



**FS Future Series**



**eGPS**

**USB GPS Receiver**

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OKM GmbH

Julius-Zinkeisen-Str. 7, 04600 Altenburg, Germany

Tel: +49 3447 4993000 \* Fax: +49 3447 49930029

Internet: <http://www.okm-technologies.com>

# 1 General Description

The eGPS receiver contains an active built-in antenna and will work in conjunction with a computer and an appropriate navigation software. Furthermore you can use the GPS receiver for own developments by evaluating the NMEA messages by yourself.

## 2 Setup and Driver Installation

First download the virtual COM port (VCP) drivers from <http://www.ftdichip.com>, connect the eGPS receiver with a standard USB port of your computer and install the drivers according to your operating system and the instructions on your screen. On the FTDI driver download page you will also find installation guides. After successful installation of the USB drivers the eGPS receiver is ready to use.

## 3 NMEA Protocol and Messages

The eGPS receiver supports GPS (\$GP) and GLONASS (\$GL) data records as well as combined data records (\$GN) according to the NMEA protocol.

### 3.1 Talker ID

One of the ways the NMEA standard differentiates between GNSS<sup>1</sup> is by using a two-letter message identifier, the “Talker ID”. The list below shows the Talker ID that will be used for various GNSS configurations:

- **GP** = GPS, SBAS, QZSS
- **GL** = GLONASS
- **GA** = Galileo
- **GB** = BeiDou
- **GN** = Any combination of GNSS

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1 Global Navigation Satellite System

### 3.2 Latitude and Longitude Format

According to the NMEA standard, latitude and longitude are output in the format degrees, minutes and (decimal) fractions of minutes. To convert to degrees and fractions of degrees, or degrees, minutes, seconds and fractions of seconds, the “minutes” and “fractional minutes” parts need to be converted.

In other words: If the GPS receiver reports a latitude of 4717.112671 North and longitude of 00833.914843 East,

this is

- Latitude 47 Degrees, 17.112671 Minutes
- Longitude 8 Degrees, 33.914843 Minutes

or

- Latitude 47 Degrees, 17 Minutes, 6.76026 Seconds
- Longitude 8 Degrees, 33 Minutes, 54.89058 Seconds

or

- Latitude 47.28521118 Degrees
- Longitude 8.56524738 Degrees

### 3.3 Position Fix Flags

<i>NMEA Message: Field</i>	<i>No position fix (at power-up, after losing satellite lock)</i>	<i>GNSS fix, but user limits exceeded</i>	<i>Dead reckoning fix, but user limits exceeded</i>	<i>Dead reckoning fix (ADR with external sensors, linear extrapolation, or map matching)</i>	<i>2D GNSS fix</i>	<i>3D GNSS fix</i>	<i>Combined GNSS/dead reckoning fix (ADR with external sensors)</i>
GLL, RMC: status	V	V	V	A	A	A	A
<i>V=Data Invalid, A=Data Valid</i>							
GGA: quality	0	0	6	6	1 / 2	1 / 2	1 / 2
<i>0=No Fix, 1=Autonomous GNSS Fix, 2=Differential GNSS Fix, 6=Estimated/Dead Reckoning Fix</i>							
GSA: navMode	1	1	2	2	2	3	3
<i>1=No Fix, 2=2D Fix, 3=3D Fix</i>							
GLL, RMC, VTG, GNS: posMode	N	N	E	E	A / D	A / D	A / D
<i>N=No Fix, E=Estimated/Dead Reckoning Fix, A=Autonomous GNSS Fix, D=Differential GNSS Fix</i>							

## 3.4 Supported Messages

### 3.4.1 \$GNRMC

Message Structure:

\$xxRMC,time,status,lat,NS,long,EW,spd,cog,date,mv,mvEW,posMode,navStatus\*cs<CR><LF>

Example:

\$GPRMC,083559.00,A,4717.11437,N,00833.91522,E,0.004,77.52,091202,,,A,V\*57

<i>Name</i>	<i>Unit</i>	<i>Format</i>	<i>Example</i>	<i>Description</i>
xxRMC		string	\$GPRMC	RMC Message ID (xx = current Talker ID)
time	-	hhmmss.ss	083559.00	UTC time
status	-	character	A	Status: V = Navigation receiver warning A = Data valid
lat	-	ddmm.mmmmm	4717.11437	Latitude (degrees & minutes)
NS	-	character	N	North/South indicator
long	-	dddmm.mmmmm	00833.91522	Longitude (degrees & minutes)
EW	-	character	E	East/West indicator
spd	knots	numeric	4	Speed over ground
cog	degrees	numeric	77.52	Course over ground
date	-	ddmmyy	91202	Date in day, month, year format
mv	degrees	numeric	-	Magnetic variation value (blank = not supported)
mvEW	-	character	-	Magnetic variation E/W indicator (blank = not supported)
posMode	-	character	-	Mode Indicator, also see section 5 "Position Fix Flags"
navStatus	-	character	V	Navigational status indicator (V = Equipment is not providing navigational status information) <b>NMEA v4.1 and above only</b>
cs	-	hexadecimal	*57	Checksum
<CR> <LF>	-	character	-	Carriage return and line feed

### 3.4.2 \$GNVTG

Message Structure:

\$xxVTG,cogt,T,cogm,M,knots,N,kph,K,posMode\*cs<CR><LF>

Example:

\$GPVTG,77.52,T,,M,0.004,N,0.008,K,A\*06

<b>Name</b>	<b>Unit</b>	<b>Format</b>	<b>Example</b>	<b>Description</b>
xxVTG	-	string	\$GPVTG	VTG Message ID (xx = current Talker ID)
cogt	degrees	numeric	77.52	Course over ground (true)
T	-	character	T	Fixed field: true
cogm	degrees	numeric	-	Course over ground (magnetic), not output
M	-	character	M	Fixed field: magnetic
knots	knots	numeric	4	Speed over ground
N	-	character	N	Fixed field: knots
kph	km/h	numeric	8	Speed over ground
K	-	character	K	Fixed field: kilometers per hour
posMode	-	character	A	Mode Indicator, also see section 5 "Position Fix Flags" <b>NMEA v2.3 and above only</b>
cs	-	hexadecimal	*06	Checksum
<CR> <LF>	-	character	-	Carriage return and line feed

### 3.4.3 \$GNGGA

Message Structure:

\$xxGGA,time,lat,NS,long,EW,quality,numSV,HDOP,alt,M,sep,M,diffAge,diffStation\*cs<CR><LF>

Example:

\$GPGGA,092725.00,4717.11399,N,00833.91590,E,1,08,1.01,499.6,M,48.0,M,,\*5B

<b>Name</b>	<b>Unit</b>	<b>Format</b>	<b>Example</b>	<b>Description</b>
xxGGA	-	string	\$GPGGA	GGA Message ID (xx = current Talker ID)
time	-	hhmmss.ss	092725.00	UTC time
lat	-	ddmm.mmmmm	4717.11399	Latitude (degrees & minutes)
NS	-	character	N	North/South indicator
long	-	dddmm.mmmmm	00833.91590	Longitude (degrees & minutes)
EW	-	character	E	East/West indicator
quality	-	digit	1	Quality indicator for position fix: <ul style="list-style-type: none"> <li>• 0 = No Fix / Invalid</li> <li>• 1 = Standard GPS (2D/3D)</li> <li>• 2 = Differential GPS</li> <li>• 6 = Estimated (DR) Fix</li> </ul> also see section 5 "Position Fix Flags"
numSV	-	numeric	8	Number of satellites used (range: 0-12)
HDOP	-	numeric	01.01.15	Horizontal Dilution of Precision
alt	m	numeric	499.6	Altitude above mean sea level
uAlt	-	character	M	Altitude units: meters (fixed field)
sep	m	numeric	48.0	Geoid separation: difference between geoid and mean sea level
uSep	-	character	M	Separation units: meters (fixed field)
diffAge	s	numeric	-	Age of differential corrections (blank when DGPS is not used)
diffStation	-	numeric	-	ID of station providing differential corrections (blank when DGPS is not used)
cs	-	hexadecimal	*5B	Checksum
<CR> <LF>	-	character	-	Carriage return and line feed



### 3.4.4 \$GNGSA

Message Structure:

\$xxGSA,opMode,navMode{,sv},PDOP,HDOP,VDOP,systemId\*cs<CR><LF>

Example:

\$GPGSA,A,3,23,29,07,08,09,18,26,28,,,,,1.94,1.18,1.54,1\*0D

<b>Name</b>	<b>Unit</b>	<b>Format</b>	<b>Example</b>	<b>Description</b>
xxGSA	-	string	\$GPGSA	GSA Message ID (xx = current Talker ID)
opMode	-	character	A	Operation mode: <ul style="list-style-type: none"> <li>• M = Manually set to operate in 2D or 3D mode</li> <li>• A = Automatically switching between 2D or 3D mode</li> </ul>
navMode	-	digit	3	Navigation mode: <ul style="list-style-type: none"> <li>• 1 = Fix not available</li> <li>• 2 = 2D Fix</li> <li>• 3 = 3D Fix</li> </ul> also see section 5 "Position Fix Flags"
<i>Start of repeated block (12 times)</i>				
sv	-	numeric	29	Satellite number
<i>End of repeated block</i>				
PDOP	-	numeric	01.01.94	Position dilution of precision
HDOP	-	numeric	01.01.18	Horizontal dilution of precision
VDOP	-	numeric	01.01.54	Vertical dilution of precision
systemId	-	numeric	1	NMEA defined GNSS System ID <b>NMEA v4.1 and above only</b>
cs	-	hexadecimal	*0D	Checksum
<CR> <LF>	-	character	-	Carriage return and line feed

### 3.4-5 \$GPGSV, \$GLGSV

Message Structure:

\$xxGSV,numMsg,msgNum,numSV,{,sv,elv,az,cno},signalId\*cs<CR><LF>

Example:

\$GPGSV,3,1,10,23,38,230,44,29,71,156,47,07,29,116,41,08,09,081,36,0\*7F

\$GPGSV,3,2,10,10,07,189,,05,05,220,,09,34,274,42,18,25,309,44,0\*72

\$GPGSV,3,3,10,26,82,187,47,28,43,056,46,0\*77

<b>Name</b>	<b>Unit</b>	<b>Format</b>	<b>Example</b>	<b>Description</b>
xxGSV	-	string	\$GPGSV	GSV Message ID (xx = GSV Talker ID)
numMsg	-	digit	3	Number of messages, total number of GSV messages being output
msgNum	-	digit	1	Number of this message
numSV	-	numeric	10	Number of satellites in view
<i>Start of repeated block (1..4 times)</i>				
sv	-	numeric	23	Satellite ID
elv	deg	numeric	38	Elevation (range 0-90)
az	deg	numeric	230	Azimuth, (range 0-359)
cno	dBH z	numeric	44	Signal strength (C/N0, range 0-99), blank when not tracking
<i>End of repeated block</i>				
signalId	-	numeric	0	NMEA defined GNSS Signal ID (0 = All signals) <b>NMEA v4.1 and above only</b>
cs	-	hexadecimal	*7F	Checksum
<CR> <LF>	-	character	-	Carriage return and line feed

### 3.4.6 \$GNGLL

Message Structure:

\$xxGLL,lat,NS,long,EW,time,status,posMode\*cs<CR><LF>

Example:

\$GPGLL,4717.11364,N,00833.91565,E,092321.00,A,A\*60

<b>Name</b>	<b>Unit</b>	<b>Format</b>	<b>Example</b>	<b>Description</b>
xxGLL	-	string	\$GPGLL	GLL Message ID (xx = current Talker ID)
lat	-	ddmm.mmmmm	4717.11364	Latitude (degrees & minutes)
NS	-	character	N	North/South indicator
long	-	dddmm.mmmmm	00833.91565	Longitude (degrees & minutes)
EW	-	character	E	East/West indicator
time	-	hhmmss.ss	092321.00	UTC time
status	-	character	A	V = Data invalid or receiver warning, A = Data valid also see section 5 "Position Fix Flags".
PosMode	-	character	A	Positioning mode, also see section 5 "Position Fix Flags" <b>NMEA v2.3 and above only</b>
cs	-	hexadecimal	*60	Checksum
<CR> <LF>	-	character	-	Carriage return and line feed

## 4 Technical Specifications

The technical specifications are subject to change for future products to incorporate technical improvements!

- Supported by Windows, Linux and Mac OS
- USB connection (serial protocol)
- BackUp storage capacitor
- NMEA 0183 Standard
- Serves GPS and GLONASS data
- Data transfer rate: 1s
- Warm start: 1s
- Cold start: 60 s
- Input voltage: 5 V DC
- Input current (maximum): 350 mA
- Input current (typical): 46 mA
- Weight: 60 g
- Dimensions: 50 x 50 x 20 mm