# Extending USB 3.0 Over Fiber For Machine Vision Applications

USB (Universal Serial Bus) is undisputedly the most successful computer connection interface to date, with over ten billion USB devices already in the field and numbers increasing every day. But for machine vision applications, USB 2.0 has been only a minor player due to relatively low throughput rate (480 Mbps) and distance reach (5 metres) when compared to rival camera interfaces like FireWire, GigE Vision, and Camera Link.

## A New Standard

Considerable excitement was generated when the AIA (Automated Imaging Association) announced it would be developing a new camera specification called USB3 Vision based on USB 3.0. Hot off the press (January 23, 2013), USB3 Vision cameras support up to 5 Gbps of data throughput producing quality resolution, vibrant colours, and high frame rates comparable to CameraLink at a fraction of the total solution cost. USB3 Vision is well poised to become a dominant standard.

The only flaw with this good news story is USB's weakness, distance limitation. Not all copper cables are capable of supporting USB 3.0's higher bandwidth at any appreciable distance; while great strides were made in improving throughput from USB 2.0's 480 Mbps to USB 3.0's 5 Gbps, distance took a step backward from 5 metres to 3 metres.

## Bridging the Distance with Fiber

Fiber Optic cabling is the obvious choice over copper, especially with newer transmission standards such as OM3 multimode fiber. Fiber offers plenty of benefits. The cable has a small diameter which allows for easy and convenient installation and greater future-proofing by supporting increasing bandwidths. And while still carrying a premium over copper cables, fiber costs have come down markedly over the past few years.

All things being equal, USB 3.0 and fiber should work together to resolve the distance gap, but it is never quite that easy. Simply firing USB 3.0 data across fiber isn't going to magically get high-definition vision cameras running at 100 metres from your control centre. That's where ExtremeUSB® extension technology comes into play to complete the solution.

## ExtremeUSB®

ExtremeUSB® has long been the extension standard for USB 1.1 and 2.0, and is now bridging the gap for USB3 Vision. ExtremeUSB is a patented extension solution from Icron Technologies

Corporation supporting plug and play functionality (no software drivers required) and compatibility with all operating systems including Windows, Mac OS, and Linux.

The Icron USB 3.0 Spectra™ 3022 system meets the USB3 Vision specification and is able to extend USB3 Vision applications up to 100 metres over OM3 multimode fiber. Moreover, it is the first commercially available fiber extender to be certified by machine vision camera leaders like IDS, Lumenera, NET, Point Grey, and Ximea.


*Icron's fiber based extender system, the USB 3.0 Spectra 3022*

## Additional Advantage with Fiber

Fiber not only facilitates throughput and distance, it also offers electrical isolation, which is a requirement for many critically sensitive medical and military applications, and can be manufactured to be flexible enough for tight locations or moving parts.

## Summary

USB 3.0 has arrived in the machine vision world as USB3 Vision and will start to increase market share at the expense of other standards. Fiber is a very willing partner for cabling due to its ability to handle high traffic rates and easier installation attributes. ExtremeUSB technology based extenders for USB 3.0 are fiber based and certified with USB3 Vision cameras, thus offering system integrators a reliable solution when vision applications need to be extended beyond 3 metres.