

# AN1807-001 automation test avoiding potential difference for instrument protection

## 1. introduction

I'm an electronic testing engineer, in practical work, custom automated testing required is quite often. connect different type of equipment to PC and running an application on PC for data collection and measurement if meets the requirements or not.

But the proportion of damage to the instrument is relatively high, most because communication interface failed or it is not stable.

This problem has long plagued me, but one day I decided to explore the cause carefully, after analysis, that found the biggest hidden danger is potential difference between different equipment, sometimes even up to 110VAC,

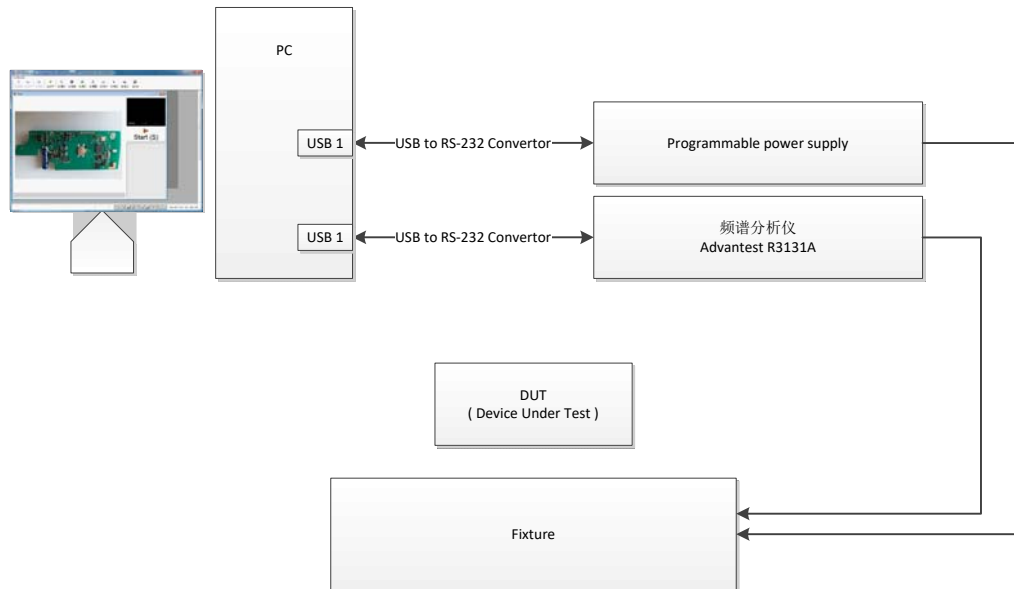
As a result, the interface is subjected to too high voltage and damaged when the instrument is in operation 99.99VAC between PC and HP6612 housing measurement picture see below:



## 2. implementation process

the following is an example of an automation test station

### 2.1 instrument connection block diagram



Above test requires the following equipment:

- HP6612 20V 2A DC programmable power supply 1pcs
- Advantest R3131A 0~3GHz spectrum analyzer 1pcs
- PC 1sets

Test connection diagram see below:



The above devices are connected to the PC through the RS-232 interface since the PC doesn't have a physical serial port, we need to use a USB to RS-232 converter for instrument connection.

run a test software called "WPFT" On the PC that will customize the test steps and automatically determine the results.

## 2.2 Problems encountered (unsatisfactory grounding leads to large potential differences between the housing of the instrument)

After the device is connected, we found a large potential difference between the instrument housings.

Voltage difference up to 110VAC between HP6612 and R3131. So many instruments ports are damaged under such conditions.

Even if this voltage doesn't directly cause damage to the instrument, higher voltage will cause the device to work unstable. Therefore we must use the isolation connector to avoid direct connection between instruments.

### 2.3 Solution ---Use isolated USB to RS-232 converter

We found that with the INHAO UC-3100P, it is very easy to achieve electrical isolation between instruments, and the UC-3100P provide isolation up to 2750 V which is sufficient for our requirements.

By replacing the extension cable, the UC-3100P is very easy to implement USB to UART, USB to RS-232 and USB to RS-485, and the UC-3100P also provides DB9 male and DB9 female extension cables.

When using the RS-232 expansion cable, the UC-3100P can achieve a maximum baud rate of 1 Mbps. This is a very good rate. Most of the isolators on the market work intelligently up to 115Kbps.

We use the UC-3100P to connect the instrument. After such a connection, the housing between the instruments no longer has an electrical connection, and the interface can be used without any voltage difference.

We have made the same improvements to the equipment of the production line. After a long time of tracking, the damage of the instrument has basically disappeared, and the workload of instrument maintenance has been greatly reduced.

UC-3100P family portrait :



The link for UC-3100P:

[http://www.inhaos.com/product\\_info.php?products\\_id=124](http://www.inhaos.com/product_info.php?products_id=124)

### 3. Summary

To fundamentally solve the problem of potential difference between instruments and equipment, it is necessary to start from the grounding line of the transformation production line. Only when all the equipment has good grounding can fundamentally eliminate the voltage difference between equipment, but this is beyond my scope of work. I have asked other departments to solve this problem. Before the grounding problem is completely solved, the UC-3100P can guarantee the safe operation of our equipment.

The front test picture as below:

