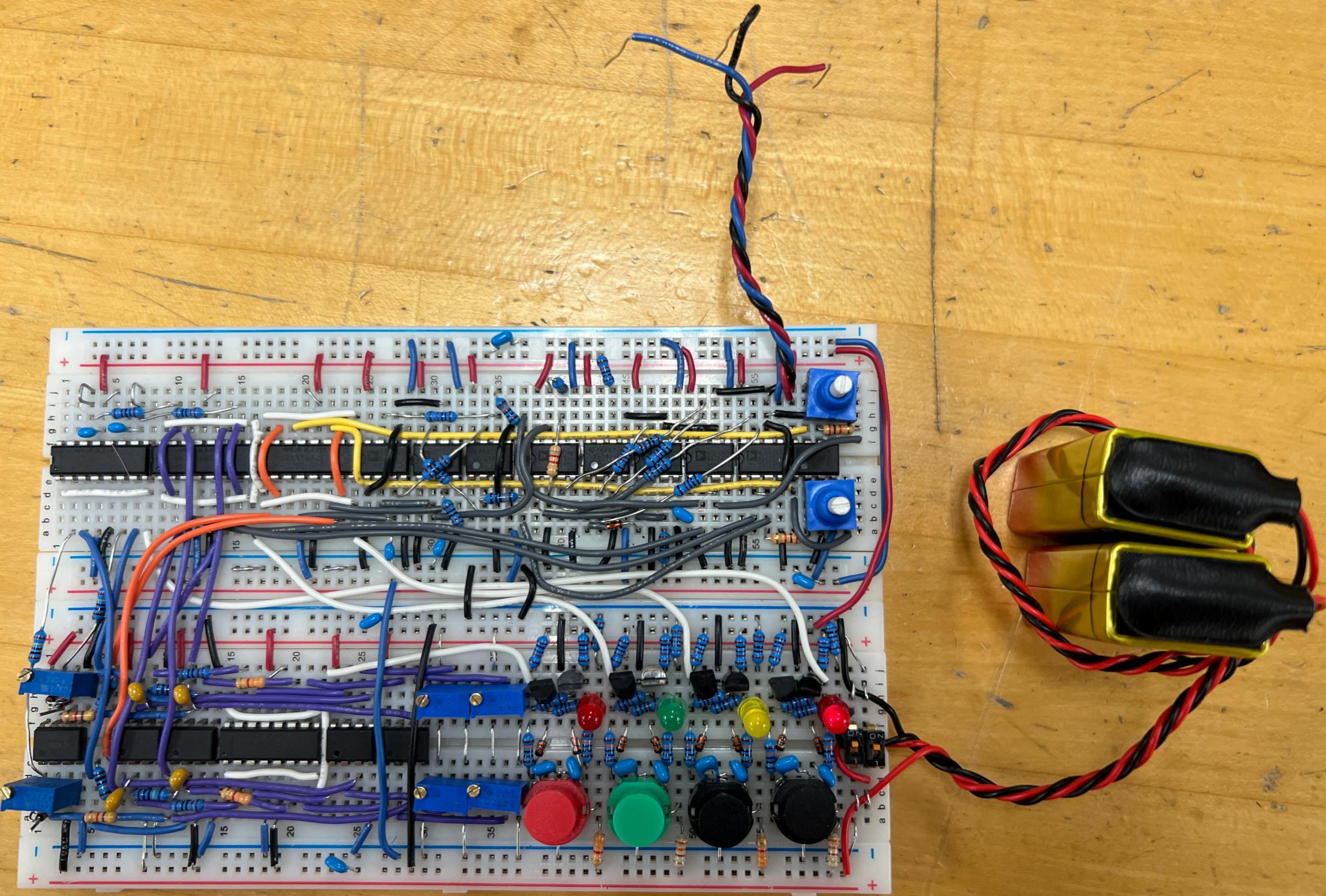


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**Hooke's Law + Inverse Square**

# FORCE SIMULATION

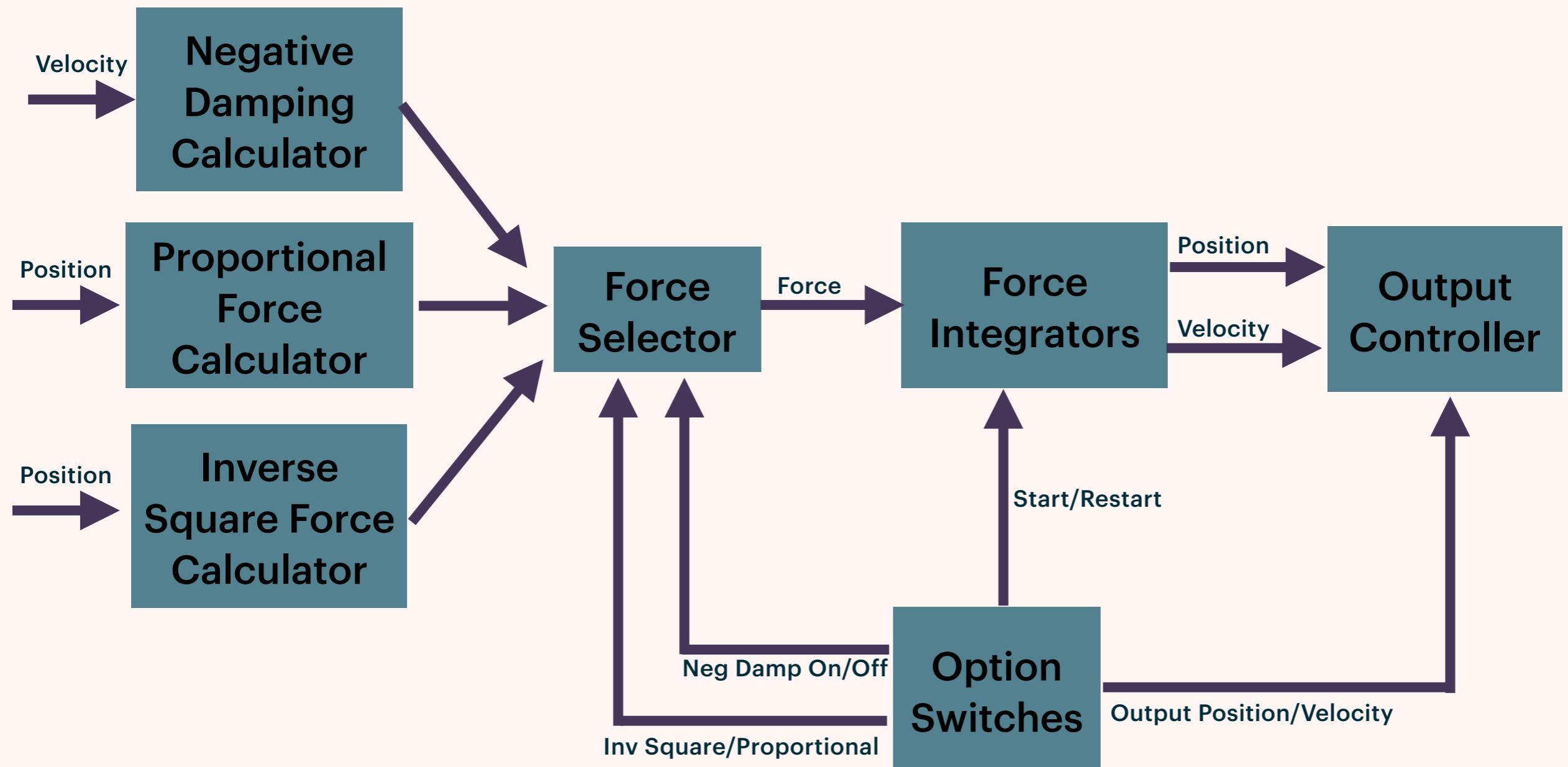


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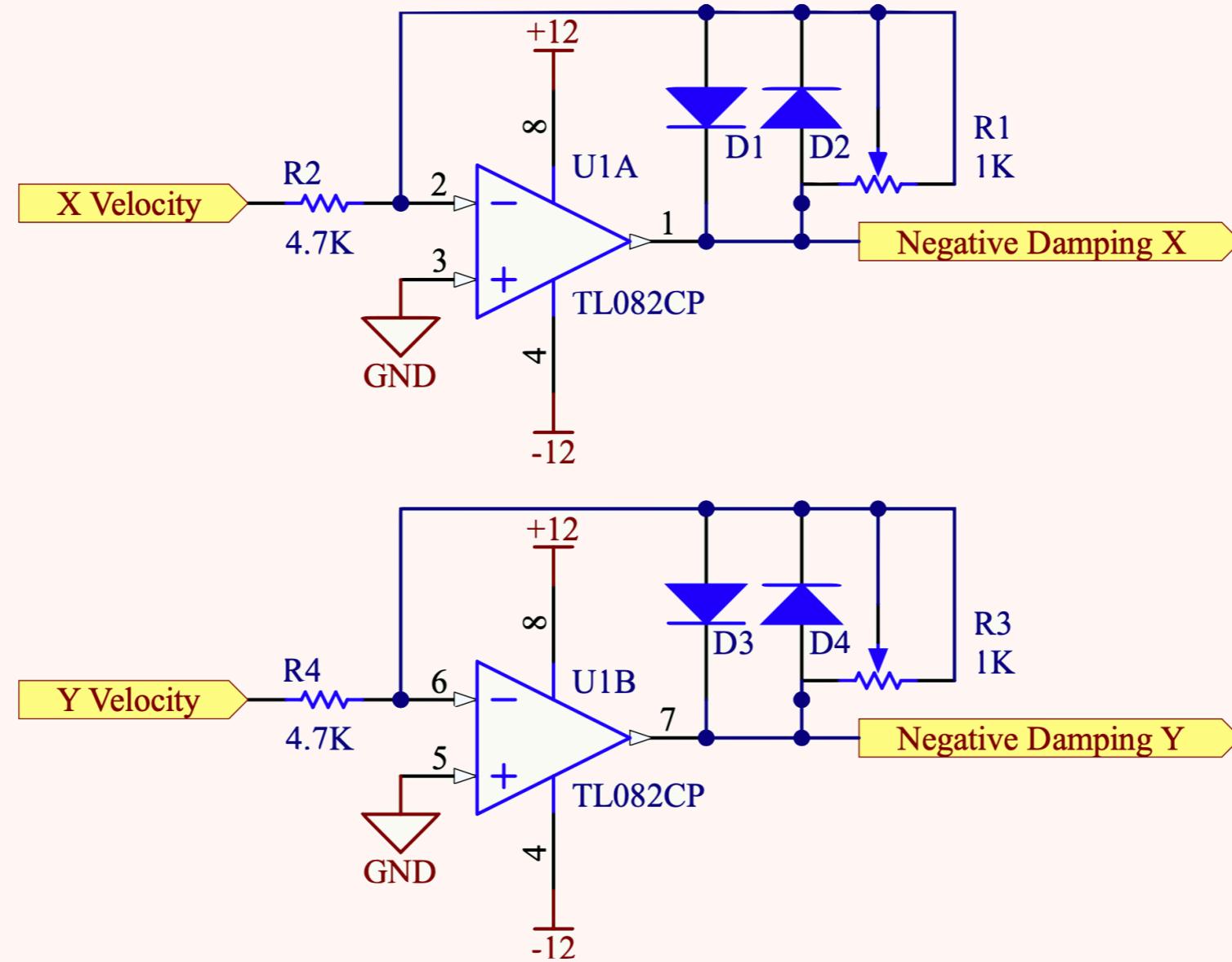
# CIRCUIT SPECS

- **Simulate a body's motion under a position dependent force using analog circuitry**
  - **Output a pair of voltages that can be switched between representing the body's current X&Y position or velocity**
  - **Be able to reset the simulation to an initial position / velocity anywhere in the simulation space**
  - **Be able to turn on/off a negative damping force to compensate for the drag due to the circuits imperfections and attain perpetual oscillation under the proportional restoring force**
  - **Be able to switch between an inverse-square force and a proportional restoring force with individually adjustable X&Y constants**
-

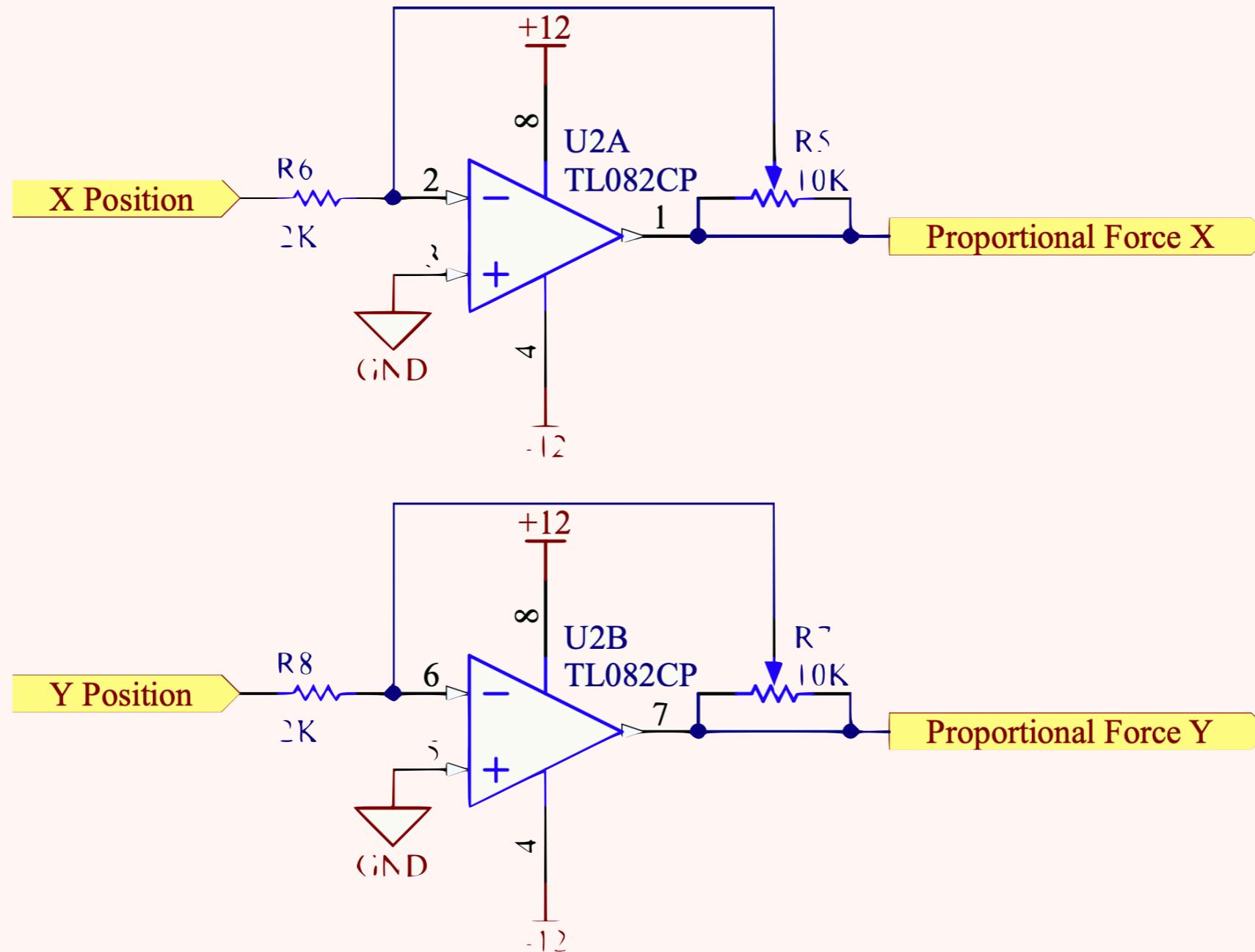
# BLOCK DIAGRAM



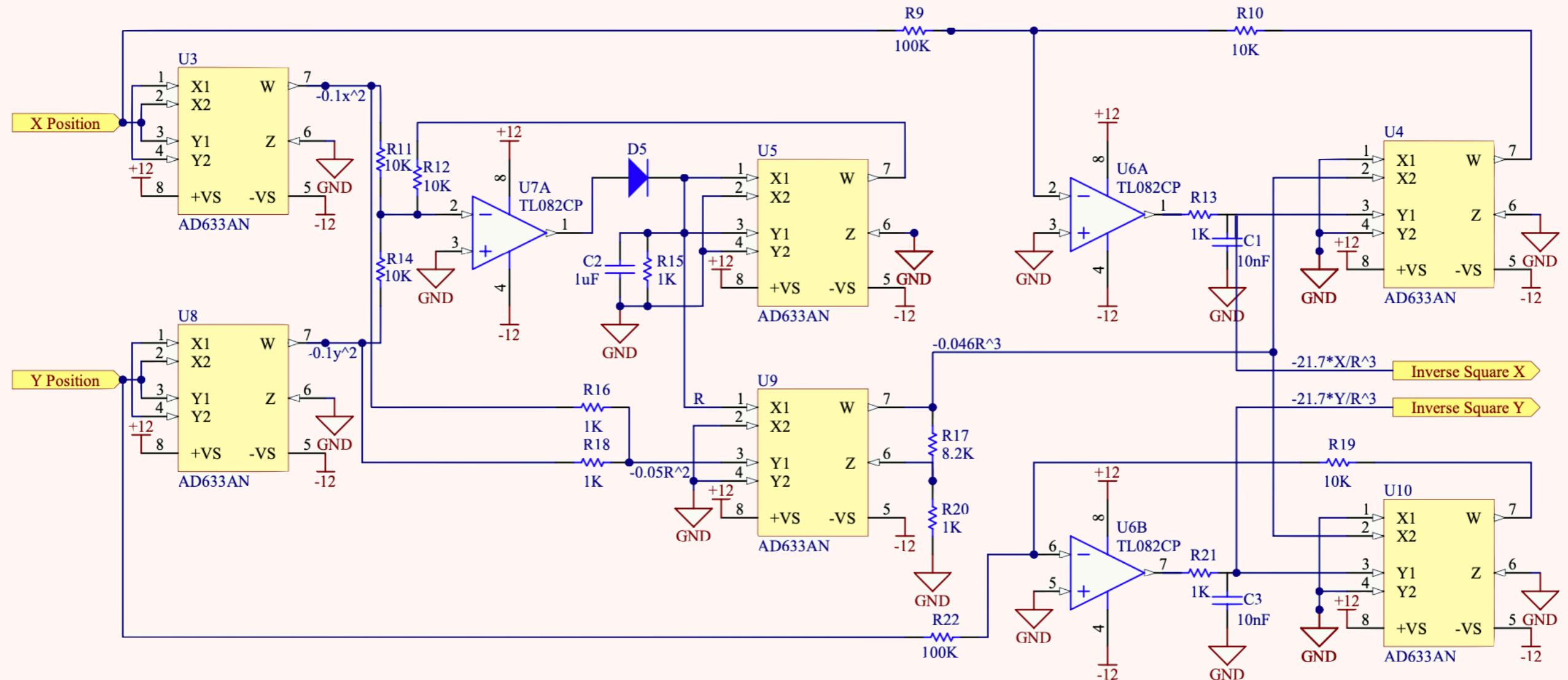
# NEGATIVE DAMPING



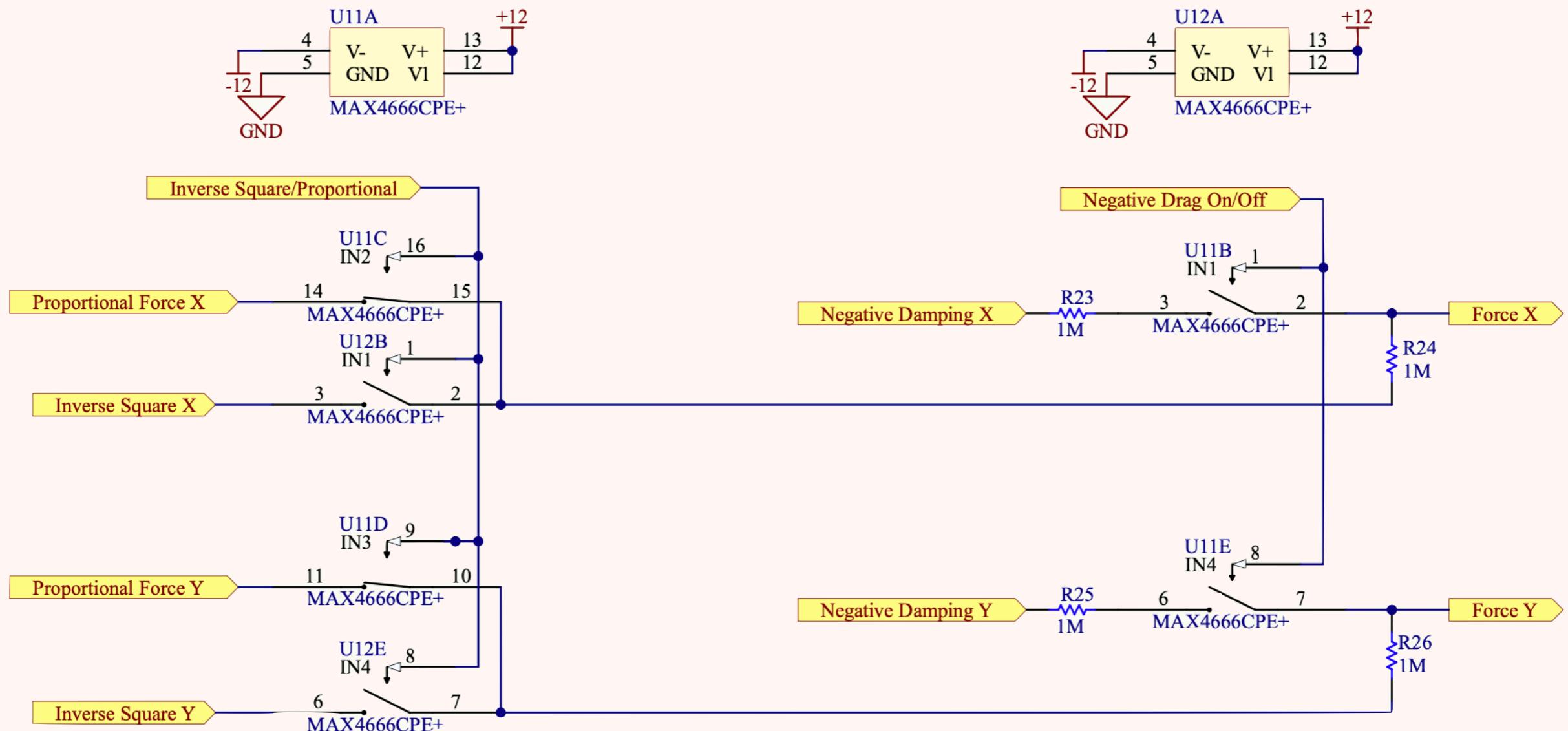
# PROPORTIONAL FORCE



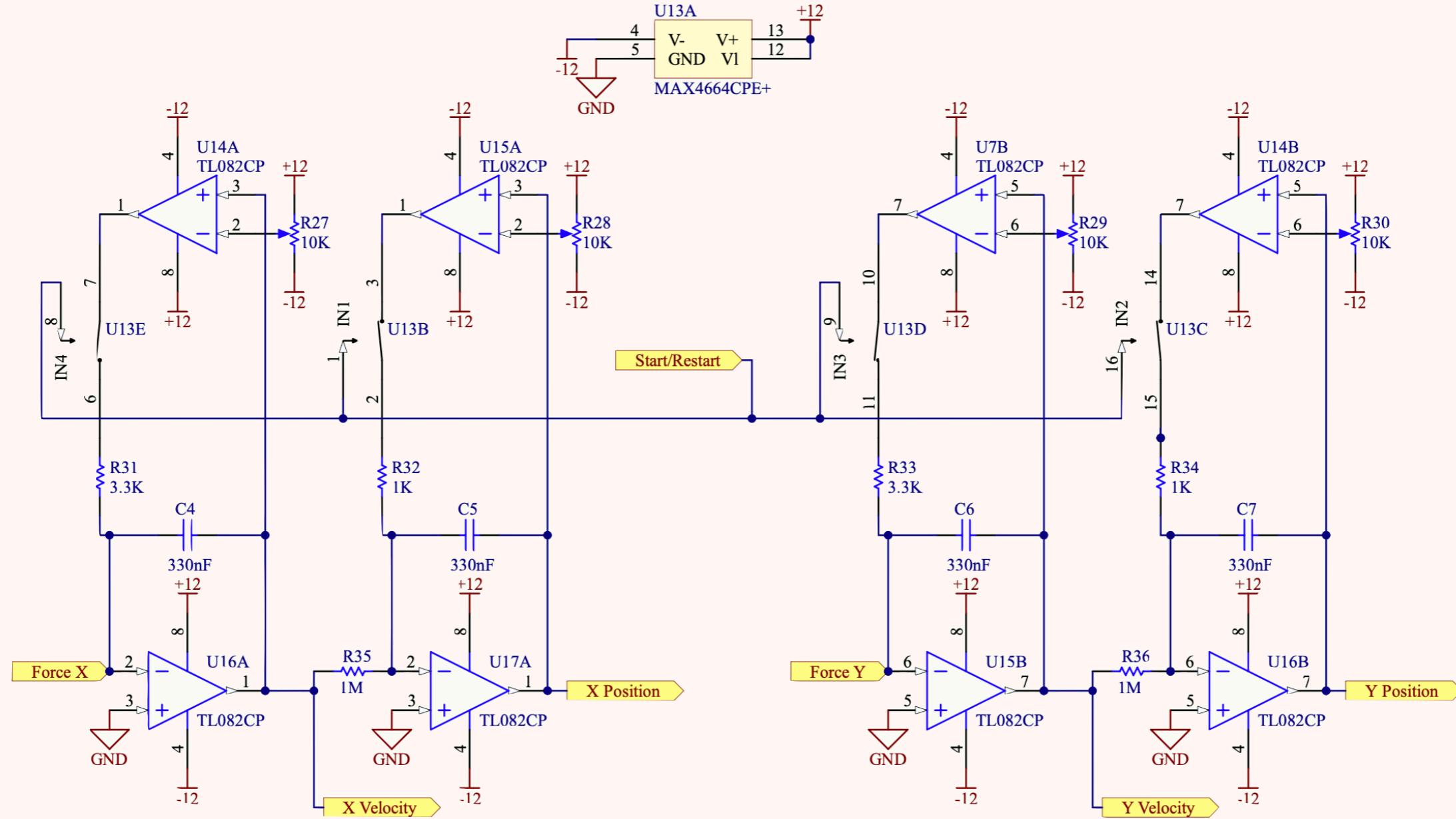
# INVERSE SQUARE



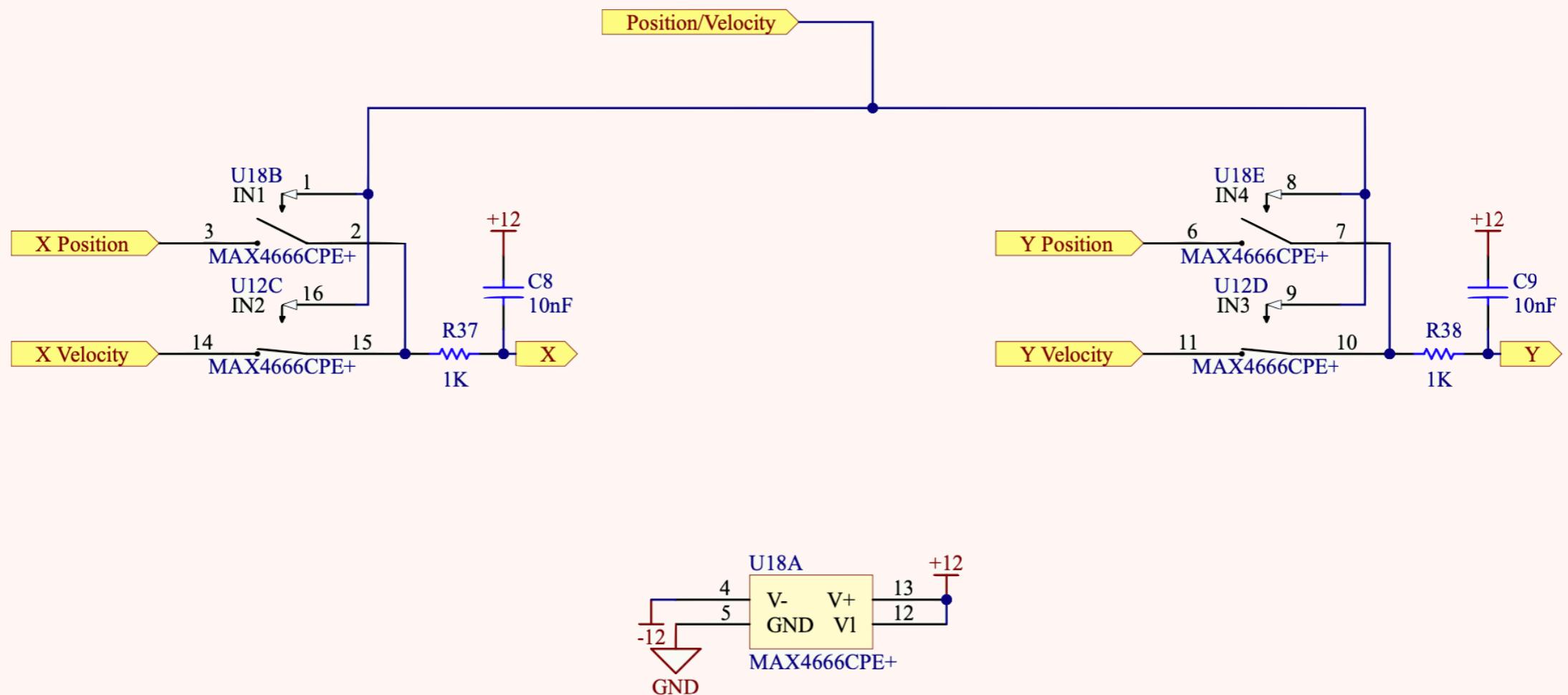
# FORCE SELECTOR



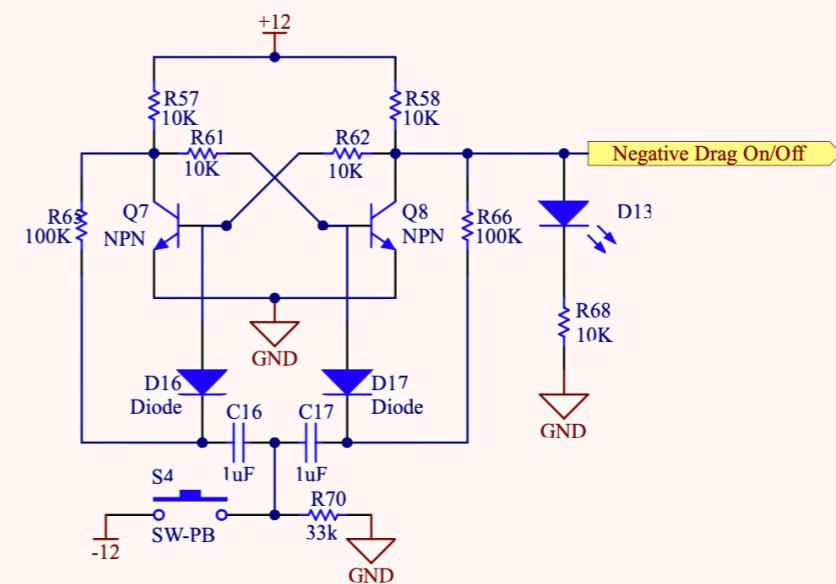
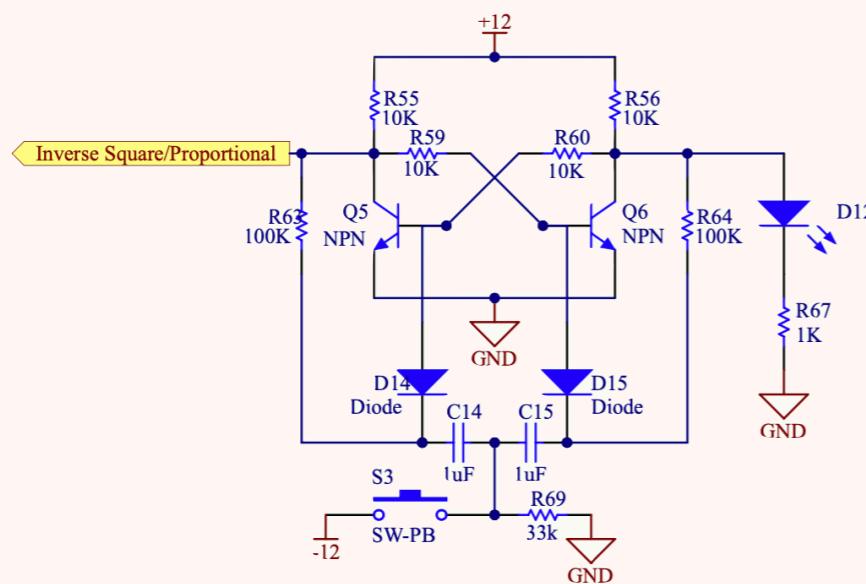
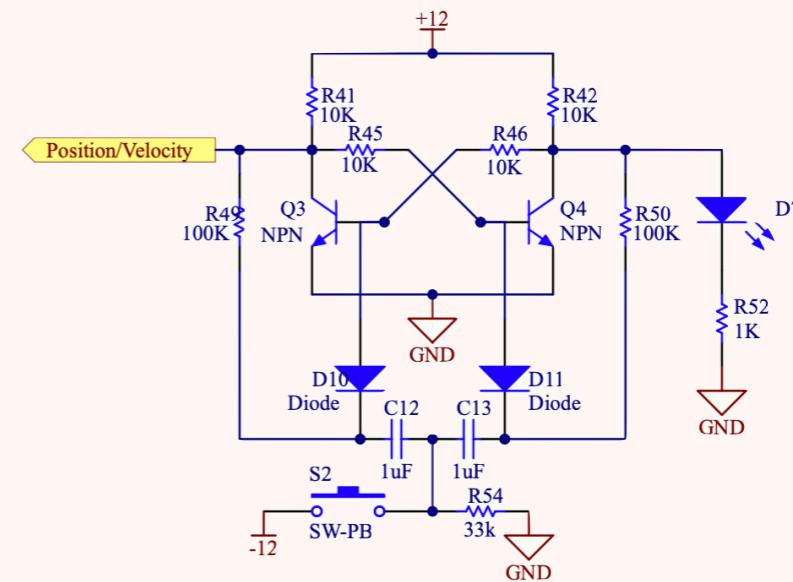
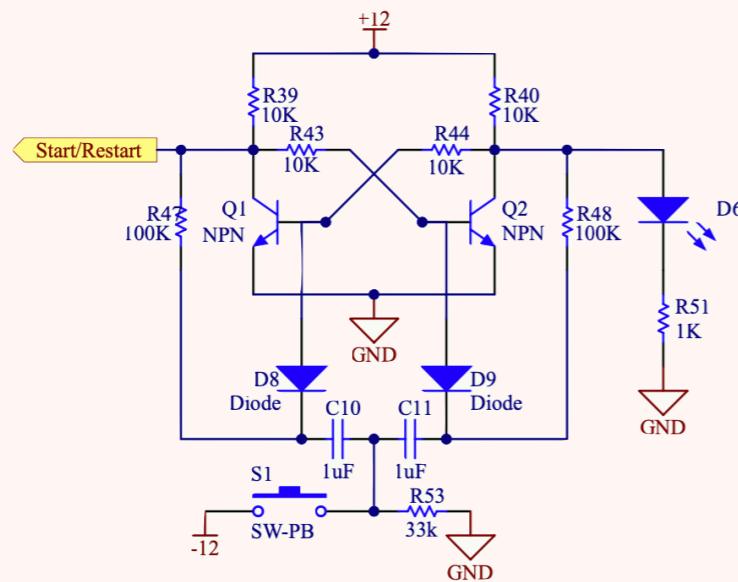
# FORCE INTEGRATORS



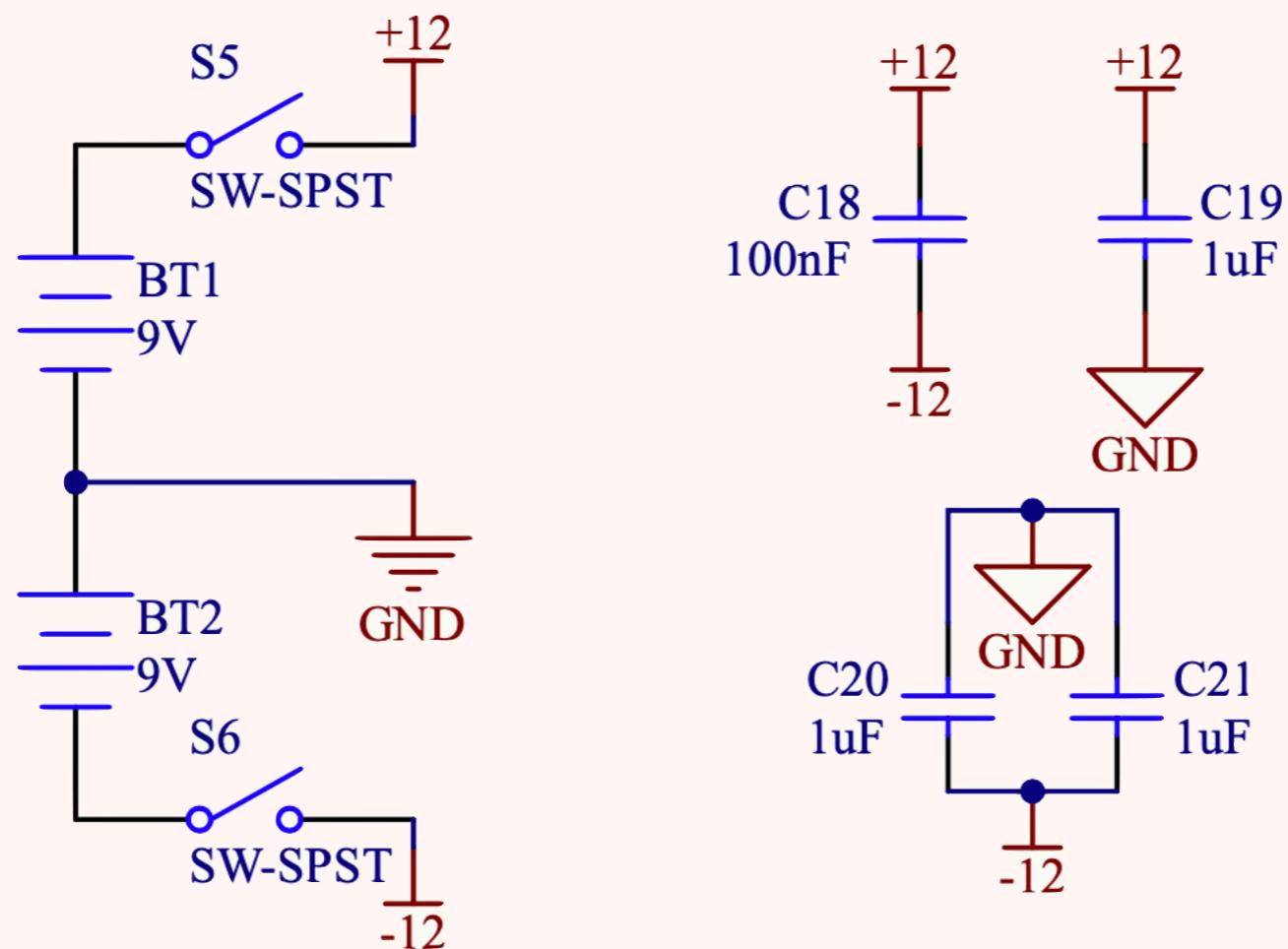
# OUTPUT CONTROLLER



# OPTION BUTTONS

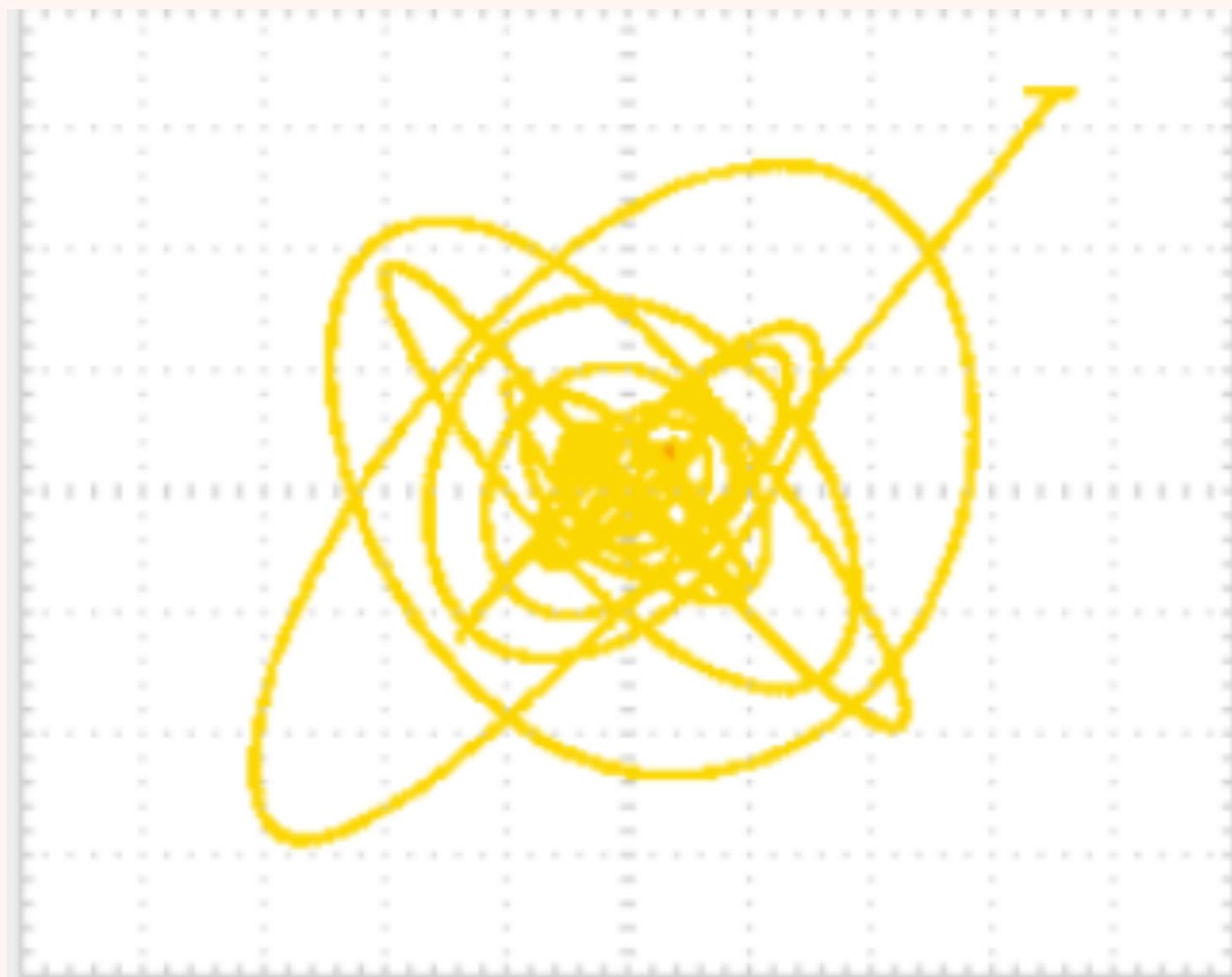


# POWER

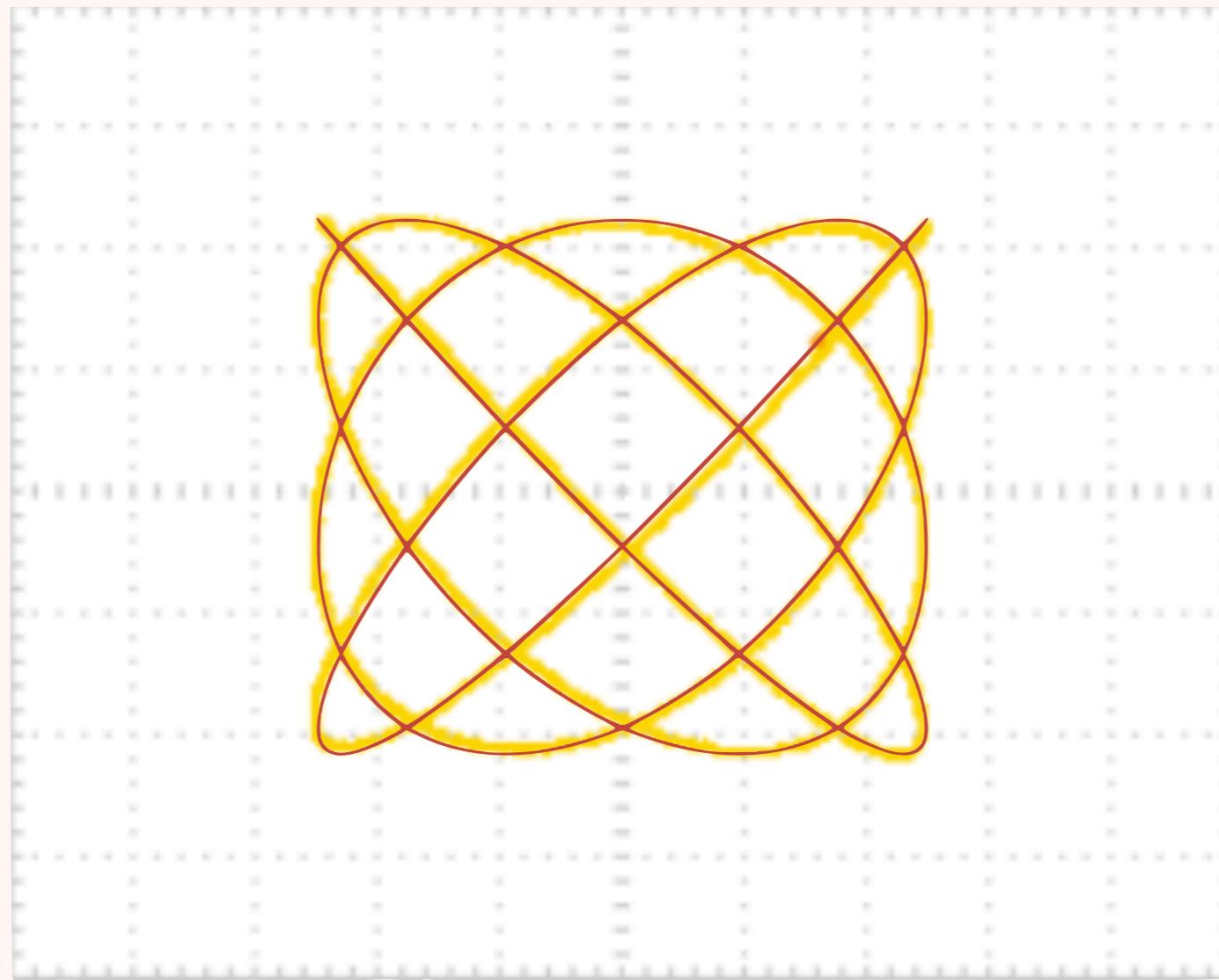


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# HOOKE'S LAW

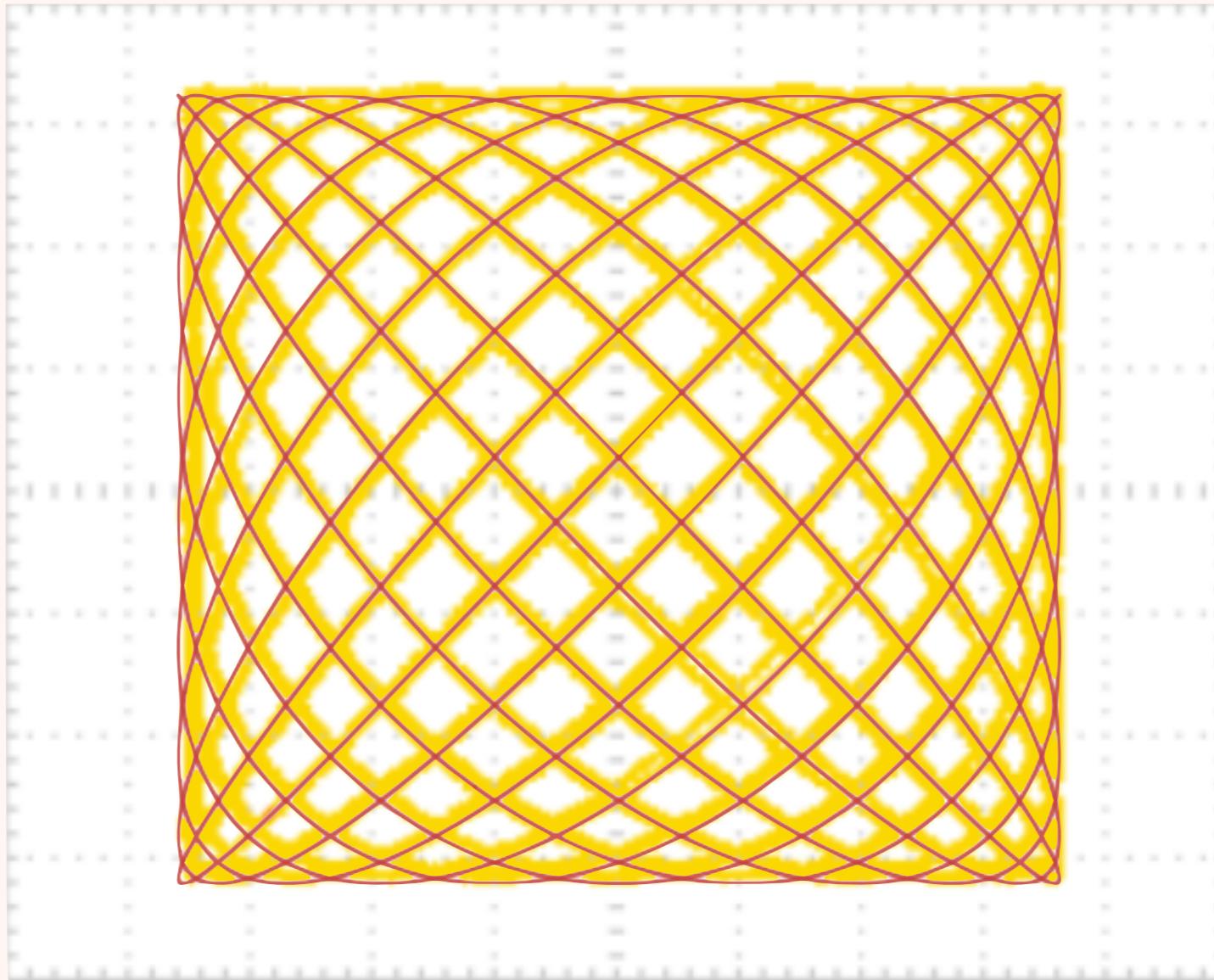


# HOOKE'S LAW + NEGATIVE DAMPING



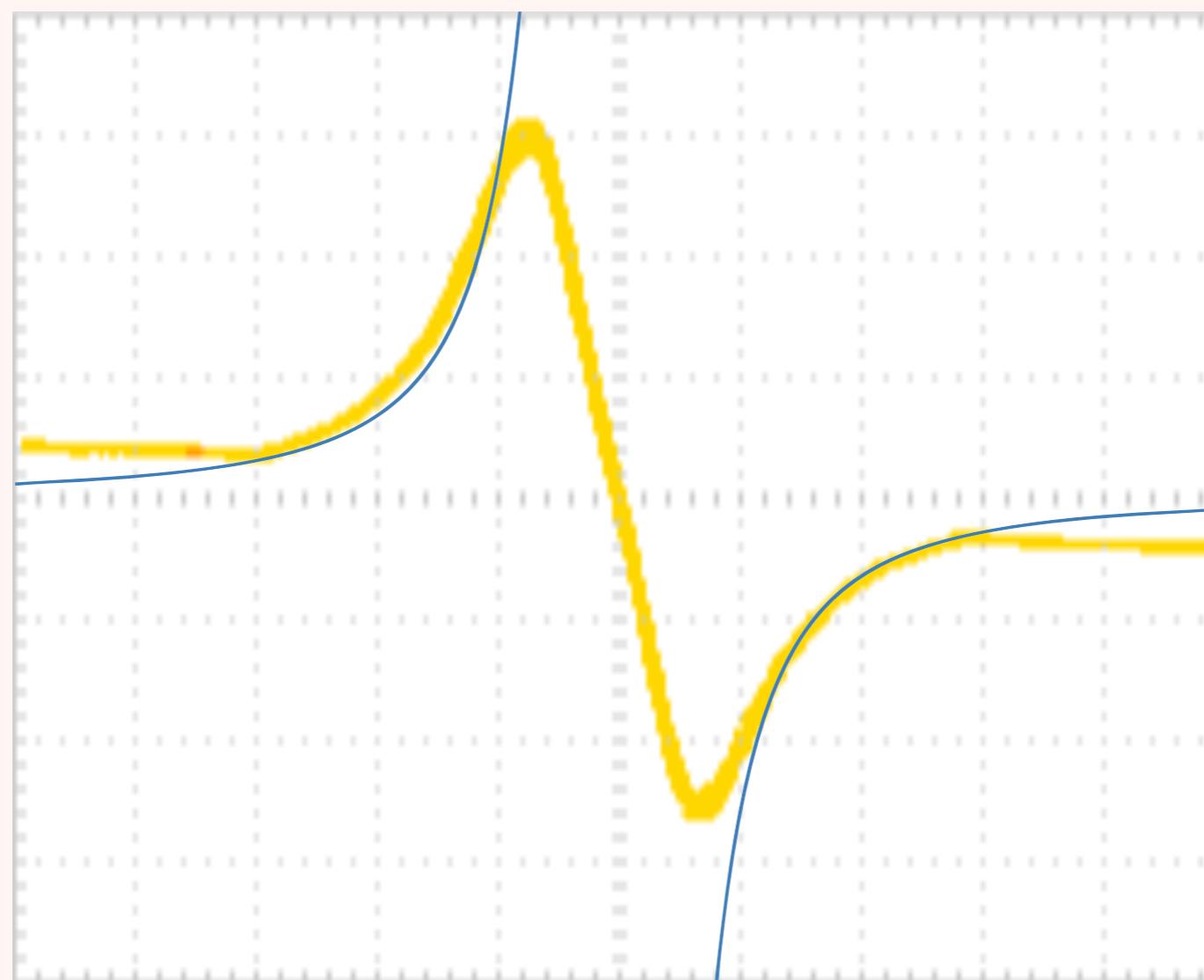
$(\cos(7t), \cos(8t))$

# HOOKE'S LAW + NEGATIVE DAMPING



$(\cos(19t), \cos(22t))$

# INVERSE SQUARE



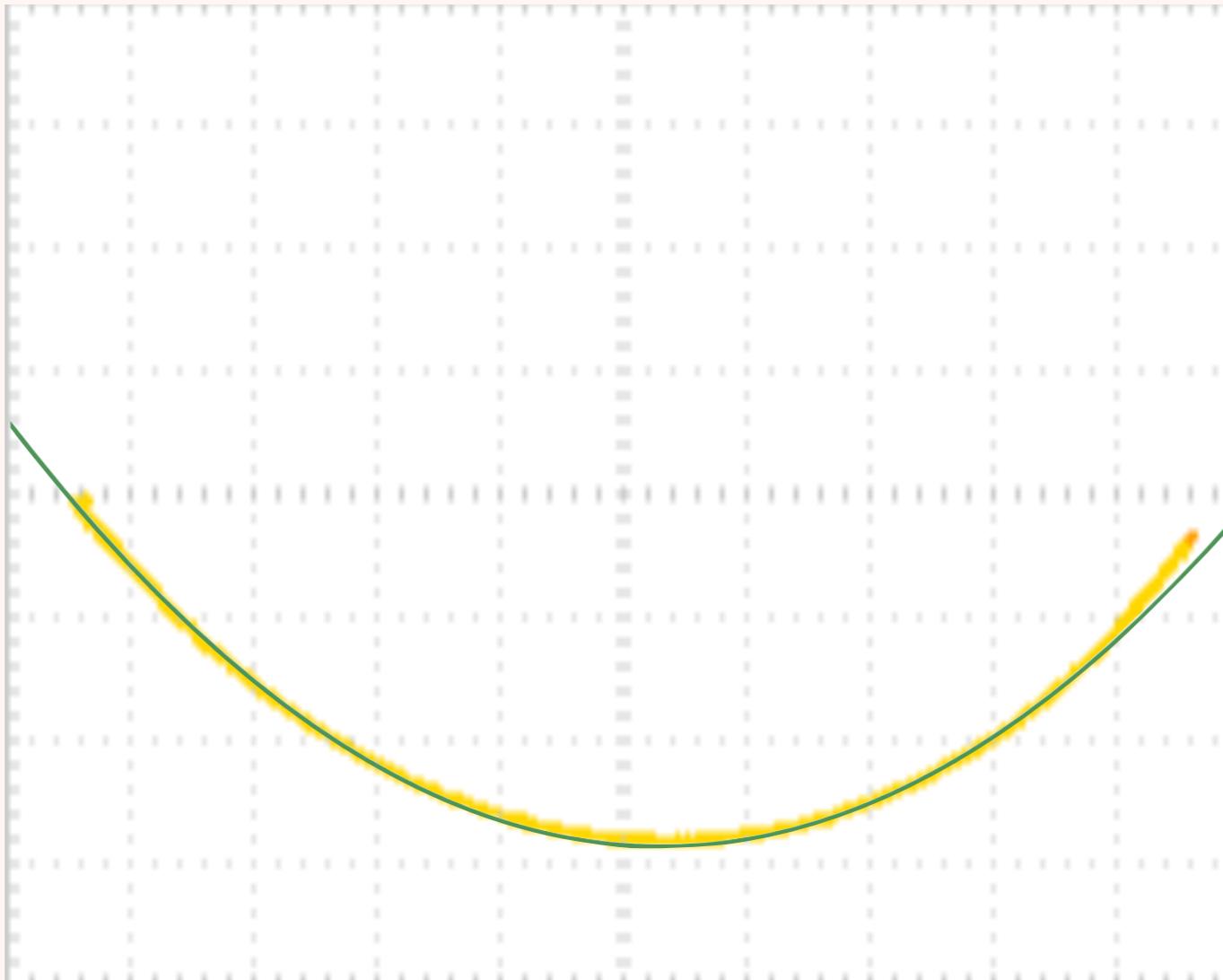
$$-21.7x/r^3 \text{ (y=0)}$$

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# INVERSE SQUARE



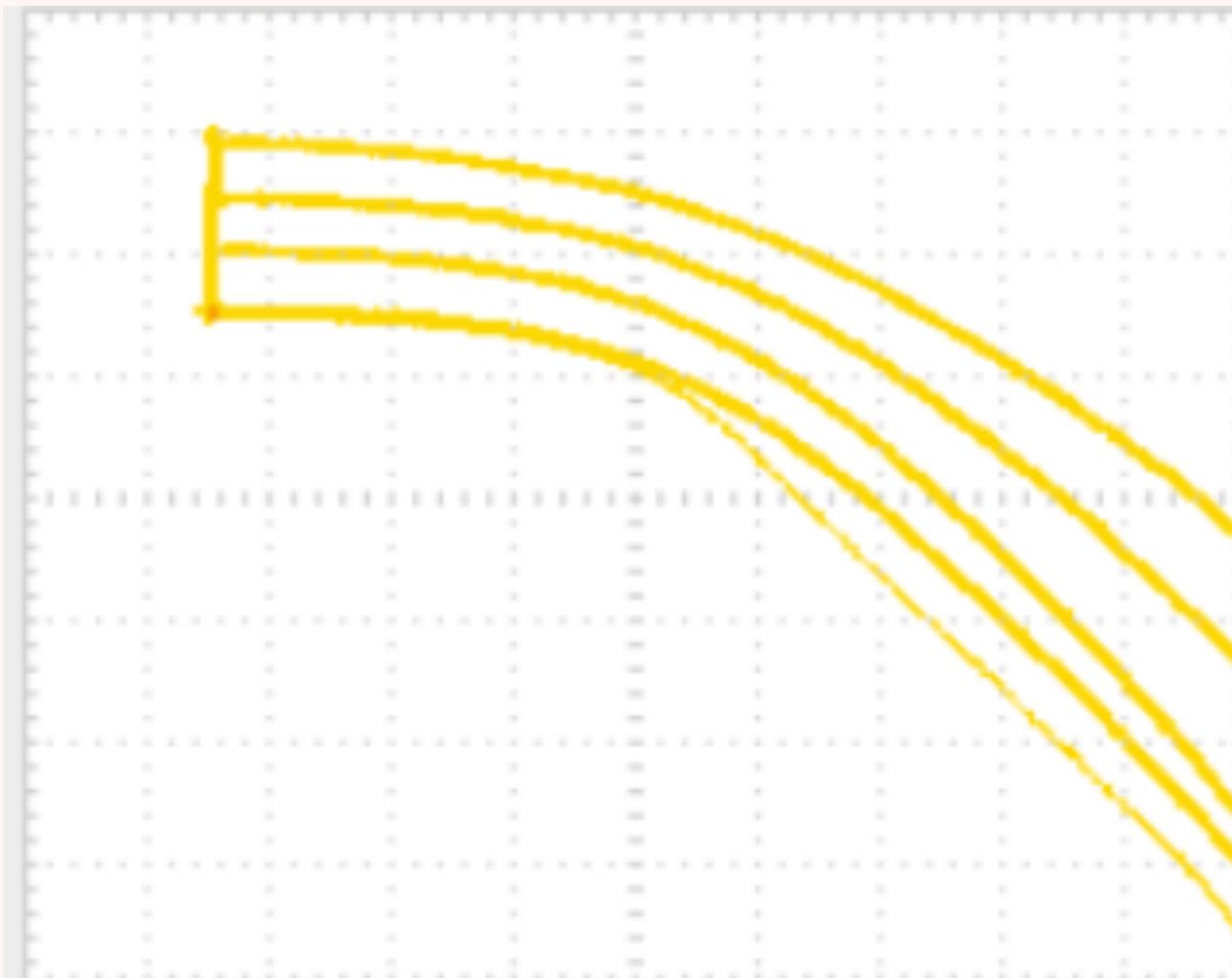
# INVERSE SQUARE



$$-21.7x/r^3 \text{ (y=0)}$$

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# INVERSE SQUARE



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# INVERSE SQUARE

