SEH



Stagecraft Problem Solved

Setting Up Scenery Motors with PC Software When They're Hanging from the Ceiling

FABRICATORS

Stagecraft Problem Solved with USB over IP: Setting Up Scenery Motors with PC Software When They're Hanging from the Ceiling

When we talk about industrial automation, we tend to think first about such things as factories and oil pumps, not entertainment. But go tell that to Ryan Poethke, Automation and Electrics Designer at Showman Fabricators, makers of what he calls „the weird and the wonderful."

The Premise

Founded over 30 years ago, Showman Fabricators designs and creates custom sets and environments, using all kinds of materials and shape-building techniques. Whether it's the glitzy set of a TV show or a Broadway play, a replica of a historical street in a museum, or a unique retail or public space, this company builds 3D structures, as well as associated electronics, graphics, and mechanical parts in a state-of-the-art facility in Bayonne, NJ.

Showman rides the crest of a wave of innovation in theater technology; itself a subset of developments in industrial automation generally, including such popular areas as 3D printing and IP-enabled motion control. A good case in point is the automated scenery system they created for a new TV studio in New York City. The project involved 20 Clearpath driver-integrated servo motors from Teknic, used to raise and lower illuminated scenery pieces in order to change the size and the „feel" of the set, as seen through the camera.

PLCs for motor operation; PC Software for Setup, Monitoring

Hanging from the studio ceiling 25 feet up, the servo motors hoist these scenic elements — large „light rings" containing LEDs that shine in multiple colors — on command to specified positions above the studio's floor. These positions are pre-programmed into programmable logic controllers (PLCs), the brains behind many industrial automation systems. The commands are sent over Ethernet, strung up into the ceiling, from the stagehand's touch-screen operator station at floor level to the motors above.

Using Clearpath's PC-based setup and configuration software, the servo motors need to be commissioned with such parameters as the weight of scenery element they lift. And that, in turn, requires a one-to-one USB connection – whose cable length limit is 16 feet, or five meters — between PC and servo motor. The Clearpath software is also needed for system monitoring and possible troubleshooting, to ensure the precision of those positions and movements.

Manually plugging each of 20 ceiling-mounted motors into a PC — presumably while standing on a scissor lift — was not going to work, says Poethke. The only practical way that Showman Fabricators could effectively tune servo motors that were mounted on the ceiling was by simulating that direct USB connection over that same Ethernet network.

„This was only the second project we'd used these particular servos for,". In the previous project they were set up at floor level, so accessibility was not an issue. „This is the first time we wanted to put them up in the air, which led us down this path."

- Ryan Poethke, Automation and Electrics Designer

Research and Tests

That path led Poethke to a PLC programming discussion forum, where he picked the brains of generous fellow engineers. He asked forum members to recommend a solution with crash-resistant software (rebooting devices hanging from the ceiling to reestablish connectivity was also a non-starter); easily customized addressability, so that each of 20 devices would have logical "friendly" names; DIN-rail mounting, and 24V power, requiring no separate power supply.

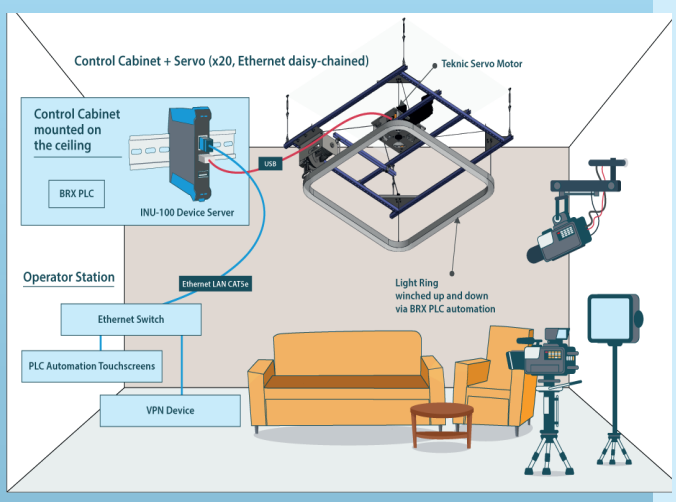
„We needed a way to communicate over Ethernet with the servos, so we needed to do USB communication over our IP network," as Poethke posed the problem. „Ethernet was a logical choice for us, as we already had a network in place for PLC-based control of the automation system." Forum responders came up with several USB device servers for Poethke to try.

SEH Technology's INU-100 USB device server soon rose to the top of the list for several reasons. Importantly, notes Poethke, they were able to confirm lead time for a relatively large quantity — 20 — units. Equally important, test samples are a standard service at SEH, something other vendors were unwilling or unable to provide. Mike Majewski, SEH Technology President, North America, sent Poethke a sample INU-100 for testing with the servos. Showman couldn't commit to purchasing 20 device servers with the chance there would be incompatibilities.

„I set it up on the test bench with my laptop and had the thing talking to the servo in about ten minutes," Poethke recalls. The servo's USB port was cabled to the INU-100; the INU-100's Ethernet port to the pre-existing Ethernet LAN, and each motor assigned a meaningful "friendly" name in the device server's software interface.

„It's very easy to configure and works flawlessly," says Poethke. „It's also nice because I can have 20 of these things sitting on the network and just talk to the motor that I need to set up. I've played with a couple of other device servers over the years. I have to say these were certainly the most user-friendly to set up and very stable."

SEH Technology in the Studio: Bringing USB Connectivity to Ceiling-Mounted Motors



Teknic servo motors raise and lower scenic lighting elements in the TV studio, in an automated system run by programmable logic controllers (PLCs). The system must be calibrated, monitored and programmed through Teknic Clearpath software running on a PC. To bring the motors' USB connectivity from the ceiling down to stage level, Showman Fabricators installed INU-100 USB device servers from SEH Technology into the control cabinets of each motor. These converted USB signaling for transport over Ethernet, previously installed for the PLC-based control.

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Ryan Poethke, Automation and Electrics Designer

The Results

Poethke's Automation & Electrics Department team built a Showman-Fabricators-branded control cabinet, labeled „Light Ring Winch Controller," for each of the 20 servo motors (see Figures 1-4). Each double-sided cabinet, built with a center back plane for compactness and serviceability, contains a PLC, power supply, LED dimmer, and braking resistor as well as the INU-100 that bridges the integrated servo to the IP network and its Clearpath MSP software. Each cabinet exterior is also labeled with two IP addresses; one for the PLC controlling the motor's routine operation, and one for the USB device server.

Poethke can easily foresee future orders for more SEH Technology INU-100s, as freedom from scissor lifts and the possibility of remote access using a VPN give him added design flexibility for future projects involving moving parts or other USB-accessed hardware.

„Especially if we use these Teknic servo motors again and need to mount them where they'll be inaccessible, I can definitely see us using the device server again," he notes. „Just being able to talk to the motor without having to be attached to it or the control cabinet is very helpful for us."

Features
INU-100 USB Deviceserver

- USB devices are integrated seamlessly and comfortably
- Access control via a PC/Industrial PC possible
- The use of standard USB devices allows for a cost-effective solution
- Fail-safe and highly available
- The integrated change-over (CO) relay allows for automatic or event-controlled switching
- Fast data transfer with up to 100 MB/s
- The INU-100 ensures highest data security during transmission

Showman Fabricators

Showman Fabricators builds your vision. In its state-of-the-art facility, custom fabricated designs for television, theatre, experiential, and performing arts organizations come to life. Showman creates sculpture for public spaces, retail, museum display and architectural environments; crafting the oversized and seemingly impossible. Founded over 30 years ago, Showman has emerged as the premiere scenic shop building outstanding and innovative projects, delivered on-time, with the highest quality and durability.

For more information visit https://www.showfab.com/

SEH Computertechnik GmbH

SEH Computertechnik is an innovator for network solutions, primarily in the licensed software/USB management and printing sectors. Founded in 1986 as a custom software and technology company, SEH has evolved to offer professional and secure network solutions for all types of businesses across a variety of industries. SEH adapts its technologies to create unique, highly integrated solutions with exceptional price/performanceratios.

All SEH products are developed and produced at the company's headquarters in Bielefeld, Germany. U.S. headquarters are located in Phoenixville, PA, with offices across Europe, Asia and North America.

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