

# BUILDING BROOXES DANDY DOWNLINK

The Xcam2 security camera sold by X10.com is a compact package including a broadcast-quality color camera, microphone, transmitter, and directional antenna. While the package is small, it isn't really suited for use on a KAP rig as is, because its shape is a bit awkward. Furthermore, it requires a 12v power supply and the patch antenna is too directional for KAP use.

Repackaged, the X10 system is useful as a tandem aiming device with a 35mm KAP rig. For use on a digital rig, the X10 camera may be discarded. The transmitter works well to send the video output of the digital camera itself to the ground for use in through-the-lens aiming.

The purposes of this project, then, are to make the transmitting antenna omnidirectional for better reception, to add a compact and reliable power supply which may be driven by the r/c receiver's 4.8v battery, and to repackage the whole thing in an even more compact form for use on a KAP rig.

**NOTE:** It is against Federal Communications Commission regulations to modify the performance of any transmitter or antenna from the condition in which it was licensed. So what you are about to do is illegal.

## PARTS & MATERIALS

- 1 Xcam2 Camera/Transmitter
- 1 assembled Maxim 4.8v to 12v converter board,  
per separate instructions
- 1 project box, 3" x 2" x 1" (Radio Shack #270-1801)
- 2 36mm pieces of #14 solid copper wire
- 2 3" pieces of 1/8" heatshrink tubing
- 1 1" piece of 1/16" heatshrink tubing
- 2 3" pieces of 1/2" plastic electrical tape
- 1 6" servo extension
- 1 1/8" stereo jack (Radio Shack #274-246)

## TOOLS

pencil-point soldering iron & resin-core solder  
desoldering braid (Radio Shack #64-2090)  
metric ruler  
small diagonal cutters  
heat gun or some such to shrink tubing  
1/4" and 5/16" drill bits with drill  
sharp knife  
hot glue gun & glue

Desirable, not essential: nibbling tool (Radio Shack #64-823)

## ANTENNA CONVERSION

I learned this conversion from David (Geach) McGeachy's web site, [www.bird-shots.com](http://www.bird-shots.com). Very helpful. The pix are his, used by permission, with my thanks.

1. Remove and discard the bottom of the Xcam2 housing by removing four screws. Cut the power cord, leaving about 1-1/2" connected to the board. Cut the five tiny wires to the camera as long as possible above the board. Save the plastic grommet from the wires. Set aside or discard the camera.

2. With diagonal cutters, cut just enough off one corner of the patch antenna's plastic cover to reveal copper and white antenna within. Carefully insert a knife under the plastic and pry the cover apart. With your diagonals, carefully cut the mounting joint in half to free the antenna lead. Discard all plastic.

3. Using desolder braid and a hot iron, carefully unsolder the antenna lead from the copper plate. The outer shield is soldered to one side of the plate, and the center lead passes through the plate and is soldered on the opposite side. The leads are very light gauge wire, so be very careful not to break any strands, especially on the center lead. **DO NOT CUT ANY WIRE!** Leave the plastic grommet on the antenna lead; slide it to the board.

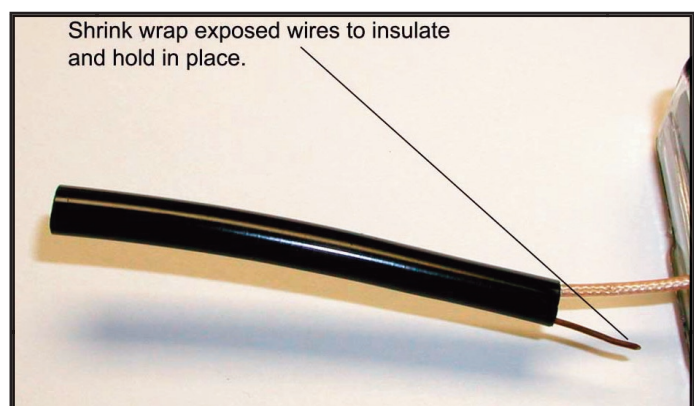
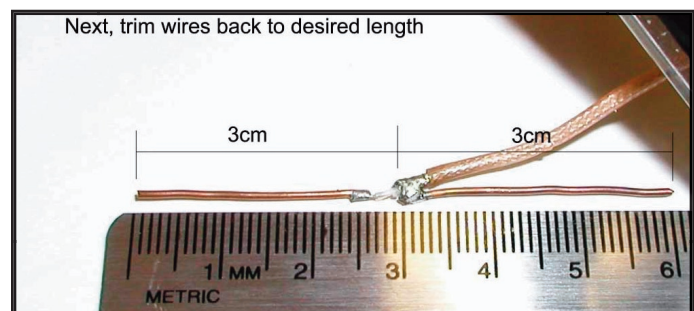
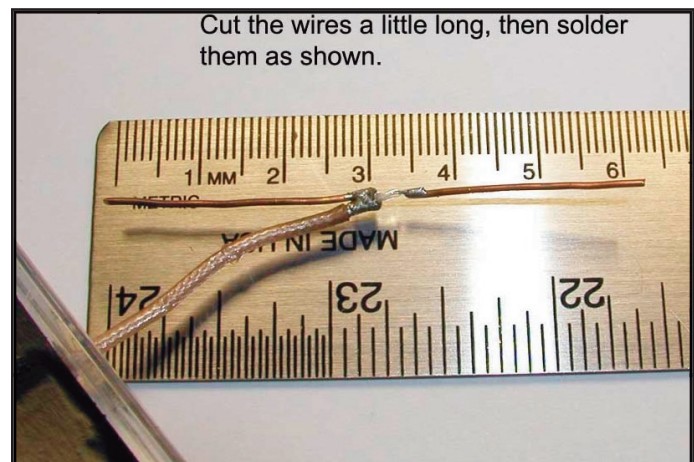
4. Lay one of the two pieces of #14 copper wire flat against the antenna lead, and solder one end to the point where you unsoldered the outer shield.

5. Solder the other piece of #14 copper wire as an extension of the inner conductor. Now you should have the shield wire pointing down along the antenna wire, and the center conductor extension pointing up, directly opposite each other, 180° apart.

6. Carefully measure the lower #14 wire exactly 3 cm from the top of the exposed shield and cut with diagonals.

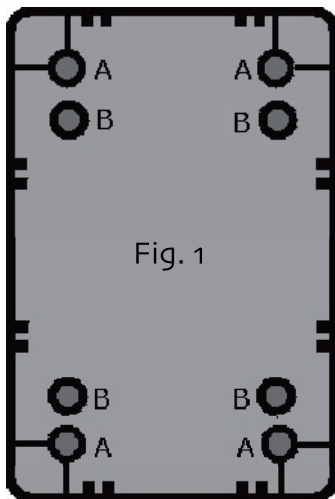
7. Likewise, carefully measure the upper wire from the same point on the shield and cut it to exactly 3 cm. Now you should have two stiff wires extending exactly 3 cm each way from the same point on the antenna wire.

8. Slide one piece of 1/8" heatshrink tube over the whole assembly, nearly to the circuit board, and shrink it in place. Repeat with the remaining heatshrink tube, so you now have a fairly stiff antenna wire with two layers of protection.



## REPACKAGING THE TRANSMITTER

1. See figure 1. Open the RadShack project box; discard the metal cover and screws. Using a 5/16" drill and/or diagonals, remove all four of the corner screw receptacles (A) inside down to 1/4", about level with the circuit board standoffs (B). Trim all plastic webbing along the sides of these screw sockets.
2. Test your box by sliding the Xcam2 circuit board (X) into place at one end of the box (figure 2), with antenna pointing out and channel switch visible. Trim any remaining plastic webs to make it fit snugly.
3. With nibbler or knife or diagonals, cut a slot for the antenna at the end of the box, nearly to the bottom of the box. Test the fit again.
4. Test the fit of the Maxim power converter board (Y) at the other end of the box, with the bottom of the board facing the end of the box and the ground side of the board towards you. Trim any obstructing plastic inside the box; carefully sand the edges of the board if necessary.



5. Shorten the X10 power cable so it's a comfortable length to reach the right end of the converter board. Without cutting through the braided wire shield, remove 1/2" of outer sleeving from the free end of the power cable and strip 1/4" of insulation off each wire. Gather and twist the braided shield wires together, and tin all leads with solder.

6. Remove both boards and solder the red and white leads of the power cable to the 12v out terminal on the converter board, and the black or shield lead to 12v ground terminal.

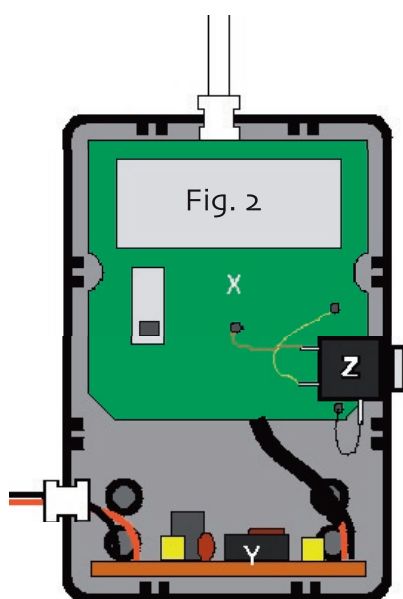
7. Put a healthy blob of hot glue on all small wires where they enter the X10 circuit board for strain relief. Cut the blue and white leads from the X10 camera wires to 3/4" and seal end of each with a short piece of 1/16" heatshrink tubing. These are the audio leads, not needed.

8. Cut the 6" servo extension in half, and strip, remove, and discard the white wire from the female end. Set aside the male end. Insert the wire from the female end into the remaining plastic grommet and strip 1/4" of insulation off each lead. Tin the leads with solder. This will be the 4.8v power cord.

9. Solder the power cord to the input terminals of the converter board, red to + and black to ground.

10. Cut a slot on the lower left side of the box for the power cord and its grommet. Slide all boards into place and secure with small blobs of hot glue. (Keep the glue blobs accessible to a knife in case you ever have to remove the boards.)

11. Find a place for stereo jack Z in the right wall of box with long ground tab pointing towards the converter board. Drill 1/4" hole for jack, install it, and solder leads from X10 board as follows: black to ground, red (12v+) to tip, and yellow (video) to collar.



You'll need to fabricate an adaptor cable to connect your digicam or Xcam2 to the downlink. Use a 1/8" stereo plug at the downlink end of the cable.

If you want to use the X10 camera, connect the camera's wires to a 1/8" stereo plug as follows: red to tip, yellow to collar, black to ground. Seal the ends of the blue and white leads with 1/16" heatshrink as before. This wiring configuration will supply the X10 camera with 12v.

With a digicam, no power is necessary. BE SURE that when you wire the connecting cable to either type of camera that you connect video to the collar, not to the tip of the plug. The tip is unused in the digicam configuration, but as this downlink is configured, you can use either kind of camera interchangeably as long as the connecting cable is wired right.

12. Remove enough of the flange from the lid so that it fits snugly on the box. Drill a 1/4" hole in the lid to provide screwdriver access to the channel switch. Tape the lid in place with the two pieces of plastic tape.

Using the remaining male half of the servo extension, split the output of your rig's power switch to serve both the r/c receiver and the video transmitter.

Attach your repackaged video link to the fixed frame of your rig with Velcro®, with the antenna pointing down. Don't put it on the tilting frame or you'll change your signal every time you tilt.

It's done! Give it the smoke test — plug it in — and enjoy the view. And keep those batteries charged — the video will fail before radio control will.

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