
PC-3000 for HDD. SSHD drives. What it is and how does it work.

Posted on 10/17/2017 by ACELab team



Technology does not stand still. More and more new drives of all types with new features appear every year. And they all do break just as well. Let's talk about SSHD – the most popular device in data recovery branch.

What exactly is SSHD drives and how do you work with them?

Welcome to this article.

SSHD drives are general HDD drives with NAND chip (SLC – first generation SSHD drives or MLC – modern SSHD drives) on the PCB. This NAND chip is used for fast booting and mounting of the drive and contains the most often addressed data (like a microprogram info, translator, SMART, OS structures and partition tables). The exact list of this data differs from one manufacturer or model to another

As of today, SSHD drives are presented by Western Digital, Seagate and Toshiba brands.

Approximately 5 years ago Seagate corp. started to manufacture drives with Media cache area. This Area is very much the same to our modern SSHD drives.

Special area (Media cache) is located on the platter's edge (where the reading/writing speed is the highest). It stores a most often addressed data (File system structures, OS important files, etc.). The media cache is located on the surface, and for recovering cases, with Media cache issues it's usually enough just to clean it up (it's 346 sys file).

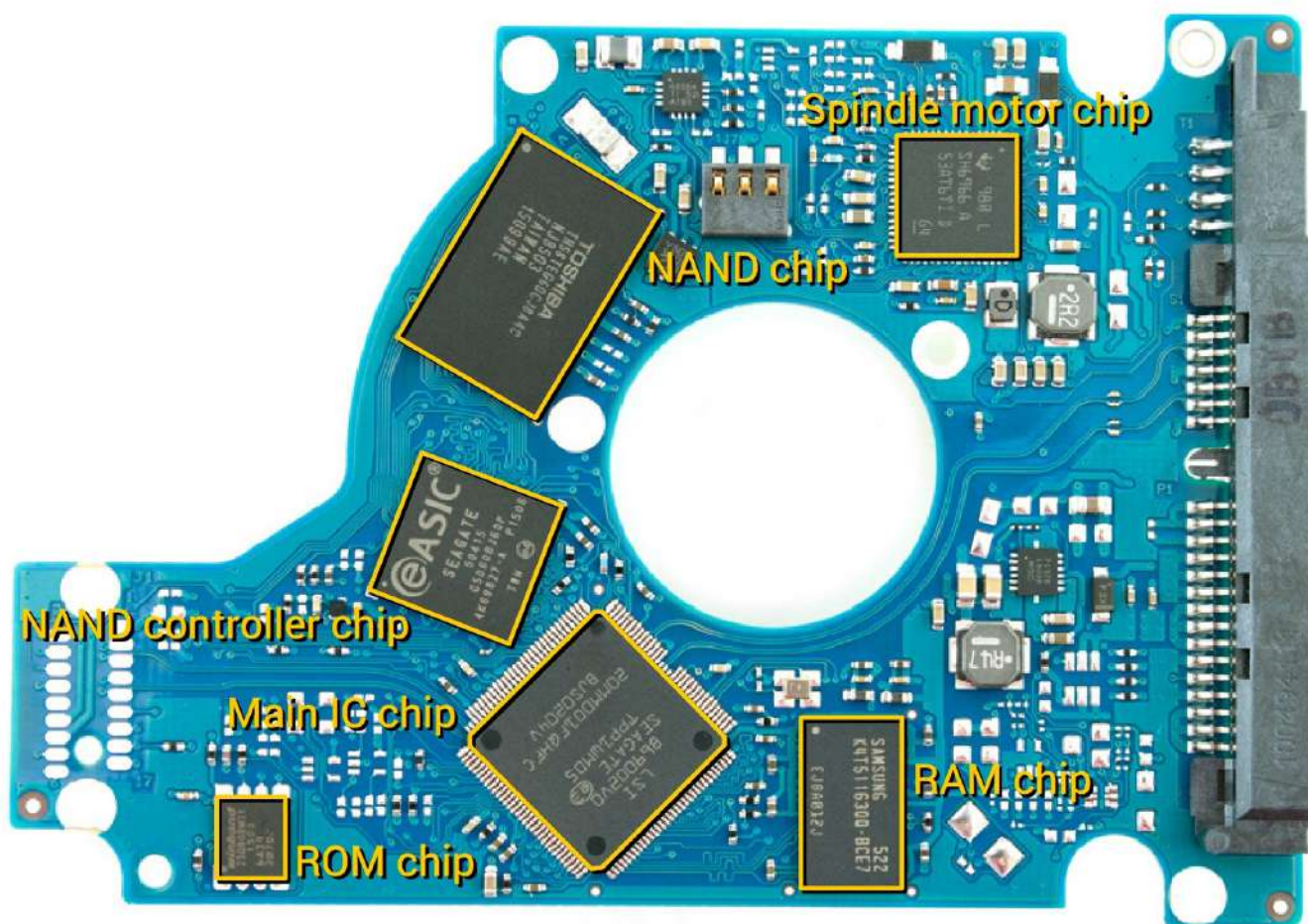
Note that modern family drives (like Rosewood) can have some unique data, like MFT tables, in Media cache, not in a general user area space. So, when working on them, make a backup of 346 (or 348) sys files each time before cleaning attempt.

SSHD drives are the most complex of the storage devices and require sophisticated methods for solving the issues that may arise.

Hybrid drives technology has pros and cons inherent in both technologies separately (SSD and HDD). Firstly we have a basic problem with moving parts (heads, spindle, surface), the secondary problems are related to the Service area modules and Translation, and finally, there are issues related to NAND chip (memory cells wear off, ECC errors in data, temperature issues, etc..).

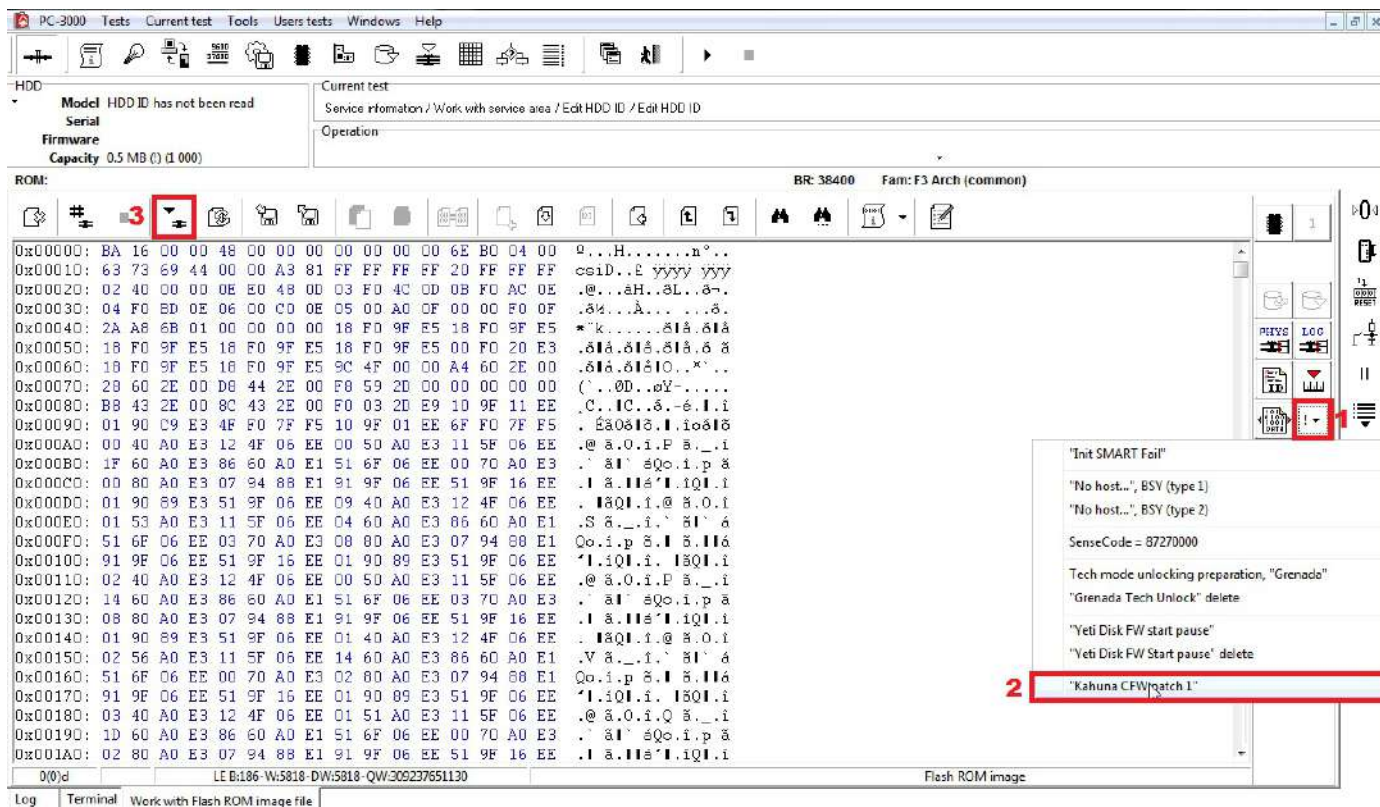
Let's separate the NAND-chip part from the general HDD. As a result, we get basic HDD problems, similar to those of the general Seagate drives, and NAND problems.

For example here is a photo of Kahuna family drive PCB:

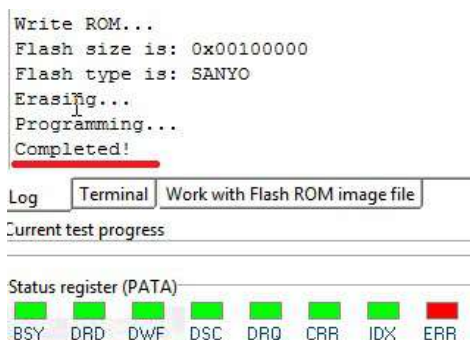


There are a lot of articles on how to work with general Seagate HDD (like a [damaged sys files](#), [ticks in 93 sys file](#) and [translator issues](#)). But what about NAND chip?

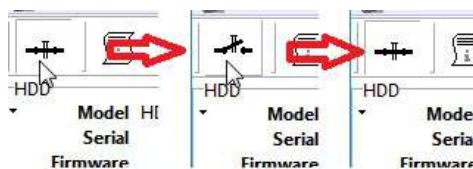
Then use a "Kahuna patch" option from the right side of the utility window (1st and 2nd steps) and write this ROM into the ROM chip (step 3):



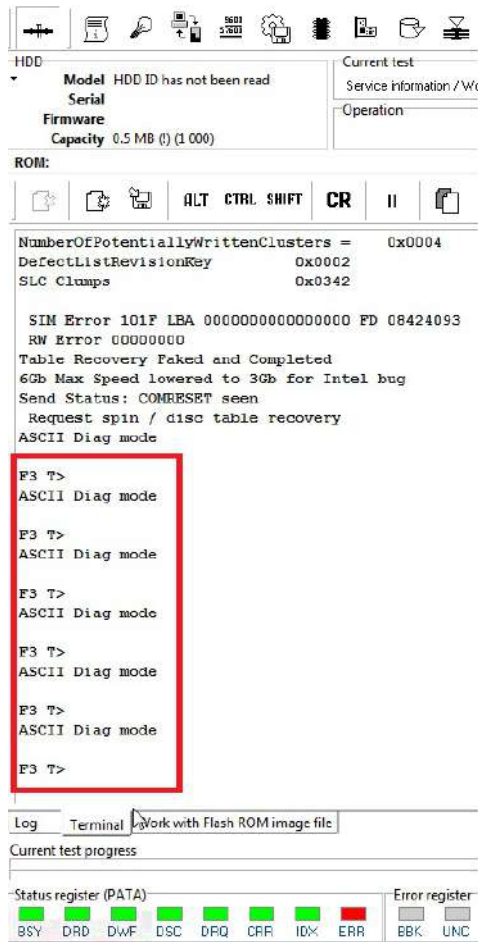
Wait a while for the writing to proceed, and check the status in the Log tab:



When the process is completed repower the drive...



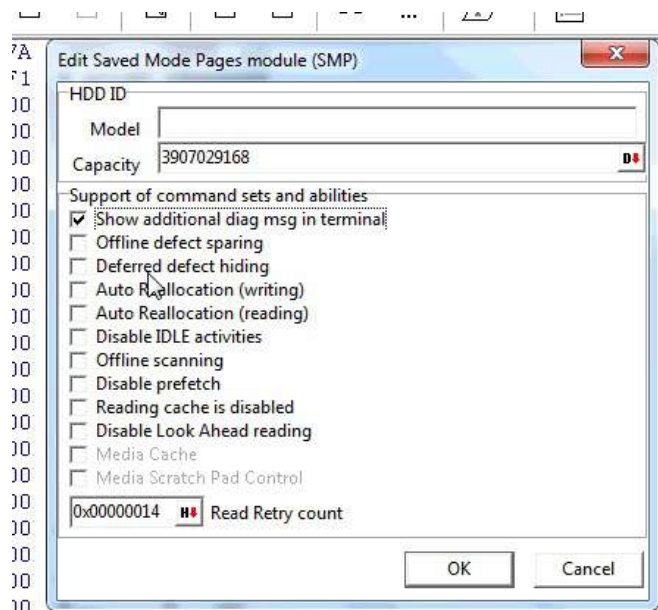
...and try to get a Terminal access by pressing ctrl+Z:



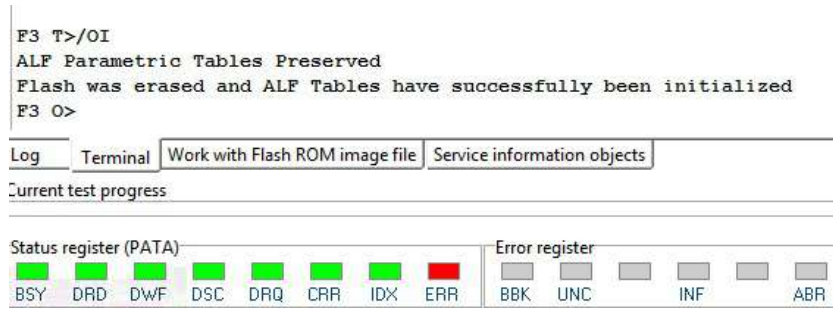
As you can see the Terminal mode is now available and ready to receive and execute your commands. Note that the drive is not fully initialized, and in registers you can see a different LEDs. Don't pay attention to these LEDs for now. Drive is not available via ATA, and we have only a terminal mode, but we can perform any diagnostics with general HDD: like [check a system files by Ctrl+X command](#), make a manual backup of important system files (28, 35, 93, 1B, 135 etc), regenerate a Translator (if needed!), [remove a ticks in 93 sys file \(SMP flags\)](#), and other.

Before proceeding make a backup of the system file that you are going to modify!

For every case it is advisable to remove ticks in 93 sys file (SMP flags):

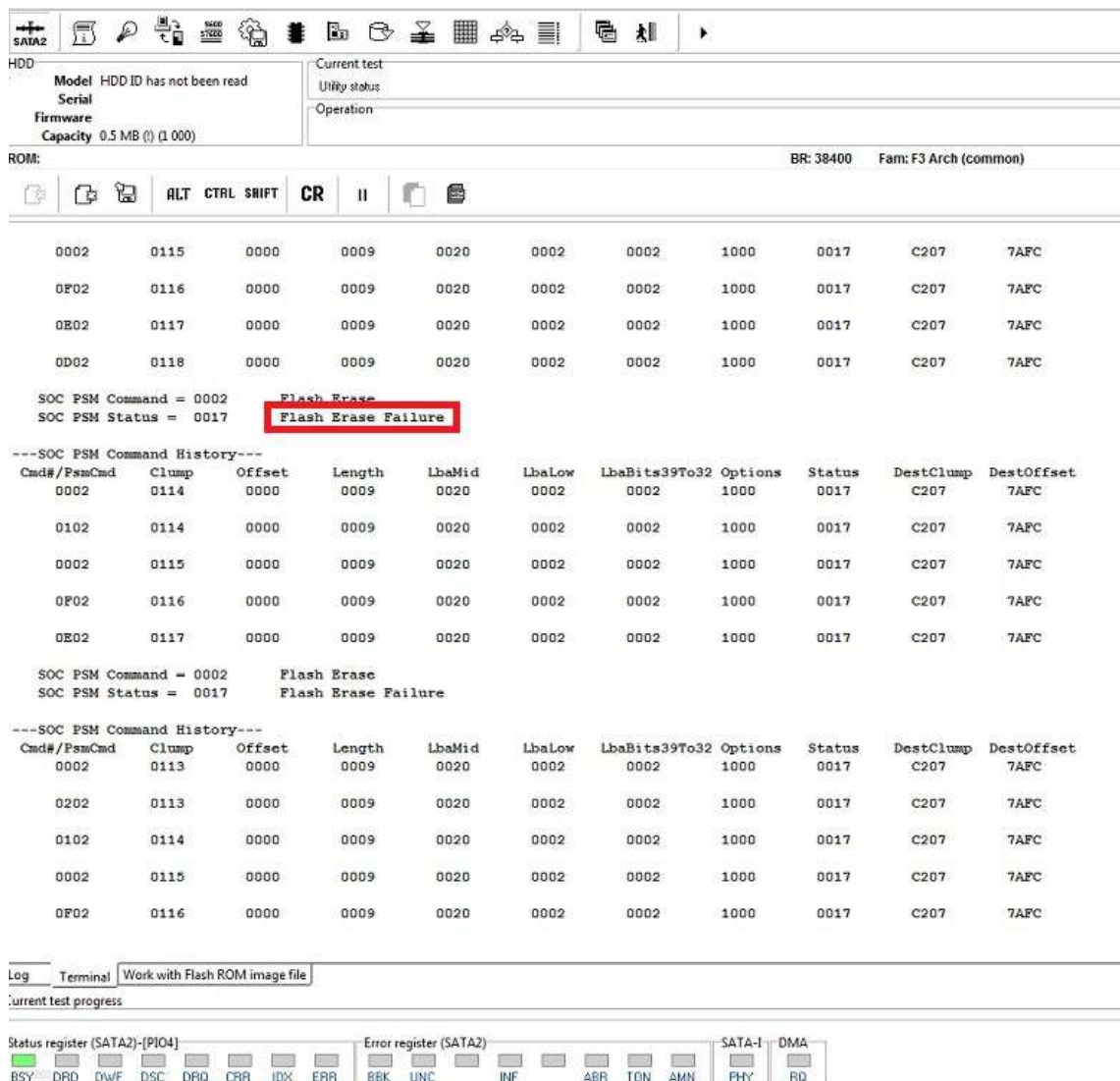


After performing full diagnosis you need to reinitialize a NAND chip to actualize (refresh) the data. This operation requires a special terminal command:



The terminal report can be either short or very long. It's not important, just wait until you get a Terminal response.

If you get the following terminal report:



It means the drive has a hardware problem with NAND chip. You need to set a donor PCB with the patient ROM chip then send a NAND initialization command again.

After completing NAND reinitialization you need to write back the original ROM dump (that you did not forget to backup, didn't you?). Open this ROM.bin file from backup profile folder:

The screenshot shows the PC-3000 software interface. At the top, a toolbar contains various icons, with the 'Load' icon (a floppy disk) highlighted by a red box. Below the toolbar is a hex dump window displaying data in hexadecimal and ASCII. The hex dump shows a series of memory addresses from 0x00000 to 0x001A0, with corresponding hex values and their ASCII representations. Below the hex dump, there are fields for '0(0)d' and 'LE B:186-W:5818-DW:5818-QW:309237651130'. A tabbed interface below these fields includes 'Log', 'Terminal', 'Work with Flash ROM image file' (which is selected and highlighted with a red box), and 'Service information objects'. Below the tabs, there is a section for 'Current test progress'. At the bottom, there are two status registers: 'Status register (PATA)' and 'Error register'. The Status register (PATA) has seven indicators: BSY (green), DRD (green), DWF (green), DSC (green), DRQ (green), CRR (green), and ERR (red). The Error register has six indicators: BBK (grey), UNC (grey), INF (grey), ABR (grey), TON (grey), and AMN (grey).

...and write it by Boot code mode:

...and repower the drive. Re-read Drive ID and check the user area access:

As a result, you get an access to the user area and can now read all user data.

The information in this article will soon be added to the Seagate F3 manual. Follow your Update Box to get the latest one.

If you have any questions or need of assistance – don't hesitate to [contact Technical Support dept.](#)

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8 Responses to PC-3000 for HDD. SSHD drives. What it is and how does it work.

jojo2012 says:
10/17/2017 at 19:26

Great, thanks for the good article.

Right now I have to handle a Seagate SSHD.

Jojo

[Reply](#)



rcz says:

10/25/2017 at 19:56

Looking forward to try this !

[Reply](#)



rcz says:

10/26/2017 at 19:01

it works like a charm ! 😊

[Reply](#)



China_2 says:

11/01/2017 at 16:37

it works like a charm !

[Reply](#)



jojo2012 says:

11/13/2017 at 19:34

Unfortunately in my case with FW DEMC did not work.

I tried with a donor PCB identical to the patient but I always received the same message:

“ERROR: Flash Led 9C17 – RestoreALFTablesToDRAM Failed – could not recover data from Tables Clump”

[Reply](#)



ACELab team says:

11/20/2017 at 17:09

Please contact Technical Support with the particular case you have got.

[Reply](#)



Goran Rajko Jugoslav says:

04/13/2018 at 11:26

Hello,

Does it work for LED BC errors and servo fail errors?

Thanks

[Reply](#)



ACELab team says:

04/18/2018 at 12:17

If both these errors on the same drive then it's heads/surface issue (not NAND problem), so it's necessary to investigate drive inside the case.

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Lost forever ... can still be found