CompactGPS™

User Manual

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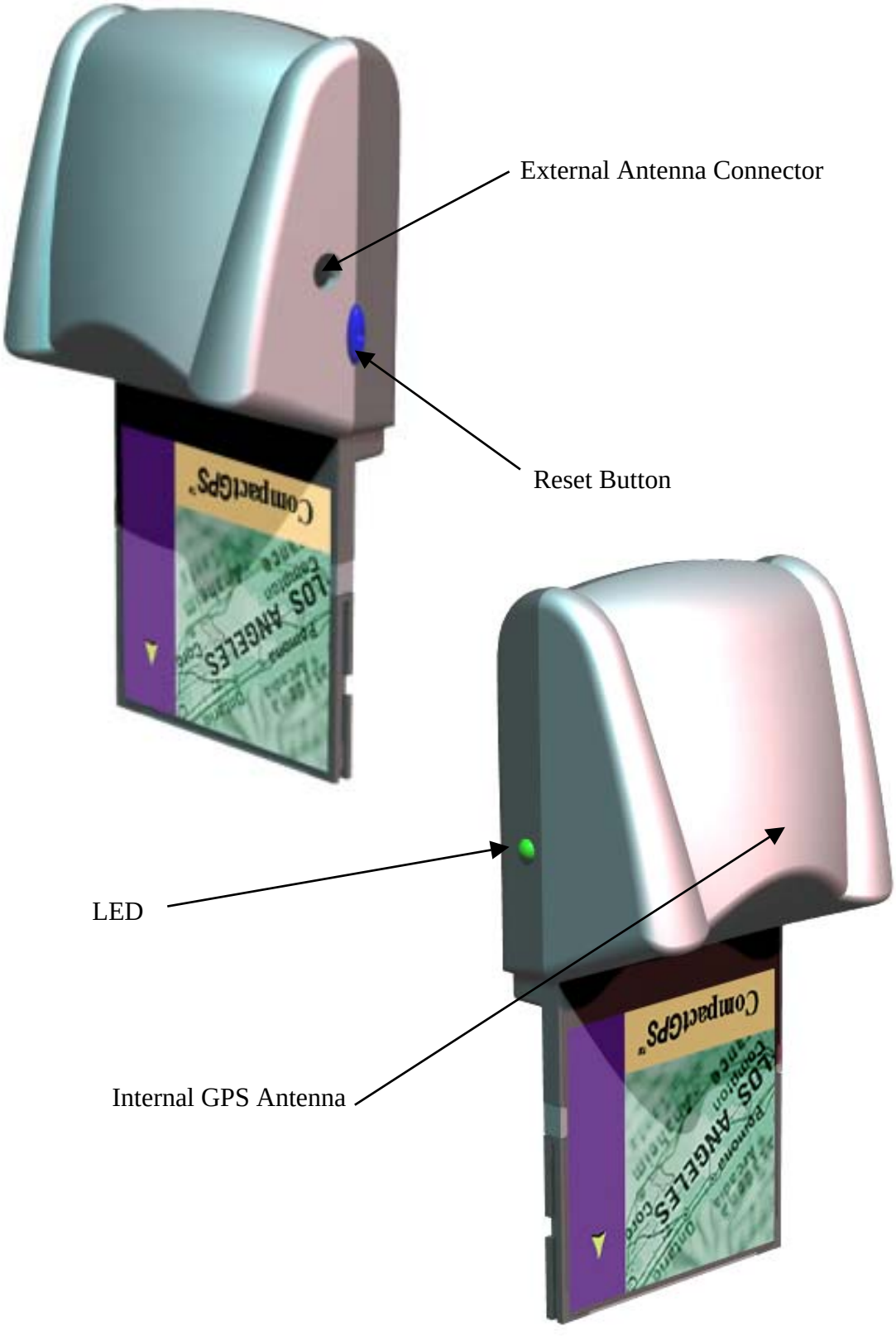
CompactGPS™ at A Glance



About CompactFlash™

The CompactFlash™ Association (CFA) was established in October 1995 with the premise that CompactFlash™ (CF) technology would enable the introduction of a new class of advanced, small lightweight, low power mobile products that would significantly increase the productivity and enhance the lifestyles of millions of people.

The concept behind CF technology was simple: to capture, retain and transport data, audio and images on CompactFlash™ Storage Cards. CF Storage Cards provided the capability to easily transfer all types of digital information and software between a large variety of digital systems.

The CFA approved and published the CompactFlash™ standard. This vendor-independent specification enabled users to develop CF products that function correctly and are compatible with future CF designs, eliminating compatibility issues.

Now the CFA has developed the CF+ specification to expand the CF concept beyond flash data storage and include I/O devices and magnetic disk data storage. The CF+ specification also includes the original Type I (3.3mm thick) card and newer Type II (5mm thick) cards. While CompactFlash™ and many I/O devices can fit into the Type I card, the Type II cards enable higher capacity CompactFlash™ cards, magnetic disk cards and many additional I/O cards.

What Is CompactGPS™?

CompactGPS™ introduces a GPS module in CompactFlash™ interface. CompactGPS™ represents the latest ingenious GPS technology from the leading GPS receiver manufacturer.

Inserting it and implementing a map or navigation software, CompactGPS™ will convert the compatible devices for GPS functions, such as locate one or multiple objects, conduct personal & vehicle navigation, and / or apply for geographical surveys.

What Have Inside the Package?

Before you start up, make sure that your package includes the following items. If any items are missing or damaged, contact your dealer immediately. Please refer to the contact information on the last page of this manual.

- ◆ GPS Receiver
- ◆ User Manual CD
- ◆ External Antenna (Option)
- ◆ Warranty Card

What Is GPS?

In 1974 the USA Department of Defense set about developing a Global Positioning System (GPS), a constellation of 24 satellites that Orbits 12,000 miles above the Earth. Using triangulation of signals from four of the satellites, a receiving unit on earth can pinpoint its current location to within a few meters. A GPS device receives the GPS data from satellites and then converts the GPS data into longitude, latitude, and altitude (LLA) data, velocity, time and etc. Position and navigation information is vital to a wide range of professional and recreational activities covering surveying, search and rescue, tracking, hiking, navigating, and so forth.

Description of the interfaces

LED Function

LED off	GPS receiver switch off
LED on	GPS receiver searching signal
LED flashing	GPS signal is fixed.

Reset Button

When push the Reset button, it will initialize and restart the CompactGPS™ system.

External Antenna Connector/External GPS antenna

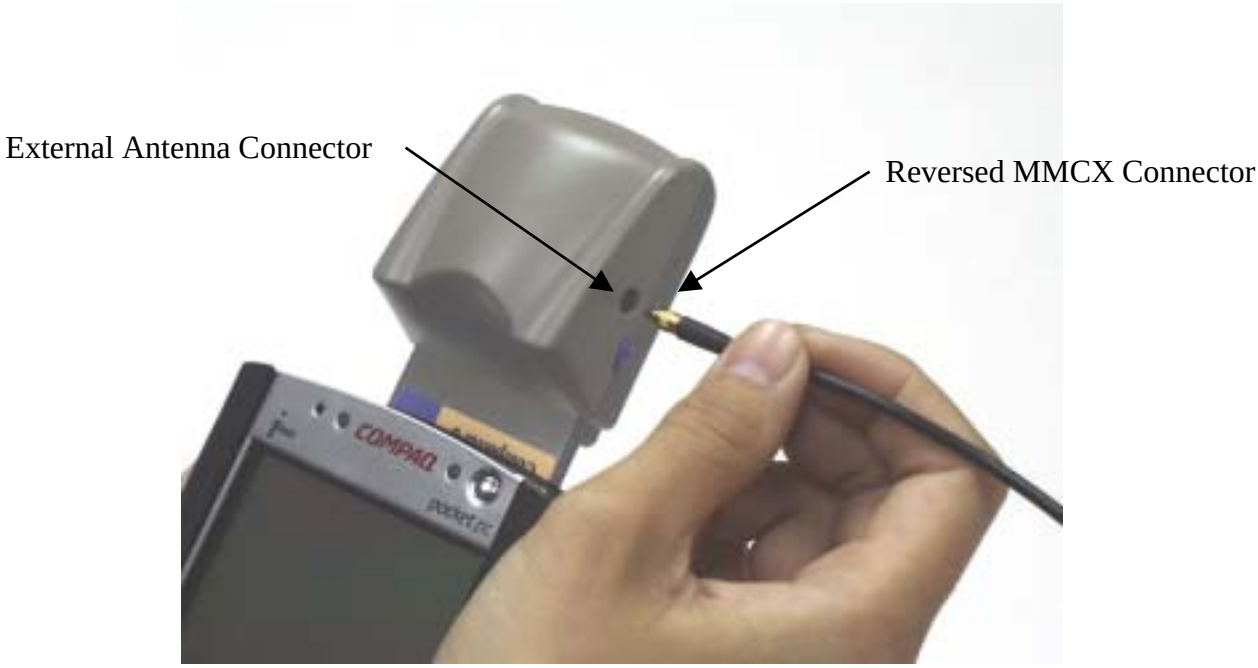
This connector is designed for external GPS antenna. Please refer the Accessory Specifications for detail descriptions and specification of external antenna.

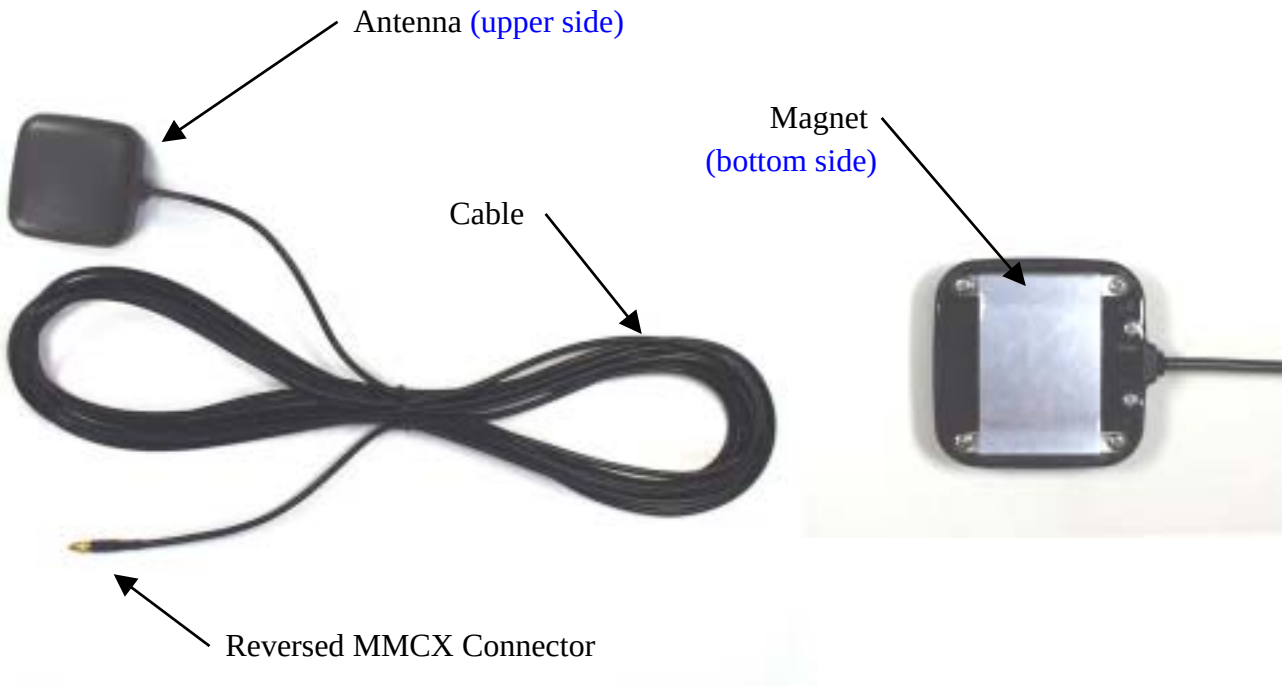
When to use the External Antenna

When you are in a car, or any environments that GPS signal is blocked, the external GPS antenna will help to receive better GPS signal. Please place the external GPS antenna in an outdoor open-space to ensure a better GPS performance.

How to use the External Antenna

Plug the reversed MMCX connector of the external antenna to the jack on CompactGPS™. Place the external antenna on the roof of the car or an outdoor open-space, and make sure place it in correct direction. That is, the side with magnetic is the bottom side, and the upper side must face to sky in order to receive better signal reception.





How to Install & Operate CompactGPS™

The CompactGPS™ supports plug and play.

1.If your PDA or laptop have CompactFlash™ slot just plug your CompactGPS™ into the slot.

2.If you don't have the CompactFlash™ slot but you got a PCMCIA slot, then you can apply a adapter to connect your CompactGPS™ to PCMCIA slot.

Note:

1.In order to see NMEA0183 navigational data, use the Hyper Terminal program of Windows 95/98®. Please setup the COM port connected with CompactGPS™ to:

Baud rate:	4800
Data bit:	8
Parity:	None
Stop bit:	1
Flow control:	None.

2.Refer to NMEA 0183 data format.

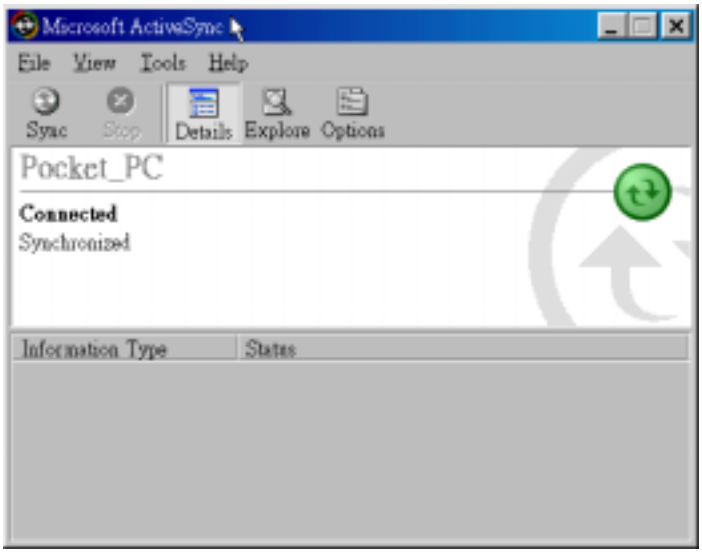
How to Test Your CompactGPS™

Install Guide:

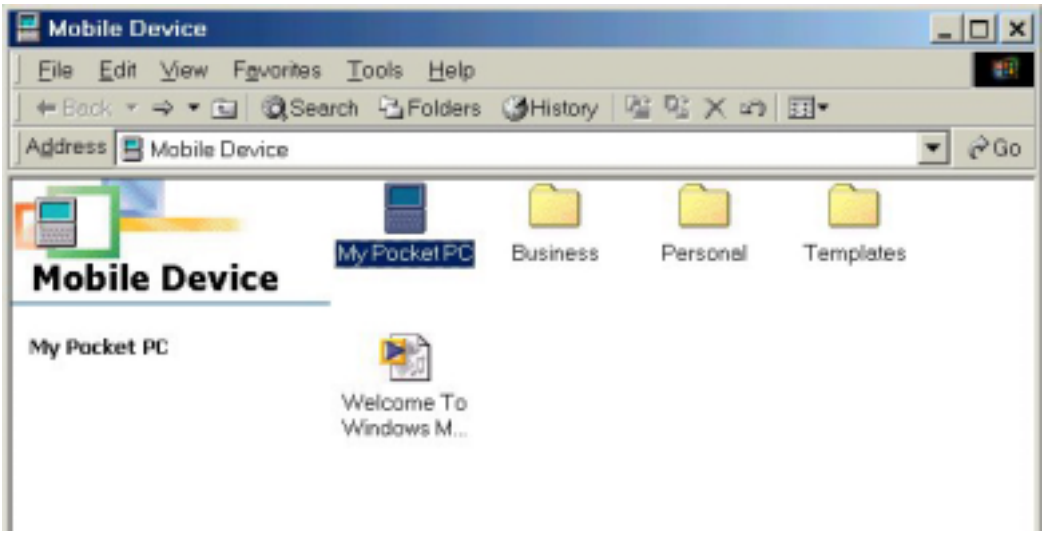
1. Copy GPSDemo.exe from PC to your Pocket PC.

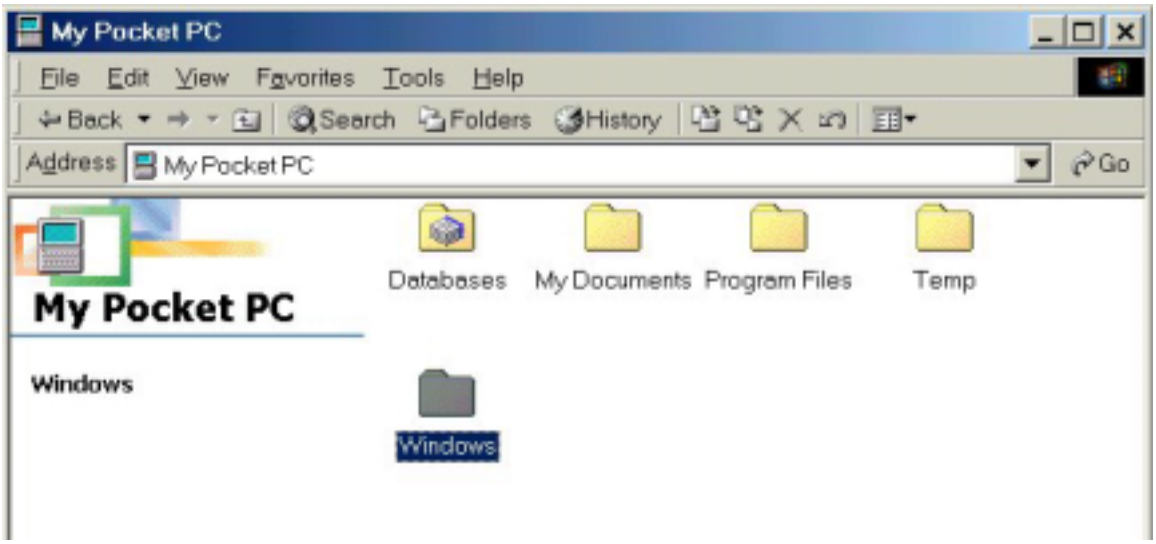
(1) Install Microsoft ActiveSync to your PC. Refer to your Pocket PC manual for installation procedure.

(2) Setup your Pocket PC cradle to Desktop PC UART port. The Microsoft ActiveSync will detect your Pocket PC automatically.



(3) After finish the connection between PC and the Pocket PC. Copy GPSDemo.exe file to the target path: \Mobile Device\My Pocket PC\windows\Start Menu. ActiveSync will automatically transfer to Pocket PC




My Pocket PC
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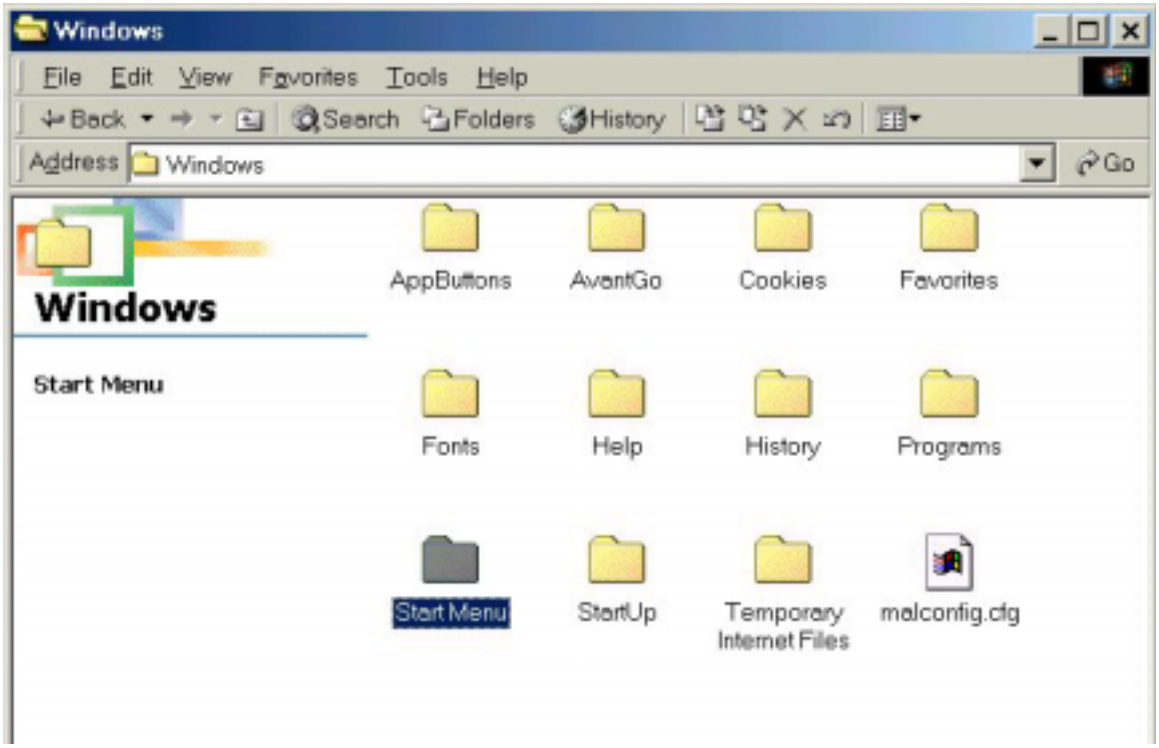
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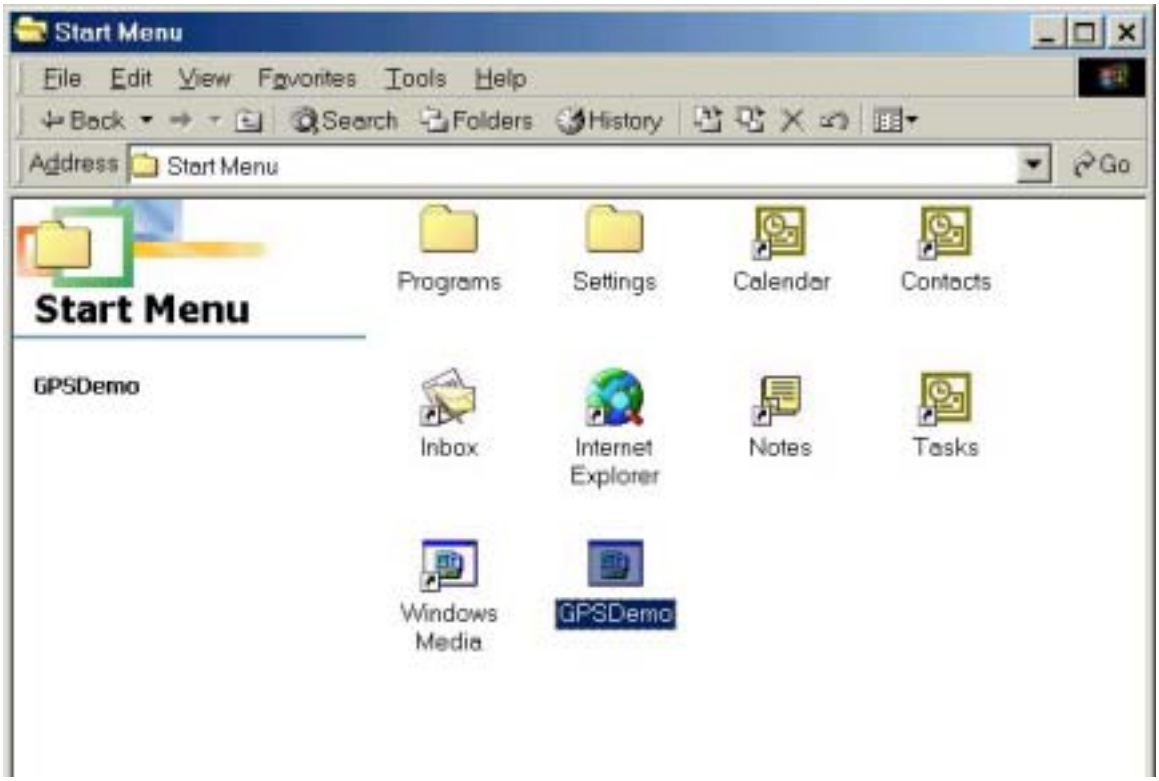
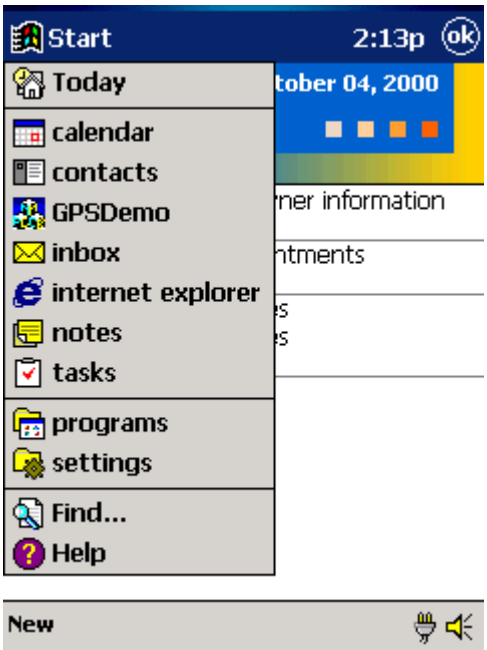
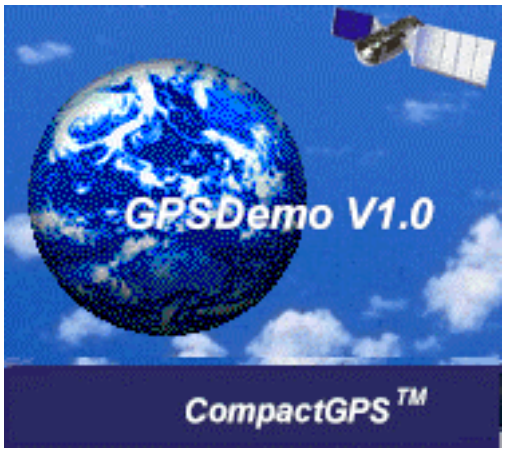


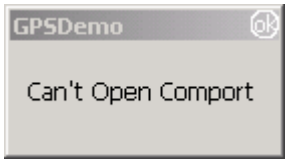
2. Execute GPSDemo by double click the GPSDemo Icon as show below.



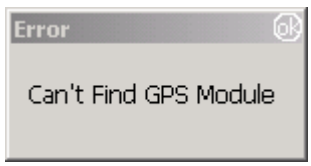
3. Show initial Logo



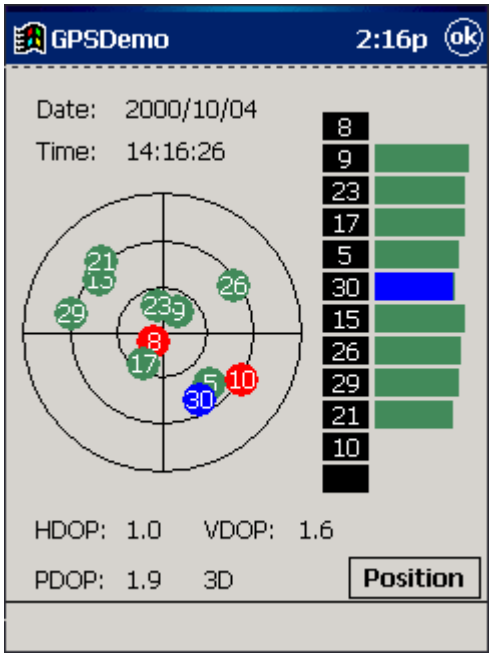
If there is no GPS module on the CompactFlash™ slot, it will show Message “Can’t Open Comport”. Then, please try to choose other Comport, (For example :If you use HP Jornada PDA you can try to choose Com 2) you must insert the GPS module and enter OPEN button to restart.



4. If the GPS module can’t receive any signal in about 5 seconds, it will show Message “Can’t Find GPS Module”. Then, you must insert the GPS module and enter OPEN button to restart.



5. If everything is ok, it will show the satellite diagram like below. Push the **ok** button on title bar will terminate the program. Enter the “Position” Button will change to Position diagram



6. Position Diagram will show the position. Enter **ok** button can return to the satellite diagram. Push **Cold St.** button can clear the GPS module data and initialize GPS data receiving.

Specifications

Physical characteristics

Dimension	48mm(W) * 103.5mm(L) * 33mm(H)
Weight	65 grams

Temperature characteristics

Storage temperature:	-20℃ ~ + 65℃.
Operating temperature:	0℃ ~ + 55℃.

General

Sensitivity	-135 dBm
Channels	12 channels
L1	1575.42 MHz.
C／A code	1.023MHz chip rate.

Accuracy

Position accuracy：10m, 95%

Velocity accuracy：0.1 meters / second without SA

Time accuracy：1 microsecond synchronized to GPS time.

Datum

WGS-84.

Position update period

Every 1 second

Dynamic conditions

Altitude：18000 meters (60000 feet) max.

Velocity：515 meters / second max.

Acceleration：4 G, max.

Jerk：20 meters / second^3, max.

Power

It shall use the following power	：DC 3.3V ± 10 %
Full/Max current	：160mA
Trickle/Min current	：35mA
Typical current	：80mA

Accessory Specifications

External GPS Antenna

Physical characteristics

Dimensions	45mm(W)*45mm(L)*15mm(H)
Cable length	500cm
Weight	110 ± 10g (typical)
Connector	Reversed MMCX (180°)
Cable	RG-174
Color	Black

Temperature characteristics

Storage temperature:	-40℃ ~ +85℃
Operating temperature:	-30℃ ~ +80℃

General

Center Frequency	1575.42 ± 1.023 MHz
LNA Gain	26dB(min, at 25±15℃)
Noise Figure	2.0dB(max, at 25±15℃)
Voltage	3.3 ±0.3V
Current	12mA(max)

Software Data

NMEA V2.2 Protocol

It is the compact flash interface

NMEA Output Messages

The CompactGPS™ outputs the following messages as shown in Table 1：

Table 1　NMEA Output Messages

NMEA Record	Description
GGA	Global positioning system fixed data
GSA	GNSS DOP and active satellites
GSV	GNSS satellites in view
RMC	Recommended minimum specific GNSS data

GGA－Global Positioning System Fixed Data

Table 2 contains the values of the following example：

$GPGGA, 161229.487, 3723.2475, N, 12158.3416, W, 1, 07, 1.0, 9.0, M, , , ,0000*18

Table 2　GGA Data Format

Name	Example	Units	Description
Message ID	$GPGGA		GGA protocol header
UTC Position	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 Table 2-1
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 termination

Table 2-1　Position Fix Indicator

Value	Description
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

GSA－GNSS DOP and Active Satellites

Table 3 contains the values of the following example：

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

Table 3　GSA Data Format

Name	Example	Units	Description
Message ID	$GPGSA		GSA protocol header
Mode 1	A		See Table 3-2
Mode 2	3		See Table 3-1
Satellite Used[1]	07		Sv on Channel 1
Satellite Used[1]	02		Sv on Channel 2
….			….
Satellite Used[1]			Sv on Channel 12
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

Table 3-1　Mode 1

Value	Description
1	Fix not available
2	2D
3	3D

Table 3-2　Mode 2

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

GSV－GNSS Satellites in View

Table 4 contains the values of the following example：

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

Table 4　GSV Data Format

Name	Example	Units	Description
Message ID	$GPGSV		GSV protocol header
Number of Messages[1]	2		Range 1 to 3
Messages Number[1]	1		Range 1 to 3
Satellites in View	07		
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

RMC－Recommended Minimum Specific GNSS Data

Table 5 contains the values of the following example：
$GPRMC, 161229.487, A, 3723.2475, N, 12158.3416, W, 0.13, 309.62, 120598, ,*10

Table 5　RMC Data Format

Name	Example	Units	Description
Message ID	$GPRMC		RMC protocol header
UTC Position	161229.487		hhmmss.sss
Status	A		A=data valid or V=data not valid
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
Speed Over Ground	0.13	knots	
Course Over Ground	309.62	degrees	True
Date	120598		ddmmyy
Magnetic Variation		degrees	E=east or W=west
Checksum	*10		
＜CR＞＜LF＞			End of message termination

How to enable Push To Fix function

1. Switch the communication protocol from NMEA to SIRF binary
2. Enable PTF function
3. Switch back to NMEA protocol with the output rate as following:

GPGGA 1/s

GPGSA 1/s

GPGSV 5/s

GPRMC 1/s

Set SIRF protocol at NMEA protocol

This command message is used to set the protocol (SiRF Binary or NMEA) and/or the communication parameters (baud rate, data bits, stop bits, parity). Generally, this command is used to switch the module back to SiRF Binary protocol mode where a more extensive command message set is available. When a valid message is received, the parameters are stored in battery-backed SRAM and then the Evaluation Unit restarts using the saved parameters.
Table 6 contains the input values for the following example: Switch to SIRF Binary protocol at 9600,8,N,1

$PSRF100,0,9600,8,1,0*0C

Table 6 Set Serial Port Data Format

Name	Example	Units	Description
Message ID	$PSRF100		PSRF100 protocol header
Protocol	0		0=SiRF Binary, 1=NMEA
Baud	9600		4800,9600,19200,38400
Data Bits	8		8,7[1]
Stop Bits	1		0,1
Parity	0		0=None ,1=Odd,2=Even
Checksum	*0C		
<CR><LF>			End of message termination

[1]SiRF protocol is only valid for 8data bits, 1 stop bit, and no parity.

Protocol to enable the Push To Fix function---Message I.D. 151

Table 7 contains the input values for the following example: Sets the receiver into low power Modes. Example: Set receiver to PTF off.

A0A20009—Start Sequence and Payload Length

97000000C8000000C8—Payload

0227B0B3—Message Checksum and End Sequence

Table 7 Set Trickle Power Parameters I.D. 151

Name	Bytes	Binary(Hex) Scale	Example	Units	Description
Message ID	1		97		ASCII 151
Push To Fix Mode	2		0000		ON=1, OFF=0
Duty Cycle	2	*10	00C8	%	% Time on
Milli Seconds On Time	4		000000C8	ms	Range 200 ~ 500 ms

Payload Length: 9bytes.

Push-to-Fix

In this mode the receiver will turn on every 30 minutes to perform a system update consisting of a RTC calibration and satellite ephemeris data collection if required (i.e., a new satellite has become visible) as well as all software tasks to support SnapStart in the event of an NMI. Ephemeris collection time in general this takes 18 to 30 seconds. If ephemeris data is not required then the system will re-calibrate and shut down. In either case, the amount of time the receiver remains off will be in proportion to how long it stayed on:

Off period = (On Period*(1-Duty Cycle) / Duty Cycle)

Off Period is limited to 30 minutes. The duty cycle will not be less than approximately On Period/1800, or about 1%. Push-to-Fix keeps the ephemeris for all visible satellites up to date so position/velocity fixes can generally be computed within SnapStart times (when requested by the user) on the order of 3 seconds.

Switch To NMEA Protocol at Sirf protocol– Message I.D. 129

Table 8 contains the input values for the following example:

Request the following NMEA data at 9600 baud:

GGA – ON at 1 sec, GLL – 1sec, GSA – ON at 1 sec GSV – ON at 1 sec, RMC – 1 sec, VTG – 1 sec

Example:

A0A20018 – Start Sequence and Payload Length

8102010100010501050100010001000100010001000112C0 – Payload

0164B0B3 – Message Checksum and End Sequence

Table 8 Switch To NMEA Protocol

Name	Bytes	Binary(Hex)		Units	Description
		Scale	Example		
Message ID	1		81		ASCII 129
Mode	1		02		
GGA Message[1]	1		01	1/s	
Checksum[2]	1		01		
GLL Message	1		00	1/s	
Checksum	1		01		
BSA Message	1		05	1/s	
Checksum	1		01		
GSV Message	1		05	1/s	
Checksum	1		01		
RMC Message	1		00	1/s	
Checksum	1		01		
VTG Message	1		00	1/s	
Checksum	1		01		
Unused Field	1		00		Recommended value
Unused Field	1		01		Recommended value
Unused Field	1		00		Recommended value
Unused Field	1		01		Recommended value
Unused Field	1		00		Recommended value
Unused Field	1		01		Recommended value
Unused Field	1		00		Recommended value
Unused Field	1		01		Recommended value
Baud Rate	1		12C0		38400,19200,9600,4800,2400

Payload Length: 24bytes

A value of 0x00 implies NOT to send message, otherwise data is sent at 1 message every X seconds requested (i.e., to request a message to be sent every 5 seconds, request the message using a value of 0x05.)Maximum rate is 1/255s.

A value of 0x00 implies the checksum is NOT calculated OR transmitted with the message (not recommended). A value of 0x01 will have a checksum calculated and transmitted as part of the message (recommended).

After the CompactGPS™ enter the sleep mode, user can get a fast navigation solution by pressing the Wake Up Button (Reset button).

Troubleshooting

Problem	Reason	Solution
No position output but timer is counting	Weak or no GPS signal can be received at the place CompactGPS™ is.	Connect an external antenna which locate at a outdoors open space to your CompactGPS™ and then press Reset Button.
	At outdoor space but GPS signal is blocked by buildings	Go outdoors and press Reset Button to try again, or connect an external antenna to improve the poor GPS signal.
Execute Fail	Wrong CPU Type	Pocket PC support multiple types of CPU. Make sure you download the correct software. (You can use ‘setting’ function of start menu on your PDA to check the correct CPU type)
Can’t Open COM port	The CompactFlash™ is not inserted or some other application is using the COM port.	Insert CompactFlash™ or Close all other applications that using the COM port.
Can’t Find GPS Module	Poor connection	Check the CompactFlash™ is inserted correctly.
No signal	No action for few minutes may cause Pocket PC enters power saving mode. It will close the COM port at the same time.	Close the application and execute it again to reopen the COM port.
	Weak or no GPS signal when using CompactGPS indoors.	Connect an external antenna to your CompactGPS™ and place it at an outdoors open space, then press Reset button.