The Cartridge Header

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Click here to go to this section of Pan Docs in the new location: https://gbdev.io/pandocs/#the-cartridge-header

An internal information area is located at 0100-014F in each cartridge. It contains the following values:

Contents

0100-0103 - Entry Point

After displaying the Nintendo Logo, the built-in boot procedure jumps to this address (100h), which should then jump to the actual main program in the cartridge. Usually this 4 byte area contains a NOP instruction, followed by a JP 0150h instruction. But not always.

0104-0133 - Nintendo Logo

These bytes define the bitmap of the Nintendo logo that is displayed when the gameboy gets turned on. The hexdump of this bitmap is:

```
CE ED 66 66 CC 0D 00 0B 03 73 00 83 00 0C 00 0D
00 08 11 1F 88 89 00 0E DC CC 6E E6 DD DD D9 99
BB BB 67 63 6E 0E EC CC DD DC 99 9F BB B9 33 3E
```

The Game Boy's boot procedure verifies the content of this bitmap (after it has displayed it), and LOCKS ITSELF UP if these bytes are incorrect. A CGB verifies only the first 18h bytes of the bitmap, but others (for example a pocket gameboy) verify all 30h bytes.

0134-0143 - Title

Title of the game in UPPER CASE ASCII. If it is less than 16 characters then the remaining bytes are filled with 00's. When inventing the CGB, Nintendo has reduced the length of this area to 15 characters, and some months later they had the fantastic idea to reduce it to 11 characters only. The new meaning of the ex-title bytes is described below.

013F-0142 - Manufacturer Code

In older cartridges this area has been part of the Title (see above), in newer cartridges this area contains an 4 character uppercase manufacturer code. Purpose and Deeper Meaning unknown.

0143 - CGB Flag

In older cartridges this byte has been part of the Title (see above). In CGB cartridges the upper bit is used to enable CGB functions. This is required, otherwise the CGB switches itself into Non-CGB-Mode. Typical values are:

```
80h - Game supports CGB functions, but works on old gameboys also.
C0h - Game works on CGB only (physically the same as 80h).
```

Values with Bit 7 set, and either Bit 2 or 3 set, will switch the gameboy into a special non-CGB-mode with uninitialized palettes. Purpose unknown, eventually this has been supposed to be used to colorize monochrome games that include fixed palette data at a special location in ROM.

0144-0145 - New Licensee Code

Specifies a two character ASCII licensee code, indicating the company or publisher of the game. These two bytes are used in newer games only (games that have been released after the SGB has been invented). Older games are using the header entry at 014B instead.

Sample licensee codes :

00	none	**01**	Nintendo R&D1	**08**	Capcom
13	Electronic Arts	**18**	Hudson Soft	**19**	b-ai
20	kss	**22**	pow	**24**	PCM Complete
25	san-x	**28**	Kemco Japan	**29**	seta
30	Viacom	**31**	Nintendo	**32**	Bandai
33	Ocean/Acclaim	**34**	Konami	**35**	Hector
37	Taito	**38**	Hudson	**39**	Banpresto
41	Ubi Soft	**42**	Atlus	**44**	Malibu
46	angel	**47**	Bullet-Proof	**49**	irem
50	Absolute	**51**	Acclaim	**52**	Activision
53	American sammy	**54**	Konami	**55**	Hi tech entertainment
56	LJN	**57**	Matchbox	**58**	Mattel
59	Milton Bradley	**60**	Titus	**61**	Virgin
64	LucasArts	**67**	Ocean	**69**	Electronic Arts
70	Infogrames	**71**	Interplay	**72**	Broderbund
73	sculptured	**75**	sci	**78**	THQ
79	Accolade	**80**	misawa	**83**	lozc
86	tokuma shoten i*	**87**	tsukuda ori*	**91**	Chunsoft
92	Video system	**93**	Ocean/Acclaim	**95**	Varie
96	Yonezawa/s'pal	**97**	Kaneko	**99**	Pack in soft
A4	Konami (Yu-Gi-Oh!)				

0146 - SGB Flag

Specifies whether the game supports SGB functions, common values are:

```
00h = No SGB functions (Normal Gameboy or CGB only game)
03h = Game supports SGB functions
```

The SGB disables its SGB functions if this byte is set to another value than 03h.

0147 - Cartridge Type

Specifies which Memory Bank Controller (if any) is used in the cartridge, and if further external hardware exists in the cartridge.

```
00h  ROM ONLY                 19h  MBC5
01h  MBC1                     1Ah  MBC5+RAM
02h  MBC1+RAM                 1Bh  MBC5+RAM+BATTERY
03h  MBC1+RAM+BATTERY         1Ch  MBC5+RUMBLE
05h  MBC2                     1Dh  MBC5+RUMBLE+RAM
06h  MBC2+BATTERY             1Eh  MBC5+RUMBLE+RAM+BATTERY
08h  ROM+RAM                  20h  MBC6
09h  ROM+RAM+BATTERY          22h  MBC7+SENSOR+RUMBLE+RAM+BATTERY
0Bh  MMM01
0Ch  MMM01+RAM
0Dh  MMM01+RAM+BATTERY
0Fh  MBC3+TIMER+BATTERY
10h  MBC3+TIMER+RAM+BATTERY   FCh  POCKET CAMERA
11h  MBC3                     FDh  BANDAI TAMA5
```

```
12h  MBC3+RAM                 FEh  HuC3
13h  MBC3+RAM+BATTERY         FFh  HuC1+RAM+BATTERY
```

0148 - ROM Size

Specifies the ROM Size of the cartridge. Typically calculated as "32KB shl N".

```
00h -  32KByte (no ROM banking)
01h -  64KByte (4 banks)
02h - 128KByte (8 banks)
03h - 256KByte (16 banks)
04h - 512KByte (32 banks)
05h -   1MByte (64 banks)  - only 63 banks used by MBC1
06h -   2MByte (128 banks) - only 125 banks used by MBC1
07h -   4MByte (256 banks)
08h -   8MByte (512 banks)
52h - 1.1MByte (72 banks)
53h - 1.2MByte (80 banks)
54h - 1.5MByte (96 banks)
```

0149 - RAM Size

Specifies the size of the external RAM in the cartridge (if any).

```
00h - None
01h - 2 KBytes
02h - 8 Kbytes
03h - 32 KBytes (4 banks of 8KBytes each)
04h - 128 KBytes (16 banks of 8KBytes each)
05h - 64 KBytes (8 banks of 8KBytes each)
```

When using a MBC2 chip 00h must be specified in this entry, even though the MBC2 includes a built-in RAM of 512 x 4 bits.

014A - Destination Code

Specifies if this version of the game is supposed to be sold in Japan, or anywhere else. Only two values are defined.

```
00h - Japanese
01h - Non-Japanese
```

014B - Old Licensee Code

Specifies the games company/publisher code in range 00-FFh. A value of 33h signalizes that the New License Code in header bytes 0144-0145 is used instead. (Super GameBoy functions won't work if <> $33.) A list of licensee codes can be found here.

014C - Mask ROM Version number

Specifies the version number of the game. That is usually 00h.

014D - Header Checksum

Contains an 8 bit checksum across the cartridge header bytes 0134-014C. The checksum is calculated as follows:

```
x=0:FOR i=0134h TO 014Ch:x=x-MEM[i]-1:NEXT
```

The lower 8 bits of the result must be the same than the value in this entry. The GAME WON'T WORK if this checksum is incorrect.

014E-014F - Global Checksum

Contains a 16 bit checksum (upper byte first) across the whole cartridge ROM. Produced by adding all bytes of the cartridge (except for the two checksum bytes). The Gameboy doesn't verify this checksum.

Category: Pandocs Article
