




You made it to the right place, we will get started soon.

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Providing an educational environment for training, testing, and evaluation of today's power quality and data center solutions and equipment.

P3 leads Customer Education through Power Quality University (PQU):

- Highly Qualified, Expert Instructors
- Practical, Relevant Topics
- Continuing Education Credits (CEU's) *

*CEUs, BICSI & IEEE credits available for most, but not all PQU training seminars. Visit www.powerqualityuniversity.com for more information.

Upcoming Events

General Power Quality - Friday, October 2 - 11 - 9 AM - 11 AM
 Harmonics Thursday, October 15 - 12 PM - 1 PM

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Power Quality Monitoring

Presented by



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Agenda

Introductions to P3 Hosts

Instructor: Brian Branigan
Host: Karah Butac

Program

- Defining the problem
- Determining your Target
- The Right Location
- Meter Set Up
- Meter Verification
- Case Studies
- Sample Proposals & Reports

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P3 is the industry's trusted and respected advisor for critical power, cooling and energy solutions.



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DATA CENTERS

Providing industry knowledge, product expertise, & technological innovation over a broad portfolio of products and services for our customers across a wide range of industries and applications.

To achieve your objectives, make the data center fit your ever-changing requirements, and reduce energy costs, you need the right reliable and efficient power and cooling infrastructure solutions.

Advanced & Sustainable Data Center Equipment
 Systems that grow and change with your mission Data Center

Traditional Data Center Equipment
 Systems built around existing infrastructure

We can provide both Modular (Scalable) and Traditional Data Center Equipment



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INDUSTRIAL POWER SOLUTIONS

Power Quality Specialists with expertise in your Power Quality needs.

Industrial Power Quality doesn't just happen. It takes technical expertise, knowledge of process and facility conditions to prevent the desired levels of Power Quality. With experience in both new construction and retrofit situations, P3 can help you select and install the correct products.

We provide Industrial Power Quality Solutions.

Power Factor Correction Capacitors

Harmonic Mitigating Transformers

Surge Protection Devices

Power Conditioning

Harmonic Cancellation

Scrubbing and Surge Protection Devices

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Power Quality Monitoring

System analysis and evaluation of power quality issues to provide solutions recommendations for the best possible performance from your existing power system.

The ability to quickly identify and remedy power quality problems will lengthen the life of electrical equipment and improve power system availability.

Our engineering technicians will help you understand your unique facility power system.

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Service Plans & Support Services

Service plans and support services that provide maintenance, parts, & service necessary to ensure the best possible performance from your existing power system.

We offer customized flexible, flat-fee service packages that offer flexible time system maintenance to optimize uptime at predictable cost which include technical support, preventive maintenance, quick onsite response, and remote monitoring.

- Service Plans
- Energy Management Services
- Power & Lighting Analysis
- Data Center Assessments
- Project Management
- Battery Replacement

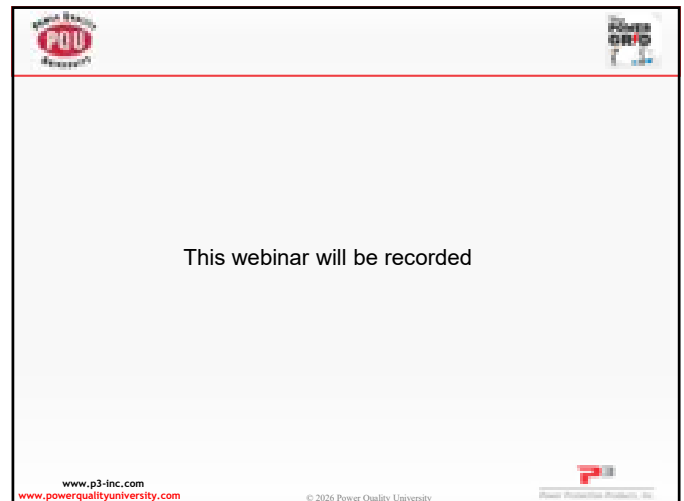
We provide top quality maintenance service & support

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P3: Power Quality Xplained



PQU seminars brought to you by P3 gives you the information you need to build confidence and reliability in your electrical system.




Monitoring for Power Quality is a complicated journey without a lot of direction and guidance but with the proper tools and people in place, a positive result is possible.

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Defining Power Quality Problems



- Power Quality problems can come from outside the facility, inside the facility or both.
 - With the proper power quality meter(s):
 - In the correct place.
 - For the correct amount of time.
- Corrective action may be taken

This is the beginning of a long journey



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Defining the problems





Using a "Good" Power Quality Analyzer in the right place will help you in this process.

- Up to date equipment
- Current Software
- Correct CT Sizing
- Trained User

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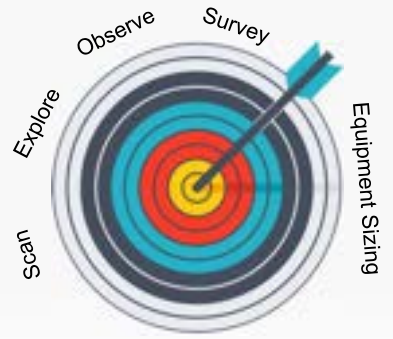


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Determining Your Target





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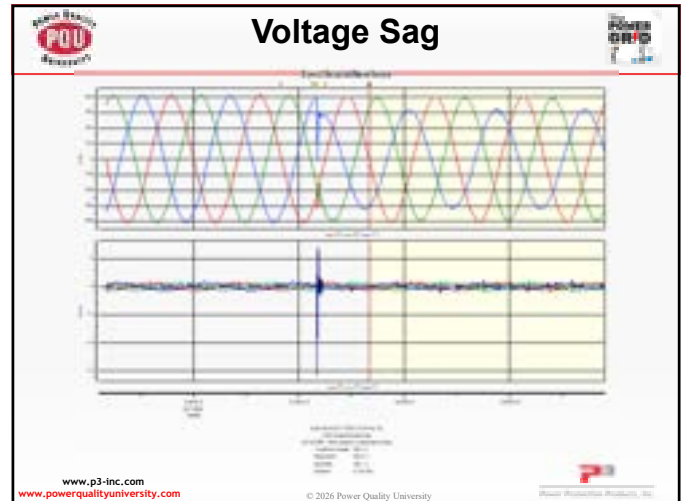
Determining Your Target

Please refer to power quality "Big Eight" handout.

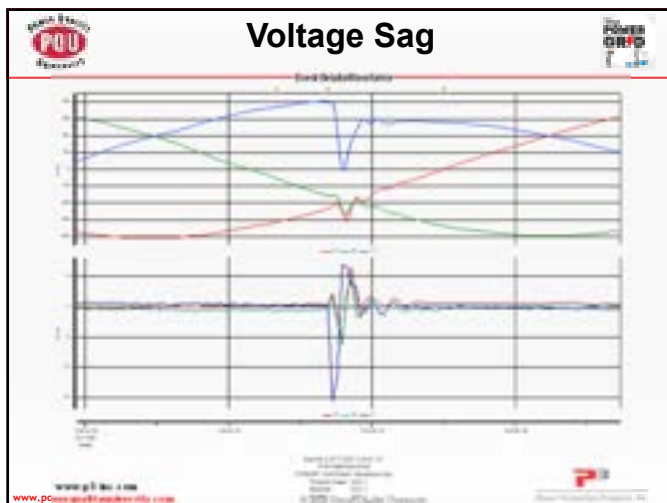
- Over-voltage
- Under-voltage
- Voltage sag
- Voltage swell
- Voltage transient
- Electrical noise
- Harmonics
- Grounding

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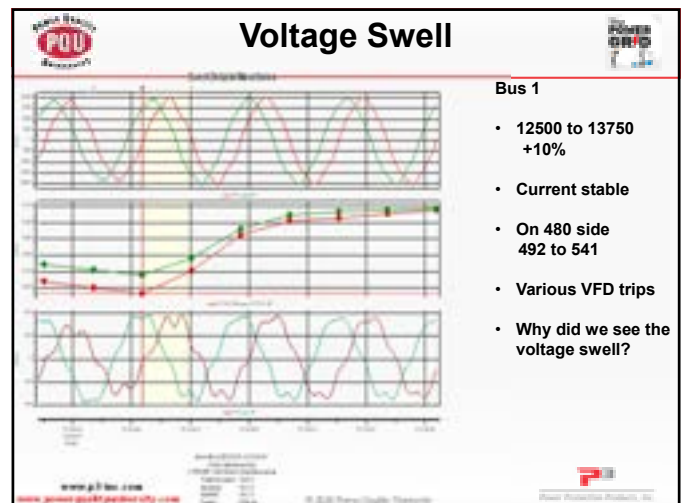
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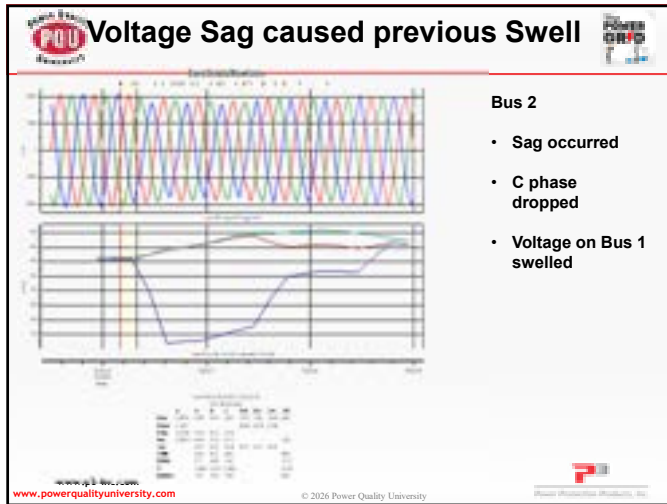


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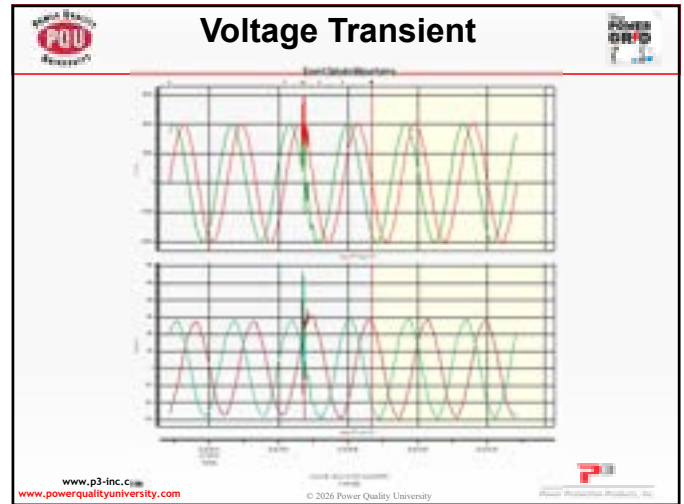


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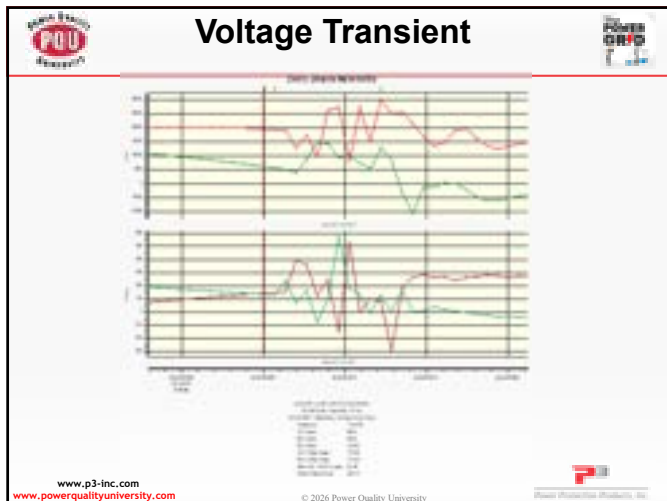
- Bus 1
- 12500 to 13750 +10%
 - Current stable
 - On 480 side 492 to 541
 - Various VFD trips
 - Why did we see the voltage swell?



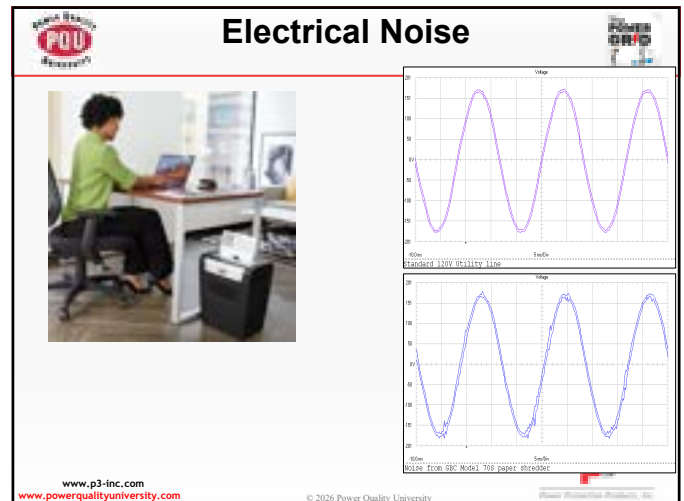
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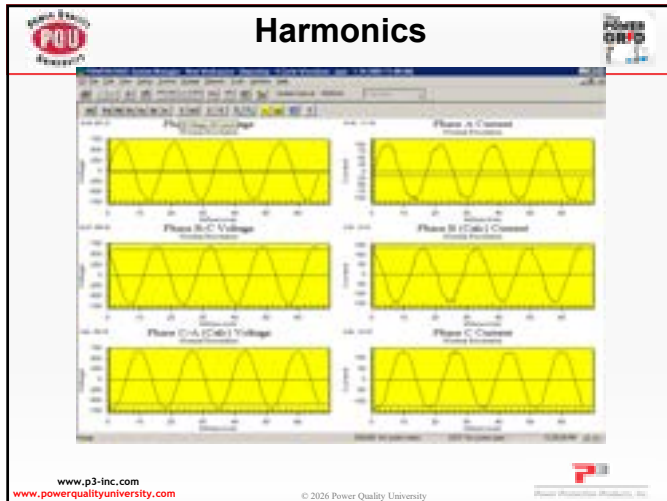
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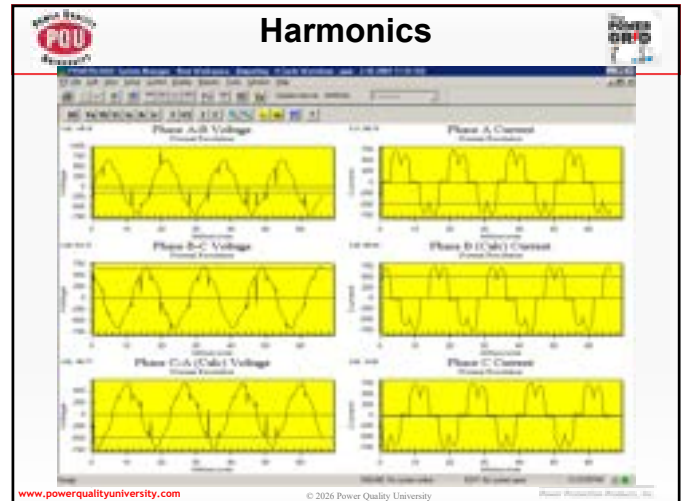
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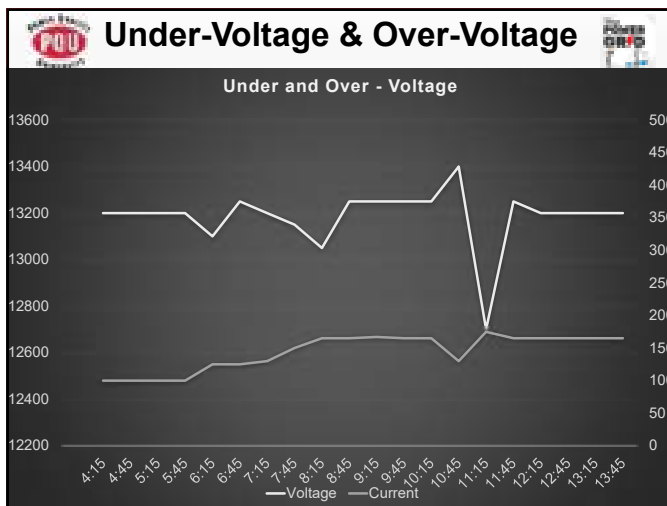
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Determining Your Target

Determining your target and what you are looking for is the most important first step in the monitoring process. This will impact the power quality meter placement, set up and duration.

- Right meter
- Right information
- Right location

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The Right Equipment

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The Right Equipment

Why High-Speed Transient Capture?

Example: High-speed transient event - impact of sampling speed

Sampling Rate	Peak Voltage (V)
1000 SPC	~1000
2000 SPC	~1500

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The Right Meter Location

Meter Placement is Critical

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The Right Location

- Customer wanted to add additional load to the facility
- Facility engineer needed to determine if the existing electrical system could provide power for the new equipment
- Where do we meter?

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The Right Location

Large Facility with Multiple Main Services



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The Right Location

Large Facility with Multiple Main Services



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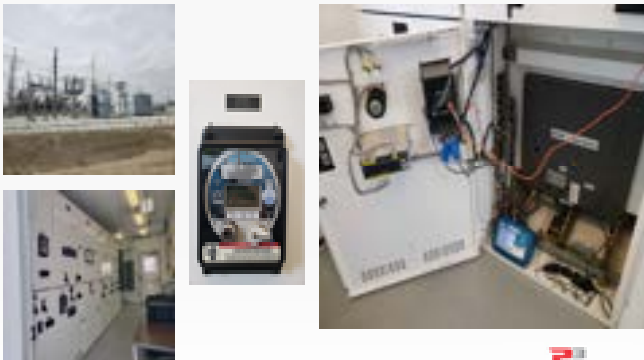
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The Right Location

Large Facility with Multiple Main Services



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The Right Location

Large Facility with Multiple Main Services



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Meter Set Up is Important



Placement of CTs?

Program Set Up

Equipment Safety

External Power Source

Software Updates

Meter Placement

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Setting up the Meter



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Setting up the Meter



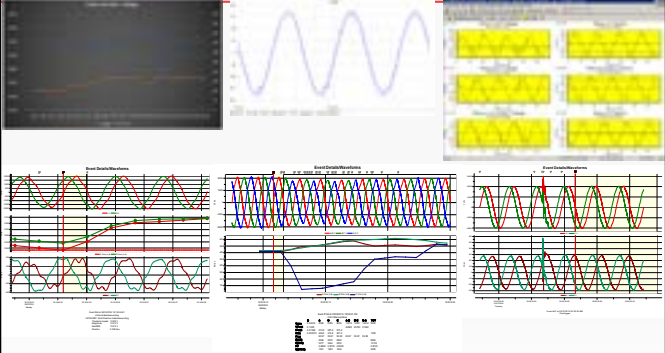
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The Right Information



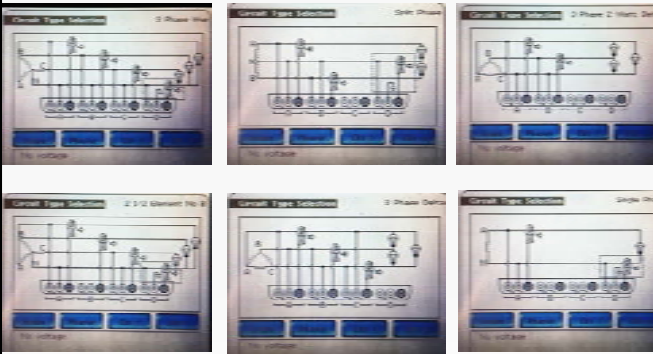
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Setting up the Meter



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Setting up the Meter



Importance of Data Verification

Once the meter is set up and in place, it is important to verify that the data is being collected at the proper rate and in the proper form, adjustments may be required based on the electrical system.

Issues:

- Is the meter working?
- Are the meter readings accurate?
- Does the meter data "make sense"?
- Is the meter Filling up?

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Setting up the Meter



Importance of Data Verification

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Setting up the Meter

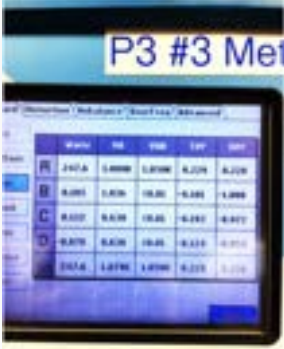


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Meter Verification



Importance of Data Verification

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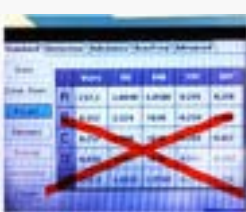
Issues:

- Is the meter working?
- Are the meter readings accurate?
- Does the meter data "make sense"?
- Is the meter memory Filling up?

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Setting up the Meter



Importance of Data Verification

Once the meter is set up and in place, it is important to verify that the data is being collected at the proper rate and in the proper form, adjustments may be required based on the electrical system.

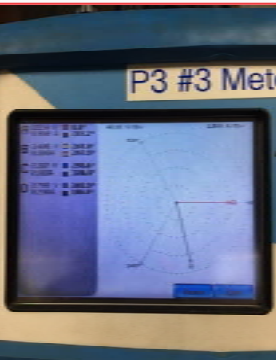
Issues:

- Is the meter working?
- Are the meter readings accurate?
- Does the meter data "make sense"?
- Is the meter Filling up?

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Setting up the Meter



Importance of Data Verification

Once the meter is set up and in place, it is important to verify that the data is being collected at the proper rate and in the proper form, adjustments may be required based on the electrical system.

Issues:

- Is the meter working?
- Are the meter readings accurate?
- Does the meter data "make sense"?
- Is the meter Filling up?

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Meter Installation & Removal



When metering, its important to have a systematic approach to the meter installation and removal: confirm data, download and check files, review time frames and results prior to safely setting up and then removing the meter.

- 8-5? – after hours? – Weekends – Holidays?
- Who is qualified?
- NFPA 70E procedures must be followed.
- Safety meetings must be held.
- Don't just hook it up and then later rip it out. It can lead to erroneous information.

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Interpreting the Data

Reports can come in many forms and levels of detail:

Requirements:

- Updated Software,
- Knowledgeable expert using the program
- Licenses up to date
- Current computer system



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Presenting the Results

Executive Summary

Presentation of Findings

Detail of the data

Recommendations



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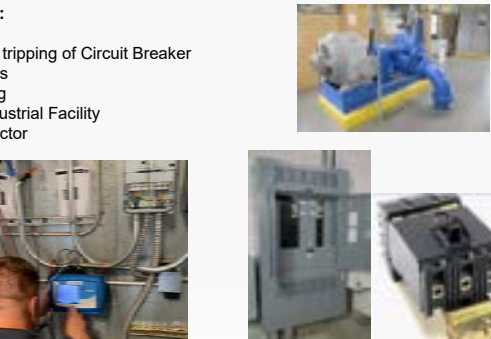
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Case Study - Examples

Case Studies:

- Nuisance tripping of Circuit Breaker
- Harmonics
- Grounding
- Large Industrial Facility
- Power Factor



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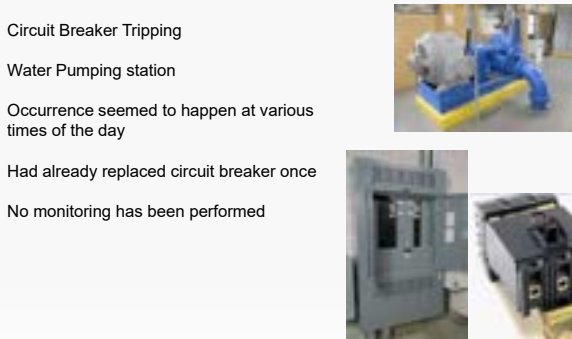
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Case Studies Breaker Trip

- Circuit Breaker Tripping
- Water Pumping station
- Occurrence seemed to happen at various times of the day
- Had already replaced circuit breaker once
- No monitoring has been performed

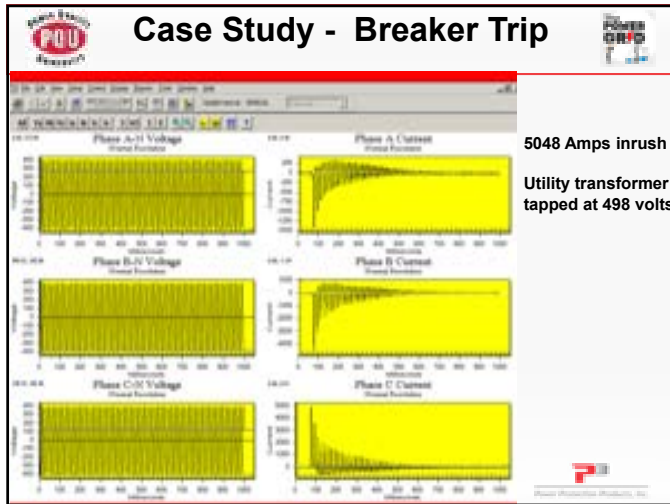


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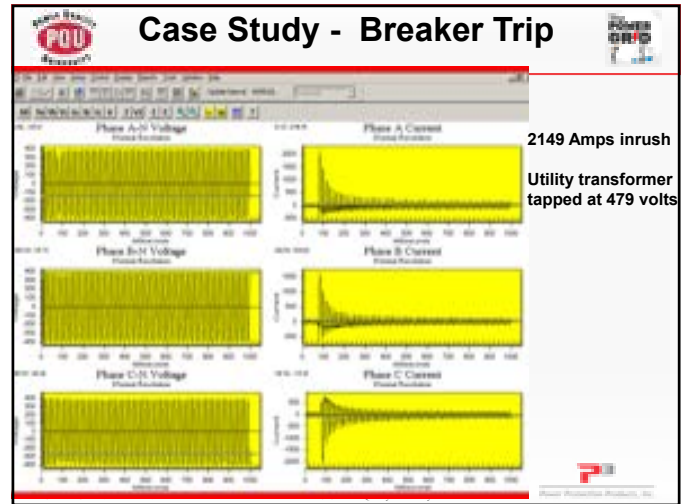
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Case Study - Harmonics



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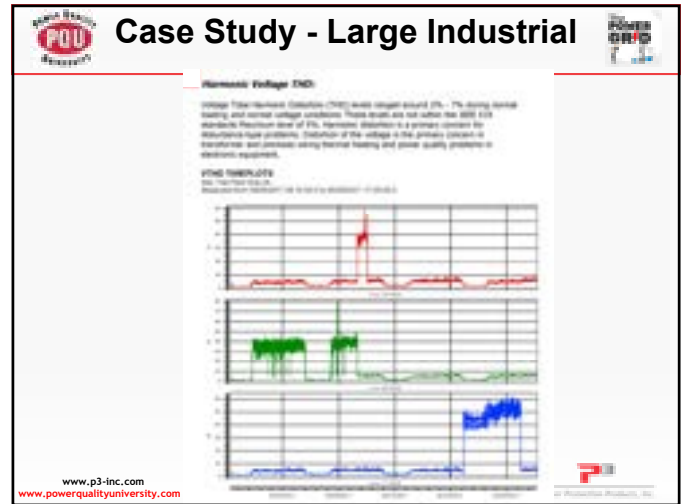
Case Study - Large Industrial



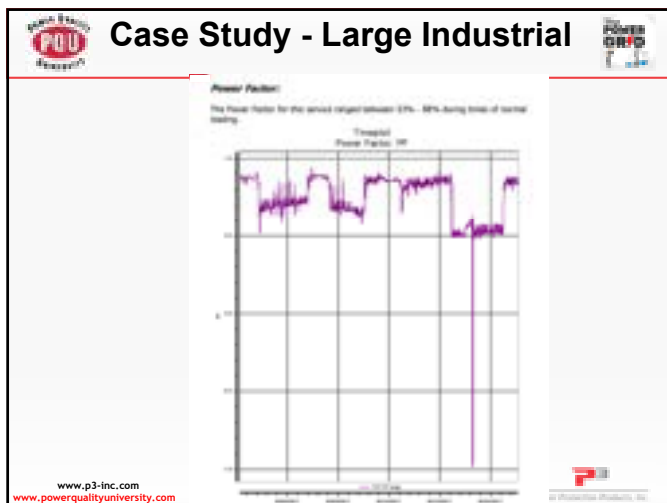
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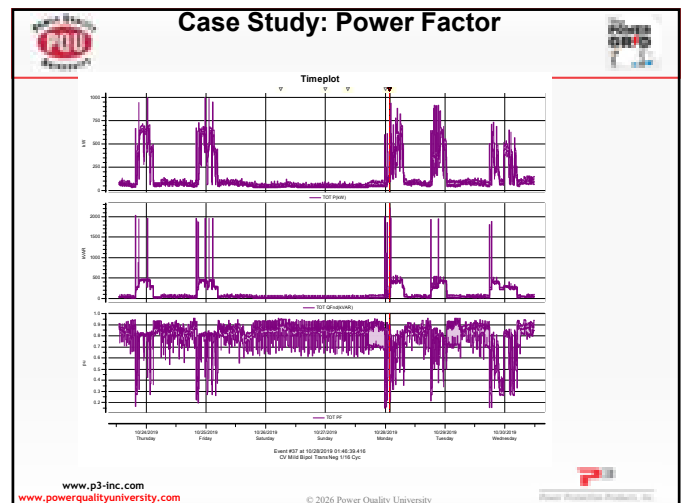
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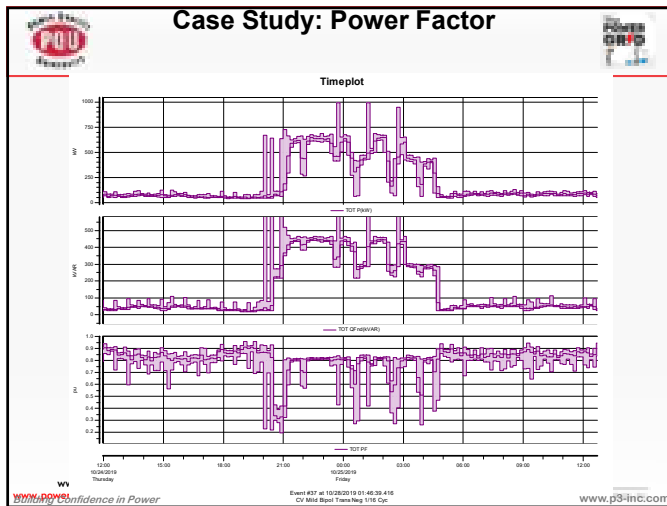
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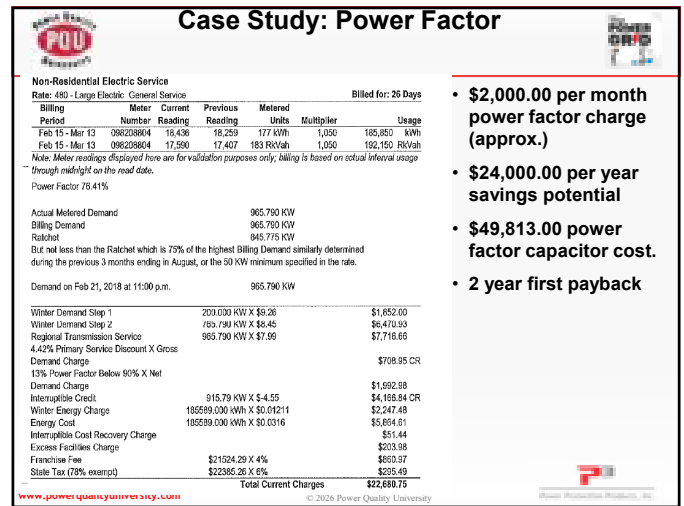
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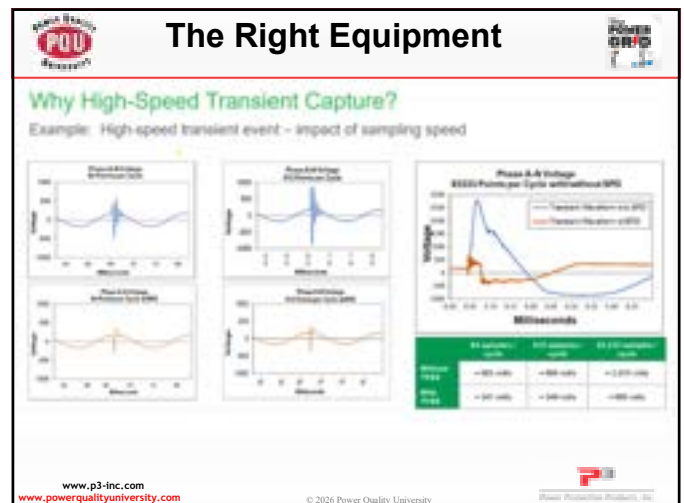


- \$2,000.00 per month power factor charge (approx.)
- \$24,000.00 per year savings potential
- \$49,813.00 power factor capacitor cost.
- 2 year first payback

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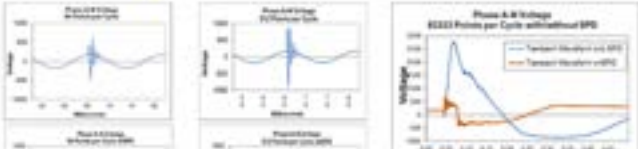
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The Right Equipment

	64 samples / cycle	512 samples / cycle	83,333 samples / cycle
Without TVSS	≈ 865 volts	≈ 866 volts	≈ 2,800 volts
With TVSS	≈ 341 volts	≈ 349 volts	≈ 680 volts



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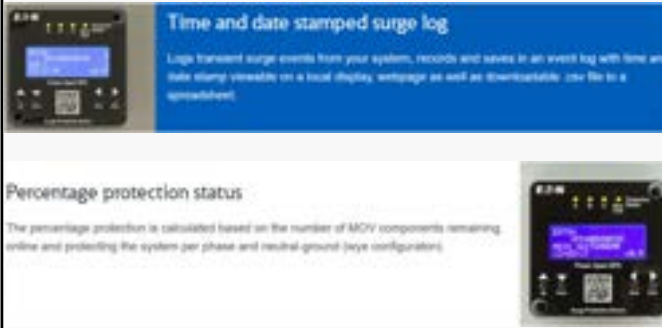
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Time and date stamped surge log

Logs transient surge events from your system, records and saves in an event log with time and date stamp viewable on a local display, webpage as well as downloadable .csv file to a spreadsheet.

Percentage protection status

The percentage protection is calculated based on the number of MOV components remaining online and protecting the system per phase and neutral ground (wye configurations).



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Advanced monitoring display

- Tri colored LED indicator lights status per phase
- Surge magnitude categorization into low, medium and high categories as well as total surge counts
- Time/date stamped event log
- % protection remaining per phase



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Remote monitoring capabilities

- Power Alert Dashboard configurable for integrated SPD
- Cloud-based webpage
- P3G800 Gateway
- Modbus TCP/IP
- BACnet/IP

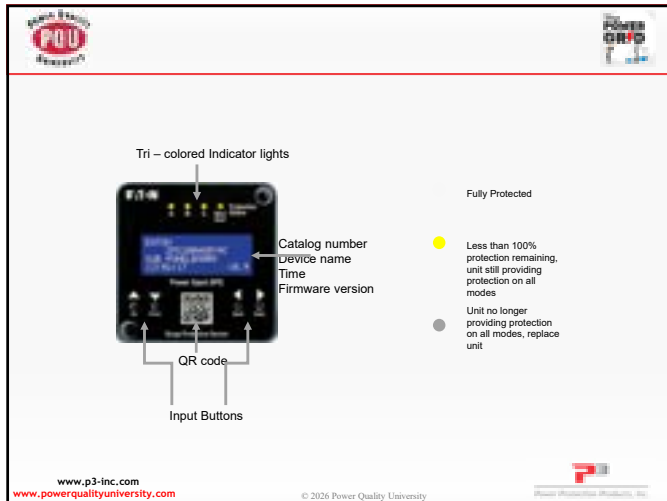


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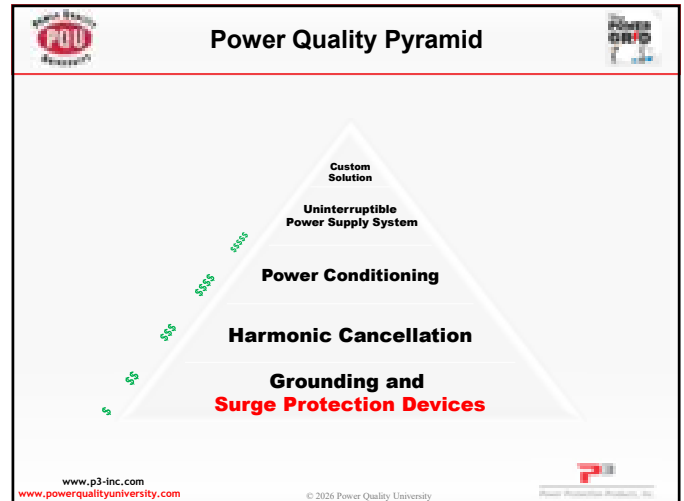
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Factors to Consider

Power Quality Metering Costs

The portable Omnic Power Monitoring Equipment will be made available and installed by your staff or your electronics contractor for the following considerations:

- Standard Price is per meter, per week
 - On-Exchange: \$1,000 (one-time fee) (plus \$100 install and labor fees)
 - After three: \$1,000 (Added per unit)
- Meter (1 meter @ 1 week \$1,000)
- Three rate (3 1/2) \$1,000 (1 meter (1 week) - City Discount for 3 meters - 10%)
- Total project cost: \$3,000

At the end of this monitoring period P3 will analyze the information recorded and provide a comprehensive summary report on the collected data.

- P3 will suggest any relevant solutions based on the data recorded during the monitoring period. The intent of this study is to properly size hardware, mitigation equipment in order to meet the demands of IEEE 1547 standard 0 meters to identify.

The price includes our hardware to properly set up the monitoring equipment and spend an additional on-site fee at the correct location and removal. Installation is for the meter house (24" x 12" and all tools, under the meter installation or labor of your technician and once a meter is installed, additional cost. There is no on-site technician, no on-site technician and portable equipment brought in.

Note: If a portable meter is required on the site of the meter, a 50% additional charge per contract period will be incurred. The 50% "premium" is based on the contract period. In this case, it is 1 meter. You can choose both of the contract per "meter" or you can choose get the meters off when available. This unit is intended to offer an on-site of the meter, another fee and monitoring the metering equipment.

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Call to Action

Monitoring for Power Quality can be a challenging task

Consider all the factors

- Set the Meter Up Correctly
- Use Correct Install and Removal Procedures
- Verify Meter Data Collection
- Interpret the Data
- Present the results
- Recommend a solution

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Power Quality Monitoring



At the end of the long power quality monitoring journey is the beginning of solution implementation and obtaining desired results.



is here to guide you on this journey.

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Power Quality Monitoring

END

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Power Quality Monitoring Webinar

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