LayerZero Power Systems, LLC.

The Foundation Layer

Series 70: eSTS

1200 A 480 V 3-Pole Static Transfer Switch

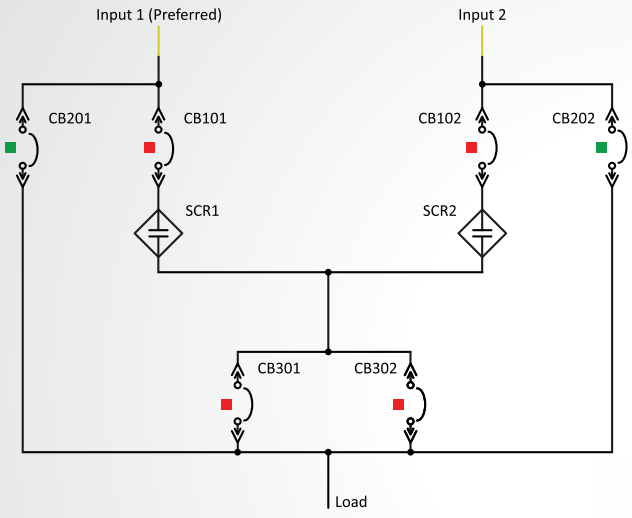
Product Brochure

The LayerZero eSTS Static Transfer Switch
Maximizes Power Reliability

eSTS Automatically Transfers Between Two or Three* Power Sources

LayerZero Power Systems designs and manufactures the world's ***most reliable*** static transfer switches. The Series 70 eSTS is a solid-state transfer switch designed to automatically or manually transfer between two in-phase AC sources in as little as a quarter cycle. The eSTS performs open-transition transfers with exceptional precision, minimizing load disruption without ever cross-connecting the power sources. One source is designated as the preferred power input. If the preferred source fails, the load is seamlessly transferred to the alternate source through an open-transition static transfer. For emergency transfers between asynchronous sources, dynamically phase-compensated transfers minimize transformer saturation in 3-phase, 3-wire eSTS systems, ensuring smooth, reliable operation across all conditions.

*Optional



eSTS Static Transfer Switch One Line Diagram

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Controls Section Contains:

Power electronics

- SCRs (Silicon Control Rectifier) in Convection Cooled Heat Sinks

Control Electronics

- System Control & Data Acquisition Boards
- SCR Gate Drives
- Redundant Power Supply System
- I/O system; VPN Router

CB Section Contains:

Input isolation switches

Bypass isolation Switches

Output isolation switches

Source connection terminals

Load connection terminals

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Standard Features

Every LayerZero eSTS is equipped with a comprehensive suite of standard features purpose-built to maximize reliability, operator safety, and operational efficiency. These advanced features work together to make LayerZero static transfer switches the industry's preferred choice for mission-critical power distribution.

Reliability

Optional Triple Modular Redundancy: Fully-independent control paths ensure no single point-of-failure.

Safe Bypass Procedure: Mechanical bypass interlock prevents human errors during bypass procedures.

Voice Guided Bypass: Audio-video guidance offers step-by-step instructions for operators.

Convection Cooling: Natural cooling system is maintenance-free.

Epoxy Coated Buswork: Eliminates potential bus-to-bus faults.

Silver Plated Terminals: Superior conductivity for enhanced electrical performance.

Maintenance-Free Joints: Permanent brazed joints ensure longevity.

Machined Hardware: Constant torque throughout product life.

Optical Fiber Based Controls: Noise and interferance free controls while ensuring high voltage isolation.

Serialized Critical Board Tracking: Active database tracking for essential boards.

Safety

INSIGHT IR® Cameras: Monitor bolted connections for temperature anomalies.

Sectionalized Components: Allows safe de-energization for maintenance.

Polycarbonate Windows: View critical board LEDs with closed dead-front door.

Front-Only Access: Safe installation and maintenance without side/rear access.

Dead Front Hinged Doors: Ensures a safe work environment with no exposed live parts.

Connectivity

Ethernet Connectivity: Secure VPN router for remote monitoring.

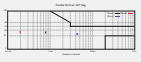
Modbus/TCP: Connect to existing systems without proprietary restrictions.

NTP Time Clock Synchronization: Enables timeline-based event logging.

SNMP Connectivity: Remote management via SNMP.

Power Quality Monitoring

Real-Time Waveform Capture: Captures a picture of the power three-cycles before and after every event.



ITIC Plotting: Analyze if equipment was affected by power quality events.

Local Touch-Screen Interface: Secure interface for local STS operations.

Waveforms Automatically Emailed: Send waveforms to designated individuals post-transfer.

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Reliability Overview

LayerZero eSTS Reliability Overview

The LayerZero eSTS Provides Many Dimensions of Reliability:

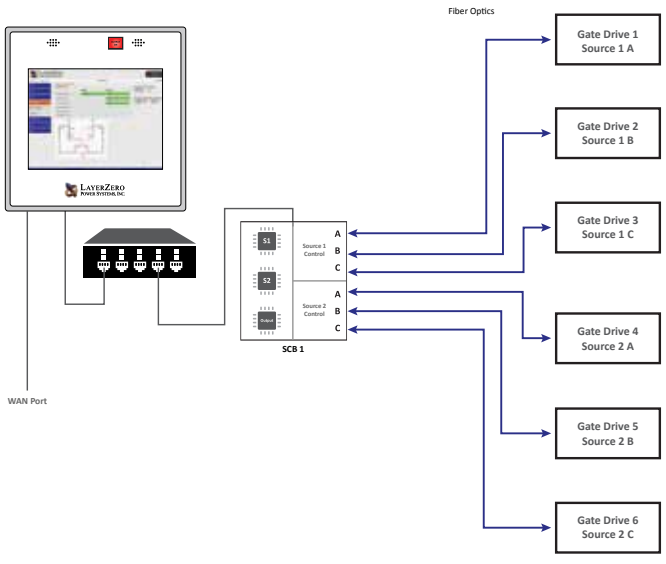
- Control System Reliability
  - SMR (Single Module Redundancy, Standard)
  - TMR (Triple Modular Redundancy, Optional)
- Control Power Supply Reliability
- Signal Reliability
- Operator Procedural Reliability

The Series 70: eSTS is designed for maximum reliability

Single Module Redundancy (SMR) Reliability (Standard)

Single Module Redundancy (SMR) is a cost-effective, fail-safe topology that provides redundant power paths to mission-critical equipment. In an SMR configuration, each power source includes triple redundancy within its processors, and every phase is individually controlled through a dedicated gate drive board.

LayerZero's SMR architecture is uniquely designed to remain fully functional even if a critical control board were to fail. This inherent fail-safe capability ensures continuous, dependable power transfer performance in every operating scenario.



Redundant Control Paths of LayerZero SMR Gate Drives

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Reliability Features: Triple Modular Redundancy (TMR) *Optional

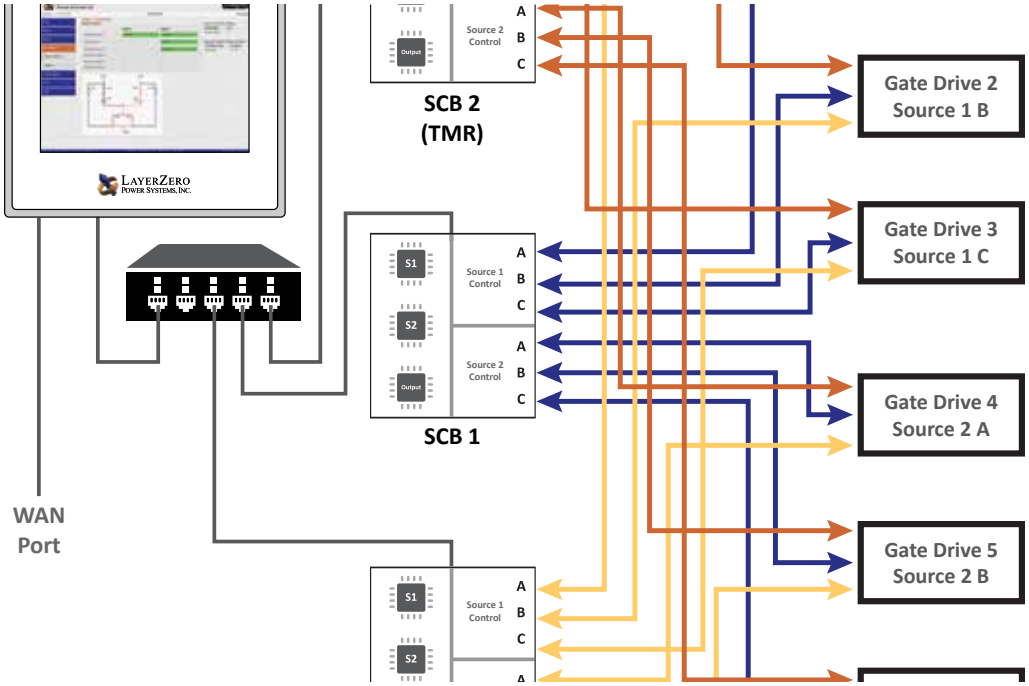
Triple Modular Redundancy (TMR) Reliability (Optional)

Triple Modular Redundancy (TMR) builds upon LayerZero's SMR architecture, introducing an additional layer of protection for the highest level of system reliability. Each eSTS equipped with TMR contains three fully independent sets of analog and digital data acquisition and control systems.

These systems share no direct communication and operate on separate system clocks, ensuring complete electrical and logical isolation. Each control system independently monitors voltage and current, evaluates source quality, and makes autonomous transfer decisions.

LayerZero's TMR is grounded in proven statistical modeling and rigorous engineering. While other manufacturers may use similar terminology ("tri-redundant" or "triple redundant"), no other system delivers the same level of true modular independence and reliability as LayerZero TMR.

Three System Control Boards (SCBs) in a TMR Configuration



Redundant Control Paths of a TMR Configuration

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Reliability Features: Single Module Redundant (SMR) Redundancy

eSTS SMR Triple Redundant Power Supply Architecture

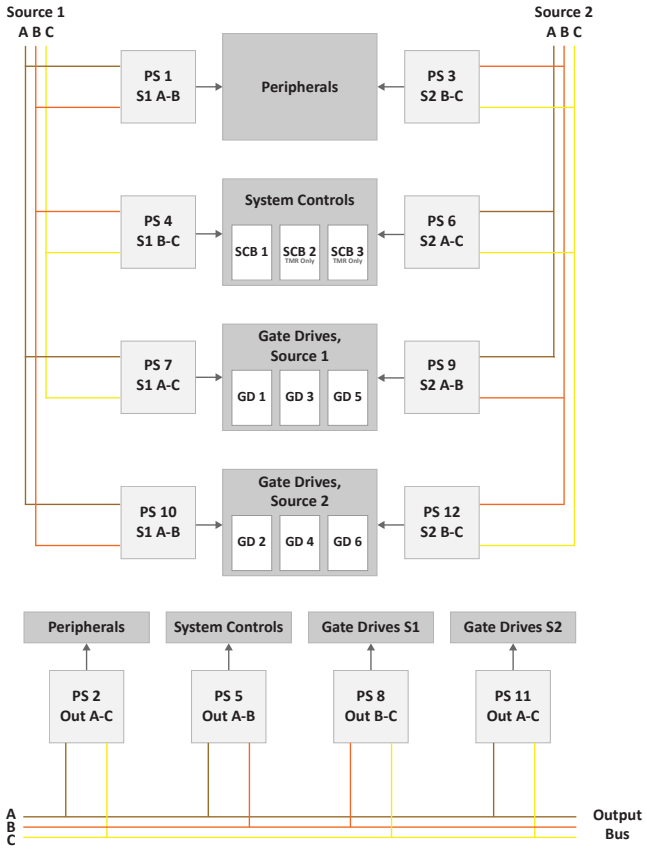
Divided into four (4) logical failure groups:

- 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:

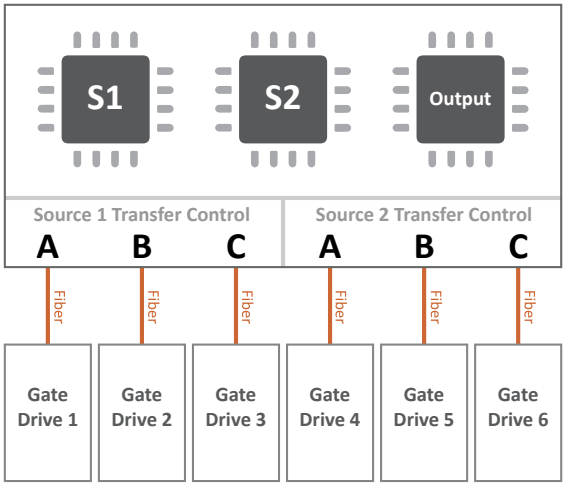
- Source 1
- Source 2
- STS Output.

This results in a total of 12 dedicated power supplies (3 sources x 4 failure groups), creating the most comprehensive and redundant control power topology in existence. By utilizing every possible power path to each logical failure group, LayerZero ensures unmatched control power reliability, even under fault conditions.



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.



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Reliability Features

Mechanical Bypass Interlock

To minimize the possibility of operator error during equipment bypass operations, LayerZero's eSTS includes multiple layers of interlocking safeguards that ensure correct and safe procedures every time:

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.

Mechanical Bypass Interlock "Goalpost" Design

Voice Guided Bypass

Operator error during manual bypass procedures is one of the most common causes of system downtime. To eliminate this risk, LayerZero's voice-guided bypass system provides clear, step-by-step audio and visual prompts throughout the process. Each action is displayed one at a time on the touchscreen, ensuring proper sequence and eliminating confusion. These intuitive visual and audio cues greatly reduce the chance of operator error, improving overall safety and system reliability.

The Voice Guided Bypass Screen in the LZA GUI

No Fans, Dust Filters, or Fan Fuses

For maximum uptime and minimal maintenance, the Series 70 eSTS employs a natural convection-cooled heat dissipation system.

By design, the eSTS contains no fans, no fan sensors, and no dust filters or fan fuses, eliminating some of the most common components to fail in traditional systems. The staggered heat sink arrangement between sources and phases helps distribute heat evenly and minimizes thermal gradients when conducting on either source, ensuring long-term, maintenance-free operation.

Convection-Cooled Design in an eSTS, showing perforated vents on the cabinet bottom

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Reliability Features

Epoxy Coated Buswork/Maintenance Free Joints

LayerZero's epoxy-coated buswork enhances system safety by eliminating the possibility of bus-to-bus faults. All bus joints are permanently brazed and maintenance-free, ensuring years of dependable performance without requiring periodic tightening or servicing.

Silver-Plated, Epoxy Coated Customer Inputs for Source 1 and Source 2

Silver Plating

All LayerZero bus joints and terminals feature silver plating for optimal conductivity and durability. Silver's high conductivity and low resistance ensure superior contact quality, reduce energy loss, and enhance overall system efficiency. and low resistance - which makes for a great contact.

Machined Hardware

All bolted electrical connections in LayerZero eSTS units utilize precision-machined cap screws and engineered disc springs. This combination delivers a flat pressure-versus-deflection profile, ensuring that every connection maintains constant torque throughout the life of the product.

These assemblies are field-proven in extreme temperature environments, maintaining integrity and torque stability over time. Once tightened, connections stay secure, contributing to LayerZero's reputation for long-term mechanical reliability.

Machined Cap Screws and Engineered Disc Springs Utilized in LayerZero Power Systems Products

Fiber Optic Controls Increase System Reliability

LayerZero's fiber optic control system eliminates electrical noise and interference while providing full galvanic isolation between high-voltage and low-voltage circuits. Control signals are transmitted optically to the gate drives, ensuring reliable communication, enhanced electrical isolation, and immunity from EMI disturbances, critical for maintaining clean, stable performance in mission-critical environments.

Fiber Optic Connections (highlighted) in a Gate Drive

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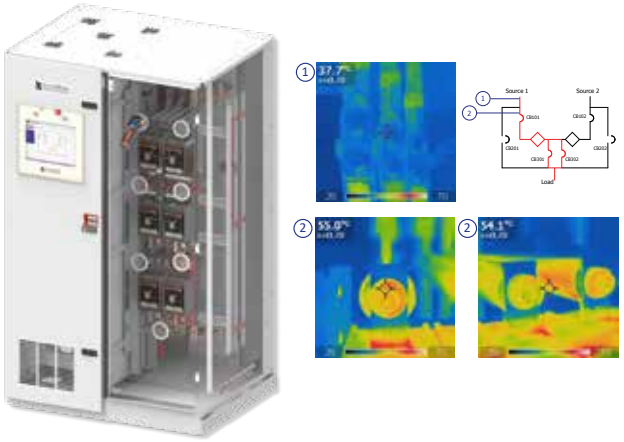
Safety - Ease of Maintenance

INSIGHT IR® Portholes Permit Scanning of Bolted Connections with Dead-Front Doors Closed

Strategically positioned INSIGHT IR® portholes allow operators to perform safe thermal scans of all bolted connections without ever opening the dead-front doors. This design eliminates exposure to energized power circuits while maintaining full diagnostic access.

Each porthole swivels upward and unlocks via keyhole access, revealing a protective mesh that allows for precise “point-and-shoot” thermal imaging. Operators can obtain accurate temperature readings directly from the front of the unit, ensuring a safe and efficient inspection process.

INSIGHT IR® Porthole mounted on a polycarbonate window.



An IR Camera Scanning an INSIGHT IR Porthole for Source 1 Input (Door and side panel hidden for visibility)

INSIGHT IR® Cameras Provide Early Detection

The INSIGHT IR® monitoring system continuously tracks the temperatures of critical components using a network of fixed infrared cameras. It displays real-time thermal images for each connection, allowing operators to view temperatures by phase and detect irregularities before they lead to issues. By providing continuous thermal visibility, INSIGHT IR® enables predictive maintenance and early intervention, helping prevent downtime, reduce risk, and extend equipment lifespan.

INSIGHT IR® live images can be viewed on a local or remote display.

INSIGHT IR® Camera Housing

INSIGHT IR® Cameras are installed near bolted connections and critical components, and generates a hybrid heat map over a visible image

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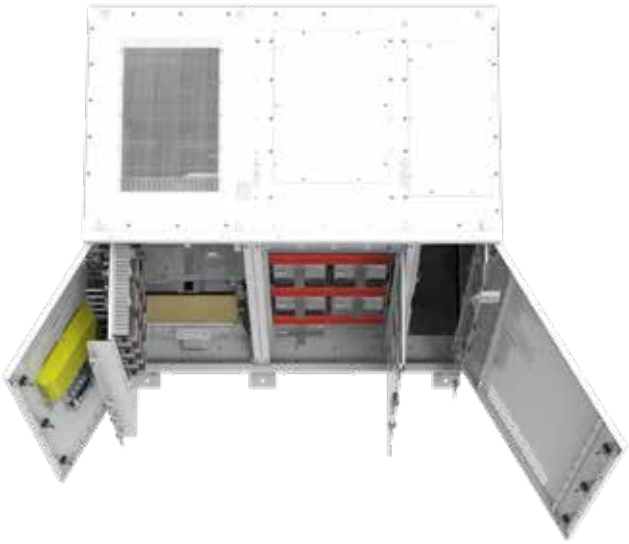
Safety

Sectionalization Maximizes Operator Safety

LayerZero's eSTS design incorporates physical separation between operator-accessible sections (breakers and switches) and high-energy areas like power and control electronics. This sectionalized architecture allows maintenance to be safely performed on one section while others remain energized. If service is required, power can be bypassed to another section, ensuring both safe access and uninterrupted operation, protecting personnel and maintaining uptime.



eSTS with the Outer Doors Open, showing physical separation between the power electronics and control sections

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

Inspired by NFPA 70E safety standards, the Series 70 product line is designed to minimize exposure risk during operation and maintenance. Operators can view diagnostic LEDs and SafePanel® circuit breaker positions through closed dead-front doors, eliminating the need to open energized panels.

This configuration ensures that system status is always visible while maintaining full electrical isolation, aligning with LayerZero's mission of combining safety, simplicity, and reliability in every product.

Polycarbonate Window on the Power Electronics Section, allowing visibility of status LEDs.

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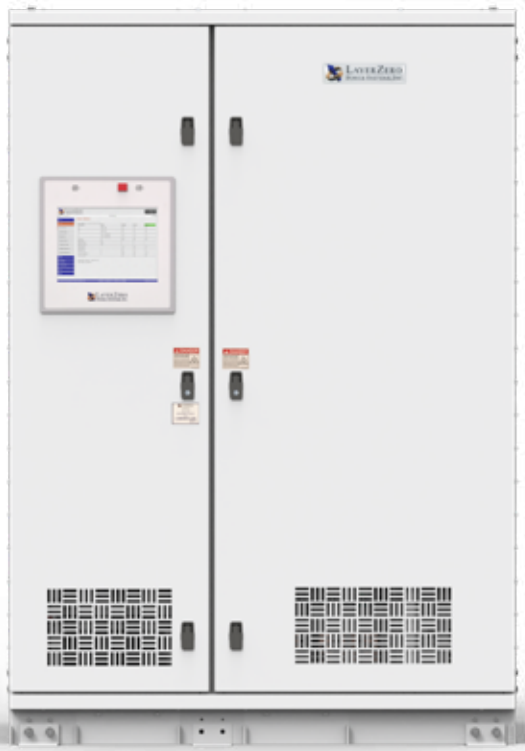
Ease of Maintenance/Connectivity Options

Front Only Access Saves Space

The Series 70: A eSTS is designed to be installed, operated, diagnosed and maintained only from the front. The dead-front panels are hinged, and side or rear covers never have to be removed.

Unhinged covers can be bulky and unwieldy, and operator error during removal and replacement of covers has been known to cause mishaps and compromise load reliability. A safe, non-invasive operation and maintenance regime results in a higher reliability of the critical load.

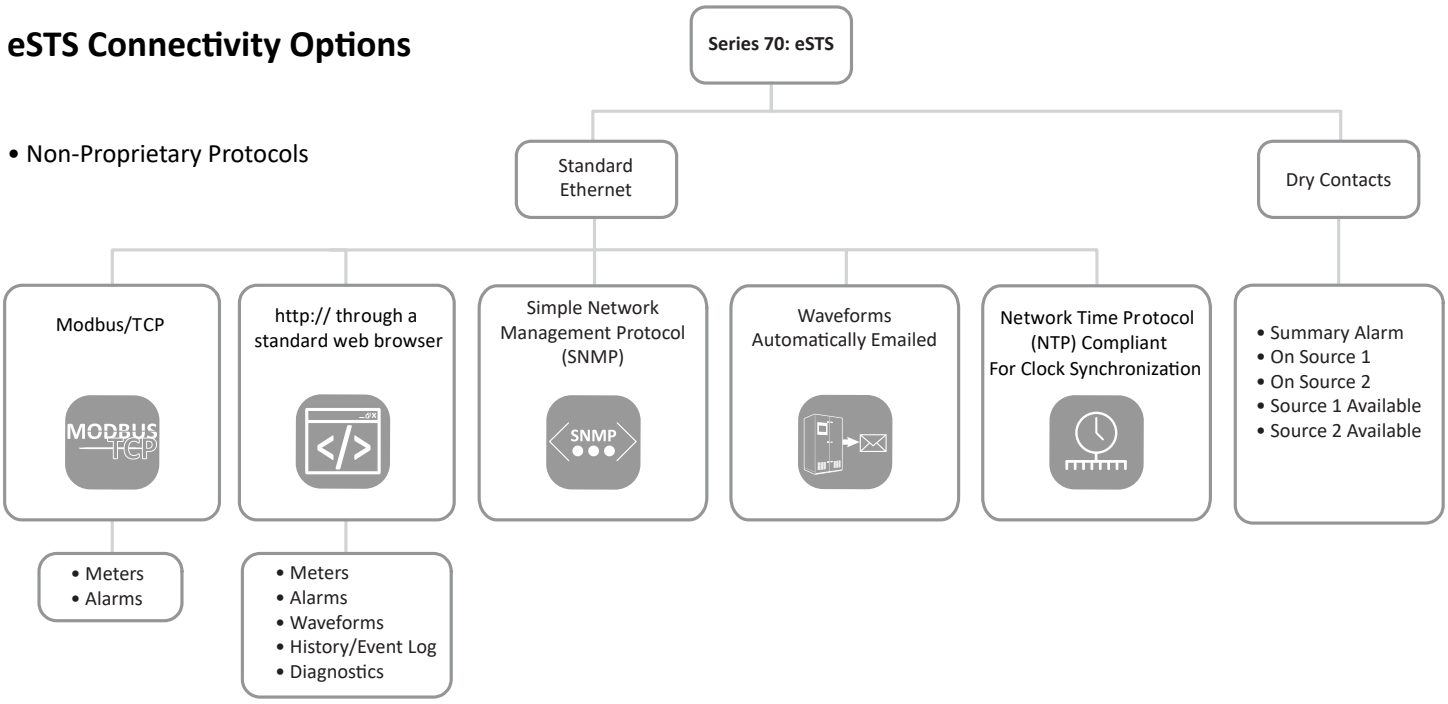
The Series 70: eSTS utilizes dead-front hinged doors. An alarm notifies when an outer door has been opened.



Front of the eSTS Static Transfer Switch

eSTS Connectivity Options

- Non-Proprietary Protocols



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Generate Easy-To-Understand Power Quality Reports with ITIC Plotting

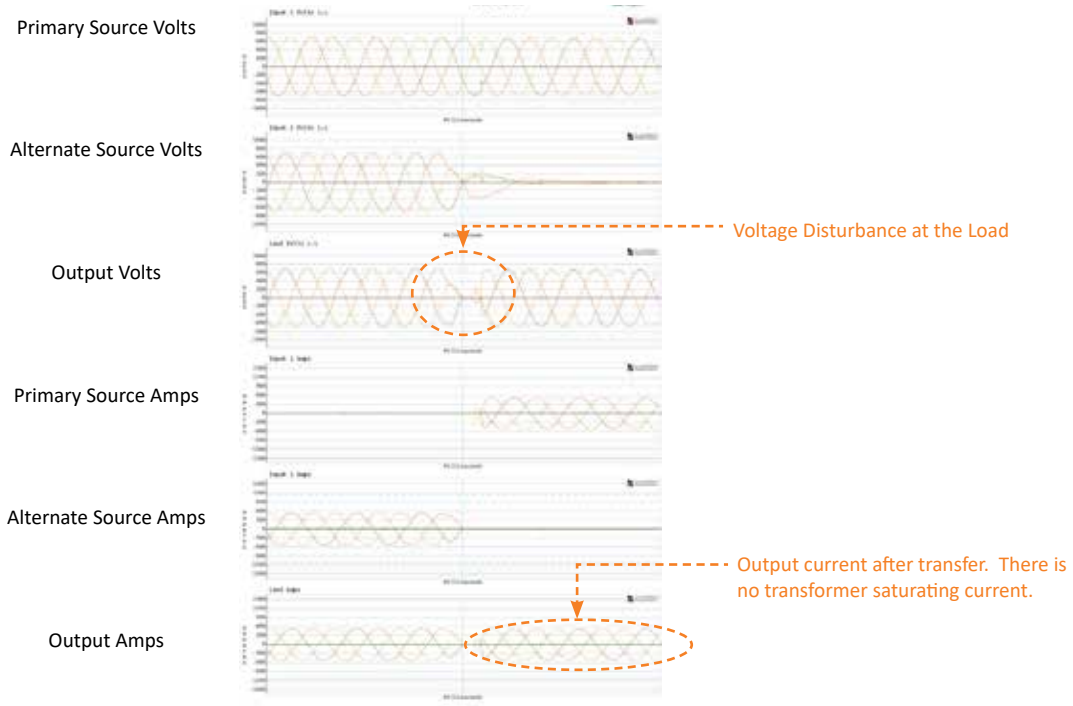
All LayerZero Power Systems products feature integrated power quality analyzers that continuously sample and evaluate source performance. When a source drifts out of specification, the STS automatically transfers to the alternate source, simultaneously generating waveform captures and VDAT-generated ITIC curves of the event.

VDAT (Voltage Disruption Analysis Tool) represents a quantum leap in power systems data interpretation. Using advanced algorithms and processing techniques, VDAT translates complex waveform information into clear, actionable insights.

Traditional waveform captures can be intricate and time-consuming to interpret. VDAT simplifies this process through intuitive plots based on ITIC (Information Technology Industry Council) standards, helping users make faster, more informed decisions about power quality.

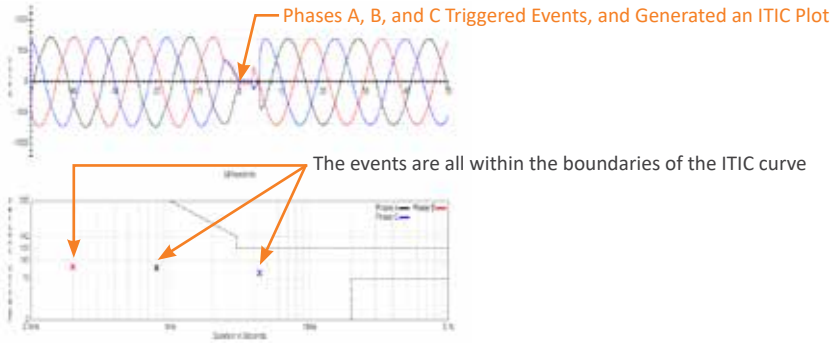
In the test shown below, the STS was connected to two sources 150° out of phase. When Source 2's breaker opened, the STS performed an automatic transfer to the primary source, generating delayed transfer events on Phases A, B, and C. VDAT automatically produced easy-to-read ITIC plots of each event, delivering instant clarity without requiring expert analysis. All captured data is remotely accessible through a standard web browser, allowing operators to monitor, review, and diagnose power performance with ease.

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 Disruption Analysis Tool (VDAT) plot shown above in the captured waveform.

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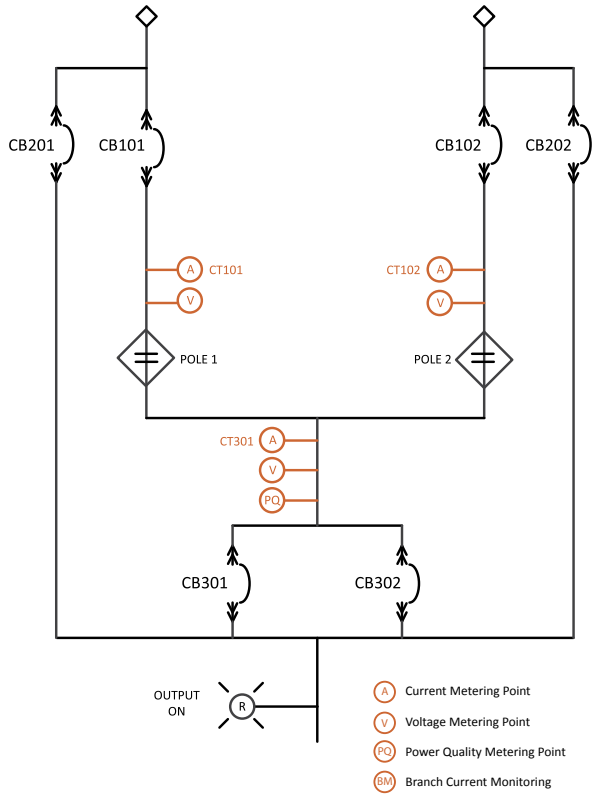
Features/Power Quality Monitoring

LayerZero Power Quality Monitoring

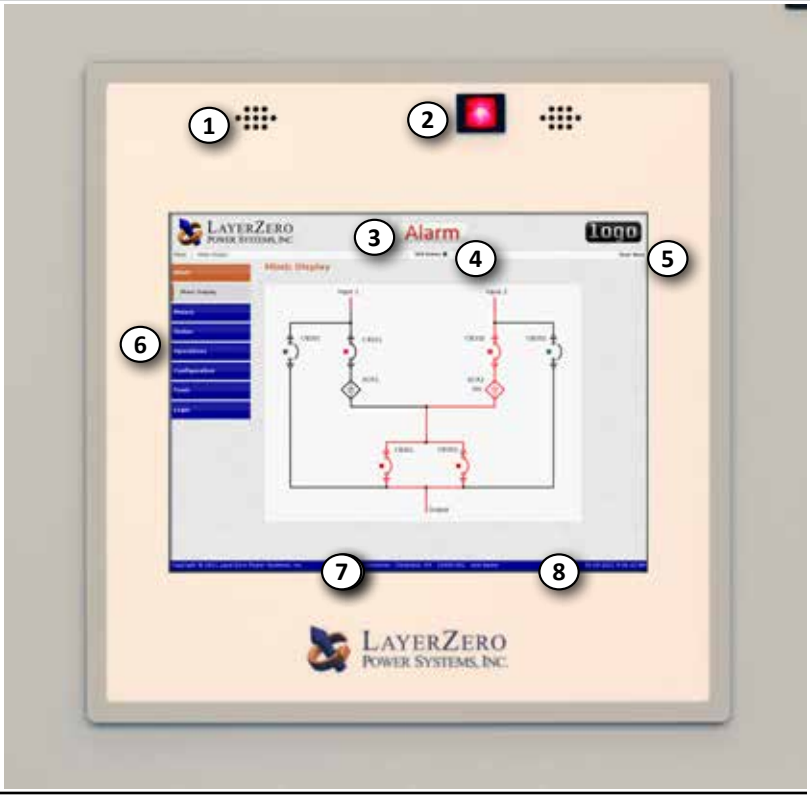
LayerZero PQM delivers comprehensive visibility into the activity of your entire critical power distribution system. From basic alarms to advanced event logging and analysis, PQM offers both local and remote communication options, ensuring constant awareness of system health.

PQM provides a vendor-neutral “bird’s eye view” of your infrastructure, alerting you if a source experiences quality issues, a UPS output becomes unstable, or an alarm is triggered. With powerful historical tracking capabilities, users can retrace sequences of past events to determine exact causes and conditions. No other tool in the mission-critical industry provides this level of detailed, retrospective insight.



15” Color Touch Screen (Standard)

1. Stereo Speakers for Guided Bypass Prompts
2. Output On Light (Remains Lit in Bypass Isolate Mode)
3. Alarm & Bypass Indicator
4. SCB Status Indicator
5. Logged In User
6. Navigation Menu
7. Customer & Project Information
8. Date & Time



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Power Quality Monitoring

Static Switch Power Quality Monitoring

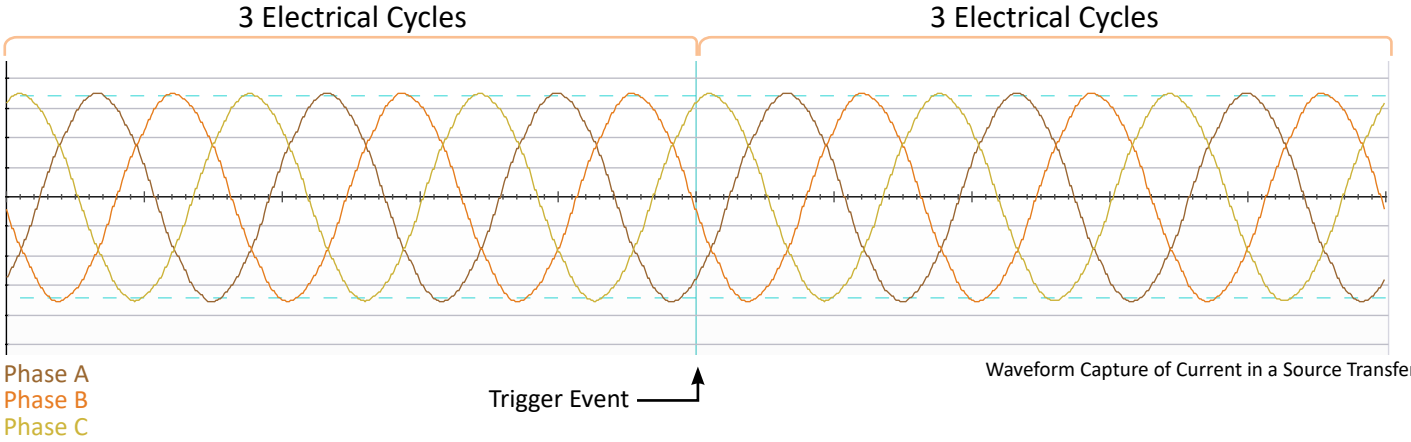
The Series 70 eSTS is equipped with LayerZero SSQM, a dedicated Static Switch Quality Monitoring system that combines local and remote capabilities for complete operational awareness.

From alarm reporting to advanced waveform analysis, SSQM empowers operators to be aware, vigilant, and proactive, ensuring a safe, stable, and reliable power environment.

eSTS Touch Screen GUI showing Real Time Waveform Capture

LayerZero's SSQM Provides Answers

SSQM captures timestamped waveform images before and after each event, enabling users to reconstruct the exact sequence of what occurred. This visibility allows facilities to identify and correct root causes with confidence. LayerZero's monitoring ecosystem collects data at the STS, PDU, and RPP levels, ensuring thorough post-event analysis and a unified view of the entire power distribution chain.



Waveform Capture of Current in a Source Transfer

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LayerZero SSQM Technical Specifications

LayerZero SSQM Parameters		Mains
Voltage Inputs and Output	Voltage (Volts)	✓
	Voltage Average of Phases (Volts)	✓
	Frequency (Hertz)	✓
	Total Harmonic Distortion (Percent VTHD)	✓
	Phase Rotation	✓
Current Inputs	Current (Amps)	✓
	Current Average of Phases (Amps)	✓
	Current Imbalance (Percent)	✓
	Real Power (kilowatts)	✓
	Apparent Power (kilovolt-amperes)	✓
	Reactive Power (kilovolt-amperes reactive)	✓
	Power Factor	✓
	Crest Factor	✓
	Crest Factor Average of Phases	✓
	Phase Difference Between Sources	✓
	Phase Difference Between Sources and Output	✓
Alarms	Summary Alarm	✓
	On Source (1/2/3)	✓
	Source Fail (1/2/3)	✓
	Source Preferred (1/2/3)	✓
	Source 1st Alternate (1/2/3)	✓
	Source Over/Under Voltage (1/2/3)	✓
	Source Over/Under Frequency (1/2/3)	✓
	Source Not Available (1/2/3)	✓
	Output Failure	✓
	Source Overcurrent (1/2/3)	✓
	Source Exceeds Manual Limit (1/2/3)	✓
	Source Exceeds Automatic Limit (1/2/3)	✓
	Bypassed to Source (1/2/3)	✓

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Technical Specifications: 3-Pole Static Transfer Switch

Mechanical Characteristics *	
Current/Voltage/Number of Poles	1200 A 480 V 3-Pole
Heat Dissipation	16,352 BTU/hr
Weight	3000 lbs [1361kg]
Dimensions	88” x 60” x 40.5” (2237 mm x 1524 mm x 1029 mm)
Clearances	Front: 42” (1067 mm) Rear: 0” Left Side: 10” For Control Bay Servicing Right Side: 0” Top: 18” (457 mm)
Frame Construction	Welded Frame
Electrical Connections	Silver-Plated Solid Busbar
Color	Textured Powder Coat White (RAL 7035), Blue (RAL 5017), Black, Custom
Floor Stands	Optional
Seismic floor stands	Optional
Junction Boxes	Optional
Sectionalization	Engineered Composite Insulation, Dead Front Doors
Electrical Characteristics	
Number of Inputs	2, 3 (3 optional)
Number of Output CBs	1, 2
Frequency	50 Hz, 60 Hz
Poles	3-pole
Phases	3 Phase, 3 Wire, 4 Wire + Ground
Neutral Rating	100%, 150%, 200%
Transfer Time	Nominal 1/4- cycle for in-phase sources
Redundancy	Single Module Redundancy, Triple Modular Redundancy (Optional)
Circuit Breaker Type	Molded Case Switch (Standard), Electronic Trip (Optional)
Circuit Breaker Mounting Type	Plug-In up through 600 A; Draw-out 800 A, 1200 A
TVSS	Standard
Power Quality Monitoring	
Power Quality Monitoring Technology	LayerZero PQM (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
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
Power Path Indicator	On Live Mimic

*Dimensional & weight data is only valid for 2-source.

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Technical Specifications

Operational Characteristics	
Transfer Modes	Automatic; Manual (via Preferred Source Selection)
Inrush Mitigation Technology	Patented Dynamic Phase Compensation Algorithm (U.S. Patent 7,589,438 B2)
Cooling	Convection Cooling
Cable Access	Top/Bottom
Service Access	Front Only
Bypass Interlock Mechanism	Mechanical
Noise & Interference Isolation	Optical Fiber in Critical Control Paths
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 (4 Failure Groups. Triple Redundant Supplies. 12 Power Supplies Provided.)
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; Local Display; Modbus/TCP; Web Browser
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	
CSA	ETL Listed to C22.22 No 107.
UL	ETL Listed to UL 1008S

All data tables above are for 3-pole only. Contact LayerZero for custom sizes and designs.

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Learn more at www.LayerZero.com

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