Modifying the internal control circuitry of a Harvard Apparatus model 11 syringe pump

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The Syringe pump in clinical and scientific environments

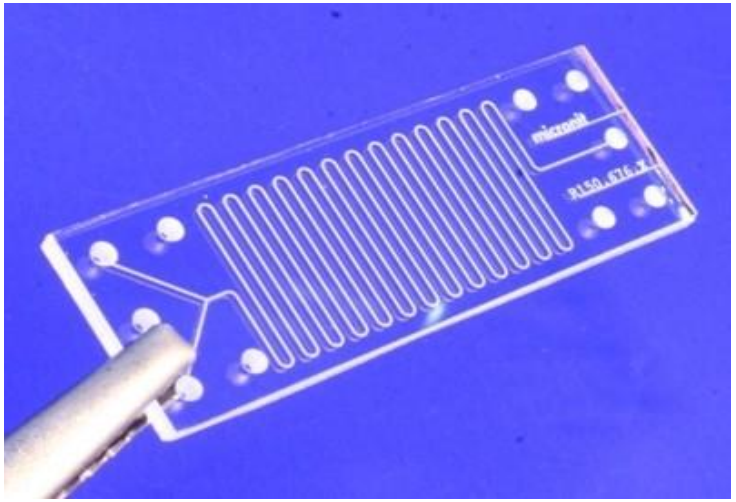
Clinical environments

Scientific environments

Syringe pump in scientific environments

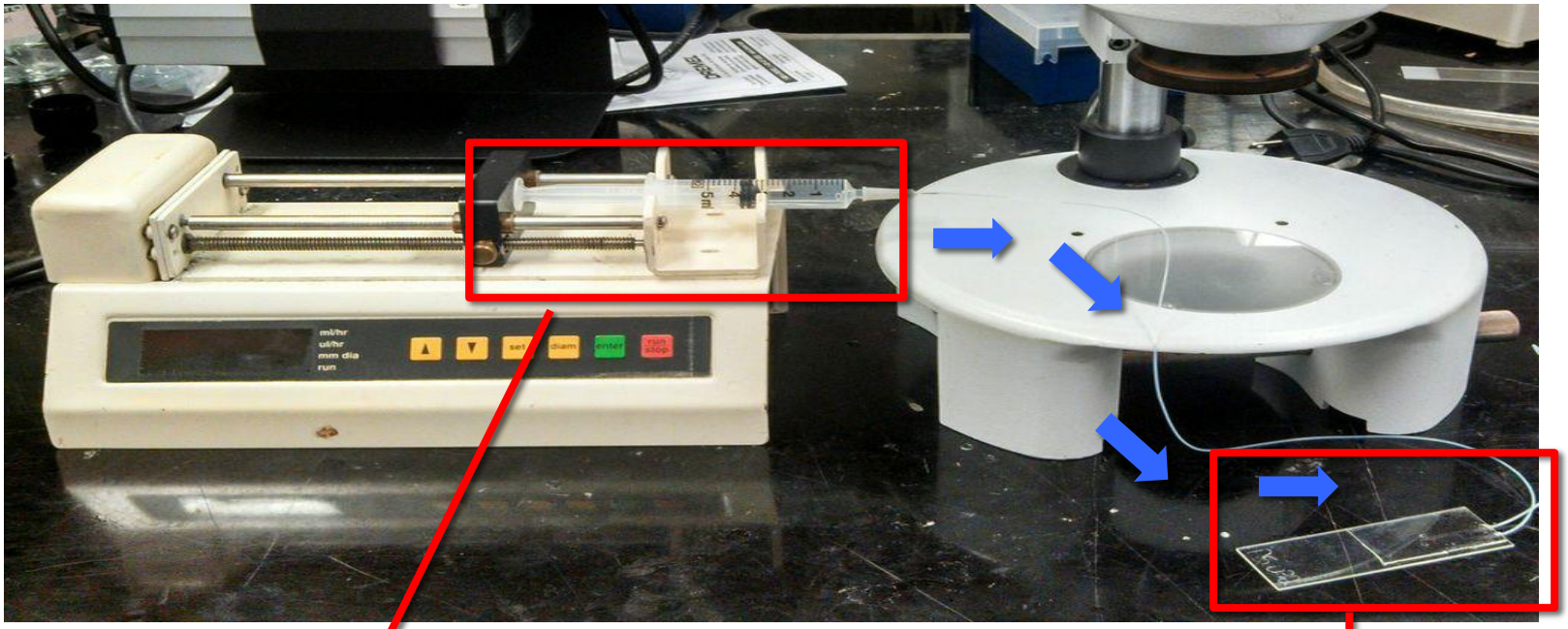
Syringe pump

Microfluidic device



Syringe pumps are used to control the flow of fluids entering a microfluidic device

Using the expelling of fluid capability

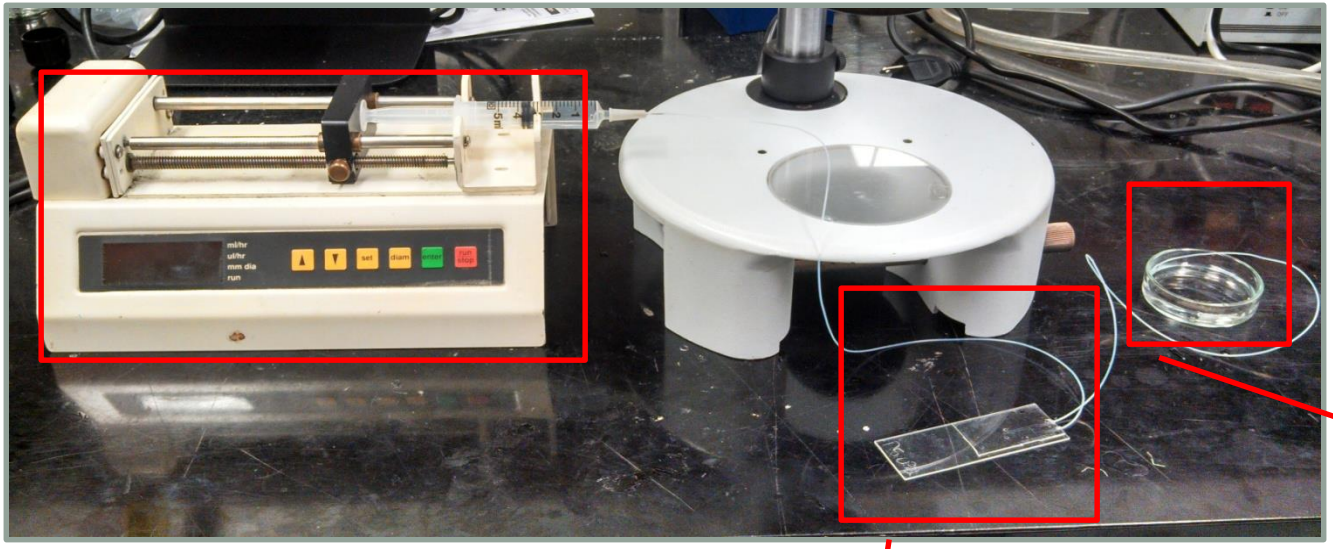


Syringe holding water

Water pressure can cause the microfluidic device to break

Microfluidic device channels 250 um

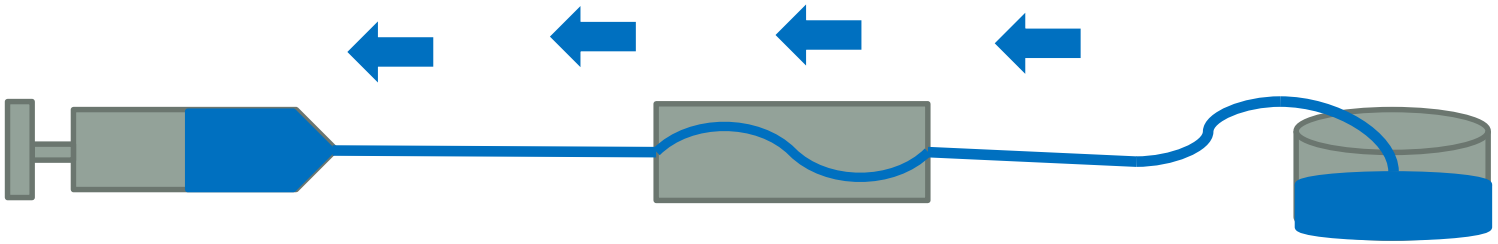
Using the withdrawing of fluid capability



Dish containing fluid

Syringe Pump

Microfluidic device



syringe

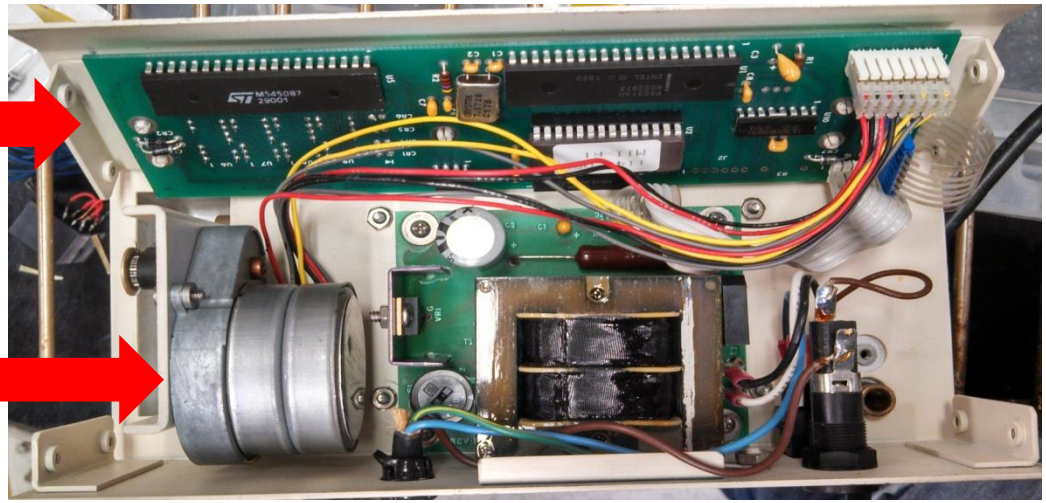
Microfluidic device

Dish containing fluid

Modifying the Internal Control Circuitry

Internal Control Circuit

Motor



Now

Motor rotates clockwise which allows for the expelling of water

After Modifications

Motor will rotate in both directions allowing for the expelling and withdrawing of water

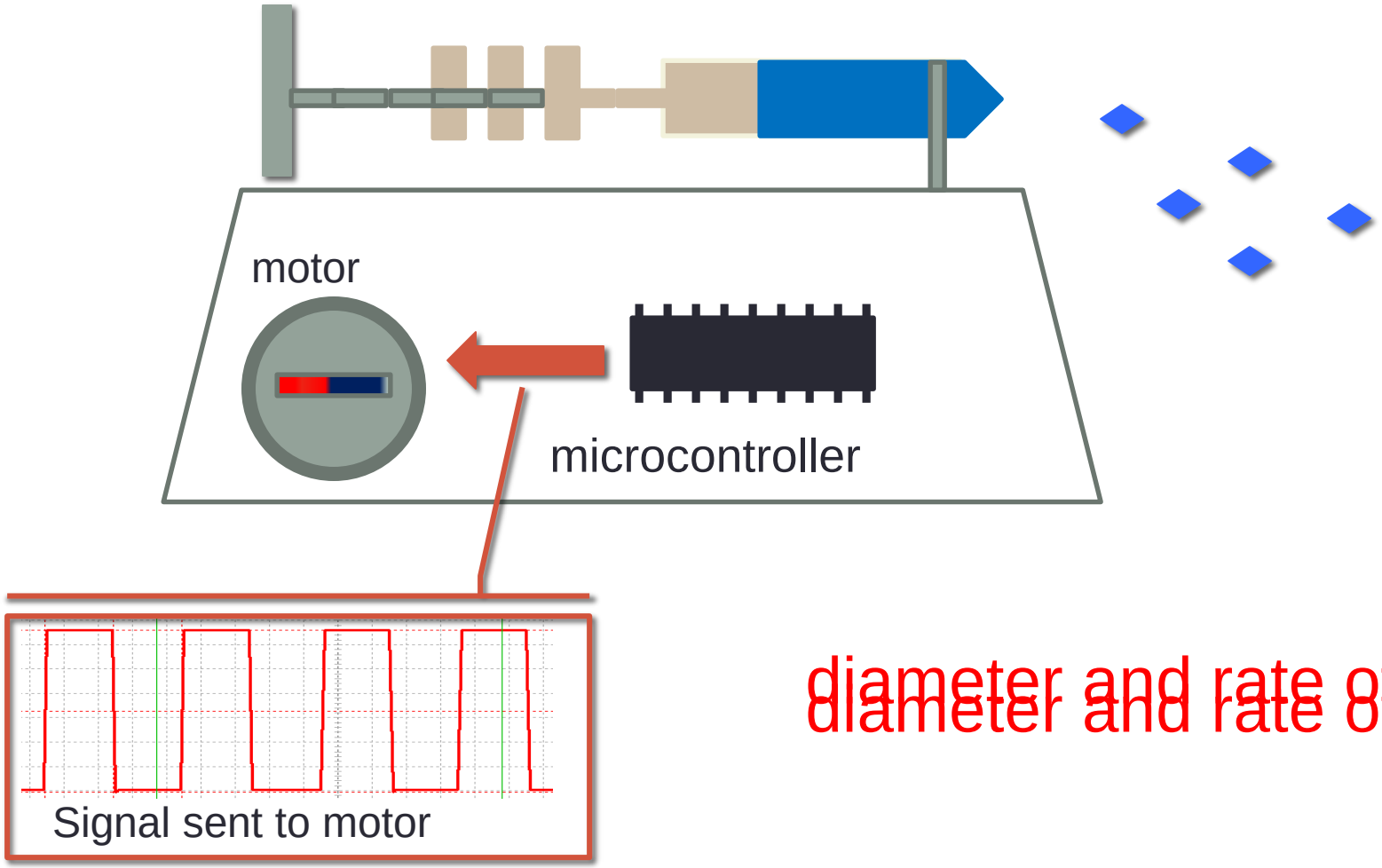
Understanding existing system mechanically

Required to select the diameter of syringe and rate to expel fluid

Syringe pump

Two inputs to activate syringe pump

Understanding existing system electrically

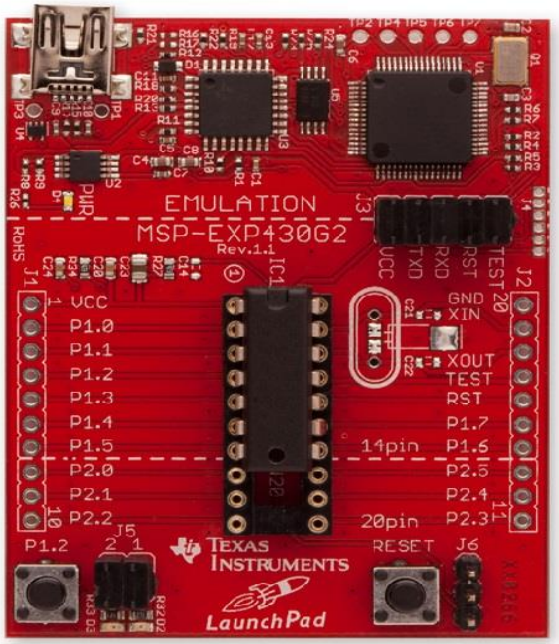


diameter and rate of flow
diameter and rate of flow

Modifying the system

Old microcontroller and memory chip

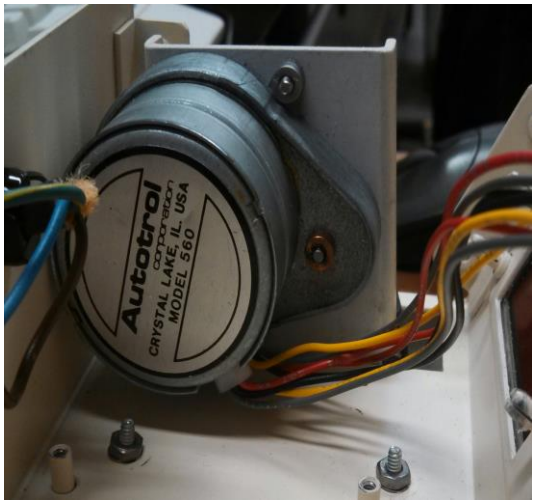
MSP430 Microcontroller
- Cheaper
- Built in programmable memory



programming microcontroller

Energīa

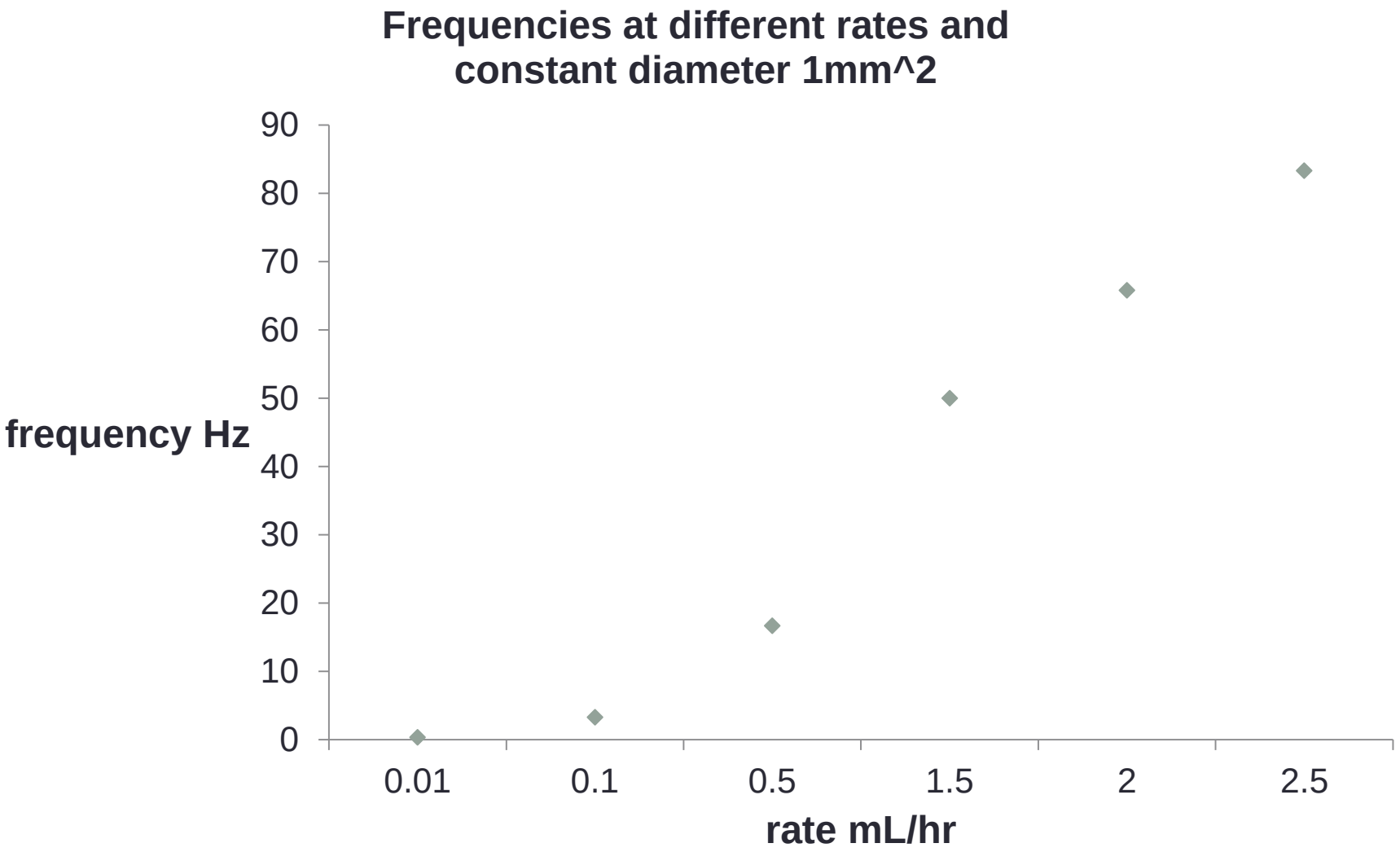
Write program for microcontroller to be able to spin motor in both direction



Ability to add NEW features!

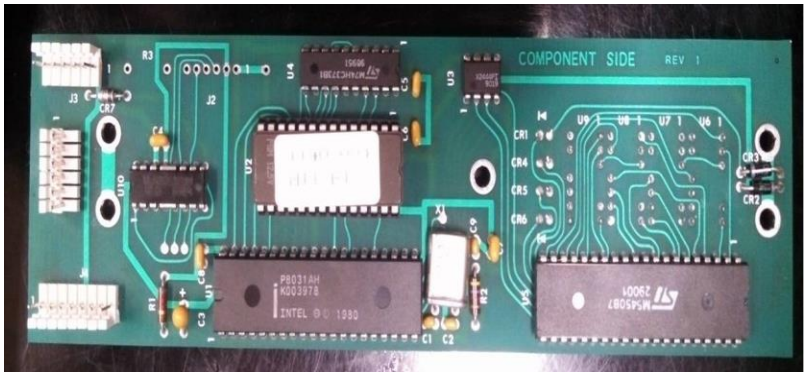
- Computer control syringe pump

Dataset before modifications



Our progress with the system

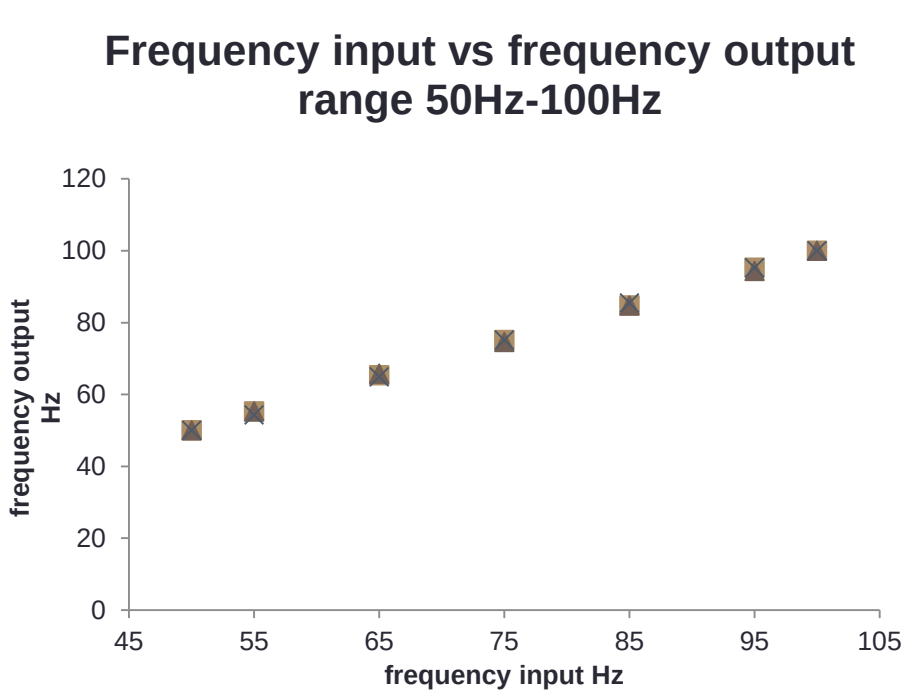
- Identified all components in circuit
- Documented connections

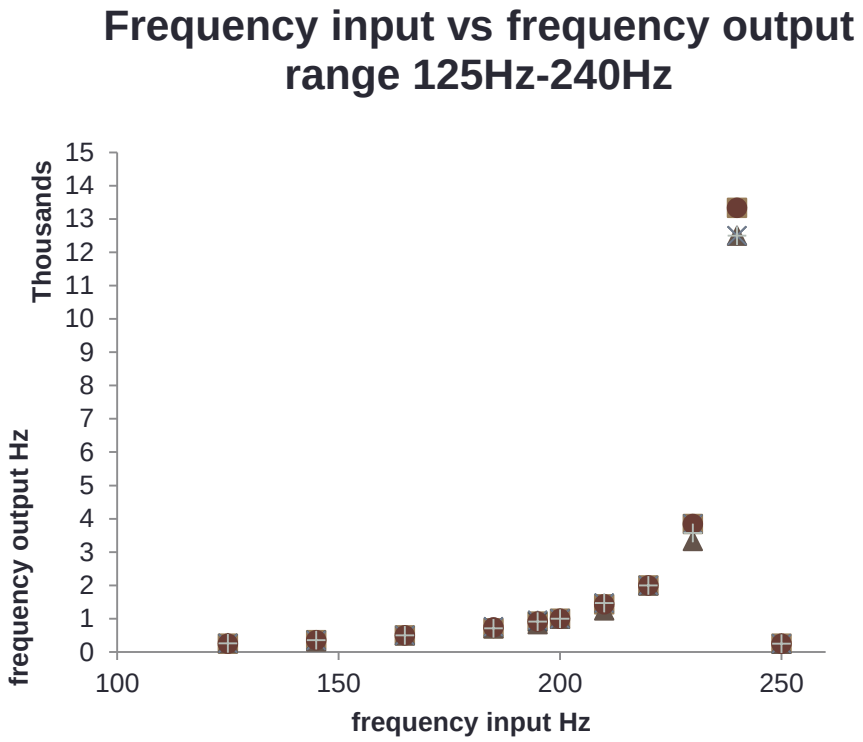


Program in process

- Function calculates frequency
  -based on diameter of the syringe and rate of flow
- Made changes to function generates signal at this frequency
  - faced problems with commands

Problem faced using signal generating function



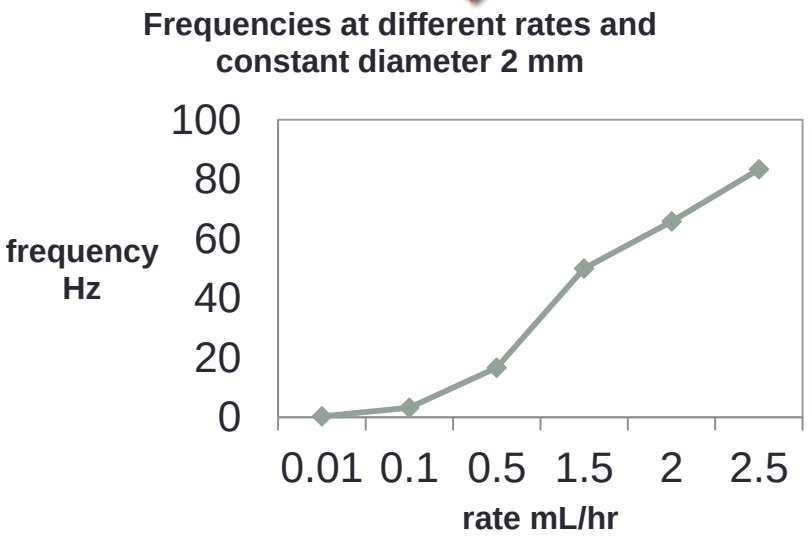


function failed to generate signals between 125hz-240hz frequency range

Future work

Implement code that will start and stop program

Test Modified Circuit



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