J1939 Communication Driver

Information Sheet for Crimson v3.0+

Compatible Devices

Support for J1939 PGN / SPN access and J1939 network management as defined in the J1939 standards.

General Information

A Red Lion CAN option card (G3CN, XCCN) or J1939 module (GMJ1939, CMJ1939) is mandatory to use the J1939 communications driver.

Overview

J1939 data access involves Parameter Group Numbers or PGNs. There are two types of PGNs to consider:

Global – PGNs that have a most significant byte greater than 240.

Destination Specific – PGNs that have a most significant byte of 240 or less. The least significant byte of a destination specific PGN indicates the destination device's drop number. Red Lion's J1939 driver will automatically insert the target devices ECU Drop Number in the least significant byte of the PGN number.
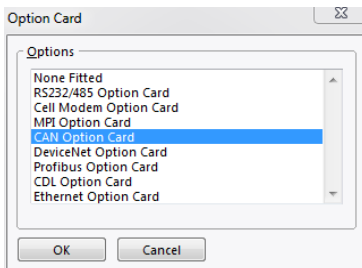
The remainder of this information sheet describes configuration and data access details.
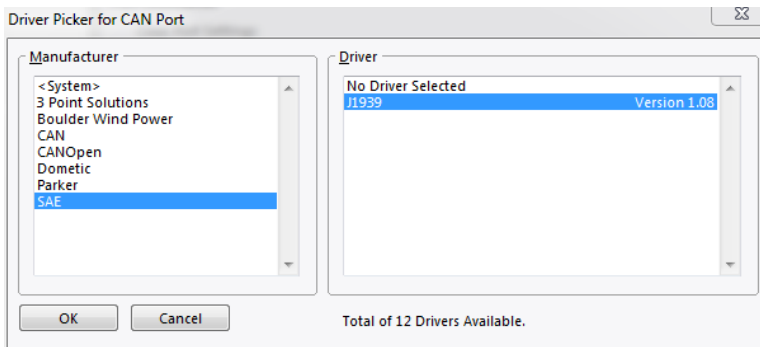
Driver Selection

When using the CAN Option Card, within the Communications category of Crimson, select the Option Card item of the Communications tree.
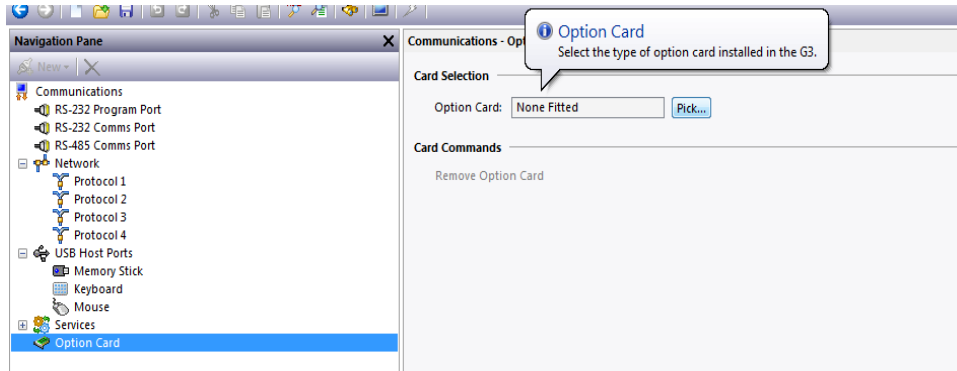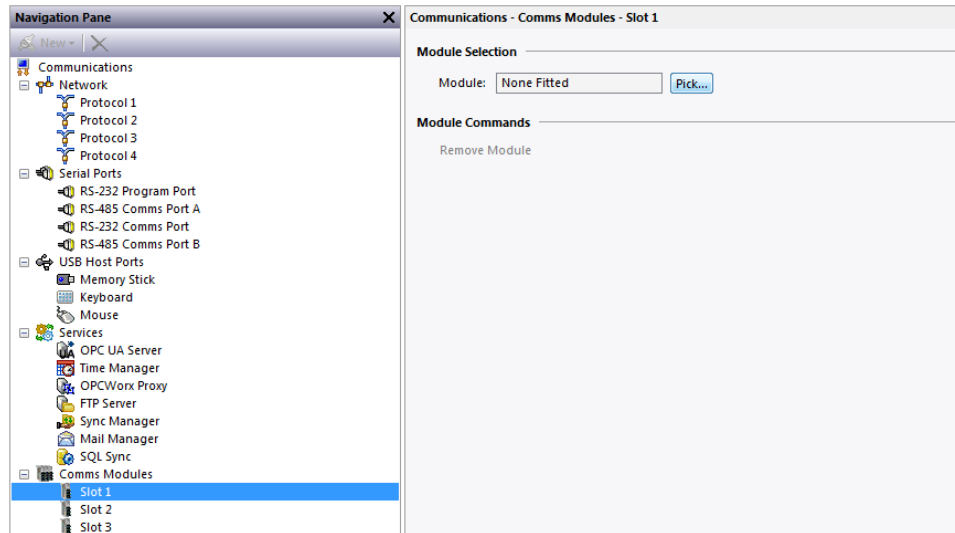

Click on the Pick... button in the Communication Options Card Selection group.

Upon selection of the CAN Option Card, use the Pick... button to configure the J1939 driver in the CAN Interface element of the tree.
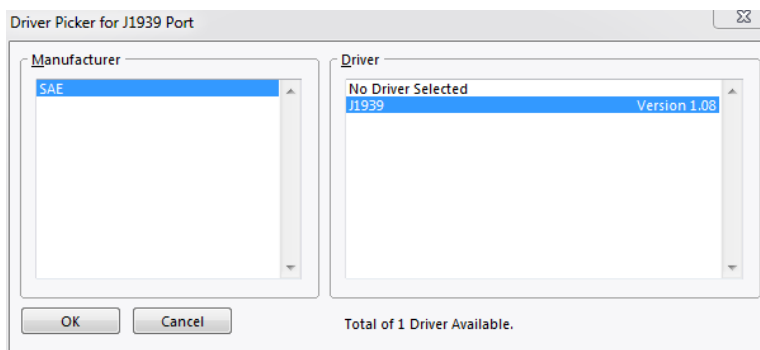
When using the J1939 Module, within the Communications category of Crimson, select a Slot within the Comms Modules item of the Communications tree.


Click on the Pick… button in the Communications Module Selection group.
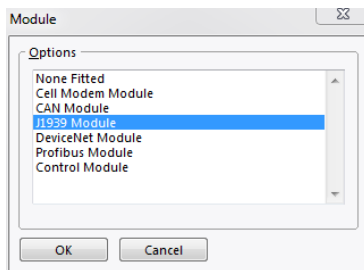
Upon selection of the J1939 Module, use the Pick… button to configure the J1939 driver in the J1939 Interface element of the tree.
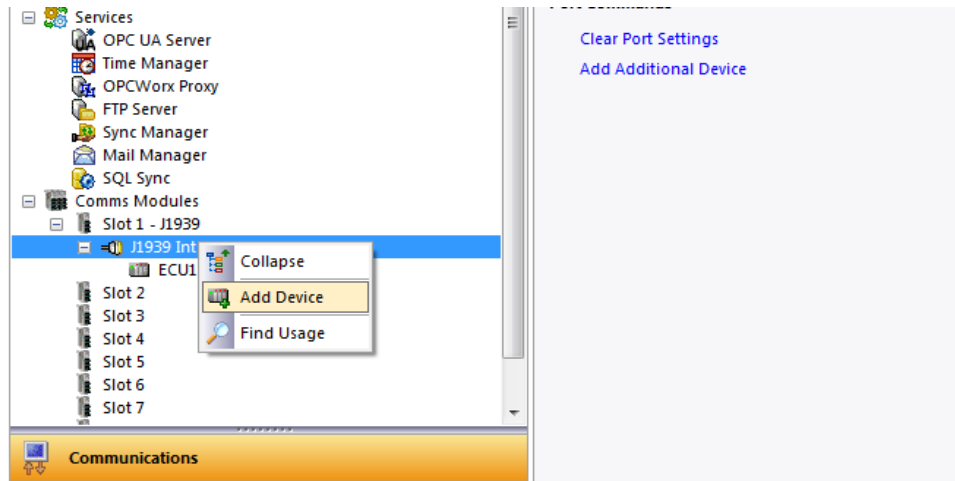
Select the J1939 Interface. In the Driver Settings group indicate the Source Address of the J1939 Red Lion device. Remember each device address on a J1939 bus must be unique.
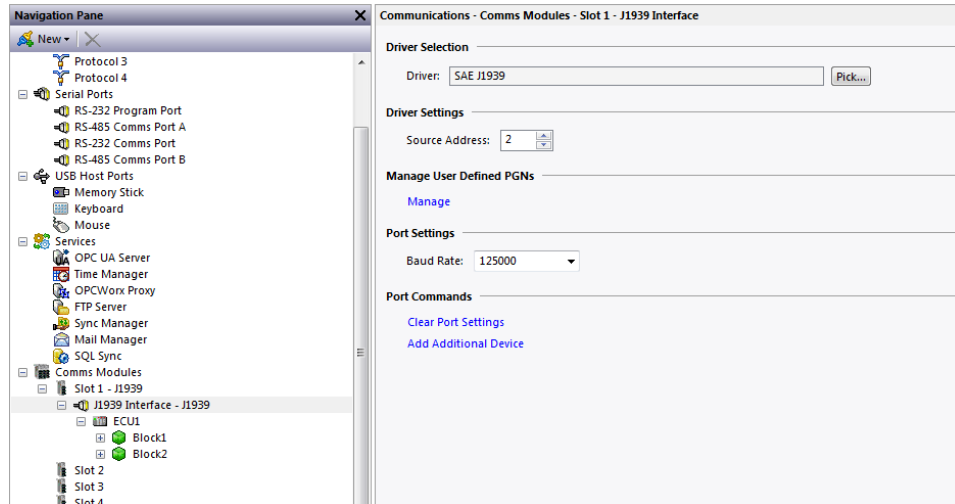

In the Port Settings group configure the baud rate of the J1939 bus.

Device Configuration

Add a device or ECU for each device that will require data transfer in the application. Right click on the J1939 Interface and select Add Device from the popup menu.

Select the ECU device. In the Device Settings group indicate the Drop Number of the J1939 target device. Remember each device address on a J1939 bus must be unique.
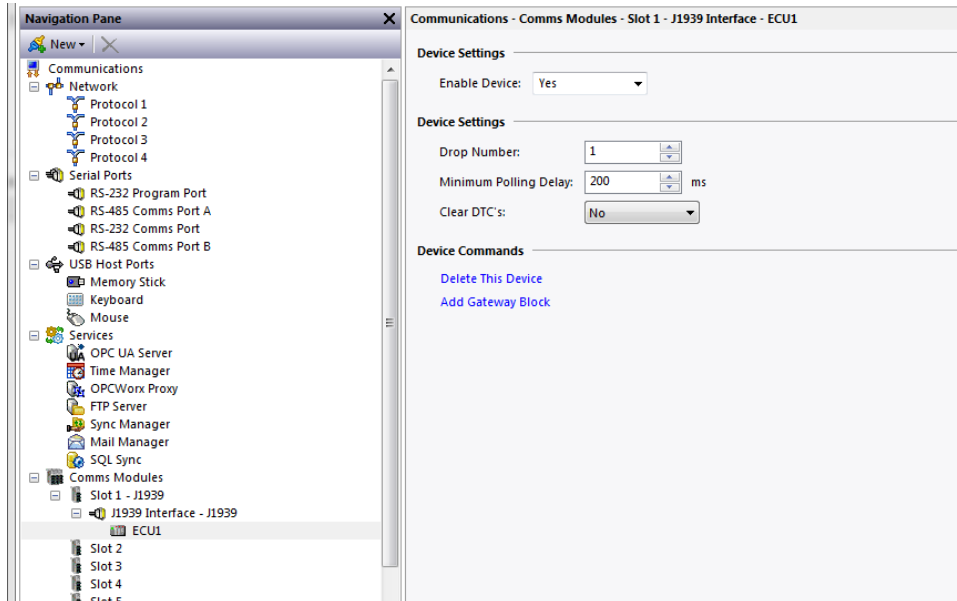
Configure the remaing device settings as required by the application.

Options are as follows:

Minimum Polling Delay – Indicate the minimum amount of time the driver should wait to send a request. This setting will only have an affect upon blocks that are set to a Direction of Device to Red Lion and have the PGN's Send Data Request enabled.

Clear DTC's – Indicate whether Diagnostic Trouble Codes should be cleared when not included in the most recent diagnostic message (PGNs 65226, 65227).
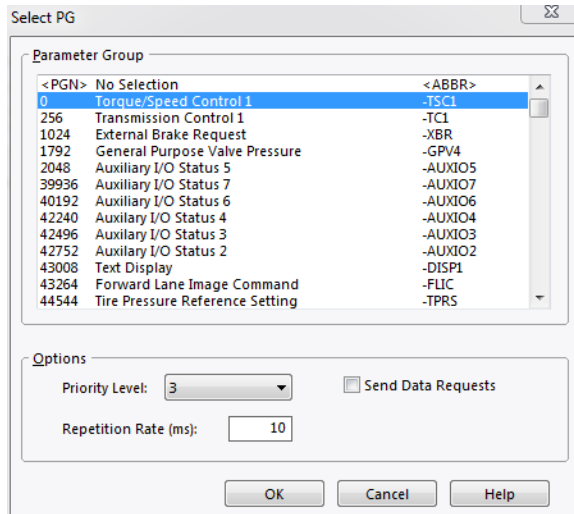
Gateway Block Configuration

Add a Gateway Block to each ECU for each PGN (Parameter Group Number) transferred to and/or from that ECU. Right click on the ECU device and select Add Block from the popup menu.
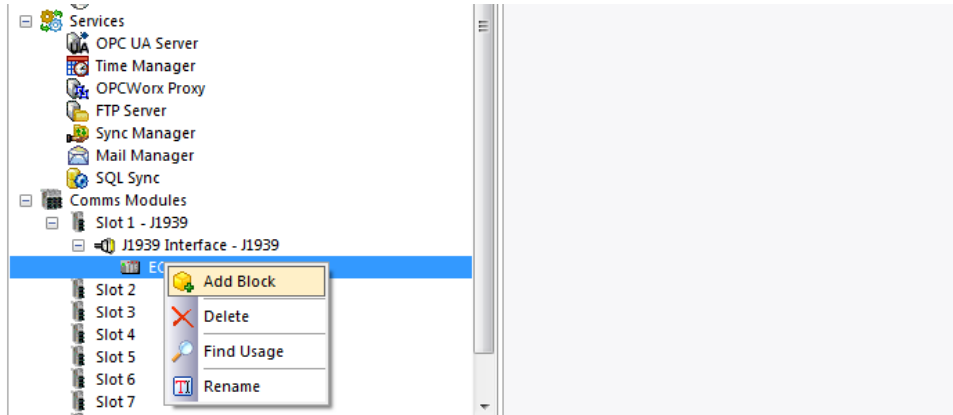
With the newly created Block element selected click on the Pick... button to activate the Select PG dialog box.
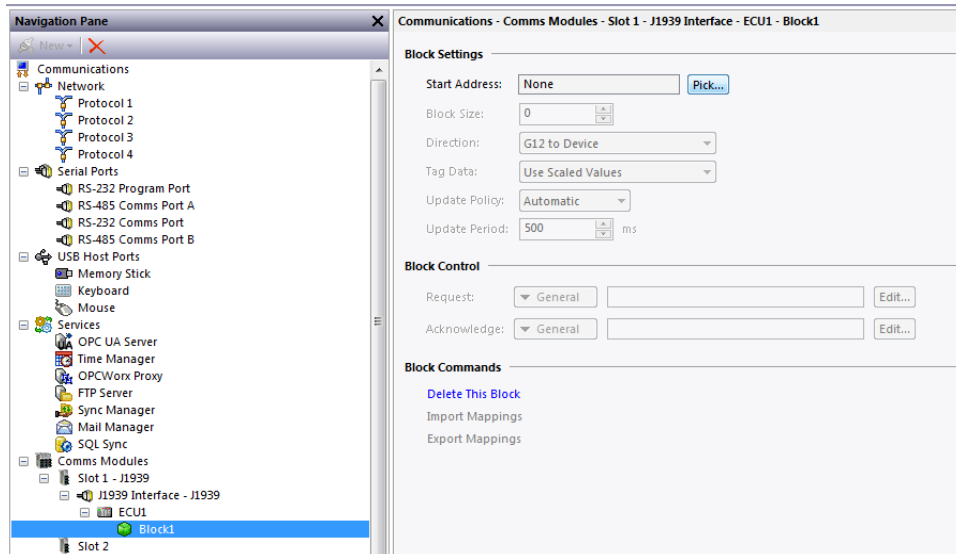
Select the desired PGN from the Parameter Group listbox. Each PGN will set the options to it's default settings. Options settings are as follows:

Priority Level – The priority for any PGN is selectable from 0 which represents the highest priority to 7 which represents the lowest priority. Priority is used to optimize message latency of bus transmissions.

Repetition Rate (ms) – The Repetition Rate in milliseconds determines how often a PGN will be transmitted on the bus. Received data associated with the PGN will timeout at a rate of 3 times the Repetition Rate. Data transmission will occur at Repetition Rate intervals and On Event. When the Repetition Rate is a value of zero data will be only transmitted On Event.

Send Data Requests – The Send Data Requests checkbox should only be checked if the target device requires a request for a PGN transmission to occur. When enabled, PGN requests are sent at an interval based upon the "Minimum Polling Delay" device option.

If different settings are needed for the application make the appropriate changes then click OK.

PGN(s) are comprised of SPN(s) (Suspect Parameter Numbers) which appear within each Gateway Block after defining the Gateway Block Size found in the Block Settings.
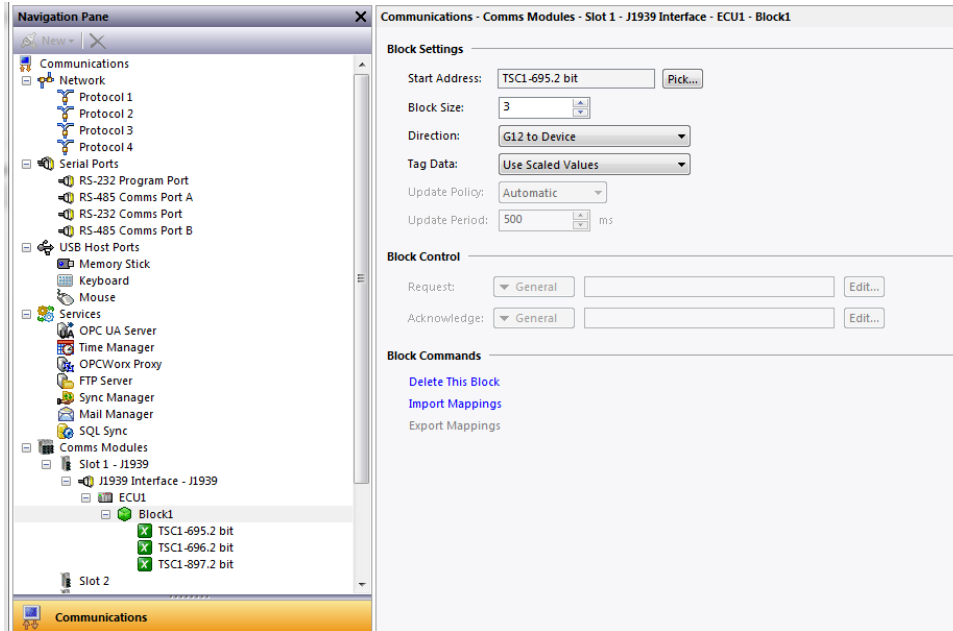
Also, set each Gateway Block to the direction desired.

SPNs are available for Tags and/or PLC data mappings as needed for the application.

Please note, all predefined PGN(s) and SPN(s) are as defined by SAE. Should you have questions regarding the definitions, please refer to SAE 1939 standards documents or contact Red Lion Technical Support.

Since the J1939 driver maintains a PGN list it is necessary to rebuild communications blocks after references have been manipulated/deleted. The Rebuild Comms Block utility can be found in the Utilities submenu of Crimson's File menu as shown below.
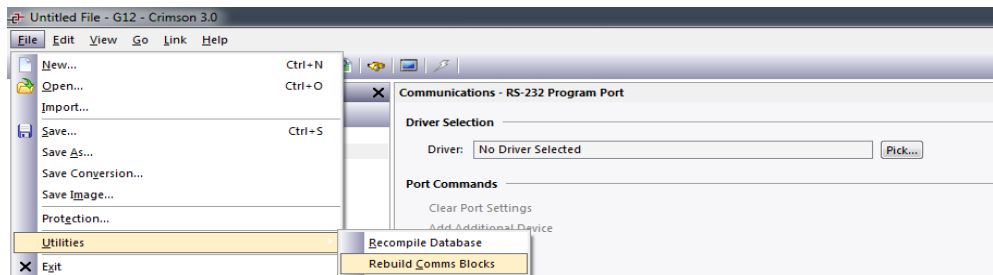
User Defined PGN Support

In the event that PGN(s) used on the J1939 network are not predefined by SAE standards, PGN(s) as well as its SPN(s) can be created and configured as needed. All PGN(s) created are added to the Parameter Group list shown in the Select PG dialog box as described previously.

To begin select the J1939 Interface – J1939 element in the communications tree then click on the Manage button in the Manage User Defined PGNs group. This will activate the Manage User Defined PGNs dialog box.
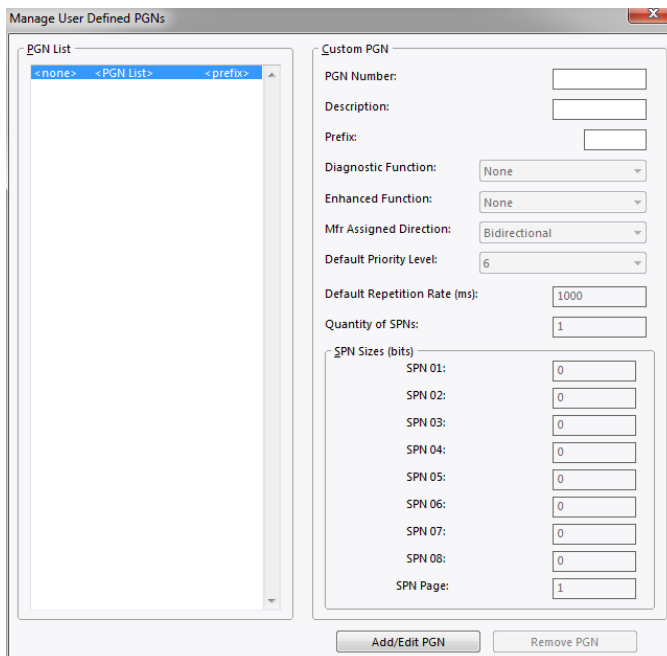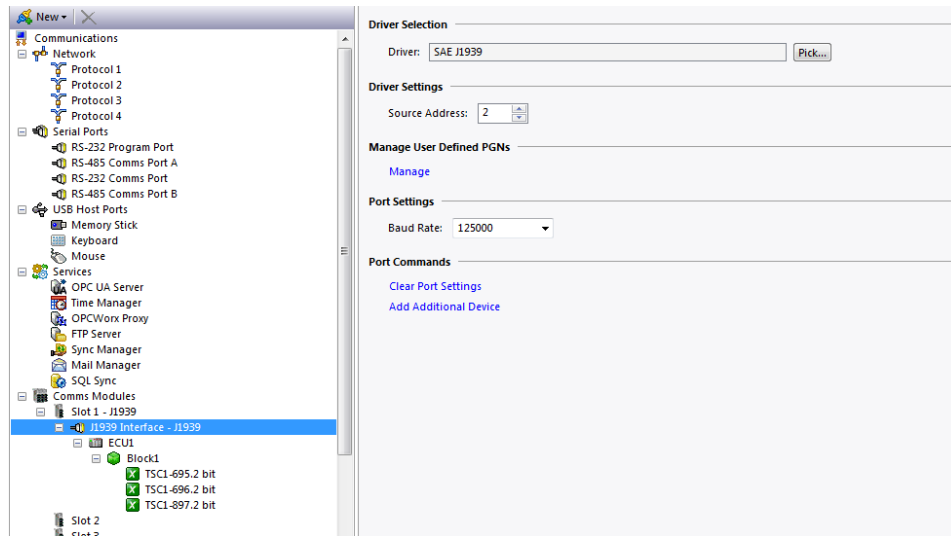
PGN configuration settings are as follows:

PGN Number – Enter the desired PGN number in decimal form. Keep in mind that the least significant byte of the PGN number for device specific PGNs should be zero as the Drop Number in the ECU device options will designate this byte during communications.

Description – Enter text to describe the PGN data. This will be used to show this PGN in the PG Select dialog box.

Prefix – Enter short text to describe the PGN. The prefix will be used in the PG Select dialog box as well as in the Gateway Block designation.

Diagnostic Function – See Diagnostic Function section below for details.

Enhanced Function – See Enhanced Function section below for details.

Mfr Assigned Direction – This selection is available in J1939 driver versions 1.09. It is used to determine data direction for Manufacturer Assigned PGNs. This selection is only available when a PGN number is entered that uses manufacturer designated data (PGNs that have a most significant byte of 0xEF or 0xFF, or PGN 65229 (DM4)). Either Bidirectional or Transmit/Receive PGNs are allowed. Bidirectional PGN's cannot coexist with Transmit or Receive PGNs.

Default Priority Level – The priority for any PGN is selectable from 0 which represents the highest priority to 7 which represents the lowest priority. Priority is used to optimize message latency for bus transmissions. This is the default value only, each ECU configuration can hold its own values for this parameter.

Default Repetition Rate (ms) – The Repetition Rate in milliseconds determines how often a PGN will be transmitted on the bus. Received data associated with the PGN will timeout at a rate of 3 times the Repetition Rate. Data transmission will occur at Repetition Rate intervals and On Event. When the Repetition Rate is a value of zero, data will be only transmitted On Event. This is the default value only, each ECU configuration can hold its own values for this parameter.

Quantity of SPNs – Enter the number of SPNs contained in this PGN. This will enable the appropriate fields to be enabled for SPN configuration.

SPN Configuration

Enter the size in bits of each SPN in consecutive order in the SPN xx fields enabled with the Quantity of SPNs designation.

Consider the example below:

With 10 SPNs SPN Page 2 will need to be accessed.

After entering the remaining SPN sizes click on the Add/Edit PGN button.
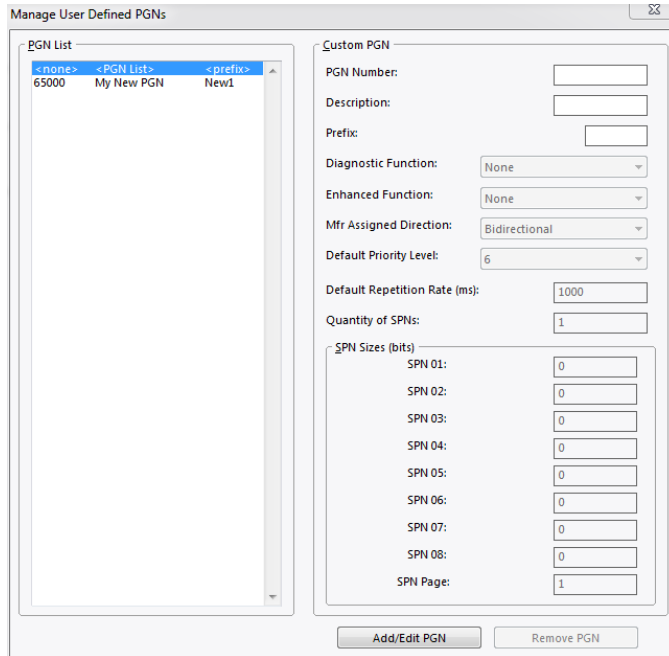
Close the Manage User Defined PGNs dialog by clicking on the red X in the upper right corner.

Right click on the ECU device and select Add Block from the popup menu. From the Block Settings group click on the Pick... button then find the newly added PGN and click OK.
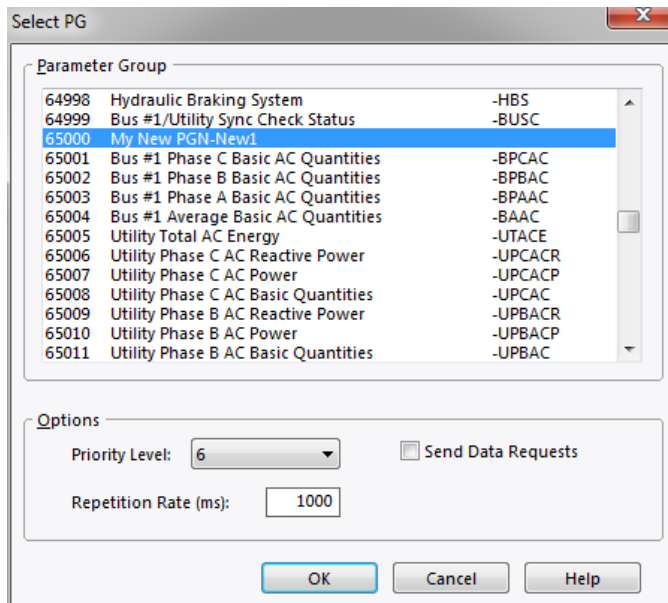
The user defined PGN is available for mapping to Tags and/or PLC data.

Diagnostic Function

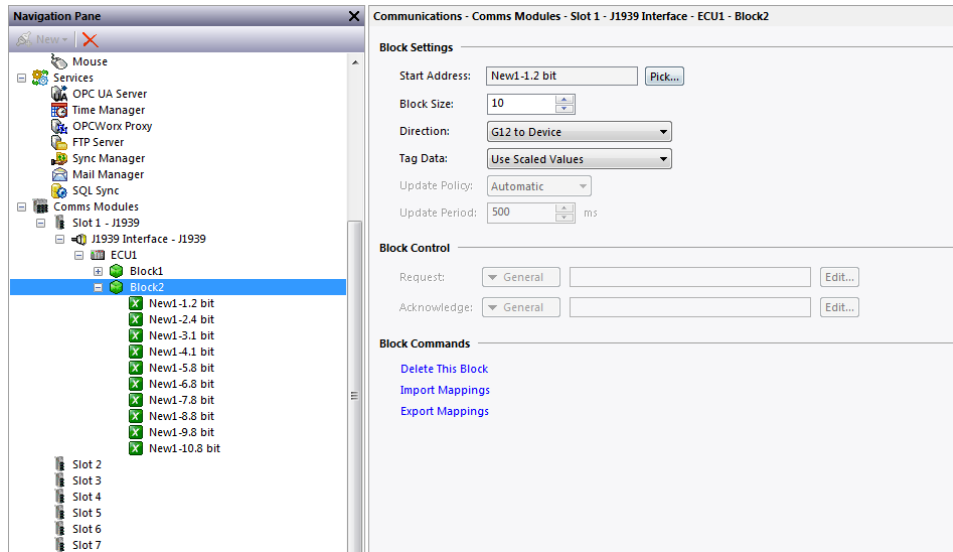Diagnostic functionality has been provided within the User Defined PGN area in J1939 driver versions 1.05+. After a User Defined PGN has been created, a Diagnostic Function drop down list is provided. Each Gateway Block that uses this PGN should be set to a direction of Device to Red Lion unless this PGN is to be sent to another device for informational purposes. **NOTE:** Diagnostic functions have been provided as a useful tool to interrogate the J1939 bus during database construction and should not be used for any other purpose.

Functions Supported:

Report Network Nodes - This function will report all active nodes on the J1939 network. Values are initialized to 0 and re-initialized to 255 (since a node can be an address of 0) after J1939 bus communications have been established.

Report Network PGNs (Crimson 3.0+) - This function will report all PGNs and their source node on the J1939 network. Each SPN under this function should be set to a size of 32 bits. When viewed in 8 digit hexadecimal format each SPN value is defined as PPPPPPSS where P is the PGN number and S is the source node. SPN values are initialized to a value of 0xFFFFFFFF.

Enhanced Function

Enhanced functionality has been provided within the User Defined PGN area in J1939 driver versions 1.08+. After a User Defined PGN has been created, an Enhanced Function drop down list is provided.

Functions Supported:

Rapid Fire Message - Only use Rapid Fire Message enhancement when receiving PGN's that send multiple packet data within the same 8 byte frame overwriting the previous data. The first byte of each transaction will be considered a sequence number and will not be transferred as data. Set the repetition rate to the minimum interval that this PGN will be received to ensure proper 'end of burst' detection.

Revision History

03/26/08 – v1.01+ - Added PGN Repetition Rate (See Gateway Block Configuration)
06/03/08 – v1.03+ - Added User Defined PGN support (See User Defined PGN Support)
11/24/08 – v1.05+ - Added Diagnostic Function support (See Diagnostic Function)
12/23/10 – v1.07+ - Added Diagnostic Function – Report Network PGNs
03/13/12 – v1.08+ - Added Enhanced Function – Rapid Fire Message
05/20/16 – Added Diagnostic Function note, updated Report Network Nodes description.
08/30/18 – Updated to new Crimson 3.0+ information sheet format.

Cable Information