

Garmin MapSource (MPS), GPS Database (GDB) and Folder and Item (GFI) File Format

Herbert Oppmann

herby@memotech.franken.de

<http://www.memotech.franken.de/FileFormats/>

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Usage

Files with filename extension *.mps are created by Garmin MapSource. MapSource < version 3 used an old MPS format which is documented separately. From version 3 until and including version 5, the MPS format documented here was the standard format. Starting with version 6, MapSource introduced a slightly modified format using filename extension *.gdb, but it was still able to produce *.mps files using the Export menu entry.

Garmin BaseCamp is the successor of MapSource. It uses the same *.gdb format, but can't export *.mps format anymore. While MapSource saved only on explicit user action, BaseCamp automatically saves the last state to C:\Users\<username>\AppData\Roaming\Garmin\BaseCamp\Database\<Version> as AllData.gdb. In addition, it stores its user interface data in a very similar *.gfi format in the same directory as FolderData.gfi.

Garmin HomePort behaves the same as BaseCamp, just that the path for automatic saves is C:\Users\<username>\AppData\Roaming\Garmin\HomePort\Database\<Version>.

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

Text highlighted like **this** is where further investigation is needed.

Basic data types

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

Type	Length	Description
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)
ulong	8	64 bit unsigned integer (range 0 .. 18446744073709551615)
short	2	16 bit signed integer (range -32768 .. 32767)
int	4	32 bit signed integer (range -2147483648 .. 2147483647)
long	8	64 bit signed integer (range -9223372036854775808 .. 9223372036854775807)
double	8	64 bit floating point value according to [6]
char	1	A character in ISO/IEC 8859-1 [7]
string	1..n	0-terminated string (may be empty). Character set is either ISO/IEC 8859-1 [7] or UTF-8 [8].
flag	1	A byte, with allowed values 0=no and 1=yes
version	2	An ushort, whose value is computed as major version x 100 + minor version.
coord	4	An int which has to be multiplied by 360.0° and divided by 2 ³² to get a longitude or latitude coordinate.

Basic structures

fint

Type	Content
flag	0=value unknown 1=value given
int	If flag=1: Present and content is the value If flag=0 and File Format Version <= 1.5: Present, but value is to be ignored else (flag=0 and File Format Version > 1.5): Not present.

fdouble

Type	Content
flag	0=value unknown 1=value given
double	If flag=1: Present and content is the value If flag=0 and File Format Version <= 1.5: Present, but value is to be ignored else (flag=0 and File Format Version > 1.5): Not present.

Subclass

Version	Type	Content
>= 1.0	int	Map segment ID for map objects 0 for user waypoint – not the same as the Map IDs in the “L” section!
>= 1.0	int	Map object ID for map objects -1 for user waypoint – unique identifier for each road, POI, river, area, intersection, city, airport, and so on.
>= 1.0	long	Subclass 1 Waypoint subclass for auto-routes. -1 for user waypoint.
1.0	byte	Subclass 2 Waypoint subclass. 0 for user waypoints.
> 1.0	short	Subclass 2 Waypoint subclass. 0 for user waypoints.
> 1.2	int	Subclass 3 Waypoint subclassing for auto-routes. -1 for user waypoint.

General file structure

Type	Content
char[4]	Signature “MsRc” (probably stands for “MapSource”): MPS and GDB “DifG” (probably stands for “GFI Database” backwards): GFI
version	Primary file format
Record ‘D’ – File format version	
Record ‘A’ – File author information	
string	Application field (the presence of this field depends on the primary file format version)
List of further records	

Primary file format:

Value	as version	Meaning
0x0064	1.0	MPS
0x0065	1.1	old GDB according to [1], but not seen yet
0x0066	1.2	GDB and GFI

General record structure

All records have this general structure:

Type	Content
uint	Record length, excluding the record type and length
char	Record type Identifies the record content. 'A' File author information 'C' Geocaching 'D' File format version 'E' ?? 'F' Folder information 'G' Image 'I' Inventory item 'J' Image 'J' BirdsEye 'K' BirdsEye 'L' Map section 'O' BirdsEye 'R' Route 'T' Track 'V' Map set name 'W' Waypoint 'X' End of file
byte[Record length]	Record content

Records common for MPS, GDB and GFI file format

All file formats start with the two records 'D' and 'A' and then (if the primary file format version is > V1.0) the application field.

File format record (Type='D')

Type	Content
version	File format

File format:

Value	as version	Meaning
0x0064	1.0	MapSource (*.mps) 3.0-3.5
0x0065	1.1	MapSource (*.mps) 3.6
0x0066	1.2	MapSource (*.mps) 4.0
0x0067	1.3	MapSource (*.mps) 4.3-4.9
0x0068	1.4	MapSource (*.mps) 4.10-4.13
0x0069	1.5	MapSource (*.mps) >= 5.0
0x006B	1.7	MapSource (*.gdb) 6.1-6.3 "Ver 1"
0x006C	1.8	MapSource (*.gdb) 6.5-6.11.6 "Ver 2"
0x006D	1.9	MapSource (*.gdb) 6.12.2-6.16.3 "Ver 3"
0x0073	1.15	BaseCamp 2.x
0x0081	1.29	BaseCamp 3.0.1-3.0.2
0x0083	1.31	BaseCamp 3.0.3
0x0084	1.32	BaseCamp 3.0.4-3.0.6
0x008A	1.38	BaseCamp 3.1.x
0x0092	1.46	BaseCamp 3.2.0.1 Beta
0x0093	1.47	BaseCamp 3.2.0.2 Beta-3.2.1

Value	as version	Meaning
0x0094	1.48	BaseCamp 3.2.2
0x009A	1.54	BaseCamp 3.3.x
0x009F	1.59	BaseCamp 4.0.0.5 Beta
0x00A0	1.60	BaseCamp 4.0.0.6 Beta-4.0.x
0x00A4	1.64	BaseCamp 4.1.0
0x00A9	1.69	HomePort
0x00AC	1.72	BaseCamp 4.2.0.2 Beta
0x00B1	1.77	BaseCamp 4.2.0.4 Beta
0x00B2	1.78	BaseCamp 4.2.1
0x00B3	1.79	BaseCamp 4.2.2-4.2.4
0x00B4	1.80	BaseCamp 4.2.5
0x00BA	1.86	BaseCamp 4.3.0.1 Beta-4.3.1, 4.4.0.1 Beta
0x00BB	1.87	BaseCamp 4.3.2-4.3.5
0x00BC	1.88	BaseCamp 4.4.1-4.6.2

File author information record (Type='A')

Type	Content
version	Program version
string	Builder Usually "SQA" or "sqa", which probably stands for "Software Quality Assurance"
string	Build date, format is MMM dd yyyy or M/d/yyyy
string	Build time, format is HH:mm:ss or HH:mm:sszzz

Seen file author information records:

Product	File author information record (record 'A')			
	Program version	Builder	Build date	Build time
MapSource 3.0	3.0	"SQA"	"Oct 7 1999"	"08:24:26"
MapSource 3.1	3.1	"SQA"	"Oct 11 1999"	"14:31:20"
MapSource 3.2	3.2	"SQA"	"Oct 20 1999"	"12:50:03"
MapSource 3.3	3.3	"SQA"	"Jan 4 2000"	"15:46:22"
MapSource 3.5	3.5	"SQA"	"Jul 18 2000"	"13:56:29"
MapSource 3.6	3.6	"SQA"	"Feb 2 2001"	"13:46:01"
MapSource 4.0	4.0	"SQA"	"Feb 28 2001"	"09:55:29"
MapSource 4.3	4.3	"SQA"	"Jun 12 2001"	"16:35:33"
MapSource 4.5	4.5	"SQA"	"Oct 12 2001"	"13:37:16"
MapSource 4.6	4.6	"SQA"	"Oct 22 2001"	"15:45:05"
MapSource 4.7	4.7	"SQA"	"Apr 29 2002"	"14:54:31"
MapSource 4.8	4.8	"SQA"	"May 13 2002"	"13:59:05"
MapSource 4.9	4.9	"SQA"	"Jun 3 2002"	"08:51:52"
MapSource 4.10	4.10	"SQA"	"Dec 4 2002"	"14:56:32"
MapSource 4.11	4.11	"SQA"	"Dec 20 2002"	"16:41:26"
MapSource 4.12	4.12	"SQA"	"Feb 13 2003"	"13:24:05"
MapSource 4.13	4.13	"SQA"	"Mar 7 2003"	"15:12:28"
MapSource 5.0	5.0	"SQA"	"Jul 3 2003"	"08:35:33" and "08:35:39"!
MapSource 5.2	5.2	"SQA"	"Aug 26 2003"	"13:41:10"
MapSource 5.3	5.3	"SQA"	"Sep 24 2003"	"11:44:25"
MapSource 5.4	5.4	"SQA"	"Nov 6 2003"	"16:01:32"

MapSource 6.1	6.1	"SQA"	"May 18 2004"	"15:57:15"
MapSource 6.3	6.3	"SQA"	"Jun 21 2004"	"14:29:29"
MapSource 6.5	6.5	"SQA"	"Dec 27 2004"	"17:40:51"
MapSource 6.6. ? Beta	6.6	"neaderhi"	"Jun 2 2005"	"14:04:28"
MapSource 6.7	6.7	"SQA"	"Jul 22 2005"	"13:50:50"
MapSource 6.8.0	6.8	"SQA"	"Aug 8 2005"	"10:17:17"
MapSource 6.9.1	6.9	"SQA"	"Oct 18 2005"	"12:03:34"
MapSource 6.10.2	6.10	"SQA"	"Mar 13 2006"	"17:49:25"
MapSource 6.11.1	6.11	"SQA"	"May 22 2006"	"12:17:10"
MapSource 6.11.3	6.11	"SQA"	"Jul 11 2006"	"16:36:02"
MapSource 6.11.5	6.11	"SQA"	"Aug 21 2006"	"11:56:45"
MapSource 6.11.6	6.11	"SQA"	"Nov 3 2006"	"12:19:11"
MapSource 6.12. ? Beta	6.12	"neaderhi"	"Jan 17 2007"	"16:52:04"
MapSource 6.12.2	6.12	"SQA"	"Feb 20 2007"	"14:45:13"
MapSource 6.12.3	6.12	"SQA"	"Mar 20 2007"	"13:26:48"
MapSource 6.12.4	6.12	"SQA"	"May 1 2007"	"14:47:56"
MapSource 6.13.0.1 Beta	6.13	"neaderhiadmin"	"Aug 3 2007"	"10:59:15"
MapSource 6.13.1	6.13	"SQA"	"Aug 14 2007"	"18:14:36"
MapSource 6.13.2	6.13	"SQA"	"Aug 30 2007"	"15:29:23"
MapSource 6.13.4	6.13	"SQA"	"Sep 17 2007"	"17:00:00"
MapSource 6.13.5	6.13	"SQA"	"Nov 8 2007"	"17:21:34"
MapSource 6.13.6	6.13	"SQA"	"Nov 28 2007"	"11:23:32"
MapSource 6.13.7	6.13	"SQA"	"Jan 21 2008"	"14:11:50"
MapSource 6.14.0.1 Beta	6.14	"schulzem"	"May 21 2008"	"16:26:51"
MapSource 6.14.1	6.14	"sqa"	"Jun 26 2008"	"18:40:52"
MapSource 6.15.3	6.15	"sqa"	"Dec 26 2008"	"16:08:03"
MapSource 6.15.4	6.15	"sqa"	"Feb 9 2009"	"11:31:30"
MapSource 6.15.6	6.15	"sqa"	"Apr 14 2009"	"15:02:31"
MapSource 6.15.7	6.15	"sqa"	"Sep 21 2009"	"15:33:52"
MapSource 6.15.11	6.15	"sqa"	"Jan 26 2010"	"11:31:06"
MapSource 6.16.0.2 Beta	6.16	"schulzem"	"Feb 26 2010"	"09:04:38"
MapSource 6.16.0.3 Beta	6.16	"schulzem"	"Mar 18 2010"	"13:35:29"
MapSource 6.16.1	6.16	"sqa"	"May 7 2010"	"13:22:26"
MapSource 6.16.2	6.16	"sqa"	"Jun 15 2010"	"11:06:04"
MapSource 6.16.3	6.16	"sqa"	"Oct 14 2010"	"08:33:45"
BaseCamp 2.0.5	2.0	"sqa"	"May 12 2009"	"13:56:02"
BaseCamp 2.0.6	2.0	"sqa"	"Jul 6 2009"	"11:51:05"
BaseCamp 2.0.7	2.0	"sqa"	"Aug 14 2009"	"15:50:48"
BaseCamp 2.0.8	2.0	"sqa"	"Nov 23 2009"	"16:07:02"
BaseCamp 2.0.9	2.0	"sqa"	"Dec 22 2009"	"16:54:00"
BaseCamp 3.0.1	3.0	"sqa"	"Mar 25 2010"	"13:31:51"
BaseCamp 3.0.2	3.0	"sqa"	"Apr 9 2010"	"10:07:54"
BaseCamp 3.0.3	3.0	"sqa"	"May 10 2010"	"15:58:14"
BaseCamp 3.0.4	3.0	"sqa"	"May 19 2010"	"09:01:19"
BaseCamp 3.0.5	3.0	"sqa"	"Jun 7 2010"	"13:51:32"
BaseCamp 3.0.6	3.0	"sqa"	"Aug 26 2010"	"09:56:44"

BaseCamp 3.1.1	3.0	"sqa"	"Oct 13 2010"	"10:20:36"
BaseCamp 3.1.2	3.1	"sqa"	"Nov 11 2010"	"08:18:12"
BaseCamp 3.1.3	3.1	"sqa"	"Jan 27 2011"	"12:55:49"
BaseCamp 3.2.0.1 Beta	3.2	"neaderhi"	"May 5 2011"	"15:51:44"
BaseCamp 3.2.0.2 Beta	3.2	"neaderhi"	"May 26 2011"	"15:37:38"
BaseCamp 3.2.1	3.2	"sqa"	"Jun 21 2011"	"09:27:26"
BaseCamp 3.2.2	3.2	"sqa"	"Aug 5 2011"	"16:47:53"
BaseCamp 3.3.0.2 Beta	3.3	"neaderhi"	"Dec 13 2011"	"15:43:24"
BaseCamp 3.3.0.3 Beta	3.3	"neaderhi"	"Dec 28 2011"	"20:42:48"
BaseCamp 3.3.1	3.3	"sqa"	"Feb 6 2012"	"12:24:13"
BaseCamp 3.3.2	3.3	"sqa"	"Mar 8 2012"	"16:21:17"
BaseCamp 4.0.0.5 Beta	4.0	"neaderhi"	"Jul 24 2012"	"11:55:10"
BaseCamp 4.0.0.6 Beta	4.0	"neaderhi"	"Aug 21 2012"	"15:22:30"
BaseCamp 4.0.1	4.0	"sqa"	"Aug 27 2012"	"11:52:28"
BaseCamp 4.0.2	4.0	"sqa"	"Sep 20 2012"	"16:12:33"
BaseCamp 4.0.4	4.0	"sqa"	"Oct 25 2012"	"15:58:58"
BaseCamp 4.0.5	4.0	"sqa"	"Nov 13 2012"	"08:35:42"
BaseCamp 4.1.0	4.1	"sqa"	"Jan 15 2013"	"12:10:55"
BaseCamp 4.1.1	4.1	"sqa"	"Jan 31 2013"	"15:55:05"
BaseCamp 4.1.2	4.1	"sqa"	"Mar 4 2013"	"12:11:44"
BaseCamp 4.2.0.2 Beta	4.2	"neaderhi"	"Apr 10 2013"	"15:24:06"
BaseCamp 4.2.0.4 Beta	4.2	"neaderhi"	"May 6 2013"	"15:32:48"
BaseCamp 4.2.1	4.2	"sqa"	"Jun 19 2013"	"15:23:09"
BaseCamp 4.2.2	4.2	"sqa"	"Jul 18 2013"	"15:16:56"
BaseCamp 4.2.3	4.2	"SQA"	"Sep 23 2013"	"11:17:06"
BaseCamp 4.2.4	4.2	"SQA"	"Oct 18 2013"	"15:57:08"
BaseCamp 4.2.5	4.2	"SQA"	"Dec 12 2013"	"13:57:14"
BaseCamp 4.3.0.1 Beta	4.3	"michlowitz"	"Mar 18 2014"	"10:06:43"
BaseCamp 4.3.0.2 Beta	4.3	"michlowitz"	"Mar 27 2014"	"13:37:59"
BaseCamp 4.3.0.3 Beta	4.3	"dev"	"	"
BaseCamp 4.3.1	4.3	"SQA"	"5/8/2014"	"15:23:55-07:00"
BaseCamp 4.3.2	4.3	"SQA"	"5/29/2014"	"11:00:39-07:00"
BaseCamp 4.3.4	4.3	"SQA"	"6/23/2014"	"15:42:03-07:00"
BaseCamp 4.3.5	4.3	"SQA"	"7/24/2014"	"09:38:04-07:00"
BaseCamp 4.4.0.1 Beta	4.3	"dev"	"	"
BaseCamp 4.4.1	4.4	"SQA"	"9/19/2014"	"15:26:19-07:00"
BaseCamp 4.4.2	4.4	"SQA"	"9/30/2014"	"11:30:44-07:00"
BaseCamp 4.4.4	4.4	"SQA"	"11/17/2014"	"07:47:47-07:00"
BaseCamp 4.4.6	4.4	"SQA"	"12/11/2014"	"15:56:37-07:00"
BaseCamp 4.4.7	4.4	"SQA"	"4/15/2015"	"09:11:53-07:00"

BaseCamp 4.5.0	4.5	"SQA"	"7/17/2015"	"15:53:32-07:00"
BaseCamp 4.5.1	4.5	"SQA"	"8/14/2015"	"15:34:21-07:00"
BaseCamp 4.5.2	4.5	"SQA"	"8/31/2015"	"16:34:39-07:00"
BaseCamp 4.6.1	4.6	"dagsqa"	"1/29/2016"	"12:39:16-07:00"
BaseCamp 4.6.2	4.6	"dagsqa"	"2/12/2016"	"14:47:41-07:00"
HomePort 2.2.5	2.2	"SQA"	"Jun 4 2014"	"16:07:41"
HomePort 2.2.9	2.2	"SQA"	"Jan 23 2015"	"16:40:20"
HomePort 2.2.10	2.2	"sqa"	"Nov 2 2015"	"10:26:01"
GPSTabel 1.3.4	6.5	"GPSTabel-1.3.4"	"Jul 14 2007"	"21:06:14"
GPSTabel 1.3.6	6.5	"GPSTabel-1.3.6"	"Sep 11 2008"	"20:41:43"

GPSTabel version info according to source (not seen yet):

"A].GPSTabel_1.2.7-beta*Sep 13 2005*20:10:00" - gpstabel V1.2.7 BETA

"A].GPSTabel_1.2.8-beta*Jan 18 2006*20:11:00" - gpstabel 1.2.8-beta01182006_clyde

"A].GPSTabel_1.2.8-beta*Apr 18 2006*20:12:00" - gpstabel 1.2.8-beta20060405

"A].GPSTabel-1.3*Jul 02 2006*20:13:00" - gpstabel 1.3.0

"A].GPSTabel-1.3.1*Sep 03 2006*20:14:00" - gpstabel 1.3.1

"A].GPSTabel-1.3.2*Nov 01 2006*22:23:39" - gpstabel 1.3.2

New since 11/01/2006:

version: version and release of gpstabel (defined in configure.in)

timestamp: date and time of gdb.c (handled by CVS)

"A].GPSTabel-1.3.2*Nov 01 2006*22:23:39" - gpstabel 1.3.2

"A].GPSTabel-beta20061125*Feb 06 2007*23:24:14" gpstabel beta20061125

"A].GPSTabel-1.3.3*Feb 20 2007*20:51:15" - gpstabel 1.3.3

Application field (no record!)

Type	Content
string	"MapSource", "HomePort", or "BaseCamp" GPSTabel writes "MapSource" here

MPS

Product versus primary file format version and file format version:

Product	Primary file format version (Header)	File format version (record 'D')
MapSource 3.0-3.5	1.0	1.0
MapSource 3.6	1.0	1.1
MapSource 4.0	1.0	1.2
MapSource 4.4-4.9	1.0	1.3
MapSource 4.10-4.13	1.0	1.4
MapSource >= 5.0	1.0	1.5

GDB and GFI

GFI is not used with MapSource, only with BaseCamp and HomePort.

Product versus primary file format version and file format version:

Product	Primary file format version (Header)	File format version (record 'D')
MapSource 6.1-6.3	1.2	1.7
MapSource 6.5-6.11.6, GPSBabel-1.3.4 and -1.3.6	1.2	1.8
MapSource 6.12.2-6.16.3	1.2	1.9
BaseCamp 2.x	1.2	1.15
BaseCamp 3.0.1-3.0.2	1.2	1.29
BaseCamp 3.0.3	1.2	1.31
BaseCamp 3.0.4-3.0.6	1.2	1.32
BaseCamp 3.1.x	1.2	1.38
BaseCamp 3.2.0.1 Beta	1.2	1.46
BaseCamp 3.2.0.2 Beta-3.2.1	1.2	1.47
BaseCamp 3.2.2	1.2	1.48
BaseCamp 3.3.x	1.2	1.54
BaseCamp 4.0.0.5 Beta	1.2	1.59
BaseCamp 4.0.0.6 Beta-4.0.x	1.2	1.60
BaseCamp 4.1.0	1.2	1.64
HomePort	1.2	1.69
BaseCamp 4.2.0.2 Beta	1.2	1.72
BaseCamp 4.2.0.4 Beta	1.2	1.77
BaseCamp 4.2.1	1.2	1.78
BaseCamp 4.2.2-4.2.4	1.2	1.79
BaseCamp 4.2.5	1.2	1.80
BaseCamp 4.3.0.1 Beta-4.3.1, 4.4.0.1 Beta	1.2	1.86
Basecamp 4.4.1-4.6.2	1.2	1-88

Records specific for MPS and GDB File Format

Sequence of records after the common records:

'W'*, 'R'*, 'T'*, 'G'*, 'O'*, 'L'*, 'j'*, 'J'*, 'C'*, 'V', 'E?', 'X'? (is there an order for G, O, L, j and J?)

* = 0..n times, + = 1..n times, ? = optional (0..1 times)

Records 'G', 'O' and 'X' were introduced with File Format version 1.29, i.e. BaseCamp V3.0.1

Records 'j' and 'J' were introduced with File Format version 1.31, i.e. BaseCamp V3.0.3

Waypoint record (Type='W')

Version	Type	Content
>= 1.0	string	Waypoint name
>= 1.0	uint	Waypoint class
>= 1.0	string	Countrycode
>= 1.0	Subclass	
>= 1.0	coord	Latitude
>= 1.0	coord	Longitude
>= 1.0	fdouble	Altitude in meter
>= 1.0	string	Comment
>= 1.0	fdouble	Proximity in meter
>= 1.0	uint	Display mode, see table below
>= 1.0	uint	Color, see table below
>= 1.0	uint	Icon, see table below
>= 1.0	string	City
>= 1.0	string	State
>= 1.0	string	Facility
>= 1.0	byte	Map line 8 Seen values: 0, 1, 4, 5, 6, 8, 0xA, 0xB, 0xC, 0xD, 0x10, 0x11, 0x13, 0x15, 0x16, 0x19, 0x1C, 0x1D, 0x1E, 0x1F, 0x2C, 0x3C, 0x48, 0x9F or 0xC0
>= 1.0	fdouble	Depth in meter
>= 1.0	string	Street
>= 1.0	byte	Unknown1 =0
> 1.1	uint	Predicted leg time in seconds for auto-routed routes.
> 1.1	string	Directions
1.7-1.8	string	Link
>= 1.9	uint	Number of links
>= 1.9	Number of links x string Link	
>= 1.7	ushort	Categories 1-16 (bit 0 = category 1, .. bit 1 = category 16)
>= 1.7	fdouble	Temperature in °C
>= 1.7	fint	Creation time (Unix time, seconds since 1970-01-01)
>= 1.9	uint	Unknown3 = 0 or 1
	The next two fields are only present when Unknown3 ==1	
>= 1.9	string	Phone Number
>= 1.9	byte	Unknown4 =0
>= 1.9	string	Country
>= 1.9	string	Postal Code
>=1.15	byte	Show direction icon: 0=no, 1=yes
>=1.15	byte	Direction icon (none if show direction icon =0), see table below
>=1.15	byte	Thumbnail flag (0=not present, 1=present)
	The next three fields are only present when Thumbnail flag != 0:	
>=1.15	string	Origin
>=1.15	uint	Size
>=1.15	byte[Size]	Thumbnail in PNG format
	The next field is only present if Show direction icon != 0:	
>=1.15	byte	Unknown6 = 0
>= 1.29	ushort	Unknown7 = 0

>= 1.46

Version	Type	Content
	string	Waypoint name
	uint	Waypoint class
	coord	Latitude
	coord	Longitude
	string	Comment
	fdouble	Proximity in meter
	uint	Display mode, see table below
	uint	Icon, see table below
	uint	Color, see table below
	byte	Unknown1=0
>= 1.54	byte	Subclass1 present flag, 0=no, 1=yes
	Subclass1 (in >= 1.54 only present if Subclass1 present flag = yes)	
>= 1.54	byte	?=0
>= 1.54	Subclass1 (only present if Subclass2 present flag = yes)	
	fdouble	Altitude
	byte	Unknown2=0
	uint	Number of links
	Number of links x string Link	
	fdouble	Temperature in °C
	fint	Creation time (Unix time, seconds since 1970-01-01)
	byte	Unknown3=0
	byte	Thumbnail flag (0=not present, 1=present)
	if Thumbnail present next two fields follow:	
	string	Origin
	string	UUID in format "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx"
	8 x byte	Unknown4=0

Display mode:

Value	Meaning
0	Symbol
1	Symbol & Name
2	Symbol & Comment
3	Image
4	Image & Name

Color:

Value	Meaning
0	Unknown
1	Black
2	Dark red
3	Dark green
4	Dark yellow
5	Dark blue
6	Dark magenta
7	Dark cyan
8	Light grey
9	Dark grey
10	Red

Value	Meaning
11	Green
12	Yellow
13	Blue
14	Magenta
15	Cyan
16	White
17	Transparent

Icon: (see [3])

Value	Meaning
0	Anchor
1	Bell
2	DiamondGrn
3	DiamondRed
4	Dive1
5	Dive2
6	Dollar
7	Fish
8	Fuel
9	Horn
10	House
11	Knife
12	Light
13	Mug
14	Skull
15	SquareGrn
16	SquareRed
17	Wbuoy
18	WptDot
19	Wreck
20	Mob
21	BuoyAmbr
22	BuoyBlck
23	BuoyBlue
24	BuoyGrn
25	BuoyGrnRed
26	BuoyGrnWht
27	BuoyOrng
28	BuoyRed
29	BuoyRedGrn
30	BuoyRedWht
31	BuoyViolet
32	BuoyWht
33	BuoyWhtGrn
34	BuoyWhtRed
35	Dot
36	Rbcn
37	BoatRamp
38	Camp
39	Restrooms
40	Showers

Value	Meaning
41	DrinkingWtr
42	Phone
43	1stAid
44	Info
45	Parking
46	Park
47	Picnic
48	Scenic
49	Skiing
50	Swimming
51	Dam
52	Controlled
53	Danger
54	Restricted
55	Ball
56	Car
57	Deer
58	ShpngCart
59	Lodging
60	Mine
61	TrailHead
62	TruckStop
63	UserExit
64	Flag
65	CircleX
66	MiMrkr
67	Trcbck
68	Golf
69	SmlCty
70	MedCty
71	LrgCty
72	CapCty
73	AmusePk
74	Bowling
75	CarRental
76	CarRepair
77	Fastfood
78	Fitness
79	Movie
80	Museum
81	Pharmacy
82	Pizza
83	PostOfc
84	RvPark
85	School
86	Stadium
87	Store
88	Zoo
89	GasPlus
90	Faces
91	WeighSttn
92	TollBooth
93	Bridge

Value	Meaning
94	Building
95	Cemetery
96	Church
97	Civil
98	Crossing
99	HistTown
100	Levee
101	Military
102	OilField
103	Tunnel
104	Beach
105	Forest
106	Summit
107	Airport
108	Heliport
109	Private
110	SoftFld
111	TallTower
112	ShortTower
113	Glider
114	Ultralight
115	Parachute
116	Seaplane
117	Geocache
118	GeocacheFound
119	ContactAfro
120	ContactAlien
121	ContactBalCap
122	ContactBigEar
123	ContactBiker
124	ContactBug
125	ContactCat
126	ContactDog
127	ContactDreads
128	ContactFem1
129	ContactFem2
130	ContactFem3
131	ContactGoatee
132	ContactKungFu
133	ContactPig
134	ContactPirate
135	ContactRanger
136	ContactSmiley
137	ContactSpike
138	ContactSumo
139	WaterHydrant
140	FlagRed
141	FlagBlue
142	FlagGreen
143	PinRed
144	PinBlue
145	PinGreen
146	BlockRed

Value	Meaning
147	BlockBlue
148	BlockGreen
149	BikeTrail
150	FHSFacility
151	PoliceStation
152	SkiResort
153	IceSkating
154	Wrecker
155	NoAnchor
156	Beacon
157	CoastGuard
158	Reef
159	WeedBed
160	DropOff
161	Dock
162	Marina
163	BaitTackle
164	Stump
165	CircleRed
166	CircleGreen
167	CircleBlue
168	DiamondBlue
169	OvalRed
170	OvalGreen
171	OvalBlue
172	RectRed
173	RectGreen
174	RectBlue
175	SquareBlue
176	LetterARed
177	LetterAGreen
178	LetterABlue
179	LetterBRed
180	LetterBGreen
181	LetterBBlue
182	LetterCRed
183	LetterCGreen
184	LetterCBlue
185	LetterDRed
186	LetterDGreen
187	LetterDBlue
188	Number0Red
189	Number0Green
190	Number0Blue
191	Number1Red
192	Number1Green
193	Number1Blue
194	Number2Red
195	Number2Green
196	Number2Blue
197	Number3Red
198	Number3Green
199	Number3Blue

Value	Meaning
200	Number4Red
201	Number4Green
202	Number4Blue
203	Number5Red
204	Number5Green
205	Number5Blue
206	Number6Red
207	Number6Green
208	Number6Blue
209	Number7Red
210	Number7Green
211	Number7Blue
212	Number8Red
213	Number8Green
214	Number8Blue
215	Number9Red
216	Number9Green
217	Number9Blue
218	TriangleBlue
219	TriangleGreen
220	TriangleRed
221	ContactBlonde
222	ContactClown
223	ContactGlasses
224	ContactPanda
225	MultiCache
226	LetterboxCache
227	PuzzleCache
228	Library
229	BusStation
230	CityHall
231	Winery
232	ATV
233	BigGame
234	Blind
235	BloodTrail
236	Cover
237	Covey
238	FoodSource
239	Furbearer
240	Lodge
241	SmallGame
242	AnimalTracks
243	TreedQuarry
244	TreeStand
245	Truck
246	UplandGame
247	Waterfowl
248	WaterSource

Direction icon:

Value	Meaning
0	none
2, 15, 18	 right
3	 sharp right
4	 U-turn
5	 sharp left
6, 16, 19	 left
8, 11, 13, 17, 20, 21, 22, 23	 ahead
10	 turn right
12	 ferry
14	 circle
24, 25	 turn left

Route record (Type='R')

Version	Type	Content
>= 1.0	string	Route name
>= 1.0	byte	Auto-name flag, 0=no, 1= auto-named
>= 1.0	byte	No bounds flag, 0=no, 1=yes
	The following 6 fields are only present if the No bounds flag is 0.	
>= 1.0	coord	Latitude max
>= 1.0	coord	Longitude max
>= 1.0	fdouble	Altitude max
>= 1.0	coord	Latitude min
>= 1.0	coord	Longitude min
>= 1.0	fdouble	Altitude min
>= 1.0	uint	Number of route points in route
>= 1.0	Number of route points in route x Route point	
1.7-1.8	string	Link
>= 1.9	uint	Number of links
>= 1.9	Number of links x string Link	
>= 1.9	uint	Color
>= 1.9	byte	Flag Auto-route info present, 0=no, 1=yes
	The following fields up to and including the "Number of waypoints to create" are only present if Auto-route info present is 1	
>= 1.9	byte	Unknown1 =0
>= 1.9	byte	Unknown2 =0 or 1
>= 1.9	byte	Unknown3 =0 or 1
>= 1.9	byte	Unknown4 =1
>= 1.9	byte	Unknown5 =0
>= 1.9	byte	Unknown5a =0 or 1
>= 1.9	byte	Route style. 0= use direct routes, 1= use auto-routing

Version	Type	Content
>= 1.9	uint	Calculation type, 0=Faster time, 1=Shorter distance
>= 1.9	byte	Vehicle type, see table below
>= 1.9	uint	Road selection: -3 (minor roads) to 3 (highways)
>= 1.9	double	Average driving speed for residential street, in $\frac{1}{10}$ meter per second
>= 1.9	double	Average driving speed for collector road, in $\frac{1}{10}$ meter per second
>= 1.9	double	Average driving speed for other highway, in $\frac{1}{10}$ meter per second
>= 1.9	double	Average driving speed for major highway, in $\frac{1}{10}$ meter per second
>= 1.9	double	Average driving speed for interstate highway, in $\frac{1}{10}$ meter per second
>= 1.9	byte[8]	Unknown6 =0
>= 1.15	uint	Unknown7 =1
>= 1.15	double	Distance between waypoints
>= 1.15	uint	Unknown8 =0
>= 1.15	uint	Number of waypoints to create
>= 1.9	string	Notes (may be empty)
>= 1.15	byte	Flag "is filtered route". 0= no, 1= yes
>= 1.15	uint	Number of filtered points
		Number of filtered points x Link point
>= 1.15	byte	Unknown9 Flag ? If 1, nothing follows. Else if 0, the next two fields follow:
>= 1.15	Link point	?
>= 1.15	Link point	?
>= 1.29	byte	Unknown10 =0

>= 1.46

Version	Type	Content
	string	Route name
	byte	Auto-name flag, 0=no, 1= auto-named
	uint	Number of route points in route
		Number of route points in route x Route point
	...	

Nach Route points (d.h. da fehlt einiges!):

1 Byte =0 ← unknown9 Flag

2 Link Points

uint 0 ← könnte Anzahl Links sein

uint 14 ← könnte Color sein

irgendwo hier +/- 1-2 byte beginnt die Auto-Route info

uint 1

byte 1 1 1 1

usw. double Geschwindigkeiten

Flag filtered, number of filtered points, points

Route point:

Version	Type	Content
>= 1.0	string	Point name

Version	Type	Content
>= 1.0	uint	Waypoint class
1.0-<1.4 6	string	Countrycode
1.0-<1.4 6	Subclass	
>= 1.0	byte	Unknown1 =0
>= 1.0	uint	Unknown2 =0, 1 or 3
>= 1.0	uint	Unknown3 =0 or 0xFFFFFFFF or 0x00??????
>= 1.0	uint	Unknown4 =0 or 0x00??????
1.0	byte	Unknown5 =0
>1.0	ushort	Unknown5 =0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 19, 22 or 26
>= 1.0	uint	Unknown6 =0, 1 or 2
>= 1.0	uint	Number of link points
	Number of link points x Link point	
>= 1.0	byte	Flag "Is last point". 0=no, 1=yes
	The next 6 fields are only present if not last point:	
>= 1.0	coord	Latitude max
>= 1.0	coord	Longitude max
>= 1.0	fdouble	Altitude max
>= 1.0	coord	Latitude min
>= 1.0	coord	Longitude min
>= 1.0	fdouble	Altitude min
>= 1.8	byte[8]	Unknown7 =0xFFFFFFFFFFFFFFFF
>= 1.9	ushort	Unknown8 =0
>= 1.15	ushort	Unknown9 =0
>= 1.15	byte	Unknown10 =1
>= 1.15	fint	Unknown11. Time? Coord?
>= 1.15	fint	Unknown12. Time? Coord?
>= 1.29	fdouble	Unknown13
>= 1.29	fdouble	Unknown14
>= 1.29	ushort	Unknown15 = 0

Link point:

Version	Type	Content
	coord	Latitude
	coord	Longitude
	fdouble	Altitude

Vehicle type:

Value	Meaning
0	Car or motorcycle
1	Bus
2	Taxi
4	Pedestrian
5	Bicycle
6	Truck
8	Delivery truck
9	Ambulance

Track record (Type='T')

Version	Type	Content
>= 1.0	string	Track name
>= 1.0	byte	Track display (0=no, 1=yes)
>= 1.0	uint	Track color, see table above
>= 1.0	uint	Number of points in track
>= 1.0	Number of points in track x Point	
1.7-1.8	string	Link
>= 1.9	uint	Number of links
>= 1.9	Number of links x string Link	
>= 1.15	string	Notes (may be empty)

Point:

Version	Type	Content
>= 1.0	coord	Latitude
>= 1.0	coord	Longitude
>= 1.0	fdouble	Altitude in meter
>= 1.0	fint	Time (Unix time, seconds since 1970-01-01)
>= 1.0	fdouble	Depth in meter
>= 1.7	fdouble	Temperature in °C
>= 1.29	uint	Unknown1 =0

File formats > 1.38:

Type	Content
string	Track name
uint	? =0 or 1
byte	Track display (0=no, 1=yes)
uint	Track color, see table above
byte[5]	? =0
coord	Latitude
coord	Longitude?
ushort	? =0
coord	Latitude max
coord	Longitude max
coord	Latitude min
coord	Longitude min
byte	? =0
double	?
byte	? =0
uint	? =1
uint	Number of Track segments
Number of Track segments x Track segment	
uint	Total number of points
string	UUID in format "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx"
byte[12]	? =0
byte	? =0 or 1

Type	Content
string	File or URL (may be empty)
byte[3]	=0, maybe present if byte before string is =1, Format >= 1.69

Track segment:

Type	Content
byte	? =0
coord	Latitude max
coord	Longitude max
coord	Latitude min
coord	Longitude min
uint	Number of Points in Track segment
Number of Points in Track x Point	

Point:

Type	Content
coord	Latitude
coord	Longitude

Image record (Type='G')

This record was introduced with File Format version 1.29, i.e. BaseCamp V3.0.1

Version	Type	Content
>= 1.29	string	UUID in format "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx"
>= 1.29	byte	Unknown1
>= 1.29	string	Web path
>= 1.29	...	
>= 1.29		
>= 1.29		

BirdsEye record (Type='O')

This record was introduced with File Format version 1.29, i.e. BaseCamp V3.0.1

Version	Type	Content
	string	Name
	byte	Unknown1
	coord	Latitude max
	coord	Longitude max
	fdouble	Altitude max
	coord	Latitude min
	coord	Longitude min
	fdouble	Altitude min
	string	Web path
	byte	Unknown2
	string	UUID in format "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx"
	string	Unknown3
	string	Unknown4
	3 x byte	Unknown5
	coord	Latitude max

Version	Type	Content
	coord	Longitude max
	fdouble	Altitude max
	coord	Latitude min
	coord	Longitude min
	fdouble	Altitude min
	string	Unknown6
	uint	count
	count x string	
	uint	= 0x0B
	count x string	
	uint	= 0x0F
	count x string	
	uint	= 0x12
	uint	= 0
	uint	= 0
		= 01 00
	uint	Number of Images
	Number of Images x string	UUID in format "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxxx"

Map section record (Type='L')

Type	Content
ushort	Product ID, see table below
ushort	Family ID, see table below
uint	Segment ID
string	Product Name
string	Segment Name
string	Area Name
uint	Unknown1 =0

Product ID:

Value	Meaning
0x0001	[Use Family ID]
0x0005	WorldMap
0x0006	US Topo East
0x0007	US Topo West
0x0008	US Topo Hawaii
0x0009	US Topo Alaska
0x000D	GB R&R
0x000F	GB MG

Family ID:

Value	Meaning
0x0000	[Use Product ID]

Value	Meaning
0x0004	MG USA v4
0x0009	GPSMAP 162/168 Tide Points
0x000C	European City Select v4
0x000E	European MG v4
0x001A	Australian MG v4
0x0025	European MG v5
0x002E	MG USA v5
0x0033	MG Canada v4
0x0040	Trip/Waypoint Manager v2
0x0055	City Select N America v6
0x0063	City Select Europe v7

Image record (Type='j')

This record was introduced with File Format version 1.31, i.e. BaseCamp V3.0.3

Version	Type	Content
>= 1.31	string	UUID in format "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx"
>= 1.31	byte	Unknown1 =1
>= 1.31	string	Web path
>= 1.31	...	
>= 1.31		
>= 1.31		

BirdsEye record (Type='J')

This record was introduced with File Format version 1.31, i.e. BaseCamp V3.0.3

Version	Type	Content
>= 1.31	string	Name of BirdsEye
>= 1.31	uint	Number of Images
>= 1.31	Number of Images x string	UUID in format "xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx"
>= 1.31	...	
>= 1.31		
>= 1.31		

Geocaching record (Type='C')

This record was introduced with File Format version ...

Version	Type	Content
	...	

Map set name record (Type='V')

Type	Content
string	Map set name, may be empty
byte	Auto name flag, 0x00 = user-named, 0x01 = auto-named

?? record (Type='E')

Type	Content
uint	Unknown1 =0

End of file record (Type='X')

This record was introduced with File Format version 1.29, i.e. BaseCamp V3.0.1

Version	Type	Content
>= 1.29	string	"EndOfFile"

Records specific for GFI File Format

GFI is not used with MapSource, only with BaseCamp and HomePort.

Sequence of records after common records:

'F*', 'I*', 'R*', 'T*', 'W*', 'K*', 'J*'

* = 0..n times, + = 1..n times, ? = optional (0..1 times)

Folder information record (Type='F')

Version	Type	Content
>= 1.15	uint	Folder ID (starting with 0, 0xFFFFFFFF is the predefined folder "My Collection")
>= 1.15	string	Folder name
>= 1.15	uint	Parent Folder ID (for the "My Collection" folder, this must be the "My Collection" folder)
>= 1.15	uint	Number of subordinated elements
>= 1.15	Nr of subordinated elements times: Reference to element (see below)	
>= 1.15	byte	Unknown1 =1
1.15 - 1.38, 1.69	int	Unknown2 =0

Reference to element:

Version	Type	Content
>= 1.15	uint	Type: 0=Item, 1=Folder
>= 1.15	uint	Item or Folder ID

Item record (Type='I')

In 1.15, 1.29, 1.31, 1.32 and 1.38, folders could not be nested, therefore there is no Parent Folder ID.

Version	Type	Content
>= 1.15	uint	Item ID
>= 1.15	string	Item name (UTF-8)
>= 1.15	uint	Created by: 0 = User, 1= Auto-created on import, 8 = at item "Unlisted Data"
For 1.29, 1.31, 1.32 and 1.38:		
	byte	Unknown1 =1
	uint	Unknown2 = seems to be Item ID repeated
For 1.8, 1.9, 1.46, 1.54, 1.69 and 1.88:		
	uint	Parent Folder ID
	The remaining fields are present if Created by != 0	
	byte	Unknown1 =1
	uint	Unknown2 =1
	uint	Unknown3 =9

Route record (Type='R')

Version	Type	Content
>= 1.15	uint	Parent Item ID
>= 1.15	string	Route name
>= 1.15	byte	0 = Route was made from Track by program 1 = User made this Route

Track record (Type='T')

Version	Type	Content
>= 1.15	uint	Parent Item ID
>= 1.15	string	Track name
For 1.8, 1.9, 1.69, and 1.88:		
	uint	Unknown1 =0 or 1

Waypoint record (Type='W')

Version	Type	Content
>= 1.15	uint	Parent Item ID
>= 1.15	string	Waypoint name
>= 1.15	uint	Waypoint class. Values seen: 0 and 1
For 1.8, 1.15, 1.29, 1.31, and 1.38:		
	string	Countrycode
	Subclass	

Birdseye record (Type='K')

This record was introduced with File Format version 1.29, i.e. BaseCamp V3.0.1

Version	Type	Content
>= 1.29	uint	Parent Item ID
>= 1.29	string	BirdsEye name

Birdseye record (Type='J')

This record was introduced with File Format version 1.31, i.e. BaseCamp V3.0.3

Version	Type	Content
>= 1.31	uint	Parent Item ID
>= 1.31	string	BirdsEye name

References

Used sources of information

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- [2] GPSTabel <https://www.gpsbabel.org/>, file <https://github.com/gpsbabel/gpsbabel/blob/master/gdb.cc>
- [3] GPSMapEdit partial source code <http://www.geopainting.com/en/src.html>
- [4] MapEdit++ <https://sourceforge.net/projects/gmeaddons/?source=navbar>
- [5] <https://forums.garmin.com/showthread.php?1165-via-points-in-MapSource&p=131057>

Standards and specifications

- [6] ISO/IEC/IEEE 60559:2011, *Information technology – Microprocessor Systems – Floating-Point arithmetic* (which is the successor of IEEE Std 754-2008)
- [7] ISO/IEC 8859-1:1998, *Information technology – 8-bit single-byte coded graphic character sets, Part 1: Latin alphabet No. 1*
- [8] IETF RFC 3629, *UTF-8, a transformation format of ISO 10646*, available at <http://tools.ietf.org/html/rfc3629>

Sources of sample files

- [9] <http://www.neve-trek.be/organisation/GPS2006/org-gps2.htm>
- [10] <http://www.militarycampgrounds.us/files/download/5-gps-and-mapping-data-files/14-garmin-mapsource-mps>
- [11] <https://planyourhike.com/maps/gps-waypoints/>
- [12] <http://www.herkuleshof.com/touren.php>
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- [18] http://www.schwarzwald-bike.de/tour_detail.php?tour_nr=142