

Keysight Technologies

Migrating Balanced Measurements from the  
HP 8903B to the Keysight U8903A Audio Analyzer

Application Note

## Abstract

Hewlett-Packard introduced the HP 8903B audio analyzer in 1980. It quickly became the industry standard because of its unprecedented performance and features. The U8903A audio analyzer is the next-generation audio analyzer from Keysight Technologies, Inc. (refer to Figure 1).

This application note explains the HP 8903B and U8903A audio analyzers balanced connection architectures, and the accessories for migrating connections from the HP 8903B to U8903A



Figure 1. The HP 8903B (left) and Keysight U8903A (right) audio analyzers

## HP 8903B Output and Input

Older generation instruments like the HP 8903B provided BNC connector pairs for both the generator output and the analyzer input. Figure 2 shows a simplified block diagram of the analyzer input.

The 'HIGH' BNC connector is used in isolation when an unbalanced measurement is made. When a balanced measurement is made both the 'HIGH' and 'LOW' BNC connectors are used. The center conductor of the 'HIGH' connector carries the signal and the 'LOW' conductor carries the inverted signal. The outer conductors of both connectors are connected to ground. The generator output connections function in a similar way.

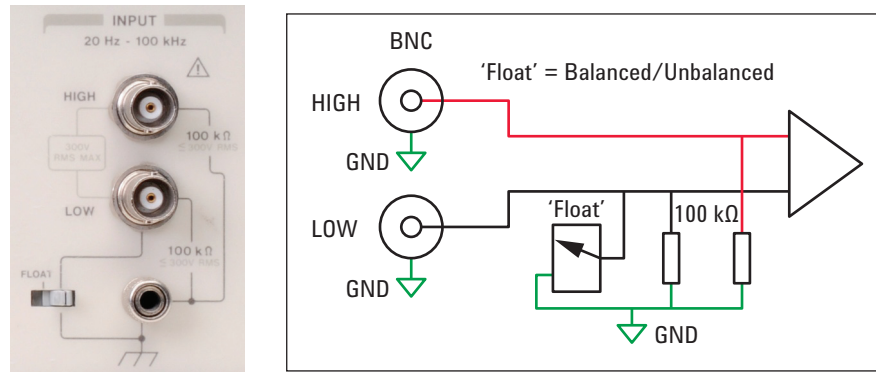


Figure 2. Analyzer input connections and block diagram for the HP 8903B

## HP 8903B Float Switch

A common misunderstanding is that the 'FLOAT' switch on the HP 8903B floats the ground reference of the generator or analyzer. In actuality the 'FLOAT' switch shorts the 'LOW' input line to ground when the unbalanced configuration is required (see Figure 2). When the switch is in the 'FLOAT' position the 'LOW' input floats to the level of signal that is applied to it from the source, thereby enabling a balanced measurement.

In the era of the HP 8903B, engineers referred to this as "floating the input", hence the name float switch.

## Keysight U8903A Output and Input

The U8903A audio analyzer also uses BNC connectors for unbalanced measurements. For balanced measurements the instrument uses the industry-standard XLR connectors. EIA Standard RS-297-A describes the use of the XLR connector in balanced audio signal applications.

Figure 3 shows a simplified block diagram of the U8903A input configuration. The same 'FLOAT' switch is used to select balanced/unbalanced configurations. The difference between the HP 8903B and the Keysight U8903A is that the U8903A uses an internal relay which is controlled via the user interface.

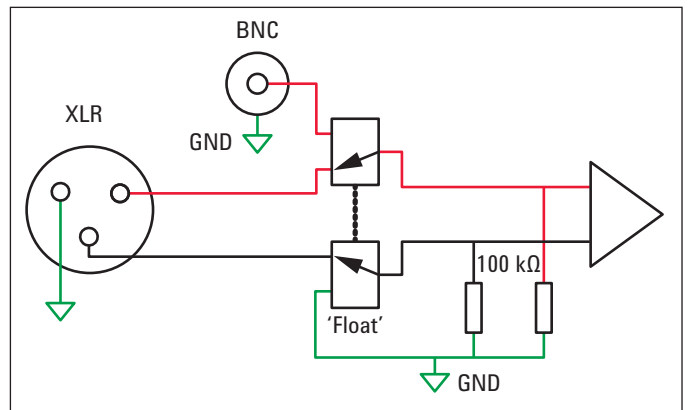
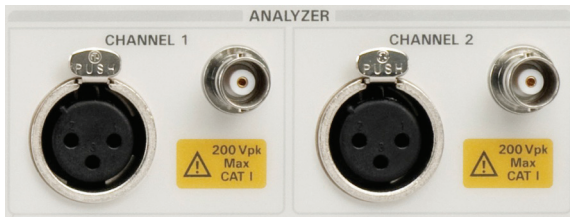


Figure 3. Analyzer input connections and block diagram for the U8903A

## Migrating Balanced Connections from the HP 8903B to Keysight U8903A

While Keysight recommends users upgrade to the industry-standard XLR connectors, there are situations, such as in military applications or standards testing, where this is neither desirable nor possible. As an alternative to re-cabling from the U8903A to your system, Keysight has made available two accessory cables: U8903A-107 and U8903A-108 (see Figure 4). The schematic of the analyzer accessory cable alongside the input block diagram of the U8903A is shown in Figure 5. U8903A-107 is available for the analyzer input and U8903A-108 is available for the generator output.

Note that the BNC connectors are mounted on insulating spacers. This performs two functions. First, it sets the connector spacing to match the HP 8903B for compatibility with test jigs developed for this instrument. Second, the spacers stop the BNCs' ground connections from touching each other in a random fashion. This eliminates local ground loops within the cable assembly and ensures the highest measurement integrity. The plastic spacers can be easily removed for applications where they are not required.



Figure 4. Accessory cables simplify the conversion of balanced measurements from HP 8903B to U8903A

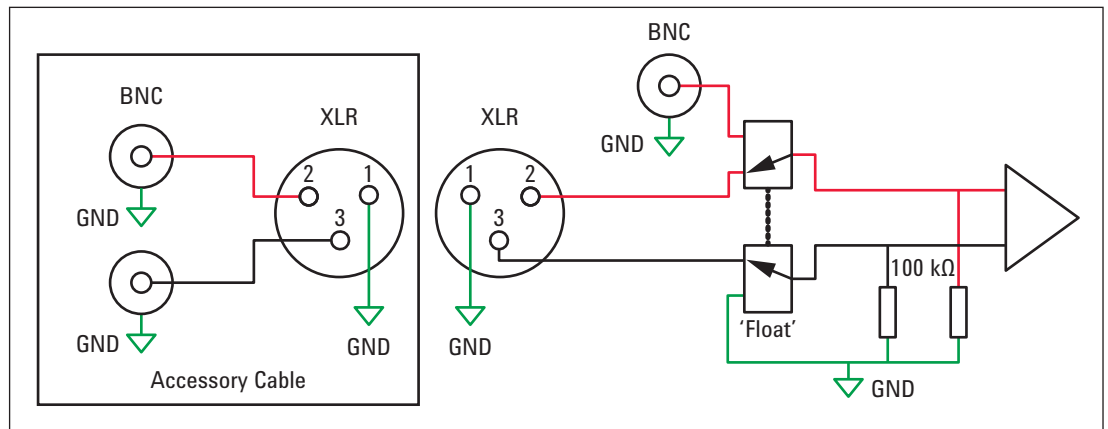


Figure 5. A U8903A-107 schematic alongside the input block diagram of the U8903A

## Summary

HP 8903B's outputs/inputs employ two BNC connectors ('HIGH' and 'LOW') to enable balanced measurements. There is a manual 'FLOAT' switch which shorts the 'LOW' connection to ground where unbalanced measurements are required. The Keysight U8903A outputs/inputs use BNC (unbalanced) and XLR (balanced) connectors. The function of the manual 'FLOAT' switch on the HP 8903B audio analyzer is replaced by an internal relay in the Keysight U8903A. U8903A-107 and U8903A-108 accessory cables allow the migration of balanced measurements from the HP 8903A to the U8903A without the need to re-cable the whole measurement system.

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