

# User Manual

## ZJ\_Matching\_Mini

### 1.4.1

ZJ\_Matching\_Mini is designed for a Windows® 2000 or a Windows® XP based Vector Network Analyzer. It is a strip down version of ZJ\_Matching.

ZJ\_Matching\_Mini is an installation-free optimization tool for designing antenna matching network. Just download and unzip the file, then run the executable file.

To designing a matching network for a cell phone antenna, many commercial software packages, such as Agilent ADS®, Microwave Office® and etc., can be used. When I was working for the industry as an antenna engineer, I did feel that although those commercial codes were very powerful, but they were not very efficient and were a kind of overkill in an antenna matching network designing, which normally uses less than 4 components. Thus I decided to write this software in my spare time. The first version was written in 2003 and I keep modifying it since then. After I made my career U-turn in 2007, the software can now be released to the public.






**This is a freeware, so you can use and distribute it as your wish. But I do not take any responsibility for any consequence of using this software.**

Have Fun!

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**File lists:**

There are 7 files in the package

 COMDLG32.OCX help.pdf ZJ\_Antenna\_Matching\_Mini.exe extended.s1p retracted.s1p C\_value.txt L\_value.txt

Help file

Main Program

Example antenna data file #1

Example antenna data file #2

The values of C\_value.txt and L\_value.txt files are capacitor and inductor values used in the software. These values are good enough for most application. But both files can to be modified according to capacitors and inductors available to you.

**Current Supported data format:**

1. TOUCHSTN .S1P
2. TOUCHSTN .S2P (only the first port can be seen)
3. TOUCHSTN .SNP (only the first port can be seen)
4. CITIFILE (only the basic single segment format)

**Version History:**

- |       |             |                      |
|-------|-------------|----------------------|
| 1.4.1 | 01-Sep-2007 | First public release |
| 1.0   | 20-Feb-2003 | Initial Version      |

1. The ZJ\_Matching\_Mini is designed for a monitor with a resolution of 640x480 pixels, which is used by most Windows® 2000 or Windows® XP based vector network analyzers (VNA), such as R&S® ZVB series and Agilent® ENA series. Of course, you need have a USB keyboard and a USB mouse installed on your network analyzer to use this software.

There are two important short keys:

**Ctrl + Esc:** Show Windows interface. When you see windows interface, you can control the VNA just like a normal computer

**Alt + Tab:** Switch between the VNA interface and this software

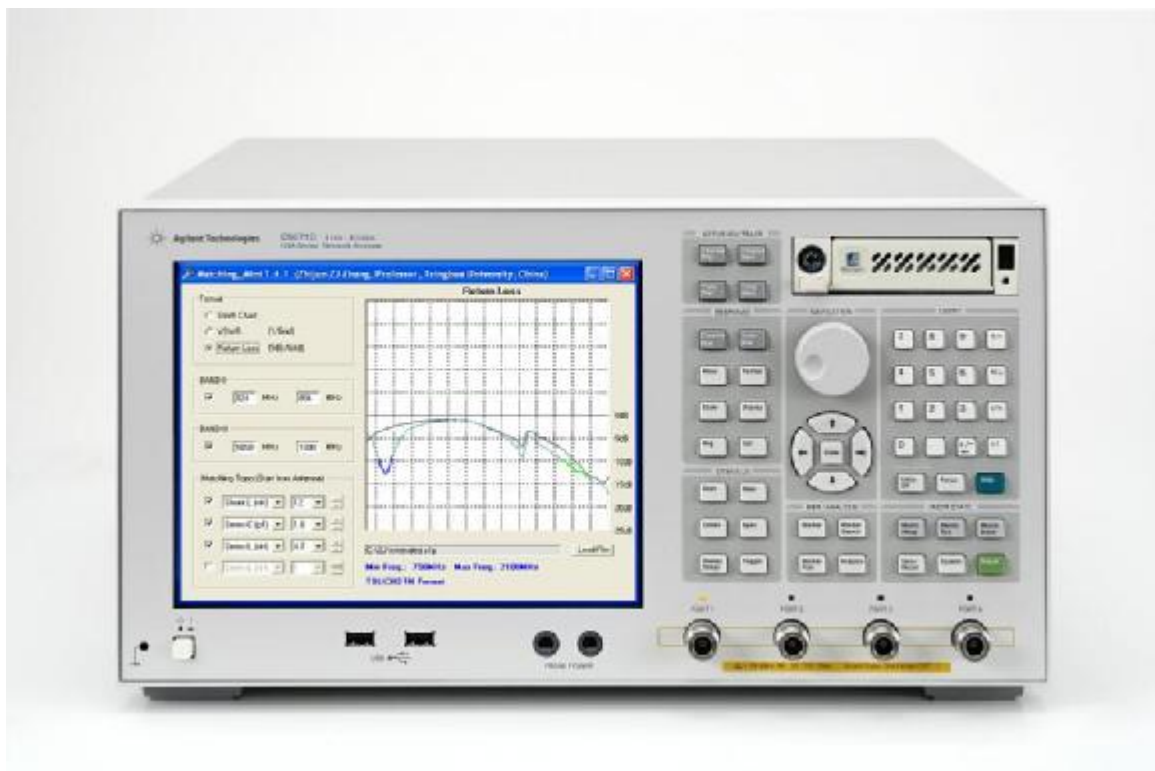


Fig. 1

2. You need to load an antenna data file to use the software. Two sample files, `externed.s1p` and `retracted.s1p`, are included in the software package. You can use them for practice.

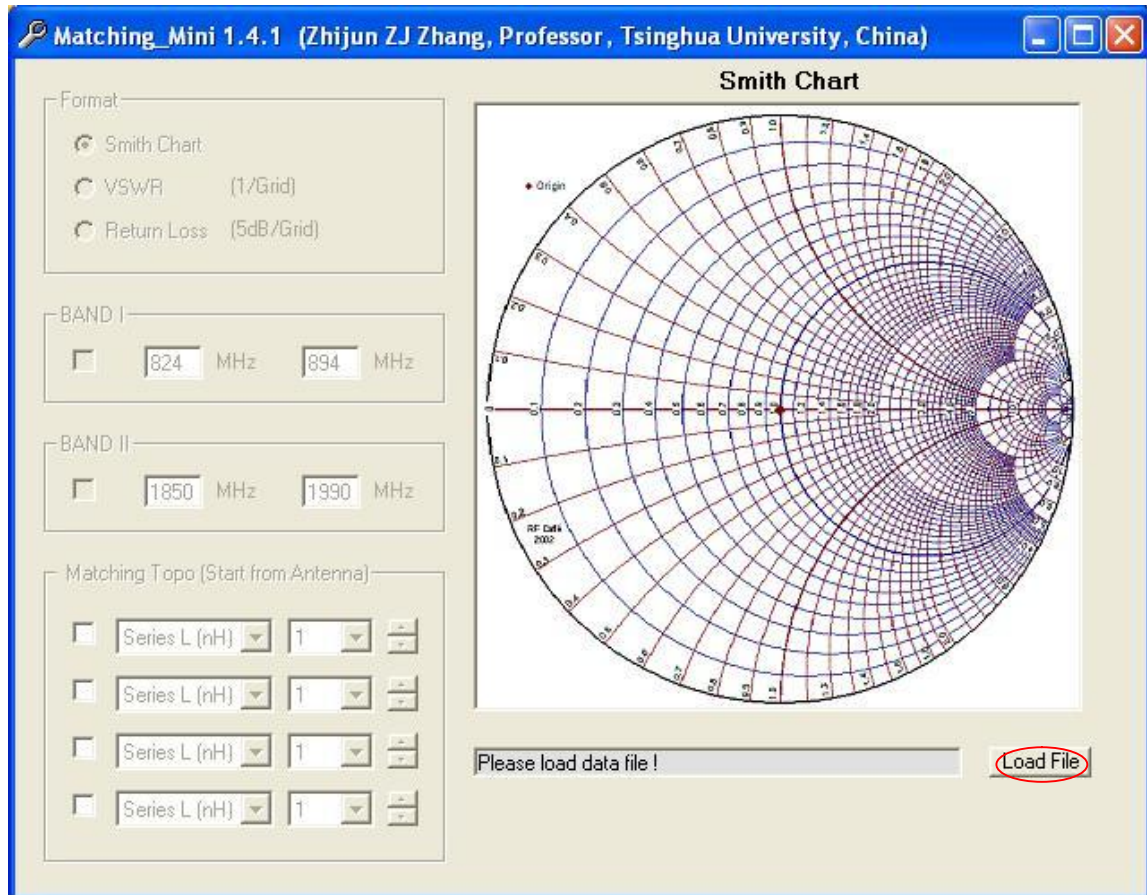


Fig. 2

3. After load the data file, the software reports some information. If you can not see the following info, , which means the data format is not compatible.
  - a. The minimum and maximum frequencies are indicated after the antenna file is loaded.
  - b. The software indicates what data format the loaded file is. The software currently only supports TOUCHSTN and CITIFILE formats.
  - c. The plot on Smith Chart should be same as what you saw on your Network Analyzer, otherwise it is most likely because you have saved the file as unformatted data which does not includes the port extension you have done. Please read the user manual shipped with your VNA and save the data file as formatted data.

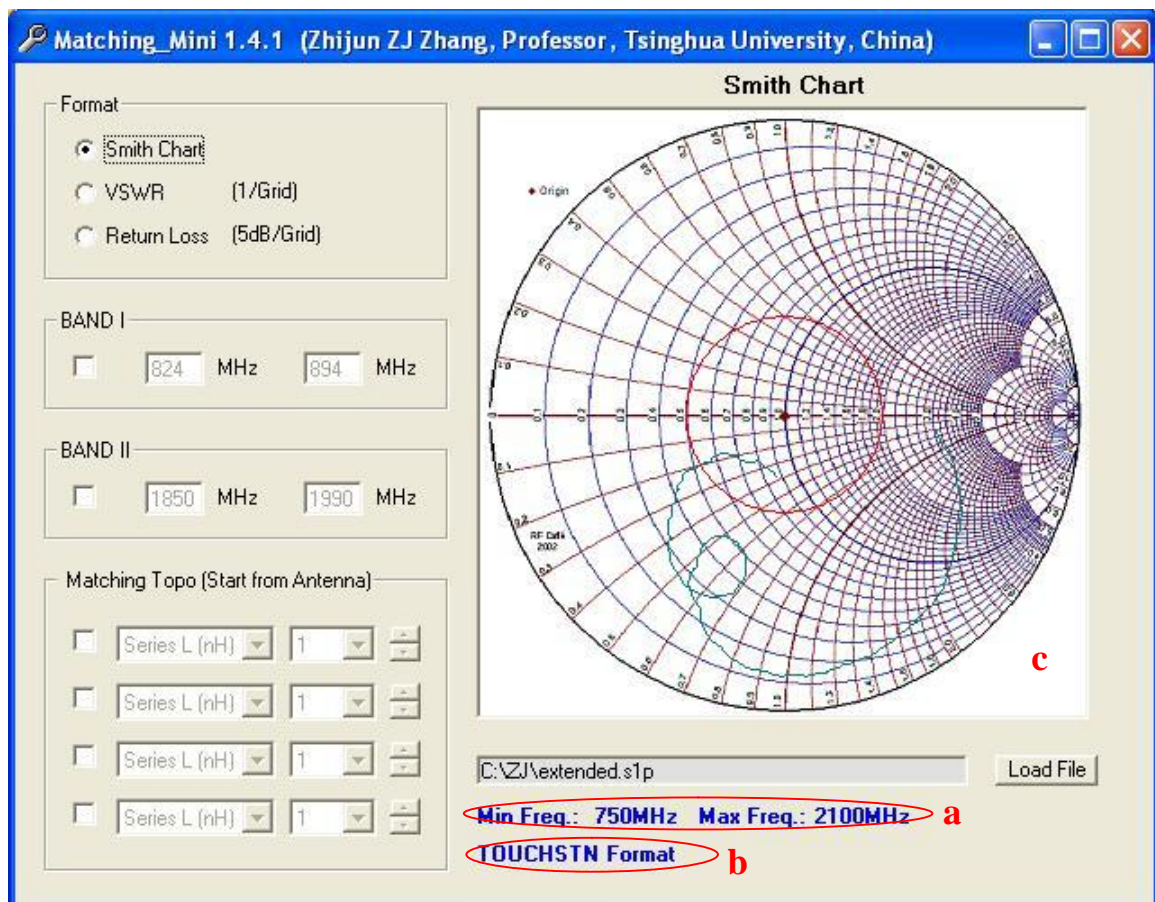


Fig. 3



4. There are some settings you can change.
  - a. You can switch display format between Smith Chart (Fig. 4a) VSWR (Fig. 4b) and Return Loss (Fig. 4c).
  - b. You can highlight up to two interested bands. The band-I will be marked by blue color. The band-II will be marked by green color.
  - c. The red circle in Smith Chart is VSWR 2:1 circle. In VSWR/Return Loss plot, the grid is 100MHz each grid along X-axis. Along Y-axis, the unit of VSWR plot is 1/grid and that of Return Loss plot is 5dB/grid

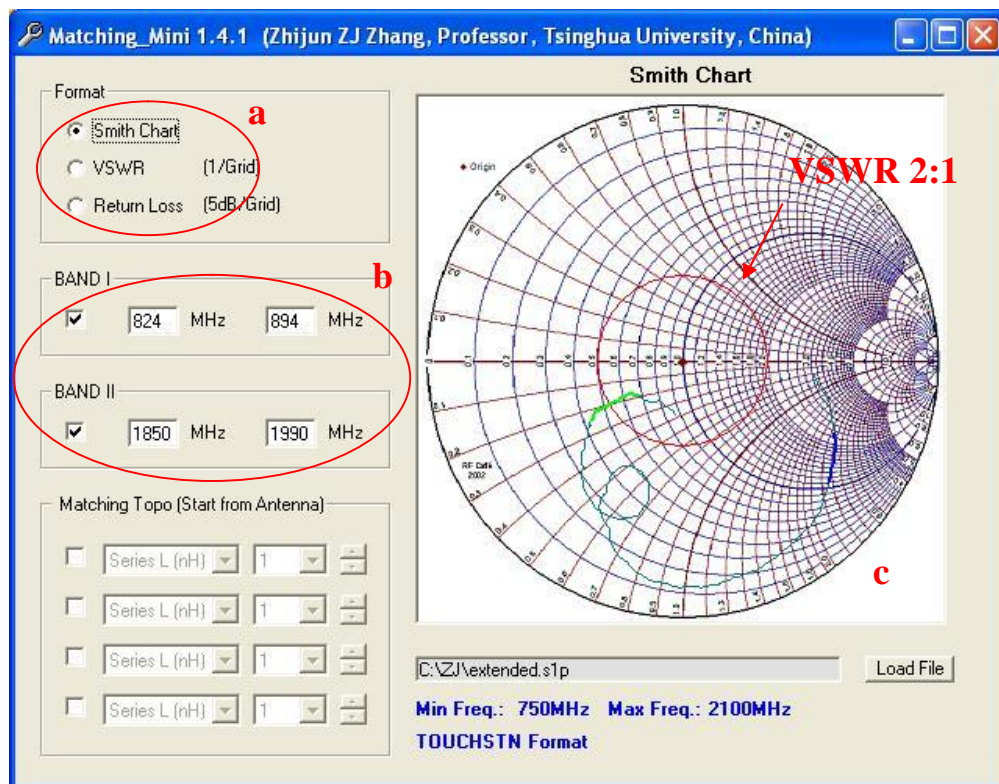


Fig. 4a Smith display

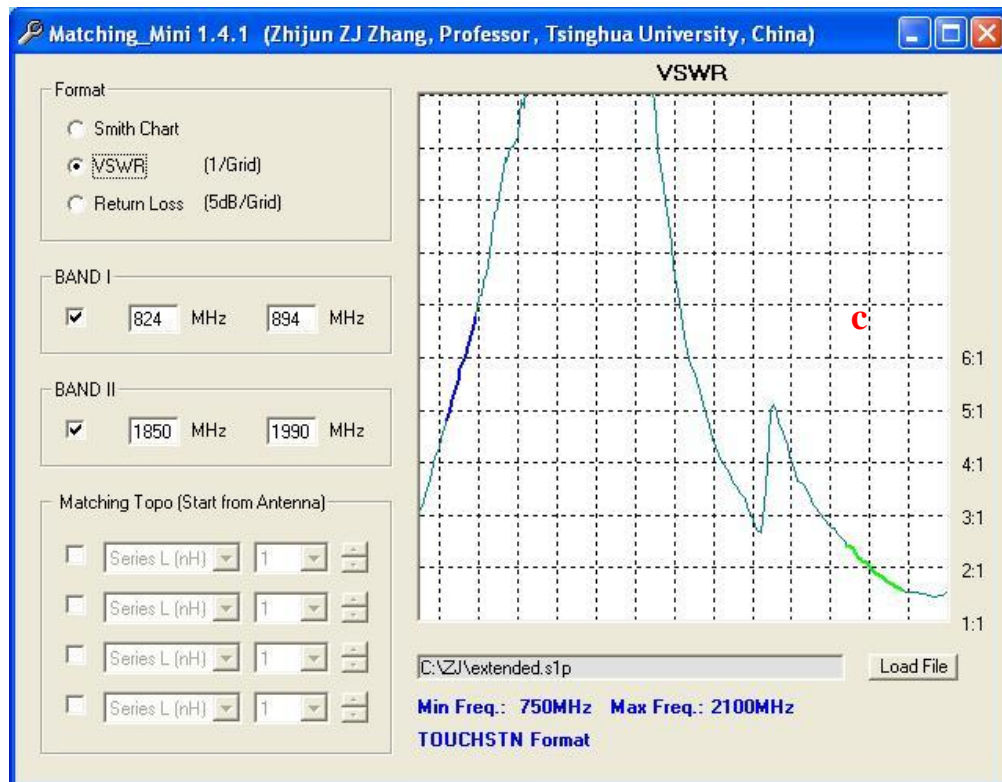


Fig. 4b VSWR display

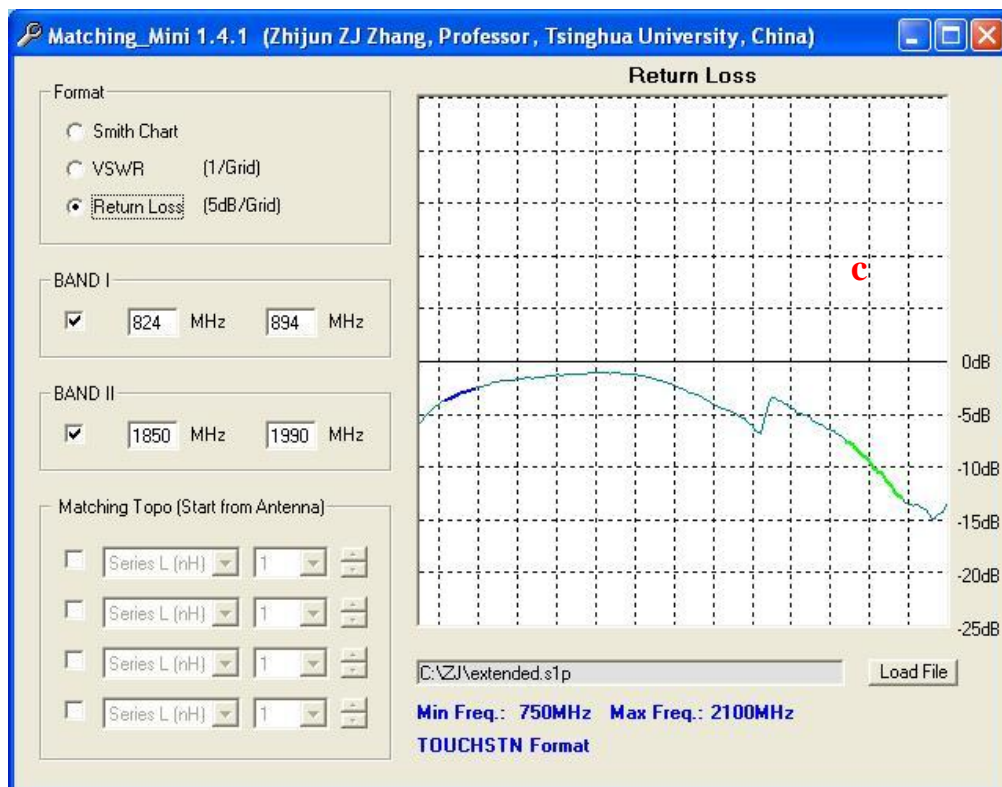
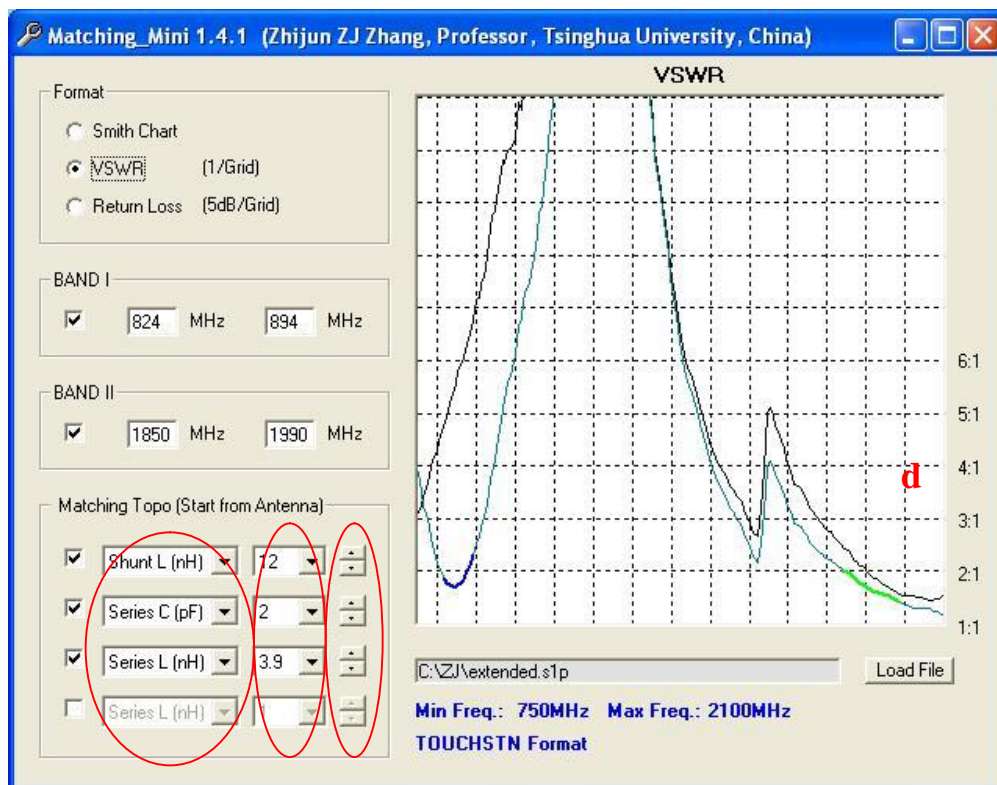


Fig. 4c Return Loss display

5. You can modify the matching network to simulate the response in Smith Chart, VSWR or Return Loss format.
  - a. If looking from antenna side, the top one is the first component. You can add up to four matching components. Each component can be series inductor (Serial L), shunt inductor (Shunt L), series capacitor (Serial C) or shunt capacitor (Shunt C). The unit for capacitor is pF and for inductor is nH.
  - b. You can use pull down menu to adjust matching component value. If you can not find the value you need, please modify C\_value.txt and L\_value.txt files according to capacitors and inductors available to you. Please restart the software to valid modification.
  - c. You can also use the up/down button to adjust matching component value
  - d. The black line inside graphic area is the original antenna response without the matching network. The blue line is the response of the matched antenna.



a b c

Fig. 5