

How to Write Protect an SD Card

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About SD card write protection TMP_WRITE_PROTECT

This step is optional. It will increase the durability of the system. If you or your friend already work with Raspberry Pis, you may find this fun. If you don't then you might find this frustrating and it's perfectly OK to skip this optional step.

About TMP_WRITE_PROTECT:

- Raspbian and DietPi, don't generally like to be rudely shut down i.e. having the power plug pulled.
- Rude power downs can interrupt writes to the micro SD card and potentially corrupt the OS.
- But we have a special case here, because DQMusiXBox does not need to be online and does not need to be updated. In other words, it is safe to write protect the micro SD card.
- The SD card standard has a rarely used feature known as TMP_WRITE_PROTECT (which is a useful google search term) i.e. temporary write protection.
- When in this mode, the SD accepts write requests, but any such writes are made to temporary storage and are deliberately lost upon reboot or power loss.
- In other words, if you pull the plug on a DQMusiXBox you are effectively doing a factory reset. Music stored on the USB thumb drive is unaffected.
- To enable this, set the TMP_WRITE_PROTECT bit in the Card Specific Data on micro-SD card (more on this below).
- Here is the SD Association's official description of TMP_WRITE_PROTECT from the [SD Specifications Part 1 Physical Layer Simplified Specification Version 6.00](#): *Temporarily protects the entire card content from being overwritten or erased (all write and erase commands for this card are temporarily disabled). This bit can be set and reset. The default value is 0, i.e. not write protected.*
- For the curious, here are some of the other fields in the Card Specific Data, chart taken from the same document linked just above:

File format group	FILE_FORMAT_GRP	1	xb	R/W(1)	[15:15]
copy flag	COPY	1	xb	R/W(1)	[14:14]
permanent write protection	PERM_WRITE_PROTECT	1	xb	R/W(1)	[13:13]
temporary write protection	TMP_WRITE_PROTECT	1	xb	R/W	[12:12]
File format	FILE_FORMAT	2	xxb	R/W(1)	[11:10]
reserved		2	00b	R/W	[9:8]
CRC	CRC	7	xxxxxxb	R/W	[7:1]
not used, always '1'	-	1	1b	-	[0:0]

Table 5-4 : The CSD Register Fields (CSD Version 1.0)

- References:
 - [SD Card Write Protection](#)
 - [Build the SD Locker and Make Your SD Cards More Secure](#)

Option 1: Build the SD locker project

There are several ways to implement TMP_WRITE_PROTECT. I was originally inspired by the [SD locker project on Hackaday](#) and by its [successor](#). Both of which look like fun. But I ended up using Option 2 below as it is more consistent with Raspberry Pi work.

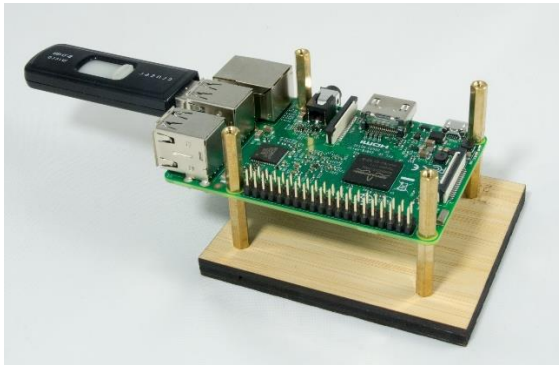
Option 2: Use a Raspberry Pi 3

This is the option that I used. In brief, the write protection process is:

1. Write the DQMusicBox image to a micro-SD card, as per the instructions above.
2. Boot a Raspberry Pi 3 from a USB thumb drive.
3. Once booted, insert a micro-SD card and issue the following command:

```
sudo ./sdtool/static/arm-sdtool /dev/mmcblk0 lock
```

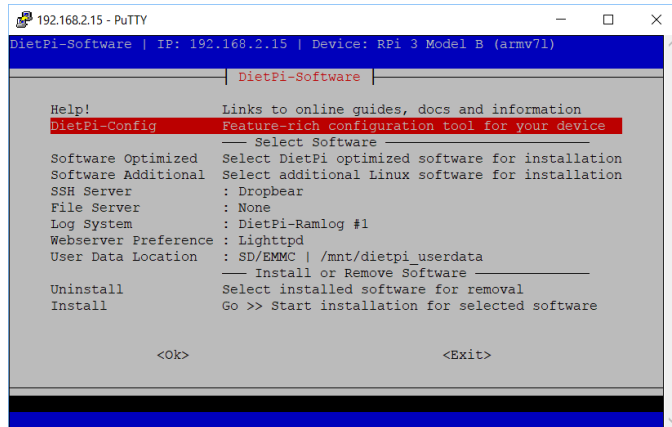
This is my setup for doing so:



The slightly tricky bit is to get the Raspberry Pi 3 to boot from USB. See below for the process that I used to create to create the setup above. You will only have to do this once.

1. You'll need:
 - a. **A Raspberry Pi 3.** I keep a Pi 3 just for this purpose i.e. I don't use this Pi 3 inside a DQMusicBox.
 - b. **A good USB thumb drive.** I keep a thumb drive just for this purpose. Apparently this won't work with some low performance USB thumb drives, although it worked with my old 2GB thumb drive (pictured above). I now use a [SanDisk Extreme 32GB thumb drive](#).
 - c. **A micro-SD card.** You will only need for 30 minutes to complete the steps below, then you can use the card for other purposes.
2. Download [DietPi](#).
3. Write the DietPi image to the micro-SD card (using Etcher or Win32diskimager).

4. Write the same DietPi image to the USB thumb drive.
5. Attach Ethernet to your Raspberry Pi 3.
6. Insert the micro-SD card.
7. Start the DietPi installation process i.e.:
 - a. Boot the Pi 3 from the micro-SD card
 - b. Connect to the Pi 3 over the network with Putty or something similar, login with username=root password=dietpi
8. After a while, you will get to this screen, choose DietPi-Config

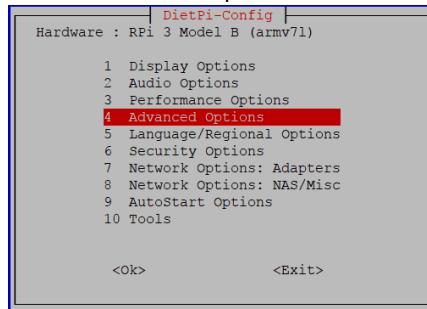


The screenshot shows a terminal window titled "192.168.2.15 - PuTTY". The terminal displays the "DietPi-Software" menu. At the top, it says "DietPi-Software | IP: 192.168.2.15 | Device: RPi 3 Model B (armv7l)". The menu options are:

- Help! Links to online guides, docs and information
- DietPi-Config** Feature-rich configuration tool for your device
- Select Software ---
- Software Optimized Select DietPi optimized software for installation
- Software Additional Select additional Linux software for installation
- SSH Server : Dropbear
- File Server : None
- Log System : DietPi-Ramlog #1
- Webserver Preference : Lighttpd
- User Data Location : SD/EMMC | /mnt/dietpi_userdata
- Install or Remove Software ---
- Uninstall Select installed software for removal
- Install Go >> Start installation for selected software

At the bottom, there are two options: "<Ok>" and "<Exit>".

9. Choose Advanced Options:

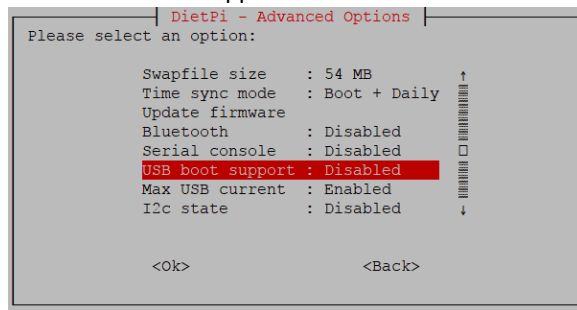


The screenshot shows a terminal window titled "DietPi-Config". At the top, it says "Hardware : RPi 3 Model B (armv7l)". The menu options are:

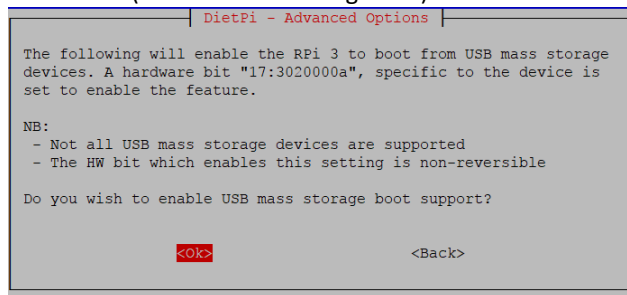
- 1 Display Options
- 2 Audio Options
- 3 Performance Options
- 4 Advanced Options**
- 5 Language/Regional Options
- 6 Security Options
- 7 Network Options: Adapters
- 8 Network Options: NAS/Misc
- 9 AutoStart Options
- 10 Tools

At the bottom, there are two options: "<Ok>" and "<Exit>".

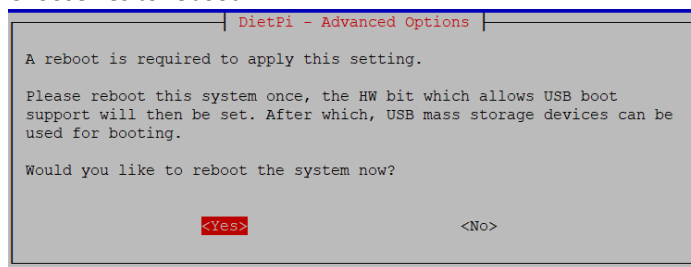
10. Choose USB boot support and choose to **enable** it:



11. Choose OK (read the full message first):



12. Choose Yes to reboot:



13. After rebooting, choose Install:

```
DietPi-Software | IP: 192.168.2.15 | Device: RPi 3 Model B (armv7l)
DietPi-Software
Help!                               Links to online guides, docs and information
DietPi-Config                       Feature-rich configuration tool for your device
----- Select Software -----
Software Optimized                  Select DietPi optimized software for installation
Software Additional                 Select additional Linux software for installation
SSH Server                         : Dropbear
File Server                        : None
Log System                         : DietPi-Ramlog #1
Webserver Preference               : Lighttpd
User Data Location                  : SD/EMMC | /mnt/dietpi_userdata
----- Install or Remove Software -----
Uninstall                          Select installed software for removal
Install                             Go >> Start installation for selected software
<Ok>                               <Exit>
```

14. Let the installation run and finish.

```
DietPi-Services
Mode: stop
Please wait...

[Ok] cron

DietPi-Software
Mode: Update & upgrade APT
Please wait...

Hit http://mirror.ox.ac.uk jessie InRelease
Hit http://archive.raspberrypi.org jessie InRelease
Hit http://mirror.ox.ac.uk jessie/main armhf Packages
Hit http://archive.raspberrypi.org jessie/main armhf Packages
Hit http://mirror.ox.ac.uk jessie/contrib armhf Packages
Hit http://mirror.ox.ac.uk jessie/non-free armhf Packages
Hit http://archive.raspberrypi.org jessie/ui armhf Packages
Hit http://mirror.ox.ac.uk jessie/rpi armhf Packages
Ign http://archive.raspberrypi.org jessie/main Translation-en_GB
Ign http://archive.raspberrypi.org jessie/main Translation-en
19% [Packages 50.1 MB] [Waiting for headers]
```

15. Once the installation is complete, switch to a USB setup:

- a. Unplug the Pi.
- b. Remove the micro-SD Card.
- c. Insert the USB thumb drive.
- d. Plug the Pi back in and boot.

16. Install DietPi on the USB thumb drive. Start by letting DietPi update itself:

```
[Ok] NTPD: time sync | Completed

[Info] Detecting drives, please wait...
[Info] Detected PARTUUID mount: /dev/sda1 > /boot
[Info] Detected PARTUUID mount: /dev/sda2 > /
[Info] Processing drive information, please wait...
[Info] Checking available free space on RootFS, please wait...
[Ok] 28348 MB available, 500 MB required
[Info] Testing connection to http://mirror.ox.ac.uk/sites/archive.raspbian.org/
archive/raspbian
[Info] Max duration of 20 seconds, please wait...
[Ok] Connection test | Completed

Get:1 http://mirror.ox.ac.uk jessie InRelease [14.9 kB]
Get:2 http://archive.raspberrypi.org jessie InRelease [22.9 kB]
Get:3 http://mirror.ox.ac.uk jessie/main armhf Packages [9,535 kB]
Get:4 http://archive.raspberrypi.org jessie/main armhf Packages [170 kB]
```

17. When prompted, restart your Pi:

```
DietPi Update Completed

DietPi has been updated to the latest version.
Your system will now reboot. Once completed, simply login to
resume DietPi Setup.

Press Enter to Continue.

<Ok>
```

18. Install:

```
DietPi-Software | IP: 192.168.2.15 | Device: RPi 3 Model B (armv7l)

DietPi-Software

Help!           Links to online guides, docs and information
DietPi-Config   Feature-rich configuration tool for your device
                ----- Select Software -----
Software Optimized  Select DietPi optimized software for installation
Software Additional Select additional Linux software for installation
SSH Server         : Dropbear
File Server        : None
Log System         : DietPi-Ramlog #1
Webserver Preference : Lighttpd
User Data Location  : SD/EMMC | /mnt/dietpi_userdata
                ----- Install or Remove Software -----
Uninstall         Select installed software for removal
Install           Go >> Start installation for selected software

                <Ok>                                <Exit>
```

19. Let DietPi do more updating:

```
DietPi-Services
-----
Mode: stop
Please wait...

[Ok] cron

DietPi-Software
-----
Mode: Update & upgrade APT
Please wait...

Hit http://mirror.ox.ac.uk jessie InRelease
Hit http://archive.raspberrypi.org jessie InRelease
Hit http://mirror.ox.ac.uk jessie/main armhf Packages
```

20. DietPi will reboot to complete the installation, then you'll get a normal command prompt:

```
DietPi | 04:22 | Sat 12/08/17
-----
V154 | RPi 3 Model B (armv7l)
-----
IP Address | 192.168.2.15
-----

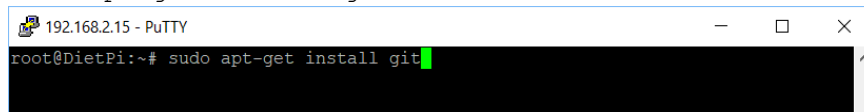
Created by : Daniel Knight
Web : http://DietPi.com
Twitter : http://twitter.com/dietpi_
Donate : http://goo.gl/pzIst9
DietPi's web hosting is powered by: MyVirtualServer.com

dietpi-launcher = All the DietPi programs in one place.
dietpi-config = Feature rich configuration tool for your device.
dietpi-software = Select optimized software for installation.
htop = Resource monitor.
cpu = Shows CPU information and stats.

root@DietPi:~#
```

21. Install git with

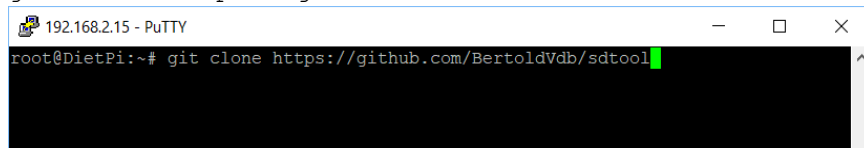
`sudo apt-get install git`



```
192.168.2.15 - PuTTY
root@DietPi:~# sudo apt-get install git
```

22. Get the write protection tool [sdtool](https://github.com/BertoldVdb/sdtool) with

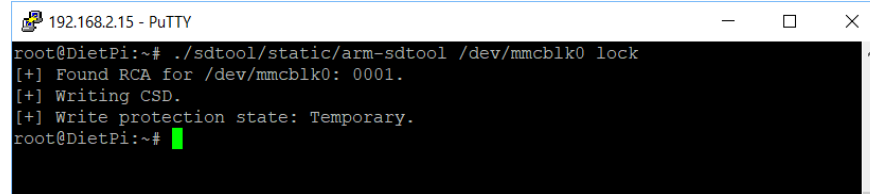
`git clone https://github.com/BertoldVdb/sdtool`



```
192.168.2.15 - PuTTY
root@DietPi:~# git clone https://github.com/BertoldVdb/sdtool
```

23. Put an micro-SD card in the slot, practice enabling TMP_WRITE_PROTECT:

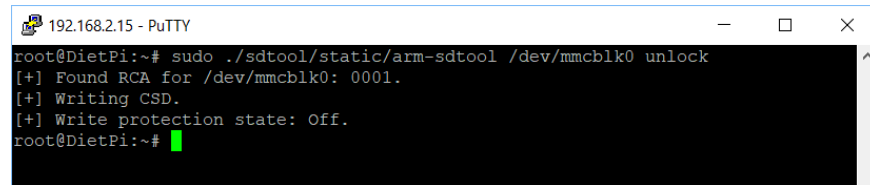
```
sudo ./sdtool/static/arm-sdtool /dev/mmcblk0 lock
```



A screenshot of a PuTTY terminal window titled "192.168.2.15 - PuTTY". The terminal shows the command `./sdtool/static/arm-sdtool /dev/mmcblk0 lock` being executed. The output consists of four lines: `[+] Found RCA for /dev/mmcblk0: 0001.`, `[+] Writing CSD.`, `[+] Write protection state: Temporary.`, and a prompt `root@DietPi:~#` with a green cursor.

24. Now practice reversing the above:

```
sudo ./sdtool/static/arm-sdtool /dev/mmcblk0 unlock
```



A screenshot of a PuTTY terminal window titled "192.168.2.15 - PuTTY". The terminal shows the command `sudo ./sdtool/static/arm-sdtool /dev/mmcblk0 unlock` being executed. The output consists of four lines: `[+] Found RCA for /dev/mmcblk0: 0001.`, `[+] Writing CSD.`, `[+] Write protection state: Off.`, and a prompt `root@DietPi:~#` with a green cursor.

25. You are done!