

# **Garmin GCD Firmware Update File Format**

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## Garmin GCD Firmware Update File Format

Filename extension \*.gcd

This documentation is based on own research and the sources listed in the references section.

### Basic data types

All values are serialized in little-endian byte order (least significant byte first).

Type	Length	Description
char	1	ASCII character, see [5]
byte	1	8 bit unsigned integer (range 0 .. 255)
ushort	2	16 bit unsigned integer (range 0 .. 65535)
uint	4	32 bit unsigned integer (range 0 .. 4294967295)

Version:

A byte or ushort where the value is calculated as major version x 100 + minor Version.

E.g. 0x0064 = 100 = V1.0

### General file structure

Header
List of Records (without holes)

#### Header

Type	Content
char[6]	Signature = "GARMIN"
byte	Format version Seen value: V1.0

### General record structure

Type	Content
ushort	Record ID Identifies the record content. See table below.
ushort	Record Length
byte[Record Length]	Record Content

Record ID values:

Value	Meaning
0x0001	CheckPoint
0x0002	Filler
0x0003	Main header?
0x0005	Copyright message
0x0006	Firmware descriptor structure
0x0007	Firmware descriptor
<other>	Firmware data (see table below)

Value	Meaning
0xFFFF	End

Record ID values for firmware data records:

Value	Meaning
0x0008	boot.bin
0x02BD	fw_all.bin *.BIN
0x0401	external_data.bin
0x0505	firmware file *.BIN
0x0510	logo (Garmin Bitmap)
0x051B	?
0x052B	?
0x0533	dskimg_0533.bin (in IMG file format containing *.S16 or *.SNR files)
0x0534	?
0x0535	?
0x0536	?
0x0537	?
0x0538	?
0x0549	?
0x0550	?
0x0555	fw_0555.bin
0x0556	?
0x0557	?
0x0566	files.bin
0x057F	resources_057F.bin
0x0588	?
0x0590	?
0x0595	?
0x0599	?
0x059E	resources_059E.bin
0x05A2	? Sometimes a ZIP file containing *.JPG and *.XML files
0x05A4	?
0x05A5	?
0x05F5	?
0x05F9	*.GCD file
0x05FA	?
0x05FB	?
0x07D0	Combines 0x07D1-0x07D3
0x07D1	?
0x07D2	?
0x07D3	?

The RGN region corresponding with the Record ID is the least significant byte of the Order ID, except for 0x0008 which has 0x0C and 0x02BD which has 0x0E as RGN region.

## Sequence of records

Copyright\*, 0x0003, Copyright\*, (Firmware Descriptor Structure, Firmware Descriptor, Firmware Data\*, Copyright\*)+, End

\* = zero or more occurrences, + = at least one occurrence

CheckPoint Records and Alignment Records may be inserted anywhere in this sequence.

Firmware Data records must cover the complete Length as indicated in the Firmware Descriptor (and may be missing altogether when Length=0).

### CheckPoint Record (ID=0x0001)

Length = 1, content is checksum byte.

Can appear anywhere. The content byte is chosen so that the sum over all bytes from the start of the file up to and including the CheckPoint Record is 0x00. It's a way to verify file integrity up to this point.

### Filler Record (ID=0x0002)

Length varies, content is always empty (0x00).

Can appear anywhere.

### ?? Record (ID=0x0003)

If Length= 2, the value is 2 bytes HWID

If Length= 9, the value is always = 0x10, 0xD4, 0x5C, 0x13, 0x04, 0x45, 0x0D, 0x14, 0x41

### Copyright Record (ID=0x0005)

ASCII string, not 0-terminated.

### Firmware Descriptor Structure Record (ID=0x0006)

Length is multiple of 2.

It tells what information is included in the firmware descriptor record.

Type	Content
Length/2 times:	
byte	Field ID See table below.
byte	Field type See table below.

Field ID values:

Value	Meaning
3	End of list (with type=<end of list>)
7	? (with type=31 byte)
9	HWID (with type=ushort)
10	XOR (with type=byte) Record ID (with type=ushort)
11	?? (with type=byte)

Value	Meaning
12	? (with type=byte), seen value: 1 Build? (with type=ushort)
13	SW version (with type=ushort)
14	? (with type=ushort)
15	? (with type=ushort)
16	? (with type=ushort)
17	? (with type=ushort)
18	? (with type=ushort)
19	? (with type=ushort)
20	Some version (with type=ushort), seen values: 0.54 in Xero A1i 0.89 in vivoactive 3 1.04 in Instinct 2.00 in fenix5 and D2Charlie 2.10 in fenix5x and Xero A1i 2.02 in Forerunner 645 Music 2.30 in Forerunner935_295Beta 2.40 in vivoactive3 APAC 2.50 in Forerunner935APAC_GCDfile__600.gcd 4.87 in fenixChronos1000
21	Length (with type=uint) / Some version? (with type = ushort), seen values 0.01 in Forerunner 645 Music 0.59 in fenix5Plus_655Beta\System_Backdate_v600 0.78 in fenix5 2.00 in D2Charlie 2.10 in Xero A1i 2.20 and 3.41 in fenix5x 3.20 in XeroA1_i__320.gcd 3.41 in Fenix5X APAC 4.62 in fenixChronos1000
22	? (with type=ushort), seen values 0x2000 in Rino6xx_WebUpdater__500.gcd 0x3340 in Fenix5PlusSeries_355Beta\WiFi_v250 0x3800 in Approach G80 0x4800 in GPSMAP64_WebUpdater__510.gcd 0x5000 in eTrex20_30_Webupdater__470.gcd 0x5400 in GPSMAP62_78_WebUpdater__700.gcd 0x6C00 in Montana_WebUpdater__750.gcd 0x8800 in Edge810_630.gcd 0x9000 in eTrex Webupdater 480 0x9C00 in eTrex20x_30x_Webupdater__270.gcd 0xA000 in Approach G30 0xB400 in eTrexTouch25_35 Webupdater 0xBC00 in Approach G80 0xC000 in Montana610_680_330.gcd 0xCC00 in GPS 17x HVS 0xDC00 in Rino700_WebUpdater__250.gcd 0xE000 in Oregon6x0_WebUpdater__540.gcd

Value	Meaning
	0xE400 in GPSMAP62_78_WebUpdater__690.gcd 0xFC00 in RV_Camper770_560.gcd
23	Length of firmware part 1 (with type=uint)
24	Length of firmware part 2 (with type=uint)
25	Length of firmware part 3 (with type=uint)
26	Destination address (with type=uint)
32	? (with type=byte)

Field type values:

Value	Meaning
0x00	byte
0x10	ushort
0x20	uint
0x40	31 byte
0x50	<end of list>

### Firmware Descriptor Record (ID=0x0007)

This record has a variable length. It contains the sequence of fields as described in the Firmware Descriptor Structure Record.

Meaning of the fields:

Field ID	Field type	Meaning
9	ushort	HWID (hardware identification). For a list see my other document Garmin_BIN_Format.
10	byte	XOR byte used for obfuscating the firmware stream
10	ushort	Record ID used by the following Firmware Data Records for this firmware stream. See table above.
11	byte	?, Usually 0, but value 1 seen on Approach 60 2.77 beta.
12	ushort	Build?
13	ushort	SW version (software version)
23	uint	Length (in byte) of this firmware stream

### Firmware Data Record (ID varies)

The Firmware Descriptor Record contains the length of the firmware stream. This length can be much more than what a single Firmware Data Record may hold, so there are as many Firmware Data Records following until the complete firmware stream is done. The Record ID varies (see Record ID table above), but it is the same across all Firmware Data Records belonging to one firmware stream. The same Record ID can appear multiple times in a GCD file, so it is more a firmware stream type than a unique identification.

The actual length of a firmware stream is sometimes four more than the size indicated in the Firmware Descriptor Record.

### End Record (ID=0xFFFF)

Length is 0.

## **Firmware**

See my other document [Garmin\\_BIN\\_Format](#).



## References

### Used sources of information

- [1] <https://reverseengineering.stackexchange.com/questions/6867/trying-to-reverse-gps-watch-firmware-image-with-binwalk>
- [2] [http://www.gpspassion.com/forumsen/topic.asp?TOPIC\\_ID=115804](http://www.gpspassion.com/forumsen/topic.asp?TOPIC_ID=115804)
- [3] [http://www.gpspassion.com/forumsen/topic.asp?TOPIC\\_ID=117239](http://www.gpspassion.com/forumsen/topic.asp?TOPIC_ID=117239)
- [4] RGN\_Tool [http://www.gpspassion.com/forumsen/topic.asp?TOPIC\\_ID=137838](http://www.gpspassion.com/forumsen/topic.asp?TOPIC_ID=137838), [https://web.archive.org/web/20170718095456/http://turboccc.wikispaces.com:80/RGN\\_Tool](https://web.archive.org/web/20170718095456/http://turboccc.wikispaces.com:80/RGN_Tool)

### Standards and specifications

- [5] ISO/IEC 646:1991, Information technology – ISO 7-bit coded character set for information interchange

### Sources of sample files

- [6] Garmin Marine Device Software Updates <http://www8.garmin.com/support/software/marine.html>
- [7] Russification of Garmin GPS devices <https://sourceforge.net/projects/flawia/?source=navbar>
- [8] <http://www.gmaptool.eu/pl/content/trail>
- [9] <http://gpsrchive.com/>
- [10] <https://www.dropbox.com/sh/60fl2temsvbf29i/AAAAX1-vz-M-LWhnGs5aAsvCa?dl=0>
- [11] <https://wiki.ubuntuusers.de/Garmin/Firmware/>
- [12] <http://www.gawisp.com/perry/>
- [13] <http://www.tramsoft.ch/DOWNLOADS/GARMIN/>