

## Ham Radio Building Blocks

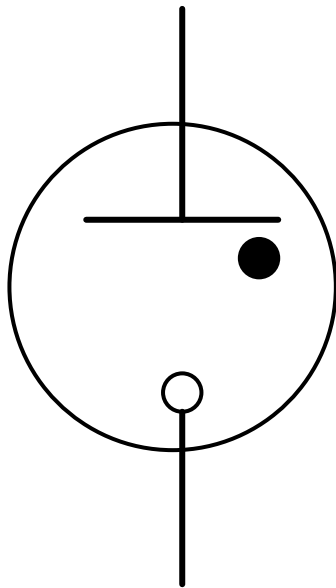
### The Anatomy of a Boat Anchor Part 3

#### The Tubes that Made them Work

Hal Silverman WB6WXO

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Recently, there were several postings on the Yahoo Heathkit User's Group regarding tubes that glowed purple when the rig was fired up. After several more postings, I think the original ham that wanted the explanation finally got it.



Gas Voltage Regulator Tube

Figure 1

I did not answer him but thought I would write my own dissertation on the subject. Vacuum tubes are those devices that keep hams warm on cold nights.

The symbol is for a class of voltage regulator tubes. The tube envelope is back filled with a gas. When a voltage is applied to the anode, the tube glows in the dark.

The tube is evacuated and then back filled with a gas. As a voltage is applied to the tube, there is a point where the gas ionizes and the voltage across the tube remains constant. The voltage will remain constant over a large amount of current that passes through tube.

There several gases are applied to the tube. This allows for several different constant voltage drops.

More important is the voltage across the tube is constant over a wide range current load. The most popular one is the 0A2. It provides a constant voltage of 150Vdc.

There are several tubes types of gas filled tubes that are used to regulate different voltages.

In today's electronics, there are several state devices that are used to provide a stable regulated voltage.

The earliest ones, and are still being used, are Zener Diodes. However, I will concentrate on the Gas tubes. Gas filled tubes are used as a regulated source of voltage.

The schematic shown here are the used in the Heathkit HW101. The 0A2 is used to regulate a 300Vdc supply down to 150Vdc. The 150Vdc

It is used to supply voltage to the VFO (Variable Frequency Oscillator) used in the HW101.

The voltage generated from the 0A2 is also divided down with a resistor divider to generate 100Vdc. Both the 150Vdc and the 100Vdc are as stable as the regulator tube.

Those circuits are not subject to any fluctuations from the 300Vdc rail from the radio switching from receiving to transmit.

In a newer technology that operates from a 13.8Vdc power supply, a Zener Diode or a three **term** regulator could be substituted from a gas filled tube.

As with zener diodes, gas filled regulator tubes can be connected in series to derive several stable voltages.

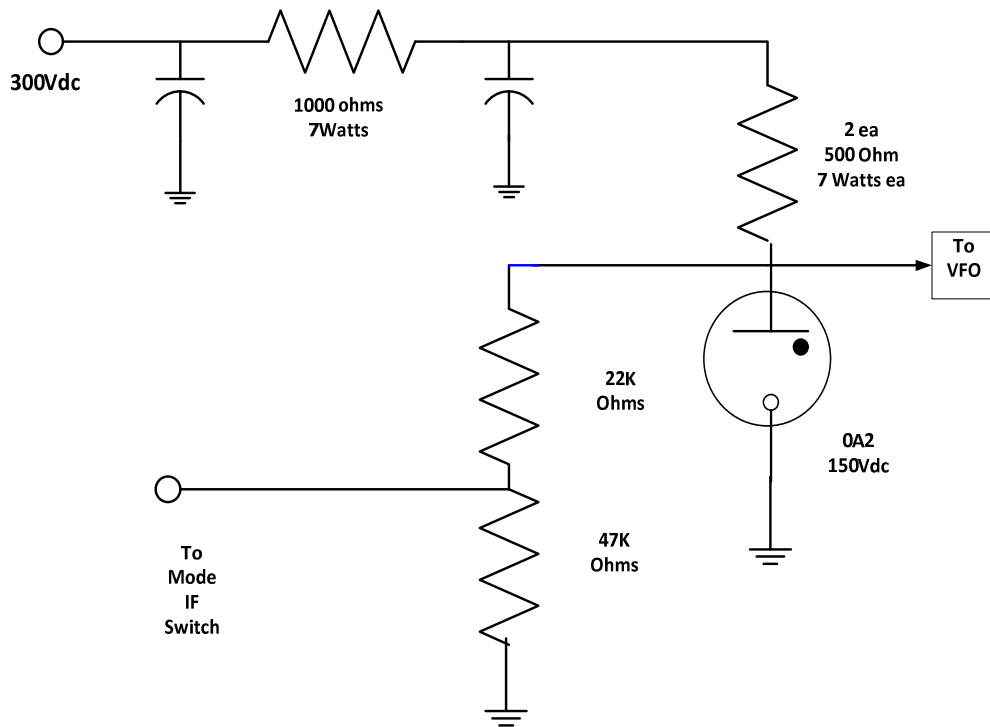


Figure 2

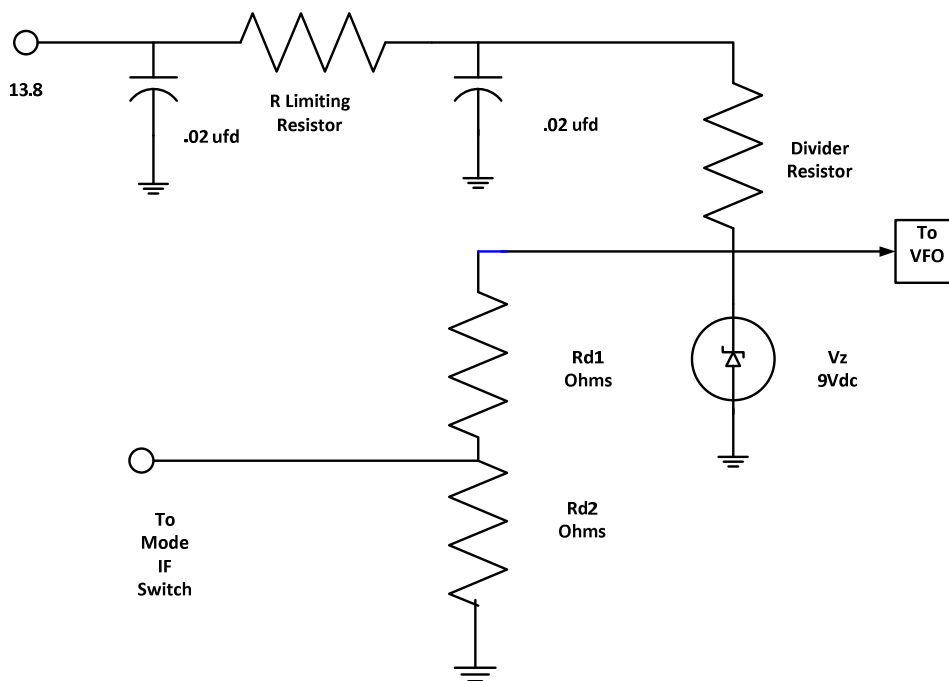
HW 101 0A2 Schematic

The zener regulator is presented as a simple solid state alternative to the gas tube. Since most modern circuits are solid state devices, a Zener of some type is typically employed.

There are a number of three terminal regulators (LM340-X) used for this application.

I hope that this article helps explain the use of circuits from days long ago.

If there are any questions, I can be reached at [WB6WXO@SOARA.org](mailto:WB6WXO@SOARA.org).



**Figure 3**

### **Zener regulator to drive an analog VFO**