

Keysight Technologies

Identifying an Electrical Circuit Using the Keysight Wireless Remote Connectivity Solution



Application Note

Introduction

Troubleshooting electrical circuits in an industrial environment can be difficult and hazardous. Sometimes, this troubleshooting task can lead to extended equipment outages, increased costs of repairs, and lost revenue. Commercial or residential electricians often need to identify the correct circuit breaker before commencing troubleshooting tasks. This is a time consuming and incredibly frustrating task. Electricians must also identify all loads connected to the same circuit, since the electrical panel's labeling may not be adequate or correct. This application note explains how the Keysight Technologies, Inc. wireless remote connectivity solution helps to accelerate electrical circuit troubleshooting.

Methods to Identify an Electrical Circuit

Without proper labeling at the circuit breaker box or service panel, electricians first have to turn off each suspect circuit breaker in succession to identify the right electrical circuits. This works well for lighting circuits that are visible from the panel. However, in most industrial environment, this method is too disruptive and not acceptable. An alternative method of identifying an electrical circuit uses a test instrument called a circuit tracer which consists of two parts: the transmitter and the receiver. The circuit breaker transmitter is connected to one end of the circuit to transmit a signal along the wire to an inline load switch or directly to the load. The receiver of the circuit tracer detects the signal being transmitted on the electrical circuit. The receiver generates a buzz sound or activates a light when the receiver is held close to the circuit transmitting the signal. With this tool, electricians hope to quickly identify the electrical circuit in need of service. However, two common problems arise. One, the electrical circuit between the breaker and the end load (or switch controlling the load) has to be open in order to inject a transmitter signal at one end or the circuit's path. Two, the transmitter signal often leaks across circuits at the panel, making identification impossible.

The Non-Intrusive Circuit Identification

If the methods previously mentioned are not viable solutions, electricians can identify suspect electrical circuits by measuring the load at the panel and the circuit's end point to make a load change, for example, turning on light switches. This tedious and time-consuming process is repeated until the correct circuit is identified and all measurements are noted. Once located, the electrician needs to identify all of the other loads connected to this same circuit. It is not uncommon to have three to five separate loads connected to one circuit. This necessitates a lot of walking back and forth between the circuit breaker and all the possible loads to ensure the entire circuit is properly checked.

The Keysight Wireless Remote Connectivity Solution

With the rising popularity of smartphones and tablet PCs, electricians can now establish *Bluetooth*® communication from an Android-based phone or tablet PC with an Keysight handheld multimeter via the new Keysight U1177A IR-to-*Bluetooth* adapter. To enable remote monitoring, users just need to install a free Android-based application called Keysight Mobile Meter. The software enables up to three real time measurement to be displayed simultaneously. Users just have to open up the panel and attach the Keysight U1583B AC current clamp to the hot wire in the circuit breaker. The U1583B AC current clamp provides an output of 10 mVAC for each ampere measured. By monitoring three circuits at the same time, this increases the chances of finding the right circuit faster.



Figure 1. Measure current drawn on the hot wire with AC current clamp

Now, using the U1583B, electricians simply need to flip light switches to change circuit loads and read the current drawn on the hot wire with Android devices. The Android display instantly reflects how each load change affects the circuit, eliminating the need for electricians to walk back and forth between the circuit panel and the switch or end load. The Keysight solution allows electricians to extend their reach to two or three places and negate the need to be physically present at various points.



Keysight Mobile Logger Application on a tablet PC

Intermittent faults are among the most frustrating, time consuming, and expensive problems to diagnose in electrical systems. Keysight Mobile Logger (another free Android application) allows electricians to perform data logging over a long period of time and provides trending graphs from the Keysight handheld digital multimeter. Both Keysight Mobile Meter and Keysight Mobile Meter Logger applications offer an array of extended functionality such as the ability to automatically send e-mail or Short Message Service (SMS), and use pan and zoom functions via the Android device's touch screen.

Summary

Identifying an electrical circuit can be very challenging and time consuming. Without the proper tool, electricians use the trial and error approach that can result in hours of wasted time; and time is money. Using the Keysight U1177A IR-to-**Bluetooth** adapter, electricians can establish **Bluetooth** connectivity to an Keysight's handheld multimeter, enabling the faulty circuit to be found quickly and easily. The Keysight wireless remote connectivity solution frees electricians from needless repetitive testing and has been field-proven to help reduce troubleshooting time and achieve higher productivity.

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