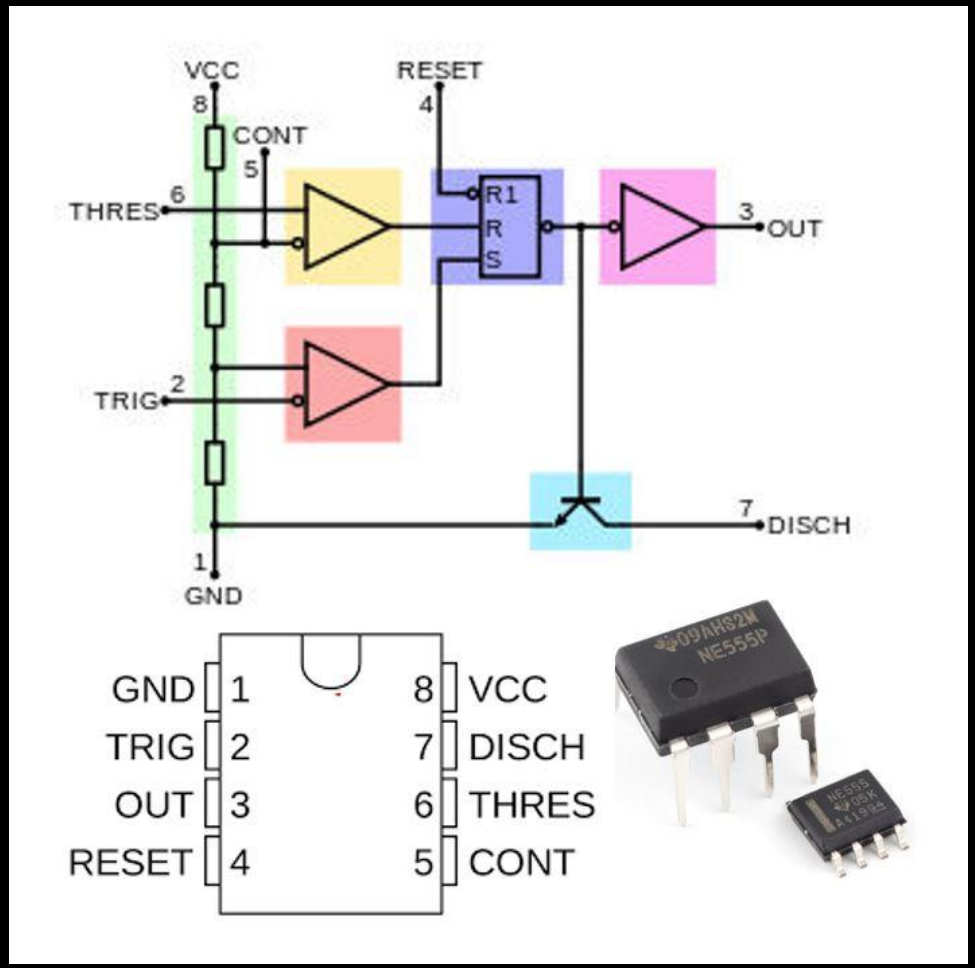
STEAM CLOWN™ PRODUCTIONS

555 /556 TIMER



STEAM CLOWN™ & Squeaky Hinge PRODUCTIONS

STEAM CLOWN™ PRODUCTIONS

SEE APPENDIX A, FOR LICENSING & ATTRIBUTION INFORMATION

by-nc-sa-3.0

https://creativecommons.org/licenses/by-nc-sa/3.0/

https://creativecommons.org/faq/#what-does-some-rights-reserved-mean

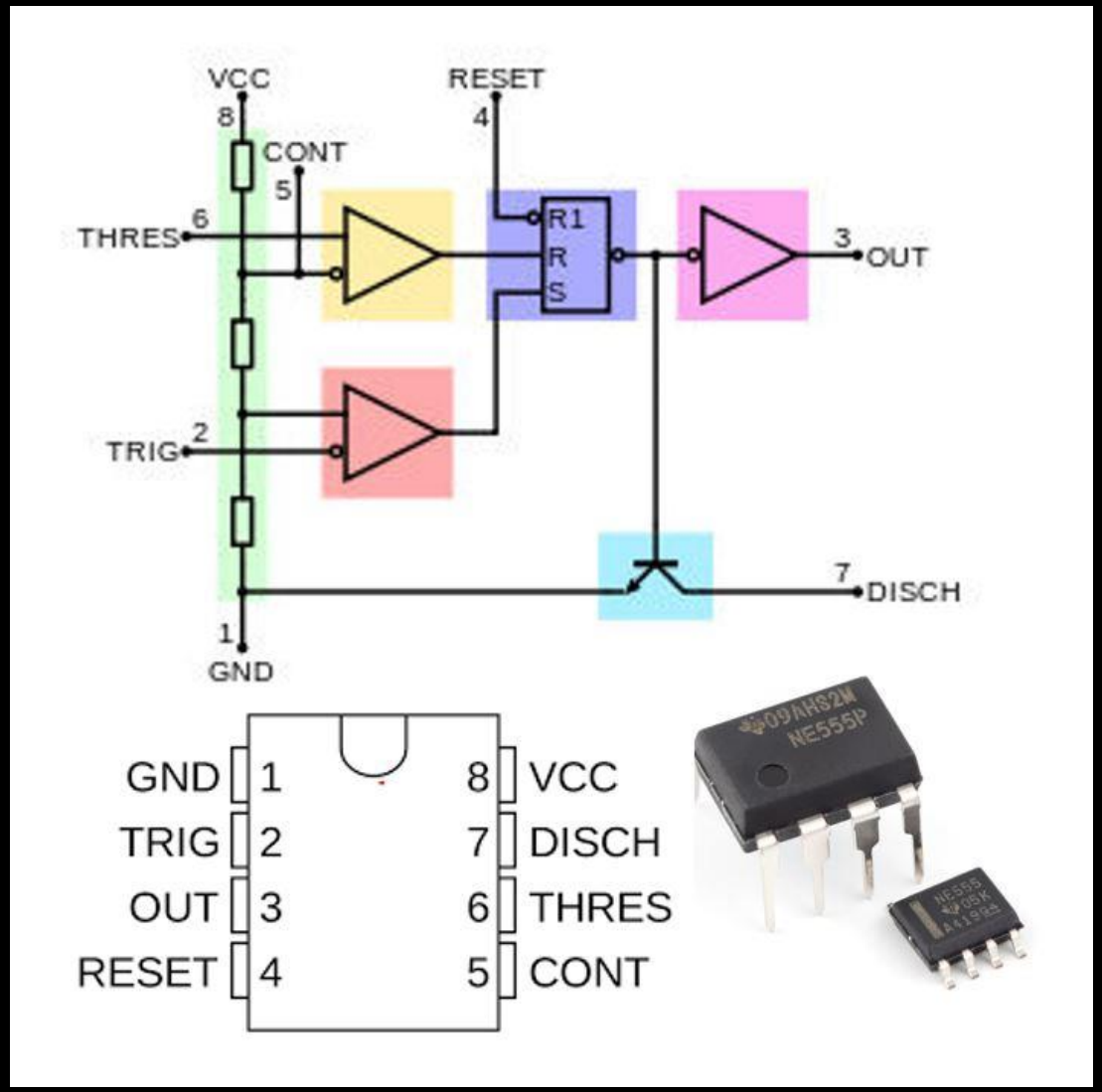
NEW WORDS...

- Oscillator
- Relaxation Oscillator
- Duty Cycles
- Monostable
- Bistable
- Astable

- The **555 Timer Oscillator** which is more commonly called the **“555 Timer”** is a dedicated IC’s
  - Designed to produce an output waveform
  - It can create square waves, as well as other wave forms
  - It requires just a few extra external Resistors and Capacitors as timing components

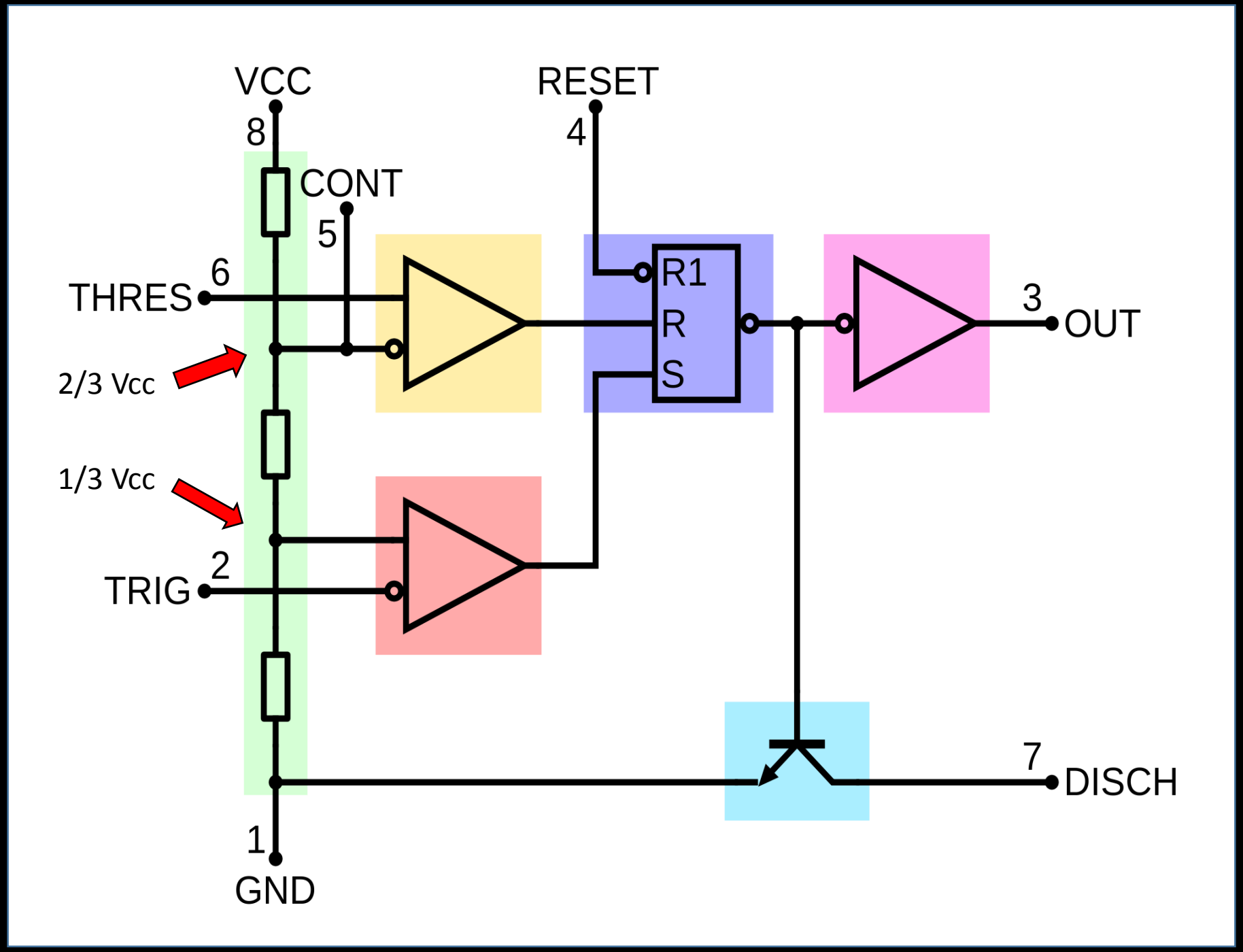
WHY 555?

- The **555 timer** gets its name from the three 5kΩ resistors it uses to generate the two comparators reference voltage
- It is a very cheap, popular and useful precision timing device
- It can act as either a simple timer to generate single pulses or long time delays
- Bistable, where it can be used as a On/Off switch
- Or as a relaxation oscillator producing stabilized waveforms of varying duty cycles from 50 to 100%.



STEAM CLOWN™ & Squeaky Hinge PRODUCTIONS

- How A 555 Timer Works
  - https://www.youtube.com/watch?v=i0SNb__dkYI



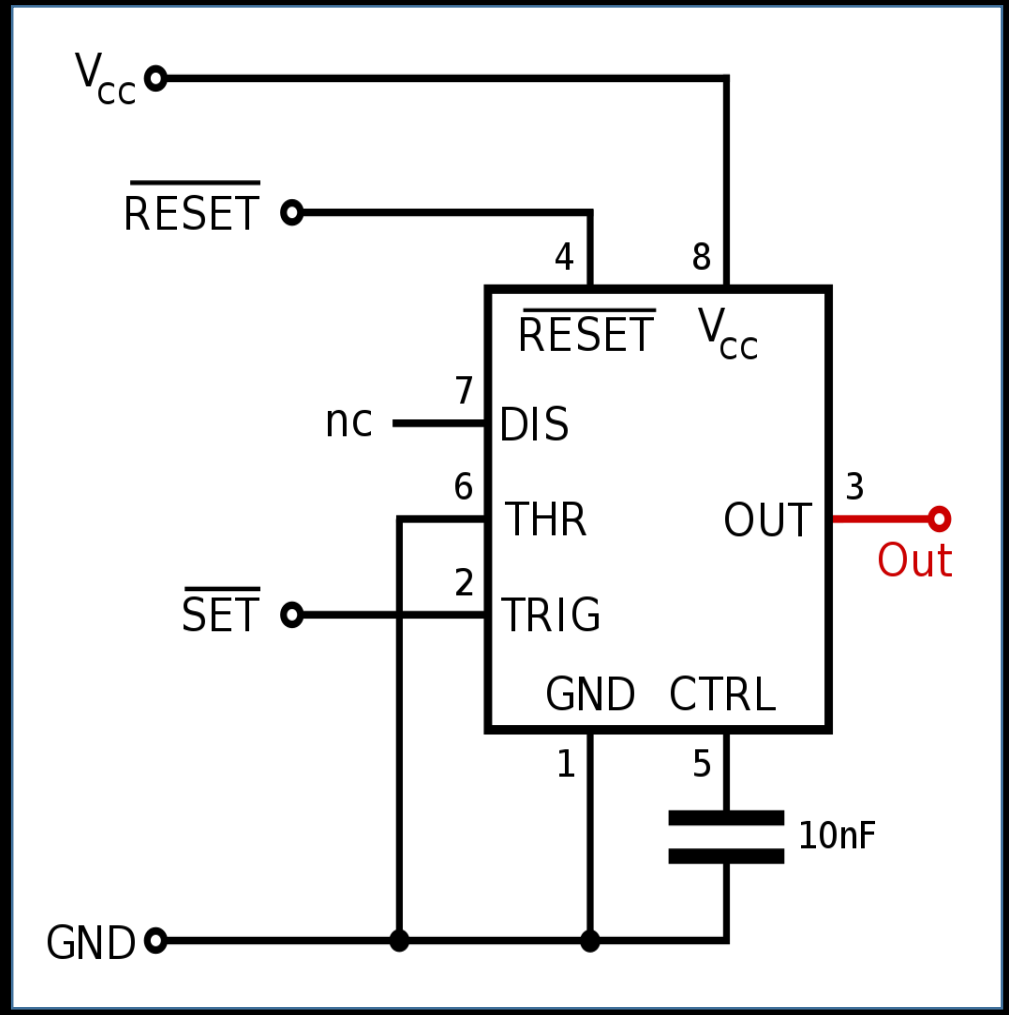
STEAM CLOWN™ PRODUCTIONS

LAB TIME

STEAM CLOWN™ & Squeaky Hinge PRODUCTIONS

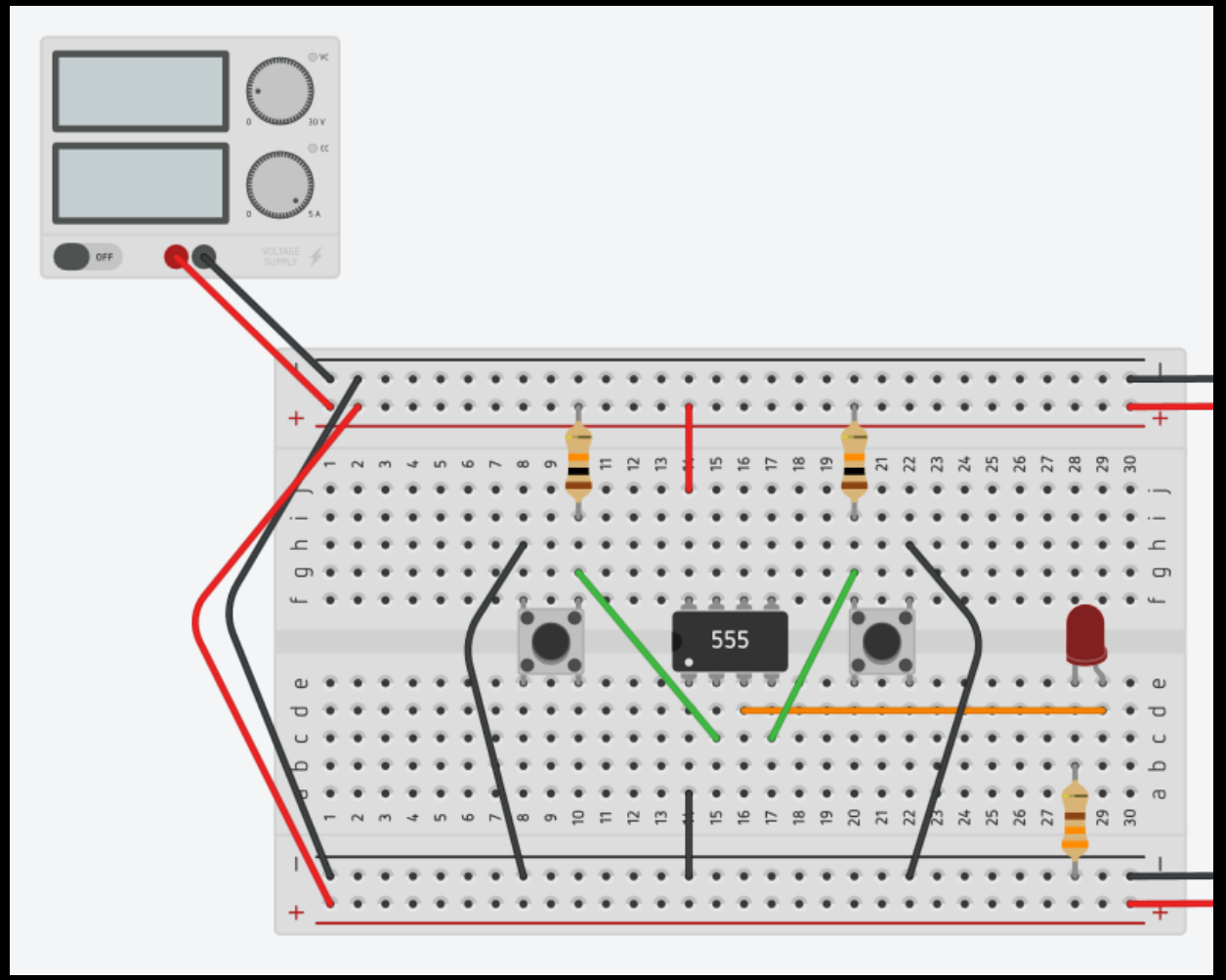
BISTABLE

- Acts like a Flip/Flop
- Presenting a “low” on the reset or trigger pins will cause the output to change



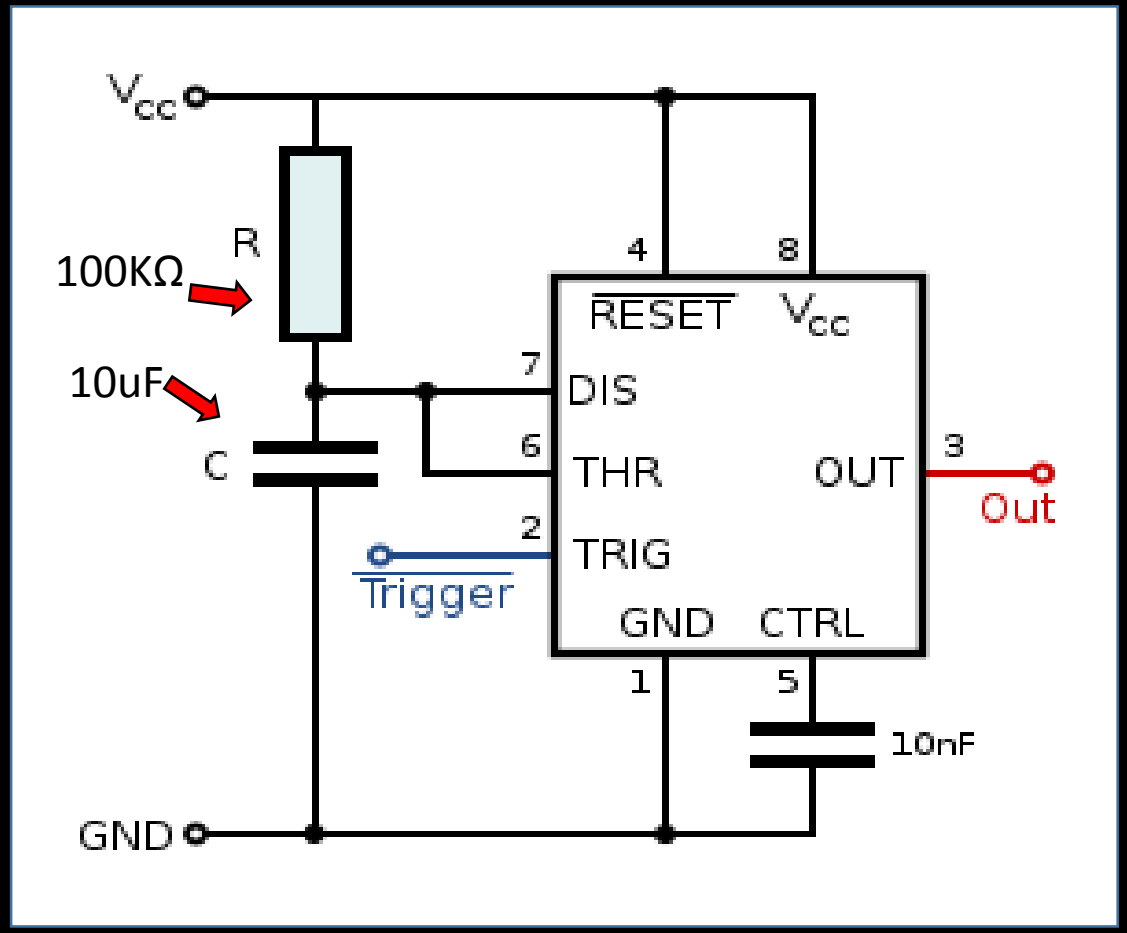
BISTABLE TIMER LAB

- Using a bread board…
- Build a Bistable circuit
- Show me… and…
- Turn in to IC Why you might use a circuit like this, rather than just a switch?



MONOSTABLE

- Triggers a pulse of variable width
- $t = 1.1R_1C_1$
- MonoStable Calculators
  - Solve for time
  - Solve with components



$$t = 1.1R_1C_1$$

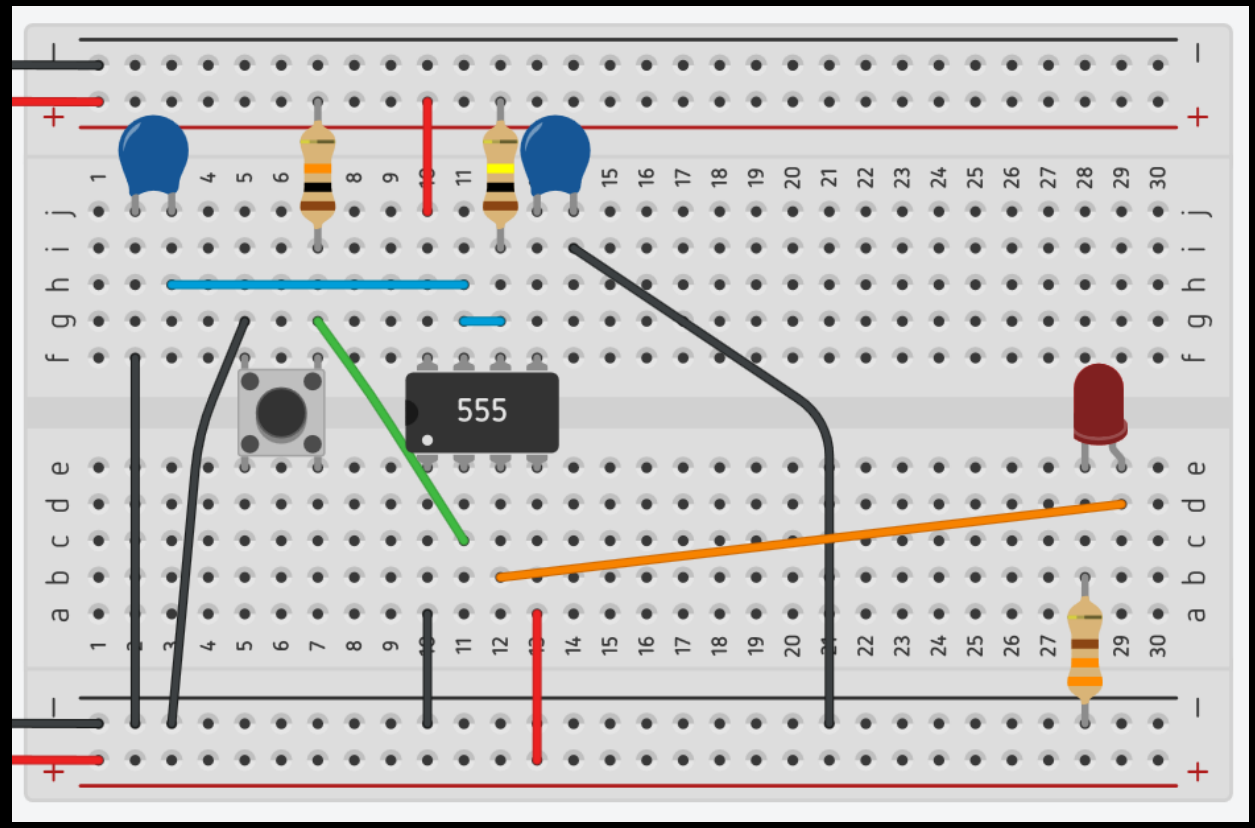
$$\frac{t}{1.1} = R1\ C1$$

$$\frac{(t/1.1)}{C1} = R1$$

$$R1 = \frac{\left(\frac{t}{1.1}\right)}{C1}$$

MONOSTABLE TIMER LAB

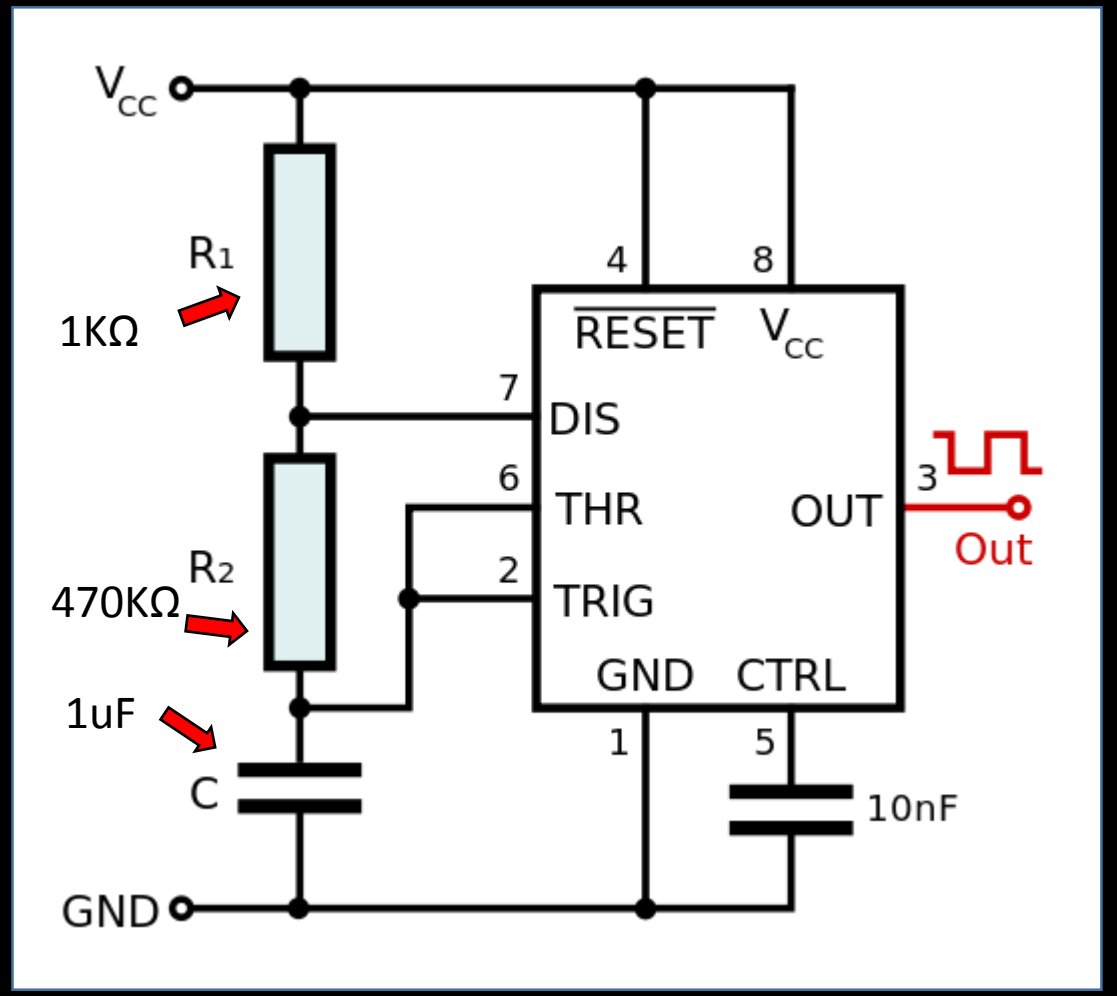
- Using a bread board…
- Build a Monostable circuit
- Show me… and…
- Turn in to IC what the R1 and C1 values are needed for a
  - 1 sec pulse
  - 10 second pulse
  - 1 min pulse



STEAM CLOWN™ & Squeaky Hinge PRODUCTIONS

ASTABLE

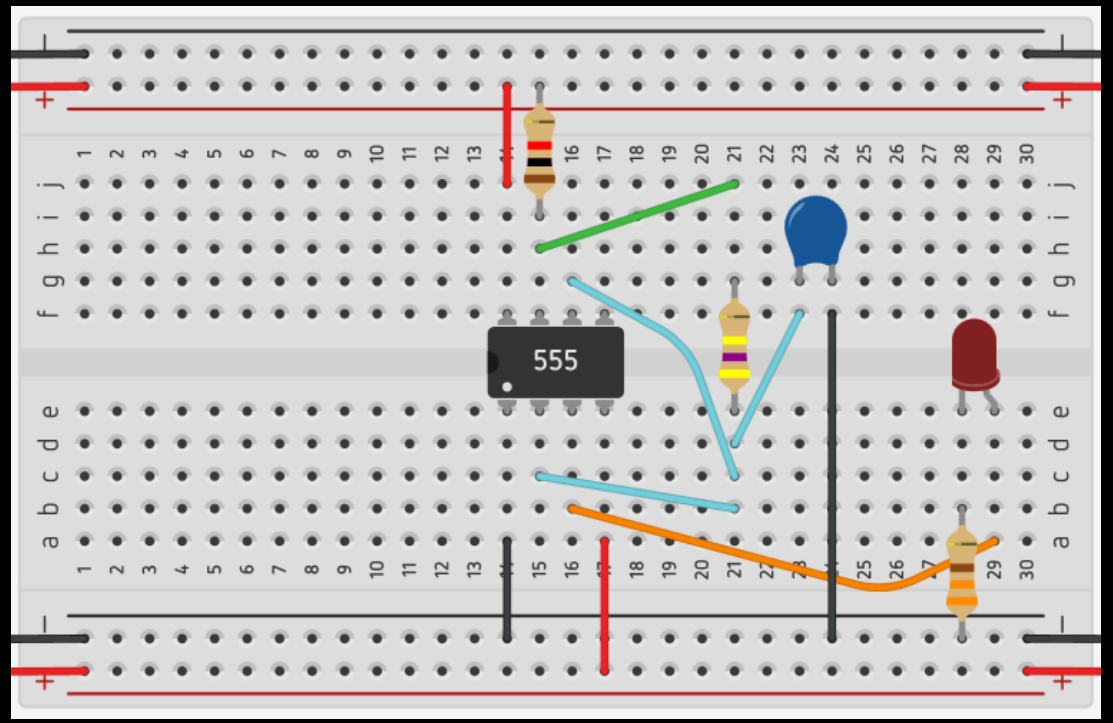
- Generates a repeating output wave form
  - $t_{on} = 0.69 * C_1 * (R_1+R_2)$
  - $t_{off} = 0.69 * C_1 * R_2$
- 555 Timer Calculators
  - Solve for time
  - Solve with components



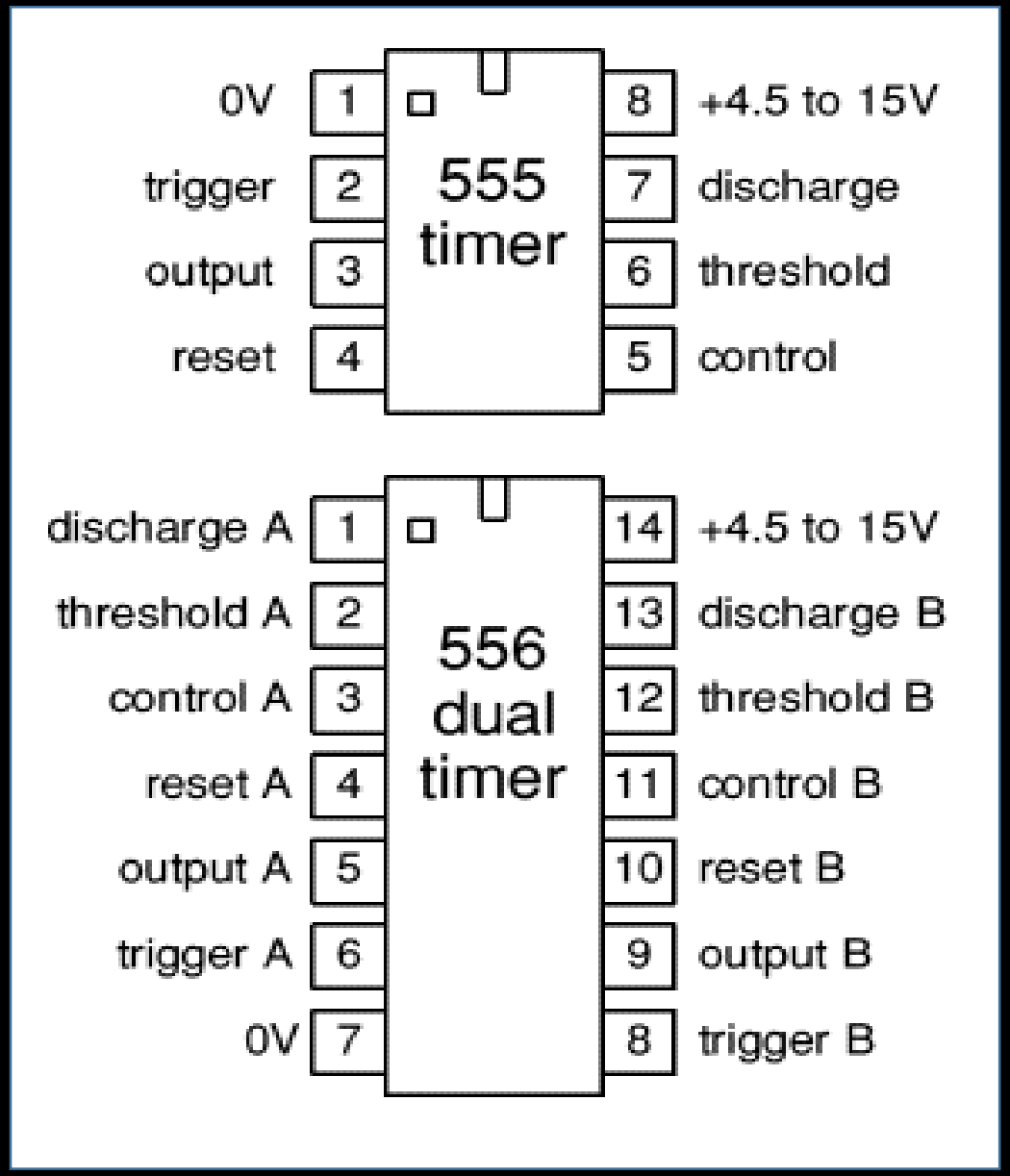
Increase C to increase the period (reduce the frequency).
Increase R1 to increase High Time (T1), without affecting the Low Time (T0).
Increase R2 to increase High Time (T1), increase Low Time (T0) and decrease the duty cycle.

ASTABLE TIMER LAB

- Using a bread board…
- Build a Monostable circuit
- Show me… and…
- Turn in to IC what the R_1 R_2 and C_1 values are needed for a
  - 1 sec Square Wave
  - 0.5 sec Square Wave



555 VS 556?



- 556 Timer is a Dual 555
- This means there are 2 555 in a 556 Timer
  - See pins for Timer “A” and Timer “B”

LETS BUILD SOME CIRCUITS

- 555 Time in STEAM Clown's Closet
- Flashing LED Circuit

STEAM CLOWN™ & Squeaky Hinge PRODUCTIONS

REFERENCE SLIDES

STEAM CLOWN™ & Squeaky Hinge PRODUCTIONS

APPENDIX

Appendix A: License & Attribution

- This interpretation is primarily the Intellectual Property of Jim Burnham, Top STEAM Clown, at STEAMClown.org
- This presentation and content is distributed under the Creative Commons License CC-by-nc-sa-3.0
- My best attempt to properly attribute, or reference any other sources or work I have used are listed in Appendix B

Under the following terms:

Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

NonCommercial — You may not use the material for commercial purposes.

ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original.

No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

STEAM CLOWN™ & Squeaky Hinge PRODUCTIONS

Appendix B: Attribution for Sources Used