DATA TRANSFER PROTOCOL

DUT-E CAN Fuel Level Sensor (model code 116)

Version 1.4

TECHNOTON
ADVANCED VEHICLE TELEMATICS

1 Purpose

The protocol is used for data transfer between DUT-E CAN digital fuel level sensors (model code 116), developed by JV Technoton, Minsk, Belarus.

2 Description

Data Link Layer of the DUT-E CAN output protocol meets the requirements of SAE j1939/21 standard and sets the data transfer procedure via CAN bus according to the specifications of CAN 2.0B interface.

DUT-E CAN messages are transferred at 250 Kbit/s and consist of 6 fields of an extended 29-bit CAN ID, that meets the requirements of CAN 2.0B interface, and of a data field (0-8 bytes) (see figure 1).

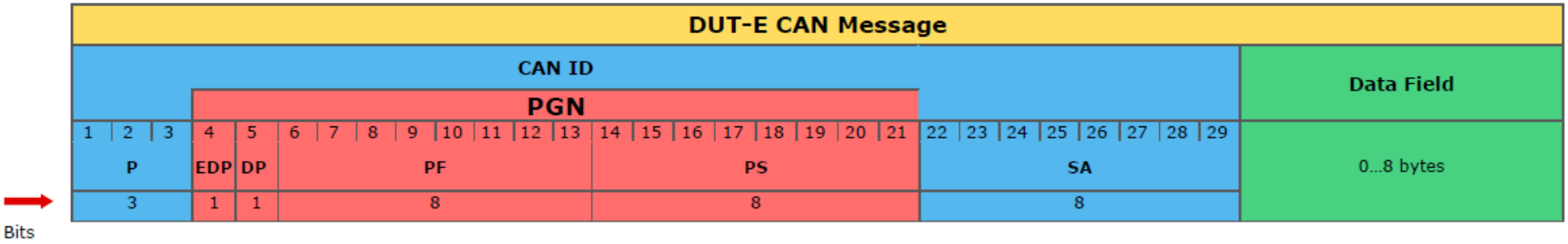

Figure 1 — DUT-E CAN message output according to j1939/21 protocol

The first 3 bits of the CAN ID are used for identifying the priority of the message (field **P**). With $P=000_2$ the message bears the highest priority, and with $P=111_2$ – the lowest priority.

The field **EDP** (1 bit) is reserved. For transferred messages EDP is always set to 0_2.

The field **DP** (1 bit) serves for selecting the data page from the whole PGN range (can possess the values 0_2 or 1_2).

PGN (Parameter Group Number) is a number of a group of parameters that defines the contents of its related DUT-E CAN message, in accordance with SAE j1939/21.

The totality of single-byte fields **PF** (sets PDU format) and **PS** (sets PDU specification) forms a PGN.

PDU (Protocol Data Unit) is a data transfer packet, in accordance with SAE j1939/21 protocol.

If the field PS takes a value from 0 to 239, then it contains a decimal identity address of the device receiving the **DA** (Destination Address) message, which designates as PDU1. The PDU1 format allows direct data transfer to the address recorded into the DA of the device-receptor of the message.

If the field PS takes a value from 240 to 255, then it has a large-format addressing, designated as PDU2. The PDU2 format can only be used for data transfer where no address of the DA device-receptor of the message was specified.

The last single-byte field **SA** (Source Address) contains a decimal identity address of the device-sender of the message. For DUT-E CAN, select the identity address from range 101…108.

Packet data transfer of up to 8 bytes inclusive is done in one message.

If you need to transfer more than 8 bytes of data, the packet is divided into several messages of up to 8 bytes. The maximum packet size for one PGN is 1785 bytes.

DUT-E CAN fuel level sensor transfers useful data either automatically (main mode), or by request.

DUT-E CAN configuration is done via K-Line interface (ISO 14230) using SK DUT-E service kit or other devices that support S6 bus service protocol.

The parameters, structure, and contents of DUT-E CAN messages are defined by the application level of Vehicle Application Layer protocol, according to SAE j1939/71. Refer to tables 1 and 2for this data.

Table 1 — The description of the messages of DUT-E CAN data transfer protocol

#	Message name	Message parameters								Message content			
		Broadcast interval	Data length	Extended data page (EDP)	Data page (DP)	PDU format (PF)	PDU specific (PS)	Default priority (P)	Parameter group number (PGN)	Initial position	Length	Valuable data	Suspect Parameter Number (SPN) SAE j1939
1	PGN 62982 "Fuel level and fuel volume in the tank"	1 s	8	0	0	246	6	6	62982 (0xF606)	1	2 bytes	Fuel level (0.1 mm)	521023
										3	2 bytes	Fuel volume in the tank (0.1 L)	521024
										5	2 bytes	Reserve	521025
										7	1 byte	Fuel temperature (step 1 °C, offset 40 °C) Example: 0 value stands for temperature of -40 °C	174
										8	1 byte	Reserve	524000
2	PGN 62995 "Unit passport"	On request	45	0	0	246	19	6	62995 (0xF613)	1	16 bytes	Serial number DUT-E CAN	521120
										17	8 bytes	Firmware version DUT-E CAN	521121
										25	8 bytes	Hardware version DUT-E CAN	521123
										33	8 bytes	Settings version DUT-E CAN	521124
										41	4 bytes	Production date DUT-E CAN	521125
										44	1 byte	DUT-E CAN address in the CAN bus	521188
3	PGN 63008 "Unit state"	1000 ms	8	0	0	246	32	6	63008 (0xF620)	1.1	2 bytes	Ignition Key State	521049
										1.3	2 bytes	Cross-Axle Blocking Status	521054
										1.5	2 bytes	PTO Switch Status	521059
										1.7	2 bytes	Events Status	521136
										2.1	2 bytes	Active Faults Presence Status	521137
										2.3	2 bytes	Passive Faults Presence Status	521138
										2.5	2 bytes	Unit Power Status	521129
										2.7	4 bytes	Engine Mode by Fuel Rate	521181
										3.3	4 bytes	Movement mode based on vehicle speed	521180
										3.7	2 bytes	Vehicle Fuel Saving Mode Status	521139
										4.1	4 bytes	Axle Weight Mode	521182
										4.7	2 bytes	GPS/GLONASS Receiver Status	521134
										5.1	2 bytes	GPS/GLONASS Antenna Status	521135
										5.3	2 bytes	Modem Power Status	521130
										5.5	2 bytes	Modem Registration Status	521131
										8	1 byte	Reserved_8	524000

#	Message name	Message parameters								Message content			
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4	PGN 65226 "Active Diagnostic Trouble Codes (DTC)"	1 s	Variable	-	0	254	202	6	65226 (0XFECA)	1	7-8 bits	Reserve	987
											5-6 bits		624
											3-4 bits		623
											1-2 bits		1213
										2	7-8 bits		3041
											5-6 bits		3040
											3-4 bits		3039
											1-2 bits		3038
										3-4	2 bytes	SPN 523000 (see table 2) 16 high valuable bits	1214
										5	6-8 bits	SPN 523000 (see table 2) 3 low bits	
											1-5 bits	FMI malfunction codes (see table 2)	1215
										6	8 bit	Reserve. Value equals 0	1706
											1-7 bits	Counter. Value is 127 if counter is used. Value varies from 0 to 126 if counter is not used	1216
5	PGN 65276 "Dash display"	1 s	8	0	0	254	252	6	65276 (0xFEFC)	1	1 byte	Reserve	80
										2	1 byte	Fuel level	96
										3	1 byte	Reserve	95
										4	1 byte		99
										5-6	2 bytes		169
										7-8	2 bytes		-
6	PGN 65279 "Operator indicators"	10000 ms	2	6	0	254	255	6	65279 (0xFEFF)	1.1	2 bits	Water in Fuel Indicator (1 – yes; 0 – no)	97
										1.3	2 bits	Operator Shift Prompt	5675
										2.1	3 bits	Driver Warning System Indicator Status	5825
										2.4	3 bits	Emission Control System Operator Inducement Severity	5826

The bytes are not used.

DUT-E CAN data transfer protocol is using malfunctions codes (FMI) according to table 2.

Table 2 — DUT-E CAN malfunctions codes (FMI)

Parameter number (SPN)	Malfunction codes (FMI)	Description	Possible solution
523000	13	Sensor is not calibrated (the difference between calibration frequencies of signal generator with minimum and maximum fuel levels is less than 100 Hz)	Check if the measuring probe actual size value is inserted correctly and (or) recalibrate the sensor*
		Sensor is not calibrated for maximum fuel level	
523000	4	Signal generator is not functioning. Possible short circuit in measuring probe tubes	Wash the measuring probe tubes with clean fuel, clean fuel tank of mud and water.
523000	12	Calibration values for minimum and maximum fuel levels in the sensor differ less than 5 Hz	Check if the measuring probe actual size value is inserted correctly and (or) recalibrate the sensor*
523000	0	Current frequency of the signal generator is more than fixed one when calibrating for minimum (the difference is more than 100 Hz)	Check if the measuring probe actual size value is inserted correctly and (or) recalibrate the sensor*
* Fuel tank calibration table should be recompiled and recorded all over again into sensor internal memory.			