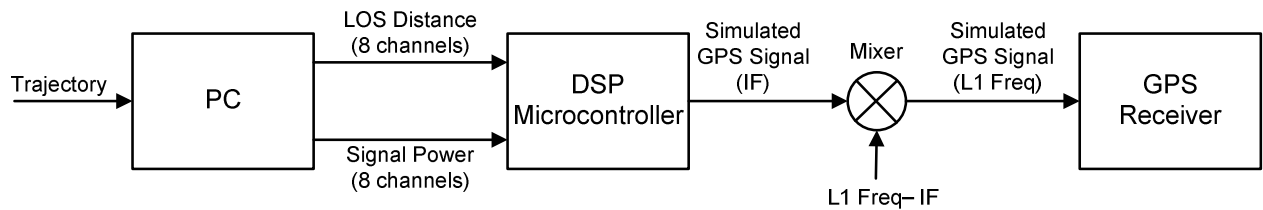


## GPS Signal Simulator: Senior Project System Block Diagram

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### Overview

The purpose of this project is to develop a system that will generate a simulated Global Positioning System (GPS) signal. An arbitrary trajectory can be loaded into the system and a signal will be produced that can drive a GPS receiver so it will track the intended trajectory. A high-level block diagram of the system is shown in Fig. 1.



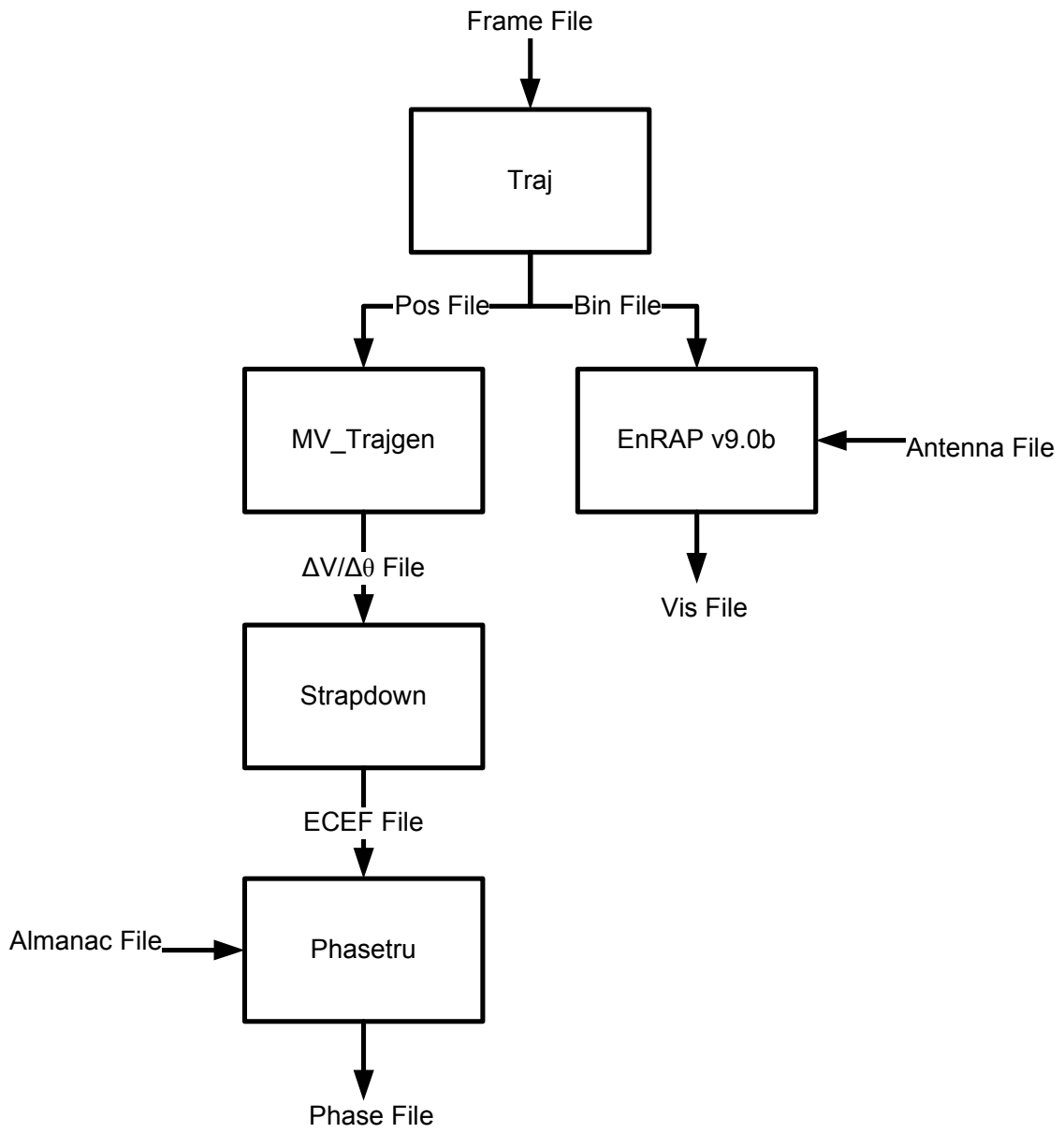
**Figure 1 – System Block Diagram**

### PC

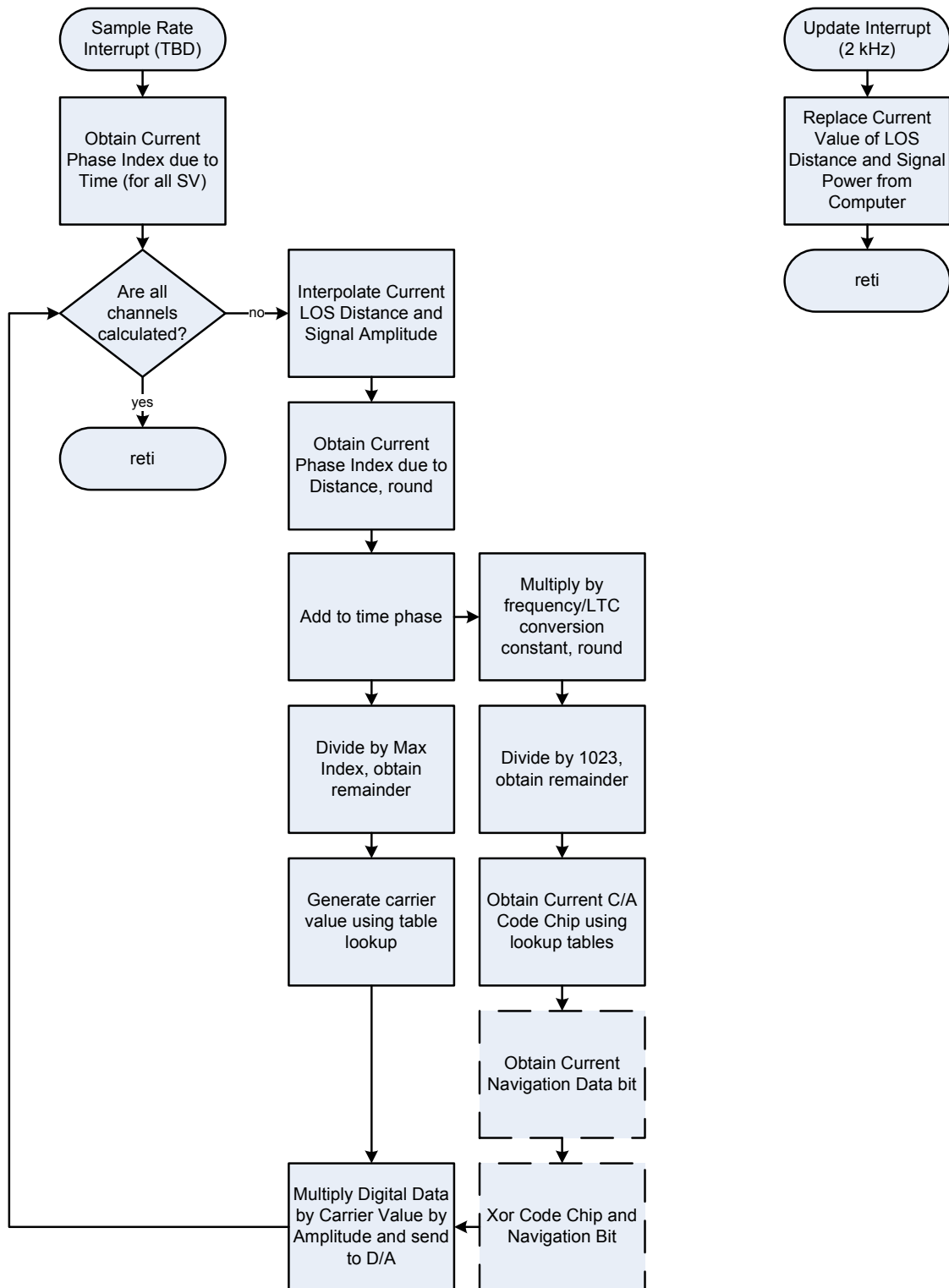
The primary input to the PC is a frame file that contains a receiver trajectory in terms of duration of jerk in 4 axes: thrust, roll, pitch, and yaw. This data is passed through several programs and stored in several intermediary files, as shown in Fig. 2. Two files are used to generate the output from the PC to the DSP. These are the phase file and the VIS file, which contain the line of sight (LOS) distance and the signal strength for each satellite. All of these programs have already been supplied by Tracking and Imaging Systems, Inc. A GUI will be developed for the user of the GPS Signal Simulator which calls these programs automatically. Additional inputs to the process include an antenna pattern file and almanac file, which will be selected or supplied by the software user. This software will also be responsible for selecting the best set of 8 satellites to send to the DSP board, and maintaining the PC half of the communication link between these systems.

### DSP

Fig. 3 shows the software flowcharts for the DSP board. There will be a 2 kHz interrupt that retrieves the next values of distance and amplitude for each channel from the PC. The primary interrupt will run at the D/A sample rate which should be at least 5 MHz. For each sample the current distance and amplitude will be interpolated, then used to calculate the current value of the output. The inclusion of the GPS Navigation Data is shown with a dashed line because it is an optional portion of the product which will be implemented if time permits.



**Figure 2 - PC Data Path**



**Figure 3 - Software Flowcharts for the DSP**