Important Hardware/Software Notes for Researchers Using PASSCAL Equipment

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**January 17, 2019: GPS Rollover**

Late 2018 PASSCAL learned of a GPS week rollover event that can affect data logger performance and timing. PASSCAL has acquired a GNSS signal generator that can emulate GPS satellite signals. This satellite emulator allows us to test PASSCAL equipment that relies on GPS timing and to determine how equipment will handle the GPS rollover event. To date, we have determined that some models of GPS engines are affected by the rollover. How the rollover errors manifest is dependent on the data logger’s model and firmware version of the GPS engine.

If you have PASSCAL equipment that will be affected by rollover errors during your experiment, we should have contacted you to let you know what is required to avoid these errors. Requirements could include: replacing data loggers, replacing components associated to the data logger, firmware updates to station components or another action. If you currently have a PASSCAL experiment and have not heard from us, feel free to contact us to ensure your equipment is not affected.

If you own your own seismic equipment that utilizes GPS timing, we recommend you contact the manufacturer for information specific to your instrumentation’s handling of the GPS week rollover.

**December 31 2016 Leap Second**

Leap Second’s effect on PASSCAL RT-130 and Q330

**Summary:**

**Q330:**

Data time starting at 2017:001:00:00:00 is +1 second from truth for 1-2 minutes (seen in controlled tests) until a clock correction, followed by a gap of 2-40 seconds per channel depending on sample rate.

**RT-130:**

Data time starting at 2017:001:00:00:00 is +1 second from truth for 15min - 9:42hrs (seen in controlled tests) until a clock correction. Some data (~6secs in tests) around the time correction is mistimed, sometimes 11 years in the future, or missing.

Units that did not make the correction for 9:42hrs did not perform phase timing corrections during this period and could also have timing errors due to clock drift that can not be corrected by -1sec adjustment.

PASSCAL has developed software to adjust RT130 data for the December 31 2016 leap
A leap second was added on December 31, 2016 at 23:59:59. This has the effect of delaying the year rollover by one second. Let's say that a datalogger (DAS) is running with its oscillator keeping time, with the GPS off, and then the DAS turns the GPS on when it thinks it is Jan 1 2017 00:00:01. If the GPS could get a lock instantaneously, the time from the satellites would be Jan 1 00:00:00, and the DAS need to do a -1 second time correction. Details of how PASSCAL Q330 and RT130 dataloggers handled the leap second and what users may expect to see in their data are described in the complete article, with numerous examples. Also note that the dataloggers on the PASSCAL benches during the leap second had no problems obtaining GPS locks. If a GPS in the field is having difficulty obtaining a lock on the satellites, the leap second correction could be delayed.

Important Update to rt2ms

This is to inform you about an important software update needed for processing of Reftek RT130 data in PASSCAL experiments. We recently discovered an issue with running rt2ms on the second card installed in the RT130. Sometimes insufficient header values are being written by the RT130 and then rt2ms passes over these packets potentially resulting in a gap on one or more channels (typically less than 1 hour on higher sample rate data, larger gaps on 1sps data). The PASSCAL Software Group has patched rt2ms to handle the missing packet headers and write all of the data that are on the card. We highly recommend that you download and install the updated rt2ms program if you are processing any RT130 data.

If you run 'rt2ms' without any other flags or input, it will show you which version you currently have installed. There are two new versions available, depending on what build you used for your PASSOFT installation:

Yosemite and El Capitan (using the 10.10 passcal-osx-10.10-2015.139.pkg build): the current and latest version is 'rt2ms 2016.083 Developmental'
Pre-Yosemite (using PASSOFT_LION.dmg or any older builds): the current and latest version is 'rt2ms 2016.098 Developmental'

PASSCAL OwnCloud link to patched rt2ms
https://cloud.passcal.nmt.edu/index.php/s/u2ISyAWjVqMqSC6

Choose the version (2016.083 or 2016.098) based on your computer OS and PASSOFT.
distribution. Most field laptops newer than May 1, 2016 already have the latest version of rt2ms. Download the version appropriate to your system and follow the instructions in the readme file. Please do not hesitate to contact us (data_group [at] passcal [dot] nmt [dot] edu) if you have any questions or run into any problems!

*Posted on May 31st, 2016*

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**RT130 ALERT - Issue when using two 4GB CF cards**

PASSCAL recently received reports of RT130’s failing when using two RefTek 4G CF cards at moderately low temperatures during an Antarctic experiment. We have duplicated the failure in our lab and in our testing the failure was associated with a specific version of RefTek well board (RT526D). Although we have not had failures in our testing with earlier or later versions of the board, our sample set is small and we cannot rule out problems with these boards when using two 4G CF cards. We have communicated with RefTek about the issue and at this time they are in agreement with these findings.

In our testing we have determined that cold RT130s will not boot with two 4GB cards installed and that units started warm will fail when the temperature dips below a threshold (+14 to +7C). The mode of failure is that units can be hung in a cycle of rebooting, with LCD screen repeatedly cycling through normal messages along with "DISK IN USE", or if the temperature is too low the LCD screen will just go gray and the unit will not boot up. The units do recover on their own when the DAS internal temperature warms back up to the failing temperature.

Our recommendation, at this time, if you have units in-field with two 4GB CF cards is to service these sites and replace the two 4GB cards. Our testing to date suggests that reconfiguring the site with one 2GB and one 4GB CF card, two 2GB CF cards, or a single slot filled are all stable configurations.

Please don’t hesitate to passcal [at] passcal [dot] nmt [dot] edu (contact us).

*Posted on January 6th, 2015*
RefTek GPS Alert

This note is to alert all past and current users of RefTek RT130 hardware that these instruments have been experiencing GPS failures in-field. To date, the failures are geographically confined to East Africa and symptoms include intermittent or total loss of timing.

There is no evidence at this time that there is a global problem with our RefTek GPS. We are recommending that all users of PASSCAL RefTek RT130 dataloggers review their data and log files for signs of GPS failure that are consistent with the failures seen in East Africa. To identify failure behavior please visit this page for a brief tutorial. If you identify failures in your data, please contact passcal [at] passcal [dot] nmt [dot] edu and include “RT130 GPS failure” in the subject line and unit serial numbers in the body of the email.

More info here.

Posted on December 5th, 2013

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