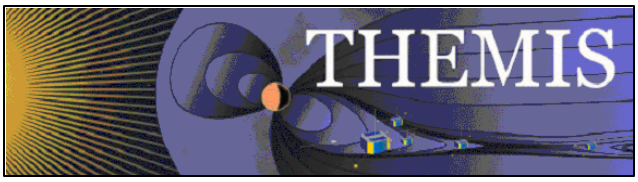

1. Spin Fit Calculations (SPIN.A)

The Spin Fit determines the Electric Field and Magnetic Field strength and direction by using a sine-wave least squares fit method on EFI and FGM data. The formulae are shown in Figure 18-1 and the solution matrices are shown in Figure 18-2.

1.1 Initialization.

The SPIN module requires no initialization.

1.2 Operation.

The SPIN module accepts a pointer to the input array of samples and a pointer to the result memory location. The input array has 32 points of 16-bit, 2's complement values, ls byte first. The steps involved are as follows:

1. Initialize the Matrix Solver by telling it where to find the matrix;
2. Calculate the sums of quantities as defined in the following diagrams;
3. Solve the matrix built by the summing process;
4. Calculate the standard deviation of the fit;
5. Reject all points which are very far from the fit;
6. Repeat the process until no more points are rejected.

During the rejection process, the SPIN module removes rejected points from each relevant summation, rather than repeating summations from the beginning which would take considerably longer.

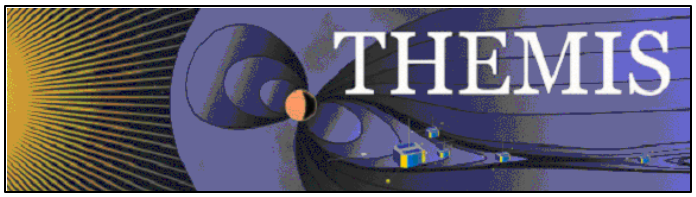

Figure 18-1. Sine-Wave Least Squares Fit (Spin Fitting) Equations

$$F = \sum_{i=1}^{N} [\, E(t_i) - (A + B\cos(? t_i) + C\sin(? t_i))]^2$$

$$\frac{? F}{? A} = \sum_{i=1}^{N} -2[\, E(t_i) - (A + B\cos(? t_i) + C\sin(? t_i))]$$

$$\frac{? F}{? B} = \sum_{i=1}^{N} -2[\, E(t_i) - (A + B\cos(? t_i) + C\sin(? t_i))] -\sin(? t_i)$$

$$\frac{? F}{? C} = \sum_{i=1}^{N} -2[\, E(t_i) - (A + B\cos(? t_i) + C\sin(? t_i))] \cos(? t_i)$$

$$G = \sqrt{F/(N-1)}$$

Figure 18-2. Sine-Wave Least Squares Fit (Spin Fitting) Matrix

A	B	C	
N	N ? cos $i=1$	N ? sin $i=1$	N ? $E(t_i)$ $i=1$
N ? cos $i=1$	N ? $\cos^2$ $i=1$	N ? sincos $i=1$	N ? $E(t_i)\cos$ $i=1$
N ? sin $i=1$	N ? sincos $i=1$	N ? $\sin^2$ $i=1$	N ? $E(t_i)\sin$ $i=1$