

J1939 Simulator Ver2.00

Features:

- Device Name and address of the simulator can be configured by PC.
- VIN# can be customized by user
- J1939 Frame format (DTC format) can be configured from version 1 to version 4
- 2 extra user defined PGNs can be simulated in addition to 30 parameters
- Data longer than 8 bytes can be simulated in both broadcast and request way.
- Total 3 DTCs can be simulated.
- CAN Bus Baud Rate can be 250Kbps or 500Kbps.
- Work well in "Standalone" where PC cannot be used
- Work well in "Monitor" where PC will give simulated parameter values in real time

Product Specification

- Power supply : +7VDC~+25VDC
- Working current : less than 50mA
- CAN BUS Transfers distance : 0~10km
- Working temperature : -45 ~70
- Compact Size: 4.062" X 1.68"X0.818"

The simulator has two work ways. One is called "PC Monitor". The other is called "Standalone".

For "PC Monitor" way, you connects the simulator with PC by RS232 port, and you will set the parameters of truck in real time. The simulator will generate the value of PGNs according to data from PC in real time. The Top row's 5 green LEDs are bright for displaying this working way.

For "Standalone" way, you don't need PC, it's convenient for the field. In "Standalone" way, the simulator has two working mode, one is the "Static Mode", the other is "Dynamic Mode".

"Static Mode" means every parameter are fixed. their value is decided by the key "UP" or "Down", The top row's LED will display the fixed percentage value

"Dynamic Mode" means every parameter are not fixed. It will automatically change with time. The top row's all LEDs will blink to display "Dynamic Mode".

The default state for the simulator is shown below:

- 8 bytes of device name are all zero.
- J1939 address of the simulator is 0x0
- Work mode is "Static Mode"
- There are not any extra user defined PGNs
- DTC Format is version 4
- VIN# is "DafulaiElectronic"

We strongly recommend customer to read [DFL-SJ1939 datasheet](#) before reading this datasheet.
The physical image of this board is shown in Fig.1



Fig. 1. J1939 Simulator

1 Get started

For "Standalone way"

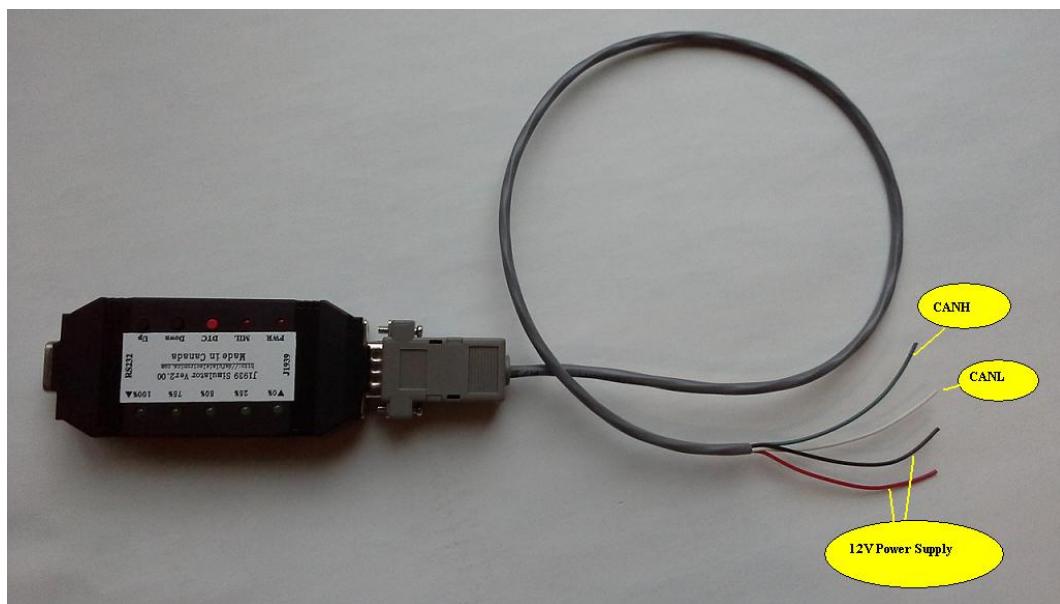
Step1: Connect +7VDC ~+24VDC to the "power+" and "Gnd" on the male DB9 of the Simulator, connect CAN_H and CAN_L to the CAB BUS network. Turn on this power supply. The PWR LED should light up. See fig.2



Pin1=ground
 Pin5=+12VDC
 Pin6=CANL
 Pin7=CANH

Fig.2 the footprint of Male DB9

If you order our cable , Part Number:DFLDB9Cv1 , simply use DB9 cable, Red wire is for "power+", Black wire is for "Gnd ",Green wire is for "CAN_H",White wire is for "CAN_L". Please see figure below:



If you order our Deutsch/DB9 cable, Part Number:DFLDC9CV1, Simply plug DB9 into simulator, plug Tester into Deutsch Connector, connect Red wire for "power+", Black wire for "Gnd". Please see figure below:



You can use our OBD2/J1708/J1587 Simulator: Part Number DFLSOBD2. In this case, you don't need extra power supply. Just Purchase our Cable (Part Number:DFLDC15CV1). Pug in the cable to OBD2/J1708/J1587 Simulator and J1939 Simulator. However, for OBD2/J1708/J1587 Simulator, you cannot select ISO15765 protocols because it uses CAN Bus too. Two different high layer CAN Bus protocols could cause data collision . For connection, please see figure below:



Plug the female DB9 of the Simulator to PC's RS232 port. If you don't want to change the configuration or you want to use manufacturer's default configuration, just jump to step3.

Step2: This step is only used for the configuration.

Download the configuration software to your PC from
<http://www.dafulaielectronics.com/Documents/J1939Simulator.zip>

After successfully installing the software, run config_j1939.exe, the window below will appear

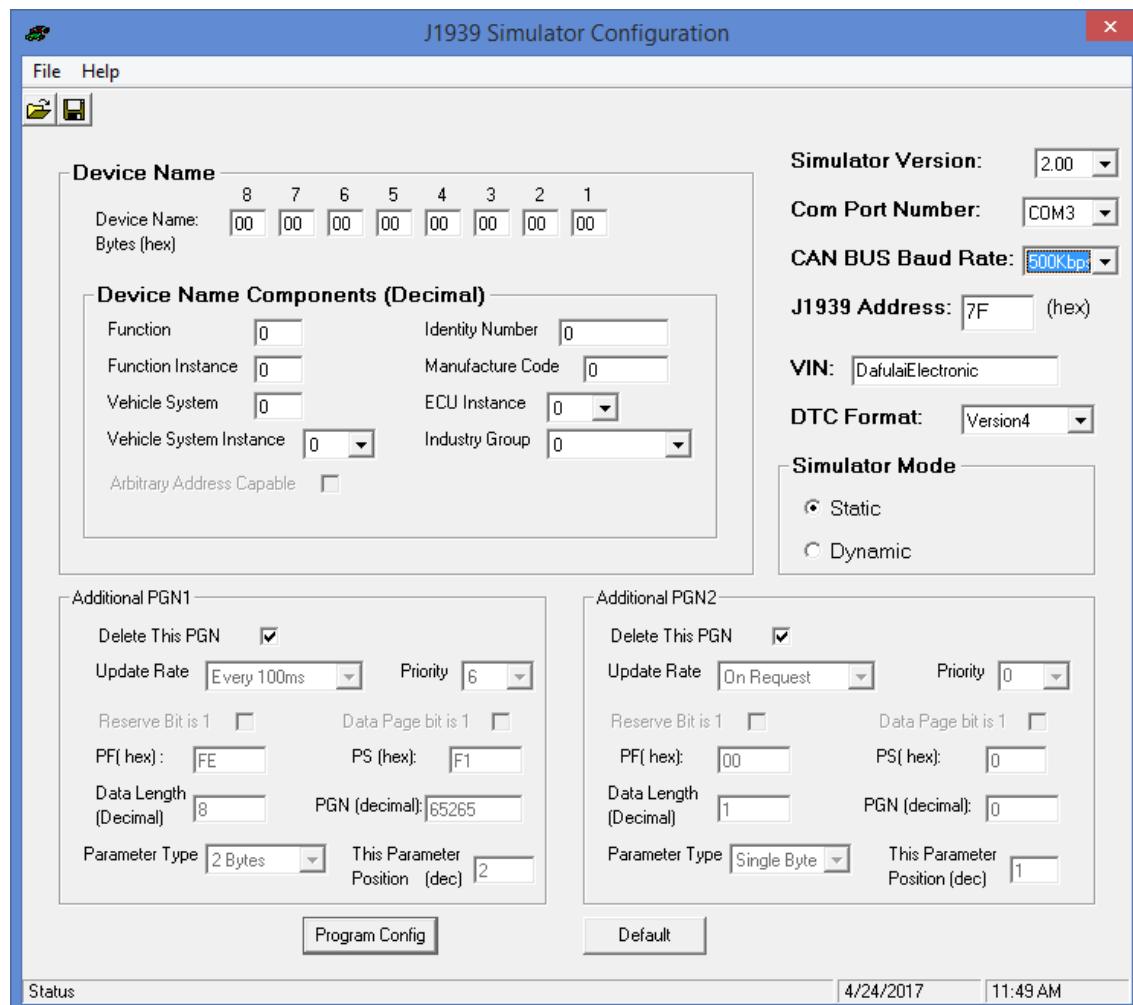
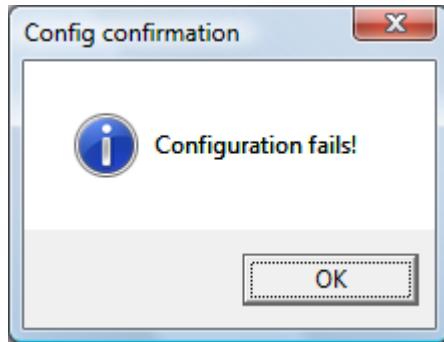


Fig. 3 J1939 Configuration software

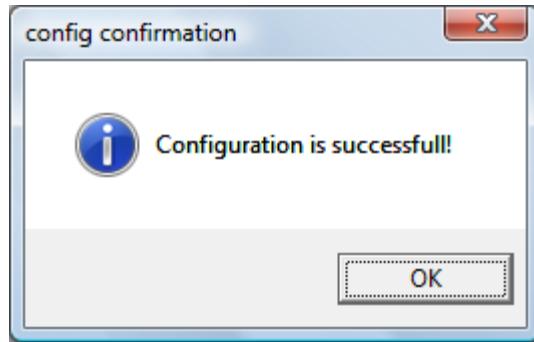
The Com Port number must be chosen to the Com number your simulator is connected to. Simulator Version should be chosen to 2.00 for this ver2.00 simulator. Can bus baud rate can be chosen "250Kbps" or "500Kbps" (500Kbps is only for Apr 10 2017 or after.). You can open the previous configuration by clicking "open" item on tool bar or choosing file/open menu.

You can save your configuration by clicking "save" item on tool bar or choosing "File/save" menu. You can save to different file name by choosing "File/ Save as" menu.

When you complete the configuration, you can click on the "Program Config" button for downloading the configuration to the simulator. After a while, if the following window appears, the configuration is not successful. You have to check the connection between the PC and simulator or the COM number. Power off the simulator , Wait for a couple of seconds, Power on again. Try the configuration software again.



If the following window appear, It means the configuration is successful. Now the simulator will use new configuration. But you have to power off and power on again in order to work correctly for the simulator.



Step 3: The following operation is optional. You have to choose them according to your needs.

- Press the button "Up" and "Down" at the same time on the simulator
You will hear a long beep sound. This is for toggling between "Static mode" and "Dynamic mode". The simulator can remember the work mode even though you power off. The LEDs "0%", "25%", "50%", "75%", and "100%" will blink when the simulator works in the "Dynamic mode".
- Press the button "Up"
You will hear a short beep sound. This is used in the "Static mode". The parameter value will increase 25% until 100% when you press the button "Up" and release it once. The LED of top row will display the parameter percentage value.
- Press the button "Down"
You will hear a short beep sound. This is used in the "Static mode". The parameter value will decrease 25% until 0% when you press the button "Down" and release it once. The LED of top row will display the parameter percentage value.
- Press the button "DTC"
You will hear a short beep sound and the LED "MIL" will light up. The number of "DTC" will increase 1 until the maximum of 3 when you press the button "Up" and release it once.
- Press the button "Down" and "DTC" at the same time
This will turn off the buzzer. So you cannot hear any beep after you did them
- Press the button "Up" and "DTC" at the same time
You will hear a long beep sound. This will turn on the buzzer. So you can hear beep again after you did them

For "PC Monitor way"

Step1: It is the same as "Step 1 of Standalone way"

Step2 : It is the same as "Step 2 of Standalone way"

Step3 : If you arrive at this step from step 2, please close "J1939 Configuration software" firstly. And then, please Download the pc_tool software to your PC from <http://www.dafulaielectronics.com/Documents/PCtool.zip>

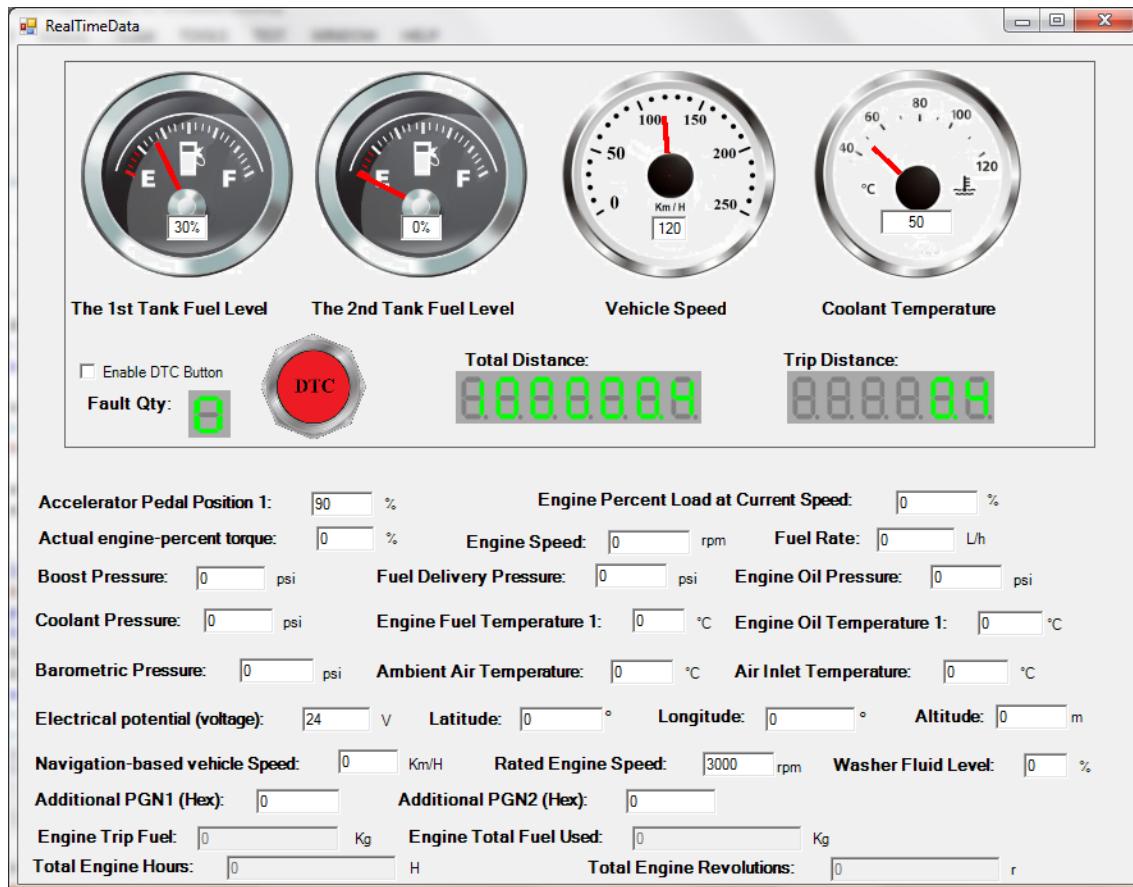
After successfully installing the software, run PCtool.exe, the window below will appear if COM port is not correct:



Please select correct COM port, then the window below will appear :



Please follow the red hint and turn off simulator power for 1 or 2 seconds, and then power on simulator again, the window below will appear :



and Top row's 5 green LEDs of simulator will be bright , that means simulator is "PC Monitor way". You can change any parameter value as you want. the simulator will use the value you set. PC will keep all settings you make when you close software. And PC will use the setting values when you run PCtool.exe again.

Notes:

- 1 In ""PC Monitor way", all parameters values are stored in Default.txt file in the installing directory. You can copy the file to the other computer. So you can share the setting with your co-worker.
- 2 In ""PC Monitor way", Key "Up" and "Down" of simulator cannot change the parameter value. But key "DTC" of simulator still can generate DTC. The button "DTC" of software still can generate DTC only when "Enable DTC Button" is checked.
- 3 The default status is that there is a 120 Ohms' resistor between the terminal "CANH" and "CANL" in the box of the simulator. If your simulator is not last one or first one in the CAN BUS, please open the box of the simulator and make the jumper open in the Fig.4

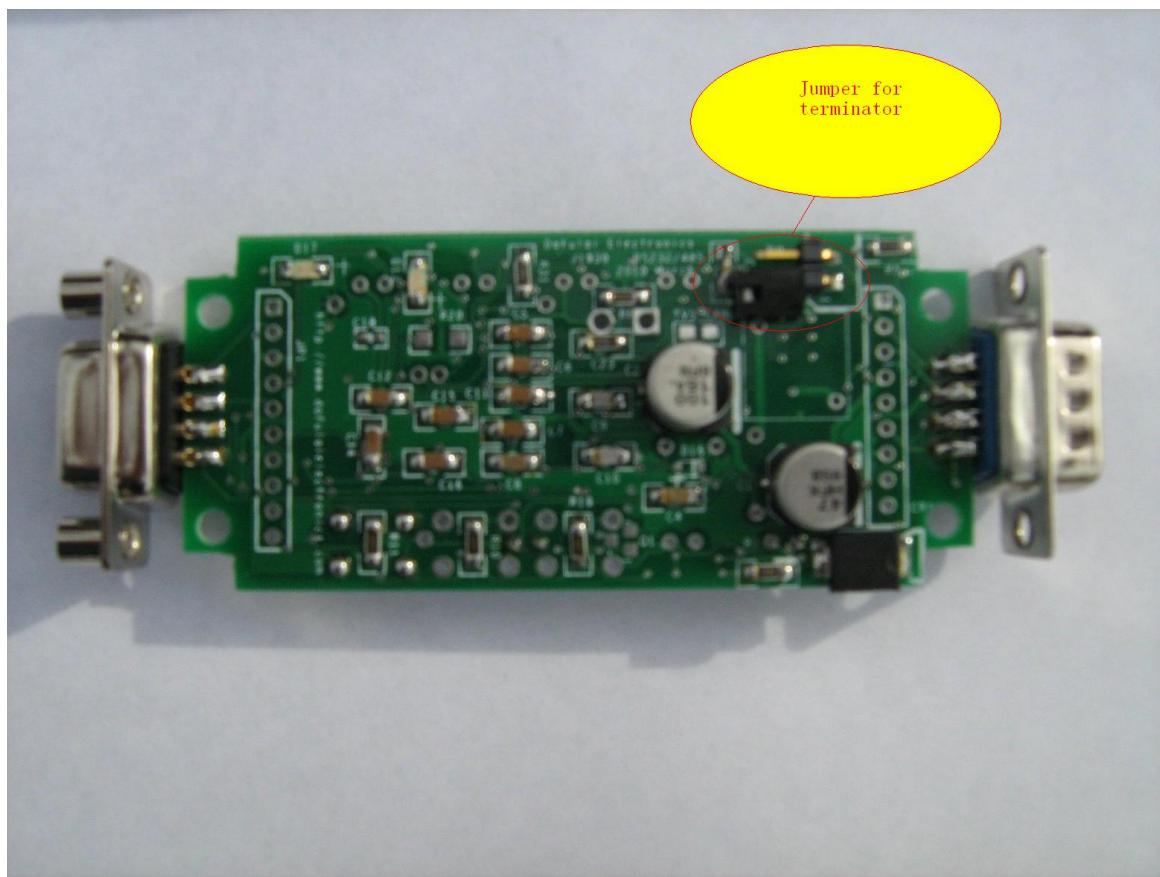


Fig.4 Jumper for 120 ohm's terminator

2. Supported PGNs

PGN 65267 Vehicle Position

Transmission Repetition Rate : 5 s

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 243

Default Priority : 6

Parameter Group Number : 65267 (0xEF3)

Start Position	Length	Parameter Name	SPN
1-4	4 byte	Latitude	584
5-8	4 bytes	Longitude	585

With ECU simulated parameter value

Latitude: -210°(south) to 211.108122°(north) 10⁻⁷ °/bit

Longitude: -210°(west) to 211.108122°(east) 10⁻⁷ °/bit

PGN 65256 VEHICLE DIRECTION/SPEED

Transmission Repetition Rate :on request

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 232

Default Priority : 6

Parameter Group Number : 65256 (0xFEE8)

Start Position	Length	Parameter Name	SPN
1-2	2 bytes	Compass bearing	165
3-4	2 bytes	Navigation-based vehicle speed	517
5-6	2 bytes	Pitch	583
7-8	2 bytes	Altitude	580

With ECU simulated parameter value

Navigation-based vehicle speed: 0 to 250.996km/h 1/256 km/h/bit

Altitude: -2500m to 5531.875m 0.125m/bit

Another position are all 0xFF (not yet implemented)

PGN 65262 Engine Temperature 1

Transmission Repetition Rate : 1 s

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 238

Default Priority : 6

Parameter Group Number : 65262 (0xFFFF)

Start Position	Length	Parameter Name	SPN
1	1 byte	Engine Coolant Temperature	110
2	1 bytes	Engine Fuel Temperature 1	174
3-4	2 bytes	Engine Oil Temperature 1	175
5-6	2 bytes	Engine Turbocharger Oil Temperature	176
7	1 bytes	Engine Intercooler Temperature	52
8	1 bytes	Engine Intercooler Thermostat Opening	1134

With ECU simulated parameter value

Engine Coolant Temperature: -40 to 210°C 1°C/bit

Engine Fuel Temperature 1: -40 to 210°C 1°C/bit . We use the fixed value of 80 °C when "standalone" way

Engine Oil Temperature 1: -273 to 1735°C 0.03125°C/bit

Another position are all 0xFF (not yet implemented)

PGN 65269 AMBIENT CONDITIONS

Transmission Repetition Rate : 1 s

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 245

Default Priority : 6

Parameter Group Number : 65269 (0xFEF5)

Start Position	Length	Parameter Name	SPN
1	1 byte	Barometric pressure	108
2-3	2 bytes	Cab interior temperature	170

Start Position	Length	Parameter Name	SPN
4-5	2 bytes	Ambient air temperature	171
6	1 bytes	Air inlet temperature	172
7-8	2 bytes	Road surface temperature	79

With ECU simulated parameter value

Barometric pressure: 0 to 125 kPa (0 to 18.1psi) 0.5kPa/bit

Ambient air temperature: -273 to 1735°C 0.03125°C/bit. We use the fixed value of 25 °C when "standalone" way

Air inlet temperature: -40 to 210°C 1°C/bit. We use the fixed value of 35 °C when "standalone" way

Another position are all 0xFF (not yet implemented)

PGN 65257 FUEL CONSUMPTION

Transmission Repetition Rate : 1 s

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 233

Default Priority : 6

Parameter Group Number : 65257 (0xFEE9)

Start Position	Length	Parameter Name	SPN
1-4	4 bytes	Engine trip fuel	182
5-8	4 bytes	Engine total fuel used	250

With ECU simulated parameter value

Engine trip fuel: 0 to 2105540607.5 kg 0.5kg/bit. We give the value according to "Fuel rate"

Engine total fuel used: 0 to 2105540607.5 kg 0.5kg/bit. We give the value according to "Fuel rate"

PGN 61444 ELECTRONIC ENGINE CONTROLLER #1: EEC1

Transmission Repetition Rate : 100ms

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 240

PDU Specific : 4

Default Priority : 3

Parameter Group Number : 61444 (0xF004)

Start Position	Length	Parameter Name	SPN
1	4 bits	Status_EEC1	899
2	1 byte	Driver's demand engine - percent torque	512
3	1 byte	Actual engine - percent torque	513
4-5	2 bytes	Engine speed	190
6-8	3 bytes	not defined	

With ECU simulated parameter value

Actual engine - percent torque: -125% to 125% 1%/bit

Engine speed: 0 to 8031.875rpm 0.125rpm/bit

Another position are all 0xFF (not yet implemented)

PGN 61443 Electronic Engine Controller 2 - EEC2

Transmission Repetition Rate : 50ms

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 240

PDU Specific : 3

Default Priority : 3

Parameter Group Number : 61443 (0xF003)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Accelerator Pedal 1 Low	558

Start Position	Length	Parameter Name	SPN
		Idle Switch	
1.3	2 bits	Accelerator Pedal Kickdown Switch	559
1.5	2 bits	Road Speed Limit Status	1437
1.7	2 bits	Accelerator Pedal 2 Low Idle Switch	2970
2	1 byte	Accelerator Pedal Position 1	91
3	1 byte	Engine Percent Load at Current Speed	92
4	1 byte	Remote Accelerator Pedal Position	974
5	1 byte	Accelerator Pedal Position 2	29
6.1	2 bits	Vehicle Acceleration Rate Limit Status	2979

With ECU simulated parameter value

Accelerator Pedal Position 1: 0% to 100% 0.4%/bit

Engine Percent Load at Current Speed: 0% to 125% 1%/bit

Another position are all 0xFF (not yet implemented)

PGN 65270 Electronic Engine Controller 2 - EEC2

Transmission Repetition Rate : 0.5s

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 246

Default Priority : 6

Parameter Group Number : 65270 (0xFEF6)

Start Position	Length	Parameter Name	SPN
1	1 byte	Particulate trap inlet pressure	81
2	1 byte	Boost pressure	102
3	1 byte	Intake manifold	105

Start Position	Length	Parameter Name	SPN
		temperature	
4	1 byte	Air inlet pressure	106
5	1 byte	Air filter differential pressure	107
6-7	2 bytes	Exhaust gas temperature	173
8	1 byte	Coolant filter differential pressure	112

With ECU simulated parameter value

Boost pressure: 0 to 500kPa (72.5psi) 2kPa/bit

Another position are all 0xFF (not yet implemented)

PGN 65132 Tachograph - TCO1

Transmission Repetition Rate : 50ms

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 108

Default Priority : 6

Parameter Group Number : 65132 (0xFE6C)

Start Position	Length	Parameter Name	SPN
1.1	3 bits	Driver 1 working state	1612
1.4	3 bits	Driver 2 working state	1613
1.7	2 bits	Vehicle motion	1611
2.1	4 bits	Driver 1 Time Related States	1617
2.5	2 bits	Driver card, driver 1	1615
2.7	2 bits	Vehicle Overspeed	1614
3.1	4 bits	Driver 2 Time Related States	1618
3.5	4 bits	Driver card, driver 2	1616
4.1	2 bits	System event	1622
4.3	2 bits	Handling information	1621
4.5	2 bits	Tachograph performance	1620
4.7	2 bits	Direction indicator	1619
5-6	2 bytes	Tachograph output shaft speed	1623

Start Position	Length	Parameter Name	SPN
7-8	2 bytes	Tachograph vehicle speed	1624

With ECU simulated parameter value

Tachograph vehicle speed: 0 to 250.996km/h 1/256km/h/bit

Another positions are all 0xFF (not yet implemented)

PGN 65265 Cruise Control/Vehicle Speed

(This PGN is only supported for Version 2.00 of the year 2017 or after)

Transmission Repetition Rate : 100ms

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific :241

Default Priority : 6

Parameter Group Number : 65265 (0xEF1)

Start Position	Length	Parameter Name	SPN
1.1	2 bits	Two Speed Axle Switch	69
1.3	2 bits	Parking Brake Switch	70
1.5	2 bits	Cruise Control Pause Switch	1633
1.7	2 bits	Park Brake Release Inhibit Request	3807
2-3	2 bytes	Wheel-Based Vehicle Speed	84
4.1	2 bits	Cruise Control Active	595
4.3	2 bits	Cruise Control Enable Switch	596
4.5	2 bits	Brake Switch	597
4.7	2 bits	Clutch Switch	598
5.1	2 bits	Cruise Control Set Switch	599
5.3	2 bits	Cruise Control Coast (Decelerate) Switch	600
5.5	2 bits	Cruise Control Resume Switch	601
5.7	2 bytes	Cruise Control Accelerate Switch	602
6	1 byte	Cruise Control Set Speed	86

Start Position	Length	Parameter Name	SPN
7.1	5 bits	PTO Governor State	976
7.6	3 bits	Cruise Control States	527
8.1	2 bits	Engine Idle Increment Switch	968
8.3	2 bits	Engine Idle Decrement Switch	967
8.5	2 bits	Engine Test Mode Switch	966
8.7	2 bits	Engine Shutdown Override Switch speed	1237

With ECU simulated parameter value

Wheel-Based Vehicle Speed: 0 to 250.996km/h 1/256km/h/bit

Another positions are all 0xFF (not yet implemented)

PGN 65271 VEHICLE ELECTRICAL POWER

Transmission Repetition Rate : 1s

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 247

Default Priority : 6

Parameter Group Number : 65271 (0xFEF7)

Start Position	Length	Parameter Name	SPN
1	1 byte	Net battery current	114
2	1 bytes	Alternator current	115
3-4	2 bytes	Alternator potential (voltage)	167
5-6	2 bytes	Electrical potential (voltage)	168
7-8	2 bytes	Battery potential (voltage), switched	158

With ECU simulated parameter value

Electrical potential (voltage): 0 to 3212.75V 0.05V/bit. We use the fixed value of 24V when "standalone" way

Another positions are all 0xFF (not yet implemented)

PGN 65266 FUEL ECONOMY

Transmission Repetition Rate : 100ms

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 242

Default Priority : 6

Parameter Group Number : 65266 (0xFEF2)

Start Position	Length	Parameter Name	SPN
1-2	2 byte	Fuel rate	183
3-4	2 bytes	Instantaneous fuel economy	184
5-6	2 bytes	Average fuel economy	185
7-8	2 bytes	not defined	

With ECU simulated parameter value

Fuel rate: 0 to 3212.75L/h 0.05L/h/bit

Another positions are all 0xFF (not yet implemented)

PGN 65263 ENGINE FLUID LEVEL/PRESSURE

Transmission Repetition Rate : 0.5s

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 239

Default Priority : 6

Parameter Group Number : 65263 (0xFEEF)

Start Position	Length	Parameter Name	SPN
1	1 byte	Fuel delivery pressure	94
2	1 byte	Not defined	
3	1 byte	Engine oil level	98
4	1 byte	Engine oil pressure	100
5-6	2 bytes	Crankcase pressure	101
7	1 byte	Coolant pressure	109
8	1 byte	Coolant level	111

With ECU simulated parameter value

Fuel delivery pressure: 0 to 1000kPa 4kPa/bit

Engine oil pressure: 0 to 1000kPa 4kPa/bit

Coolant pressure: 0 to 500kPa 2kPa/bit

Another position are all 0xFF (not yet implemented)

PGN 65253 Engine Hours, Revolutions

Transmission Repetition Rate :on request

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 229

Default Priority : 6

Parameter Group Number : 65253 (0xFEE5)

Start Position	Length	Parameter Name	SPN
1-4	4 bytes	Total engine hours	247
5-8	4 bytes	Total engine revolutions	249

With ECU simulated parameter value

Total engine hours: 0 to 210554060.75h 0.05h/bit. We give the value according to actual running time.

Total engine revolutions: 0 to 4211081215000r 1000r/bit. We give the value according to engine speed and actual running time.

PGN 65214 ELECTRONIC ENGINE CONTROLLER #4: EEC4

Transmission Repetition Rate : on request

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 190

Default Priority : 7

Parameter Group Number : 65214 (0xFEBE)

Start Position	Length	Parameter Name	SPN
1-2	2 byte	Rated engine power	166
3-4	2 bytes	Rated engine speed	189
5-8	4 bytes	not defined	

With ECU simulated parameter value

Rated engine speed: 0 to 8031.875rpm 0.125rpm/bit. We use the fixed value of 3000rpm when "standalone" way

Another positions are all 0xFF (not yet implemented)

PGN 65260 Vehicle Identification Number

Transmission Repetition Rate : on request

Data Length : variable and it can be more than 200, but this IC uses a fixed value 17 when the simulator is configured to ver 2.00 and fixed value 203 when the simulator is configured to ver 1.01

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 236

Default Priority : 6

Parameter Group Number : 65260 (0xFEEC)

must use long message broadcast.

With ECU simulated parameter value

Vehicle Identification number:

If the simulator is configured to Version 1.01, The VIN# will be Continuous 28 "Dafulai" followed by "CD. XIA" , Total 203 bytes. (Note: Space is "*" character)

If the simulator is configured to Version 2.00, The VIN# will be configured into 17 non-space characters. Default VIN# is "DafulaiElectronic"

PGN 65226 DM1 - When no any DTC

This is a healthy heart beat

Transmission Repetition Rate : 1s

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 202

Default Priority : 6

Parameter Group Number : 65226 (0xFECA)

Byte 1

bits 8-7 = 00

bits 6-5 = 00

bits 4-3 = 00

bits 2-1 = 11

Byte 2

bits 8-7 = 11

bits 6-5 = 11

bits 4-3 = 11

bits 2-1 = 11

Byte 3 to byte 6 = 0 no SPN

Byte 7 = 0

Byte 8 = 0

PGN 65226 DM1 - When there is a DTC

Transmission Repetition Rate : 1s

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 202

Default Priority : 6

Parameter Group Number : 65226 (0xFECA)

SPN 1208 is generated

SPN 1208 = 0x4B8 = 000 00000100 10111000 (19 bits)

FMI 3 = 3 = 00011 (5 bits)

OC 10 = 0xA = 0001010 (7 bits)

Byte 1

bits 8-7 = 01 (MIL LED on)

bits 6-5 = 00

bits 4-3 = 00

bits 2-1 = 11

Byte 2

bits 8-7 = 11 (flashing not yet implemented)

bits 6-5 = 11

bits 4-3 = 11

bits 2-1 = 11

DTC Format Version 1:

DTC (SPN=1208)																							
Byte3								Byte4								Byte5							
8 most significant bits of 16 most significant bits of SPN (bit 8 most significant)								8 least significant bits of 16 most significant bits of SPN (bit 8 most significant)								3 least significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)							
SPN								FMI				CM	OC										
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	1	0	0	0	0	0	1	1	1

DTC Format Version 2:

DTC (SPN=1208)																
Byte3								Byte4								Byte5
8 least significant bits of 16 most significant bits of SPN								8 most significant bits of 16 most significant bits of SPN								3 most significant bits of SPN and the FMI

(bit 8 most significant)								(bit 8 most significant)								(bit8 SPN msb and bit5 FMI msb)															
SPN																FMI				CM		OC									
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0

DTC Format Version 3:

DTC (SPN=1208)																																
Byte3 8 least significant bits of SPN (bit 8 most significant)								Byte4 second byte of SPN (bit 8 most significant)								Byte5 3 most significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)								Byte6								
SPN																FMI				CM		OC										
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	
1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0	

DTC Format Version 4:

DTC (SPN=1208)																																
Byte3 8 least significant bits of SPN (bit 8 most significant)								Byte4 second byte of SPN (bit 8 most significant)								Byte5 3 most significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)								Byte6								
SPN																FMI				CM		OC										
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	
1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0	

Byte7=0xff

Byte8=0xff

PGN 65226 DM1 - When there is two DTCs

Transmission Repetition Rate : 1s

Data Length : 14

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 202

Default Priority : 6

Parameter Group Number : 65226 (0xFECA)

SPN 1208 is generated

SPN 1208 = 0x4B8 = 000 0000100 10111000 (19 bits)

FMI 3 = 3 = 00011 (5 bits)

OC 10 = 0xA = 0001010 (7 bits)

SPN 656 is generated

SPN 656 =0x290=000 0000 0010 1001 0000 (19 bits)

FMI 3 = 3 = 00011 (5 bits)

OC 2 = 0x2 = 0000010 (7 bits)

Byte 1

bits 8-7 = 01 (MIL LED on)

bits 6-5 = 00

bits 4-3 = 00

bits 2-1 = 11

Byte 2

bits 8-7 = 11 (flashing not yet implemented)

bits 6-5 = 11

bits 4-3 = 11

bits 2-1 = 11

DTC Format Version 1:

DTC (SPN=1208)																							
Byte3 8 most significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte4 8 least significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte5 3 least significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)				Byte6			
SPN								FMI								CM		OC					
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	1	0	0	0	0	0	0	1	1

DTC Format Version 2:

DTC (SPN=1208)																							
Byte3 8 least significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte4 8 most significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte5 3 least significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)				Byte6			
SPN								FMI								CM		OC					
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1

DTC Format Version 3:

DTC (SPN=1208)																							
Byte3 8 least significant bits of SPN								Byte4 second byte of SPN								Byte5 3 most significant bits of				Byte6			

(bit 8 most significant)								(bit 8 most significant)								SPN and the FMI (bit8 SPN msb and bit5 FMI msb)															
								SPN								FMI				CM		OC									
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
1	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0

DTC Format Version 4:

DTC (SPN=1208)																															
Byte3 8 least significant bits of SPN (bit 8 most significant)								Byte4 second byte of SPN (bit 8 most significant)								Byte5 3 most significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)								Byte6							
								SPN								FMI				CM		OC									
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
1	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0

DTC Format Version 1:

DTC (SPN=656)																															
Byte7 8 most significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte8 8 least significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte9 3 least significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)								Byte10							
								SPN								FMI				CM		OC									
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0

DTC Format Version 2:

DTC (SPN=656)																																
Byte7 8 least significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte8 8 most significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte9 3 least significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)								Byte10								
								SPN								FMI				CM		OC										
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	
0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0

DTC Format Version 3:

DTC (SPN=656)																																
Byte7 8 least significant bits of SPN (bit 8 most significant)								Byte8 second byte of SPN (bit 8 most significant)								Byte9 3 most significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)								Byte10								
								SPN								FMI				CM		OC										
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	
1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1	0

DTC Format Version 4:

DTC (SPN=656)																																	
Byte7 8 least significant bits of SPN (bit 8 most significant)								Byte8 second byte of SPN (bit 8 most significant)								Byte9 3 most significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)								Byte10									
SPN																FMI								CM		OC							
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1		
1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0		

Byte11=0xff

Byte12=0xff

Byte13=0xff

Byte14=0xff

PGN 65226 DM1 - When there is three DTCs

Transmission Repetition Rate : 1s

Data Length : 14

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 202

Default Priority : 6

Parameter Group Number : 65226 (0xFECA)

SPN 1208 is generated

SPN 1208 = 0x4B8 = 000 0000100 10111000 (19 bits)

FMI 3 = 3 = 00011 (5 bits)

OC 10 = 0xA = 0001010 (7 bits)

SPN 656 is generated

SPN 656 = 0x290 = 000 0000 0010 1001 0000 (19 bits)

FMI 3 = 3 = 00011 (5 bits)

OC 2 = 0x2 = 0000010 (7 bits)

SPN 108 is generated

SPN 108 = 0x6c = 000 0000 0000 0110 1100 (19 bits)

FMI 11 = 0xb = 01011 (5 bits)

OC 5 = 0x5 = 0000101 (7 bits)

Byte 1

bits 8-7 = 01 (MIL LED on)

bits 6-5 = 00

bits 4-3 = 00

bits 2-1 = 11

Byte 2

bits 8-7 = 11 (flashing not yet implemented)

bits 6-5 = 11

bits 4-3 = 11

bits 2-1 = 11

DTC Format Version 1:

DTC (SPN=1208)																															
Byte3 8 most significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte4 8 least significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte5 3 least significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)								Byte6							
SPN																FMI								CM				OC			
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
0	0	0	0	0	0	0	0	1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0

DTC Format Version 2:

DTC (SPN=1208)																															
Byte3 8 least significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte4 8 most significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte5 3 least significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)								Byte6							
SPN																FMI								CM				OC			
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
1	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0

DTC Format Version 3:

DTC (SPN=1208)																															
Byte3 8 least significant bits of SPN (bit 8 most significant)								Byte4 second byte of SPN (bit 8 most significant)								Byte5 3 most significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)								Byte6							
SPN																FMI								CM				OC			
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
1	0	1	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1	0	0	0	1	0

DTC Format Version 4:

DTC (SPN=1208)																															
------------------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Byte3 8 least significant bits of SPN (bit 8 most significant)	Byte4 second byte of SPN (bit 8 most significant)	Byte5 3 most significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)	Byte6
SPN			
8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	8 7 6 5 4 3 2 1	CM
1 0 1 1 1 0 0 0	0 0 0 0 0 0 1 0 0	0 0 0 0 0 0 1 1	OC

DTC Format Version 1:

DTC (SPN=656)																															
Byte7								Byte8								Byte9								Byte10							
8 most significant bits of 16 most significant bits of SPN (bit 8 most significant)								8 least significant bits of 16 most significant bits of SPN (bit 8 most significant)								3 least significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)															
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	0

DTC Format Version 2:

DTC (SPN=656)																															
Byte7								Byte8								Byte9								Byte10							
8 least significant bits of 16 most significant bits of SPN (bit 8 most significant)								8 most significant bits of 16 most significant bits of SPN (bit 8 most significant)								3 least significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)															
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	0

DTC Format Version 3:

DTC (SPN=656)																							
Byte7 8 least significant bits of SPN (bit 8 most significant)								Byte8 second byte of SPN (bit 8 most significant)					Byte9 3 most significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)						Byte10				
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1
1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	1	0

DTC Format Version 4:

DTC (SPN=656)																			
Byte7 8 least significant bits of SPN (bit 8 most significant)					Byte8 second byte of SPN (bit 8 most significant)					Byte9 3 most significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)					Byte10				
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5
1	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1

DTC Format Version 1:

DTC (SPN=656)																									
Byte11 8 most significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte12 8 least significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte13 3 least significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)				Byte14					
SPN																FMI				CM		OC			
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1		
0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	1	0	1	1	0	1	0

DTC Format Version 2:

DTC (SPN=656)																									
Byte11 8 least significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte12 8 most significant bits of 16 most significant bits of SPN (bit 8 most significant)								Byte13 3 least significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)				Byte14					
SPN																FMI				CM		OC			
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1		
0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0

DTC Format Version 3:

DTC (SPN=656)																									
Byte11 8 least significant bits of SPN (bit 8 most significant)								Byte12 second byte of SPN (bit 8 most significant)								Byte13 3 most significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)				Byte14					
SPN																FMI				CM		OC			
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1		
0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0

DTC Format Version 4:

DTC (SPN=656)																									
Byte11 8 least significant bits of SPN (bit 8 most significant)								Byte12 second byte of SPN (bit 8 most significant)								Byte13 3 most significant bits of SPN and the FMI (bit8 SPN msb and bit5 FMI msb)				Byte14					
SPN																FMI				CM		OC			
8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1	8	7	6	5	4	3	2	1		
0	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0

PGN 65248 Vehicle Distance

Transmission Repetition Rate : 100ms

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 224

Default Priority : 6

Parameter Group Number : 65248 (0x00FEE0)

Start Position	Length	Parameter Name	SPN
1-4	4 bytes	Trip Distance	244
5-8	4 bytes	Total Vehicle Distance	245

With ECU simulated parameter value

Trip Distance: 0 to 526,385,151.9 km 0.125 km/bit. We give the value according to tachograph vehicle speed and actual running time.

Total Vehicle Distance: 0 to 526,385,151.9 km 0.125 km/bit. We give the initial value 100,000km when Simulator power on, and then we will accumulate the distance according to tachograph vehicle speed and actual running time.

PGN 65276 Dash Display

Transmission Repetition Rate : 1s

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 252

Default Priority : 6

Parameter Group Number : 65276 (0x00FEFC)

Start Position	Length	Parameter Name	SPN
1	1 byte	Washer Fluid Level	80
2	1 byte	Fuel Level 1	96
3	1 byte	Engine Fuel Filter Differential Pressure	95
4	1 byte	Engine Oil Filter Differential Pressure	99

Start Position	Length	Parameter Name	SPN
5-6	2 bytes	Cargo Ambient Temperature	169
7	1 byte	Fuel Level 2	38

With ECU simulated parameter value

Washer Fluid Level: 0 to 100 % 0.4 %/bit.

Fuel Level 1: 0 to 100 % 0.4 %/bit.

Fuel Level 2: 0 to 100 % 0.4 %/bit.

Another positions are all 0xFF (not yet implemented)

PGN 59392 Acknowledgement

Transmission Repetition Rate : on request

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 232

PDU Specific : Destination address, or Global =255

Default Priority : 6

Parameter Group Number : 59392 (0xE800)

Byte1 =0x00 denotes positive acknowledgement (ACK), but 0x01 denotes negative acknowledgement (NACK)

Byte2 = Group Function Value (if applicable) , the IC sets it to 0xff

Byte3 to Byte5 reserved to CATARC assignment, the IC sets them to 0xff

Byte6 : Parameter Group Number of requested information (8 LSB of parameter group number, bit 8 most significant)

Byte7: Parameter Group Number of requested information (2nd byte of parameter group number, bit 8 most significant)

Byte8: Parameter Group Number of requested information (8 MSBs of parameter group number, bit 8 most significant)

at request for not implemented PGN, the IC sends a NACK setting the control byte to 1.
When a request of DM11 is received by the IC, the IC clears all the DTCs and sends a ACK setting control byte to 0 and sends DM11.

PGN 60416 Transport Protocol - Connection Management (TP.CM)

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 236

PDU Specific : Destination address, or Global =255

Default Priority : 7

Parameter Group Number : 60416 (0xEC00)

Byte1 is control byte.

Byte1=16=0x10 denotes TP.CM_RTS

Byte1=17=0x11 denotes TP.CM_CTS

Byte1=19=0x13 denotes TP.CM_EndOfMsgAck

Byte1=255=0xff denotes TP.CM_abort

Byte1=32 =0x20 denotes TP.CM_BAM

Other bytes' meaning depends on control byte

When control byte is TP.CM_RTS,

byte3 and byte2 are message size (Number of bytes)

byte4 is total number of packages

byte5 is reserved to SAE (should be filled with 0xFF)

Byte6 : Parameter Group Number of multi-packet message (8 LSB of parameter group number, bit 8 most significant)

Byte7: Parameter Group Number of multi-packet message (2nd byte of parameter group number, bit 8 most significant)

Byte8: Parameter Group Number of multi-packet message (8 MSB of parameter group number, bit 8 most significant)

When control byte is TP.CM_CTS,

byte2: number of packages, which is a maximum quantity the other side can transmitted

after receiving this CTS.

byte3: Sequence Number which will be transmitted next time.

byte4 and byte5 are reserved to SAE (should be filled with 0xFF)

Byte6: Parameter Group Number of multi-packet message (8 LSB of parameter group number, bit 8 most significant)

Byte7: Parameter Group Number of multi-packet message (2nd byte of parameter group number, bit 8 most significant)

Byte8: Parameter Group Number of multi-packet message (8 MSB of parameter group number, bit 8 most significant)

When control byte is TP.CM_EndOfMsgAck,

byte3 and byte2 are message size (Number of bytes)

byte4 is total number of packages

byte5 is reserved to SAE (should be filled with 0xFF)

Byte6: Parameter Group Number of multi-packet message (8 LSB of parameter group number, bit 8 most significant)

Byte7: Parameter Group Number of multi-packet message (2nd byte of parameter group number, bit 8 most significant)

Byte8: Parameter Group Number of multi-packet message (8 MSB of parameter group number, bit 8 most significant)

When control byte is TP.CM_abort,

byte2 to byte5 are reserved to SAE (should be filled with 0xFF)

Byte6: Parameter Group Number of multi-packet message (8 LSB of parameter group number, bit 8 most significant)

Byte7: Parameter Group Number of multi-packet message (2nd byte of parameter group number, bit 8 most significant)

Byte8: Parameter Group Number of multi-packet message (8 MSB of parameter group number, bit 8 most significant)

When control byte is TP.CM_BAM,

byte3 and byte2 are message size (Number of bytes)

byte4 is total number of packages

byte5 is reserved to SAE (should be filled with 0xFF)

Byte6: Parameter Group Number of multi-packet message (8 LSB of parameter group number, bit 8 most significant)

Byte7: Parameter Group Number of multi-packet message (2nd byte of parameter group number, bit 8 most significant)

Byte8: Parameter Group Number of multi-packet message (8 MSB of parameter group number, bit 8 most

significant)

PGN 60160 Transport Protocol - Data Transfer (TP.DT)

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 235

PDU Specific : Destination address, or Global =255

Default Priority : 7

Parameter Group Number : 60160 (0xEB00)

Byte1: Sequence Number (1 to 255)

Byte2 to Byte8 are Data

PGN 60928 Address claimed or Cannot claim source address

Data Length : 8

Reserve Bit : 0

Data Page : 0

PDU Format : 238

PDU Specific : 255

Default Priority : 3

Parameter Group Number : 60928 (0xEE00)

when source address is 254, it becomes "Cannot claim source address"

when source address is 0 to 253, it becomes "Address claimed"

Byte1 to Byte8 are the 8 bytes of device name. Byte1 is LSB, Byte8 is MSB.

PGN 59904 - PGN Requests

Data Length : 3

Reserve Bit : 0

Data Page : 0

PDU Format : 234

PDU Specific : Destination address, or Global =255

Default Priority : 6

Parameter Group Number : 59904 (0xEA00)

Byte1 : Parameter Group Number of requested information (8 LSB of parameter group number, bit 8 most significant)

Byte2: Parameter Group Number of requested information (2nd byte of parameter group number, bit 8 most significant)

Byte3: Parameter Group Number of requested information (8 MSBs of parameter group number, bit 8 most significant)

PGN 65235 - Diagnostic Data Clear/Reset for Active DTCs (DM11)

All of the diagnostic information pertaining to the active diagnostic trouble codes will be erased.

This IC clears the DTCs and sends a Positive Acknowledgement to this request message.

Transmission Repetition Rate : On request using PGN 59904

Data Length : 0

Reserve Bit : 0

Data Page : 0

PDU Format : 254

PDU Specific : 211

Default Priority : 6

Parameter Group Number : 65235 (0xFED3)

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