



Au SAE J1708 to J1939 Gateway

(part #: GW2-1708-1939-001)
Rev. D March 2023

Au SAE J1708 to J1939 gateway (GW2) can translate 24 signals from SAE J1708/1587 network to SAE J1939 network. It is designed for trucks with SAE J1708/J1587 network only and will add a J1939 network to those trucks.



Figure 1

Features

- Power Supply: +12V - +24V DC, 65mA typical, 250mA max
- Two sleep modes available to reduce power consumption
- Operating Temperature: -40°F to 185°F (-40°C to 85°C)
- TVS (Transient Voltage Suppressor) protection on J1939
- Size: 3-1/8"L X 1-11/16"W X 13/16" H (78mm X 42mm X 21mm)
- One LED (Bus Communication)
- One RS232 interface (DB9 female connector): can be connected to a PC or any device with an RS232 serial port for device running status monitoring and in-field programming (default RS232 baud rate: 115.2K).
- One BUS interface (DB9 male connector): can be connected to J1939/CAN, J1708/J1587 network, and a power supply (+14.2V DC nominal). The pin-out of the DB9 male "BUS" interface is illustrated in Figure 2.

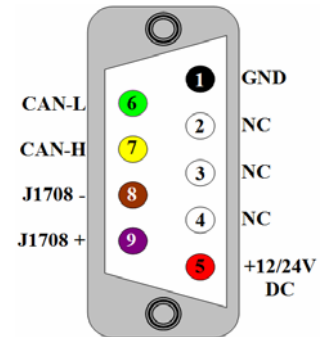


Figure 2 - BUS side DB9 male connector

Factory Reprogrammable Default Settings

Table 1

	MID on J1708 / J1587 network	SA on J1939 network
GW2 device (Off Board Diagnostic Service Tool 1)	172	0
GW2 device shipped after June 9, 2017	164 (multiplexer)	37 (Off Vehicle Gateway)

MID for Relevant PID (to be received by GW2)

Table 2

PID	MID (with priority from high to low)
84 (0X54) - Road Speed	136, 128, all other MID
245 (0XF5) - Total Vehicle Distance	128, all other MID
247 (0XF7) - Total Engine Hours	128, all other MID

If the same PID is received from multiple MIDs, parameter with higher priority will override parameter with lower priority parameter(s).

Supported Parameters Cross Reference

Cross reference of the supported 24 parameters can be found in the following table.

Table 3 List of supported Parameters

Parameters	SAE J1708 / J1587	SAE J1939
Reference #	PID: 84	PGN: 65265 SPN: 84
Description	Road Speed	Wheel-Based Vehicle Speed
Transmission rate	100 ms	100 ms
Data Range	0.0 to 205.2 km/h (0.0 to 127.5 mph)	0 to 250.996 km/h (0.0 to 155.96 mph)
Bit Resolution	0.805 km/h (0.5 mph)	1/256 km/h per bit, 0 offset



2	Reference #	PID: 245	PGN: 65248 SPN: 245
	Description	Total Vehicle Distance	Total Vehicle Distance
	Transmission rate	10.0 s *	100 ms
	Data Range	0.0 to 691,207,984.6 km (0.0 to 429496729.5 mil)	0 to 526,385,151.9 km (327080569.41 mil)
	Bit Resolution	0.161 km (0.1 mi)	0.125 km/bit, 0 offset
3	Reference #	PID: 247	PGN: 65253 SPN: 247
	Description	Total Engine Hours	Engine Hour
	Transmission rate	On request *	On request
	Data Range	0.0 to 214,748,364.8 hr	0 to 210,554,060.75 hr
	Bit Resolution	0.05 h	0.05 hr/bit, 0 offset
4	Reference #	PID: 190	PGN: 61444 SPN: 190
	Description	Engine Speed	Engine Speed
	Transmission rate	100 ms	20ms
	Data Range	0.0 to 16383.75 rpm	0 to 8,031.875 rpm
	Bit Resolution	0.25 rpm	0.125 rpm
5	Reference #	PID: 110	PGN: 65262 SPN: 110
	Description	Engine Coolant Temperature	Engine Coolant Temperature
	Transmission rate	1.0 s	1s
	Data Range	0.0 to 255.0 °F	- 40 to 210 ° C
	Bit Resolution	1.0 °F	1.0 °C
6	Reference #	PID: 100	PGN: 65263 SPN: 100
	Description	Engine Oil Pressure	Engine Oil Pressure
	Transmission rate	1.0 s	0.5s
	Data Range	0.0 to 879.0 kPa (0.0 to 127.5 lbf/in2)	0 to 1000 kPa
	Bit Resolution	3.45 kPa (0.5 lbf/in2))	4 kPa
7	Reference #	PID: 102	PGN: 65270 SPN: 102
	Description	Boost Pressure	Engine Turbocharger Boost Pressure
	Transmission rate	1s	0.5s
	Data Range	0.0 to 219.8 kPa (0.0 to 31.875 lbf/in2)	0 to 500 kPa
	Bit Resolution	0.862 kPa (0.125 lbf/in2)	2 kPa
8	Reference #	PID: 86	PGN: 65265 SPN: 86
	Description	Cruise Control Set Speed	Cruise Control Set Speed
	Transmission rate	10s	100ms
	Data Range	0.0 to 205.2 km/h (0.0 to 127.5 mph)	0 to 250 km/h
	Bit Resolution	0.805 km/h (0.5 mph)	1 km/h
9	Reference #	PID: 91	PGN: 61443 SPN: 91
	Description	Percent Accelerator Pedal Position	Accelerator Pedal Position 1
	Transmission rate	0.1s	100ms
	Data Range	0.0 to 102.0%	0 to 100 %
	Bit Resolution	0.40%	0.40%



10	Reference #	PID: 92	PGN: 61443 SPN: 92
	Description	Percent Engine Load	Engine Percent Load At Current Speed
	Transmission rate	0.1s	50ms
	Data Range	0.0 to 127.5%	0 to 250 %
	Bit Resolution	0.50%	1%
11	Reference #	PID: 105	PGN: 65270 SPN: 105
	Description	Intake Manifold Temperature	Engine Intake Manifold 1 Temperature
	Transmission rate	1s	0.5s
	Data Range	0.0 to 255.0 °F	- 40 to 210° C
	Bit Resolution	1.0 °F	1 ° C
12	Reference #	PID: 108	PGN: 65269 SPN: 108
	Description	Barometric Pressure	Barometric Pressure
	Transmission rate	1s	1s
	Data Range	0.0 to 109.9 kPa (0.0 to 15.9375 lbf/in2)	0 to 125 kPa
	Bit Resolution	0.431 kPa (0.0625 lbf/in2)	0.5 kPa
13	Reference #	PID: 168	PGN: 65271 SPN: 168
	Description	Battery Potential(Voltage)	Battery Potential / Power Input 1
	Transmission rate	1s	1s
	Data Range	0.0 to 3276.75 V	0 to 3212.75 V
	Bit Resolution	0.05 V	0.05 V
14	Reference #	PID: 174	PGN: 65262 SPN: 174
	Description	Fuel Temperature	Engine Fuel Temperature
	Transmission rate	1s	1s
	Data Range	-8192.00 to +8191.75 °F	- 40 to 210 ° C
	Bit Resolution	0.25 °F	1 ° C
15	Reference #	PID: 175	PGN: 65262 SPN: 175
	Description	Engine Oil Temperature	Engine Oil Temperature 1
	Transmission rate	1s	1s
	Data Range	-8192.00 to +8191.75 °F	- 273 to 1735 deg C
	Bit Resolution	0.25 °F	0.03125 deg C
16	Reference #	PID: 183	PGN: 65266 SPN: 183
	Description	Fuel Rate (Instantaneous)	Engine Fuel Rate
	Transmission rate	0.2s	100ms
	Data Range	0.0 to 1.07665 L/s (0.0 to 0.28442190 gal/s or 0.0 to 1023.98 gal/h)	0 to 3,212.75 L/h
	Bit Resolution	16.428 x 10 ⁻⁶ L/s (4.34 x 10 ⁻⁶ gal/s or 1/64 gal/h)	0.05 L/h
17	Reference #	PID: 184	PGN: 65266 SPN: 184
	Description	Instantaneous Fuel Economy	Engine Instantaneous Fuel Economy
	Transmission rate	0.2s	100ms
	Data Range	0.0 to 108.835 km/L (0.0 to 255.996 mpg)	0 to 125.5 km/L
	Bit Resolution	1.66072 x 10 ⁻³ km/L (1/256 mpg)	1/512 km/L per bit, 0 offset



18	Reference #	PID: 185	PGN: 65266 SPN: 185
	Description	Average Fuel Economy	Engine Average Fuel Economy
	Transmission rate	10s	100ms
	Data Range	108.835 km/L (0.0 to 255.996 mpg)	0 to 125.498046875 km/L
	Bit Resolution	1.66072 x 10 ⁻³ km/L (1/256 mpg)	1/512 km/L
19	Reference #	PID: 187	PGN: 65264 SPN: 187
	Description	Power Takeoff Set Speed	Power Takeoff Set Speed
	Transmission rate	10s	100ms
	Data Range	0.0 to 16383.75 rpm	0 to 8,031.875 rpm
	Bit Resolution	0.25 rpm	0.125 rpm
20	Reference #	PID: 83	PGN: 61443 SPN: 1437
	Description	Road Speed Limit Status	Road Speed Limit Status
	Transmission rate	1s	50ms
	Data Range	1=active / 0=not active	00 - Active / 01 - Not Active
	Bit Resolution	Binary	4 states/2 bit, 0 offset
21	Reference #	PID: 85	PGN: 65265 SPN: 595
	Description	Cruise Control Status	Cruise Control Status
	Transmission rate	0.2s	100ms
	Data Range	1=active /0=not active	00 - Cruise control switched off /01 - on
	Bit Resolution	Binary	
22	Reference #	PID: 89	PGN: 65264 SPN: 981
	Description	Power Takeoff Status	Engine PTO Governor Accelerate Switch
	Transmission rate	1s	100 ms
	Data Range	1=active / 0=not active	00 - Off / 01 - On
	Bit Resolution	Binary	4 states/2 bit, 0 offset
23	Reference #	PID: 71	PGN: 65252 SPN: 590
	Description	Idle Shutdown Timer Status	Engine Idle Shutdown Timer State
	Transmission rate	1s	1s
	Data Range	1=active / 0=not active	00 - Inactive /01 - Active
	Bit Resolution	Binary	4 states/2 bit, 0 offset
24	Reference #	PID: 121	PGN: 61440 SPN: 571
	Description	Engine Retarder Status	Retarder Enable - Brake Assist Switch
	Transmission rate	0.2 s	100 ms
	Data Range	1=on / 0=off	00 Retarder - brake assist disabled /01 - enabled
	Bit Resolution	Binary	4 states/2 bit, 0 offset

* Per SAE J1708 definition, Total Vehicle Distance (PID: 245) on J1708 network is broadcasted every 10 seconds, however, per SAE J1939 definition, transmission rate for Total Vehicle Distance on J1939 network is 100 milliseconds, so every time after GW2-1708-1939 device is powered up, there will be a period up to 10 seconds the "Total Vehicle Distance " on J1939 network will displays as 0xFF FF FF FF (255 255 255 255) as there are no "Total Vehicle Distance" data available from J1708 network during at that time frame.



Following example shows that Total Vehicle Distance (PGN 65248, SPN 245 data from byte 5 to byte 8) showed up 9851 ms (80478ms - 70627 ms) after powered up.

Table 4

Timestamp (ms)	P	R	DP	Srr	exid	PF	PS	SA	PGN	DLC	Data 1	Data 2	Data 3	Data 4	Data 5	Data 6	Data 7	Data 8
70627	6	0	0	0	1	254	224	37	65248	8	255	255	255	255	255	255	255	255
...	6	0	0	0	1	254	224	37	65248	8	255	255	255	255	255	255	255	255
80478	6	0	0	0	1	254	224	37	65248	8	255	255	255	255	21	83	98	0

Hardware Connection

- Following is an example of how GW2 (Au J1708 to J1939 gateway) was used in the lab environment, Au J1939 Data center captured the PGN 65265, 65248, 65253 on J1939 / CAN network, the result is displayed on Au J1939 Data Center PC GUI. optional PC was used for demonstration purpose (Figure 3). Two 120-ohm terminal resistor must present on each end of the J1939 network backbone.
- On Figure 3, the J1708 ECU broadcasts "road speed" and "total vehicle distance" signals on J1708 network. Au GW2 receive these two parameters (road speed, odometer signals) on J1708 network. Then it will perform the following:
 - convert J1587 "Road Speed" to J1939 "wheel based road speed" and transmit PGN 65265 on J1939 / CAN network.
 - convert J1587 "Total Vehicle Distance" to J1939 "Total Vehicle Distance" and transmit PGN 65248 on J1939 / CAN network.
 - In the mean time, it also output ASCII string on RS232, which can be displayed on PC screen using Tera Term (open source serial communication software) for monitoring purpose, please see details at the next paragraph for AT command.

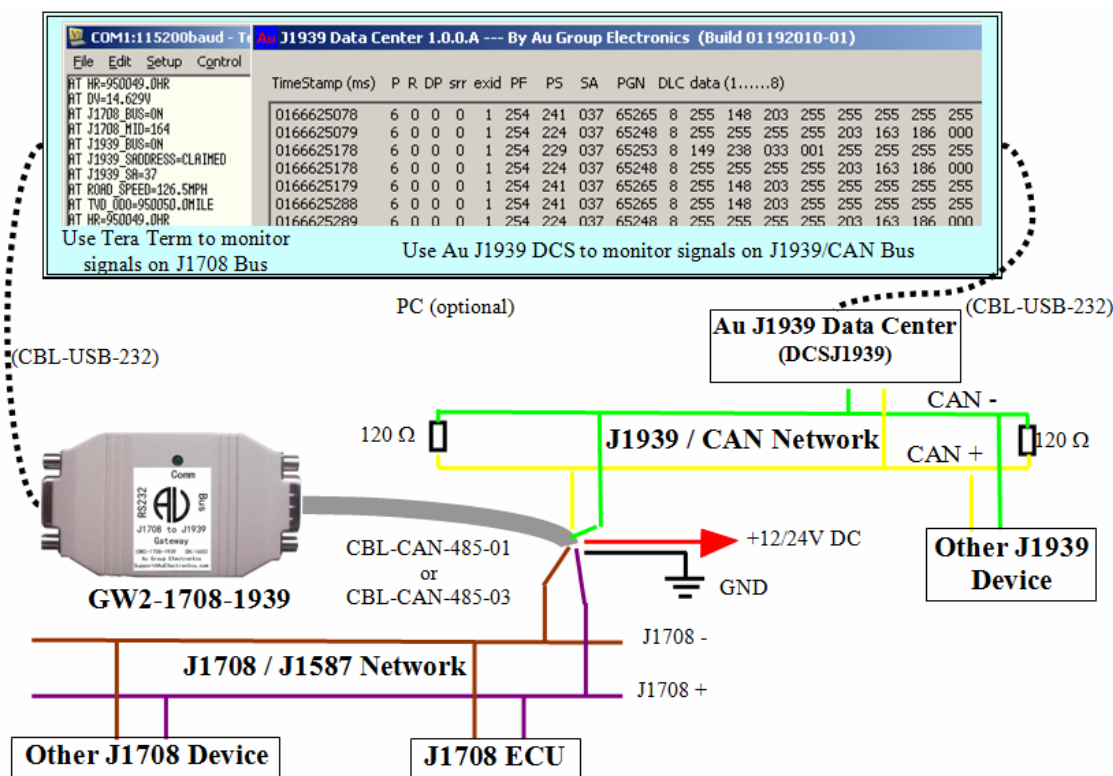


Figure 3

- On Figure 3, A J1939 device (Au J1939 Interpreter) was used to send out Engine Hour request command to J1939 network (using PGN 59904), once GW2 receive the request, it will send the request to J1708 ECU, then J1708 ECU will reply with the current Total Engine Hours and send it over to J1708 network (PID 247). GW2 then convert Total Engine Hour to SAE J1939 Engine Hour and transmit SPN 247 (PGN 65243) on J1939 / CAN network. Engine Hour data flow is illustrated in Figure 4.

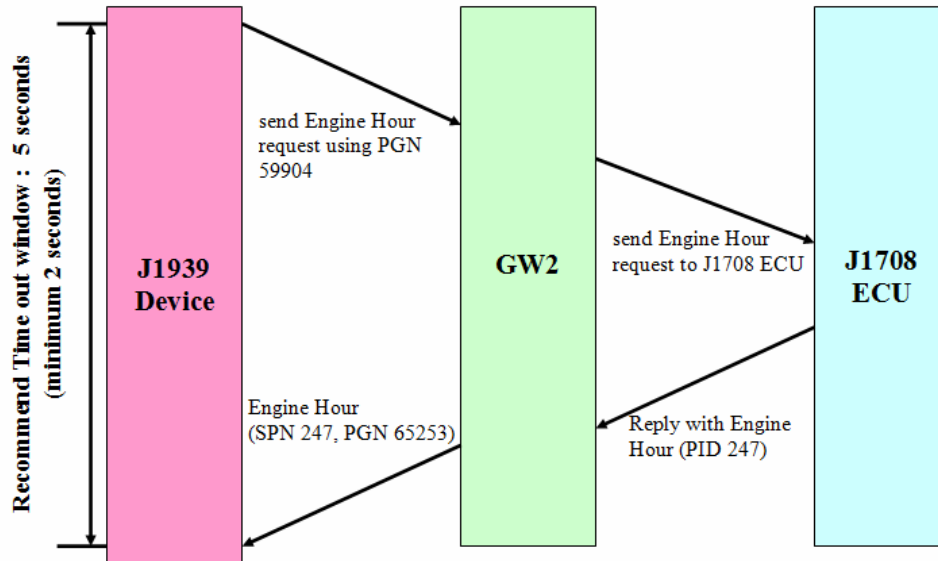


Figure 4

Optional Accessories

On the Bus side, use CBL-CAN-485-01 or CBL-CAN-485-03 or CBL-CAN-485-03GD to connect Au J1708 to J1939 Gateway to power supply, J1708 network, and J1939 network: connect black wire to GND, red wire to +12V/24V DC Power Supply , Yellow wire to CAN-L, Green wire to CAN-H), Brown wire to J1708 B -, Violet wire to- J1708 A+ On the RS232 side, use CBL-USB-232 to connect GW2 to a PC.

Table 5

	<p>CBL-CAN-485-01: A 6-wire color coded cable which can be used for Au J1939 devices, Au J1708 devices. One end of the cable is DB9 female connector; it is designed to mate with Au devices on BUS side.</p> <p>The other side of the cable is a pig tail with 3 pairs of twisted color coded wires:</p> <p>Red wire: Power supply, e.g. +12V DC Black wire: Ground Yellow wire: CAN High Green wire: CAN Low Violet: J1708A+ Brown: J1708B-</p>
	<p>CBL-CAN-485-03</p> <p>CBL-CAN-485-03 is a 0.33 meter CAN/J1939/J1708 cable with DB9 female connector and 9-way round threaded plug (HD16-9-1939S).</p> <p>This cable can be used to connect Au J1939 / J1708 products to trucks and school buses equipped with 9 pin diagnostic connectors.</p>
	<p>CBL-CAN-485-03GD</p> <p>Au J1708/CAN cable with a DB9 female connector and double SAE J-Bus connectors.</p>
	<p>CBL-USB-232</p> <p>USB to RS232 Converter Cable</p>



When GW2 connected to active J1708 and J1939 network, captured AT command will be displayed as:

Table 6

AT Command	Description
AT J1708_BUS=ON	J1708 Network is ON, (broadcast every 1 second)
AT J1939_BUS=ON	J1939 Network is ON, (broadcast every 1 second)
AT J1939_SADDRESS=CLAIMED	Device Source Address Claimed Status - Claimed, (broadcast every 1 second)
AT DV=14.239V	Device voltage is 14.239 volts, (broadcast every 1 second)
AT ROAD_SPEED=126.5MPH	Road Speed is 126.5 mile per hour
AT HR=950049.0HR	Engine Hour is 950049.0 hours
AT TVD_ODO=950050.0MILE	Total vehicle distance is 950050.0 mile

AT Command

Once GW2 gets powered up and connected to PC serial port, the following AT command about the device and bus information will be displayed (not connected to J1708 and J1939 network):

Table 7

Device Status	To request current setting or to change default setting																											
AT ID=GW2-1708-1939-001	Device ID, display once at power up. It can be requested using: AT ID=?\r\n																											
AT FW=0.1B(32K-BUILD08032022-01)	Device Firmware, display once at power up, It can be requested using: AT FW=?\r\n																											
AT SN=1612	Device Serial Number , display once at power up, it can be requested using: AT SN=?\r\n																											
AT J1708_MID=164	Device Message ID - Default setting at 164 (Multiplex) AT MID=165\r\n (change device default MID to 165)																											
AT J1939_SA=0	Device Source Address is set at 0 AT SA=249\r\n (change device source address to 249)																											
AT CBS1=0B00100011	<p>Device Configuration Byte 1, contains control bits status</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Bit #</th> <th>7</th> <th>6</th> <th>5</th> <th>4</th> <th>3</th> <th>2</th> <th>1</th> <th>0</th> </tr> </thead> <tbody> <tr> <td>Bit name</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> <td>N/A</td> <td>Deep sleep</td> <td>Standby sleep</td> <td>N/A</td> </tr> <tr> <td>Default</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>1</td> </tr> </tbody> </table> <p>Standby sleep is enabled.</p> <p>The status of Control bits 1 to 2 is configurable, using DSLEEP or SSLEEP commands:</p> <p>AT DSLEEP =0\r\n The device gets out of deep sleep mode and responds with CBS1 once. CBS1 bit 2 will be set to 0 (AT CBS1=0B001**0**)</p> <p>AT DSLEEP =1\r\n The device deep sleep mode is enabled and responds with CBS1 once. CBS1 bit 2 will be set to 1(AT CBS1=0B000**1**) If there is no J1708 or J1939 data detected for 10 seconds, the device will get into deep sleep mode, in which it cannot wake up by either J1708 or J1939 data flow. It can only wake up by cranking the power supply in deep sleep mode.</p> <p>AT SSLEEP =0\r\n The device gets out of standby sleep mode and responds with CBS1 once. CBS1 bit 1 will be set to 0 (AT CBS1=0B001***0*)</p> <p>AT SSLEEP =1\r\n The device standby sleep mode is enabled and responds with CBS1 once. CBS1 bit 1 will be set to 1(AT CBS1=0B000***1*) If there is no J1708 or J1939 data detected for 10 seconds, device will get into standby sleep mode, and it can be wake up with either J1708 or J1939 data flow.</p>	Bit #	7	6	5	4	3	2	1	0	Bit name	N/A	N/A	N/A	N/A	N/A	Deep sleep	Standby sleep	N/A	Default	0	0	1	0	0	0	1	1
Bit #	7	6	5	4	3	2	1	0																				
Bit name	N/A	N/A	N/A	N/A	N/A	Deep sleep	Standby sleep	N/A																				
Default	0	0	1	0	0	0	1	1																				