

## GBxCart RW v1.1/v1.2/v1.3

A device for backing up GB, GBC and GBA cart's game ROMs, save games to your PC and restoring saves from your PC.

### Main Features

- Backup games ROM to your PC
- Backup/Restore save games to/from your PC
- Supports Gameboy, Gameboy Colour, Gameboy Advance cartridges
- Supports SRAM/Flash/EEPROM saves for Gameboy Advance cartridges
- GUI or Console interfacing programs

### Other Features

- Backup GB Camera (active images) to BMP with a one click program called GB Camera Saver
- GB Sachen ROM mapper reading support
- GBA "24-in-1" Flash cart ROM mapper reading support (may not work for all flash carts)

### Gameboy Flash Carts/Flash Chips supported

AM29F010B, SST39SF010A, SST39SF040, AT49F040 (Audio/WR), Catskull / BV5, ES29LV160 Flash (PCB 0883\_DRV), AM29LV160DB, 29LV160CTTC, AM29F016B, 256M29, M29W640

[Check your cart – Jump to the Supported Flash Cart page](#)

### Gameboy Advance Flash Carts supported

MSP55LV128, MSP55LV128M, 29GL128EHMC, 29LV128DTMC, 256M29EWH, M36L0R706 (36LOR-DRV), 256L30B (28F256L03B-DRV), MX29LV320

[Check your cart – Jump to the Supported Flash Cart page](#)

### Read/Write Speeds (using Windows GUI Interface)

#### Gameboy

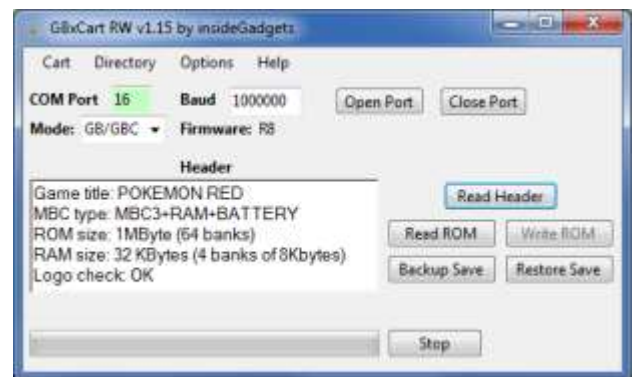
1MByte ROM Read	16s
32KByte SRAM Read/Write	3s
32KByte Flash Cart Write	5s
2MByte Flash Cart Write	~2.5m

#### Gameboy Advance

8MByte ROM Read	1.5m
256Kbit SRAM Read/Write	3s
512Kbit Flash Read	3s
512Kbit Flash Write	~8s
64Kbit EEPROM Read	3s
64Kbit EEPROM Write	13s
16MByte Flash Cart Write	~10-13m



(v1.3 PCB pictured)



(GUI Pictured)

### Specifications

Size (regular): 48mm (L) x 50mm (W) x 9mm (H)  
 Size (mini): 43mm (L) x 50mm (W) x 9mm (H)  
 Voltage: Switchable between 3.3V for GBA and 5V for GB/GBC. GBxCart Mini RW only supports 5V.  
 Weight (regular): 16 grams  
 Weight (mini): 15 grams

### Requirements

v1.2/v1.3 Board - Micro USB or USB-C cable  
 v1.1 Board - Mini USB cable (discontinued)

### OS Compatibility

Windows XP or higher  
 Linux/Mac (console version)

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## Quick How to Use

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1. Before inserting the cartridge, select the correct voltage for your cartridge using the switch (GB/GBC use 5V while GBA uses 3.3V). If you have the v1.3 board, this is controlled by software – in the GUI you choose GB or GBA mode and press connect.
2. Connect the USB cable to ensure the correct voltage LED lights up. If the device isn't automatically detected, you will need to open up Device manager, find the "USB 2.0 Serial" device and update the driver using the files in the \Drivers folder.
3. Unplug the device from your computer. Insert your cartridge to the device (make sure the cartridge sticker is facing up) and connect the device again.
4. For the GUI interface, follow "GUI Program" steps or for the console program follow "Console Program" steps.
5. When changing cartridges, always unplug the USB cable from the device, swap the cartridge and then reconnect the USB cable.

## Troubleshooting

---

### **If no lights are showing when plugging in the device or the device isn't being detected**

- Try using a different USB cable (preferably a non-phone type USB cable).
- Try using a non-USB 3.0 port if you are using one.
- Try to unplug all other USB devices except your keyboard and mouse.
- Uninstall the device from Device Manager and choose to delete the driver files as well, then try to re-install the drivers and ensure the device shows as CH340.

### **If it's timing out when performing any of the functions**

- Try using a different USB cable (preferably a non-phone type USB cable).
- Check to see that you have no other software which monitors COM ports such as the Arduino IDE running in the background.

If you've tried all the above steps but are still experiencing issues, please contact us at [support@insidegadgets.com](mailto:support@insidegadgets.com)

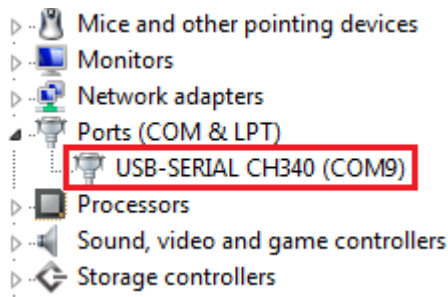
## GUI Program

### Setup

1. Download and Install Microsoft Visual C++ Redistributable Packages (x86 and x64) for Visual Studio 2015 - <https://www.microsoft.com/en-us/download/details.aspx?id=53840>

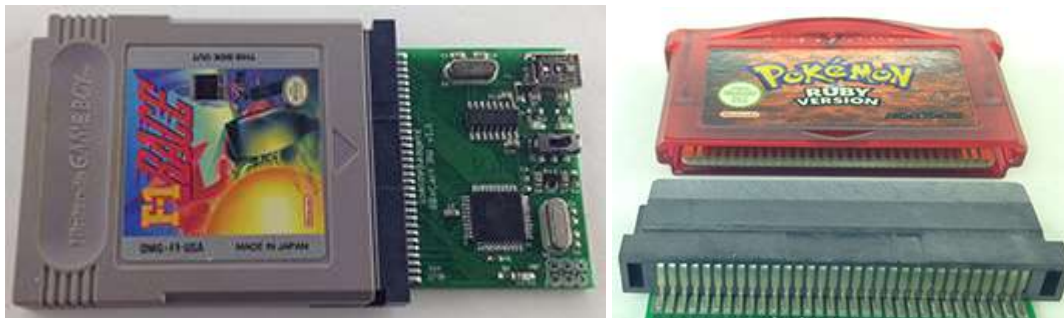


2. Open \Interface\_Programs\GBxCart\_RW\_vx.x\_GUI\_Interface\GBxCart\_RW\_vx.x.exe and click the Open Port button. It should automatically detect the COM port that the device is using. The COM port text box should turn green if it has successfully connected. Once the port is successfully opened, the port number and baud rate will be remembered for next time. You will see the mode currently selected GB/GBC or GBA and the Hardware Firmware version.



(If the COM port turns red, you may have to manually change the COM port number to match the COM port your operating system has assigned the device, this can be found in device manager.)

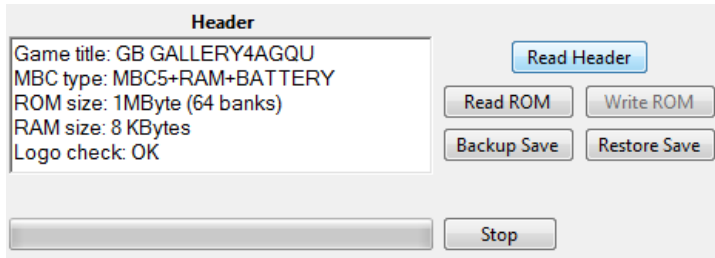
### Inserting/Removing Cartridges



1. Before inserting the cartridge, select the correct voltage for your cartridge using the switch (GB/GBC use 5V while GBA uses 3.3V). If you have the v1.3 board, this is controlled by software – in the GUI you choose GB or GBA mode and press connect. Connect the USB cable to ensure the correct voltage LED lights up.

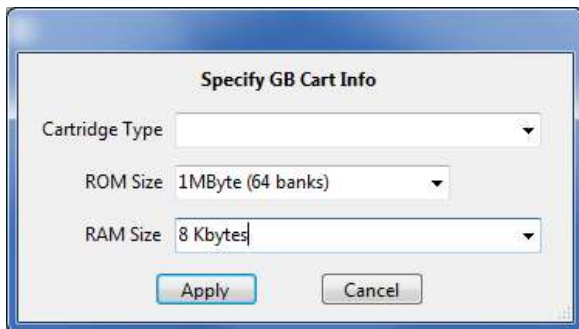
2. Unplug the device from your computer. Insert your cartridge to the device (make sure the cartridge sticker is facing up and that you can see the pins on the bottom of the cartridge), connect the device again and click Open Port as before.
3. You can now read the header, read the ROM, etc.
4. When removing cartridges, always unplug the USB cable from the device first before removing the cartridge.

## Reading the Header



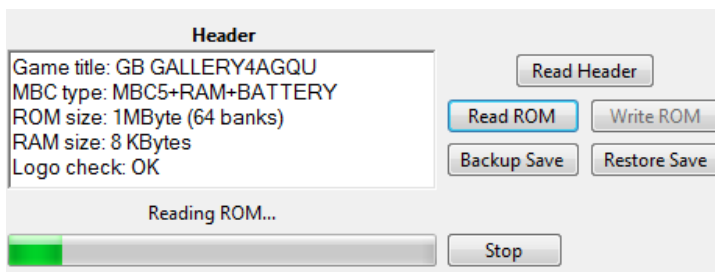
Press the Read Header button and the cartridge information should show up (GBA carts can take 4 seconds as tests are being performed to determine the ROM and SRAM/Flash/EEPROM sizes). *Note: You don't need to read the header for Flash Carts.*

Make sure that the "Logo check" comes back as OK otherwise the cartridge may not be read correctly and you will have to disconnect the device, remove and re-insert the cartridge.



If the cartridge information doesn't match what you know to be correct, you can select "Cart" from the top menu and select "Specify Cart Info" button to change the ROM size and RAM size/type.

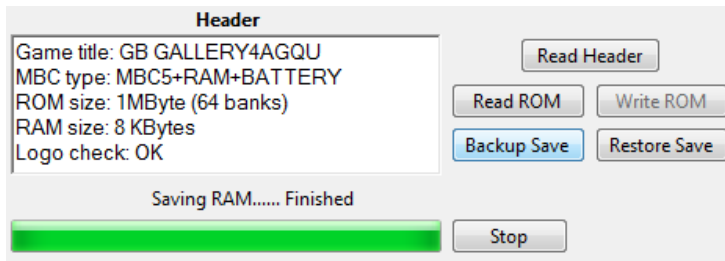
## Read the ROM



You can now press the "Read ROM" button to download the ROM from the cartridge to your PC, it will be saved as <Gametitle>.gb or <Gametitle>.gba.

*We recommended verifying your Gameboy/Gameboy Advance ROMs and Saves by using emulators such as BGB for Gameboy and VisualBoyAdvance for Gameboy Advance.*

## Backup save from Cartridge to PC

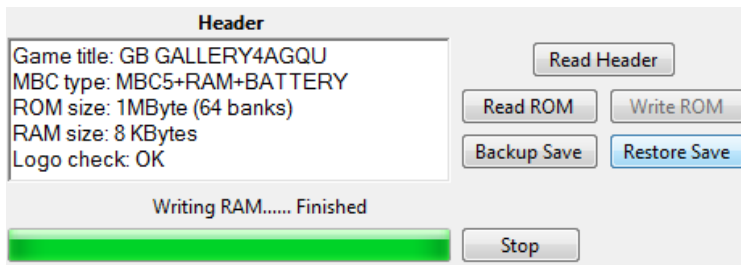


You can download the save game from your cartridge to your PC by pressing the “Save RAM” button, it will be saved as <Gametitle>.sav. If a save file exists on your PC, you will be asked to confirm you wish to overwrite the save file or save the file with the date/time added to it.

If you are backing up a game regularly as you progress through it, it’s best to turn on the Option > “Always add date/time to backed up Save Game files” to Yes. This will add the date/time to your save file so you can have multiple save files on your PC.

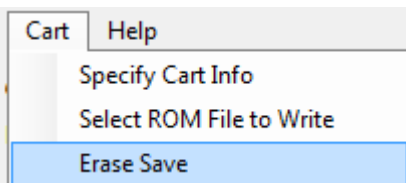
*We recommended verifying your Gameboy/Gameboy Advance ROMs and Saves by using emulators such as BGB for Gameboy and VisualBoyAdvance for Gameboy Advance.*

## Restore save from PC to Cartridge



You can upload the save game from your PC to your cartridge by pressing the “Write RAM” button, it will load the save file <Gametitle>.sav. You will always be asked to confirm you wish to overwrite the save game on the cartridge.

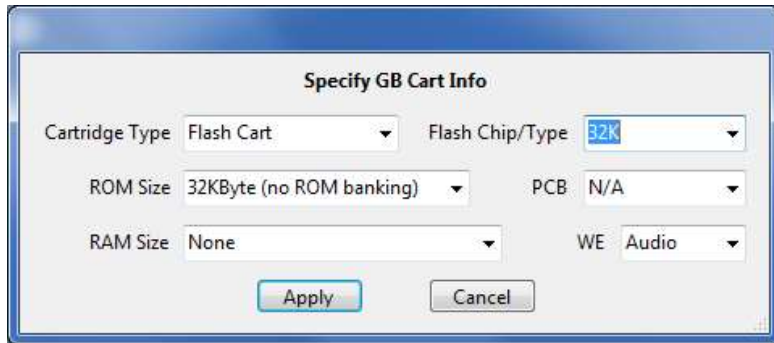
## Erase save from cartridge



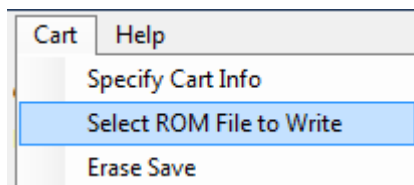
You can erase the save game from the cartridge by pressing the “Cart” menu item and selecting “Erase Save”. You will always be asked to confirm. This is useful if you wish to wipe the cartridge and insert it back to the Gameboy/Gameboy Advance to start a new save.

## Write ROM to Flash cart

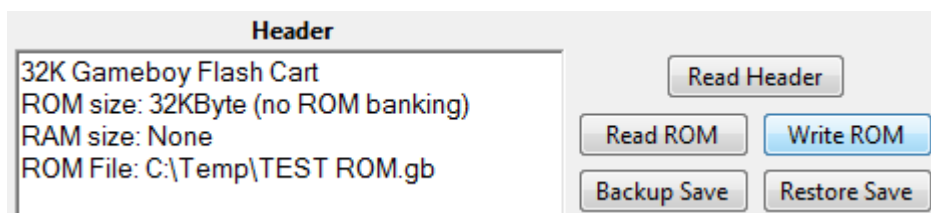
Please check the first page to see supported Flash carts. You don't need to read the header before specifying the cart info.



From the "Cart" menu, select "Specify Cart Info" and then from the Cartridge Type choose Flash Cart. Additional fields will show up allow you to select the Flash Chip/Type, PCB and WE (if applicable).



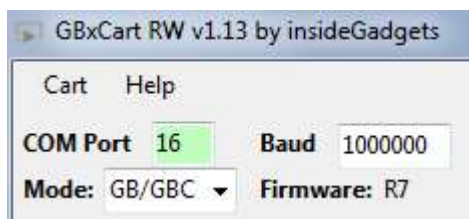
You will need to select the ROM file to write from the "Cart" menu, select "Select ROM File to Write" and then browse to your ROM file.



Now you can press the "Write ROM" button to write the ROM file to the Flash cart.

### Note:

A few Gameboy flash carts may require that you switch the voltage to 3.3V before they will allow you to write to them, you will receive a prompt if that's the case. If you have the v1.3 board, it will automatically switch to 3.3V for you.

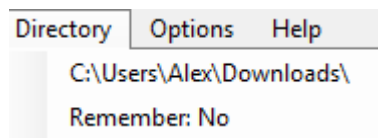


You can do this by unplugging the device, switching to 3.3V, pressing the Open Port button and then changing the Mode from "GBA" to "GB/GBC".



## Change the directory to save to and load from

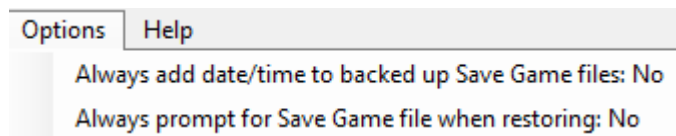
You can change the directory where ROMs are saved to and where save games are saved to and loaded from. This might be useful if you have multiple saves for the same game.



When you click “Directory” in the menu it will advise you the folder where you opened the software from. You can then click the folder listed and it will let you change the folder location.

To always remember the location, make sure “Remember” is set to Yes.

## Options: Add date/time to Save File and Prompt for Save Game file when restoring



The “Always add date/time to backed up Save Game files” option is useful if you are backing up a game regularly as you progress through it. This will add the date/time to your save file so you won’t overwrite your existing save file, for example, F1RACE\_2018.02.25-15.33.12.sav.

The “Always prompt for Save Game file when restoring” option will allow you to choose your save file to restore, this is useful if you use the option above.

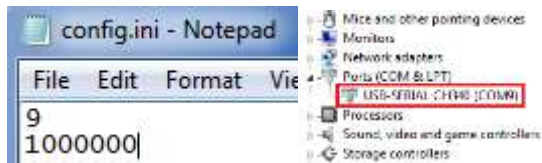


## Console Program

### Setup

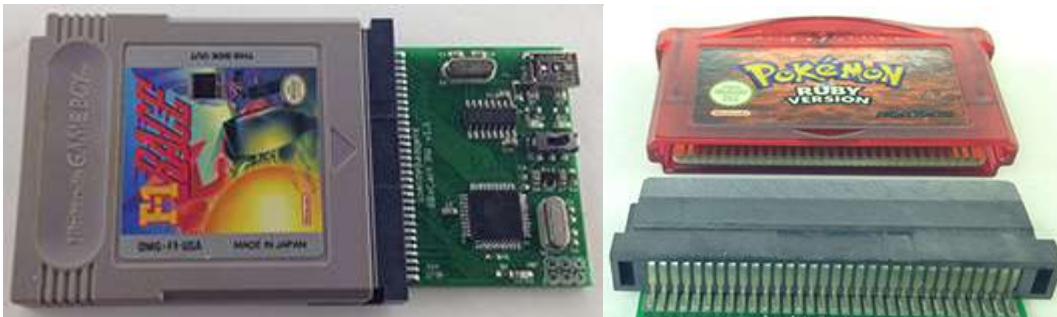
```
GBxCart RW v1.7 by insideGadgets
#####
Please select an option:
0. Read Header
1. Read ROM
2. Backup Save <Cart to PC>
3. Restore Save <PC to Cart>
4. Erase Save from Cart
5. Specify Cart ROM
6. Specify Cart RAM
7. Custom commands
8. Other options
x. Exit
```

1. Open \Interface\_Programs\GBxCart\_RW\_vx.x\_Console\_Interface\GBxCart\_RW\_Console\_vx.x.exe and the options menu should appear.



2. If the device couldn't be automatically detected, open the \Interface\_Programs\GBxCart\_RW\_vx.x\_Console\_Interface\config.ini file and change the first number to your COM port, e.g. 9 = COM9 and change the second number to the baud rate, default is 1Mbit (1000000) which should work fine. Your COM port can be found in device manager.

### Inserting/Removing Cartridges



1. Before inserting the cartridge, select the correct voltage for your cartridge using the switch (GB/GBC use 5V while GBA uses 3.3V). If you have the v1.3 board, this is controlled by software – in the GUI you choose GB or GBA mode and press connect. Connect the USB cable to ensure the correct voltage LED lights up.
2. Unplug the device from your computer. Insert your cartridge to the device (make sure the cartridge sticker is facing up and that you can see the pins on the bottom of the cartridge), connect the device again and click Open Port as before.
3. You can now read the header, read the ROM, etc.
4. When removing cartridges, always unplug the USB cable from the device first before removing the cartridge.

### Reading the Header

```
--- Read Header ---
Game title: GB GALLERY4AGQU
MBC type: MBC5+RAM+BATTERY
ROM size: 1MByte (64 banks)
RAM size: 8 KBytes
Logo check: OK
```

Press “0” and hit enter to read the cartridge information. Make sure that the “Logo check” comes back as OK otherwise the cartridge may not be read correctly and you will have to disconnect the device, remove and re-insert the cartridge.

```
--- Specify ROM size ---
1. 32KByte <no ROM banking>
2. 64KByte <4 banks>
3. 128KByte <8 banks>
4. 256KByte <16 banks>
5. 512KByte <32 banks>
6. 1MByte <64 banks> - only 63 banks used by MBC1
7. 2MByte <128 banks> - only 125 banks used by MBC1
8. 4MByte <256 banks>
9. 8MByte <512 banks>
x. Return

--- Specify RAM size ---
1. None
2. 2 KBytes
3. 8 Kbytes
4. 32 KBytes <4 banks of 8KBytes each>
5. 128 KBytes <16 banks of 8KBytes each>
6. 64 KBytes <8 banks of 8KBytes each>
7. 512bytes <nibbles>
x. Return
```

If the cartridge information doesn’t match what you know to be correct, you can press “4” or “5” and hit change the ROM size and RAM size/type.

## Read the ROM

```
--- Dump ROM ---
Dumping ROM to GB GALLERY4AGQU.gb
[ 25% 50% 75% 100% ]
[#####]
Finished
```

You can press “1” and hit enter to button to download the ROM from the cartridge to your PC, it will be saved as <Gametitle>.gb or <Gametitle>.gba.

*We recommended verifying your Gameboy/Gameboy Advance ROMs and Saves by using emulators such as BGB for Gameboy and VisualBoyAdvance for Gameboy Advance.*

## Backup save from Cartridge to PC

```
--- Save RAM to PC---
Saving RAM to GB GALLERY4AGQU.sav
[ 25% 50% 75% 100% ]
[#####]
Finished
```

You can download the save game from your cartridge to your PC by pressing “2” and hit enter, it will be saved as <Gametitle>.sav. If a save file exists on your PC, you will be asked to confirm you wish to overwrite the save file.

## Restore save from PC to Cartridge

```
--- Write RAM to GB Cart ---
Going to write to RAM from GB GALLERY4AGQU.sav...

*** This will erase the save game from your Gameboy Cartridge ***
Press y to continue or any other key to abort.
y

Writing to RAM from GB GALLERY4AGQU.sav
[ 25% 50% 75% 100% ]
[#####]
Finished
```

You can upload the save game from your PC to your cartridge by pressing “3” and hit enter, it will load the save file <Gametitle>.sav. You will always be asked to confirm you wish to overwrite the save game on the cartridge.

## Erase save from cartridge

```
--- Erase save from Cart ---
*** This will erase the save game from your Gameboy/Gameboy Advance Cart ***
Press y to continue or any other key to abort.
y
Testing for SRAM or Flash presence... SRAM found

Erasing save from Cart
[ 25% 50% 75% 100% ]
[#####]
Finished
```

You can erase the save game from the cartridge by pressing “4” and hit enter. You will always be asked to confirm. This is useful if you wish to wipe the cartridge and insert it back to the Gameboy/Gameboy Advance to start a new save.

### Sachen ROM Mapper support

You can use the “Other options” in console program to select ROMs to dump within a Sachen cart; the ROMs will be dumped into their own file. You will be required to input the ROM starting address in hex and the number of banks.

```
--- Other options ---
1. Sachen ROM mapper
x. Exit
>1

--- Sachen ROM mapper ---
Used for mapping ROMs to 0x00 and decoding the Sachen header.
Type x to exit

Enter the ROM start location in Hex: 0x8000

Select the ROM size
1. 32KByte <no ROM banking>
2. 64KByte <4 banks>
3. 128KByte <8 banks>
4. 256KByte <16 banks>
5. 512KByte <32 banks>
>1

Selecting ROM Base 0x02 at Address: 0x08000, Size: 32KByte, ROM Mask 0xFE
Done

--- Dump ROM ---
Dumping ROM to Sachen_0x8000.ghb
[ 25% 50% 75% 100% ]
[#####]
Finished
```

For more information please check [https://wiki.tauwasser.eu/view/Sachen\\_Mappers](https://wiki.tauwasser.eu/view/Sachen_Mappers) and <https://board.byuu.org/viewtopic.php?f=16&t=1557>

### GBA Flash Cart ROM Mapper support

You can use the “Other options” in console program to select ROMs to dump within a GBA Flash Cart similar to the “24-in-1” carts; the ROMs will be dumped into their own file named “FC\_<Gametitle>.gba” after you select Address 2 and Address 3/4. Some ROMs may not work properly in emulators.

```
--- GBA Flash cart ROM mapper ---
Used for mapping ROMs to 0x00 on GBA flash carts like "24 in 1" ones.
There are 2 address data bytes to set and ROM size. Most of the time data bytes
are in multiples of 8 (and can be 0 too).
E.g. Address 2 set to 0x30 and Address 3 set to 0x28 gives "Ice Age" game.
Type x to exit

Would you like to autoscan for game titles? <y/n>
>y
Address 2 = 0x0, Address 3 = 0x0, Game title: POKEMON RUBY
Address 2 = 0x0, Address 3 = 0x10, Game title: GBAZELDA
Address 2 = 0x0, Address 3 = 0x20, Game title: GBAZELDA MC
Address 2 = 0x0, Address 3 = 0x40, Game title: POKEMON RUBY
Address 2 = 0x0, Address 3 = 0x50, Game title: GBAZELDA
Address 2 = 0x0, Address 3 = 0x60, Game title: GBAZELDA MC
Address 2 = 0x10, Address 3 = 0x10, Game title: BOF EUR
Address 2 = 0x10, Address 3 = 0x20, Game title: HM MFOM USA
Address 2 = 0x10, Address 3 = 0x50, Game title: BOF EUR
Address 2 = 0x10, Address 3 = 0x60, Game title: HM MFOM USA
Address 2 = 0x20, Address 3 = 0x0, Game title: RAREDKC1
```

Once entering the menu, it will prompt you if you wish to automatically scan the addresses for Game Titles.

```
Enter Address 2 byte in Hex: 0x50
Enter Address 3 byte in Hex: 0x20
Game title: ERAGON

Enter the ROM size in Mbytes to dump <or any key to cancel>
>16

Dumping ROM to FC ERAGON.gba
[          25%          50%          75%          100% ]
[#####]
```

You will be required to input the Address 2 and Address 3/4 in hex and enter the ROM size you wish to dump.

## Raw I/O Access

If you wish to read/write to a special cartridge which the regular functions don't support, you can access the raw I/O of the ATmega8515L on board with the following COM commands. Commands should be sent as characters, a null terminator byte (0) is used to determine the end of some strings sent. No responses will be returned except for reading a PORT.

### Enable/Disable common lines RD/WR/MREQ-CS/Reset-CS2 set high after each command

(recommended to disable so you drive these lines yourself)

To enable: M1            To disable: M0

### Set pins as inputs/output

To set PB7 as an input: IB0x80 (include a null-terminator byte at the end)

The value set will be applied as `DDR &= ~(setValue);`

To set PB7 as an output: OB0x80 (include a null-terminator byte at the end)

The value set will be applied as `DDR |= (setValue);`

### Set output low

To set PB7 low: LB0x80 (include a null-terminator byte at the end)

The value set will be applied as `PORTB &= ~(setValue);`

### Set output high

To set PB7 high: HB0x80 (include a null-terminator byte at the end)

The value set will be applied as `PORTB |= (setValue);`

### Read all pins of a PORT

Returns a byte representing all pins of that port, e.g. 128

To read PORTB: DB

### Port mappings to Gameboy Slot pins (for PCB v1.1/v1.2)

PB0 = A0 PB1 = A1 PB2 = A2 PB3 = A3 PB4 = A4 PB5 = A5 PB6 = A6 PB7 = A7  PD6 = *WR PD5 = *RD	PA0 = A8 PA1 = A9 PA2 = A10 PA3 = A11 PA4 = A12 PA5 = A13 PA6 = A14 PA7 = A15  PD4 = *MREQ/CS PE2 = *RESET/CS2	PC0 = D0/A16 PC1 = D1/A17 PC2 = D2/A18 PC3 = D3/A19 PC4 = D4/A20 PC5 = D5/A21 PC6 = D6/A22 PC7 = D7/A23  PE1 = Audio In
--	--	--

```
--- Custom Commands ---  
Enter the custom command from the list:  
Type x to exit  
  
>DB  
Read: 0x00
```

You can use “Custom commands” the console program to input these commands into by selecting option 6 (it will automatically add null terminator bytes when needed).

## Dedicated Console Programs

---

### Gameboy Camera Saver

This program is useful if you are constantly using the Gameboy Camera and wish to save the images quickly to BMP files. Found in the \Interface\_Programs\GBxCart\_RW\_GBCamera\_Saver\_vx.x folder.

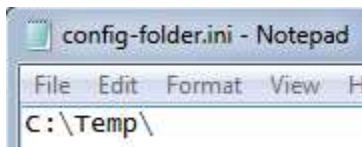
```
$ gbxcart_rw_gbcamera_saver_v1.0.exe
GBxCart RW - GB Camera Saver v1.0 by insideGadgets
#####

Game title: GAMEBOYCAMERA
MBC type: Gameboy Camera
ROM size: 1MByte (64 banks)
RAM size: 128 KBytes (16 banks of 8Kbytes)
Logo check: OK

Saving RAM to 2017-07-10_18-44-26\GBCAMERA.sav
[          25%          50%          75%          100% ]
[#####]

Extracting images from .sav file and converting to BMP images
Finished
```

Automatically creates a folder with the current date/time (<year>-<month>-<date>\_<hour>-<minute>-<second>), saves the GB camera memory to this folder and extracts the active (non-deleted) images from the save to separate BMP files labelled 1.bmp to 30.bmp. It's a good idea to check the images created match the images stored on the GB Camera.



If you wish to change where the folder is created, you can create a config-folder.ini file and enter in the directory where you wish the folder should be created in.

### Console Flasher

This program is useful if you would like drag and drop interface to write ROMs to your flash carts. Please check the list of supported flash carts on the first page of this manual.

Found in the \Interface\_Programs\GBxCart\_RW\_Console\_Flasher\_vx.x folder.

```
GBxCart RW Flasher v1.10 by insideGadgets
#####

Please select a Flash Cart:
--- Gameboy ---
1. 32 KByte
2. 2 MByte (BU5)
3. 1 MByte (ES29LU160)
4. 2 MByte (AM29LU160DB / 29LU160CTTC)
5. 2 MByte (AM29F016B)

--- Gameboy Advance ---
6. 16 MByte (MSP55LU128 / 29LU128DTMC)
7. 16 MByte (MSP55LU128M / 29GL128EHMC / 256M29EWH)
8. 16 MByte M36L0R706 / 32 MByte 256L30B

x. Exit
>
```

Open the program first and select the Flash Cart you will be writing the ROM to.

```
GBxCart RW Flasher v1.0 by insideGadgets
#####
--- Write ROM to Flash Cart ---
Cart selected: 32K Gameboy Flash Cart

Writing to ROM <Flash cart> from TEST ROM.gb
[          25%          50%          75%          100%]
[#####]
```

Now you can drag and drop your ROM file to gbxcart\_rw\_flasher\_vx.x.exe without having to select the Flash cart type again.



## Update the Firmware

---

### On R3+ devices

If you have Firmware R3 or higher you can use the below steps to update to the latest firmware.

```
GBxCart RW v1.1 PCB - Firmware R4 Update
-----
This will update your v1.1 PCB Hardware Firmware R3 to Firmware R4.
Please enter your COM Port Number: 16
Are you sure you wish to update the Firmware <Y/[N]>?y
GBxCart RW - WDT Reset by insideGadgets
#####
Done
READ USER DATA    ... OK
FLASH WRITE $0F3F ... OK
Press any key to continue . . .
```

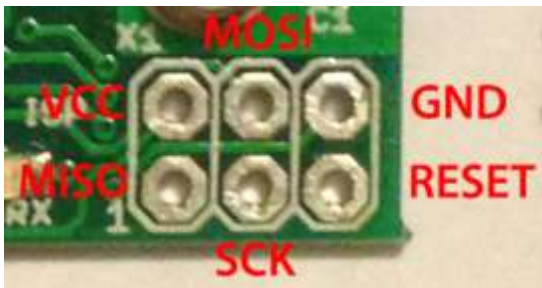
Run the file \Firmware\_Update\Rx\_Firmware.bat which will prompt you for your COM port number and if you wish to continue. After a few seconds you should see “OK” shown twice as above, the new firmware has now been uploaded.

### On R2 or lower devices or Re-program the ATmega using an AVR programmer

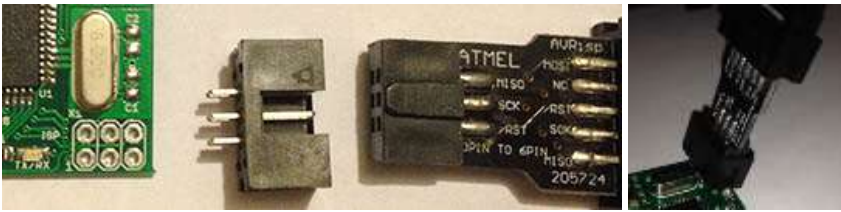


You will require an AVR programmer such as USBTinyISP, USBasp, etc, one that has a 6 pin interface (if the device has a 10 pin interface you can use a 10 pin to 6 pin converter cable). You'll also need to download the Hardware/Firmware zip file from <https://www.insidegadgets.com/projects/gbxcart-rw/>

Make sure that the voltage selected on the AVR programmer matches the 3.3V or 5V that you have selected on the GBxCart RW board.



The PCB has an ISP 6 pin interface where you can solder male headers.



If you don't wish to do any soldering or would rather keep it clean, you can buy a DC3-6P connector, plug it into the AVR programmer then insert it into the pins and hold it at an angle so the pins touch the pads.

You now have 2 options, either program the new firmware release directly or program TinySafeBoot which becomes the boot loader so you can easily program any future updates without the need of an AVR programmer.

### If you wish to program the boot loader and new firmware release

```
Program-Bootloader.bat - Notepad
File Edit Format View Help
@echo OFF
avrdude -p atmega8515 -c usbasp -u lfuse:w:0xaf:m -u hfuse:w:0xda:m
avrdude -p atmega8515 -c usbasp -u flash:w:GBxCart_RW_v1.1_R3\tsb\tsb_m8515_d0d1_20161027.hex
pause
```

Depending on your programmer, you may need to open the /MCU\_Files/Program-Bootloader.bat file to change the programmer to suit, by default its set to "usbasp".

Once you have the programmer pins connected to the board, insert the USB cable for your programmer and then run the /MCU\_Files/Program-Bootloader.bat file which should show it uploading and should return "Avrdude Done".

Please unplug the AVR programmer.

```
TSB-Program.bat - Notepad
File Edit Format View Help
@echo OFF
GBxCart_RW_v1.1_R3\tsb\tsb.exe com16:57600 fw GBxCart_RW_v1.1_R3\main.hex
pause
GBxCart_RW_v1.1_R3\tsb\tsb.exe com16:9600 T 25
pause
```

Open up the /MCU\_Files/ TSB-Program.bat, you will need to change the COM port to suit.

```
READ USER DATA ... OK
FLASH WRITE $0E3F ... OK
Press any key to continue . . .
```

Plug in the USB cable to the GBxCart RW board. Run /MCU\_Files/TSB-Program.bat and you should see the above result. You should also see the LEDs on the board light up.

```
... Press any key to continue ...  
READ USER DATA    ... OK  
WRITE USER DATA   ... OK  
VERIFY USER DATA  ... OK  
  
TINY SAFE BOOTLOADER  
VERSION   : 20161027  
STATUS    : F0  
SIGNATURE : 1E 93 06  
DEVICE    : ATmega8515  
FLASH     : 8192  
APPFLASH  : 7616  
PAGESIZE  : 64  
EEPROM    : 512  
APPJUMP   : 0000  
TIMEOUT   : 25  
  
Press any key to continue . . .
```

Unplug and reconnect the USB cable then press a key and you should see the above result.

The boot loader and new firmware have now been uploaded.

### **If you wish to program the new firmware release directly without a boot loader**

Depending on your programmer, you may need to open the /MCU\_Files/Program.bat file to change the programmer to suit, by default its set to "usbasp".

Once you have the programmer pins connected to the board, insert the USB cable for your programmer and then run the /MCU\_Files/Program.bat file which should show it uploading and should return "Avrdude Done".

## Flash Cart Support

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### Supported Gameboy Flash Cart PCB Pictures

For a larger view of the boards, please check out: <https://www.insidegadgets.com/gbxcart-rw-flash-cart-support/>

#### Catskull / DIY Carts - AM29F010B, SST39SF010A, AT49F040 – 32KByte

Audio pin or WR pin as WE.



#### AM29LV160DB – 2MByte

Requires 3.3V to erase/program. PCB Text: LJ3843-2



#### SST39SF040 - 512KByte

Audio pin as WE.



#### 29LV160CTTC – 2MByte

Requires 3.3V to erase/program.



*[Image courtesy of Stephan G.]*

### ES29LV160 - 1MByte

Requires 3.3V to erase/program.

PCB Text: 0883\_DRV



Originally purchased as Tetris DX.

PCB Text: 16BIT\_0883\_32M



*[Image courtesy of Brian N.]*

### M29W640 – 4MByte

Requires 3.3V to erase/program. If you install a CR2032 coin cell battery, the battery will only last about 1 year as the cart consumes about 19uA for its data retention. .

Originally purchased as a “Shantae”.

PCB Text: SD007\_48BALL\_64M



### AM29F016B - 2MByte



### 256M29 - 32 MByte (4x 8MB Banks)

Requires 3.3V to erase/program. You need remove the solder bridge on the top left to the one a little bit lower. If using a Multi-game loader, you need to power cycle GBxCart RW when writing to a different 8MB Bank. Originally purchased as a "22 in 1" Pokemon cart (yellow cartridge).

PCB Text: SD008-6810-V3





## Supported Gameboy Advance Flash Cart PCB Pictures

For a larger view of the boards, please check out: <https://www.insidegadgets.com/gbxcart-rw-flash-cart-support/>

### MSP55LV128 – 16MByte

PCB Text: AGB-E05-01



### 29LV128DTMC – 16MByte

PCB Text: AGB-E08-09



### MSP55LV128M – 16MByte

PCB Text: AGB-E05-01



*[Image courtesy of Jonas S]*

### 256M29EWH – 32MByte

PCB Text: PC28F256M29EW / AGB-E05-01



*[Image courtesy of Jonas S]*

### 29GL128EHMC – 16MByte

PCB Text: AGB-E08-09



*[Image courtesy of Jonas S]*

### M36L0R706 – 16MByte

PCB Text: 36LOR-DRV / AGB-E05-01



### 256L30B – 32MByte

Use 256L30B (2) if the first option doesn't write to your cart. It seems there is a little issue which prohibits writing to certain variants of this cart. Originally purchased as a "150 Games, NES Classic" transparent red cart.

PCB Text: 28F256L03B-DRV





# Software Revision History

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## GUI Interface

v1.24 – 28 January 2019

- Fixed bug where the flash ID wasn't read properly the first time when reading GBA carts *[Thanks to Scott K. for testing]*
- Added timeout checking and recovery to all reading functions *[Thanks to Conor R. for reporting/testing]*
- Adjusted EEPROM detection as some GBA carts were being detected as having an EEPROM when they didn't *[Thanks to Nevin V. for reporting/testing]*

v1.23 – 4 December 2018

- Added support for 4 MByte (MX29LV320) Gameboy Advance Flash Cart
- Added MBC type selection to GB Cart Info section
- Changed GB / GBA mode drop down box to radio buttons
- Added support for v1.3 PCB & GBxCart Mini RW v1.0

v1.22 – 5 October 2018

- Added support for M29W640 – 4MByte Gameboy Flash Cart and provided another method “(2)” for flashing M36L0R706 & 256L30B Gameboy Advance Flash Carts

v1.21 – 13 September 2018

- Added support for SST39SF040 - 512KB & 256M29 - 32MB (4x 8MB Banks) Gameboy Flash Carts *[Thanks to David D. for the loan cart & Bart C. for testing]*
- Added progress bar in the task bar (for Windows 7+) *[Thanks to Jonas S for the suggestion]*
- Added a taskbar pop-up to alert you when the functions such as reading the ROM, writing the ROM, etc is completed and if the progress bar hasn't moved for 1 minute, if the software is minimized. *[Thanks to Jonas S for the suggestion]*
- Added support for reading 8MB Gameboy Carts

v1.20 – 2 August 2018

- Fixed bug when a colon “:” was in the Game title, reading the ROM/RAM wouldn't write anything to the PC. *[Thanks to Casey F. for reporting]*

v1.19 – 14 July 2018

- Fix bug when backing up saves with automatic date/time set then unset, sometimes it continue to be set and when prompting to restore save files, it wouldn't work if the base save wasn't present.
- Small bug fix for M36L0R706 & 256L30B Gameboy Advance Flash Carts
- Fixed bug when checking for EEPROM on Intel based GBA Flash Carts, it wouldn't allow the end 2MB to be read. Now we check if an Intel chip is present and skip the EEPROM check if so

v1.18 – 19 June 2018

- Speed up writing to Gameboy / Gameboy Advance Flash carts
- Slightly speed up reading Gameboy Advance ROMs

- Added support for M36L0R706 (36LOR-DRV) & 256L30B (28F256L0RB-DRV) – 16MB/32MB Gameboy Advance Flash Carts *[Thanks to Sanni's Cartreader project and Chris K. for loaning me a cart]*
- Added checkbox option to not erase a flash chip before writing to it. Useful if you have a DIY Gameboy Multi-cart with an MCU controlling the ROM chip address lines or using DIP switches *[Thanks to Jonas S for the suggestion/testing]*

#### v1.17 – 30 March 2018

- Added auto detecting of COM port if the COM port from the configuration file doesn't respond correctly
- Added support for AM29F016B – 2MB Gameboy Flash Carts *[Thanks to Davide I. for reporting/testing]*

#### v1.16 – 19 March 2018

- Added a more thorough check for GBA SRAM/Flash saves
- Added support for SST39SF010A & AT49F040 – 32K Gameboy Flash Carts (Firmware update R9 required) *[Thanks to Jonas S. & Wes for reporting/testing]*

#### v1.15 – 28 February 2018

- Added option to remember the specified folder where everything should save to and load from if you changed it
- Added the option to add date/time to your save game file name when backing it up and also an option to prompt for the save game file to restore (useful if you are backing up your progress when playing a game)

#### v1.14 – 15 February 2018

- Fixed issue where some Gameboy Advance games with Flash saves weren't restoring save games properly *[Thanks to Patrick R. for reporting and testing]*
- Added support for 29LV128DTMC (16MByte) & 256M29EWH (32MByte) Gameboy Advance Flash Carts *[Thanks to Jonas S. for testing]*
- Added support for AM29LV160DB & 29LV160CTTC – 2MByte Gameboy Flash Carts (Firmware update R8 required) *[Thanks to Stephan G. for testing]*
- Added support for specifying a folder where everything should save to and load from *[Thanks to Bart C. for the suggestion]*

#### v1.13 – 17 January 2018

- Added support for 32K Gameboy Carts that use WR pin instead of the Audio pin *[Thanks to Jonas S. for the suggestion and testing]*
- Added support for Gameboy ES29LV160 - 1MByte Flash Cart

#### v1.12 – 26 December 2017

- Added support for GBA (MSP55LV128M / 29GL128EHMC) 16MByte Flash Carts *[Thanks to Jonas S. for reporting and testing]*

#### v1.11 – 5 December 2017

- Added support for 16MByte MSP55LV128 Gameboy Advance Flash cart *[Thanks to Sanni's Cartreader project]*

#### v1.10 – 28 November 2017

- Adjusted check for EEPROM to occur before SRAM/Flash check (MCU pins would be floating if no SRAM/Flash was present, can cause false positives)

#### v1.9 – 15 October 2017

- Added support for 2Mbyte BV5 Gameboy Flash Carts (R4 Firmware required)

#### v1.8 – 5 September 2017

- Added erase cart memory option *[Thanks to Jonas S. for the suggestion]*
- Allow “\_” in GB/GBA title
- Fixed bug when selecting 64Kbit EEPROM option in Specify cart info
- Changed text on some buttons

#### v1.7 – 26 August 2017

- Added support for writing ROMs to Gameboy 32K Flash Carts (works with R2+, faster with R3+)
- Updated check of SRAM/Flash, re-read the first 64 bytes twice (if the cart has an EEPROM, sometimes data lines can come back with random data in the first 64 bytes read).
- Changed GUI text font, added “Manual” and “Check for updates” options

#### v1.6 – 17 August 2017

- Added better checks for 512Kbit or 1Mbit Flash
- Added a check for flash sector erases that may take longer than the usual 25ms, waits until byte 0x00 of the sector reads 0xFF. *[Thanks to EGJ for reporting the issue and assisting in troubleshooting]*

#### v1.5 – 13 August 2017

- Fixed bug when writing to a GBA 1Mbit Flash save, wasn’t ending the write before switching banks
- Fixed bug where some GBA cartridges would be stuck in Flash ID mode and would keep repeating some bytes over and over again when backing up the save to the PC. We now exit Flash ID mode another way.  
*[Thanks to Black Phoenix for bringing both of the above issues up and for the vast amount of time spent troubleshooting it]*

#### v1.4 – 24 June 2017

- Added check to see if device is still connected before “Read Header”, “Read ROM”, etc buttons are pressed
- Added the current mode (GBA or GB/GBC) and firmware version once connected

#### v1.3 – 8 May 2017

- Added alternative method (very slow) to read Gameboy Camera if you aren’t able to re-program the firmware to R2
- Added additional check for carts with EEPROM that seemed to allow 4Kbit or 64Kbit reads without any issues
- Added special check for “Chu-Chu Rocket!” SRAM size
- Added support for “.” in GBA game title
- Fixed bug when reading EEPROM with GBA 32MB carts (firmware update R2 required)

#### v1.2 – 4 May 2017

- Fixed a bug when opening/closing COM port that would cause the program to lock up
- Fixed a bug that wouldn’t open the “Specify Cart Info” menu when a GBA cart was inserted
- Updated ROM size check from 16MB to 32MB

- Update the check for GBA SRAM/Flash between 256k/512k to correct some carts been detected as 256k

v1.1 – 4 April 2017

- Updated some text labels

v1.0 – 11 March 2017

- Initial Release

## Console Interface

v1.20 – 28 January 2019

- Fixed bug where the flash ID wasn't been read properly the first time when reading GBA carts [\[Thanks to Scott K. for testing\]](#)
- Added timeout checking and recovery to all reading functions [\[Thanks to Conor R. for reporting/testing\]](#)
- Adjusted EEPROM detection as some GBA carts were being detected as having an EEPROM when they didn't [\[Thanks to Nevin V. for reporting/testing\]](#)

v1.19 – 23 December 2018

- Added another COM port for Apple Mac [\[Thanks to Conor R.\]](#)
- Fixed reading ROM timeouts that were happening on Apple Macs [\[Thanks to Conor R. for testing\]](#)

v1.18 – 4 December 2018

- Advises you which COM port number it's connected on [\[Thanks to Kim R. for the suggestion\]](#)
- Added MBC type selection to GB Cart Info section
- Added support for v1.3 PCB & GBxCart Mini RW v1.0

v1.17 – 5 October 2018

- Added another COM port for Apple Mac [\[Thanks to rebbTRSi\]](#)

v1.16 – 14 September 2018

- Added support for reading 8MB Gameboy Carts

v1.15 – 2 August 2018

- Fixed bug when a colon ":" was in the Game title, reading the ROM/RAM wouldn't write anything to the PC. [\[Thanks to Casey F. for reporting\]](#)
- Fixed up Linux compiling issues after MacOS support was added [\[Thanks to Jan B. for reporting\]](#)

v1.14 – 14 July 2018

- Fixed bug when checking for EEPROM on Intel based GBA Flash Carts, it wouldn't allow the end 2MB to be read. Now we check if an Intel chip is present and skip the EEPROM check if so

v1.13 – 19 June 2018

- Slightly speed up reading Gameboy Advance ROMs
- Added MacOS support (untested) [\[Thanks to grossheij\]](#)

v1.12 – 30 March 2018

- Added auto detecting of COM port if the COM port from the configuration file doesn't respond correctly

#### v1.11 – 19 March 2018

- Added a more thorough check for GBA SRAM/Flash saves
- Added support for SST39SF010A & AT49F040 – 32K Gameboy Flash Carts (Firmware update R9 required)  
*[Thanks to Jonas S. & Wes for reporting/testing]*

#### v1.10 – 15 February 2018

- Fixed issue where some Gameboy Advance games with Flash saves weren't restoring save games properly  
*[Thanks to Patrick R. for reporting and testing]*

#### v1.9 – 28 November 2017

- Adjusted check for EEPROM to occur before SRAM/Flash check (MCU pins would be floating if no SRAM/Flash was present, can cause false positives)

#### v1.8 – 4 November 2017

- Added support for Linux *[Thanks to Michael C]*

#### v1.7 – 5 September 2017

- Added erase cart memory option *[Thanks to Jonas S. for the suggestion]*
- Allow “\_” in GB/GBA title

#### v1.6 – 26 August 2017

- Remove check for EEPROM if SRAM/Flash found
- Updated check of SRAM/Flash, re-read the first 64 bytes twice (if the cart has an EEPROM, sometimes data lines can come back with random data in the first 64 bytes read).

#### v1.5 – 17 August 2017

- Added better checks for 512Kbit or 1Mbit Flash
- Added a check for flash sector erases that may take longer than the usual 25ms, waits until byte 0x00 of the sector reads 0xFF. *[Thanks to EGJ for reporting the issue and assisting in troubleshooting]*

#### v1.4 – 13 August 2017

- Fixed bug when writing to a GBA 1Mbit Flash save, wasn't ending the write before switching banks
- Fixed bug where some GBA cartridges would be stuck in Flash ID mode and would keep repeating some bytes over and over again when backing up the save to the PC. We now exit Flash ID mode another way.  
*[Thanks to Black Phoenix for bringing both of the above issues up and for the vast amount of time spent troubleshooting it]*
- Fixed bug where specify flash type/size was not taking effect
- Updated Sachen ROM mapper to support v1.1 PCB
- Added support for reading ROMs from GBA “24-in-1” Flash Carts (may not work for all flash carts)

#### v1.3 – 8 May 2017

- Added alternative method (very slow) to read Gameboy Camera if you aren't able to re-program the firmware to R2

- Added additional check for EEPROMs which seem to allow 4Kbit or 64Kbit reads without any issues
- Added special check for “Chu-Chu Rocket!” SRAM
- Added support for “.” in game title
- Fixed bug when reading EEPROM with GBA 32MB carts (firmware update R2 required)

#### v1.2 – 4 May 2017

- Updated ROM size check from 16MB to 32MB
- Update the check for GBA SRAM/Flash between 256k/512k to correct some carts been detected as 256k

#### v1.1 – 4 April 2017

- Added custom commands functionality for raw I/O access
- Added Sachen mapper support so you can dump ROMs from the Sachen cart into their own files  
[\[Thanks to Voltagex for bringing this up and helping with troubleshooting\]](#)  
[\[Thanks to Tauwasser for the Sachen information/post explaining how it works\]](#)

#### v1.0 – 11 March 2017

- Initial Release

### **GB Camera Saver**

#### v1.7 – 23 December 2018

- Added another COM port for Apple Mac [\[Thanks to Conor R.\]](#)

#### v1.6 – 4 December 2018

- Advises you which COM port number it’s connected on [\[Thanks to Kim R. for the suggestion\]](#)
- Added a variant to to also include deleted images as well [\[Thanks to Santiago C. for the suggestion\]](#)

#### v1.5 – 5 October 2018

- Added another COM port for Apple Mac [\[Thanks to rebbTRSi\]](#)

#### v1.4 – 2 August 2018

- Fixed up Linux compiling issues after MacOS support was added [\[Thanks to Jan B. for reporting\]](#)

#### v1.3 – 30 March 2018

- Added auto detecting of COM port if the COM port from the configuration file doesn’t respond correctly

#### v1.2 – 15 February 2018

- Added support for specifying a folder to save to in config-folder.ini [\[Thanks to Bart C for the suggestion\]](#)

#### v1.1 – 4 November 2017

- Added support for Linux [\[Thanks to Michael C\]](#)

#### v1.0 – 12 July 2017

- Initial Release

## Console Flasher

v1.15 – 23 December 2018

- Added another COM port for Apple Mac [\[Thanks to Conor R.\]](#)

v1.14 – 4 December 2018

- Advises you which COM port number it's connected on [\[Thanks to Kim R. for the suggestion\]](#)
- Added support for GB 64 MB Mighty Flash Cart and 4 MByte (MX29LV320) Gameboy Advance Flash Cart
- For Windows: Moved config.ini and config-flash.ini file to C:\Users\<username> folder so ROMs can be dragged and dropped from anywhere

v1.13 – 5 October 2018

- Added support for M29W640 – 4MByte Gameboy Flash Cart and provided another method “(2)” for flashing M36L0R706 & 256L30B Gameboy Advance Flash Carts
- Added another COM port for Apple Mac [\[Thanks to rebbTRSi\]](#)

v1.12 – 14 September 2018

- Added support for SST39SF040 - 512KB & 256M29 - 32MB (4x 8MB Banks) Gameboy Flash Carts [\[Thanks to David D. for the loan cart & Bart C. for testing\]](#)

v1.11 – 2 August 2018

- Fixed bug when a colon “:” was in the Game title, reading the ROM/RAM wouldn't write anything to the PC. [\[Thanks to Casey F. for reporting\]](#)
- Fixed up Linux compiling issues after MacOS support was added [\[Thanks to Jan B. for reporting\]](#)

v1.10 – 14 July 2018

- Small bug fix for M36L0R706 & 256L30B Gameboy Advance Flash Carts

v1.9 – 19 June 2018

- Speed up writing to Gameboy / Gameboy Advance Flash carts
- Added support for M36L0R706 (36LOR-DRV) & 256L30B (28F256L0RB-DRV) – 16MB/32MB Gameboy Advance Flash Carts [\[Thanks to Sanni's Cartreader project and Chris K. for loaning me a cart\]](#)
- Added MacOS support (untested) [\[Thanks to grosshei\]](#)

v1.8 – 30 March 2018

- Added auto detecting of COM port if the COM port from the configuration file doesn't respond correctly
- Added support for AM29F016B – 2MB Gameboy Flash Carts [\[Thanks to Davide I. for reporting/testing\]](#)

v1.7 – 19 March 2018

- Added support for SST39SF010A & AT49F040 – 32K Gameboy Flash Carts [\[Thanks to Jonas S. & Wes for reporting/testing\]](#)

v1.6 – 15 February 2018

- Added support for 29LV128DTMC (16MByte) & 256M29EWH (32MByte) Gameboy Advance Flash Carts [\[Thanks to Jonas S. for testing\]](#)



- Added support for AM29LV160DB & 29LV160CTTC – 2MByte Gameboy Flash Carts (Firmware update R8 required) *[Thanks to Stephan G. for testing]*

v1.5 – 17 January 2018

- Added support for 32K Gameboy Carts that use WR pin instead of the Audio pin *[Thanks to Jonas S. for the suggestion and testing]*
- Added support for ES29LV160 - 1MByte Flash Cart

v1.4 – 26 December 2017

- Added support for GBA (MSP55LV128M / 29GL128EHMC) 16MByte Flash Carts *[Thanks to Jonas S. for reporting and testing]*

v1.3 – 5 December 2017

- Added support for 16MByte Gameboy Advance MSPLV128 Flash cart *[Thanks to Sanni's Cartreader project]*

v1.2 – 4 November 2017

- Added support for Linux *[Thanks to Michael C]*

v1.1 – 15 October 2017

- Added support for Gameboy 2Mbyte BV5 Flash Carts

v1.0 – 26 August 2017

- Initial Release - Support for writing ROMs to Gameboy 32K Flash Carts (works with R2+, faster with R3+)

## Hardware/Firmware Revision History

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### PCB v1.1 / v1.2 / v1.3 Firmware

Firmware R12 – 4 December 2018

- Added support for GB 64 MB Mighty Flash Cart and 4 MByte (MX29LV320) Gameboy Advance Flash Cart

Firmware R11 – 14 September 2018

- Added support for SST39SF040 - 512KB & 256M29 - 32MB (4x 8MB Banks) Gameboy Flash Carts *[Thanks to David D. for the loan cart & Bart C. for testing]*
- Set reset pin low for 50ms to reset the cart at startup (for some CPLD carts to initialise properly)

Firmware R10 – 19 June 2018

- Speed up writing to Gameboy / Gameboy Advance Flash carts
- Slightly speed up reading Gameboy Advance ROMs
- Added support for M36L0R706 (36LOR-DRV) & 256L30B (28F256L0RB-DRV) – 16MB/32MB Gameboy Advance Flash Carts *[Thanks to Sanni's Cartreader project and Chris K. for loaning me a cart]*

Firmware R9 – 19 March 2018

- Re-written Gameboy flash cart writing functions
- Added support for SST39SF010A & AT49F040 – 32K Gameboy Flash Carts *[Thanks to Jonas S. & Wes for reporting/testing]*

Firmware R8 – 15 February 2018

- Added support for AM29LV160DB & 29LV160CTTC – 2MByte Gameboy Flash Carts *[Thanks to Stephan G. for testing]*

Firmware R7 – 17 January 2018

- Added support for 32K Gameboy Carts that use WR pin instead of the Audio pin *[Thanks to Jonas S. for the suggestion and testing]*
- Added support for Gameboy ES29LV160 - 1MByte Flash Cart

Firmware R6 – 26 December 2017

- Verifies bytes when programming all flash carts

Firmware R5 – 5 December 2017

- Added support for writing ROMs to 16MByte MSP55LV128 Gameboy Advance Flash cart *[Thanks to Sanni's Cartreader project]*

Firmware R4 – 15 October 2017

- Added support for writing ROMs to Gameboy 2Mbyte BV5 Flash Carts

Firmware R3 – 26 August 2017

- Now using TinySafeBoot bootloader so ATmega MCU can be reprogrammed without the need for a programmer. (If you purchased a board before 23 August 2017, you will require an AVR programmer, please check "Reprogramming the MCU" section in the manual)

- Added support for writing ROMs to Gameboy 32K Flash Carts

#### Firmware R2 – 8 May 2017

- Added extra nop when reading Gameboy Camera SRAM as some of data would change sometimes leading to artifacts on the pictures
- Changed A0-A23 address when preparing to read EEPROM from 0xFFFFF to 0xFFFF00 to support GBA 32MB carts

#### Firmware R1 – 27 April 2017

- Switched from ATmega32A to ATmega8515L, some assigned ports have changed

### PCB v1.0 Firmware

#### (Firmware R2) – 8 May 2017

- Added extra nop when reading Gameboy Camera SRAM as some of data would change sometimes leading to artifacts on the pictures
- Changed A0-A23 address when preparing to read EEPROM from 0xFFFFF to 0xFFFF00 to support GBA 32MB carts

#### (Firmware R1) – 11 March 2017

- Initial Release (Errata - The switch operates in reverse, for example, moving it to the left should select 3.3V but it selects 5V and moving it to the right should select 5V but it selects 3.3V.)

### PCB Hardware

#### v1.3 – 4 December 2018

- Removed switch to select voltage, it's now software controlled.

#### v1.2b – 19 July 2018

- Added 10K pull-up to Reset/CS2 line as some GBA flash cart's SRAM may corrupt a few bytes when the device is plugged/unplugged
- Added 2 extra pads for to hold micro USB port more securely

#### v1.2a – 5 March 2018

- Added "GB" and "GBA" silkscreen to existing "5V" and "3V" text

#### v1.2 – 29 December 2017

- Changed through-hole crystals to SMD crystals
- Changed Mini USB connector to Micro USB connector

#### v1.1 – 27 April 2017

- Changed ATmega169A to ATmega8515L

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