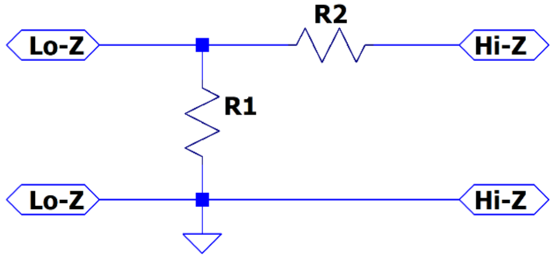
Measurements in a non-50 Ohm Universe (065)

Creating the Impedance Matching Pad

R2, the series resistor is equal to

$$R_2 = \sqrt{(R_{Hi-Z})^2 - [(R_{Lo-Z}) * (R_{Hi-Z})]}$$



Where R_{Hi-Z} is the high impedance side. In our case, this is 75 Ohms. And R_{Lo-Z} is the low impedance side. In our case here, this is 50 Ohms looking into the VNA.

This would give us an $R_2 = 43.3\ Ohms$. This is not a standard resistor value, but 43.2 Ohms is.

Now that we know what R2 needs to be, we can calculate what the parallel resistor, R1 needs to be.

$$R_1 = \frac{R_{Lo-Z} * (R_{Hi-Z} - R_2)}{R_{Lo-Z} - R_{Hi-Z} + R_2}$$

Plugging our value for R2 into this equation, we get $R_1 = 86.6\ Ohms$. This is a standard resistor value.

Translating the 50 Ohm Measurement to the 75 Ohm Universe

Whatever the reported impedance is … multiply it by the characteristic impedance of the world you are operating in and then divide by 50, the world of the VNA.

So, for instance … at 25 MHz the reported input impedance of my filter is 53.744 – 9.5653j.

This is in the 50 Ohm world of the VNA.

Let's translate this to the 75 Ohm world that my filter lives in …

$$Z_{in}(75\Omega) = \frac{75}{50} * \left(Z_{in}(50\Omega)\right)$$

$$Z_{in}(75\Omega) = \frac{75}{50} * (53.744 - 9.5653j)$$

$$= \frac{75}{50} * 53.744 - \frac{75}{50} * 9.5653j$$

$$Z_{in}(75\Omega) = 80.616 - 14.348j$$