

3rd Planet Solar /  
KC9ON



Amateur Radio and Electronic Hobby Kits, Parts, and Accessories

# FOX HUNT OFFSET ATTENUATOR V6 smd





When you're 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.

## Parts List:

| Section | QTY | Ref      | Description                        | Markings       |
|---------|-----|----------|------------------------------------|----------------|
| FINAL   | 1   |          | Enclosure Custom Fox6 Assembly     |                |
| FINAL   | 2   | J1,J2    | Connector RF BNC Female Chassis    |                |
| FINAL   | 1   |          | Wire 24gA Solid Bare (102mm)       |                |
| FINAL   | 4   |          | Hardware Spacer 3D Fox6            |                |
| FINAL   | 4   |          | Hardware Screw SMS #4 x 3/8"       |                |
| FINAL   | 1   | RV1      | Hardware Knob KN136 Red<br>16x12mm |                |
| HAND    | 1   | X1       | Crystal HC49/s 4.000MHz            |                |
| HAND    | 1   | SW1      | Hardware 8mm Switch Cap            |                |
| HAND    | 1   | SW1      | Switch DPDT-8mm Latching           |                |
| HAND    | 1   | BT1      | Battery clip 9V                    |                |
| HAND    | 1   | RV1      | Potentiometer 10K                  |                |
| HAND    | 1   | D1       | LED 3mm Red                        |                |
| SMD     | 1   | PCB      | PCB Fox6smd                        |                |
| SMD     | 1   | R1       | Resistor SMD 1206 5% 1K            | 102 or<br>1001 |
| SMD     | 3   | R2,R5,R6 | Resistor SMD 1206 5% 2.2K          | 222 or<br>2201 |
| SMD     | 1   | R3       | Resistor SMD 1206 5% 1M            | 105 or<br>1004 |
| SMD     | 1   | R4       | Resistor SMD 1206 5% 4.7K          | 472 or<br>4701 |
| SMD     | 1   | C1       | Capacitor SMD 1206 .1uF            |                |
| SMD     | 2   | C2,C5    | Capacitor SMD 1206 15pF            |                |
| SMD     | 2   | C3,C4    | Capacitor SMD 1206 220pF           |                |
| SMD     | 1   | D2       | Diode SMD SOT-23 MMDB914           | 5D             |
| SMD     | 1   | Q1       | Transistor SMD JFET MMBF5457       | 6D             |

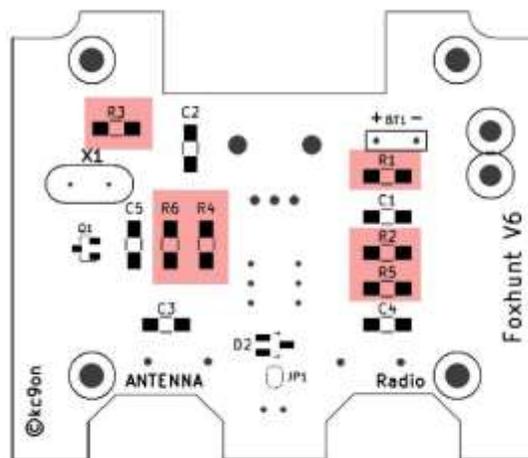
**PLEASE NOTE:** Do not take components out of their bags until they are needed, as invariably they will get lost. Many SMD Capacitors are typically not marked, by removing them from their Tape or Compartments too early, will result in the only way to tell the apart is by measuring them.

## Equipment Required:

- Low Wattage soldering iron with a fine tip- Temperature control is useful
- Thin solder (60/40) less than .7mm dia, .4mm preferred
- Flux pen
- Magnifying glass
- Fine pointed tweezers
- White tray to hold components while soldering
- Vice or PCB holder to keep the board steady while soldering
- Oscilloscope, frequency counter, or shortwave radio capable of receiving 4.0MHz (optional)

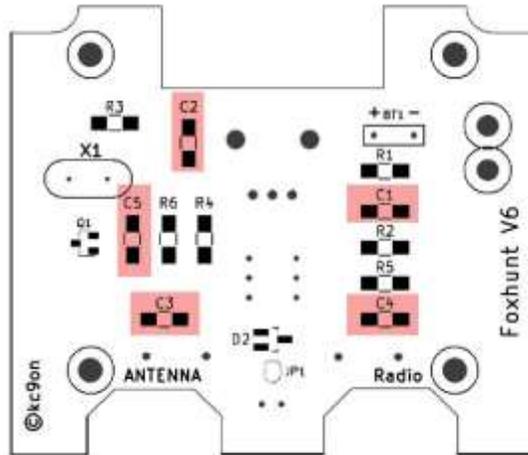
1. Install the following SMD components:

|                          |    |                           |             |
|--------------------------|----|---------------------------|-------------|
| <input type="checkbox"/> | R1 | Resistor SMD 1206 5% 1K   | 102 or 1001 |
| <input type="checkbox"/> | R2 | Resistor SMD 1206 5% 2.2K | 222 or 2201 |
|                          | R5 |                           |             |
|                          | R6 |                           |             |
| <input type="checkbox"/> | R3 | Resistor SMD 1206 5% 1M   | 105 or 1004 |
| <input type="checkbox"/> | R4 | Resistor SMD 1206 5% 4.7K | 472 or 4701 |



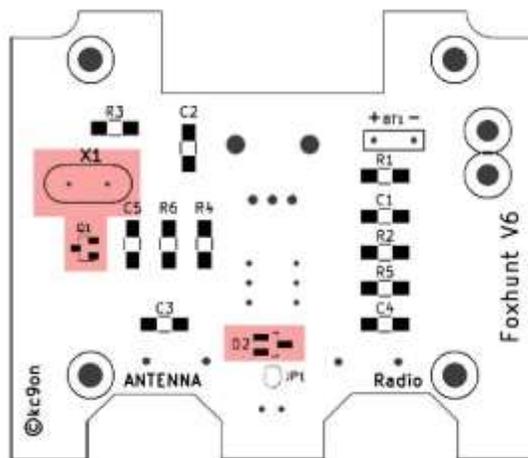
2. Install the following SMD components:

|                          |    |                          |
|--------------------------|----|--------------------------|
| <input type="checkbox"/> | C1 | Capacitor SMD 1206 .1uF  |
| <input type="checkbox"/> | C2 | Capacitor SMD 1206 15pF  |
|                          | C5 |                          |
| <input type="checkbox"/> | C3 | Capacitor SMD 1206 220pF |
|                          | C4 |                          |



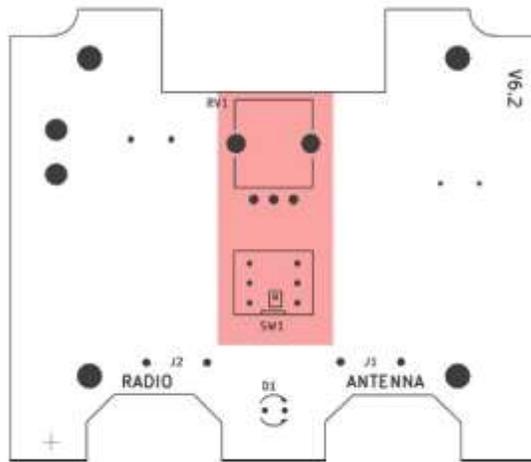
3. Install the following SMD components:

|                          |    |                              |    |
|--------------------------|----|------------------------------|----|
| <input type="checkbox"/> | D2 | Diode SMD SOT-23 MMDB914     | 5D |
| <input type="checkbox"/> | Q1 | Transistor SMD JFET MMBF5457 | 6D |
| <input type="checkbox"/> | X1 | Crystal HC49/s 4.000MHz      |    |



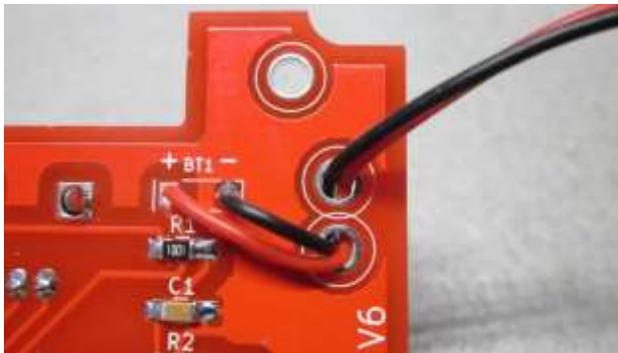
4. Install the following components on the OPPOSITE side of the PCB:

|                          |     |  |
|--------------------------|-----|--|
| <input type="checkbox"/> | SW1 | Switch DPDT-8mm Latching               |
| <input type="checkbox"/> |     | Install the switch cap into the switch |
| <input type="checkbox"/> | RV1 | Potentiometer 10K                      |

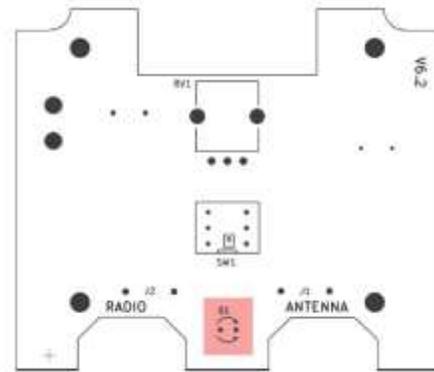


5. Install the following components:

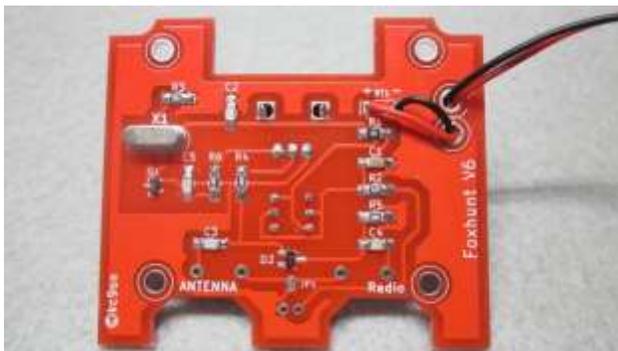
|                          |     |                 |   |
|--------------------------|-----|-----------------|---|
| <input type="checkbox"/> | BT1 | 9V Battery Clip | Route the battery clip wires through the strain relief holes. Then connect the red lead to the "+" position and black lead to the "-" position. Solder and clip excess leads. |
| <input type="checkbox"/> | D1  | 3mm LED         | Orient the flat side and insert – <b><i>DO NOT SOLDER AT THIS TIME</i></b>  |



Battery Wiring



LED Position



PCB Components Side



PCB Controls Side

6. BNC connector preparation:

- |     |   |
|-----|---|
| [ ] | J1 Remove the front panel from the enclosure. Insert a BNC connector into each hole and tighten with supplied terminal lug, lock washer, and nut. Bend each lug perpendicular to the end of the center connector. See Picture Below.  |
|     | ** Pre-tin the grounding lugs before attaching to the panel. You may find it easier to solder by using a little additional flux or scuffing the solder hole with a file or emery paper.   |
|     | ** Place the grounding lugs at a slight angle toward the top of the panel (away from the lettering) to avoid interference with the PCB.   |
| [ ] | Cut 4 pieces of the bare wire to about 25.4mm (1") long. Solder a wire onto each BNC center and ground connection. Insert the 4 wires into the Radio and Antenna holes on the PCB from the controls side (see picture). Make sure the PCB Radio/Antenna silkscreen mates to the front panel markings. <b>DO NOT SOLDER.</b> |
|     | ** The 2 ground wires can optionally be just connected to each other and do not need to be connected to the PCB.  |



BNC connectors and wires – Do not solder until placed in enclosure

7. Final Enclosure Assembly:

- |     |  |
|-----|--|
| [ ] | Place the enclosure top face down. Add a spacer in the 4 PCB mounting holes.   |
| [ ] | Carefully slide the PCB, LED, and front panel into place. Once aligned use 4 of the #4x3/8" screws to secure the PCB. DO NOT OVER TIGHTEN as the screws will easily strip the plastic. Make sure the potentiometer and switch operate freely – some adjustments to the PCB position may be made. |
| [ ] | Aligned the LED in the enclosure hole. Solder the LED and the 4 BNC connection wires in place. Clip off any excess leads.  |
| [ ] | Add a 9V battery to the battery clip and mount inside the enclosure. Secure the enclosure bottom using the 2 large black screws provided with the enclosure.   |
| [ ] | Secure the potentiometer knob to the potentiometer.  |



**This completes the PCB Assembly.**

## Power Wiring & Initial Testing

- [ ] Connect the battery. Press the on/off switch, the LED should be lit when the switch is depressed in the on position.
- [ ] Optional testing and troubleshooting: Using an Oscilloscope, with the ground connected to the negative battery terminal, a 4MHz signal of 0-300+mV can be seen at the Antenna and Radio terminal as RV1 is turned. Alternatively, a signal should be heard when placing the unit near an HF radio tuned to 4.00MHz using a short piece of wire attached to either the radio or antenna terminals.
- [ ] Place the battery inside the enclosure, attach the enclosure rear panel and bottom using the screws provided.

## Using the Offset Attenuator

**WARNING!! DO NOT TRANSMIT** with the offset attenuator 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.

- [ ] Connect a directional antenna, such as a tape measure beam, to the ANT jack on the offset attenuator.
- [ ] Connect your radio to the RAD jack on the offset attenuator.
- [ ] 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.
- [ ] Adjust the pot until the fox is barely audible. Sweep the antenna to look for a peak or null to find the fox.
- [ ] 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.

Example typical attenuation levels:

|                                 | <b>Frequency</b>      | <b>Attenuation dB</b> |
|---------------------------------|-----------------------|-----------------------|
| Attenuator OFF,at fox frequency | 146.52MHz             | 20                    |
| Attenuator ON,at fox frequency  | 146.52MHz             | 6-20                  |
| -/+4MHz Offset                  | 142.52MHz / 150.52MHz | 30-60                 |
| -/+8MHz Offset                  | 138.52MHz / 154.52MHz | 35-70                 |
| -/+12MHz Offset                 | 134.52MHz / 158.52MHz | 60->80                |

