Spark Fun ELECTRONICS

GPS Logger v2.4
9/11/2007

The GPS Logger V2.4 is Spark Fun's second offering into practical GPS logging. Following the release of the first GPS Logger, many customers had suggestions and comments to improve the design. And we listened! The new GPS logger comes in a smaller form factor, has an RTC for intermittent logging with sleep mode, and incorporates an EM-406 GPS module from US Globalsat which has an integrated antenna and sensitivity down to –159dBm.

1 Feature Overview

- Smaller profile:
  1.5"x1.75"x.9" (38.1x44.5x22.9mm)

- Intermittent logging with sleep mode

- 4V to 7V operation

- Sleep mode current draw of 1.5mA

- 160mA current draw in normal operation

- Utilizes US Globalsat EM-406 GPS module with embedded antenna and supercap for almanac retention, sensitive to –159dBm

- Selectable NMEA sentences to be logged

- Holdoff function for intermittent logging, user settable

- Weighs 1.0 ounce (28.3g)

2 Setup and Operation

2.1 Start up

1) Power the board with 4V to 7V. A single Lipo cell will work, but the GPS can lose accuracy when the cell gets to the end of it's run time.

2) Insert an SD card (tested cards up to 1GB) formatted in FAT16 into the socket and turn the unit on. There will be a short "blinky" sequence on the tri-color LED indicating power up. If the red LED comes up blinking at the end, it means that the logger can't read the SD card. Try reformatting the card and try again.

3) If the red LED doesn't come up blinking, turn off the unit, remove the SD card and put it in your card reader. There will be 2 files on your card: GLOGCON.TXT and LOG0.TXT. The first is the configuration file, the second is the first log file (probably empty, or nearly so). Open the config file.

2.2 The config file, GLOGCON.TXT

When you open this file, you will see:

```
Mode = 0
Log What = RMC;GGA;GSA
```

```
Time Between Logs = 00:10:00
Holdoff = 5
WAAS = 0
Max Time to Lock = 300
```

Here's a description of what this all means:

2.3 Mode

There are 2 modes that the unit can run in: 0 and 1. Mode 0 will log everything that comes out of the GPS module to the SD card. Mode 1 will log selectively based on the next 3 (and the last) parameters in the config file. Mode 0 only looks at the WAAS setting in addition to itself.

2.4 Log What

The EM-406 module from US Globalsat outputs 4 different NMEA sentences by default: RMC, GGA, GSA and GSV. Additionally, these GPS modules can be configured to output GLL and VTG NMEA sentences, but the logger unit cannot perform the reconfiguration to do this. However, the logger unit is capable of logging any and all of these sentences. The user only has to put the desired sentence identifiers in the "Log What" line just like it shows in the above example. The identifiers can be in any sequence, but they do need to be separated by ";" and they need to be all capitals. If there is only one identifier, for example "RMC", there is no need for a semicolon nor should you use one as it will confuse the parser that reads the settings from the config file. Lastly, this setting is only active in Mode 1.

2.5 Time Between Logs

This sets the time between logs for intermittent logging, and the format is hours:minutes:seconds. The maximum delay is 24 hours (one log per day). If the delay is set to more than that, it will default to a 24 hour delay. The unit will shutdown during times between logs and have a current draw of about 1.5mA. The delay time does not include time to lock for the GPS, it is only the time that the unit spends in its power-down state.

Setting the delay time to 0 will cause the unit to log continuously and not shut down, and it will log according to what's set in "Log What".

2.6 Holdoff

When a GPS unit powers up, the first lock is rarely the best. It usually takes a few before it becomes what one might call "reasonably" accurate. The Holdoff setting allows the user to specify how many instances of the RMC sentence to disregard after the initial lock before taking data and logging it. RMC does not need to be set in "Log What" for this to be active, and other sentences logged will also obey this setting. The RMC sentence just happens to be the one that the parser watches for this setting, and it will do so regardless of the other settings (except if the unit is in mode 0, in which case everything is logged).

The default setting for Holdoff is 5. We find this to be a reasonable compromise between accuracy and power consumption, but it can be set as high as 99 or as low as 1. If any number greater than 99 or less than 1 is used, the value will revert to 5.

2.7 WAAS

For increased accuracy, you can enable the WAAS feature of the EM-406 by setting WAAS = 1 in the config file. However, the user should note that lock times are generally longer for a WAAS enabled unit. The user should also note that the WAAS service is only available in the U.S., and that a WAAS enabled device will give more inaccurate GPS positions outside of the U.S. than if WAAS were not enabled. In short, if you're outside the U.S., this setting should be 0 for best results.

2.8 Max Time to Lock

It's possible that the EM-406 can't get a lock in a "timely" fashion. For such occasions, this number will govern the number of seconds that the unit will try to acquire a lock, up to 999 seconds. If it fails to get a lock the allotted time, the unit will go back to sleep for the normal interval and try to lock the next time around. Nothing gets saved to the SD card in the event of a lock failure.

3 The Stop Button

The reader may have noticed a button on the GPS Logger V2.4 called STOP. When running in mode 0, the stop button will finish the current text file, shut everything down and flash the red LED. This is the proper way to stop the unit in mode 0, otherwise the text file may be corrupted. When running in mode 1, the stop button will act as a standby and the unit will not log while the button is depressed. If the unit is in sleep mode, actuating the stop button will not wake it up. The button would need to be actuated at the time of wake up, then the unit would go into standby mode.

Stopping the unit in mode 1 does not require the use of the stop button. You can simply wait for the unit to go into sleep mode (all of the LED's off), turn the unit off and pull out the SD card. You can optionally leave the unit on and pull out the card while it's sleeping, copy the text file off of the card and reinsert it into the logger without any interruption. As long as the logger doesn't wake up during the procedure it will happily continue logging to the same text file. If it wakes up while the card's out, the session will terminate and you have to cycle power to start it up again.

4 Firmware

If the user wishes, the source code for the GPS Logger V2.4 is freely available either from the product description page, or by requesting it from support@sparkfun.com. Programming the GPS Logger V2.4 is accomplished with the use of an LPC serial port boot loader interface (SKU# LPC-ICP) and the Philips 2000 Flash Utility (free download). For more information, check out our support forum at http://www.sparkfun.com/cgi-bin/phpbb/login.php.