

# WIRELESS HACKS™

**2nd  
Edition**

*Tips & Tools for Building, Extending,  
and Securing Your Network*



**O'REILLY®**

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HACK  
#56

## Send Power over Your Ethernet

Power your access point without a separate power cable by using free pairs on CAT5.

A number of access point manufacturers (Proxim, Symbol, and D-Link, to name just three) are now offering Power over Ethernet (PoE) add-ons for their access points. PoE modules insert DC voltage into a standard Ethernet cable. The idea is to supply the AP's power and UTP Ethernet connectivity requirements via a single Ethernet cable.

This works great in areas where you might not have power easily accessible, such as a roof. This also allows you to more easily place the AP closer to the antenna, thus reducing signal loss over antenna cabling. Ethernet signal travels well over CAT5 cable; a 2.4 GHz signal doesn't do as well over antenna cabling. Also, Ethernet cabling is much cheaper than antenna cable such as LMR400. This hack demonstrates how to build a simple PoE module pair.

In June 2003, the IEEE ratified the 802.3af standard for Power over Ethernet, which has spurred the release of standards-compliant PoE products. 802.3af defines two types of power source equipment: *end-span* and *mid-span* devices. An end-span device is an Ethernet switch with embedded PoE technology. These switches deliver data and power over the same wiring pairs: 1/2 and 3/6.

We're going to build a pair of mid-span devices, which in the 802.3af specification can be placed between a legacy switch and the device to be powered. A mid-span device has an RJ-45 data input and a power input, and it sends the data on pairs 1/2 and 3/6, while sending power on the unused 4/5 and 7/8 pairs.

### Step by Step

If you have a device such as a VoIP phone or a Soekris PC that will accept Power over Ethernet without a secondary adapter, you will only need to build the power injector in steps 1–3.



Don't try this unless you have some knowledge of electricity. 12v isn't going to kill you, but you might cause serious damage to your access point and other equipment.

1. Solder wires to the DC Male Power Plug. Solder one pair (two wires twisted together) to the inner-contact connection. These will be the positive power wires. Solder another pair to the outer-contact connection. Notice that there are three connectors on this DC male power plug. One is for the center pin, one is for the outer surface, and one goes to the plug housing. You do not need to solder anything to the plug-housing connector. [Figure 4-6](#) shows what it should look like when finished.



*Figure 4-6. The completed power plug*

2. Drill a hole in your two-port mount housing. Mount the male DC plug in the housing, as shown in [Figure 4-7](#).
3. Connect the wires in your two-port jack as follows:

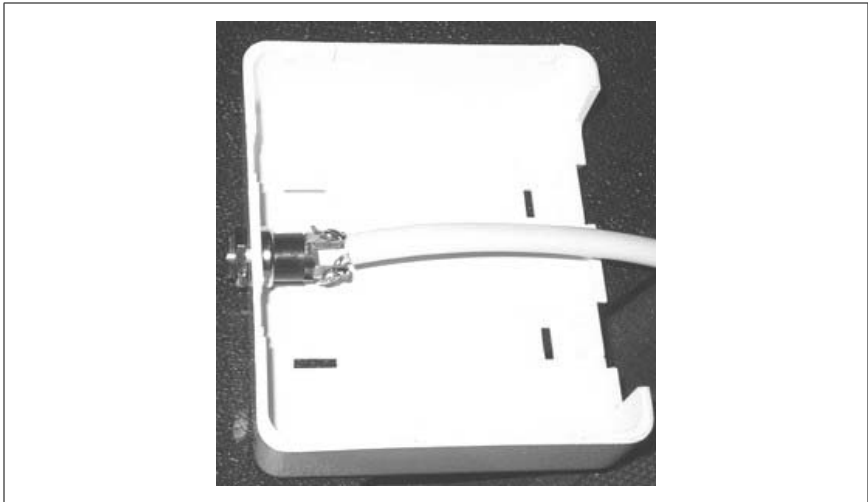


Figure 4-7. The DC plug mounted in the housing

Input jack		Output jack		DC plug
Pin 1	<->	Pin 1		
Pin 2	<->	Pin 2		
Pin 3	<->	Pin 3		
		Pin 4	<->	DC Positive Wire 1 → Center Connector
		Pin 5	<->	DC Positive Wire 2 → Center Connector
Pin 6	<->	Pin 6		
		Pin 7	<->	DC Negative Wire 1 → Outer Connector
		Pin 8	<->	DC Negative Wire 2 → Outer Connector

4. Wire the one port wall mount jack as follows:

Output plug		Input jack		DC plug
Pin 1	<->	Pin 1		
Pin 2	<->	Pin 2		
Pin 3	<->	Pin 3		
		Pin 4	<->	DC Positive Wire 1 → Center Connector
		Pin 5	<->	DC Positive Wire 2 → Center Connector
Pin 6	<->	Pin 6		
		Pin 7	<->	DC Negative Wire 1 → Outer Connector
		Pin 8	<->	DC Negative Wire 2 → Outer Connector

5. Plug in and test. Figure 4-8 shows the completed modules.

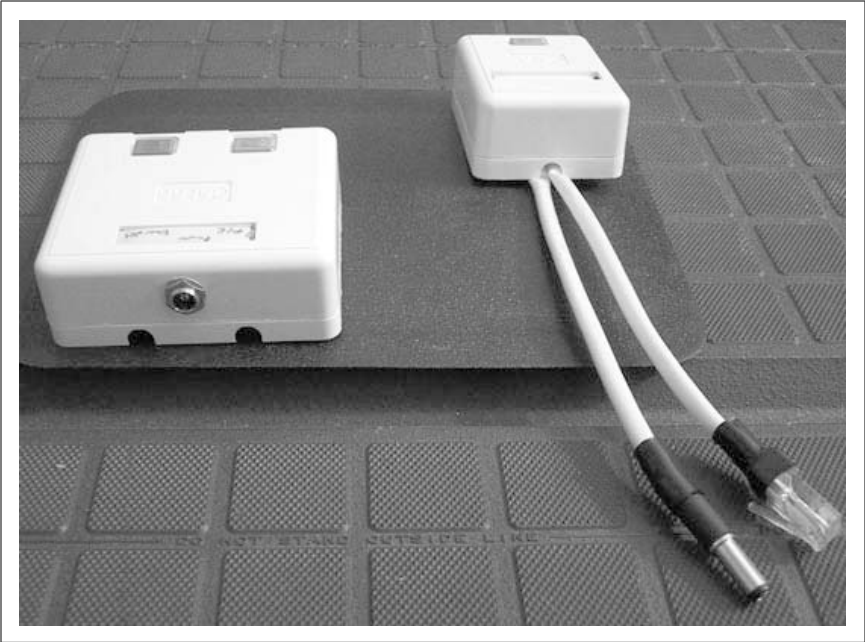


Figure 4-8. The completed PoE modules

## Resistance Is Futile

The DC resistance of CAT5 is about 3 ohms per 100 feet per conductor, so a 250-foot cable has at least 7 ohms resistance. Most of the time, an AP draws much less than 0.8A, so you would still be above 6V at the AP. In fact, the access points typically use linear regulators to drop the voltage down to 5V on their insides, so as long as you're giving them something better than 6V at the terminals, they're likely to work.

There is a good calculator online at <http://www.gweep.net/~sfoskett/tech/poecalc.html> that calculates the voltage drop for a given length of CAT5. Use it to estimate how much power you need to provide at one end of your cable run in order to power your access point.

—Terry Schmidt