User Guide for Disk Verifier v1.1.0 and higher

generated by DAPS

User Guide for Disk Verifier v1.1.0 and higher: generated by DAPS

Version 1.0

Revision: 4

Link To GNU Free Documentation License [http://www.gnu.org/licenses/fdl-1.3-standalone.html]

Source code for this documentation can be found at https://www.hamishmb.com/html/Docs/diskverifier.php

Source code for Disk Verifier is available from your purchase page (this is Python code so the executable is the source code)

Table of Contents

List of Figures

Preface

Abstract

Disk Verifier is a Graphical User Interface that makes it easy to verify your disks have been erased successfully, and can help achieve NIST 800-88 compliance. This document will teach you how to use Disk Verifier, and serves as a general-purpose troubleshooting reference.

Why read this document?

Reading this document will make it easier for you to use Disk Verifier to its fullest extent, and if you are not yet sure whether to purchase Disk Verifier, it will also make it easier for you to decide whether this is the tool for you. It's quite easy to get confused about which disk is which, and accidentally erase and/or verify the wrong disk, and this guide will also show you how to avoid this confusion.

The other reason it is worth reading this document is that it will help you to understand some of the concepts underpinning securely erasing and verifying disks, and it will hopefully answer any questions you may have.

What is covered in this document?

Hopefully, it covers anything you might want to know about Disk Verifier, and erasing and verifying disks. I know that's a large undertaking for a small guide, so at various points I may direct you to read other materials for more detail in particular areas.

To be specific, this document covers:

Basic Information About Disk Verifier	*Why you should use it, what systems it works on, and whether you should buy the Parted Magic module or the Live Disk (or both).*
Concepts Underpinning Disk Erasure and Verification	*Explains important concepts in plain language, and other important things like device names.*
Using the Disk Verifier Parted Magic Module	*This section shows you exactly how to use the Parted Magic module with the Secure Erase GUI.*
Using the Disk Verifier Live Disk	*This section shows you how to use the Live Disk. As this builds on the functionality in the Parted Magic module, I recommend you read*

	the above section even if you aren't going to buy or use the Parted Magic module.
Frequently Asked Questions and Troubleshooting	*Some of the questions I get asked a lot, and also some extras to help you if you encounter problems.*

Conventions

I have used a few conventions in this book, but I've tried to keep it simple where possible. Screenshots are provided in various places in the guides to make it easier to understand what is being discussed, and where options are. At any point where you need to be careful about something, this icon is used with some information:

Caution

Some general advice about how to do something, or what you should check.

Alternately, if there's some important information you need to read, I'll use this:

Important

Some important information which may apply in a few scenarios.

If there's a little snippet of useful information that might apply to you, I'll put it in a note:

Note

These are used to point out little pieces of information that may serve as shortcuts or as platform-specific features.

If there's a general-usage tip for you, it might look like this:

Tip

These might suggest something extra or optional you can do in particular circumstances.

If you need to follow instructions carefully, I might use this:

Warning

These are used to emphasise important part of instructions, or instructions that may have severe consequences if followed improperly.

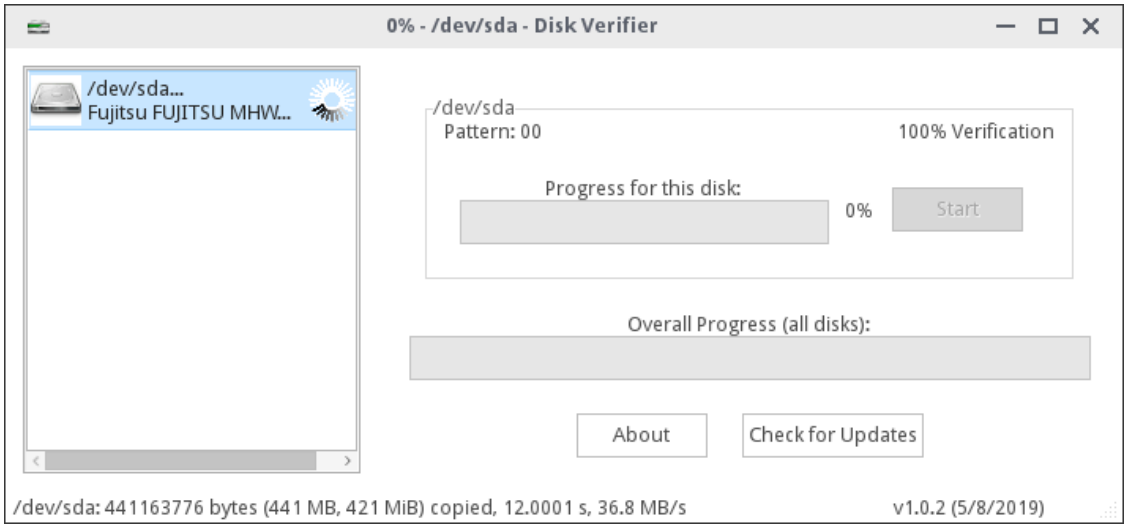
Chapter 1. What is Disk Verifier?

Abstract

Disk Verifier is a simple GUI that can be used to verify your disks have been erased correctly. It can be used as a stand-alone live disk, or as a Parted Magic [http://www.partedmagic.com] module, in conjunction with Parted Magic's Secure Erase GUI. This chapter provides basic information about Disk Verifier. I'm going to start at the start, to make sure everything is very clear. If you already know about securely erasing and verifying disks, you can safely skip to the next chapter.

What is Disk Verifier?

Figure 1.1. Disk Verifier in action



Disk Verifier makes it easy to verify your disks have been erased successfully. You can verify any pattern that can be represented with two hexadecimal digits (explained later), and you can verify your disk to any percentage. Combined with other tools, such as Parted Magic's Secure Erase GUI, Disk Verifier can also help you achieve NIST 800-88 compliance.

Why should I use the Disk Verifier Parted Magic module?

When you use the Parted Magic module, you have the benefit of being able to erase and verify your disks in one fell swoop. This is very convenient, because once the process has started, it will run on its own to completion - you can set it and forget it.

Disk Verifier also logs the serial numbers and verification status of the drive(s) you verify, and you save save this as a report. This is useful if later on you want to double check that a particular drive was erased and verified successfully.

Additionally, purchasing Parted Magic gives you access to a load of other useful software tools on a live disk. However, if you want to use a different tool to erase your disks, you need to buy the live disk.

Why should I use the Disk Verifier Live Disk?

This gives you all the features you get from the Parted Magic module, except that you can also verify any previously erased disk. Tools to erase disks are not provided on this live disk, because the goal here is to verify disks that you've already erased, but with a tool other than Parted Magic's Secure Erase GUI.

The live disk also allows you to save a report when you close Disk Verifier that details which drives were verified, their serial numbers, and whether they verified successfully.

From version 1.1.0 onwards, the live disk includes networking support and a web browser so you can get help or view this user guide while running Disk Verifier. DDRescue-GUI and WxFixBoot are also included for your convenience.

System Requirements

Disk Verifier is designed to be lightweight, so it will run on most systems.

The Parted Magic module will run on any system that is capable of running Parted Magic. To see the current system requirements for Parted Magic, visit www.partedmagic.com [https://www.partedmagic.com].

The live disk has the following system requirements:

- A 64-bit x86 CPU.
- BIOS (old-style) or EFI/UEFI (new-style) firmware.
- At least 1 GB of system RAM.
- A 1GB USB stick or blank CD/DVD to write the software to.

UEFI Secure boot is not supported. As always, the faster your system, the faster the software will run.

Note

Most hardware is supported, however Intel Macbook users with SPI keyboards and touchpads may need to use a USB keyboard and mouse. This issue will be fixed in a future release.

Where can I buy Disk Verifier and Parted Magic?

Disk Verifier can be purchased from my website at www.hamishmb.com [https://www.hamishmb.com/html/diskverifier.php]. Parted Magic can be bought from www.partedmagic.com [https://www.partedmagic.com].

Chapter 2. Disk Drive Concepts

Abstract

In order to make best use of this tool, you need to understand some of the concepts behind disk drives, and securely erasing disks. This chapter will explain the basics, and it will also show you how to get help when you're using the GUI. You can safely skip this chapter if you already understand the concepts, because I've gone into fairly basic detail here.

Device Names

Device names are a bit of a weird concept to a lot of people, particularly those who use Windows, where drive letters are used instead, like C:, D: and so on. On Linux, however, devices (like hard drives, USB drives, DVD drives) have names. These names are used to access the drives, so for example, to read directly from the DVD drive, you might read from a device called "/dev/sr0", which you can think of as being similar to the D: drive in Windows.

Linux tends to use different names for devices. It's quite common to have names like "/dev/sda" (first hard drive), "/dev/sdb" (second hard drive), and "/dev/sr0" (first optical drive). You might also see names like "/dev/sda1", which represents the first partition on the first hard drive. If you're finding this confusing, don't worry: a thorough understanding of these names is not required to use the GUI.

"Disk"

This is quite a vague term that can mean a lot of things. In this user guide, and in the program, a disk is a device that you want to securely erase and/or verify.

HDD

Short for Hard Disk Drive. These are the rotating magnetic drives that have been in common use for many years.

SSD

Short for Solid State Drive. These are the new flash-based storage media that have been gaining popularity rapidly over the last several years. There are no moving parts in these drives.

ATA

Short for Advanced Technology Attachment. Also known as PATA, IDE, ATAPI, EIDE, and similar. This is the name for the interface that older HDDs and optical drives used, with the ribbon cables.

SATA

An improvement over IDE/ATA that is faster and uses slim cables. This is the most common, but older standard, used for HDDs and slower SSDs.

NVME

A new, very fast protocol used by faster SSDs to get the highest speed possible. These newer drives usually connect using a PCI Express or M.2 connector.

Note

There are also other drive and connector standards, such as SAS. These are also supported by Disk Verifier, but not mentioned much in this user guide because they are less common and don't affect the way that Disk Verifier works.

Hexadecimal numbers

These are numbers that are in base 16, instead of our usual base 10. The letters A-F are used for the final 6 characters. These are commonly used in computing because one byte can represent exactly two hexadecimal characters - it is a very convenient way of displaying binary data.

In order to understand how to use the patterns, you should know that if a disk's data consists entirely of 0s - that is, bits that are 0 instead of 1 - the hexadecimal pattern will be "00" for each byte. Likewise, if the disk has only 1s on it, the hex pattern will be "FF" for each byte. Generally, you can leave this setting as it is ("00"), because usually disks are erased by writing 0s to them.

ATA/SATA Secure Erase Command

This is a special ATA/SATA command sent to a drive to tell it to erase itself securely. There are other ways of erasing media as well, such as degaussing, and using the OS to write zeros or random data to it, but this is the preferred method, because it also erases reserved areas of the disk that the OS cannot access.

More information on the ATA secure erase command can be found at https://ata.wiki.kernel.org/index.php/ATA_Secure_Erase

NVME Secure Erase Command

This is much the same, but it is used for NVME SSDs that connect through the faster M.2 or PCI Express connectors, rather than through SATA or ATA.

"Secure Erase" vs "Enhanced Secure Erase"

A standard Secure Erase overwrites all the data on the disk with zeros. On SSDs, the process is different, and often much faster, but the end result is the same. This is the standard option provided with most drives.

Enhanced Secure Erase is provided on some newer or more specialist drives. It writes predetermined patterns on to the disk, usually multiple times. As a result of this, it takes a lot longer to perform. It is much harder to verify the disk has been erased in this case, because the patterns are manufacturer-specific.

Warning

As a result of the Enhanced Secure Erase writing manufacturer-dependent patterns to the disk, you need to use the standard Secure Erase feature in order to be able to verify the disk with Disk Verifier.

NIST 800-88

The NIST 800-88 specification is a set of guidelines for sanitizing media. The specification is long and complicated, but part of the specification states that at least 10% of the media should be verified. This is the default percentage to verify, but of course, if you want to be absolutely sure, you should verify 100% of the disk. I recommend always verifying 100% of the disk unless you have a very good reason not to do this.

The full NIST 800-88 specification can be found at https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-88r1.pdf

Chapter 3. Using the Disk Verifier Parted Magic Module

Abstract

This chapter covers using the Parted Magic module with the Secure Erase GUI. This is a bit simpler than the live disk, but I recommend you read this even if you have bought only the live disk, as the basics are pretty much the same.

Preparing the module

This is a fairly simple process if you're using a USB stick to boot Parted Magic (which I recommend). Create your USB stick using the instructions here [https://partedmagic.com/creating-liveusb/], and drop the .txz file you downloaded into "pmodules" in the "pmagic" folder.

This is more complicated if you're booting from a DVD, because it involves re-mastering the Parted Magic ISO file.

Full instructions for this, complete with a tutorial video, are available on my blog [https://www.hamishmb.com/blog/disk-verifier-parted-magic-tutorial-video-released/].

Booting Parted Magic

Plug your USB stick in, or insert your optical media, and shut down your computer. Next you need to power it back on while holding a special key. On most systems, you need to press and hold the either F12, F10, or Delete key, and on Macs you need to press and hold the Option key. This should get you into the boot menu.

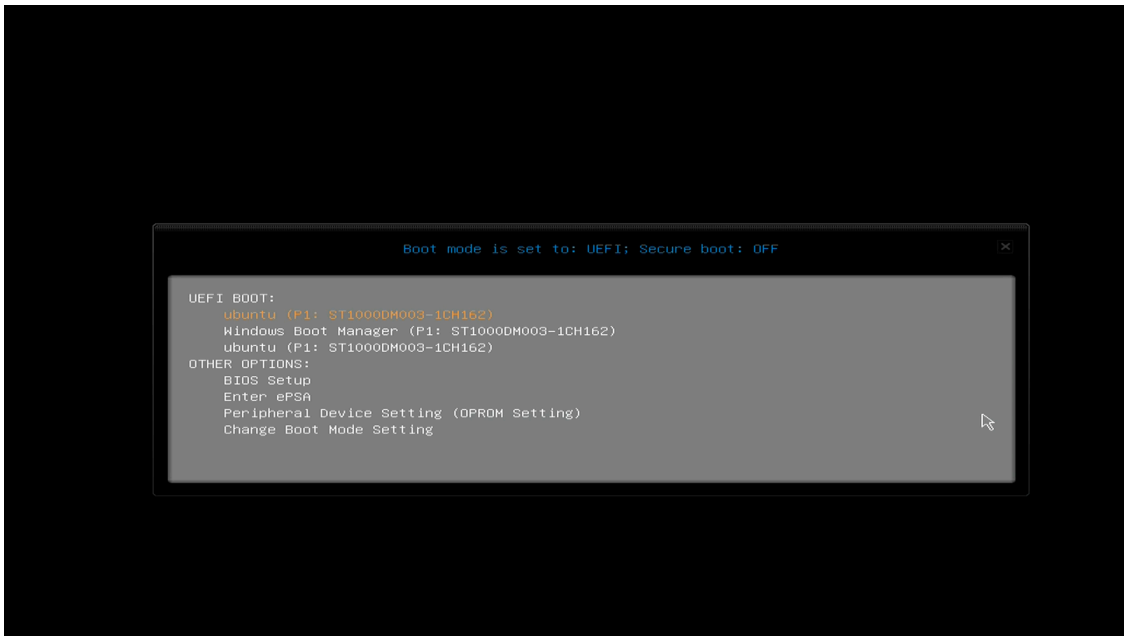
Tip

It can sometimes be difficult to get into the boot menu, depending on your computer. Especially on PCs, you may find you need to tap the key rapidly.

While uncommon, it's also possible that you might need to press a different key. When your computer starts, see if there is any text telling you which key to press. This is usually in the bottom right-hand corner of the screen, and it may say something like "F5: Boot Menu".

Once you're gotten into your boot menu, you may be presented with a screen something like this:

Figure 3.1. The boot menu (PC)



This often looks different on different systems, especially on Macs, so here is a picture of a Mac boot menu:

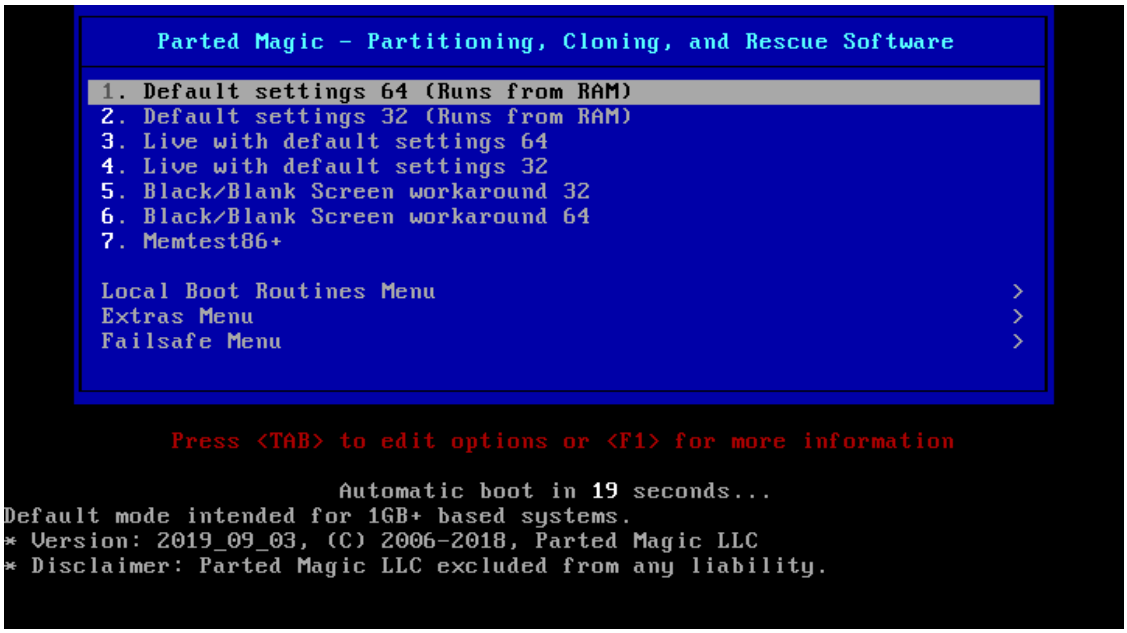
Figure 3.2. The boot menu (Mac)

(Used with permission from OSX Daily. Source: http://osxdaily.com/2011/03/22/change-the-mac-startup-drive-on-boot/)

Now, all you need to do is select the option that corresponds to your USB stick or optical drive. This is usually fairly easy to figure out, and might be prefixed with "USB:" or "DVD:".

Next you'll be presented with Parted Magic's boot menu:

Figure 3.3. Parted Magic's Boot Menu



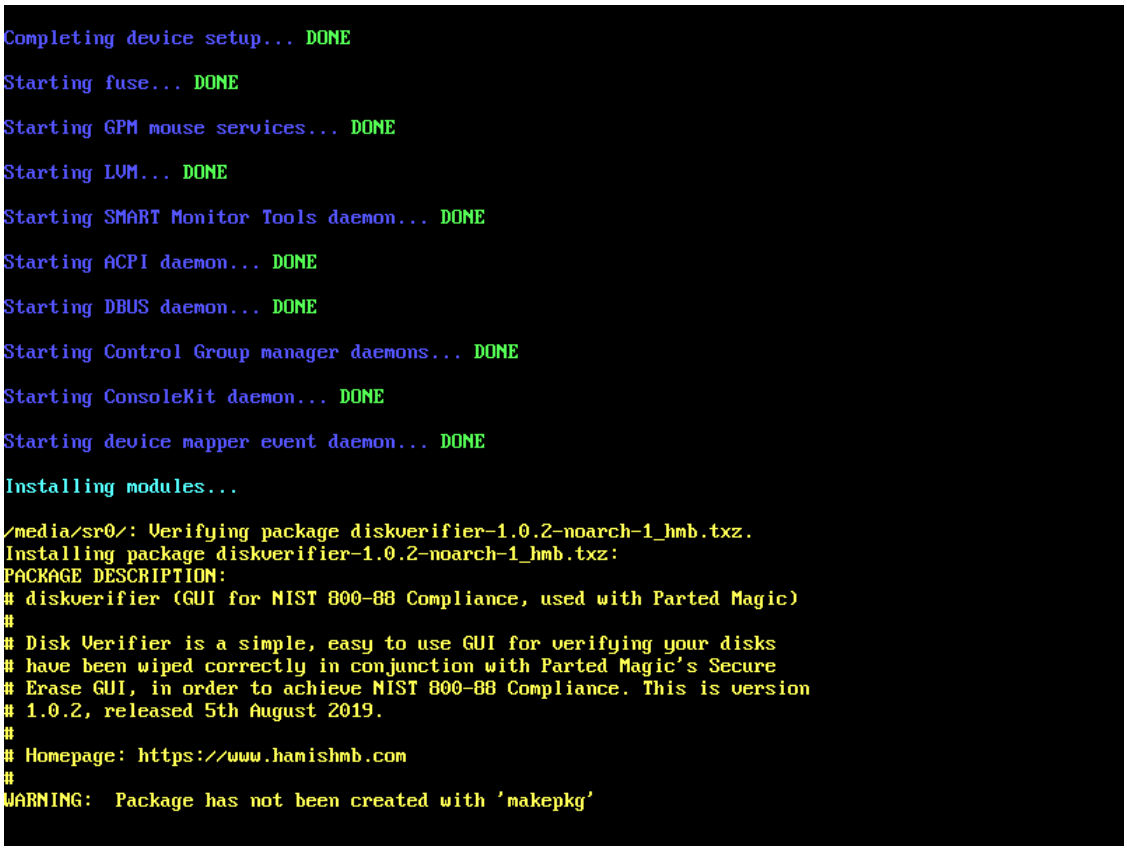
Generally, you can just press the Enter/Return key to boot - the default options are usually fine.

Tip

If it doesn't boot, you can instead boot the "Live" option, which almost always works.

During the bootup process, you should see the following (yellow) message appear:

Figure 3.4. Parted Magic installing the Disk Verifier module



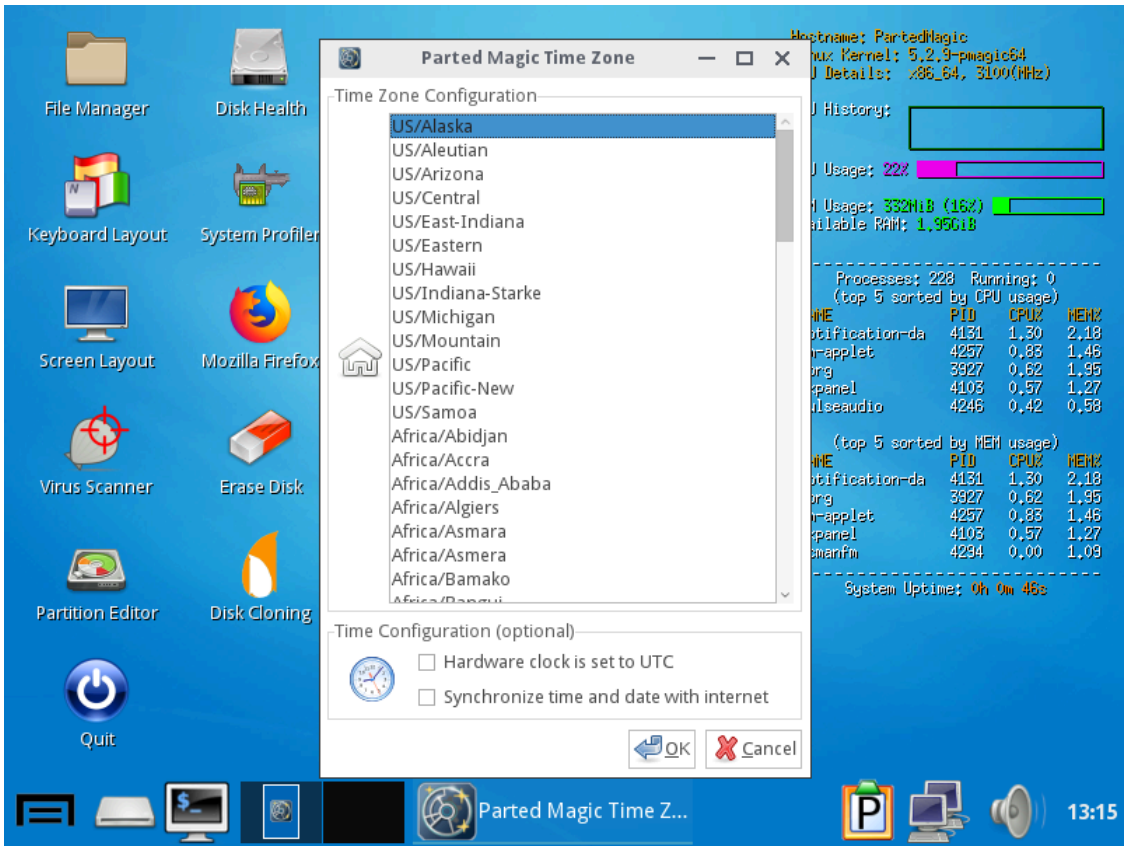
This is normal, and to be expected. The boot process may also seem to hang here for a little while, but it will resume.

Warning

If you don't see this message, or a similar one, it indicates that the Disk Verifier module has not been installed successfully. Please re-read the instructions in the section called “Preparing the module” and watch the tutorial video.

Eventually, Parted Magic should boot to this screen:

Figure 3.5. Parted Magic desktop



Simply enter your time zone, and you're ready to begin erasing and verifying disks.

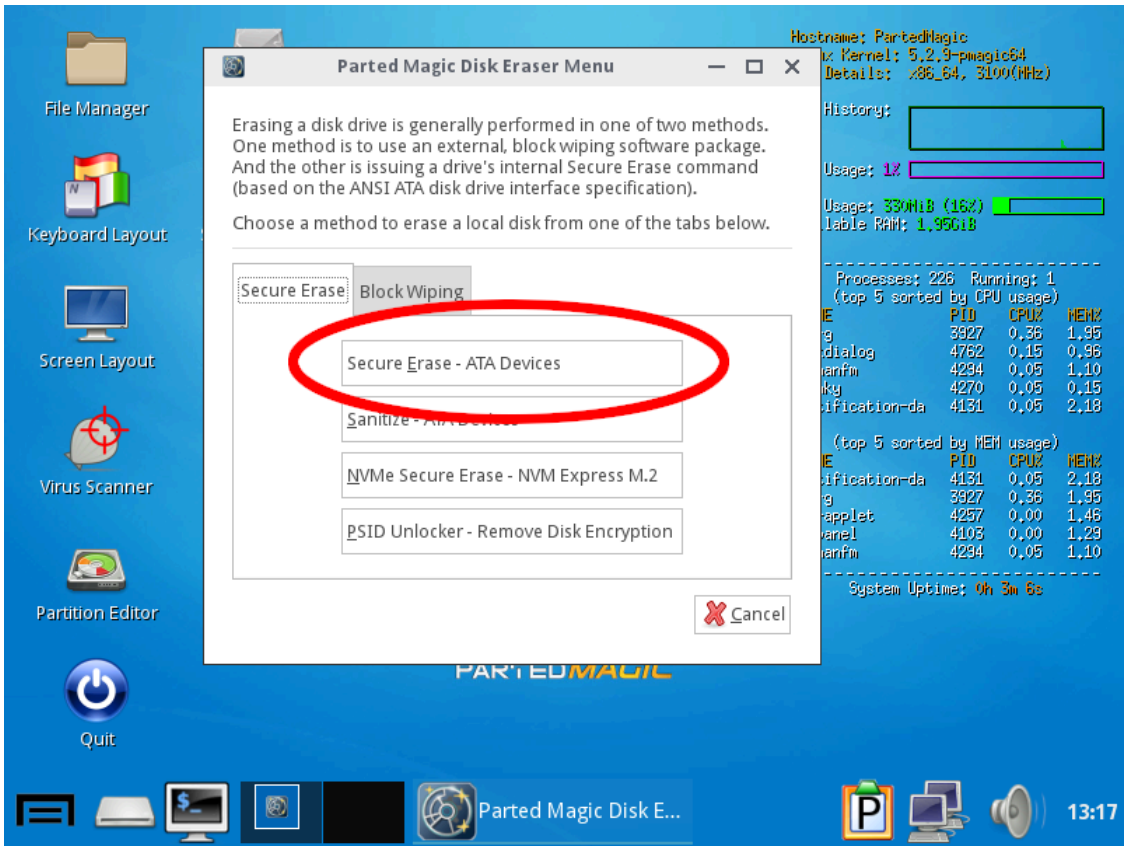
Using the Secure Erase GUI

Now you need to open the Secure Erase GUI from the desktop:

Figure 3.6. Parted Magic Secure Erase GUI shortcut

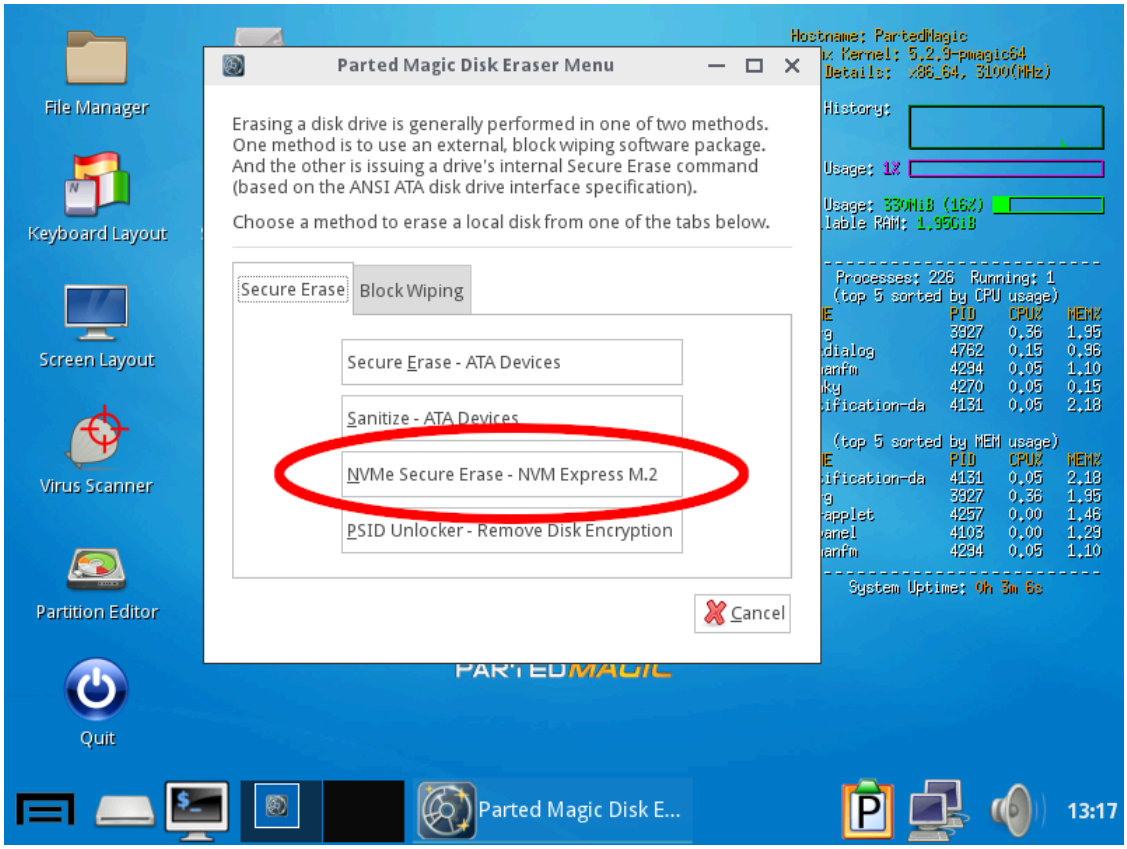
And select the secure erase option:

Figure 3.7. Parted Magic SATA Secure Erase option



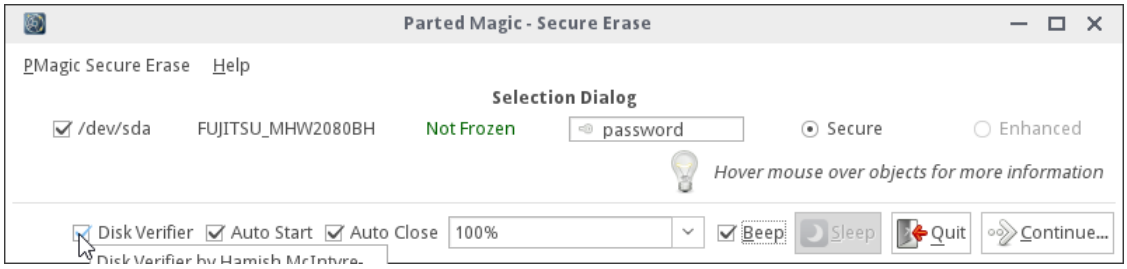
Alternatively, select this option for NVME drives:

Figure 3.8. Parted Magic NVME Secure Erase option



Next, the Secure Erase GUI will present you with a list of disks you can erase:

Figure 3.9. Parted Magic Secure Erase disk selection



Simply tick the "Disk Verifier" option, and specify the disks you want to verify, and the percentage of the disk you want to verify (defaults to 100%), and click continue.

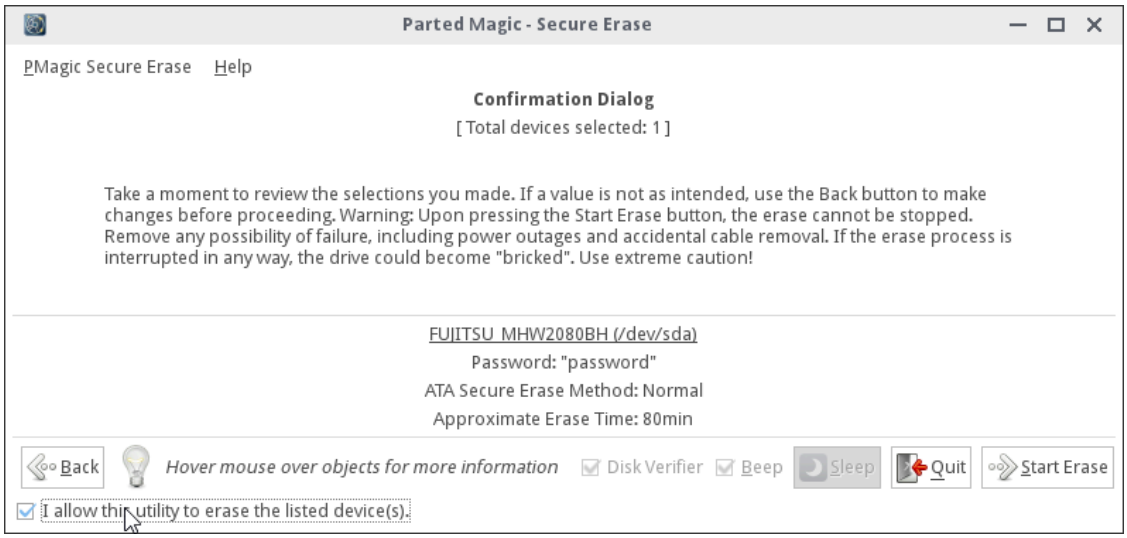
Tip

You can deselect the "Auto Start" and "Auto Close" options if you wish, but this just means Disk Verifier will wait for you to start the verification

for all drives, and will wait for you to close it when the verification is done.

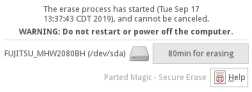
After this, you'll see a confirmation dialog:

Figure 3.10. Parted Magic Secure Erase confirmation



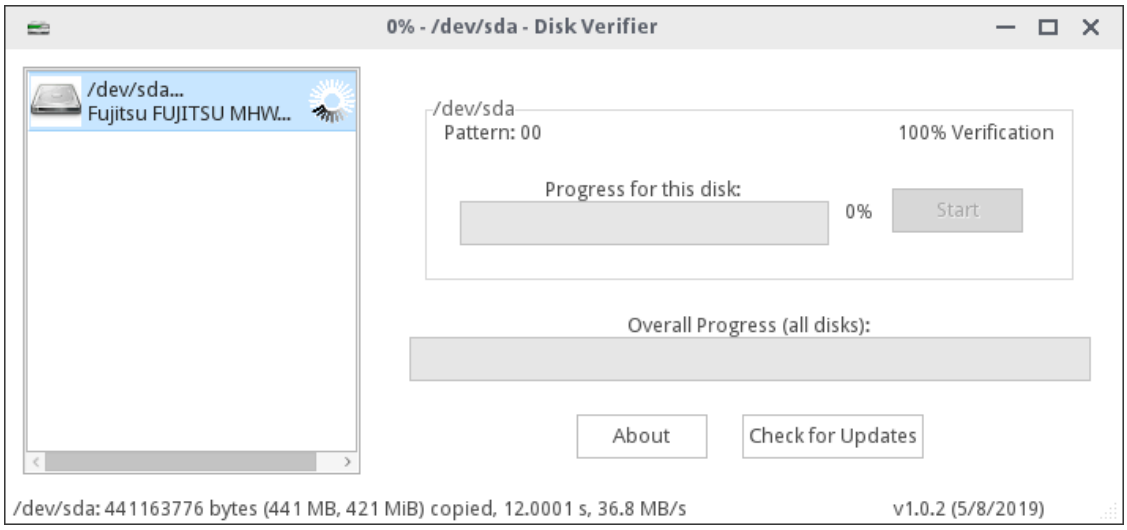
After ticking the tick box at the bottom, you can click "Start Erase" to begin erasing the disk(s). This can take anything from a few seconds for new SSDs, to hours or even days for larger HDDs. As you can see from the screenshot, my disk takes around 80 minutes.

Figure 3.11. Parted Magic Secure Erase in action



Once erasing is complete, the window will disappear, and Disk Verifier will open. Depending on the options you picked, Disk Verifier will now usually begin verifying the disk(s). This may take a while depending on the size and speed of your disk(s).

Figure 3.12. Disk Verifier running on Parted Magic

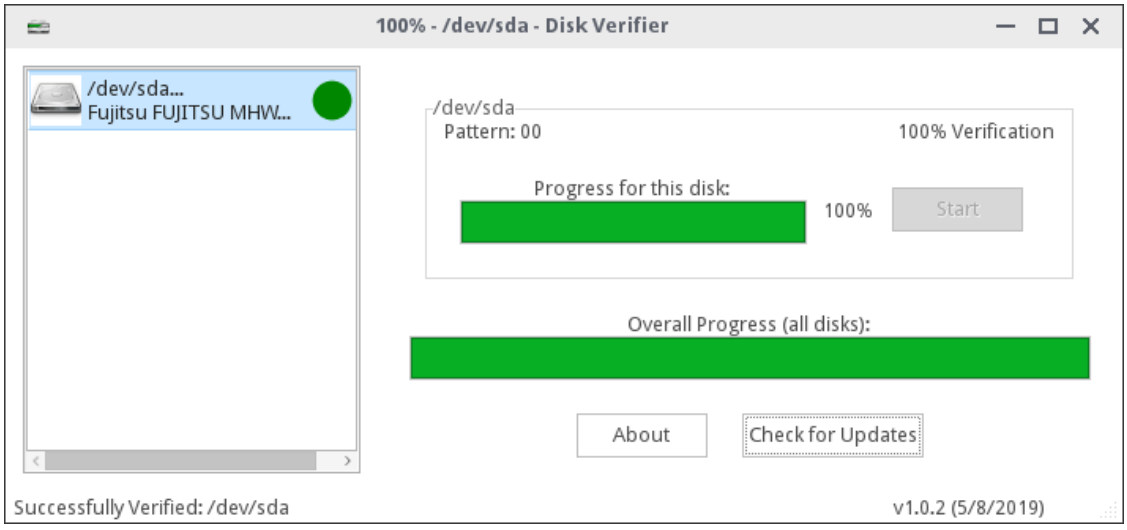


Hopefully, your verification will complete successfully, and you'll get a green mark:

Warning

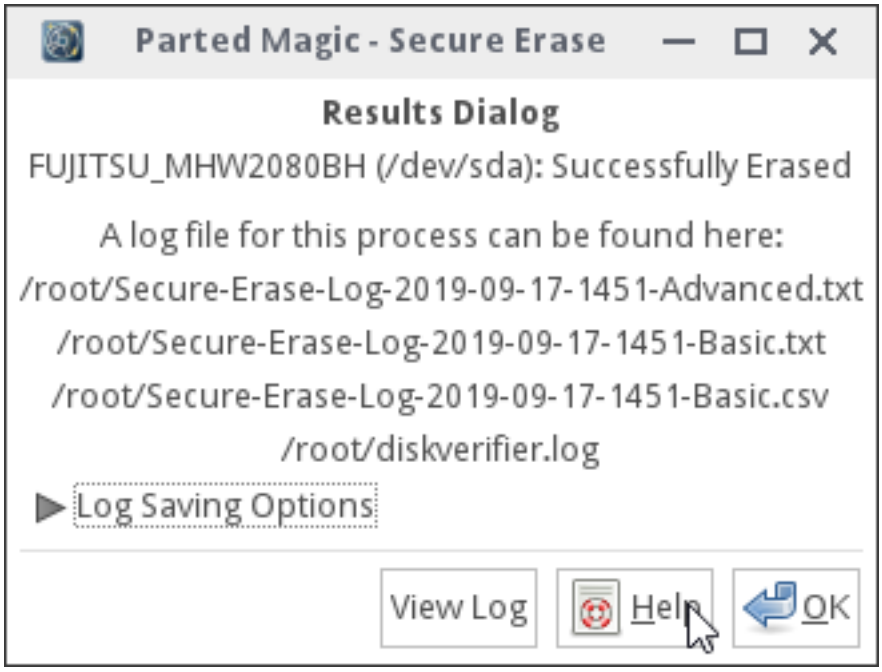
If you instead get a red mark, it indicates that verification has failed. This may mean that your disk is damaged and couldn't be erased. Attempt to erase it again, and try again.

Figure 3.13. Disk Verifier success on Parted Magic



Once finished, you'll be presented with this window, so you can save the logs if you wish. Note that these logs include drive serial numbers - please keep them in a safe place if you save them.

Figure 3.14. Parted Magic Secure Erase and Disk Verifier Logs



Chapter 4. Using the Disk Verifier Live Disk

Abstract

This chapter builds on the previous one and shows you how to use the Disk Verifier Live Disk to verify a previously-erased disk.

Preparing the live disk

As with preparing the Parted Magic module, this is fairly simple.

If you're using a CD or DVD to boot the live disk, simply burn it to a disk using your favourite burning program. macOS and Windows both include programs to burn CDs and DVDs, and with Linux I recommend you use K3B, which you can read about here [https://userbase.kde.org/K3b].

If you're using a USB stick to boot the live disk, you can use Rufus [https://unetbootin.github.io/] to do this on Windows (use "DD" or "raw" mode). A tutorial to do this for Parted Magic (the process is almost identical) is available here [https://www.youtube.com/watch?v=YDRVDEBs62w].

If you're using macOS, you can use Etcher [https://www.balena.io/etcher/]. A tutorial to do this for Parted Magic (the process is almost identical) is available here [https://www.youtube.com/watch?v=iLExY7d9eYw].

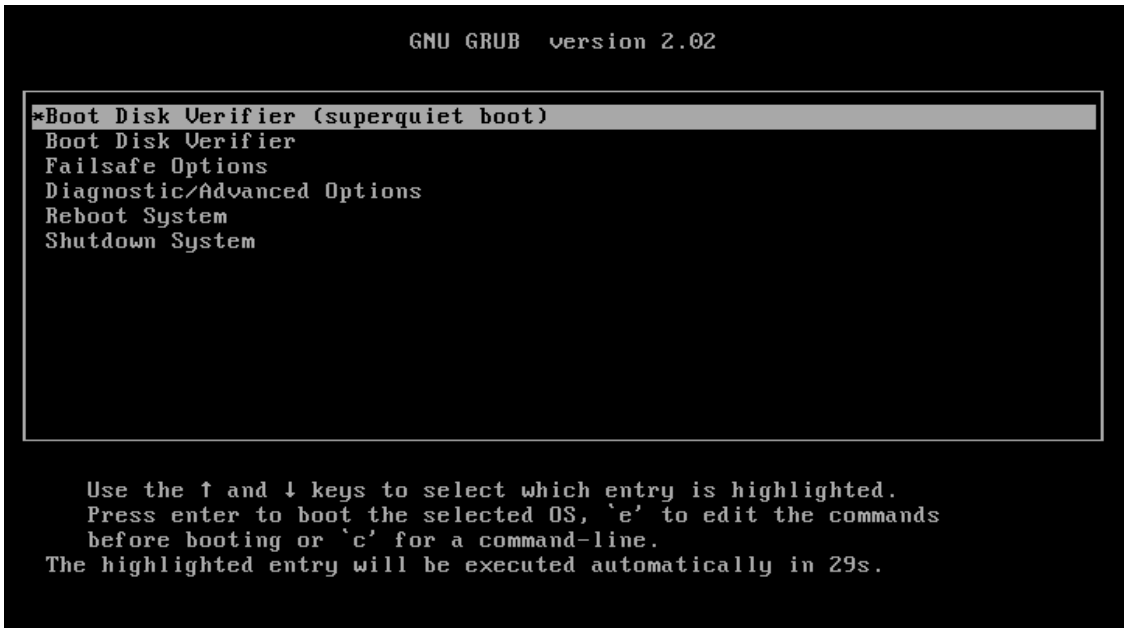
Linux users can use GNOME Disks to achieve the same result.

Booting the live disk

Plug your USB stick in, and access your boot menu the same way as shown in the section called “Booting Parted Magic”.

Once the live disk has started to boot, you'll be presented with the following boot menu:

Figure 4.1. Disk Verifier Live Disk boot menu



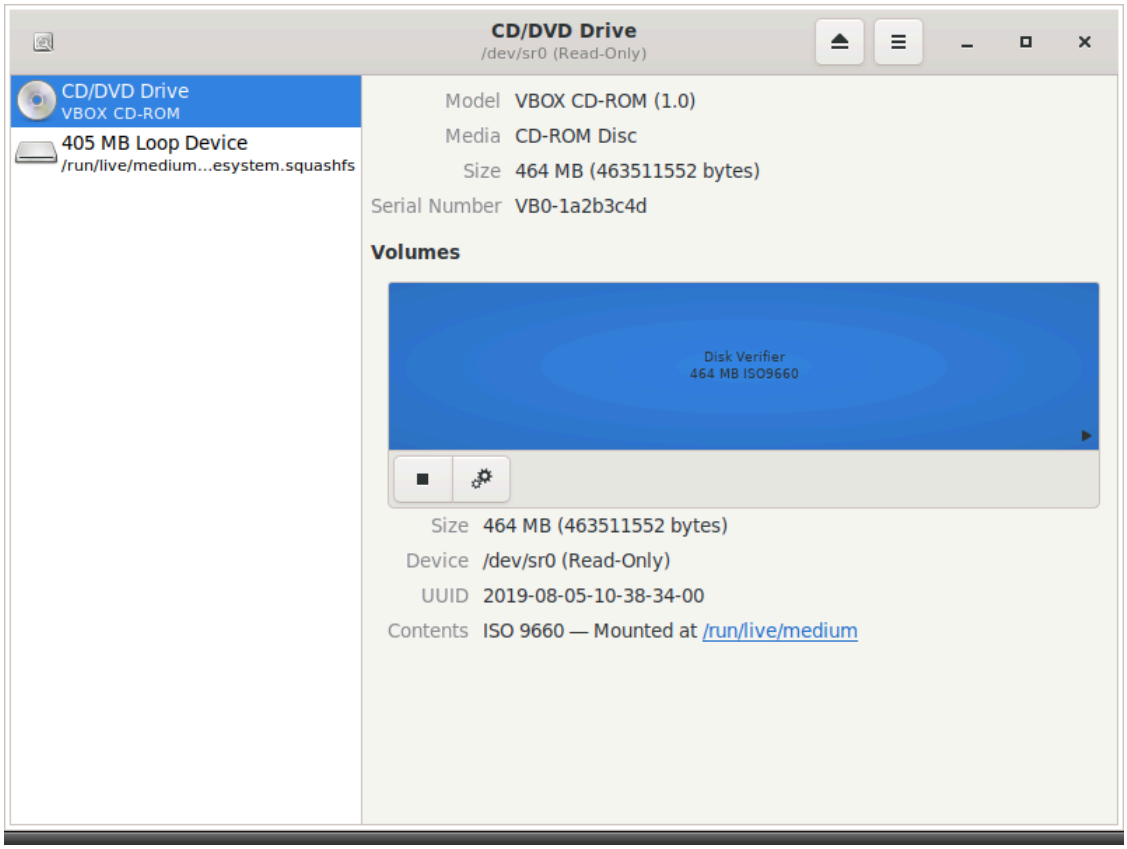
Usually, the "super-quiet boot" option will work, and you can just press the enter key, but if not, you can post on my support forum [https://www.hamishmb.com/forum/] or use the contact form if you payed for the Business Edition [https://www.hamishmb.com/blog/contact-me] and I'll do my best to help.

Tip

If you're having trouble getting the live disk to work, you can also try the Fail-safe and Diagnostic options to see if they help you. If not, contact me using the methods noted above and I'll be happy to help.

After it starts to boot, you may see some text scrolling, and then eventually you'll see the desktop. The first thing you'll see is likely to be a program called GNOME Disks:

Figure 4.2. GNOME Disks

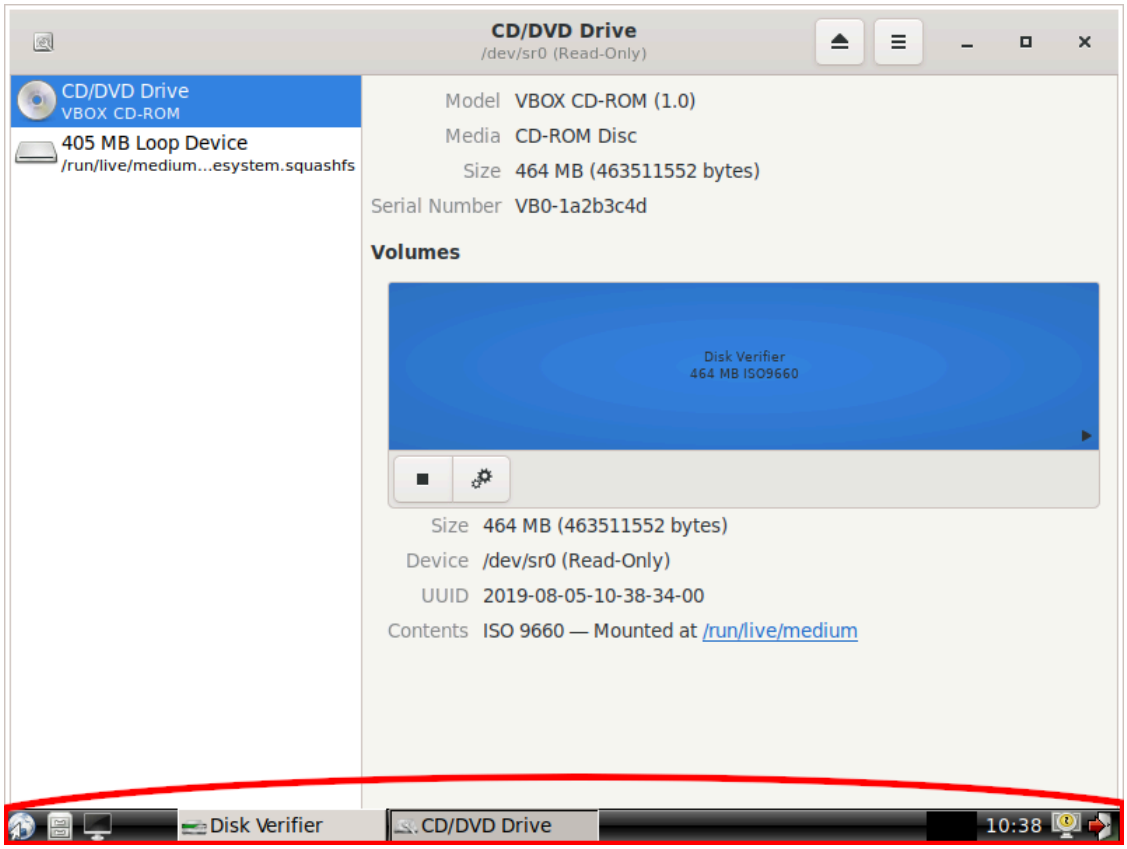


This indicates the live disk booted successfully.

Using the live disk

If you move the mouse to the bottom of the screen, you'll see that a panel pops up:

Figure 4.3. The Panel



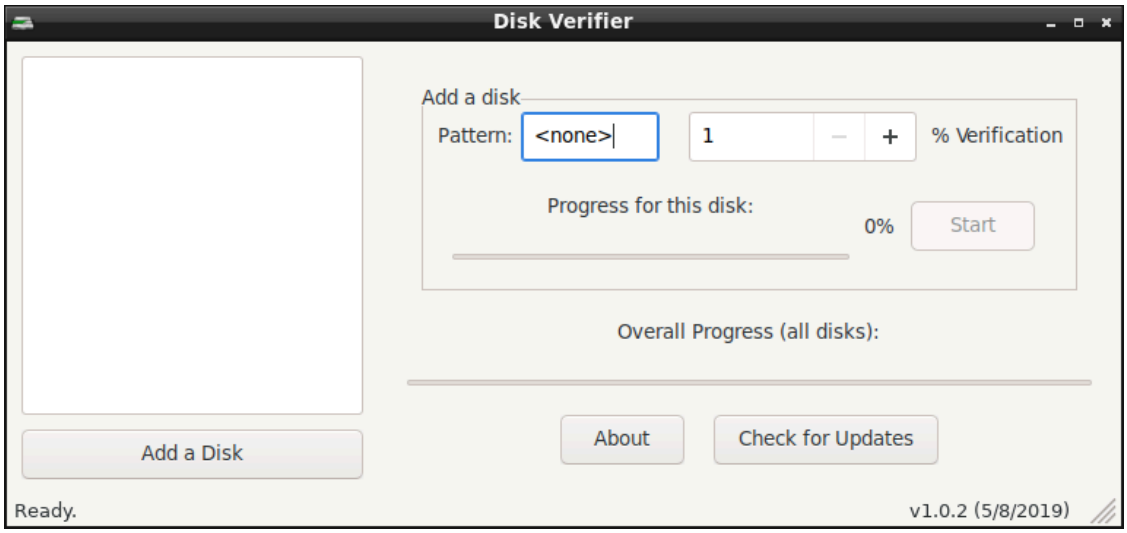
From here, you can access the file manager, a web browser, and a terminal, as well as shut down the system. DDRescue-GUI and WxFixBoot are also available on the desktop. You'll see that Disk Verifier is open in the background. Click the tab to bring Disk Verifier to the foreground.

Tip

You can also shut down the system by closing Disk Verifier.

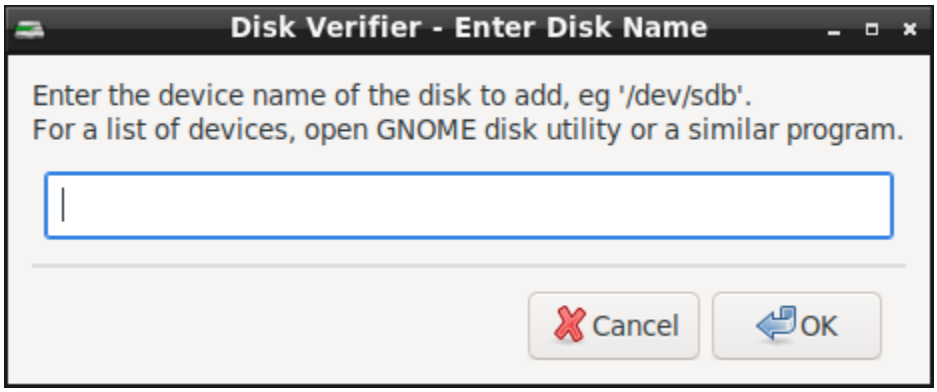
You'll now see the Disk Verifier main window:

Figure 4.4. The Main Window



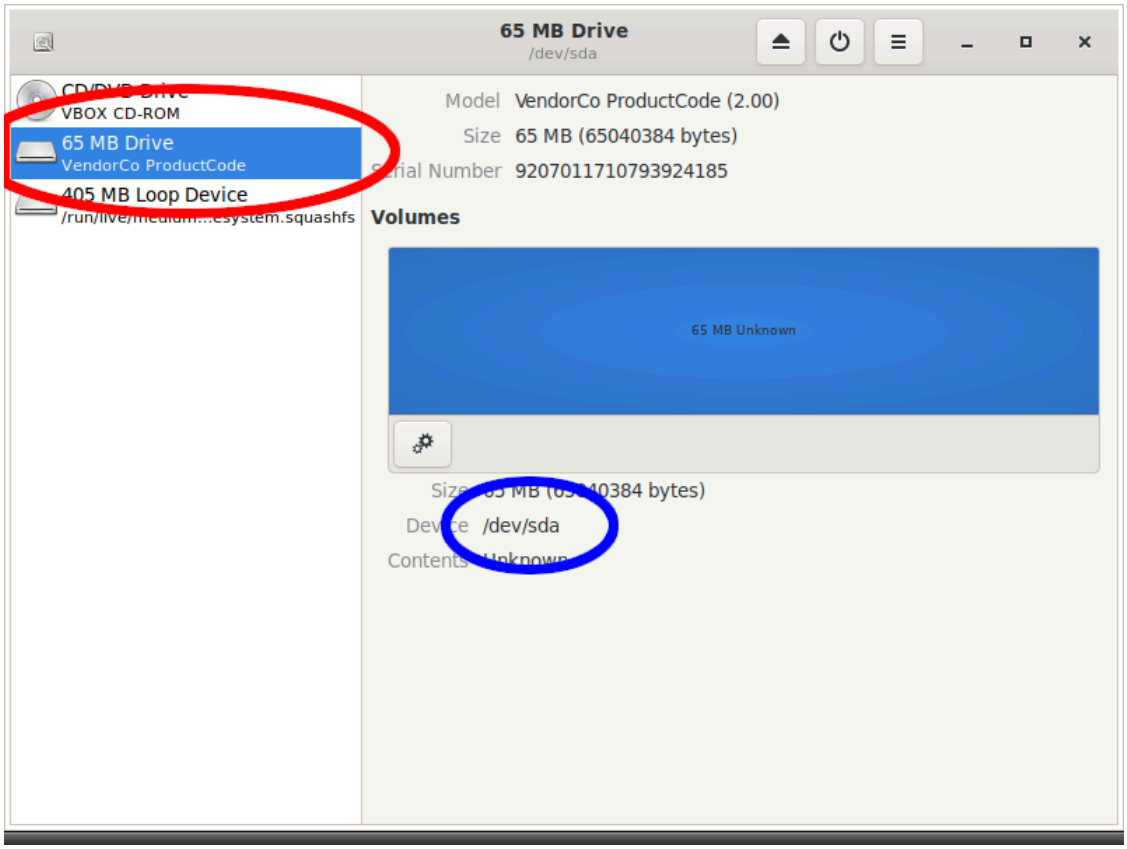
It looks very similar to the Parted Magic module, but it has some extra features. The first thing you'll need to do is add a disk by clicking on the button. You'll then be asked to enter the name of the disk:

Figure 4.5. Disk Verifier prompting for disk name



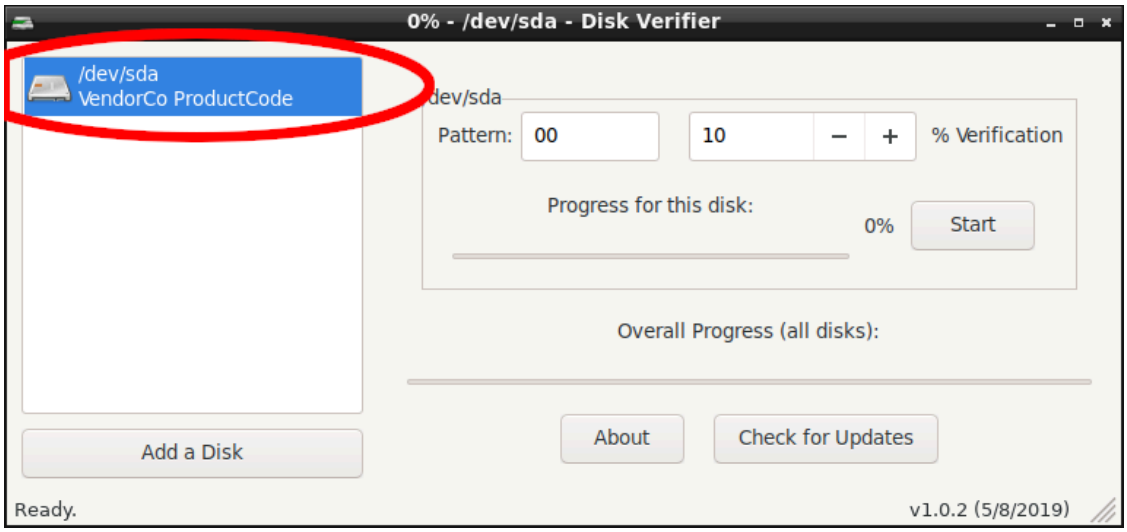
For the sake of this tutorial, I'm verifying a USB stick, which has now been plugged in. Heading back to GNOME Disks, you can see the new disk, and its name:

Figure 4.6. The new disk showing up in GNOME Disks



As you can see in the screenshot, the disk's name is "/dev/sda". Your disk may have a different name, so be sure to check. Now we can enter the name in Disk Verifier's dialog box, and press enter. After a few moments, you'll see the disk show up in Disk Verifier's list:

Figure 4.7. Disk Verifier: new disk added



Tip

You can use the following instructions to verify multiple disks at the same time. Simply click through them using the list box to view settings and progress for each disk. Each disk needs to be started separately.

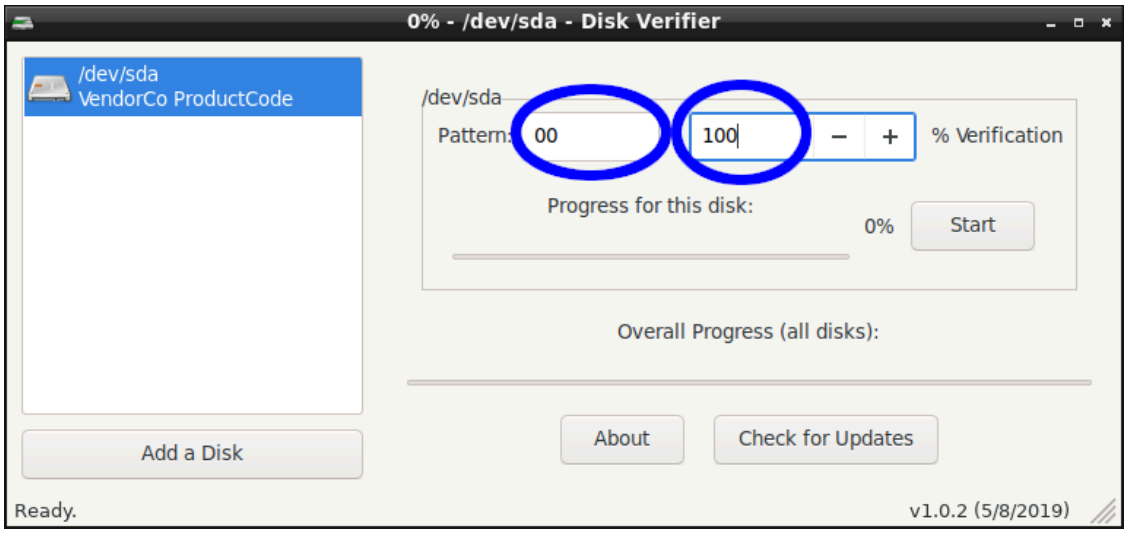
Now, we need to set the pattern and percentage verification. In my case, the disk has been overwritten with zeros, so the default pattern of "00" is fine.

Tip

You can enter any two-digit hexadecimal pattern in the box, for example "FF".

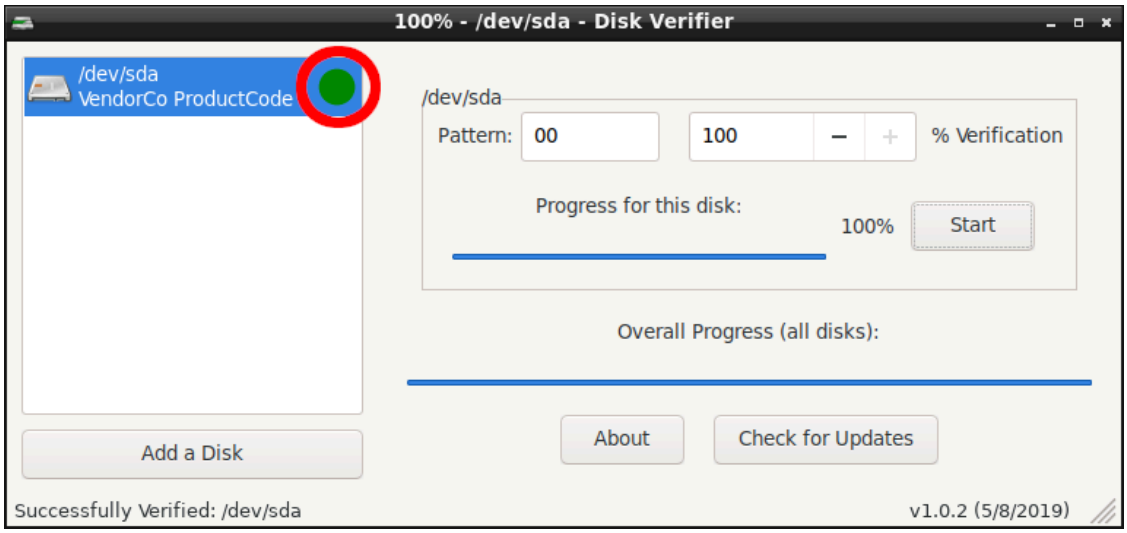
I want to verify all of the disk, so I'll set the percentage verification to 100%:

Figure 4.8. Disk Verifier: new disk configured



You may now begin, by clicking the start button. When your disk is finished, it should have a green circle next to it to show that verification was successful:

Figure 4.9. Disk Verifier: verification successful



Warning

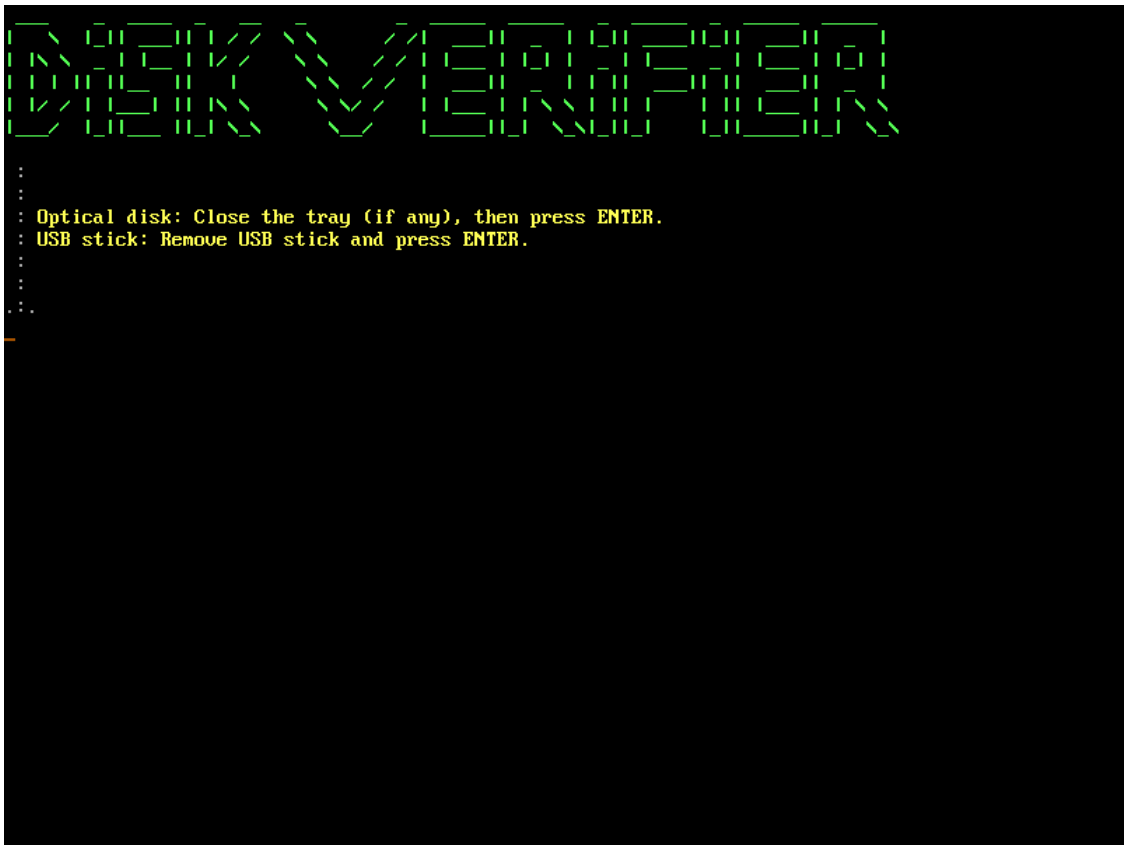
If you get a red dot instead, this indicates that your disk was not verified successfully. Check you specified the right pattern, and then try again. If you're sure you've specified the right pattern, then you may need to erase your disk again.

A blue dot indicates that you aborted the verification.

Once all of your disks have been verified, you can shut down the live disk by closing Disk Verifier, or by using the option in the far-right hand side of the panel. When you do this, you will have the option to save a report of the verification(s) you just performed. Please note that these include serial numbers, so please save them somewhere safe.

Just before shut down, Disk Verifier will prompt you to remove your USB stick or optical media:

Figure 4.10. Live Disk eject prompt



I hope this user guide has been useful for you. Hopefully any further questions you have are answered in the FAQs section, but if not, you can post on my support forum [https://www.hamishmb.com/forum/] or use the contact form if you payed for the Business Edition [https://www.hamishmb.com/blog/contact-me] and I'll do my best to help.

Chapter 5. Frequently Asked Questions

Abstract

The final chapter in this user guide has frequently asked questions, which will hopefully help resolve any issues you have. I've also added a few that I thought might be helpful.

Setup-related Questions

Q: Can I run Disk Verifier on Windows or macOS?

A: No, Disk Verifier is intended to be used only from Parted Magic, or the Live Disk.

Q: Can I run Disk Verifier on my pre-installed Linux Distro?

A: No, as above.

Q: Can I use tools other than Unetbootin to prepare my Live USB?

A: For Parted Magic, it is recommended that you use Unetbootin, but other solutions are possible.

For the Disk Verifier Live Disk, you can also use Rufus [https://rufus.ie/] on Windows, but make sure to use "Raw" or "DD" mode. On Linux and macOS, you may be able to use GNOME Disks and Disk Utility, but I would still recommend using Unetbootin if possible.

Q: I see a warning when booting Parted Magic: Warning: package was not created with "makepkg"

A: This is normal, and nothing to be concerned about.

Q: Why not just zero-out the disk instead of using secure erase?

A: Using the secure erase command can also erase other parts of the disk not accessible to the operating system, for example spare areas of the disk used to fill in when disks start to develop bad sectors. Zeroing out a disk (also known as sanitizing) cannot access these parts of the disk, so they may still contain data.

Q: Can I use enhanced secure erase?

A: No, as enhanced secure erase may not leave the disk with just zeros to verify afterwards - this is manufacturer specific. As such, disks erased with enhanced secure erase are much harder to verify as having been erased correctly.

Runtime Questions

Q: Why is my disk coming up as "Unknown Device"?

A: While most disks can be identified, there are some that are not. This doesn't matter, as long as you can determine if this is the right disk to verify by other means (for example by using GNOME Disks).

Q: Secure Erasing my SSD only took a few seconds!

A: This is normal. Modern SSDs have a special way of erasing their data that is extremely fast compared to HDDs, which often take hours.

Q: How can I be compliant with NIST 800-88 when verifying my disk(s)?

A: With the current version of Disk Verifier, you need to verify 100% of the disk(s) to be compliant. A future update may add the ability to verify disks in chunks to a lower percentage while still being compliant. However, 100% verification is really the only way to be absolutely sure the disk is erased, so I will always recommend 100% verification.

Q: How does Disk Verifier verify my disk has been erased correctly?

A: Disk Verifier reads over the whole surface of the disk to check that it contains only zeros. Note that the spare areas of the disk set aside for handling bad sectors cannot be verified in this way, so we just have to trust that any data stored there has been erased.

Q: How do I add a pre-erased disk on Parted Magic?

A: You can't - you need to buy the live disk to verify pre-erased disks, or you have to secure erase the disk again on Parted Magic.

Troubleshooting Questions

Q: Parted Magic isn't booting on my system!

A: This can happen for a number of reasons. First try the "Live" option, and then try any of the options in the "Fail-safe" menu that seem to apply to your problem.

If you are unable to solve your problem, I would recommend searching and asking on Parted Magic's forums at https://partedmagic.com/forums/.

Q: I don't see the yellow text when Parted Magic is booting up, and the "Disk Verifier" option is missing from the Secure Erase GUI!

A: This indicates that the Disk Verifier module has not been installed successfully. Please re-read the instructions in the section called “Preparing the module” and watch the tutorial video.

Q: Why isn't my disk appearing in the Secure Erase GUI?

A: This can happen for a number of reasons.

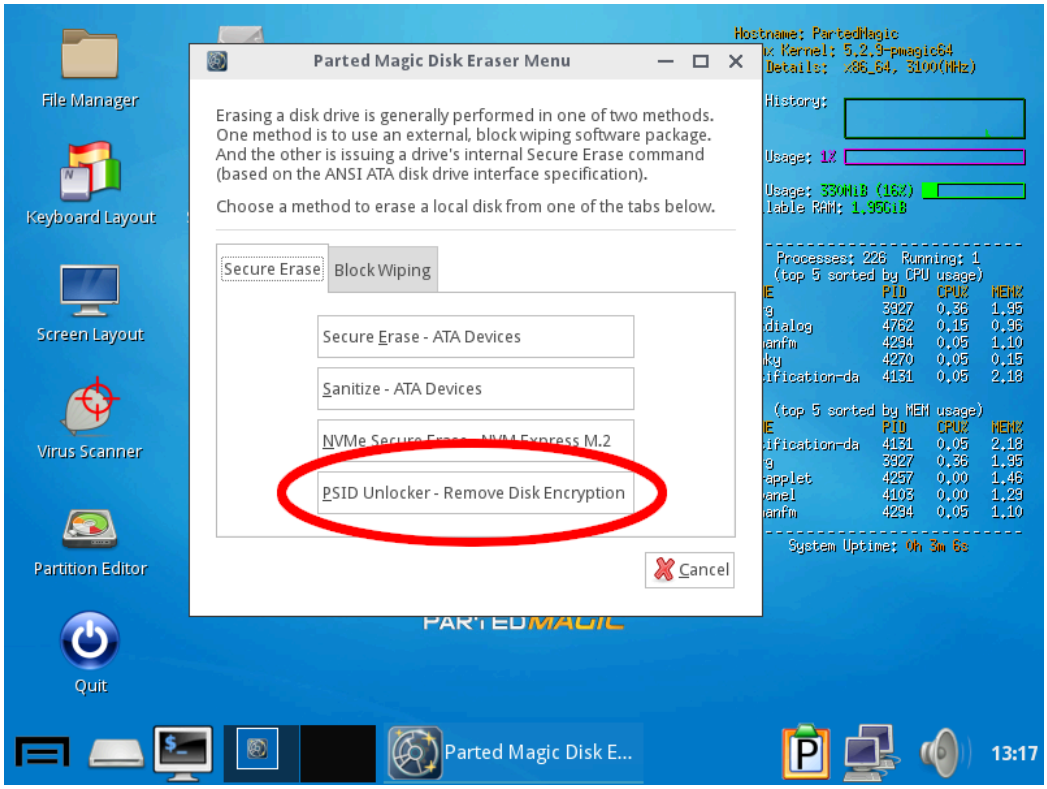
The most likely reason is you selected the wrong option when you opened the Secure Erase GUI. You may need the SATA option instead of the NVME option or vice versa.

Failing that, it's most likely that your disk doesn't support the secure erase feature, and you'll have to use another method to erase your disk.

Q: Why is my disk coming up as "unsupported" in the Secure Erase GUI?

A: Your disk may be locked. Microsoft Windows sometimes locks SSDs and prevents them from being secure erased. Fortunately, I recently wrote another GUI that comes with Parted Magic that helps fix this problem. Simply open "PSID Unlocker GUI" from the Secure Erase GUI to unlock your SSD using the physical ID printed on its case:

Figure 5.1. Parted Magic Secure Erase PSID GUI option



There is a full tutorial for using the PSID Unlocker GUI on my blog [https://www.hamishmb.com/blog/how-to-unlock-a-drive-with-the-psid-unlocker-in-parted-magic/]

Q: The live disk isn't booting on my system!

A: You can try the "Fail-safe" and "Diagnostic" options, but if they don't help you, you can post on my support forum [https://www.hamishmb.com/forum/] or use the contact form if you payed for the Business Edition [https://www.hamishmb.com/blog/contact-me] and I'll do my best to help.

Appendix A. License For The Stylesheets used to generate this documentation.

Note that I have slightly modified the PDF stylesheet so that it uses a sans-serif font instead of a serif font for ease of reading. Other than that, the styleheets used to generate this documentation are identical to the standard DocBook XSL Stylesheets.

Warranty

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL NORMAN WALSH OR ANY OTHER CONTRIBUTOR BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM, OUT OF OR IN CONNECTION WITH THE SOFTWARE OR THE USE OR OTHER DEALINGS IN THE SOFTWARE.

Contacting the Author

The DocBook XSL stylesheets are maintained by Norman Walsh, <ndw@nwalsh.com>, and members of the DocBook Project, <docbook-developers@sf.net>

Appendix B. License For This Documentation

GNU Free Documentation License
Version 1.3, 3 November 2008

0. PREAMBLE

The purpose of this License is to make a manual, textbook, or other functional and useful document "free" in the sense of freedom: to assure everyone the effective freedom to copy and redistribute it, with or without modifying it, either commercially or noncommercially. Secondarily, this License preserves for the author and publisher a way to get credit for their work, while not being considered responsible for modifications made by others.

This License is a kind of "copyleft", which means that derivative works of the document must themselves be free in the same sense. It complements the GNU General Public License, which is a copyleft license designed for free software.

We have designed this License in order to use it for manuals for free software, because free software needs free documentation: a free program should come with manuals providing the same freedoms that the software does. But this License is not limited to software manuals; it can be used for any textual work, regardless of subject matter or whether it is published as a printed book. We recommend this License principally for works whose purpose is instruction or reference.

1. APPLICABILITY AND DEFINITIONS

This License applies to any manual or other work, in any medium, that contains a notice placed by the copyright holder saying it can be distributed under the terms of this License. Such a notice grants a

world-wide, royalty-free license, unlimited in duration, to use that work under the conditions stated herein. The "Document", below, refers to any such manual or work. Any member of the public is a licensee, and is addressed as "you". You accept the license if you copy, modify or distribute the work in a way requiring permission under copyright law.

A "Modified Version" of the Document means any work containing the Document or a portion of it, either copied verbatim, or with modifications and/or translated into another language.

A "Secondary Section" is a named appendix or a front-matter section of the Document that deals exclusively with the relationship of the publishers or authors of the Document to the Document's overall subject (or to related matters) and contains nothing that could fall directly within that overall subject. (Thus, if the Document is in part a textbook of mathematics, a Secondary Section may not explain any mathematics.) The relationship could be a matter of historical connection with the subject or with related matters, or of legal, commercial, philosophical, ethical or political position regarding them.

The "Invariant Sections" are certain Secondary Sections whose titles are designated, as being those of Invariant Sections, in the notice that says that the Document is released under this License. If a section does not fit the above definition of Secondary then it is not allowed to be designated as Invariant. The Document may contain zero Invariant Sections. If the Document does not identify any Invariant Sections then there are none.

The "Cover Texts" are certain short passages of text that are listed, as Front-Cover Texts or Back-Cover Texts, in the notice that says that the Document is released under this License. A Front-Cover Text may be at most 5 words, and a Back-Cover Text may be at most 25 words.

A "Transparent" copy of the Document means a machine-readable copy, represented in a format whose specification is available to the general public, that is suitable for revising the document straightforwardly with generic text editors or (for images composed of pixels) generic paint programs or (for drawings) some widely available drawing editor, and that is suitable for input to text formatters or for automatic translation to a variety of formats suitable for input to text formatters. A copy made in an otherwise Transparent file format whose markup, or absence of markup, has been arranged to thwart or discourage subsequent modification by readers is not Transparent.

An image format is not Transparent if used for any substantial amount of text. A copy that is not "Transparent" is called "Opaque".

Examples of suitable formats for Transparent copies include plain ASCII without markup, Texinfo input format, LaTeX input format, SGML or XML using a publicly available DTD, and standard-conforming simple HTML, PostScript or PDF designed for human modification. Examples of transparent image formats include PNG, XCF and JPG. Opaque formats include proprietary formats that can be read and edited only by proprietary word processors, SGML or XML for which the DTD and/or processing tools are not generally available, and the machine-generated HTML, PostScript or PDF produced by some word processors for output purposes only.

The "Title Page" means, for a printed book, the title page itself, plus such following pages as are needed to hold, legibly, the material this License requires to appear in the title page. For works in formats which do not have any title page as such, "Title Page" means the text near the most prominent appearance of the work's title, preceding the beginning of the body of the text.

The "publisher" means any person or entity that distributes copies of the Document to the public.

A section "Entitled XYZ" means a named subunit of the Document whose title either is precisely XYZ or contains XYZ in parentheses following text that translates XYZ in another language. (Here XYZ stands for a specific section name mentioned below, such as "Acknowledgements", "Dedications", "Endorsements", or "History".) To "Preserve the Title" of such a section when you modify the Document means that it remains a section "Entitled XYZ" according to this definition.

The Document may include Warranty Disclaimers next to the notice which states that this License applies to the Document. These Warranty Disclaimers are considered to be included by reference in this License, but only as regards disclaiming warranties: any other implication that these Warranty Disclaimers may have is void and has no effect on the meaning of this License.

2. VERBATIM COPYING

You may copy and distribute the Document in any medium, either commercially or noncommercially, provided that this License, the copyright notices, and the license notice saying this License applies to the Document are reproduced in all copies, and that you add no

other conditions whatsoever to those of this License. You may not use technical measures to obstruct or control the reading or further copying of the copies you make or distribute. However, you may accept compensation in exchange for copies. If you distribute a large enough number of copies you must also follow the conditions in section 3.

You may also lend copies, under the same conditions stated above, and you may publicly display copies.

3. COPYING IN QUANTITY

If you publish printed copies (or copies in media that commonly have printed covers) of the Document, numbering more than 100, and the Document's license notice requires Cover Texts, you must enclose the copies in covers that carry, clearly and legibly, all these Cover Texts: Front-Cover Texts on the front cover, and Back-Cover Texts on the back cover. Both covers must also clearly and legibly identify you as the publisher of these copies. The front cover must present the full title with all words of the title equally prominent and visible. You may add other material on the covers in addition. Copying with changes limited to the covers, as long as they preserve the title of the Document and satisfy these conditions, can be treated as verbatim copying in other respects.

If the required texts for either cover are too voluminous to fit legibly, you should put the first ones listed (as many as fit reasonably) on the actual cover, and continue the rest onto adjacent pages.

If you publish or distribute Opaque copies of the Document numbering more than 100, you must either include a machine-readable Transparent copy along with each Opaque copy, or state in or with each Opaque copy a computer-network location from which the general network-using public has access to download using public-standard network protocols a complete Transparent copy of the Document, free of added material. If you use the latter option, you must take reasonably prudent steps, when you begin distribution of Opaque copies in quantity, to ensure that this Transparent copy will remain thus accessible at the stated location until at least one year after the last time you distribute an Opaque copy (directly or through your agents or retailers) of that edition to the public.

It is requested, but not required, that you contact the authors of the Document well before redistributing any large number of copies, to

give them a chance to provide you with an updated version of the Document.

4. MODIFICATIONS

You may copy and distribute a Modified Version of the Document under the conditions of sections 2 and 3 above, provided that you release the Modified Version under precisely this License, with the Modified Version filling the role of the Document, thus licensing distribution and modification of the Modified Version to whoever possesses a copy of it. In addition, you must do these things in the Modified Version:

A. Use in the Title Page (and on the covers, if any) a title distinct from that of the Document, and from those of previous versions (which should, if there were any, be listed in the History section of the Document). You may use the same title as a previous version if the original publisher of that version gives permission.
B. List on the Title Page, as authors, one or more persons or entities responsible for authorship of the modifications in the Modified Version, together with at least five of the principal authors of the Document (all of its principal authors, if it has fewer than five), unless they release you from this requirement.
C. State on the Title page the name of the publisher of the Modified Version, as the publisher.
D. Preserve all the copyright notices of the Document.
E. Add an appropriate copyright notice for your modifications adjacent to the other copyright notices.
F. Include, immediately after the copyright notices, a license notice giving the public permission to use the Modified Version under the terms of this License, in the form shown in the Addendum below.
G. Preserve in that license notice the full lists of Invariant Sections and required Cover Texts given in the Document's license notice.
H. Include an unaltered copy of this License.
I. Preserve the section Entitled "History", Preserve its Title, and add to it an item stating at least the title, year, new authors, and publisher of the Modified Version as given on the Title Page. If there is no section Entitled "History" in the Document, create one stating the title, year, authors, and publisher of the Document as given on its Title Page, then add an item describing the Modified Version as stated in the previous sentence.
J. Preserve the network location, if any, given in the Document for public access to a Transparent copy of the Document, and likewise the network locations given in the Document for previous versions it was based on. These may be placed in the "History" section.

You may omit a network location for a work that was published at least four years before the Document itself, or if the original publisher of the version it refers to gives permission.

K. For any section Entitled "Acknowledgements" or "Dedications", Preserve the Title of the section, and preserve in the section all the substance and tone of each of the contributor acknowledgements and/or dedications given therein.

L. Preserve all the Invariant Sections of the Document, unaltered in their text and in their titles. Section numbers or the equivalent are not considered part of the section titles.

M. Delete any section Entitled "Endorsements". Such a section may not be included in the Modified Version.

N. Do not retitle any existing section to be Entitled "Endorsements" or to conflict in title with any Invariant Section.

O. Preserve any Warranty Disclaimers.

If the Modified Version includes new front-matter sections or appendices that qualify as Secondary Sections and contain no material copied from the Document, you may at your option designate some or all of these sections as invariant. To do this, add their titles to the list of Invariant Sections in the Modified Version's license notice. These titles must be distinct from any other section titles.

You may add a section Entitled "Endorsements", provided it contains nothing but endorsements of your Modified Version by various parties--for example, statements of peer review or that the text has been approved by an organization as the authoritative definition of a standard.

You may add a passage of up to five words as a Front-Cover Text, and a passage of up to 25 words as a Back-Cover Text, to the end of the list of Cover Texts in the Modified Version. Only one passage of Front-Cover Text and one of Back-Cover Text may be added by (or through arrangements made by) any one entity. If the Document already includes a cover text for the same cover, previously added by you or by arrangement made by the same entity you are acting on behalf of, you may not add another; but you may replace the old one, on explicit permission from the previous publisher that added the old one.

The author(s) and publisher(s) of the Document do not by this License give permission to use their names for publicity for or to assert or imply endorsement of any Modified Version.

5. COMBINING DOCUMENTS

You may combine the Document with other documents released under this License, under the terms defined in section 4 above for modified versions, provided that you include in the combination all of the Invariant Sections of all of the original documents, unmodified, and list them all as Invariant Sections of your combined work in its license notice, and that you preserve all their Warranty Disclaimers.

The combined work need only contain one copy of this License, and multiple identical Invariant Sections may be replaced with a single copy. If there are multiple Invariant Sections with the same name but different contents, make the title of each such section unique by adding at the end of it, in parentheses, the name of the original author or publisher of that section if known, or else a unique number. Make the same adjustment to the section titles in the list of Invariant Sections in the license notice of the combined work.

In the combination, you must combine any sections Entitled "History" in the various original documents, forming one section Entitled "History"; likewise combine any sections Entitled "Acknowledgements", and any sections Entitled "Dedications". You must delete all sections Entitled "Endorsements".

6. COLLECTIONS OF DOCUMENTS

You may make a collection consisting of the Document and other documents released under this License, and replace the individual copies of this License in the various documents with a single copy that is included in the collection, provided that you follow the rules of this License for verbatim copying of each of the documents in all other respects.

You may extract a single document from such a collection, and distribute it individually under this License, provided you insert a copy of this License into the extracted document, and follow this License in all other respects regarding verbatim copying of that document.

7. AGGREGATION WITH INDEPENDENT WORKS

A compilation of the Document or its derivatives with other separate and independent documents or works, in or on a volume of a storage or distribution medium, is called an "aggregate" if the copyright

resulting from the compilation is not used to limit the legal rights of the compilation's users beyond what the individual works permit. When the Document is included in an aggregate, this License does not apply to the other works in the aggregate which are not themselves derivative works of the Document.

If the Cover Text requirement of section 3 is applicable to these copies of the Document, then if the Document is less than one half of the entire aggregate, the Document's Cover Texts may be placed on covers that bracket the Document within the aggregate, or the electronic equivalent of covers if the Document is in electronic form. Otherwise they must appear on printed covers that bracket the whole aggregate.

8. TRANSLATION

Translation is considered a kind of modification, so you may distribute translations of the Document under the terms of section 4. Replacing Invariant Sections with translations requires special permission from their copyright holders, but you may include translations of some or all Invariant Sections in addition to the original versions of these Invariant Sections. You may include a translation of this License, and all the license notices in the Document, and any Warranty Disclaimers, provided that you also include the original English version of this License and the original versions of those notices and disclaimers. In case of a disagreement between the translation and the original version of this License or a notice or disclaimer, the original version will prevail.

If a section in the Document is Entitled "Acknowledgements", "Dedications", or "History", the requirement (section 4) to Preserve its Title (section 1) will typically require changing the actual title.

9. TERMINATION

You may not copy, modify, sublicense, or distribute the Document except as expressly provided under this License. Any attempt otherwise to copy, modify, sublicense, or distribute it is void, and will automatically terminate your rights under this License.

However, if you cease all violation of this License, then your license from a particular copyright holder is reinstated (a) provisionally,

unless and until the copyright holder explicitly and finally terminates your license, and (b) permanently, if the copyright holder fails to notify you of the violation by some reasonable means prior to 60 days after the cessation.

Moreover, your license from a particular copyright holder is reinstated permanently if the copyright holder notifies you of the violation by some reasonable means, this is the first time you have received notice of violation of this License (for any work) from that copyright holder, and you cure the violation prior to 30 days after your receipt of the notice.

Termination of your rights under this section does not terminate the licenses of parties who have received copies or rights from you under this License. If your rights have been terminated and not permanently reinstated, receipt of a copy of some or all of the same material does not give you any rights to use it.

10. FUTURE REVISIONS OF THIS LICENSE

The Free Software Foundation may publish new, revised versions of the GNU Free Documentation License from time to time. Such new versions will be similar in spirit to the present version, but may differ in detail to address new problems or concerns. See http://www.gnu.org/copyleft/.

Each version of the License is given a distinguishing version number. If the Document specifies that a particular numbered version of this License "or any later version" applies to it, you have the option of following the terms and conditions either of that specified version or of any later version that has been published (not as a draft) by the Free Software Foundation. If the Document does not specify a version number of this License, you may choose any version ever published (not as a draft) by the Free Software Foundation. If the Document specifies that a proxy can decide which future versions of this License can be used, that proxy's public statement of acceptance of a version permanently authorizes you to choose that version for the Document.

11. RELICENSING

"Massive Multiauthor Collaboration Site" (or "MMC Site") means any World Wide Web server that publishes copyrightable works and also provides prominent facilities for anybody to edit those works. A

public wiki that anybody can edit is an example of such a server. A "Massive Multiauthor Collaboration" (or "MMC") contained in the site means any set of copyrightable works thus published on the MMC site.

"CC-BY-SA" means the Creative Commons Attribution-Share Alike 3.0 license published by Creative Commons Corporation, a not-for-profit corporation with a principal place of business in San Francisco, California, as well as future copyleft versions of that license published by that same organization.

"Incorporate" means to publish or republish a Document, in whole or in part, as part of another Document.

An MMC is "eligible for relicensing" if it is licensed under this License, and if all works that were first published under this License somewhere other than this MMC, and subsequently incorporated in whole or in part into the MMC, (1) had no cover texts or invariant sections, and (2) were thus incorporated prior to November 1, 2008.

The operator of an MMC Site may republish an MMC contained in the site under CC-BY-SA on the same site at any time before August 1, 2009, provided the MMC is eligible for relicensing.

ADDENDUM: How to use this License for your documents

To use this License in a document you have written, include a copy of the License in the document and put the following copyright and license notices just after the title page:

> Copyright (c) YEAR YOUR NAME.
> Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.3 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts. A copy of the license is included in the section entitled "GNU Free Documentation License".

If you have Invariant Sections, Front-Cover Texts and Back-Cover Texts, replace the "with...Texts." line with this:

> with the Invariant Sections being LIST THEIR TITLES, with the Front-Cover Texts being LIST, and with the Back-Cover Texts being LIST.

If you have Invariant Sections without Cover Texts, or some other

combination of the three, merge those two alternatives to suit the situation.

If your document contains nontrivial examples of program code, we recommend releasing these examples in parallel under your choice of free software license, such as the GNU General Public License, to permit their use in free software.