

GOSOF

Gottlieb Soundboard on FPGA

user manual

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Important remark

By using GOSOF it is possible to damage your pinball machine. As this is a private project with NO commercial interest the author accepts no liability for any damage that may arise by using GOSOF!

1. Introduction

- GOSOF is a 100% hobby project. This makes the solution cheap, depending on where you buy your components it is possible to create your Gottlieb replacement Soundboard for less than 50€.

What do you need?

- Basic soldering skills
- Possibility to read/write micro SD cards
- A PC with an USB port in order to be able to program the FPGA

2. Soldering

By using the preassembled PCB from JLC you need only solder a few components.

2.1. DFPlayer Mini

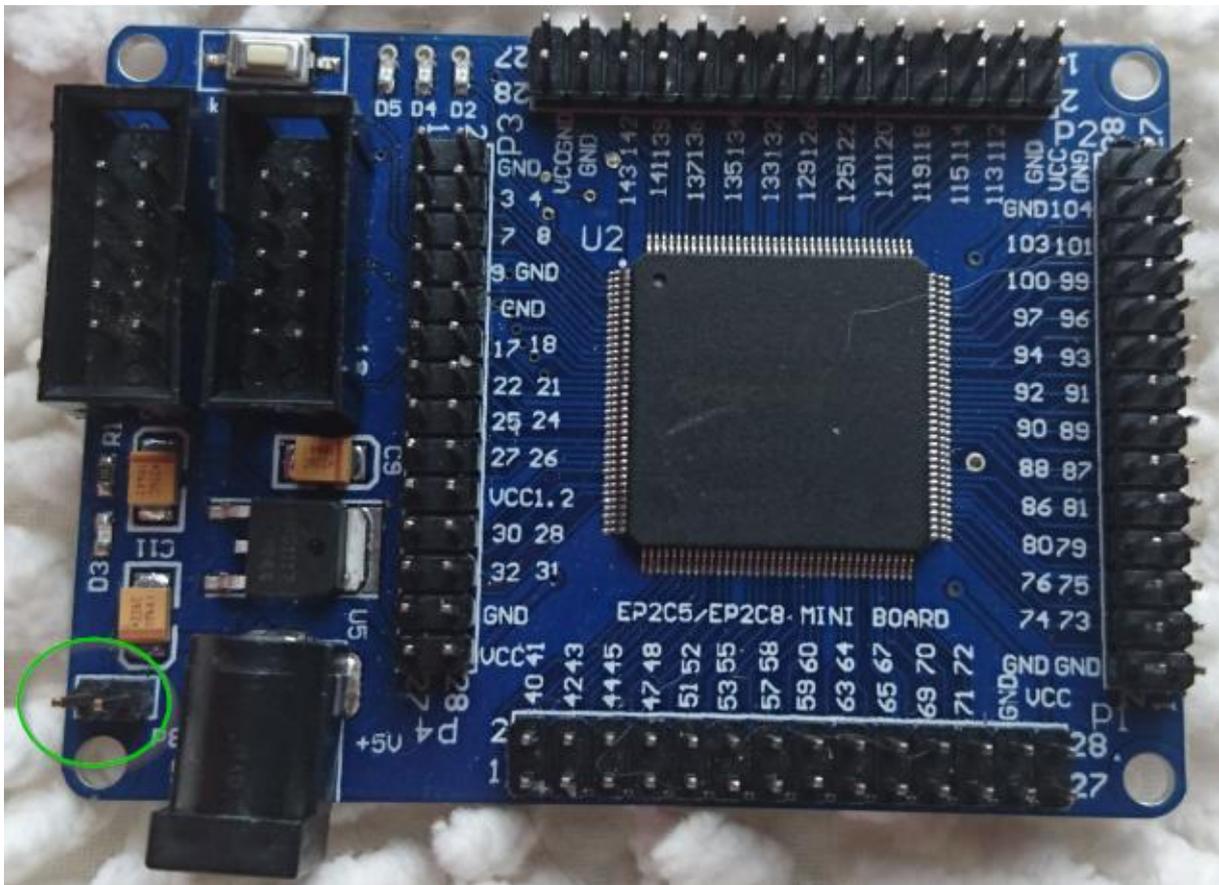
No special instructions. You can either use sockets or solder the Mini Player directly onto the PCB.

2.2. TDA7267

For better cooling solder this amplifier directly onto the PCB **without** an IC socket.

2.3. Altera CycloneII EP2C5T144

Solder the four 2*14 pin headers on the FPGA. **In addition**, you need to solder one 1*2 header (green circle in the picture) to connect the FPGA to the 5 Volt supply voltage.



3. Quickstart

1. Order your Gosof PCB
2. Buy the additional components according to the documentation cart provided
3. Do the soldering
4. Choose latest version of FPGA program and program the FPGA with USB programmer
5. Configure switch 'game select' according to your pinball (Appendix A)
6. Write needed 'speeches' as wav or mp3 files to the first micro SD card
7. Write the needed prom code to the second micro SD card
8. Replace your original System80 or System1 Soundcard with Gosof80
9. Switch the Game ON and enjoy

Note: step 6 is only needed for game with speech, all sounds are generated by Gosof80 and not played from SD card.

4. Installation

The Gosof board has the same connectors and same mounting holes as the original Gottlieb Soundboards, so replacing of the board can be done in seconds.

Gosof does fit for Gottlieb 'export' and 'non export' versions. In contrast to the Gottlieb Soundboard Gosof **does not need an additional power supply**. It will work **with or without** the additional power supply. No need to change your game!

Note: In case you exchange your export version soundcard to Gosof80 and choose the 'speech' version you need to replace your MPU rom! Games with export versions of Gottlieb Soundcards have roms installed which can only play 15 different sounds, where the speech soundboard can play up to 31 different sounds.

5. Dip Switch Settings

5.1. 'S1' SB options

This DIP switch bank is has the same functionality as the DIP switch bank on your original soundboard. Take a look at your Gottlieb Manual. For 'small' soundboards which have only two dip switches use dip switches 1 & 2 of the dip switch bank

5.2. 'S2' game select

With each program a number of different Gottlieb soundcards can be emulated. With this dip switch bank, you select which game will be emulated. For a complete list take a look to Appendix A

5.3. 'S3' options

With DIP 1,2 and 3 you can adjust the speed of the tones (System1 Multisound & MA55 only!). All DIPs OFF is the default and should match the original game.

With DIP4 to ON, you disable the 'multi game' feature. In this mode Gosof80 will read always the first rom found on the micro SD card.

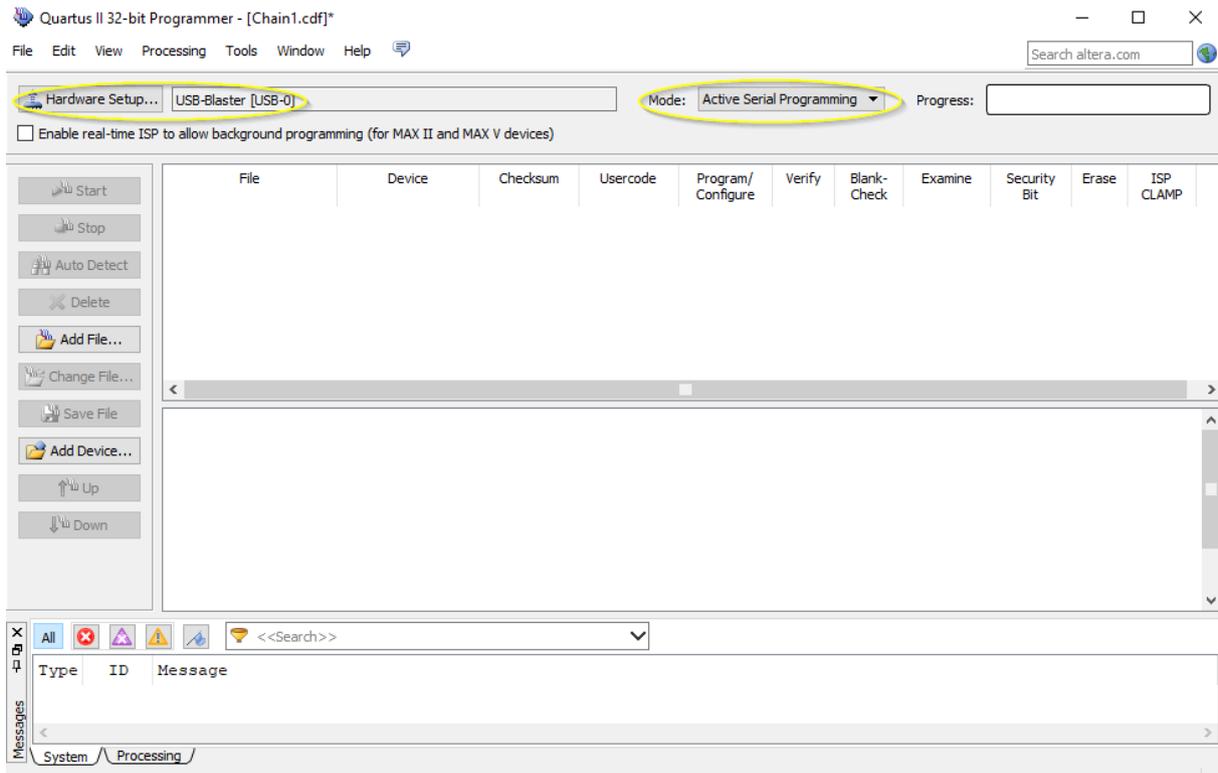
Note that you still need to select your game according to Appendix A!

6. Programming the FPGA

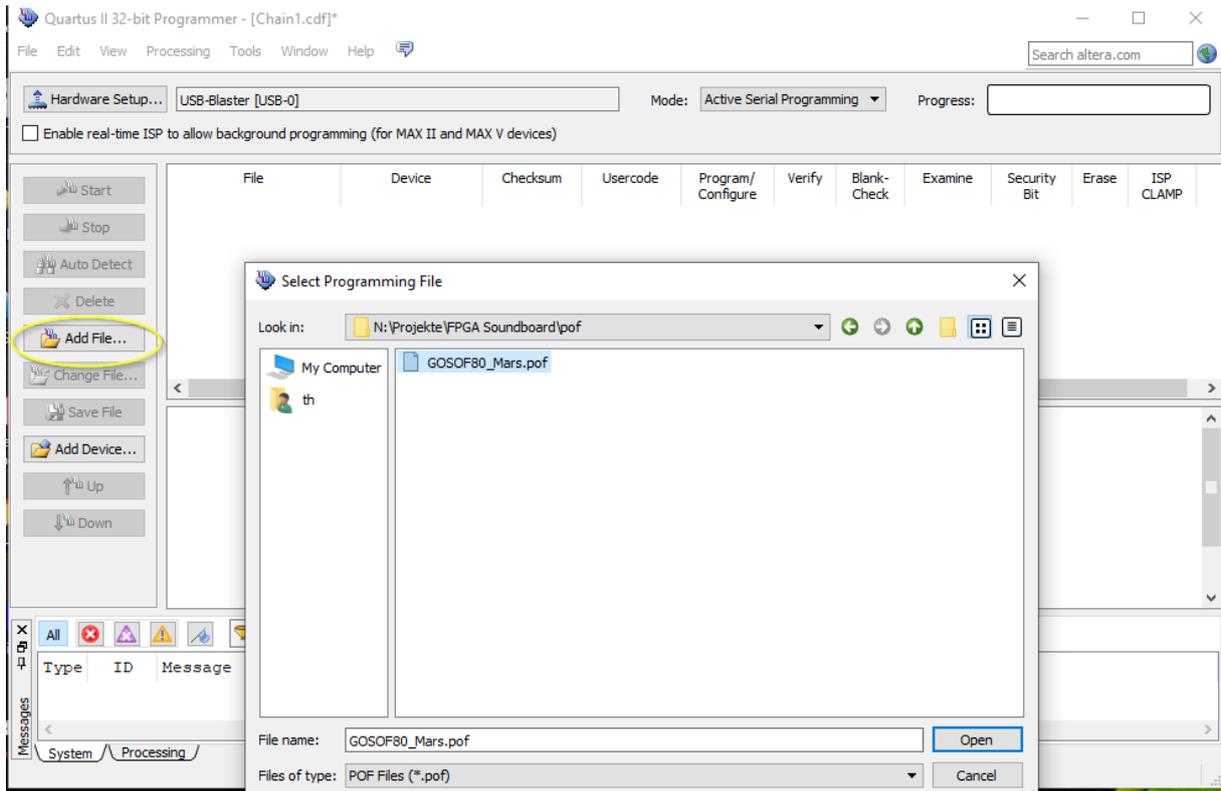
- 1) Connect the USB Blaster to the PC



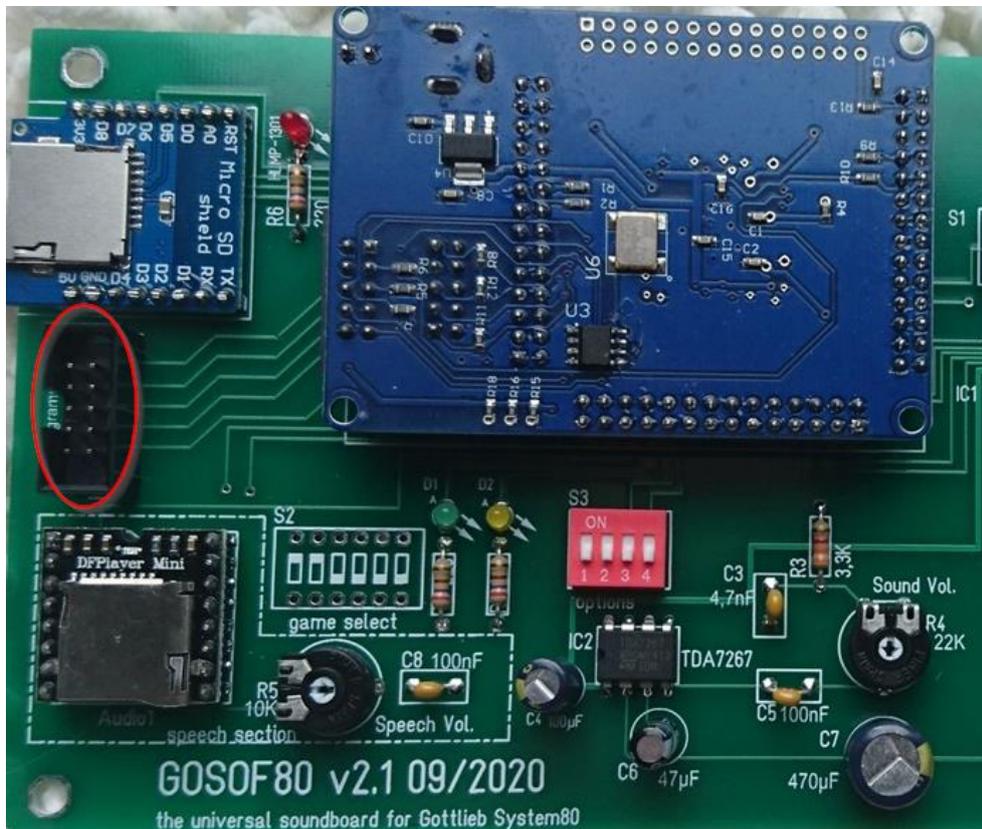
- 2) Start the programmer, make sure in the Hardware setup ,USB-Blaster' is visible and set the Mode to ,Activeserial Programming'



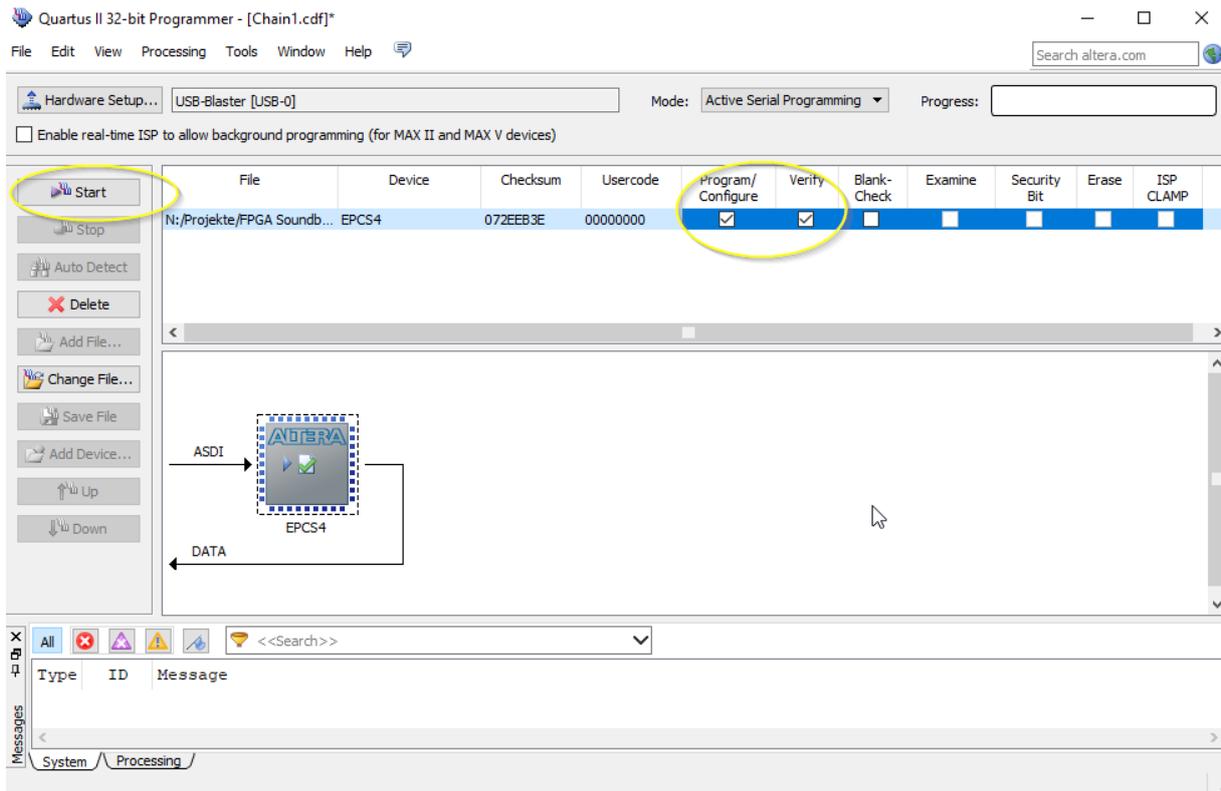
- 3) Select ,Add File' and choose the right ,pof' file for your game



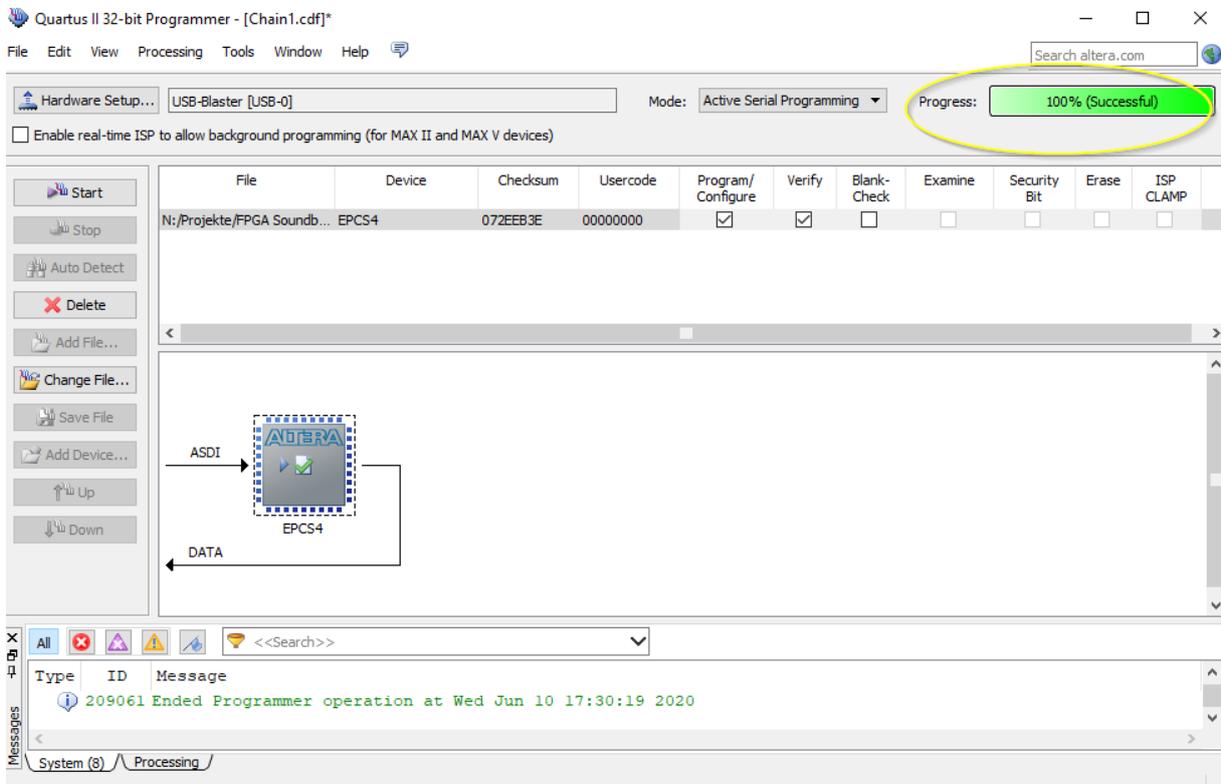
- 4) Power the FPGA (or the Gosof80 PCB) with 5 Volt and connect the USB Blaster to the ,AS' programming connector.



5) Select 'Program/Configure' and 'Verify'



6) Push start, wait for progress 100%



That's it!

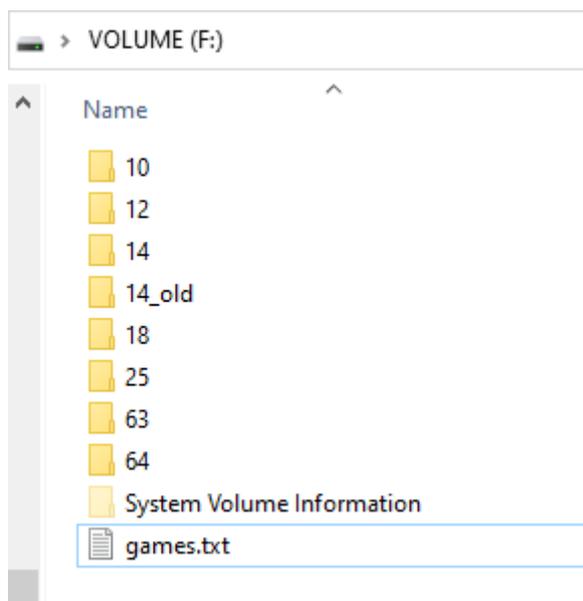
7. DFPlayer Mini

Gosof80 use a small device ('DFPlayer' Mini) for the speeches used by some games. The speeches are stored on a standard micro SD card in the Mini player.

You only need the DFPlayer Mini if you want to emulate a Gottlieb soundboard which is capable of producing speech (Votrax chip). Gottlieb games with speech are: Mars - Volcano - Black Hole - Devil's Dare - Rocky - Striker - Q*Bert's Quest – Caveman

7.1. speechfiles on the SD card

I do provide a ZIP file containing all speeches on my website. Just extract the ZIP archive and write it on a micro SD card. The structure should look like this:



Speech

10 - Mars

12 - Volcano

14 - Black Hole

18 - Devils Dare

20 - Rocky

23 - Striker

25 - Q*Bert's Quest

63 - Caveman

64 - Test (numbers as wav)

8. Gottlieb sound roms

You need to place the Gottlieb sound roms to the micro SD card in the 'Micro SD shield'.

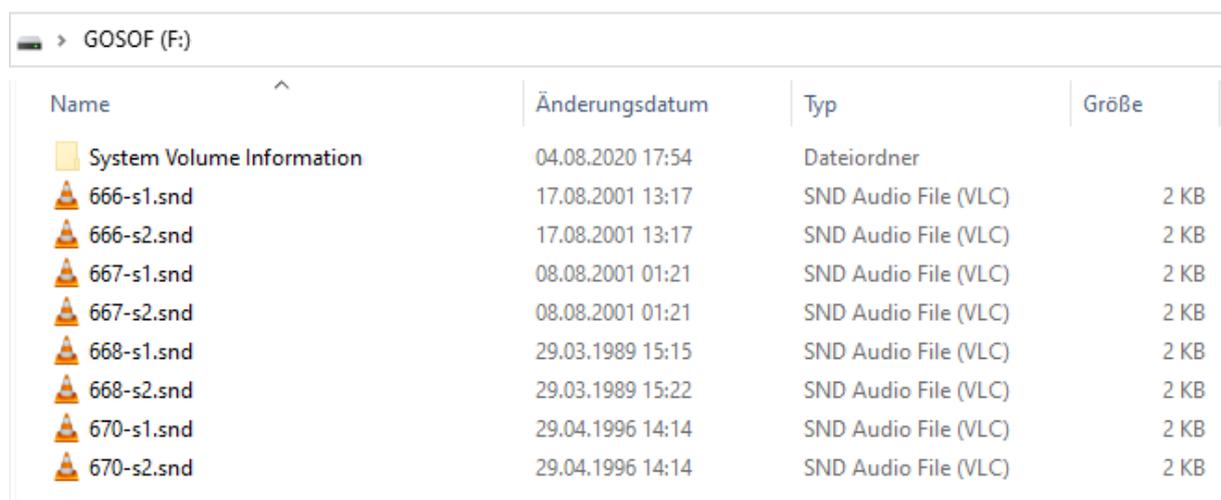
Due to limitations of the SD card read routine in the FPGA (it does read fix sector numbers instead of looking for filenames) it is necessary to use my SD-card image (128 Mbyte). You can write the image to a SD-card of your choice. (see Chapter 'win32Diskimager' to learn how to do that).

On my website you will find the latest version of Gosof80 an (zipped) image file. After unpacking the image can be put on a SD card. I do recommend using Win32DiskImager for doing that.

8.1. rom file structure for Gosof

At boot time Gosof80 reads 4Kbyte of the Sd card content according to what you have selected with 'S1' game select (Note: if you have DIP4 of the options dip switch bank set to ON, Gosof80 will read always the first 4Kbyte!)

Example for the first 4 games (Mars, Volcano, Black Hole, Devils Dare):



Name	Änderungsdatum	Typ	Größe
System Volume Information	04.08.2020 17:54	Dateiordner	
666-s1.snd	17.08.2001 13:17	SND Audio File (VLC)	2 KB
666-s2.snd	17.08.2001 13:17	SND Audio File (VLC)	2 KB
667-s1.snd	08.08.2001 01:21	SND Audio File (VLC)	2 KB
667-s2.snd	08.08.2001 01:21	SND Audio File (VLC)	2 KB
668-s1.snd	29.03.1989 15:15	SND Audio File (VLC)	2 KB
668-s2.snd	29.03.1989 15:22	SND Audio File (VLC)	2 KB
670-s1.snd	29.04.1996 14:14	SND Audio File (VLC)	2 KB
670-s2.snd	29.04.1996 14:14	SND Audio File (VLC)	2 KB

Note that the **order** you put these files on the SD card is **very important!** As said the FPGA routine read fixed sector numbers, so the filename is absolutely irrelevant. Best to use an 'old fashioned' dos batch file to copy the soundroms in the right order to the SD card.

9.Win32DiskImager

This article uses content from the eLinux wiki page [RPI Easy SD Card Setup](#), which is shared under the [Creative Commons Attribution-ShareAlike 3.0 Unported license](#)

- Insert the SD card into your SD card reader. You can use the SD card slot if you have one, or an SD adapter in a USB port. Note the drive letter assigned to the SD card. You can see the drive letter in the left hand column of Windows Explorer, for example **E:**
- Download the Win32DiskImager utility from the [Sourceforge Project page](#) as an installer file, and run it to install the software.
- Run the Win32DiskImager utility from your desktop or menu.
- Select the LISY image file you extracted earlier.
- In the device box, select the drive letter of the SD card. Be careful to select the correct drive: if you choose the wrong drive you could destroy the data on your computer's hard disk! If you are using an SD card slot in your computer, and can't see the drive in the Win32DiskImager window, try using an external SD adapter.
- Click 'Write' and wait for the write to complete.
- Exit the imager and eject the SD card.

Appendix A

game sel.						MA 216 / MA309 Soundboard
S1	S2	S3	S4	S5	S6	
off	off	off	off	off	off	Mars
on	off	off	off	off	off	Volcano
off	on	off	off	off	off	Black Hole
on	on	off	off	off	off	Devils Dare
off	off	on	off	off	off	Rocky
on	off	on	off	off	off	Striker
off	on	on	off	off	off	Q*Bert's Quest
on	on	on	off	off	off	Caveman

game sel.						MA309 Soundboard
S1	S2	S3	S4	S5	S6	
off	off	off	on	off	off	Haunted House
on	off	off	on	off	off	Spirit
off	on	off	on	off	off	Krull
on	on	off	on	off	off	Goin'Nuts
off	off	on	on	off	off	Super Orbit
on	off	on	on	off	off	Royal Flush Deluxe

game sel.						MA 55 Soundboard
S1	S2	S3	S4	S5	S6	
off	off	off	off	on	off	Panthera
on	off	off	off	on	off	Spiderman
off	on	off	off	on	off	Circus
on	on	off	off	on	off	Counterforce
off	off	on	off	on	off	Star Race
on	off	on	off	on	off	James Bond
off	on	on	off	on	off	Timeline
on	on	on	off	on	off	Force II
off	off	off	on	on	off	Pink Panther
on	off	off	on	on	off	Volcano
off	on	off	on	on	off	Black Hole
on	on	off	on	on	off	Eclipse
off	off	on	on	on	off	Devils dare

game sel.						MA 490 Soundboard
S1	S2	S3	S4	S5	S6	

off	off	off	off	off	on	Amazon Hunt
on	off	off	off	off	on	Rack'Em UP
off	on	off	off	off	on	Ready... Aim... Fire!
on	on	off	off	off	on	Jacks to Open
off	off	on	off	off	on	Touchdown
on	off	on	off	off	on	Alien Star
off	on	on	off	off	on	The Games
on	on	on	off	off	on	El Dorado City of Gold
off	off	off	on	off	on	Ice Fever
on	off	off	on	off	on	Bounty Hunter
off	on	off	on	off	on	Chicago Triple Play
on	on	off	on	off	on	Tag Team Pinball

game sel.						System1 Multi Sound
S1	S2	S3	S4	S5	S6	
off	off	off	off	on	on	Totem
on	off	off	off	on	on	Hulk
off	on	off	off	on	on	Genie
on	on	off	off	on	on	Buck Rogers
off	off	on	off	on	on	Torch
on	off	on	off	on	on	Roller Disco
off	on	on	off	on	on	Asteroid Annie