J1939/Modbus Slave Gateway FAQ

Version 1.2

(For GW-7228/GW-7238D)

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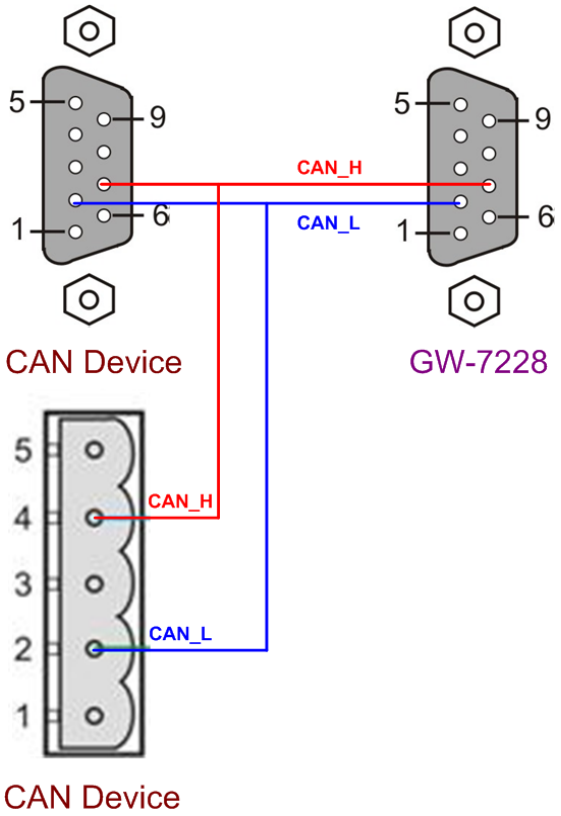
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Q01 : How to solve CAN Bus Transmission Fail problem?

A01 :

Make sure the CAN bus wiring is connected, and connected to the correct pins. The CAN bus wire connection for the GW-7228 should be noted as follows:



Q02 : How to solve CAN Bus-Off problem?

A02 :

Make sure that no short circuit exists in the CAN bus wiring between the GW-7228/GW-7238D and other J1939 devices.

Q03 : Why the gateway can not transmit J1939 output messages?

A03 :

1. Make sure the Start/Stop sending J1939 output messages register (42009) is 0.
2. Make sure the Update Rate of J1939 output messages table is not zero.

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Q04 : How to restore factory default?

A04 :

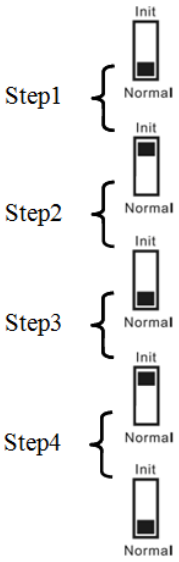
1. Power on the GW-7228/GW-7238D.
2. Change the Dip-Switch position of the GW-7228/GW-7238D and to complete the following steps in 5 seconds.

   Step1. From “Normal” to “Init” position.

   Step2. From “Init” to “Normal” position.

   Step3. From “Normal” to “Init” position.

   Step4. From “Init” to “Normal” position.



3. When the correct implementation of the above steps, the J1939/Modbus LEDs of the gateway should be turn on, and that should be turn off after 500 ms later.
4. Power cycle the gateway, and it would go back to the factory defaults.
5. For serial network, reconnect the GW-7228/GW-7238D by using the network setting as 115200 baud with none parity, 1 stop bit and 1 Net ID.

   For Ethernet network, reconnect the GW-7238D via the default IP address 192.168.255.1 with the same subnet.

Q05 : What is the communication Baud Rate in J1939 protocol?

A05 :

According the J1939-11 specification, the J1939 communication Baud Rate is 250K bps.

Q06 : Should I add the termination resistor (120Ω) between CAN-H and CAN-L with our engine, when it connect to the gateway?

A06 :

It depends on the environment, we usually use the oscilloscope to measure the CAN bus signals, it will be determined according to the waveform, please refer the following figure.

- In this situation, we recommend to add termination resistor.

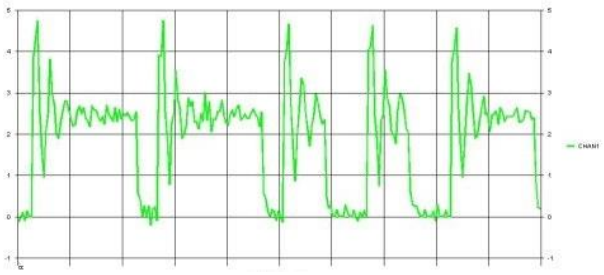


Figure 1: Waveform of the termination resistor being not added.

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➢ After add the termination resistor, the waveform is as below.

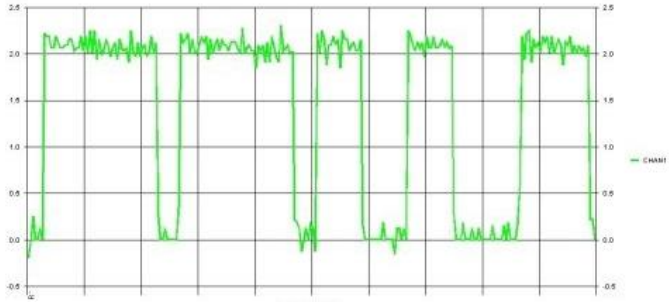
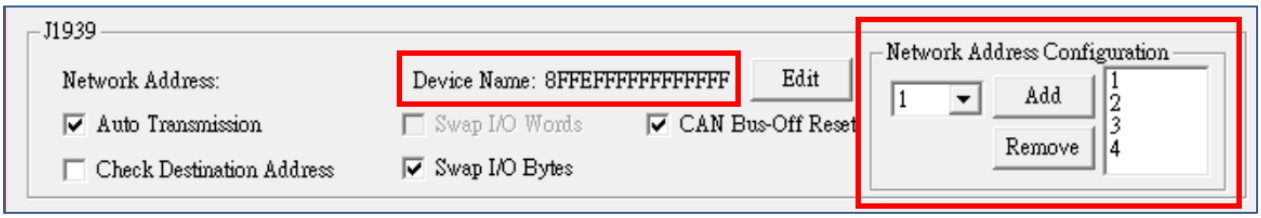


Figure 2: Waveform of the termination resistor being added

Q07 : Explain the Device Name and Network Address Configuration in the Utility.



A07 :

- Device Name

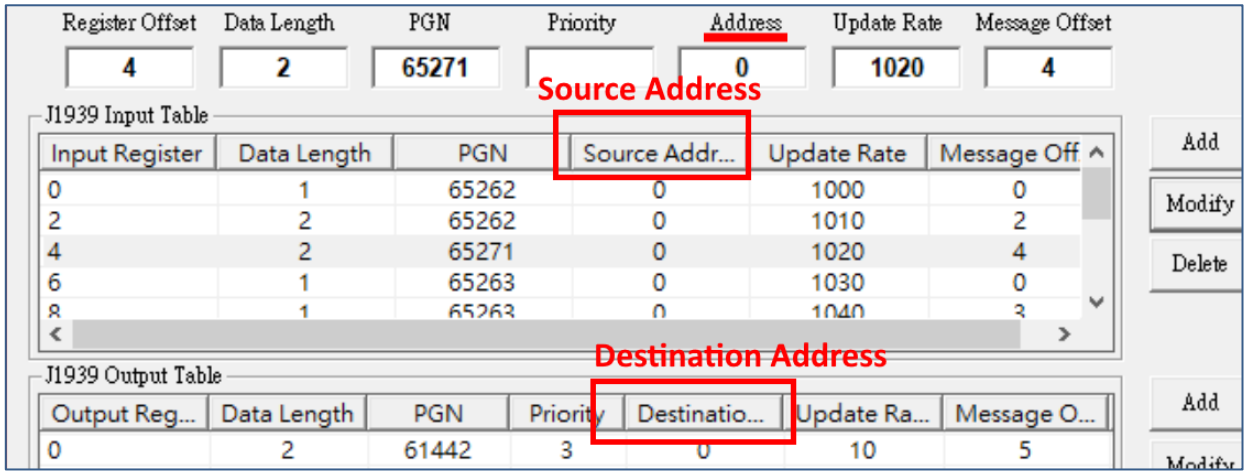
The “Device Name” is not the name of the connected J1939 devices. It is the name of the J1939 gateway itself. In general, it will not affect the function without changing it.

- Network Address Configuration

It is the network address of the J1939 gateway on the CAN bus. The J1939 gateway can avoid address conflict on the CAN bus by setting multiple spare network addresses (max.:20) for the gateway in this field. When the address conflict happens, the J1939 gateway will apply the other spare address for normal communication.

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Q08 : What's the relation between the address in the J1939 Input/Output Table and the J1939 device?



A08 :

The J1939 gateway can receive the J1939 messages from the J1939 device. The J1939 gateway can also send out the J1939 messages to the J1939 device on the bus.

- J1939 Input Table is the configuration table for the gateway to receive the J1939 messages from the J1939 devices. The "Address" field is the "Source Address" in the table, which is the address of the J1939 device.

- J1939 Output Table is the configuration table for the gateway to send out the J1939 messages to the J1939 devices. The "Address" field is the "Destination Address" in the table, which is the address of the J1939 device.

Q09 : Is Input or Output Table for getting the J1939 messages from the engine?

A09 :

Please refer to the J1939 Input Table configuration and the comparision table in the "**Q10**". These configurations for getting the speed, temperature, pressure, etc. of engine should be added to the J1939 Input Table in the utility.

The J1939 PGN/SPN Tx messages listed in the engine manual are J1939 messages sent from the ECU of the engine to the gatway. They should be configured in the J1939 Input Table.

The J1939 PGN/SPN Rx messages listed in the engine manual are J1939 messages got by the ECU of the engine from the gateway. They should be configured in the J1939 Output Table.

Every PGN message is composed of several SPNs.

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Q10 : The J1939 Input Table configuration with common PGNs from the engine.

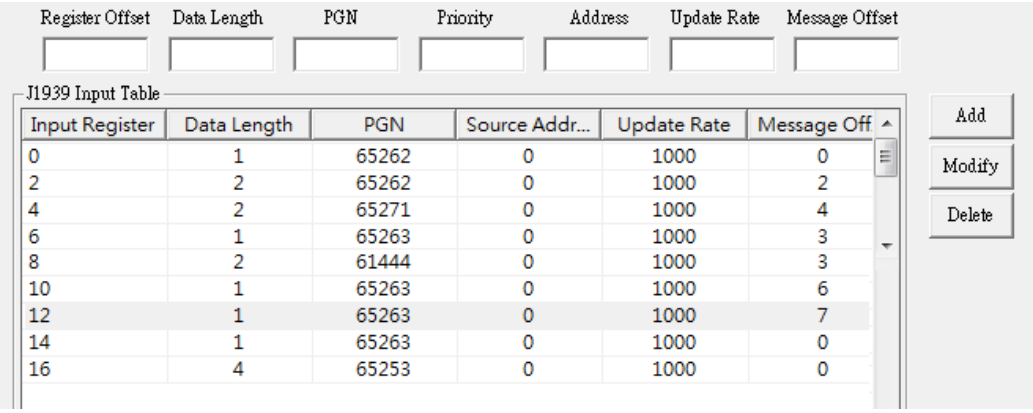
A10 :

Please refer to the following J1939 input table configuration and Modbus register comparison table.

Modbus Register comparison table

Item	Parameter Name	Modbus Data Offset (From 0)	Data Length	PGN (DEC)	J1939 Data Offset (0~7)	SPN (DEC)	Data Resolution	Data Offset	Modbus Input Registers
1	Engine Coolant Temperature	0	1	65262	0	110	1 deg C/bit	-40 deg C	30001
2	Engine Oil Temperature	2	2	65262	2	175	0.03125 deg C/bit	-273 deg C	30002
3	Battery Potential	4	2	65271	4	168	0.05 V/bit	0 V	30003
4	Engine Oil Pressure	6	1	65263	3	100	4 kPa/bit	0	30004
5	Engine Speed	8	2	61444	3	190	0.125 rpm/bit	0	30005
6	Engine Coolant Pressure	10	1	65263	6	109	2 kPa/bit	0	30006
7	Engine Coolant Level	12	1	65263	7	111	0.4 %/bit	0	30007
8	Engine Fuel Delivery Pressure	14	1	65263	0	94	4 kPa/bit	0	30008
9	Engine Total Hours of Operation	16	4	65253	0	247	0.05 hr/bit	0	30009 30010

J1939 Input Table Configuration in GW-7228/GW-7238D Utility



It is also recommended to read the pdf file "**J1939_PGN_Modbus_Comparison.pdf**" and load the configuration file "**GW7228_BasedJ1939PGN.txt**" in the utility folder.

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Q11 : Example of the J1939 Input/Output Table configuration.

A11 :

1. Please refer to "**Q13**" for the J1939 Output Table configuration.

2. **Example of the J1939 Input Table configuration:**

For reading the engine speed, the J1939 PGN 61444 message (Electronic Engine Controller 1, EEC1) contains the engine speed which is the SPN 190.

The SPN 190 (Engine Speed) is located at the 4th, 5th byte (Start Position 4-5) and the length is 2 bytes. The value of the SPN 190 is integer which need to be multiplied by the "Resolution"(Table 2) to convert it to the physical speed. Users can refer to the engine manual for more detailed information on the supported PGNs.

Table 1: Content of the PGN 61444 message

Start Position	Length	Parameter Name	SPN
1.1	4 bits	Engine Torque Mode	899
1.5	4 bits	Actual Engine - Percent Torque High Resolution	4154
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	1 byte	Source Address of Controlling Device for Engine Control	1483
7.1	4 bits	Engine Starter Mode	1675
8	1 byte	Engine Demand – Percent Torque	2432

Note: PGN 61444 Transmission Repetition Rate: engine speed dependent.

Table 2: SPN 190 Engine Speed

Data Length	2 bytes
Resolution	0.125 rpm/bit, 0 offset
Data Range	0 to 8,031.875 rpm
Operational Range	Same as Data Range
Type	Measured
PGN Reference	61444

To get the SPN 190 (Engine Speed) from engine, a PGN 61444 item should be added to the J1939 Input Table in the utility. Map the SPN 190 (Engine Speed) to the address 30001 of the Modbus input register in the gateway for the request by the Modbus master as depicted in the following figure 1.

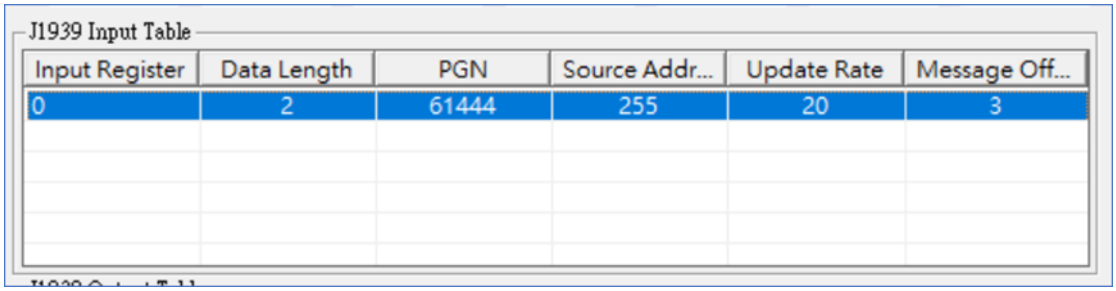


Figure 1: J1939 Input Table configuration for engine speed

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Where the instructions to the columns are as follows:

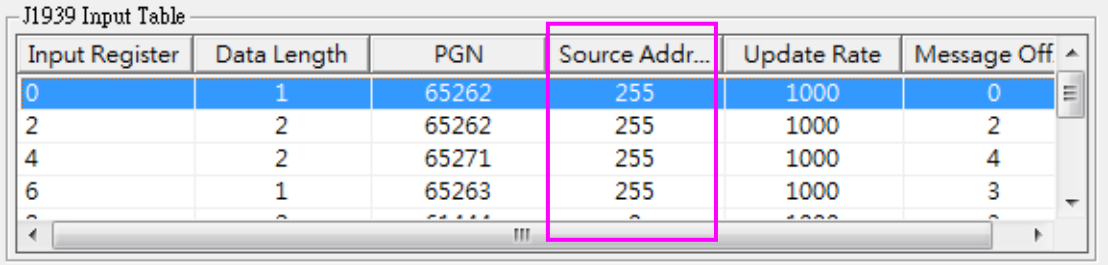
- **Input Register**: Unit: Byte. It is 0-based byte address which mapped to the Modbus Input Register (Unit: word, 2 bytes, 1-based address started from 30001). In this case, the value is 0 which is mapped to the MSB of the Modbus address 30001(0~1 byte). If this field is set to 2 which maps to the start of the Modbus address 30002 (2~3 byte).
- **Data Length**: Unit: byte. The data length of this item. In this eample, it is 2 for the engine speed. Consider the "Input Register" and "Data Length" together, it means the received engine speed(2 bytes) will be stored at the Modbus Input Register 30001 (0 ~ 1 byte).
- **PGN**: It is 61444 in this example.
- **Source Address**: The address of the J1939 device (engine ECU) which sends out the PGN 61444. If the address is unknown, address 255 can be set to receive the PGN(61444) messages from all J1939 devices with different addresses on the bus.
- **Update Rate**: Uint: ms. Update Rate is equivalent to the "Transmission Repetition Rate" of the supported PGNs listed in the engine manual. It is "engine speed dependent" in this example. 20 ms is set here.
- **Message Offset**: Unit: byte. The offset value is 0-based value which is corresponding to the "Start Position" of the.SPN in the PGN. Engine Speed (SPN 190) is at the 4th byte in the PGN 61444. The message offset should be 3 (3 = 4-1, 0-based index).

After the above configuration is uploaded to the J1939 Gateway, the Modbus Input Register 30001 is stored with the engine speed(2 bytes). The value of the 2 bytes integer need to be multiplied by the "Resolution" in the previous Table 2 to get the physical speed.

Q12 : How to get the parameter from engine if the source address of the engine is unknown?

A12 :

For the Source Address in the J1939 input configuration table, it shall only be one device on the network with a given source address, messages received must match both the PGN and source address to be used for this data field. If the **Source Address set to 255**, any message with a matching PGN will be accepted.


J1939 Input Table

Input Register	Data Length	PGN	Source Addr...	Update Rate	Message Off
0	1	65262	255	1000	0
2	2	65262	255	1000	2
4	2	65271	255	1000	4
6	1	65263	255	1000	3

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Q13 : How to configure the gateway to send requested speed to the engine?

A13 :

Please refer to the manual of the engine to understand the supported J1939 messages. The following is an example of setting the requested engine speed.

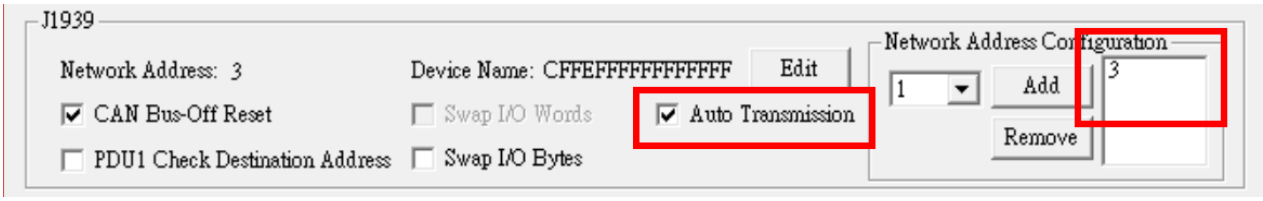
a. TSC1 - PGN 0, SPN 898 (Requested Speed)

The Requested Speed (SPN 898) in the PGN 0 message is at the position of the 2nd and the 3rd byte.

TSC1 (Torque/Speed Control #1)		Parameter Group	0
Transmission Rate		20 ms	
Data Length	8	Default Priority	3
Identifier (hex)	0C 00 00 03		
Start Position	**Length**	**Parameter Name**	**SPN**
1.1	2 bits	Override Control Mode	695
1.3	2 bits	Requested Speed Control Conditions	696
1.5	2 bits	Override Control Mode Priority	897
2, 3	2 bytes	Requested Speed	898
4	1 byte	Requested Torque	518
5-8	4 bytes	Not defined	

b. Configure the J1939 Output Table

Identifier = 0C000003h where 03h is the address of the gateway. So, address 3 should be only added to the “Network Address Configuration” in the utility as shown in the below figure. The “Auto Transmission” should be checked to enable the function, too.

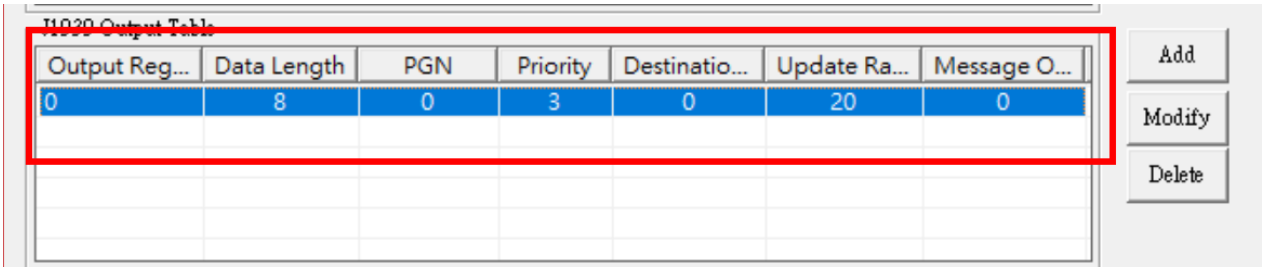


The following item can be added to the J1939 Output Table:

Output Register	Data Length	PGN	Priority	Destination Address	Update Rate	Message Offset
0	8	0	3	0	20	0

Please refer to the manual for details about these parameters. The payload (8 bytes) of the PGN 0 message is mapped to the Modbus Holding registers 40001 ~ 40003 in the gateway (according to Output Register = 0 and Data Length = 8).

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Download the configuration to the gateway to take effect the settings ([File]=>[Download Parameter]). The gateway sends out the PGN 0 messages continuously after download.

c. Set Requested Speed

The following table shows the Scaling/Range of the requested speed, which help to get the physical values. 2 bytes value of the Requested Speed multiplying 0.125 gets the rpm value. Rpm value multiplying 8 gets the 2 bytes value.

Parameter	PGN	SPN	Offset	Data Length	Update Rate	Scaling	Range
Control Mode	0	695	0 bits	2 bits	10ms		
Control Condition	0	696	2 bits	2 bits	10ms		
Control Priority	0	897	4 bits	2 bits	10ms		
Requested Speed / Speed Limit	0	898	1 byte	2 bytes	10ms	0.125 RPM/bit 0 RPM offset	0 – 8031.875 rpm
Requested Torque / Torque Limit	0	518	3 bytes	1 byte	10ms	1 %/bit -125 % offset	-125 – 125 %

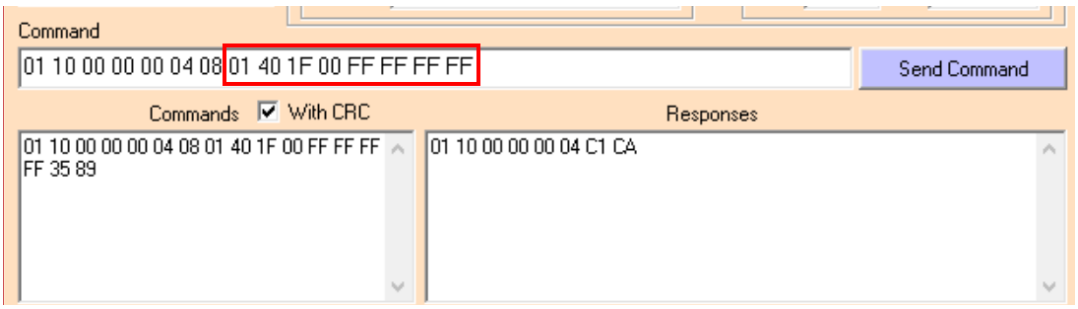
If you want 1000 rpm set to the engine, 1000 rpm is multiplied with 8 to give 8000 (decimal), **1F40**h in hex (big endian). Flip these bytes to get little endian format, **401F**h. The payload of the PGN 0 message will look like this:

Identifier	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
0C000003	01	**40**	**1F**	00	FF	FF	FF	FF

s

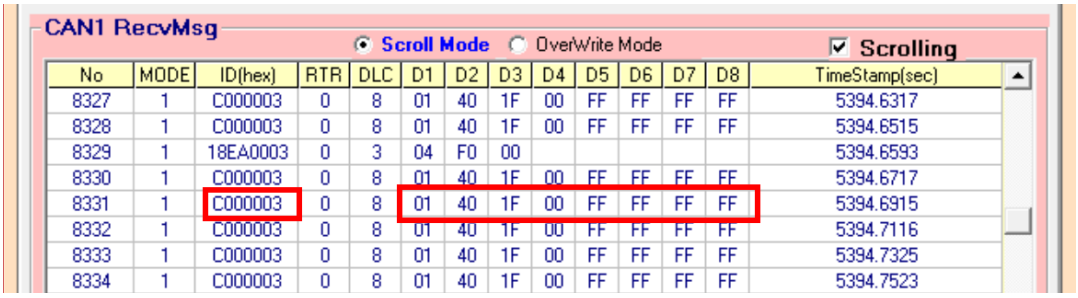
Use Modbus FC16 command to setup the requested speed 1000 rpm.

(hex) 01 10 00 00 00 04 08 **01 40 1F 00 FF FF FF FF** 35 89



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The following figure shows the J1939 PGN 0 messages sent out from the gateway.



CAN1 RecvMsg — Scroll Mode / OverWrite Mode — Scrolling

No	MODE	ID(hex)	RTR	DLC	D1	D2	D3	D4	D5	D6	D7	D8	TimeStamp(sec)
8327	1	C000003	0	8	01	40	1F	00	FF	FF	FF	FF	5394.6317
8328	1	C000003	0	8	01	40	1F	00	FF	FF	FF	FF	5394.6515
8329	1	18EA0003	0	3	04	F0	00						5394.6593
8330	1	C000003	0	8	01	40	1F	00	FF	FF	FF	FF	5394.6717
8331	1	C000003	0	8	01	40	1F	00	FF	FF	FF	FF	5394.6915
8332	1	C000003	0	8	01	40	1F	00	FF	FF	FF	FF	5394.7116
8333	1	C000003	0	8	01	40	1F	00	FF	FF	FF	FF	5394.7325
8334	1	C000003	0	8	01	40	1F	00	FF	FF	FF	FF	5394.7523

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