

USB-DLA

USB Data Link Adapter

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1. Introduction

These instructions are meant as a reference tool for the vehicle manufacturer's design, production, and service personnel.

The user of this manual should have basic knowledge in the handling of electronic equipment.

1.1. Safety symbols

Sections regarding safety, marked with a symbol in the left margin, must be read and understood by everyone using the system, carrying out service work or making changes to hardware and software.

The different safety levels used in this manual are defined below.



WARNING

Sections marked with a warning symbol in the left margin, indicate that a hazardous situation exists. If precautions are not taken, this could result in death, serious injury or major property damage.



CAUTION

Sections marked with a caution symbol in the left margin, indicate that a potentially hazardous situation exists. If precautions are not taken, this could result in minor injury or property damage.



NOTICE

Sections marked with a notice symbol in the left margin, indicate there is important information about the product. Ignoring this could result in damage to the product.

Contact the manufacturer if there is anything you are not sure about or if you have any questions regarding the product and its handling or maintenance.

The term "manufacturer" refers to Parker Hannifin Corporation.

2. Precautions

2.1. General safety regulations

Work on the hydraulics control electronics may only be carried out by trained personnel who are well-acquainted with the control system, the machine and its safety regulations.



WARNING

Mounting, modification, repair and maintenance must be carried out in accordance with the manufacturer's regulations. The manufacturer has no responsibility for any accidents caused by incorrectly mounted or incorrectly maintained equipment. The manufacturer does not assume any responsibility for the system being incorrectly applied, or the system being programmed in a manner that jeopardizes safety.



WARNING

Damaged product may not be used. If the control system shows error functions or if electronic modules, cabling or connectors are damaged, the system shall not be used.



WARNING

Electronic control systems in an inappropriate installation and in combination with strong electromagnetic interference fields can, in extreme cases, cause an unintentional change of speed of the output function.



NOTICE

As much as possible of the welding work on the chassis should be done before the installation of the system. If welding has to be done afterwards, the electrical connections on the system must be disconnected from other equipment. The negative cable must always be disconnected from the battery before disconnecting the positive cable. The ground wire of the welder shall be positioned as close as possible to the place of the welding. The cables on the welding unit shall never be placed near the electrical wires of the control system.

2.1.1. Construction regulations



CAUTION

The vehicle must be equipped with an emergency stop which disconnects the supply voltage to the control system's electrical units. The emergency stop must be easily accessible to the operator. The machine must be built if possible, so that the supply voltage to the control system's electrical units is disconnected when the operator leaves the operator's station.

2.1.2. Safety during installation



CAUTION

Incorrectly positioned or mounted cabling can be influenced by radio signals which can interfere with the functions of the system.

2.1.3. Safety during start-up



WARNING

The machine's engine must not be started before the control system is mounted and its electrical functions have been verified.

Ensure that no one is in front, behind or nearby the machine when first starting up the machine.

Follow the instructions for function control in the Start-up section.

2.1.4. Safety during maintenance and fault diagnosis



CAUTION

Ensure that the following requirements are fulfilled before any work is carried out on the hydraulics control electronics.

- The machine cannot start moving.
 - Functions are positioned safely.
 - The machine is turned off.
 - The hydraulic system is relieved from any pressure.
 - Supply voltage to the control electronics is disconnected.
-

3. USB-DLA Description

The purpose of a Data Link Adapter (DLA) is implied by its name: it is an adapter that provides a link between two different data networks or protocols. The Parker 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) to vehicle ports (J1939, J1708).

The Data Link Adapter is sold in kit form, with all of the necessary cables and connectors included. This manual explains the contents of the kit, and how to set up and use the DLA for USB communication.

3.1. Contents of USB-DLA kit

The USB-DLA kit is supplied in a high density polyethylene, blow-molded case. The kit includes the following:

Table 1: Contents of USB-DLA kit

Part No.	Description	Remarks
	USB-DLA Data Link Adapter	
75144	CBL ASSY NETWORK DLA DEUTSCH	connects vehicle to DLA
75145	CBL ASSY NETWORK DLA CANNON	connects vehicle to DLA and modules
75850	CBL ASSY DLA BATTERY CLIP	power cable
76547	CBL ASSY NETWORK CANNON DEUTSCH	connects VMM to vehicle bus w/Deutsch
93373	CBL ASSY J1939 0.9M CANNON	connects VMM to vehicle bus w/Cannon
51858	DT04-3P-P007 CONN RECP Y 3M DT	Deutsch J1939 y connector
53801	130446-0000 SPLICE Y 4M AU J1939	Cannon J1939 y connector
53800	086-0068-002 PLUG TERM 4F AU J1939	120 bus terminating plug
89248	CABLE USB 1.1 6FT MALE A-B	connects USB-DLA to PC



Figure 1: USB-DLA kit

4. Software Installation

The software for the USB-DLA should be installed *before* plugging the DLA into your computer.



INFORMATION

If you plug in the DLA first, Windows™ will try to install its own 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 on your PC.
2. Plug in the DLA and let the PC recognize the device and load the USB drivers.
3. Install the applications.

4.1. Installing the USB 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 Parker Electronic Controls Division website: <http://www.parker.com/ecd>. Go to the *Customer Toolbox* and select *Vansco DLA and PGM Drivers*. Extract the setup files and save them to a temporary directory using WinZip. Run the setup.exe program to launch the setup.

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



Figure 2: Software setup screen

The next screen is a license agreement between the end user and Parker Vansco. Once you have read and agreed to the license click on **I Agree**.



Figure 3: License agreement

This is followed by an installation location screen. It is recommended that the files be installed in the default location. Click **Install** to continue.

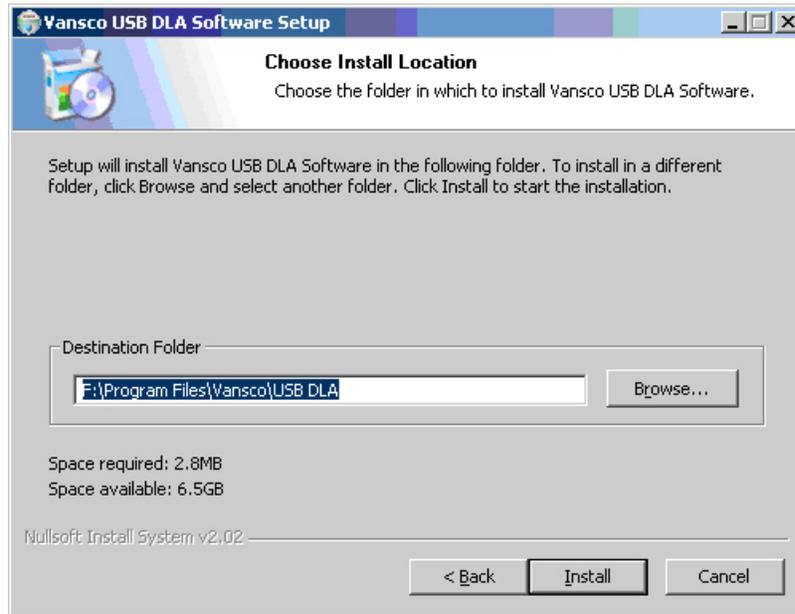


Figure 4: File location

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.

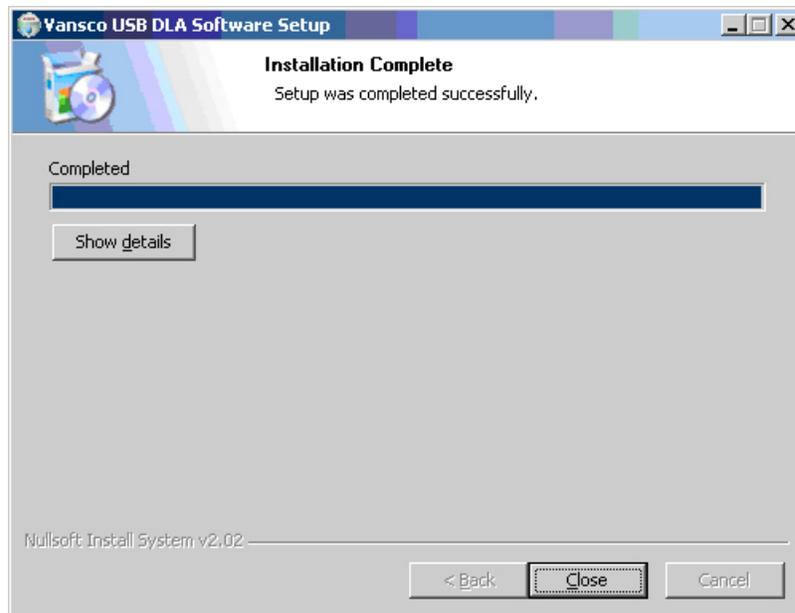


Figure 5: Installation complete

5. Using the USB-DLA

5.1. Plug in the USB cable

Connect the DLA to your computer using the USB cable provided. Plug the A-type receptacle into the back of your computer (1), and the B-type receptacle into the DLA (2). You should hear a Windows alert every time the DLA is connected or disconnected.



INFORMATION

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 un-powered USB hub.



Figure 6: Connect DLA to PC

5.1.1. Load the USB drivers

The USB-DLA will be detected automatically when it is plugged into your laptop. The first time the device appears on a USB port, Windows will launch the *Found New Hardware Wizard* in order to load the USB drivers. Windows will do this every time the device appears on a new USB port (e.g., 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**.



Figure 7: Found New Hardware Wizard

Windows will then load the drivers for the USB-DLA.

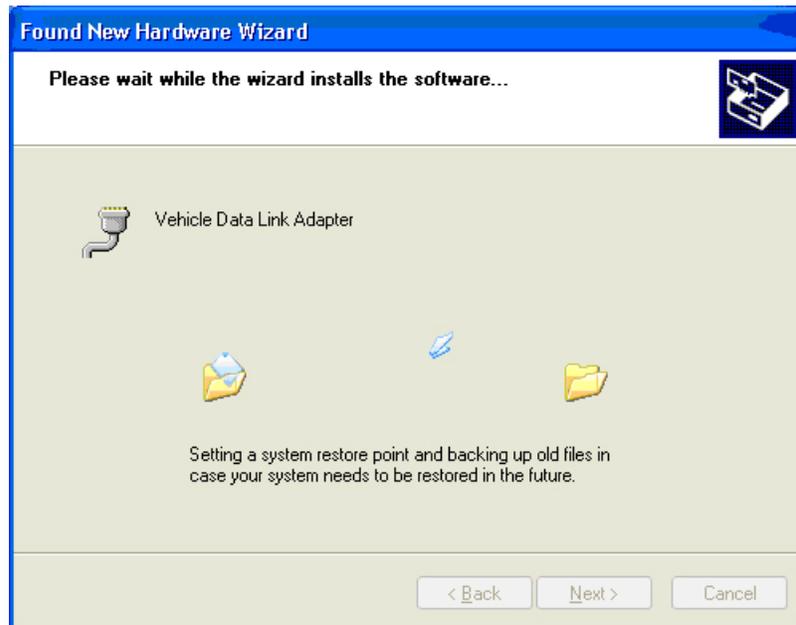


Figure 8: DLA drivers being loaded

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

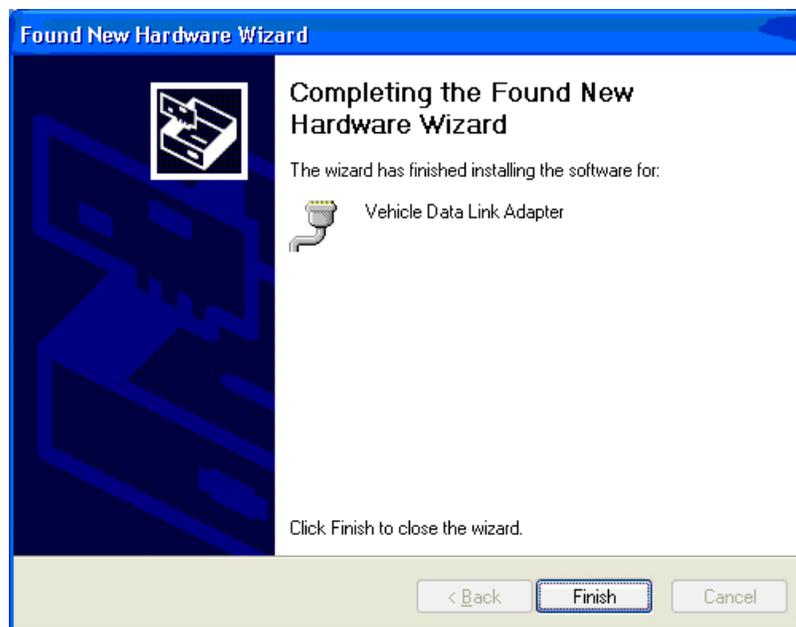


Figure 9: DLA drivers are now loaded

5.2. 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 (3) connected to a 9-pin Deutsch (4). Note that the vehicle connector may change depending on the preference of the vehicle manufacturer.



Figure 10: Connect USB-DLA to vehicle



CAUTION

The USB ground is not isolated from the power ground. A computer connected to the USB port must be electrically floating and not have any connections to the outside world, including the AC power adapter and the serial port. **Failure to observe this may result in damage to the DLA and the computer USB port.** If a laptop battery needs to be charged, the USB port must be disconnected from the DLA. If the DLA is to be used with a desktop computer, care must be taken to ensure that the power supply to the DLA is isolated from any earth or vehicle ground.

5.3. USB-DLA LED Indicators

The USB-DLA has 3 LEDs for status indication. The LED indicators on the USB-DLA fall into two categories: power status (1 LED) and network status (2 LEDs).

5.3.1. LED Colors and Blink codes

POWER ON (red) - The LED is off when no power applied. After the LED self-test, the LED goes on steady.

J1708 (green) - The LED flashes on when the DLA detects traffic on the J1708 input terminals or when a J1708 message is sent from the DLA. During heavy traffic, the LED may appear to be on steady. The LED stays off if no traffic is detected and no messages are sent.

J1939/CAN (red) - The 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. During heavy traffic, the LED may appear to be on steady. The LED stays off if no traffic detected and no messages are sent.

6. Software Tools for the USB-DLA

The following software tools are used to support the DLA on a PC.

USB update tool 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.

RP1210 Chooser allows the use of different DLA hardware (such as Vansco's serial or parallel DLA) on the same computer.

Parker Vansco also has a number of software tools that are useful for troubleshooting vehicle networks. These are applications that have been 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 CANbus 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 the DLA.



INFORMATION

These softwares started as engineering tools and, as a result, are not full-featured, professional software tools.

For further information about these software tools, please contact your Parker Vansco representative.

6.1. USB Update Tool



NOTICE

USB update tool 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 then be returned to Parker Vansco for reprogramming.

This tool 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.

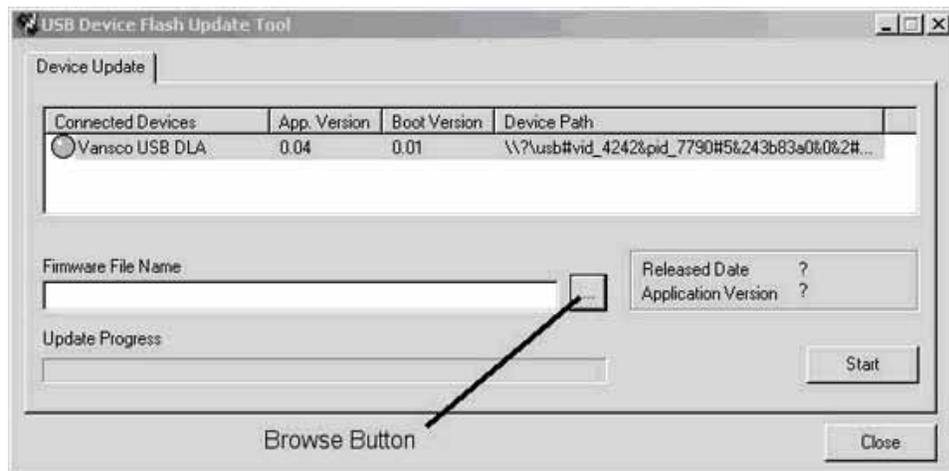


Figure 11: Updating the DLA firmware with udutool

USB update tool 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 USB update tool reports the update has completed successfully.

6.2. VAPI Server

A new icon appears in your system tray when you start an RP1210 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.



Figure 12: VAPI Server icon

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.

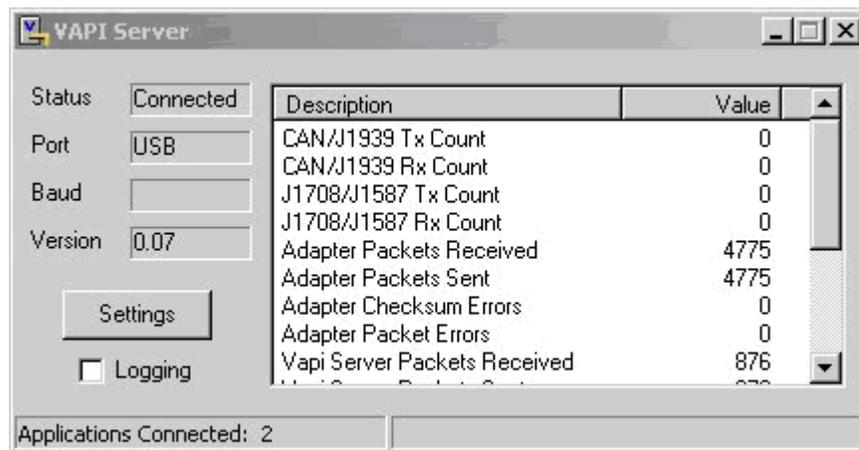


Figure 13: VAPI Server status window

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.

Table 2: Status window messages

Description	Explanation
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 packet 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 1 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 table.

Table 3: Status byte

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.

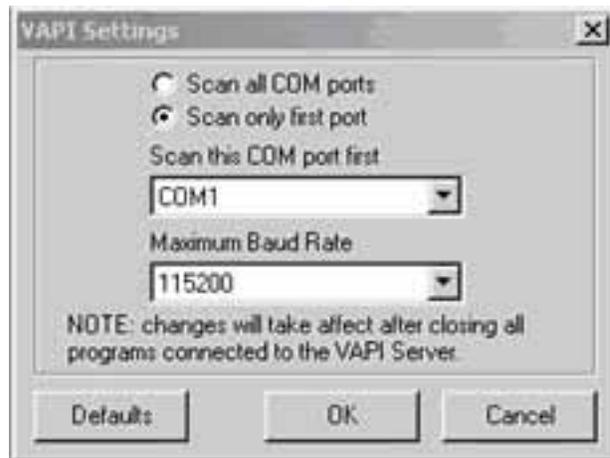


Figure 14: VAPI settings window

6.2.1. 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.

Therefore, you can run *SimGauges* and *SimEngine* (two 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.

6.3. RP1210 Chooser

RP1210 was intended to reduce the number of DLA hardware devices. However, one DLA may be USB, another wireless and another the original Vansco Electronics parallel version. The application will not know the difference, as all will present a standard RP1210 API. In order to select which API for the application 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. Parker 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.

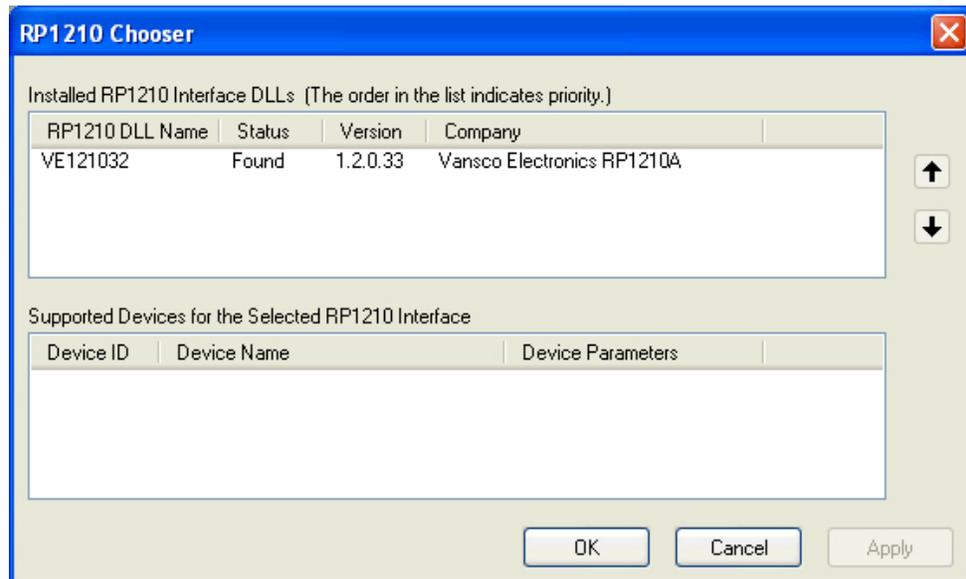


Figure 15: RP1210 Chooser dialog

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 RP1210 Chooser and move the corresponding API to the top of the list, such as PCSRP32 for a legacy serial only DLA.

7. Appendix A

7.1. USB-DLA Electrical Specifications

The USB-DLA operates using power supplied by typical automotive battery/charging system for both 12 and 24 volt systems. The following table lists the electrical requirements.

Table 4: General ratings (@ 25 °C unless otherwise specified).

Parameter	Min	Nom	Max	Units	Remarks
Operating temperature	-40		+85	°C	
Storage temperature	-55		+125	°C	
Operating voltage	4.4	4.75	5.0	V	when powered by USB from PC
Operating current draw (USB power pin)		150	200	mA	when powered by USB from PC
Operating voltage	5	12-24	32	V	when powered by vehicle battery
Operating current draw		100	300	mA	when powered by vehicle battery

7.2. USB-DLA Environmental Specifications

The USB-DLA is made to operate in a typical automotive service environment. The unit is protected to extremes of temperature and chemicals. As a handheld unit, the unit can withstand being dropped but is not protected from vehicle stresses such as steam cleaning or pressure washing.

The test descriptions below are based on the following Environmental Specifications:

ANSI/SAE EP455 JUL 91

ISO 7637 2nd edition

ISO 14982 1st edition

J1455 APR 03

Table 5: Environmental rating tests passed by USB-DLA

Test Spec. Ref.	Test Description	Deviation
EP455 Section 5.1.1	Operating Temperature Level 2	
EP455 Section 5.1.2	Storage Temperature Level 2	
EP455 Section 5.1.3	Thermal Shock	
EP455 Section 5.10.1	Operating Voltage Level 1	7 VDC to 32 VDC
J1455 Section 4.11.1	Over Voltage Level 2	32 VDC
J1455 Section 4.11.1	Reverse Polarity	-26VDC
EP455 Section 5.10.4	Short Circuit Protection	+26 VDC
J1455 Section 4.11.1	Starting Voltage	
EP455 Section 5.10.7	Power Up Operational	Test from 7 VDC
EP455 Section 5.11.1	Accessory Noise	$26 + 1.5 \sin(2 \text{ ft})$
EP455 Section 5.11.3	Batteryless Operation Level 2	$6 + 26 \sin(2 \text{ ft}) $
ISO 7637-2	Pulse 1 (Inductive Load Switching)	$V_s = -300 \text{ V}$
ISO 7637-2	Pulse 2 (Mutual Coupling Power Lines)	$V_s = 200 \text{ V}$
ISO 7637-2	Pulse 5 (Load Dump)	
EP455 Section 5.11.2	Alternator Field Decay	$V_s = 24 \text{ VDC}$, $R_i = 10 \text{ } \Omega$, Cycle = 50 sec.
ISO 7637-3	Mutual Coupling Signal Lines	
EP455 Section 5.12	Electrostatic Discharge	
EP455 Section 5.14.1	Mechanical Shock Operational	
EP455 Section 5.14.2.2	Mechanical Shock Handling Bench Level 1	

EP455 Section 5.14.2.2	Mechanical Shock Handling Bench Level 2	
EP455 Section 5.15.1	Random Vibration	
ISO 14982	EMC Susceptibility Level 2	
ISO 14982	EMC - Emissions	

8. Appendix B

8.1. 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.

8.1.1. 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 120 Ω resistor. The maximum data rate is 250Kbps. The data packet format is <PGN><8 DATA BYTES><CRC>.

8.1.2. 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 4.7K Ω pull-up / pull-down and 47 Ω 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>.

8.2. RP1210 Compatibility

RP1210 was developed by the Technology and Maintenance Council (TMC) of the American Trucking Association (ATA) 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. Parker Vansco's industry standard RP1210 API is ve121032.dll.

Parker has made every effort to make the USB-DLA RP1210 compliant. It should be usable with test tools from Dearborn, Cummins, and other manufacturers. We

cannot guarantee this into the future, as the engine developers may add extensions to RP1210 to address issues unique to their systems.

The TMC RP1210 Specification is available from ATA for a fee.

Parker Vansco developed the RP1210 drivers used with the USB-DLA. The latest updates are available on our website: www.parker.com/ecd.

8.3. Software Model

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



INFORMATION

This section only compares how the USB and Legacy 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 Parker 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. Parker 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.



INFORMATION

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.

8.4. Software 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.

8.4.1. Files copied during software installation:

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 any time.

dlapnp.sys: Plug and play driver for USB DLA

usbdlasys: USB DLA driver

Readme.txt: Installation information

8.4.2. Default File locations (all versions of Windows):

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

C:\Program Files\Vansco\USB DLA\Driver\usbdlasys

C:\Program Files\Vansco\USB DLA\Driver\usbdlasys

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

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 PC. The USB driver will also be copied onto your PC.

**INFORMATION**

Windows will not use the new USB driver until you have updated the driver in *Device Manager*.

Manually update the driver in Windows, (ie: Settings > Control Panel > System > Hardware > Device Manager).

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

9. Glossary of Terms

A

application software

A level of software that makes a product (hardware) perform desired functions for the end user.

C

CAN

Controller Area Network

CAN High

One of the wires used in the shielded twisted-pair cable, which provides the positive signal that, when connected with CAN Low, provides a complete CAN differential signal.

CAN Low

One of the wires used in the shielded twisted-pair cable, which provides the negative signal that, when connected with CAN High, provides a complete CAN differential signal.

CAN Shield

A shielding that wraps around the CAN High and CAN Low wires (twisted-pair), completing the shielded twisted-pair cable.

Controller Area Network

A computer network protocol designed for the heavy equipment and automotive environment that allows microcontrollers and other devices to communicate with each other without using a host computer; also known as CAN.

D

Data Link Adaptor (DLA)

A development tool that connects the CAN bus to a personal computer (through a USB or RS232 port), so that programming and diagnostics can be performed on the product before installing it in a vehicle.

driver (software)

A block of software that provides access to different hardware components.

R

RS232

An inexpensive type of serial communication used on most PC and laptop computers that doesn't define the communication protocol, making it attractive for

embedded applications. RS232 is an older technology that is slowly being phased out of production in favor of USB.

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