

# Keysight Technologies

## Measuring High Voltages using the U8903A Audio Analyzer

### Application Note

This note shows how the U8903A-109 BNC accessory kit can be used to make an attenuator that will extend the input voltage range of the U8903A to 300 vRMS.



The U8903A Audio Analyzer can measure a maximum of 140 vRMS on the unbalanced BNC connection. This is more than adequate for most applications but some situations do need to extend beyond this limit.

This note shows how the U8903A-109 BNC accessory kit can be used to make an attenuator that will extend the input voltage range of the U8903A to 300 vRMS. An example is shown in Figure 1.



## Attenuator

Attenuation can be achieved in many ways depending on the requirements. For this application there are two main requirements. The first is that that attenuator must have a high input impedance otherwise power dissipation and voltage drop will be too high. The second requirement is that the attenuator must have low output impedance so that it does not form a low pass filter with the input capacitance of the U8903A.

The 'L' type attenuator is best suited to this application and the schematic is shown in Figure 2.

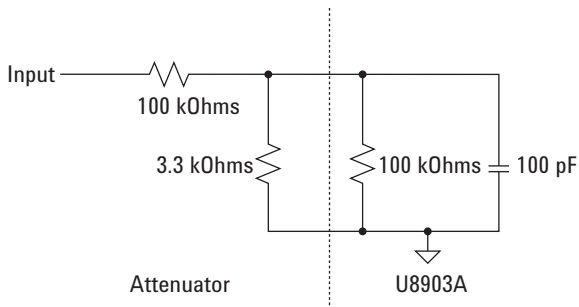


Figure 2.

The requirement for high input impedance and low output impedance mean that the attenuator will naturally be of high value, the values shown result in attenuation value of a little over 30 dB.

## Component Choice

The 100 k resistor will be dissipating 0.85 W with a 300 vRMS input. A 1 W metal film 1% tolerance device is the best choice here. For the 3.3 k resistor power is not such an issue but physical size is important. A 0.125 W metal film 1% tolerance device is most suitable. The 100 k resistor in this particular example was from Vishay Dale, model number CCF60. The 3.3 k was from Multicomp, model number MF12.

## U8903-83401 BNC Accessory

The U8903A-109 BNC accessory kit is used to house the attenuator components as shown in Figure 3. Application note 5991-1466EN should be referred to for assembly instructions. Given the high voltage application care should be taken when positioning and soldering the resistors. Some heat shrink tubing may be beneficial on the ground lead of the 3.3 k resistor.

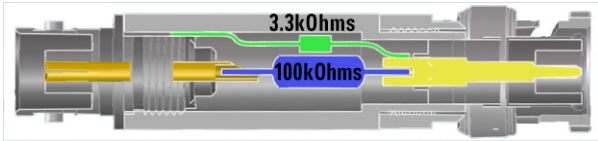


Figure 3.

## Measurement Compensation

With the attenuator connected to the input of the U8903A and 300 vRMS applied to the attenuator there will be around 9.5 v at the instrument input. This places the instrument in the 12.8 v range. The instrument should be fixed in this range via the input range menu.

With the range set we need to compensate for the attenuator value, this can be done with the aid of the external gain function under the input settings of the analyzer as shown in Figure 4. The instrument will now compensate for the external attenuation and display the level at the input of the attenuator. A 300 vRMS measurement is demonstrated in Figure 5.

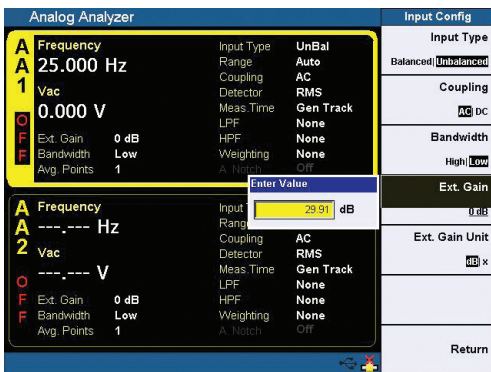


Figure 4.

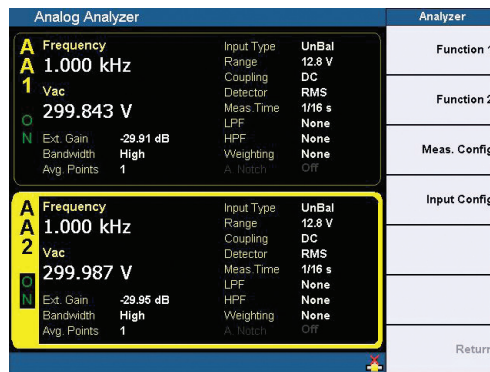


Figure 5.

## Summary

This note shows how the U8903A-109 accessory kit can be used to make a simple attenuator that will extend the measurement range of the U8903A audio analyzer up to 300 vRMS. Measurement compensation using the instruments UI is also demonstrated.

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