OCTANE
Quick-Start
Guide

Instruction on Using the OCTANE
Open Car Testbed and Network Experiments

April, 2014

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1 Getting Started

Octane is an automobile network packet analyzer. It lets you examine network traffic flowing into and out of the car. It can be used to facilitate the analysis, understanding and testing of automotive cyber-physical systems. Octane enables researchers and students to rapidly begin to explore automotive cyber-physical systems by providing a platform for reverse-engineering and testing through real-world experimentation of a lab network setup or an automobile.

Metaphorically, OCTANE can be thought of as specific goggles that let you see the information that flows within the car network.

However, OCTANE does not stop there, for since just seeing the raw data would be useful for some users it would be hard to understand a raw stream of data. That is why we try to use the features to identify the packets and add them to XML files so that it would be easily sharable within the researcher's and user community.

OCTANE is developed as open source software. This means that newer versions will be based on community efforts, and the source code is freely available. However, it is licensed under the GNU General Public License, (http://www.gnu.org/licenses/gpl.html) (GPL3) version 3 or later. This license gives you the right to use the software for free. However, you may NOT sell the software or a derivative of it. Also, if you modify the source code, you must be willing to submit the changes back to the open source community.

1.1 Current Version

This documentation is based on OCTANE version Beta (released 2 May 2014), running on Windows XP, Vista and 7.

1.2 Installation

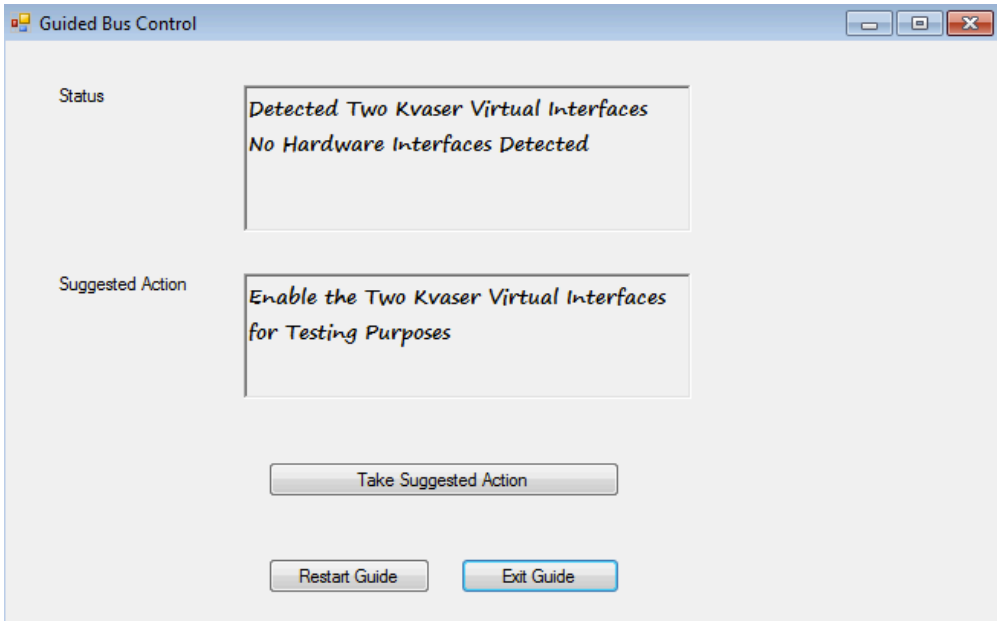
OCTANE can be downloaded directly from OCTANE website at octane.gmu.edu. The download file is an archive of an exe file and a msi file. You can use either of them at your discretion. When the file is downloaded, double click on it to start the installation process. The default installation settings should work fine. You are required to install another piece of software before you can use OCTANE. In order to use Octane without actually attaching it to the car (using virtual interface or to use Kvaser adapter, please make sure that you install Kvaser driver for windows from http://www.kvaser.com/support/downloads/ . If you are planning to use ECOM

cables, please make sure that you install ECOM drivers from https://www.cancapture.com/ecom.html - Latest Driver Installation section.)

1.3 Identify and Activate the Interfaces

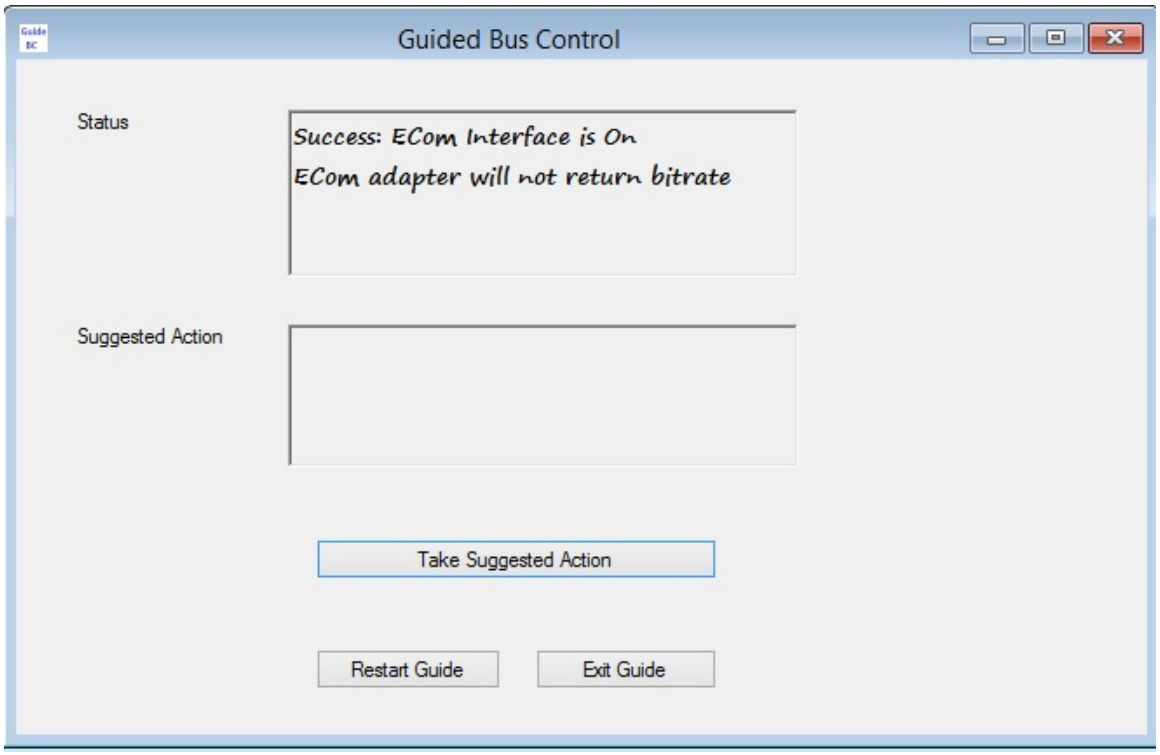
1.3.1 Virtual Interfaces

If we want to use the software when it is not connected to a car via any adapters, we can use the virtual interfaces. In order to do that once we start the software, "Guided Bus Control" window shows up and based on the status of the system (it is not connected to the car) it recognizes that it has ("Detected Two Kvaser Virtual Interfaces" and "No Hardware Interfaces Detected") and it gives you the suggestion to "Enable the Two Kvaser Virtual Interfaces for Testing Purposes". You can go with the suggestion by clicking on "Take Suggested Action" or Exit the guide. If you exit the guide, you can activate the available interfaces with the selected frequency (the default is 500K). If you connect your laptop to the car while you're running the software you can use restart guide so that the suggestion changes based on the new environment.



1.3.2 Connecting with Physical Interfaces

If you connect any of the Kvaser or ECOM adapters and start the software, it will automatically recognize the cables and waits for you to turn on the detected interfaces. You can also use the Advanced Bus Control by closing the Guided Bus Control and using that you can turn on any of the interfaces that you choose with the speed of your choice (The default speed is 500K). On a side note, you can choose the XML filter file that you want to use from the XML filter tab of the Advanced Bus Control.

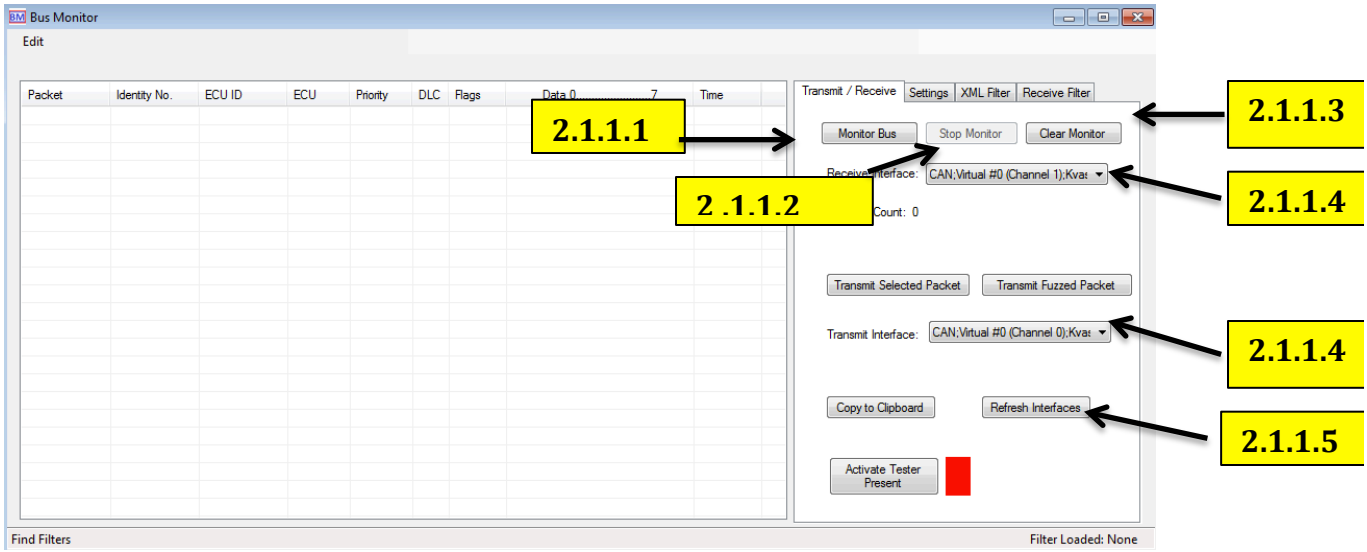


2. Using OCTANE

2.1 Capture packets

2.1.1 Bus Monitor

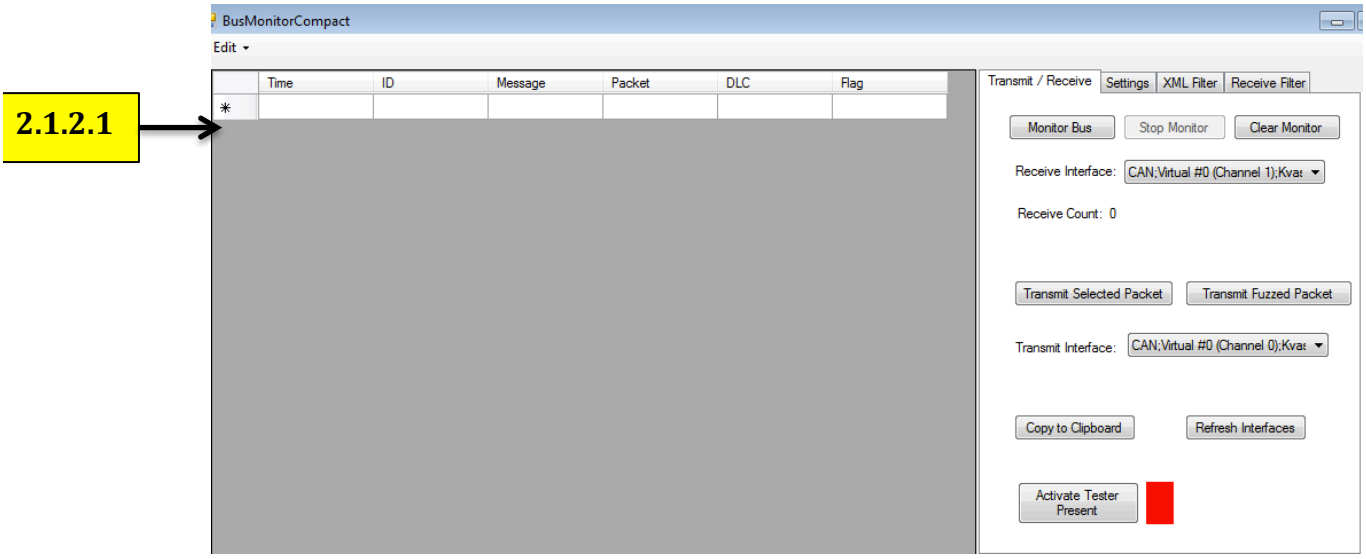
In order to capture the packets, you have to activate the sniffing feature. One way to start the Capture process can be by selecting BM from the menu and 2.1.1.1. Clicking on Monitor Bus as depicted in the picture.



2.1.1.2. It can be stopped by stop monitor button.
2.1.1.3. Clear Interface will clear all the packets that are received or sent from the monitor bus.
2.1.1.4. The receiving and transmitting interfaces are chosen on this window too.
2.1.1.5. The Interfaces are refreshed by clicking Refresh Interfaces.
We get back to other parts of monitor bus when we study transmit packets.

2.1.2 Compact Bus Monitor

This interface looks similar to Bus Monitor with one exception; the packets show one instance of a packet with a specific ID. In this way it would be easier for the user to keep track of the changes in messages of a certain ID. This will be extremely useful in understanding/reverse-engineering the meaning of packets. It will become clearer once we get to the transmitting packet chapter.

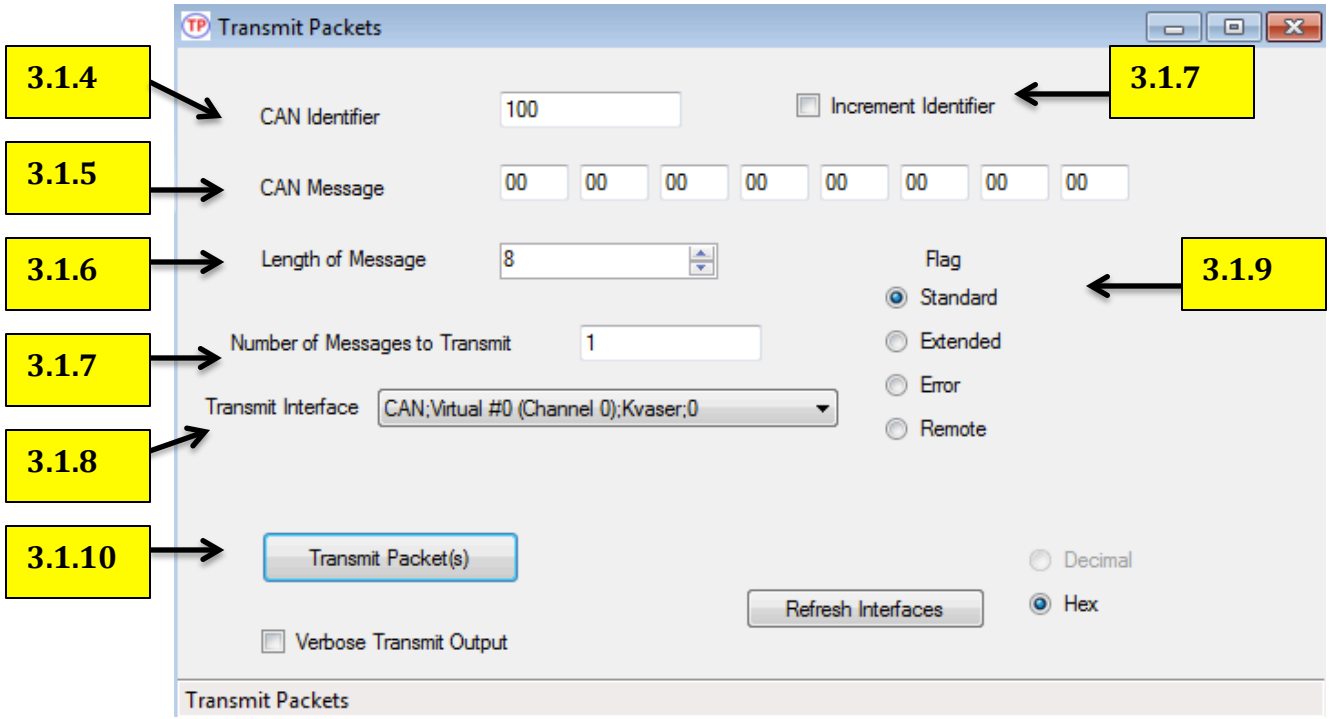


2.1.2.1 If the software is connected to the car, as soon as the Monitor Bus button is clicked in either cases of Monitor Bus, the packets show up in the monitor bus table.

3. Transmit Packets

3.1 Transmit Packets using Transmit Packet Interface

In order to transmit packets over the car CAN network or over the virtual interfaces, we can easily use the Transmit Packets interface.



3.1.1 Turn on the Bus Monitor of your choice refer to 2.1.1 and 2.1.2.

3.1.2 Click on TP or click on view → Transmit Packets.

3.1.3 Fill out the transmit packet form based on the information below:

3.1.4 CAN ID is a three digit hex value (it accepts digits from 0-F)

3.1.5 CAN Message also accepts hex values only

3.1.6 The length of the message can be determined in cases that the length is less than 8.

3.1.7 Number of Messages to transmit, determines how many instance of the message you want to send. If the Increment Identifier is selected, the Number of Message to Transit shows the number of ID increments that is transited. For instance if we choose ID 100, we check increment identifier and choose 3 as the Number of Messages to Transmit, the system will transmit the same message with IDs 100,101,102.

3.1.8 Transmit Interface depicts the interface used to send the message over

3.1.9 Flag, there are different types of CAN packets, here you can send the different kinds of packets with their associated flags.

3.1.10 Transmit will send the packets over

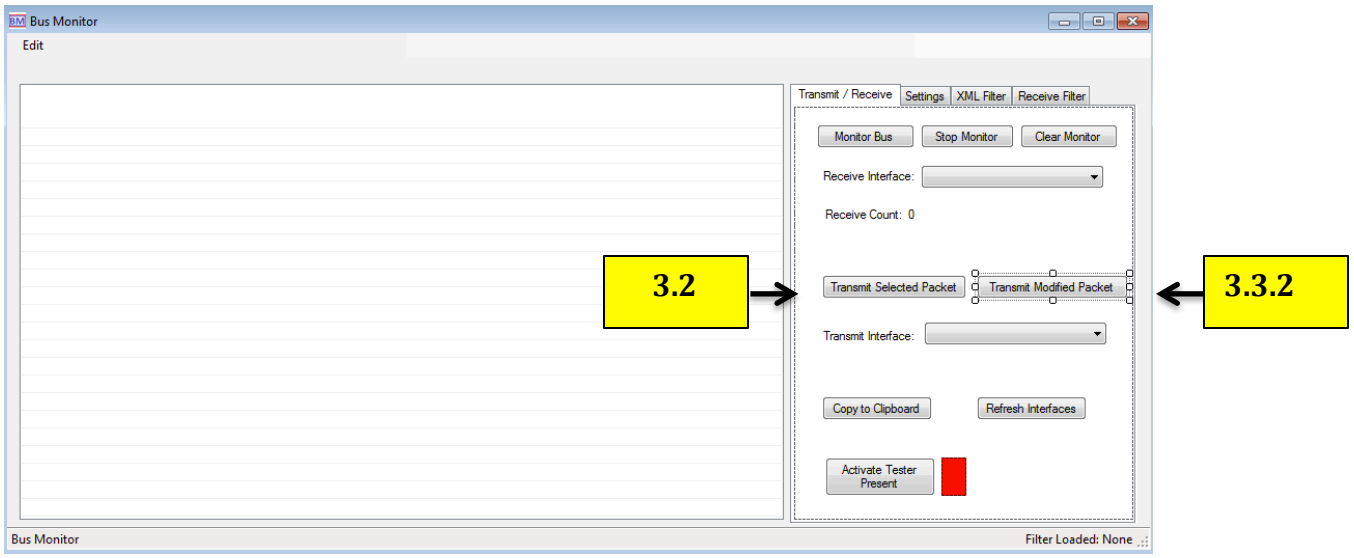
3.2 Transmit Selected Packet

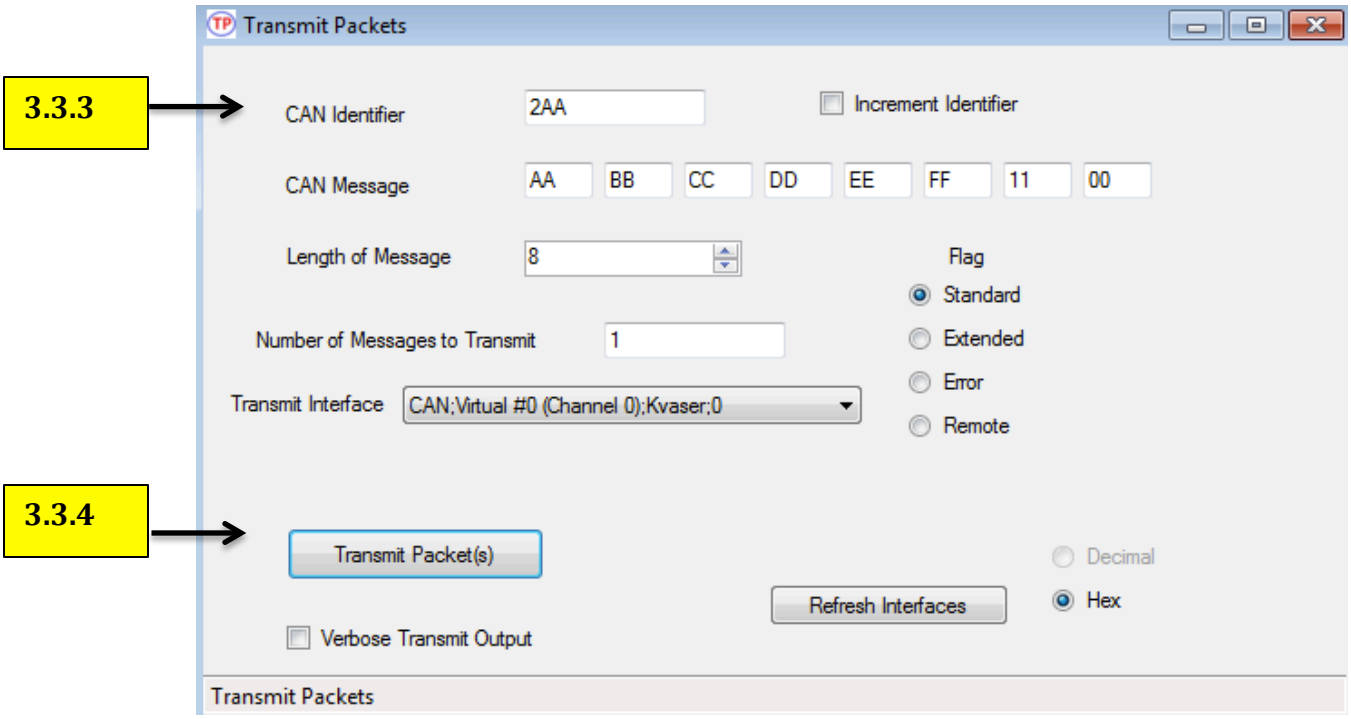
You can select any packets from either of the Monitor Buses and send the exact packet again using Transmit Selected Packet button. This is useful in finding the effect of a specific packet. For instance, a packet may result in the ceiling lights to be turned on.

3.3 Transmit Modified Packet

In order to send packets that are slightly different from a received packet, we can

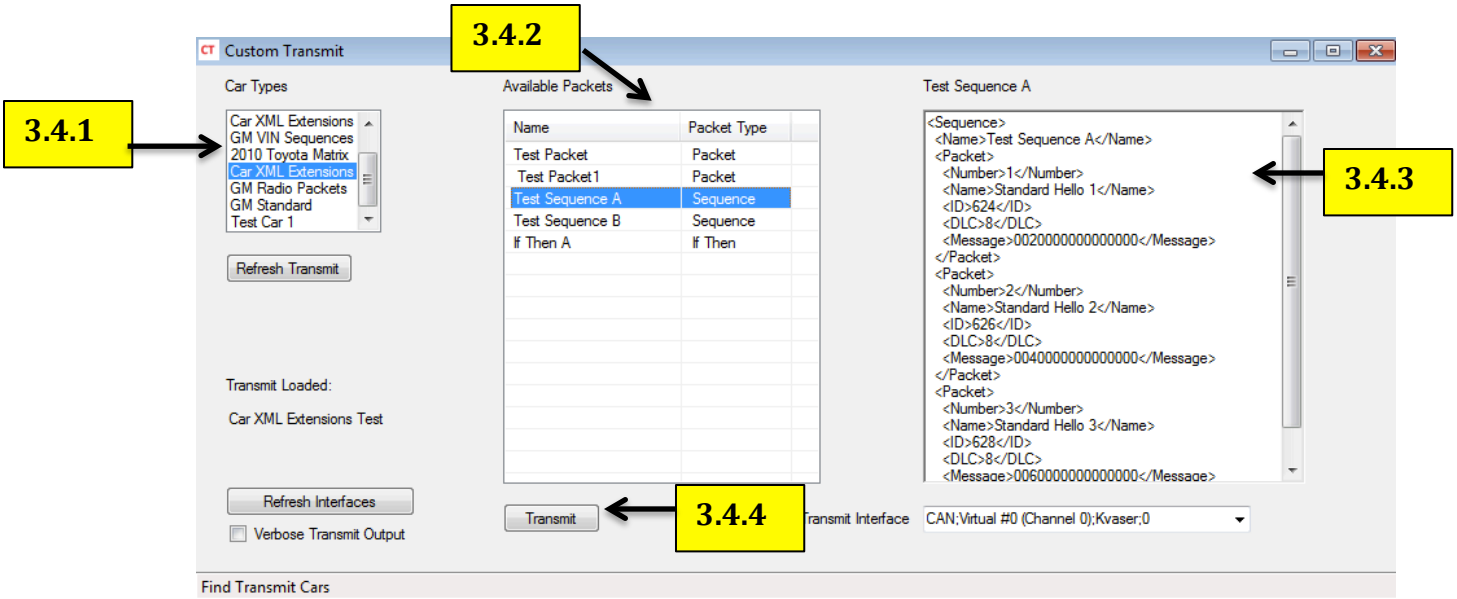
3.3.1 Select the desired packet.
3.3.2 Click on Transmit modified Packet. Once we do that, the transmit packet window is going to pop up with the packet values in it.
3.3.3 Modify the parts that you want.
3.3.4 Click on Transmit Packets.





3.4 Custom Transmit

Custom Transmit is used to send a packet or a sequence of packets or send a packet only if a situation is satisfied, these are identified or defined in an XML file or configurations file that can be share among users.



In order to transmit custom packets, we have to

3.4.1 Choose the desired car type

3.4.2 Select from the packets identified for that car type
3.4.3 You can see the content of the packets
3.4.4 Transmit the packets.

The packets that can be sent can be categorized into several types, the kind that consists of a sequence of packets, the kind that send one packet every couple of seconds, and finally the packets that require the first packet to happen before the rest of the packets can be transmitted.

3.5 Activate Tester Present

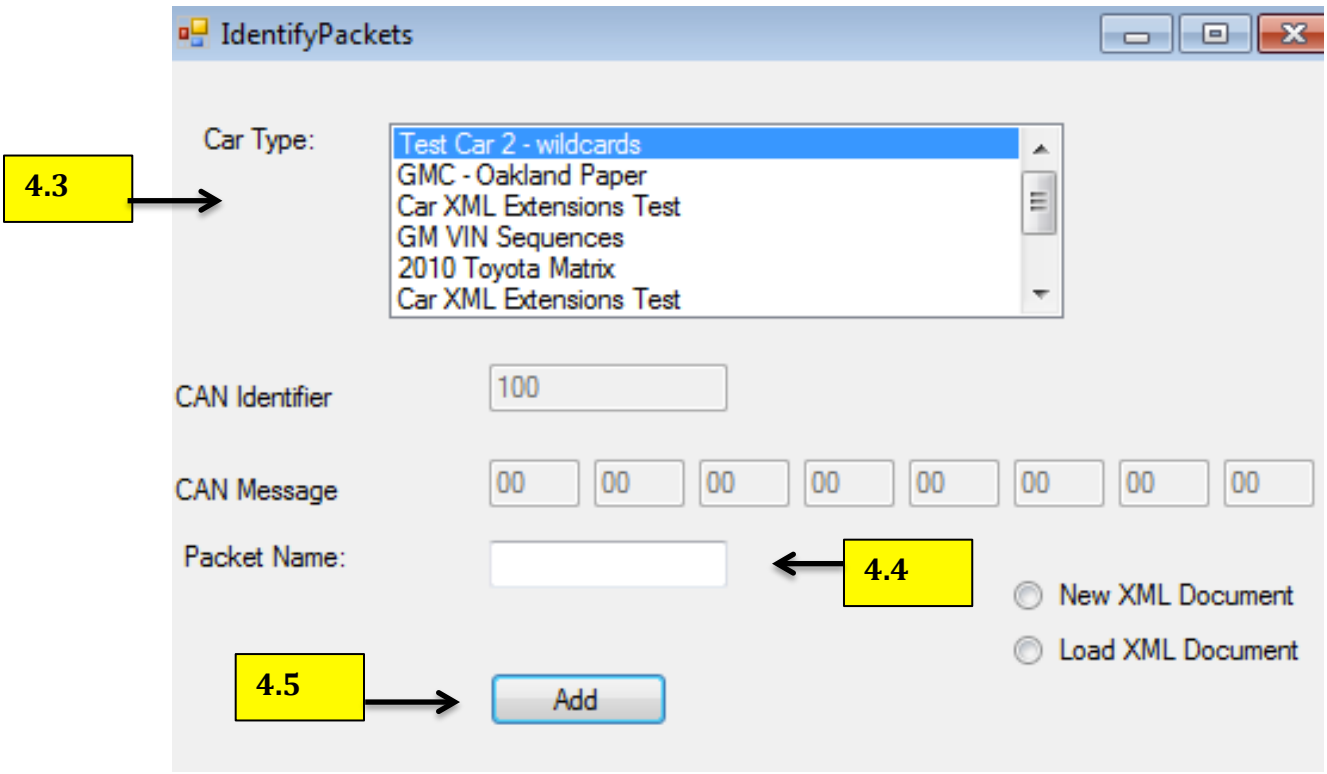
Tester present works as the heartbeat of the diagnostic tool. It lets the controller know that there is a tester present. This is the way that some services use to keep the controller in a diagnostic state. Since timeout for tester present is 3 seconds, tester present should be sent every 1 to 2.5 seconds so that the ECUs listen to OBD commands. Clicking on Tester Present button on Monitor Bus or Compact Monitor Bus activates tester present. When it is activated the box next to the button is green and when it is deactivated it is red. The tester present message can be set on the setting tab of Monitor Bus or Compact Monitor Bus.

4. Identify Packets

One of the important tasks in studying automotive network is trying to identify the packets, since each manufacturer has their own protocol that is based on their model and year; it is a demanding task to try to reverse engineer the whole protocol. Therefore, using the identify packets users can collaboratively identify the packets and share this with their fellow users. Here is how it works.

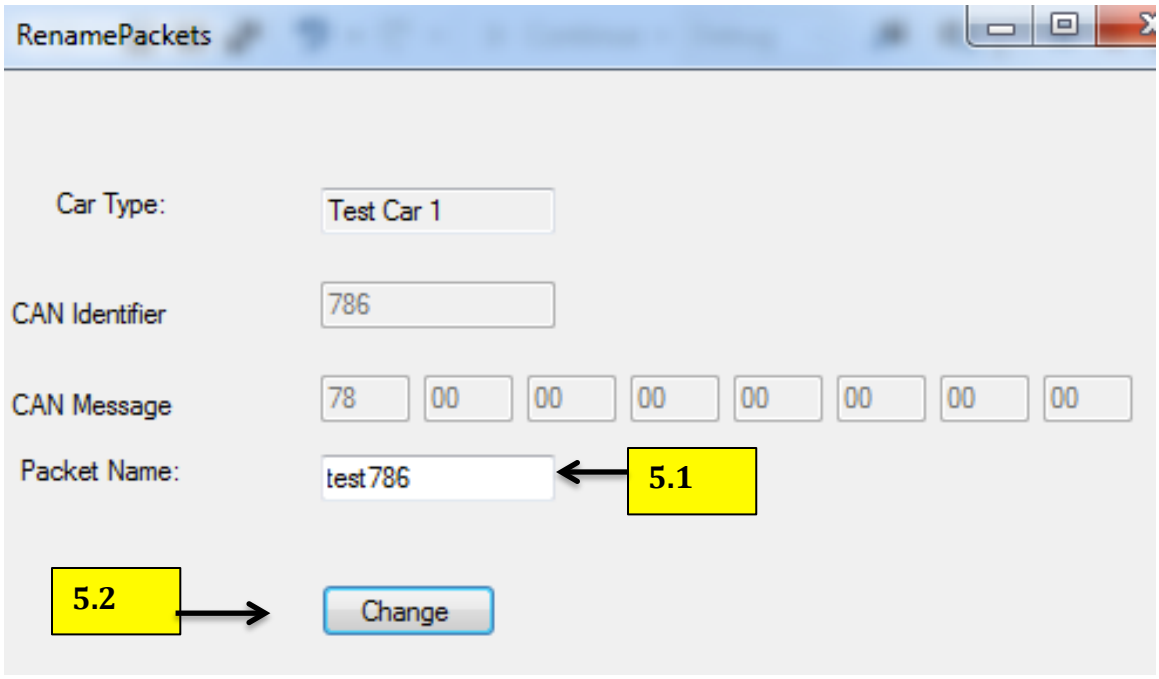
4.1 You have to choose a packet from either of the monitor buses
4.2 Click on edit →Identify Packet or CTRL+P to bring up the Identify Packet window
4.3 Choose the Car Type that you want to add the packet to
4.4 Give it a Name
4.5 Add

This will add the packet to the existing configuration file that is selected from Advanced Bus Monitor → XML Filter
However, if you want to choose a new XML file, you just need to choose the radio button next to New XML Document. If you want to choose a different configuration document, you can do so easily from Load XML Document and select the desired document. If the packet is named in the chosen configuration file, it will inform you and ask you if you want to rename it.



5. Rename Packet

If you named a packet by mistake or you realize there is a better name for a packet and you wanted to change it later on, you can do this by selecting the packet and click on Edit→Rename Packets or CTRL+R to do so. It will open up the Rename Packets window



5.1 You can change the name of the packet
5.2 Click Change to make it effective.

6. Log to File

Sometimes you may need to keep the captured packets for your reference in a file; this is possible by choosing Log to file from edit from tool bar menu. The file can be open as a text document or in a spreadsheet.

7. Copy to Clipboard and Copy All

It is possible to copy a single packet or all the packets by clicking on edit→Copy/Copy All or CTRL+C and CTRL+A or by clicking Copy to Clipboard.

8. Receive Filter and Highlight

Receive filters can be used to narrow in the focus on certain packets that is defined by the criteria. Receive filter hides any packet not meeting a specified condition, but it does not discard any information. Using Reset Filters returns the filtered packets.
Highlighting is another feature that helps in pinpointing packets with specific characteristics among the other packets. These tools will be very useful in understanding and reverse engineering of the packets.
In order to highlight or filter the packets, you should fill out the fields of your choice and choose Apply Highlight or Apply Filter, based on your requirement.