

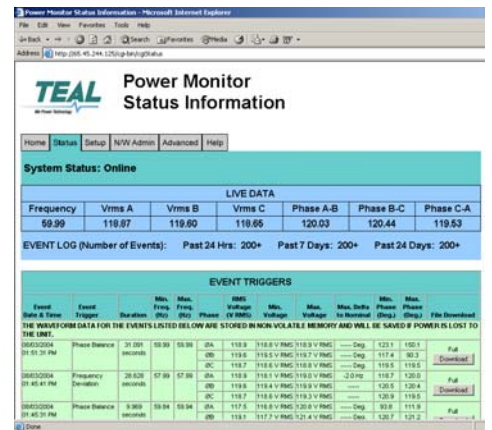


nection of the TEALwatch™ with a standard Ethernet (10base-T) cable to an internet accessible network or directly to a PC or laptop.

The TEALwatch™ will enable our customers to monitor the power at all of their sites and installations 24/7/365 from anywhere in the world, helping to reduce service costs by proactively diagnosing power related issues prior to service calls.

The TEALwatch™ will be available as an option on TEAL three phase power subsystems beginning in December. It will also be available as a retrofit kit for many TEAL power subsystems already installed in the field to enable our customer base to monitor sites already operating.

See related story on page 2 for more TEALwatch™ power monitor details.



The TEALwatch™ Power Monitor easy to use interface via a standard web browser, shows live data as well as down-loadable event files that are stored for viewing and analysis.

TEAL Electronics is the leading provider of custom power subsystems for the technology sector, primarily serving the medical imaging and semiconductor production/testing markets.

For more information about TEAL Electronics and its products, please visit our web site at www.teal.com or contact Kevin Harris at (858) 558-9000 or kharris@teal.com.

We Start with People...

TEAL would like to offer a very warm welcome to our new President, Rod Bolton! Rod may be new at TEAL, but he is no stranger to the San Diego business community. Since 1985, Rod has been President of APW Electronic Solutions (ES), a local company that designs and manufactures embedded computer products. During Rod's tenure as President, ES grew from 32 employees and \$5 million annually to more than 600 employees and \$80 million annually.

Rod is a past President of the San Diego chapter of the AeA and has served on the National Board of Directors. Rod also served on the Board of Directors for the San Diego Chamber of Commerce, TEAL Electronics, and ITECH Corp. Rod was recognized by the San Diego Business Journal as one of the Who's Who in San Diego and has received numerous community service awards. "I look forward to the opportunities that TEAL presents. TEAL has been very successful in the past, and some of our challenges include growing the company in additional markets to help diversify our business base" said Rod. On a personal note, Rod has completed a dozen marathons, including the 100th Boston Marathon in 1996.

Rod takes the reigns from Jim Taylor, who was recently promoted to Executive Vice President and Chief Operating Officer of SL Industries. Jim commented, "Rod has many years of experience and has had much success in growing a company that serves the technology industry. I am confident that under Rod's leadership TEAL will continue to be successful and grow, just like his former company."

TEAL's employees gather to bid farewell to Jim Taylor, who is moving on to a corporate position, and to welcome our new President, Rod Bolton!

TEAL News...

TEAL Introduces the TEALwatch™ Power Monitor

The first truly cost effective embedded monitoring solution designed to reduce our customer's service costs...

TEAL is announcing the release of our new TEALwatch™ Power Monitor. The TEALwatch™ is a very cost effective



TEALwatch™ Power Monitor Module that will be offered as an option in TEAL power subsystems beginning in September 2004 (shown next to coffee mug for size comparison)

power monitor designed as an embedded option in a TEAL power subsystem. The TEALwatch™ monitors the AC mains voltage and utilizes a very easy to use interface via any standard web browser. No special software is required, only the con-

TEAL News...

2004 Top Electronics Company - San Diego Business Journal



TEAL Electronics was recently named as one of the top electronics companies in San Diego by the San Diego Business Journal. TEAL continues to grow and provide a stable environment for continued employment in the Sorrento Valley area.

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TEAL Tech...

TEAL Releases the first TEALwatch™ Power Monitor

Release scheduled to coincide with the Radiological Society of North America conference, Nov 28 - Dec 3, 2004, Chicago, Ill, www.rsna.org

TEAL Electronics is introducing the TEALwatch™ power monitor, a low-cost embedded power monitor utilizing a web based interface for remote monitoring capability. The TEALwatch™ is designed to be integrated into a 3-phase power subsystem, monitoring the mains voltage at the power entry point for the OEM equipment such as Semiconductor Automated Test or Medical Imaging equipment. The monitoring interface is Ethernet 10base-T, enabling remote monitoring with a simple web browser from any Internet connected

PC, with no special software required. The TEALwatch™ features programmable triggering parameters and has built-in non-volatile storage for multiple waveforms captured on triggered events with 128 samples per cycle resolution

Embedding an Ethernet connected web-based low-cost power monitor into a permanently installed Original Equipment Manufacturer's (OEM) 3-phase power subsystem gives the user the ability to monitor their sites 24x7x365. As compared to the more traditional temporary power monitoring for OEMs, having a monitor permanently installed at each site can help prevent costly and repetitive site problems by identifying if the AC power is related to a specific site problem anytime. To make an embedded power monitor solution feasible, the device must be low cost, and to capture typical power quality events, it must be high performance.

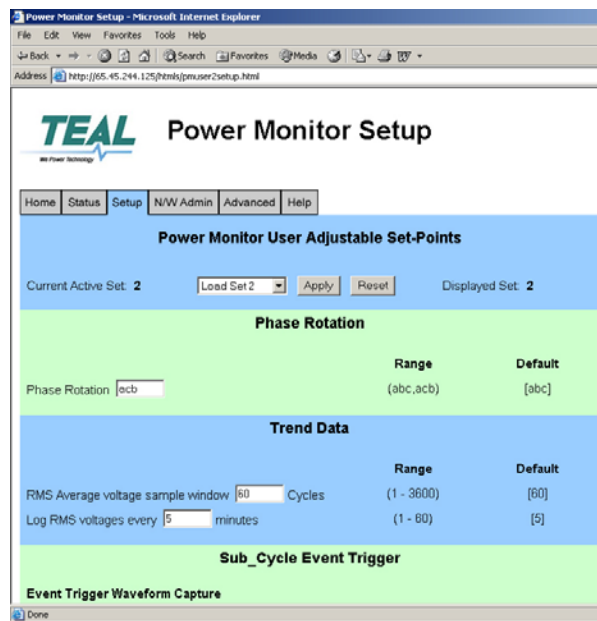
Why Develop a Power Monitor?

Over the past several years, TEAL has integrated various power monitors into our OEM power subsystems for several customers that desired to have monitoring capability 24x7x365. The advantages of having a permanently installed power monitor at each site are that the OEM customer can correlate site issues with power issues to identify or eliminate the root cause of a site issue at anytime. With a temporary monitor installed, you often miss events or are simply too late to capture critical information. The primary issue in each of these cases was simply that the cost for the monitor option was just too high. The added cost for the optional monitor often approached the cost of the rest of the power subsystem. Most customers are unwilling to pay the

added premium for a permanently installed solution.

TEAL investigated low cost options from many of the power monitor manufacturers without finding a device that could meet our cost, specification or performance targets. TEAL undertook a project to develop our own power monitor. The result of this project is the TEALwatch™ power monitor.

The TEALwatch™ is essentially a Linux-based web-server in a box with an outboard power supply including an isolated voltage divider to provide the input connections. It was developed by TEAL



The TEALwatch™ web interface SETUP tab allows the OEM to load both universal settings and adjust triggering and data capture for specific devices or applications.

Electronics specifically as an extremely cost-effective power monitor device to be offered as an option on TEAL 3-phase power subsystems.

Having a TEALwatch™ connected to the output of the TEAL power subsystem to monitor the input to the OEM customer's

critical equipment provides a proactive diagnostic tool for power quality issues that will decrease service costs for each site or installation by enabling remote diagnostics of power related events.

Design Optimization

The design of the TEALwatch™ power monitor was optimized for cost versus performance. Our aggressive cost targets were the primary project drivers, but we had several prerequisites for performance that had to be met.

To facilitate the design of the Ethernet based web browser interface, a microprocessor hardware design was implemented utilizing a Linux based web-server hardware design, with TEAL designing the in-

put and output functions and interfaces. The processor that was selected enabled a sampling rate of 128 samples per cycle. This sampling rate is high enough to capture a waveform excursion with a transient event, even with a high frequency transient event. The microprocessor has the ability to process the data to monitor longer term RMS type data as well as perform data trending.

A reasonable amount of both dynamic Random Access Memory (RAM) as well as Non-Volatile (N-V) RAM was provided to allow for multiple full waveform storage and many summary events in N-V RAM as well as many more full waveforms in dynamic RAM. Data stored in N-V RAM can be retrieved even after a full power outage. The waveforms and trend data that are stored in the TEALwatch™ are easily downloaded by simply clicking on the download button and directing the file to the location of your choice when you are connected via the standard Ethernet connector. Different types of power quality signatures, waveforms, and events are used to trigger events in the TEALwatch™ monitor. Events that can trigger the TEALwatch™ include positive and negative sub-cycle waveform excursions (transients), waveform distortion, voltage surges and sags (longer-term RMS type events), phase rotation, phase-to-phase balance, and frequency deviations. In addition, trend data is recorded at regular intervals.

The hardware pipeline design includes 8 channels for monitoring, and the power

supply - voltage divider interface is robustly filtered to both protect the data lines and to ride-through most power disturbances without dropping out.

Lastly, the TEALwatch™ design is specifically an embedded design. The TEALwatch™ hardware consists of 2 pieces, the web-server section and the power supply - voltage divider section. The web-server section is a small box with the external Ethernet connector for network connection. The power supply - voltage divider section is an open frame PCB that is mounted near the web-server box inside a power subsystem.

User Interface

The real innovation for the TEALwatch™ power monitor is the extremely easy to use web browser interface. No special software is required for the interface, only standard Internet Explorer or Netscape browsers. The connection is via a standard 10base-T Ethernet connector, and direct or router based connections can be used. Network connection of the TEALwatch™ allows 24x7x365 monitoring from anywhere.

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TEAL Tech...

The Advantages of Multiple Input Voltages in a Power Subsystem

Many of the power subsystem products

that TEAL produces have multiple input voltage capability, typically including 200, 208, 240, 400, and 480VAC, with 50Hz and 60Hz capability. This is easy to provide when an isolation transformer is a part of the power subsystem.

The main advantage of multiple input voltages for a power subsystem is flexibility. The same exact subsystem can be installed virtually anywhere in the world and configured in a matter of minutes for the local voltage and frequency.

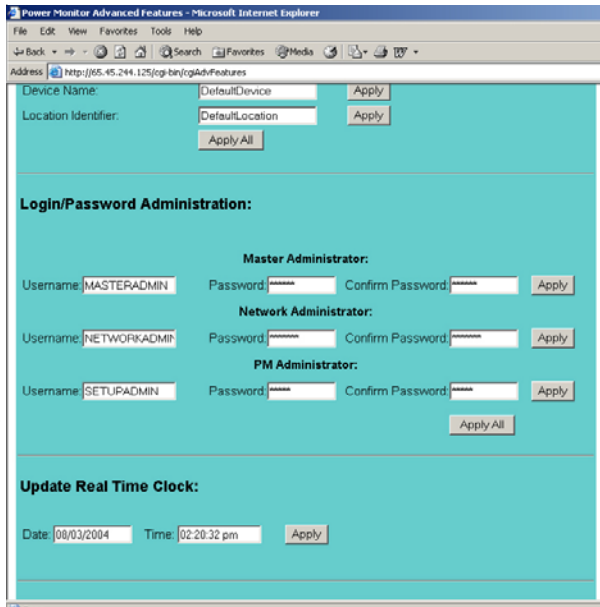
This enables TEAL's OEM customer to produce only one model of it's equipment that can be designed and optimized to run off a specific AC line voltage or voltages,



A view of the inside of a typical TEAL power subsystem containing a 3-phase isolation transformer. The transformer taps for various input voltages are easily accessible "loops" and can be switched in a matter of minutes.

and the input power subsystem can be configured and adjusted for the local installation, whether it is in Detroit, London, Tokyo, or Moscow, saving design, manufacturing, and service costs for the OEM customer. It also enables a system to be moved from one location to another, even from continent to continent, without having to replace large and expensive parts of the OEM system. This is just one example of the hidden value that TEAL provides to it's OEM customer base.

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The TEALwatch™ web interface ADVANCED tab allows the OEM to control access (via passwords) to both power quality settings as well as network settings.

We Power...

Semiconductor Automated Test Equipment (ATE)

Testing of semiconductors is an important step in the process of ensuring reliable products that work as expected and achieve yield optimization by proper identification and diagnosis of faults. Semiconductors are used in a wide range of products including automotive, cell phones, computers, and consumer electronics. Many of the integrated circuits (ICs) have evolved into a System on a Chip (SOC). This complex chip incorporates several circuit functions onto a single chip and often requires a very accurate set of mixed electrical signals to fully test its functionality.

Semiconductor test equipment may test ICs before or after they are packaged. Many of the testers are directly connected to semiconductor handling equipment and accept automated IC placement for testing. These testers become a critical link in the overall semiconductor manufacturing process and can become a

bottleneck that slows throughput and capacity if they are not functioning correctly. Test equipment manufacturers have created advanced testers that can test many chips in parallel to help increase throughput.

TEAL powers some of the most advanced semiconductor testers on the market today and is the leading supplier

can damage chips under test which can significantly reduce yield.

TEAL provides an optimized combination of required voltages, noise filtering, transient suppression, and single point grounding with power systems that are engineered specifically for testers. TEAL's optimized power systems provide clean power that enables peak

performance and reliable operation for thousands of semiconductor testers worldwide.

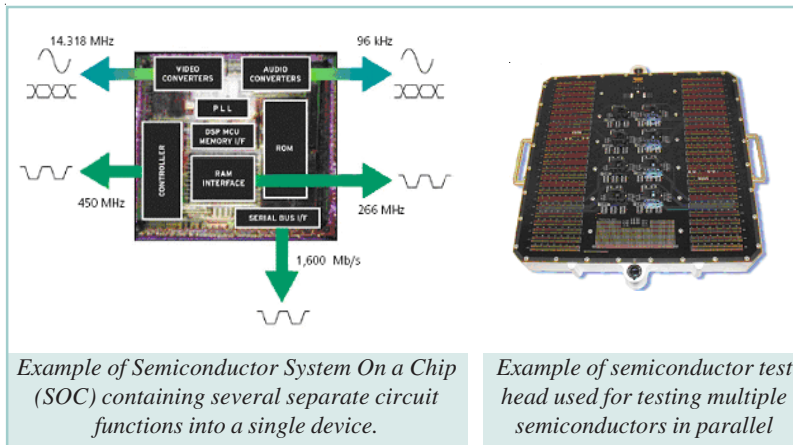
TEAL Electronics - We Power Technology™

Submit Your Application

Submit a **We Power...** application to TEAL and receive a complimentary copy of our "Power Quality Handbook", a comprehensive publication that details common power quality problems and recommended solutions. If we select your application for inclusion in POWERLINES we'll also send you a complimentary TEAL logo polo shirt.

Let us know how TEAL helps **Power Your Technology**.

Submit your application to Kevin Harris @ kharris@teal.com.



Example of Semiconductor System On a Chip (SOC) containing several separate circuit functions into a single device.

Example of semiconductor test head used for testing multiple semiconductors in parallel

of power subsystems for major manufacturers of these advanced testers. The power required to keep these advanced testers operating at peak performance is critical with very specific power requirements and they are susceptible to noise and transients. Noise can create soft faults in chips that are difficult to diagnose and significantly reduce expected throughput. Transients



10350 Sorrento Valley Road, San Diego, CA 92121