LayerZero Power Systems, LLC.

The Foundation Layer

Series 70: eSTS

1000 A 480 V 3-Pole Static Transfer Switch

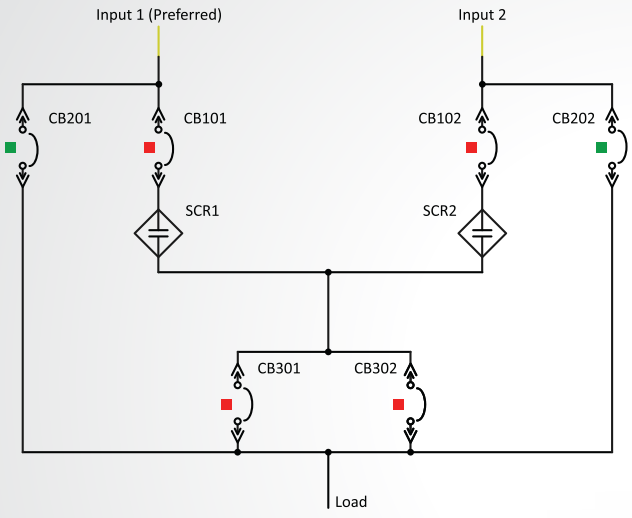
Product Brochure

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, designed for unmatched reliability in mission-critical environments. The Series 70 eSTS is a solid-state transfer switch that automatically or manually transfers between two in-phase AC power sources in a quarter cycle or less. Its open-transition transfer design minimizes disruption to connected loads without ever cross-connecting power sources. One source is designated as the preferred source. If the preferred source experiences a failure or falls out of specification, the load is automatically and seamlessly transferred to the alternate source, ensuring continuous operation.

*Optional



eSTS Static Transfer Switch One Line Diagram

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:

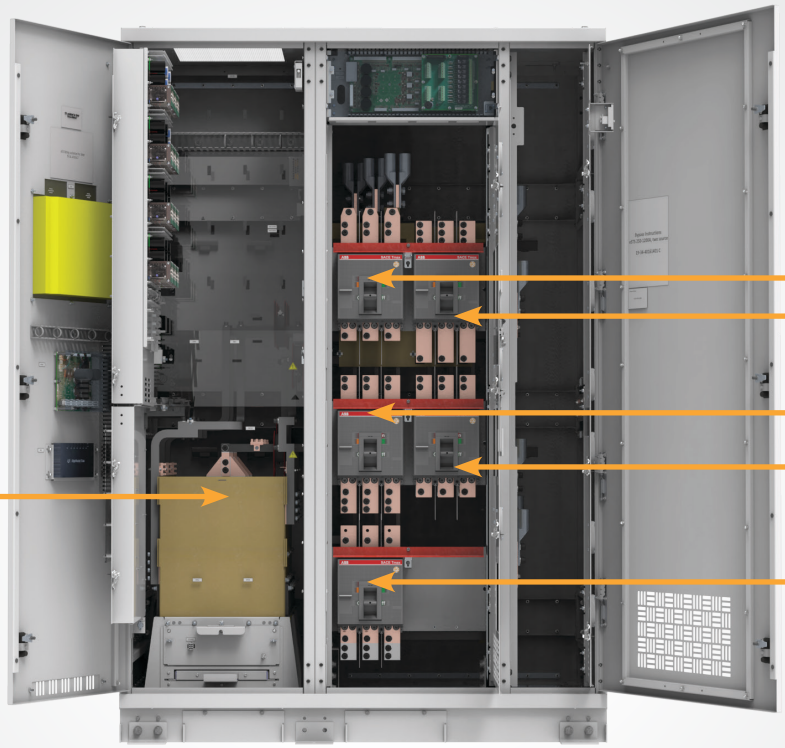
Input isolation switches

Bypass isolation Switches

Output isolation switches

Source connection terminals

Load connection terminals



Standard Features

Every LayerZero Series 70 eSTS is equipped with a suite of standard features designed to maximize power reliability, operator safety, and operational efficiency. These features represent the culmination of LayerZero's commitment to excellence, ensuring that every static transfer switch embodies the highest standards of performance and protection.

Reliability

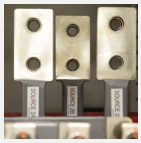
Optional Triple Modular Redundancy: Fully-independent control paths ensure no single point-of-failure.

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

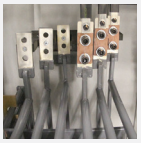
Voice Guided Bypass: Audio-video guidance offers step-by-step instructions for operators.

Convection Cooling: Natural cooling system is maintenance-free.

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

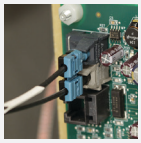


Silver Plated Terminals: Superior conductivity for enhanced electrical performance.



Maintenance-Free Joints: Permanent brazed joints ensure longevity.

Machined Hardware: Constant torque throughout product life.



Optical Fiber Based Controls: Noise and interference 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.

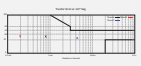
Modbus/TCP: Connect to existing systems without proprietary restrictions.

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.

Reliability Overview

LayerZero eSTS Reliability Overview

The LayerZero eSTS Provides Many Dimensions of Reliability:

- **Control System Reliability:**
  - **SMR (Single Module Redundancy, Standard):** Our foundational system ensures consistent, dependable operation under all conditions.
  - **TMR (Triple Modular Redundancy, Optional):** LayerZero's TMR architecture goes beyond SMR with three fully independent control systems. Each operates in isolation, individually assessing and acting on voltage and current data. Even if one control path fails, the STS continues operation seamlessly.
- **Control Power Supply Reliability:** Designed for consistent, uninterrupted power delivery, preventing unforeseen operational interruptions.
- **Signal Reliability:** Ensures clear, precise, and noise-free signal transmission, minimizing the risk of communication errors.
- **Operator Procedural Reliability:** Incorporates intuitive, error-preventing features that maintain the integrity and safety of system operation.

The Series 70: eSTS is designed for maximum reliability

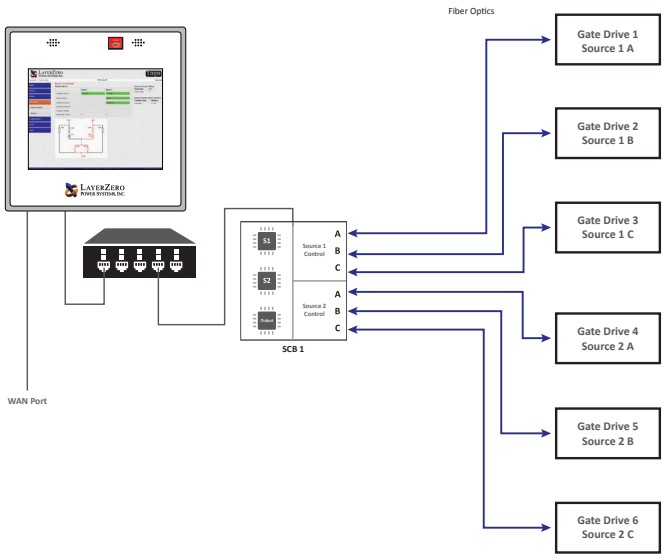
Single Module Redundancy (SMR) Reliability (Standard)

Single Module Redundancy (SMR) is a cost-effective, highly reliable topology that provides redundant power paths for mission-critical equipment.

In SMR systems:

- Each source includes built-in triple redundancy of processors.
- Every phase is controlled by an independent gate drive board.

LayerZero's Single Module Redundancy topology is fail-safe, maintaining full switching functionality even in the event of a critical board failure, ensuring uninterrupted performance when reliability matters most.



Redundant Control Paths of LayerZero SMR Gate Drives

Reliability Features: Triple Modular Redundancy (TMR) *Optional

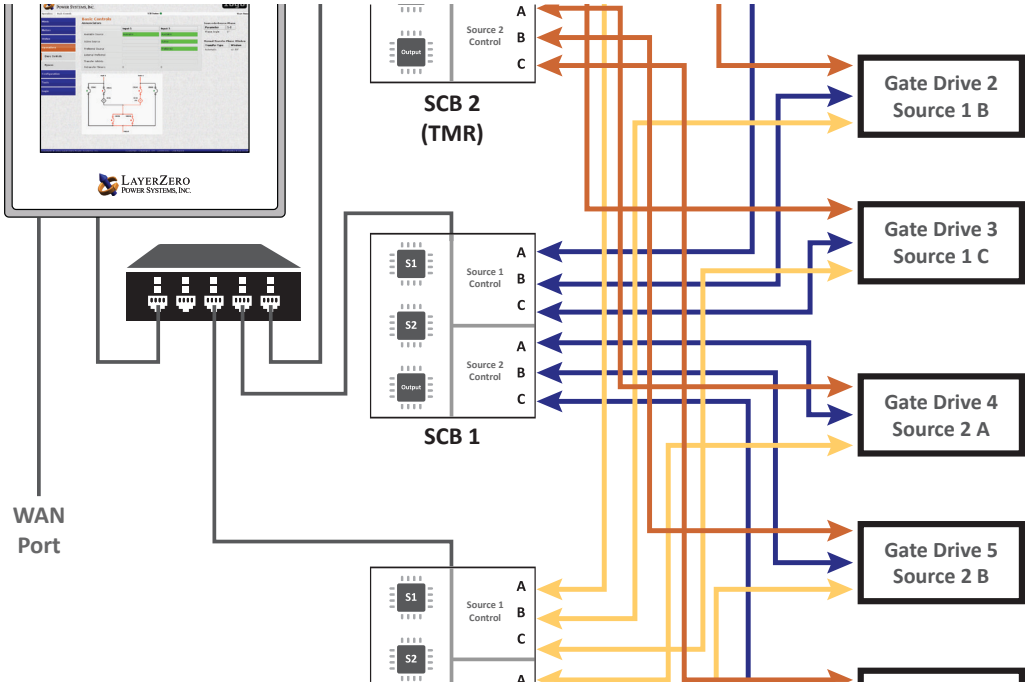
Triple Modular Redundancy (TMR) Reliability (Optional)

LayerZero TMR builds upon SMR architecture with an additional layer of protection, featuring three independent sets of analog and digital data acquisition and control systems.

- Each control system operates in complete isolation, with no shared communication paths or system clocks.
- Every control path independently acquires voltage and current data, evaluates source quality, and makes transfer decisions autonomously.
- Even if an entire control path fails, followed by a failure of the active power source, the STS continues its mission by completing the transfer to the alternate source.

Triple Modular Redundancy is founded on proven statistical principles and rigorous mathematical design. While other manufacturers may use similar terms like “tri-redundant,” LayerZero TMR delivers a far higher level of reliability, setting the benchmark for redundancy in mission-critical power systems.

Three System Control Boards (SCBs) in a TMR Configuration



Redundant Control Paths of a TMR Configuration

Reliability Features: Single Module Redundant (SMR) Redundancy

eSTS SMR Triple Redundant Power Supply Architecture

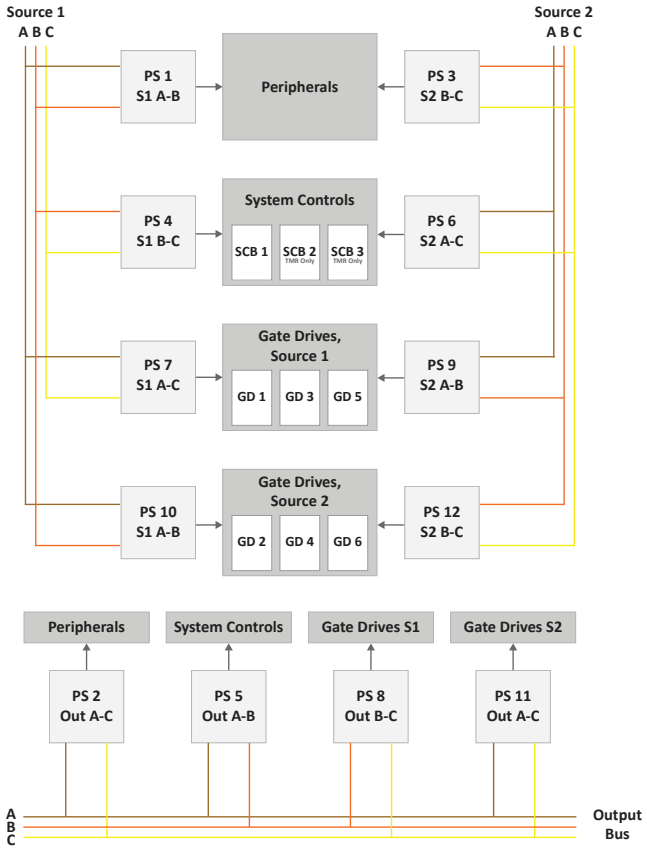
Divided into four (4) logical failure groups:

- 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:

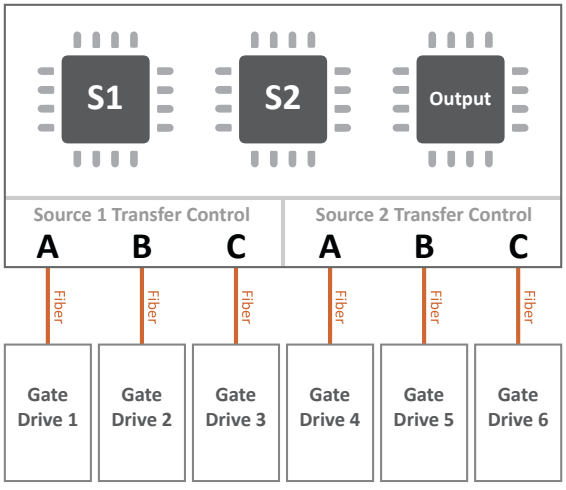
- Source 1
- Source 2
- STS Output.

This configuration results in a total of 12 power supplies (3 power sources feeding 4 failure groups), creating the most comprehensive and redundant control power topology in existence. The design ensures uninterrupted control capability even in the event of multiple component failures.



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.

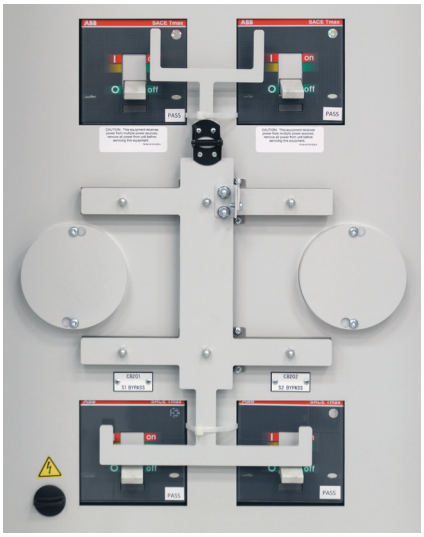


Reliability Features

Mechanical Bypass Interlock

To minimize operator error during maintenance bypass, LayerZero integrates advanced mechanical and procedural safeguards:

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

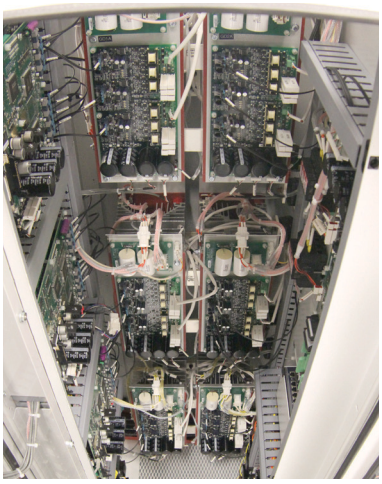
Human error is a known reliability risk during manual bypass operations. LayerZero’s voice-guided bypass system eliminates ambiguity by walking the operator through each step, one at a time. Audio and visual cues ensure the correct sequence is followed, reducing the probability of misoperation and enhancing overall procedural reliability.

The Voice Guided Bypass Screen in the LZA GUI

No Fans, Dust Filters, or Fan Fuses

The Series 70 eSTS employs a natural convection-cooled thermal management system, meaning no fans, no dust filters, and no fan fuses. These are common points of failure in competing products.

LayerZero’s staggered heat sink arrangement distributes heat evenly between sources and phases, reducing thermal gradients and improving long-term reliability. The result is a quiet, maintenance-free design optimized for maximum uptime.



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

Reliability Features

Epoxy Coated Buswork/Maintenance Free Joints

LayerZero's epoxy-coated buswork provides superior safety and long-term reliability by eliminating the potential for bus-to-bus faults. All bus faults are permanently brazed, creating a maintenance-free design that ensures dependable electrical performance over the life of the product.

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

Silver Plating

To achieve optimal electrical conductivity and minimal resistance, LayerZero uses silver plating on all bus joints and terminals. Silver's superior conductive properties enable cleaner, more efficient power flow and contribute to the system's exceptional performance and durability.

Machined Hardware

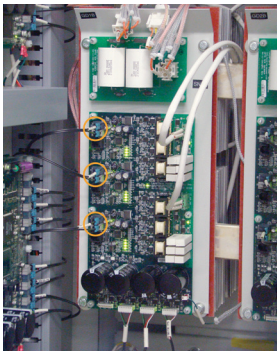
Every bolted connection in the eSTS uses precision-machined cap screws combined with engineered disc springs. This pairing delivers a flat pressure-versus-deflection profile, maintaining constant torque throughout the product's lifespan.

These connection methods have been extensively tested across wide temperature ranges to ensure that once fasteners are tightened, they remain secure, guaranteeing consistent electrical and mechanical integrity.

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

Fiber Optic Controls Increase System Reliability

LayerZero employs fiber optic-based control architecture to eliminate electrical noise, prevent interference, and isolate control circuits from high-voltage components. Control signals are transmitted via optical fibers from the logic-level system to the gate drives located at the power circuit voltage. This design improves signal clarity and enhances safety and serviceability by reducing the risk of electrical disturbances.



Fiber Optic Connections (highlighted) in a Gate Drive

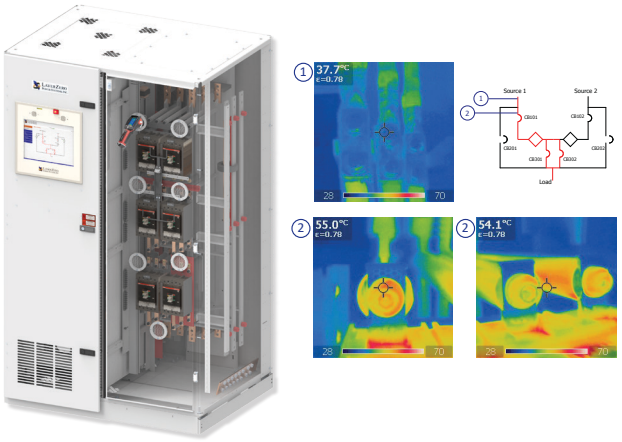
Safety - Ease of Maintenance

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 to reveal a protective mesh, enabling precise “point-and-shoot” thermal imaging for quick, accurate readings, all from the front of the unit.

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® system continuously monitors the temperature of critical components using a network of fixed infrared cameras. Real-time thermal data is displayed live, allowing operators to view connection temperatures by phase and identify irregularities before they become problems. By detecting potential hotspots early, INSIGHT IR® helps prevent downtime, enabling predictive maintenance that keeps systems safe, stable, and operational.

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

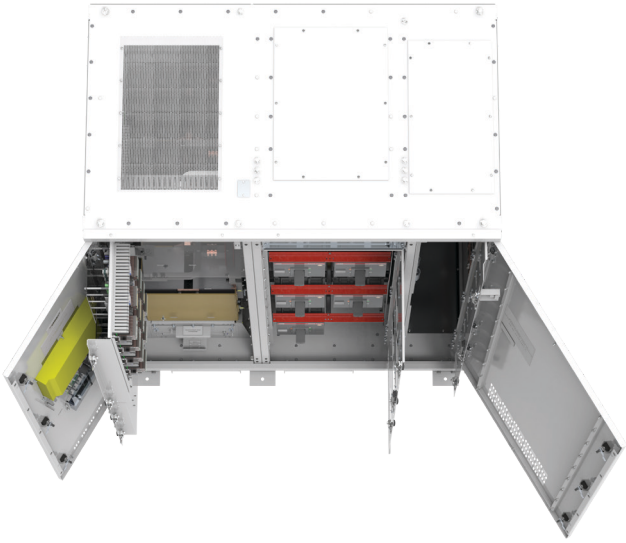
INSIGHT IR® Camera Housing

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

Safety

Sectionalization Maximizes Operator Safety

LayerZero's eSTS design physically separates operator-accessible sections (such as breakers and switches) from high-energy power and control electronics. This sectionalized layout allows maintenance personnel to safely service one section while others remain energized. When maintenance is required, power can be bypassed to another section, ensuring safe, continuous operation and maximum 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 principles, LayerZero's Series 70 product line prioritizes operator safety and risk reduction. Diagnostic LEDs are viewable without exposure to energized components, and SafePanel® circuit breaker positions can be observed with the dead-front door securely closed.

This design enables operators to visually confirm system status without compromising safety.

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

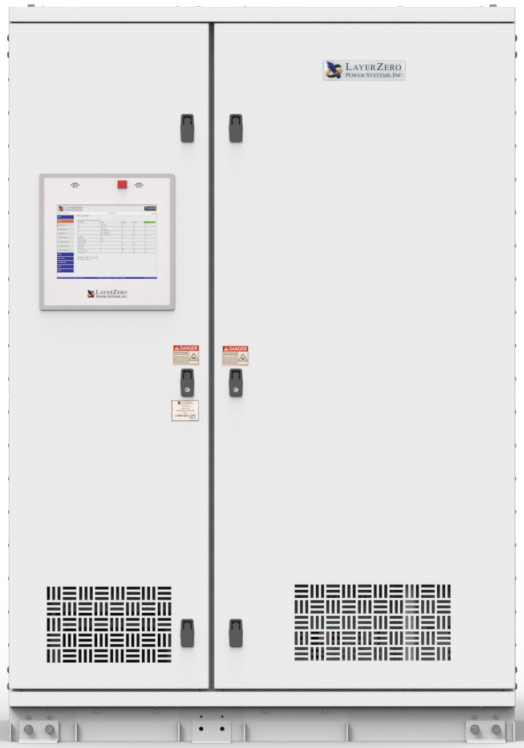
Ease of Maintenance/Connectivity Options

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.

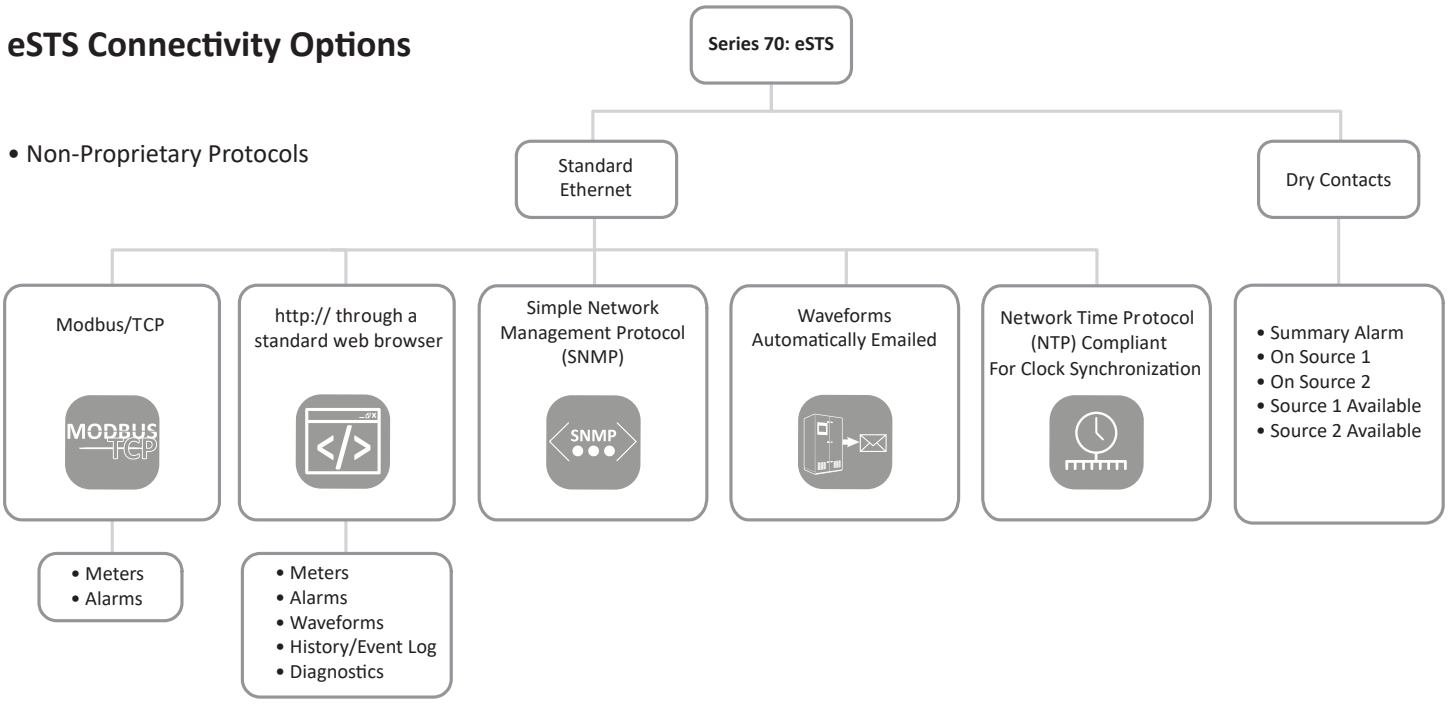
The Series 70: eSTS utilizes dead-front hinged doors. An alarm notifies when an outer door has been opened.



Front of the eSTS Static Transfer Switch

eSTS Connectivity Options

- Non-Proprietary Protocols



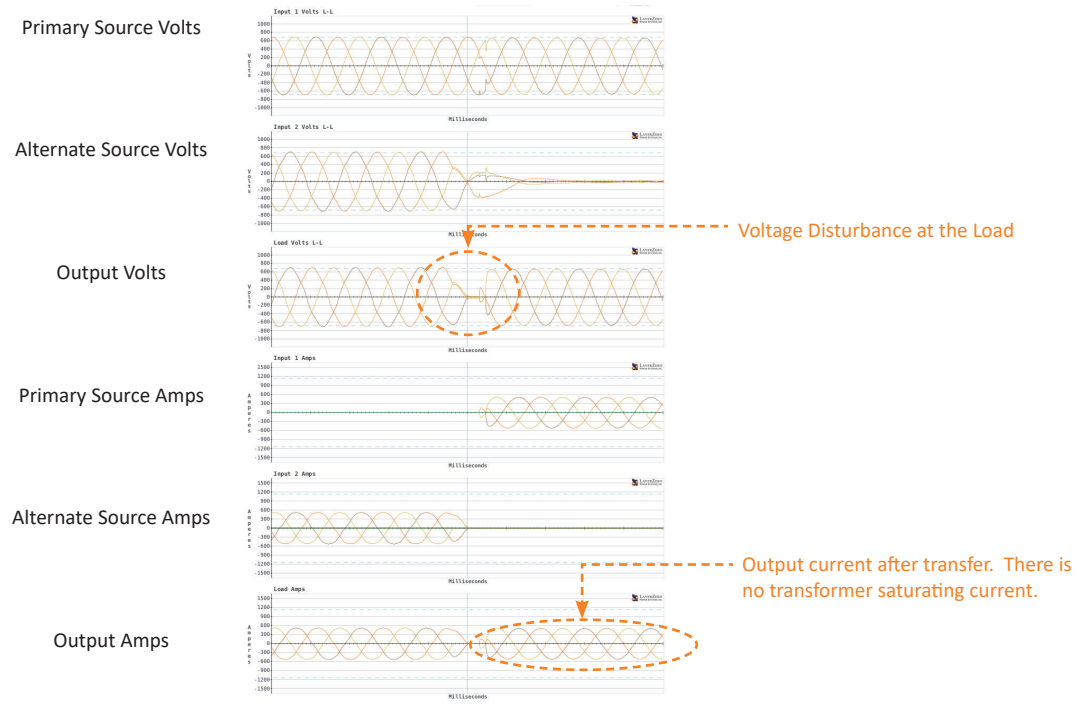
Generate Easy-To-Understand Power Quality Reports with ITIC Plotting

Every LayerZero Power Systems product includes a built-in power quality analyzer that continuously samples incoming power sources. When a source drifts out of specification, the eSTS automatically transfers to the alternate source and records detailed waveform captures, accompanied by ITIC-compliant VDAT plots. All data can be securely accessed remotely via a standard web browser.

VDAT (Voltage Disruption Analysis Tool) represents a significant advancement in power data interpretation. Leveraging advanced algorithms, VDAT translates complex waveform data into clear, actionable insights. While traditional waveform captures often require expert analysis, VDAT simplifies interpretation through intuitive plots based on Information Technology Industry Council (ITIC) standards, employing operators to make quick, informed decisions.

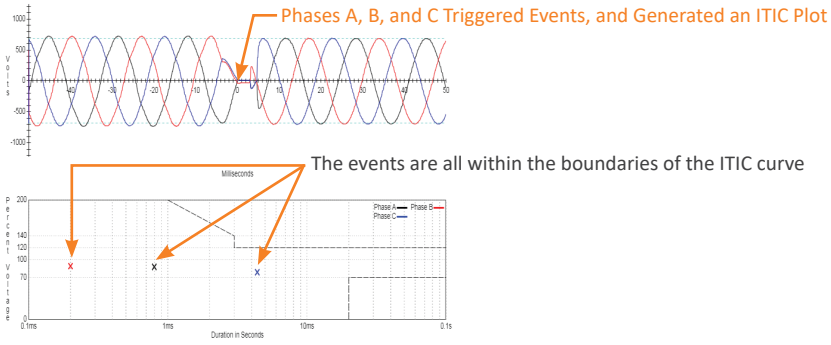
In the illustrated test, the STS was connected to two sources 150° out of phase. When the Source 2 breaker was opened, the STS performed an automatic transfer to the primary source. This delayed transfer event triggered ITIC plots for Phases A, B, and C, offering an immediate, easy-to-read visualization of system performance.

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).



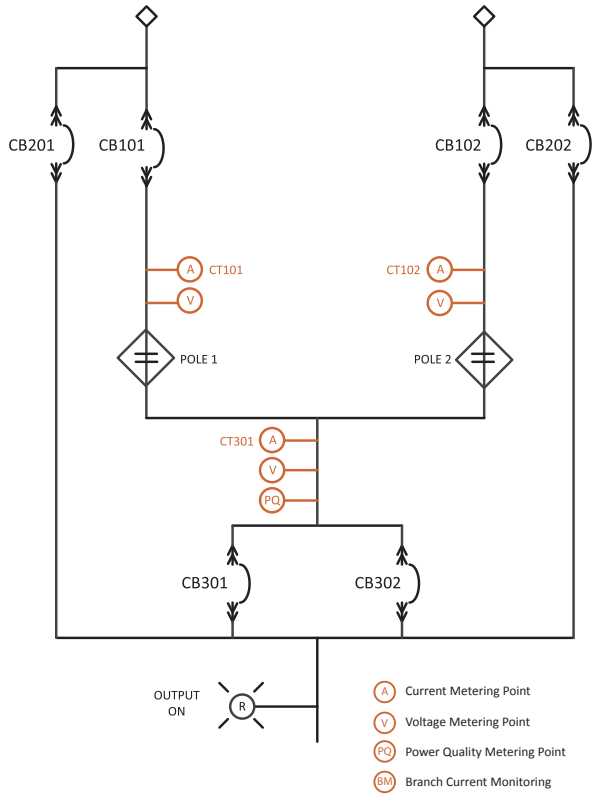
The ability to keep the transfers within the ITIC limits was verified through the Voltage Disturbance Analysis Tool (VDAT) plot shown above in the captured waveform.

Features/Power Quality Monitoring

LayerZero Power Quality Monitoring

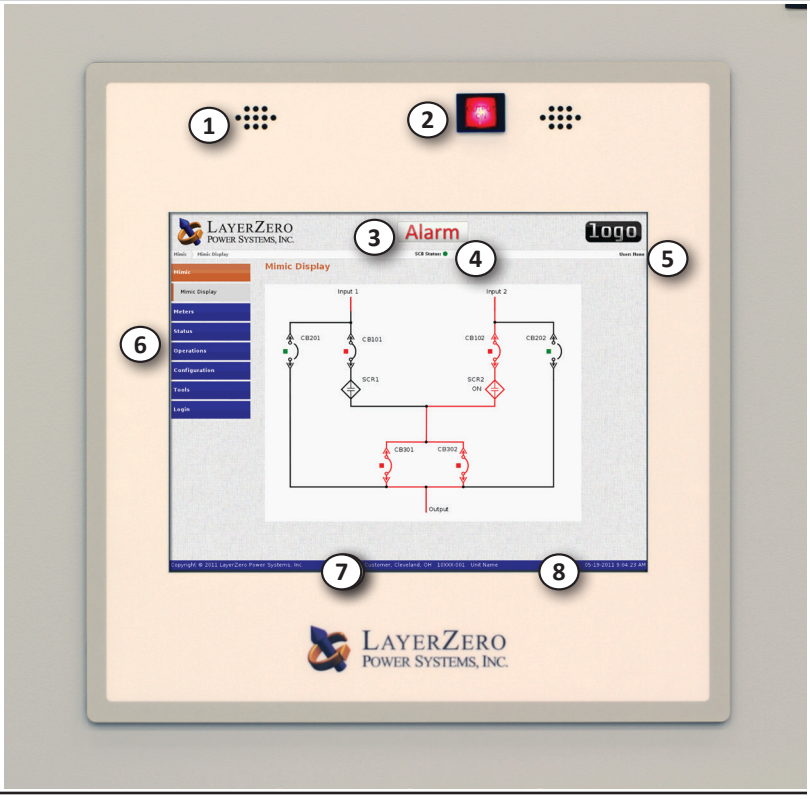
LayerZero PQM (Power Quality Monitoring) provides comprehensive visibility into every aspect of your critical power distribution system. Designed with both local and remote communication capabilities, PQM allows operators to monitor performance, alarms, and detailed power quality data, all from a centralized, intuitive interface.

LayerZero PQM delivers a vendor-neutral “bird’s eye” view of your power infrastructure, enabling you to instantly identify quality issues, UPS output irregularities, or alarm conditions. This intelligent monitoring system not only ensures peak reliability but also empowers users to review historical data and retrace the exact sequence of past events. No other tool in the mission-critical industry offers such powerful, time-based insight into system performance.



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



Power Quality Monitoring

Static Switch Power Quality Monitoring

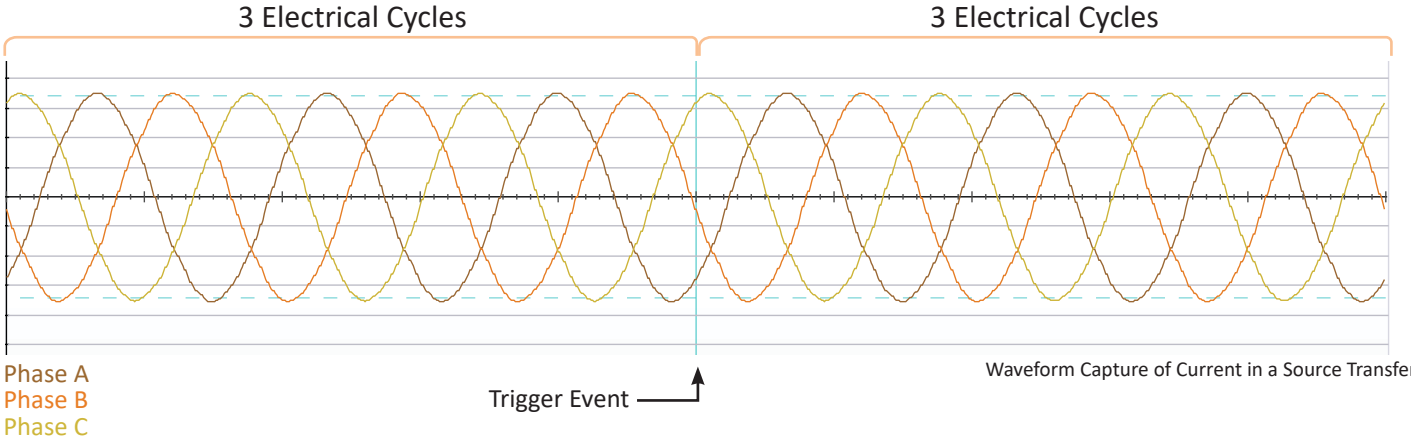
Every Series 70 eSTS is equipped with LayerZero SSQM (Static Switch Quality Monitoring), a robust system designed to deliver real-time visibility, event analysis, and proactive power quality assurance. With both local and remote access options, SSQM provides everything from standard monitoring and alarm reporting to advanced waveform and event data analysis.

LayerZero SSQM enhances operational awareness, allowing users to be vigilant, informed, and proactive in maintaining safe, stable, and reliable power distribution.

eSTS Touch Screen GUI showing Real Time Waveform Capture

LayerZero's SSQM Provides Answers

LayerZero's SSQM automatically captures and timestamps waveform data before and after every event, giving operators a clear picture of what occurred and when. This comprehensive historical data enables facilities to accurately identify root causes, streamline troubleshooting, and prevent future issues. By continuously collecting power quality information at the STS, PDU, and RPP levels, LayerZero SSQM provides the industry's mostcomplete post-event analysis, helping operators maintain uptime, safety, and confidence in every critical power decision.



Waveform Capture of Current in a Source Transfer

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)	✓

Technical Specifications: 3-Pole Static Transfer Switch

Mechanical Characteristics *	
Current/Voltage/Number of Poles	1000 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.

All product specifications are subject to change without notice.

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.

All product specifications are subject to change without notice.

Learn more at www.LayerZero.com

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Rev. 4/26 #11