



Application Note: SecureSync®

Timing Appliance Meets Rapid Deployment Needs

SecureSync can now provide stratum-1 time synchronization data to devices and clients through NTP protocol within minutes of start-up for applications requiring rapid deployment.

Operations around the globe are occurring at an increasingly faster pace partly due to the increase in mobility. One obvious example is with the military electronics systems. Today's defense operations critically depend on rapid deployment. These trends add burden to the requirements of equipment that support communications and other electronic transactions such as synchronization systems. Spectracom's SecureSync time and frequency reference system meets the needs of the military through flexible configurations and the most modern electronics and processing of data including references such as GPS to support fast set-up and operation. This application note describes some of the issues of synchronization start-up time and specific features of SecureSync to meet the needs of mobile military forces.

The exact nature of GPS signals, synchronization algorithms, timescales and protocols such as NTP are out of the scope of this document. But it is helpful to understand some advanced functionality of GPS receivers and their features as they pertain to synchronization systems. GPS receivers work so well since they acquire and store data about satellite orbits and future locations of the satellites (typically this data is known as the almanac). A receiver can acquire the signals more efficiently if it knows where to look. But first, it needs to know where it is. So when an instrument like the SecureSync is turned on after some long period of power-off (cold-start), it normally figures out where it is (GPS survey), builds an updated version of the almanac, and then synchronizes its clock with as much accuracy as possible.

Task	Duration
GPS Survey – continuous tracking of at least 4 satellites	33 minutes
Almanac building	13 minutes
Clock sync (after GPS survey)	3 minutes

Therefore, in the typical case, the GPS survey limits the ability of the unit to function as an accurate stratum-1 time and frequency reference. While a half-hour may not be a long-time to start-up in a data center environment, for applications where every minute counts, 33 minutes is an eternity. The GPS survey can be made faster by entering in the unit's position coordinates through SecureSync's secure web-based user interface. This also assumes the unit is stationary. GPS receivers have the ability to operate

in mobile mode which can be utilized for rapid deployments since it can ignore the requirement for a GPS survey. The tradeoff is slightly degraded timing accuracy, but if you have a few tens of nanoseconds to spare, it may not really be that important compared to speed of bringing up the synchronization application.

With SecureSync's firmware version 4.7 or higher, only 2.5 minutes is required to acquire time synchronization from GPS either in mobile mode, or for stationary applications when the almanac has recently been downloaded (warm start). The ability to rapidly achieve traceable synchronization assumes there has been no leap second since the unit was last synced to GPS, however. Firmware version 4.6 or lower uses 13 minutes to detect the presence of a leap second, even in the unlikely case where there is one, so it can adjust its TAI and GPS timescales to UTC (normally used by electronic clocks). Even though leap seconds are extremely rare, if your application requires long periods of time with no synchronization to GPS and you are concerned about missing a leap second in the first 10 minutes of a start, then there are several things SecureSync allows you to do including:

1. Use the TAI/GPS time scale instead of UTC.
2. Check for the presence of a leap second, and manually add it to the SecureSync configuration.

Even if a leap second is missed in the first minutes of start up, the unit will be corrected in less than 13 minutes.

There is an additional consideration for rapid deployments if the network time protocol (NTP) is used in the application. Once the SecureSync unit is synced to GPS, its NTP server algorithm requires some time to declare its level of accuracy as stratum-1 instead of stratum-16 per the NTP specification. Starting with firmware version 4.6, the time to declare stratum-1 NTP server is 2.5 minutes. In previous versions it took up to 15 minutes during which time NTP clients may ignore the NTP server even if it is providing accurate data.

New versions of SecureSync firmware allows for the start-up, synchronization and a stratum-1 NTP server in 5 minutes to support applications for rapid deployment. Other features overcome the need for a full GPS survey and to automatically detect a leap second even though it is likely one has not occurred. Lastly, SecureSync is designed with another feature important for the military. It has the ability to remove any data acquired during a field operation including any acquired position data.

