Ham Radio 101

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Heathkit Home Brew Project

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I have gotten back on the hybrid after a bit of a layoff. Several changes had to be made to interface the Heath Power Supply (HP-23C). When I first started, I chose to use an Astron power supply for the 13.8V low voltage supply. That works just fine for all of the low voltage circuitry. After reading the manual and reviewing the schematic for the Heath supply, I found that the Heath supply is energized by turning on the HW32A and completing the primary side of the power transformer. So, for this application, I chose to use a 12Vdc relay that is energized when the front panel switch is turned to the "**on**" position. I have connected the leads from the HP-23C (Pins 9 and 10) to the relay NO relay contacts.

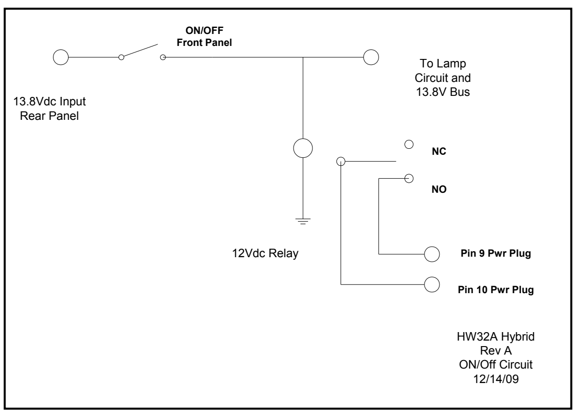


Figure 1
On-Off Circuit~Hybrid

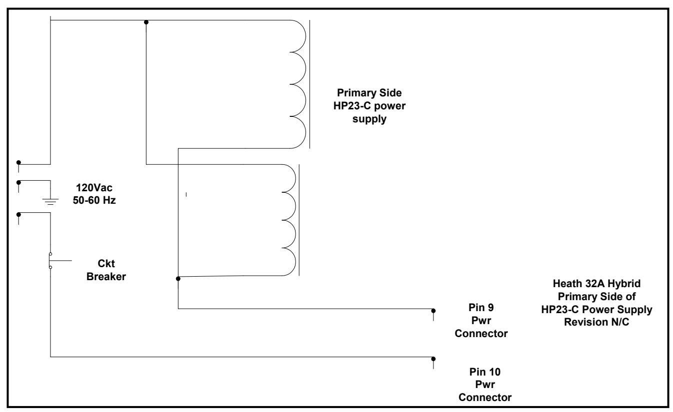


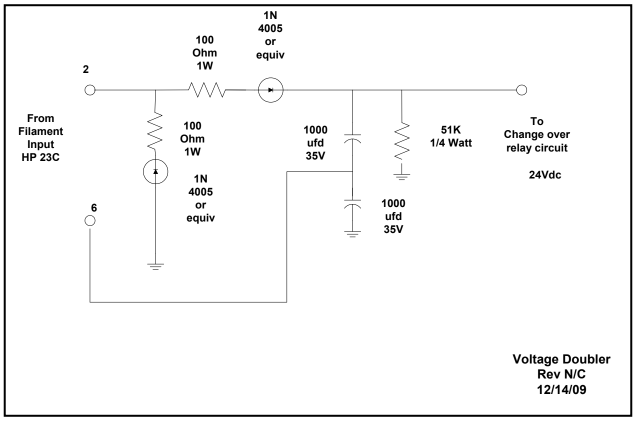
Figure 2
Primary Side Power Transformer Heath HP23-C

The next item that had to be reviewed was the change-over relay circuit. The original idea was to use a 12Vdc relay. This would have worked well but the real estate to be used would have been prohibitive. The relay and socket was not going to work well. I decided to use the original Heath part that I removed from the clunkers that I bought from E Bay. These are open frame 3P-DT relays (Heath P/N 69-34). There were already mounting holes in the chassis so this was going to be a good fit. The original Heath circuit used a vacuum tube (6EA8) to switch the relay. I tested the relay to find out where it energized reliably. It turned out to be a 24Vdc relay.

The next problem that was encountered was where to get 24Vdc. That was an easy fix. I took the 12.6Vac filament voltage and constructed a 24Vdc voltage doubler. The doubler came from the 1976 ARRL handbook.

Since the capacitors charge to the peak voltage of the sine wave, the output voltage turned out to be about 34Vdc. This was more than sufficient to energize the change over relay.

The schematic and layout on a perf board are shown in figures 3 and 4.



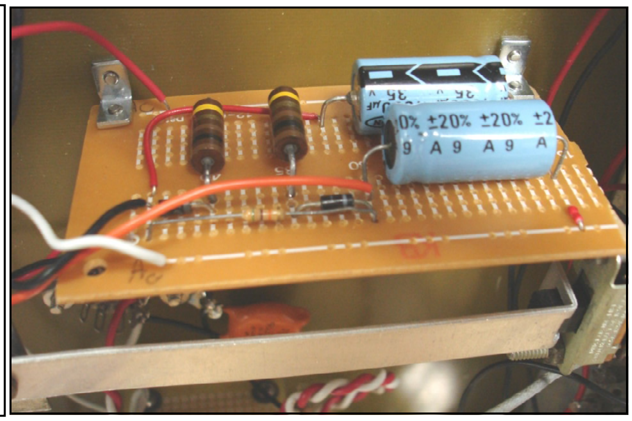


Figure 3:
Schematic Diagram of Voltage Doubler

Figure 4:
Voltage Doubler Perf Board Layout

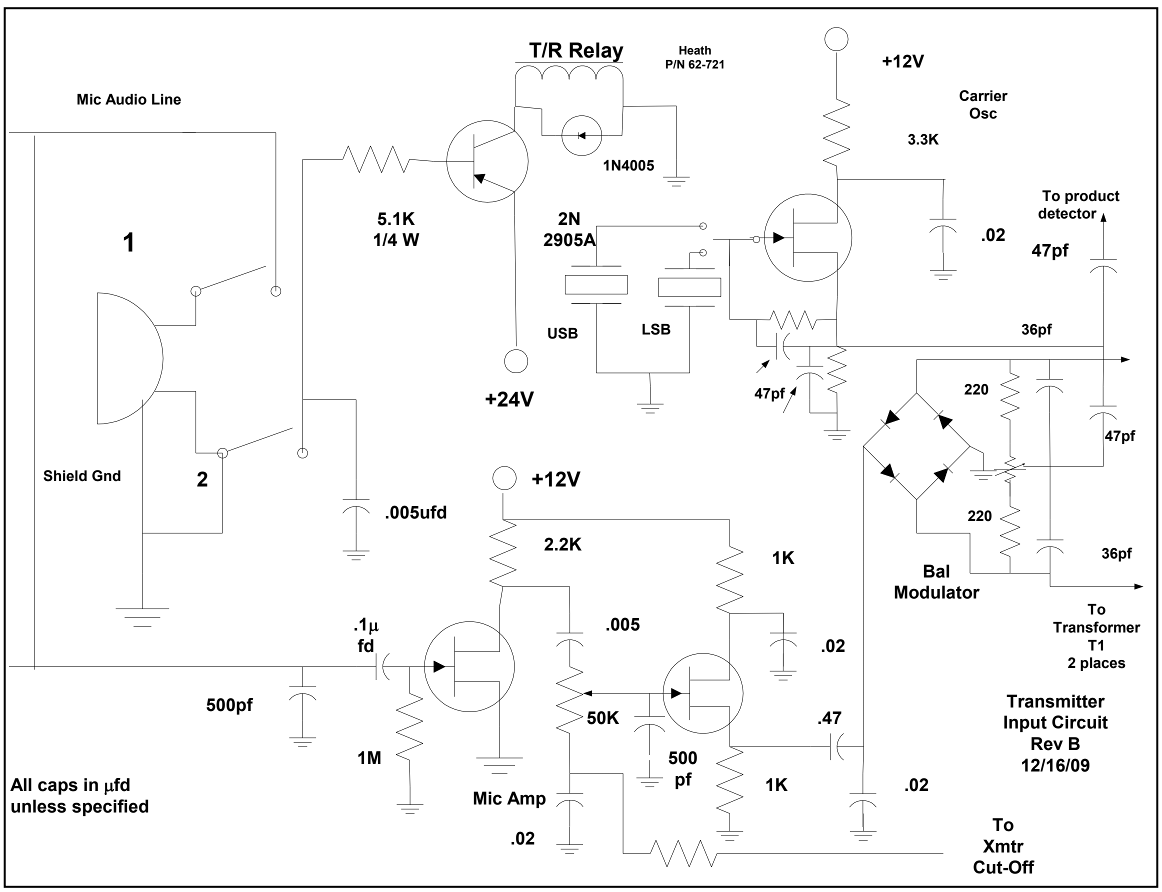


Figure 5
Transmitter input circuit.

The transmitter input circuit was also slightly modified to accommodate the increased relay voltage. The schematic in figure 5 shows the present design. The transistor 2N2907 was changed to a 2N2905A. The “A” version of the transistor has a 60Vceo instead of 40Vceo. I have added a reverse diode across the coil of the relay as a spike suppressor. I also changed the base resistor from 3K Ohms to 5.1K Ohms. There is still approximately the same base current to saturate the transistor.

I also wanted to test out some of the functionality between the HP23-C and the hybrid. So I decided to connect the filament voltage from the HP23-C to the filaments of the hybrid. There is a bifilar choke that is connected to the filaments of the 6GE5. Figure 6 is the schematic of the filament circuit. Figure 7 is a picture of the bifilar choke assembly.

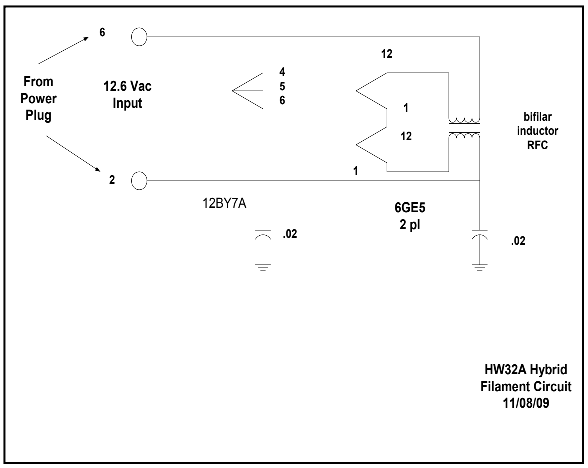


Figure 6
Schematic of Filament Circuit

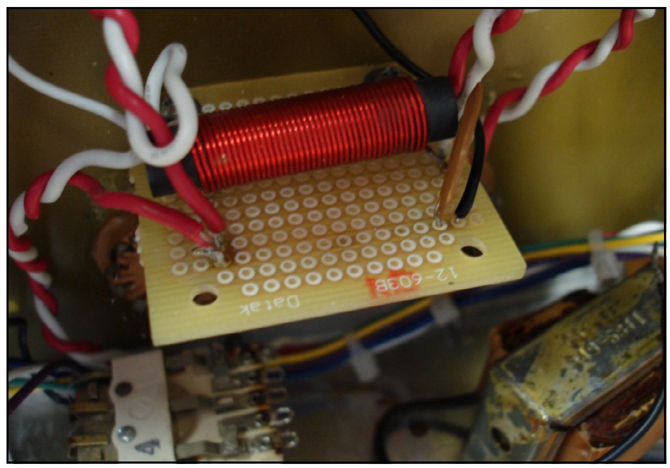


Figure 7
Perf Board of the Bifilar Choke

With all of the circuitry described in this article installed on the chassis, the following functionality is operational.

1) On-Off switch turns on the HP23-C and provides 13.8Vdc from the Astron power supply, and the following happens:
2) Filament voltage is provided to the 3 tubes
3) Filament voltage provides an input to the voltage doubler circuit
4) When the mike is keyed the change over relay is keyed and the mike amplifier provides a signal to balanced modulator
5) Front panel lamps are lighted.
6) VFO is energized.
7) Carrier oscillator provides an USB and LSB signal to the balanced modulator.

The other circuit that has been tested but not installed is the heterodyne crystal controlled oscillator. This is a signal that is 18.275 MHz that has to be mixed with the VFO. This is still an ongoing issue that has to be resolved.

The plan for the next article is to build the driver and final circuits. This will be a copy of the existing Heath circuit. I would like to be able to drive a signal through the change-over relay, the driver and the finals into a dummy load.

This is an after thought that I may incorporate later. The 12.6AC filament voltage could be rectified into a 13.8Vdc voltage to power the low voltage bus. The original filament circuit was meant to drive 12 vacuum tubes. In my design, the filament circuit is driving 3 vacuum tubes and a 24Vdc relay that draws about 10mA. There should be sufficient 12.6 Vac capacity to drive the solid state circuitry. This is food for thought after some more work is done on the transmitter.

If there are any comments, please feel free to contact me at WB6WXO@SOARA.org