Software User Guide

VA 1051000 | Parker Vehicle System Gateway

1051G02.57A

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Revision History

Rev #	Description of Change	Date
57A	Issue PVSG-7867 • Added information for new LIN frame timeouts.	2025-May-23
56A	Issue PVSG-7771 • Added new LIN Translation section. • Added new PVSG variant 10516014.	2025-Jan-30
55A	Case 86409 • Updated Overview section to include condition of use note.	2023-Jun-08
54A	Case 82607 • Updated the maximum number of CAN Log pre-trigger messages allowed. Case 80638 • PVSG Config tool: Update max number of CAN logs that are available. Case 82027 • Warn the User About the Dependency of Having J1939 Management Enabled On for Fault Logging. Case 82911 • Added new System Errors in table. Case 81201/82681 • Updated CAN Logging section. Case 82431 • PVSG PC Tool: Add support for continuous logging. Case 82632 • Updated CAN Logging section to include information about the "Go To Trigger" functionality.	2023-Feb-13
53A	Case 79436 • Added notes on CAN Log DIN Triggers Case 79435 • Added notes on CAN Log DM1 Fault Triggers Case 79427 • Updated CAN Logging section. Case 80642 • Updated Variant Manager icon color, tool tip text based on configuration conflicts of the selected variant and displaying the conflict summary view if there are conflicts, when the user clicks on the Variant Manager icon of the configuration tool. Case 80928 • Added note that if a CAN log trigger fails, it will be logged as a system log. Case 79437 • CAN logger dashboard: Add support for CAN log duration. Case 81968 • Added information about using the 1051605 command line argument /legacy_DLA_compatibility to install the RP1210 dll from	2022-Nov-02

	1051605 V1.12 instead of the RP1210C compliant one.	
52A	Case 77257 • Updated CAN Log screen. Case 67311 • Added notes on sleep mode now working with J1939 managed buses.	2022-June-30
51A	Case 76919 • Added notes to the variants about the RP1210 routing messages on some variants. Case 78580 • Added two new variants: 1051011 and 1051012	2022-May-27
50A	Case 77377 • Added notes on Update Tool Error Codes. • Added note on resetting locked out PVSG.	2022-Mar-31
49A	Case 76724 • Updated Storage Administrator diagram.	2022-Feb-25
48A	Case 74964 • Added new 2:8 PVSG Error Code. • Added notes on how to verify a successful PVSG Update or Configuration.	2021-Nov-30
47A	Case 73579 • Added CAN Message Filters Errors table.	2021-Sep-30
46A	Case 72236 • Added operating current ratings. • Added notes about the CAN Filter Import Spreadsheet.	2021-Jul-22
45A	Case 70526 • Added Importing and Clearing CAN Filters sections. • Added a caution about J1939 management message and routing. • Added note about how Time and Date shall be used for it to persist.	2021-Jun-18
44A	Case 66968 • Added security recommendations section. • Added note about separating safety critical devices on CAN buses. • Added Update Steps section • Updated the Message Filtering Notes section in relation to large message routing. • Added more information to the Sleep Mode tables. • Added note about User Account details.	2020-Dec-22
43A	Case 65039 • Added Features section.	2020-Aug-20
42A	Case 64793 • Reworded Administrator permissions note to say that it is required.	2020-Aug-06
41A	Case 63888 • Added CAN Configuration and Message Filtering section.	2020-Jun-24
40A	Case 62210 • Added notes about J1939 management and large message routing.	2020-Apr-30

	• Updated CAN Logging section.	
39A	Case 61686	2020-Mar-30
38A	Case 59763	2019-Dec-17
37A	Case 59191	2019-Nov-22
36A	Case 58699	2019-Oct-25
35A	Case 58082	2019-Sep-30
34A	Case 56950	2019-Aug-02
33A	Case 56549	2019-Jul-02
32A	Case 55423	2019-May-08
31A	Case 55043	2019-Apr-15
30A	Case 54952	2019-Apr-08
29A	Case 54038	2019-Feb-22
28A	Case 53329	2019-Feb-01
27A	Case 52994	2018-Dec-20
26A	Case 52269	2018-Nov-22
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21A	Case 48811	2018-Jul-06
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11A	Case 41679	2017-Sept-25
10A	Case 41105	2017-Aug-25
09B	Case 40817	2017-Jul-28
09A	Case 40817	2017-Jul-28
08A	Case 40034	2017-Jun-30
07A	Case 39163	2017-Jun-02
06A	Case 38567	2017-May-08
05A	Case 37804	2017-Apr-10
04A	Case 37055	2017-Mar-13
03A	Case 36610	2017-Feb-14
02C	Case 35723	2017-Jan-16
01A	Case 35553	2016-Nov-30
00A	Case 34734	2016-Oct-25

1. Overview

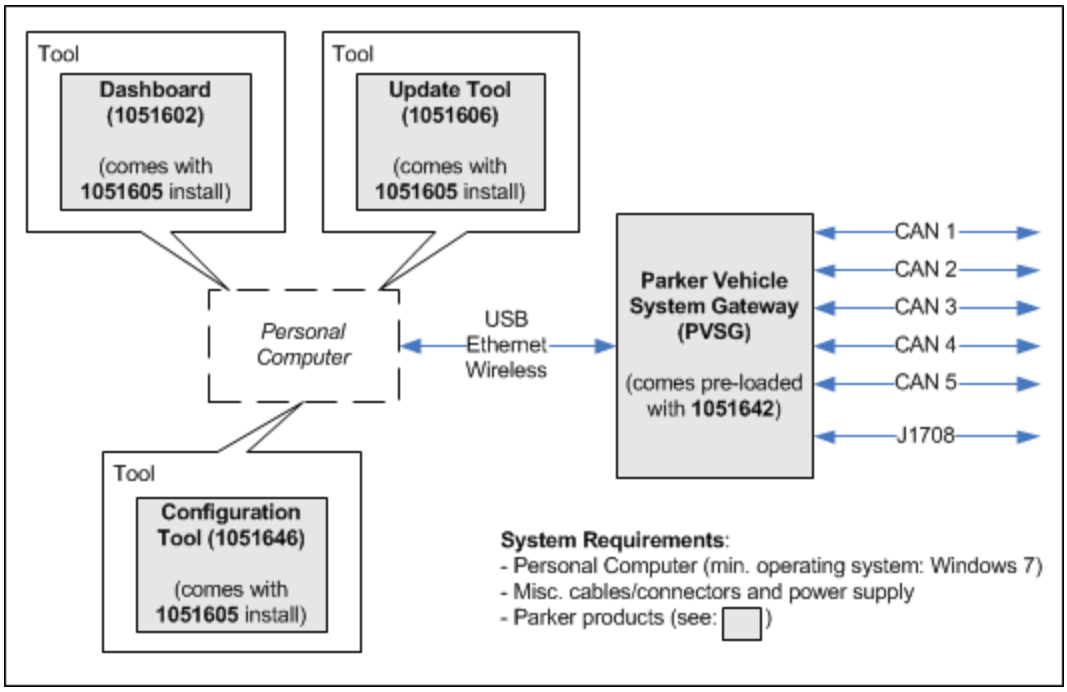
This document provides information relevant to those using the Parker Vehicle System Gateway (PVSG).

Note: this document is subject to change. Contact Parker for more information should you have questions not covered by this document.

Note: This document is to be used as a reference tool for the vehicle manufacturer's application design. The user of these instructions should have experience in the handling of electronic equipment on mobile vehicles and proper understanding of the application development environment.

1.1. Product Overview

The following diagram shows an overview of the software components and communication interfaces currently supported by the PVSG.



Internally, the PVSG consists of three basic components:

- Router: provides CAN and J1708 interface including all functionality related to CAN message filtering performed to allow CAN messages received on one CAN port to be transmitted on one or more of the other CAN ports.
- Server: provides on board management capabilities including USB / Ethernet / Wireless interface and all functionality associated with them.
- Power Control: performs power management functions including controlling when the product goes to sleep and wakes up.

1.2. Connector Pinout

The pinout for PVSG connectors are as follows:

J1 Connector

Pin	Function	Pin	Function
J1-1	GPIO2	J1-11	CAN3 Shield
J1-2	GPIO1	J1-12	CAN3 High
J1-3	CAN2 Shield	J1-13	CAN3 Low
J1-4	CAN2 Low	J1-14	CAN4 Shield
J1-5	CAN2 High	J1-15	CAN4 High
J1-6	CAN1 Shield	J1-16	CAN4 Low
J1-7	CAN1 Low	J1-17	CAN5 Shield

Pin	Function	Pin	Function
J1-8	CAN1 High	J1-18	CAN5 High
J1-9	Ground	J1-19	CAN5 Low
J1-10	Power	J1-20	Ground

Note: GPIO1 and GPIO2 are configurable wakeup sources (active high, see "Power Management" section below).

Note: CAN1, CAN2, CAN3, CAN4, CAN5 are configurable wakeup sources (see "Power Management" section below).

Note: Power (J1-10) requires greater than 8V to wakeup and more than 6V to continue operating.

J2 Connector

Pin	Function	Pin	Function
J2-1	J1708A	J2-9	RS232 RTS
J2-2	J1708B	J2-10	Ground
J2-3	Ground	J2-11	LIN4
J2-4	LIN2	J2-12	Recovery
J2-5	Ground	J2-13	RS232 RX
J2-6	LIN1	J2-14	RS232 TX
J2-7	RS232 CTS	J2-15	Ground
J2-8	Output 1	J2-16	LIN3

Note: All RS232 signals are labelled as DTE (Data Terminal Equipment) signals (TX & RTS are outputs and RX & CTS are inputs).

Note: Access to RS232 signals should be restricted to only those authorized to use them (e.g. place PVSG inside a locked compartment, don't include RS232 connection in production harness).

Note: Access to the Recovery input (J2-12) should be restricted to only those authorized to use it (e.g. place PVSG inside a locked compartment, don't include recovery connection in production harness).

Note: Output 1 may appear to toggle due to the strobing of the open load detection circuitry if the load attached is small.

J12 Connector (USB)

Pin	Function
J12-1	USB GND
J12-2	USB PWR

Pin	Function
J12-3	USB DP
J12-4	USB DN
J12-5	USB OTG ID

Note: USB is one of the configurable wakeup sources (see "Power Management" section below).

Note: Access to J12 should be restricted to only those authorized to use it (e.g. place PVSG inside a locked compartment, don't leave mating connector with standard USB connector connected to PVSG).

J11 Connector (Ethernet)

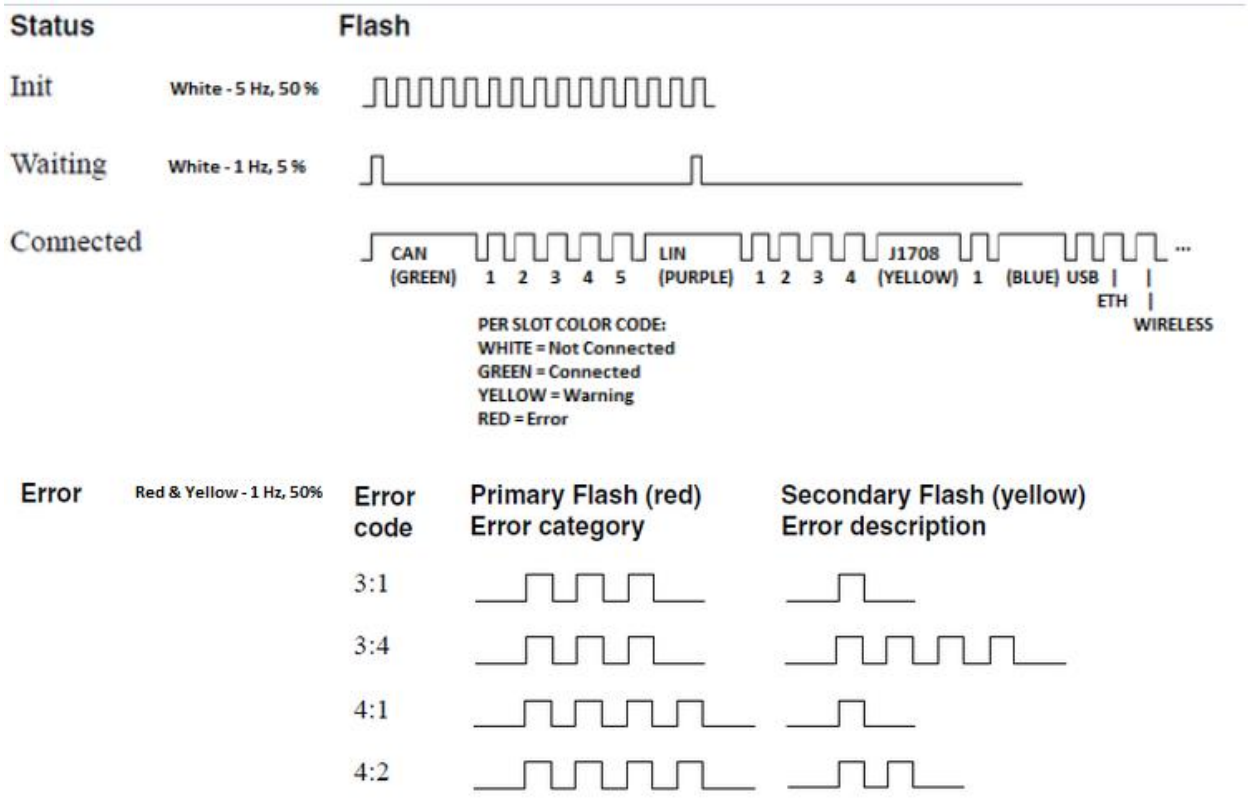
Pin	Function
J11-1	Ehternet TXP
J11-2	Ethernet RXP
J11-3	Ethernet TXN
J11-4	Ethernet RXN

Note: When Ethernet is enabled (see "Network Configuration" section below), access to J11 should be restricted to only those authorized to use it (e.g. place PVSG inside a locked compartment, don't leave mating connector with standard Ethernet connector connected to PVSG).

SMA Connector (External Antenna)

1.3. Status LED

The LED on the PVSG is a multi-color LED that provides diagnostic information as follows (drawing is not to scale):



Where:

- **Init** indicates PVSG is performing some form of initialization (i.e. a portion of the PVSG is still booting up, or performing a configuration/programming step).
- **Waiting** indicates nothing is connected to the PVSG (i.e. no CAN traffic detected, no USB connection, etc.).
- **Connected** indicates something is connected to the PVSG. Use legend to decode connected network status.
  - CAN slot color codes as follows:
    - White: CAN bus inactive (no transmitted or received messages).
    - Green: CAN bus actively transmitting and/or receiving messages.
    - Yellow: Not used.
    - Red: CAN "bus off" or "error passive".

Note: it may be required to successfully transmit and receive a message to clear "error passive" state.

- **Error** indicates an error has been detected.
  - Error codes shown in the diagram are examples.
  - The error codes supported by the PVSG are available in the "Error Codes" section below.

1.4. Error Codes

The following table is a list of error codes supported by the PVSG.

Error Code	Description	Detectable via	Disabled Function(s)	Recovery
1:1	Server offline (not detected at all since startup).	LED	Server disabled.	Reset PVSG.
1:2	Server offline (detected at startup, but then later not detected).	LED	Server disabled.	Reset PVSG.
1:3	Configuration missing or invalid. Note: CAN bit rate defaulted to 250 kbps.	LED	CAN transmission disabled.	Configure PVSG.
1:4	Invalid hardware. Note: CAN bit rate defaulted to 250 kbps.	LED	CAN transmission disabled.	Verify version of 1051642 in use supports the hardware in use.
2:1	USB communications failure.	LED	USB disabled.	Reset PVSG.
2:2	Server failed to load configuration.	LED, Dashboard	Default configuration.	Configure PVSG.
2:3	Server failed to mount internal storage.	LED, Dashboard	Server disabled.	Reset PVSG.
2:4	Power control offline.	LED, Dashboard	Power management disabled (PVSG will not sleep regardless of configured wakeup sources).	Reset PVSG.
2:5	Server internal service has stopped responding.	LED, Dashboard, DM1	Server disabled.	Reset PVSG.
2:6	Router offline.	LED, Dashboard	CAN receive/transmit not available.	Reset PVSG.
2:7	Shutdown not	LED,	Server shutdown	Reset PVSG.

Error Code	Description	Detectable via	Disabled Function(s)	Recovery
	possible.	Dashboard	is not possible due to an internal error.	
2:8	XMC failed to reprogram.	LED, Dashboard	PVSG XMC software or configuration is not updated.	Perform update/configuration again.
2:9	CAN "log until memory is full" is disabled.	Dashboard, DM1	The CAN "Log until memory is full" functionality is no longer allowed on this PVSG.	There is no recovery from this error.
2:10	CAN log triggers disabled	Dashboard, DM1	No more CAN logs are able to be triggered.	Reset PVSG.
20:1	Missing modules.	Dashboard, DM1	Expected modules are missing from the system.	Connect the missing modules.
20:2	Unknown modules detected.	Dashboard, DM1	Unexpected modules are connected to the system.	Remove the unknown modules from the system.
21:1	Custom logic: incompatible SDK.	Dashboard, DM1	Custom logic halted.	Update PVSG and/or custom logic SDK in use. Consult document 1051G05, *Custom Logic User Guide* for more details.
21:2	Custom logic: resource utilization limits exceeded.	Dashboard, DM1	Custom logic halted.	Debug/rework custom logic. Consult document 1051G05, *Custom Logic User Guide* for more details.
21:3	Custom logic: failed to load.	Dashboard, DM1	Custom logic halted.	Check PVSG configuration.
21:4	Custom logic: terminated.	Dashboard, DM1	Custom logic halted.	Debug custom logic. Consult document 1051G05, *Custom Logic User Guide* for more details.
21:5	Custom logic: stalled.	Dashboard, DM1	Custom logic halted.	Debug custom logic. Consult document 1051G05, *Custom Logic User Guide* for more details.

Where possible, error information is also available in the **PVSG Dashboard**. See the "Dashboard" section of this document for more details.

Error information is available in a periodic DM1 message broadcast by the PVSG on J1939 interfaces that have management enabled (see "J1939 Configuration" section below). Each

active Diagnostic Trouble Code (DTC) included in the DM1 message uses proprietary SPN 52xxyy, where x and y are taken from the error code in the table above. E.g. SPN 520205 is error 2:5, and SPN 521510 is error 15:10. Each active DTC uses Failure Mode Identifier (FMI) 31, where 31 is defined by J1939-73 JAN2016 to mean "Condition Exists ... the reported SPN name spells out the component and a non-standard failure mode". Each active DTC sets Amber Warning Lamp (AWL) to flash slow and Red Stop Lamp (RSL) to off.

Note: LED off indicates the PVSG is not operating due to power off, or powered without an activated unmasked wakeup source.

2. Licensing

Licensing is covered in several contexts with respect to the PVSG. The following is a summary of the contexts and specific license related references in this document:

1. Section "Software Licensing & Copyright" below deals with the GPL code used in the PVSG that is licensed under the GNU General Public License (refer to section "GNU GENERAL PUBLIC LICENSE" at the end of this document).
2. Section "Licences" under "Dashboard" describes how the dashboard provides an interface to install a tool license or a PVSG feature license.
3. Section "Variants" under "Configuration Tool" > "Creating/Editing Configurations" describes how PVSG feature licenses can be used to enable functionality on certain variants of the PVSG.
4. Document 1051G05, *Custom Logic User Guide* describes additional licenses for the development of custom applications and programming plugins.

Note: License and licence is used interchangeably in this document and in the software.

2.1. Software Licensing & Copyright

The software running on the PVSG makes use of code built around the GNU General Public License, version 2.

All Parker-modified GPL code continues to be licensed under the GNU General Public License. This license is available in its entirety at the end of this document. You may obtain the complete Corresponding Source code from us for a period of three years after our last shipment of this product, which will be no earlier than 2021-01-01, by a request to:

Parker Hannifin Canada
Electronic Controls Division
1305 Clarence Avenue
Winnipeg, MB R3T 1T4 Canada

Please include the following with your request: “Request for source code corresponding to Parker-modified GPL code licensed under GNU General Public License in product PVSG 1051000”. This offer is valid to anyone in receipt of this information.

3. Security

The following security related risk reductions factors are included in the PVSG to reduce the risk associated with security threats (including cybersecurity related threats):

- Configuration file includes optional password-based protection to restrict view and/or edit access. Configuration files are encrypted to prevent unauthorised access and modification. See "Configuration Security" section below for details. This can be used to:
  - Prevent unauthorised users from modifying the installed configuration.
  - Prevent unauthorised users from reading an installed configuration and gaining unapproved knowledge of the system.
- Wireless configuration includes optional support for connection-oriented security modes to restrict access when wireless is enabled. See "Network Configuration" section below for details.
  - The configuration warns the user if an acceptable level of security has not been configured.
- User access control provides optional support for restricting access to certain PVSG features. See "User Accounts" and "User Access Control" sections below for details.
  - The configuration tools warns the user if the specified user account password does not meet specific security criteria.
- Critical data exchange with the PVSG (e.g. configuration, authentication) uses a secure session to prevent eavesdropping and man-in-the-middle attacks. This uses industry standard transport layer security (TLS) mechanisms to protect the system and its users.
- Data signing techniques are employed where necessary to validate the authenticity of specific data and its sender.
- Open TCP/IP ports limited to only required ports in use.
- Some critical functions are protected by hardware separation.
- Internal access to the PVSG is protected via a layered security approach to prevent unauthorised access.

When incorporating the PVSG into a system with security requirements, ensure that security related PVSG features are configured appropriately and that any system level security related risk reduction factors are also considered to reduce the risk associated with security threats (including cybersecurity related threats).

Contact Parker for more information should you have questions not covered by this document.

3.1. Security Recommendations

At least one user account with read and write access should be configured to lock out any unauthorised configuration of a PVSG. If Wifi is used, a Password should be also be used.

4. Features

This sections describes some of the PVSG features in more detail.

4.1. Data Link Adapter (DLA)

The PVSG along with PVSG PC software is able to provide DLA functionality. The PVSG software is fully compliant with the RP1210 standard and provides CAN, J1939 data traffic on all five CAN ports at 250, 500 or 1000 Kb/s, as well as J1708 traffic on the single J1708 port. The PVSG connects to your PC via USB and via ethernet or wifi on select models (See configuration section below to configure the PVSG to be used via ethernet or wifi).

4.2. CAN Routing

The PVSG is able to route CAN messages from one CAN port to other ports. See the "Message Filter" section below for more details on how to configure the PVSG for CAN routing.

PVSG's running software V1.07 or higher will route DLA CAN messages sent from the PVSG CAN ports based on the CAN routing configuration on the PVSG.

Note: CAN routing will be interrupted during sleep or wakeup therefore it is good practice to keep safety critical devices on the same CAN bus.

4.3. Current Ratings

The operating current ratings are the following:

- 12V - 122 to 137 mA with wifi enabled.
- 24V - 61 to 74 mA with wifi enabled.
- Output adds an additional 250 mA when enabled.

5. Embedded Software

Embedded software for the PVSG is distributed as a deployment package, software part number 1051642. 1051642 is pre-programmed in the PVSG, and upgradable using the update tool (1051606).

5.1. J1939

J1939 Controller Applications (J1939 CAs) are configurable for each physical CAN interface via the configuration tool (1051646).

5.1.1. Version Information

Version information is available on each configured J1939 CA via the J1939 Software Identification (SOFT) and Component Identification (CI) messages. The information can be requested from the CA using the J1939 Request (RQST) message. Note that the information returned by each CA will be identical. The response for both SOFT and CI is compliant with 983F17.01A (internal Parker ECD Standard). In the case of the SOFT message, the fields present are as shown in the following table.

Field Name	Use
APP	The version of the 1051642 embedded deployment package.
PAR	Information pertaining to the installed configuration. This includes the configuration version, label and file name information.
MODE	The current operating mode of the product. Valid values are "Run" and "Test".
FMT	The specification with which the J1939 SOFT output is complaint. Currently, this is 983F17.01A.

For the Component Identification message, the final SAP number and final serial number are published for the "Model" and "Serial Number" fields respectively. The format is governed by J1939DA August 2015.

Example:

Below is an example trace from CANsniff:

```
Timestamp   | Len. | PGN    | P SA DA | Data
-------------------------------------------------------------------------------
12:57:40.260 |   3 | 00EA00 | 6 F9 00 | DA FE 00  |
12:57:40.307 |  94 | 00FEDA | 6 00 FF | 04 41 50 50 2C 31 30 35 31 36 34 32 2C 56 30 2E 35 42 32 37 2A 50 41 52 2C 2C 56 30 2E 30 42 31 2C 31 30 35 31 4D 30
36 20 54 31 31 38 2C 31 30 35 31 4D 30 36 5F 30 34 41 5F 54 31 31 38 2E 70 76 73 67 63 2A 4D 4F 44 45 2C 52 75 6E 2A 46 4D 54 2C 39 38 33 46 31 37 2C 52 30
31 41 2A  | APP,1051642,V0.5B27*PAR,V0.0B1,1051M06 T118,1051M06_04A_T118.pvsgc*MODE,Run*FMT,983F17,R01A*
13:05:19.997 |   3 | 00EA00 | 6 F9 00 | EB FE 00  |
13:05:20.031 |  25 | 00FEEB | 6 00 FF | 2A 31 36 32 37 35 30 2A 50 52 4F 31 30 35 31 30 30 31 52 30 30 3F 3F 2A 2A  | *162750*PRO1051001R00??**
```

The following information was returned upon request of the SOFT message:

APP,1051642,V0.3B18*PAR,,V0.0B1,1051M06
T118,1051M06_04A_T118.pvsgc*MODE,Run*FMT,983F17,R01A*

The following information was returned upon request of the CI message:

*162750*PRO1051001R00??**

where the final SAP number was set to "162750" and the final serial number was set to "PRO1051001R00??".

5.2. Configuration

A PVSG is to be configured using a compatible version of the Configuration Tool. To verify compatibility, compare the Config Format version used by the embedded software installed on your PVSG with the Config Format versions supported by the PC Software installed on your computer. If the Config Format version does not fall within the range of supported versions, downgrade or upgrade the PVSG PC Software on your computer to a suitable version.

6. PC Software

6.1. Overview

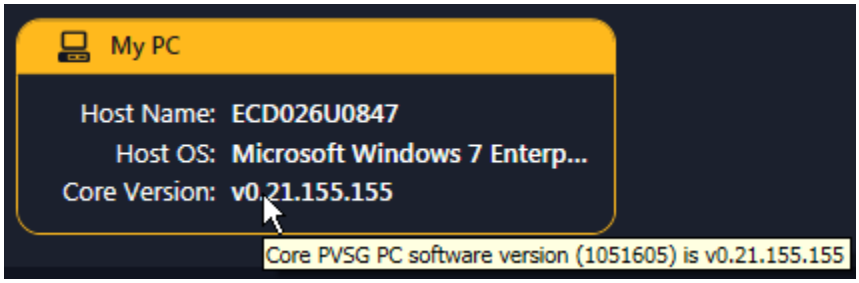
PC software for the PVSG is distributed via a single installer (1051605). This installer currently installs the following components:

Component Name	Software Number
Core Driver (*)	1051602
Update Tool	1051606
Configuration Tool	1051646

* - The core driver is made up of more than just 1051602, but 1051602 includes the dashboard which is the only user-visible piece.

Note: To determine the correct version of 1051605 PC software to use with the version of 1051642 embedded software used in the PVSG, refer to the release notes accompanying each software package.

Note: The current installed version of the PC software (1051605) can be determined from the dashboard:



The current installed version of the PC software (1051605) can also be determined by going to **Control Panel > All Control Panel Items > Programs and Features** and examining the version reported by **Parker Vehicle System Gateway Suite**.
For example:

Note: An administrator login is required to successfully install the PVSG PC software.

6.1.1. System Requirements

The PVSG PC Software currently requires Windows 7 / 10 (32-bit or 64-bit), a minimum screen resolution of 1024 x 768, and USB 2.0 or higher.

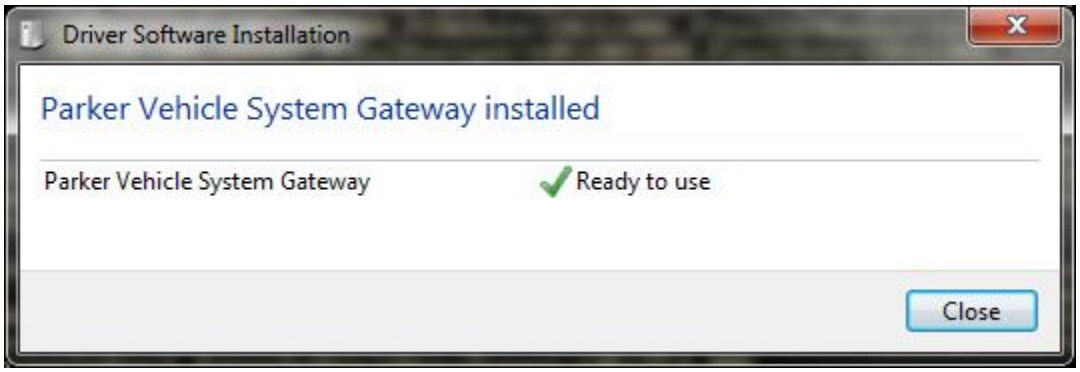
6.1.2. File Types

The following file types are used by the PVSG PC software.

File Extension	Type	Used By	Description
.pvsgs	PVSG Software	Update Tool (1051606)	PVSG embedded software package. Created by Parker Engineering.
.pvsgc	PVSG Configuration	Configuration Tool (1051646)	PVSG configuration source file. Configuration can also be distributed in this format.
.pvsgapp	PVSG Custom Logic	Configuration Tool (1051646)	PVSG custom logic file (custom application or custom programming plugin). Contact Parker for more details.

6.1.3. USB Driver Software Installation

The first time a PVSG is connected to a PC via USB, Windows will initiate a PVSG USB Driver Software installation. The PVSG PC Software should not be used until the PVSG USB Driver Software installation has completed:



6.1.4. Management Connectivity

It is possible to connect to the PVSG for management purposes via 3 interfaces:

- USB
- Ethernet
- Wireless

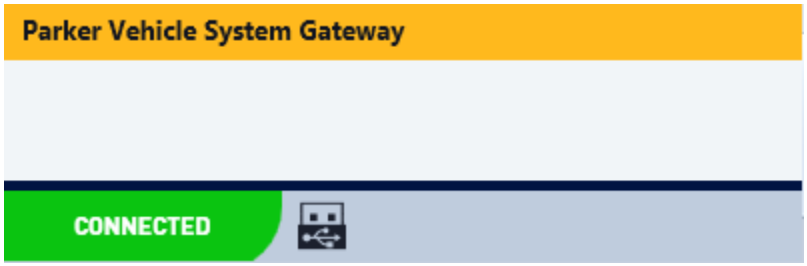
The PVSG PC drivers can handle all 3 types of communication link. From an architectural perspective, Ethernet and Wireless are the same mechanism and are categorised herein simply as "Network" since the underlying layer (TCP/IP) is the same for each. The active communication mechanism can be selected from the **Dashboard** application within the **Connection** tab.

6.2. Dashboard

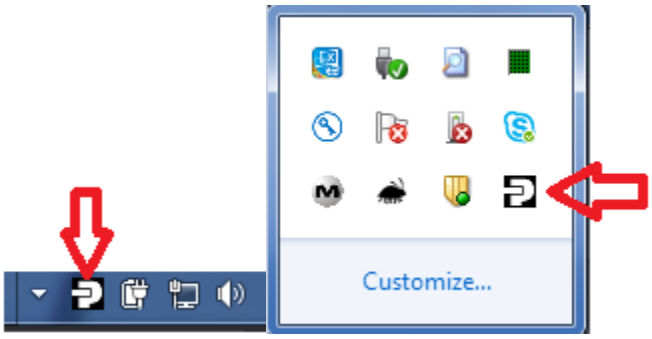
The dashboard is the user-visible portion of the core driver (1051602) that is the single endpoint for PVSG communication with the PC. Any PC tool(s) needing to communicate with the PVSG does so via this service.

6.2.1. Accessing the Dashboard

The dashboard will start automatically when you log in to Windows as a tray application. Connection change notifications will be shown near the system tray area, for example:

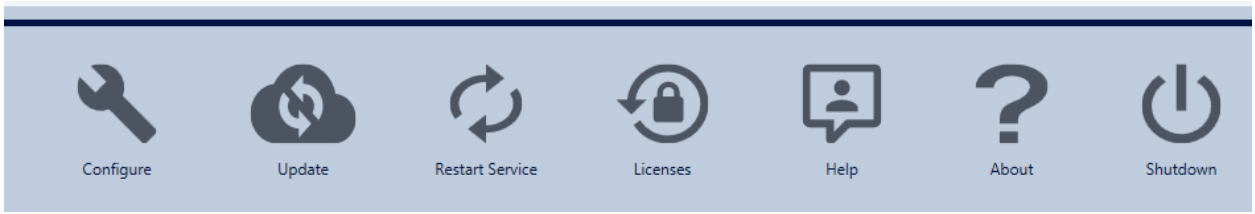


The dashboard tray application can be opened by double-clicking the 'Parker' icon in the system tray area:



When closed, the dashboard will be hidden and continue to run in the background. The dashboard tray application can be permanently shutdown using the **Shutdown** option on the dashboard dock. The dashboard dock can be accessed by clicking the dock button in the top right corner:

Or pressing **Ctrl + D** when the dashboard is in focus. The dock appears at the bottom of the dashboard window:



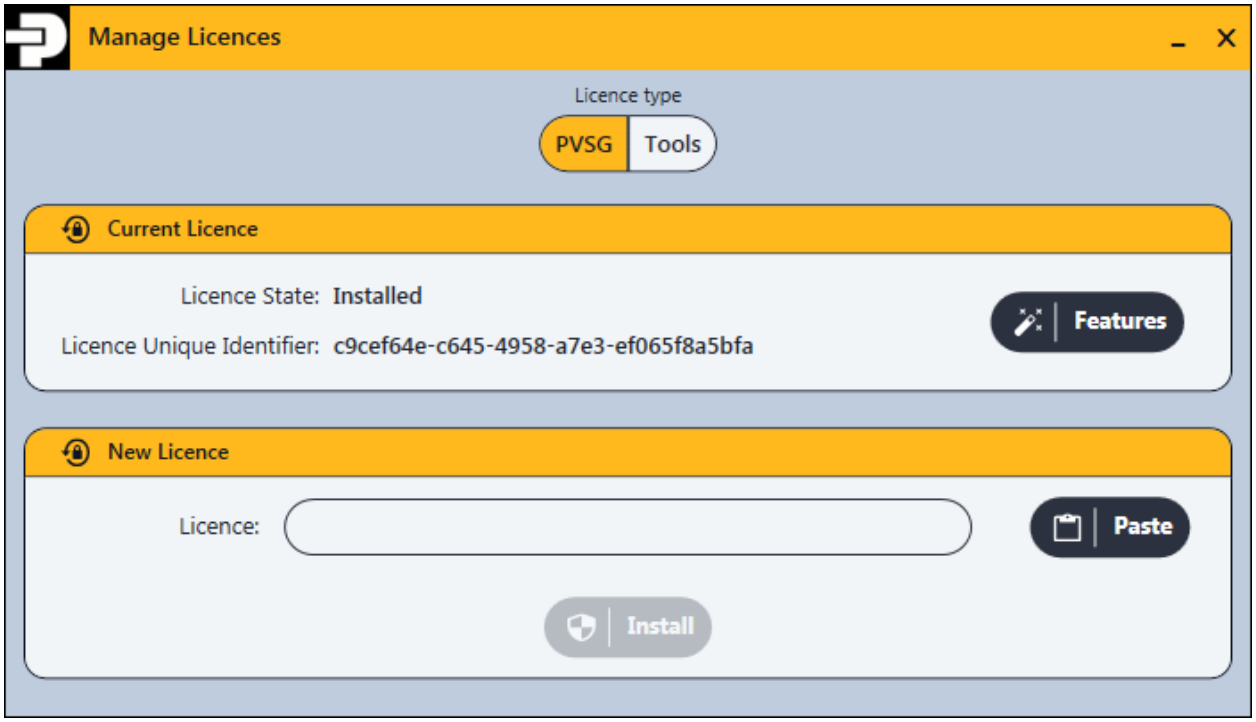
The dock provides quick access to other PVSG tools as well as access to the help files and version information.

If needed to be relaunched after a permanent shutdown, run **PVSG Dashboard** (shortcut added to Windows start menu by default as part of the installer (1051605) under **Parker > ECD > PVSG**).

Note: Shutting down the dashboard does not shut down the portion of the core driver (1051602) that runs as a Windows service. If you need to restart the core driver, select **Restart Service** from the dashboard dock. Alternatively, from the Windows start menu select **Run**, enter **services.msc** and click **OK**. This should launch a **Services** screen listing Windows services. In the list of services, find **PVSG Driver Core Manager**, right-click on it and select **Restart**. The security principal of an administrator may be required to restart the **PVSG Driver Core Manager** service. If you can't restart the service, restart Windows.

6.2.2. Licences

PVSG feature licences and tool licences can be installed via the licence manager.



6.2.2.1. PVSG

PVSG feature licences can be obtained from Parker Hannifin Corporation, or are pre-installed on a PVSG unit. To install a licence, copy the licence data provided by Parker to the Windows clipboard, and click the **Paste** button under **New Licence**. The PVSG must be restarted (per the prompt) in order for the new licence to take effect. The state of any installed licence is reported under **Current Licence** along with a summary of the enabled feature state via the **Features** button.

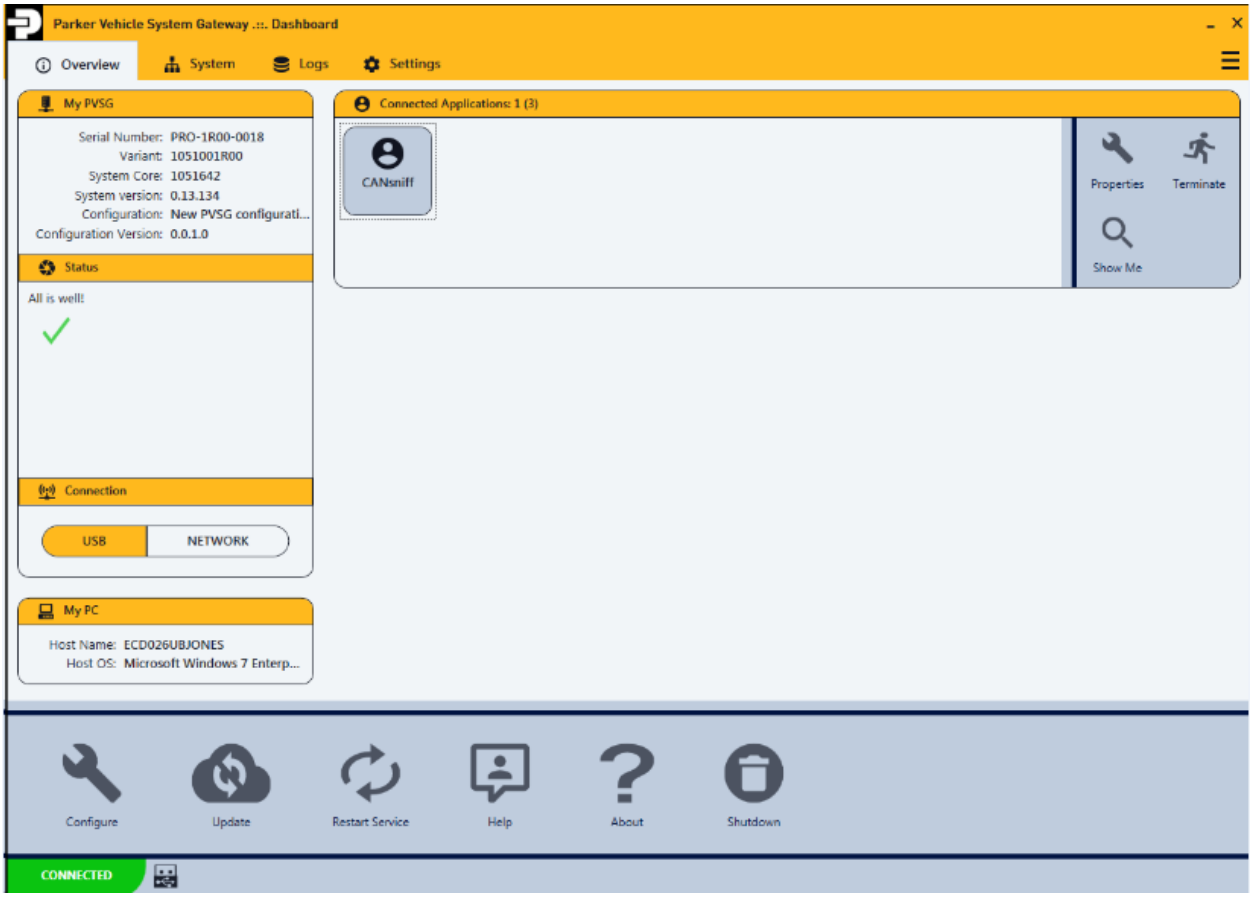
Note: the state of any installed licence is only available when the PVSG has a valid configuration installed.

6.2.2.2. Tools

This section provides easy access to licence data for installed PVSG tools. Refer to the specific tool help for more details on the licence in relation to that particular tool.

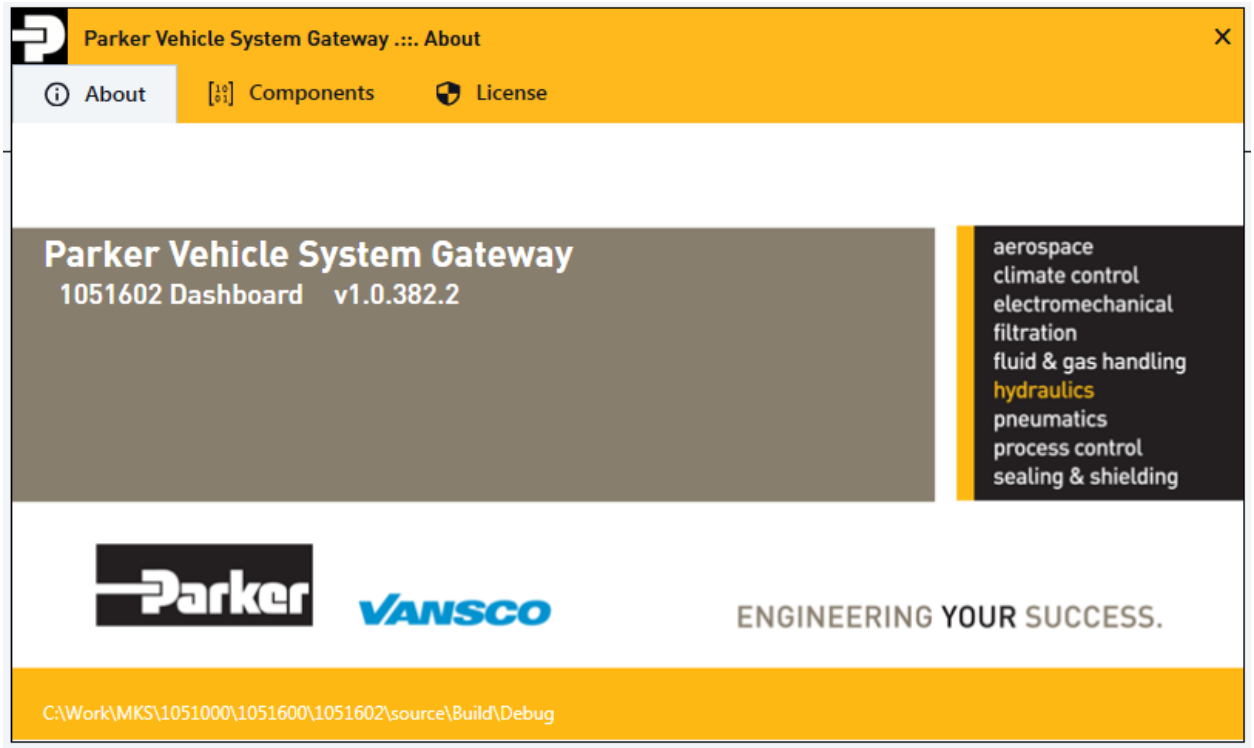
6.2.3. Overview

The **Overview** tab provides a quick view of the current state of the connected PVSG (if one exists) and the current state of the PC drivers, including which applications are connected.

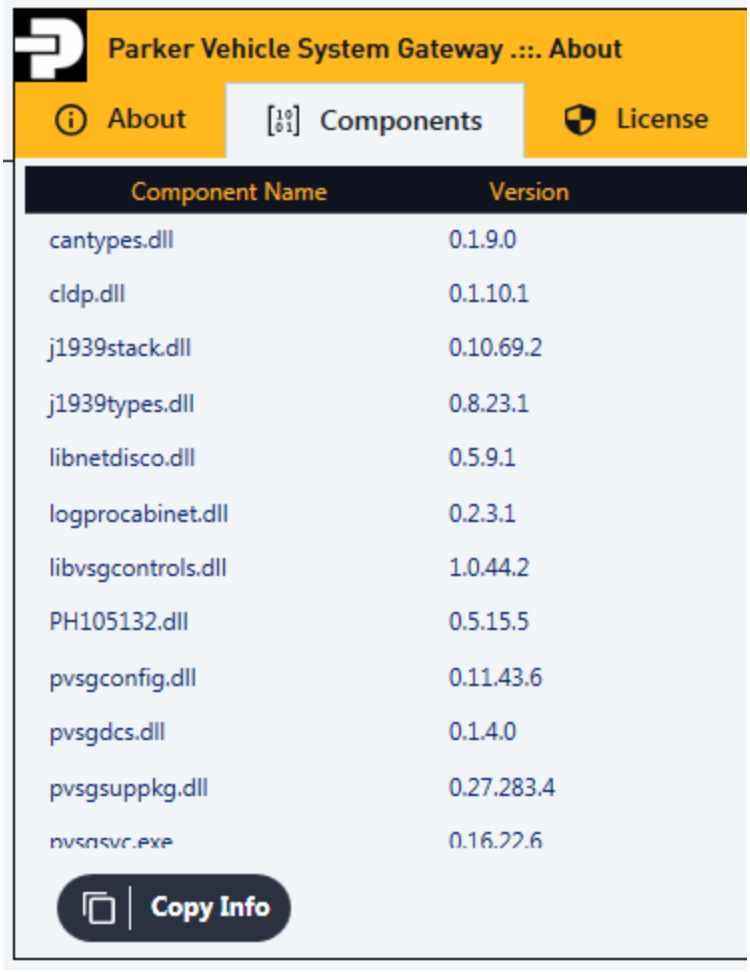


Note: The **Configuration Version** number is composed as follows: the first three numbers match the major version, minor version, and build number entry in the configuration tool, and the fourth number (is known as the 'runtime configuration version') is a number updated by PVSG whenever configuration is modified internally (incremented per change at shutdown) or a new configuration is installed (set to 0).

Driver version information can be obtained by selecting the **About** option on the dashboard dock:

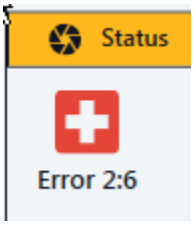


The **Components** tab provides detailed information on all major driver components:



Note that the **Copy Info** button can be used to help provide diagnostic information to Parker; this will copy all of the component version information to the Windows clipboard which can then be pasted into an email, for example.

Active target errors are shown within the **Status** panel. The error codes match those shown on the PVSG's status LED and the "Error Codes" section within this document can be used to lookup the meaning.



6.2.4. Connection Information

The bottom right corner of the Dashboard provides connection information summary.

The connection status indicator on the left reports the connection state as CONNECTED or NOT CONNECTED. When connected, the connection method will be shown as USB () or network (). In addition, when connected, a lock symbol () will appear when a secure session has been established with the PVSG.

Note: A secure session is required to perform critical data exchange with the PVSG (e.g. configuration, authentication).

The **Connection** panel provides an interface to select between available target connection methods (USB or Network (including Ethernet and wireless)).

6.2.4.1. USB

USB is the primary management connection mechanism. If another management connectivity mechanism is in use and the USB connection becomes connected, communication will transition to the USB link once a connection is established.

6.2.4.2. Network

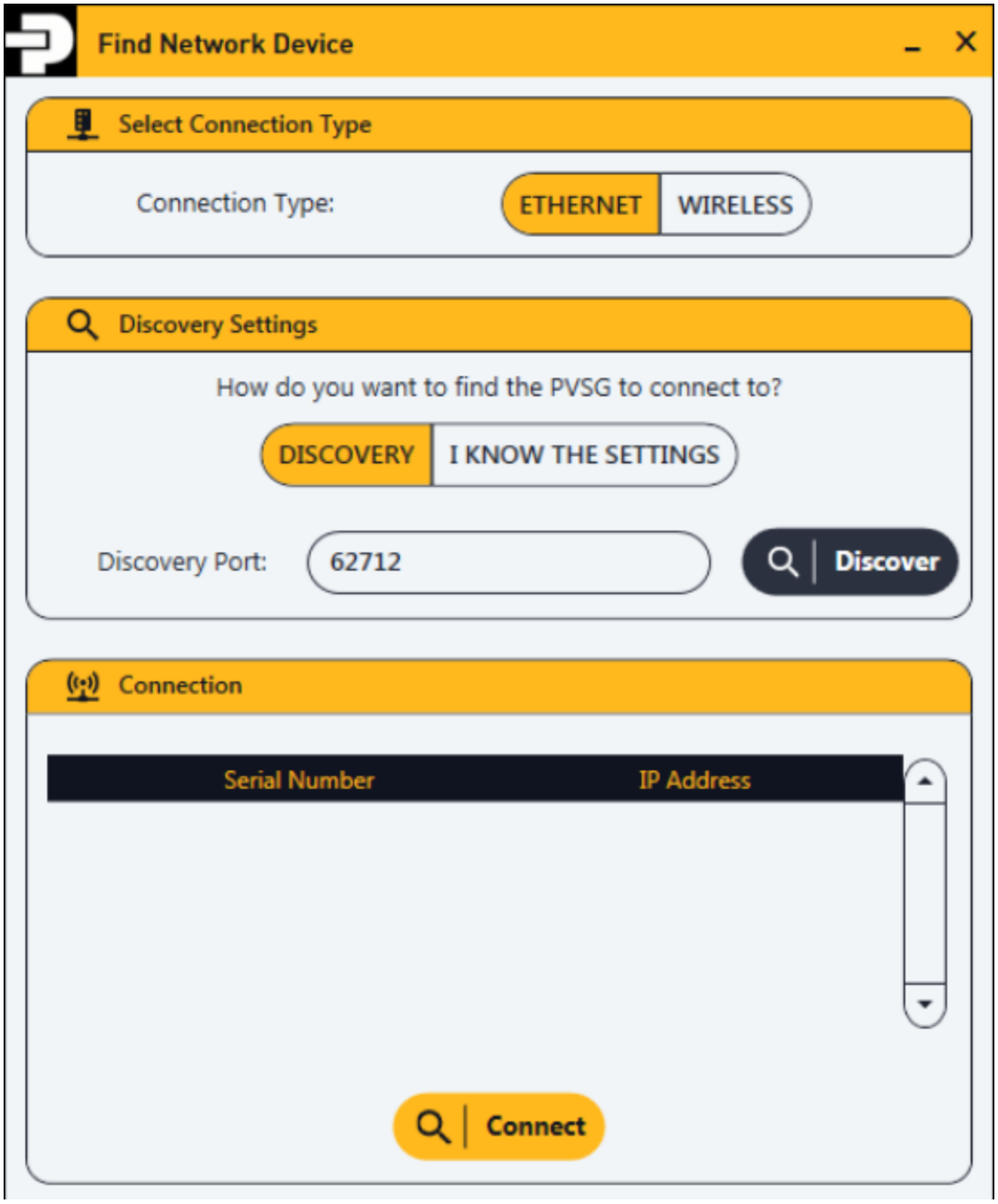
The default network connection mechanism is Ethernet. If Ethernet and/or wireless is enabled in the configuration and depending on whether Ethernet is physically connected to the target or not, one or the other will become active whenever the USB link is determined to be disconnected. If wireless is enabled in the configuration, the radio will power up and down as necessary when the network connection mechanism is available.

All network configuration can be done via the configuration tool (1051646) from the **Network Configuration** menu option.

6.2.4.2.1. Discovery

The network communication mechanism provides a discovery feature which allows one or more PVSGs to be discovered on the network. This allows such devices to be connected to without knowing their address details. For this to work, discovery must be enabled in the configuration and the discovery port must be known. The discovery mechanism uses broadcast UDP transmissions, and so PVSGs can ONLY be discovered within the broadcast domain of the network to which they are connected. The broadcast domain is controlled by both the physical topology of the network and the addressing scheme in use. Importantly, note that broadcast transmissions are never forwarded by network routers. The PVSG(s) which you wish to discover and the PC performing the discovery operation must be on the same network segment and be visible to one another.

The discovery interface can be accessed from the dashboard by going to the **Connection** panel and clicking on **Network**. This will bring up the following screen.



Click **Discover** to discover available PVSGs. Available PVSGs will appear in the *Connection* area of the screen. Select the desired PVSG and then click **Connect** to establish a connection with it.

6.2.4.2.2. Ports

As is good practice with services which use TCP/IP communication, the ports used are configurable. Note that the default values have been carefully chosen to avoid collision with known standard ports, and so should not be changed by the user without very good reason.

6.2.5. Client Information

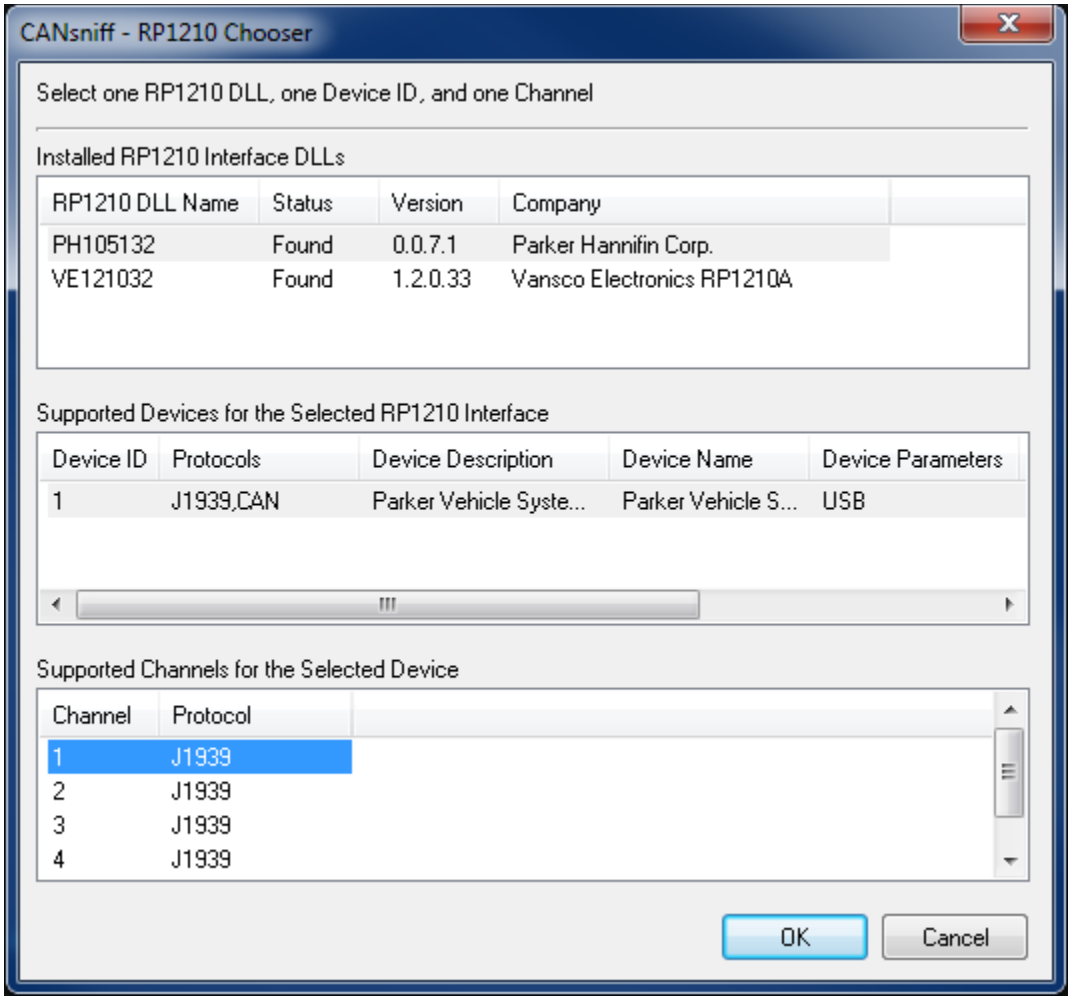
The dashboard provides information on the clients connected to the target. The **Connected Applications** panel provides an interface to select between connected applications.

6.2.5.1. Connecting an RP1210 Client

The PVSG supports a subset of RP1210C (reference *TMC RP 1210C - Windows Application Program Interface*) to provide diagnostic tool access to all of the PVSG CAN, J1939 and J1708 interfaces.

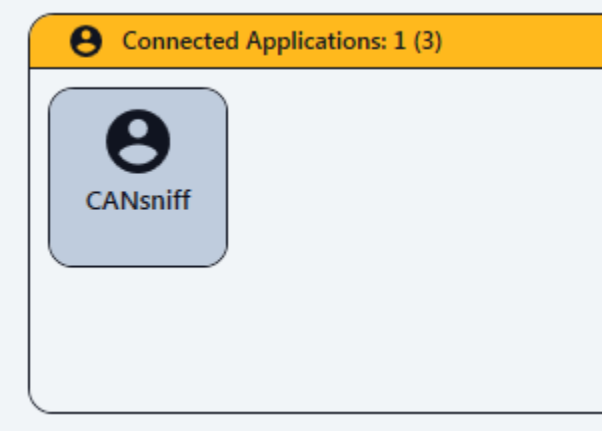
Note: In order to use a legacy version of the RP1210 dll (this is not compliant with RP1210C), there is a command line option that can be used when installing the PC software installer (1051605): /legacy_DLA_compatibility=true

In order to connect a RP1210-based tool to the PVSG (e.g. CANsniff), the PVSG DLL (i.e., PH105132) must be specified as the RP1210 Vehicle Datalink Adapter (VDA) to use. For example, CANsniff supports a built-in RP1210 chooser that allows you to choose the RP1210 VDA to use. Note other tools may require other steps to be taken to specify the PVSG DLL.

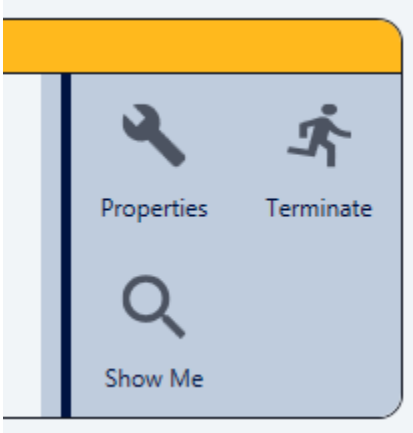


Note: The physical CAN bus with which an RP1210 client is associated is set by channel selected for the supported device when specifying PH105132 (third section of the screen above *Supported Channels for the Selected Device*). The channel number is the physical CAN bus number (i.e. Channel 1 is CAN 1, Channel 2 is CAN 2, etc.).

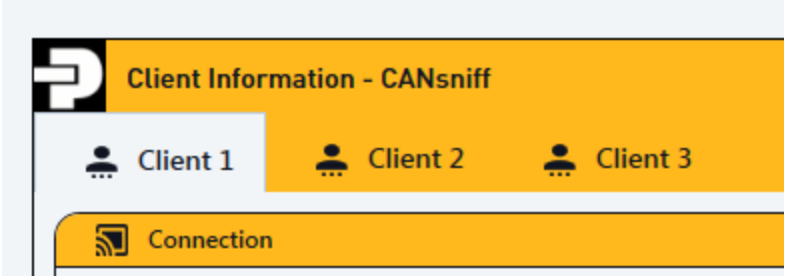
Once connected, the client can be seen from the dashboard tray application, **Connected Applications** panel.



Clicking on any client application will bring up a menu with actions that can be performed upon the application attached to the PVSG.

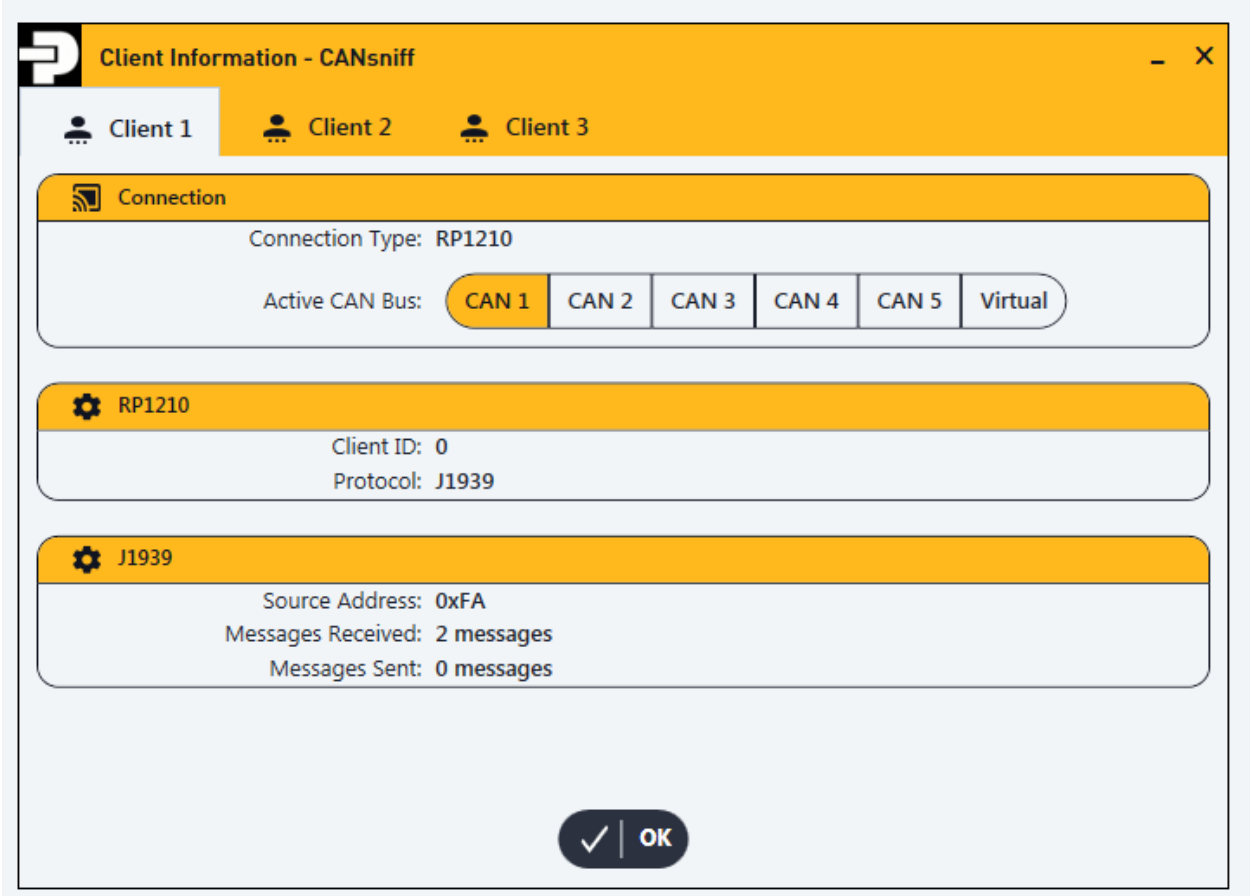


Note: A single application may contain multiple "clients". In terms of RP1210 clients, for example, a single application instance may open more than one RP1210 client connection. Each logical connection which a connected application owns is shown as a tab in the properties window:



6.2.5.2. Properties

The **Properties** window shows various metric information about a particular client connection. For CAN (or J1939) type connections, it also allows the active CAN bus to be changed:

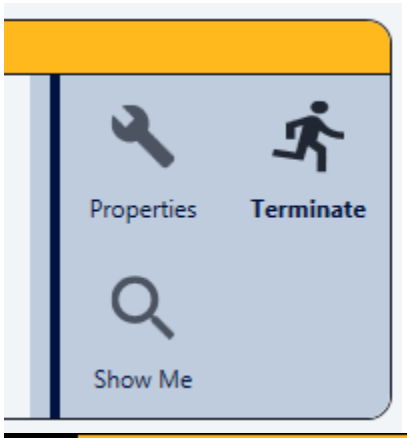


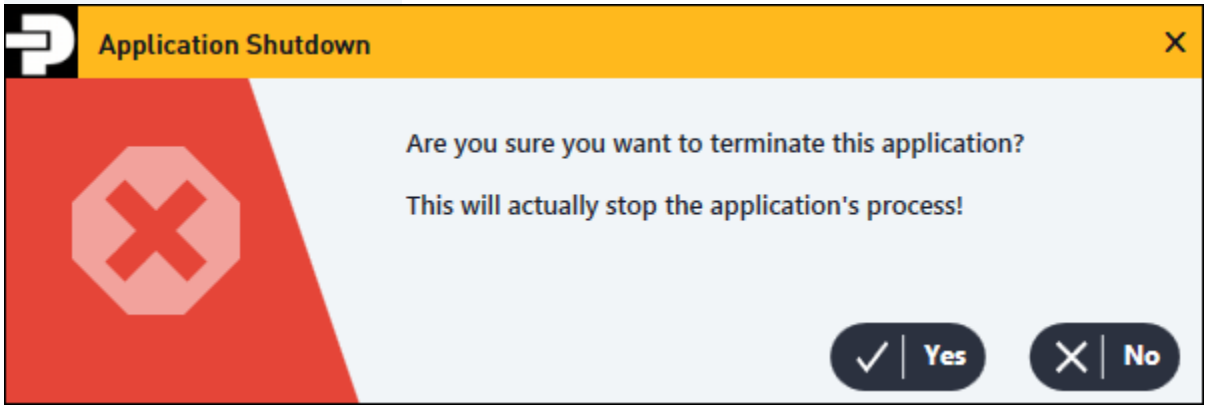
Notes:

- The virtual CAN bus connection (the ***Virtual*** tab seen above) is currently a stub (non-existent).
- Some applications (e.g. CANsniff) may make more than one RP1210 client connection and all of the RP1210 client connections associated with a particular instance of an application may need to be updated to the same CAN bus in order for the application to function properly.

6.2.5.3. Terminate

The **Terminate** option can be used to stop the connected application's process:





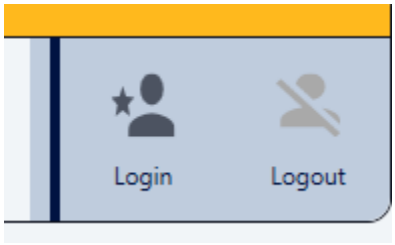
This terminates any logical client connections and then shuts down the application's process.

6.2.5.4. Show Me

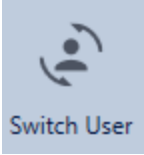
The **Show Me** option can be used to give visual focus to the selected application's process.

6.2.6. User Access Control

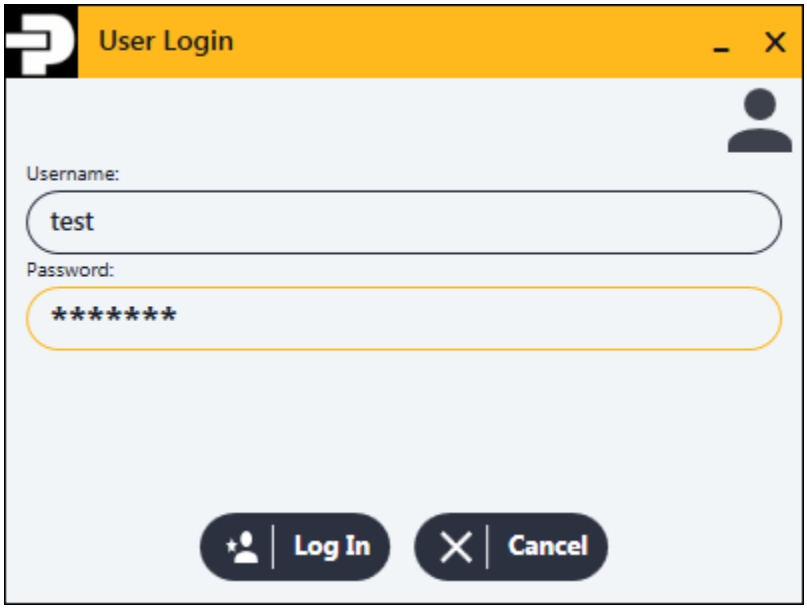
The dashboard provides the ability to log in to the PVSG. By default, the anonymous user is logged in. The current user will be logged out whenever an attached management device is disconnected, or the PVSG is rebooted. The **Login** and **Logout** buttons may be used to log in as a new user, or log out as the current user respectively:



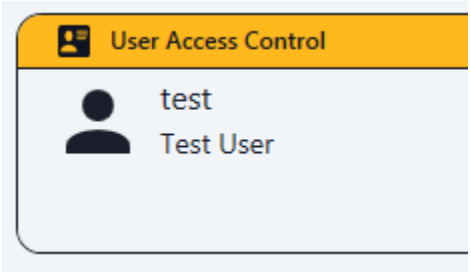
If a user is already logged in, the **Switch User** option appears:



When logging in (or switching user), the **User Login** window is displayed:

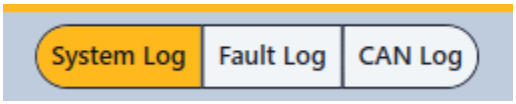


Entering the correct username and password will log the respective user in. Entering an incorrect username and password will log in the anonymous user.

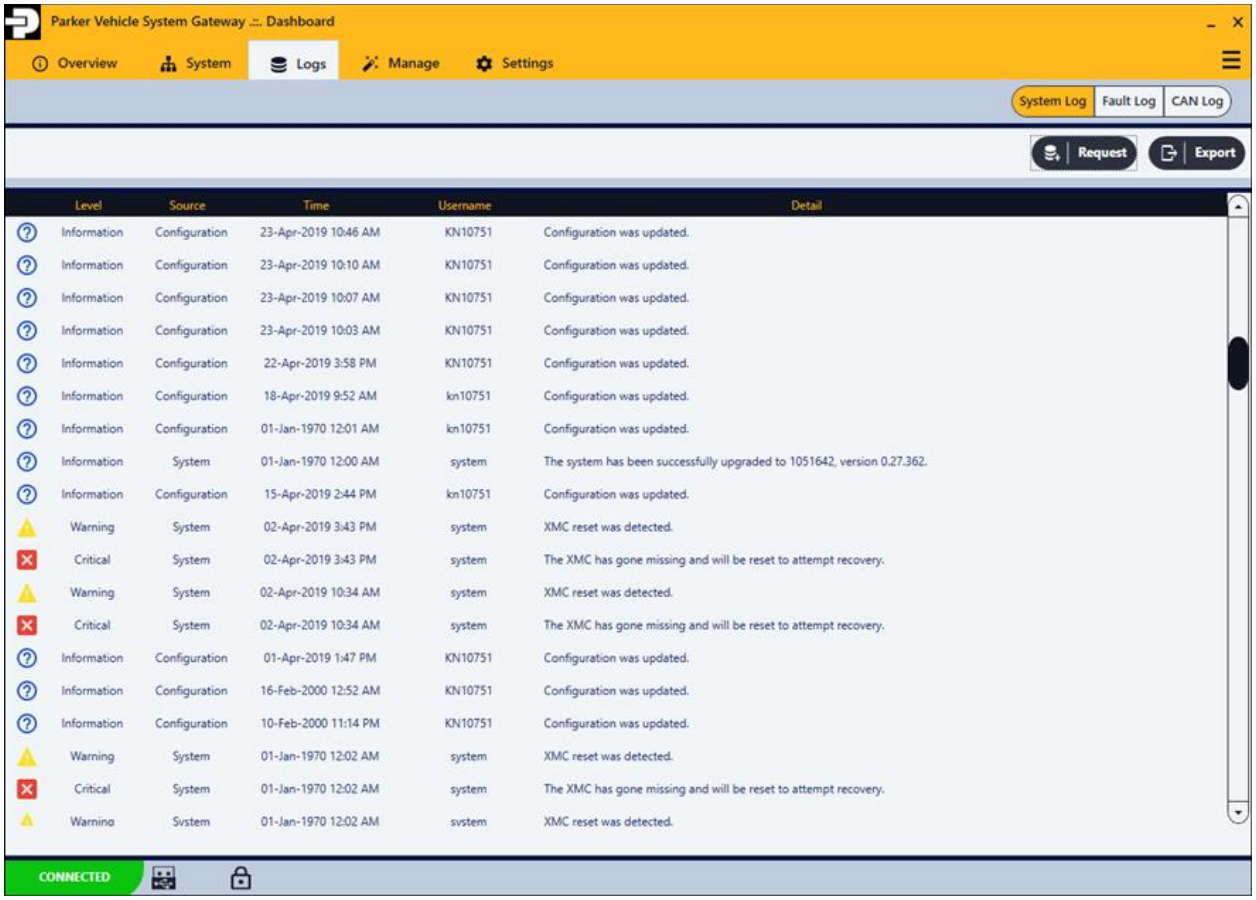


6.2.7. Logs

The **Logs** tab provides an interface to retrieve logs, including system logs, fault logs, and CAN logs. The log type can be selected using the toolbar buttons:



Refresh the logs by clicking the **Request** button in the top right corner.



The listing of logs are displayed in reverse chronological order.

To export logs to a .csv file, select **Export** button in the top right corner.

For system logs, the following events are logged:

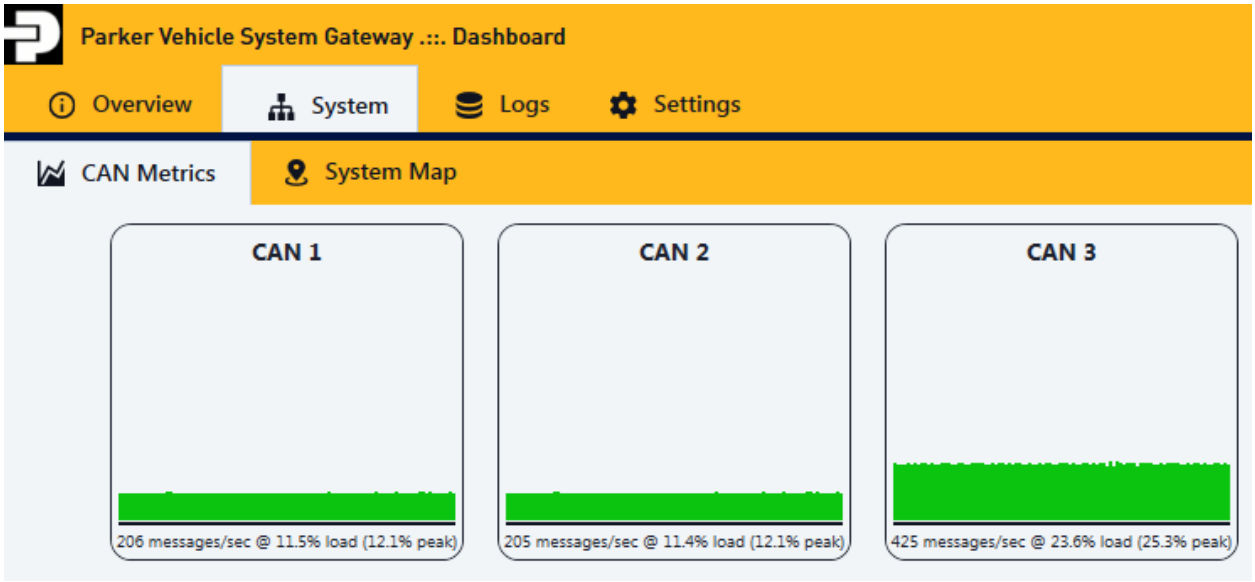
- Configuration failed to load
- eMMC failed to mount
- Softdog related events (server services/router (XMC)/power control (M0) gone missing)
- Configuration updated (including username of user who performed the update)
- System update events
- Shutdown provider stopped
- USB service stopped
- Custom application errors
- Error triggering a CAN log

For details on the data logged within a fault log, see the **Fault Logging** section under **Configuration Tool**. Likewise, see the **CAN Logging** section under **Configuration Tool** for more details on CAN logging.

6.2.8. System

The **System** tab provides access to CAN metric information and the system map.

6.2.8.1. CAN Metrics



This shows the number of CAN messages being received by the PVSG per second, for each available CAN bus. The approximate bus load is also shown as a percentage, given the configured baud rate. The traffic graph uses the following colours:

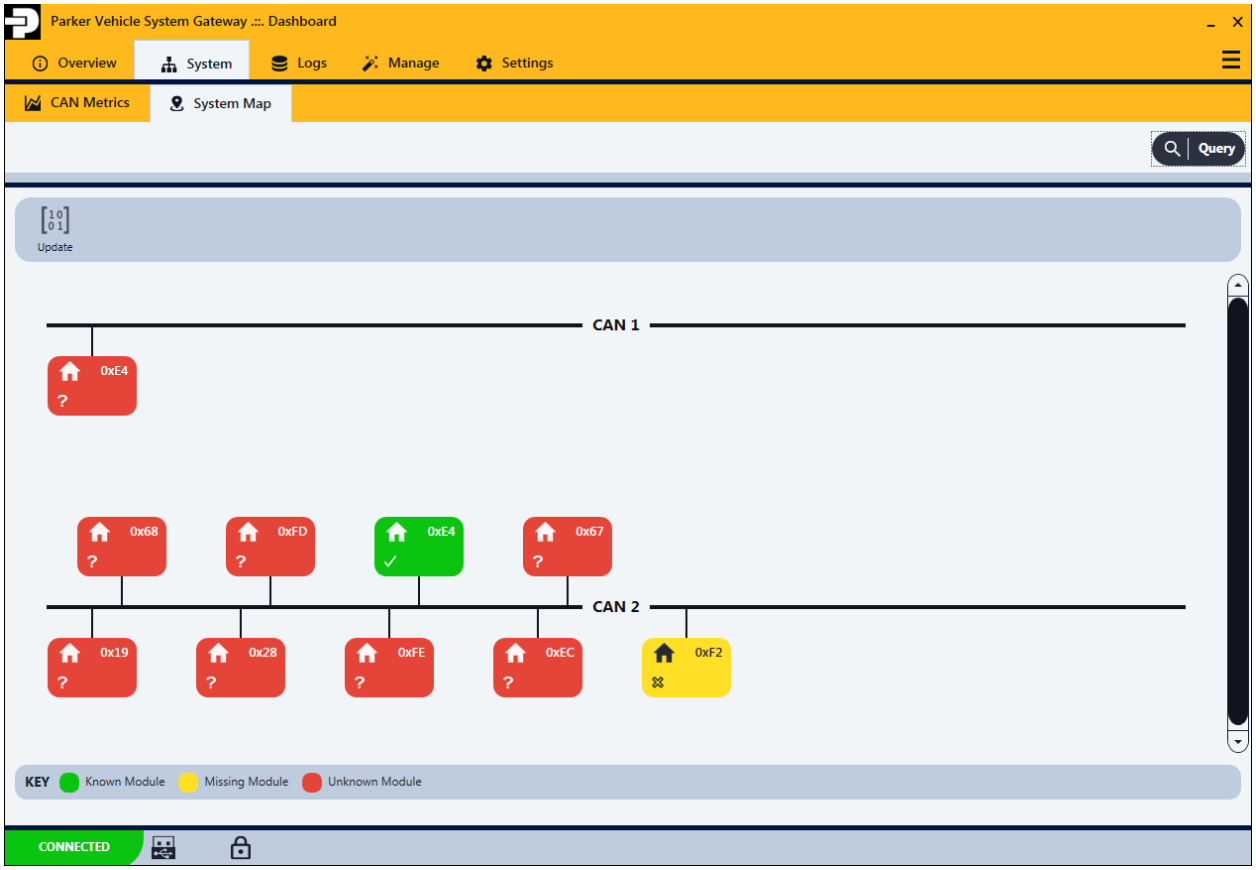
- Green. 0% <= CAN bus load < 40%
- Yellow. 40% <= CAN bus load < 70%
- Red. 70% <= CAN bus load <= 100%

Note: The CAN bus metric colour scheme is merely used to provide a visual aid. It does <u>not</u> provide any indication as to the state of the system and should not be used as such.

6.2.8.2. System Map

The **System Map** tab shows a visual representation of the modules connected to the system in which the currently attached PVSG resides. Clicking **Request** retrieves the module data currently stored by the PVSG. Clicking **Probe** forces the PVSG to detect new modules first.

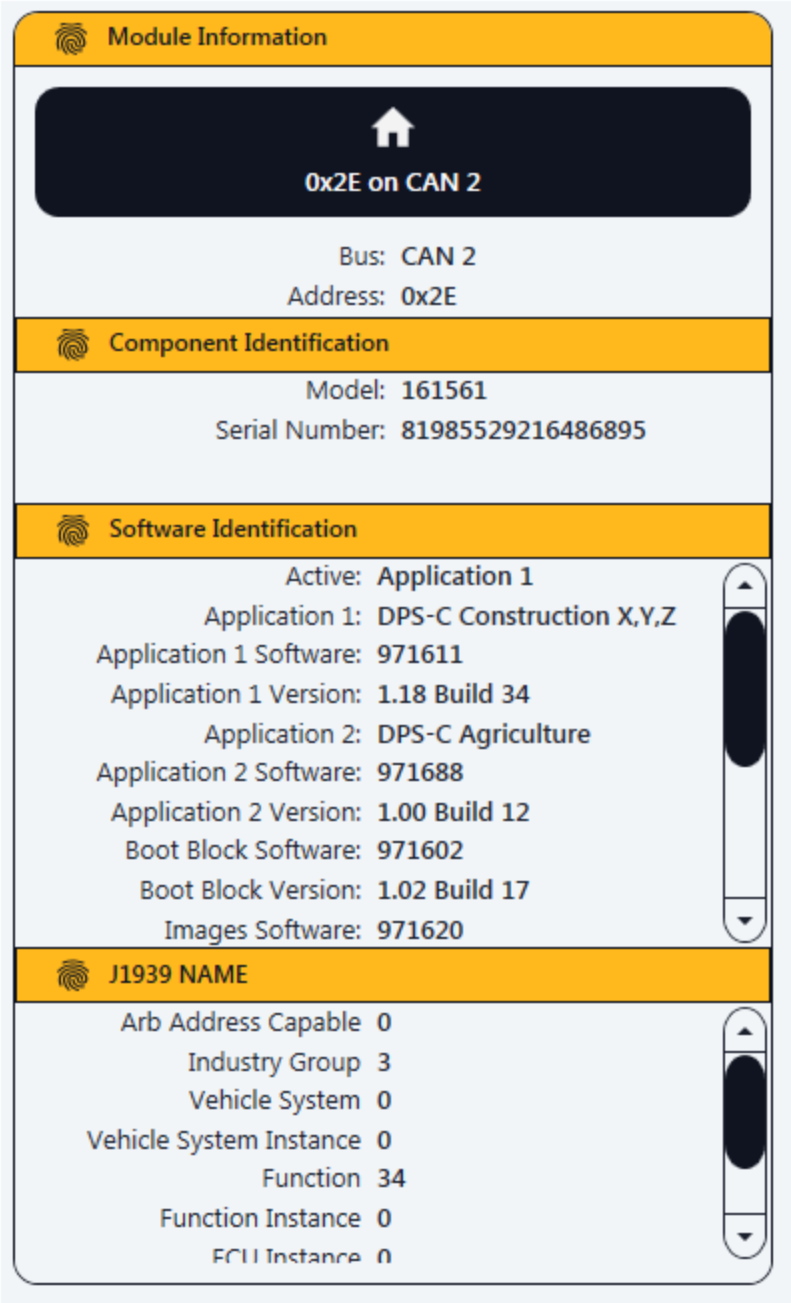
Modules are detecting by the PVSG making a "J1939 global request for address claim" on all configured CAN buses (see the "Configuration Tool" section for details on how to configure module detection). Additional information is retrieved from modules which respond, where possible.



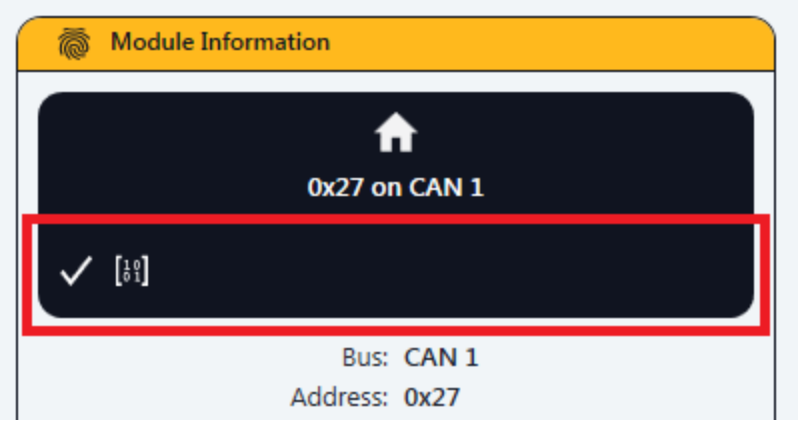
The icons shown within a module card differ depending upon the state of the module:

Icon	Description
✓	Module is known, and is expected on the system.
?	Module is not known, and is not expected on the system.
⊠	Module is missing from the system.
[10 01]	The configuration holds software for this module, and it can be updated.

Clicking on a particular module shows additional information, where available:



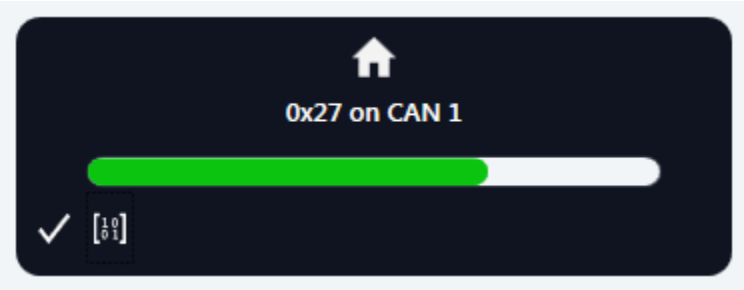
If a module is "known" to the system (i.e. it is present in the configuration), an extra section appears under the module header, known as the **Module Toolbox**:



Several icons/buttons are available (note that the module toolbox contents are dynamic and different icons/buttons will appear depending on the state of the module and the installed configuration):

Icon/Button	Function (click)	Description
✓	None	Indicates that the identity of the detected module matches that set in the configuration.
[10 01]	Updates module software	Only appears if the module ID matches and the module is configured for software updates (i.e. the configuration contains software for this module). When selected, the module will be updated with the software contained within the configuration.

If an operation is currently in progress on a module, a progress bar is also shown within the module toolbox:

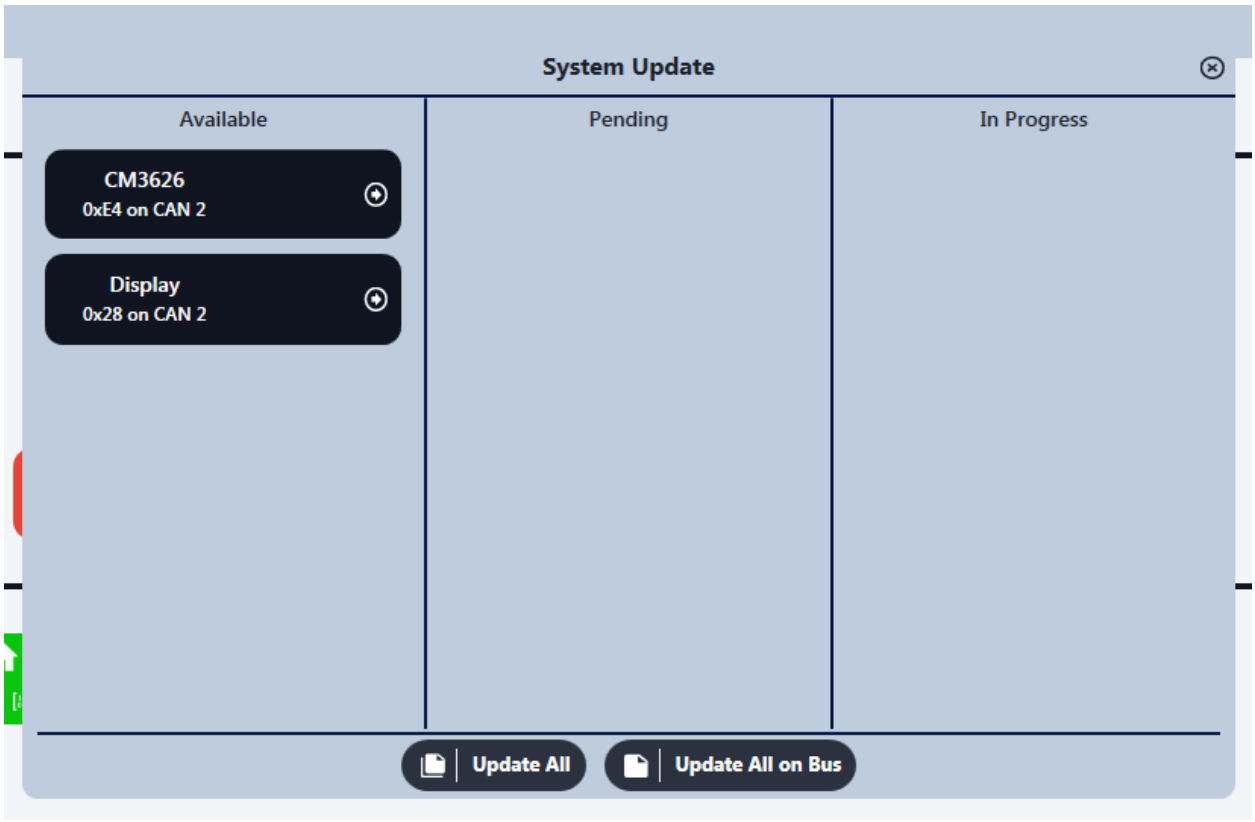


The **System Toolbox** is shown at the top of the system map:

This contains available "global" (to the system) actions.

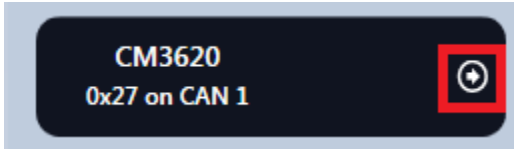
6.2.8.3. Update

Opens a popup giving access to system software update options:



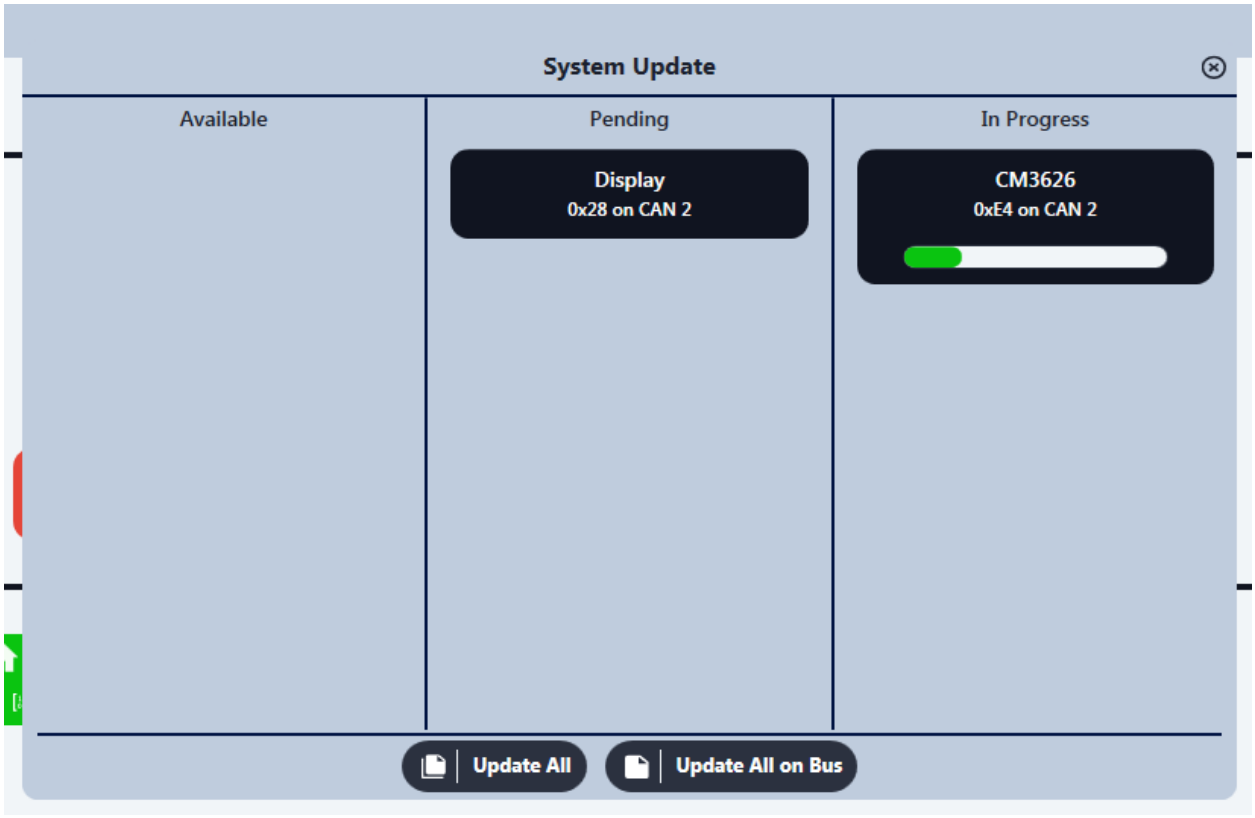
Modules which are available for software update are shown in the **Available** column.

Individual modules can be updated by clicking the arrow on the module info within the **Available** column:



Using the **Update All** and **Update All on Bus** buttons at the bottom of the popup, all eligible modules and all eligible modules on a chosen CAN bus can be updated respectively.

Operations currently in progress are shown under the **In Progress** column. Operations which cannot start yet are shown within the **Pending** column.



Concurrent operation policies are controlled via the configuration tool.

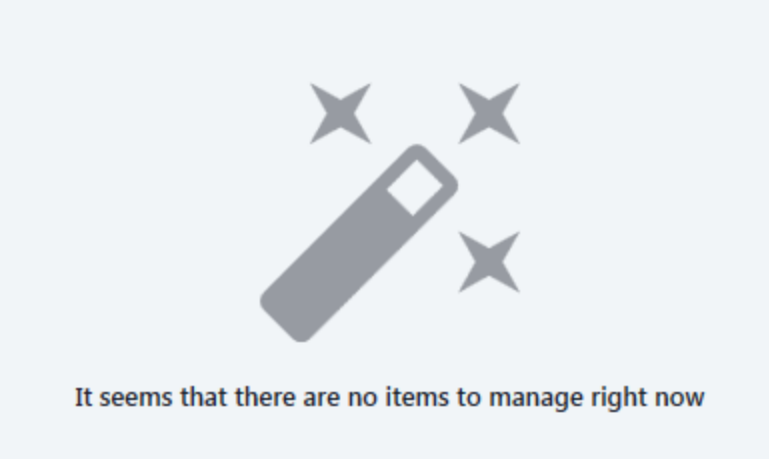
System module update operations are logged in the system log (refer to **Logs** section above). In the case of failure, the meaning of the returned status codes are dependent upon the protocol in use.

6.2.8.4. Vansco Flashload-over-CAN

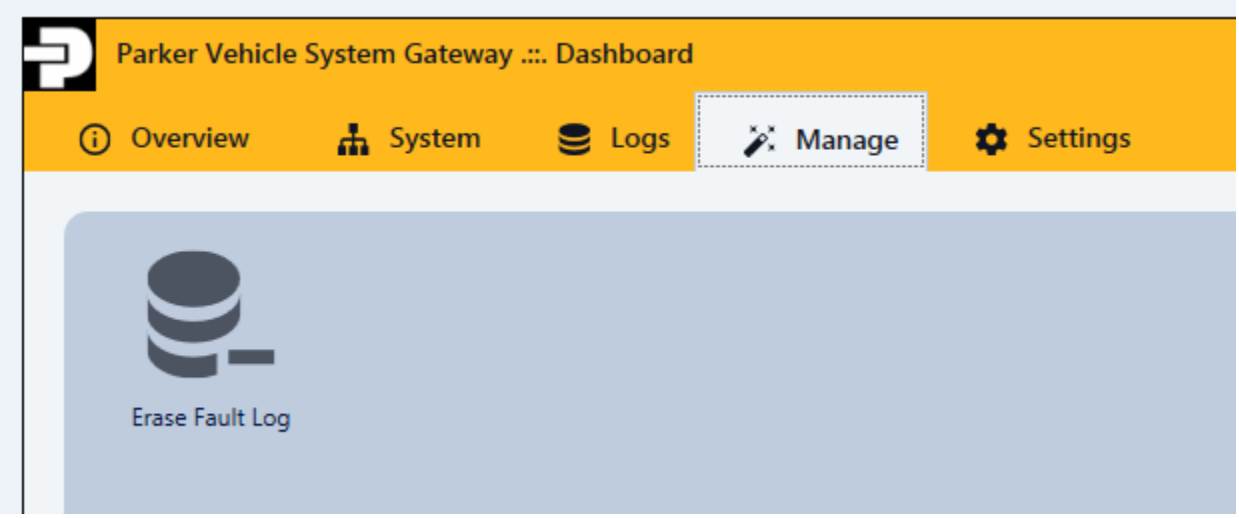
Code	Description
-9	The system module software file header was malformed.
-61	There was insufficient memory available to perform the operation.
-61	The system module software file was empty.
-125	Operation cancelled.
-131	A general error occurred which could not be recovered from.

6.2.9. Manage

Management options are available under the **Manage** tab. If no management options are available for the currently logged in user, the following is seen:



To access management options, log in as a user (if user management is not configured, all possible management options are displayed without a user being logged in).

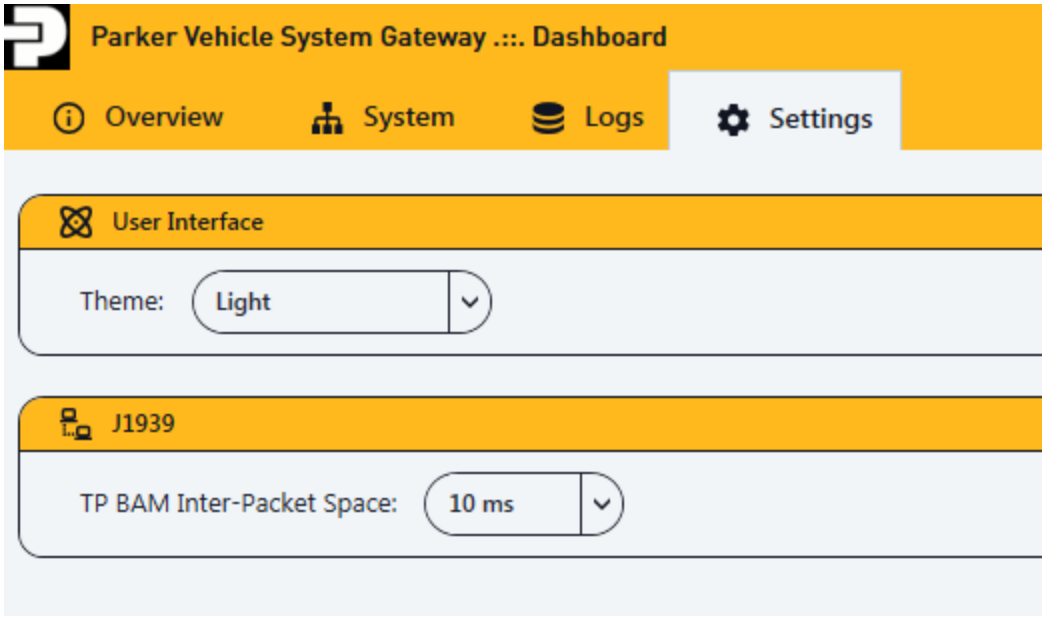


Possible management options are listed below.

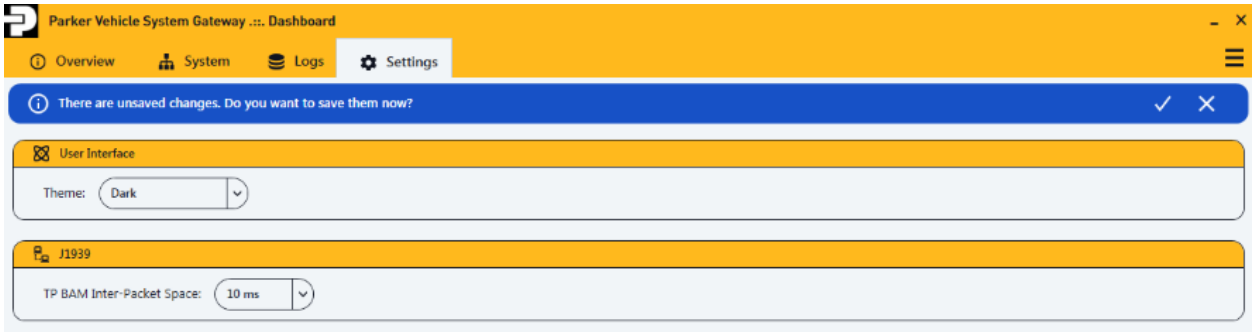
Option	Description
Erase Fault Log	Erases all logs currently stored in the fault log database. This action cannot be undone.

6.2.10. Settings

The **Settings** tab gives access to available user settings:



When settings are changed, the user is prompted to save them:



The following settings are available:

- User Interface: Theme. This sets the current visual theme from two available options:
  - Light
  - Dark
- J1939: TP BAM Inter-Packet Space: Sets the time interval between consecutive data packets on a J1939 Transport Protocol Broadcast Announce Message transmission. The J1939 standard states that this should be set between 50ms and 200ms. 10ms is also provided as an optional performance enhancement at the user's discretion.

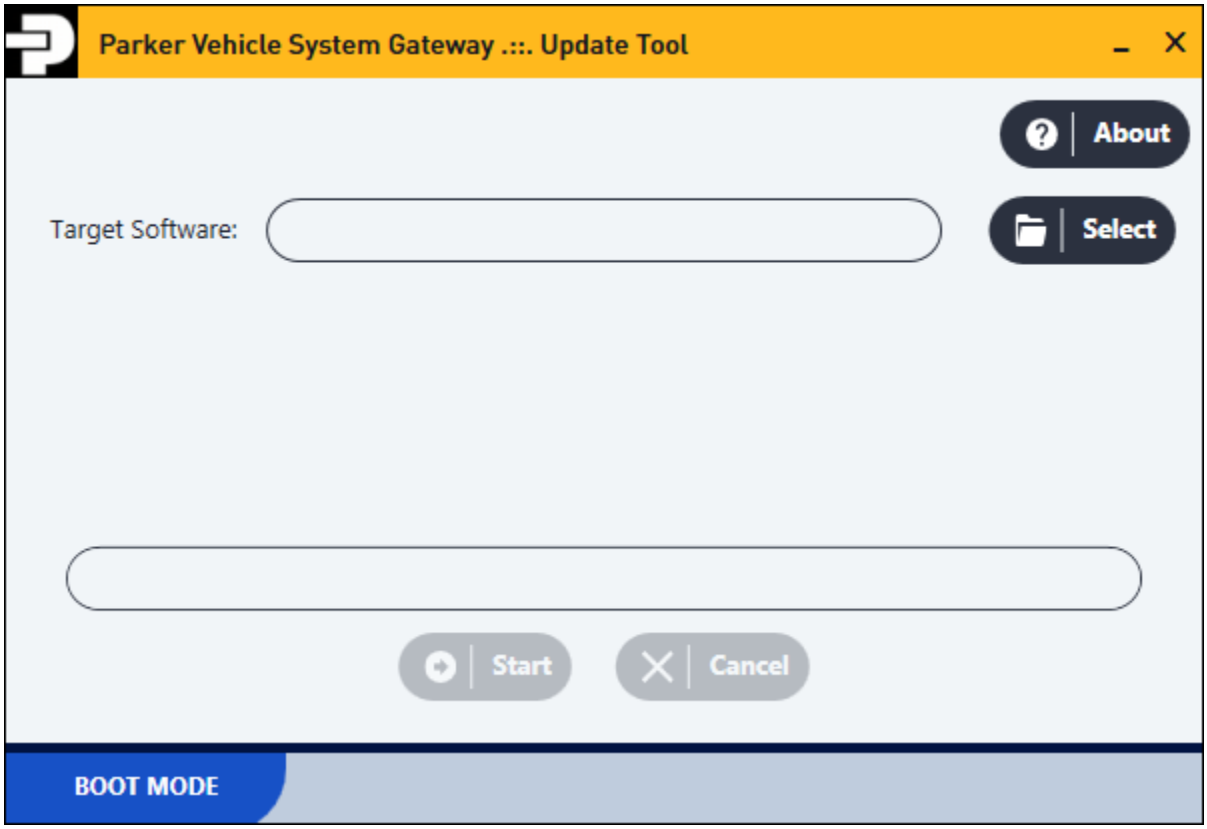
Note: Once changes are saved, they are not applied until the relevant PC software component is restarted.

6.3. Update Tool

The update tool may be used to update the version of the software (1051642) installed on the PVSG. The update tool requires a USB connection to the PVSG to update.

6.3.1. Accessing the Update Tool

The update tool can be accessed by using the **PVSG Update** shortcut added to the Windows start menu by default as part of the installer (1051605) under **Parker > ECD > PVSG**.



In order to update a PVSG, with the PVSG connected, run the update tool, select the appropriate file and click Start. Then follow the on screen instructions to complete the update process.

Note: The update tool also provides a command line interface. Locate pvsgupd.exe (installed as part of the installer 1051605), and run "pvsgupd.exe -h" to get a listing of all of the available commands.

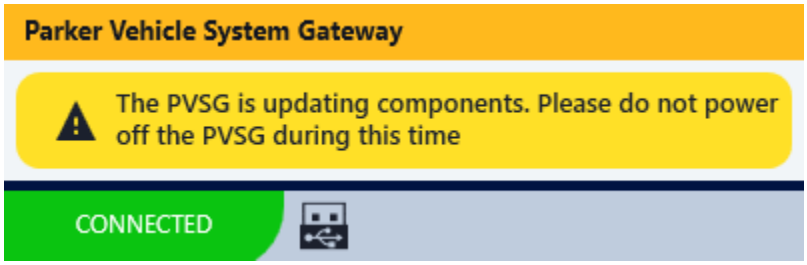
6.3.2. Update Steps

The following upgrade procedure can be used to update PVSG software alongside PVSG PC software.

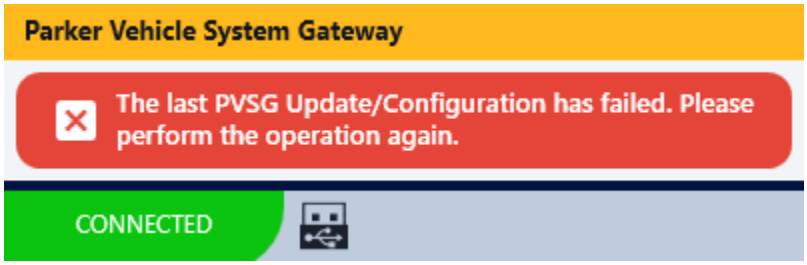
1. Read configuration from PVSG with currently installed PVSG PC software and save configuration. This configuration can be used on PCs with the same PVSG PC software versions installed and can also be used on laptops with newer versions of PVSG PC software.
2. Install newer version of 1051605 PC Software.
3. Read configuration from PVSG and save configuration. Save this config as precautionary or if step 1 was missed.
4. Update PVSG.

5. Send configuration from Step 1 to PVSG.

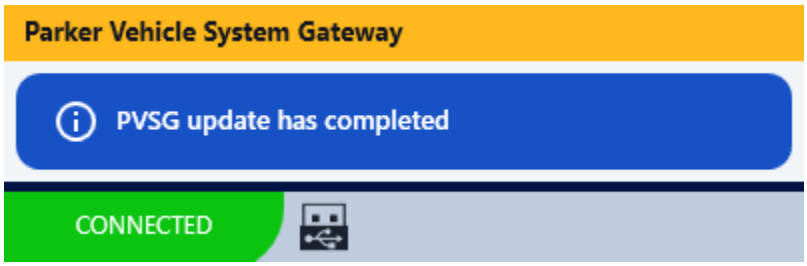
Depending on which PVSG software version the PVSG is being updated to, the following pop may appear at the bottom right of the screen:



If the reprogram fails, a 2:8 error code will appear along with the following pop up:



If the reprogram succeeds, the following pop up will be shown:



To confirm that your reprogram was successful, verify that the "PVSG update has completed" pop up appears and that no new errors appear in the dashboard.

6.3.3. Update Tool Error Codes

Under some conditions, the PVSG update tool generates numeric error codes. A brief description of the general fault area is given to the user, but the exact meaning of the error is intentionally hidden since providing the error details would likely expose information surrounding our update procedure which should ideally remain confidential to Parker.

The error codes are dynamically formed from a base code, and a specific error. The base codes currently in use are:

Base Error Code	Description
0x1000	Error downloading bootloader.
0x2000	Error downloading device tree blob.
0x3000	Error downloading RAM filesystem.
0x4000	Error downloading kernel.
0x5000	Error jumping to address.
0x6000	Error missing security keys.

Base Error Code	Description
0x7000	Error missing files.
0x8000	General bootstrap error.

The specific error codes currently in use are:

Specific Error Code	Description
1	Operation not permitted.
2	No such file or directory, or the expected data is missing.
5	General I/O error.
0x13 (19)	No device.
0x16 (22)	Invalid argument.
0x3D (61)	No data.
0x46 (70)	General communication error.

Error codes can be decoded as per the following examples.

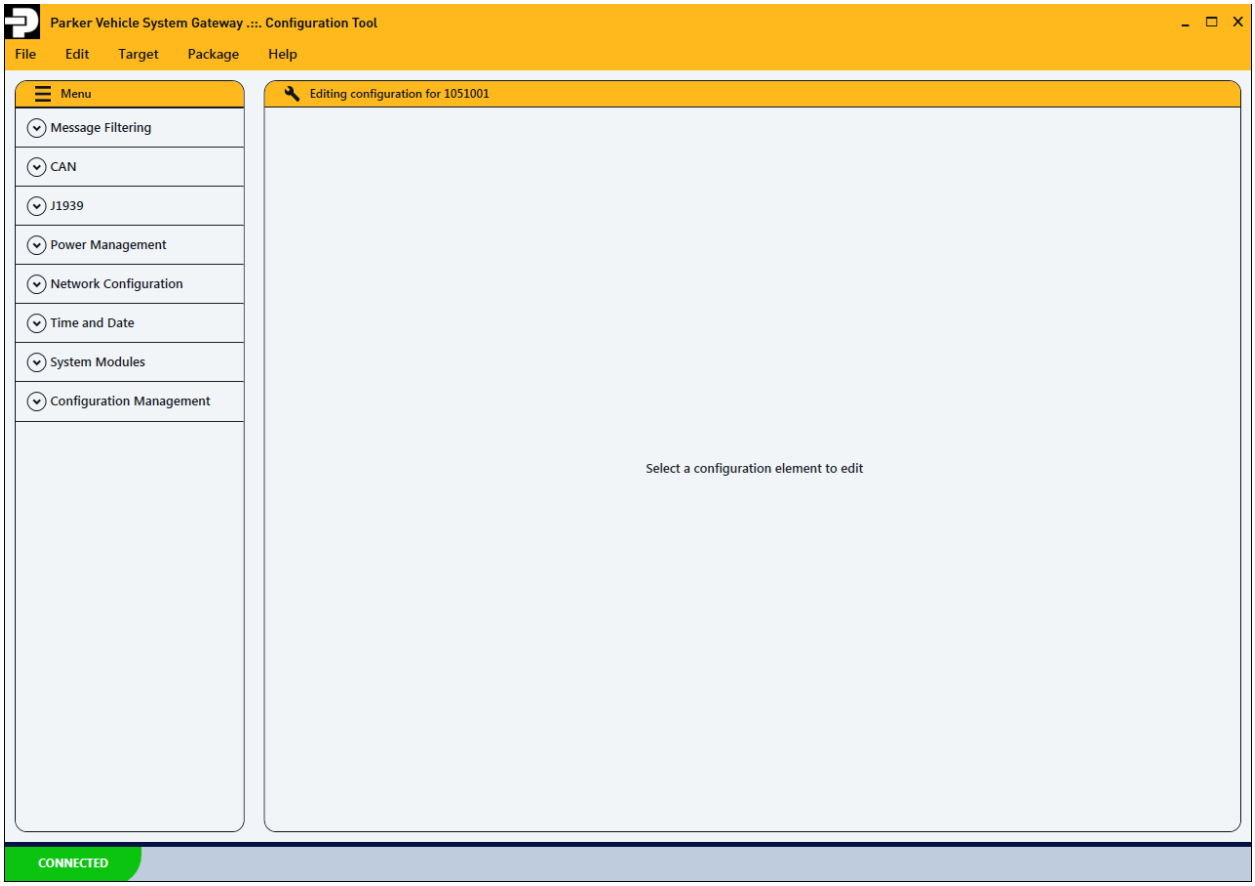
1. Error 4166. 4166 = 0x1046, therefore base code is 0x1000, specific code is 0x46 = 70. Hence, error 4166 is a general communication error which occurred when downloading the bootloader.
2. Error 16454. 16454 = 0x4046, therefore base code is 0x4000, specific code is 0x46 = 70. Hence, error 16454 is a general communication error which occurred when downloading the kernel.

6.4. Configuration Tool

The PVSG is configured using the configuration tool.

6.4.1. Accessing the Configuration Tool

The configuration tool can be accessed by using the **PVSG Configuration** shortcut added to the Windows start menu by default as part of the installer (1051605) under **Parker > ECD > PVSG**. Configurable elements are accessible via the menu system on the left side of the tool and are organized by area.

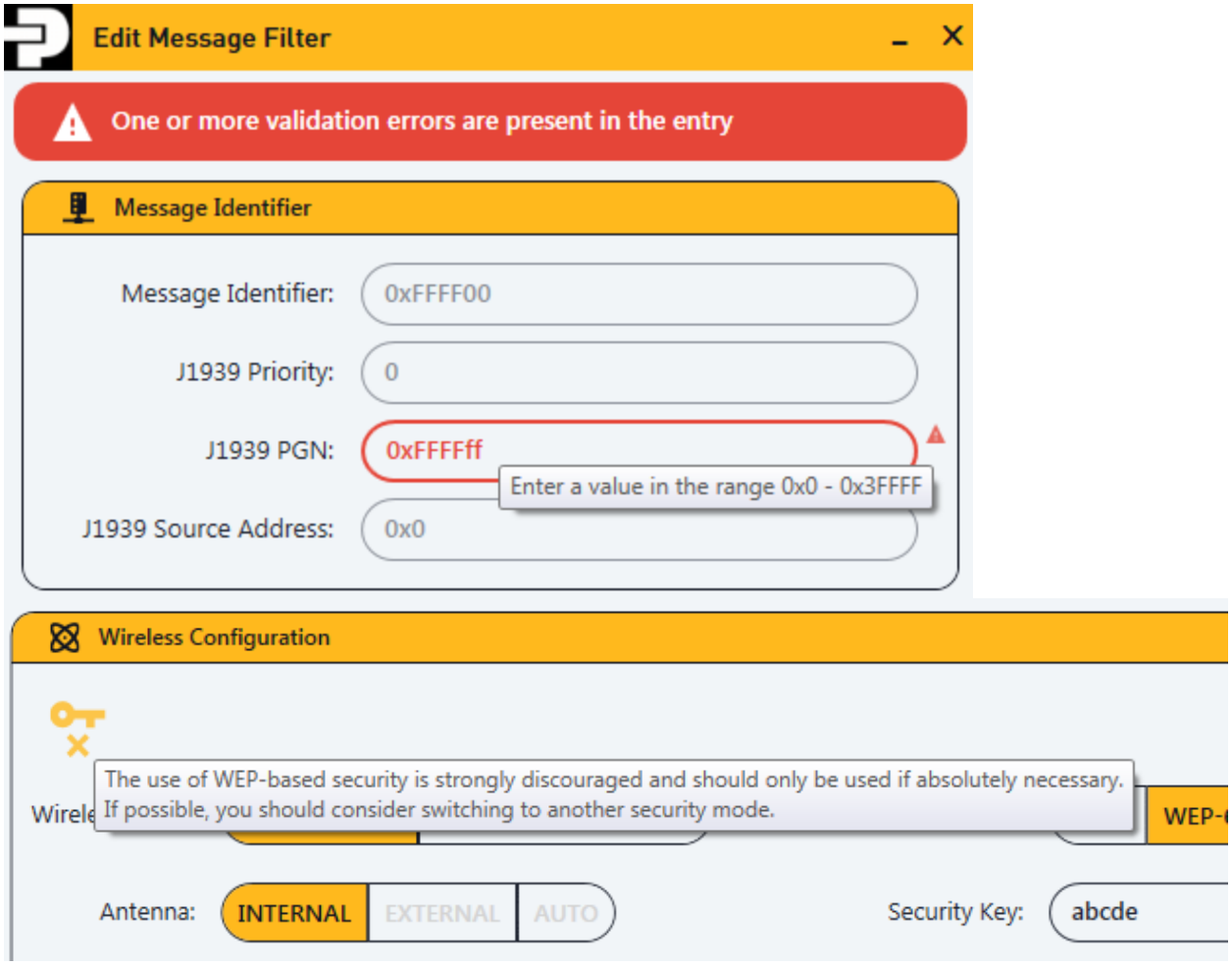


Note: The configuration tool also provides a command line interface. Locate pvsgcfg.exe (installed as part of the installer 1051605), and run "pvsgcfg.exe -h" to get a listing of all of the available commands.

Note: The configuration tool will show/popup (wherever applicable) a symbol on its interface to bring attention to:

- an error (with a red color scheme),
- a warning (with a yellow color scheme), or
- information (with a blue color scheme)

Further information can often be found on the symbol tooltip (place the mouse cursor over the symbol to access). Some examples:



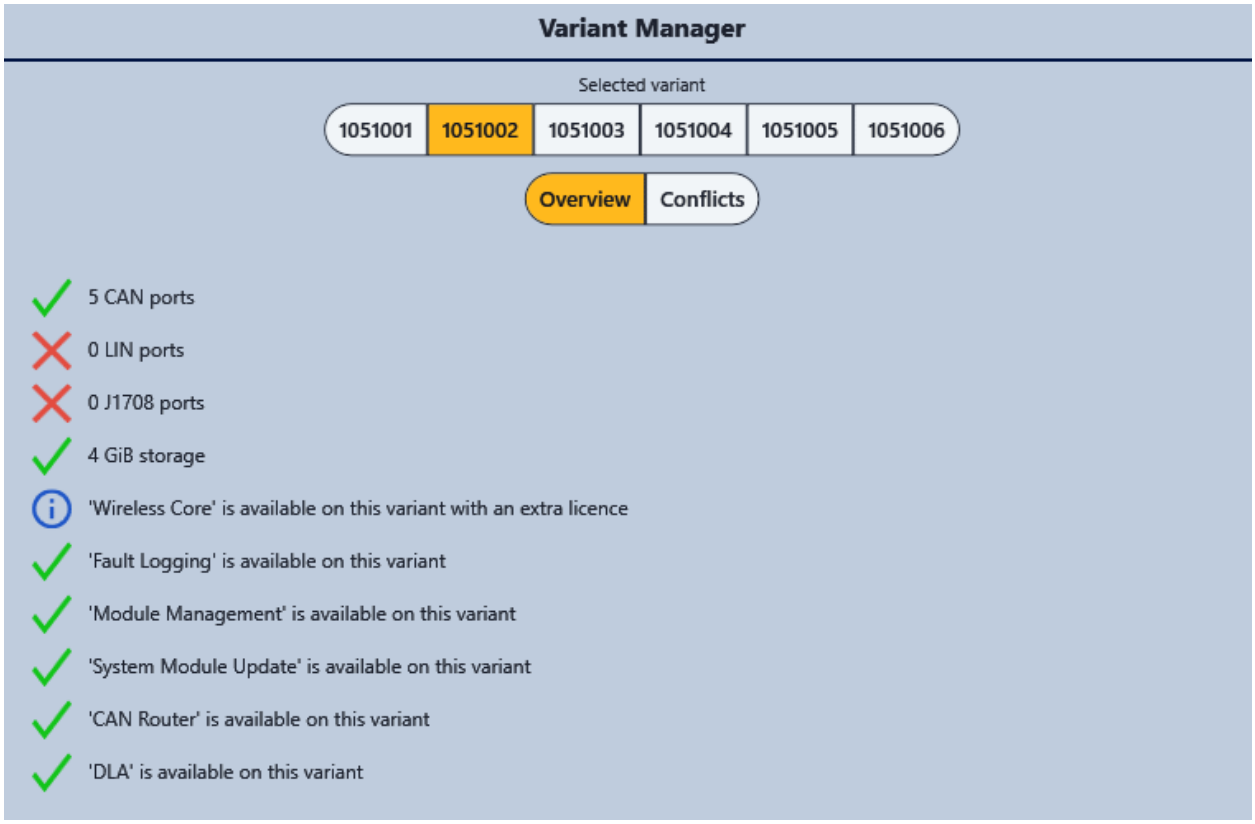
6.4.2. Creating/Editing Configurations

A blank configuration is created by default every time the tool is started. To destroy any unsaved changes and start a new configuration, select **File -> New**.

6.4.2.1. Variants

The configuration tool supports multiple variants of the PVSG product. The configuration tool allows all options and features to be configured irrespective of which variant of PVSG is connected or selected in the Variant Manager. If a feature or option is configured which is not supported on the variant on which the configuration is deployed, the particular feature or option will be disabled and the configuration will fall back to a default state.

In order to assist with understanding the particular features available on a particular variant, the **Variant Manager** is available. Open the **Variant Manager** by selecting **Variant** from the menu bar and then the **Summary** option. This can also be accessed using the icon in the bottom right-hand corner of the tool.



The **Overview** view shows the features which are available on the selected variant. A feature can be configured in one of 3 states, per the table below.

Feature State	Description
Enabled 	The feature is available by default on the selected variant.
Enabled with License 	The feature is not available by default on the selected variant, but can be enabled with the addition of a license.
Disabled 	The feature is not available on the selected variant.

The **Conflicts** view shows any features which have been configured in the configuration but are not available on the selected variant.

The following is a table of supported variants, and features supported:

Features / Variant	1051001	1051002	1051003	1051004	1051005, 1051011 and 1051012	1051006	1051007	1051014
5 - CAN	✓	✓	✓	✓	✓	✓	✓	✓

Features / Variant	1051001	1051002	1051003	1051004	1051005, 1051011 and 1051012	1051006	1051007	1051014
1 - J1708	✗	✗	✗	✓	✗	✓	✓	✗
Internal Storage	4 GiB	4 GiB	4 GiB	4 GiB	4 GiB	4 GiB	4 GiB	4 GiB
Wireless Core	✓	✗	✓	✓	✗	✓	✗	✗
• External Antenna	✗	✗	✓	✗	✗	✓	✗	✗
Fault Logging	✓	✓	✓	✓	✓	✓	✗	✓
Module Management	✓	✓	✓	✓	✓	✓	✗	✓
• System Module Update	✓	✓	✓	✓	✓	✓	✗	✓
CAN Router	✓	✓	✓	✓	✓	✓	✓	✓
• The CAN router configuration also applies to messages that originate from RP1210.	✓	✓	✓	✓	✗	✓	✓	✗
DLA	✓	✓	✓	✓	✓	✓	✓	✓
Custom Applications	ⓘ	✓	ⓘ	ⓘ	✓	✓	✓	✓
Custom Programming Plugins	ⓘ	✓	ⓘ	ⓘ	✓	✓	✗	✓
Sleep Mode 2 Supported	✗	✗	✗	✓	✓	✓	✓	✓
CAN Logging	✗	✗	✗	✗	ⓘ	✓	✗	ⓘ

Features / Variant	1051001	1051002	1051003	1051004	1051005, 1051011 and 1051012	1051006	1051007	1051014
LIN Translation	✗	✗	✗	✗	✗	✗	✗	✓
LIN Buses Supported	0	0	0	0	0	0	0	1

6.4.2.2. Opening and Saving Configurations

Configurations can be opened/saved using the **File -> Open** and **File -> Save** menus respectively. The .pvsgc format is used for configuration files (See File Types table above); this format is a proprietary format belonging to Parker. Note that these files cannot be edited manually and should only be modified using the configuration tool.

Unsaved changes to the current configuration are indicated by an icon in the status bar (bottom right corner):

The color of the Variant Manager icon (bottom right corner of the configuration application) is used to indicate a configuration errors.

Color	ToolTip	State	Icon Color
Dark slate grey	Variant Manager: There are no conflicts with the selected variant.	There are no conflicts between the current configuration and selected variant.	
Red	There are configuration conflicts with the selected variant.	A feature has been configured that is not possible to enable on the selected variant.	
Gold	There are potential configuration conflicts with the selected variant.	A feature has been configured that requires a license on the selected variant.	

Table: Variant Manager icon color and its tool tip.

Note: When the Variant Manager icon is selected while there are conflicts or potential conflicts in the configuration, the Variant Manager will be displayed in the Conflicts view.

6.4.3. Keyboard Shortcuts

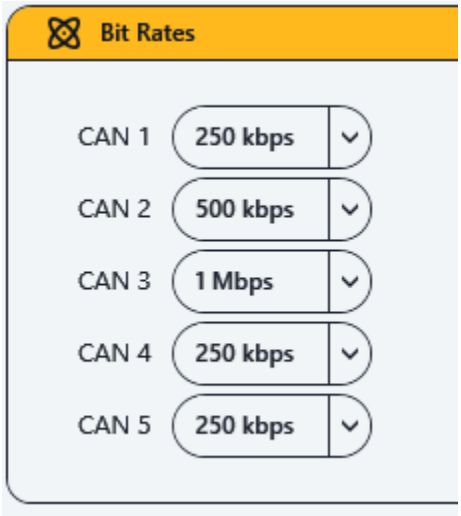
The following 'special' keyboard shortcuts can be used:

Keyboard Shortcut	Area Active	Function

Keyboard Shortcut	Area Active	Function
Ctrl + S	Global (all areas)	Saves the current configuration (equivalent to a **File > Save**).
Ctrl + C	Message filter list editor	Copies the currently selected message filter entry/entries. Note that groups of entries may be selected by selecting the first entry, holding the SHIFT key and then selecting the last entry.
Ctrl + V	Message filter list editor	Pastes any message filter entries on the clipboard into the current list.
Del	Message filter list editor	Deletes the currently selected message filter entry/entries. Note that groups of entries may be selected by selecting the first entry, holding the SHIFT key and then selecting the last entry.
Ctrl + A	Message filter list editor	Selects all message filter entries in the current view.
Ctrl + left mouse click(s)	Message filter list editor	Allows multiple non-contiguous message filter entries to be selected/deselected for further operation (copy, delete, etc.).
Shift + left mouse click	Message filter list editor	Allows multiple contiguous message filter entries to be selected/deselected for further operation (copy, delete, etc.).

6.4.4. CAN Configuration

The **CAN configuration** menu allows you to change the CAN bus speeds on all five CAN ports. The PVSG supports 250, 500, and 1000 kbps CAN bit rates.



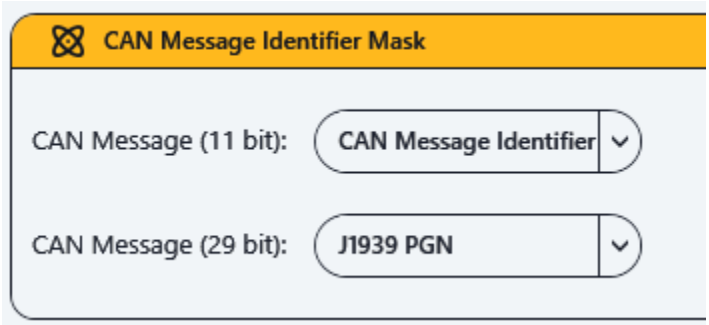
6.4.5. Message Filtering

The PVSG can route messages from one CAN port to any other CAN port based on message filters. These filters are configured in the **Message Filtering** menu.

6.4.5.1. Options

The ***Message Filtering Options*** section allows you to set **CAN Message Identifier mask** (criteria), and choose **Filter Types** for the message filters.

CAN Message Identifier Mask options allow users to specify which parts of a CAN Message ID is used when the PVSG is determining which messages to route. There is one mask type for Standard 11-bit and four mask types for Extended 29-bit CAN messages.

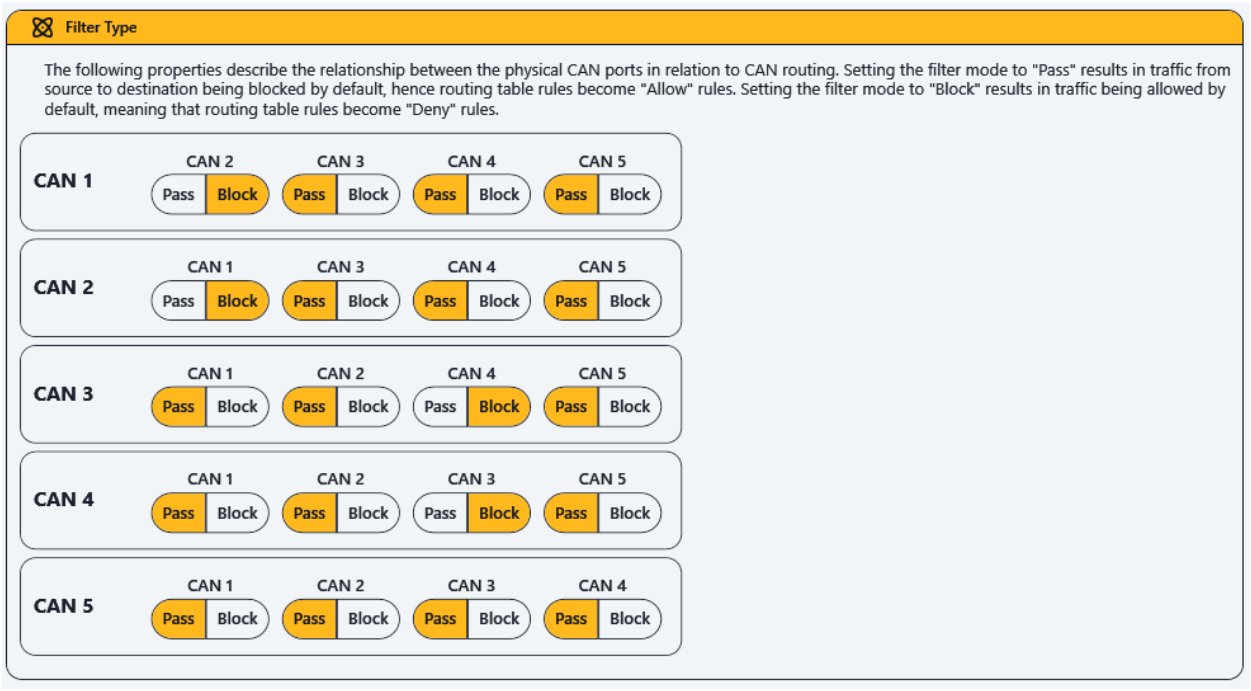


CAN Message ID Mask Types	Match Description (All definitions as specified in SAE J1939-21)
J1939 PGN	Only the J1939 PGN portion of the CAN message ID is used for matching.
J1939 PGN and Source Address	Only J1939 PGN and source address of the CAN message ID is used for matching.
J1939 PGN, Source Address and Priority	Only J1939 PGN, source address, and priority of the CAN message ID is used for matching.
CAN Message Identifier	All parts of the CAN Message ID is used for matching.

There are two ways to define the messages filters between two CAN ports. This is done via **Filter Types**: **Pass filters** and **Block filters**.

Filter Types	Description
Pass Filters	If pass filter type is used, only CAN messages that match one of the message filters will be routed from CAN A to CAN B. No other messages will be routed.
Block Filters	If block filter type is used, CAN messages that match one of the message filters for CAN A to CAN B will not be routed (blocked) from CAN A to CAN B. All other messages will be routed.

For example, in the image below, it shows that CAN 1 is set to block filter type between itself to CAN2, but pass filter type between itself to CAN 3, 4, and 5. All messages seen on CAN 1 are sent to CAN 2 so long as the messages don't match a message filter entry set between CAN 1 to CAN 2. Messages seen on CAN 1 are not sent to CAN 3, 4 or 5 unless they there is a message filter entry set between CAN 1 to the corresponding CAN.



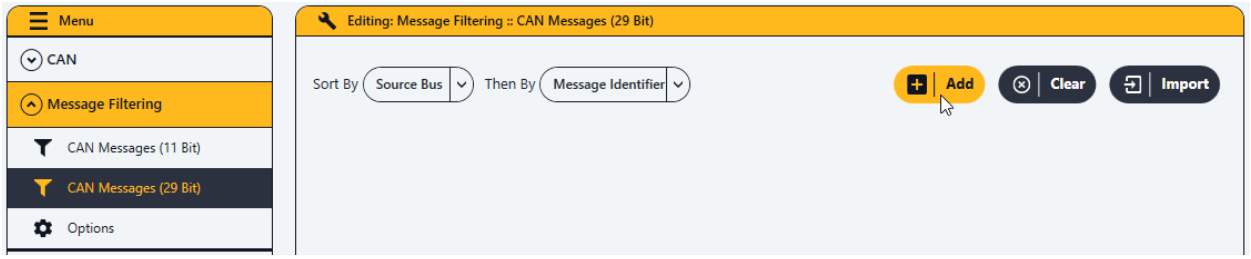
6.4.5.2. Message Filters

Filters for CAN routing are added to the configuration via the menus **CAN messages (11 Bit)** for standard CAN messages and **CAN messages (29 Bit)** for extended CAN messages.

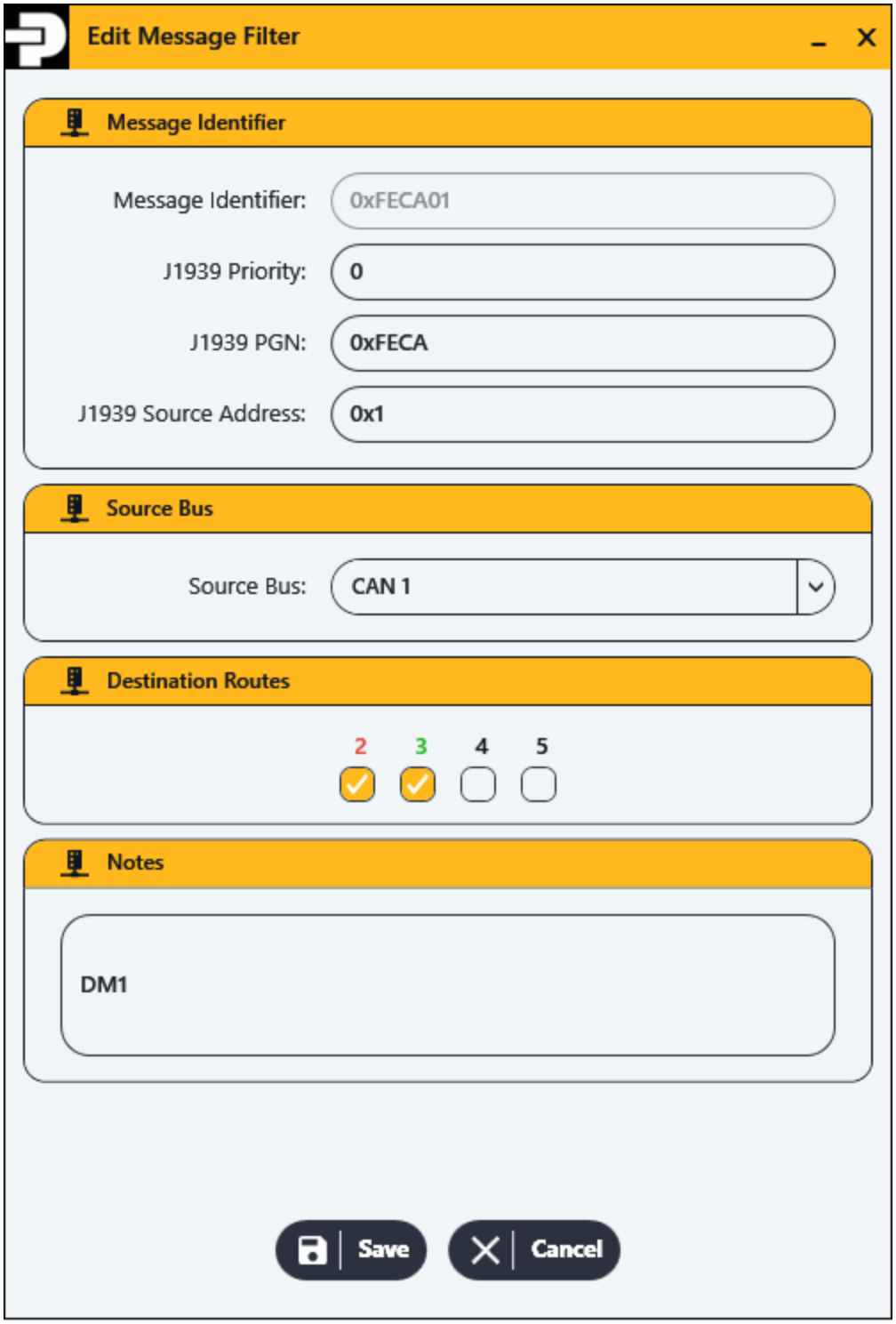
6.4.5.3. CAN Messages (11 Bit) and CAN Messages (29 Bit) Filters

To add a new message filter click on the **Add** button while in either CAN Message screen.

To edit or delete a message filter click on the **Edit** or **Delete** button on the entry.



The Edit window is broken up four sections. The *Message Identifier* section allows you to edit the filters message ID data based on the CAN Message Identifier Mask selected in the Options screen. The *Source Bus* section allows you to choose the source bus for the messages filter. The *Destination Routes* section allows you to choose the destination bus for this message filter. And the *Notes* section allows you to enter any notes for the message filter.

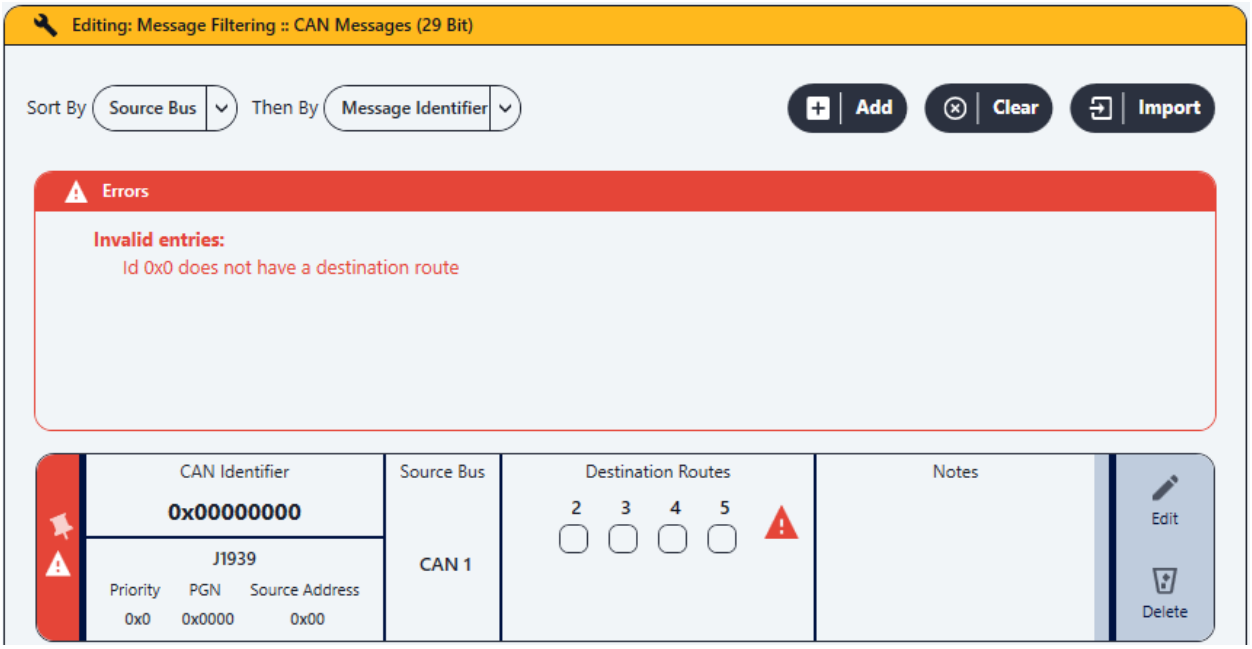


In the example above, J1939 PGN and J1939 Source Address are the only fields in the *Message Identifier* section that are modifiable since the CAN Message Identifier Mask is set to J1939 PGN and Source Address only. This message filter is for messages appearing on CAN 1 and will route messages that match this filter to CAN 3 but will block them to CAN 2.

6.4.5.4. Message Filtering Notes

- J1939 large messages (data greater than 8 bytes) are transmitted via a connection between two devices using multiple sequence packets and multiple data packets using J1939 messages defined in the SAE J1939-21 specification (see spec for more details). The PVSG will handle routing of these large messages for you so long as the large message message ID matches the filters and filters types for the CAN port.
- Tracking of active J1939 large messages is required to successfully route them between the source and destination CAN port. Once these large messages connections are completed or aborted, tracking of the large message is no longer required. Tracking is done internally to the PVSG and only active large message connections are tracked. Routing of future large messages will be impacted if the message filtering configuration is too "loose" for the system. Meaning if any large messages are allowed to be routed to another CAN bus that does not contain the corresponding destination device and therefore never properly completed or terminated.
- To setup the PVSG to be a "repeater" between two CAN ports (no blocking or tracking), set the filter type to Block type in both directions and do not specify any block message filters between the two CAN ports in either direction.
- It is possible to route messages from one CAN port bus speed to a different one, so long as the port being routed to can handle the extra bus utilization.

Any message filter errors will be displayed at the top, and the offending entries are highlighted in red.



6.4.5.4.1. CAN Message Filter Errors

Error Title	Error Text	Solution
Duplicate Entries	PGN 0x####	Locate each erroneous entry and provide a unique entry for each duplicate parameter.
Duplicate Entries	PGN 0x####, source address 0x##	Locate each erroneous entry and provide a unique entry for each duplicate parameter.

Error Title	Error Text	Solution
Duplicate Entries	PGN 0x####, source address 0x##, priority 0xA	Locate each erroneous entry and provide a unique entry for each duplicate parameter.
Duplicate Entries	Message Id 0x########	Locate each erroneous entry and provide a unique entry for each duplicate parameter.
Invalid Entries	Id 0x######## does not have a destination route	Add a destination route to the message.
Invalid Entries	Invalid message with Id 0x########	11-Bit CAN: Ensure the message ID is less than 0x000007FF.
Invalid Entries	Invalid message with Id 0x########	29-Bit CAN: Ensure the message ID is less than 0x1FFFFFFF.
Invalid Entries	Message ID 0x######## has priority set when it should not be	1. Confirm that you have the appropriate CAN Message Identifier Mask set for your message filters. 2. Switch the CAN Message Identifier Mask to "J1939 PGN, Source Address and Priority" and remove priority from the offending entry and switch the mask back to "J1939 PGN and Source Address". – Alternatively, switch the CAN Message Identifier to "J1939 PGN, Source Address, and Priority" and switch it back to "J1939 PGN and Source Address" then confirm the automatic deletion of the priority bits.
Invalid Entries	Message ID 0x######## has priority and/or source address set when they should not be	1. Confirm that you have the appropriate CAN Message Identifier Mask set for your message filters. 2. Switch the CAN Message Identifier Mask to "J1939 PGN, Source Address and Priority and Source Address" and remove source address and/or priority from the offending entry and switch the mask back to "J1939 PGN". – Alternatively, switch the CAN Message Identifier to "J1939 PGN, Source Address, and Priority" and switch it back to "J1939 PGN" then confirm the automatic deletion of the source address and priority bits.

6.4.5.5. Importing CAN Messages (11 Bit) and CAN Messages (29 Bit) Filters

Another option for adding and configuring CAN Messages (11 Bit) and CAN Messages (29 Bit) filters is by creating excel spreadsheets (.xlsx) that follow the requirements below and importing it.

For 11-Bit CAN filters, a workbook tab could look similar to the template shown below.

	A	B	C	D	E	F	G	H
1	ID	Source Bus	Destination CAN 1	Destination CAN 2	Destination CAN 3	Destination CAN 4	Destination CAN 5	Notes
2	0x123	1		Yes	Yes			Hello World
3	0x124	2	Yes					
4	0x125	3		Yes				
5	0x126	4			Yes			
6	295	5				Yes		Test
7								

Instructions | 11-Bit CAN Filters | 29-Bit CAN Filters

For 29-Bit CAN filters, a workbook tab could look similar to the template shown below.

	A	B	C	D	E	F	G	H	I	J	K
1	ID	Priority	PGN	Source Address	Source Bus	Destination CAN 1	Destination CAN 2	Destination CAN 3	Destination CAN 4	Destination CAN 5	Notes
2		0	0x1200	0x20	1		Yes				Hello World
3		1	0x1200	0xFD	2	Yes					
4		2	0xDD00	0x00	3		Yes				
5		3	0xDC00	16	4			Yes			
6		4	0xFEFA	32	5				Yes		
7		5	0xFEEB	100	1		Yes				
8		6	0xE000	0xF9	2	Yes					
9		7	0xFDC6	0xfa	3				Yes	Yes	

Instructions | 11-Bit CAN Filters | 29-Bit CAN Filters

In order to utilize this feature, you must first create a properly configured excel spreadsheet (.xlsx) that follow the workbook requirements:

General Workbook Requirements:

- All column headers shown in the templates above must be included into your filter tab.
- If you are importing 11-Bit filters, the workbook must contain a tab named "**11-Bit CAN Filters.**"
- If you are importing 29-Bit filters, the workbook must contain a tab named "**29-Bit CAN Filters.**"
- Numeric values can be entered as decimal or hexadecimal (0x####).
- Valid **Source Buses** are 1, 2, 3, 4 and 5.
- To set a **Destination Bus**, enter the keyword "Yes" under the correct cell.

11-Bit Filter Row Requirements:

- Each data row must have at least one **Destination Bus** set in the 11-Bit tab.
- Each data row in the 11-Bit tab must contain **ID** and **Source Bus** data.
- **ID** must be between 0 and 2047 inclusive.
- "**Notes**" information is optional.

29-Bit Filter Row Requirements:

- Each data row must have at least one **Destination Bus** set in the 29-Bit tab.
- Each data row in the 29-Bit tab must contain **Source Bus**.
- If "**J1939 PGN**" 29-Bit routing mode/mask is used, each data row in the 29-Bit tab must contain **PGN** data.
- If "**J1939 PGN and Source Address**" 29-Bit routing mode/mask is used, each data row in the 29-Bit tab must contain **PGN** and **Source Address** data.
- if "**J1939 PGN, Source Address**" 29-Bit routing mode/mask is used, each data row in the 29-Bit tab must contain **PGN, Source Address**, and **PGN** data.
- **PGN** must be between 0 and 262143 inclusive.

- "**Notes**" information is optional.

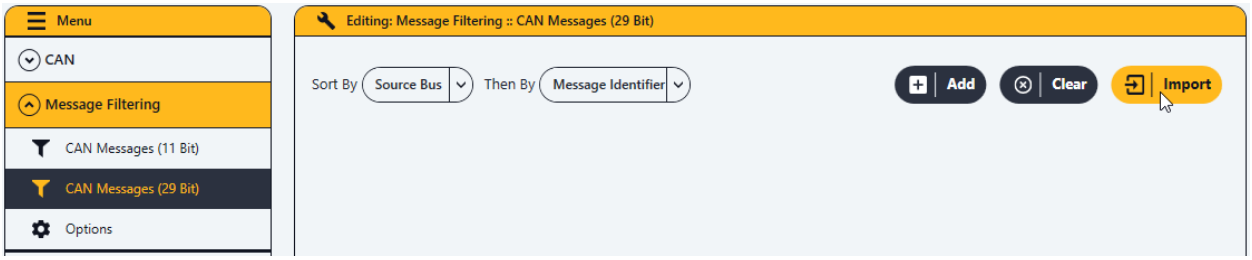
Some Things to Consider:

- Tab or column order does not matter.
- Tab or column names are not case sensitive.
- If any required filter data is missing, the row is considered invalid.
- If any columns are missing, the import is aborted.
- If any rows are found to be invalid, no filters are imported and the corresponding error information is displayed.
- Invalid data/rows are to be revised using the error information displayed before attempting to import again (see error types below).

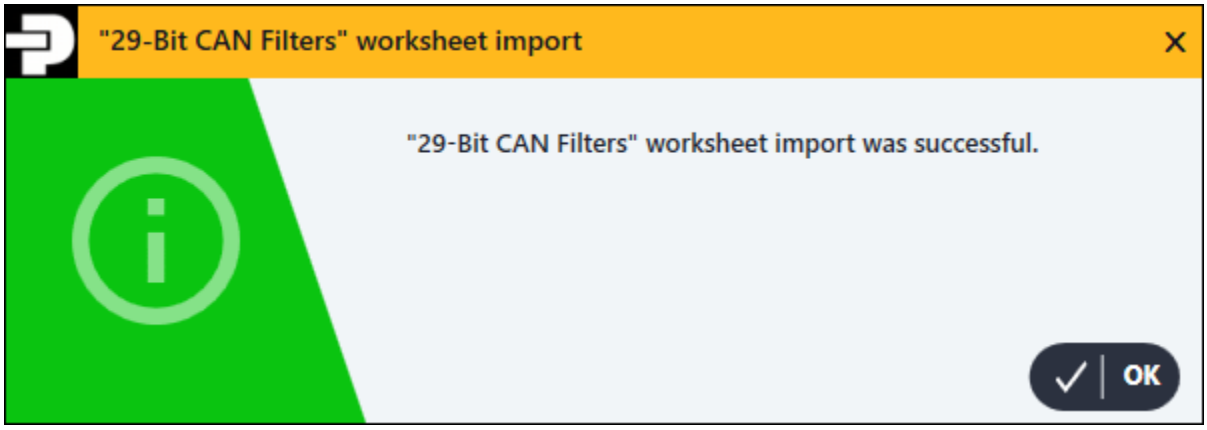
An example CAN filter import spreadsheet can be found in:

- C:\Program Files (x86)\Parker\ECD\PVSG\doc for 64-bit operating systems.
- C:\Program Files\Parker\PVSG\ECD\doc for 32-bit operating systems.

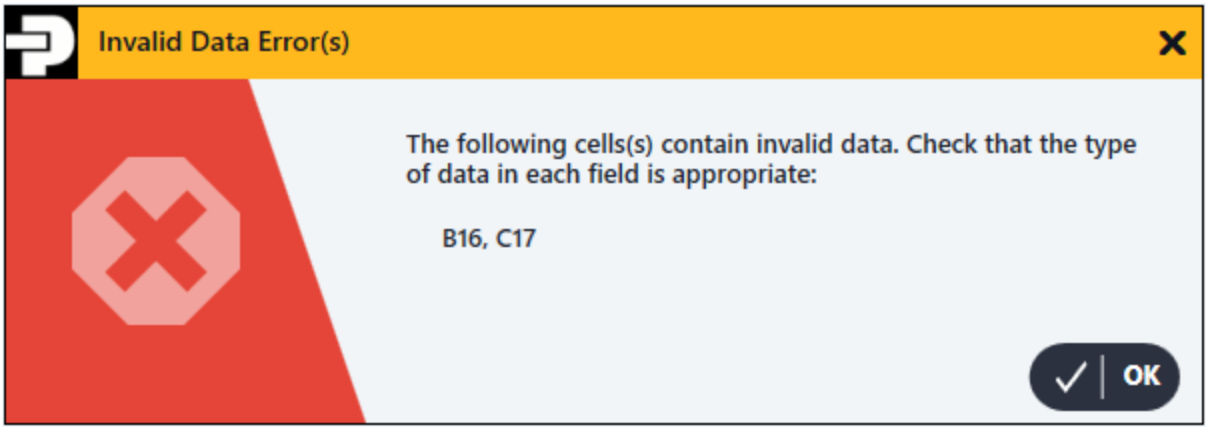
To import a message filter configuration file, navigate to the **Message Filtering** menu. Select **CAN Messages (11 Bit)** or **CAN Messages (29 Bit).** Finally, click on the **Import** button and select the excel file (.xlsx) you created.



If your excel file (.xlsx) was configured properly, a window will pop up indicating your filters were imported successfully.



If your excel file (.xlsx) was not configured properly, a window will pop up indicating the error(s). Information on this window will direct you to where to find the error(s).



Below is a list of possible errors that can appear when importing.

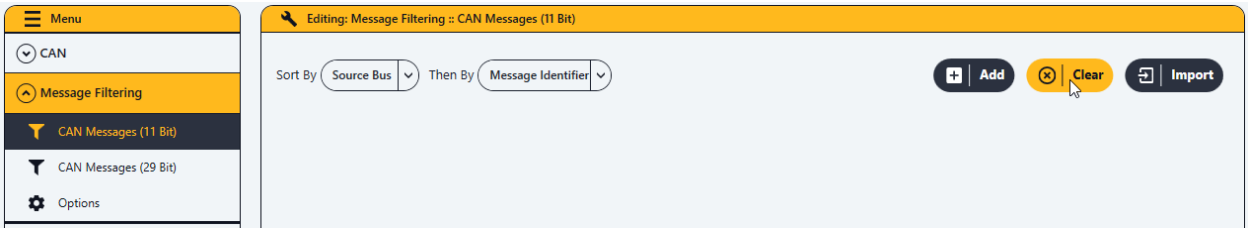
6.4.5.6. CAN Message Filter Importing Error Types

Error Title	Solution
No Destination Bus Error(s)	Navigate to the row(s) mentioned and ensure that the data row has at least one **Destination Bus.**
Destination Matches Source Bus Error(s)	Navigate to the row(s) mentioned and ensure their **Destination Bus(es)** do not match their **Source Bus.**
Invalid Data Error(s)	Navigate to the cell(s) mentioned and ensure that a valid entry is entered.
Missing Information Error(s)	Navigate the the cell(s) mentioned and ensure that a valid entry is entered.
Out of Range Error(s)	Navigate the the cell(s) mentioned and ensure that a valid entry is entered.
Incorrect Spreadsheet Tab Label	Verify that you are on the correct menu option, i.e., CAN Messages (11 Bit) or CAN Messages (29 Bit) and that your workbook has the corresponding tab named properly ("**11-Bit CAN Filters** "or "**29-Bit CAN Filters**").
11-Bit CAN Filter Import Failed	Correct the error(s) within the "**11-Bit CAN Filters**" tab in your workbook and try importing again.
29-Bit CAN Filter Import Failed	Correct the error(s) within the "**29-Bit CAN Filters**" tab in your workbook and try importing again.

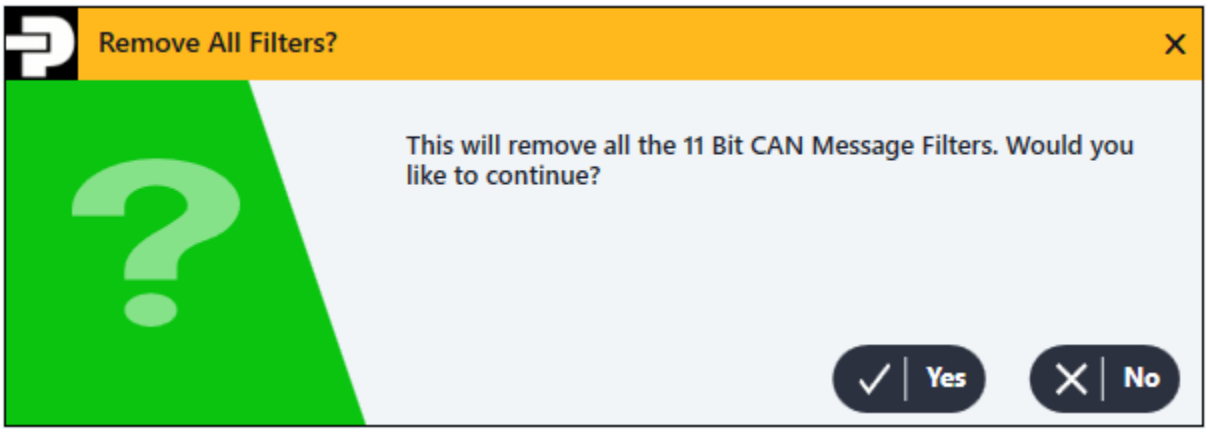
6.4.5.7. Clearing Message Filters

You can remove all filters at once using the **Clear** button.

To clear the filters, navigate to the **Message Filtering** menu. Select **CAN Messages (11 bit)** or **CAN Messages (29 Bit)**. Finally, click on the **Clear** button.



If there are filters to be cleared, a confirmation window will pop up confirming you want to remove all filters.

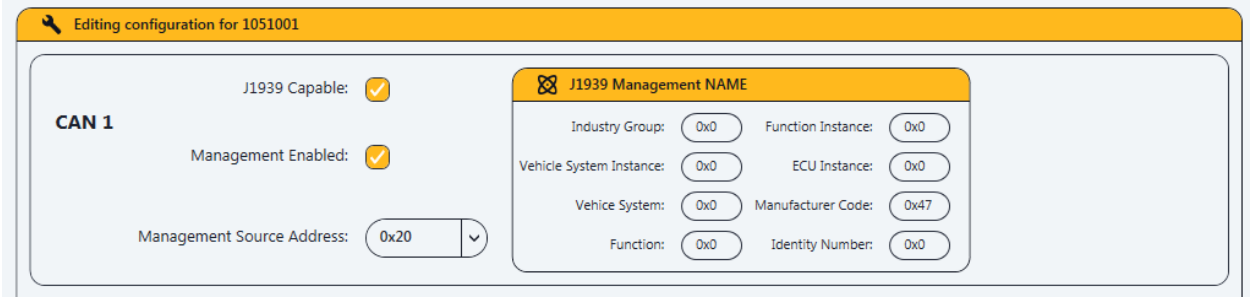


Once you click **Yes**, your message filters will be cleared and your filtering table will be blank.

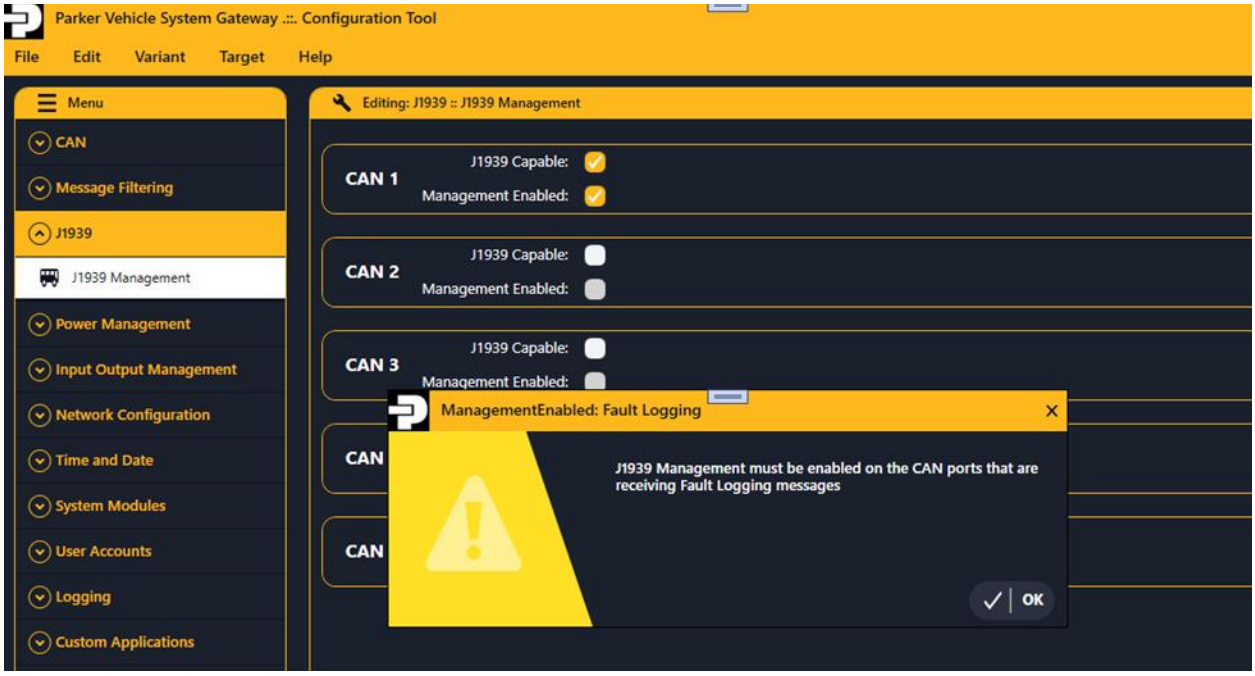
Note: Clearing CAN Messages (11 Bit) filters will not clear CAN Messages (29 Bit) filters and vice versa.

6.4.6. J1939 Configuration

The PVSG contains 5 physical CAN interfaces, each of which is capable of supporting J1939 communication. J1939 configuration can be adjusted using the ***J1939 Management*** section under the **J1939** menu.



To support J1939, an interface must have its **J1939 Capable** property set. This denotes that the interface is connected to a J1939 capable network but does not necessarily create any Controller Applications (CAs) on it. To create a CA which can be used for management purposes (for SOFT and CI retrieval, for example), the **Management Enabled** property must also be checked. When both **J1939 Capable** and **Management Enabled** are checked, the management configuration fields become visible which allows the management source address and NAME field to be configured.



Note: A periodic DM1 message is broadcast on J1939 interfaces that have management enabled. See "Status LED" section above for details on how error information is made available in a DM1 message.

Note: If J1939 management is enabled on a bus, J1939 Request (RQST) messages for J1939 Software Identification (SOFT) and Component Identification (CI) are sent out to each J1939 module(s) on that bus.

Note: If J1939 management is enabled on a bus, then only the respective bus can receive the fault logging messages. So a warning message is displayed, if user un-checks the management enabled check-box for the fault added to fault logging view across the bus.

Caution: Pay close attention to your CAN routing configuration, as J1939 management messages are routed if allowed to. This may cause J1939 address conflicts.

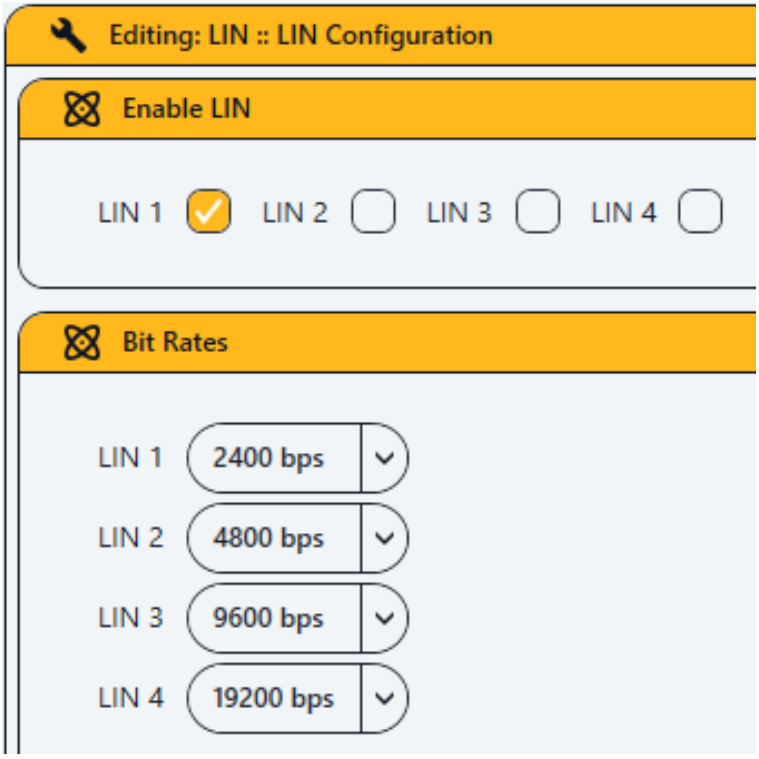
Caution: J1939 Software Identification (SOFT) and Component Identification (CI) responses mentioned above will be J1939 large messages directed at the PVSG. Use caution when using "block" filters in the PVSG CAN routing configuration as these large messages will be routed, using entries in the internal CAN router buffers. These entries in the buffer will never be cleared, and there are a limited amount of entries in the buffer.

6.4.7. LIN Configuration

LIN is a feature supported by the PVSG, configured exclusively to operate as a Master.

LIN bus configuration can be managed through the sub-menus in the **LIN** menu. In the **LIN Configuration** sub-menu, the LIN bus can be enabled. Enabling the LIN bus is required before configuring LIN translation. Additionally, a baud rate must be selected.

The supported baud rates are 2400, 4800, 9600, and 19200 bps.



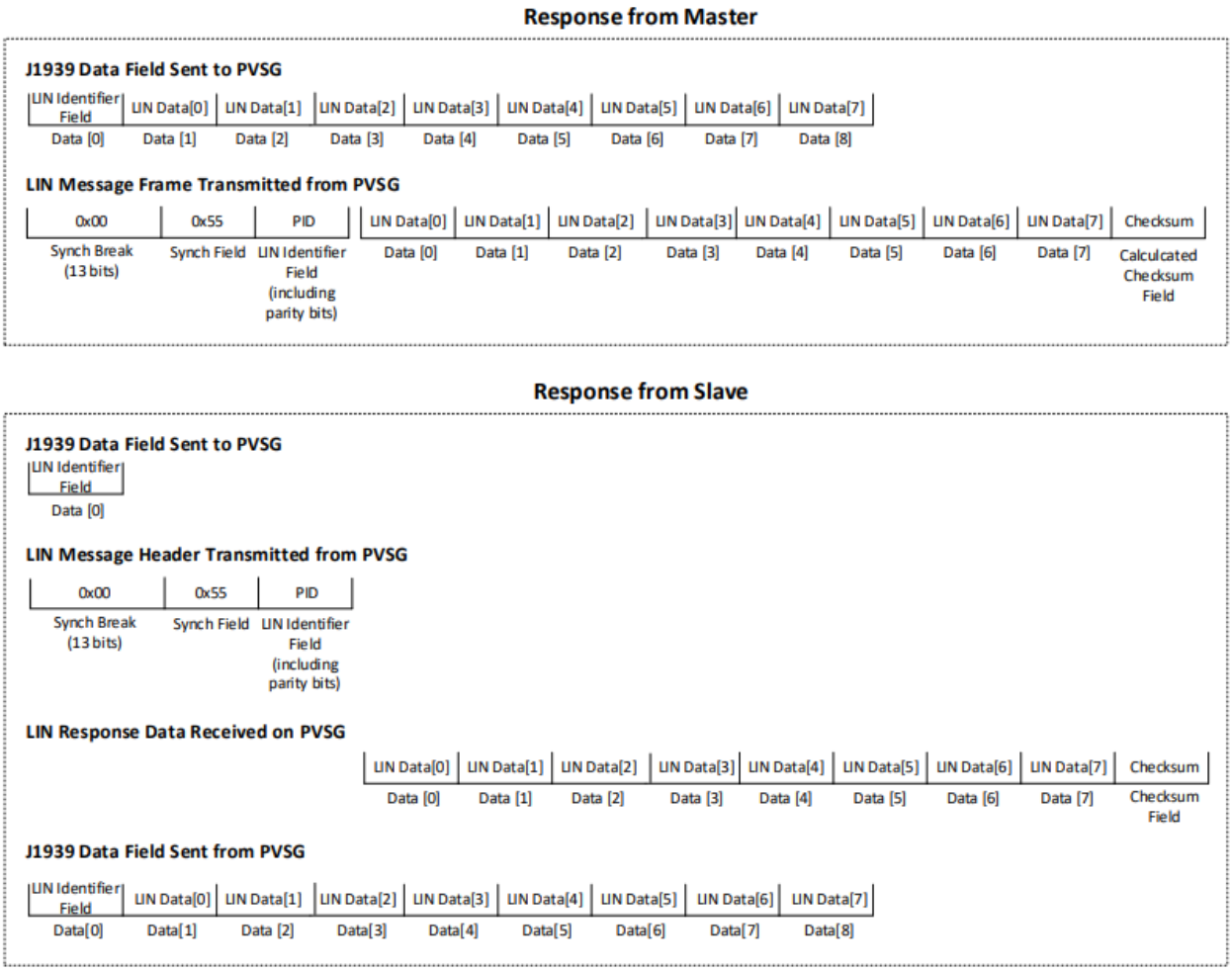
6.4.7.1. LIN Translation

The LIN translation feature enables J1939 messages to be translated to the LIN bus, with LIN responses translated back to the J1939 bus. For LIN translation to work, J1939 Management must be enabled on at least one bus to provide the necessary information for translation.

J1939 messages are filtered based on the J1939 bus, PGN, and potentially the source address. Upon receiving a filtered J1939 message, the PVSG parses the J1939 data field to determine the corresponding LIN identifier and LIN data field.

If a LIN response is expected from a slave, it will be translated back to J1939, starting with the LIN identifier followed by the response data. Otherwise, the PVSG will determine the LIN data field to transmit by parsing the data following the LIN identifier.

Below is a representation of how J1939 messages are mapped to LIN messages, and how LIN responses are mapped back to J1939 messages:



In the image above, the 'Response from Master' section explains how the PVSG derives the LIN ID and LIN data fields from a J1939 message. Using this information, the PVSG will transmit the LIN header followed by the LIN response. "Response from Slave" describes how the PVSG determines the LIN ID from a J1939 message and how the response from a LIN slave device is translated back to a J1939 message.

Note: The PVSG automatically calculates the identifier parity bits and data checksum, so the user does not need to provide these. Checksum calculations adhere to LIN Specification 1.3.

The PVSG is configured to determine the size of the data field using bits 4 and 5 of the identifier field, as specified in LIN Specification 1.3. The table below illustrates how the size of the data field is defined by these bits:

ID5	ID4	Size of Data Field [bytes]
0	0	2
0	1	2
1	0	4
1	1	8

Whether a LIN response is sent by the master or a slave along with various other translation options are configured in the **LIN Translation Management** sub-menu by adding and configuring LIN translation entries.

Note: If any errors occur during LIN communication, an error code is transmitted on the J1939 bus in **data byte 0**. Since LIN identifiers are limited to the range of **0x00 to 0x3F**, error codes can be easily distinguished as they exceed this range.

The following error codes are supported:

Error Code	Error Name	Description
0xFC	Checksum Error	The checksum received does not match the checksum calculated from the received data
0xFD	Transmit Error	LIN data transmission failed due to collision or physical LIN bus error
0xFE	Receive Error	PVSG failed to receive a response from a LIN slave

Note: The PVSG enforces a timeout for each LIN frame. Frames exceeding this timeout are considered failed, triggering a 0xFD or 0xFE error code as described above. The timeout calculation follows the LIN V1.3 specifications:

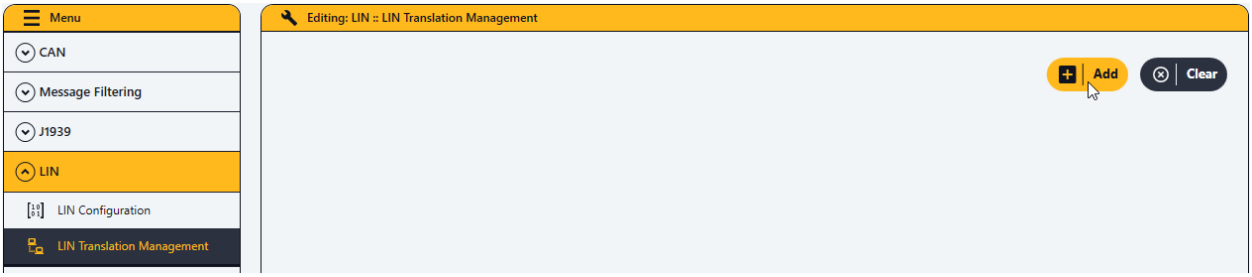
$$Minimum\ Length\ of\ Message\ Frame = T_{FRAME\_MIN} = (10 \times N_{Data}) + 44$$

$$Maximum\ Length\ of\ Message\ Frame = T_{FRAME\_MAX} = (T_{FRAME\_MIN} + 1) \times 1.4$$

$$Maximum\ Timeout\ of\ Message\ Frame\ in\ ms = (T_{FRAME\_MAX}) \times \frac{1000\ (\frac{ms}{seconds})}{Baudrate\ (\frac{bits}{second})}$$

6.4.7.1.1. LIN Translation Table

To add a new LIN translation entry, click on the **Add** button.

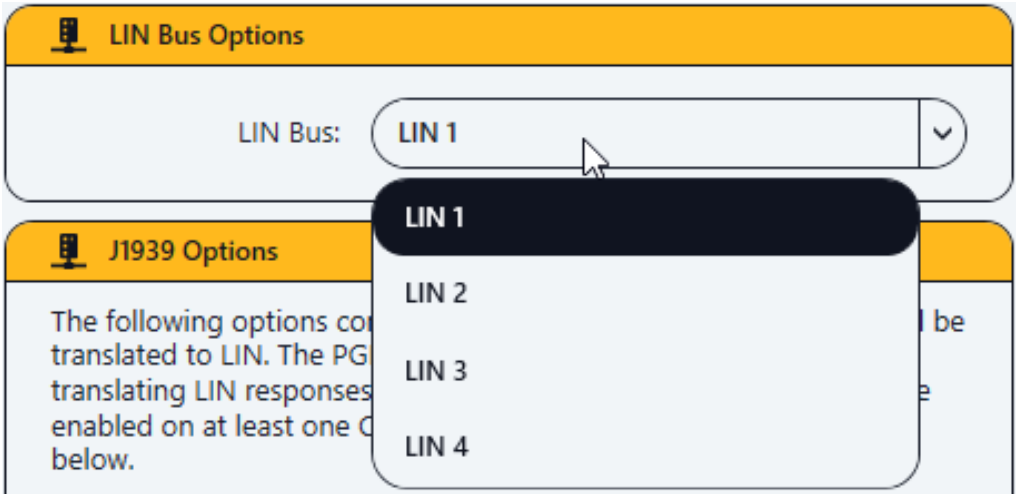


To edit or delete a LIN translation entry, click on the **Edit** or **Delete** button on the entry.

The **Edit LIN Translation Options** window is divided into four sections:

1. *LIN Bus Options*
   - LIN Bus: Allows the user to select a LIN bus for LIN communication.

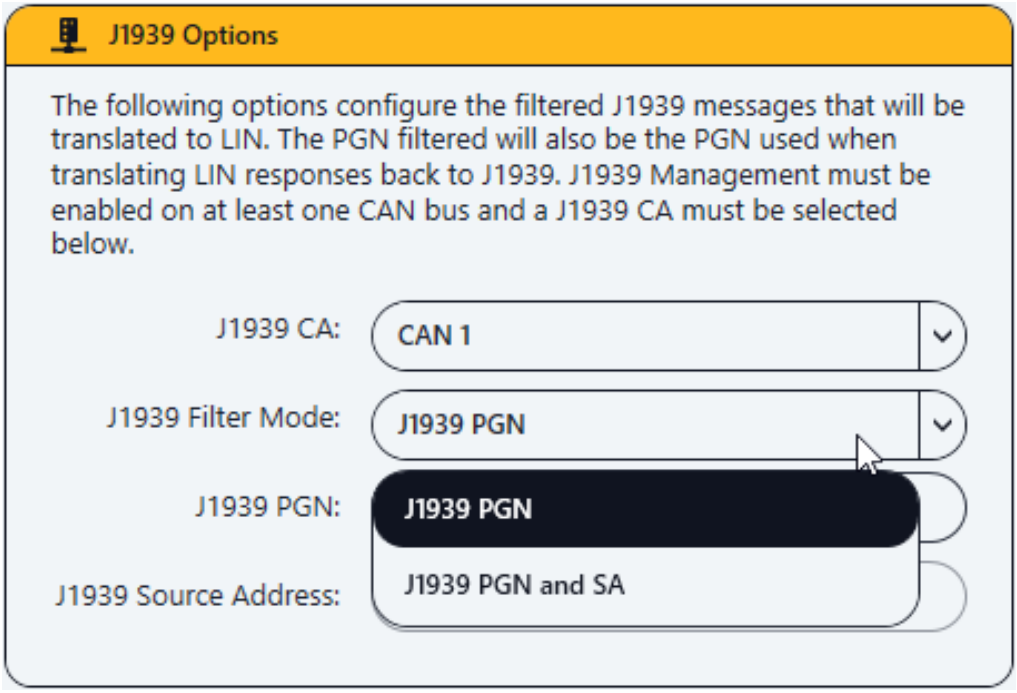
Note: The selected LIN bus must be enabled within the **LIN Configuration** sub-menu.



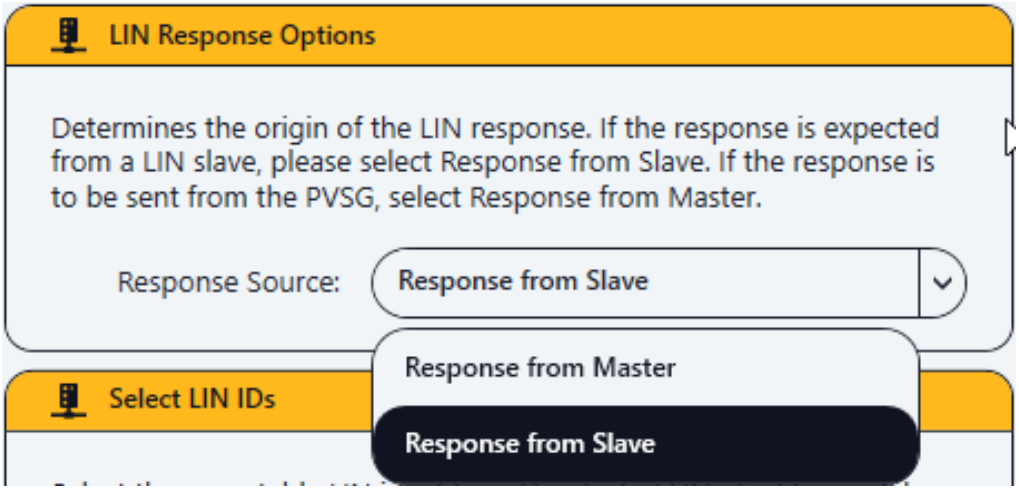
2. *J1939 Options*
   - J1939 CA: Allows the user to select a J1939 CA to translate J1939 messages to LIN and vice-versa.

Note: The selected J1939 CA must have *Management Enabled* within the **J1939 Management** sub-menu.

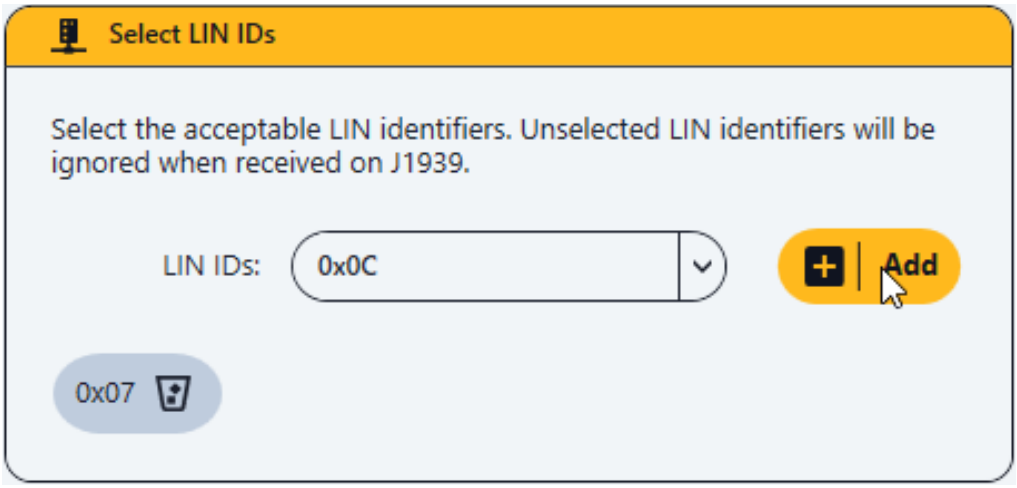
   - J1939 Filter Mode: Allows the user to choose whether J1939 messages to translate to LIN are filtered on J1939 PGN or J1939 PGN and source address.
   - J1939 PGN: J1939 PGN mask to filter on.
   - J1939 Source Address: J1939 source address mask to filter on (only used if J1939 Filter Mode is set to J1939 PGN and SA).



3. *LIN Response Options*
   - Response Source: Allows the user to choose whether LIN responses will originate from the master (PVSG) or if the PVSG should expect a response from a LIN slave. If a response is expected to originate from a LIN slave, the PVSG will translate the response back to the J1939 bus.



4. *Select LIN IDs*
   - LIN IDs: Acceptable LIN frame identifiers can be selected by parsing the drop down menu, clicking a chosen ID, and clicking ‘Add’.
     - Selected LIN IDs can be removed by clicking the trash icon.

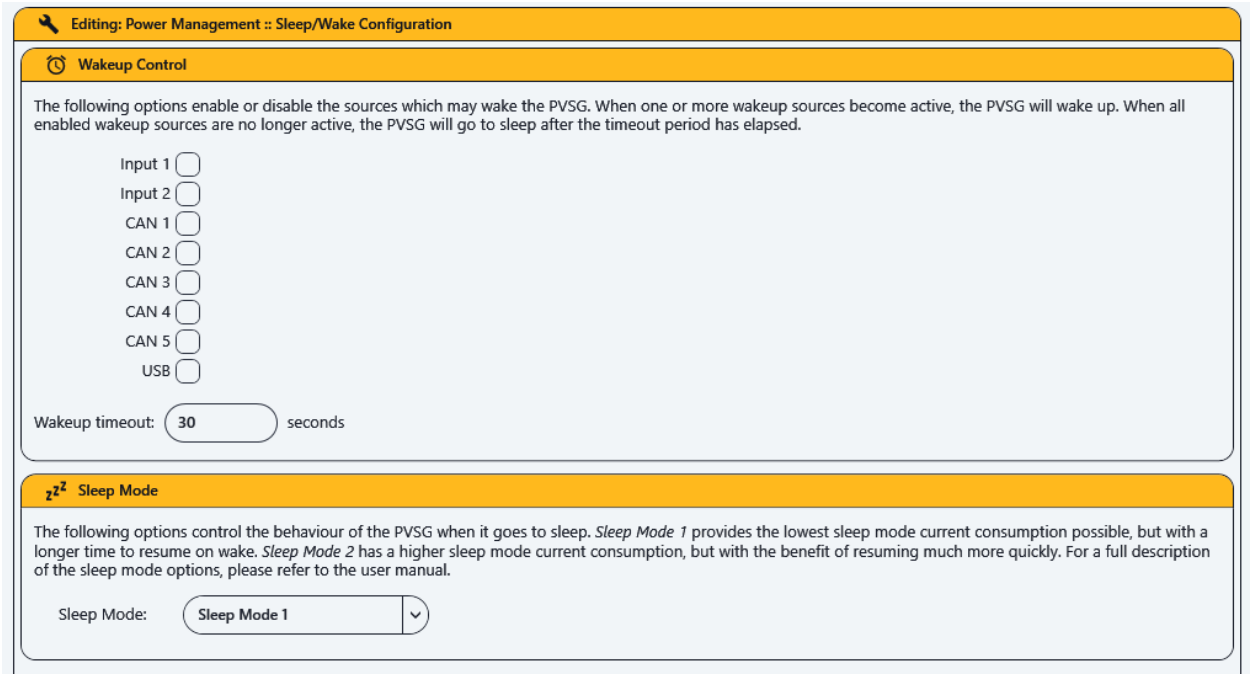


6.4.8. Power Management

Power management features of the PVSG can be controlled via sub-menus of the **Power Management** menu. Currently, this allows the wakeup sources to be selected, via the ***Wakeup Options*** section.

When one or more enabled wakeup sources become active, the PVSG will wake up. When all enabled wakeup sources are no longer active, the PVSG will initiate a proper shutdown and go to sleep.

Note: There is a risk of corrupting the PVSG filesystem if power is removed from a PVSG prior to allowing a PVSG to go to sleep. Therefore is it recommended to always use Wakeup control to put the PVSG to sleep if power needs to be removed.



Note: The **Wakeup timeout** defines the duration that all enabled wakeup sources must be idle for before being considered inactive, allowing the PVSG to go to sleep.

Note: When wakeup is enabled (any **GPIO 1** .. **USB** checkbox (as seen above) is checked), upon waking (regardless of the wakeup source), the PVSG will require the **Wakeup timeout** to expire before going to sleep.

Note: If wake on CAN X is used and J1939 Management is enabled on CAN X, the PVSG will turn off DM1 messages after 5-10 seconds of inactivity on CAN X. DM1 messages will resume upon receiving messages on CAN X. Due to the delay of shutting off DM1 messages, the entrance into sleep mode (Wakeup Timeout) may increase by 5 - 10 seconds.

6.4.8.1.1. Sleep Mode

The **Sleep Mode** setting controls what the PVSG does when it goes to sleep. This happens when all of the unmasked wakeup sources become inactive. Available options are documented in the tables below. Note that the available sleep modes depend upon the variant used.

Sleep Mode	Description	Time to Sleep	Router on Wakeup	Server on Wakeup	Supported Variants
Sleep Mode 1	Sleep mode with the lowest current consumption possible. Slower to fully wake from sleep than sleep mode 2.	16 seconds	Restart	Restart	All
Sleep Mode 2	Wakes from sleep much faster than sleep mode 1, but at the expense of slightly higher current consumption.	16 seconds	Restart	Resume	1051004, 005, 006 and 007.

Example Start-up Times

Function

On Power Up

Sleep Mode 1

Sleep Mode 2

Critical Tasks (CAN routing)

456 ms

432 ms

97.2 ms

Non-Critical Tasks (ex. DLA functionality, product reprogramming, custom application/programming plugins)

9.92 secs

7.89 sec

468 ms

Example Current Draw

Sleep Mode

12V

24V

Sleep Mode 1

3.2 mA

1.7 mA

Sleep Mode 2

11.4 mA

5.9 mA

6.4.9. Input Output Management

The single output of the PVSG can be configured via the **Input Output Management** menu. Output Control can be used to toggle the output based on whether or not the PVSG is awake and/or there is a programming in progress.

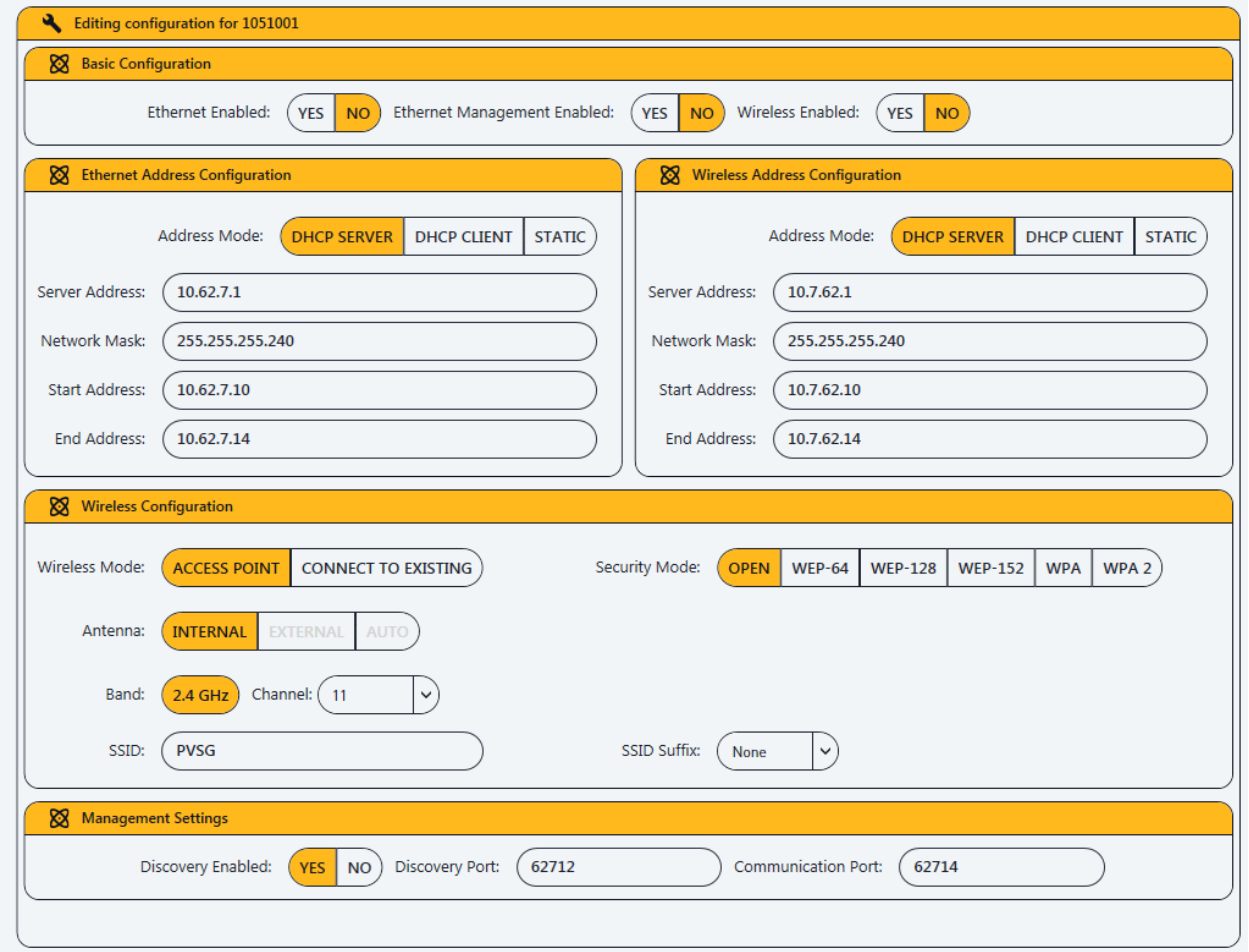
Wireless is enabled and disabled as described in the "Connection Information" section, but can also be configured to be enabled or disabled via Inputs 1 and 2 using the **Input Output Management** menu. Note: Wireless configuration is still required via the **Network Configuration** menu.

If CAN Logging is enabled on any of the CAN buses, you can configure Inputs 1 and/or 2 to trigger logging of CAN messages. In addition to enabling the digital inputs for triggering CAN Logging, you can specify the trigger direction by selecting "Rising Edge" or "Falling Edge". Selecting "Rising Edge" as the trigger direction will cause the PVSG to begin CAN logging when the source has become active. Selecting "Falling Edge" as the trigger direction will cause the PVSG to begin CAN logging when the source has become inactive.

More information about CAN Logging can be found in the CAN Logging section.

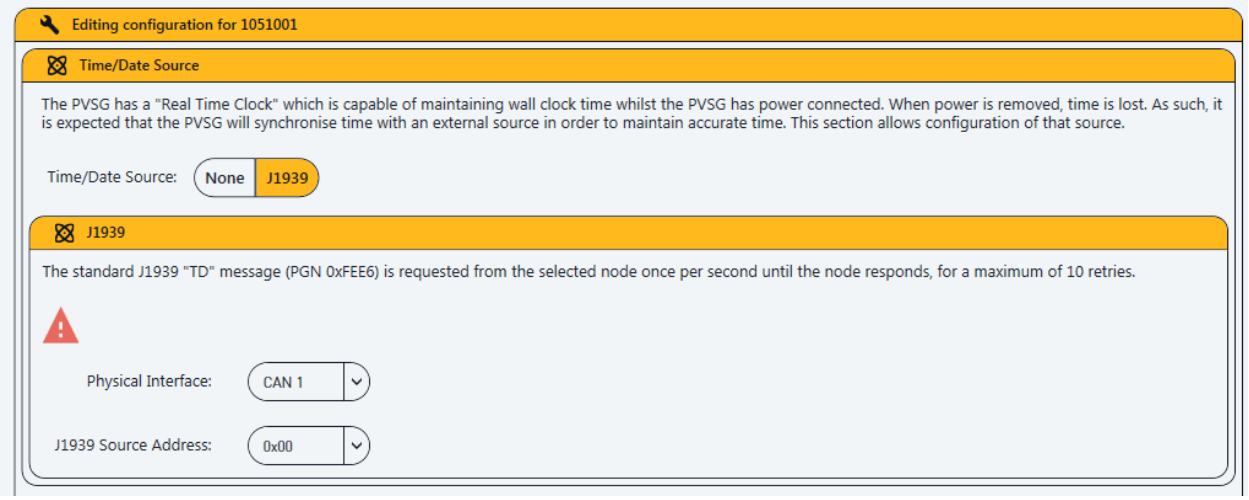
6.4.10. Network Configuration

PVSG network configuration is controlled by the **Network Configuration** menu. This menu can be used to configure a PVSG to use Ethernet and/or wireless as a management connection interface. For a description of each network configuration option please refer to the tool-tip that appears when hovering over an option in the configuration tool.



6.4.11. Time and Date

PVSG Time and Date configuration is controlled by the **Time/Date Configuration** menu. This menu allows the user to specify the time/date source (either **None** or **J1939**) for setting the PVSG Real Time Clock (RTC) time and date values. For a description of each **Time/Date Source** option, please refer to the tooltip that appears when hovering over a non-selected time/date source option in the configuration tool.



If the **J1939** option is selected, the physical CAN bus where the external source resides as well as its source address need to also be specified. Note that the user is required to enable and configure (via the **J1939 Management** menu) the J1939 management settings for the chosen **Physical Interface** (which houses the time/date source, a J1939-based node). The time and date configuration takes effect as soon as the configuration becomes active. The RTC will only be set via J1939 once per power session; once the first received message has been processed, all future time/date messages received by the PVSG will be ignored until the PVSG is power cycled.

Regardless of the **Time/Date Source** option selected, the RTC will contain a random time and date every time the PVSG is power cycled (until the time/date is set, if applicable). The use of one of the Sleep Modes and permanent battery shall be supplied to the PVSG if valid Time and Date data is to persist.

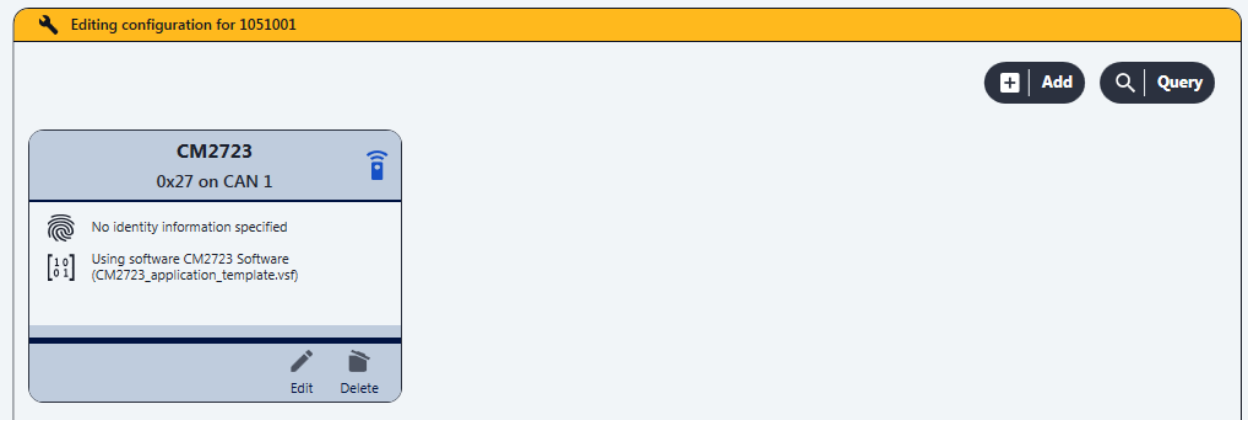
6.4.12. System Modules

This section relates to other modules within the system to which the PVSG is connected.

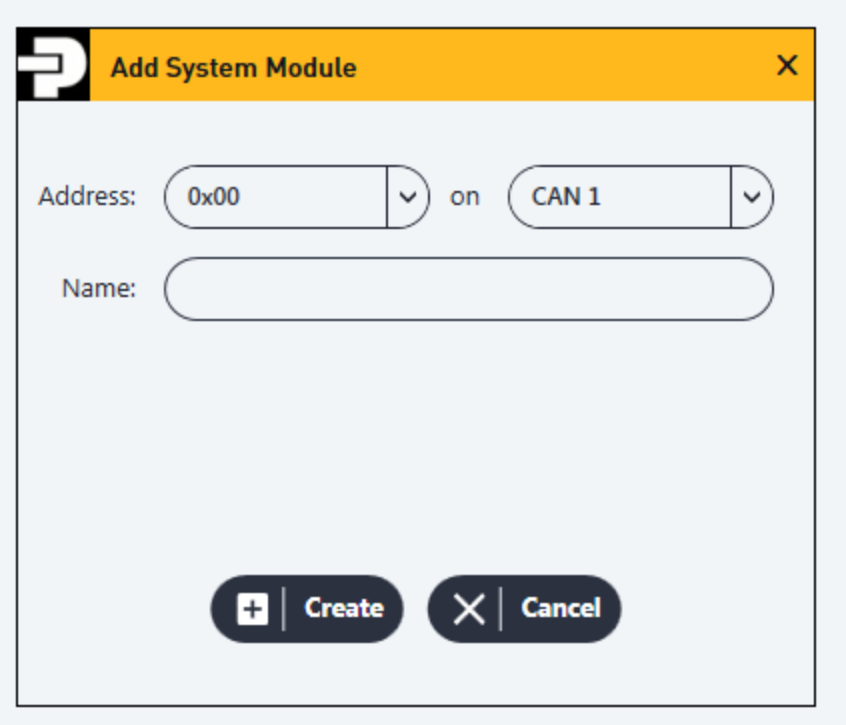
6.4.12.1. Module Management

"Modules of interest" in the target system can be identified within the module management interface. A module's core identity is comprised of its J1939 source address and the physical CAN bus on which it resides. It is possible to further refine a module's identity by using the following pieces of information:

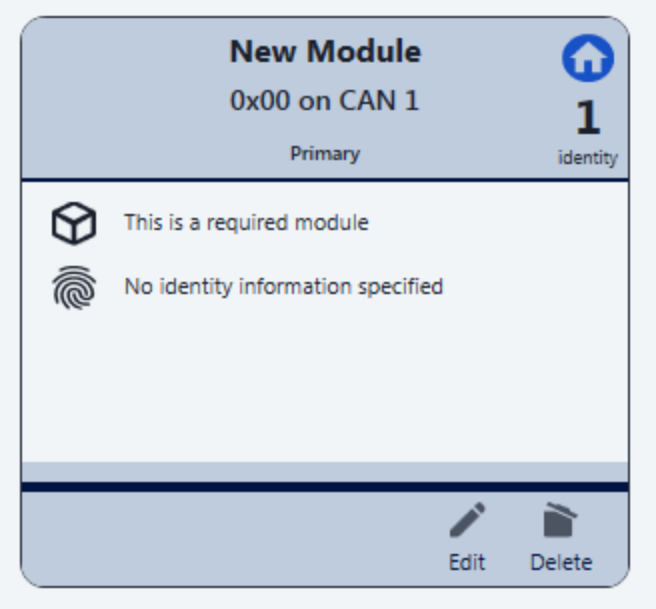
- J1939 NAME Field
- J1939 Software Identification message (PGN 0xFEDA) data
- J1939 Component Identification message (PGN 0xFEEB) data



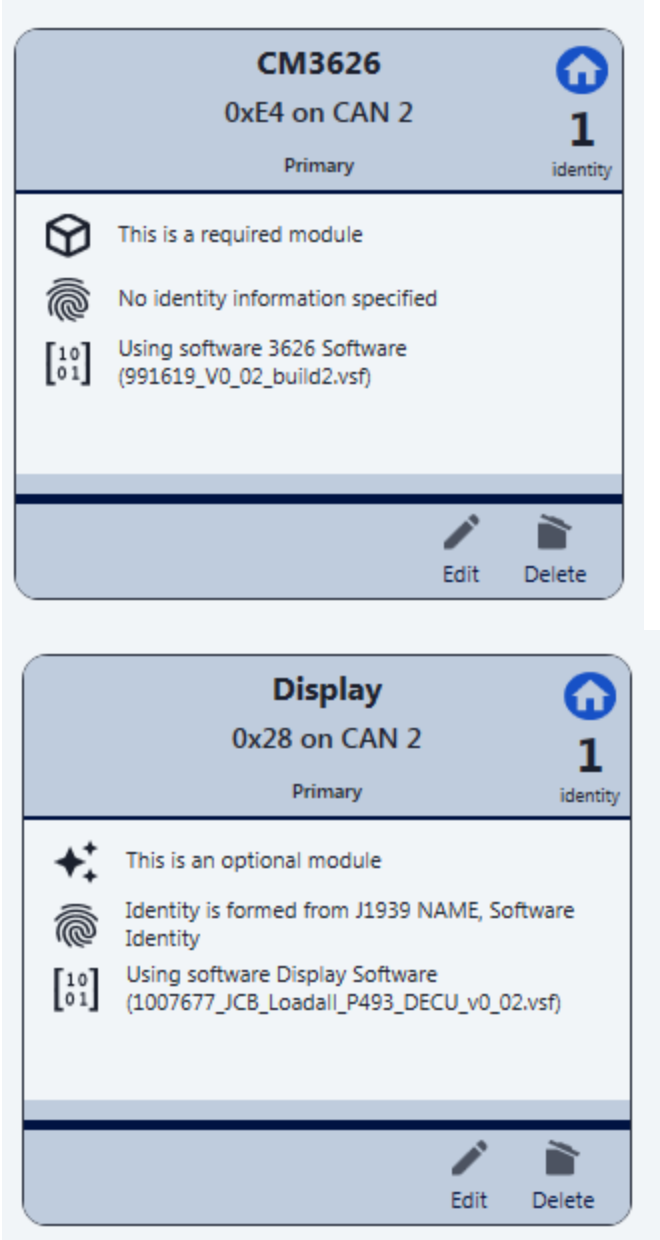
Selecting the **Add** button under the **Module Management** configuration applet allows a new module to be created:



The J1939 source address and physical CAN bus should be set, along with a descriptive name for the module. Clicking **Create** adds the module to the current configuration and shows a new **Module Card**:



The module card data changes depending upon the configuration:



Each module offers options of **Edit** (covered in the following section) and **Delete** which, as the name suggests, allows the module to be removed from the configuration.

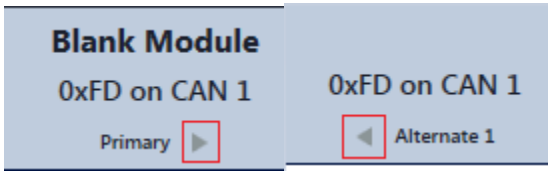
If the PC is connected to a PVSG, the **Query** button queries the information from the modules connected to the system in which the currently connected PVSG resides. The icon in the top right corner of the module information control shows the status of the module in the current system, if the PC is connected to a PVSG. It can show one of four states:

- Not queried. It isn't currently known whether this module exists or not. Icon is blue. Click **Query** to begin.
- Not connected. The module is not present in the current system. Icon is red.
- Connected, but the identity does not match. The module source address was found on the particular CAN bus, but the identity was different than configured. Icon is yellow.

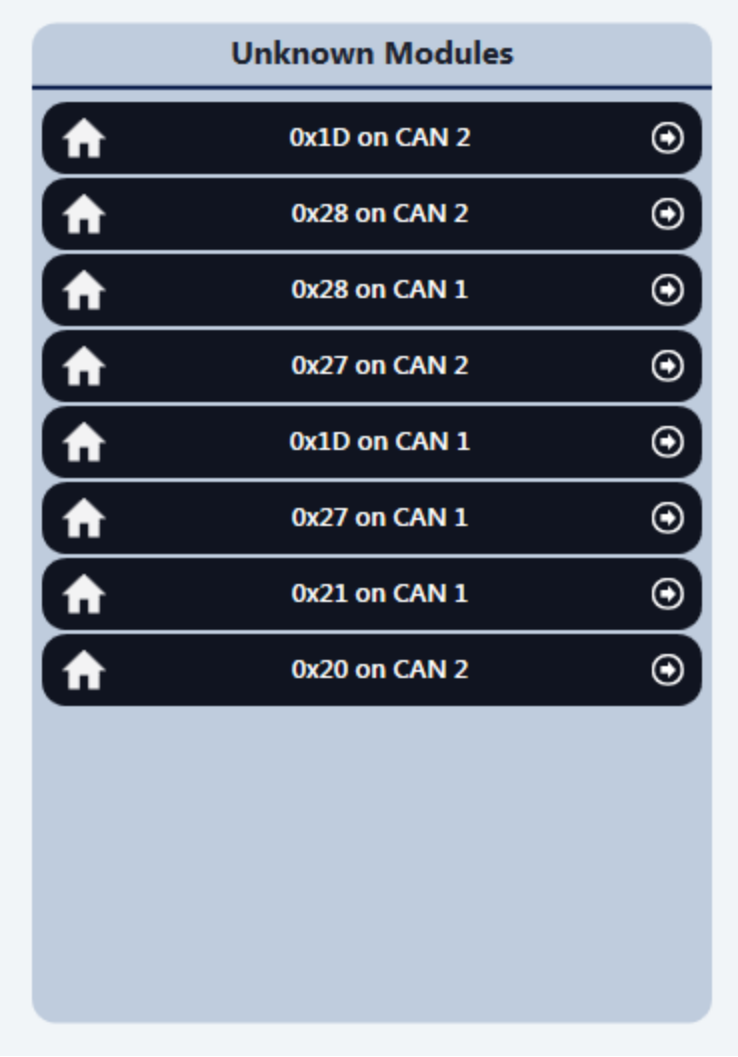
- Connected, and the identity matches. The module source address was found on the particular CAN bus, and the identity matches that which was configured. Icon is green.

Each module may contain multiple identities; a module's core identity is formed from the J1939 source address and CAN bus though it is possible under certain conditions for a particular source address and CAN bus combination to change meaning, or be used for multiple purposes within a single system. An example of this is a blank module, containing no application software; such modules often use 0xFD as their J1939 source address until they have been programmed with a valid application. Alternate identities can be used to handle such cases, by using extra identity information to identify a unique instance of a module and then apply a different behaviour, such as installing different module software. A module must contain a primary identity, and may contain multiple alternate identities. The number of available identities is indicated in the module card header

The module card can show information about alternate identities by cycling through the available identities:



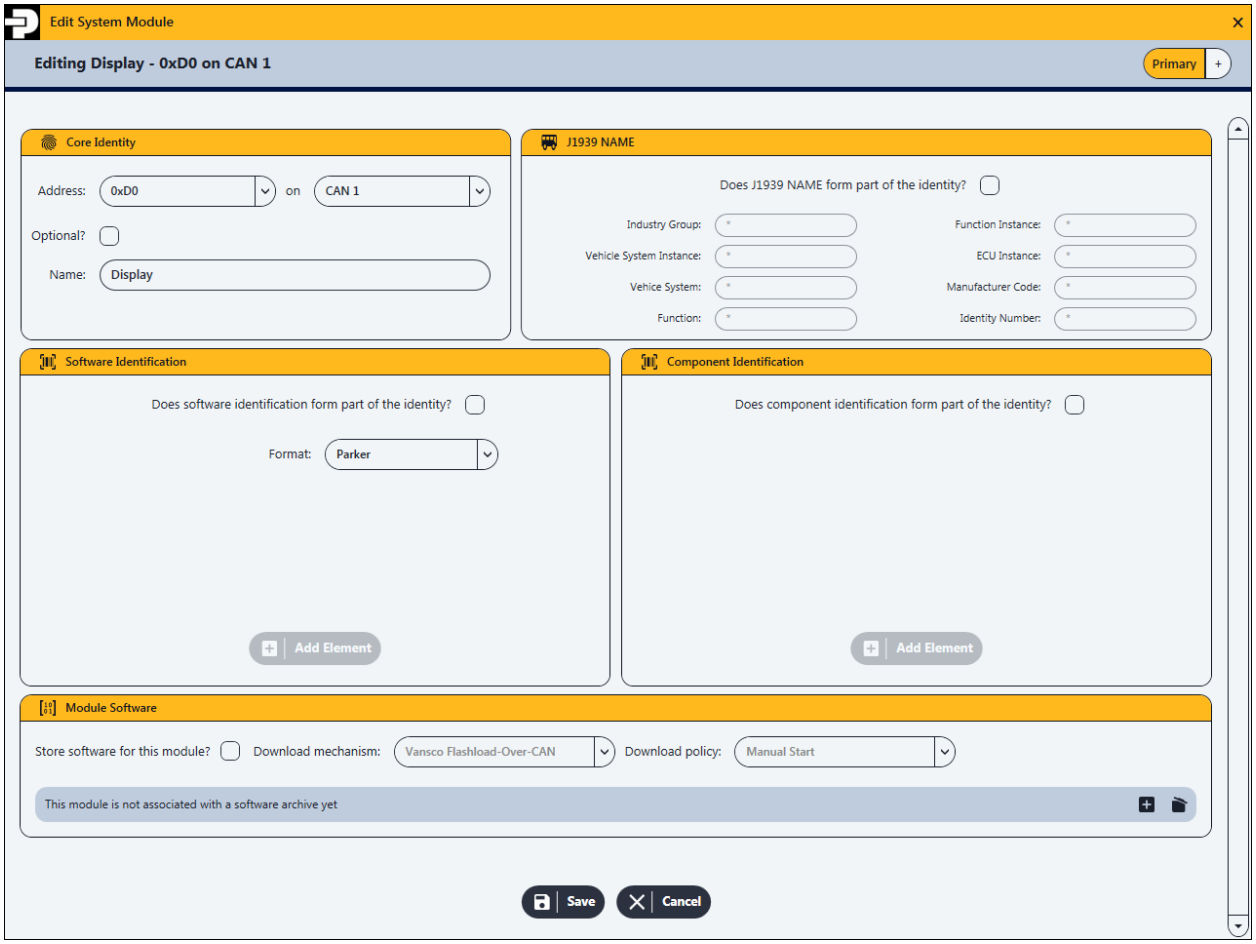
If modules are detected on the system which are not listed in the configuration, an **Unknown** button appears. Clicking this shows the **Unknown Modules Popup**:



Modules listed here can be added to the configuration by clicking the arrow button beside each set of module information. When using this method, a module is added with all known properties selected. They can be removed as required using the **Edit System Module** interface.

6.4.12.2. Editing a Module

A module can be changed by clicking the **Edit** button on a particular module instance. This shows the **Edit System Module** window:



This allows the user to specify which components make up a module's identity. Additional alternate identities may be added and switched between using the toolbar buttons at the top of the window:

Note that when editing an alternate identity, only a subset of the module properties may be available for editing; in order to edit these properties, switch to the primary identity.

6.4.12.2.1. J1939 NAME

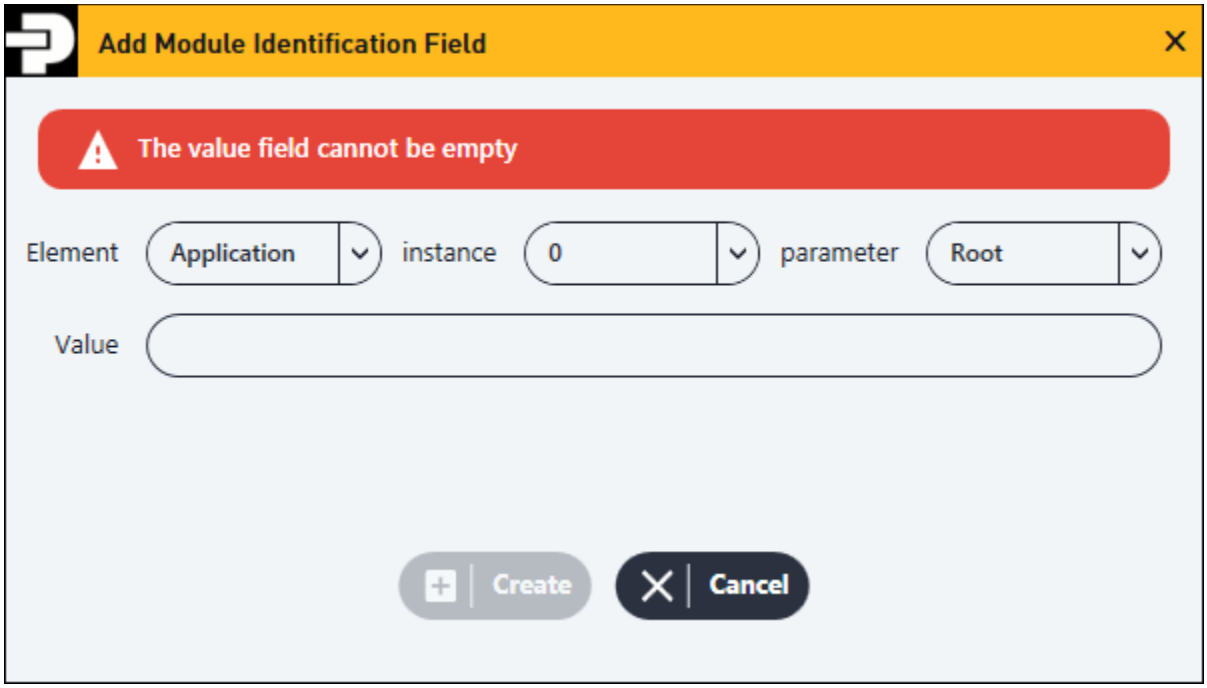
The J1939 NAME field components can be used to identify a module. To enable this, tick the box labelled **Does J1939 NAME form part of the identity?**. Values can then be specified for the individual fields of interest. For fields which are not required to be part of the identity, an asterisk (*) should be placed to indicate that any value is acceptable.

6.4.12.2.2. Software Identification

To make software identification a part of a module's identity, tick the box labelled **Does software identification form part of the identity?**. The SOFT message format must then be specified:

- Parker. The SOFT message uses the format defined in 983F17. Currently, R00A, R01A and R02A revisions of the standard are supported. Advanced element matching is supported.
- Raw. The SOFT message will be inspected as a raw string. Only basic value matching is provided.

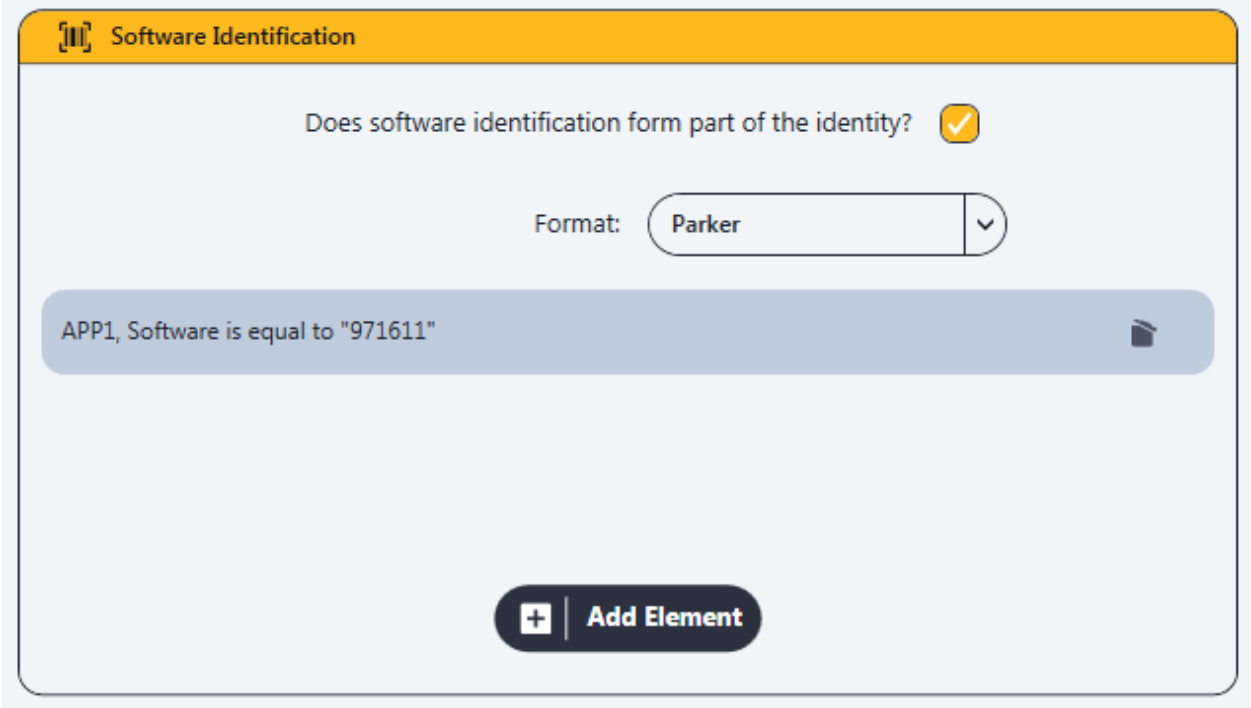
When the format is chosen, use the **Add Element** button to add a new element to the identity:



The element, the instance of that element and the parameter within that element must be chosen. Refer to 983F17 for a description of the format. The value field should be populated with the ASCII string data which should be expected for the particular element and parameter combination. Click **Create** to finish.

In raw mode, only basic string comparison is supported. The user may enter any number of fields which the SOFT message data should contain:

In **Parker** format mode, the view is enhanced:



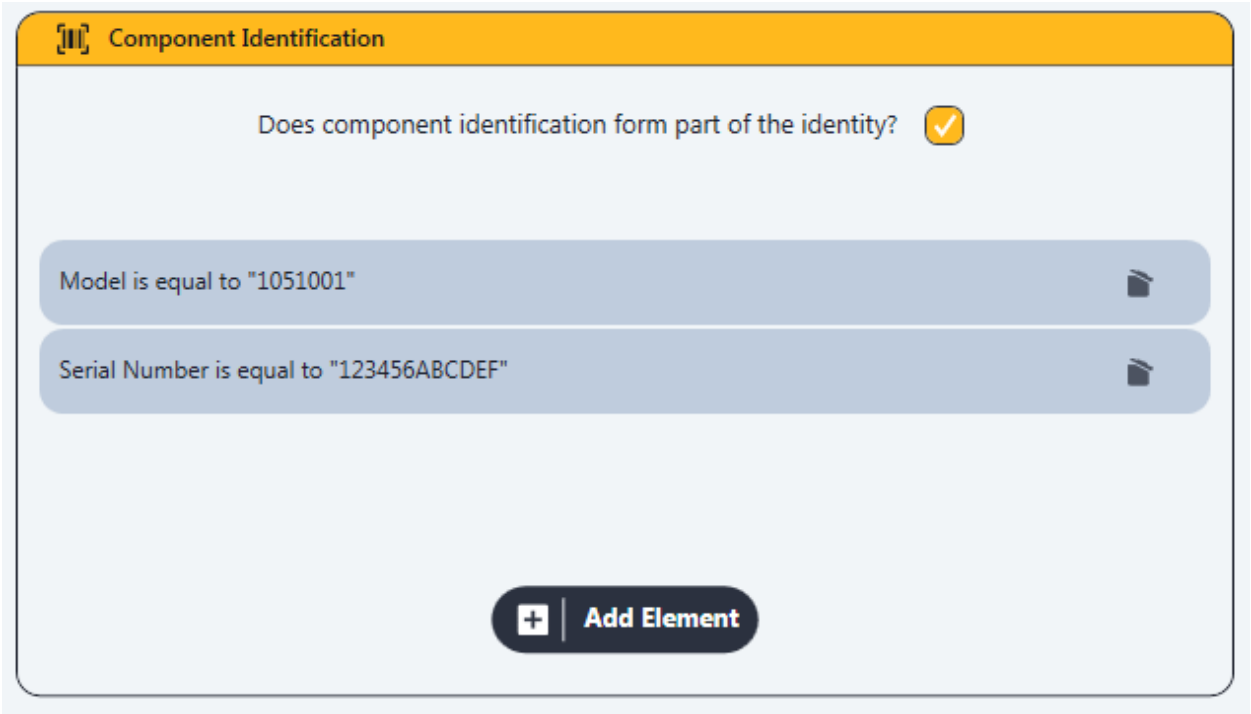
Note: Changing the software identification format when elements already exist will erase any currently stored elements.

A matching element can be removed by clicking the **Delete** icon to the far right side of the particular element to remove.

6.4.12.2.3. Component Identification

Component identification follows the same principle as software identification. To make component identification a part of a module's identity, tick the box labelled **Does component identification form part of the identity?**. The user may choose to match the following fields:

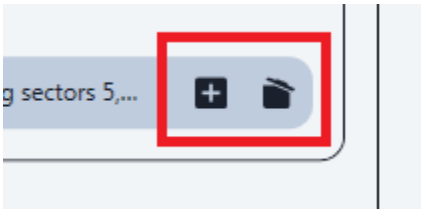
- Model. The "model" field from the component identification message. See J1939-71.
- Serial Number. The "serial number" field from the component identification message. See J1939-71.



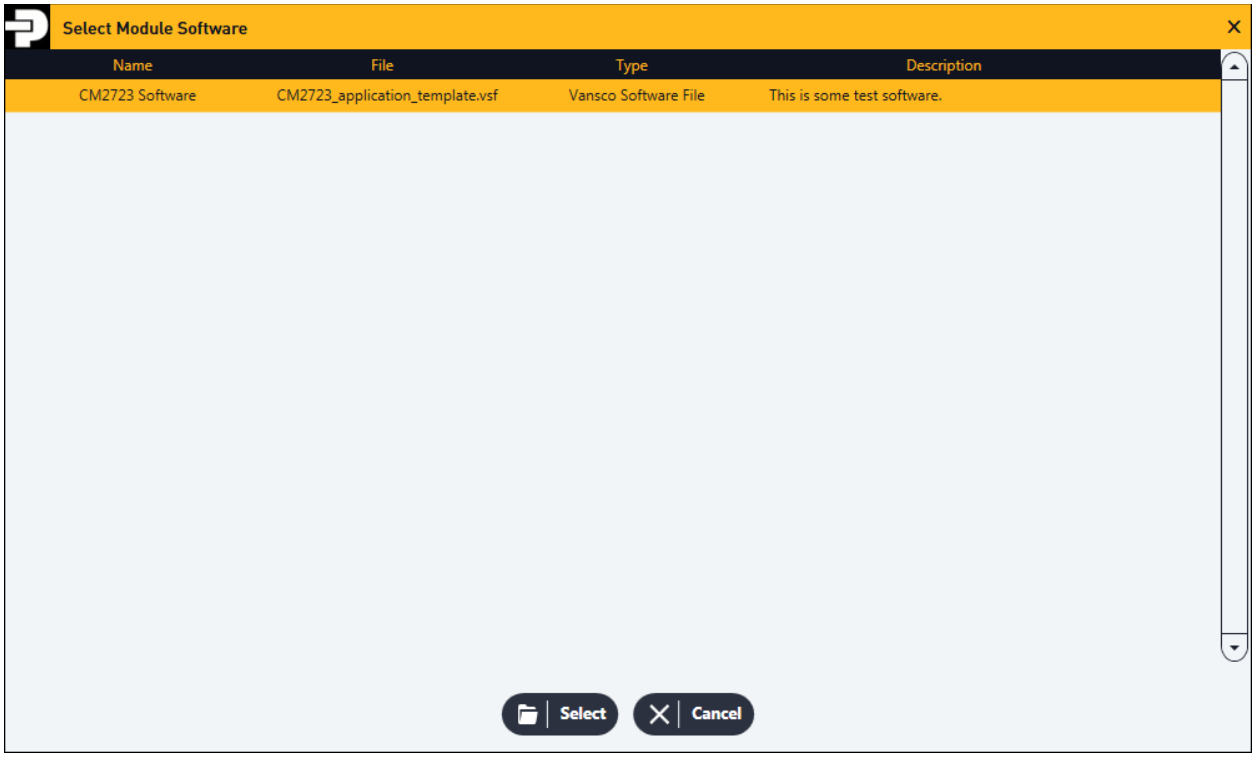
6.4.12.3. Module Software

This section controls whether the configuration stores software for this module or not, and if it does, which software is used and how and when it is deployed.

To attach a pre-configured software element to this module, tick the box labelled **Store software for this module?**. Software can be selected and removed using the **Add** and **Remove** buttons:



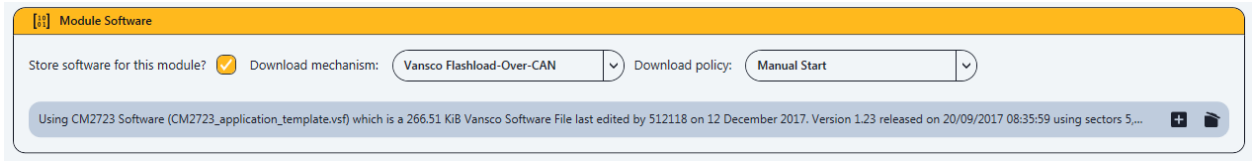
Clicking the **Add** button shows the **Select Module Software** dialog:



This dialog allows the user to select from software already loaded into the configuration via the **Software Archive** interface (see below). Clicking **Select** attaches the selected software to the module.

Note that the **Remove** button does *not* remove the software item from the configuration; it simply disassociates the software with the current module.

When selected, some detail on the software is shown:



Note that the detail shown will change depending upon the file type selected and the information actually available in the selected file.

The supported download mechanisms and download policies are per the following:

Download Mechanism	**Description**
Vansco Flashload-Over-CAN (VFOC)	The Vansco Flashload-Over-CAN-Protocol per Parker document 983F08.
Download Policy	**Description**
Manual Start	The module software is updated via manual invocation from a user via the PVSG dashboard (see "Dashboard" section in this document).

6.4.12.4. Software Archive

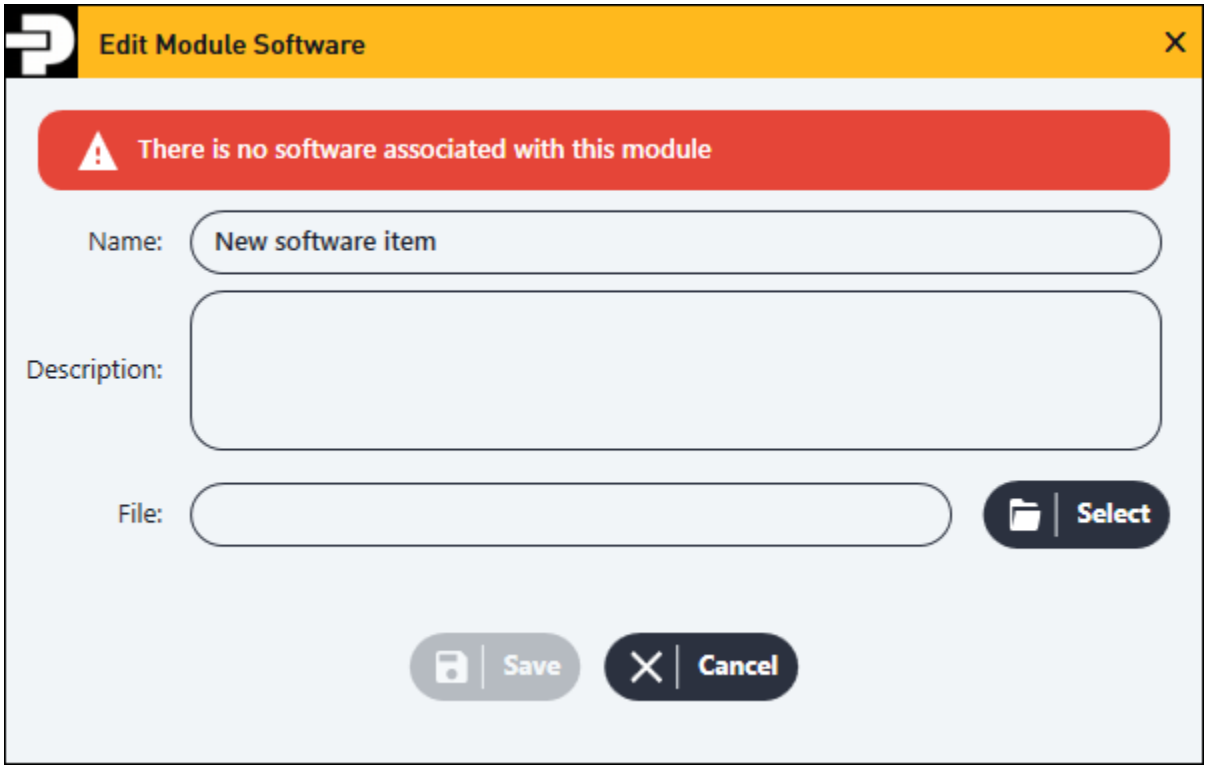
The **Software Archive** holds all system module software for this configuration; that is, the software which is used by the external modules attached to the PVSG system.

Software must be added here before it can be used by a module.

To add a software item, click the **Add** button. This adds a blank software item:

The red exclamation mark icon indicates that there is an error with the software item. This is expected because it has not yet been configured.

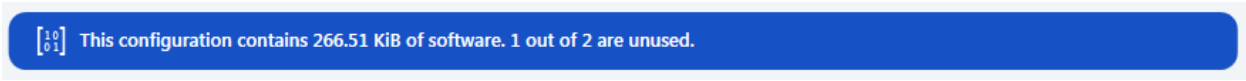
To edit a software item, click the **Edit** button:



Edit the **Name** and **Description** and select a software **File** to use. When complete, click **Save.**

Note that it is not required for the software item name to be unique within a configuration.

The information bar at the top of the **Software Archive** applet shows information on the software stored:

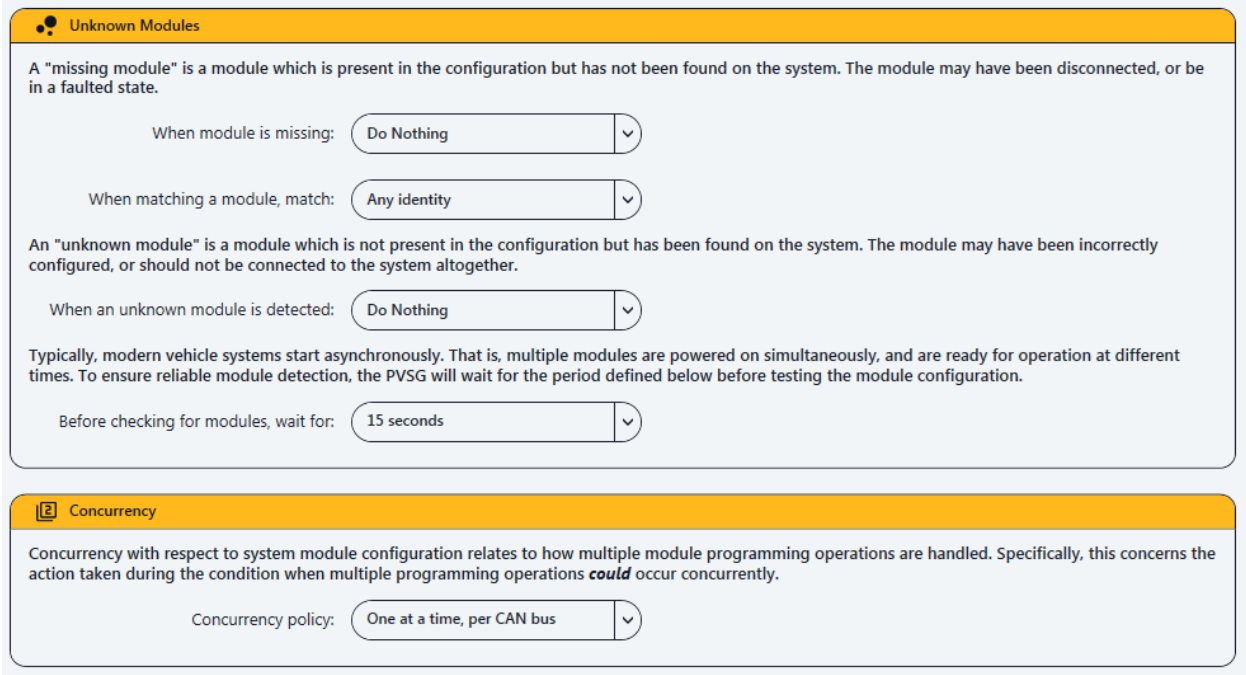


This includes the total size of the software stored, and whether any items are unused. Note that unused software items waste space and so it is encouraged to remove them when possible.

When software archive editing is complete, click the **Save** button to save the changes.

6.4.12.4.1. Module Management Settings

This section covers settings which are related to the PVSG module management system.



Setting	Description
Missing module action	Controls the action taken when a module is determined to be missing from the system. Possible actions are **Do Nothing**, or **Show a Fault** (error code 20:1, see "Error Codes" section within this document for details) .
Module matching scheme	Controls how the PVSG determines whether a module matches its configured identity or not. Available options are using any identity, or requiring the primary identity.
Unknown module action	Controls the action taken when an unknown module is connected to the system. Possible actions are **Do Nothing**, or **Show a Fault** (error code 20:2, see "Error Codes" section within this document for details).
Module check hold off time	Controls the time which will be waited by the PVSG on startup before checking for modules on the system.
Concurrency policy	Controls the number of software update operations which may happen simultaneously. Options are limiting concurrency to one simultaneous operation, or one simultaneous operation per CAN bus.

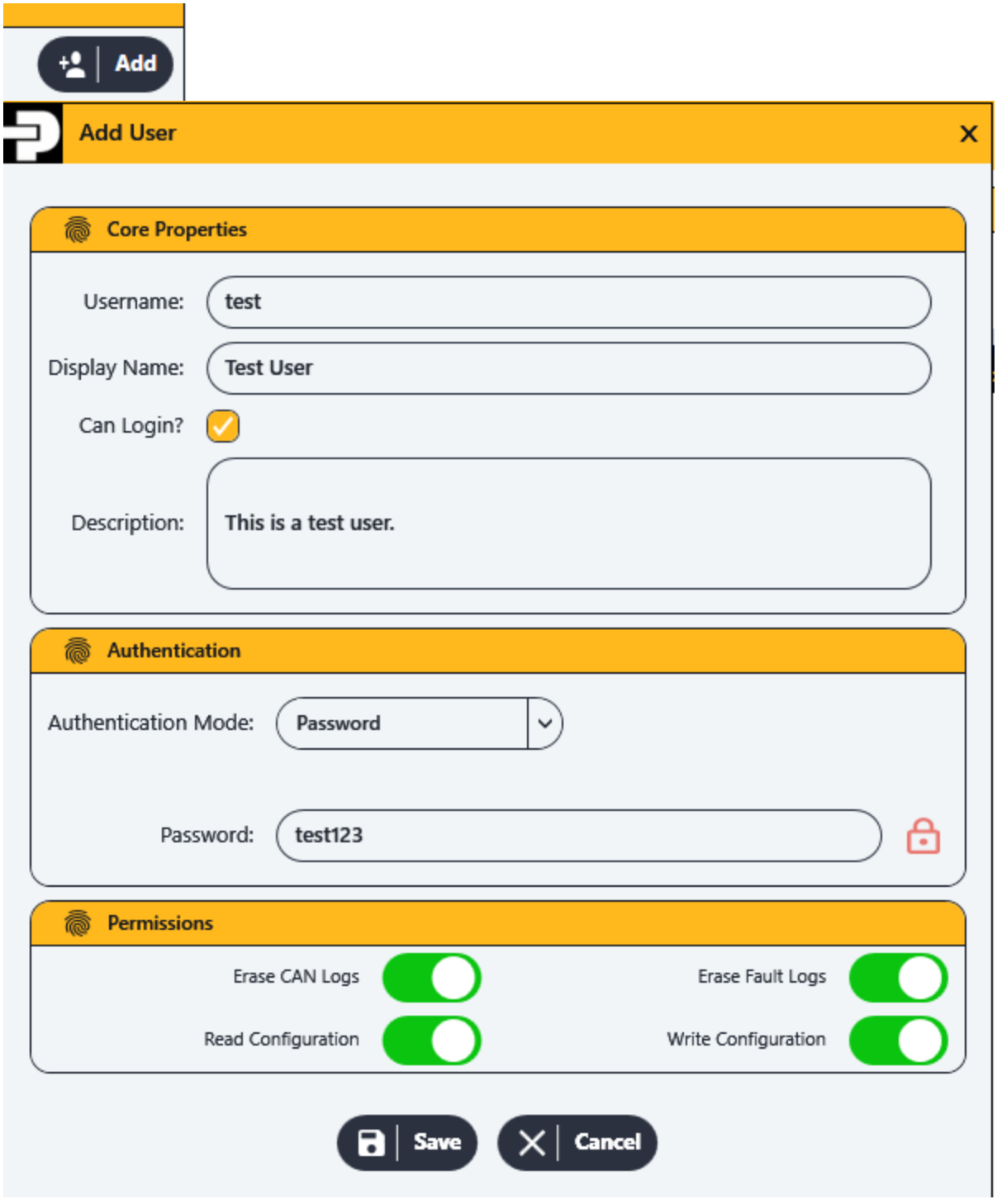
6.4.12.5. Custom Programming Plugins

The **Custom Programming Plugin** manager allows the user to add a custom programming plugins, built specifically to run on the PVSG. Consult document 1051G05, *Custom Logic User Guide* or contact Parker for more information on custom programming plugins.

6.4.13. User Accounts

6.4.13.1. User Account Management

User accounts can be managed via the **User Account Management** section. If user management is configured, certain operations can be restricted to specific users. If user management is not configured (i.e. there are no users present), all available end-user operations are possible via the anonymous user, which is logged in by default. Add a new user by clicking the **Add** button.



Basic user properties may be configured, in addition to the authentication mechanism and accessible features. Possible authentication mechanisms are listed below:

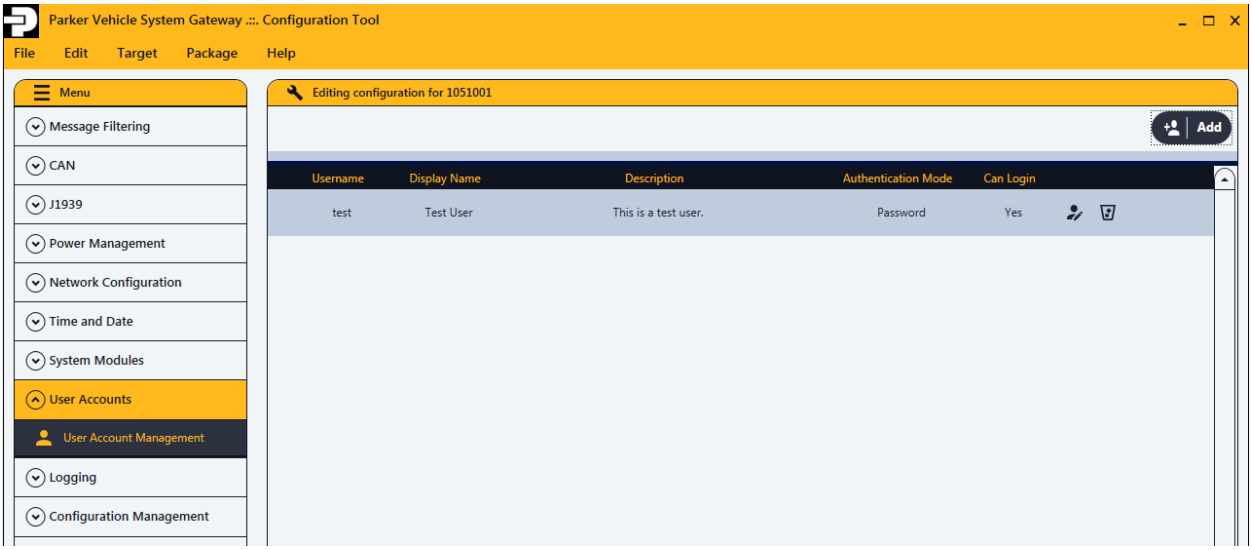
Authentication Mechanism	Description
Password	A username and password combination is required to log in as this user. The padlock icon at the end of the password field indicates the strength of

Authentication Mechanism	Description
	the password; to be considered secure, a password should contain at least 5 characters including upper case and lower case letters, one number and one symbol. "Weak" passwords may still be used at the discretion of the user.

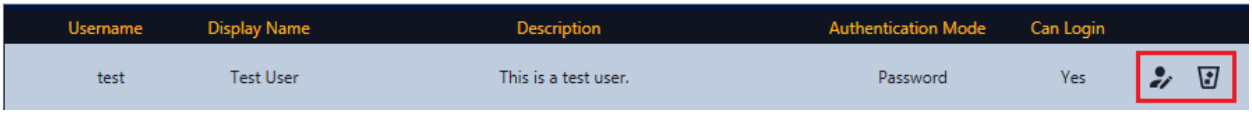
Available permissions, and their meaning, are listed below:

Permission	Description
Erase CAN Logs	Controls whether or not the CAN logs may be erased by this user.
Erase Fault Logs	Controls whether or not the fault logs may be erased by this user.
Read Configuration	Controls whether or not the configuration may be read by this user.
Write Configuration	Controls whether or not the configuration may be written by this user.

Available users are listed within the main **User Account Management** applet:



A specific user may be edited or deleted using the buttons within the user information:



Note: OEM's must retain User Account details as to not lock themselves out of the unit. If a PVSG's User Accounts passwords are misplaced, the unit can be sent to Parker at the OEM's expense where it can be reset to factory setting for an additional cost.

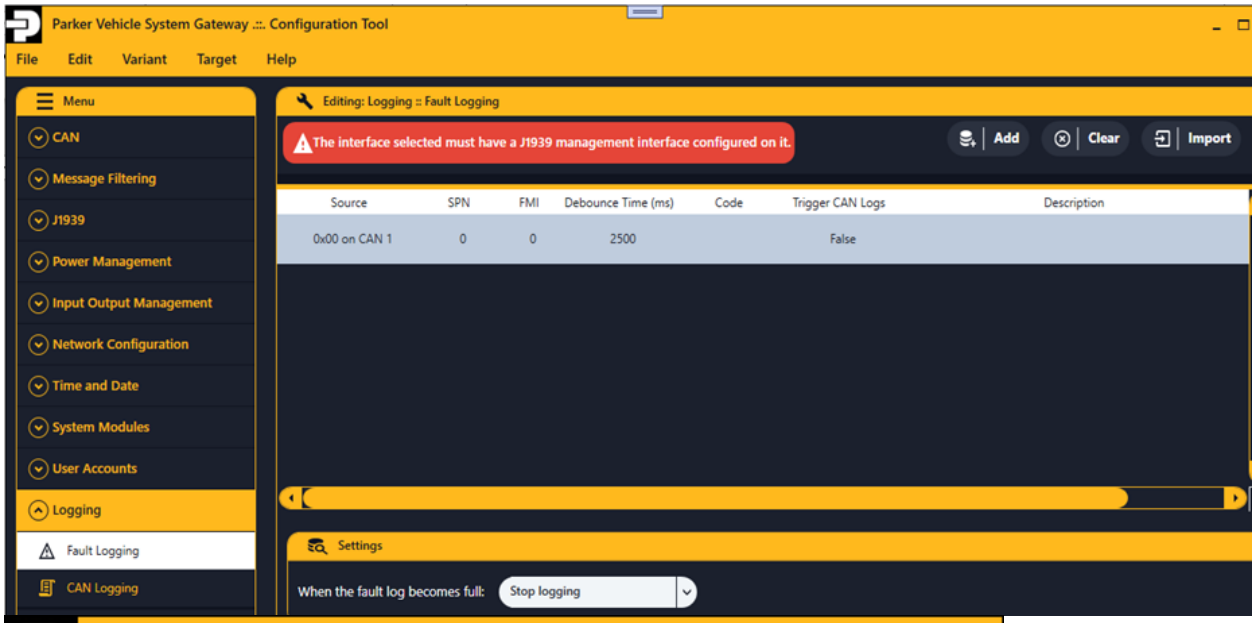
6.4.14. Logging

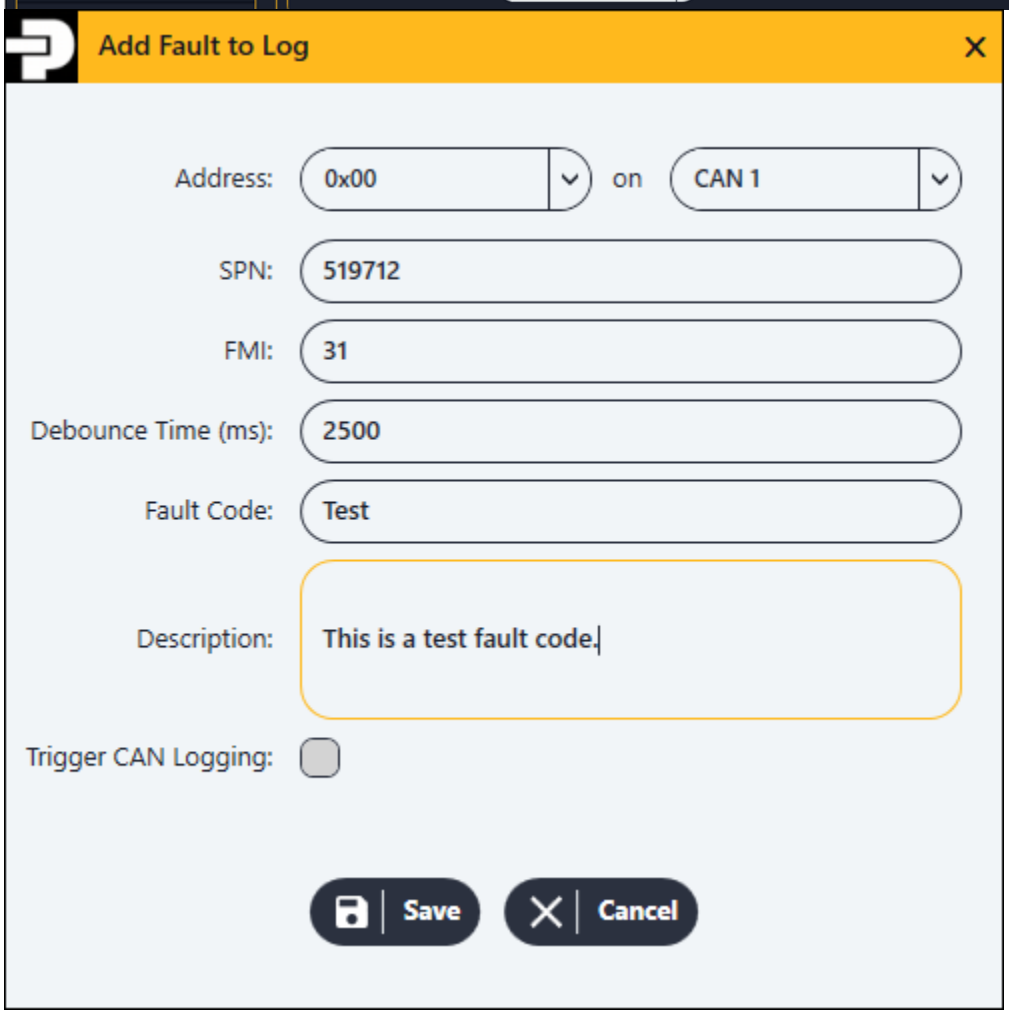
6.4.14.1. Fault Logging

Fault logging configuration relates to specific J1939 Diagnostic Trouble Codes (DTCs) contained within J1939 DM1 messages which should be logged to non-volatile memory within the PVSG.

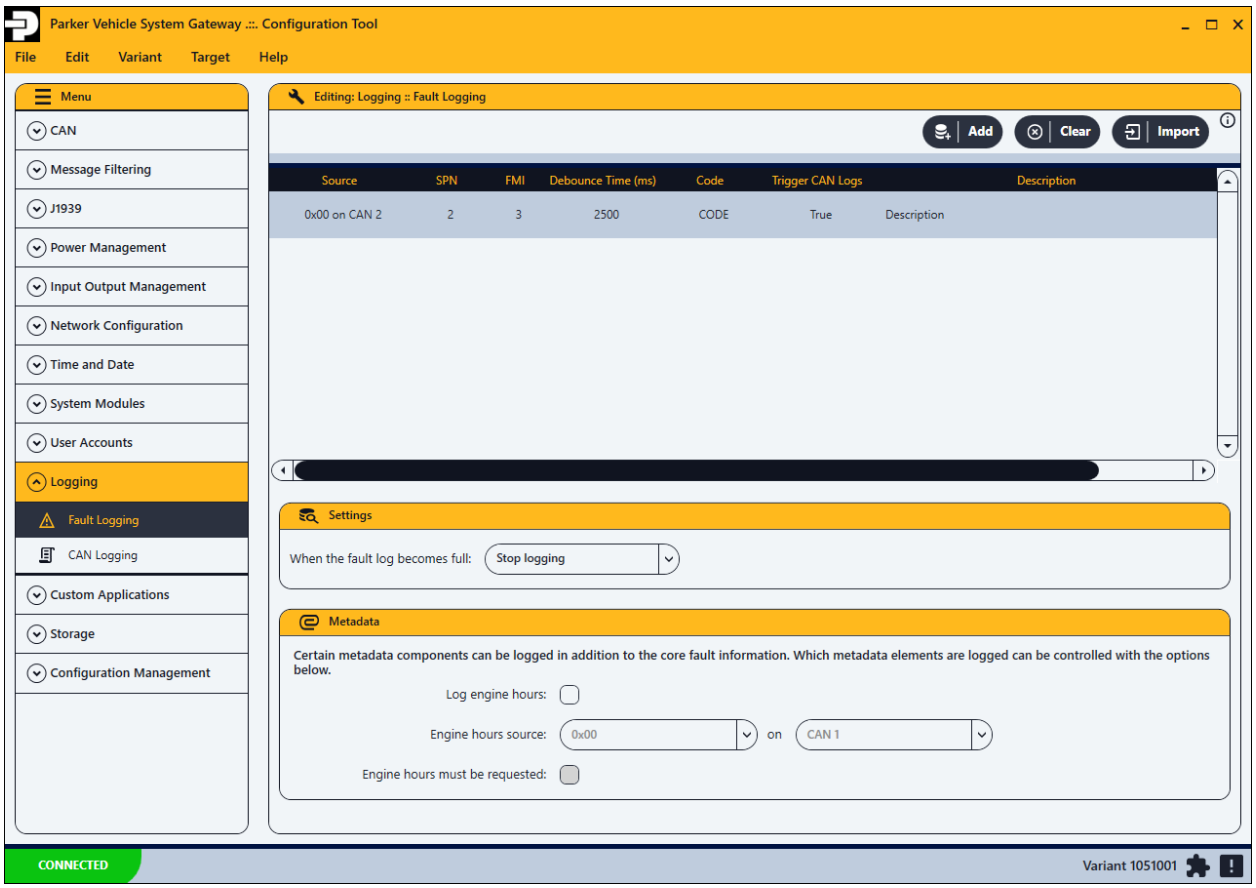
Validating Fault Logging with J1939 Management:

J1939 Management should be enabled for Fault Logging to work for the respective source bus. So, a warning banner (red color) is displayed if" Management Enabled" is not checked for the bus and fault for the bus is added to fault logging (reference Note 2).





Specific faults are configured in terms of Suspect Parameter Number (SPN), Failure Mode Index (FMI) and the J1939 source address and CAN bus of the originating module. A customer specific "code" can optionally be specified (which is logged with the fault information). Note that the description field is for configuration management purposes only and is not logged with the fault data. The debounce time relates to the minimum time period for which a fault must be seen to be inactive before another occurrence of the fault will be logged. This helps to prevent multiple faults from being logged for a single fault event. Note that the minimum debounce time is 2.5 seconds, which is required due to the period of the J1939 DM1 message.



The action taken when the fault log becomes full (per storage limits, see "Storage Administrator" section) can be set within the **Settings** group. The following actions are available.

Action	Description
Stop Logging	Faults will no longer be logged until the fault log is manually cleared via the dashboard.
Overwrite Oldest Logs	Each time a new fault instance is required to be logged, the oldest fault log at that time will be erased.

Optionally, metadata may be logged with each fault. Currently available metadata types are listed below.

Metadata	Description
Engine	The current running hours of the engine. Obtained via J1939 PGN 0xFEE5. The

Metadata	Description
Hours	PVSG can optionally request this information (via the J1939 RQST message) if required. If request is enabled, the information will be queried at an interval of 5 seconds.

If CAN Logging is enabled on CAN Bus X, a fault on CAN X can be configured to trigger CAN Logging. To enable this functionality, activate CAN Logging on CAN X. After doing so, add the fault on CAN X within the Fault Logging window and ensure that the "Trigger CAN Logging" checkbox is checked off.

More information about CAN Logging can be found in the CAN Logging section.

Files storing fault data can be imported using the **Import** button, for adding larger quantities of faults. These files are Excel spreadsheets (.xlsx) that follow the format shown below.

Source Address	Source Bus	SPN	FMI	Debounce Time	Code	Description	Trigger CAN Logs
0x05	2	2	3	2500	CODE	Description	True

To use this feature, Microsoft Office must be installed on the computer. The top row will be used as a header row with the fault data under in their appropriate columns. The values accepted for these data fields are:

- Source Address: Integer values from 0x00 (0) to 0xFD (253).
- Source Bus: Integer values from 1 to 5 (for their respective CAN port bus).
- SPN: Integer values from 0 to 524287
- FMI: Integer values from 0 to 31
- Debounce Time: Integer values from 2500 to 20000
- Code: Text with a maximum length of 10 characters
- Trigger CAN Logs: Text that reads True if the fault will trigger CAN Logging or False if the fault will not trigger CAN Logging

Note: CAN Logging must be enabled on the Source Bus of the fault for the Trigger CAN Logs functionality to work.

Note: J1939 Management Enabled must be configured on the Source Bus of the fault for Fault Logging functionality to work.

All numeric fields can accept decimal and hexadecimal values. Hexadecimal values must be prefixed with "0x", such as "0xED". Note that larger files will take noticeably longer to read and import. Currently, a maximum of 1800 faults can be configured to be logged by the PVSG.

An example fault log import spreadsheet can be found in:

- C:\Program Files (x86)\Parker\ECD\PVSG\doc for 64-bit operating systems.
- C:\Program Files\Parker\PVSG\ECD\doc for 32-bit operating systems.

6.4.14.2. CAN Logging

CAN message logging on the PVSG is configurable via the CAN Logging section under Logging on PVSG variants that support it. All CAN traffic seen on a CAN port is recorded if configured to do so. There are two different types of CAN logging features available:

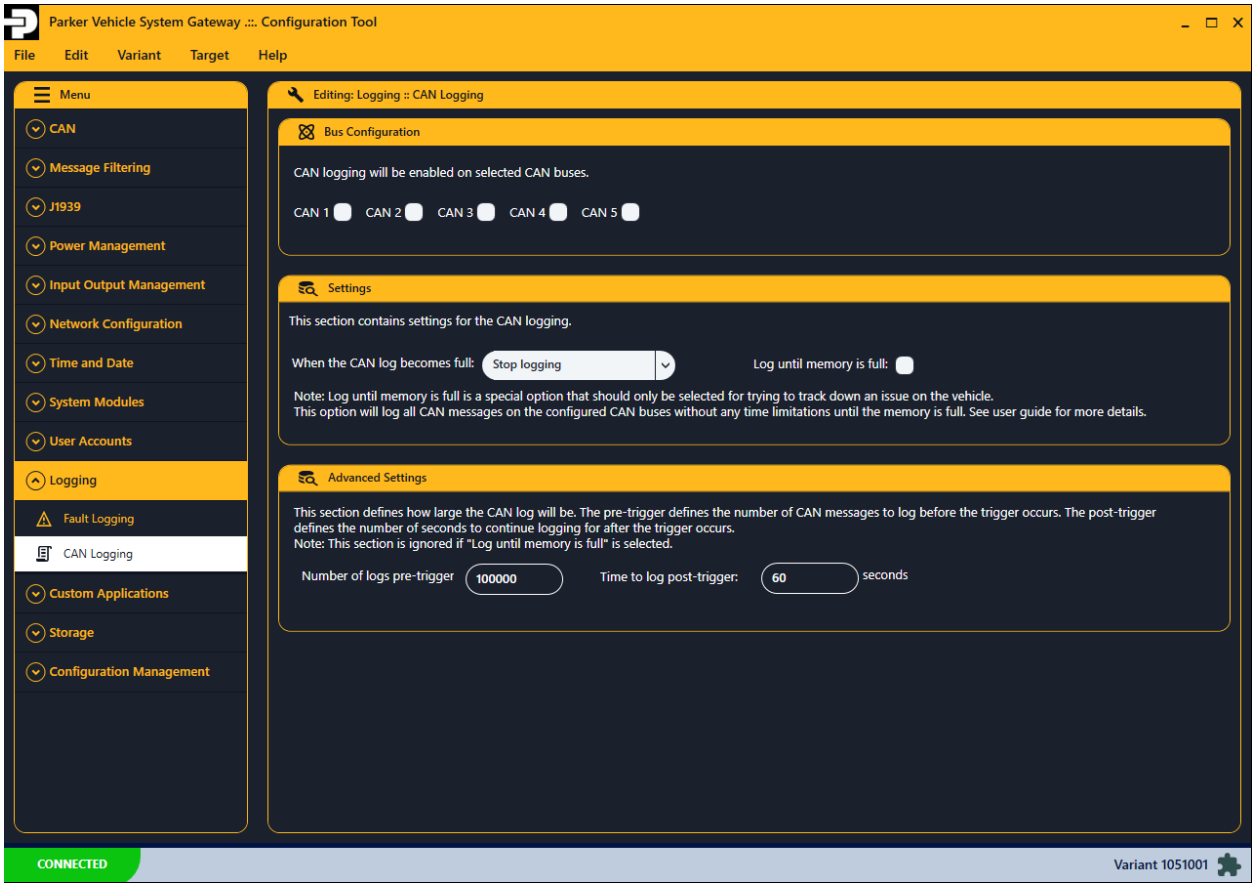
- Log when a CAN log trigger occurs: this is the standard method of CAN logging. When the trigger occurs, the PVSG will store the CAN messages (from configured CAN buses) that are in its pre-trigger buffer into the log file and continue logging until the number of post-trigger seconds is complete.
- Log until memory is full: this is a special case method of CAN logging. In this mode, the PVSG will log all of the CAN messages (from configured CAN buses) until the memory available to the CAN logger is full.

The CAN log relies on receiving the proper time and date that is sent to the PVSG on power up. Refer to the **Time and Date** section for information on configuring time the PVSG to accept time.

Note: If CAN Logging is to be used, Sleep Mode 1 or 2 is required to ensure no loss of data in the logs.

CAN Logging Configuration

There are several different options available in the configuration for CAN logging.



Option	Value	Description
CAN 1 to 5	Checkboxes	When selected, this CAN bus traffic will be stored in the CAN log when triggered.
When the CAN log	Stop Logging	CAN messages will no longer be logged until the CAN log is manually cleared via the **PVSG Dashboard**. Note:

Option	Value	Description
becomes full		when "Log until memory is full" is selected, "Stop Logging" will be forced.
When the CAN log becomes full	Overwrite Oldest Logs	Each time new CAN messages are required to be logged, the oldest CAN messages at that time will be erased.
Log until memory is full	Checkbox	When selected, all of the CAN bus traffic will be stored until the memory allocated to the CAN logs is full. Due to the wearable aspect of the PVSG memory, this option is recommended to be used sparingly. Note the following will occur when this option is selected: • The option "When the CAN log becomes full" will be forced to "Stop logging". • The Advanced Settings options will be disabled, as they only apply to standard CAN logs.
Number of logs pre-trigger	1 to 100,000 CAN messages. Default value is 100,000.	This is the maximum number of CAN messages that will be stored in the log file prior to when a trigger occurs. These messages are stored in RAM and written to the log file when needed. Note: when "Log until memory is full" is selected, this option is not configurable.
Time to log post-trigger	1 to 60 seconds. Default value is 60.	This is the number of seconds to continue storing CAN messages to the log file after the trigger has occurred. Note: when "Log until memory is full" is selected, this option is not configurable.

The main purpose of the pre-trigger is to capture the CAN traffic that occurs before the event that triggered the CAN log, thus providing insight of the moments leading up to the event. The buffer period after the event is the post-trigger. This not only ensures the event is entirely captured but is essential for analyzing the outcome of the event. When a CAN log is triggered by an event, CAN messages that have been received before the trigger and CAN messages that continue to be received for a configured time period will be logged to the PVSG. The number of seconds of pre-trigger CAN traffic logged depends on a few factors such as:

- The average number of CAN messages per second for all of the CAN buses that are being logged.
- The "Number of logs pre-trigger" value.

Here are some example scenarios for how long, in seconds, the maximum "number of logs pre-trigger" would span in various CAN loading scenarios:

# pre-trigger messages	Baud Rate (bps)	CAN Load	CAN messages/second	Number of CAN ports	Number of seconds the pre-trigger buffer would span
100,000	500,000	80%	3000	1	33.3
100,000	500,000	80%	3000	2	16.7
100,000	500,000	80%	3000	3	11.1
100,000	500,000	80%	3000	4	8.3
100,000	250,000	80%	1500	1	66.7
100,000	250,000	80%	1500	2	33.3

# pre-trigger messages	Baud Rate (bps)	CAN Load	CAN messages/second	Number of CAN ports	Number of seconds the pre-trigger buffer would span
100,000	250,000	80%	1500	3	22.2
100,000	250,000	80%	1500	4	16.7
100,000	250,000	80%	1500	5	13.3

CAN Logging Limitations

The number of times that the CAN logger memory can be written to is limited due to hardware limitations.

- For standard CAN logging, the PVSG will only allow 5 CAN log triggers per power up. When the PVSG wakes up from sleep mode, another 5 CAN log triggers is allowed.
- The PVSG will only allow "Log until memory is full" if the CAN log memory health is not critical. One can view the health of the CAN log memory on the "Logs/CAN Log" page in the **PVSG Dashboard**. Another limitation is that the PVSG will not automatically erase any old CAN logs in this mode when the memory is full.

Logging CAN messages to the memory takes up a lot of system resources. Due to this, the maximum number of CAN logs that the PVSG can log is approximately 13,000 CAN messages per second. This is the total amount of CAN traffic spread out over all of the CAN buses that are being logged. For example, see the following setup:

- 3 CAN buses configured at 500 kbps, running at 80% load (~9,000 CAN messages per second).
- and 2 CAN buses configured at 250 kbps, running at 80% load (~ 3,000 CAN messages per second).
- The combined total is approximately 12,000 CAN messages per second, which is within the target range of 13,000 CAN messages per second.

When the PVSG is powering up, there is a delay before the CAN logging feature will be available to log the CAN messages to memory. This power up delay depends on the Sleep Mode used:

- Fresh power up: approximately 7 seconds. Note that not using sleep mode to shut the PVSG down before removing power is not recommended and can lead to data loss.
- Sleep mode 1: approximately 7 seconds
- Sleep mode 2: approximately 3 seconds

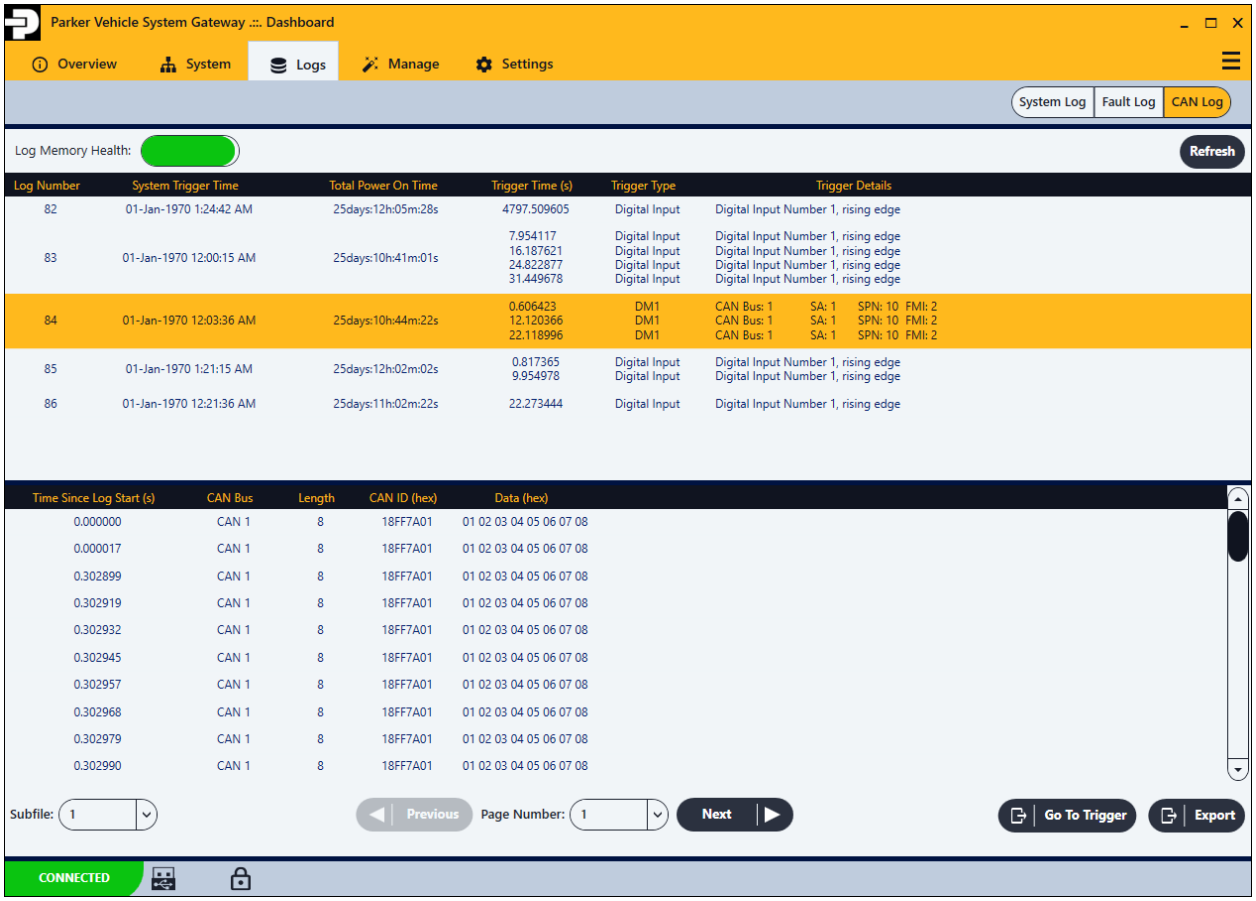
Note: Since the logger memory is a wearable part, overuse of the logger memory's "Log until memory is full" feature is not covered under warranty. In order to prevent memory failure, we have limited "Log until memory is full" to two-thirds of the maximum write cycle.

Retrieving CAN Logs from PVSG

CAN logs are retrieved from a PVSG using the **PVSG Dashboard**. To retrieve CAN logs, navigate to the CAN log window within the **Logs** tab and then click the **Refresh** button. The PVSG will return a list of log groups that are identified by a **Log Number**. Each log group specifies the **Trigger Type** which can either be DM1, DIN, Custom Application or Log until full. Information about the trigger such as various timestamps related to trigger and

information specific to the trigger type will also be included. A new **Log Number** will be created whenever one of the triggers starts a new CAN Log. To learn more about CAN Logging Triggers, look in the **Fault Logging** section and the **Input Output Management** section.

To view the CAN logs corresponding to the **Log Number**, simply click on the Log group of interest and the **PVSG Dashboard** will automatically load the CAN messages.



To reduce the size of a single log file, CAN logs are split into subfiles. Once the CAN messages have been loaded, the user can select which subfile to view by simply using the 'Subfile' dropdown menu. When a new subfile is selected, there will be a short delay as the subfile is downloaded from the PVSG. Since these log subfiles may contain a large amount of log entries, they will be displayed throughout numerous pages. Similar to subfiles, the user can select which page number to view by using the 'Page Number' drop down menu or by using the 'Next' and 'Previous' buttons.

CAN logging is intended to be used as a method of viewing *past* messages. To view live messages on the PVSG, refer to the **Connecting an RP1210 Client** section. For J1939 logging or logging with more precision use another tool such as a CANalyzer.

Exporting CAN logs

The CAN logs are able to be stored into text files by selecting the **Export** button on the **Logs/CAN log** screen of the **PVSG Dashboard**. There are two different file types that are available:

- CSV file - these files can be viewed in Excel.

- The CSV subfiles are approximately 11 MB each in size.

- ASC file - these files can be viewed in CANalyzer.
  - The ASC subfiles are approximately 6 MB each in size.

Logs will be exported to several files, based on the number of subfiles that are in the log file. The first file will be the name provided and each subsequent file will have _L### appended to the file name, where ### is the exported file number. For example, if the file name is CAN_log, and the file type is CSV, the first few names will be:

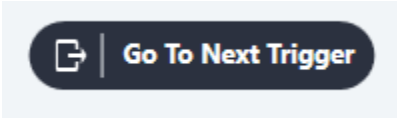
- CAN_log.csv
- CAN_log_L001.csv
- CAN_log_L002.csv

Note: the amount of time that it takes to download the CAN log files is around 1 to 2 seconds per CAN subfile. When downloading a "Log until memory is full" file that filled up the memory, which can be around 1100 subfiles, will take approximately 18 to 36 minutes.

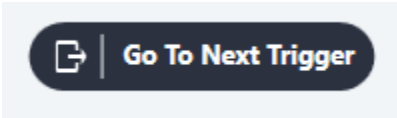
Since the downloading of CAN logs may take a while, the user may select the subfile range that they are interested in. For example, if the CAN log is around 4 hours long and it is known that the event being looked for is in the last half of the log, the user may tell the **PVSG Dashboard** to export only the last half of the subfiles. Normally in this situation, the logs will be indexed based on the subfile number (minus one), however, if desired, the user may select the "Start the output file indexes at 0." option. This option will start the exported files names at the name provided and append the standard _L### starting at index 001.

Go To Trigger

Once a user selects a CAN log to view, the **Go To Trigger** button will appear on the **Logs/CAN log** screen of the **PVSG Dashboard**. The user can navigate to the CAN log message that occurs on or nearest to the trigger time by selecting the **Go To Trigger** button:



Clicking the button will select and highlight the CAN log message. If there is more than one trigger for the selected CAN log, the button's text will change from "Go To Trigger" to "Go To Next Trigger".



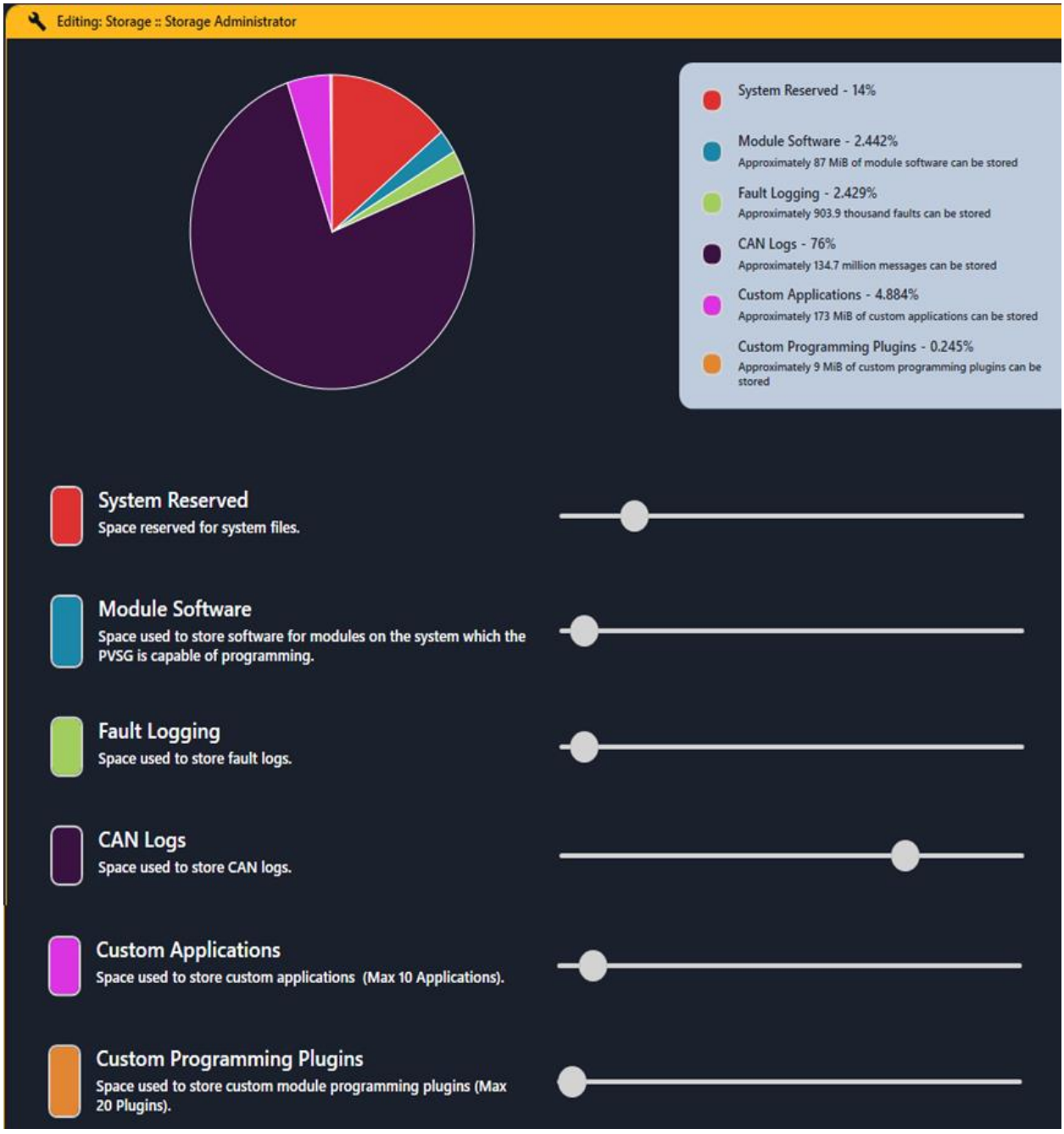
Clicking this button will continue to cycle through each of the triggers in the CAN log.

6.4.15. Custom Applications

The **Custom Application Manager** allows the user to add a custom application, built specifically to run on the PVSG. Consult document 1051G05, *Custom Logic User Guide* for more details or contact Parker for more information on custom applications.

6.4.16. Storage Administrator

The **Storage Administrator** allows the user to view how the 'data log' memory on the PVSG is used by various features. Each feature which requires storage space on the data log memory is allocated a percentage of the available space.

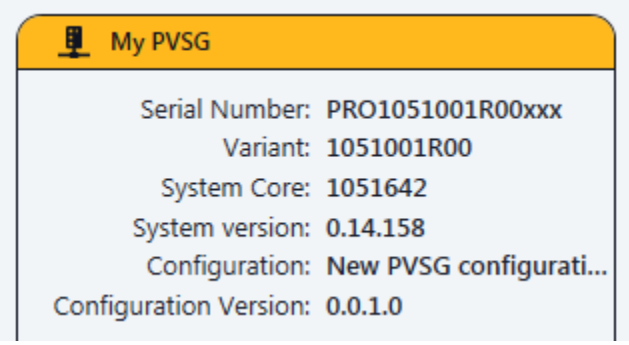


In the allocation summary, a translation of percentage storage allocation to feature specific units is given, though it should be noted that this translation is approximate.

Note that storage allocation limits are approximate and subject to a certain amount of error. The PVSG platform software will do its best to achieve the desired limits, however a certain degree of variance is expected.

6.4.17. Configuration Management

It is recommended to use the ***Version Information*** section under the **Configuration Management** menu to properly version control your configuration files. This allows both a 3-component version number to be attached to your configuration as well as a label of your choosing. It is recommended to increment the version number upon configuration changes according to your local version control scheme. The information inputted here will be shown in the PVSG dashboard window under the *Target Info* section:



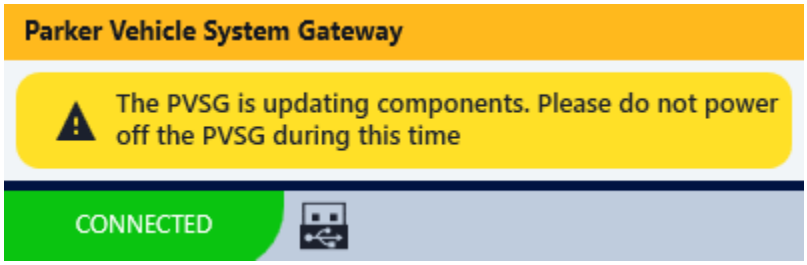
6.4.18. Exporting Configurations

A configuration report can be generated in HTML format via the **File > Export > Report** menu. Any modern web browser should be capable of viewing the report.

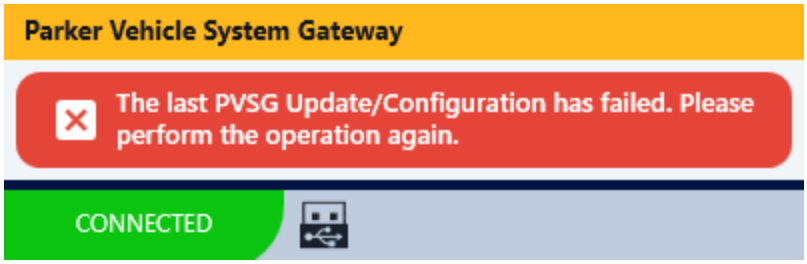
6.4.19. Transferring Configurations

The active configuration can be transferred to the target directly from the tool. With the target connected (LED status shows connected to USB, Ethernet or Wireless and dashboard reports connected), select **Target > Send Configuration** to start the process. Note that the process will require the target to be rebooted before the new configuration takes effect. In addition, after rebooting, there may be a delay until the target reports it is back online (LED status reports "Waiting" or "Connected") as it performs any necessary internal reconfiguration steps (LED status will report "Init" while reconfiguring).

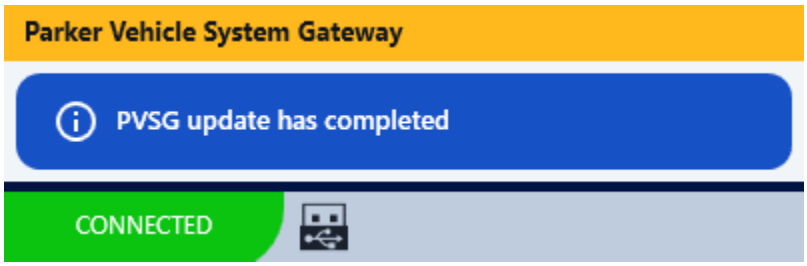
Once reconfiguration has begun, a pop up on the bottom right of the screen will appear as shown:



If the reconfiguration fails, a 2:8 error code will appear along with the following pop up:



If the reconfiguration succeeds, the following pop up will be shown:

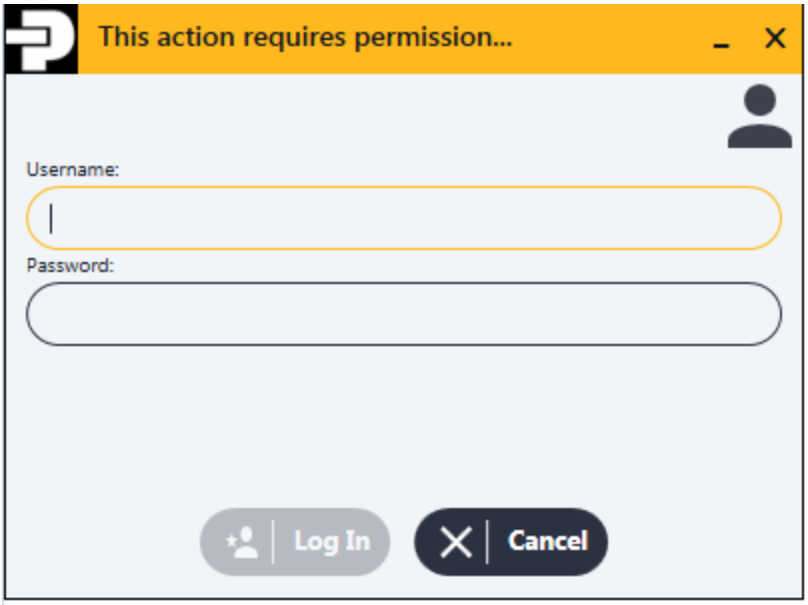


To confirm that your configuration was successful, verify that the "PVSG update has completed" pop up appears and that no new errors appear in the dashboard.

The configuration from a currently connected PVSG can be read using the **Target > Read Configuration** menu. Note if the configuration is password protected (see the "Configuration Security" section of this document for details on how to password protect a configuration), you will be prompted for this during the read procedure. Also note that if you have not reset the PVSG (either manually or via prompt from configuration tool) after transferring a configuration, the retrieved configuration is the new configuration, not the currently active configuration.

6.4.19.1. Configuration Security

If user management has been configured (see "User Account Management" section) on the configuration already installed on the PVSG, attempting to read or write the configuration will result in a request for authentication if the currently logged in user does not have permission to read/write the configuration respectively. Note that the need for user authentication is based on the configuration already installed on the PVSG, and not the configuration loaded into the configuration tool. If authentication is required, the following window will appear:



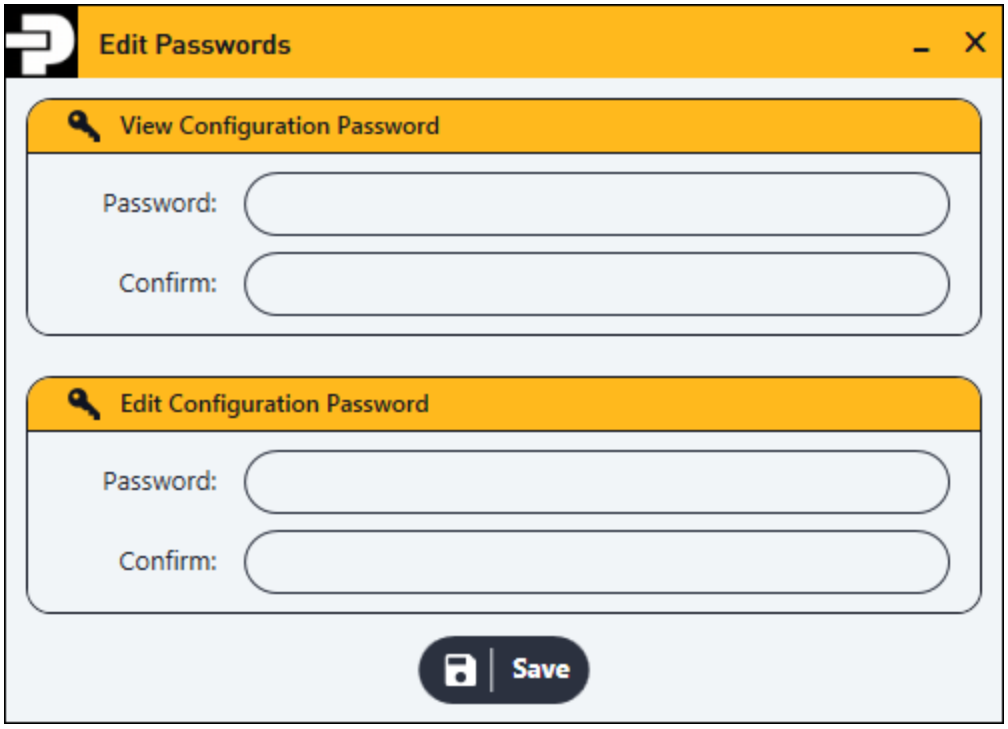
To continue, enter the username and password of a user who has permission to perform the respective operation (either read configuration or write configuration).

Configuration Overwrite

The option labelled **Force Configuration Overwrite** on the *Build Combined Target Package* window allows control over whether the configuration already installed on the target is overwritten. If selected, the combined configuration will always be deployed to the target and will overwrite any installed configuration. If not selected, the combined configuration will only be written to the target if no configuration is already present.

6.4.20. Configuration Security

A configuration can be protected with passwords to provide security. Separate passwords for 'view' and 'edit' can be set. This can be done via the **Edit > Passwords** menu.



Passwords are operated in a hierarchical manner; that is if the user has the 'edit' password, then they can of course 'view' the configuration as well. If a configuration file only has an 'edit' password is set, upon opening the configuration, cancel the login operation to view the configuration without edit abilities.

6.4.21. Tool Information

Version information for the configuration tool can be sought using the **Help > About** menu.

6.4.22. Command Line Interface

The configuration tool also provides a command line interface. Locate pvsgcfg.exe (installed as part of the installer 1051605), and run "pvsgcfg.exe -h" to get a listing of all of the available commands.

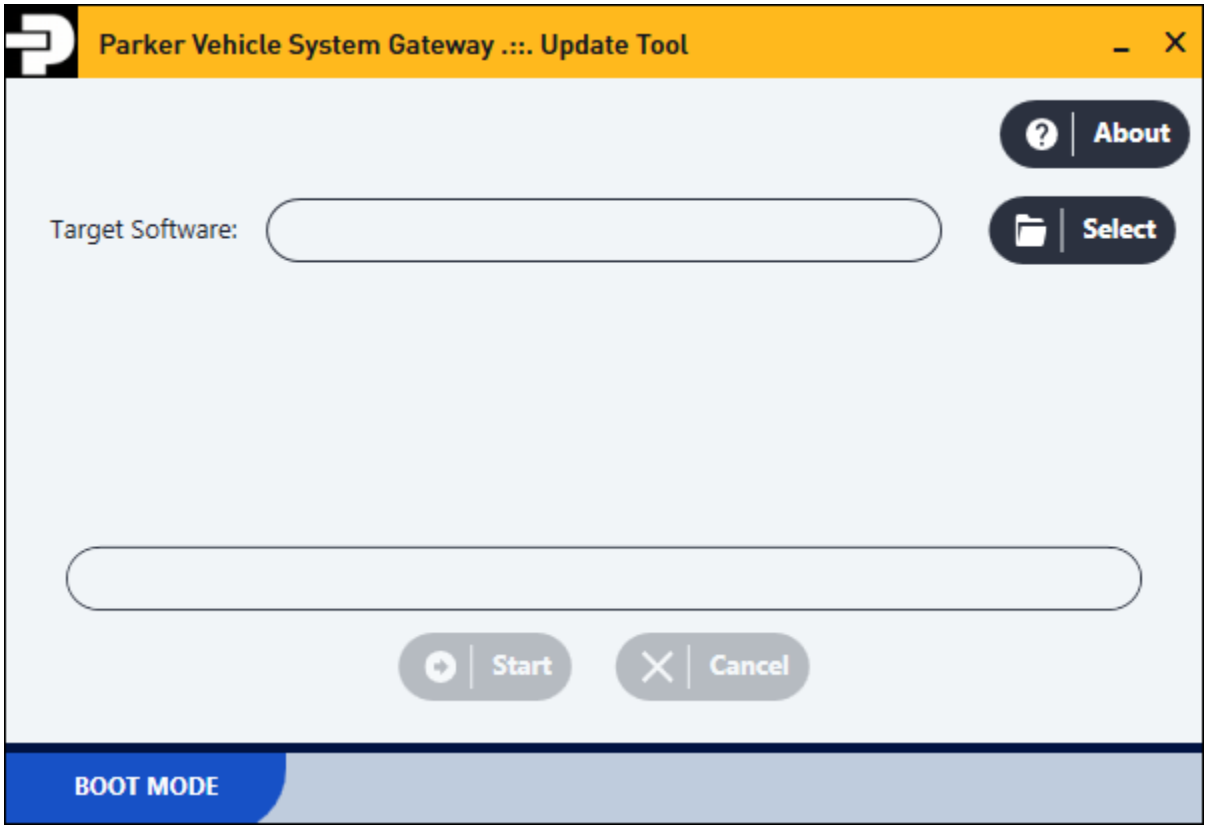
7. Recovery

In the event a PVSG is corrupted or embedded software upgrade has failed, attempt recovery via:

1. Run update tool (1051606),
2. (if previous step did not work) activate hardware recovery mechanism (see "Connector Pinout" section of this document for "Recovery" pin, active high), power cycle the PVSG to enter bootstrap mode (see Note below), and redo 1.

Note: The first time a PVSG is connected to a PC via USB with the "Recovery" pin active, Windows will initiate a USB Driver Software installation. The PVSG PC Software should not be used until the USB Driver Software installation has completed.

Note: update tool status will show BOOT MODE to indicate hardware recovery mechanism has been activated correctly:



8. Known Limitations

Component	Case	Description	Workaround
USB	PVSG-15	USB interface is not isolated. This can result in damage to the PVSG or a PC when the PC is powered off of the Mains (as opposed to powered by a battery alone). This is a known limitation that was decided upon at design time and will not be changed.	Use of a USB isolator is recommended to reduce the risk of damage to the PVSG or other equipment, when connecting to the PVSG from a USB host port on a PC connected to Mains supply.
PVSG Software	PVSG-2242	The PVSG currently utilises an internal system clock whereby the maximum encodable time is 03:14:07 19 January 2038.	It is expected that a workaround will be available in a future software update.
PVSG Software	PVSG-827	PVSG message routing operates according to a FIFO algorithm whereby messages are dispatched in the same order as they are received.	None.
PVSG Software	PVSG-3848	Serialisation error when using trying to save configuration files created with 1051605 V0.14.x.x when using 1051605 V0.15.x.x or newer.	Go to **System Modules** > **Module Management Settings** and select something from each of the drop down boxes.
PVSG Hardware	PVSG-4594	There is a known issue with wireless channel 6 where the connections can be unexpectedly dropped.	Avoid using channel 6.
PVSG Software	PVSG-7321	With J1939 management and wakeup enabled on the same CAN bus, once awake, the PVSG will not go sleep due to the periodic J1939 DM1 message sent by the PVSG keeping the CAN bus active.	Avoid using J1939 management and wakeup on the same CAN bus if wake to sleep transition is required.
PVSG Software	PVSG-6368	System and Fault log databases can become corrupt if the server is not properly shutdown before removing power from the PVSG.	Always use a wake up to initiate a server shutdown before powering off the PVSG.
PVSG as a DLA		The CM0504 cannot be reprogrammed using the PVSG as a DLA, since the CM0504 requires a special programming tool that is hard-coded to use the Vansco DLA.	Use a Vansco DLA to program the CM0504.

Component	Case	Description	Workaround
USB		The PVSG PC Software may lose connection with the PVSG while still connected to the PVSG via USB.	Remove all unnecessary USB devices from the PC. Remove and restore USB connection to PVSG and/or restart PVSG Driver Core via the PVSG Dashboard ("Restart Service") until connection is restored.
WIFI	PVSG-7741	When downloading a large CAN log file (greater than 70 subfiles) over WIFI, the download may fail.	Connect the PVSG to an existing network and ensure that "Ethernet Management Enabled" is disabled.

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