

Firearm Magazine With Integral Ammunition Counter

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Background

In military tactical doctrine, it is common to perform what is known as a *tactical reload*, wherein a user preemptively reloads their weapon and retains the partially depleted magazine. To differentiate these partial magazines, they are often re-inserted face-up, as pictured below.

What happens when every magazine has been tactically reloaded?

The user has no easy way to tell which is the *most* full, and must physically handle each magazine, estimating round-count by weight. Should the user then require an immediate reload, their selection between a magazine with 4 rounds and one with 28 is left to chance.

Our device makes this choice clear



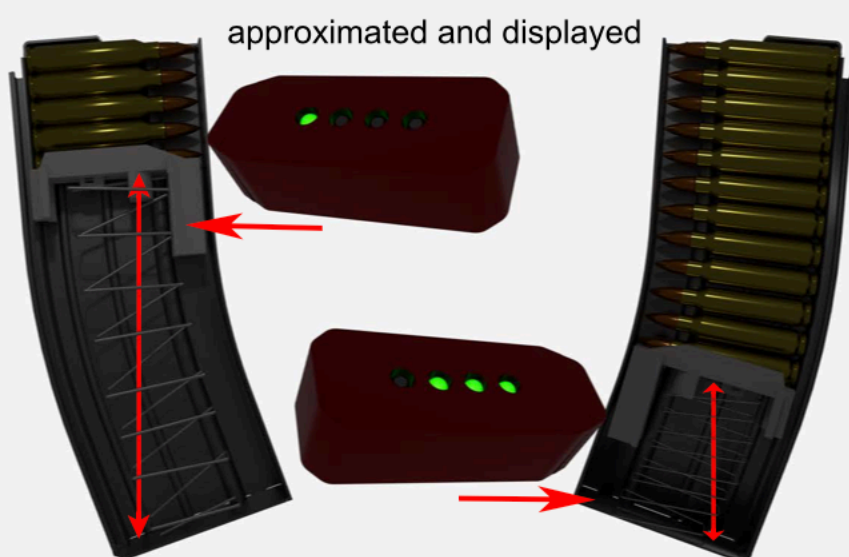
Objective

Develop a method to track and display the amount of ammunition remaining in spare magazines

- LED indicator on the bottom of the magazine, making the display visible when placed in a magazine pouch
- Low cost design
- Compatible with industry standard MAGPUL PMAGs
- Simple and easy installation by end user

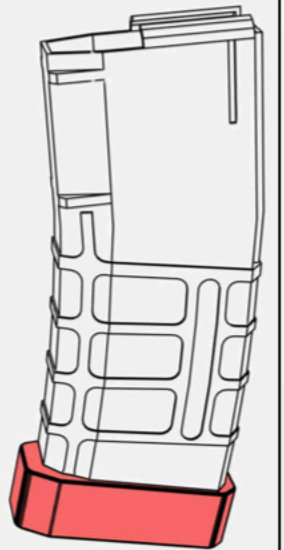
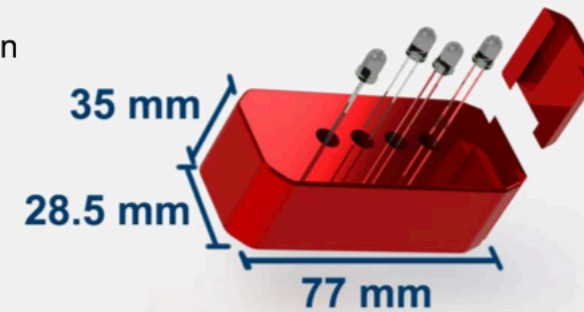
How it Works


By measuring the distance from the bottom of the magazine to the follower, the number of cartridges can be



The Device

- Microelectronics unit is housed in an replacement baseplate, easily converts existing MAGPUL PMAGS

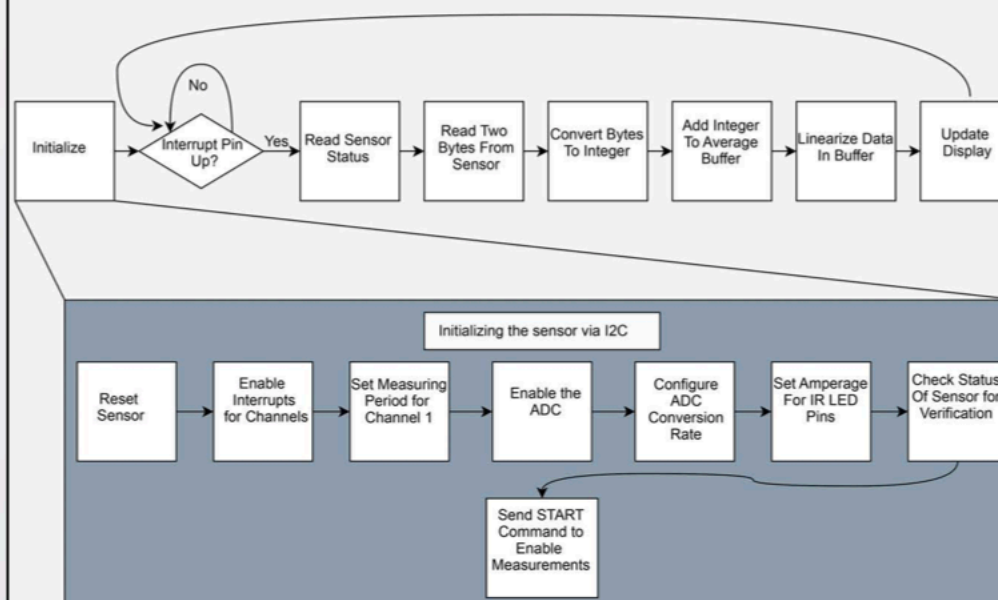


- Distance from the unit to the follower is approximated with a Silicon Labs SI1153 infrared proximity sensor
 - 940 nm light is emitted from an IR LED in the unit, the IR reflectivity of the magazine follower is measured by the SI1153
 - IR sensor and LEDs are controlled by microcontroller, currently an Adafruit Trinket m0, which processes the sensor data and updates the display
 - 4 LEDs are positioned at bottom of the unit, indicating an approximate percentage of the total capacity at a glance
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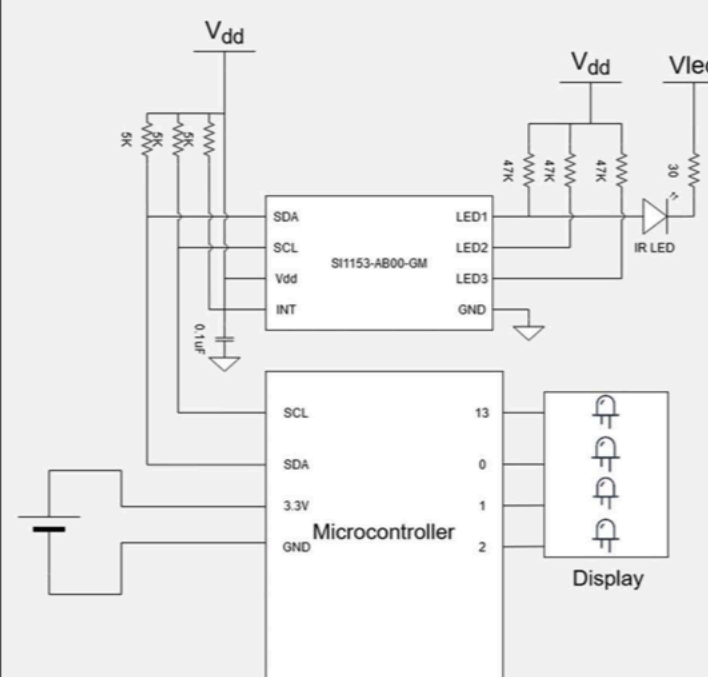
- A USB port is included to charge and program the device. Multiple preset profiles can be loaded to support various magazine capacities and cartridge calibers

Design



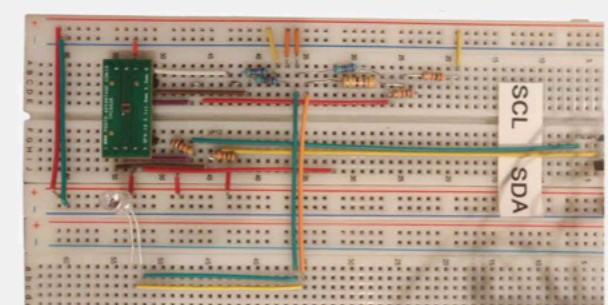
Software

- Stateless** - Robust and fault tolerant
- Simple software loop** - Reliable and battery efficient
- No persistent storage** - Simple and secure
- Smart data collection** - Readings are accurate and stable



Hardware

- USB** - Rechargeable and configurable
- Efficient** - Low power draw and long battery life
- Few parts** - Reduced cost per unit and increased reliability
- I2C serial connection** - Minimal pin use reduces size, power, and cost



Acknowledgments

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