DiskSync

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1. Introduction

The program DiskSync was written to backup the internal disk of my Hifidelio to an external USB drive. The intention is to create a complete backup of the music data to allow a restore of not only the audio tracks but also the play- and searchlists and the rest of the preferences. Key features are:

- The audio tracks are written as single files to disk and can be accessed on any computer capable of reading EXT3 filesystems[1].
- Incremental backups save only changes and therefore improve the time needed for subsequent backups.
- The program can be operated from the front panel controls. No need to use a computer or network and type commands after the installation is done.
- Messages on screen are available in german and english depending on the selected locale of the device.
- An indicator in the display shows the progress of the current backup or restore operation.
- Details of the backup and restore are written to a logfile into the import folder and can be accessed over the network.
- No changes of the installed software on the Hifidelio are necessary.

The program has been developed with the Hifidelio software verson `2.3.18 PRO`. Also I did not encounter any problems after updating the Hifidelio to version `2.3.21 PRO`. Unfortunately it is not possible to ensure the correct mode of operation for arbitrary earlier versions of the Hifidelio software.

[1] A driver for Microsoft Windows can be downloaded from `http://www.fs-driver.org/`. Note that I did not test this driver myself.

2. Installation

The first installation will prepare the external disk for the backups. This setup is described in the following sections. Future updates of DiskSync can be installed much easier, which will be described in detail in section 2.3.

2.1. Preparation of the external disk

The disks that are sold today normally contain a partition table with one partition spanning the whole disk. If this is not the case the disk should be attached to a PC and at least one partition should be created with the help of the disk management utility. Unfortunately it is not possible to do this on the Hifidelio as it is missing the necessary tools.

There have been reports that the Hifidelio may hang when an unformatted disk is attached so it is probably the best to create a filesystem on the partition as well. The type of filesystem (NTFS, HFS, ...) does not matter as it will be overwritten during the installation process. There even seems to be a problem with Windows 2000 and Windows XP not being able to create FAT32 filesystems of more than 32 GB and in general the disks used for backup tend to be much larger.

If you only want to use a part of the disk for backup of the Hifidelio you can create more than one partition here and format the rest of the partitions for other use. With the partition in place the disk is all set for the rest of the installation and it should be connected to the Hifidelio now.

2.2. Initial setup of DiskSync

The software package `disksync.zip` contains the two files `setup` and `disksync`. Both of these files will have to be copied into the import folder of the Hifidelio for an initial installation.

Then you will need to access the Hifidelio over telnet to perform the installation and prepare the disk. It may be necessary to enable the telnet service from the menu `Settings & Specials` → `Network` → `Services` first.

Depending on your operating system there are differnet programs available to establish a telnet connection. In Microsoft Windows you can normally start the telnet program from the menu `Start` → `Run` and entering `telnet`. The program will open a new window and print out the prompt (figure 1).

To establish a connection with your Hifidelio you need to enter the command `open`, then a space and the IP address of your Hifidelio (figure 2). The IP address can be found on the Hifidelio menu `Settings & Specials` → `Network` → `Configuration`. After pressing the return key you should see the login prompt of the Hifidelio.

For a login you enter the username `root` and press the enter key. If you did not set a password for the user `root` you can just press return again when the password prompt is shown. Otherwise you will need to enter the choosen password. Then you change the directory with the command `cd`

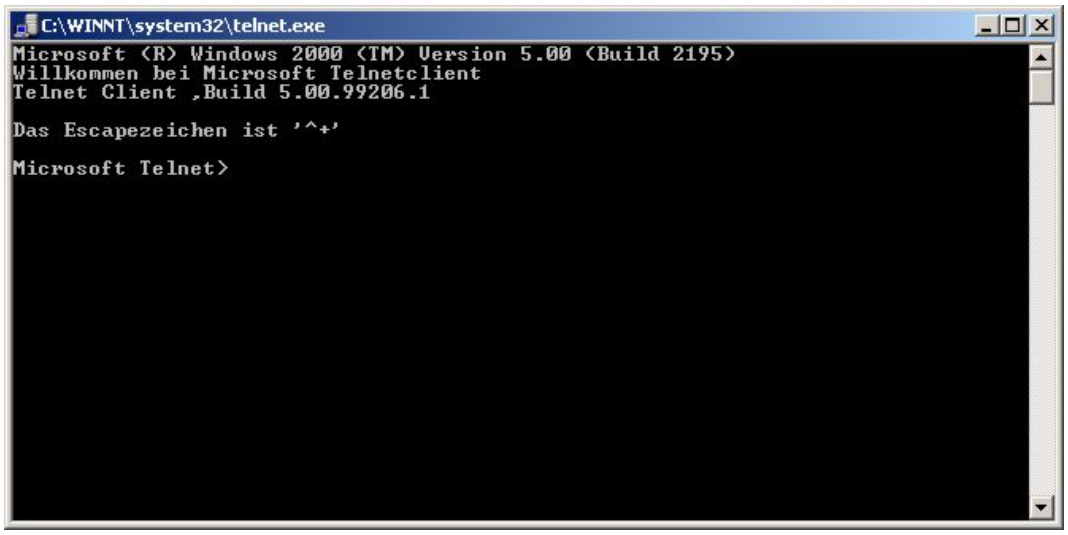

Figure 1: Telnet in Microsoft Windows

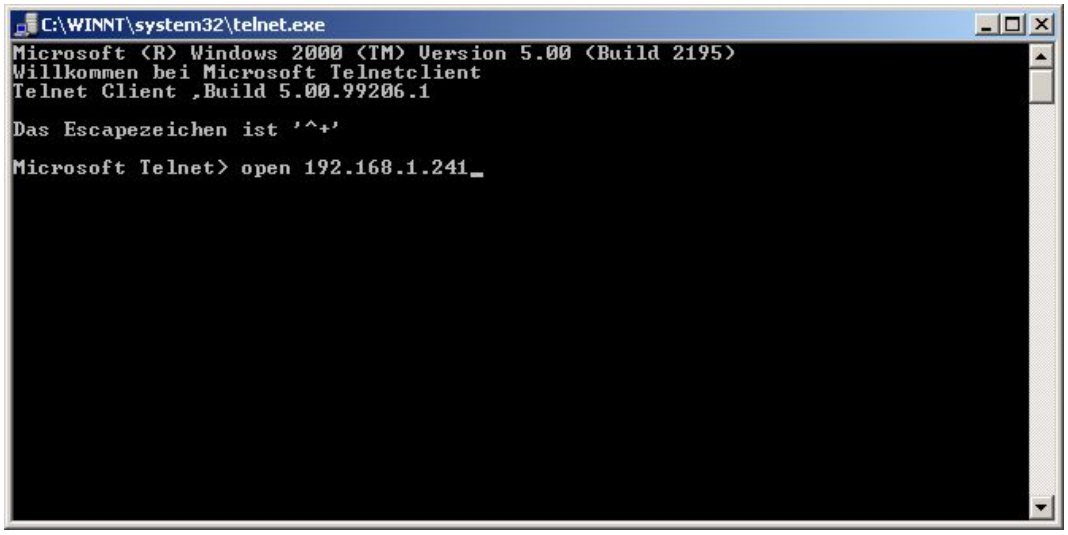

Figure 2: Establish a telnet connection to the Hifidelio

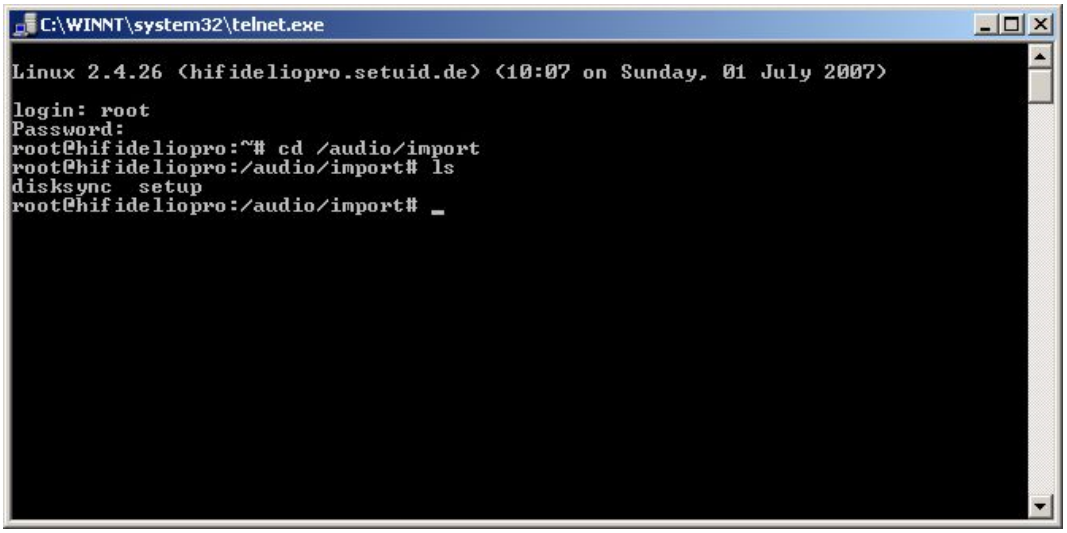

Figure 3: Change into the import directory

to `/audio/import` where the two files should be. You can use the command `ls` to verify that both files are there (figure 3).

If the files `setup` and `disksync` are listed you can prepare the external disk for DiskSync. After typing `bash setup` the menu to select the external disk will appear (figure 4).

The menu should have the external disk as an option. The manufacturer and model of the disk will also be displayed to prevent the selection of the wrong disk in case of two or more connected devices.

The list will show all partitions on the disk if it has been divided into partitions on a PC beforhand. This allows using a larger disk for other things as well.

The disk or partition will be selected by entering the number of the entry. If the disk is still mounted on the Hifidelio it will have to be ejected by selecting the menu `USB` → `Eject` on the unit. This is required to prevent the Hifidelio software from accessing the disk during the setup. But of course the disk has to stay attached to the unit. The setup program will continue writing a message to the console until the disk has been ejected successfully (figure 5).

After an additional confirmation dialogue the setup will create the new filesystem on the disk. This will erase all data on the disk! There is a last chance to abort the operation if you are uncertain (figure 6).

After the confirmation the program creates an EXT3 filesystem on the disk. EXT3 is the prefered filesystem as it is the same type that the Hifidelio uses to store the data internally. Special characters used in the filenames will therefore not lead to a problem when the file is written to the external disk. Tests with other filesystems like FAT32 unfortunately resulted in not all files being stored in

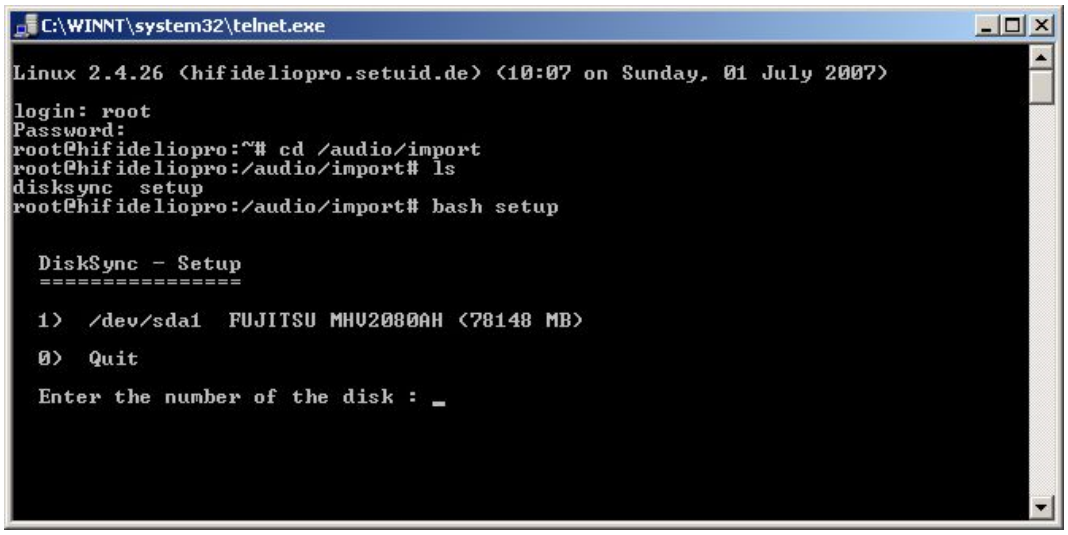

Figure 4: Starting the setup program

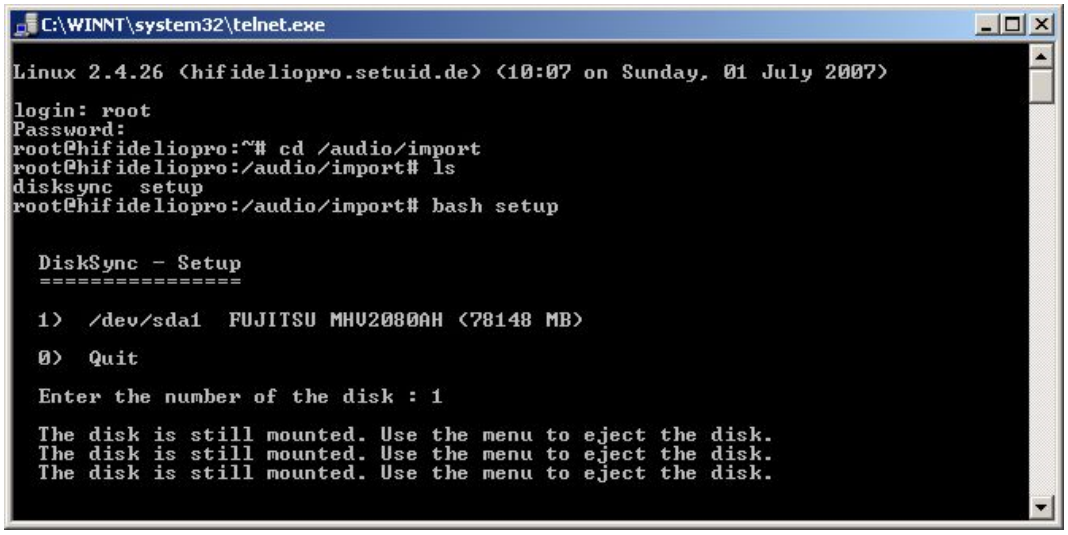

Figure 5: Selecting the external disk

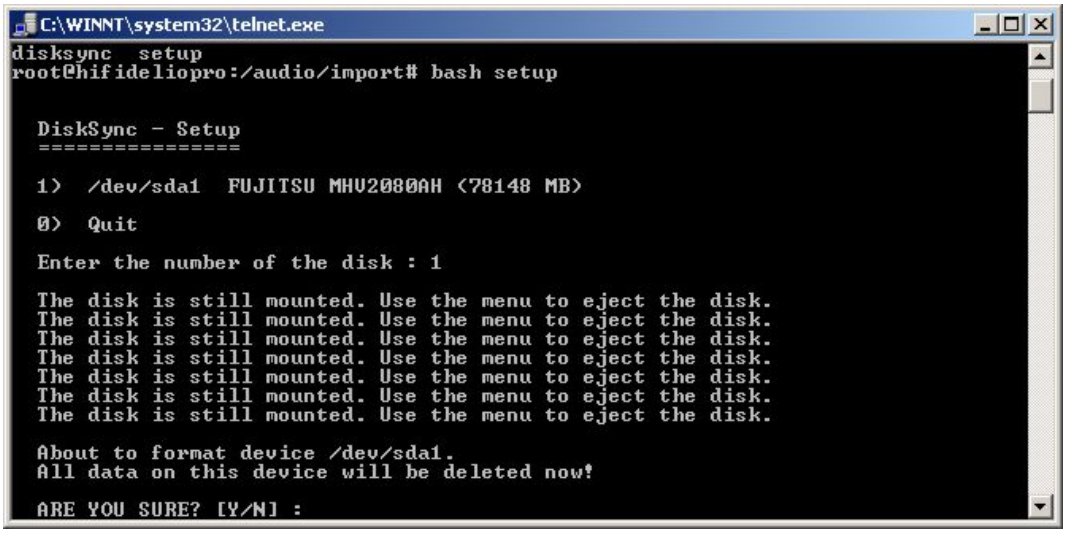

Figure 6: Confirmation dialogue before filesystem creation

the backup. This of course is unacceptable for a backup solution.

Creating the filesystem will take some time and a progress counter will be shown (figure 7).

In a last step the DiskSync program will be installed on the disk after the filesystem has been created. Then you can detach the disk from the unit and everything will be set for the backup (figure 8).

The telnet connection to the Hifidelio can be closed again by entering the `exit` command and you can leave the program.

The files `setup` and `disksync` are no longer needed in the import folder and should be removed.

As no files are modified on the unit itself there is no need for an additional installation of DiskSync after the Hifidelio software has been updated.

2.3. Update of DiskSync

During the start of the program it looks into the import folder for a file named `disksync` and installs it automatically. For an update it is sufficient to copy the new version of `disksync` into the import folder and connect the prepared disk to the unit. The logfile contains a message if the update was successful.

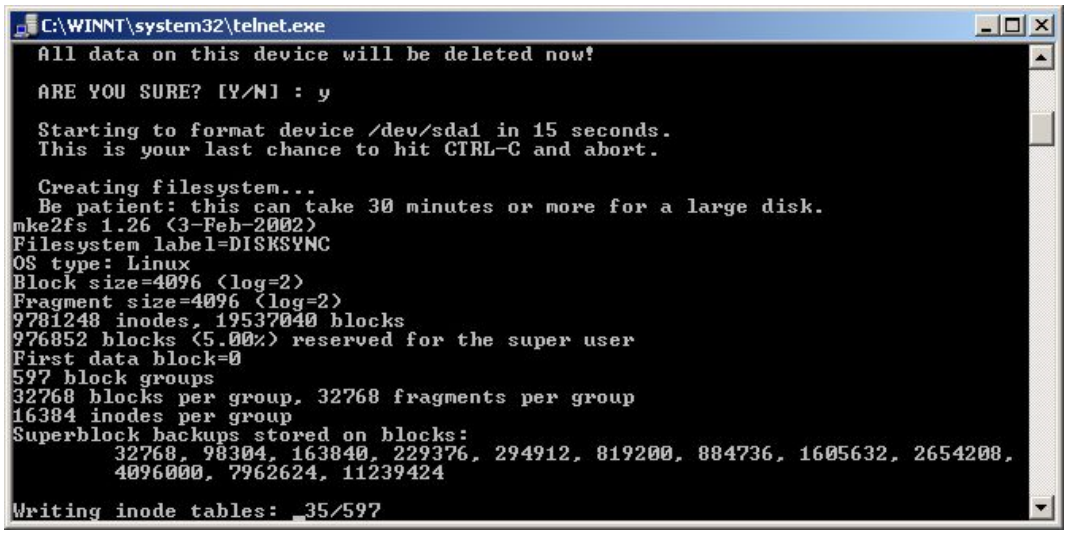

Figure 7: Creation of the EXT3 filesystem

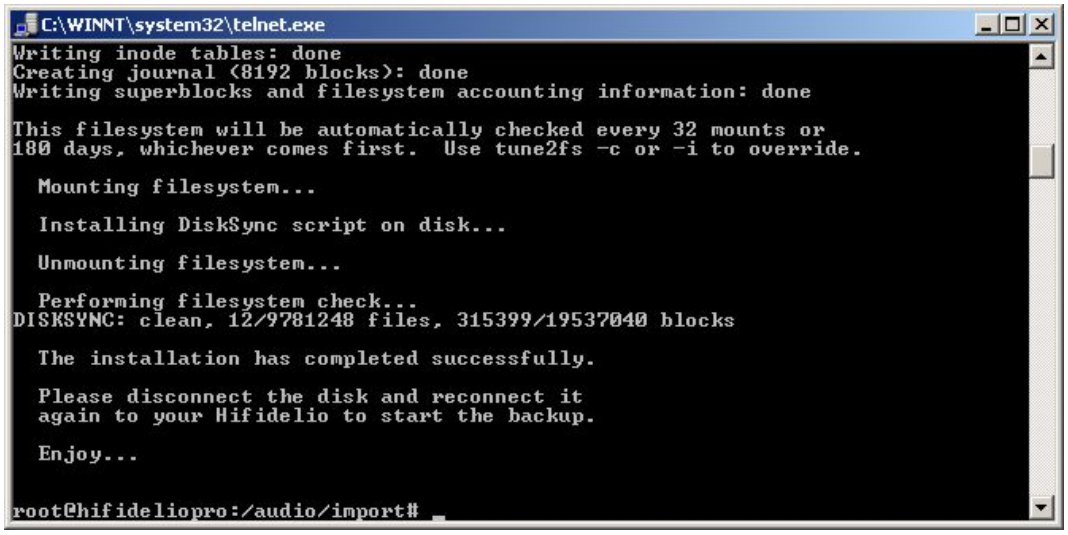

Figure 8: Setup finished successfully

Figure 9: Selection after program start

3. Operation

The procedure for a regular backup or a restore will be explained in the next sections.

3.1. Start

The DiskSync program starts whenever the external disk is attached to the unit[2]. The program will terminate most of the Hifidelio services and therefore the curtain in the display will close. This is essential to be able to create a consistent backup of the database and avoid a mixup when multiple programs access the display at the same time.

If the VNC server *Veronica* is active it will be restarted again. The progress of the backup can be monitored from a host connected over the network. Unfortunately it is not possible to operate DiskSync over the network like this, because the component responsible for evaluating the key actions is not activated. So this is purely for monitoring purpose.

The program will display a menu on screen with the choice between Backup and Restore (figure 9). The action can be selected as usual by pressing one of the buttons next to the screen. There is also the possibility of aborting the program without any action. In this case the Hifidelio services will be restarted immediately.

After quitting the program the disk is still mounted on the Hifidelio and visible as a menu named `DISKSYNC`. It is possible to browse the disk just like every other device and play or import songs directly from it.

[2]The Hifidelio software starts any program called `hfhermstedtsupermagicscript` from a connected device automatically.

Figure 10: Progress indicator while looking for changed files

Before the disk can be removed from the Hifidelio it will have to be ejected by selecting the menu `DISKSYNC` → `Eject`.

3.2. Backup

The backup will start immediately after selecting the corresponding menu entry. It will run in two passes. The number of changed files will be determined first (figure 10).

After completion the actual backup to the external disk starts. During the backup the screen will show a progress indicater next to the number of changed files (figure 11). The backup will delete files from the external disk that no longer exist on the Hifidelio. Therefore the backup will be a snapshot of the current state and can only be used to restore this state. It is not possible to restore an older state from this backup.

During the backup a logfile `backup.txt` will be written into the import folder. This log contains a list of files saved during the backup.

The backup is done with the `rsync` program[3], which efficiently copies only changed files to disk and therefore allows incremental backups. After the initial backup the time for a backup only depends on the number of files changed since the last time.

Since `rsync` works with single files, a renamed file will look like one deleted and one new file. The number of changed files will be larger if a whole album or artist is renamed. This should be taken into account if the number of changes displayed seems to be too large.

A backup contains the music library, analogue recordings, internal database and also the locally changed FreeDB profiles.

[3] It is not necessary to install `rsync` on the Hifidelio as DiskSync brings it's own copy

Figure 11: Syncing changed files

3.3. Restore

The restore starts after selecting the corresponding menu entry. It will run independently for each of the following areas:

- music library (`/audio/music`)
- analogue recordings (`/audio/record`)
- Hifidelio database (`/data/db`)
- modified FreeDB profiles (`/data/cddb2`)

For each pass the number of files that would be written is shown. Then the user can decide if the restore for this directory should proceed (figure 12).

Only after confirmation the files will be copied onto the Hifidelio. During this operation there is also a progress indicator shown in the display (figure 13).

When restoring the internal Hifidelio database there is an additional check if the unit has a PRO upgrade key installed. If such a key is found there will be an confirmation request if the installed key should be overwritten with a key from the backup. This prevents that a backup performed on a different Hifidelio renders the local key unusable due to the tied serial number.

In contrast to the approach for a backup the files from the external disk will only be copied into the directories on the Hifidelio. Files that are not part of the backup will not be removed from the Hifidelio during a restore. Therefore it may be necessary to use the maintenance procedures under the menu `Settings & Specials` → `Service` → `Maintenance` to synchronize database and library again.

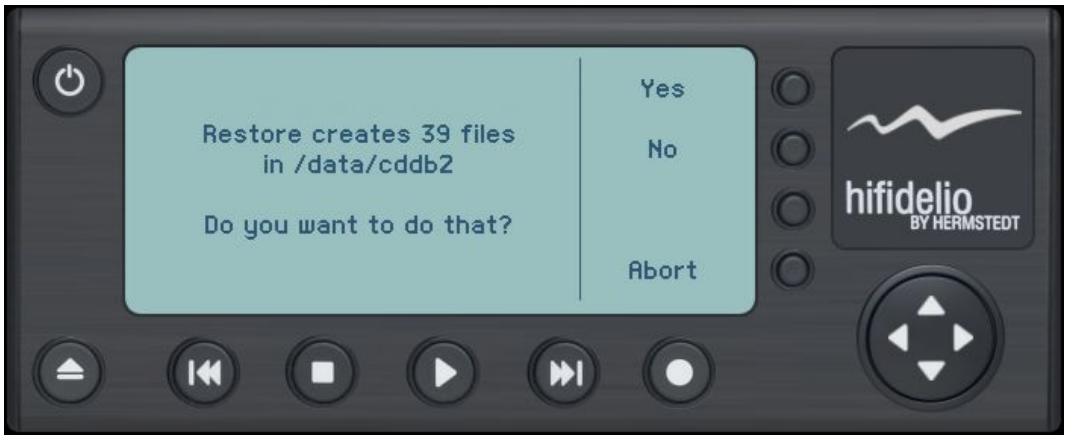

Figure 12: Confirmation dialogue before starting a restore

Figure 13: Performing a restore

Restoring only audio tracks without restoring the appropriate database leaves these files being unknown to the Hifidelio. The maintenance function `Settings & Specials` → `Service` → `Maintenance` → `Check Music Folder` would move these files right back into the import folder. Restoring the database on the other hand would lead to a loss of all changes made after the backup was done. In case those changes should be kept it is important to not overwrite the database from an older backup. If there is no current backup it is sometimes preferable to just import the missing tracks from the external disk without doing a full restore.

A restore will also write a logfile to `backup.txt` in the import folder.

3.4. Performance

As mentioned before the backup and restore uses two passes. The first pass determines the number of files that need to be copied. Even with a large music collection this should not take more than one or two minutes.

Then the changed files will be copied. During the first backup this will of course apply to all files. I have seen a throughput of about 10 GB per hour on my unit. So depending on the size of the music collection this will probably take a couple of hours.

During the following backups only the changed files will be copied which will improve the time needed for a backup significantly. After importing a single CD the backup should not take more than five minutes.

Actual times depend on the used USB disk and therefore can not be predicted reasonably.

A. Legal

The software was written with maximal care and tested thoroughly. Nevertheless I would like to point out that even with state-of-the-art programming it is not possible to write software that will work correct under all circumstances. Therefor this software is provided as is and without any warranty and you may use it only on your own risk. The author does not assume liability for errors contained in or for damages arising from the use of the software.

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