

GottFA1 _PluS

Gottlieb System 1 FPGA Replacement Board

User Manual

Software Version 7.00 | Revision 1.00



Distributed by Drop Targets · www.droptargets.ca

Board design by ralf@lisy.dev · www.lisy.dev
August 2024

Table of Contents

Important Notice	3
1. Introduction	3
2. Quick Start	4
3. Installation	4
4. DIP Switch Settings	5
4.1 S1 — Game Select	5
4.2 S2 — Board Options	5
4.3 Integrated Soundcard Options	5
4.4 Gottlieb DIP Banks	6
5. Boot Sequence	6
6. Integrated Soundcard	7
6.1 Background Music	7
7. Attract Mode	8
7.1 Configuration File Syntax	8
7.2 Converter Tool	8
7.3 Creating a ROM File	9
8. Writing a New SD Card for Main Board	9
A. Appendix: Supported Game List	10

⚠ **WARNING** GottFA1_PLuS can damage your pinball machine if installed or configured incorrectly. This is a community project with no commercial backing. The author accepts no liability for any damage that may result from its use. Proceed at your own risk.

1. Introduction

GottFA1_PLuS is a single-board replacement for virtually all active electronics in a Gottlieb System 1 pinball machine. One board replaces four:

- Main CPU Board
- Power Supply
- Driver Board
- Sound Card

2. Quick Start

1. Using the game list in Appendix A, identify the correct S1 DIP switch position for your machine and set it on the GottFA1_PLuS board. This tells the board which ROM image to load from the SD card.
2. Remove the original Gottlieb System 1 MPU from the machine and seat the GottFA1_PLuS board in its place. The connector layout and mounting holes are identical — no mechanical modifications are required. See Section 3 for full installation details and important connector orientation notes.
3. Turn S2-Dip1 to ON, then power on the machine. This triggers a one-time NVRAM initialisation for the selected game. The board will run through its boot sequence — the game will start automatically when complete.
4. Once the first boot is complete, power off the machine. Turn S2-Dip1 back to OFF, then power on again. The board is now configured for normal play.
5. Enjoy your game.

3. Installation

GottFA1_PLuS uses the same connector layout and mounting holes as the original Gottlieb System 1 MPU. No mechanical modifications are required — the board seats directly in place of the original.

If you choose to use the integrated soundcard instead of your original sound board, run two speaker wires from the GottFA speaker connector to the cabinet speaker.

⚠ IMPORTANT — Connector A2 J1 Orientation Before connecting the wire harness, always double-check the orientation of connector A2 J1. This connector has no mechanical key — it can be inserted either way. Installing it backwards can damage the board and your machine. Verify the pin-1 marker on the board aligns with the correct wire in the harness before applying power.

4. DIP Switch Settings

4.1 S1 — Game Select

S1 selects which ROM image GottFA1 loads from the SD card. The mapping between switch positions and game numbers is described in Appendix A. See Section 8 for SD card file ordering.

4.2 S2 — Board Options

DIP	Label	Description
Dip 1	Init NVRAM	When ON, clears all NVRAM for the selected game during boot. Use on first power-up or to perform a full factory reset. Turn OFF after initialisation.
Dip 2	Freeplay	When ON, press and hold the Credit button for more than two seconds to simulate a coin insert on the left chute.
Dip 3	LED Displays	When ON, refreshes the display at LED-optimised timing. Use this setting if your displays are LED replacements. (Original tube displays may ghost slightly.)
Dip 4	Slam Disable	When ON, disables the Gottlieb slam-tilt detection. Recommended for most installations.

4.3 Integrated Soundcard Options

These switches mirror the function of the original Gottlieb Multisound board option switches.

DIP	Label	Description
Dip 1	Sound / Tones	Selects between digitised sound samples and tone-chime emulation — same behaviour as the original Multisound board.
Dip 2	Attract Sounds	Enables Gottlieb attract-mode audio. The original board fires attract sounds approximately every 8 minutes.
Dip 3	Background Music	Activates the onboard MP3 player for background music during gameplay. See Section 6.1.

4.4 Gottlieb DIP Banks

The Gottlieb DIP banks (S1–S8, S9–S16, S17–S24) behave identically to those on the original MPU. Refer to your machine's manual for game-specific settings. For a clean first start, use the defaults below:

Bank	Recommended Default
S1 – S8	All OFF
S9 – S16	All ON
S17 – S24	DIP19 OFF — all others ON

NOTE DIP16 and DIP24 have no function on the original MPU but are used by GottFA1_PLuS. DIP16 controls background music behaviour (see Section 6.1.1). DIP24 enables Attract Mode (see Section 7).

5. Boot Sequence

On power-up, GottFA1_PLuS runs through three boot phases. Progress is shown on the playfield displays.

Phase 1 — Initialisation

Player 1 display: GOTTFA

Players 2–4 display: Welcome message

Status display: Soundcard DIP settings and current S1 game number (decimal)

Phase 2 — SD Card Read

Player 1 display: GOTTFA

Player 2 display: FPGA firmware version

Player 3 display: READSD

Player 4 display: Blank (success) or ERROR (SD card not found/readable)

NOTE If the SD card cannot be read, the red 'SD Error' LED illuminates and Player 4 shows ERROR. Verify the card is seated correctly and is not a SanDisk model (SanDisk cards are not compatible with GottFA1).

Phase 3 — Game Execution

The ROM indicated by S1 is loaded from the SD card and executed. When the game is running normally, the 'Active' LED illuminates.

6. Integrated Soundcard

GottFA1_PLuS includes a full soundcard emulation. You can use either the integrated soundcard or your original sound board — the choice is yours.

The integrated soundcard supports two emulation modes:

- Gottlieb Multisound card (Totem and later games)
- 3-Tone Chime Board (early games — can also be added to games that originally had a chime board)

6.1 Background Music

With Soundcard DIP3 set to ON, the onboard MP3 player streams background music during gameplay. To add your own music:

1. Use a standard microSD card (up to 32 GB).
2. Create a folder named 02 (zero-two) in the root of the card.
3. Copy your MP3 or WAV files into that folder.

GottFA1 plays the files in random order during gameplay.

6.1.1 Music Resume Behaviour (DIP16)

DIP16	Behaviour
ON	Music restarts from the beginning of a track each time a new game starts.
OFF	GottFA1 remembers the playback position and resumes from where it left off at the start of the next game.

7. Attract Mode

GottFA1_PLuS (software v0.98 or later) supports a fully customisable attract mode for System 1. Attract mode is toggled on and off using Gottlieb DIP switch #24.

A set of ready-made attract configuration files is available on the author's repository server at www.lisy.dev.

7.1 Configuration File Syntax

Attract actions are defined in a CSV file. The file is looped continuously — when the end is reached, playback restarts from the top. GottFA1_PLuS is compatible with the LISY1 attract syntax, with support for two commands:

time <value> <s | ms>

Pause for the specified duration before executing the next command. Only whole-number (integer) values are accepted. Use s for seconds, ms for milliseconds.

Example	Effect
time 2 s	Wait 2 seconds
time 500 ms	Wait 500 milliseconds

lamp <number> <on | off>

Switch lamp number (1–36) on or off.

Example	Effect
lamp 5 on	Turn lamp 5 on
lamp 12 off	Turn lamp 12 off

7.2 Converter Tool

Once your CSV is ready, convert it to a binary file using the Attract Converter tool (available to download on droptargets.ca under the GottFA1_PLuS board page). The resulting .bin file must be embedded into the ROM image on the SD card.

Example — converting 005_attract.csv for Charlie's Angels:

```
attractcsv2bin 005_attract
opening input file: 005_attract.csv
creating output file: 005_attract.bin
csv contained 34 commands
22 lamp commands written
12 time commands written
wrote 121 of possible 4096 bytes
```

7.3 Creating a ROM File

Each game requires a ROM image file on the SD card. GottFA1_PLuS reads this image during boot to run your selected game. To create a ROM image you will need three components:

- **System ROMs** — the two Gottlieb System 1 system ROMs required by every game: u5_cf.bin and u4_ce.bin
- **Game ROM** — the game-specific CPU ROM file for your title (filename varies per game)
- **Filler files** — blank padding files (1K, 2K, 4K, 6K, 7K) used to align the image to the correct size. These contain no data. Download them from droptargets.ca under the GottFA1_PLuS board page (included in the blank ROM zip file).

NOTE ROM files for Gottlieb games are not supplied with GottFA1_PLuS and are not available from Drop Targets. You must source these yourself. Copyright restrictions apply.

Example — Charlie's Angels (game ROM: 425.cpu)

To build the ROM image without attract mode (Windows command prompt):

```
copy /b u5_cf.bin + u4_ce.bin + 425.cpu + 4K + 7K Charlies.img
```

To build the ROM image with attract mode included (see Section 7.1 and 7.2 for creating and converting the attract CSV file):

```
copy /b u5_cf.bin + u4_ce.bin + 425.cpu + 7K + 005_attract.bin Charlies.img
```

When adding attract mode, the 4K filler is replaced by the 005_attract.bin file, which must be exactly 4096 bytes. The 7K filler remains to pad the end of the image correctly.

8. Writing a New SD Card for Main Board

If your SD card becomes corrupt or stops working, you can write a new one to get back up and running. The GottFA1_PLuS SD card image is available to download on droptargets.ca under the GottFA1_PLuS board page. Download the image, unzip it, then follow the steps below to write it to a new microSD card using Win32DiskImager.

⚠ WARNING SanDisk microSD cards are not compatible with GottFA1. Use any other brand of 128 MB or larger.

Steps — Win32DiskImager

1. Insert your microSD card into the card reader. Note the drive letter assigned (e.g. E:) — visible in Windows Explorer.
2. Download Win32DiskImager from the Sourceforge project page and install it.
3. Launch Win32DiskImager. Select the unpacked GottFA1 .img file.
4. In the Device box, select the drive letter of your SD card. Double-check — selecting the wrong drive will overwrite your hard disk.
5. Click Write and wait for the process to complete (progress shown on screen).
6. Click Exit, then safely eject the SD card.

Appendix A — Supported Game List

The table below shows the full list of supported Gottlieb System 1 games and the S1 DIP switch settings required to select each one.

No.	S1	S2	S3	S4	Short Name	Full Title
0	OFF	OFF	OFF	OFF	cleoptra	Cleopatra
1	ON	OFF	OFF	OFF	sinbad	Sinbad
2	OFF	ON	OFF	OFF	jokrpokr	Joker Poker
3	ON	ON	OFF	OFF	dragon	Dragon
4	OFF	OFF	ON	OFF	closeenc	Close Encounters of the Third Kind
5	ON	OFF	ON	OFF	charlies	Charlie's Angels
6	OFF	ON	ON	OFF	solaride	Solar Ride
7	ON	ON	ON	OFF	countdown	Count-Down
8	OFF	OFF	OFF	ON	pinpool	Pinball Pool
9	ON	OFF	OFF	ON	totem	Totem
10	OFF	ON	OFF	ON	hulk	The Incredible Hulk
11	ON	ON	OFF	ON	genie	Genie
12	OFF	OFF	ON	ON	buckgrs	Buck Rogers
13	ON	OFF	ON	ON	torch	Torch
14	OFF	ON	ON	ON	roldisco	Roller Disco
15	ON	ON	ON	ON	astannie	Asteroid Annie and the Aliens