

VS1000B Nand Flash Low Level Formatting Procedure

VS1000B can use a Nand Flash chip for 2 purposes:

- Storing .ogg music files for playing
- Storing boot software that customizes the operation of VS1000B.

This documents helps you to

- Initialize the Nand Flash chip so the VS1000B recognizes it and can use it
- Create a data storage area on the Nand Flash that can be used to store .ogg files and can be used as a USB flash disk
- Insert boot software that customizes the operation of the VS1000B to the nand flash.

To make the Nand Flash detectable by the VS1000B ROM software, an identification header must be written to the beginning of the Nand Flash. Optionally this can be followed by boot code.

The header can be programmed to the nand flash before soldering the nand flash chip by using a memory programmer.

If the nand flash is already soldered to the device, VS1000B can be used to write the header. One way to do this is to use the **VS1000 USB RAM disk backdoor**.

Step1. Get the VS1000B RAM disk to appear.

When VS1000B can't detect or use a Nand Flash, it displays a 16 kB RAM disk when you attach it to a computer's USB port. In Windows it looks like:

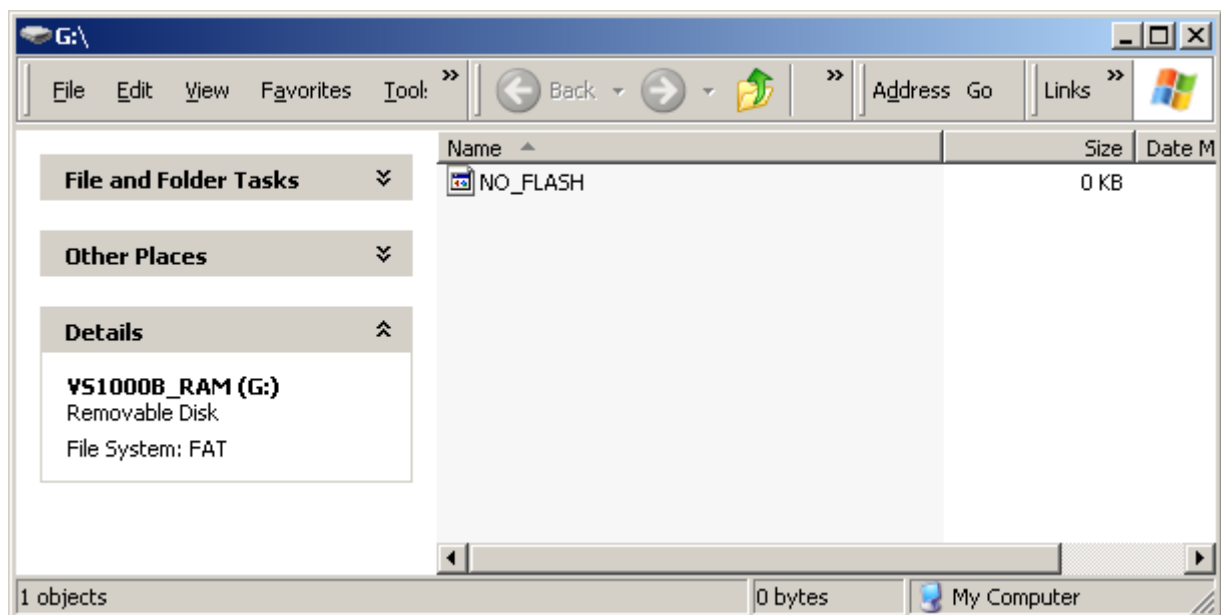


Illustration 1: The VS1000B RAM disk

This RAM disk can be used to run initialization software on the VS1000B.

Forcing the "NO_FLASH" RAM disk to appear:

If the Nand Flash is uninitialized, the "NO_FLASH" ramdisk appears automatically. But if you have already initialized the nand flash and need to do it again, you can force the RAM disk to appear by pulling the nand flash chip select pin low when you power up the VS1000B device.

This can be necessary for instance to replace the boot software on the nand flash.

- if you have **Developer Board**, remove the NAND boot jumper and reset the board:

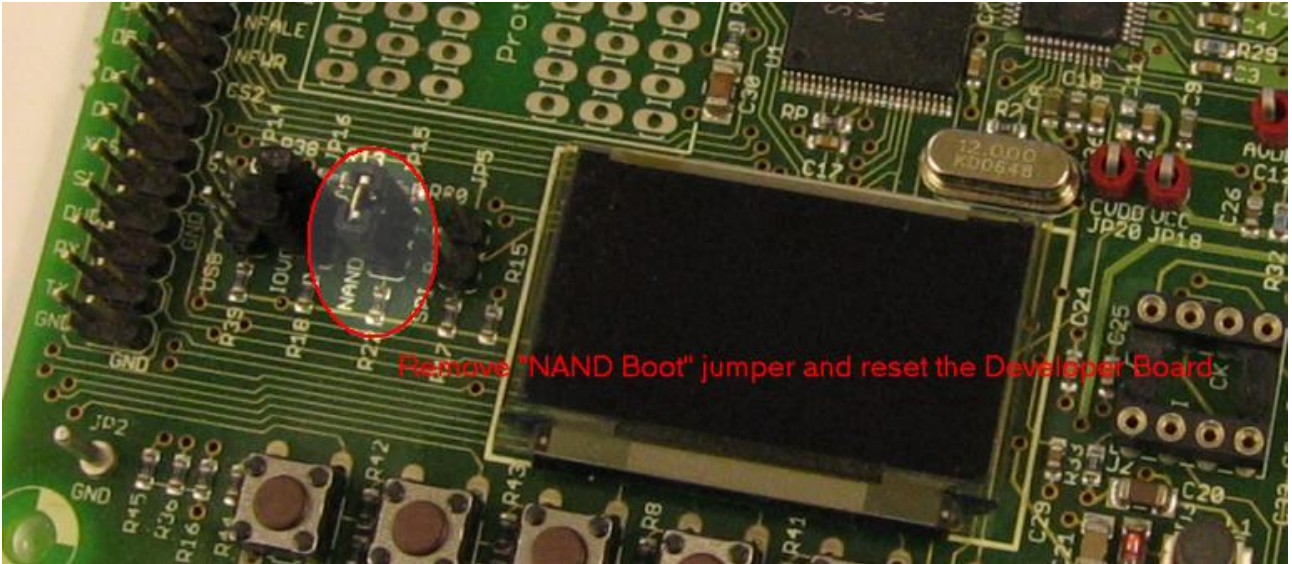


Illustration 2: Developer Board: Prevent detection of nand flash at bootup to get ramdisk

- If you have a **Demonstration Board**, you must short-circuit the CS1 and TP2 pins when you power up the board:

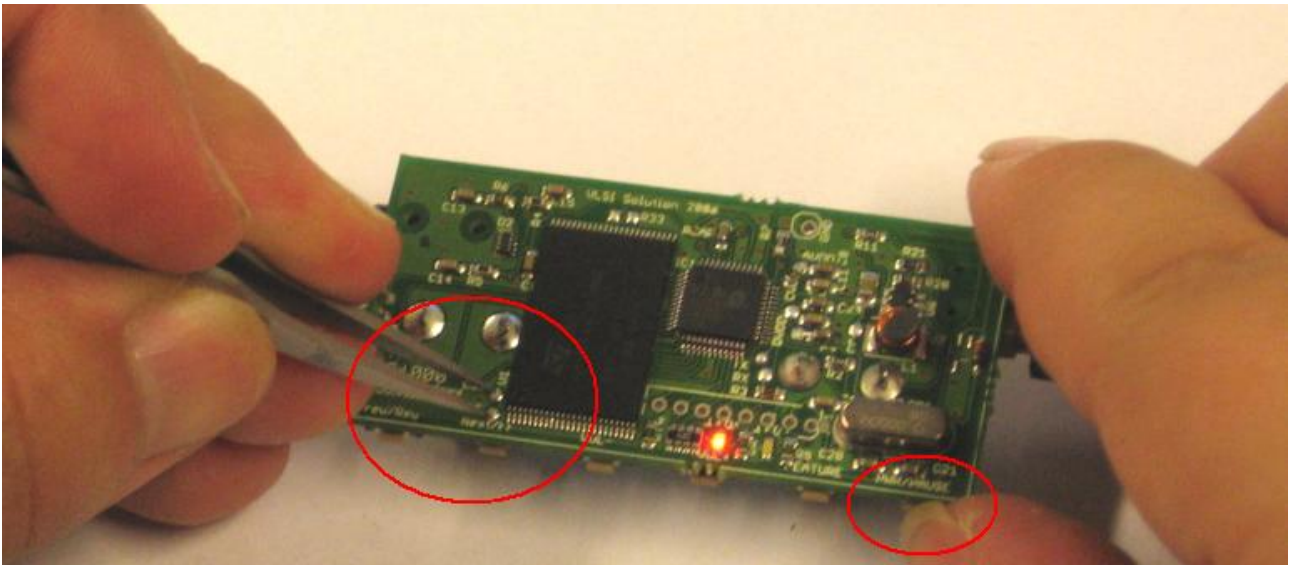


Illustration 3: Demonstration Board: prevent detection of nand flash at bootup to get ramdisk

Step 2. Use the **mkformat.exe** tool to make an initialization program for your nand flash.

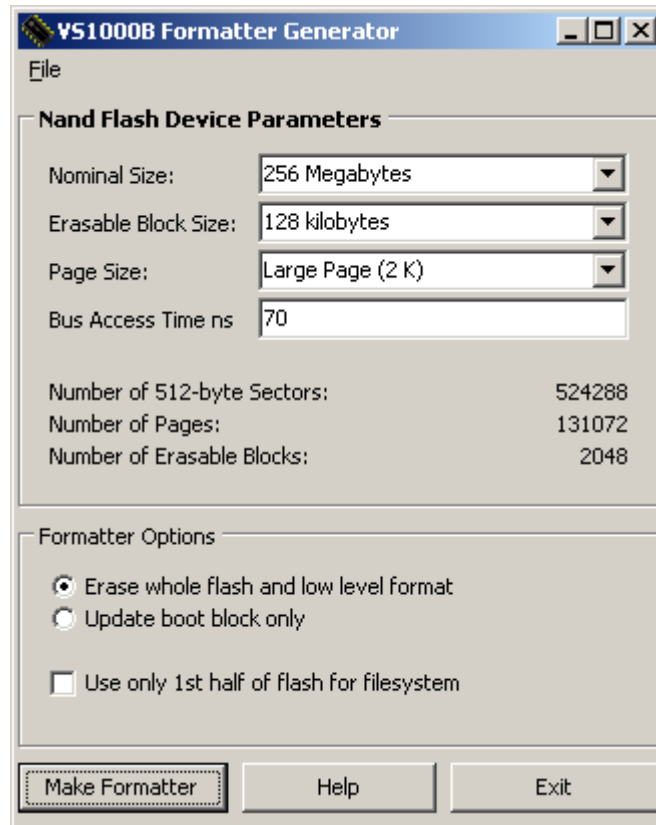


Illustration 4: The mkformat.exe tool is used to make a formatter program for the nand flash. The picture's parameters are for K9F2G08 flash.

Select the nand flash parameters (Nominal size, Erasable Block Size, Page Size and Bus Access Time) from the drop-down lists. You can find the parameters on your Nand Flash's datasheet.

From the "File" menu you can find shortcuts to correct parameters for the Samsung K9F2G08 chip (large page) and the ST NAND128W chip (small page). You can use these as examples by comparing them against values in ST and Samsung datasheets.

Options:

- "Erase whole flash and low level format" removes all content from the nand flash data area and creates the Nand Flash Wear Leveling structures that are needed to map logical sectors to physical sectors. For a K9F2G08UOM flash (256 megabytes) this takes about 26 seconds.
- "Update boot block only" can be used to install new version of *boot software* to the nand flash without erasing the flash.
- "Use only 1st half of flash for filesystem" option uses only half of the nand flash surface for the filesystem area. The second half is left completely unused. This can be useful for special applications like saving data that is not to visible to the user by the USB disk interface.

Click the "Make Formatter" button to save a formatter file.

- This makes a file names VS1000_B.RUN that actually is a program that can be run by the VS1000B. It contains the code for initializing the nand flash and also the nand flash parameters that you have selected.

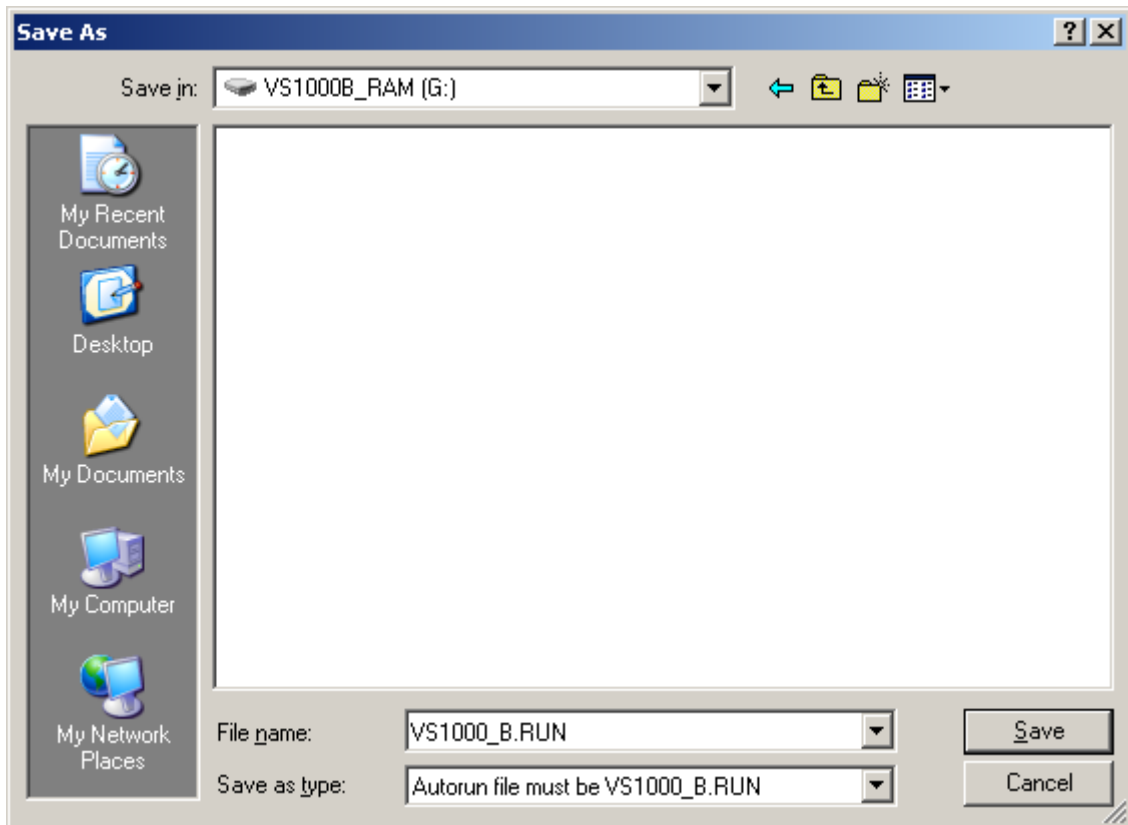


Illustration 5: Exporting a formatter program from mkrecord.

The formatter file must be called VS1000_B.RUN. It contains a program that performs the low level format on the VS1000B when it's detached from the USB. You can save the formatter directly to the VS1000B ramdisk or to another folder in the PC for dragging-and-dropping to the ramdisk.

Optionally you can also include boot software that will be installed to the nand flash. Use it by dropping a .IMG file to the ramdisk before detaching the VS1000B from USB. For instructions, see appendix A.

The VS1000B RAM disk should now contain the VS1000_B.RUN file.

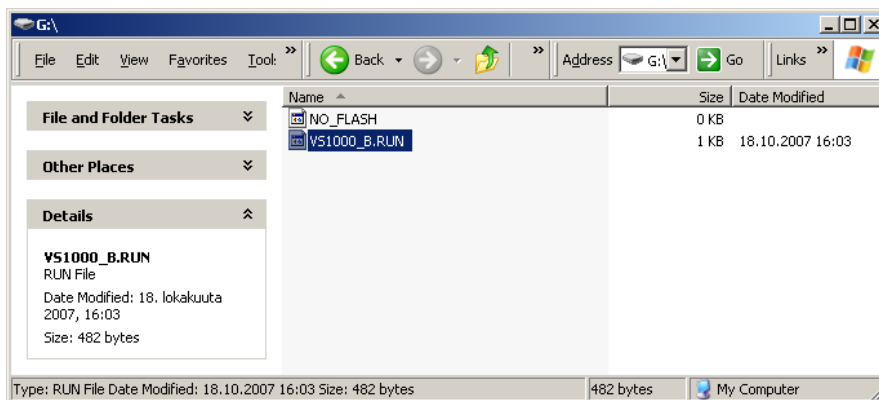


Illustration 6: VS1000B RAM disk with the formatter program.

Step 3. Detach the USB data lines but don't interrupt power.

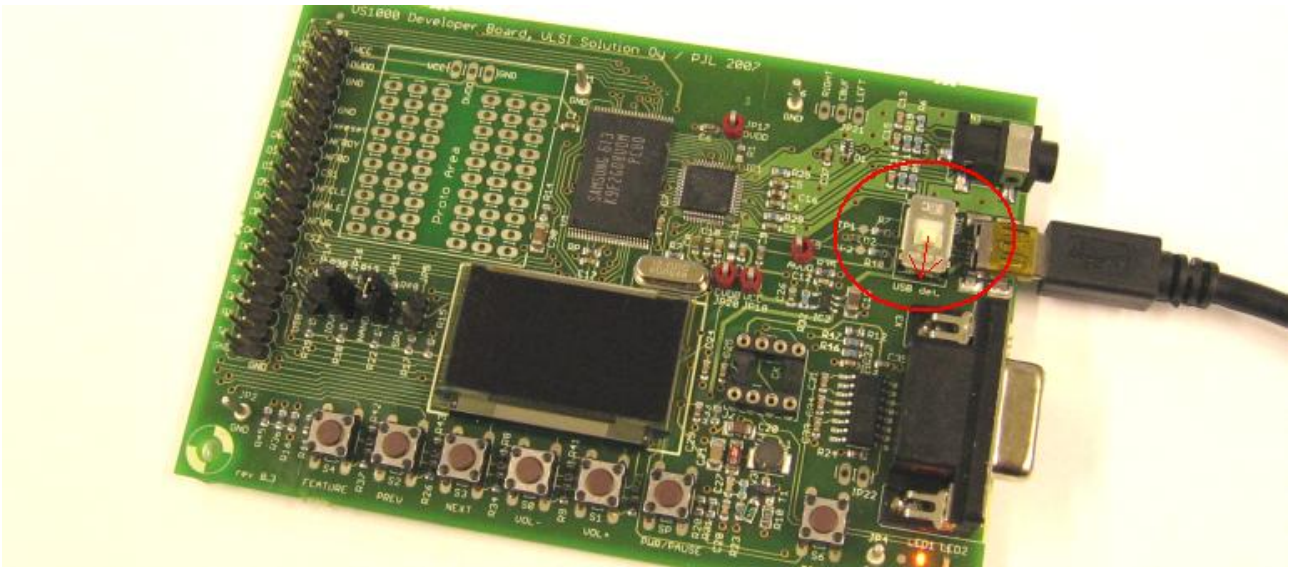


Illustration 7: If you have a Developer Board, switch SW1 to "USB Detached" position (down).

If you have a demonstration board, you should construct a USB cable that has a switch in the data lines so you can switch the USB data lines off without interrupting power.

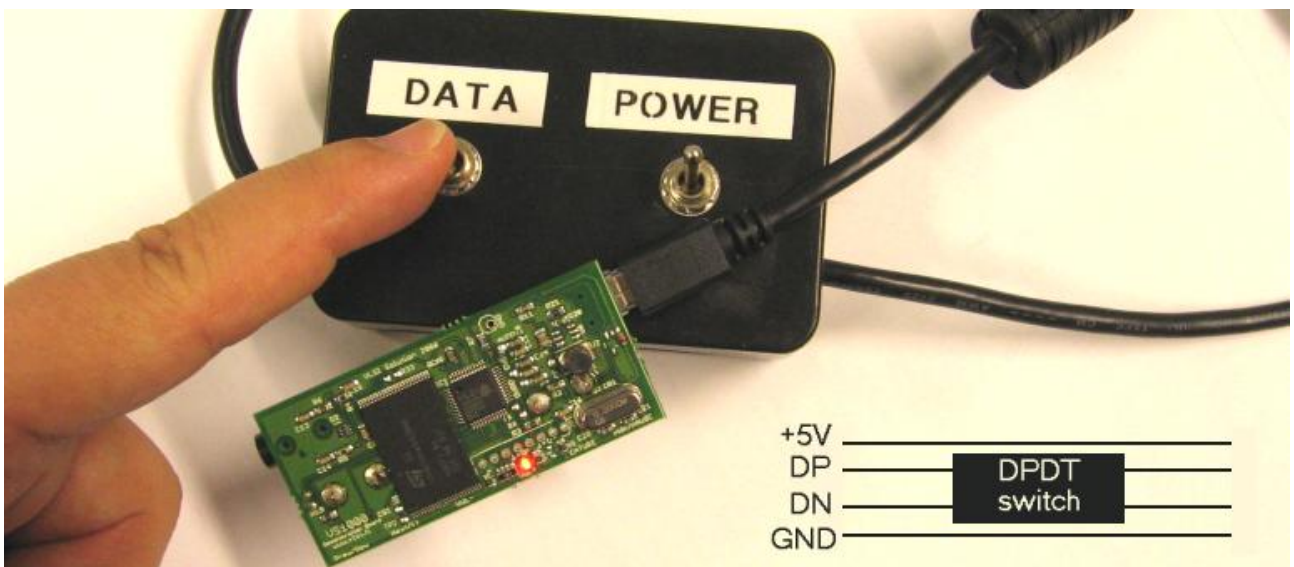


Illustration 8: Special Cable: Switch the USB data lines off but not the power lines.

Step 4. Wait for the low level format to complete.

When you detach the USB, both LEDs of the board lit up. When the formatting is complete, the LEDs resume normal operation. For a K9F2G08 flash this takes 26 seconds.

Step 5. Reset the board and connect it to PC.

- If you have a developer board, put back the "NAND Boot" jumper before resetting the board.
- Attach USB. Open "My Computer". The new Removable Disk appears.
- When you try to use the disk, Windows says that it is not formatted, e.g. That it does not contain a filesystem. Use Windows to format the new disk.

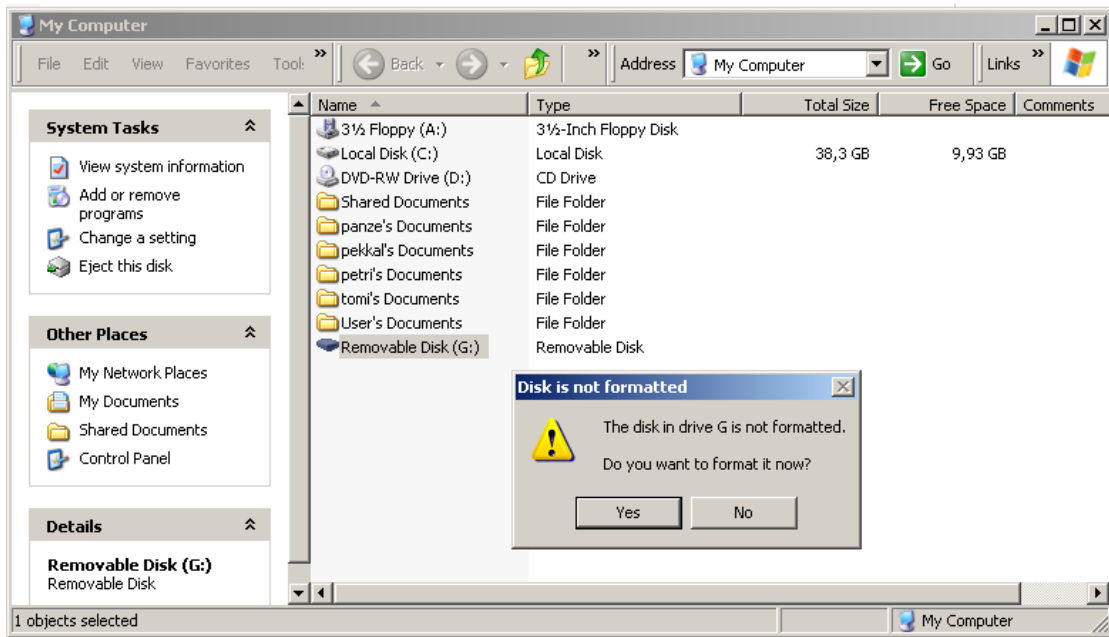


Illustration 9: Select "Yes" to make a FAT filesystem to the nand flash.

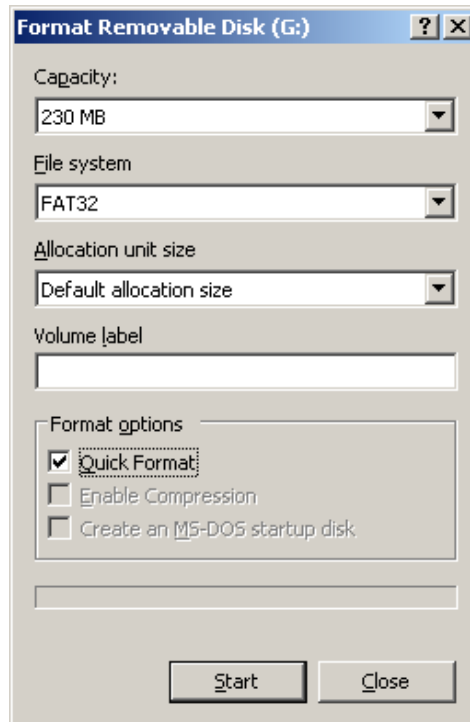


Illustration 10: Select the "Quick Format" option and click Start.

The board is now ready to use.

Drag some .ogg files to disk and detach the board. VS1000B will play the .ogg files.

If you don't get an unformatted disk, but instead get the "NO_FLASH" disk again, the formatter did not run. This is probably result of power failure during USB detach, but can also happen because of wrong nand flash parameters.

Notes:

10% of the data area is reserved for wear leveling. So for instance instead of a 256MB disk you get a 230MB disk.

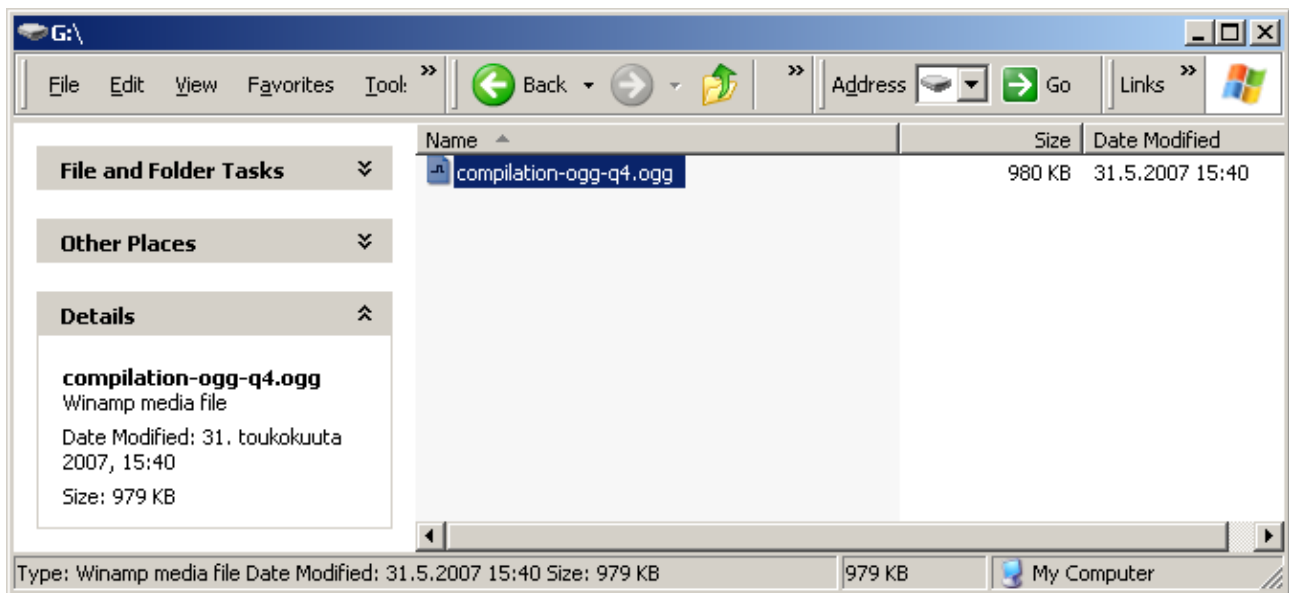



Illustration 11: An .OGG music file is dropped to the newly formatted flash disk.

For further instructions:

- please contact the VLSI's Audio Solution Support at mp3@vlsi.fi

Appendix A. Installing boot-up software to the nand flash

First you must compile the boot software you wish to install to the nand flash. For example, the "display.c" file in the vskit 1.33 package contains the preprogrammed example of the Demonstration Board. It is compiled by the command "build display".



```
C:\WINDOWS\system32\cmd.exe
C:\panze\vs1kit\vs1kit133\vs1000bc>build display
Compiling display.c ...
display.c(506) : warning 30: parameter 1 is a pointer to a different object
display.c(669) : warning 250: symbol 'i' hides previous declaration (display.c:651)
display.c(676) : warning 30: assignment argument is a pointer to a different object
Successfully compiled 3768 lines (687 in source file)
With 3 warnings
(2167 1726 1599 1597 1587 1576 1571 1571 1571)
C 1572 CF 0 X 44 Y 16 F 0
Linking for Nand Flash loading... (combining with libraries)
Linking for Emulator and SPI EEPROM loading... (combining with libraries)
==OK== Emulator runnable program is now in o_emuspi.bin.
==OK== Exec() -loadable file is in EXECFILE.PRG
Creating SPI EEPROM image (25LC640 etc)...
I: 0x0050-0x0678 In: 6309, out: 6309
X: 0x1fa0-0x1fca In: 89, out: 89
X: 0x1fcc-0x1ffc In: 101, out: 101
In: 6499, out: 6504
==OK== EEPROMmable image is now in eeprom.img
Creating NAND FLASH loadable image for ST NAND128W chip...
coff2nandboot build Jun 27 2007 (vs1000bc compatible)
NandType: 0 Small-Page 4-byte addr, 16kB blocks, 16MB flash
I: 0x0050-0x0676 In: 6302, out: 6302
X: 0x1fa0-0x1fca In: 90, out: 90
X: 0x1fcc-0x1ffc In: 102, out: 102
In: 6494, out: 6500
size 13
==OK== ST NAND128W compatible image is in NAND128W.IMG
Creating NAND FLASH loadable image for Samsung chip...
coff2nandboot build Jun 27 2007 (vs1000bc compatible)
NandType: 3 Large-Page 5-byte addr, 128kB blocks, 256MB flash
I: 0x0050-0x0676 In: 6302, out: 6302
X: 0x1fa0-0x1fca In: 90, out: 90
X: 0x1fcc-0x1ffc In: 102, out: 102
In: 6494, out: 6500
size 13
==OK== Samsung K9F2G08U0M compatible image is in K9F2G08.IMG
-
==OK== Compilation seems to be successful.
Switch VS1000 on now. (You may need to turn vs1000 power off first)
Remember that you may need to clear code from nand flash before loading.
Hit [Ctrl-C] to quit this batch job or [Enter] to load code via emulator
Terminate batch job (Y/N)? Y
C:\panze\vs1kit\vs1kit133\vs1000bc>
```

Illustration 12: Use the "build" command to make installable boot software

When the script asks you to hit [Ctrl-C] to quit the batch job, do so. It's not needed to continue to emulator loading.

Alongside with other files, the build script generates a number of .IMG files that are prepared for nand flash loading. The various .IMG files contain different Nand Flash parameters, but if you use the **mkformat** -generated formatter, you don't need to pay attention to these: the parameters selected in the mkformat window are used. So you can select any of the generated .IMG files.

Copy one .IMG file (such as "NAND128W.IMG") to the VS1000B ramdisk before detaching the USB:

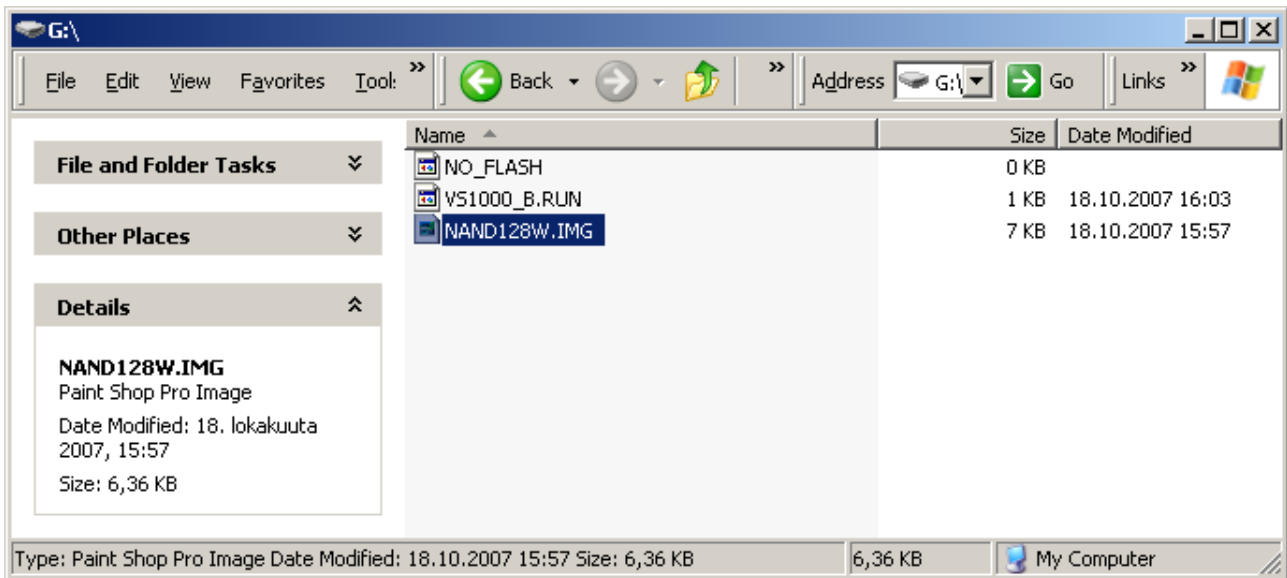


Illustration 13: Nand boot software (NAND128W.IMG) is dropped on the ramdisk.

The formatter will detect the .IMG file and install its contents to the nand flash when it runs when you detach USB.

Important!

If you use the RS-232 emulator interface (vs3emu), you must remove the boot software from the nand flash before running software in the VS1000B with the emulator. If you don't do this, the nand boot software and your emulator loaded software will interfere with each other (they are loaded to same memory addresses) and unpredictable events will occur.

Remove the nand software either 1) by using the vs3emu interface to run the "nandprog" program in the vskit/vs1000bc directory or 2) by running a formatter with "Update boot block only" option but without dropping a boot software .img file to the ramdisk.