J1939 Signal Generator
(SWI-CAN-SG-J1939-202003)

User Manual v1.0

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Noted

- **This document is intended for the 「J1939 Signal Generator User Manual」. Some of the information, such as the engineering specification or BOM or firmware source codes, described in this document should not appear in any of the 「 J1939 Signal Generator User Manual」.**
- **This copyright of this document belongs to the SwiSys. Any persons who view/edit this document should be liable to the loyalty to the team group members.**

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1. Introduction

J1939 signal generator is a high-level communications protocol, which operates on a Controller Area Network (CAN) Bus. J1939 simulator specifies exactly how information (e.g. engine RPM) is exchanged between electronic control units (ECUs) on a vehicle. It defines the data's priority, size, scaling, and offset. The standard goes on to define many other aspects, including message timeouts, how large messages are fragmented and reassembled, the network speed, the physical layer, and how applications acquire network addresses. J1939 simulator compliant vehicle signals, this product is suitable for connecting PCs, smart phones, and tablets.

1.1. Panel & Connector
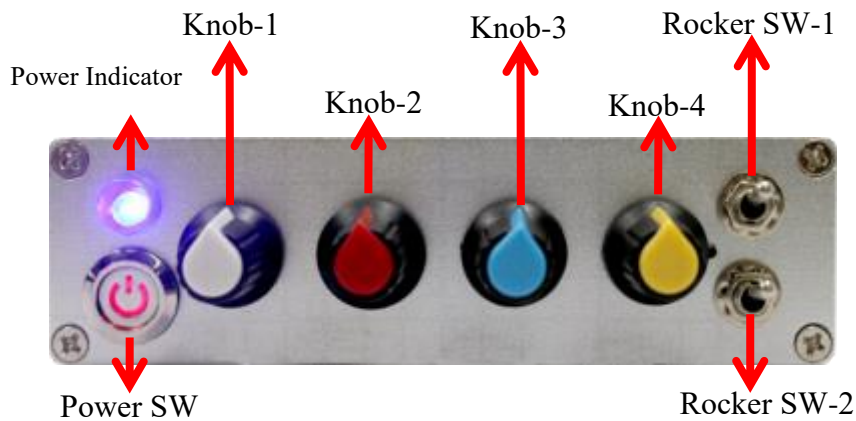
Figure 1: Front panel of J1939 Simulator [SWI-CAN-SG-J1939-202003]

Table 1: Function of Switch & Knobs

Switch/Knob	Function
Power Indicator	Indicate the power status (5V)
Power SW	For switch on/off the power
Knob-1	Emulate the signal-1 (Accelerator Pedal Position 1 or Engine Throttle Valve 1 Position 1)
Knob-2	Emulate the signal-2 (Engine Speed or Engine Throttle Engine Intake Manifold #1 Pressure)
Knob-3	Emulate the signal-3 (Brake Pedal Position or Engine Coolant Temperature)
Knob-4	Emulate the signal-4 (Tachograph vehicle speed or Engine Fuel Temperature 1)
Rocker SW-1	Used to active/generate DTC
Rocker SW-2	Used to configure the emulated signal sets
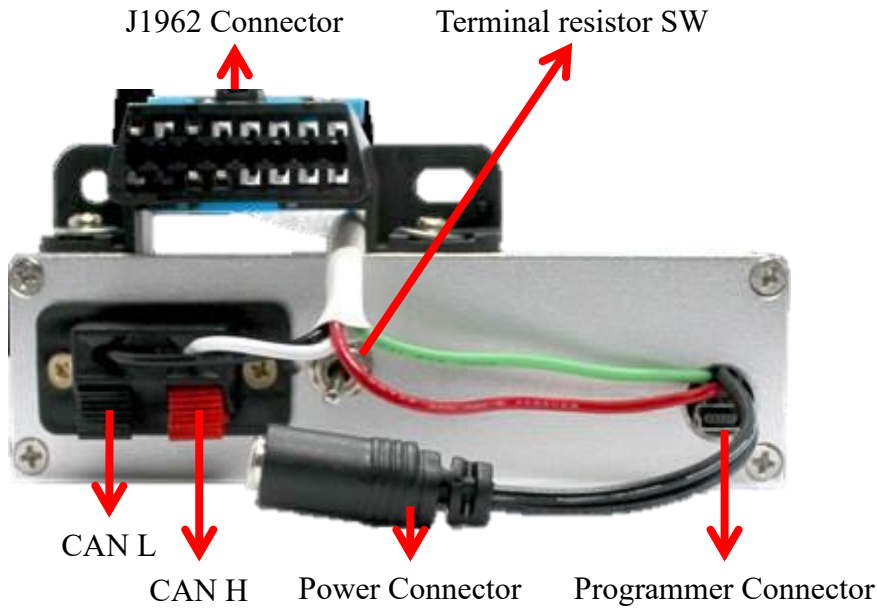
Figure 2: Back panel of J1939 Simulator [SWI-CAN-SG-J1939-202003]

Table 2: Function of Switch & Connector

Switch/Connector	Function
J1962 Connector	SAE J1962 Connector.
Terminal resistor SW	Down (↓): CAN Bus without 120 Ω Terminal Resistor UP (↑): CAN Bus with 120 Ω Terminal Resistor
Power Connector	DC2.1 in 7V ~ 30V power supply, it is recommended to use more than 12V / 1A.
Programmer Connector	For programming only. USB DC Port (5V)

Figure 3: Front panel of J1962 Connector

Table 3: J1962 Connector Pinout

Pin	Description	Pin	Description
1	Not connected	9	Not connected
2	Not connected	10	Not connected
3	Not connected	11	Not connected
4	Signal ground	12	Not connected
5	Signal ground	13	Not connected
6	CAN high（J1939）	14	CAN low（J1939）
7	Not connected	15	Not connected
8	Not connected	16	DC 2.1 in Voltage

1.2. Product Specification

- Power supply: +7VDC ~ +30VDC

- Working current: < 30mA

- CAN BUS Transfers distance: 0~10 km

- Working temperature: 0℃ ~ 705℃

- Compact Size: 113*44*120*mm

1.3. Features

- J1939 signal generator is a standalone without PC

- Compatible with J1939 Standard for heavy duty vehicle

- CAN 2.0B 29 bit with 250 kB baud rate

- Support J1979 complaints Diagnostic Message (DMs)

- Support more than 8 SPN data

- Upgradeable firmware to simulate different PGN

- Simulates Truck and CAR ECUs

- ECU source address is 0x00

1.4. Available PGN/SPN/DTC Data

- **PGN/SPN Data**

The [SWI-CAN-SG-J1939-202003] J1939 simulator can be used to generate two sets of live data based on the configuration of the Rocker SW-2 located on the right hand side on the front panel. Refer to the Table 1, the first emulated signal set-1 covers the following signals:

1. Accelerator Pedal Position（油門踏板）
2. Engine Speed（引擎轉速）
3. Engine Coolant Temperature（引擎冷卻水溫度）
4. Tachograph vehicle speed（車速）

The second emulated signal set-2 covers the following signals:

1. Engine Throttle Valve 1 Position（引擎節氣門位置）
2. Engine Intake Manifold Pressure（引擎進氣歧管壓力）
3. Engine Coolant Temperature（引擎冷卻水溫度）
4. Engine Fuel Temperature（引擎燃油溫度）

Table 4: Setting for Emulated Signal Set 1 and Set 2 by Rocker SW-2

Rocker SW-2	Knob	Emulated Signals	Note
Down (↓)	Knob-1	Accelerator Pedal Position 1	Signal set-1
	Knob-2	Engine Speed	
	Knob-3	Brake Pedal Position	
	Knob-4	Tachograph vehicle speed	
UP (↑)	Knob-1	Engine Throttle Valve 1 Position 1	Signal set-2
	Knob-2	Engine Intake Manifold #1 Pressure	
	Knob-3	Engine Coolant Temperature	
	Knob-4	Engine Fuel Temperature 1	

● **Diagnostic Trouble Code (DTC)**

Table 5: Setting DTC By Rocker SW-1

Rocker SW-1	DTC Status
Down (↓)	-
UP (↑)	Active/Generating DTC

2. Emulated Signal vs. SPN/PGN value

● SPN (Suspected Parameter Number)

● PGN (Parameter Group Number)

1.1. (Signal Set-1, Knob-1) Accelerator Pedal Position 1

The data value of this emulated signal is located at the SPN=91 in 『PGN 61443 Electronic Engine Controller 2 - EEC2』 message frame as shown in the following tables.

Table 6: Basic information of Electronic Engine Controller 2 - EEC2 (PGN 61443)

Transmission Rate : 50ms

Data Length : 8

Extended Data Page : 0

Data Page : 0

PDU Format : 240

PDU Specific : 3

Default Priority : 3

Parameter Group Number : 61443(0xF003)

Parameter Name	SPN	Position (Byte)	Data Length (Byte)	Data Range
Accelerator Pedal Position 1	91	2	1	0x00 .. 0xFF

Note: The data in the other bytes are flushed as 0xFF.

Table 7: CAN Data Field value for SPN=91

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
FF	(SPN=91)	FF	FF	FF	FF	FF	FF

2.1. (Signal Set-1, Knob-2) Engine Speed

The data value of this emulated signal is located at SPN=190 in the 『PGN 61444 Electronic Engine Controller 1 - EEC1』 message frame as shown in the following tables.

Table 8: Basic information of Electronic Engine Controller 1 - EEC1 (PGN 61444)

Transmission Rate   : 100ms
Data Length   : 8
Extended Data Page   : 0
Data Page   : 0
PDU Format   : 240
PDU Specific   : 4
Default Priority   : 3
Parameter Group Number   : 61444(0xF004)

Parameter Name	SPN	Position (Byte)	Data Length (Byte)	Data Range
Engine Speed	190	4-5	2	0x0000 .. 0xFFFF

Note: The data in the other bytes are flushed as 0xFF.

Table 9: CAN Data Field value for SPN=190

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
FF	FF	FF	*L*	*H*	FF	FF	FF
			(SPN=190)				

2.2. (Signal Set-1, Knob-3) Brake Pedal Position

The data value of this emulated signal is located at SPN=521 in the 『PGN 61441 Electronic Brake Controller 1 - EBC1』 message frame as shown in the following tables.

Table 10: Basic information of Electronic Brake Controller 1 - EBC1 (PGN 61441)

Transmission Rate   : 100ms
Data Length   : 8
Extended Data Page   : 0
Data Page   : 0
PDU Format   : 240
PDU Specific   : 1
Default Priority   : 3
Parameter Group Number   : 61441(0xF001)

Parameter Name	SPN	Position (Byte)	Data Length (Byte)	Data Range
Brake Pedal Position	521	2	1	0x00.. 0xFF

Note: The data in the other bytes are flushed as 0xFF.

Table 11: CAN Data Field value for SPN=521

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
FF		FF	FF	FF	FF	FF	FF
	(SPN=521)						

2.3. (Signal Set-1, Knob-4) Tachograph vehicle speed

The data value of this emulated signal is located at the SPN=1624 in the 『PGN 65132 Tachograph - TCO1 』 message frame as shown in the following tables.

Table 12: Basic information of Tachograph - TCO1 (PGN 65132)

Transmission Rate	: 50ms
Data Length	: 8
Extended Data Page	: 0
Data Page	: 0
PDU Format	: 254
PDU Specific	: 109
Default Priority	: 3
Parameter Group Number	: 65132(0xFE6C)

Parameter Name	SPN	Position (Byte)	Data Length (Byte)	Data Range
Tachograph vehicle speed	1624	7-8	2	0x0000 .. 0xFFFF

Note: The data in the other bytes are flushed as 0xFF.

Table 13: CAN Data Field value for SPN=1624

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
FF	FF	FF	FF	FF	FF	*L*	*H*
						(SPN 1624)	

2.4. (Signal Set-2, Knob-1) Engine Throttle Valve 1 Position 1

The data value of this emulated signal is located at the SPN=51 in the 『PGN 65266 Fuel Economy (Liquid) - LFE1 』 message frame as shown in the following tables.

Table 14: Basic information of Fuel Economy (Liquid) - LFE1 (PGN 65266)

Transmission Rate	: 100ms
Data Length	: 8
Extended Data Page	: 0
Data Page	: 0
PDU Format	: 254
PDU Specific	: 242
Default Priority	: 3
Parameter Group Number	: 65266(0xFEF2)

Parameter Name	SPN	Position (Byte)	Data Length (Byte)	Data Range
Engine Throttle Valve 1 Position 1	51	7	1	0x00 .. 0xFF

Note: The data in the other bytes are flushed as 0xFF.

Table 15: CAN Data Field value for SPN=51

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
FF	FF	FF	FF	FF	FF	(SPN 51)	FF

2.5. (Signal Set-2, Knob-2) Engine Intake Manifold #1 Pressure

The data value of this emulated signal is located at the SPN=102 in the 『PGN 65270 Intake/Exhaust Conditions 1 - IC1』 message frame as shown in the following tables.

Table 16: Basic information of Intake/Exhaust Conditions 1 - IC1 (PGN 65270)

Transmission Rate	: 500ms
Data Length	: 8
Extended Data Page	: 0
Data Page	: 0
PDU Format	: 254
PDU Specific	: 246
Default Priority	: 6
Parameter Group Number	: 65270(0xFEF6)

Parameter Name	SPN	Position (Byte)	Data Length (Byte)	Data Range
Accelerator Pedal Position 1	102	2	1	0x00 .. 0xFF

Note: The data in the other bytes are flushed as 0xFF.

Table 17: CAN Data Field value for SPN=102

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
FF	(SPN 102)	FF	FF	FF	FF	FF	FF

2.6. (Signal Set-2, Knob-3) Engine Coolant Temperature & (Signal Set-2, Knob-4) Engine Fuel Temperature 1

The data value of these two emulated signals are located in the 『PGN 65262 Engine Temperature 1 – ET1』 message frame as shown in the following tables.

Table 18: Basic information of Engine Temperature 1 – ET1 (PGN 65262)

Transmission Rate : 1000ms
Data Length : 8
Extended Data Page : 0
Data Page : 0
PDU Format : 254
PDU Specific : 238
Default Priority : 6
Parameter Group Number : 65262(0xFEEE)

Parameter Name	SPN	Position (Byte)	Data Length (Byte)	Data Range
Engine Coolant Temperature	110	1	1	0x00 .. 0xFF

Parameter Name	SPN	Position (Byte)	Data Length (Byte)	Data Range
Engine Coolant Temperature	174	2	1	0x00 .. 0xFF

Table 19: CAN Data Field value for SPN=110 & SPN=174

Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
		0xFF	0xFF	0xFF	0xFF	0xFF	0xFF
(SPN=110)	(SPN=174)						

3. Diagnostic Message (DM)

Based on the definition of SAE J1939-73 (Application Layer - Diagnostics) :2006, the definition of the DM is quoted as follows.

Diagnostic messages (DMs) provide the utility needed when the vehicle is being repaired. Diagnostic messages are also used during vehicle operation by the networked electronic control modules to allow them to **report diagnostic information** and self-compensate as appropriate, based on information received. Diagnostic messages include services such as periodically broadcasting active diagnostic trouble codes, identifying operator diagnostic lamp status, reading or clearing diagnostic trouble codes, reading or writing control module memory, providing a security function, stopping/starting message broadcasts, reporting diagnostic readiness, monitoring engine parametric data, etc.

Note that the conversion method (CM) is set to 0 in this product. That is the DTC format is configured as version 4.

3.1.   Active Diagnostic Trouble Code(DTC) - DM1

DM1 contains the lamp status and a list of diagnostic codes and occurrence counts for currently active diagnostic trouble codes. This is all DTCs including those that are emissions related. The currently defined lamps (Malfunction Indicator Lamp, Red Stop Lamp, Amber Warning Lamp, and Protect Lamp) are associated with DTCs. If the transmitting electronic component does not have active DTCs, then the lamp status of that component will indicate that the lamps should be off. However, the component controlling the actual lamp illumination must consider the status of all components that use these lamps before changing the state of the lamps.

Following are the overview and description of various messages in DM1

According to the SAE J1939-73 (Application Layer - Diagnostics):2006, the definition of the DM1 is quoted as follows.

The information communicated is limited to the currently active diagnostic trouble codes (DTCs). The active diagnostic codes are preceded by the diagnostic lamp status. Together they convey the diagnostic condition of the transmitting electronic component to other components on the network. Occurrence counts for currently active diagnostic trouble codes may be provided as described in paragraph 5.7.1.12. DM1 should contain all active DTCs including the emissions related DTCs. The defined lamps (Malfunction Indicator Lamp, Red Stop Lamp, Amber Warning Lamp, and Protect Lamp) comprise a component's lamp status. Typically, they are associated with DTCs provided in DM1. If the transmitting electronic component does not have active DTCs, then the lamp status of that component will indicate that the lamps should be off. However, the component controlling the actual lamp illumination must consider the status of all components that provide these lamps before changing the display to the operator. The lamp information (Malfunction Indicator Lamp, Red Stop Lamp, Amber Warning Lamp, and Protect Lamp) should reflect the present state of the transmitting electronic component. DM1 shall not convey temporary signals to provide for lamp test illumination or DTC flash out. When there are multiple DTCs with different lamp command (for example SPN1213 is for the MIL) and lamp flash (for example SPN3038 is for the flash MIL) requirements, then the DTC with the MIL and fast flash takes priority over, MIL with slow flash, which takes priority over the Short MIL, which takes priority over the class C.

The part of the DM1is a reference to Datasheet（鏈結）of Scan tool（i.e we are with J1939 Simulator）

DM1 transmission

DM1 contains the lamp status and a list of diagnostic codes and occurrence counts for currently active diagnostic trouble codes. This is all DTCs including those that are emissions related. The currently defined lamps (Malfunction Indicator Lamp, Red Stop Lamp, Amber Warning Lamp, and Protect Lamp) are associated with DTCs. If the transmitting electronic component does not have active DTCs, then the lamp status from that component will indicate that the lamps should be off. However, the component controlling the actual lamp illumination must consider the status from all components that use these lamps before changing the state of the lamps.

Following are the overview and description of various messages in DM1

DM1 message overview

Single packet
(heart beat)
0x18 FE CA 00 1 Sec Transmitted as heart beat only if there are no active faults.

Single packet
(one defect is active)
0x18 FE CA 00 1 Sec Transmitted if there is only one active fault

原文為 Scantool 的 Datasheet P.12

3.1.1. DM1 message format

Table 20: Basic information of DM1 (PGN 65226)

Transmission Rate	1000ms
Data Length	Variable
Extended Data Page	0
Data Page	0
PDU Format	254
PDU Specific	202
Default Priority	6
Parameter Group Number	65226(0xFECA)

Address: No.2, Aly. 26, Ln. 442, Kaiyuan Rd., North Dist., Tainan City 704, Taiwan (R.O.C.)
Tel: +886-6-200-6070   Fax: +886-6-275-9435   Website: http://swisystem.com/

Table 21: Data frame format of DM1 (PGN 65226)

Default Priority		6	
PDU Format		254	
PDU Specific		202	
PGN		65226	
Byte 1 (Lamp Status)	bits 8-7	Malfunction Indicator Lamp status (故障指示燈狀態) 又稱之為 MIL 燈	在 SPN 的號碼定義內，此區域為 SPN=1213
	bits 6-5	Red Stop Lamp status (紅色停止燈狀態) 又稱之為 RSL 燈	在 SPN 的號碼定義內，此區域為 SPN=623
	bits 4-3	Amber Warning Lamp status(琥珀色警告燈狀態) 又稱之為 AWL 燈	在 SPN 的號碼定義內，此區域為 SPN=624
	bits 2-1	Protect Lamp status (保護燈狀態) 又稱之為 Protect 燈	在 SPN 的號碼定義內，此區域為 SPN=987
Byte 2 (Reserved)	bits 8-7	Flash Malfunction Indicator Lamp	在 SPN 的號碼定義內,此區域為 SPN=3038
	bits 6-5	Flash Red Stop Lamp	在 SPN 的號碼定義內,此區域為 SPN=3039
	bits 4-3	Flash Amber Warning Lamp	在 SPN 的號碼定義內,此區域為 SPN=3040
	bits 2-1	Flash Protect Lamp	在 SPN 的號碼定義內,此區域為 SPN=3041
Byte 3 (SPN)	bits 8-1	SPN LSB	DTC
Byte 4 (SPN)	bits 8-1		
Byte 5 (SPN +FMI)	bits 8-6	msb is bit-8 在 SPN 的號碼定義內，此區域為 SPN=1214	
	bits 5-1	FMI。msb is bit-5 在 SPN 的號碼定義內，此區域為 SPN=1215	
Byte 6 (CM + OC)	bit 8	SPN Conversion Method (CM) 在 SPN 的號碼定義內，此區域為 SPN=1706	
	bit 7-1	Occurrence Count (OC) 在 SPN 的號碼定義內，此區域為 SPN=1216	

Possible Commanded Conditions		Required Lamp Output Operation			
Lamp SPNs: 1213; 623; 624; 987	Flash SPNs: 3038, 3039, 3040, 3041	MIL SPN 1213	RSL SPN 623	AWL SPN 624	Protect SPN 987
00	00	Off	Off	Off	Off
00	01	Off	Off	Off	Off
00	10	Off, class C not active	SAE reserved	SAE reserved	SAE reserved
00	11	Off	Off	Off	Off
01	00	On, slow flash	On, slow flash	On, slow flash	On, slow flash
01	01	On, fast flash	On, fast flash	On, fast flash	On, fast flash

Possible Commanded Conditions		Required Lamp Output Operation			
Lamp SPNs: 1213; 623; 624; 987	Flash SPNs: 3038, 3039, 3040, 3041	MIL SPN 1213	RSL SPN 623	AWL SPN 624	Protect SPN 987
01	10	Off, class C active	SAE reserved	SAE reserved	SAE reserved
01	11	On, don't flash	On, don't flash	On, don't flash	On, don't flash
10	00	Short MI not active	SAE reserved	SAE reserved	SAE reserved
10	01	Short MI active	SAE reserved	SAE reserved	SAE reserved
10	10	SAE reserved	SAE reserved	SAE reserved	SAE reserved
10	11	SAE reserved	SAE reserved	SAE reserved	SAE reserved
11	00	SAE reserved	SAE reserved	SAE reserved	SAE reserved
11	01	SAE reserved	SAE reserved	SAE reserved	SAE reserved
11	10	SAE reserved	SAE reserved	SAE reserved	SAE reserved
11	11	Don't Care	Don't Care	Don't Care	Don't Care

Figure 4: Lamp command and lamp flash dependency definition (Source: J1939-73 Table 5/Table 24)

3.1.2.   Single Fault (Single Frame) Transmission

3.1.2.1. CASE 1: No DTC is active

請確認，我們的 J1939 Simulator 有 Implement 此功能嗎？因為，你所模仿的 DSL J1939 工具，他們有 PCTOOL 可以設定要產生多少個 Fault (如下表)，我們並沒有此外部工具，也就是一旦 Rocker SW-1 被設定為 UP，就是要產生 DTC, 除非我們有另一個 開關 (建議是 7 段顯示器)…

我們目前是有 No DTC is active 的功能的，Rocker SW-1 被設定為 UP，就是要產生 DTC, Rocker SW-1 被設定為 Down，就是沒有 DTC,

底下內容是我們目前 J1939 模拟器与市售模拟器的 Single Fault 功能比较。

J1939 Simulator（SwiSys）

Lift up Rocker SW-1 to generate the DM1， the DM1 is a sixed Single Frame DTC。， cannot be changed，Scan tool is also a fixed single fault.

ECU Simulator（Mored）

Under OBDII mode, the DTC is generated by twisting Dip Switch（7 of Dip Switch left）。

Under J1939 mode, display only Live Data，DTC could not be generated.

J1939 ECU simulator v1.00（Scantool）

Press "DTC" Switch to display DTC data that is fixed to Single Frame DTC.
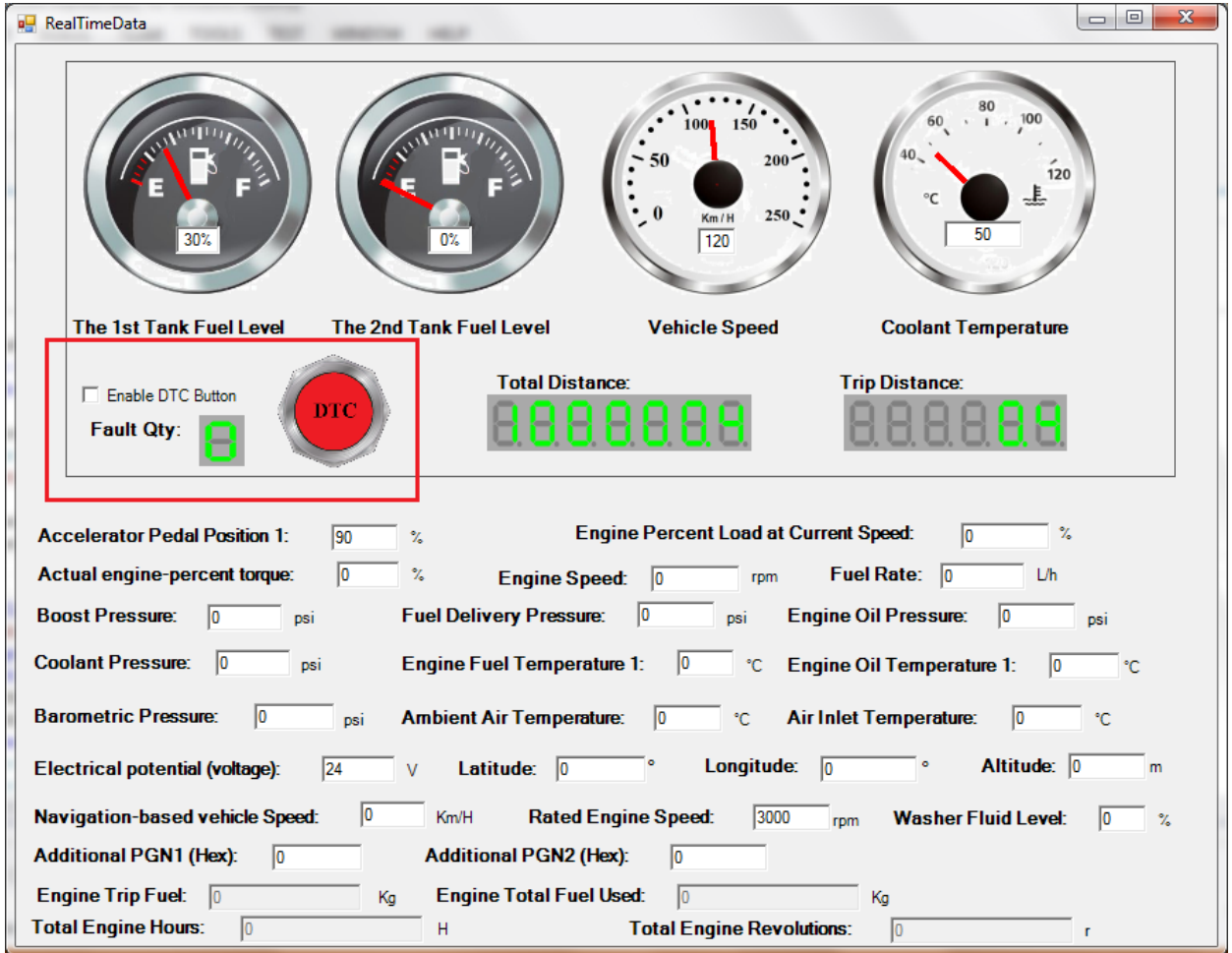
(heartbeat)

0x18 FE CA 00 1 Sec Transmitted as heartbeat only if there are no active faults.

Single packet

(When DTC Rocker SW 1 has been turn on, then one defect is active)

0x18 FE CA 00 1 Sec Transmitted if there is only one active fault.

Table 22: CAN Data Field value for PGN 65226 (DM1)

	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Bit 8→0	00000011	11111111	00000000	00000000	00000000	00000000	00000000	00000000
	0x03	0xFF	0x00	0x00	0x00	0x00	0x00	0x00

Figure 4, the above Table 22 data appear to be interpreted correctly…

1) Byte 1 的 Bit 8-7: 00 & Byte 2 的 Bit 8-7:11 ➔ MIL Off
2) Byte 1 的 Bit 6-5: 00 & Byte 2 的 Bit 6-5:11 ➔ RSL Off
3) Byte 1 的 Bit 4-3: 00 & Byte 2 的 Bit 4-3:11 ➔ AVL Off
4) Byte 1 的 Bit 2-1: 11 & Byte 2 的 Bit 6-5:11 ➔ Don't Care

沒錯，是的。

3.1.2.2. CASE 2: DTC is active (Rocker SW-2 is UP)

When the Rocker SW-2 is pulled UP, then a DTC code for SPN=1208 will be generated. The detail data value generated with respect to each byte is shown in the following tables.

- SPN= 1208 = 0x4B8 = 000 00000100 10111000 (19 bits)
- FMI= 3 = 3 = 00011 (5 bits)
- OC = 10 = 0xA = 0001010 (7 bits)
- CM = 0 = 0 (1 bit)

Table 23: CAN Data Field for DM1

	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
Bit 8→0	01000011	11111111	00000000	00000000	00000000	00000000	00000000	00000000
	0x43	0xFF	0xB4	0x04	0x03	0x8A	0xFF	0xFF
	MIL on		DTC					

DTC			
Byte 3 8 least significant bits of SPN(bit 8 most significant)	Byte 4 second byte of SPN(bit 8 most significant)	Byte 5 3 most significant bits of SPN and the FMI(bit 8 most significant)	Byte 6
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 1 0 0 / 0 0 0	0 0 0 1 1	1 0 0 0 1 0 1 0

3.1.3. Multiple Faults (Multiple Frame) Transmission

If more than one DTC is active, the data length of DM1 will exceed 8-bytes. That is it needs more than 8 bytes to deliver multiple pairs of DTC codes (SPN+FMI+OC). The multiple packets sequence are arranged as follows. It is an example for 2 DTC codes.

ID	DLC	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
18ECFF00	8	20	0A	00	02	FF	CA	FE	00
TP.CM			Total data bytes=10		2 DTCs		PGN=65226 (FECA) DM1		
18EBFF00	8	01	04	FF	00	54	8B	81	00
TP.DT		Byte Seq. = #1			**DTC-1: SPN=676, FMI=11, OC=1**				
18EBFF00	8	02	9A	6E	FB	FF	FF	FF	FF
TP.DT		Byte Seq. = #2	DTC-2: SPN=1235, FMI=14, OC=3						

EMR 4/ TIER4f CAN BUS Specification

11.3.11.   Interpreting DM1 Single Frame

If a single DTC is active, the data length of DM1 is less than 8 bytes and therefore sent as a single frame. Lamp information is sent once, followed by the 0xFF separator and one pair of SPN/FMI/OC. How to extract SPN/FMI/OC is described in Chapter 12.2 .

18FECA00	8	04	FF	00	54	8B	81	FF	FF

Note: Amber warning lamp is on, DTC is SPN 676, FMI 11, OC 1

11.3.12.   Interpreting DM1 Multiple Frame

If more than one DTC is active, the data length of DM1 exceeds 8 bytes and therefore is sent as multiple frames via the multipackage protocol. Lamp information is sent once, followed by the 0xFF separator and multiple pairs of SPN/FMI/OC. How to extract SPN/FMI/OC is described in Chapter 12.2 .

ID	DLC	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7	Byte8
18ECFF00	8	20	0A	00	02	FF	CA	FE	00
18EBFF00	8	01	04	FF	00	54	8B	81	00
18EBFF00	8	02	9A	6E	FB	FF	FF	FF	FF

Note: Amber warning lamp is on, there are 2 DTCs present, SPN 676,FMI 11, OC 1, and SPN1235, FMI 14, 0C 3

Decoding Procedure: (以下資料翻譯自我的講義)

When you select multiple DTCs, the simulator will generate more than one DTC codes. The standard communication protocol -- Transfer Protocol (TP) will be utilized. Basically, it has two parts: TP.CM and TP.DT which is defined in the J1939-21(Layer 2: Data Link & Layer 4: Transport) standard 。The following decoding procedure is for your reference.

Step 1: Please locate the message frame   PGN= ECFF/ 60671 which represents the TP.CM for control message。
- Byte 1: starts with 20
- Byte 2~3: 0A00 (01) Total message size/number of bytes
- Byte 4: 02 (02) Total number of packets ➔ 2 DTCs
- Byte 5: reserved, filled with FF
- Byte 6 ~ Byte 8: PGN value = **65226(FECA)** ➔ **Active Diagnostic Trouble Code**

Step 2: Please locate the message frame PGN=EBFF/60415 which represents the TP.DT for data transfer。
- Byte 1: sequence number= 01
- Byte 2: 04 ➔ 4 bytes value for a DTC
- Byte 3: FF ➔ separator
- Byte 4~7: **00 54 8B 81** ➔ **DTC-1: SPN=676, FMI=11, OC=1**
- Byte 8: 00 ➔ 1st byte data for DTC-2

Step 3: Please locate the message frame PGN=EBFF/60415 which represents the TP.DT for data transfer。

- Byte 1: sequence number= 02
- Byte 2~4: 9A 6E FB ➔ 3 bytes value for DTC-2 ➔ **SPN=1235, FMI=14, OC=3**
- Byte 5~8: filled with FF

3.2.   Diagnostic Data Clear/Reset for Active DTCs – DM11

All of the diagnostic information pertaining to the active diagnostic trouble codes will be erased. Implementers be aware that no positive or negative acknowledgement is sent when the request was sent to the global address.

ECU simulator clears the DTCs and sends a Positive Acknowledgement to this request message.

All of the diagnostic information pertaining to the active diagnostic trouble codes should be erased. Sent as a request whenever the service tool wishes to clear/reset diagnostic data for active DTCs. This is expected to occur once the SAE J1939-73 Revised SEP2006 Page 46 of 158 problem has been corrected. Upon the completion of this operation or if there are no faults to clear, a positive acknowledgment shall be sent as required (see SAE J1939-21 PGN 59392). If for some reason a device cannot perform the requested action, then it is required to send a negative acknowledgement (see SAE J1939-21 PGN 59392). Implementers be aware that no positive or negative acknowledgement is sent when the request was sent to the global address.

Table 24: Basic information of DM11 (PGN 65235)

Transmission Rate	On request
Data Length	0
Extended Data Page	0
Data Page	0
PDU Format	254
PDU Specific	211
Default Priority	6
Parameter Group Number	65235(0xFED3)