

Garmin GPS problems on APEX and NAVIS floats

From Dave Murphy at SeaBird

Each GPS receiver keeps an almanac of information about the GPS satellites that is updated when the receiver connects with the satellites to measure a position. The almanac contains information about the position and status of each satellite and this information is used to configure the data acquisition of the GPS receiver.

The GPS system counts weeks to a maximum of 1024 counts (0 to 1023). The original week 0 was 12:00 am, January 6, 1980, every 1024 weeks the counter rolls over to 0 again. A recent roll over to 0 took place on April 6, 2019. Each satellite entry in the almanac is time stamped with this week count and when an almanac entry is received it is compared to the one currently stored and if the received one has a lower week count than the stored one the received one is discarded.

This is where the firmware bug has effect. An example would be if a stored almanac entry is week stamped 1023 and the counter rolls over the next almanac entry would have week stamp 0 and would be discarded because $1023 > 0$. When this happens the almanac will never be updated and the GPS receiver will configure data acquisition based on old information.

The current thought about the impact of this is that GPS positions would be measured with less than all the available satellites and that the time for a float to measure a position would grow longer. Garmin is working to understand the how out of date almanacs will affect performance in the long term.