Remote DC Power through your Coax Cable

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## Introduction

I often find that I sometimes need to get DC from my shack out to my antenna (remote antenna tuner, remote relay switching, etc.). So I decided to build up a couple of DC IN/OUT boxes to let me inject 12VDC power into the rig end of the coax, and recover the 12VDC at the remote end of the coax cable.

## The Design

Injecting DC onto a coax cable requires good RF isolation between the signal and the DC source, since the DC source will effectively look like a ground, or short, to the RF signal riding on the coax. So you need an inductor that provides a high impedance at RF, and also handles the DC current required.

For the inductor, I chose a Radio Shack RS273-102 100 uhy 2-amp inductor. Unfortunately I found that this inductor becomes series resonant around 11.5 MHz. However, 100 uhy is much more inductance than is necessary to provide good RF isolation at HF. A value of 25 uhy gives excellent isolation from 3.5 MHz on up, and is even pretty good at 1.8 MHz (XL = 283 ohms at 1.8 MHz).

The Radio Shack inductor consists of 50 turns of enameled wire in two layers (25 turns/layer) on a ferrite form. To modify the inductor to 25 uhy, clip the enameled wire lead associated with the top winding and unwind the top row of 25 turns. Now cut off the excess length, and re-solder the enameled wire from the coil to the tinned lead it was originally connected to. This gives you almost exactly 25 uhy. Re-checking the modified inductor, I found that the series resonance point had moved above 70 MHz.

The rest of the design is straightforward. I fused the input at ½-amp, since my remote current requirements would be below this. And I used a 1N4001 diode oriented as shown in Figure 1 to protect against reverse voltage at the input. Both high-and low-frequency bypass capacitors (0.01uf, 0.1uf and 4.7uf) were used on the DC side of the inductors as shown in Figures 1 & 2. On the output box, I put in a 15 volt zener diode to clamp any voltage spikes should they occur. If you plan to operate on 160 meters, you may want to parallel two 0.01 uf capacitors instead of using the single 0.01 uf blocking capacitors shown in Figures 1 and 2. Try to keep your signal-carrying lead lengths as short as possible, though this is not that critical at HF. Figure 3 and photo “Pigtail” shows how I picked off the 12-volts directly from the antenna tuner connector on my IC-706MKIIG.

Refer to the photos “DC In (inside)” and DC In (outside)” to help with your assembly. You’ll see that I used a pig-tail coax cable for the connection to my transceiver. This is obviously an alternative to the SO-239 interface shown on the schematic and in the parts list. I labeled the two boxes with Casio “black on clear” tape. I also used a permanent marker pen to draw an RF/signal flow direction arrow on both boxes. See “DC In (outside)” and “DC Out (outside)”.

For a remote box permanently located outside, build the DC output circuitry into an electrical weatherproof outlet box. The electrical outlet box used here is a 3-hole ½-inch outlet box. The blank panel comes with a weather resistant seal. The outlet box comes with two ½-inch plugs, so you need a third plug – that's the reason I show an additional package of plugs on the optional parts list. All circuitry is built onto the blank cover as is seen in photos "WXproof Inside.jpg" and "WXproof Outside". I also connected a ground wire between the panel and the outlet box ground, though the panel screws are probably fine for providing ground between the two assemblies.

The screws that come with the blank panel are NOT stainless steel, so they will rust over time. Therefore, replace these screws with #6 stainless steel flat-head screws, and also use #6 stainless steel hardware to mount the terminal strip to the blank panel. To weatherproof the DC output cable, punch a ¼" hole in the blank panel and pass the DC cable through it. Apply hot glue to the inside of the blank panel, letting a little hot glue seep through the hole. Then apply epoxy to the outside of the blank panel around the exiting DC cable. Also apply epoxy and/or hot glue around the SO-239 connectors to weatherproof them as well. Finally, install the three ½" plugs into the outlet box.

## Conclusion

This article describes simple circuitry for injecting DC voltage on the rig side of your coax, and recovering the voltage at the other end of the coax. Measured performance is excellent from 1.8 MHz-54 MHz.

## Parts List

| QTY | Description | Source | Price |
|---|---|---|---|
| 4 | 0.01uf 500V cap. | All Electronics 103D50 | 10/$0.60 |
| 2 | 0.1uf 50V cap. | All Electronics 104D50 | 10/$1.00 |
| 2 | 4.7uf electrolytic cap. | All Electronics 4.7uf | $0.10 ea |
| 2 | 100 uhy RF choke | Radio Shack 273-102 | $1.29 ea |
| 1 | 15V zener diode | All Electronics 1N4744 | 15/$1.00 |
| 1 | 5x20mm ½-amp fuse | All Electronics GMA-05 | 5/$1.00 |
| 1 | 5x20mm fuse holder | All Electronics FHPM-45 | 2/$1.00 |
| 2 | Aluminum box | Mouser 563-CU-3000A | $2.63 ea |
| 1 | Terminal strip | Radio Shack 274-688 | 4/$1.29 |
| 4 | SO-239 | All Electronics SO-239 | $1.00 |
| 2 | Grommets | RS64-3025 | 12/$1.99 |
| 2 | Pair Powerpole | www.powerwerx.com | 10 Pair/$9.95 |

Optional for weather-proof outside box:

| | | | |
|---|---|---|---|
| 1 | Outlet box | Red Dot RIH31LM | $3.99 @ Home Depot |
| 1 | Blank Cover | Red Dot RCCB | $0.99 @ Home Depot |
| 1 pkg | ½" plugs | Red Dot S603E | $1.29 @ Home Depot |

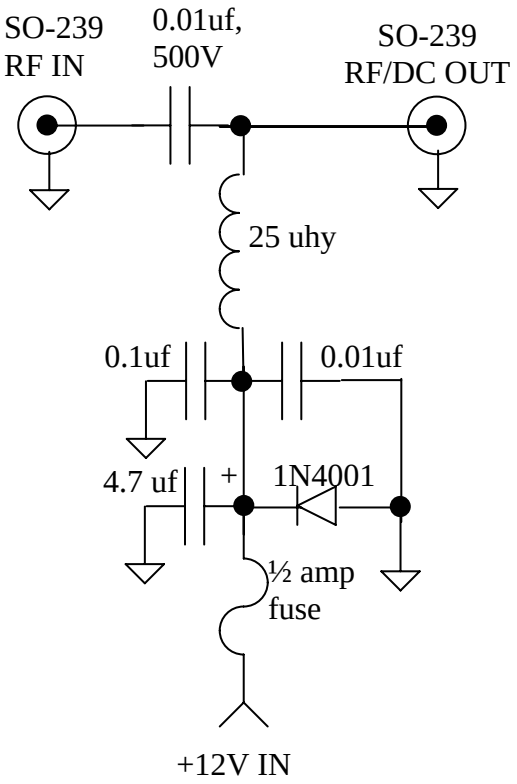



Figure 1 – Inject DC

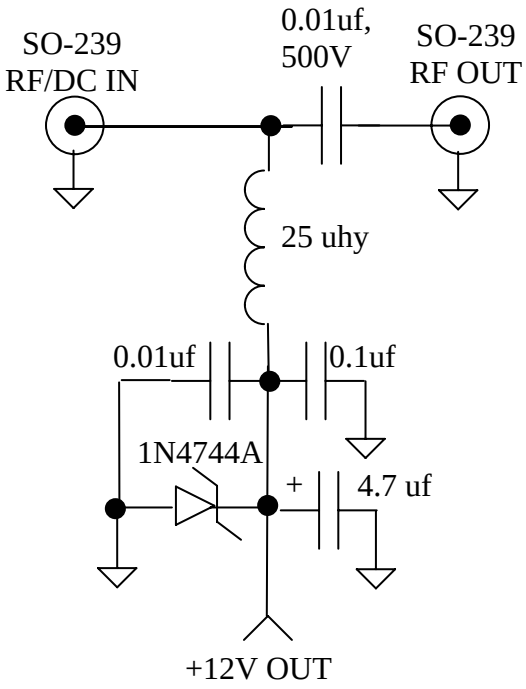
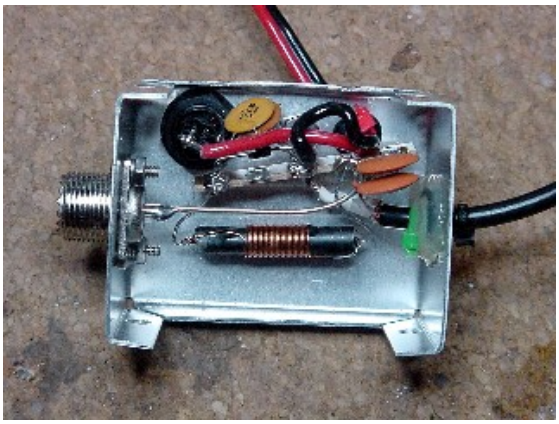
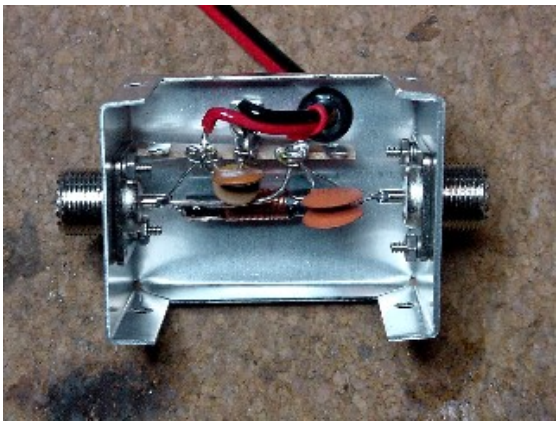



Figure 2 – Recover DC

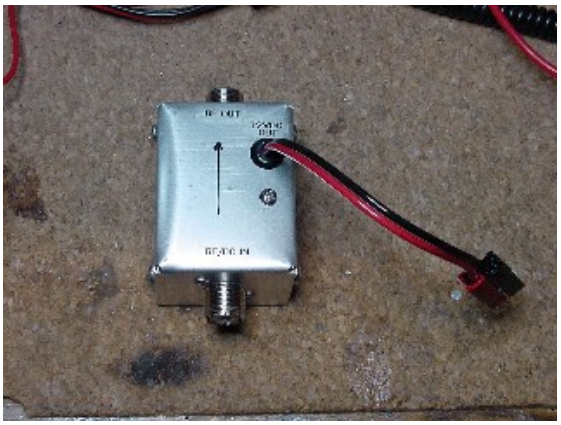


DC In (inside)

DC In (outside)



DC Out (inside)



DC Out (outside)

WXproof (inside)

WXproof (outside)