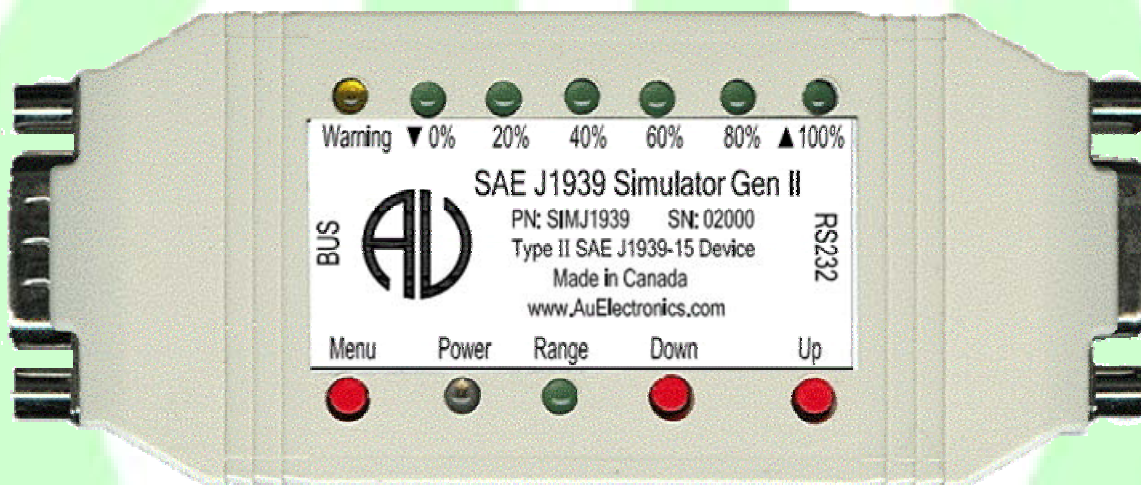


# Au SAE J1939 Simulator V1.00A User Manual

Rev. I

Au Group Electronics

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## Chapter - 1 Introduction

Au SAE J1939 Simulators (Gen II 1.00A), a family of well designed devices (Figure 1-1), are capable of simulating majority of J1939 signals on a SAE J1939 network. It is widely for product development, validation, assembly-line testing, incoming inspection, and business demonstration, etc.

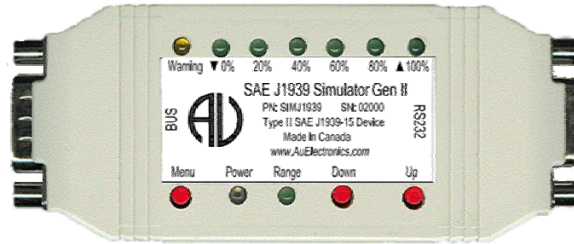


Figure 1-1

### 1.1 Typical SAE J1939-15 Network Topology with Au SAE J1939 Simulators

A typical SAE J1939-15 network topology with an Au SAE J1939 Simulator is illustrated in Figure 1-2.

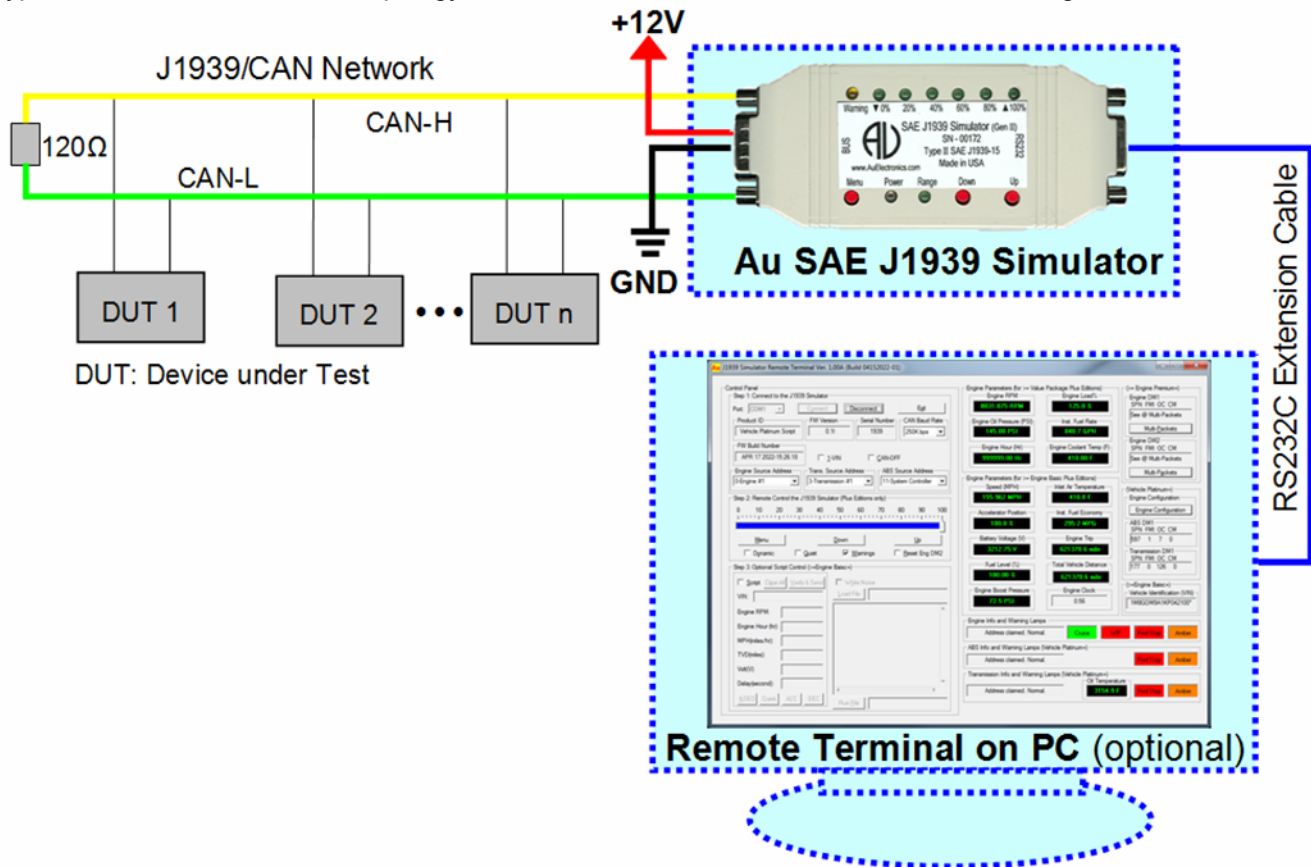


Figure 1-2

### 1.2 Major Hardware Features

- Power supply: +12V~+14.2 VDC nominal, 250mA max
- SAE J1939-15 Type II ECU: contain an internal 120 ohm load resistor for easy network setup
- Compact size: 4-1/8" L X 1-3/4"W X 7/8"H
- Enclosure color: Black or PC white
- Operating temperature: -4 °F to 185 °F (-20 °C to 85 °C)
- 1 buzzer: Can be muted or enabled
- 9 LED indicators: Power, Range, Warning, ▼0%, 20%, 40%, 60%, 80%, ▲100%

- 3 push buttons: Simulated SAE J1939 signals can be adjusted by push buttons: Menu, Down, Up
- TVS (Transient Voltage Suppressor) protection on CAN bus
- 1 DB9 Male "BUS" Interface: For power supply and CAN/J1939 network connection (Figure 1-3)



Figure 1-3

- 1 RS232 interface: for CAN baud rate setting, Source address configuration, in-field firmware update, license management, and computer remote control (for **Plus** editions and **script** editions) (Figure 1-4).



Figure 1-4

Au J1939 Simulator can be connected to a PC through an RS232 serial extension cable (part # CBL-RS232-01), as shown in Figure 1-5.

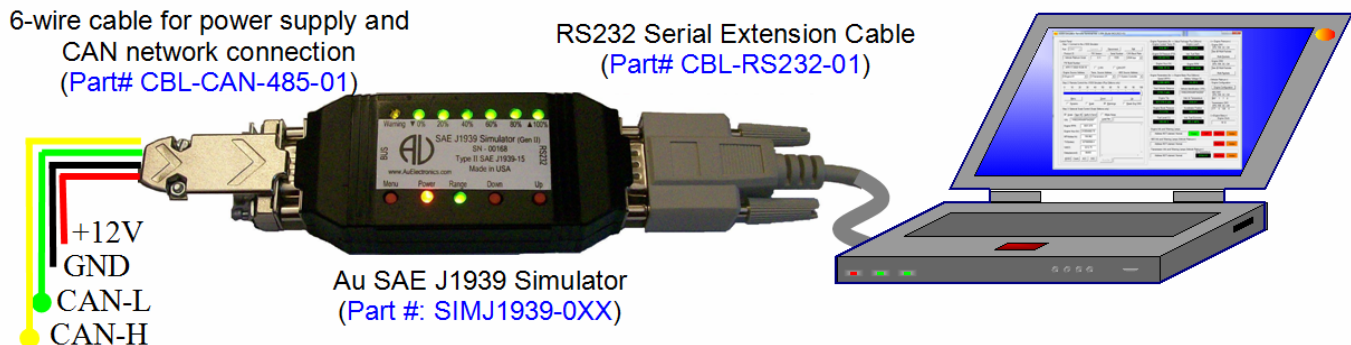


Figure 1-5

For a PC with USB port, a USB to RS232 serial convert cable (part # CBL-USB-232) can be used (Figure 1-6).








Figure 1-6

The following cables and power supply are optional components for different application, they are sold separately.



Table 1-1 Necessary accessories for Au J1939 Simulator

|  |  |
|--|--|
| <p>CBL-CAN-485-01</p>   | <p>A 6-wire color-coded cable used for Au J1939 and Au J1708 devices. One end of the cable is a DB9 female connector, designed to mate with Au devices on the BUS side. The other side of the cable is a pigtail with 3 pairs of twisted color-coded wires:</p> <p>Red wire: Power supply, e.g. +12V DC      Black wire: Ground<br/> Yellow wire: CAN High      Green wire: CAN Low<br/> Violet: J1708A+      Brown: J1708B-</p>   |
| <p>CBL-CAN-485-02D</p>  | <p>CBL-CAN-485-02D cable provides power supply, J1708/J1587 and CAN network connection similar to what's available on trucks, RVs and School buses.</p> <p>One end is a DB9 female connector, the other end are dual HD10 Serial 9-way SAE compatible Receptacles (green for 500K CAN baud rate and black for 250K CAN baud rate) . It also includes a power Supply Jacket (2.1 mm Positive center), which can supply power to all devices connected on the cable. The cable can be used for SAE J1939-11, J1939-14, 250Kbps and 500Kbps networks.</p>   |
| <p>PWR-912V-CP</p>     | <p>Wall mount AC/DC power supply can supply power to all devices connected to CBL-J1708-02 or CBL-CAN-485-02D.</p> <ul style="list-style-type: none"> <li>• Positive center</li> <li>• Connector style: 2.1mm I.D. x 5.5mm O.D. x 12mm Female (compatible with the power jacket of CBL-J1708-02 and CBL-CAN-485-02)</li> <li>• Voltage input: 110~120V AC Input</li> <li>• Voltage output: 12V DC</li> <li>• Current output: 500mA Max.</li> <li>• Inrush current: 40A Maximum</li> <li>• Power: 6.0W</li> <li>• Line Regulation: +/- 2%</li> <li>• Load Regulation: +/- 5%</li> </ul>   |
| <p>CBL-RS232-01</p>   | <p>RS232 Serial extension cable can be used to connect computer Serial port to Au J1939 / J1708 products (on RS232 Side).</p> <ul style="list-style-type: none"> <li>• Fully shielded to prevent unwanted EMI/RFI</li> <li>• Fully molded connectors with thumbscrews provide a quick and easy connection every time</li> <li>• Connectors: DB9 Male to DB9 Female</li> <li>• Cable length: 6 feet</li> </ul> <p>All 9 connector pins are wired straight through</p>   |
| <p>CBL-USB-232</p>    | <ul style="list-style-type: none"> <li>• The USB to Serial Converter cable can be used to connect computer USB port to Au J1939 / J1708 products (on RS232 Side).</li> <li>• Compatible with Vista, XP, Win7, and Win10. Three LED (Power, TX and RX) are included. Power LED is on when USB power is supplied. TX LED will blink when COM port is transmitting. RX LED will blink when COM port is receiving.</li> <li>• Compatible with all Au Group Electronics system products, J1939 Simulators, J1708 Simulators, FMS Simulators, NMEA2000 Simulators, J1939 /J1708 Interpreters, J1939/J1708 MCS, J1939/J1708 DCS, J1939/J1708 Gateways.</li> </ul> |



### 1.3 Major Operating Features

- Smart features: Recalls last operating mode at power-on, and capable of generating dynamic data.
- Easy to use: No software setup experience or CAN/J1939 protocol configuration skills are required. After a network is connected, apply power and it will dynamically generate J1939 data when in dynamic mode.
- CAN bus on/off switch
- Configurable CAN Baud Rate: Sets CAN baud rate at 250K, 500K, 62.5K, 125K, or 1M bps
- Multiple Source Addresses to select from
- One VIN or multiple VIN switch
- Static mode or Dynamic Mode
  - Static mode output static J1939 signals, signals can be changed manually
  - Dynamic mode automatically change the output value of SAE J1939 signals
  - Two modes can be switched easily (*via press and hold both Menu and Up buttons until a long beep is heard*)
- PC Remote Terminal GUI:
  - Connects Au J1939 Simulator to a PC through serial communication.
  - Displays the simulator information, alters and displays simulator SA settings, and performs license upgrading.
  - Displays simulated J1939 signals on a computer screen for "Plus" editions and "Script" editions.
  - Provides script control capabilities for "Script" editions.
- Script control capabilities (for "Script" editions only):
  - Capable of setting six parameters to any value in SAE J1939 specification allowed range, generating script, running script file.
  - The script can be delayed, repeated, running with or without white noise.
  - Script control can be turn on/off easily
  - White noise can be turn on/off easily
- In-field license upgrade feature.
- In-field firmware update capability
- Annual support and minor upgrade services are available
- Custom firmware and GUI modification is available upon request

### 1.4 Eleven Editions of Au SAE J1939 Simulators

Eleven editions of Au SAE J1939 simulator 1.00A are available: 4 Non-Plus editions, 4 Plus editions, and 3 Script editions.

#### 1.4.1 Non-Plus Editions

Au J1939 Simulator Non-Plus editions are stand-alone devices. They can be operated independently without a PC. Full range of J1939 signals can be generated by controlling 3 push buttons.

#### 1.4.2 Plus Editions

Au J1939 Simulator **Plus** editions have all functions of **Non-Plus** editions, with the addition of a **PC Remote Terminal GUI**. Like the Non-Plus editions, all the Plus editions can still work independently without a PC. The "Remote Terminal GUI" connects Au J1939 Simulator to a PC through serial communication. It displays the simulator information, alters and displays the simulator settings, and performs license upgrading for all editions. It also shows simulated J1939 signals on a computer screen for "Plus" editions and "script" editions.

**Plus Edition = Non-Plus Edition + PC Remote Terminal GUI Program**

#### 1.4.3 Script Editions

Au J1939 Simulator **Script** editions have all the functions of **Plus** editions, with the addition of **script control capabilities**. Detail information can be found at chapter 4.

**Script Edition = Plus Edition + Script control capabilities**

- Script control sets six parameters to any value in the SAE-J1939 specification allowed range: Engine RPM, Vehicle speed, VIN, Battery voltage, Engine hour, Total vehicle distance.
- Engine hour and Total vehicle distance can be set with initial values, then they will accumulate over time.
- Four buttons to generate frequently used script segments.
- Script control can load and run a saved script file.
- The script can be delayed and repeated with or without white noise.



- Script control can switch CAN bus on/off.
- Script control can be turned on/off with a click
- White noise can be turned on/off with a click.

## 1.5 Basic Functions of Each Edition

### 1.5.1 Value Package editions:

- "Statically" or "dynamically" generate 6 most frequently used engine parameters
- Two push buttons (**Up** and **Down**) are used in "static mode" to adjust data outputs
- In "dynamic mode", data cycles automatically in its SAE defined range
- LEDs indicate the control step value and reflect push button operations
- Buzzer sound also reflects push button inputs, and can be enabled/disabled
- "Script" control capability is **NOT** available for Value Package editions

### 1.5.2 Engine Basic editions:

- Includes all Value Package edition functions
- "Statically" or "dynamically" generate 23 most frequently used engine parameters
- "Script" control capability is available for Engine Basic Script edition

### 1.5.3 Engine Premium editions:

- Includes all Engine Basic edition functions
- Includes Premium features on SAE J1939 Transport Protocols:
  - Engine DM1/DM2 warnings (support both single packet and multi-packets)
  - Engine "Red Stop" and "Amber" lamp warnings
  - Engine DM3
- "Script" control capability is available for Engine Premium Script edition

### 1.5.4 Vehicle Platinum editions:

- Includes all Engine Premium edition functions
- Includes Vehicle Network features (3 controller applications have been implemented):
  - **ABS** related signals
  - **Transmission** related signals
  - **Engine Configurations**
- "Script" control capability is available for Vehicle Platinum Script Edition

## 1.6 License /Firmware Upgrade and Annual Support Service

Part numbers for license upgrading and annual service for the 11 editions of Au SAE J1939 Simulator 1.00A are summarized in Figure 1-7.

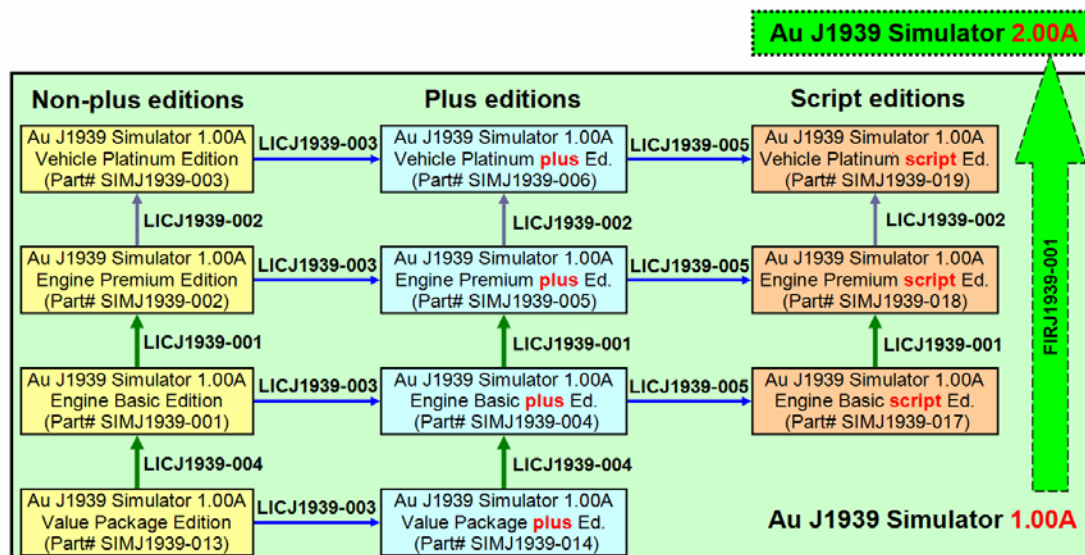


Figure 1-7





- Simulator license can be in-filed upgraded to higher editions. "Au License Management" in the remote terminal GUI provides the in-filed license upgrading capability.
  - Value Package editions can be upgraded to Engine Basic editions (part #: LICJ1939-004).
  - Engine Basic editions can be upgraded to Engine Premium editions (part #: LICJ1939-001).
  - Engine Premium editions can be upgraded to Vehicle Platinum editions (part #: LICJ1939-002).
  - "Non-Plus" editions are able to be upgraded to plus editions (part #: LICJ1939-003).
  - Engine Basic "Plus" editions and above are able to be upgraded to "Script" editions (part #: LICJ1939-005).
- Firmware can be in-field updated with **Au PIC Boot-loader**
  - Firmware update code or customized codes can be re-programmed to gain new or special features.
  - Au J1939 Simulator 1.00A can be upgraded to Au J1939 Simulator 2.00A (part #: FIRJ1939-001)
  - "Au PIC Boot-loader " provides the in-field firmware upgrading capability.
- Annually minor upgrade and support service is available (part #: SVS-SIM-J1939).

### 1.7 Order information

All of Au J1939 Simulators, accessories, and license upgrade are available to be ordered at the website of Au Group Electronics: <https://www.auelectronics.com/System-J1939Simulator.htm>

The part# for 11 editions of Au SAE J1939 simulator are summarized in Table 1-2.

Table 1-2 Part# for eleven editions of Au SAE J1939 simulator Gen II 1.00A

| Au SAE J1939 Simulators 1.00A Editions |   | Part#           |
|--|---|-----------------|
| Non-Plus Edition                       | Au SAE J1939 Simulator (Value Package <b>Non-Plus</b> Edition)  | SIMJ1939-013    |
|  | Au SAE J1939 Simulator (Engine Basic <b>Non-Plus</b> Edition)   | SIMJ1939-001    |
|  | Au SAE J1939 Simulator (Engine Premium <b>Non-Plus</b> Edition)   | SIMJ1939-002    |
|  | Au SAE J1939 Simulator (Vehicle Platinum <b>Non-Plus</b> Edition)   | SIMJ1939-003    |
| Plus Edition                           | Au SAE J1939 Simulator ( <b>Value Package Plus</b> Edition)   | SIMJ1939-014    |
|  | Au SAE J1939 Simulator ( <b>Engine Basic Plus</b> Edition)  | SIMJ1939-004    |
|  | Au SAE J1939 Simulator ( <b>Engine Premium Plus</b> Edition)  | SIMJ1939-005    |
|  | Au SAE J1939 Simulator ( <b>Vehicle Platinum Plus</b> Edition)  | SIMJ1939-006    |
| Script Edition                         | Au SAE J1939 Simulator ( <b>Engine Basic Script</b> Edition)  | SIMJ1939-017    |
|  | Au SAE J1939 Simulator ( <b>Engine Premium Script</b> Edition)  | SIMJ1939-018    |
|  | Au SAE J1939 Simulator ( <b>Vehicle Platinum Script</b> Edition)  | SIMJ1939-019    |
| Accessories                            | 6-wire cable for power supply and J1939/J1708 network connection  | CBL-CAN-485-01  |
|  | CAN/J1939/J1708 cable with a power jacket, a DB9 female connector, and dual SAE 9-way Receptacles (for 500K and 250K CAN baud rate) | CBL-CAN-485-02D |
|  | 14V Wall mount AC/DC power supply, positive center, 110V input  | PWR-912V-CP     |
|  | RS232 Serial Extension Cable (for computer with RS232 port)   | CBL-RS232-01    |
|  | USB to RS232 Serial Convert Cable (for computer with USB port )   | CBL-USB-232     |
| Service                                | 1 year support and minor upgrades for Au SAE J1939 Simulator  | SVS-SIM-J1939   |
| License Upgrade                        | From Value Package Edition to Engine Basic Edition  | LICJ1939-004    |
|  | From Engine Basic Edition to Engine Premium Edition   | LICJ1939-001    |
|  | From Engine Premium Edition to Vehicle Platinum Edition   | LICJ1939-002    |
|  | From Non-Plus Edition to Plus Edition   | LICJ1939-003    |
|  | From Plus Edition to Script Edition   | LICJ1939-005    |

## Chapter - 2 Supported SAE J1939 Parameters

### 2.1 Value Package editions

Au SAE J1939 Simulator Gen II 1.00A Value Package editions supports 11 most frequently used engine parameters:

- Engine % Load at Current Speed (SPN 92)
- Engine Oil Pressure (PSI) (SPN 100)
- Engine Coolant Temperature (SPN 110)
- Engine Fuel Rate (SPN 183)
- Engine Speed (RPM) (SPN 190)
- Engine Total Hours of Operation (Hr) (SPN 247) \*
- Response for Engine Hour Request (Rx)
- Engine Address Claiming
- Engine Address CANNOT Claim
- Response for Address Claim Request (Rx)
- Address Conflict Response with Contention

\* Response only with SAE J1939-21 Request PGN 59904.

### 2.2 Engine Basic editions

Au SAE J1939 Simulator Gen II 1.00A Engine Basic editions support all parameters listed with Value package editions, plus the following 20 SAE J1939 engine parameters (total 31):

- Wheel Based Vehicle Speed (MPH) (SPN 84)
- Accelerator Pedal Position 1 (SPN 91)
- SAE J1939 Fuel Level 1 (SPN 96)
- Engine Turbocharger Boost Pressure (PSI) (SPN 102)
- Engine Intake Manifold 1 Temperature (F) (SPN 105)
- Battery Potential (Voltage), Switched (SPN 158)
- Engine Instant Fuel Economy (SPN 184)
- Engine Trip Distance (SPN 244)
- Total Vehicle Distance (SPN 245)
- Cruise Light (SPN 595)
- Engine Clock (HH:MM) (SPN 961, 960)
- Response for Engine Clock Request (Rx)
- Engine Clock setup (SPN 1605, 1604) (Rx)
- SAE J1939 Acknowledge protocol (ACK, NACK)
- Engine DM1 Red Stop Lamp OFF status (SPN 623)
- Engine DM1 Amber Lamp OFF status (SPN 624)
- Engine DM1 (Health-heart-beat)\*
- **Vehicle Identification Number (VIN) (SPN 237)**
- Response for VIN global request
- Response for VIN specific request
- Water-in-Fuel Indicator (Health-heart-beat)\* (SPN 97)

\* Health-heart-beat: normal signal only, no warning, signal repeats in SAE defined "heart-beat" rate.

### 2.3 Engine Premium editions

Au SAE J1939 Simulator Engine Premium editions support all SAE J1939 parameters listed with Engine Basic editions, plus the following 12 SAE J1939 parameters and new features (total 43):

- Engine DM1 Warning On/Off control
- Engine Red Stop Lamp On/Off
- Engine Amber Lamp On/Off
- Engine DM1 Single-Packet warning
- Engine DM1 Multi-Packet warnings
- Engine DM2 Single-Packet warning
- Engine DM2 Multi-Packet warnings
- Response for DM2 global request (Rx)
- Response for DM2 specific request (Rx)
- Engine DM3 and Engine DM2 On/Reset control (Rx)
- SAE J1939 TP.CM.BAM, TP.DT protocol
- SAE J1939 TP.CM.EndOfMsgAck, TP.CM.RTS, TP.CM.CTS, TP.Conn.Abort, TP.DT protocol

### 2.4 Vehicle Platinum editions

Au J1939 Simulator vehicle Platinum editions support all SAE J1939 parameters listed with Engine Premium editions, plus 40 bytes of Engine Configuration, ABS related parameters, and Transmission related parameters (total 61).

- Engine Configuration (40 bytes)
- ABS address claim
- ABS Address CANNOT Claim
- ABS Response Request for Address Claim (Rx)
- ABS address conflict Response with Contention
- ABS Red Stop Lamp On/Off
- ABS Amber Lamp On/Off
- ABS DM1 (No warning or 1 warning)
- ABS Heart-beat PGN-EBC1
- Transmission address claim
- Transmission Address CANNOT Claim
- Transmission response request for address claim(Rx)
- Transmission address conflict response with contention
- Transmission Red Stop Lamp On/Off
- Transmission Amber Lamp On/Off
- Transmission DM1 (No warning or 1 warning)
- Transmission Oil Temperature
- Transmission Heart-beat PGN-ET

## Chapter - 3 Operating Instructions

All editions of Au SAE J1939 Simulator Gen II 1.00A can be operated by just controlling 3 push buttons. It generates SAE J1939 signals for product developers, testers, operators and manufacturers.

### 3.1 Power On

Mate the DB9 female connector of a 6-wire cable (Part#: CBL-CAN-485-01) to the **BUS** side DB9 male connector of Au SAE J1939 Simulator, connect the **Red** wire to +12 ~ +14.2V DC power supply, **Black** wire to ground, **Yellow** wire to CAN-H, **Green** wire to CAN-L. The **Power** LED on simulator will light up, and the simulator will resume the last saved operating mode (static mode or dynamic mode).

### 3.2 Operating Mode (Static/Dynamic)

After power on, Au SAE J1939 Simulator will work in either **static** mode or **dynamic** mode.

- **Static mode:** Au SAE J1939 Simulator Gen II generates steady SAE J1939 signals. In this mode, two push buttons (**Up** and **Down**) can be used to change the data outputs. When no button is pushed, all data will remain at the last value.
- **Dynamic mode:** The value of all data will change automatically every second in SAE J1939 defined range
- Switch between dynamic mode and static mode: Press and hold both **Menu** and **Up** buttons until a long beep is heard if buzzer is enabled; or both the "▼0% LED" and "▲100% LED" flip their status (from on to off or vice versa)

Au SAE J1939 Simulator Gen II equipped with 3 push buttons (**Menu**, **Down**, **Up**) and 9 LEDs (Figure 3-1). Each LED is named after its function.

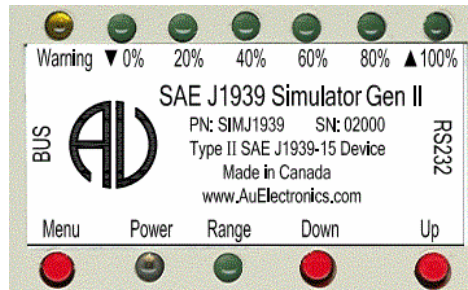


Figure 3-1

### 3.3 Push Button Functions

- Press **Menu** button:
  - **Menu** button is used to control **Warning** LED on/off. A single press on **Menu** button will turn on the **Warning** LED if the Warning LED was off, and vice versa.
  - The **Menu** button function is available **only** on Engine Premium editions and Vehicle Platinum editions. For Value Package editions and Engine Basic editions, Menu button is not used. Warning LED will be constant off.
  - If buzzer is enabled, a short beep will be heard upon a press on the **Menu** button.

In dynamic mode, the simulator automatically adjusts the control step value by itself. This will generate dynamic J1939 signals. In static mode, all\* simulated SAE J1939 signal will be controlled by the control step value, which is still able to be manually controlled by the **Up** and **Down** buttons.

**Note:** \* The Engine Clock is not controlled by the control step value and push buttons; it runs all by itself just like a real clock.

- Press **Down** button:
  - **Down** button is used to decrease the values of all J1939 signals. A single press will decrease all data one step from previous values until they reach the minimum values. ▼0% LED will be triggered on/off.
  - If ▼0% LED is on, press **Down** button one time, ▼0% LED will be off.
  - If ▼0% LED is off, press **Down** button one time, ▼0% LED will be on.
  - 80% LED blinks when control step value equals to 80%,
  - 60% LED blinks when control step value equals to 60%,
  - 40% LED blinks when control step value equals to 40%,
  - 20% LED blinks when control step value equals to 20%,
  - ▼0% LED blinks when control step equals to 0%,
  - If buzzer is enabled, a short beep will be heard upon a press on **Down** button.



- Press **Up** button:
  - **Up** button is used to increase the values of all J1939 signal. A single press will increase all simulated data one step to next data level until they reach the maximum values, ▲ 100% LED will be triggered on or off.
  - If ▲ 100% LED is on, press **Up** button one time, ▲ 100% LED will be off.
  - If ▲ 100% LED is off, press **Up** button one time, ▲ 100% LED will be on.
  - 20% LED blinks when control step value equals to 20%,
  - 40% LED blinks when control step value equals to 40%,
  - 60% LED blinks when control step value equals to 60%,
  - 80% LED blinks when control step value equals to 80%,
  - ▲ 100% LED blinks when control step value equals to the highest value, 100%.
  - If buzzer enabled, a short beep will be heard upon a press on **Up** button.
- Press and hold both **Down + Up** button for more than 1 second:
  - **Down + Up** buttons are used to turn buzzer on/off.
  - If buzzer is on, press and hold **Down + Up** for more than 1 second will silent buzzer thereafter.
  - If buzzer is mute, press and hold **Down + Up** for more than 1 second will enable the buzzer thereafter.
  - Both ▲ 100% and ▼ 0% LED will flip their on/off status as a visual indication of this dual-button input.
  - If buzzer is enabled, a long beep will be heard to reflect the input of **Down + Up** button.
- Press and hold both **Menu + Down** button for more than 1 second:
  - **Menu + Down** buttons are used to turn Engine DM2 warning on/Reset.
  - Both ▲ 100% LED and ▼ 0% LED will flip their status as a visual indication of this dual-button input.
  - If buzzer is enabled, a long beep will be heard to reflect the input of **Menu + Down** button.
  - The Engine DM2 warning messages (on premium and platinum editions) are always on after power-on. It can be reset when an Engine DM3 PGN is received.
  - For continuous test purpose, after an Engine DM3 PGN is received, either re-power-on the simulator or press and hold both **Menu + Down** button for more than 1 second will turn on the Engine DM2 warning again.
- Press and hold both **Menu + Up** button:
  - **Menu + Up** buttons are used to switch between static mode and dynamic mode.
  - Both ▲ 100% LED and ▼ 0% LED will flip their status as a visual indication of this dual-button input.
  - If buzzer enabled, a long beep will be heard to reflect the input of **Menu + Up** button.
- Press and hold both **Menu + Up + Down** button for more than 1 second:
  - **Menu + Up + Down** buttons are used to switch CAN bus On/Off.
  - If CAN-OFF is checked, means CAN bus is off, no parameters will be transmitted by the J1939 Simulator. Three LED (▼ 0% LED, ▲ 100% LED, and Range LED) will blinking every one second.
  - Both ▲ 100% LED and ▼ 0% LED will flip their status as a visual indication of this dual-button input.
  - If buzzer enabled, a long beep will be heard to reflect the input of **Menu + Up + Down** button.

The push button functions are summarized in Table 3-1.

Table 3-1 Summary of Push button functions

| Push Button Operation                       | Function  |
|---|---|
| Press <b>Down</b> button                    | Decrease all simulated data until they reach the lowest value                 |
| Press <b>Up</b> button                      | Increase all simulated data until they reach the highest value                |
| Press <b>Menu</b> button                    | DM1 Warning On/Off control (N/A for Value Package and Engine Basic editions)  |
| Press & hold both <b>Down + Up</b> button   | Buzzer ON/OFF control   |
| Press & hold <b>Menu + Up</b> button        | Switch between Static/Dynamic mode  |
| Press & hold <b>Menu + Down</b> button      | Engine DM2 ON/Reset control (N/A for Value Package and Engine Basic editions) |
| Press & hold <b>Menu + Up + Down</b> button | Switch On/Off CAN bus   |

### 3.4 LED Indicator Status

**Note:** Red LEDs and Green LEDs are used in this document for illustration purpose; actual product might have different LED color. Same applies to the push buttons. Au Group Electronics reserve the right of changing the color on each LEDs and push buttons without further notification.

- When power on, both **Power** LED and **Range** LED lit, as shown in Figure 3-2.

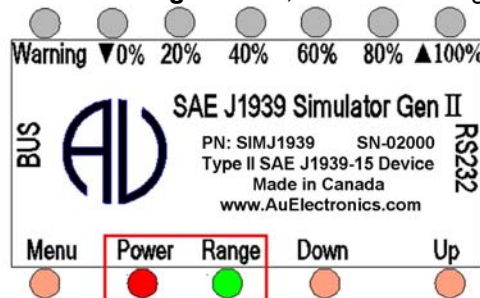


Figure 3-2

All SAE J1939 data can be changed within the SAE defined range from 0 to 100 control steps (named 0% to 100% control step value from now on), 6 LEDs are used to identify the control step value in the range of 0%, 20%, 40%, 60%, 80%, and 100%.

- ▲100% LED will be on or off with a press on the **Up** button, accompany with the increasing brightness of **Range** LED. A press on the **Up** button will also increase the control step value and all simulated data.
  - When control step value equals to 0%, the ▼0% LED blinks, as shown in Figure 3-3

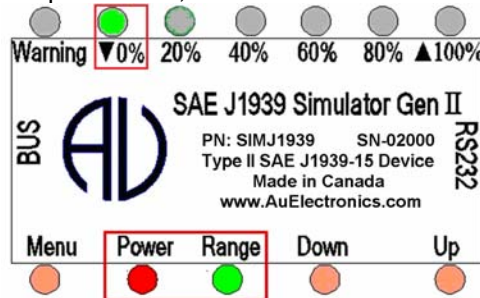


Figure 3-3

- When control step value equals to 20%, 20% LED blinks.
- If keep pressing **Up** button, the control step value will keep increasing. The 20% LED will then be always on, as shown in Figure 3-4. This indicates a data range from 21- 39%.

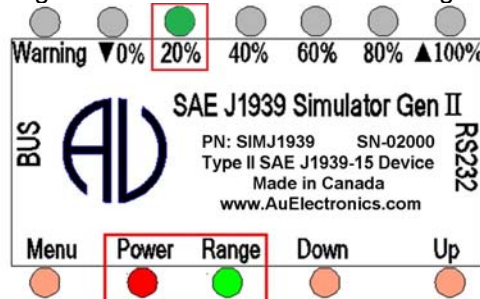


Figure 3-4

- When control step value equals to 40%, 40% LED blinks.
- If keep pressing **Up** button, the control step value will keep rising, 20% and 40% LED will be always on, as shown in Figure 3-5. It indicates the data range from 41% to 59%.



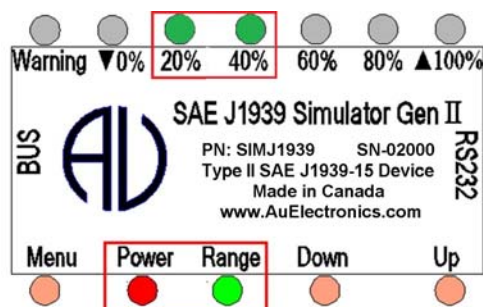


Figure 3-5

- When control step value equals to 60%, 60% LED blinks
- If keep pressing **Up** button, the control step value will keep rising, the 20%, 40%, and 60% LED will be on, as shown in Figure 3-6, it indicates the data range from 61% to 79%.

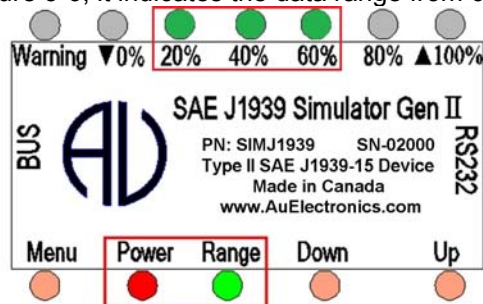


Figure 3-6

- When control step value equals to 80%, 80% LED blinks.
- If keep pressing **Up** button, the control step value will keep rising, 20%, 40%, 60%, and 80% LED will be on, as shown in Figure 3-7, it indicates the data range from 81% to 99%.

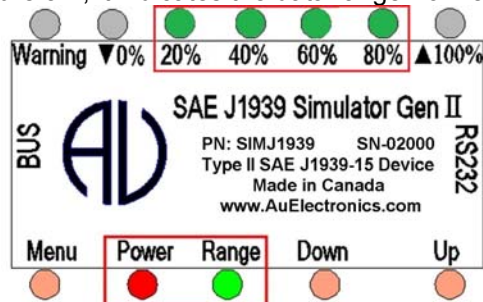


Figure 3-7

- When control step value equals to 100%, 20%, 40%, 60%, and 80% LED will be constant on. ▲ 100% LED blinks, as shown in Figure 3-8.

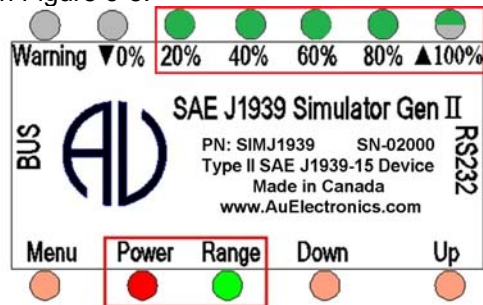


Figure 3-8

- ▼0% LED will be on or off when pressing **Down** button, accompany with the decreasing brightness of Range LED. A press on the **Down** button will also decrease the control step value and all simulated data. When the control step value equals to 0%, ▼0% LED blinks.
- When CAN bus is off, three LED (▼0% LED, ▲100% LED, and Range LED) blinks, as shown in Figure 3-9.

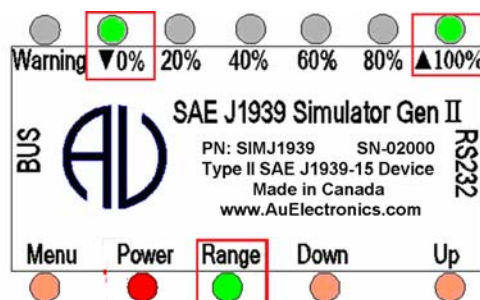


Figure 3-9

The control step value LED indicator status is summarized in Table 3-2.

Table 3-2 Control step value vs. LED indicator status (in Static Mode)

| Step | Operation   | LED Status  |
|------|---|---|
| 1    | Connect <b>+12~+14.2 V DC</b> power supply                      | <b>Power, Range</b> LED on, the rest LED will recall the last saved status in Static mode |
| 2    | Press <b>Down</b> button  | <b>▼0%</b> LED on/off   |
| 3    | Continue press <b>Down</b> button until the control step = 0%   | <b>▼0%</b> LED blink  |
| 4    | Press <b>Up</b> button  | <b>▲100%</b> LED on/off   |
| 5    | Continue press <b>Up</b> button for control step from 1 to 19%  | <b>Power, Range</b> LED constant on   |
| 6    | Continue press <b>Up</b> button for control step = 20%          | <b>Power, Range</b> LED on, <b>20%</b> LED Blink  |
| 7    | Continue press <b>Up</b> button for control step from 21 to 39% | <b>Power, Range</b> LED on, <b>20%</b> LED on   |
| 8    | Continue press <b>Up</b> button for control step = 40%          | <b>Power, Range, 20%</b> LED ON, <b>40%</b> LED Blink                                     |
| 9    | Continue press <b>Up</b> button for control step from 41 to 59% | <b>Power, Range, 20%, 40%</b> LED on  |
| 10   | Continue press <b>Up</b> button for control step = 60%          | <b>Power, Range, 20%, 40%</b> LED on, <b>60%</b> LED blink                                |
| 11   | Continue press <b>Up</b> button for control step from 61 to 79% | <b>Power, Range, 20%, 40%, 60%</b> LED on   |
| 12   | Continue press <b>Up</b> button for control step = 80%          | <b>Power, Range, 20%, 40%, 60%</b> LED on, <b>80%</b> LED blink                           |
| 13   | Continue press <b>Up</b> button for control step from 81 to 99% | <b>Power, Range, 20%, 40%, 60%, 80%</b> LED on  |
| 14   | Continue press <b>Up</b> button for control step = 100%         | <b>Power, Range, 20%, 40%, 60%, 80%</b> LED on, <b>▲100%</b> blink                        |
| 15   | Press & hold <b>Menu + Up + Down</b> to switch CAN bus on/off   | <b>▼0%, ▲100%, Range</b> LED blink  |

## Chapter - 4 Au J1939 Simulator Remote Terminal GUI

The Remote Terminal Graphic User Interface(GUI) includes a control panel and a display panel. The control panel is located on the left side, while the display panel is located on the right side. The display panel is applicable only for “Plus” editions and “Script” editions of Au SAE J1939 Simulator. It displays engine, ABS, Transmission information, warning lamp, etc. Figure 4-1 shows Remote Terminal GUI for Au SAE J1939 Simulator Gen II 1.00A **vehicle platinum script** edition. All features are active.

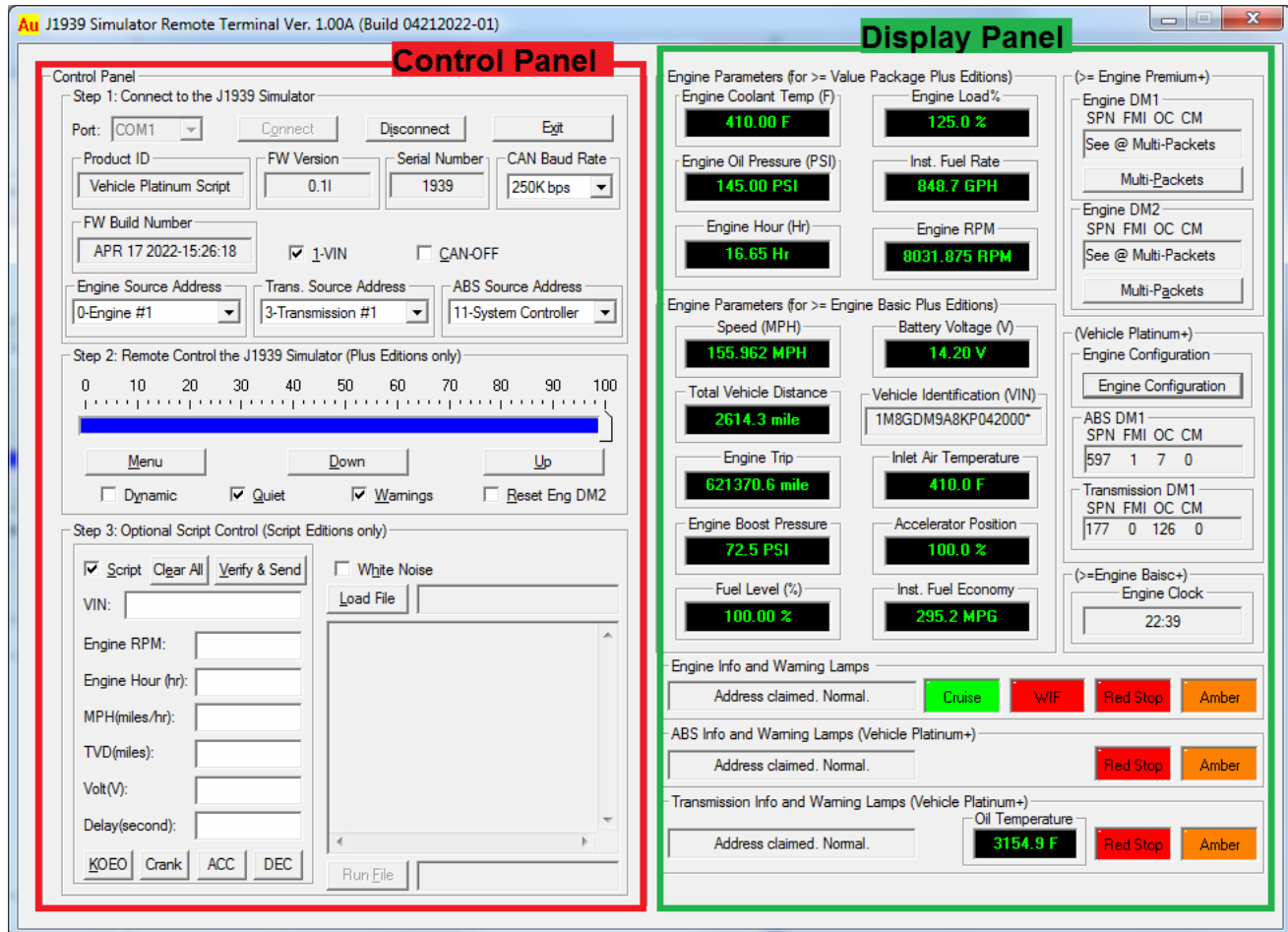


Figure 4-1

Au J1939 Simulator Remote Terminal structure is summarized in Figure 4-2.

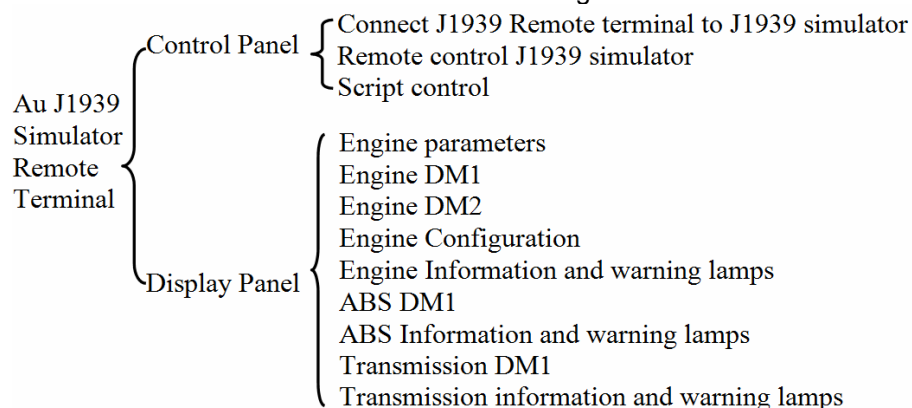


Figure 4-2

Following paragraphs will explain Au J1939 Simulator 1.00A remote terminal GUI in details.

#### 4.1 Control Panel – Step 1: Connect to J1939 Simulator

Typical connection of Au J1939 Simulator in a J1939 network is illustrated in Chapter 1, Figure 1-3.

- Connect the simulator to power supply and a CAN network, and then connect it to PC serial port.
- Select correct serial port from the “Port” drop down list, click “Connect” button.

Product information about the connected J1939 simulator, such as Product ID, FW version, Serial Number, CAN Baud Rate, FW Build number, and Source addresses will show up, 1-VIN switch, CAN-OFF switch, and Source Address settings will recall the last saved status, as shown in Figure 4-3.

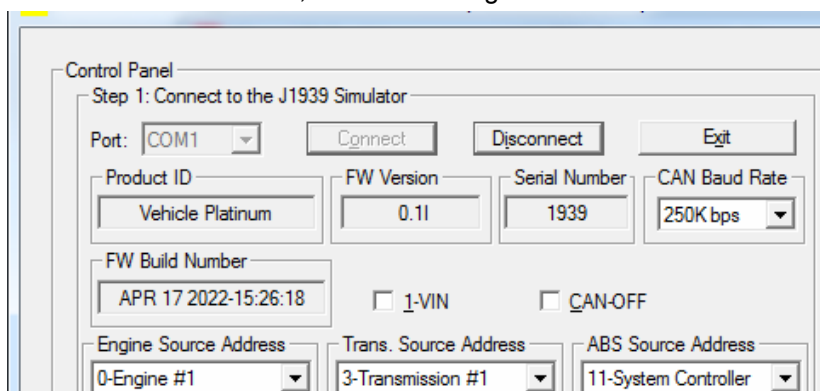


Figure 4-3

**Note:** Control panel step 1 is available for all editions of Au J1939 simulator (non-plus, plus and script editions).

##### 4.1.1. Device Information

The function of step 1 control items is summarized in Table 4-1

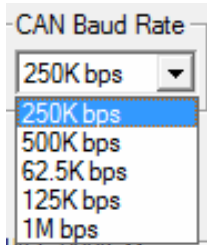
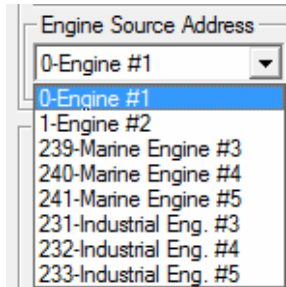
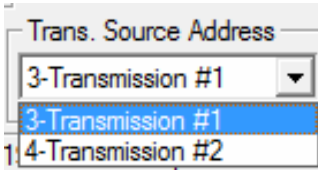
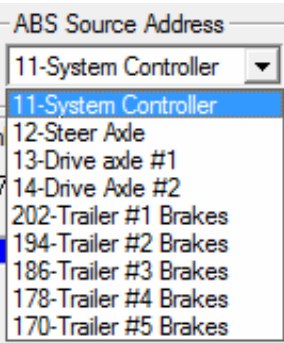
Table 4-1 Function summary of step 1 control items

| Items           | Function  |
|-----------------|---|
| Port            | Serial port can be selected from drop down list (COM1 to COM16)   |
| Connect         | Click “Connect” button to connect J1939 simulator with selected PC serial port.   |
| Disconnect      | Click “Disconnect” button to release the selected PC serial port.   |
| Exit            | Click “Exit” button to close the J1939 remote terminal GUI  |
| Product ID      | Display the current edition of J1939 simulator (Vehicle Platinum non-plus Edition)  |
| FW Version      | Display the current version of J1939 simulator that’s hooked up with the serial port. (0.11)  |
| Serial Number   | Display the serial number of J1939 simulator that’s connected to the serial port. (SN = 1939)   |
| FW Build Number | Display the firmware build number. (FW is APR 17 2022-15:26:18)   |
| 1-VIN           | If checked, VIN will be a fixed VIN, if unchecked, VIN changes as control step changes.   |
| CAN-OFF         | If checked, CAN bus will be turned off, <i>Script command "AT CANBUS=0"</i><br>if unchecked, CAN bus will be turned on. <i>Script command "AT CANBUS=1"</i> |

##### 4.1.2. CAN Baud Rate and Source Address Settings

- Default CAN baud rate is 250K bps, other CAN baud rate can be selected from the drop-down list.
- Default engine source address is 0, other engine source addressees can be selected from the drop-down list.
- Default transmission source address is 3, other engine source addressees can be selected from the drop-down list.
- Default ABS source address is 11, other engine source addressees can be selected from the drop-down list.

Table 4-2 Au J1939 Simulator CAN Baud rate and Source Address Settings

| CAN Baud Rate   | Engine Source Address   | Trans. Source Address  | ABS Source Address  |
|---|---|--|---|
| <p>Au J1939 simulator can be configured to one of the following 5 CAN Baud Rate:</p> <p>62.5K bps<br/>125K bps<br/>250K bps<br/>500K bps<br/>1M bps</p>  | <p>8 Engine SA are available to choose from:</p> <p>0 - Engine #1<br/>1 - Engine #2<br/>239 -Marine Engine #3<br/>240 -Marine Engine #4<br/>241 -Marine Engine #5<br/>231 -Industrial Engine #3<br/>232 -Industrial Engine #4<br/>233 -Industrial Engine #5</p>  | <p>8 transmission SA are available to choose from:</p> <p>3 - Transmission #1<br/>4 - Transmission #2</p>  | <p>9 ABS SA are available to choose from:</p> <p>11 - System Controller<br/>12 - Steer Axle<br/>13 - Drive Axle #1<br/>14 - Drive Axle #2<br/>202-Trailer #1 Brakes<br/>194-Trailer #2 Brakes<br/>186-Trailer #3 Brakes<br/>178-Trailer #4 Brakes<br/>170-Trailer #5 Brakes</p>  |

## 4.2 Control Panel – Step 2: Remote control Au J1939 Simulator

Remote control includes 1 scale bar, 3 push buttons (**Menu**, **Down**, **Up**), and 4 check boxes (**Dynamic**, **Quite**, **Warnings**, **Reset Eng DM2**), as shown in Figure 4-4. These tools are able to remote control the output/simulated signal of the Au J1939 Simulator **Plus** editions and **Script** editions from a PC. **Note:** The "**Warning**" Check box and the "**Menu**" push button are not applicable in Value Package edition(s) and Engine Basic edition(s).

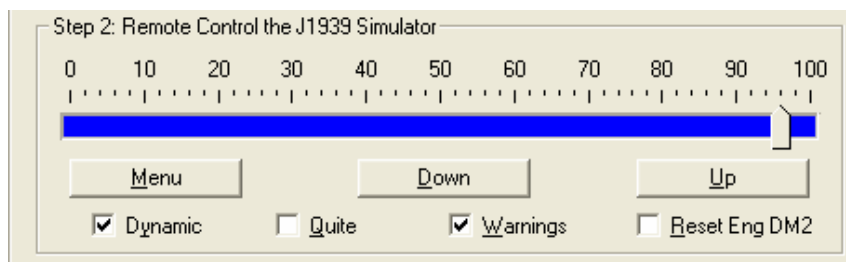


Figure 4-4

The scale bar represents the control step values from 0 to 100. The sliding action can be made by 4 methods: keyboard, mouse or Down/Up buttons from remote terminal, or the Down/Up push button on the device. They are summarized in Table 4-3

Table 4-3 Control Methods for Slide Bar

|                          | Action      | Function   |
|--------------------------|-------------|--|
| Mouse                    | Left Click  | Left click bring the slide to the desire location            |
|                          | Drag        | Click and hold left button drag the slide to desire location |
| Keyboard                 | ▲ or ►      | Increase the scale range in 1 interval                       |
|                          | ▼ or ◀      | Decrease the scale range in 1 interval                       |
|                          | Pg Up       | Increase the scale range in 10 interval                      |
|                          | Pg Dn       | Decrease the scale range in 10 interval                      |
| Remote terminal / Device | Down button | Decrease the scale range in 1 interval                       |
|                          | Up button   | Increase the scale range in 1 interval                       |



The function for the 3 push buttons and 4 check boxes is listed in Table 4-4.

Table 4-4 Functions for push button and check boxes in step 2

| Tool      |               | Function                                    |
|-----------|---------------|---|
| Button    | Menu          | Turn on/off warning (see <b>note</b> below) |
|           | Down          | Decrease the control step value in 1        |
|           | Up            | Increase the control step value in 1        |
| Check box | Dynamic       | Switch between dynamic mode / static mode   |
|           | Quiet         | Turn on/off buzzer                          |
|           | Warning       | Turn on/off Eng/ABS/Trans DM1 warnings      |
|           | Reset Eng DM2 | Turn on/reset all Engine DM2 code           |

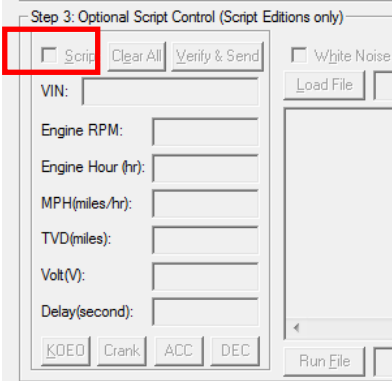
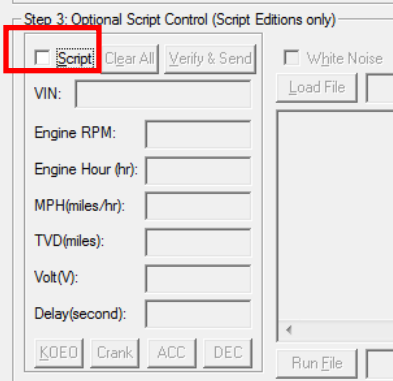
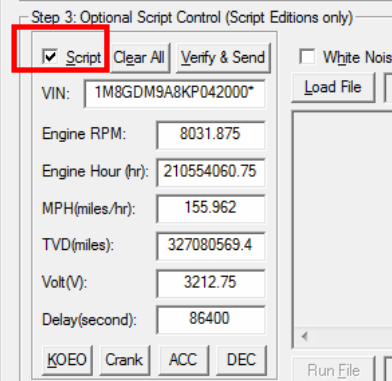
**Note:** Menu button is active only in the **Engine Premium Plus / Script** edition and **Vehicle Platinum Plus / Script** edition.

### 4.3 Control Panel – Step 3: Script control

#### 4.3.1 Turn On Script control

- Script control capabilities are available for 3 script editions only: Engine Basic Script Edition, Engine Premium Script Edition, Vehicle Platinum Script Edition.
- When Script control is available, it can be switched on/off. When script control is not available or is turned off, all supported J1939 parameters are controlled by the step value.
- When script control is turned on, six J1939 parameters will be controlled by the input value of script control, all the other J1939 parameters will still be controlled by step value.

Table 4-5 Script Control

| Script control is not available  | Script control is turned off  | Script control is turned on  |
|--|---|--|
|  <p>All parameters controlled by step control</p> |  <p>All parameters controlled by step control</p> |  <p>6 parameters controlled by Script control inputs, all other parameters controlled by step control</p> |

#### 4.3.2 Generate Script Command

- When script control is enabled, 6 parameters will be controlled by script control, the maximum allowed values will be showing in its input area respectively.
- Click "Clear All" button will clear all values in the input area, it has no effect on the simulator.
- Change the inputs to a desired value.
- Click "Verify & Send" button, script command will be sent to J1939 Simulator, those value change will be reflected on the display panel.
- Script command can be copied as part of a script file, which can be saved and run at later time.

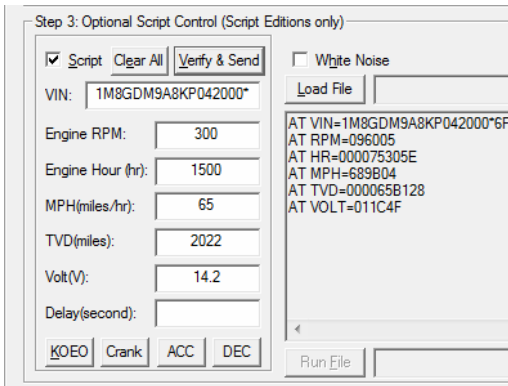


Figure 4-5

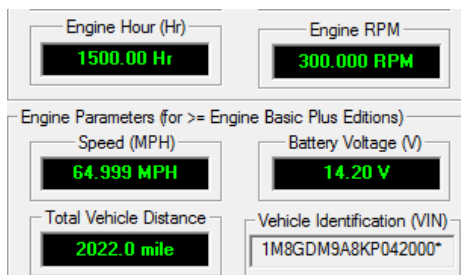


Figure 4-6

Input value of each parameters must be valid within the following range, it will be verified and send when "Verify & Send" button is clicked. If no desire to change a particular parameter, just leave the input area blank.

Table 4-6 Valid input values of script controlled parameters

| Script Controlled Parameters         | Min. Input Value   | Max. Input Value |
|--------------------------------------|--|------------------|
| VIN                                  | VIN must consist of 17 digits and followed by a "*" delimiter. |                  |
| Engine RPM                           | 0  | 8031.875         |
| Engine Hour (hours)                  | 0  | 210554060.75     |
| MPH (mile/hour)                      | 0  | 155.962          |
| TVD (Total Vehicle Distance) (miles) | 0  | 327080569.4      |
| Voltage (volts)                      | 0  | 3212.75          |
| Delay (seconds)                      | 1  | 86400 (24 hours) |

- Delay is the time that specify how many seconds to wait before running another script command. If delay time is not set, all script commands will run once and then remain at those values except for Engine Hour and TVD..
- The input of Engine hour and Total vehicle distance will change their initial values, both Engine Hour and Total Vehicle Distance will accumulate over time.

### 4.3.3 Script Syntax for Au J1939 Simulator

- Each line of script end with \r\n,
- All line comments are preceded by a semicolon (;)
- Always use the script commands generated by Au J1939 Simulator Script generator as any other script may not work properly. For example, the script generated from Au J1708 Simulator will not work for Au J1939 Simulator and vice versa.

Table 4-7 Script Syntax for Au J1939 Simulator

| Keyword    | Script command Syntax and Format  | Example                     |
|------------|---|-----------------------------|
| ;          | Line comment are preceded by a semicolon (;)  | ;Cranking Profile           |
| CANBUS     | CAN bus on/off control<br>0: CAN bus is off, 1: CAN bus is on   | AT CANBUS=0                 |
|            |   | AT CANBUS=1                 |
| WHITENOISE | White noise on/off control<br>0: white noise is off, 1: white noise is on   | AT WHITENOISE=0             |
|            |   | AT WHITENOISE=1             |
| RPM        | AT RPM=aabbef\r\n - script command to set Engine Speed  | AT RPM=3F70F3               |
| MPH        | AT MPH=aabbef\r\n - script command to set Vehicle Speed   | AT MPH=337F64               |
| VOLT       | AT VOLT=aabbef\r\n - script command to set Battery voltage  | AT VOLT=00FC0E              |
| TVD        | AT TVD=aabbccdd\r\n - command to set Total vehicle Distance   | AT TVD=000065B128           |
| HR         | AT HR=aabbccdd\r\n - script command to set Engine Hour  | AT HR=000075305E            |
| VIN        | AT VIN=abcd... - script command to set VIN (17 characters with a *)   | AT VIN=1M8GDM9A8KP042000*6F |
| DELAY      | DELAY(t) -- The last status will stay unchanged for t seconds   | DELAY(1)                    |
| REPEAT     | REPEAT(n){ ...}<br>The script commands enclosed between a pair of bracelets will repeat for n times, Repeat feature can be nested up to 10 levels | REPEAT(5){<br>... ..<br>}   |

#### 4.3.4 Example of script command segments

To help forming script file, Script control also provides 4 buttons that generate 4 most commonly used script command segments. There segments can be copied and modified, then saved as a script file with extension of \*.txt.

Table 4-8 Script Command Segments

| KOEO<br>(Key On Engine Off)   | Crank   | ACC (MPH accelerating)  | DCC (MPH decelerating)  |
|---|---|---|---|
| <pre> ;KOEO Profile ;===== ;Turn off CAN bus ;AT CANBUS=0 ;===== ;Turn on CAN bus ;AT CANBUS=1 ;===== ;Turn on White Noise ;AT WHITENOISE=1 ;===== ;Turn off White Noise ;AT WHITENOISE=0 ;===== ;Repeat block function for 5 times ;Repeat feature can be nested up to 10 levels REPEAT(5){   ... .. } ;===== ;Key On Engine Off. RPM=0; MPH=0; Volt=12.6V; ;===== AT RPM=0000F5 AT MPH=000096 AT VOLT=00FC0E </pre> | <pre> ;Cranking Profile ;===== ;MPH=0 AT MPH=000096 ;===== ;RPM=0, Volt=12.6V, delay 1s, AT RPM=0000F5 AT VOLT=00FC0E DELAY(1) ;===== ;RPM=400, Volt=11.4V, delay 1s, AT RPM=0C8044 AT VOLT=00E40F DELAY(1) ;===== ;RPM=800, Volt=4.2V, delay 1s, AT RPM=190055 AT VOLT=005400 DELAY(1) ;===== ;RPM=1200, Volt=13.8V, delay 1s, AT RPM=258005 AT VOLT=011430 DELAY(1) ;===== ;RPM=650, Volt=14.2V, delay 1s, AT RPM=145055 AT VOLT=011C4F DELAY(1) </pre> | <pre> ;Accelerate Profile ;===== ;RPM=650, MPH=0, delay 1s, AT RPM=145055 AT MPH=000096 DELAY(1) ;===== ;RPM=880, MPH=8, delay 1s, AT RPM=1B8044 AT MPH=0CDFC2 DELAY(1) ;===== ;RPM=1110, MPH=16, delay 1s, AT RPM=22B094 AT MPH=19BF73 DELAY(1) ;===== ;RPM=1340, MPH=24, delay 1s, AT RPM=29E0F3 AT MPH=269F24 DELAY(1) ;===== ;RPM=1570, MPH=32, delay 1s, AT RPM=3110A5 AT MPH=337F64 DELAY(1) ;===== ;RPM=1800, MPH=40, delay 1s, AT RPM=384005 AT MPH=405FA4 DELAY(1) ;===== ;RPM=2030, MPH=48, delay 1s, AT RPM=3F70F3 AT MPH=4D3F83 DELAY(1) ;===== ;RPM=2260, MPH=56, delay 1s, AT RPM=46A044 AT MPH=5A1FC3 DELAY(1) ;===== ;RPM=2500, MPH=65, delay 1s, AT RPM=4E2044 AT MPH=689B04 DELAY(1) </pre> | <pre> ;Decelerate Profile ;===== ;RPM=2500, MPH=65, delay 1s, AT RPM=4E2044 AT MPH=689B04 DELAY(1) ;===== ;RPM=2260, MPH=56, delay 1s, AT RPM=46A044 AT MPH=5A1FC3 DELAY(1) ;===== ;RPM=2030, MPH=48, delay 1s, AT RPM=3F70F3 AT MPH=4D3F83 DELAY(1) ;===== ;RPM=1800, MPH=40, delay 1s, AT RPM=384005 AT MPH=405FA4 DELAY(1) ;===== ;RPM=1570, MPH=32, delay 1s, AT RPM=3110A5 AT MPH=337F64 DELAY(1) ;===== ;RPM=1340, MPH=24, delay 1s, AT RPM=29E0F3 AT MPH=269F24 DELAY(1) ;===== ;RPM=1110, MPH=16, delay 1s, AT RPM=22B094 AT MPH=19BF73 DELAY(1) ;===== ;RPM=880, MPH=8, delay 1s, AT RPM=1B8044 AT MPH=0CDFC2 DELAY(1) ;===== ;RPM=650, MPH=0, delay 1s, AT RPM=145055 AT MPH=000096 DELAY(1) </pre> |

#### 4.3.5 Run script from a file

- Click "Load File" to load a script file

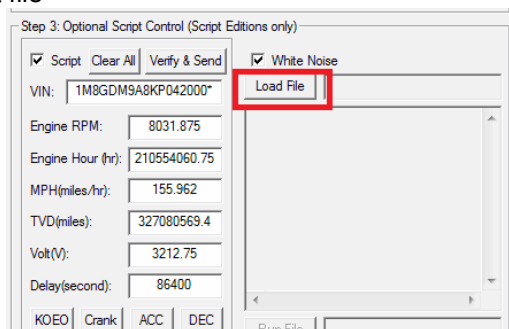


Figure 4-7

- Select a desire script file, click "Open"

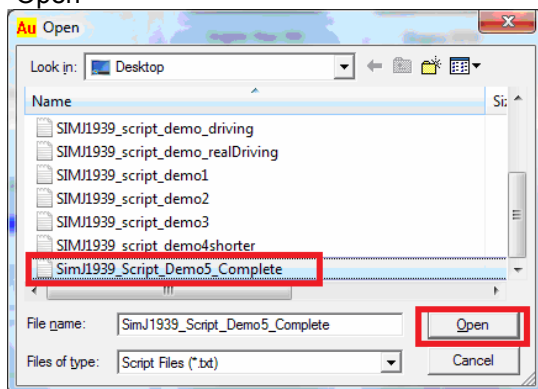


Figure 4-8

- Loaded script file name will display, script commands in the script file will display in the script view-port. Click "Run File" button to run script file.

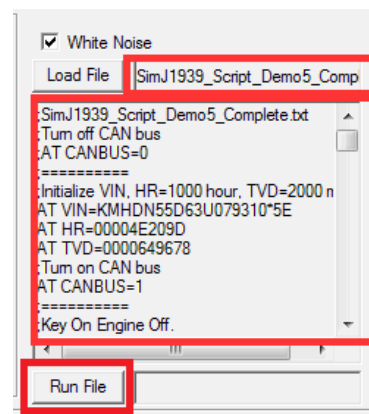


Figure 4-9

- Current running script command will be highlighted in the script view-port. Script running status will display (for example, current command is delay, delay counting down timer is showing)

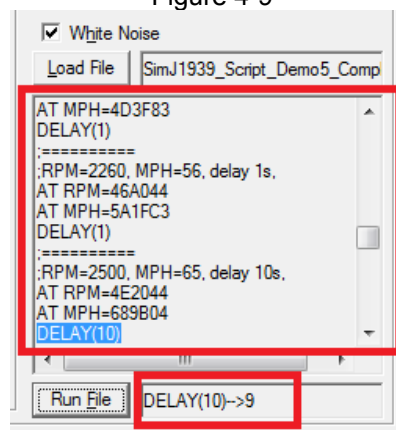


Figure 4-10

- When finish running, last command of the script file will be highlighted. "Script Finished Successfully" message will be showing as the running status

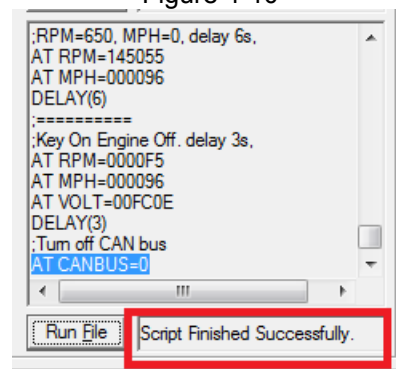


Figure 4-11

## 4.4 Display Panel

### 4.4.1. Value Package Parameters

SIMJ1939 1.00A Value Package plus edition display the following 6 engine parameters, as shown in figure 4-11.

- Engine coolant temperature
- Engine load percentage (%)
- Engine oil pressure (PSI)
- instant fuel economy (MPG)
- Engine hour (Hr)
- Engine Speed(RPM)

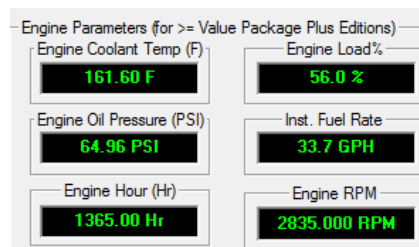


Figure 4-12

### 4.4.2. Engine Basic Parameters

SIMJ1939 1.00A Engine Basic plus edition display the following 17 engine parameters, as shown in Figure 4-12:

- Engine Speed(RPM)
- Engine oil pressure (PSI)
- Engine hour (Hr)
- Engine load percentage (%)
- Instant fuel rate (GPH)
- Engine coolant temperature (F)
- Vehicle speed (MPH)
- Accelerator position (%)
- Battery voltage (V)
- Fuel level (%)
- Engine boost pressure (PSI)
- Inlet air temperature (F)
- Instant fuel economy (MPG)
- Engine trip (mile)
- Total vehicle distance (mile)
- Engine clock (HH:MM)
- Vehicle Identification Number (VIN)

**Note:** Engine Clock is not controlled by the control step value, it runs by itself like a real clock, and can be setup by PGN 54528.

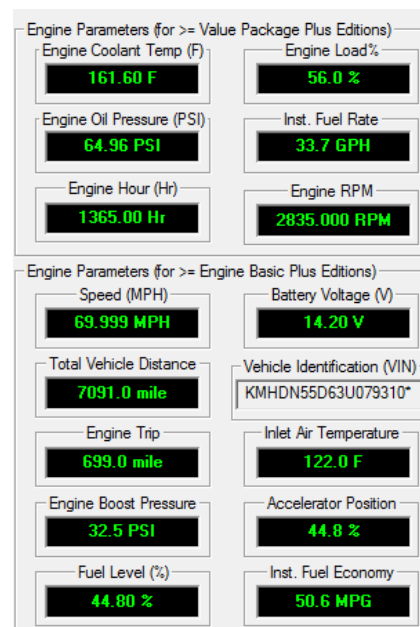


Figure 4-13

### 4.4.3. Engine DM1

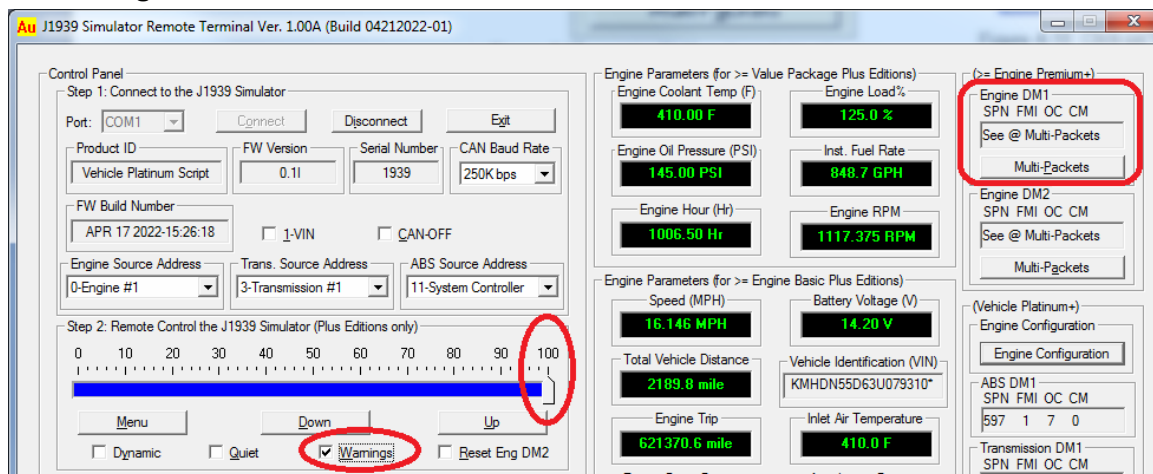


Figure 4-14

- Engine DM1 Multi-Packets will be available when both of the following two conditions are met :
  - Warning is on
  - Control step value is 100



- If Engine DM1 or DM2 warning is off, a SAE defined non-warning message will be shown as (0,0,0,0).
- Engine DM1 message could be single packet (without warning or with 1 warning) or multi-packet.
- When engine DM1 is a single packet message, SPN, FMI, OC, CM will display.
- when engine DM1 is a multi-packet message, “see @ Multi-Packets” will display, “Multi-packets” button will be active , click on it, the whole list of engine DM1 will display (Figure 4-15).

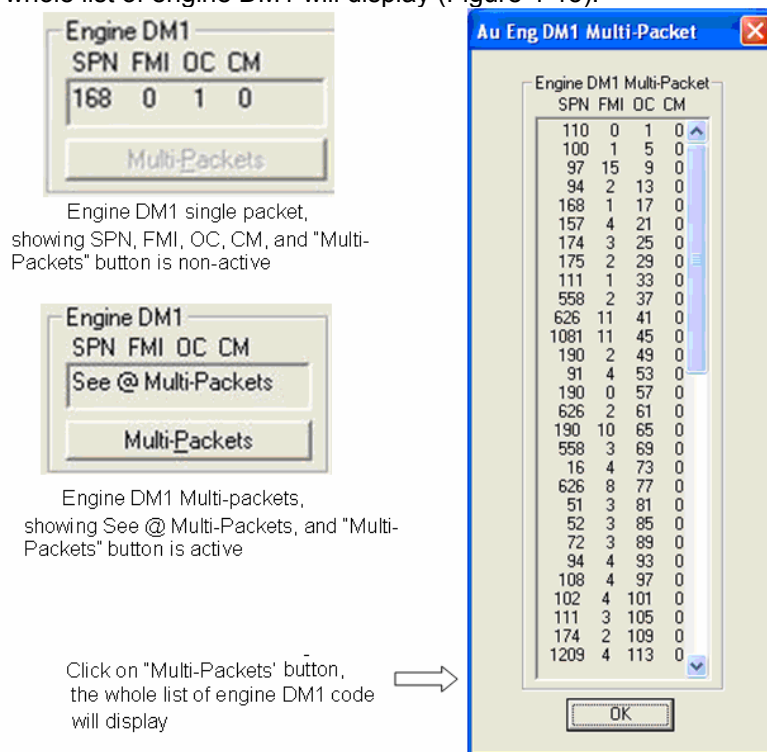


Figure 4-15

Detail data information of engine DM1 multi-packet is showing in Table 4 – 9 to 4 – 12.

Table 4 – 9 Engine DM1 Multi-Packets (1 – 16)

|     | 1   | 2   | 3  | 4  | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12   | 13  | 14 | 15  | 16  |
|-----|-----|-----|----|----|-----|-----|-----|-----|-----|-----|-----|------|-----|----|-----|-----|
| SPN | 110 | 100 | 97 | 94 | 168 | 157 | 174 | 175 | 111 | 558 | 626 | 1081 | 190 | 91 | 190 | 626 |
| FMI | 0   | 1   | 15 | 2  | 1   | 4   | 3   | 2   | 1   | 2   | 11  | 11   | 2   | 4  | 0   | 2   |
| OC  | 1   | 5   | 9  | 13 | 17  | 21  | 25  | 29  | 33  | 37  | 41  | 45   | 49  | 53 | 57  | 61  |
| CM  | 0   | 0   | 0  | 0  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0    | 0   | 0  | 0   | 0   |

Table 4 – 10 Engine DM1 Multi-packets (17 – 32)

|     | 17  | 18  | 19 | 20  | 21 | 22 | 23 | 24 | 25  | 26  | 27  | 28  | 29   | 30   | 31  | 32  |
|-----|-----|-----|----|-----|----|----|----|----|-----|-----|-----|-----|------|------|-----|-----|
| SPN | 190 | 558 | 16 | 626 | 51 | 52 | 72 | 94 | 108 | 102 | 111 | 174 | 1209 | 2791 | 176 | 175 |
| FMI | 10  | 3   | 4  | 8   | 3  | 3  | 3  | 4  | 4   | 4   | 3   | 2   | 4    | 3    | 2   | 3   |
| OC  | 65  | 69  | 73 | 77  | 81 | 85 | 89 | 93 | 97  | 101 | 105 | 109 | 113  | 117  | 121 | 125 |
| CM  | 0   | 0   | 0  | 0   | 0  | 0  | 0  | 0  | 0   | 0   | 0   | 0   | 0    | 0    | 0   | 0   |

Table 4 – 11 Engine DM1 Multi-Packets (33 – 48)

|     | 33  | 34  | 35  | 36  | 37  | 38  | 39  | 40  | 41  | 42  | 43  | 44  | 45  | 46  | 47  | 48  |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| SPN | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 |
| FMI | 0   | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  |
| OC  | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   |
| CM  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |

Table 4 – 12 Engine DM1 Multi-Packets (49 – 64)

|            | 49  | 50  | 51  | 52  | 53  | 54  | 55  | 56  | 57  | 58  | 59  | 60  | 61  | 62  | 63  | 64  |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| <b>SPN</b> | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 | 102 |
| <b>FMI</b> | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23  | 24  | 25  | 26  | 27  | 28  | 29  | 30  | 31  |
| <b>OC</b>  | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1   |
| <b>CM</b>  | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   | 0   |

#### 4.4.4. Engine DM2

- Engine DM2 message could be a single packet or multi-packet.
- If engine DM2 is a single packet, SPN, FMI, OC, CM will display.
- Engine DM2 Multi-Packets will be available when control step = 100.

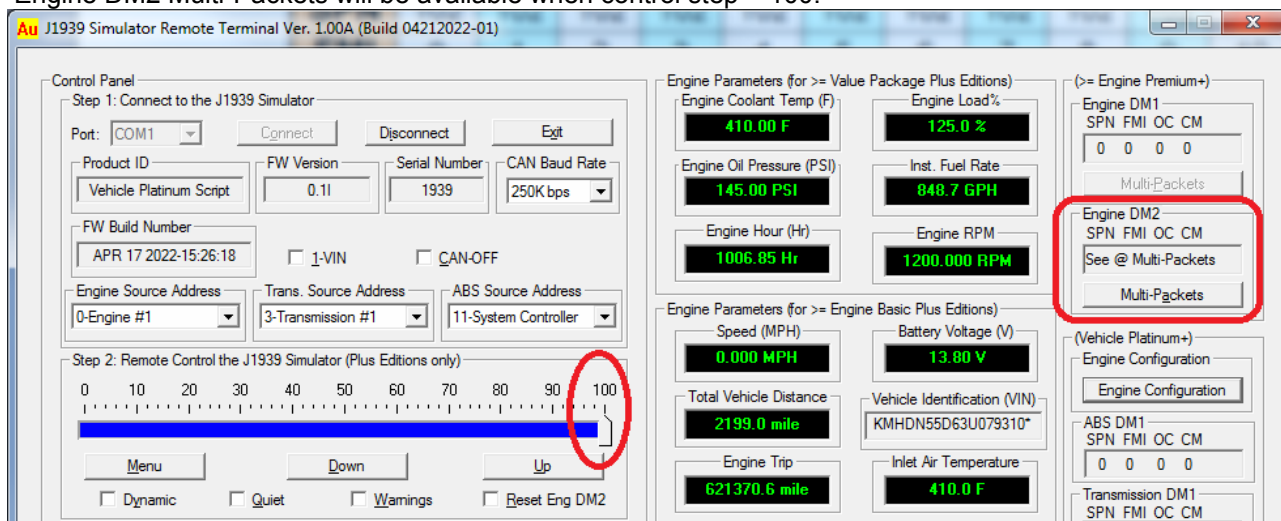


Figure 4-16

- If engine DM2 is a multi-packet, "see @ Multi-Packets" will display, "Multi-packets" button will be active (Figure 4-16), Click on it, the whole list of engine DM2 will display (Figure 4-17).
- \*Note: The "Multi-Packets" buttons are used as a trigger for a pop-up sub-window which will display all DM1/DM2 code. It is not used to turn on/off Multi-Packets DM1/DM2.
- When "Reset Eng DM2" is checked, Engine DM2 will be reset to 0.

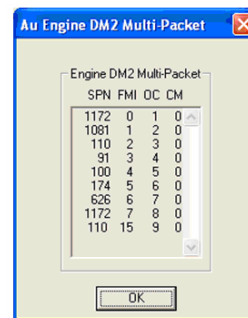


Figure 4-17

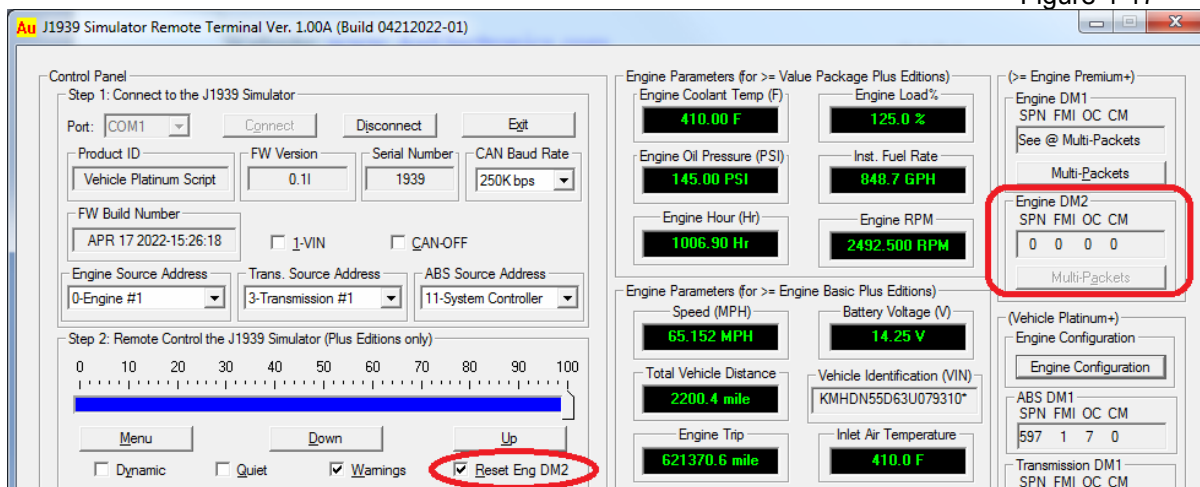


Figure 4-18

#### 4.4.5. Engine Configuration

- Engine Configuration PGN includes 39 bytes of messages, which require transport protocol for multi-packet communication.
- "Engine Configuration" button will be active on the remote terminal GUI for Vehicle Platinum editions, as shown in Figure 4 - 19.

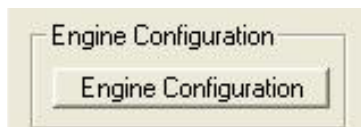


Figure 4-19

Click on "Engine Configuration" button, detail information will show up, as shown in Figure 4-20.

**Au Engine Configuration**

Point 1:  
 Engine Speed At Idle, Point 1 (SPN 188) : 700 RPM  
 Engine Percent Torque At Idle, Point 1 (SPN 539) : 10%

Point 2:  
 Engine Speed At Point 2 (SPN 528) : 3600 RPM  
 Engine Percent Torque At Point 2 (SPN 540) : 5%

Point 3:  
 Engine Speed At Point 3 (SPN 529) : 1500 RPM  
 Engine Percent Torque At Point 3 (SPN 541) : 40%

Point 4:  
 Engine Speed At Point 4 (SPN 530) : 2000 RPM  
 Engine Percent Torque At Point 4 (SPN 542) : 60%

Point 5:  
 Engine Speed At Point 5 (SPN 531) : 2500 RPM  
 Engine Percent Torque At Point 5 (SPN 543) : 95%

Point 6 and Kp:  
 Engine Speed At High Idle, point 6 (SPN 532) : 4000 RPM  
 Engine Gain (Kp) Of The Endspped Governor (SPN 545) : 40

Point 7 (Engine Maximum Momentary Override) Speed and Time:  
 Engine Max. Momentary Override Speed, Point 7 (SPN 533) : 4200 RPM  
 Engine Maximum Momentary Override Time Limit (SPN 534) : 5.0S

Engine Reference Torque :  
 Engine Reference Torque (SPN 544): 3000 Nm

Engine Requested Speed Control Range:  
 Engine Requested Speed Control Range Lower Limit (SPN 535) : 550 RPM  
 Engine Requested Speed Control Range Upper Limit (SPN 536) : 2400 RPM

Engine Requested Torque Control Range:  
 Engine Requested Torque Control Range Lower Limit (SPN 537) : 0%  
 Engine Requested Torque Control Range Upper Limit (SPN 538) : 75%

Engine Moment of Inertia and Default Torque:  
 Engine Moment of Inertia (SPN 1794) : 50 kg-m2  
 Engine Default Torque Limit (SPN 1846) : 16000 Nm

Engine Extended Range Requested Speed Control Range Upper Limit:  
 eng. ext. range requested speed control range upper limit (SPN1712) : 3600 RPM

Byte 35-40  
 Support Variable Rate TSC1 Message (SPN 3344) : 0B0000 0000  
 Support TSC1 Control Purpose Group 2 (SPN 3346) : 0B1111 1111  
 Support TSC1 Control Purpose Group 4 (SPN 3348) : 0B1111 1111  
 Support TSC1 Control Purpose Group 1 (SPN 3345) : 0B1110 0000  
 Support TSC1 Control Purpose Group 3 (SPN 3347) : 0B1111 1111  
 Engine Default Idle Torque Limit (SPN 7828) : 5%

OK

Figure 4-20

#### 4.4.6. ABS DM1 and Transmission DM1

Both ABS DM1 and Transmission DM1 are single-packet PGN.

Table 4 – 13 ABS and Transmission DM1

|                  | Warning Off   | Warning On   |
|------------------|---|--|
| ABS DM1          | SAE defined non-warning message will show as (0,0,0,0)<br>    | A Brake Switch signal low warning will show as (597,1,7,0)<br> |
| Transmission DM1 | SAE defined non-warning message will show as (0, 0, 0, 0)<br> | A transmission warning will show as (177, 0, 126, 0)<br>       |

#### 4.4.7. Engine / ABS / Transmission Info and Warning Lamp

- Engine info and Warning Lamps

Display the engine address claiming information, 1 information lamp (Cruise lamp), and 3 warning lamps for engine (WIF - water in fuel, Red Stop, Amber). The warning lamps will turn on/off based on the scale range, see Table 4-4 to Table 4-7 for more information.



Figure 4-21

- ABS info and Warning Lamps

Display the ABS address claiming information and 2 warning lamps for ABS (Red Stop, Amber) (Figure 4-9).



Figure 4-22

- Transmission info and Warning Lamps

Display the transmission address claiming information, transmission oil temperature, and 2 warning lamps for transmission (Red Stop, Amber), as shown in Figure 4-10.

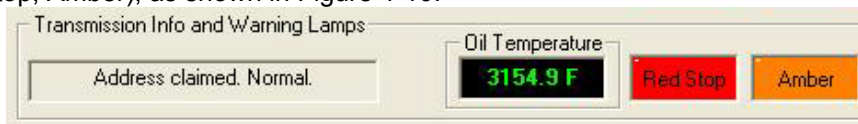


Figure 4-23

## Chapter - 5 Data Configuration

Table 5-1 Simulated result at control step value of 0%, 20%, 40%, 60%, 80%, and 100%.

| J1939 Parameters              | 0%   | 20%     | 40%     | 60%     | 80%    | 100%    |
|-------------------------------|------|---------|---------|---------|--------|---------|
| RPM (rpm)                     | 0    | 1606.38 | 3212.75 | 4819.13 | 6425.5 | 8031.88 |
| Engine Hour (Hr)              | 0    | 250     | 500     | 750     | 1000   | 999999  |
| Engine Oil Pressure (PSI)     | 0    | 29      | 58      | 87      | 116    | 145     |
| Engine Coolant Temp (F)       | -40  | 50      | 140     | 230     | 320    | 410     |
| Engine Load % (%)             | 0    | 25      | 50      | 75      | 100    | 125     |
| Instant Fuel Economy (MPG)    | 0    | 22.5    | 45      | 67.5    | 90     | 295.2   |
| Battery Voltage (V)           | 0    | 7.5     | 15      | 22.5    | 30     | 3212.75 |
| Fuel Level (%)                | 0    | 20      | 40      | 60      | 80     | 100     |
| Vehicle Speed (MPH)           | 0    | 31.19   | 62.38   | 93.58   | 124.77 | 155.96  |
| Total Vehicle Distance (mile) | 0    | 621.4   | 1242.7  | 1864.1  | 2485.5 | 621372  |
| Engine Boost Pressure (PSI)   | 0    | 14.5    | 29      | 43.5    | 58     | 72.5    |
| Instant Fuel Rate (GPH)       | 0    | 15      | 30      | 45      | 60     | 848.7   |
| Accelerator Position (%)      | 0    | 20      | 40      | 60      | 80     | 100     |
| Inlet Air Temp (F)            | -40  | 32      | 104     | 176     | 248    | 410     |
| Engine Trip (mile)            | 0    | 310.7   | 621.4   | 932.1   | 1242.7 | 621372  |
| Transmission Oil Temp (F)     | -459 | -40     | 104     | 248     | 392    | 3154.9  |
| Vehicle Identification (VIN)  | 0*   | ~020*   | ~030*   | ~060*   | ~080*  | *100*   |

### NOTE:

- Engine Clock is a self-running clock parameter, it will automatically change every minute.
- Transmission oil temp is only available for Vehicle Platinum editions.
- The first 14 digital bit of VIN number is "1M8GDM9A8KP042\*\*\*\*", the last 3-bit changes from 000 to 100, and end with a \* delimiter.

### 5.1 Warning simulation

Warning simulation is available for Engine Premium editions and Vehicle Platinum editions. It can be easily turned on / off. When warning is turned on, change the control step value will generate different warnings signals. The warning information will be displayed on the remote terminal GUI for plus editions and script editions. The specific warning message, SPN, and FMI are listed in Table 5-2 for reference.

Table 5-2 SAE J1939 Warning simulation result vs. controlled Steps

| Control Step | Warning Lamps  | Warning message  | SPN | FMI |
|--------------|--|--|-----|-----|
| 0%           | Engine Amber   | Low engine coolant level   | 111 | 1   |
| 1 - 9%       | Engine Amber   | Low battery electrical potential                                     | 168 | 1   |
| 10 - 19%     | Engine (Amber + Red Stop)  | Low battery electrical potential                                     | 168 | 1   |
| 20%          | Engine (Amber + WIF)   | Water in Fuel  | 97  | 15  |
| 21 - 29%     | Engine Amber   | Low engine oil pressure  | 100 | 1   |
| 30 - 39%     | Engine (Amber + Red Stop)  | Low engine oil pressure  | 100 | 1   |
| 40%          | Engine Amber   | High battery electrical potential                                    | 168 | 0   |
| 41 - 49%     | Engine Amber   | High engine coolant temperature                                      | 110 | 0   |
| 50 - 59%     | Engine (Amber + Red Stop)  | High engine coolant temperature                                      | 110 | 0   |
| 60%          | Engine Amber   | High engine oil pressure   | 100 | 0   |
| 61 - 69%     | ABS Amber  | Brake switch short   | 597 | 1   |
| 70 - 80%     | ABS (Amber + Red Stop)   | Brake switch short   | 597 | 1   |
| 81 - 89%     | Transmission Amber   | Transmission oil temperature high                                    | 177 | 0   |
| 90 - 99%     | Transmission (Amber + Red Stop)  | Transmission oil temperature high                                    | 177 | 0   |
| 100%         | Engine (WIF +Red Stop + Amber)<br>+ ABS (Red Stop + Amber)<br>+Transmission (Red Stop + Amber) | Engine DM1, DM2 multi-packets,<br>ABS DM1 on,<br>Transmission DM1 on |     |     |

When warning is turned off, all Engine/ABS/Transmission DM1 warning will be off.



## 5.2 Au SAE J1939 simulator 1.00A supported PGN and SPN

Table 5-3 List of Supported PGN and SPN supported by Au SAE J1939 simulator 1.00A

| PGN   | Description   | Parameters (SPN)  |
|-------|---|---|
| 54528 | Time/Date Adjust (TDA)                                      | Adjust minutes (1604), Adjust hours (1605)  |
| 59392 | Acknowledgment  | Positive Acknowledgment (ACK),<br>Negative Acknowledgment (NACK)  |
| 59904 | Request   | Parameter Group Number (PGN) being requested  |
| 60160 | Transport Protocol-Data Transfer (TP.DT)                    | Sequence Number, Packetized Data  |
| 60416 | Transport Protocol-Connection Management (TP.CM)            | Connection Mode Request to Send (TP.CM_RTS)<br>Connection Mode Clear to Send (TP.CM_CTS)<br>End of Message Acknowledgment (TP.CM_EndOfMsgACK)<br>Connection Abort (TP.Conn_Abort)<br>Broadcast Announce Message (TP.CM_BAM) |
| 60928 | Address Claimed Message                                     | N.A   |
| 61441 | Electronic Brake Controller 1 (EBC1)                        | EBS Red Warning Signal(1439)<br>ABS/EBS Amber Warning Signal (Powered Vehicle) (1438)   |
| 61442 | Electronic Transmission Controller 1 (ETC1)                 | Source Address of Controlling Device for Transmission Control (1482)  |
| 61443 | Electronic Engine Controller 2 (EEC2)                       | Accelerator Pedal Position 1 (91)<br>Engine Percent Load At Current Speed (92)  |
| 61444 | Electronic Engine Controller 1 (EEC1)                       | Engine Speed (190)  |
| 65226 | Active Diagnostic Trouble Codes (DTC) (DM1)                 | Red Stop Lamp, Amber Warning Lamp Status, Miscellaneous   |
| 65227 | Previously Active Diagnostic Trouble Codes (DM2)            | Red Stop Lamp, Amber Warning Lamp Status, Miscellaneous   |
| 65228 | Diagnostic data clear/reset of previously active DTCS (DM3) | On request using PGN 59904, See SAE J1939-21  |
| 65248 | Vehicle Distance (VD)                                       | Trip Distance (244)<br>Total Vehicle Distance (245)   |
| 65251 | Engine Configuration (EC)                                   | 188, 539, 528, 540, 529, 541, 530, 542, 531, 543, 532, 545, 544, 533, 534, 535, 536, 537, 538, 1712   |
| 65253 | Engine Hours, Revolutions (HOURS)                           | Engine Total Hours of Operation (247)   |
| 65254 | Time/Date (TD)  | Minutes (960), Hours (961)  |
| 65260 | Vehicle Identification (VI)                                 | Vehicle Identification Number (237)   |
| 65262 | Engine Temperature 1(ET1)                                   | Engine Coolant Temperature (110)  |
| 65263 | Engine Fluid Level/Pressure 1(EFL/P1)                       | Engine Oil Pressure (100)   |
| 65265 | Cruise Control/Vehicle Speed (CCVS)                         | Wheel-Based Vehicle Speed (84),<br>Cruise Control Active (595)  |
| 65266 | Fuel Economy (Liquid) (LFE)                                 | Engine Fuel Rate (183),<br>Engine Instantaneous Fuel Economy (184)  |
| 65270 | Inlet/Exhaust Conditions 1(IC1)                             | Engine Turbocharger Boost Pressure (102)<br>Engine Intake Manifold 1 Temperature (105)  |
| 65271 | Vehicle Electrical Power (VEP)                              | Electrical Potential (Voltage) (168),<br>Battery Potential (Voltage) Switched (158)   |
| 65272 | Transmission Fluids (TF)                                    | Transmission Oil Temperature (177)  |
| 65276 | Dash Display (DD)   | Fuel Level (96)   |
| 65279 | Water in Fuel Indicator (WFI)                               | Water In Fuel Indicator (97)  |

### 5.3 Transport Protocol for DM2 Request

As defined by SAE J1939-21, Au SAE J1939 simulator response to different “engine DM2 request” with different transport protocols (illustrated in Table 5-4).

Table 5 - 4 Transport Protocol for DM2 global/specific request

| Request          | Transport Protocol |
|------------------|--------------------|
| Global request   | TP.CM.BAM          |
|                  | TP.DT              |
| Specific request | TP.CM.RTS          |
|                  | TP.CM.CTS          |
|                  | TP.DT              |
|                  | TP.CM.EndofMessage |
|                  | TP.CM.Abort        |

### 5.4 Simulation result vs. control step value

The simulation result vs. control step value (from 0 to 100) is illustrated in Table 5-5 to Table 5-14.

Table 5 – 5 SAE J1939 Simulation result vs. control step values (from 1 to 10)

| Control Step                  | 0      | 1      | 2      | 3      | 4      | 5      | 6      | 7      | 8      | 9      | 10     |
|-------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| RPM (rpm)                     | 0.00   | 80.25  | 160.63 | 240.88 | 321.25 | 401.50 | 481.88 | 562.13 | 642.50 | 722.75 | 803.13 |
| (Hr)                          | 0.0    | 12.5   | 25.0   | 37.5   | 50.0   | 62.5   | 75.0   | 87.5   | 100.0  | 112.5  | 125.0  |
| Engine Oil Pressure (PSI)     | 0.00   | 1.16   | 2.90   | 4.06   | 5.80   | 6.96   | 8.70   | 9.86   | 11.60  | 12.76  | 14.50  |
| Engine Coolant Temp (F)       | -40.0  | -36.4  | -31.0  | -27.4  | -22.0  | -18.4  | -13.0  | -9.4   | -4.0   | -0.4   | 5.0    |
| Battery Voltage (V)           | 0.00   | 0.35   | 0.75   | 1.10   | 1.50   | 1.85   | 2.25   | 2.60   | 3.00   | 3.35   | 3.75   |
| Fuel Level (%)                | 0.0    | 0.8    | 2.0    | 2.8    | 4.0    | 4.8    | 6.0    | 6.8    | 8.0    | 8.8    | 10.0   |
| Vehicle Speed (MPH)           | 0.00   | 1.56   | 3.12   | 4.68   | 6.24   | 7.80   | 9.36   | 10.92  | 12.48  | 14.03  | 15.60  |
| Engine Boost Pressure (PSI)   | 0.0    | 0.6    | 1.4    | 2.0    | 2.9    | 3.5    | 4.3    | 4.9    | 5.8    | 6.4    | 7.3    |
| Instant Fuel Economy (MPG)    | 0.0    | 1.1    | 2.2    | 3.4    | 4.5    | 5.6    | 6.7    | 7.9    | 9.0    | 10.1   | 11.2   |
| Instant Fuel Rate (GPH)       | 0.0    | 0.7    | 1.5    | 2.2    | 3.0    | 3.7    | 4.5    | 5.2    | 6.0    | 6.7    | 7.5    |
| Accelerator Position (%)      | 0.0    | 0.8    | 2.0    | 2.8    | 4.0    | 4.8    | 6.0    | 6.8    | 8.0    | 8.8    | 10.0   |
| Inlet Air Temp (F)            | -40.0  | -36.4  | -32.8  | -29.2  | -25.5  | -22.0  | -18.4  | -14.8  | -11.2  | -7.6   | -4.0   |
| Engine Load %                 | 0      | 1      | 2      | 3      | 5      | 6      | 7      | 8      | 10     | 11     | 12     |
| Engine Trip (mile)            | 0.0    | 15.5   | 31.1   | 46.6   | 62.1   | 77.7   | 93.2   | 108.7  | 124.3  | 139.8  | 155.3  |
| Total Vehicle Distance (mile) | 0.0    | 31.1   | 62.1   | 93.2   | 124.3  | 155.3  | 186.4  | 217.5  | 248.5  | 279.6  | 310.7  |
| Transmission Temp (F)         | -459.4 | -438.5 | -417.5 | -396.5 | -375.5 | -354.5 | -333.6 | -312.6 | -291.7 | -270.7 | -249.7 |
| Vehicle Identification (VIN)  | ~000*  | ~001*  | ~002*  | ~003*  | ~004*  | ~005*  | ~006*  | ~007*  | ~008*  | ~009*  | ~010*  |

Table 5 – 6 SAE J1939 Simulation result vs. control step values (from 11 to 20)

| Control Step                  | 11     | 12     | 13      | 14      | 15      | 16      | 17      | 18      | 19      | 20      |
|-------------------------------|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|
| RPM (rpm)                     | 883.50 | 963.75 | 1044.13 | 1124.38 | 1204.75 | 1285.00 | 1365.38 | 1445.63 | 1526.00 | 1606.38 |
| Engine Hour (Hr)              | 137.5  | 150.0  | 162.5   | 175.0   | 187.5   | 200.0   | 212.5   | 225.0   | 237.5   | 250.0   |
| Engine Oil Pressure (PSI)     | 15.66  | 17.40  | 18.56   | 20.30   | 21.46   | 23.20   | 24.36   | 26.10   | 27.26   | 29.00   |
| Engine Coolant Temp (F)       | 8.6    | 14.0   | 17.6    | 23.0    | 26.6    | 32.0    | 35.6    | 41.0    | 44.6    | 50.0    |
| Battery Voltage (V)           | 4.10   | 4.50   | 4.85    | 5.25    | 5.60    | 6.00    | 6.35    | 6.75    | 7.10    | 7.50    |
| Fuel Level (%)                | 10.8   | 12.0   | 12.8    | 14.0    | 14.8    | 16.0    | 16.8    | 18.0    | 18.8    | 20.0    |
| Vehicle Speed (MPH)           | 17.16  | 18.71  | 20.27   | 21.83   | 23.39   | 24.95   | 26.50   | 28.07   | 29.63   | 31.19   |
| Engine Boost Pressure (PSI)   | 7.8    | 8.7    | 9.3     | 10.1    | 10.7    | 11.6    | 12.2    | 13.0    | 13.6    | 14.5    |
| Instant Fuel Economy (MPG)    | 12.4   | 13.5   | 14.6    | 15.7    | 16.9    | 18.0    | 19.1    | 20.2    | 21.4    | 22.5    |
| Instant Fuel Rate (GPH)       | 8.2    | 9.0    | 9.7     | 10.5    | 11.2    | 12.0    | 12.7    | 13.5    | 14.2    | 15.0    |
| Accelerator Position (%)      | 10.8   | 12.0   | 12.8    | 14.0    | 14.8    | 16.0    | 16.8    | 18.0    | 18.8    | 20.0    |
| Inlet Air Temp (F)            | -0.4   | 3.2    | 6.8     | 10.4    | 14.0    | 17.6    | 21.2    | 24.8    | 28.4    | 32.0    |
| Engine Load %                 | 13     | 15     | 16      | 17      | 18      | 20      | 21      | 22      | 23      | 25      |
| Engine Trip (mile)            | 170.9  | 186.4  | 201.9   | 217.5   | 233.0   | 248.5   | 264.1   | 279.6   | 295.2   | 310.7   |
| Total Vehicle Distance (mile) | 341.8  | 372.8  | 403.9   | 435.0   | 466.0   | 497.1   | 528.2   | 559.2   | 590.3   | 621.4   |
| Transmission Temp (F)         | -228.8 | -207.8 | -186.8  | -165.8  | -144.9  | -123.9  | -102.9  | -82.0   | -61.0   | -40.0   |
| Vehicle Identification (VIN)  | ~011*  | ~012*  | ~013*   | ~014*   | ~015*   | ~016*   | ~017*   | ~018*   | ~019*   | ~020*   |

Table 5 – 7 SAE J1939 Simulation result vs. control step values (from 21 to 30)

| Control Step                  | 21      | 22      | 23      | 24      | 25      | 26      | 27      | 28      | 29      | 30      |
|-------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| RPM (rpm)                     | 1686.63 | 1767.00 | 1847.25 | 1927.63 | 2007.88 | 2088.25 | 2168.50 | 2248.88 | 2329.13 | 2409.50 |
| Engine Hour (Hr)              | 262.5   | 275.0   | 287.5   | 300.0   | 312.5   | 325.0   | 337.5   | 350.0   | 362.5   | 375.0   |
| Engine Oil Pressure (PSI)     | 30.16   | 31.90   | 33.06   | 34.80   | 35.96   | 37.70   | 38.86   | 40.60   | 41.76   | 43.50   |
| Engine Coolant Temp (F)       | 53.6    | 59.0    | 62.6    | 68.0    | 71.6    | 77.0    | 80.6    | 86.0    | 89.6    | 95.0    |
| Battery Voltage (V)           | 7.85    | 8.25    | 8.60    | 9.00    | 9.35    | 9.75    | 10.10   | 10.50   | 10.85   | 11.25   |
| Fuel Level (%)                | 20.8    | 22.0    | 22.8    | 24.0    | 24.8    | 26.0    | 26.8    | 28.0    | 28.8    | 30.0    |
| Vehicle Speed (MPH)           | 32.75   | 34.31   | 35.87   | 37.43   | 38.99   | 40.55   | 42.11   | 43.67   | 45.23   | 46.79   |
| Engine Boost Pressure (PSI)   | 15.1    | 15.9    | 16.5    | 17.4    | 18.0    | 18.9    | 19.4    | 20.3    | 20.9    | 21.8    |
| Instant Fuel Economy (MPG)    | 23.6    | 24.7    | 25.9    | 27.0    | 28.1    | 29.2    | 30.4    | 31.5    | 32.6    | 33.7    |
| Instant Fuel Rate (GPH)       | 15.7    | 16.5    | 17.2    | 18.0    | 18.7    | 19.5    | 20.2    | 21.0    | 21.7    | 22.5    |
| Accelerator Position (%)      | 20.8    | 22.0    | 22.8    | 24.0    | 24.8    | 26.0    | 26.8    | 28.0    | 28.8    | 30.0    |
| Inlet Air Temp (F)            | 35.6    | 39.2    | 42.8    | 46.4    | 50.0    | 53.6    | 57.2    | 60.8    | 64.4    | 68.0    |
| Engine Load %                 | 26      | 27      | 28      | 30      | 31      | 32      | 33      | 35      | 36      | 37      |
| Engine Trip (mile)            | 326.2   | 341.8   | 357.3   | 372.8   | 388.4   | 403.9   | 419.4   | 435.0   | 450.5   | 466.0   |
| Total Vehicle Distance (mile) | 652.4   | 683.5   | 714.6   | 745.6   | 776.7   | 807.8   | 838.9   | 869.9   | 901.0   | 932.1   |
| Transmission Temp (F)         | -32.8   | -25.6   | -18.4   | -11.2   | -4.0    | 3.2     | 10.4    | 17.6    | 24.8    | 32.0    |
| Vehicle Identification (VIN)  | ~021*   | ~022*   | ~023*   | ~024*   | ~025*   | ~026*   | ~027*   | ~028*   | ~029*   | ~030*   |

Table 5 – 8 SAE J1939 Simulation result vs. control step values (from 31 to 40)

| Control Step                  | 31      | 32      | 33      | 34      | 35      | 36      | 37      | 38      | 39      | 40      |
|-------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| RPM (rpm)                     | 2489.88 | 2570.13 | 2650.50 | 2730.75 | 2811.13 | 2891.38 | 2971.75 | 3052.00 | 3132.38 | 3212.75 |
| Engine Hour (Hr)              | 387.5   | 400.0   | 412.5   | 425.0   | 437.5   | 450.0   | 462.5   | 475.0   | 487.5   | 500.0   |
| Engine Oil Pressure (PSI)     | 44.66   | 46.40   | 47.56   | 49.30   | 50.46   | 52.20   | 53.36   | 55.10   | 56.26   | 58.00   |
| Engine Coolant Temp (F)       | 98.6    | 104.0   | 107.6   | 113.0   | 116.6   | 122.0   | 125.6   | 131.0   | 134.6   | 140.0   |
| Battery Voltage (V)           | 11.60   | 12.00   | 12.35   | 12.75   | 13.10   | 13.50   | 13.85   | 14.25   | 14.60   | 15.00   |
| Fuel Level (%)                | 30.8    | 32.0    | 32.8    | 34.0    | 34.8    | 36.0    | 36.8    | 38.0    | 38.8    | 40.0    |
| Vehicle Speed (MPH)           | 48.35   | 49.91   | 51.47   | 53.07   | 54.59   | 56.14   | 57.71   | 59.26   | 60.82   | 62.38   |
| Engine Boost Pressure (PSI)   | 22.3    | 23.2    | 23.8    | 24.6    | 25.2    | 26.1    | 26.7    | 27.5    | 28.1    | 29.0    |
| Instant Fuel Economy (MPG)    | 34.9    | 36.0    | 37.1    | 38.2    | 39.4    | 40.5    | 41.6    | 42.7    | 43.9    | 45.0    |
| Instant Fuel Rate (GPH)       | 23.2    | 24.0    | 24.7    | 25.5    | 26.2    | 27.0    | 27.7    | 28.5    | 29.2    | 30.0    |
| Accelerator Position (%)      | 30.8    | 32.0    | 32.8    | 34.0    | 34.8    | 36.0    | 36.8    | 38.0    | 38.8    | 40.0    |
| Inlet Air Temp (F)            | 71.6    | 75.2    | 78.8    | 82.4    | 86.0    | 89.6    | 93.2    | 96.8    | 100.4   | 104.0   |
| Engine Load %                 | 38      | 40      | 41      | 42      | 43      | 45      | 46      | 47      | 48      | 50      |
| Engine Trip (mile)            | 481.6   | 497.1   | 512.6   | 528.2   | 543.7   | 559.2   | 574.8   | 590.3   | 605.8   | 621.4   |
| Total Vehicle Distance (mile) | 963.1   | 994.2   | 1025.3  | 1056.3  | 1087.4  | 1118.5  | 1149.5  | 1180.6  | 1211.7  | 1242.7  |
| Transmission Temp (F)         | 39.2    | 46.4    | 53.6    | 60.8    | 68.0    | 75.2    | 82.4    | 89.6    | 96.8    | 104.0   |
| Vehicle Identification (VIN)  | ~031*   | ~032*   | ~033*   | ~034*   | ~035*   | ~036*   | ~037*   | ~038*   | ~039*   | ~040*   |

Table 5 – 9 SAE J1939 Simulation result vs. control step values (from 41 to 50)

| Control Step                  | 41      | 42      | 43      | 44      | 45      | 46      | 47      | 48      | 49      | 50      |
|-------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| RPM (rpm)                     | 3293.00 | 3373.38 | 3453.63 | 3534.00 | 3614.25 | 3694.63 | 3774.88 | 3855.25 | 3935.50 | 4015.88 |
| Engine Hour (Hr)              | 512.5   | 525.0   | 537.5   | 550.0   | 562.5   | 575.0   | 587.5   | 600.0   | 612.5   | 625.0   |
| Engine Oil Pressure (PSI)     | 59.16   | 60.90   | 62.06   | 63.80   | 64.96   | 66.70   | 67.86   | 69.60   | 70.76   | 72.50   |
| Engine Coolant Temp (F)       | 143.6   | 149.0   | 152.6   | 158.0   | 161.6   | 167.0   | 170.6   | 176.0   | 179.6   | 185.0   |
| Battery Voltage (V)           | 15.35   | 15.75   | 16.10   | 16.50   | 16.85   | 17.25   | 17.60   | 18.00   | 18.35   | 18.75   |
| Fuel Level (%)                | 40.8    | 42.0    | 42.8    | 44.0    | 44.8    | 46.0    | 46.8    | 48.0    | 48.8    | 50.0    |
| Vehicle Speed (MPH)           | 63.94   | 65.50   | 67.06   | 68.62   | 70.18   | 71.74   | 73.30   | 74.86   | 76.42   | 77.98   |
| Engine Boost Pressure (PSI)   | 29.6    | 30.4    | 31.0    | 31.9    | 32.5    | 33.3    | 33.9    | 34.8    | 35.4    | 36.3    |
| Instant Fuel Economy (MPG)    | 46.1    | 47.2    | 48.4    | 49.5    | 50.6    | 51.7    | 52.9    | 54.0    | 55.1    | 56.2    |
| Instant Fuel Rate (GPH)       | 30.7    | 31.5    | 32.2    | 33.0    | 33.7    | 34.5    | 35.2    | 36.0    | 36.7    | 37.5    |
| Accelerator Position (%)      | 40.8    | 42.0    | 42.8    | 44.0    | 44.8    | 46.0    | 46.8    | 48.0    | 48.8    | 50.0    |
| Inlet Air Temp (F)            | 107.6   | 111.2   | 114.8   | 118.4   | 122.0   | 125.6   | 129.2   | 132.8   | 136.4   | 140.0   |
| Engine Load %                 | 51      | 52      | 53      | 55      | 56      | 57      | 58      | 60      | 61      | 62      |
| Engine Trip (mile)            | 636.9   | 652.4   | 668.0   | 683.5   | 699.0   | 714.6   | 730.1   | 745.6   | 761.2   | 776.7   |
| Total Vehicle Distance (mile) | 1273.8  | 1304.9  | 1336.0  | 1367.0  | 1389.1  | 1429.2  | 1460.2  | 1491.3  | 1522.4  | 1553.4  |
| Transmission Temp (F)         | 111.2   | 118.4   | 125.6   | 132.8   | 140.0   | 147.2   | 154.4   | 161.6   | 168.8   | 176.0   |
| Vehicle Identification (VIN)  | ~041*   | ~042*   | ~043*   | ~044*   | ~045*   | ~046*   | ~047*   | ~048*   | ~049*   | ~050*   |

Table 5 – 10 SAE J1939 Simulation result vs. control step values (from 51 to 60)

| Control Step                  | 51      | 52      | 53      | 54      | 55      | 56      | 57      | 58      | 59      | 60      |
|-------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| RPM (rpm)                     | 4096.25 | 4176.50 | 4256.88 | 4337.13 | 4417.50 | 4497.75 | 4578.13 | 4685.38 | 4738.75 | 4819.13 |
| Engine Hour (Hr)              | 637.5   | 650.0   | 662.5   | 675.0   | 687.5   | 700.0   | 712.5   | 725.0   | 737.5   | 750.0   |
| Engine Oil Pressure (PSI)     | 73.66   | 75.40   | 76.56   | 78.30   | 79.46   | 81.20   | 82.36   | 84.10   | 85.26   | 87.00   |
| Engine Coolant Temp (F)       | 188.6   | 194.0   | 197.6   | 203.0   | 206.6   | 212.0   | 215.6   | 221.0   | 244.6   | 230.0   |
| Battery Voltage (V)           | 19.10   | 19.50   | 19.85   | 20.25   | 20.60   | 21.00   | 21.35   | 21.75   | 22.10   | 22.50   |
| Fuel Level (%)                | 50.8    | 52.0    | 52.8    | 54.0    | 54.8    | 56.0    | 56.8    | 58.0    | 58.8    | 60.0    |
| Vehicle Speed (MPH)           | 79.54   | 81.10   | 82.66   | 84.22   | 85.78   | 87.34   | 88.90   | 90.46   | 92.02   | 93.58   |
| Engine Boost Pressure (PSI)   | 36.8    | 37.7    | 38.3    | 39.1    | 39.7    | 40.6    | 41.2    | 42.0    | 42.6    | 43.5    |
| Instant Fuel Economy (MPG)    | 57.4    | 58.5    | 59.6    | 60.7    | 61.9    | 63.0    | 64.1    | 65.2    | 66.4    | 67.5    |
| Instant Fuel Rate (GPH)       | 38.2    | 39.0    | 39.7    | 40.5    | 41.2    | 42.0    | 42.7    | 43.5    | 44.2    | 45.0    |
| Accelerator Position (%)      | 50.8    | 52.0    | 52.8    | 54.0    | 54.8    | 56.0    | 56.8    | 58.0    | 58.8    | 60.0    |
| Inlet Air Temp (F)            | 143.6   | 147.2   | 150.8   | 154.4   | 158.0   | 161.6   | 165.2   | 168.8   | 172.4   | 176.0   |
| Engine Load %                 | 63      | 65      | 66      | 67      | 68      | 70      | 71      | 72      | 73      | 75      |
| Engine Trip (mile)            | 792.3   | 807.8   | 823.3   | 838.9   | 854.4   | 869.6   | 885.5   | 901.0   | 916.5   | 932.1   |
| Total Vehicle Distance (mile) | 1584.3  | 1615.6  | 1646.6  | 1677.7  | 1708.8  | 1739.8  | 1770.9  | 1802.0  | 1833.0  | 1864.1  |
| Transmission Temp (F)         | 183.2   | 190.4   | 197.6   | 204.8   | 212.0   | 219.2   | 226.4   | 233.6   | 240.8   | 248.0   |
| Vehicle Identification (VIN)  | ~051*   | ~052*   | ~053*   | ~054*   | ~055*   | ~056*   | ~057*   | ~058*   | ~059*   | ~060*   |

Table 5 – 11 SAE J1939 Simulation result vs. control step values (from 61 to 70)

| Control Step                  | 61      | 62      | 63      | 64      | 65      | 66      | 67      | 68      | 69      | 70      |
|-------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| RPM (rpm)                     | 4899.38 | 4979.75 | 5060.00 | 5140.38 | 5220.63 | 5301.00 | 5381.25 | 5461.63 | 5541.88 | 5622.25 |
| Engine Hour (Hr)              | 762.5   | 775.0   | 787.5   | 800.0   | 812.5   | 825.0   | 837.5   | 850.0   | 862.5   | 875.0   |
| Engine Oil Pressure (PSI)     | 88.16   | 89.90   | 91.06   | 92.80   | 93.96   | 95.70   | 96.86   | 98.60   | 99.76   | 101.50  |
| Engine Coolant Temp (F)       | 233.6   | 239.0   | 242.6   | 248.0   | 251.6   | 257.0   | 260.6   | 266.0   | 269.6   | 275.0   |
| Battery Voltage (V)           | 22.85   | 23.25   | 23.60   | 24.00   | 24.35   | 24.75   | 25.10   | 25.50   | 25.85   | 26.25   |
| Fuel Level (%)                | 60.8    | 62.0    | 62.8    | 64.0    | 64.8    | 66.0    | 66.8    | 68.0    | 68.8    | 70.0    |
| Vehicle Speed (MPH)           | 95.14   | 96.70   | 98.25   | 99.83   | 101.37  | 102.93  | 104.49  | 106.05  | 107.61  | 109.17  |
| Engine Boost Pressure (PSI)   | 44.1    | 44.9    | 45.5    | 46.4    | 47.0    | 47.8    | 48.4    | 49.3    | 49.9    | 50.8    |
| Instant Fuel Economy (MPG)    | 68.6    | 69.7    | 70.9    | 72.0    | 73.1    | 74.2    | 75.4    | 76.5    | 77.6    | 78.8    |
| Instant Fuel Rate (GPH)       | 45.7    | 46.5    | 47.2    | 48.0    | 48.7    | 49.5    | 50.2    | 51.0    | 51.7    | 52.5    |
| Accelerator Position (%)      | 60.8    | 62.0    | 62.8    | 64.0    | 64.8    | 66.0    | 66.8    | 68.0    | 68.8    | 70.0    |
| Inlet Air Temp (F)            | 179.2   | 183.2   | 186.8   | 190.4   | 194.0   | 197.6   | 201.2   | 204.8   | 208.4   | 212.0   |
| Engine Load %                 | 76      | 77      | 78      | 80      | 81      | 82      | 83      | 85      | 86      | 87      |
| Engine Trip (mile)            | 947.6   | 963.1   | 978.7   | 994.2   | 1009.7  | 1025.3  | 1040.8  | 1056.3  | 1071.9  | 1087.4  |
| Total Vehicle Distance (mile) | 1895.2  | 1926.3  | 1957.3  | 1988.4  | 2019.5  | 2050.5  | 2081.6  | 2112.7  | 2143.7  | 2174.8  |
| Transmission Temp (F)         | 255.2   | 262.4   | 269.6   | 276.8   | 284.0   | 291.2   | 298.4   | 305.6   | 312.8   | 320.0   |
| Vehicle Identification (VIN)  | ~061*   | ~062*   | ~063*   | ~064*   | ~065*   | ~066*   | ~067*   | ~068*   | ~069*   | ~070*   |



Table 5 – 12 SAE J1939 Simulation result vs. control step values (from 71 to 80)

| Control Step                  | 71      | 72      | 73      | 74      | 75      | 76      | 77      | 78      | 79      | 80      |
|-------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| RPM (rpm)                     | 5702.63 | 5782.88 | 5863.25 | 5943.50 | 6023.88 | 6104.13 | 6184.50 | 6264.75 | 6345.13 | 6425.50 |
| Engine Hour (Hr)              | 887.5   | 900.0   | 912.5   | 925.0   | 937.5   | 950.0   | 962.5   | 975.0   | 987.5   | 1000.0  |
| Engine Oil Pressure (PSI)     | 102.66  | 104.40  | 105.56  | 107.30  | 108.46  | 110.20  | 111.36  | 113.10  | 114.26  | 116.00  |
| Engine Coolant Temp (F)       | 278.6   | 284.0   | 287.6   | 293.0   | 296.6   | 302.0   | 305.6   | 311.0   | 314.6   | 320.0   |
| Battery Voltage (V)           | 26.60   | 27.00   | 27.35   | 27.75   | 28.10   | 28.50   | 28.85   | 29.25   | 29.60   | 30.00   |
| Fuel Level (%)                | 70.8    | 72.0    | 72.8    | 74.0    | 74.8    | 76.0    | 76.8    | 78.0    | 78.8    | 80.0    |
| Vehicle Speed (MPH)           | 110.73  | 112.29  | 113.85  | 115.41  | 116.97  | 118.53  | 120.09  | 121.65  | 123.21  | 124.77  |
| Engine Boost Pressure (PSI)   | 51.3    | 52.2    | 52.8    | 53.6    | 54.2    | 55.1    | 55.7    | 56.5    | 57.1    | 58.0    |
| Instant Fuel Economy (MPG)    | 79.9    | 81.0    | 82.1    | 83.2    | 84.4    | 85.5    | 86.6    | 87.7    | 88.9    | 90.0    |
| Instant Fuel Rate (GPH)       | 53.2    | 54.0    | 54.4    | 55.5    | 56.2    | 57.0    | 57.7    | 58.5    | 59.2    | 60.0    |
| Accelerator Position (%)      | 70.8    | 72.0    | 72.4    | 74.0    | 74.8    | 76.0    | 76.8    | 78.0    | 78.8    | 80.0    |
| Inlet Air Temp (F)            | 215.6   | 219.2   | 222.8   | 226.4   | 230.0   | 233.6   | 237.2   | 240.8   | 244.4   | 248.0   |
| Engine Load %                 | 88      | 90      | 91      | 92      | 93      | 95      | 96      | 97      | 98      | 100     |
| Engine Trip (mile)            | 1102.9  | 1118.5  | 1134.0  | 1149.5  | 1165.1  | 1180.6  | 1196.1  | 1211.7  | 1227.2  | 1242.7  |
| Total Vehicle Distance (mile) | 2205.9  | 2236.9  | 2268.0  | 2299.1  | 2330.1  | 2361.2  | 2392.3  | 2423.4  | 2454.4  | 2485.5  |
| Transmission Temp (F)         | 327.2   | 334.4   | 341.6   | 348.8   | 356.0   | 363.2   | 370.4   | 377.6   | 384.8   | 392.0   |
| Vehicle Identification (VIN)  | ~071*   | ~072*   | ~073*   | ~074*   | ~075*   | ~076*   | ~077*   | ~078*   | ~079*   | ~080*   |

Table 5 – 13 SAE J1939 Simulation result vs. control step values (from 81 to 90)

| Control Step                  | 81      | 82       | 83       | 84       | 85       | 86       | 87       | 88       | 89       | 90       |
|-------------------------------|---------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| RPM (rpm)                     | 6505.75 | 6586.13  | 6666.38  | 6746.75  | 6827.00  | 6907.38  | 6987.63  | 7068.00  | 7148.25  | 7228.63  |
| Engine Hour (Hr)              | 5095.0  | 100899.9 | 150849.8 | 200799.8 | 250749.7 | 300699.7 | 350649.6 | 400599.6 | 450549.5 | 500499.5 |
| Engine Oil Pressure (PSI)     | 117.16  | 118.90   | 120.06   | 121.80   | 122.96   | 124.70   | 125.86   | 127.60   | 128.76   | 130.50   |
| Engine Coolant Temp (F)       | 323.6   | 329.0    | 332.6    | 338.0    | 341.6    | 347.0    | 350.6    | 356.0    | 359.6    | 365.0    |
| Battery Voltage (V)           | 33.00   | 36.00    | 39.00    | 42.00    | 45.00    | 48.00    | 51.00    | 54.00    | 57.00    | 60.00    |
| Fuel Level (%)                | 80.8    | 82.0     | 82.8     | 84.0     | 85.8     | 86.0     | 86.8     | 88.0     | 88.8     | 90.0     |
| Vehicle Speed (MPH)           | 126.33  | 127.89   | 129.45   | 131.01   | 132.57   | 134.13   | 135.68   | 137.25   | 138.80   | 140.36   |
| Engine Boost Pressure (PSI)   | 58.6    | 59.4     | 60.0     | 60.9     | 61.5     | 62.3     | 62.9     | 63.8     | 64.4     | 65.3     |
| Instant Fuel Economy (MPG)    | 100.3   | 110.5    | 120.8    | 131.0    | 141.3    | 151.6    | 161.8    | 172.1    | 182.3    | 192.6    |
| Instant Fuel Rate (GPH)       | 99.4    | 138.9    | 178.3    | 217.7    | 257.2    | 296.6    | 336.0    | 375.5    | 414.9    | 454.3    |
| Accelerator Position (%)      | 80.8    | 82.0     | 82.8     | 84.0     | 84.8     | 86.0     | 86.8     | 88.0     | 88.8     | 90.0     |
| Inlet Air Temp (F)            | 255.2   | 264.2    | 271.4    | 280.4    | 287.6    | 296.6    | 303.8    | 312.8    | 320.0    | 329.0    |
| Engine Load %                 | 101     | 102      | 103      | 105      | 106      | 107      | 108      | 110      | 111      | 112      |
| Engine Trip (mile)            | 32249.2 | 63255.7  | 94262.1  | 125268.6 | 156275.1 | 187281.5 | 218288.0 | 249494.4 | 280300.9 | 311307.4 |
| Total Vehicle Distance (mile) | 33429.8 | 64374.1  | 95318.4  | 126262.8 | 157207.1 | 188151.4 | 219095.8 | 250040.1 | 280984.4 | 311928.8 |
| Transmission Temp (F)         | 530.1   | 668.2    | 806.4    | 944.5    | 1082.7   | 1220.8   | 1359.0   | 1497.1   | 1635.3   | 1773.4   |
| Vehicle Identification (VIN)  | ~081*   | ~082*    | ~083*    | ~084*    | ~085*    | ~086*    | ~087*    | ~088*    | ~089*    | ~090*    |

Table 5 – 14 SAE J1939 Simulation result vs. control step values (from 91 to 100)

| Control Step                  | 91       | 92       | 93       | 94       | 95       | 96       | 97       | 98       | 99       | 100      |
|-------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| RPM (rpm)                     | 7309.00  | 7389.25  | 7469.63  | 7549.88  | 7630.25  | 7710.50  | 7790.88  | 7871.13  | 7951.50  | 8031.88  |
| Engine Hour (Hr)              | 550449.4 | 600399.4 | 650349.3 | 700299.3 | 750249.2 | 800199.2 | 850149.2 | 900099.1 | 950049.0 | 999999.0 |
| Engine Oil Pressure (PSI)     | 131.66   | 133.40   | 134.56   | 136.30   | 137.46   | 139.20   | 140.36   | 142.10   | 143.26   | 145.00   |
| Engine Coolant Temp (F)       | 368.6    | 374.0    | 377.6    | 383.0    | 386.6    | 392.0    | 395.6    | 401.0    | 404.6    | 410.0    |
| Battery Voltage (V)           | 375.25   | 690.55   | 1005.80  | 1321.10  | 1636.35  | 1951.65  | 2266.90  | 2582.20  | 2897.45  | 3212.75  |
| Fuel Level (%)                | 90.8     | 92.0     | 92.8     | 94.0     | 94.8     | 96.0     | 96.8     | 95.0     | 98.8     | 100.0    |
| Vehicle Speed (MPH)           | 141.93   | 143.48   | 145.04   | 146.60   | 148.16   | 149.72   | 151.28   | 152.84   | 154.40   | 155.96   |
| Engine Boost Pressure (PSI)   | 65.8     | 66.7     | 67.3     | 68.2     | 68.7     | 69.6     | 70.2     | 71.0     | 71.6     | 72.5     |
| Instant Fuel Economy (MPG)    | 202.8    | 213.1    | 223.4    | 233.6    | 243.9    | 254.2    | 264.4    | 274.7    | 284.9    | 295.2    |
| Instant Fuel Rate (GPH)       | 493.8    | 533.2    | 572.7    | 612.1    | 651.5    | 691.0    | 730.4    | 769.8    | 809.3    | 848.7    |
| Accelerator Position (%)      | 90.8     | 92.0     | 92.8     | 94.0     | 94.8     | 96.0     | 96.8     | 98.0     | 98.8     | 100.0    |
| Inlet Air Temp (F)            | 336.2    | 345.2    | 352.4    | 361.4    | 368.6    | 377.6    | 384.8    | 393.8    | 401.0    | 410.0    |
| Engine Load %                 | 113      | 115      | 116      | 117      | 118      | 120      | 121      | 122      | 123      | 125      |
| Engine Trip (mile)            | 342313.9 | 373320.4 | 404326.8 | 435333.3 | 466339.8 | 497346.2 | 528352.7 | 559359.1 | 590365.6 | 621372.1 |
| Total Vehicle Distance (mile) | 342873.1 | 373817.5 | 404761.7 | 435706.1 | 466650.5 | 497594.7 | 528539.1 | 559483.4 | 590427.8 | 621372.1 |
| Transmission Temp (F)         | 1911.6   | 2049.7   | 2187.9   | 2326.0   | 2464.2   | 2602.3   | 2740.5   | 2878.6   | 3016.8   | 3154.9   |
| Vehicle Identification (VIN)  | ~091*    | ~092*    | ~093*    | ~094*    | ~095*    | ~096*    | ~097*    | ~098*    | ~099*    | ~100*    |

## Chapter - 6 Appendix

### 6.1 Appendix A - Remote Terminal GUI Installation Guide

A remote terminal program can be used to control and display detail information of simulated SAE J1939 signals on a PC screen.

#### 6.1.1 What is needed to install Au J1939 Simulator Remote Terminal GUI

- PC software: The installation program "AU setup J1939 Simulator Remote Terminal V1.00A" will be provided when Au SAE-J1939 Simulator is ordered.
- A PC equipped with a serial port, and a serial extension cable, or a PC equipped with a USB port, and a "USB to serial convert cable".

#### 6.1.2 Step by step guide on installing the software to your PC.

1. Double click the "Setup J1939 Simulator Remote Terminal V1.00A" installation file, as shown in Figure A-1.

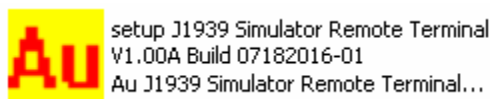


Figure A-1

2. Open file – security warning window pop up, click "Run" ( Figure A-2 )

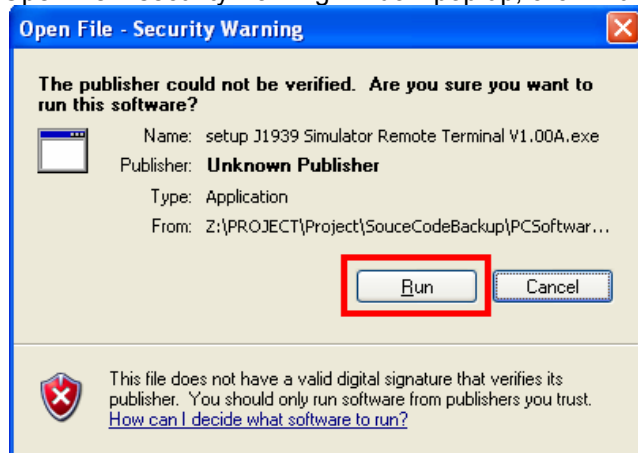


Figure A-2

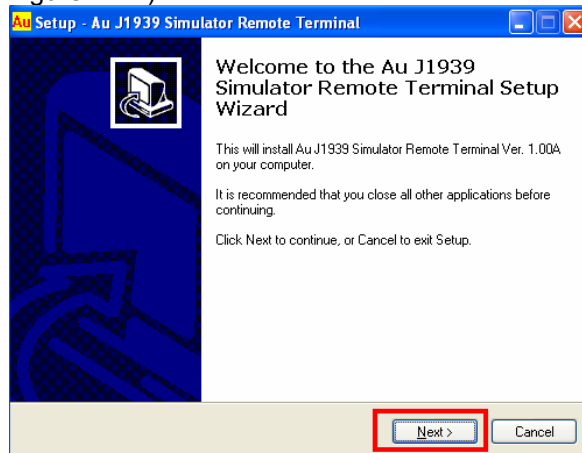


Figure A-3

3. "Welcome to the Au J1939 Simulator Remote Terminal Setup Wizard" window pop up, click "Next" to continue (Figure A-3).
4. "License Agreement" window pop up, please read the license agreement and select "I accept the agreement", click "Next" to continue (Figure A-4).

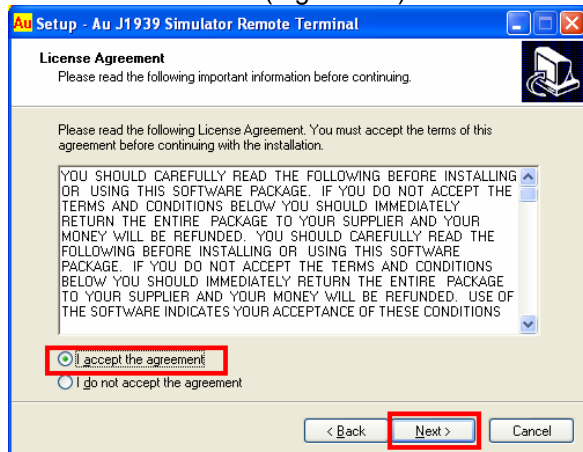


Figure A-4

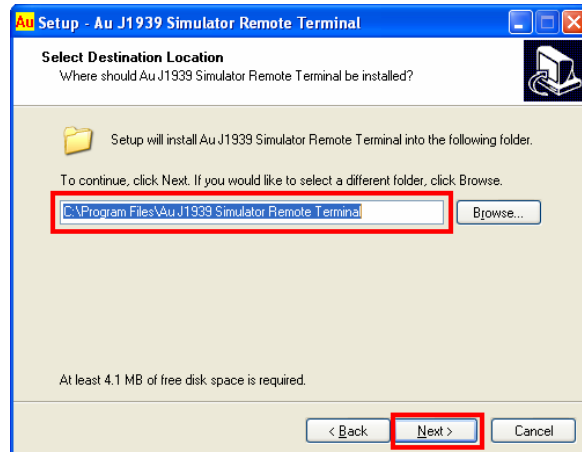


Figure A-5

5. "Select Destination Location" window pop up, use the default folder, and click "Next" to continue (Figure A-5).
6. "Select Start Menu Folder" window pop up, use the default folder and click "Next" to continue (Figure A-6).

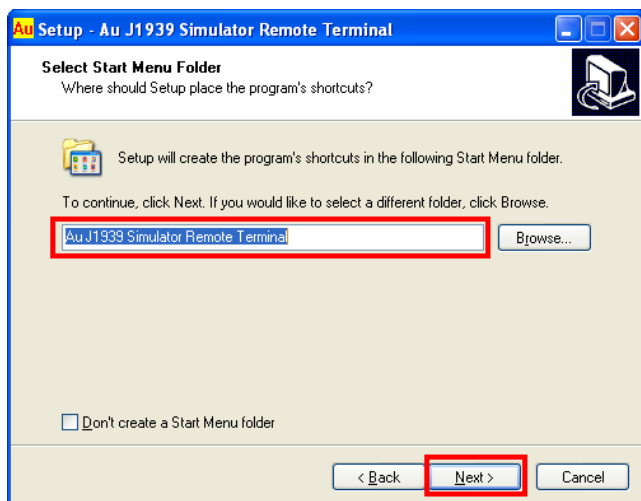


Figure A-6

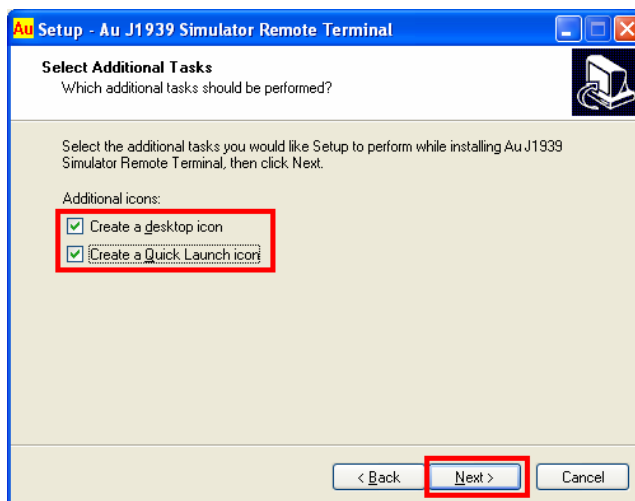


Figure A-7

7. "Select Additional Tasks" window pop up, check both "Create a desktop icon, and Create a Quick Launch icon", click "Next" to continue (Figure A-7).
8. "Ready to Install" window pop up, click "Install" (Figure A-8)

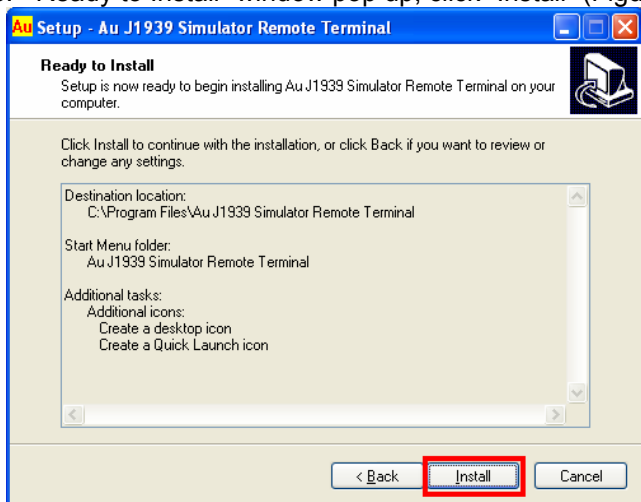


Figure A-8



Figure A-9

9. Check "launch Au J1939 Simulator Remote Terminal", click "Finish" (Figure A-9)

## 6.2 Appendix B - How to upgrade Au J1939 Simulator License

Upgrading Au J1939 Simulator license can be done in-field in a few seconds. Providing the J1939 Simulator device is hooked up to PC and license upgrade code is ready.

### 6.2.1 What is needed to upgrade Au J1939 Simulator License?

1. Order license upgrade code from the following web link: <https://www.auelectronics.com/System-J1939Simulator.htm> (Please refer to figure 1- 7 to find out which code to be ordered.)
2. A PC equipped with serial port and a RS232 serial extension cable (Item # CBL-RS232-01) or a PC equipped with USB port and a "USB to serial converter cable" (Item #: CBL-USB-232).
3. Au J1939 Simulator.
4. Au J1939 Simulator Remote Terminal. (Refer to Appendix A for how to install)

### 6.2.2 Step by Step License Upgrading Procedure

1. Connect your PC with Au J1939 Simulator, and power up Au J1939 Simulator using a AC/DC power supply (part # PWR-912V-CP).

2. Launch Au J1939 Simulator Remote Terminal program, select the serial communication port that was used to connect J1939 Simulator, e.g. COM1, then click "Connect" button, notice the Product ID shows "Value Package" (Figure B-1)

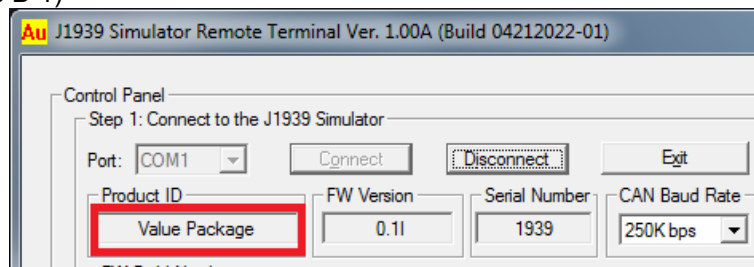


Figure B - 1

3. Click the Au Logo on the top left corner of Au J1939 Simulator Remote Terminal, then click "About J1939 SimulatorRemoteTerminal ..." as shown in Figure B - 2.

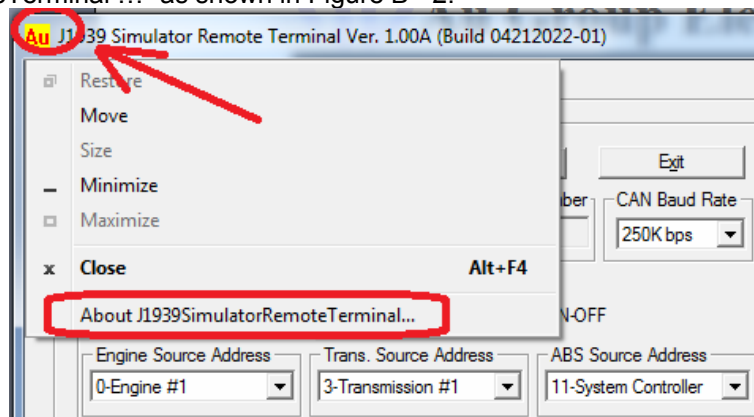


Figure B - 2

4. A "About Au J1939 Simulator" window will pop up (Figure B-3). Enter a validate license code, and then click "Validate license" button to continue.

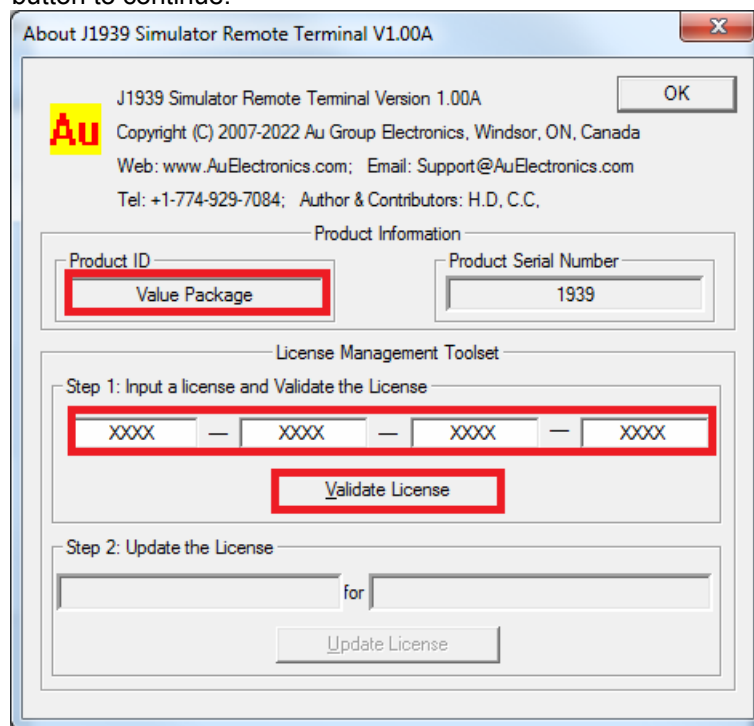


Figure B - 3

5. Each Au J1939 Simulator will have a unique Serial Number. If the license code is invalid, an error message will be pop up, as shown in Figure B-4.



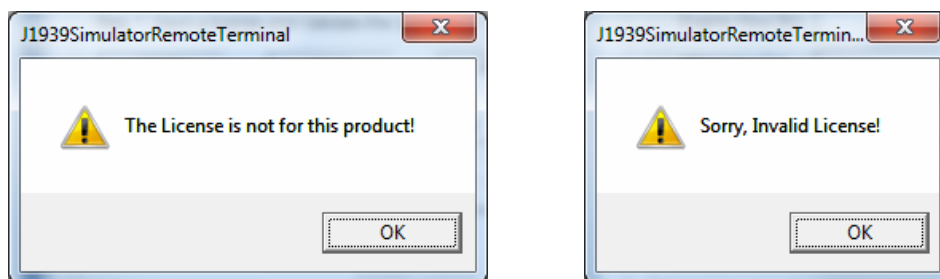


Figure B - 4

6. After a validate license is entered, updated license Information will display, as demonstrated here in Figure B-6, J1939 Simulator Value Package edition will be upgraded to vehicle Platinum Script Edition click "Update License" button.

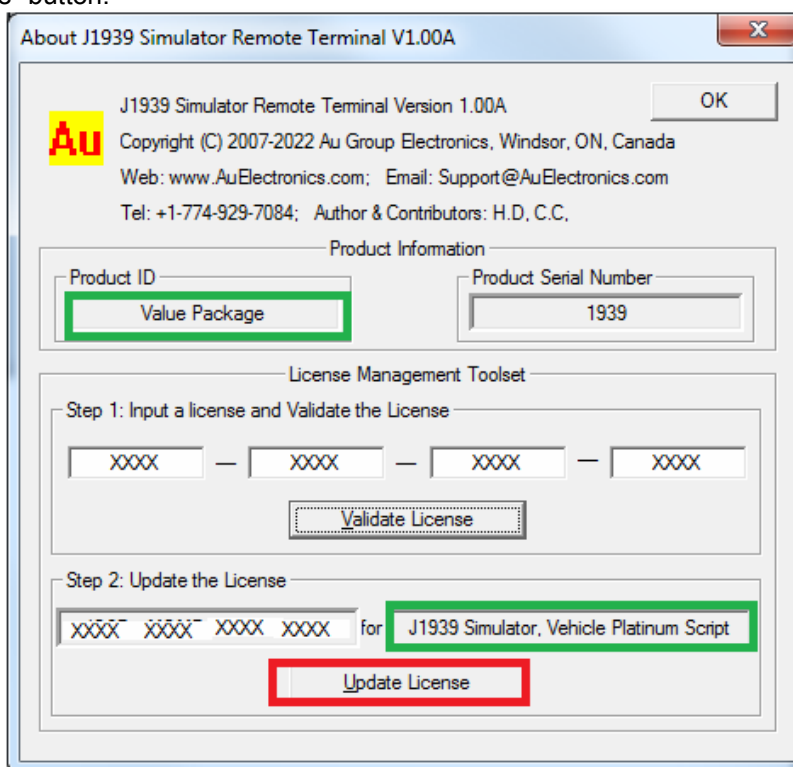


Figure B - 5

7. When it is updated successfully, a beep will be heard. About J1939 Simulator window will close automatically, and the Product ID (Edition of J1939 Simulator) will update to the new edition (Vehicle Platinum Scrip edition in this demonstration, as shown in Figure B-7).

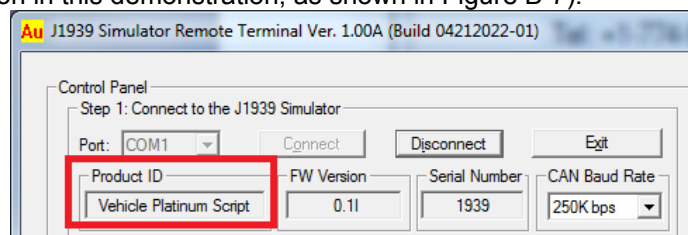


Figure B - 6

## 6.3 Appendix C - Au PIC Serial Boot-loader Application Note

### 6.3.1 What is needed before install Au PIC Boot-loader?

- A PC equipped with serial port or PC equipped with USB port + "USB to Serial Converter" or a serial cable to connect a PC to Au J1939 Simulator.
- Au PIC Boot-loader installation program (it is available through Au Group Electronics)



- An encrypted PIC-code file with extension of "aud" (it will be provided by Au Group Electronics for different products, e.g. SAE-J1939 simulator, etc.)

### 6.3.2 How to install Au PIC Boot-loader

**Note:** If the Au PIC Boot-loader has been installed on PC before, please bypass step 1 to step 8, and start with step 9.

1. Double click icon of the "Setup Au PIC Boot-loader V1.00B" to start installing Au PIC Boot-loader (Figure C-1).

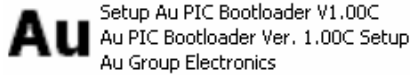


Figure C-1 - Setup Au PIC Boot-loader V1.00A icon

2. "Welcome to the Au PIC Boot-loader Setup Wizard" window show up, click "Next" (Figure C- 2)

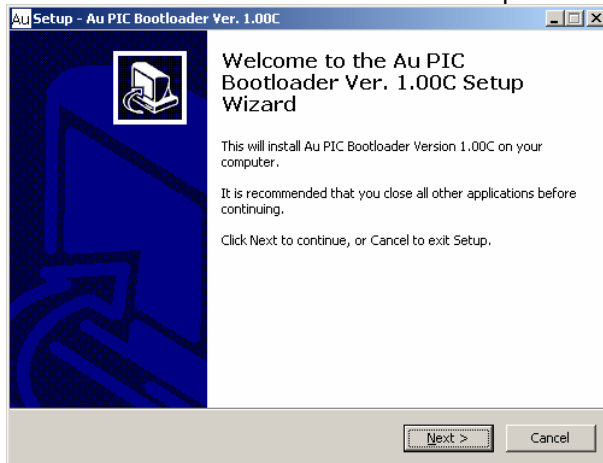


Figure C-2

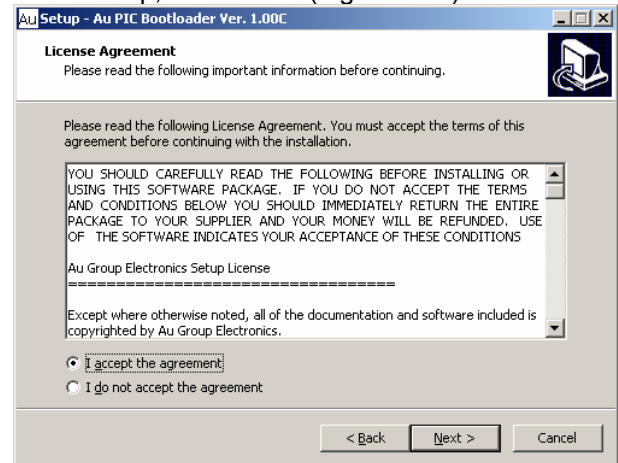


Figure C-3

3. "License Agreement" window show up, read the license agreement and select "I accept the agreement", then click "Next" to continue (Figure C-3).
4. "Select Destination" window shows up, use default path: C:\Program Files\ AU PIC Boot-loader", then click "next" to continue (Figure C-4).

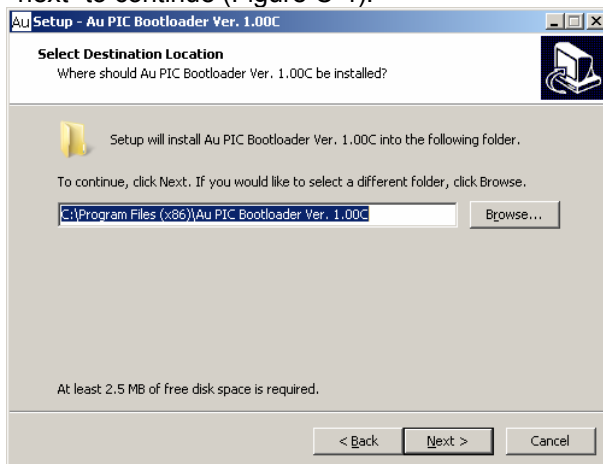


Figure C-4

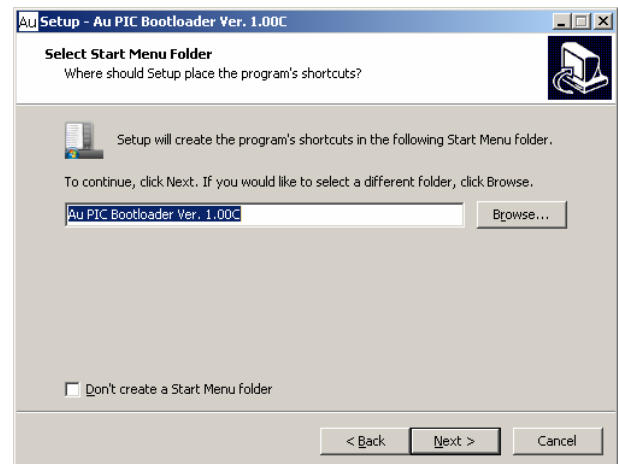


Figure C-5

5. "Select Start Menu Folder" window show up, use default setting "AU PIC Boot-loader", then click "next" (Figure C-5).
6. "Select Additional Task" window shows up, check both "create a desktop icon" and "Create a quick launch icon", and then click "next" to continue (Figure C-6).

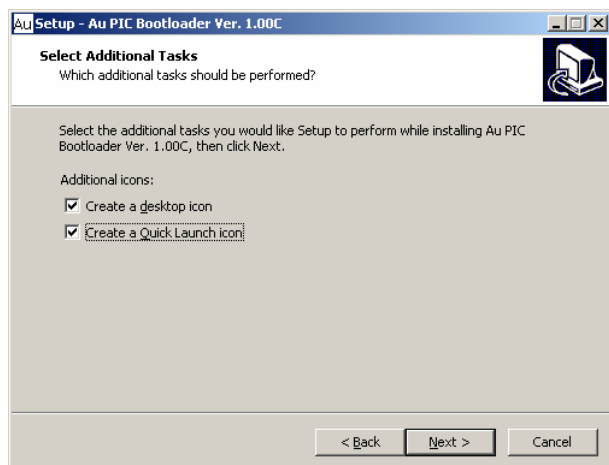


Figure C-6

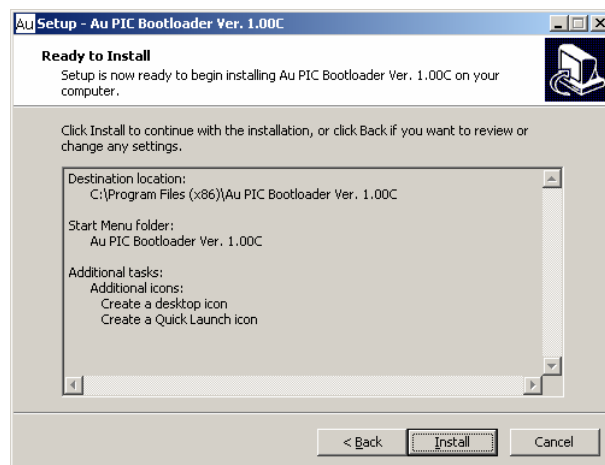


Figure C-7

7. "Ready to Install" window shows up. Click "Install" (Figure C-7).
8. After a few seconds, "Completing the Au PIC Boot-loader Setup Wizard" window shows up, check "launch Au Boot-loader", click "Finish" to exit setup (FigureC-8).

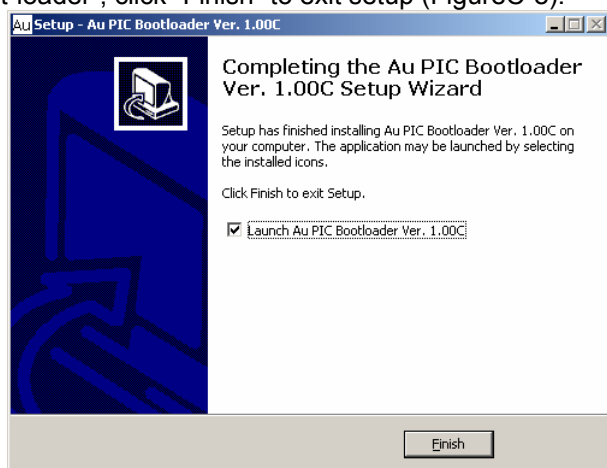


Figure C-8

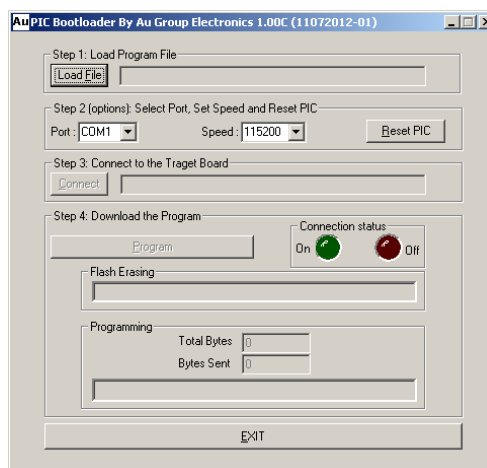


Figure C-9

9. Au PIC18 Boot-loader is launched, as shown in Figure C-9

### Thank You

Thank you for choosing Au Group Electronics products.

Should you have any question or comments, please contact us at:  
[support@AuElectronics.com](mailto:support@AuElectronics.com)

We look forward to serving you again in the near future.