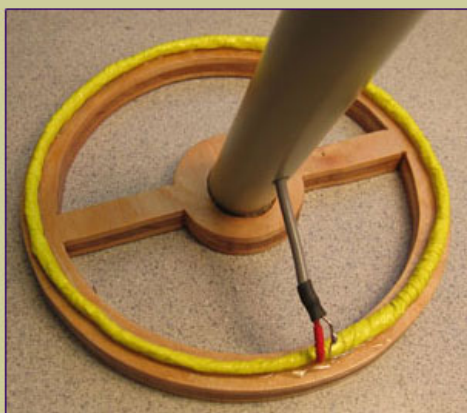


## BFO Metal Detector (Beat Frequency Oscillator):

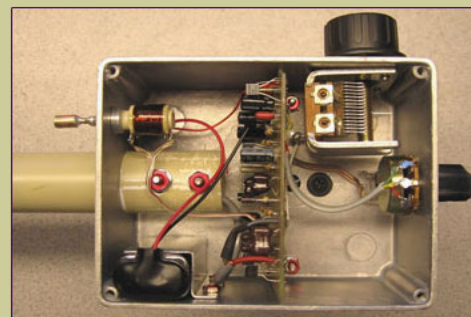


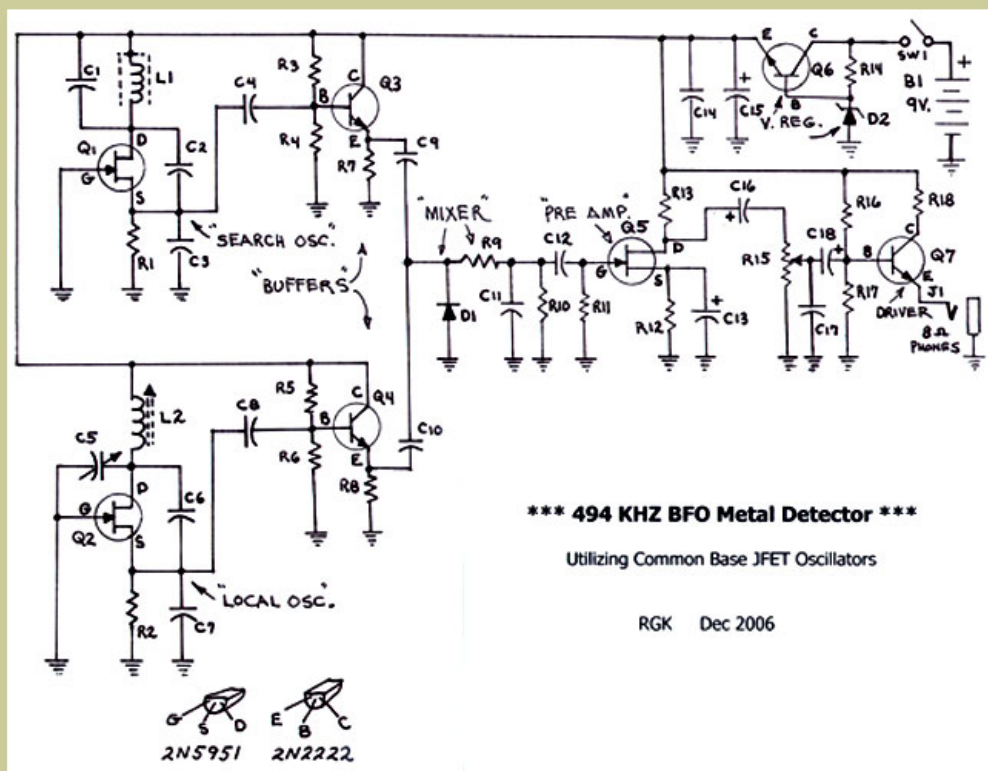
### Description:

This metal detector is of the older variety, however, very sensitive. It is not extremely temperature stable and as such will require that you allow it to adjust to the relative temperature in which you are using it. Beyond that, it is extremely sensitive and capable of detecting very small objects at a depth of at least 8 inches. The oscillators in this circuit operate just below the bottom end of the AM Broadcast Band at a frequency of 494 KHZ. Although this is a bit high for a BFO metal detector, it allows for the finding of very small objects such as small rings and coins.

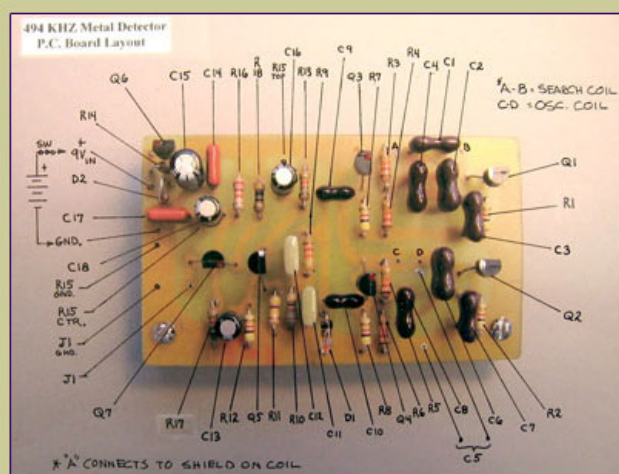
### How it Works:

One JFET oscillator working with the search coil operates around 494 KHZ. The other oscillator operates at about 494.1 KHZ. Although you cannot hear either of these..... the difference is about 100 HZ which is produced in the mixer stage. As metal is brought near the search coil... the frequency shifts a bit, producing an audible frequency shift that can be heard in the earphones. A following stage, amplifies the audio signal and drives the 8 ohm earphone.





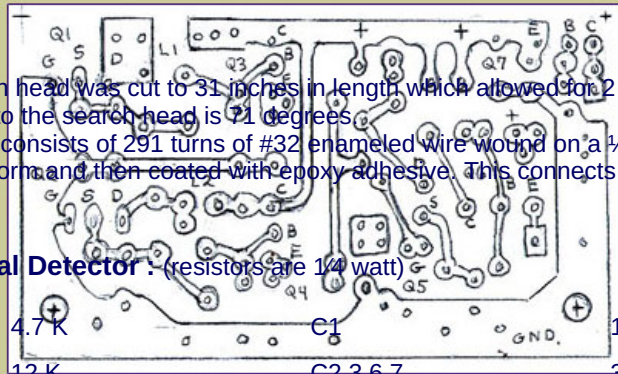
To operate the detector: Adjust the frequency of the local oscillator by adjusting the slug in L2, then adjust variable capacitor so that a low audio frequency of around 40 to 300 HZ is heard. When this tone shifts....the detector coil has just passed over a metallic object. This circuit employs buffer stages to isolate the outputs of each oscillator from each other, thus eliminating oscillator pulling which greatly increases sensitivity. It takes practice to use this unit, however the results can be quite rewarding. The lower that you can set the frequency with the variable capacitor ....the more sensitive it is to detecting underground objects.



## Construction:

PC Board: 3 1/4 long by 1 7/8 inches wide. The aluminum case is 4 1/2 long by 3 1/2 wide by 2 1/4 high. Search Coil: This is composed of 22 turns of #28 enameled wire wound on a 6 1/4 inch diameter form and then wrapped in tape...followed by a wrapping of aluminum foil as a shield. The aluminum foil should only go around about 355 degrees and should not again touch itself. This would produce an rf short. Now wrap about 8 inches of tinned #20 wire around one end of the aluminum foil and connect this to one end of the coil. This connection will go to point "A" on the pc board, the other end of the coil goes to point "B".

The PVC pipe for the search head was cut to 31 inches in length, which allowed for 2 inches to go into the aluminum case. The angle to the search head is 71 degrees. The local oscillator coil, L2, consists of 291 turns of #32 enameled wire wound on a 1/4 inch diameter ceramic, adjustable ferrite slug, coil form and then coated with epoxy adhesive. This connects to points C and D on the PC board.



#### Parts List for the 494 KHZ Metal Detector : (resistors are 1/4 watt)

R1,2,7,8,12	4.7 K	C1	10 pF *(Mica)
R3,4,5,6,9	12 K	C2,3,6,7	330 pF *(Mica)
R10	47 K	C4,8	.001 uF *(Mica)
R11	470 K	C5	12-24 pF Variable
R13,17	5.1K	C9,10	100 pF
R14	560 Ohms	C11,12,14,17	.047 uF
R15	10 K Pot.	C13	47 uF / 35V
R16	22K	C15	100 uF / 35V
R18	47 Ohms	C16,18	22 uF / 35V

\* Or any other high quality, stable capacitor device.

L1 (The search coil) 22 turns of #28 enameled wire on a 6 1/4 inch diameter. This coil also has an aluminum Faraday shield. (see text)

L2 (The local osc. coil) 291 turns of #32 enameled wire on a 1/4 inch diameter Ceramic form with an adjustable ferrite core. Coil windings are over a 1/2 inch length and then covered with epoxy resin.

Q1,2,5	2N5951 JFET Transistors
Q3,4,6,7	2N2222 BJT Transistors
D1	1N34 or 1N270 Germanium Diode
D2	6.8 Volt Zener Diode (1W)