Fun with High-Voltage Toys

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Quick Overview

▶ Ask Questions!

▶ Tools

▶ Parts and Availability

▶ Simple Toys

▶ More sophisticated uses

▶ Web Resources

▶ Hands-on Some Toys

Background and Level-set

- I am a software type (not hardware).
- I am a builder, not a designer. You can do this!
- Started with low-voltage because it was an easy way to learn electronics basics.
- Worked with
  - B.E.A.M. robots (Biology, Electronic, Aesthetics, Mechanics)
  - Then low-voltage, on-the-skin micros (Atmel, PIC, and TI)

- A 3.5 years ago, I discovered higher-voltage geeekdom and it turns out...

I am a likely to continue remain a HV Noob!

It is a Fun Hobby ...but we all know that quickly devolves…
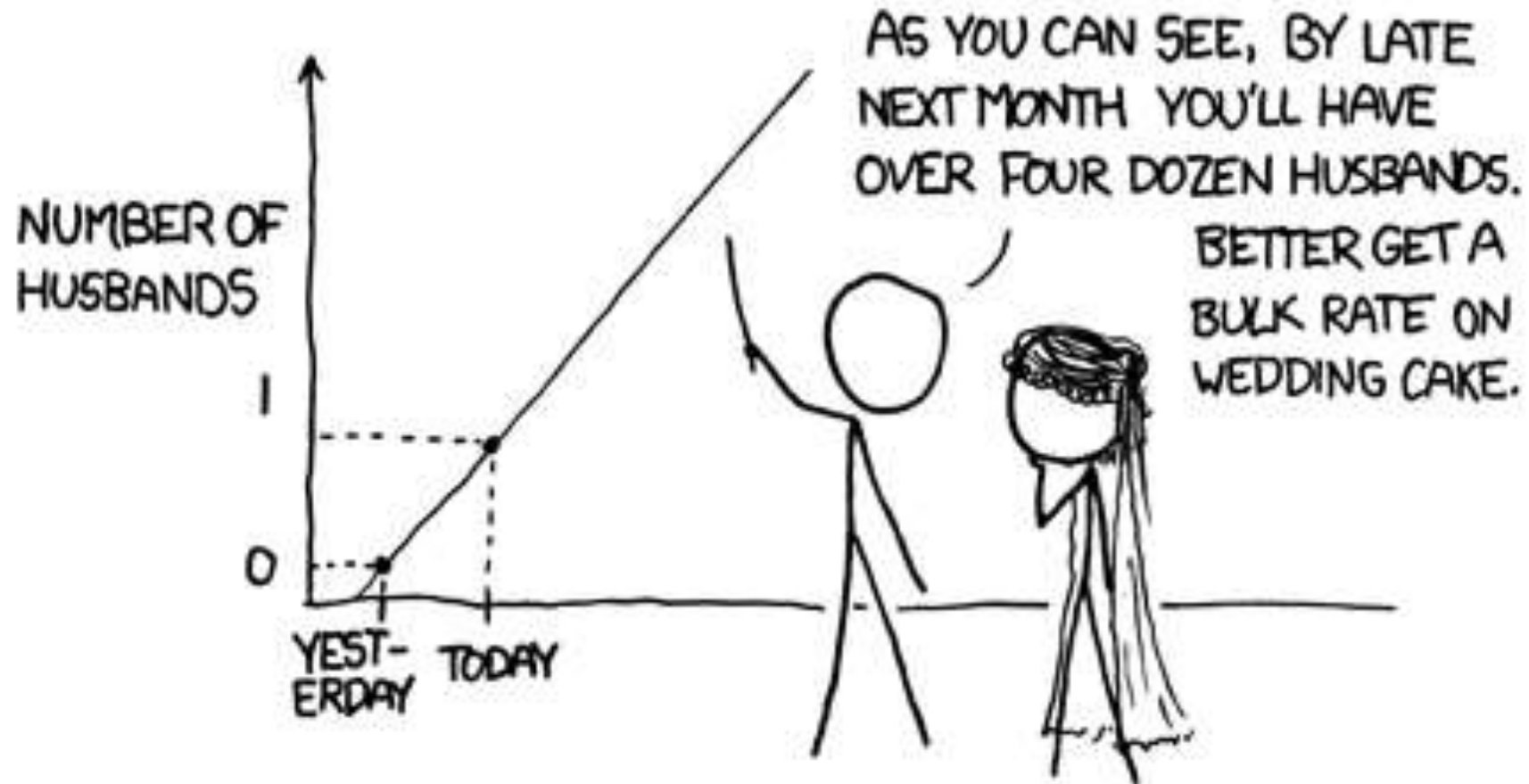
Starting Equipment

- A decent voltmeter
- Soldering equipment
  - Iron/solder
  - Third-hand
  - Magnifying device
- Oscilloscope (optional)
- Grounding strap
- Power supply wall warts – LOTS of power supplies and/or a bench power supply
- Supply sources for:
  - Tubes/arcane parts
  - Standard electronics (eBay, Mouser, Digi-Key, Jameco, etc.)
- If using computers, the programming set-up
  - (i.e. Arduino/PIC/TI and requisite programming tools)

Things that GLOW!

A QUICK HISTORY OF DISPLAY TUBES

Chronological Guide to Display Tubes

But first, a pedantic clarification...

- Vacuum Tube – Invented 1904
  - Commonly used as Di/Triodes and Amplifiers
- Not Technically the same for many (not all) of the tubes mentioned in this talk.
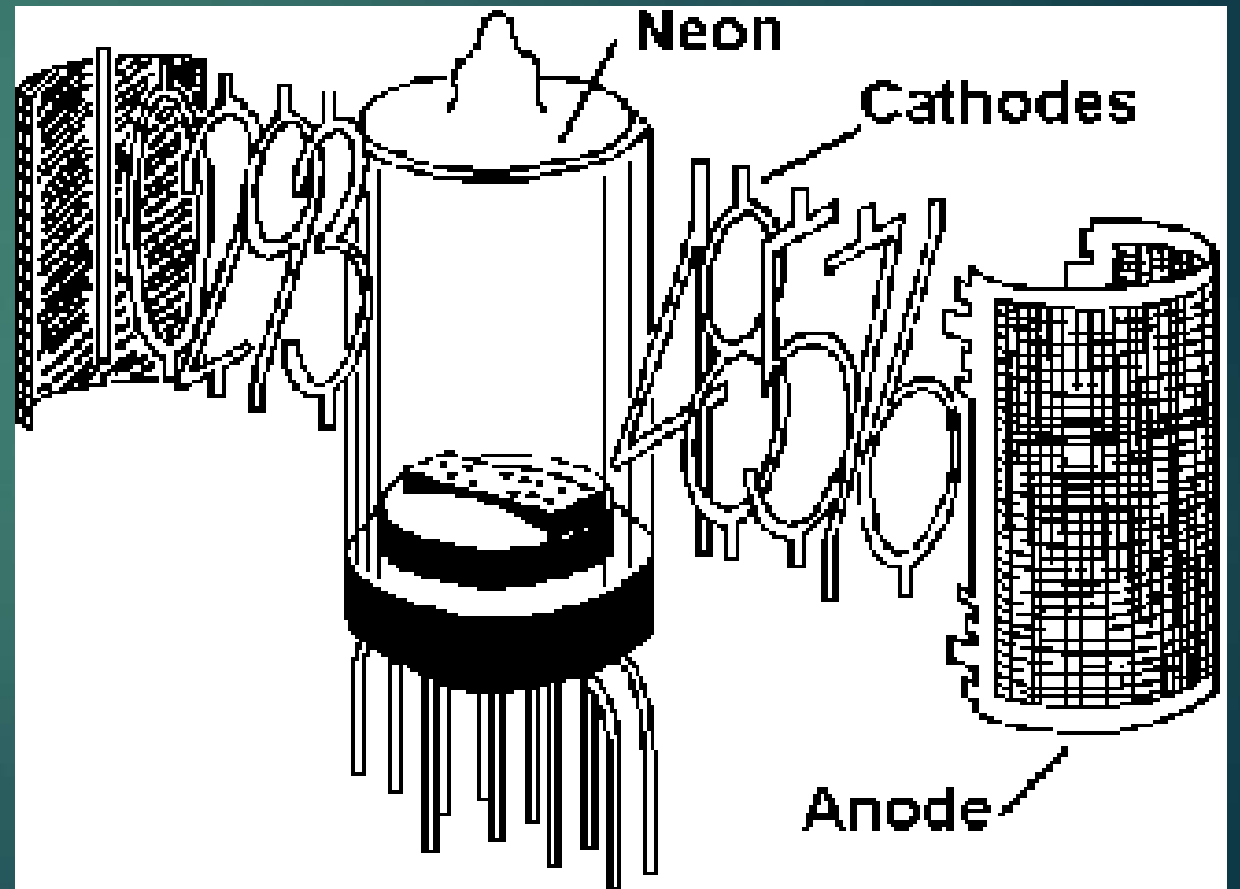- Technically, speaking, nixies, numitrons, dekatrons are not "vacuum" tubes but are cold-cathode tubes.

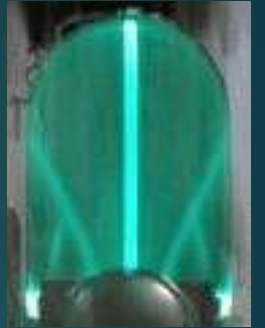# Cold Cathode Tubes
Not a Typical Diode or Triode

Typical "Vacuum Tube"
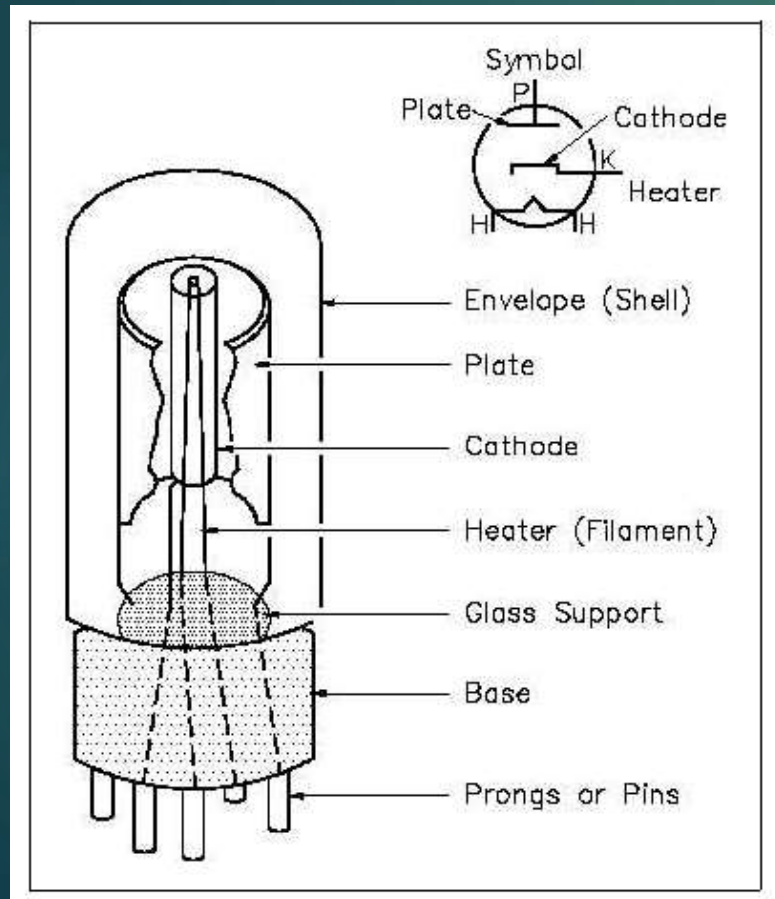
Typical "Vacuum Tube"

Magic Eyes

- A true Vacuum Tube/Valve with a heater
- Common Vacuum Tube in Console Radios from 1930's - 1960's
- Often deployed as a tuning "eye" for fine tuning or similar visual
- Huge assortment of styles
  - http://www.magiceyetubes.com/patterns.htm
- Run varying voltages - 270V-400V
- Fairly easy to get
- Top displays seem to carry a higher price.

Dekatrons

- Counting tubes
  - Originally used for electronic registers/counting.
  - Come in many flavors...
    - Neon or Argon-filled (some were helium and other exotic gasses)
    - Argon are really cheap and pretty, but NOT recommended unless you have a good source and are willing to toss-out a lot of tubes.
  - They usually require somewhere between 250V- 400V.

Dekatron Types

Nixie and Pixies

➤ NIX (ie) – Numeric Indicator Experimental 1 (maybe)

➤ It is (was) a trademarked name (Burroughs) representing any cold cathode display tube.

➤ Not to be confused with vacuum florescent display tubes (FVD) that came later.

➤ Strictly used for visual display.

➤ They come in all sorts of shapes and sizes.

➤ Run usually a little lower voltage than Dekatrons or Eyes – about 150V –180+V.

Nixie Specimens

ZM-12 (Europe)

IN-1 (Russia)

Pixie (U.S.) –

IN-12 workhorse (Russia)

IN-2 (Russia)

Sources for Parts

- Former Soviet Bloc
  - Russia
  - Ukraine
  - Romania, Bulgaria, etc.
- China
- On eBay a lot, but be careful.
  - Establish a relationship with the seller
- Most often I use
  - Russia
  - Tubemall
  - eBay one-off for needful things like Magic Eyes, wires, sockets, and other supporting tubes.

Web Sites

- Google Neonixie group
- http://glowtubeglow.com/   http://www.fb.com/glowtubeglow
- http://www.tindie.com/stores/nixiekeith

- Magic eye cross mapping - http://www.magiceyetubes.com/

- Cool chart of eye display patterns http://www.magiceyetubes.com/patterns.htm

- Vintage Technology Association http://www.decadecounter.com/vta/

- ThreeNeurons (Pile o Poo) -
  ▶ http://threeneurons.wordpress.com/

Let's go over the toys here…

PC Speedometer

Bar Display SR04 Distance meter (needs tweaks)

Rotary Phone Calculator

Toys…

- Spinners (dekatrons)
- Clocks – Analog and Digital (nixie, dekatrons)
- Decibel / Sound meters
- Thermometers (great for Nixie bars)
- Magic Eyes – Decibel meters, Winkers, Capacitor Tester, Radios
- Integrated with Digital Processors
  - Arduino (Atmel)
  - PIC
  - TI

Dekatron Spinners

- Some great analog kits are sold by Michael Moorrees in California.

Clocks - Analog

- Several sources for kits and computer controlled nixies.
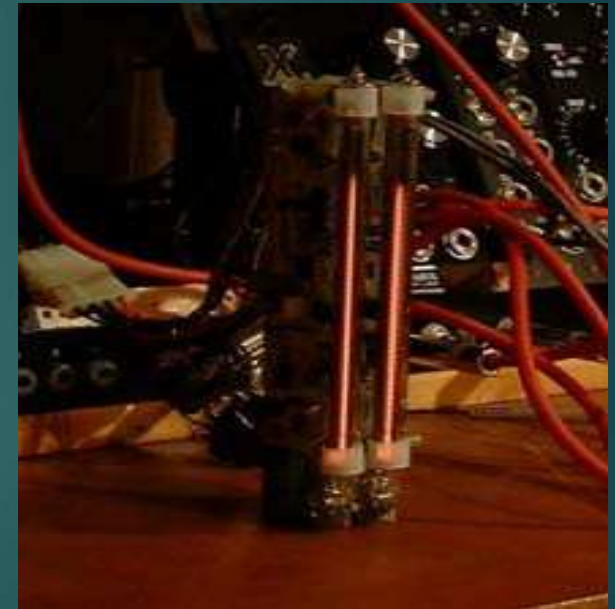- There are Dekatron-only, Dekatron + Nixie, and Nixie kits available

Clocks - Digital

- Smartnixie – Taylor Electronics
http://www.tayloredge.com/storefront/SmartNixie
- Arduinix (more later)
- Divergence Meter (Steins;Gate)

Bars

IV-26 (FVD)

Nixie (IN-9 or IN-13)

Magic Eyes

- Any number of choices for eyes
- Kits from "Mr. Nixie" (pricey) http://nixiekits.eu/
- M. Moorrees plans
 http://threeneurons.wordpress.com/magic-eye-stuff/

Numitrons

- Usually a segment display
- Most are vertical display (not on top)
- A Great way to start
  - Inexpensive
  - Low-Voltage (5 Volts!)
  - Easy to use with Arduino/Rasp/TI/PIC
  - Relatively plentiful supply
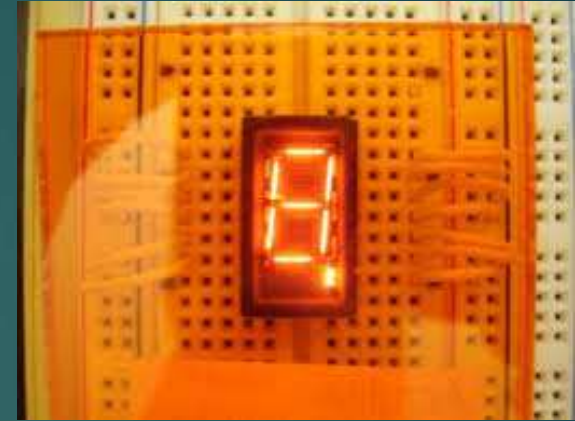
DIY and Arduinix

- Arduinix – Arduino breadboard/daughter for Nixie (FVD?)
  - VERY cool!
  - Completely open source/hardware
    - I used the plans to make completely from scratch using OSHPark (PCB) and other PCB sources, and parts from electronic supply.
    - Supports up to 6 (8?) nixies using 20+3 pins with simple/fast current management
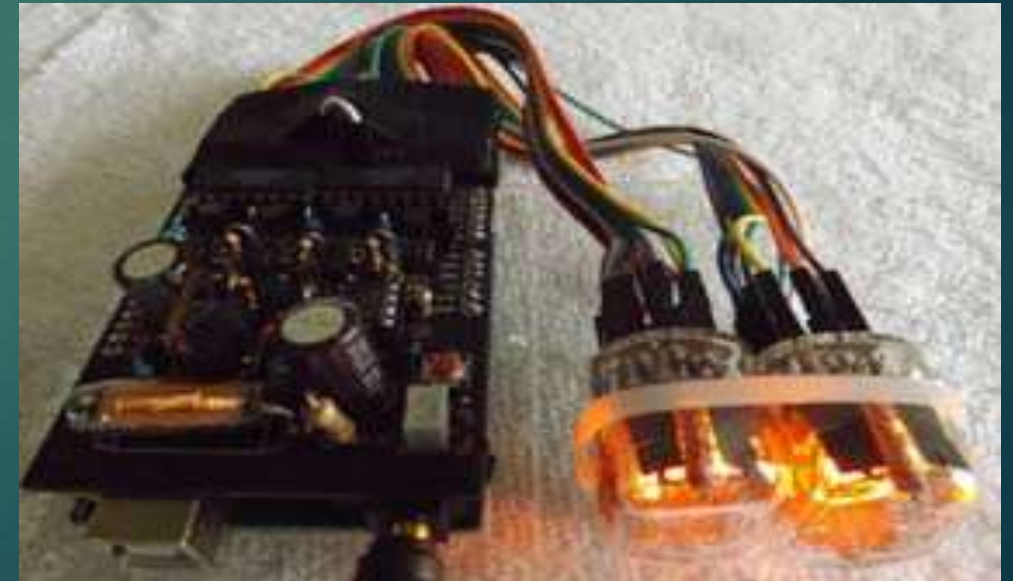
Mild Safety Note…

- I have lots of examples.

- Maybe we can split into groups at the table? If that makes sense?

- Be polite! I will answer all I can. And contact me offline if necessary.

- Feel free to play with them, but…
  - These are medium-to-high-voltage!
  - Do not play with them unless you can take accidental shock. In all of these, I have only been hit a couple times, but you have to expect it will happen.
  - Normally, this is not normally life threatening unless you have physical conditions that cannot take a jolt. (e.g. Pacemaker, heart issues, other condition)

Questions?
Conversation?