is not recommended to mount MasterCAN Display 35 close to the vehicle electrical circuits.

We recommend installing MasterCAN Display 35 in driver's cab. To make sure the display is in the eyesight of a driver, it is recommended to place the display on the top of the panel (see figure 7).

Figure 7 — Recommended place of installation MasterCAN Display 35

2.3 Installation procedure

> ⚠️ **IMPORTANT:** When installing MasterCAN Display 35 it is **strongly recommended** to use installation elements from delivery set.

1) Put fastening plate into groove on the back cover of MasterCAN Display 35 (see figure 8) and fix it with two crews.

2) Fasten the clamp of the mounting plate to a selected place on the panel with two self-tapping screws.

3) Put fastening plate under the fixator and fasten in using wing screw.

Figure 8 — MasterCAN Display 35 fixed using elements from delivery set

2.4 Electrical connection

1) MasterCAN Display 35 is power-supplied from external source (e.g. electrical network of vehicle) using S6 signal cable from delivery set in accordance to **S6** connectors pinout (see table 5).

> ⚠ **IMPORTANT:**
> **1)** Before mounting and connecting MasterCAN Display 35 switch off power supply of the Vehicle electrical circuits. To do this switch off the battery switch or release the terminals of the wires connected to the battery.
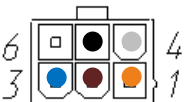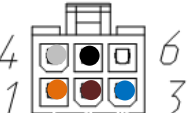> **2)** Prior to electrical connection of the MasterCAN Display 35 pay special attention to checking Vehicle chassis ground. Resistance between any point of vehicle chassis and "-" terminal of the battery or between terminals of the chassis ground switch should not exceed 1 Ohm.
> **3)** When connecting MasterCAN Display 35 to onboard electrical network of Vehicle, use fuse (2 A) from delivery set.
> **4)** It is strongly recommended to lay signal cable together with standard electrical vehicle wiring with mandatory cable ties fixing of every 50 cm, at a positive ambient temperature.
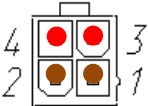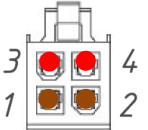
2) MasterCAN Display 35 connection through CAN j1939/S6 digital interface (see 1.4.2) is carried out using S6 signal cable from delivery set in accordance to **S6** connectors pinout (see table 5).

*Table 5 — Designation of contacts of **S6** connectors*
of MasterCAN Display 35 and S6 signal cable

Connector Pinout	Connector Contact Number	Wire Marking	Wire Color	Circuit Designation	Signal Parameters
S6 socket of MasterCAN Display 35: **S6 plug of S6 signal cable:**	1	VBAT	Orange	Power "+"	Analog, voltage 9…45 V
	2	GND	Brown	Ground "-"	—
	3	CANH	Blue	CAN HIGH	Digital, CAN 2.0B, SAE J1939 Standard
	4	CANL	White	CAN LOW	
	5	KLIN	Black	K-Line	Digital, ISO 14230 Standard

3) Connection to the analog inputs of MasterCAN Display 35 is performed with SENS signal cable from the delivery set (see 1.2), in accordance with the designation of contacts of **SENS** connectors, according to table 8.

*Table 6 — Designation of contacts of **SENS** connectors*
of MasterCAN Display 35 and SENS signal cable

Connector Pinout	Connect or Contact Number	Wire Marking	Wire Color	Circuit Designation	Signal Parameters
SENS socket of MasterCAN Display 35: **SENS plug of SENS signal cable:**	1	2_AFIN-	Brown	Frequency/ Voltage input 2	see 1.4.3 (table 4)
	3	2_AFIN+	Red		
	2	1_AFIN-	Brown	Frequency/ Voltage input 1	
	4	1_AFIN+	Red		

For connecting MasterCAN Display 35 to signal wires of Vehicle, we recommend to use special connectors (see figure 9).
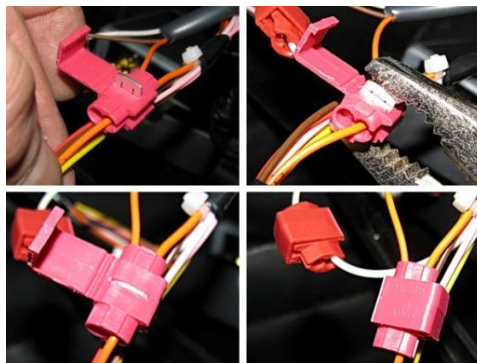

Figure 9 — Using connectors to connect wires

Example scheme of connecting MasterCAN Display 35 to Units using S6 Technology, to automotive CANbus and to analogue sensors (including a list of necessary elements of S6 cabling system) can be found in appendix D.

3 MasterCAN Display 35 configuration

MasterCAN Display 35 configuration is carried out via K-Line interface (ISO 14230).

To start configuration connect MasterCAN Display 35 to PC through S6 SK using S6 SK service adapter which is to be purchased separately.

⚠️ **ATTENTION:** To avoid any service adapter faults in communication between PC and MasterCAN Display 35 make sure there are no sources of electromagnetic enterference close to the workplace (running electric motors, welding equipment, high-power transformers, power lines, etc.).

Prior to using S6 SK, download USB driver and Service S6 MasterCAN Software (version 3.6 and higher) from http://www.jv-technoton.com (Software/Firmware section) and install to your PC.

Note — Installation file of software has the view as: ServiceS6_MasterCAN_X_X_Setup.exe. X_X corresponds to the version of software.

S6 SK description can be found in CAN j1939/S6 Telematics interface Operation Manual.
See annex A for MasterCAN Display 35 settings (SPN), displayed and/or made by Service S6 MasterCAN software.

3.1 Connecting MasterCAN Display 35 to PC

⚠️ **ATTENTION:** Prior to connecting MasterCAN Display 35 to a PC, it is necessary to turn off electrical circuits of the Vehicle*. To do this, use the battery switch or remove the battery terminals.

Before starting to use service adapter, have a closer look on its elements to detect defects which can occur while service adapter was transported, stored or handled carelessly.

Avoid the following when connecting service adapter to MasterCAN Display 35, installed on the Vehicle:

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

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* When configuring MasterCAN Display 35 installed on Vehicle. When configuring Units connected by S6 Technology, power supply of onboard network (battery) can be turned on.

MasterCAN Display 35 is connected to PC in the following order

1) Connect the adapter to MasterCAN Display 35.
   Plug of service cable of adapter is connected to S6 SK connector to **S6** socket. Power supply of MasterCAN Display 35 and service adapter can be either done through using free plug of S6 SK connector or using wires of service adapter (see figure 10 a).

   During the setup of MasterCAN Display 35 connected using S6 Technology the connector of the adapter service cable is to be connected to the corresponding free S6 input connector (see figure 10 b). Power supply for the MasterCAN Display 35 and adapter is provided through the S6 cable system.

2) Plug the adapter to USB port of PC with the USB cable.
   Note – it is allowed to connect adapter to USB-port of your PC after turning on power supply of MasterCAN Display 35 and running Service S6 MasterCAN software.

3) Connect power supply and ground wires to vehicle electrical system or battery.

4) Power on the Vehicle (battery).

LED-indicator of red color (marked POWER) placed on the front panel of the adapter will light up after the adapter is connected to PC. If the indicator does not light up, check that USB cable is properly connected to PC.
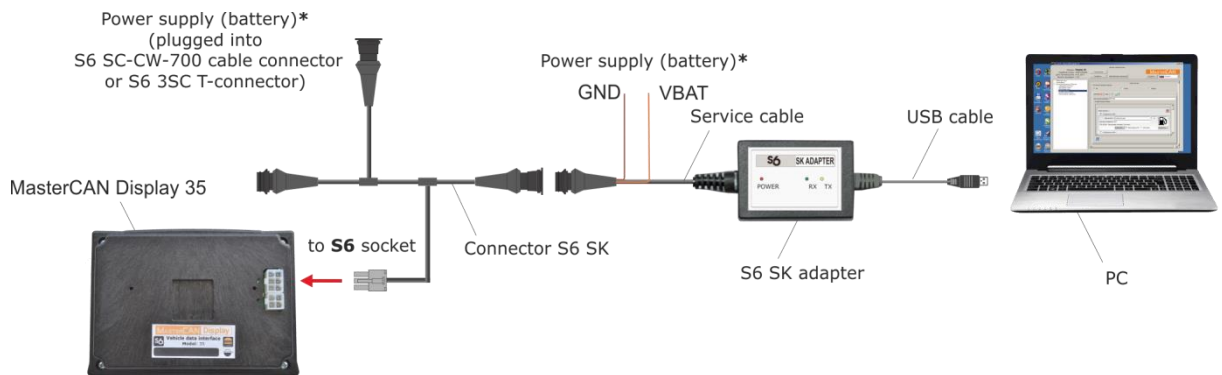
a) connecting MasterCAN Display 35 using S6 SK
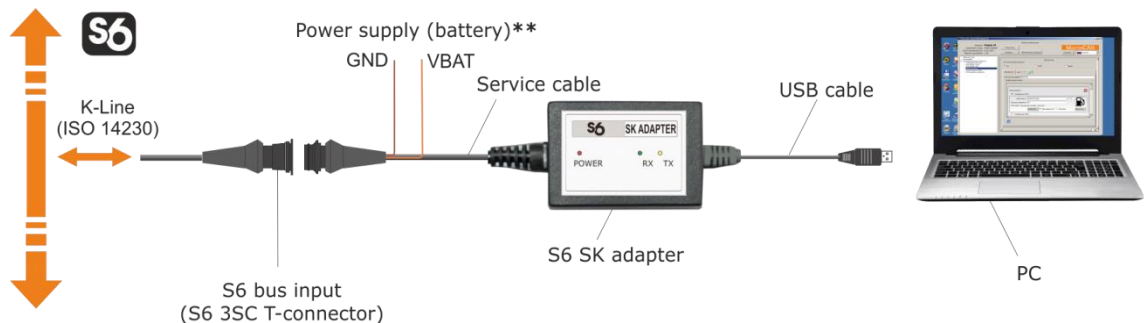
b) connecting MasterCAN Display 35 using S6 SK via S6 Technology

Figure 10 – Schemes of MasterCAN Display 35 connection to PC

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* For connecting power supply (battery) you can choose any of marked places.
****** No need to connect. Power supply (battery) is carried out though S6 cabling system.
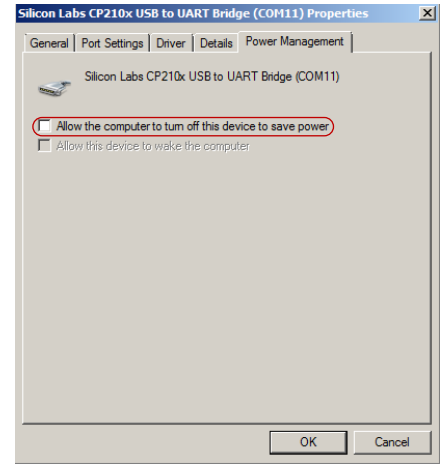
Windows automatically detects adapter connected to PC's USB port as USB device and enables virtual COM port driver for it. The virtual COM port will be displayed in the list of ports of Windows Device manager (see figure 11).

⚠️ **ATENTION:** It is recommended to untick power save check box for Service S6 MasterCAN in the virtual COM-port properties for energy safety purpose (see figure 11 b).
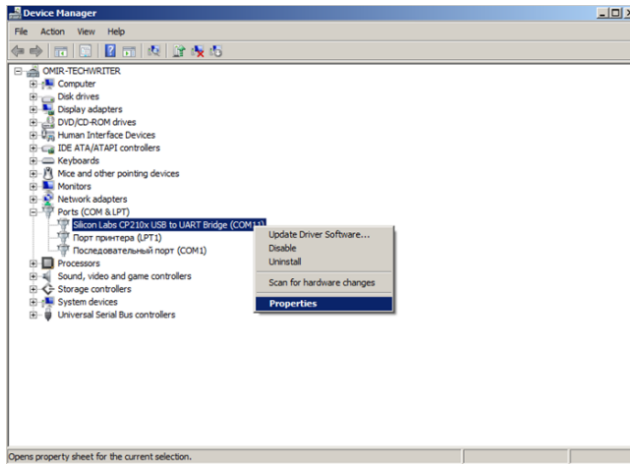
a) selecting port properties   b) disabling power save option

Figure 11 — Setting up a virtual COM-port in the Device Manager

Service adapters are ready for use since turning on power supply. LED-indicators' signal description is specified in table 6.

Table 6 – LED-indicators' signal description S6 SK service adapter

LED Indicator			Signal description
Marking	**Status**	**Light color**	
POWER	🟥	Red	Power supply is on
	No signal		Power supply is off (or voltage is less than minimum required)
RX	🟩 🟩 🟩	Green	MasterCAN Display 35 data is being received
	No signal		No data from MasterCAN Display 35
TX	🟨 🟨 🟨	Yellow	Data is being transmitted to MasterCAN Display 35
	No signal		No data to MasterCAN Display 35

3.2 Connection parameters for CAN j1939/S6 interface

For connecting MasterCAN Display 35 to automotive CAN bus or using S6 Technology, go to **Interface** menu of Service S6 MasterCAN software to configure CAN j1939/S6 parameters (see figure 12):

1) From **CAN Protocol Type** drop-down list, select **SAE 1939+S6** Data transfer protocol.

2) To identify the MasterCAN Display 35 within a network of several Units connected using S6 Technology, enter the unique DUT-E network address in the field **S6 Address (SA)** from the range of values 109 or 110 (109 by default).

3) From **CAN Baudrate** drop-down list, select the speed of data transfer from the following options: 100; 125; 250; 500; 1000 kbit/s (by default — 250 kbit/s)

4) From the drop-down menu **CAN Mode** select necessary mode of data acquisition via CAN j1939/S6 interface:

- **Active (CAN Requests Enable)** – MasterCAN Display 35 sends active request to standard CAN bus or to Units, which are connected using S6 Technology. Active requests are necessary for receiving data which is sent only upon receiving appropriate request.
  Note – in contrast to Units connected using S6 Technology, sending active request to standard CAN bus may cause malfunction of Vehicle electronic units.
- **Passive (CAN Requests Disable) –** MasterCAN Display 35 does not send active requests to standard CAN bus or to Units, connected using S6 Technology. In this mode, MasterCAN Display 35 is identified by its network address by other Units and receives data from them in automatic mode.
- **Silent (Sniffer)** — MasterCAN Display 35 is not identified by other Units. Data are received in sniffer mode.

5) Through **Enable Termination Resistor** drop-down list, turn on or off (by default - Off) built-in terminating resistor (120 Ohm) between the CAN LOW and CAN HIGH pins of **S6** socket of MasterCAN Display 35. Turning on terminating resistor ensures correct data transfer via CAN 2.0B (SAE J1939) communication line when using a signal cable that does not have terminating resistors at its ends.
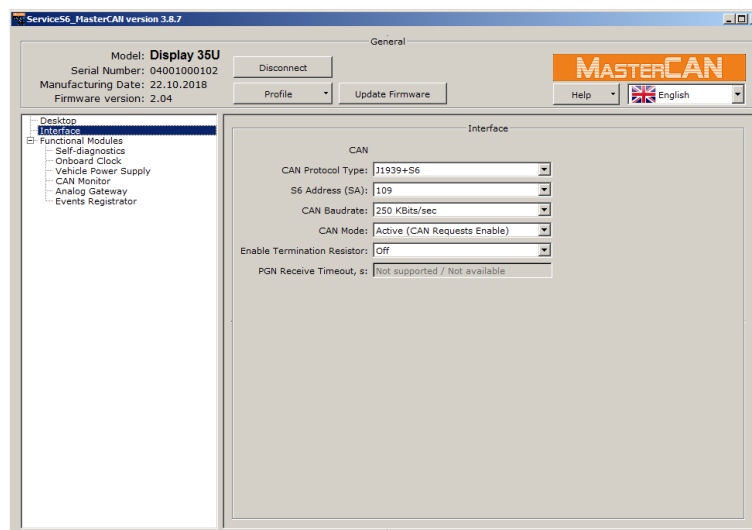

Figure 12 — Configuration of the MasterCAN Display 35 connection parameters via CAN j1939/S6 interface

3.3 Configuring informational screens

For configuring informational screens of MasterCAN Display 35 (will be discussed below taking MasterCAN Display 35 U modification as an example), submenu CAN Monitor FM is used. It allows to create up to 201 screens (200 containing SPN from CAN j1939/S6 interface and 1 screen with data converted from analog inputs). Each screen can contain 1 or 2 parameters (SPN) of Vehicle.

Screens configuration sequence:

1) For creating a screen, select necessary field in **Input Data Source** area (SPN 521291) situated in the upper part of **CAN Monitor** area (see figure 13):

- **S6** – for displaying SPN received from Units using S6 Technology;
- **T-CAN** – for displaying SPN received from standard automotive CAN bus;
- **Inputs** – for displaying data converted into SPN from voltage/frequency signals of standard and additional analog sensors of Vehicle.
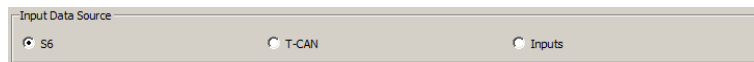

Figure 13 — Selecting incoming data source for MasterCAN Display 35

> **ATTENTION:**
> **1)** After selecting incoming data source, the Software will show current configurations of screens for selected source **only**.
> **2)** If **Inputs** incoming data source is selected, it is possible to configure only one screen for SPN, received as result of conversion from input channels MasterCAN Display 35 (see annex A, settings of Analog Gateway FM).

2) By pressing button [+] **CAN Monitor** area, you can create new group of screens for displaying homogenous SPN from selected source (except **Inputs** source).

Name each new group of screens in **Screen Group Name** field (SPN 521293). Name of the group should not contain more than 8 characters. You can configure up to 20 screen groups in MasterCAN Display 35.

By default, MasterCAN Display 35 has the following configured screen groups (see figure 14):

- for **S6** input data source:

  - **Tanks** — output Parameters (total volume of fuel in the tanks, volume of fuel in each tank, temperature of fuel in the tanks) of DUT-E CAN / DUT-E 2Bio / DUT-E GSM fuel level sensors are displayed;
  - **Fuel Line** — output Parameters of DFM CAN / DFM D CAN fuel flow meters are displayed (average fuel consumption per hour, fuel consumption per hour in "supply" and "return" lines, onboard circuit voltage), as well as Counters of fuel consumption and time of operation (total and specifically for "Idling", "Optimal", "Overload" "Tampering", "Interference" modes of operation, as well as Counters that can be cleared);
  - **Telematics** — Parameters (rpm, actual torque and time of engine operation, fuel consumption per hour, total fuel consumption, fuel level, oil level and pressure, temperature and level of the engine cooling agent) received from the Vehicle standard CAN-bus via MasterCAN CC vehicle data interface or FMSCrocodile CCAN contactless reader/converter are displayed;

- **DAC** — Parameters (axles load, oil pressure in the engine, temperature of the engine cooling agent) received through conversion of analog signals from standard and additional (GNOM DDE / GNOM DP) Vehicle sensors by MasterCAN DAC15 / MasterCAN DAC2113 digital to analog converters are displayed;

- for **T-CAN** input data source:
  - **T-CAN** — Parameters (fuel consumption per hour and fuel consumption for the trip, speed according to tachograph, total mileage and mileage for one trip, rpm, time of operation and engine actual torque, axles load, oil pressure in the engine, temperature of the engine cooling agent etc.) that can be received from the Vehicle standard CAN-bus using CANCrocodile / CANCrocoLITE contactless reader or by means of contact connection are displayed;

    Note — when you connect to CAN-bus using CANCrocodile / CANCrocoLITE or by means of contact connection, the display of data is only possible on the screens for T-CAN source of input data. Simultaneous connection of other Units to **S6** connector is not allowed in this case.

- for **Inputs** input data source:
  - **Inputs** — Parameters of the Vehicle axles load resulting from conversion of analog signals from GNOM DP / GNOM DDE axle load sensor or DUT-E AF fuel level sensor by MasterCAN Display 35 are displayed.

    Note — Before that, you have to select the type of input signal which corresponds to the physical value of the analog signal which is being converted in the settings of Analog Gateway FM (see A.5)

All configured groups of screens are displayed as tabs; each of them has its name and button ☒ for deletion.

Note — **Inputs** group cannot be deleted.

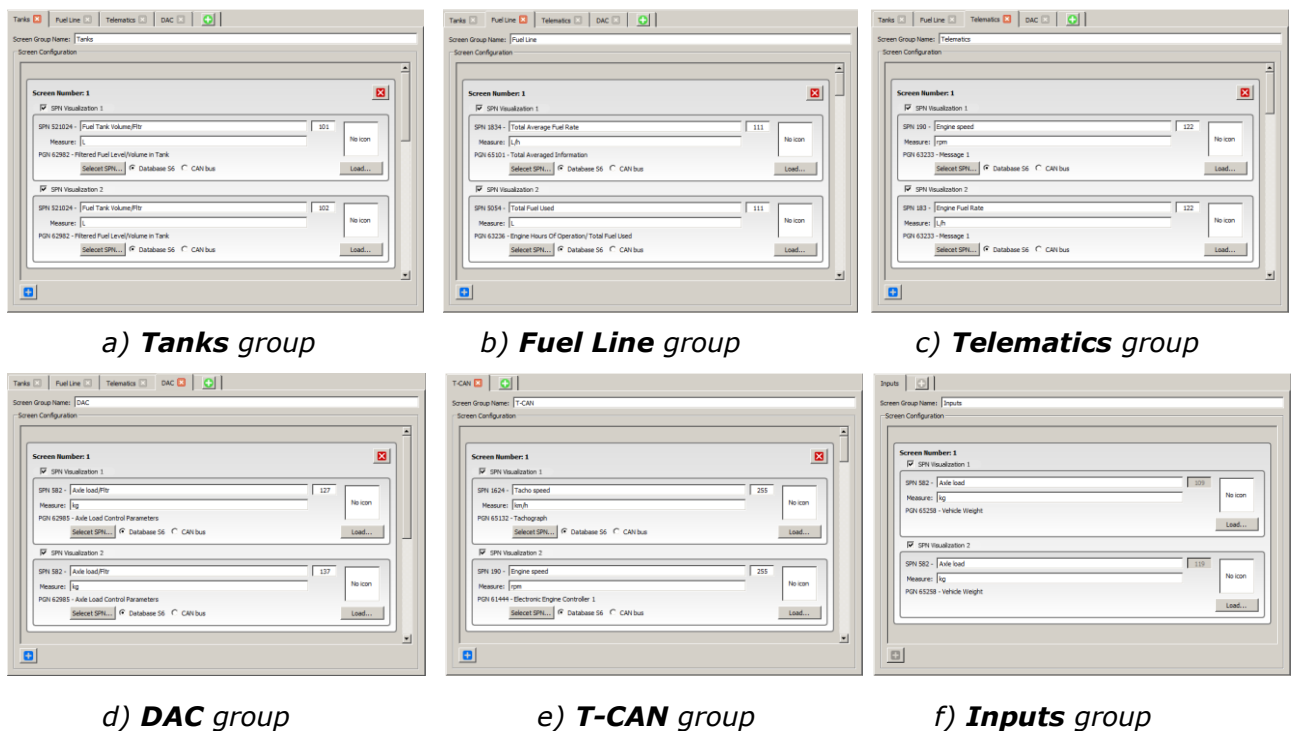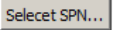| *a)* ***Tanks*** *group*	*b)* ***Fuel Line*** *group*	*c)* ***Telematics*** *group*
d) ***DAC*** *group*	*e)* ***T-CAN*** *group*	*f)* ***Inputs*** *group*

Figure 14- Default configurations of MasterCAN Display35 screen groups

3) For adding new screen to the group (except **Inputs** group) use button, which is in the lower left part of **Screen Configuration** area. One group can contain 10 screens maximum. Configurations of all screens are identical. Each added screen is automatically submitted with own number (SPN 521298).

For delete the screen (except **Inputs** group) use button, which is in the right of his number.

4) Each screen has two **SPN** fields which can be shown on MasterCAN Display 35 display. To configure it, enter parameter source (**Database S6** and **CAN bus** fields) and press Select SPN... button, which brings up **Select SPN/PGN** window (see figure 15).

To select SPN from **Database S6** source it can be searched according its number or name using search field of **Select SPN/PGN** window. Highlight PGN which contains SPN you need and confirm your choice by pressing OK button. For SPN with the same numbers within one PGN, whenever you place the cursor on them, the prompt shows the specificator (see figure 15 b).
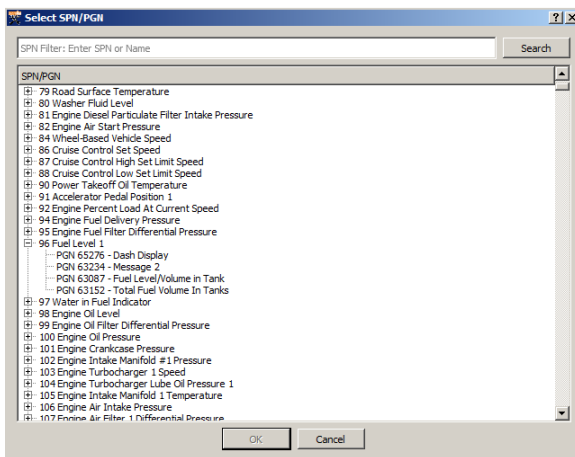
a) a list of SPNs in S6 Database
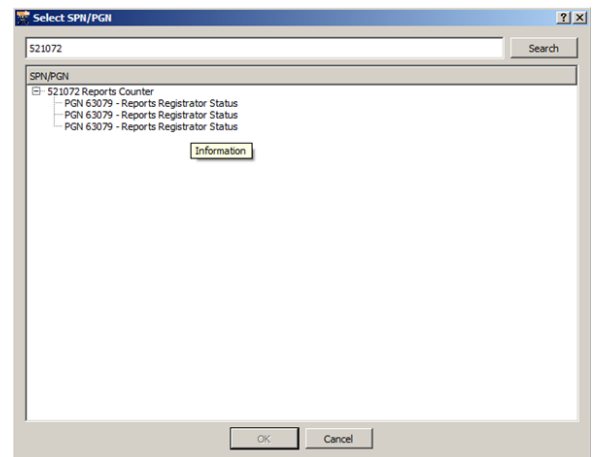
b) an example of displaying qualifier of SPNs with the same names
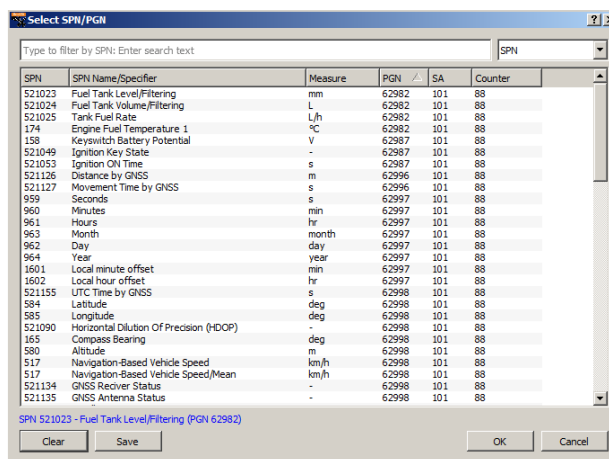
c) SPN selection from current CAN bus data

Figure 15 — Select SPN/PGN window for adding to Screen

In order to select SPN from the source **CAN bus**, there is an option to filter it from the list of current PGN by SPN number, or by SPN/Specificator name, or by PGN number or by network address SA of the source Unit.

In the window **Select SPN/PGN**, while selecting SPN from the source **CAN bus** using [Save] button, there is an option to save the current PGN list in (***.csv**) file on the PC disc. [Clear] button serves to clear the current list of PGN and reset their counters.

> ⚠️ **IMPORTANT:**
> **1)** When selecting SPN from **Database S6** source it is necessary to **manually** enter SA network address of Unit source in the field located to the left from SPN name (SPN 521188).
> **2)** Selecting SPN from **CAN bus** source is possible only when MasterCAN Display 35 is connected to Units or standard CAN bus and **if any input data are available** through CAN j1939/S6 interface. In this case SA network address of Unit will be entered automatically.

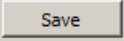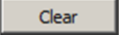After entering SPN in respective configuration in **Screen Configuration** field, you can see SPN name and number, its unit of measure (SPN 521297), and PGN name and number, from which SPN is read out.

> ⚠️ **WARNING:** You can select SPNs having a **digital value** and a length of **no more than 4 bytes** only. If you select SPN that does not meet specified conditions, a corresponding warning window will appear (see figure 16).
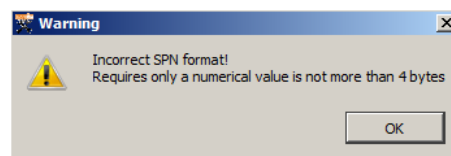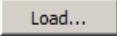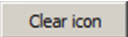
Figure 16 — Warning on choosing SPN of inappropriate format

5) If necessary, user can change name of selected SPN (24 characters maximum), units of measure (5 characters maximum) and SA network address of SPN source.

> ⚠️ **WARNING:** For correct display of text on display, use only Cyrillic or Latin symbols when configuring screens.

For SPN visualization with your own icon, press [Load...] button and upload icon from local drive of your PC. Otherwise, MasterCAN Display 35 will show only SPN number. Icon requirements – black-and-white graphics, 24x24 pixels, ***.png** file format. To delete icon, right-click it and press [Clear icon] button.

To enable displaying necessary SPN on display of MasterCAN Display 35, tick the box near **SPN Visualization 1** or **SPN Visualization 2**.

> ⚠️ **WARNING:** All changes made to MasterCAN Display 35 configurations are applied **only after saving profile to Unit!**

4 Displaying informational screens

4.1 Main menu

If MasterCAN Display 35 is connected properly, the device will turn on after vehicle's onboard electrical network is ON. In 3…5 s after power is supplied to LCD display, after the screen with "MasterCAN" logo is displayed, the screen that was active during the previous session before power supply switching off is displayed.

When you switch on MasterCAN Display 35 for the first time, **Main menu** is displayed (see figure 17) which contains information on the device modification, current date and time, as well as the following groups of screens:

- — to display screens containing values of SPN received from Units using S6 Technology (see figure 18);

- — to display screens containing values of SPN received from the vehicle CAN-bus;

- — to display the screen containing SPN values converted from analog/frequency signals of standard and/or additional vehicle sensors;

- — to display screens containing lists of active saved malfunctions (DTC) of external Units.

- — to display screens containing lists of emergency, important and information Events of external Units.

- — to display **screen of settings** (see figure 19) by means of which the user can:

  - enable/disable messages of Events from external Units (ON by default);

  - enable/disable messages of malfunctions from external Units (ON by default);

  - enable/disable sound signal in case of incoming messages (OFF by default);

  - enable/disable sound signal in case of pressing buttons (OFF by default);

  - select automatic/manual display backlighting (AUTO by default);

  - manual display backlighting adjustment.

Figure 17 — View of Main menu of MasterCAN Display 35
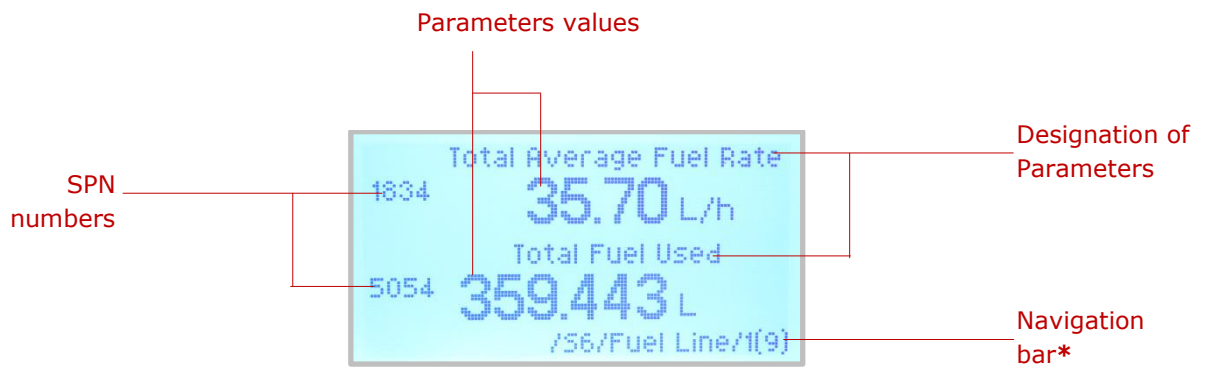
* Composition of the navigation bar: Source of input data/Group of screens/Screen number (Number of screens in the group)

Figure 18 — Example of data display on MasterCAN Display 35 information screen

Figure 19 — View of MasterCAN Display 35 screen of settings

4.2 Screen navigation
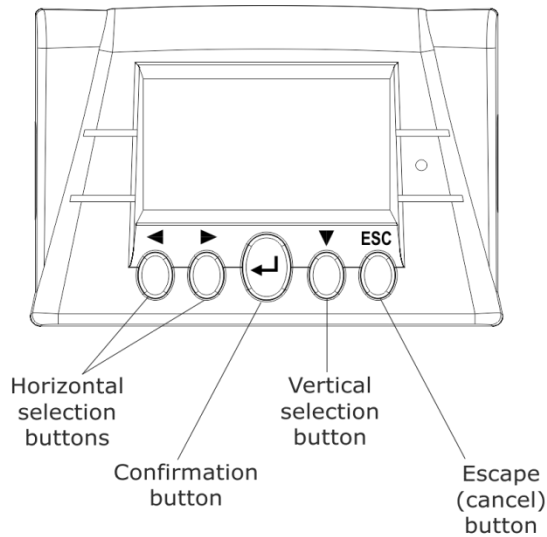
Example 1 Displaying DFM CAN/DFM D CAN data

press 1x ↵   press 1x ▼   press ▶ until
                    press 1x ↵   necessary
                                        screen appears
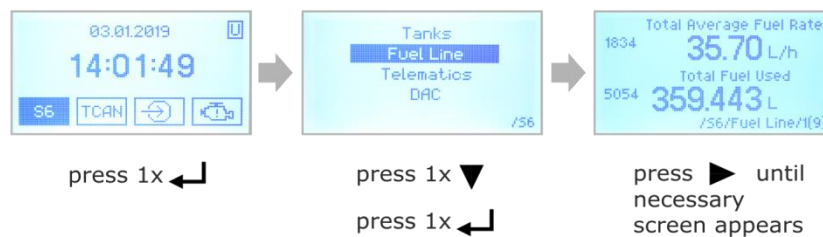
Example 2 Switching to DUT-E CAN/DUT-E 2Bio CAN data

press 1x **ESC**   press 1x ↵   press ▶ until
press 3x ▼   necessary
                                             screen appears
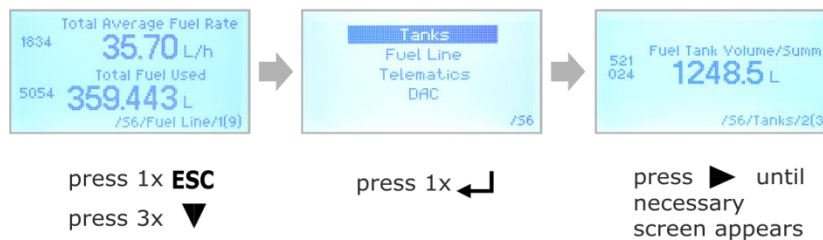
Example 3 Switching to data screens of converted signals of analog sensors

press 2x **ESC**   press 1x ↵
press 2x ▶

*Figure 20 — Navigation keys description and examples of navigation
between screens of MasterCAN Display 35*

Note — In case you need, you may switch over MasterCAN Display 35 display into "sleeping" (energy saving) mode by pressing and holding **ESC** button during (2…3) s. In this mode the device remains active and operable. The screen "wakes up", whenever you press and hold **ESC** button again.

4.3 External Units operability check

1) Quality Control of Units operation: in [icon] group of screens up to 15 active (i.e. current) malfunctions and up to 15 saved malfunctions (if any) of external Units connected to MasterCAN Display 35 by means of S6 Technology can be displayed.

For each active/saved malfunction (DTC) the following data are displayed on the separate information screen (see figure 21):

- SA network address of Unit;
- malfunction code (SID);
- malfunction name (FMI).

Malfunctions contained in the lists are displayed in chronological sequence, starting from the most recent.

Those malfunctions that occurred, when MasterCAN Display 35 was disconnected from the network of Units, may also be displayed in the list of saved Units malfunctions.

As soon as the maximum possible number of malfunctions displayed is reached, new malfunctions overwrite the earliest deleted malfunctions. The user cannot clear lists of active and saved malfunctions.

Figure 21 — Example of MasterCAN Display 35 information screen displaying data of external Unit active malfunction

2) Quality Control of MasterCAN Display 35 operation:

By pressing and holding ◀ ▶ **ESC** key combination during (2…3) s you may switch on service information screens of MasterCAN Display 35 (see figure 22); the data on these screens comply with data of its Self-diagnostics FM (see A.1), Onboard clock FM (see A.2) and Vehicle power supply FM (see A.3):

- service information screen #1 contains:
  - serial Unit number of Unit;
  - Unit model;
  - designation of line of products;
  - designation of Manufacturer;
  - version of inbuilt software (firmware);
  - date of manufacturing;
  - network address;
  - version of loader.

- service information screen #2 contains:
  - current air temperature inside the casing;
  - current power supply voltage;
  - current date and time;
  - total time of operation starting from the moment of manufacturing;
  - number of Unit restarts.

- service information screen #3 contains a list of active malfunctions (if any) MasterCAN Display 35; for each malfunction the following data are displayed:

  - malfunction code (SID);

  - malfunction designation (FMI).

Figure 22 — Example of displaying service information screens by MasterCAN Display 35

4.4 Events monitoring

Events (if any) from external Units connected to MasterCAN Display 35 using S6 Technology

may be displayed in ⚠ group of screens:

- emergency (up to 20) — e.g. pressing the emergency button;
- important (up to 20) — e.g. onboard circuit failure (with voltage specified) or too high onboard circuit voltage;
- information (up to 20) — e.g. power ON and OFF or Unit connection/disconnection from S6-bus.

For each Event, the following data are specified (see figure 23): source Unit network address, designation of Event, date/time of occurrence, as well as additional information (if any).

Events can be registered only during MasterCAN Display 35 operation in the network of Units.

Events are displayed in chronological sequence, starting from the most recent. As soon as the maximum possible number of Events displayed is reached, new Events overwrite the earliest deleted Events. The user cannot clear lists of important Events.

Figure 23 — Example of data display by MasterCAN Display 35 information screen containing data of an important Event from an external Unit

5 Packaging

MasterCAN Display 35 delivery sets come in cardboard box of the following shape (see figure 25):

Figure 24 — MasterCAN Display 35 packaging

Label sticker with information on the product name, certificates, used technologies, serial number, firmware version, manufacture date, weight as well as Quality Control seal and QR code is stuck on two sides of the MasterCAN Display 35 box (see figure 26).

Figure 25 — MasterCAN Display 35 packaging label

Note — label design and contents can be modified by the Manufacturer.

6 Storage

MasterCAN Display 35 is recommended to be stored in dry enclosed areas.

MasterCAN Display 35 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 Display 35 in the same room with substances that cause metal corrosion and/or contain aggressive impurities.

MasterCAN Display 35 shelf life must not exceed 24 months.

7 Transportation

Transportation of [MasterCAN Display 35](#) is recommended in closed transport that provides protection for MasterCAN Display 35 from mechanical damage and precipitation.

When transporting by air, MasterCAN Display 35 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 Display 35 should be sealed.

8 Utilization/re-cycling

MasterCAN Display 35 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 Display 35 does not contain precious metals in amount that should be recorded.

Contacts

Manufacturer

Tel/Fax: +375 17 240-39-73

https://www.jv-technoton.com/

http://s6.jv-technoton.com/

E-mail: marketing@technoton.by

Technical support

E-mail: support@technoton.by

Annex A
SPN of MasterCAN Display 35 Functional modules

Data receiving, processing and displaying, also Parameter configuration and self-diagnostics of MasterCAN Display 35 is ensure by coordinated operation of Functional Modules (FM).
Parameter form (SPN) of FM MasterCAN Display 35 matches with Data base (DB) S6 Technology.

A.1 Self-diagnostics FM

Self-diagnostics FM — designed for user authorization, identification of MasterCAN Display 35 passport data, operation time recording and also active and saved malfunctions.
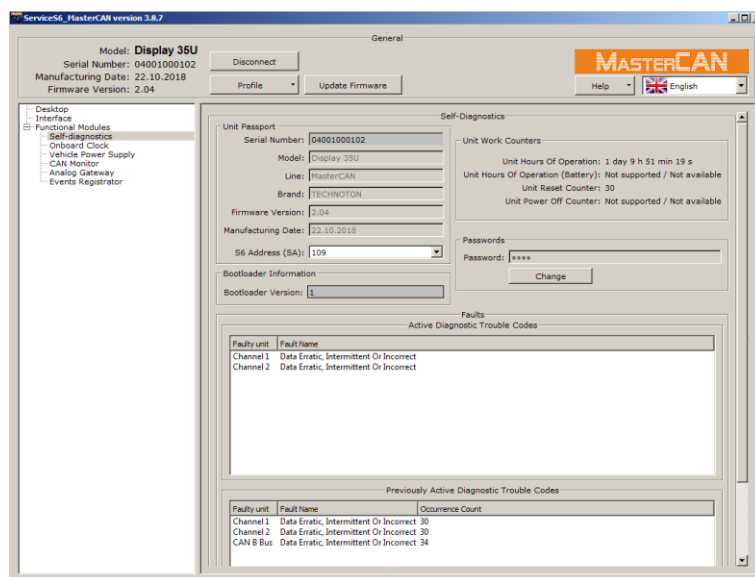
Figure A.1 — Window of settings of Self-diagnostics FM in Service S6 MasterCAN software

*Table A.1 — Self-diagnostics FM. Displayed and/or editable SPN
            with the help of Service S6 MasterCAN software*

SPN	Name	Factory value	Unit of measure	Clarification
unit				

SPN	Name	Factory value	Unit of measure	Clarification
Unit. Passport PGN 62995				
521120	Serial number	On the fact	No	Serial number is a set of numbers that is used for identification of specific MasterCAN Display 35. Serial number MasterCAN Display 35 has the following format: AABBB C DDDDD, where: AA - code of MasterCAN model; BBB – digits that reflect changes product changes; C – Manufacturer code; DDDDD – sequential number. Setting is not available for editing.
521345	Model	Display 35	No	Model – this is version of the MasterCAN Display 35 inside of MasterCAN product line. Each model has its own functional and constructive features. Feature of MasterCAN Display 35 – visual display of any User-selected SPN received through CAN j1939/S6 interface. Setting is not available for editing.

SPN	Name	Factory value	Unit of measure	Clarification
521123	Line	MasterCAN	No	Name of the product line. The line represents a group of similar products for vehicle information buses data conversion, produced under general trademark MasterCAN. Setting is not available for editing.
521344	Mark	TECHNOTON	No	Name of MasterCAN Display 35 Manufacturer. Setting is not available for editing.
521121	Firmware version	On the fact	No	Version of built in Software MasterCAN Display 35. Setting is not available for editing.
521125	Date of production	On the fact	No	Date (day, month, year) of MasterCAN Display 35 production. Setting is not available for editing.
521188	Address at S6 (SA) bus	109	No	Network address MasterCAN Display 35 which is connected via S6 Technology. Network address value can be selected by user from the values 109 or 110.
Unit. Counters PGN 62994				
521116	Unit working time	On the fact	s	Counter of summarized working time of the MasterCAN Display 35 since its production moment. The user cannot reset the value of this counter. It can be reset by the Manufacturer or RSC only.
521118	Number of Unit restarts	On the fact	No	Counter of MasterCAN Display 35 processor restarts at a time when the power is On or there is an impact of conducted interferences of the vehicle's on-board network. Restarts accounting is carried out since production date of MasterCAN Display 35. The user cannot reset the value of this counter. It can be reset by the Manufacturer or RSC only.
Unit. Passwords PGN 63017				
521593/3.3	Password/ 3.3 Installer	1111	No	Password is entered for user authorization while establishing connection session between MasterCAN Display 35 and service Software for configuring the Unit. Password is a specific combination of four digits. By default, used: Login – 0, password – 1111. User can change password of the MasterCAN Display 35. After entering and confirming the new password is recorded into internal memory of the MasterCAN Display 35.
Active DTC PGN 65226				
521044	Malfunction code (SID)	On the fact	No	List of current MasterCAN Display 35 malfunctions are displayed at the settings field (in case of its presence — up to 10). For each active malfunction is indicated following: - faulty nod; - malfunction name. This setting allows to monitor MasterCAN Display 35 working performance. In case of lack of active malfunctions, the following message is displayed "No malfunctions".
Saved DTC PGN 65227				
521044	Malfunction code (SID)	On the fact	No	List of saved MasterCAN Display 35 malfunctions are displayed at the settings field (in case of its presence — up to 20). For each saved malfunction is indicated following: - faulty nod; - malfunction name; - malfunction counter. This setting allows to monitor MasterCAN Display 35 working performance. In case of lack of saved malfunctions, the following message is displayed "No malfunctions".
Bootloader information PGN 63009				
521122	Bootloader Version	On the fact	No	Displays current version of the bootloader used for the correct start of service software, as well as when updating firmware of the Unit.

A.2 Onboard clock FM

Onboard clock FM — designed for generation of signals of time and its transmission to other functional modules MasterCAN Display 35.
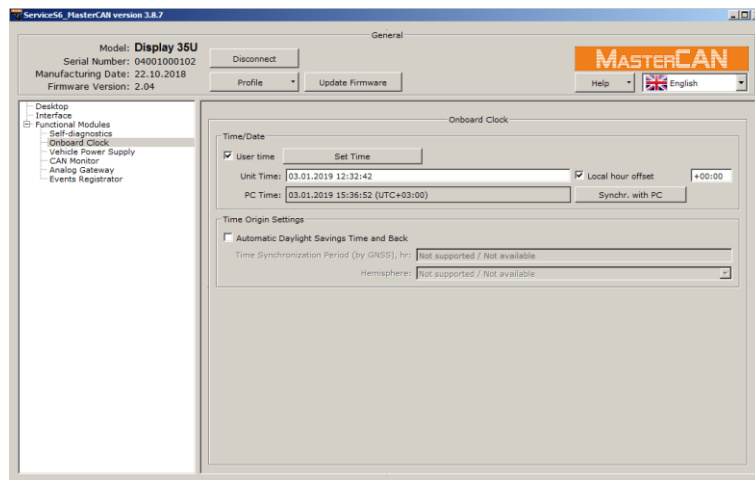
Figure A.2 — Window of settings of Onboard clock FM in Service S6 MasterCAN software

*Table A.2 — Onboard clock FM. Displayed and/or editable SPN
         with the help of Service S6 MasterCAN software*

SPN	Name	Factory value	Unit of measure	Range	Clarification
			Time/Date PGN 65254		
959	Seconds	On the fact	s	0…62.5	Present time — seconds**.
960	Minutes	On the fact	min	0…250	Present time — minutes**.
961	Hours	On the fact	h	0…250	Present time — hours**.
963	Month	On the fact	month	0…250	Present date — month**.
962	Day	On the fact	d	0…62.5	Present date — day**.
964	Year	On the fact	year	1985…2235	Present date — year**.
1601	Local minute offset	0	min	0…59	Time displacement (in minutes) in relation to Coordinated Universal Time that matches with local time (Time zone). It is activated and available for editing when configuring present time manually and when synchronizing time with PC
1602	Local hour offset	+3	h	-24…+24	Time displacement (in hours) in relation to Coordinated Universal Time that matches with local time (Time zone). It is activated and available for editing when configuring present time manually and when synchronizing time with PC
			Time origin settings PGN 63011		
521350	Automatic daylight savings time and back	Off	No	On/Off	Daylight saving time automatic adjustment ON/OFF.
* Used during Events registration. By default, time is set in UTC format (Coordinated Universal Time standard) and displayed according to local displacement. Present time is available for user for editing manually or synchronizing of date/time with computer clock.					

A.3 Vehicle power supply FM

Vehicle power supply FM — is designed for monitoring of onboard power network voltage, current mode of power network, operation time of Vehicle in different power network modes, quantity of engine starts*****, exceeding permissible time of continuous operation of starter*****.

* Not supported by the current firmware version (version 2.04) of MasterCAN Display 35.

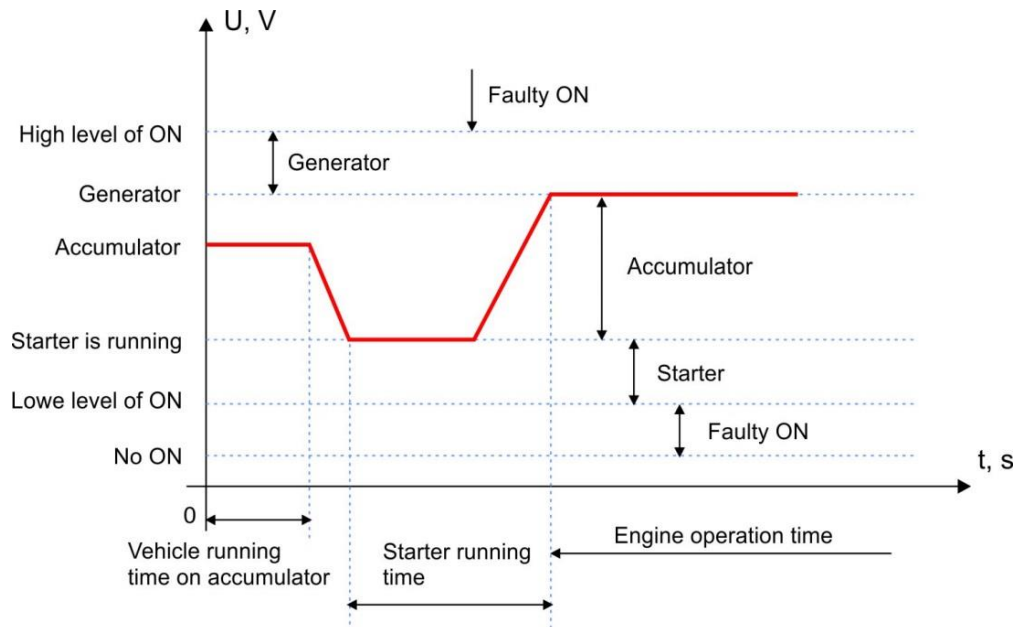*Figure A.3 — Operation modes on onboard network (ON) voltage level*
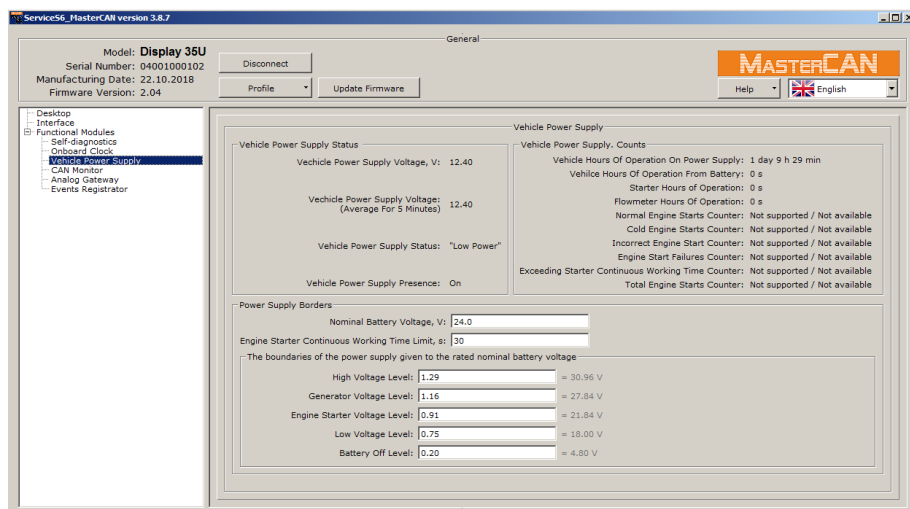

Figure A.4 — Window of settings of Vehicle power supply FM in Service S6 MasterCAN software

Table A.3 — Vehicle power supply FM. Displayed and/or editable SPN
with the help of Service S6 MasterCAN software

SPN	Name	Factory value	Unit of measure	Range	Clarification
Vehicle power supply status PGN 63089
521055	Vehicle Power Supply Voltage	On the fact	V	0...3212.75	Shows current value of ON voltage.
521055/2.9	Vehicle Power Supply Voltage/ 2.9 Average For 5 Minutes	On the fact	V	0...3212.75	Shows average value of ON voltage within previous 5 minutes.
521056	Vehicle Power Supply Status	On the fact	No	Off/ Lowe level/ Accumulator/ Starter/ Generator/ High level	Shows current mode of ON in accordance with user-defined borders of ON voltage levels of Vehicle (see figures A.3 and A.4).
521076	Vehicle Power Supply Presence	On the fact	No	On/Off	Displays the current state of the board (On/Off) in accordance with the user-set voltage level of the TC system trip (see figures A.3 and A.4).
Power supply borders PGN 63067
521075	Nominal Battery Voltage	24	V	0...60	Field for entering a nominal value of accumulator voltage of Vehicle (U_{nom}=12V/24V).
521063	High Voltage Level	1.29	-	0...1.99	Field for entering value of high voltage level of onboard network (1.29·U_{nom}) (see figures A.3 and A.4). Entered value of voltage is used as a threshold for recording "Faulty ON" Event.
521064	Generator Voltage Level	1.16	-	0...1.99	Field for entering value of voltage level of generator, i.e. when engine of Vehicle is running (1.16·U_{nom}) (see figures A.3 and A.4).
521065	Engine Starter Voltage Level	0.91	-	0...1.99	Field for entering value of voltage level starter is running, i.i when Vehicle's engine is starting (0.91·U_{nom}) (see figures A.3 and A.4).
521067	Low Voltage Level	0.75	-	0...1.99	Field for entering value of low voltage level of ON (0.75·U_{nom}). Entered value of voltage is used as a threshold for recording "Faulty ON" Event. (see figures A.3 and A.4).
521068	Battery Off Level	0.20	-	0...1.99	Field for entering value of voltage level when ON switches off (0.20·U_{nom}). (see figures A.3 and A.4).
521074	Engine Starter Continues Working Time Limit	30	s	5...30	Field for entering value of starter's permissible time of continuous operation, above which the starter may fail (see figures A.3 and A.4). Entered value is used as a threshold for recording "Exceeding permissible time of continuous operation of starter" Event.
Vehicle power supply. Counts PGN 62976
521173	Vehicle hours of operation on power supply	On the fact	s	0...4211080000	Counter of total operating time of Vehicle from onboard network since sensor installation to the Vehicle. User cannot reset the value of this Counter*.
521172	Vehicle hours of operation from battery	On the fact	s	0...4211080000	Counter of total operating time of Vehicle from accumulator since sensor installation to the Vehicle. User cannot reset the value of this Counter*.
521170	Starter hours of operation	On the fact	s	0...4211080000	Counter of total operating time of starter since sensor installation to the Vehicle. User cannot reset the value of this Counter*.
521171	Starter hours of operation	On the fact	s	0...4211080000	Counter of total operating time of Vehicle's engine since sensor installation to the Vehicle. User cannot reset the value of this Counter*.
***** Counter can be reset by the Manufacturer of RSC.

A.4 CAN Monitor FM

CAN Monitor FM — Used for showing on display of MasterCAN Display 35: data from standard CAN bus, from CAN j1939/S6 Telematics interface and digital messages converted from analog signals of standard vehicle sensors.
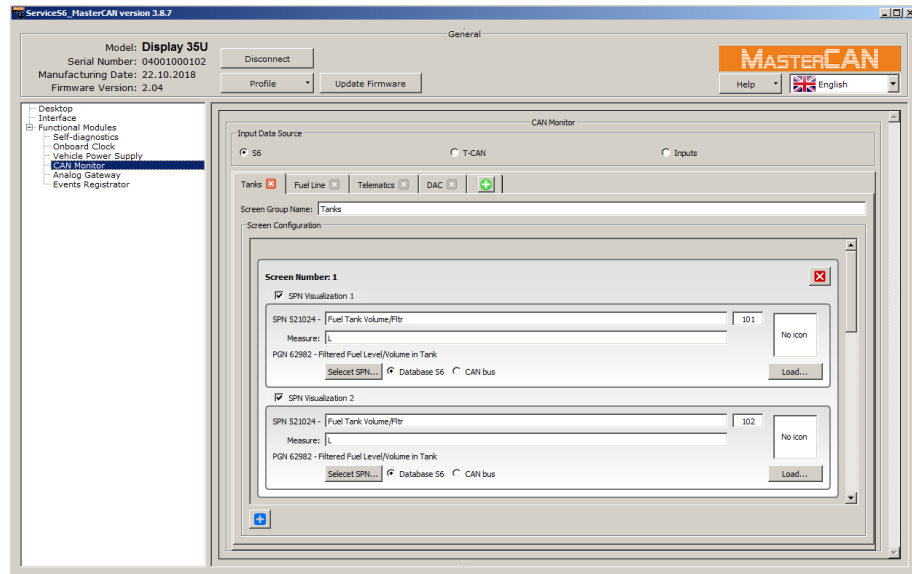
Figure A.5 — Window of settings of CAN Monitor FM in Service S6 MasterCAN software

Table A.4 — CAN Monitor FM. Displayed and/or editable SPN
with the help of Service S6 MasterCAN software

SPN	Name	Factory value	Unit of measure	Clarification
				Screens Groups PGN 63209
521291	Input Data Source	S6	No	For creating a screen, select input SPN source: - S6 – for displaying SPN received from Units; - T-CAN – for displaying SPN received from standard automotive CAN bus; - Inputs – for displaying data converted into SPN from voltage/frequency signals of standard and additional analog sensors of Vehicle.
521293	Screen Group Name	On the fact	No	Name each new group of screens for displaying homogenous SPN from selected source (except Inputs source). Name of the group should not contain more than 8 characters.
521355	Array Elements Count	On the fact	pcs.	Maximum quantity group of screens, which can be configured in MasterCAN Display 35: - for S6 and T-CAN sources – up to 20 groups of screens; - for Inputs source – 1 group of screens.
521292	Screen Quantity	On the fact	pcs.	Maximum quantity of screens, which can be configured in MasterCAN Display 35 for each group: - in groups from S6 and T-CAN sources– maximum 10 screens; - in group from Inputs source – 1 screen.
				Screen Configuration PGN 63208
521298	Screen Number	On the fact	No	Automatically assigned number when adding each new screen
521304	SPN Visualization	No	No	Field for enabling displaying necessary SPN on the display. After saving profile to Unit, SPN is shown on the display.

SPN	Name	Factory value	Unit of measure	Clarification
521347	SPN Value	On the fact	On the fact	Value of SPN, selected for showing on the display. Only those SPNs can be selected, which has only numeric value and length of up to 4 bytes.
521294	SPN Name	On the fact	On the fact	Field for editing SPN name. Name should be no longer than 24 characters. It is recommended to use only Cyrillic and Latin characters. After saving profile to Unit, SPN name will show up on the display.
521297	Measure	On the fact	On the fact	Field for editing SPN's units of measure. Maximum 5 characters are allowed. It is recommended to use only Cyrillic and Latin characters. After saving profile to Unit, SPN unit of measure will show up on the display.
521150	PGN	On the fact	No	PGN which contains SPN selected for displaying on the display.
521188	S6 Address (SA)	On the fact	No	Network address of electronic unit in CAN bus or Unit, which is a source of SPN selected for displaying.
521308	Icon	On the fact	No	Picture (uploaded from local drive of PC) for visualizing SPN on the display. Icon requirements – black-and-white graphics, 24x24 pixels, in PNG format.
521303	Icon Presence	On the fact	No	After uploading icon from local drive of PC and saving profile to Unit, the icon will show up on the screen. Otherwise, MasterCAN Display 35 will show SPN number.

A.5 Analog Gateway FM

Analog Gateway FM — Intended for converting analog/frequency signals though two input channels of MasterCAN Display 35 into digital messages according to user-defined configurations (SPN).
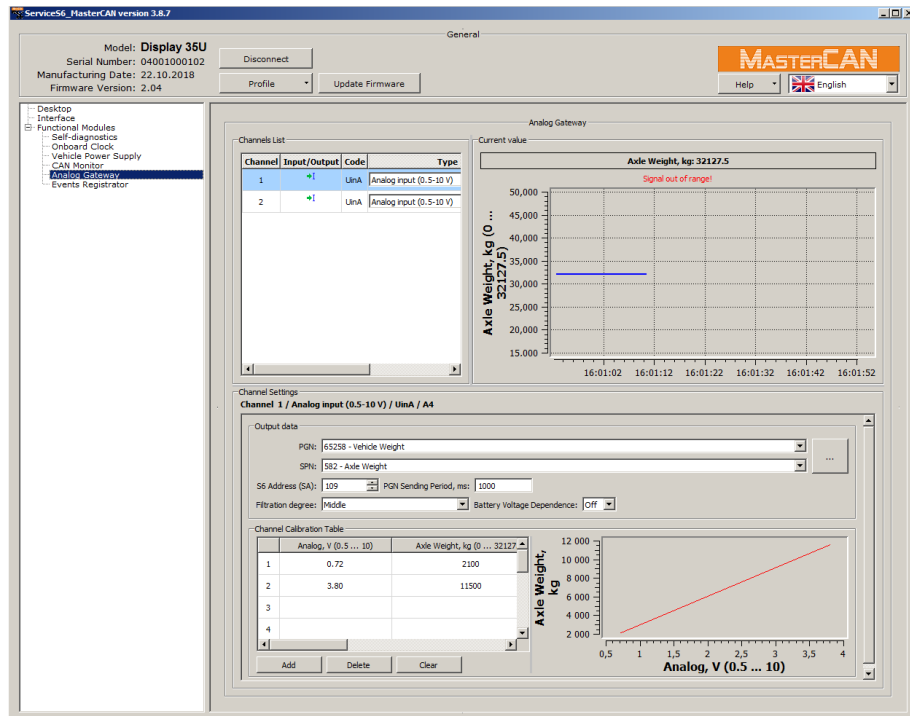
Figure A.6 — Window of settings of Analog Gateway FM in Service S6 MasterCAN software

*Table A.5 — Analog Gateway FM. Displayed and/or editable SPN
    with the help of Service S6 MasterCAN software*

SPN	Name	Factory value	Unit of measure	Range	Clarification
Channels List PGN 63175					
521355	Array Elements Count	No	pcs.	0…2	Overall quantity of configurable input channels of MasterCAN Display 35. MAsterCAN Display 35 has 2 input channels.
521371	Channel Number	No	No	1…2	From the list of Unit channels a number (1st or 2nd) of configured channel is selected. Physical characteristics of channel (input/output) 1) MasterCAN Display 35's channels are physically inputs (marked ⁺ᴵ). 2) Input/output connector and pin numbers for electric connection.
521372	Channels Type	On the fact	On the fact	0…4294970000	For selected channel number from a drop-down list select channel type, which corresponds to physical value of converted signal. To disable channel, select "not supported". Depending on selected channel type, Service Software wil automatically assign a special code, which is structured as follows: 1) Physical type: - F - frequency - U - voltage 2) Physical characteristics - in (input); 3) Channel sequence number (A or E) with identical physical type. When hovering pointer over, a pop-up message with detailed description of selected channel will appear.

SPN	Name	Factory value	Unit of measure	Range	Clarification
521373	Connector Name	On the fact	No	A	Alphabetic designation of Unit's connector for electrical connection to Unit which should be configured.
521374	Pin 1	On the fact	No	1…4	Designation of Unit's connector pin number for connection to Unit which should be configured.
521375	Pin 2	On the fact	No	1…4	Designation of number of the second pin of connector (I ncase if channel uses two pins) connection to Unit which should be configured.
Channel Settings PGN 63176
521371	Channel Number	No	No	1…2	Number of configured channels of Unit is shown (see PGN 63175).
521376	Channel Type	On the fact	On the fact	0…255	Current type of configured channel of Unit us shown (see PGN 63175).
521150	PGN	On the fact	On the fact	0…65535	When configuring input channels – enter output PGN, which include SPN converted from analog signal. For correct operation of MasterCAN Display 35 it is not recommended to assign different SPN from one PGN to different inputs of Unit.
1214	SPN	On the fact	On the fact	0…524287	When configuring input channels – select SPN which should be converted from analog signal.
521188	S6 Address (SA)	109	No	0…254	When configuring input channels – enter network address of MasterCAN Display 35 (any address within 0…254 range, 255 cannot be use).
521378	Filtration degree	Not supported	No	Low/ Middle/ Hight/ Not supported	This setting allows to select necessary degree of averaging (within time interval) input analog signal.
521379	Battery Voltage Dependence	Not supported	No	On/Off	This setting allows to avoid dependence of input analog signal on vehicles onboard electrical network voltage. Only available for UinA analog input channels.
Channel Calibration Table PGN 63177
521371	Channel Number	No	No	1…2	Number of configured channels of Unit is shown. (see PGN 63175).
521355	Array Elements Count	2	pcs.	1…10	Quantity of points in calibration table, which is composed when configuring channel. Maximum allowed quantity is 10.
521347	SPN Value	On the fact	On the fact	0…4294970000	When configuring input channels - enter values of points in calibration table for converted parameter. By default, table contains two points corresponding to minim and maximum values of data range. Maximum quantity is 10 points. Software shows chart of correlation between values of converted SPN and input analog signal values.
521377	Signal Value	On the fact	On the fact	0…4294970000	When configuring input channels – enter values of points in calibration table for input analog signal. By default, table contains two points, corresponding to minimum and maximum values of data range. Maximum quantity is 10. Software shows chart of correlation between values of converted SPN and input analog signal values.

A.6 Events registrator FM

Events registrator FM – designed for registration of 15 important and 15 informative latest Events.
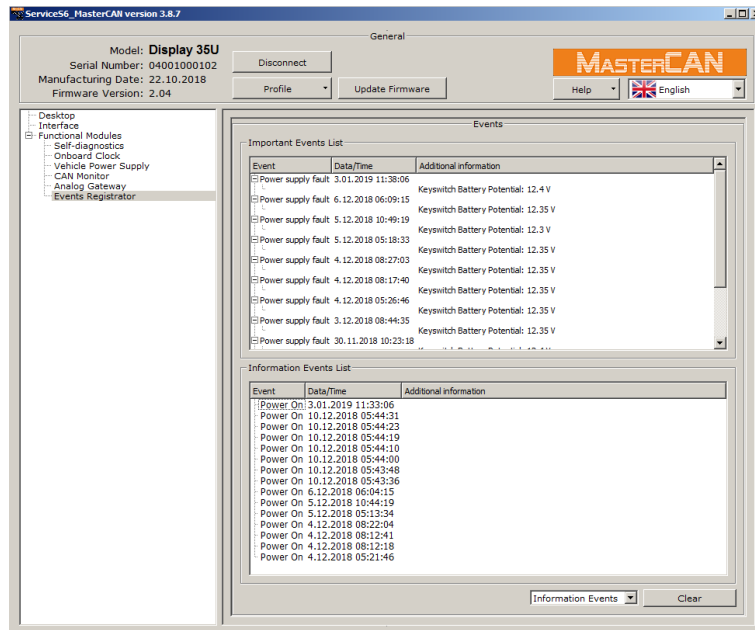
Figure A.7 — Window of settings of Events registrator FM in Service S6 MasterCAN software

Table A.6 — Events registrator FM.
    Displayed SPN with the help of Service S6 MasterCAN software

SPN	Name	Factory value	Unit of measure	Clarification
List of important Events PGN 63055			
521166	SPN Events	No	No	Displayed list of an important Events (up to 15)**.** Important Events include: - onboard circuit failure (with voltage specified); - too high onboard circuit voltage. The user cannot clear the list of important Events.
List of informative Events PGN 63056			
521166	SPN Events	No	No	Displayed list of informative Events (up to 15)**.** Information Events include: - power ON and OFF; - Unit connection/disconnection from S6-bus. The user may clear the list of informative Events.

* For each Event, its designation, date/time of occurrence as well as additional information (if any) are specified.
  Events are displayed in chronological sequence starting from the most recent. As soon as the maximum possible number of the Events displayed is reached, new Events are recorded over the preceding ones, the earliest Events being deleted first.

Detailed parameters description (SPN), structure and content of messages (PGN) of FM MasterCAN Display 35 are placed at the following web site https://www.jv-technoton.com/ (to access S6 DB registration is required).

Annex B
Diagrams of pre-set information screens for modifications of MasterCAN Display 35

B.1 Screens of MasterCAN Display 35 G ("Truck")
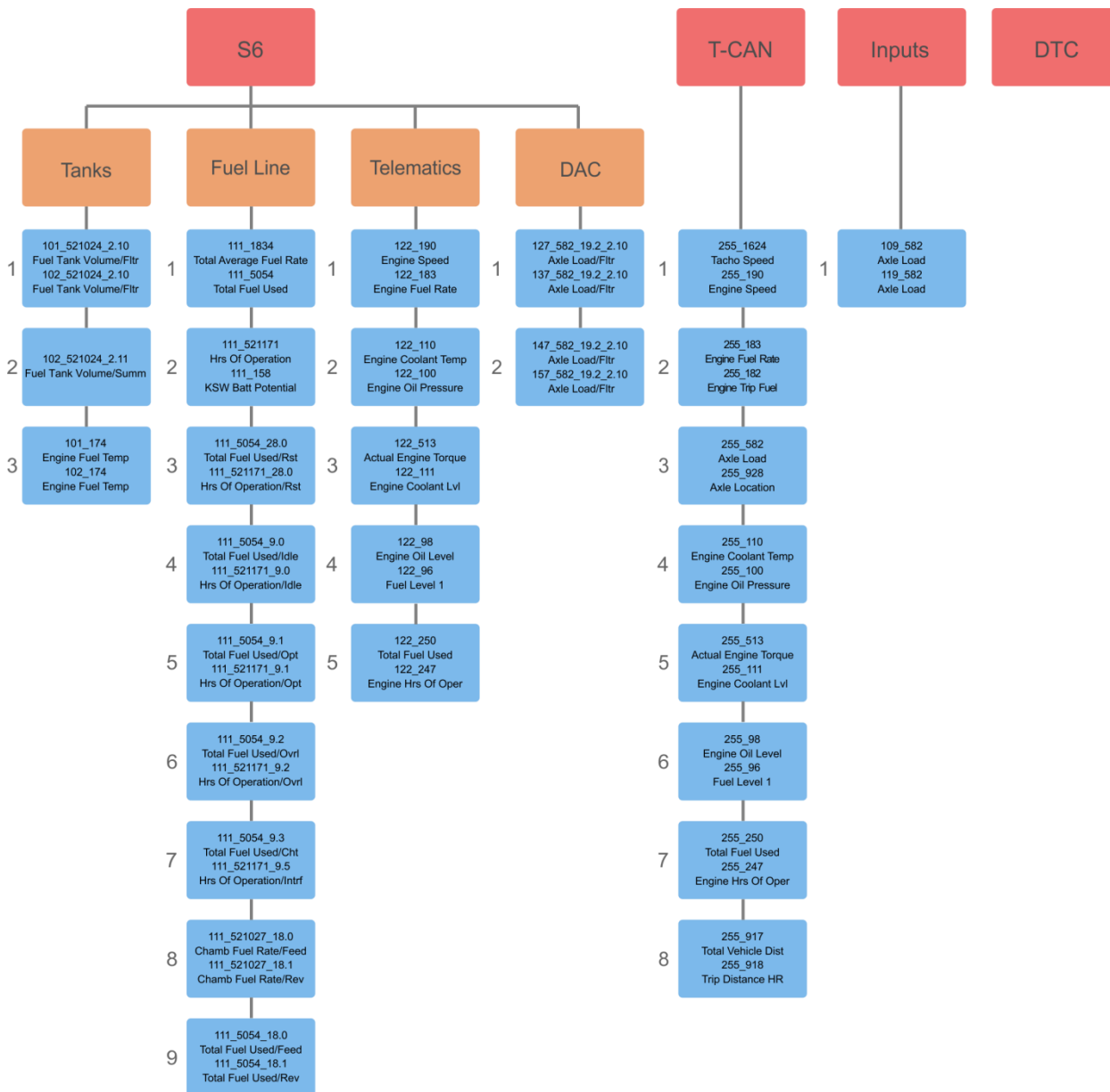
Notes

1 Pre-set screens of MasterCAN Display 35 G cannot be edited or deleted by the user.

2 In order to display a standard set of specified parameters, you need to connect equipment to MasterCAN Display 35 G, in accordance with table 1.

3 In any of MasterCAN Display 35 G pre-set group of screens for sources of data from **S6** and **T-CAN** the user can add new screens to the maximum possible number of screens (10).

4 The number of pre-set screens of MasterCAN Display 35 G and the content of the data displayed may be modified by the Manufacturer without prior notice.

B.2 Screens of MasterCAN Display 35 T ("Tractor")

	S6			T-CAN	Inputs	DTC

	Tanks	Fuel Line	Telematics			

#	Tanks	Fuel Line	Telematics	T-CAN	Inputs
1	101_521024_2.10 Fuel Tank Volume/Fltr 102_521024_2.10 Fuel Tank Volume/Fltr	111_1834 Total Average Fuel Rate 111_5054 Total Fuel Used	122_190 Engine Speed 122_183 Engine Fuel Rate	255_190 Engine Speed 255_183 Engine Fuel Rate	109_582 Axle Load 119_582 Axle Load
2	102_521024_2.11 Fuel Tank Volume/Summ	111_521171 Hrs Of Operation 111_158 KSW Batt Potential	122_110 Engine Coolant Temp 122_100 Engine Oil Pressure	255_110 Engine Coolant Temp 255_100 Engine Oil Pressure	
3	101_174 Engine Fuel Temp 102_174 Engine Fuel Temp	111_5054_28.0 Total Fuel Used/Rst 111_521171_28.0 Hrs Of Operation/Rst	122_513 Actual Engine Torque 122_111 Engine Coolant Lvl	255_513 Actual Engine Torque 255_111 Engine Coolant Lvl	
4		111_5054_9.0 Total Fuel Used/Idle 111_521171_9.0 Hrs Of Operation/Idle	122_98 Engine Oil Level 122_96 Fuel Level 1	255_98 Engine Oil Level 255_96 Fuel Level 1	
5		111_5054_9.1 Total Fuel Used/Opt 111_521171_9.1 Hrs Of Operation/Opt	122_250 Total Fuel Used 122_247 Engine Hrs Of Oper	255_250 Total Fuel Used 255_247 Engine Hrs Of Oper	
6		111_5054_9.2 Total Fuel Used/Ovrl 111_521171_9.2 Hrs Of Operation/Ovrl			
7		111_5054_9.3 Total Fuel Used/Cht 111_521171_9.5 Hrs Of Operation/Intrf			
8		111_521027_18.0 Chamb Fuel Rate/Feed 111_521027_18.1 Chamb Fuel Rate/Rev			
9		111_5054_18.0 Total Fuel Used/Feed 111_5054_18.1 Total Fuel Used/Rev			

Notes

1 Pre-set screens of MasterCAN Display 35 T cannot be edited or deleted by the user.

2 In order to display a standard set of specified parameters, you need to connect equipment to MasterCAN Display 35 T, in accordance with table 1.

3 In any of MasterCAN Display 35 T pre-set group of screens for sources of data from **S6** and **T-CAN** the user can add new screens to the maximum possible number of screens (10).

4 The number of pre-set screens of MasterCAN Display 35 T and the content of the data displayed may be modified by the Manufacturer without prior notice.

B.3 Screens of MasterCAN Display 35 M ("Vessel")

Top level: **S6**, **T-CAN**, **Inputs**, **DTC**

Under S6: **Tanks**, **Main engine 1**, **Main engine 2**, **Generator 1**, **Generator 2**

#	Tanks	Main engine 1	Main engine 2	Generator 1	Generator 2
1	101_521024_2.10 Fuel Tank Volume/Fltr 102_521024_2.10 Fuel Tank Volume/Fltr	111_521314_2.15 Total Fuel Used/D 111_521171_2.15 Hrs Of Operation/D	113_521314_2.15 Total Fuel Used/D 113_521171_2.15 Hrs Of Operation/D	115_183 Engine Fuel Rate 115_5054 Total Fuel Used	116_183 Engine Fuel Rate 116_5054 Total Fuel Used
2	102_521024_2.11 Fuel Tank Volume/Summ	111_521313 Engine Fuel Rate 111_521181 Eng Mode By Rate	113_521313 Engine Fuel Rate 113_521181 Eng Mode By Rate	115_521171 Hrs Of Operation 115_158 KSW Batt Potential	116_521171 Hrs Of Operation 116_158 KSW Batt Potential
3	101_174 Engine Fuel Temp 102_174 Engine Fuel Temp	111_521314_2.15_28.0 Total Fuel Used/RstD 111_521171_2.15_28.0 Hrs Of Operation/RstD	113_521314_2.15_28.0 Total Fuel Used/RstD 113_521171_2.15_28.0 Hrs Of Operation/RstD	115_5054_28.0 Total Fuel Used/Rst 115_521171_28.0 Hrs Of Operation/Rst	116_5054_28.0 Total Fuel Used/Rst 116_521171_28.0 Hrs Of Operation/Rst
4		111_521314_2.15_9.0 Total Fuel Used/D 111_521171_2.15_9.0 Hrs Of Operation/D	113_521314_2.15_9.0 Total Fuel Used/D 113_521171_2.15_9.0 Hrs Of Operation/D	115_5054_9.0 Total Fuel Used/Idle 115_521171_9.0 Hrs Of Operation/Idle	116_5054_9.0 Total Fuel Used/Idle 116_521171_9.0 Hrs Of Operation/Idle
5		111_521314_2.15_9.1 Total Fuel Used/OptD 111_521171_2.15_9.1 Hrs Of Operation/OptD	113_521314_2.15_9.1 Total Fuel Used/OptD 113_521171_2.15_9.1 Hrs Of Operation/OptD	115_5054_9.1 Total Fuel Used/Opt 115_521171_9.1 Hrs Of Operation/Opt	116_5054_9.1 Total Fuel Used/Opt 116_521171_9.1 Hrs Of Operation/Opt
6		111_521314_2.15_9.2 Total Fuel Used/OvrID 111_521171_2.15_9.2 Hrs Of Operation/OvrID	113_521314_2.15_9.2 Total Fuel Used/OvrID 113_521171_2.15_9.2 Hrs Of Operation/OvrID	115_5054_9.2 Total Fuel Used/Ovrl 115_521171_9.2 Hrs Of Operation/Ovrl	116_5054_9.2 Total Fuel Used/Ovrl 116_521171_9.2 Hrs Of Operation/Ovrl
7		111_521314_2.15_9.3 Total Fuel Used/ChtD 111_521171_2.15_9.3 Hrs Of Operation/ChtD	113_521314_2.15_9.3 Total Fuel Used/ChtD 113_521171_2.15_9.3 Hrs Of Operation/ChtD	115_5054_9.3 Total Fuel Used/Cht 115_521171_9.5 Hrs Of Operation/Intrf	116_5054_9.3 Total Fuel Used/Cht 116_521171_9.5 Hrs Of Operation/Intrf
8		111_521171_2.15_9.5 Hrs Of Operation/Intrf 112_521171_2.15_9.5 Hrs Of Operation/Intrf	113_521171_2.15_9.5 Hrs Of Operation/Intrf 114_521171_2.15_9.5 Hrs Of Operation/Intrf	115_521027_18.0 Chamb Fuel Rate/Feed 115_521027_18.1 Chamb Fuel Rate/Rev	116_521027_18.0 Chamb Fuel Rate/Feed 116_521027_18.1 Chamb Fuel Rate/Rev
9		111_521313 Engine Fuel Rate 112_521313 Engine Fuel Rate	113_521313 Engine Fuel Rate 114_521313 Engine Fuel Rate	115_5054_18.0 Total Fuel Used/Feed 115_5054_18.1 Total Fuel Used/Rev	116_5054_18.0 Total Fuel Used/Feed 116_5054_18.1 Total Fuel Used/Rev

Notes

1 Pre-set screens of MasterCAN Display 35 M cannot be edited or deleted by the user.

2 In order to display a standard set of specified parameters, you need to connect equipment to MasterCAN Display 35 M, in accordance with table 1.

3 In any of MasterCAN Display 35 M pre-set group of screens for source of data from **S6** the user can add new screens to the maximum possible number of screens (10). Also, in case the user needs, he may add additional groups to the pre-set groups of screens to the maximum possible number of groups (21).

4 To reset the clearable Counters, you need to press and hold (2…3) ▼↵ key combination during (2…3) s.

5 The number of pre-set screens of MasterCAN Display 35 M and the content of the data displayed may be modified by the Manufacturer without prior notice.
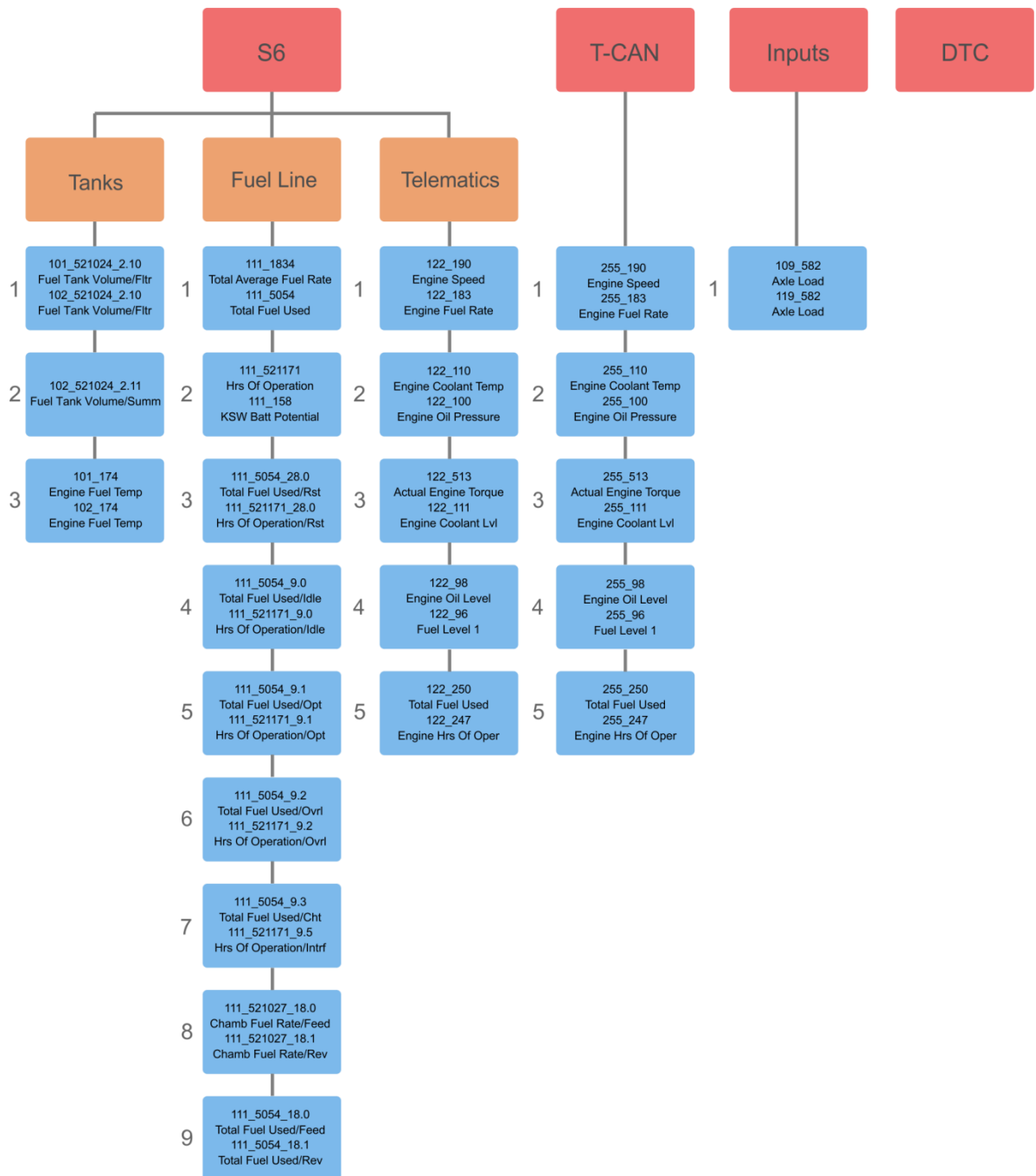
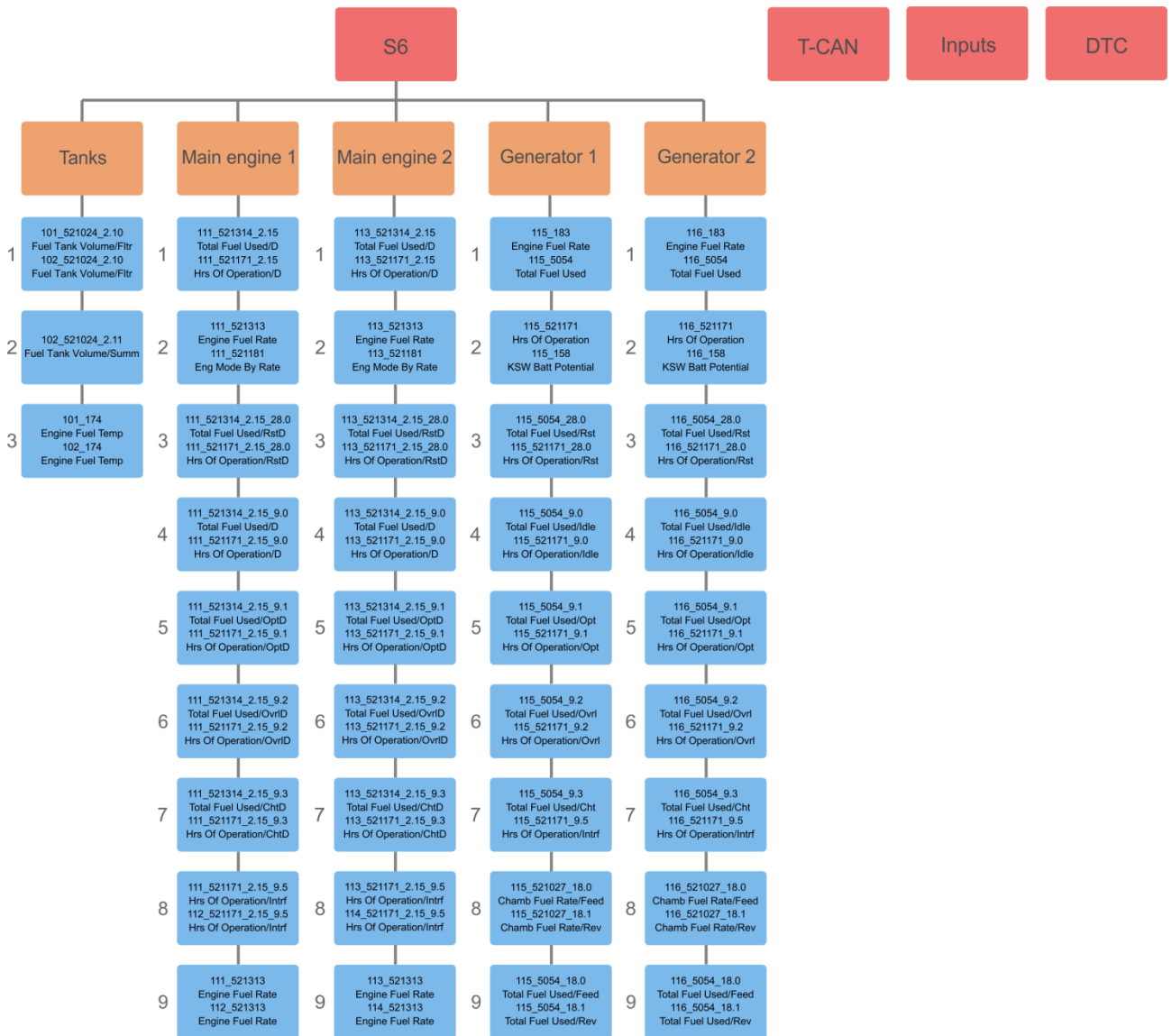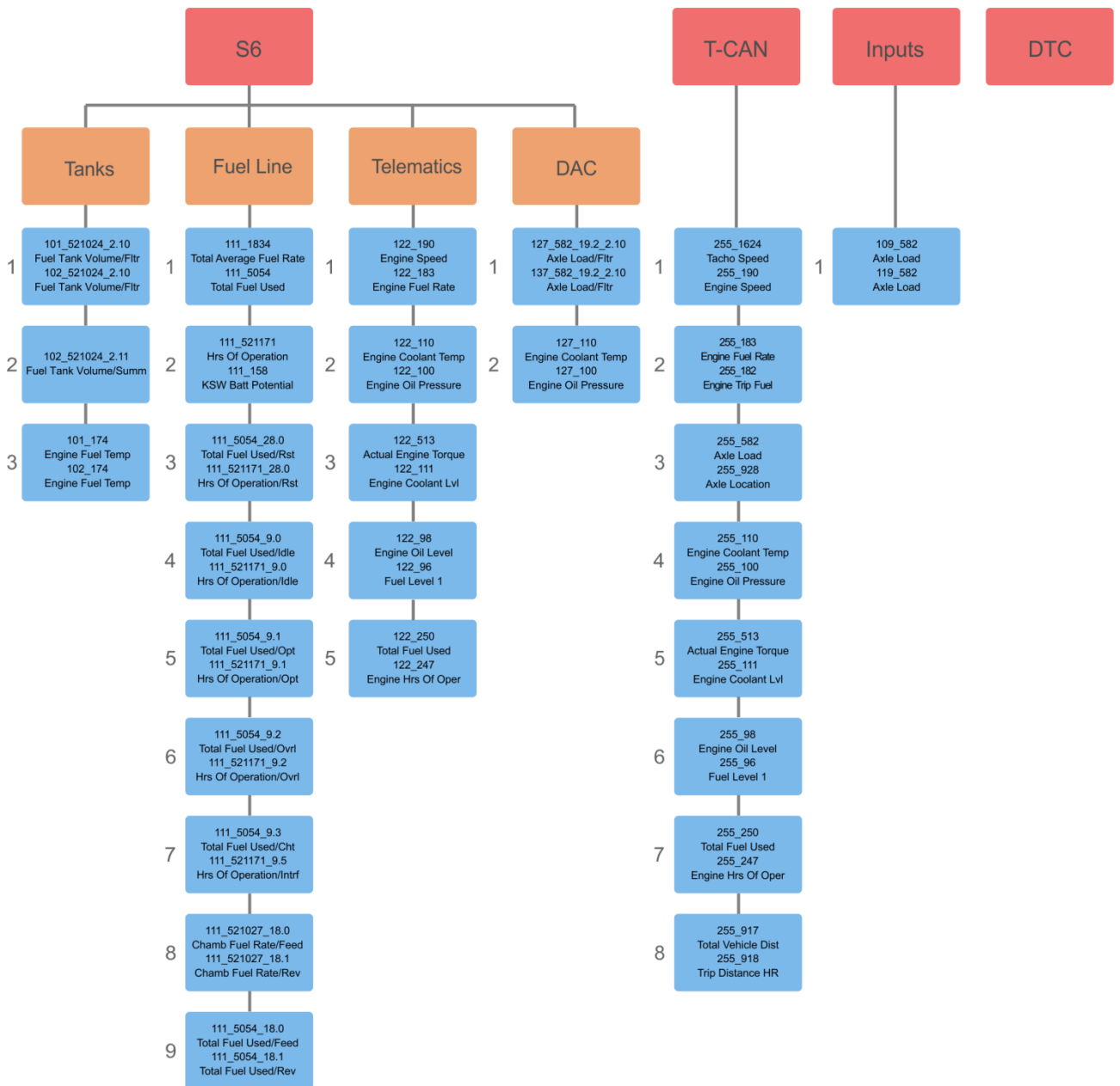## B.4 Screens of MasterCAN Display 35 U ("Universal")

Notes

1 Pre-set screens of MasterCAN Display 35 U can be edited or deleted by the user. In case the user needs, he may replace all pre-set groups of screens by groups with parameters he specifies himself (21 groups at a maximum).

2 In order to display a standard set of specified parameters, you need to connect equipment to MasterCAN Display 35 U, in accordance with table 1.

3 The number of pre-set screens of MasterCAN Display 35 U and the content of the data displayed may be modified by the Manufacturer without prior notice.
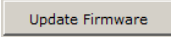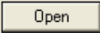
Annex C
Firmware upgrade

> ⚠️ **WARNING:** MasterCAN Display 35 firmware update should be carried out **only** for implementing improvements, recommended by the Manufacturer.

To upgrade MasterCAN Display 35 firmware the following actions should be made:

1) Connect MasterCAN Display 35 to PC using S6 SK service adapter S6 SK.

> ⚠️ **WARNING:** When re-uploading firmware, power supply voltage of MasterCAN Display 35 should not drop out of 9…45 V range.

2) After login press `Update Firmware` button in Service S6 MasterCAN Software.

3) Choose firmware upgrade file **(*.blf3)** on PC or memory stick.

4) Press `Open` button, that will start firmware file downloading into MasterCAN Display 35 memory.

After firmware file integrity and compatibility check by Service S6 MasterCAN Software window of firmware uploading into MasterCAN Display 35 memory will appear. In case of any errors the Software will send warning message.

To cancel firmware upgrade it is needed to press `Stop` button.

> ⚠️ **ATTENTION:** To avoid MasterCAN Display 35 failure, before the end of the firmware upgrade process **is forbidden:**
> - to switch off PC;
> - to switch off the power supply for MasterCAN Display 35;
> - to disconnect MasterCAN Display 35 from the adapter and the adapter from the PC;
> - run any resource-intensive applications on the PC.

After successfully finishing firmware updated procedure, a confirmation message will be shown, and Software will automatically terminate connection between PC and MasterCAN Display 35.

In case of successful firmware update, MasterCAN Display 35 will be ready for operation. When it will be connected to PC again, Software will show new firmware version.

In case of any error occur that leaded to the damage of present MasterCAN Display 35 firmware check all cables and adapter connections and retry. In this case the internal firmware loader is activated and will try to fix MasterCAN Display 35 operation performance. Contact Technoton technical support at support@technoton.by if another try is also unsuccessful.

Annex D
Example of onboard equipment connection diagram to MasterCAN Display 35

to socket
SENS

MasterCAN Display 35
Display CAN j1939/S6

2_AFin+

1_AFin+

to socket
S6

S6 2Mol Cable [3]

S6 4Mol Splitter

Power supply
(battery)

GND   VBAT
(KL30)

S6 SC-Mol
Extension cable/Adapter [2]

S6 2Mol power
Cable with power wire [3]

Automotive
CAN bus (SAE J1939)

Contactless reader-converter
FMSCrocodile CCAN

S6 3SC T-connector

DUT-E CAN
Fuel level sensor [4]

GNOM DDE
Pressure sensor

S6 2SC Extension cable [1]

GNOM DP
Position sensor

S6 3SC T-connector

DUT-E CAN
Fuel level sensor [4]

S6 2SC Extension cable [1]

[1] The length is selected according to installation conditions.
Standard lengths are 1, 3, 7 and 12 m.

[2] The length is selected according to installation conditions.
Standard lengths are 3 and 7 m.

[3] The length is selected according to installation conditions.
Standard lengths are 0.2 and 1 m.

S6 3SC T-connector

DFM CAN
Fuel flow meter [4]

[4] Embedded termination resistor of CAN j1939/S6 interface
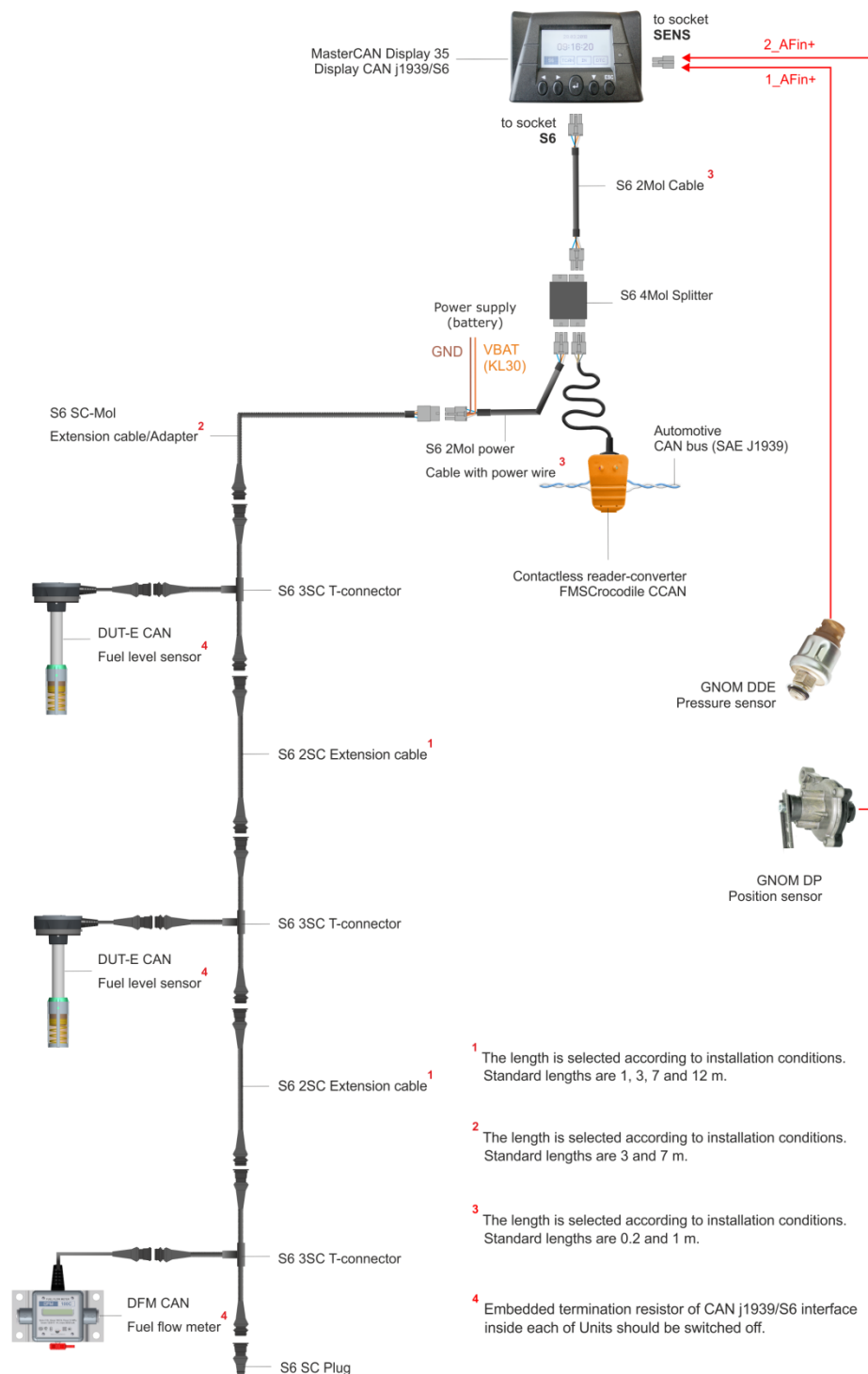inside each of Units should be switched off.

S6 SC Plug

*Figure D.1 — Example of MasterCAN Display 35 connection to display data from Units,
from a standard CAN-bus and converted signals from analog sensors*