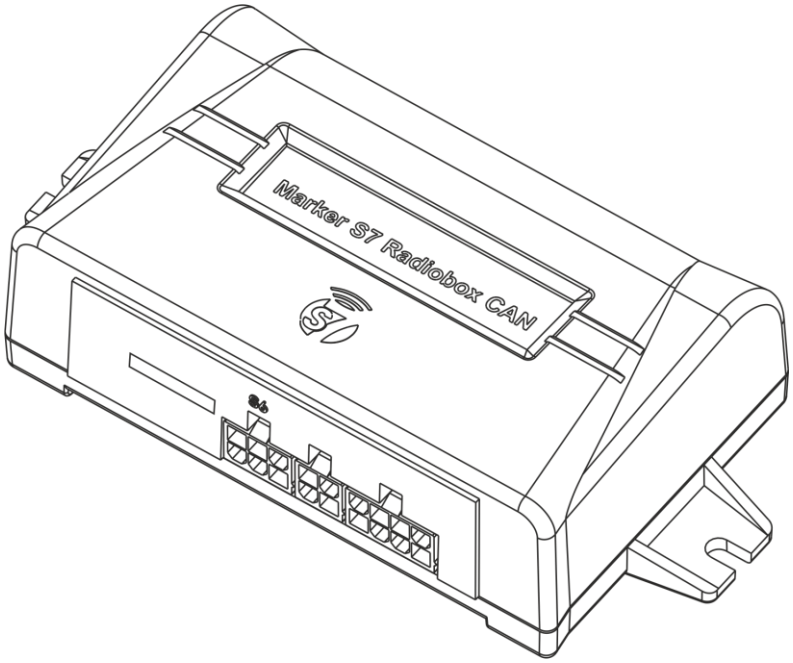
Marker S7

WIRELESS INTERFACE



Marker S7 Radiobox CAN

OPERATION MANUAL

Version 1.0

S6 S7 IoT BURGER

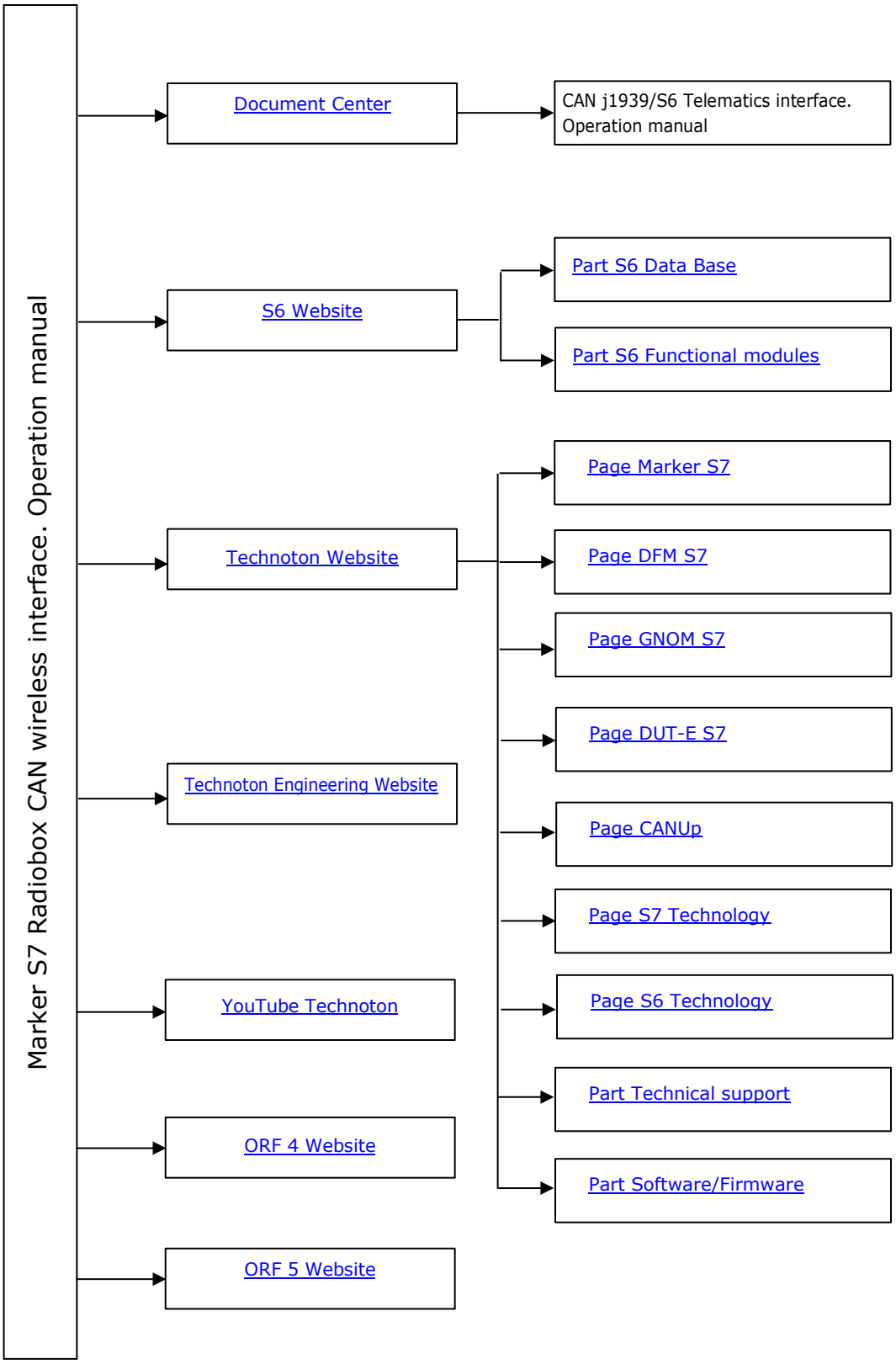
TECHNOTON
ADVANCED VEHICLE TELEMATICS

Contents

Revision history

Version	Date	Editor	Description of changes
1.0	09.2020	OD	Basic version

Structure of external links



Terms and Definitions

S7 — Technology designed for wireless collection of data from unattended sensors in systems of industrial and automobile Telematics. S7 Technology is recommended for use in facilities where wiring is impossible or hard to install.
S7 Technology implements Bluetooth 4.X Low Energy (BLE) as a communication channel.
S7 Technology provides ultra-low power consumption and a long period of independent operation for smart sensors and other IoT devices.
On the application level, S7 Technology is fully compatible with S6 Technology which uses cabling.
Advantages of S7 Technology:

- Simple design of data transmission protocol;
- Low power consumption, a potential for fully independent operation of sensors for several years;
- Option of data collection by several data recipients at one time.

Marker S7 Radiobox CAN wireless interface is implemented based on S7 Technology.

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.

Marker S7 Radiobox CAN wireless interface is implemented based on 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.
Marker S7 Radiobox CAN wireless interface is implemented based on S6 Technology.

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).

GNSS (Global Navigation Satellite System) — System for area positioning of an object through satellite signal processing. GNSS is composed of space, ground and user segments. Currently, there are several GNSSs: GPS, GLONASS, Galileo, BeiDou.

Onboard reports (Reports) — information about vehicle which is returned to a user of Telematics system in accordance with inputted criteria. The Reports are generated by a terminal unit both periodically (Periodic reports) and on Event occurrence (Event report).

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.

Server (AVL Server) — hardware-software complex of Telematics service ORF 4, used for processing and storage of Operational data, formation and transmission of Analytical reports through Internet by request of ORF 4 / ORF 5 users.

Event — a relatively rare and sudden change of SPN. For example, the disappearing of a signal from Marker S7 Active asset tag is the Event "Tag Release". An Event can have one or several characteristics. Thus, for the Events "Tag release" and "Tag Attachment" — "Tag ID" is always specified. 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.

Counter — cumulative numerical characteristic of Parameter. Counter is displayed by a single number and over time its value is increasing. Examples of counters: fuel consumption, trip, engine hours counter etc.

Telematics terminal (Tracking device, Telematics unit) 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 / ORF 5.

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 or S7 Technology.

Introduction

The Operation manual contains guidelines and rules which refer to **Marker S7 Radiobox CAN wireless interface** (further on — Marker S7 Radiobox CAN), model code **01** developed by Technoton company.
The model code of Marker S7 Radiobox CAN is defined by 3^{d} and 4th digits of its serial number placed on the name plate in the bottom portion of its casing or on the packaging label (see figure 1):

Figure 1 — Defining the model code of Marker S7 Radiobox CAN

The manual contains information on design, operation principle, specifications and instructions use of Marker S7 Radiobox CAN.

Marker S7 Radiobox CAN is designed for integration of data from Marker S7 wireless active asset tags into the Telematics system and automatic identification of the Vehicle attached equipment.

Marker S7 Radiobox CAN key features:

- wireless reception of data from active asset tags by means of S7 Technology via the **Bluetooth Low Energy** channel and their conversion into SPN;
- IoT Burger Technology provides internal data processing (Parameters filtration and normalization, Events logging, Counters recording) for easier server operation and data traffic saving;
- compliance with Units, Database and cabling system S6 Technology;
- wireless configuration via Bluetooth directly, using the Android device, without use of any additional service adapter;
- function of digital self-diagnostics for monitoring the quality of performance;
- monitoring Parameters and modes of the Vehicle onboard circuit operation;
- simple mounting, a set of mounting elements in the mounting kit;
- high-quality technical support and documentation;
- conformity with European and national automotive standards.

Marker S7 Radiobox CAN wireless interface is mounted on the Vehicle together with Marker S7 active asset tags (further on — Marker S7).

Marker S7 Radiobox CAN is configured for work with active asset tags by means of S7 Technology with a smartphone/tablet based on Android 6.X and higher platform (further on — Android device) by means of **Service Marker S7 (Android)** mobile application whose functionality enables to:

- Display a list of all available Marker S7 active asset tags, specifying for each tag:
  - ID data (serial number, MAC-address of the BLE-module);
  - Signal level (RSSI);
  - "Manufacturing" mode of operation (if the tag operates in this mode);
  - Ambient temperature in the mounting location.
- Display the list of all accessible Marker S7 Radiobox CAN wireless interfaces specifying for each Unit:
  - ID data (serial number, MAC-address of the BLE-module);
  - signal level (RSSI).
- View the list of attached tags (up to 2 pcs.), with displaying ID data of each tag.
- View the statistics of all tags ever attached (up to 8 pcs.), with specifying the total time of attachment for each tag.
- Configure Parameters for automatic identification of active asset tags.
- Record the Events:
  - "Tag release"/"Tag attachment";
  - "Onboard circuit malfunction", "Increased onboard circuit voltage".
- Display passport data, active malfunctions and Counters of operation time, restarts, outages of power supply for Marker S7 Radiobox CAN.
- Monitor the current voltage and the Vehicle onboard circuit mode, the time of the Vehicle operation in different modes of the onboard circuit operation, establish limits for monitoring the onboard circuit modes.
- Adjust signals of time for Marker S7 Radiobox CAN Functional modules.
- Configure Parameters of Marker S7 Radiobox CAN connection to the external device via CAN j1939/S6 interface.
- Conduct operations with Marker S7 Radiobox CAN profile.

The user may download the Service Marker S7 (Android) application from Google Play (rearch request "Technoton").

ATTENTION: It is strongly recommended to follow strictly the instructions of the present Manual when using, mounting or maintaining Marker S7 Radiobox CAN.

The Manufacturer guarantees Marker S7 Radiobox CAN 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 Marker S7 Radiobox CAN 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, operation principle, application area

Marker S7 Radiobox CAN is used for:

- Wireless reception of data from Marker S7 active asset tags by means of S7 Technology and their conversion into CAN j1939/S6 Telematics interface (see figure 2);
- Automatic generation of the Events "Tag release / "Tag attachment" for 2 pcs. of tags mounted on the Vehicle attached equipment.

Figure 2 — Marker S7 Radiobox CAN wireless interface designation

Application area: Marker S7 Radiobox CAN wireless interface is employed for monitoring the Vehicle attached equipment within transport Telematics systems based on the Terminal with CAN j1939/S6 interface (see figure 3).

Operating principle: Marker S7 Radiobox CAN wireless interface is mounted in the Vehicle driver's cabin. Marker S7 Radiobox CAN operates in combination with Marker S7 active asset tags receiving signals from all tags located within 50 m from it in the continuous mode of operation based on S7 Technology.

Up to 2 pcs. of Marker S7 tags are mounted on the Vehicle attached equipment. In accordance with the user settings, Marker S7 Radiobox CAN automatically identifies the fact of attachment or release of attached equipment by the maximum level of signal from the tags and provides the appropriate data of it (SPN) into CAN j1939/S6 Telematics interface.

The monitoring Terminal connected to Marker S7 Radiobox CAN by means of S6 Technology sends Reports on the Event of attachment/release of the equipment to ORF 4 / ORF 5 Telematics service or directly to the user, by SMS/E-mail.

The Telematics terminal connected to the Marker S7 Radiobox CAN by means of S6 Technology sends Reports on the Event of the equipment attachment/release to the ORF 4 / ORF 5 Telematics service or directly to the user by SMS or E-mail.

You can also connect CAN j1939 vehicle bus by means of S6 Technology to one CAN input of the Terminal (e.g. of CANUp 27 Telematics gateway) using FMSCrocodile wireless gateway and up to 16 pcs. DFM CAN fuel flow meters together with DUT-E CAN / DUT-E 2Bio fuel level sensors (up to 16 pcs.).

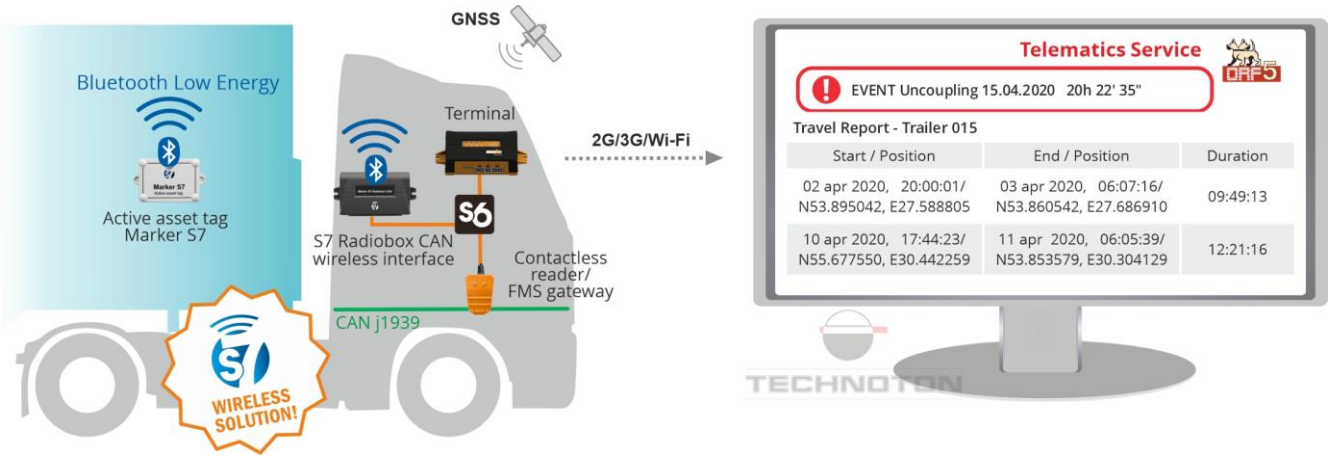


Figure 3 — Example of Marker S7 Radiobox CAN wireless interface employment for monitoring the Vehicle attached equipment in the Telematics system

The employment of Marker S7 Radiobox CAN in the transport Telematics system enables to monitor:

1) Parameters

- time of the equipment attachment/release;
- equipment attachment/release coordinates;
- average and maximum speed of the trip with attached equipment;
- ambient temperature;
- current voltage and the Vehicle onboard circuit mode;
- equipment identifiers;
- Unit active malfunctions.

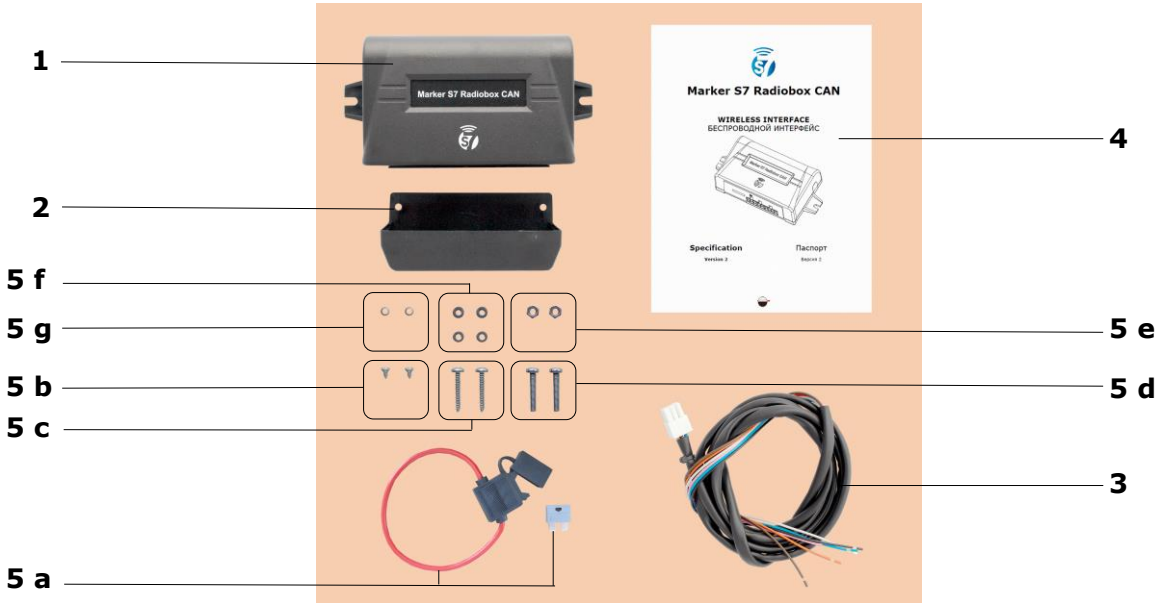
2) Counters

- duration of the trip with attached equipment;
- fuel consumption during the trip with attached equipment;
- duration of the Vehicle onboard circuit operation in different modes.

3) Events

- equipment attachment;
- equipment release;
- onboard circuit malfunction;
- increased onboard circuit voltage.

1.2 2 Exterior view and delivery set



1	Marker S7 Radiobox CAN wireless interface	– 1 pc.;
2	Sealing plank	– 1 pc.;
3	S6 cable (2 m)	– 1 pc.;
4	Passport	– 1 pc.;
5	Mounting kit (1 pc) including:	
	a) fuse with holder (2 A)	– 1 pc.;
	b) self-tapping screw 3x6	– 2 pcs.;
	c) self-tapping screw 4.2x25	– 2 pcs.;
	d) screw M4x25	– 2 pcs.;
	e) nut M4	– 2 pcs.;
	f) washer 4	– 4 pcs.;
	g) lock washer 4.65	– 2 pcs.

Figure 4 — Marker S7 Radiobox CAN delivery set

1.3 Design

1 – casing inside which there is the BLE-module for wireless data reception/transmission by means of S7 Technology and the electronic unit;

2 – **S6** plug for connection to the onboard circuit power supply, to terminal 15 of the Vehicle ignition lock and to the external device via CAN j1939/S6 interface;

3 – mounting elements;

***** – spare component.

Figure 5 — Marker S7 Radiobox CAN design

1.4 Technical specifications

The Marker S7 Radiobox CAN wireless interface is powered from onboard Vehicle power source (accumulator battery).

1.4.1 Main specifications

Table 1 — Marker S7 Radiobox CAN main specifications

Parameter, measurement units	Value
Wireless data exchange interface	Bluetooth 4.1
Output interface	CAN j1939/S6
Transmission unit power (Tx Power), dBm	+4
Receiver sensitivity (Rx Power), dBm	-88
Maximum distance to the tag, m	20 (in case there are metal partitions in the mounting location) 50 (when mounted within line-of-sight range)
Voltage range of external power supply, V	9…45
Maximal current consumption at supply voltage 12/24 V, mA, not more than	0.5/0.25
Temperature range, °C	-40…+85
Level of sealing protection from dust and moisture	IP40
Certificates of BLE module electromagnetic compatibility	CE FCC and IC (see annex B), TELEC BQE
Weight, kg, not more than	0.2
Overall dimensions, mm, not more than	see figure 6

1.4.2 CAN j1939/S6 interface characteristics

Marker S7 Radiobox CAN has CAN j1939/S6 interface whose characteristics comply with S6 Technology. The data transmission protocol is based on SAE J1939 standard and meets its requirements.
The list of messages of Marker S7 Radiobox CAN data transmission protocol is provided in table 2.
Wireless configuration of Marker S7 Radiobox CAN for automatic identification of Marker S7 active asset tags and for connection to the Telematics terminal is conducted via Bluetooth 4.1 using Service Marker S7 (Android) mobile application (the current version can be installed from Google Play (search request "Technoton")).
During its operation using S6 Technology within the network made up by Units, Marker S7 Radiobox CAN has the network address (SA) — 131 which has no access for its changing.

Table 2 — Data composition in Marker S7 Radiobox CAN output messages

Field number	Length	Parameter	Description	Rules of output
Unit Passport PGN 62995 (0xF613)				On request
1	16 bytes	SPN 521123	Line	
17	16 bytes	SPN 521344	Mark	
33	16 bytes	SPN 521345	Model	
49	16 bytes	SPN 521120	Serial number	
65	8 bytes	SPN 521121	Firmware version	
73	4 bytes	SPN 521125	Date of production	
77	1 byte	SPN 521188	Address at S6 (SA) bus	
Unit Work Counters PGN 62994 (0xF612)				On request
1	4 bytes	SPN 521116	Unit Hours Of Operation	
9	4 bytes	SPN 521118	Unit Reset Counter	
13	4 bytes	SPN 521119	Unit Power Off Counter	
Active diagnostic trouble codes PGN 65226 (0xFECA)				1000 ms
3	3 bytes	SPN 521044	Malfunction code (SID)	
Attached Tags List PGN 63306 (0xF74A)				1000 ms
1	4 bytes	SPN 521676/31.1	ID Tag. Tag 1	
5	1 byte	SPN 521178/31.1	Received Signal Strength Indicator (RSSI). Tag 1	
6	2 bytes	SPN 171/31.1	Ambient Air Temperature. Tag 1	
8	4 bytes	SPN 521676/31.2	ID Tag. Tag 2	
12	1 byte	SPN 521178/31.2	Received Signal Strength Indicator (RSSI). Tag 2	
13	2 bytes	SPN 171/31.2	Ambient Air Temperature. Tag 2	
Tags Statistics PGN 63307 (0xF74B)				1000 ms
1	1 byte	SPN 521355	Array Elements Count	
2	4 bytes	SPN 521676/31.1	ID Tag. Tag 1	
6	4 bytes	SPN 521495/31.1	Hours Of Operation With Tag. Tag 1	
10	4 bytes	SPN 521676/31.2	ID Tag. Tag 2	
14	4 bytes	SPN 521495/31.2	Hours Of Operation With Tag. Tag 2	
18	4 bytes	SPN 521676/31.3	ID Tag. Tag 3	
22	4 bytes	SPN 521495/31.3	Hours Of Operation With Tag. Tag 3	
26	4 bytes	SPN 521676/31.4	ID Tag. Tag 4	
30	4 bytes	SPN 521495/31.4	Hours Of Operation With Tag. Tag 4	
34	4 bytes	SPN 521676/31.5	ID Tag. Tag 5	
38	4 bytes	SPN 521495/31.5	Hours Of Operation With Tag. Tag 5	

Field number	Length	Parameter	Description	Rules of output
42	4 bytes	SPN 521676/31.6	ID Tag. Tag 6	
46	4 bytes	SPN 521495/31.6	Hours Of Operation With Tag. Tag 6	
50	4 bytes	SPN 521676/31.7	ID Tag. Tag 7	
54	4 bytes	SPN 521495/31.7	Hours Of Operation With Tag. Tag 7	
58	4 bytes	SPN 521676/31.8	ID Tag. Tag 8	
62	4 bytes	SPN 521495/31.8	Hours Of Operation With Tag. Tag 8	
Radio Tag Identifier Configuration PGN 63308 (0xF74C)				On request
1	4 bytes	SPN 521496	Time Window For Determining Tag Operation Mode	
5	1 byte	SPN 521497	Part Of Messages In Time Slot To Determine Tag Attachment	
6	1 byte	SPN 521498	Part Of Messages In Time Slot To Determine Tag Release	
7	1 byte	SPN 521178/2.8	Received Signal Strength Indicator (RSSI). Min	
8.1	2 bits	SPN 521677	Allow Work Tag. Ignition ON	
Vehicle Power Supply Status PGN 63089 (0xF671)				1000 ms
1	2 bytes	SPN 521055	Vechicle Power Supply Voltage	
3	2 bytes	SPN 521055/2.9	Vechicle Power Supply Voltage. Average For 5 Minutes	
5.1	3 bits	SPN 521056	Vehicle Power Supply Status	
5.4	2 bits	SPN 521076	Vehicle Power Supply Presence	
5.6	2 bits	SPN 521049	Ignition Key State	
Vehicle power supply. Counts PGN 62976 (0xF600)				On request
1	4 bytes	SPN 521170	Starter Hours Of Operation	
5	4 bytes	SPN 521171	Flowmeter Hours Of Operation	
9	4 bytes	SPN 521173	Vehicle Hours Of Operation On Power Supply	
13	4 bytes	SPN 521172	Vechicle Hours Of Operation From Battery	
Time/Date PGN 65254 (0xFEE6)				On request
1	1 byte	SPN 959	Seconds	
2	1 byte	SPN 960	Minutes	
3	1 byte	SPN 961	Hours	
4	1 byte	SPN 963	Month	
5	1 byte	SPN 962	Day	
6	1 byte	SPN 964	Year	
7	1 byte	SPN 1601	Time Displacement In Minutes	
8	1 byte	SPN 1602	Time Displacement In Hours	
List Of Importnant Events PGN 63055 (0xF64F)				On request
1	4 bytes	SPN 521166	SPN Events	
5	1728 bytes	SPN 521357	Data	
List Of Informative Events PGN 63056 (0xF650)				On request
1	4 bytes	SPN 521166	SPN Events	
5	1728 bytes	SPN 521357	Data	

1.4.3 Compatibility with Terminals

Marker S7 Radiobox CAN can be used together with Telematics terminals or other tracking devices whose inputs are compatible with parameters of CAN j1939/S6 interface, in accordance with 1.4.2.

Technoton regularly conducts tests of its products for compatibility and mutual accuracy with different models of Terminals.

The table containing the up-to-date list of Declarations of compatibility of Telematics terminals of different manufacturers with equipment manufactured by Technoton is provided at https://www.jv-technoton.com/.

Recommendations on the equipment connection and configuration can be obtained at Technoton technical support service.

RECOMMENDATION: The best compatibility with Marker S7 Radiobox CAN during its operation according to S6 Technology is ensured by CANUp 27 Telematics gateway. The procedure for a Unit connection to the gateway is provided in CANUp 27 Operation manual.

1.4.4 Overall dimensions

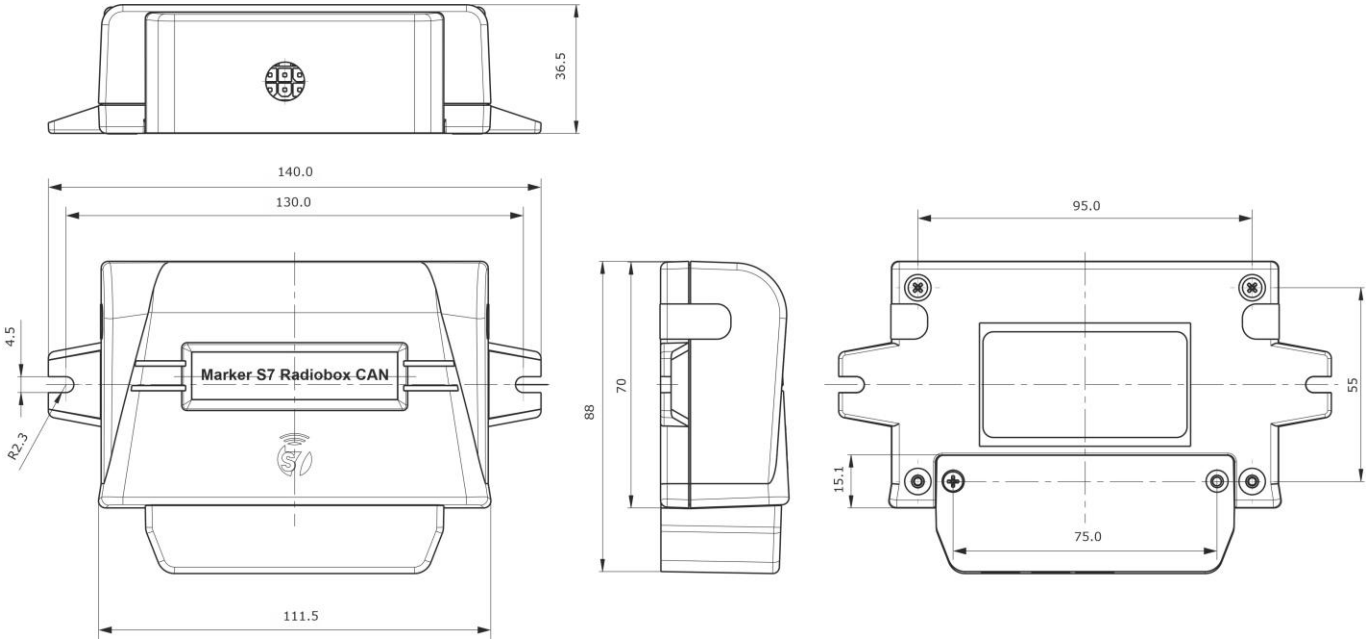


Figure 6 — Marker S7 Radiobox CAN overall dimensions

2 Installation

For Marker S7 Radiobox CAN correct operation its mounting and configuration should be carried out by certified specialists who have passed corporate technical training.

ATTENTION: When mounting Marker S7 Radiobox CAN, strictly follow safety rules of car repair works as well as local safety rules of the customer' company.
Before starting Marker S7 Radiobox CAN connection operations, study carefully the electric equipment circuit diagram and the operation documentation of the Vehicle to be equipped.

2.1 Exterior inspection prior to starting works

It is required to conduct Marker S7 Radiobox CAN 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 Mounting

IMPORTANT: We do not recommend to mount Marker S7 Radiobox CAN:
1) Close to the Vehicle heating and cooling components, power electric circuits.
2) Closer than 10 cm to the Vehicle rotating mechanisms and surfaces.
3) Close to radiotelephones, video signal transmitting devices and other wireless devices operating within 2.4 or 5.0 GHz ranges.
4) In closed metal boxes that might prevent the radio signal travel.

For mounting Marker S7 Radiobox CAN, select a dry place (with respect to the above limitations) which is protected from the aggressive impact of the environment. The most suitable Marker S7 Radiobox CAN mounting location on the Vehicle is the driver's cabin.

For uninterrupted data transmission in conditions of the Vehicle, we do not recommend that the distance between Marker S7 Radiobox CAN and Marker S7 tags should exceed **20 m**.

To fix Marker S7 Radiobox CAN, make use of the self-adhesive clasps that are contained in the delivery set.

2.3 Electrical connection

Marker S7 Radiobox CAN is powered from the external power source (Vehicle onboard circuit).

IMPORTANT:

1) Before mounting and connecting Marker S7 Radiobox CAN 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. To eliminate the electric equipment damaging, the accumulator battery is allowed to be switched on only after the completion of the electric equipment connection.

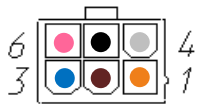
2) Prior to electrical connection of the sensor pay special attention to checking Vehicle chassis ground. Resistance between any point of vehicle chassis and "-" terminal of the battery or between terminals of the chassis ground switch should not exceed 1 Ohm.

3) When connecting Marker S7 Radiobox CAN to onboard electrical network of Vehicle, use fuse (2 A) from delivery set in accordance to scheme of connection.

Use **S6 cable** for the electrical connection of Marker S7 Radiobox CAN (see the delivery set), in accordance with the designation of contacts of **S6** plugs (see table 3 and figure 7).

In order to connect the wires of **S6 cable** to the respective wires of the Vehicle onboard circuit and to the signal wires, we recommend to purchase and use connectors.

*Table 3 — Designation of contacts of **S6** plugs*

Connector Pinout	Connector Contact Number	Wire Marking	Wire Color*	Circuit Designation	Signal Parameters
S6 connector of Marker S7 Radiobox CAN  **S6 connector of S6 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
	6	KL15	Pink	Signal of terminal 15 of ignition lock	Analog, voltage 0…36 V

* Manufacturer reserves the right to modify wire colors, that is why pay attention to its markin.

**The circuit is not used. We recommend to insulate the wire.

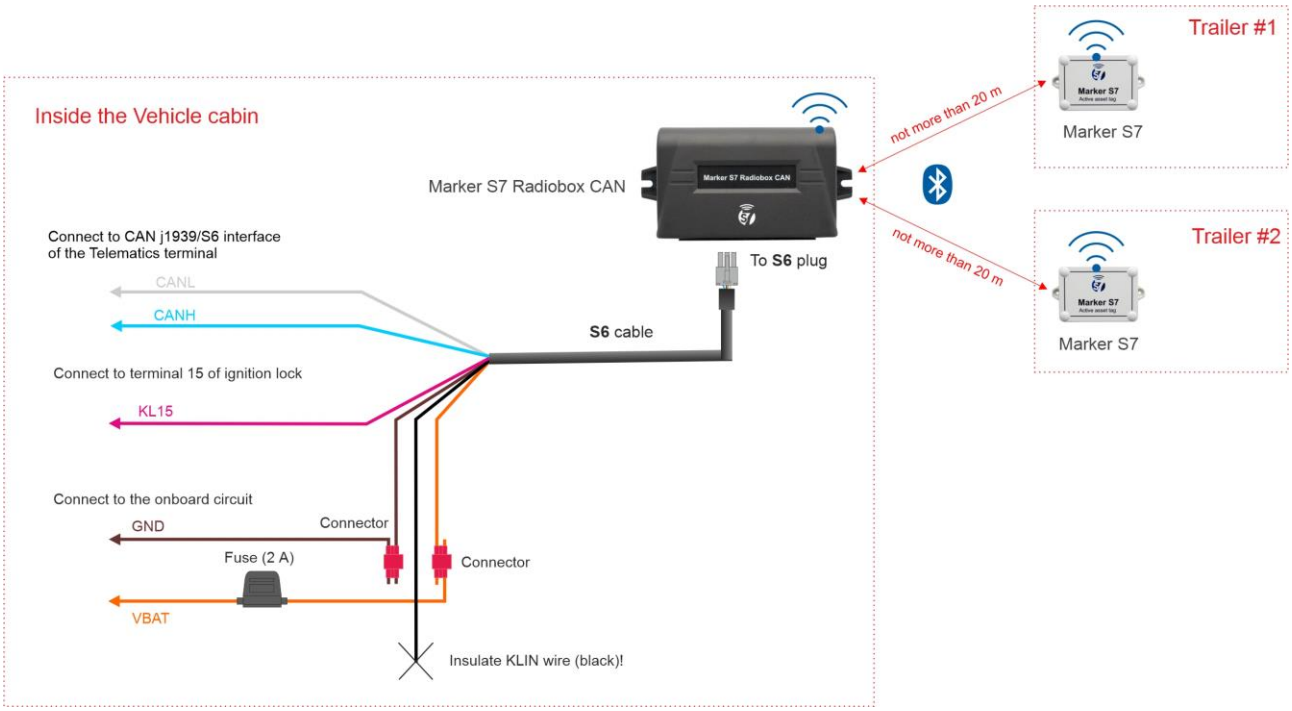


Figure 7 — Diagram of [Marker S7 Radiobox CAN] electrical connection

Marker S7 Radiobox CAN starts its operation from the moment the power supply is on (the onboard circuit is on); whenever the power supply is off, it switches off.

2.4 Marker S7 Radiobox CAN configuration for work with tags

2.4.1 Basic provisions

For wireless configuration of Marker S7 Radiobox CAN using S7 Technology, first, install the Service Marker S7 mobile application based on Android 6.X and higher platform on your smartphone/tablet (Android) from Google Play (search request "Technoton") (see figure 8).

IMPORTANT:

1) During your work with Service Marker S7 (Android), to eliminate any communication disruption between Marker S7 Radiobox CAN and the Android device, you need to make sure that there are no sources of electromagnetic interference close to the workplace (radiotelephones, video signal transmitting devices and other wireless devices operating within 2.4 or 5.0 GHz ranges, powerful transformers and switching equipment, welding equipment, high-voltage power lines and so on).

2) The maximum allowed distance between Marker S7 Radiobox CAN and the Android device depends on the quality of the Bluetooth module of the Android device. To ensure the uninterrupted data transfer, we do not recommend that this distance should exceed **20 m**.

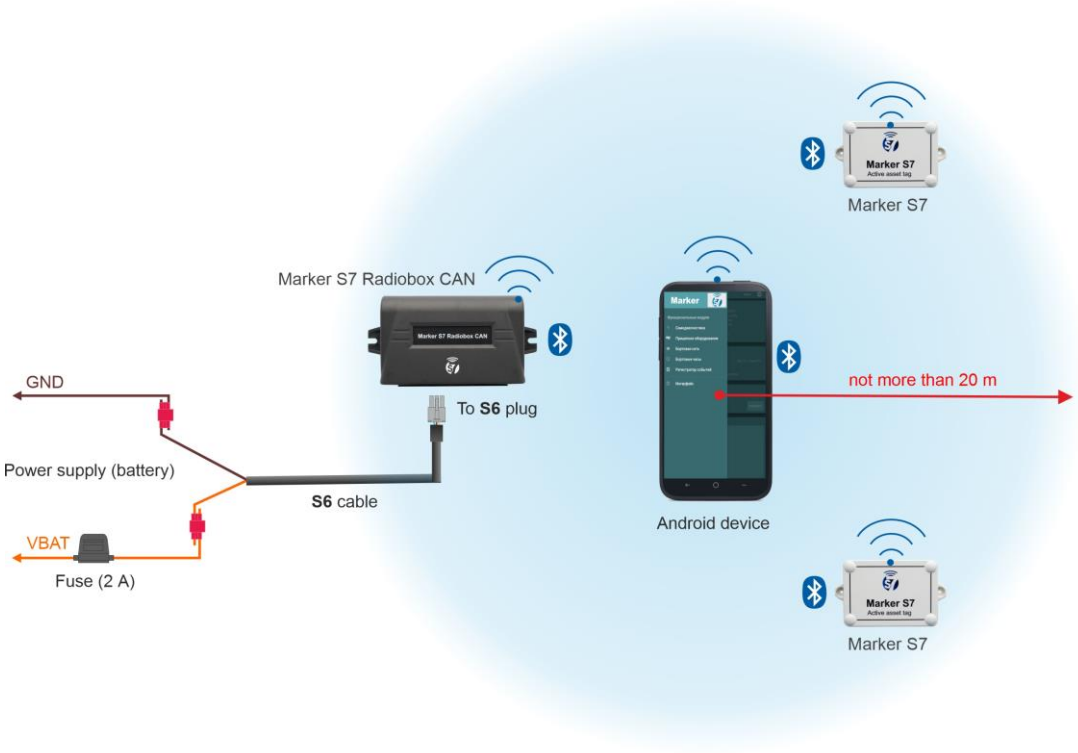


Figure 8 — Connection diagram of Marker S7 Radiobox CAN and the tags connection to the Android device

The settings of Marker S7 Radiobox CAN Functional modules displayed and/or edited using Service Marker S7 (Android) mobile application are provided in annex A.

2.4.2 Testing operability

Launch the Service Marker S7 (Android) mobile application with  icon from the main menu of the Android device.

Immediately after starting the Service Marker S7 (Android) application will offer to allow to enable the Bluetooth of the Android device (see figure 9 a).

After switching on the Bluetooth, the application will search and identify active Marker S7 Radiobox CAN wireless interface and the available Marker S7 tags. Each idenyified Unit is automatically included into the list of accessible devices; the following data will be displayed (see figure 9 b):

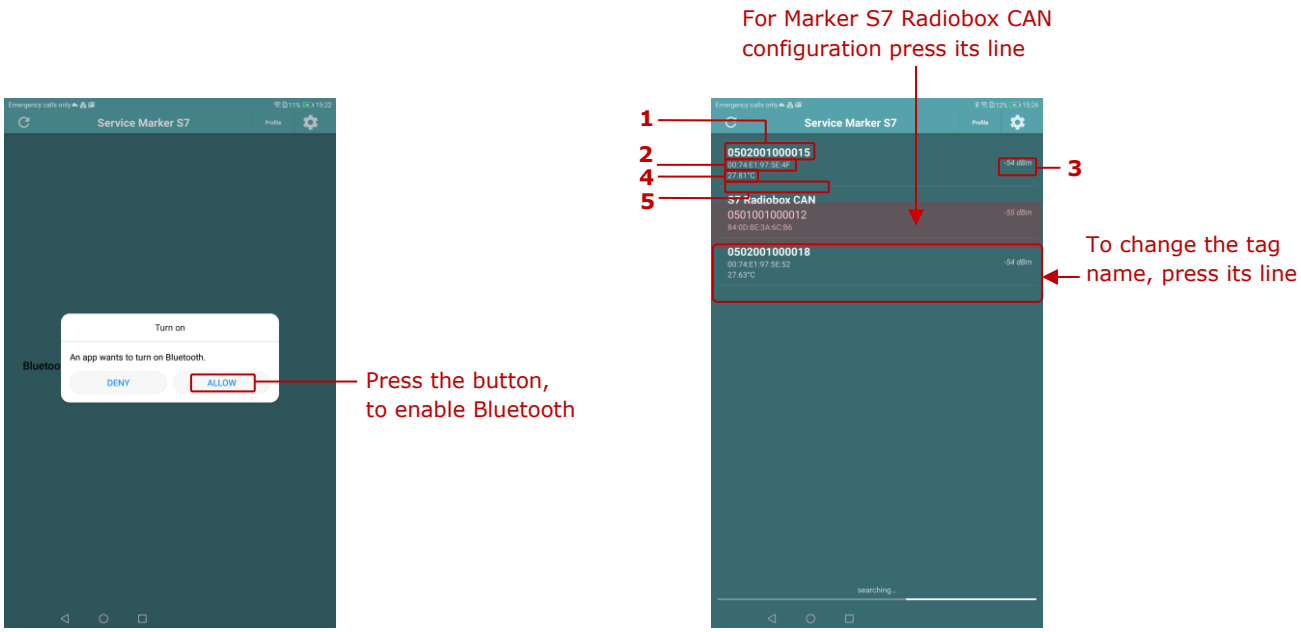
- serial number **(1)**;
- MAC-address of the BLE-module **(2)**;
- signal strength indicator (RSSI) **(3)**;
- ambient temperature in the location the tag is mounted **(4)***;
- "Manufacturing" mode (if the tag operates in this mode) **(5)***.

In order to configure Marker S7 Radiobox CAN wireless interface, press the line with the serial number of the required Unit in the list of accessible devices.

WARNINGS:

1) Marker S7 tag is ready for operation with Service Marker S7 (Android) application only after activation of its BLE module (see Marker S7 active asset tag operation manual).

2) During the working session with Service Marker S7 (Android) mobile application the information on tags attached to Marker S7 Radiobox CAN is neither updated after changing RSSI of their signals, nor in case of communication disruption.



a) offer to allow the Bluetooth connection

b) display of Units in the list of accessible devices

Figure 9 — Establishment of connection between Marker S7 Radiobox CAN tags and the Android device with Service Marker S7 (Android) application

***** Valid only for Marker S7 tags.

2.4.3 Interface of Service Marker S7 (Android) application

The interface of Service Marker S7 (Android) application consists of **Information and Configuration Area** and **Tools Panel** (see figure 10).

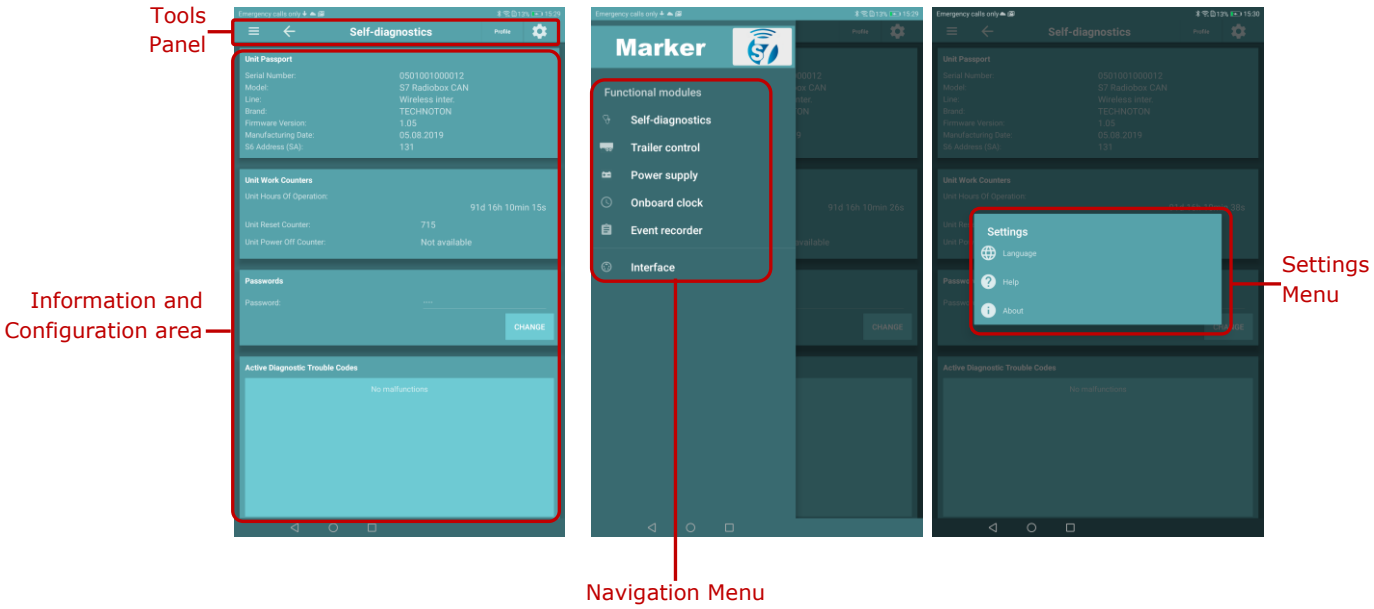


Figure 10 — Interface of Service Marker S7 (Android) mobile application

Information on Marker S7 active asset tags, as well as settings of Functional modules (FM) Marker S7 Radiobox CAN wireless interface are displayed in the **Information and Configuration** area.

In the **Tools Panel** area there are the following elements for use during work with Service Marker S7 (Android) application:

- button to display the **Settings Menu** (selection of the interface language, help and software information);
- button to select operations with Marker S7 Radiobox CAN profile;
- name of selected FM of Marker S7 Radiobox CAN;
- icon to complete the working session with Service Marker S7 (Android) application;
- icon to display the **Navigation Menu** (selection of FM of Marker S7 Radiobox CAN, monitoring of attached tags, configuration of automatic identification Parameters, monitoring Events, diagnostics of malfunctions, configuration of connection to an external device etc.).

When working with Marker S7 Radiobox CAN, the Service Marker S7 (Android) mobile app operates with data (PGN and SPN) from S6 databases.

2.4.4 Authorization

To start a session of wireless communication between Marker S7 Radiobox CAN and the Android device, press the line of the required Unit in the list of accessible devices (see figure 9 b). The mobile application will automatically connect the Unit with the selected Marker S7 Radiobox CAN.

Enter the Unit password into the appropriate boxes of the **Authorization** window. The password by default is 1111. To save the password entered (to exclude its entering manually another time during the next session of work with the Unit), checkmark the box **Remember Password** (see figure 11).

After the successful user authorization, the Profile of the selected Marker S7 Radiobox CAN is downloaded.

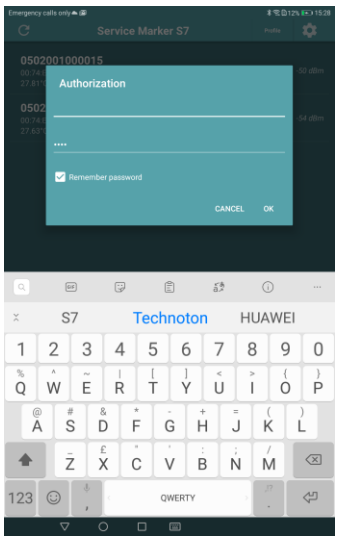


Figure 11 — Staring a wireless communication session between Marker S7 Radiobox CAN and the Android device

2.4.5 Operations with Marker S7 Radiobox CAN profile

Marker S7 Radiobox CAN profile is a set of PGN (passport/specification data and configuration of Functional modules).

To perform any operations with Marker S7 Radiobox CAN, the menu **Profile** is used which is opened by pressing the appropriate button on the **Tools Panel** (see figure 12).

The **Profile** menu contains the following options for operations:

- Load from file — is used to load the profile saved in the memory of the Android device before. In the window where the file is to be loaded you need to find and select the profile file (***.prf**);
- Save to file — is used to save the changed settings of the profile in the Android device memory;
- Load from Unit — is used to download the profile from the Unit connected to the Android device;
- Save to Unit — is used to save the changed profile settings in the memory of the connected Unit;
- Load default profile — is used for loading a profile with standard settings.

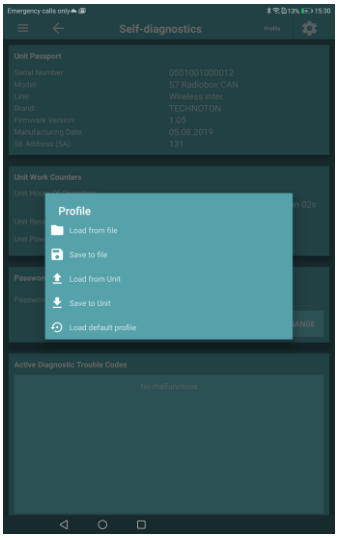


Figure 12 — View of Profile menu of Service Marker S7 (Android) mobile application

2.4.6 Configuration of connection via CAN j1939/S6 interface

To connect Marker S7 Radiobox CAN to the Telematics terminal, you need to configure parameters of CAN j1939/S6 interface in the Interface submenu (**Navigation Menu** of Service Marker S7 (Android) application see in 2.4.3) (see figure 13):

1) From the dropdown list **CAN Protocol Type** select the data transfer protocol via CAN interface:
- **J1939+S6** (by default) — in case of using the Terminal with the CAN-input supporting operation by means of S6 Technology (e.g. CANUp 27 Telematics gateway);
- **BITREK*** — in case of using Bitrek Terminal.

2) From the dropdown list **CAN Baudrate** choose data transfer speed: 100; 125; 250; 500; 1000 kbit/s (by default — 250 kbit/s).

3) From the dropdown list **Enable Termination Resistor** select ON or OFF (OFF by default) of the inbuilt terminal resistor (120 Ohms) between the contacts CAN LOW and CAN HIGH **S6** connector of Marker S7 Radiobox CAN. Note — The availability of terminal resistors between CAN LOW and CAN HIGH wires at the ends of CAN 2.0B (J1939) communication line is the necessary condition for correct data transmission.

4) CAN Mode (the setting is not accessible for changing) — the **Active (CAN Requests Enable)** mode of data reception is set. Marker S7 Radiobox CAN generates active requests to Units connected by means of S6 Technology. Active requests are needed to receive PGN which, by default, are missing in the CAN-bus, but may be provided only upon request.

Note — It should be taken into account that during the connection of Marker S7 Radiobox CAN to a standard vehicle CAN-bus by means of CAN j1939/S6 interface active requests may cause the Vehicle onboard equipment failures.

5) Enter the maximum time (by default — 1000 s) into the field **PGN Receive Timeout, s** (the setting is accessible only in case the BITREK protocol is selected); during this time the absence of messages is allowed from tags to be converted into PGN of CAN j1939/S6 interface. In case the specified time of waiting is exceeded, the FM Self-diagnostics (see A.1) will issue an error message via CAN communication line.

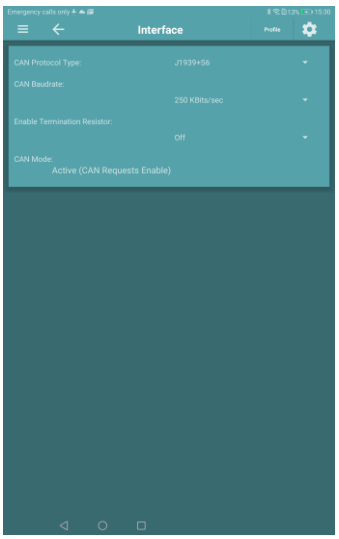


Figure 13 — Configuration of connection parameters for Marker S7 Radiobox CAN connection via CAN j1939/S6 interface

***** Is in preparation for introduction.

3 Packaging

Marker S7 Radiobox CAN delivery sets come in cardboard boxes of the following shape (see figure 14).

Figure 14 — Marker S7 Radiobox CAN packaging

Label sticker with information on the product name, serial number, firmware version, manufacture date, Technologies, weight as well as Quality Control seal and QR code is stuck on two sides of the Marker S7 Radiobox CAN box (see figure 15).

Figure 15 — Marker S7 Radiobox CAN packaging label

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

4 Storage

Marker S7 Radiobox CAN is recommended to be stored in dry enclosed areas.

Marker S7 Radiobox CAN storage is allowed only in original packaging at temperature range from -50 to +40 °C and relative humidity 98 % at 25 °C.

Do not store Marker S7 Radiobox CAN in the same room with substances that cause metal corrosion and/or contain aggressive impurities.

Marker S7 Radiobox CAN shelf life must not exceed 24 months.

5 Transportation

Transportation of Marker S7 Radiobox CAN is recommended in closed transport that provides protection for Marker S7 Radiobox CAN from mechanical damage and precipitation.

When transporting by air, Marker S7 Radiobox CAN 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 Marker S7 Radiobox CAN should be sealed.

6 Utilization/re-cycling

Marker S7 Radiobox CAN does not contain harmful substances and ingredients that are dangerous to human health and environment during and after the end of life and recycling.

Marker S7 Radiobox CAN does not contain precious metals in amount that should be recorded.

Contacts

Distribution, technical support and service

sales@jv-technoton.com

support@jv-technoton.com

Annex A
SPN of Marker S7 Radiobox CAN Functional modules

Reception and processing of data from Marker S7 active asset tags and their conversion into digital CAN j1939/S6 interface, self-diagnostics, configuration of Parameters, maintenance of Counters, generation of Events are ensured by the well-concerted operation of the Functional modules (FM) of Marker S7 Radiobox CAN wireless interface (**Navigation Menu** of Service Marker S7 (Android) mobile application (see 2.4.3).

Parameter form (SPN) of FM Marker S7 Radiobox CAN matches with Data base (DB S6) S6 Technology.

A.1 Self-diagnostics FM

Self-diagnostics (Self-diagnostics FM) — designed for user authorization, identification of the Unit passport data, operation time recording and also active and saved malfunctions.

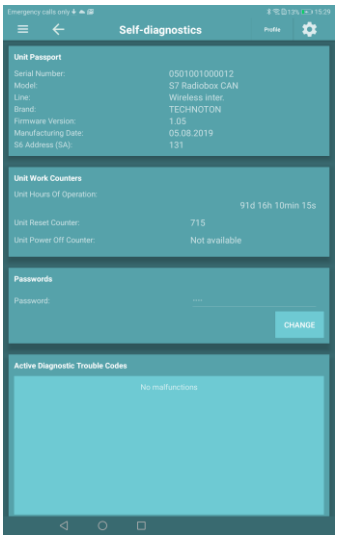


Figure A.1 — Example of the window of settings of FM Self-diagnostics in the Service Marker S7 (Android) mobile application

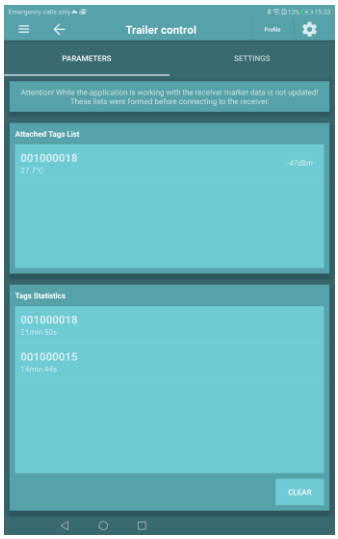
Table A.1 — Self-diagnostics FM. Displayed and/or editable SPN with the help of Service Marker S7 (Android) app

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 Unit. Serial number of the Unit has the following format: AABBB C DDDDD, where: AA – code of model; BBB – digits that reflect changes product changes; C – Manufacturer code; DDDDD – sequential number. Setting is not available for editing. SPN is not available for editing.

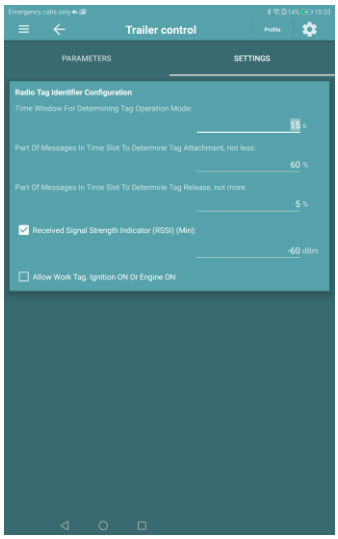
SPN	Name	Factory value	Unit of measure	Clarification
521345	Model	On the fact	No	Model – this is version of the Unit inside of S7 product line. Each model has its own functional and constructive features. Particularity of Marker S7 Radiobox CAN — the conversion of signals from Marker S7 active asset tags received by means of S7 Technology into CAN j1939/S6 interface. SPN is not available for editing.
521123	Line	S7	No	Name of the product line. S7 – is the Technology of wireless data collection via Bluetooth Low Energy channel from autonomous Units in transport and industrial Telematics systems. SPN is not available for editing.
521344	Mark	TECHNOTON	No	Name of the Unit Manufacturer. SPN is not available for editing.
521121	Firmware version	On the fact	No	Version of built in Software of the Unit. SPN is not available for editing.
521125	Date of production	On the fact	No	Date (day, month, year) of the Unit production. SPN is not available for editing.
521188	Address at S6 (SA) bus	131	No	Network address of the Marker S7 Radiobox CAN. Values of unique network addresses are automatically set by the service software and are not accessible for editing by the user.
Unit. Counters PGN 62994				
521116	Unit working time	On the fact	s	Counter of summarized working time of the Unit 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	pcs.	Counter of Unit's 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 the Unit. 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	The password is entered for user authorization during establishing the communication session between Marker S7 Radiobox CAN and the service mobile application. Password is a specific combination of four digits. By default, used: Login – 0, password – 1111. User can change password of the Unit. After entering and confirming the new password is recorded into internal memory of the Unit.
Active DTC PGN 65226				
521044	Malfunction code (SID)	On the fact	No	List of current Unit 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 Unit working performance. In case of lack of active malfunctions, the following message is displayed "No malfunctions".

A.2 Trailed Equipment Control FM

Trailer control (Trailed Equipment Control FM) — is designed for monitoring of tags attachment/release, configuration of automatic identification of the Vehicle attached tags and for maintenance of statistics.



a) ***Parameters*** *tab*



b) ***Settings*** *tab*

Figure A.2 — Example of the window of settings of Trailed Equipment Control FM in the Service Marker S7 (Android) mobile application

Table A.2 — Trailed Equipment Control FM. Displayed and/or editable SPN with the help of Service Marker S7 (Android) app

SPN	Name	Factory value	Unit of measure	Range	Clarification
Attached Tags List* PGN 63306					
521676/31.1	ID Tag/ 31.1 Tag 1	On the fact	No	0…4294970	Displays the identifier of the 1st tag mounted on the Vehicle attached equipment. The identifier consists of the tag serial number without the first four digits. The data are not accessible for editing.
521178/31.1	Received Signal Strength Indicator (RSSI)/ 31.1 Tag 1	On the fact	dBm	-125…0	Displays the signal power (by the logarithmic scale) received from the 1st tag mounted on the Vehicle attached equipment. The data are not accessible for editing.
171/31.1	Ambient Air Temperature/ 31.1 Tag 1	On the fact	°C	-273…1734.97	Displays the current value of ambient temperature in the location the 1st tag which is mounted on the Vehicle attached equipment. The data are not accessible for editing.
521676/31.2	ID Tag/ 31.2 Tag 2	On the fact	No	0…4294970	Displays the identifier of the second tag mounted on the Vehicle attached equipment. The identifier consists of the tag serial number without the first four digits. The data are not accessible for editing.
521178/31.2	Received Signal Strength Indicator (RSSI)/ 31.2 Tag 2	On the fact	dBm	-125…0	Displays the signal power (by the logarithmic scale) received from the second tag mounted on the Vehicle attached equipment. The data are not accessible for editing.

SPN	Name	Factory value	Unit of measure	Range	Clarification
171/31.2	Ambient Air Temperature/ 31.2 Tag 2	On the fact	°C	-273…1734.97	Displays the current value of ambient temperature in the location the second tag location which is mounted on the Vehicle attached equipment. The data are not accessible for editing.
Tags Statistics* PGN 63307					
521355	Array Elements Count	2	pcs.	1…60	Number of tags in the list "Tags statistics" (maximum 8 pcs.). These are all tags that were mounted on the equipment ever attached to the Vehicle (after the latest list reset).
521676/31.1	ID Tag/ 31.1 Tag 1	On the fact	No	0…4294970	Displays the identifier of the 1st tag from the list "Tags statistics". The identifier consists of the tag serial number without the first four digits. The data are not accessible for editing.
521495/31.1	Hours Of Operation With Tag/ 31.1 Tag 1	On the fact	s	0…4211080000	Displays the Counter of the total attachment time to the Vehicle of the equipment on which the 1st tag from the "Tags statistics" list is mounted. The data are not accessible for editing.
521676/31.2	ID Tag/ 31.2 Tag 2	On the fact	No	0…4294970	Displays the identifier of the second tag from the list "Tags statistics". The identifier consists of the tag serial number without the first four digits. The data are not accessible for editing.
521495/31.2	Hours Of Operation With Tag/ 31.1 Tag 2	On the fact	s	0…4211080000	Displays the Counter of the total attachment time to the Vehicle of the equipment on which the second tag from the "Tags statistics" list is mounted. The data are not accessible for editing.
521676/31.3	ID Tag/ 31.3 Tag 3	On the fact	No	0…4294970	Displays the identifier of the third tag from the list "Tags statistics". The identifier consists of the tag serial number without the first four digits. The data are not accessible for editing.
521495/31.3	Hours Of Operation With Tag/ 31.3 Tag 3	On the fact	s	0…4211080000	Displays the Counter of the total attachment time to the Vehicle of the equipment on which the third tag from the "Tags statistics" list is mounted. The data are not accessible for editing.
521676/31.4	ID Tag/ 31.4 Tag 4	On the fact	No	0…4294970	Displays the identifier of the fourth tag from the list "Tags statistics". The identifier consists of the tag serial number without the first four digits. The data are not accessible for editing.
521495/31.4	Hours Of Operation With Tag/ 31.4 Tag 4	On the fact	s	0…4211080000	Displays the Counter of the total attachment time to the Vehicle of the equipment on which the fourth tag from the "Tags statistics" list is mounted. The data are not accessible for editing.
521676/31.5	ID Tag/ 31.5 Tag 5	On the fact	No	0…4294970	Displays the identifier of the fifth tag from the list "Tags statistics". The identifier consists of the tag serial number without the first four digits. The data are not accessible for editing.
521495/31.5	Hours Of Operation With Tag/ 31.5 Tag 5	On the fact	s	0…4211080000	Displays the Counter of the total attachment time to the Vehicle of the equipment on which the fifth tag from the "Tags statistics" list is mounted. The data are not accessible for editing.
521676/31.6	ID Tag/ 31.6 Tag 6	On the fact	No	0…4294970	Displays the identifier of the sixth tag from the list "Tags statistics". The identifier consists of the tag serial number without the first four digits. The data are not accessible for editing.
521495/31.6	Hours Of Operation With Tag/ 31.6 Tag 6	On the fact	s	0…4211080000	Displays the Counter of the total attachment time to the Vehicle of the equipment on which the sixth tag from the "Tags statistics" list is mounted. The data are not accessible for editing.

SPN	Name	Factory value	Unit of measure	Range	Clarification
521676/31.7	ID Tag/ 31.7 Tag 7	On the fact	No	0…4294970	Displays the identifier of the seventh tag from the list "Tags statistics". The identifier consists of the tag serial number without the first four digits. The data are not accessible for editing.
521495/31.7	Hours Of Operation With Tag/ 31.7 Tag 7	On the fact	s	0…4211080000	Displays the Counter of the total attachment time to the Vehicle of the equipment on which the seventh tag from the "Tags statistics" list is mounted. The data are not accessible for editing.
521676/31.8	ID Tag/ 31.8 Tag 8	On the fact	No	0…4294970	Displays the identifier of the eighth tag from the list "Tags statistics". The identifier consists of the tag serial number without the first four digits. The data are not accessible for editing.
521495/31.8	Hours Of Operation With Tag/ 31.8 Tag 8	On the fact	s	0…4211080000	Displays the Counter of the total attachment time to the Vehicle of the equipment on which the eighth tag from the "Tags statistics" list is mounted. The data are not accessible for editing.
Radio Tag Identifier Configuration PGN 63308					
521496	Time Window For Determining Tag Operation Mode	120	s	0…4211080000	Field in which the time interval (in seconds) is specified during which Marker S7 Radiobox CAN must automatically identify the fact of attachment to the Vehicle or release from the Vehicle of the equipment with the tag mounted on it. The value of the time interval is selected experimentally.
521497	Part Of Messages In Time Slot To Determine Tag Attachment	60	%	0…250	Field in which the % from the number of all tag messages is specified (messages received by Marker S7 Radiobox CAN during the specified time interval) which is needed to identify automatically the fact of attachment to the Vehicle of the equipment with the tag mounted on it. The value of the % ratio is selected experimentally.
521498	Part Of Messages In Time Slot To Determine Tag Release	30	%	0…250	Field in which the % from the number of all tag messages is specified (messages received by Marker S7 Radiobox CAN during the specified time interval) which is needed for automatic identification of the fact of release from the Vehicle of the equipment with the tag mounted on it. The value of the % ratio is selected experimentally.
521178/2.8	Received Signal Strength Indicator (RSSI)/ 2.8 Min	-90	dBm	-125…0	Field in which the minimal level of signal from the tag which is received by Marker S7 Radiobox CAN is specified; the signal level which is sufficient for automatic identification of the fact of attachment/release to/from the Vehicle of the equipment with the tag mounted on it. To enable this setting, tick it. The value of the minimal level of signal from the tag is selected experimentally.
521677	Allow Work Tag. Ignition ON	Off	No	On/Off	Field to enable/disable automatic identification of the fact of attachment to the Vehicle or release from the Vehicle of the equipment with the tag mounted on it only after the Vehicle ignition is switched on or when the Vehicle engine is running. To enable this setting, you need connect Marker S7 Radiobox CAN to terminal 15 of the ignition lock (see 2.3).
***** During the working session of Service Marker S7 (Android) mobile application with Marker S7 Radiobox CAN (service mode) data on tags are not updated. "List of attached tags" and "Tags statistics" are generated automatically till the moment Marker S7 Radiobox CAN switches into the service mode.					

A.3 Vehicle power supply FM

Power supply (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*.

* Preparation for release.

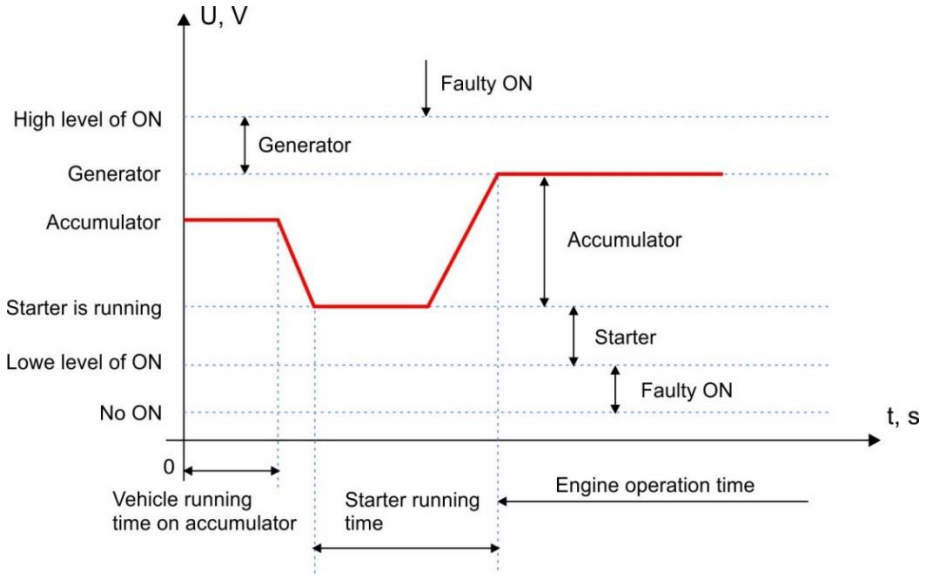


Figure A.3 — Operation modes on onboard network (ON) voltage level

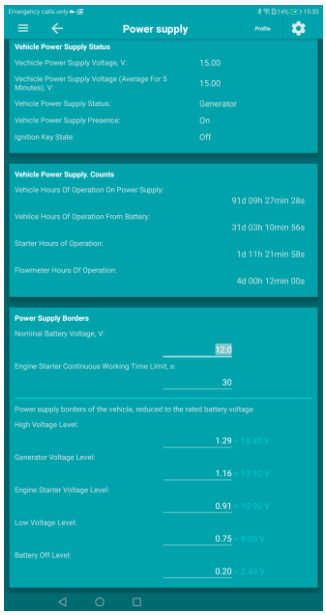


Figure A.4 — Example of the window of settings of Vehicle power supply FM in the Service Marker S7 (Android) mobile application

Table A.3 — Vehicle power supply FM. Displayed and/or editable SPN with the help of Service Marker S7 (Android) app

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).
521049	Ignition Key State	On the fact	No	On/Off	Displays the current position of the Vehicle ignition key (ON/OFF). The tension on terminal 15 of the Vehicle ignition lock indicates that the ignition key is in the ON position. To enable this setting, you need to provide electric connection of Marker S7 Radiobox CAN to terminal 15 of the ignition lock (see 2.3).
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) (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.
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).
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 Unit installation to the Vehicle. The user cannot reset the value of this Counter by himself*.
521172	Vehicle hours of operation from battery	On the fact	s	0…4211080000	Counter of total operating time of Vehicle from accumulator since Unit installation to the Vehicle. The user cannot reset the value of this Counter by himself*.
521170	Starter hours of operation	On the fact	s	0…4211080000	Counter of total operating time of starter since Unit installation to the Vehicle. The user cannot reset the value of this Counter by himself*.
521171	Starter hours of operation	On the fact	s	0…4211080000	Counter of total operating time of Vehicle's engine since Unit installation to the Vehicle. The user cannot reset the value of this Counte by himself*.
* Counter can be reset by the Manufacturer of RSC.					

A.4 Onboard clock FM

Onboard clock (Onboard clock FM) — designed for generation of signals of time and its transmission to other Functional modules of Marker S7 Radiobox CAN.

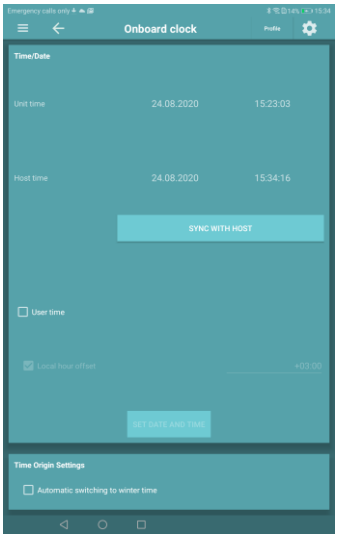


Figure A.5 — Example of the window of settings of Onboard clock FM in the Service Marker S7 (Android) mobile application

Table A.4 — Onboard clock FM. Displayed and/or editable SPN with the help of Service Marker S7 (Android) app

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	Time Displacement In Minutes	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	Time Displacement In Hours	+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 Counter Settings PGN 63011					
521350	Automatic Time Switching (winter/ summer)	Off	No	On/Off	Enabling/disabling of automatic present time switching to winter/summer.
521353	Period Of Time Synchronization With GNSS	1.0	h	0…210554000	Time interval value (in hours), after which there is an automatic present time adjustment performed according to GNSS signals. This setting is available for editing by user. Automatic time adjustment with GNSS signals is not carried out when the value is 0 h.
* Used during Events registration. Present time is available for user for editing manually or synchronizing of date/time with computer clock. By default, time is set in UTC format (Coordinated Universal Time standard) and displayed according to local displacement.					

A.5 Events Registrator FM

Event recorder (Events Registrator FM) — designed for registration of 15 important and 15 informative latest Events of Marker S7 Radiobox CAN.

Figure A.6 — Example of the window of settings of Events Registrator FM in the Service Marker S7 (Android) mobile application

Table A.4 — Events Registrator FM. Displayed and/or editable SPN with the help of Service Marker S7 (Android) app

SPN	Name	Factory value	Unit of measure	Clarification
Important Events List PGN 63055				
521166	Event SPN	No	No	List of important Events is displayed (up to 15).* The following Events are considered to be important: - onboard circuit failure (with voltage value displayed); - too high onboard circuit voltage.
Information Events List PGN 63056				
521166	Event SPN	No	No	List of information Events is displayed (up to 15).* The following Events are considered to be information Events: - tag attachment (with ID specification); - tag release (with ID specification).
* For each Event the following data are specified: designation, date/time of occurrence, as well as additional information (if any). Events are displayed in chronological sequence, starting from the most recent. As soon as the maximum number of Events displayed is reached, new Events overwrite the earliest Events. The user cannot clear the list of important Events.				

Detailed parameters description (SPN), structure and content of messages (PGN) of FM Marker S7 Radiobox CAN are placed at the following web site http://s6.jv-technoton.com/ (to access S6 DB registration is required).

Annex B
Electromagnetic compatibility of BLE-module

BLE-module installed in Marker S7 Radiobox CAN wireless interface is certified and found to comply with:

- FCC Rules Part 15 (marking — Contains FCC ID: S9NSPBTLERF);
- IC Rules, RSS-210 (marking — Contains IC: 8976C-SPBTLERF).

WARNING: Any changes or modifications of BLE-module, which are not approved by the party responsible for compliance with FCC and IC certificates, may deprive the user of the wireless interface of the right to operate it.

1) BLE-module complies with the restrictions for Class B digital device in accordance with Part 15 of the FCC Rules and RSS-210 of the IC Rules.

These restrictions are used for providing protection from harmful interference when operating in residential premises. BLE-module generates and can transmit/receive radio frequency energy. If it is not installed and is not used in accordance with the instructions, it may cause harmful interference to radio communication. There is no guarantee that interference will not occur in a particular installation. If BLE-module creates harmful interference to the reception of radio or television signals, what can be determined by turning BLE-module on and off, it is recommend for a user to try to eliminate the interference in one or more of the following ways:

- change the direction or location of the receiving antenna;
- increase the distance between the equipment and the receiver;
- plug the equipment into an outlet on a circuit different from that to which receiver is connected;
- contact the dealer or an experienced radio / television technician for a help.

2) BLE-module complies with the restrictions for Class A digital device in accordance with Part 15 of the FCC Rules and RSS-210 of the IC Rules.

These restrictions are designed to provide reasonable protection against harmful interference when the BLE-module is operated in a commercial environment. BLE-module generates and can transmit / receive radio frequency energy. If it is not installed and is not used in accordance with the instructions, it may cause harmful interference to radio communication. Operation of BLE-module in a residential area may cause harmful interference in which case the user will be required to correct the interference at his own expense.

Annex C
Videography

Technoton videos are on the YouTube channel which is regularly updated:

https://www.youtube.com/channel/UCq7EF3DHrgl7fOWB2ynsR-A