

Summary

Ground lead inductance can cause signal distortion.

Choosing the correct signal lead configuration is important

General purpose high impedance passive probes have a ground lead connection as a signal reference. The probes are usually made with a short wire that connects the probe head to the signal ground reference. Since the short wire has inductance, some distortion may be caused to the signal, especially if it has a fast transition time. Because of this lead inductance, it is recommended to keep the length as short as possible.

LeCroy's passive probes such as PP007-WR provide different ground connection accessories to improve signal fidelity. Included in the standard accessory kit is the Standard Ground Lead (PK007-002). This Standard Ground Lead has the highest inductance among available ground leads, and may distort the signal the more than any other ground connections. Although it has more inductance, many people like to use this Standard Ground Lead because of the lead length (about 4.5"), which proves to be very convenient. For those who want longer ground lead with less inductance, LeCroy offers an optional High Frequency Compensated Ground Lead (PK007-030). It is a long wire about 9.5" long, that has less inductance than Standard Ground Lead. If the signal ground is near the signal source and one wants to reduce the ground lead inductance, then he or she may consider using a Ground Spring or a Ground Blade. The Ground Blade has less inductance than the Ground Spring.



PK007-002 Standard Ground Lead PK007-030 HF Compensated Ground Lead PK007-016 Ground Spring PK007-103 Ground Spring

To illustrate the difference between each ground lead, we measured each using a fast edge signal. We used a 1nsec rise time square wave. Below is a scope screen capture exhibiting each ground lead. Standard Ground Lead (M1 trace) has the highest ringing and overshoot followed by HF Compensated Ground Lead (M2 trace), then Ground Spring (M3 trace)

and finally Ground Blade (M4 trace). Ch2 trace was measured without the use of any ground lead. For Ch 2, the probe head ground ring was touched directly to the signal reference ground. Obviously, the Ch2 signal that didn't use any ground lead produced the least overshoot and the least ringing. As you can see the overshoot measurements, Standard Ground Lead has the highest overshoot value (36.6%).

Therefore, you should select proper ground lead, depending on your application. If you need a longer ground lead and a better HF response, you can use Standard Ground Lead or you can use HF Compensated Ground Lead. Otherwise, using Ground Spring or Ground Blade will give you a better signal quality because of its low inductance.

