GPS CF Card Receiver

FGPCFCD02

Operating Manual

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TABLE OF CONTENTS

Usage Notice

Please read before you start to use the GPS receiver:

- GPS(Global Position System) is found and operated by US Department of defense. The Organization is responsible for accuracy and maintenance of the system with full authority. Any change that is made by the organization will affect accuracy and function of GPS.
- For your driving security, we strongly suggest that you do not operate the device during driving.
- When satellite is navigating, if you are inside a building, tunnel or near huge blocks, it will affect GPS satellite signal receiving. At this time, this device probably dose not have positioning capability.
- If you have a speed alarm in your car, the signal receiving of this device will be interfered. If this situation happens, please stop using your speed alarm.
- Please do not expose this device to sun for a long time to avoid damage to internal precision circuit.

1 BASIC COMPONENT

1.1 Top view:

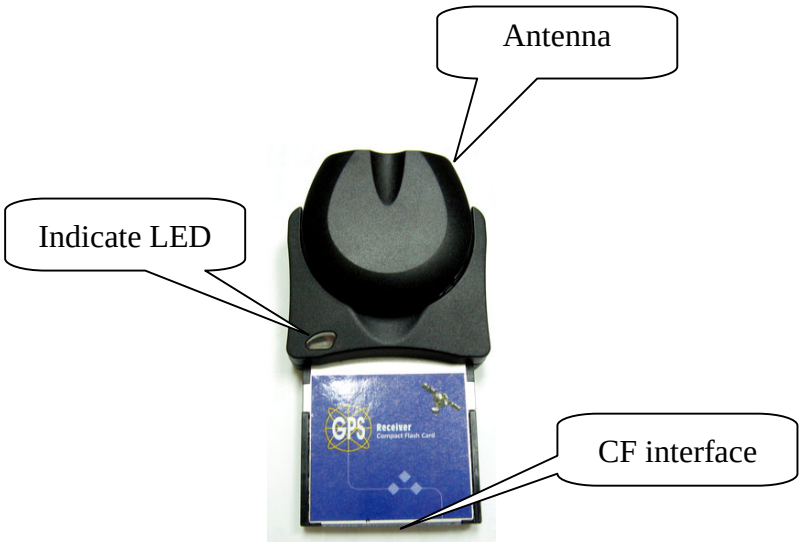


Fig 1. GPS CF card top view

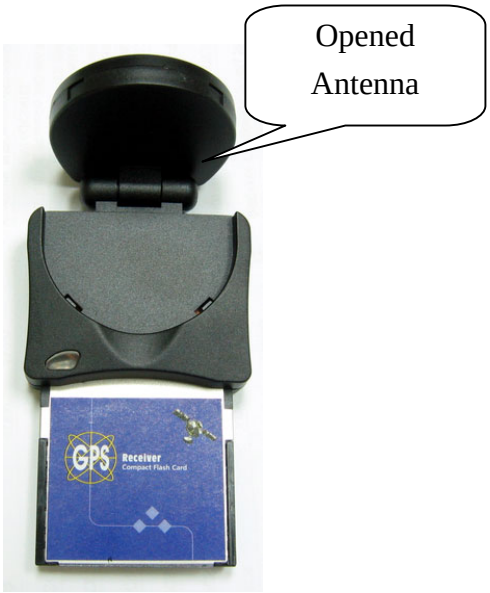


Fig 2. GPS CF card with antenna opened

1.2 Rear view:

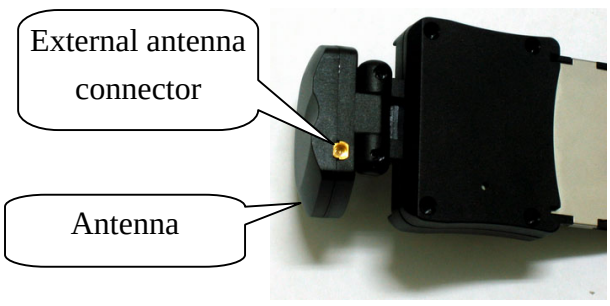


Fig 3. GPS CF card antenna

Fig 4. With external antenna

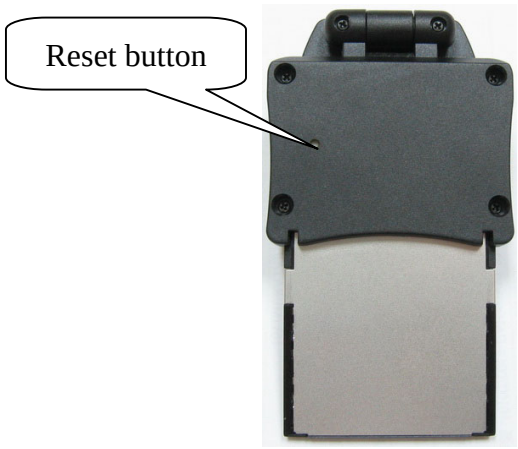


Fig 5. GPS CF card rear view

1.3 Side view and Open the antenna:

Fig 6. Antenna open procedure

2 INTRODUCTION

2.1 Caution:

2.1.1 New user: With GPS 3D fix in map software, put the GPS receiver under satellites signal environment about 15~20 min for updating ALMANAC data while using firstly.

2.1.2 Whenever not in use over 3 months or travel 500 Km away from the original location, please insert GPS CF card receiver into CF slot of your PDA, repeat 2.1.1 again.

2.1.3 Overview

The FGPCFCD02 CF GPS receiver is a total solution GPS Receiver designed for use with PDA, Tablet PC, Wall plate PC or any portable PCs. Features the revolutionary FirstGPS^{TM} architecture. This completes tracking capabilities in urban canyon conditions. The FGPCFCD02 delivers major advancements in GPS needs such as car navigation, mapping, surveying, security, agriculture and so on, only clear view of sky and certain power supply are necessary to the unit.

2.2 Features

- Facilitating FirstGPS™ core technology.
- High sensitivity: to-173 dBW tracking, superior urban canyon performances.
- High positioning accuracy_ < 5m (50% CEP), OR <7M (95% CEP) without SA (horizontal).
- Ultra low power: 35mA typical with active antenna – tracking at 3.3 Volts, full power.
- A rechargeable battery sustains internal clock and memory and is recharged during normal operation.
- LED display status: The LED provides users visible positioning status,
  GREEN LED"ON" when power connected;
  RED LED "BLINKING" while GPS in acquiring;
  RED LED "ON" when GPS is fixed.
- Reset button: See Fig 3.
  Push 1~2 secs for last position (longitude, latitude) deletion.
  Push 4~6 secs for cold start, UTC, longitude, latitude will be zeroing. Proper will take 2~5 min to 3D fix.

2.3 FirstGPS™ Architecture Highlights

2.3.1 Industry leading GPS Performance

- Builds on high performance FirstGPS™ .
- Satellite signal tracking engine to perform GPS acquisition and tracking functions without CPU intervention.
- High sensitivity: to –143 dBm (-173dBW) tracking, superior urban canyon performances.
- Position accuracy:< 5m (50% CEP) or < 7M (95% CEP) without SA (horizontal)
- Warm start is under 42 seconds (90%)
- Hot Start is under 10 seconds (90%)

2.3.2 Low Power

- Ultra low power integrated circuit design, optimized RF and DSP architectures
- Further power saving thanks to 4 different power down mode

2.4 Technology specifications

2.4.1 Physical Dimension

Single construction integrated antenna and receiver.

- Size: 90.2(L) x 50.2(W) x 23.4(H) (mm)
- 3.55"(W)*1.98"(D)*0.92(H) (inch)

2.4.2 Environmental Characteristics

- Operating temperature: -10°C to +70°C (internal temperature).
- Storage temperature: -40°C to +85°C

2.4.3 Electrical Characteristics

- Input voltage: +3.0 ~ 3.6VDC
- Backup power: 3V Rechargeable Lithium cell battery.

2.4.4 Performance

- Tracks up to 8 satellites.
- Update rate: 1 second.
- Acquisition time

Reacquisition	1	sec.
Hot start	10	sec. (90%)
Warm start	42	sec. (90%)
Cold start	120	sec. (90%)

- Position accuracy:
  - NON-DGPS

    Position <5 meter (50% CEP) or < 7 meter (95% CEP)

    Velocity 0.05 meters/second, typical
  - DGPS (Differential GPS)

    Position <1 meter, typical

    Velocity 0.05 meters/second, typical
- Dynamic Conductions:

Altitude	16,000	meters (60,000 feet) max
Velocity	515	meters / second (1000 knots) max
Acceleration	4G	max.
Jerk	20	meters / second, max

2.5 Important Characters

Receiver	L1, C/A code
Channels	8
Update Rate	1/second down to 1/min
Satellite Reacquisition Time	< 1 second
Hot Start	< 10 seconds (90%)
Warm Start	< 42 seconds (90%)
Cold Start	< 120 seconds (90%)
Tracking Sensitivity	-173 dBW
Power consumption (Full Power)	< 35 mA at 3.3 Volts
Voltage Supply	3.0 - 3.6 Volts
Protocol	NMEA 0183 V3.01
Position Accuracy	3 meters CEP (50%) horizontal, SA off < 1 meter, DGPS corrected

Interfaces

- NMEA 0163 Version 2.1 ASCll output (GPGGA, GPGLL, GPGSA, GPGSV, GPRMC, GPVTG, GPZDA)

3 Operational characteristics

3.1 Initialization

As soon as the initial self-test is complete, the GPS CF card receiver begins the process of satellite acquisition and tracking automatically. Under normal circumstances, it takes approximately 120 seconds to achieve a position fix, 42 seconds if ephemeris data is known. After a position fix has been calculated, information about valid position, velocity and time is transmitted over the output channel.

The GPS CF card receiver utilizes initial data, such as last stored position, date, time and satellite orbital data, to achieve maximum acquisition performance. If significant inaccuracy exists in the initial data, or the orbital data is obsolete, it may take more time to achieve a navigation solution. The FirstGPS^{TM} feature is to provide fast and accurate position. However, acquisition performance can be impacted when the host system initializes the GPS CF card receiver in the following situation:

1) Moving further than 500 kilometers.
2) Failure of data storage due to the inactive internal memory battery.

3.2 Navigation

After the acquisition process is completed, the GPS CF card receiver sends valid navigation information over output channels. These data include:

1) Latitude / longitude / altitude
2) Velocity
3) Date / time
4) Error estimates
5) Satellite and receiver status

4 Hardware

4.1 Dimension

90.2(L) x 50.2(W) x 23.4(H) (mm)
3.55”(W)*1.98”(D)*0.92(H) (inch)

4.2 Hardware Interface

The GPS CF card receiver includes an antenna. Simply insert it into the CF slot of a PDA, or other devices, or insert it in a PCMCIA adapter.

4.3 Connector

Standard 50 pins CF type 1 connectors.

5 Software Protocol

The GPS CF card receiver protocol is based on the National Marine Electronics

Association's NMEA 0183 ASCII interface specification, which is defined in NMEA 0183, Version 3.01.

5.1 NMEA Transmitted Messages

The GPS CF card receiver outputs data in NMEA-0183 format as defined by the National Marine Electronics Association (NMEA), Standard. The default communication parameters for NMEA output are 4800 baud, 8 data bits, stop bit, and no parity.

NMEA Sentence	Description
GPGGA	Global positioning system fixed data
GPGLL	Geographic position latitude \ longitude
GPGSA	GNSS DOP and active satellites
GPGSV	GNSS satellites in view
GPRMC	Recommended minimum specific GNSS data
GPVTG	Course over ground and ground speed
GPZDA	Data and Time

Table 4-1 NMEA-0183 Output Messages

5.1.1 Global Positioning System Fix Data (GGA)

Table 4-2 contains the values for the following example:

$GPGGA, 1612229,487,3723,2475,N,12158.3416,W,1,07,1,0,9,0,,,,0000*18

Name	Description	Units	Description
Message ID	$GPGGA		GGA protocol header
UTC Time	161229.487		Hhmmss.sss
Latitude	3723.2475		ddmm.mmmm
N/S Indicator	N		N = north or S = south
Longitude	12158.3416		dddmm.mmmm
E/W Indicator	W		E = east or W = west
Position Fix Indicator	1		See Table4-3
Satellites Used	07		Range 0 to 12
HDOP	1.0		Horizontal Dilution of Precision
MSL Altitude	9.0	Meters	
Units	M	Meters	
Geoid Separation		Meters	
Units	M	Meters	
Age of Diff. Corr.		Second	Null fields when DGPS is not used
Diff. Ref. Station ID	0000		
Checksum	*18		
<CR> <LF>			End of message temination

Table 4-2 GGA Data Format

Value	Description
0	0 Fix not available or invalid
1	GPS SPS Mode fix valid
2	Differential GPS, SPS Mode fix valid
3	GPS PPS Mode fix valid

Table 4-3 Position Fix Indicators

5.1.2 Geographic Position - Latitude/Longitude (GLL)

Table 4-4 contains the values for the following example
$GPGLL,3723.2475,N,12158.3416,W,161229.487,A*2C

Name	Example	Units	Description
Message ID	$GPGLL		GLL protocol header
Latitude	3723.2475		dd mm.mmmm
N/S Indicator	N		N = north or S = south
Longitude	12158.3416		ddd mm.mmmm
E/W Indicator	W		E = east or W = west
UTC Position	161229.487		hh mm ss.sss
Status	A		A = data valid or V = data not valid
Checksum	*2C		
<CR><LF>			End of message termination

Table 4-4 GLL Data Format

5.1.3 GNSS DOP and Active Satellites (GSA)

Table 4-5 contains the values for the following example

$GPGSA,A,3,07,02,26,27,09,04,15, , , , , ,1.8,1.0,1.5*33

Name	Example	Units	Description
Message ID	$GPGSA		GSA protocol header
Mode 1	A		See Table 4-6
Mode 2	3		See Table 4-7
Satellite Used *1	07		SV on Channel 1
Satellite Used *1			SV on Channel 2
…..			…...
Satellite Used *1			SV on Channel N
PDOP	1.8		Position Dilution of Precision
HDOP	1.0		Horizontal Dilution of Precision
VDOP	1.5		Vertical Dilution of Precision
Checksum	*33		
<CR><LF>			End of message termination

*1 Satellite used in solution.

Table 4-5 GSA Data Format

Table 4-6 Mode 1

Value	Description
M	Manual – forced to operate in 2D or 3D mode
3	Automatic – allowed to automatically switch 2D/3D

Table 4-7 Mode 2

Value	Description
1	Fix Not Available
2	2D
3	3D

5.1.4 GNSS Satellites In View (GSV)

Table 4-8 contains the values for the following example

$GPGSV,2,1,07,07,79,048,42,02,51,062,43,26,36,256,42,27,27,138,42*71

$GPGSV,2,2,07,09,23,313,42,04,19,159,41,15,12,041,42*41

Name	*Example*	*Units*	*Description*
Message ID	$GPGSV		GSV protocol header
Number of Messages1	2		Range 1 to 3
Message Number 1	1		Range 1 to 3
Satellites in View	07		Range 1 to 12
Satellite ID	07		Channel 1 (Range 1 to 32)
Elevation	79	degrees	Channel 1 (Maximum 90)
Azimuth	048	degrees	Channel 1 (True, Range 0 to 359)
SNR (C/No)	42	dBHz	Range 0 to 99, null when not tracking
…..	……		
Satellite ID	27		Channel 4 (Range 1 to 32)
Elevation	27	degrees	Channel 4 (Maximum 90)
Azimuth	138	degrees	Channel 4 (True, Range 0 to 359)
SNR (C/No)	42	dBHz	Range 0 to 99, null when not tracking
Checksum	*71		
<CR><LF>			End of message termination

Table 4-8 GSV Data Format

NOTE: Items <4>,<5>,<6> and <7> repeat for each satellite in view to a maximum of four (4) satellite per sentence. Additional satellites in view information must be sent in sentences. These fields will be null if unused.

5.1.5 Recommended Minimum Specific GNSS Data (RMC)

Table 4-9 contains the values for the following example

$GPRMC,161229.487,A,3723.2475,N,12158.3416,W,0.13,309.62,120598, 02.6,W*10

Name	Example	Units	Description
Message ID	$GPRMC		RMC protocol header
UTC Position	161229.487		Hh mm ss.sss
Status	A		A = data valid or V = data not valid
Latitude	3723.2475		dd mm.mmmm
N/S Indicator	N		N = north or S = south
Longitude	12158.3416		ddd mm.mmmm
E/W Indicator	W		E = east or W = west
Speed Over Ground	0.13	knots	
Course Over Ground	309.62	degrees	True
Date	120598		dd mm yy
Magnetic Variation1	02.6	degrees	
E/W Indicator	W		E = east or W = west
Checksum	*10		
<CR><LF>			End of message termination

Table 4-9 GSV Data Format

5.1.6 Course Over Ground and Ground Speed (VTG)

Table 4-10 contains the values for the following example
$GPVTG,309.62,T,,M,0.13,N,0.2,K*6E

Name	Example	Unit	Description
Message ID	$GPVTG		VTG protocol header
Course	309.62	Degrees	Measured heading
Reference	T		
Course		Degrees	Measured heading
Reference	M		Magnetic[*1]
Speed	0.13	Knots	Measured horizontal speed
Units	N		
Speed	0.2	Km/hr	Measured horizontal speed
Units	K		Kilometer per hour
Checksum	*6E		
<CR><LF>			End of message termination

[*1]:All "course over ground" data are geodetic WGS84.

Table 4-10 VTG Data Format

5.1.7 Time & Date (ZDA)

Table 4-11 contains the values for the following example:

$GPZDA,114523.62,12,04,2001,10,34*6E

Name	Example	Units	Description
Message ID	$GPZDA		ZDA protocol header
Hour, Min, Sec, Sub Sec	114523.62		Hhmmss.ss
Day	12		day in UTC, 01 to 31
Month	4		month in UTC, 01 to 12
Year	2001		year in UTC
Local Zone Hours	10		local zone hours, +/- 13 hours
Local Zone Minutes	34		local zone minutes, 0 to +59
Checksum	*6E		
<CR><LF>			End of message termination

Table 4-11 ZDA Data Format

6 Order Information

6.1 Product Options

FGPCFCD02

FGPCFPKG01

6.2 Color Option

Black

Other Color: By demand

7 Warranty

The FGPCFCD02 is warranted to be free from defect in materials and functions for one year from the date of purchase. Any failure of this product within the period under normal conditions will be replaced at no charge to the customers.

This warranty does not cover failures due to abuse, misuse, accident, or unauthorized alteration or repairs, inappropriate disassemble.

8 Caution

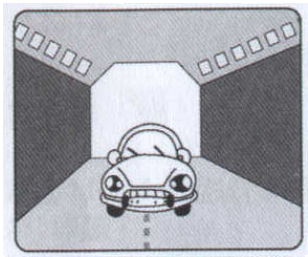
8.1 Keep away from radio/RG equipment.

8.2 Give the receiver as much exposure to the sky as possible to ensure maximum signal strength.

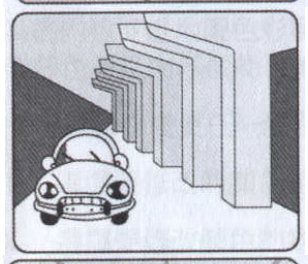
9 Troubleshooting Guide

9.1 GPS Signal Bad

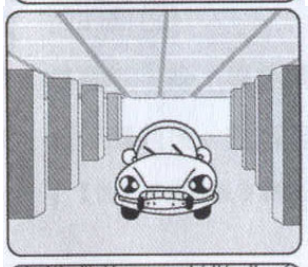
GPS signal bad location: Here is the location list may not able to receive GPS signal or signal bad:



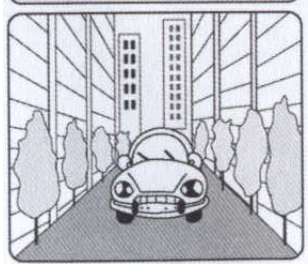
➢ Inside tunnel, unable to receive GPS signal. Please leave and retry.



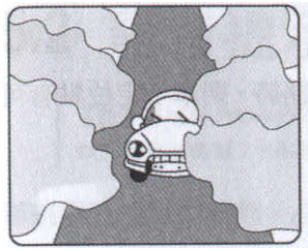
➢ Covers above, unable to receive GPS signal. Please leave and retry.



➢ Inside building, unable to receive GPS signal. Please leave and retry.



➢ Besides building, the GPS signal may be interfered. Please leave and retry.



➢ Inside jungle, too many trees around may interfere the GPS signal.

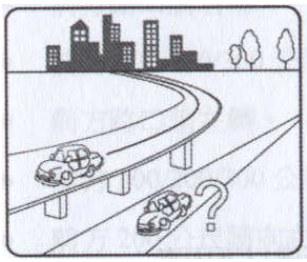
- Sun control film: if you use the GPS receiver inside the car, some sun control film may cut-off the GPS signal. You can try our external antenna.
- External antenna signal quality bad: If you usually wrap the cable of external antenna

like the picture below. We found that it will cause the signal decay if you do so. Please unwrap it.

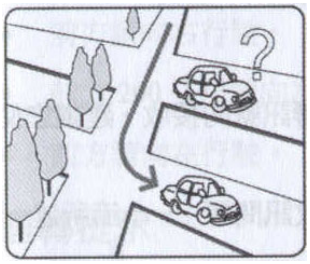
- GPS satellites are governed by America Ministry of National Defense. Sometimes they will downgrade the preciseness level. In such case, the position may not exactly where they are.

9.2 Position Fix Deviation

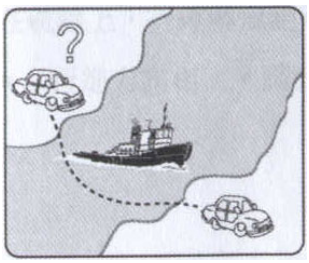
The position fix diversion situation below doesn't mean the GPS receiver malfunction:



- The position is shown at the road beside while you are driving on an overpass.



- Driving on a grid shape road and the distance between 2 lanes is smaller than the auto-road-lock definition of your map software; you might see your car is located at the wrong lane.



- If you transport the GPS receiver without GPS signal, the GPS receiver will keep the older location information.

9.3 Unable to Fix Position

If you see [No Fix] shown at your map software after you start the GPS receiver, please consider the possibility below:

- Please wait a few minutes. GPS position inquire may need minutes.
- Please make sure you put the GPS receiver at the proper location. Some sun-control film for cars may cut-off the GPS signal. You may purchase an external antenna to

solve such problem.

- Please make sure you are not inside the GPS signal shading area. Please refer the chapter [GPS Signal Bad].