GPS Week Number System Rollover Update

Nir Tshobani – Focus Telecom

What You Need to Know

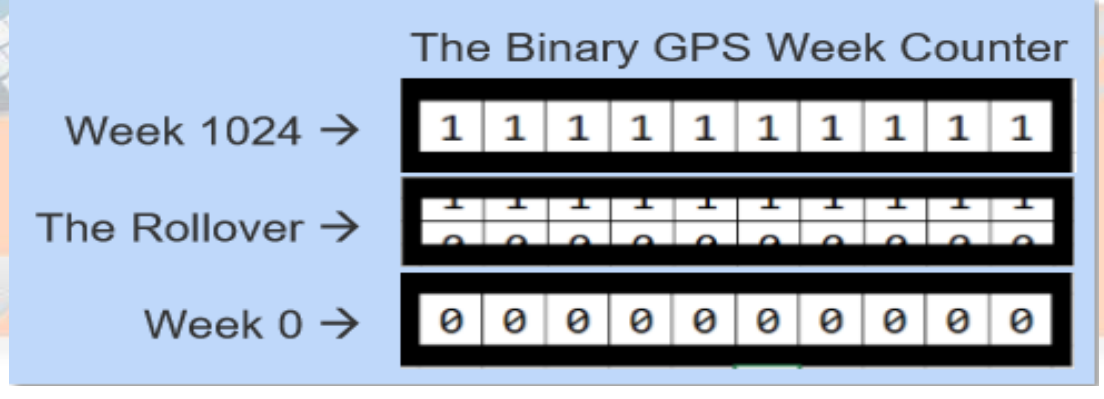
- What's the Key Issue?
- Should I Be Concerned?
- How to prepare for the Rollover ?

What's the Key Issue?

- The Global Positioning System provides accurate timing information to many of our critical systems.
- The GPS supply the receiver with the current week and the current number of seconds into the week. This allows the receiver to translate the date and time into a more typical format – day, month, year, and time of day.
- The field that contains the week number is a 10-bit binary number. This limits the range of the week number to 0 – 1023, or 1024 total weeks.

What's the Key Issue?

- GPS week zero started January 6, 1980.
- The 1024 weeks counter ran out and rolled over on August 21, 1999. The week counter then reset to zero, and it has been recounting ever since.
- The next time the counter will reach week 1023 and rollover to zero is on April 6, 2019.



What about the receiver?

- Receivers must properly interpret that week number as the correct date.
- To do this, receivers use various methods to ensure that they are providing the correct date.
- One common method is to use the firmware date as a reference. This works well if the receiver is new or is receiving firmware updates.
- Another way is to shift that 1023 window with reference to some firmware or manufacture date within the receiver. Using this method, the problem could occur, but at a different date and year than the actual GPS rollover date.

Should I Be Concerned?

- Due to the fact that this it is the second time the GPS week rollover will occur, many receiver manufacturers have prepared for it, and newer receivers will continue to operate without issue.

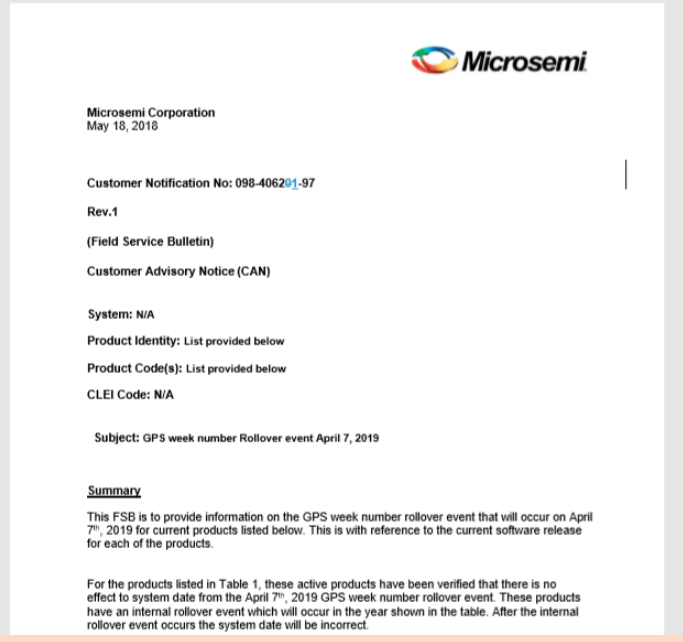
- One should be concerned, though, if either of the following applies:
  - Receiver has been fielded for more than 10-15 years without firmware updates.
  - Receiver is a core component of a critical timing system.

How to prepare for the Rollover ?

- Microsemi have tested all our GPS products to determine the impact of this Rollover .
- Microsemi have issued an FSB no. 098-40621-97 May 18, 2018, with full details.
- FSB can be found on Focus Telecom website:

http://focus-telecom.com/news

http://www.focus-telecom.com/sync-products



Microsemi

Microsemi Corporation
May 18, 2018

Customer Notification No: 098-40621-97

Rev.1

(Field Service Bulletin)

Customer Advisory Notice (CAN)

System: N/A

Product Identity: List provided below

Product Code(s): List provided below

CLEI Code: N/A

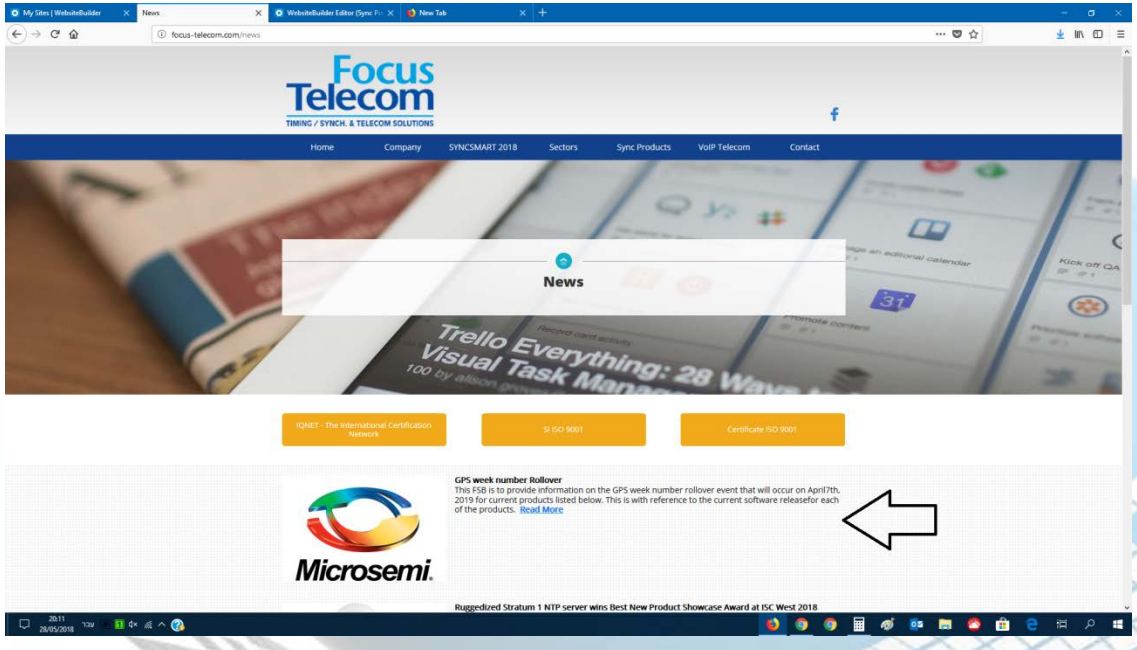
Subject: GPS week number Rollover event April 7, 2019

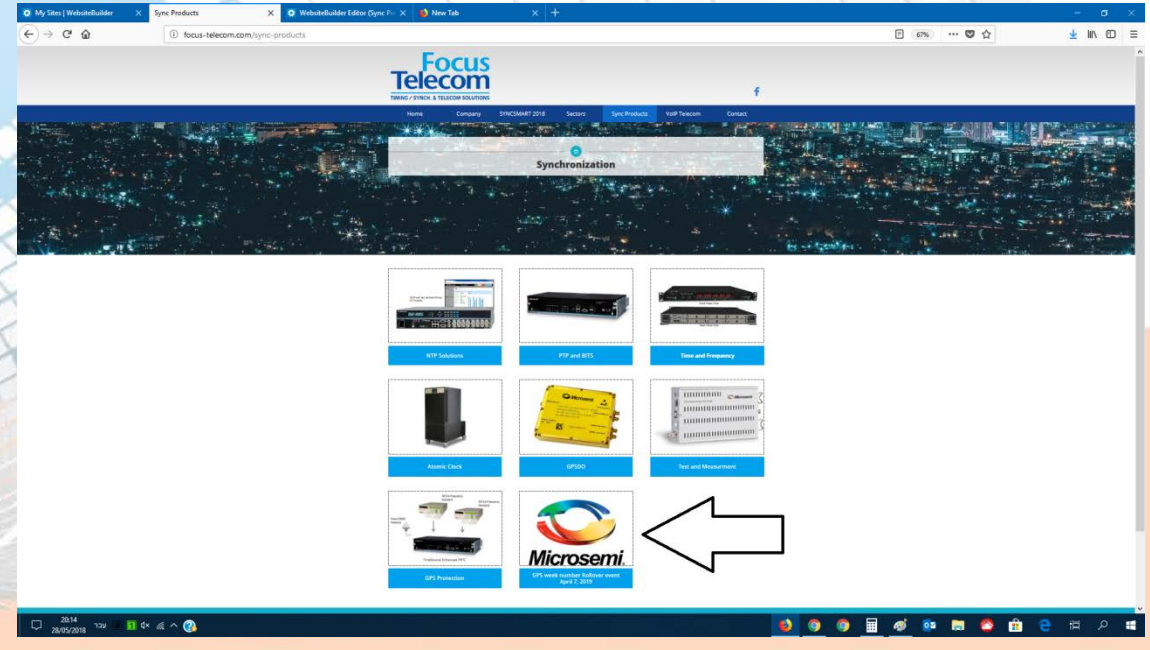
Summary

This FSB is to provide information on the GPS week number rollover event that will occur on April 7th, 2019 for current products listed below. This is with reference to the current software release for each of the products.

For the products listed in Table 1, these active products have been verified that there is no effect to system date from the April 7th, 2019 GPS week number rollover event. These products have an internal rollover event which will occur in the year shown in the table. After the internal rollover event occurs the system date will be incorrect.

Microsemi FSB

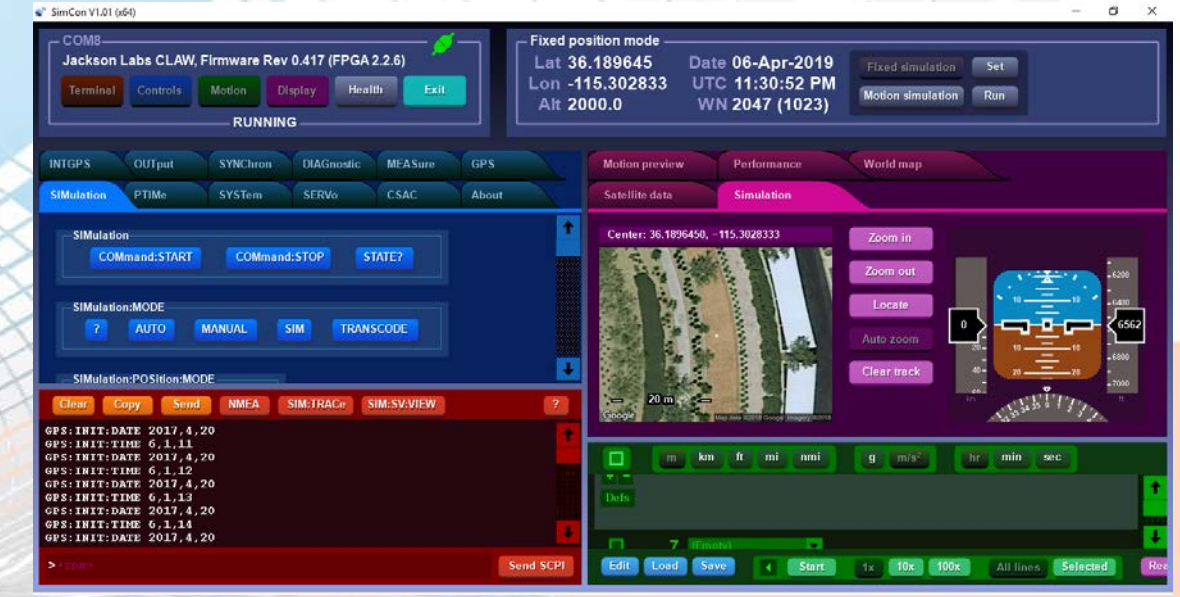




Rollover Test

- Using a GPS simulator create a true simulation of 06-Apr-2019.
- WE expect that if the rollover event happen (week 1023 = 6 Apr 2019 to week 0 = 22 Aug 1999), then we'll see the Day Number of the Year also jumps.

Week beginning at 0000 GPS Time on	GPS Week Number broadcast by satellites
08 Aug 1999	1022
15 Aug 1999	1023
22 Aug 1999	0
29 Aug 1999	1
24 Mar 2019	1022
31 Mar 2019	1023
07 Apr 2019	0
14 Apr 2019	1



Week rollover info from USNO (http://www.usno.navy.mil/USNO/time/gps/gps-week-number-rollover):

Rollover Test – S650 Results

- 6 Apr 2019 is day 96 : http://mistupid.com/calendar/dayofyear.htm
- 22 Aug 1999 is day 234, therefore no jump had happened.

096:23:59:56
096:23:59:57
096:23:59:58
096:23:59:59
097:00:00:00
097:00:00:01

Summary

- Every 19 Years/1024 weeks the GPS System Rolls Over to Week 0
  - When rollover occurs, the date goes backwards 19 years
  - The next Week Number Rollover will be April 2019
  - The last Week Number Rollover event occurred in August 1999
  - Typically, this rollover event will affect a product based on the date that its GPS receiver was manufactured; after rollover occurs, the system date will be incorrect.

- Recommended Action
  - Download Microsemi rollover FSB from Focus Telecom Website
  - Test for rollover event using GPS simulator.

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