* Radio based necklace which connect to device that notifies you when sheep leave a radius. In "locating mode", necklace creates a sound to help locate sheep
* Ringer on sheep
  + Projects a loud noise unique to each owner
  + Rings either when the owner turns it on (when they can't find them) or once it gets too far from the shepherd or a certain object/place
  + The shepherd can hold something to be the measurement point (?) to see how far away sheep are
  + Should be on the cost efficient side since no need for GPS, all you need is a trigger for sound?
  + Inspiration: Apple watch pinging mechanism?

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Disadvantages:

* Mainly: not cost efficient:
  + Would require sensors, buzzers, and a type of microcontroller for every single sheep that is way out of our budget
  + For the sensors, we would have to use something a lot more advanced than ultrasonic sensors which only detect up to 10m which or not only not offered by MyFab but also not affordable
* Portability:
  + Including all these circuit components + power source for every single sheep is not feasible as it wouldn’t be able to fit in a single necklace form or anything similar
  + To make it weather proof, it would even require a case which would make it even less portable and affordable

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Triggering the sound:

* Connect with an app that shepherds and owners can use to “ping” the sheep
  + Apple watch “pinging” iPhone mechanism or airtag, tile mechanism
  + Bluetooth + circuit + programming? (connect an ultrasonic sensor to an app)
* Ring the device once it escapes a certain bound
  + Radio based
  + Ultrasonic sensor:
    - <https://www.maxbotix.com/articles/how-ultrasonic-sensors-work.htm#:~:text=An%20ultrasonic%20sensor%20is%20an,information%20about%20an%20object's%20proximity>.
      * “An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves.”
      * “An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object’s proximity. “
      * “High-frequency sound waves reflect from boundaries to produce distinct echo patterns.”
    - Measures the distance using ultrasonic sound waves --> will be used to detect how far away the sheep is from the shepherd or whoevers holding the “key” device

The sound:

* Something that shouldn’t hurt the sheep, yet loud enough to hear
  + Decibel:
* Unique sound for different owners/groups of sheep --> Solves the identifying problem
* Piezo buzzers:
  + 108dB: Loud enough for locating in public (loudest buzzer in radioshack)
    - <https://www.thepositiverail.com/blog/how-loud-can-it-get-the-radio-shack-108db-piezo-buzzer>
  + Can alter different tones and basic beeps

Radius of bound:

Device to use:

* Controlling everything:
  + Microcomputer or microcontroller:
    - Arduino or Raspberry Pi Pico
* Projecting the sound
  + Piezo buzzer
* Triggering the sound
  + Ultrasonic Sensor
* Design:
  + Necklace form
* Protection for device:
  + Weatherproof: hydrophobic material

Cost:

* Cost of devices
  + Piezzo Buzzer
  + Ultrasonic Sensor: