USER GUIDE

USB Data Link Adapter
(USB DLA)

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1. Introduction

The purpose of a Data Link Adapter (DLA) is implied by its name: an adapter that provides a link between two different data networks or protocols. The Vansco DLA provides the link between a PC and an automotive network. Information from the engine and transmission is converted into a format that a laptop can understand. The DLA transfers data from computer ports (USB, RS232 and wireless) to vehicle ports – J1939, J1708. This manual explains how to set up and use Vansco's USB & USB/RS232 DLA.

2. Software installation

The software for the USB DLA should be installed before plugging the DLA into your computer. (If you plug in the DLA first, Windows will try to install USB drivers. You will have to cancel this driver installation and Windows may ignore the device the next time it is plugged in.) The software installation is done in three parts:

1) Install the USB DLA Drivers.
2) Plug in the DLA and load the USB drivers.
3) Install the applications.

2.1 Installing the USB DLA drivers

You must be logged on as an administrator to install the USB DLA drivers. The latest drivers for the USB DLA are available from Vansco Electronics website: http://www.vansco.ca/. Go to the multiplexing products page and select **Software Downloads.** Extract the setup files and save them to a temporary directory using WinZip. Run the setup.exe program to launch the setup. If you are installing off of a CD the setup program should run automatically after the CD has been inserted.

The following example shows the installation on a computer running Windows 2000. (Windows NT, 98 & XP installations are similar.) Upon running "setup.exe" the following installation screen will appear, click **Next** to continue:

The next screen is a license agreement between the end user and Vansco Electronics LP. Once you have read and agreed to the license click on **I Agree**.
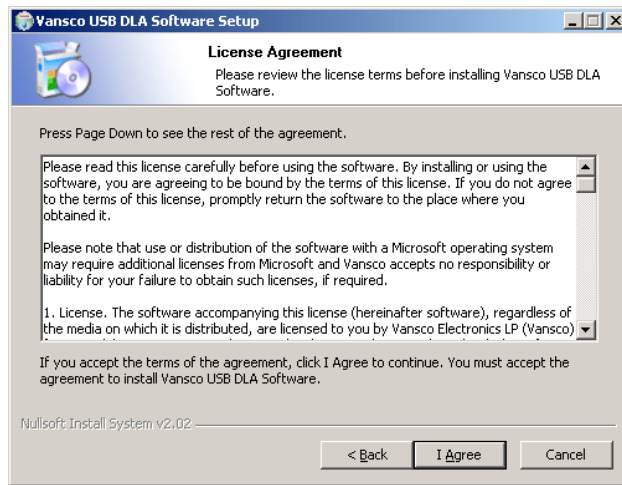
This is followed by an installation location screen. It is that the files be installed in the default location. Click **Install** to continue.
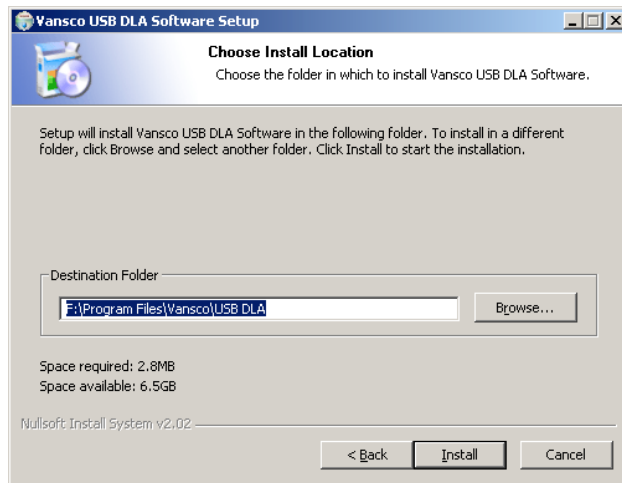
After installing the files, a final screen will indicate that the setup program is complete. Click **Close** to finish the software installation of the USB DLA.
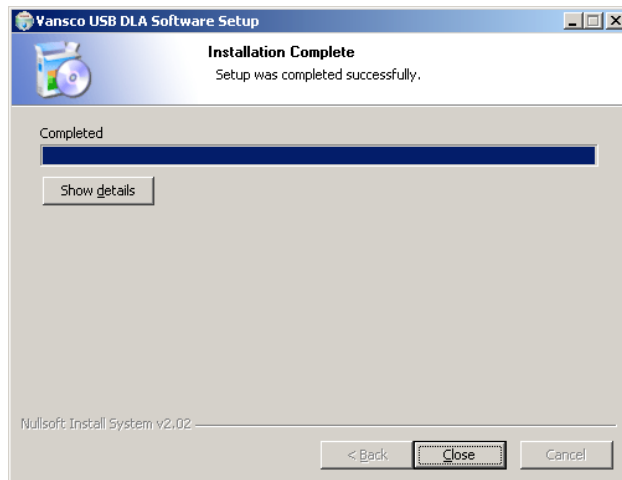
2.2 Loading the USB drivers

The first step to loading the USB drivers is plugging in the DLA and getting windows to recognize it. Connect the DLA to your computer using the USB cable provided. Plug the A-type receptacle into the back of your computer and the B-type receptacle into the DLA.

NOTE: The DLA is considered a high current device because it draws more than 100mA when operating. The unit must be plugged directly into your PC, or into a powered USB hub. It will not operate if plugged into an unpowered USB hub.

The USB DLA will be detected automatically when it is plugged into your laptop. Windows will launch the Found New Hardware Wizard in order to load the USB drivers. (Windows likes to do this every time the device appears on a new USB port. For example, if you attach the USB DLA to a new hub, Windows will want to install the driver for each port on the hub.) The USB drivers are loaded like any other USB device. The following example shows how the drivers are loaded in Windows XP. Select "Install the software automatically (Recommended)" and click **Next**.
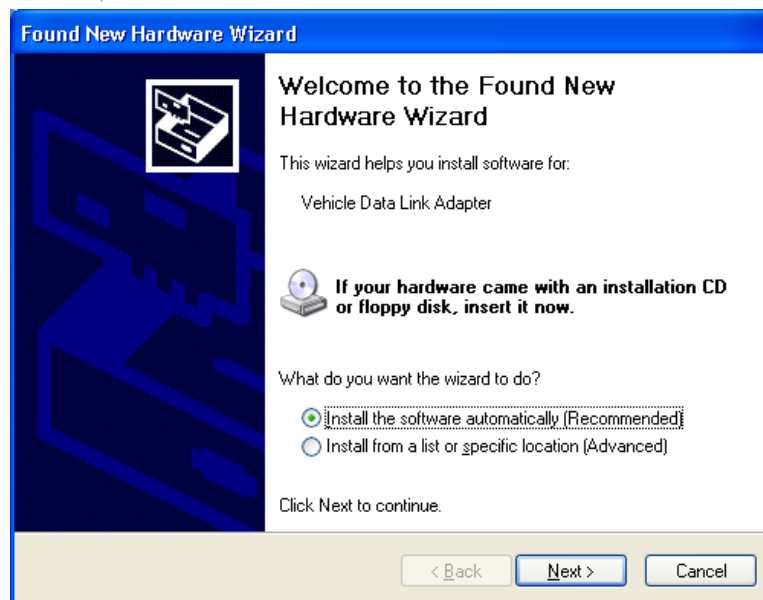
Windows will then install the USB DLA.

A final screen will indicate when the USB DLA installation is complete. Click **Finish** to close the window.

3. Using the USB DLA

3.1 Connecting the DLA to the PC USB port

Plug in the USB cable: Connect the DLA to your computer using the USB cable provided. Plug the A-type receptacle into the ba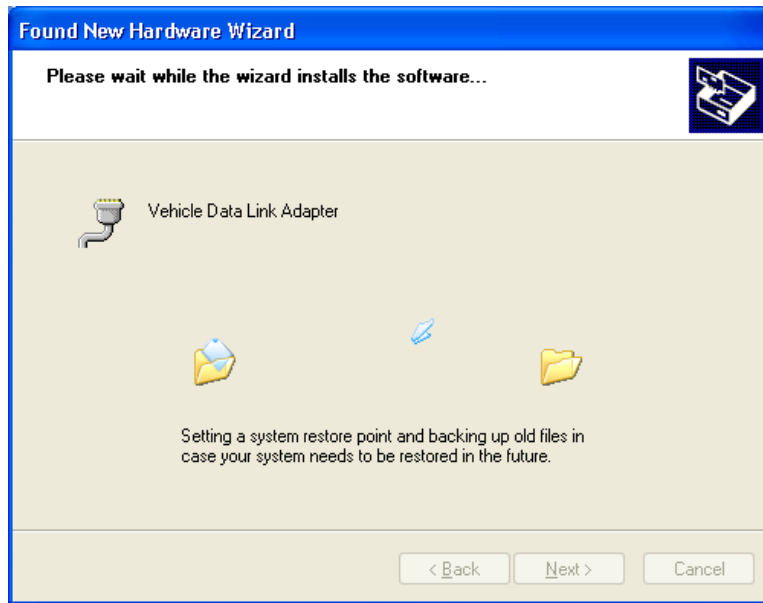ck of your computer and the B-type receptacle into the DLA. The DLA must be plugged directly into your PC, or into a powered hub. It will not operate if plugged into an unpowered hub. As soon as the D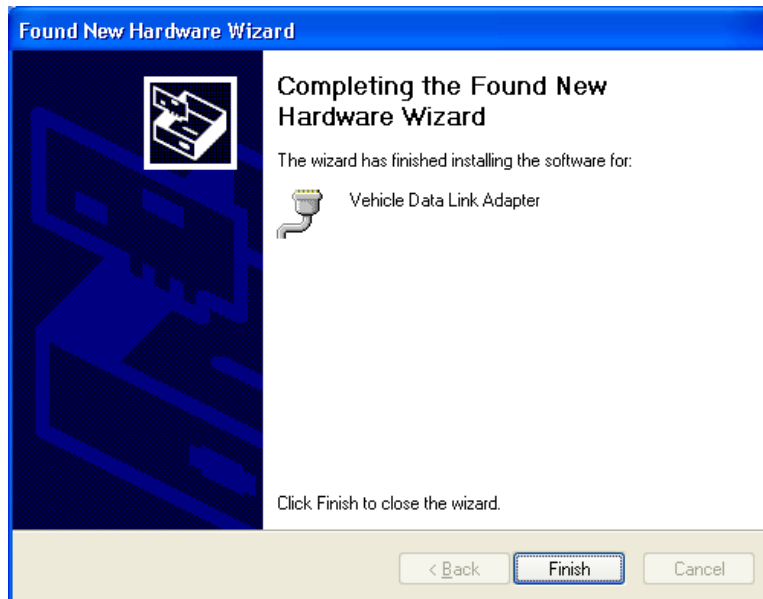LA is plugged into your PC, it will be recognized as a Vansco USB DLA and Windows will load the USB driver. You should hear a Windows alert every time the DLA is connected or disconnected.
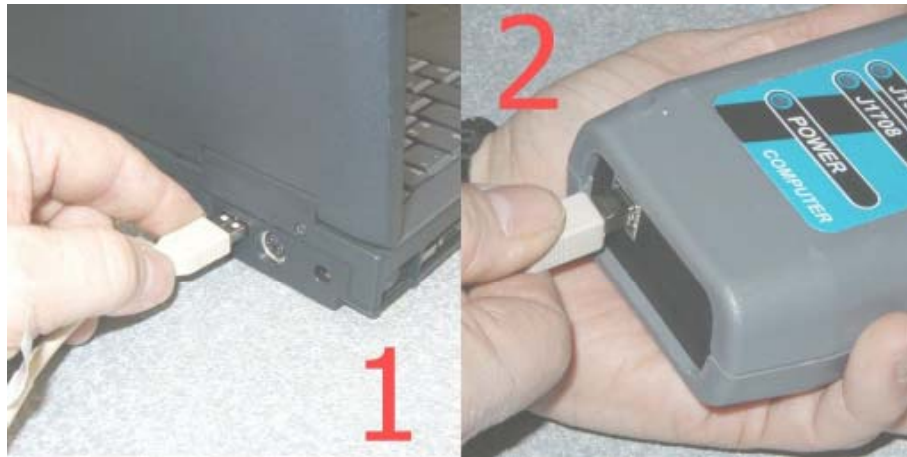
Plug in the vehicle interface cable: Connect the DLA to the vehicle using the vehicle interface cable provided. This cable is typically a DB-15 connected to a 9-pin Deutsch. Note that the vehicle connector may change depending on the preference of the vehicle manufacturer.

3.2 Connecting the DLA to the PC serial port

USB/RS232 DLA: The USB DLA is also available with a serial port. This enables it to be used with older laptops or handheld tools (such as Pocket PCs or Palm Pilots) which do not have a USB port.   Also, in situations where the DLA will be under constant vibration or severe movement, the serial port provides a much more secure connection than the USB port. The setup of a USB/RS232 DLA for serial port use is the same as a USB DLA.

Plug in the computer interface cable: Connect the DLA to your computer using a 9-pin M-F serial cable. The cable required is an RS232 extension cable. Communication with the DLA requires only 3 wires: receive (RX), transmit (TX) and ground. There are no crossovers or loopbacks in the cable. The cable can be up to 25 feet long. Plug the female end into the back of the computer and the male end into the DLA.   The PC will not automatically detect the DLA through the serial port. You must run the software installation in order to use the USB/RS232 DLA on the serial port. If you've already used the DLA on the USB port, the software for the serial port will already be loaded.

The computer will attempt to communicate with the DLA starting at the highest possible speed of 115200bps. If communication cannot be established at this rate the computer will try slower speeds until a link can be maintained.
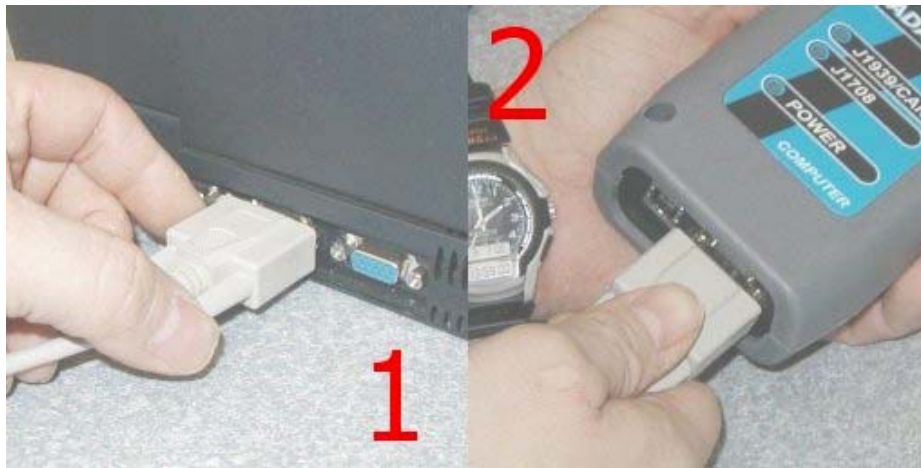
Plug in the vehicle interface cable: This is the same as plugging in the USB version. However,   the serial port on your laptop does not provide power like the USB port; power must come from the vehicle when using the serial port on the USB/RS232 DLA. The vehicle interface cable **must** be connected for the USB/RS232 DLA to work over the serial port.

3.3 Additional versions of the USB DLA

Isolated DLA: The USB DLA is also offered in an isolated version. There is no electrical connection between your laptop and the vehicle when using this version. This version is USB only and not offered with a serial port. Network transceiver power is provided by the vehicle. Therefore the isolated version requires power from both the USB port and the vehicle to operate.

Serial port only DLA: The USB DLA can also be purchased without USB. We call this the serial port only version. (Go figure!) This version is connected in the same manner as already described. The serial port only DLA must be connected to the vehicle to operate as all power comes from that side.

It is important to remember where the DLA gets its power. It can cause unexpected operation and confusion when changing between vehicles. For example: the USB port on a USB/RS232 DLA is being used on a vehicle and it seems to work just fine. It is then moved to a bench setup and used with a serial cable and doesn't seem to work. Why? The bench setup cable only has the vehicle networks wired and doesn't have power lines in it.

3.4 LED indicators

The LED indicators on the USB DLA fall into two categories: power status (1 LED) and network status (up to 3 LEDs). The USB and USB/RS232 DLAs can have up to 4 LEDs.

1) POWER (red/green) – This LED is used to indicate power and communication status. If the LED is solid green, it means that the DLA is receiving power from the USB port and that it has been enumerated. If the LED is blinking green, it indicates that it is passing data to the PC over the USB port. If the power LED is red, it indicates that it is powered from the vehicle side and does not sense a USB connection. If the LED is blinking red, it indicates that it is passing data to the PC over the serial cable.

Summary: green = USB power; red = vehicle power; blinking = passing data to PC.

2) J1708 (green) – This LED is off until the DLA has been instructed to connect to the J1708 port. Once connected, this LED flashes on when the DLA detects traffic on the J1708 input terminals, or when a J1708 message is sent from the DLA.

3) J1939/CAN (red) - This LED is off until the DLA has been instructed to connect to the J1939 port. Once connected, this LED flashes on when the DLA detects traffic on the J1939/CAN input terminals or, when a J1939/CAN message is sent from the DLA.

4) Some versions of the DLA may have three vehicle networks (e.g. J1850). An additional network status LED will be present on these versions. This LED will display the status of the third vehicle network and will operate in the same manner as the J1708 and J1939 LEDs. This LED is off until the DLA has been instructed to connect to the J1939 port by a PC application. Once connected, this LED flashes on when the DLA detects traffic on the J1939/CAN input terminals or, when a J1939/CAN message is sent from the DLA.

Note: That during heavy traffic the LEDs may not appear to be flashing simply because they are switching on and off so quickly. The LED will be off if no traffic is detected and no messages are sent.

4. Software applications

The following applications are used to support the DLA on a PC. udutool can be used to update the embedded firmware in the DLA. VAPIserver starts automatically when an RP1210 application is started and provides a link between the USB or serial hardware and the PC application. Finally, RP1210Chooser allows the use of different DLA hardware (such as Vansco's serial/parallel DLA) on the same computer.

Vansco also has a number of application tools useful for troubleshooting vehicle networks. These are applications that we have developed over the years to assist in developing products such as instrument clusters, transmission controllers and DLAs. CANsniff is a PC application that displays the amount of data on the CANline as well as actual traffic. SimEngine is a powerful PC application that can simulate engine controller messages. SimGauges creates a virtual J1939 instrument cluster on a PC for a graphical display of data received by a DLA. Note that these applications started as engineering tools and, as a result, are not full-featured professional applications. For further information about these applications please contact Vansco Electronics at www.vansco.ca.

4.1 udutool

WARNING: udutool is a program for updating the embedded firmware in the USB DLA. If this is done incorrectly or the wrong firmware is loaded, the DLA can be rendered inoperative. The unit must be returned to Vansco Electronics for reprogramming.

This application is used to update the embedded firmware on the DLA itself.

Plug the DLA into the USB port and run the program udutool.exe. The program should show you that the DLA is connected to the USB port. Click on the DLA to select it for a firmware update.

Use the browse button (indicated by the ellipsis) to select an appropriate firmware file. A valid DLA firmware file can be identified by three characteristics:

1) The filename should start with the DLA product number **779.**

   Never program the DLA with firmware file that does not start with 779.

2) The filename should end with the application version number .

   Never program the DLA with an application code that has a lower version number.

3) The file type should be .VSF.

The software will display an alert asking you if you are sure you want to reprogram the DLA. Click **Yes** to continue. A progress bar will move across the screen. A dialog box will inform the user if the update was successful.
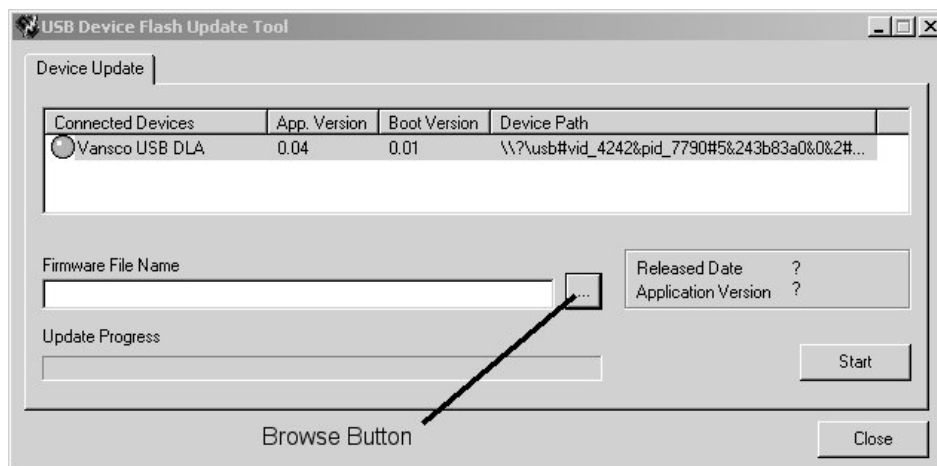
udutool will only allow you to update only the application code in the DLA and not the bootcode. This means that if you interrupt the update, you should be able to run it again and complete the update. However, it is highly recommended that the update be run without interruptions. The DLA should only be disconnected when udutool says the update has completed successfully.

4.2 Vansco's RP1210 API: VAPIserver

You will notice that a new icon appears in your system tray when you start application that uses the USB DLA. This is the VAPIserver (Vansco Application Program Interface Server) program; it provides the interface between the applications (such as SimGauges, SimEngine and CANsniff) and the DLA hardware. See appendix 7.2 for more information on the RP1210 protocol.
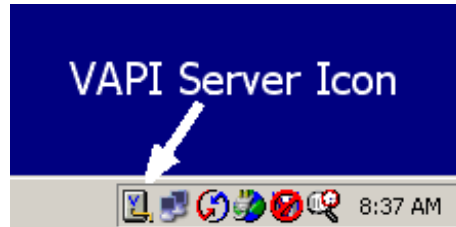
Double clicking the VAPIserver icon will bring up a window showing the status of the VAPIserver program. The VAPIserver will search for a DLA connected to the PC once every minute. If it finds one, the status will change to "Connected" and the VAPIserver will use that DLA until the connection is lost. The status window shows the number of applications that are connected to the DLA.
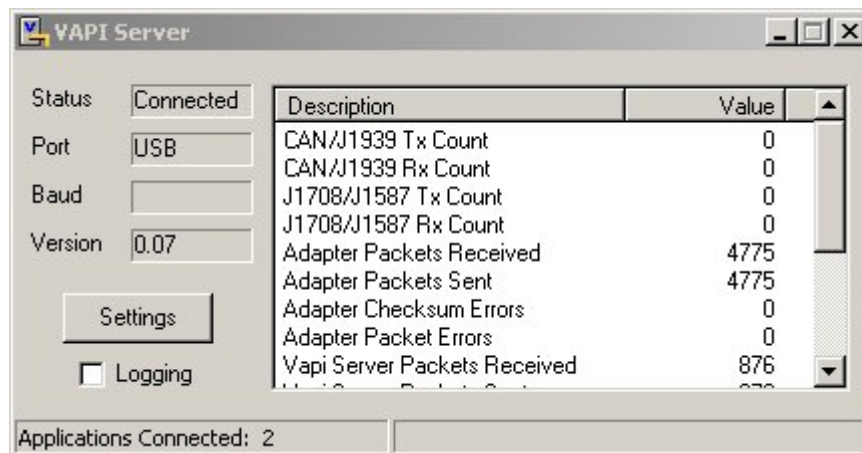
The status window displays information on the data being sent through the DLA. This includes counts of the bytes sent through J1939 and J1708 and also connection status. In general, the Adapter Packets Tx count should match the Vapi Server Packets Rx count. However, if the DLA is disconnected, the Adapter Packets TX count will continue to increase as the PC attempts to communicate with the DLA.

- CAN/J1939 Tx Count   Number of J1939 messages transmitted by DLA.
- CAN/J1939 Rx Count   Number of J1939 messages received by DLA.
- J1708/J1587 Tx Count   Number of J1708 messages transmitted by DLA
- J1708/J1587 Rx Count   Number of J1708 messages received by DLA.
- Adapter Packets Tx Count   Number of packets transmitted by DLA to the PC.
- Adapter Packets Rx Count   Number of packets received by DLA from the PC.
- Adapter Packet Errors   Number of packets errors detected by the DLA.
- Adapter Checksum Errors   Number of packet checksum errors.
- Vapi Server Packets Tx Count   Number of packets transmitted by the PC to the DLA.
- Vapi Server Packets Rx Count   Number of packets received by the PC from the DLA.

- Vapi Server Packets Errors Number of packet errors detected by the PC.
- CAN 1 Status Status of CAN 2 port. See table below.
- CAN 2 Status Status of CAN 2 port. See table below.
- J1708 Status Status of J1708 port. See table below.
- Other Status Status of optional port. See table below.
- Client Threads Number of clients

A status byte is associated with each of the vehicle ports on the DLA. The status byte is displayed in hex format with each of the bits representing the following.

Bit 7	Reserved
Bit 6	Reserved
Bit 5	Reserved
Bit 4	Reserved
Bit 3	Set to 1 when the data link is in the BUS OFF state (if applicable)
Bit 2	Set to 1 when traffic has been detected on the data link.
Bit 1	Set to 1 when the data link is enabled.
Bit 0	Set to 1 when the data link is present.

Clicking the **Settings** button will display a second dialog box, which allows the user to limit the serial ports that the VAPI Server uses. This is useful on a Bluetooth enabled laptop which may have up to 15 virtual COM ports. The Maximum Baud Rate setting reduces the connection speed. Older laptops, and laptops with multiple applications running in the background may have difficulty maintaining a connection at 115200.
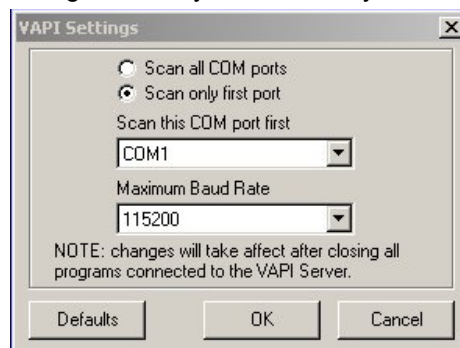
4.2.1 Multiple client connections

The VAPIserver program allows multiple applications to be simultaneously connected to the DLA. This is shown in the Status window as two active clients connected to the DLA.

Thus, you can run SimGauges and SimEngine (two Vansco applications mentioned earlier) at the same time. This can be useful in testing a third device such as a transmission or ABS controller. However, it can also cause some confusion in that you may see data appear on SimGauges before you've hooked it up to the vehicle. This is valid as SimEngine is instructing the DLA to broadcast messages, which are then received by the DLA. In order to reduce traffic going to the DLA, the VAPI Server will transfer this data locally between applications.

4.3   RP1210Chooser

RP1210 was intended to reduce the number of DLA hardware devices. (See appendix 7.2 for more information on the RP1210 protocol.) However, one DLA may be USB, another wireless and another the original Vansco parallel version. The application is not supposed to know the difference, as both will present a standard RP1210 API. But how does the application know which API to use? Provisions for using multiple DLAs with the same laptop have been included in the RP1210 specification. Some applications will recognize this and present the user with a choice of available APIs.   *Vansco applications will use the first API on the list*. In order to make sure the DLA uses the correct API the installer includes a small PC application called RP1210 Chooser.

Running RP1210Chooser.exe provides the screen shown below.
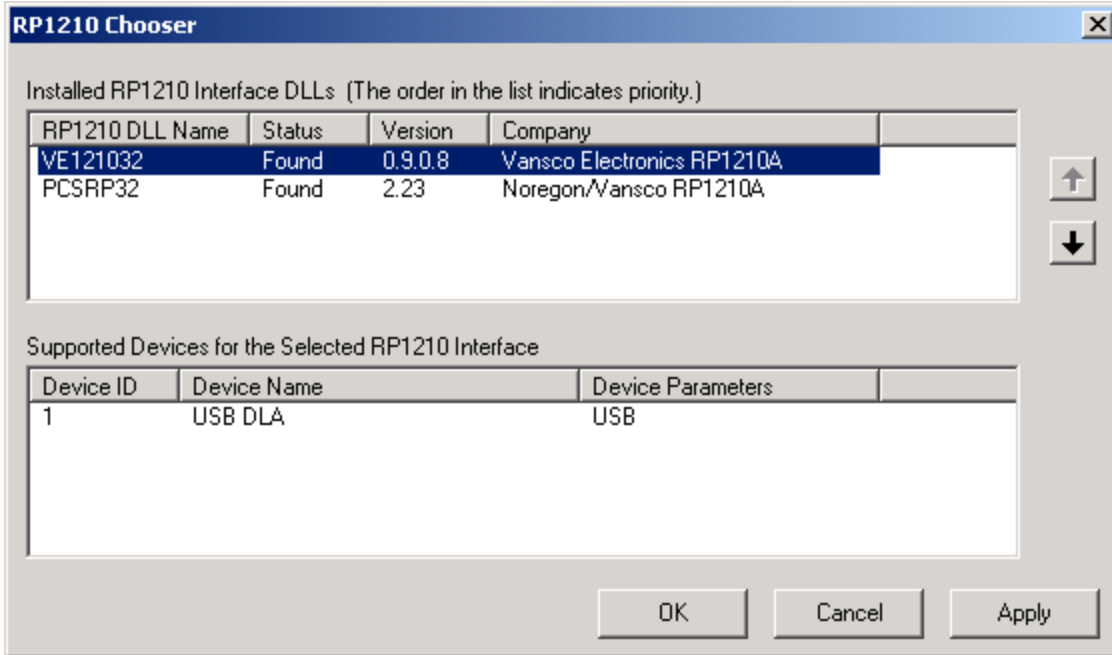
Simply select the API required for your device, VE121032 for the USB DLA, and move it to the top of the list with the arrows on the right hand side of the screen. If you subsequently need to use another RP1210 device on the same PC, run RP1210Chooser and move the corresponding API to the top of the list, such as PCSRP32 for Vansco's serial DLA.

5. Connector Pinouts

USB connector: 4 pin, Type-B receptacle

#	Function
1	Vbus
2	Data Minus
3	Data Plus
4	Gnd
	Shield (Shell)
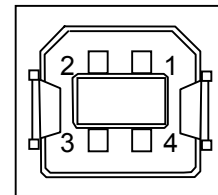
RS-232 connector: 9-pin D-socket, DLA configured as Data Communication Equipment (DCE).

Pin names are from perspective of PC

#	Function	#	Function
1		6	
2	RXD	7	RTS
3	TXD	8	CTS
4		9	
5	GND		
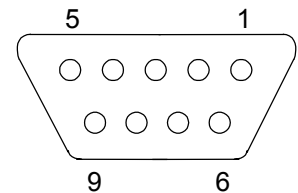
Vehicle connector: 15-pin D-socket

#	Function	#	Function
1	*CAT DLA HI	9	* CAN B -
2	*CAT DLA LO	10	* CAN B +
3	*GPIO 1	11	
4	* CAN B shield	12	CAN A -
5		13	CAN A +
6	GND	14	J1708 -
7	CAN A shield	15	J1708 +
8	BATTERY +		

* pins reserved for future use
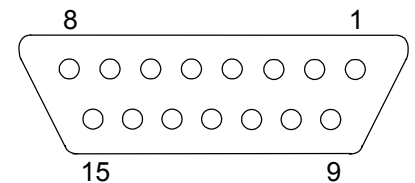
Internal option header connector: 20-pin 0.100" header.

#	Function	#	Function
1	+5V Vehicle	11	UART TX
2	+5V Micro	12	UART RX
3	GND Vehicle	13	UART CTS
4	GND Micro	14	UART RTS
5	Vin Filtered	15	/Enable Pseudo
6	MRST	16	Micro TX
7	MTSR	17	GND Micro
8	SPICLK	18	+5V Micro
9	Option Interrupt	19	/Boot Enable
10	/Reset	20	Micro RX
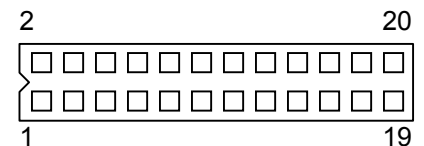
6. Electrical and Environmental Requirements

General (+25°C unless otherwise stated):

Version	Parameter	MIN	NOM	MAX	UNIT
USB Powered	Operating Voltage	4.4	4.75	5.0	V
	Operating Current Draw (USB Power Pin)		150	200	mA
	Operating Temperature	-40		+85	°C
	Storage Temperature	-55		+85	°C
	ESD Protection		15		KV
Vehicle Powered	Operating Voltage (Vehicle Power Pin)				V
	Standard Model	7	12-24	32	
	Low Input Voltage	5	12-24	32	
	Operating Current Draw 12V Supply			500	mA
	Operating Current Draw 24V Supply			250	mA
	Over Voltage (5 Minutes)		40		V
	Reverse Voltage (5 Minutes)		32		V
	ESD Protection		15		KV
	Power Supply Isolation: PC to Vehicle		500		V
All Versions	Operating Temperature	-40		+85	°C
	Storage Temperature	-55		+85	°C
	Dimension: Height		43		mm
	Dimension: Width		84		mm
	Dimension: Length		178		mm

Note 1: Unit may disconnect from power if input voltage is above its operating voltage.

Note 2: The bus powered DLA will continue will maintain a connection to the PC if the vehicle power drops below minimum.

Data link protocols supported:
CAN 2.0B, J1939, J1708/J1587

Operating systems supported:
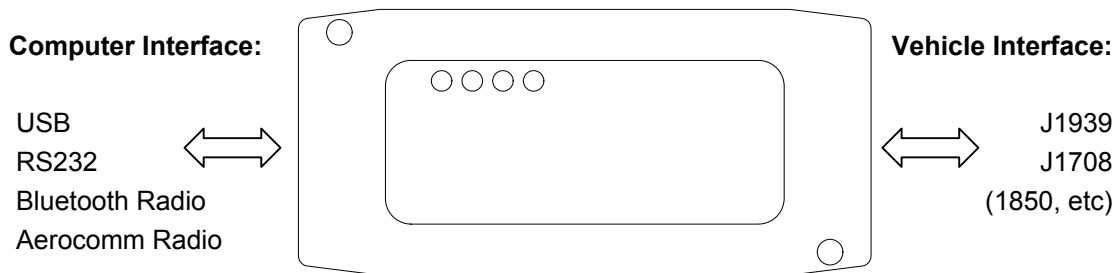Windows XP (Recommended), 2000, Millennium, 98
Windows NT 4.0 (Service Pack 3 or 4) (Serial port only as NT does not support USB)

7. Appendices

7.1 Automotive networks

Automotive information networks will not communicate with standard computer interfaces. PCs use parallel, RS232 serial, and USB ports, while engine controllers and instrument panels typically use J1708, J1850 and J1939. These are automotive network standards defined by the Society of Automotive Engineers (SAE). PC ports and automotive networks use different voltage levels, data rates and check sums. An adapter is required to connect the laptop and engine together, this is where the DLA comes into play. The DLA supports CAN (Controller Area Network) and the J1708 and J1939 automotive networks:

J1939: In the 1980's Bosch developed a system called Controller Area Network (CAN). CAN was intended to be used as a communication network for industrial controllers. It has gained acceptance in a wide variety of markets including the automotive industry. CAN hardware ports are now embedded in micro-controllers. J1939 is a standard developed by the Society of Automotive Engineers (SAE) that defines how information is passed on a CAN network. J1939 is a differential pair network using CAN Transceivers in a dominant/recessive mode. The network cable is terminated on each end by a 120Ω resistor. The maximum

Computer Interface:

USB
RS232
Bluetooth Radio
Aerocomm Radio

Vehicle Interface:

J1939
J1708
(1850, etc)

data rate is 250Kbps. The data packet format is <PGN><8 DATA BYTES><CRC>.

J1708: J1708 is an automotive network developed by SAE about the same time as CAN. J1708 is a differential pair network using standard RS485 drivers in a dominant/recessive mode. J1708 is terminated by 4.7KΩ pull-up / pull-down and 47Ω series resistor. The data format and rate is the same as the standard computer serial port: 9600bps, 1 start bit, 8 data bits, 1 stop bit. The data packet format is <MID><PID><DATA><PID><DATA><CHK>.

7.2 RP1210 compatibility

RP1210 was developed by the Technology and Maintenance Council (TMC) of the American trucking Association to address issues in servicing vehicles manufactured by different vendors. Service personnel were forced to purchase an expensive DLA to communicate with each different type of vehicle and engine. RP1210 provides a consistent application interface so that the same DLA hardware can be used with many different applications. If software developers follow the RP1210 standard, then their engine diagnostic software should work a DLA from any manufacturer. Vansco's industry standard RP1210 API is ve121032.dll.

Vansco has made every effort to make the USB DLA RP1210 compliant. It should be useable with test tools from Dearborn, Cummins, etc. We cannot guarantee this as the engine developers may add extensions to RP1210 to address issues unique to their system.

The TMC RP1210 Specification is available from ATA for a fee. Contact information for the TMC can be found at http://www.truckline.com/cc/councils/tmc/.

Vansco Electronics Ltd developed the RP1210 drivers used with the Vansco USB DLA. The latest updates are available on our website: www.vansco.ca.

The RP1210 drivers used with the original, 25-pin serial, Vansco DLA (the 416 DLA) were developed by Noregon Systems Inc. The latest updates are available on their website: www.noregon.com.

7.3 Software model

Several levels of software are required to operate a Vansco DLA: application, the RP1210 interface, the VAPI server interface, the VAPIserver, and the USB driver.

```
┌─────────────────────┐   ┌─────────────────────┐
│    Application 1     │   │    Application 2    │
└─────────┬───────────┘   └─────────┬───────────┘
          ▼                         ▼
┌─────────────────────┐   ┌─────────────────────┐
│     VE121032.dll    │   │     VE121032.dll    │
└─────────┬───────────┘   └─────────┬───────────┘
          ▼                         ▼
┌─────────────────────┐   ┌─────────────────────┐
│       VAPI.dll      │   │       VAPI.dll      │
└─────────┬───────────┘   └─────────┬───────────┘
          ▼                         ▼
┌───────────────────────────────────────────────┐
│                  VAPI Server                   │
└─────────┬─────────────────────────┬────────────┘
          ▼                         │
┌─────────────────────┐            │
│      USB Driver     │            │
└─────────┬───────────┘            │
          ▼                         ▼
┌─────────────────────┐   ┌─────────────────────┐
│     USB Hardware    │   │    RS232 Hardware   │
└─────────────────────┘   └─────────────────────┘
```
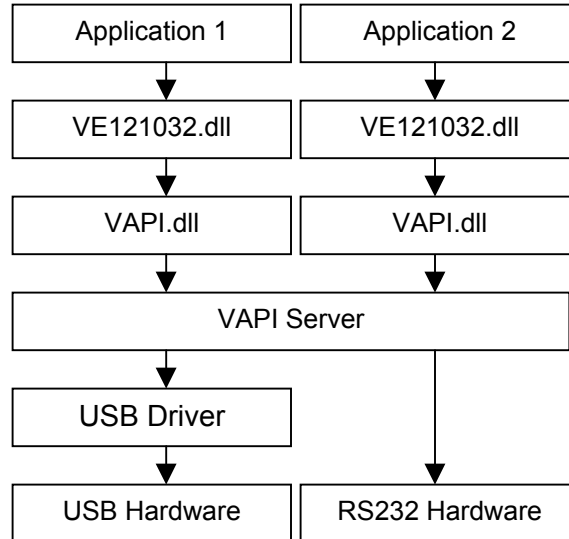
*Note that this only compares HOW the USB and RS232 software models look. However, they cannot be used at the same time.

Applications: The main purpose of the application is to present information to the user in an organized manner. This allows the user to decide the kind of data to transmit or receive on the automotive network. The application is the highest software level and it does not require information on how the data was passed to the computer. The application gets all its information from either the RP1210 API or Vansco's proprietary API.

ve121032.dll: An industry standard RP1210 API. Allows applications to communicate with vehicle networks even when different DLA hardware is used. The hardware interface could be USB, Serial, or even 802.11. Vansco provides an RP1210 front end which in turn makes calls to the VAPI.dll

VAPI.dll: The VAPI.dll provides a software interface for applications and for ve121032.dll to communicate with the VAPI Server.   Note: Although it is possible to bypass the RP1210 interface and communicate directly with the vapi.dll, we do not recommend this. The software model was developed to address legacy issues. The long-term goal is to support the industry standard interface (RP1210).

VAPIserver: The VAPIserver program communicates with the PC hardware in order to transfer data to a DLA. The DLA may be connected to any of the PC hardware ports. The VAPIserver searches for and maintains a connection to a DLA and makes the DLA available to the application. The VAPIserver can support multiple clients; more than one application can request information from the VAPIserver.

USB Drivers: VAPIserver does not communicate directly with the USB hardware, rather it passes all requests on to the USB driver.

7.4 Files and locations

If you experience difficulty installing the software or if you want to update only one file it may be easier to manually copy the files into the proper locations.

Files copied during software installing:

ve121032.dll	RP1210 API. Receives RP1210 calls and hands them off to a VAPI.dll Interface.
VE121032.h	Header file that contains the parameter, error definitions and prototypes of the functions exported by VE121032.dll.
VAPI.dll	Vansco API that passes data from applications to the VAPIserver.
	Multiple copies of the dll's can be running at any given time.
VAPIserver.exe	Provides the interface between the dll's and the DLA hardware.
	Only one VAPIserver is running at one time.
dlapnp.sys	Plug and play driver for USB DLA
usbdla.sys	USB DLA driver
Readme.txt	Installation information

File locations (all versions of Windows):

C:\Program Files\Vansco\USB DLA\Driver\dlapnp.sys

C:\Program Files\Vansco\USB DLA\Driver\usbdla.inf

C:\Program Files\Vansco\USB DLA\Driver\usbdla.sys

C:\Program Files\Vansco\USB DLA\udutool.exe

C:\Program Files\Vansco\USB DLA\RP1210Chooser.exe

C:\WINDOWS\system32\VAPIserver.exe

C:\WINDOWS\system32\VE121032.dll

C:\WINDOWS\system32\VAPI.dll

Note: The Windows directory in Windows 2000 is called WINNT.

File locations: WIN NT 4.0 (serial port only, NT does not support USB.)

C:\WINNT\system32\VAPIserver.exe

C:\WINNT\system32\VAPI.dll

Note: Running a newer version of the setup program will install updated versions of the USB drivers and applications. The updated version of the applications will be copied over existing versions installed on your machine. The USB driver will be copied onto your machine, but Windows will not used it until you have updated the driver in the Device Manager.

ie: **Settings** > **Control Panel** > **System** > **Hardware** > **Device Manager**.

Right click on Vansco USB DLA and select **Update Driver.**