

## The case for isolated grounds in a ScopeMeter® 190 Series II Test Tool

### Application Note

Ever needed to measure several signals simultaneously without earth grounding or reference potential? With most oscilloscopes such measurements are extremely dangerous, and at times impossible. Lucky for you, the Fluke 190 Series II ScopeMeter portable oscilloscope can handle these types of situations.

#### Introduction

Today measuring multiple signals each with a different origin is a common requirement. Whether diagnosing motor drives, uninterruptible power supplies, amplifiers or other analog circuits, several signals will need to be measured simultaneously. Even determining the characteristics of a basic component such as a transformer or transistor requires the need for independent inputs. In these situations, isolated input circuits are needed to avoid disturbances and short circuits, and a separated ground is needed to prevent dc ground loops from influencing measurement results.

Measurement isolation in an oscilloscope can be obtained by using either the differential method or independently floating input circuitry. The differential method uses both inputs of an operational amplifier, and has a bandwidth range of approximately 30 MHz. However, with the independently floating method, input circuitry is galvanically separated from the main unit, which allows for higher bandwidth and better input sensitivity.

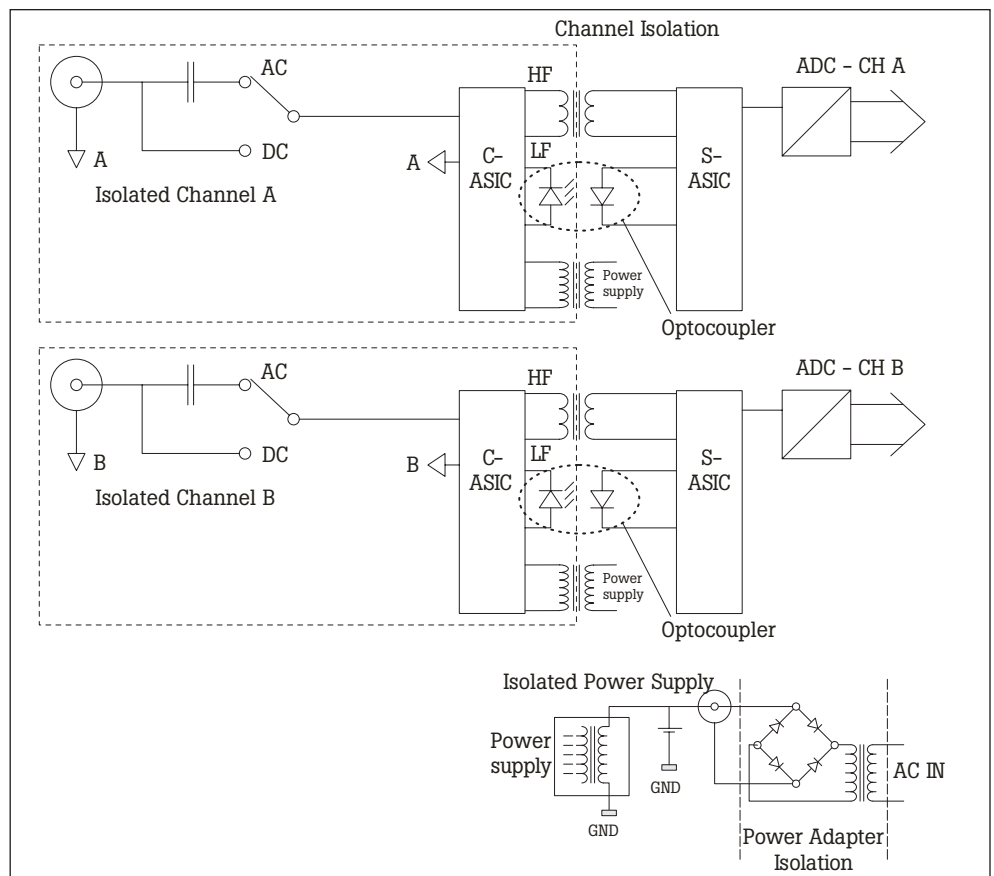


Figure 1.

#### Hardware implementation

An independently floating, isolated input is realized by using an Opto coupler and a transformer. These two devices are necessary because no single component can transfer signals from dc up to a 300 MHz range. Opto couplers can take care of signal transmissions from dc up to approximately 100 KHz. HF transformers can cover a range from 1 kHz up to 300 MHz or more. The signals are routed to both devices and added up to reconstruct the complete signal.

To maintain isolation at the input power and control paths are also connected to the circuitry via transformers and Opto couplers. Having circuitries for each individual input ensures similarity between the inputs. Additionally, separated circuitries offer double isolation for the user, enabling measurements of independently floating signals up to 1000 V CAT III and 600 V CAT IV.

Figure 1 shows how the signal is split in a LF and HF component.

Although the concept is explained for the BNC inputs, it should also be noted that all other inputs such as the power supply, USB ports and the calibration port are isolated from each other by using transformers and Opto couplers.

Fluke refers to this technology as isolated floating inputs.

This concept is turned into a high value user benefit in terms of safety and ease of use.

In this context it is important to mention that the ScopeMeter is designed to work in a Dirty, Unsafe and Harsh environment as it complies with the IP51 standard.

### **The ideal choice**

The new 2- and 4-channel Fluke 190 Series II ScopeMeter portable oscilloscopes are battery powered and offer independently isolated inputs. Keep your high voltage systems such as motor drives and un-interruptible power supplies up and running with 1000 V probes that come standard with the 190 Series II tools. Besides performing your job safely, features such as Connect & View automatic triggering and the handy Replay function all you to cover your application accurately, efficiently and safely.

**Fluke.** *Keeping your world up and running.*<sup>®</sup>

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