SOFTIDEA

CANBOX

CAN BUS Decoder

Datasheet

June 2017

1 Features

- CANBOX by SoftIdea is a hardware module for communication with the vehicle CAN bus.
- Applicable in passenger and truck vehicles, construction and agricultural machinery, forklifts...
- Compatible with GSM / GPRS communicators from other manufacturers
- Serial data transfer of values from CAN bus
- RS-232 compatible
- Allows to track the following values:
  - Odometer
  - Fuel level
  - Total Fuel Consumption
  - RPM
  - Speed
  - Accelerator
  - Brake
  - Total Moto Minutes
  - Coolant Temperature
  - Oil Temperature
- RFID driver identification
- Three ways to detect ignition
- Optional interface for external fuel probe and other peripherals (analogue/digital/PWM)
- It supports the leading manufacturers' vehicles from the year 2004 to the present, including the latest models.
- Widely configurable
- Possibility to modify the firmware as required
- Very low power consumption (typ. <35mA@12V)

2 Function

The task of the CANBOX is to decode the required values from the CAN bus and periodically send them through the serial protocol. The CANBOX is typically coupled to a GSM communicator (e.g., GV300) that transmits the decoded values to a remote user. The device allows the driver to log on using the RFID card. It is possible to connect the fuel probe and other peripherals (analogue / digital / PWM) to customer requirements.

CANBOX uses a sophisticated power management algorithm to achieve very low power consumption.

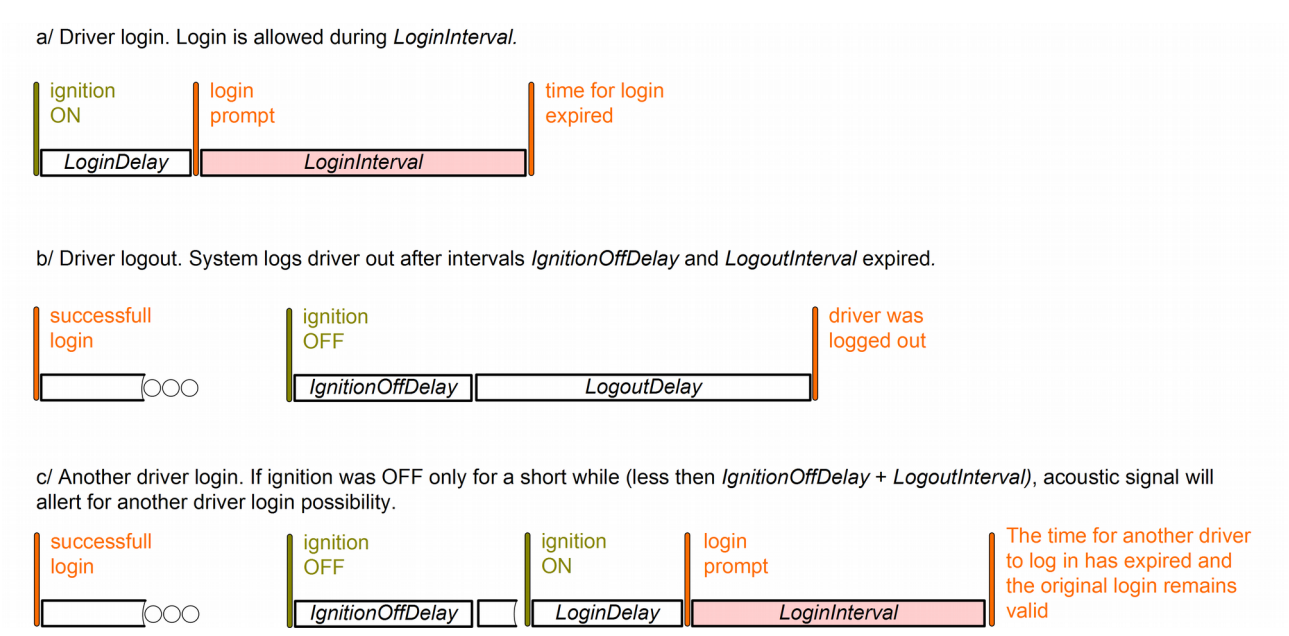
2.1 Ignition detection

While the engine is off, the CANBOX is in sleep mode. Ignition on is detected in one of the following ways:

- By increasing the supply voltage above the configurable level[1] *IgnitionUbatLevel*
- From CAN
- From input "15" (connector A , pin 8)

2.2 Driver logon

The timing of driver logon using the RFID card is evident from the following figure.



1 This feature use the phenomenon of on-board voltage increases after the engine is started

2.2.1 Acoustic signaling

Signal	Parameters	Meaning	Waveform
Login	Period 1s alternation 1:9	Call for driver login. The RFID reader is active. The signal lasts during the configured *LoginInterval* or the driver login.	
Login OK	One pulse 1s	Confirmation of successful driver login.	
Login Timeout	Five 50ms pulses within 300 ms	Login time expired. The RFID reader is deactivated	
Relogin	One pulse 100ms	Prompt to logon to another driver. Defines the start time (*LoginInterval*) during which another driver can log in. Login is confirmed by *Login OK*. If you do not log in, your original login remains valid and *Login Timeout* is not signaled.	

2.3 Timing

The operation of the device is determined by a set of timers with a configurable value. The list of configurable timers is in the following table. Uncertainty of timer values is 1s.

Timer	Meaning
OutputInterval	Defines the period of data messaging.
LoginDelay	Interval length after detection of ignition on during which the RFID reader is inactive.
LoginInterval	The length of the interval during which the RFID reader is active and the driver can be logged in. The value of -1 indicates that the reader is active indefinitely. The value 0 means that the reader is deactivated.
LogoutTimeout	Defines the interval after the ignition is switched off, after which the driver automatically turns off.
IgnitionOffDelay	Length of delay after switching off the ignition, after which the device detects the ignition off. This setting prevents jump changes in the status of the device, for example, in the case of repeated unsuccessful engine start-ups.

2.4 Message with output data

The message with output data is sent to the serial interface periodically, with the period defined by the configurable value of *OutputInterval* and also once, always after logging in and logging out the driver. The data output protocol is described in the chapter 3.1.

3 Serial protocol

The communication protocol defines messages in both directions as follows:

$label,	comma separated values	*checksum

Comma separated values match the parameter based on their position in the message. If a parameter has not defined value there is no value at given position in the message, for example in the message:

$label,	value1,, value3,,	*checksum

values of parameter 2, 4 and 5 are not present.

The checksum is XOR of all the message characters between the leading character $ and the ending character * encoded in the hexadecimal system. The check sum can be calculated and verified at http://www.hhhh.org/wiml/proj/nmeaxor.html . Message always ends with <CR> (0x0d).

3.1 Output message

The CANBOX Data Output Protocol contains the number of the version encoded in the hexadecimal system in two digits **xy**:

$CBxy,	comma separated values	*checksum

The list of parameters and their position in the message are defined for each version of the protocol in the following text.

3.1.1 CB01

Max message length is 40 chars.

$CB01,38008046CE30,1122345,78,P*69

CB01	Output message in protocol version 1
38008046CE30	RFID (10 chars) and checksum (2 chars). RFID=38008046CE, checksum=30. “000000000000” if RFID not available or logged out. Checksum is XOR from RFID represented as 5 hexadecimal bytes.
1122345	Odometer
78	Fuel Level
P	Fuel Units (P - %, L – litres)

3.1.2 CB02

Max message length is 80 chars.

$CB02,38008046CE30,1122345,78,P,1126489557,2432,54,20,0,987654321,85*48

CB02	Output message in protocol version 2
38008046CE30	RFID (10 chars) and checksum (2 chars). RFID=38008046CE, checksum=30. “000000000000” if RFID not available or logouted. Checksum is XOR from RFID represented as 5 hexadecimal bytes.
1122345	Odometer
78	Fuel Level
P	Fuel Units (P - %, L – litres)
1126489557	Total Fuel Consumption
2432	RPM
54	Speed
20	Accelerator
0	Brake
987654321	Total Moto Minutes
85	Coolant Temperature

3.2 Configuration

The maximum length of the configuration message is 80 characters. The CANBOX Configuration Protocol contains a character in the label that specifies the configuration message format used.

$SETx,	comma separated values	*checksum

If the **x** is digit encoded in the decimal system, then the message is encoded by the *full configuration protocol* (chapter 3.2.1), and value of **x** defines protocol version.

If the **x** is not a digit the message is encoded using the *partial configuration protocol* (chapter 3.2.2), and value of **x** defines the parameter to be configured.

The list of parameters and their positions in the report is defined for each version of the configuration protocol below.

3.2.1 Full configuration protocol

3.2.1.1 SET1

*$SET1,44,500,1,10,20,67h,13800*0B*

Pozícia	Hodnota	Význam	Rozsah	Default
	$SET1	Full config protocol 1		∄
1	44	BUS type	see table bellow	16
2	500	BUS speed	(83, 100, 125, 250, 500) kbd	see table bellow
3	1	*ListenMode*. 1 = CAN BUS in Read Only mode, 0 = CAN BUS in R/W mode.	(0,1)	see table bellow
4	10	*OutputInterval*	(0-1200) sec.	15
5	20	*LogoutTimeout*	(0-3600) sec.	60
6	67h	*OutputFlags*. Defines the data that will the output message contain according to the table below.	One byte in hex format (0h-ffh) or dec format (0-255)	∄
7	13800	*IgnitionUbatLevel*. Decision level for detection of ignition from on-board voltage. Setting 0 deactivates the ignition detection from the on-board voltage.	(10000-26000) mV 0 to deactivate	0

3.2.1.2 SET2

$SET2,44,500,1,10,20,67H,13800,3,60,20,8007H*58

Parameters 1-7 of protocol SET2 are the same as for SET1. In addition the following parameters gets added:

Pozícia	Hodnota	Význam	Rozsah	Default
	$SET2	Full config protocol 2		∄
8	3	*LoginDelay*	(0 až 120) sekúnd	2
9	60	*LoginInterval*	(-1 až 3600) sekúnd 0 pre deaktiváciu -1 neobmedzene	60
10	20	*IgnitionOffDelay*	(0 až 120) sekúnd	0
11	8007h	*InternalFlags*. The individual bits of this register are designed to enable special functions. The first three bits define the mask of the allowed ignition sources in accordance with the table below.	16 bitov hex	7

CAN BUS type:

ID	CAN BUS type	From version	Location of connection*	CAN speed	Listen Mode	Ignition from	
16	VAG	0102	M	500k	1		
4	VAG 4	0102	K	100k			
5	VAG 5	0102	K	100k			
6	VAG 6	0102	K	100k			
7	VAG 7	0102	K	100k			
9	VAG 9	0102	K	500k			
10	VAG 10	0102	K	500k			
192	VAG MQB1	0102	M	500k			
193	VAG CNG1	0102	M	500k			
3	MERCEDES	0102	M	500k			
48	MERCEDES SPRINTER	0102	M	500k			
49	MERCEDES VITO	0102	M	500k			
50	MERCEDES 1	0102	K	83k			
15	MERCEDES TRUCK	0102	M	500k			

*Connection point: M=Engine BUS, K=Comfort BUS, OBD, CAN-C, CAN-B, FMS

OutputFlags:

Flag	Value
0x0001	RFID
0x0002	Odometer
0x0004	Fuel Level
0x0008	Total Fuel Consumption
0x0010	RPM
0x0020	Speed
0x0040	Accelerator
0x0080	Brake
0x0100	Total Moto Minutes
0x0200	Coolant Temperature

InternalFlags:

Flag	Value
0x0001	Ignition detection from line 15
0x0002	Ignition detection from *Ubat*
0x0004	Ignition detection from CAN BUS

3.2.2 Partial configuration protocol

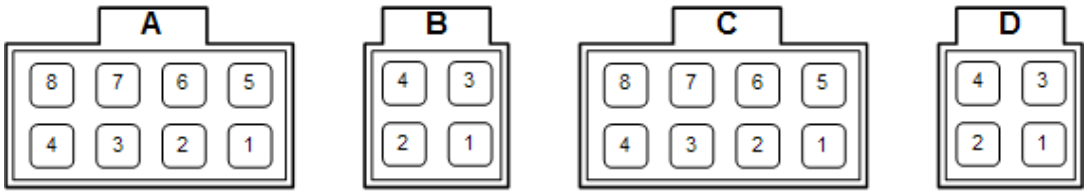
The Partial Configuration Protocol allows you to configure only one specific parameter. The following example illustrates the bus type setting:

$SETT,44*3A

The list of permitted labels and their assignment to the configuration parameter is in the following table:

Label	Parameter
SETT	CAN BUS type
SETR	CAN speed
SETM	ListenMode
SETO	OutputTimeout
SETL	LogoutTimeout
SETF	OutputFlags
SETI	IgnitionUbatLevel

4 Connector diagram



A	AUTO	
1	CAN_HI	GREEN / RED 1m
2	GND	BLACK 1m
3	GND	BLACK 0.6m
4	+12V	RED / BLACK 1m
5	CAN_LO	ORANGE / BLACK 1m
6	15	WHITE 1m
7	COM1_Tx	WHITE / BLACK 0.6m
8	COM1_Rx	PINK 0.6m

B	RFID	
1	PWR	
2	Rx	LIYY 4x0.34 1.2m
3	BUZZ	
4	GND	

C	I/O	
1	RELE	GREEN 0.6m
2	INA1	BROWN 0.6m
3	GND	opt.
4	IN4	opt.
5	RELE	BLUE 0.6m
6	INA2	opt.
7	IN3	opt.
8	GND	BLACK 0.6m

D	TANK (opt.)	
1	GND	opt.
2	COM2_Tx	opt.
3	INA2	opt.
4	COM2_Rx	opt.

INA1, INA2 analog inputs.
IN3, IN4 digital inputs with threshold 3V.

5 LED indication

5.1.1 Red LED

The red LED blinks with the 1s period. The LED flashing time in each period has the following meaning:

Time of light	Meaning
100ms	CANBOX ready
300ms	CANBOX ready + ignition ON

5.1.2 Green LED

The green LED indicates that the data from the CAN bus is correctly received. Once the individual data (km, fuel, ignition) is received, the green LED lights up for one second.

6 Supported vehicles

make / model	from year	to
AUDI, ŠKODA, VW, SEAT	2004	now
VOLVO XC90	2007	now
VOLVO XC60	2012	now
PORSCHE	2007	now
BMW	2010	now
DODGE	2012	now
JEEP	2012	now
CHRYSLER	2012	now
FIAT	2012	now
MERCEDES	2007	now
RENAULT	2010	now
LAND ROVER	2014	now
JAGUAR	2014	now
RANGE ROVER	2014	now

7 Technical data

Supply voltage : 10 to 16 V
Working temperature : -40 to 80 °C

Power consumption from vehicle power supply

- Average, RFID ON : <35 mA
- Average, RFID OFF : <17 mA
- Average, RFID, CAN OFF : <2 mA
- Sleep : <1,5 mA

8 Standards

The GGK device complies with the requirements of the following standards:

99/05/EC	Directive of the European Parliament and of the council of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity, in short referred to as R&TTE Directive 1999/5/EC
2004/108/EC	Directive on electromagnetic compatibility
2006/95/EC	Directive on electrical equipment designed for use within certain voltage limits (Low Voltage Directive)
2002/95/EC	RoHS Directive
95/94/EC	Automotive EMC Directive

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