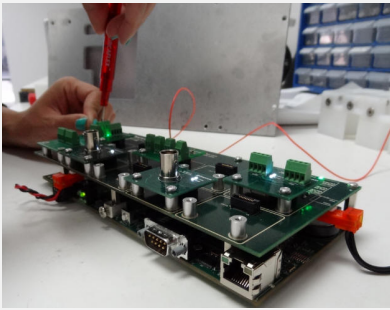


Rapid OEM Prototyping of Medical, Biotech, and Industrial Devices and Products Using Multisim, Ultiboard, and NI Single-Board RIO



Close-up of a Circaflex Board

"The growing library of components and connectors in Multisim 12.0 helps us build boards without having to generate symbols and footprints for hardware connectors, which saves us one to three hours on each part."

- Candice Garcia, [Cyth Systems](#)

The Challenge:

Developing ready-to-use, technically proven signal conditioning circuitry that can rapidly integrate daughterboards and daughterboard kits into the NI Single-Board RIO platform for medical and biotech applications.

The Solution:

Taking advantage of the productive, optimized circuit simulation and prototyping environments of NI Multisim and NI Ultiboard to rapidly produce our Circaflex boards with few design iterations.

Author(s):

Candice Garcia - [Cyth Systems](#)

Introduction

Cyth Systems is a leading integration and engineering firm with a history of success designing and building automated test and embedded control systems. Cyth differentiates itself by creating systems that use standard products as building blocks for hardware and software aspects of a project. The end products are maintainable, flexible, reliable, and meet time and budget constraints. For example, Cyth builds Circaflex products that help speed developing and prototyping medical and biotech devices. As an off-the-shelf control system, Circaflex products reduce the risk, cost, and time required to make successful prototypes. One of the key components of the product line is a family of daughterboards, built for [NI Single-Board RIO](#), which contain a variety of circuitry, signal conditioning, and connectors. Circaflex products are very useful in evaluating and launching projects with NI Single-Board RIO. Examples of Circaflex applications include the development of a polymerase chain reaction (PCR) machine used for immunology, a bioreactor used for live cell cultivation, and numerous portable medical device testers.

Powerful Component Library

Our engineering teams value the growing library of components and connectors in [Multisim 12.0](#) because it helps us build boards more rapidly. We typically spend one to three hours creating a symbol, a footprint, and a library entry for a part. Our engineers generate proposals and pricing based on their previous experiences creating symbols and footprints. Therefore, using the existing components and connectors in Multisim to avoid generating our own symbols and footprints translates directly to cost and time-savings for us and for our customers. Additionally, any mistakes made during footprint creation introduce time, material, and monetary costs, so using the connectors and components in the improved, built-in Multisim library help avoid unnecessary cost, delays, and damage to the devices or equipment. Multisim comes with a variety of global connectors as well as customized connectors for NI hardware, such as the NI Single-Board RIO connectors Circaflex uses.

Intuitive Design Transfer to Production

When customizing our Circaflex daughterboards for our clients, we often take mechanical and physical dimensions into account. For example, we might use a mechanical drawing to help decide where to place mounting holes or components, then export our final board layout to verify that the customer likes the shape and size. In some cases, we actually export 3D models of the board so they can be integrated into a solid model for the OEM product. [Ultiboard](#) helps us conduct these import and export functions with reliable DXF import/export functionality, accurate Gerber file extraction, and easy 3D model generation. Since that type of modeling and design verification helps find physical design constraints, we see noticeable efficiency improvements and fewer errors in physical design and layout while designing custom daughterboards for our OEM control system applications.

Customizing Circaflex Using Multisim

At later stages in the development process, after successfully prototyping an instrument or device, we often develop a custom version of our reference board. This version incorporates our customer's desired signal conditioning, power distribution, cables, and connectors. So we can not only create our own product using NI Multisim and Ultiboard 12.0, but also provide custom modifications to our product for customers using the same environment. We can simulate signals into a circuit design and measure the circuit's responses or outputs using the simulation capabilities of Multisim. This confirms that the final product will work as expected and helps us select components such as resistors or filters before fabrication begins.

Results

NI Multisim and Ultiboard 12.0 have helped us offer a product that is making a difference in the life science industry. Circaflex helps our customers develop powerful, life-saving medical devices, biotech instruments, and industrial systems. With the new features available in Multisim and Ultiboard 12.0, we are already seeing time-savings, reduced mistakes, and an opportunity to rapidly customize our products for customers.

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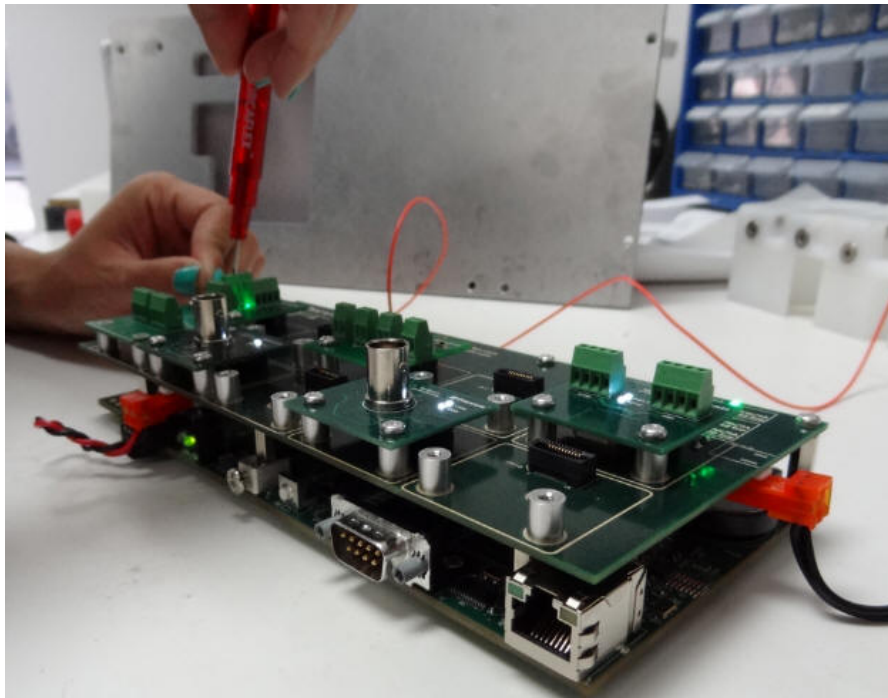
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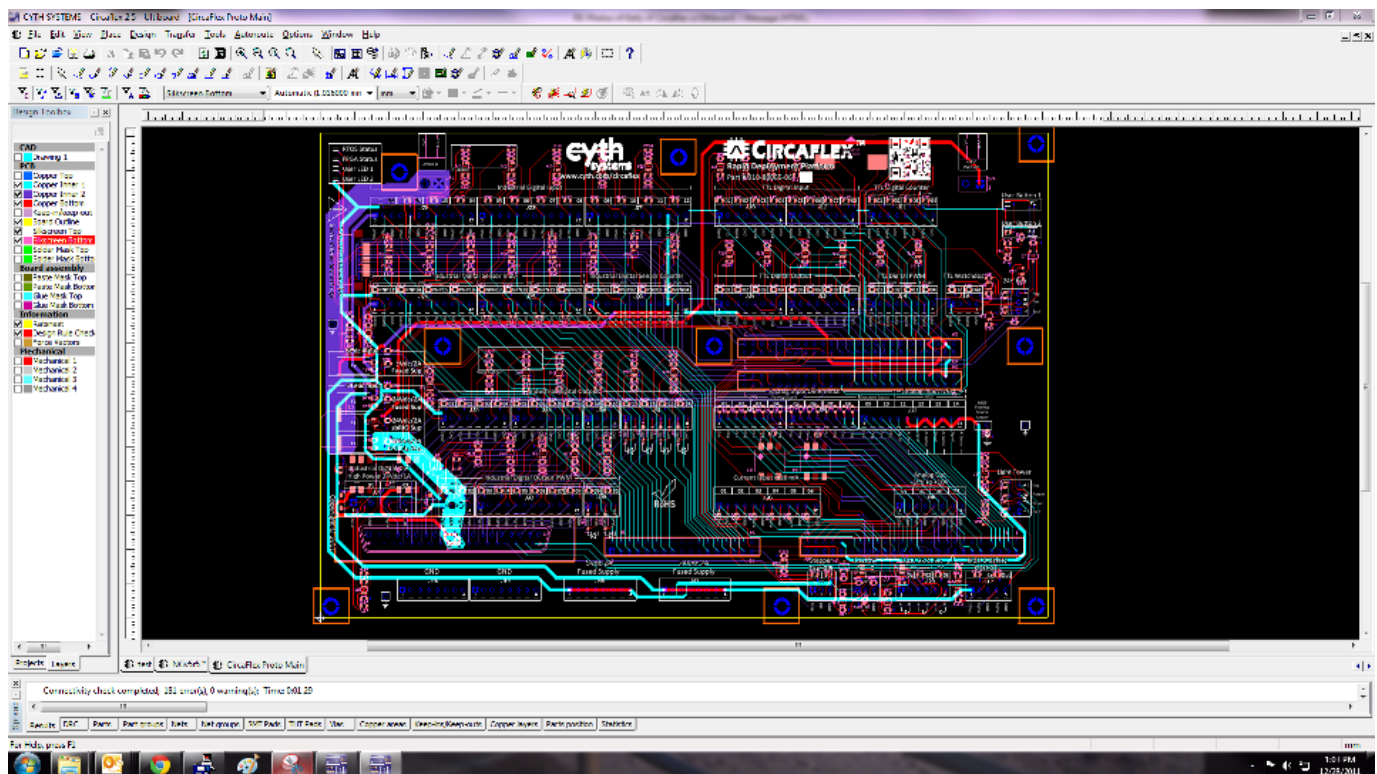
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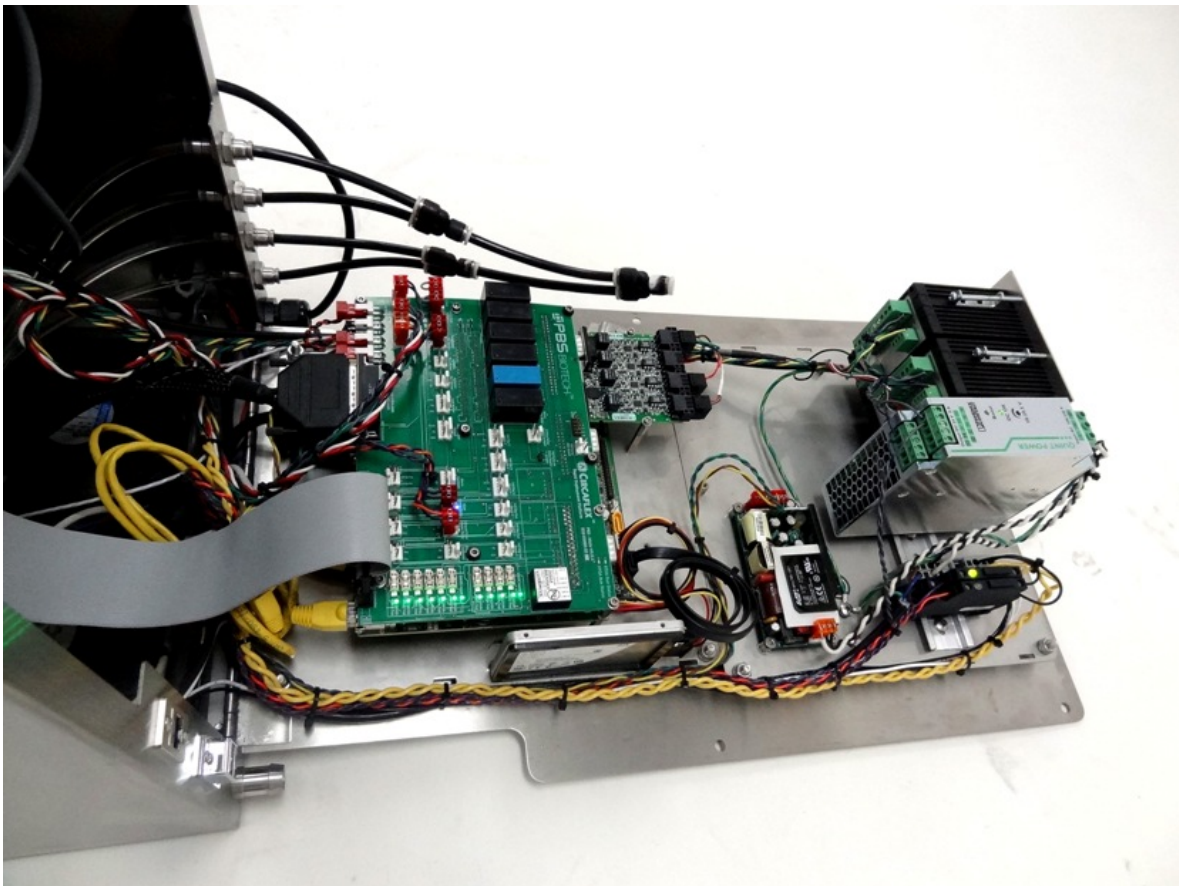
Close-up of a Circaflex Board



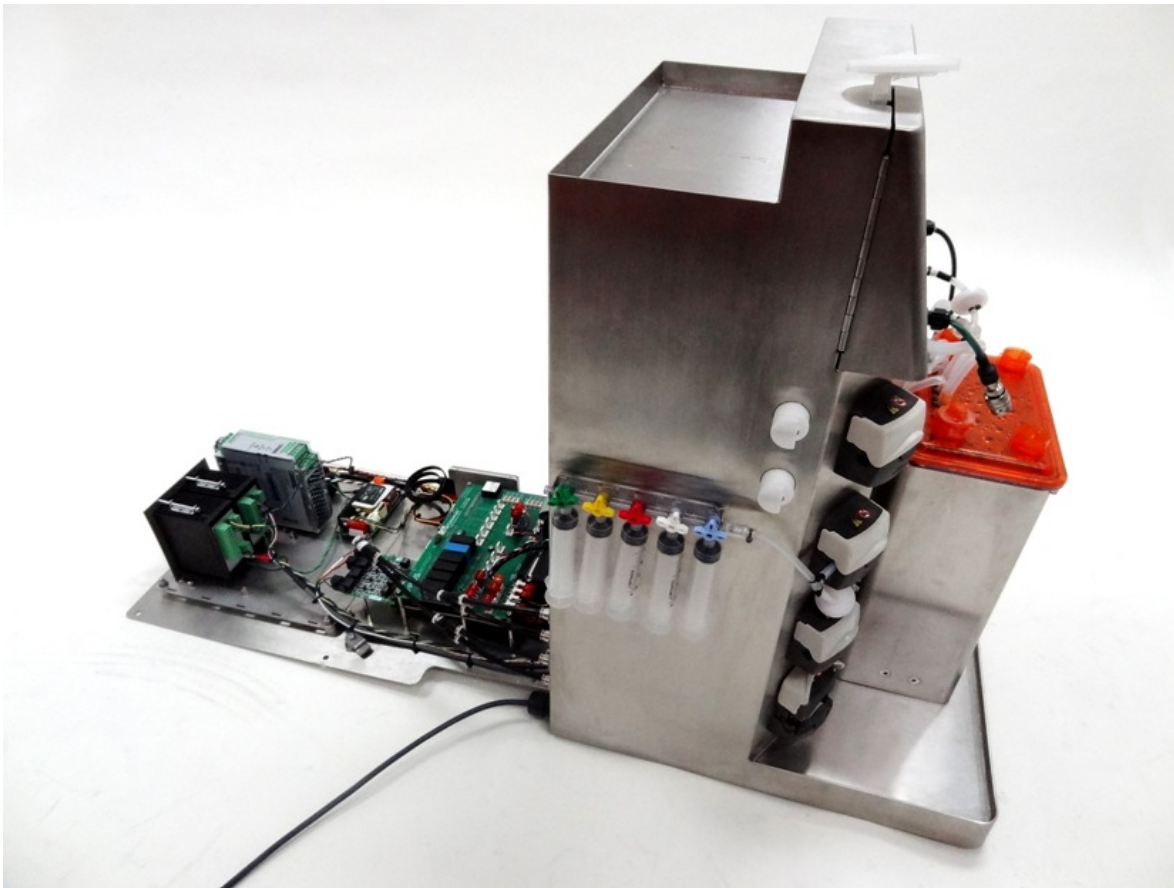
Circaflex PCB Layout in Ultiboard



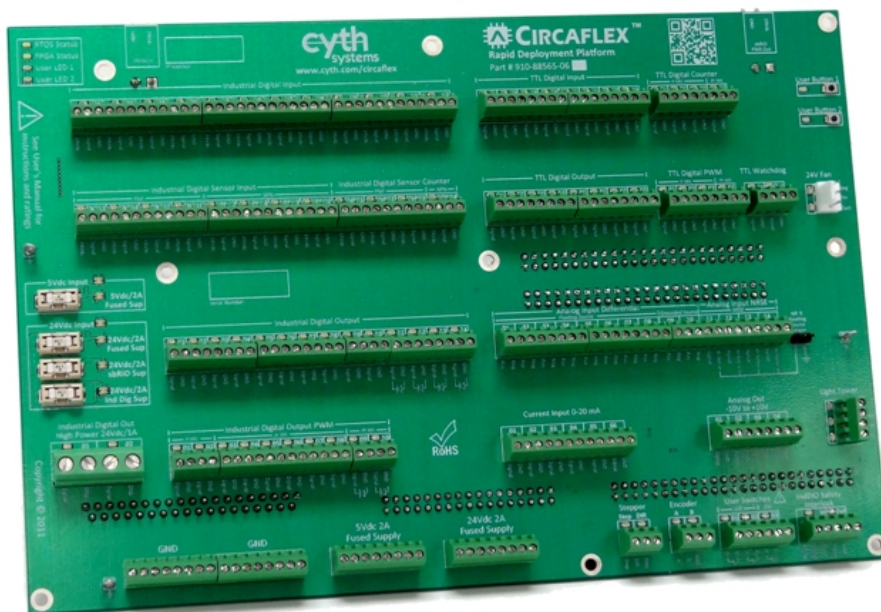
Software Application of Circaflex



Integration of Circaflex and Single-Board RIO in a Biowash Medical Application



Integration of Circaflex and Single-Board RIO in a Biowash Medical Application



PCB Prototype of Circaflex

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