Top Dog Technologies

Territory Tracking and Restriction System

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Problem Background

- Track and control pet whereabouts when humans are absent
- Protecting indoor furniture and belongings

Needs Statement

There is a need to have a pet deterrent system that tracks pet movement throughout the house 24/7 by monitoring and documenting when a pet enters off-limit areas and deters the pet when needed.

Goal

Create a network of receivers and transmitters that can record the general location of a pet and deter it from the off-limit areas.

Requirements

- The prototype system must cost less than $500 to meet the project's budget.
- The commercial system should cost $50 or less per receiver and $30 or less per transmitter to be competitively priced on the market.
- The system must use a power source accessible to the public, such as a battery, and the power source must last at least 1 month without being replaced.
- The system must not harm animals or people.

Requirements

- The system must function well in a typical indoor environment.
- The collars should be light, less than 1 pound, and comfortable for the pet.
- The system must be easy for the user to set up which is defined as the set up time taking less than 30 minutes.
- The system must be easy to use and adjust; any adult with basic computer knowledge should be efficient with the computer software after 1 week.

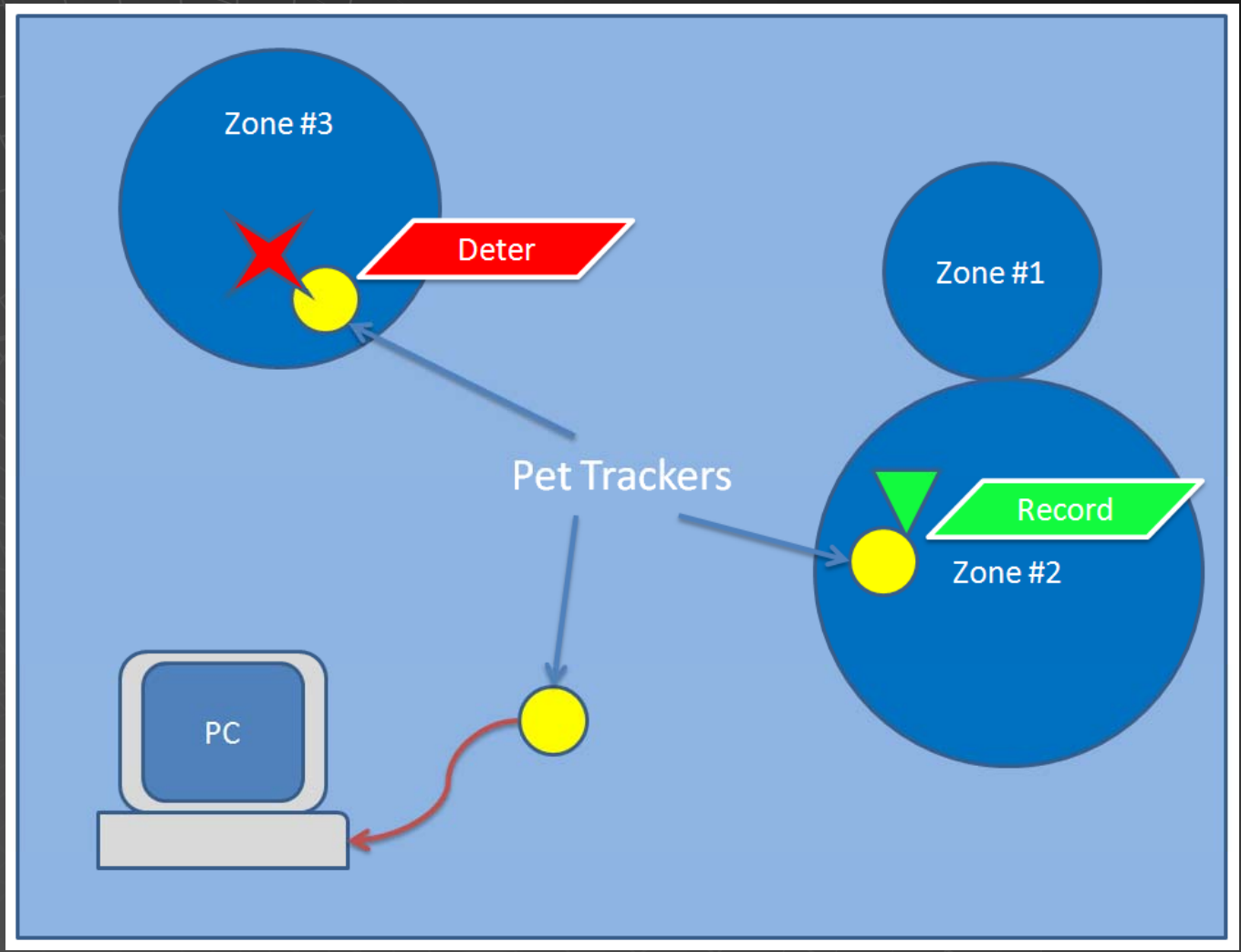
Requirements

- The system should have a variable range that covers an area with a 1 foot radius to an area with a 10 foot radius.
- The system should document the zone and time when a pet violates a restricted location; should also record when a pet enters an allowable zone.
- The recorded information should be displayed to the user in an organized and understandable fashion.

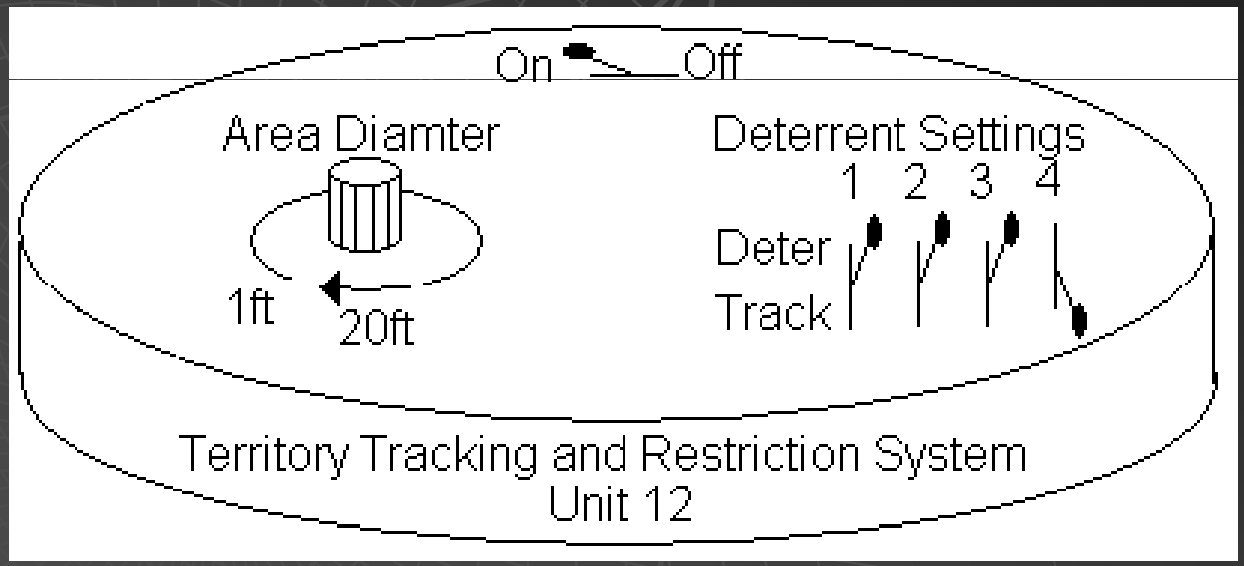
Design Alternatives

- System Alternatives
  - Triangulation based on RF, RFID, GPS, UWB and Ultrasonic technology
- Transmitter and Receiver Chips
  - TRF7960 from TI
  - ADF7020 from Analog Devices
  - CC1100 from TI
  - TXM-315-LR from Linx
- Deterrent Settings
  - Programmable through client software
  - Hardware Switches

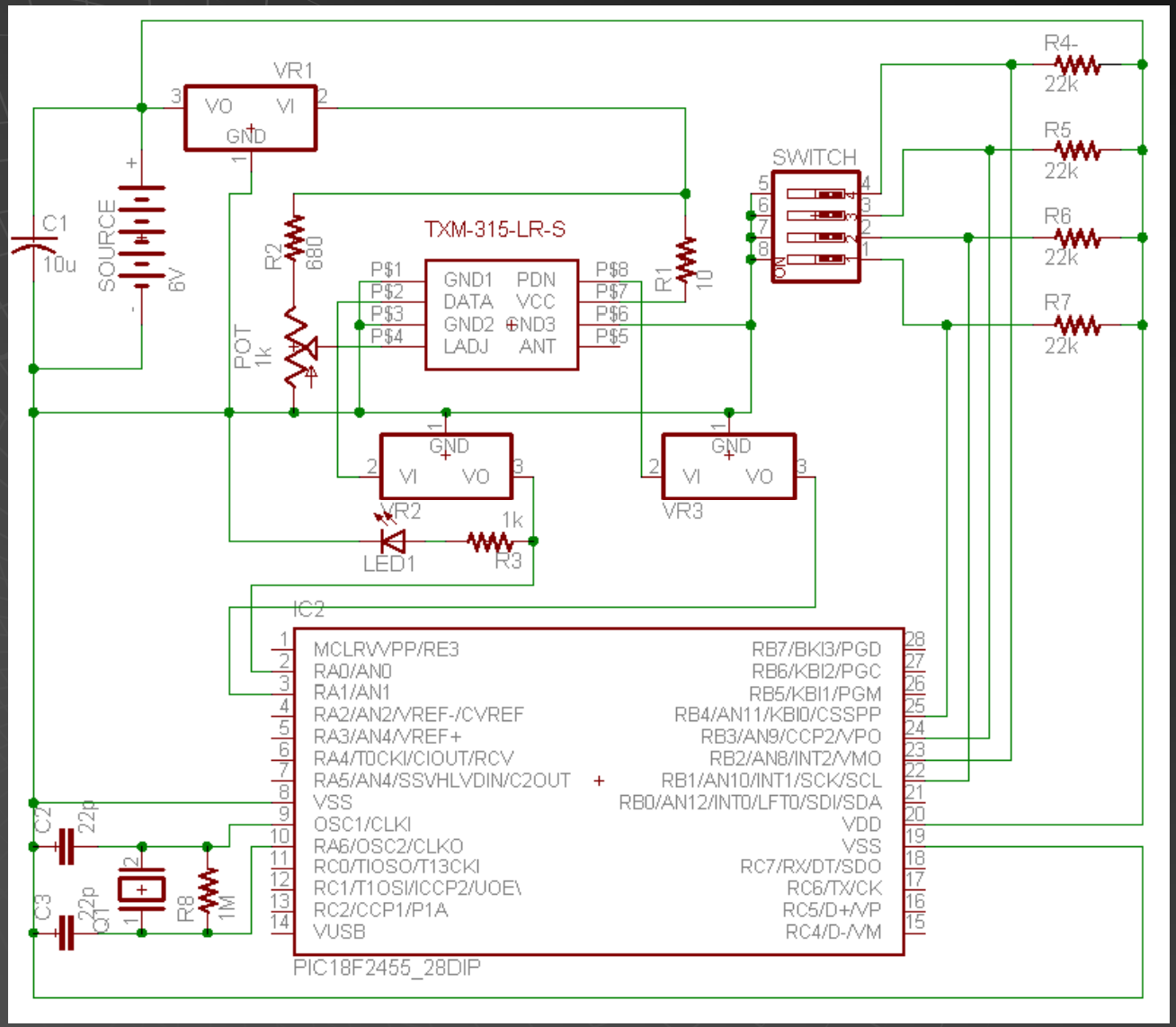
System Level Description



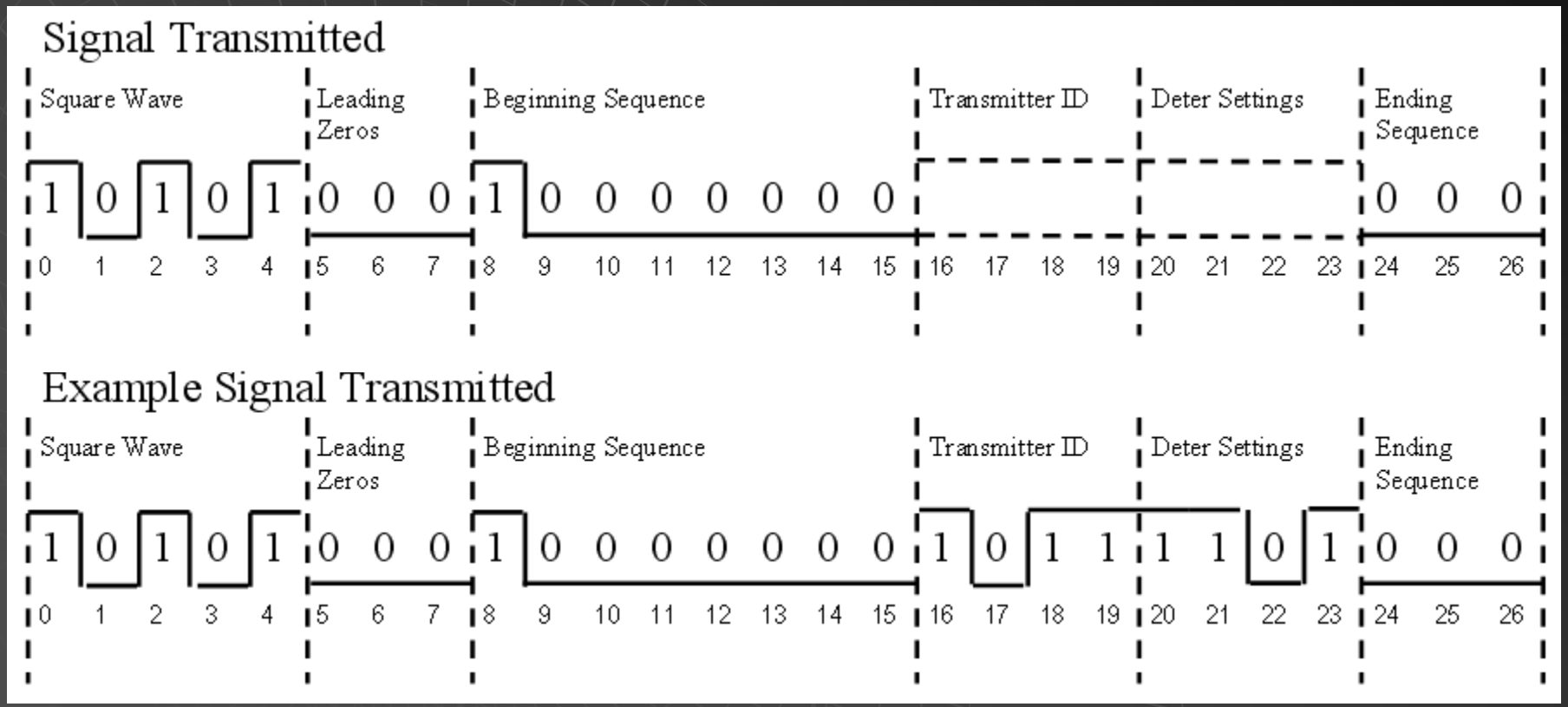
Transmitter Design



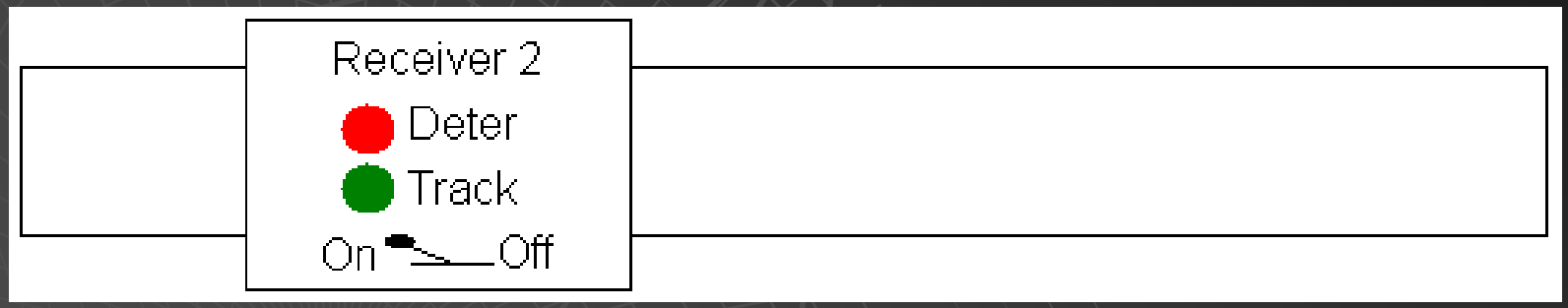
Transmitter Design



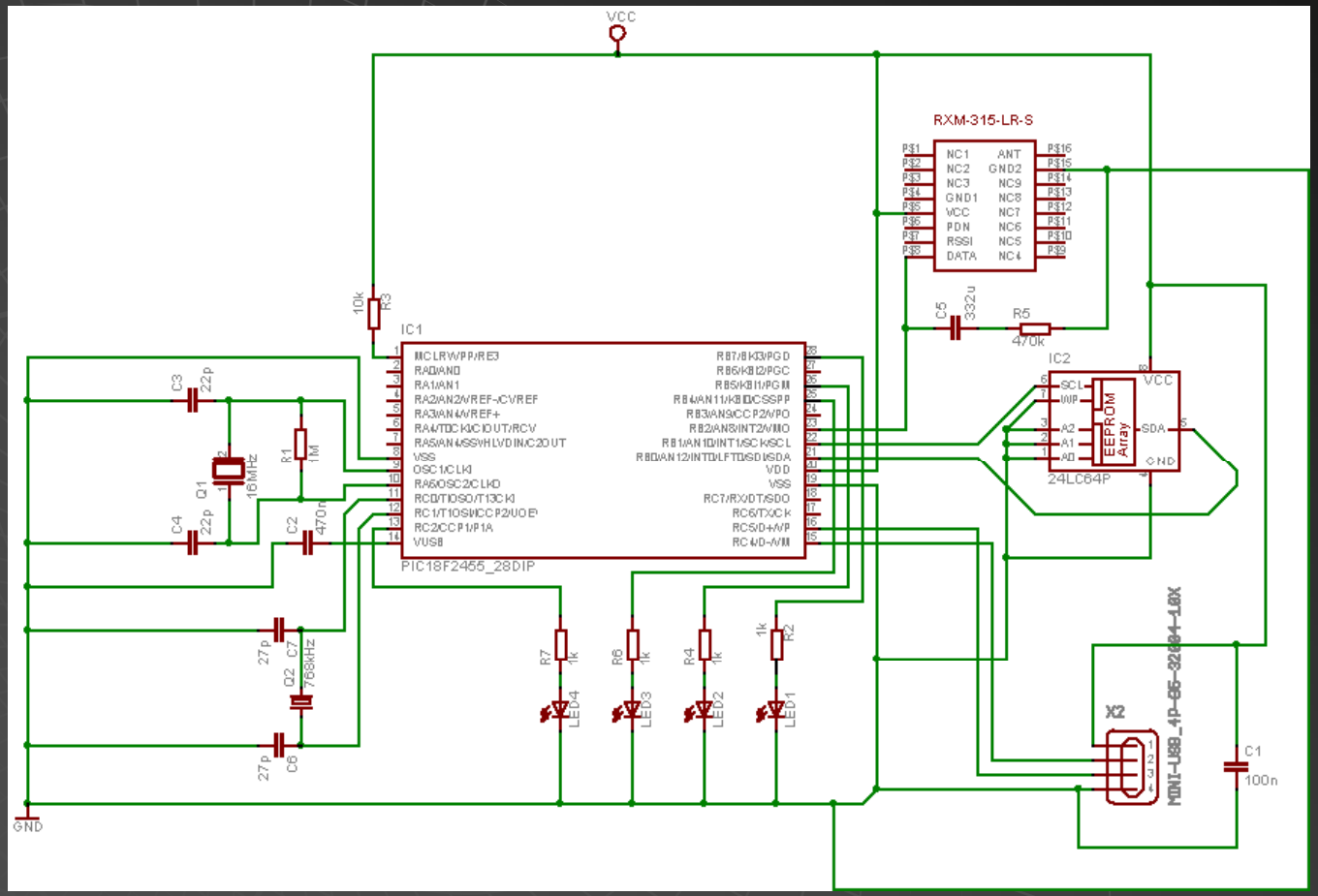
Transmitter Design



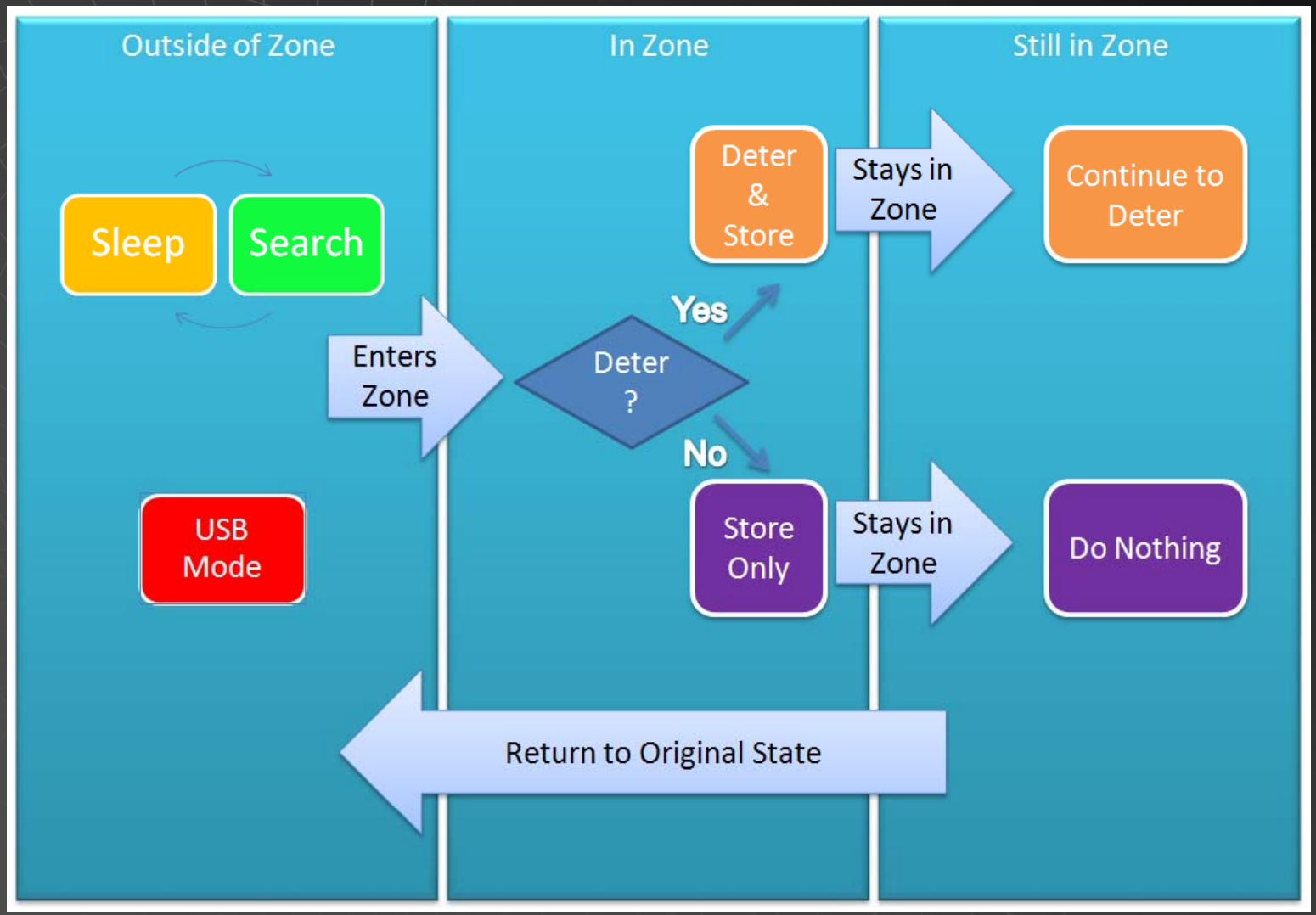
Receiver Design



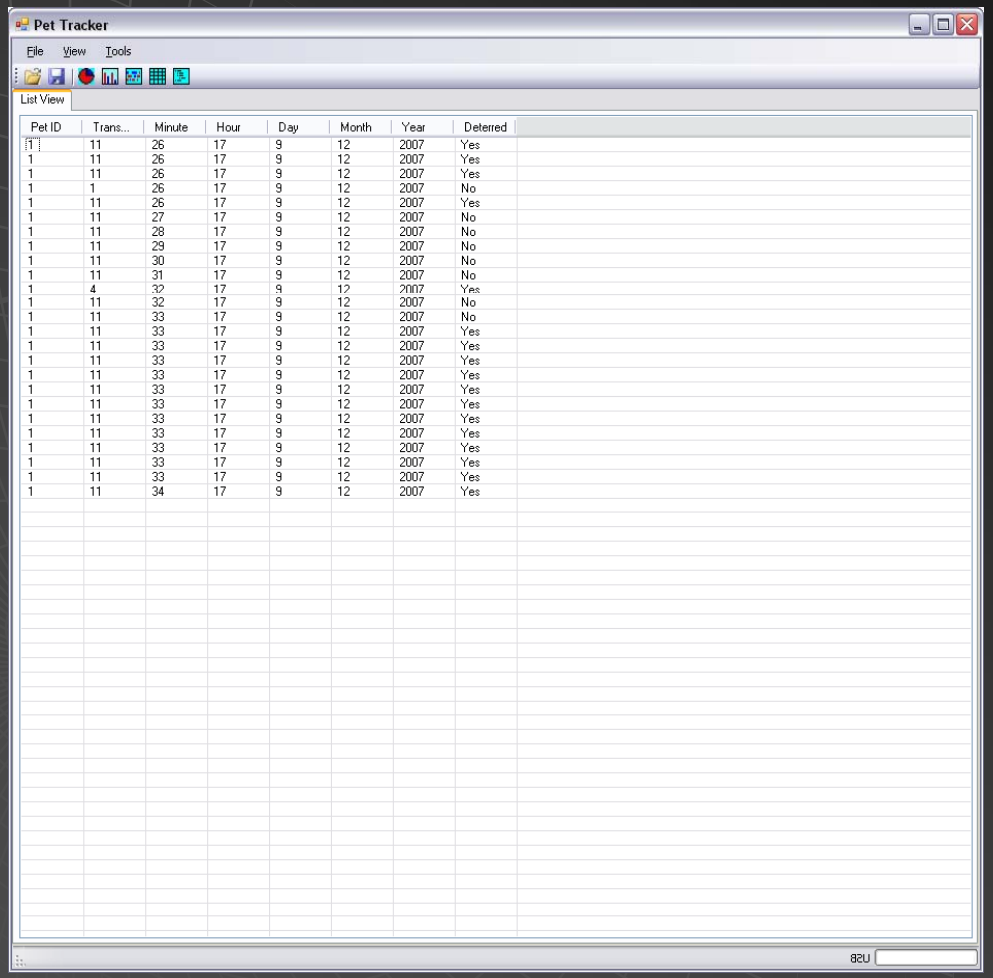
Receiver Design



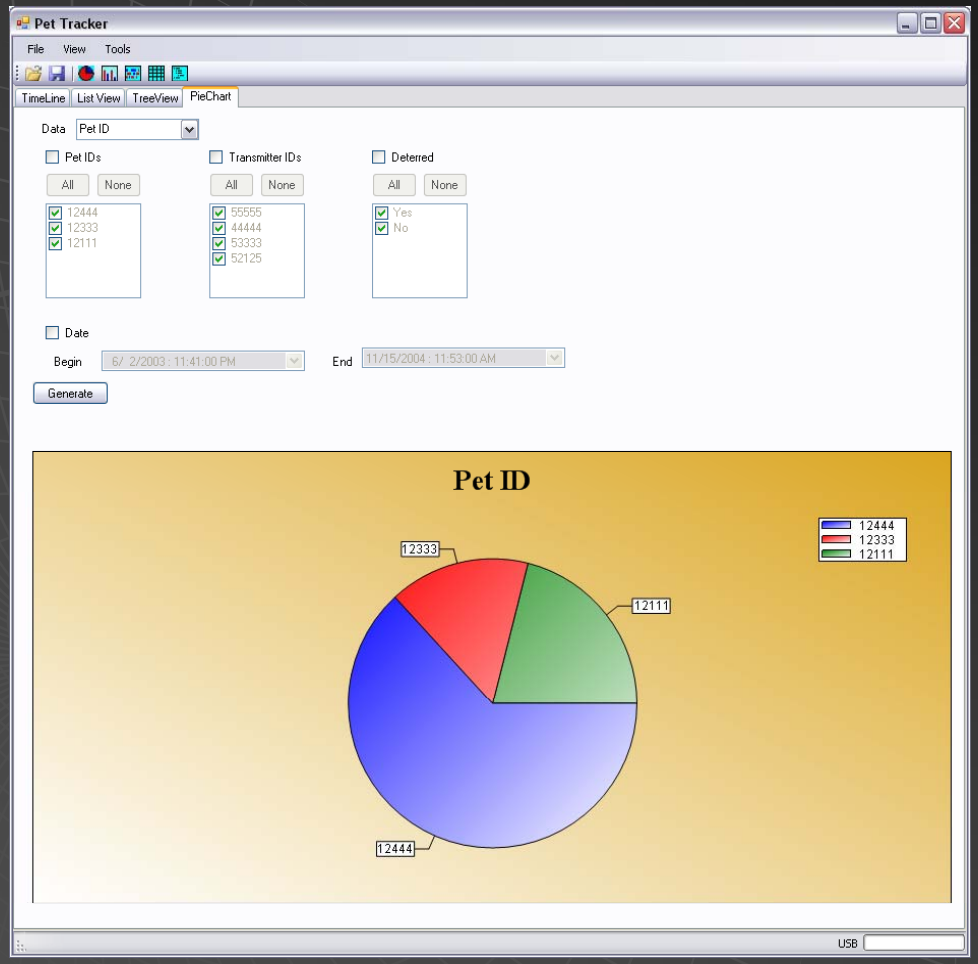
Receiver System Design



Software Design



Software Design



Team Management

- Michael
  - Team Leader, Head of Finances and Purchases
  - Working on receiver hardware
- Chris
  - Head of Software Design, Head of Technical Reports
  - Working on software suite
- John
  - Head of Systems Design, Head of Documentation
  - Working on of PIC programming
- Denise
  - Head of Hardware Design, Head of Project Validation
  - Working on transmitter hardware

Teamwork

- Dividing the project equally
- Had open communication through meetings and email
- Overcame problems as a team

Environment, Health and Safety Concerns

- Verify that the transmitted signal conforms to FCC regulations
- Design the collar and deterrent method to not harm or hinder the pet

Social, Political and Ethical Concerns

- The Territory Tracking and Restriction System runs in the privacy of the user's home
- Situations where the collar is not used as intended (placed on children)

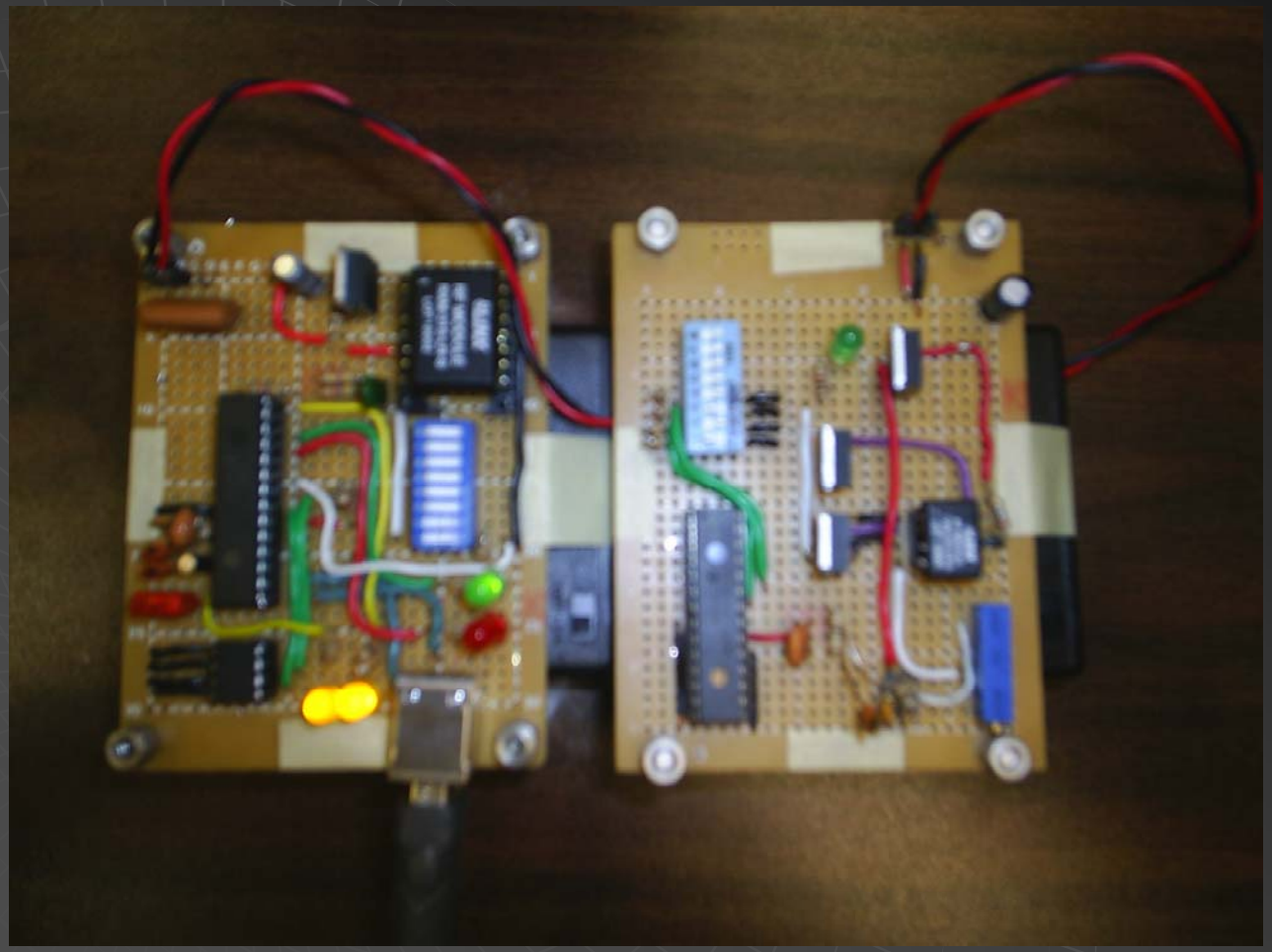
Manufacturability, Sustainability and Economics

- Manufacturability:
  - Can be created in mass quantities
  - Information programmed on PIC
- Sustainability:
  - Battery can be replaced
  - Information can be stored on the computer
- Economics:
  - Low material cost

Budget

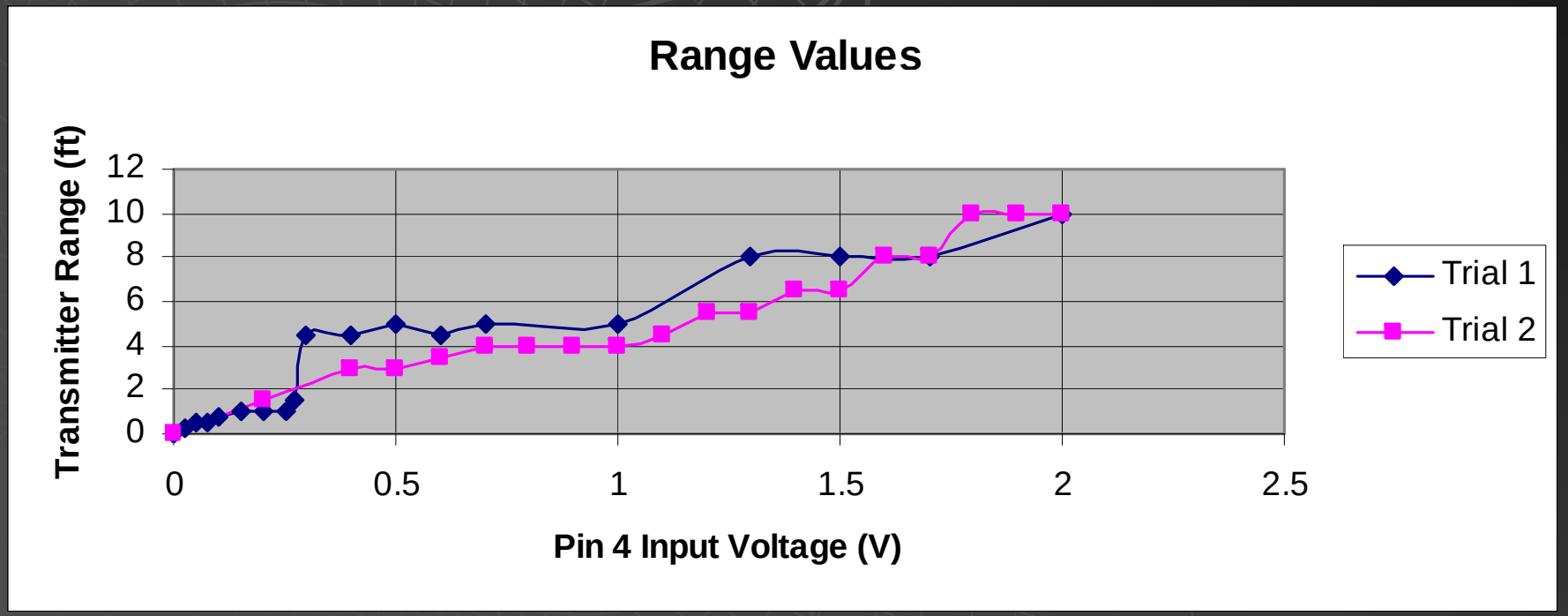
- Prototype Cost: $298.32
- Transmitter Calculated Cost: $15.75
- Receiver Calculated Cost: $20.01

Final Product



Evaluation Results

- Range Testing



Evaluation Results

- Power Testing
  - Receiver will last 31.92 hours
  - Transmitter will last 44.15 hours
- Ways to improve battery life
  - Use batteries with higher mAhour rating
  - Sleep Receiver
  - Sleep PICs that control the transmitter and receiver
  - Use better voltage regulators
  - Create a recharging station for components

Evaluation Results

- Deterrent Testing
  - When the transmitter is in “Deter Mode” the receiver’s red LED lights up
  - When the transmitter is in “Track Mode” the receiver’s green LED lights up
  - Tests and demonstrations have shown reasonable consistency
- Software Testing
  - Data transferred from the receiver to the client software via USB is accurate
  - Client software responds correctly to user commands

Overview

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Any Questions?