18 Interface CAN-2 on bridge display

18.1 General instructions

1. The precise scope of the sensor values transmitted to the customer is dependent on the engine project and is to be clarified with MAN.

   Non-present values are set by the control unit with

   0xFF00 (two-byte value)
   0xFF (one-byte value)

2. If the sending control unit detects an error on a transmitted parameter or sensor value, the following identifier is sent:

   0xFE00 (two-byte value)
   0xFE (one-byte value)

18.2 Ship-CAN interface (CAN-2 of the displays)

Display - Send Messages

18.2.1 EEC1

Transmission repetition rate: 10 ms
Data length: 8 bytes

Identifier: **0x 0C F0 04 27**

Byte 1: (Control Bits)
Bit 1-4: Default Value = 0xF
Not supported

Bit 5-8: Actual Engine - Percent Torque High Resolution
Value:
0000_{bin} +0.000 %
0001_{bin} +0.125 %
...
0111_{bin} +0.875 %
$1000 - 1111_{bin}$ not available

	(SAEJ1939-71: SPN 4154)

Byte 2: Drivers demand engine torque
0x FF
Not supported

Byte 3: Actual engine torque
1 % per bit
-125 % offset
Range: -125 % ... 125 %

	SAEJ1939-71: SPN 513

Byte 4, 5: Actual engine speed
0.125 rpm per bit
0 rpm offset
Range: 0 rpm ... 8031.875 rpm

	SAEJ1939-71: SPN 190

Byte 6: Source address of controlling device for Engine Control

0x00:	EDC17 (drive leverage to EDC17 for classes-engines)
0x27	MCS (idle or drive leverage)
0xD0	Driving from Emergency stand 1
0xD1	Driving from Emergency stand 2
0xD2	Driving from Emergency stand 3
0xD3	Driving from Emergency stand 4
0xD4	Driving from Emergency stand 5
0xD5	Driving from Emergency stand 6
0xF2	Local drive from Engine Display

	SAEJ1939-71: SPN 1483

Byte 7: (Control Bits)
Bit 1-4: Engine Starter Mode

000bin	Start not requested
001bin	Before Start
010bin	Start
100bin	After Start

	SAEJ1939-71: SPN 1675

Bit 5-8: Default Value = 0xF
Not supported

Byte 8: Engine Demand, percent torque
0x FF
Not supported

18.2.2 EEC2

Transmission repetition rate: 50 ms
Data length: 8 bytes

Identifier: **0x0C F0 03 27**

Byte 1: Default Value = 0xFF
Not supported

Byte 2: Throttle position
0.4 % per bit
0 % offset
Range: 0 % ... 100 %

	SAEJ1939-71: SPN 91

Byte 3: Load at current speed
1 % per bit
0 % offset
Range: 0 % ... 125 %

	SAEJ1939-71: SPN 92

Byte 4 - 8: Default Value = 0xFF FF FF FF FF
Not supported

18.2.3 Turbocharger Info 4

Transmission repetition rate: 500 ms
Data length: 8 bytes

Identifier: **0x18 FE 98 27**

Byte 1, 2: Exhaust temperature before turbo 1
0.03125 °C per bit
-273 °C offset
Range: -273 °C ... 1735 °C

	SAEJ1939-71: SPN 1180

Byte 3, 4: Exhaust temperature before turbo 2
0.03125 °C per bit
-273 °C offset
Range: -273 °C ... 1735 °C

	SAEJ1939-71: SPN 1181

Byte 5 - 8: Default Value = 0xFF FF FF FF
Not supported

18.2.4 Turbocharger Info 5

Transmission repetition rate: 500 ms
Data length: 8 bytes

Identifier: **0x18 FE 97 27**

Byte 1, 2: Exhaust temperature after turbo 1
0.03125 °C per bit
-273 °C offset
Range: -273 °C ... 1735 °C

	SAEJ1939-71: SPN 1184

Byte 3, 4: Exhaust temperature after turbo 2
0.03125 °C per bit
-273 °C offset
Range: -273 °C ... 1735 °C

	SAEJ1939-71: SPN 1185

Byte 5 - 8: Default Value = 0xFF FF FF FF
Not supported

18.2.5 Engine Temperature

Transmission repetition rate: 1000 ms
Data length: 8 bytes

Identifier: **0x18 FE EE 27**

Byte 1: Engine coolant temperature
1 °C per bit
-40 °C offset
Range: -40 °C ... 210 °C

	SAEJ1939-71: SPN 110

Byte 2: Fuel temperature
1 °C per bit
-40 °C offset
Range: -40 °C ... 210 °C

	SAEJ1939-71: SPN 174

Byte 3, 4: Engine oil temperature
0.03125 °C per bit
-273 °C offset
Range: -273 ... 1735.0 °C

	SAEJ1939-71: SPN 175

Byte 5 - 8: Default Value = 0xFF FF FF FF
Not supported

18.2.6 Fluid Level Pressure

Transmission repetition rate: 50 ms
Data length: 8 bytes

Identifier: **0x18 FE EF 27**

Byte 1: Engine fuel delivery pressure
40 mbar per bit
0 mbar offset
Range: 0 bar ... 10 bar

	SAEJ1939-71: SPN 94

Byte 2: Extended Crankcase Blow-by Pressure
0x FF
Not supported

Byte 3: Engine oil level
0.4 % per bit
0 % offset
Range: 0 % ... 100 %

	SAEJ1939-71: SPN 94

Byte 4: Engine oil pressure
40 mbar per bit
0 mbar offset
Range: 0 bar ... 10 bar

	SAEJ1939-71: SPN 100

Byte 5, 6: Engine crankcase pressure
0x FF FF
Not supported

Byte 7: Engine coolant pressure
10 mbar per bit
0 mbar offset
Range: 0 bar ... 5 bar

	SAEJ1939-71: SPN 109

Byte 8: Engine Coolant Level
0.4 % per bit
0 % offset
Range: 0 % ... 100 %

	SAEJ1939-71: SPN 111 *only two states supported:* 0 % Low level detected 100 % No low level detected

18.2.7 Intake/Exhaust Conditions

Transmission repetition rate: 500 ms
Data length: 8 bytes

Identifier: **0x18 FE F6 27**

Byte 1: Exhaust back pressure
5 mbar per bit
0 mbar offset
Range: 0 ... 1.25 bar

	SAEJ1939-71: SPN 81

Byte 2: Boost pressure
20 mbar per bit
0 mbar offset
Range: 0 ... 5 bar

	SAEJ1939-71: SPN 102

Byte 3: Intake manifold temperature
1 °C per bit
-40 °C offset
Range: -40 °C ... 210 °C

	SAEJ1939-71: SPN 105

Byte 4 - 8: Default Value = 0xFF FF FF FF FF
Not supported

18.2.8 Engine Electrical Power

Transmission repetition rate: 1000 ms
Data length: 8 bytes

Identifier: **0x18 FE F7 27**

Byte 1: Net battery current
0x FF
Not supported

Byte 2: Alternator current
0x FF
Not supported

Byte 3, 4: Alternator potential (voltage)
50 mV per bit,
0 V offset
Range: 0 V ... 3212.75 V

	SAEJ1939-71: SPN 167

Byte 5, 6: Electrical potential (voltage)
50 mV per bit,
0 V offset
Range: 0 V ... 3212.75 V

	SAEJ1939-71: SPN 168

Byte 7, 8: Battery potential (voltage), switched
0x FF FF
Not supported

18.2.9 Exhaust Fluid Tank

Transmission repetition rate: 1000 ms
Data length: 8 bytes

Identifier: **0x18 FE 56 27**

Byte 1: Exhaust Fluid Tank Level
0.4 % per bit
0 % offset
Range: 0 % ... 100 %

	SAEJ1939-71: SPN 1761

Byte 2: Exhaust Fluid Tank Temperature
1 °C per bit
-40 °C offset
Range: -40 °C ... 210 °C

	SAEJ1939-71: SPN 3031

Byte 3 - 8: Default Value = 0xFF FF FF FF FF FF
Not supported

18.2.10 Transmission Fluids

Transmission repetition rate: 1000 ms
Data length: 8 bytes

Identifier: **0x18 FE F8 27**

Byte 1: Default Value = 0xFF
Not supported

Byte 2: Transmission Oil Level
0.4 % per bit
0 % offset
Range: 0 % ... 100 %

	SAEJ1939-71: SPN 124 *only two states supported:* 0 % Low level detected 100 % No low level detected

Byte 2: Transmission Filter Differential Pressure
20 mbar per bit
0 mbar offset
Range: 0 ... 5 bar

	SAEJ1939-71: SPN 126

Byte 3: Transmission Oil Pressure
160 mbar per bit
0 mbar offset
Range: 0 ... 40 bar

	SAEJ1939-71: SPN 127

Byte 4: Transmission Oil Temperature
0.03125 °C per bit
-273 °C offset
Range: -273 °C ... 1735 °C

	SAEJ1939-71: SPN 177

Byte 3 - 8: Default Value = 0xFF FF
Not supported

18.2.11 Time/Date

Transmission repetition rate: 1000 ms
Data length: 8 bytes

Identifier: **0x18 FE E6 27**

Byte 1: Seconds (MAN internal UTC)
0.25 s per bit
0 s offset
Range: 0 ... 59.75 s

	SAEJ1939-71: SPN 959

Byte 2: Minutes (MAN internal UTC)
1 min per bit
0 min offset
Range: 0 ... 59 min

	SAEJ1939-71: SPN 960

Byte 3: Hours (MAN internal UTC)
1 h per bit
0 h offset
Range: 0 ... 23 h

	SAEJ1939-71: SPN 961

Byte 4: Month (MAN internal UTC)
1 month/bit
0 month offset
Range: 0 ... 12 month

	SAEJ1939-71: SPN 963

Byte 5: Day (MAN internal UTC)
0.25 day per bit
0 day offset
Range: 0 ... 31.75 day

	SAEJ1939-71: SPN 962

Byte 6: Year (MAN internal UTC)
1 year per bit
+1985 year offset
Range: 1985 ... 2235 year

	SAEJ1939-71: SPN 964

Byte 7: Local minute Offset
1 min per bit
-125 min offset
Range: -125 ... 125 min

	SAEJ1939-71: SPN 1601

Byte 8: Local hour Offset
1 h per bit
-125 h offset
Range: -125 ... 125 h

	SAEJ1939-71: SPN 1602

18.2.12 Engine Hours

Transmission repetition rate: 1000 ms
Data length: 8 bytes

Identifier: **0x18 FE E5 27**

Byte 1…4: Total engine hours of operation
0.05 h per bit
0 h offset
Range: 0 ... 210 554 060.75

	SAEJ1939-71: SPN 247

Byte 5 - 8: Total engine revolutions
0x FF FF FF FF
Not supported

18.2.13 Fuel Economy

Transmission repetition rate: 100 ms
Data length: 8 bytes

Identifier: **0x18 FE F2 27**

Byte 1, 2: Fuel rate
0.05 l/h per bit
0 l/h offset
Range: 0 ... 3212.75 l/h

	SAEJ1939-71: SPN 183

Byte 3 - 8: Default Value = 0xFF FF FF FF FF FF
Not supported

18.2.14 Fuel Consumption

Transmission repetition rate: 1000 ms
Data length: 8 bytes

Identifier: **0x18 FE E9 27**

Byte 1…4: Engine Trip Fuel
0.5l per bit, 0l offset
Range: 0 … 2105540607.5l

	SAEJ1939-71: SPN 182

Byte 5…8: Engine Total Fuel Used
0.5l per bit, 0l offset
Range: 0 … 2105540607.5l

	SAEJ1939-71: SPN 250

18.2.15 Aftertreatment 1 SCR Service Info 2

Transmission repetition rate: 1000 ms

Data length: 8 bytes
Identifier: **0x18 FC BD 27**

Byte 1…4: SCR System Total DEF Used
0.5l per bit, 0l offset
Range: 0 … 2105540607.5l

	SAEJ1939-71: SPN 5963

Byte 5…8: SCR System Trip DEF Used
0.5l per bit, 0l offset
Range: 0 … 2105540607.5l

	SAEJ1939-71: SPN 6563

18.2.16 Aux MAN Engine

Transmission repetition rate: 50 ms
Data length: 8 bytes

Identifier: **0x18 FF 1C 27**

Byte 1: (Control Bits)
Bit 1, 2: Status gearbox neutral position
Value:
00_{bin} Gearbox not in neutral
01_{bin} Gearbox in neutral
$1x_{bin}$ invalid, interpretation as with 00_{bin}

	MAN-specific

Bit 3, 4: Status gearbox forward position
Value:
00_{bin} Gearbox not in forward position
01_{bin} Gearbox in forward position
$1x_{bin}$ invalid, interpretation as with 00_{bin}

	MAN-specific

Bit 5, 6: Status gearbox reverse position
Value:
00_{bin} Gearbox not in reverse position
01_{bin} Gearbox in reverse position
$1x_{bin}$ invalid, interpretation as with 00_{bin}

	MAN-specific

Bit 7, 8: Default Value = 11_{bin}
(not used)

Byte 2: (Control Bits)
Bit 1, 2: Engine start - request
Value:
00_{bin} Engine start request is not active
01_{bin} Engine start request is active
$1x_{bin}$ invalid, interpretation as with 00_{bin}

	MAN-specific

Bit 3, 4: Engine stop request
Value:
00_{bin} Engine stop request is not active
01_{bin} Engine stop request is active
$1x_{bin}$ invalid, interpretation as with 00_{bin}

	MAN-specific

Bit 7, 8: Default Value = 0xF
(not used)

Byte 3: Current maximum permissible load
1 % per bit
-125 % offset
Range: -125 % ... 125 %

	MAN-specific

Byte 4: Exhaust Back Pressure 2
5 mbar per bit
0 mbar offset
Range: 0 ... 1.25 bar

	MAN-specific – similar to SAEJ1939-71: SPN 81

Byte 5, 6: SCR System 1 Catalyst Outlet Gas Temperature
0.03125 °C per bit
-273 °C offset
Range: -273 °C ... 1735 °C

	MAN-specific – similar to SAEJ1939-71: SPN 4363

Byte 7, 8: SCR System 2 Catalyst Outlet Gas Temperature
0.03125 °C per bit
-273 °C offset
Range: -273 °C ... 1735 °C

	MAN-specific – similar to SAEJ1939-71: SPN 4363

18.2.17 DM_1_MAN-Engine

Transmission according to SAE standard J 1939 - 73
Transmission repetition rate: 1000 ms
Data length: variable (use MultiPackage Transport on more than 1 error)

Identifier:	**DM_1_MAN-Engine**	**0x1CFECA27**	(if no, or only one failure active)
	BAM_MAN-Engine_to_global	0x1CECFF27	(broadcast announce message)
	P_MAN-Engine_to_global	0x1CEBFF27	

The following SPN numbers are transmitted in the DM1 messages, if the according alarm on the MAN display is active:

SPN	FMI is set to	Description
190	Sensor failure = 2 Warning/Alarm = 0	Engine speed
91	Sensor failure = 2 Warning/Alarm = 14	Throttle
525	Sensor failure = 2 Warning/Alarm = 14	Transmission Requested Gear
100	Sensor failure = 2 Warning/Alarm = 1	Oil Pressure

SPN	FMI is set to	Description
99	Sensor failure = 2 Warning/Alarm = 0	Difference Pressure Oil Filter
175	Sensor failure = 2 Warning/Alarm = 0	Oil Temperature
98	Sensor failure = 2 Warning/Alarm = 14	Engine oil level
1381	Sensor failure = 2 Warning/Alarm = 1	Fuel Pressure Hand Pump
94	Sensor failure = 2 Warning/Alarm = 1	Fuel Supply Pressure
174	Sensor failure = 2 Warning/Alarm = 0	Fuel Temperature
1239	Sensor failure = 2 Warning/Alarm = 14	Injection Pipe Leakage
97	Sensor failure = 2 Warning/Alarm = 14	Water In Fuel Indicator
108	Sensor failure = 2 Warning/Alarm = 14	Atmospheric Pressure
102	Sensor failure = 2 Warning/Alarm = 14	Charge air Pressure
105	Sensor failure = 2 Warning/Alarm = 0	Charge air Temperature
109	Sensor failure = 2 Warning/Alarm = 1	Coolant Pressure
110	Sensor failure = 2 Warning/Alarm = 0	Coolant Temperature
111	Sensor failure = 2 Warning/Alarm = 1	Coolant Level
1209	Sensor failure = 2 Warning/Alarm = 0	Engine Exhaust Pressure
5749	Sensor failure = 2 Warning/Alarm = 0	Engine Exhaust Pressure 2
4358	Sensor failure = 2 Warning/Alarm = 0	Aftertreatment 1 SCR Differential Pressure
4411	Sensor failure = 2 Warning/Alarm = 0	Aftertreatment 2 SCR Differential Pressure
1180	Sensor failure = 2 Warning/Alarm = 0	Exhaust Temperature before Turbo 1
1181	Sensor failure = 2 Warning/Alarm = 0	Exhaust Temperature before Turbo 2
1184	Sensor failure = 2 Warning/Alarm = 0	Exhaust Temperature after Turbo 1
1185	Sensor failure = 2 Warning/Alarm = 0	Exhaust Temperature after Turbo 2
4363	Sensor failure = 2 Warning/Alarm = 0	Aftertreatment 1 SCR Outlet Temperature
4415	Sensor failure = 2 Warning/Alarm = 0	Aftertreatment 2 SCR Outlet Temperature
1761	Sensor failure = 2 Warning/Alarm = 1	DEF Tank Level

SPN	FMI is set to	Description
3031	Sensor failure = 2 Warning/Alarm = 0	DEF Tank Temperature
127	Sensor failure = 2 Warning/Alarm = 1	Gear Oil Pressure
126	Sensor failure = 2 Warning/Alarm = 0	Differential Pressure of Gear Oil Filter
177	Sensor failure = 2 Warning/Alarm = 0	Gear Oil Temperature
124	Sensor failure = 2 Warning/Alarm = 1	Gear Oil Level
2435	Sensor failure = 2 Warning/Alarm = 1	Sea Water Pressure
1136	Sensor failure = 2 Warning/Alarm = 0	Temperature MCS
158	Sensor failure = 2 Warning/Alarm = 14	Battery Voltage
167	Sensor failure = 2 Warning/Alarm = 14	Alternator Voltage
606	Sensor failure = 2 Warning/Alarm = 14	Override
520192	Sensor failure = 2 Warning/Alarm = 0	Engine Fuel Return Flow Pressure
520194	Sensor failure = 2 Warning/Alarm = 0	Sea Water Temperature
520196	Sensor failure = 2 Warning/Alarm = 1	Temperature Plug X1
520197	Sensor failure = 2 Warning/Alarm = 14	Reduction by Partner Engine
520198	Sensor failure = 2 Warning/Alarm = 14	Emergency Stop
520199	Sensor failure = 2 Warning/Alarm = 14	Alarm Safety System
520200	Sensor failure = 2 Warning/Alarm = 14	General Electronic Error
520201	Sensor failure = 2 Warning/Alarm = 14	Engine Stop by Safety System
520202	Sensor failure = 2 Warning/Alarm = 14	Engine Start Prevented
520203	Sensor failure = 2 Warning/Alarm = 14	MAN Emergency Operation Units
520204	Sensor failure = 2 Warning/Alarm = 14	MAN Start/Stop Unit
520205	Sensor failure = 2 Warning/Alarm = 14	MAN Local Operation Unit
520206	Sensor failure = 2 Warning/Alarm = 0	Engine is operating in Overload
520207	Sensor failure = 2 Warning/Alarm = 14	Inducement Failure DEF Tank Level
520208	Sensor failure = 2 Warning/Alarm = 14	Inducement Failure DEF Quality

SPN	FMI is set to	Description
520209	Sensor failure = 2 Warning/Alarm = 14	Inducement Failure Dosing System Error
520210	Sensor failure = 2 Warning/Alarm = 14	Inducement Failure Interrupt of Dosing
520211	Sensor failure = 2 Warning/Alarm = 0	Oil Temperature Axial Bearing
520212	Sensor failure = 2 Warning/Alarm = 1	Gear Lube Oil Pressure

DM1 Single Message **0x1CFECA27**

Byte 1: **Readiness and Error Lamp Status**

Bit 1, 2: **Protect Lamp Status** (equals Sensor Failure)

00_{bin} no Sensor Failure active

01_{bin} Sensor Failure active

	MAN-specific

Bit 3, 4: **Amber Warning Lamp Status** (equals Warning)

00_{bin} no Warning active

01_{bin} Warning active

	MAN-specific

Bit 5, 6: **Red Stop Lamp Status** (equals ALARM)

00_{bin} no Alarm active

01_{bin} Alarm active

	MAN-specific

Bit 7, 8: not used = 11_{bin}

Byte 2: not used = 0xFF

Byte 3: Bits 1 - 8: **SPN** (8 least significant bits of SPN (bit 8 most significant))

Byte 4: Bits 1 - 8: **SPN** (second byte of SPN (bit 8 most significant))

Byte 5: Bits 1 - 5: **FMI** (Fault Monitoring Identifier, according table above)

00000_{bin} Data valid but above normal operational range

00001_{bin} Data valid but below normal operational range

00010_{bin} Data erratic, intermittent or incorrect

01110_{bin} Special instructions - necessity for the service technician to take some action to complete the specific diagnosis

Bits 6 - 8: **SPN** (most significant bits of SPN (bit 7 is MSB of SPN))

Byte 6: Bits 1 - 7: **Occurrence Counter**

set to 0000000_{bin}, if no failure is active

set to 0000001_{bin}, if a failure is active

Bit 8: **CM** (SPN conversion method)

set to 0_{bin}

Overview of assignment byte 3 to 6:

Byte	2	3	4	5

Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
SAE J1939	LSB								SPN								MSB			FMI					CM		OC						

Byte 7, 8: not used = 0xFFFF

Hint: The SPN is set to Zero if there is no fault active!

If there is more than one failure active, the DM1 Message is transmitted as multi packet message:

Header message:

BAM_MAN-Engine_to_global **0x1CECFF27**

Byte 1: 0x20, broadcast announce message (BAM)

Byte 2, 3: Total length of the message (number of Use Bytes)

Byte 4: Number of the following packages (P_MAN-Engine)

Byte 5: 0x FF

Byte 6 - 7: **PGN** (= **0x FE CA**)

Byte 8: 0x00

Packet message:

1. Transport protocol: P_MAN-Engine_to_global 0x1CEBFF27

Byte 1: 0x01 (1st package number)

Byte 2: **Readiness and Error Lamp Status (stored over all send faults)**

Bit 1, 2: **Protect Lamp Status** (equals Sensor Failure)

00_{bin} no Sensor Failure active

01_{bin} Sensor Failure active

	MAN-specific

Bit 3, 4: **Amber Warning Lamp Status** (equals Warning)

00_{bin} no Warning active

01_{bin} Warning active

	MAN-specific

Bit 5, 6: **Red Stop Lamp Status** (equals ALARM)

00_{bin} no Alarm active

01_{bin} Alarm active

	MAN-specific

Bit 7, 8: not used = 11_{bin}

Byte 3: not used = 0xFF

Byte 4: Bits 1 - 8: **SPN** (8 least significant bits of SPN (bit 8 most significant))
[1st active fault]

Byte 5: Bits 1 - 8: **SPN** (second byte of SPN (bit 8 most significant))

Byte 6: Bits 1 - 5: **FMI** (Fault Monitoring Identifier, according Table above)

00000_{bin} Data valid but above normal operational range

00001_{bin} Data valid but below normal operational range

00010_{bin} Data erratic, intermittent or incorrect

01110_{bin} Special instructions - necessity for the service technician to take some action to complete the specific diagnosis

Bits 6 - 8: **SPN** (most significant bits of SPN (bit 7 is MSB of SPN))

Byte 7: Bits 1 - 7: **Occurrence Counter**
set to 0000001_{bin}

Bit 8: **CM** (SPN conversion method)
set to 0_{bin}

Byte 8: Bits 1 - 8: **SPN** (8 least significant bits of SPN (bit 8 most significant))
[2nd active fault]

2nd transport protocol: P_MAN-Engine_to_global 0x1CEBFF27

Byte 1:	0x02 (2nd package number)	
Byte 2:	Bits 1 - 8:	**SPN** (second byte of SPN (bit 8 most significant))
Byte 3:	Bits 1 - 5:	**FMI** (Fault Monitoring Identifier, according Table above)
	00000_{bin}	Data valid but above normal operational range
	00001_{bin}	Data valid but below normal operational range
	00010_{bin}	Data erratic, intermittent or incorrect
	01110_{bin}	Special instructions - necessity for the service technician to take some action to complete the specific diagnosis
	Bits 6 - 8:	**SPN** (most significant bits of SPN (bit 7 is MSB of SPN))
Byte 4:	Bits 1 - 7:	**Occurrence Counter** set to 0000001_{bin}
	Bit 8:	**CM** (SPN conversion method) set to 0_{bin}
Byte 5:	Bits 1 - 8:	**SPN** (8 least significant bits of SPN (bit 8 most significant)) [3rd active fault]
Byte 6:	Bits 1 - 8:	**SPN** (second byte of SPN (bit 8 most significant))
Byte 7:	Bits 1 - 5:	**FMI** (Fault Monitoring Identifier, according Table above)
	00000_{bin}	Data valid but above normal operational range
	00001_{bin}	Data valid but below normal operational range
	00010_{bin}	Data erratic, intermittent or incorrect
	01110_{bin}	Special instructions - necessity for the service technician to take some action to complete the specific diagnosis
	Bits 6 - 8:	**SPN** (most significant bits of SPN (bit 7 is MSB of SPN))
Byte 4:	Bits 1 - 7:	**Occurrence Counter** set to 0000001_{bin}
	Bit 8:	**CM** (SPN conversion method) set to 0_{bin}
→	The number of packets depends on the number of faults Unused bytes in the last packet are filled with 0xFF.	

Example deciphering of the DM1 messages from display on the CAN-2

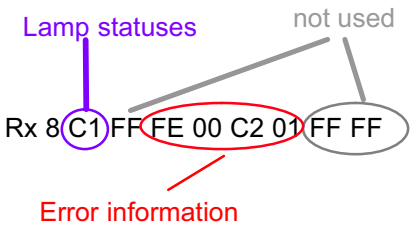
Following CAN trace from CAN-2:

Timestamp	ID	Message name	Dir	DLC	Data
[+] 1.200000	1CFECA27x	DM_1_MAN-Engine	Rx	8	C1 FF FE 00 C2 01 FF FF
[+] 2.200000	1CFECA27x	DM_1_MAN-Engine	Rx	8	C1 FF FE 00 C2 01 FF FF
[+] 3.200000	1CECFF27x	BAM_MAN-Engine_to_global	Rx	8	20 0A 00 02 FF CA FE 00
[+] 3.250000	1CEBFF27x	P_MAN-Engine_to_global	Rx	8	01 D1 FF FE 00 C2 01 00
[+] 3.300000	1CEBFF27x	P_MAN-Engine_to_global	Rx	8	02 0C 81 01 FF FF FF FF
[+] 4.200000	1CECFF27x	BAM_MAN-Engine_to_global	Rx	8	20 0A 00 02 FF CA FE 00
[+] 4.250000	1CEBFF27x	P_MAN-Engine_to_global	Rx	8	01 D1 FF FE 00 C2 01 00
[+] 4.300000	1CEBFF27x	P_MAN-Engine_to_global	Rx	8	02 0C 81 01 FF FF FF FF
[+] 5.200000	1CECFF27x	BAM_MAN-Engine_to_global	Rx	8	20 0A 00 02 FF CA FE 00
[+] 5.250000	1CEBFF27x	P_MAN-Engine_to_global	Rx	8	01 D1 FF FE 00 C2 01 00
[+] 5.300000	1CEBFF27x	P_MAN-Engine_to_global	Rx	8	02 0C 81 01 FF FF FF FF

(Pink highlighted = identifier for DM1 message)

Translation of DM1 single message of the display:

[+] 1.200000 1CFECA27x DM_1_MAN-Engine



Decryption of lamp statuses:

0x C1 corresponds to binary → 1100 0001

Protect Lamp Status → “Sensor Failure active”
Amber Warning Lamp Status → “Warning not active”
Red Stop Lamp Status → “Alarm not active”

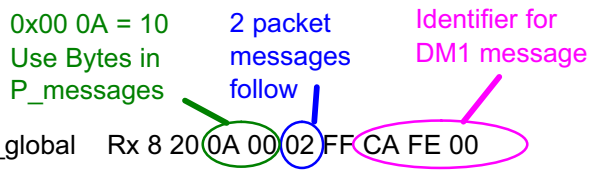
Decryption of error:

0x FE 00 C2 01 corresponds to binary → 1111 1110 0000 0000 1100 0010 0000 0001

SPN:	52198	→ via SPN list “Emergency Stop”
FMI:	2	→ via SPN list “Sensor failure”
Conversion method:	0	→ *Default Value*
Occurrence counter:	1	→ “Error is active”

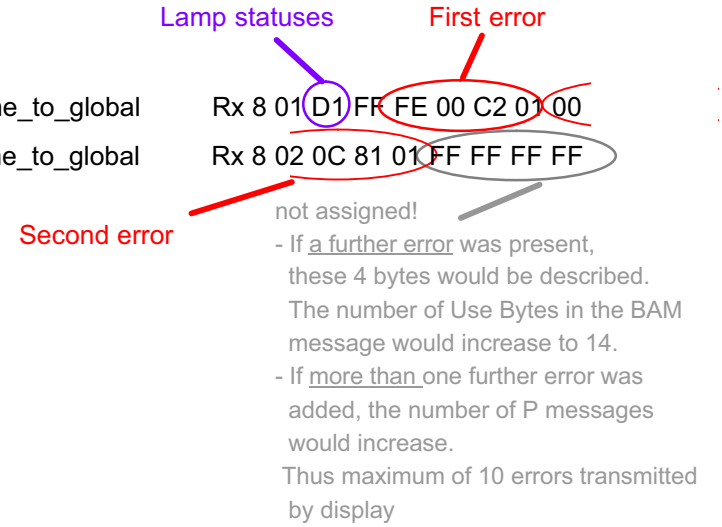
Translation of DM1 multi-packet message of the display:

Evaluation of BAM message:



[+] 3.200000	1CECFF27x	BAM_MAN-Engine_to_global	Rx 8 20 0A 00 02 FF CA FE 00
[+] 3.250000	1CEBFF27x	P_MAN-Engine_to_global	Rx 8 01 D1 FF FE 00 C2 01 00
[+] 3.300000	1CEBFF27x	P_MAN-Engine_to_global	Rx 8 02 0C 81 01 FF FF FF FF

Evaluation of packet messages:



[+] 3.250000	1CEBFF27x	P_MAN-Engine_to_global	Rx 8 01 D1 FF FE 00 C2 01 00
[+] 3.300000	1CEBFF27x	P_MAN-Engine_to_global	Rx 8 02 0C 81 01 FF FF FF FF

Decryption of lamp statuses:

0x D1 corresponds to binary → 1101 0001

Protect Lamp Status → “Sensor Failure active”
Amber Warning Lamp Status → “Warning not active”
Red Stop Lamp Status → “Alarm active”

Decryption “Second error” (all other errors analogous):

0x 00 0C 81 01 corresponds to binary → 0000 0000 0000 1100 1000 0001 0000 0001

SPN:	100	→ via SPN list: “Oil pressure”
FMI:	1	→ Value below normal operational range
Occurrence counter:	1	→ “Error is active”