

# Time Synchronization Notes

*The following was posted by Tom Nolan to Slack in November 2015.*

The ExoMars rover doesn't use the SCLK terminology. In some other missions there is an SCLK, which is a counter onboard the spacecraft that counts up at some frequency. For those missions, you usually use a toolkit to convert SCLK to some usable time format.

The rover uses Rover Elapsed Time (RET), which is a 6-byte quantity: 4 bytes of seconds, and 2 bytes of subsecond ticks (65536 ticks = 1 second). They have not specified what time corresponds to 0 RET, but at some point they presumably will.

The FSW uses 3 different tick counts in various places: 100-microsecond ticks, 10-millisecond ticks, and 1-second ticks. The 100-us ticks start from power-on, because they're kept in a register in the FPGA. The other two start from FSW boot time, because they're kept in the flight software.

The telemetry packets contain 100-us ticks (what you're calling "FSW ticks"). The correspondence between ticks and RET is recorded in the digital status packet: whenever I get the time command from the rover, I record the RET contained in the command and the 100-us ticks when I got the command (a "time at the tone" concept). From this information, you can reconstruct the RET for each packet, but then you still need to do the RET-to-time conversion.

We're currently using a convention embedded in the EGSE for the RET-to-time correspondence (I think it's seconds since 1/1/2000, but I don't know for sure). But we need to anticipate that there will be other RET-to-time conventions when we integrate with the rover. I suspect that there is no requirement at the rover level to make RET unique. So during rover I&T, they will probably start RET=0 at power-on, and we'll potentially get data sets with overlapping times every time the rover is power-cycled.

There is also the possibility that RET will start over again at 0 on Mars, which would add to our headaches.

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