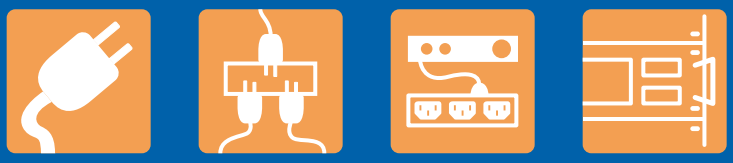
MARWAY
POWER SOLUTIONS

Custom Products

Power Distribution Units
Rack Power Integration



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Contact our power specialists: info@marway.com • 800-462-7929

Innovating solutions for multiple industries and applications.

Optima™ Custom

PDUs Optimized for Industrial, Defense, and OEM Applications

A custom PDU offers the opportunity to consolidate power management capabilities such as electrical noise filtering, power monitoring, outlet control, safety interlocks, and more into a convenient, single-enclosure solution tailored to the application. Marway specializes in working closely with customers to configure custom PDUs to meet all aspects of power distribution, power conversion, conditioning, control, safety, installation, environment, and even regulatory requirements.

A Solid Power Foundation

Power Sources and Conversion

- Up to 480 Vac, 400 Vdc, and 400 A.
- Single phase, three phase, 50 Hz, 60 Hz, and 400 Hz.
- Conversions for ac-ac, ac-dc, dc-dc and dc-ac.
- Voltage isolation.
- Auto-transfer switching between dual sources.

Power Monitoring

- Indicators for phases, circuits, outlets, and interlocks.
- Monitoring and display of volts, current, and power quality.
- Monitor voltage, current, and power quality over Ethernet.
- Remote panels for control and display.
- Ethernet-based monitoring up to 200 amps and 240 Vac

Marway specializes in custom PDUs from 1U to rack sized for commercial to MIL-STD applications. We integrate power conditioning, conversion, control, and compliance requirements into a single-package solution. Customization enhances safety, protection of equipment, simplifies installation, and reduces the size compared to multiple off-the-shelf components.

Power Conditioning

- Mitigate voltage spikes and transients using surge suppression.
- Meet EMI standards using filters and shielded enclosures.

Power Control and Safety

- Remote outlet control via HTTP/S, Telnet, SSH over Ethernet.
- Remote dry-contact control, EPO, and interlocks.
- Switches, relay logic, programmable or embedded controllers.
- Integrate external sensors and signals to automate management of control and safety dependencies.
- Ethernet-based switching of up to 120 outlets

Quality and Compliance

- Certified AS9100 with ISO 9001.
- UL and/or CE (and other marks) when required.
- Designed and manufactured to UL/IEC 62368.
- Designed and manufactured to MIL-SPECs.
- Other industry-specific compliance when required.
- Environment and HALT testing when required.

Defense and Aeronautic Applications

Much of Marway's history has focused on meeting the needs of military, defense, aeronautic, and related applications. With products in ships, submarines, aircraft payload systems, and land applications, we are supplying power management solutions to many programs. Marway's products are also used in development, manufacturing, and test of defense program equipment, and in training simulators. In addition to platform deployment, our PDUs are are in forward operating bases powering service depot diagnostic and support systems.

Some of the most unique combinations of ac, dc, and 400 Hz power types are found in these applications, and many of them require creative solutions to fulfill requirements in tight space budgets. In addition to design and manufacturing, Marway also handles compliance testing through partner NRTLs to meet UL, CE, and numerous MIL-STDs as needed.

Custom Test Applications

Whether for development or diagnotics and support, Marway has been meeting the specialized needs of test and automated test power distribution for decades. We've done countless slightly modified variations of existing designs to meet those "just the same as, except..." cases that other companies won't do. And we specialize in doing those top-to-bottom custom designs that very few companies even could do.

EMI filters, surge suppressors, isolation transformers, and more can be integrated into a test PDU to mitigate noise problems in facility lines. Power transformers, supplies, and converters are often integrated to provide distribution of various ac and dc power forms to the target work area. Connector mixes to match commercial and military DUTs, interlocks, and custom controls for peripheral equipment are all refinements to create a productive and safe solution for unique test equipment and processes.

Industrial and OEM Applications

Many industrial, commercial, and OEM applications have unique requirements met only with a customized PDU. We can provide combinations of power conversion and conditioning needed for downstream equipment, and integrate customized interlocks, EPO circuits, and switching to meet safety and control needs. Marway's experience in product configuration, power engineering, and compliance management provides a single-point service to create the solutions needed for industrial environments and OEM equipment to operate safely and efficiently.


ATE


OEM


BACN

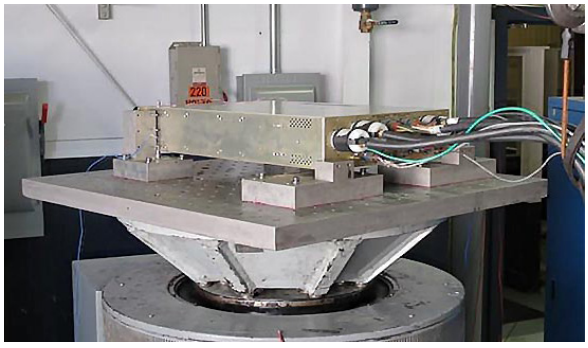

WIN-T


AMDR


OEM


VPM
CSRR

Marway's custom PDUs are found in test/ATE applications from commercial OEM modules to defense service depots in the field. We support several platform programs in communications, weapons, and other areas. In addition to custom design and manufacture, we also provide compliance process management for UL, CE, and MIL-STD requirements.



PowerPlus™

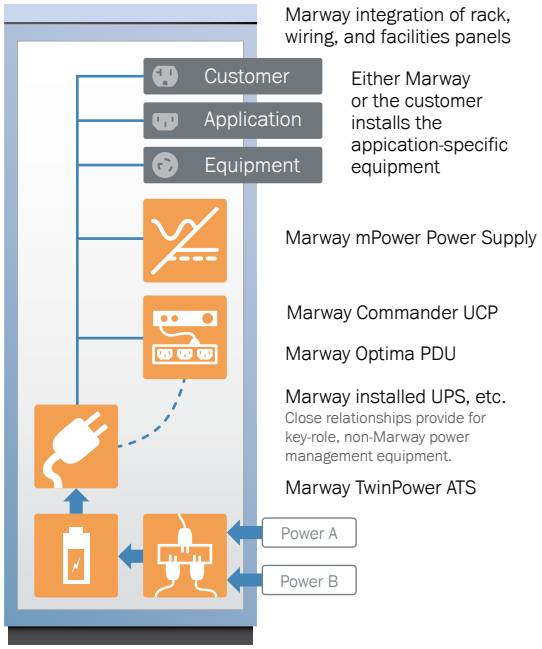
We integrate the power. You integrate the application.

A Turn-key Power Platform

While Marway is not a general contract integrator, we do provide value-added engineering and manufacturing services to ensure the successful integration of Marway and third-party products into a rack. We call these projects PowerPlus.

PowerPlus projects are focused on delivering power and rack infrastructure as an integrated platform ready for a customer's application hardware. Core power distribution requirements are often combined with auto-transfer switching, uninterruptible power supplies, programmable power supplies, EPO and interlocks, control panels, and other capabilities with customized interconnect and termination panels.

The customer will specify application-specific equipment and usually perform their own final assembly and test. Our role is to provide a holistically engineered power foundation pre-built and pre-tested into the rack, so that adding the application hardware is a relatively simple "bolt-on" task for the customer.



Capability Highlights

- Up to 480 Vac, 400 Vdc, and 400 A.
- A Marway- or customer-selected rack with integration of all power system hardware including:
  - All power forms needed by application equipment unified into a cohesive control system providing ac, dc, 50/60 Hz, 400 Hz, single-phase, and three-phase power as needed.
  - Marway power distribution units.
  - Marway auto-transfer switching systems.
  - Third-party UPS and programmable power supplies.
  - Power conditioning components for EMI and RFI reduction, surge suppression, voltage isolation, etc.
  - Monitors for voltage and current as well as energy usage and power quality with remore data acquisition capability.
  - All wiring between control panels, power management components, and customized facility panels.
- Software development for PLCs and other controllers.
- Remote outlet countrol with discrete signals or with Ethernet through HTTP (web and REST), Telnet, and SSH.
- UL and/or CE (and other marks) when required.
- Designed and manufactured toh UL/IEC 62368-1, 61010-1.
- Designed and manufactured to MIL-SPEC when required.
- Other industry-specific compliance when required.
- Environment and HALT testing when required.

With this rolling test station, the majority of the hardware is power related. Only a computer system was needed to complete the final product. The customer chose to provide us their hardware and have us finish the integration so the rack could ship as a completed unit.

Engineering Experience, and Manufacturing Know-how

As a projects starts, we'll work with the customer to understand the application, it's needs and constraints, and where the opportunities are for customization to add value. Marway's pillars of power management often provide a useful framework for exploring features and capabilities to consider.

- Power conditioning—mitigate facility and internally-induced spikes, transients, EMI, and RFI.
- Power conversion—use facility ac and/or dc input sources and internal transformers, inverters, converters, and power supplies to create additional needed voltages.
- Power control—fully customize operations and maintenance with switches, breakers, interlocks, EPO, PLCs, and remote switching of outlets.
- Power monitoring—be assured that power is running as expected with indicators, analog and digital meters to monitor quality, capacity usage, and more.

When basic power distribution is supplemented with signal modification, it is critical that all products are properly matched and compatible. A number of power specification details can have significant impact on overall efficiency of the system. Improperly matched products can result in excessive heat, costly energy waste, and shorter life expectancy. By consolidating a platform's needs into a unified PowerPlus project, we can leverage our expertise with UPSs, power conversion, and signal conditioning components to help ensure all components are properly matched and integrated.

Additionally, assembling a complex set of power products into a rack requires knowledge of connectors, cables, enclosures, and numerous safety standards. There are many details learned through experience to ensure proper operation, signal integrity, ease of maintenance, and safety. Using Marway's PowerPlus services to provide a properly integrated power-ready platform can help ensure a successful project.

Applications

PowerPlus projects apply to a wide range of industrial and defense applications. Marway is able to support one-off customizations for unique industrial work cells, to multiple systems needed to standardize internationally deployed test bays. We've shipped systems for environments from development labs to navy ships.

A unit like this features high-current input power fed to transformers and power supplies to create several internal ac and dc power services. In this case, independent enclosures were avoided to make maximum use of available space in the rack. The front panel provided multiple branch breakers, on/off control circuits, and power monitoring. Serviceability was accomodated through access panel design and slideouts for heavy components.

PowerPlus platforms have been developed for industrial and military applications such as this unit developed for a naval ship.

The Custom Design Process

A Collabortive Partnership for Success

Advantages of Custom and Outsourced Solutions

When standard catalog power distribution units can't offer the integration or performance needs of your project, a customized product from Marway can. Marway specializes in application-specific power distribution designed to meet distinct requirements while being optimized to conserve space, weight, and cost.

The most common reason to consider a customized product is that the technical requirements simply can't be met by off-the-shelf products. Another common reason is that the sum of "close enough" off-the-shelf products end up costing more, or take up more space, than desired.

These challenges can lead an application engineer to consider developing the power distribution in house in addition to the core hardware. However, there are advantages to having Marway develop and manufacture this element of your project.

- Cost-competitive design, and manufacturing in parallel to your in-house team.
- Shorter turn-around time because we've already done the component research, and have many of them in stock.
- Power engineering expertise to assure properly matched components for efficiency, signal quality, and reliability.
- Experience with safety- and compliance-qualified designs and components helps to avoid late-stage redesigns.
- Design experience in finding solutions which result in better performance, a smaller package, and lower cost.
- Experience with PDU configuration management to simplify end-product development, compliance testing, purchasing, manufacturing, and sales.

From 1U to Rack Sized

Marway's experience with custom designs range from industrial applications to field-deployed defense applications.

- Rackmount enclosures from 0U to 21U and larger.
- Non-rackmount enclosures in custom shapes and sizes.
- Rolling test stations.
- Power sub-systems integrated across multi-rack systems ready for application-specific hardware installation.
- Remote control panels, and remote outlet switching.

Understand the Needs

A new PDU design from Marway begins with a discussion to help us understand the PDU's purpose and environment. We'll discuss functional needs, power performance, safety, packaging, and more. In each area, we'll identify core requirements along with any constraints.

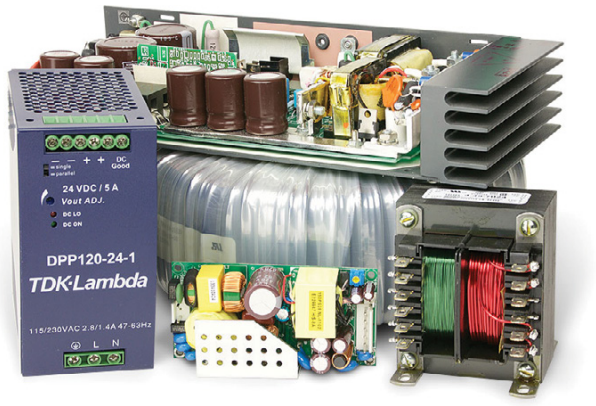
Next, we'll consider the service environment needs such as vibration and temperature tolerance to details of installation and operator ergonomics.

This collaborative approach helps Marway to understand the application, environment, and role of the PDU. This enables us to better interpret your project's needs, and offer our experience towards a more successful design.

Consider All Options

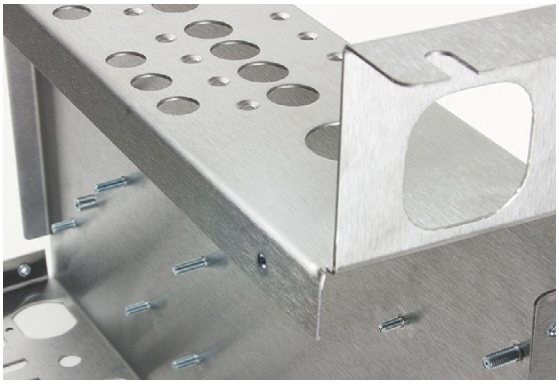
Having identified key technology requirements and constraints, the design process will move into component selection. You may prefer specific components based on experience, existing support stock, or other reasons. Likewise, Marway may suggest components based on its experience with specific applications. Next, we consider the operator panel for logical layout where placement may matter based on nearby equipment, design uniformity with other equipment, or other parameters.

Between technologies, components, panel layouts, and more, there are a lot of options to consider. For many cases, Marway handles all these decisions. In other cases, there's a lot of two-way dialog with the customer. Either way, considering these options helps us to better balance performance, cost, space, and other design factors which create a successful design.



Optimize the Packaging

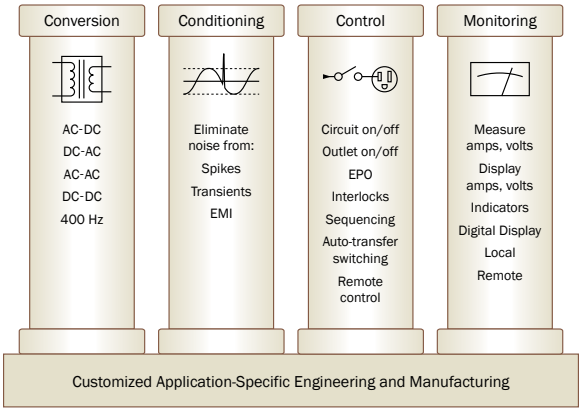
When creating an integrated solution, we optimize the selection of components for performance, capacity, space, accessibility, and other design parameters. This optimization extends to the enclosure. By having in-house chassis fabrication, we're not boxed in by standardized sizes and panels. Even "standard" rackmount enclosures don't have to be identical. For many OEM/VAR applications, enclosures will be in rather unique shapes and sizes. Regardless of form factor, we create enclosures so they complement all other design decisions to result in better panel layouts, labeling, operator conveniences, installation advantages, and more.



Core Technologies

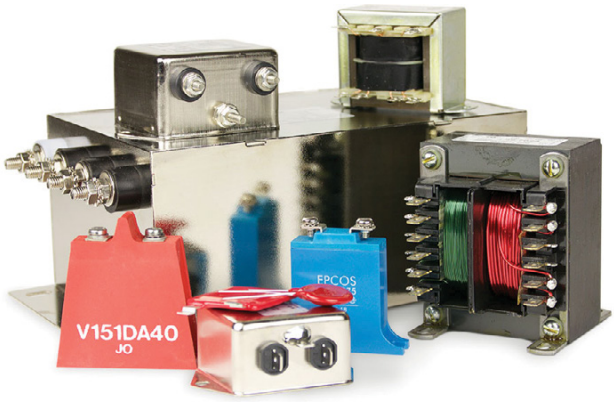
The Pillars of Power Management

When creating custom power distribution applications, the PDU becomes an ideal place to consolidate many power management needs of electrical platforms. This includes power conversion, conditioning, control, and monitoring. We call these capabilities the pillars of power management. Each represents features which build on the core foundation of power distribution to create an optimized solution. The overviews below are expanded upon in detail on our web site's Technology section.



Power Conversion

Many installations of electronic equipment require more than one type of power source. There can be advantages to consolidating multiple power sources and adding power conversion into a single PDU. Using transformers, power supplies, converters, and inverters we can optimize space, weight, cost, and even simplify the installation and operation of electrical systems.



Power Conditioning

Most facilities have imperfections in their power signals which can cause poor performance, incorrect functionality, or even damage. Most electronic equipment has limited built-in protection against these imperfections. Marway can consolidate power conditioning needs into the PDU using EMI filters, transformers, varistors, and other features to assure clean and stable power to all connected equipment.

Power Control

Control capabilities in PDUs offer a range of options including switches, breakers, remote switching over Ethernet, and even automated switching between power sources. Whether for safety, redundancy, or convenience, consolidating power control features into the PDU can help reduce the complexity, cost, and packaging of a power distribution application.

Power Monitoring

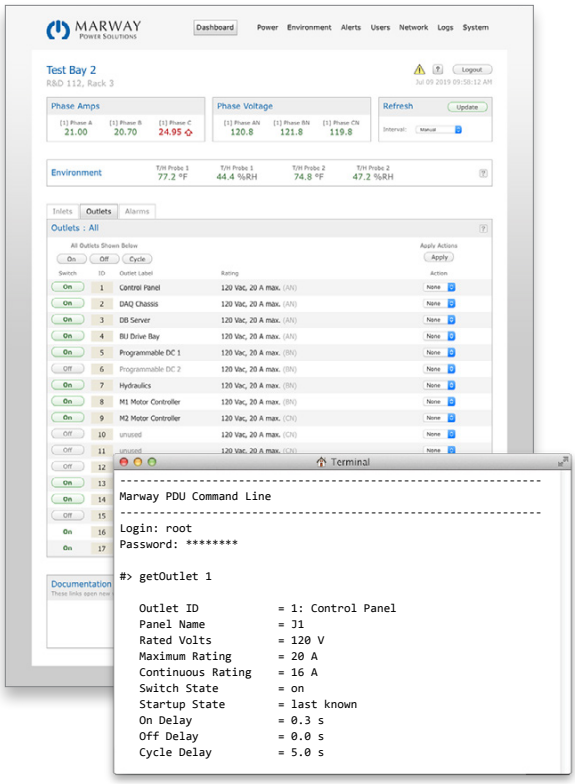
Power monitoring with digital displays and status indicators provide confidence that downstream equipment is getting what it needs. This might include capabilities to allow tracking of power quality, available capacity, and simple on/off status of circuits or outlets. If the PDU is not visible, remote panels with these features are possible, as is remote monitoring over Ethernet.

Optima RCM Software

Remote Power Monitoring and Switching of PDU Outlets

Software Highlights

- Remote switching of up to 120 outlets (manual and automated)
- Ac inlet current and voltage monitoring with setpoints
- Measurement of V, A, W, VA, VAR, PF, and Hz
- Event tracking of startup, user login, outlet state change, EPO, power setpoint excursion, and configuration changes
- Alerts of events via SNMP, email, and text message
- Web-based user interface (HTTP, HTTPS)
- Command-line user interface (Telnet, SSH, Serial)
- SNMP v1/2/3 for monitoring, switching, and alerts
- RESTful API for scripted switching and monitoring
- Multiple users with independent login credentials
- Granular user permissions
- On-board event logging



User interfaces include web and CLI. Each provides access to outlet control and configuration settings.

Outlet Control

Each outlet may be user labeled to reflect its purpose or what it is connected to. Each outlet includes on/off/cycle control with individually adjustable on delay, off delay, and cycle delay. Each outlet can be configured so that during startup of the PDU, the outlet will be switched on or off, or whatever the last stored state was prior to shutdown.

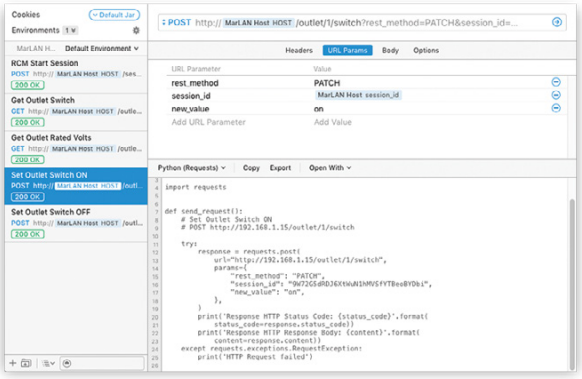
Inlet Monitoring

Inlet monitoring is available for single-phase and three-phase inlets up to 200 amps 240 Vac to provide comprehensive power data. Power monitoring measures volts, amps, watts, voltamps, voltamps-reactive, power factor, and frequency. Single-inlet systems can take advantage of a cost-effective current-only monitoring option. Acquiring inlet data can be automated using the SNMP, CLI, or REST interfaces.

RESTful API for Scripted Automation

REST is a common technique used by internet services to communicate and exchange data. URL-like commands are sent using the HTTP API of any programming language, and responses are provided in simple text format.

For example, an HTTP `GET /outlet/3/switch` request will respond with either a simple “on” or “off” text value with no follow-up parsing needed. Since it is intended as a machine-to-machine interface, using the RESTful API is easier to work with and more efficient than forcing the human-oriented Telnet into scripted automation.



RESTful APIs are designed for machine-to-machine interfaces. They use simple HTTP URLs and parameters to send commands and queries. There's no specialized parsing of text string responses like when using Telnet. Shown above is one of many utility applications useful for experimenting with APIs and creating script code in a variety of languages.

Networking

Ethernet 10/100T
- IPv4: DHCP, Static

Web Interface
- HTTP, HTTPS

Command Line Interface
- Telnet, SSH, RS-232

SNMP
- Access to power data, alarms, outlet switching

Alerts
- Email over SMTP
- SMS over SMTP
- SNMP v2/v3 Traps

Other Protocols
- SNTP, FTP, RESTful API

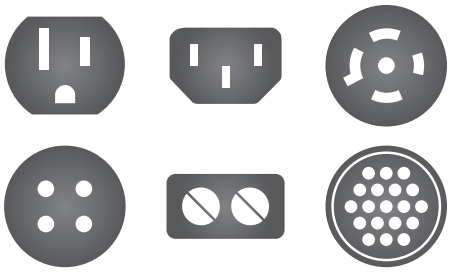
Power Management

Inlet Phases*
- Volts RMS
- Volts Alarm State
- Amps RMS
- Amps Alarm State
- Amps Percent Consumed
- Watts
- Voltamps
- Voltamps Reactive
- Power Factor
- Frequency

Outlets
- On/Off State
- User defined outlet label
- Individual On Delay
- Individual Off Delay
- Individual Cycle Delay
- Individual Startup State

Outlet Switching

Switched outlets can take any form such as:
- NEMA receptacles
- IEC receptacles
- Screw terminals
- Pin and sleeve
- Molex- or Amp-style connectors
- Ac or Dc



Software Features

Dashboard
- Displays phase currents & voltages
- Displays alarm state indicators
- Outlet on/off control and state

Power Configuration
- Outlet on / off / cycle delays
- Outlet startup state (on, off, last known)
- Current setpoints for phases
- Voltage setpoints for phases
- User-defined labels for inlets and outlets

Power and Environment Alarm Setpoints
- Low Critical, Low Warning
- High Warning, High Critical
- Adjustable hysterisis and debounce time

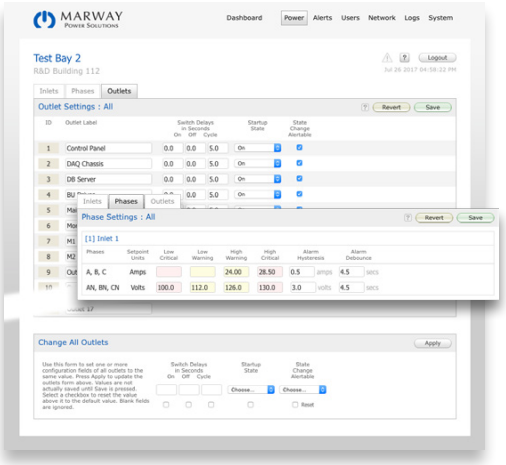
Alert Configuration
- Each setpoint alarm can be sent to one or more users as Email and/or SMS notifications
- Adjustable re-alert interval
- Adjustable alert silence duration
- Alerts automatically broadcast on SNMP

User Configuration
- Profile fields for company, job role, and contact information
- Granular authorization permissions

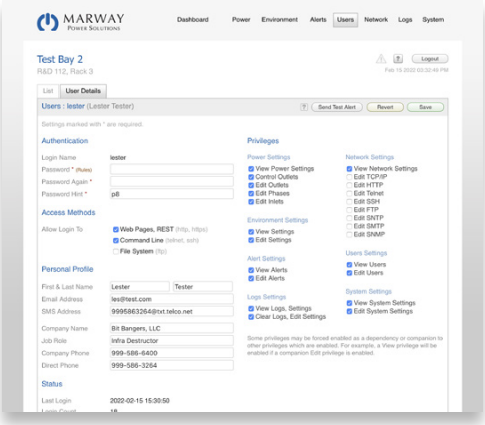
Logged Events
- Startup time, restart requests
- Outlet state changes
- Setpoint trips (amps, volts, temperature, humidity)
- Alert preparation, alert sucess
- User login
- Configuration and firmware changes
- Log display filtered by severity and category

System
- PDU label, location, asset ID, and contact

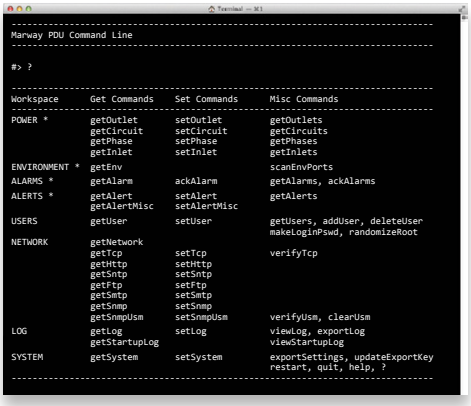
Power configuration includes several outlet switching features, and flexible setpoints for power alarms.



Up to 20 users with independent login and granular permissions provide control over specific protocols, configure outlets, configure networking, and more.



A rich command line interface provides access to all power data, and all configurable settings.



* Power monitoring available for 1φ and 3φ wye units. Current monitoring available for 3φ delta.

Other Products

Optima™ and Optima RCM
Standard Basic and Networked PDUs

Optima 8, 5, 3 Series Standard PDUs

- Integral EMI filtering, surge suppression, and remote on/off/EPO.
- Over 280 models offer numerous inlet, outlet, circuit configurations (various series have different sets of standard and optional features).
- 2U and 3U units have multiple individually breakered circuits.
- Optima 8 includes Ethernet switching, inlet power monitoring, event logging, power setpoints, automated alerts, remote control scripting.
- 120 Vac, 200–240 Vac, 100–240 Vac, or 120/208 Vac 3ϕ inlets with straight blade, twist lock, and C12 connector options.
- 15 A, 20 A, 30 A maximum ratings.
- 1U, 2U, 3U, 0U enclosures.

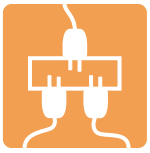
Commander™
Remote Control and EPO Panels

- On/Off power control to one or more PDUs, EPO for all PDUs.
- UCP 5000/5100 includes time meter, audible alarm, and convenience outlets on front and back. NEMA and IEC models.

TwinPower™
Auto Transfer Switches

- Automatically transfers power from primary input to secondary input using “break before make” mechanism upon power loss to primary input.
- Standard models for 120 and 208 Vac 1-phase, 30 amps.

Optima™ PDUs
Custom and Standard
for Ac, Dc, 400Hz



TwinPower™ ATSs
Auto Transer Switches
for power redundancy

Commander™ UCPs
Remote and EPO
control panels

PowerPlus™
Turn-key rack
power integration

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Marway is a HEICO Electronic Technologies company.

MARWAY
POWER SOLUTIONS

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