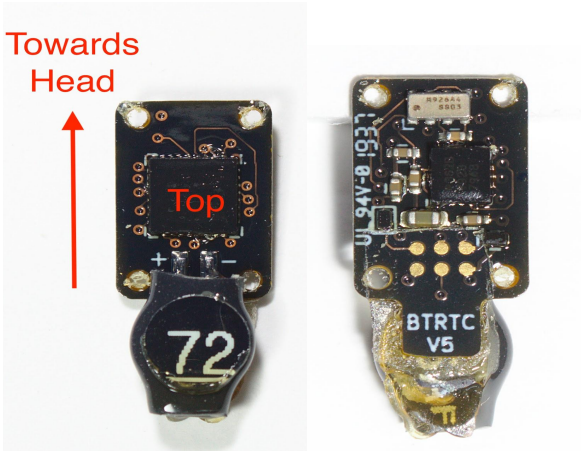
Bit Tag Manual

Visual Glossary of Components

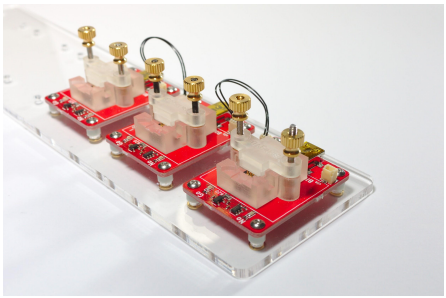
Bit Tags

Ultra-low power reusable accelerometer loggers, capable of logging activity for 100+ days.



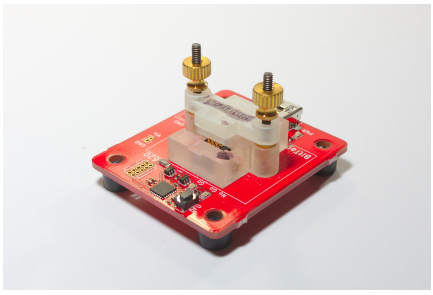
Charger Bases

Charges Bit Tag batteries and displays battery charge status.



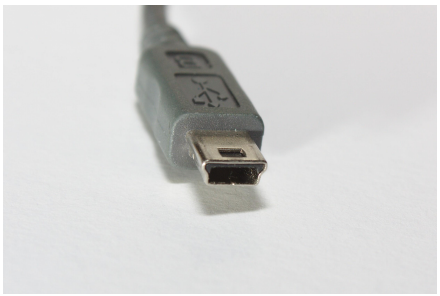
Programmer Base

Allows data transfer between Bit Tags and computer, for configuration and data downloading



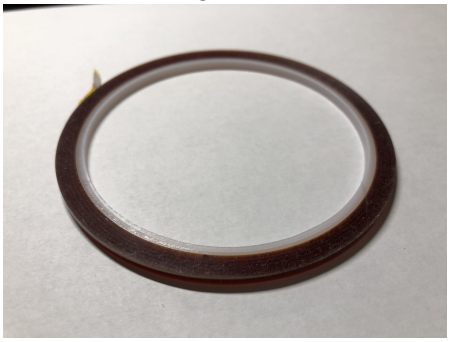
Mini-USB Cable

Delivers power and data to Bit Tag chargers and programming base.



Insulating Tape (3mm Kapton)

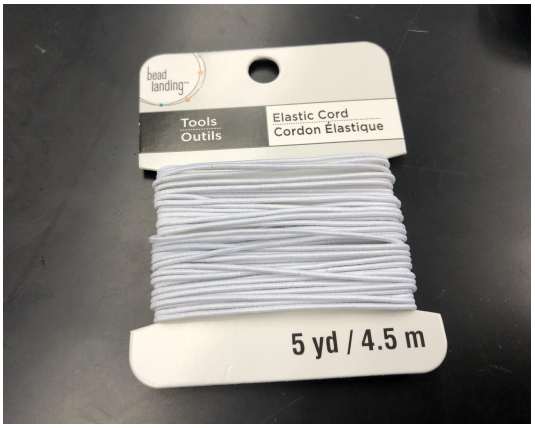
Protects Bit Tag contacts from short-circuits.



Tape Application Sticks (4mm width)

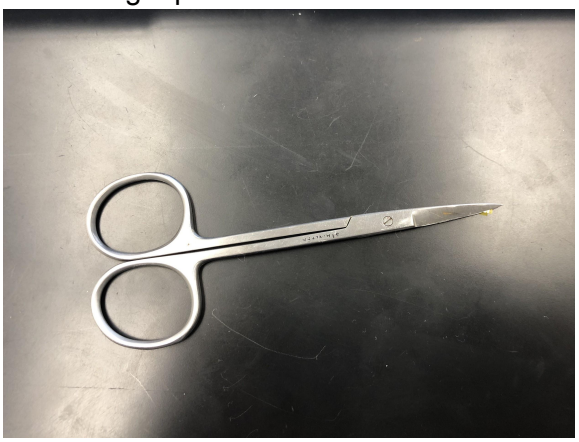
Flat wooden sticks, commonly used as coffee stirrers. Useful for applying tape to Bit Tags, and for measuring tape length.

Harness Material



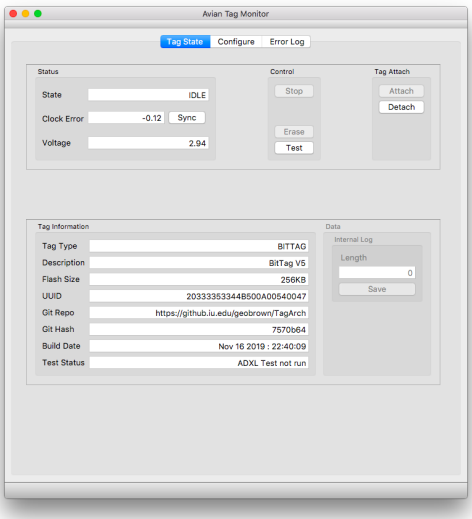
Scissors

For cutting tape and harness material. The smaller the better.



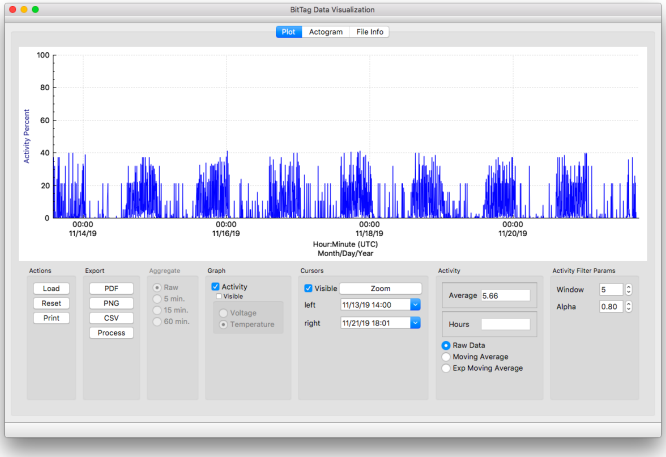
Monitor Program

Configures and downloads data from Bit Tag

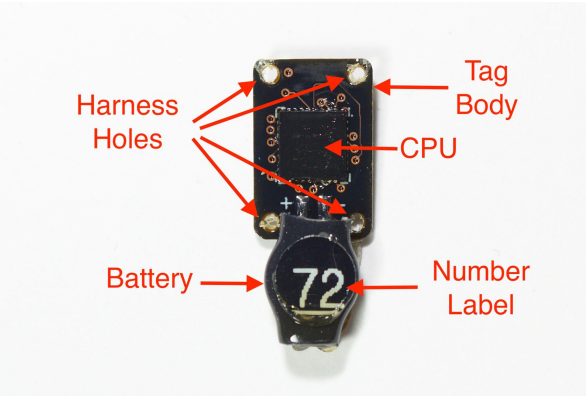


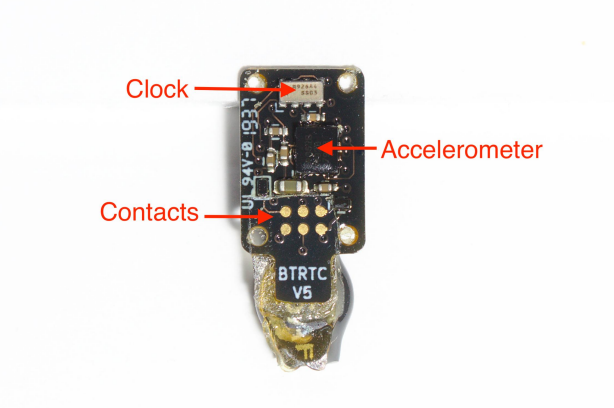
qtdataviz Program

Displays data and generates actograms



Bit Tags

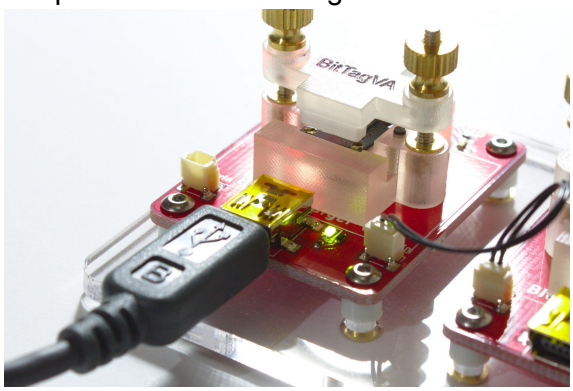
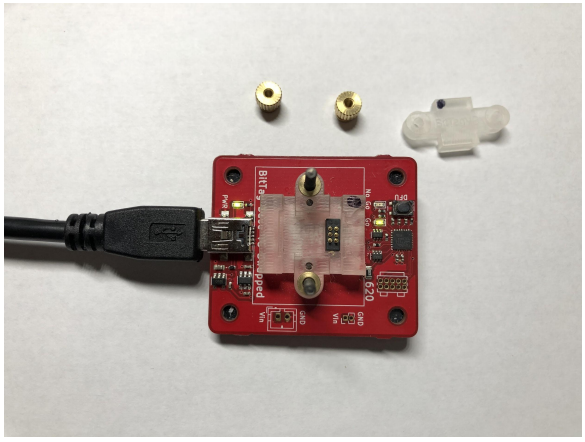
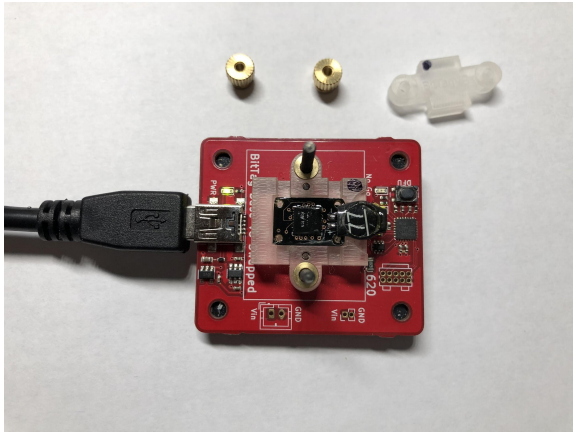


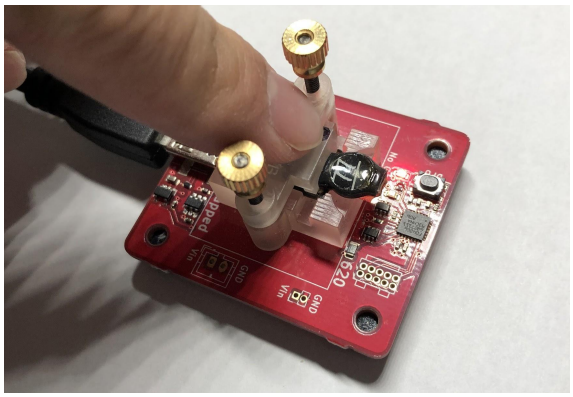


Specifications

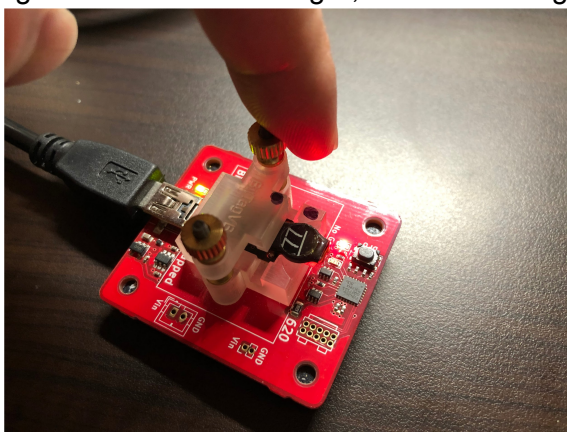
- Weight (Without Harness) **0.64g**
- Dimensions **22Lx9Wx6H mm**
- Run Time (Depends on mode, limited by battery to 5000 hours)
  - Bits Per Second **239 hours (~10 days)**
  - Counts per Minute **2395 hours (~100 days)**
  - Counts per 4 Minutes **5000 hours (~208 days)**
  - Counts per 5 Minutes **5000 hours (~208 days)**
- Battery Capacity **5.5 mAh**
- Average Current Consumption **< 1µA**
- CPU **STM32L432KC**
- Accelerometer **ADXL362**
- Clock Accuracy **±3ppm**

Pre-Flight

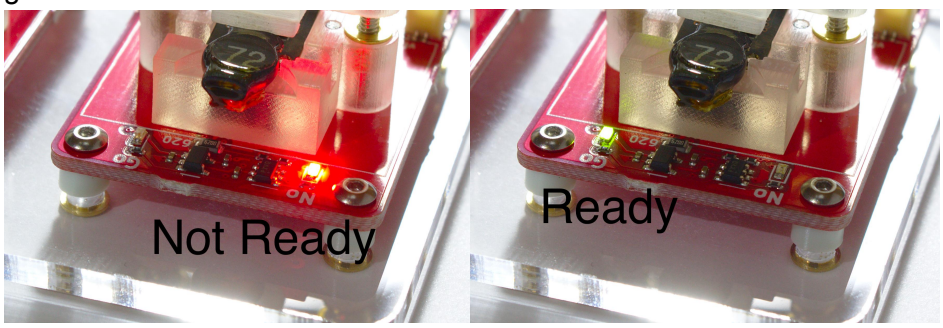
1. Charge Bit Tags
    a. Plug in Charger Base and ensure it is receiving power. A green light will illuminate on the Charger Base that is plugged in. All other Charger Bases can then share power from this Charger Base.
        i. 
    b. Remove nuts and lid from Charger Base
        i. 
    c. Place Bit Tag in the plastic holder, ensuring it seats fully.
        i. 
    d. Place lid on base, aligning dots.

i. 

e. Gently tighten nuts with one finger, to avoid damaging delicate electronics.

i. 

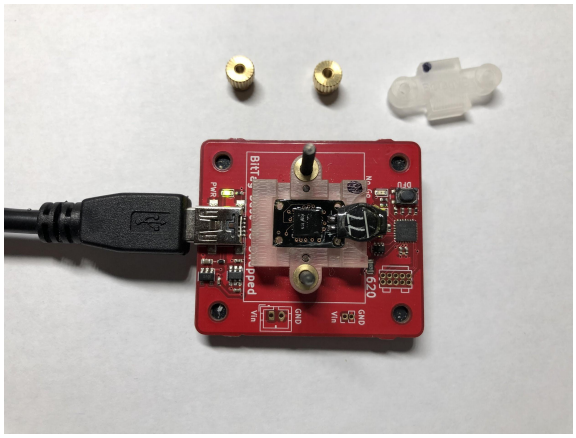
f. Check to make sure Bit Tag makes contact with charger.
g. Bit Tags typically take 24-48 hours to charge.
h. The Battery Indicator will turn from red to green when charge is complete. To maximize runtime, leave Bit Tags on charger for an additional 24 hours after green light turns on.

i. 

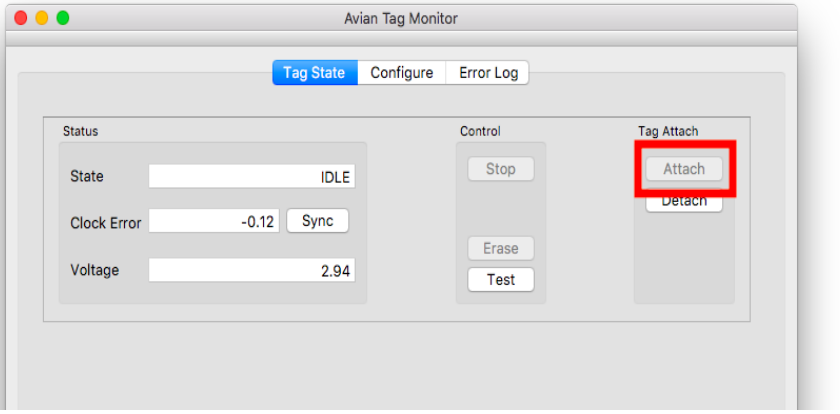
i. Remove Bit Tags when done charging. Unused Bit Tags can store for 1-2 months before needing to be recharged.
    i. To remove, reverse the installation process.

2. Configure Bit Tags

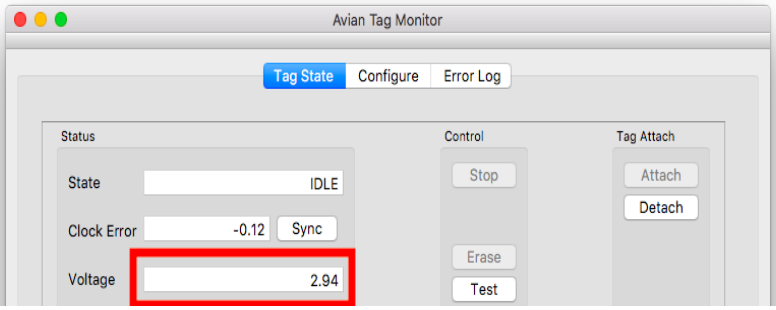
a. Place Bit Tag in Programmer Base, following the same procedure as installing Bit Tags into chargers.
    i. Note: Programmer Base must be plugged into computer before receiving a Bit Tag.

ii. 

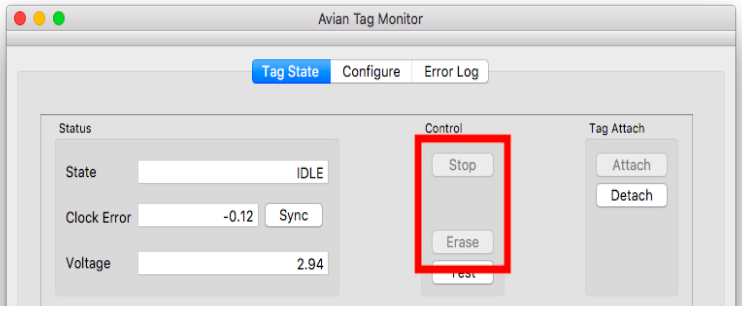
b. Open the monitor program.
c. Click “Attach”

i. 

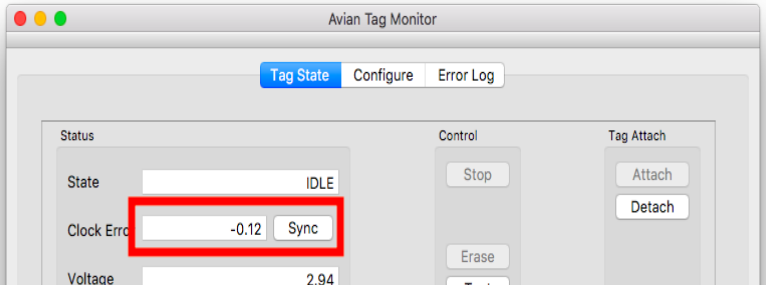
d. Check that battery voltage is **3.0 volts** or greater. If not, detach and recharge. While still functional, battery voltage below 3.0 volts will result in suboptimal runtimes.

i. 

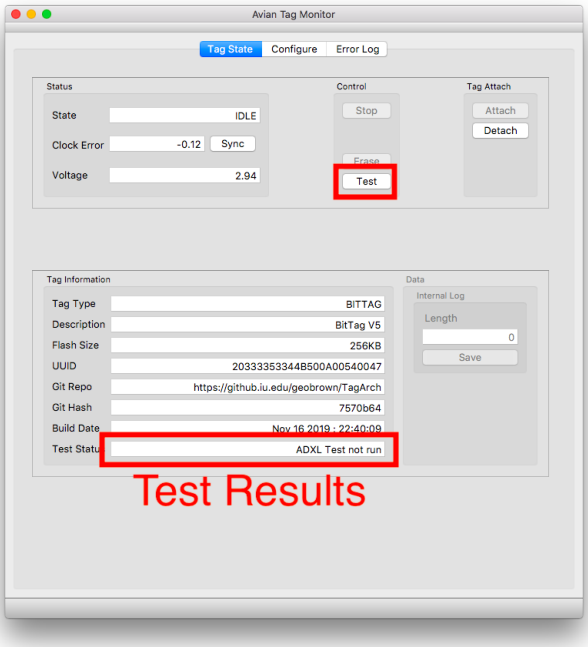
e. If Bit Tag is in a state other than “IDLE”, you may need to “Stop” and then “Erase” Bit Tag.

i. 

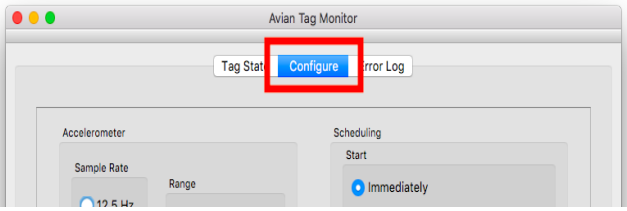
f. If Bit Tag Clock Error is greater than ~1 second, you may synchronize it to your computer's clock by clicking "Sync"

i. 

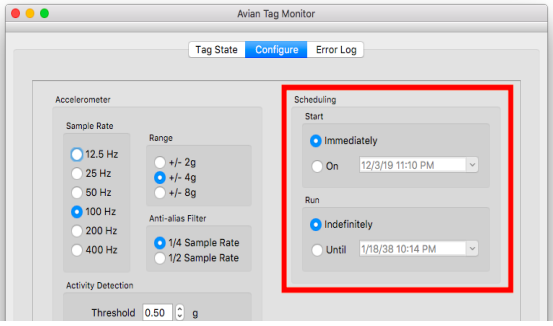
g. Run a Test of the Bit Tag to ensure systems are functional. Test results will appear after a few seconds.

i. 

h. Click into the "Configure" tab.

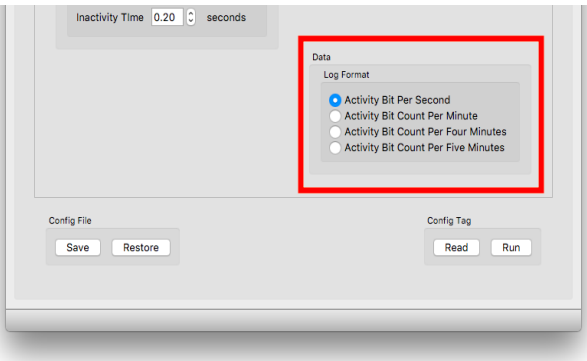
i. 

ii. Schedule Bit Tag Data Collection

1. 

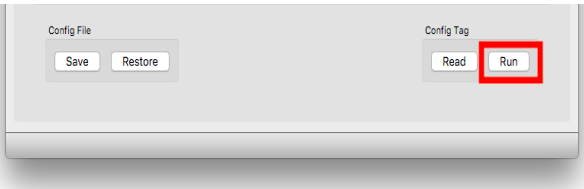
iii. Select Data Type Log Format based on experiment requirements:

1. **Activity Bit Per Second**: Gives second-by-second log of whether or not the animal is active. Highest resolution data. Run Time of around **10 days**.
2. **Activity Bit Count Per Minute**: Records the percentage of each minute the animal was active. Run Time of around **100 days**.
3. **Activity Bit Count Per Four/Five Minutes**: Same as Activity Bit Count Per Minute, but over four or five minute intervals. Lowest resolution, but allows Run Time of around **200 days**.



4.

iv. Click “Run” to save settings and start Bit Tag.

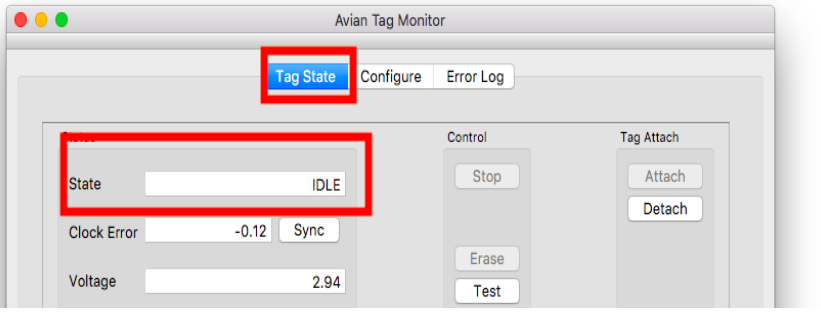


1.

i. Return to the “Tag State” tab.

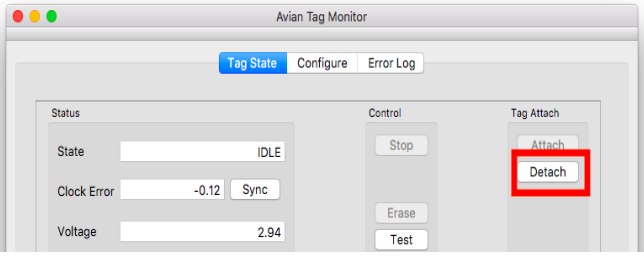
i. Ensure that the Bit Tag is in the “CONFIGURED” or “RUNNING” state. If not, check your configuration and click “Run” again.

1.



ii. Click “Detach”

1.

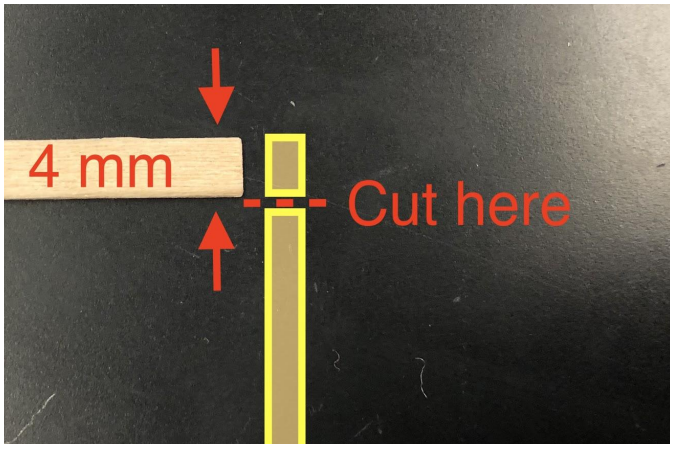


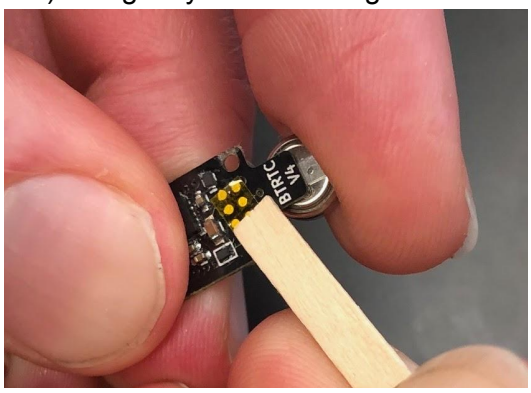
j. Remove Bit Tag from base.

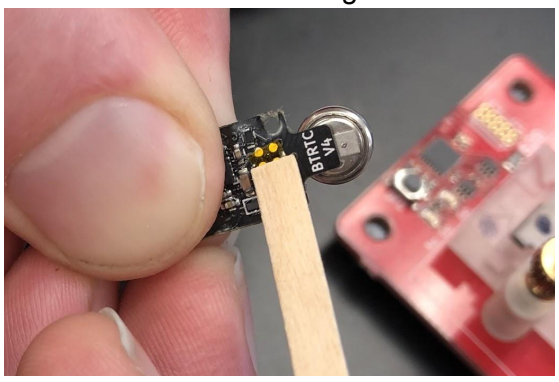
3. Insulate Bit Tags

a. Cut a short strip of Insulating Tape just long enough to fully cover contacts (about 4mm - or the width of tape application sticks) on the back of Bit Tag. See picture below:

i.



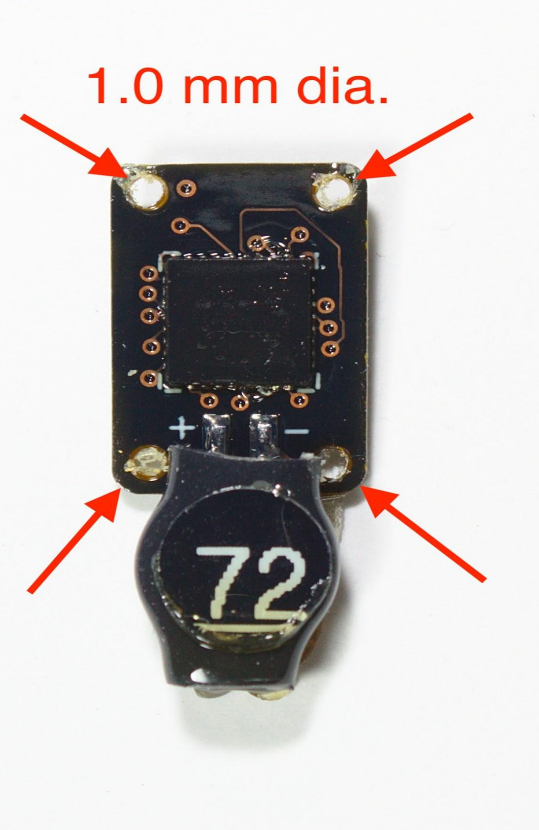
b. Place tape partially on Tape Application Stick (leaving ~2mm overhang lengthwise) and gently stick one edge onto Bit Tag
    i. 

c. Press stick firmly onto tape and “squeegee” out any air bubbles or pockets. Tape should sit flat on surface of Bit Tag.
    i. 

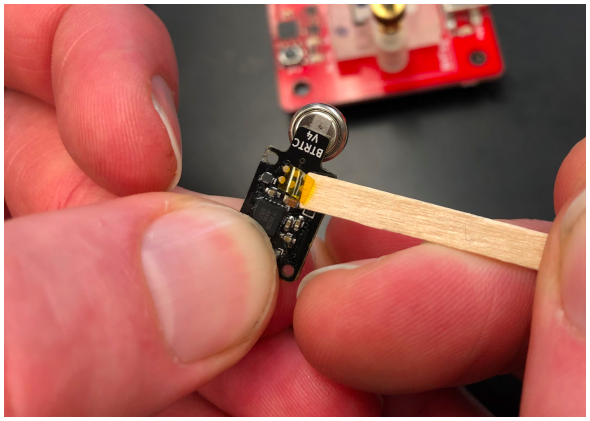
4. Build Harnesses

a. Bit Tags can be attached via harness using the four mounting holes (1mm diameter)

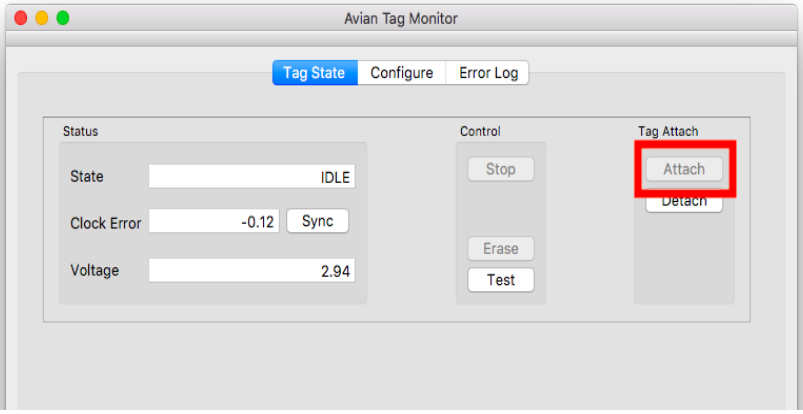
b. For songbird, the size of the leg-loop harness can be estimated using the function described by Naef-Daenzer (2007, J. Avian Biology, 38: 404-407)



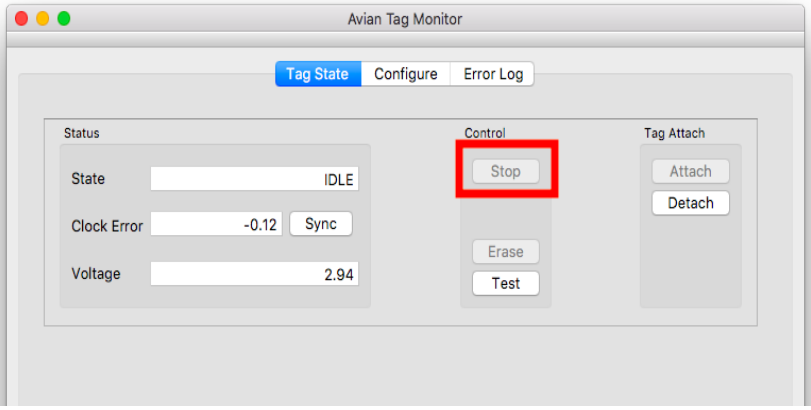
Post-Processing

1. Recovery
    a. Remove harnesses and insulating tape, being careful not to contact the Bit Tag with sharp or metallic tools.
        - The Tape Application Stick can also be used to gently peel up the tape.
        - 
    b. Place Bit Tag into Programmer Base.
        - Note: Ensure Programmer Base is plugged into the computer first.

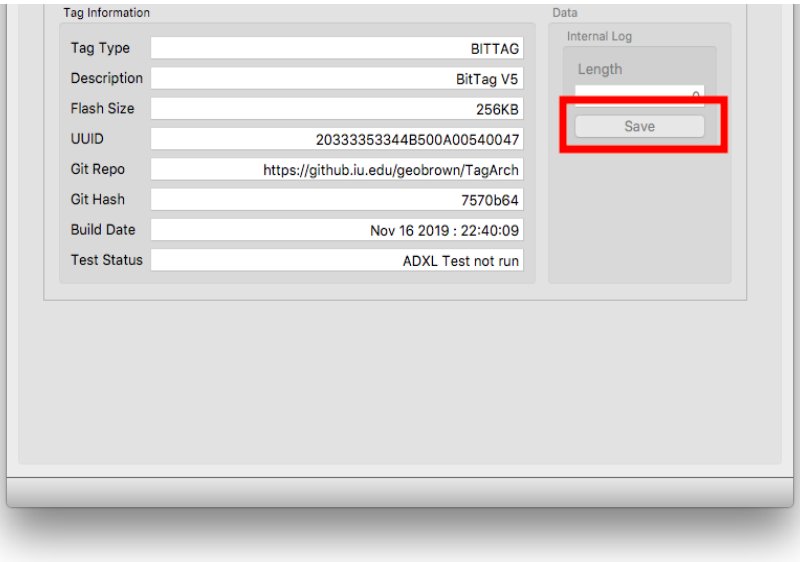
c. Open the monitor program and attach.



d. Stop the Bit Tag.

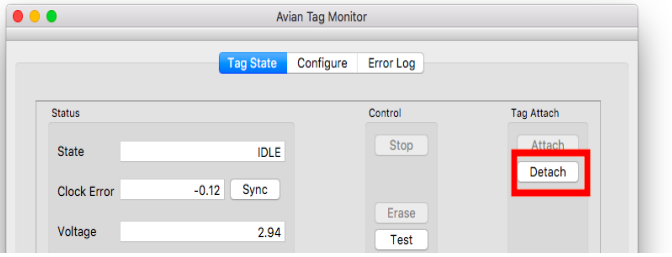


e. Save data. **Important:** Save your data as a ".txt" file.

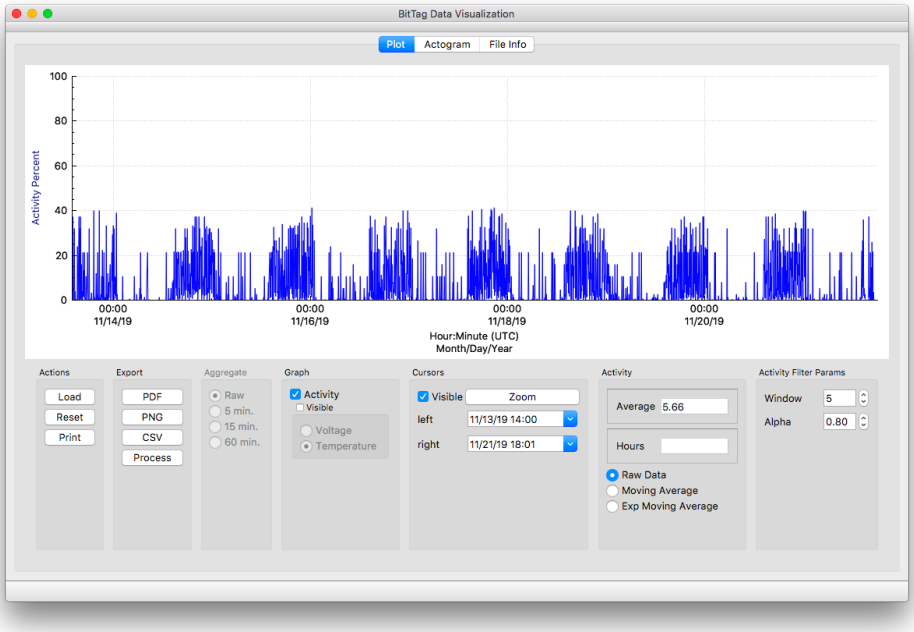


- **Note: The data length may sometimes show up as zero, even if there is saved data onboard.**

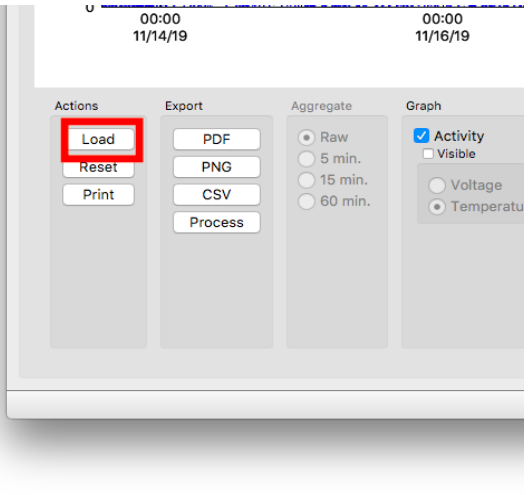
f. Detach the Bit Tag and remove from base.



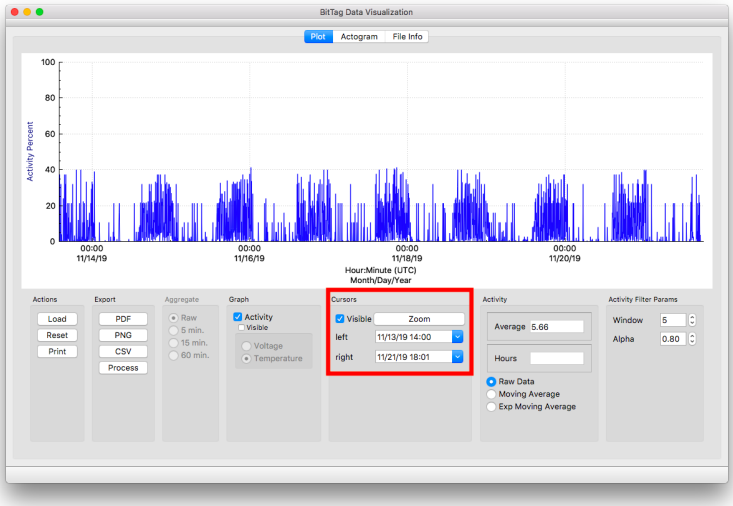
2. Data Visualization



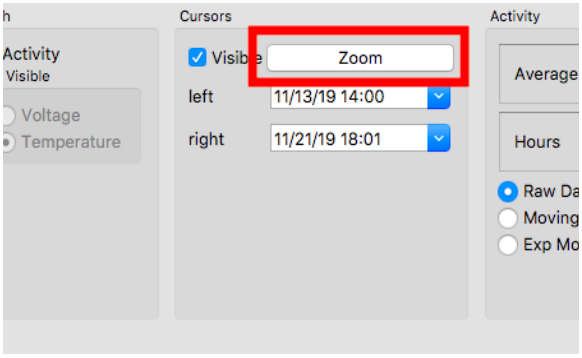
a. Open qtdataviz
b. To import data click ‘load’ and select data file (data file should have a .txt extension)



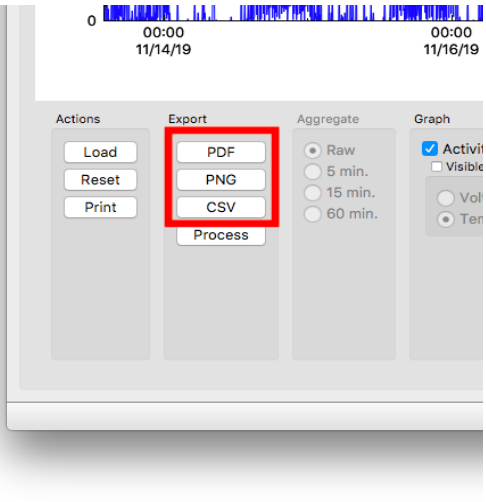
c. If you need to trim your data, enter Start and End times and then click “Zoom”



-
- You may also use your mouse to visually select these times:
    1. Double-click on the chart with the Left Mouse Button to set the Start time (One-finger double-click on Mac).
    2. Double-click on the chart with the Right Mouse Button to set the End time (Double-click with two fingers, or while holding Control (⌃) on Mac).
    3. Click “Zoom”

a. 

d. You may export your data in a variety of formats:
- **PDF/PNG**: Saves the currently displayed figure as an image
- **CSV**: Saves all data currently visible in the image as a .csv file of data points.



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e. You may also view and save actograms by clicking on the ‘actogram’ tab at the top.

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