



**LAYERZERO**  
POWER SYSTEMS, INC.

The Foundation Layer

## Series 70 ePODs: Dual Type-P

Static Transfer Switch → Two Transformers → Distribution



Product Brochure

# The LayerZero ePODs: Dual Type-P PDU Maximizes Operator Safety

## ePODs Dual Type-P Is Inspired by NFPA-70E

The Dual Type-P design provides switching between two independent power sources on the primary side of two transformers providing dual power-path distribution capability. The Series 70 ePODs: Dual Type-P provides the ability to transfer power between two or three sources in quarter of an electrical cycle, while delivering that power to up to twelve sub-feed circuit breakers. The Finger-Safe SafePanel is IP-20, inspired by the recommendations of NFPA-70E.



## LayerZero's ePODs: Dual Type-P Is Equipped Fully-Loaded

### Reliability

- ☑ **Optional Triple Modular Redundancy:** TMR Contains Fully-Independent Control Paths With No Single Point-Of-Failure
- ☑ **Safe Bypass Procedure:** Mechanical Bypass Interlock Eliminates Human Error When Performing Bypass Procedures
- ☑ **Voice Guided Bypass:** Step-By-Step Instructions With Audio and Video Guidance To Assist Operators Through Bypass
- ☑ **Convection Cooling:** Natural Convection-Cooled Heat Dissipation System is Maintenance-Free
- ☑ **Epoxy Coated Buswork:** Maximizes Reliability By Eliminating The Possibility of Bus-To-Bus Faults
- ☑ **Silver Plated Terminals:** Silver Has Excellent Conductivity To Provide Superior Electrical Performance and Reliability
- ☑ **Maintenance-Free Joints:** Brazed Joints Are Permanent And Maintenance-Free, Maximizing Product Life
- ☑ **Machined Hardware:** Machined Cap Screws and Engineered Disc Springs Maintain Constant Torque Throughout Product Life
- ☑ **Screw Thread Inserts:** Prevents Screws From Loosening Under Vibration For Long-Term Reliability
- ☑ **Optical Fiber Based Controls:** Eliminates Noise and Interference While Isolating Components from High Voltage
- ☑ **Serialized Critical Board Tracking:** Critical Boards Are Serialized And Cataloged in an Active Database For Traceability
- ☑ **Transformer Vibration Isolation:** Vibro-Elastic Pads to Absorb Vibrations from the Transformer

### Safety

- ☑ **InSight™ IR Portholes:** Bolted Connections & Critical Boards Can Be IR Scanned With the Dead-Front Doors Closed
- ☑ **Sectionalized Components:** Isolated Sections That Can Be Safely De-Energized For Performing Maintenance
- ☑ **Polycarbonate Windows:** Allows Critical Board LEDs To Be Viewed With The Dead-Front Door Closed
- ☑ **Front-Only Access:** Installation and Maintenance Can Be Safely Performed Without Side or Rear Access
- ☑ **Dead Front Hinged Doors:** Barrier To Provide A Safe Working Area With No Exposed Live Parts
- ☑ **SafePanel™ Distribution:** NFPA-70E Inspired Finger-Safe Panel Board With No Exposed Live Parts

### Connectivity

- ☑ **Ethernet Connectivity:** Secure VPN Router Connects To Network For Advanced Remote Monitoring Capabilities
- ☑ **Modbus/TCP:** Open Connectivity to Existing Monitoring Systems Without Proprietary Limitations
- ☑ **NTP Time Clock Synchronization:** Facilitates Timeline-Based Logging For Post-Event Reconstruction
- ☑ **SNMP Connectivity:** Permits Remote Management Via Simple Network Management Protocol

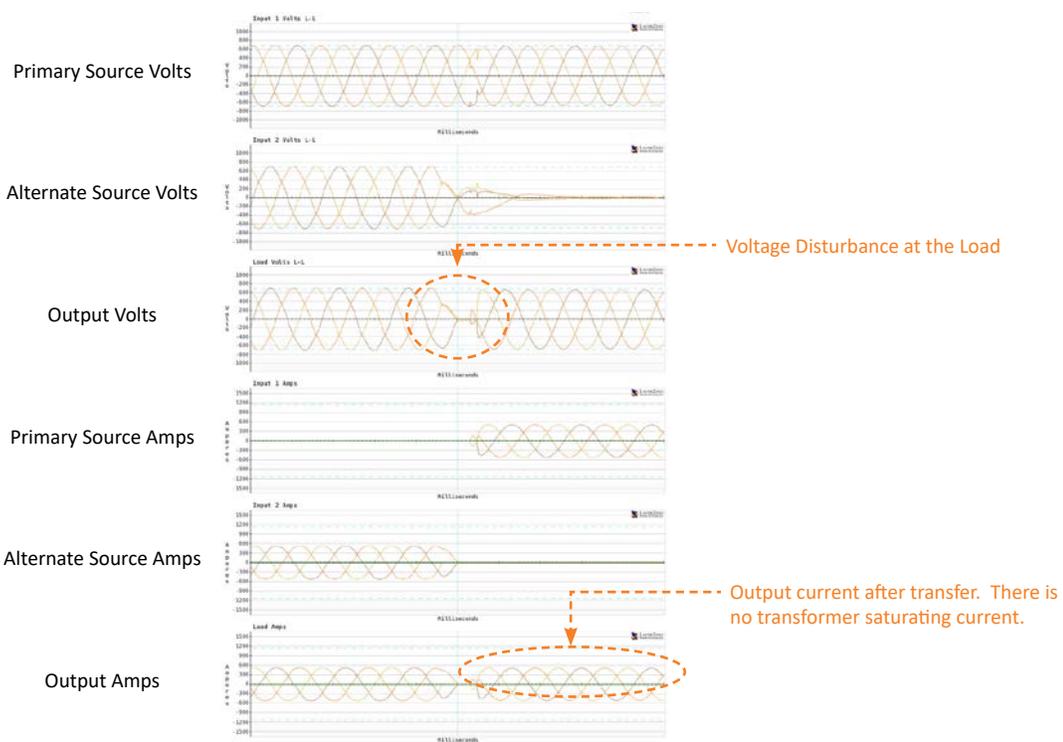


- ☑ **Real-Time Waveform Capture:** Automatically Captures A Picture Of The Power Three-Cycles Before and After Every Event
- ☑ **Local Touch-Screen Interface:** Password-Protected Color Touch-Screen GUI For Local STS Setup/Operation/Administration
- ☑ **Black-Box Forensics:** Captures and Records All Events To Provide Vital Information In Root-Cause Analysis
- ☑ **Waveforms Automatically Emailed:** Capability to Send Waveform Captures To Designated Individuals For Every Transfer

All LayerZero Power Systems products have on-board power quality analyzers that break down power sources into samples. If the power quality goes out of specification on a source, eSTS will transfer to the alternate source, automatically generating waveform captures and ITIC curves of the event. This data is remotely accessible by connecting to the unit via web browser.

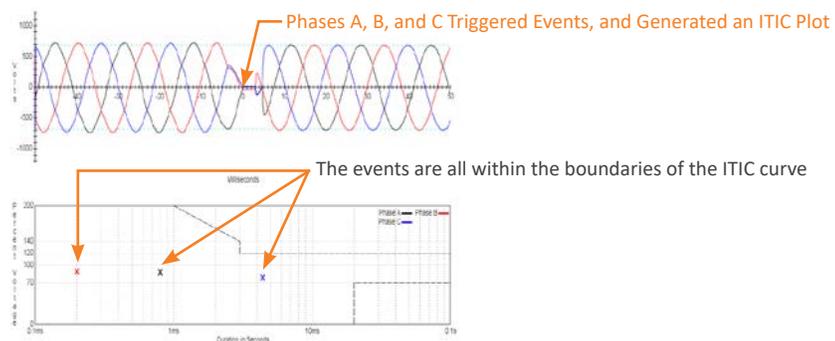
In the test below, the STS was connected to two sources 150 degrees out-of-phase. Source 2 breaker was opened, causing the STS to perform an automatic transfer to the primary source. A delayed transfer occurred, causing events on Phases A, B, and C, automatically generating ITIC plots. Unlike waveform captures, ITIC plots are easy-to-read, and do not require expert analysis to understand.

### Example Waveform Capture of Source 2 to Source 1 Transfer Event, 150 Degrees Out-of-Phase



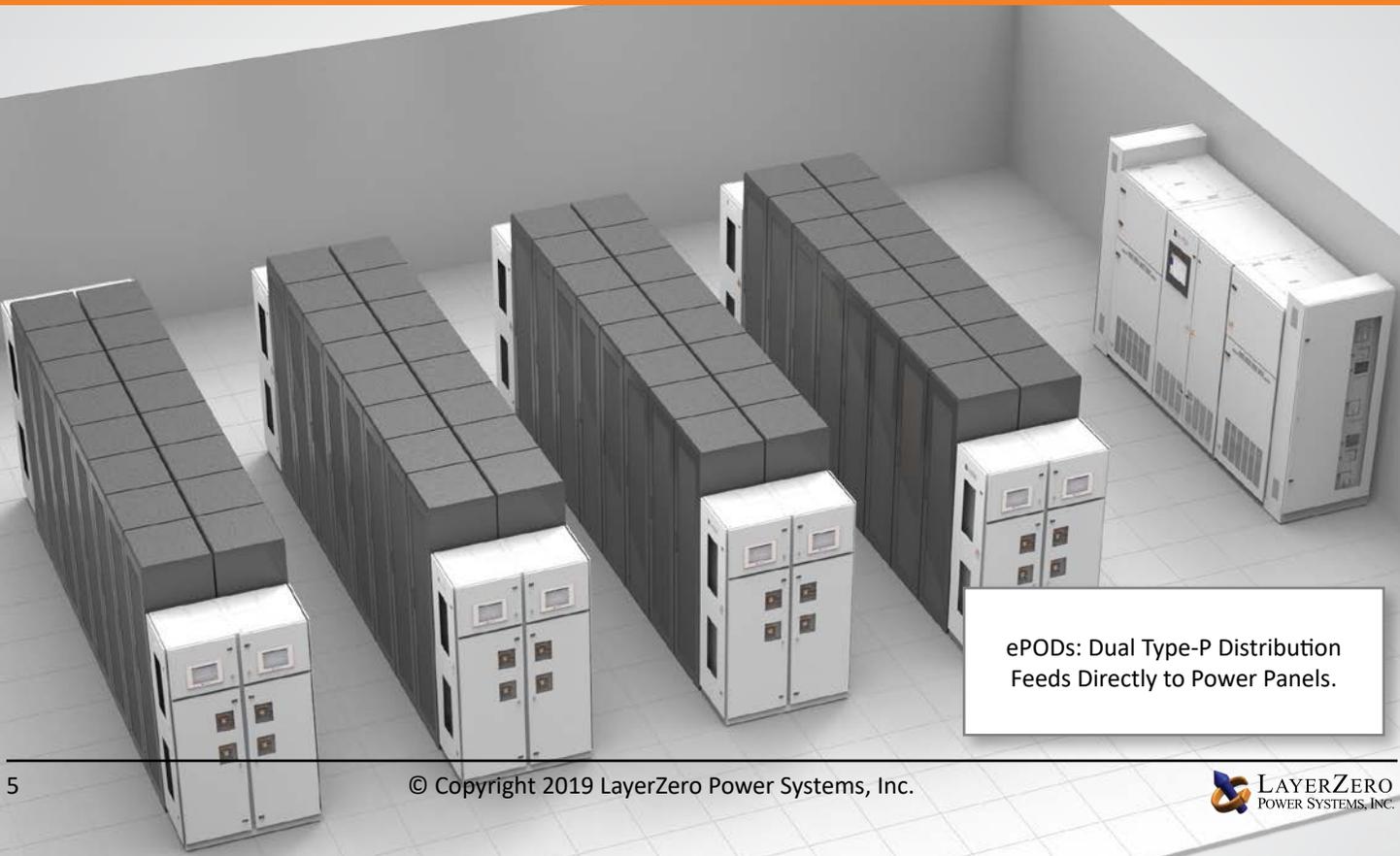
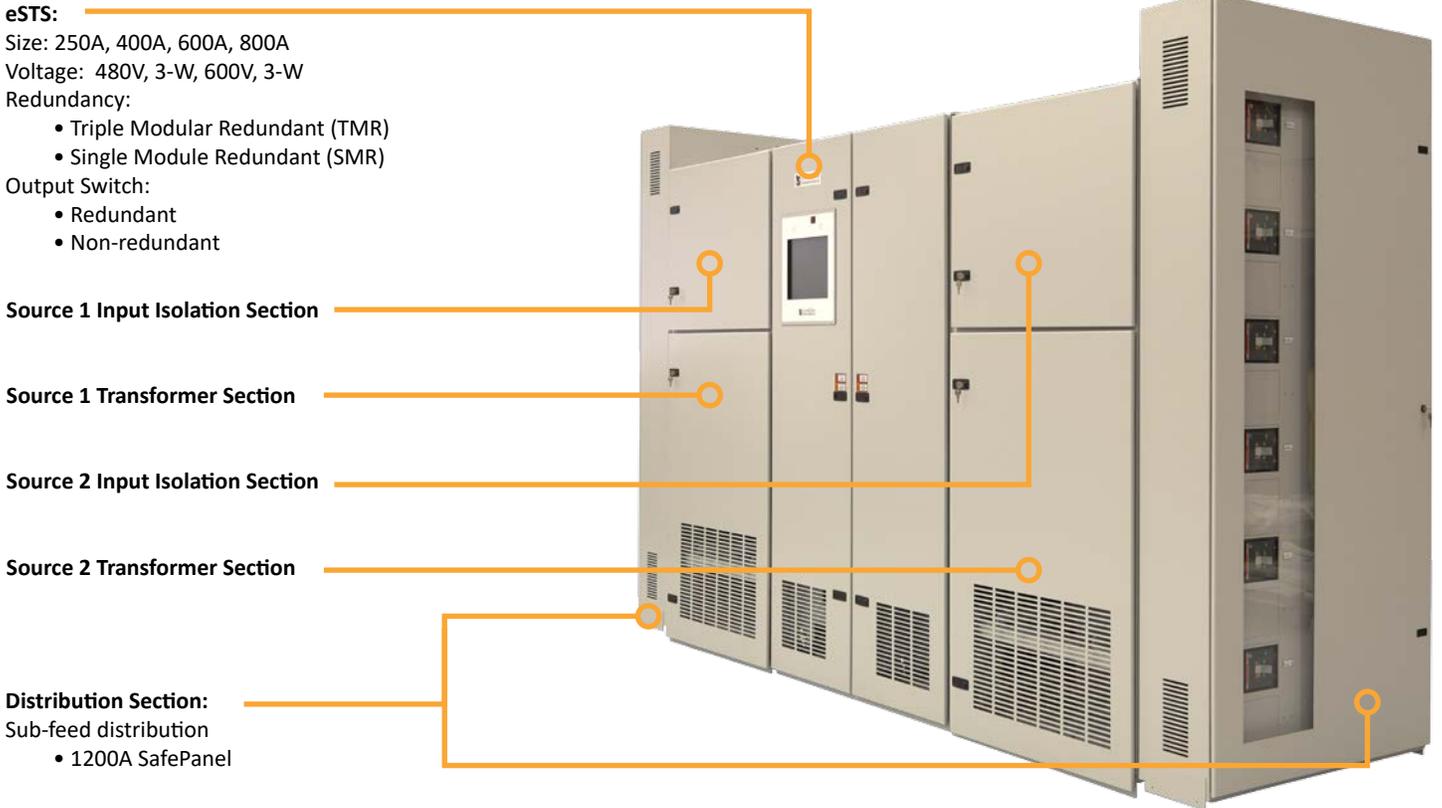
### Source 2 to Source 1 Transfer Event, 150 Degrees Out-of-Phase - WFC & ITIC Plot

Dynamic Transfer was enabled during these tests in order to mitigate transformer inrush while completing the transfer within the boundaries set by the Information Technology Industry Council (ITIC).

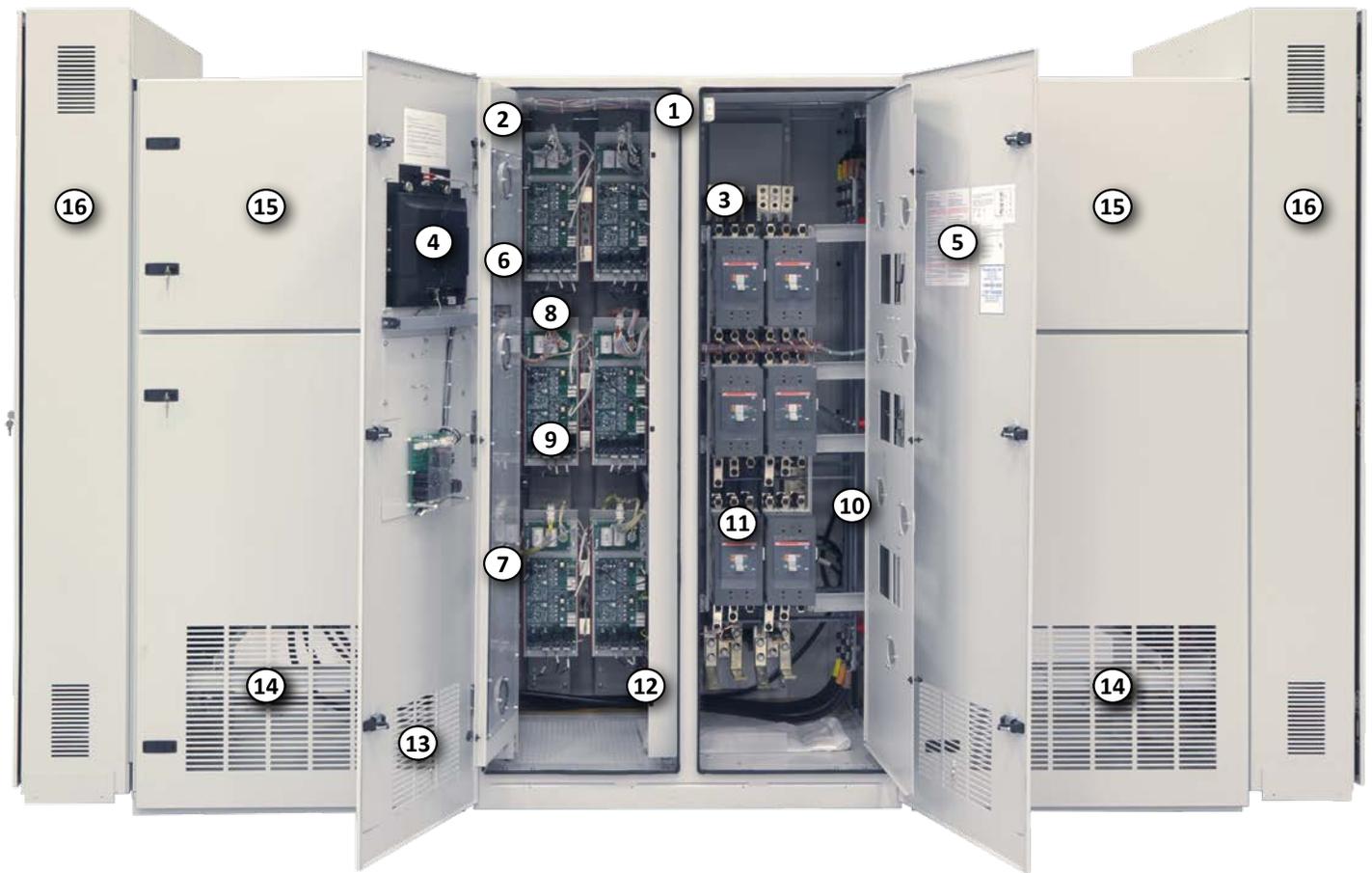


The ability to keep the transfers within the ITIC limits was verified through the Voltage Disturbance Analysis Tool (VDAT) plot shown above in the captured waveform.

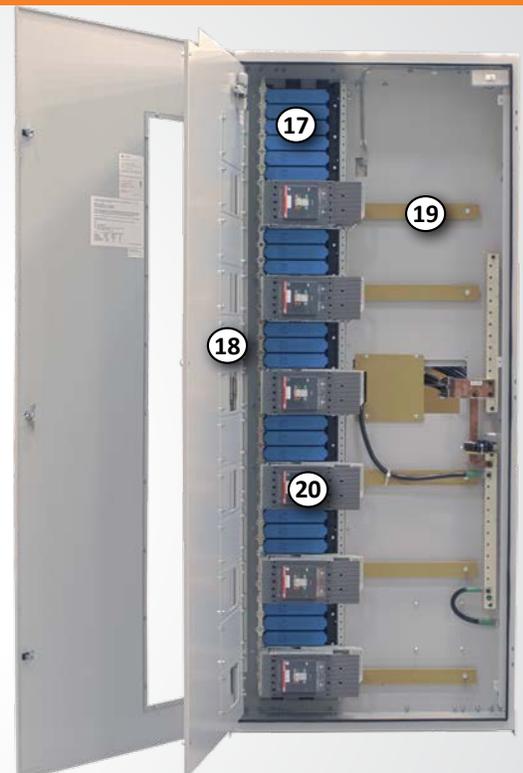
Equipment Layout



Equipment Construction Detail



- |                                       |                                       |
|---------------------------------------|---------------------------------------|
| 1. Alarmed Doors                      | 15. Transformer Circuit Breaker       |
| 2. Hinged Dead Front Doors            | 16. SafePanel™                        |
| 3. Silver Plated Terminals            | 17. SafePanel™ Shrouds                |
| 4. 15" Color Touch Screen GUI         | 18. Universal Dead Front Door         |
| 5. Printed Bypass Instructions        | 19. Cable Organization Clips          |
| 6. Polycarbonate Window               | 20. Up to 12 Subfeed Circuit Breakers |
| 7. InSight™ IR Portholes              |                                       |
| 8. Convection Cooled Heat Sinks       |                                       |
| 9. Staggered Gate Drive Arrangement   |                                       |
| 10. Epoxy Coated Buswork              |                                       |
| 11. Circuit Breakers                  |                                       |
| 12. Redundant Power Supplies          |                                       |
| 13. Louvered Convection Cooled Intake |                                       |
| 14. Transformer                       |                                       |



Reliability Overview

**LayerZero ePODs: Dual Type-P Reliability Overview**

The LayerZero ePODs: Dual Type-P Provides Many Dimensions of Reliability:

- Control System Reliability
  - SMR (Single Module Redundancy, Standard)
  - TMR (Triple Modular Redundancy, Optional)
- Control Power Supply Reliability
- Signal Reliability
- Operator Procedural Reliability

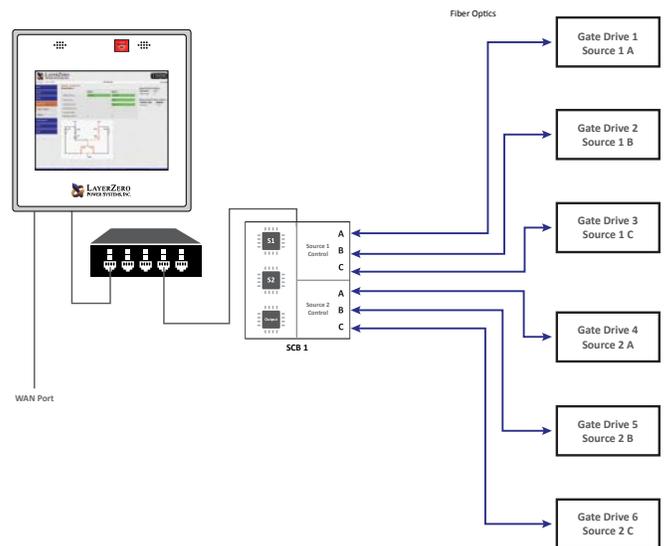


**Single Module Redundancy (SMR) Reliability (Standard)**

Single Module Redundancy is a cost-effective topology that provides redundant power paths to mission-critical equipment. In SMR systems, sources each have built-in triple redundancy of processors.

In addition, every phase is controlled with a separate gate drive board.

LayerZero Single Modular Redundant topology is unique that it the system is fail-safe, maintaining full switching functionality even if a critical board were to fail.



Reliability Features: Triple Modular Redundancy (TMR) \*Optional

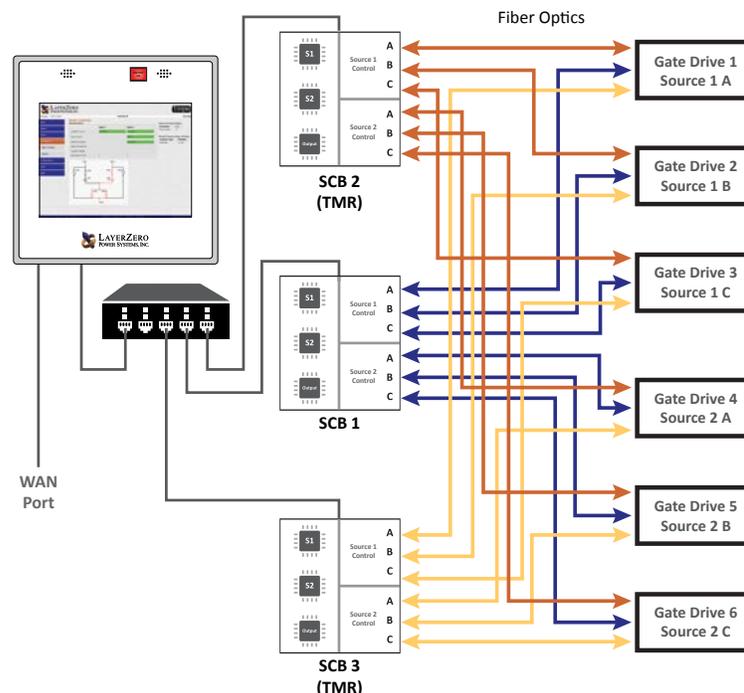
**eSTS TMR Triple Redundant Power Supply Architecture Has All Redundancy Features of SMR Architecture, Plus:**

Each STS has three independent sets of analog and digital data acquisition and control systems. There is no direct communication between the three systems. The three systems do not even share a common system clock.

- Each control system acquires voltage and current data independently
- Each control system determines whether a source is good/bad independently
- Upon loss of a source, each control system makes decisions to transfer independently

Each SCR pair is driven by three separate actuators (gate drives)

Even if an entire control path or its subcomponent were to fail; and then if the active power source were to fail, the STS is designed to meet its emergency transfer specifications. It is able to complete its mission of transferring to the alternate source.



Reliability Features: Single Module Redundant (SMR) Redundancy

eSTS SMR Triple Redundant Power Supply Architecture

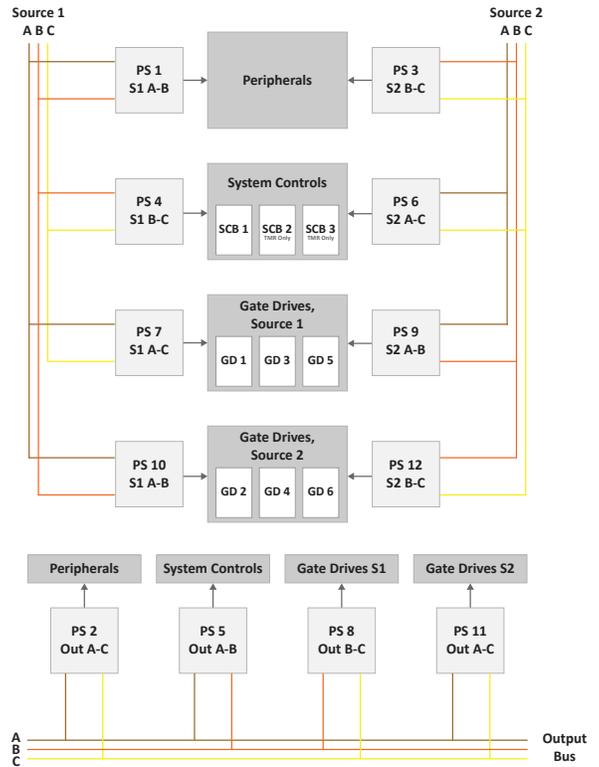
Divided into four (4) logical failure groups:

- System controls
- Source 1 gate drives
- Source 2 gate drives
- Peripherals.

The three (3) available source of power from which to supply control power to each failure group are:

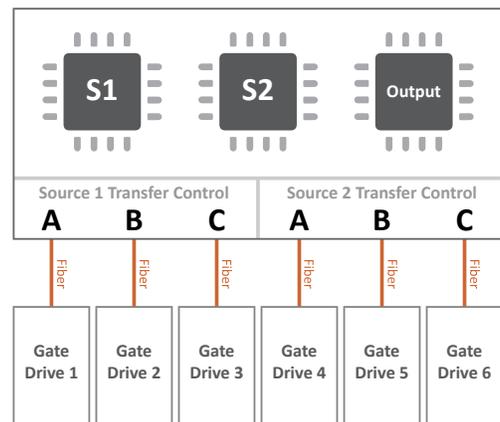
- Source 1
- Source 2
- STS Output.

LayerZero’s STS design incorporates twelve (12) power supplies (3 power sources x 4 failure groups.) The resultant control power topology utilizes all possible power paths to the four logical STS failure groups; and is the most comprehensive and redundant power supply system in existence.



eSTS SMR Triple Redundant Processors

- Separate/independent processors for Source 1, Source 2 and Output power quality analysis
- If Source 1 processor malfunctions then system is able to be commanded to transfer to Source 2; & vice versa.
- If main control system fails then STS continues to conduct power to the load from the existing source of power. (However STS is unable to transfer to the other source)
- Each phase of each source is controlled with a separate gate drive circuit board.



## Reliability Features

### Mechanical Bypass Interlock

In order to minimize the possibility of operator error during equipment bypass operations, LayerZero provides:

1. Interlocked breakers
2. Mechanisms to ensure that a source cannot be bypassed without the STS on the correct source.
3. Safeguards to make certain that sources cannot be connected to each other inadvertently.
4. A voice-prompted bypass procedure that guides the operator through the sequence.
5. A step-wise pictorial & video presentation is provided on the touch-screen display during bypass.



### Voice Guided Bypass

Operator error during maintenance bypass has been known to be a reliability hazard. To help prevent operators from completing the bypass procedure out-of-sequence, our product features a voice prompted bypass procedure. This instructs the operator in a step-by-step course of action of the process, with only one operation per screen. Visual and audio cues provide clear instructions on the bypassing sequence, reducing the probability of operator error.



### No Fans, Dust Filters, or Fan Fuses

The Series 70: eSTS Static Transfer Switch utilizes a natural convection-cooled heat dissipation system.

Fans and fan sensors are some of the most common components to fail. For maximum uptime, LayerZero's eSTS systems do not contain any fans, dust filters to change, or fan fuses to replace.

The heat sink arrangement is staggered between sources and phases to minimize the creation of extreme thermal gradients between heat sink columns when conducting on one source or the other.



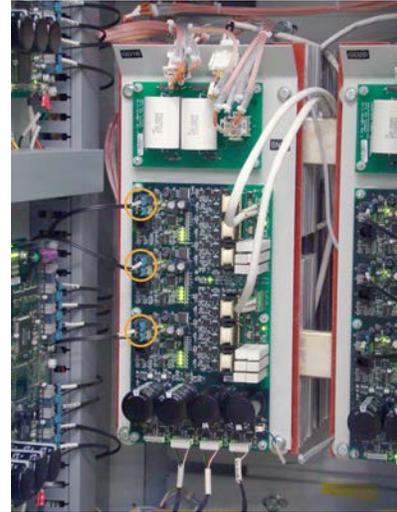
## Reliability Features

### Fiber Optic Controls Increase System Reliability

Fiber optic based controls eliminate noise and interference, while isolating components from high voltage.

Optical fiber allows service to be reliably connected, while protecting the equipment.

In LayerZero's ePODs: Dual Type-P design, the gate drives (at Power Circuit Voltage) receive control signals via optical fibers.



### Vibration Isolation Damper Mounts

Transformers in the Series 70: ePODs Type-P Power Distribution Unit are equipped with vibration isolation damper mounts, helping to reduce the amount of vibration and noise that originates from transformers, ultimately leading to a higher reliability of electrical and mechanical connections over the life of the product.



### Sectionalization Maximizes Operator Safety

Operators are well-protected from exposed connections. Normal operator sections (breakers/switches) are physically separated from the power electronics and control electronics sections, so that maintenance on a section can be safely performed. If maintenance is required on a particular section, power can be bypassed to another section to allow for safe repairs to be made.



## Ease of Maintenance

**InSight™ IR Portholes Permit Scanning of Bolted Connections with Dead-Front Doors Closed**

Strategically positioned IR-scan portholes to enable safe thermal scanning of all bolted connections with the deadfront closed, without exposing the operator to power circuit voltage. Thermal scans can be done from the front – without ever having to open the dead-front door.

The IR window swivels upward and unlocks with key-hole access to reveal a mesh, allowing the operator to point-and-shoot thermal cameras to obtain readings.

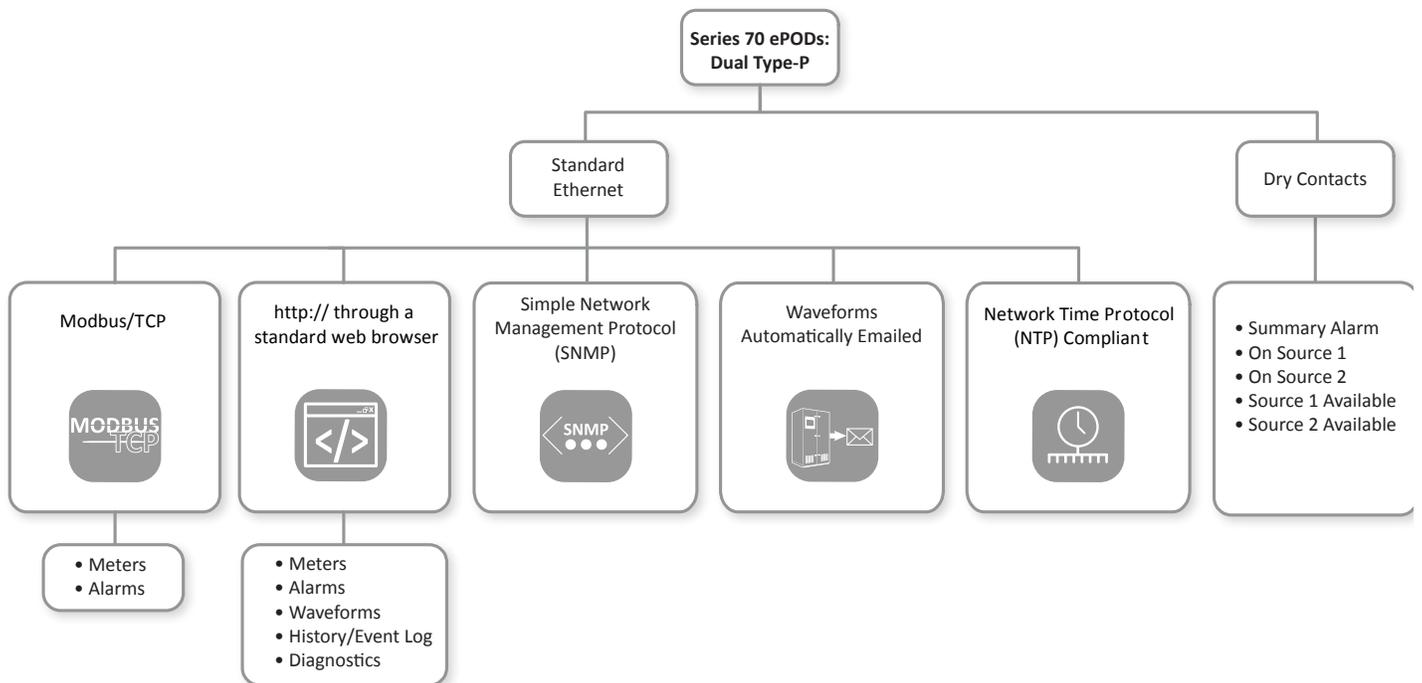


Ease of Maintenance/Connectivity Options

**View Status LEDs and Distribution CB Positions With Dead-Front Doors Closed**

Our Series 70 product line was inspired by NFPA-70E, to help data centers drastically reduce the risks of their energy distribution systems.

Operators can view the status of diagnostic LEDs without exposure to the energized power electronics section. In addition, SafePanel circuit breaker positions can be viewed with the dead-front door closed.



Safety Features

**The LayerZero SafePanel™**

The Series 70 ePODs: Dual Type-P features an IP-20, finger-safe panel board, meaning that the opening will not allow ingress of ½” (12.5mm) diameter probe, for maximum operator safety.

An arc can form as two live conductors are separated – such as the removal of a circuit breaker from a panel board. The SafePanel design ensures that a potential arc would be contained in the connection well so that even if a branch breaker were to be removed, the arc would be contained in the connection well.

Insulated with the components deeply isolated, removal of the breaker is safe and easy.



**Dual Type-P 1200 A Circuit Breaker Installation Process**



The Breaker Is Inserted Into The SafePanel



The Handle Is Unlocked



Screws Help Secure The Breaker



For Maximum Safety, The SafePanel Has Recessed Bus Work and Finger Safe Lattice.

# zen SSQM

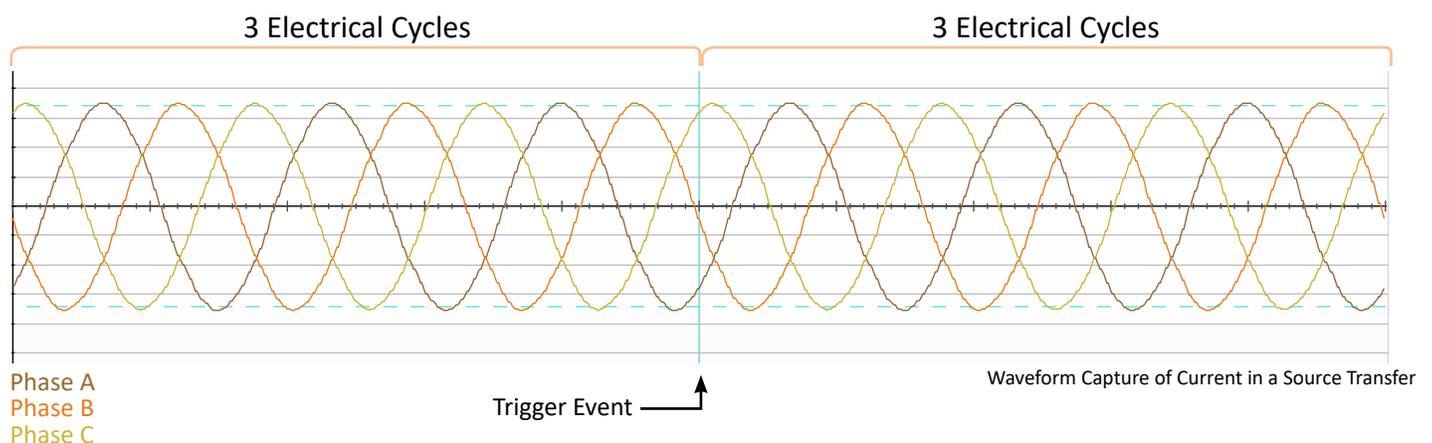
The Series 70: eSTS is equipped with Zen SSQM (Static Switch Quality Monitoring), an all encompassing monitoring system with local and remote communications options.

From basic monitoring & alarm reporting, to advanced power quality monitoring functionality, Zen SSQM provides a wide-range of options to help you be aware, be vigilant, be proactive in your quest to create a safe, stable and reliable operation.



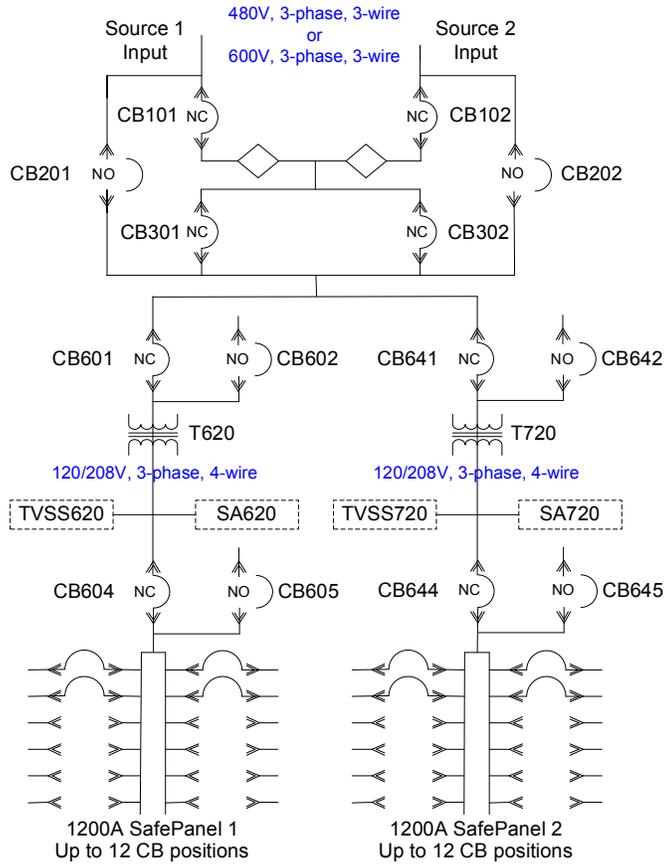
## Zen SSQM Provides Answers

Zen SSQM provides timestamped pictures of waveforms before and after events, providing information that enables facilities to go back in time to methodically identify and correct the root causes of events. Zen actively captures power quality information at the STS, PDU, and RPP - permitting thorough post-event analysis.





Zen SSQM Parameters		Mains	Subfeeds or Branch Circuits
<b>Voltage Inputs and Output</b>	Voltage	✓	
	Frequency (Hertz)	✓	
	Phase Rotation	✓	
<b>Current Inputs</b>	Current (Amps)	✓	✓
	Current Fraction of Rating (Percent)	✓	✓
	Current Imbalance (Percent)	✓	✓
	Real Power (kilowatts)	✓	✓
	Apparent Power (kilovolt-amperes)	✓	✓
	Reactive Power (kilovolt-amperes reactive)	✓	✓
	Power Factor	✓	✓
	K Factor	✓	✓
	Crest Factor	✓	
<b>Alarms</b>	Summary Alarm	✓	
	Voltage (High, Low)	✓	
	Overload	✓	
	Thermostat (High, Low)	✓	
	THD Over Limit	✓	
	Frequency (Over, Under)	✓	
	I A/B/C K-Factor Over Limit	✓	
	Average K-Factor Over Limit	✓	
	Incorrect Phase Rotation	✓	
	Voltage Failure	✓	
	I G1/G2 Over Ground Fault Limit	✓	
	I G1/G2 Over Ground Overcurrent Limit	✓	✓
	TVSS 1/2/3/4 Failure	✓	



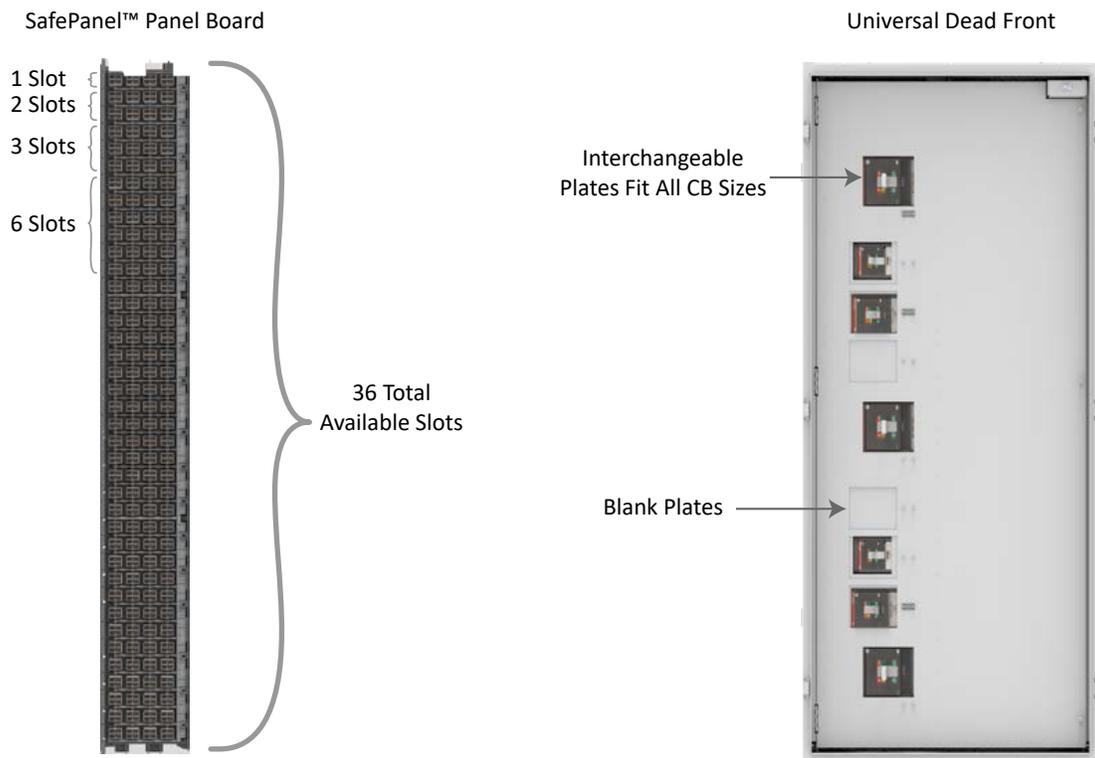
ePODs: Dual Type-P Models with Withstand Ratings					
Frame Rating	480 V		575 V		600 V
250 A	150kAIC; 100kAIC; 65kAIC; 35kAIC; 25kAIC		100kAIC; 65kAIC; 35kAIC; 25kAIC; 18kAIC		
400 A					
600 A					
800 A	100kAIC; 65kAIC; 50kAIC; 35kAIC		42kAIC; 35kAIC; 25kAIC; 20kAIC		
Mechanical Characteristics					
	75 kVA - 300 kVA		400 kVA		
Dimensions (side facing distribution):	154"W x 86"H x 36"D (3911 mm x 2032 mm x 914 mm)		178"W x 86"H x 36"D (4521 mm x 2032 mm x 914 mm)		
Dimensions (front facing distribution):	202"W x 86"H x 36"D (5131 mm x 2032 mm x 914 mm)		226"W x 86"H x 36"D (5740 mm x 2032 mm x 914 mm)		
Weight	2,650 - 4,050 lbs (1202 kg - 1837 kg) Varies on Configuration, Please Contact LayerZero Engineering				
Heat Dissipation	Varies on Transformer Efficiency, Please Contact LayerZero Engineering.				
Frame Construction	Welded Frame				
Electrical Connections	Flexible Laminated Bus, Silver-Plated Solid Busbar				
Color	Textured Powder Coat White (RAL 7035), Blue (RAL 5017), Black, Custom				
Seismic Floor Anchors	Optional				
Seismic Floor Stand	Optional				
Sectionalization	Engineered Composite Insulation, Dead Front Doors				
Electrical Characteristics					
Static Transfer Switch					
System Input Voltage	480 V, 3-Phase, 3-Wire + Ground; 575 V, 3-Phase, 3-Wire + Ground; 600 V, 3-Phase, 3-Wire + Ground				
System Output Voltage	120/208 V, 3-Phase, 4-Wire + Ground; 240/415 V, 3-Phase, 4-Wire + Ground				
eSTS Current	250 A	400 A	600 A	800 A	
Transformer Sizes	75 kVA	130 kVA, 144 kVA, 150 kVA	216 kVA, 225 kVA	250 kVA, 288 kVA, 300 kVA	
Number of Inputs	2, 3				
Number of Output CBs	1, 2				
Frequency	50 Hz, 60 Hz				
Poles	3-pole, 4-pole				
Phases	3 Phase, 3 Wire, 4 Wire + Ground				
Neutral Rating	100%, 150%, 200%				
eSTS Transfer Time	< 4ms (3 ms typical)				
eSTS Redundancy	Single Modular Redundancy, Triple Modular Redundancy Optional				
Circuit Breaker Type	Electronic Trip, Molded Case Switch, Thermal Magnetic Trip				
Circuit Breaker Mounting Type	Plug-In				
eSTS TVSS	Optional				
Subfeed Distribution					
Distribution	SafePanel™ Distribution				
Power Quality Monitoring					
Power Quality Monitoring Technology	Zen SSQM™ (Static Switch Quality Monitoring)				
Waveform Capture	Local Display, Remote Display via Web Browser, Waveforms Automatically Emailed				
Voltmeter	Input sources and Output, for each phase				
Ammeter	Input sources and Output, for each phase				
Frequency Meter	Both Sources				
Real-Time Synchroscope	Phase Angle Meter Between Sources				
Metering	Apparent Power, Real Power, Power Factor, Output Total Harmonic Distortion				
Time Stamped Transfer Count	From First Day Use, From Last Reset				
CB Status Indicator	Open/Closed/Tripped Circuit Breaker				
Source Indicator	Preferred Source				
Phase Indicator	When Any Two Sources Are Within Window				
Current Path Indicator	Energized Current Path				

All product specifications are subject to change without notice.

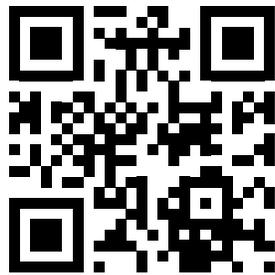
Operational Characteristics	
Transfer Modes	Manual, Automatic
Inrush Mitigation Technology	Patented Dynamic Phase Compensation Algorithm (U.S. Patent 7,589,438 B2)
Password Protection	User Configurable Roles
Cooling	Convection Cooling
Cable Access	Top/Bottom
Service Access	Front Only
Bypass Interlock Mechanism	Mechanical
Noise & Interference Isolation	Optical Fiber
IR Scan Port Type	InSight™ IR Portholes
SCR Type	Puck
Display Type	15" Color Touch Screen
Display Resolution	1024x768
Bypass Assistance	Voice-Guided Bypass
Audio	Bezel-Mounted Stereo Speakers
Languages	English, French
Mimic Panel	Digital
Setpoints Control	Digital
Power Supplies	Redundant
Connectivity	
Meters	Local Display, Ethernet, Modbus/TCP, http via Web Browser (Non-Proprietary)
Alarms	Local Display, Ethernet, Modbus/TCP, http via Web Browser (Non-Proprietary)
Summary Alarm	Dry Contacts
Waveforms	Local Display, Ethernet, http via Web Browser (Non-Proprietary)
History/Event Log	Local Display, Ethernet, http via Web Browser (Non-Proprietary)
Diagnostics	Local Display, Ethernet, http via Web Browser (Non-Proprietary)
Time Synchronization	Network Time Protocol (NTP)
Standards Conformance: Static Transfer Switch	
UL	ETL Listed to UL 1008S
CSA	ETL Listed to C22.22 No 107.
Standards Conformance: SafePanel Distribution	
UL	ETL Listed to UL 60950
CSA	C22.2 No 29-M1989

All product specifications are subject to change without notice.

Number of Output Circuit Breakers	
Number of Available SafePanel™ Slots	36
CB Rating	Number of Slots Required
100 AF	2
250 AF	3
400 AF	3
400 AF 100%	6
800 AF	6



All product specifications are subject to change without notice.



Learn more at [www.LayerZero.com](http://www.LayerZero.com)



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