Marway specializes in application-specific PDUs optimized to meet unique requirements while conserving space, weight, and cost. Hundreds of systems have been developed for a variety of industrial and military applications. Custom Optima PDUs offer tremendous flexibility in power distribution by consolidating the technologies of power conversion, conditioning, circuit and outlet control, and monitoring all in one optimized package.

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 50 amps and 240 Vac

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 62368-1, 61010-1.
• Designed and manufactured to MIL-SPEC when required.
• Other industry-specific compliance when required.
• Environment and HALT testing when required.
Industrial and Commercial Applications

Whether for automated test, manufacturing, chemical refinement, or others, industrial applications can benefit from customized power distribution. Customized facilities can have unique power conditioning needs and combinations of power types. Coordinating equipment grouped together in task-specific spaces may require customized interlocks, EPO circuits, and other control needs. Marway’s customized Optima PDUs provide an open canvas to create the power distribution solutions needed for these environments to operate safely and efficiently.

Commercial applications such as data processing, laboratories, recording, broadcasting, and others also see blends of power needs which need customized solutions. While standard, off-the-shelf products suffice for many purposes, these environments can still require mixes of power connections, safety controls, and other requirements which standard products don’t offer.

Defense and Aerospace Applications

Much of Marway’s history has focused on meeting the demanding needs of military, defense, aerospace, and related applications. With products in aircraft, ships, and submarines, we are supplying power management solutions to many programs. Marway’s products can also be found in support facilities and forward operating bases powering mobile data processing to multi-rack test and service bays. Some of the most unique combinations of ac, dc, and 400 Hz power types are found in these applications, and many of them also require creative solutions to fulfill requirements in tight space and weight budgets.

OEM and VAR Applications

For original equipment manufacturers and value-added resellers, Marway’s ability to create unique power distribution solutions has been a valuable contribution to helping create competitive feature and cost benefits. Marway can offer creative technical solutions as well as creative packaging. An often unique need for OEM/VAR applications is a custom shaped enclosure for when standard rack mounting is not part of the host product. Many of these applications require hundreds of units at a time, and Marway has both the capacity and supply-chain services to accommodate such partnerships.
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 remote data acquisition capability.
  - All wiring between control panels, power management components, and customized facility panels.
  - Software development for PLCs and other controllers.
  - Remote outlet control 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 to 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.
Engineering Experience, and Manufacturing Know-how

As a project starts, we’ll work with the customer to understand the application, its 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.
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 20U 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.
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.
Software Highlights

• Remote switching of up to 120 outlets (manual and automated)
• 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)
• SNMP v1/2/3 for monitoring, switching, and alerts
• RESTful API for scripted outlet switching automation
• Multiple users with independent login credentials
• Granular user permissions
• On-board event logging

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 50 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 Script 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.
Marway PDU Command Line

Login: root
Password: ********

#> ?

Workspace      Get Commands    Set Commands      Misc Commands
---------------------------------------------------------------------
POWER *        getOutlet       setOutlet         getOutlets
              getPhase        setPhase          getPhases
              getInlet        setInlet          getInlets
ENVIRONMENT *  getEnv                            scanEnvPorts
ALARMS *       getAlarm        ackAlarm          getAlarms, ackAlarms
 ALERTS *       getAlert        setAlert          getAlerts
              getAlertMisc    setAlertMisc
USERS          getUser         setUser           getUsers, addUser, deleteUser
              makeLoginPswd, randomizeRoot
NETWORK        getNetwork
              getTcp          setTcp            verifyTcp
              getHttp         setHttp
              getSntp         setSntp
              getFtp          setFtp
              getSmtp         setSmtp
              getSnmp         setSnmp
              getSnmpUsm      setSnmpUsm        verifyUsm, clearUsm
LOG            getLog          setLog            viewLog, exportLog
              viewStartupLog
SYSTEM         getSystem       setSystem         exportSettings, help, ?, quit
---------------------------------------------------------------------

Type 'help' before a command, or type '?' after a command for more details.

* Depending on the PDU configuration, some commands may not be supported.

Inlet Phases
- Volts RMS (± 1%)
- Volts Alarm State
- Amps RMS (± 1%)
- Amps Alarm State
- Watts
- VoltAmps
- Power Factor
- Frequency

Outlets
- On/Off State

Software Features

Dashboard
- Displays phase power data
- Displays alarm states
- Outlet on/off control and state

Power Configuration
- Outlet on / off / cycle delays
- Outlet startup state (on, off, last known)
- Setpoints for phase volts and amps
- User labels for outlets

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

Alert Configuration
- Each power alarm can be sent to to SNMP and to users as Email and/or SMS
- Notifications include “Acknowledge” link
- Adjustable re-alert interval
- Adjustable alert silence duration

User Configuration
- Support for strong passwords
- Profile fields for company, job role, and contact information
- Granular authorization permissions control exactly what an individual user can do

Logged Events
- Startup, restart, login, EPO
- Setpoint trips
- Alert preparation, alert success
- Configuration changes
- Outlet state changes

Networking
- Ethernet 10/100T
  - IPv4, IPv6
- Web Interface
  - HTTP, HTTPS
- Command Line Interface
  - Telnet, SSH
- Configuration Access
  - Web, CLI, FTP
- Data/Switching Access
  - Web, CLI, SNMP, REST
- Alerts
  - Email, SMS, SNMP
- Other
  - SNTP

Power Data

Outlet Connectivity

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

Screenshots
Other Products

Optima™ and Optima RCM
Standard Basic and Networked PDUs

520 & 820 Series 1-Phase (1U)
- 120 Vac, 200–240 Vac, or 110–240 Vac 1Φ.
- Options include current and voltage meter, remote switching and EPO interface, sequencing of two groups of four outlets, and an EMI filter.
- 820 RCM Series includes Ethernet monitoring and switching

532/533 & 833 Series 3-Phase (2U/3U/3U)
- All models are 120/208 Vac 3Φ wye, 24/30 A, with an L21-30 inlet.
- Standard main power circuit breaker, phase power indicator, surge suppression, EMI filtering, and remote EPO control.
- Options for location of the inlet on the front or rear panel.
- 833 RCM Series includes Ethernet monitoring and switching

529/539 & 829/839 Series 1-/3-Phase (0U)
- Single-phase in 120 Vac, 200–240 Vac, or 110–240 Vac.
- Three-phase in 120/208 Vac 3Φ wye.
- Full-rack and short-rack models.
- 829/839 RCM Series includes Ethernet monitoring and switching

Commander™
Remote Control and EPO Panels

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

TwinPower™
Auto Transfer Switches

- Automatically transfers power from primary input to secondary input upon power loss to primary input.
- Uses “break before make” mechanism to ensure input isolation and eliminate need for power feeds to be synchronized.
- Suitable for equipment which will not lose functionality due to a power interruption lasting just under 20 milliseconds.
- Standard models for 120 and 208 Vac 1-phase, 30 amps.
Optima™ PDUs
Custom and Standard for AC, DC, 400Hz

TwinPower™ ATSs
Auto Transfer Switches for power redundancy

Commander™ UCPs
Remote and EPO control panels

PowerPlus™
Turn-key rack power integration

Contact Our Power Specialists
info@marway.com • 800-462-7929