

We Start with People...

TEAL believes that people are a critical element for any business to be successful. Individuals who answer our phones, assemblers who build our products, engineers who introduce new ideas, managers who coach our teams, accountants who pay our bills, specialists who keep our systems running, buyers who ensure we have the parts we need. They are the reason we are successful and why our customers are happy.

TEAL had a very successful 2003 and exceeded goals in nearly every area thanks to our dedicated people. 2004 has started with the same goal-exceeding effort as we finished with in 2003 and it has enabled us to hire several new individuals.

Several new faces joined TEAL this last quarter. With production reaching record levels we added 15 new assembly folks to meet the demand. We also added a new Customer Service Representative, Joe Laut, a new Electrical Engineer, Jerome Brown, and a new Vice President of Sales and Marketing, Gary Jasinski.

Each quarter we would like to introduce new people and profile groups within TEAL who make us successful and keep our customers happy. This quarter we'll review our **Customer Program Teams.**

Each Customer Program Team's objective is to ensure our customer's needs are accurately communicated and met. Each team consists of three key people. An Account/Program Manager (the customer's primary champion), a Program Engineer (the primary pre and post sale technical contact for the customer), and a Program Customer Service Representative (the day-to-day and logistics expert for the customer).

TEAL News...

First Program and Installations of our new Voltage Regulator

TEAL is pleased to announce the first program and first installations of our new TEALtrak™ Voltage Regulator products with a major Medical Imaging OEM. Combining an advanced high performance dual conversion voltage regulator with an isolation transformer-based power sub-system, TEAL has developed a new line of power conditioning equipment that will correct the vast majority of power related problems.



TEAL Power Subsystem with Integrated TEALtrak™ Continuous Sub-cycle Voltage Regulator

TEAL's new TEALtrak™ Voltage Regulator products are designed to provide a tightly regulated clean AC waveform to customers' sensitive electrical systems by recreating the AC waveform and removing potentially damaging and disruptive surges, swells, sags, and transients in the process.

TEAL Awarded Patent on Filter That Improves System Performance and Reliability

TEAL was recently awarded a patent for an advanced electrical noise filtering circuit that helps improve our OEM customer's system performance and reliability by significantly reducing damaging and disruptive power line disturbances. The patent was awarded to Rey Llanos, Randy Redding, and Victor Soto for "Electrical Power Conditioner", which is a high performance scalable shunt filtering circuit with a very low series impedance designed to provide clean electrical power to the customer's system. "TEAL continues to advance the technology in the power quality arena, and the technology in this patent can be found in the TEALwave™ family of electrical filters available in our power subsystem and power conditioning products," said Jim Taylor, President of TEAL Electronics.

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

TEAL Tech...

Down to Earth: Ground Rods and Ground Electrodes

by Jude M. Russell / PowerLines (Newington, CT)

TEAL Electronics' customers appreciate the benefits of high quality grounding. Power subsystem units from TEAL have a lot going for them: filtering, transient suppression, small size, low impedance transformers, high efficiency, site prep-in-a-box. But by and large, the biggest reason our customers come to

TEAL is to improve their equipment grounding – and a TEAL power subsystem is the #1 grounding solution in the industries that we serve.

So it is quite a surprise to find that many TEAL customers who have purchased and installed power subsystems do not always adopt “best practices” to ensure optimum grounding. And in almost every case – these best practices include a Ground Rod or Ground Electrode.

Required by Code

A ground electrode is, first of all, a legal

used on occasion, it more often results in an improperly insulated or isolated ground system, and a magnification of ground related problems, especially when external ground loops and connections cannot be controlled.

Use of a TEAL power subsystem ensures that the Neutral-Ground bond is physically close to the sensitive load. Use of a ground electrode ensures a good reference to the local ground or earth. Other techniques (insulated grounds, isolated data and communications ports, floating grounds, etc) are often unsafe, expensive to install, difficult to maintain, or all of these!

Physically Close

We see too many sites where a ground electrode conductor ③ is run to a ground rod or the main building ground that is hundreds of feet from the power subsystem. **This is incorrect.** The NEC (and good power quality practice)

requires the ground electrode to be “...as near as practical to and preferably in the same area...” as the power subsystem where the neutral and ground bond is derived. Ground electrodes that are derived elsewhere can create ground loops and actually reduce the efficacy of the power subsystem grounding.

From a power quality standpoint, a local ground electrode means that the system grounding is referenced tightly to the local environment, ensuring that the inevitable ground loops that occur within the load are kept small and less likely to introduce noise into the system controls. If the ground electrode is more than 25’ from the power subsystem – you need to consider that your grounding is less than optimum.



Medical imaging applications benefit from improved image quality when proper system grounding is employed.

Ground Rod – Least Preferred Option

It is a common mistake to want to derive a ground from the distant service entrance. Similarly, it is also very common to see a ground rod chosen as the ground electrode. Power quality experts understand that *ground rods are often very poor earth references* – with impedance to true earth in the 10’s or 100’s of ohms.

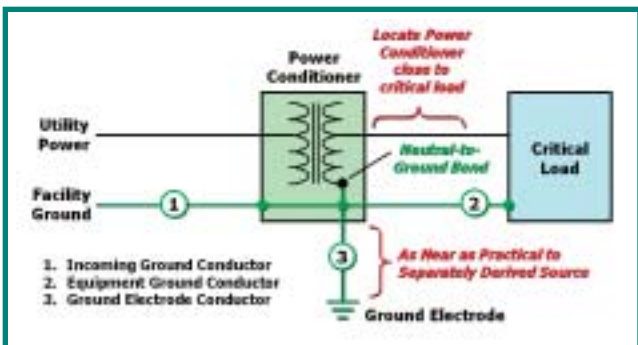
Building Steel is almost always a better choice – especially for equipment installed within a large building, above grade level. Ground electrode conductors can be bonded to building steel using listed fittings so long as the connection location is clean and dry; welded fittings may be a better option in some cases.

In buildings without accessible steel structure, a ground rod or other electrode may be required. Keep in mind that the effectiveness of this type of ground is highly dependent upon soil conditions (moisture, soil characteristics) and that multiple ground rods, or higher performance ground electrodes (chemical based, ground rings, buried conductors, etc.) may be required to ensure a low impedance to earth.

Summary

Ensuring a well-grounded electrical system is not easy, but a TEAL power subsystem is the place to start. Once you have your power subsystem in place, you can optimize your equipment grounding by:

- Ensuring that a Ground Electrode is present and properly connected
- Ensuring that the Ground Electrode is physically close to the power subsystem
- Using Building Steel as a Ground Electrode if it is available. Otherwise, ensure that the ground electrode or ground rod provides as low an impedance to earth as is practical. Multiple ground rods or special chemical ground rods may be needed at some sites.



requirement. In the United States, NEC 250.30 (2002 Edition) requires that a separately derived AC system (such as provided by a TEAL power subsystem) be connected to a ground electrode. Such an electrode may be an effectively grounded structural member of the structure, an effectively grounded metal water pipe within 5 ft. of the building entrance, or another type of electrode (e.g. – a ground rod) where structural steel or a water pipe ground are not available.

The ground electrode ③ is intended to supplement the incoming ground conductor ①, and works with the equipment ground conductor ② to ensure that the equipment is properly grounded and bonded.

A Dirty Ground ?

We’d love to see this phrase disappear from the power quality lexicon! Dirty grounds imply that there is also a clean ground that is kept separate from the other facility grounds (presumably, the dirty ones). While this sort of approach (separating and isolating grounds) can be

Market News...

SEMI Market Showing Signs of Recovery??

The Semiconductor Market took a tremendous downturn in recent years but is showing some life recently. Analysts are being very careful with predicting a full recovery, however, some early indicators such as book-to-bill ratios are up and at the highest levels they have been in years.

The December 2003 book-to-bill was reported by SEMI at 1.2, the highest level since July of 2002. As a comparison December 2002 book-to-bill was at .84. Major forecasters at the Semiconductor Equipment and Materials International 27th meeting in Pebble Beach this January all projected a healthy 2004. Projections for chip revenue increases ranged from 20% to 31%, with chip manufacturing equipment projected as high as 40% growth.



Driven by increased PC sales (the largest users of chips), SEMI predicted a 39% increase for equipment makers in 2004, while Dataquest predicts a 36% increase. Other large chip users are also projected to grow in 2004 as well.

IDC reports signs of renewed growth in the datacom/telecom infrastructure market. IDC expects this market to grow by 6.2% year over year to \$3.7 billion in 2004, reversing direction from a year ago when this market segment declined by 4.5%.

Although it appears to be unanimous that there will be growth in 2004, there

isn't quite as clear a picture for how long the growth will last. The consensus seems to believe that growth will be relatively short lived and that a down turn will be here again by 2005.

One geographical area that is a major benefactor of this market growth and many others is China. The *National Bureau of Statistics* in Beijing reports a Gross Domestic Product growth for 2003 at 9.1% year over year. This is the overall fastest growth for China in six years, and the quarter to quarter growth has actually been accelerating. Growth was at 9.6% in Q3 of 2003 and peaked at 9.9% in Q4 of 2003.

Technical Reminder...

Power Monitoring: Where to Connect the Power Analyzer

When TEAL customers have power problems, we often suggest that they monitor the power quality to get a better understanding of the nature of their problems. But often, there is some confusion about where to connect the power monitor, especially if a power conditioning device is in place. Here is our recommendation:

Monitor on the Primary, or Line Side if...

- You suspect utility type faults such as sags, outages, or harmonic distortion
- You are confident in your power conditioning system
- You want to minimize the number of disturbance events generated by the load (these can lead to large data sets requiring extensive analysis)

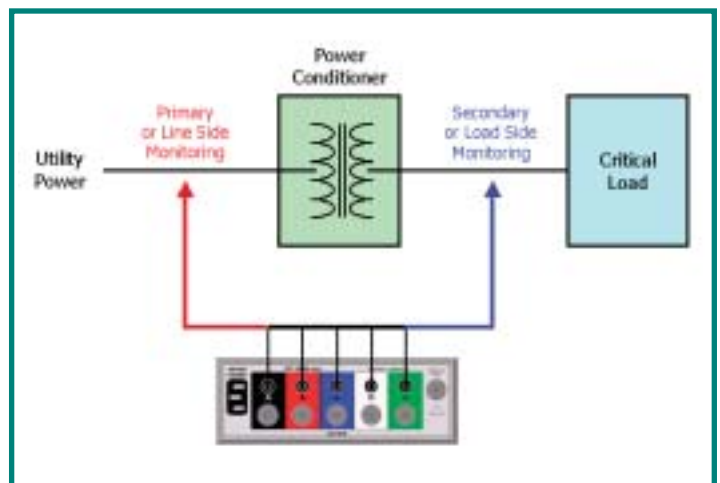
When monitoring on the primary side of a three-phase TEAL Power Subsystem, set your power analyzer up for Delta connected power

Monitor on the Secondary, or Load Side if...

- You are concerned about mains impedance or load generated disturbances
- You are checking to see if the power conditioning device is working properly or attenuating line side disturbances
- You are willing to work to separate line generated disturbances from load generated disturbances when evaluating the data from the power analyzer

When monitoring on the secondary side of a three-phase TEAL power subsystem, set your power analyzer up for Wye connected power

Should I monitor the current? We recommend it! Without current data, it can be difficult to differentiate line generated events from load generated events. In addition, the current that the load draws during a voltage disturbance may be an important piece of data needed to determine if a particular event is benign or disruptive. Finally, load current characteristics can pinpoint equipment or component problems that might be masquerading as power problems. Hook up those current probes whenever possible.



WE Power...

Computed Tomography

TEAL powers many new technologies that provide advanced medical diagnostics, medical treatment, and high-speed semiconductor manufacturing and automated test equipment. In each edition of this newsletter, we will feature an application that TEAL powers and how we help that application achieve peak performance. This edition we will focus on medical imaging CT (Computed Tomography) scanners.

High-speed CT scanners have revolutionized how doctors diagnose and determine patient treatments. Combining advanced detection imaging technology with high-resolution 3D capable computer systems, today's multi-slice CT scanners improve image clarity, increase the speed of processing and help reduce X-Ray dosage levels for treatment.

The CT technology produces very detailed accurate representations of a patient's soft tissues and organs, improving visualization of 3D anatomic structures. This enables specialists to diagnose and review patients' conditions without intrusive operations.

Medical centers today use advanced CT scanners for a variety of purposes including rapid head scans of pediatric

patients without having to sedate children and low stress check up of coronary conditions. The accurate and fast diagnosis of a patient's condition enabled by CT scanners has significantly increased successful treatments.

TEAL powers some of the most advanced CT scanners on the market today and is the leading supplier of power conditioning sub-systems for major makers of these life saving systems.

TEAL provides an optimized combination of low impedance, noise filtering, transient suppression, and isolation with power systems that are engineered specifically for CT scanners.

TEAL's optimized power systems provide clean power that enables peak performance and reliable operation for thousands of CT Scanners worldwide.

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:
Attention: POWERLINES at TEAL
10350 Sorrento Valley Road
San Diego, CA 92121 or
Email: kharris@teal.com



Volume
Rendered Image
of a Brain



Volume
Rendered Image
of a Heart

The power required to keep these advanced CT systems operating at peak performance is critical. They have a very specific power profile that is low power during standby and high power during scans, along with computer system power that is susceptible to noise and transients.



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