CONTACTLESS READER

CANCrocoLITE

OPERATION MANUAL

Version 1.0

Content

Revision history

Version	Date	Editor	Description of changes
1.0	02.2017	OD	Basic version

Terms and Definitions

ORF 4 — is the Telematics Service by Technoton developed for receiving and processing Onboard Reports via Internet, displaying Operational Data overlapped on area maps, information storage in database and Analytical Reports generation upon user's request.

S6 — is the vehicle onboard data interface developed by JV Technoton to enable integrating the GPS/GLONASS-based vehicle monitoring system into the vehicle electrical equipment. It comprises a set of cables, interfaces and protocols. Physically, it is implemented on the basis of CAN 2.0B (ISO 11898-1:2003) and K-Line (ISO 9141). S6 bus data exchange protocol complies with SAE J1939 International Standard.

To get more details on S6 telematics interface visit http://s6.jv-technoton.com/en/

Telematics interface S6 operation manual contains guidelines and rules which refer to S6 cabling system, S6 SK service kit and service software for S6 Telematics interface

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).

FMS are data packets of vehicles' digital onboard interfaces (further on vehicles) that comply with the document FMS-Standard Interface Description (further on — FMS-Standard). FMS-Standard is an open FMS Interface Standard developed by world leading truck manufacturers. More detailed description of FMS messages are described in FMS-Standard Interface description document. Actual version of the document can be downloaded from the web site of developer http://www.fms-standard.com.

Telematics — special set of telematics messages developed by Technoton. Meets requirements of SAE J1939/71 standards. Teleamtics messages contain important operation parameters of vehicle.

Onboard equipment (OE) — Telematics System Elements, directly installed in vehicle.

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 real-time and after trip vehicle monitoring and control. Main vehicle parameters monitored: route, fuel consumption, operation time, technical condition of vehicle, safety. Consists of OE, Communication channels, Telematics service ORF 4.

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

Introduction

Recommendations and guidelines contained in this Operation Manual are related to contactless reader CANCrocoLITE (hereinafter CANCrocoLITE) developed by TECHNOTON JV, Minsk, BELARUS.

This document contains information on CANCrocoLITE design, principle of operation, specifications as well as recommendations on its installation, connection and exploitation.

CANCrocoLITE — is a tool for Telematics systems **used for data reading from on-board CAN bus of personal cars and light commercial vehicles without interference in integrity of electronic circuits.**

Distinctive features of CANCrocoLITE:

- contactless data obtaining through wires insulation without interfering into its integrity;

- zero impact on the electronic and electrical equipment of the Vehicle;

- compact open-frame design allows handy connection to the wires of CAN bus even in the most hard-to-reach places of a car;

- reliable protection of car's electronic circuits against exposures via CAN interface, e.g. active requests sent from connected Telematics unit;

- safe data integration from one or several informational vehicle buses to **S6** Telematics interface ***;**

- powered from vehicle's onboard power supply — does not require an additional equipment (power supply unit);

- protected against reverse polarity;

- easy to install and operate;

- setting-up is not needed;

- competitive price.

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

To ensure the proper functioning of CANCrocoLITE, certified professionals who are trained by the manufacturer should carry out its installation and setup.

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

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* When CANCrocoLITE is used together with MasterCAN vehicle data interface.

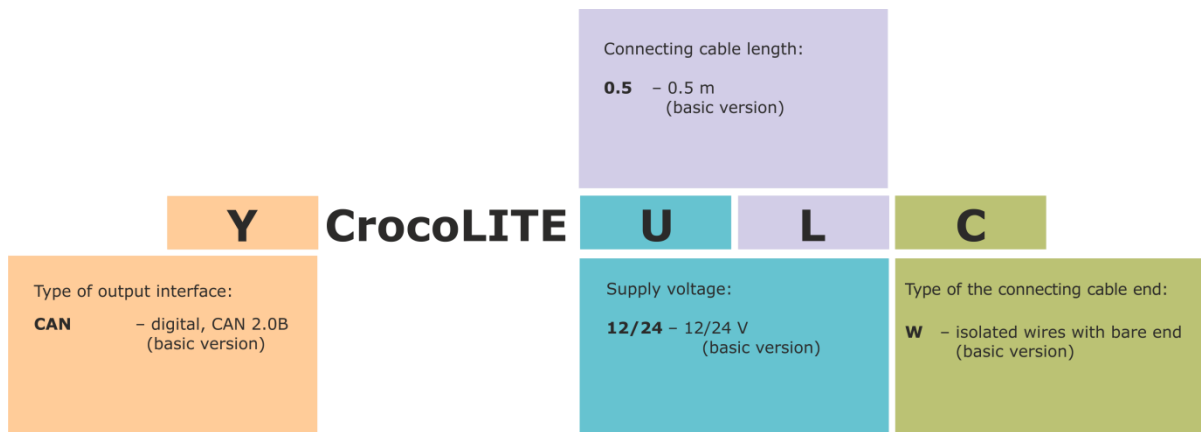See figure 1 for identification codes for CANCrocoLITE ordering:

Figure 1 — CANCrocoLITE order identification codes

⚠️ **ATTENTION:** While making an order, it is allowed not to specify the identification codes that correspond to basic version of CANCrocoLITE.

Example of CANCrocoLITE ordering identification codes:

"Contacless reader CANCrocoLITE",
(output interface — CAN 2.0B; nominal supply voltage — 12/24 V;
length of connecting cable — 0.5 m; end of connecting cable — isolated wires with bare end).

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

1 General information and technical specifications

1.1 Purpose of use and application area

CANCrocoLITE **is used for contactless data reading from CAN bus of personal cars and light commercial vehicles. CANCrocoLITE generates output signal fully corresponding to data set of connected vehicle bus.**

Application – CANCrocoLITE is used within Telematics system to obtain available data on fuel consumption, engine operation modes, status of sensors and gauges, presence of malfunctions.

CANCrocoLITE can be installed on all types of personal cars, vans and light commercial vehicles equipped with CAN bus (see figure 2).

CANCrocoLITE is compatible with all types of Telematics terminals that have a port for CAN bus connection.
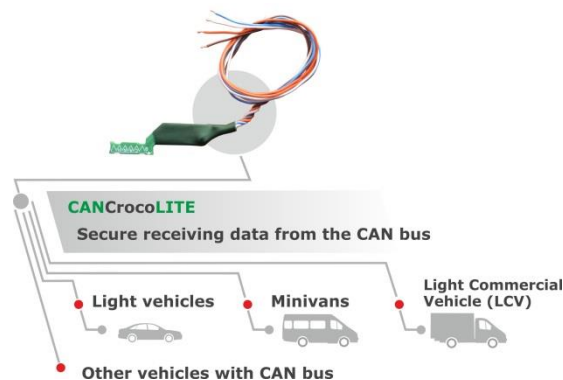

Figure 2 — CANCrocoLITE application area

CANCrocoLITE output signal is received by tracking device that collects, records, stores and transfers received signals to the vehicle tracking system server. Software installed on the server processes and analyzes received data and then compiling reports that contain information on fuel consumption, operating modes of the engine, sensors status and troubleshooting of the vehicle (see figure 3).
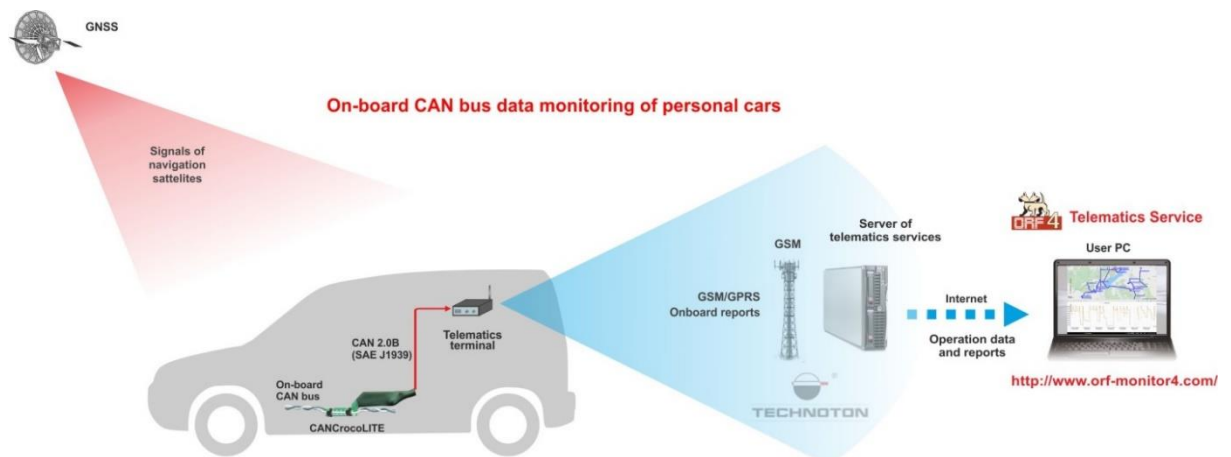

Figure 3 — Secure data obtaining use of CANCrocoLITE

While used together with MasterCAN vehicle data interfaces, CANCrocoLITE becomes a ready-made solution for safe data integration from automotive CAN bus into S6 Telematics interface. It allows to monitor over 100 operation parameters of Vehicle via just one CAN-port of telematics terminal (see figure 4).

Output messages content (FMS и Telematics), installation and setting-up sequence and other useful information about MasterCAN can be found in MasterCAN operation manual.
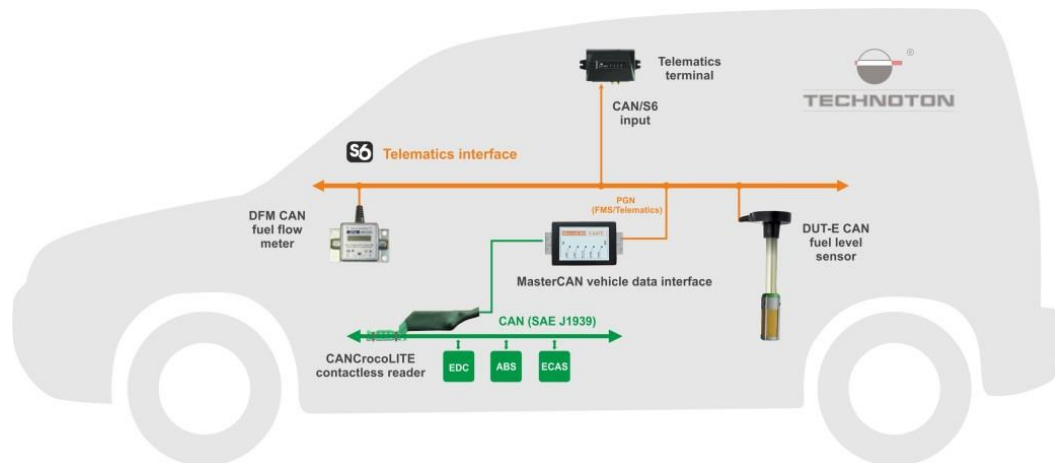

Figure 4 — Secure integration of standard onboard CAN bus data through CANCrocoLITE into S6 Telematics interface

ORF 4 Telematics service's reports, based on data obtained via CANCrocoLITE, which is used together with MasterCAN CC, provide extensive possibilities for monitoring of vehicle's hourly fuel consumption as well as total fuel consumption per trip (see figure 5).

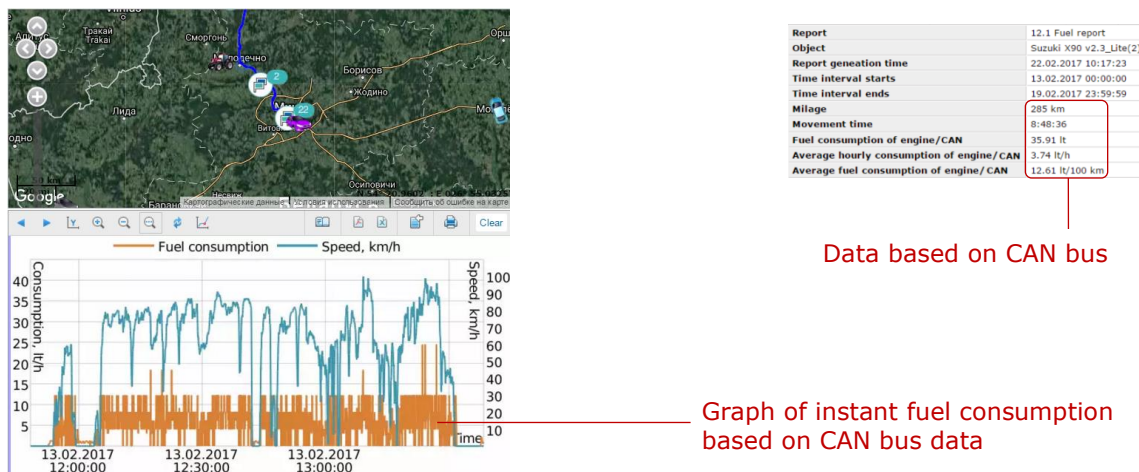*Figure 5 — Automotive CAN bus data monitoring through CANCrocoLITE in ORF 4 software*

⚠️ **WARNING:** set of information transmitted via CAN bus may differ depending on manufacturer, model and manufacture year of a Vehicle.

1.2 Delivery set
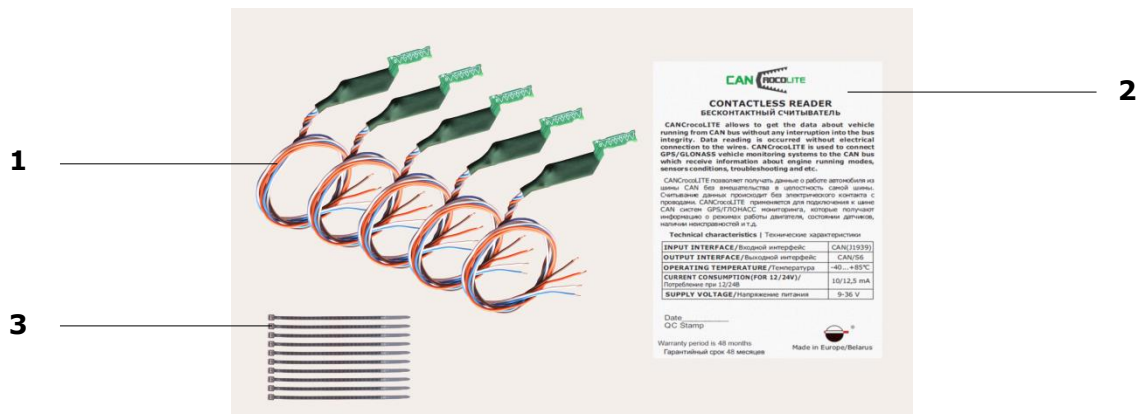
1	Contactless reader	– 5 pcs.;
2	Specification containing basic technical characteristics and brief installation instructions	– 1 pc.;
3	Cable tie	– 10 pcs.

Figure 6 — CANCrocoLITE delivery set

1.3 Technical specifications

1.3.1 Main exploitation specifications

Table 1 —CANCrocoLITE main exploitation specifications

| Parameter, measuring unit	Value
Acceptable message loss, %, not more than	1
Nominal supply voltage for versions U12/24, V	12 or 24
Current consumption at supply voltage 12 V, mA, not more	10
Current consumption at supply voltage 24 V, mA, not more	12.5
Power supply voltage range for versions U12/24, V	from 9 to 36
Temperature range, °C	from -40 to +85
Dimensions, mm, not more than	see figure 7
Weight, kg, not more	0.05
Compatibility	SAE J1939, CAN Open, DeviceNet, NMEA 2000

1.3.2 Overall dimensions
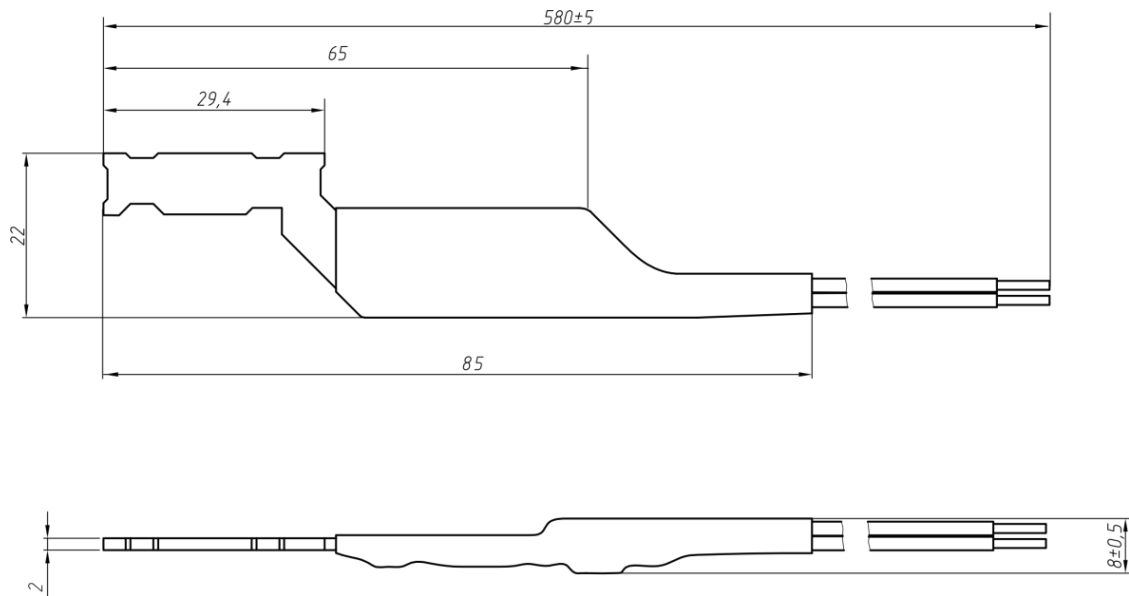
Figure 7 — CANCrocoLITE dimensions

1.3.3 Output interface of CANCrocoLITE

CANCrocoLITE output interface — CAN 2.0B, according to international standard SAE J1939.

1.4 Unit structure and operation principle of CANCrocoLITE

1 - electronic board

2 - connection cable

Figure 8 — CANCrocoLITE structure
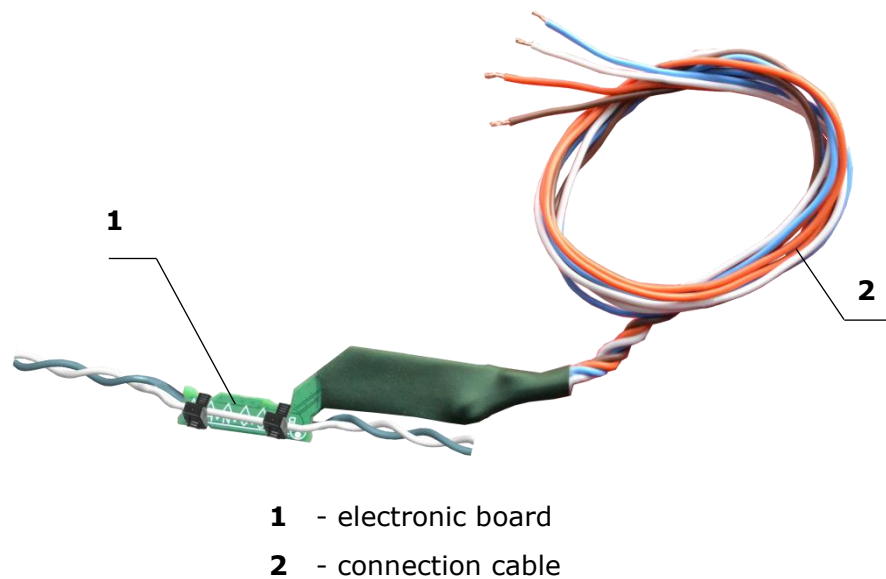
Principle of CANCrocoLITE operation is based on reading the electromagnetic field that is formed around the wires during the signal passing.

CANCrocoLITE forms digital output signals that contain data package identical to the signal of the connected CAN bus. This signal can contain information about operating modes of the engine, fuel consumption, sensor status, malfunctioning of the Vehicle.

2 Connection of CANCrocoLITE

⚠️ **ATTENTION:** Strictly follow safety rules of automobile repair works as well as local safety rules of the customer company when mounting CANCrocoLITE.
Before CANCrocoLITE installation it is recommended to study carefully the electrical circuit diagram and the Operating Manual of the vehicle on which CANCrocoLITE is mounted.

2.1 Exterior inspection prior to connection

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

Contact the supplier if any defects detected.

2.2 Recommendations for search of CAN bus wires

To connect CANCrocoLITE to on-board CAN bus, you should find and identify CAN-H (CAN HIGH) and CAN-L (CAN LOW) wires.

Physically, CAN bus most often represents a twisted (stranded) pair of wires (30 windings per running meter) with splitters to connect electronic control units (further on – ECU) that have terminating resistors of 120 Ohms nominal impedance located at the ends of the bus. The resistors may be mounted separately or may be integrated into the ECU. As a rule, there is no SHLD wire.

Example: DEUTSCH company manufactures CAN buses made of special three-conductor cable (CAN-H, CAN-L, and signal GND) with 7 to 12 mm external coating diameter, special splitters, and terminating elements – terminating resistors designed to match wave impedance during the transmission of messages in the bus and to suppress interference (see figure 9).

Figure 9 — Elements of the CAN bus manufactured by DEUTSCH company

There may be from one to six and more CAN buses on the vehicle of EURO-3 Environmental Standard. They may be defined as M-CAN, T-CAN, I-CAN, H-CAN, A-CAN, EBS-CAN etc. **The following three CAN buses are of interest for fuel consumption monitoring: T-CAN, M-CAN, and I-CAN (seldom).**

T-CAN and M-CAN may have the following features:
- Availability of OBD II connector for diagnostics (see figure 10);
- the color and cross-section of stranded pairs of wires;
- connection of stranded pairs of wires to contacts at OBD II and ECU connectors.

Example: If there is an OBD II diagnostics connector on the vehicle and a pair of stranded wires of orange color one of which has a black band, and the other has a brown one, and this pair of stranded wires matches the OBD II diagnostics connector, so this may be the CAN bus you are looking for. In this case, the orange wire with the black band is CAN-H, while the wire with the brown band is CAN-L.

Figure 10 — Examples of OBD II diagnostics connector

Contacts of the ABS/ASR ECU system corresponding to CAN bus are identified according to figure 11.
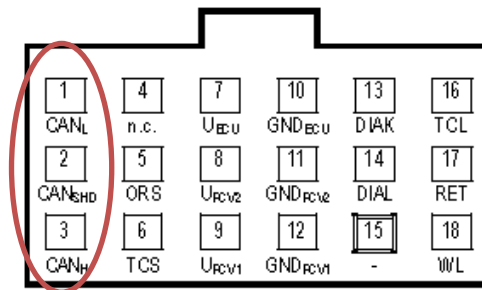

Figure 11 — Identification of CAN bus in the ABS/ASR ECU connector ABS/ASR ECU

> **WARNING:** Features of CAN bus may be different for different vehicle manufacturers. Besides, those features may be different for the same manufacturer depending on the design features of the vehicle and its configuration (the engine, fuel supply system, the link between the engine EDC and the throttle pedal, availability or absence of the electronic dashboard, digital tachograph, etc).

Initial diagnostics and assessment of CAN bus serviceability may be carried out using a multimeter by means of the following traditional methods:

- continuity test of CAN-L and CAN-H wires;
- short circuit and impedance check (full impedance depending on the terminating resistors and input impedance of ECUs connected to the bus) between CAN-L and CAN-H wires;
- measurement of voltages in CAN-L and CAN-H wires in the recessive mode (the ignition is off, the battery disconnect switch is on) and in the dominant mode (the ignition is on and engine has been started).

The impedance check should be carried out with the whole onboard circuit off (the battery disconnect switch is off). The control impedance value must be no more than 60 Ohms.

The serviceability check of CAN bus is carried out with the ignition and engine on, by pressing and releasing the throttle pedal between the wires of the stranded pair of wires. The control voltage value must be from 1.2 to 3.0 V.

CAN-H and CAN-L can be identified according to the following voltage values:
- recession mode — about 2.5 V (on both CAN-L and CAN-H);
- dominant mode — less than 2.5 V (on CAN-L) and more than 2.5 V (on CAN-H).

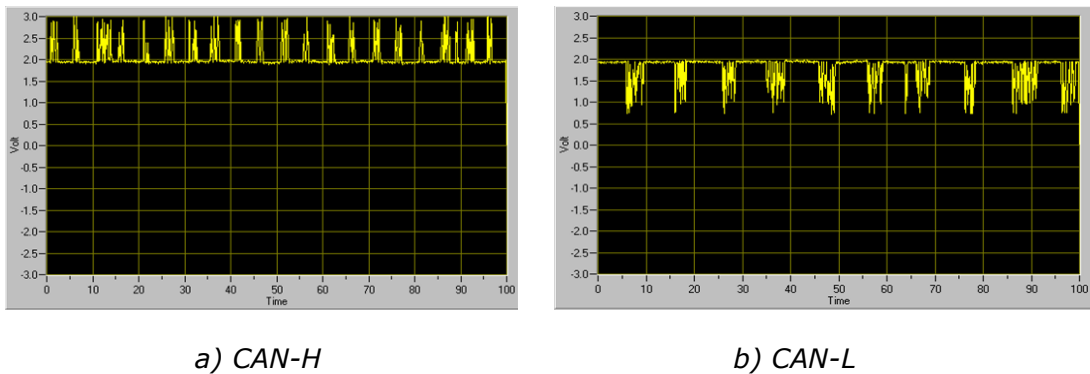Example of oscilloscope pictures of signals from CAN-high and CAN-low are presented at figure 12.

a) CAN-H   b) CAN-L

Figure 12 — Oscilloscope pictures of signals from CAN-high and CAN-low

2.3 Exploitation restrictions

To install CANCrocoLITE, you need to choose dry area protected from aggressive environmental influences.

It is not allowed to install CANCrocoLITE near heating or cooling elements (e.g.: climate-control systems). Also, it is not recommended to install CANCrocoLITE close to the automobile power circuits. Driver's cabin will be the best place for the installation.

During installation under the automobile hood, you need to make sure that CANCrocoLITE housing and its cable are located at least 10 cm far from engine rotating parts and surfaces.

2.4 Electrical connection

CANCrocoLITE can be powered from the Vehicle's onboard power network or from the Tracking device.

> **ATTENTION:**
>
> **1)** Before starting CANCrocoLITE installation, it is needed to disconnect electrical circuit of the Vehicle. To do this, you shall use battery disconnect switch or remove contact terminals from it.
>
> **2)** It is recommended to use fuses when connecting CANCrocoLITE power supply (see figure 13 a). Nominal fuse current is not more than 2 A.
>
> **3)** CANCrocoLITE power supply "+" and Ground "-" wires should be connected to the same points of vehicle electric circuit as correspondent wires of the Tracking device.
>
> **4)** Prior to electrical connection of the CANCrocoLITE 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.

To connect CANCrocoLITE power supply wires, it is recommended to use terminals (see figure 13 b), while connecting signal wires, it is recommended to use connectors as shown at figure 13 c.

a) fuse with holder   *b) terminals*   *c) connectors*

Figure 13 — Terminal and connector accessories for CANCrocoLITE connection

CANCrocoLITE electrical connection is made according to interface cable wires assignment (see table 2).

*Table 2 — CANCrocoLITE cable wires assignment*

Wire			Signal	
Marking	**Color**		**Designation**	**Parameters**
VBAT	Orange	⬤	Power Supply "+"	Analog, voltage from 10 to 50 V
GND	Brown	⬤	Ground "-"	—
CANH	Blue	⬤	CAN HIGH	Digital, in accordance with SAE J1939 standard
CANL	White	⬤	CAN LOW	

After powering-on CANCrocoLITE, please switch on the battery (ignition).

2.5 Contactless connection to the vehicle wires

To connect CANCrocoLITE, follow the steps in accordance with figure 14.
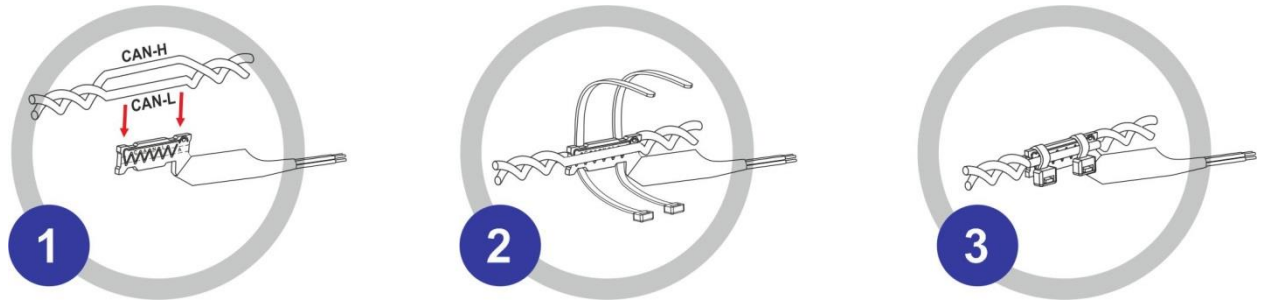
1 — put CAN bus wires on CANCrocoLITE board according to marking.

2 — firmly fix wires using two cable ties from delivery set.

3 — CANCrocoLITE is ready for operation.

Figure 14 — Steps for CANCrocoLITE connection

3 Functioning check

If the connection is done correctly, [CANCrocoLITE](#) starts its operation as soon as it is powered on (ignition is on). When you disconnect the power supply (turning off the ignition),
CANCrocoLITE will be switched off.

Correctness of connection can be confirmed by presence of CAN bus data in the output interface of CANCrocoLITE.

4 Disconnecting CANCrocoLITE

⚠️ **ATTENTION:** Before you start CANCrocoLITE dismounting, you need to disconnect electrical circuit of the Vehicle. To do this, you shall use the battery disconnect switch or remove contact terminals from it.

To switch off CANCrocoLITE, you need to fulfill the following steps:

1) Disconnect CANCrocoLITE connection cable (wire) from the Tracking device. If CANCrocoLITE is powered from onboard power supply, you need to disconnect CANCrocoLITE power ("+" and "-" wires) from the onboard power supply.

2) Carefully cut cable ties, which fix CAN bus wires on CANCrocoLITE electronic board.

3) Put off CAN bus wires from CANCrocoLITE board's surface.

After dismounting, you can use CANCrocoLITE on other Vehicle.

5 Packing

CANCrocoLITE delivery set (see 1.2) is placed in bubble package 230x170 mm.

6 Storage

CANCrocoLITE is recommended to be stored in dry enclosed areas or other premises with natural ventilation, without simulated climatic conditions and unheated warehouses.

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

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

7 Transportation

Transportation of CANCrocoLITE is recommended in closed transport that provides protection for CANCrocoLITE from mechanical damage and precipitation.

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

8 Utilization/re-cycling

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

CANCrocoLITE does not contain precious metals in amount that should be recorded.

Contacts

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