

Raspberry Pi 4 / Z-Stick Gen5 USB electrical test.

This test is done to determine the issues that prevent Z-Stick G5 ZW090 USB enumeration process over Raspberry Pi4.

Test instrument :

Agilent DSO-X 3024A oscilloscope.
Raspberry Pi 4 (RPi4)
Z-Stick G5
Laptop

Note:

The blue signal indicates the measurement of the D- port.
The green signal indicates the measurement of the D+ port.

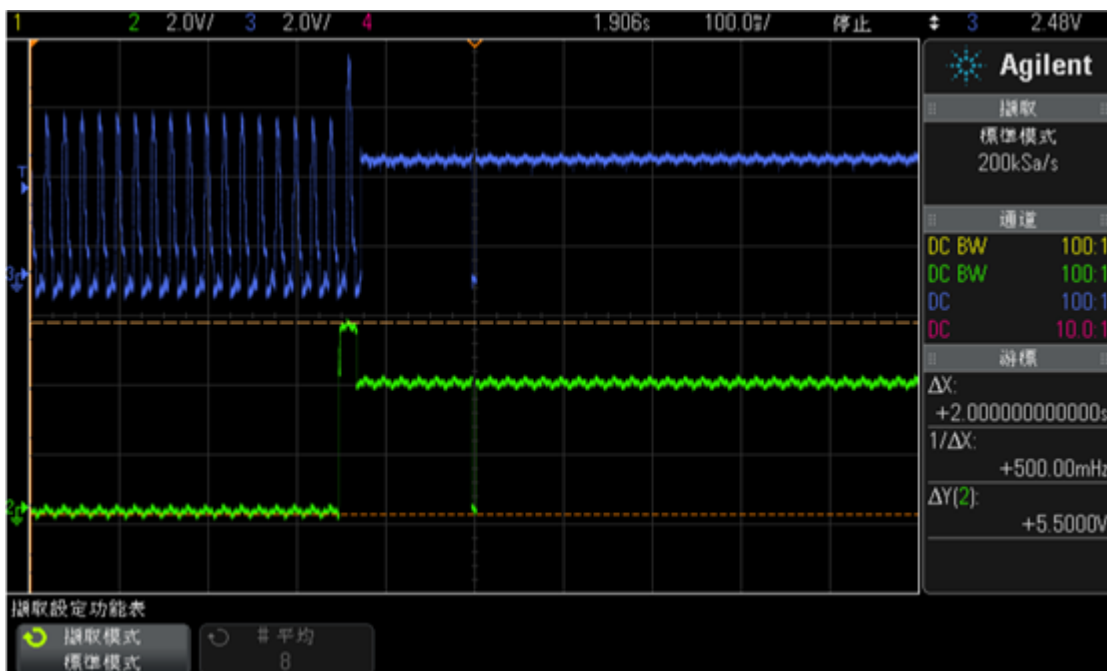
Test items :

1. Test voltage change of D+ and D- when z-stick G5 is initially plugged into RPi4's USB 3.0 port.
2. Test voltage change of D+ and D- when z-stick G5 is initially plugged into Laptop's USB 3.0 port.

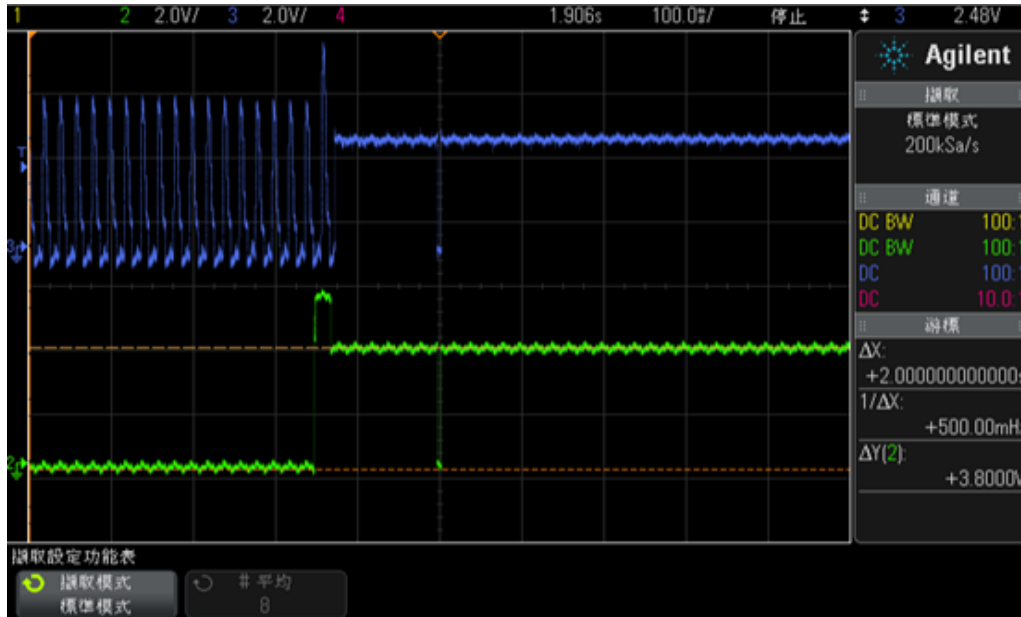
Test 1 – Initial plugin to Raspberry Pi 4

When z-stick is plugged into the USB 3.0 port of Rpi4:

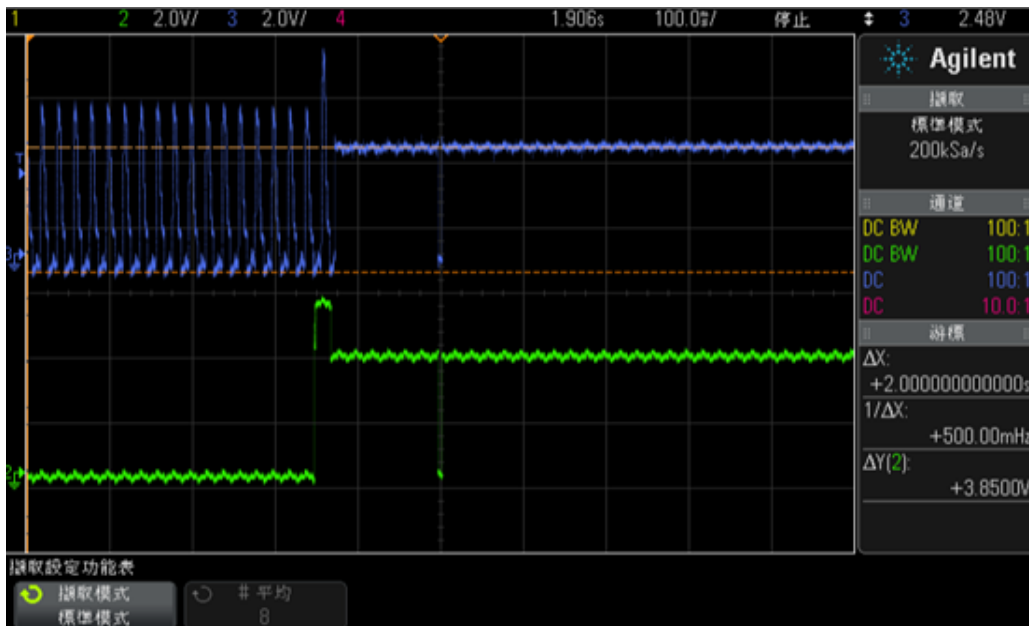
1. D+ voltage is pulled up from 0V to 5.5V.



2. After about 300ms, D+ voltage dropped from 5.5V to 3.8V.



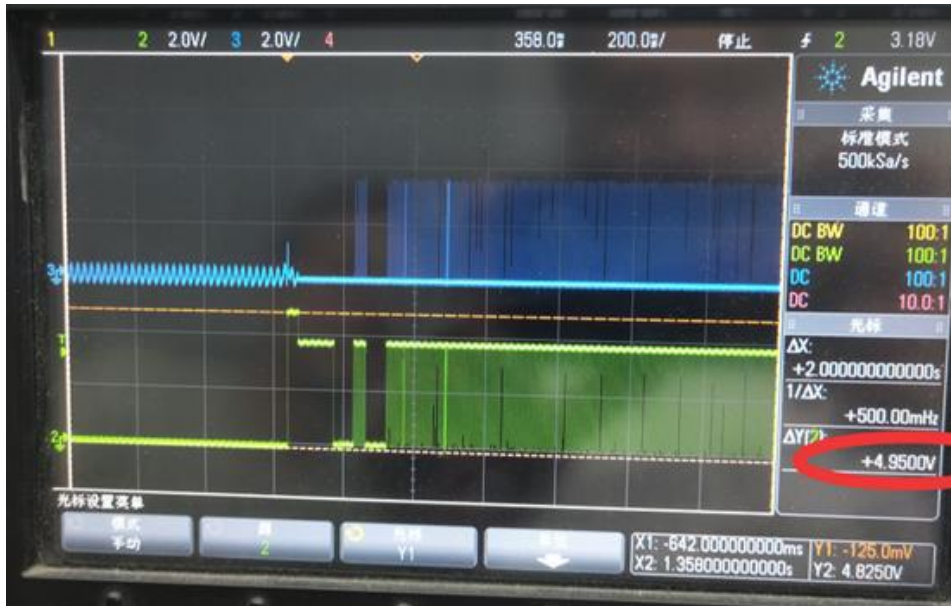
Refer to waveform of D-. When Z-Stick is plugged into the USB port of Rpi4, D- port has obvious noise waves, and voltage is always kept at 3.85V, which is not normal. Normally, the voltage of D- should be 0V initially before the enumeration begins, so in this case, seems the USB enumeration process is not implemented properly.



Test 2 – Initial plugin to Laptop

In order to find out what caused the problem of D- port, a comparative test I done by plugging Z-Stick G5 into the USB port of a Laptop.

1. When the Z-Stick is plugged into the Laptop's USB port, D+ voltage is pulled up from 0V to 4.95V.



2. After ~300ms, the D+ voltage drops from 4.95V to 3.85V.



3. Then look at the voltage of D-.

When Z-Stick is plugged into the USB port of a Laptop, the D- voltage is 0V. After about 2 seconds, it rises from 0V to 3.625V, the USB enumeration begins, and all processes seem to be normal.

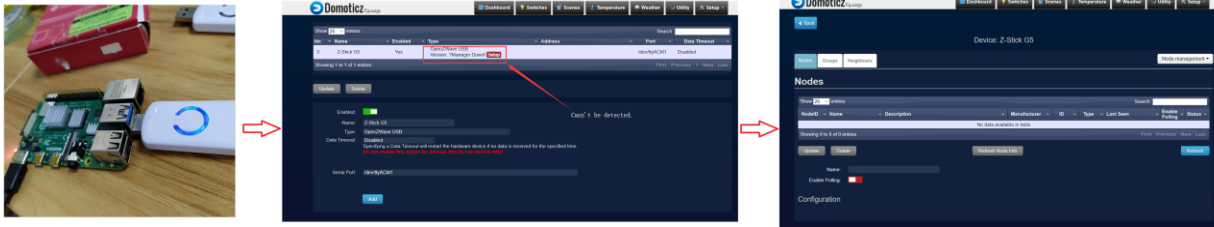


Conclusion:

When Z-Stick is plugged into the USB port of RPi4, it causes the voltage of D- to be non-zero and has large noise; this is the main reason that causes the Z-Stick to be unrecognized by RPi4. By comparing other host device, we can conclude that this specific issue does not happen on other USB iterations.

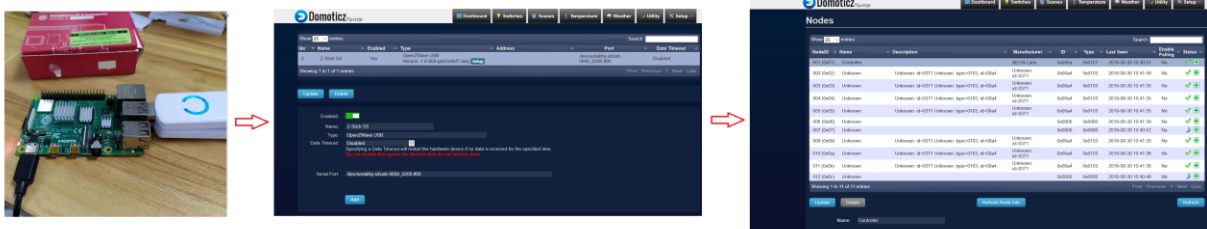
Other Observations:

1. When the Pi4's USB 3.0 port is plugged into a Z-Stick G5, the Z-Wave software or Rpi4 cannot detect the UZB device.



The Z-Stick can not be detected by the USB 3.0 port.

2. When plugging 2 Z-Stick G5 into the Pi4's 2 USB 3.0 ports, then one of the 2 Sticks can be detected, see attached photo 2.



The Z-Stick can be detected by the USB 3.0 port.