

MatchMaker

Version 2.0.0 – March 29, 2023

Introduction

MatchMaker helps you determine the optimum matching network for your antenna. Instantly see the effects of these matching techniques:

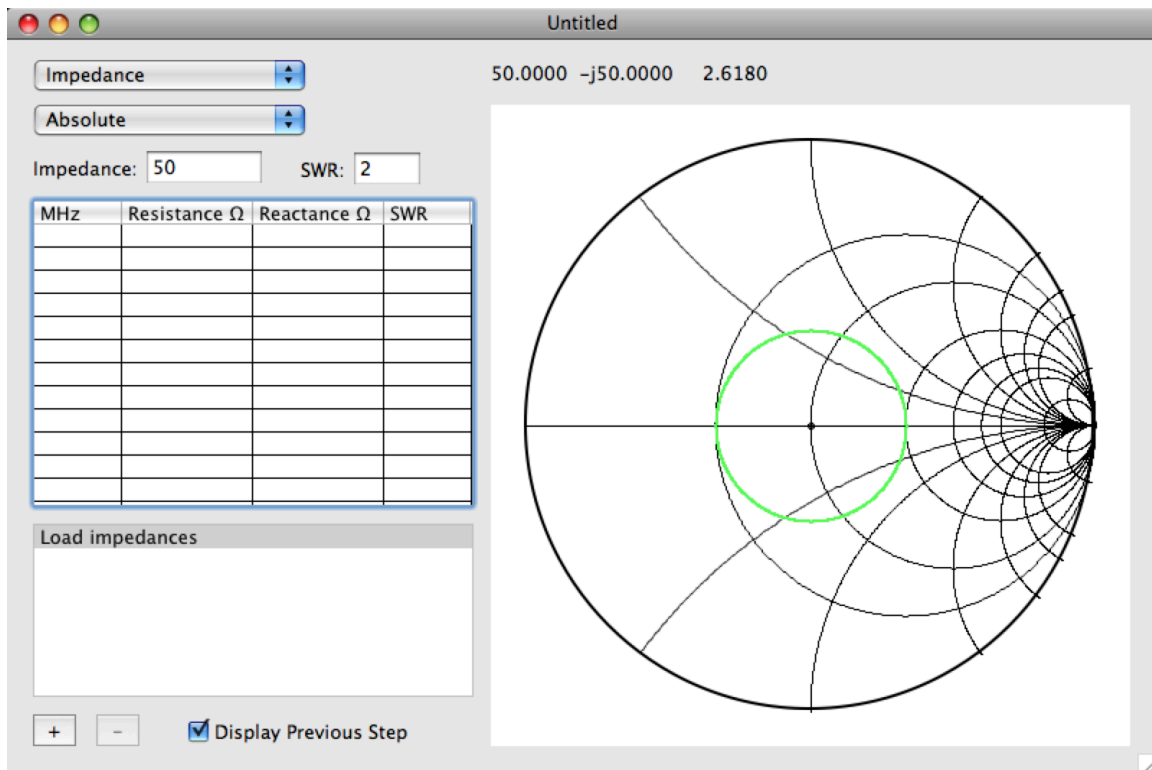
- Series Capacitor
- Series Inductor
- Shunt Capacitor
- Shunt Inductor
- Transmission Line
- Open Stub Transmission Line
- Shorted Stub Transmission Line
- Open Series Transmission Line
- Shorted Series Transmission Line

MatchMaker is easy to use:

Enter in the impedance values for the frequencies of interest (either measured using a noise bridge or other device, or calculated using MININEC Pro or another antenna analysis package). The impedance values are plotted on a Smith-type chart, and the SWR values are calculated.

Then start selecting possible matching components. As the values for each are entered or modified, you instantly see the effects on all impedance values, allowing you to optimize the results.

When you first open MatchMaker, you see the following window, which will be explained in detail below:



First, we'll go through the various parts of the window

In the upper left corner of the window are two popup menus. The first allows either the impedance or admittance (inverse of impedance) to be displayed and plotted. The second controls whether the displayed values are absolute, or are normalized to the characteristic impedance.

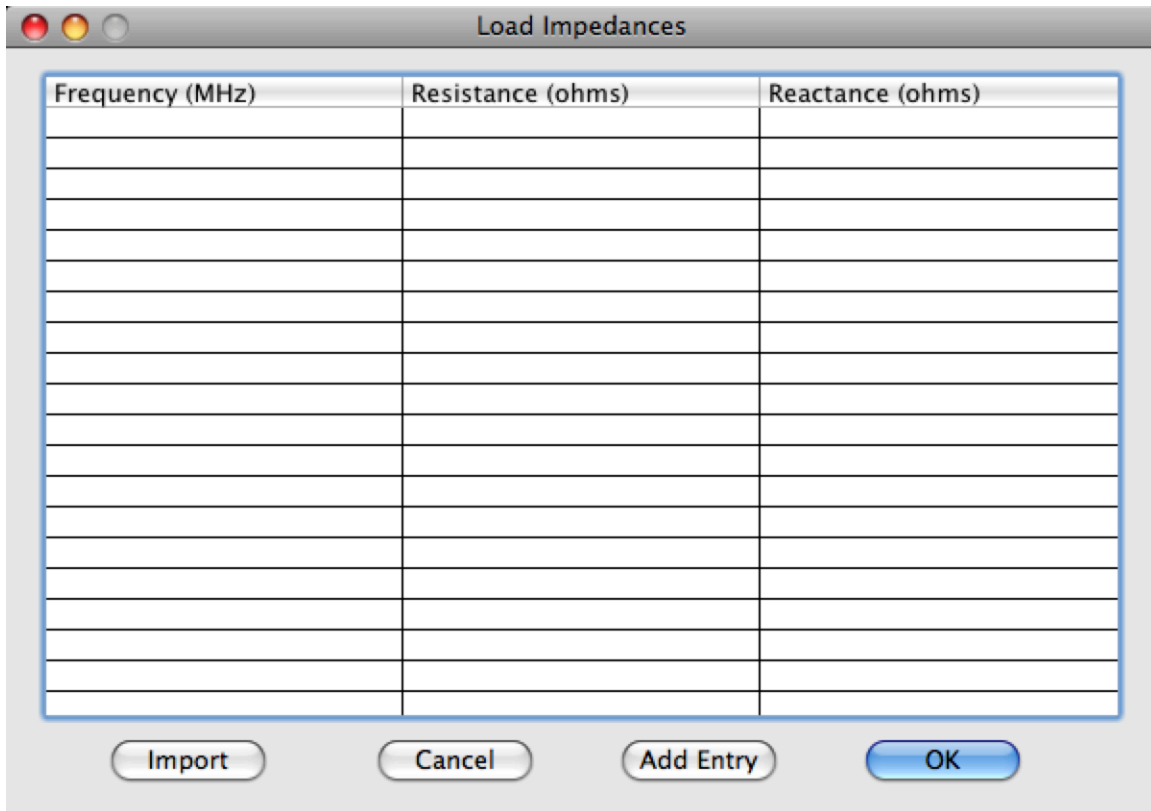
Under these two menus are fields where the characteristic impedance can be entered (this is the impedance of the radio system, normally 50 ohms), as well as the value of the SWR circle.

Under this is the listing of the various impedance values, which is blank since we haven't entered any yet.

Below this is a list of the various transformations that have been applied. Since none have been added yet, the only entry is for the load impedances themselves. The + and - buttons below allow transformations to be added or deleted. The Display Previous Step checkbox allows two sets of impedances to be plotted at once, both the current values, and those from before the last transformation.

To the right is the impedance (or admittance) chart, which looks like a traditional Smith chart. Above the chart is a display of the impedance (or admittance) and SWR for the current location of the cursor, when it is positioned over the chart.

The first step is to enter in the load impedance values. Double click on Load Impedances to bring up another window, where they can be entered:



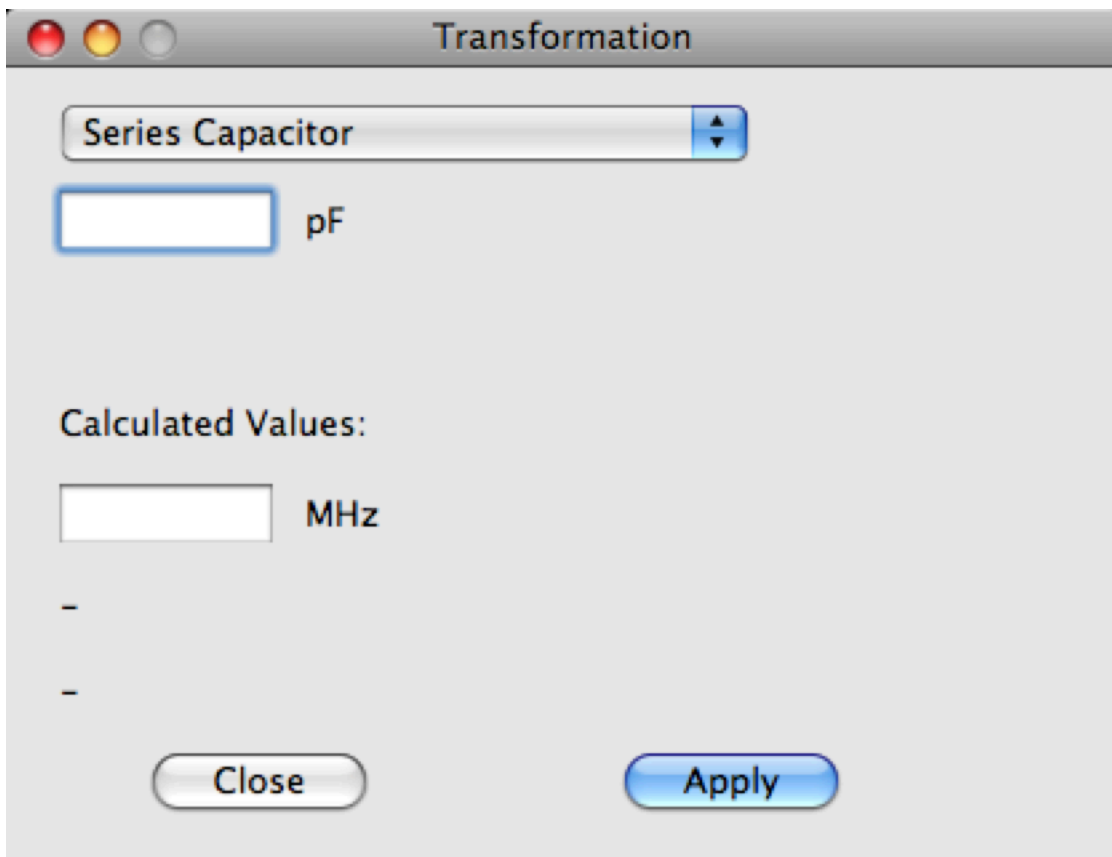
Frequency (MHz)	Resistance (ohms)	Reactance (ohms)

Import Cancel Add Entry OK

To add an impedance entry, click Add Entry, which adds a new row to the list, with 0 values for the frequency, resistance, and reactance. Double click on each 0 value to edit it, and enter in the actual value. Do this for as many entries as necessary, then click OK. The frequency and impedance values will be displayed in the main window, as well as plotted on the chart.

To delete an impedance entry from the Load Impedances window, select that line, then pick Delete from the Edit menu.

To add a transformation (such as an inductor, capacitor, or transmission line) click on the + button. Another window will appear:



The image shows a software window titled "Transformation". At the top, there is a dropdown menu currently set to "Series Capacitor". Below this is a text input field, which is empty, followed by the unit "pF". Further down, under the heading "Calculated Values:", there is another empty text input field followed by the unit "MHz". Below these fields are two horizontal lines, each starting with a minus sign "-". At the bottom of the window are two buttons: "Close" on the left and "Apply" on the right.

The type of transformation is selected from the popup menu. Depending on the type, one or two values will be entered, either the capacitance in pF or inductance in uH, or for transmission lines the characteristic impedance as well as the line length in meters.

For the selected transformation component, the reactance can be computed for a specified frequency, by entering it into the text field next to MHz. This can be used to assist in determining the correct values to use, by seeing their effect.

Clicking Apply will add this transformation component, or update an existing value. You can keep this window open, if you want to make changes to see the effect. When done, you can click Close to close the window.

A Quick Tutorial To Get Started

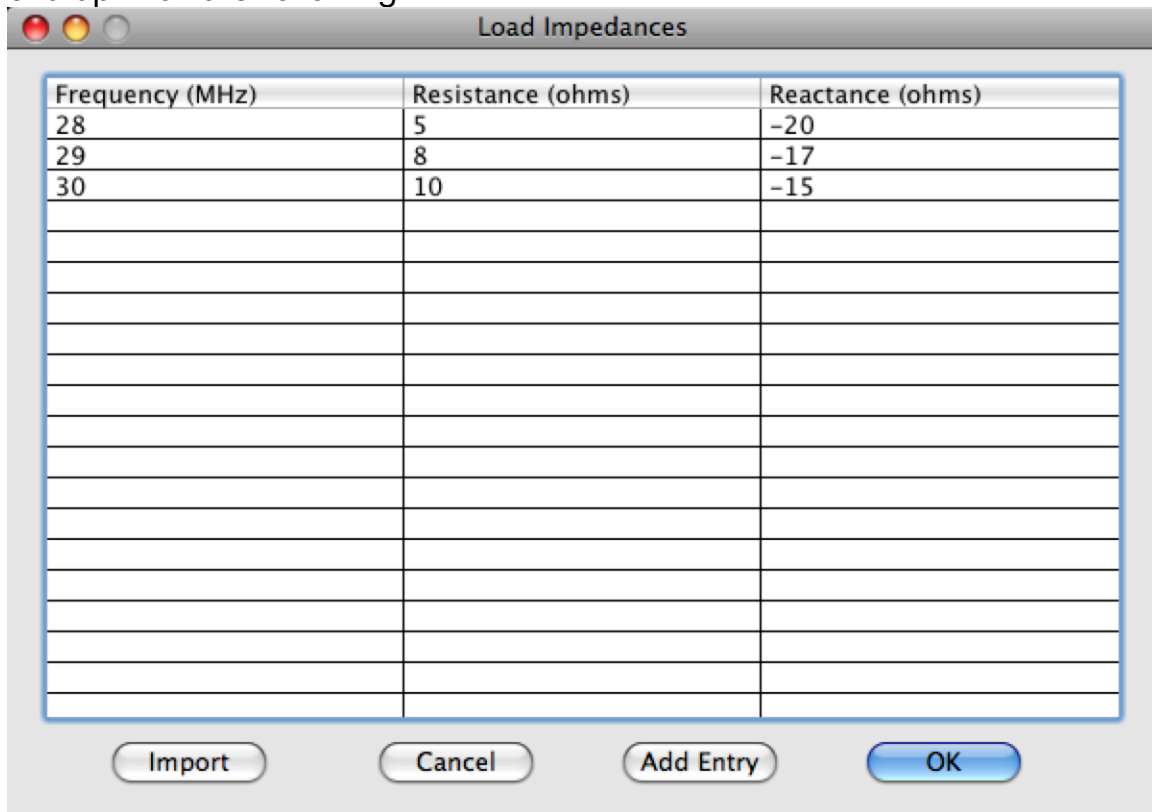
The best way to learn about MatchMaker is to go through an actual example:

28 MHz: 5 – j20 ohms

29 MHz: 8 – j17 ohms

30 MHz: 10 – j15 ohms

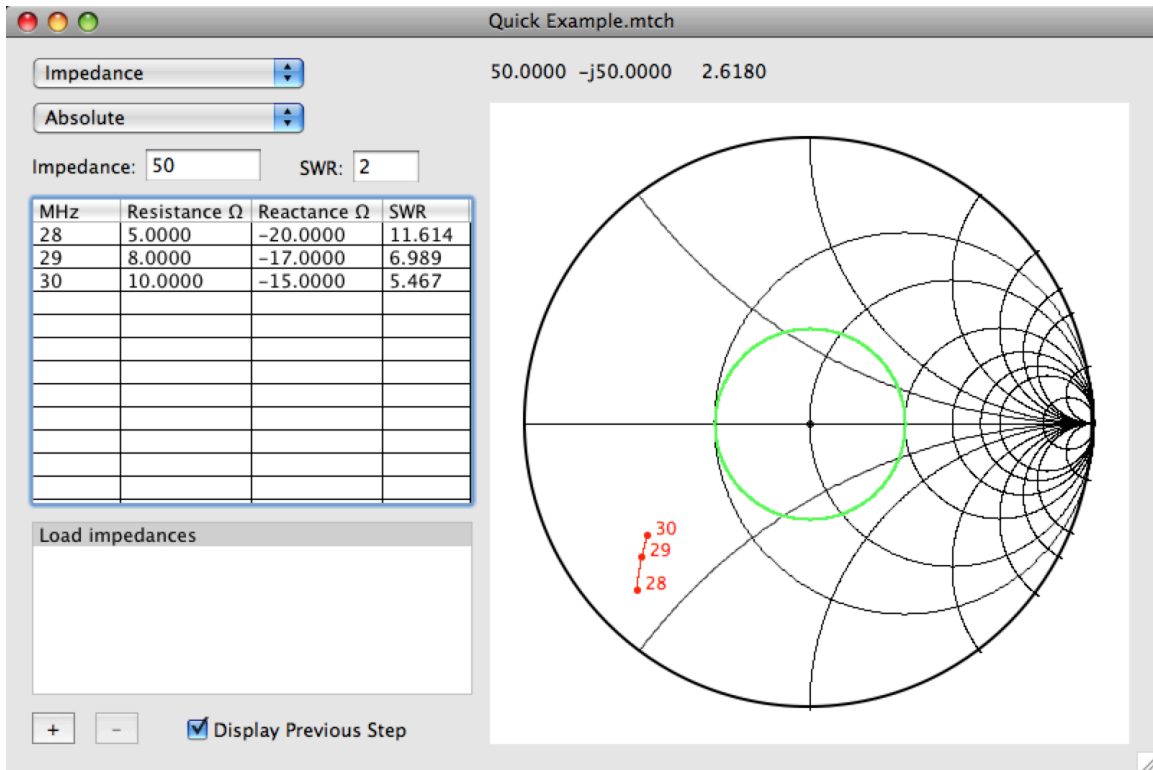
Open a new MatchMaker window, and click on Load Impedances. Click the Add Entry button, and a new line will be added to the list, with a zero in each of the three columns. Change the first value to 28 by double clicking it until the insertion cursor appears, then type in 28. Do the same for the 5 and –20 values (don't enter in the j, and watch the reactance signs). Do the same for the 29 and 30 MHz inductance values, and you should end up with the following:



Frequency (MHz)	Resistance (ohms)	Reactance (ohms)
28	5	-20
29	8	-17
30	10	-15

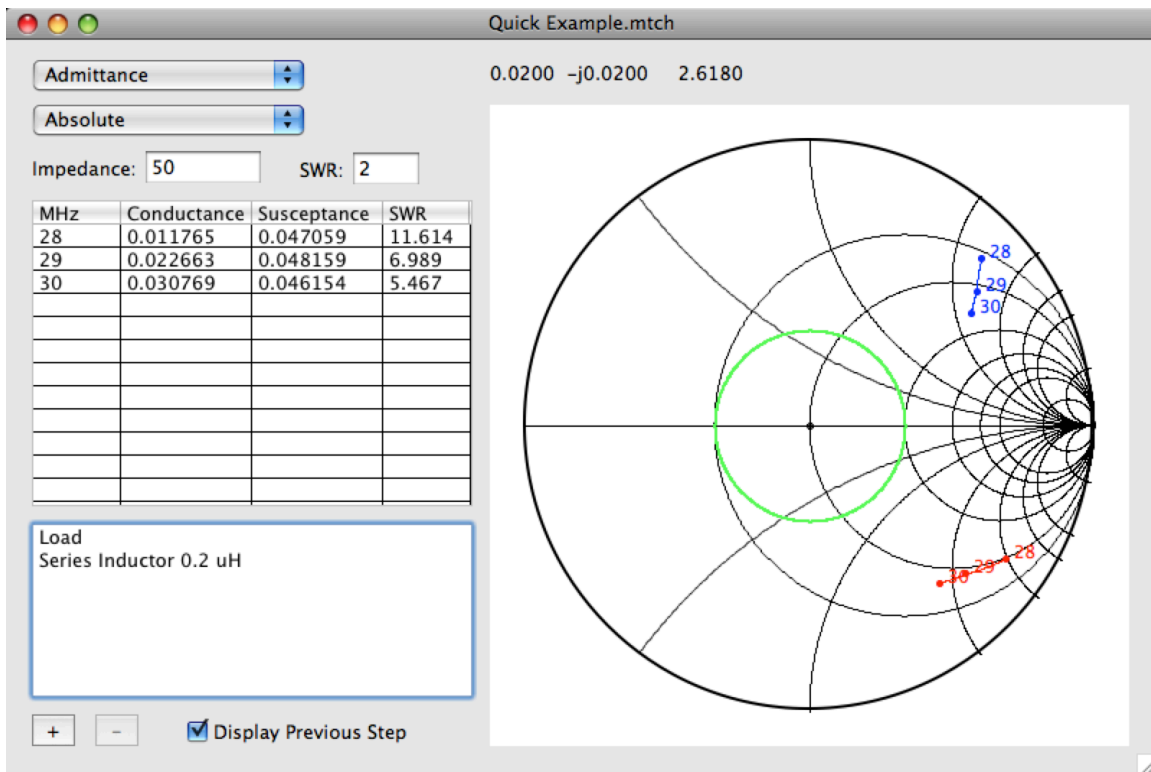
Import Cancel Add Entry OK

Click OK. The main window display will look like this:

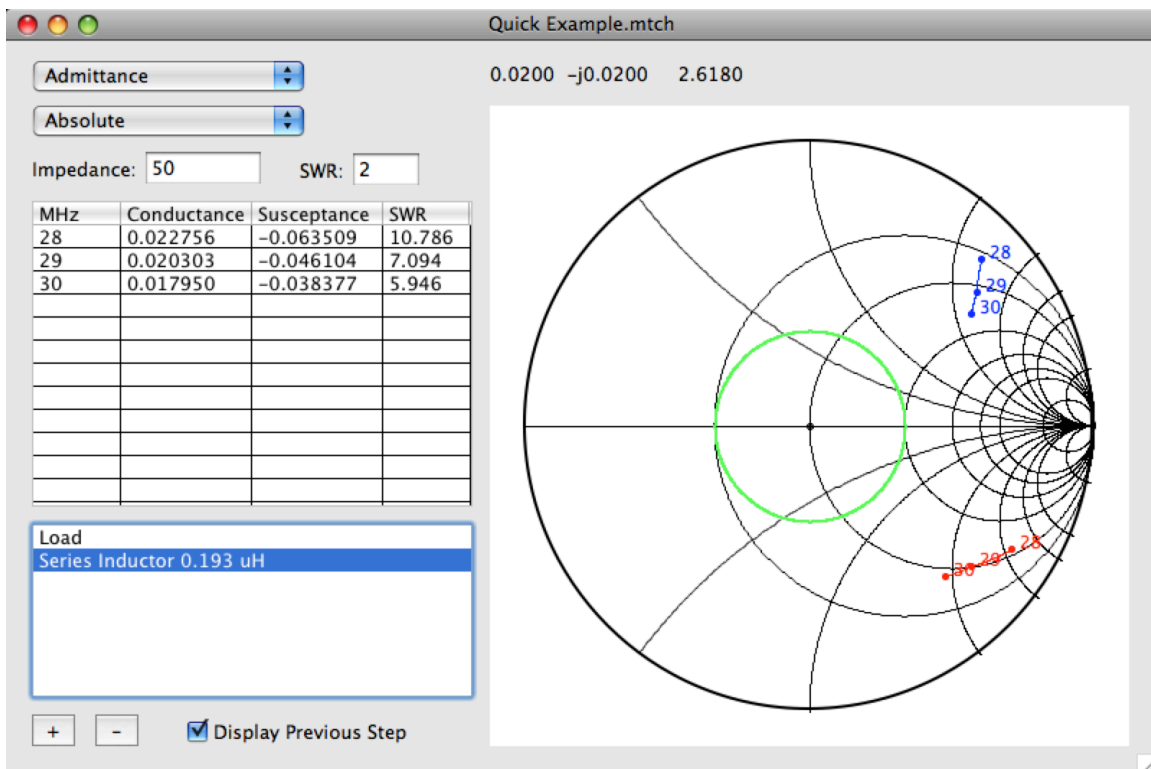


We'll start by adding a series inductance. We want the admittance of the center (29 MHz) point to be on the admittance circle that passes through the center of the chart (0.02 conductance). So select Admittance of the popup menu.

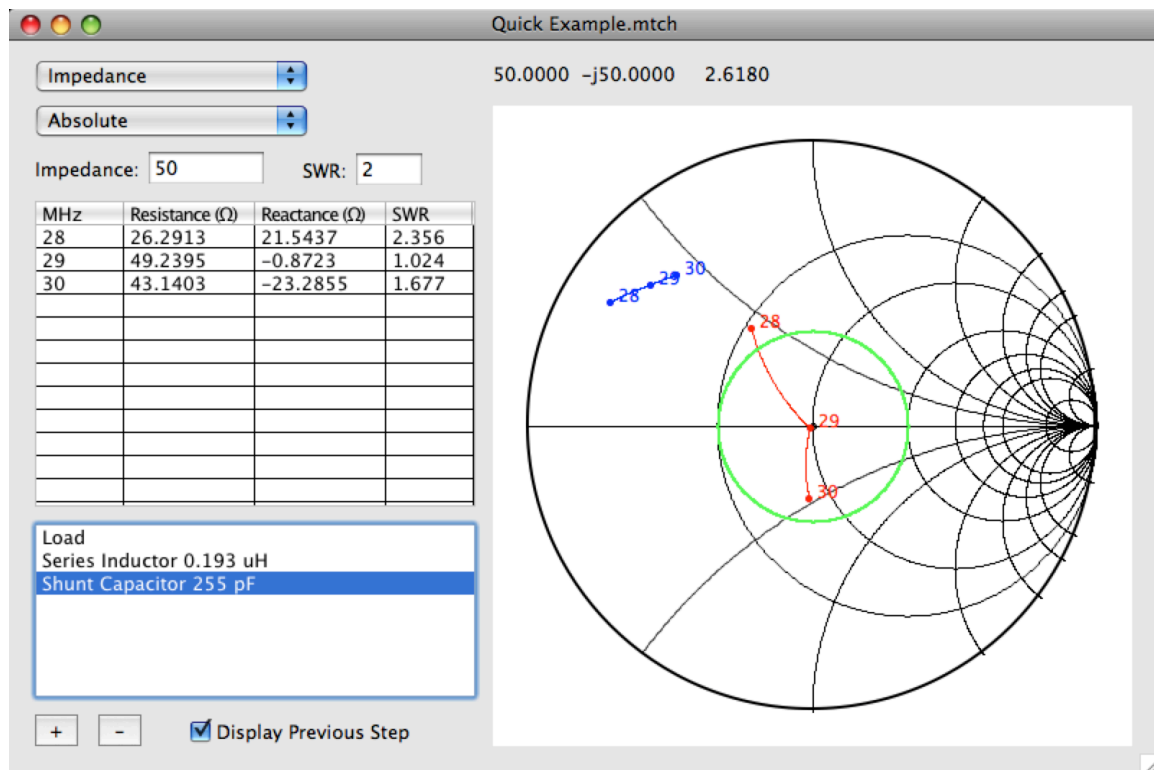
Click the + button, and select Series Inductor from the popup menu. Let's try a value of 0.2 uH. Enter in 0.2, and click the Apply button. Go back to the main window, and click on the Series Inductor 1 uH entry to update the chart display to show the effect:



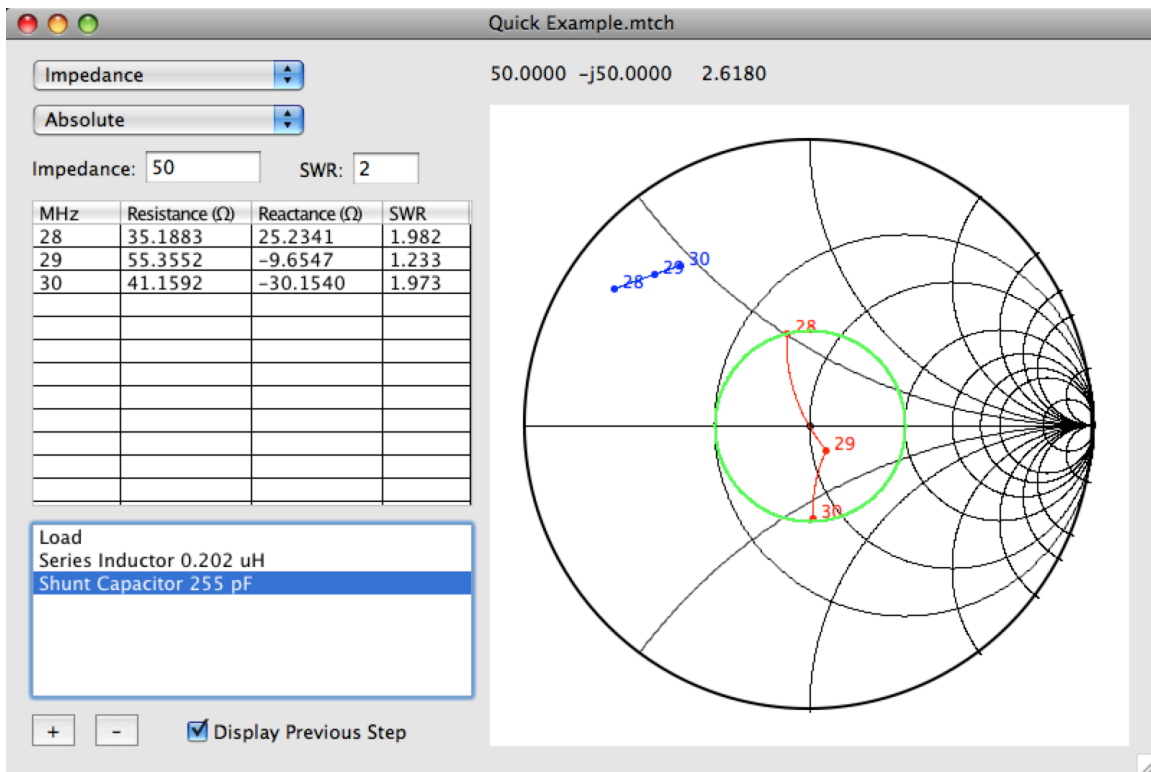
We're very close with this first try. If we adjust the inductance value slightly, to 0.193 uH, we get:



Now we'll add a shunt capacitance. Change the chart display from Admittance back to Impedance, and click + to add another transformation, change the type to Shunt Capacitor. We want to add enough capacitance to move the points to center center of the graph, ideally inside the SWR=2 circle. We can try 100 pF first, and see that it is not enough. Nor is 200 pF. We can keep increasing the value, and note that 255 pF seems to be about the best we can do:



We're very close, the 29 and 30 MHz points are in the SWR=2 circle, but 28 MHz is outside. We can try adjusting the previous inductor value to see if we can move it inside the circle, without moving the other points too far. Select the Series Inductor transformation window, and adjust the inductance value, clicking Apply after each change. With some experimentation, we find that 0.202 uH brings the 28 MHz point inside the SWR=2 circle, but does not affect the other points too much:



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USA

MatchMaker Version History

2.0.0 March 29, 2023

Updates for macOS.

1.0.1 January 3, 2012

Correct a bug that could cause a freeze when importing load impedances.

1.0.0 February 4, 2010

Initial Release

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