Table 20-IV. Elements of Coordinate Systems (sheet 1 of 2)	
$\mu = 3.986005 \times 10^{14}$ meters^3/sec^2	WGS 84 value of the earth's gravitational constant for GPS user
$\dot{\Omega}_e = 7.2921151467 \times 10^{-5}$ rad/sec	WGS 84 value of the earth's rotation rate
$A = \left(\sqrt{A}\right)^2$	Semi-major axis
$n_0 = \sqrt{\frac{\mu}{A^3}}$	Computed mean motion (rad/sec)
$t_k = t - t_{oe}$*	Time from ephemeris reference epoch
$n = n_0 + \Delta n$	Corrected mean motion
$M_k = M_0 + nt_k$	Mean anomaly
$M_k = E_k - e \sin E_k$	Kepler's Equation for Eccentric Anomaly (may be solved by iteration) (radians)
$\nu_k = \tan^{-1}\left\{\frac{\sin \nu_k}{\cos \nu_k}\right\}$	True Anomaly
$= \tan^{-1}\left\{\frac{\sqrt{1-e^2}\sin E_k / (1 - e\cos E_k)}{(\cos E_k - e)/(1 - e\cos E_k)}\right\}$	

* t is GPS system time at time of transmission, i.e., GPS time corrected for transit time (range/speed of light). Furthermore, t_k shall be the actual total time difference between the time t and the epoch time t_{oe}, and must account for beginning or end of week crossovers. That is, if t_k is greater than 302,400 seconds, subtract 604,800 seconds from t_k. If t_k is less than -302,400 seconds, add 604,800 seconds to t_k.

Table 20-IV. Elements of Coordinate Systems (sheet 2 of 2)		
$E_k = \cos^{-1}\left\{\frac{e + \cos\nu_k}{1 + e\cos\nu_k}\right\}$		Eccentric Anomaly
$\Phi_k = \nu_k + \omega$		Argument of Latitude
$\delta u_k = c_{us}\sin 2\Phi_k + c_{uc}\cos 2\Phi_k$	Argument of Latitude Correction	Second Harmonic Perturbations
$\delta r_k = c_{rs}\sin 2\Phi_k + c_{rc}\cos 2\Phi_k$	Radius Correction	
$\delta i_k = c_{is}\sin 2\Phi_k + c_{ic}\cos 2\Phi_k$	Inclination Correction	
$u_k = \Phi_k + \delta u_k$		Corrected Argument of Latitude
$r_k = A(1 - e\cos E_k) + \delta r_k$		Corrected Radius
$i_k = i_0 + \delta i_k + (\text{IDOT})\, t_k$		Corrected Inclination
$x_k' = r_k \cos u_k$ $y_k' = r_k \sin u_k$		Positions in orbital plane.
$\Omega_k = \Omega_0 + (\dot{\Omega} - \dot{\Omega}_e)\, t_k - \dot{\Omega}_e\, t_{oe}$		Corrected longitude of ascending node.
$x_k = x_k'\cos\Omega_k - y_k'\cos i_k \sin\Omega_k$ $y_k = x_k'\sin\Omega_k + y_k'\cos i_k \cos\Omega_k$ $z_k = y_k'\sin i_k$		Earth-fixed coordinates.

20.3.3.4.3.2 Parameter Sensitivity.

The sensitivity of the SV's antenna phase center position to small perturbations in most ephemeris parameters is extreme. The sensitivity of position to the parameters $\sqrt{A}$, C_{rc} and C_{rs} is about one meter/meter. The sensitivity of position to the angular parameters is on the order of 10^8 meters/semicircle, and to the angular rate parameters is on the order of 10^{12} meters/semicircle/second. Because of this extreme sensitivity to angular perturbations, the value of π used in the curve fit is given here. π is a mathematical constant, the ratio of a circle's circumference to its diameter. Here π is taken as $\pi = 3.1415926535898$.

20.3.3.4.3.3 Coordinate Systems.

20.3.3.4.3.3.1 ECEF Coordinate System.

The equations given in Table 20-IV provide the SV's antenna phase center position in the WGS 84 ECEF coordinate system defined as follows: