

USER GUIDE

Trimble[®] GPS Studio Application





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Trimble® GPS Studio Application

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CHAPTER

Introduction to Trimble GPS Studio

In this chapter:

- Features
- Technical assistance

The *Trimble GPS Studio Application User Guide* describes the Trimble[®] GPS Studio application, which you can use to configure GPS receivers. With a rich user interface and feature set, the Trimble GPS Studio has replaced earlier programs used for monitoring and interacting with Trimble Embedded Devices.

The application, which works with a serial connection, needs a virtual serial USB driver to work with the standard USB interface provided on GPS receiver starter kits.

Instructions for the virtual serial USB interface are included.

Features

Feature	Description
New Connection with Auto-Detect Receiver	Tests a GPS receiver port for protocol and baud rate so that you do not have to remember them when you connect the GPS Studio application to the GPS receiver.
Monitor	Shows time, velocity, position data, receiver mode and status, map functions, and an auto-query function to report satellite data, and more.
Receiver Configuration	Enables you to configure a receiver and save its configuration
Configurator.	Enables you to load, modify, and save receiver configurations and then apply them to additional receivers.
Data Logger	Logs the output of one or more GPS devices at the same time.
Data Converter	Converts logs from the data logger into formats used by other applications.
Generic Packets	Sends and views received raw data.
Flash Loader	Loads new firmware into the GPS receiver.

Technical assistance

If you have a problem and cannot find the information you need in the product documentation, contact the Trimble Technical Assistance Center at 800-767-4822 or email ctsupport@trimble.com.

CHAPTER

2

Downloading and Installing the Application

In this chapter:

- Downloading and installing the application
- Extracting the Trimble GPS Studio application
- Installing the FTDI USB Virtual COM port driver
- Connecting the starter kit to the computer
- Assigning the USB virtual COM port
- Disabling the Microsoft serial ballpoint driver

This chapter describes how to install software and hardware needed for the Trimble GPS Studio application, and how to connect the Starter Kit to your computer.

Downloading and installing the application

Requirements

You need the following:

- A computer running one of the following Microsoft[®] operating systems:
 - Windows® 7
 - Windows Vista®
 - Windows XP with Service Pack 3
- A free USB port on the computer
- Internet access

Downloading the application

- 1. Go to the Trimble Support website at http://www.trimble.com/support.shtml.
- 2. In the *Support A-Z* screen, scroll to and then click the GPS receiver that is included in your starter kit, for example the Condor Family of GPS Modules or the Copernicus[®] II.



- 3. Click the *Support* tab for the selected product.
- 4. In the *Support* tab, select the *Support link*.

Overview	Specificati	on Key Featur	es Support	
Condor F	amily of GPS Mo	dules		
Documentat	ion- Manual, Certificate	s and Product Bulletins		
Support)			
< Back				

The *Support* page shows all the software that is available for download.

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- 5. Download the files you require and save them to a folder on the computer hard drive.
 - You *must* download:
 TrimbleStudio_vn-nn-nn.zip (where "vn-nn-nn" is the file version)
 - If you are not currently running the Windows 7 operating system, you *may* need: FTDI_USB-Serial_Driver.exe.

Extracting the Trimble GPS Studio application

- 1. Use Windows Explorer to browse to the TrimbleStudio_Vn-nn-nn.zip file you downloaded.
- 2. Extract the application to a location on the hard drive.

Note – The directory you select will also become the initial default directory for logs and reports from the application.

Installing the FTDI USB Virtual COM port driver

The starter kit uses a USB 2.0 dual serial port emulator interface chip from Future Technology Devices International (FTDI) Ltd. The GPS Studio application requires the FTDI driver.

• Installation is automatic if you are running the Windows 7 operating system, have granted Windows Update permissions, and are currently accessing the Internet. In this case, continue with the procedure described in Connecting the starter kit to the computer, page 8.

Note – The Windows 7 operating system automatically connects to the Windows Update website and to install the latest WHQL" (Microsoft Windows Hardware Quality Labs) Certified Available driver for the USB-to-serial emulator interface chip from FTDI. This happens when you plug in the USB cable, as long as you have an available Internet connection and if your update settings are set to allow this.

• If you are *not* running the Windows 7 operating system, you must manually install the driver that you downloaded from www.trimble.com. See below.

Note – The latest driver is available as a setup executable from the FTDI website at http://www.ftdichip.com/Drivers/VCP.htm.

Manually installing the driver

- 1. Use Windows Explorer to browse to the *FTDI_USB-Serial_Driver.exe* file you downloaded from the Trimble website (or the file from the FTDI website) and then double-click it.
- 2. The following message may appear: FTDI CDM Drivers have been successfully installed. Click **OK**.
- 3. Save any open files, close open programs and then click **Restart Now**.

Connecting the starter kit to the computer

1. Connect one end of the USB cable (supplied) to the USB connector on the Starter Kit:



2. Connect the other end of the USB cable to your computer. The USB cable now supplies power to the unit.

Note – Depending on the starter kit product and the antenna supplied with it, you may need to connect power supply to the power connector on the starter kit. (One or more power supply accessories may be supplied with the starter kit; accessories vary by GPS receiver product.)

3. Connect the GPS antenna to the interface unit:



- 4. For the best GPS reception, place the antenna outside or near a window.
- 5. Optionally connect to the BNC connector on the rear of the interface unit for the PPS output:

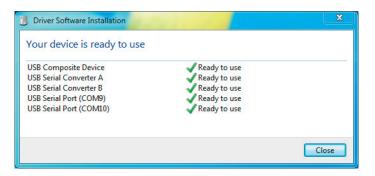


6. Turn on the GPS Starter Kit (interface) unit. The power LED lights green.



Assigning the USB virtual COM port

After you have physically plugged in the USB connectors and turned on the Starter Kit, a dialog similar to the following appears on the desktop. It indicates that the FTDI driver has automatically assigned two virtual serial COM ports to the USB port. Click **Close**.

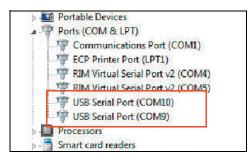


Note – When you later need to select a COM port within the GPS Studio application, these two USB Serial Ports appear in the application for selection.

Note – If the Windows 7 operating system did not automatically install a driver for the USB-to-serial emulator interface chip from FTDI, you may need to install the driver manually. See Installing the FTDI USB Virtual COM port driver, page 7.

Viewing the assigned COM ports in Windows Device Manager

Expand the *Ports (COM & LPT)* node and then find the two USB Serial Port COM numbers; in this example, COM10 and COM9.

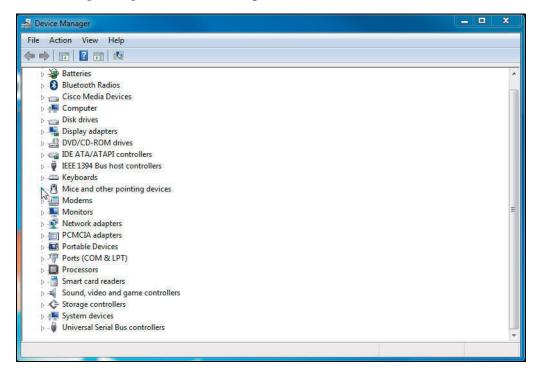


Note – In general, the COM A port of the GPS device is the lower COM number; the COM B port is the higher number.

Disabling the Microsoft serial ballpoint driver

If the mouse pointer jumps around on the screen, check the system tray to see if the Microsoft serial ballpoint (mouse pointer) device has been enabled. If this is the case, do the following to disable it:

- 1. Turn off the Starter Kit to stop the pointer jumping.
- 2. On the computer, open the *Device Manager*:

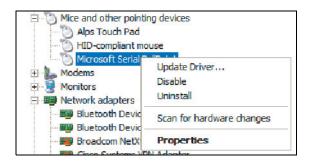


Note – In the Windows 7 Start menu, enter **Device Manager** in the Search field and then select it from the results list under the Control Panel heading.

3. Expand the *Mice and other pointing devices* node.



4. If *Microsoft Serial BallPoint* is listed, right-click it and then select *Disable*.



5. Turn on the starter kit.

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CHAPTER

3

Running the Application

In this chapter:

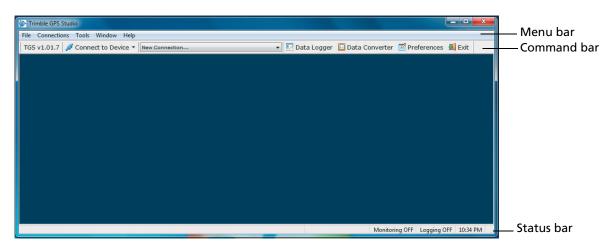
- Starting the Trimble GPS Studio application
- Trimble GPS Studio screen
- Connecting the Trimble GPS Studio application to the GPS receiver
- Monitor screen

This chapter describes how to start the Trimble GPS Studio application and how to connect to the Starter Kit from the application. It also includes overview descriptions of the *Trimble GPS Studio* window and the *Monitor* window.

Starting the Trimble GPS Studio application

Double-click the icon in the folder where the application is stored.

Trimble GPS Studio screen



Note – Additional windows appear within the main Trimble GPS Studio window if you leave them open when you exit the application.

Menu bar

Select	To access
File	Preferences and Exit
Connections	New Connection, Auto-Detect, Refresh Com List, and Device Manager
Tools	Data Logger, Data Converter, Flash Loader, and Configurator
Window	Window functions and a list of the open windows
	Note – By selecting an open window this is brought into view.
Help	Current release information

Command bar

Click	То
Version number	Open the <i>About</i> screen.
Connect to Device drop-down list	View the list of devices that you can connect to. Click an item on the list to select it.
New Connection	View a list of connection features and COM ports. Click an item on the list to select it.
drop-down list	Note – This is the featured method for connection used in the user guide.
Data Logger	Log raw data from one or more connected devices.
Data Converter	Convert logged raw data to various formats

Click	То
Preferences	Configure various program settings.
Exit	Exit the Trimble GPS Studio application

Status bar

This contains the following display-only status items:

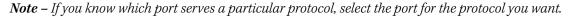
Status item	Options	
Monitoring	ON or OFF.	
Logging	ON or OFF.	
Time	Hours, minutes; AM or PM	

Connecting the Trimble GPS Studio application to the GPS receiver

The *New Connection* feature enables you to connect to the GPS receiver and provides auto-detection of baud rates, parity, data bits, and stop bits settings.

1. Click **New Connection...** ▼ and then select the required USB Serial Port (in this example, *USB Serial Port (COM 9)*) from the drop-down list:

Trimble GPS Studio		And in case of
File Connections Tools Window Help		
TGS v1.01.20 💋 Connect to Device 🔻	New Connection	🗾 Data Logger
	New Connection Auto-detect	
	Communications Port (COM1) COM 3 RIM Virtual Serial Port v2 (COM4) RIM Virtual Serial Port v2 (COM5)	
	USB Serial Port (COM9) USB Serial Port (COM10)	
	Refresh COM List Device Manager	



Note - If you do not see the COM ports for the GPS receiver in the list, refresh the list as follows:

- 1. Select New Connections / Refresh COM List.
- 2. Click the information screen to close it.
- 3. If it is open, close the New Connection screen.
- 4. Click New Connection... ▼ again. The COM port should now appear in the list.

The New Connection dialog appears:

Device:	GPS Receiver	
COM Port:	USB Serial Port (COM9)	•
Baud Rate:	38400	
Baud Rate: Parity: Data Bits:	38400 None	

2. Select the *Auto-detect settings* check box. The Trimble GPS Studio application now auto-detects baud rate and other settings in turn for each protocol. A message **Checking** for <**PROTOCOL> using** appears on screen to show the auto-detect status:

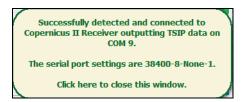
Device:	GPS Receiver	•
COM Port:	USB Serial Port (COM9)) 🔻
Auto-det	ect settings. If not ched	ked, select below:
Checking for	TSIP using:	
Baud Rate:	38400	v
Baud Rate: Parity:	38400 None	
		*

Note – If you clear the check box, only the settings selected in the bottom half of the dialog (for Baud Rate, Parity, Data Bits, and Stop Bits) are used.

3. Click **OK**. The *Monitor* screen appears:

us II Receiver Monitor	[COM 9]			F	- 0		1			
🔹 🍉 Receiver 🔹	Сом э 👻	AUTO QUERY: ON	💹 Мар							
	Receiver M	1ode & Status	Satel	lite Data		-				
Wed 19:40:16	Mode	3-D, Auto (7 SV), SBAS			-					
		doing position fixes	22					N		
1624 TOW 33001	6 Almanac	complete & current	14	33.0	252.6	23.4		3		
	DOPs	Status								
0.084 r	n/s PDOP	3.05								
0.011 r	n/s HDOP	1.00								
0.050 r	n/s VDOP		18							
0.0 m	i/hr TDOP		9	43.0	111.7	65.5				
	Firmware I	info	15	41.0	57.5	43.2				
N 42° 24.3020	9' Application	n 1.07.1 06/24/10								
W 71° 16.5039	6' Monitor Pr	otocols	133	34.0	216.7	34.8				
49.15 m H/	E In TSI	P Out TSIP -	21	42.0	195.9	44.6				
	 ▼ Provide a state of the state	Wed 19:40:16 Receiver N February 23, 2011 Status 1624 TOW 0.084 m/s 0.001 m/s 0.002 m/s 0.003 m/s 0.001 m/s 0.00 mi/hr TDOP 100P 0.00 mi/hr TDOP 100P Interval Poop 0.00 mi/hr TDOP 100P Interval Poop Interval Poop	N 42° 24.30207 0.0 mi/hr TDOP 2.71 0.0 mi/hr TDOP 2.05 0.0 mi/hr TDOP 2.05	N 42° 24.30209' AUTO QUERY: ON Map Receiver COM 9 AUTO QUERY: ON Satel Wed 19:40:16 Receiver Mode & Status Satel Pebruary 23, 2011 Map John to (7 5V), SBAS Status 1624 TOW 330016 Almanac complete & current Id 0.084 m/s PDOP 3.05 RTC ANT 22 0.011 m/s PDOP 3.05 RTC 23 ANT OK 0.050 m/s Firmware Info	▼ Receiver ▼ COM 9 AUTO QUERY: ON ∑m Aap Sen Wed 19:40:16 Receiver Mode & Status Sotellite Data Sotellite	N 42° 24.30209* AUTO QUERY: ON Map Sensitivity N 42° 24.30209* AUTO QUERY: ON Satellite Data SV C/No Az. Wed 19:40:16 Node 3-D, Auto (7 SV), SBAS Satellite Data SV C/No Az. 1624 TOW 330016 Almanac complete & current 14 33.0 252.6 0.084 m/s PDOP 3.05 BBRAM RC 22 42.0 68.7 0.050 m/s PDOP 2.71 Occ (ppm) -1619.84 111.7 N 42° 24.30209* Application 1.07.1 06/24/10 13 3.40 216.7	▼ COM 9 AUTO QUERY: ON Image: Comparing the second se	N 42° 24.30209' AUTO QUERY: ON Map Sensitivity: Indoor Wed 19:40:16 Receiver Mode & Status Satellite Data Sv C/No Az Elev. Wed 19:40:16 Mode 3-D, Auto (7 SV), SBAS Sv C/No Az Elev. 1624 TOW 330016 Almanac complete & current 14 33.0 252.6 23.4 DOPs Status BBRAM POOP 305 RTC POOP 28 42.0 68.7 55.2 0.050 m/s HDOP 1.39 ANT <ok< td=""> 18 41.0 325.5 75.2 0.0 mi/hr TDOP 2.05 Oct pom) -1619.84 111.7 65.5 N 42° 24.30209' Application 1.07.1 06/24/10 133 34.0 216.7 34.8</ok<>	Image: Sensitivity: Index Wed 19:40:16 Receiver Mode & Status Satellite Data Wed 19:40:16 Receiver Mode & Status Satellite Data Wed 19:40:16 Mode 3-D, Auto (7 SV), SBAS Satellite Data Ife24 TOW 330016 Status doing position fixes Satellite Data 0.084 m/s DOPs Status Status <td>▼ COM 9 AUTO QUERY: ON Image: Composition fixes Wed 19:40:16 Receiver Mode & Status Satellite Data Wed 19:40:16 Mode 3-D, Auto (7 SV), SBAS Pebruary 23, 2011 Status doing position fixes 1624 TOW 330016 O.084 m/s POOP 0.011 m/s POOP 0.050 m/s VOCP (2.71) 0.050 m/s POOP (2.05) 0.050 m/s POOP (2.05) 0.00 mi/hr TDOP (2.05) 1100 1.07.1 06/24/10 Weid 19:4.0 123 34.0 216.7 34.0 216.7</td>	▼ COM 9 AUTO QUERY: ON Image: Composition fixes Wed 19:40:16 Receiver Mode & Status Satellite Data Wed 19:40:16 Mode 3-D, Auto (7 SV), SBAS Pebruary 23, 2011 Status doing position fixes 1624 TOW 330016 O.084 m/s POOP 0.011 m/s POOP 0.050 m/s VOCP (2.71) 0.050 m/s POOP (2.05) 0.050 m/s POOP (2.05) 0.00 mi/hr TDOP (2.05) 1100 1.07.1 06/24/10 Weid 19:4.0 123 34.0 216.7 34.0 216.7

- If the receiver *is* detected, data appears in the *Monitor* screen, and a message screen appears. Click the message screen to close it:



- If the receiver is *not* detected, an error message appears. You can try to resolve the issue by doing the following:



- If you cleared the *Auto-detect settings* check box, select it and then try again.
- Select another COM port and then try again.
- Refresh the COM port list, see page 15.
- Use the On / Off switch to turn off the starter kit and then turn it on again.

Monitor screen

The *Monitor* screen indicates that the Trimble GPS Studio application is connected to the GPS receiver; use it to monitor the receiver performance.

eeiver ▼ 200 9:40:16 7 23, 2011 V 330016 m/s m/s 0 m/s	Receiver M Mode Status Almanac DOPs PDOP HDOP	Mode & S 3-D, Aut doing (to (7 SV), SB/ position fixes ete & current Status BBRAM RTC	AS	Map Satell SV 22 14	ite Data C/No 40.0 33.0	Az. 303.0 252.6	23.4	_
v 23, 2011 V 330016	Mode Status Almanac DOPs PDOP HDOP	3-D, Aut doing p comple 3.05	to (7 SV), SB/ position fixes ete & current Status BBRAM RTC	•	SV 22 14	C/No 40.0 33.0	Az. 303.0 252.6	41.8	
v 23, 2011 V 330016	Status Almanac DOPs PDOP HDOP	doing (comple	position fixes ete & current Status BBRAM RTC	•	14	33.0	252.6	23.4	
V 330016 H m/s L m/s	Almanac DOPs PDOP HDOP	comple	Status BBRAM RTC	•					
m/s	PDOP HDOP		BBRAM RTC		27	42.0			
m/s	HDOP		RTC		27	42.0			
	HDOP			•	27	42.0		200000	
) m/s		1.35	ANT		147	42.0	68.7	55.2	
				OK	18	41.0	325.5	75.2	
	VDOP	2.71	Osc (ppm)		9	43.0	111.7	65.5	
mi/hr	TDOP	2.05	-1619.8	4		-			
	Firmware	Info			15	41.0	57.5	43.2	
24.30209'	Applicatio	n 1.07	.1 06/24/1	0			-		
16.50396'	Monitor Pr	rotocols			133	34.0	216.7	34.8	
m HAE	In TSI	P Ou	It TSIP	•	21	42.0	195.9	44.6	
	16.50396'	24.30209' Applicatio 16.50396' Monitor Pr	16.50396' Monitor Protocols	24.30209' Application 1.07.1 06/24/1 16.50396' Monitor Protocols	24.30209' Application 1.07.1 06/24/10 16.50396' Monitor Protocols	24.30209' Application 1.07.1 06/24/10 16.50396' Monitor Protocols 133	24.30209' Application 1.07.1 06/24/10 16.50396' Monitor Protocols 133 34.0	24.30209' Application 1.07.1 06/24/10 16.50396' Monitor Protocols 133 34.0 216.7	24.30209' Application 1.07.1 06/24/10 133 34.0 216.7 34.8 16.50396' Monitor Protocols 133 34.0 216.7 34.8

Command bar

Click	То
Monitor drop-down list	Access a menu that includes raw data, GPS receiver, and GPS system information.
Receiver drop-down list	Access a menu that includes GPS receiver configuration and reset options.
Port drop-down list	Select the appropriate port. When you select a port from the list, the <i>Port Settings</i> dialog appears.
Auto Query (ON or OFF)	Click, if ON, to request additional information from the GPS receiver (this information is not automatically sent by the receiver).
Мар	Open the Position Map window.
Sensitivity	Read-only field with either "Outdoor" or "Indoor" as value.

Status bar

This contains the following display-only status items:

Status item	Options
Тх	If blinking green, this means that the application is transmitting to the GPS receiver. Mouse over <i>Tx</i> to view the <i>Incoming Serial Data Statistics</i> :
	Incoming Serial Data Statistics
	Total bytes received: 35171 Total packets received: 1497 Average packet size: 23 bytes Average traffic: 456 bytes/sec
	Tx 🔹 🗱 Monitoring Copernicus II Receiver 0:01:17 COM 12: 38400-8-N-1
Rx	If blinking green, this means that the application is receiving from the GPS receiver.
Elapsed Time	The hours, minutes, and seconds that the application has been connected to the receiver.
Port	COM port settings

CHAPTER

4

Configuring the Receiver

In this chapter:

- Configuring the GPS port
- Configuring outputs
- Configuring PPS
- Configuring NMEA
- Completing the configuration

This chapter describes how to configure the GPS receiver. To do this, you will configure the GPS port, Outputs, PPS, and NMEA.

Note – GPS modules from the Condor family have a limit of 8 "Saves" in the Configure Receiver screen. After this, you must reflash the device. See Using the Flash Loader application, page 39.

Note – *Change the settings that you require and then click* **Set**. *Only click* **Save Configuration** *when you are completely done.*

Note – The options that are available from the Configure Receiver drop-down list depend on the device that is being configured.

Configuring the GPS port

1. From the *Monitor* window, click **Receiver** and then select *Configure* from the drop-down list:

Note -	Options	available	within th	he Config	ure Receive	er box def	bend on	the devic	e being	configured.

Copernic	Copernicus II Receiver Monitor [COM 9]									
Monitor	- 🛞	Recei	ver 🗸 🔽	19 🔻	AUTO	QUERY: ON	🔰 Мар	Sen	sitivity:	Indoor
Time [GPS] Time Date		ed 19:4	10:16 3, 2011	Receiver I Mode Status	3-D, Au	Status to (7 SV), SBAS position fixes	Satelli SV 22	te Data C/No 40.0	Az.	Elev. 41.8
Week	1624		330016	Almanac		ete & current	14	33.0	252.6	23.4
Velocity East South Down Speed	0	0.084 0.011 0.050 0.0	m/s m/s m/s mi/hr	HDOP VDOP	3.05 1.39 2.71 2.05	Status BBRAM RTC ANT OK Osc (ppm) -1619.84	27 18 9	42.0 41.0 43.0	68.7 325.5 111.7	55.2 75.2 65.5
Position Latitude Longitude Altitude	W 7		24.30209' 16.50396' m HAE	Firmware Applicatio Monitor Pr In TSI	on 1.07	7.1 06/24/10 ut TSIP 💌	15 133 21	41.0 34.0 42.0	57.5 216.7 195.9	43.2 34.8 44.6
Tx @ Rx @ Satellite & Channel Data: Packet 0x5C						0:01:08	CON	19: 3840	0-8-N-1	

2. In the *Receiver Configuration* dialog, select the *Port Configuration* tab:

PPS Configuration			TAIP utputs Po:	GPIO sition Filter
Receiver Port:	Port A 🗸	Protocols Input:	Output:	
Baud Rate:	38400 🗸	TSIP	TSIP	
Parity:	None 😽	NMEA	NMEA	
Data Bits:	8 🗸	AUX	AUX	23
Stop Bits:	1 🗸		local COM se eceiver's port	
ave Configuratio	_			Close

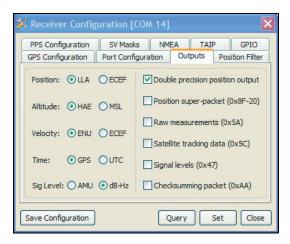
- 3. Select:
 - The required Receiver Port, Baud Rate, Parity, Data Bits, and Stop Bits.
 - One *Input* and one *Output* protocol.
- 4. Click **Set** to save the settings on this tab.

Note – Do not click Save Configuration until you have completed changes on all tabs.

5. Continue with Configuring outputs or go to Completing the configuration

Configuring outputs

1. In the *Receiver Configuration* dialog, select the *Outputs* tab:



- 2. Select the required setup options.
- 3. Click **Set** to save the settings on this tab.

Note - Do not click Save Configuration until you have completed changes on all tabs as needed.

4. Continue with Configuring PPS or go to Completing the configuration.

Configuring PPS

1. In the Receiver Configuration dialog, select the PPS Configuration tab.:

X Receive	r Config	uration	[COM 1	4]			
GPS Config	uration	Port Con	figuration	0	utputs	Posi	tion Filter
PPS Config	guration	SV Mas	iks 1	MEA	TAI	P	GPIO
Output:	⊙ Alwa ○ Fix-b	ys ON ased	Offset: Pulse W		0 4200		nanosec nanosec
Polarity:	 Alwa Posit Nega 	ive					
Save Config	uration		(Quer	y [Set	Close

- 2. Select an option from the *Output* list. The options are:
 - *Always ON*. PPS is present even without a GPS fix and will free-run until a fix is obtained.
 - *Fix-based.* The PPS is output only when the receiver has a fix.

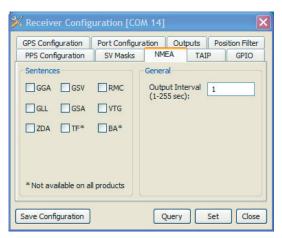
- Always OFF.
- 3. Enter values or select settings for additional fields as required. The parameters and settings in this step are determined by the receiver being configured:.
 - Enter a value in the *Offset* field (units are in nanoseconds).
 - Enter a value in the *Pulse Width* field (units are in nanoseconds).
 - Select an option in the *Polarity* field (positive or negative).
- 4. Click **Set** to save the settings on this tab.

Note – Do not click Save Configuration until you have completed changes on all tabs as needed.

5. Continue with Configuring NMEA or go to Completing the configuration

Configuring NMEA

1. In the *Receiver Configuration* dialog, select the *NMEA* tab:



- 2. Select the required setup options:
 - *Sentences:* Select one or more NMEA messages. The options are:

Message	Description
GGA	GPS fix data
GSV	GPS satellites in view
RMC	Recommended minimum specific GPS/Transit data
GLL	Geographic position - Latitude/Longitude
GSA	GPS DOP and active satellites
VTG	Track made good and ground speed
ZDA	Time and date
TF ¹	Receiver status and position fix
BA ¹	Antenna status
GST ¹	GPS Pseudo-range noise statistics
CHN ¹	GPS channel status

¹Not available on all products

- *General*: Enter an integer (between 1 and 255) to represent the output interval in seconds.
- 3. Click **Set** to save the settings on this tab.

Note – Do not click Save Configuration until you have completed changes on all tabs as needed.

4. If required, you can now click any other tab to set additional parameters or go to Completing the configuration.

Completing the configuration

1. Once you have made all changes, in the last tab click **Set** and then click **Save Configuration**.

Note – GPS modules from the Condor family have a limit of 8 "Saves" in the Configure Receiver screen. After this, you must reflash the device. See Using the Flash Loader application, page 39.

2. Click **Close** to close the *Configure Receiver* dialog.

CHAPTER

5

Using the Core Tools

In this chapter:

- Logging the GPS receiver output
- Converting output logs
- Sending raw data to the receiver
- Managing configurations
- Using the Flash Loader application

This chapter describes how to use the core tools of the Trimble GPS Studio application.

These tools are useful for a range of activities including debugging, testing new commands, systematically configuring GPS receivers, and updating receiver firmware.

Logging the GPS receiver output

1. In the command bar of the main *Trimble GPS Studio* screen, click **Data Logger**:

🗾 Data Logger		
	Logging Calendar 💿 St	tart Logging on COM 15
Available Ports COM 1 COM 3 COM 5 COM 11 COM 14 COM 15	Log File for COM 15 File: Append to file if exists Use standard file naming: Port Settings for COM 15 Baud Rate: 38400 Parity: None Data Bits: 8 Stop Bits: 1 Status Info for COM 15 Activity: Ready to start Received: 0 bytes	Unit ID Test Case # Miscellaneous Settings for COM 15 Cmd TSIP Split: 0 MB Prot: 0 MB Log SV tracking info Log GPS time Generate .csv (MS Streets) Generate .kml (Google Earth) • TX O ALM O BB O SV's n/a RX O FIX O RTC O Dim n/a

- 2. From the Available Ports list, select the COM port that connects to your device.
- 3. In the *Log File* field, enter a filename and path or click the **Browse** button to select the path.
- 4. If appropriate, select the *Use standard file naming* check box and then complete the *Unit ID* and *Test Case #* fields.
- 5. Select the correct protocol and logging options.
- 6. Click Start Logging.

Note – If you are working with more than one receiver, you can create additional logs on the other available COM ports.

Converting output logs

It is sometimes useful to convert the files from the Data Logger into formats used by other applications, for example Google Earth or the Microsoft Excel® spreadsheet software:

1. In the command bar of the main *Trimble GPS Studio* screen, click **Data Converter**:

🛅 Data Converter		- • •							
🎇 Configuration									
Select a file to convert:									
G:\2011\For David\TRMB	STUDIO ETC SW	\TrimbleStudio_v1-							
Convert all .log, .txt and .tsp files in this directory									
Select output files to gener	ate:								
Format	Extension	Supported Protocols							
Google Earth	.kml	ALL							
MS Streets & Trips	.CSV	ALL							
Microsoft Excel	.xlx	TSIP, NMEA, TM3000							
ASCII Text	.txt	TSIP							
NMEA GGA	.txt	ALL							
DR-GPS Logs	.xlx, .txt	HIPPO							
Status:		Records:							
Progress:		Convert Close							

- 2. In the *Select a file to convert* field, browse to and then select the file that you want to convert.
- 3. In the *Select output files to generate* section, select the check box next to each type of output file that you want to generate.
- 4. Click **Convert**. The converted files appear in the source file directory.

Sending raw data to the receiver

🛿 Monitor 🔻 👺 Receiver 🔻	CON	49 🔻	AUTO QL	ERY: ON	🔰 Мар	Sens	sitivity:	Indoo
 Auto Query 		Receiver I	Mode & Stat	JS	Satel	lite Data		
Clear Window		Mode	3-D, Auto	(9 SV), SBA	NS SV	C/No	Az.	Elev.
		Status	doing pa	sition fixes	14	31.0	138.0	13.8
Data Playback	0	Almanac	complete	e & current	16	43.0	215.9	61.1
Generic Packets		DOPs		Status	25	19.0	47.8	5.3
View Position Map	n/s	PDOP	1.62	BBRAM	• 30	44.0	208.1	82.0
View Sky Plot	n/s	HDOP	0.95	RTC	• 31	43.0	63.2	55.4
View GPS System Data	n/s			ANT	OK 32	39.0	236.1	34.6
	-	VDOP	1.31	Osc (ppm)		46.0	0.0	-90.0
📊 View Raw Data	i/hr	TDOP	0.81	-1619.8	32 20	38.0	267.4	29.8
View Receiver Version		Firmware	Info		29	37.0	53.9	22.9
Timing Receiver Monitor	7	Applicatio	n 1.07.1	06/24/		36.0	218.1	
DR Status	9'	Monitor Pr	otocols		6	24.0	169.4	
Protocol Tester	Æ	In TS	IP Out	TSIP	23	41.0	310.9	

1. In the Monitor screen, select Monitor / Generic Packets:

2. In the *Generic Packets* window, in the first section:

Generic	Packets									
supported	This feature allows to send a manually-formatted packet in any supported protocol. It can be used to test packets that do not have built-in support in this program.									
1) Select t formatted	the protocol accordin	g to which th	ie packet wil	l be						
Protocol:	TSIP	Presets:	<select></select>	-						
	2) Enter packet data according to the following rules for the selected protocol:									
by a space	protocol, enter each e. Do not enter the s Iff DLE bytes.									
Packet Da	ta: 10		:	10 03						
button be the raw of	3) To view a response to this packet, click View Raw Data button below to open a raw data window. Make sure to pause the raw output after sending the command as there may be multiple packets coming in.									
View Rav	v Data		Send	Close						

- Select the required *Protocol* to use for sending the raw data from the drop-down list.
- **Optional**. Select an existing message from the *Presets* drop-down list. This message populates the *Packet Data* field (in the second section) with data in accordance with the selected protocol.



Tip – You can use *Presets* to see an example of how to enter a packet for the selected protocol. You can then edit the *Packet Data* field as required for your selected message.

🚾 Generic Packets			
This feature allows to supported protocol. It have built-in support in	can be used to	test packets that	
1) Select the protocol formatted:	according to w	hich the packet w	ill be
Protocol: TSIP	- • Pr	esets: FW Versio	in 🗸
2) Enter packet data a selected protocol:	ccording to the	e following rules f	or the
For TSIP protocol, ent by a space. Do not en Do not stuff DLE bytes	ter the starting		
Packet Data: 10 1F	$\mathbf{)}$		10 03
 To view a response button below to open the raw output after s multiple packets comin 	a raw data win ending the con	dow. Make sure t	to pause
View Raw Data		Send	Close

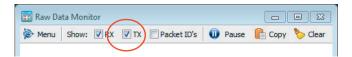
3. If you did not select a *Presets* message, enter your own data in the *Packet Data* field.

Note – *Enter the user data only, not the start and end bytes that appear to the left and right of the field.*

4. Click **View Raw Data**. This opens the *Raw Data Monitor* screen where you can view data from the GPS receiver—by default, only the *Show RX* check box is selected, meaning that the window displays only data received by the application from the GPS receiver:

🗄 Raw Data Monitor [COM12]																			
۲	Men	u	Show	r: 🔽	RX		тх	Pi	acket	ID's	0) Pa	use	P	Сор	y	b d	ear	r:
10	41	48	9F	5A	85	06	62	41	70	00	00	10	03						*
10	46	00	01	10	03														
10	4B	01	02	01	10	03													
10	6D	74	ЗF	FC	FO	6E	3F	88	5F	9C	3F	D5	06	E9	3F	8D	1A	1	
10	82	07	10	03															
10	46		01	10	03														
10	4B		02			03													
10	6D			FC						9C				E9	3F	8D	1A	1	
10	5C	_	00	01	01	42	18	00	00	48	9F		8E		93	03	CO	4	
10	5C		08	01	01	42	10	00	00	48	9F	5A		3F	1B	D9	C7	4	
10	5C	_		01	01	41	EO	00	00	48	9F			3E		1.1	CE	4	
10	5C			01	01	42		00	00	48	9F	5A		3F	02	04	43	4	
10	5C	_		01	00	41	98	00	00	48	9F	5A		3D	FD	55	B9	1	
10	5C			01	01	42	18	00	00	48	9F	5A		3F	8E	8B	BA	1	
10	5C			01	01	42	00	00	00	48		5A	_	3E		17	79		
100	5C		50	00	00	42	00	00	00	48	-	5A		3F	24	F5	3A		
10	5C			01	01			00						3F	67	F6	B9	1	
10	41	48	9F	5A	8E	06	62	41	70	00	00	10	03						
																		1	-
1																			
1																			

Note – To also view data sent to the GPS receiver, select the TX check box. Sent data appears in red on the screen:



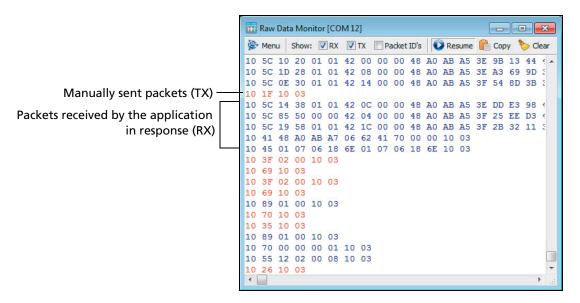
Note – Depending on the GPS receiver and its setup—and whether the application GPS Studio has Auto Query set to ON—the Raw Data Monitor screen may immediately show data being received by the application.

5. Press **Pause / Resume** as required so that you can examine the stream of data more easily:

	¢	📰 Raw Data Monitor [COM 12]																	
	۲	Menu	Sho	w: 🖪	RX		тх	🔳 Pa	acket	ID's	0) Pa	use	C	Сор	y 🎙	岁 Cle	ar	
		10	24 1	0 03															
Packets sent to the receiver (TX)		10	3C 0	0 10															
L		10	21 1	0 03	121223	1010													
Γ		10	10 0	0 01		03	0.0												
		10	4B 0	1 04	2 01	10 D3	03	3F	56	B 3	1D	3F	90	8E	70	3F	27	05	
		10	6D 9	F 00	01	01	42	20	00	00	40	JC 9F	9C	FC	25	10	57	05	1
		10	5C 2	0 08	01	01	42	00	00	00	48	9F	AF	FC	SF	2B	FA	D9	2
		10	5C 1	E 10	01	01	42	04	00	00	48	9F	AF	FC	3E	D3	9F	9F	2
		10	5C 1	6 18	01	01	42	08	00	00	48	9F	AF	FC	3E	D4	CA	D9	4
Packets received by the		10	5C 1	8 20	00	01	41	90	00	00	48	9F	AF	FC	3E	39	81	9B	4
GPS Studio application (RX)		10	5C 1	D 28	01	01	41	DO	00	00	48	9F	AF	FC	3E	36	BA	03	1
		10	5C 0	E 30	01	01	42	18	00	00	48	9F	AF	FC	3F	85	FB	35	2
		10	5C 0	C 40	01	01	41	D8	00	00	48	9F	AF	FC	3E	8B	31	08	2
		10	5C 8	5 50	00	00	41	F8	00	00	48	9F	AF	FC	3F	25	46	DB	4
		10	5C 1	9 58	01	01	42	1C	00	00	48	9F	AF	FC	3F	5C	36	F9	2
		10	41 4	8 91	AF	FD	06	62	41	70	00	00	10	03					
		10	5F 0	3 11	00	00	00	00	00	00	00	00	00	00	00	00	00	00	(
_																			
		4																	
		1																	ti

- 6. To return to the *Generic Packets* window, close the screen.
- 7. To send the raw data to the receiver, in the *Generic Packets* window, click **Send**.

8. Click **View Raw Data** again—you can now see the packets that you specified for sending to the GPS receiver, and the packets returned in response:



Note: Red: Sent (by TGS) data; Blue: Received (from GPS module) data.

9. Return to the *Generic Packets* screen and then click **Close**.

Managing configurations

You can load receiver configurations into the GPS Studio application's *Configurator* and then edit the settings if required (optional). After you have finalized a configuration, you can then save it to a file. You can open this file later and use it to configure one or more receivers.

1. From the menu bar of the main *Trimble GPS Studio* window, select *Tools / Configurator:*

Menu 🔻		
elect product: <pre><select product=""></select></pre>	✓ and configure	settings belo
eneral Settings Timing Receiver S	ettings Miscellaneous Settings	
I/O Options	Port A	Port B
Position: OLLA OECEF	Baud Rate: 📃 👻	-
Altitude: OHAE OMSL	Parity:	-
Velocity: O ENU O ECEF	Data Bits:	
Time: O GPS O UTC	Stop Bits:	
Signal Level: 🔘 AMU 👘 dB-Hz	· · · ·	
Position super-packet (0x8F-20)	Input TSIP Protocol: NMEA	TSIP NMEA
Double precision position output	TAIP	TAIP
Raw measurements (0x5A)	Output TSIP	TSIP
Satellite tracking data (0x5C)	Protocol: NMEA	NMEA TAIP
GPS Configuration		
Receiver Mode:	 Elevation Mask (deg) 	: -1
Dynamics:	- Signal Level Mask (Al	MU): -1
DGPS Mode:	PDOP Mask:	-1
Datum:	PDOP Switch:	-1

2. Select the product.

👗 Configurator			3
🍃 Menu 🔻		7	
Select product: Copernicus II	▼] a	and configure settings below.	•]
General Settings Timing Receiv	ver Settings Miscellaned	ous Settings	
I/O Options	Port A	Port B	
Position: OLLA OEC	EF Baud Rate:	•	
Altitude: OHAE OM	SL Parity:		
Malasihu O ENILL O EZ			

Loading the configuration from the receiver

1. From the *Menu* drop-down list, select *Load from Receiver* to load the settings from the receiver into the Configurator:

💑 C	Configurator		_	- • •
<u>م</u>	1enu 🔻			
	Open Save	•	and configure	settings below
		ttings Miscellane	eous Settings	
	Configure Receiver(s)	Port A		Port B
1	COM Settings	Baud Rate:		
	Reset Current Tab	Parity:		
	Reset All Tabs	Data Bits:	-	-
	1 C:\Users\\config.dat	Stop Bits:	-	-
T	Position super-packet (0x8F-20)	Input Protocol:	TSIP	

2. In the *Configure Receivers* dialog, select the required COM port from the drop-down list and then click **Start**:

 Configure Receivers 		
Select the COM port of the re	eceiver from the drop-do	wn list below and click Start.
COM12		
COM1		
СОМЗ		
COM4		
COM12		
Пусом13		
		0

This loads the configuration into the *Configurator* dialog:

🔏 Configurator	
👺 Menu 🔻	
✓ I/O Options Position: ● LLA Altitude: ● HAE Velocity: ● ENU Time: ● GPS	I value of the settings below. The settings Miscellaneous Settings ECEF Baud Rate: 38400 v MSL Parity: None v ECEF Data Bits: 8 v UTC Stop Bits: 1 v 1 v
The current receiver Raw measurements (0X3)	Protocol: NMEA VINEA
GPS Configuration	
Receiver Mode: Auto (2D/3	BD) Elevation Mask (deg): 5
Dynamics: Land	✓ Sensitivity:
SBAS Mode: On	▼ Indoor (High) ▼
Datum: WGS-84	•
	Configure Receiver(s) Close

Saving a configuration file

1. From the *Menu* drop-down list, select *Save*:

	-			
<u>۱ (چ</u>	Menu 🔻			
	Open –		and configure	settings help
	Save			securigs belo
	Load from Receiver et	ttings Miscella	aneous Settings	
	Configure Receiver(s)	Port A		Port B
	COM Settings	Baud Rate:	38400 -	4800 -
	Reset Current Tab	Parity:	None 🔻	None 🔻
	Reset All Tabs	Data Bits:	8 -	8 -
	1 C:\Users\\config.dat	Stop Bits:	1 •	1 •
TE	Position super-packet (0x8F-20)	Input Protocol:	TSIP	TSIP

2. In the *Choose the receiver configuration file* dialog, browse to the required location, rename the file as appropriate and then click **Save**:

Choose the red	ceiver configurat	ion file			×
Save in:	Downloads		•	G 🦻 📂 🛄 -	
æ	Name	*		Date modified	Туре
Recent Places	🐌 Earlier Dow	nloads		4/27/2011 7:55 PM	File folder
Desktop					
Libraries					
Computer					
Network	₹				F.
	File name:	config.dat		-	Save
	Save as type:	Receiver Configuration File	es (.dat)	•	Cancel

Opening a configuration file

1. From the *Menu* drop-down list, select *Open*:

1	🔏 C	onfigurator	-	_	- • •
	<u>ا ، الماري</u>	Menu 🔻	- 100		
		Open		od configure	settings below.
	H	Save		na comigare	setungs below.
		Load from Receiver	ettings Miscellaneo	ous Settings	
		Configure Receiver(s)	Port A		Port B
		COM Settings	Baud Rate: 38	400 🔻	4800 🔻
		Reset Current Tab	Parity: No	one 🔻	None 🔻
		Reset All Tabs	Data Bits: 8	•	8 🔻
		1 C:\Users\\config.dat	Stop Bits: 1	•	1 •
	-		Input 🔽	TSIP	TSIP

2. In the *Choose the receiver configuration file* dialog, browse to the required location, select the required file and then click **Open**:

Choose the re	ceiver configuration file	×
Look in:	📜 Downloads	- G 🤌 🖂 -
Ca	Name	Date modified Type
Recent Places	Barlier Downloads Config.dat	4/27/2011 7:55 PM File folder 5/4/2011 4:26 PM DAT File
Desktop		
Libraries		
Computer		
	< III	Þ
Network	File name: config.dat	- Open
	Files of type: Receiver Configuration	Files (.dat) Cancel

Configuring receivers using the Configurator settings

1. From the *Menu* drop-down list, select *Configure Receiver(s)*:

🔏 C	Configurator			[- • x
<u>ا ،</u>	Menu 🔻				
	Open Save		•	and configu	re settings below.
	Load from Receiver	ettings	Miscella	aneous Setting	S
	Configure Receiver(s)		Port A		Port B
1	COM Settings	Ba	ud Rate:	38400 🔻	4800 -
	Reset Current Tab	Par	rity:	None 🔻	None 🔻
	Reset All Tabs	Da	ta Bits:	8 🔻	8 🔻
	1 C:\Users\\config.dat	10000	p Bits:	1 •	1
TE	Position super-packet (0x8E-20	Inp	out	✓ TSIP	TSIP

Note – Alternatively, click Configure Receiver(s).

- 2. In the *Configure Receivers* dialog, select one or more COM ports from the top drop-down list and then click **Start**:
- *Note –* You would select multiple COM ports if you are working with more than one receiver.

Configure Receivers		- C X
Select the COM port(s)	from the drop-down list below a	and click Start.
COM4, COM12		
COM1		
COM3		
COM5	4	
COM12 COM13		
		U
	0	0
	0	0
	0	0
		0
		0
	— ŏ i —	ŏ
	— ŏ i —	
	—ŏ —	0
	—ŏ —	ŏ
	0	0
		0
	0	0
COM Settings		Start Close

3. The receiver(s) are configured, and a message appears in the *Configure Receivers* window. Click **Close**:

Configure Receivers						
Select the COM port(s) from the drop-down list below and dick Start.						
COM4, COM12				•		
COM4: Configuration completed!	•			0		
COM12: Configuring receiver	0			0		
	0			0		
	0			0		
	0			0		
	0			0		
	0			0		
	0			0		
	0			0		
	0			0		
	0			0		
	0			0		
	0					
	0			0		
	0			0		
	0			0		
COM Settings			2	Start Close		

4. Click **Close** in the *Configurator* window.

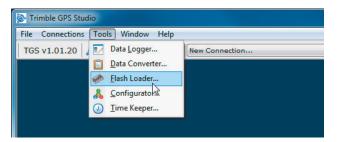
Using the Flash Loader application

Use the Flash Loader application to load firmware onto the GPS receiver.



Tip – To use the Flash Loader, your computer must be physically connected to the GPS receiver.

- 1. Download and extract the new firmware.
- 2. From the main Trimble GPS Studio window, select Tools / Flash Loader:



3. In the *Flash Loader* dialog, click **Browse**:

Firmware File		Browse	Start
Com Port Selection	Loading Status	Loading Progre	ess Time
COM1 -		0	
СОМЗ 🔻		0	
COM4 -		0	
COM5 -		0	
СОМ9 -		0	
COM10 -		0	
		0	

- 4. In the *Choose the firmware file* dialog, navigate to the required firmware file and then click **Open**.
- 5. In the *Com Port Selection* list, select the required communications port and then click **Start**:

• Menu 🔻			
	loads\Artemis_3011_v1-0:	Browse	Start
Com Port Selection	Loading Status	Loading Pro	ogress Time
COM1 -		0	
СОМЗ 👻		0	
COM4 -		0	
COM5 -		0	
Сома 🔺		0	
СОМ10 -		0	
		0	
		0	

The current firmware is erased and the new firmware is loaded.

- 6. When the firmware has been successfully loaded, close the *Flash Loader* window.
- 7. Turn the GPS receiver off and then turn it on again.
- 8. Connect to the GPS receiver, see Connecting the Trimble GPS Studio application to the GPS receiver, page 15.

The new firmware version appears in the Monitor screen, in the Firmware Info section.

CHAPTER

6

Using the Position Map

In this chapter:

- Position Map tab
- Position Plot (Horizontal, 2D) tab

This chapter describes how to use the *Position Map* dialog, accessed from the *Monitor* window.

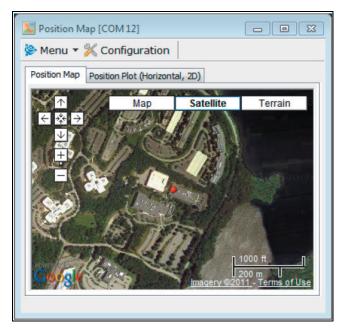
The *Position Map* dialog has two tabs: The *Position Map* tab, and the *Position Plot* tab.

Position Map tab

If you are connected to the Internet, the *Position Map* screen enables you to view Google Maps for your location in the *Position Map* tab. In the *Monitor* window, click **Map**:

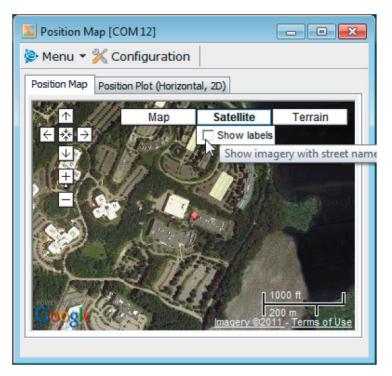
Monitor	- 🖗	Rece	iver 🔻 🖸 COI	M 12 🔻	AUTO Q	UERY: ON	Мар	Sens	sitivity:	Indoor
Time [GPS]				Receiver I	Mode & Stat	tus		ite Nata	10 - 10 - 10 - 10 - 10 - 10 - 10 - 10 -	
Time		Wed 21:	45:20	Mode	3-D, Auto	(9 SV), SBAS	s Vi	ew rea	I-time p	osition n
Date		May 04,	2011	Status	doing p	osition fixes	31	38.0	90.3	36.1
Week	1634	4 TOW	337520	Almanac	complet	te & current	32	29.0	219.3	15.0
elocity				DOPs		Status	30	40.0	42.5	69.3
East		0.025	m/s	PDOP	2.01	BBRAM 🗢	23	41.0	290.1	59.7
North		0.039	m/s	HDOP	1.09	RTC 🔶	16	40.0	271.9	83.1
Up		0.044	m/s			ANT OK	29	16.0	34.6	8.3
				VDOP	1.68	Osc (ppm)	13	33.0	315.4	27.0
Speed		0.0	mi/hr	TDOP	1.22	-1619.79	20	25.0	244.3	16.4
Position				Firmware	Info		6	37.0	158.4	40.1
Latitude	Ν	42°	24.30147	Applicatio	n 1.07.1	06/24/10	3	32.0	176.3	31.7
Longitude	W	71°	16.50435'	Monitor Pr	rotocols		133	33.0	218.0	37.1
Altitude		54.84	m HAE	In TS	SIP Out	TSIP 💌				

The *Position Map* screen opens, showing the *Position Map* tab—wait for Google Map data to load. The default view is the Satellite view, and the screen shows the usual Google Map controls:

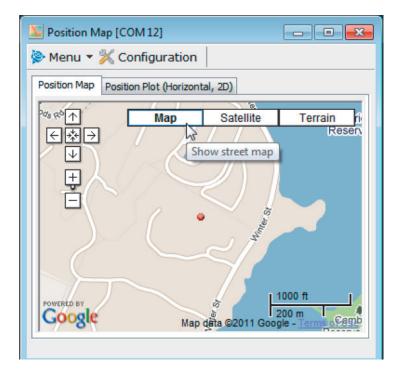


You can now do the following:

• Mouse over the **Satellite** button to see the *Show labels* check box. Select or clear this check box to turn overlay map labels on or off:

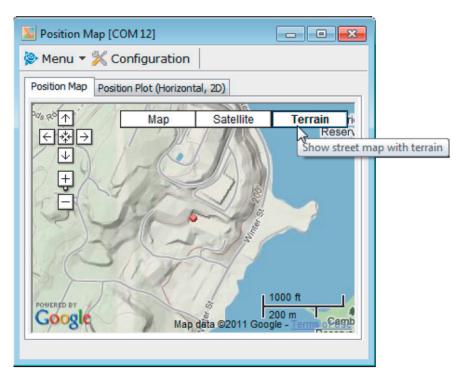


• Click **Map** to show the street map view:



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• Click **Terrain** to show the terrain view:

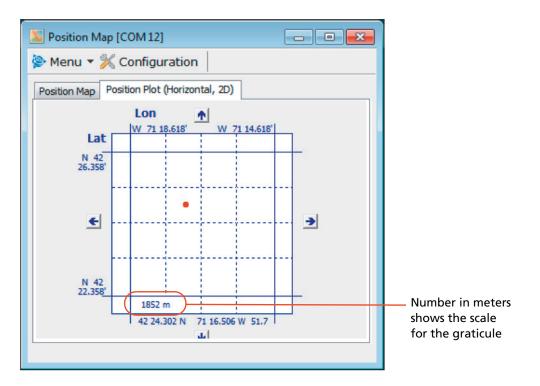


Tip – To use the screen features (such as *Zoom In, Zoom Out, Erase,* and *Measure Distance*), you can either use the screen controls, or select them from the *Menu* drop-down list. The following example shows how you can select a closer view by using the Zoom In feature:



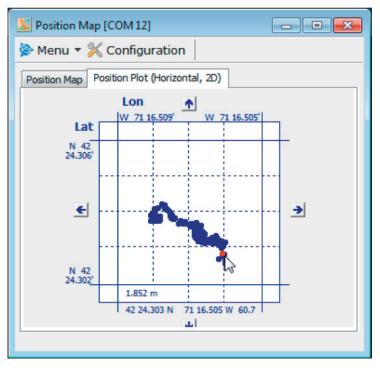
Position Plot (Horizontal, 2D) tab

Click the *Position Plot (Horizontal, 2D)* tab:

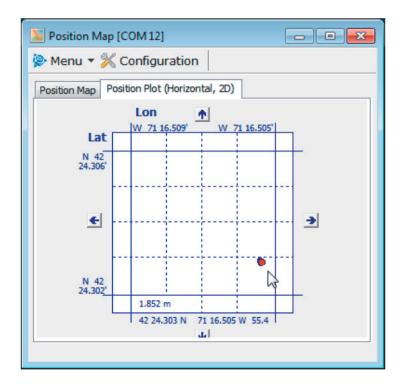


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Tip – To use the screen features (such as *Zoom In, Zoom Out,* and *Erase*), you can either use the screen controls, or select them from the *Menu* drop-down list. The following example shows the *Position Plot* tab using the *Zoom In* feature:



To erase the displayed plot, select Menu / Erase:



CHAPTER

7

Using GPS Studio With GPS Timing Receivers

In this chapter:

- Overview of GPS timing receivers
- Connecting the GPS Studio application to the GPS timing receiver
- Configuring the timing receiver

This chapter describes how to use the Trimble GPS Studio application with GPS timing receivers. It includes descriptions of the *Timing Receiver Status and Control* window and the *Timing Receiver Configuration* window.

Overview of GPS timing receivers

GPS timing receivers are high-performance receivers that have been specially adapted for timing applications. Trimble GPS timing receivers feature the Trimble improved signal processing code, a high-gain RF section for compatibility with standard active gain GPS antennas, and a CMOS level pulse-per-second (PPS) output for timing and synchronization applications. Timing applications are assumed to be static.

GPS timing receivers operate in two main modes:

- Self-survey mode (position fix operating mode, at startup)
- Overdetermined Clock mode (timing mode, after reference position fix)

The special timing software used with a timing receiver configures the unit into an automatic self survey mode at startup. The receiver will average position fixes for a specified time (one per second) and at the end of this period will save this reference location. The receiver then goes into an Overdetermined Clock mode, during which time the receiver no longer solves for position. Instead, it only solves for clock error and clock bias using all of the available satellites. This provides an accuracy of 15 ns RMS or better for the 1PPS output.

User settings such as port parameters and TSIP settings can be stored in the receiver's non-volatile (Flash) memory. These settings are retained without mains power.

Note – When customizing port assignments or characteristics, confirm that any changes do not affect the ability to communicate with the receiver.

Self-Survey mode

At power-on, the unit performs a self-survey by averaging position fixes. The default number for position fixes (2000) is configurable in the GPS Studio application.

The default mode during self-survey is 2D/3D Automatic, where the receiver must obtain a 3D solution. If fewer than four conforming satellites are visible, the unit suspends the self-survey. 3D mode may not be achieved when the receiver is subjected to frequent obscuration or when the geometry is poor due to an incomplete constellation.

Overdetermined Clock mode

Overdetermined Clock mode is used only in stationary timing applications. This is the default mode for GPS timing receivers once a surveyed (or user-entered) position is determined. After the receiver self-surveys its static reference position, it automatically switches to Overdetermined Clock mode and determines the clock solution. The timing solution is qualified by a TRAIM algorithm, which automatically detects and rejects faulty satellites from the solution.

Connecting the GPS Studio application to the GPS timing receiver

The *New Connection* function enables you to connect to the GPS timing receiver, opening both the *Timing Receiver Status and Control* and the *Monitor* dialogs.

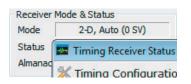
The *New Connection* function provides auto-detection of baud rates, parity, data bits, and stop bits settings.

To connect to the GPS receiver, see Connecting the Trimble GPS Studio application to the GPS receiver, page 15:

S v1.01	20 🔊 Co	nnect to De	evice 🔻 New Cor	inection				•	Data Logger	Data Conver	ter 🗹	Preferences 🗐 Exit
Resolutio	on SMT Monit	or [COM 12]					- 6		Timing Rece	iver Status and Cor	ntrol [CO	M12] 🗖 🗐
Monitor	r 🔻 👺 Rece	eiver • Co	M 12 - AUT(O QUERY: ON	Мар	Sens	sitivity:	Indoor	🎇 Timing Cor	figuration		
ime [GPS]			Receiver Mode &	Status	Satell	ite Data	9		GPS Status			Status
Time	Fri 18:2	24:22	Mode O-D	, Manual (3 SV)	SV	C/No	Az.	Elev.	Self-Survey Pr	ogress: 100%		Antenna Open
Date	July 01,	2011	Status over-	determined clock	16	20.0	6.0	79.0	Rcvr Mode:	(7) Overdet Clock (Antenna Short
Neek	1642 TOW	498262	Almanac com	plete & current	23	20.0		63.0				Satellite Tracking
elocity			DOPs	Status	6	19.0	143.0	56.0	GPS Status:	(0) Doing Fixes	s	Self-Survey Active
Nest	0.000	m/s	PDOP	BBRAM 🗢	3	20.0	171.0	50.0	Timing			Stored Position
South	0.000	m/s	HDOP	RTC 🔶	13	20.0	307.0	43.0	Bias:	286235.91	ns	Leap Second Pending
Down	0.000	m/s	VDOP	ANT OK	31	0.0	104.0	24.0			-	
	0.0	mi/hr		Osc (ppb)	19	0.0	183.0	19.0	Bias Rate:	949.64	ppb	Test Mode
Speed	0.0	mi/nr	TDOP 1.00	949.64	21	0.0	74.0	7.0	PPS Quant Erro	or: 11.5	ns	Position Questionable
osition			Firmware Info		10	0.0	319.0	6.0	Miscellaneous			Almanac
atitude	N 42°	24.30024	Application 1.0	5.1 03/18/11	20	0.0	232.0	6.0	UTC Offset:	15 secon		PPS Generated
ongitude	W 71°	16.50743'	Monitor Protocols		7	0.0	295.0	5.0			IOS	PPS Good
Altitude	47.51	m HAE	In TSIP	Out TSIP 🔻	32	0.0	210.0	3.0	Temperature:	38.98 °C		
Rx @	Monitoring	Resolution S	MT	1:1	0:35	сом	12:960	0-8-0-1				

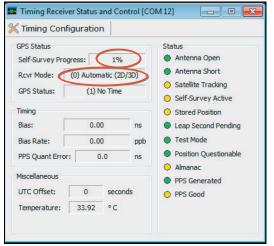
The Trimble GPS Studio application is now connected to the GPS timing receiver. You can use the application to configure and monitor the performance of the GPS timing receiver.

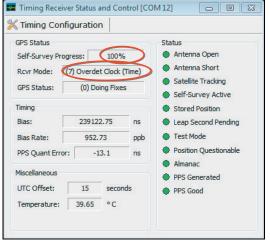
Note – In the Monitor window, notice the Receiver Mode & Status section in the upper middle. After self-survey, the Mode will be "O-D only" (initially, it may be "2D, Auto" then "3-D, Auto").



Timing Receiver Status and Control dialog

The *Timing Receiver Status and Control* dialog displays key GPS status information and status alerts that change during a self-survey of position fixes:





Self-survey in progress

Self-survey completed

The screen shows the following information:

Element	Description
Timing Configuration	Click to open the Timing Receiver Configuration dialog.
GPS Status	 The options are: Self-Survey Progress: Shows the percentage of GPS fixes collected so far during the self-survey process. (Percentage of total fixes in the Timing Receiver Configuration dialog's Survey Length field.) It shows 100% when a self-survey has been completed. Rcvr Mode: Shows the fix mode the GPS timing receiver is currently configured for. GPS timing receivers spend most of their time in the Overdetermined Clock ("O-D time only") mode, in which they use all available satellites to perform the best time-only fix possible. GPS Status: "(0) Doing Fixes", "(1) No Time".
Timing Miscellaneous	 Bias: In ns. Bias Rate: In ppb. PPS Quant Error: In ns. UTC Offset: In seconds.
Miscellarieous	Temperature

Element	Description
Status indicators	The status indicators are user alerts. They do not necessarily indicate impaired function.
	 Antenna Open: If this indicator is yellow, the antenna input connection is open, that is, not drawing sufficient current. Normally, GPS timing receivers provide power to the antenna's LNA (Low Noise Amplifier) through the center conductor of the antenna cable. On-board circuitry senses this current draw, and if it is low, this indicator is yellow. If the antenna is powered elsewhere (for example, when using a splitter) the antenna open condition is expected. This does not imply a fault condition, and does not impair operation.
	 Antenna Short: If this indicator is yellow, the antenna input is shorted (drawing too much current).
	 Satellite Tracking: If this indicator is yellow, no satellites are usable yet. For a satellite to be usable, it must be tracked long enough to obtain ephemeris and health data.
	 Self-Survey Active: If this indicator is yellow, a self-survey procedure is in progress.
	• Stored Position: If this indicator is yellow, no position is stored in Flash ROM.
	• Leap Second Pending: If this indicator is yellow, the GPS system has alerted the timing receiver that a leap second transition is pending.
	 Test Mode: If this indicator is yellow, the timing receiver unit is operating in one of its test modes.
	 Position Questionable: If this indicator is yellow, the accuracy of the position used for time-only fixes is questionable. It may mean that the unit has been moved since it last completed a self-survey procedure. If this alarm persists, restart the self-survey of the unit. See Configuring the timing receiver, page 52
	 Almanac: If this indicator is yellow, means the Almanac is not current or complete.
	 PPS Generated: If this indicator is yellow, the PPS was not generated this second This could mean that there were not enough usable satellites to generate an accurate PPS output. It could also mean that the unit is generating an Even Second output (see Packet 8E-4E) and that the unit did not output a PPS on the odd second.
	• PPS Good: If this indicator is green, the PPS is good.

• *PPS Good*: If this indicator is green, the PPS is good.

Configuring the timing receiver

You can configure position, self-survey, and timing output.

To configure the timing receiver, click **Timing Configuration** in the command bar of the *Timing Receiver Status and Control* dialog:

en-ourvey, Pos	ition, General	Timing Ou	tputs			
Self-Survey			Accurat	te Positi	on	
Survey Flag:	Enable		Lat:	0	deg	(+N, -S)
Position Flag:	 Disable Save 		Lon:	0	deg	(+E, -W)
rosidorridg.	 Don't Save 	e	Alt:	0	m	
Survey Length	: 2000 f	ixes	Dou	ble Pred	tision	
R	estart Se	et	Save	D	elete	Set
General Option	s					
SV for One-Sat	ellite Mode: 0	Set]			
Current mode:	Timing Co	onfigure for	PVT M	ode	•	Set
Poll Timing Pack	kets:	Primary	Sup	plement	al	

The *Timing Receiver Configuration* dialog has two tabs:

- Self-Survey, Position, General tab, page 52
- Timing Outputs tab, page 54

Click **Query** to query the receiver for its current configuration settings.

Click **Close** to close the screen.

Self-Survey, Position, General tab

Use this tab to reset and restart the self-survey, and reset position and general options.

Self-Survey

The Self-Survey area is used to configure and restart a self-survey:

- 1. In the *Self-Survey* area, you can make the following changes if required:
 - *Survey Flag*: Enable or disable self-surveys.
 - *Position Flag*: Save (or do not save) the surveyed position when the self-survey is complete.

Note – The survey flag and position flag are both enabled by default. If you disable them, there is the option to set your own position. See Accurate Position, page 53.

Survey Flag:	 Enable Disable 	
Position Flag:	 Save 	5.9
	O Don't	Save
Survey Length:	2000	fixes

- Survey Length: To shorten the survey process, change the total number of fixes that are to be averaged together to form the self-surveyed position to be used for clockonly fixes.
- 2. If you changed any parameters, click Set.
- 3. Click **Restart**. In the *Timing Receiver Status and Control* window, the *Self-Survey Progress* field restarts at 0%.

Accurate Position

The *Accurate Position* fields are used to specify and save the position used to perform time-only fixes. Use the WGS-84 datum to enter the coordinates.

- 1. Enter or edit the following coordinates:
 - Lat (deg (+N, -S)): Latitude of the accurate position, in decimal degrees. For a southern latitude, enter a minus sign before the value.

Lon:	0	deg (+E, -W)
Alt:	0	m
Dout	ole Prec	ision

- Lon (deg (+E, -W)): Longitude of the accurate position, in decimal degrees. For a western longitude, enter a minus sign before the value.
- *Alt* (m): Altitude of the accurate position (in meters).

Note – Click the **Query** button at the bottom of the screen to populate the fields with any currently set coordinates.

- 2. Select the *Double Precision* check box (recommended) to send double-precision values of the position. If you do not do this, a single-precision packet is used.
- 3. Click **Set** to immediately set the receiver's position to the specified coordinates and switch the receiver to Over Determined timing mode.

Note – If a self-survey is in progress when you click **Set***, the self-survey is cancelled.*

Note - If you click Set, the position to not saved automatically to non-volatile (Flash) memory.

4. Wait at least two seconds and then click **Save** to save the receiver's currently set position to non-volatile (Flash) storage.

To delete saved coordinates from Flash storage, click **Delete**.

General Options

In this area, you can do the following:

1. *SV for One-Satellite Mode:* Enter the satellite ID (1 to 32) that you want to use for the one-satellite, time-only fix mode and then click **Set**.

General Options			
SV for One-Satellite Mode:	0 Set		
Current mode: Timing	Configure for	PVT Mode 👻	Set
Poll Timing Packets:	Primary	Supplemental	

- Note If you enter 0, the GPS receiver automatically selects the best satellite.
 - 2. *Current Mode:* From the *Configure for* drop-down list, select the required mode (*Timing* or *PVT Mode*) and then click **Set**:

- *Timing Mode:* This is the timing receiver output mode. If you select this option, the receiver will automatically outputs timing packets only, for example, 0x8F-AB and 0x8F-AC.
- *PVT Mode:* This is the position/velocity/time mode. If you select this option, the receiver automatically outputs packets associated with positioning, for example, 0x56, 0x6D, and 0x84.

Note – Always use timing receivers in static applications in timing mode. Do not use them in PVT Mode before talking to Trimble Support.

- 3. Select the *Poll Timing Packets* check boxes to turn on polling of timing packets only if the product being monitored does not automatically output the particular timing packet. If you select Primary, you must also select Supplemental, but you may use Supplemental on its own:
 - *Primary*: Select this option to turn on polling of the primary timing packet 0x8F-AB. *Supplemental*: Select this option to turn on polling of the supplemental timing packet 0x8F-AC.

Collectively, there are only three valid states for these check boxes:



Timing Outputs tab

Use this tab to change settings for Packet Masks, PPS Qualifier, PPS Output, and UTC GPS Timing.

seit-surve	y, Position, General	Timing	Outputs		
Packet M	lasks (0x8E-A5)		PPS Qualifier (0x8E-4E)		
🔽 Prima	ry Timing (8F-AB) (B	it 0)	Qual: 🔘 Alwa	ays 🔘 >=1 🔘 >=3	
Supp	Timing (8F-AC) (Bit	2)	Type: () 1PP	S O Even Second	
Auto	Event Packets (Bit 6)			
	Set M	1asks		Set Qualifier	
PPS Out	out (0x8E-4A) / Widt	th (-4F)	UTC/GPS Timir	ng (0x8E-A2)	
Output:	Enable O Dis	able	Date/Time Re	port (8F-AB):	
Polarity:	Positive Ne	gative	GPS	⊚ итс	
Offset:	0	sec	PPS Output A	lignment:	
Width:	0	sec	GPS	🔘 итс	
	Set	PPS		Set Timing	

Packet Masks (0x8E-A5)

The broadcast mask is bitwise encoded to allow you to turn on and off the broadcast of certain packets. The settings for Packet Masks are:

Setting	Select to automatically output
Primary Timing (8F-AB) (Bit 0)	the primary timing packet 0x8F-AB.
Supplemental Timing (8F-AC) (Bit 2)	the supplemental timing packet 0x8F-AC.
Auto Event Packets (Bit 6)	the position, velocity, and receiver mode packets 0x56, 0x6D, and 0x84.

Click Set Masks to set the packet broadcast masks according to the options.

Note – If broadcast packets have multiple formats, the receiver broadcasts only one of the formats. If more than one of the formats is masked **on** for broadcast, the format with the greatest precision of content masked **on** is sent and the rest is not sent.

PPS Output (0x8E-4A) / Width (-4F)

You can specify the PPS Output characteristics that apply to the receiver. The settings for PPS Output are:

Setting	Description
Output	Enable or Disable PPS output
Polarity	Set polarity positive (on time rising edge) or negative (on time falling edge).
Offset (in seconds)	Value for PPS offset or cable delay. Negative offset values advance the PPS, and are normally used to compensate for cable delay.
Width (in seconds)	Value for PPS pulse width. If this field is unavailable, the receiver does not support setting the PPS pulse width.

Click Set PPS to set the PPS Output characteristics according to the selected options.

PPS Qualifier (0x8E-4E)

The settings for PPS Qualifier are:

Setting	Description
Qual	When PPS is turned on:
	Always: PPS is always turned on.
	 >=1: PPS is output when at least one satellite is tracking.
	 >=3: PPS is output when at least three satellites are tracking.
Туре	• 1PPS: PPS is generated every second (Qual setting applies).
	• Even Second: PPS is generated every even second (Qual setting applies).

Click Set Qualifier to set the PPS Qualifier according to the selected options.

UTC/GPS Timing (0x8E-A2)

You can specify the UTC/GPS time report alignment (time and date fields) in packet 0x8E-A2 and the temporal location of the output PPS. The settings for UTC/GPS Timing are:

Setting	Description
Date/Time Report (8F-AB) – GPS or UTC	Time report is to be aligned to the GPS time or UTC time.
PPS Output Alignment – GPS or UTC	PPS is to be aligned to the GPS time or UTC time.

Click **Set Timing** to set the time report alignment and the temporal location of the output PPS according to the selected options.



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