



## GPS600 GPL-GPS RECEIVER USER GUIDE

The GPS Creations GPS600 board consists of a USB interface card with a Novatel SuperStar II GPS receiver installed on it that has been modified to run the GPL-GPS OpenSource code. The following instructions detail how to set-up the GPS600 to run on a PC with a Windows® operating system. It can also be used in a Linux operating system just as easily, but these instructions are for those that want to run the board in a Windows environment.



**Figure 1 – GPS600 USB GPL-GPS OpenSource GPS Receiver**

The modified Novatel SuperStar II GPS receiver is shown installed on a USB interface card as can be seen in figure 1. The modifications done to the SuperStar II GPS receiver consist of a larger capacity RAM chip installed and the firmware in flash exchanged to run the GPL-GPS OpenSource GPS source code. **The GPS600 board will boot running the “RedBoot” firmware described at: <http://gps.psas.pdx.edu/>**

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```

New Connection - HyperTerminal
File Edit View Call Transfer Help

Time = 2008/1/19 2:52:0.449 (state:2)
ECEF = (X:2.437306e+04 Y:-5.224574e+06 Z:3.646447e+06) tb:4.220e-02
LLH = (Lat:35.09332 Lon:-89.73271 Hgt:182.44)
State: positioning = 1, last position valid = 1, busy = 1

Ch: PN C PrV EpV Pseudorange Elev. Azim.
0: 22 L 1 1 3.306172e+07 44.8 83.4
1: 14 L 1 1 3.350865e+07 71.2 55.9
2: 7 A 0 0
3: 19 A 0 0
4: 23 A 0 0
5: 1 L 1 1 3.432214e+07 73.8 216.0
6: 13 C 0 0
7: 21 A 0 1
8: 32 L 1 0
9: 18 L 1 1 3.488372e+07 6.7 92.6
10: 11 A 0 0
11: 20 A 0 0

Connected 5:53:53 Auto detect 57600 8-N-1 SCROLL CAPS NUM Capture Print echo

```

Figure 2 – OpenSource GPL-GPS Main Screen

The screen shown in figure 2 is the main screen that appears when the GPL-GPS program is started. This screen shot shows four GPS satellites were being received and a position solution of 35.09332° North Latitude And 89.73271° West Longitude. There are several screens of information available in the GPL-GPS program, see appendix A at the end of this document for more information.

## **GETTING STARTED**

First, it will be necessary to install the driver for the FTDI USB interface chip. The CD that comes with the GPS600 kit contains a folder called “FTDI Drivers”. If the computer goes to the “Found New Hardware” screen, direct it to the folder with the FTDI drivers. If the Found New Hardware window does not appear, it will be necessary to copy the driver into the Windows driver folder. See figure 3 for the system VID and PID information once the driver has been properly installed.

Next, be sure the UART selection switch on the GPS600 is set to position # 1. Plug the USB cable into the GPS600 and the PC on which the unit is to be used.

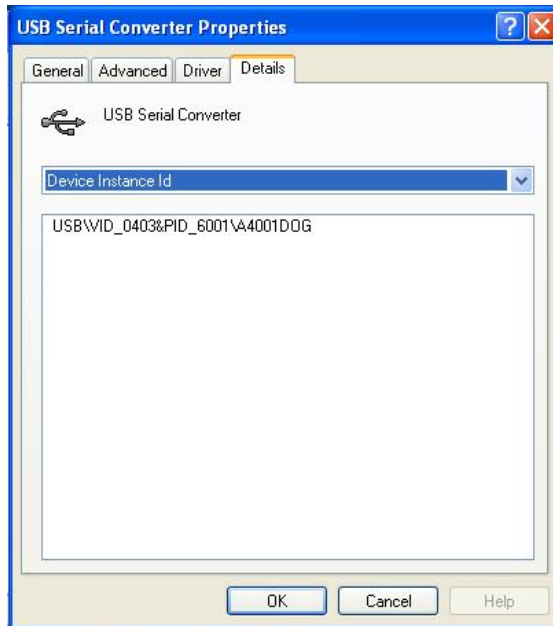


Figure 3 – FTDI Driver Information

To begin communicating with the GPS600 board, in this example, the Windows HyperTerminal program is used. The GPS600 board comes with Windows driver software that will be used to recognize the board as an additional serial I/O card. Normally, com ports above the standard #1 thru #4 ports are assigned for the FTDI device.



Figure 4 – HperTerminal Com Port Settings

In setting up HyperTerminal, make the selection for the Com Port at 57,600 BPS, 8 bit, and no parity along without any flow control. See figure 4 for an example window.

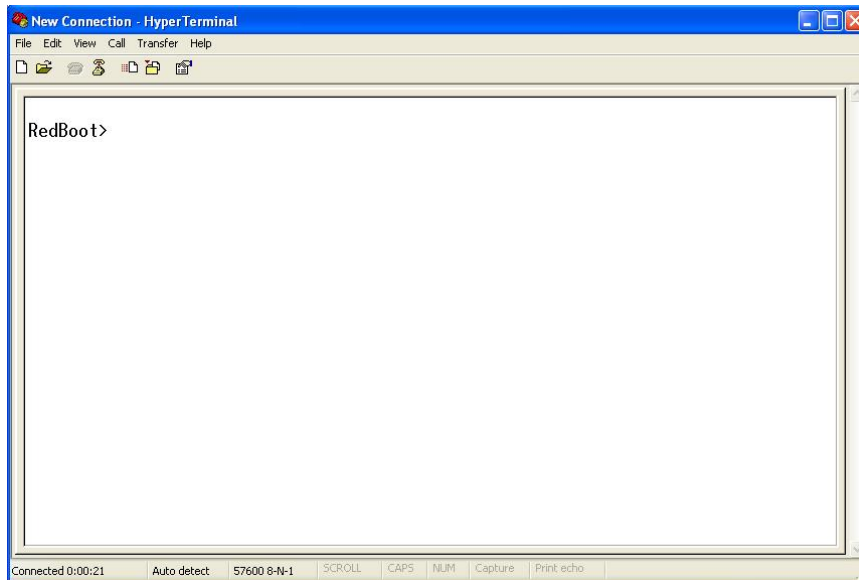


Figure 5 – RedBoot Prompt

Once HyperTerminal is configured, hitting the return key should cause the RedBoot prompt to appear on the screen. See figure 5 for an example.

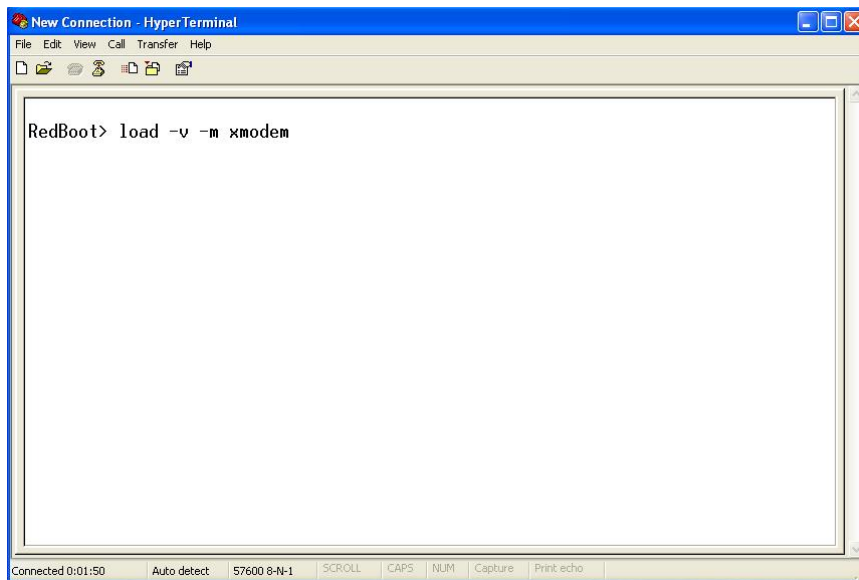


Figure 6 – Xmodem Command

Next, locate the GPS600 folder on the distribution CD and copy the GPL-GPS.srec file to the hard drive. This file is the executable OpenSource GPS receiver program. It is in Motorola Hex file format (i.e., hence the extension of “srec”). Load this file on to the GPS600 board’s RAM by typing the following: “load -x -m xmodem”. See figure 6 for an example. After entering this command, go to the “Transfer” button on the HyperTerminal screen. Select “Send File” and HyperTerminal will ask you for the location of the file to transfer. See figure 7 & 8.

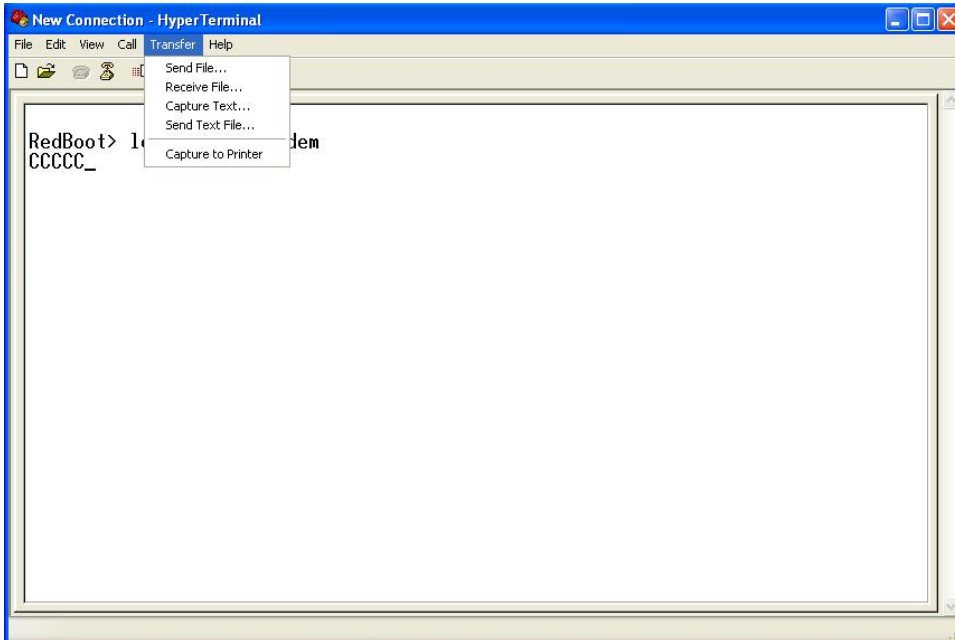


Figure 7 – File Transfer Operation

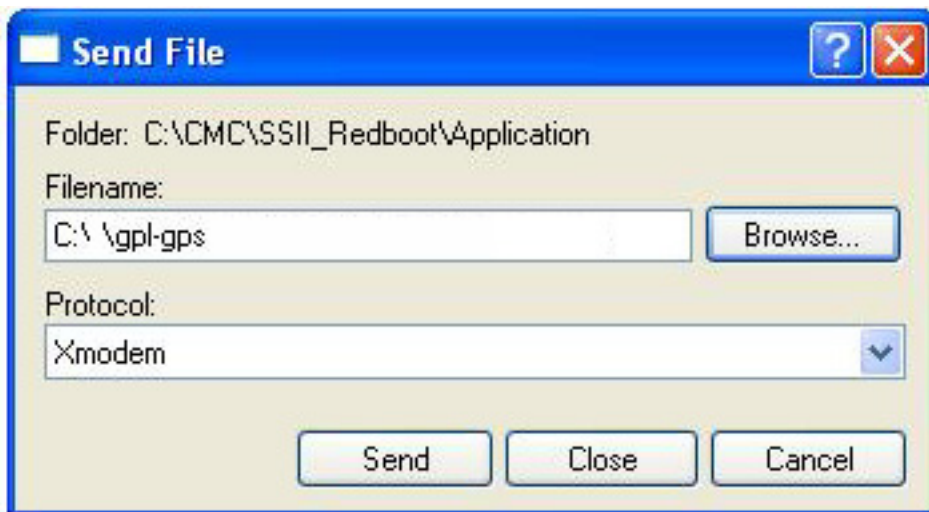


Figure 8 – Entering File Name to Send

The screen shown in figure 9 will appear as data is being transmitted to the GPS600 board.

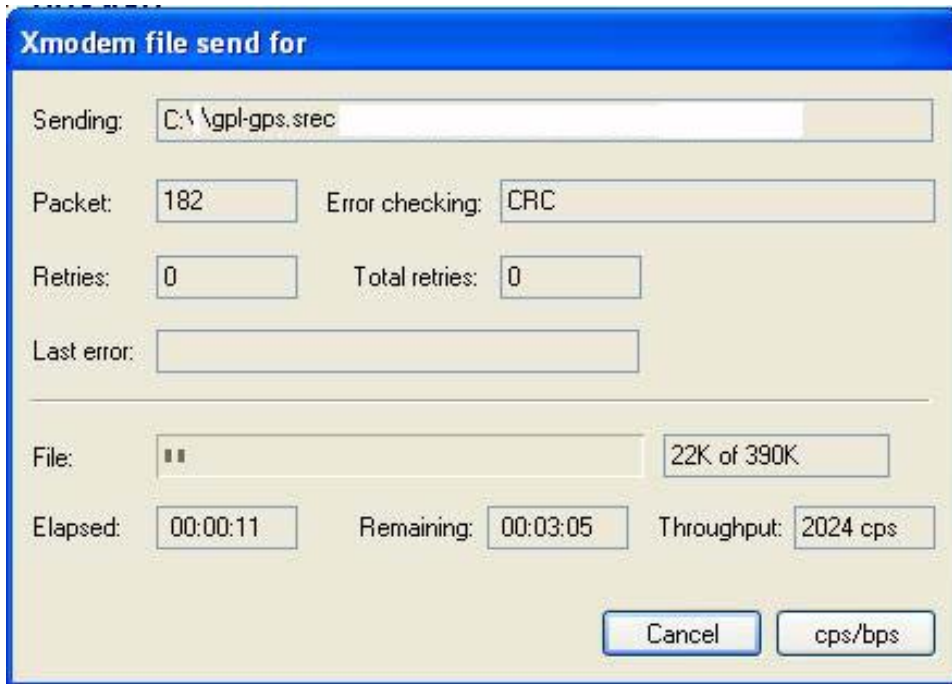


Figure 9 – Xmodem Data Transfer Progress Screen

Sometimes, (actually, very frequently) the transfer progress using Windows Hyper Terminal will hang up and it is necessary to start this over again. Hit return a couple times to clear the errors and type "load -x -m xmodem" and select the file again. This may be due to a glitch in HyperTerminal or it may be for some other reason. **But, don't give up, eventually the file will go to completion!** When all the data in the file has been transmitted, the screen will look like figure 10. Maybe someone will figure out what causes this with Hyper Terminal and let us know!

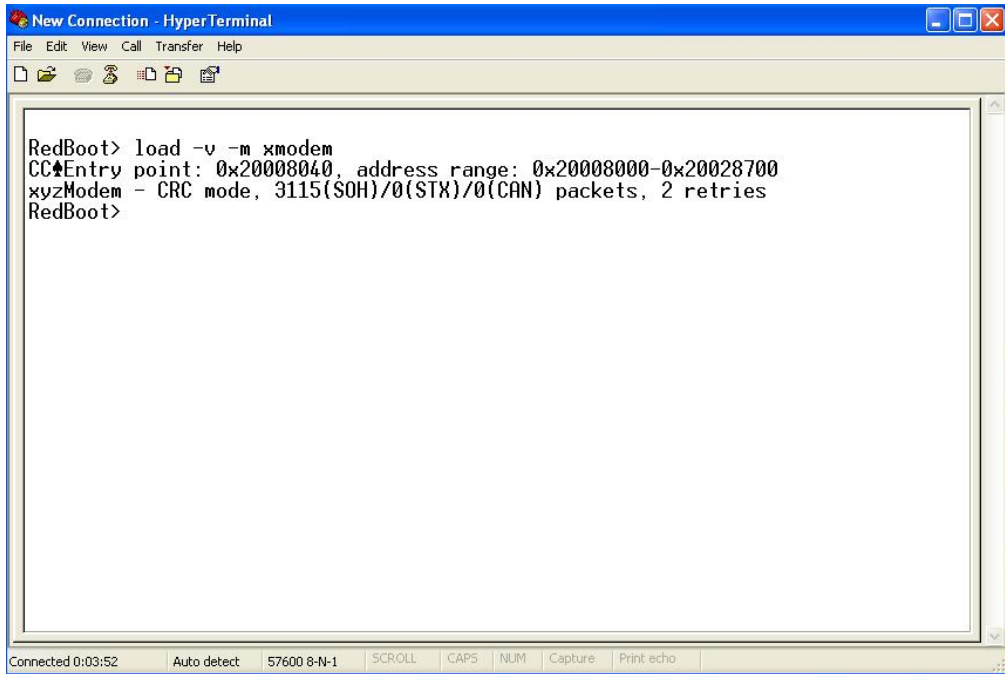


Figure 10 – Completion of Data Transfer

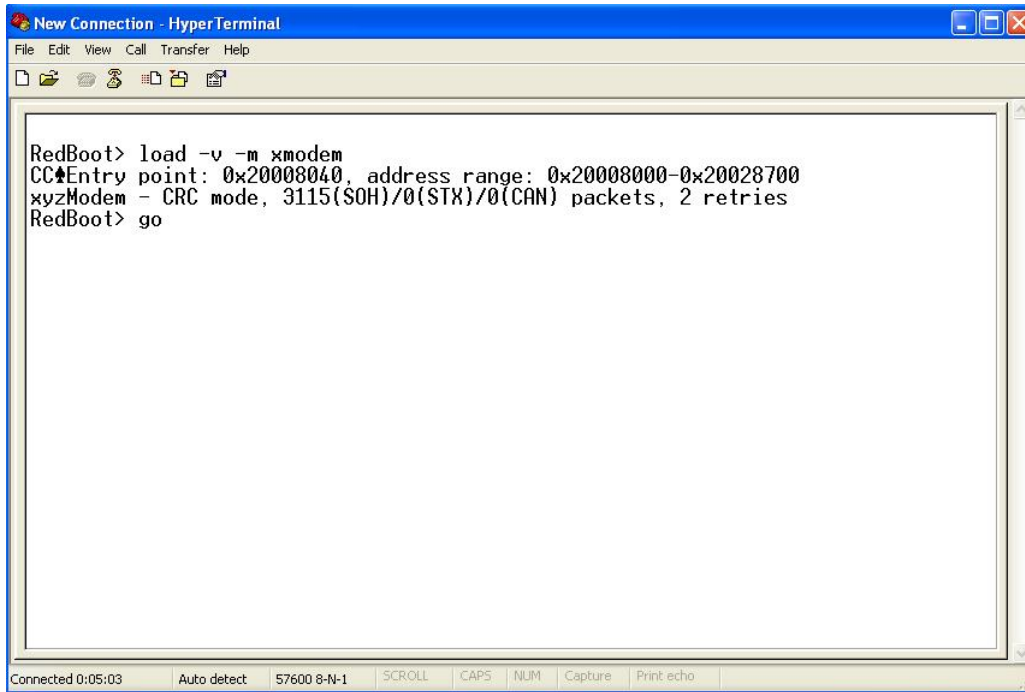


Figure 11 – GPL-GPS Program Start Command

After the file transfer is completed with no errors, type “go”. This command starts the GPL-GPS code execution. **The program will now output data on UART # 2.** It will be necessary to switch the UART switch to position #2. Again, the parameters are the

same as for position #1, 57,600 BPS, N, 8, 1 and no flow control. After switching to UART #2, the screens shown in appendix A can be seen by entering the appropriate single key command as shown.

### Appendix A

```

Time = 2008/1/19 2:52:0.449 (state:2)
ECEF = (X:2.437306e+04 Y:-5.224574e+06 Z:3.646447e+06) tb:4.220e-02
LLH = (Lat:35.09332 Lon:-89.73271 Hgt:182.44)
State: positioning = 1, last position valid = 1, busy = 1

Ch: PN C Pr-V EpV Pseudorange Elev. Azim.
0: 22 L 1 1 3.306172e+07 44.8 83.4
1: 14 L 1 1 3.350865e+07 71.2 55.9
2: 7 A 0 0
3: 19 A 0 0
4: 23 A 0 0
5: 1 L 1 1 3.432214e+07 73.8 216.0
6: 13 C 0 0
7: 21 A 0 1
8: 32 L 1 0
9: 18 L 1 1 3.488372e+07 6.7 92.6
10: 11 A 0 0
11: 20 A 0 0
  
```

P = Position Screen

```

Ch: PN Mis Frq DelCarFreq Iprmt Qprmt RSSI State Avg
0: 22 2 39 -30681 -196 2509 42387 L(BF) 45851
1: 14 2 17 -34242 118 -2398 38725 L(BF) 40396
2: 13 6 24 56376 188 -47 211 A(-- ) 6619
3: 8 17 34 79866 -83 177 218 A(-- ) 6619
4: 11 14 26 61074 -254 -258 385 A(-- ) 6619
5: 1 6 29 -65671 -151 2425 47562 L(BF) 46887
6: 16 29 11 -23490 42 -155 176 A(-- ) 6619
7: 21 21 1 0 -142 230 301 A(-- ) 6619
8: 32 43 29 -63474 -271 -1317 34120 L(BF) 35315
9: 18 26 23 16515 -285 -3160 51932 L(BF) 53442
10: 15 73 21 -46980 99 -34 116 A(-- ) 6619
11: 19 306 9 -18792 -201 201 301 A(-- ) 6619
  
```

T = Tracking Screen

```

New Connection - HyperTerminal
File Edit View Call Transfer Help
-----tgd-----toc-----
CH: PN V SF UR HE IODC
0: 22 1 1f 2 0 87 -1.816079e-08 5.328000e+05
1: 14 1 1f 0 0 97 -8.847564e-09 5.328000e+05
2: 0 0 0 0 0
3: 0 0 0 1 0
4: 0 0 0 0 0
5: 1 1 1f 0 0 67 -3.725290e-09 5.327840e+05
6: 0 0 0 1 0
7: 21 1 1f 0 0 13 -1.210719e-08 5.327840e+05
8: 32 0 e 0 3f
9: 18 1 1f 0 0 186 -1.071021e-08 5.328000e+05
10: 0 0 0 0 0
11: 0 0 0 0 0

```

Connected 5:56:53 Auto detect 57600 8-N-1 SCROLL CAPS NUM Capture Print echo

E = Ephemeris Screen

```

New Connection - HyperTerminal
File Edit View Call Transfer Help
Ch: PN Mi TOW SF SF1V SF2V SF3V SF4V SF5V State Avg
0: 22 0 22600 3 3ff 3ff 7f 3ff 3ff L(BF) 42611
1: 14 0 22600 3 3ff 3ff 7f 3ff 3ff L(BF) 36754
2: 2 0 0 1 0 0 0 0 0 A(--) 6619
3: 30 0 0 1 0 0 0 0 0 A(--) 6619
4: 27 0 0 1 0 0 0 0 0 A(--) 6619
5: 1 0 22600 3 3ff 3ff 7f 3ff 3ff L(BF) 36888
6: 29 0 0 1 0 0 0 0 0 A(--) 6619
7: 21 0 0 1 0 0 0 0 0 A(--) 6619
8: 32 0 22600 3 3ff 3ff 7f 3ff 3ff L(BF) 37699
9: 18 0 22600 3 3ff 3ff 7f 3ff 3ff L(BF) 45776
10: 28 0 0 1 0 0 0 0 0 A(--) 6619
11: 4 0 0 1 0 0 0 0 0 C(--) 6619
-

```

Connected 5:55:38 Auto detect 57600 8-N-1 SCROLL CAPS NUM Capture Print echo

M = Message Screen

```
,17110808.9,-19540846.1,4741377.1,
1462.529067.349062867, 2439943.2,-1451104.4,-877754.8,4.185391e-02,4.1,6.814981e
-02,22.33036219.7,6004806.8,-20427266.1,16011845.5,14,33320524.7,-2825782.8,-156
94498.7,21360216.6,1,34191008.6,-13838300.4,-16175808.8,16150043.0,18,34865773.0
,17111074.3,-19540900.3,4740138.5,
1462.529067.749062467, 2439948.5,-1451152.6,-877747.3,4.185361e-02,4.1,6.812618e
-02,22.33036114.7,6005470.8,-20427727.3,16010998.2,14,33320418.7,-2824757.9,-156
94185.6,21360580.3,1,34190805.4,-13837531.0,-16175583.6,16150937.3,18,34865827.1
,17111339.6,-19540954.5,4738899.8,
1462.529068.149062067, 2439945.5,-1451169.3,-877733.3,4.185325e-02,4.1,6.810031e
-02,22.33036010.1,6006134.7,-20428188.5,16010150.9,14,33320300.4,-2823733.0,-156
93872.6,21360944.0,1,34190587.4,-13836761.5,-16175358.4,16151831.6,18,34865885.8
,17111604.9,-19541008.6,4737661.2,
SF3.8,32.0,6,1.192093e-07,-2.935948e+00,1.322478e-07,9.713849e-01,2.889375e+02,-
1.337233e+00,-7.783896e-09,2.346526e-10
1462.529068.649061567, 2439937.4,-1451131.1,-877742.1,4.185269e-02,4.1,6.807282e
-02,22.33035908.2,6006964.5,-20428765.0,16009091.7,14,33320172.1,-2822451.9,-156
93481.3,21361398.5,1,34190325.3,-13835799.6,-16175077.0,16152949.3,18,34865969.7
,17111936.5,-19541076.2,4736112.8,
1462.529069.049061167, 2439942.9,-1451107.3,-877759.4,4.185221e-02,4.1,6.805490e
-02,22.33035815.6,6007628.4,-20429226.2,16008244.3,14,33320067.5,-2821427.0,-156
93168.4,21361762.1,1,34190116.9,-13835030.0,-16174851.8,16153843.5,18,34866015.0
,17112201.6,-19541130.3,4734874.1,
```

L = Log Screen

To summarize, the keyboard commands for the various different screens are as follows:

- D= Debug Information
- E= Ephemeris Information
- L= Logging Information
- M= Message Information
- T= Tracking Information
- P= Position Information
- R= Pseudorange Information
- S= Stop or freeze display of Information (any of the other keys start the display again)

This completes the GPS600 user guide document. As mentioned earlier, in order to modify the open source code running on the GPS receiver, go to the web site:

<http://gps.psas.pdx.edu/>

Should you have problems with any part of the GPS600 installation process, feel free to contact GPS Creations at: [sales@gpscreations.com](mailto:sales@gpscreations.com).