TECHNICAL TIPS from   INLAND GPS

Configuring Trimble R8 GNSS receiver to output serial data

This Technical Tip provides instructions for configuring a Trimble R8 GNSS receiver (hereinafter referred to simply as a Trimble R8) to output serial data through one of its serial ports.

Serial-data output is useful for many purposes, such as providing real-time position information to a depth sounder with position-logging capability or a computer running a map-display program.

The Trimble R8 is factory-enabled to output a variety of serial-data messages. The most commonly used are the various NMEA-0183 messages as defined by the National Marine Electronics Association. Other options include the Trimble-proprietary GSOF, RT17, and RT27 messages.

In this document we will configure a Trimble R8 to output the NMEA-0183 GGA message from Port 2 (the DE9M receptacle) on the Trimble R8. The user will be able to see how to select other options as required for their specific requirements. It is common for a receiver to be configured to output multiple serial messages at various frequencies.

It is expected that these instructions will also work with the Trimble 5800, Trimble R6, Trimble R4, and all similar receivers but we have no way of testing that. Please advise Inland GPS of any experience you may have attempting to configure any of those models using these instructions.

This procedure requires some basic Windows skills such as using a computer mouse or pointer, etc. It is also recommended to have and know how to operate a basic terminal program such as HyperTerminal.

Because web URLs can and do change, in most instances this document does not contain actual hyperlinks to resources outside the control of Inland GPS. For those items this document provides general navigation information that should not quickly go out of date. Please advise Inland GPS if you have trouble finding any of the required files.

These instructions presume you have a recent version of Trimble's GPS Configurator utility installed on your computer.

The latest version of GPS Configurator is available from Trimble's web site at *http://www.trimble.com*, then follow the hyperlink sequence *Support & Training | Support A–Z List | GPS Configurator | Downloads* There you will also notice a hyperlink to a couple of archived older versions.

These instructions were prepared using a Windows 7 Professional x64 computer with a USB-to-serial adapter. The computer's User Account Control (UAC) was set to the most-sensitive **Default – Always notify me when:** setting. The GPS Configurator software used was Version 4.10 (Build 4 – 20 March 2013). The Trimble R8 Model 3 receiver had Version 4.12 firmware, an older version released in late 2009.

The steps are as follows:

1. Preparing the receiver
Achieving our desired results, specifically configuring the Trimble R8 to output serial data through Port 2 (the DE9M receptacle), requires a power-up configuration file (named **POWER_UP.CFG**) be installed in the receiver.

Operations such as updating the firmware in or performing a full reset of the receiver will purge any **POWER_UP.CFG** file or other application or configuration file(s) in the receiver. If you are going to update the receiver firmware it would save time and effort to do that update before creating and installing the **POWER_UP.CFG** file.

We recommend performing a full reset of the receiver before beginning this procedure. That way the user can be confident that no previous configuration artifacts are hindering the successful completion of this procedure. (**Warning:** Make sure to download any needed data from the receiver before resetting because resetting will permanently delete all data files.)   For instructions on resetting the Trimble R8 and other models, refer to the Inland GPS Technical Tips document titled *Resetting Trimble GPS/GNSS Survey Receivers*.

2. Establishing necessary connections to the receiver

The Trimble R8 must be powered during this procedure, either by internal batteries or an external power source.

It is also necessary to have a serial-data connection between the Trimble R8 and the computer running GPS Configurator. Either serial port on the Trimble R8 should work fine; in preparing these instructions we used Port 2 mainly because all Trimble R8 users are likely have a null-modem cable that will connect to this port.
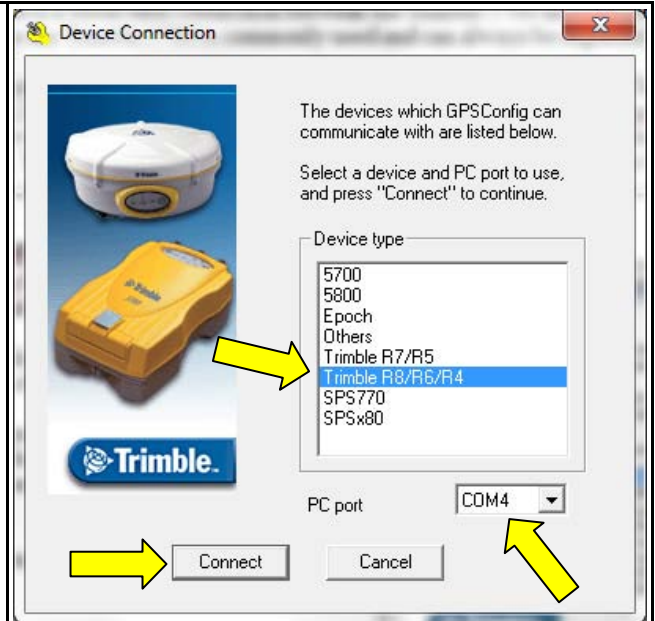
3. Starting GPS Configurator and connecting to the Trimble R8

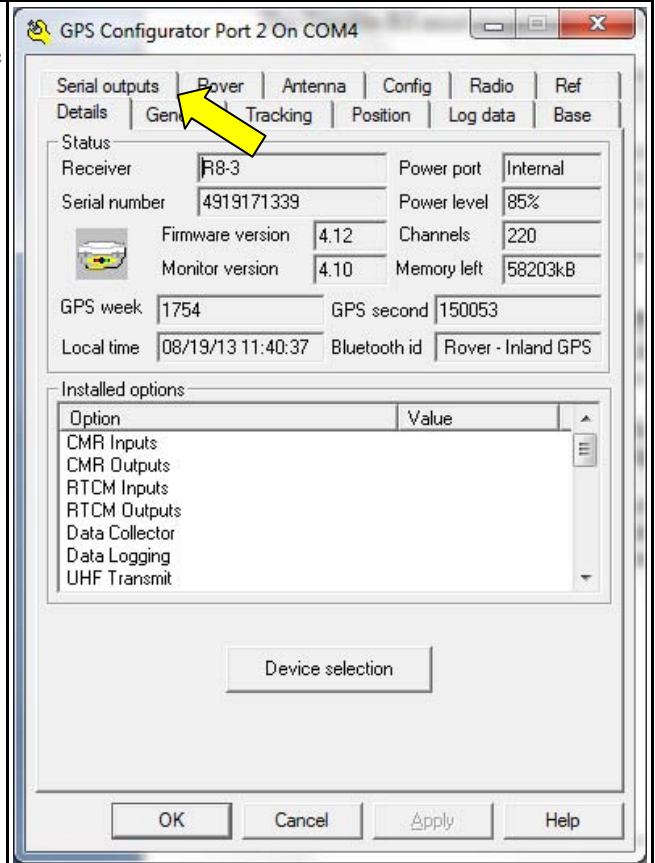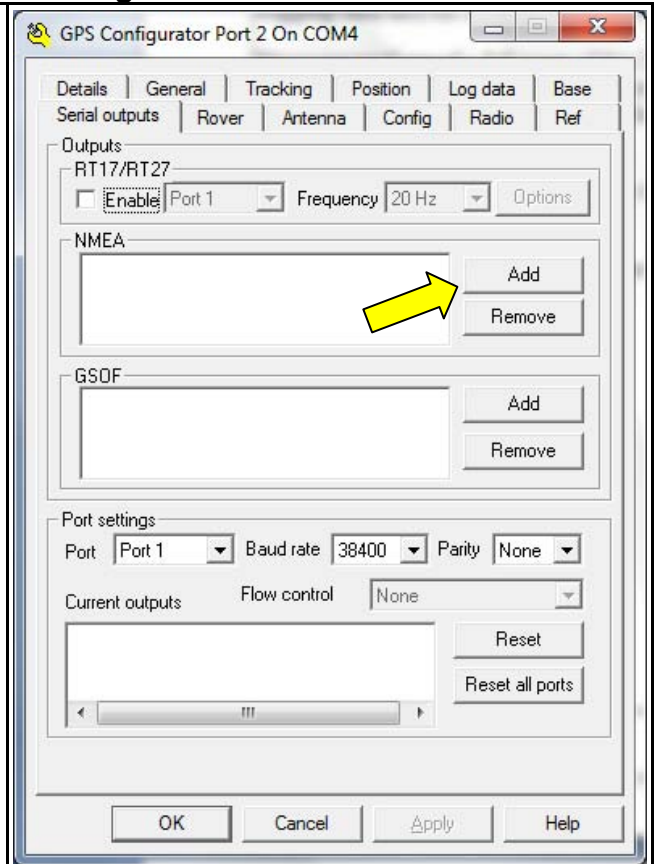|	
Start GPS Configurator by double-clicking its shortcut. The **Device Connection** dialog will appear as shown at right. Under **Device Type**, click the appropriate model designation (**Trimble R8/R6/R4** in this case) to highlight that selection. To the right of the **PC port** label, select the COM port that is connected to the Trimble R8. In our situation that happened to be COM4, but the user needs to select the correct COM port on their computer. Click the **Connect** button.	
GPS Configurator will establish a connection with the Trimble R8 and display a dialog as shown at right. This time the **Details** tab came up first; your results may vary. There is much useful information accessible via GPS Configurator, but we will concentrate on the task at hand. Click on the **Serial outputs** tab to bring up the next dialog.	

4. Configuring the Trimble R8 so it sends serial data through Port 2

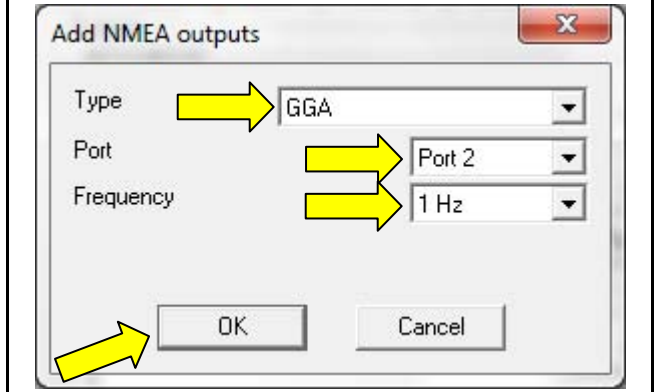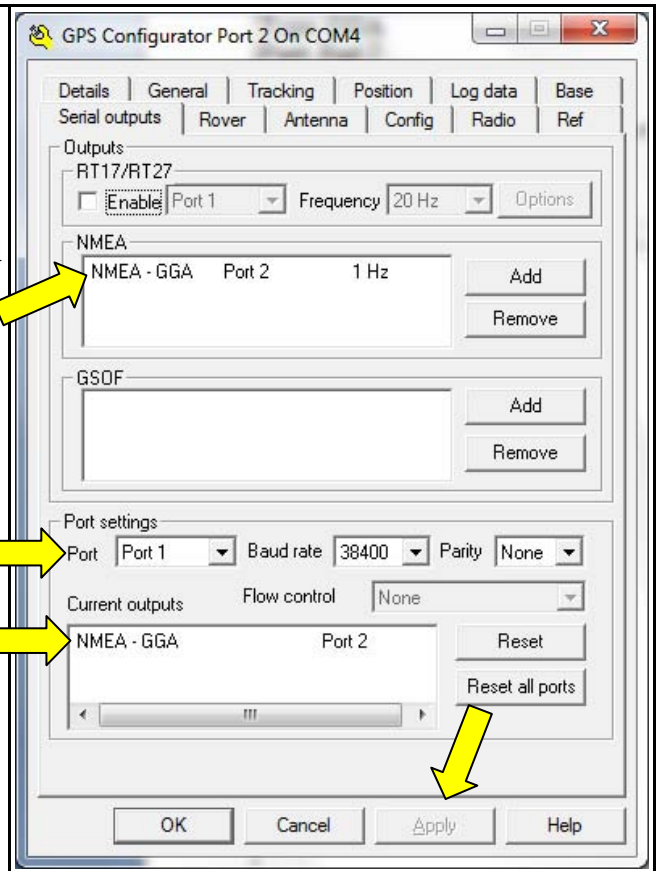|	
You will notice in the **Serial outputs** dialog at right that the receiver is not outputting any data at present, which is what we expect since we performed a full reset of this Trimble R8 before starting the procedure. It is our objective to configure the receiver so it outputs the NMEA GGA data sentence through Port 2, so click the **Add** button in the **NMEA** area of the dialog.	
The **Add NMEA outputs** dialog appears as shown at right. Using the pull-down boxes, make the following settings: **Type** GGA **Port** Port 2 **Frequency** 1 Hz Click the **OK** button to accept these settings	

Now we are back to the **Serial outputs** dialog. NMEA-GGA appears in the **NMEA** area of the dialog.

Click the **Apply** button in the bottom row of the dialog. After a few seconds NMEA – GGA will appear in the **Current Outputs** area of the dialog.

In the **Port settings** area of the dialog, set **Port** to **Port 2** and confirm that baud rate is **38400** and parity is **None**.

Please note that you may add additional NMEA-0183 and other messages as necessary. It is not necessary that all messages are output at the same frequency.
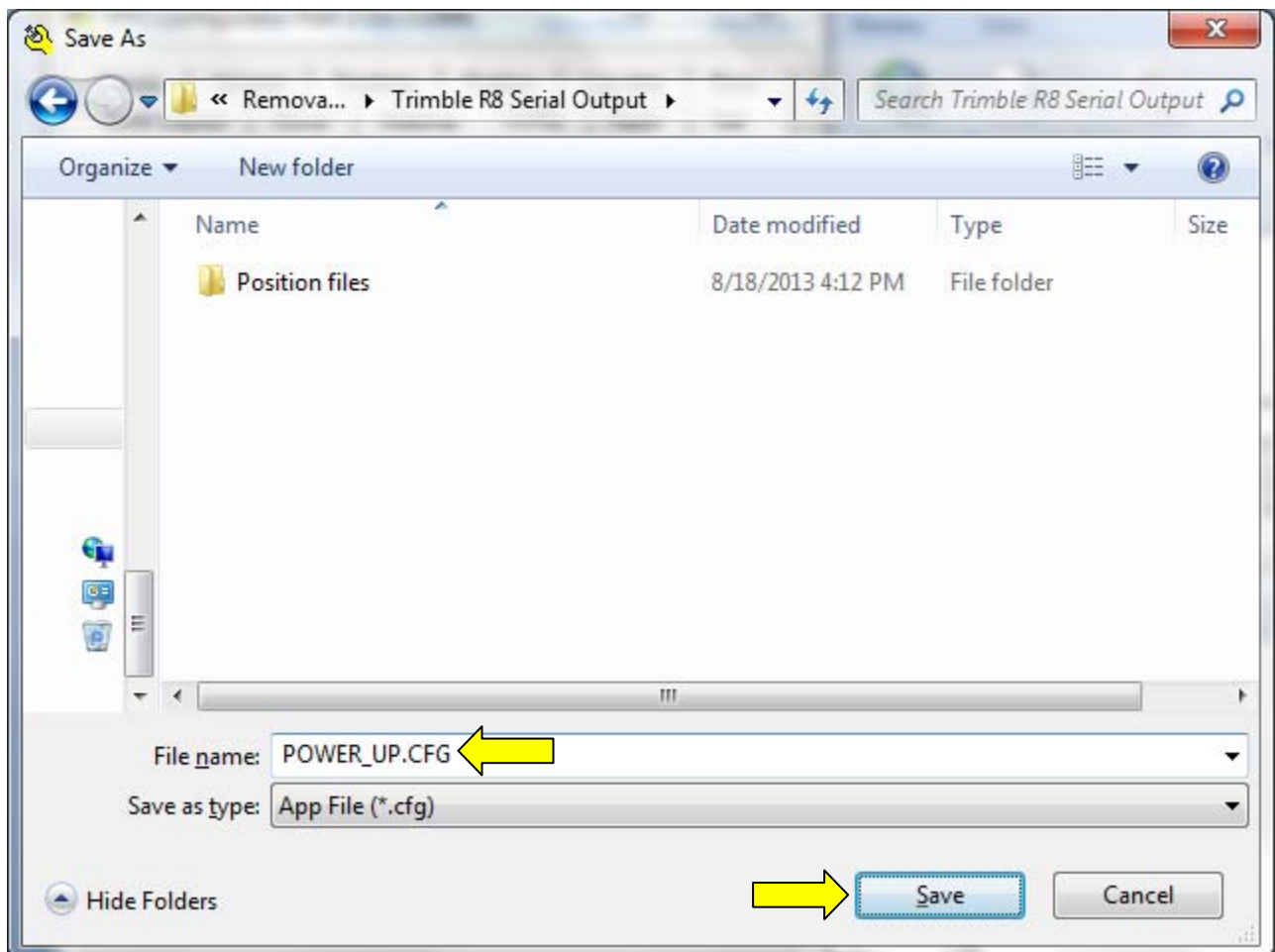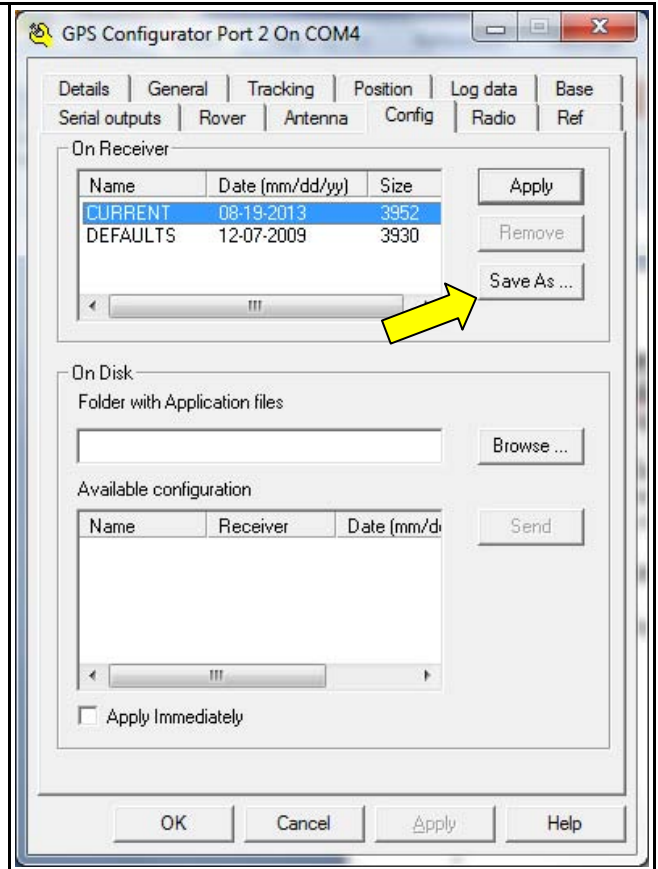
5. Creating the POWER_UP.CFG configuration file

Click on the **Config** tab to open the dialog of the same name and as shown at right.

The **CURRENT** file within the **On Receiver** area of the **Config** dialog now has the settings we want the Trimble R8 to have each time we power up the Trimble R8.

Highlight **CURRENT**, then click the **Save As** button.

The **Save As** dialog shown below will appear.

Tell the **Save As** dialog to store this file as **POWER_UP.CFG**. (Don't forget the underbar.)

Set the destination to an appropriate folder on your computer, or else remember where the file will be saved. Click the **Save** button.

6. Sending the `POWER_UP.CFG` configuration file to the Trimble R8

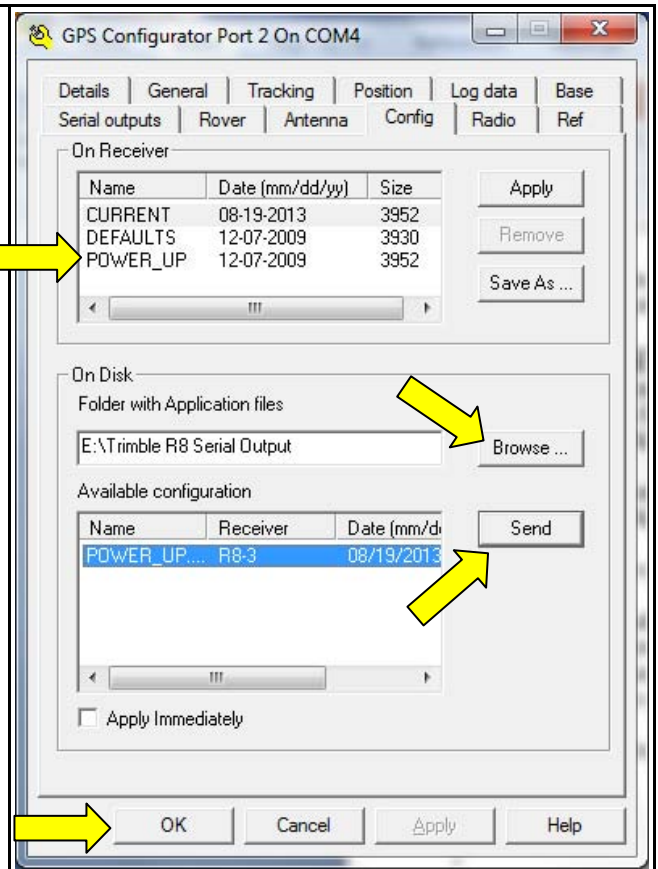|	
In the **On Disk** area of the **Config** dialog, click the **Browse** button and navigate to the folder in which you saved the **POWER_UP.CFG** configuration file in the previous step. In the **Available configuration** field you will see the **POWER_UP.CFG** file. Highlight that file name and click the **Send** button. After a few seconds you should see the **POWER_UP.CFG** file (minus the extension) in the **On Receiver** field. (If it does not appear and there was no error message, it may be necessary to close and restart GPS Configurator.) Click the **OK** button to close GPS Configurator. Power down the Trimble R8 using the power button on the receiver.	

Now when you start the Trimble R8 it will load the settings in the POWER_UP.CFG file and operate as it was when the POWER_UP.CFG file was created.

The serial output through Port 2 will continue even when the Trimble R8 is controlled as a RTK rover by Trimble Survey Controller or Trimble Access software, as long as the survey style does not tell Port 2 to do something other than output serial data.

7. Verifying data output from the Trimble R8

At this time, the user could connect the device or equipment that is to receive the serial-data message to Port 2 on the Trimble R8.

It is suggested that the user confirm the data output with HyperTerminal or another terminal program. The NMEA-0183 messages consist entirely of ASCII characters, so they are easily viewed in a basic terminal program, as shown in the next image.


```
Direct to COM4 - HyperTerminal
File  Edit  View  Call  Transfer  Help

2.0,0021*4A
$GPGGA,182752.00,4431.51821193,N,10902.20912714,W,4,09,0.9,1550.681,M,-17.051,M,
3.0,0021*49
$GPGGA,182753.00,4431.51821041,N,10902.20912785,W,4,09,0.9,1550.684,M,-17.051,M,
4.0,0021*4C
$GPGGA,182754.00,4431.51820920,N,10902.20912714,W,4,09,0.9,1550.679,M,-17.051,M,
5.0,0021*4F
$GPGGA,182755.00,4431.51820820,N,10902.20912708,W,4,09,0.9,1550.680,M,-17.051,M,
6.0,0021*47
$GPGGA,182756.00,4431.51820838,N,10902.20912607,W,4,09,0.9,1550.678,M,-17.051,M,
7.0,0021*45
$GPGGA,182757.00,4431.51820725,N,10902.20912825,W,4,09,0.9,1550.683,M,-17.051,M,
8.0,0021*42
$GPGGA,182758.00,4431.51820562,N,10902.20912665,W,4,09,0.9,1550.672,M,-17.051,M,
9.0,0021*49
$GPGGA,182759.00,4431.51821147,N,10902.20912724,W,4,09,0.9,1550.682,M,-17.051,M,
1.0,0021*49
$GPGGA,182800.00,4431.51821076,N,10902.20913145,W,4,09,0.9,1550.686,M,-17.051,M,
1.0,0021*4D
$GPGGA,182801.00,4431.51821104,N,10902.20912927,W,4,09,0.9,1550.684,M,-17.051,M,
1.0,0021*47
$GPGGA,182802.00,4431.51821254,N,10902.20913049,W,4,09,0.9,1550.694,M,-17.051,M,
1.0,0021*43
_

Connected 0:02:43    Auto detect    38400 8-N-1    SCROLL   CAPS   NUM   Capture   Print echo
```

The above image of a HyperTerminal screen shows the second-by-second output of the NMEA-0183 GGA message. Two items that bear mention are

1. The GPS-quality indicator (right arrow above.) The "4" in this column indicates "Real-Time Kinematic, fixed integers."

2. The reference-station indicator (left arrow above). The point ID of reference station used in preparing these instructions was 21. This can be useful in detecting if the Trimble R8 is receiving reference data from a station other than the desired station.

Other considerations –

Serial communications

In the course of preparing this document we were pleasantly surprised to find that GPS Configurator could still communicate with the Trimble R8 through Port 2 on the receiver which was outputting the NMEA GGA data string at the same time. All prior experience with serial communication indicated this was not to be expected.

It may be that outputting only the one data string left sufficient available time each second for GPS Configurator to get through. Perhaps if the Trimble R8 was sending multiple data strings or using a slower data rate this would not have been possible.

In some cases it may be necessary to run GPS Configurator through Port 1 on the Trimble R8 while outputting data on Port 2, or vice-versa.

Dates displayed by GPS Configurator

It has been noticed for several years that GPS Configurator shows incorrect and erratic dates for the files on the Config dialog. We have tried running GPS Configurator as Administrator, but that did not help. It is believed that this is a program quirk that is not likely to be corrected.

Automatic initialization

If the internal radio modem in the Trimble R8 receives valid RTK reference-station data at power up the receiver will automatically initialize. Connecting to the Trimble R8 with GPS Configurator and viewing the **Position** dialog will confirm this.

Reference-station data received via internet

If the Trimble R8 receives RTK reference-station data via a data collector connected to the internet, the GPS solution will be autonomous at times when there is not an active survey involving the Trimble R8 and the data collector. If the Trimble R8 receives RTK reference-station data via a built-in GSM module it may initialize when powered on, but this is merely a guess because we have no way of testing that.

Performing configuration while tracking satellites

Experience with other Trimble survey receivers indicates that in some circumstances GPS Configurator produces better and more predictable results if the receiver is actually tracking both L1 and L2 on four or more GPS satellites while connected to GPS Configurator. If the user encounters problems while using these instructions, it is suggested to try with the receiver tracking satellites.