

Models: LDV6S and LDV6U

LDV Communications Specification

2/19/2002	Rev 0.1	Created document draft	JDS
2/22/2002	Rev 0.11	Added instructions on the use of Broadcast Messages	JDS
3/18/2002	Rev 1.0	Added information on broadcast mode and initialization and timestamp commands. Added documentation for Command \$43	MJF
3/22/2002	Rev 1.01	Corrected information about Command \$43	JMP
3/27/2002	Rev 1.02	Corrected Serial number information	JMP
5/3/2002	Rev 1.03	New Modes 25 & 26 for High & Low speed J1850VPW speed selection	JMP
5/6/2002	Rev 1.04	Changed operation of EEPROM Commands 10 & 11	JMP
5/9/2002	Rev 1.05	Updated/Corrected Overview & updated broadcast mode	JMP
5/10/2002	Rev 1.06	Created Command 44 for physical message without filters.	JMP
8/15/2002	Rev 1.07	Removed Command 20. It was never implemented in any of the firmware. Use command 43 to remove filters.	JMP
8/30/2002	Rev 1.08	Added information for ISO baud rate settings.	JMP
9/17/2002	Rev 1.08	Removed Command 44. It does the same function as command 43	JMP
11/1/2002	Rev 1.08	Removed Command 75(Get copyright info.) It has no useful function	JMP
3/4/2003	Rev 1.09	Removed Commands 0A, 0B, 0C, 0D Added Monitor Mode Documentation	JMP
5/27/2003	Rev 1.10	Combined ISO & KWP keepalive commands into general keepalive commands	JMP
7/7/2003	Rev 1.10	Added CAN & V3.00 Firmware information	JMP
8/18/2003	Rev 1.11	Added Vehicle Power Detect command and CAN Flow control info.	JMP
9/26/2003	Rev 1.11	Modified Reboot Command(22)	JMP
3/25/2004	Rev 1.12	Modified for V3.10 Firmware	JMP
11/10/2005	Rev 1.13	Corrected Broadcast Mode Command Information.	JMP
1/14/2008	Rev 1.14	<ul style="list-style-type: none"> • Change description of CAN flow control messages • Fix filtering on J1850PWM that was allowing some broadcast messages through • Fix startup on CAN that was affecting some Ford trucks on VIN requests • Change filtering on J1850VPW to enable J2190 on Chrysler. • Add an extended physically addressed CAN command that allows specification of a return address. • Add \$3C KWP_Fast_Init for physical initialization of a KWP2000 bus • Add \$0F Set SCI Baud Rate for accessing F-table information 	KEN



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Firmware Revision History

- Version 1.XX Not Applicable, Old 15 byte fixed length.
- Version 2.00 Updated to new variable length protocol & added broadcast & timestamp modes.
- Version 2.01 Added commands \$25, \$26. Updated broadcast mode options. Updated EEPROM read & write access via commands 10 & 11.
- Version 2.02 This revision attempted to correct some issues with ISO & KWP, but failed to do so on every vehicle.
- Version 2.03 This revision was for the LDV100P1 only. This improved the performance of the LDV in cases of high bus utilization on the J1850VPW bus.
- Version 2.04 This version corrects many issues with ISO, KWP, and SCI protocols.
- Version 3.00
- Added support for both 11-bit identifier and 29-bit identifier CAN bus.
 - Added a version with a USB interface.
 - Added a larger transmit and receive message buffer.
 - Corrected some issues with multiple response KWP2000 vehicles.
 - Added command \$30 that will disable SCI autodetect. When SCI autodetects it slows down the entire autodetect sequence drastically.
- Version 3.05 This version corrects many issues with the USB Hardware interface. This version also adds the extended reboot command.
- Version 3.06
- Corrected some issues with PC communications
 - Corrected KeepAlive problem in ISO9141-2 protocol
- Version 3.07 Separated Model number from the Serial number. This allows faster manufacturing times.
- Version 3.08 Added a 5 second delay between 5-baud init and KWP fast init. Added a 5 second delay to command 21 before re-initializing KWP using either 5-baud init and fast init.
- Version 3.09 Corrects a problem where the hardware stops responding if the vehicle is disconnected during an autodetect.
- Version 3.10 Correct implementation error in commands 35 & 36.
- Version 3.20
- Change to physical addressing on CAN flow control messages to physical addressing
 - Change filtering on J1850VPW to enable J2190 on Chrysler.
 - Add an extended physically addressed CAN command (0x41) that allows specification of a return address.
 - Add \$3C KWP_Fast_Init for physical initialization of a KWP2000 bus
 - Add \$0F Set SCI Baud Rate for accessing F-table information



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Overview

The Via™ LDV family of interface converters translates RS-232/USB data to and from the J1979 OBDII-equipped vehicles. This section will provide a brief explanation of how to get started communicating with the LDV module.

Getting Connected

Both the serial and USB versions of the LDV use COM ports on the computer. The USB LDV will create a virtual COM port that can be opened and used the same way as a real COM port. All data going back and forth to the VIA is encapsulated in a protocol packet as shown below, further described in the VIA Protocol section of this document. Please refer to that section for a detailed description of each field of the protocol.

Byte	Byte	Up to 32 Bytes	Byte	Up to 32 Bytes	Byte
Start of Frame	Control Length	Control Bytes	Data Length	Data Bytes	Checksum

Upon receiving power from the vehicle, the VIA hardware will enter an idle state. The hardware must be reset in order for it to autodetect all supported protocols. The first command send to the LDV should be reboot device (command \$22).

To reboot the LDV send the following string to the LDV in hex format:

```
$01 $01 $22 $00 $24
```

The LDV will respond immediately with a reboot confirmation message, and then it will initiate the reboot. During a reboot sequence the autodetect function is called. The autodetect can take up to 30 seconds to complete. The LDV will transmit its model number followed by a Line Feed (\$0A) and a Carriage Return (\$0D) to the PC when it is booted and ready for messages. It is recommended that you not send any messages to the LDV until you receive the Line Feed and Carriage Return characters.

To request all supported protocols send the following string to the LDV.

```
$01 $01 $13 $00 $15
```

Note: All values in examples are displayed as hexadecimal. In the above example the array sent to the VIA can be setup as follows:

```
//*****
LPSTR tx = (LPSTR)GlobalAlloc(LPTR, 128);
tx[0] = 0x01;
tx[1] = 0x01;
tx[2] = 0x13;
tx[3] = 0x00;
tx[4] = 0x15;
//*****
```

Once this string is sent, the following string will be returned from the LDV.

```
$01 $02 $93 $XX $00 $CS
```



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\$XX = Supported Protocols

Bit 7-J1850VPW

Bit 6-J1850PWM

Bit 5-ISO-9141

Bit 4-Chrysler SCI

Bit 3-ISO-14230 (Keyword Protocol 2000)

Bit 2-CAN(J2284) at 500Kbps using 11-bit identifier

Bit 1-CAN(J2284) at 500Kbps using 29-bit identifier

Bit 0-Other(Send Command \$14 for more information)

\$CS = Checksum for the VIA protocol packet. This is equal to the least significant byte of the sum of all the bytes in the message, in hexadecimal format. For example, if the protocols on the vehicle are J1850VPW and ISO-9141 the returned message from the LDV is: **\$01 \$02 \$93 \$0A \$00 \$A0**

After the supported protocols are determined, command **\$03** should be sent to the VIA to determine the current protocol. The VIA can only communicate using one protocol at any time.

Requesting Data

Once the current protocol is verified, data can be requested from the vehicle. This can be done by sending a **\$40** request to the VIA. Command **\$40** will pass a message to the vehicle bus. For information on data to send to the vehicle refer to the book HS-3000 written by the Society of Automotive Engineers (SAE) <http://www.sae.org>.

In this example RPM is requested from the vehicle. Note that the protocol on this vehicle is ISO9141. The following string will be sent to the VIA:

\$01 \$01 \$40 \$05 \$68 \$6A \$F1 \$01 \$0C \$17

Breakdown of the message:

\$01 - Start of Packet

\$01 - Number of Control Bytes

\$40 - Command \$40 for LDV: *Send Functionally Addressed Message (J1979 Command) to Bus*

\$05 - Number of Data Bytes to send to vehicle bus.

\$68 \$6A \$F1 \$01 \$0C – Message to be sent to the vehicle bus. The LDV hardware will append a checksum to this message as required by the vehicle.

\$17 - Checksum

The VIA will respond with the following message:

\$01 \$01 \$C0 \$07 \$48 \$6B \$D1 \$41 \$0C \$00 \$00 \$9A

Breakdown of the response:

\$01 - Start of Packet

\$01 - Number of Control Bytes

\$C0 - Control byte. The control byte in the response from the LDV are \$80 greater than the corresponding request ($\$40 + \$80 = \$C0$).

\$07 - Number of Data bytes returned from the vehicle.

\$48 \$6B \$D1 \$41 \$0C \$00 \$00 - Response from the vehicle.

\$9A - Checksum

In this case the RPM is returned in the last two bytes of the vehicle response. The RPM is 0.



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Broadcasting

Broadcasting mode is only implemented for the J1850VPW protocol. The LDV is capable of transmitting one message at a specified interval. Before the LDV can accomplish this task the message must be defined and the interval rate must be set. This is done through the use of commands **\$16** and **\$17**. Once commands **\$16** and **\$17** are sent, commands **\$1C** and **\$1D** can be used to enable and disable broadcasting.

In this example RPM will be requested from the vehicle. This time the LDV will be configured to ask for the RPM from the vehicle every 8 seconds.

Command 1:

\$01 \$02 \$16 \$01 \$05 \$68 \$6A \$F1 \$01 \$0C \$EF

Command 2:

\$01 \$02 \$17 \$0A \$00 \$24

Command 3:

\$01 \$01 \$1C \$00 \$1E

Command 1 is used to set the broadcast message. Note that the message being broadcasted is the same message used above to get the RPM.

Breakdown of command 1:

- \$01** - Start of Packet
- \$02** - Number of Control Bytes
- \$16** - First Control byte. Command to set broadcast message
- \$01** - Enable filters with broadcast message. The LDV will only return the response to the broadcast message.
- \$05** - Number of Data bytes (Length of message for J1979 bus)
- \$68 \$6A \$F1 \$01 \$0C**
- \$EF** - Checksum

Command 2 is used to set the interval that the broadcast message is sent at. The broadcast interval is set to 5 seconds. To determine the interval in seconds multiply the value sent to the device by 0.524288.

Breakdown of command 2:

- \$01** - Start of Packet
- \$02** - Number of Control Bytes (Note there are two control bytes)
- \$17** - First control byte. Command to set broadcast interval
- \$0A** - Second control byte. Broadcast interval
- \$00** - Number of data bytes to be transmitted to the vehicle. (None)
- \$24** - Checksum

In this case the timeout is set to 5.24288 seconds. That the value sent to the LDV as the broadcast interval is **\$0A**. $\$0A * 0.524288 = 5.24288 \text{ sec}$.

The broadcast message is enabled by sending Command 3.

Breakdown of command 3:

- \$01** - Start of Packet
- \$01** - Number of Control Bytes
- \$1C** - Command to enable broadcast mode.
- \$00** - Number of data bytes to be transmitted to the vehicle. (None)
- \$1E** - Checksum

When all three messages have been transmitted to the LDV, the broadcast messages will begin transmitting.



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Via LDV Protocol

The LDV protocol is used to communicate with the LDV. All commands sent to the LDV as well as all bus traffic returned by the LDV are formatted in this style.

Byte	Byte	Bytes	Byte	Bytes	Byte
Start of Frame	Control Length	Control Bytes	Data Length	Data Bytes	Checksum

Start of Frame (SOF) - \$01

Control Length - The length of the control bytes.

Control bytes - Internal commands used by the VIA.

Data Length - This specifies the number of data bytes to be sent to the vehicle. A length of zero may be used in cases where there is no message to be transmitted to the vehicle.

Data Bytes - This is the data that is sent to the vehicle bus.

Checksum - This is the LSB of the sum of all bytes including SOF, Control length, Control bytes, Data length, and Data bytes.

Autodetect

Because the LDV devices contain support for the SCI bus, the protocol autodetect sequence does not conform to SAE recommendations. Autodetect is initiated by rebooting the LDV. Autodetect does not run on an initial power up. Before the autodetect has been run the current and available protocols will respond as 0.

- 1.) Test for CAN protocol (Only in V3.00 firmware and higher)
- 2.) Test J1850VPW, if present go to step 5
- 3.) Test J1850PWM, if present then exit the autodetect routine.
- 4.) If SCI autodetect is disabled(Command \$30) then go to 7.
- 5.) Delay for 5 Seconds with the SCI bus selected
 - a. The SCI RX is shared with the ISO-9141 TX/RX pin. The hardware switches between a 5V pull-up for SCI and a Vehicle Battery pull-up for ISO-9141.
- 6.) Test SCI
 - a. Since the SCI bus never needs initializing the test procedure simply sends a mode 10 request to the SCI bus. The LDV will send this request 64 times at a 200mS interval. If there is a response to the mode 10 request the LDV will stop sending requests. The reason for this implementation is due to certain vehicles not behaving correctly when switching between ISO-9141 and SCI.
 - b. If J1850VPW was detected in step 1 then exit the autodetect routine.
- 7.) Delay for 5 seconds with the ISO9141-2 bus selected
- 8.) Test ISO9141-2 using 5-baud init. If ISO9141-2 is present then exit the autodetect routine.



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- a. The autodetect sequence will check the keywords returned to determine if the protocol is ISO9141-2 or KWP2000.
 - b. The 5-baud init will use address \$33h.
- 9.) Delay for 5 seconds.
- 10.) Test KWP2000 using fast initialization.

Monitor Mode

Command 43 can be used to monitor all of the traffic on the vehicle bus. To enable monitor mode simply send a command 43 to the LDV.

e.g.

\$01 \$01 \$43 \$05 \$68 \$6a \$f1 \$01 \$00 \$0E

Command 43 will disable all of the filters that the LDV uses to determine if a message is to be returned to the PC. The LDV will return all bus traffic to the PC until the filters are re-enabled by sending a command 40 or 41.

CAN Support

The V3.00 LDV is capable of communicating with the CAN protocol at 250 & 500 Kbps with both 11 bit standard identifiers and 29 bit extended identifiers.

Messaging

To send a CAN command to the vehicle, first check the supported protocol. The supported protocol will indicate whether the vehicle supports standard or extended identifiers. Commands \$40 & \$41 can be used to transmit data to the vehicle. Commands \$40 should be used for functionally addressed messages, while command \$41 should be used with physically addressed messages. Both commands will only return responses to the requested message.

The LDV is setup by default to remove the PCI byte(s) from all CAN Single, First, and Consecutive frames returned from the vehicle. Command \$35 can be sent to the LDV to disable this feature. This command must be sent every time the LDV is powered/rebooted.

The LDV is setup by default to remove the extra bytes at the end of a CAN frame. Command \$36 can be sent to the LDV to disable this feature. This command must be sent every time the LDV is powered/rebooted.

CAN messages are transmitted by sending the CAN identifier and then the CAN data field. The host is responsible for generating the PCI data byte. Refer to ISO standard 15765-4 for CAN frame information.

Example: Mode 1 Pid 0 Functional

Command to TX:

\$01 \$01 \$40 \$05 \$07 \$DF \$02 \$01 \$00 \$30

Response from ECU #1:

\$01 \$01 \$C0 \$05 \$07 \$E8 \$41 \$00 \$XX \$XX \$XX \$XX \$CS

Note that there is no PCI byte on the return CAN message. Also note that the extra bytes have been removed from the end of the CAN Frame. The \$XX bytes are the return data from the request, and the \$CS byte is the checksum.



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CAN messages that have a multi-frame response will be returned in multiple responses from the LDV. By default, they will have the PCI bytes and extra pad bytes removed.

Example: Mode 9 Pid 2 Functional (Get VIN Request)

Command to TX:

\$01 \$01 \$40 \$05 \$07 \$DF \$02 \$09 \$02 \$3A

Response from ECU #1:

\$01 \$01 \$C0 \$08 \$07 \$E8 \$49 \$02 \$01 \$XX \$XX \$XX \$CS

\$01 \$01 \$C0 \$09 \$07 \$E8 \$XX \$XX \$XX \$XX \$XX \$XX \$XX \$CS

\$01 \$01 \$C0 \$09 \$07 \$E8 \$XX \$XX \$XX \$XX \$XX \$XX \$XX \$CS

Flow Control:

When the LDV receives a first frame message from another CAN node, it will automatically transmit a flow control frame to the CAN network. The CAN flow control frame transmitted is physically addressed.

Standard ID: Flow control address will be sent to the received first frame address minus 8.

Extended ID: Flow control address will be sent to the same address as the previous request.



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LDV Commands

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\$00 Request Firmware Version

Command to Send:

\$01 \$01 \$00 \$00 \$02

You will receive the following:

\$01 \$04 \$80 \$XX \$YY \$ZZ \$00 \$CS

Where the Version is XX.YYZZ

XX = Major Revision

YY = MSB Minor Revision

ZZ = LSB Minor Revision

\$01 Request Firmware Date

Command to Send:

\$01 \$01 \$01 \$00 \$03

You will receive the following:

\$01 \$04 \$81 \$YY \$MM \$DD \$00 \$CS

Date = MM/DD/YY

YY = Year

MM = Month

DD = Day

\$02 Request LDV Model Number

This command will return the model number (LDV100P1, LDV200P1, etc.) in an ASCII string.

Command to Send:

\$01 \$01 \$02 \$00 \$04

You will receive the following:

\$01 \$LN \$82 \$XX ... \$XX \$00 \$CS

\$XX ... \$XX = Model number.

\$LN = Length of model number + 1 for \$82 (3rd byte)

Example:

\$01 \$09 \$82 \$4C \$44 \$56 \$31 \$ 32 \$33 \$50 \$31 \$00 \$89

Model Number = LDV123P1



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\$03 Request Current Protocol

When multiple protocols are detected on a vehicle, only one protocol may be active at any time. The active protocol is chosen so that an OBDII protocol is selected first. CAN(J2284) has a lower priority than other OBDII protocols so it will not be the current protocol if CAN(J2284) and another protocol is detected.

Command to Send:

\$01 \$01 \$03 \$00 \$05

You will receive the following:

\$01 \$02 \$83 \$XX \$00 \$CS

Protocol = XX

XX = 0 - No Protocol Selected
 XX = 1 - J1850VPW
 XX = 2 - J1850PWM
 XX = 3 - ISO9141-2
 XX = 4 - Chrysler SCI
 XX = 5 - KWP2000 (ISO14230-4)
 XX = 6 - CAN(J2284) using 11-bit Identifier-500Kbps
 XX = 7 - CAN(J2284) using 29-bit Identifier-500Kbps
 XX = 8 - CAN(J2284) using 11-bit Identifier-250Kbps
 XX = 9 - CAN(J2284) using 29-bit Identifier-250Kbps
 XX = A - J1708*
 XX = B - J1939*
 XX = C - ALDL**
 XX = D - Ford UBP**
 XX = E - CCD**

* Implemented on HDV100A1

** Not yet Implemented

New in Version 3.00

\$04 Request VIA Serial Number

Command to Send:

\$01 \$01 \$04 \$00 \$06

You will receive the following:

\$01 \$0B \$84 \$XX \$00 \$CS

The serial number is ten bytes long and returned as ASCII characters.

\$05 Request Legacy Firmware Version

Command to Send:

\$01 \$0B \$05 \$73 \$00 \$00 \$00 \$00 \$00 \$00 \$00 \$80 \$00 \$04

You will receive the following:

\$01 \$0B \$85 \$MM \$DD \$MA \$M1 \$M2 \$MO \$00 \$00 \$00 \$00 \$00 \$04

This command is present to support old versions of the hardware. Software not written to support legacy hardware should use only the Version and Model Number commands. If you do not need reverse compatibility with older hardware units, do not use this command.



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\$06 Read Baud Rate Divisor

Not used in USB version.

Command to Send:

\$01 \$01 \$06 \$00 \$08

You will receive the following:

\$01 \$03 \$86 \$MSB \$LSB \$00 \$CS

This command reads the baud rate divisor bytes from the VIA adaptor. The power-up default data rate is 19.2kbaud, which has the following baud rate divisor:

MSB = 00

LSB = 0C

\$07 Set Baud Rate Divisor

Not used in USB version.

Command to Send:

\$01 \$03 \$07 \$MSB \$LSB \$00 \$CS

You will receive the following:

\$01 \$03 \$87 \$MSB \$LSB \$00 \$CS

Baud Rate	Decimal Divisor	MSB (hex)	LSB (hex)
9600	24	00 hex	18 hex
19200	12	00 hex (default)	0C hex (default)
38,400	6	00 hex	06 hex
57,600	4	00 hex	04 hex
115,200	2	00 hex	02 hex

\$08 Read ISO/KWP Baud Rate Divisor

Command to Send:

\$01 \$01 \$08 \$00 \$0A

You will receive the following:

\$01 \$02 \$88 \$XX \$00 \$CS

Baud Rate = $4000000 / (64 * (1 + XX))$



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\$09 Set ISO/KWP Baud Rate Divisor

Command to Send:
\$01 \$02 \$09 \$XX \$00 \$CS

You will receive the following:
\$01 \$02 \$89 \$XX \$00 \$CS

Baud Rate = $4000000/(64*(1+XX))$

Example values for \$XX

0	62.5k	
1	31.2k	
2	20.8k	
3	15.625k	
5	10.4k	*(ISO Standard)
7	7812.5	

The maximum value of \$XX is 255 which corresponds to 244 baud.

\$0F Set SCI Baud Rate

Command to Send:
\$01 \$02 \$0F \$XX \$00 \$CS

You will receive the following:
\$01 \$02 \$8F \$XX \$00 \$CS

\$XX	
0	7812.5 bps
1	62.5 kbps

\$13 Get Interfaces Supported by the Vehicle

This command will return \$00 as the \$XX byte until the autodetect routine has been run. To initiate the autodetect routine send a command \$22.

Command to Send:
\$01 \$01 \$13 \$00 \$CS

You will receive the following:
\$01 \$02 \$93 \$XX \$00 \$CS

\$XX Supported Protocols

- Bit 7-J1850VPW
- Bit 6-J1850PWM
- Bit 5-ISO-9141
- Bit 4-Chrysler SCI
- Bit 3-ISO-14230 (Keyword Protocol 2000)
- Bit 2-CAN(J2284) at 500Kbps using 11-bit Identifier
- Bit 1-CAN(J2284) at 500Kbps using 29-bit Identifier
- Bit 0-Other(Send Command \$14 for more info)



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\$14 Get Additional Interfaces Supported by the Vehicle

This command will return \$00 as the \$XX byte until the autodetect routine has been run. To initiate the autodetect routine send a command \$22. This command will not report any supported protocols if command \$13 bit 0 is 0.

Command to Send:

\$01 \$01 \$14 \$00 \$CS

You will receive the following:

\$01 \$02 \$94 \$XX \$00 \$CS

\$XX Supported Protocols

Bit 7-CAN(J2284) at 250Kbps using 11-bit identifier

Bit 6-CAN(J2284) at 250Kbps using 29-bit identifier

Bit 5

Bit 4

Bit 3

Bit 2

Bit 1

Bit 0

\$16 Set Broadcast Message(J1850VPW Only)

Command to Send:

\$01 \$02 \$16 \$FE \$NB \$XX ... \$XX \$CS

You will receive the following confirming the Broadcast message was set:

\$01 \$01 \$96 \$NB \$XX ... \$XX \$CS

Responses to Broadcast Messages will be in the following format:

\$01 \$01 \$96 \$NB \$YY ... \$YY \$CS

\$FE = Filter enable.

0 – Send the broadcast message without changing the previously set filters.

1 – Send the broadcast message without any filters.

2 – Send the broadcast message with filters set to only allow the broadcast message's response to be returned.

\$NB = Number of Bytes to Transmit or number of bytes received

\$XX... \$XX = The broadcast message to be transmitted to the vehicle.

\$YY... \$YY = The response to the broadcast message from the vehicle.

In version 2.00 hardware, the set broadcast message is a 1 byte command. There is no option to change the filters.



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\$17 Set Broadcast Interval(J1850VPW Only)

Command to Send:
\$01 \$02 \$17 \$XX \$00 \$CS

You will receive the following:
\$01 \$02 \$97 \$XX \$00 \$CS

\$XX is the broadcast interval in multiples of 0.524288 seconds.

\$18 Enable Keep Alive

Command to Send:
\$01 \$01 \$18 \$00 \$1A

You will receive the following:
\$01 \$01 \$98 \$00 \$9A

\$19 Disable Keep Alive

Command to Send:
\$01 \$01 \$19 \$00 \$1B

You will receive the following:
\$01 \$01 \$99 \$00 \$9B

\$1C Enable Broadcast Mode(J1850VPW Only)

Command to Send:
\$01 \$01 \$1C \$00 \$1E

You will receive the following:
\$01 \$01 \$9C \$00 \$9E

Note: The Broadcast Message (Command \$16) and Broadcast Interval (Command \$17) must be set before Enabling Broadcast Mode.

\$1D Disable Broadcast Mode(J1850VPW Only)

Command to Send:
\$01 \$01 \$1D \$00 \$1F

You will receive the following:
\$01 \$01 \$9D \$00 \$9F



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\$1E Enable Time Stamping (J1850 VPW & CAN Protocols Only)

Command to Send:
\$01 \$01 \$1E \$00 \$20

You will receive the following:
\$01 \$01 \$9E \$00 \$A0

Once enabled all data from the vehicle will include a 4 byte timestamp. The timestamp is a rolling counter, and can be found in the control bytes of each response.

Each <XX> refers to 1 byte.
<01><Command Response><MSB><XX><XX><LSB>

Timestamp LSB resolution: 8 microseconds
 LSB + 1 resolution: 2.04 milliseconds
 LSB + 2 resolution: 0.5202
 MSB resolution: 132.651 seconds

The power-up default mode is Timestamp Disabled

\$1F Disable Time Stamping

Command to Send:
\$01 \$01 \$1F \$00 \$21

You will receive the following:
\$01 \$01 \$9F \$00 \$A1

\$21 Reinitialize Vehicle Communications

Command to Send:
\$01 \$01 \$21 \$00 \$23

You will receive the following if change was successful:
\$01 \$01 \$A1 \$00 \$A3

This command reinitializes communications on the currently active bus. It should be called after commanding the LDV to change to a new protocol with command \$23 (for example, after switching from ISO to SCI mode).

Note: If the current protocol is set to SCI and ISO is also present, the firmware will insert a 5 second delay before reinitializing the SCI bus. This is present to allow the ISO bus to time-out before initializing the SCI bus. The firmware will then attempt to reinitialize the SCI bus by sending 64 mode 10 requests to the vehicle at 200mS intervals. The LDV will stop sending requests after it receives a response.

This command may take up to 16 seconds to complete.



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\$22 Reboot LDV

Command to Send:
\$01 \$01 \$22 \$00 \$24

You will receive the following if change was successful:
\$01 \$01 \$A2 \$00 \$A4

This command is not equivalent to a power up reset. This command will reboot the LDV and set the LDV to start the autodetect routine on startup. The autodetect command can take up to 30 seconds to complete depending on the available protocols.

Extended Reboot Command:

Command to Send:
\$01 \$02 \$22 \$XX \$00 \$CS

You will receive the following if change was successful:
\$01 \$02 \$A2 \$XX \$00 \$CS

Reboot Mode = XX

This byte is bitmapped. Any of the following bits can be set in any combination to achieve the desired action.

- XX = 00 – Normal Reboot (Initiate Full Autodetect)
- Bit 0 – Don't Detect SCI(Faster Autodetect)
- Bit 1 – If CAN is detected exit Autodetect Routine

In a normal reboot if CAN is detected, the hardware will attempt to detect any other protocols present. Setting the mode to 02 will force the firmware to stop the autodetect routine if CAN is detected.

\$23 Change Current Protocol

Command to Send:
\$01 \$02 \$23 \$XX \$00 \$CS

You will receive the following if change was successful:
\$01 \$02 \$A3 \$XX \$00 \$CS

Protocol = XX

- XX = 0 - No Protocol Selected
- XX = 1 - J1850VPW
- XX = 2 - J1850PWM
- XX = 3 - ISO9141-2
- XX = 4 - Chrysler SCI
- XX = 5 - KWP2000 (ISO14230-4)
- XX = 6 - CAN(J2284) using 11-bit Identifier @ 500Kbps #
- XX = 7 - CAN(J2284) using 29-bit Identifier @ 500Kbps #
- XX = 8 - CAN(J2284) using 11-bit Identifier @ 250Kbps #
- XX = 9 - CAN(J2284) using 29-bit Identifier @ 250Kbps #
- XX = A - J1708*
- XX = B - J1939*
- XX = C – ALDL**
- XX = D - Ford UBP**
- XX = E – CCD**

* Implemented on HDV100A1

** Not yet Implemented

New in Version 3.00

You will receive the following if change was unsuccessful.
\$01 \$02 \$A3 \$XX \$00 \$CS

Note: Command 21, reinitialize vehicle communications needs to be called after a command 23 is called.



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\$25 Set Low Speed J1850VPW Mode

This command will set the J1850VPW transmission speed to 10.4 Kbps. If the LDV is already in the low speed mode, you will receive a successful response.

Command to Send:
\$01 \$01 \$25 \$00 \$27

You will receive the following if change was successful:
\$01 \$01 \$A5 \$00 \$A7

\$26 Set High Speed J1850VPW Mode

This command will set the J1850VPW transmission speed to 41.6 Kbps. If the LDV is already in the high speed mode, you will receive a successful response.

Command to Send:
\$01 \$01 \$26 \$00 \$28

You will receive the following if change was successful:
\$01 \$01 \$A6 \$00 \$A8

\$31 Vehicle Power Present(USB Only)

Use this command to determine whether vehicle power is present. This command is useful because the LDV's processor is powered from the USB bus while the vehicle interface circuitry is powered from the vehicle. The LDV can communicate with the PC even if the LDV is not connected to a vehicle.

Command to Send:
\$01 \$01 \$31 \$00 \$33

You will receive the following if transmit and receive were successful:
\$01 \$02 \$B1 \$VP \$00 \$CS

\$VP = Vehicle Power
<00> = No Power
<01> = Power Present

\$35 Set CAN PCI byte removal

Use this command to disable the removal of the PCI byte(s) on all Single, First, and Consecutive CAN frames. This command is only effective for the current power on cycle. If the LDV is rebooted this command must be sent again in order to receive the PCI bytes.

Command to Send:
\$01 \$02 \$35 \$XX \$00 \$CS

You will receive the following if transmit and receive were successful:
\$01 \$02 \$B5 \$XX \$00 \$CS

\$XX = Removal Status
0 = Remove PCI
1 = Don't remove PCI



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\$36 Disable Trailing CAN byte removal

Use this command to disable the removal of extra CAN bytes at the end of a CAN frame. This command is only effective for Single Frame messages where the data length is provided in the PCI byte. This command is only effective for the current power on cycle. If the LDV is rebooted this command must be sent again in order to receive the PCI bytes.

Command to Send:

\$01 \$02 \$36 \$XX \$00 \$CS

You will receive the following response:

\$01 \$02 \$B6 \$XX \$00 \$CS

\$XX = Removal Status

0 = Remove Trailing Bytes

1 = Don't remove Trailing Bytes

\$3C KWP_Fast_Init

Use this command to send a KWP Fast init sequence onto the currently selected ISO bus.

Command to Send:

\$01 \$03 \$3C \$SA \$TA \$00 \$CS

You will receive the following response:

\$01 \$03 \$BC \$SA \$TA \$00 \$CS

\$SA = Source Address

\$TA = Target Address

The \$SA and \$TA fields define which source address and target address to use in the KWP fast init sequence.



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\$40 Send Functionally Addressed Message with Filter (J1979 Command) to Bus

This command will transmit your functionally addressed message to the vehicle bus and only return messages in response to this request. All other bus traffic is filtered. Note that if filters had been turned off (using the \$43 command), sending the \$40 command will re-instate the filtered mode. SCI communications do not use filters and sending a SCI message using command 40 will turn off all filters.

The CAN Data Length Control (DLC) parameter is fixed at 8 bytes long. If a CAN message is sent to the LDV without the full 8 data bytes, then the LDV will add \$FF bytes to the end of the message making it 8 bytes long. Refer to "CAN Support" section at the beginning of this document for more information on assembling and receiving a CAN message.

Command to Send:

```
$01 $01 $40 $LN $DATA $CS
```

\$LN = Length of the Data bytes to be transmitted to the vehicle.

\$DATA = The data to be transmitted to the vehicle bus.

You will receive the following if transmit and receive were successful:

```
$01 $01 $C0 $LN $DATA $CS
```

\$LN = Length of the response in bytes.

\$DATA = The message returned from the vehicle.



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\$41 Send Physically Addressed Message (J2190 Command) to Bus

This command will transmit your physically addressed message to the vehicle bus and only return messages in response to this request. All other bus traffic is filtered. Note that if filters had been turned off (using the \$43 command), sending the \$41 command will re-instate the filtered mode. SCI communications do not use filters and sending a SCI message using command 41 will turn off all filters.

Command to Send:

```
$01 $01 $41 $LN $DATA $CS
```

\$DATA = Data to be transmitted to the vehicle.

You will receive the following if transmit and receive were successful:

```
$01 $01 $C1 $XX $DATA $CS
```

The CAN Data Length Control (DLC) parameter is fixed at 8 bytes long. If a CAN message is sent to the LDV without the full 8 data bytes, then the LDV will add \$FF bytes to the end of the message making it 8 bytes long. Refer to "CAN Support" section at the beginning of this document for more information on assembling and receiving a CAN message.

This message can be sent with three control bytes for a CAN vehicle. When sent with three control bytes, the first control byte will specify command 0x41, and the second two control bytes will specify the return address filter to use for a CAN 11-bit response.

Command to Send:

```
$01 $03 $41 $ADDR $LN $DATA $CS
```

\$ADDR = Two bytes containing the return address filter.

\$DATA = Data to be transmitted to the vehicle.

You will receive the following if transmit and receive were successful:

```
$01 $01 $C1 $XX $DATA $CS
```

\$43 Send Message without Filter to Bus

This command will transmit your functionally addressed message to the vehicle bus and return messages in response to this request in addition to all other bus traffic. Sending a \$43 request one time will turn off all filters until a \$40 command is received by the LDV.

Command to Send:

```
$01 $01 $43 $LN $DATA $CS
```

\$LN = Length of \$DATA in bytes

\$DATA is the message to be passed to the vehicle bus.

\$CS is a message checksum, which is the least significant byte of the sum of the entire message in hex.

Response: You will receive the following from the LDV if the transmit was successful. Additional messages may follow.

```
$01 $01 $C3 $LN $RESP $CS
```

\$LN = Length of \$RESP in bytes

\$RESP is the data read from the vehicle bus.



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\$FF General Command Error

You will receive the following if a general command error occurs:

\$01 \$02 \$FF \$XX \$00 \$CS

Where XX =

- \$00 = General Error
- \$01 = Too Many Control Bytes (Out of Range)
- \$02 = Too Many Data Bytes (Out of Range)
- \$03 = Incorrect Checksum
- \$04 = Invalid Command
- \$05 = Invalid Start of Frame
- \$06 = Command Parameters out of Range
- \$07 = Invalid Functional Address Message Format
- \$08 = Invalid Physical Address Message Format
- \$09 = Invalid Protocol Selected
- \$0A = Both Control length and data length are zero
- \$0B = Incorrect Number of Control Bytes (Doesn't match expected value)
- \$0C = Incorrect Number of Data Bytes (Doesn't match expected value)
- \$0D = CAN TX or RX Warning
- \$0E = CAN RX Warning Counter > 95
- \$0F = CAN TX Warning Counter > 95
- \$10 = CAN RX Bus Passive Error Counter > 127
- \$11 = CAN TX Bus Passive Error Counter > 127
- \$12 = CAN TX Bus Off Error Counter > 255
- \$13 = CAN RX Buffer Overflow



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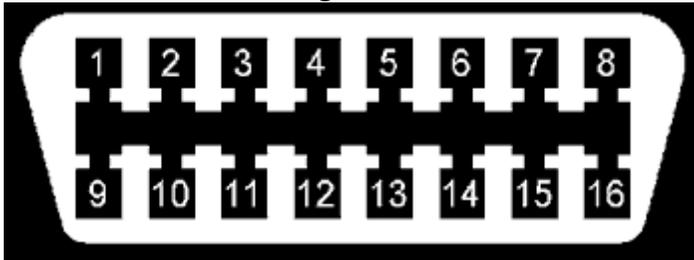
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Hardware Specifications

SAE J1962 Connector Pinout

Pin	Function
1	
2	J1850 Bus (+)
3	
4	Chassis Ground
5	Signal Ground
6	CAN +
7	ISO 9141 K-Line/SCI RX
8	
9	
10	J1850 Bus (-)
11	
12	SCI TX
13	
14	CAN -
15	ISO L Line
16	Power

Connector Pin Numbering



Specifications(Serial)

Dimensions:	4.125 x 1.75 x 0.9 in (10.4 x 4.5 x 2.3 cm)
Weight:	4oz (.11kg), plus cables
RS-232 Connection:	DB9 female, DCE
Bus Connection:	Molded J1962 Connector
Input:	SAE J1850 VPW (Variable Pulse Width Modulation) OBD II Signal Standard SAE J1850 PWM (Pulse Width Modulation) OBD II Signal Standard ISO-9141 OBD II Signal Standard ISO-14230 (Keyword Protocol) OBD II Signal Standard Chrysler SCI - Nonstandard OBDII protocol SAE J2284 (CAN)
Output:	RS-232 serial signal
Converter/PC Cable:	3 Meter Strain-Relieved Serial Cable
External Power:	None required. Draws about 100mA from vehicle cable.
Data Rates:	RS-232: 19200 Default to 115.2k (User selectable) SAE J1850: 10.4k or 41.6k ISO9141: Autodetected ISO14230: 10.4k Chrysler SCI: 7812.5 SAE J2284: 500k
Data Transmission:	Word length 8, no parity, 1 stop bit
Temperature Range:	32° to 158°F (0° to 70°C) non-condensing

Specifications(USB)

Dimensions:	4.85 x 1.80 x 0.95 in (12.3 x 4.6 x 2.4 cm)
USB Connection:	Virtual Serial Port
Bus Connection:	Molded J1962 Connector
Input:	SAE J1850 VPW (Variable Pulse Width Modulation) OBD II Signal Standard SAE J1850 PWM (Pulse Width Modulation) OBD II Signal Standard ISO-9141 OBD II Signal Standard ISO-14230 (Keyword Protocol) OBD II Signal Standard SAE J2284(CAN) Chrysler SCI - Nonstandard OBDII protocol
Output:	Virtual Serial Port on PC
Converter/PC Cable:	3 Meter Strain-Relieved USB Cable
External Power:	None required. Draws power from Vehicle and USB Cable. USB power is <100 mA
Data Rates:	USB: No Baud Rate SAE J1850: 10.4k or 41.6k ISO9141: 10.4k ISO14230: 10.4k Chrysler SCI: 7812.5 SAE J2284: 500k
Temperature Range:	32° to 158°F (0° to 70°C) non-condensing



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