RFG-1000

GPS Receiver

User Manual

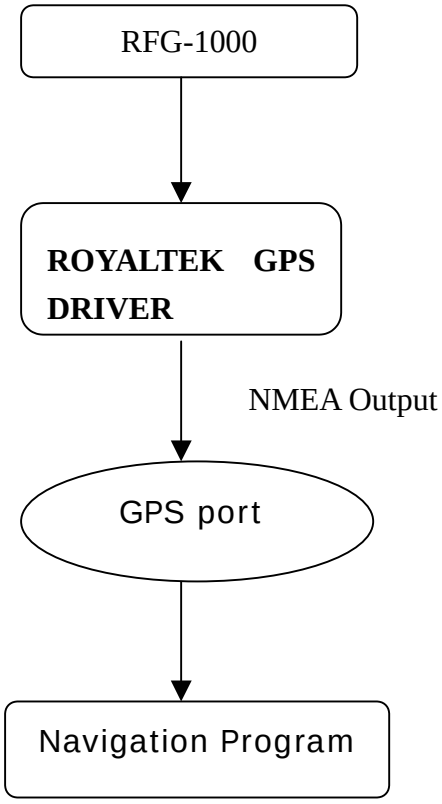
RFG-1000 Ver1.5,
Jan/21/03’

Contents

What is RFG-1000 ?

RFG-1000 introduces a First GPS module in G-mouse type.
The RFG-1000 provides a GPS measurement platform that performs the processor-intensive GPS tracking and processing tasks and FirstGPS software. It enables the host CPU–based software to calculate the actual position, velocity and time (PVT) solutions at its own pace, without burdening the other applications running on the device.

RFG-1000 Architecture



What Is Inside ?

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

◆GPS Receiver ◆ Cable(RS-232 , USB, or PDA adaptor)

◆RFG-1000 install CD Disc

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 receive the data, then convert the longitude, latitude, and altitude (LLA) data into a location point. 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.

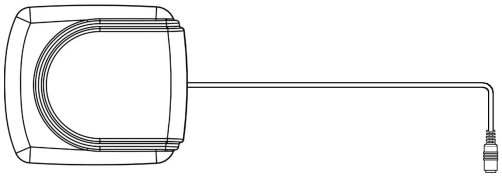
What's Inside the Package?

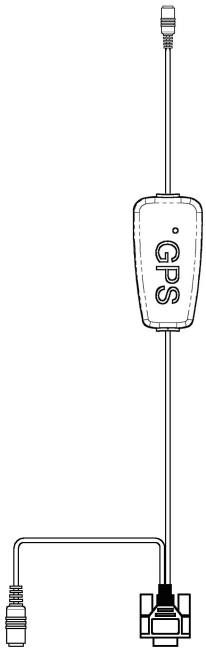
Before you start up, make sure your package includes the following items. If any item is missing or damaged, contact your dealer immediately. Please refer to the contact information on the last page of this manual.

◆ GPS Receiver ◆ Application CD

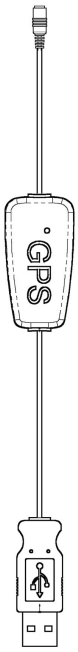
◆ Cable for RS232 , USB , or PDA adaptor(depending on what you buy)

RFG-1000

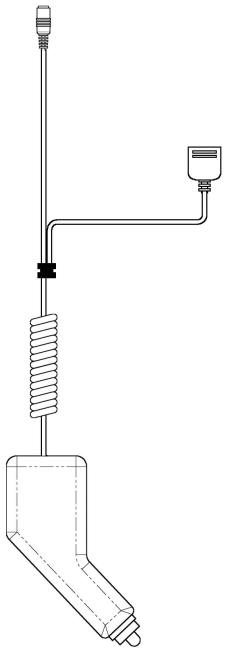




RS-232/PS2



USB



Car cigarette adaptor
12V

IPAQ
36xx/37xx/38xx
Series

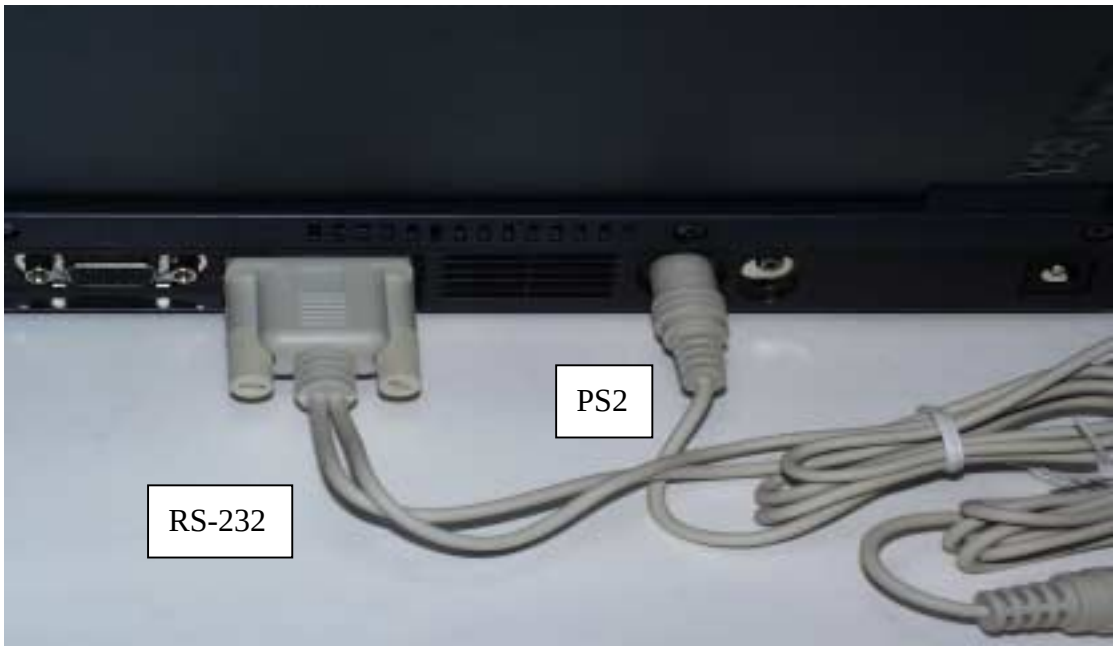
HP Jornada 565

Start-Up for RFG-1000(RS-232 & USB)?

Getting Started

Step 1: Plug-in RS-232 or USB cable to your laptop or desktop PC.

Step 2:Install USB driver if you use USB cable to connect RFG-1000 to your PC.(for detail , please go to **USB driver installation for Windows Operation System**)



Step 3:Install & run **RoyalTek GPS Driver** program.(for detail, please refer **RoyalTek GPS Driver installation** and **RoyalTek GPS Driver operation**)

Step 4:Choose the correct COM port and baud rate (4800bps) for map or navigation software.

Notice:

(1) For safety reason, please do not install RFG-1000 while driving.

(2) The formats of NMEA messages are illustrated on Software Data section.

(3) It is strongly recommend that user doesn't plug and unplug this connector frequently.

Start-Up for RFG-1000(PDA)?

Getting Started

Step 1: Plug-in PDA connector to your PDA.

Step 2: Connect the car cigarette adaptor to your car.

Step 3 Run **RoyalTek GPS Driver** program.(for detail, please refer **RoyalTek GPS Driver installation** and **RoyalTek GPS Driver operation**)

Step 4:Choose the correct COM port and baud rate (4800bps) for map or navigation software.

USB Driver Installation for Windows Operation System?

Getting Started

Step 1:Plug USB connector to USB port of your laptop or desktop PC.

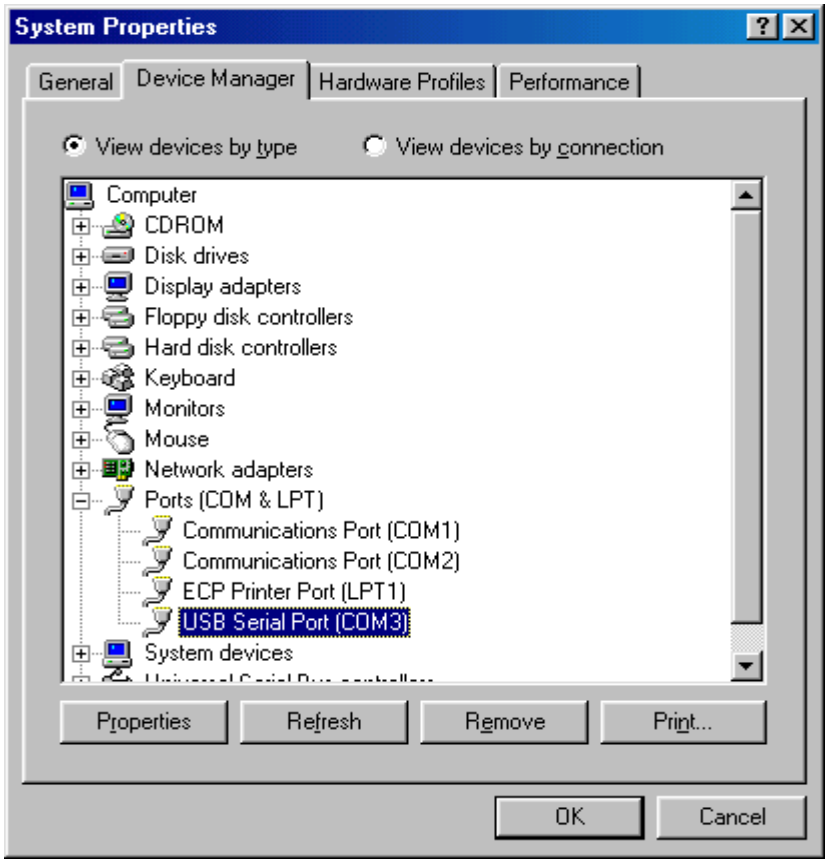
Step 2: After plugging in RFG-1000, it will automatically detect hardware .

Step 3: Insert RFG-1000 CD, system will automatically search and find the correct USB driver.

> Caution: During USB driver installation, a message box “Driver is not certificated by Microsoft” may pop-up. Please crick “Continue” to continue the USB driver installation.

Step 4:Please go to Control Panel>System>Universal Serial Bus Controllers to check USB driver is successfully installed or not!

Step5. You can check COM port number of RFG-1000 from System properties now. The default COM port is COM3 in this example.



Step 6:Place RFG-1000 on the roof of your vehicle with magnetic base.

Step 7:Choose the correct COM port and baud rate (4800bps) for map or navigation software.

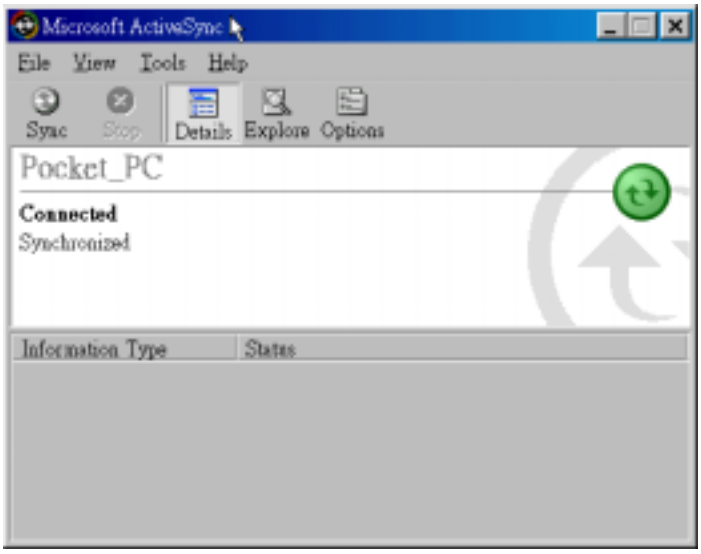
Caution: Sometimes, USB driver can't work properly after recovering from power-saving mode. To solve this problem, please restart your PC and disable power-saving function.

USB Driver Un-Installation for Windows Operation System?

To completely remove the USB-driver , please run "DRemover98_2K.exe" in RFG-1000 CD.

RoyalTek GPS Driver Installation(PC and PDA version)

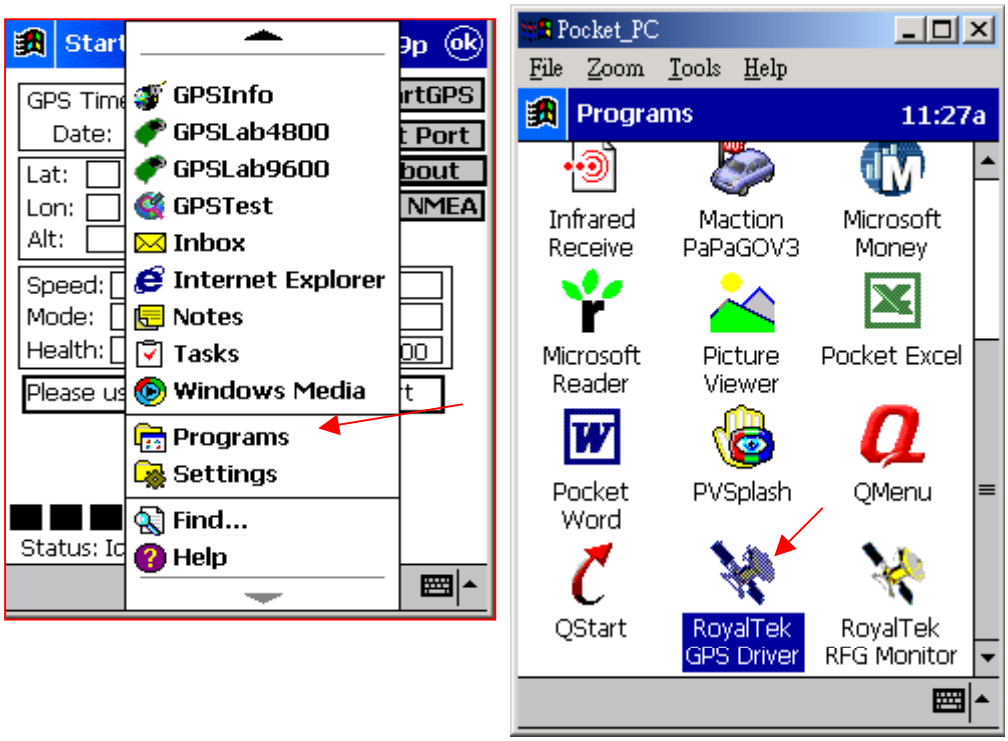
1. The RFG-1000 Installation CD provides the whole set of the RoyalTek GPS Driver installation for PC and PDA. **If you want to install RoyalTek GPS Driver on PDA**, you should check the following items:
   (1) Install Microsoft ActiveSync to your PC. Refer to your Pocket PC manual for installation procedure.
   (2) Setup your PDA cradle to Desktop PC UART port . Microsoft ActiveSync will detect your Pocket PC automatically.



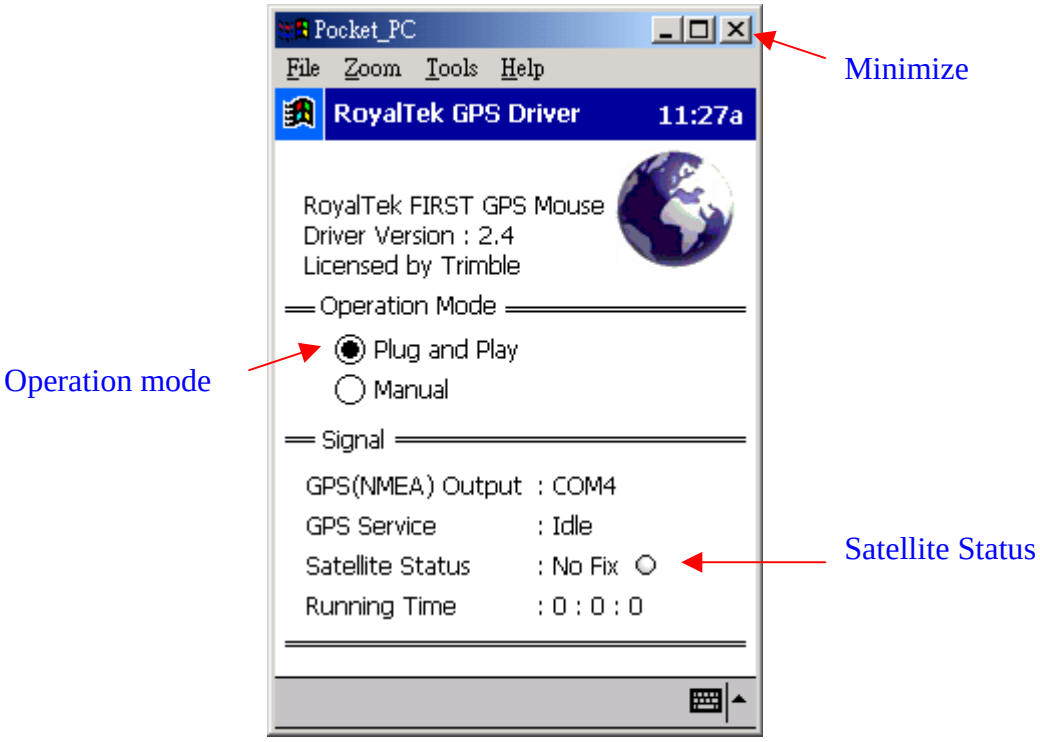
2. Insert the RFG-1000 Install CD to your PC's CD-ROM, the installation program will execute automatically. If the installation program does not start-up automatically, you can run the setup.exe file at the CD content.
3. You should choose the type of driver that you need to install, if you just need to install this driver to **Pocket PC** then you can choose **Pocket PC** item. If you need to install the driver to **PC** then you should choose **PC** item, then click the setup icon for running installation.

RoyalTek GPS Driver Operation(for PDA version)

1. **RFG-1000 needs RoyalTek GPS Driver program running at your PDA to process the signal received from the RFG-1000**.
2. Once you install the RoyalTek GPS Driver, the RoyalTek GPS Driver program will add to your computer “Startup” directory. In manual mode, if you want to run RoyalTek GPS Driver, you can run “**RoyalTek GPS Driver.exe**” which is located at Windows\Start Menu\Programs



Main screen of RoyalTek GPS



Satellite Status:

Green : RFG-1000 fixed the satellites and got its position(2D or 3D)

Red : Searching the satellite signal

GPS(NMEA) OUTPUT: COM port which is assigned to your map or navigation software. For this example, you should select COM5 .

Operation Mode:

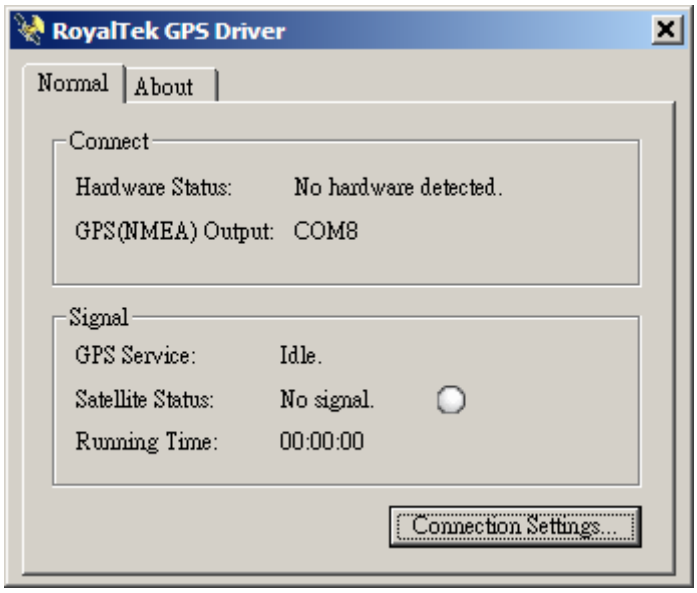
Plug and Play : RoyalTek GPS Driver will detect RFG-1000 automatically.

Manual Mode :RoyalTek GPS Driver will be executed by user manually. If user unplug RFG-1000 , program will quit . When user plugs RFG-1000 ,RoyalTek GPS Driver will NOT be executed automatically. User needs to execute RoyalTek GPS Driver manually.

X: Minimize the RoyalTek GPS Driver program.

RoyalTek GPS Driver User Guide(PC version)

This version provides the RoyalTek GPS Driver program that make the RFG-1000 working at PC.



Hardware Status:

Display the hardware status, which is one of the following conditions:

1) RoyalTek USB Cable GPS: RFG-1000 with USB interface.
2) Royaltek serial cable device: RFG-1000 with RS-232 interface
3) No hardware detected.

GPS(NMEA) Output:

GPS Port. You should assign this COM port for map or navigation software.

Satellite status:

Display the RFG-1000 status, which is one of the following conditions:

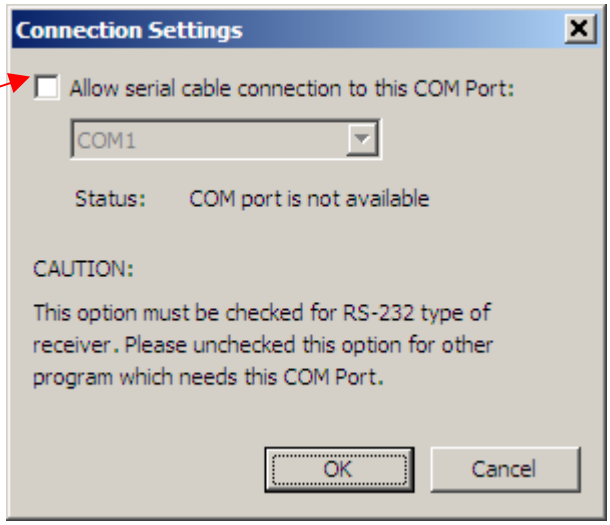
1) Green: Show green color when the program is running., and the position is fixed.(2D or 3D)
2) Red: Show red color when the program is running, but the position is not fixed.
3) Grey: Show gray icon when the program is not running.

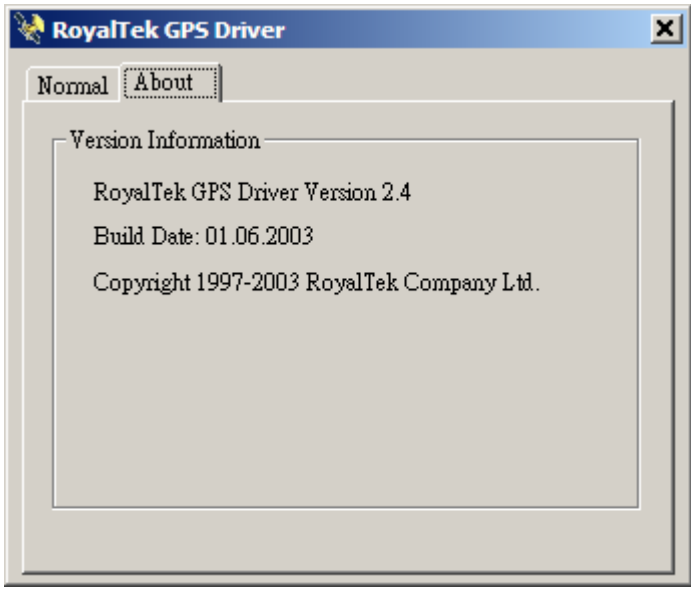
Running Time:

Display GPS running time from power on.

Connection Settings:

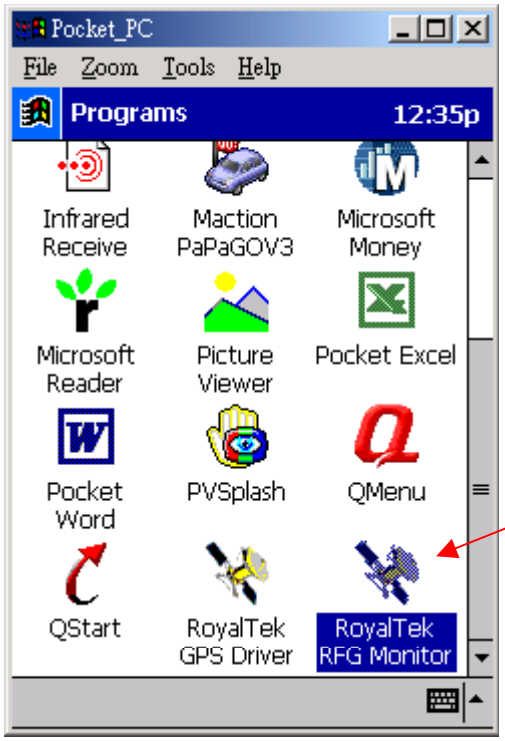
Enable/Disable COM port check





In this page, firmware version and built date were displayed here.

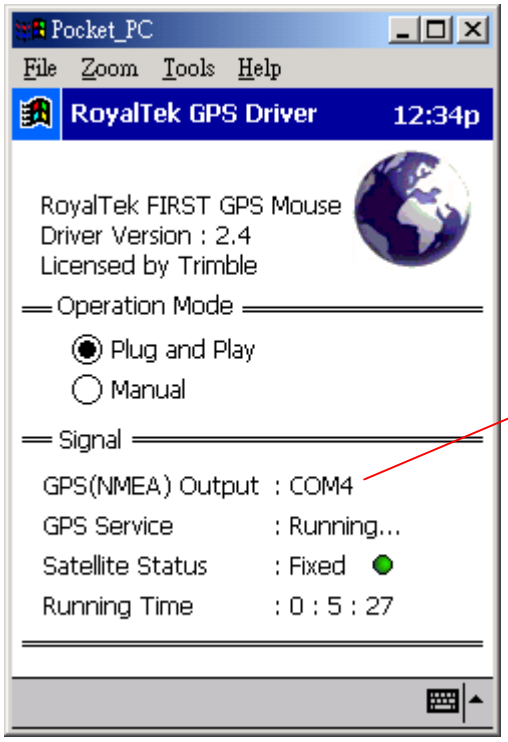
How to test RFG-1000(PDA version only)

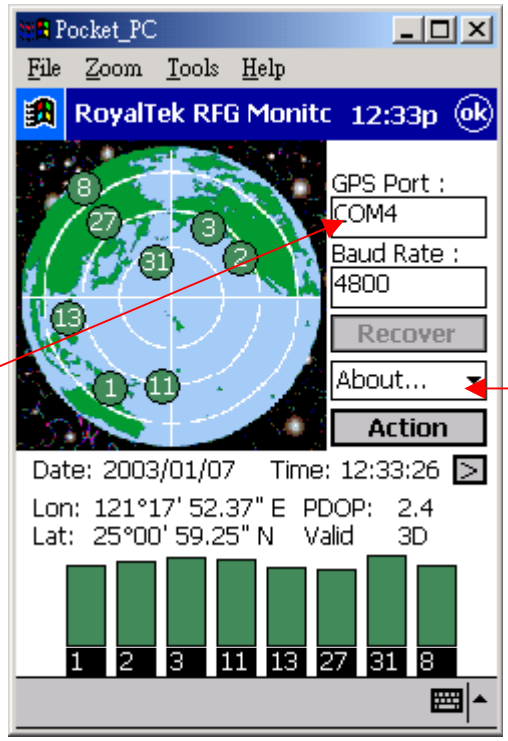


1. Once you start RoyalTek RFG Monitor, the RoyalTek GPS Driver will be activated automatically.

2. Execute RoyalTek RFG Monitor by double clicking the RoyalTek RFG Monitor Icon as shown .

3. Please choose the COM port specified by RoyalTek GPS Driver.





"Function" scroll bar:

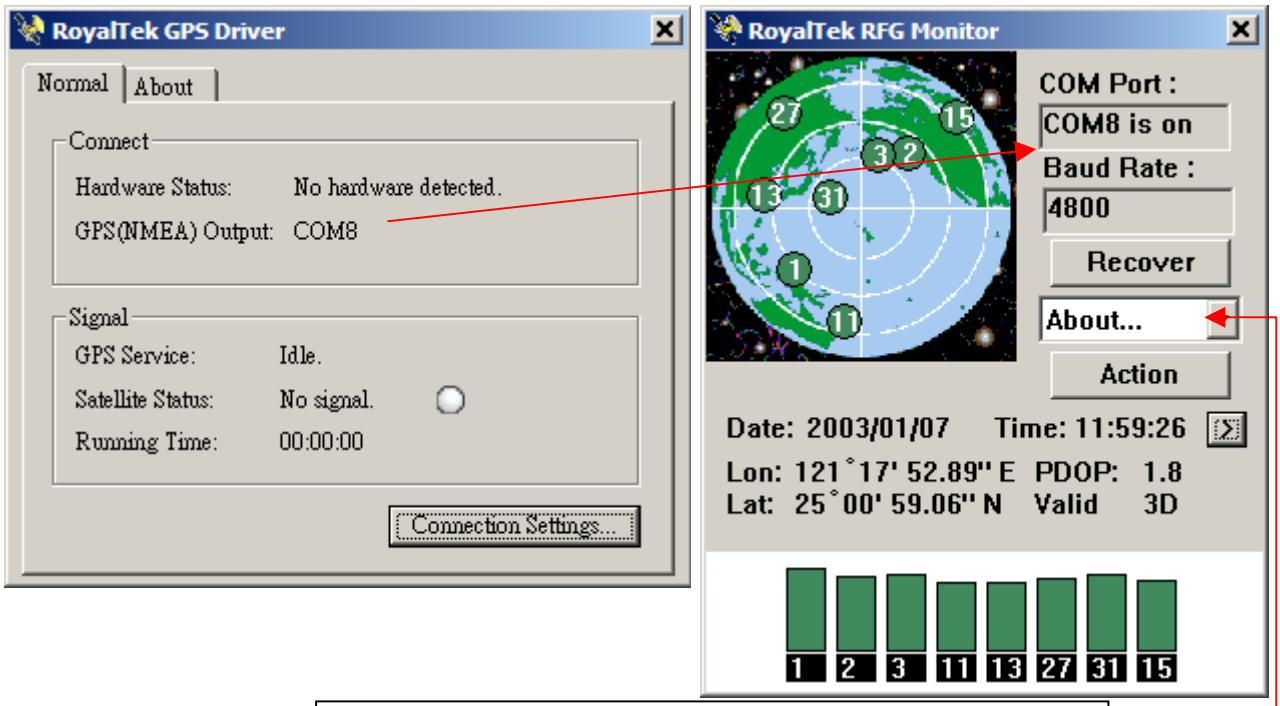
1) About: Display the version of driver
2) Cold start: Initialize a cold start
3) Warm start: Initialize a warm start
4) Hot start: Initialize a hot start.

The baud rate of the RFG-1000 was defaulted as 4800 bps. RFG-1000 only work at the StrongArm CPU Pocket PC, so if your Pocket PC CPU is not this type then RFG-1000 cannot be activated.

4. If everything is OK, it will show the position information and satellite's constellation.
5. If you want to cold start the GPS receiver, select "Cold Start" from the "Function" menu and click "Action" icon, the system will clear the RFG-1000 module data and initialize a cold start on GPS receiver.

How to test RFG-1000(PC version only)

1. Once you start RoyalTek RFG Monitor, the RoyalTek GPS Driver will be activated automatically.
2. To execute RoyalTek RFG Monitor, please Go to Start up>Program>Royaltek>RFG-1000>RoyalTek RFG Monitor by double clicking the RoyalTek RFG Monitor.
3. Please choose the COM port specified by RoyalTek GPS Driver.



"Function" scroll bar:

5) About: Display the version of driver
6) Cold start: Initialize a cold start
7) Warm start: Initialize a warm start
8) Hot start: Initialize a hot start.

- **The baud rate of the RFG-1000 was defaulted as 4800 bps. RFG-1000 only work at the StrongArm CPU Pocket PC, so if your Pocket PC CPU is not this type then RFG-1000 cannot be activated.**

4. If everything is OK, it will show the position information and satellite's constellation.

5. If you want to cold start the GPS receiver, select "Cold Start" from the "Function" menu and click "Action" icon, the system will clear the RFG-1000 module data and initialize a cold start on GPS receiver.

RoyalTek GPS Driver Un-Installation (for PDA version)

Go to Start->Setting->System and select “Royaltek GPS Driver” for un-installation.

RoyalTek GPS Driver Un-Installation (for PC version)

1. **Quit RoyalTek GPS Driver program.**
2. **Go to Control panel>Remove & Install Program**
3. **Choose “Royaltek GPS Driver” for Win98,Me,2000 or XP**

Specifications

Physical characteristics

Dimension: 50±0.3(length) X 57 ±0.3(width) X 15.5 ±0.3(height)
Weight 25 grams

Temperature characteristics

Storage temperature: -40℃ ~ +85℃.
Operating temperature: -40℃ ~ +85℃.

General

Channels	8 channels
L1	1575.42 MHz.
C／A code	1.023MHz chip rate.

Accuracy

Position accuracy：25m, CEP without SA(50%).
Velocity accuracy：0.1 meter / second without SA

Datum

WGS-84.

Position update rate

Once per second.

Dynamic conditions

Altitude	：18000 meters (60000 feet) max.
Velocity	：514 meters / second max.
Jerk	：20 meters / second^3, max.
Acceleration	：4 G, max.

Power

PS2/USB input power: DC 5V ± 5 %, 25mA, typical

Car cigarette power adaptor: +9V ~ +16V.

Certification

FCC/CE compliant

Waterproof standard

IEC 68-2-18 test Ra1

Software Data

NMEA V2.2 Protocol

It is the RS-232 interface：4800 bps, 8 bit data, 1 stop bit and no parity.

NMEA Output Messages

The Sapphire 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 5-1
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

Troubleshooting

Problem	Reason	Solution
No position output but timer is counting	At outdoor space but GPS signal is blocked by buildings	Go outdoors where you can see clear sky and press Reset Button to try again,
Execute Fail	Wrong Pocket PC Type	RFG-1000 support Pocket PC(iPaq 3600 series) and Pocket PC 2002 with StrongArm type of CPU. Make sure your Pocket PC is this type
Can't Open COM port	Some other application is using the COM port.	Reset the Pocket PC.
	PDA Low Battery	Using AC/DC charge for recharge
Can't Find GPS Module	Poor connection	Check the RFG-1000 is inserted correctly.
PC can't detect RFG-1000 via USB cable.	Sometimes, PC will detect RFG-1000 as ballpoint or serial mouse when you plugged in RFG-1000.	1. First, disconnect RFG-1000 with your PC. 2. Plug-in the USB cable only to PC. 3. Connect USB cable with RFG-1000 core module.
No GPS signal output	No action for few minutes may cause Pocket PC entering 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.
	The RoyalTek GPS Driver did not run	Check if the RoyalTek GPS Driver is in "Running" status

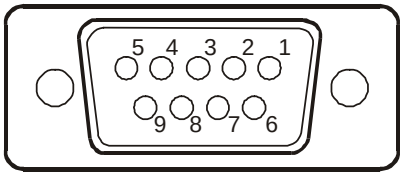
Note

- **Please don't expose the unit under the sun for long period of time.**
- **Please don't leave the unit in the vehicle while not using.**
- **Before installing RoyalTek GPS Driver (ver2.3) ,please be sure to remove RoyalTek GPS Driver(Ver2.1) completely.**
- **Please perform Cold start if last fixed position is more than 500km away from the present position.**
- **Please adjust your PDA system time to correct local time to achieve better GPS performance. Incorrect PDA system time may cause poor TTFF(Time To First Fix).**

Appendix : Connector Interface

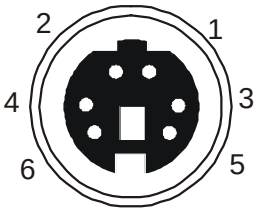
9 pin D-SUB

Pin NO	Signal Name	I/O	Description	Characteristics
1	No connect			
2	TX	O	Serial Data Output	High: -3V ~ -15V Low: +3V ~ +15V
3	RX	I	Serial Data Input	High: -3V ~ -15V Low: +3V ~ +15V
4	No connect			
5	GND	G	Ground	
6	No connect			
7	No connect			
8	No connect			
9	No connect			



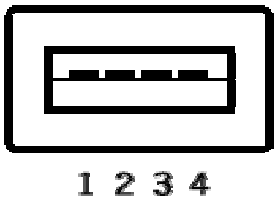
6 pin mini din

Pin NO	Signal Name	I/O	Description	Characteristics
1	No connect			
2	No connect			
3	GND	G	Ground	
4	VCC	I	+5V DC Power Input	DC +5V ± 10%.
5	No connect			
6	No connect			



USB A Type Connector

Pin NO	Signal Name	I/O	Description	Characteristics
1	GND	-	Ground	Ground
2	D+	I/O	Data plus	Data plus
3	D-	I/O	Data Minus	Data Minus
4	VCC	+	+5V DC Power Input	+5V DC Power Input



Limited Warranty

Distributor for RFG-1000 grants a warranty for this product for one year starting from the date of purchasing of the product. Please retain the sales receipt as proof of purchase. During the warranty period, the product is eligible for replacement in case of defects in material and workmanship. In such case, the defective unit will be repaired or replaced according to an assessment by Manufacturer. However this warranty does not cover damages caused by improper use or from unauthorized modifications by third parties. In addition, this warranty does not cover expendable materials and defects, which constitute as normal wear or tear. Please contact us as following: