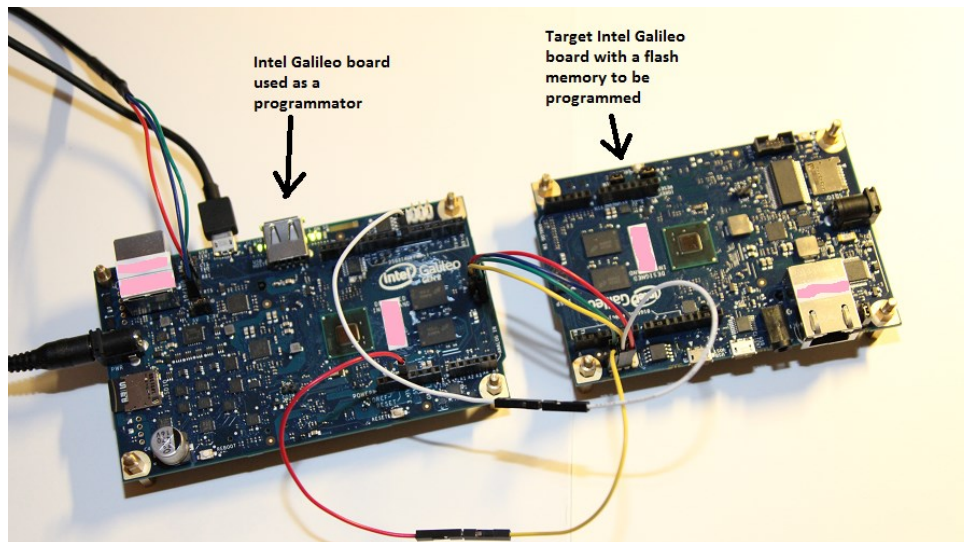


1. GaliProg... What is it? It is a tool (sketch) which allows to read/program/erase/verify SPI flash memory image on Intel® Galileo board. Galiprog may help in a situation when Galileo board is bricked after a failed firmware upgrade.

NOTE: it was tested only in two configurations:

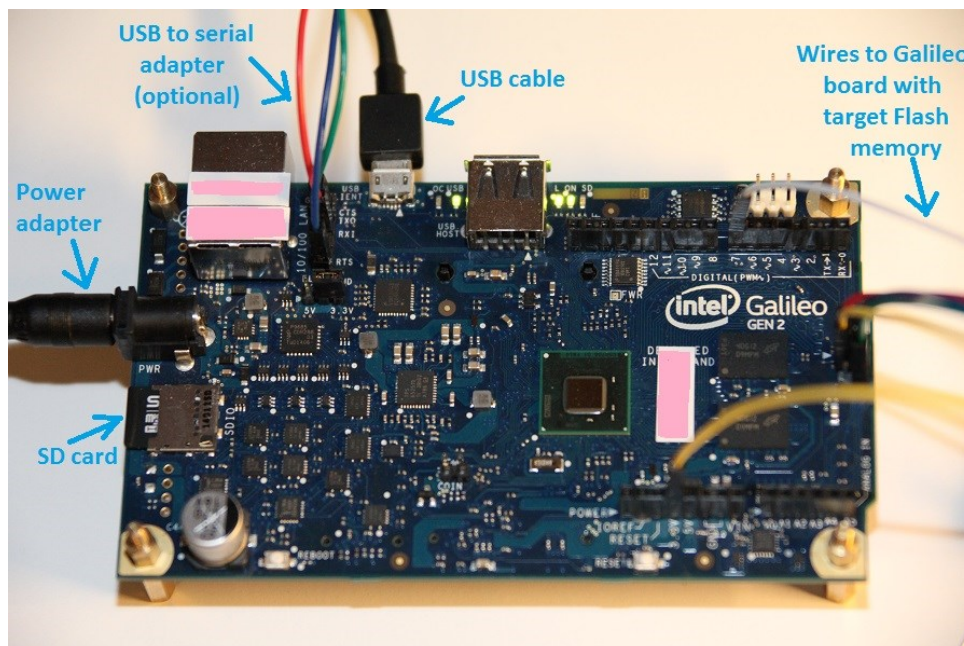
- a) when Galileo Gen 2 used as programmer and Galileo Gen 1 used as target board;
- b) when Galileo Gen 1 used as programmer and Galileo Gen 2 used as target board.



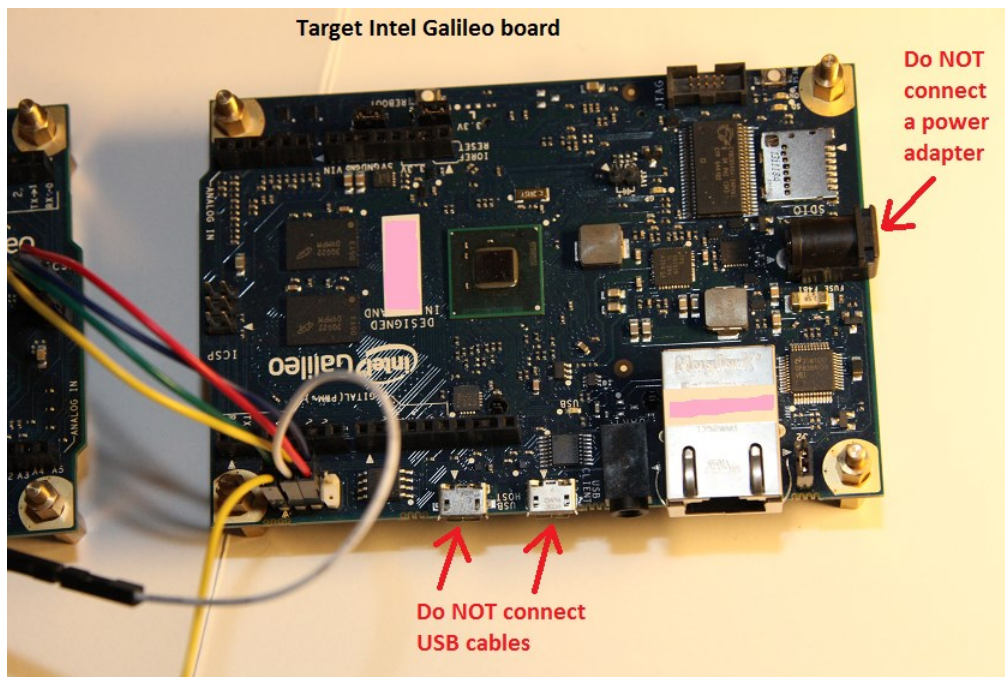
2. Required hardware

Need to have the following items to program SPI flash memory:

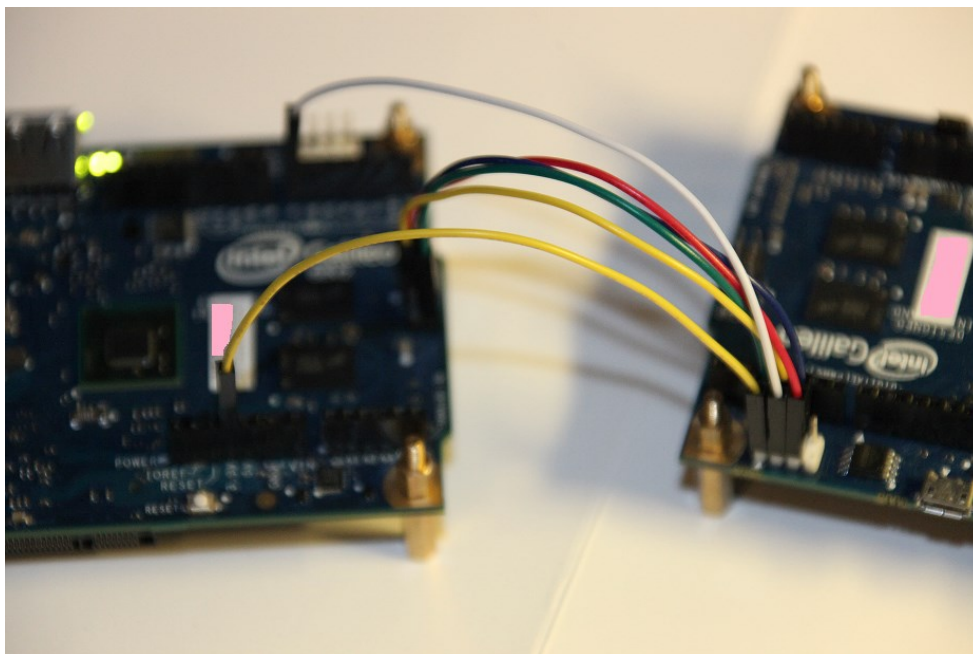
- a) Properly worked Intel Galileo board with USB cable, micro SD card and power adapter. It will be used as used as a programmer.



- b) Galileo board with target Flash memory



- c) wires to connect Galileo boards



- d) PC with installed Intel Arduino Software 1.5.3
- e) Micro SD card reader
- f) Two 10k Ohm resistors (in case when Galileo Gen 1 used as programmator and Galileo Gen 2 used as target board)

3. Required software

a) Intel Arduino Software (IDE) 1.5.3 created for Intel Galileo board

Link to download: <https://communities.intel.com/docs/DOC-22226>

b) SD-Card Linux Image

Link to download: <https://communities.intel.com/docs/DOC-22226>

c) SPI flash image

Select a way to get SPI flash image from described below:

Official way:

1) Flash Missing PDAT Release (.bin file)

Link to download: <https://communities.intel.com/docs/DOC-22226>

2) BSP Patches and Build Instructions

Link to download: <https://communities.intel.com/docs/DOC-22226>

Following the instruction above need to patch .bin file with a required platform configuration. Next need to rename a resulting file 'Flash+PlatformData.bin' to 'galiprog_flash_write.bin'.

Simplified way:

If you do not want to read documentation, compile and patch a firmware, I recommend you to use this way.

1) Galileo SPI Binary Pack 1.0.4

This minimized pack contains all required tools and data to create SPI flash image. It is based on BSP 1.0.4. Need just to enter MAC address and Platform type to create a flash image with name 'galiprog_flash_write.bin'.

See Annex 1 below for license information.

Link to download: <https://github.com/xbolshe/galiprog>

Clone way:

If you have a problem with generation of SPI flash image with your MAC address, it is possible to copy SPI flash image from one board (use same Gen !) and copy it to another board. Need just to rename 'galiprog_flash_dump.bin' to 'galiprog_flash_write.bin'.

d) Galiprog (galiprog.ino)

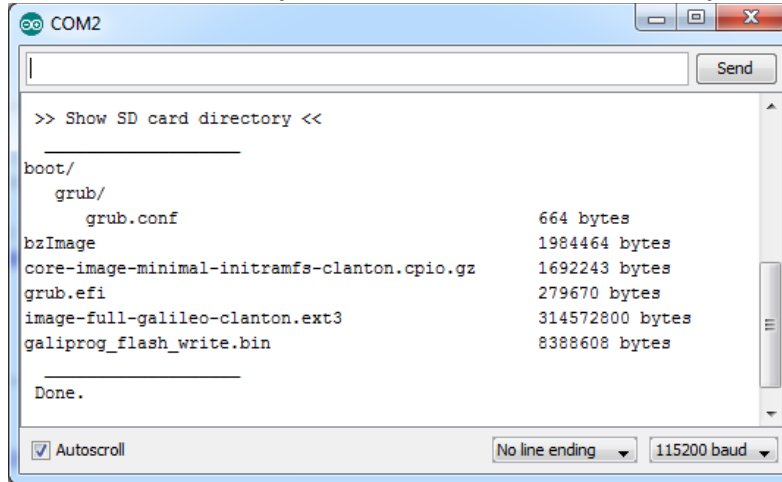
This is a flash programming tool.

Link to download: <https://github.com/xbolshe/galiprog>

4. Prepare a data on SD card

- a) Format SD card
- b) Unpack SD-Card Linux Image to the root of SD card
- c) Copy 'Flash+PlatformData.bin' as 'galiprog_flash_write.bin', if you selected Official way.

Here is a root directory on SD cards in case of 'Official way':



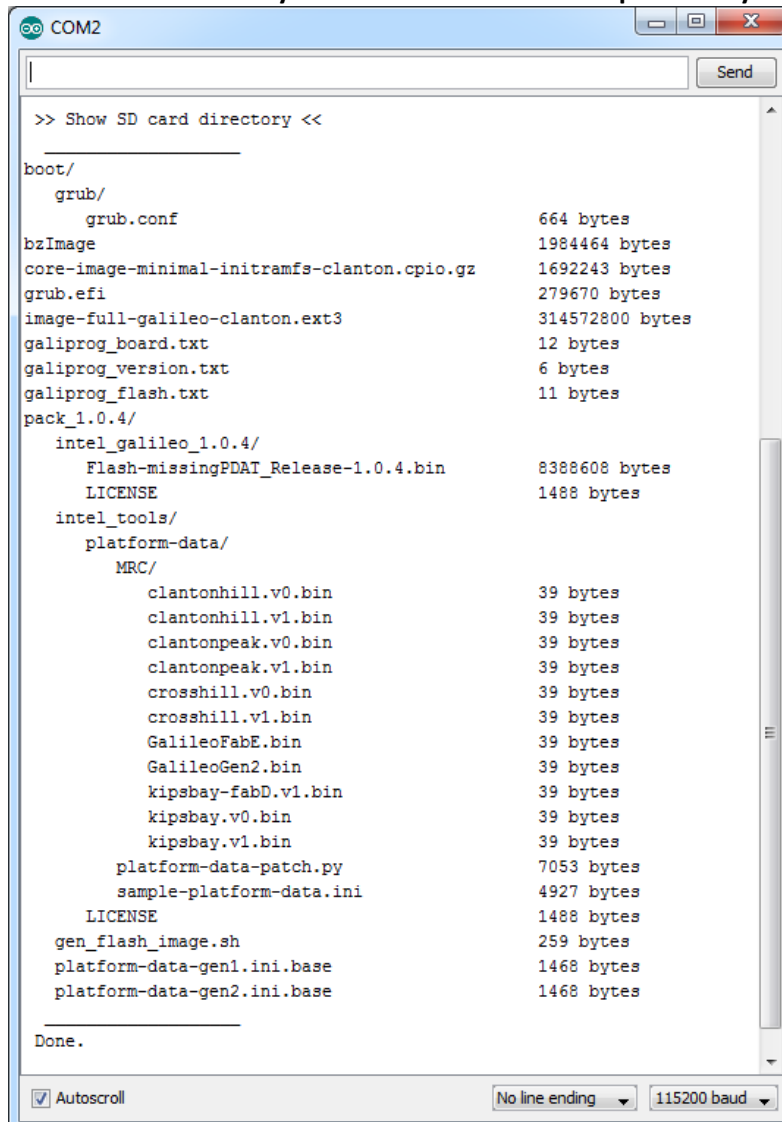
A terminal window titled 'COM2' showing the output of a command to display the SD card directory. The output lists files and their sizes in bytes.

```
>> Show SD card directory <<
boot/
  grub/
    grub.conf          664 bytes
bzImage                1984464 bytes
core-image-minimal-initramfs-clanton.cpio.gz 1692243 bytes
grub.efi               279670 bytes
image-full-galileo-clanton.ext3 314572800 bytes
galiprog_flash_write.bin 8388608 bytes

Done.
```

At the bottom of the window, there are settings: ☒ Autoscroll, No line ending, and 115200 baud.

Here is a root directory on SD cards in case of 'Simplified way':



A terminal window titled 'COM2' showing the output of a command to display the SD card directory. The output lists files and their sizes in bytes, including a detailed directory structure for the 'Simplified way'.

```
>> Show SD card directory <<
boot/
  grub/
    grub.conf          664 bytes
bzImage                1984464 bytes
core-image-minimal-initramfs-clanton.cpio.gz 1692243 bytes
grub.efi               279670 bytes
image-full-galileo-clanton.ext3 314572800 bytes
galiprog_board.txt     12 bytes
galiprog_version.txt   6 bytes
galiprog_flash.txt     11 bytes
pack_1.0.4/
  intel_galileo_1.0.4/
    Flash-missingPDAT_Release-1.0.4.bin 8388608 bytes
    LICENSE                             1488 bytes
  intel_tools/
    platform-data/
      MRC/
        clantonhill.v0.bin 39 bytes
        clantonhill.v1.bin 39 bytes
        clantonpeak.v0.bin 39 bytes
        clantonpeak.v1.bin 39 bytes
        crosshill.v0.bin 39 bytes
        crosshill.v1.bin 39 bytes
        GalileoFabE.bin 39 bytes
        GalileoGen2.bin 39 bytes
        kipsbay-fabD.v1.bin 39 bytes
        kipsbay.v0.bin 39 bytes
        kipsbay.v1.bin 39 bytes
        platform-data-patch.py 7053 bytes
        sample-platform-data.ini 4927 bytes
        LICENSE               1488 bytes
        gen_flash_image.sh 259 bytes
        platform-data-gen1.ini.base 1468 bytes
        platform-data-gen2.ini.base 1468 bytes
Done.
```

At the bottom of the window, there are settings: ☒ Autoscroll, No line ending, and 115200 baud.

5. Connections between Galileo boards and hardware settings

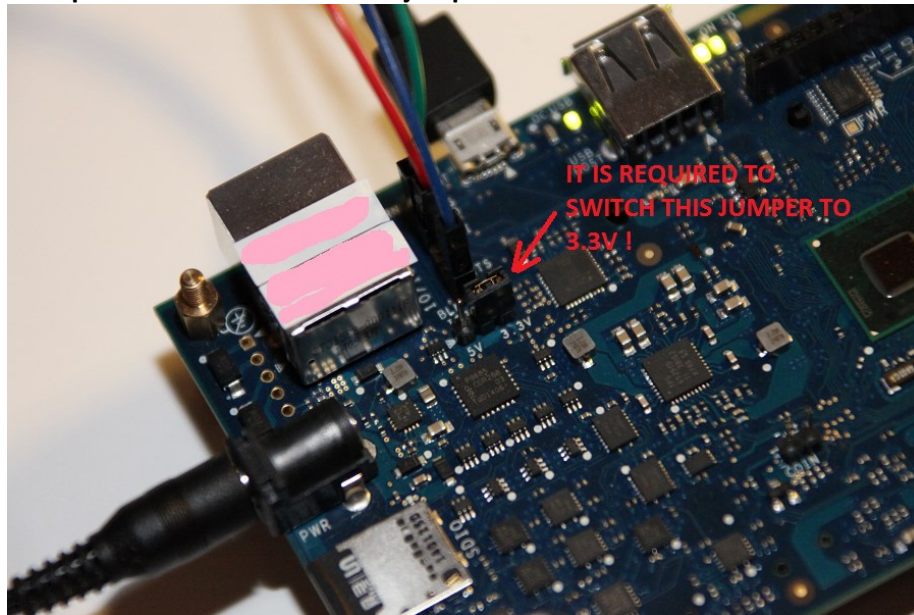
a) Configure Galileo board which works as a programmer

A SPI flash memory works with 3.3V lines. So, it is required to switch Galileo board - programmer to 3.3V.

NOTE: providing 5V may damage your Galileo board! Be careful with connecting boards and selecting a jumper setting.

Need to switch a jumper shown on a picture below to 3.3V option.

On a picture below it is shown a jumper for Galileo Gen2 board.



In case of Galileo Gen1 a jumper is located near with REBOOT button.

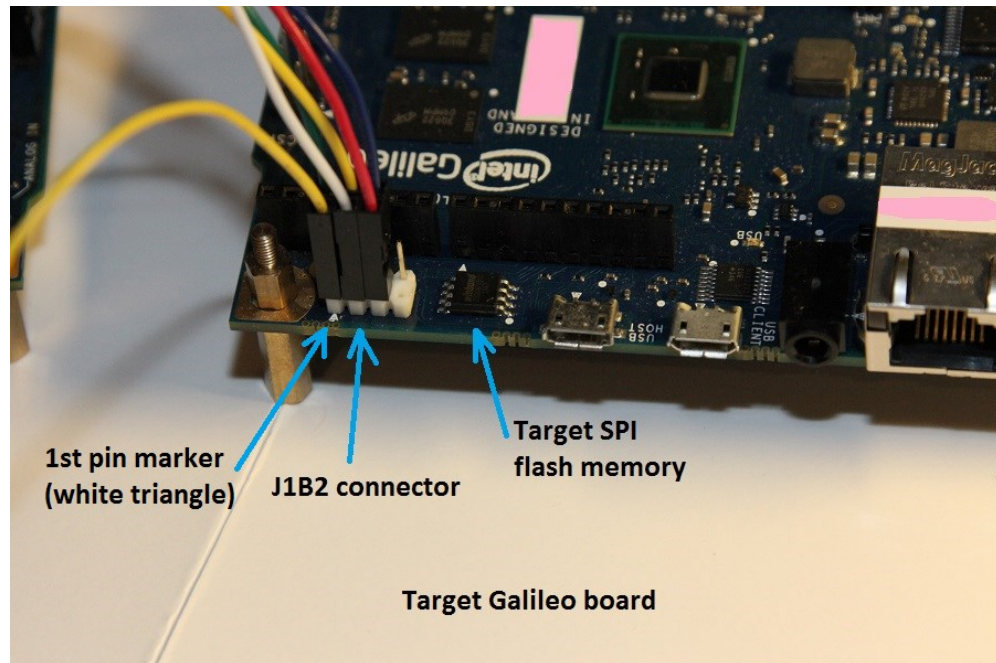
b) Wire connections

Nº	Galileo Gen2 board - programmer	Signal role	Galileo Gen1 board - target
1	3.3V	VCC	J1B2 – pin 1
2	Digital IO7	Slave selection	J1B2 – pin 3
3	ICSP – pin 4	MOSI	J1B2 – pin 6
4	ICSP – pin 1	MISO	J1B2 – pin 5
5	ICSP – pin 3	SCK	J1B2 – pin 4
6	ICSP – pin 6	Ground	J1B2 – pin 2

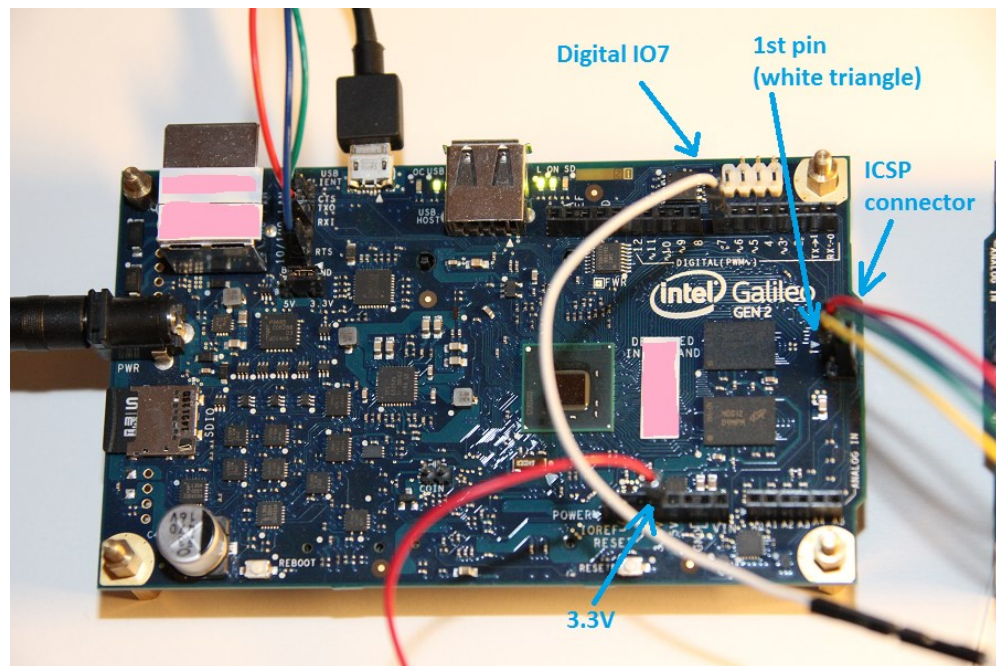
Nº	Galileo Gen1 board - programmer	Signal role	Galileo Gen2 board - target
1	3.3V	VCC	J1B2 – pin 1
2	Digital IO7	Slave selection	J1B2 – pin 3
3	ICSP – pin 4	MOSI, pull-up resistor 10kOhm	J1B2 – pin 6
4	ICSP – pin 1	MISO, pull-up resistor 10kOhm	J1B2 – pin 5

5	Digital IO13	SCK	J1B2 – pin 4
6	ICSP – pin 6	Ground	J1B2 – pin 2

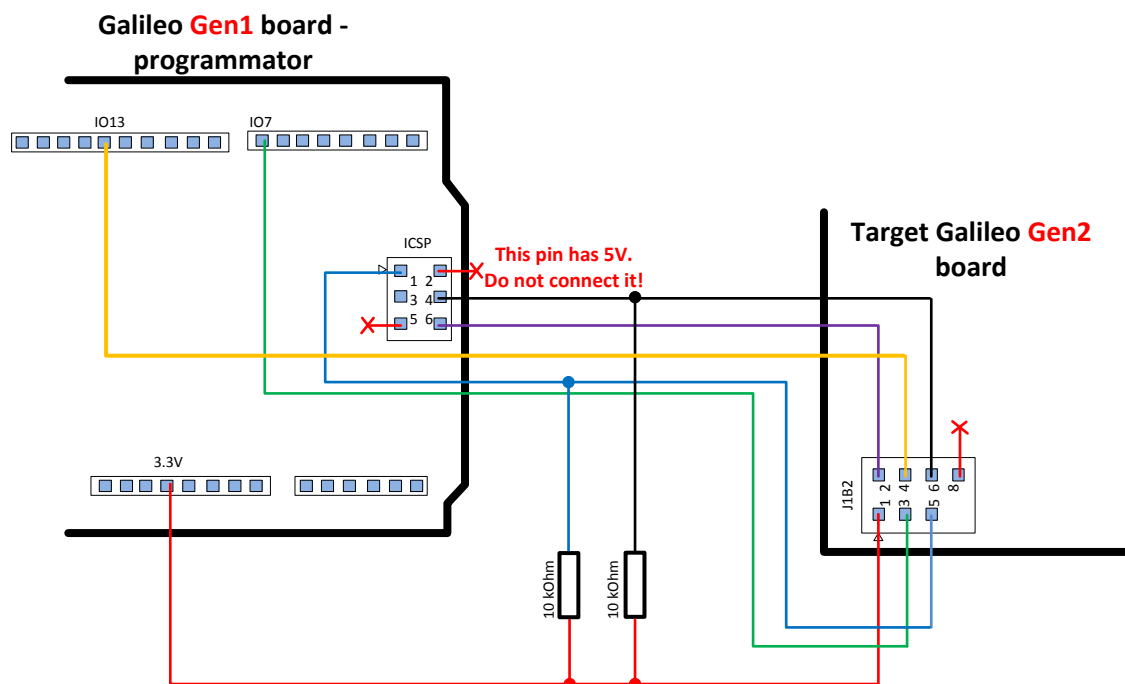
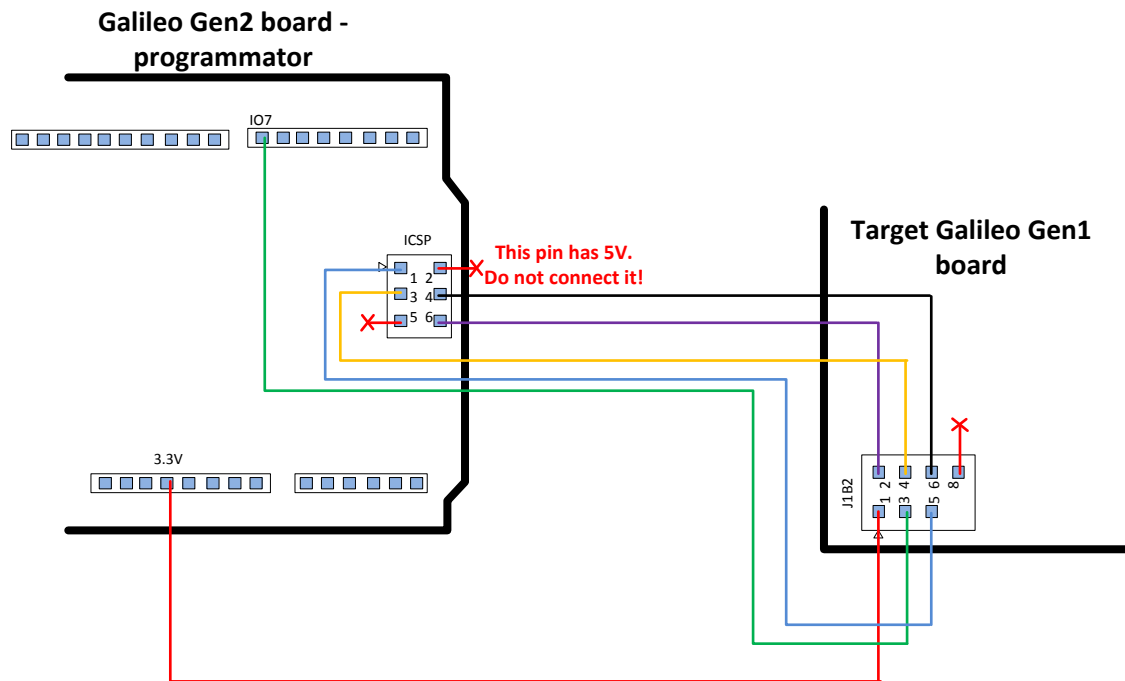
A location of J1B2 connector is shown on a picture below:



A location of ICSP connector is shown on a picture below:

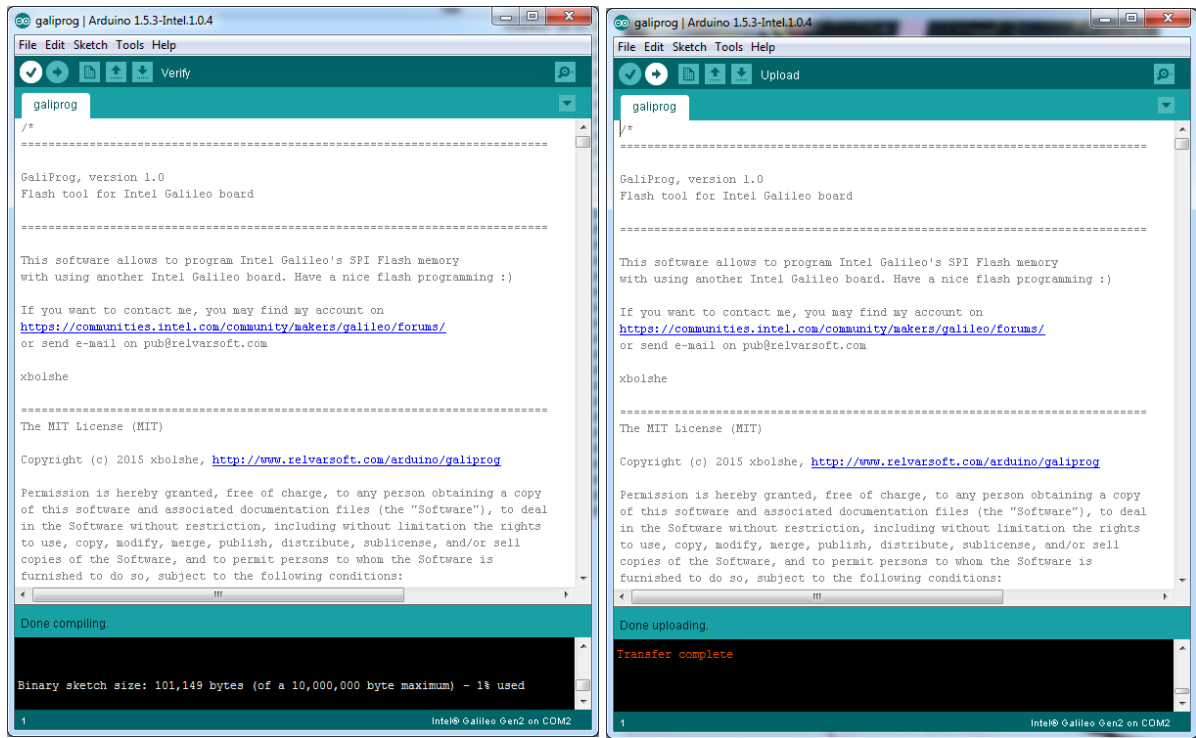


Select a scheme below for your boards.



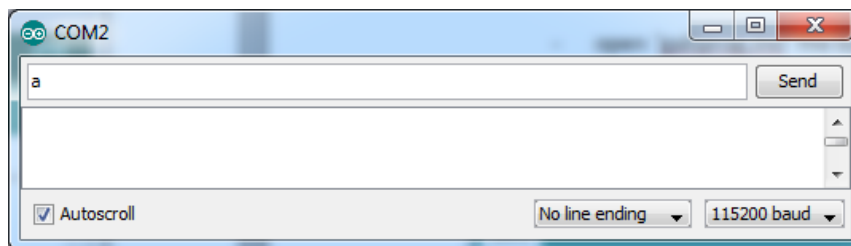
6. Compiling Galiprog sketch

- open 'galiprog.ino' file by Intel Arduino Software (IDE) 1.5.3
- compile it with using 'Verify' button
- upload it to Galileo Board with using 'Upload' button

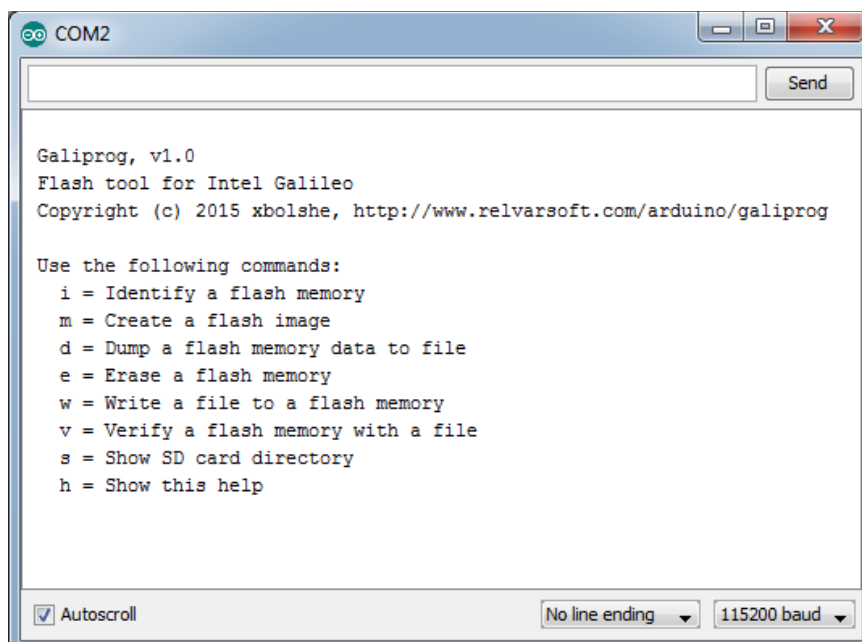


7. Galiprog commands

- when galiprog is uploaded to Galileo board, select Tools -> Serial Monitor
- type any character and push 'Send' button



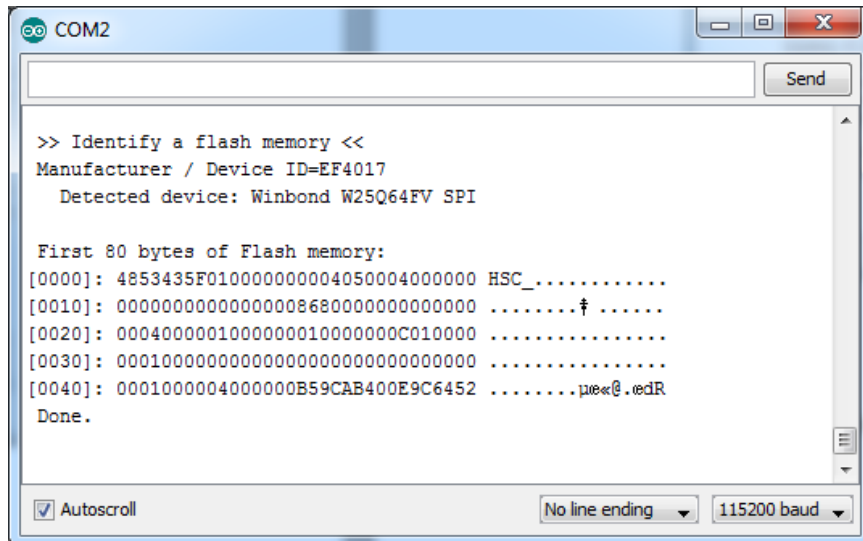
- a command list will be shown



To select menu item type a letter and push 'Send' button.

1. Identify a flash memory

This menu item allows to check that a connection with a target Galileo board is correct. It is recommended to use it before operations.



```
>> Identify a flash memory <<
Manufacturer / Device ID=EF4017
Detected device: Winbond W25Q64FV SPI

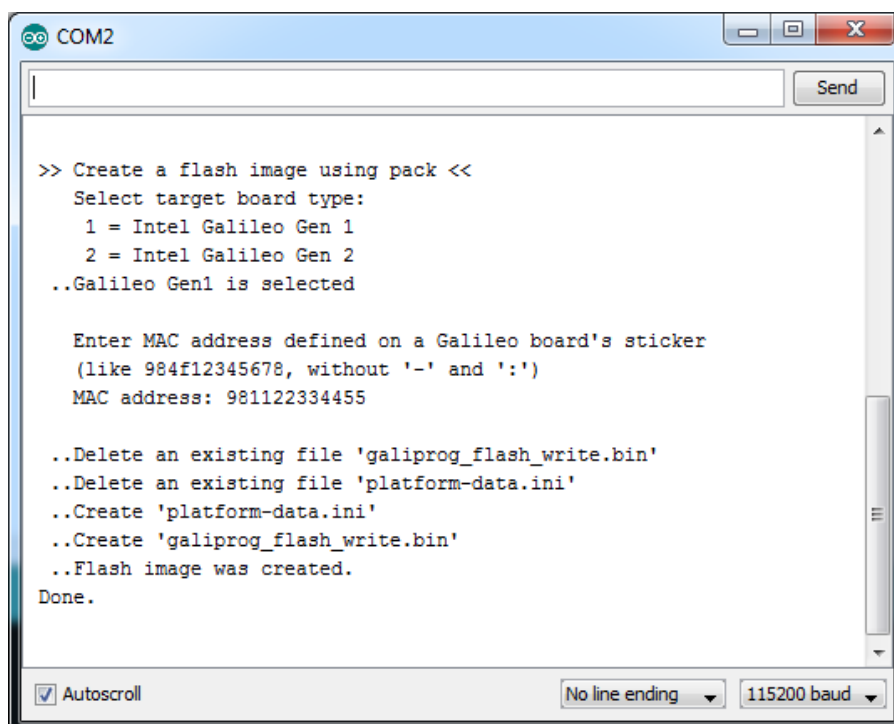
First 80 bytes of Flash memory:
[0000]: 4853435F01000000000040500040000000 HSC_.....
[0010]: 0000000000000000008680000000000000 .....†.....
[0020]: 00040000010000000100000000C010000 .....
[0030]: 000100000000000000000000000000000 .....
[0040]: 0001000004000000B59CAB400E9C6452 .....µe«@.edR
Done.
```

Autoscroll: ☒ No line ending: No line ending 115200 baud

2. Create a flash image

This menu item is available only when 'Simplified way' is used (Pack 1.0.4 is installed on SD card).

Type '1' or '2' and push 'Send' button to select a board type.
Enter MAC address shown on a board sticker and push 'Send'.
A file 'galiprog_flash_write.bin' will be created in the root of SD card.

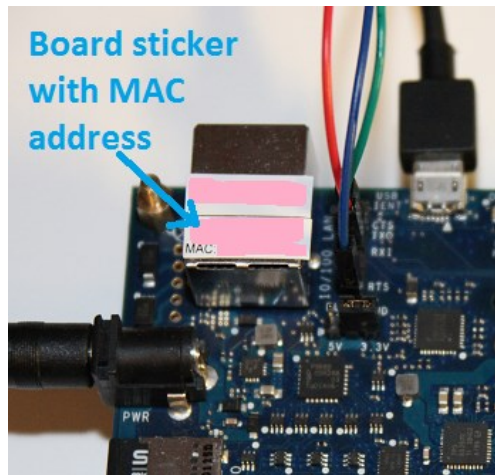


```
>> Create a flash image using pack <<
Select target board type:
  1 = Intel Galileo Gen 1
  2 = Intel Galileo Gen 2
..Galileo Gen1 is selected

Enter MAC address defined on a Galileo board's sticker
(like 984f12345678, without '-' and ':')
MAC address: 981122334455

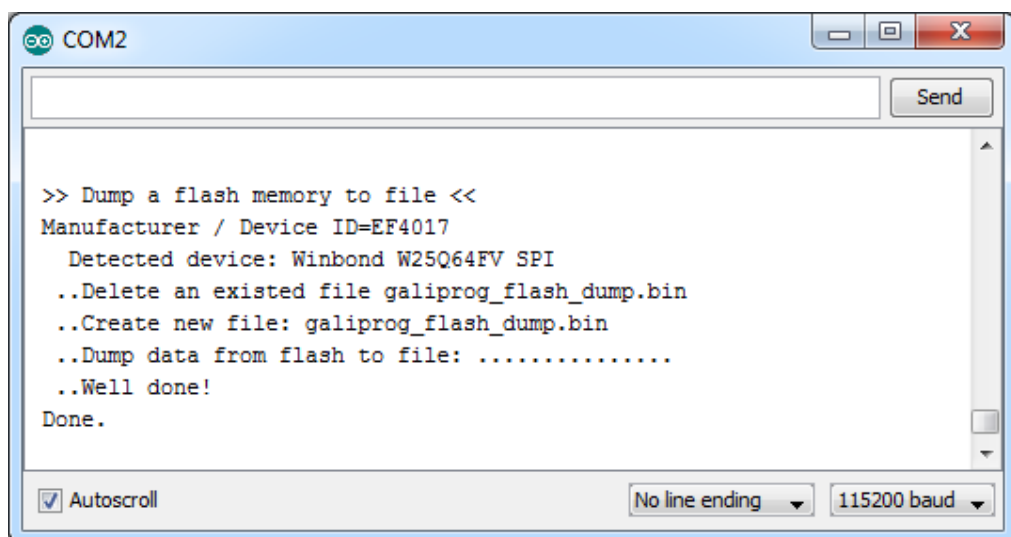
..Delete an existing file 'galiprog_flash_write.bin'
..Delete an existing file 'platform-data.ini'
..Create 'platform-data.ini'
..Create 'galiprog_flash_write.bin'
..Flash image was created.
Done.
```

Autoscroll: ☒ No line ending: No line ending 115200 baud



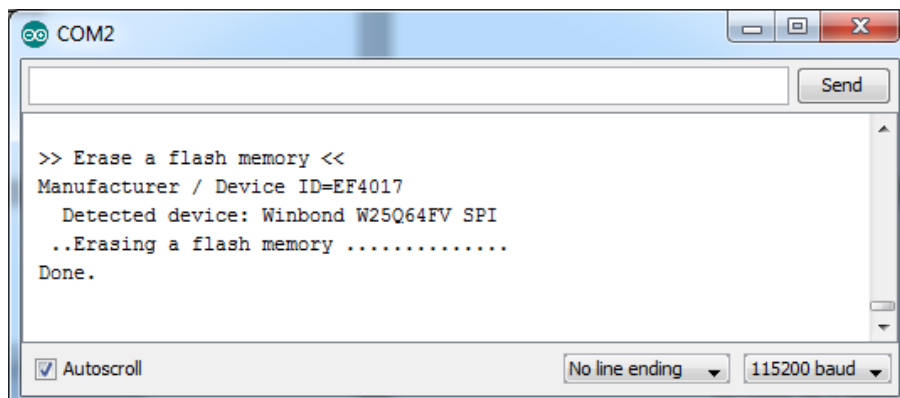
3. Dump a flash memory data to file

This menu item allows to read all data (8 Megabytes) from SPI flash memory to a file with name 'galiprogram_flash_dump.bin' (located in the root of SD card).



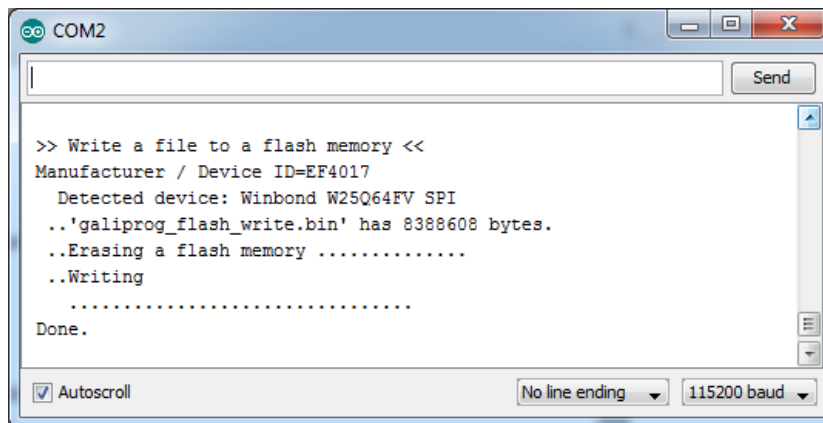
4. Erase a flash memory

This menu item erases all SPI flash memory (fill it by 0xFF).



5. Write a file to a flash memory

This menu item erases all SPI flash memory (fill it by 0xFF) and writes a data from a file with name 'galiprog_flash_write.bin' to a flash memory.

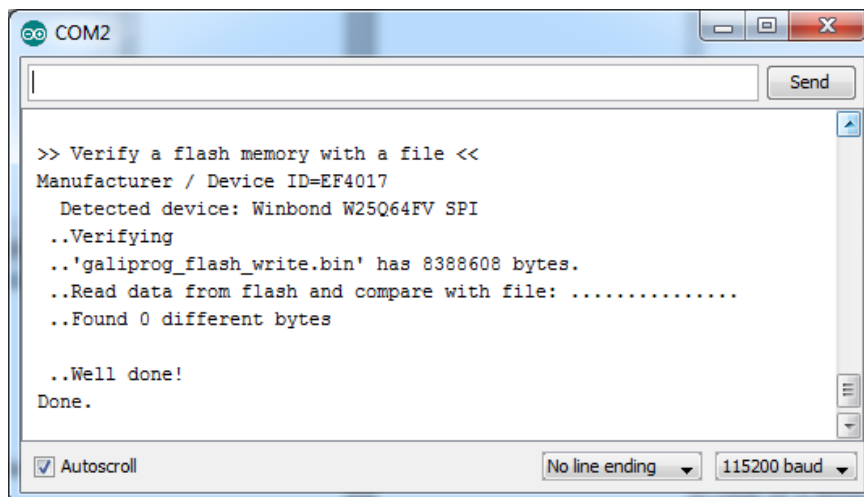


```
>> Write a file to a flash memory <<
Manufacturer / Device ID=EF4017
Detected device: Winbond W25Q64FV SPI
..'galiprog_flash_write.bin' has 8388608 bytes.
..Erasing a flash memory .....
..Writing
.....
Done.
```

☒ Autoscroll No line ending 115200 baud

6. Verify a flash memory with a file

This menu item reads all SPI flash memory and compares with a data from a file with name 'galiprog_flash_write.bin'.

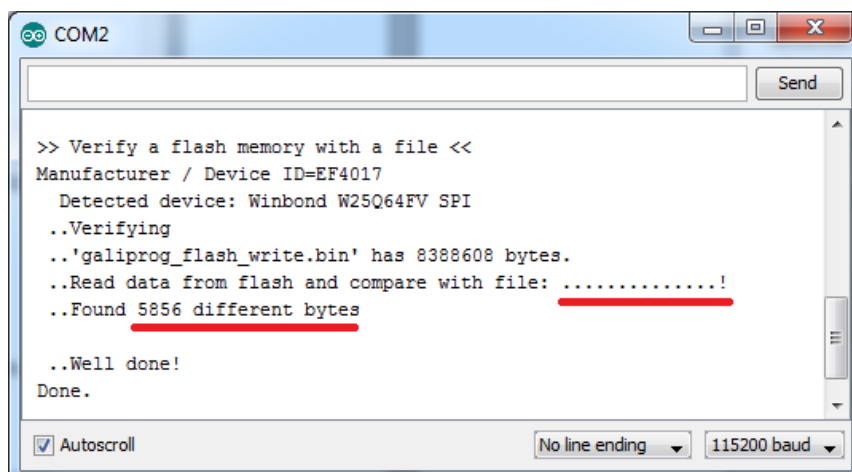


```
>> Verify a flash memory with a file <<
Manufacturer / Device ID=EF4017
Detected device: Winbond W25Q64FV SPI
..Verifying
..'galiprog_flash_write.bin' has 8388608 bytes.
..Read data from flash and compare with file: .....
..Found 0 different bytes

..Well done!
Done.
```

☒ Autoscroll No line ending 115200 baud

In case of a difference between the file and flash memory the following information will be shown:



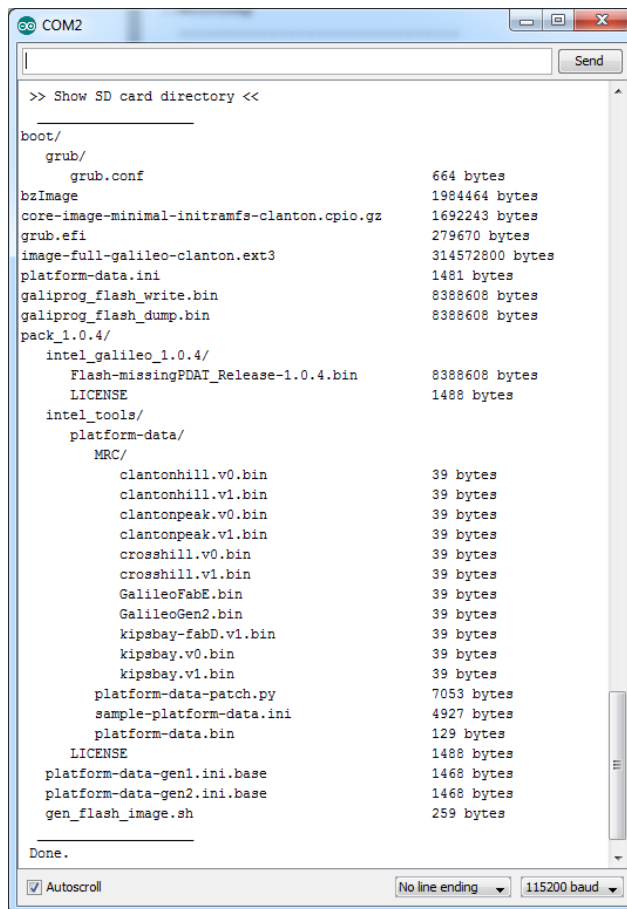
```
>> Verify a flash memory with a file <<
Manufacturer / Device ID=EF4017
Detected device: Winbond W25Q64FV SPI
..Verifying
..'galiprog_flash_write.bin' has 8388608 bytes.
..Read data from flash and compare with file: .....!
..Found 5856 different bytes

..Well done!
Done.
```

☒ Autoscroll No line ending 115200 baud

7. Show SD card directory

This menu item prints a current list of files on SD card.



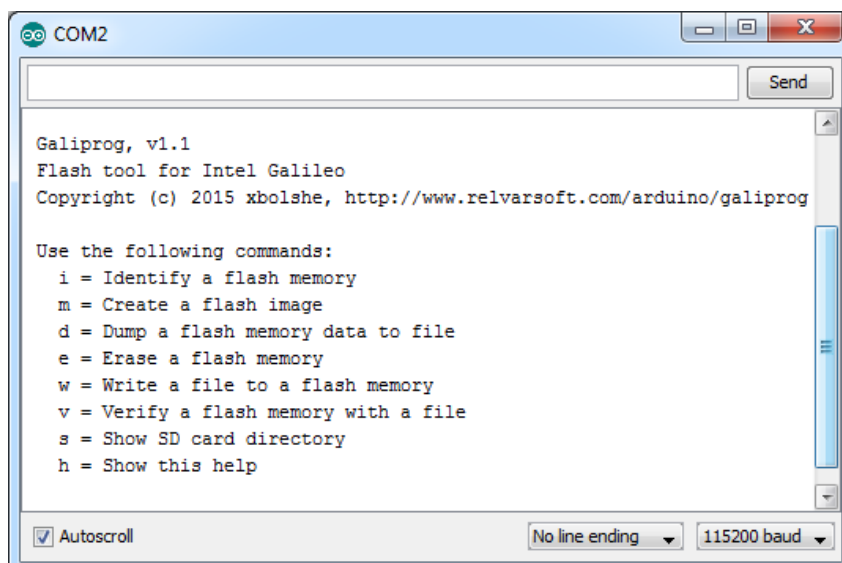
```
>> Show SD card directory <<

boot/
  grub/
    grub.conf                                664 bytes
  bzImage                                  1984464 bytes
  core-image-minimal-initramfs-clanton.cpio.gz 1692243 bytes
  grub.efi                                279670 bytes
  image-full-galileo-clanton.ext3          314572800 bytes
  platform-data.ini                        1481 bytes
  galiprog_flash_write.bin                 8388608 bytes
  galiprog_flash_dump.bin                 8388608 bytes
  pack_1.0.4/
    intel_galileo_1.0.4/
      Flash-missingPDAT_Release-1.0.4.bin    8388608 bytes
      LICENSE                                1488 bytes
    intel_tools/
      platform-data/
        MRC/
          clantonhill.v0.bin                  39 bytes
          clantonhill.v1.bin                  39 bytes
          clantonpeak.v0.bin                  39 bytes
          clantonpeak.v1.bin                  39 bytes
          crosshill.v0.bin                    39 bytes
          crosshill.v1.bin                    39 bytes
          GalileoFabE.bin                     39 bytes
          GalileoGen2.bin                     39 bytes
          kipsbay-fabD.v1.bin                  39 bytes
          kipsbay.v0.bin                      39 bytes
          kipsbay.v1.bin                      39 bytes
          platform-data-patch.py               7053 bytes
          sample-platform-data.ini             4927 bytes
          platform-data.bin                    129 bytes
          LICENSE                             1488 bytes
          platform-data-gen1.ini.base           1468 bytes
          platform-data-gen2.ini.base           1468 bytes
          gen_flash_image.sh                   259 bytes
        Done.

Autoscroll No line ending 115200 baud
```

8. Show this help

This menu item shows help screen like shown below:



```
Galiprog, v1.1
Flash tool for Intel Galileo
Copyright (c) 2015 xbolshe, http://www.relvarsoft.com/arduino/galiprog

Use the following commands:
i = Identify a flash memory
m = Create a flash image
d = Dump a flash memory data to file
e = Erase a flash memory
w = Write a file to a flash memory
v = Verify a flash memory with a file
s = Show SD card directory
h = Show this help

Autoscroll No line ending 115200 baud
```


8. Questions

1) What I need to execute to restore broken image in SPI flash memory?

Answer:

- Identify a flash memory
- Dump a flash memory data to file (optional)
- Write a file to a flash memory
- Verify a flash memory with a file

2) How to check a stability of data read/write?

Answer:

Use «Verify a flash memory with a file» 5 times.

If a difference is the same all the times, then a processing is stable. You may write a data to flash memory.

If a difference (in bytes) is not the same even one time compare with others, DO NOT WRITE a data to SPI flash memory! Need to fix a reason of this problem before writing a data.

3) More questions or comments? Write me e-mail.

Annex 1. About Pack 1.0.4

Pack 1.0.4 contains «Flash-missingPDAT_Release-1.0.4.bin» (original source: <https://communities.intel.com/docs/DOC-22226>) and a part of «spi-flash-tools-v1.0.1» (original source: https://downloadcenter.intel.com/Detail_Desc.aspx?DwnldID=23197) under the following license:

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