Maintenance of temperature data loggers at GLORIA summit sites

Two main types of temperature loggers are currently in use for measuring soil temperature on GLORIA summits: Onset TidBit v2 (www.onsetcomp.com) and Geo-Precision MLog5W (www.geoprecision.com).
TidBit loggers were replaced at a number of sites, such as across most of Europe, by Geo-Precision MLog5W. Geo-Precision loggers have several advantages over TidBit. They allow for wireless data access, so, after installation, measuring is possible for years without disturbing the covering soil column. Further, Geoprecision loggers are equipped with a replaceable battery which can be used for at least 5 years of hourly measurements, so, on the long run, this is a very cost effective device.
As the frequency of 433 MHz of data transmission of the Geoprecision loggesr is not available for use everywhere (e.g. USA), the Onset TidBit v2 logger is an alternative in such locations. The Onset logger is connected via USB to a computer, thus needs to be excavated for data access. This logger has a producer-stated lifetime of 5 years, but experience showed that many devices died after 2 ½ years in the cold environment of GLORIA summits. So the safe time for these loggers in the field is 2 years.

Onset TidBit v2 units are replaced by installing new devices, whereas the maintenance of Geo-Precision MLog5W requires some equipment for changing the battery, as described below. In principle, battery change is possible in the field or at a nearby mountain refuge, thus, measuring gaps can be kept short. We recommend to purchase a small set of spare loggers (e.g. 4 or 5 devices) which could replace old ones in case of failure.

Battery replacement of GLORIA Geo-Precision data loggers

Required tools (Figure 1)

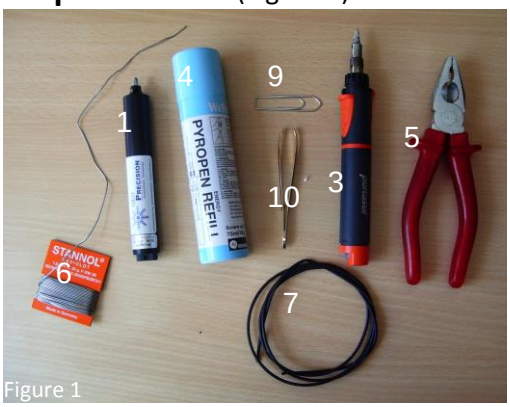

Figure 1

1. Geo-Precision MLog5W Data logger (earlier versions differ by having a sensor cable, but the procedure of battery change is the same)
2. Battery (see figure 2)
3. Gas-fired (gas-powered) soldering iron
4. Refill gas tank (lighter gas)
5. End-cutting (universal) pliers
6. Tin-solder (soldering wire)
7. Heat-shrink tubing: inner diameter unshrinked (original) ca. 2-3 mm
8. Petroleum spray or vaseline (not shown)
9. Paper-clip (optional)
10. Tweezers (optional)

Battery

Figure 2


Figure 3


Figure 4

Battery properties:

- Lithium
- Size AA
- 3.6 V
- High pulse load capability
- Solder tail (already mounted to the battery, figure 2)

Product suggestions:

- Tek Cell SBAA11-AX
- Saft LS14500CNA

You can check out as well the homepage of the data logger producer http://www.geo-precision.de

Preparations before going into the field:
Shorten the solder tails of the batteries to approx. 5-8 mm (figure 3 and 4)

Preparations

Prepare the following for the battery change:

- New Logger batteries and all tools and materials shown above.

- A set of spare T-loggers for the case of logger failure.

- A laptop which works in the field with
- the T-logger software installed – see T-Loggers_GP-M-Log5W_English_20130822.pdf.
- the appropriate time settings (in UTC) – see details in T-Loggers_GP-M-Log5W_English_20130822.pdf.

- The USB-interface (dongle) for reading out the T-data.

- Photos of the logger positions and of the 3x3m grid positions.

- Your logger data (logger codes, serial numbers).

- New sheets of Form 4 Temperature Loggers (one per summit).

Readout the temperature data

- With your laptop and the dongle mounted, get connection with the T-logger. Readout the T-data, but do not clear (do not delete) the data on the logger. Leaving the old data on the logger is just a precaution for the case of failure of your laptop. There should still be sufficient logger memory space for a decade or more for hourly measuring intervals.

- Write the readout date, time, UTC-difference on the new Form 4 in the fields ‘stop date’, ‘stop time’ and ‘UTC diff’. Indicate on the form ‘battery change’.

You may complete the data readout for all four loggers per summit before you start with the battery change.

Replacement of the battery

- Find the exact position of your logger using the photos (be careful about trampling impacts in the 3x3m area).

- Carefully excavate the logger.

- Open the screw lock at the rear side of the logger (never in the front where the sensor is situated/located) and remove the battery. You may use a paper-clip or pliers for a better leverage effect (figure 5).

Figure 5

- Slide away the old heat-shrinking tube from the contact (only on the positive pole) and desolder the old battery. Remove the contact from the **negative** pole before removing the contact from the **positive** pole. Remember which contact is positive and which negative (usually positive is red) and remove the old heat-shrinking tube (figure 6).

Figure 6

- Cut a piece of 5-10 mm of the new heat-shrinking tube and slide it over and down the positive contact (figure 7). The heat-shrinking tube will protect the contacts from interfering with each other.


Figure 7

- For installation of the new battery solder the **positive** pole first. You may use tweezers to hold the contacts in place while soldering (figure 8).


Figure 8

- Slide the heat-shrinking tube from the contact up to the battery and over the soldered **positive** pole and heat it up with the soldering iron so that it shrinks and secures the positive contact from interfering with the negative one (figure 9).

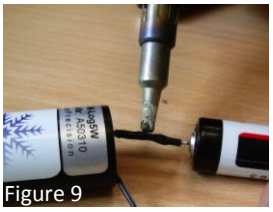
Figure 9

- Solder the **negative** contact. There is no heat-shrinking tube needed (figure 10).


Figure 10

- Slide the battery back into the data logger
- Use petroleum spray to seal the screw lock of the logger and lock it again tightly
- Carefully dig in the logger und cover it with substrate material so that the situation looks like on the old photo.

Check of logger settings

- Check with your laptop and the dongle mounted if the logger is properly working and if time settings and parameters are still appropriate (see details in T-Loggers_GP-M-Log5W_English_20130822.pdf). Just check the settings and adjust if necessary, but do not clear (do not delete) the old data on the logger.
- After having successfully checked the loggers settings, write the start date, time, UTC-difference on the new Form 4 in the fields ‘start date’, ‘start time’ and ‘UTC diff’.