1) Build the circuit shown in figure, preferably on your solderless breadboard (note that any small speaker can be used whether or not it is in an enclosed box).

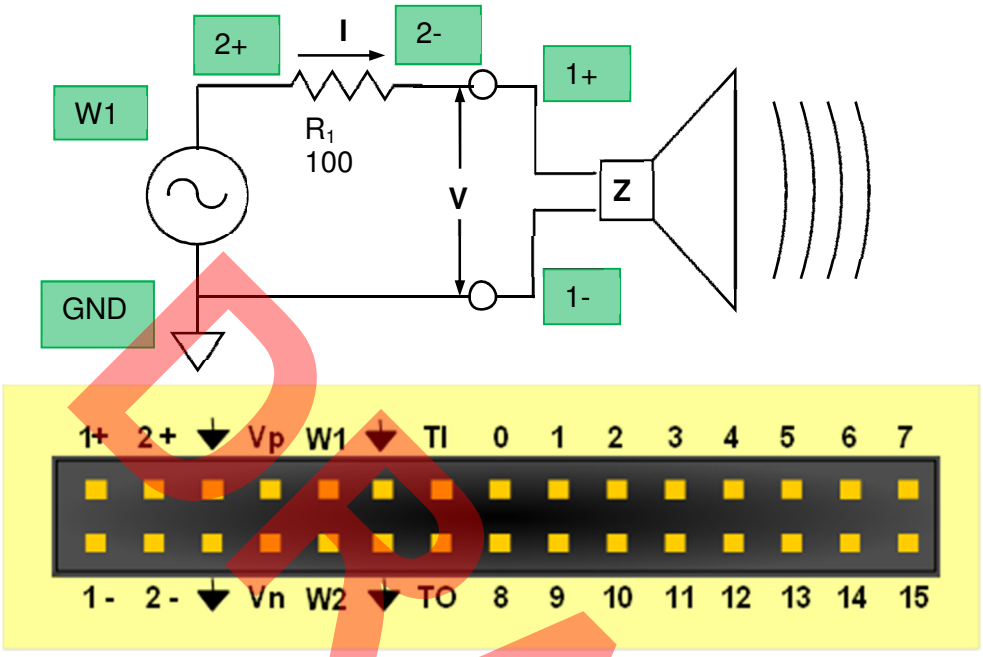


Figure 1

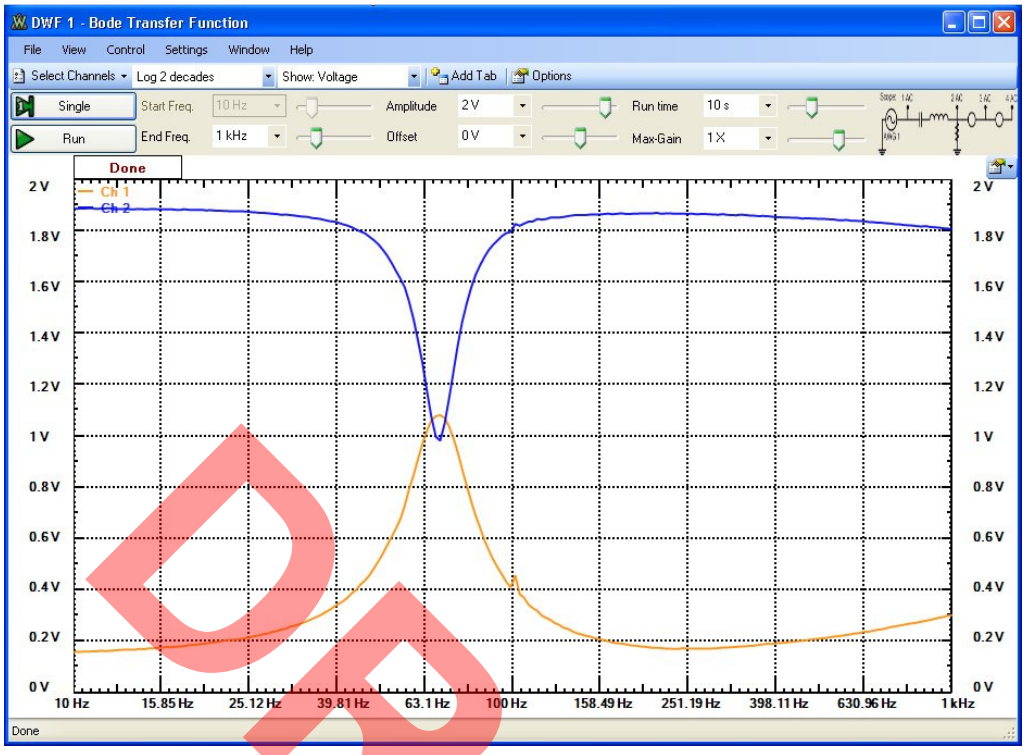
2) Connect waveform generator 1, and the two scope channels to the Loudspeaker circuit as shown.

3) Start the Waveforms software.

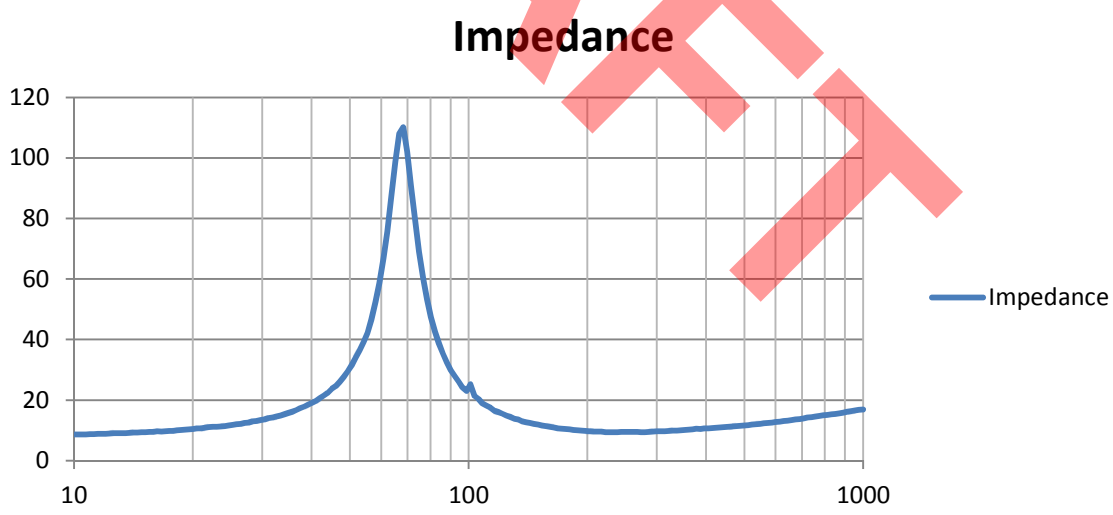
Note: When closing, the WaveForms software stores the last configuration (if set to do so). This tutorial assumes the factory default settings are used. To make sure that you have the factory default settings (even if somebody previously saved a different WaveForms configuration on your machine), click "Options" in the WaveForms main window, then "Erase configuration" in the Options window. Close the Options window.

4) Select the Bode Transfer Function instrument from the Miscellaneous Instruments tab in the main launcher window. Set the frequency sweep mode to Log 2 decades, and set the magnitude representation to Show Voltage. Set the End Frequency to 1KHz, the amplitude to 2 Volts and the offset to 0V. Set the run time to 10s and the max gain to 1X.

5) Hit the green Run Single button. You should see the frequency response of the voltage across the loudspeaker and the current through the speaker (by measuring the voltage across the 100 ohm resistor).



6) You can now Export the data to a comma separated values file and load it into a spreadsheet program such as Excel. You can first calculate the speaker current by dividing the channel 2 data by the 100 ohm resistor. Then the magnitude of the speaker impedance is calculated by dividing the channel 1 voltage by the current.



7) The speaker impedance is very close to 8 ohms in the linear region but is much higher at the resonance frequency.

8) Congratulations – you have made your first frequency response (voltage and current) measurement with the Analog Discovery!