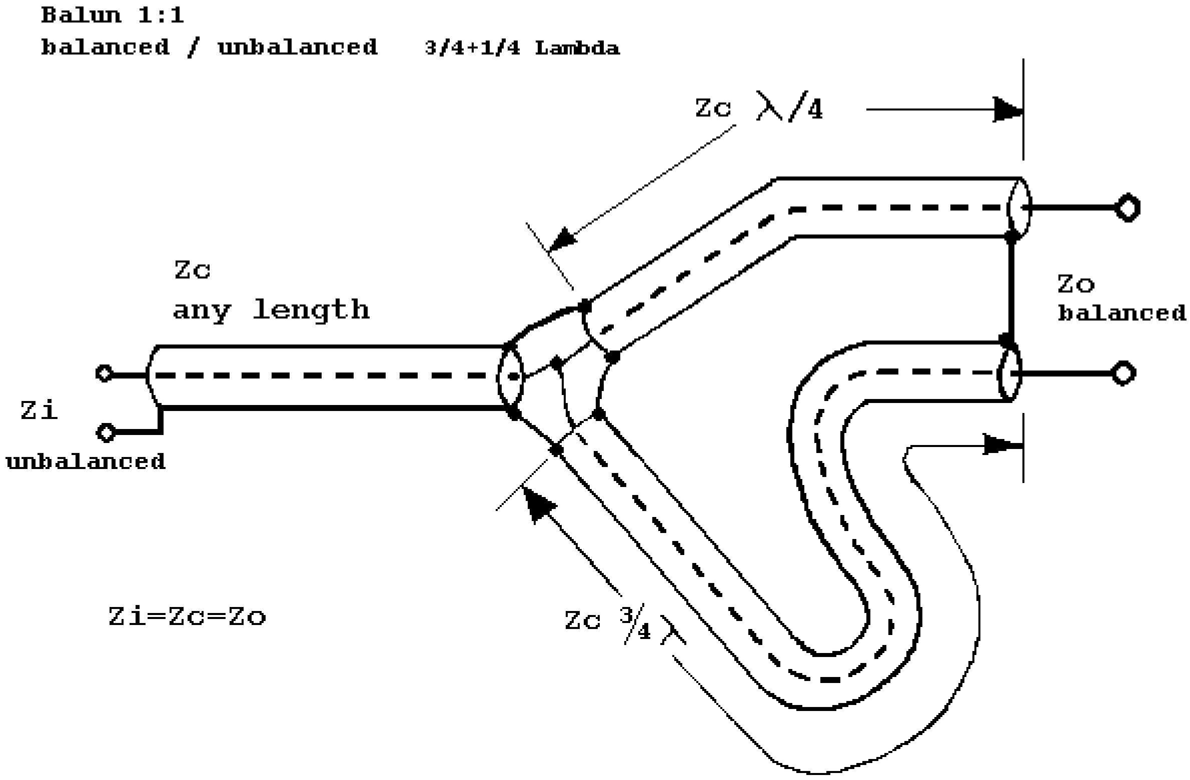
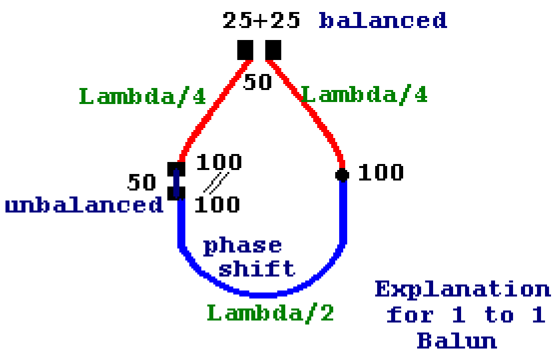
# Coaxial Balun by IØQM




*Revised from a sketch made by I4BBE in the early 70's*

This balun use a ¼ wavelength and the ¾ wavelength adapting sections with the 50-Ohm coaxial cable (Zc), or a coax line with the impedance you need. As the electrical length of both sections include the ¼ wavelength coaxial transformer, and if the unbalanced impedance has the same value of the coaxial cable, then the impedance seen at the other extremes is exactly the same value. For this reasons the name is just 1:1 balun. The length difference between the ¼ wavelength and the ¾ wavelength sections provides for the necessary 180 degrees phase shift as requested from the open dipole radiator. Since the narrow bandwidth, this balun is well suited for the monobander antenna only, and it ideally matches the radiator of the Yagi-Uda VHF/UHF antenna, designed for purely resistive 50 Ohm. Remember to take account of the electrical length of your cable, generally a factor of about 0.659 for most of the cable. So please, use your particular cable specifications. Instead the 1:1 Balun, You can match your 50 Ohm unbalanced Line or with any Zc=Zi unbalanced line to any "balanced" purely resistive Impedance Zo. To do it, replace the ¼ wavelength pair's transformer, with two section of coaxial line at calculated value. This is better explained if you follow the below explanation given as 1:1 balun example.



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As shown in the 144 MHz balun image, the 1:1 balun is done by the
[ ¼WL * Vc ] coax cable section of Zc impedance; and the

[ ¾WL * Vc ] coax cable section of Zc impedance;
which is three folded to obtain the same physical length of the shortest section, this is not the electrical requirements then it is for practical layout convenience only.

"WL" is the Wave Length ; WL = ( constant light speed / frequency )
"Vc" is the Velocity constant of propagation in the coax cable i.e. the electrical length.
"Vc" value is 0.659 for the RG58, please use your particulars "Vc" of your own coax cable.

I used RG58 coaxial cable since I use less than 300 W power. Better is the use of the RG142 Coaxial cable with Teflon dielectric, which handle a power of 2 KW ( at 144 MHz ) with a lower loss also.

You can couple any unbalanced "Zi" to your balanced "Zo" needs, by replacing the two WL/4 pairs transformer "Zc" (red coloured in the balun explanation figure). Even removing them you get the well known 4:1 balun. A very important thing is that you do not need to use any particular "Zc" impedance for the WL/2 section (the blue coloured in the explanation) which is built-in inside the 3/4*wavelength Zc adapting sections, since any WL/2 section do not involve any Z transform. Finally, The mathematical formula for this gear is simply:

**$Zc = \text{sqrt}( Zo * Zi )$** { **Zc,** is the Impedance value you need in the coaxial balun cable }
**$Zo = ( Zc )^2 / Zi$** { **Zo,** is the purely resistive balanced antenna impedance }
**$Zi = ( Zc)^2 / Zo$** { **Zi,** is the final unbalanced value for the Rx / Tx coaxial line }

Practical 1:1 Balun for 144 MHz, ready to use: