Position/Location Tracking and Communications Software Defined Radio (POSCOMM)

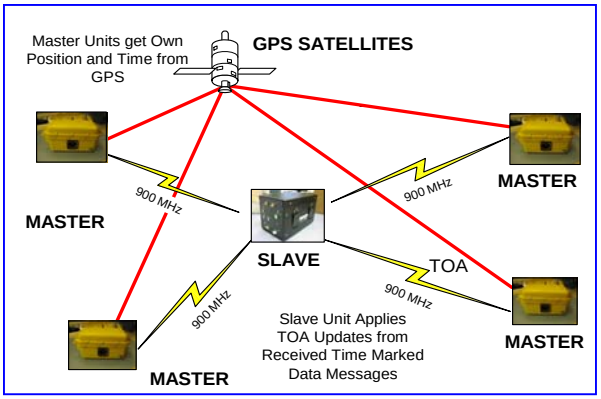
navsys

EXCELLENCE IN GPS PRODUCTS & SERVICES

Netork Aided Positioning Solution in Urban and Other Weak GPS Signal Environments

The GPS signals can be significantly attenuated, or even blocked, when they have to be received inside buildings, under foliage, in jamming, etc. The NAVSYS solution to this problem is to use network aiding with our POSCOMM, Position/Location tracking and Communications Software Defined Radio (SDR).

The network aiding function requires the use of multiple "Master" units to be operating in the network in locations where they have access to the GPS signals. These can be either other participants in the operation or pre-positioned "nodes" to provide coverage in areas where GPS has difficulty operating. These Master units transmit a Time of Arrival (TOA) message which includes a pseudo-random sequence from which the time of arrival at the "Slave" unit can be precisely determined. A message is also sent including the precise time of transmission of the TOA message and the precise location of the Master unit based on the GPS observations. The time-of-arrival differenced with the time-of-transmission provides the Slave unit with a pseudorange observation from each of the Master unit's locations. This can be used to solve for the position of the Slave either using the TOA updates alone or using a combination of both the GPS and TOA observations.



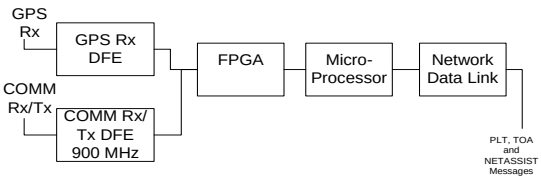
POSCOMM System Concept

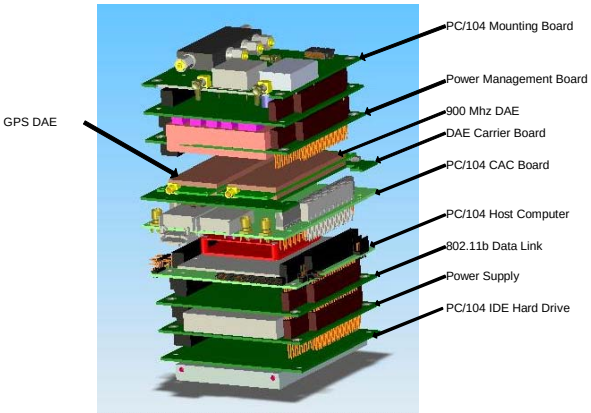
The master units act as Pseudolites to aid the slave unit (Remote Unit) to navigate when the GPS signal is too small for direct tracking. The Remote Units can be configured to operate in any of the following navigation states.

- GPS-only navigation (only uses GPS satellite observations)
- Pseudolite-only navigation (only uses TOA pseudolite observations)
- GPS/PL navigation (uses available GPS satellite and TOA pseudolites)

POSCOMM Design

POSCOMM is a Software Defined Radio suitable for man-portable applications, which can support both the positioning and communication functions associated with the POSCOMM SDR. Since both the GPS and communications functions reside within common SDR hardware, they can be linked to provide a positioning capability that leverages both the GPS derived pseudo-range and carrier phase observations and also TOA observations derived from the communications channel. The POSCOMM unit includes a GPS front end and a communications transmit/receive front end. An 802.11b Network Data Link is also included to transfer PLT, TOA and network assist messages as is shown in the block diagram.





NAVSYS Corporation 14960 Woodcarver Road, Colorado Springs, Colorado 80921
phone 719-481-4877 *fax* 719-481-4908 *Web site* www.navsys.com

Advantages of POSCOMM

The POSCOMM SDR approach has the following advantages:

- Provides a low cost hardware implementation including both GPS and communication functions in a single device.
- Allows for power saving for man-portable operations through sharing of common components and through snapshot tracking (GPS DFE is only powered on when data is being collected).
- Improves the GPS signal tracking capability by providing network assistance through the communication link to allow operation under low signal power conditions.
- Improves GPS positioning performance by providing GPS corrections through the network.
- Provides a back-up positioning capability using network aiding with TOA observations in the event of GPS signal drop-out.

Receiver of the First Responder Communicator Tracking System

POSCOMM Characteristics

GPS Frequency	1575.42 MHz (L1)
GPS Code	C/A (the system could be P(Y) configured)
GPS Channels	Six (with growth to 12)
GPS Signal Acquisition (Normal Mode-C/A)	32 dB-Hz
Maximum Dynamics	4 m/s, 1g
GPS Signal Acquisition (Network Assisted)	24 dB-Hz
GPS Signal Tracking (Normal Mode)	34 dB-Hz
GPS Signal Tracking (Network Assisted)	24 dB-Hz
Time to First Fix Normal Mode	40 secs
Time to First Fix Network Assisted Mode	10 secs
Reacquisition Time	10 secs
Remote PVT Accuracy	1m Horiz, 1m Vert, 0.03 m/s Vel.
Remote unit Power Required	28 Watts with an additional watt when Pseudolite (900 MHz) is transmitting
900 MHz Center Frequency	915 MHz
900 MHz Bandwidth	20 MHz (total)
900 MHz channels tracked	6
900 MHz threshold tracking	40 dB-Hz
900 MHz transmitted accuracy	1m relative to GPS reference signal
Wireless Data Link	802.11b
Wireless Bandwidth	80 MHz

NAVSYS Corporation 14960 Woodcarver Road, Colorado Springs, Colorado 80921
phone 719-481-4877 *fax* 719-481-4908 *Web site* www.navsys.com