Appendix

E

GPS Implementation

The interface between the GPS space and user segments consists of a two-frequency (L1 = 1675.42 MHz and L2 = 1227.60 MHz) radio link. Utilizing these links, the satellites that comprise the *space* segment provide continuous earth coverage, transmitting signals that provide to the *user* segment the ranging codes and system data needed to accomplish the GPS navigation mission. The transmitted satellite parameter set is computed and controlled by the *control* segment and uploaded to the satellite for broadcast to the user. The satellite signals are received and decoded by the user GPS receiver. The decoded data are available from the receiver, usually by means of a serial link.

The data decoded from the satellite signal include satellite clock calibration parameters, satellite position calculation parameters, atmospheric correction parameters, reference time, and almanac and health information for all space-segment satellites. The satellite message parameter set is displayed in Table E.1. Readers interested in the details of the satellite signal format should see Refs. 73 and 144. In this book it is assumed that the reader will download the satellite parameter set into a local data structure. In this appendix the data set processing to determine clock corrections, satellite positions, and atmospheric corrections is described. This Appendix is based on the text and examples of Ref. 34.

E.1 Satellite Clock Corrections

Assume that a set of simultaneous time-tagged pseudoranges are available. Define

$$\tilde{t}_t = \frac{\tilde{\rho}}{c} \tag{E.1}$$

to be the measured satellite-to-receiver transit time expressed in seconds and $\tilde{t}_m$ to be the time at which the pseudorange was measured (i.e., the time tag).