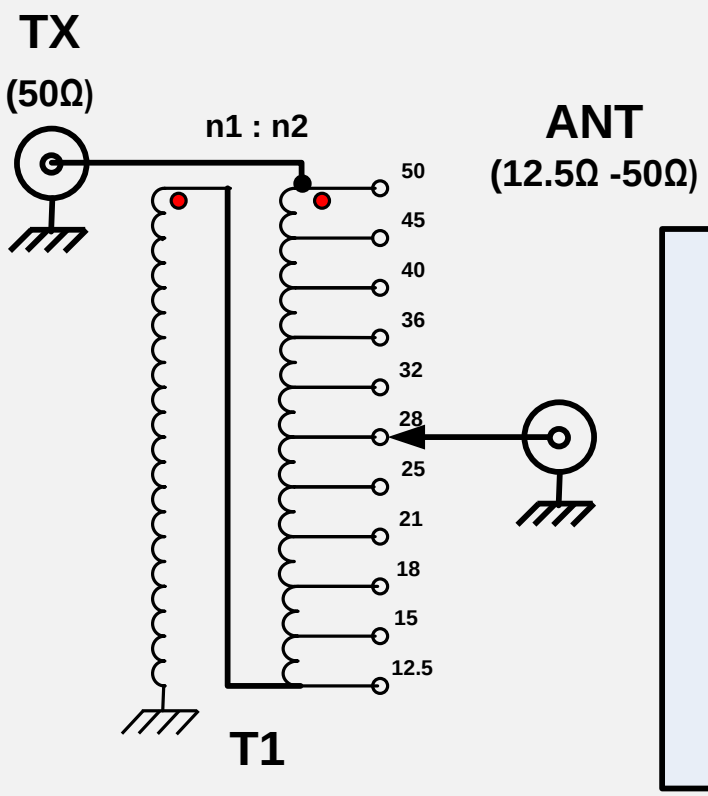
HF Matching Transformer With 11 Taps
(12.5 Ω – 50Ω)

This is designed to match the impedance of antennas that are already at resonance, but have a low characteristic impedance. It will step up the impedance to match the 50 ohms of the transceiver.



This design is from the RSGB publication

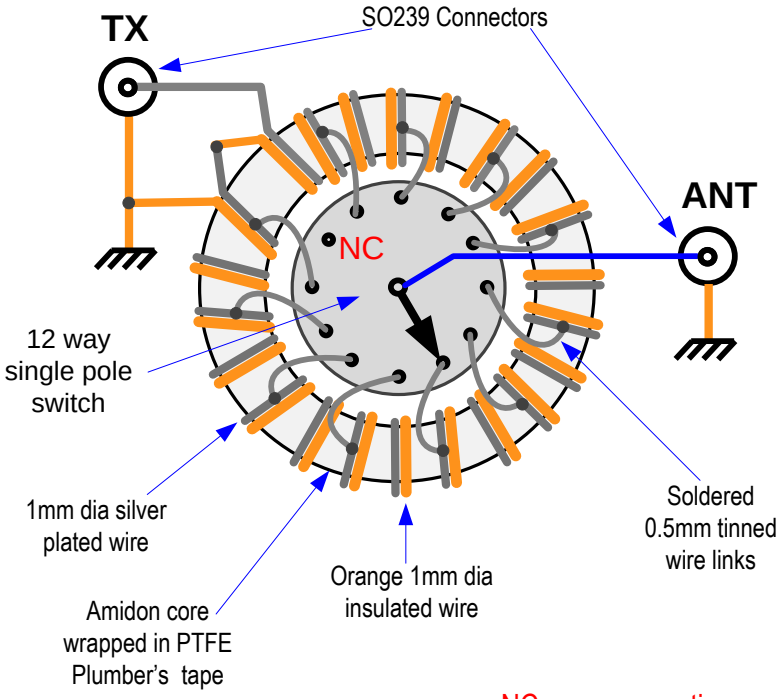
HF ANTENNA COLLECTION (1991)
by
Erwin David , G4LQI
ISBN 1 872309 08 9

1. T1 20+20 turns bi-filar wound using silver plated copper & orange insulated wire both 1mm diam wire. Short tinned wire links for switch connections are 0.5mm diam.

2. Just over a metre of each wire is required for the two windings

3. The toroid is an Amidon 157-2 core covered in plumbers Teflon tape.

4. The switch is a single pole 12 way switch, but a 6 way 2 pole switch can be used if suitably modified.



The G8ODE prototype of the G4 LQI design

Graphics by G8ODE July 2012 iss 1.3

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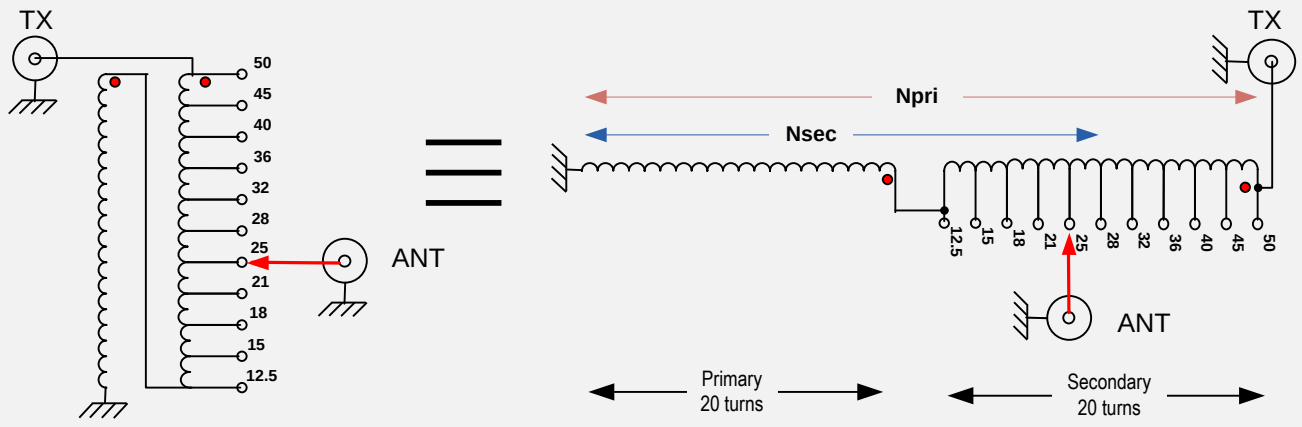
Transformer Tap Impedance Calculations

The following redrawn circuit is used to calculate the impedance of the various taps needed to transform a given 50 ohms primary (non-reactive) impedance to a given secondary (non-reactive) impedance, and assumes a lossless transformer.

The redrawn transformer shows that the primary turns remain the same but the secondary turns depend on the position of the rotary switch. The switch is shown on Tap 25 (up 4x2 turns from the start of the secondary), the secondary thus has 20+8 turns, and the impedance is Zant = 50 / (Npri/Nsec)^2 = 50 / (40/28)^2 = 24.50 Ohms

The table below shows all the tap position's theoretical impedances.



Redrawing the circuit

Transformer Impedances Equation Zsec =Zpri/ (Npri / Nsec)^2			
Npri	**Nsec**	**Zant Ω 50/(Npri/Nsec)^2**	**Value on circuit diag.**
40	40	50.00	50
40	38	45.13	45
40	36	40.50	40
40	34	36.13	36
40	32	32.00	32
40	30	28.13	28
40	28	24.50	25
40	26	21.13	21
40	24	18.00	18
40	22	15.13	15
40	20	12.50	12.5

TESTINGTHE VARIABLE TRANFORMER

To test the transformer, a 50Ω dummy load is connected on the TX side and an AUTEK ™ VA1 antenna analyser on the ANT side. The analyser is set to test frequency of 3.75MHz and the resistances for each switch setting are measured. The prototype unit's resistance values closely matched the theoretical values. The slight errors were within the accuracies quoted by AUTEK for the analyser.

Alternatively, a low power transmitter can be used with the SWR meter and dummy load connected to the antenna side.

Since for resistive loads the SWR = 50 /Zi :1 where Zi has values from 12.5 Ω to 50Ω, the SWR will change with each switch position from approximately 1:1 to approximately 4:1 for the lowest impedance setting.

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