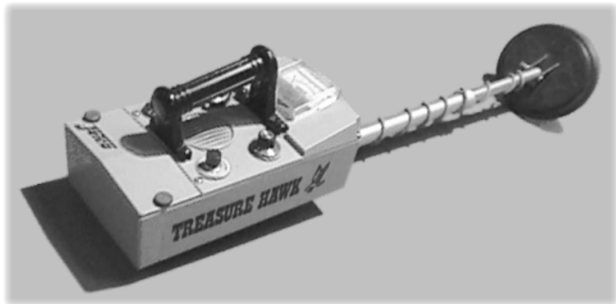
Jetco
TREASURE HAWK



During the early hobby years of metal detecting Jetco was a prominent name. Not because it produced high-quality state-of-the-art designs - it did not - but because it was widely advertised and reasonably affordable. In later years as other brands introduced more advanced T/R detectors, Jetco faded from the magazines but was still sold in nationwide department and catalog stores. Thus it became a popular beginner's detector, the first and often only exposure some had to the metal detecting hobby. In the end - which came in the late 70's I believe - Jetco introduced blue aluminum-boxed White's look-alikes, including a basic T/R unit, but by then everyone else was producing much more powerful units with discrimination and ground balancing.

Jetco was, in fact, my first metal detector. Like many who bought one, I quickly exhausted myself digging mostly garbage and a very few coins. This is the downfall of buying an overly cheap detector as a first: those who become disillusioned by the poor performance of such a unit will often abandon the hobby. Some, like myself, do a little more research into other available brands and move on to something better. Other hobbies, such as astronomy with its telescopes, suffer similar problems with mass-produced low quality equipment.

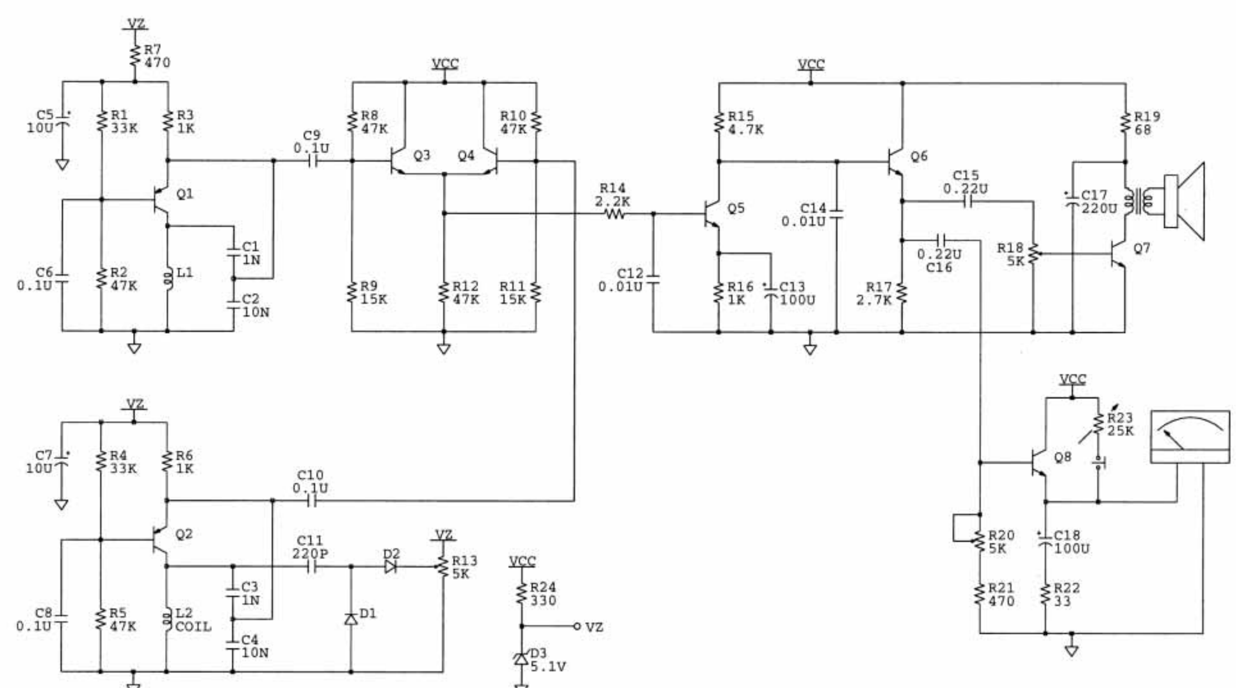


Figure 1

So what is the Treasure Hawk? It is an extremely simple BFO design using a total of 8 transistors. The schematic is shown in Figure 2 and is easy for any hobbyist to replicate and get working. Transistors Q1 and Q2 form the two standard Colpitts-style oscillators, Q2 being the search oscillator with the search coil as the tank inductor. Both oscillators run at roughly 500KHz. The search oscillator also adds a few extra components - namely D1 and D2 plus potentiometer R13 - which give it a little bit of tunability. It's a safe bet that D1 and D2 are varactor diodes, that is, diodes that have a depletion capacitance that decreases with increasing applied voltage. These types of diodes are always operated in a reverse-biased configuration, and tuning potentiometer R13 provides the applied voltage that changes their capacitance. C11 provides AC-coupling to the oscillator so the whole thing appears to be an additional parallel capacitance to C3-C4. Note that the two oscillators are run from a 5v zener regulated supply. This keeps them off of the same supply as the audio amp, a good practice.

Mixer Q3-Q4 applies the beat frequency to Q5 with R14-C12 forming a 7200 Hz low-pass filter. Q5 is the primary amplifier and has a gain of roughly 130, assuming VCC is a 9v supply. R15-C14 is another low-pass filter set to ~3300 Hz and Q6 is a buffer which drives both the audio amp and the meter. R18 is the volume control and Q7 is the audio amp which drives the audio transformer. Q8 is another buffer (actually, it rectifies) which drives the meter and R20 is the sensitivity control. Sensitivity in this case means how sensitive the meter is to beat frequency, not how sensitive the detector is to metal. Finally, there is a battery check momentary switch with R23 being an on-board trimmer pot to set the full-scale current for the 9v battery.

The transistors used are not critical. Oscillator PNPs can be 2N3906s and the NPNs can be 2N3904s with the exception of Q7. The audio transistor needs to be a little beefier than the others, although a TO-220 style device is probably overkill. Coil L2 is 6" search loop probably made of multiple turns of coated magnet wire. L1 is any inductor which roughly matches the inductance of the coil. The values of C1-C2 can be changed to accommodate a mismatched L1. The four capacitors C1-C4 are really the most critical devices in the circuit, type not values. They must be highly stable devices versus temperature and humidity. Polystyrene is an excellent choice but they are a little hard to find. Other good choices are mylar, metallized film, and polypropylene. Using ceramic disc for these will result in severe drift problems, but ceramic disc can be used for the other caps except the polarized ones which are electrolytic.