GPS Series - Part 2	By Michael Simpson
	Interface to a GPS Module or Receiver **As seen in November 2007 of Servo Magazine Pick up an issue at www.servomagazine.com**

Last month we looked at the PC interface for the EM-406A and the EM-408. This month we will be looking at the Etek EB-85A, Copernicus, and Holux modules.

Etek EB-85A

Figure 1

The Etek EB-85A module shown in Figure 1 is the most accurate GPS that I have ever tested. It supports up to 32 parallel channels with WAAS enabled. The downside is that WAAS is not enabled by default, so you must send commands to the module in order to enable this feature. Once the module is powered down it loses these settings.

Let's take a quick look at the feature set of the Etek EB-85A

- 32 Channel Receiver
- Built-in antenna
- High sensitivity: -158dBm
- 1-5 Hz update rate
- Selectable baud rate from 4800 to 115200bps
- 9.8' Positional Accuracy / 8.2' with WAAS
- Hot Start : 1 seconds

- Warm Start : 33 seconds
- Cold Start : 36 seconds
- 55mA power consumption to acquire and 30mA for tracking
- 3.3 – 5 volt operation
- Outputs NMEA 0183
- Small foot print : 30mm x 30mm x 8.6mm
- 8-pin interface cable included
- Free Mini GPS utility available

Currently there is no development board available for the Etek EB-85A, but the Copernicus evaluation board works perfectly. I recommend the following steps in order to connect the EB-85A to the Copernicus board.

Step 1

Start by cutting the white connector off the end of the included cable. Strip about 1/8" of the insulation from each of the connected wires, then connect the wires to an 8-pin male header as shown in Figure 2. I recommend using heat shrink on each of the leads as shown. Be sure to connect the wires to the header in the following order:
Red, Black, White, Green Yellow, Blue, Purple, Orange.
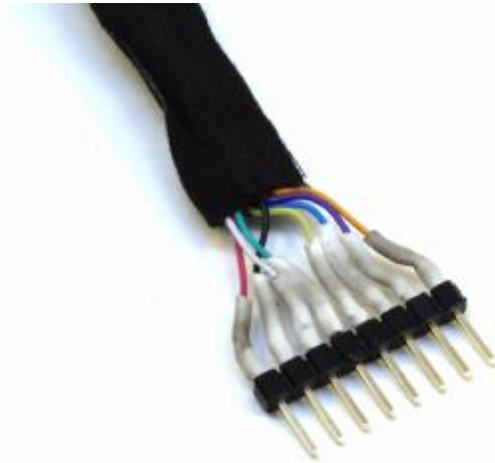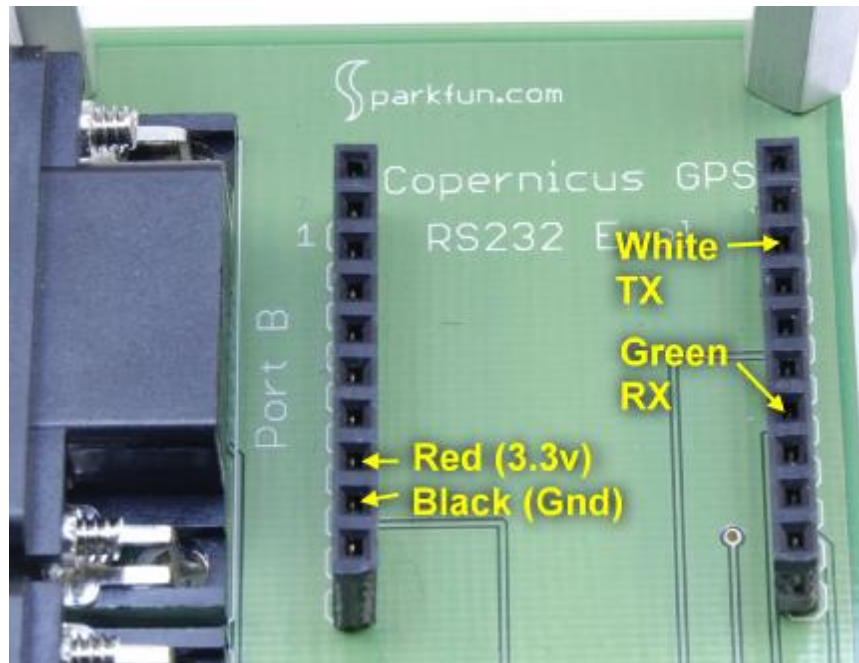

Figure 2

Step 2

Break off the Black and Red leads as shown in Figure 3. Then break off the White and Green leads as shown. Place a piece of black tape on the remaining leads.
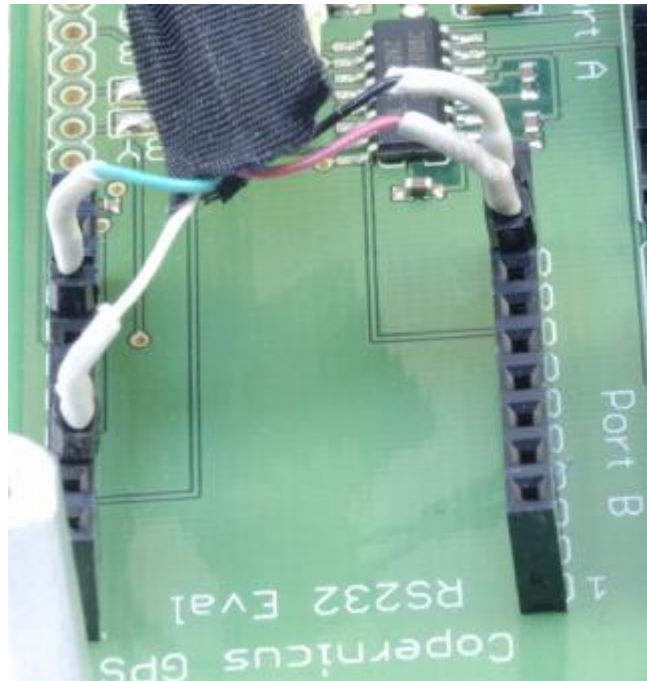
Figure 3

Step 3

Only 4 leads are needed to connect the EB-85A to the Copernicus board. These are shown in Figure 4. Connect the appropriate leads to the board as shown in Figure 5.

Figure 4

Figure 5

Step 4

Place a small piece of double stick foam tape on the DB9 connector marked Port A. Attach the EB-85A to the foam tape as shown in Figure 6. Make sure the patch antenna is facing up as shown.

Figure 6

Step 5

As outlined in Part 1 of this series, I sandwiched the evaluation board between two pieces of plastic shown in Figure 7. This will make the board more durable and easier to test.
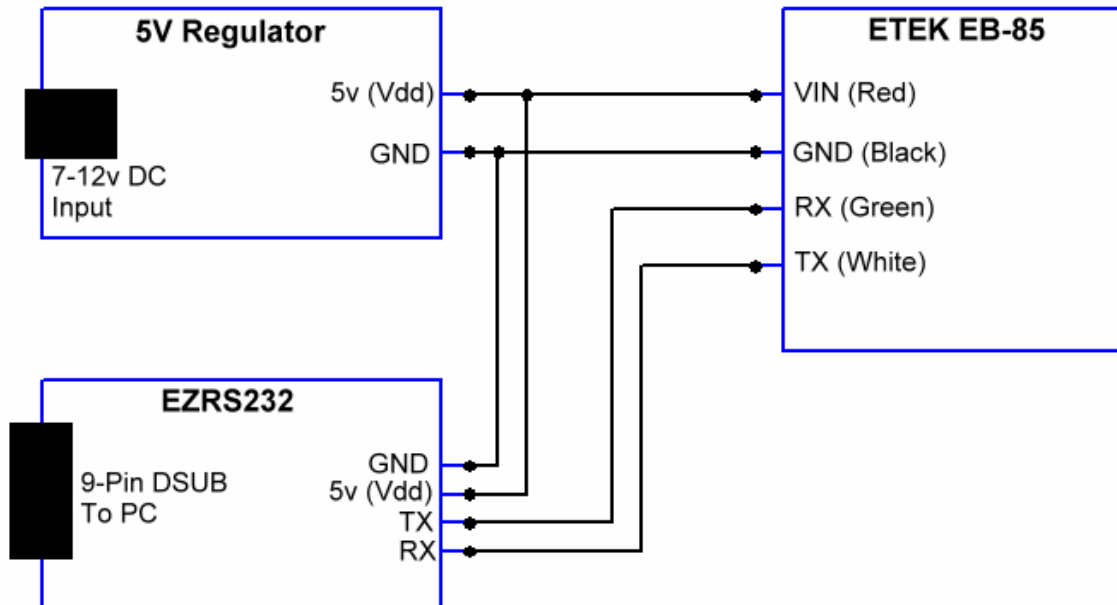
Figure 7

The Etek EB-85A module defaults to 34800 baud so keep this in mind later when we test the module. Since the EB-85A can be powered by a 5v source you may use the alternative interface shown in Figure 8. This is simply a 5v regulator and EZRS232 driver available from Kronos Robotics. Schematic 1 shows the actual hookup.
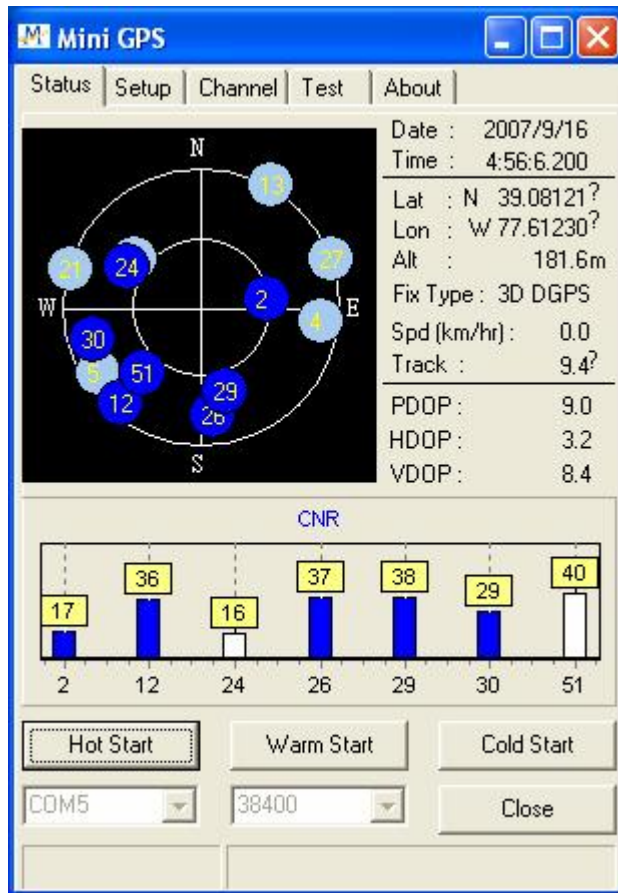

Figure 8

Schematic 1

Testing the ETEK EB-85A

You have a couple of choices available to you in order to test your interface. First you can download the free Mini GPS software available from the Sparkfun web site at:
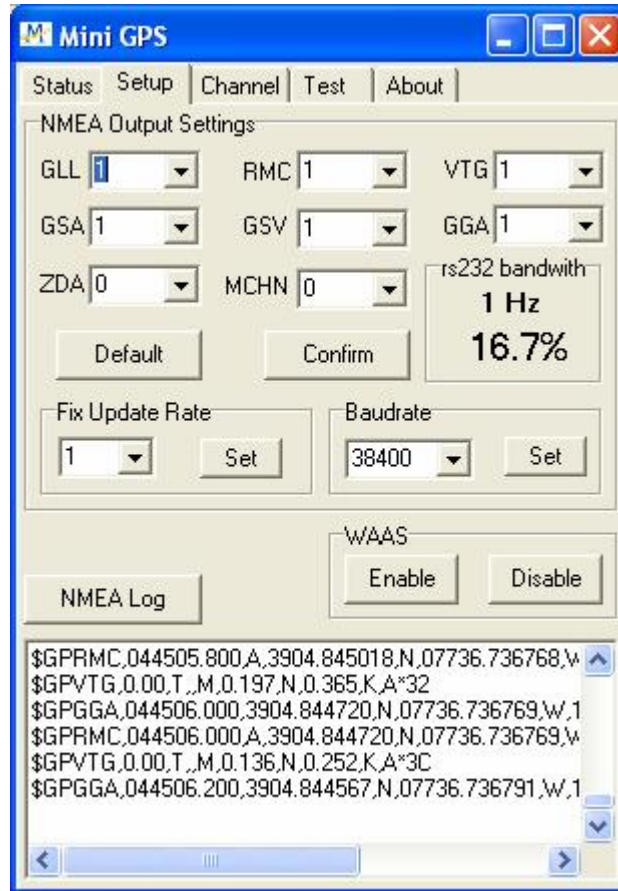http://www.sparkfun.com/datasheets/GPS/MiniGPS_1.32.zip

Use the port marked Port B on the evaluation board to interface with the module.

This software was specially designed to monitor and control the EB-85A as shown in Figure 9. You can also use it to turn on the WAAS feature as shown in Figure 10.

Figure 9

Figure 10

You may also use the QuickTerm and Satellites software included in the project download shown in Figures 11 and 12. The EB-85 does not power up with the WAAS feature enabled. Both these programs send the commands to enable WAAS. I have also included the ZeusPro source code used to make these applications. The function turnonwaas is used to send the commands to turn on the feature. Be sure to download the MTK Packet manual from Sparkfun. This manual lists all the commands used to configure the EB-85.
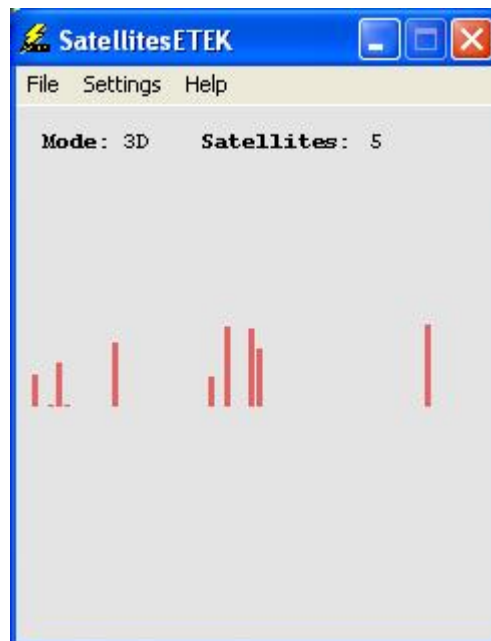
Figure 11

Figure 12

Copernicus GPS Module

I have used the Copernicus evaluation board so much that is only seems fair that we have a look at the Copernicus GPS module. It was meant to plug into the evaluation board, but with a bit of bending you can plug the board into a standard breadboard. Just keep in mind that you will need to create a 3.3v interface.

Figure 13

Copernicus Features.

- 12 Channel Receiver
- External Antenna Connector
- High sensitivity: -152dBm
- NMEA 0813, TSIP, and TAIP protocols supported
- Cold Start : 39 seconds
- 28.5mA power consumption
- Small foot print : 30mm x 30mm x 8.6mm
- Free GPS utility available

You may have noticed that the Copernicus module does not support WAAS. It is rumored that a WAAS firmware upgrade will be made available in the near future.

Step 1

There's not much to the installation of the Copernicus module, You simply slip the module into the evaluation board as shown in Figure 14.

Figure 14

Step 2

I recommend you sandwich the board between two pieces of plastic as we did earlier. You will also need to connect an external antenna to the module as shown in Figure 15. The Copernicus module does not come with a built-in antenna.
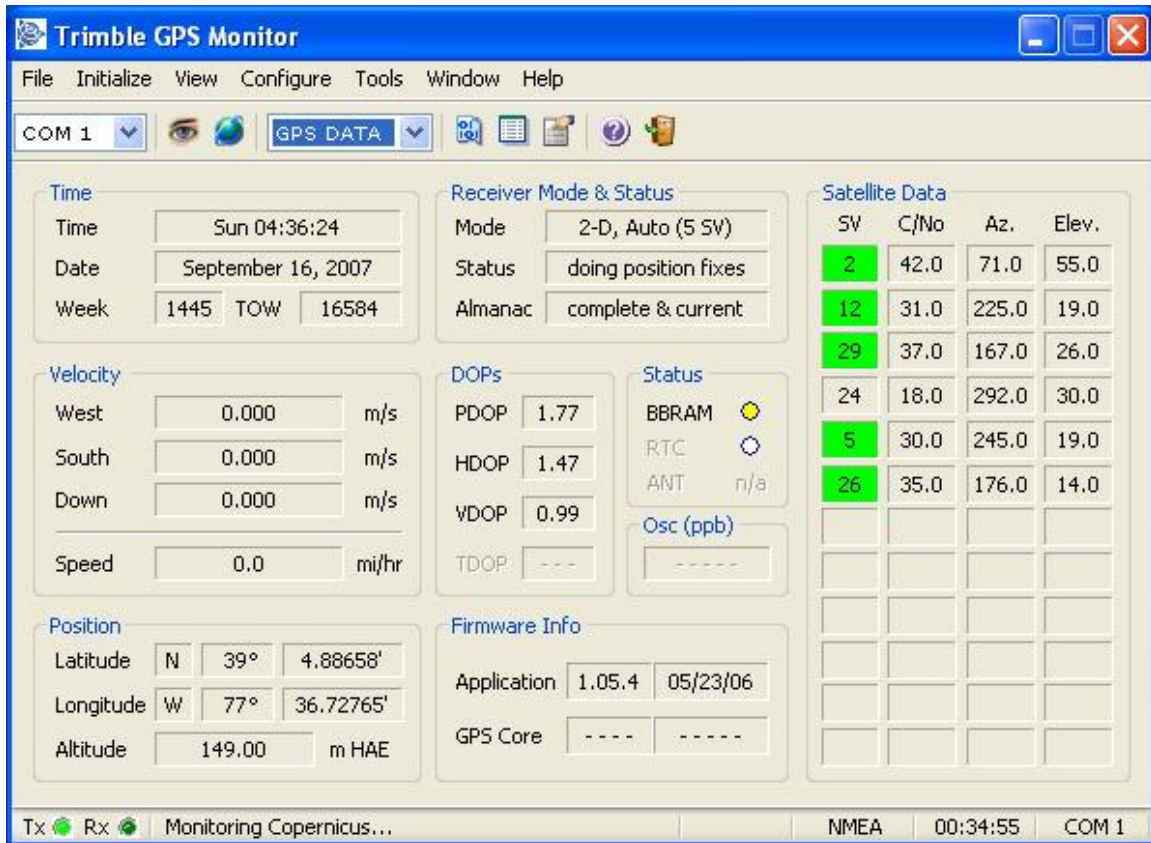
Figure 15

Testing the Copernicus Module

Again you have a couple of choices available to you in order to test the Copernicus interface. First you can download the free Copernicus Monitor software available from the Sparkfun web site at:
http://trl.trimble.com/dscgi/ds.py/Get/File-339488/Copernicus_Monitor_V1-02-07.exe

Use the port marked Port B on the evaluation board to interface with the module.

The software called Trimble GPS Monitor (shown in Figure 16) is quite extensive and comes with its own manual.

Figure 16

The monitor allows you to log GPS data and monitor key data points such as satellite signal strength as shown in Figure 17. It also has a real time plotter shown in Figure 18.
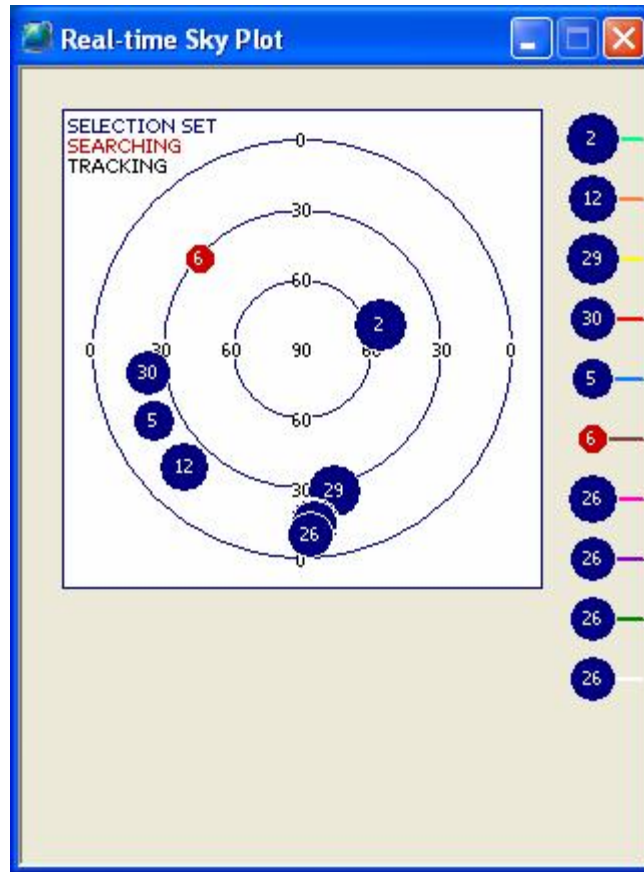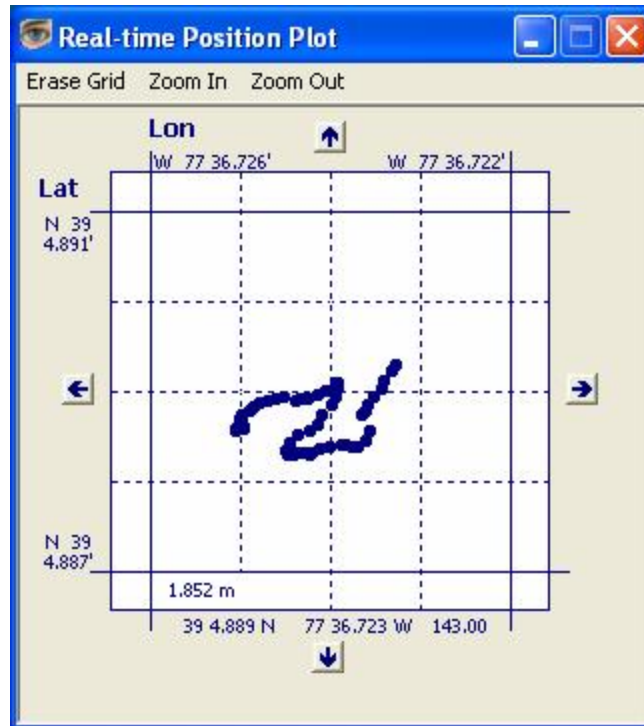
Figure 17

Figure 18

I have also created a special version of the QuikTerm and Satellites programs for the Copernicus module. The Copernicus module does not display some of the NMEA messages we need by default. The two programs included in the download send special commands to the module to enable the needed messages. Again, I have included ZeusPro source code so you can modify and create your own programs.

Holux GPSlip236 Receiver

Last month I briefly mentioned the Holux GPSlip236 shown in Figure 19. Due to its versatility, I feel a more detailed look at this receiver is warranted.

Figure 19

The GPSlim236 has several things going for it. Take a look at some of the features.

- USB/Serial Interface
- Bluetooth Interface
- TTL Interface
- SiRF III chip Set
- Supports both SiRF Binary and NMEA 0813 formats
- Built-in (Replaceable) Lion Battery gives 10 hours of operation
- Can be powered by 5v
- On/Off switch with LED indicators
- Home and Auto adapters/chargers included
- Compatible with PC, LapTop, Tablet, PocketPC, Smartphones
- WAAS compatibility
- Built-in Antenna
- External Antenna Connector

While the features list shows WAAS compatibility, I have yet to see this feature manifest its self with any application. Even the GPS viewer software that has an option to turn this feature on fails to do so. What does this mean? Forget about WAAS on this device. Even without WAAS this receiver outperformed most others I tested.

The two easiest ways to communicate with the GPSlim236 is via the optional USB cable or a Bluetooth dongle shown in Figure 20. The small USB connector is not a true USB interface. To connect the module to your PC using USB you need a special proprietary USB cable which is not included with the receiver. The actual output format of the mini USB connector is asynchronous serial at 38400 baud at a TTL level.   This makes it perfect for interfacing to a microcontroller, or as an option you can build an RS232 interface as shown in Figure 21. Notice how I used SchmartBoard jumpers as interconnects

Figure 20
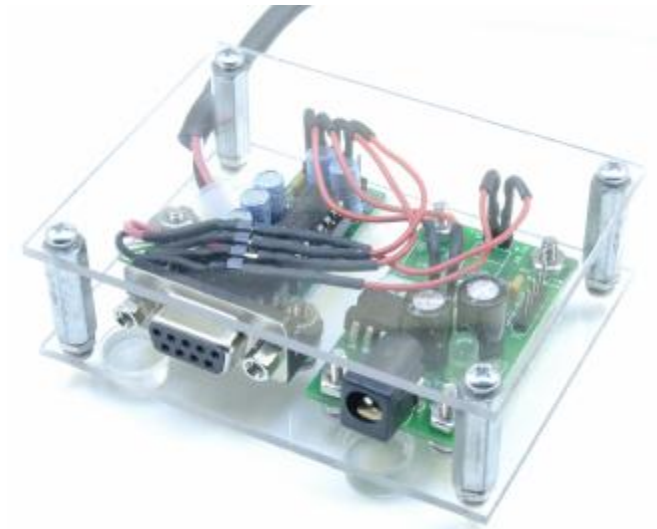
Figure 21

The antenna connector can be connected to the Sparkfun adapter as shown in Figure 22. This allows you to connect the same antenna that we used on the Copernicus and other modules tested previously.

Figure 22

Just like before, I have included a QuickTerm and Satellites version of the test software along with source code for use on the GPSlim. The receiver comes with some test software on the included CD for both the PocketPC and Desktop.

So what is all the fuss about concerning this receiver? Bluetooth. With the Bluetooth interface you can connect this receiver to Pocket PCs and smartphones that do not have serial interfaces.

If you decide you would like to pick up one of these little gems just visit the Amazon web site at www.amazon.com and do a search on GPSlim236.

What's Next?

I ran out of room this month, but next month we will look at creating a data logger that all the modules can use. A data logger is extremely important as it will allow us to collect data that we can use to help us test various aspects of our project without having to resort to testing in the field. We will also start looking at the various microcontroller interfaces for each of the modules.

Be sure to check for updates and downloads for this article at:
http://www.kronosrobotics.com/Projects/GPS.shtml

Parts

The following is a breakdown of the source for all the components needed for Parts 2 and 3 of this project.

Spark Fun Electronics

ETek EB-85A GPS Module
http://www.sparkfun.com/commerce/product_info.php?products_id=8266

Copernicus Module
http://www.sparkfun.com/commerce/product_info.php?products_id=8146

Copernicus Evaluation Board
http://www.sparkfun.com/commerce/product_info.php?products_id=8145

9-Pin Serial Cable
http://www.sparkfun.com/commerce/product_info.php?products_id=65

6V AC Adapter
http://www.sparkfun.com/commerce/product_info.php?products_id=737

External Antenna with SMA connector
http://www.sparkfun.com/commerce/product_info.php?products_id=464

SMA to MMCX adapter cable
http://www.sparkfun.com/commerce/product_info.php?products_id=285

KRMicros

ZeusPro
http://www.krmicros.com/Development/ZeusPro/ZeusPro.htm

Kronos Robotics

5v Regulator
http://www.kronosrobotics.com/xcart/product.php?productid=16304

EZRS232 Board
http://www.kronosrobotics.com/xcart/product.php?productid=16167

SchmartBoard

Jumpers 5" Yellow
http://www.schmartboard.com/index.asp?a=11&id=42

Jumpers 3" Red
http://www.schmartboard.com/index.asp?a=11&id=41