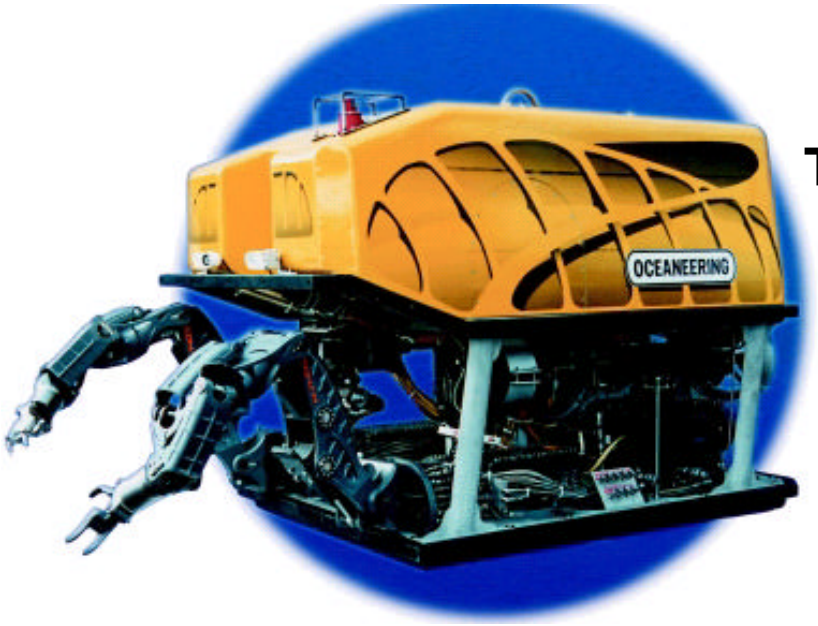


TINITRON, Inc
5160 NW Five Oaks Drive
Hillsboro, OR 97124-5608

Toll Free: 1-877-TINITRON
Fax: 503-533-5615
www.tinitron.com

Left: Oceaneering's deep-sea Remotely Operated Vehicles (ROV's) are used for petroleum exploration and production, communications cable installation and maintenance and recovery operation including the RMS Titanic and TWA Flight 800

Below: An ROV is lowered for a maintenance dive on a marine oil well platform

Oceaneering Inc. searched high and low for the right components for their deep-sea submersibles

They found the custom transformers they needed just above sea level at TINITRON

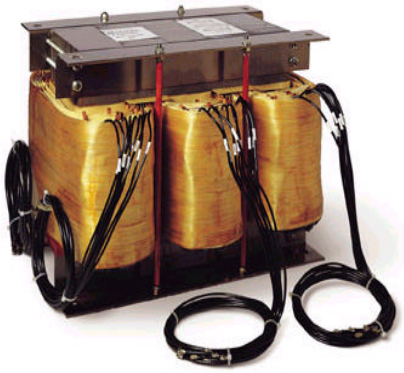
It's not often we see water and electricity mix, but with Oceaneering, it's a way of life. Electricity powers their deep-sea ROV's and submersibles to extraordinary depths and Tinitron components help provide it. Reliably getting power to an ROV 2,300 feet under the sea presented several challenges to the Tinitron team.

The Request for Proposal ruled out an off the shelf solution; small package, relatively lightweight, very little power loss, high voltage for a hydraulic pump, and low voltage for the microcircuitry, must with-stand pressure to 10,000 psi, a harsh environment, and more.

Working with Oceaneering's engineers, problems started getting solved. Small packages and high power output typically generate lots of heat, which can be a problem, unless you've got a good heat sink. We then realized the ocean itself would provide an infinite heat sink.

Power loss transmitting over such a long distance would be significant at application voltage so we built a mini power sys-tem Much like the residential power grid. Low volt-ages just don't travel well but high voltages do. On the command vessel, a Tinitron power distribution transformer boosts the voltage to a high level, much like the lines running to your local substation. On the ROV's end, the power is stepped back down, conditioned and apportioned out to the various devices like the transformer on the pole and the breaker box at home do.

We were concerned that both power and data had to flow over the ROV's umbilical cable tethered to the surface 2,000 feet away; leaving plenty of opportunity for interference. Fiber optics for data was a smart decision to totally eliminate interference, and the cable would weigh less.



Saving space was a requirement, but the rules of electromagnetics dictate how much wire is required to produce the desired result in a transformer. It seemed like there was no way around these fundamental principles. You simply can't do the same job with less material.

Undaunted by apparent reality, Tinitron engineers kept thinking; looking for "the solution outside the box." In this case, a box turned out to be the solution. A 15% space savings was achieved by using square wire, instead of traditional round wire, because it packs so much tighter.

If you find you're up against similar obstacles, we invite you call Tinitron. With experience in high quality transformers, power supplies and electromagnetic components for industries as diverse as medical and scientific instruments, aerospace, forest products, mining, hydroelectric projects and more. Tinitron offers a broad based resource you can count on for quality, service and value.

Left: Tinitron distribution transformers like this one send power to the ROV. Tinitron components on the ROV condition and regulate power for its many electrical components including a hydraulic pump, motors, lights, and microprocessors.