CAR2FMS Interface

Contents:

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General description

Device is designed as generator of information from digital tachographs VDO SIEMENS, ACTIA, and STONERIDGE at CAN bus and as transducer of information from CAN bus of cars at CAN bus in FMS format. Thus, it forms FMS gateway for cars.

At the bus, information about driver's ID, set working activity and so on are generated from tachograph.

From the car CAN bus, available data is convert into FMS format. Some data can be provided in adjusted format.

Technical information

- 2x CAN interface, high-speed type. Output CAN speed is 250 kbit (different speed available on demand). Input CAN speed depends on car settings.
- Without galvanic separation of CAN.
- VDO SIEMENS, ACTIA a STONERIDGE digital tachographs connection with galvanic separation.
- Output data converted from the car into the FMS format generated approx. every 250 ms.
- Allows to connect signal 15 (ignition) and automatic device switch-off.
- Synchronous output switching with generating of each segment of tachograph message at CAN.
- 5 x signal LED
- Consumption 30 mA at 12 V (0.36 W), approx. 20 mA at 24 V (0.48 W)
- Dimensions: 10 x 5 x 3 cm.

Structure of messages generated from tachograph

On CAN bus, the device generates information from tachograph at the moment of change of this information. Message with PGN FE6B is used for generating. Information is generated in sequence of several of these messages.

FE6B h							
65131							
Data Byte 1	**Data Byte 2**	**Data Byte 3**	**Data Byte 4**	**Data Byte 5**	**Data Byte 6**	**Data Byte 7**	**Data Byte 8**
Data Marker - data type - index	Data	Data	Data	Data	Data	Data	Data

Data marker:
It indicates type of data transferred, this type also defines its length (number of segments of CAN messages that have to be connected). It also indicates segment index.

Bit 7..5 data type
Bit 4 odd/even sequence, bit changes state in each sequence
Bit 3..0 segment index

Data type 0 – Driver ID

This data type is made of 7 segments

Data Byte 1	**Data Byte 2**	**Data Byte 3**	**Data Byte 4**	**Data Byte 5**	**Data Byte 6**	**Data Byte 7**	**Data Byte 8**
Data Marker - data type 0 - index 0	Work states	Driver 1 states	Driver 2 states	Tachograph status	Driver 1 ID length	Driver 1 ID length	Not used (255)
Data Marker - data type 0 - index 1	Driver 1 ID, character #1	Driver 1 ID, character #2	Driver 1 ID, character #3	Driver 1 ID, character #4	Driver 1 ID, character #5	Driver 1 ID, character #6	Driver 1 ID, character #7
Data Marker - data type 0 - index 2	Driver 1 ID, character #8	Driver 1 ID, character #9	Driver 1 ID, character #10	Driver 1 ID, character #11	Driver 1 ID, character #12	Driver 1 ID, character #13	Driver 1 ID, character #14
Data Marker - data type 0 - index 3	Driver 1 ID, character #15	Driver 1 ID, character #16	Driver 1 ID, character #17	Driver 1 ID, character #18	Driver 1 ID, character #19	Driver 1 ID, character #20	Not used (255)
Data Marker - data type 0 - index 4	Driver 2 ID, character #1	Driver 2 ID, character #2	Driver 2 ID, character #3	Driver 2 ID, character #4	Driver 2 ID, character #5	Driver 2 ID, character #6	Driver 2 ID, character #7
Data Marker - data type 0 - index 5	Driver 2 ID, character #8	Driver 2 ID, character #9	Driver 2 ID, character #10	Driver 2 ID, character #11	Driver 2 ID, character #12	Driver 2 ID, character #13	Driver 2 ID, character #14
Data Marker - data type 0 - index 6	Driver 2 ID, character #15	Driver 2 ID, character #16	Driver 2 ID, character #17	Driver 2 ID, character #18	Driver 2 ID, character #19	Driver 2 ID, character #20	Not used (255)

Tachograph information structure

Work states

Bit 2..0: Driver 1 working state
- 000 = Break/Rest
- 001 = Driver available
- 010 = Work
- 011 = Drive
- 110 = Error
- 111 = Not available

Bit 5..3: Driver 2 working state
- 000 = Rest
- 001 = Driver available
- 010 = Work
- 011 = Drive
- 110 = Error
- 111 = Not available

Bit 7..6: Drive recognize
- 00 = Vehicle motion not detected
- 01 = vehicle morion
- 10 = Error
- 11 = Not available

Driver 1 states

Bit 3..0: Driver 1 time rel states
- 0000 = normal
- 0001 = 15 min bef. 4 ½ h
- 0010 = 4 ½ h reached
- 0011 = 15 min before warning 1 (9h)
- 0100 = warning 1 reached
- 0101 = 15 min before warning 2 (16h)
- 0110 = warning 2 reached
- 1101 = Other
- 1110 = Error
- 1111 = Not available

Bit 5..4: Driver 1 card
- 00 = Card not present
- 01= Card present
- 10 = Error
- 11 = Not available

Bit 7..6: Overspeed
- 00 = No overspeed
- 01 = Overspeed
- 10 = Error
- 11 = Not available

Driver 2 states

Bit 3..0: Driver 1 time rel states
- 0000 = normal
- 0001 = 15 min bef. 4 ½ h
- 0010 = 4 ½ h reached
- 0011 = 15 min before warning 1 (9h)
- 0100 = warning 1 reached
- 0101 = 15 min before warning 2 (16h)
- 0110 = warning 2 reached
- 1101 = Other
- 1110 = Error
- 1111 = Not available

Bit 5..4: Driver 1 card
- 00 = Card not present
- 01= Card present
- 10 = Error
- 11 = Not available

Bit 7..6: Overspeed
- 00 = No overspeed
- 01 = Overspeed
- 10 = Error
- 11 = Not available

tachograph[3]

Bit 0..1: System event
- 00 = No tachograph event
- 01 = Tachograph event
- 10 = Error
- 11 = Not available

Bit 2..3: Handling information
- 00 = No handling information
- 01 = Handling information
- 10 = Error
- 11 = Not available

Bit 5..4: Tachograph performance
- 00 = Normal performance
- 01 = Performance
- 10 = Error
- 11 = Not available

Bit 7..6: Direction indicator
- 00 = Forward
- 01 = Reverse
- 10 = Error
- 11 = Not available

Data type 1 – Extinfo 1

Data are generated with 10 seconds period consisted of 3 segments.

Data Byte 1	Data Byte 2	Data Byte 3	Data Byte 4	Data Byte 5	Data Byte 6	Data Byte 7	Data Byte 8
Data Marker - data type 1 - index 0	Hours	Minutes	Seconds	Day	Month	Year	Not used (255)
Data Marker - data type 1 - index 1	RPM	RPM	Total vehicle distance	Total vehicle distance	Total vehicle distance	Total vehicle distance	Not used (255)
Data Marker - data type 2 - index 2	Tachograph vehicle speed	Tachograph vehicle speed	Trip vehicle distance	Trip vehicle distance	Trip vehicle distance	Trip vehicle distance	Not used (255)

Data type 2 – Extinfo 2

Data are generated only after the start of device.

Data Byte 1	Data Byte 2	Data Byte 3	Data Byte 4	Data Byte 5	Data Byte 6	Data Byte 7	Data Byte 8
Data Marker - data tpye 2 - index 0	Vehicle REG length	Vehicle REG, character #1	Vehicle REG, character #2	Vehicle REG, character #3	Vehicle REG, character #4	Vehicle REG, character #5	Vehicle REG, character #6
Data Marker - data type 2 - index 1	Vehicle REG, character #7	Vehicle REG, character #8	Vehicle REG, character #9	Vehicle REG, character #10	Vehicle REG, character #11	Vehicle REG, character #12	Vehicle REG, character #13
Data Marker - data type 2 - index 2	Vehicle REG, character #14	Vehicle REG, character #15	Vehicle REG, character #16	Vehicle REG, character #17	Vehicle REG, character #18	Vehicle REG, character #19	Vehicle REG, character #20
Data Marker - data type 2 - index 3	Vehicle ID length	Vehicle ID, character #1	Vehicle ID, character #2	Vehicle ID, character #3	Vehicle ID, character #4	Vehicle ID, character #5	Vehicle ID, character #6
Data Marker - data type 2 - index 4	Vehicle ID, character #7	Vehicle ID, character #8	Vehicle ID, character #9	Vehicle ID, character #10	Vehicle ID, character #11	Vehicle ID, character #12	Vehicle ID, character #13
Data Marker - data type 2 - index 5	Vehicle ID, character #14	Vehicle ID, character #15	Vehicle ID, character #16	Vehicle ID, character #17	Vehicle ID, character #18	Vehicle ID, character #19	Vehicle ID, character #20
Data Marker - data type 2 - index 6	CAR2FMS FW, character #2	CAR2FMS FW, character #3	CAR2FMS FW, character #4	CAR2FMS FW, character #5	CAR2FMS FW, character #6	CAR2FMS FW, character #7	CAR2FMS FW, character #8
Data Marker - data type 2 - index 7	Segments period low byte	Segments period high byte	Startup delay	Shutdown delay	Not used (255)	Not used (255)	Not used (255)

Structure of messages generated from the car

VW settings

Mentioned data describes ideal situation, some car types do not have to support all mentioned data.

- data format corresponds to FMS standard
- data format has different interpretation

Cruise Control/Vehicle Speed: CCVS

00FEF1							
65265							
Data Byte 1	**Data Byte 2**	**Data Byte 3**	**Data Byte 4**	**Data Byte 5**	**Data Byte 6**	**Data Byte 7**	**Data Byte 8**
Not used for FMS-Standard	Wheel based speed 1/256 km/h Bit gain 0 km/h offset SPN 84	Wheel based speed 1/256 km/h Bit gain 0 km/h offset SPN 84	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard

Electronic Engine Controller #2: EEC2

00F003							
61443							
Data Byte 1	**Data Byte 2**	**Data Byte 3**	**Data Byte 4**	**Data Byte 5**	**Data Byte 6**	**Data Byte 7**	**Data Byte 8**
Not used for FMS-Standard	Accelerator pedal position 1 0.4 % / Bit gain 0 % offset SPN 91	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard

Dash Display: DD

00FEFC							
65276							
Data Byte 1	**Data Byte 2**	**Data Byte 3**	**Data Byte 4**	**Data Byte 5**	**Data Byte 6**	**Data Byte 7**	**Data Byte 8**
Not used for FMS-Standard	Fuel Level 1 1L / Bit gain 0 % offset	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard

Electronic Engine Controller #1: EEC1

00F004							
61444							
Data Byte 1	**Data Byte 2**	**Data Byte 3**	**Data Byte 4**	**Data Byte 5**	**Data Byte 6**	**Data Byte 7**	**Data Byte 8**
Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard	Engine speed 0.125 rpm / Bit gain 0 rpm offset SPN 190	Engine speed 0.125 rpm / Bit gain 0 rpm offset SPN 190	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard

High Resolution Vehicle Distance: VDHR

00FEC1							
65217							
Data Byte 1	**Data Byte 2**	**Data Byte 3**	**Data Byte 4**	**Data Byte 5**	**Data Byte 6**	**Data Byte 7**	**Data Byte 8**
High resolution total vehicle distance 5 m / Bit gain 0 m offset SPN 917	High resolution total vehicle distance 5 m / Bit gain 0 m offset SPN 917	High resolution total vehicle distance 5 m / Bit gain 0 m offset SPN 917	High resolution total vehicle distance 5 m / Bit gain 0 m offset SPN 917	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard

Engine Temperature 1: ET1

00FEEE							
65262							
Data Byte 1	**Data Byte 2**	**Data Byte 3**	**Data Byte 4**	**Data Byte 5**	**Data Byte 6**	**Data Byte 7**	**Data Byte 8**
Engine	Not used	Not used	Not used	Not used	Not used	Not used	Not used

coolant temperature 1 °C / Bit gain - 40 °C offset SPN 110	for FMS-Standard	for FMS-Standard	for FMS-Standard	for FMS-Standard	for FMS-Standard	for FMS-Standard	for FMS-Standard

Ambient Conditions: AMB

00FEF5							
65269							
Data Byte 1	**Data Byte 2**	**Data Byte 3**	**Data Byte 4**	**Data Byte 5**	**Data Byte 6**	**Data Byte 7**	**Data Byte 8**
Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard	Ambient Air Temperature 0.03125 °C / Bit gain - 273 °C offset SPN 171	Ambient Air Temperature 0.03125 °C / Bit gain - 273 °C offset SPN 171	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard

Fuel Economy: LFE

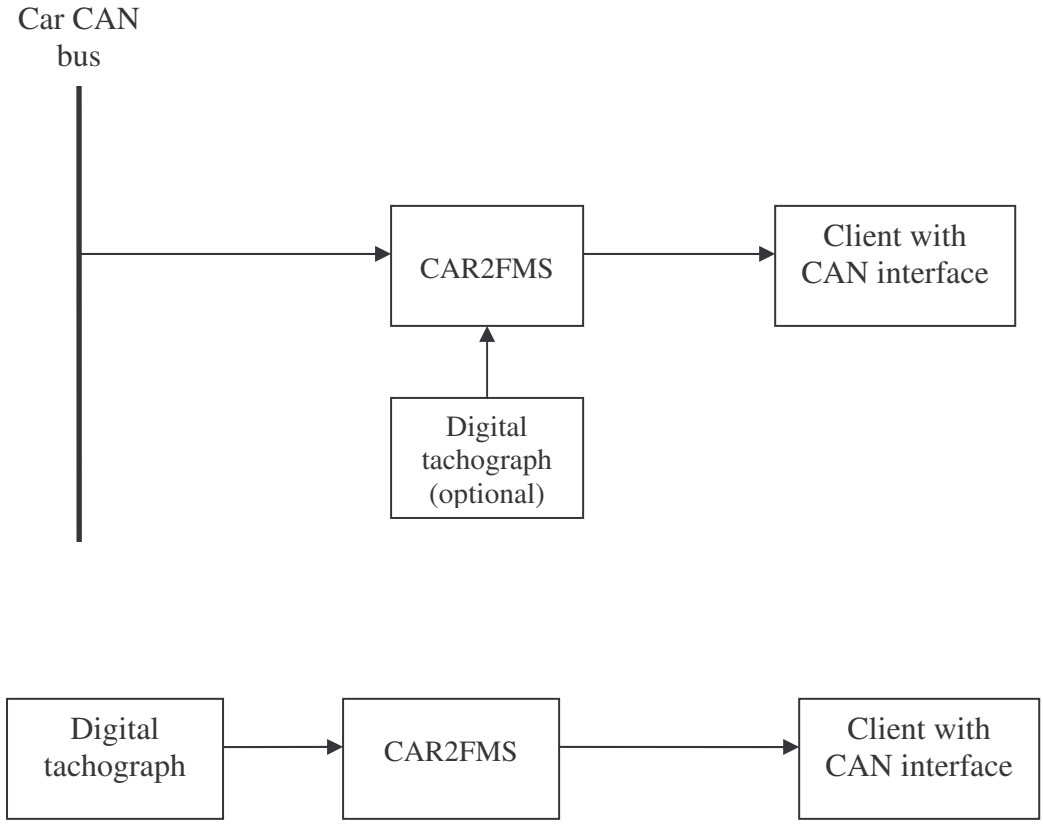
00FEF2							
65266							
Data Byte 1	**Data Byte 2**	**Data Byte 3**	**Data Byte 4**	**Data Byte 5**	**Data Byte 6**	**Data Byte 7**	**Data Byte 8**
Fuel Used 1 mL per bit	Fuel Used 1 mL per bit	Average Fuel Economy 1/512 km/L per bit 0 offset 0 to 125.5 km/L	Average Fuel Economy 1/512 km/L per bit 0 offset 0 to 125.5 km/L	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard	Not used for FMS-Standard

Door Control 2: DC2

00FDA5							
64,933							
Data Byte 1	**Data Byte 2**	**Data Byte 3**	**Data Byte 4**	**Data Byte 5**	**Data Byte 6**	**Data Byte 7**	**Data Byte 8**
bit 7..0	**bit 7..0**	**bit 7..0**	**bit 7..0**	**bit 7..0**	**bit 7..0**	**bit 7..0**	**bit 7..0**
Open Status Door 1 bit 3,2 00 = Closed 01 = Open 11 = Not available	**Open Status Door 2** bit 1,0 00 = Closed 01 = Open 11 = Not available **Open Status Door 3** bit 7,6 00 = Closed 01 = Open 10 = Error 11 = Not available	**Open Status Door 4** bit 5,4 00 = Closed 01 = Open 11 = Not available	**Open Status Door 5** bit 3,2 00 = Closed 01 = Open 11 = Not available	**Open Status Door 6** bit 1,0 00 = Closed 01 = Open 11 = Not available	Not used	Not used	Not used

Door 1 – driver's door
Door 2 – co-driver's door
Door 3 – left rear door
Door 4 – right rear door
Door 5 – engine bonnet
Door 6 – baggage compartment bonnet

Connection variants



Digital tachograph connection

Device is connected to digital tachographs using D-connector, pin 8. Signal ground of tachograph is connected using A-connector, pin 6. Connector for tachograph connection is not provided with the delivery, however, it can be ordered.

Settings

Basic setting is made using DIP switch. Other optional parameters can be preset during production according to customer needs or using CAN bus.

DIP setting

DIP	Description
1	Not used
2	Car type setting
3	0000 = switched off
4	0001 = VW
5	1111= boot mode
6	Setting of input CAN into Listen only mode..
7	Tachograph type setting. 00-VDO, 10-Stoneridge, 01-ACTIA (not tested), 11-
8	not connected

Settings through CAN bus

Other settings saved in EEPROM memory can be changed by sending data to output CAN.

Setting of time distance among tachograph information segments at CAN:

11bit (standard ID) 0x333, DLC=4, DB0=67 (0x43), DB1=76 (0x4C), DB2+3 = TIME. TIME is 16bit number in the range 40..2000. Resolution 5 ms. Value 40 corresponds to 200 ms interval, value 2,000 corresponds to 10,000 ms (10s). Value preset by manufacturer is 200, 1s.

Setting of lag after start.
This lag influences generating of the first tachograph information. Other information is generated only after the change of tachograph data.

11bit (standard ID) 0x334, DLC=3, DB0=67 (0x43), DB1=76 (0x4C), DB2 = TIME. TIME is 8bit number in the range 0..20. Resolution is 1s.

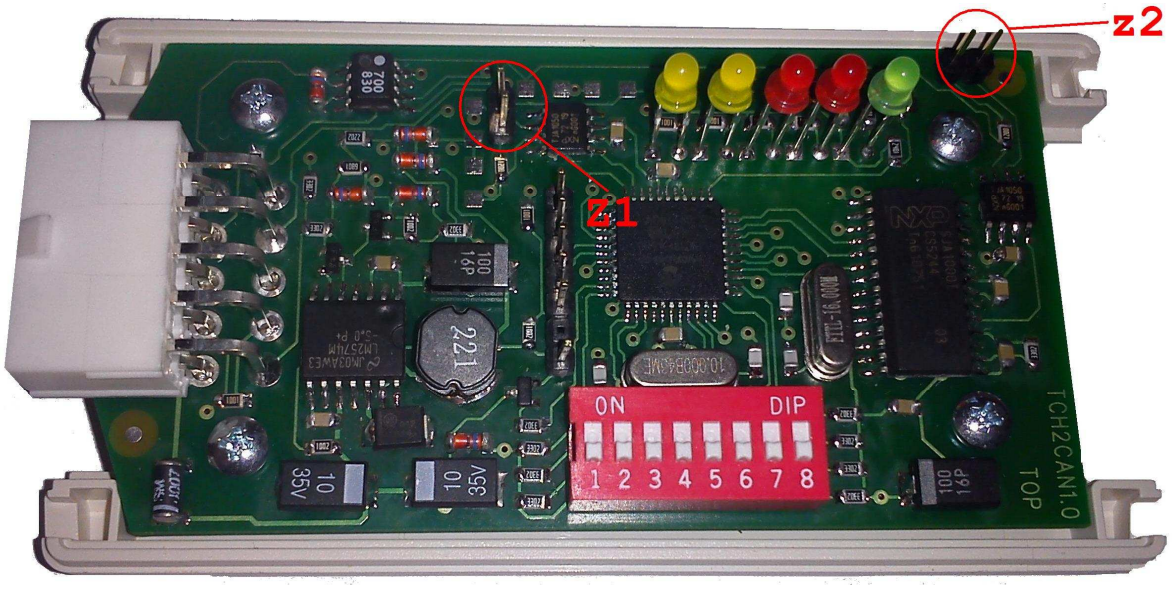
Setting of disconnection lag after ignition switch-off.
This lag influences delay of device switch-off after signal 15 disconnection (key).

11bit (standard ID) 0x335, DLC=3, DB0=67 (0x43), DB1=76 (0x4C), DB2 = TIME. TIME is 8bit number in the range 0..180. Resolution is 1s.

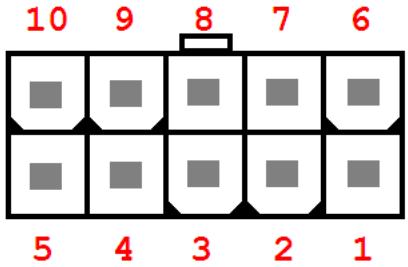
In case of high rate of errors of output CAN this interval can be automatically extended up to 3 minutes. During this time, the device tries to transfer tachograph data.

Terminal resistance setting

On the device, switching of terminate resistance of 120 ohm for both CANs can be done using short-circuit connectors. Z1 activates terminate resistance for output CAN. Z2 activates terminate resistance for input CAN.



Connector wiring



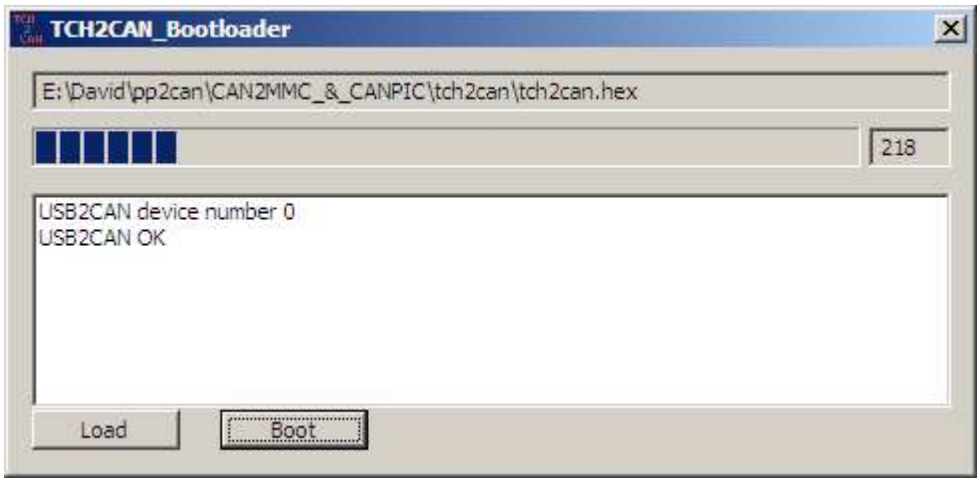
Pin	Description
1	Power 8..32V
2	Output – signal switched on (5V) during tachograph information segment generating at CAN with lag of 70 ms, pulse duration 50 ms. Signal used for example for preferred data sending from car unit to the server.
3	CAN OUT, high.
4	CAN IN, high.
5	Tachograph GND (pin 6 at tachograph A-connector.
6	Signal 15 (key, ignition). If continuous run required, connect with power.
7	GND
8	CAN OUT, low.
9	CAN IN, low.
10	Tachograph (pin 8, tachograph D-connector).

Signal LED

LED	Description
1	Power signalizing
2	Output CAN error signalizing
3	Input CAN error signalizing
4	Signalizing incoming data at input CAN
5	Signalizing incoming data at tachograph input.
2+3	Simultaneous flashing of both LED signalizes sending of tachograph information segment to CAN.

Firmware update

Firmware update is realized through CAN bus. Transducer USB2CAN with special application TCH2CAN_Bootloader.exe must be used.



Procedure:

1) On TCH2CAN switch DIP 7 and 8 to ON position.
2) Connect USB2CAN at output CAN and activate TCH2CAN_Bootloader.
3) Click Load to read firmware.
4) Click Boot to start the firmware recording process.
5) After the firmware has been loaded, disconnect the power from TCH2CAN.
6) At DIP 7 and 8, set respective tachograph.
7) When power connected, new firmware will be launched.

Warning

Customer attaches the chip to the car **at his own risk**. Incorrect setting of the chip can cause incorrect function of car control units. CANLAB s.r.o. is not liable for any damage of the car.