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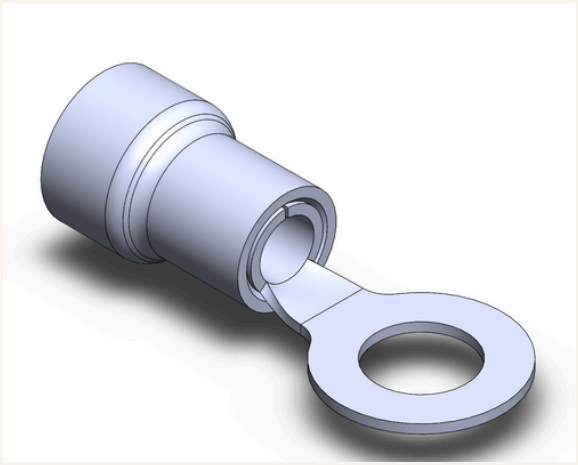
Thermal Cutoff Electronic - Bourns Inc.



Objective

- Developed a device to regulate the **thermal activity** for a **Battery Management System** trailer.
- Engineered to **cutoff electric current flow** when the batteries **exceed 80F**.

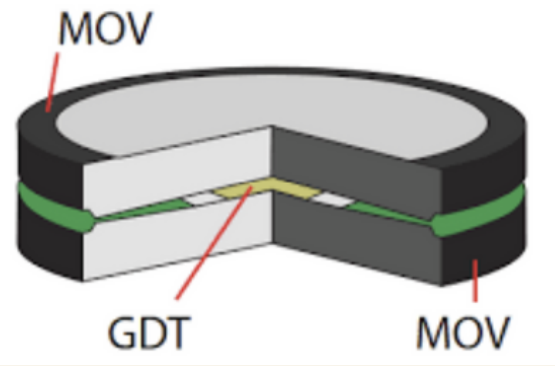
Action

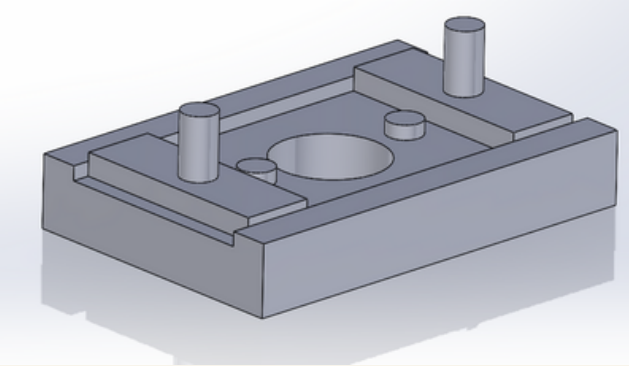
- Assembled the **electric thermal cutoff device** to a **ring connector** in order to connect with battery.
- Used **SolidWorks CAD** to model a **standard ring connector.** Then **soldered** the thermal cutoff to the connector.

Result

- Applied direct heat to the ring connector with a **soldering iron** and a **digital multimeter** to track the **electric current measurement.**
- **Digital multimeter** read **0 amps** from the device after it reached **80F for 3+ trials.**

Surge Protector - Bourns Inc.





Objective

- Conceptualized a method to **mass manufacture** a **surface mounted** version of a **electronic surge protector**.
- Integrating the different components (**PCBs, wires, and surge protector**) of the product along with exterior casing.

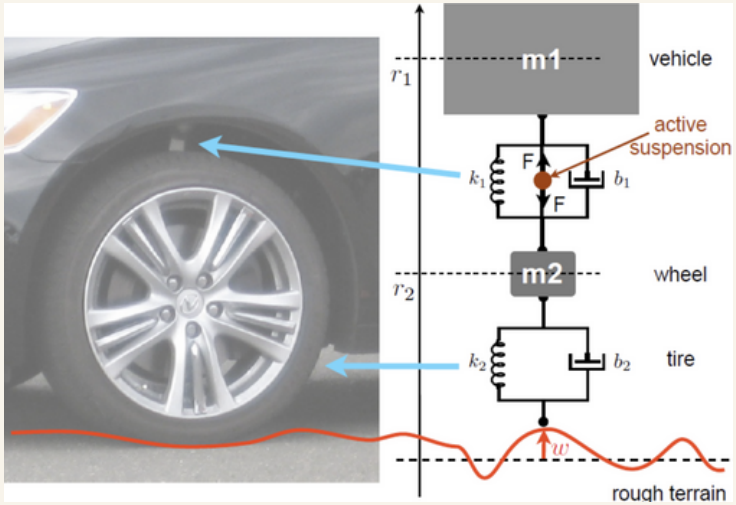
Action

- Used **SolidWorks CAD** to design assembly **fixtures**.
- **Fabricated** fixtures using **SLA 3D printing**. Then thermally cured.
- **Soldered** all components to the PCB. Fixtures were used to thermally cure **5 models** through a **soldering oven**.

Result

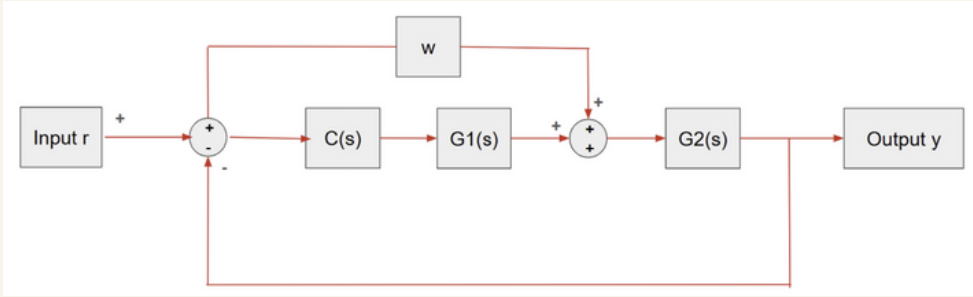
- Encased in an **epoxy exterior.**
- Finished **15 models** of a **5 mm version and 10 mm** version.
- Trial products were sent off to another facility for **shock testing.**

Car Suspension Simulation Project - Feedback Control

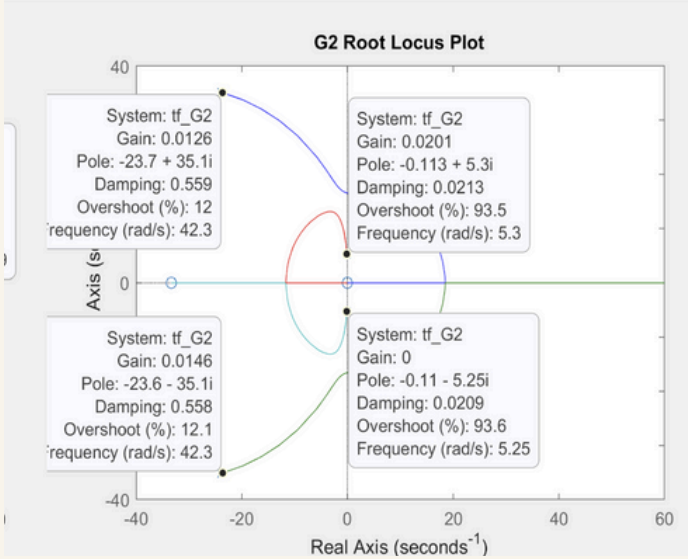


- Analyzing the forces applied to a car and wheel in this active suspension scheme.
- The concepts of feedback control are used to analyze this linear system using MATLAB.

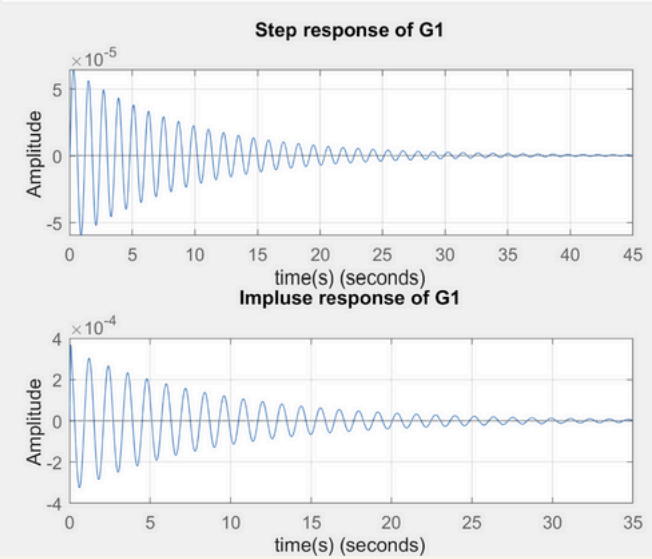
- vehicle mass = G1(s) and wheel mass = G2(s)



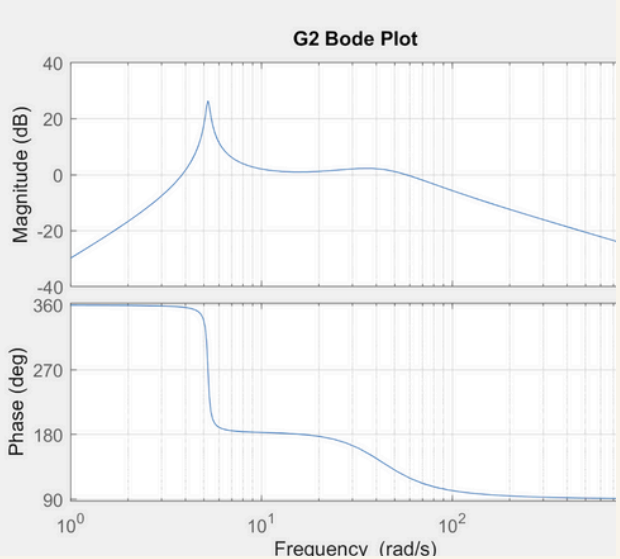
Control Block Diagram



Root Locus Plot

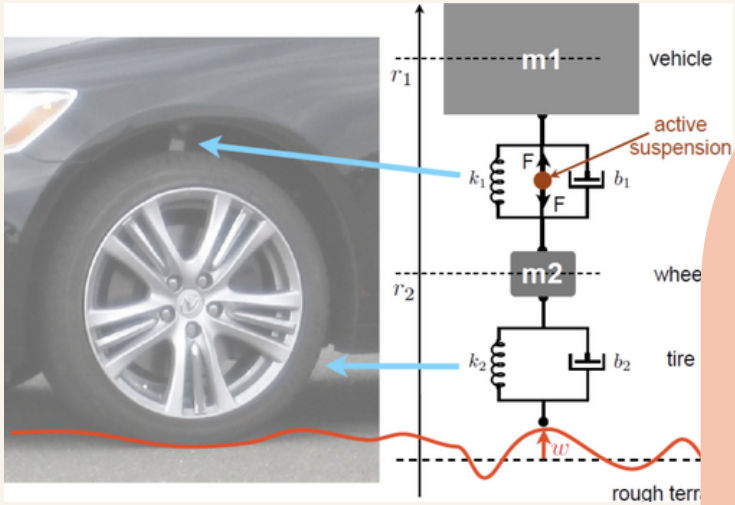


Step and Impulse Response



Bode Plot

Car Suspension Simulation Project - Feedback Control

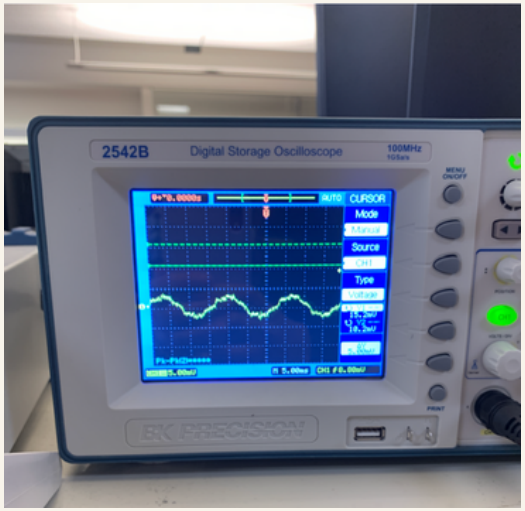


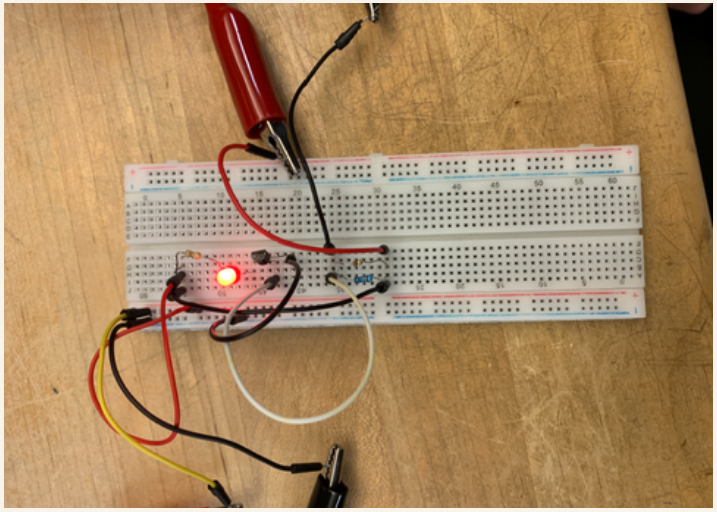
- vehicle mass = G1(s) and wheel mass = G2(s)

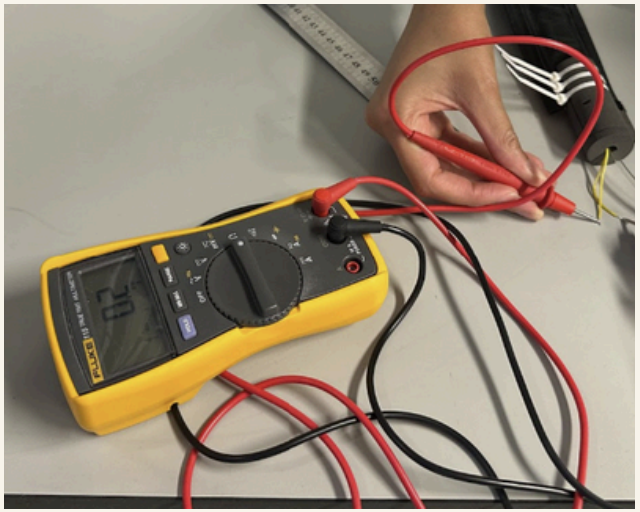
MATLAB Script:

```
clear all;
clc;
% define numerical values given from chart
m1= 2500;
m2= 320;
k1= 80000;
k2= 500000;
b1= 350;
b2= 15000;
% need to define the denominator delta s for
both G(s)1 and G(s)2
delta_s= [(m1*m2), (m1*b1+m1*b2+b1*m2),
(m1*k1+m1*k2+b1*b2+k1*m2), (b1*k2 + k1*b2),
k1*k2];
%numerators/coeffs -(m1+m2)s^2 - b2s - k2
num_G1 = [(-m1+m2), -b2, -k2]; %
num_G2 = [(-m1*b2), (-m1*k2), 0, 0]; %-
m1b2s^3 - m1k2s^2
%transfer func
tf_G1 = tf(num_G1, delta_s);
tf_G2 = tf(num_G2, delta_s);
%% G1 plots
%G1 Step
subplot (2, 1, 1); %step response
step(tf_G1);
title('Step response of G1');
grid on;
xlabel('time(s)');
ylabel('Amplitude');
xlim([0 10]);
subplot(2, 1, 2) % impulse response
impulse(tf_G1);
title('Impluse response of G1');
grid on;
xlabel('time(s)');
ylabel('Amplitude');
xlim([0 10]);
%% G2 plots
%G2 Step
subplot (2, 1, 1); %step response
step(tf_G2);
title('Step response of G2');
grid on;
xlabel('time(s)');
ylabel('Amplitude');
xlim([0 10]);
subplot(2, 1, 2) % impulse response
impulse(tf_G2);
title('Impluse response of G2');
grid on;
xlabel('time(s)');
ylabel('Amplitude');
xlim([0 10]);
```

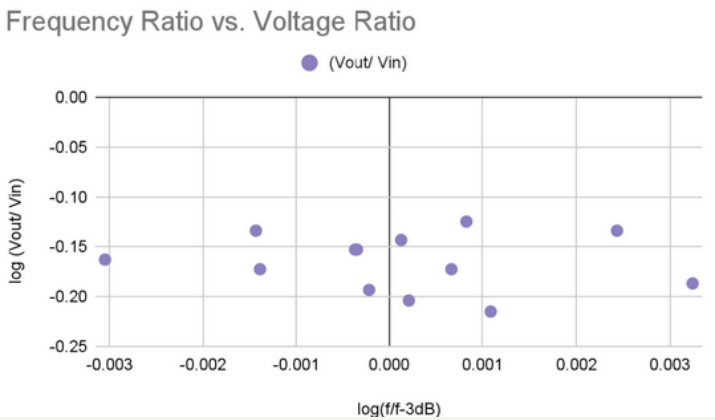
Various Lab Coursework Assignments (Circuits, Digital Multimeters, Oscilloscopes, Power Supplies, etc.)







Resistor/Capacitor Lab



- **Objective -** created a low pass system with a starting parameter of 100 Hz, 5V amp, 10 kOhm resistor, and an unknown capacitor.

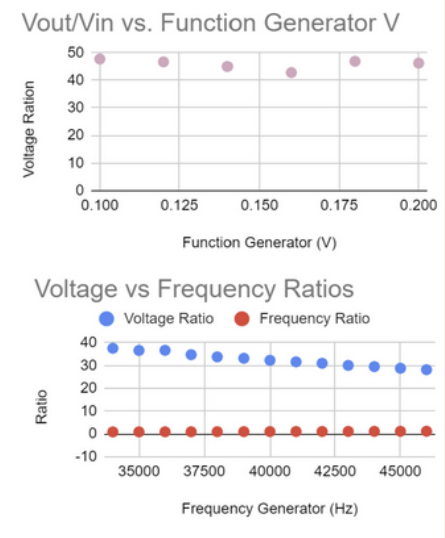
- **Instruments used -** Oscilloscopes, function generator, and Digital Multimeter.

Various Lab Coursework Assignments (Circuits, Digital Multimeters, Oscilloscopes, Power Supplies, etc.)

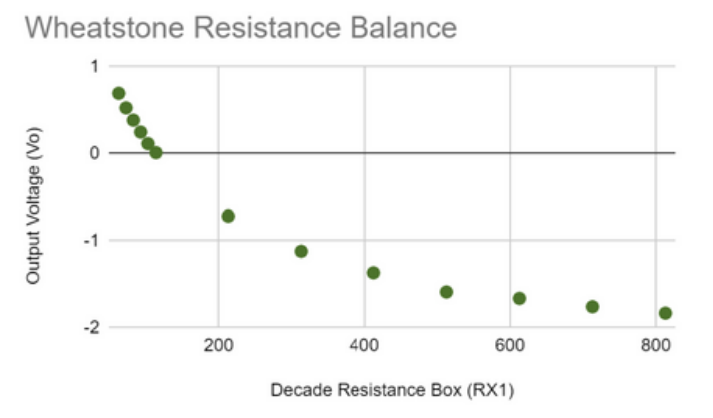
Amplifier Lab

- **Objective -** created a Inverting and Non-Inverting Amplifier circuit system with 200 mVamp and 100 Hz.

- **Instruments used -** Operational Amplifier, Oscilloscopes, Function Generator, and Digital Multimeter.



Wheatstone Bridge Lab



- **Objective -** created a Wheatstone Bridge Circuit Bridge with 3 120 Ohm resistors and a Decade Resistance Box. Input voltage of 5V.

- **Instruments used -** DC Power Supply, Digital Multimeter, Decade Resistance Box.