Foxhunt Offset Attenuator

When your closing in on the fox you may find the signals to be so strong that you can no longer find a peak or null with your antenna. Sometimes the signal is so strong that the RF will leak straight into the radio, connections and other equipment making the antenna useless. The solution is to use an offset attenuator. The circuit consists of a small RF generator, in this case 4MHz, which will mix with the incoming fox signal (such as 146.52MHz) and produce new signals at plus and minus the fox signal (142.52Mhz and 150.52Mhz). A potentiometer on the board changes the injection level of the RF generator which in turn attenuates the incoming mixed signal to your radio to a level where tracking can continue.

TIP: This project also makes a nice generic crystal oscillator for the basis of a QRP radio or other multiple uses. Before inserting the crystal, solder in a machine pin header (not included) in order to put in various crystal frequencies.

Parts List:

Qty	Reference	Description	Markings
3	C2 C3 C4	Cap Disc 220pF .1"LS	221
1	C1	Cap Disc .1uF 3mmLS	104
1	C5	Cap Disc 15pF .1"LS	15
1	D2	Diode 1N4148	
1	D1	LED 5mm	
2	R2 R5	Res 2K2	Red-Red-Red-Gold
1	R1	Res 1K	Brown-Black-Red-Gold Sub 2% Brown-Black-Red-Red
1	R3	Resistor 1M 1/4W	Brown-Black-Green-Gold
1	R4	Res 4K7	Yellow-Violet-Red-Gold
1	RV2	Trimmer 20K 6mm Horiz	204
1	X1	Xtal 4MHz HC49s	4.0000
1		PCB Foxhunt	
1	Q1	Transistor FET MPF102	MPF102
1	RV1	Pot 10K Horiz .2"LS	A-1929
1	P1	9V Battery Clip	
3	P2 P3 9V	Terminal Blocks 5mm 2 pin	
1		LED Bezel 5mm	
1		Knob	A-5098(green)/A-327(red)
1		Bag 3x4"	
1		Switch Toggle SPST	
0.25		Wire 22ga Red Strnd	

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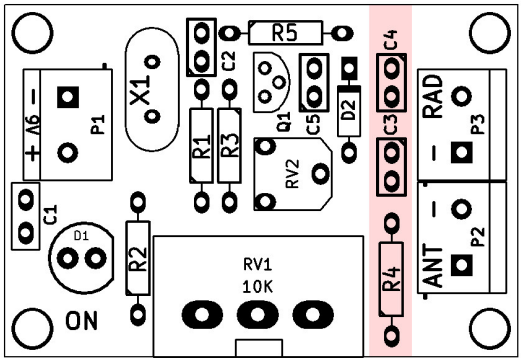
PCB Assembly

1. Install, solder and clip the excess leads on the following components:

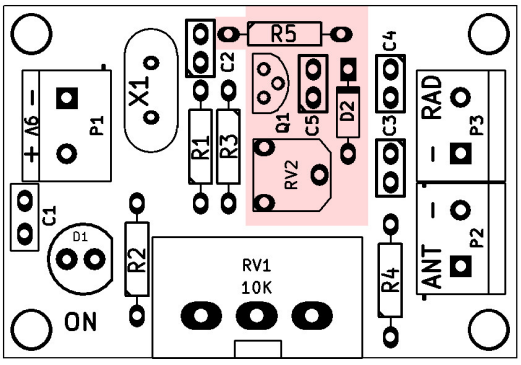
[ ] R4	Resistor 4.7K ohm	Yellow-Violet-Red-Gold
[ ] C3	Capacitor 220pF	221
[ ] C4	Capacitor 220pF	221



a)

2. Install, solder and clip the excess leads on the following components:

[ ] D2	Diode 1N4148	Observe the band position.
[ ] C5	Capacitor 15pF	15
[ ] Q1	Transistor MPF102	Align the flat side of the transistor to the flat side on the PCB.
[ ] R5	Resistor 2.2K ohm	Red-Red-Red-Gold
[ ] RV2	Trimmer 20K	Set trimmer to <u>counter-clockwise position</u>. Note: RV2 may be a tight fit. Gently wiggle into position.



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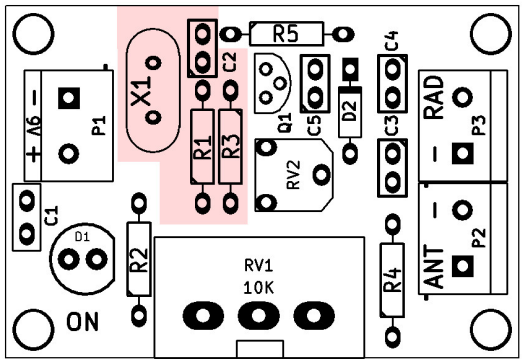
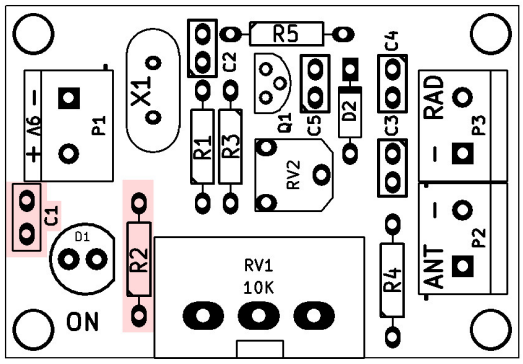
3. Install, solder and clip the excess leads on the following components:

[ ] C2	Capacitor 220pF	201
[ ] R3	Resistor 1M ohm	Brown-Black-Green-Gold
[ ] R1	Resistor 1K ohm	Brown-Black-Red-Gold
[ ] X1	Crystal 4.000MHz	



4. Install, solder and clip the excess leads on the following components:

[ ] R2	Resistor 2.2K ohm	Red-Red-Red-Gold
[ ] C1	Capacitor .1uF (100nF)	104



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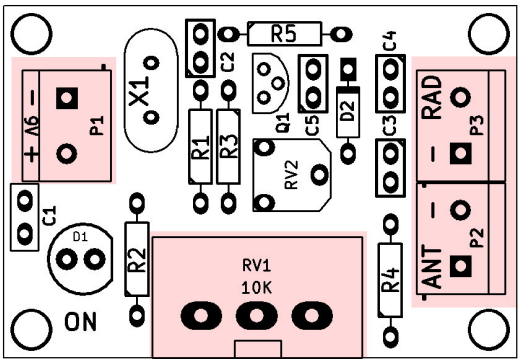
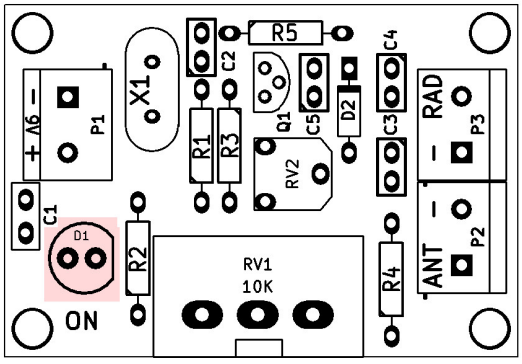
5. Install, solder, and clip the excess leads on the following components:
   a) Slide 2 terminal blocks together using the pins and grooves on the sides of the block. Solder the combined block at P2 and P3. Make sure the wire insertion area is positioned AWAY from the board. Once soldered, unscrew the screws until they are flush to the top of the block.
   b) Insert a terminal block at position P1 using the same technique as above.
   c) Insert the 10K potentiometer at RV1. Keep as perpendicular to the board as possible when soldering. Install the knob on the potentiometer.



6. Install the LED as follows:
   a) Position the LED with the flat spot (short lead) is on the right. Insert the LED bezel over the LED. Bed the LED leads downward 90 degrees where it exits from the bezel.
   b) Place the leads into position D1 on the PCB. Adjust the height to 1/2" between the PCB and the center of the LED. The LED shoud be aligned with the center of the potentiometer shaft. Apply a small amount of solder to 1 lead. Check spacing and adjust as needed. When spacing is correct solder both leads and trim the excess. Note: You may wish to perform the final and adjustment of the LED when placing the PCB inside a chassis. The bezel may also be removed until chassis build.

c)



This completes the PCB Assembly.

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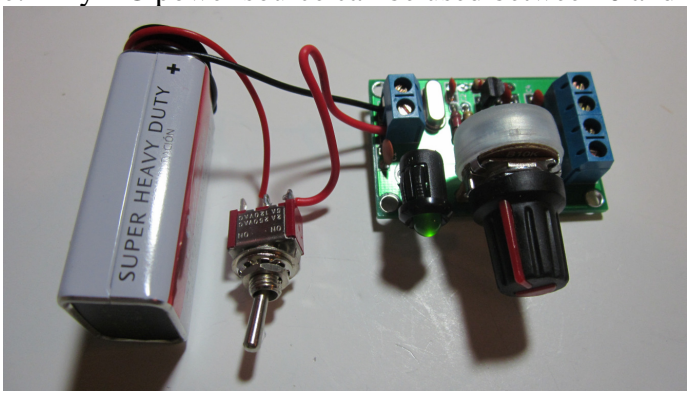
Power Wiring & Initial Testing

1. Strip and tin 1/4" of insulation from each end of the 9V battery clip wires.
2. Connect the 9V battery clip negative (black) lead to the terminal block P1 negative connection. Note: you may need to loosen the terminal block screws in order to insert the wires.
3. Solder the 9V battery clip positive (red) lead to the center terminal of the toggle switch.
4. Strip and tin 1/4" of insulation from each end of the supplied red wire.
5. Solder one end of the red wire to one of the toggle switch end terminals.
6. Connect the other end of the red wire to the terminal block P1 positive connection.
7. Connect a 9V batttery to the battery clip. The LED should be lit. Using an Oscilloscope a 4MHz signal up to 200mV can be seen at the Antenna and Radio terminal as RV1 and RV2 are turned. Alternatively, a signal should be heard when placing the unit near an HF radio tuned to 4MHz using a short piece of wire attached to either the radio or antenna terminals.

*Note: Any DC power source can be used between 6 and 12V.



Chassis Assembly (Parts NOT included in kit)

For best performance it is recommended to use a metal enclosure to keep stray RF to a minimum. A plastic box, cookie tin, coffee tin, or even mount straight on the antenna could also be used. Below is a list of possible material and example of final assembly.

Materials Needed (may vary with build and not included with kit):

QTY	Description
1	Enclosure 2"w x 2"d x 1"h (50.8mmx50.8mmx25.4mm) or larger
1	9V Battery or 6-12V power source
1	1" Double Sided Sticky Tape
2	RF Connectors, Chassis Mount BNC or UHF
8	4-40x1/2" (or 6-32x1/2") screws with lock washers (for SO-239)
2	#4 solder lugs (for SO-239 Ground)
6”	Coax RG-174

1. Lay out, drill and deburr Holes for potentiometer, LED, Switch and RF Connectors. Try to keep the RF connectors as close together as possible.

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a) SO-239 Rf Connectos – 5/8" hole (I used a step drill) with a 9/64 drill for the 4 mounting holes. Drill the 5/8" hole fist. Then using the SO-239 as a template, mark and drill the mounting holes.
b) The LED mount is spaced .75" from the potentiometer (center to center) using a 1/4" hole.
c) Potentionmeter stop notch is 5/16" (7.9mm) from the center of the shaft using a 1/8" drill bit. The pot uses a 1/4" hole
d) Switch stop notch is 1/4" from the center using a 3/32" drill bit. The switch uses a .25" hole.

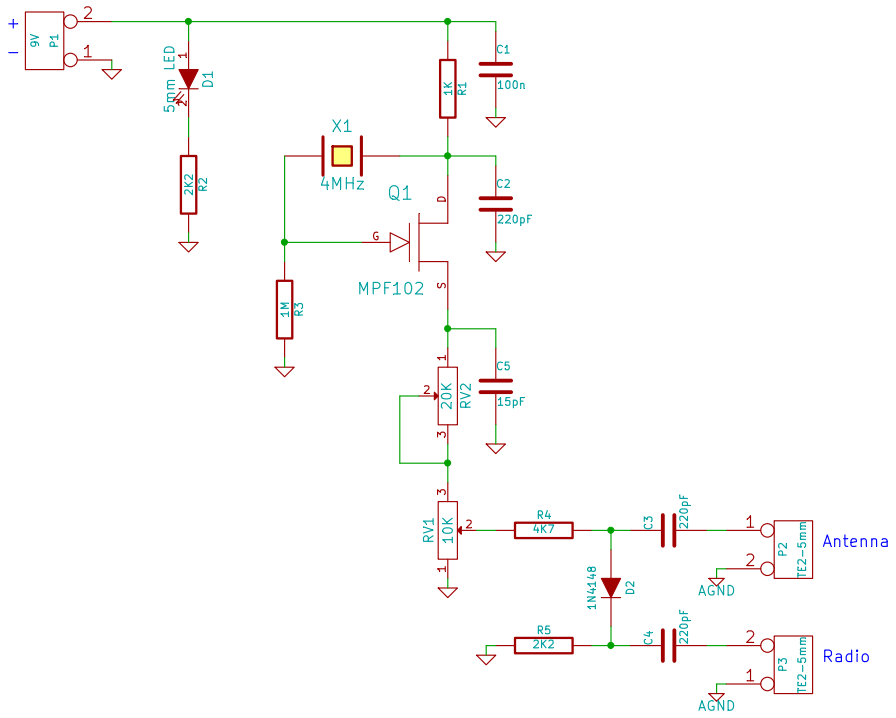
2. Attach the 2 SO-239 Connectors to the chassis using the 4-40 or 6-32 screws. Attach a solder lug to one of the screws on each connector.
3. Attach the On/Off switch to the chassis.
4. If the connectors are within an inch of the PCB, cut short lengths of wire from the Antenna, Radio, and Ground terminals on the PCB. For longer lengths short pieces of coax should be used. Note: IF the RF connectors are mounted on a metal chassis and the lead lengths are short then the groun wire to the PCB is not needed.
5. Install the LED mount into the chassis. Mount the PCB to the chassis using the Potentiometer nut and washer. Snap the LED into the LED mount.
6. Solder the following:
   a) Wire/coax from the Antenna terminal block to the Antenna RF connector.
   b) Wire/coax from the Radio terminal block to the Radio RF connector.
7. Attach the 9V Battery. Use double sided sticky tape to attach the battery to the chassis. Place lid on chassis.

Using the Offset Attenuator

WARNING!! DO NOT TRANSMIT with the offset antennuator in place! Damage to your radio and attenuator may occur!

TIP: Practice, adjust, and set up your equipment using a fixed frequency, like the National Weather Service. It's a great way to find your beam antenna peaks and nulls.

1. Connect a directional antenna, such as a tape measure beam, to the Antenna jack on the offset attenuator.
2. Connect a receiver to the Radio jack on the offset attenuator.
3. Tune the radio 4MHz ABOVE OR BELOW the fox frequency. For example, if the fox is on 146.52MHz then tune the radio to either 150.52MHz or 142.52MHz.
4. Adjust the pot until the fox is barely audible. Sweep the antenna to look for a peak or null to find the fox.
5. You may find the RV1 pot to not be sensitive enough to attenuate depending on your equipment, fox, etc. In these cases set the RV1 pot to mid position. Then adjust trimmer RV2 clockwise where desired attenuation occurs.
6. Right on top of the fox and need even more attenuation? Try higher multiples of 4MHz. For the example above use 154.520MHz 158.520MHz, 162.520Mhz, etc.



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Size: USLetter Date: 4 jun 2015	**Rev: 5**
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Pot Drill: 9/32"
Pot Tab hole: 7/64"
LED Hole: 13/64 or 7/32

Bottom of PCB to
Center of POT&PED: .560" or 9/16"

Mounting holes are #4

Toggle Switch hole size: 15/64"