COMPONENTS EXPRESS, INC.
INDUSTRY LEADING PERFORMANCE

Components Express Develops USB3 Vision Copper Cable

Transmits 100 Million Images in Harsh Environments up to 20 M

1-800-578-6695 || 1-630-257-0605 || componentsexpress.com

BIT MAXX™

Cables matter. If a consumer uses a standard USB3 cable to connect an external hard drive to their computer, they don't need to worry about slow data or data loss due to a poorly constructed cable. In machine vision, however, a poorly constructed USB3 cable can result in data loss between a guidance system and a powerful industrial robot, creating production line shutdowns and financial consequences.

The handful of machine vision network options available today have all worked to overcome the challenges of transmitting high-frequency data through harsh, noisy industrial environments. When machine vision system developer Applied Vision Corp. (Akron, Ohio) struggled to find a long-distance USB3 Vision cable solution for the food and beverage industry, the company turned to Components Express, Inc. (Woodridge, Illinois), manufacturer of industrial data cables and developers of the Camera Link cable test bed that had helped overcome similar challenges for that popular machine vision protocol just a few years before.

USB3 Vision Cable Challenge

Different than consumer-grade USB3 cables, USB3 Vision-specified cables have unique shielding requirements as well as their own mechanical requirements, such as how cable connectors must be designed to screw down and mate with USB3 Vision devices. Many machine vision projects also call for additional capability to fit the application, such as flexible cable types for vision-guided robots.

For one particular machine vision application, Applied Vision needed a USB3 Vision-compatible cable that could transmit data up to 20 m, well beyond the standard length of 3 to 5 m. Due to the distance, Applied Vision engineers had been forced to use USB3 Vision copper transceivers with a fiber bridge in between. However, none of the USB3 active optical cables tested was backward-compatible with USB2 protocols. While backward compatibility to USB2 is not part of the USB3 Vision Standard, it is a key component of the handshaking specified in the USB-IF standard between a USB host and device.

The optical cable's performance was also inconsistent. In the case of asynchronous operation, the camera may not use the cable's full bandwidth for long periods or, conversely, may send bursts of image data that utilize USB3 Vision's full 5 GB bandwidth. In both cases, the connection would often become unstable and unresponsive. Finally, high-temperature environments could trigger subtle timing errors in the USB3 data path and cause communication errors between the camera and the processor that result in dropped image frames. If frames are dropped,

inspections may be incomplete, and the entire production line could shut down — unacceptable results for many applications.

In addition to the active optical cables, Applied Vision used off-the-shelf copper cables that worked adequately for general purpose computing but could not stand up to the demands of critical applications that required peak bandwidth and extreme environmental conditions. In need of high-frequency, high-reliability transmission, the company turned to Components Express to codevelop a custom copper 20 m USB3 Vision cable capable of transmitting 100 million images at 70°C with zero frames dropped.

USB3 Vision Copper Cable Success at 20 M

The active USB3 Vision-compatible cable that Components Express developed with Applied Vision underwent rigorous testing — not just to the consumer USB3 standard but to the levels required to succeed in a high-performance machine vision industrial system.

To prove the cable's utility, Applied Vision engineers plugged the Components Express cable into a multitude of off-the-shelf USB3 cameras. They tested each system with actual image data and recorded all the dropped frames. While Components Express' cable succeeded with every USB3 Vision camera tested, none of the competing cables could deliver the necessary performance beyond 5 m.

Applied Vision and Components Express conducted further verification on the USB3 cable, including temperature and vibration tests. The companies also conducted electrostatic tests on the cable up to 60 kV, well beyond the industrial standard of 15 kV.

The resulting cost-effective 20 m USB3 Vision cable provides a stable connection that withstands transmission of important data. The cables have been used in two recent Applied Vision inspection systems.

One system is Orion G6™, which inspects exterior beer and soda can decoration at a rate of 3,000 cans per minute to verify parameters such as appropriate design elements, correct logo printing, and true online colorimetric measurements. The other system, Volcano™, is a more mission-critical system that inspects glass containers through multiple angles and ranges of the electromagnetic spectrum to look for critical defects that are both aesthetic and safety related, including chips in the glass. Both systems are expected to minimize costly false rejects that might result from a dropped frame.

Despite the challenges associated with developing a longer, high-bandwidth USB3 Vision cable, Components Express and Applied Vision overcame the odds to create a 20 m cable that consistently and reliably withstands the demands of industrial machine vision applications. ●

CALL TO ACTION

For more information about Components Express USB3 Vision active cables, please visit **componentsexpress.com/_Bit_MAXX-long-distance-usb3-cables** or contact us at **630-257-0605** or **sales@ComponentsExpress.com**.

10330 Argonne Woods Drive (Suite 100) || Woodridge, IL 60517-5066
1-800-578-6695 || 1-630-257-0605 || componentsexpress.com

COMPONENTS EXPRESS, INC.
INDUSTRY LEADING PERFORMANCE