User Manual: How to Program the W213 Instrument Cluster over HSVL

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1 History

Revision	Date	Author, Editor	Reason
1.3	2013-09-24	Florian Schindler, Thomas Rave	initial revision
1.1	2013-10-30	Florian Schindler (Lucian Caprarescu)	Changed types of Maxim chips
1.2	2013-11-26	Florian Schindler	Reason why USB3 adapter does not work. Added hint for image source box version.
1.3	2014-01-17	Florian Schindler	Add hint to start flashing with sequence #1
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3 Terms and Abbreviations

CAN: Controller Area Network

DIP: Dual Inline Package

DVI: Digital visual interface

FHost: PC Software to program electronic control units

HSVL: High Speed Video Link

HUD: head up display

MiB: 2^{20} Bytes = 1048576 Bytes

PIP: PictureInPicture

SPI: Serial Peripheral Interface

W213, BR213: Project name for a Daimler instrument cluster

4 Overview

This document provides a basic overview about the hardware assembly, the software and the settings that are required to program the Daimler BR213 instrument cluster over the PIP/HSVL connector. Furthermore a short introduction into HSVL and the 'end of line' programming work flow will be given. The documentation is only meant as a user manual that shows the procedure of the initial start up and gives an overview over the used hard- and software components, including some hints that should be concerned when using them.

Developers and integrators who want to have a more detailed explanation are invited to have a look at the software system design. Especially for Integrators who want to reuse the HSVL components, there is also a module specification.

Note: HSVL is an equivalent technology to LVDS. HSVL uses a coaxial cable for data transmission, LVDS uses a 4 wire twisted pair cable.

4.1 Reasons to use HSVL

The final version of the Daimler BR213 instrument cluster has a very large external NAND flash (512 MiB), which has to be programmed at the end of the production line and during development. Usually the instrument cluster is programmed with a software called FHost over the CAN bus and/or via SPI (up to E006 hardware), but this will take too much time because of the large external flash (2 - 3 h for CAN only). The other alternative of flashing would be over SPI, but the SPI-connector will be removed in future hardware releases and is not available for the customer. So another way of transferring the data had to be found.

Because the Daimler BR213 instrument cluster offers a HSVL input (for the PiP connection from the Head Unit, it was decided to transmit and program data over HSVL the end of the production line and during development, instead of using the slow CAN connection. The aim of this decision was to increase the programming speed and therewith the production speed of the instrument clusters.

4.2 Introduction into HSVL

HSVL is a differential signaling system that can run at very high speeds. It became popular in the second half of the 1990ies. Its first widespread application was to transport video data from graphic adapters to computer monitors. Nowadays it is also often used to connect displays and multimedia devices in modern cars. The HSVL connection basically consists of two microchips: A serializer and a deserializer. It is recommended that a special cable (e. g. Rosenberger Dacar 548) is used to guarantee a working transmission line between both microchips. Even if there is a HSVL standard and the protocol is defined, it is recommended to use a pair of serializer and deserializer from the same manufacturer, to achieve the highest possible interoperability and data rates.

For the Daimler BR213 instrument cluster a MAX9275 serializer and a MAX9276 deserializer are used. The maximum data rate that can be achieved over the HSVL connection is rated with 2.5 GiBit/s.

5 Initial startup

In this chapter the required soft- and hardware components and their tasks are explained. If you want to start immediately the hardware setup without any further information please directly step to chapter 5.5.

5.1 Hardware requirements

In this chapter the hardware components for programming the Daimler BR213 instrument cluster over HSVL will be introduced.

There is a variety of hardware. Only a subset of it was tested and is confirmed to work by the author. In this document they are labeled with “(approved)”.

5.1.1 PC

To run the software for programming the Daimler BR213 instrument cluster a computer is needed. The recommended operating systems are Windows XP(approved) and Windows7 64 bit(approved) .

5.1.2 USB - DVI graphic adapter

FHost can be used with two different graphic adapters: a ‘Digitus’ USB graphic card, with a ‘Magic Control Technology’ chip and USB 2.0 connector(approved), Model No.: *DA-70832*, (*Fig. 1*). The model used for W222 flashing works.

Fig. 1 - Digitus USB graphic card

There exists a ‘Digitus’ USB graphic cards with USB 3.0 interface, Model No.: *DA-70451*, but **did not it work** at the test-PCs, because of the built-in anti-aliasing.

In some cases the DVI connector of your PC’s graphic card *could* work.

The graphic adapter must be connected to your PC.

To avoid failures, FHostSP only allows selecting *one* of these cards in its configuration. FHost also checks for the correct driver versions and only displays the adapter in its settings, if the correct driver is installed. For the required drivers and software settings see chapter 5.3.1.

5.1.3 DVI cable

To connect the USB – DVI graphic adapter with the Imagesource a DVI-D cable is needed. Normal PC DVI-D cable will do.

5.1.4 Imagesource

5.1.4.1 External Imagesource Configuration

The Imagesource is a special device made by Continental and used during development to test and to flash data. The Imagesource is build up modularly. To support a HSVL output, the HSVL serializer board is built-in the Imagesource. The DVI Input is a default part of the Imagesource that is always available at the main board.

Fig. 2 - Imagesource HSVL (LVDS OUT) output, power supply and power switch

To use the Imagesource for programming, the DVI output of one of the supported graphic adapters (chapter 5.1.2) has to be connected to the DVI IN input of the Imagesource (*Fig. 3*). The LVDS output of the Imagesource (see *Fig. 2*) has to be connected to the amber HSVL input of the Daimler BR213 PC (*Fig. 7*).

Fig. 3 - Imagesource DVI input

The Project must be set to '**E**' by using the switch shown in *Fig. 3*.

The content of the SD card is stored at \\cw01\root\Loc\bbuv\did35794\14_SW\zz_Tools\Imagesource-SD-Card-Contents. It is not possible to flash without SD-card inserted.

Note that Imagesource Boxes, built for **W222 flashing do not work**, because of different LVDS connector.

5.1.4.2 Internal Imagesource Configuration

In case your Imagesource is not working, please double check the internal configuration. You must open the cover to check this.

Step 1. Make sure that the DIP switches are set as in the next image:

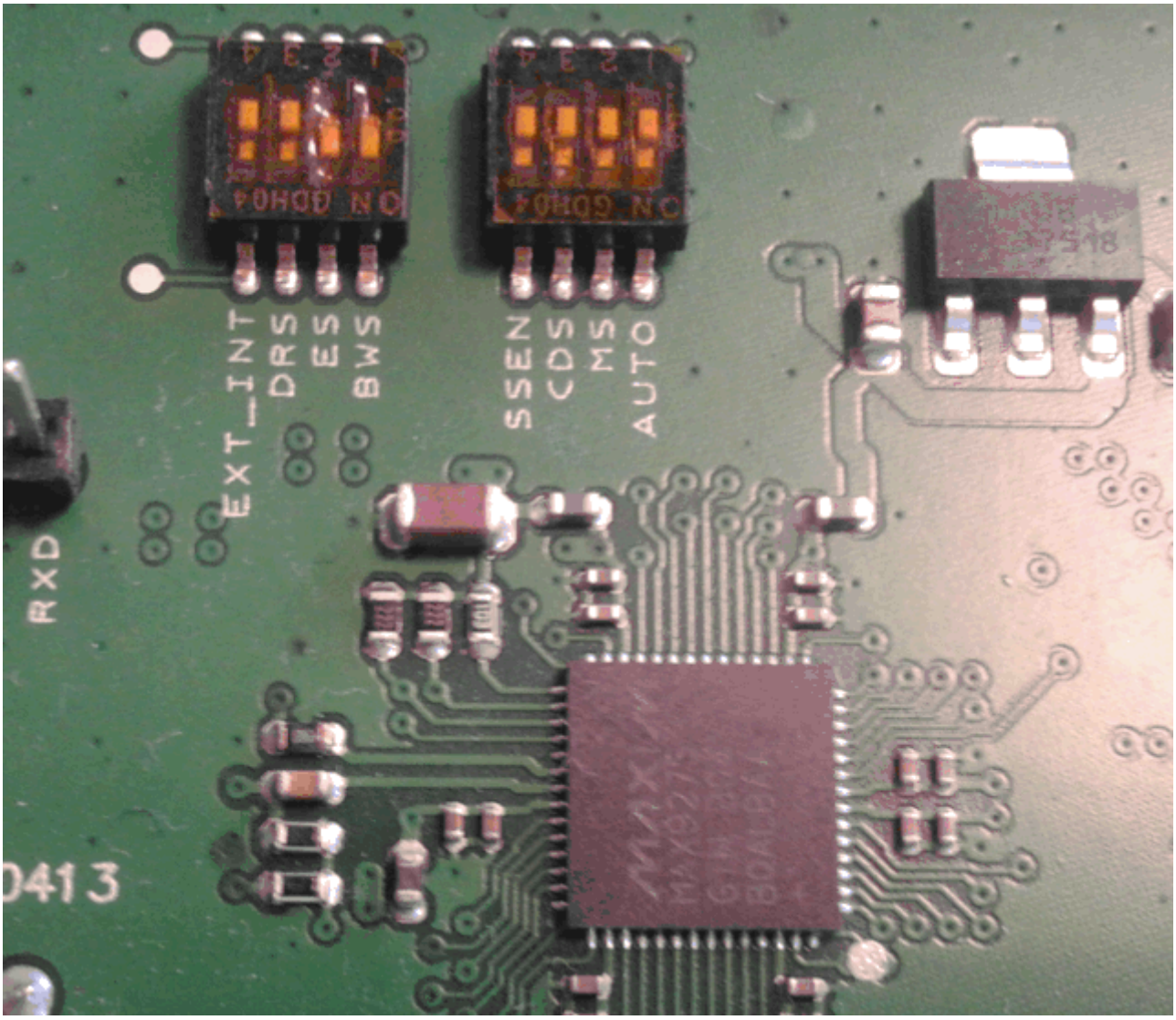

Fig. 4 - DIP switch configuration

Step 2: Configure the box to use the external input (DVI input)
a) Connect the box to the PC via a RS232 (UART) cable (the box has a DB9 connector)
b) Use a serial terminal (like Putty) using a connection with these parameters: 8 bit, no parity, one stop bit, 115200 bps
c) Configure the box to use the external input by entering the "e e" command.

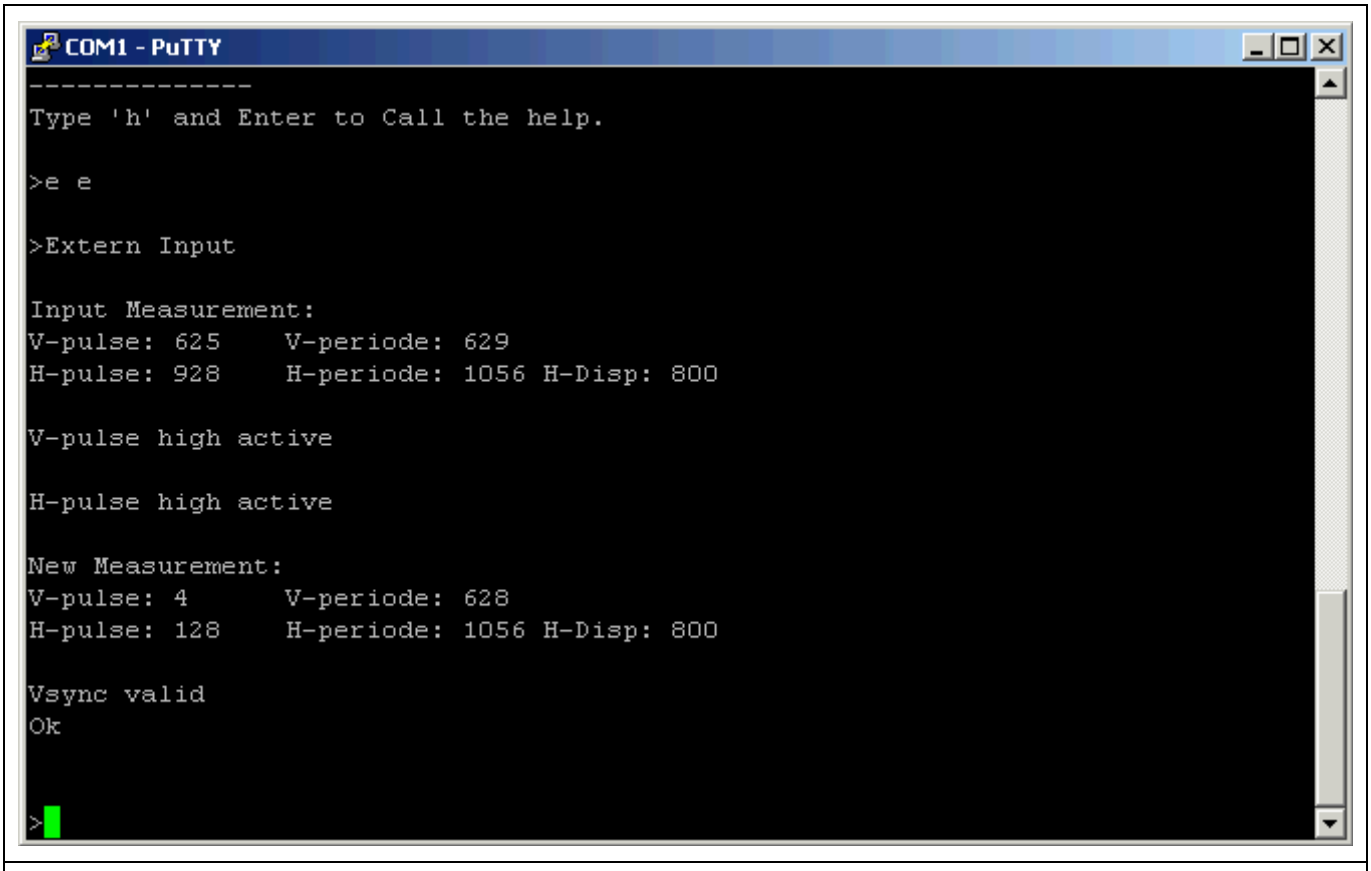

Fig. 5 - Serial settings (1)

d) Make sure that the selected project is configured for a resolution of 800x600 (using the "s" command).

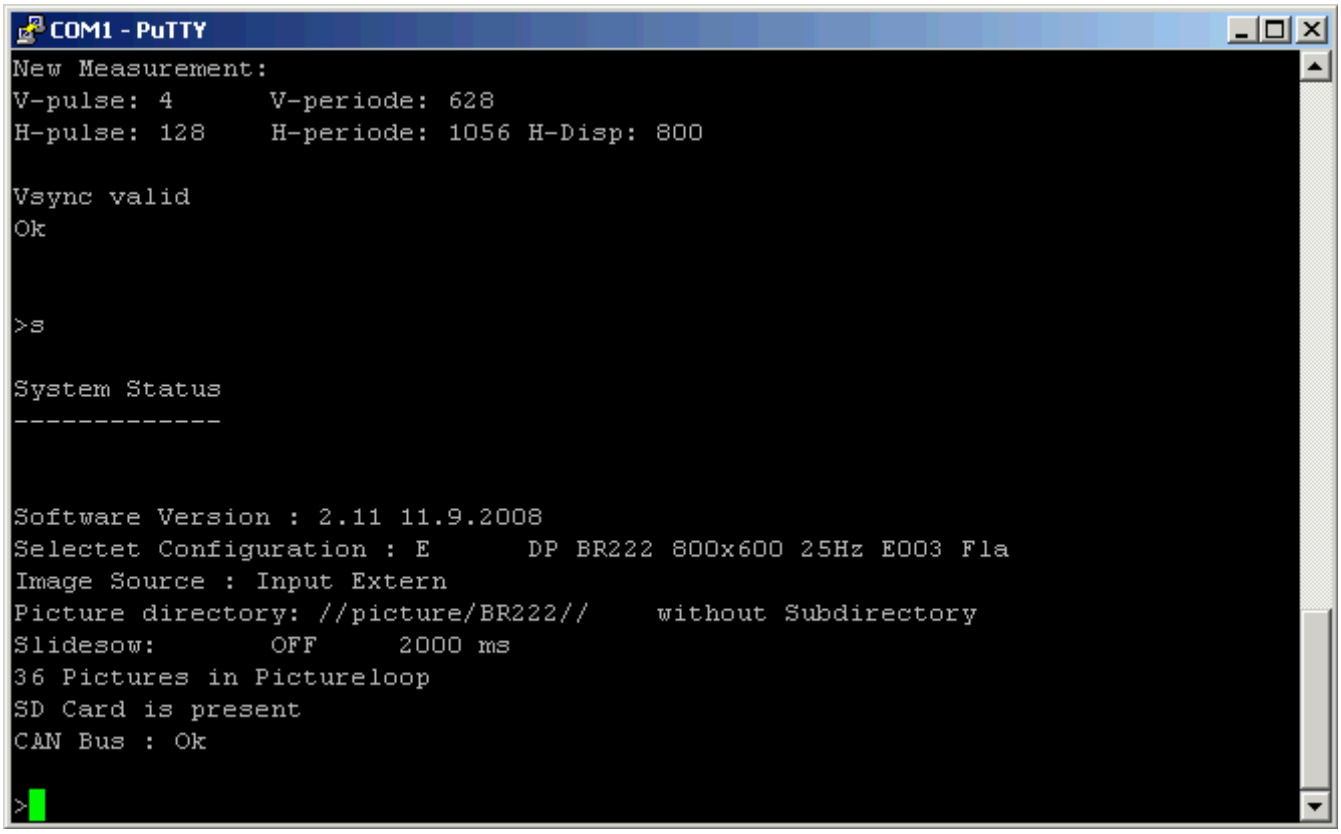

Fig. 6 - Serial settings (2)

WARNING! Sometimes these settings are not kept after a reset! You have to do it every time when you turn on the box.

5.1.5 Daimler BR213 PCB

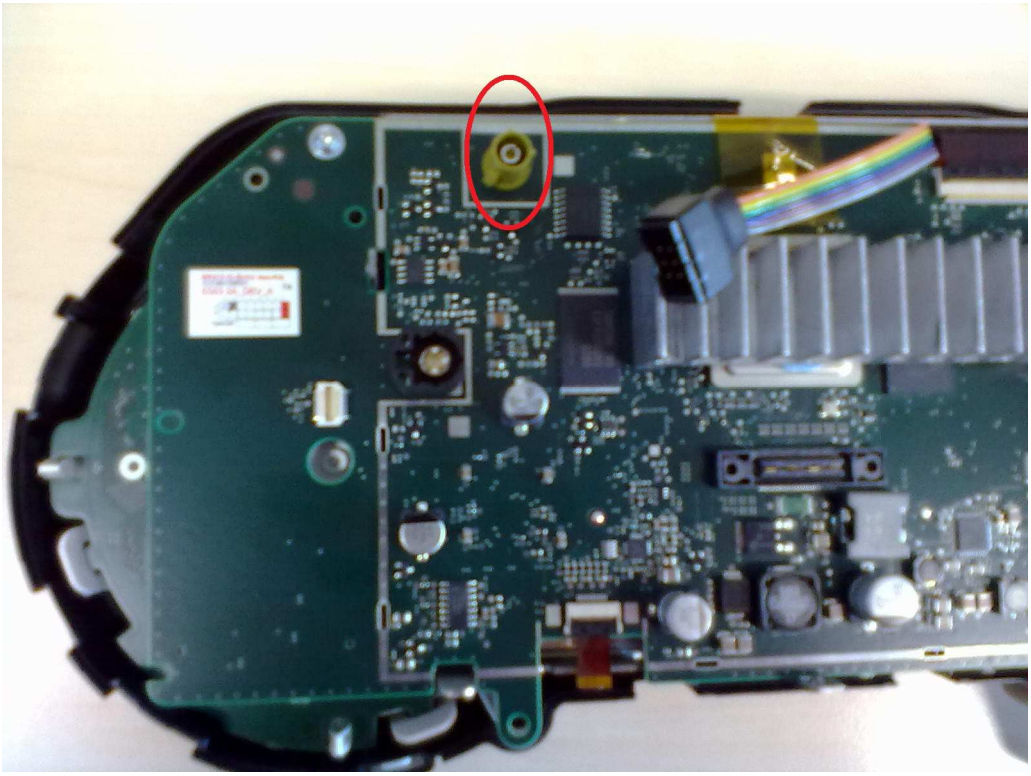

Fig. 7 - Daimler BR213 PCB with amber PiP input connector (encircled in red)

In *Fig. 7* the PCB of the Daimler BR213 instrument cluster is shown. The amber PiP connector is the input.

5.1.6 Power supply

It must be possible to independently toggle the power for the instrument cluster and for the Imagesource. The Imagesource should not be switched on and off with the instrument cluster. The recommended voltage to operate both devices is 13.5 V.

Caution: do not apply more than 16 Volts to the Imagesource. Otherwise it could be destroyed!

5.1.7 CAN adapter

For the connection of the CAN bus a CanCaseXL or a similar CAN device has to be used. At the moment FHost supports the following CAN adapters:

- Can-AC2 (ISA)
- Can-AC2-PCI (PCI)
- CanBoardXL
- CanCard2
- CanCardX (PCMCIA)
- CanCardXL (PCMCIA) (approved)
- CanCardY (PCMCIA)
- CanCaseXL (USB) (approved)
- CanPari (Parallel port – Adapter)
- ValueCan

Fig. 8 - CanCaseXL

For the configurations that need to be made in FHost to communicate over the CAN hardware please see chapter 5.3.1.

5.2 Hardware setup

In *Fig. 9* the complete hardware assembly shows how the introduced components will be connected:

- The CAN interface and the Digitus USB-DVI graphic adapter are connected to the PC via USB (partly visible).
- From the graphic adapter a DVI cable is connected to the DVI input of the Imagesource.
- At the LVDS OUT output of the Imagesource a HSVL cable leads to the HSVL input (amber connector) of the instrument cluster.
- The CAN output of the CAN interface is connected to the wiring harness of the instrument cluster (partly visible).
- Imagesource and instrument cluster are powered by two different outputs of the voltage source and operate at a voltage level of 13.5 V (partly visible).

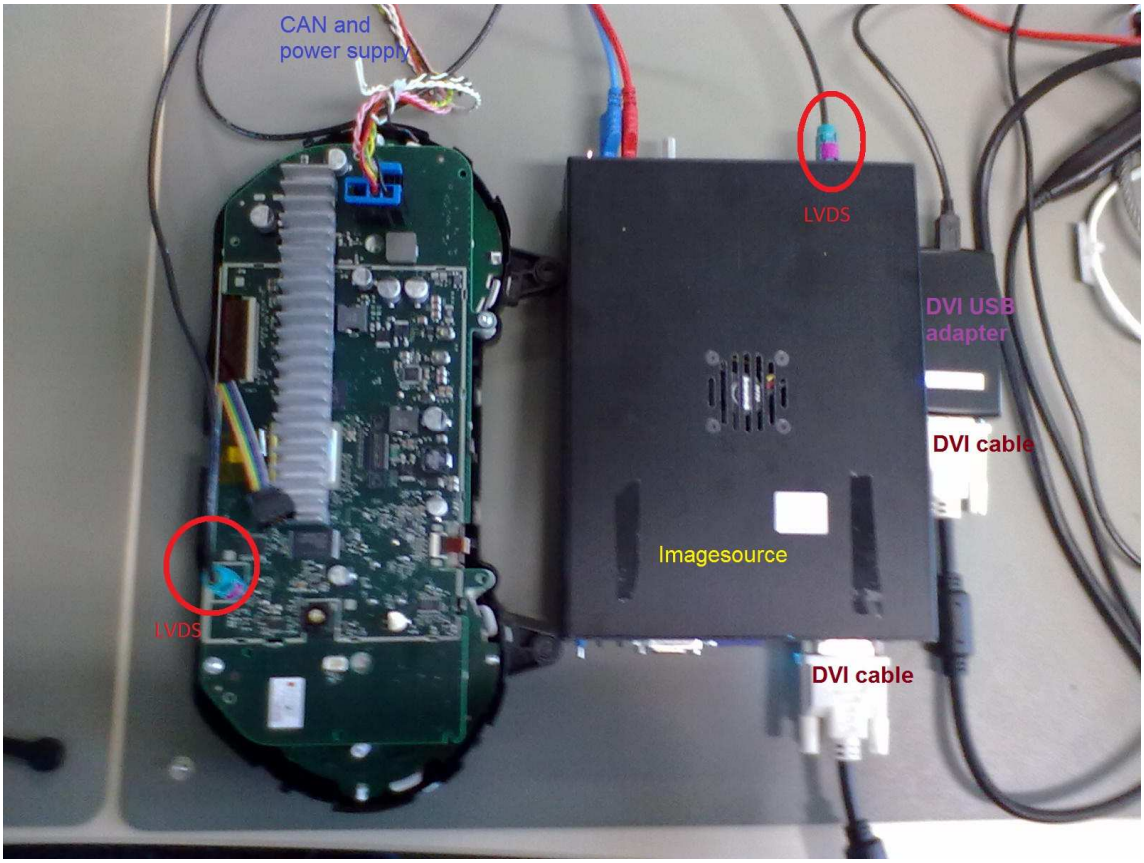

Fig. 9 - Hardware assembly

5.3 Software Requirements

In this chapter the software required software and its settings to program the Daimler BR213 instrument cluster are shown.

5.3.1 Graphic driver

The supported graphic adapters (see chapter 5.1.2) can only be used by FHost, if the correct driver is installed. Both adapters have only been tested with one driver version, so other drivers then the one listed here should not be used:

- Digitus USB graphic adapter: The official name of the driver is '10.01.0105.0159_WHQL'. When this driver is installed, the driver version shown in the system settings is 6.10.10.1004(approved) for Windows XP(approved) and Windows 7 64 bit(approved).

The drivers should be installed before the graphic card is connected to the system.

5.3.2 FHostSP

FHost v06.00.pre02(approved) or later must be used. Previous versions of FHost might work but are strongly discouraged. For the settings that have to be made in FHost please see chapter 5.4.2.

5.4 Software Setup

5.4.1 Graphic Settings

In *Fig. 10* the graphic settings dialog of the driver's toolbar, with the correct configuration is shown.

Make sure the resolution is set to 800x600x32.

After you have powered on the Imagesource make sure that the light blue LED named "DVI lock" is illuminated. If not, click on the "Off" entry.

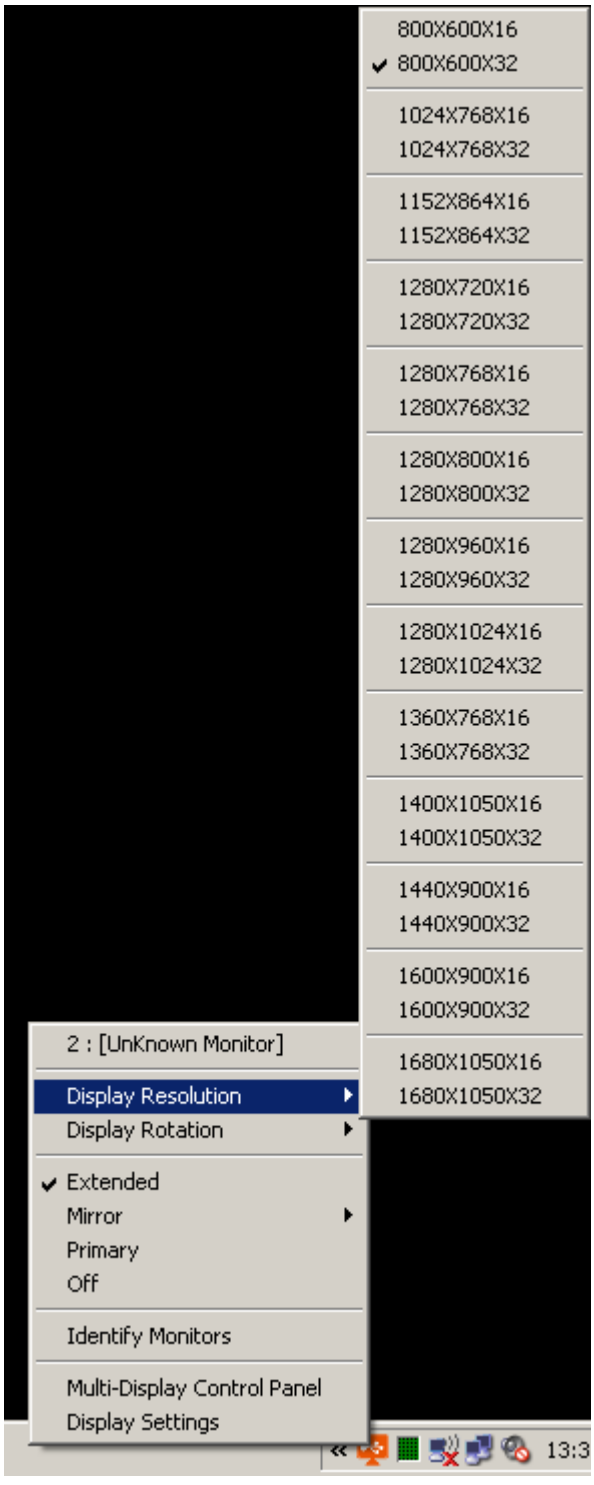

Fig. 10 - Graphic settings

5.4.2 Settings in FHostSP

First open the setup menu and double check that a CAN device is listed and the LVDS (HSVL) hardware appears also.

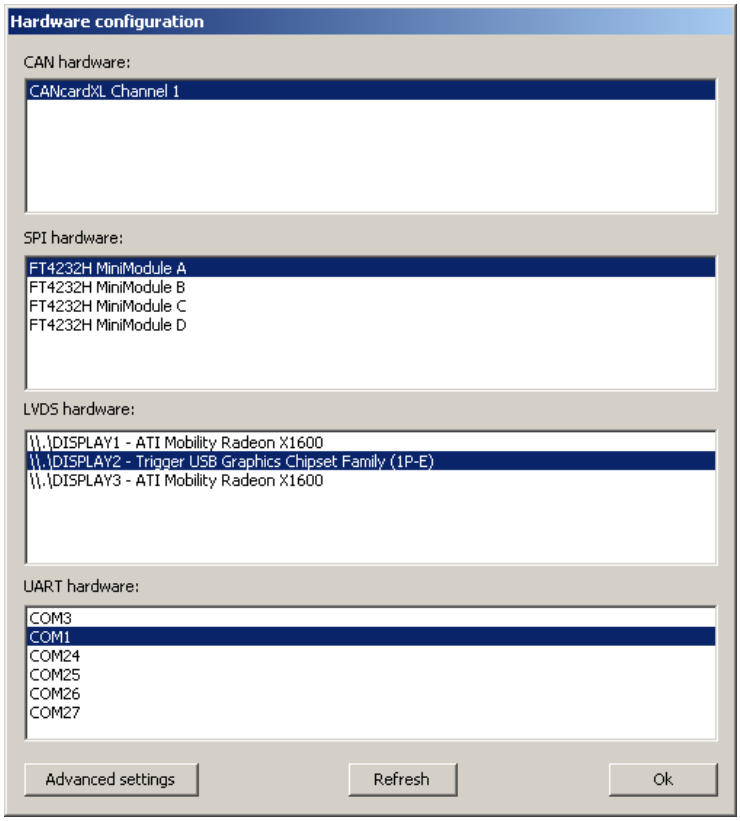

Fig. 11 – Fhost settings

Then load the desired *.prg file into FHost.

After loading the PRG file, double check - and set if necessary – the device to “LVDS + CAN” for *all* sequences *except* sequence 1, which must be set to “Vector CAN”.

To make the right pane visible click on the “Show Config” button in the lower right corner.

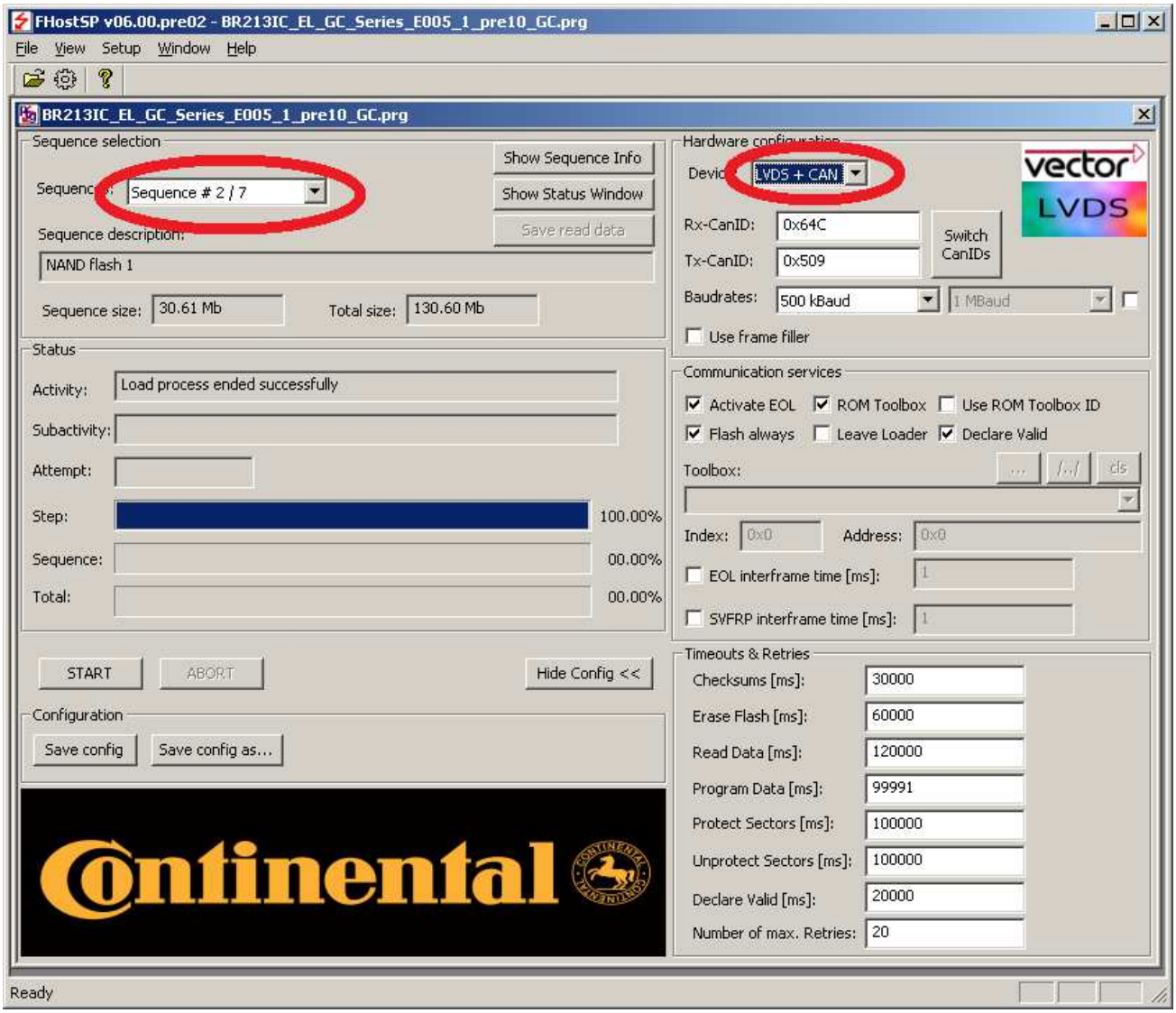

Fig. 12 – FHost sequence settings

I propose that you save the configuration.

Caution: set to Sequence #1 / 7 before starting the flash process!

Now you can start the flash process, by clicking on the START button. Power-on the instrument cluster.

5.4.3 Troubleshooting: special settings for the graphic driver

Please note this information, which was provided in a former LVDS flashing guideline. The steps described here were not necessary at any testing of the authors.

It has been observed that problems can occur if the tool chain, which is delivered with the graphic driver, is loaded automatically at Windows start. The main problem is that the included tools try to extend the desktop to their graphic adapter under some conditions. This is a problem because the user could be able to disturb the transmission with the mouse pointer, if it is moved to the screen that is assigned to the graphic adapter used for flashing.

To avoid this issue, the automatic start of the graphic tools has to be disabled. This has only to be done once after installing the driver. After the automatic start of the graphic tools is disabled, Windows will always use the exact settings made by the user, which are described in chapter 5.4.1. Depending on the used graphic adapter the automatic startup of its tools can be disabled in different ways:

- *Village Tronic VTBook PCMCIA card: Open the registry and delete the key 'HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Run\VTBookGauge'*
- *Digitus USB card: Rename 'C:\WINNT\system32\MTri1+.exe' to 'MTri1+.exe_'*

5.5 Step by step tutorial

The following steps are a recapitulation of the previous chapters and can be used to set up the tool chain for programming over HSVL immediately. It is assumed that the drivers are installed and configured properly.

Everything should work after performing the following steps:

1. Connect the hardware as described in chapter 5.2. Make sure the instrument cluster is powered off.
2. Power on the Imagesource. Check if the blue LED named “DVI Lock” is illuminated. Do not power off the Imagesource until the files are flashed!
3. Start FHost. Load the desired *.prg file.
4. Double check the settings as described in chapter 5.4.2. Check in particular the device is set to “LVDS + CAN” (all sequences, except the first).
5. In FHost click on the START button
6. Power on the instrument cluster.
7. Flashing should start and finish within a few minutes.

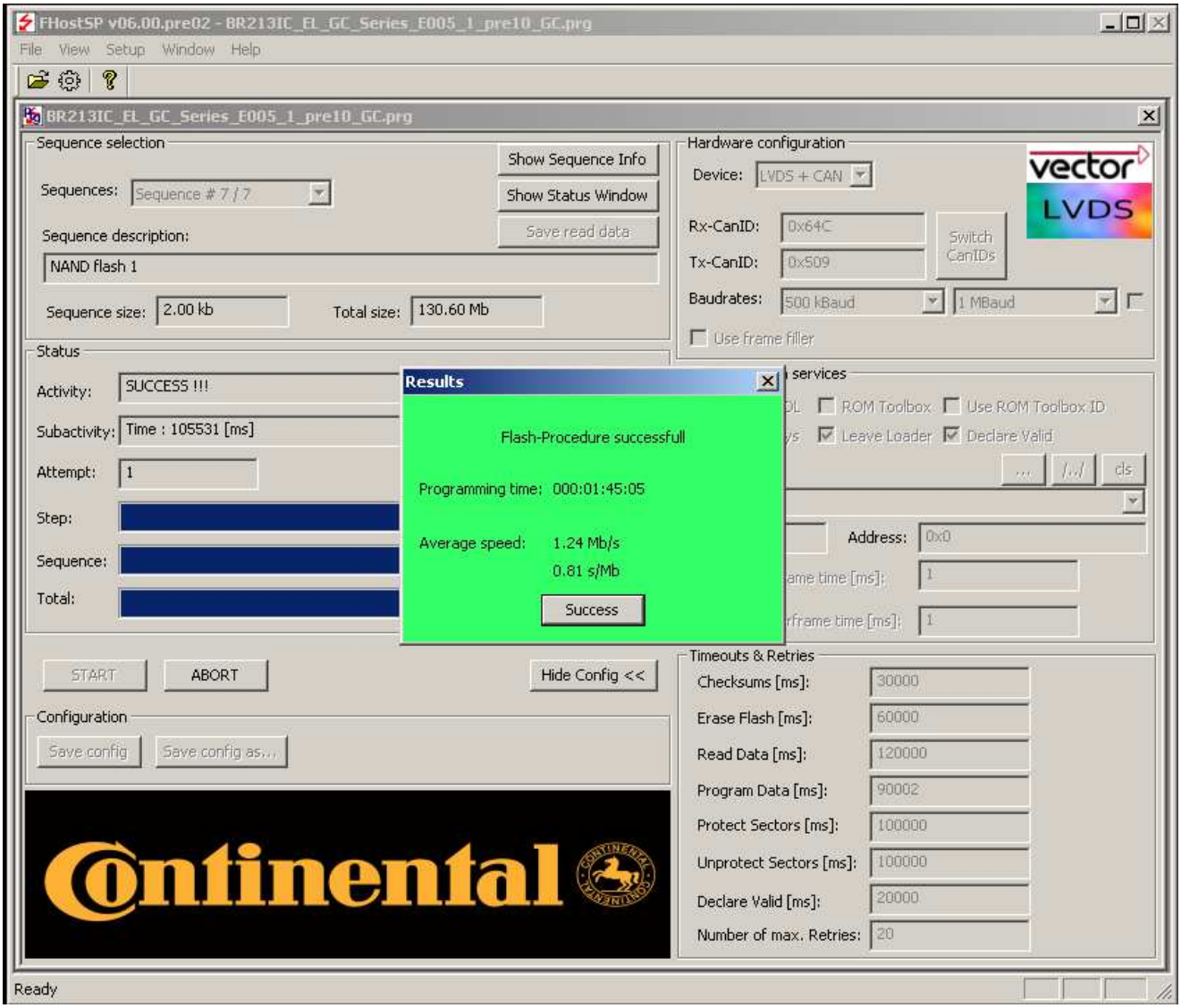

Fig. 13 – FHost success screen

6 Known issues

At the moment there are no specific issues known that occur when programming with HSVL. Some common problems that are known can be found in the FHost manual.

7 Annex

7.1 References

Name of the Document	Version or Release Date
W222 LVDS Software System Design (W222LVDS1D1.doc)	1.0
LVDS1UM1.doc	1.0
FLVDS module specification (FLVDS1S1.doc)	1.0
FHost manual (FHostSP_Manual_e.doc)	1.10

7.2 Image directory