Air Wound Balun Construction

1:1 Choke Balun

The G5RV is a balanced antenna fed with a balanced 450 ohm line. When feeding this antenna with an unbalanced line (such as coaxial cable), it is a good idea to use a 1:1 choke BALUN at the coax to feedpoint connection.

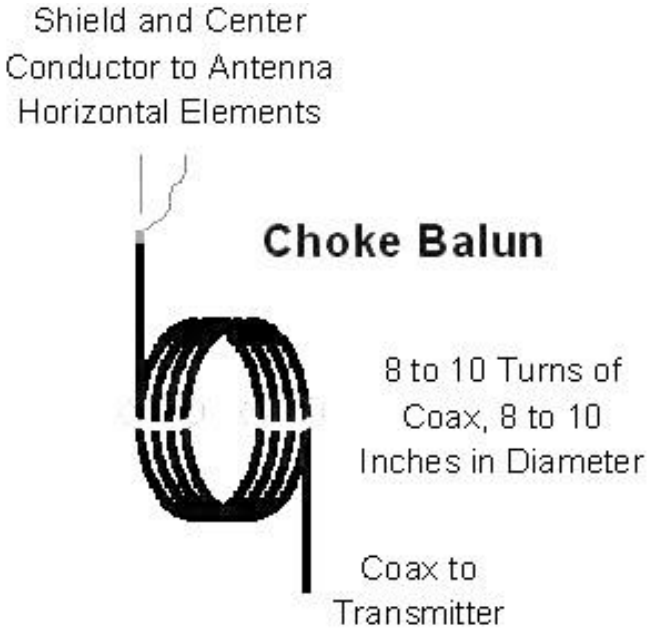
The balun will reduce or eliminate parallel currents on the outside of the coax shield. This will prevent or reduce RFI, RF feedback, RF burns, and other effects of excessive RF in the station.

The best balun for this antenna is an **air-core choke balun**. Avoid using other types of baluns, such as ferrite sleeve or transformer type baluns. This antenna has a high reactive component at the feedpoint SWR of more than 2:1. The high SWR increases loss in ferrites and may cause excessive core heating, core saturation, or arcing in the windings.

The air wound balun required for a center-fed antenna with 450-ohm ladder line can be constructed by winding the coaxial feedline cable in a single-layer solenoid coil with at least 10 turns of 4 to 6 inch diameter. One source suggest 10 turns wound on a 10-inch diameter form.

The turns can be taped or secured by nylon cable ties. The balun can be wound on PVC pipe or any other non-metallic form.

Place the balun immediately at the point where the feedline leaves the air (for 160 meter operation) or at the feedpoint connection (if the antenna is only operated on 80-10 meters). The feedline shield should not be grounded on the antenna side of the balun. The balun should be kept away from any conductive material.



General description

A balun is a device that joins a balanced line. It may have two conductors, with equal currents in opposite directions, such as a twisted pair cable to an unbalanced line. Or, it may have just one conductor and a ground, such as coaxial cable.

A balun is a type of transformer - it is used to convert an unbalanced signal to a balanced one or vice versa. Baluns isolate a transmission line and provide a balanced output.

A typical use for a balun is in a television antenna. The term is derived by combining balanced and unbalanced. In a balun, one pair of terminals is balanced, that is, the currents are equal in magnitude and opposite in phase. The other pair of terminals is unbalanced; one side is connected to electrical ground and the other carries the signal.

Balun transformers can be used between various parts of a wireless or cable communications system. The following list illustrates some common applications.

- Balanced Unbalanced
- Television receiver coaxial cable network
- Television receiver Coaxial antenna system
- FM broadcast receiver Coaxial antenna system
- Dipole antenna Coaxial transmission line
- Parallel-wire transmission line Coaxial transmitter output
- Parallel-wire transmission line Coaxial receiver input
- Parallel-wire transmission line Coaxial transmission line

Baluns can also provide impedance transformation in addition to conversion between balanced and unbalanced signal modes - others provide no impedance transformation.

For 1:1 baluns (no impedance transformation), the input and output are usually both 50 ohms or 75 ohms.

The most common impedance-transformation ratio is 1:4 (alternatively 4:1). Some baluns provide other impedance-transformation ratios, such as 1:9 (and 9:1), 1:10 (and 10:1), or 1:16 (and 16:1).

Impedance-transformer baluns having a 1:4 ratio are used between systems with impedances of 50 or 75 ohms (unbalanced) and 200 or 300 ohms (balanced). Most television and FM broadcast receivers are designed for 300-ohm balanced systems, while coaxial cables have characteristic impedances of 50 or 75 ohms. Impedance-transformer baluns with larger ratios are used to match high-impedance balanced antennas to low-impedance unbalanced wireless receivers, transmitters, or transceivers.

In order to function at optimum efficiency, a balun must be used with loads whose impedances present little or no reactance. Such impedances are called "purely

resistive." As a general rule, well-designed communications antennas present purely resistive loads of 50, 75, or 300 ohms, although a few antennas have higher resistive impedances.

The "balanced" terminals of some baluns can be connected to an unbalanced system. One terminal of the balanced pair (input or output) is connected to ground, while the other is connected to the active system element. When this is done, the device does not operate as a true balun, because both the input and the output are unbalanced. A balun used in this way has been called an "un-un" (for "unbalanced-to-unbalanced").

Some baluns can work as an impedance transformer between two unbalanced systems if there is little or no reactance. But certain types of baluns do not work properly when connected in this manner. It is best to check the documentation provided with the device, or contact the manufacturer, if "un-un" balun operation is contemplated.

Build an All Band HF Air Core

1:1 Choke Balun

A balun's purpose is to allow connecting a balanced, (e.g., a dipole or driven element) to an unbalanced line such as coax which is not balanced, thus the name, Balun. The 1:1 choke "balun" is not actually a balun. It's function is to help eliminate rf currents from flowing on the outside of coaxial cable using the principle of choke action. Another name is air choke.

In transmitting antennas, this is accomplished by presenting a high impedance (resistance), to RF currents flowing outside the coax shield. This forces currents in each side of a driven elements to be equal. This is especially important in beam antennas because it prevents distortion of the beam's pattern caused by unequal currents in the driver(s). In a simple dipole, the balun (choke), assures that the dipole, and not the feed line, is doing the radiating.

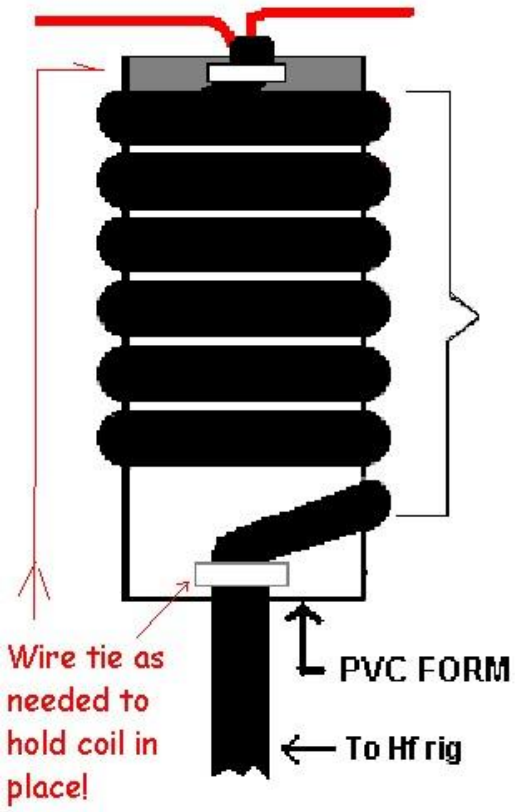
When you connect center fed antennas, like dipoles, V's, triangles, yagis, rhombics, loops and so on, to coaxial cable, unless care is taken, it is not difficult to end up with feeder radiation. Not only can the loss in power be quite significant, but the radiation characteristics of the antenna system will also be seriously compromised. In laymen's terms, it won't be what you are expecting from the pattern of your antenna.

As the feedline becomes part of the antenna, currents can flow from the line into the mains and on TV cables, metal masts and yagi booms, causing a variety of EMI problems that can be very difficult to trace. Frequently these problems are simply due to unbalance - and the solution is the humble air choke.

If an antenna system is fed at center with a parallel conductor line (provided that correct installation procedures are followed) balance will be maintained, USING A BALUN, with currents in equal and opposite phase canceling each other out.

When the connection is to a coaxial cable, WITHOUT A BALUN, this cannot occur because currents flowing inside the cable from the connection to the inner conductor are

separated from those flowing on the outside from the connection to the shield, and the result is unbalance causing feeder radiation. However, if the two electrical circuit elements (antenna and coaxial cable) are coupled using a balun, balance will be maintained.



This is the basic construction drawing for the 1:1 Choke Balun for 160 thru 10 meters using one continous length to the rig starting at the antenna attachment points. Depending on your use, coax connectors can be added or other connectors can be made for different types of antennas. Balun should be located AT the feed point of the antenna or very close. Drawing is not to scale and is only showing one method of winding the coax on a PVC form. The important part of the drawing is the 18 to 21 feet of coax close wound on the form. The number of coils is not important....just the length! Don't wind your coax tight enough to crush the internal insulation.