

J1939 – CAN PROTOCOL APPLICATION NOTE

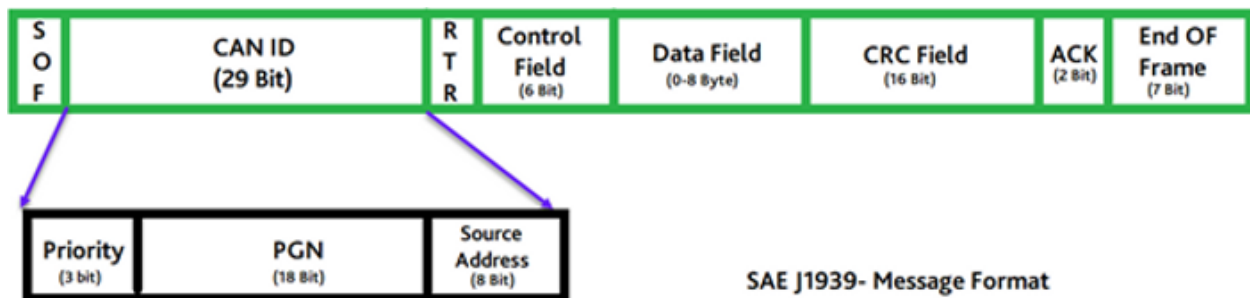
Rev 001, March 2023

By:R&D

1. Description.

CAN Protocol	SAE J1939 standards
CAN-bus Speed	250 Kbit/s
CAN identifier	29 bits

2. Sensor data.



SAE J1939- Message Format

Default PGN	0FF0Bh (65291)
CAN ID	18FF0B80h
Data Length	8
Source Address	80 (initial value)
Priority	6
Transmission Rate	50 ms (initial value)

It must be possible to update the software, change the default baud rate and configure the source address on the sensor over the CAN bus.

Data Field:

Start Position	Length	Name	Data
0-1	2 Bytes	Angle 1	CW, 16 bits: 0 to 3600 (0...360°; 0.1° resolution)
2-3	2 Bytes	Angle 2	CCW, 16 bits: 0 to 3600 (0...360°; 0.1° resolution)
4-5	2 Bytes	Reserved	0xFF
6	1 Bytes	Error	0 to 255
7	1 Bytes	Checksum	0 to 255

Error code:

HEX CODE	Description
0x00	No error.
0x01	Error Hall sensor communication.
0x02	Hall sensor in error status.
0x03	Initialize error.
0x04	Angle out of range.
0x05	Checksum error
0x06 to 0xFF	T.B.D.

Message Checksum is used to verify the signal path from the transmitting device to the receiving device. The checksum is calculated using the first 7 data bytes, and it is calculated as follows:

```
uint8_t getChecksum (uint8_t data[])
{
    uint8_t XOR;
    uint8_t c;

    for (uint8_t i = 0; i < 8; i++)
    {
        c = data[i];
        XOR ^= c;
    }

    return XOR;
}
```

3. Getting started.

When the sensor is turned on, it sends an Address Claimed message according to PGN60928 (EEFFh). The message is composed of:

- Identifier: 18EEFFXXh
- Data: device name.

After the sensor has acquired a valid address, it starts sending the angle position message according to PGN65291 (FF0Bh). The message is composed of:

- Identifier: 18FF0BXXh
- Data: Angle position.

ID	Time Stamp	Length	Data	Type	Dir	Frame Name
0x18FF0B80	14:28:17,193	8	03 3D 0A D2 FF FF 00 E6	E	Rx	
0x18FF0B80	14:28:17,143	8	03 54 0A BB FF FF 00 E6	E	Rx	
0x18FF0B80	14:28:17,093	8	03 4B 0A C4 FF FF 00 86	E	Rx	
0x18FF0B80	14:28:17,043	8	03 41 0A CE FF FF 00 86	E	Rx	
0x18FF0B80	14:28:16,993	8	03 3F 0A D0 FF FF 00 E6	E	Rx	
0x18FF0B80	14:28:16,943	8	03 3E 0A D1 FF FF 00 E6	E	Rx	
0x18FF0B80	14:28:16,893	8	03 54 0A BB FF FF 00 E6	E	Rx	
0x18FF0B80	14:28:16,843	8	03 56 0A B9 FF FF 00 E6	E	Rx	
0x18FF0B80	14:28:16,793	8	03 49 0A C6 FF FF 00 86	E	Rx	
0x18FF0B80	14:28:16,743	8	03 4C 0A C3 FF FF 00 86	E	Rx	
0x18FF0B80	14:28:16,694	8	03 4D 0A C2 FF FF 00 86	E	Rx	
0x18FF0B80	14:28:16,644	8	03 51 0A BE FF FF 00 E6	E	Rx	
0x18FF0B80	14:28:16,594	8	03 4C 0A C3 FF FF 00 86	E	Rx	
0x18EAF80	14:28:03,300	3	00 EE 00	E	Rx	
0x18EEFF80	14:27:44,307	8	64 00 E0 FF 00 8E 00 B0	E	Rx	

Port Name: CAN2, Baud Rate: 250kBaud, Filter: OFF, Listen Only: OFF, Logging: OFF, Termination: ON

Figure 1. Example Address Claimed message.

- 1- Send response address claimed PGN 59904.
- 2- Send request address claimed, PGN 60928.
- 3- Start angle position information, PGN 65291.

4. Change transmission rate.

The sensor transmission rate can be configured sending the PGN 45568 Proprietary Configurable Message 2 composed of:

- Identifier: 18B2XXYYh (XX -> Destination address YY-> Source address)
- Data: Transmission rate (view table)

Data 7	Data 6	Data 5	Data 4	Data 3	Data 2	Data 1	Data 0
0x67	0x65	0x66	0x72	Trans. Rate LSB	Trans. Rate MSB	0x00	0x00
32 bits: "gefr"				16 bits, Resolution: 1ms Range 10 ... 65535 0 = stop Ex:0x01F4=500ms Data2 = 0x01 Data3 = 0xF4			

5. Change the source address.

The Source Address of the sensor can be change by sending the Commanded Address Message according to PGN 65240 (FED8h). this is sent by using the Broadcast Announce Message of the Transport Protocol according to PGN 60416 and PGN 60160. Three messages must be sent:

- 1- Transport Protocol – Connection Management
Identifier: 1CECFFXXh

0x1C				0xEC	0xFF	0xFF	0xFF	0xXX
000	111	0	0	1110 1100	1111 1111			xxxx xxxx
	Priority:7	Reserved	Data page	PDU format	PDU dest	Source address		
PGN 60416 (0EC00h)								

Data Field: Transport Protocol – Connection Management

Data 7	Data 6	Data 5	Data 4	Data 3	Data 2	Data 1	Data 0
0x00	0xFE	0xD8	0xFF	0x02	0x00	0x09	0x20
PGN of the packet message, MSB	PGN of the packet message	PGN of the packet message, LSB	Reserved	Number of packages	Total message size, number of bytes MSB	Total message size, number of bytes LSB	Control byte

2- Transport Protocol – Data transfer packet1
Identifier: 1CEBFFXXh

0x1C				0xEB	0xFF	0XX
000	111	0	0	1110 1011	1111 1111	xxxx xxxx
	Priority:7	Reserved	Data page	PDU format	PDU dest	Source address
PGN 60160 (0EB00h)						

Data Field: Transport Protocol – Data transfer packet1

Data 7	Data 6	Data 5		Data 4	Data 3		Data 2	Data 1	Data 0	
0b0000000	0b0	0xXX	0bXXXXXX	0bXXX	0xXX	0bXXX	0bXXXXXX	0xXX	0xXX	0x01
7 bits	1 bit	8 bits	5 bits	3 bits	8 bits	3 bits	5 bits	8 bits	8 bits	8 bits
Vehicle system	Reserved bit	Function	Function instance	ECU instance	Manufacturer code, MSB	Manufacturer code, LSB	Identity number MSB	Identity number	Identity number LSB	Sequence number

3- Transport Protocol – Data transfer packet 2
Identifier: 1CEBFFXXh

0x1C				0xEB	0xFF	0XX
000	111	0	0	1110 1011	1111 1111	xxxx xxxx
	Priority:7	Reserved	Data page	PDU format	PDU dest	Source address
PGN 60160 (0EB00h)						

Data Field: Transport Protocol – Data transfer packet 2

Data 3 – data 7	Data 2	Data 1			Data 0
0xFF	0xXX	0bX	0bXXX	0bXXXX	0x02
	8 bits	1 bit	3 bits	4 bits	8 bits
Reserve	New Source Address	Arbitrary address bit	Industry group	Vehicle system instance	Sequence number