SEO CANlog CONVERTER
GENERAL DESCRIPTION

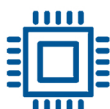## SEO Electronics

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CAN BUS devices   AVL and GPS/GSM systems   CAR security systems

1. Brief description of SEO CANlog converter

SEO CANlog is a multifunctional passive-active (for reading and sending) converter used to acquire data from digital buses (CAN, J 1939, J 1708/1587, K-LINE, LIN and others) of various types of machines and vehicles **in a contact way or contactless – using the SEO CANtouch (P400 or U400** reader when only the data obtained in the listening mode is needed). The unified self-programming 2 in 1 version is called SEO CANeasy. SEO CANlog converter obtains all data from 1- and 2-wire busses, analyzes them and processes using developed algorithms; parameters useful for GPS / GSM monitoring systems are sent in a specific own SEO protocol or SEO FMS protocol (extended with additional parameters in relation to the standard FMS SAE J1939 protocol) by UART, RS232 or CAN communication port. The device is designed to be installed in vehicles of M1 and N1 categories with 12V-24V-48V electrical systems.

2. How to start when deciding to use the SEO CANlog converter?

The customer must specify:
- a list of parameters (or software Level) that he wants to get from the vehicle (details in section 4). It may occur that device with 8 pre-compiled parameters will be enough: vehicle mileage, total fuel consumption, fuel level (dashboard), engine speed (RPM), engine temperature, vehicle speed, acceleration pedal position, oil pressure/level. If additional special data is necessary, please specify what data from the list is needed,
- a group of vehicles in which SEO CANlog will be used: cars, electric cars, trucks, construction vehicles, agricultural machinery, special vehicles,
- which inputs in the GPS/GSM system used by the customer are available for external devices: RS232, UART, CAN,
- whether it is necessary to implement a part of our 4.0 protocol in client's GPS/GSM device, or whether it is enough to extend previously implemented standard FMS protocol with SEO FMS extension,
- if he is interested in device's additional functionalities:
  - tachograph DDD files,
  - vehicle diagnostics (DTC),
  - *eco driving* algorithm.

Usually we offer our clients to begin cooperation with simpler compilation of the device, i.e. sending basic parameters in 4.0 or CAN/FMS J1939 protocol.

3. What is SEO CANlog used for and how does it work?

SEO CANlog is used to **obtain detailed vehicle data** from available digital buses. Connecting the device to the GPS/GSM system (AVL – Automatic Vehicle Location) significantly **extends fleet management capabilities.** It can also improve driving safety and influence the savings in fuel consumption and exploitation of automotive parts.

The basic AVL system gives the possibility to determine the location, i.e. the location of the vehicle on the map. By analyzing the "point movement in time", you can, for example, calculate vehicle speed and acceleration using simple algorithms. SEO CANlog converter additionally provides **up to 300 parameters** obtained from over 2500 different types of vehicles. It is the largest database of this type in the world. In order to obtain useful data from a particular machine, we had to have access to the original vehicle's CAN transmission description or check the wires transmitting digital data and select the most optimal buses according to the amount of useful information. There are many buses in the vehicles and not all of them have a complete set of data, so our standard devices have

a possibility of connecting usually two buses, but we produce modules with the ability to **read data from five CAN buses** – depending on the customer's needs. We analyze over 1000 events that carry the necessary parameters, but the information from CAN BUS requires decryption and use of complex calculations and computational algorithms based on a lot of data from various CAN identifiers – this is a complicated and time-consuming programming process. We obtain digital data from ECU (Engine Computer Unit), BCM (Body Computer Module), ICM (Instrument Cluster Module) and other digital modules existing in vehicles. Often SEO CANlog works as a factory diagnostic computer communicating with car's ECU, BCM and ICM. We have 15 years of experience in reading CAN BUS.

4. Obtained parameters and software Levels

SEO CANlog reads CAN data from **vehicles of various types and makes**.
- passenger cars,
- electric cars,
- delivery vans,
- trucks,
- buses,
- agricultural machinery,
- construction machines,
- forest industry machines,
- port/harbor transhipment machines,
- mining equipment,
- municipal and road machinery (cleaning machines, salt/sand spreaders, snow plows, asphalt cutting machines, pouring asphalt, etc.),
- forklifts and other special machinery, such as: cranes, pumps, refrigerator trucks, etc.

We provide information about a vehicle from a database of about 300 various acquired parameters.

Basic read values are related to fuel, engine, safety, dashboard indicators and special parameters for special machinery.
Simplified sample extract of the acquired parameters from cars of various types and makes is attached.

A complete database of acquired parameters from cars together with connection-diagrams is available at **www.can24.pro** after logging using assigned **login and password.**

MAIN PARAMETERS
- Total engine work time
- Total engine work time - counted
- Total mileage of the vehicle
- Total mileage of the vehicle - counted
- Total fuel consumption
- Total fuel consumption - counted
- Fuel level in percent
- Fuel level in liters
- Engine speed RPM
- Engine temperature
- Vehicle speed
- AdBlue level in percent
- AdBlue level in liters
- VIN number
- Acceleration pedal position
- Engine load
- Retarder load
- Engine pressure
- Drive system temperature
- Current trip distance

- Overall distance covered during work time
- Current distance covered during work time
- Oil pressure
- Temperature outside
- Battery voltage
- HV battery temperature
- HV battery level
- Average power consumption HV battery
- HV battery pack health
- Electric engine work time - counted
- Wheel speed sensor impulses - counted
- Electric engine comsumed kWh
- Time left until the end of the battery charge
- Total CNG use
- Total CNG use - counted
- CNG level in percent
- CNG level in kilograms
- Vehicle's range
- Vehicle's range on HV battery
- Vehicle's range on CNG
- Brake pedal position
- Axle 1 load

- Axle 2 load
- Axle 3 load
- Axle 4 load
- Axle 5 load
- Load weight
- Gross combination vehicle weight
- Service - distance to next service
- Service - distance elapsed since the occurrence of the need for servicing
- Service - distance from the last service
- Service - time to next service
- Service - time exceeded since the occurrence of the need for servicing
- Service - time elapsed since the last service

CAN BUSES CONNECTION FLAGS
- CAN1 connected
- CAN2 connected
- CAN3 connected
- CAN4 connected
- CAN5 connected
- CAN6 connected

SECURITY STATE FLAGS
- Ignition on
- The key is in the ignition lock
- Webasto on
- Engine is working
- Standalone engine is working
- Ready to drive
- Engine is working on CNG
- Work mode - company
- Operator is absent
- Interlock active
- Engine lock active
- Request to lock the engine
- Handbrake is active
- Footbrake is active
- Clutch is pushed
- Status of the hazard warning lights switch active
- Front left door opened
- Front right door opened
- Rear right door opened
- Rear left door opened
- Trunk door opened
- Engine cover opened
- Charging wire is plugged
- Battery charging on
- Electric engine is working
- Car is closed
- Car is closed with factory remote control
- Factory installed alarm is active
- Emulated alarm is active
- Signal of closing with factory remote control was sent
- Signal of opening with factory remote control was sent
- Rearm signal was sent
- Trunk was opened with remote control
- Signal of closing with factory remote control was sent three times
- Parking is active (automatic gearbox)
- Reverse off
- Neutral is active (automatic gearbox)
- Drive is active (automatic gearbox)

STATE FLAGS
- Parking lights turned on
- Dipped headlights turned on
- Full beam headlights turned on
- Rear fog lights turned on
- Front fog lights turned on
- Additional front lights on
- Additional rear lights on
- Light signal turned on
- Air conditioning turned on
- Cruise control turned on
- Automatic retarder turned on
- Manual retarder turned on
- Driver's seatbelt fastened
- Front passenger's seatbelt fastened
- Rear left passenger's seatbelt fastened
- Rear right passenger's seatbelt fastened
- Rear center passenger's seatbelt fastened
- Front passenger is present
- PTO on

STATE FLAGS - INDICATORS
- Check engine indicator turned on
- ABS indicator turned on
- ESP indicator turned on
- ESP is turned off
- STOP indicator turned on
- Oil pressure/level indicator turned on
- Coolant liquid temperature/level indicator turned on
- Battery not charging indicator turned on
- Handbrake system indicator turned on
- AIRBAG indicator turned on
- EPS (Electric Power Steering) indicator turned on
- Warning indicator turned on
- Lights failure indicator turned on
- Low tire pressure indicator turned on
- Wear of brake pads indicator turned on
- Low fuel level indicator turned on
- Maintenance required indicator turned on
- Glow plug indicator turned on
- FAP indicator turned on
- EPC (Electronic Power Control) indicator turned on
- Engine oil filter clogged indicator turned on
- Low engine oil pressure indicator turned on
- Too high engine oil pressure indicator turned on
- Low coolant level indicator turned on
- Hydraulic system oil filter clogged indicator turned on
- Hydraulic system low pressure indicator turned on
- Hydraulic oil low level indicator turned on
- Hydraulic system high temperature indicator turned on
- Oil overflow in hydraulic chamber indicator turned on
- Air filter is clogged indicator turned on
- Fuel filter is clogged indicator turned on
- Water in fuel indicator turned on
- Clogged brake system filter indicator turned on

STATE FLAGS FROM AGRICULTURAL VEHICLES
- Right joystick moved right active
- Right joystick moved left active
- Right joystick moved forward active
- Right joystick moved back active
- Left joystick moved right active
- Left joystick moved left active
- Left joystick moved forward active
- Left joystick moved back active
- First rear hydraulic turned on
- Second rear hydraulic turned on
- Third rear hydraulic turned on
- Fourth rear hydraulic turned on
- First front hydraulic turned on
- Second front hydraulic turned on
- Third front hydraulic turned on
- Fourth front hydraulic turned on
- Front three-point hitch turned on
- Rear three-point hitch turned on
- Front power take-off turned on
- Rear power take-off turned on
- Mowing active
- Threshing active
- Grain release from hopper turned on
- Grain tank is less than 100%
- Grain tank is less than 70%
- Grain tank is opened
- Unloader drive is on; unloading tube is in idle position
- Cleaning fan control turned off
- Threshing drum control turned off
- Straw walker is clogged
- Excessive clearance under the threshing drum
- Low temperature of drive system hydraulics <5
- High temperature of drive system hydraulics >86
- Ear auger speed below the norm
- Grain auger speed below the norm
- Straw chopper speed below the norm
- Straw shaker speed below the norm
- Feeder speed below the norm
- Straw chopper switched on
- Corn header connected
- Grain header connected
- Feeder reverse switched on
- Pressure filter of the hydraulic pump is clogged

STATE FLAGS FROM UTILITY VEHICLES
- Salt/sand disperser is on
- Pouring chemicals turned on
- Conveyor belt turned on
- Salt spreader's drive wheel turned on
- Brushes turned on
- The amount of spreaded coarse-grained calcium

- Vacuum cleaner turned on
- Water supply turned on
- High pressure washer turned on
- Liquid pump turned on
- Unloading from the hopper turned on
- Low salt/sand level in container indicator turned on
- Low water level in container indicator turned on
- Chemicals turned on
- Compressor turned on
- Water valve is opened
- Cabin moved up status active
- Cabin moved down status active

STATE FLAGS FROM CISTERNS
- Section 1 - presence of fluid in the downpipe
- Section 1 - filled
- Section 1 - overfilled
- Section 2 - presence of fluid in the downpipe
- Section 2 - filled
- Section 2 - overfilled
- Section 3 - presence of fluid in the downpipe
- Section 3 - filled
- Section 3 - overfilled
- Section 4 - presence of fluid in the downpipe
- Section 4 - filled
- Section 4 - overfilled
- Section 5 - presence of fluid in the downpipe
- Section 5 - filled
- Section 5 - overfilled
- Section 6 - presence of fluid in the downpipe
- Section 6 - filled
- Section 6 - overfilled
- Section 7 - presence of fluid in the downpipe
- Section 7 - filled
- Section 7 - overfilled
- Section 8 - presence of fluid in the downpipe
- Section 8 - filled
- Section 8 - overfilled

PARAMETERS READ FROM AGRICULTURAL VEHICLES
- Harvesting time
- Harvesting area
- Mowing efficiency
- Mown grain volume
- Grain moisture
- Threshing drum RPM
- Gap under threshing drum
- Rotational speed of auger conveyor
- Rotational speed of grain auger
- Rotational speed of chopper
- Rotational speed of straw shaker
- Rotational speed of fan
- Rotational speed of feeder
- Speed of reel
- The amount of load in the grain elevator
- Current hours of harvester's work with threshing drum on
- Overall hours of combine harvester's work with threshing drum on
- Current harvest area
- Total harvest area
- Total bale count
- Bale count
- Bale count cut
- Bale slices

PARAMETERS READ FROM SPECIAL VEHICLES
- The slope of the arm
- Rotation of the arm
- Ejection of the arm
- Horizontal distance between the arm and vehicle
- Height of the arm above the ground
- Level of water for fire fighting
- Level of fire fighting foam
- Pressure in fire fighting pump
- Wind speed
- Outside temperature
- Drill RPM

PARAMETERS READ FROM MUNICIPAL VEHICLES
- The amount of salt/sand spreaded per square meter
- The amount of spreaded fine-grained salt
- The amount of spreaded coarse-grained salt
- The amount of spreaded mixture DiMix

- The amount of spreaded calcium chloride
- The amount of spreaded sodium chloride
- The amount of spreaded magnesium chloride
- The amount of spreaded gravel
- The amount of spreaded sand
- The width of pouring left
- The width of pouring right
- Salt spreader work hours
- Distance during salting

PARAMETERS READ FROM TACHOGRAPH DRIVER CARD
- Driver name
- Driver surname
- Driver ID
- Driver state
- Driver continuous driving time
- Driver cumulative break time
- Driver duration of selected activity
- Driver cumulated driving time for previous and current week
- Driver current daily driving time
- Numer of times driver exceeded 9 h daily driving time during a week
- Driver cumulative uninterrupted rest time
- Driver remaining current driving time
- Driver remaining driving time on current shift
- Driver remaining driving time of current week
- Driver remaining 2 weeks driving time
- Driver time left until next driving period
- Driver remaining time until next break or rest
- Driver end of last daily rest period
- Driver end of second last weekly rest period
- Driver current weekly driving time
- Driver maximum daily driving time
- Driver number od used reduced daily rest periods
- Driver duration of next driving period
- Driver duration of next break rest
- Driver remaining time of current break rest
- Driver time left until new daily rest period
- Next mandatory download date from driver card
- Driver time left until new weekly rest period
- Driver end of last weekly rest period
- Driver card expiry date
- Driver minimum daily rest
- Driver open compensation in the last week
- Driver open compensation in week before last
- Driver open compensation in 2nd week before last

GENERAL PARAMETERS READ FROM TACHOGRAPH
- Total vehicle distance from tachograph
- Trip distance from tachograph
- Vehicle speed from tachograph
- Tachograph driver card presence
- Tachograph next mandatory download date

DDD FILES

AVAILABLE **SOFTWARE LEVELS**, DETERMINING THE RANGE OF SUPPORTED DATA

			Level 1	Level 2	Level 3	Level 4
Supported vehicles		Passenger and electric cars	•	•	•	•
		Delivery vehicles (vans, pickups)	•	•	•	•
		Buses		•	•	•
		Heavy duty transport, HGV, TIR		•	•	•
		Agricultural, construction, utility, forestry, municipal and special machinery				•
SPUUPORTED PARAMETERS	Basic vehicle's data	Total vehicle mileage,	•	•	•	•
		Total fuel consumption,	•	•	•	•
		Fuel level,	•	•	•	•
		Engine RPM,	•	•	•	•
		Vehicle speed,	•	•	•	•
		Acceleration pedal position,	•	•	•	•
		Engine temperature,			•	•
		Ignition,	•	•	•	•
		Door status,	•	•	•	•
		Footbrake status,	•	•	•	•
		P, R, N, D position of automatic gearbox,	•	•	•	•
		R position of manual gearbox,	•	•	•	•
		CNG level,	•	•	•	•
		CNG consumption,	•	•	•	•
		Battery level,	•	•	•	•
		Charging wire plug-in status,	•	•	•	•
		Charging status,	•	•	•	•
		Parameters read from tachograph driver card.		•	•	•
	Other obtained data	Dashboard indicators			•	•
		Other parameters from about 300 supported			•	•

SAMPLE EXTRACT OF SUPPORTED PARAMETERS

2500 VEHICLES — DATABASE & CONNECTION DIAGRAMS FOR **FLEET MANAGEMENT** AND **SECURITY SYSTEMS**

UP TO 300 CAN BUS PARAMETERS — INDICATORS, DIAGNOSTICS, SPECIAL FEATURES

CARS AND ELECTIRC CARS

Vehicle	Year	Engine lifetime	Vehicle mileage	Total fuel consumption	Fuel level (Dashboard)	Engine speed (RPM)	Engine temperature	Vehicle speed	AdBLUE level
BMW I8 (I12)	2014	+	+		+	+			
LAND ROVER DISCOVERY SPORT HSE SD4	2016	+	+	+	+	+	+	+	
MERCEDES E (213)	2016	+	+			+	+		+
TOYOTA COROLLA	2017	+	+	+	+	+	+	+	

TRUCKS / TIR

DAF XF (EURO 6)	2015	+	+	+	+	+	+	+	+
IVECO STRALIS (EURO 6)	2017	+	+	+	+	+	+	+	+
MERCEDES ACTROS MP4 (EURO6)	2011	+	+	+	+	+	+	+	+
VOLVO FH (EURO 6)	2013	+	+	+	+	+	+	+	+

BUSES

IVECO KAPENA (EURO 6)	2014	+	+	+	+	+	+	+	+
MERCEDES TOURISMO RHD M (EURO 6)	2016	+	+	+	+	+	+	+	+
SCANIA OMNIEXPRESS	2007	+	+	+	+	+	+		
SETRA S431 DT (EURO 6)	2013	+	+	+	+	+	+		

CONSTRUCTION MACHINERY

BOBCAT TL470 HF (Telescopic handler)	2012	+		+	+	+	+		
CAT 12M3 (Grader)	2015	+	+	+	+	+	+	+	+
JCB 541-70 (Wheeled loader)	2011	+	+	+	+	+	+	+	
MANITOU MT 1440 (Telescopic handler)	2013	+	+	+		+	+	+	+

AGRICULTURE MACHINERY

CLAAS AXION 950 (Tractor)	2011	+	+	+	+	+	+	+	+
FENDT 939 VARIO PROFI 954 (Tractor)	2015	+	+	+	+	+	+	+	+
JOHN DEERE 7380 (Forage harvester)	2012	+	+	+	+	+	+	+	+
NEW HOLLAND T7.270 (Tractor)	2011	+	+	+		+	+	+	+

GRAIN HARVESTERS

CLAAS TUCANO 450 (Grain harvester)	2012	+	+	+	+	+	+	+	
JOHN DEERE W650 (Grain harvester)	2012	+	+	+	+	+	+	+	
NEW HOLLAND TC5.80 (Grain harvester)	2015	+		+	+	+	+	+	

SPECIAL MACHINERY / FOREST / PUMPS/ UTILITY

BUCHER CityCat 2020 (Sweeper)	2008	+			+	+	+	+	
HYSTER J2.0 XNT (Forklift)	2009	+	+	-	+	-	+	+	
MERCEDES UNIMOG U400 (Mulag mower)	2006	+	+	+	+	+	+	+	+
SCHMIDT STRATOS B70 (Salt Spreader)	2007	+	+						

5. Software versions

Description (XXXX) in naming of SEO CANlog (XXXX) defines the available outputs, hardware version and software version (i.e. compilation). Depending on the client's needs, we currently use over 50 different compilations in CANlog device PCB P145 (E20 10R-04 3878) and PCB U245. This is due to the fact that each CPU is equipped or may be equipped with possibility of acquisition of up to 300 parameters from more than 2500 different vehicles. Some compilations helps to improve vehicle fleet management, so the parameters such as: VIN number, fuel level, Adblue level, tire pressure, check engine indicator are useful. Other compilations help to implement guidelines of laws and directives, e.g. data from the tachograph. Sometimes customers put emphasis on driving safety and on savings – in this case speed, turn signals, "eco driving" algorithm, etc. are important. Other customers check the honesty of drivers by monitoring: fuel level, fuel consumption, mileage, pressure on saddle and axles, etc. In conclusion, separate compilations are used depending on a group of vehicles, group of parameters and the algorithms used. In addition, the required outputs of the device and the way of marking and packing expand number of versions up to 70 positions. Software versions can be enriched with additional features and special functions – description of non-standard functions in sections 9 – 11.

The table of some available products, available ports and available parameters.

Lp.	Device name	Previous marking	PCB board	Software version	Software level*	Number of CAN BUSes	Available outputs	Bundle
1	SEO CANlog (23591001)	U245_59_10	U245	59	1	2	RS232, UART	RS, UART after reconnecting
2	**SEO CANlog (23591002)**	**U245_59_10**	**U245**	**59**	**1**	**2**	**RS232, UART**	**UART, RS after reconnecting**
3	SEO CANlog (23592005)	U245_59_20	U245	59	2	2	RS232, UART	RS, UART after reconnecting
4	SEO CANlog (23592006)	U245_59_20	U245	59	2	2	RS232, UART	UART, RS after reconnecting
5	SEO CANlog (23593007)	U245_59_30	U245	59	3	2	RS232, UART	RS, UART after reconnecting
6	SEO CANlog (23593008)	U245_59_30	U245	59	3	2	RS232, UART	UART, RS after reconnecting
7	SEO CANlog (23594009)	U245_59_40	U245	59	4	2	RS232, UART	RS, UART after reconnecting
8	SEO CANlog (23594010)	U245_59_40	U245	59	4	2	RS232, UART	UART, RS after reconnecting
9	SEO CANlog (245A0A02)	U245_5A_0A	U245	5A	0A	2	UART	UART
10	SEO CANlog FMS(255B0B01)	U245_5B_0B	U245	5B	0B	2	RS232, CAN/FMS	RS232, CAN
11	**SEO CANlog FMS(255F1003)**	**U245_5F_10**	**U245**	**5F**	**1**	**2**	**RS232, CAN/FMS**	**RS232, CAN**
12	SEO CANlog FMS(255F2004)	U245_5F_20	U245	5F	2	2	RS232, CAN/FMS	RS232, CAN
13	SEO CANlog FMS(255F3005)	U245_5F_30	U245	5F	3	2	RS232, CAN/FMS	RS232, CAN
14	SEO CANlog FMS(255F4006)	U245_5F_40	U245	5F	4	2	RS232, CAN/FMS	RS232, CAN
15	**SEO CANlog (26606002)**	**U245_60_60**	**U245**	**60**	**60**	**3**	**UART**	**UART**
16	SEO CANlog (12201001)	P145_20_10	P145	20	1	2	RS232, UART	RS, UART after reconnecting
17	SEO CANlog (12202005)	P145_20_20	P145	20	2	2	RS232, UART	RS, UART after reconnecting
18	SEO CANlog (12203007)	P145_20_30	P145	20	3	2	RS232, UART	RS, UART after reconnecting
19	SEO CANlog (12204009)	P145_20_40	P145	20	4	2	RS232, UART	RS, UART after reconnecting

6. The way of sending data to the GPS/GSM system

Vehicle's data is sent in a specific protocol to the GPS/GSM system. To read data sent from SEO CANlog, the GPS/GSM system must have one of the communication protocols implemented. In SEO CANlog P145 devices, the 1.0 and 2.0 (switchable) protocols were used, as well as protocols developed for a specific clients. SEO CANlog PCB U245 uses 4.0 (recommended) protocol or 2.0 protocol or customized protocol versions. One of the versions sends data in a standardized **FMS** protocol extended with additional parameters (SEO FMS protocol). Depending on the version, we

provide clients with UART and/or RS232 or CAN/FMS J1939 outputs. The basic versions of the device have the following communication ports:

- SEO CANlog (23XX): INPUTS – 2x CAN BUS, OUTPUTS – UART and/or RS232,
- SEO CANlog (26XX): INPUTS – 3x CAN BUS, OUTPUTS – UART,
- SEO CANlogFMS (25XX): INPUTS – 2x CAN BUS, OUTPUTS – CAN/FMS SAE J1939 and RS232.

7. Installation of the SEO CANlog converter in a specific vehicle

After logging-in at www.can24.pro, select „diagrams" and then the PCB version of the device (PCB U245 or P145 for CANlog converter). You will see a list of newly added vehicles for the compilation. After clicking the language flag, the full current list of vehicles will be displayed. A connection diagram with photographs and description of the cables has been developed for each vehicle. The software of SEO CANlog contains over 200.000 lines of well optimized code within which you can choose the **Program Number** corresponding to a specific vehicle. **On each connection diagram, a dedicated Program Number for a specific vehicle is shown**. It should be set using the switch button and LED located on the PCB. The program number can also be selected via the **O350** programmer device or from the GPS/GSM system after implementing the appropriate part of the 4.0 or 2.0 protocol. By default, the neutral program number 11120 is set. Connecting SEO CANlog to the car with wrong Program Number selected may generate errors on the CAN BUS. The Program Number may be changed limited number of times.

Note to the diagrams:

- the same, in terms of model, **vehicles from different markets** may have different parameters available on CAN BUS,
- car manufacturers are adapting to the requirements of each market, hence for example Toyota cars will be constructed differently for the European Union market and differently for African market – depending on the country of destination Toyota Hilux will have a different CAN BUS for Europe and another for African market; Toyota Innova 2015 from Indonesia will not be equipped with CAN BUS and Toyota Land Cruiser 2018 and 2019 for Africa will still be manufactured in versions J70, J80 and J120, while versions J150 and J200 will be manufactured for Europe and USA. Fiat Ducato 2011-2014 on the European market met the Euro5 standard and had new ECU type, while on Russian market in 2011 new models still had an older ECU type. Caterpillar from the African market may use only it's own Caterpillar's digital transmission, while the same models from the European market will use additionally (or only) CAN BUS transmission,
- the installer should carefully analyze the connection diagram and compare it with the vehicle – sometimes, on different markets, the schemes referring to previous model versions of a particular vehicle should be used, even though the car is from current production,
- the connectors on the photographs are priority over the cable colors. Depending on the market manufacturers may use a different color of wires,
- The connection diagram refers to the year of introducing a specific model on the market, e.g.: diagram for articulated hauler Bell B30D from year 2001 will also be valid for the product from 2013 – the model has not changed. The John Deere 1450 CSW combine-harvester from 2009, has the same electrical installation as the model from 2001.

8. Additional capabilities of the CANlog converter and special functions

Depending on the implemented software, SEO CANlog converter is also able to:

- read all data from tachographs (DDD files, driver-cards, and events from the **tachograph** itself),
- help optimizing fuel consumption and increase the lifespan of the car's exploiting elements and parts, thanks to the "**eco driving**" system,
- read the state of retarder, i.e. the brake assist device, which is used for long-term braking of the vehicle; the retarder is mainly used in trucks and buses to prevent excessive speed increase when driving down long hills,
- include control functions i.e. remotely open/close the central door lock, control the windows, turning the engine on and off, control Webasto system,
- additionally, SEO CANlog can read data from other devices connected to CAN BUS and send them to the GPS/GSM system, eg data from an additional digital fuel probe or data from the :Mobileye" system,
- carry out a **remote diagnosis** of the vehicle.

## 9. Tachograph – driver and caompany card/reading DDD files

The SEO CANlog device allows remote reading of information from the tachograph. It is possible to download data from the device's memory and from the cards placed in the tachograph without having to bring vehicles to the company's headquarters.

Pursuant to Regulation (WE) No. 561/2006, a company owning vehicles with a digital tachograph is obliged to read driver cards every 28 days. This problem may be solved in two ways:
- the first involves a manual connection to the tachograph. It's necessary to bring the vehicle to company's hedquarters,
- the second method we propose is a solution that saves time and reduces costs. Our SEO CANlog device, after connecting to the GPS/GSM system, is able to remotely download DDD files from a vehicle operating anywhere in the world at any time.

Authorization is required to download DDD files. Authorization can be carried out by entering the company card into a dedicated tachograph slot. You can also authorize using our SEO CANlog converter cooperating with the GPS/GSM system.

The solution of remote authorization depends on the GPS/GSM system. One of the methods proposed by the manufacturers of these devices is using a special authorization reader – then the schematic diagram of such reading looks as follows:
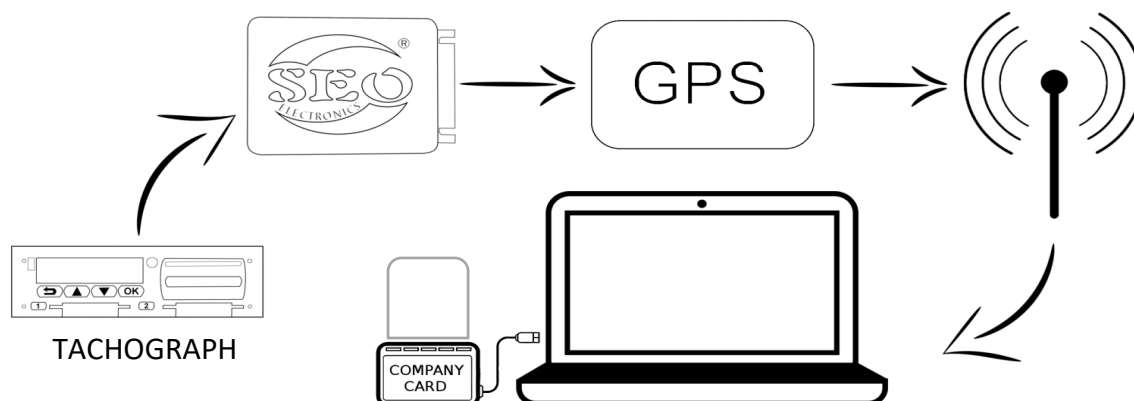
The SEO CANlog device connects to the tachograph mounted in the vehicle, then using the appropriate protocol it sends authorization request to the GPS/GSM system, and then GPS/GSM system connects to the reader via the Internet. From the customer's perspective, this process is

incredibly simple and is mainly limited to inserting the card into the reader, which can be done by an unskilled person.

After correct authorization process, the DDD files are downloaded. Parameters such as vehicle events and faults, technical data or detailed speed data are read. These files, depending on the GPS/GSM system, are available on the server or are sent directly to the client's computer. Files downloaded remotely are equivalent to those downloaded manually and can be transferred to the Road Transport Inspection if necessary.

According to the fact that the data can be read without connecting directly to the tachograph (it facilitates logistical planning), the vehicles do not have to travel to the company's headquarters. Therefore, time and money is saved. In cooperation with an appropriate GPS/GSM system there is no need to equip drivers with with company cards and require them to read data from the tachograph, because thanks to SEO CANlog converters all information can be read from the company level with only one company card for the entire fleet of vehicles.

PARAMETERS READ FROM TACHOGRAPH DRIVER CARD
- Driver name
- Driver surname
- Driver ID
- Driver state
- Driver continuous driving time
- Driver cumulative break time
- Driver duration of selected activity
- Driver cumulated driving time for previous and current week
- Driver current daily driving time
- Numer of times driver exceeded 9 h daily driving time during a week
- Driver cumulative uninterrupted rest time
- Driver remaining current driving time
- Driver remaining driving time on current shift
- Driver remaining driving time of current week
- Driver remaining 2 weeks driving time
- Driver time left until next driving period
- Driver remaining time until next break or rest
- Driver end of last daily rest period
- Driver end of second last weekly rest period

- Driver current weekly driving time
- Driver maximum daily driving time
- Driver number od used reduced daily rest periods
- Driver duration of next driving period
- Driver duration of next break rest
- Driver remaining time of current break rest
- Driver time left until new daily rest period
- Next mandatory download date from driver card
- Driver time left until new weekly rest period
- Driver end of last weekly rest period
- Driver card expiry date
- Driver minimum daily rest
- Driver open compensation in the last week
- Driver open compensation in week before last
- Driver open compensation in 2nd week before last

GENERAL PARAMETERS READ FROM TACHOGRAPH
- Total vehicle distance read from tachograph
- Trip distance read from tachograph
- Vehicle speed read from tachograph
- Tachograph driver card presence
- Date of next mandatory data download from tachograph

DDD FILES

10. Description of SEO CANlog functioning in the field of remote diagnosis

The SEO CANlog converter in cooperation with GPS/GSM locator enables remote diagnosis of vehicles, i.e. reading and defining many parameters and DTC (Data Trouble Codes) errors occurring in various car systems and controllers. The DTC readout is carried out in the following drivers:

- **ECM driver – Engine Control Module –** electronic device that selects the right proportions of fuel and air in the mixture and sets the moment of fuel injection to the cylinder based on information obtained from the engine sensors,
- **ABS– Anti-Lock Braking System –** an element of the braking system used in motor vehicles to lock the wheels during breaking. The system's task is to counteract negative phenomena associated with the loss of control of the vehicle (for example slippery road),
- **SRS– Supplementary Restrain System –** a system of additional car safety, which consists of impact sensors, controllers and executive installations such as airbags, belt pretensioners, fire extinguishing systems or battery disconnection system from the car electrical system,

- **TCM system – Transmission Control Module** – automatic gearbox (automatic transmission),
- **BCM system – Body Control Module** – module responsible for processing data from sensors of various electronic systems onboard the vehicle, such as: central locking, air conditioning, electric windows, mirrors and seats.

In the event of abnormalities in the functioning quality of the above systems, the integrator has the possibility of reading information in the UART standard using his own PC and remotely clearing error codes (clear DTC), if his GPS/GSM device allows to do so. <u>The error reading and clearing takes place with the ignition on</u>. Clearing error codes can only take place with the engine switched off.

In order for the above functionality to be available, it is required for the specific type of vehicle to be examined by our company in this regard. The appropriate list of vehicles and DTCs is available on request.

VEHICLE DIAGNOSTICS
- DTC (Diagnostic Trouble Code) - ECM controller
- DTC (Diagnostic Trouble Code) - ABS controller
- DTC (Diagnostic Trouble Code) - SRS controller
- DTC (Diagnostic Trouble Code) - TCM controller
- DTC (Diagnostic Trouble Code) - CEM controller
- DTC (Diagnostic Trouble Code) - machines controller
- DTC (Diagnostic Trouble Code) - HV battery controller
- DTC (Diagnostic Trouble Code) - hybrids controller

11. „Eco driving" algorithm

The use of *eco driving* algorithm allows to reduce fuel consumption and significant savings on the vehicle's exploitation costs. Introduction of principles of rational driving extends the longevity of the vehicle and increases safety on the road. The benefits of using functionalities of our device are much more extensive:

- Savings in fuel consumption can reach over a dozen percent, which in the fleet of vehicles means saving high amounts of money. The saving effect usually is not associated with an extended driving time,
- The longevity of vehicle components such as brake pads and discs, clutch, tires, gearbox as well as the engine is significantly extended,
- The drivers' technique of driving is improved by analyzing and changing their behavior. The driver acquires good habits, such as predicting traffic situation and less aggressive driving style, which has direct impact on safety,
- Driving style optimization reduces emission of pollution,
- The company's competitiveness is increased, comparing to other firms.

The algorithm analyses real data related to the driving style, obtained from the CAN BUS. There are solutions on the market that analyze only vehicle's location in time in combination with data from accelerometer. Our solution is based on using data from CAN BUS, on the basis of which we have created 18 new parameters, which are used in the *eco driving* algorithm. For example: duration of acceptable driving characteristics are compared with overshoots and indexes of sudden changes of multiple parameters. Warning indicators are also important. We used summary of fuel consumption in the analyzed behaviors of the vehicle and made many additional calculations to create comprehensive algorithm, which application can bring tangible benefits.

12. Driver's work mode – business/company and private

To enable the employer to determine the working time or when the vehicle is used for private purposes, and when for business purposes, in SEO CANlog, SEO CAneasy and SEO CANmax devices we provide the possibility of switching the driver's work modes between private and business/company.

The parameter can be useful in cars used by sales representatives or in delivery vehicles (i.e. pizza delivery).

The device is in business/company mode by default. To switch to private mode, switch the ignition on with the accelerator pedal pressed (the accelerator pedal should remain pressed for about 1 second after switching the ignition on). The change of operating mode to business/company mode occurs automatically after 4 seconds after switching the ignition off.