Keywords: smart cables, 1-wire chips, counterfeit cables

APPLICATION NOTE 4623

Smart Cable Aids Quality Control and Authentication

By: Bernhard Linke, Principal Member Technical Staff
Oct 15, 2009

Abstract: Embedding a DS2431 (1-Wire®) chip in the near end of a cable allows a system processor to identify a cable (manufacturing date, revision, configuration, calibration data, etc.) and to authenticate it (to prevent the use of inferior counterfeits).

This design idea appeared in the August 27, 2009 issue of *Electronic Design* magazine.

Electrical cables remain of critical importance for interconnecting equipment (**Figure 1**). Yet, cloned and knock-off cables are a growing problem, as is revealed by a quick search of the Internet. Common complaints from cable users include intermittent signals, poor long-term reliability, and complete malfunctions caused by inadequacies such as cheap wire, improper contact plating, incorrect wiring, and poor quality control.

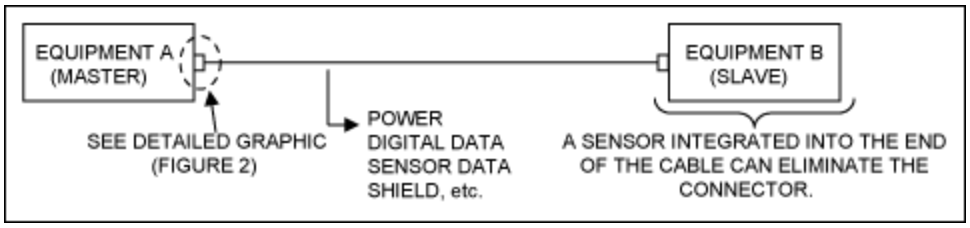

Figure 1. Typically, an electrical cable connects two pieces of equipment.

Electronic instruments alone provide no easy way to tell the difference between a genuine cable and an inferior counterfeit version. But, the situation changes when you embed an electronic (1-Wire) chip[1] in the near end of the cable (**Figure 2**). (A particular chip, the DS2431, is used to illustrate this idea, but other 1-Wire devices may be more appropriate for specific applications.) An IC with 1-Wire interface merges its power-supply voltage and communications on a single pin.[2] For typical smart-cable applications, the chip contains a unique identification number plus user-programmable memory, which can be secure memory or a write-protected EEPROM.

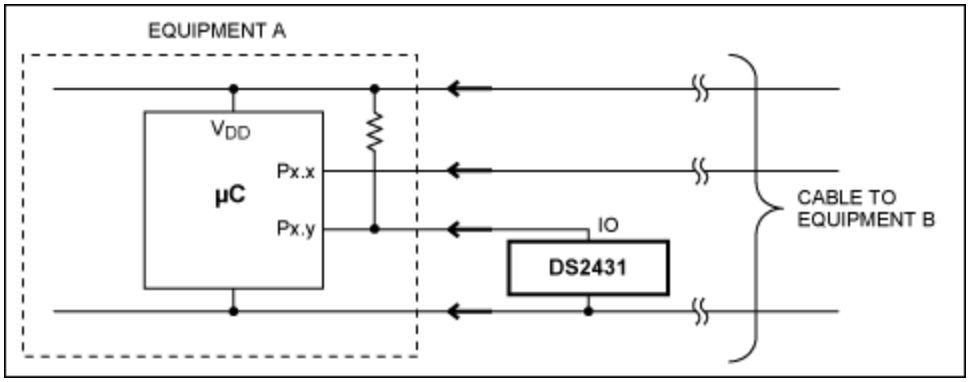

Figure 2. A 1-Wire chip embedded in the cable can provide identification and authentication of the cable.

The far end of the cable connects to a sensor, peripheral, accessory, or other equipment. For equipment that already contains a microcontroller or equivalent (such as an FPGA), you need only add a pullup resistor for the 1-Wire line. A spare I/O port and the memory space required for firmware enhancements are often available in the system, at no extra cost.

When a smart cable is plugged in, the 1-Wire chip generates a presence pulse that the microcontroller interprets as an attachment event. If the connection is made while the µC is switched off, then upon wakeup the µC generates a reset pulse on the 1-Wire line and tests for a presence pulse. If no presence pulse is seen, the µC "knows" that either no cable is plugged in or the cable is counterfeit.

If the µC detects a presence pulse, it reads the 1-Wire chip's identification number. (For some applications, it may be sufficient to verify that the ID number falls within a certain range.) The µC usually reads the chip's data memory as well, looking for an electronic description of the product (i.e., the cable, the sensor at the far end, or both).

For a cable with sensor, the data may include the manufacturing date, revision, configuration, calibration data, and expiration date. You achieve the highest level of authentication (detection and rejection of a clone) by using a secure memory that supports challenge and response authentication.[3] Thus, a 1-Wire chip, which occupies only a single dedicated pin in the cable, can add functionality, ensure quality, and provide aftermarket protection.

References

1. Linke, Bernhard, application note 4717, "Injection molding an integrated circuit into a connector or consumable item", Maxim Integrated Products, 2010.
2. Linke, Bernhard, application note 1796, "Overview of 1-Wire® Technology and its Use," Maxim Integrated Products, 2008.
3. Application note 3675, "Protecting the R&D investment: two-way authentication and secure soft-feature settings," Maxim Integrated Products, 2005.

Related Parts		
DS2431	1024-Bit 1-Wire EEPROM	Free Samples

More Information
For Technical Support: http://www.maximintegrated.com/support
For Samples: http://www.maximintegrated.com/samples
Other Questions and Comments: http://www.maximintegrated.com/contact

---

Application Note 4623: http://www.maximintegrated.com/an4623
APPLICATION NOTE 4623, AN4623, AN 4623, APP4623, Appnote4623, Appnote 4623