GB Cart Flasher

User's Manual

Introduction

GB Cart Flasher is a cartridge reader and programmer for use with Game Boy™, Game Boy Pocket™, Super Game Boy™ and Game Boy Color™ consoles and was designed as cheap and easy to build alternative for existing devices. There are two versions, first one with USB and second one with RS-232 connection to PC.

GB Cart Flasher supports games backup from cartridges you have purchased, reading and writing game saves and programming of your own games to cartridges with ROM chip replaced with FLASH chip.

GB Cart Flasher hardware is based on an ATMEGA8515 microcontroller from Atmel. USB version uses additional FT232BM converter from FTDI and RS-232 version uses MAX232 converter.

Software is available for Windows and Linux based systems in English, French, German and Polish language with support for both USB and RS-232 versions.

Disclaimer

We do not sell PCBs or electronic parts. This project was created for educational purposes only and is intended for your own Game Boy™ programming and development. This project is free and any kind of commercial usage is prohibited. If you have any questions contact us at mailto:gbflasher@interia.pl .

Game Boy™, Game Boy Pocket™, Super Game Boy™ and Game Boy Color™ are registered trademarks of Nintendo CO., LTD.

How to build GB Cart Flasher?

First, decide which version you want to build. There are two options available:

USB version	RS-232 version
Communication via modern USB interface	Communication via RS-232 interface
Powered directly from USB	Requires external power supply
Requires more experience in electronics and soldering	Simpler
A bit more expensive	Cheaper
Recommended for new PCs and notebooks	Will work with older PCs

Next step is to order all necessary electronic parts (look at the schematic). Try to find a local chip distributor on the web and order online. We suggest to buy a damaged Game Boy™ console (there are many on internet auctions) and desolder the cartridge connector. It should be a Game Boy™ Classic console because other consoles i.e. Pocket and Color, have a different connector which will not fit. The most difficult thing to produce is the Printed Circuit Board (PCB). Print PCB artwork on a laser printer and remember to check the board dimensions. There are many tutorials on the web, describing how to make good PCBs like for example:
- http://www.electricstuff.co.uk/pcbs.html
- http://www.electronicsforu.com/efylinux/efyhome/cover/Nov2000/home-pcb.htm
- http://www.efymagonline.com/pdf/Pcbs.pdf

The ATMEGA8515 microcontroller is used in both versions and needs to be programmed before working correctly. Firmware for ATMEGA8515 is provided in IntelHex files (.hex) for USB and RS-232 versions. Almost every programmer can read this format. For the microcontroller programming you will need an In System Programmer (ISP). If you do not have such programmer try to borrow it from somebody because it will be used only once. Alternatively you can build one for yourself – it is easy to build and really cheap. You can use for example PonyProg serial device programmer from
http://www.lancos.com/prog.html .
Schematic of ISP programmer is here: http://www.lancos.com/prog.html#avrisp .
Solder ISP programmer wires to PCB as described in table below:

ISP connector	ATMEGA8515 pin number
MOSI	6
RST	9
SCK	8
MISO	7
GND	20
VDD	40

You can also use this ISP programmer:
http://www.atmel.com/dyn/products/tools_card.asp?tool_id=2726 or parallel programmer for Atmel microcontrollers. After programming you have to program fuse bits to value 0xC91F. It means that in PonyProg fuse bits should be configured like this:
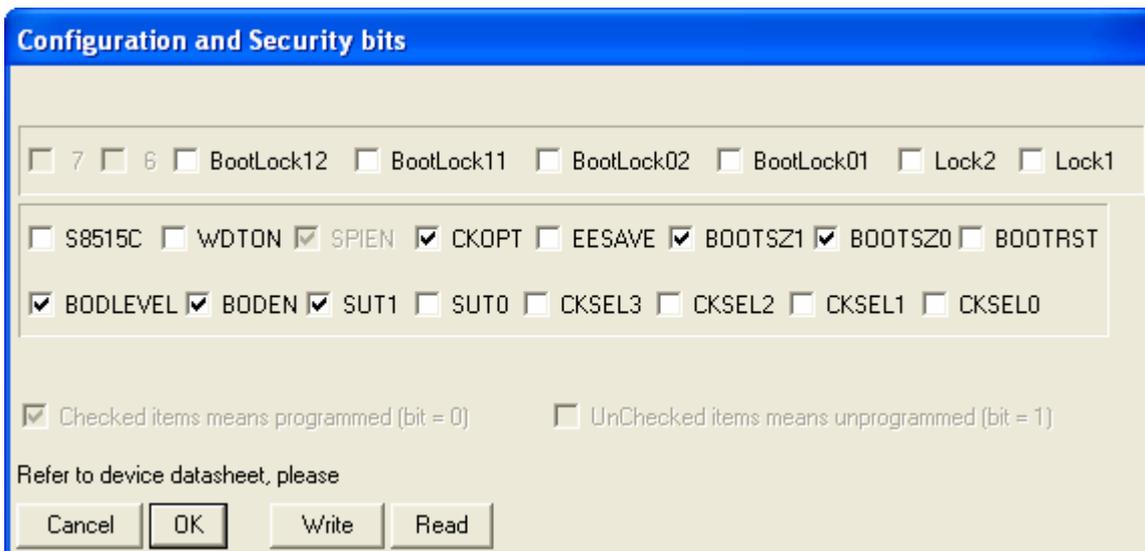
Now you can start soldering all parts onto the PCB. We suggest to use a socket for the microcontroller.

Before connecting GB Cart Flasher hardware to your PC you have to install software. For USB version it is necessary to install additional FTDI driver, which is included in the installer package (select *FTDI USB Driver* option during installation) or it can be downloaded from http://www.ftdichip.com/ . For USB version you will also need USB TYPE A-B cable like this:

For the RS-232 version you will need a Null Modem cable. You can buy it or do simplified version by yourself. Buy two DB-9 female connectors and a piece of 4-wire telephone cable and connect wires as described in table below:

DB-25	DB-9		DB-9	DB-25
2	3	-	2	3
3	2	-	3	2
7	5	-	5	7

Software

For Windows systems run setup program to install software and driver. For Linux based systems it is necessary to compile software from sources – see README file for details. The programmer is automatically detected when you start program. Main program window looks like this:

In *Settings* group you have to select appropriate Memory Bank Controller (MBC) which is installed in cartridge. If you do not know MBC type leave *MBC AUTO* setting. Select appropriate flash memory size and RAM memory size. Some memory sizes may be unavailable depending on MBC type selection. *Check file size* option allows writing files only with valid sizes when selected. If you want to check what is currently written to cartridge click *Cart Info* button:
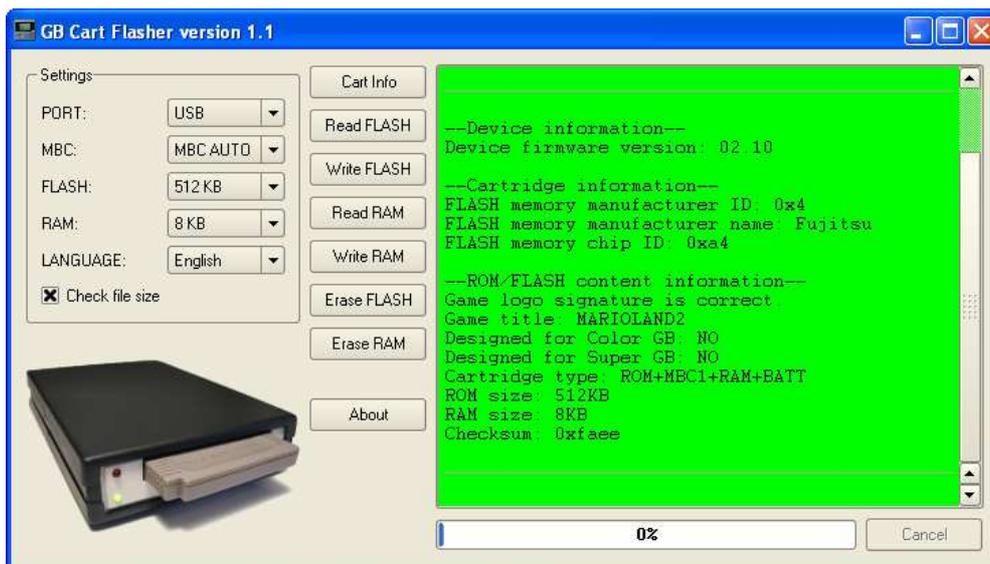
Notice that only cartridges with ROM chip replaced with FLASH chip can be written and erased. Writing and erasing cartridges with ROM chip has no effect. RAM memory can be written and erased in all cartridges. *Cart Info* displays valid information in *Cartridge information* section only for cartridges with FLASH chip.

Troubleshooting guide

Here you will find most common problems and solutions.

P: Does GB Cart Flasher work with commercial programmable cartridges?
S: No. Only original cartridges with ROM chip replaced with FLASH chip are supported.

P: Which FLASH chips will work with GB Cart Flasher?
S: It depends on what cart size you want to have. The best solution is to make MBC5 cartridge with 4-Mbyte 29F032 flash chip. In this case you will be able to program nearly all games. You can also use smaller 2-Mbyte 29F016 or 1-Mbyte 29F080 flash chips. For Classic and Pocket consoles 512-kbyte 29F040 flash chip is enough, but there are some other chips that will be suitable as well, for example 512-kbyte 49F040 or 256-kbyte 49F002 flash chip. Do not use 29Cxxx chips and other with page mode programming – they will not work. 28xxxx chips will not work too.

P: Which versions of FT232BM and ATMEGA8515 chips can be used?
S: You can use FT232BL instead of FT232BM chip. ATMEGA8515-16PI, -16PU and -16PC can be used. ATMEGA8515L-8PI, -8PU and -8PC versions should also work. Information is based only on datasheet specification.

P: Are devices other than cartridges like GB Camera or GB Printer supported by GB Cart Flasher?
S: Unfortunately no and they will not be supported in future.

P: Software freezes during read/write operation.
S: Try to run it in *Alt Mode*. You have to run software with additional *-0* command line parameter. Values in the range from *-0* to *-7* are forcing different process priorities.

P: I programmed RAM with correct game save file, but it does not work when I play games on a GB(C) console.
S: Probably RAM data is corrupted. It may happen when you are inserting/ejecting cartridges while power is on (green LED on). Eject or insert cartridges only when power is off.

P: Software does not recognize GB Cart Flasher connected to PC under Linux. FTDI USB driver is already installed.
S: You have to run software with root privileges (for example *sudo ./gbcflsh*) or log on as root.

P: I have a very slow computer and sometimes read/write operation fails, displaying "Timeout!".
S: Close all not necessary applications. If this will not help you can change communication speed between programmer and your PC. To force lower speed, bypass microcontroller pin 29 with 30 (check twice, you can damage your microcontroller) and run program with additional *-lowspeed* parameter.

P: When I start software it hangs on detecting device message and/or interferes with other devices connected to COM ports.
S: You can switch off programmer automatic detection. Just run program with *-commanual* parameter, then select appropriate COM port manually.

P: Why are some ROM/RAM sizes unavailable for some Memory Bank Controllers (MBC)?
S: It's due to their limitations. If you do not know which type of MBC is in your cartridge select MBC AUTO (default at startup).