

Emulation Tech Note 11
Validating Spectrum Digital Emulation
Drivers on Linux

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1 OVERVIEW

This document provides basic validation and trouble shooting for SD XDS510USB and SD XDS560V2 STM emulators installed as part of CCS v5.

Several Linux platforms and versions have been validated and each has its own set of installation caveats which have been detailed in section 7 troubleshooting.

2 OS VERSIONS SUPPORTED

UBUNTU - 10.04 LTS, 10.10

REDHAT - 4, 5 (SD emulation driver package 5.0.0.4 or above)

STABLE LINUX VERSION – UBUNTU 10.04 LTS (Recommended Linux version)

3 SPECTRUM DIGITAL EMULATORS SUPPORTED

XDS510 USB

XDS510 USB PLUS

C2000 XDS510LC

XDS560v2 STM

4 CCS INSTALLATION PATH

CCS_BASE_DIR - <CCS_INSTALL_PATH>/ccsv5/ccs_base_5.x.x.xxxxx

5 VALIDATING XDS510USB CLASS EMULATORS

5.1 SPECTRUM DIGITAL USB JTAG UTILITY

SdConfig GUI based utility is replaced with Sdjtag command line utility used to test connection between SD XDS510USB class emulators, Linux PC and target JTAG scan chain. It is located under <CCS_BASE_DIR>/emulation/drivers directory. It currently supports four commands – portsavailable, scantest, reset and clean.

- SDJTAG – portsavailable.

This command is used to validate connection between emulator and PC to test if USB rules for SD emulators are set correctly. A sample output is as shown below.

```
<CCS_BASE_DIR>/emulation/drivers$ ./sdjtag -X portsavailable
```

```
SpectrumDigital USB Jtag Utility
```

```
** Checking for available USB devices on valid ports.
```

```
$$ XDS510USB PLUS connected on:  
$$ EmuPortAddr=0x510  
$$ EmuSerialNumber=S330612043022426
```

- SDJTAG – reset

The reset command verifies the connection between emulator and the target which resets the emulator to a known good state. A sample output is shown below.

```
<CCS_BASE_DIR>/emulation/drivers$ ./sdjtag -p 0x510 -X scantest
```

```
SpectrumDigital USB Jtag Utility
```

```
** Resetting Emulator  
-- Emulator is Reset
```

- SDJTAG – scantest

The scantest command also verifies the connection between emulator and the target which measures the length of JTAG IR and DR registers. A sample output is shown below.

```
<CCS_BASE_DIR>/emulation/drivers$ ./sdjtag -p 0x510 -X scantest
```

```
SpectrumDigital USB Jtag Utility

** Emulator Scan Test
-- Found JTAG IR Length of 38
-- Found 1 device(s) in the scan chain
```

➤ **SDJTAG – clean**

The sdjtag clean command cleans XDS510USB open resources when CCS crashes.

5.2 SPECTRUM DIGITAL XDS510USB CONFIGURATION FILE

The Spectrum Digital configuration file sdopts.cfg is located under <CCS_BASE_DIR>/emulation/drivers directory. This file is identical to the Windows version and is where Spectrum Digital stores its emulator configuration options. Sdopts.cfg can be edited using a basic gedit text editor. Detailed documentation of the options can be found in the file itself.

5.3 BASIC VALIDATION INSTRUCTIONS

1. Install CCSv5. SD emulation drivers are installed as part of CCS install.
2. Test emulator connection with the Linux PC.

- a. Check to see if emulator is recognized on the USB port by running the following command. Make sure it is connected to a USB 2.0 port.

```
$ lsusb
Bus 001 Device 005: ID 0c55:2000 Spectrum Digital, Inc.
    - XDS510LC USB Emulators.
Bus 001 Device 004: ID 0c55:0510 Spectrum Digital, Inc. Spectrum Digital
XDS510 JTAG Debugger - XDS510 USB Emulators
Bus 001 Device 003: ID 0c55:0540 Spectrum Digital, Inc. SPI540
    - XDS510 USB PLUS Emulators.
Bus 001 Device 002: ID 050d:0234 Belkin Components F5U234 USB 2.0 4-Port
Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

- b. Check to see if low level USB rules for SD emulators are set correctly.

- i. Run sdjtag from the command line as shown below.

```
<CCS_BASE_DIR>/emulation/drivers$ ./sdjtag -X portsavailable
```

```
SpectrumDigital USB Jtag Utility

** Checking for available USB devices on valid ports.
```

```
$$ XDS510USB PLUS connected on:
$$ EmuPortAddr=0x510
$$ EmuSerialNumber=S330612043022426
```

- ii. The output shown above indicates that spectrum digital low level USB rules are set correctly. If the output to sdjtag is as shown below, go to troubleshooting section for detailed instructions.

```
<CCS_BASE_DIR>/emulation/drivers$ ./sdjtag -X portsavailable
```

```
SpectrumDigital USB Jtag Utility

** Checking for available USB devices on valid ports.
>> USB Rules not installed
>> Goto linux troubleshooting page for detailed instructions
on installing USB Rules.
```

3. Test emulator connection with the target.

- a. Run sdjtag from the command line with the scantest command as shown below.

```
<CCS_INSTALL_DIR>/ccsv4/emulation/drivers$ ./sdjtag -p 0x510 -X scantest
```

```
SpectrumDigital USB Jtag Utility

** Emulator Scan Test
-- Found JTAG IR Length of 38
-- Found 1 device(s) in the scan chain
```

5.4 CLEANING SHARED RESOURCES

Spectrum Digital's XDS510USB class emulation drivers create two named semaphores to provide synchronization between various processes. On Linux, named semaphores are created in a virtual file system, mounted under */dev/shm* with names of the form *sem.name*. XDS510USB class semaphore names start with "sem.PID_XDS510USB". When CCS crashes or is not shutdown properly, these named semaphores are cleaned up by running *sdjtag* with clean option.

```
$ cd <CCS_BASE_DIR >/emulation/drivers
$ ./sdjtag -X clean
SpectrumDigital USB Jtag Utility

!!!CAUTION!!!
-- Make sure XDS510USB class emulators are not in use.
-- Press 'Enter' to continue: ...
-- Cleaned opened resources successfully
```

6 VALIDATING XDS560V2 STM EMULATOR

6.1 Spectrum Digital XDS560v2 Configuration Utility

Spectrum Digital XDS560v2 Configuration utility (*Sd560v2Config*) is a convenient utility used to scan, test or setup a Spectrum Digital XDS560v2 STM emulator connected on to an USB port or an Ethernet port. This is a GUI based application. Detailed documentation on *Sd560v2Config* utility can be found under *<CCS_BASE_DIR>/common/uscif/Sd560v2Config_Readme.pdf*.

Sd560v2Config utility can be launched either from the command line or by double clicking the desktop icon. From the command line,

```
$ cd <CCS_BASE_DIR >/common/uscif
$ ../../../../eclipse/jre/bin/java -jar sd560v2config.jar
```

On RedHat 4 and RedHat 5, Eth and EthAdvanced tab requires the user to add */sbin* to *PATH* variable before launching the utility from the command line. If the utility is launched from the desktop, then

- In the *.bashrc* file in your home directory, add the line:
`PATH=$PATH:/sbin`
- Restart the system and relaunch the utility.

On Ubuntu 10.04 and 10.10, turn off *compiz* visual effects as shown in figure 1 below for the *sd560v2config* utility to be resizable. This is a jdk 1.5 issue, and is fixed under jdk 1.6.

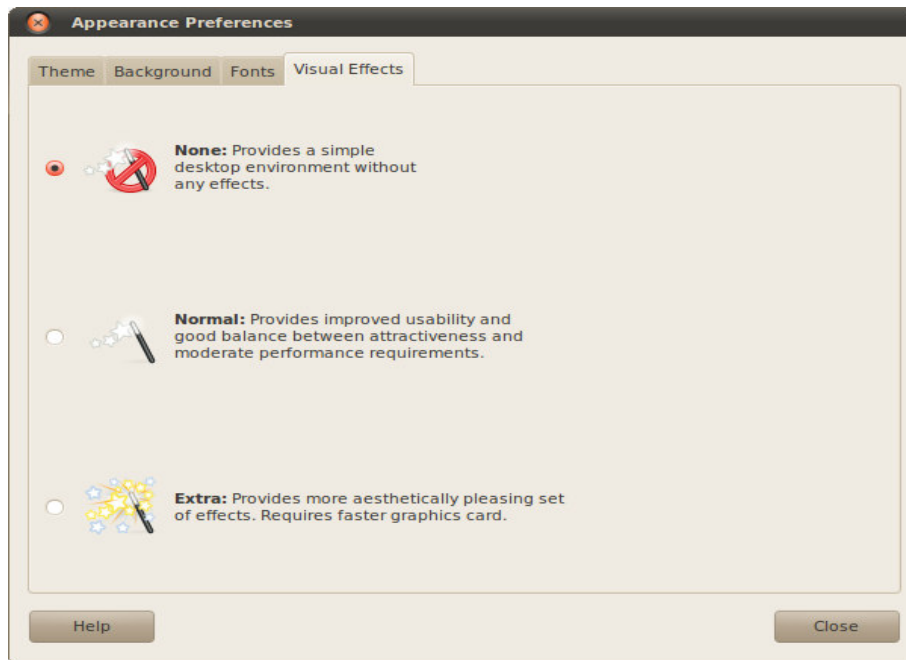


FIGURE 1: Turn off visual effects

6.2 Spectrum Digital XDS560v2 STM Configuration file

The Spectrum Digital configuration file `sd560v2opts.cfg` is located under `<CCS_BASE_DIR>/common/uscif` directory. This file is identical to the Windows version and is where Spectrum Digital stores its emulator configuration options. `Sd560v2opts.cfg` can be edited using a basic `gedit` text editor. Detailed documentation of the options can be found in the file itself.

6.3 BASIC VALIDATION INSTRUCTIONS

1. Install CCSv5. SD emulation drivers are installed as a part of CCS install.
2. Test emulator connection with the Linux PC.
 - a. Check to see if emulator is recognized on the USB port by running the following command. Make sure it is connected to a USB 2.0 port.

```
$ lsusb
Bus 001 Device 004: ID 0c55:0562 Spectrum Digital, Inc.
Bus 001 Device 003: ID 050d:0234 Belkin Components F5U234 USB 2.0 4-Port Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
```

- b. Check to see if low level USB rules for SD emulators are set correctly.
 - i. Launch `Sd560v2Config` utility from the desktop. If the icon is not populated on your desktop, launch it from the command line ,

```
$ cd <CCS_BASE_DIR>/common/uscif
$ ../../../../eclipse/jre/bin/java -jar sd560v2config.jar
```

From the USB Tab select on Find all Connected XDS560V2 USB emulators and click on start button. The output is as shown in figure 1 below. Go to troubleshooting section 7, for unexpected results.

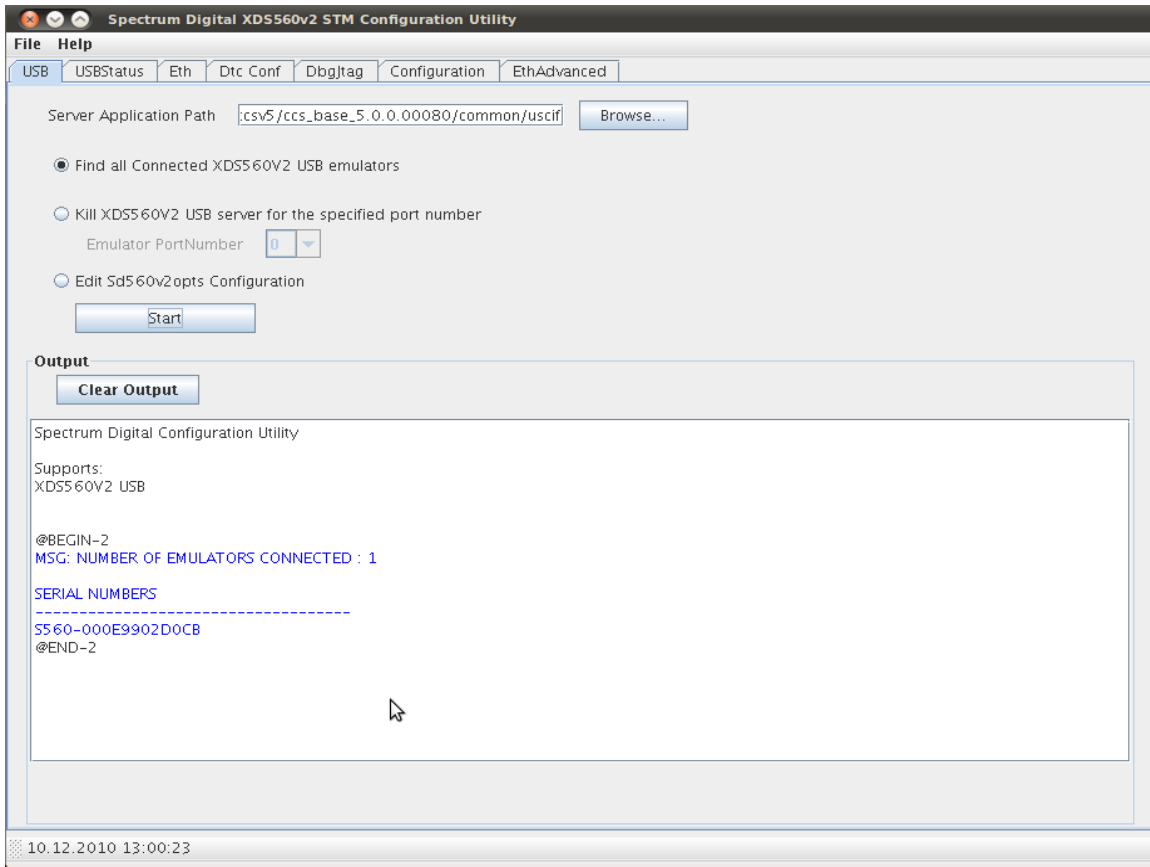


FIGURE 2: Sd560v2Config to test USB connection.

- c. Test emulator connection with the target.
 - i. Launch Sd560v2Config utility from the desktop. If the icon is not available on your desktop, launch it from the command line ,

```
$ cd <CCS_BASE_DIR>/common/uscif  
$ ../../../../eclipse/jre/bin/java -jar sd560v2config.jar
```

From the DbgJtag Tab, select the adapter to sd560v2u, address to 0, check on pathlength and click on start button. The output is as shown in figure 2 below. Go to troubleshooting section 7, for unexpected results.

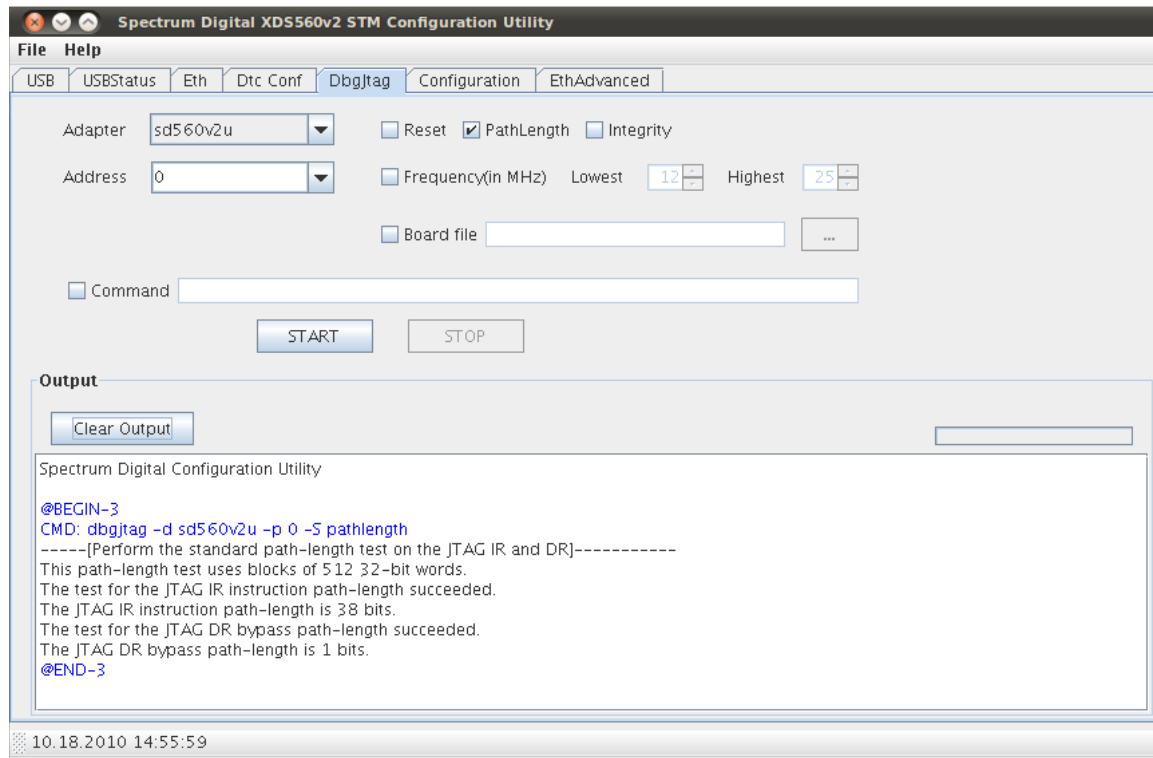


FIGURE 3: Sd560v2Config to test pathlength.

6.4 CLEANING SHARED RESOURCES

Spectrum Digital's XDS560V2 class emulation drivers create two named semaphores to provide synchronization between various processes. On Linux, named semaphores are created in a virtual file system, mounted under `/dev/shm` with names of the form *sem.name*. XDS560V2 class semaphore names start with "sem.PID_XDS560V2U". It is necessary for the user to clean these shared resources that are left open on certain use cases as listed below.

- CCS crashes or is not shutdown properly.
- Sd560v2Config utility crashes.
- When CCS is run over XDS560V2 STM USB port in one user mode, before using CCS over XDS560V2 STM USB port in another user mode.

The procedure for cleaning shared resources is as shown:

```
$ cd <CCS_BASE_DIR>/common/uscif
$ ./sd560v2u_linux_cleanup.sh
```

```
!!!CAUTION!!!
```

```
Make sure XDS560 STM EMULATOR is not in use on the USB port
Do you want to continue with the cleanup [Y]? y
```

```
--Cleaned opened resources successfully
```

7 TROUBLESHOOTING

7.1 EMULATOR CONNECTION TO THE PC

CCS can be installed in Linux as a user or root and each method of installation has some minor caveats and is also Linux platform and version dependent.

1. The table matrix shown below depicts the possible installation/validation permission options.

CCS INSTALLATION PERMISSION	SD EMULATOR VALIDATION PERMISSION	SD EMULATOR USB RULES
ROOT	ROOT	SET AUTOMATICALLY
ROOT	USER	SET AUTOMATICALLY
USER	ROOT	NOT SET. INSTALL MANUALLY
USER	USER	NOT SET. INSTALL MANUALLY

2. On RedHat 4, USB devices are mapped as a file system object and not as a device. Hence, in order for a user to gain permission to access USB port
- Add the following line to /etc/fstab file.

```
none /proc/bus/usb usbdevfs defaults,devmode=0666 0 0
```
 - Run the following command,

```
$sudo mount -a
```
3. Based on the table shown above, if SD emulator usb rules are not set, install the rules manually from the command prompt using the steps shown below.
- ❖ Unplug SD emulator from the PC's USB port.
 - ❖ Run setup_sd.sh as a root located under <CCS_BASE_DIR>/emulation/drivers directory.

```
$ cd <CCS_BASE_DIR >/emulation/drivers
$ sudo ./setup_sd.sh
```
4. Revalidate the SD emulator connection by following the validation sequence in section 4.3 for XDS510USB class emulators and section 5.3 for XDS560V2 STM emulator
5. Even after following all the instructions doesn't install SD emulators USB rules correctly, then
- ❖ For Ubuntu 10.04 and 10.10,
 - Modify /lib/udev/rules.d/50-udev-default.rules as a root at line number 62 which says

```
#libusb device nodes
SUBSYSTEM=="usb", ENV{DEVTYPE}=="usb_device, MODE="0664" to
```
 - Unplug SD emulator from the USB port.
 - Restart udev daemon using the following command as a root

```
$ restart udev
```
 - ❖ For redhat 5
 - Modify /etc/udev/rules.d/50-udev.rules as a root at line number 321 which says

```
ACTION=="add", SUBSYSTEM=="usb_device", \
PROGRAM="/bin/sh -c 'K=%k; K=${K#usbdev}; printf
bus/usb/%03i/%03i ${K%%%.*} ${K#*.} '", \
NAME="%c", MODE="0644"
```
 - Unplug SD emulator from the USB port.
 - Restart udev daemon using the following command as a root

```
$ /sbin/start_udev
```
6. If CCS still fails to communicate with the emulator, retry after cleaning shared resources as mentioned in section 5.4 for XDS510USB class emulators and section 6.4 for XDS560V2 STM emulator.

7.2 INSTALLING EMULATION DRIVERS

The correct method of installing spectrum digital emulation drivers on the top of existing CCSv5 installation is to run with /remove option. This ensures that the install package uninstalls the previous install package before installing the new package.

```
$ ./sd_emupack_setup.x.x.x.x /remove
```