Tuned Active Receiving Antenna For 10 to 200 KHz.

I have had an interest in VLF for some years now. The first thing that I ever heard were the navigation signals on around 10 KHz when I was experimenting with a ferrite rod and lots of copper wire in an attempt to bug my parents telephone as a young schoolboy! I was fascinated, to be quite honest the experience scared the hell out of me. It wasn't until several years later that I put two and two together and actually realised hat I had been listening to. If I were to repeat the experiment now I probably wouldn't hear a thing as the treble response of my hearing has undoubtably been impaired over the years.

Since the Age of 18, I have lived mainly in high rise accommodation and so antennas for HF receive have always been somewhat of a compromise. I have found that indoor antennas DO NOT WORK in high rise buildings due to lots of attenuation from concrete and steel. Interference from TV timebase and the like is also much worse indoors. During the past few years I have tried Frame Aerials, Ferrite rod aerials, I even tried the lightning arrestor at one point (not bad but difficult to resonate and a bit lethal in a thunderstorm!) and active whip aerials.

A one metre whip in free space will develop a fair signal voltage, even on VLF but there is next to no current ie the impedance is high. A means of matching to 50 ohms is required. This can be accomplished by transformer matching but results will not be as good as amplifying the signal at source. I did consider a tuned version of this antenna but the inductors tend to get a little large! The antenna is good down to at least 10 KHz and is a few dB down at 200 KHz. You may like to experiment with the filtering to see if Long wave and Medium wave may be covered but do beware that the greater the bandwidth of the antenna, the more likely that undesirable interaction between stations will occur (cross mod) due to non linearity in the amplifying stages.

Circuit Description.

The whip which is 1 to 1.5 Metres in length is connected to the gate of TR1 a field effect transistor in common source mode which has a very high input impedance and a moderately low output impedance (around 1 Kilohm in this case). The gate leak resistor R1 is of sufficiently high resistance as to be of little consequence. The amplified RF is developed across R3. R2 biases TR1. C1 helps to limit the high frequency response of the amplifier. The output at the drain of TR1 feeds emitter follower TR2 via a low pass filter consisting of R4 and C2. This stage has a voltage gain of just less than one but a high current gain such that the output impedance is lowered to a few ohms. Feed to 50 ohm coaxial cable is taken from the emitter of TR2 via R6 and C7, resistive matching and DC blocking respectively. R6 and C8 also form another low pass filter to help with cross modulation.

12 Volts is fed to the amplifier via R7, C4, C5 and C6 a line noise filter. And that's it. Obviously it needs a remote 12 volt PSU. Something along the lines of a 3 VA transformer and a 78L12 should be more than adequate as the unit only draws a few milliamps.

No alignment is necessary but placement is important. An outdoor location away from power lines and sources of interference is a must if good operation is to be realised. If the unit is mounted on a metal pole or mast then connect a ground wire from the unit to the metallic structure.

Components

R1.....10M. Metal Oxide.

R2.....2K2.

R3.....4K7.

R4.....10K.

R5.....1K.

R6.....56 ohm.

R7.....100 ohm.

TR1....2N3819.

TR2....BFY51.

C1.....560pF.

C2.....33pF.

C3.....2n2F.

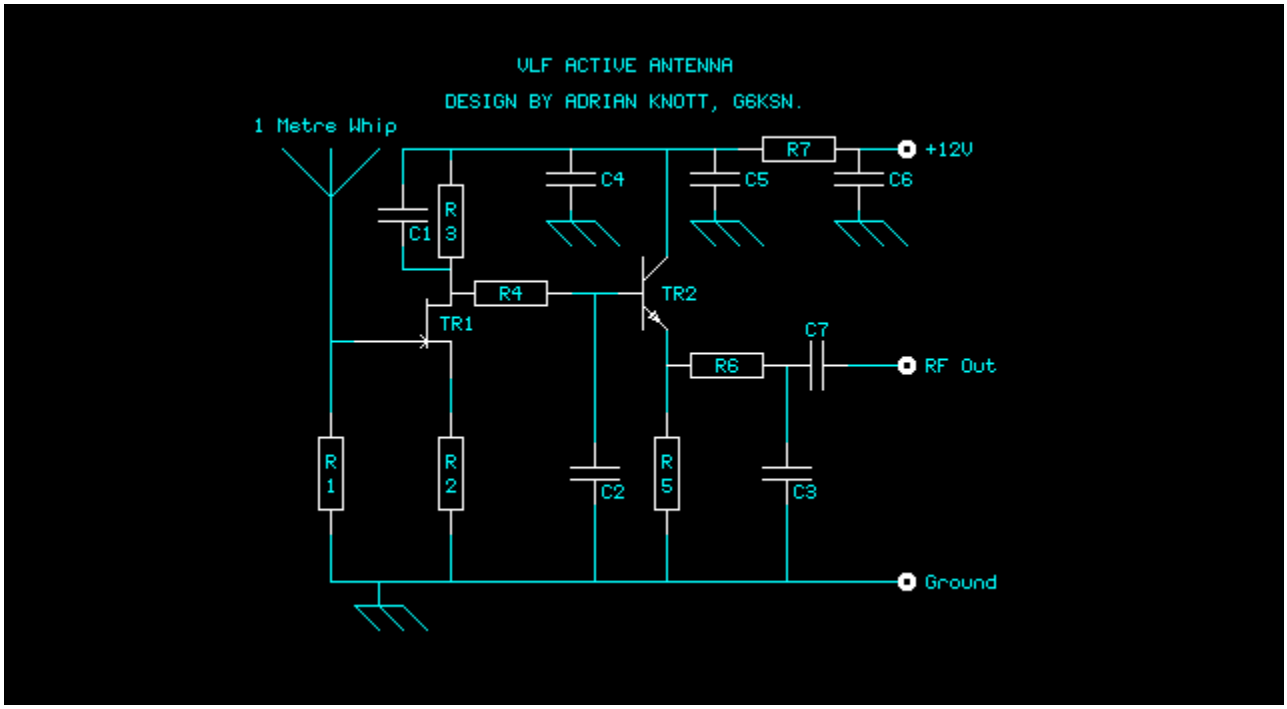
C4.....100mF. 16 Volt.

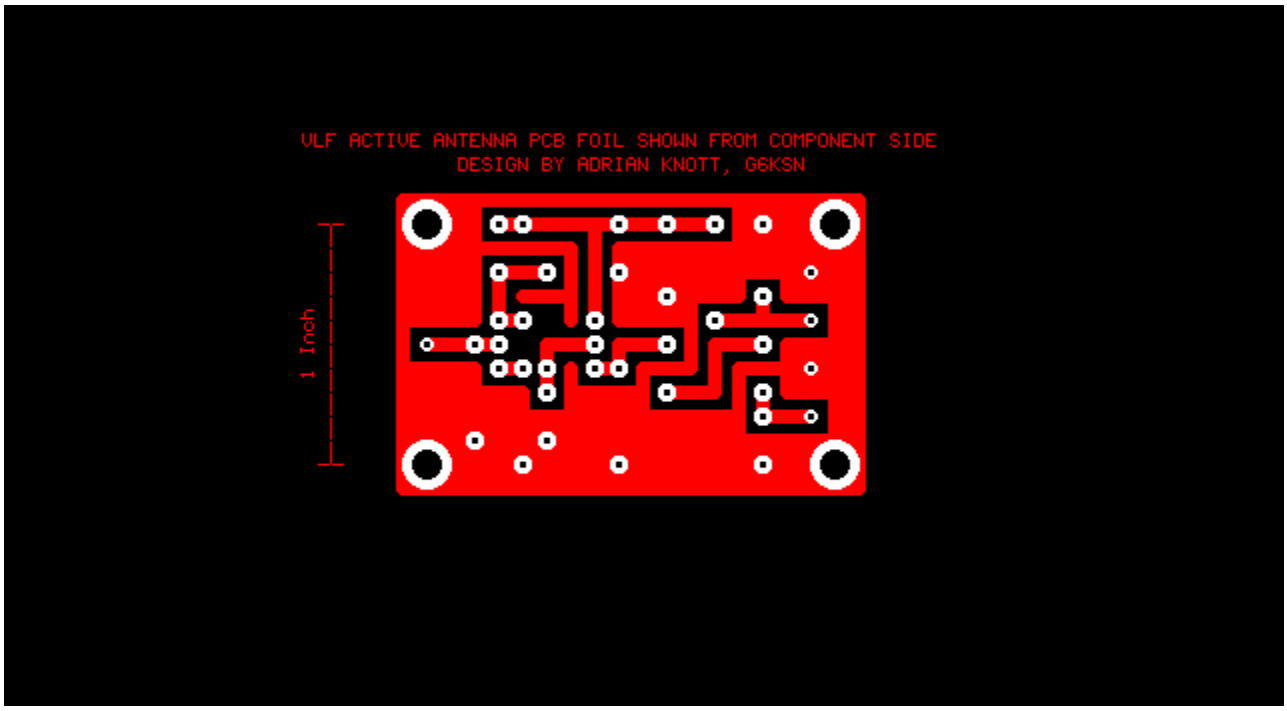
C5.....100nF.

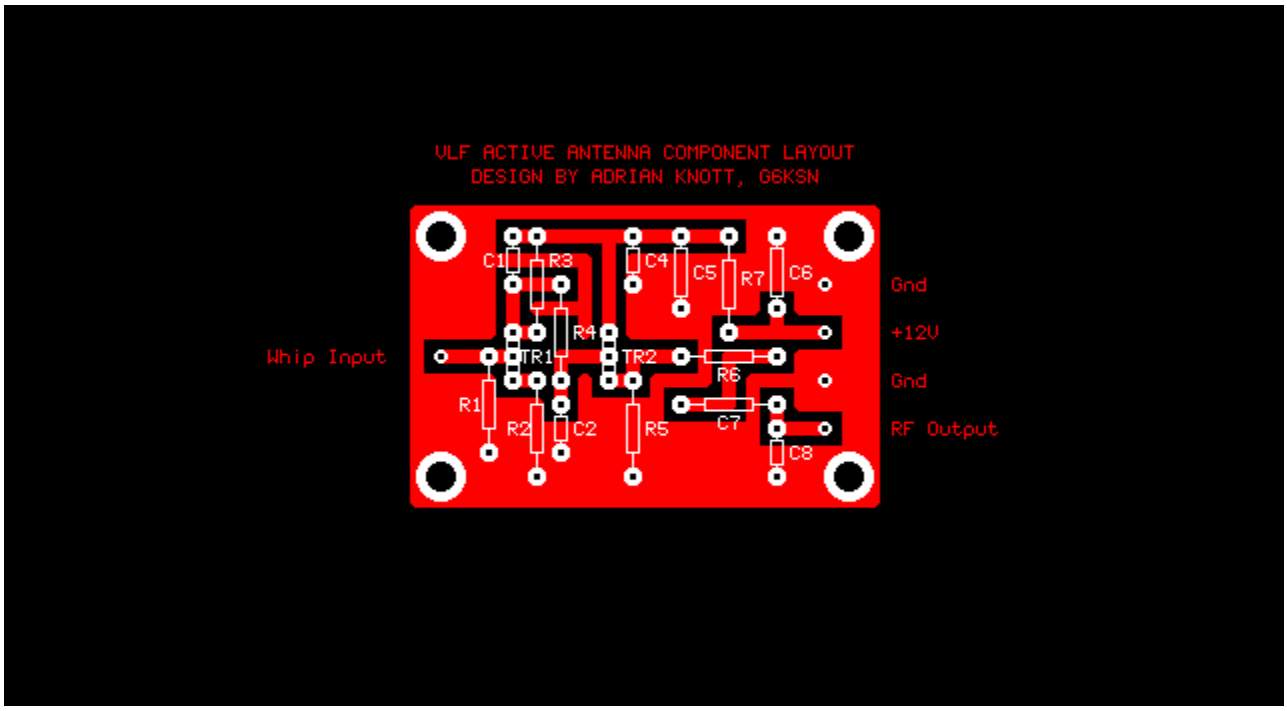
C6.....100nF.

C7.....470nF.

Whip...Telescopic 1.5 metre.


VLF ACTIVE ANTENNA
DESIGN BY ADRIAN KNOTT, G6KSN.
1 Metre Whip
R7
+12V
C4
C5
C6
C1
R 3
R4
TR2
TR1
C7
R6
RF Out
R 1
R 2
C2
R 5
C3
Ground


VLF ACTIVE ANTENNA PCB FOIL SHOWN FROM COMPONENT SIDE
DESIGN BY ADRIAN KNOTT, G6KSN
1 Inch



73's from Adrian, G6KSN, QTHR.

Happy listening!