Low-Cost, 5-Wire Global Position Acquisition

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Abstract

Autonomous navigation in real world environments relies on accurate knowledge about position. This localization is achieved on the sea surface through the EM-406 20 Channel SiRF III GPS Receiver with integrated Antenna and on-board battery backup. A microcontroller friendly +5v power requirement and five wire connector make the EM-406 ideal for integration into microcontroller systems.

Keywords

GPS, satellite, UTC, latitude, longitude, velocity, acceleration, altitude, position, localization

Introduction

The EM-406 is a small, low power (5v, 70mA), GPS receiver with a built in patch antenna and LED indicator. Although the unit is primarily designed for surface mount systems, a little patience with a soldering iron and a standard .1” header will easily interface the device with standard DIP circuit boards. Simply cut the, hopefully, included 6 pin interface cable and solder on extension wires to a standard five post DIP style header.
After completing the cable, the hard work is done. Assemble the circuit and connect the circuit to a serial port of a computer. Start Hyperterminal and set up a new connection at 4800 baud, 8 data bits, no parity, 1 stop bit, and no flow control. As soon as the EM-406 receives power it will begin transmitting information to the computer through Hyperterminal. When the device was tested indoors away from windows, it was unable to obtain azimuth data and therefore unable to provide position information, but when the device was moved near a window or completely outside, it functioned extremely well.

The EM-406 datasheets are available on the supplier’s web site, www.usglobalsat.com, or www.sparkfun.com. NMEA specifications are available on several sites, but all necessary documents are available from the previously mentioned web sites. Although the device was connected to a computer in this application, it is also possible to connect it directly to a microprocessor without the MAX232 IC. In the schematic, all capacitors are the recommended 1µF rating.

Figure 1: Schematic
### Parts List

<table>
<thead>
<tr>
<th>Qty</th>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>EM-406 GPS Receiver</td>
<td>20 Channel GPS Receiver, $80</td>
</tr>
<tr>
<td>1</td>
<td>MAX232</td>
<td>RS-232 Line Driver, $1</td>
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<tr>
<td>4</td>
<td>1 µF</td>
<td>Electrolytic Capacitors</td>
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<tr>
<td>1</td>
<td>DB9 Connector</td>
<td>Connector, $0.55</td>
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</tbody>
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### Suppliers

The DB9 connector is available from most electronics supply houses and also www.allelectronics.com for around $0.55