Heathkit Home Brew Project

By Hal Silverman, WB6WXO
SOARA Education Director

.

Now that I am retired, I have more time on my hands than brains in my head. Over the years, I have read articles that other hams have presented about equipment that they have home brewed. So I thought I would try my hand at it. What I decided to do is to make a hybrid HW32A Heathkit single band transceiver. My idea is to replace all of the vacuum tubes with FETs and bipolar transistors. My plan is to leave the driver and the finals as tubes. Hence, the hybrid approach.

The first thing I needed was a HW32A clunker. I found one on eBay and bought it for $25.00. All of the major parts were there but whoever owned it before me had tried to modify it and did a miserable job at it. I gutted the chassis and separated and salvaged the mother board. All of the transformers, and variable inductors were still there and would be used later. I also salvaged the harness and again a lot of that would be used.

Initially to drive the low voltage circuits, I am going to use an Astron 4A, 13.8V power supply. I have several HP23 series Heathkit power supplies for the high voltage part of the rig.

Now to stop and back up a bit! Why Heathkit! That is simple. The old clunkers are available on E Bay; the general parts are also available. There is a web site that has used Heathkit parts for sale Above all manuals for the Heathkit rigs are available. You can almost tune them using a DMM and the front panel meter. .

My general approach is to use a Solderless breadboard and breadboard the circuit first. The next step is to replace the solderless breadboard with a prototype breadboard where the components are soldered in place. The final step is to make a circuit board from either a set of tape and donuts or using the mini cad program that Brian Roode NJ6N recommended.

The biggest obstacle that I can see is scaling the design so that there will be enough drive voltage to have the transmitter deliver 100W to a dummy load. So with that in mind, I bread boarded the mic amplifier and added the transmit/receive changeover relay circuit. That circuit consists of a bipolar PNP transistor to drive the relay when the mic is keyed.

The other item that has been accomplished and installed in the chassis is a

lamp circuit. Since I wanted to use the parts that I have on hand, I used the type 47 bulbs that were designed into the original rig. The 13.8V from the Astron supply is switched through the front panel switch. I used a simple zener circuit and a current limiting resistor that I had on hand for to bring the voltage to 6V. I used a 6 Volt zener rated at 5 watts so that if both bulbs burned out it could handle all of the current. Each of the two bulbs consumes 150mA and I used about 20 mA for the zener.

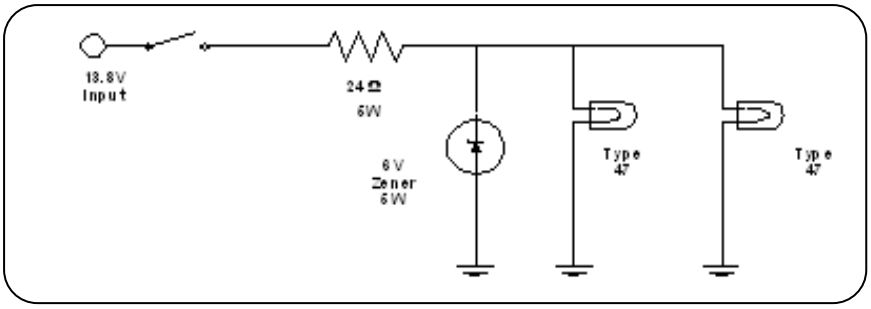

Figure 1
Lamp Circuit Schematic Diagram

The proto board circuits have the mic amplifier, the carrier oscillator circuits, the change over relay circuit installed. I have also installed part of the balanced modulator circuit.

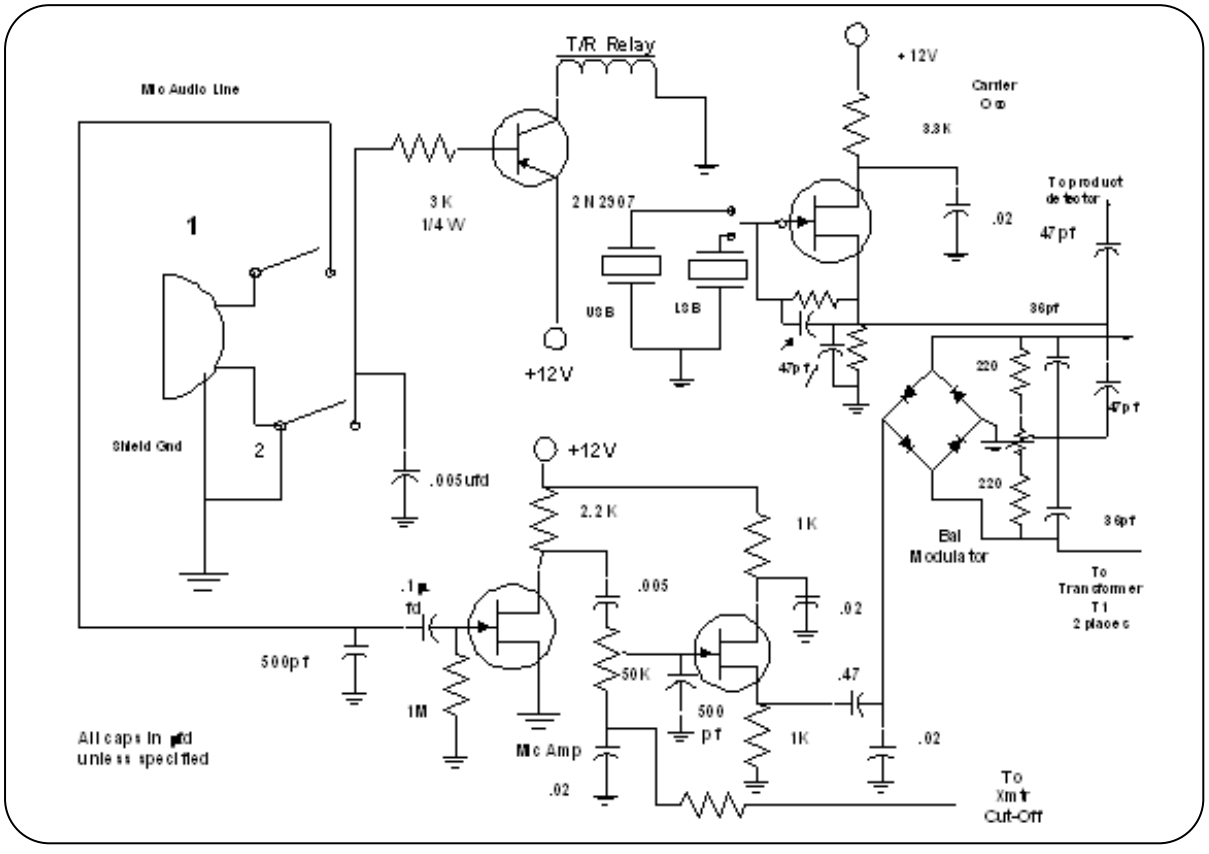

Figure 2
Transmitter Input Circuit

A point of clarification on the circuit in figure 2 is in order. The crystals for the carrier oscillator are located on the chassis and I used the same design scheme that Heath used in the original production unit. All of the capacitor values are the same as Heath used in the original version of the HW32A. The resistors have been scaled for a 13.8V bus voltage for the receiver and transmitter driver circuits.

The plan for the next step is to accomplish the following tasks:

1] The front panel ON/OFF switch has several functions including PTT, TUNE, CAL and VOX. I need to re-route the line from the mic input through this front panel switch to accommodate all of the functions.

Figure 3 is a picture of the front panel and the switch that I am referring to is located on the lower right hand side of the front panel.

Figure 3
HW32A Hybrid Front Panel

2] I also plan to breadboard the VFO and the heterodyne oscillator circuits. I would also like to accomplish building and testing the transmitter mixer circuit. The VFO will use the same variable capacitor and variable inductor that was used in the original HW32A. I need to make sure that the VFO is stable.

3] The transmitter mixer will use an MC1496 IC. This product is readily available from most electronic parts houses. I have also been able to download application notes from the internet.

4] If I could have a low power signal that puts out a few milliwatts between 14.2Mhz to 14.35 MHz, that would be an accomplishment.

5] The mic amplifier uses a 2N5484 N Channel FET as the amplifier and a second one for a source follower driver.

6] The carrier oscillator also uses a 2N5484 N Channel FET as the device for the oscillator.

7] A 2N2907 bipolar transistor is used for the change over relay circuit.

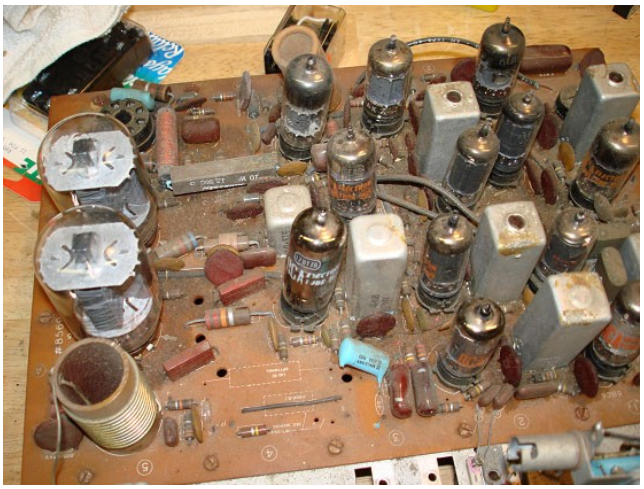

Figure 4
Original Mother Board of HW32A

Figure 4 shows the HW32A mother board as I received it from the seller on E-Bay.

Figure 5 is the chassis with a piece of copper clad board mounted on the chassis ready to accept proto boards.

The process that I am using is to use a solderless breadboard and test that part if the circuit before assembling it on a proto board.

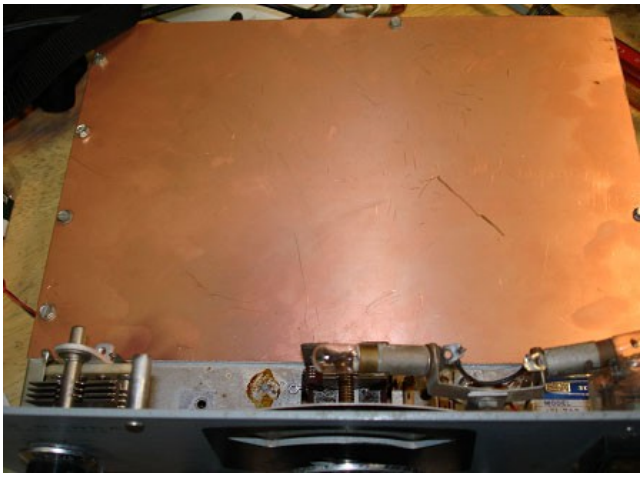

Figure 5
Chassis with New Mother Board

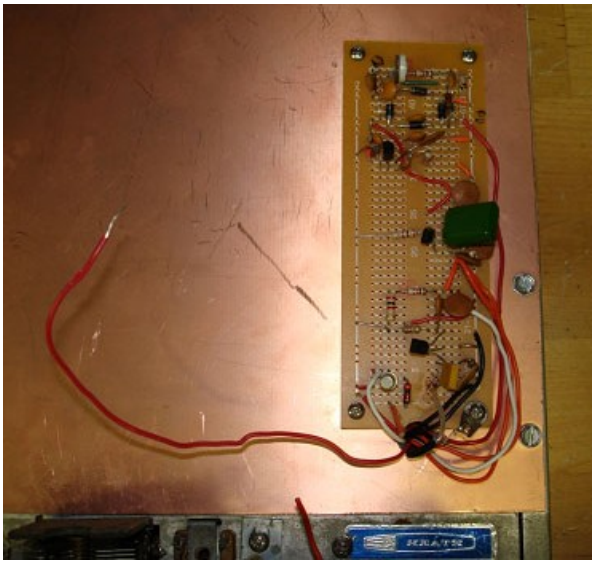

Figure 6
Chassis with Mic Amplifier Circuit

I feel that it will take the best part of the year to complete the prototype. If all works out then, I will have a circuit board fabricated.

I will present a progress report in two months.

If you have any questions, please let me know. I can be reached at WB6WXO@SOARA.org